

## **2004 Local Authority studies**

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### **The Longitudinal Based Study Consequential Adjustment.**

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## **2004 Local Authority studies: The Longitudinal Based Study Consequential Adjustment.**

The mid-2003 population estimates published today (9 September 2004), together with the revised mid-2001 and mid-2002 estimates, contain an update to the adjustment made on 26 September 2003 which was based on evidence from the ONS Longitudinal Study (LS). This update takes account of the fact that the adjustments made as a result of the LA Population Studies cover some of the same people as were identified in the LS based adjustment. This paper describes how this consequential adjustment has been calculated.

### **Background**

On 26 September 2003 an adjustment was made to add in a number of young men to the population estimates. This adjustment was based on evidence from the longitudinal study and is described in section 2.3 of the main report.

### **Re-Estimating the Size of the Adjustment at the National Level**

Evidence from the LS was used to identify how many men aged 25 – 49 were underestimated nationally in the 2001 MYEs and how they should be distributed across England and Wales. The addition derived by using the Longitudinal Study based adjustment is thought to be mainly due to within-household dependence<sup>1</sup> amongst younger males. However, the local authority population studies have shown that some of the adjustment made in September 2003 was in respect of men in uncounted households that have now been added to the appropriate local authorities through the LA Population Studies adjustment. To avoid double-counting of these men, the size of the Longitudinal Study adjustment needs to be reduced by 23,000 from 187,000 to 164,000, a reduction of 12.4 per cent.

### **Re-Estimating the Size of the Adjustment at the Sub-National Level**

From the Longitudinal Study three factors (the proportion of people in lone parent households, the proportion of people living in households with “other non-family structures”, and the proportion of people born outside the EU) were identified to allocate the younger males sub-nationally. These factors were determined to adjust for within-household dependence issues and we judge remain

appropriate for the allocation of the reduced total of 164,000.

### **Effects of the Re-Estimation**

All 68 local authorities that received a Longitudinal Study adjustment in September 2003 will see a reduction in this adjustment. The size of their longitudinal adjustment reduces by between 11 per cent and 15 per cent of the original adjustment. The exact percentage depends on the age breakdown of the adjustment for each local authority, as the percentage reduction varies between the age groups. Only those authorities that previously received an adjustment are affected, and all these 68 authorities continue to receive an adjustment.

### **Smoothing the Adjustment by Age**

The adjustment made on 26 September produced more plausible sex ratios at the national level for young adults. However, when observed at single year of age, the adjustment caused an unusual pattern in the sex-ratio, with step changes at 25 and 34 years of age. This is because the Longitudinal Study adjustment can only be calculated by five-year age group because the sample size is too small for more detailed analysis, and because this adjustment was not ‘smoothed in’. (The adjustment is then apportioned to single year of age in proportion to the existing population). ONS has now re-examined this issue in the light of comments received, and based on statistical judgement about the sex ratio pattern, we have decided to smooth the adjustment by age. Research into the effects of alternative assumptions that are built into the Longitudinal Study model provides additional support for the decision to smooth the Longitudinal Study adjustment. This ‘age-smoothing’ is now built into the revised

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<sup>1</sup> The One Number Census process imputes people based on information from Census forms and information from the Census Coverage Survey. Dependence is a complex statistical concept that occurs where (for example) someone who is missed off a Census form is less likely to be counted in the coverage survey than someone who has already been counted on a Census form. Within household dependence is where this dependence is within counted households as opposed to whole households that were missed. Thus within household dependence is where people in enumerated households are more likely to be missed by both the Census and CCS than chance alone would predict.

longitudinal study adjustment, after the affects of the local authority population studies have been taken into account.

It is important to note that this smoothing does not change the size of the adjustment at the local authority or national level, nor does it have any effect on the number of females. Rather, it changes the age at which the adjustment for younger males is applied.

Smoothing reduces the size of the adjustment at ages 25 – 34, by smoothing part of the adjustment into ages 21 – 24 and 35 – 38. The method used for smoothing is described in the Annex to this paper.

Smoothing does not affect the smaller adjustment made at ages 35 – 49, that was already based on an average over the three five year age groups. The smoothing adjustment made from the 30 – 34 age group into 35 – 38 is added on top of the original adjustment.

### **Ageing On**

As was the case previously, the adjustment for younger males is aged on to reflect the time gap between the Census (29 April) and the mid-year date (30 June) of population estimates. This means there remains a very small adjustment at age 50 for revised mid-2001 estimates, and also that a small portion of the smoothing gets aged into age 39.

For mid-2003 estimates and revised mid-2002 the adjustment 'ages on' with the rest of the population in the normal manner. In other words, an adjustment to men aged 25 in mid-2001 is included within the estimates of men aged 26 in mid-2002 and men aged 27 in mid-2003.

### Annex: Smoothing methodology

- 1 For each local authority, a reduction of 20 per cent is made from the longitudinal adjustment for each of the five-year age groups - ages 25 – 29 and ages 30 – 34.
- 2 For each local authority the amount removed from ages 25 – 29 is smoothed into ages 21 – 24 in the ratio of 1:2:3:4. That is, 10 per cent of the reduction is added to age 21, 20 per cent to age 22, 30 per cent to age 23, and 40 per cent to age 24.
- 3 Similarly the deduction made from ages 30 – 34 for each authority is smoothed into the ages 35 – 38 in the reverse ratio of 4:3:2:1. That is, 40 per cent at age 35, etc.

Given that the Longitudinal Study can only give estimates by five year age band, because of sample size, we cannot be precise about the adjustment at a single year of age. We also need to be mindful of the potential impact on a single age so as to be careful to avoid step changes in the age distribution. Thus a decision has been taken to smooth the adjustment across ages. This was done in the original adjustment for the 35 – 49 age group (taking an average across the 15-year age group). However, the adjustment for ages 25 – 29 has now been spread across ages 21 – 29 in the way described above. A similar smoothing process has been applied for ages 30 – 34.

There is no scientific method for determining the size of the 20 per cent 'top-slice' that is removed from the age ranges for smoothing. Thus, the size of the top-slice has been based on statistical judgement based on the resultant shape of the national age-sex distribution. However, an upper limit for this top-slice can be set, if we determine that the adjustment at age 24 (or 35) should be no larger than the adjustment at age 25 (or 34). Assuming an equal distribution across single years of age within the 25 – 29 (or 30 – 34) age group (which is a reasonable approximation to the actual proportions, based on the underlying age structure) sets an upper limit of 33 per cent that can be removed from the five year age groups as a whole. However, it is felt that such a large degree of smoothing is not required and it is best to limit the size of the top-slice to the smallest number that would achieve a smoothed result.