200 St Vincent Street, Glasgow

Longevity risk in pension schemes

Stephen J. Richards
5th March 2014

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1. About the speaker

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LONGEVITAS

mortalityrating.com

- Joint venture with Heriot-Watt in 2009:

PROJECTIONS TOOLKIT

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- A pension is a promise to pay a regular income throughout life.
- Note that the sole risk here is longevity*.
- All other risks associated with equities, bond yields etc are added by the question of *funding* the pension.

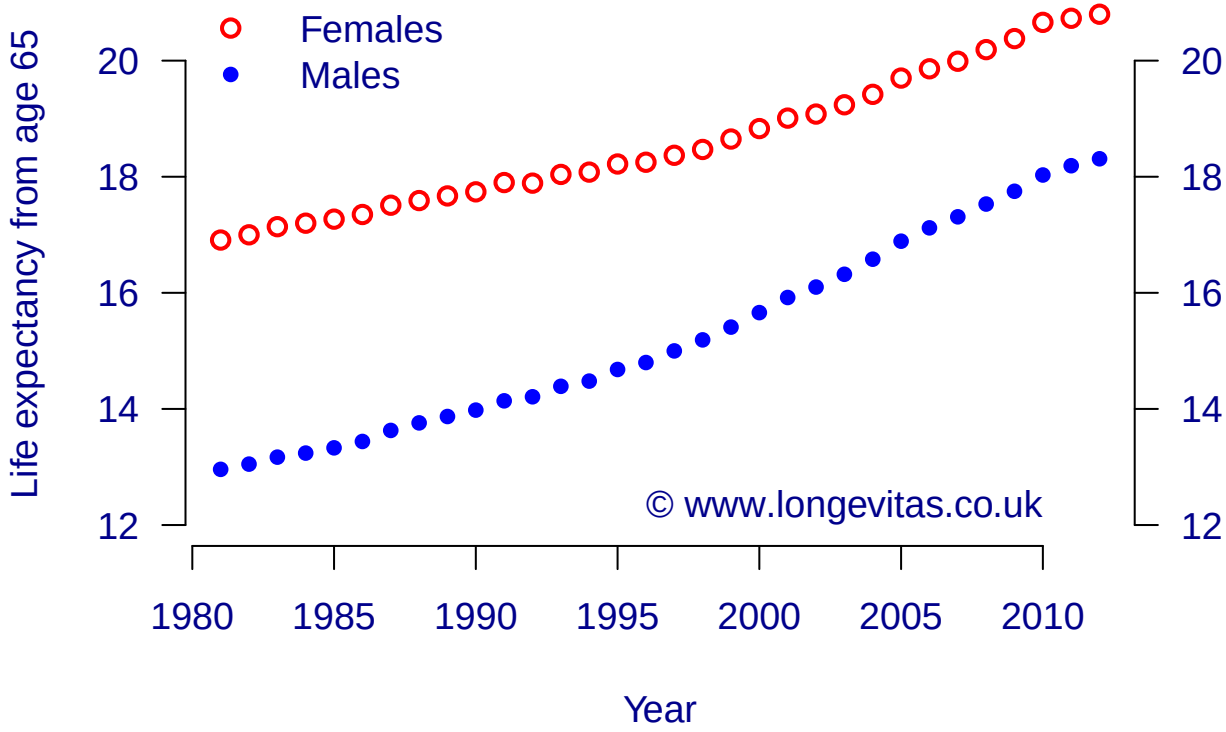
* OK, inflation risk is added if the pension is indexed!

2. Why care about longevity risk?

"Life expectancy at birth has increased by 6.3 hours per day since 1980–1982 for males, and by 4.6 hours per day for females in the UK."

Government Actuary's Department

2. Why care about longevity risk?



Source: UK National Life Tables, GAD.

3. A spot of time travel

3. 1909

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- Probability of a male aged 20 surviving to 70 was 34.8%.
- Life expectancy for a male aged 70 was 8.0 years.

Source: Richards (2013). Period survival probability and period life expectancy calculated according to ELT 6 Construction A in King (1909). No allowance for mortality improvements.

3. 2012

- UK state pension paid from age 67 (for the speaker anyway!).

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- UK state pension paid from age 67 (for the speaker anyway!).
- Probability of a male aged 20 surviving to 67 is 85.0%.
- Life expectancy for a male aged 67 is 16.8 years.

Source: Period survival probability and period life expectancy calculated according to the National Life Table for the UK for 2011–2013. No allowance for mortality improvements.

3. Pop quiz

Q. What would the state pension age have to be to restore the eight-year life expectancy at retirement of the original Old-Age Pension Act of 1908?

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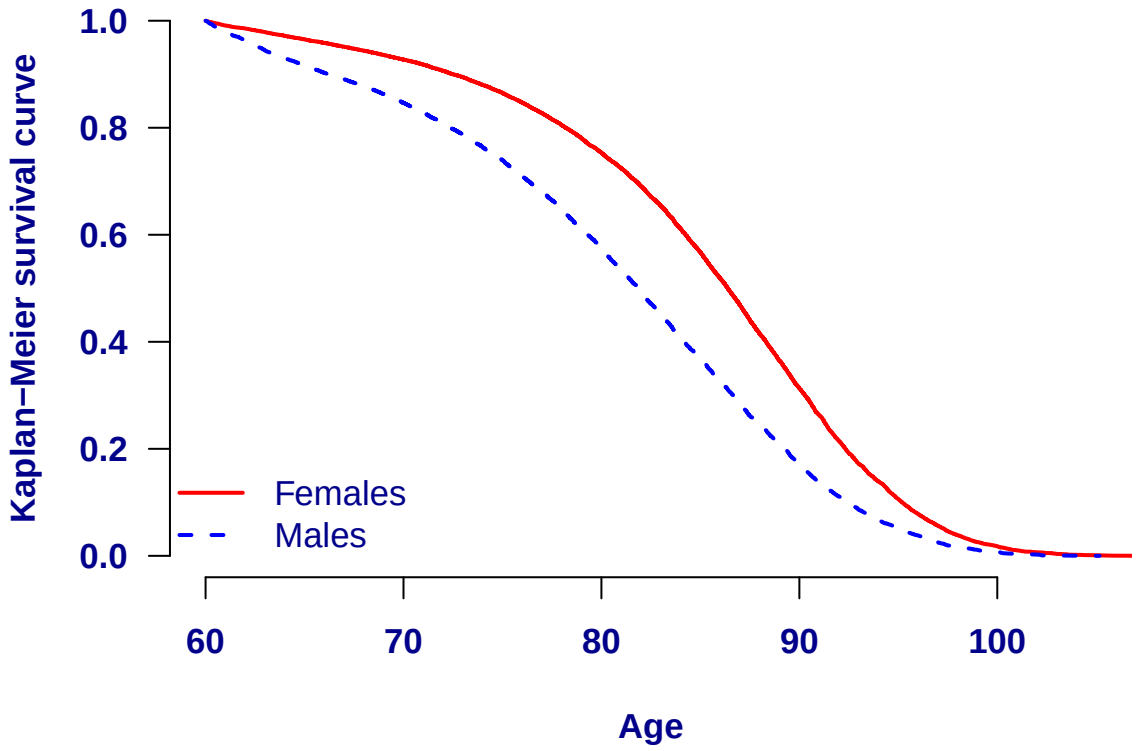
A. 80 years.

Source: Period survival probability and period life expectancy calculated according to the National Life Table for the UK for 2011–2013. No allowance for mortality improvements.

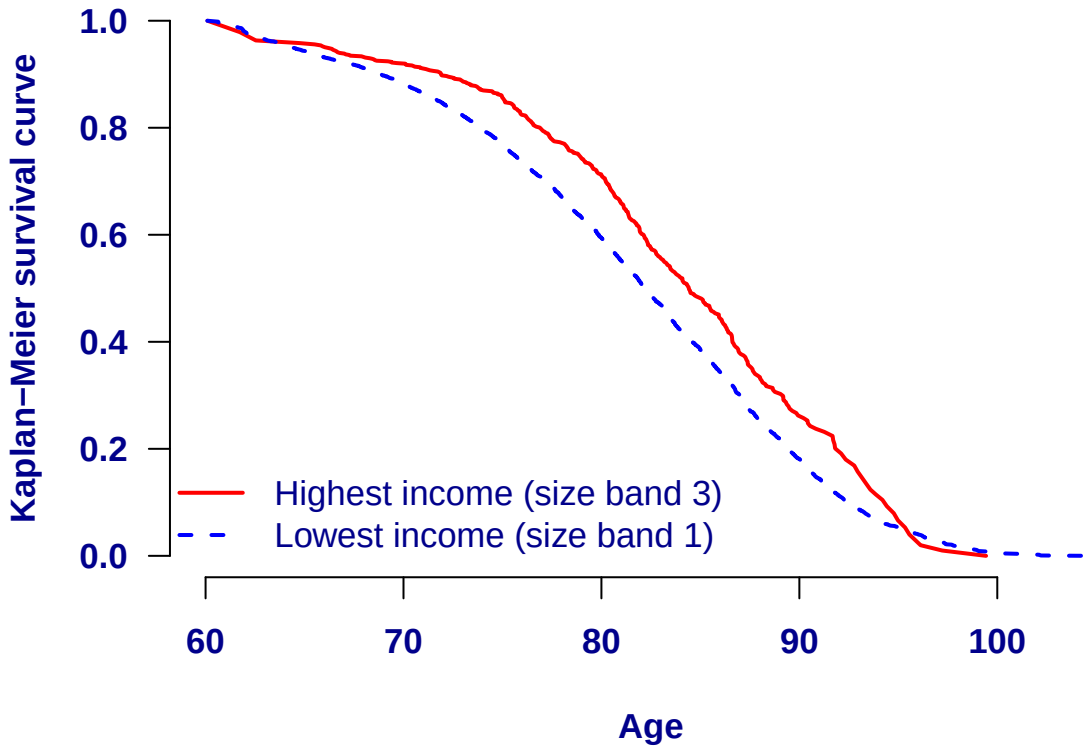
4. Longevity risk factors

4. Gender



Source: Richards, Kaufhold and Rosenbusch (2013).

4. Pension size



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4. Problem

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In this data set males account for 34.5% of lives overall...

...but 59.7% of those with large pensions.

Q. How do you disentangle correlated factors?

A. Use a statistical model.

4. Relative importance of risk factors

Financial impact of mortality rating factors:

Factor	Step change	Reserve	Change
Base case	-	13.39	
Gender	Female-male	12.14	-9.3%
Lifestyle	Top-bottom	10.94	-9.9%
Duration	Short-long	9.88	-9.7%
Pension size	Large-small	9.36	-5.2%
Region	South-North	8.90	-4.9%
Overall			-33.6%

Source: Richards and Jones (2004), page 39.

5. Postcodes

5. Anatomy of a UK postcode

5. How not to do postcode profiling

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- Compare the postcodes G1 2TD and G12 0PD.
- Both in Glasgow.
- Life expectancy "6.7 years less than the UK average" [1]

Source: [1] Punter Southall, Postcode Life Expectancy Tool, accessed on 13th January 2014.

5. G1 2TD

Source: Google Maps, accessed 2013.

5. G12 0PD

Source: Google Maps, accessed 2013.

5. How to do postcode profiling

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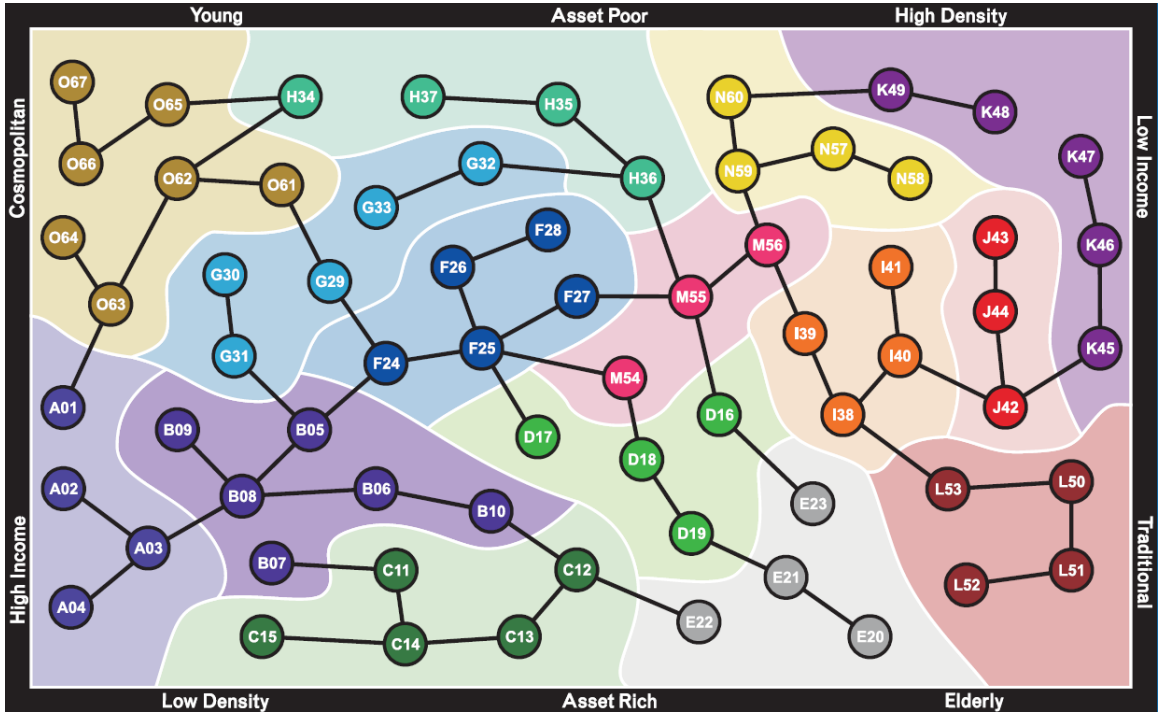
- 1.6 million residential postcodes.
- Each maps to a *geodemographic type*...

5. Geodemographic example — Mosaic



Source: Experian Ltd.

5. Profiling G1 2TD

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Mosaic Type K47 — "Upper Floor Living, Deprived View"

Source: Google Maps, Experian Ltd, CACI Ltd, all accessed in 2013.

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Mosaic Type K47 — “Upper Floor Living, Deprived View”

Acorn Type P54 — “High-Rise Hardship [...] high-rise estates”

Source: Google Maps, Experian Ltd, CACI Ltd, all accessed in 2013.

5. Profiling G12 0PD

Mosaic Type A04 — “Alpha Territory, Serious Money”

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5. Profiling G12 0PD

Mosaic Type A04 — “Alpha Territory, Serious Money”

Acorn Type D13 — “Well-off professionals, larger houses [...]”

Source: Google Maps, Experian Ltd, CACI Ltd, all accessed in 2013.

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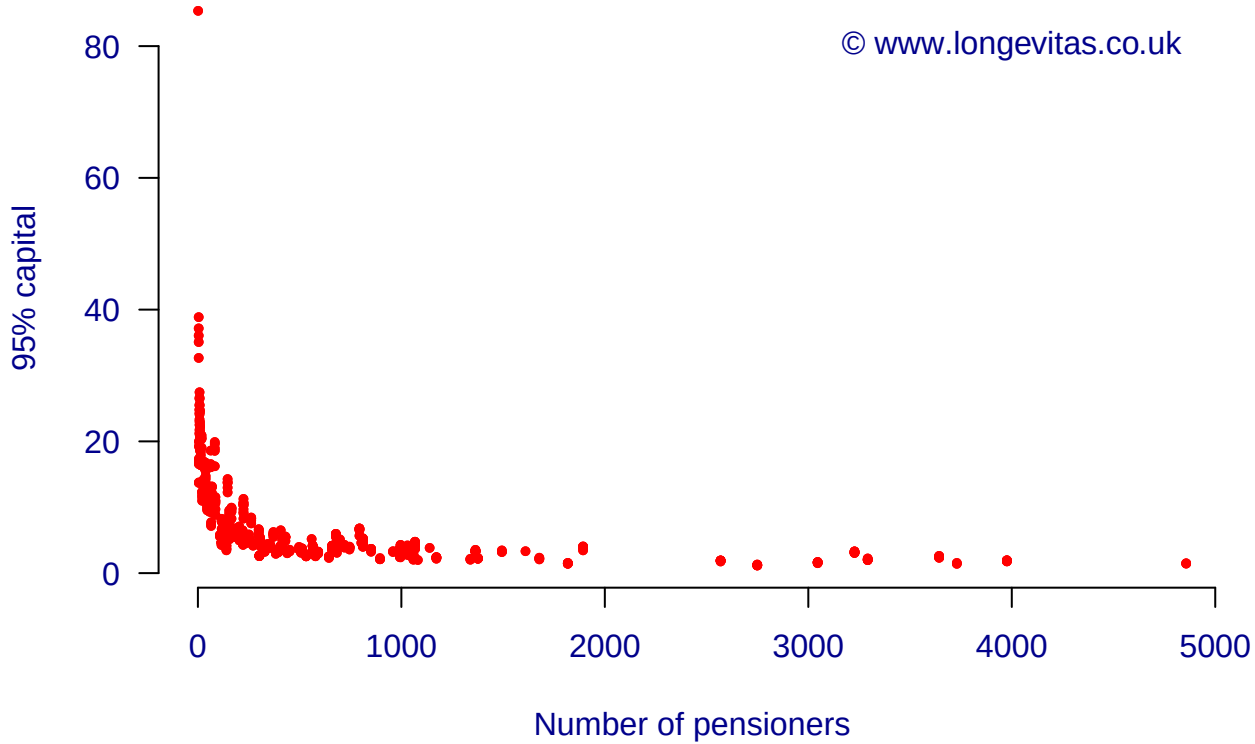
- Impact depends on number of lives and distribution of benefits...

6. Idiosyncratic risk



Source: mortalityrating.com. Extra reserves required to cover 95% of cases in 1,193 run-off simulations for schemes with between 1 and 4,857 pensioners. Some schemes are rated more than once.

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References

Richards, S. J. and Jones, G. L. **2004** *Financial aspects of longevity risk*, Staple Inn Actuarial Society, London

Richards, S. J., Kaufhold, K. and Rosenbusch, S. **2013** *Creating portfolio-specific mortality tables: a case study*, European Actuarial Journal, DOI: 10.1007/s13385-013-0076-6.