Longevity Gap: Gender & Socio-economic Circumstances

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Longevity Science Advisory Panel (LSAP)

Publications


Media

Gender directive

- The 2004 Gender Directive made it illegal to differentiate goods or services by gender
- Article 5(2) allowed insurance contracts an opt-out of the requirement where actuarial data supports the use of gender as a rating factor
- The UK implemented this opt-out in the Equality Act 2010 and companies rely upon this to differentiate premiums on the basis of gender
- In 2009 the Belgian consumer association “Test Achats” brought a case before the ECJ
- ECJ ruled on 1 March 2011 that opt-out was invalid
- New insurance business must be issued with gender-neutral pricing where the customer forms a “new contract” on or after 21 December 2012

But what do stats and science say?

Current mortality rates across lifespan in England and Wales
Ratio of male/female mortality

Source: Human Mortality Database (www.mortality.org)

Male & Female Life Expectancy at Birth (E&W, 1841-2006)

Females live longer on average since 1841

Source: Human Mortality Database (www.mortality.org)
Females live longer within sub-populations in UK (socio-economic groups)


Females live longer internationally

• 182 countries out of 188 where females live longer than males

• Source: Protection Business, Legal & General
Causes of Death that Contribute to the Difference in Life Expectancy (at Birth) between Males & Females (%)

- Cancer: 25%
- Circulatory: 37%
- Accidents, Suicide and Injury: 14%
- Respiratory: 10%
- Digestive: 9%
- Other: 5%

Figures provided by Ben Rickne, Oxford University

Male & Female Life Expectancy at Age 65 (E&W, 1841-2006)

Source: Human Mortality Database (www.mortality.org)
Difference between Male & Female Life Expectancy at age 65 (E&W, 1841/44 to 2005/09)

Source: Human Mortality Database (www.mortality.org)

International Comparison of Gender Differences in Period Life Expectancy at age 65

Source: Human Mortality Database (www.mortality.org)
Explanations for Differences in Gender Life Expectancy

Examples:
- Use of health care
- Behavioural – accidents, aggressiveness
- Biological

Note: Study of 30 European countries (2003-05). McCartney et al. 2011

Gender Differences in Biology: Chromosomes

- Sex chromosomes (XY v XX)
  - Females have 2 X chromosomes
  - Able to compensate if one is damaged

- Telomeres
  - Protect the ends of chromosomes from degradation\(^1\)
  - Shorter telomeres means shorter lifespan\(^2\)
  - Males have shorter telomeres & higher rates of cellular degradation than females\(^3\)

Gender Differences in Biology: Hormones

- **Testosterone (Male)**
  - Suppresses immune system\(^1\)
  - Contributes to aggression
  - Linked to heart problems
  - Linked with oxidative stress\(^2\)

- **Oestrogen (Female)**
  - Contributes to muscle strength/repair\(^3\)
  - Linked with antioxidant enzymes\(^4\)
  - Lowered risk of:
    - Metabolic syndrome/Type II Diabetes\(^5\)
    - Cardiovascular Disease\(^6\)


**Conclusion**

- Gender mortality differences have been robustly observed for all ages, internationally and within country’s sub-populations
- Largely due to life style differences
- But, biological difference remains,
- **So, gender mortality difference likely to remain**
Mortality Improvement by Socio-economic Circumstances in England, 1982 to 2006

Background

- Actuaries use socio-economic circumstances (SEC) for base mortality
  - Postcode
  - Pension Amount
  - Occupation
- Less is known about how mortality rates by SEC have changed over time
- Lack of credible data has hampered the study of mortality improvement by SEC
Solution – 100% Data

<table>
<thead>
<tr>
<th>Advantages</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Larger Sample</td>
<td>100% population, England</td>
</tr>
<tr>
<td>Longer Period</td>
<td>1981 to 2007</td>
</tr>
<tr>
<td>Regularity</td>
<td>Yearly data</td>
</tr>
<tr>
<td>SEC Grouping</td>
<td>Index Multiple Deprivation (IMD) 2007</td>
</tr>
<tr>
<td>Consistency</td>
<td>• Deaths counts - Death Registry</td>
</tr>
<tr>
<td></td>
<td>• Population figures - ONS</td>
</tr>
</tbody>
</table>

Findings: Fall in mortality rates between 1982 and 2006

- Differences in the fall in mortality rates in all quintiles (except IMD3 for most age groups) are statistically significantly different from that of the Total Population.

- Less deprived (IMD 1 and 2) have experienced greater fall in mortality rates than more deprived (IMD 4 and 5)

<table>
<thead>
<tr>
<th>Males Age 75-79</th>
<th>95% CI</th>
<th>Females Age 75-79</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMD 1</td>
<td>46.4%</td>
<td>0.5%</td>
<td>IMD 1</td>
</tr>
<tr>
<td>IMD 2</td>
<td>45.0%</td>
<td>0.4%</td>
<td>IMD 2</td>
</tr>
<tr>
<td>IMD 3</td>
<td>44.3%</td>
<td>0.4%</td>
<td>IMD 3</td>
</tr>
<tr>
<td>IMD 4</td>
<td>39.6%</td>
<td>0.5%</td>
<td>IMD 4</td>
</tr>
<tr>
<td>IMD 5</td>
<td>37.2%</td>
<td>0.5%</td>
<td>IMD 5</td>
</tr>
<tr>
<td>Total</td>
<td>43.7%</td>
<td>0.2%</td>
<td>Total</td>
</tr>
</tbody>
</table>
USA socio-economic differences

Annual Rates of Mortality Improvement
Males, England 1985-2005

Annual Rates of Mortality Improvement
Females, England 1985-2005

Comparison of Mortality Rates of People in Different Socio-Economic Circumstances (England 1982 v 2006)
Forces separating longevity between SEC

Risk Factors
Healthcare access
Wealth
Behaviour

Psycho-social
Life-course
Government policies
Adopting health care initiatives

Widening income gap

Relative inequalities in cardiovascular risk factors
(Males, England, age 55 and above)

Relative inequalities in cardiovascular risk factors
(Females, England, age 55 and above)
Summary

1. Greater reduction in mortality rates in the less deprived IMD quintiles over the period 1982 and 2006 (statistically significant)
2. Heat maps of annual rates of improvement in mortality suggest more pronounced cohort patterns for less deprived IMD quintiles
3. Widening of differences in annual rates of improvement in mortality between people in different SECs
4. Results can inform assumption setting and decision making for pricing and valuation of longevity risks of people in different SECs
5. Basis risk could be assessed using the appropriate data and methods

Longevity Science Advisory Paper 2
Life Expectancy: Past and future variations by gender in England & Wales

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Mortality Improvement by Socio-economic Circumstances in England, 1982 to 2006

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Questions

Comments

Expressions of individual views by members of the Institute and Faculty of Actuaries and its staff are encouraged.
The views expressed in this presentation are those of the presenter.
Treatment trends 2000-2007

Myocardial infarction treatments (Males, ages 55-74)

Aspirin

ACEI

Beta Blockers

Clopidogrel

Source: Natkins et al. (2012) Epub
Myocardial infarction treatments (Females, ages 55-74)

Aspirin

ACEI

Beta Blockers

Clopidogrel

Post-MI/Re-vascularisation treatments (Males, ages 55-74)

Aspirin

ACEI

Beta Blockers

Statins

Source: TBC
Post-MI/Re-vascularisation treatments (Females, ages 55-74)

Source: TBC

Angina treatments (Males, ages 55-74)

Source: TBC
Angina treatments (Females, ages 55-74)

Aspirin

ACEI

Statins

Source: TBC