



The Actuarial Profession
making financial sense of the future

Current Issues in Pensions

The SAPS Mortality Investigation The CMI Mortality Projections Model

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Chairman, CMI

Manchester; 6th November 2009

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Chairman, CMI Mortality Projections Model Working Party

London; 16th November 2009

The CMI Mortality Projections Model

Agenda

- SAPS Mortality
- Background to the Projections Model
- An Overview of the Model
- The Consultation Exercise
- The Effect of Adding Data for 2008
- Next Steps

The CMI Mortality Projections Model

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- **SAPS Mortality**
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The CMI Mortality Projections Model: SAPS Mortality

SAPS Mortality

Recent work

- S1 Table graduations
- Experience Report on data collected to June 08

New work

- Mortality improvements within the SAPS dataset
- Analysis by Industry
- Experience Report on data collected to June 09

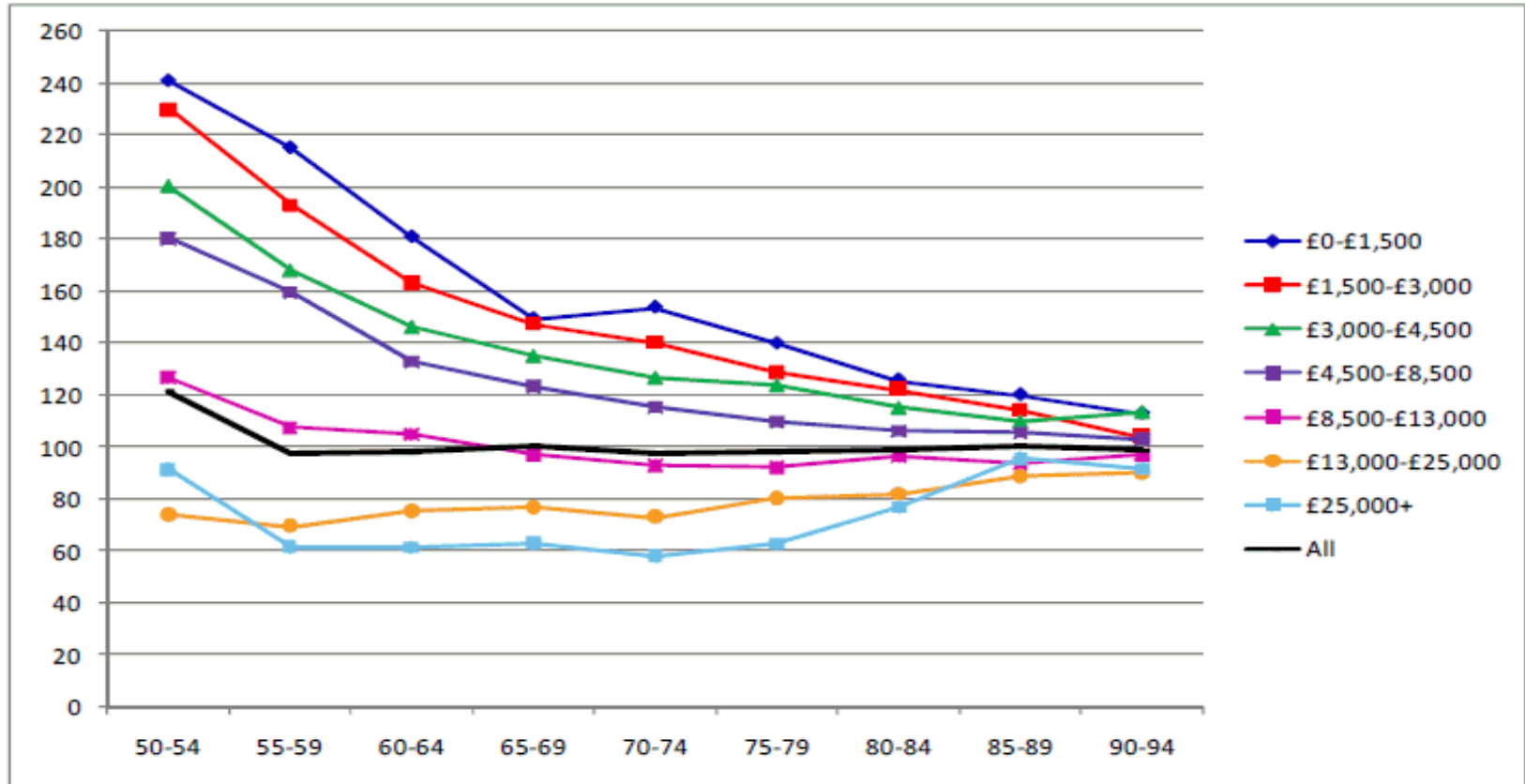
The CMI Mortality Projections Model: SAPS Mortality

SAPS Tables

- First tables to be based on mortality of pensioners of self-administered pension schemes
- Approved and published on profession's website on 31 October 08
- 20 new sets of mortality tables, including the following types of pensioner:
 - All pensioners other than dependants
 - Pensioners who retired in normal health
 - Pensioners who retired on ill-health
 - Dependants (females only - not males due to the sparsity of data)
- Graduations of the following sub-datasets:
 - 'lives' and 'amounts'
 - 'light' (pensions > £13,000 p.a. Males, >£4,750 p.a. females and dependants)
 - 'heavy' (pensions < £1,500 p.a. males, <£750 p.a. females and dependants)

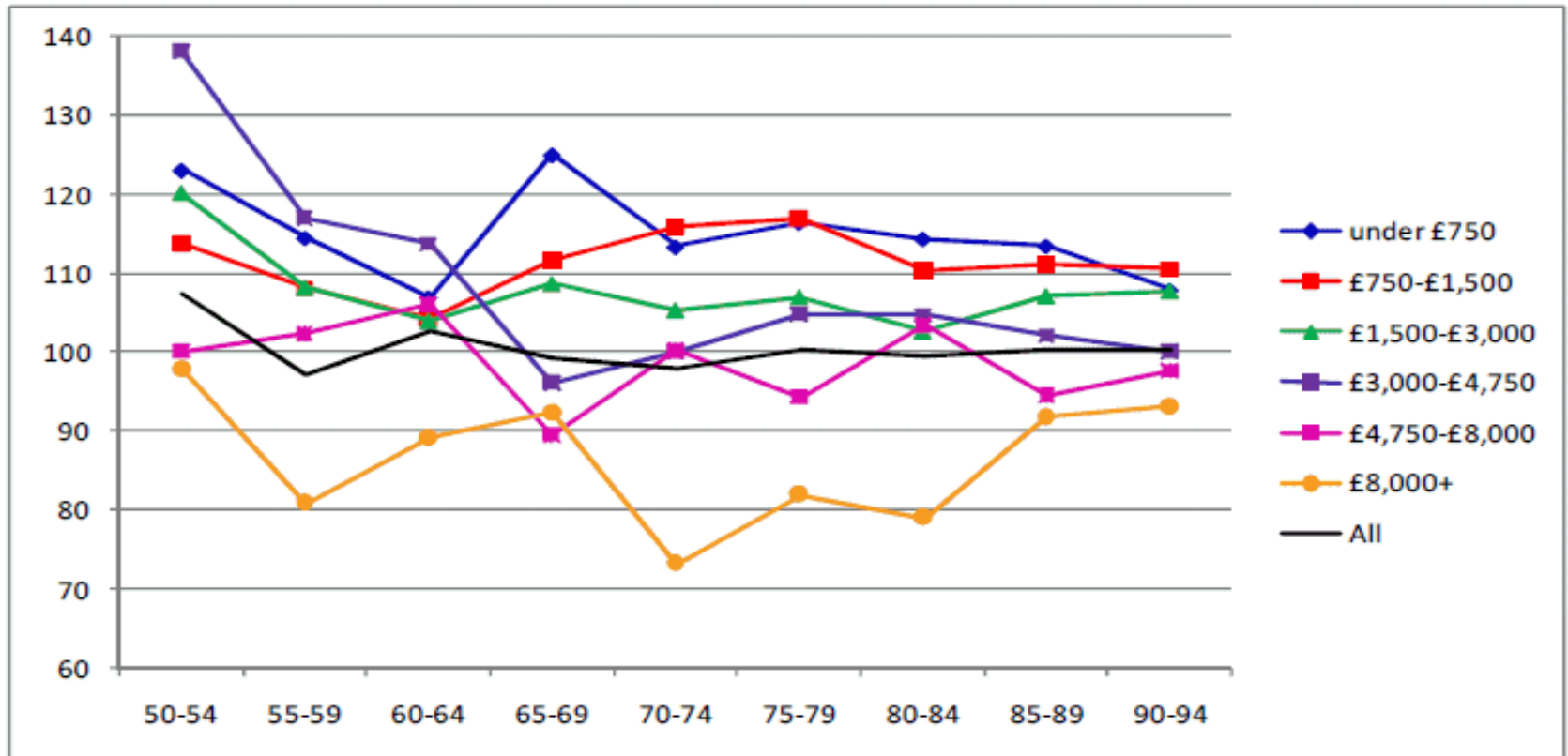
The CMI Mortality Projections Model: SAPS Mortality Report on data to June 2008 - Male

Chart 2: 100 A/E values for Male Pensioners Amounts compared to S1PMA



The CMI Mortality Projections Model: SAPS Mortality Report on data to June 2008 - Female

Chart 4: 100A/E values for Female Pensioner Amounts compared to S1PFA



The CMI Mortality Projections Model: SAPS Mortality

CMI SAPS Committee

Recent work

- S1 Table graduations
- Experience Report on data collected to June 08

New work

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The CMI Mortality Projections Model: SAPS Mortality

Mortality improvements within the SAPS dataset

- Currently under investigation by the SAPS Committee
 - Working paper will be published in due course
- Data collected from 2000
 - limited past history to consider
- SAPS committee responded to the Projections Model consultation with some initial findings
 - Some evidence to suggest the SAPS/pensioner data may experience different improvements to the population data used in model
 - In particular higher improvements in respect of members with higher pensions
 - Insufficient evidence to draw any firm conclusions, mainly due to:
 - Short past history
 - Small dataset

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CMI Interim Cohort Projections

- Published in 2002; based on data to 1999
- Inevitably becoming increasingly out-of-date
- Still in near universal use for many applications
 - Often with adjustments (%s, combinations, floors, ..)
 - But reflect very different pattern from recent data
 - Difficult to judge for reasonability
 - Short & Medium Cohort now imply rapid tail-off in rates of improvement in future mortality

Recent Research - CMI & Others

- CMI looked for stochastic projection model
 - P-spline – but vulnerable to edge effects
 - Lee-Carter – but poor fit to UK data (cohort effects)
 - No projections in “00” Series tables
- CMI Library of Mortality Projections
- Many other approaches & models developing
 - Stochastic models; Mortality by Cause; By Disease

The CMI Mortality Projections Model: Background

Towards a New Model

- Perceived Advantages of Interim Cohort Proj^{ns}
 - They offer a common currency
 - They can be easily modified
 - They can be applied to any base mortality table
- But significantly out-of-date

Working Party Goal

- To produce a projection model which shares the desirable features of the Interim Cohort Projections, but also:
 - reflects the latest experience on trends in mortality;
 - is relatively straightforward to understand and describe;
 - allows users the flexibility to modify projections to suit their own views and purpose; and
 - can be regularly updated over time to reflect emerging experience.

The CMI Mortality Projections Model: Background

Members of the Working Party

- Richard Willets (chair)
- Adrian Gallop
- Joseph Lu
- Brian Wilson
- Neil Robjohns (secretariat)

The CMI Mortality Projections Model: Background

Acknowledgements

- The CMI records its thanks to the Actuarial Profession for a research grant which was used to fund the initial development of the Model.

Working Party Deliverables

- Published in June / July 2009 for Consultation
 - A prototype version of the CMI Model: CPMv0.0
 - CMI Working Paper 38: Part I – Outline
 - CMI Working Paper 39: Part II – Detailed Analysis
 - A User Guide for CPMv0.0
 - Sensitivity tests results spreadsheet
 - Consultation on the Model and its potential uses
 - Closed on 31 August 2009
 - CMI response and final Model due mid-Nov 2009
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The CMI Mortality Projections Model

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Model Structure

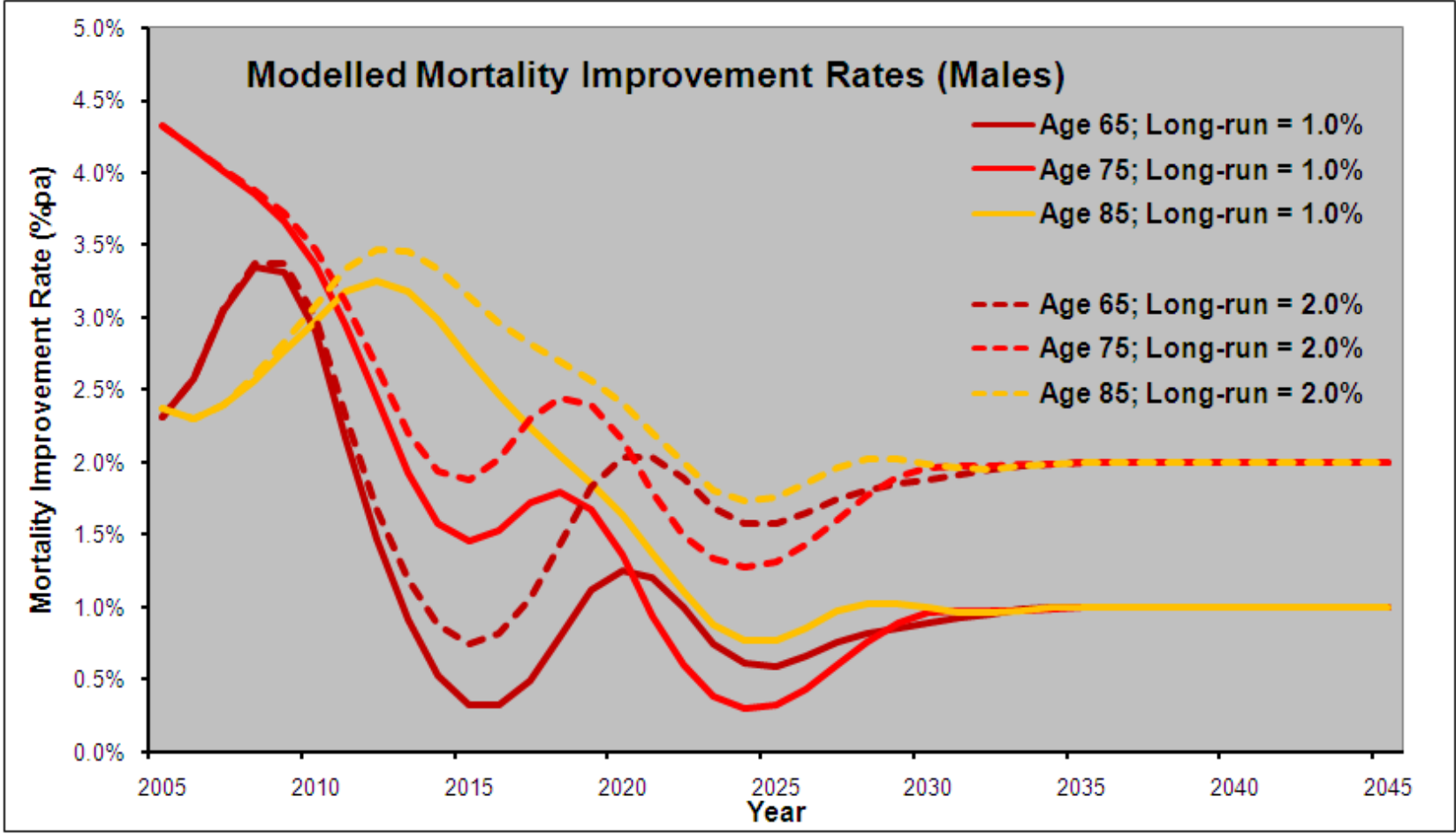
- Project annual mortality improvement rates
 - Relatively simple; Accessible; Flexible
 - Not a mathematical model of mortality fitted to data
- Deterministic projection driven by user inputs
 - Initial rates of mortality improvement
 - Long-term rate(s) of mortality improvement
 - Speed & pattern of convergence
 - Split projection by age or by year-of-birth cohort
- Core and Advanced parameter layers

Convergence to a Long-Term Rate

- In the short-term, the best guide to the likely pace of mortality improvement is the most recently observed experience
 - In the long-term, the forces driving mortality change are likely to be very different; more subjective, better informed by expert opinion
 - The Working Papers include research on:-
 - Mortality improvement by cause-of-death
 - Long-run average rates of change in a range of countries
-

The CMI Mortality Projections Model: Overview

Convergence to a Long-Term Rate



Advanced Parameter Layer

- Gives users considerable flexibility; allowing specification of:-
 - Initial Rates of Mortality Improvement
 - Cohort & Age/Period Components of Initial Rates
 - Long-term Rates of Improvement (by individual age & birth cohort)
 - Period of Convergence (by individual age & birth cohort)
 - Proportion of Convergence remaining after Mid-point (by individual age & birth cohort)
 - Initial Rates of Mortality

Core Parameter Layer

- Allows users to focus on two simplified parameters:-
 - A Long-Term Rate of Mortality Improvement
 - A Constant Addition to Rates of Mortality Improvement
- Default values are applied to other parameters
 - Initial Rates derived from Eng&Wal population data
- ‘Core Projections’ – i.e. those produced using only the Core Parameter layer – can be described using a proposed naming convention

Naming Convention

- Core Projections from version 0.0 of the Model can be given names of the following form:-

CPMv0.0 [a%] +c% {gender}

where:-

- a% = Long-Term Rate of Mortality Improvement
- c% = Constant Addition to Rates of Improvement for all ages and calendar years (omitted if zero)

The CMI Mortality Projections Model

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The CMI Mortality Projections Model: Consultation

Responses to the Consultation

- Meetings in Edinburgh & London
- 31 written responses received
- 24 addressed the specific consultation questions
 - Broad range of firms represented
 - Bias towards firms involved in pensions consultancy (14)
 - Life offices (7), Reinsurer (1), Banks (2)
 - No response from regulators or 'non-actuarial' groups
- 7 related to specific issues
- Responses will not be published in full
 - Summary will be provided; comments not attributed

Responses to the Consultation

(a) Do you agree that the CMI should be producing such a mortality projections model for use by practising actuaries?

- Unanimously positive response!
- Rationale typically included:
 - The need to replace the Interim Cohort Projections
 - The need for a model (always) reflecting recent data
 - The value of the Model as a ‘Common Currency’
 - A view that the CMI is uniquely placed for this initiative
- **Clear mandate to proceed to ‘final’ version**

The CMI Mortality Projections Model: Consultation

Responses to the Consultation

(b) Do you agree with the broad structure of the proposed Model?

- Strong & widespread support for basic structure
 - Two-level design caters well for a broad range of users
 - Blending over time, from current to assumed long-term rates of mortality improvement, is generally seen as intuitive and relatively easy to communicate
 - Majority support for deterministic model
- Maintain broad structure as it is
 - Some alterations suggested, no consensus for change

Responses to the Consultation

(c) Do you have any comments or suggestions on the proposed structure of the Model?

- Two most common issues (minorities)
 - Convergence methodology (reflect recent trend?)
 - Need for measures of uncertainty
- Propose to maintain structure as per CPMv0.0
 - Both issues considered in detail in developing CPMv0.0
 - Both would add significant complexity to Model
- But encourage research to quantify uncertainty

Responses to the Consultation

(d) Do you agree with proposed number (two) of parameters at Core level and the choice these Core parameters?

- Response broadly symmetrical around proposal
 - Add Parameter (convergence; high age LTR) 10
 - Agree with proposal 11
 - Remove Parameter (constant addition) 5
- Propose to maintain structure as per CPMv0.0
 - Results less sensitive to proposed extra parameters
 - Impossible to satisfy everyone!

The CMI Mortality Projections Model: Consultation

Responses to the Consultation

(e) Do you feel it would be useful to allow users to vary the long-term rate over time?

- Response split roughly 50:50
 - Some support for extra flexibility ...
 - ... but 'nice to have' rather than 'must have'
 - Some concern that extra complexity not justified
- Propose to maintain structure as per CPMv0.0
 - Insufficient support to pursue extra flexibility in LTR

Responses to the Consultation

(f) Do you have any comments or suggestions on the default values given to parameters?

- Many indicated broad support for proposed values
- But half of the responses raised specific issues:
 - Use of population, rather than insured / pensioner data
 - Default shape for convergence (50% at mid-point)
 - Tapering rates of mortality change to zero at high ages
 - Derivation of separate age/period & cohort components
- **Propose to expand justification of approach / value**

The CMI Mortality Projections Model: Consultation

Responses to the Consultation

(g) Do you have any comments or suggestions on the proposed naming convention?

- General support for proposed naming convention
 - and for informal naming of Advanced Projections
- Challenge set to find names:
 - with greater intuitive meaning (for non-actuaries)
 - with easier expression (more ‘catchy’)
- Naming convention to be considered further
 - Ideas welcome !

Responses to the Consultation

(h) Do you anticipate you would use this Model in practice? If so, for what purpose would you use it?

- All respondents indicated they would use Model
 - 75% expect to use it directly to produce projections
 - 25% expect to use it indirectly as means of expressing, benchmarking and communicating projection bases
 - Pension consultancy response weighted more heavily to direct use (insurer response more indirect use)
- **Strengthens mandate to proceed to 'final' version**

Responses to the Consultation

(i) Do you have any thoughts on how the proposed Model should be developed in the future?

- Calls for further research, but no dominant topics:
 - Further future mortality scenarios by cause-of-death
 - Alternative data sets / analysis by socio-economic group
 - Analysis of drivers of mortality change (cohort features)
 - Further analysis to support setting long-term rate
 - Further research & development of stochastic models
- Support further research, but outside current scope

Responses to the Consultation

(j) Should the CMI maintain the proposed Model as new data becomes available? If so, should this be each year, or at some lesser frequency?

- Strong demand for regular review; different timing:
 - Full annual updates 9
 - Annual review, but only update if material 7
 - Less frequent (2 to 5 years, average 3) 7
- Seek to balance timely review against new data, with desired stability for the model structure and for projections in common use

The CMI Mortality Projections Model: Consultation

Responses to the Consultation

(k) Do you have any other comments?

- A variety of issues were raised, including:
 - Interaction with the CMI Library of Projections
 - Some form of hind-casting / back-testing of the Model
 - Provision of further training for Users (Model & research)
 - Documentation to help users meet TAS-M
 - Release of underlying data and analysis tools
- All requests are currently being considered

Summary of Consultation Responses

- Strong support for the Model
- Widespread intention to adopt / use the Model
- General support for broad structure of the Model
- Majority support for parameter default values set
- Calls for further / ongoing research
- Desire for annual review against emerging data ...
- with stability for structure & benchmark projections

The CMI Mortality Projections Model

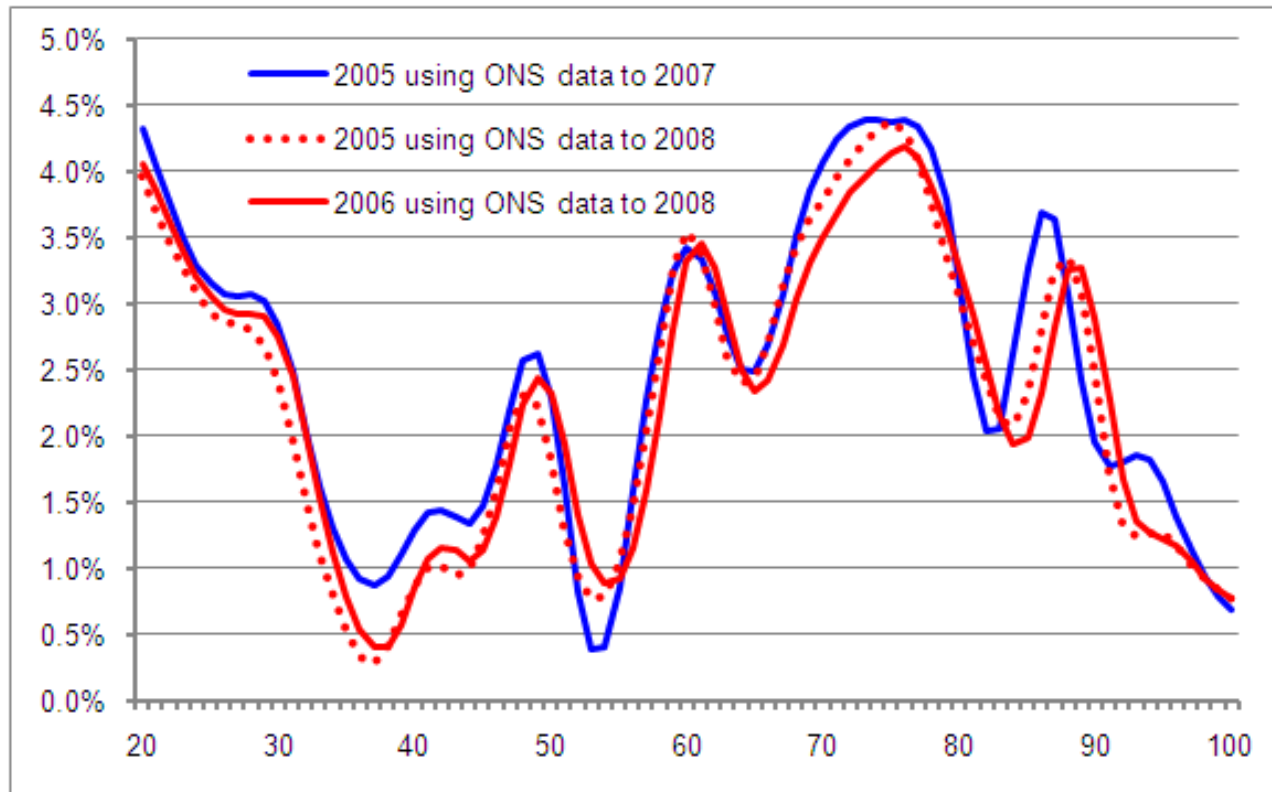
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The CMI Mortality Projections Model: 2008 Data

Estimated Mortality Improvement Rates

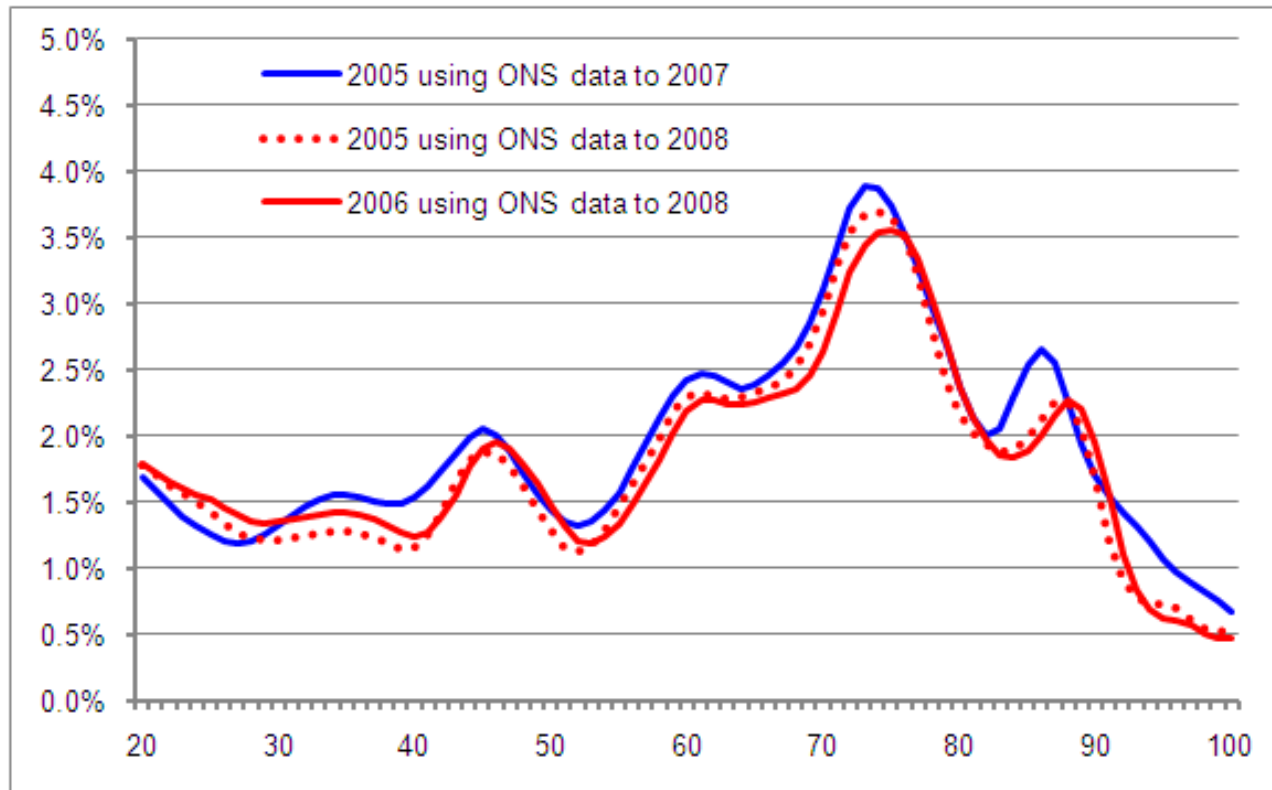
Annual Rates of Mortality Improvement, by age, 2005 & 2006
P-Spline models; Population of England & Wales; Males



The CMI Mortality Projections Model: 2008 Data

Estimated Mortality Improvement Rates

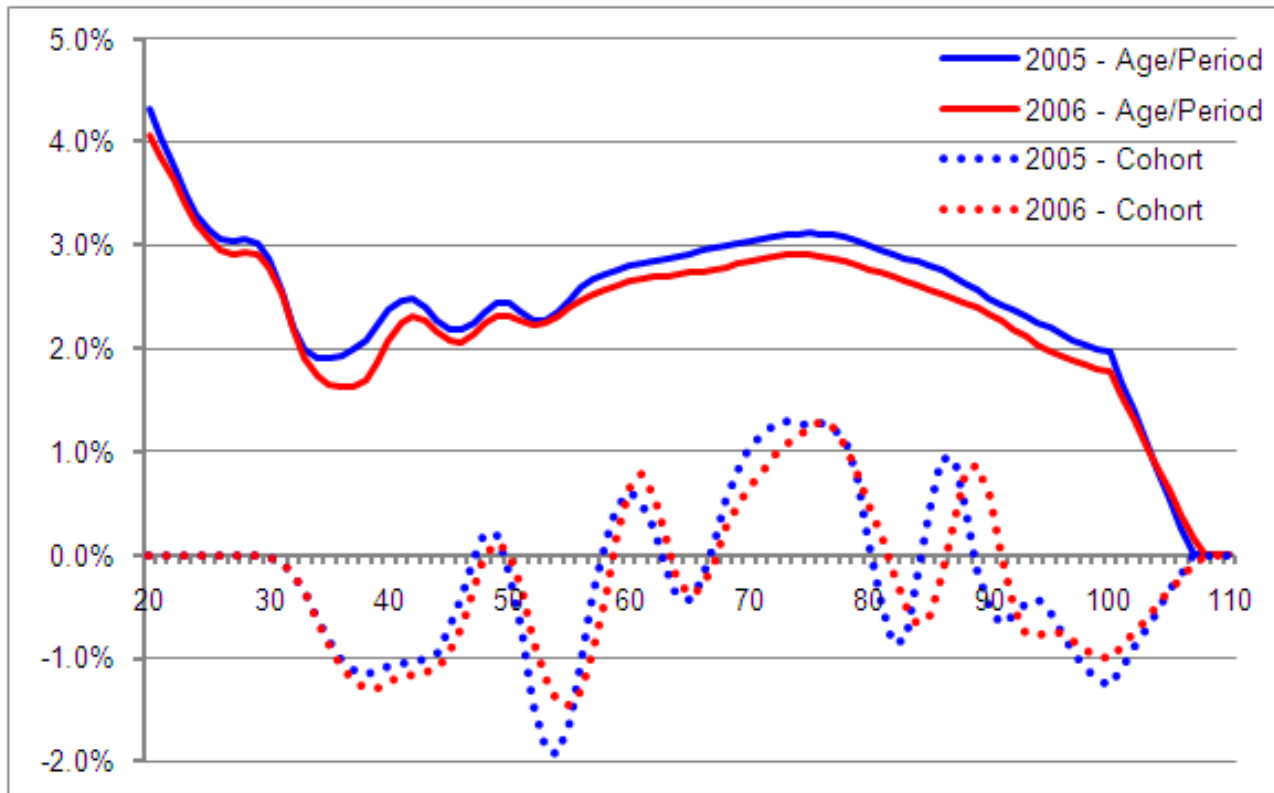
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The CMI Mortality Projections Model: 2008 Data

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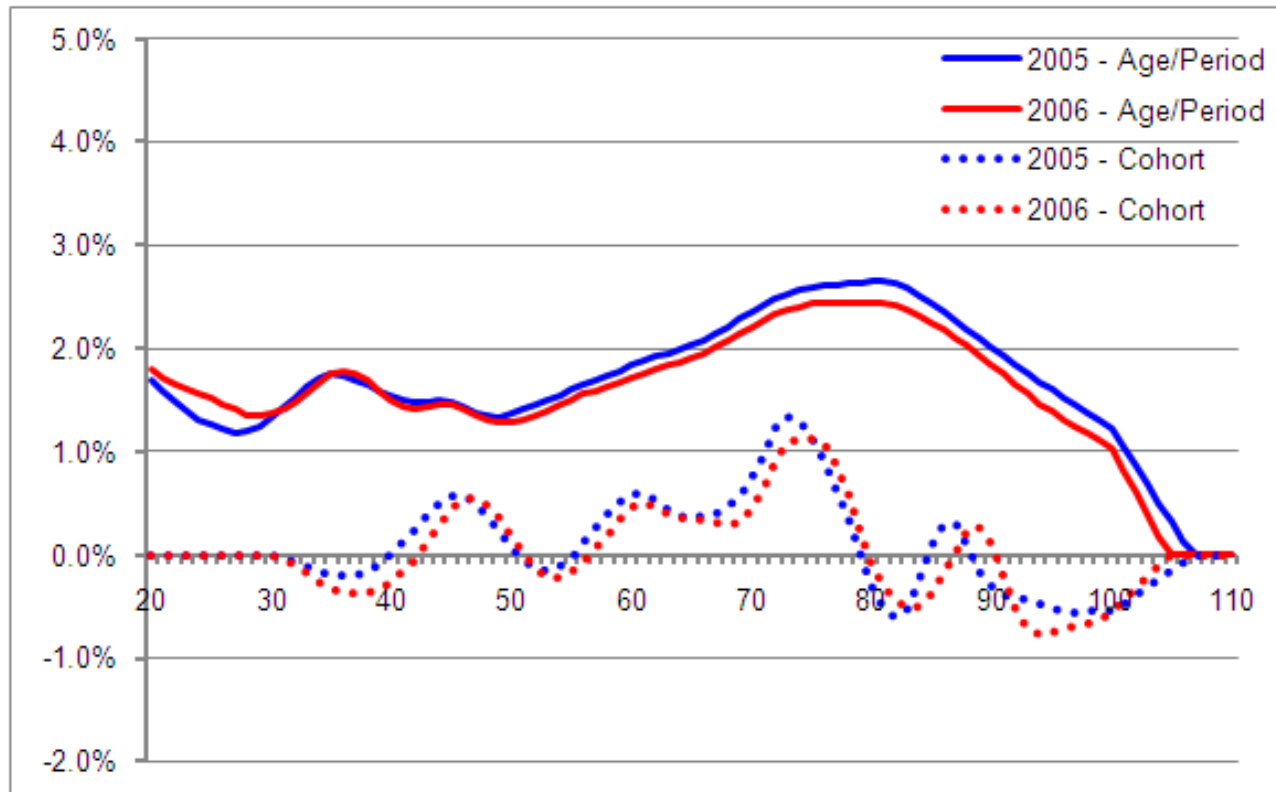
Age/Period and Cohort Components of Mortality Improvement
By age; 2005 & 2006; Population of England & Wales; Males



The CMI Mortality Projections Model: 2008 Data

Estimated Mortality Improvement Rates

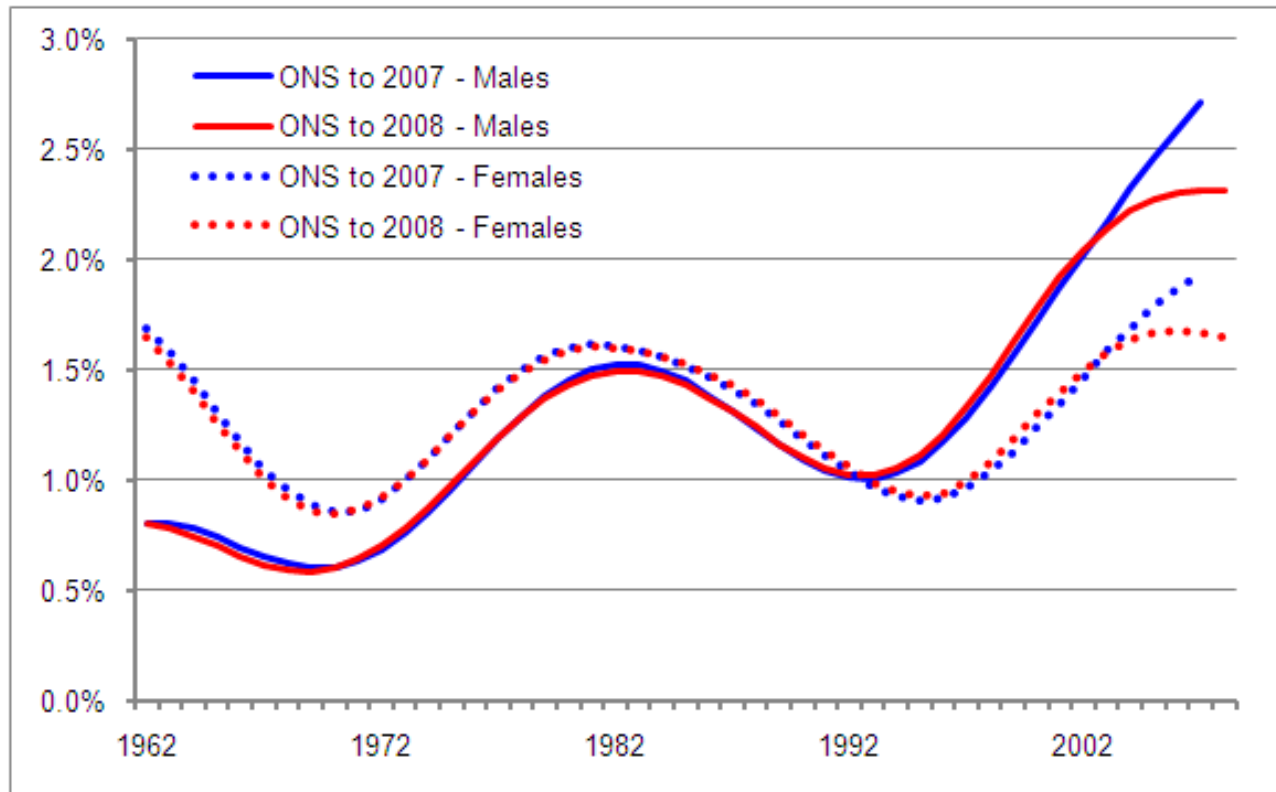
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By age; 2005 & 2006; Population of England & Wales; Females



The CMI Mortality Projections Model: 2008 Data

Estimated Mortality Improvement Rates

Estimated Period Component of Mortality Improvement, 1962-2008
Population of England & Wales



The Effect of Adding Data for 2008

- Addition of data leads to revision of estimates
 - Estimates slightly reduced for recent improvement rates
 - Revisions fall within expected range
 - ... and show methodology gives relatively stable results
- Cohort EoLs fall on average by:
 - around 0.4% for males
 - around 0.7% for females
 - [+1% on long-term rate increases EoL by 5% at age 65]

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Proposed Output

- An updated version of the Model & User Guide
 - Updated for 2008 data, but no other material change
 - User Guide will include documentation of default values
- A Working Paper
 - Summary of feedback received from consultation
 - Commentary, setting out working party responses
 - The effect of adding data for 2008
- Timing: Mid-November 2009
- Webinar: 8th December 2009

The CMI Mortality Projections Model: Next Steps

Possible Future Research Work

- Key potential research topics include:
 - Quantifying uncertainty, including in initial rates
 - Alternative datasets – variation within the population
 - ‘Hind-casting’ / back-testing the Model
 - Further future mortality scenarios by cause-of-death
 - Analysis of drivers of mortality change (cohort features)
- May be advanced by the CMI and others



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