CMI "S3" Series Mortality Tables

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Overview

- The CMI SAPS Committee are publishing proposed new "S3" series tables today, 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.**

Agenda

- Overview of SAPS
- Tables in the proposed "S3" Series
- Dataset
- Methods
- Results
- Comparison to the "S2" Series
- Private and public sector
- Summary

Overview of SAPS

Overview of SAPS

- SAPS (Self-Administered Pension Schemes) investigation started in 2003.
    - Consultancies submit data on behalf of clients with over 500 pensioners
- Publications
    - Annual reports on mortality experience
    - Ad hoc analyses
    - Mortality tables
        - "S1" (as at 1 Sep 2002) published in 2008 based on 2000-2006 data
        - "S2" (as at 1 Jan 2007) published in 2014 based on 2004-2011 data
- Now consulting on new tables:
    - "S3" (as at 1 Jan 2013) due in late-2018 based on 2009-2016 data

General Data Protection Regulation (GDPR)

- Data is submitted by consultancies and stored by the Secretariat
- Some SAPS data could be viewed as being 'Personal data' under GDPR
- The CMI have formed an initial view and data contributors were asked for their views on these proposals
- Proposed changes to reduce the risk of individuals being identified:
    - Rounded dates of birth and retirement
    - Capping very high benefit amounts at £100,000
- The CMI also intends to start collecting Index of Multiple Deprivation (IMD) data as a form of socio-economic indicator for SAPS (and other) data

Tables in the proposed "S3" Series

Range of tables

- For S3 we propose 30 tables, varying by:
  - Male or Female
  - Pensioner (split into Normal or Ill-health retirement) or Dependant
  - Lives or Amounts weighted
  - Heavy, Middle, Light or Very Light amount band
- Twelve more tables than in S2:
  - Two Male Dependant tables
  - Four new Very Light tables
  - Four new amount band tables, so there is a full set of amount band tables for Pensioners and Normal health retirements
  - Light and Very Light tables for Female Dependants

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

Dataset

Dataset

- Working Paper describes SAPS experience from 1 January 2009 to   31 December 2016.
- The dataset used to graduate S3 is based on this.
  - S3 excludes data for male pensioners with amounts below £300. Experience for this group seemed anomalous.
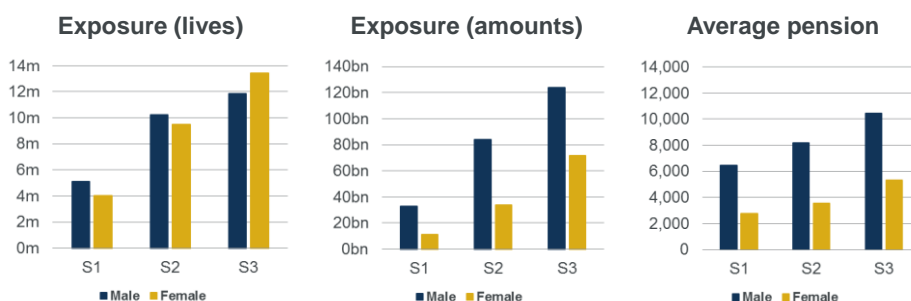- S3 data includes 452 pension schemes.

Dataset

- S3 dataset covers experience from 1 January 2009 to 31 December 2016
  - 452 pension schemes

Exposure (lives)

Exposure (amounts)

Average pension

- S3 dataset is much larger than S2

Amount bands

- Amount band limits were increased by inflation between S1 and S2.
- For S3 we have considered them from first principles. Aim for:
  - relatively consistent mortality within bands;
  - distinct mortality between bands;
  - large enough bands so that mortality is estimated reliably; and
  - ideally, the same number of bands as S2.

- To assess this, analyse a large number of subgroups by pension amount.
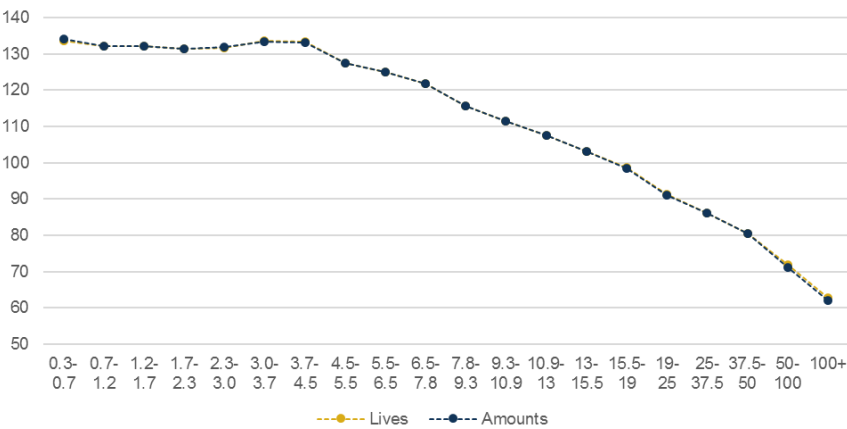
Relative mortality by amount (males)
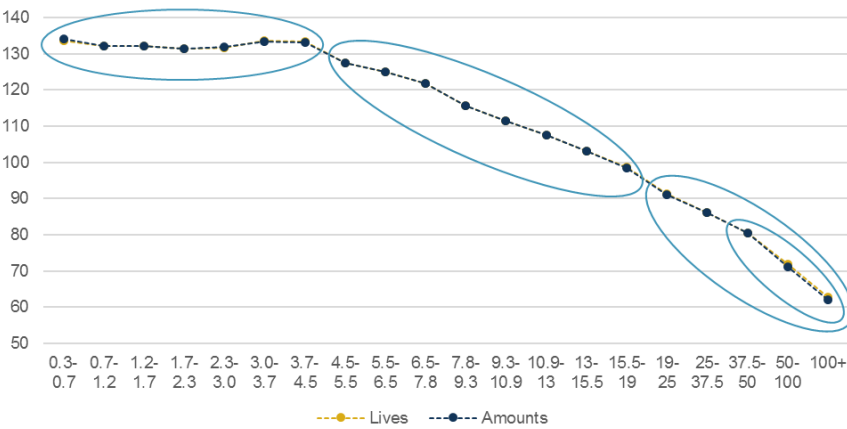
Relative mortality by amount (males)

Relative mortality by amount (females)
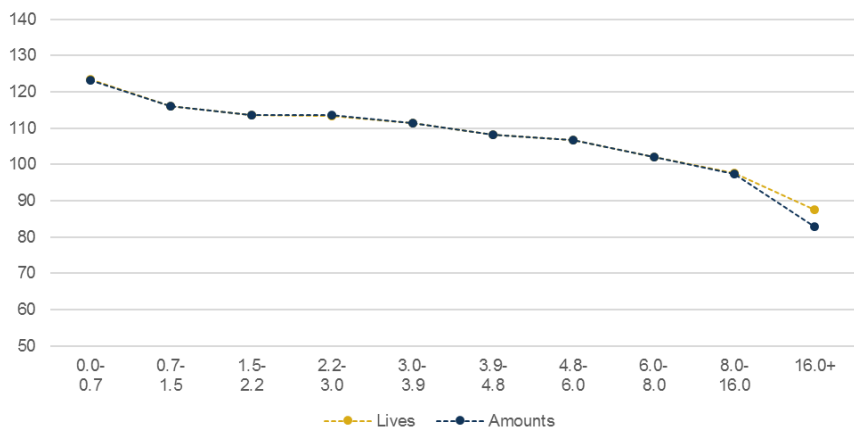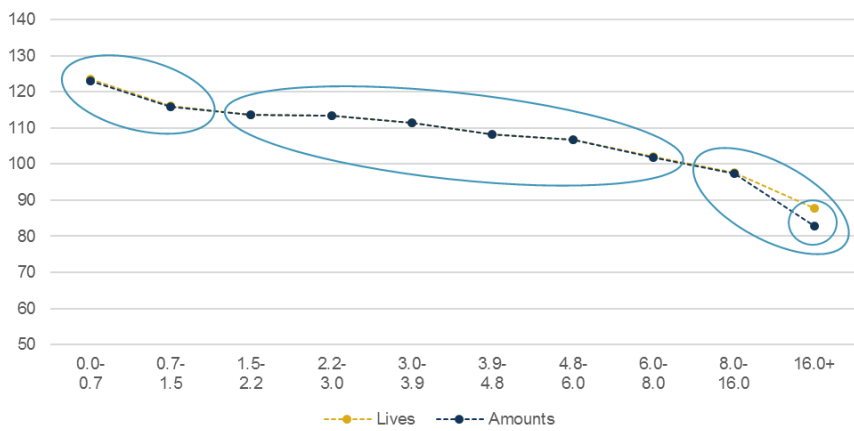
Relative mortality by amount (females)

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 experience.

Methods

Methods

- Working Paper 107 contains detailed descriptions of the methods, including formulae.
- Key features:
    - Adjust the data to be at a common effective date, 1 January 2013
    - Graduate a limited age range where data is credible
    - Select graduation formulae which are consistent and 'good enough'
    - Extend to lower and higher ages, using judgement

Adjusting to a common effective date

- All S3 tables have an effective date of 1 January 2013, half way through the experience period.
- To make them consistent we first adjust the experience data, using the Core CMI_2017 model, before graduation.
- This contrasts with :
    - S1, where no adjustment was made.
    - S2, where adjustment was made after graduation.

Selection of formulae

- We use "G(s)" formulae; i.e. the logarithm of mortality is a polynomial:

$$m_x = exp(b_0 + b_1 x + b_2 x^2 + b_3 x^3) \qquad \text{Males}$$
$$m_x = exp(b_0 + b_1 x + b_2 x^2 + b_3 x^3 + b_4 x^4) \qquad \text{Females}$$

- We need an extra parameter for female data to achieve an acceptable fit to the data.

- In each case, these formulae give a satisfactory result when assessed using a suite of statistical tests.

- The S1 and S2 series used more complex "GM(r,s)" formulae. The choice of simpler, pragmatic formulae reflects the recommendations of the CMI's "Graduation and Modelling Working Party".

- We considered "co-graduation" of related tables, but found that this did not offer significant benefits.

Low age extensions

- The consultation for the S1 tables showed strong demand for tables starting at age 16, and we have done the same for S3.

- However, we note that:
  - Data at low ages is sparse, so tables have been extended to low ages using judgement, to match general population rates (except for ill-health tables).
  - We do not have any data for active or deferred members so cannot comment on the appropriateness of the S3 tables for them.

- Users should be aware of the methods used and consider if they are appropriate for their uses.

High age extensions

- We use the new CMI standard method, published in Working Paper 106.

- We assume that at high ages mortality for a specific SAPS population converges towards that of the national population.
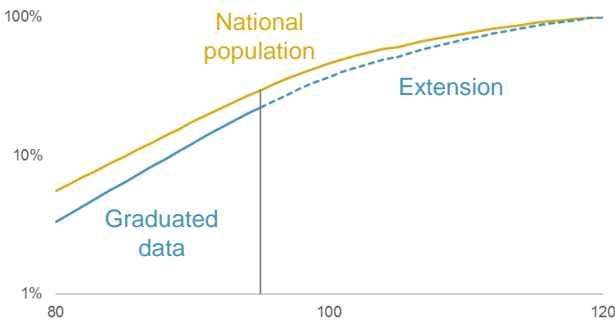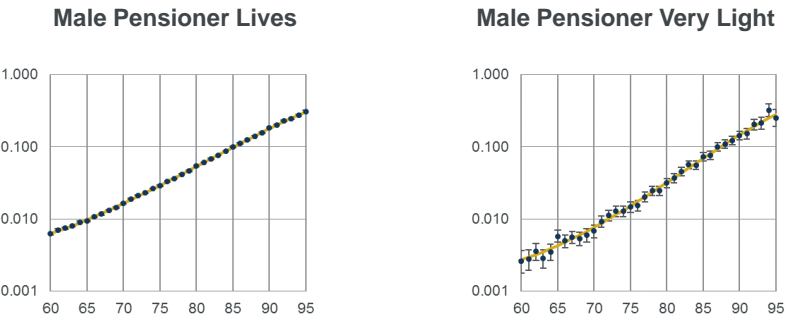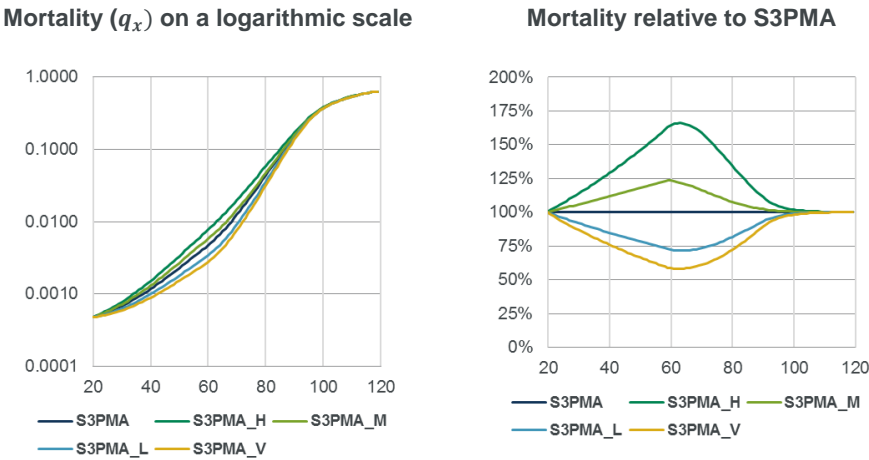
Results

Graduated age range

- We compared to graduated rates to crude rates, as below.

- Crude rates are typically 'well behaved' and because of the large size of the dataset, it is often hard to distinguish graduated and crude rates visually.
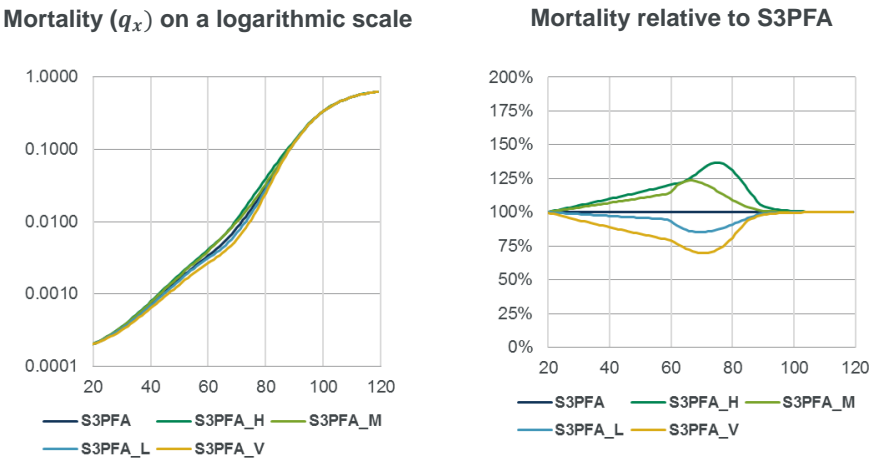
Male Pensioner Lives

Male Pensioner Very Light

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Male Pensioner amounts tables

Mortality (q_x) on a logarithmic scale

Mortality relative to S3PMA

S3PMA — S3PMA_H — S3PMA_M
S3PMA_L — S3PMA_V

S3PMA — S3PMA_H — S3PMA_M
S3PMA_L — S3PMA_V

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Female Pensioner amounts tables

Mortality (q_x) on a logarithmic scale

Mortality relative to S3PFA

Comparison to the "S2" Series

Male Pensioner amounts tables
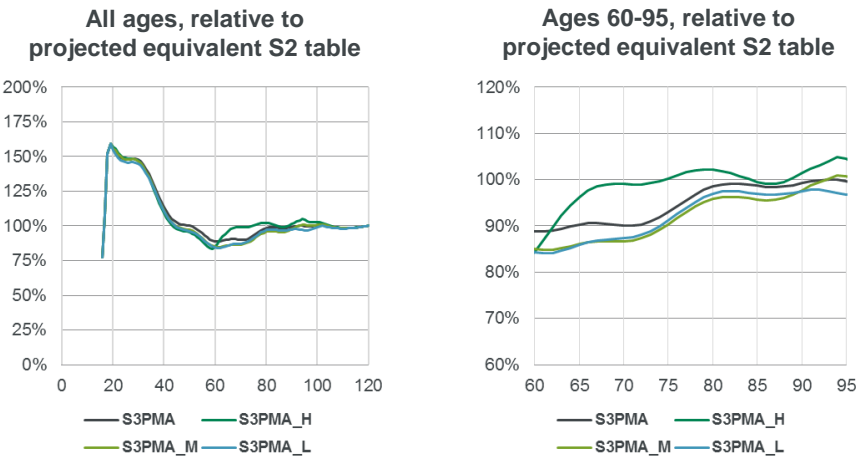
**All ages, relative to
projected equivalent S2 table**

**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**
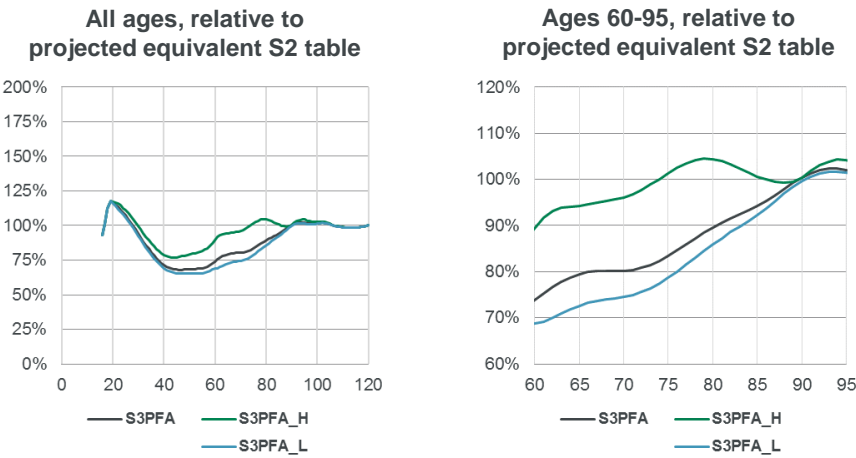
Private and public sector

Public and private sector data

- All comments in this section relate to public and private sector data within the S3 dataset.
- Public and private sector schemes in the S3 dataset do not necessarily reflect all public and private sector experience.
  - e.g. if a few large schemes had not submitted data, the picture could look quite different.
- Within the SAPS dataset, variation by industry within the private sector data is greater than variation between public and private sectors.

Data volume by sector and amount band

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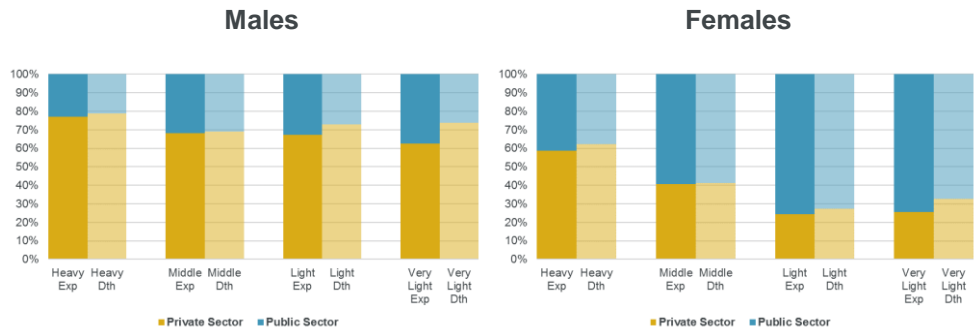
Males

Females
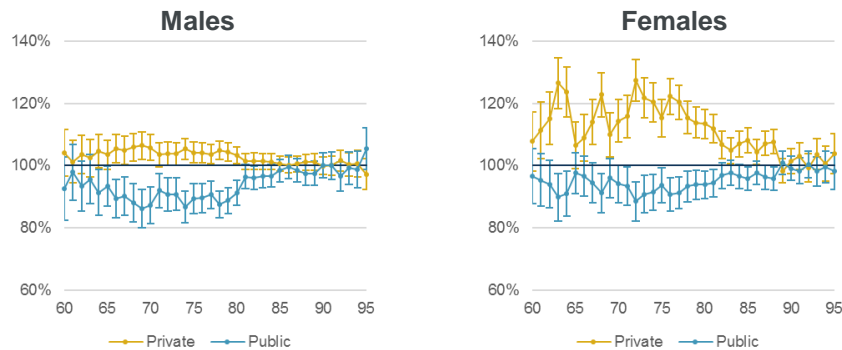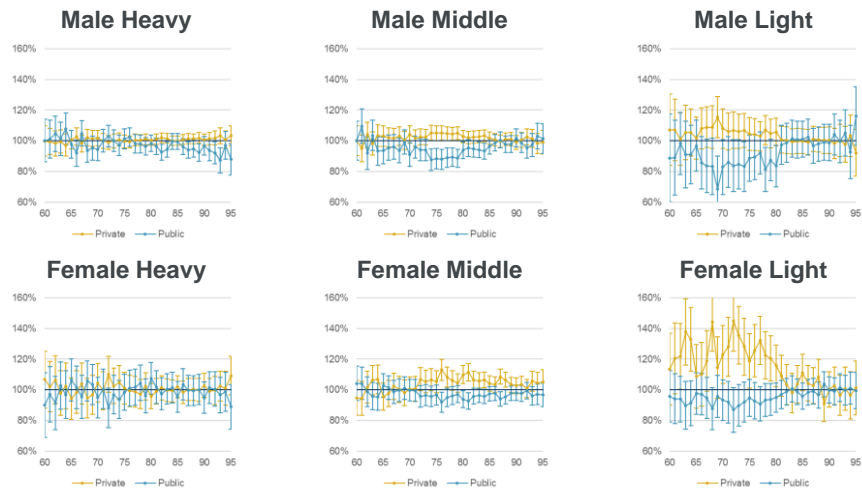
Relative mortality

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

Males

Females

Relative mortality by amount band

Life expectancy

- Life expectancies are higher for the public sector subset of the S3 dataset, than for the private sector subset.

Difference in temporary life expectancy (versus proposed tables)

	Heavy	Middle	Light	Very Light	All
Male private	-0.2%	-0.7%	-0.8%	-1.5%	**-0.8%**
Male public	+0.6%	+1.5%	+1.7%	+3.2%	**+1.8%**
Female private	-0.1%	-1.1%	-2.7%	-2.8%	**-2.4%**
Female public	+0.2%	+0.7%	+0.8%	+0.9%	**+1.1%**

Note: The table shows difference in temporary life expectancy from 60-95, to avoid the impact of high age extensions.

Conclusion

- 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.

Summary

Summary

- We are launching a consultation on proposed new S3 Series tables.
- Twelve new tables, including new "Very Light" tables.
- Some changes in method:
  - Graduation formulae are simpler and more consistent
  - New method for high age extensions
  - Adjustment to low age extensions
- Changes in the composition of the SAPS dataset between S2 and S3.
- Differences between public sector and private sector mortality in the S3 dataset, but we are only producing combined tables.

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
  - Frequency of updating tables – roughly every five years

Please let us know what you think

Questions

Comments

Continuous Mortality Investigation

Institute and Faculty of Actuaries

5 June 2018

The CMI

Mission and Vision

The Continuous Mortality Investigation (CMI) is owned by the Institute and Faculty of Actuaries.

Mission

• To produce high-quality impartial analysis, standard tables and models of mortality and morbidity for long-term insurance products and pension scheme liabilities on behalf of subscribers and, in doing so, to further actuarial understanding.

Vision

• To be regarded across the world as setting the benchmark for the quality, depth and breadth of analysis of industry-wide insurance company and pension scheme experience studies.

Aims and Objectives

Aims and Objectives include:

- Publish **standard decrement tables** and projections (where appropriate) in line with the relevant actuarial standards for each product line

- Publish **papers detailing the methods** employed in producing the standard tables **and the research conducted** to justify these

- **Publicise the work of the CMI** to employees within subscribers and, where appropriate, more widely

- Obtain regular **feedback from subscribers** on what their needs are to ensure that output continues to remain valuable and relevant

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