Institute and Faculty of Actuaries

Hot topics in mortality & longevity research from around the industry

Peter Banthorpe
Chair of IFoA Mortality Research Steering Committee

30 January 2015

Institute and Faculty of Actuaries

Hot topics in mortality & longevity research of interest to the industry

Peter Banthorpe
Chair of IFoA Mortality Research Steering Committee
Global Head of Biometric Research, RGA

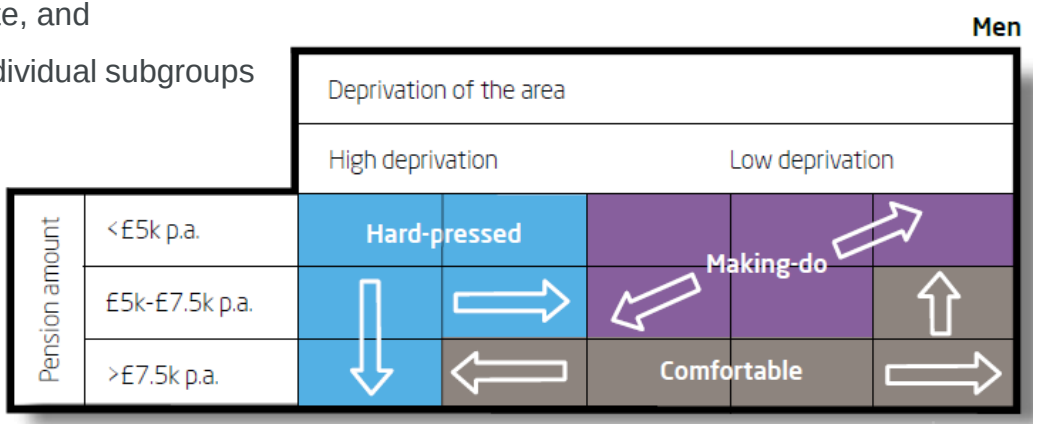
30 January 2015

Institute and Faculty of Actuaries

UK Industry publications

NAPF/Club Vita Pension Scheme Mortality Trends

- "Are DB Pensioners Different to the General Population?"
  - In aggregate, and
  - as three individual subgroups



- 2.5m pensioner records – around 2m person years of exposure in recent years (2005-2012)

Institute and Faculty of Actuaries

Source: The NAPF Longevity Model (November 2014)

Key Findings

- Typical assumptions, based on England and Wales (E&W) experience, do not reflect the pace and diversity of longevity trends experienced by DB pensioners.
- The analysis reveals that longevity had changed in different ways for individual DB schemes and for different groups of DB pension scheme members.
- Splitting the DB pensioner population into longevity trend groups that have experienced different changes in longevity reveals that:
  - The longer lived groups (described as 'comfortable' in the model) have tended to see a slower increase in life expectancy (males experienced a 1.9 years increase over the period examined);
  - The shorter lived groups (described as 'hard-pressed') have experienced a faster increase (males experienced a 2.5 years increase over the period);
  - The gap in life expectancy between these groups has narrowed.
- Because each DB scheme will be made up of different combinations of these groups, the impact on liabilities will be unique for each scheme, but will typically be an increase in the region of 1% of liabilities.

Source: The NAPF Longevity Model (November 2014)

Is the 1% increase due to APC disaggregation?

CMI WP 69

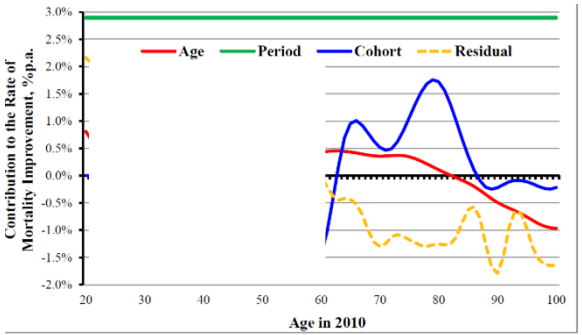
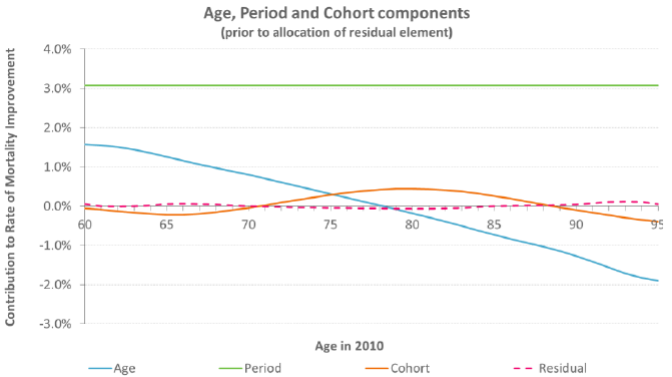


Figure 3: Results Derived from Fitted APC Model, Males; 2010 Age, Period and Cohort Components, plus Residual Errors

Source: CMI Working Paper 69 (CMI 2013)

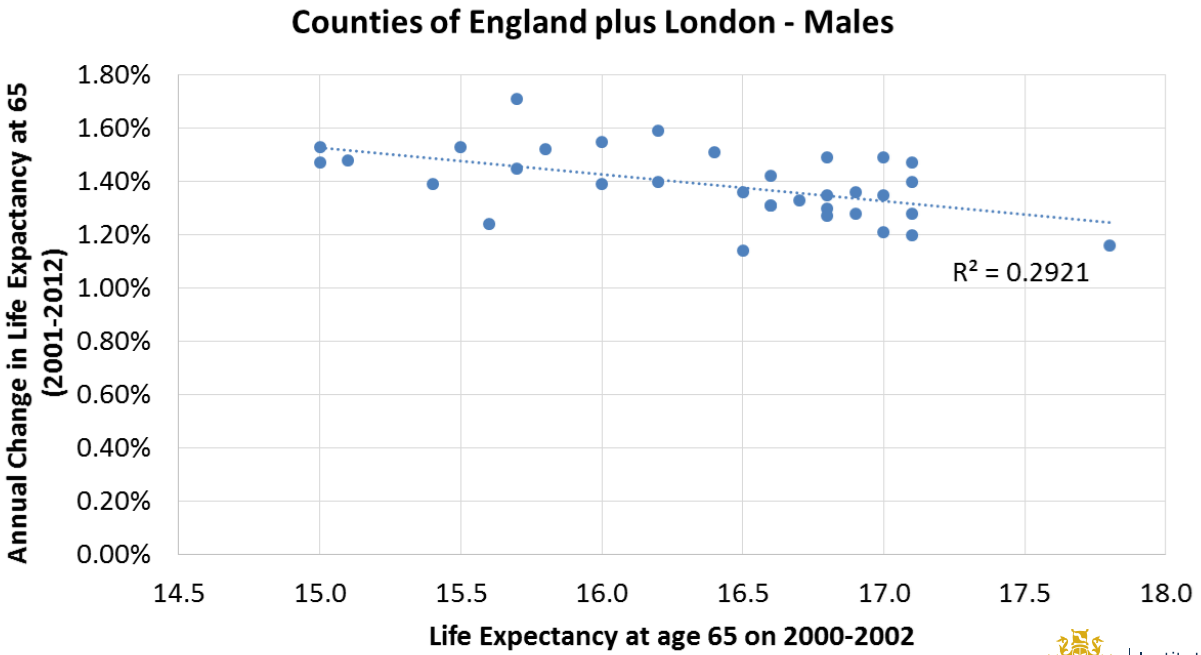
NAPF / Club Vita



Source: NAPF Technical Report (November 2014)

Institute and Faculty of Actuaries

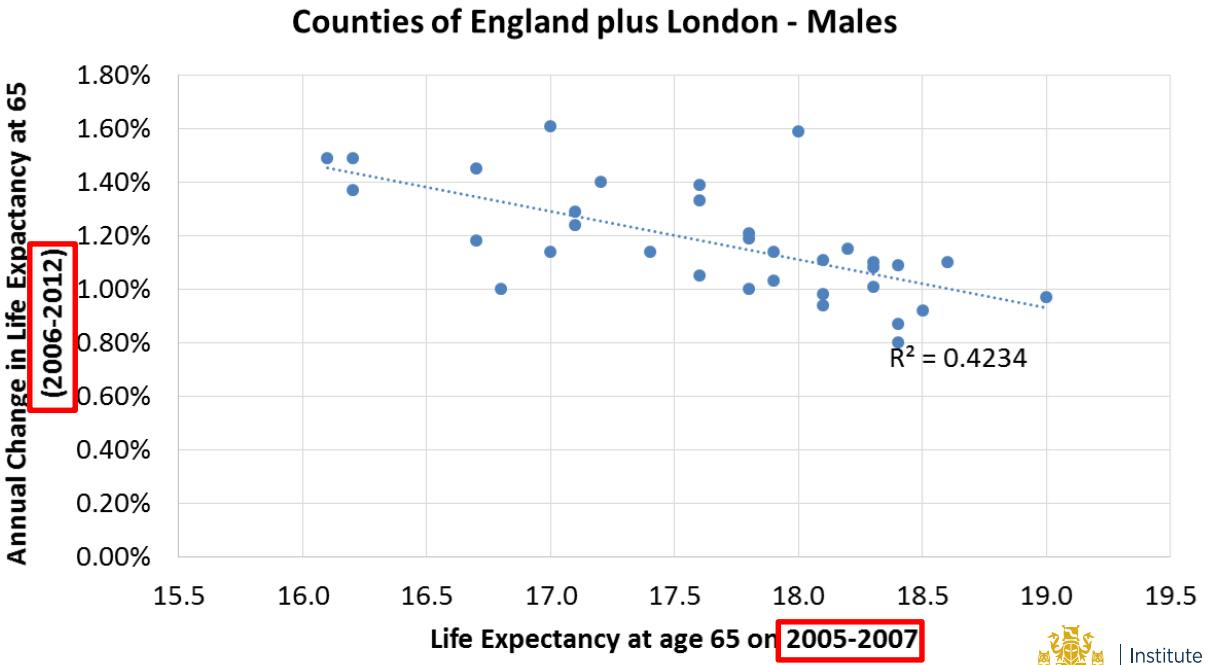
….while we are on the subject of socio-demographic trend differences….



Institute and Faculty of Actuaries

Source: Own analysis of data contained in Life Expectancy at Birth and at Age 65 by Local Areas in England and Wales, 2011–13 (ONS, Nov 2014)

So looking from 2005/7 to 2011/13:

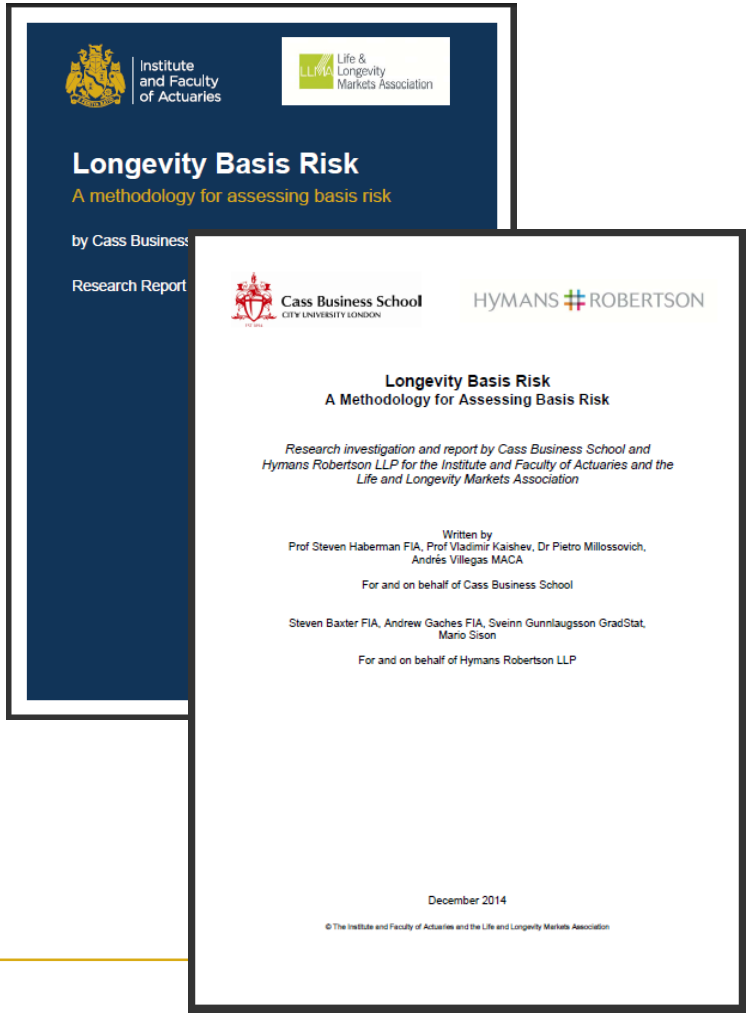


Institute and Faculty of Actuaries

Source: Own analysis of data contained in Life Expectancy at Birth and at Age 65 by Local Areas in England and Wales, 2011–13 (ONS, Nov 2014)

Basis Risk

- IFoA / LLMA sponsored research;
- Cass / Hymans Robertson research team;
- Extensive research on:
  - Historic trends
  - Two population models
  - Case studies



Source: Longevity Basis Risk (Dec 2014)

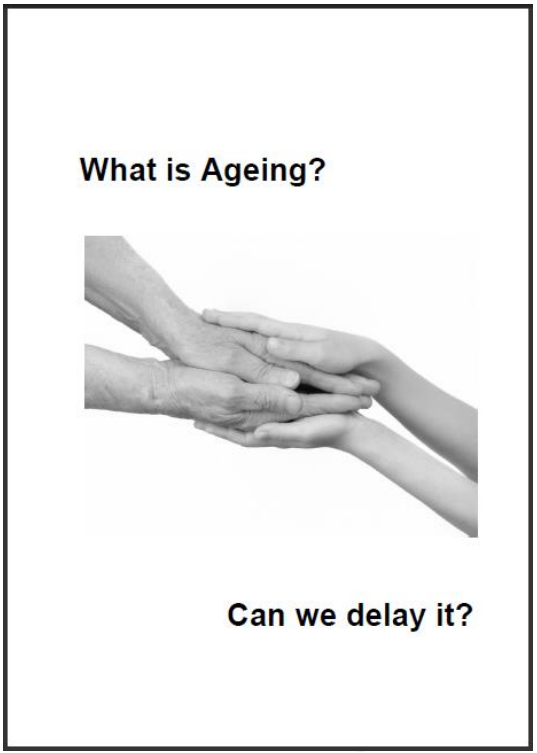
Key outputs of Basis Risk Research

- Recommendation of M7-M5 as the best 2 –population model for modelling books which are ‘self-credible’
  - Common Age Effect + Cohorts in some situations
- For modelling the majority of books which are not self-credible, an alternative, easy to apply “characterisation approach”;
- A clear decision tree framework to aid the selection of an appropriate methodology for assessing basis risk from those mentioned above;
- A clear recognition of the importance of choice of time series underpinning any 2- (or multi-) population model

Institute and Faculty of Actuaries

What is ageing? Can we delay it?

- The ageing process is complex
  - unlikely that a single drug will significantly reduce the rate of ageing,
  - preventive strategies including behavioural change are likely to be more effective.
- Compliance with lifestyle changes and drug treatment is usually poor
- An intervention that could slow the ageing rate by 50% or more is need to give a substantial increase in lifespan.
- No such treatment is currently in development or seems likely to appear in the next 10 years.



Source: Longevity Science Advisory Panel (2014), *What is Ageing. Can we delay it?*

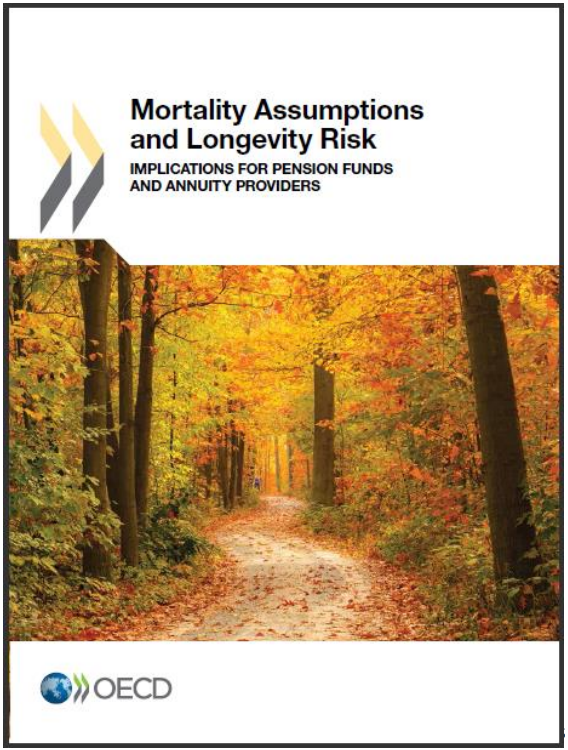
Institute and Faculty of Actuaries

The UK's place in the world

International publications

OECD Benchmarking of Longevity Assumptions from 15 countries

- Details regarding the standard mortality tables and assumptions used in 15 countries;
- Benchmarked against:
  - Lee-Carter,
  - Cairns-Blake-Dowd,
  - P-Splines and
  - CMI mortality.



OECD (2014), *Mortality Assumptions and Longevity Risk: Implications for pension funds and annuity providers*, OECD Publishing.
http://dx.doi.org/10.1787/9789264222748-en

Table 3.2. **Classification of standard mortality tables by potential shortfall in provisions**

Classification	Potential Shortfall	Pension Plans	Annuity Providers
Serious	10-20%	Brazil (*US 1983 IAM*), China (*CL2000-2003*), Switzerland (*EVK2000*)	Brazil (*US Annuity 2000*), China (*CL2000-2003*)
Significant	5-10%	Canada (*UP94-ScaleAA*), Japan (*EPI2005*), US (*RP2000-ScaleAA*)	
Moderate	2-5%	Chile (*RV2009*), Spain (*PERM/F C 2000*)	Brazil (*BR-EMS 2010*), Canada (*GAM94-CIA*), Chile (*RV2009*), Spain (*PERM/F C 2000*), US (*GAM94-ScaleAA*)
Monitor	<2%; specific issues to address	Canada(*CPM*), France (*TGH/F 2005*), Israel*, Mexico (*EMSSA 1997*), Spain (*PERM/F P 2000*), Switzerland (*BVG 2010, VZ 2010*), US (*RP2000-ScaleBB*)	France (*TGH/F 2005*), Israel, Mexico (*EMSSA 2009*), Japan (*SMT 2007*), Spain (*PERM/F P 2000*)
OK	little to no expected shortfall	Netherlands (*AG-Prognosetael 2010*), UK (*SAPS1-CMI*), UK (*SAPS2-CMI*), US (*RP2014-MP2014*)	Germany (*DAV 2004 R*), Netherlands (*AG-Prognosetael 2010*), Switzerland (*ERM/F 2000*) UK (*PCMA/PCFA 2000-CMI*)

Source: Author's calculations

* The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

OECD (2014), *Mortality Assumptions and Longevity Risk: Implications for pension funds and annuity providers*, OECD Publishing.
http://dx.doi.org/10.1787/9789264222748-en

Key findings and conclusions (2 of 4)

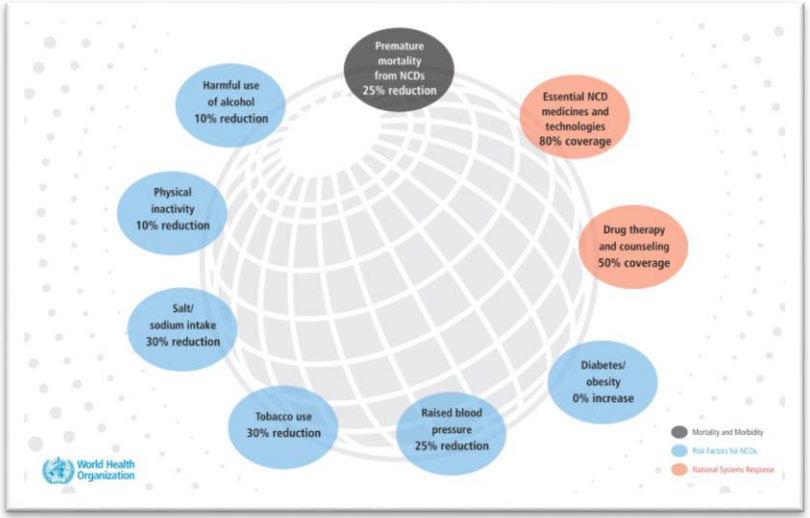
2. Governments should facilitate the measurement of mortality for the purposes of assumption setting and the evaluation of basis risk of index-based hedging instruments.
   - Accurate and timely mortality data should be publicly available.
   - Mortality data by a socio-economic indicator should be made publically available.

4. Governments should encourage the development of a market for instruments to hedge longevity in order to ensure the capacity for pension plans and annuity providers to continue to provide longevity protection to individuals. Index-based products in particular have the most potential to address the misalignment of incentives between the hedging party and the capital markets investor. Governments could encourage this development by facilitating transparency and standardisation of longevity hedges.

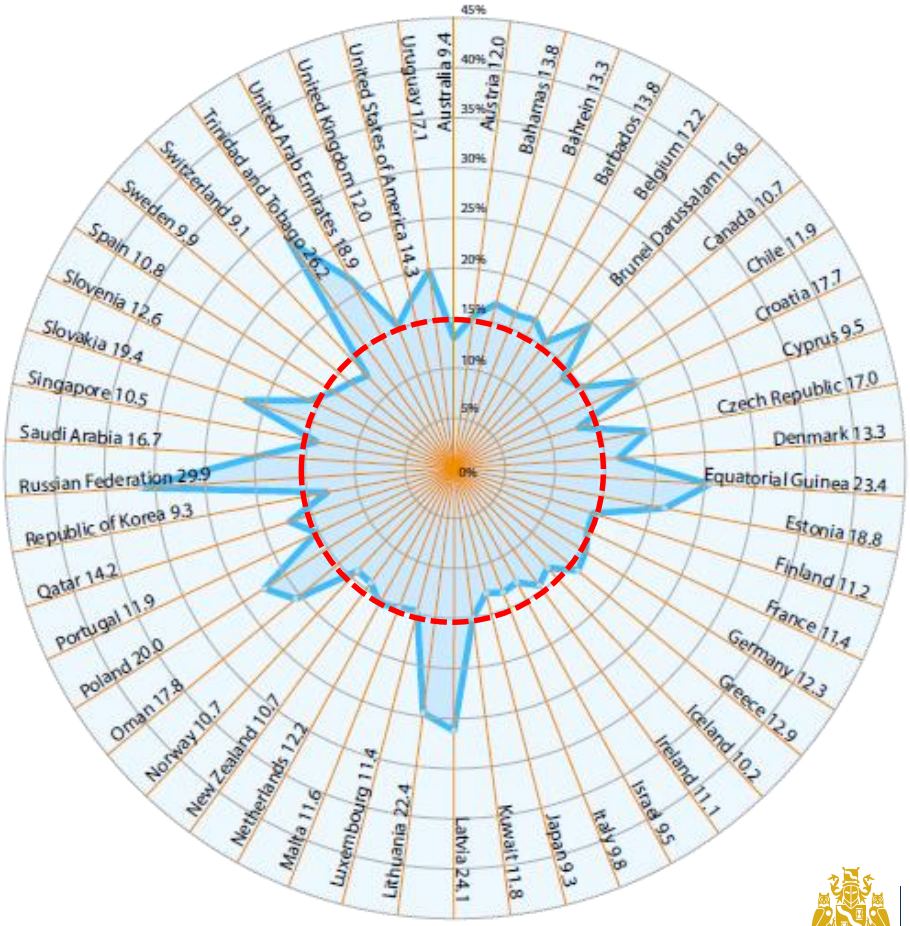
Institute and Faculty of Actuaries

OECD (2014), *Mortality Assumptions and Longevity Risk: Implications for pension funds and annuity providers*, OECD Publishing.
http://dx.doi.org/10.1787/9789264222748-en

WHO 25x25 Update Report



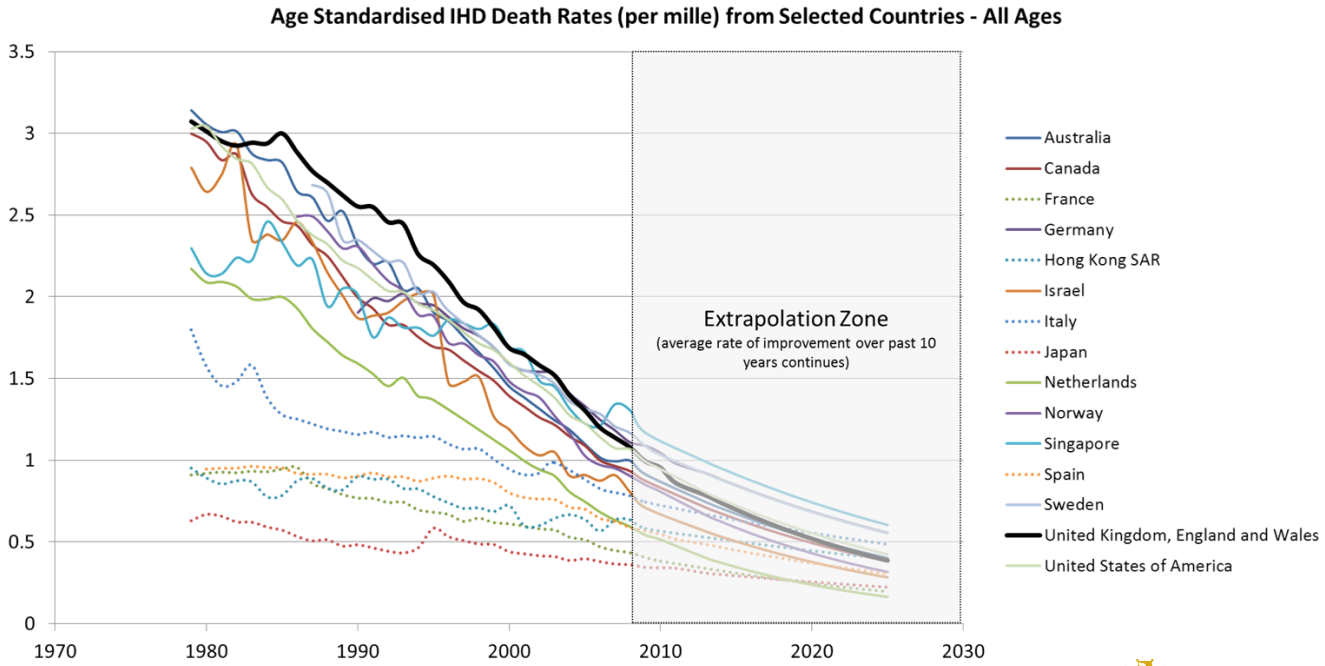
High-Income



Institute and Faculty of Actuaries

Fig. 1.5b Probability of dying from the four main noncommunicable diseases between the ages of 30 and 70 years (%), by individual country, and World Bank income group, comparable estimates, 2012

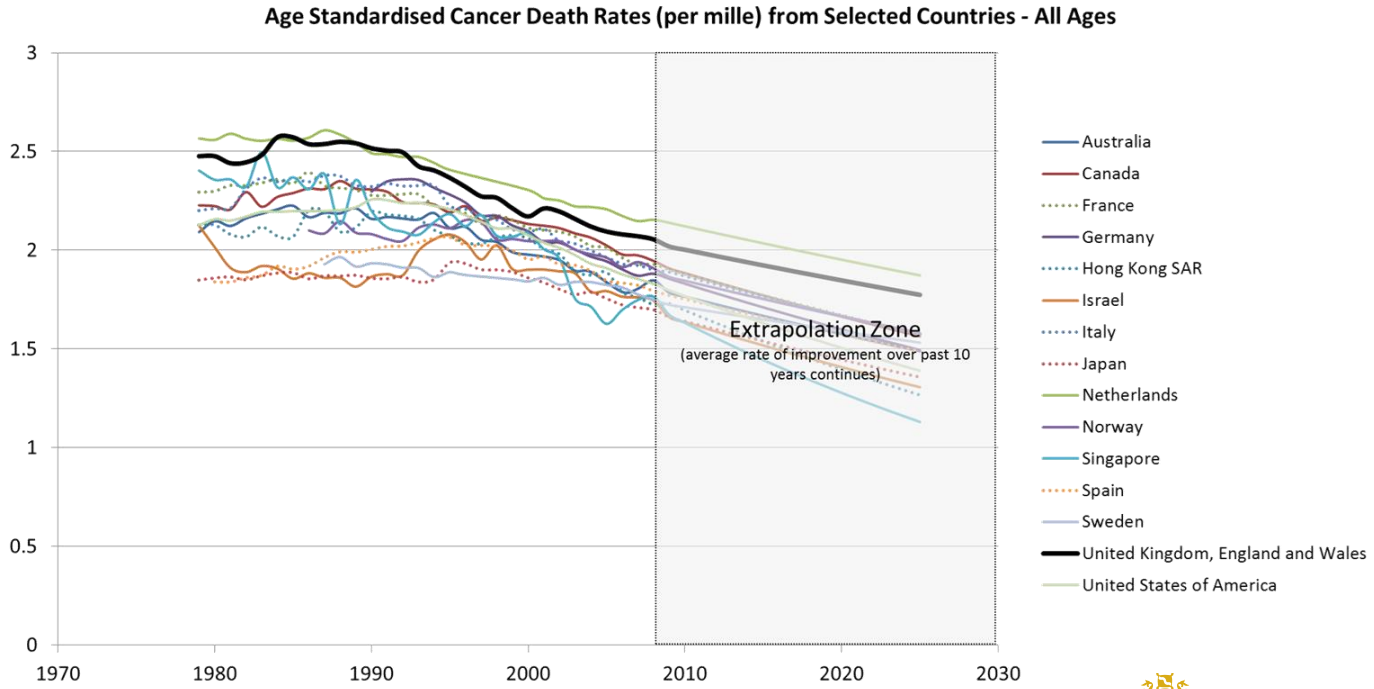
Overall context: Global IHD Trends



Institute and Faculty of Actuaries

Source: RGA calculations based on WHO Mortality Database

Overall Context: Global Cancer Trends



Institute and Faculty of Actuaries

Source: RGA calculations based on WHO Mortality Database

Cancer deaths will be eliminated for all under 80 by 2050, new research predicts[1]

"It is realistic to expect that by 2050 nearly all cancer related deaths in children and adults aged up to (say) 80 years will have become preventable through life style changes and because of the availability of protective technologies and better pharmaceutical and other therapies."(2)

Institute and Faculty of Actuaries

1: The Independent. Accessed online: 16 January 2015

2: UCL School of Pharmacy: Overcoming Cancer in the 21st Century (14 January 2015)

Institute and Faculty of Actuaries

New Academic Insights and Research

International Increases in Older Age Life Expectancy

"As yet, no evidence exists that the rate of improvement in older age mortality (60 years and older) is slowing down or that older age deaths are being compressed into a narrow age band as they approach a hypothesised upper limit to longevity.."

Institute and Faculty of Actuaries

Mathers, Colin D; Stevens, Gretchen A; Boerma, Ties; White, Richard A;Tobias, Martin I; Causes of international increases in older age life expectancy. Lancet (2015).

Subjective Wellbeing and Mortality

- Eudemonic wellbeing: judgments about the meaning and purpose of life
- Assessed using a standard questionnaire assessing autonomy, sense of control, purpose in life, and self-realisation
- Results do not unequivocally show that eudemonic wellbeing is causally linked with mortality

	Covariates	Eudemonic wellbeing	
		Quartiles	Adjusted hazard ratio (95% CI)
Model 1	Age, sex	1 (lowest)	1 (reference)
		2	0·620 (0·547–0·702)
		3	0·547 (0·475–0·629)
		4 (highest)	0·422 (0·362–0·493)
Model 2	Age, sex, plus demographic indicators	1 (lowest)	1 (reference)
		2	0·665 (0·586–0·754)
		3	0·613 (0·531–0·708)
		4 (highest)	0·489 (0·417–0·574)
Model 3	Age, sex, plus demographic indicators, plus health indicators	1 (lowest)	1 (reference)
		2	0·746 (0·656–0·849)
		3	0·733 (0·631–0·852)
		4 (highest)	0·624 (0·526–0·740)
Model 4	Age, sex, plus demographic indicators, plus health indicators, plus depression	1 (lowest)	1 (reference)
		2	0·761 (0·666–0·869)
		3	0·753 (0·644–0·881)
		4 (highest)	0·643 (0·538–0·768)
Model 5	Age, sex, plus demographic indicators, plus health indicators, plus depression, plus health behaviours[‡]	1 (lowest)	1 (reference)
		2	0·780 (0·683–0·891)
		3	0·805 (0·688–0·942)
		4 (highest)	0·697 (0·583–0·833)

Institute and Faculty of Actuaries

Steptoe A, Deaton A, Stone AA. Subjective wellbeing, health, and ageing. *Lancet* 2014; published online Nov 6. http://dx.doi.org/10.1016/S0140- 6736(13)61489-0.

And as I draw to a close…

Institute and Faculty of Actuaries

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.

Institute and Faculty of Actuaries