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Longevity trend assumptions: *Does one size fit all?*

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Prepared for ACA Northern Conference on 22 September 2017

The next 30-40 minutes…

Historical perspective…

Building projections…

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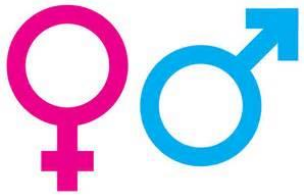
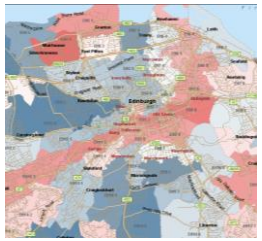
Does one size fits all?…
…why ask the question?

Baseline



3 year gap



12 year gap

Trends

- Source of greatest risk
- Essentially one-size-fits-all

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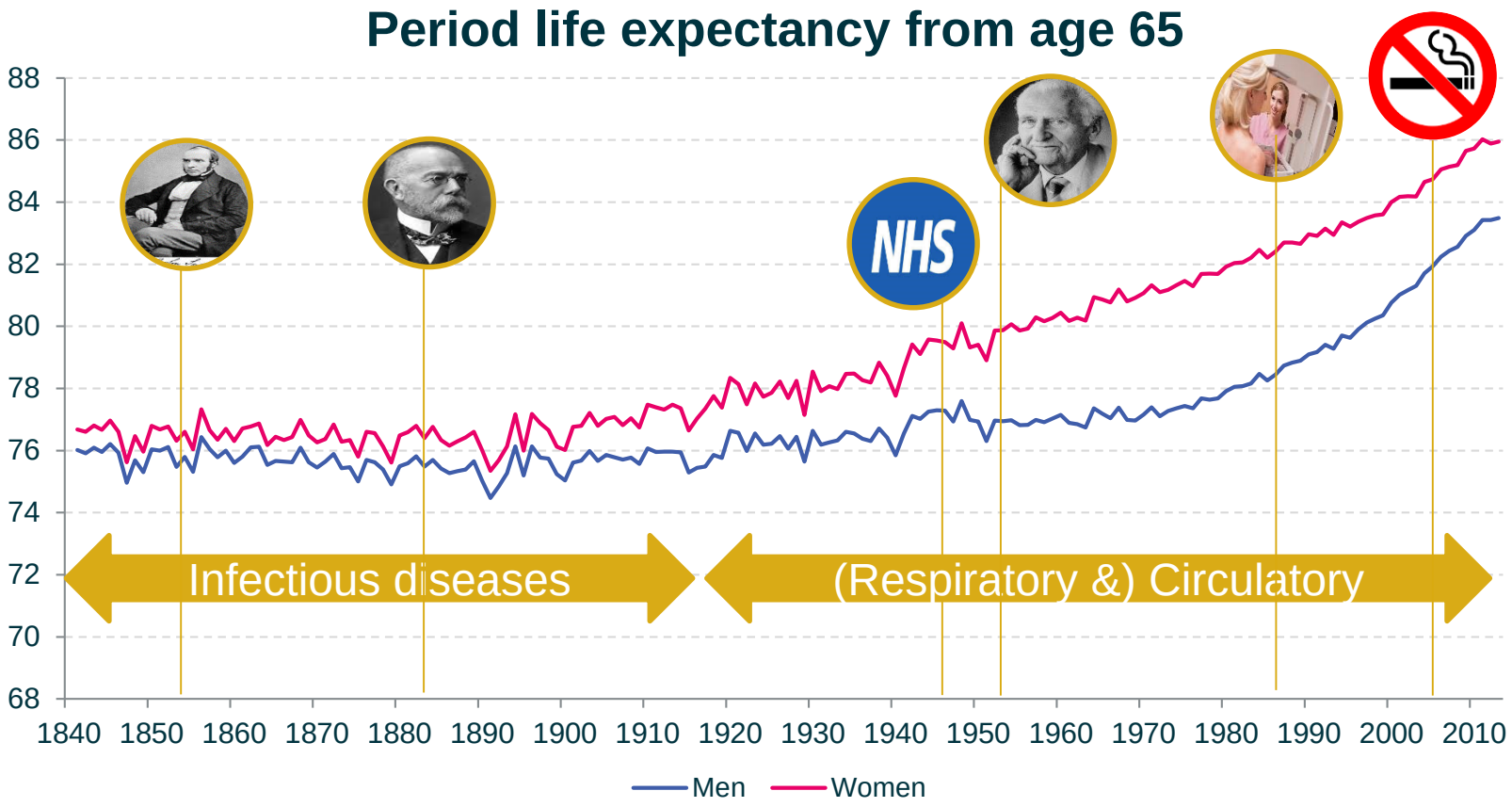
A social history of improvements

Why socio-economics matter

21 September 2017

170 years of longevity..



Source: Hymans Robertson using data from ONS and Human Mortality Database

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A long history of socio-economic differences

Source: BBC via YouTube

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Longevity is a life-course outcome

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Why socio-economics matter
Smoking example

Smoking
Over half the difference in premature death between SECs

(Sharma et al, Wanless et al; death before age 70)

Smoking cessation
Higher SECs nearly three times more likely to successfully quit

(Hiscock et al)

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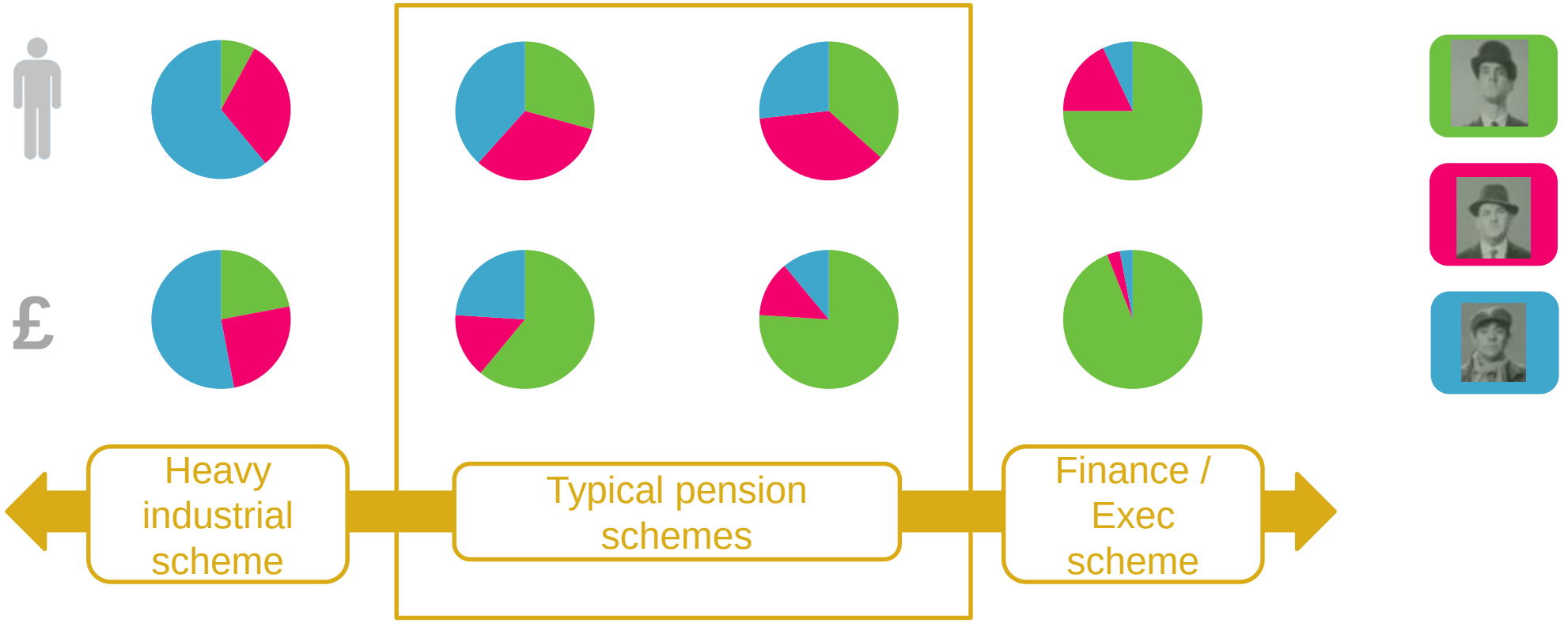
Why socio-economics matter



Source: Club Vita. Coloured areas relate to Club Vita based socio-economic classes (VitaSegments) which are subtler than the Cleese / Barker / Corbett socio groupings.

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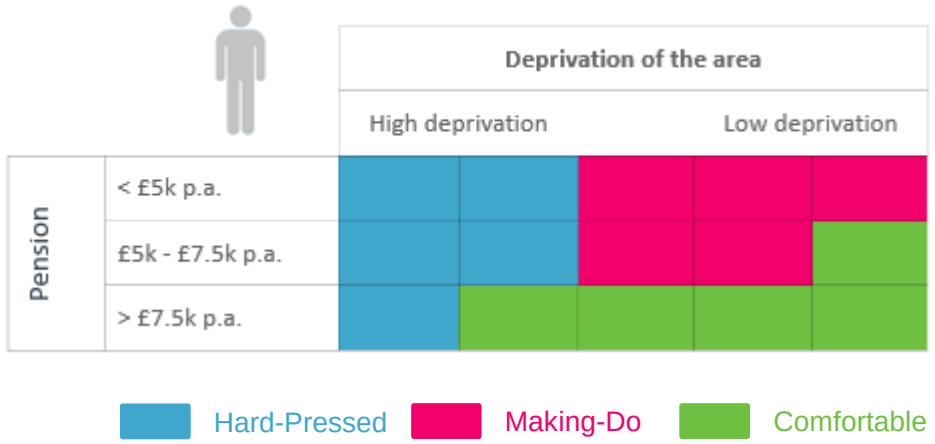
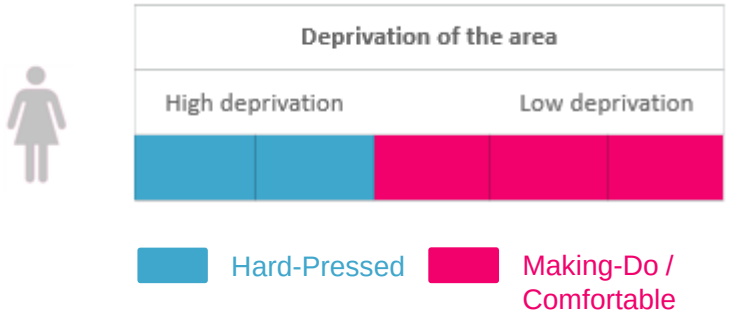
VITA SEGMENTS

Key features

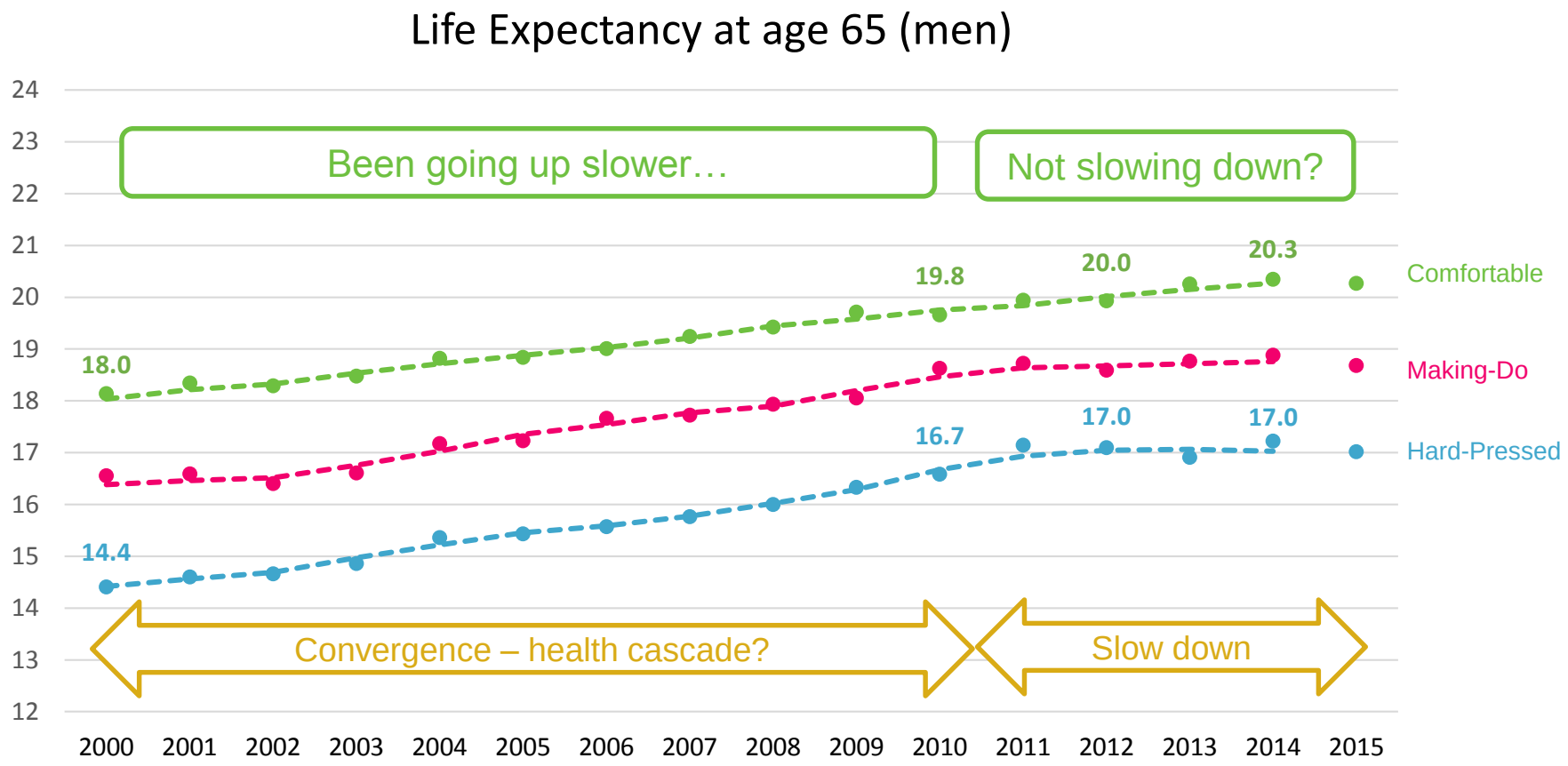
1. Calibrated to over 20 years of pension scheme back history
2. Based on 2m+ lives / 60k annual deaths
3. Use widely available variables
4. Statistically credible groups capturing differences in historical mortality improvements





Source: Club Vita

Latest emerging evidence



Notes to chart:
(i) Points relate to life expectancy for the calendar year (using crude mortality smoothed over the age range via a Gompertz curve)
(ii) Dashed lines apply three year smoothing i.e. calendar year and year prior and after)
(iii) Labels relate to the values under three year smoothing

Source: Club Vita / Hymans Robertson

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Underlying improvements

Group	Annualised mortality improvement (age-standardised)		
	2000-2005	2005-2010	2010-2015
England & Wales	2.8% (±0.1%)	2.8% (±0.1%)	1.1% (±0.1%)
Club Vita	2.4% (±0.5%)	2.8% (±0.3%)	1.3% (±0.4%)

1

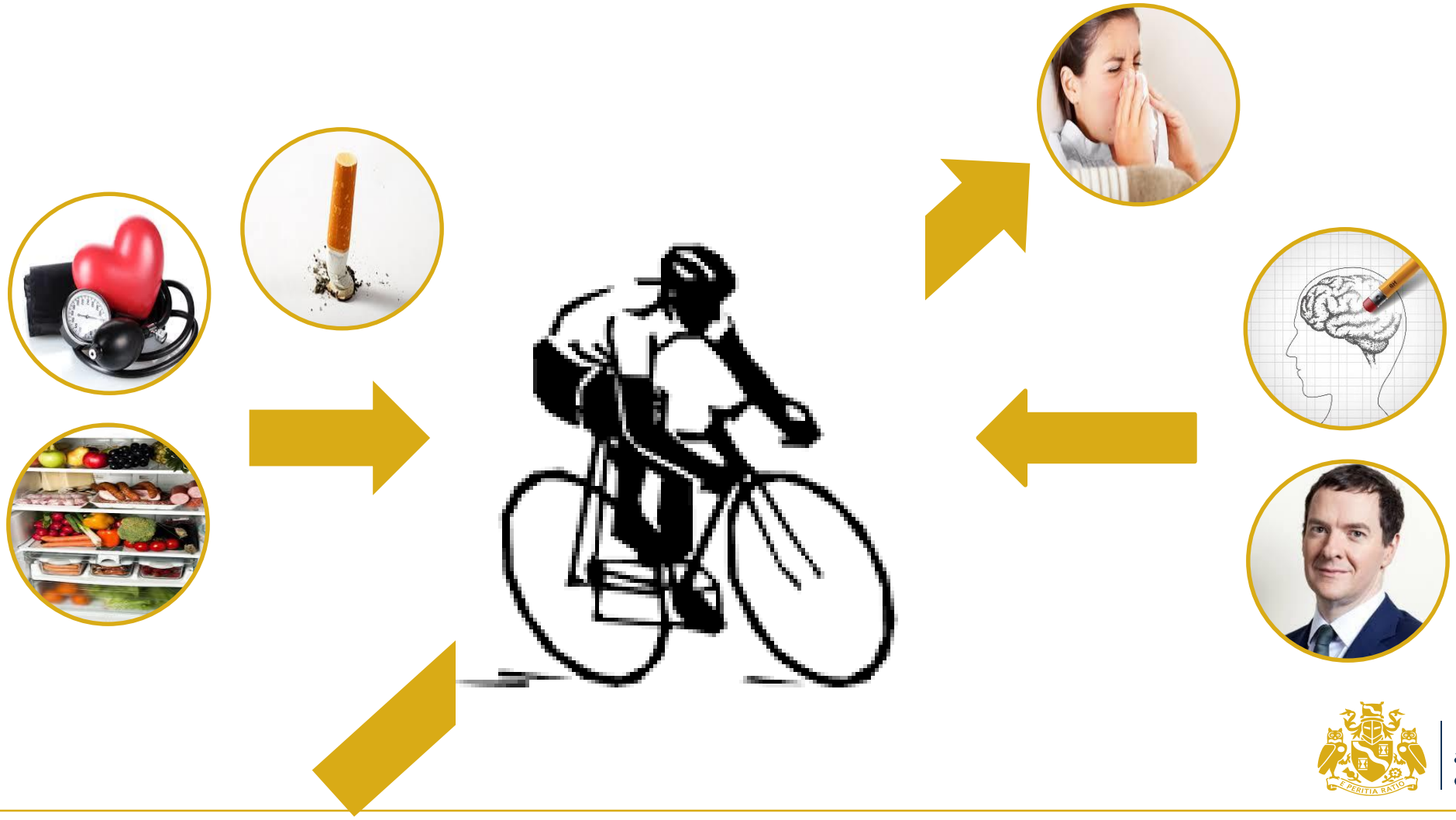
2

3

1. Pension scheme improvements mirror national data on a **lives** basis (including recent slowdown)
2. Comfortable members who dominate liabilities seen **stabler** improvements and no recent slow down
3. Lower socio-economic groups had been catching-up (convergence, 2005-2010)…
   …but recently slowed down (divergence, 2010-2015)

Source: Club Vita / Hymans Robertson. Confidence intervals calculated consistently with the approach set out in CMI WP97

Tail winds, head winds and side winds…



Unpacking the VitaSegments

Hard-pressed

Comfortable

Source: Club Vita / Hymans Robertson. Statistics quoted during seminar using Club Vita data and data from English Longitudinal Study of Ageing (ELSA) All comments relate to those in retirement with DB pensions (typically aged 65+)

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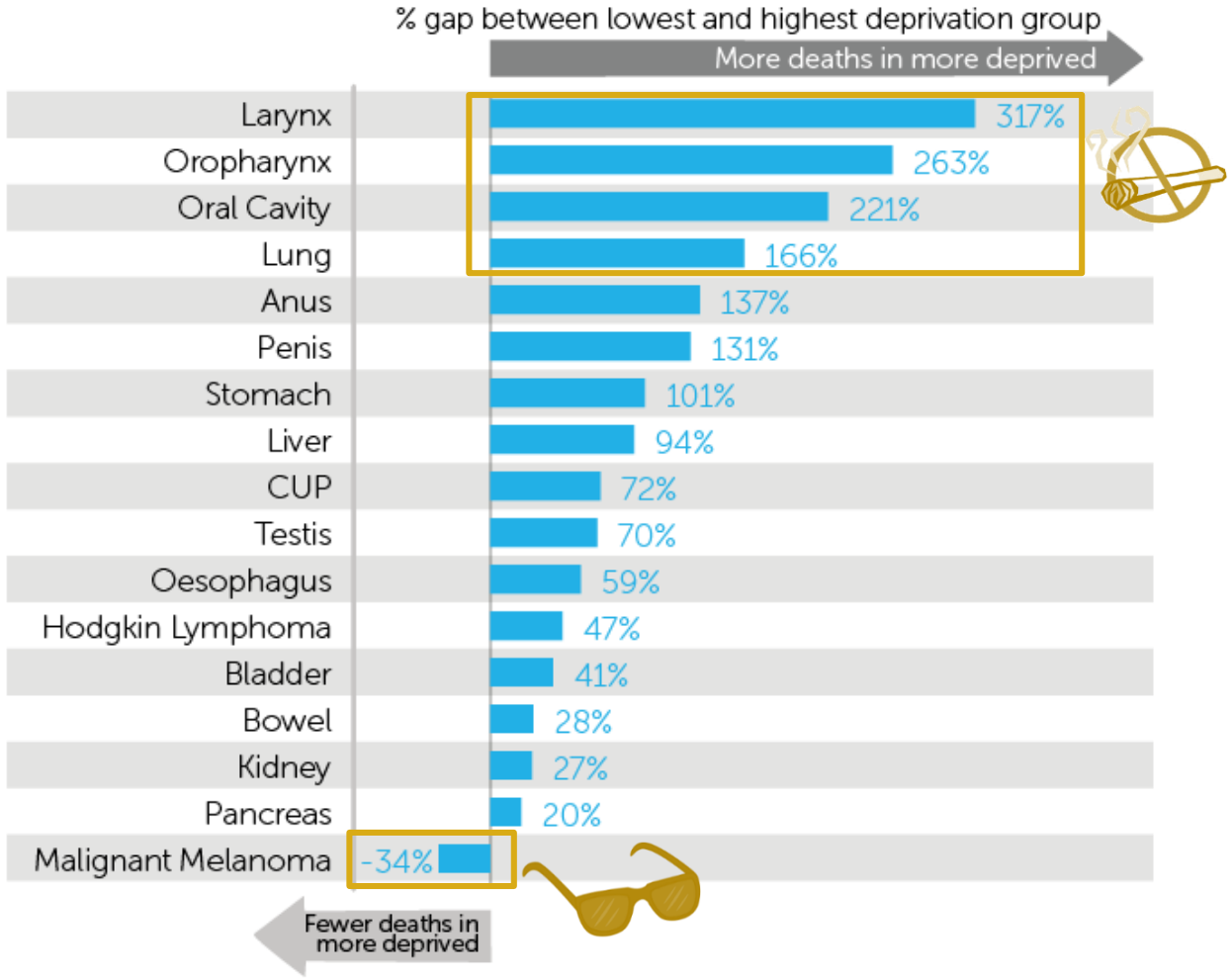
Does it make sense to segment projections by socio-economic class?

Cancer mortality varies between SECs



Percentage Deprivation Gap in Age-Standardised Mortality Rates

(Males, England 2007-2011)

Does one trend fit all?

Industry Assumption:

New developments in the real world will trigger similar responses across SECs.

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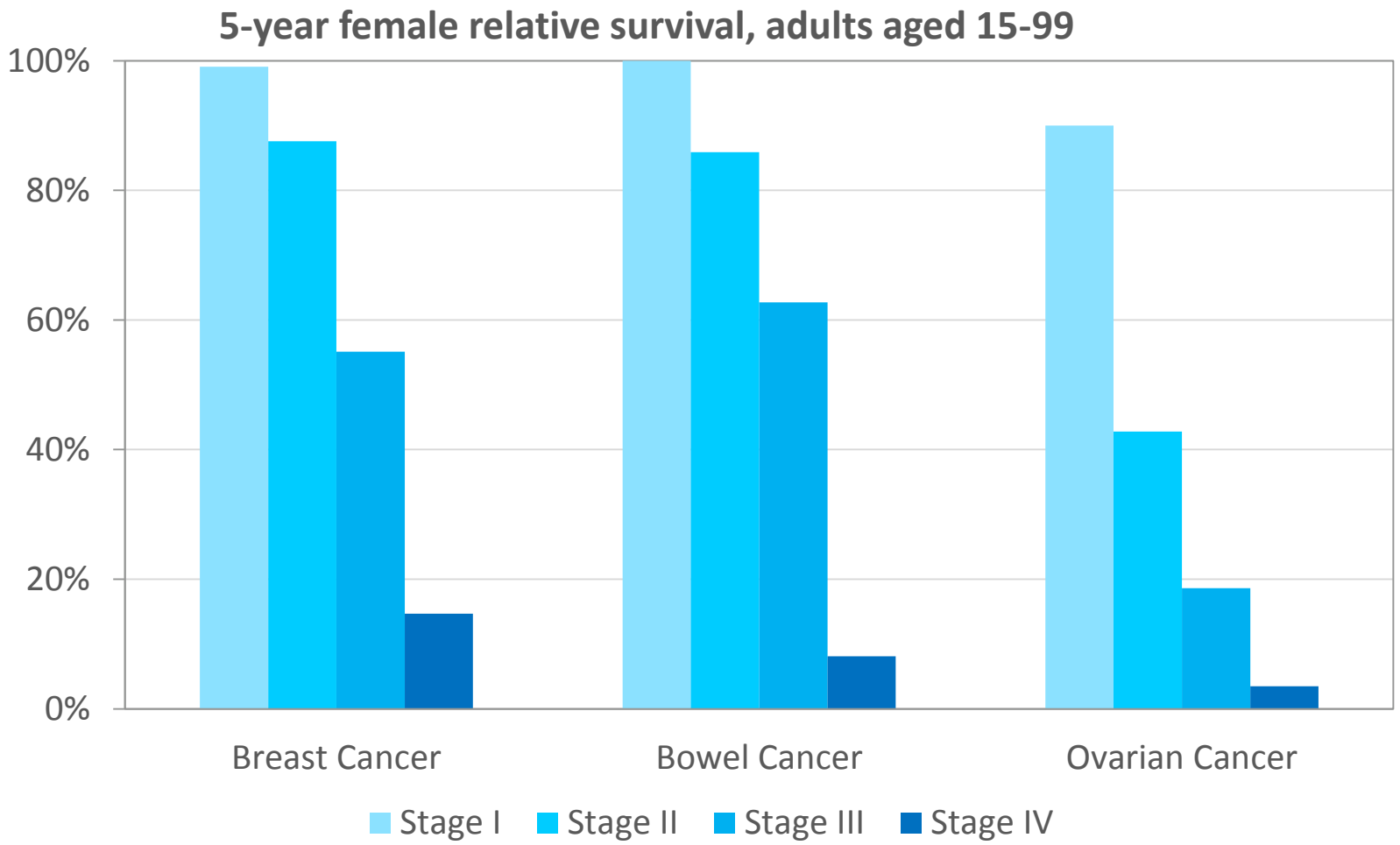
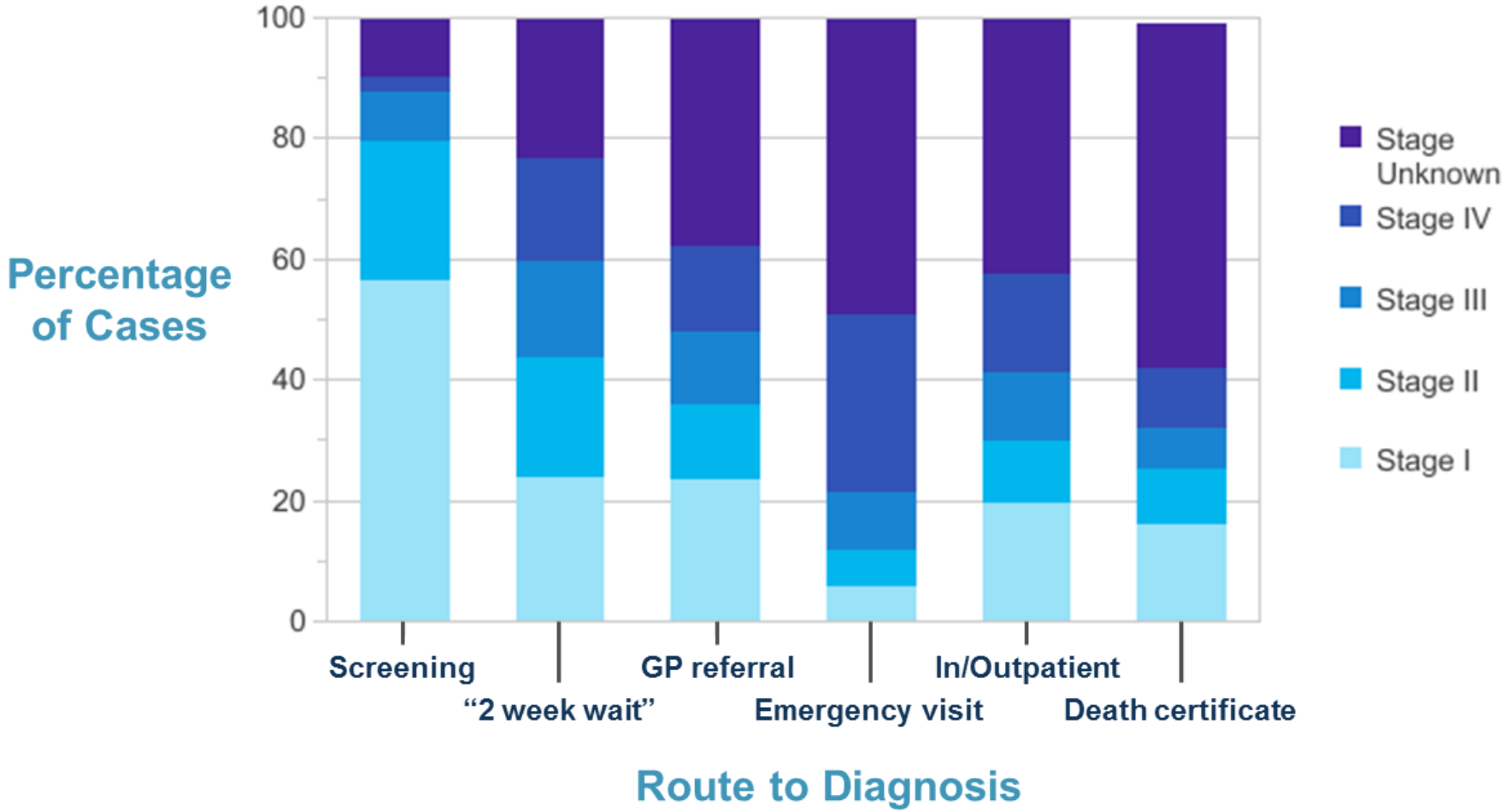
Cancer survival strongly linked to early detection



Screening is the best way to detect cancer early



Responses to screening programs vary by SEC

Bowel Cancer screening

- **2006**: screening using blood tests can reduce bowel cancer mortality by up to 25%.
  - Screening uptake showed marked differences by SEC.
- **2015**: more invasive screening test (tiny camera) can reduce bowel cancer mortality by up to 43%.
  - *"People from poorer neighborhoods were less likely to take up the offer than those in affluent areas"*

IMD quintile	Uptake of blood test screening (%)
5 *(most deprived)*	41.7
4	50.1
3	55.5
2	59.6
1 *(least deprived)*	61.4

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Richard F A Logan et al. Gut doi:10.1136/gutjnl-2011-300843

Does one trend fit all?

Industry Assumption:

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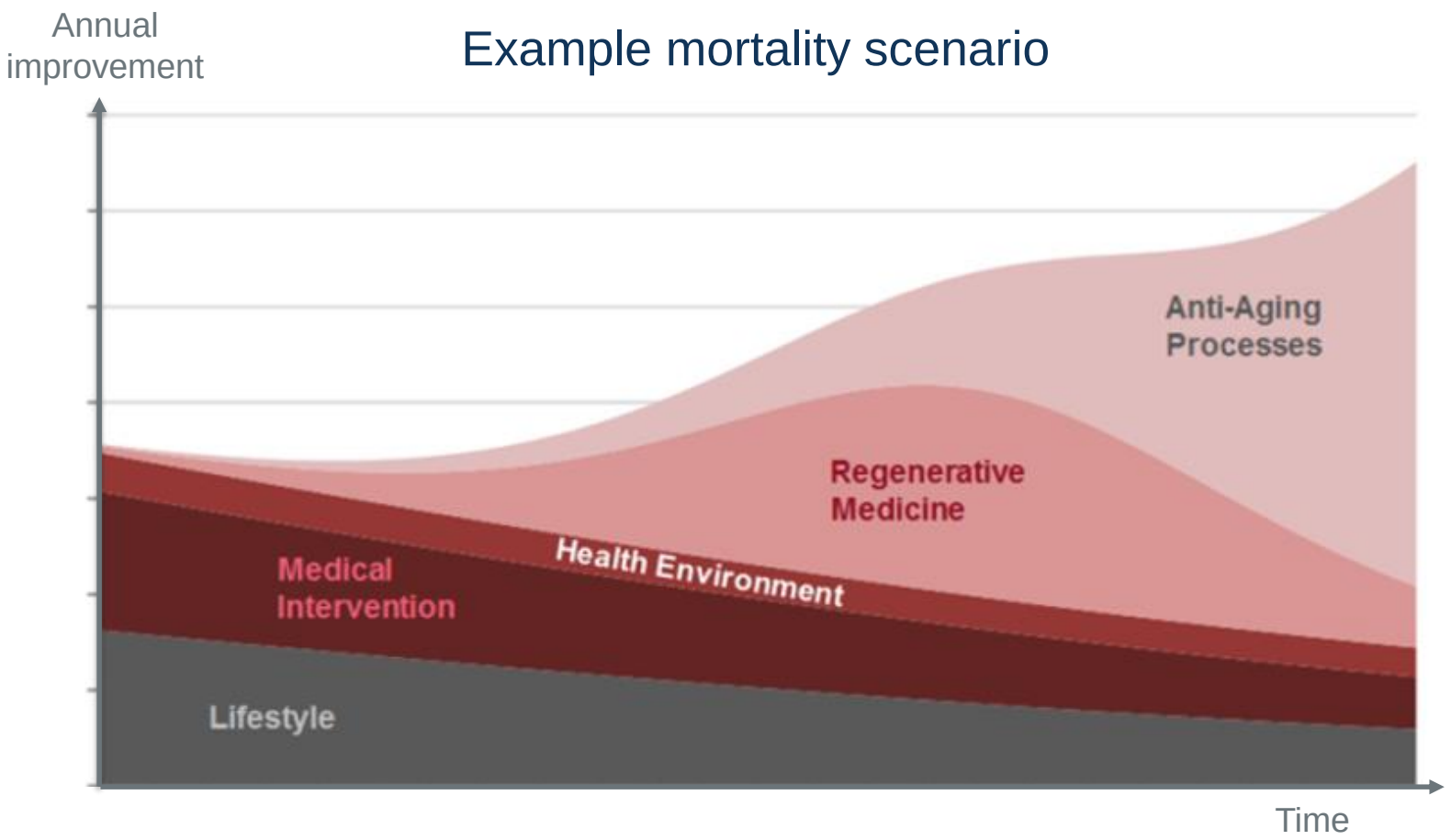
Building a segmented longevity trend model

What is driving the changes in mortality rates?

Lifestyle

Health Environment

Medical Intervention



Regenerative Medicine

Anti-Aging Processes

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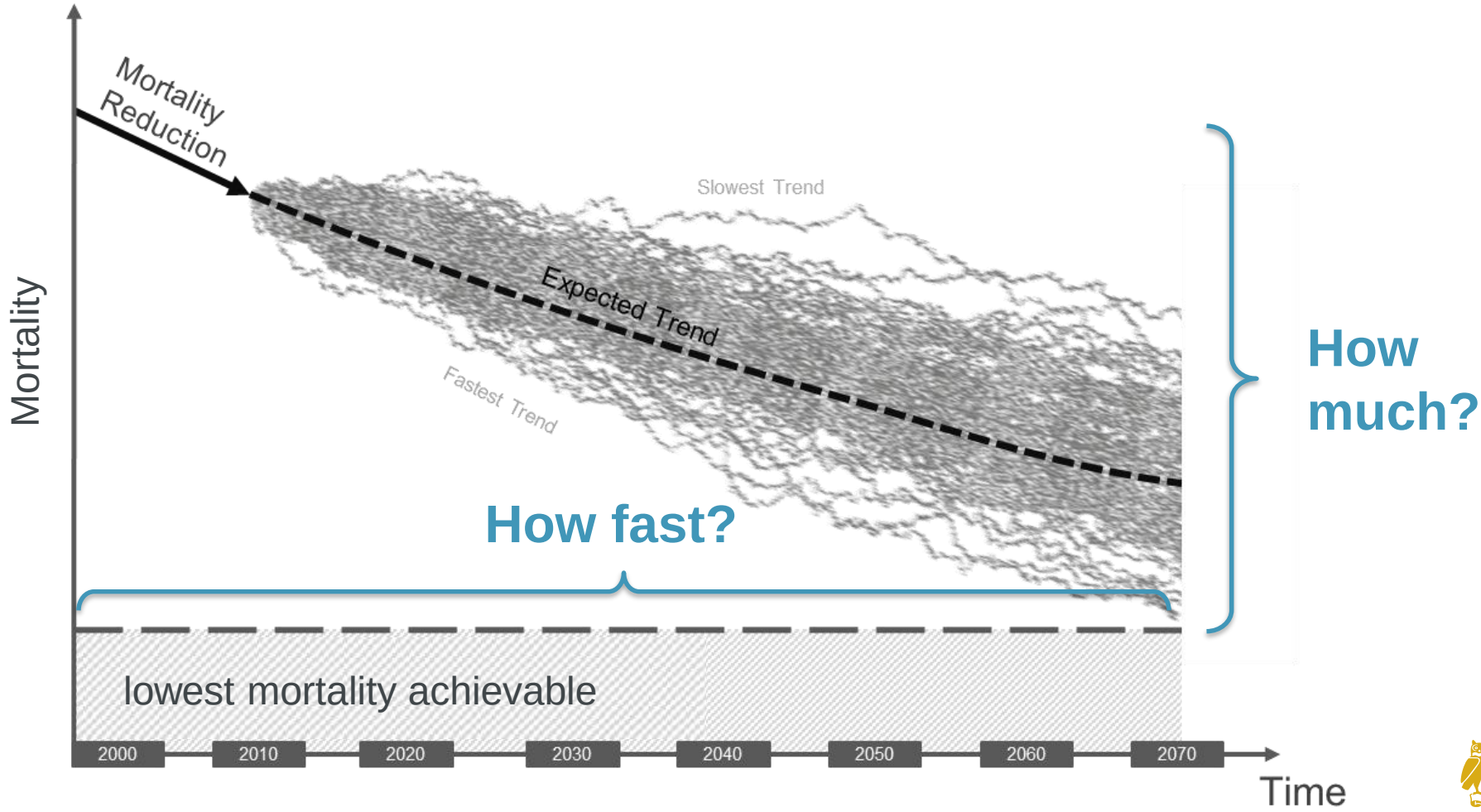
Medically informed projection constraints



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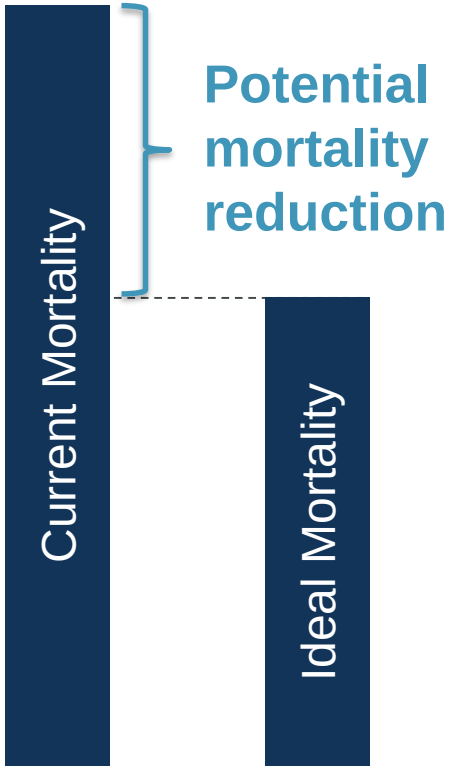
Quantifying lowest mortality: Lifestyle



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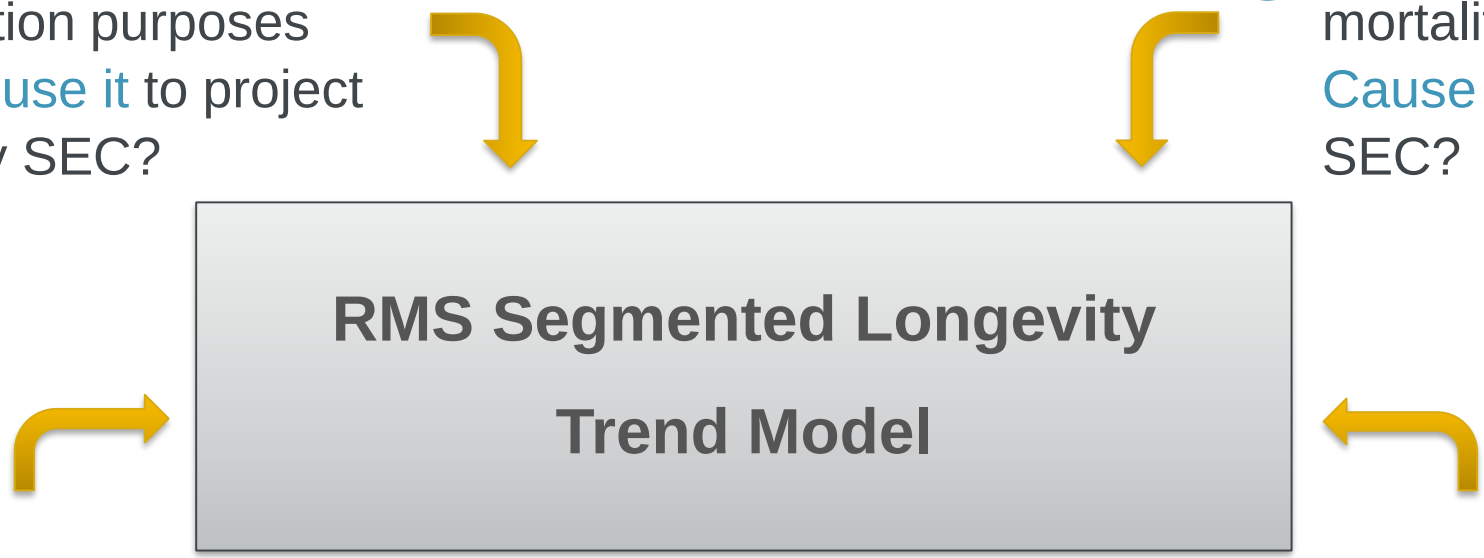
Parameterizing a segmented model

1. What is an appropriate dataset for parameterization purposes and how can we use it to project improvements by SEC?

3. How can we derive the mortality improvements by Cause of Death for each SEC?



2. What would be a credible SEC segmentation which, in addition, can be easily applied?

5. How can we specify a correlation framework which reflect the relationships in SEC improvements?

4. What additional insights from medical science can inform the projections by SEC?

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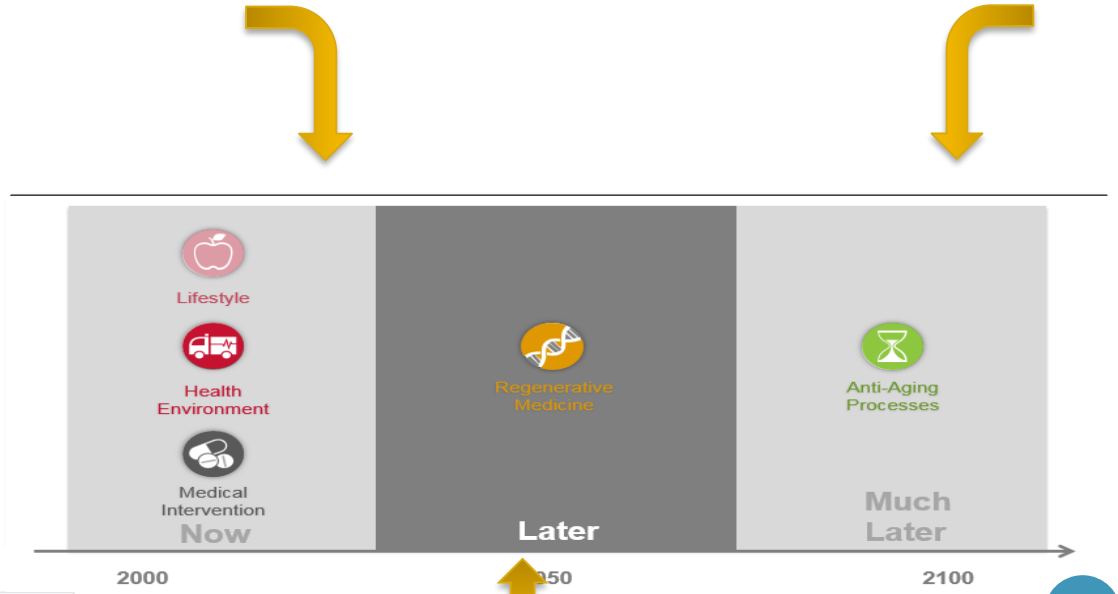
Parameterizing a segmented model

1

Office for National Statistics

CLUB VITA



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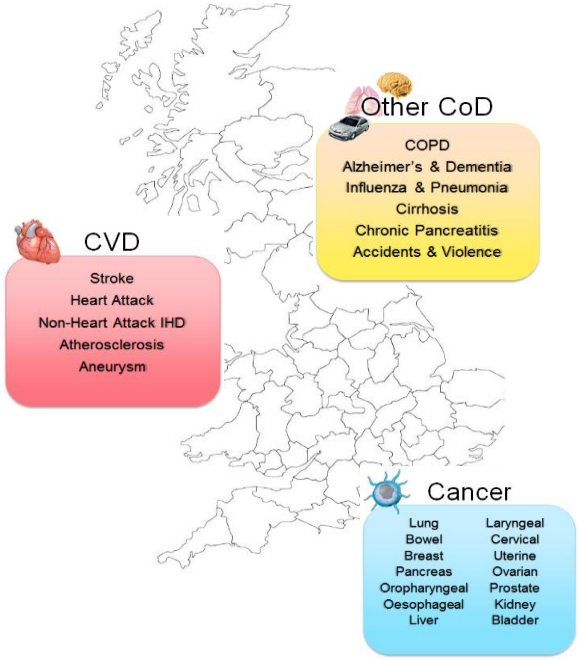

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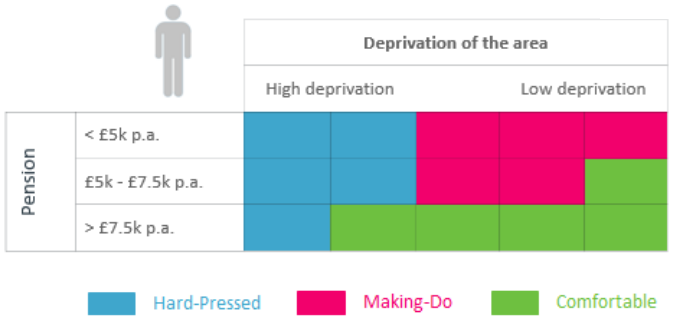

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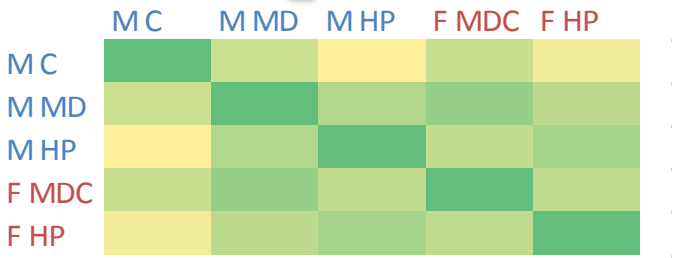

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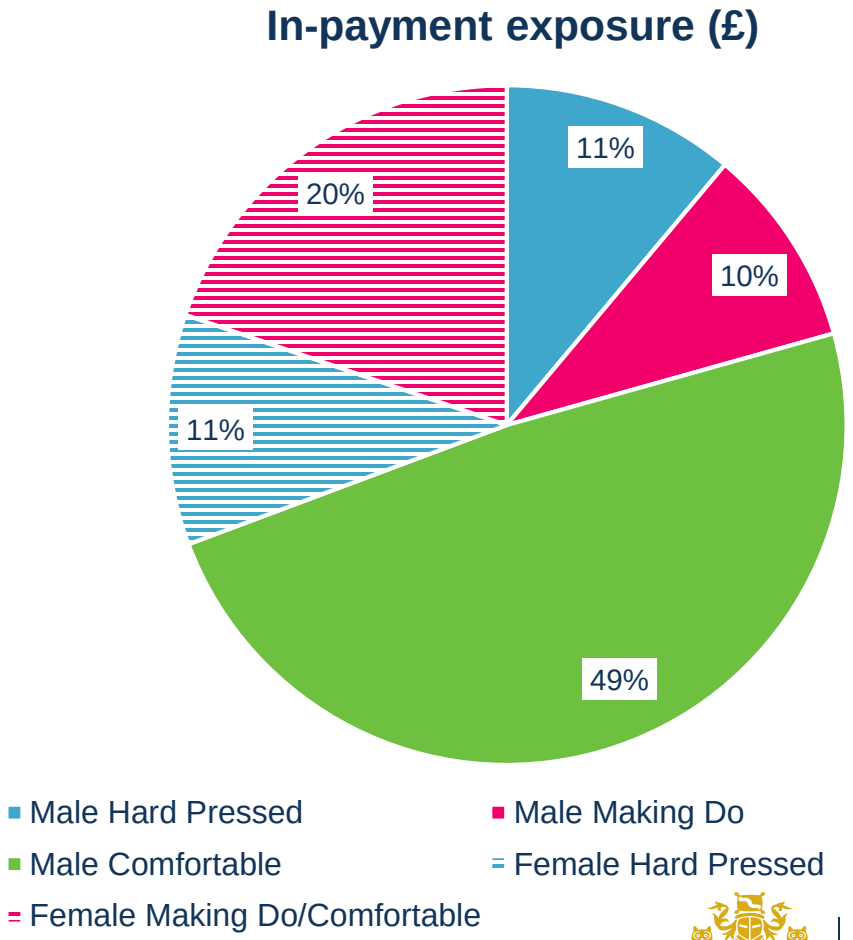
What could trend segmentation mean for pension schemes?

Impact on an example pension scheme

Scenario: Pension scheme, size £1bn, mixed workforce

- Amounts skewed towards **Male Comfortable**
- 69% Male, 31% Female
- Average age: 75



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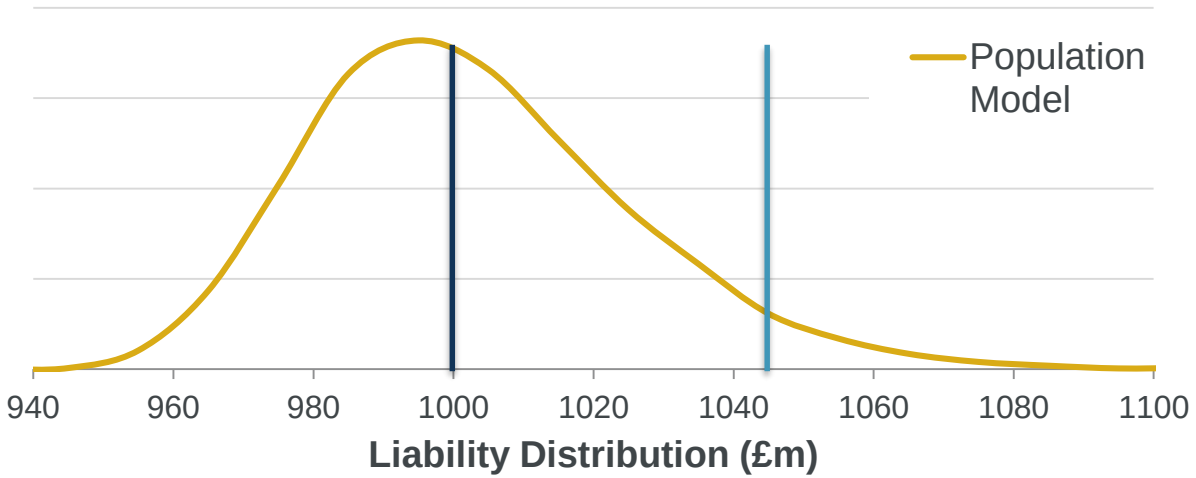
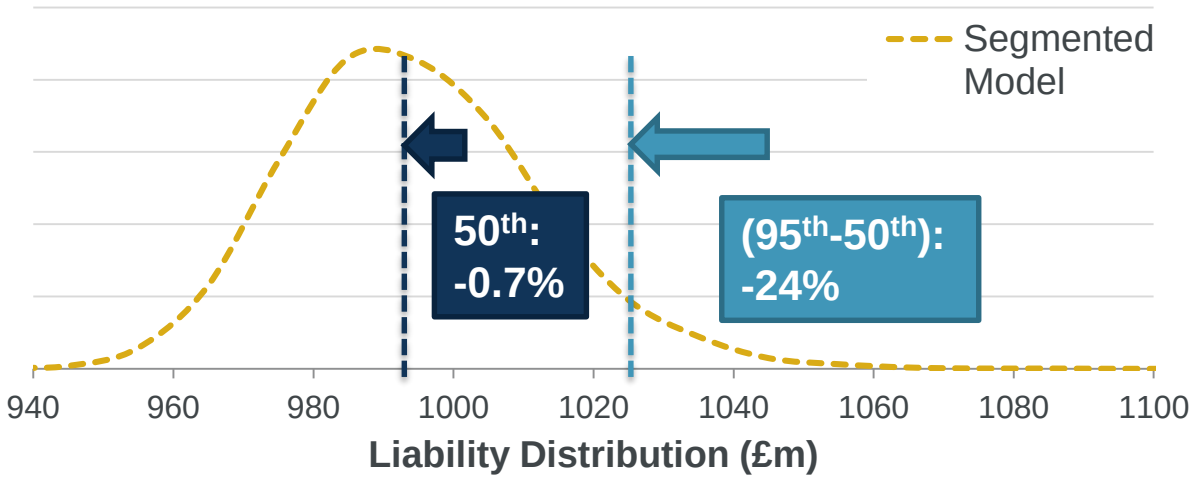
Impact on an example pension scheme





1. Reduced best estimate:
   - Better reflecting socio-economic composition of business
2. Reduced risk distribution:
   - Greater certainty in trends for some SECs
   - Diversification across SECs
   - Reduced basis risk

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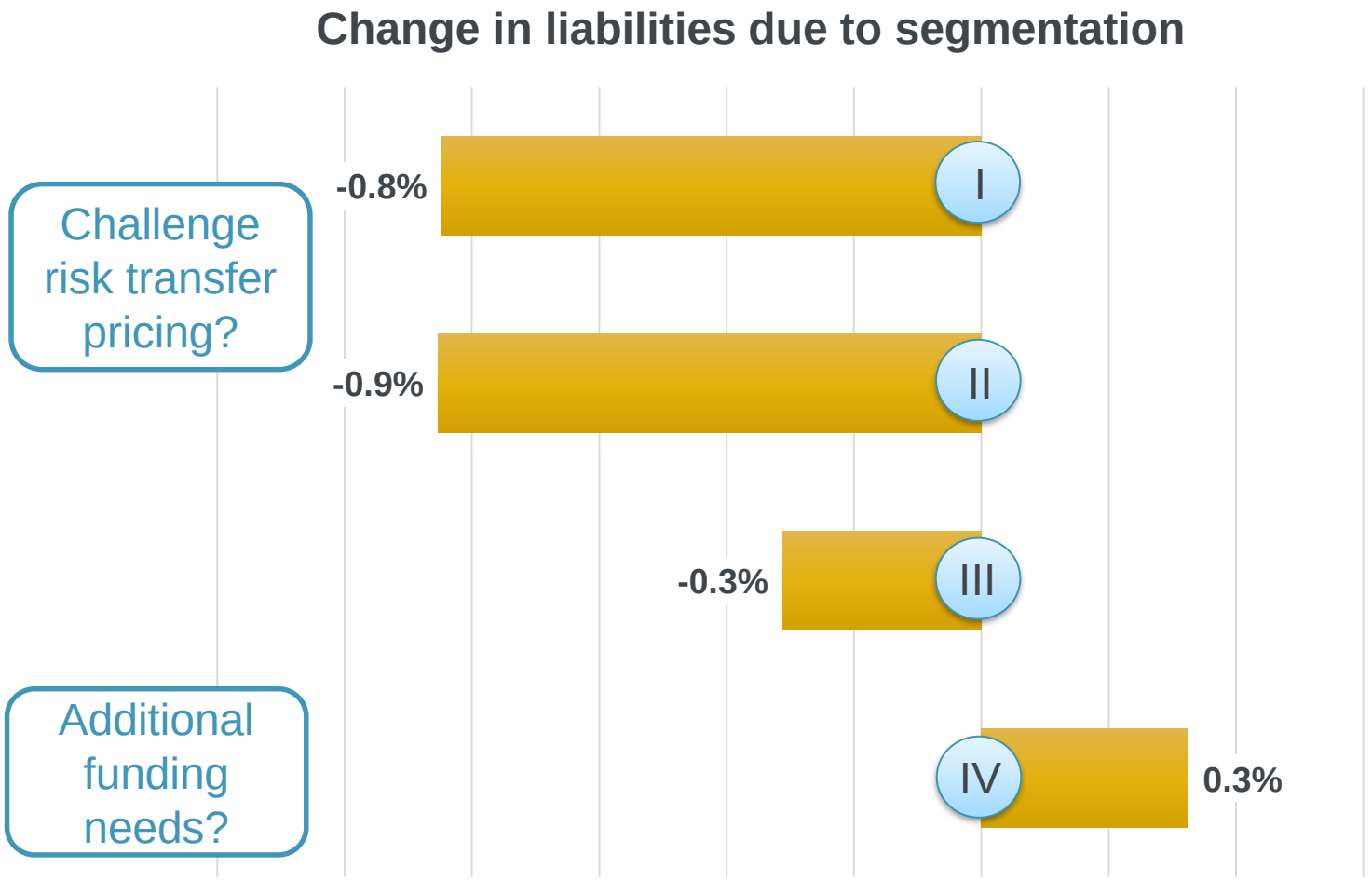
Material impact on valuations



Scenario: 4 identically-sized pension schemes under population trend assumption..

.. but with materially different SEC and age mix

Segmented approach refines liability estimates:

- Refined triennial valuation assessments
- Improved risk transfers decisions / negotiations

Summary

One size does not fit all

Socio-economic differentiation offers valuable insights

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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 presenters.

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