Highlights of the Mortality and Longevity Seminar 2018
Beverley Alford, Legal & General
To be covered:

- CMI update
- International Mortality trends
- Investing in the Age of Longevity
- Longevity indices
CMI update
CMI update – SAPS tables

• SAPS Committee published new “S3” series mortality tables on 5 June 2018 (CMI WP 107)

• Consultation closed 14 September and final tables due late 2018

• - greater range of tables (new “very light” tables)
  - review of amount bands
  - new method for high ages
  - consideration of differences between private and public sector
### CMI update – SAPS tables

#### Range of tables – S3 compared to S2

<table>
<thead>
<tr>
<th>Type</th>
<th>Gender</th>
<th>Lives</th>
<th>All</th>
<th>Heavy</th>
<th>Middle</th>
<th>Light</th>
<th>Very Light</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pensioners</td>
<td>Male</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NEW</td>
</tr>
<tr>
<td>Pensioners</td>
<td>Female</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NEW</td>
</tr>
<tr>
<td>Normal health</td>
<td>Male</td>
<td></td>
<td></td>
<td></td>
<td>NEW</td>
<td></td>
<td>NEW</td>
</tr>
<tr>
<td>Normal health</td>
<td>Female</td>
<td></td>
<td></td>
<td></td>
<td>NEW</td>
<td>NEW</td>
<td>NEW</td>
</tr>
<tr>
<td>Ill-health</td>
<td>Male</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ill-health</td>
<td>Female</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dependents</td>
<td>Male</td>
<td></td>
<td></td>
<td></td>
<td>NEW</td>
<td>NEW</td>
<td></td>
</tr>
<tr>
<td>Dependents</td>
<td>Female</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NEW</td>
</tr>
</tbody>
</table>

Source: CMI
# CMI update – SAPS tables

## Amount bands

<table>
<thead>
<tr>
<th>Gender</th>
<th>Band</th>
<th>S2 Series</th>
<th>S3 Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>Heavy</td>
<td>0 – 1,700</td>
<td>(19%) 300 – 5,000</td>
</tr>
<tr>
<td>Male</td>
<td>Middle</td>
<td>1,700 – 14,750</td>
<td>(65%) 5,000 – 20,000</td>
</tr>
<tr>
<td>Male</td>
<td>Light</td>
<td>14,750+</td>
<td>(16%) 20,000+</td>
</tr>
<tr>
<td>Male</td>
<td>Very light</td>
<td>n/a</td>
<td>n/a 40,000+</td>
</tr>
<tr>
<td>Female</td>
<td>Heavy</td>
<td>0 – 850</td>
<td>(22%) 0 – 1,000</td>
</tr>
<tr>
<td>Female</td>
<td>Middle</td>
<td>850 – 5,500</td>
<td>(60%) 1,000 – 8,000</td>
</tr>
<tr>
<td>Female</td>
<td>Light</td>
<td>5,500+</td>
<td>(18%) 8,000+</td>
</tr>
<tr>
<td>Female</td>
<td>Very light</td>
<td>n/a</td>
<td>n/a 16,000+</td>
</tr>
</tbody>
</table>

Source: CMI
CMI update – Mortality Projections

• CMI_2017 published on 1 March 2018
  - “business as usual” update

• CMI_2018 due by the end of March 2019

• Mortality improvements since 2011 have been volatile, and lower than in previous decades. Views differ on the causes of this and the prospects for future improvements.
CMI update – Mortality Projections

England and Wales population mortality

- Approximate annualised cumulative mortality rate ($q_x$) by calendar year (over 65s)

Source: L&G
International mortality trends
International mortality trend

- Where are there signs of a fall off in longevity improvements?
- UK 🇬🇧👎👎
- Other European countries 🇪🇺👎
- US 🇺🇸👎👎👎
- Canada 🇨🇦👎👎
- Australia 🇦🇺👎
- Japan 🇯🇵👍👍
International mortality trends

Some possible causes:

• Seasonal factors?
  - flu epidemic
  - Beast from the East
  - heatwave

• Cause of death?
  - cardiovascular death rates fall
  - other death rates rise e.g. dementia
  - increase in diabetes
International mortality trends

Some possible drivers:

• Decrease in smoking (but made the big gains)
• Increase in obesity (and an increase in diabetes)
• Behaviours
  - increase in drug poisoning, suicide, chronic liver disease (particularly in US)
• Socio-economic factors
• Austerity
International mortality trends

Progression of death rates for those aged 60-89 of each socio-economic circumstances quintile in England, relative to their levels in 2001. For each quintile, the value of mortality is given as a percentage of the mortality rate in 2001.

Source: Life expectancy: is the socioeconomic gap narrowing? Longevity Science Panel Feb 2018
International mortality trends

“Of the many factors including income, education, crime, health, housing, environment and unemployment, income deprivation is the strongest independent predictor of mortality rates”

Source: Life expectancy: is the socioeconomic gap narrowing? Longevity Science Panel Feb 2018
International mortality trends

Austerity – mixed messages

• Is the slowing down of life expectancy potentially correlated to the level of austerity?

• Are we entering a new era characterised by an instability in population health largely dictated by the social and political determinants of health?

• But… income inequality has increased in both the United States and France yet inequality in mortality in France remained remarkably low and stable.
International mortality trends

• Life expectancy projections have been reducing across different territories
  E.g. UK, US, Sweden

• Underlying causes unlikely to disappear
  - excess winter deaths, obesity, opioid dependency, dementia etc.

• Impact on protection and annuitant populations will differ – different subsets of the population
International mortality trend

• Japan bucking the recent trend
diet (what they eat and how much)
exercise (daily exercise, more active)
Investing in the Age of Longevity
Investing in the Age of Longevity

The following article was published in one of Britain’s largest newspapers called The Telegraph on November 29, 2015:

The Telegraph

November 29, 2015

World’s First Anti-Ageing Drug Could See Humans Live to 120

Source: Jim Mellon, Juvenescence
Investing in the Age of Longevity

WORLDWIDE LIFE EXPECTANCY

Four million years produced an 11-year increase from 20 to 31

115 years produced a 41 year increase

1900 2015 2040

Developed

Developing

31 72 120

100

Source: Jim Mellon, Juvenescence
Investing in the Age of Longevity

Age is the single biggest risk factor in the deadly quintet of diseases accounting for 70% of all deaths

747k (28%)
592k (23%)
147k (6%)
94k (5%)
76k (3%)

Source: Figures for United States - 2014

Source: Jim Mellon, Juvenescence
Investing in the Age of Longevity

Source: Jim Mellon, Juvenescence
Investing in the Age of Longevity

Gone are the days when you’re born, learn, earn, burn out, retire and expire!

Source: Jim Mellon, Juvenescence
Investing in the Age of Longevity

Global drug spend to hit USD $1.4 trillion in 2020

Source: Jim Mellon, Juvenescence
# Investing in the Age of Longevity

## Long Road to Approval

<table>
<thead>
<tr>
<th>Step</th>
<th>Time</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4.5 years</td>
<td><strong>Discovery</strong>&lt;br&gt;5-10,000 potential drugs are investigated&lt;br&gt;Pharma firms seek treatments for a condition and do the work in-house</td>
</tr>
<tr>
<td>2</td>
<td>1 year</td>
<td><strong>Testing and Improving</strong>&lt;br&gt;Thousands of potential molecules are whittled down to the most promising 10-20 drugs or ‘leads’. Sometimes companies buy in promising drugs from scientists who have done the basic work</td>
</tr>
<tr>
<td>3</td>
<td>1.5 years</td>
<td><strong>Clinical trials</strong>&lt;br&gt;After thorough testing in the lab, 5-10 drugs are taken forward into the first in-human trials</td>
</tr>
<tr>
<td>4</td>
<td>1.5 years</td>
<td><strong>Clinical trials (Phase 2)</strong>&lt;br&gt;2-5 drugs show promise in patients and are taken forward into larger trials</td>
</tr>
<tr>
<td>5</td>
<td>2.5 years</td>
<td><strong>Clinical trials (Phase 3)</strong>&lt;br&gt;1 or 2 drugs work well enough to go into late-stage clinical trials</td>
</tr>
<tr>
<td>6</td>
<td>1.5 years</td>
<td><strong>Drug approval</strong>&lt;br&gt;1 drug is shown to have an effect on the disease</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td><strong>Drug approved for patients</strong></td>
</tr>
</tbody>
</table>

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Source: Jim Mellon, Juvenescence
Investing in the Age of Longevity

TOTAL ADULT POPULATION: 5.70 billion

GLOBAL MEDIAN INCOME: $9,733 per year

~15% EARN MORE THAN

GLOBAL MARKET FOR LONGEVITY: $312 billion per year

@ $1 per day

Source: Jim Mellon, Juvenescence
Mortality Improvements – what’s the answer?

• Unknown and uncertain (and will remain so)
• Differing views (direction and speed of development)
• Key drivers for population mortality remain behavioural:
  Diet & Nutrition
  Exercise
  Smoking
  Alcohol
  Obesity
Longevity indices
Longevity indices

• Will we see a UK longevity index market? i.e. benefit payments based on the experience of a reference population (possibly for fixed term)

• Finite (mortality) capital to support indemnity insurance
  - optimised diversification of negatively correlated risk
  - look to capital markets?

• Potential risks (relative to indemnity insurance):
  - data risk
  - event risk
  - basis risk
Longevity indices

• Price of index swap relative to price of indemnity swap important.

• Index swap should be cheaper
  - simpler administration
  - standardisation
  but....
  - lack of supply?
  - higher capital requirements?
  - risk v reward?
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