

Does money buy you longevity?

Mortality & Longevity Symposium 2016

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30 second summary....

Yes!

But....

What do we know
about longevity of
higher income
annuitants?

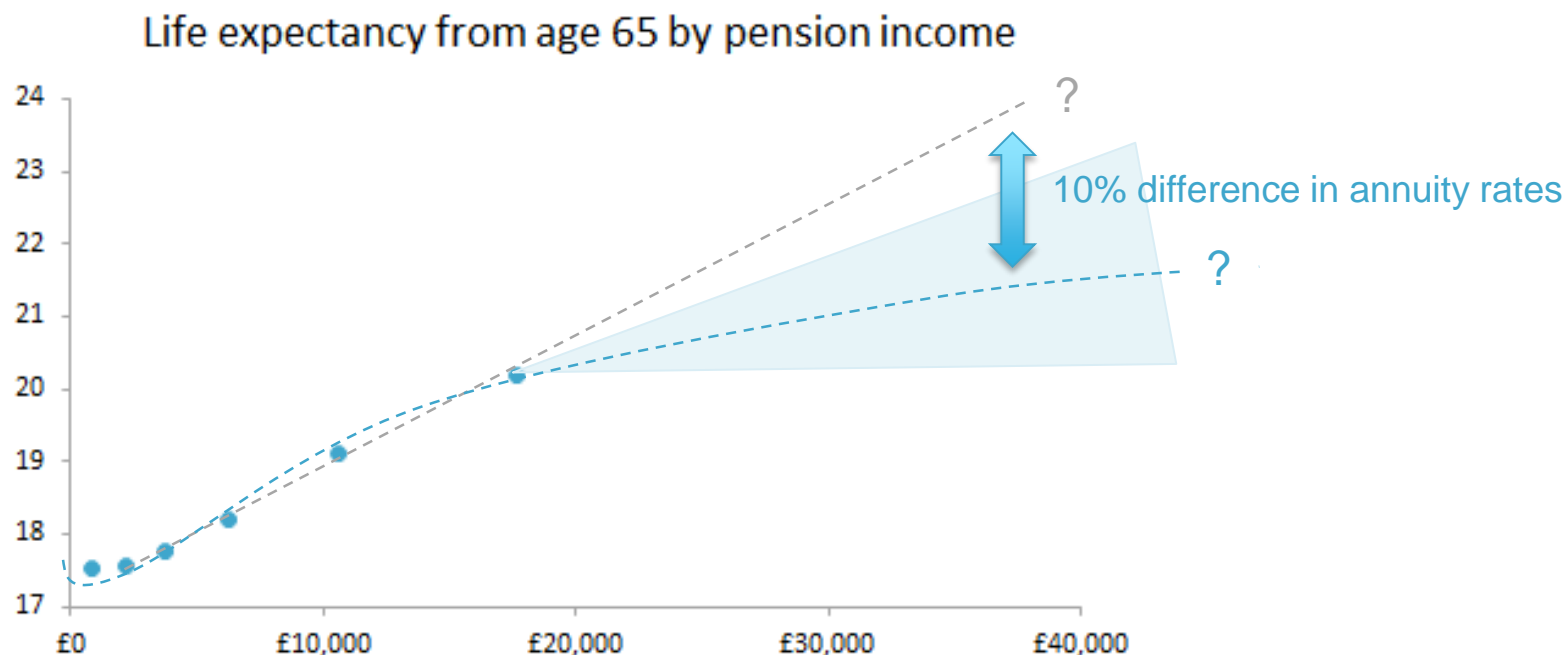


Get Rich, Live Longer: The Ultimate Consequence of Income Inequality

The income gap meets the longevity gap.



Exploring the CMI SAPS study



- For each pension band in CMI S2 dataset:
 - Life expectancies based upon fitting a Gompertz model to amounts based mortality rates within each pension band
 - Average pension amount calculated as total amounts exposure amongst divided by total lives exposure (amongst those aged 65 and over)
- Ultimate age of life table assumed to be 125

An illustrative model

Method

1. Mortality assumed to be Gompertz with parameters a function of pension amount

$$\ln(\mu_x: Pension = P) = f_1(P) + f_2(P).x$$

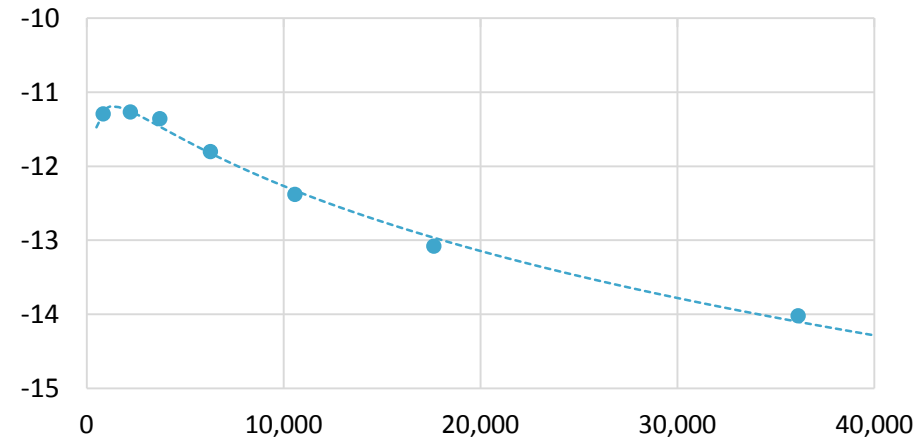
2. Fit a function for the Gompertz intercept and slope parameters for log force of mortality

$$f_i(P) = g_i(\ln P)$$

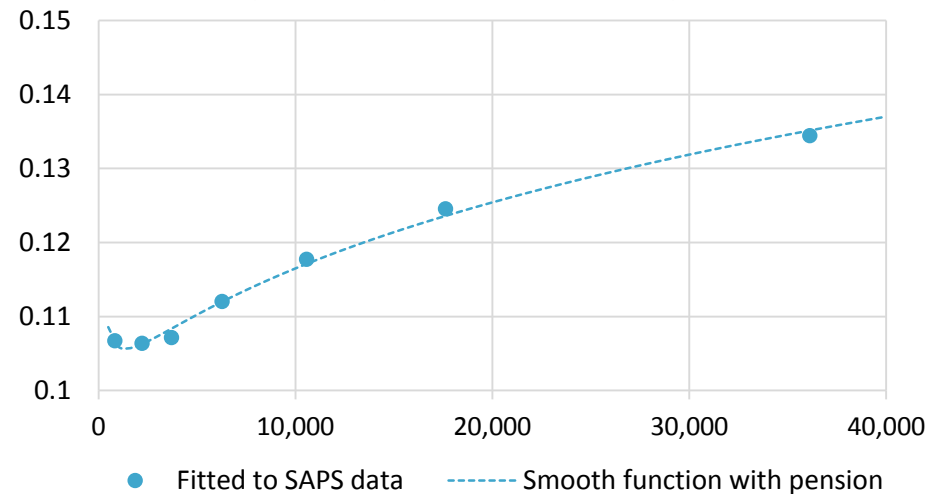
$$g_i(y) = ay^2 + by + c$$

3. Extrapolate outside of range fitted to as a means of informing assumption across affluence scale / higher pension amounts

Gompertz intercept as a function of pension



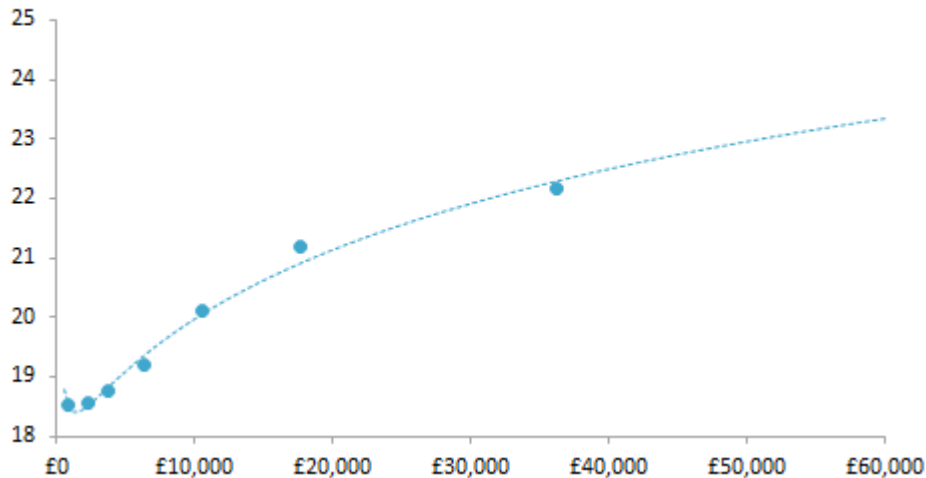
Gompertz slope as a function of pension



An illustrative model

Results

Life expectancy from age 65 by pension income



} Some 'flattening' of life expectancy with pension amount?

Weaknesses of illustrative model

- Extrapolation beyond realm of data
- Simple Gompertz (no curvature with age)
- Poor fit to life expectancies (£10k to £40k)?
- Crossovers of mortality / absence of co-fitting

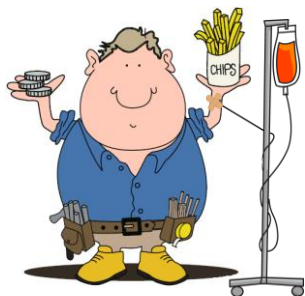
Needs improving if going to rely on...

Weaknesses of data

- Small number of data points
- Largest pension band very influential
- Pension a 'noisy' affluence metric
- Socio-economic drift (potential overstatement of life expectancy)

Fundamental! Let's explore...

A noisy covariate



Meet Joe

- Worked for 10 years
- Routine manual job
- 1.25% accrual
- Retired in 2011 on a salary of £20,000
- **Pension of £2,500 p.a.** ($= 10 \times 1.25\% \times £20k$)



Meet John

- Worked for 2 years
- Senior manager
- 1.67% accrual
- Retired in 2011 on a salary of £75,000
- **Pension of £2,500 p.a.** ($= 2 \times 1.67\% \times £75k$)

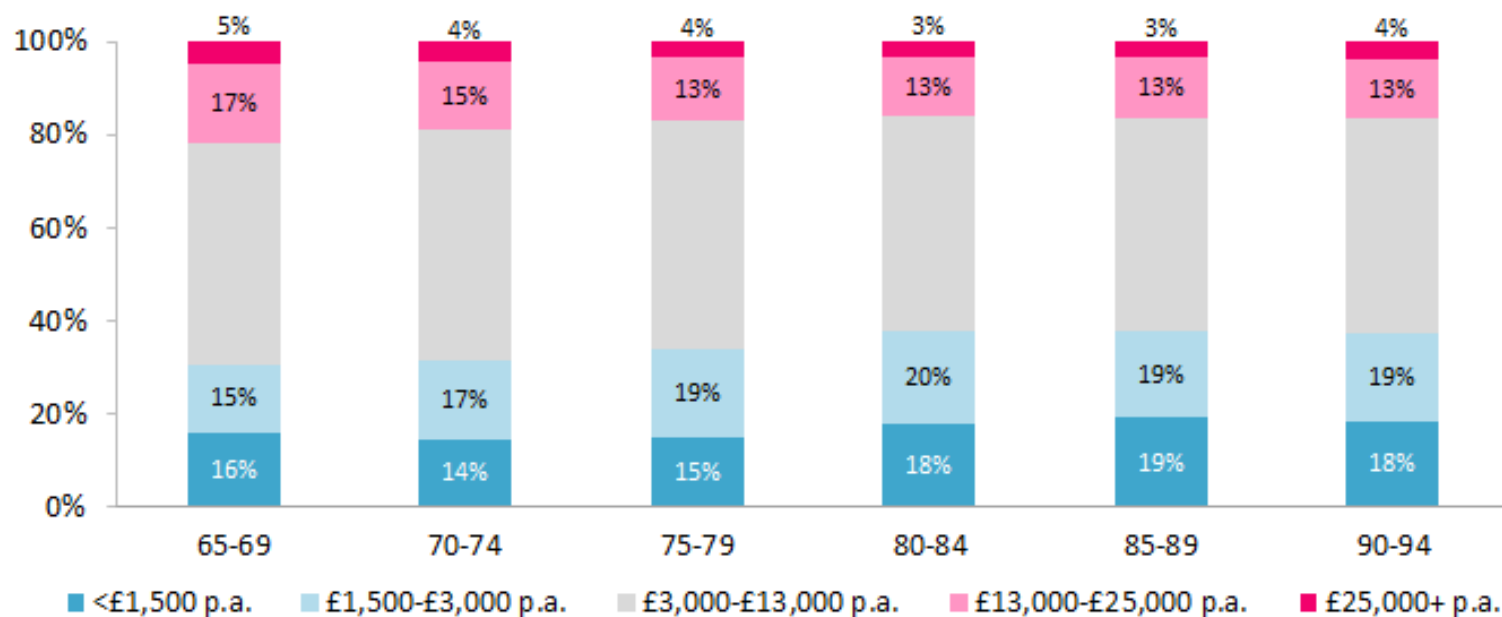
4 times

less likely to die
between 60 and
65

Relying on pension amount will be misleading

Socio-economic drift

Split of pensioners by pension income for different age bands



Source: Own calculations based upon SAPS S2 data for normal health pensioner men.

- **Survivorship bias:** Expect increased prominence of high income at older ages
- **Socio-economic drift:** A £10k pension at age 95 represents higher affluence than a £10k pension at age 65
 - Impact of pension increases (often less than inflation) vs earnings (often inflation plus) and history of pension schemes.
 - If do not control for this risk overstating life expectancies for younger cohorts (drift up socio-economics as age)

Using salary to add
insights into high
earner baseline
longevity.



A practical alternative

Salary widely held

2 in every 3 BPA
transactions

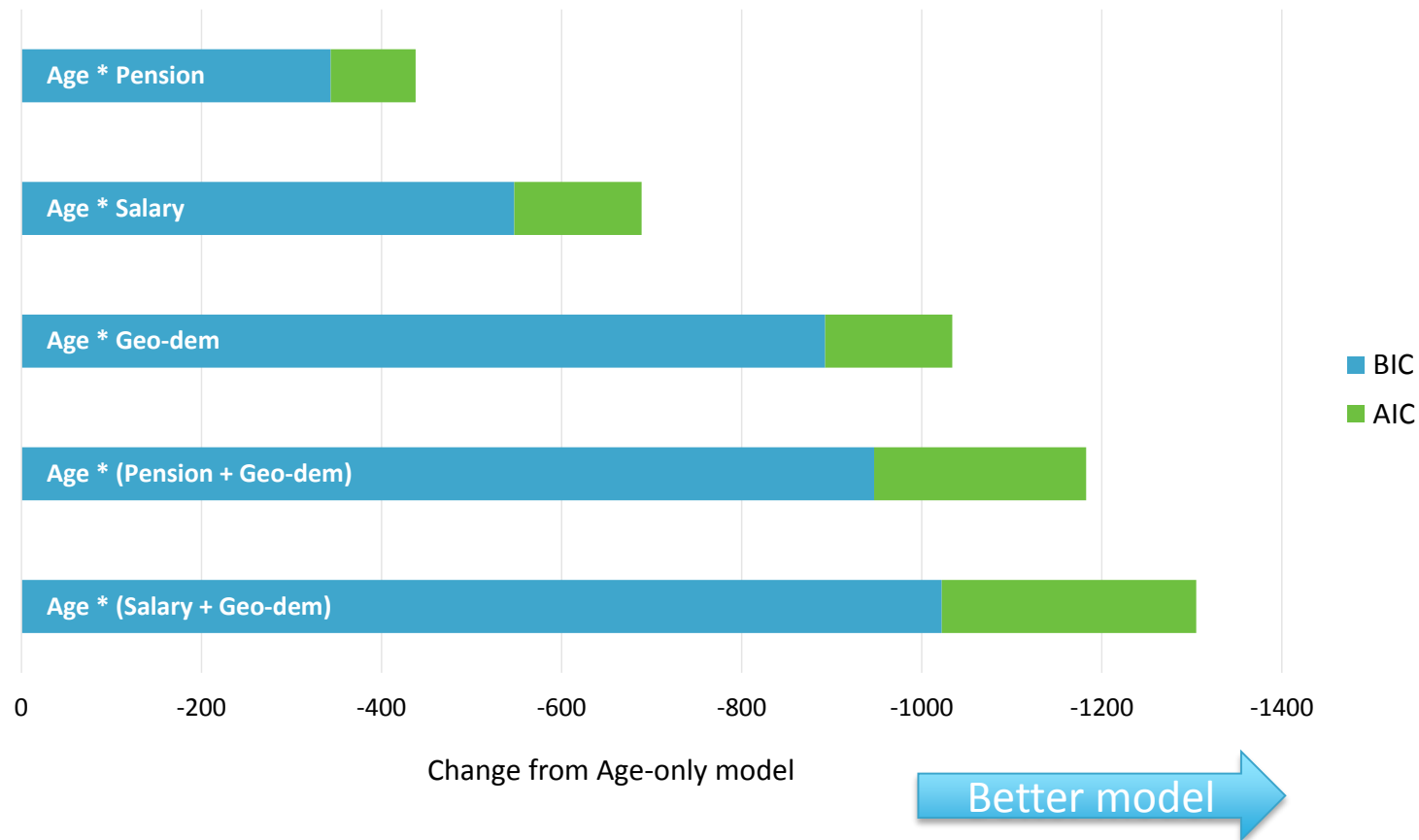
When available
have for 88% of
members

Richness at top
ages

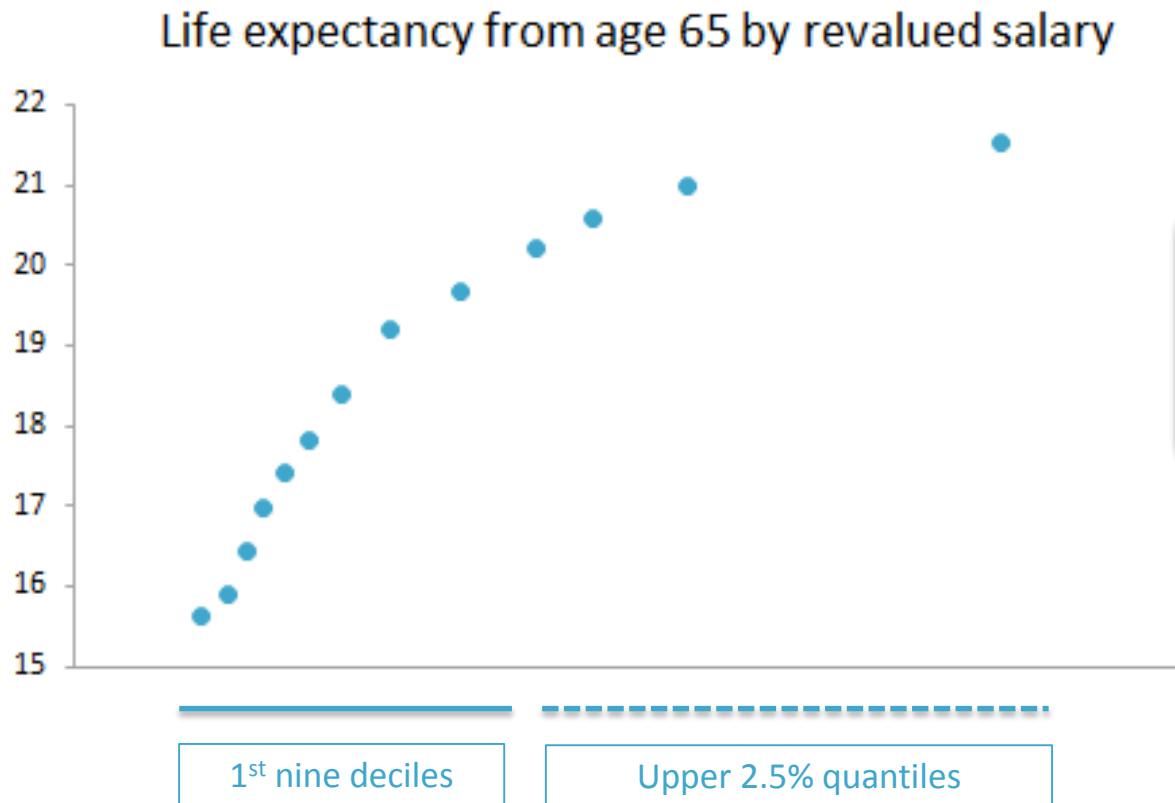
A more powerful covariate

Salary improves model fit

Improvement in modelling mortality rates over and above reflecting age (normal health pensioner men)



A diminishing marginal impact



Solid foundation for applying interpolative models

Analysis of Club Vita data spanning 2004-2013. Data subject to usual Club vita quality controls and only good quality salary data included. Each point represents a salary quantile and a fitted life expectancy has been plotted at the average salary for that quantile. Life expectancies fitted by fitting a Gompertz formula to underlying data and assuming a terminal age of 125. Salaries revalued to April 2016 from last known date with RPI.



Affluence and women?



For current pensioners

- Affluence (pension or salary) less predictive than for men
- Better to include occupation (manual/non-manual) with postcode-based socio-demographics
 - Role of household vs individual?
- Conclusion dominated by those 75+

For younger annuitants / future pensioners

- Changes in employment histories mean care needed with younger annuitants / deferred annuitants

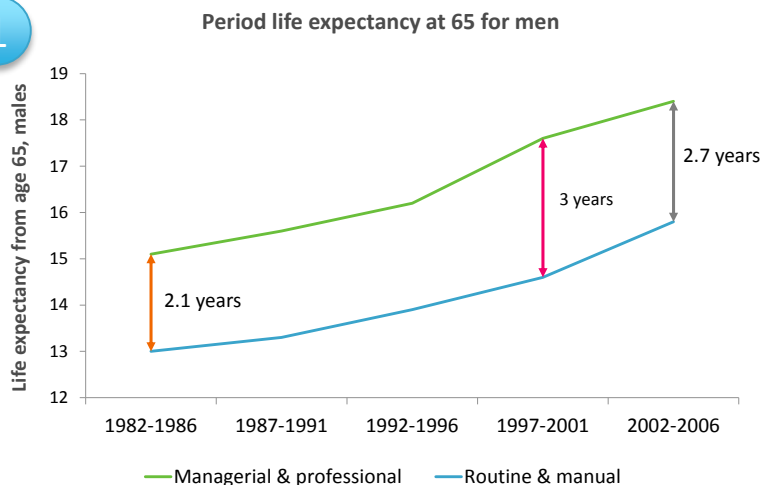


Adding insights into
high earner
longevity trends.



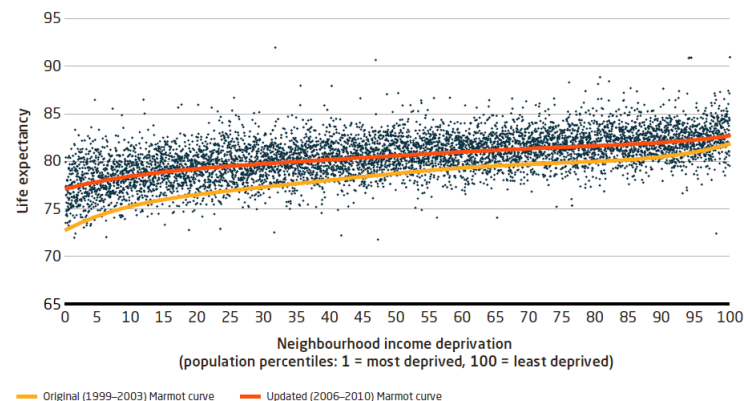
Socio-economic convergence?

1



2

Figure 3 Original (1999–2003) and updated (2006–10) Marmot curves – life expectancy by percentiles of income deprivation for English MSOAs (2011 Census geography)



3

Table 3. Male Average Annualised Mortality Improvement Rates (Ages 65–84)

Population Group	1985–2005 (%)	1995–2005 (%)	2000–2005 (%)
IMD Quintile 1	2.55	3.36	3.70
IMD Quintile 2	2.57	3.18	3.53
IMD Quintile 3	2.49	3.15	3.50
IMD Quintile 4	2.22	2.79	2.98
IMD Quintile 5	1.98	2.43	2.41
Total	2.45	3.10	3.36

Sources:

1. Own calculations based upon ONS data
2. Kings Fund report:
3. Lu et al (2014) *Mortality improvement by socio-economic circumstances in England (1982 to 2005)*

Socio-economic trend groups

Method...

- Clustering based on **pension** and **deprivation**
- Split into 4 groups and 5 deprivation quintiles
- Clustered according to **six core principles**
- 3 groups for men and 2 groups for women
- Used combination of methods:
 - Partitioning about medoids
 - Fuzzy analysis

Principles...

1. Credible size
2. Clear differences in improvements
3. Group where similar improvements
4. Separate where levels very different
5. Interpretable
6. Manageable number

Socio-economic trend groups



Deprivation of the area

High deprivation

Low deprivation

Pension		Deprivation of the area				
		High deprivation		Low deprivation		
	< £5k p.a.					
	£5k - £7.5k p.a.					
	> £7.5k p.a.					



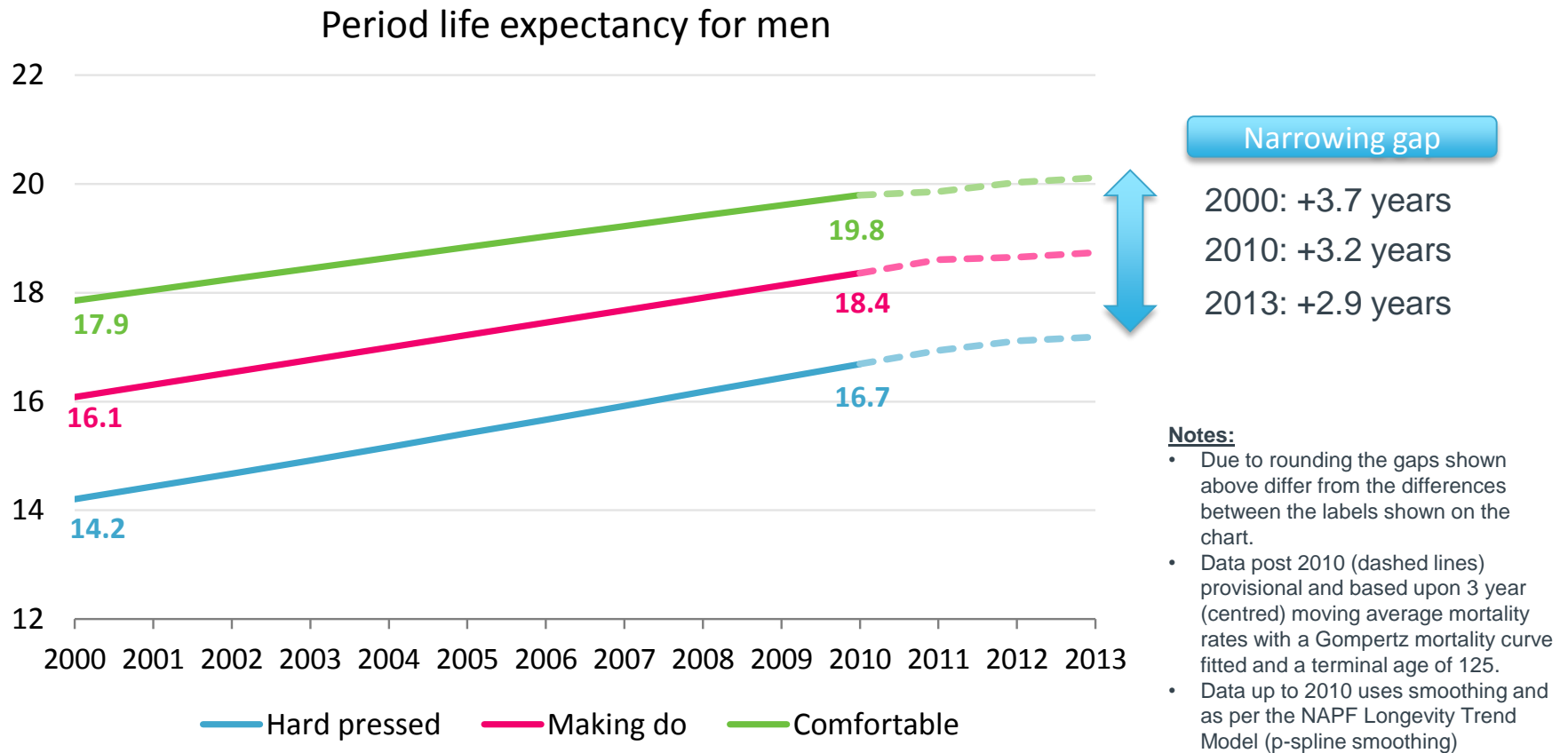
Deprivation of the area

High deprivation

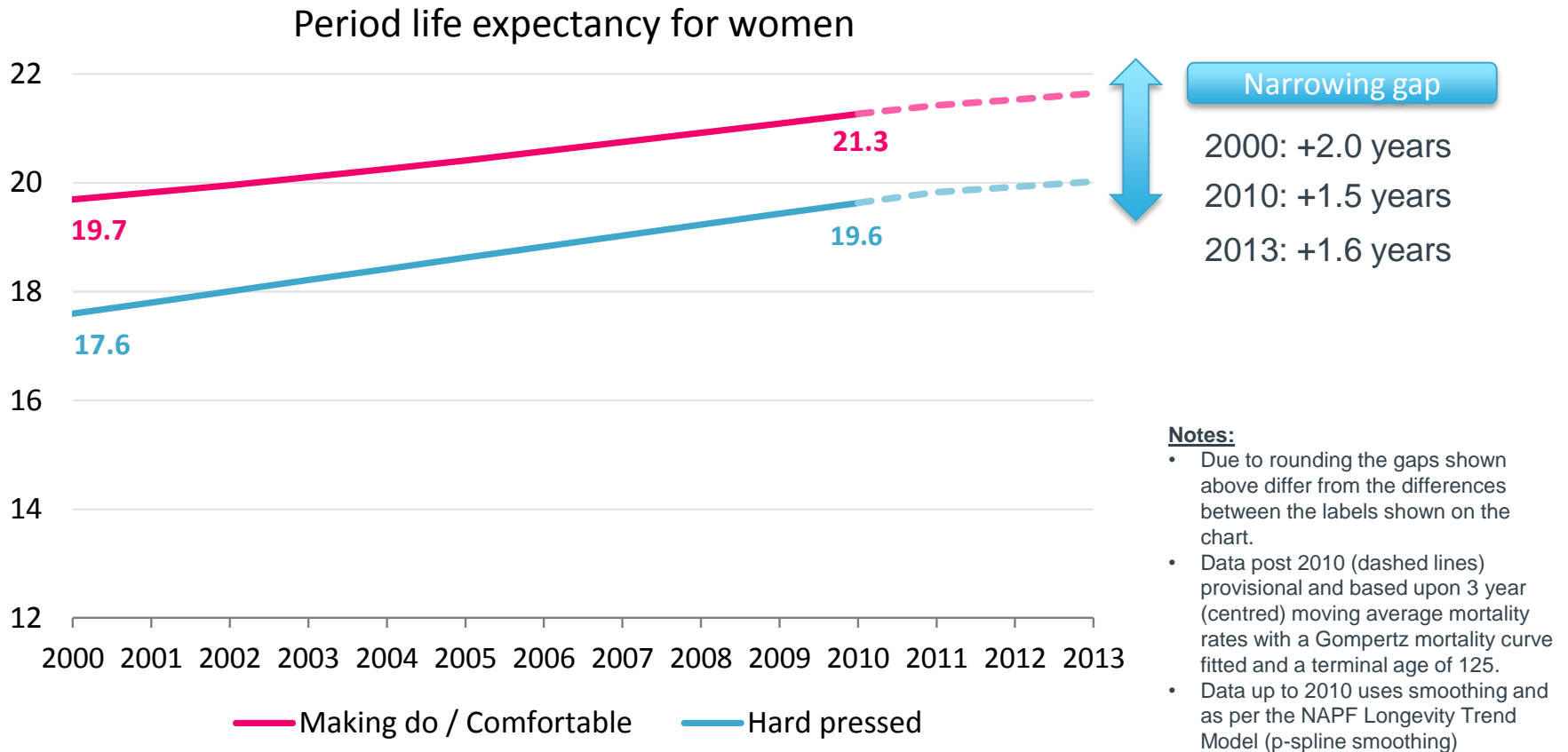
Low deprivation

Deprivation of the area				
High deprivation		Low deprivation		

A narrowing longevity gap (men)

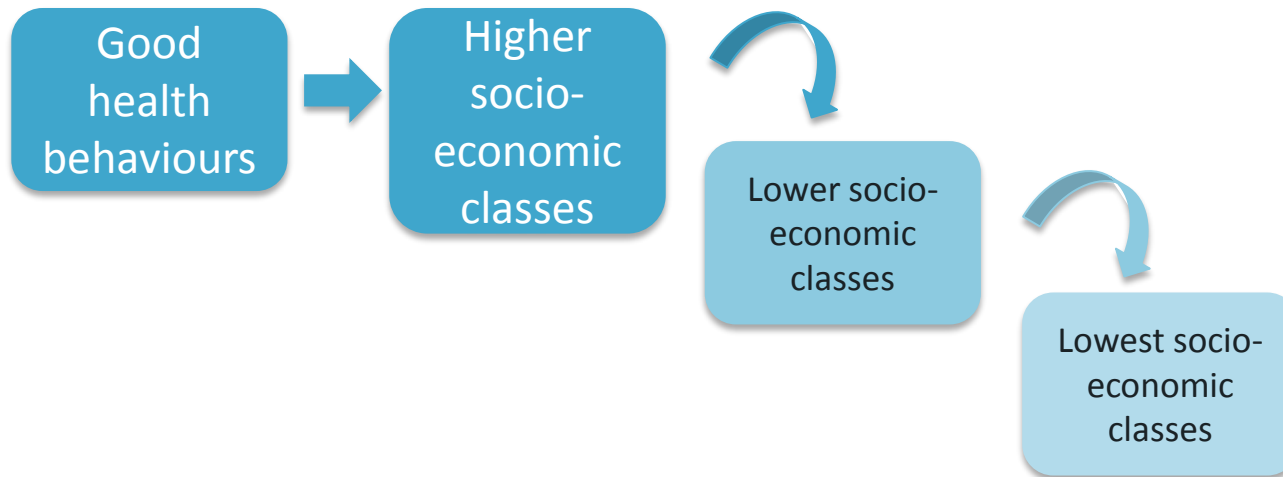


A narrowing longevity gap (women)



Socio-economic health cascade?

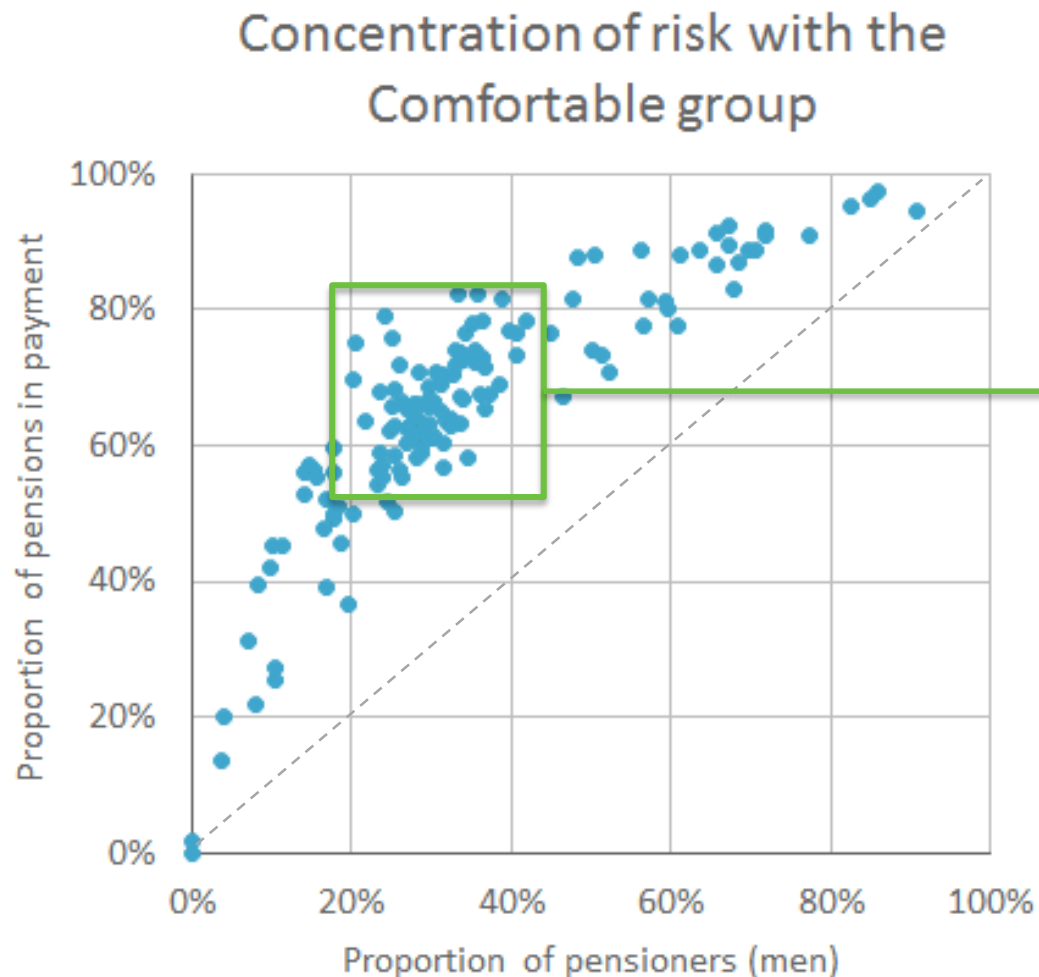
An “information cascade” / “social diffusion” in action



- Earlier adopters tend to be of higher socio-economic status
- Influence of social networks:
 - decision of whether to adopt made in context of observing friends, neighbours and colleagues
 - “Social diffusion” a long discussed concept e.g. tetracycline adoption (Coleman et al, 1967) and hybrid corn (Ryan & Gross, 1950)*

“A paradox inherent in the scientific method is that, attached though we are to the hypotheses we formulate, we must subject them to assault and search for circumstances that really test their resilience.” Paneth & Susser

Why socio-economic trends matter



Most BPA books have 20-40% lives in the 'comfortable' group, but 50-80% of annual pensions

What else do we
know about high
earners?



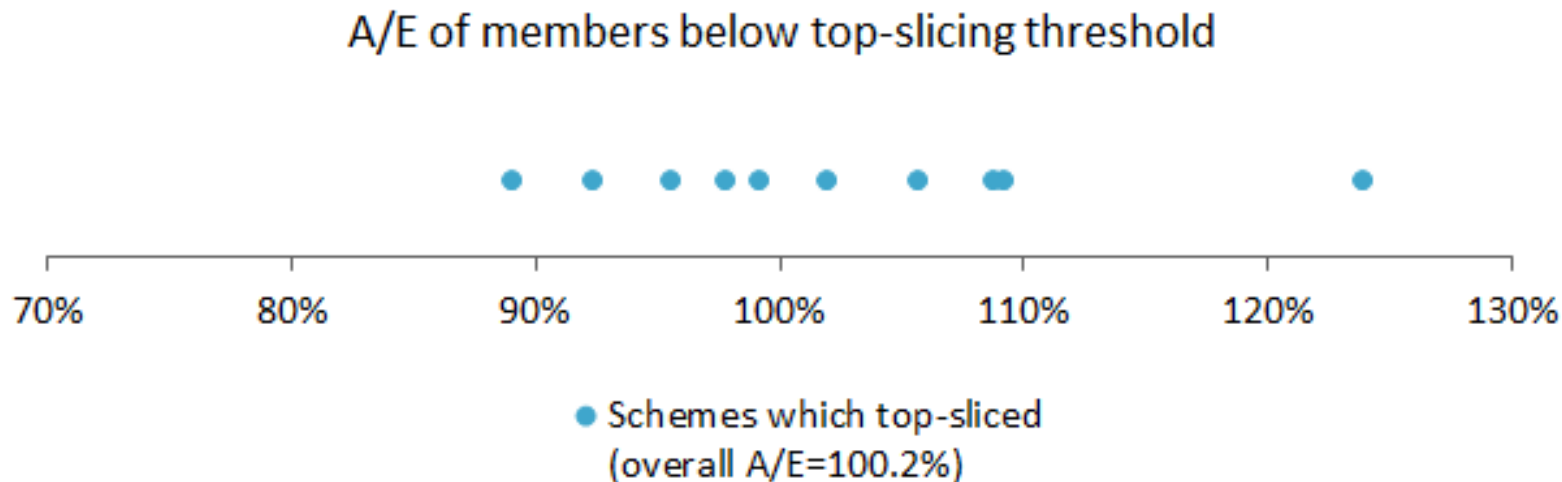
Top-slicing



1. Identify individuals representing (say) top 20% of liabilities in a pension scheme
2. Seek quotations for medically underwritten annuities
3. Purchase annuities for these named lives *(may release capital, removes a concentration of risk)*
4. Leaves a residual population to be secured at a later date

“The problem with top-slicing is that no insurer will be interested in the rest of the annuity book....”

Is top-slicing a Pandora's box?



- Looked at 23 pensioner portfolios in Club Vita dataset with between 500 and 5,000 lives
- Assumed a top-slicing approach to market happened in 2005
- **Objective criteria for top-slicing:** Based on pensions in payment above a (scheme-specific) threshold so that covered 20% of liabilities
- Where those lives went on to have 'heavier than expected' mortality we have assumed this was due to a health condition which would have been identified by underwriting and so those schemes would have 'top-sliced'
- Looked at experience of residual population post 2005 for schemes which top-sliced for evidence of selection – **no (obvious) evidence of adverse selection**

Is there any truth in stereotypes?



Healthier




More likely to
be married



Young spouse





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Thank you

