

2001 Census: Local Authority Population Studies Progress Review

Office for National Statistics

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2001 Census: Local Authority Population Studies - Progress Review

Summary

The Office for National Statistics (ONS) has now concluded a series of studies designed to improve population estimates in the areas that proved hardest to count in the 2001 Census in England and Wales. The results of this work by ONS, involving experts from local government and other bodies, has confirmed the analysis contained in reports by the Statistics Commission and the Local Government Association, that the One Number Census (ONC) worked well in most areas but that there were a few cases where it was not able to sufficiently adjust for exceptional circumstances.

The results from this analysis show that there is a need for further revisions to the 2001 Census based population figures of around 60,000 for England and Wales as a whole. The revisions are within the 95% confidence interval for the population as a whole, as estimated from the ONC sample in 2002, of +/- 0.2 percent (or +/- 104,100). The revisions are confined to 15 local authorities (LAs). Manchester and Westminster are the authorities with the largest changes, while there are much smaller revisions announced today to 13 other LAs. The estimated revisions for these 15 LAs is given below, in alphabetical order:

Bristol	5,800
Cardiff	3,000
Derby	7,800
Hartlepool	1,500
Kingston upon Hull	6,600
Manchester	26,200
Middlesbrough	5,800
Milton Keynes	3,800
Newcastle-upon-Tyne	4,400
Southwark	4,800
Stockton-on-Tees	5,200
Sunderland	3,800
Wandsworth	5,000
Westminster	17,500
Wirral	2,800

The total revisions for these authorities amount to 104,000. This includes the provisional estimate of 24,500 already made for Manchester released in November 2003 which is confirmed by these results, with a small upwards revision. A further 20,000 are estimated already to have been included in an adjustment made in September 2003 following analysis of the Longitudinal Study. Thus the net change as a result of the work described in this report is a revision of around 60,000.

Following extensive study of areas where the 2001 Census population estimate may have been at risk, we have concluded that relatively small changes are required in some areas. Inevitably, uncertainty remains around these estimates. For Manchester and Westminster this is described in the '2001 Census: Manchester and Westminster Matching Studies Summary Report' published alongside this report and for the other LAs in section 3 of this report. For the great majority of areas, the previously published estimate remains the best estimate of the population.

These studies have given us a stronger understanding of the operation of the Census, Census Coverage Survey and local authority registers in areas where it is most difficult to measure the population. The knowledge we now have both about those authorities where an adjustment will be made this year and those where there is no or insufficient evidence to make an adjustment, either up or down, will be invaluable in the continuing work on population estimates we have in train.

1. Introduction

The methodology for the 2001 Census results based on the ONC approach was designed to produce the best possible estimates of population in September 2002. The ONC was

designed to take full account of people missed by the Census count itself. Further information on the ONC is given at this link: <http://www.statistics.gov.uk/census2001/pdfs/oncguide.pdf> and a glossary of ONC terms and abbreviations is given at this link: <http://www.statistics.gov.uk/census2001/pdfs/oncinfopaper.pdf>

Results from the 2001 Census identified a difference of 1.1 million in England and Wales, between the Census results and Mid-Year Population Estimates (MYEs) rolled forward from earlier censuses. Since the first results were published, ONS has conducted and reported extensive research to establish the main reasons for this difference, which are outlined in section 2. There was no single simple explanation for the 1.1 million difference, although the way it affected different local authorities was believed to have been explained by significant flaws in migration estimation, both inwards and outwards.

The Local Government Association published a report 'The 2001 One Number Census and its quality assurance' in September 2003. This report recognises that the design, planning and implementation of ONC strategies were highly positive developments for UK statistics. It acknowledges that there is a general acceptance of the census results for the great majority of local authorities, but highlights key concerns about certain aspects of the population estimates for areas with specific characteristics. The Statistics Commission published an interim report 'The 2001 Census in Westminster Interim Report' in October 2003. ONS again agrees with the main conclusion of this report - that the ONC was the best methodology available for a conventional Census but that the method could not correct for the most extreme circumstances, one of which was in Westminster.

This report describes the further work that has been carried out to investigate these issues and presents summary results. These results will feed into the revised Mid-Year Population Estimates (MYEs) for 2001 and 2002, and the new 2003 MYEs to be published on 9th September 2004. The MYEs will take account of the revisions already made in 2003, based on an analysis of the Longitudinal Study (http://www.statistics.gov.uk/about/methodology_by_theme/revisions_to_population_estimates/downloads/Methodology_for_revision_to_mid-2001.pdf) and the unattributable population change component included in the MYEs published in 2003.

The results presented here show that there is a need for further revisions to the 2001 Census based population figures of around 60,000 for England and Wales as a whole. The revisions are within the 95% confidence interval for the population as a whole, as estimated from the ONC sample in 2002, of +/- 0.2 percent (or +/- 104,100). The revisions are confined to 15 LAs. Manchester and Westminster are the most affected LAs, with smaller revisions to 13 other LAs. This report describes the analysis, uncertainties and future work in this area.

ONS produces a single point estimate for the population of each Local Authority (LA). There is inevitably uncertainty around these estimates. In the case of the most difficult areas, even after this further work, in some cases the revisions made are within the original confidence intervals published in 2002 but now represent better point estimates within those ranges.

2. Background

2.1 2001 Census and differences with Mid-Year Population Estimates

Results from the 2001 Census were published in September 2002. These results identified a difference of about 1.1 million (2 per cent) between the 2001 Census estimates for England and Wales and the MYEs rolled forward from the 1981 Census.

2.2 Explanation of differences – summary

The explanation of the difference between the 2001 Census based mid-2001 population estimates and the rolled forward population estimates is summarised numerically in the table below, with all adjustments detailed immediately under the table.

Intercensal Discrepancy	1,140,000
1991 Adjustment	351,000
Migration Adjustment	305,000
Longitudinal Study Adjustment (and others in November 2003)	193,000
Unexplained difference	291,000
Manchester Adjustment	26,000
Westminster Adjustment	17,000
LA Studies Adjustment	60,000
Longitudinal Study Consequential Adjustment	-20,000
Remaining unexplained difference	208,000

2.2a) 1991 Adjustment

The 2001 Census provided evidence that the 1991 base used to produce the mid-1991 population was too high. This was due to overestimation of the impact of underenumeration in the 1991 Census. The 1991 base was reduced by 351,000.

Further information on the 1991 adjustment published on 13th February 2003 is at the following link:

http://www.statistics.gov.uk/downloads/theme_population/Meth_PopES_82_2000.pdf

2.2b) Adjustment for migration

Migration is the most difficult component of population change to measure accurately due to the paucity of high quality data sources, particularly on emigration. Detailed research into the data sources and methods resulted in changes in methodology for compiling estimates of total international migration. The net effect of the revisions was a reduction in the estimate of net inward migration, and hence of the population estimates by 305,000 over the decade.

Further information on the adjustment for migration published on 12th June 2003 is at the following link:

http://www.statistics.gov.uk/about/methodology_by_theme/downloads/international_migration_methodology.doc

2.2c) Longitudinal Study Adjustment (and others in November 2003)

Revised 2001 MYEs were published on 26th September 2003 and added about 193,000 to the population of England and Wales. This revision has four components – the Longitudinal Study adjustment, a small element to take account of some unprocessed

forms, an update of the census base between September 2002 and February 2003 and a reduction to take into account previous double counting between England and Wales and Northern Ireland of some armed forces personnel.

The majority of this adjustment related to the first of these components. Research, including demographic analysis of sex ratios, fertility and mortality indicated a possible underestimate of men aged 25-49 and in particular those aged 25-34. Evidence from the Longitudinal Study (LS) was used to identify how many males aged 25-49 were underestimated nationally and how they were distributed across England and Wales. An adjustment based on the LS added 187,100 to the population of England and Wales across 68 LAs.

Further background information on the LS is given at this link:

http://www.statistics.gov.uk/about/methodology_by_theme/revisions_to_population_estimates/downloads/Analyses_of_Population_Estimates_using_the_Longitudinal_Study.pdf

Further information on the LS adjustment published on 26th September 2003 is given at this link:

http://www.statistics.gov.uk/about/methodology_by_theme/revisions_to_population_estimates/downloads/Methodology_for_revision_to_mid-2001.pdf

The other smaller adjustments made in November 2003 for some unprocessed forms, an update of the census base between September 2002 and February 2003 and a reduction for previous double counting of some armed forces personnel are described at the following link:

http://www.statistics.gov.uk/about/methodology_by_theme/revisions_to_population_estimates/implications.asp

2.2d) Unexplained difference

After making the adjustments already published, the majority of the 1.1 million difference was explained. However, there remained about 291,000 that was unexplained. The further studies reported here reduced the unexplained difference to around 208,000. This is likely to be largely attributable to remaining difficulties in estimating migration accurately and issues associated with the usual residence definition.

2.3 LA Population Studies

2.3a) 2001 Census: Manchester and Westminster Matching Studies

The Census Manchester and Westminster Studies were set up to investigate potential discrepancies between the administrative address lists of Manchester and Westminster City Councils, and the address list collated by ONS for the 2001 Census. Quality Assurance of the ONC had shown that these two authorities were exceptional. Manchester had the greatest difference between its Census-based population estimates and the administrative sources used in the Quality Assurance process. Westminster had the largest population change between the 2000 MYE and the 2001 Census results. As a result of the initial matching work, ONS released a provisional adjustment for Manchester in November 2003 of 14,000 addresses and 24,500 people - an explanation of this adjustment is given at this link:

http://www.statistics.gov.uk/downloads/theme_population/pe_manchester.pdf

ONS then continued the study to gain a fuller understanding of what happened in Manchester and to complete the matching work in Westminster. This study has resulted in an estimate for both authorities of the population by which the Census has undercounted. The conclusions are shown below and will feed into the calculation of the MYEs.

Further information on dependence, referred to in the table below can be found at this link:

<http://www.statistics.gov.uk/census2001/pdfs/dependency.pdf>

Local Authority	Adjustment	Percentage increase on original Census estimate	Reason for adjustment
Manchester	26,200	6.7%	Evidence of enumeration failure resulting in missed addresses Evidence that Census Coverage Survey sample did not reflect the changes in Manchester that had occurred by the time of the Census Evidence of dependence between the Census and Census Coverage Survey
Westminster	17,500	9.6%	Evidence of enumeration failure in several wards resulting in missed addresses Unprocessed forms Evidence that a high number of outliers may have reduced the estimate Evidence of dependence between the Census and Census Coverage Survey
Total	43,700		

Further details on the methods, results and continuing uncertainty are described in the '2001 Census: Manchester and Westminster Matching Studies Summary Report' published alongside this report.

2.3b) Programme of LA Studies

As part of the future work programme that ONS announced late in 2003, a rolling programme of Local Authority (LA) studies was started to identify where there are higher than usual risks that ONS population estimates might miss material changes at the local level. LAs were selected for study on the basis of criteria applied across all LAs. These criteria identified areas where the Census based population estimates could have been at risk. 13 LAs (excluding Manchester and Westminster) were identified as needing a revision, which totalled 60,300 across these LAs. This work is detailed in section 3.

2.4 Longitudinal Study Consequential Adjustment

Some of the additional people identified from the LA studies are the same people as were identified from the Longitudinal Study adjustment. This overlap amounts to some 20,000 people in total.

3. Programme of Local Authority Studies

A series of studies was planned, geared towards understanding the extent of the differences between the Census results for England and Wales and evidence from other sources, including local authority registers. Full details on the methods and results will be described in a report to be published alongside the population estimates on 9th September 2004.

3.1 Initial 9-area study

In November 2003 ONS selected LAs for initial study, based on a comparison of all 376 Local Authority Districts in England and Wales, using the following indicators of risk:

- Percentage reduction in population between the original 2000 and revised 2001 MYEs
- Census response rates
- Comparisons with administrative sources (for example Council Tax, Electoral Roll, Patient Registers)
- Factors associated with difficulty of enumeration, including the number of vacant properties and proportion of multi-occupied addresses

The LAs were ranked 376 - 1 on each measure. In order to reflect the relative merits and issues with each of the data sources used in the analysis, a weighting was added to each and an overall score for each LA calculated. The LAs were then ranked according to their final score, which resulted in the selection of 9 LAs named in the annex for study.

3.2 Further LA Study

The intention of the initial 9-area study was to work with each of the selected LAs to review specific areas of concern, in order to better inform population estimates during the years prior to the next Census in 2011, and to contribute to planning the next Census. This work was to help ONS to understand specific problems in different areas of the country. As a result of meetings with the selected LAs and some initial work including the Manchester and Westminster study, it became clear that there may have been some areas where initial enumeration was poor and the ONC could not have compensated for this. ONS reviewed the available evidence using a refined set of indicators of risk in the Census results. The study assessed whether there was sufficient evidence to justify adjustments to the 2001 MYEs for any area, in order to feed into production of the 2003 MYEs in September 2004.

3.2a) Indicators for selection of LAs and consideration of adjustment

All LAs across England and Wales were reviewed on the basis of a series of indicators of risk aimed at identifying where underlying assumptions in the ONC may have been stretched. The indicators included those used to select the initial 9 LAs plus the following:

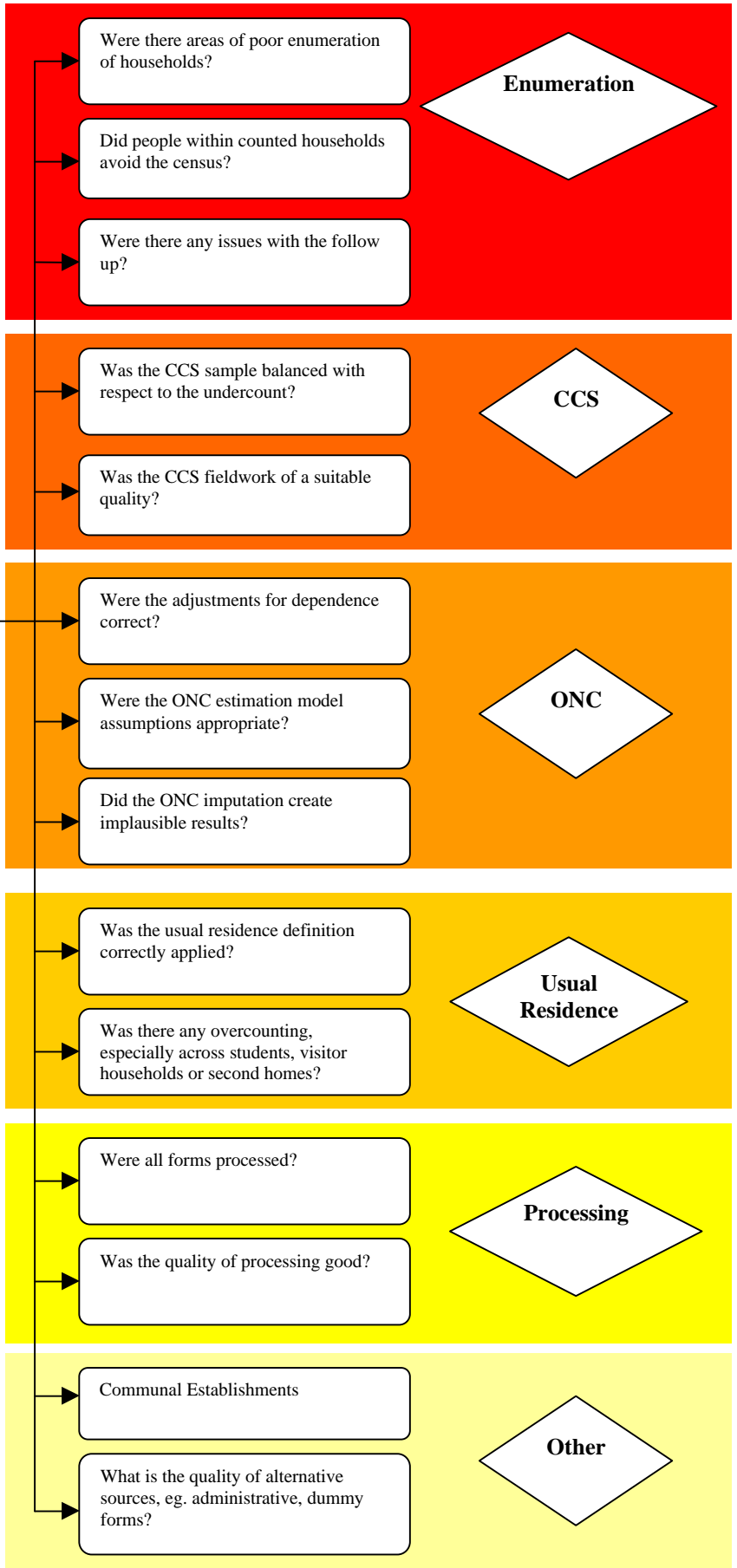
- Enumeration – analysis of Census fieldwork
- Census Coverage Survey (CCS) – assessment of the extent to which the CCS could compensate for underenumeration. In some areas the information on which the sample was designed could not reflect rapid changes in the area.
- ONC Process – analysis of response rates, outliers, change in Hard to Count (HtC) distribution
- Processing of Census forms

This process selected another 23 LAs named in the annex for further assessment.

The following framework was used to identify the 13 LAs (excluding Manchester and Westminster) where there is evidence of a basis for making a better estimate of the population.

Framework to identify LAs
where a better estimate of
the population can be made

KEY ISSUE:
Is there any indication that
the Census results were at
risk?



3.2b) Brief account of methods for adjustment

The methods of adjustment adopted are designed to provide more robust estimates of population using the ONC framework by including a modified approach to allow for specific unusual local circumstances. They also take into account local and other evidence relevant to the estimation of the population in each area. The approaches used included the following:

- Estimating for localised extremely high undercount
 - Used where there is evidence of extremely poor enumeration, high non-response or processing issues, for which the ONC could not compensate.
 - This method identifies areas within the LA with the above evidence and essentially treats them separately within the ONC. The original ONC method still stands for the rest of the area, but these separated areas have their own population estimate constructed using Council Tax based populations which are then added to the estimates for the other areas.
- Borrowing strength
 - Used where there is evidence of a problem with CCS sample size or fieldwork.
 - This method is based on the original contingency strategy from the ONC process whereby new estimates are produced based on data from areas showing similar demographic characteristics. The borrowing strength areas had previously been defined through the ONC consultation process.
 - The application of the ONC adjustments for the borrowing strength areas is used, as described in section 5.1 in 'A Quality Assurance and Contingency Strategy For the One Number Census' at:
<http://www.statistics.gov.uk/census2001/pdfs/oncinfopaper.pdf>
- Post-stratification of Hard to Count (HtC) Index
 - HtC Index has a value of 1, 2 or 3 based on certain demographic characteristics of an area. HtC 3 is classed as the hardest to count.
 - This method is used where there is evidence that the original HtC index did not reflect local circumstances in 2001.
 - The method creates a new HtC stratification using 2001 Census data.

Where more than one issue was identified, a combination of methods has been applied.

3.2c) LAs where an adjustment has been made

The adjustments that have been made are in the small number of areas where there is evidence which provides a basis for making a better estimate of the population.

The table below shows the 13 LAs (excluding Manchester and Westminster) where an adjustment has been made, the scale of the adjustment and the extremely difficult circumstances for which the ONC could not compensate.

As with any estimate there remain inevitable uncertainties, even after the extensive work of the LA Studies. The 95% confidence intervals in the final column are those used in the 2001 Census estimates published in September 2002, at the following link:

<http://www.statistics.gov.uk/census2001/downloads/95conf.xls>

These are provided for information to give an indication of the level of uncertainty likely to be present around the point revised estimate of the population.

Local Authority	Adjustment	Percentage increase on 2001 Census estimate	Reasons for adjustment	95% Confidence Interval (+/-) around the 2001 Census estimate
Bristol	5,800	1.5%	Enumeration issues in 3 wards	6,500
Cardiff	3,000	1.1%	Enumeration issues in 3 wards	4,700
Derby	7,800	3.6%	Enumeration issues in 1 ward Evidence that the HtC Index was not a good stratifier	2,000
Hartlepool	1,500	1.6%	Evidence that the HtC Index was not a good stratifier	700
Kingston upon Hull	6,600	2.6%	Evidence that the HtC Index was not a good stratifier HtC 3 stratum estimates were implausible	3,200
Middlesbrough	5,800	4.3%	Enumeration issues in 2 wards Evidence that the HtC Index was not a good stratifier HtC 3 stratum estimates were implausible	1,200
Milton Keynes	3,800	1.8%	Evidence that HtC was not a good stratifier LA allocation of undercount was not robust	3,100
Newcastle-upon-Tyne	4,400	1.7%	Enumeration issues in 5 wards	7,600
Southwark	4,800	2.0%	Enumeration issues in 1 ward Significant number of unprocessed Census forms	7,500
Stockton-on-Tees	5,200	2.9%	Evidence that the HtC Index was not a good stratifier HtC 3 stratum estimates were implausible	1,300
Sunderland	3,800	1.4%	Evidence that the HtC Index was not a good stratifier HtC 3 stratum estimates were implausible	3,400
Wandsworth	5,000	1.9%	Evidence that the HtC Index was not a good stratifier HtC 3 stratum estimates were implausible	9,200
Wirral	2,800	0.9%	Enumeration issues in 1 ward Evidence that the HtC Index was not a good stratifier	6,100
Total	60,300	0.1%		

3.2d) Conclusions from the study

Nationally, the adjustments made as a result of this further work total 0.1 per cent of the 2001 Census population for England and Wales. Some of the changes, especially in relation to enumeration failure, should have been taken into account in the original estimates published in September 2002 and this has been done now within these estimates. Most of the changes, however, rely on analysis that could not have been done within the time available or with the information that was known at that time. We have studied areas where problems are likely to have occurred and concluded that relatively small changes are required in some areas, but for the majority the Census based population estimate remains the best estimate of the population. These conclusions reinforce earlier analysis described in the Statistics Commission and Local Government Association reports.

ONS has concluded, on the basis of all the evidence available that a better estimate of population can be made in 15 areas, where extremely difficult circumstances occurred. From these studies, ONS has also developed further knowledge of the ONC assumptions and how they are stretched in exceptional circumstances.

These studies have given us a stronger understanding of the operation of the Census, CCS and local authority registers. The knowledge we now have both about those authorities where an adjustment will be made this year and those where there is no or insufficient evidence to make an adjustment, either up or down, will be invaluable in the continuing work on population estimates we have in train.

3.3 Links to MYEs

The 2001 MYEs will be revised to incorporate the adjustments published above. The revised population estimates will also take into account the likelihood that some of the additional people identified from the LA studies are the same people as were identified from the Longitudinal Study adjustment. As noted above this overlap amounts to some 20,000 people in total. The revised 2001 MYEs will feed into a revision of the 2002 MYEs and the calculation of the new 2003 MYEs. These will also take into account other minor amendments and corrections arising from the usual quality assurance process for the MYEs.

4. Future

4.1 Rolling programme of LA Studies

ONS intends to continue to work with LAs over the next few years, including the forward looking work with the areas originally identified for study in 2004 and with a new set of LAs in 2005 and 2006. The objective of these studies is to carry out further work to investigate administrative sources, assess their reliability and determine the scope for utilising these sources in population statistics.

4.2 2007 Special Population Study

The intention to conduct a mid-decade special population study for certain areas was officially recognised when the report 'A Demographic Statistics Service for the 21st century' was released. It is the third action listed in the plan that was published with the National Statistician's covering letter to the study, at this link:

http://www.statistics.gov.uk/about/methodology_by_theme/dem_stat_ser_act_points.asp

ONS has set up a project to take forward the work. The project aim is to reduce the risk that, when population estimates become available from the 2011 Census, users of population statistics are once again faced with large differences between these and the mid-year population estimates based on the 2001 Census.

The 2007 Special Population Study is part of ONS's programme of work to improve population estimates, including the Local Authority Population Studies and the implementation of the action plan to the National Statistics Quality Review on international migration. A central theme of this work is improving our understanding of sources such as administrative data and investigating the scope for utilising those sources to help improve population statistics.

4.3 Census 2011

Through the 2001 Census: Manchester and Westminster Matching Studies and Local Authority Population Study, ONS has gained a further insight into specific problems in different areas of the country and characteristics that can be difficult to enumerate. This knowledge will be taken forward and fed into the planning and development of the 2011 Census.

Annex – Local Authority Selection

9 LAs selected for initial study (in alphabetical order)

Bradford
Bristol
Derby
Kingston upon Hull
Middlesbrough
Shepway
Southend-on-Sea
Wandsworth
Wirral

23 other LAs selected for further assessment (in alphabetical order)

Birmingham
Blackburn with Darwen
Cardiff
Camden
Ceredigion
Croydon
Great Yarmouth
Halton
Hartlepool
Kensington and Chelsea
Liverpool
Manchester (covered in the Matching Study)
Milton Keynes
Newcastle-upon-Tyne
Salford
Sandwell
Sheffield
Southwark
Stockton-on-Tees
Sunderland
Teesdale
Tower Hamlets
Westminster (covered in the Matching Study)