Setting mortality assumptions for the National Population Projections

Sophie Sanders, Senior Research Officer, Demographic Analysis Unit, Office for National Statistics
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National Population Projections

- Provide estimates of future size and age structure of the population
- Not forecasts - do not take account of future government policies
- Projected period and cohort life tables.
Example uses of projections

• Office for Budget Responsibility (OBR) - key input to long-term fiscal projections

• Government Actuary’s Department (GAD) - quinquennial review of National Insurance

• Department for Work and Pensions (DWP) - analysis for policy on benefits and pensions

• Department for Education (DfE) - basis for projections of future school pupil numbers

• Base for sub-national population projections, widely used for resource allocation and planning.
How are the projections produced?

• Cohort component method
  
  - Population (year x) + Births (between years x and y) - Deaths (between years x and y) + In-Migrants (between years x and y) - Out-Migrants (between years x and y) = Population (year y).
  
  (mid year basis)
  
  - assumptions about the future – fertility, mortality and migration

• Variant projections as well as principal projection – using differing assumptions.
How do we produce the mortality assumptions?

1. Estimate base rates of mortality improvement by age and sex
2. Make assumptions on method and speed of convergence of base rates to target rates
3. Set target rates of mortality improvement for some future year
4. Apply successively to assumed base mortality rates
5. Improvement rates and base mortality rates country specific
6. Adjustment for known deaths data
7. Expert opinion
Who is involved?

• NPP Committee
  - ONS, devolved administrations and Home Office
  - Sign-off decisions on assumptions etc

• Expert advisory panel
  - advise on demographic trends through questionnaire and meeting

• NPP Consultations
  - England, Scotland, Wales and Northern Ireland consult with users
Discussion with expert group

• Choice of target rate:
  – Common target rate for all ages or vary by age?
  – Same target rates for males and females or different? What level?
  – Same target rates for all four countries of the UK or different?

• Cohort patterns – will they persist at older ages? Will we see cohort patterns for younger ages?

• Convergence/divergence/same differential between male and female mortality rates/expectation of life?

• Migrant mortality

• Socio-economic class differentials

• Mortality at oldest ages (90 and over)
Deaths- Males, UK
# Leading causes of death in 2016

<table>
<thead>
<tr>
<th></th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Ischaemic heart diseases</td>
<td>13.7%</td>
</tr>
<tr>
<td>2.</td>
<td>Dementia and Alzheimer disease</td>
<td>8.2%</td>
</tr>
<tr>
<td>3.</td>
<td>Malignant neoplasm of trachea, bronchus and lung</td>
<td>6.5%</td>
</tr>
<tr>
<td>4.</td>
<td>Chronic lower respiratory diseases</td>
<td>6.1%</td>
</tr>
<tr>
<td>5.</td>
<td>Cerebrovascular diseases</td>
<td>5.4%</td>
</tr>
</tbody>
</table>
Male age-standardised mortality rates for top five leading causes of death, 2001 to 2016, E&W
Female age-standardised mortality rates for top five leading causes of death, 2001 to 2016, E&W
Obesity in adults

In 2015, 63% of adults in England were overweight or obese.

- 68% of men
- 58% of women

In England, the prevalence of obesity among adults rose from 14.9% to 26.9% between 1993 and 2015.

Of every 100 adults in England, there are:

- 2 underweight
- 35 healthy weight
- 36 overweight
- 24 obese
- 3 morbidly obese

Source: Public Health England
# Obesity in children

**Source:** Public Health England

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Underweight</th>
<th>Healthy Weight</th>
<th>Overweight</th>
<th>Obese</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 &amp; 5 year olds</td>
<td>1</td>
<td>77</td>
<td>13</td>
<td>9</td>
</tr>
<tr>
<td>10 &amp; 11 year olds</td>
<td>1</td>
<td>65</td>
<td>14</td>
<td>20</td>
</tr>
</tbody>
</table>

Younger generations are becoming obese at earlier ages and staying obese into adulthood.
In 2016, a total of 7,327 people died from alcohol-specific causes in the UK, which equates to a rate of 11.7 deaths per 100,000 population.

The rate observed in 2016 is significantly higher than that observed in 2001, when there were 10.6 deaths per 100,000 population.
In 2016, 56.9% of adults aged 16 years and above drank alcohol in the week before being interviewed for the Opinions and Lifestyle Survey, the lowest level seen since the time series began in 2005 (64.2%).
In the UK, the proportion of current smokers in 2016 (15.8%) which was the lowest prevalence recorded since 2010

17.7% of men were current smokers, 14.1% of women.
Potential drivers for future mortality change

Drivers

Changes in biomedical technology

Emergence of new diseases
Re-emergence of old diseases

Behavioural changes related to health

Environmental changes

Policy changes

Changes in population composition
Mortality assumptions

• Annual improvement in mortality rates in 25 years time of 1.2% for most ages, males and females

• Lower improvements for those born before 1924

• Rates of improvement remain constant beyond 25\textsuperscript{th} projection year (by cohort for those born before 1960, by age for those born 1960 and later)

• No longer assumed higher long-term rates of improvement for those born between 1925 and 1938.
Assumed smooth percentage changes in death rates between 2015 and 2016 by age, UK
Actual and assumed overall annual rates of mortality improvement, ages 0-99, UK

<table>
<thead>
<tr>
<th>Last/Next Years</th>
<th>Males (%) Past (Actual)</th>
<th>Future (Assumed)</th>
<th>Females (%) Past (Actual)</th>
<th>Future (Assumed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>2.32</td>
<td>1.59</td>
<td>1.54</td>
<td>1.33</td>
</tr>
<tr>
<td>25</td>
<td>2.20</td>
<td>1.52</td>
<td>1.45</td>
<td>1.31</td>
</tr>
<tr>
<td>30</td>
<td>2.12</td>
<td>1.47</td>
<td>1.43</td>
<td>1.29</td>
</tr>
<tr>
<td>50</td>
<td>1.68</td>
<td>1.36</td>
<td>1.33</td>
<td>1.25</td>
</tr>
<tr>
<td>80</td>
<td>1.29</td>
<td>1.30</td>
<td>1.28</td>
<td>1.23</td>
</tr>
<tr>
<td>100</td>
<td>1.15</td>
<td>1.29</td>
<td>1.14</td>
<td>1.24</td>
</tr>
</tbody>
</table>
2016-based annual improvement in smoothed mortality rates, females 1961/2 – 2040/41
2016-based annual improvement in smoothed mortality rates, males 1961/2 – 2040/41
Life expectancy projections for the UK

Expectation of life at birth

<table>
<thead>
<tr>
<th></th>
<th>2016</th>
<th>2021</th>
<th>2031</th>
<th>2041</th>
<th>2091</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>79.2</td>
<td>80.5</td>
<td>82.1</td>
<td>83.4</td>
<td>89.3</td>
</tr>
<tr>
<td>Females</td>
<td>82.9</td>
<td>83.8</td>
<td>85.1</td>
<td>86.2</td>
<td>91.5</td>
</tr>
</tbody>
</table>

Expectation of life at age 65

<table>
<thead>
<tr>
<th></th>
<th>2016</th>
<th>2021</th>
<th>2031</th>
<th>2041</th>
<th>2091</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>18.6</td>
<td>19.4</td>
<td>20.6</td>
<td>21.6</td>
<td>26.2</td>
</tr>
<tr>
<td>Females</td>
<td>21.0</td>
<td>21.6</td>
<td>22.6</td>
<td>23.5</td>
<td>27.9</td>
</tr>
</tbody>
</table>
Mortality variants

• High life expectancy (HLE) - 1.9% annual improvement at 2041
• Moderately high life expectancy (MHLE) - 1.6% annual improvement at 2041
• Moderately low life expectancy (MLLE) – 0.6% annual improvement at 2041
• Low life expectancy (LLE) – 0% annual improvement at 2041

Additional plus or minus 2.0% on improvement rate in first year of projection.
Mortality variants

- High LE - males
- Moderately Low LE - males
- Moderately High LE - males
- Low LE - males
- High LE - females
- Moderately Low LE - females
- Low LE - females
- Principal LE - males
- Principal LE - females
- Moderately High LE - females

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Male period life expectancy at birth for selected projections and periods, UK 2016-2066
Female period life expectancy at birth for selected projections and periods, UK 2016-2066
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