



Continuous Mortality Investigation

Institute and Faculty of Actuaries

CMI update

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CMI

CMI

- Wholly owned by Institute and Faculty of Actuaries
- Independent executive and management

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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.*

Our vision is 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

SAPS

SAPS Committee activity

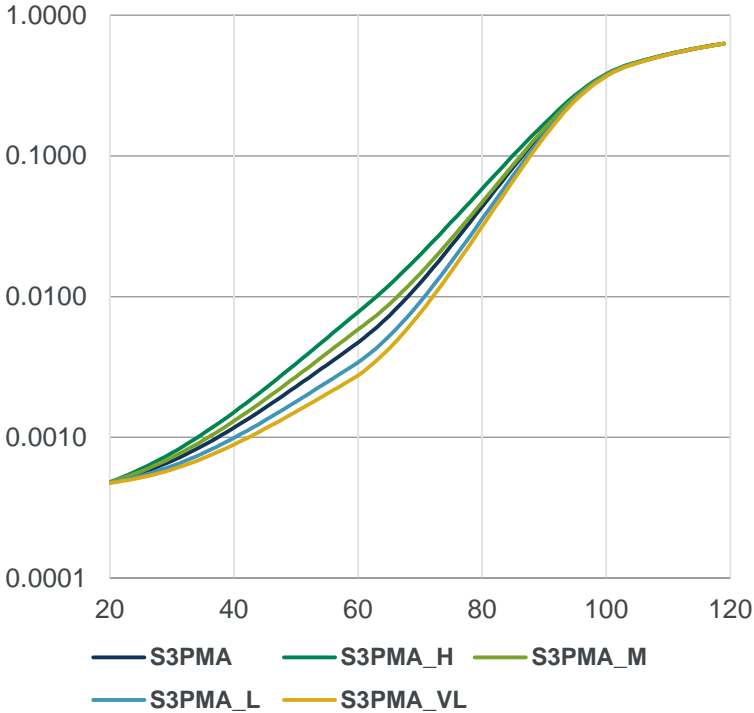
Date	Activity
Nov 2015	Mortality experience by industry classification of SAPS pensioners for the period 2006-2013 (WP86)
Feb 2016	Mortality experience of SAPS pensioners for the period 2007-2014 (WP88)
Feb 2017	Mortality experience of SAPS pensioners for the period 2008-2015 (WP95)
Jan 2018	Mortality experience of SAPS pensioners for the period 2009-2016 (WP104)
May 2018	Proposed “S3” Series mortality tables released for consultation (WP107)
Dec 2018	Final “S3” Series mortality tables (WP113)
Feb 2019	Mortality experience of SAPS pensioners for the period 2010-2017 (WP118)
May 2019	Mortality experience by industry classification of SAPS pensioners for the period 2009-2016 (WP121)

Range of tables – S3 compared with S2

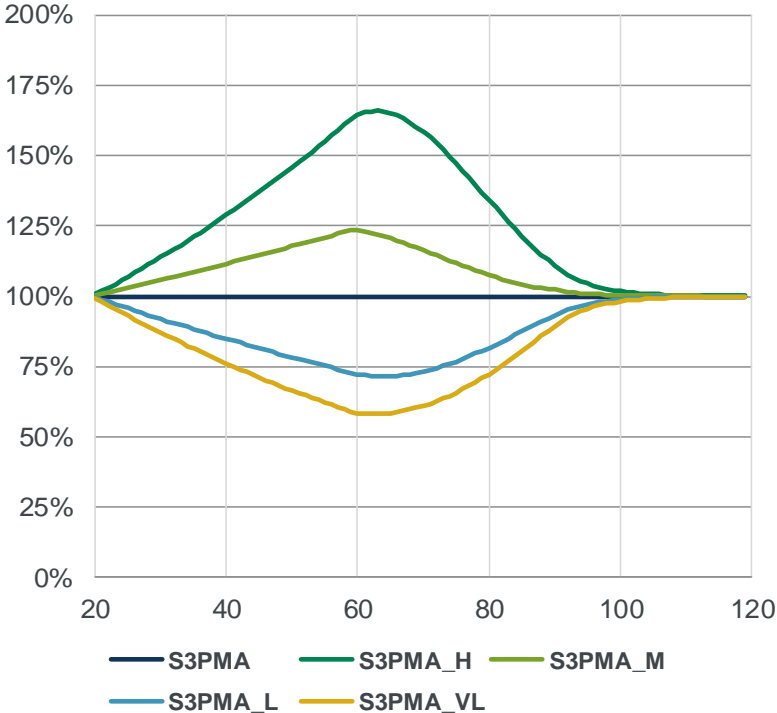
Type	Gender	Lives	Amounts				
			All	Heavy	Middle	Light	Very Light
Pensioners	Male						NEW
Pensioners	Female				NEW		NEW
Normal health	Male				NEW		NEW
Normal health	Female				NEW	NEW	NEW
Ill-health	Male						
Ill-health	Female						
Dependants	Male	NEW	NEW				
Dependants	Female					NEW	NEW

Male Pensioner amounts tables

Mortality (q_x) on a logarithmic scale



Mortality relative to S3PMA



	All S3PMA	Heavy S3PMA_H	Middle S3PMA_M	Light S3PMA_L	Very Light S3PMA_VL
e_{60}	24.9	22.4	24.2	26.3	27.1

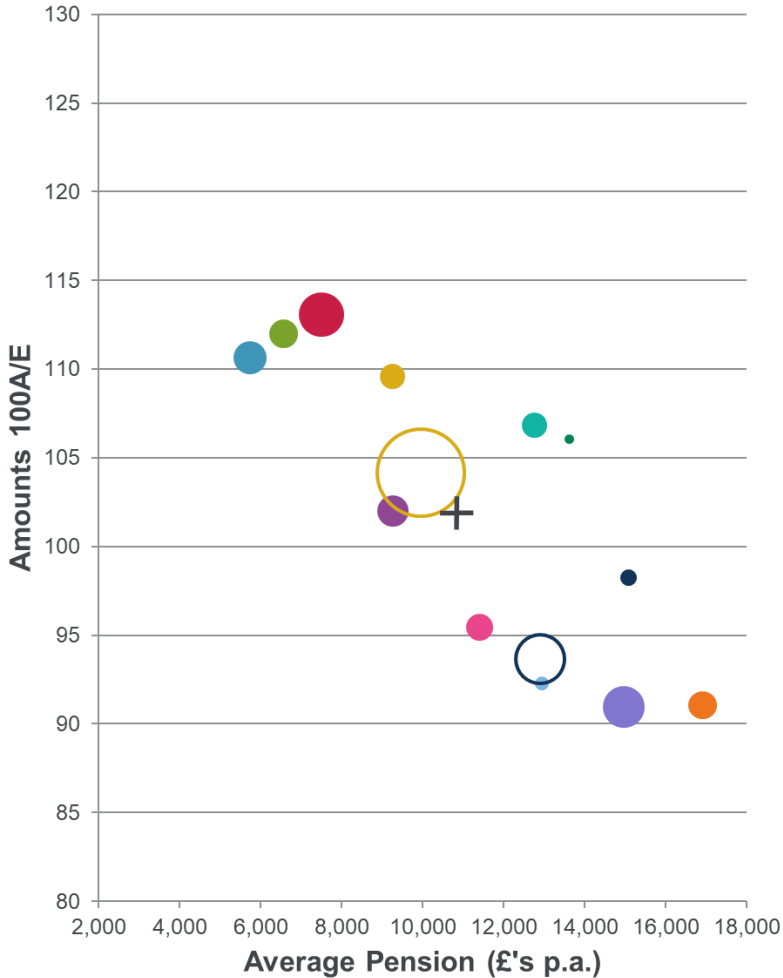
Changes from S2 to S3

- Key differences between S2 and S3 tables are:
 - New “Very Light” and male Dependants tables
 - Composition of the SAPS dataset
 - Changes to Heavy / Middle / Light amount table cut offs
 - Technical methodology changes, e.g. choice of formulae underlying tables, extension of tables to high and low ages
- Mortality improvements for pension scheme members in S3 dataset higher than general population over period between S2 and S3

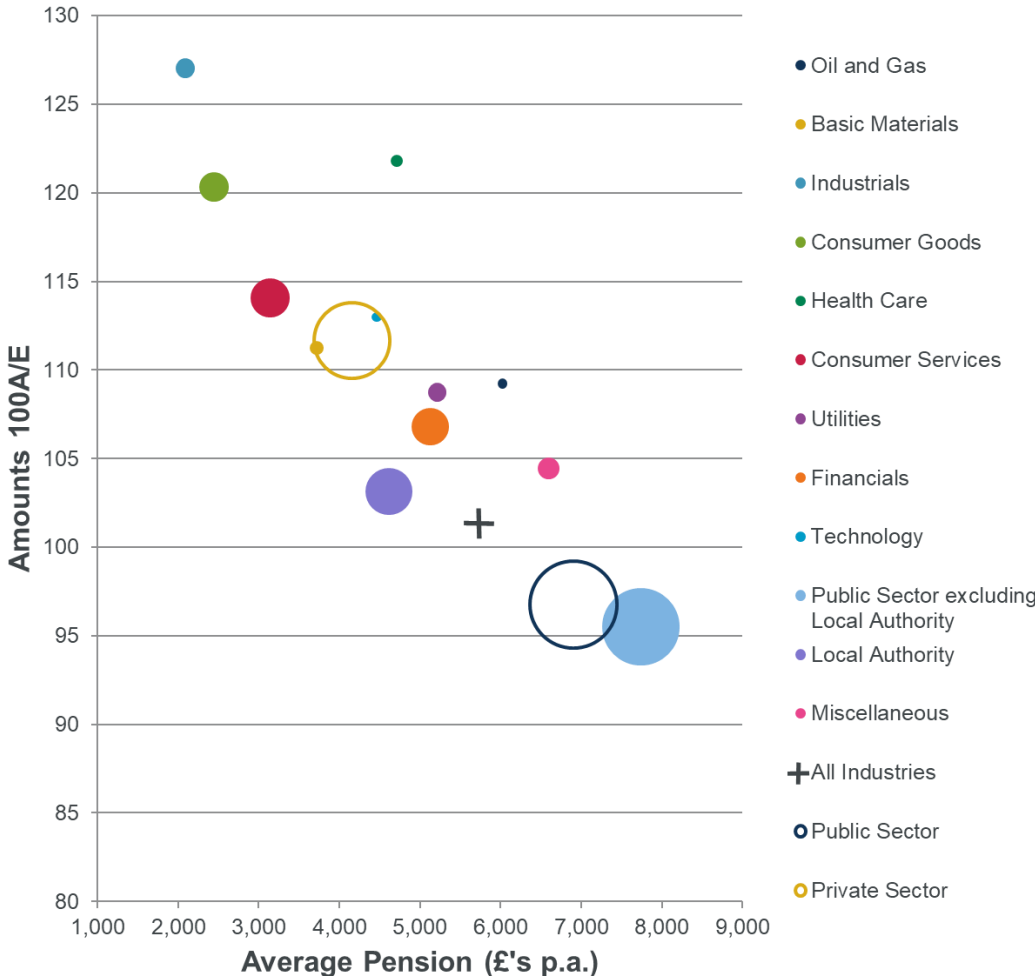
Users should consider whether similarly named S3 table is still appropriate when updating from S2 to S3.

Experience by industry classification

Male Pensioners

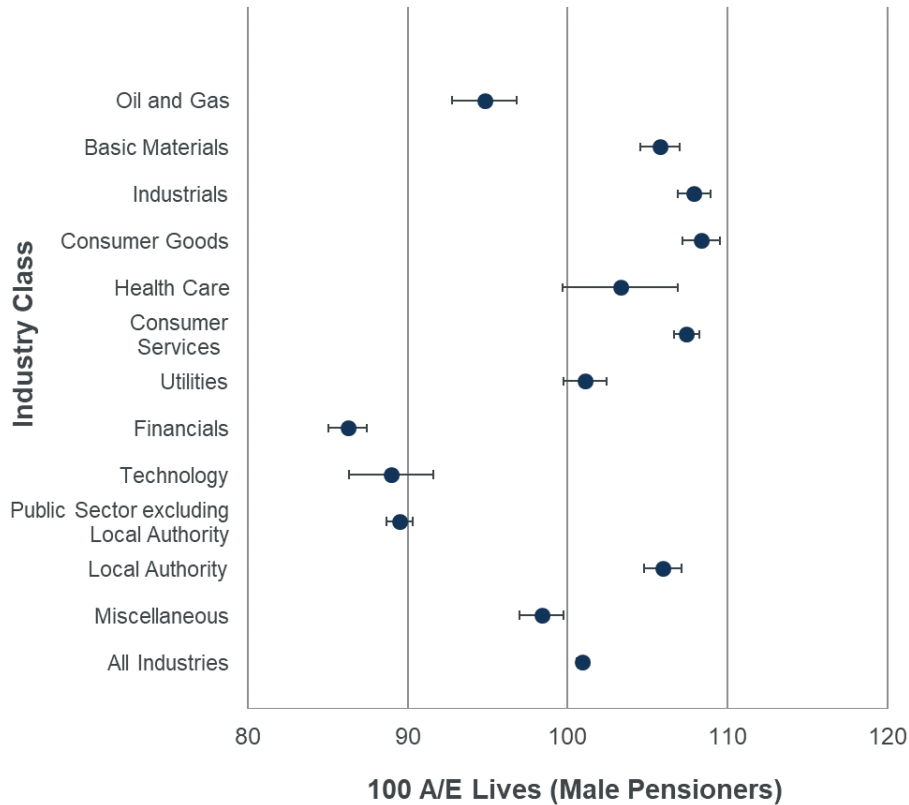


Female Pensioners

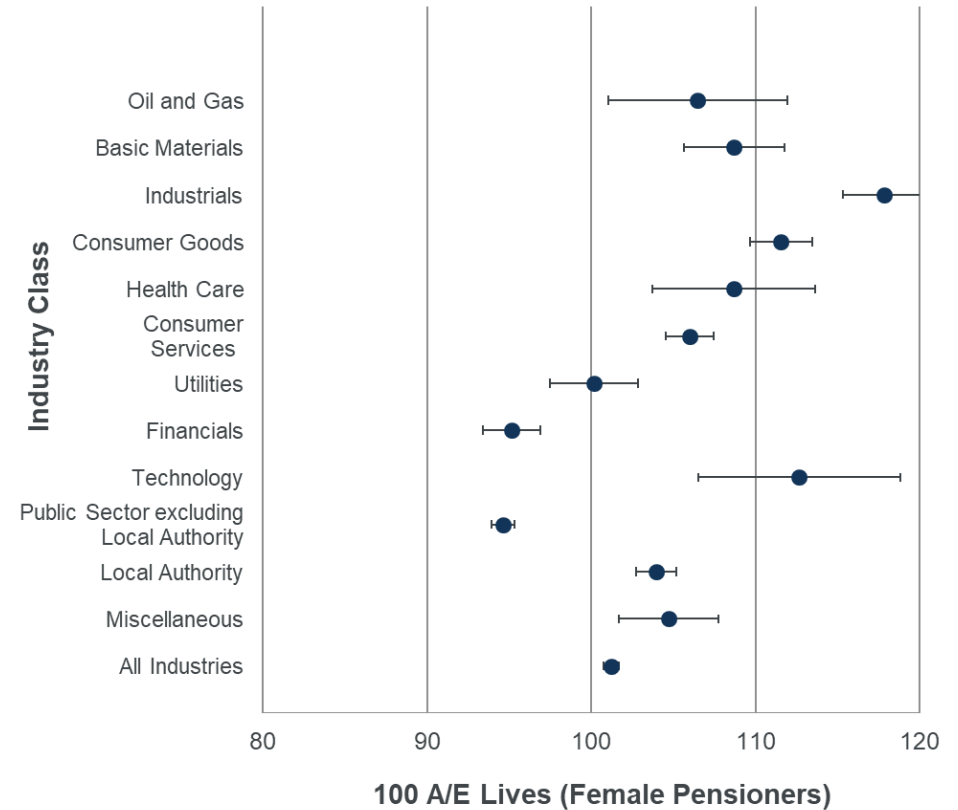


Confidence intervals of 100A/E lives

Male Pensioners



Female Pensioners



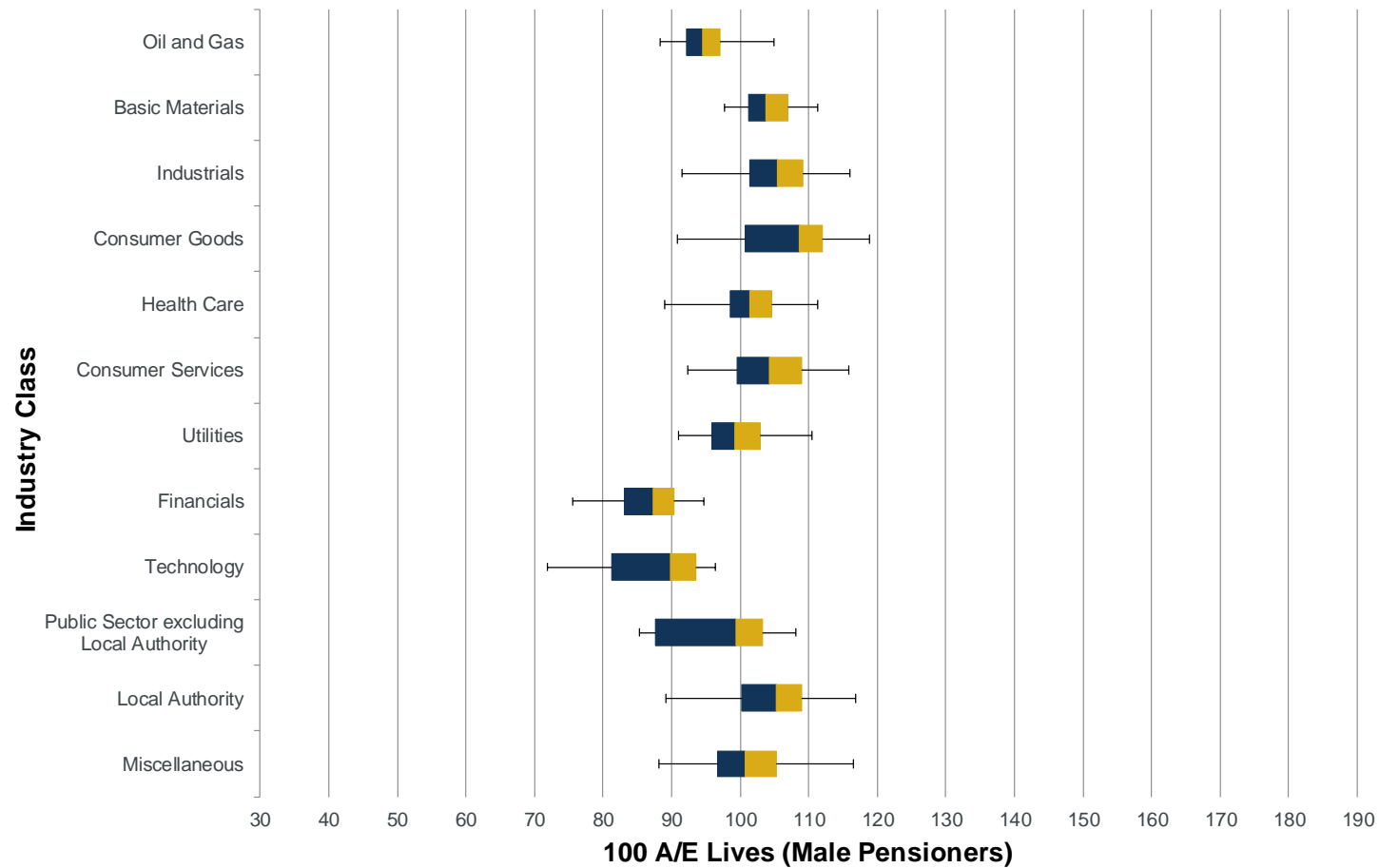
NEW Weighting methodology

- Previous industry analyses: box and whisker charts based on centiles of 100A/Es for each industry
- NEW methodology: charts based on centiles of weighted 100A/Es
- Weighted 100A/Es calculated as follows:

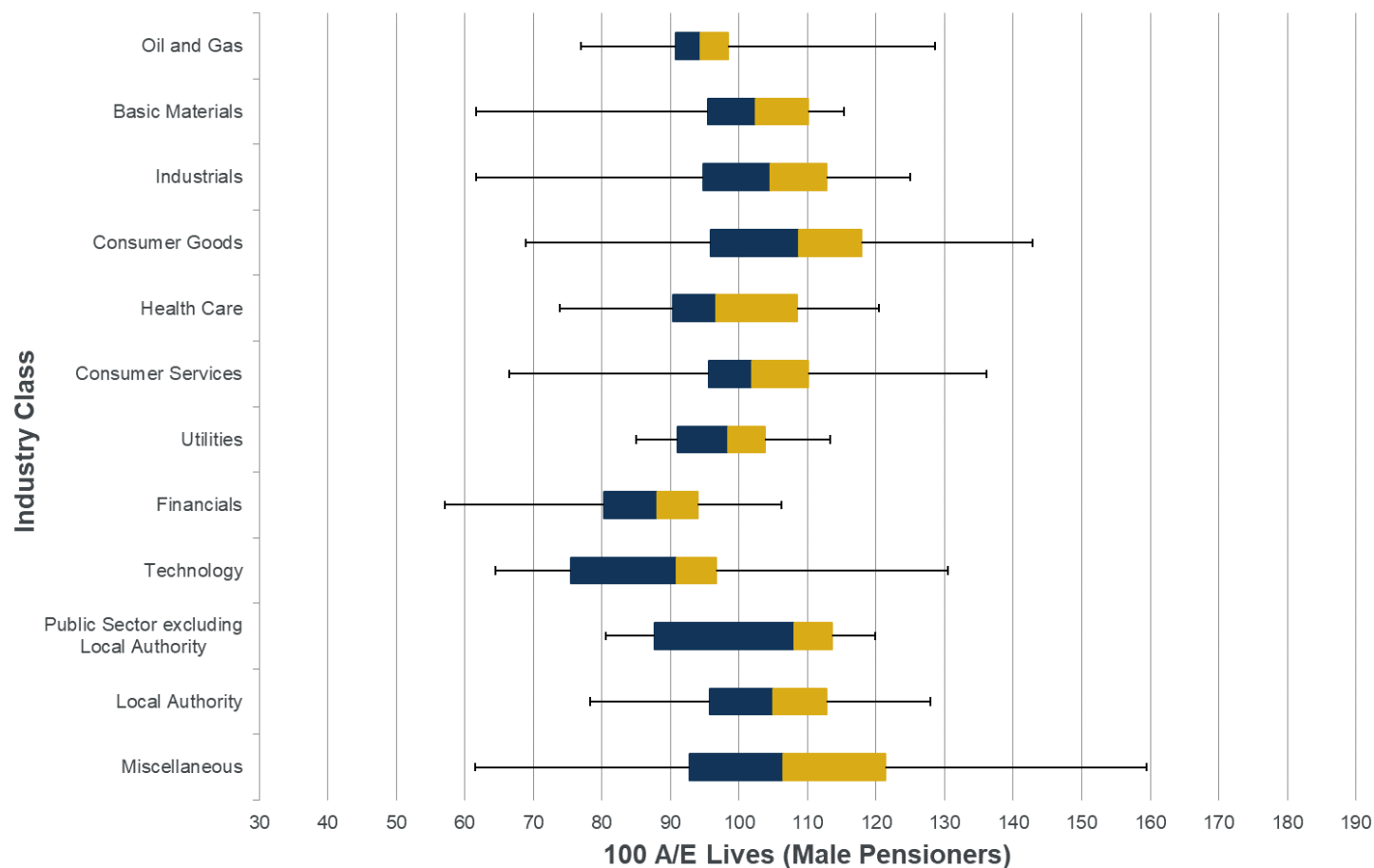
$$\frac{\sigma_{mid-sized\ scheme}^{-2}}{\sigma_{mid-sized\ scheme}^{-2} + \sigma_{submission}^{-2}} \times 100A/E_{industry} + \frac{\sigma_{submission}^{-2}}{\sigma_{mid-sized\ scheme}^{-2} + \sigma_{submission}^{-2}} \times 100A/E_{submission}$$

- Weights for $\sigma_{mid-sized\ scheme}^{-2}$ have been based on median for each data group.
 - Same $\sigma_{mid-sized\ scheme}^{-2}$ is used for all industries in each chart, BUT
 - Different $\sigma_{mid-sized\ scheme}^{-2}$ for each chart (e.g. wider for females/amounts than for lives/males)

Variation of 100A/E (lives-weighted)



Variation of 100A/E (lives-weighted) – previous methodology

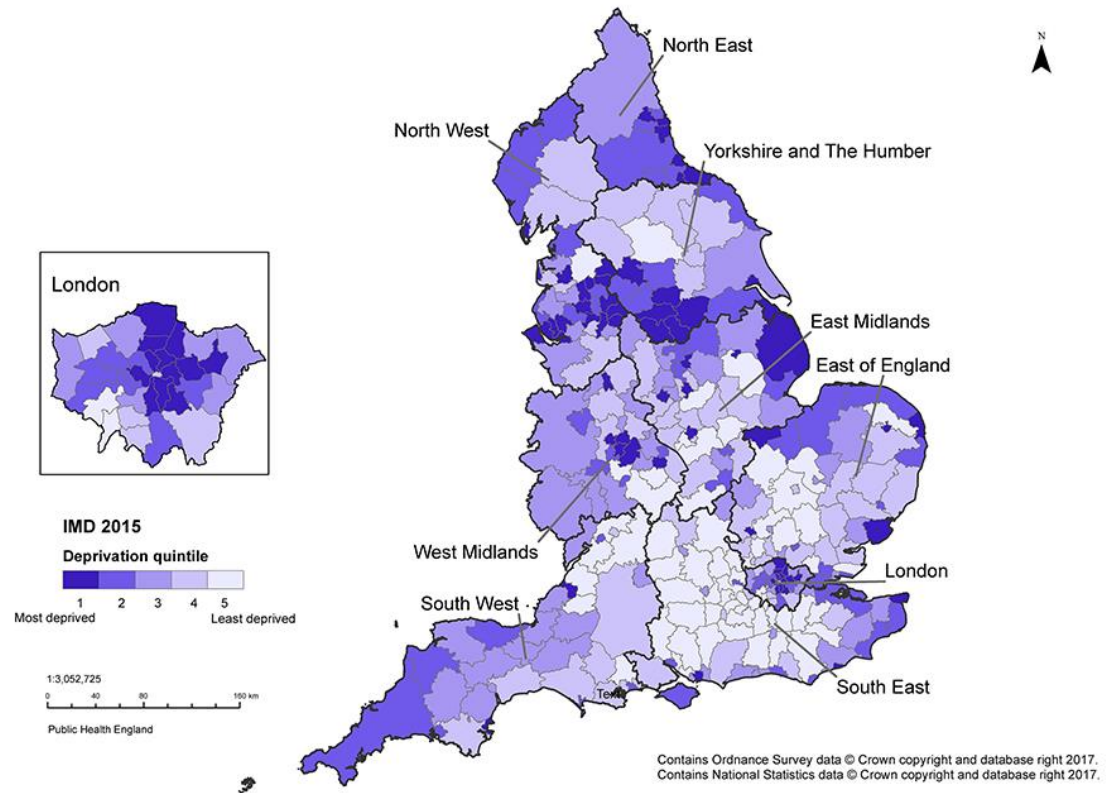


Data collection

- Next annual deadline for SAPS data submissions on 30 June
- Encourage all Scheme Actuaries to consider submitting new data
- In particular:
 - including Industry Supersector, if appropriate
 - including IMD and regional measure data, if possible
- More information on data submission in SAPS Coding Guide
<https://www.actuaries.org.uk/learn-and-develop/continuous-mortality-investigation/cmi-data>

The CMI Postcode mapping tool

- CMI wants to analyse mortality/morbidity by socio-economic status
- We are now seeking a data field that data contributors have pre-mapped from postcode to the Index of multiple deprivation
- The tool generates two measures:
 - A UK-wide academic measure
 - A Country- or region-specific measure (splitting England into nine regions)



Mortality Projections

Mortality Projections Committee activity

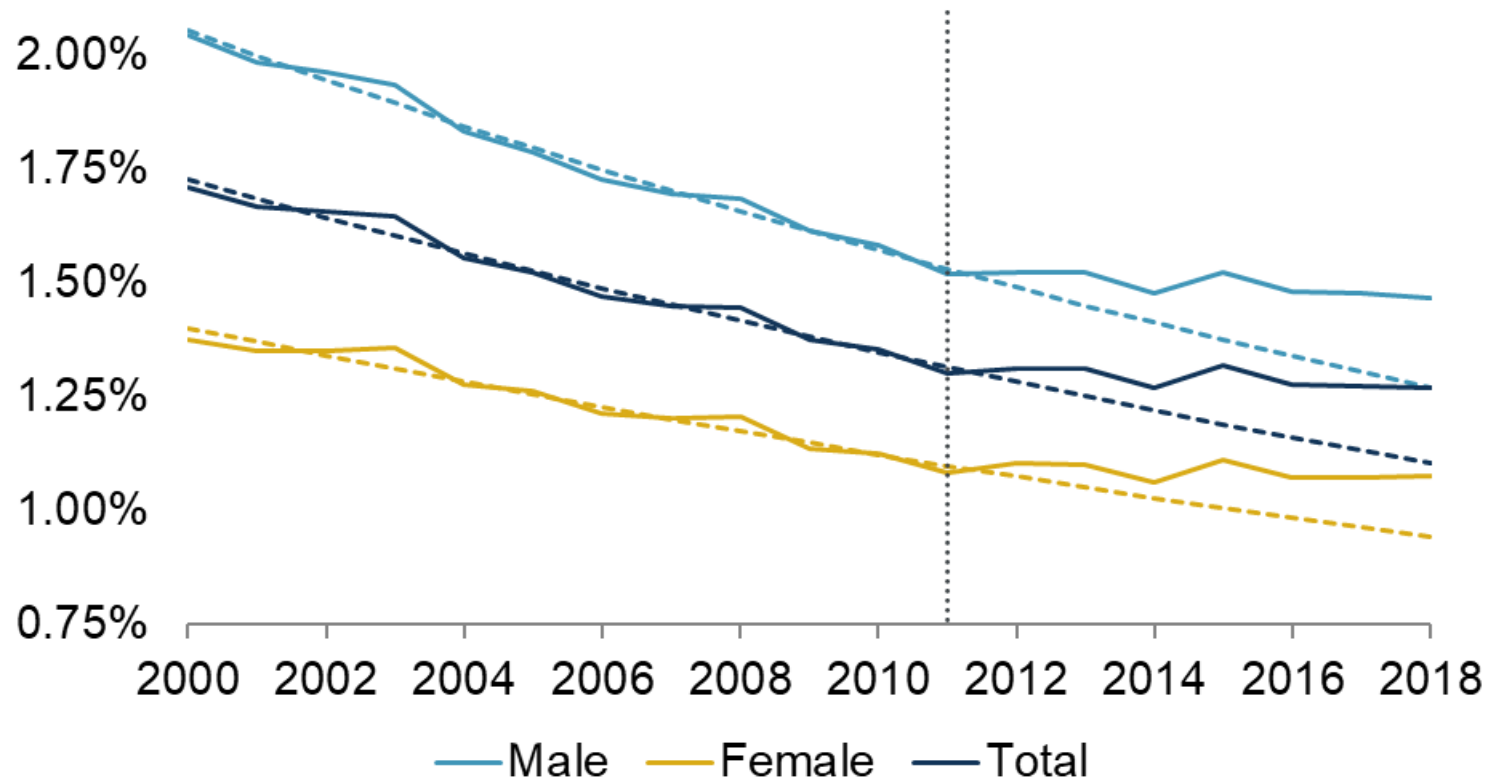
Date	Activity
Nov 2017	Mid-year update working paper (WP103)
March 2018	CMI Mortality Projections Model: CMI_2017 (WP105)
Oct 2018	Regular monitoring of England & Wales population mortality; consultation on proposed methodology (WP111)
Dec 2018	Consultation on the value of the smoothing parameter, S_{κ} , in the Core CMI_2018 model
Dec 2018	Interim update working paper (WP115)
Feb 2019	Confirmation of a change to the value of S_{κ} in Core CMI_2018 (WP116)
Mar 2019	CMI Mortality Projections Model: CMI_2018 (WP119)
Quarterly	Monitoring of England & Wales population mortality
Late 2019	Interim update working paper
Feb/Mar 2020	Publication of CMI_2019

CMI Mortality Projections Model

- A model of projected mortality improvements.
 - First version, CMI_2009, published in November 2009.
 - Latest version, CMI_2018, published in March 2019.
- Mortality improvements are projected by blending between:
 - “initial improvements” – estimated current mortality improvements, calibrated to historical mortality data; and
 - “long-term rate” – an assumption provided by the user of the Model, recognising that levels and causes of improvements change over time.
- The “Core” Model is calibrated to England & Wales, but can use data for other countries, from the Human Mortality Database, or user-specified.

Historical mortality rates

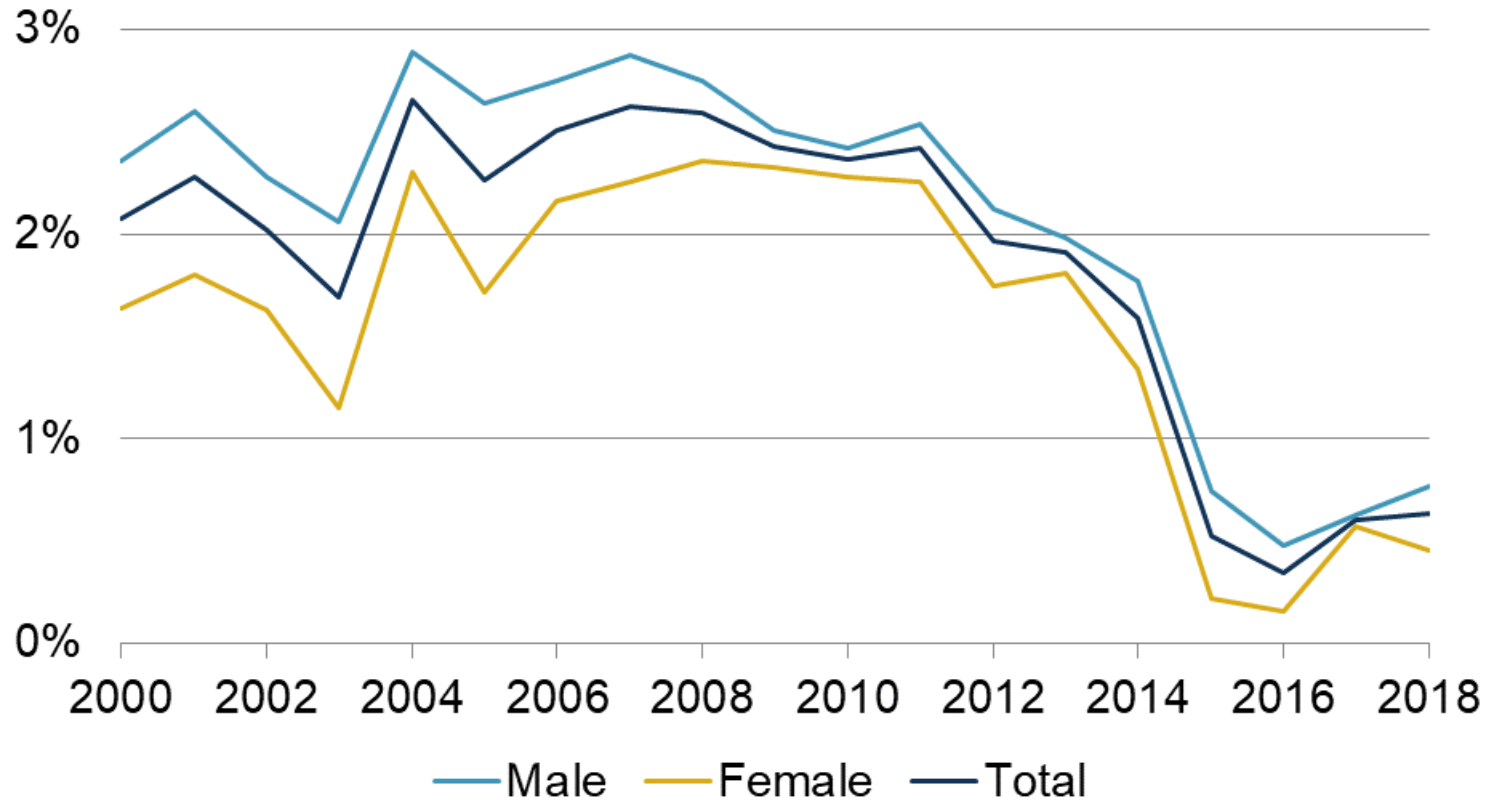
Standardised mortality rates, with 2000-2011 trend lines



Source: CMI calculations based on ONS data for England & Wales.

Historical mortality improvements

Five-year average standardised mortality improvements



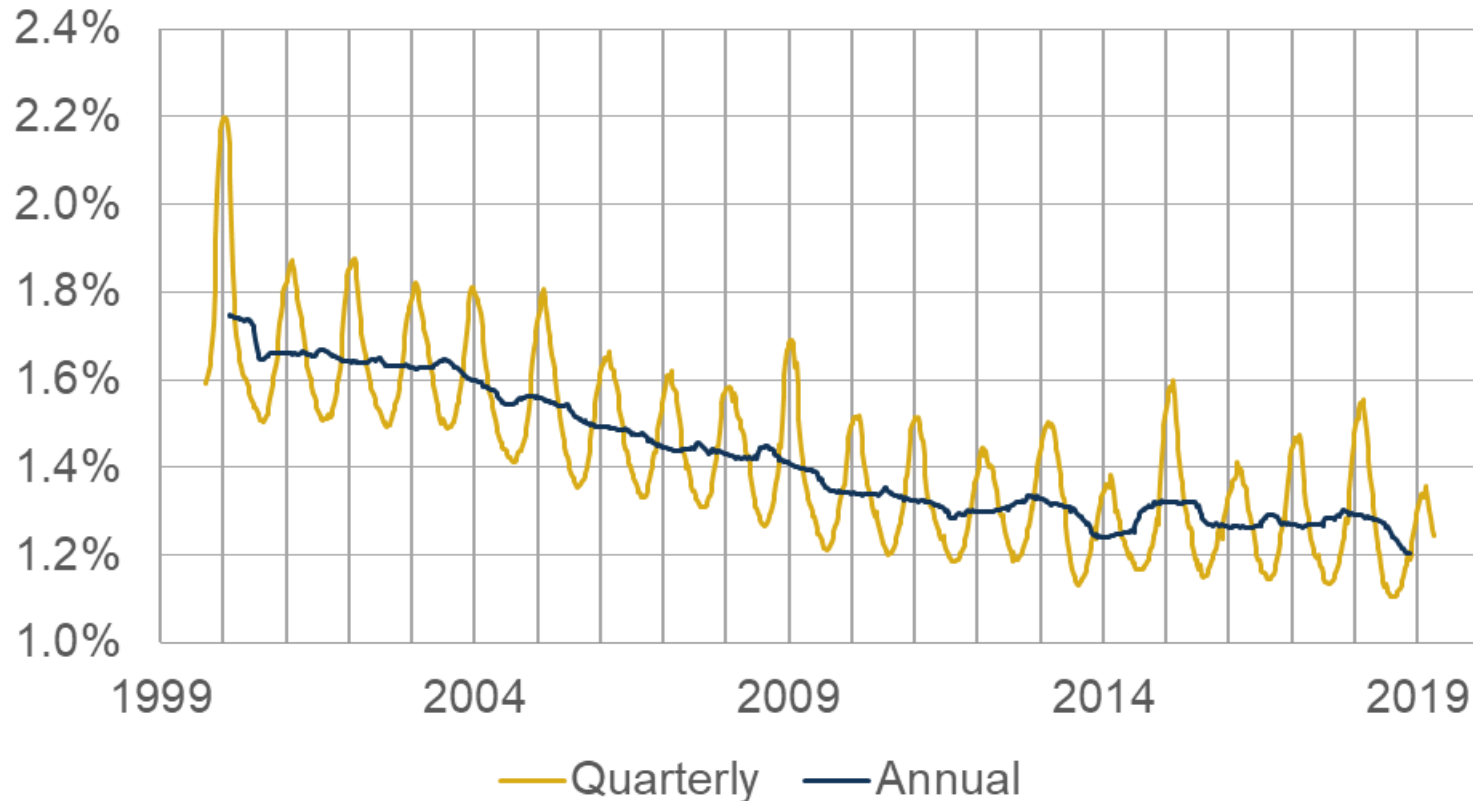
Source: CMI calculations based on ONS data for England & Wales.

Mortality monitoring

- Since October 2018, CMI has published quarterly reports monitoring mortality in England & Wales.
- Analysis is based on provisional weekly deaths data published by the Office for National Statistics (ONS).
- Here we show the latest figures, based on data to 17 May 2019.

Seasonal mortality

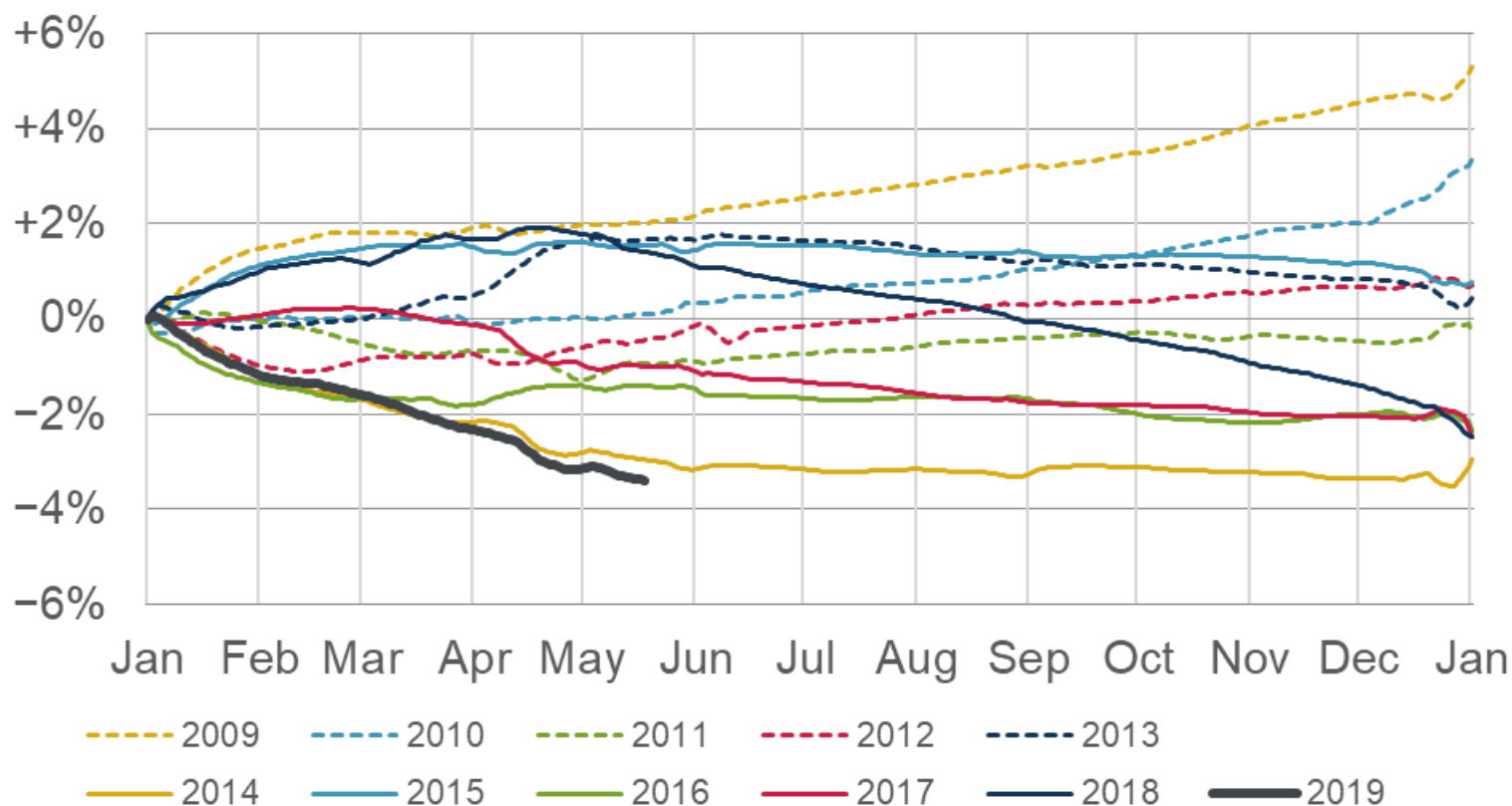
Quarterly and annual average standardised mortality



Source: CMI calculations based on ONS data for England & Wales.

Relative mortality

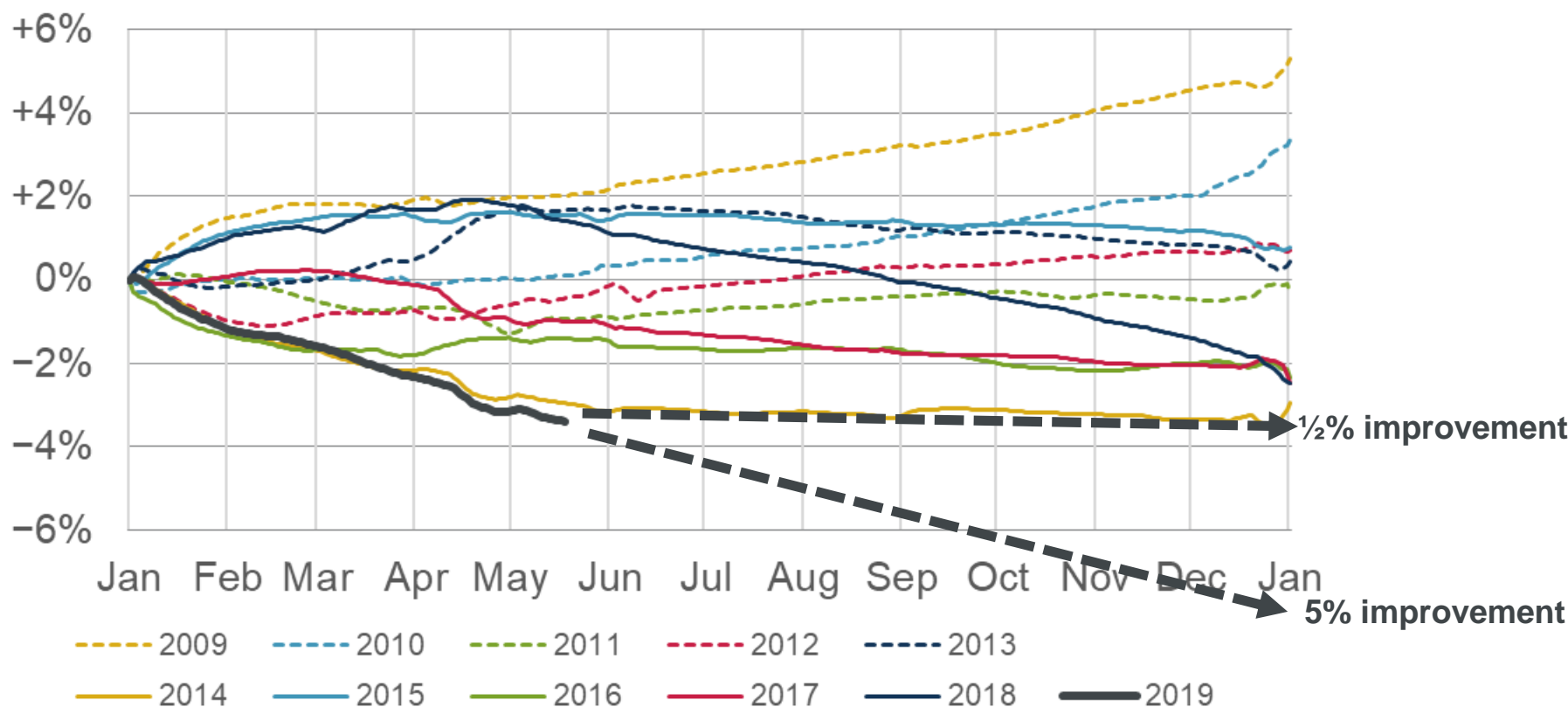
Cumulative standardised mortality relative to the 2009-2018 average



Source: CMI calculations based on ONS data for England & Wales.

Relative mortality

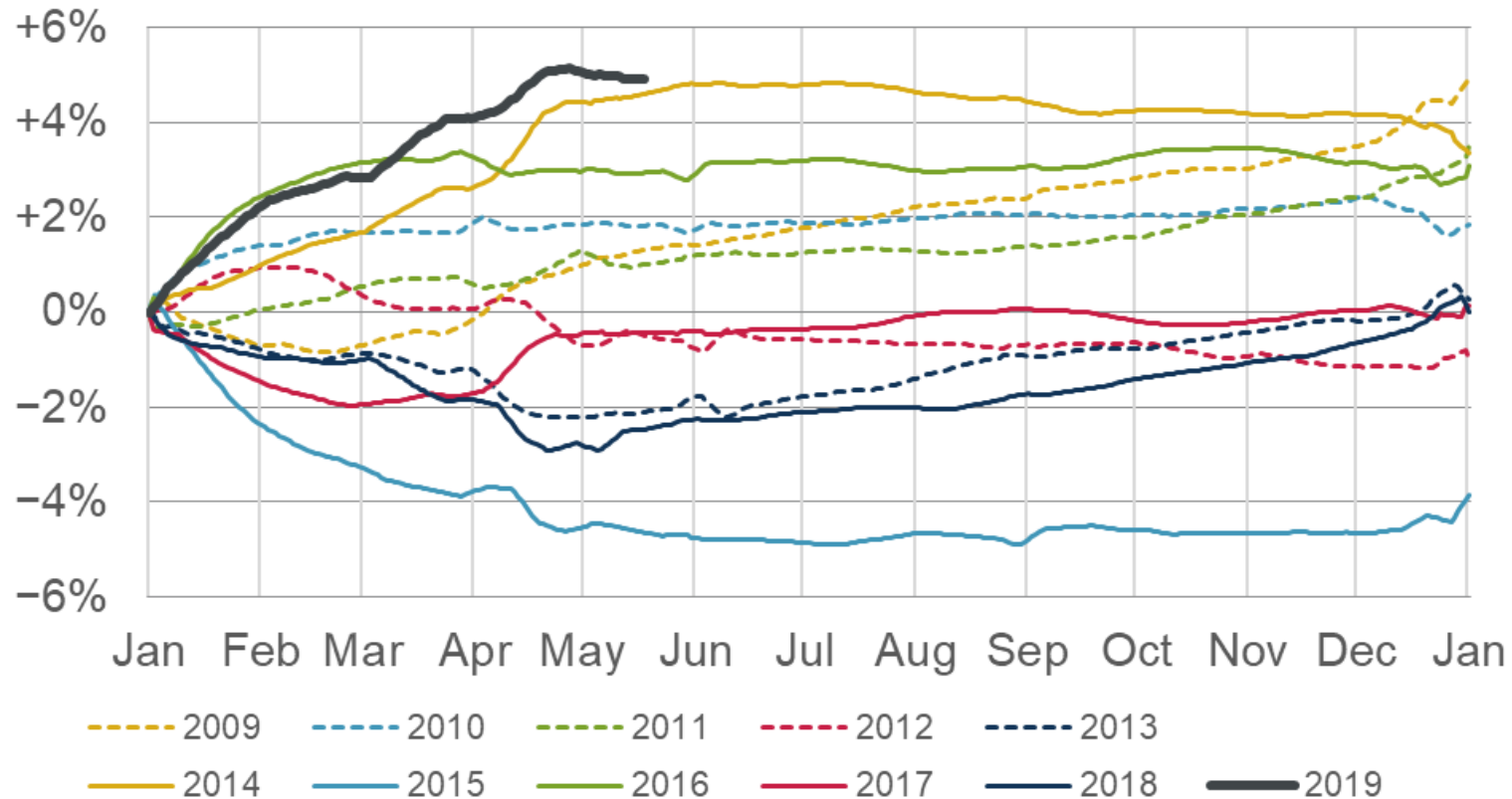
Cumulative standardised mortality relative to the 2009-2018 average



Source: CMI calculations based on ONS data for England & Wales.

Mortality improvements

Cumulative annual standardised mortality improvement



Source: CMI calculations based on ONS data for England & Wales.

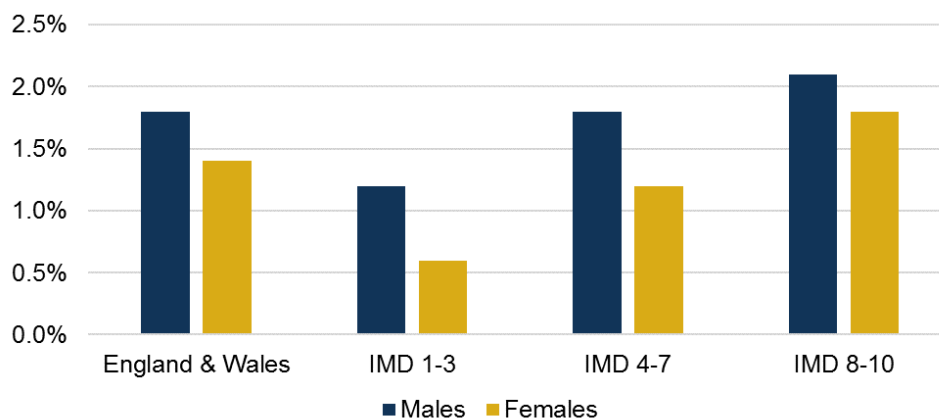
Implications for CMI_2019

- Based on data to 17 May 2019, we have seen an improvement of 5%.
- That would lead to CMI_2019 showing an **increase** in cohort life expectancy of around 2½ months at age 65, compared to CMI_2018.
- If we instead saw an improvement of ½%, that would lead to a **decrease** in life expectancy of around 2 months at age 65.

Mortality improvements and deprivation

- Index of Multiple Deprivation (IMD) is a measure of “relative deprivation” (poverty, crime, unemployment etc) for around 33,000 areas in the UK
 - IMD 1 = most deprived and IMD 10 = least deprived
- Individuals living in less-deprived areas have experienced higher mortality improvements.

Average mortality improvements between 2008 and 2015



Source: CMI Working Paper 115.

Mortality improvements in pension schemes

- The CMI's SAPS dataset contains mortality data for members of self-administered pension schemes in the United Kingdom.
- SAPS pensioners have experienced higher mortality improvements on average than the general population

Comparison of annualised mortality improvements for males and females combined

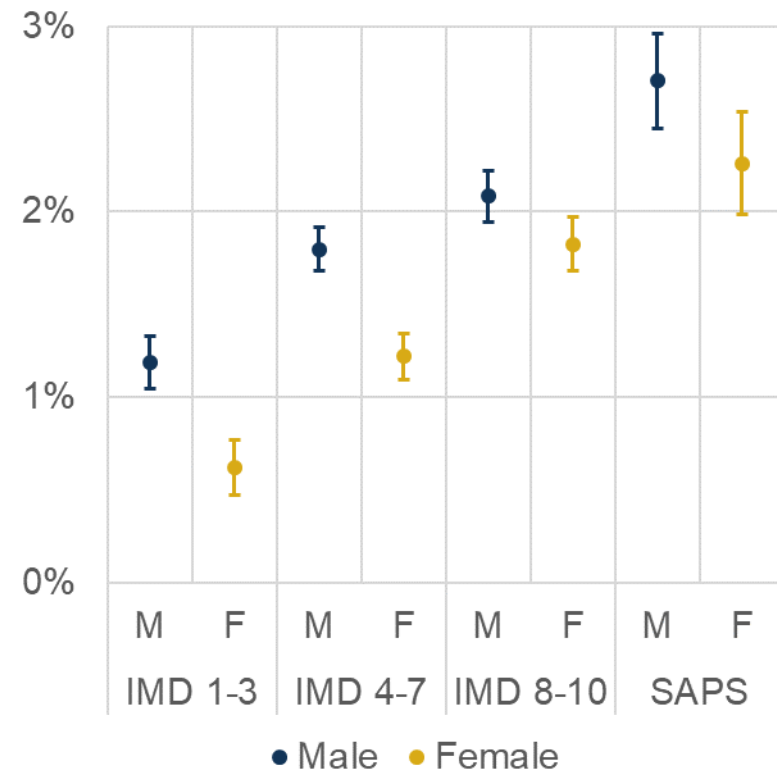
Years	England & Wales	SAPS (amounts weighted)
2008-11	+2.8%	+3.7%
2012-16	+0.4%	+2.7%
2008-16	+1.5%	+3.1%

Source: CMI Working Paper 115.

Initial mortality improvements

- The CMI Model is calibrated to data for England & Wales
- There is evidence of higher recent mortality improvements for less-deprived areas, and for SAPS pensioners
- We encourage users of the Model to adjust the Core parameters to suit the population they use it for.

Average mortality improvements 2008-2015 with 95% observational confidence intervals



How to adjust initial improvements?

- Period smoothing parameter S_K
 - Intended to reflect how quickly we recognise new data
 - Some users have used it to modify initial improvements
 - Impact on improvements of a given change in S_K varies over time
- Recommend use of the “initial addition to mortality improvements” (A)
 - Introduced in CMI_2018
 - Specifies additional initial age-period improvements at ages 20-85
 - Tapers to nil at age 110 (like the Core shape of the long-term rate)
 - Affects historical improvements also; relevant since the base table date
- More complex changes possible using Advanced parameters
- Software being updated to allow “A” to be used with Advanced parameters

How much to adjust initial improvements?

- Historical analyses of specific datasets can be a guide to past differences in mortality improvements.
- For projections, also need to consider other factors, including:
 - Credibility of analyses – statistical uncertainty, and any artefacts of the data
 - Which factors have caused past differences, and whether they are likely to persist
 - The extent to which mortality rates for different groups may converge or diverge over the convergence period



Questions



Comments

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



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