



Institute  
and Faculty  
of Actuaries

## CMI Update

Tim Gordon, CMI Chairman



29 January 2015

---

---

---

---

---


---

---

---

## Agenda

- The CMI
- SAPS (Self Administered Pension Schemes)
- Working parties
- Annuities
- Assurances
- Mortality Projections



29 January 2015

---

---

---

---

---


---

---

---

## The CMI

- We aim to be regarded across the world as setting the benchmark for the quality, depth and breadth of analysis for graduation and projection
- CMI tables and models are the UK actuarial lingua franca
- The CMI works because of
  - industry support – sharing data and supporting volunteers
  - dedication of individual actuaries
- Quality of CMI output derives from
  - diversity of CMI committees
  - dedicated secretariat
  - consultation and openness



29 January 2015

---

---

---

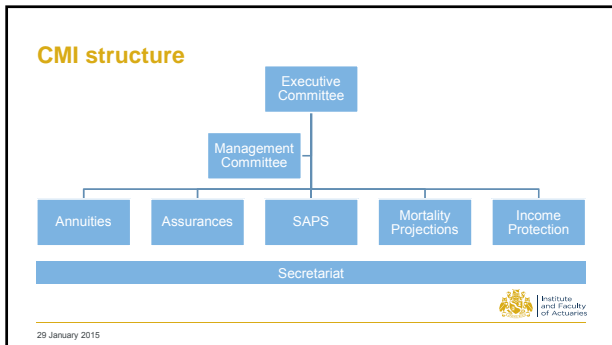
---

---

---

---

---




---

---

---

---

---

---

---

---

- Roadmap**
- Overhaul graduation and modelling methods and tools
  - Business as usual e.g. SAPS S2 (2014), annuities graduation (2015)
  - Ongoing/planned
    - High age mortality
    - Review projections model
    - SAPS mortality improvements analysis
  - International co-operation / consistency / coherence
- 29 January 2015

---

---

---


---

---

---

---

---

 Institute and Faculty of Actuaries

**SAPS  
(Self Administered Pension Schemes)**

Sponsorship  
 Thought leadership  
 Progress  
 Community  
 Professional Meetings  
 Education  
 Working parties  
 Volunteering  
 Research  
 Shaping the future  
 Networking  
 Professional support  
 Enterprise and risk  
 Learned society  
 Opportunity  
 International profile  
 Journals  
 Support

29 January 2015

---

---

---

---

---

---

---

---

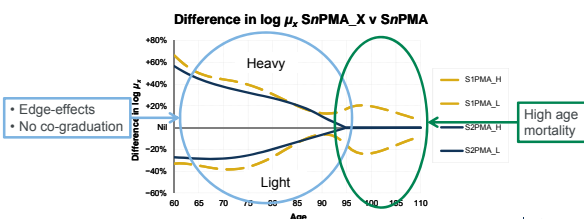
## SAPS

- Tables published
  - S1 (2009) – 2000-06 experience
  - S2 (2014) – 2004-11 experience
- Good range of sub group calibrations:
  - all / heavy / (mid) / light
  - all / normal / ill / dependants
- Table selection + scaling 100%  $\pm 10\%$  leads to good shape
- S2 v S1
  - Similar approaches – stable
  - Timing locked down to CMI (and other) projection models
  - Different high and young age extrapolations
- Forthcoming
  - Industry-based analysis
  - SAPS + mortality improvement

29 January 2015



## High age extrapolation S2 v S1



29 January 2015



## Working parties

Advisory  
Sponsorship  
Thought leadership  
Progress  
Community  
Professional Meetings  
Education  
Working parties  
Volunteering  
Research  
Shaping the future  
Networking  
Professional support  
Enterprise and risk  
Learned society  
Opportunity  
International profile  
Journals  
Support

29 January 2015

### Graduation and Modelling Working Party

- Issues: CMI methods specific to CMI, edge effects/unpredictable extrapolation, intractability, over-fitting and overdispersion
- Objective: overhaul CMI graduation and modelling methods and tools
- Initial report to CMI Management Committee in January 2014
- Findings already fed into
  - CMI\_2014 Model – ONS data quality and overdispersion
  - Annuities graduation – co-graduation and visualisation of results – also used to test and harden the software
- Plan to publish initial report and (beta) software



29 January 2015

---

---

---

---

---

---

---

---

### High Age Mortality Working Party

- Issue: poor data at high ages, inconclusive academic view, but view required for base tables (annuity and SAPS) and projections
- Objective: investigate estimation of mortality at high ages (90+)
  - Survey current state of knowledge and make it accessible to actuaries
  - Undertake further research on high age mortality
- Ongoing:
  - Active but inconclusive debate on pattern of mortality at high ages
  - Data and modelling affect – and may bias – high age mortality analysis
- Working towards a paper / presentation in Summer 2015



29 January 2015

---

---

---

---

---

---

---

---



Institute  
and Faculty  
of Actuaries

### Annuities

Advice  
 Sponsorship  
 Thought leadership  
 Progress  
 Community  
 Professional Meetings  
 Education  
 Working parties  
 Volunteering  
 Research  
 Shaping the future  
 Networking  
 Professional support  
 Enterprise and risk  
 Learned society  
 Opportunity  
 International profile  
 Journals  
 Support

29 January 2015

---

---

---

---

---

---

---

---

### 2007-2011 data: timeline

- May 2012 – exercise launched at CILA
- June 2012 – first data received
- Sept 2012 – Secretariat started focussing on annuities over assurances
- May 2013 – last annuities data received
- Oct 2013 – Working Paper 70 / All Office annuities results
- May 2014 – last assurances data received
- Dec 2014 – Working Paper 75 / All Office assurances results

NB 2011 data used to "complete" claims data for 2007-2010; no allowance for subsequent late-reporting



29 January 2015

---

---

---

---

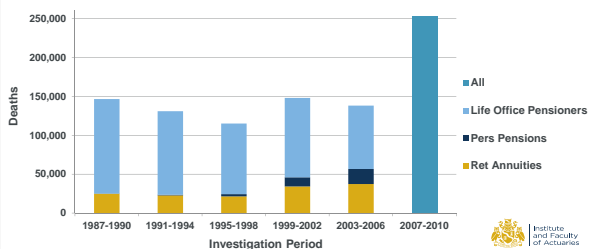
---

---

---

---

### Data Volumes: Pension annuities in payment



29 January 2015

---

---

---

---

---

---

---

---

### Proposed annuities graduations (1/2)

"00" Series		"01" Series	
Name	Description	Description	Additional information
IML00	Immediate Annuity, males, lives	Life Annuity, males, lives	Experience for amounts vs lives
IFL00	Immediate Annuity, females, lives	Life Annuity, females, lives	Experience for amounts vs lives
PNML00	Pensioners, males, normal, lives		
PFML00	Pensioners, females, Early, lives		
PCML00	Pensioners, males, Combined, lives	Pension Annuity, males, lives	Experience by duration
RMV00	Retirement Annuity, males, vested		Experience by distribution channel
PPMV00	Personal Pensioners, males, vested		
PNFL00	Pensioners, females, Normal, lives		
PEFL00	Pensioners, females, Early, lives		Experience by duration
PCFL00	Pensioners, females, Combined, lives	Pension Annuity, females, lives	Experience by distribution channel
RFV00	Retirement Annuity, females, vested		Widow/pensioner's experience
PPFV00	Personal Pensioners, females, vested		
WLD00	Widows, lives		



29 January 2015

---

---

---

---

---

---

---

---

### Proposed annuities graduations (2/2)

"08" Series		"08" Series	
Name	Description	Description	Additional information
PNMA00	Pensioners, males, Normal, amounts	Pension Annuity, males, amounts	Experience by duration
PEMA00	Pensioners, males, Early, amounts		Experience by distribution channel
PCMA00	Pensioners, males, Combined, amounts		Experience by amount band
PNFA00	Pensioners, females, Normal, amounts	Pension Annuity, females, amounts	Experience by duration
PEFA00	Pensioners, females, Early, amounts		Experience by distribution channel
PCFA00	Pensioners, females, Combined, amounts		Experience by amount band
WMA00	Widows, amounts		Widows/pensioners experience
RMD00	Retirement Annuity, males, deferred	Deferred Pensioners, males (lives)	[None]
PPMD00	Personal Pensioners, males, deferred		
RFD00	Retirement Annuity, females, deferred		
PPFD00	Personal Pensioners, females, deferred	Deferred Pensioners, females (lives)	[None]
RMCD00	Retirement Annuity, males, combined		
RFCD00	Retirement Annuity, females, combined		
PPMCD00	Personal Pensioners, males, combined	[None]	
PPFCD00	Personal Pensioners, females, combined		



29 January 2015

---

---

---

---

---

---

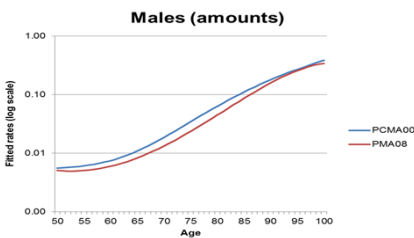
---

---

---

---

### Proposed graduations – Pension Annuity



29 January 2015

---

---

---

---

---

---

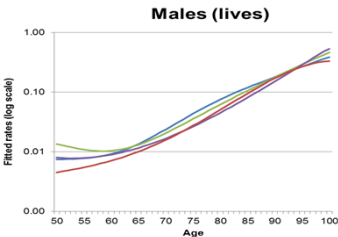
---

---

---

---

### Proposed graduations – Pension Annuity



29 January 2015

---

---

---

---

---

---

---

---

---

---

### CMI Annuities Committee – Next steps

- Consult on proposed graduations
  - Proposed graduated tables
  - Extensions to younger / older ages
  - Target by Feb 2015
- Graduated “08” Series tables
  - Final tables + accompanying working paper
  - Target Q2 2015 – but dependent on responses to draft tables
- What’s next?
  - Enhanced Annuities
  - All-Offices results for standard annuities for 2011 (and 2012)
  - Individual Offices’ experience by GLM?

29 January 2015



### Assurances

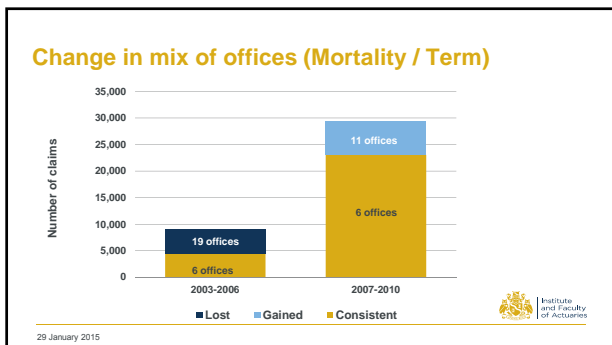
29 January 2015

### CMI Assurances – 2007-2010 results

- Working Paper 75 described data and high-level commentary
- Summary results produced by:
  - Age (last birthday: 5-year age bands)
  - Duration (curtate: 0, 1-4, 5+)
  - Gender and Smoker status (where relevant)
  - Product category (separately for mortality, accelerated CI and stand-alone CI)
- Datasheets:
  - Individual age / duration + sum assured band and distribution channel
- No allowance for IBNS
- Further analysis now underway -> additional working papers and graduated tables.

29 January 2015






---

---

---

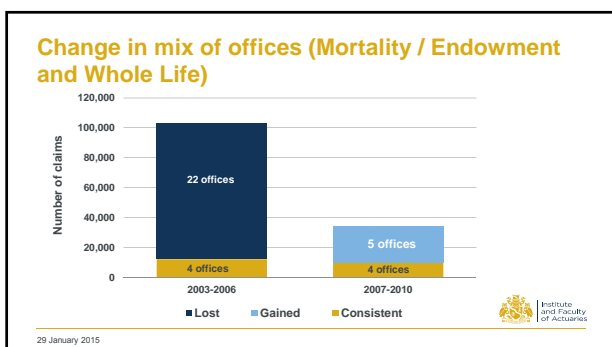
---

---

---

---

---




---

---

---

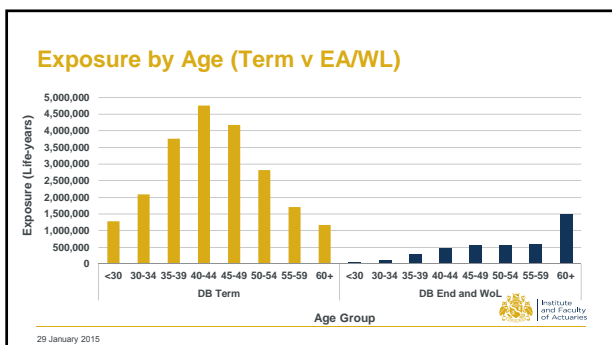
---

---

---

---

---




---

---

---

---

---

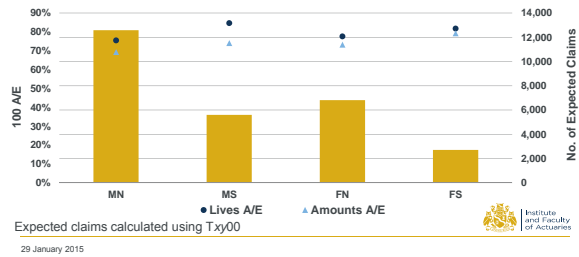
---

---

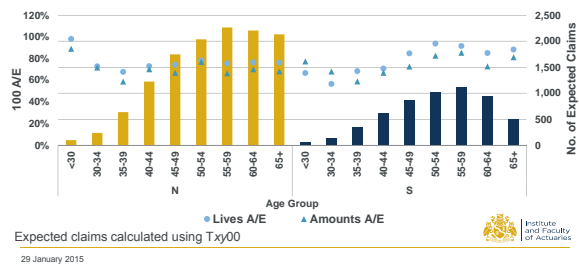
---



### Mortality / Term Results: Lives vs. Amounts




### Mortality / Term Results by Age – Males



### CMI Assurances – 2007-2010 graduations

- Do we need to update the 00 tables?
  - Critical Illness tables look like they are in more need of work
  - T00 tables look a better fit
  - A00 will largely be used at ultimate durations
- Issues to consider:
  - Graduate (a) Term only or (b) Term + Endowment + WoL?
  - Should the tables vary by:- distribution channel, sum assured?
  - Lives tables only, or lives and amounts?
- Should we conduct a specific investigation in GA WoL?

29 January 2015



Institute  
and Faculty  
of Actuaries

## Mortality Projections

29 January 2015

Enterprise  
 Sponsorship  
 Thought leadership  
 Progress  
 Community  
 Professional Meetings  
 Education  
 Working parties  
 Volunteering  
 Research  
 Shaping the future  
 Networking  
 Professional support  
 Enterprise and risk  
 Learned society  
 Opportunity  
 International profile  
 Journals  
 Support

---

---

---

---

---


---

---

---

### CMI\_2014 changes to initial rates calibration

- Driven by population data quality:
  - Start from 1974 to avoid lower quality earlier data – expect to use a 40-year rolling period going forward
  - Adjust exposure data for age/year cells which are anomalous
  - Allow for overdispersion when fitting the p-spline model – smoother fit
- Driven by perceived need for up-to-date fit:
  - Use weekly deaths data 1 January 2013 to 30 September 2014
    - more up-to-date
    - reduces volatility due to 2013/14 experience



Institute  
and Faculty  
of Actuaries

29 January 2015

---

---

---

---

---

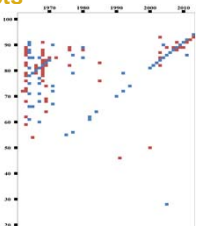
---

---

---

### Population data quality/artefacts

- P-spline model fits data less well than would be expected
  - over-dispersion in general
  - particular issues with 1960s calendar years and 1919 birth cohort
- Informed by:
  - Graduation and Modelling Working Party
  - Cairns et al – ‘Phantoms never die’ (2014)



Extreme deviance residuals  
(1-in-10,000 probability)

29 January 2015

---

---

---

---

---

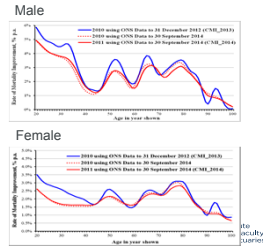
---

---

---

### Mortality improvements in 2013 and 2014

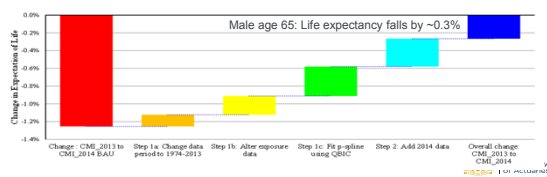
- Crude improvements of
  - ~0% in 2013
  - 4-5% in 2014
- CMI\_2014** improvements lower than **CMI\_2013** at most ages
- CMI\_2014** improvements have less extreme cohort effects, due to changes in calibration method.



29 January 2015

### Impact on (male) life expectancy

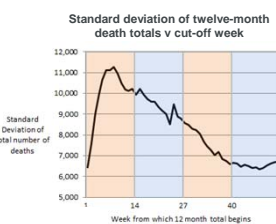
- Most ages see a modest fall in life expectancy
- Changes to CMI\_2014 led to a lower fall v 'business as usual' (BAU)



29 January 2015

### Release timing

- Release timing driven by ONS data availability
- Problem for life offices:
  - November too late for year-end
  - Auditors need justification for not using the latest model
- Can achieve September *provided no issues arise*, but this is still late
- Consultation planned shortly



29 January 2015

### Future versions of the Model

- SoA (US), CIA (CA) and AG (NL) recently improved their projections
- Projections Committee is actively reviewing:
  - More objective statistical approach – e.g. how volatile should projections be?
  - Review current deterministic method and consider alternatives
  - Not cause of death, but cause of death data does inform the philosophy
  - Coherent modelling: males v females, UK v Western World, SAPS
- Best guess
  - CMI\_2015 – business as usual
  - CMI\_2016 – new approach/model (subject to prior consultation)?

29 January 2015



### Disclaimer and statutory information

- **Disclaimer:** This document has been prepared by and/or on behalf of Continuous Mortality Investigation Limited (CMI). This document does not constitute advice and should not be relied upon as such. While care has been taken to ensure that it is accurate, up-to-date and useful, CMI will not accept any legal liability in relation to its contents.
- Continuous Mortality Investigation Limited is a company limited by shares and wholly owned by the Institute and Faculty of Actuaries. It is registered in England and Wales (Company number: 8373631) with its Registered Office at: Staple Inn Hall, High Holborn, London, WC1V 7QJ.

© Continuous Mortality Investigation Limited.

29 January 2015



**Questions**

**Comments**

Expressions of individual views by members of the Institute and Faculty of Actuaries and its staff are encouraged.

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

Feedback always welcome: [info@cmlimited.co.uk](mailto:info@cmlimited.co.uk).

29 January 2015

