

**The Actuarial Profession**  
making financial sense of the future

**Pensions Conference 2010**  
Vassos Vassou and Daniel Ryan



**How long are we going to live?**  
Practical insights on both the past and the future

10 June 2010

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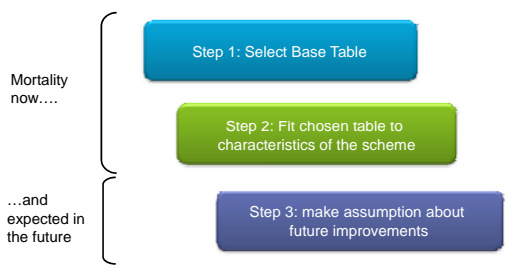
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### How are mortality assumptions chosen?

Mortality now....

...and expected in the future



Step 1: Select Base Table

Step 2: Fit chosen table to characteristics of the scheme

Step 3: make assumption about future improvements

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### Standard Base table – developments

Continuous Mortality Investigation (CMI) has issued tables of mortality rates over many years

- Based on mortality data from insurance companies
- Until recently was the "industry standard"
- Tables issued in 1999 based on experience in 1991-1994 called the "92" series tables
- Latest tables issued in 2006 based on 1999-2002 experience, called the "00" series tables

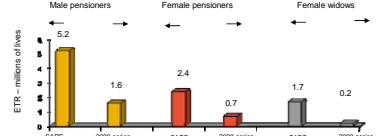
Tables based on self-administered pension schemes (SAPS) data was released in 2008

- Mortality data was taken from pension scheme valuations conducted between 2000 and 2006
- CMI have published 3 main tables: Heavy, Light and All.

Most notable features of the SAPS data compared with that used for the 2000 series tables are:

- larger size of the SAPS data set
- significantly higher average pension
- proportionately much larger female widows data set

Comparison of exposed to risk (ETR) for SAPS with data used for 2000 series tables



Category	SAPS	2000 series
Male pensioners	5.2	1.6
Female pensioners	2.4	0.7
Female widows	1.7	0.2

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## What are the SAPS tables?

- CMI Working Paper 35 (released on 31 October 2008) contained the final graduated tables derived from the SAPS data that relate to years 2000-06.
- The data used in the graduated tables comprised 9.1 million life years of exposure and 343,000 deaths.
- There are 20 'S1' tables in all; split by gender, lives/amounts, health status and pensioner/dependants status.
- For the major categories there are separate tables for the mortality rates experienced by the highest and lowest pensions in the SAPS data.

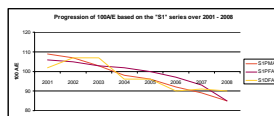
	Light Tables		Heavy tables	
	Males	Females	Males	Females
Threshold	> £13,000 pa	> £4,750 pa	< £1,500 pa	< £750 pa
Proportion of lives	13%	16%	20%	25%
Proportion of amounts	43%	49%	2%	4%

- The published mortality rates (i.e. 'qx') are deemed to relate to the year beginning 1 September 2002 (based on the weighted average exposure in the data).

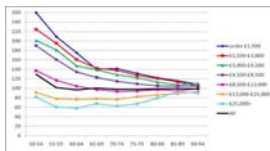
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## CMI SAPS update – Working Paper 44



100 AE values for Male Pensioners Amounts compared to S1PMA



- Analysis of data submitted to 30 June 2009; eight years experience from 2001 to 2008
- Substantial amount of new data submitted in 2009
- Overall mortality experience on more recent dataset is lighter than unadjusted "S1" tables
- In general experience is still slightly heavier overall than unadjusted PA00 tables
- Patterns for members with different pension amount bands are similar to those seen in dataset for "S1" tables

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## CMI SAPS Committee – further investigations

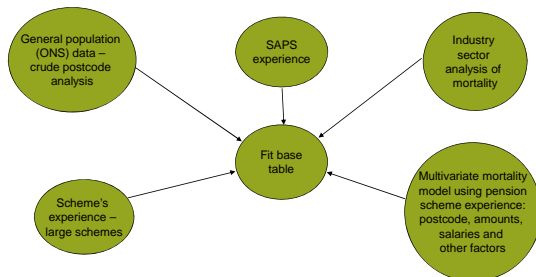
- Analysis of mortality improvements within SAPS dataset
  - care required due to heterogeneity
  - underlying improvement rates
  - comparison of improvement rates with those seen in general population experience
- Experience analysis of SAPS data collected to 30 June 2010
- Analysis of SAPS mortality rates by industry sector
  - based on data collected to 30 June 2010
- Consider whether to produce "S2" SAPS mortality tables
  - Take account of more recent data (collected to 30 June 2010); and
  - Increased data volumes

Plea for providers to submit the maximum amount of high quality data to the CMI prior to 30 June 2010

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## Fitting to the characteristics of the scheme

Range of options for fitting a base table to the characteristics of the scheme which is likely to include one or more of the following approaches

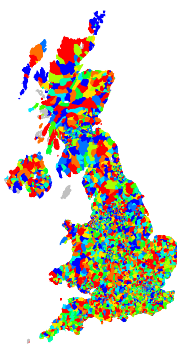


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## Base table - Postcode analysis

- The use of postcodes in mortality investigations is **becoming more common** in the UK pensions sector (it facilitates adjustment for the characteristics of the scheme).
- Individual life expectancies produced by postcode can vary by **up to 10 years**, depending on members' postcode and pension amount
- Postcode does not directly impact life expectancy.** However, postcode does say a lot about the individual and says a lot about factors that do impact life expectancy.
- For schemes that are too small for experience analysis, postcode analysis gives trustees and the sponsor **powerful information** on their current mortality and for setting a base table.

Post town	Average multiplier
Kibson	154%
Boofe (Liverpool)	153%
Newmarket	100%
Leighton Buzzard	100%
Brookenhurst	67%
Montacute	64%

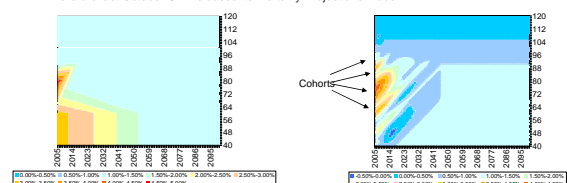


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## Future improvement rates

- "Industry standard" for a number of years has been the Interim Cohort projections (e.g. Medium, Long) with some level of adjustment
- CMI has become concerned about continuing widespread use of the Interim Cohort projections
- Do not take account of data after 1999 and so increasingly out of date
- Improvements rates not sufficient and so on arbitrary adjustment (i.e. floors) tend to be used
- Position of cohort is out of line with more recent experience and other data courses
- Therefore last October CMI released its Mortality Projections Model



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## Core CMI Mortality Projections Model

- CMI\_2009 allows the user to define:
  - a current (short-term) set of mortality improvements
  - a long-term rate of improvements, and
  - the way in which the short-term rates blend into the long-term rates (convergence)
- The "Core Projection" model uses default assumptions for the majority of the inputs and allows the user to vary three key standard assumptions:
  - Gender
  - The long-term rate of annual mortality improvement
  - A constant addition to / subtraction from rates of mortality improvement, which can be applied for example to incorporate prudence into the projection.
- The shape of the improvements produced by the "Core Projection" model is significantly different to the Interim Cohort projections

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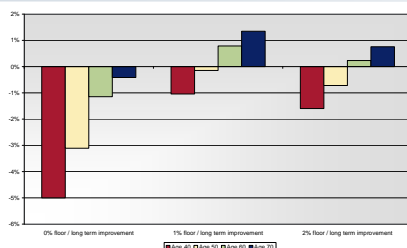
## Long-term improvements

- The level of long-term improvements is similar to, but more sophisticated than, a "floor" that is currently often applied to the CMI's original cohort projections. The key areas where the concepts differ are:
  - CMI's Interim Cohort projections with a floor**
    - The cohort projections tend towards zero
    - The floor is assumed to apply even at the highest ages
    - The floor is an absolute minimum - no projected rates of improvement will be less than the floor, at any age or projection date
    - The floor chosen does not affect rates of improvement where the floor does not apply
  - CMI's Projection Model with long-term improvements**
    - Rates tend towards the long-term improvement rate
    - At a particular point in time the improvement rates may be above or below the long-term rate (and in some cases are negative)
    - The long-term improvement chosen affects the rates of improvement at all ages and points in time
    - Rates fall linearly to zero between ages 90 and 120

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## Impact on annuity values



- The chart shows the impact of moving from Medium Cohort projections with a floor to CMI\_2009 with an equivalent long-term improvement
  - The figures are based on male joint-life annuities, vesting age 60, 2% net discount rate
  - Shows that annuities are similar at a floor / long-term improvement of 1-2% across a range of ages

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