Emerging Trends in Mortality and Longevity Symposium 2011
Hande Love

Disease-based incidence and mortality rates

13 September 2011
Agenda

• Mortality differentiation by socio-economic status
• Mortality differentiation by smoking status
• General Practice Research Database (GPRD)
• Disease-based mortality model
• Incidence rates by socio-economic and by smoker status
• Mortality rates by socio-economic and by smoker status
• Mortality improvements
• Life expectancies
• Implications
• Acknowledgements
# Index of Multiple Deprivation 2007

<table>
<thead>
<tr>
<th>Domain</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income Deprivation</td>
<td>22.50%</td>
</tr>
<tr>
<td>Employment Deprivation</td>
<td>22.50%</td>
</tr>
<tr>
<td>Health Deprivation and Disability</td>
<td>13.50%</td>
</tr>
<tr>
<td>Education, Skills and Training Deprivation</td>
<td>13.50%</td>
</tr>
<tr>
<td>Barriers to Housing and Services</td>
<td>9.30%</td>
</tr>
<tr>
<td>Crime</td>
<td>9.30%</td>
</tr>
<tr>
<td>Living Environment Deprivation</td>
<td>9.30%</td>
</tr>
</tbody>
</table>
Mortality differentiation by socio-economic status – males (ONS data – England)
Mortality differentiation by socio-economic status – females (ONS data – England)

Female mortality rates per 100,000 in 2007 by sex, age and IMD quintile, England

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Mortality differentiation by smoker status – males (GPRD data – UK)

Male mortality rates per 100,000 in 2007 by smokers

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Mortality differentiation by smoker status – females (GPRD data – UK)

Female mortality rates per 100,000 in 2007 by smokers

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General Practice Research Database

• One the largest databases of computerised and anonymised patient records
• Established as The Value Added Medical Products Research (“VAMP”) Databank in 1987
• Changed name to GPRD in 1994
• Managed by the Medicines and Healthcare products Regulatory Agency (“MHRA”) since 2003
• Only quality checked data is available => Up-To-Standard
General Practice Research Database
General Practice Research Database – available data

- Demographics, including age and sex
- Medical symptoms, signs and diagnoses, including comments
- Therapy (medicines, vaccines, devices)
- Treatment outcomes
- Events leading to withdrawal of a drug or treatment
- Referrals to hospitals or specialists
- Laboratory tests, pathology results
- Lifestyle factors (height, weight, BMI, smoking and alcohol consumption)
- Patient registration, practice and consultation details
General Practice Research Database – stratification

- Access to database via an interrogation tool
- Stratification:
  - Age groups
  - Gender
  - Smoking status
  - Socio-economic class as measured by IMD2007 for England only
  - Query period
## Disease-based mortality model (DBMM)

<table>
<thead>
<tr>
<th>Disease groups</th>
<th>Diseases considered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disease Group 1 (DG1)</td>
<td>stroke</td>
</tr>
<tr>
<td>Disease Group 2 (DG2)</td>
<td>cancers of breast, cervix, larynx, prostate and uterus plus malignant melanoma</td>
</tr>
<tr>
<td>Disease Group 3 (DG3)</td>
<td>aneurysms, ischaemic heart disease, heart failure</td>
</tr>
<tr>
<td>Disease Group 4 (DG4)</td>
<td>chronic obstructive pulmonary disease, pneumonia and tuberculosis</td>
</tr>
<tr>
<td>Disease Group 5 (DG5)</td>
<td>cancers of colon, ovary, rectum and urinary system, plus oral cancers, leukaemias and lymphomas</td>
</tr>
<tr>
<td>Disease Group 6 (DG6)</td>
<td>Crohn’s disease, gastric and duodenal ulcers, clostridium difficile infection, ulcerative colitis, and kidney and liver disease</td>
</tr>
<tr>
<td>Disease Group 7 (DG7)</td>
<td>cancers of brain, lung, oesophagus, pancreas and stomach and multiple myeloma</td>
</tr>
<tr>
<td>Disease Group 8 (DG8)</td>
<td>Alzheimer’s disease, dementia, Parkinson’s disease</td>
</tr>
<tr>
<td>Intermediate Disease Group 1 (IG1)</td>
<td>atherosclerosis, cardiac arrhythmias, cardiomyopathy, diabetes, hypercholesterolaemia, hypertension, transient ischaemic attacks, valvular disease</td>
</tr>
<tr>
<td>Intermediate Disease Group 2 (IG2)</td>
<td>benign neoplasms, malignant skin cancers other than malignant melanoma</td>
</tr>
<tr>
<td>Intermediate Disease Group 3 (IG3)</td>
<td>epilepsy, motor neurone disease, MRSA, multiple sclerosis, osteoporosis, osteoarthritis, rheumatoid arthritis</td>
</tr>
</tbody>
</table>
DBMM – simplified figure

Healthy

Intermediate DGs

Death

Single DGs

Double DGs
DBMM – male prevalence (GPRD data – UK)

Prevalence in 2007 for Males
All lives

Age bands

% of total exposure

Healthy | IGs | DG1 | DG2 | DG3 | DG4 | DG5 | DG6 | DG7 | DG8 | Double diseases

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Prevalence in 2007 for Females
All lives

Age bands

% of total exposure

Healthy IGs DG1 DG2 DG3 DG4 DG5 DG6 DG7 DG8 Double diseases

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

20-29
30-39
40-49
50-59
60-69
70-79
80-89
% of total exposure

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DBMM – male deaths (GPRD data – UK)

Number of deaths in 2007 for Males
All lives

Age bands

% of total deaths

Healthy IGs DG1 DG2 DG3 DG4 DG5 DG6 DG7 DG8 Double diseases
DBMM – female deaths (GPRD data – UK)

Number of deaths in 2007 for Females
All lives

Age bands

% of total deaths

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

20-29
30-39
40-49
50-59
60-69
70-79
80-89

% of total deaths

Healthy IGs DG1 DG2 DG3 DG4 DG5 DG6 DG7 DG8 Double diseases
Male incidence rates for ages 60-69 by IMD2007 (GPRD data – England)

Male incidence rates per 100,000 in 2007 by IMD quintile for ages 60-69

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Male incidence rates for ages 70-79 by IMD2007 (GPRD data – England)
Female incidence rates for ages 60-69 by IMD2007 (GPRD data – England)

Female incidence rates per 100,000 in 2007 by IMD quintile for ages 60-69

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Female incidence rates for ages 70-79 by IMD2007 (GPRD data – England)
Male incidence rates for ages 60-69 by smoking status (GPRD data – UK)
Male incidence rates for ages 70-79 by smoking status (GPRD data – UK)
Female incidence rates for ages 60-69 by smoking status (GPRD data – UK)

Female incidence rates per 100,000 in 2007 by smokers for ages 60-69

- Smokers
- Non-Smokers
- All
Female incidence rates for ages 70-79 by smoking status (GPRD data – UK)

Female incidence rates per 100,000 in 2007 by smokers for ages 70-79

- Smokers
- Non-Smokers
- All
Male mortality rates for ages 60-69 by IMD2007 (GPRD data – England)
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Female mortality rates per 100,000 in 2007 by smokers for ages 60-69

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Female mortality rates for ages 70-79 by smoking status (GPRD data – UK)
Life expectancies – males by IMD2007 (GPRD data – UK & England)
Life expectancies – females by IMD2007 (GPRD data – UK & England)

Female life expectancies by IMD2007

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Life expectancies – males by smoking status (GPRD data – UK & England)
Life expectancies – females by smoking status (GPRD data – UK & England)
Implications

• GPRD reveals disease and mortality differences among socio-economic classes
• Potentially able to contribute to underwriting of annuitants
• Potentially able to contribute to projection of future trends by studying historical trends (work in progress)
• Reconciliation to other datasets (work in progress)
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Questions or comments?