

## **2001 Census**

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# **Local Authority Population Studies: Full report**

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### Annexes to this report:

#### Population Estimates Numbers

([www.statistics.gov.uk/statbase/Product.asp?vlnk=601&More=N](http://www.statistics.gov.uk/statbase/Product.asp?vlnk=601&More=N))

#### 2001 Census: Manchester and Westminster Matching Studies Full Report

([www.statistics.gov.uk/downloads/theme\\_population/ManchesterandWestminster\\_FullReport.pdf](http://www.statistics.gov.uk/downloads/theme_population/ManchesterandWestminster_FullReport.pdf))

#### Selection of Local Authorities for further study

([www.statistics.gov.uk/downloads/theme\\_population/LAStudy\\_SelectionCriteria.pdf](http://www.statistics.gov.uk/downloads/theme_population/LAStudy_SelectionCriteria.pdf))

#### 32 Full LA Reports

(See table 1 on page 13 and list on page 14)

#### Adjustment Methodology

([www.statistics.gov.uk/downloads/theme\\_population/LAStudy\\_AdjustmentMethodology.pdf](http://www.statistics.gov.uk/downloads/theme_population/LAStudy_AdjustmentMethodology.pdf))

#### Longitudinal Study Consequential Adjustment

([www.statistics.gov.uk/downloads/theme\\_population/LAStudy\\_LS\\_ConsequentialAdjustment.pdf](http://www.statistics.gov.uk/downloads/theme_population/LAStudy_LS_ConsequentialAdjustment.pdf))

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## Executive summary

The Office for National Statistics (ONS) has 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 show that the One Number Census (ONC) worked well in most areas, but that there were a few cases where it was not able sufficiently to adjust for exceptional circumstances.

Late in 2003, ONS announced a programme of Local Authority (LA) studies covering nine LAs. This was subsequently extended to include analysis of all the LAs in England and Wales to identify where the 2001 Census population estimates might have been at risk. From this analysis, 32 LAs were selected for further study to determine the significance and scale of that risk. An extensive review was carried out for each of these selected areas to assess whether there was evidence that the population might have been under or overestimated, and to determine whether a better estimate of the population could be made. ONS concluded that better estimates of the population could be made in 15 areas; Manchester and Westminster were the authorities with the largest changes with much smaller revisions to another 13 LAs. For the great majority of areas (361 LAs), the previously published 2001 Census based population estimate remains the best estimate of the population.

The results from this analysis were published in a summary report on 8 July titled 2001 Census: Local Authority Population Studies - Progress Review, available at [www.statistics.gov.uk/downloads/theme\\_population/2001Censuslapopulationstudies.pdf](http://www.statistics.gov.uk/downloads/theme_population/2001Censuslapopulationstudies.pdf). The analysis showed that there was a need for revisions to the 2001 Census based population figures of around 107,000 for England and Wales as a whole (58,000 of which were further revisions in addition to the results provisionally announced in November 2003). The revisions are just outside the 95 per cent 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 were confined to 15 local authorities (LAs). This report and annexes provide further details of the LA Population Studies.

The adjustments for LAs contained within this report have been included in the new mid-year population estimates for 2001. The census database itself will not be revised following the publication of these adjustments. The best source of population estimates for 2001 are the revised MYEs.

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 planning the 2011 Census and in continuing work on population estimates.

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## 2001 Census

### Local Authority Population Studies: Full report

#### 1 Introduction

The population is getting harder to count, particularly in the years between censuses. The current period of population change reflects a mix of drivers and population flows have become much greater in the last two decades. This period of change is expected to continue as family and household structures evolve and respond to social, demographic and economic forces, the EU expands and labour supply continues its international flexibility.

The census is a key anchor for much of the official statistical system, and the benchmark for numerous surveys and analysis. The methodology for the 2001 Census, based on the One Number Census (ONC) approach, was designed to produce the best possible estimates of population in April 2001. The ONC project aimed to integrate the 2001 Census counts with the estimated level of underenumeration in the census, that is the number of households and people not counted by the enumeration itself. The ONC process recognised that there would be areas that were hard to count, where the census enumeration itself may have missed some people, and the Census Coverage Survey (CCS) was designed to compensate for this. The ONC provided a new base for the mid-year population estimates at the Local Authority (LA) level. It also adjusted the Census database itself for the estimated undercount so that all statistics added to 'One Number' - the national estimate of the population. Further information on the ONC is given at [www.statistics.gov.uk/census2001/pdfs/oncguide.pdf](http://www.statistics.gov.uk/census2001/pdfs/oncguide.pdf) and a glossary of ONC terms and abbreviations is given at [www.statistics.gov.uk/census2001/pdfs/oncinfopaper.pdf](http://www.statistics.gov.uk/census2001/pdfs/oncinfopaper.pdf)

The ONC was the framework used for estimating and adjusting for undercount in the 2001 Census. A key element of the assessment of the ONC estimates of population was a quality assurance process which followed a strategy that had been agreed with representatives of local authorities. This involved the comparison of local authority population by age and sex against diagnostic ranges derived from rolled-forward population estimates and aggregated administrative sources. Where the ONC

estimates fell outside of the diagnostic ranges, extensive checks of the ONC results were undertaken and contingency action was taken if any issues were identified. In conjunction with quantitative analyses a large amount of qualitative information from the field was considered.

Further information on the ONS quality assurance process can be found in this article at [www.statistics.gov.uk/CCI/article.asp?ID=487&Pos=1&ColRank=2&Rank=224](http://www.statistics.gov.uk/CCI/article.asp?ID=487&Pos=1&ColRank=2&Rank=224)

The diagnostics used in the quality assurance process were the best indicators of population that were available prior to the Census. It was clear, however, that the quality of administrative sources varied considerably for quality assurance purposes; definitions differ and coverage varies between different groups and areas.

The 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. Because of concern over this difference at the national level and because of its size for some Local Authorities, ONS has continued to conduct and report on extensive research to establish the reasons for this difference.

This report and annexes cover in detail the programme of Local Authority (LA) studies initiated to identify areas where there were higher than usual risks that ONS population estimates might have missed material changes at the local level. It details the further analysis undertaken in the 32 areas selected to determine the significance and scale of the risk to the 2001 Census population figure; this includes detailed LA specific reports for each of the 32 authorities. These specific reports document the analysis undertaken to determine whether a better estimate of the population could be made in the areas and explain the calculation of any adjustment made. Adjustments made have fed into the Mid-Year Population Estimates (MYEs) published today, both the revised MYEs for 2001 and 2002, and the new 2003 MYEs.

The results of this work by ONS, involving experts from local government and other bodies, have confirmed the analysis contained in reports by the Statistics Commission and the Local Government Association, that the ONC worked well in most areas but that there were a few cases where it was not able sufficiently to adjust for exceptional circumstances.

## 2 Context: The difference between the 2001 Census results and 2001 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 2001 MYEs rolled forward from the 1981 Census.

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 described immediately under the table.

<b>Intercensal Discrepancy</b>	<b>1,140,000</b>
1991 Adjustment	351,000
Migration Adjustment	305,000
Longitudinal Study Adjustment (and others in September 2003)	193,000
<b>Unexplained difference</b>	<b>291,000</b>
LA Population Studies	107,000 <sup>1</sup>
Longitudinal Study Consequential Adjustment (and other adjustment in September 2004)	-25,000 <sup>2</sup>
<b>Remaining unexplained difference</b>	<b>209,000</b>

1 This figure (107,000) is different from the one published in the summary report on 8 July due to amendments made to the revisions in three local authorities. This figure (107,000) may not tally with others in the report due to rounding.

2 25,000 represents the final consequential adjustments in September 2004. The figure (20,000) contained in the summary report published on 8 July was a provisional estimate based on work in progress at that point in time.

### 2.1 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 13 February 2003 is at

[www.statistics.gov.uk/downloads/theme\\_population/Meth\\_PopES\\_82\\_2000.pdf](http://www.statistics.gov.uk/downloads/theme_population/Meth_PopES_82_2000.pdf)

### 2.2 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 12 June 2003 is at [www.statistics.gov.uk/downloads/theme\\_population/Methodology%20for\\_Revised\\_International\\_Migration\\_Estimates.doc](http://www.statistics.gov.uk/downloads/theme_population/Methodology%20for_Revised_International_Migration_Estimates.doc)

### 2.3 Longitudinal Study Adjustment (and others in September 2003)

Revised 2001 MYEs were published on 26 September 2003 and added approximately 193,000 to the population of England and Wales. This revision has four components - primarily the Longitudinal Study adjustment, a small element to take account of some unprocessed questionnaires, 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, the Longitudinal Study adjustment. 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 also to determine 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 local authorities.

Further background information on the LS is given at [www.statistics.gov.uk/about/methodology\\_by\\_theme/revisions\\_to\\_population\\_estimates/downloads/Analyses\\_of\\_Population\\_Estimates\\_using\\_the\\_Longitudinal\\_Study.pdf](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 26 September 2003 is given at [www.statistics.gov.uk/about/methodology\\_by\\_theme/revisions\\_to\\_population\\_estimates/downloads/Methodology\\_for\\_revision\\_to\\_mid-2001.pdf](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 September 2003 for some unprocessed questionnaires, 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 [www.statistics.gov.uk/about/methodology\\_by\\_theme/revisions\\_to\\_population\\_estimates/implications.asp](http://www.statistics.gov.uk/about/methodology_by_theme/revisions_to_population_estimates/implications.asp)

## 2.4 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 reduce the unexplained difference to around 209,000. This is likely to be largely attributable to remaining difficulties in estimating migration accurately and issues associated with the usual residence definition. ONS carried out a National Statistics Quality Review on International Migration Statistics to address the issues associated with estimating migration. This review reported in September 2003 is available at [www.statistics.gov.uk/methods\\_quality/quality\\_review/population.asp](http://www.statistics.gov.uk/methods_quality/quality_review/population.asp)

The 2001 Census was conducted on a usual residence base, that is, people were asked to fill in details on a questionnaire at their place of usual residence. It is likely that areas which have high numbers of mobile people, where usual address is not easy to define, will be difficult to count. Two such groups are students who live at difference addresses during term time and holidays and many members of the armed forces. Work was carried out for both these groups within the ONC process to quantify the numbers of people that fall outside the category of usually resident.

Other groups which are difficult to count due to the usual residence definition would be people with second homes, people living in temporary accommodation and people who consider themselves to be in the country temporarily. Also for those people who live at more than one address during the week, or who live away from their usual home for part of the year, such as contract workers, the concept of usual residence

becomes less clear. Quantifying these groups of mobile people who fall outside the category of usual residence is extremely difficult due to the lack of evidence available.

## 2.5 LA Population Studies

Late in 2003, ONS announced a rolling programme of Local Authority (LA) studies 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 these studies using indicators to identify areas where there was the potential that the census based population estimates could have been at risk. These studies, which are described in section 3, concluded that 15 LAs (including Manchester and Westminster) were identified as needing a revision.

## 2.6 Longitudinal Study Consequential Adjustment (and other in September 2004)

The total consequential adjustments are 25,000 which is 23,200 from the Longitudinal Study and 1,300 from unprocessed questionnaires. These adjustments are described in this section below.

Section 2.3 outlines the adjustment made on 26 September 2003 based on evidence from the longitudinal study (LS). The adjustments made as a result of the LA Population Studies cover some of the same people as were identified in the LS adjustment. As a consequence the LS adjustment has now been revised to avoid any double counting. Nationally the size of this adjustment has reduced from 187,000 to 164,000. This revision of 23,000 means that the adjustment made in 68 local authorities in September 2003 has been reduced by between 11 and 15 per cent. This has fed into the revised 2001 MYEs as well as the revised 2002 MYEs and new 2003 MYEs. Further details can be found in 'Longitudinal Study Consequential Adjustment' at [www.statistics.gov.uk/downloads/theme\\_population/LAStudy\\_LS\\_ConsequentialAdjustment.pdf](http://www.statistics.gov.uk/downloads/theme_population/LAStudy_LS_ConsequentialAdjustment.pdf)

Section 2.3 also details an adjustment made in September 2003 for some unprocessed questionnaires. This adjustment covered several LAs, two of which are where an adjustment has been made as a result of the LA Population Studies. The latter adjustment in those two LAs covers the people that were identified through the unprocessed questionnaires adjustment. To avoid any double counting this adjustment of 1,300 people has been removed from those two LAs.

### 3 Programme of Local Authority Studies

The programme of local authority studies covers two different types of study: the Manchester and Westminster Matching Studies and the 2004 LA 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. To complement the matching studies, the 2004 LA Studies were also set up, geared towards understanding the extent of the differences between the census results for England and Wales and evidence from other sources, including local authority administrative sources.

#### 3.1 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 difference 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 [www.statistics.gov.uk/downloads/theme\\_population/pe\\_manchester.pdf](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.

In addition to the matching work, an assessment of the performance of the ONC in these two areas was also carried out as part of the LA Studies. The analysis of the ONC and methods of adjustment used in the LA Studies are described in sections 3.3b) and 3.3c). Both the information from the matching studies and from the LA Studies was used in making a judgement of the amount by which the census underestimated the populations in Manchester and Westminster.

Further details on the matching study methods and results are described in '2001 Census:

Manchester and Westminster Matching Studies Full Report' at [www.statistics.gov.uk/downloads/theme\\_population/ManchesterandWestminster\\_FullReport.pdf](http://www.statistics.gov.uk/downloads/theme_population/ManchesterandWestminster_FullReport.pdf)

#### 3.2 Initial scope of the 2004 LA Studies

The original intention of the 2004 LA Studies announced in November 2003 was to complement the matching studies by working with a selection of Local Authorities to review specific areas of concern, in order better to inform population estimates during the years prior to the next Census in 2011, and to contribute to planning the next Census. This work would help ONS to understand specific problems in different areas of the country. ONS selected LAs for initial study based on a comparison of all 376 Local Authority Districts in England and Wales, using the following indicators:

- 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. Each measure was weighted to reflect the relative merits of each of indicator used in the analysis, and an overall score for each LA calculated. The LAs were then ranked according to their final score, which resulted in the selection of the nine LAs listed below for study.

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

#### 3.3 Expanded 2004 LA Studies

As a result of some initial work and meetings with the selected Local Authorities, plus further work on the Manchester and Westminster study, it became clear that although the ONC was designed to compensate for poor enumeration

there might have been some areas where initial enumeration was so poor that the ONC could not have adjusted for this.

ONS therefore decided to review all the available evidence, involving the collation of analyses undertaken since the release of the census results, which addressed the areas where significant risks could have occurred in the 2001 Census results. A comprehensive set of indicators were collated for all 376 LAs across England and Wales. This allowed comparisons between all LAs, so that extreme cases could be identified. It should be noted that the aim of these indicators was to highlight potential risk in the census results. For some LAs, more detailed analysis confirmed that the existing estimate remained the best estimate of the population. For others, it was concluded that a better estimate of the population could be made. In light of these analyses, methods for adjustment were developed and applied to selected LAs. These methods were based on the ONC framework, including a modified approach that allowed for extreme cases which had breached the assumptions on which the ONC was based. The methods were designed to provide better estimates of population in those LAs where there was evidence that the census had underestimated the population.

### 3.3a) Indicators for selection of LAs

All LAs across England and Wales were reviewed on the basis of a series of indicators aimed at identifying areas where underlying assumptions in the ONC might have been breached, or where there was consistent evidence across a number of sources to suggest an underestimate.

The framework shown in figure 1 - 'Framework to identify LAs where a better estimate of the Population can be made' on page 10, was considered when developing the indicators:

- Enumeration - analysis of Census fieldwork operation.
- 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 did not reflect rapid changes in the area.
- ONC Process - analysis of response rates, outliers, change in Hard to Count (HtC) distribution.
- Population Definitions - The 2001 Census was conducted solely on a usual residence base. Quantifying the numbers of people that were excluded because of definitional discrepancies is very difficult. Limited information on visitors was collected, therefore comparisons with figures collected on a different definitional base cannot be made.
- Processing of Census questionnaires - analysis of questionnaires not processed and late returned questionnaires.
- Comparisons with administrative sources (for example council tax, electoral roll, patient registers, child benefit data, pensions data).

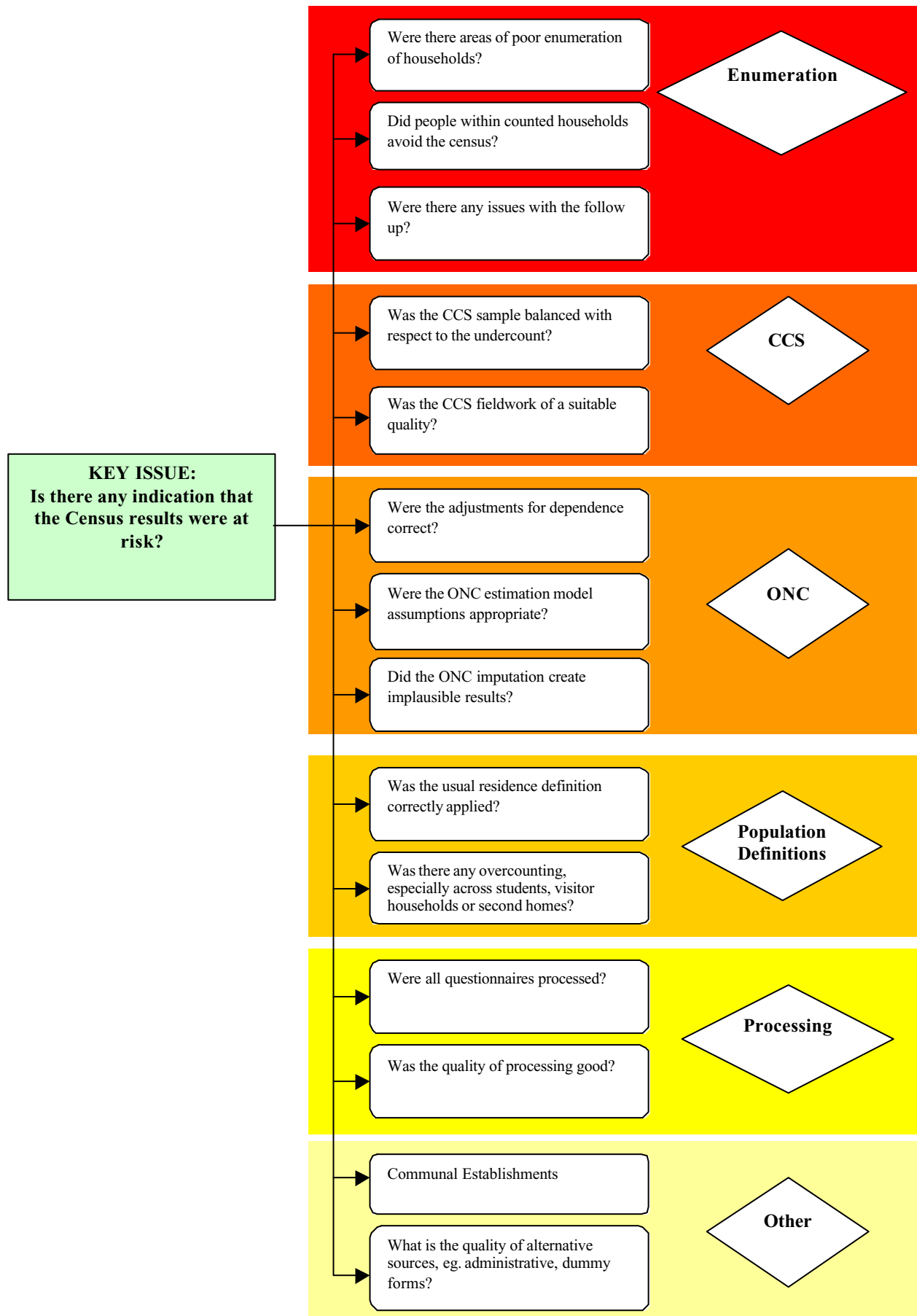
The indicators were drawn from sources available nationally for all 376 LAs and were designed to provide a comprehensive analysis of where there was a potential risk of underestimating population. The LAs were ranked according to each indicator in turn. To determine which observations were classed as extreme, the 95th or 99th centiles were used, based on an assessment of the indicator. For those indicators which were judged to be highly correlated with a risk of underestimation the 95th centile was used and for all others the 99th centile. More information about the indicators used and the results of the analysis given in 'Selection of Local Authorities for further study' at [www.statistics.gov.uk/downloads/theme\\_population/LAStudy\\_SelectionCriteria.pdf](http://www.statistics.gov.uk/downloads/theme_population/LAStudy_SelectionCriteria.pdf)

Each of the LAs was then examined by considering the ranks of the other indicators which did not produce extreme observations, in order to assess if there was consistent evidence across a number of sources to suggest an underestimate. Further information on Council Tax and Census comparisons at ward level was also considered at this stage. Where there was consistent evidence across the indicators of a potential risk the LA was taken forward for in depth study.

For LAs where there was not sufficient consistent evidence across indicators of a risk in the census results it was concluded that the census results remain the best estimate of the population.

In addition to the nine LAs selected for the original study, a further 23 LAs (listed below) were selected for further study.

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

**Figure 1****Framework to identify LAs where a better estimate of the population can be made**

### 3.3b) Consideration of adjustment

Risks in the census results could occur for a number of reasons throughout the census process, as laid out in Figure 1 above: 'Framework to identify LAs where a better estimate of the population can be made'. This framework presents a series of questions grouped into six key areas. These questions formed the basis of the in depth analysis for each of the selected LAs.

There are complex inter-dependencies between these key areas. For example, even if there was evidence of poor enumeration, the ONC may have made a robust adjustment for these problems through the CCS. Nevertheless, the framework offered a comprehensive guide in analysing the risk associated with the census results.

Detailed reports have been produced for each of the 32 LAs selected. These assess whether there is evidence of a significant risk in the census estimates. The reports can be found linked in sections 3.3d) and 3.3e).

As a result of this in depth analysis, judgements were made on the basis of evidence that there were 15 LAs (including Manchester and Westminster) where a better estimate of the population could be made, and thus result in an adjustment.

### 3.3c) Account of methods for adjustment

The methods of adjustment focus on the assumptions that underpin the ONC process, such as the quality of the census enumeration, CCS sample balance and independence of the Census and CCS. Where there was evidence that these assumptions had not been met in a selected LA, a more robust estimate of population was produced. This more robust estimate used the ONC framework, but included a modified approach to take into account the cause of risk in the census results and specific unusual local circumstances.

As outlined earlier in section 3.1, the QA process for the ONC indicated that Manchester and Westminster were exceptional. This is reflected in the methods of adjustment used which incorporated additional information from the matching studies and is explained more fully in '2001 Census: Manchester and Westminster Matching Studies Full Report' at [www.statistics.gov.uk/downloads/theme\\_population/ManchesterandWestminster\\_FullReport.pdf](http://www.statistics.gov.uk/downloads/theme_population/ManchesterandWestminster_FullReport.pdf)

The approaches used to adjust the LAs included the following:

- Estimating for extremely high localised 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 extremely high undercount 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.
  - Where there is evidence that the census failed due to exceptional circumstances, the census count could not be used in a particular ward. In these cases the council tax is taken to be the next best available count.
- 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 for the ONC process whereby new estimates are produced based on data from areas showing similar demographic characteristics. Areas from which to borrow strength 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 [www.statistics.gov.uk/census2001/pdfs/oncinfopaper.pdf](http://www.statistics.gov.uk/census2001/pdfs/oncinfopaper.pdf)
- Post-stratification of Hard to Count (HtC) Index
  - The HtC Index indicates areas that were identified as hard to count according to data from the 1991 Census. The 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, and the ONC did not compensate for this
- 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. Further description of the adjustment methodology is given in 'Adjustment Methodology' at [www.statistics.gov.uk/downloads/theme\\_population/LAStudy\\_AdjustmentMethodology.pdf](http://www.statistics.gov.uk/downloads/theme_population/LAStudy_AdjustmentMethodology.pdf)

3.3d) LAs where an adjustment has been made  
An adjustment was made in 15 areas. These are areas where there was evidence which provided a basis for making a better estimate of the population. The adjustments for these LAs were published on 8 July in 2001 Census: Local Authority Population Studies - Progress Review and are set out in Table 1 on page 13.

The Manchester and Westminster Matching Studies resulted in an estimate for both authorities of the population by which the census undercounted - 26,200 in Manchester and 17,500 in Westminster. Further details on the circumstances surrounding this estimate can be found in '2001 Census: Manchester and Westminster Matching Studies Full Report' at [www.statistics.gov.uk/downloads/theme\\_population/ManchesterandWestminster\\_FullReport.pdf](http://www.statistics.gov.uk/downloads/theme_population/ManchesterandWestminster_FullReport.pdf) Further analysis can be found in the LA specific reports covering these authorities which are linked here:

Manchester: [www.statistics.gov.uk/downloads/theme\\_population/LAStudy\\_Manchester.pdf](http://www.statistics.gov.uk/downloads/theme_population/LAStudy_Manchester.pdf)

Westminster: [www.statistics.gov.uk/downloads/theme\\_population/LAStudy\\_Westminster.pdf](http://www.statistics.gov.uk/downloads/theme_population/LAStudy_Westminster.pdf)

Table 1 below shows the other 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 per cent confidence intervals

in the penultimate column are those used in the 2001 Census estimates published in September 2002, at [www.statistics.gov.uk/census2001/downloads/95conf.xls](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.

Table 1 also links in the final column to detailed reports for the 13 LAs (excluding Manchester and Westminster) where an adjustment was made.

**Table 1**  
**13 LAs other than Manchester and Westminster where an adjustment has been made**

Local Authority	Adjustment	Percentage increase on 2001 Census estimate	Reasons for adjustment	95% Confidence Interval (+/-) around the 2001 Census estimate	Link to detailed LA Report
<b>Bristol</b>	6,700 <sup>1</sup>	1.8%	Enumeration difficulties in 3 wards Unprocessed questionnaires	6,500	<a href="http://www.statistics.gov.uk/downloads/theme_population/LAStudy_Bristol.pdf">www.statistics.gov.uk/downloads/theme_population/LAStudy_Bristol.pdf</a>
<b>Cardiff</b>	3,000	1.1%	Enumeration difficulties in 3 wards	4,700	<a href="http://www.statistics.gov.uk/downloads/theme_population/LAStudy_Cardiff.pdf">www.statistics.gov.uk/downloads/theme_population/LAStudy_Cardiff.pdf</a>
<b>Derby</b>	7,800	3.6%	Enumeration difficulties in 1 ward Evidence that the HtC Index was not a good stratifier	2,000	<a href="http://www.statistics.gov.uk/downloads/theme_population/LAStudy_Derby.pdf">www.statistics.gov.uk/downloads/theme_population/LAStudy_Derby.pdf</a>
<b>Hartlepool</b>	1,500	1.6%	Evidence that the HtC Index was not a good stratifier	700	<a href="http://www.statistics.gov.uk/downloads/theme_population/LAStudy_Hartlepool.pdf">www.statistics.gov.uk/downloads/theme_population/LAStudy_Hartlepool.pdf</a>
<b>Kingston upon Hull</b>	6,600	2.6%	Evidence that the HtC Index was not a good stratifier HtC 3 stratum estimates were implausible	3,200	<a href="http://www.statistics.gov.uk/downloads/theme_population/LAStudy_Kingston_upon_Hull.pdf">www.statistics.gov.uk/downloads/theme_population/LAStudy_Kingston_upon_Hull.pdf</a>
<b>Middlesbrough</b>	5,800	4.3%	Enumeration difficulties in 2 wards Evidence that the HtC Index was not a good stratifier HtC 3 stratum estimates were implausible	1,200	<a href="http://www.statistics.gov.uk/downloads/theme_population/LAStudy_Middlesbrough.pdf">www.statistics.gov.uk/downloads/theme_population/LAStudy_Middlesbrough.pdf</a>
<b>Milton Keynes</b>	3,800	1.8%	Evidence that HtC was not a good stratifier LA allocation of undercount was not robust	3,100	<a href="http://www.statistics.gov.uk/downloads/theme_population/LAStudy_Milton_Keynes.pdf">www.statistics.gov.uk/downloads/theme_population/LAStudy_Milton_Keynes.pdf</a>
<b>Newcastle upon Tyne</b>	5,300 <sup>1</sup>	2.0%	Enumeration difficulties in 6 wards	7,600	<a href="http://www.statistics.gov.uk/downloads/theme_population/LAStudy_Newcastle_upon_Tyne.pdf">www.statistics.gov.uk/downloads/theme_population/LAStudy_Newcastle_upon_Tyne.pdf</a>
<b>Southwark</b>	6,600 <sup>1</sup>	2.7%	Enumeration difficulties in 3 wards Significant number of unprocessed Census questionnaires	7,500	<a href="http://www.statistics.gov.uk/downloads/theme_population/LAStudy_Southwark.pdf">www.statistics.gov.uk/downloads/theme_population/LAStudy_Southwark.pdf</a>
<b>Stockton-on-Tees</b>	5,200	2.9%	Evidence that the HtC Index was not a good stratifier HtC 3 stratum estimates were implausible	1,300	<a href="http://www.statistics.gov.uk/downloads/theme_population/LAStudy_Stockton_on_Tees.pdf">www.statistics.gov.uk/downloads/theme_population/LAStudy_Stockton_on_Tees.pdf</a>
<b>Sunderland</b>	3,800	1.4%	Evidence that the HtC Index was not a good stratifier HtC 3 stratum estimates were implausible	3,400	<a href="http://www.statistics.gov.uk/downloads/theme_population/LAStudy_Sunderland.pdf">www.statistics.gov.uk/downloads/theme_population/LAStudy_Sunderland.pdf</a>
<b>Wandsworth</b>	5,000	1.9%	Evidence that the HtC Index was not a good stratifier HtC 3 stratum estimates were implausible	9,200	<a href="http://www.statistics.gov.uk/downloads/theme_population/LAStudy_Wandsworth.pdf">www.statistics.gov.uk/downloads/theme_population/LAStudy_Wandsworth.pdf</a>
<b>Wirral</b>	2,800	0.9%	Enumeration difficulties in 1 ward Evidence that the HtC Index was not a good stratifier	6,100	<a href="http://www.statistics.gov.uk/downloads/theme_population/LAStudy_Wirral.pdf">www.statistics.gov.uk/downloads/theme_population/LAStudy_Wirral.pdf</a>
<b>Total</b>	<b>64,000</b>	<b>0.1%</b>			

<sup>1</sup> These figures: Bristol (6,700), Newcastle (5,300) and Southwark (6,600), are different from those published in the summary report on 8 July due to amendments to the adjustments. Explanations of the full adjustments are given in the respective detailed LA report linked in the final column.

### 3.3e) LAs selected for study where an adjustment has not been made

There were 17 LAs selected for in-depth analysis where an adjustment was not made. These are areas where investigations described in section 3.3b) concluded that the census estimate remains the best estimate of the population. Detailed reports have been produced for these Local Authorities detailing their study and can be found at [www.statistics.gov.uk/LAStudies](http://www.statistics.gov.uk/LAStudies)

Birmingham

Blackburn with Darwen

Bradford

Camden

Ceredigion

Croydon

Great Yarmouth

Halton

Kensington and Chelsea

Liverpool

Salford

Sandwell

Sheffield

Shepway

Southend on Sea

Teesdale

Tower Hamlets

### 3.3f) 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, could have been taken into account in the original estimates published in 2002 and there are lessons for ONS to learn from this. Lessons that ONS has learnt from these studies are detailed in section 6. 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.

ONS has concluded, on the basis of all the evidence available, that a better estimate of population can be made in 15 areas. From these studies, ONS has also developed further knowledge of the ONC assumptions and how they are stretched in exceptional circumstances. ONS has 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 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 planning the 2011 Census and in continuing work on population estimates.

## 4 Mid-Year Population Estimates (MYEs)

The adjustments for LAs contained within this report have been included in the revised MYEs for 2001. It should be noted these adjustments do not equal the amount by which the MYEs have been revised as other components have been changed, including the LS consequential adjustment explained in section 2.3.

The revised 2001 MYEs have fed into a revision of the 2002 MYEs and the calculation of the new 2003 MYEs. These estimates can be found in 'Population Estimates Numbers' at [www.statistics.gov.uk/statbase/Product.asp?vlnk=601&More=N](http://www.statistics.gov.uk/statbase/Product.asp?vlnk=601&More=N). Further information on population estimates can be found at [www.statistics.gov.uk/popest](http://www.statistics.gov.uk/popest)

## 5 Implications for users

The work on Manchester and Westminster, and the Local Authority Studies, has been used to adjust the 2001 Mid Year Population estimates for 15 areas. The 2001 Census results themselves are not being revised following these adjustments. The results of the 2001 Census remain a rich and uniquely valuable source of information, and patterns within the data continue to reflect patterns within the population. The 2001 Census results as published in September 2002 should continue to be used for most analyses, except for population estimates.

ONS recognises that this creates an inconsistency between the census and the MYEs for those 15 areas and that this causes difficulty when using the data. Research on non-response generally, as well as common sense, suggests that the characteristics of the people missed by the census are likely to be different from those included. However there is no evidence or information about the people missed so ONS and census users therefore have to work on the assumption that the people missed have the same characteristics as is included in the census database and tables.

## 6 Future work

Through the 2001 Census Manchester and Westminster Matching Studies and Local Authority Population Study ONS has gained further insight into the specific problems of census-taking in certain areas of the country, as well as the characteristics that can be difficult to enumerate. Further work is required to identify the implications of these lessons learnt for the 2011 Census and to feed them into the planning and development of 2011 and into future population statistics in general.

ONS has already started a programme of work looking to the future and to improving population statistics. This includes reducing the risk that, when population estimates based on the 2011 Census become available, users of population statistics are once again faced with large differences between these and the mid-year population estimates based on the 2001 Census. This ongoing programme of work includes several elements:

- identifying the implications for the 2011 Census;
- continuing to work with Local Authorities on research to improve population estimates;
- assessing the implications of the migration reviews,
- the 2007 Special Population Study.

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.

## 6.1 Implications for the 2011 Census

The key issues highlighted by the matching and local authority studies can be divided into three main categories; addresses, enumeration and estimation issues. Some of the major issues identified are outlined below. It is important to remember that the census process worked very well in the vast majority of Local Authorities and the lessons learnt below have been identified from studies of the most difficult to enumerate Local Authorities.

### (a) Address issues

The detailed matching of census addresses with Manchester and Westminster address lists has highlighted the variability in different sources. There is currently no one list that can be regarded as definitive or authoritative. Many of the differences simply reflect the administrative purpose for which the list is collected. Some of the other differences are caused by the manner in which addresses are recorded or referenced within lists. For the 2011 Census it is essential that a more accurate and up-to-date address list exists or can be compiled and quality assured before the census questionnaires are distributed. Work on specifying census requirements has already begun. The challenge should not be under-estimated; several initiatives, in central and local Government, have attempted to create a definitive address register but none have yet achieved that aim. Whatever the solution, ONS will want to work closely with local authorities in advance of the next census, to use their local knowledge to help ensure we have the best possible address list in each area. The matching studies have shown that such close working produces a much better quality address list but is resource-intensive.

### (b) Enumeration issues

Localised enumeration failure was identified in nine of the local authorities for which an adjustment has been made to the 2001 population figures, including Manchester and Westminster. The checks and balances to identify such failure were not sufficient in 2001 and these need to be improved for 2011. A good management information system is essential, to keep track of each address, reconcile all the information, and take rapid action as necessary during the Census enumeration. This will also facilitate better targeting of enumeration resources.

The 2004 Local Authority studies have been able to investigate localised enumeration difficulties thoroughly. They occurred on a large scale in Manchester and Westminster and to a lesser extent in seven other areas. Further work is required to identify the causes of enumeration failures and risk mitigation measures.

#### (c) Estimation issues

The hard-to-count strata identified for the Census Coverage Survey sampling were based on data from the 1991 Census, which was the best information available at the time. However, the limitations of the hard-to-count index and strata were the reason for needing to make an adjustment in the other six local authorities (as well as an additional factor in one or two authorities which also suffered from extreme localised enumeration failure). The ONC estimation process was not sufficiently robust to cope with the change in hard-to-count strata that occurred in those areas. For 2011 it will be essential to use more up to date information from administrative sources, from surveys and from local authorities themselves, to improve the accuracy of the hard-to-count measures. Evaluation of data from 2001 will improve knowledge about factors associated with hard to enumerate areas but more work is also required to identify the best measures to use as indicators of all the factors that make enumeration increasingly difficult.

In addition, the ONC estimation process was not robust enough to cope with the scale of under-enumeration experienced in the nine areas with extreme localised under-enumeration. Because there was limited management information coming back from the enumerators it was difficult to identify this. For 2011 the management information system is essential, not only for tracking and action but also to provide information to assist coverage assessment and hence the estimation process.

The ONC Quality Assurance process used administrative data to assess the accuracy of the Census. It was difficult to judge whether there was a problem with the administrative data or ONC estimation. With improvements in the quality and understanding of administrative data this situation will improve before the 2011 Census. Extra safeguards and improvements to the quality assurance process can be introduced by broadening the scope of the QA process to include addresses and by carrying out QA and liaison with LAs at an earlier stage, prior to the main census data collection.

#### (d) General

There are two more general lessons about the 2001 Census as a whole.

Given the increasing variation in local authority enumeration quality, and the rate of change of this, the contingency plans need to be more locally based. In 2001, some contingency plans were not effective and there should have been different stages of contingency. Having answers to the same problems occurring in 2011 is not enough; no doubt there will be new difficulties and there must be a range of contingency plans to cope with unforeseen problems.

The other concerns better targeting and balance of resources. With hindsight the balance was not ideal for 2001; it worked well for the 361 local authorities for whom the census results have been confirmed but not for the 15 authorities where an adjustment has been required. We need to identify the difficulties in those areas earlier and switch resource to deal with the difficulties. Although most crucial with respect to enumeration, it will also be important to target better the resources involved in all stages of the census process and particularly the estimation process.

### 6.2 Local Authority Studies 2005/06

ONS intends to continue to work with Local Authorities over the next few years on a programme of research to look for ways of improving the population estimates. This will involve using some areas as case studies and the areas are likely to include both some of those originally identified for study in 2004, and a new set of Local Authorities in 2005/06. One possibility is to identify factors that make population estimation difficult and to select, as examples, areas which have these factors. We have already identified areas of rapid growth as one type of area that warrants further study.

As mentioned earlier, this research will look particularly at sources of information, principally administrative sources, to examine whether any of the sources not used at present in the MYE process could be used to assist the process. Any improvement, once identified, would have to be piloted and tested before introduction.

If suitable, there are three main ways in which a source might be used. One is to use it simply as part of the quality assurance process, to validate or not the MYEs. Another is to use it as a component of the calculation of the MYEs but

only in areas where the source is of sufficiently high quality that its accuracy can be assured. The third possibility would be to use the source routinely as a component of the MYEs, although it appears unlikely that any of the sources at present have sufficient quality and consistency across all areas of England and Wales. There are also difficulties because sources may be based on addresses, households or persons. For example, the 2004 Local Authority Studies found Council Tax to be the most accurate of the sources used but that provides figures for addresses/households whereas the MYEs are providing estimates of persons.

### 6.3 Migration review

Migration is the most difficult component of population change to estimate, particularly international migration. ONS recognised this issue even before the results for the 2001 Census were released, by initiating the National Statistics Quality Review on International Migration Statistics.

The Quality Review made recommendations for improving both (i) the estimation of total migration flows to and from the UK, and (ii) the allocation of international migration to local areas. On total migration flows, research work currently being undertaken by ONS and the Home Office includes:

- Improving estimates of migration from the International Passenger Survey (IPS) by investigating how respondents' intentions to migrate correspond with their actual behaviour
- Further improving the combination of IPS data with Home Office data on the control of immigration
- Investigating alternative data sources to validate and/or combine with existing sources - these include both overseas data sources and UK administrative sources

On the allocation of migration at a local level, work is currently being undertaken by ONS to investigate:

- The use of household surveys such as the Labour Force Survey to improve the distribution of international in-migrants to UK countries and English regions
- The use of administrative sources, in particular NHS sources, to improve the distribution of international migration at local authority level

- Whether the first onward moves of international in-migrants after arriving in the UK are adequately captured within estimates of internal migration.

Further details on the above work, and other actions arising from the Quality Review, can be found in the implementation plan published January 2004; this is again available on the National Statistics website at [www.statistics.gov.uk/methods\\_quality\\_quality\\_review/population.asp](http://www.statistics.gov.uk/methods_quality_quality_review/population.asp)

### 6.4 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 [www.statistics.gov.uk/about/methodology\\_by\\_theme/dem\\_stat\\_ser\\_act\\_points.asp](http://www.statistics.gov.uk/about/methodology_by_theme/dem_stat_ser_act_points.asp)

MYEs are based on the most recent Census with estimated population change since Census day. As noted above, during the 1990s migration became a major driver of population change and with imperfect sources for estimating migration, ten years is thought to be too long a period to make population estimates in areas where population change is especially difficult to measure, without some form of independent guide to their accuracy. The precise details of what this means in practice have to be worked through. It will be important for ONS and users to be clear about the aims of the mid-decade work, and to understand and accept any implications that it might have for LA estimates.

For the Special Population Study to be successful, it is essential that it engages the right people. In taking this work forward ONS will work closely with key users and are in the process of convening an Advisory Group with representatives from both central and local government as well as relevant experts from the academic sector.

This engagement will cover both the design and conduct of a mid-decade population study as well as the implementation of the findings. The work will define the precise user needs, assess the feasible options and recommend and implement the approach for producing estimates. This will involve developing a clear and transparent strategy that includes scientific criteria to aid decision making about whether or not there is any need for revisions to population estimates.

### 6.5 Revisions policy for population estimates

This report marks the end of the retrospective local authority studies. ONS is now looking forward and concentrating on how we can produce the best possible population statistics in the future.

Historically population estimates have been revised only after a census, when the series was rebased and the estimates, usually for the previous decade, have been revised. The exception to that general rule was that revisions were made when there were errors in the compilation or in the source data used to compile the estimates. As a consequence, new sources and changes in methodology that were introduced during the intercensal period potentially caused discontinuities in the series of population estimates. The impacts were made in the year of the change and not reworked over the previous years, resulting in the effects of several years being applied in one year. This policy is no longer appropriate given that over the next few years there will be considerable efforts to improve the quality of population statistics that will result in changes to methodology and the use of different data sources. In addition, the need for more timely population estimates may require the use of provisional data sources.

Therefore there is a need for a clearly stated revisions policy for population estimates that complies with the National Statistics Protocol. ONS will be drafting a revisions policy that will cover the annual mid-year population estimates and quarterly population estimates (a new series that ONS plans to release as experimental statistics later this year). The policy will need to take account of the needs of users and hence there will be consultation on a draft. The aim is to issue a draft revisions policy by the end of 2004 with a view to putting in place an agreed revisions policy in Spring 2005.