



**Continuous
Mortality Investigation**
Institute and Faculty of Actuaries

Life Conference 2018: CMI Update

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Chairman, Executive Committee

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Chairman, Assurances Committee

CMI

CMI

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

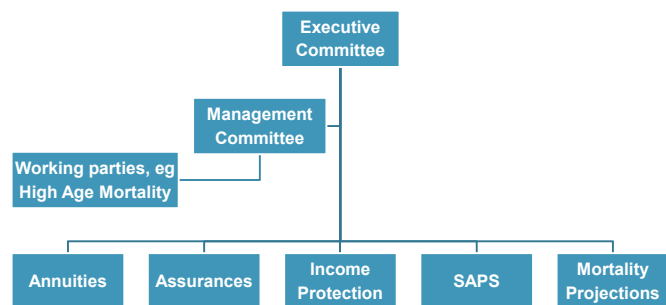
Funded by subscription but free for academics and non-commercial research

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

CMI structure

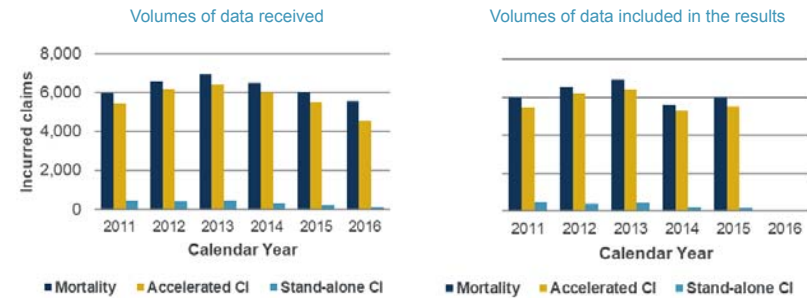


Assurances Committee update

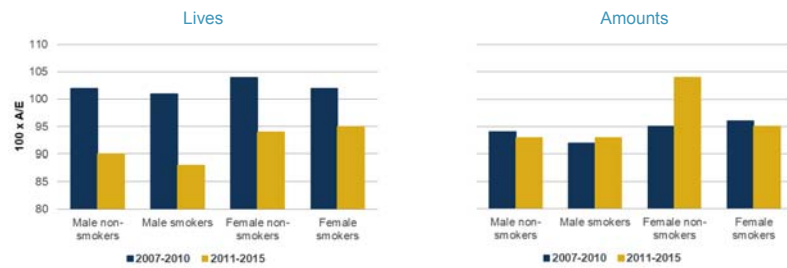
Assurances Committee activity

Date	Activity
December 2014	Experience report for 2007-2010 (WP75)
May 2016	Proposed "08" Series accelerated critical illness tables released for consultation (WP89)
October 2016	Proposed "08" Series term assurance mortality tables released for consultation (WP92)
January 2017	Final "08" Series accelerated critical illness and term mortality tables released (WP94)
June 2018	Experience report for 2011-2015 (WP108) and survey on future data collection / analyses
October 2018	Using the CMI Model for term assurances (WP110)
October 2018	Experience report for 2011-2017 – date is dependent on receipt of data!

Term assurances: 2011-2015 interim results Data volumes

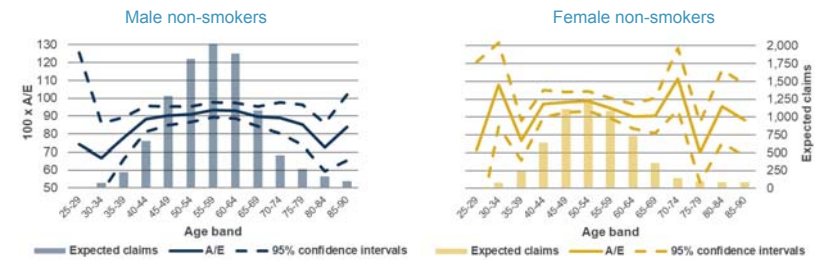


2011-2015 interim results 100 x Actual/Expected by Sex and Smoker Status (Mortality)



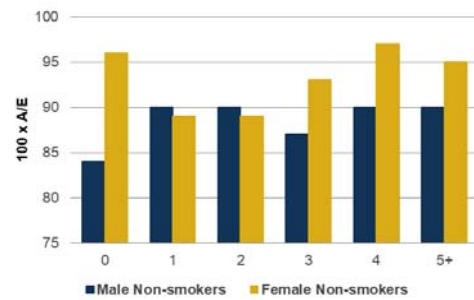
Expected claims calculated using T08 tables (lives-weighted) with no allowance for improvements

Term assurances: 2011-2015 interim results 100 x Actual/Expected by age (Mortality)



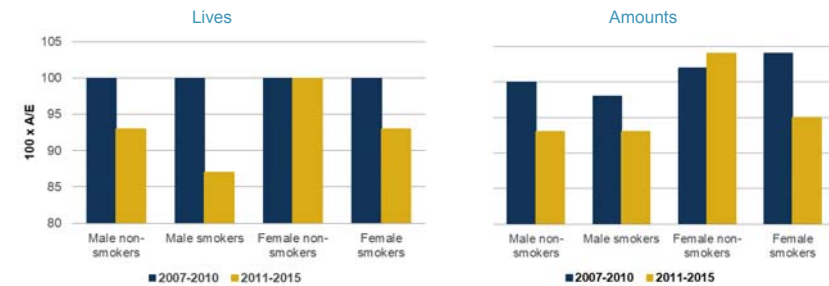
Expected claims calculated using T08 tables (lives-weighted) with no allowance for improvements

Term assurances: 2011-2015 interim results 100 x Actual/Expected by duration (Mortality)



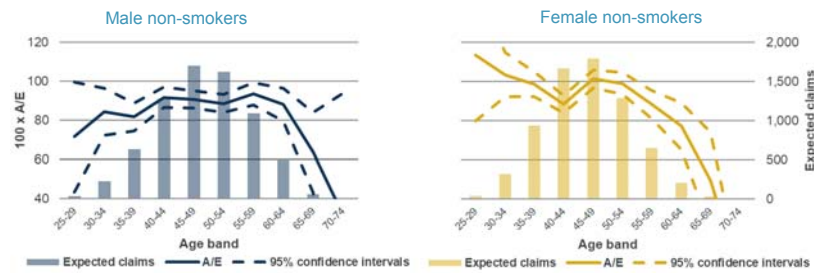
Expected claims calculated using T08 tables (lives-weighted) with no allowance for improvements

Term assurances: 2011-2015 interim results 100 x Actual/Expected by Sex and Smoker Status (ACI)



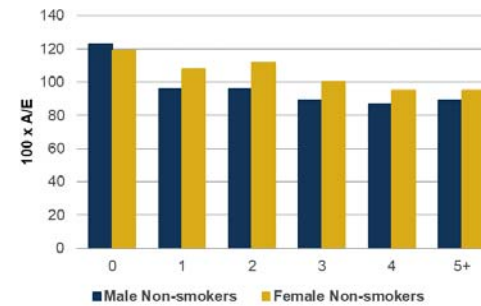
Expected claims calculated using AC08 tables (lives-weighted) with no allowance for improvements

Term assurances: 2011-2015 interim results 100 x Actual/Expected by age (ACI)



Expected claims calculated using AC08 tables (lives-weighted) with no allowance for improvements

Term assurances: 2011-2015 interim results 100 x Actual/Expected by duration (ACI)



Expected claims calculated using AC08 tables (lives-weighted) with no allowance for improvements

Term assurances: 2011-2015 interim results

One-way analyses

Sum assured band

- Four bands: up to £25,000, £25,001-£75,000, £75,001-£125,000 and £125,001+
- Mortality: experience reduces with increasing sums assured
- ACI: experience increases (slightly) with increasing sum assured

Distribution channel

- Mortality: considerable variation in experience:
 - Bancassurance and single tie business are above average
 - IFA business is below average
- ACI: limited variation.

Term assurances: 2011-2015 interim results

One-way analyses

Product type

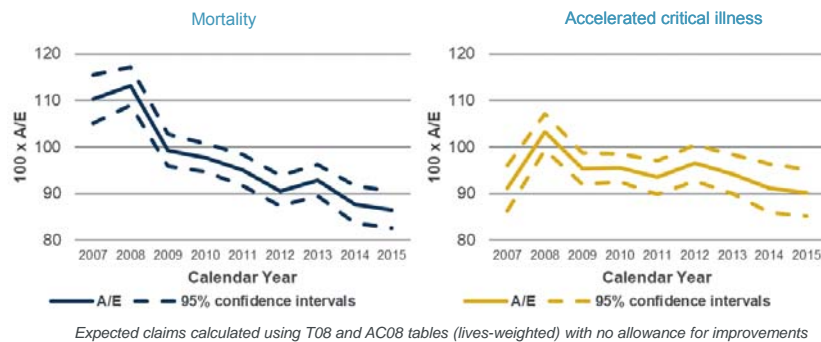
- Mainly level or decreasing term; much lower data volumes for other types of policy
- Mortality: experience is lower for level term than for decreasing
- ACI: experience of decreasing term is lower

Commencement year

- Mortality:
 - In 2007-2010 data, pre-2001 business had experience >> more recent business
 - This led us to use only "post-2000" data in the "T08" tables
 - This difference is not apparent in the 2011-2015 data
- ACI: experience in 2011-2015 appears higher for more recent business
- Warning: one-way analyses may not be able to differentiate between comm year and duration.

Term assurances: 2011-2015 interim results

Experience by calendar year 2007-2015



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CMI Model for term assurances

Impact

- The CMI Model is widely-used ... but primary focus is on pensioners/annuitants; e.g. in:
 - The choice of dataset, and the adjustments to the data; and
 - The structure and calibration of the Model
- The Assurances Committee wanted to consider the Model for term (and whole of life) policies
- Working Paper 110 illustrates the sensitivity of the Model to:
 - Two key inputs – the long-term rate and the period smoothing parameter (S_K); and
 - Different age ranges and cohort constraints
- It also discusses potential areas of basis risk of using a model based on England & Wales population:
 - Socio-economic class
 - Impact of underwriting
 - Smoker-specific rates; and
 - Potential difference in claim causes
- We are keen to receive suggestions on whether we should do further work in this area

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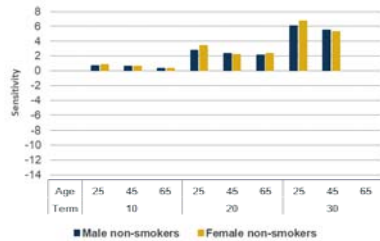
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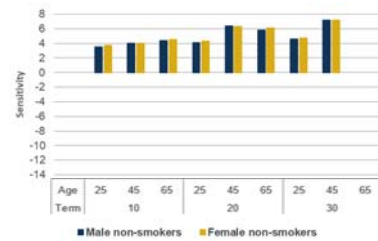
CMI Model for term assurances

Sensitivity of (indicative) premium rates

Sensitivity to a long-term rate improvement of 1.0% pa (compared with 1.5% pa)



Sensitivity to period smoothing parameter $S_k = 6.5$ (compared with 7.5)

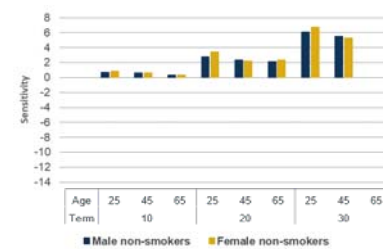


See Working Paper 110 for details of calculations

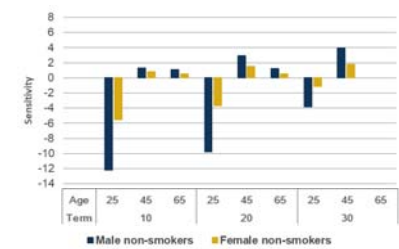
CMI Model for term assurances

Sensitivity of (indicative) premium rates

Sensitivity to a long-term rate improvement of 1.0% pa (compared with 1.5% pa)



Sensitivity to no constraint on cohort effects at ages 30 and below



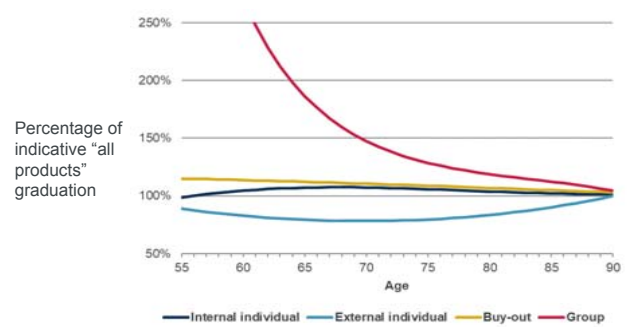
See Working Paper 110 for details of calculations

Annuities Committee update

Annuities Committee activity

Date	Activity
October 2013	Experience report for 2007-2010 (WP70)
April 2015	Proposed "08" Series annuitant mortality tables released for consultation (WP78)
June 2015	Final "08" Series annuitant mortality tables released (WP81)
December 2015	Experience report for Enhanced Annuities in 2007-2010 (WP87)
July 2017	Experience report for 2011-2014 (WP101)
October 2017	Results of survey of data contributors
Nov 2018	Additional analyses of 2011-2014 data (WP112)
Dec 2018 / Jan 2019	Experience report for 2011-2017

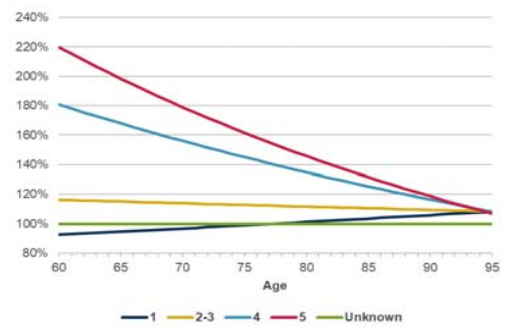
Indicative graduations by product type (male lives)



See Working Paper 112 for more detail

GLM analysis

Relative mortality by age for Acom category against the reference level, unknown



See Working Paper 112 for more detail

Income Protection Committee update

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Income Protection Committee activity

Date	Activity
July 2010	IPM 1991-98 graduations finalised (WP48)
February 2012	Experience report for 2003-2006 (WP60) Summary statement of revised methodology (WP59)
April 2014	IP Rate Table Tool released to help practitioners make use of published graduations
April 2014	Report and database of experience by cause of sickness, 1991-2009 (WP72)
March 2017	Experience report for 2007-2010 (WP96)
August 2017	Report on 2003-2010 experience by benefit amount and policy duration (WP102)
July 2018	Proposed "IP06" claim inceptions rates (WP109)
Jan 2019	Final "IP06" claim inceptions rates
TBC	2011-16 experience report – date is dependent on receipt of data!
2019	New terminations graduations expected to be released for consultation

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Proposed “IP06” claim inception rates

- Claim graduations – previously CMI has started from sickness graduations
- Used generalised linear models (GLM) ‘borrow strength’
 - Enabled us to graduate data for females and smaller occupation classes

$$\log(\mu_g) = \sum_{i=1}^s a_i \cdot D_i(g)$$

- Graduate all data together – but with DPs split – so that, e.g.
 - Male and female data combined used to determine effect of occupation classes
 - Occupation class data combined used to determine effect of being male/female

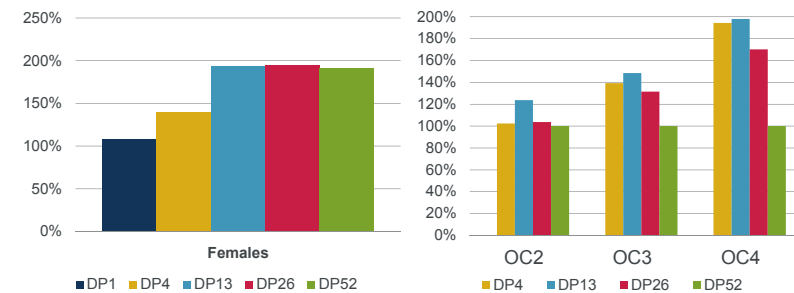
Deferred period	Model
DP1	Intercept + Age (quartic) + Sex
DP4	Intercept + Age (linear) + Sex + OC
DP13	Intercept + Age (linear) + Sex + OC + Age*Sex (may change in final rates)
DP26	Intercept + Age (linear) + Sex + OC
DP52	Intercept + Age (quadratic) + Sex

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Proposed “IP06” claim inception rates Multiplicative factors (versus males/OC1)



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Mortality Projections Committee update

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Mortality Projections Committee activity

Date	Activity
March 2017	CMI Mortality Projections Model: CMI_2016 (WP97, WP98, WP99)
Nov 2017	CMI_2016 software updated to allow users to connect directly to the Human Mortality Database
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)
30 Nov 2018	Deadline for responses to WP111 consultation
Dec 2018	Consultation on the value of the smoothing parameter, S_K , in the Core CMI_2018 model
Dec 2018 / Jan 2019	Interim update working paper (analogous to WP103)
Jan 2019	Deadline for responses to S_K consultation
Feb / March 2019	CMI Mortality Projections Model: CMI_2018

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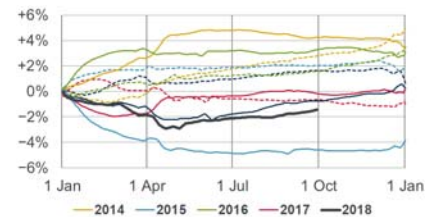
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Quarterly monitoring of population mortality

- CMI has launched quarterly analysis of standardised mortality, using ONS weekly deaths data:
 - for general public interest; and
 - to inform expectations of the next version of the CMI Model
- Working Paper 111 contains:
 - details of the method used (inviting views on its suitability); and
 - provisional analysis to Q3 2018
- Responses by 30 Nov please
- The next quarterly update is due in January 2019, for data to 31 December 2018.

Cumulative mortality improvements in England & Wales

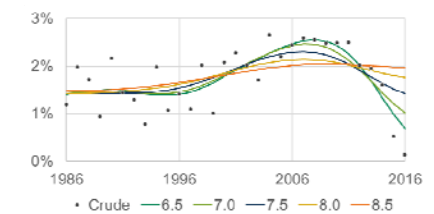


The improvement to Q3 2018 is -1.4%

Consultation on S_K

- The parameter S_K in the CMI Model controls the amount of smoothing when determining the level of initial mortality improvements
- Parameter was introduced in CMI_2016
- CMI_2016 and CMI_2017 used a Core value of 7.5 for S_K
- The Committee will soon consult on a proposal to use a value of 7.0 in CMI_2018. This would place more weight on recent low mortality improvements and lead to lower life expectancies.

Five-year average mortality improvements in England & Wales



Source: Working Paper 103

SAPS Committee update

SAPS Committee activity

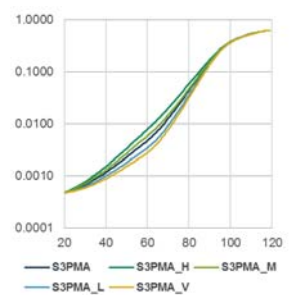
Date	Activity
Nov 2015	Mortality experience by industry classification of SAPS pensioners for the period 2006-2013 (WP86)
Feb 2016	Mortality experience of SAPS pensioners for the period 2007-2014 (WP88)
Feb 2017	Mortality experience of SAPS pensioners for the period 2008-2015 (WP95)
Jan 2018	Mortality experience of SAPS pensioners for the period 2009-2016 (WP104)
May 2018	Proposed "S3" Series mortality tables released for consultation (WP107)
Nov / Dec 2018	Target date for final "S3" Series mortality tables
Feb 2019	Mortality experience of SAPS pensioners for the period 2010-2017
Apr 2019	Mortality experience by industry classification of SAPS pensioners for the period 2009-2016

Range of tables – S3 compared to S2

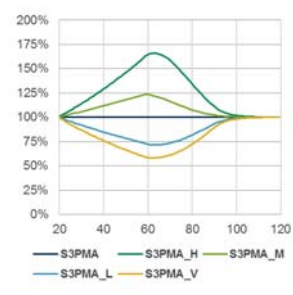
Type	Gender	Lives	Amounts				
			All	Heavy	Middle	Light	Very Light
Pensioners	Male						NEW
Pensioners	Female				NEW		NEW
Normal health	Male				NEW		NEW
Normal health	Female				NEW	NEW	NEW
Ill-health	Male						
Ill-health	Female						
Dependants	Male	NEW	NEW				
Dependants	Female					NEW	NEW

Male Pensioner amounts tables

Mortality (q_x) on a logarithmic scale



Mortality relative to S3PMA



And finally...

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The CMI Postcode mapping tool

- CMI reviewed all its practices for GDPR; in particular, no longer collecting postcode
- 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
- We are now seeking 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
- The tool generates 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)

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Survey of subscribers

- Survey sent to all Subscribers in July
- Responses were very positive - especially quality of the CMI's work
- Key area for improvement – communications:
 - Issues with reliability of e-newsletters – we are trying to resolve urgently
 - Webinars – first expected to be on the “S3” tables

Future investigations

- Survey responses included lots of suggestions for future work
- Areas currently under consideration:
 - Redemptions under Equity Release Mortgages
 - Currently seeking views from providers in conjunction with IFoA Equity Release Working Party – responses by 30 Nov
 - Guaranteed acceptance Whole of Life plans
 - Persistency risk under corporate pensions
 - Lapses under protection products
 - Proportion married / marital status / age differences (Annuities and SAPS)



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

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



**Continuous
Mortality Investigation**
Institute and Faculty of Actuaries

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