Estimation of mortality for ethnic groups at local scale

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Full paper: http://www.geog.leeds.ac.uk/wpapers/08-04.pdf

Aims and outline

Aims:
To project the ethnic populations of local areas in the UK over the next 50 years (project aim)

To outline the methods used to produce some new estimates of ethnic mortality as inputs to the projection (presentation aim)

To present results of the estimations
Aims and outline
Projection model
Background
Mortality as a function of illness
Geographically weighted mortality
Results
Discussion and conclusions

STATE SPACE

Zones (432) (O origins, D destinations)
England 352 LAs (4 merged into 2)
Wales 22 UAs
Scotland 32 CAs
Northern Ireland 26 DCs

Ages (102 period-cohorts) (A)
Bto0, 0to1, ..., 100+to101+ (102)

Sexes (2) (S)
Males, Females

Ethnic Groups (16) (E)
From 2001 Census with

Time intervals (flexible) (T)

**Accounting framework for the projection model**

This framework applies to each period-cohort, sex and ethnic group. We need to estimate survivorship probabilities for each sex and ethnic group for each home country and the local authorities therein.

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**Ethnic projections in the UK**

**Long record of work on ethnic population estimates and projections in the UK**

A substantial body of work from a forecast of the NCWP born population of Great Britain (OPCS 1977) to a projection of 10 ethnic groups in London Boroughs using the GLA model (Bains and Kilowadski 2007). These studies apply either to England and Wales or the UK as a whole or selected sets of local authorities.

**None of these models used ethnic specific mortality.**

Some work has used the Longitudinal Study to estimate ethnic mortality profiles but there are serious concerns with bias due to loss to the sample.

In June 2008 ONS has begun publishing new statistics on infant mortality by ethnicity in England and Wales based on assignment by health professional.
Work on ethnic projections/mortality elsewhere

**United States**: Routine to project the population by race (three groups, White, Black, Other). Mortality statistics collected by race.

**New Zealand**: Interesting model that project groups with inclusion of mixed origin persons included in both parental groups.

**European countries**: Use nationality (foreign, native) as the classification variable (reviewed in Coleman 2006, Population and Development Review paper)

Microdata studies show that illness predicts death

There is substantial evidence from microdata studies in several countries which show:

- Self-reported health status is a strong predictor of subsequent mortality.
- The relationship for men is different from that for women.
- Socioeconomic factors are important in explaining mortality variation across groups but self-reported health status still has a significant influence after controlling for them.
- There is variation between racial/ethnic groups in the self-reported health-mortality link but it is not huge.
- There is an important influence of immigrant generation with the first generation having better self-reported health and mortality than subsequent generations.

Burström and Friedlund (2001, p.836), using a study of 170 thousand respondents to the Swedish Survey of Living Conditions that “results suggest that poor self-rated health is a strong predictor of subsequent mortality in all sub-groups studied.”
To project populations by ethnicity for local authorities we need to estimate the mortality rates and survivorship probabilities for ethnic groups.

Previous UK projections have only used all group mortality and survivorship probabilities.

But we know that mortality varies greatly between persons classified by country of birth and from work with the Longitudinal Study.

We use an indirect method to estimate ethnic group mortality by using SIRs to estimate SMRs for ethnic groups.
Introduction a

SIR Method (3): all LAs

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Females SIRs

180 160 140 120 100 80 60

Fit line for Total

Gender Nation \( \beta \) Intercept Slope

England 0.51 52.1 0.49

Females Wales 0.78 43.9 0.37

Scotland 0.69 60.5 0.64

Northern Ireland 0.16 71.2 0.26

Males England 0.63 47.3 0.52

Wales 0.56 54.9 0.39

Scotland 0.75 28.3 0.62

Northern Ireland 0.40 59.9 0.36

Women

Men

SIR Method (3): “ethnic” vs “non-ethnic” LAs

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Women

Men
SIR Method (4): North vs South

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SIR Method (5)

We estimate SIRs for LAs using the Limiting Long Term Illness variable from the 2001 Census.

We explore use of alternative sets of LAs for fitting regression models that predict SMR from SIR:
• All UK LAs
• LAs in England, Wales, Scotland and Northern Ireland separately
• LAs in England with & without high BME populations
• LAs in the North and South of England
• We chose the Home Countries model as the best

• We use spreadsheets in a new way to compute life tables efficiently for a large number of local authorities by single year of age and sex. The LTs yield mortality rates … survivorship probabilities and so SMRs.
SIR Method: ethnic SMRs used to estimate ethnic mortality rates

We compute life tables for all UK LAs and ethnic groups to generate survivorship probabilities for the projection model.

SIR Method: the small number problem

Figure 2: Maps of LAs with small numbers (red: late, blue: early, other: unknown).
**SIR Method:** illustration for the Indian group

We used the model

\[ \text{SIR}(i,e) = \frac{\text{SIR}(e) \times \text{SIR}(i)}{100} \]

which assumes independence of the national and local effects.

**SIR Method:** Further illustration

Bangladeshis

Another example where we have fewer direct estimates

We checked out how good the simple model was.
Discussion and Results

Geographically weighted mortality as a background projection model

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SMRs for White British Males

Results: SMRs

SMRs for Indian Males

SMRs for Bangladeshi Males

SMRs for Chinese Males
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All people

White British

Bangladesh

Indian

Chinese

Survival at age 75 for males

GWR Method

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Introduction – a Comparison of SIR and GWR method

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Comparison of SIR and GWR method

Female Ethnic Groups

$e_0(GWM) = 62 + 0.23 e_0SIR \quad r = 0.73$

Male Ethnic Groups

$e_0(GWM) = 62 + 0.18 e_0SIR \quad r = 0.43$

Comparison of SIR and GWR method (2)

M SIR

M GWM

F SIR

F GWM

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FACULTY OF ENVIRONMENT
UNIVERSITY OF LEEDS
How do the ethnic groups fare?

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How do the ethnic groups fare?

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Table 11: The ranking of mean life expectancy for ethnic groups, men and women, 2001.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Ethnic group</th>
<th>Mean years of life expectancy at birth (MEL), men</th>
<th>Rank</th>
<th>Ethnic group</th>
<th>Mean years of life expectancy at birth (MEL), women</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CHI</td>
<td>78.6</td>
<td>1</td>
<td>CHI</td>
<td>82.2</td>
</tr>
<tr>
<td>2</td>
<td>OWEH</td>
<td>77.4</td>
<td>2</td>
<td>GET</td>
<td>81.6</td>
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<tr>
<td>3</td>
<td>BAF</td>
<td>77.1</td>
<td>3</td>
<td>OWA</td>
<td>81.2</td>
</tr>
<tr>
<td>4</td>
<td>OET</td>
<td>77.0</td>
<td>4</td>
<td>BAF</td>
<td>80.7</td>
</tr>
<tr>
<td>5</td>
<td>IND</td>
<td>76.3</td>
<td>5</td>
<td>ALL</td>
<td>80.6</td>
</tr>
<tr>
<td></td>
<td>ALL</td>
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<td>6</td>
<td>WBR</td>
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<tr>
<td>7</td>
<td>OAS</td>
<td>75.0</td>
<td>7</td>
<td>WAS</td>
<td>80.2</td>
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<tr>
<td>8</td>
<td>WAS</td>
<td>75.7</td>
<td>8</td>
<td>OME</td>
<td>80.1</td>
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<td>WBA</td>
<td>79.9</td>
</tr>
<tr>
<td>10</td>
<td>BCA</td>
<td>75.5</td>
<td>10</td>
<td>OAS</td>
<td>79.7</td>
</tr>
<tr>
<td>11</td>
<td>OME</td>
<td>75.5</td>
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<tr>
<td>12</td>
<td>WBA</td>
<td>75.0</td>
<td>12</td>
<td>BCA</td>
<td>79.5</td>
</tr>
<tr>
<td>13</td>
<td>OEL</td>
<td>74.7</td>
<td>13</td>
<td>WBC</td>
<td>79.2</td>
</tr>
<tr>
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<td>PAK</td>
<td>74.6</td>
<td>14</td>
<td>OEL</td>
<td>79.1</td>
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<tr>
<td>15</td>
<td>WBC</td>
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<td>15</td>
<td>BAN</td>
<td>78.5</td>
</tr>
<tr>
<td>16</td>
<td>BAN</td>
<td>74.4</td>
<td>16</td>
<td>NAK</td>
<td>78.3</td>
</tr>
</tbody>
</table>

Table 14: Regression coefficients for a model predicting life expectancy from unemployment level and degree qualification.

<table>
<thead>
<tr>
<th>Independent variable</th>
<th>Life expectancy, women</th>
<th>Dependent variables</th>
<th>Life expectancy, men</th>
<th>Dependent variables</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>R</td>
<td>Sig</td>
<td>B</td>
</tr>
<tr>
<td>% unemployed women</td>
<td>-0.118</td>
<td>-0.433</td>
<td>0.055</td>
<td>-0.044</td>
</tr>
<tr>
<td>% unemployed men</td>
<td>0.073</td>
<td>0.650</td>
<td>0.004</td>
<td>0.083</td>
</tr>
<tr>
<td>% with degree qualifications</td>
<td>0.649</td>
<td>0.745</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>74.6</td>
<td>0.001</td>
<td>0.003</td>
<td>74.6</td>
</tr>
</tbody>
</table>
Introduction-a

How do the ethnic groups fare? England

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How do the ethnic groups fare? Wales

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How do the ethnic groups fare? Scotland

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Conclusions

• In this paper we have produced estimates of the mortality experience of the UK’s ethnic groups in local authorities for all four home countries. To our knowledge no equivalent estimates have been produced hitherto.

• We need to update the life tables for 2002-2007 (probably simply by adjusting to the National Statistics LA series)

• We will analyse trends to examine the degree to which inequalities between LAs have changed (most evidence points to widening inequalities)

• We will feed these trends into central projections, taking serious account of the Olshansky et al. (2006) prediction that the obesity epidemic may bring the Oeppen and Vaupel (2001) era to an end

• We will develop variants and scenarios (but not yet stochastic projections)

Discussion

Questions, comments, suggestions please