Continuous Mortality Investigation
Institute and Faculty of Actuaries

Mortality & Longevity Seminar 2018: CMI Update

Matthew Edwards
Deputy Chair of the CMI Executive Committee

Steve Bale
Chair of the CMI High Age Mortality Working Party
Member of the CMI Mortality Projections Committee

Agenda

- Proposed "S3" Series pension scheme mortality tables
- High age mortality
- Mortality projections
- Future plans

Proposed "S3" Series mortality tables

Overview

- The CMI SAPS Committee published proposed new "S3" series mortality tables on 5 June 2018.
- Key features:
  - New "Very Light" tables
  - New method for high age extensions
  - Review of amount bands
  - Consideration of differences in private and public sector experience
- There is lots of further detail in CMI Working Paper 107.
- **Please respond to the consultation by 14 September 2018, so the final tables (due in late 2018) meet your needs.**

Range of tables – in S2

Type	Gender	Lives	Amounts				
			All	Heavy	Middle	Light	Very Light
Pensioners	Male	▨	▨	▨	▨	▨	
Pensioners	Female	▨	▨	▨	▨	▨	
Normal health	Male		▨	▨		▨	
Normal health	Female		▨	▨			
Ill-health	Male		▨				
Ill-health	Female		▨				
Dependants	Male						
Dependants	Female	▨	▨				

Range of tables – S3 compared to S2

Type	Gender	Lives	Amounts				
			All	Heavy	Middle	Light	Very Light
Pensioners	Male	▨	▨	▨		▨	NEW
Pensioners	Female	▨			NEW		NEW
Normal health	Male		▨		NEW		NEW
Normal health	Female		▨		NEW	NEW	NEW
Ill-health	Male		▨				
Ill-health	Female						
Dependants	Male	NEW	NEW				
Dependants	Female	▨	▨			NEW	NEW

Relative mortality by amount (males)

Mortality by pension amount (in £'000s) relative to all amounts (=100)

Relative mortality by amount (males)

Mortality by pension amount (in £'000s) relative to all amounts (=100)
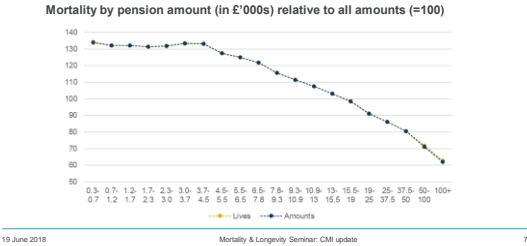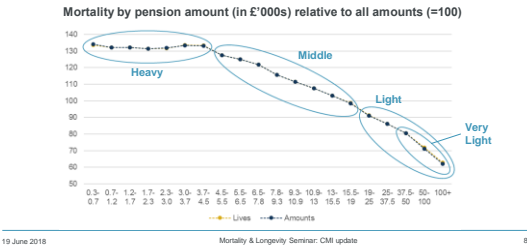
Amount bands

Gender	Band	S2 Series		S3 Series	
Male	Heavy	0 – 1,700	(19%)	300 – 5,000	(40%)
Male	Middle	1,700 – 14,750	(65%)	5,000 – 20,000	(45%)
Male	Light	14,750+	(16%)	20,000+	(15%)
Male	Very light	n/a	n/a	40,000+	(3%)
Female	Heavy	0 – 850	(22%)	0 – 1,000	(19%)
Female	Middle	850 – 5,500	(60%)	1,000 – 8,000	(58%)
Female	Light	5,500+	(18%)	8,000+	(23%)
Female	Very light	n/a	n/a	16,000+	(6%)

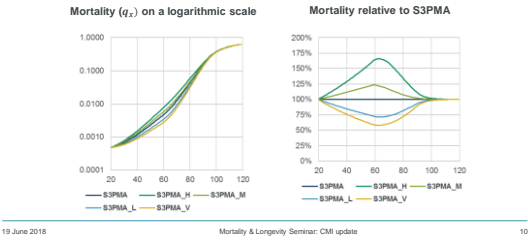Note: Percentages relate to lives-weighted Pensioner exposure.

Male Pensioner amounts tables
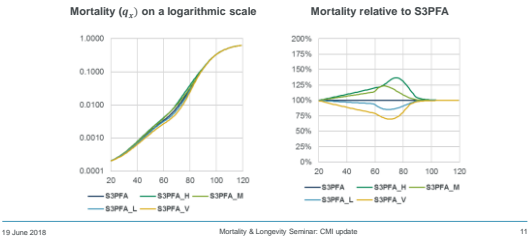
Mortality (q_x) on a logarithmic scale

Mortality relative to S3PMA

Female Pensioner amounts tables

Mortality (q_x) on a logarithmic scale

Mortality relative to S3PFA

Male Pensioner amounts tables

All ages, relative to projected equivalent S2 table

Ages 60-95, relative to projected equivalent S2 table

Female Pensioner amounts tables

All ages, relative to projected equivalent S2 table

Ages 60-95, relative to projected equivalent S2 table

Legend: S3PFA, S3PFA_H, S3PFA_L
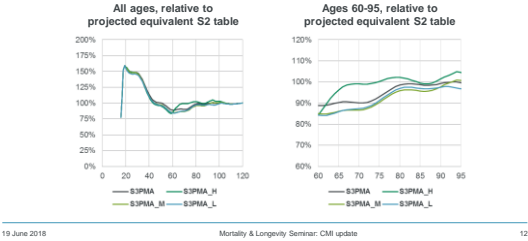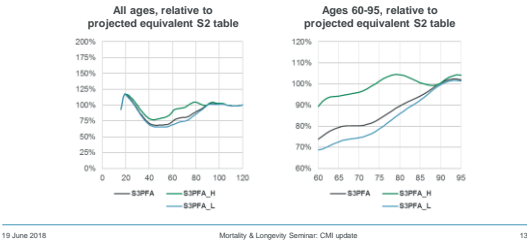
Data volume by sector and amount band

- Female data for middle, light and very light bands is dominated by the public sector
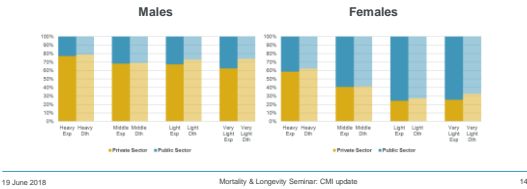
Males

Females

Legend: Private Sector, Public Sector

Relative mortality by sector

- Mortality is higher for the private sector subset of the S3 dataset than the public sector subset. The difference is greater for females than males, and for larger pension amounts.

Males

Females

Legend: Private, Public
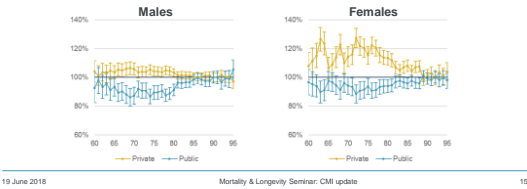
Rationale for combining public and private sector data

- Experience in the S3 dataset may not reflect differences between all public and private sector schemes. Relative levels of mortality and life expectancy could look quite different, depending on which schemes' data is submitted.
- We have only published 'combined' tables, rather than separate private or public sector tables.
- Users of these tables should consider whether they are appropriate for the schemes that they advise.
- Users may find an amount band table a more appropriate starting point for carrying out a mortality experience investigation than an All pensioners table.

Consultation

- Published in Working Paper 107. Responses due by 14 September 2018.
- Key consultation points:
  – Inclusion of new "very light" tables
  – Not producing separate public and private sector tables
  – Adjusting to a common date using the CMI Model
  – Extending to high ages with reference to UK population data
  – Frequency of updating tables – roughly every five years

- **Please let us know what you think**

High Age Mortality Working Party update

Working Paper 100 (June 2017)

- Shape of mortality at high ages
  - On balance, evidence supports old-age deceleration (not Gompertz)
  - Assumption of $\mu_{120} = 1$ is justified
- High-age extensions of graduated tables
  - New method proposed – convergence to national population mortality
  - Illustrative examples published for SAPS S2 and Annuities 08 Series
- Exposure modelling for England & Wales
  - ONS currently applies Kannisto-Thatcher method from age 90
  - HAMWP proposes implementation of K-T method at a younger age of 85
  - Further refinements include: explicit allowance for mortality trend and addressing abnormal cohort exposures.
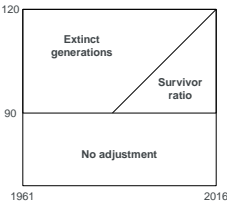 - Reduces life expectancy at 95 by 2% for males, and 1% for females

Overview of exposure modelling – current ONS approach

- Maximum assumed age of 120
- No adjustment below age 90
- Extinct generations method for earlier cohorts – summing observed deaths
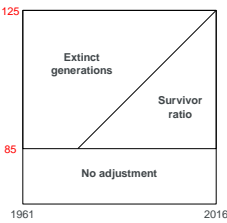- Survivor ratio for later cohorts – described on later slides

Overview of exposure modelling – CMI approach

- Maximum assumed age of 125
- No adjustment below age 85
- Extinct generations method for earlier cohorts – summing observed deaths
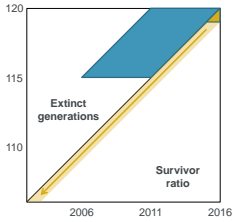- Survivor ratio for later cohorts – described on later slides

Survivor ratio – current ONS approach

- Estimate the next population at the highest age in the next cohort using a single 5x5 year "data window"
- Back-fill the cohort based on historic death counts
- Repeat for each cohort

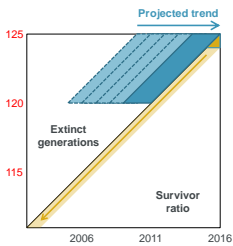## Survivor ratio – CMI approach

- Estimate the next population at the highest age in the next cohort using the five-year projected trend in 5x2 year "data windows"
- Back-fill the cohort based on historic death counts
- Repeat for each cohort

Other differences between ONS and CMI methods

- Both methods require deaths data to be converted from "age at death" to "age at 1 January"
  - The CMI method makes a more sophisticated assumption, based on Lexis triangles
- The CMI method makes an assumption about the distribution of deaths at ages 105 and above, rather than using actual deaths data (which is not available to us).
- The CMI method makes a further smoothing adjustment to some population estimates, to remove artefacts arising from uneven birth and death distributions during some years
  - e.g. rapid changes in birth rate following World War I

Working Paper 106 (June 2018)

- CMI seeking consistent approach to high age mortality modelling across committees
- Consultation on proposed framework to close mortality rate tables
- Immaterial amendments to WP100 population exposure modelling
- Use of UK rather than England & Wales population data
- Approach tested on SAPS "S3" graduation

Next Steps:
- Assessment of mortality for large pension schemes
  - Alternative views and insights from large contributors to SAPS database
- Consider impact of implementing population exposures methodology into CMI_2018
- Winding up the working party once this work is complete.

Mortality Projections Committee update

CMI Model versions

- CMI_2009 to CMI_2015
  - Annual updates to data; and some tweaks to method
- CMI_2016
  - Larger changes in method, although same principle
  - Addition of period smoothing parameter to control responsiveness
  - Change in tapering (at high ages) and definition of long-term rate
  - Overhaul of software – faster, simpler, more transparent
- **CMI_2017 (published on 1 March 2018)**
  - **"Business as usual" update – Working paper 105**
- CMI_2018 (due by end of March 2019)

Key current issues

- High age mortality
  - We may refine high age (85+) exposure data for CMI_2018.
- Basis risk
  - The Model is calibrated to general population data for England & Wales, but improvements differ for subsets of the population.
  - Users of the Model should consider whether to adjust it for use with a specific population.
- Recent mortality
  - 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.
  - The Model offers a flexible smoothing parameter to reflect different views on recent improvements. The choice of smoothing parameter has implications for the predictability of the next version, CMI_2018.
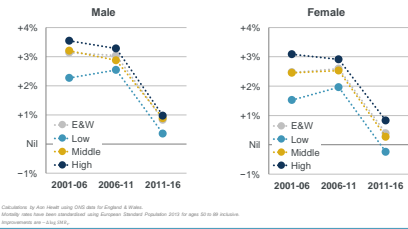
Basis risk: improvements by socio-economic group

Calculations: by Ann Hewitt using ONS data for England & Wales.
Mortality rates have been standardised using European Standard Population 2013 for ages 30 to 89 inclusive.
Improvements are – p.a.g.2013.,

Basis risk: improvements in the SAPS dataset

- Mortality improvements have been higher in the CMI's Self-Administered Pension Schemes (SAPS) dataset, than in the general population of England & Wales.
- The chart shows average mortality improvements in 2008-2015 for ages 65-100, with 95% confidence intervals

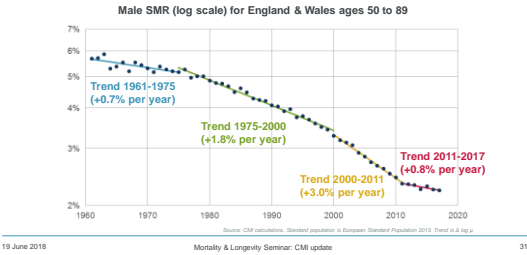## Male standardised mortality ratio (SMR)

Male SMR (log scale) for England & Wales ages 50 to 89

Trend 1961-1975
(+0.7% per year)

Trend 1975-2000
(+1.8% per year)

Trend 2000-2011
(+3.0% per year)

Trend 2011-2017
(+0.8% per year)

Source: CMI calculations. Standard population is European Standard Population 2013. Trend is Δ log μ

19 June 2018   Mortality & Longevity Seminar: CMI update   31
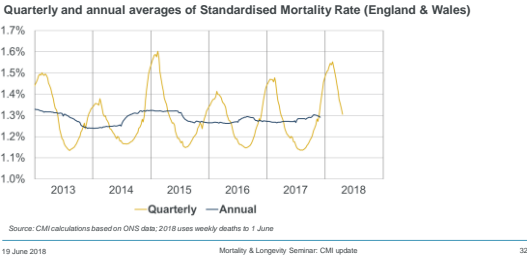
Quarterly mortality update (provisional)

Quarterly and annual averages of Standardised Mortality Rate (England & Wales)

Quarterly — Annual

Source: CMI calculations based on ONS data; 2018 uses weekly deaths to 1 June

19 June 2018   Mortality & Longevity Seminar: CMI update   32

Quarterly mortality update (provisional)

Cumulative standardised mortality relative to 2013-2017 average (England & Wales)

—2013 —2014 —2015 —2016 —2017 —2018

Source: CMI calculations based on ONS data; 2018 uses weekly deaths to 1 June

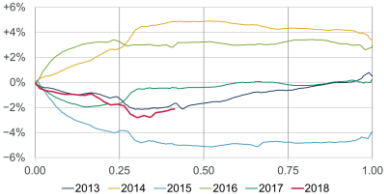19 June 2018   Mortality & Longevity Seminar: CMI update   33

Quarterly mortality update (provisional)

Cumulative standardised mortality improvement (England & Wales)

Source: CMI calculations based on ONS data; 2018 uses weekly deaths to 1 June

---

Future plans

Other committees

Committee	Date	Activity
Annuities	July 2018	Working paper on further analysis of 2011-2014 data
Annuities	31 July 2018	Target date for data submissions to 2017
Annuities	December 2018	Experience report for 2011-2017
Assurances	July 2018	"Guidance" on using the CMI Model for term assurances
Assurances	30 Sept 2018	Target date for data submissions to 2017
Assurances	Feb 2019	Experience report for 2011-2017

Socio-economic analysis – IMD measure

- CMI wants to analyse mortality/morbidity by socio-economic status but firms use different models (eg ACORN and MOSAIC) and CMI is reluctant to favour a single commercial provider
- Proposal: collect a data field that data contributors have pre-mapped from postcode to the Index of multiple deprivation (IMD) using a CMI tool:
  - Used by local governments/authorities to target funding at most-deprived areas
  - Based on series of measures: employment and income levels are biggest factors
  - Calculated for geographical areas that contain ~ 1,500 people
  - Unfortunately each nation within the UK has their own index, making comparison difficult
- Proposed approach is to collect two measures:
  - A UK-wide measure based on a method developed by academics (but some concerns, including its applicability to more recent data)
  - A Country- or region-specific measure (splitting England into nine regions)
- Next step is to develop the mapping tool and accompanying documentation

19 June 2018   Mortality & Longevity Seminar: CMI update   37

And finally…

- We do regularly advertise positions on CMI Committee – in newsletters and on the Volunteer vacancies page on the IFoA website
- Changes to subscriptions for life insurers needed for Solvency II
- "Briefing notes" aimed at NEDs and scheme trustees – first for CMI_2017 and planned for future key outputs
- Surveys:
  - Past "requests for feedback" have generated limited response
  - Survey of Annuities data contributors provided very useful input
  - "400 Club" also provided wider range of views
  - **HAMWP, SAPS and Assurances are currently seeking views on their work – see Working Papers 106, 107 and 108**
  - A survey of all subscribers is planned for 2018
  - Your feedback is important!!

19 June 2018   Mortality & Longevity Seminar: CMI update   38

Questions   Comments

The views expressed in this presentation are those of the presenter.

Please send any questions, views or feedback to
info@cmilimited.co.uk

19 June 2018   Mortality & Longevity Seminar: CMI update   39

Continuous
Mortality Investigation
Institute and Faculty of Actuaries