Why censuses are essential for estimating ethnic populations and components of change

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Based on Chapter 21, Using the 2001 and 2011 Censuses to Reconcile Ethnic Group Estimates and Components for the Intervening Decade for English Local Authority Districts, in John Stillwell (edited) A Handbook of Census Resources, Methods and Applications: Unlocking the UK 2011 Census
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21.1 Introduction

• Why is ethnicity important?
• How to measure ethnicity
• Ethnicity and the immigration debate
• Estimating ethnic populations at sub-national scale
  – LFS/APS estimates
  – Roll forward estimates (Large and Ghosh)
  – ONS stop producing LAD estimates after 2009
  – No current plans to revive
  – Enquiries referred to Leeds project team
### How well did we do in 2011?

**Table 10.3** The England and Wales populations of five ethnic groupings: Census 2011 and ETHPOP 2011

<table>
<thead>
<tr>
<th>Ethnic grouping (2011 definitions)</th>
<th>Census Population CD 2011 (thousands)</th>
<th>Average of TREND and UPTAPER Projections, MY2011 (thousands)</th>
<th>Difference = Average Projection minus Census (thousands)</th>
<th>100 × (Difference /Census) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Groups</td>
<td>56,076</td>
<td>56,057</td>
<td>-18</td>
<td>-0.03</td>
</tr>
<tr>
<td>White</td>
<td>48,209</td>
<td>49,609</td>
<td>1,400</td>
<td>2.90</td>
</tr>
<tr>
<td>Black</td>
<td>1,865</td>
<td>1,521</td>
<td>-344</td>
<td>-18.44</td>
</tr>
<tr>
<td>Asian</td>
<td>4,214</td>
<td>3,469</td>
<td>-744</td>
<td>-17.66</td>
</tr>
<tr>
<td>Mixed</td>
<td>1,224</td>
<td>1,017</td>
<td>-207</td>
<td>-16.90</td>
</tr>
<tr>
<td>Other</td>
<td>564</td>
<td>440</td>
<td>-124</td>
<td>-21.92</td>
</tr>
</tbody>
</table>

**Sources:** Census 2011 – ONS (2013c), Crown Copyright. Projections – ETHPOP (2013), funded by ESRC. Notes: CD = Census date (27 March 2011), MY = Mid-YEAR (30 June/1 July).

**Key points:**
- Very close for the total
- Over-estimated the White group (too optimistic about mortality trend)
- Poor for the ethnic minority groups (under-estimated immigration and fertility)
Local results for selected groups

Quite large errors at the LAD scale
21.2 Estimating ethnic populations and components between censuses

The issue
- This problem with the roll forward method is general to local population estimation.
- After every census ONS revises the LAD populations so that they are consistent with the latest census and the previous census.
- This upsets many local authorities. They had looked forward to the same central government grant based on population and complained when their optimistic future funding bubbles were burst. This led to huge rows between some LADs and ONS post-census (e.g. Westminster-ONS battle over 2001 Census results).

The solution
- Correct any census errors
- Revise estimates between censuses so that the population series links the start and end censuses in a decade
- Note that this then necessitates a revision of demographic rates and re-evaluation of trends
- Fortunately for LADs, funding is not recouped and redistributed to reflect the revisions

Our Aim
- To implement a similar reconciliation exercise for LAD sub-populations by ethnicity
## 21.3 Getting the census populations into shape

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>2</td>
<td>WHO</td>
<td>White: Other White</td>
<td>White: Other White</td>
<td>White: Polish White: Other White</td>
<td>White: Other White</td>
</tr>
<tr>
<td>3</td>
<td>MIX</td>
<td>Mixed/Multiple Ethnic Groups</td>
<td>Mixed/multiple ethnic group: White and Black Caribbean Mixed/multiple ethnic group: White and Black African Mixed/multiple ethnic group: White and Asian Mixed/multiple ethnic group: Other Mixed</td>
<td>Mixed or multiple ethnic groups</td>
<td>Mixed</td>
</tr>
<tr>
<td>4</td>
<td>IND</td>
<td>Asian/Asian British: Indian</td>
<td>Asian/Asian British: Indian</td>
<td>Asian, Asian Scottish or Asian British: Indian, Indian Scottish or Indian British</td>
<td>Indian</td>
</tr>
<tr>
<td>5</td>
<td>PAK</td>
<td>Asian/Asian British: Pakistani</td>
<td>Asian/Asian British: Pakistani</td>
<td>Asian, Asian Scottish or Asian British: Pakistani, Pakistani Scottish or Pakistani British</td>
<td>Pakistani</td>
</tr>
<tr>
<td>6</td>
<td>BAN</td>
<td>Asian/Asian British: Bangladeshi</td>
<td>Asian/Asian British: Bangladeshi</td>
<td>Asian, Asian Scottish or Asian British: Bangladeshi, Bangladeshi Scottish or Bangladeshi British</td>
<td>Bangladeshi</td>
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<tr>
<td>7</td>
<td>CHI</td>
<td>Asian/Asian British: Chinese</td>
<td>Asian/Asian British: Chinese</td>
<td>Asian, Asian Scottish or Asian British: Chinese, Chinese Scottish or Chinese British</td>
<td>Chinese</td>
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<tr>
<td>8</td>
<td>OAS</td>
<td>Asian/Asian British: Other Asian</td>
<td>Asian/Asian British: Other Asian</td>
<td>Asian, Asian Scottish or Asian British: Other Asian, Other Asian, Other British</td>
<td>Other Asian</td>
</tr>
<tr>
<td>10</td>
<td>BLC</td>
<td>Black/Black British: Caribbean</td>
<td>Black/African/Caribbean/Black British: Caribbean</td>
<td>Caribbean or Black: Black, Black Scottish or Black British Caribbean or Black: Caribbean Scottish or Caribbean British</td>
<td>Black Caribbean</td>
</tr>
<tr>
<td>11</td>
<td>OBL</td>
<td>Black/Black British: Other Black</td>
<td>Black/African/Caribbean/Black British: Other Black</td>
<td>Caribbean or Black: Other Caribbean or Black</td>
<td>Black Other</td>
</tr>
<tr>
<td>12</td>
<td>OTH</td>
<td>Other Ethnic Group</td>
<td>Other ethnic group: Arab Other ethnic group: Any other ethnic group</td>
<td>Other ethnic groups: Arab, Arab Scottish or Arab British Other ethnic groups: Other ethnic group</td>
<td>Other</td>
</tr>
</tbody>
</table>
21.4 Time and age-time frameworks for inter-census estimates

**Figure 21.1** A time framework for estimation and projection of populations and components by ethnicity

<table>
<thead>
<tr>
<th>Calendar Years</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
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<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
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<td>Fertility Component (Calendar Years)</td>
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<td>Fertility Component (Mid Years)</td>
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<td>Mortality Component (Calendar Years)</td>
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<tr>
<td>Internal Migration Component (Mid Years)</td>
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</tr>
<tr>
<td>International Migration Component (Mid Years)</td>
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</tr>
</tbody>
</table>

**Notes:** Mid Years = time interval between a mid-year and the next

**Key:** Populations
- Census Based Book End Populations
- Populations at risk (Calendar Years)
- Populations at risk (Mid Years)

**Key:** Components
- Census Based Book End Components
- Interpolated Components
- Roll Forward Components
Figure 21.2
Age-time diagram for standard and new-born period-cohorts over 10 years.
21.5 Estimation of mid-year populations and populations at risk

Equation for interpolating between CBBEs for population existing at the first census:

\[
P^{i,2001+y}_{g,x+y,e} = P^{i,2001}_{g,x,e} + \left( \frac{y}{10} \right) \times \left[ P^{i,2011}_{g,x+10,e} - P^{i,2001}_{g,x,e} \right] \tag{21.1}
\]

where \(P\) stands for population, \(i\) for LAD, \(g\) for gender, \(x\) for age (0, 100+) and \(e\) for ethnicity; \(y (= 1, 9)\) is the mid-year number counting forward from year zero (mid-year 2001). A tenth of the difference between the 2001 and 2011 CBBE populations in the same cohort, 10 years of age apart, is multiplied by the year index and added to the mid-2001 population. This equation applies to the cohorts aged 0-100+ at mid-year 2001.

Equation for interpolating between births between censuses and the population at the second census:

\[
P^{i,2001+(10-y)+x}_{g,x,e} = B^{i,2001+(10-y)}_{g,e} + \left( \frac{x + 0.5}{y + 0.5} \right) \times \left[ P^{i,2011}_{g,y,e} - B^{i,2001+(10-y)}_{g,e} \right]
\]

\(\forall y \in [9,0], x \in [0, y - 1]\) \tag{21.2}
Figure 21.3 Scheme for estimating ethnic-specific populations and PAR, mid-year 2001 to mid-year 2011
PAR=Population at risks for computing demographic rates
21.6 The estimation of ethnic components of change

Figure 21.4 Scheme for estimating ethnic-specific fertility rates and births, mid-year 2001 to mid-year 2011
Figure 21.5 Scheme for estimating ethnic-specific mortality, mid-year 2001 to mid-year 2011
Figure 21.6
Scheme for estimating ethnic-specific internal migration, mid-year 2001 to mid-year 2011
Figure 21.7 Scheme for estimating ethnic-specific international migration, mid-year 2001 to mid-year 2011
21.7 (Some Results)

Trends in the 12 ethnic group populations for the UK

2001 Based Projection

2011 Based Projection
The changing diversity of England’s local populations

2001 Based, MY2011

2001 Based, MY2051

2011 Based, MY2011

2011 Based, MY2051
21.8 Discussion and conclusions

- Using two censuses we have made **better estimates** of ethnic populations over the MY2001 to MY2011 decade.
- We have used the 2011 CBBE for populations, fertility rates, mortality rates, internal migration rates and international flows by ethnicity for local authorities as the **baseline or jump-off numbers** for projecting the UK population by ethnicity.
- The **internal migration assumptions** in particular have benefitted from availability of out-migration rates for ten mid-year to mid-year periods, to explore the influence of time period choice on future redistribution.
- Post 2011 estimates **not attempted** because we don’t have (yet) a 2021 Census.
- Post 2011 populations and components are therefore the **outputs of our projection model** and so subject to the errors we saw in our 2001-based forecasts.
- Could we use post 2011 household **surveys** (LFS/APS) or **administrative data** to improve the rates we used for MY2011 to (say) MY2017? Possible at national and regional level but not at local level for ethnic sub-populations.
- Why is it **important to include ethnic detail** in our view of future populations? Come to Session 7C Energy & Water Demand to-morrow at 1400 to learn how ethnic populations have been used in *Forecasting Water Demand under Policy Scenarios for a UK Water Company*