USS
UNIVERSITIES
SUPERANNUATION
SCHEME LIMITED

Longevity – It's academic

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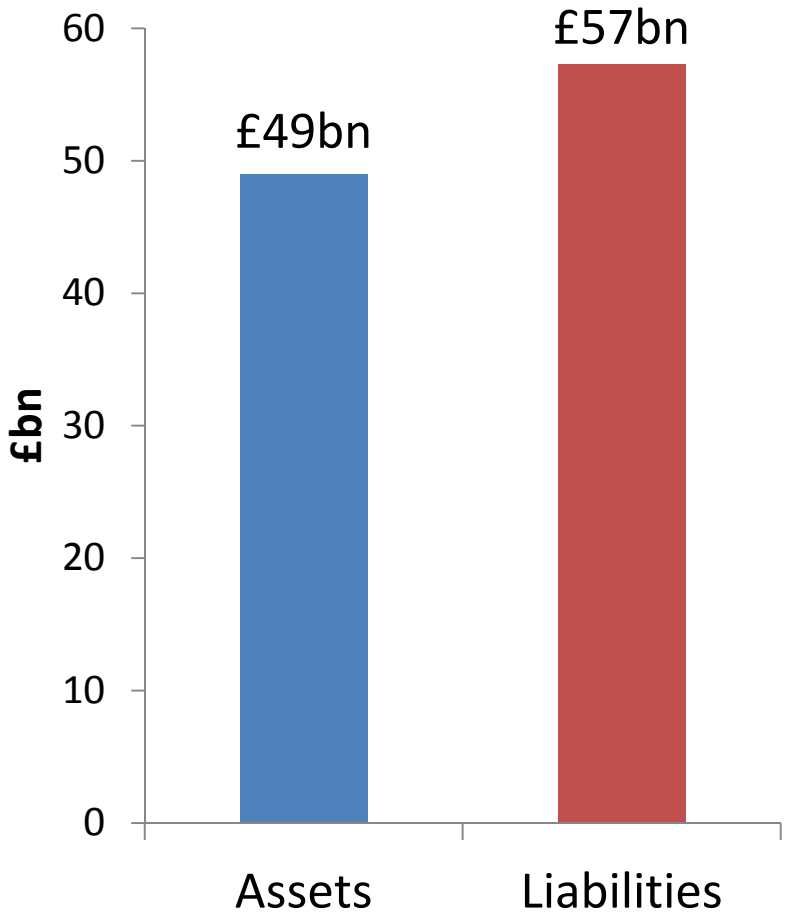
Agenda

- **USS background and profile**
- Mortality tables for actuarial valuations
- USS mortality experience
- Conclusions

USS is a defined benefit pension plan for the UK higher education sector

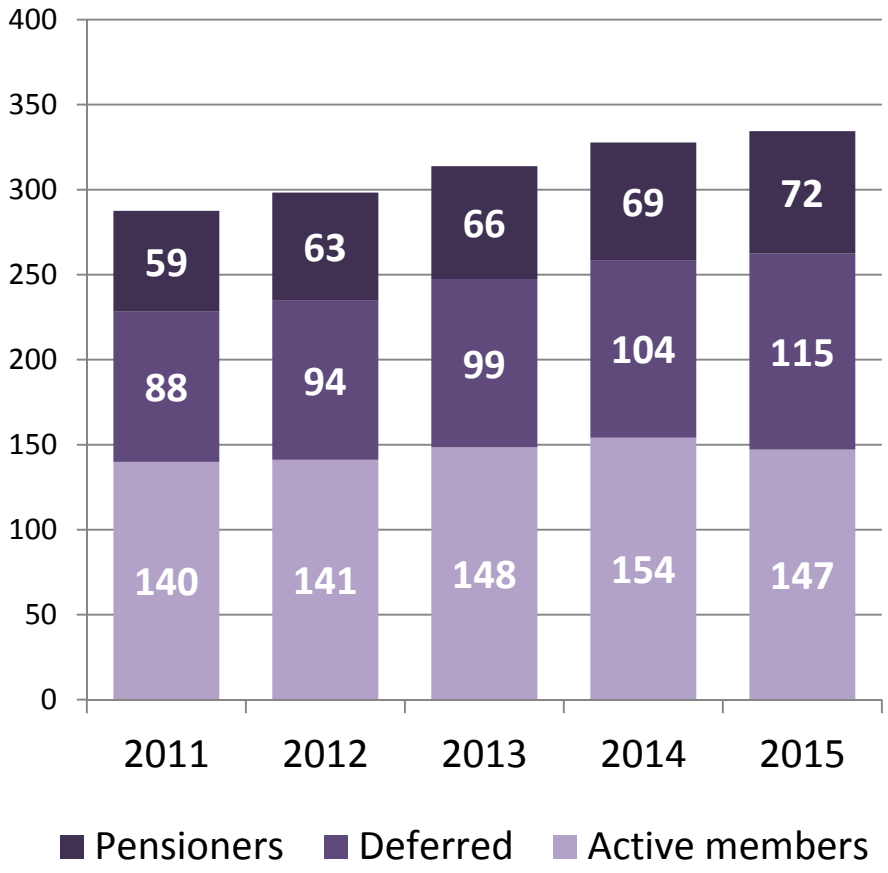
- Multiemployer plan
  - Mutual liability
  - Last man standing
  - 364 sponsoring employers[1)]
- Single benefit structure
- Key characteristics:[1)]
  - Assets: £49bn
  - Liabilities: £57bn[2)]
  - Members: 334,440[3)]



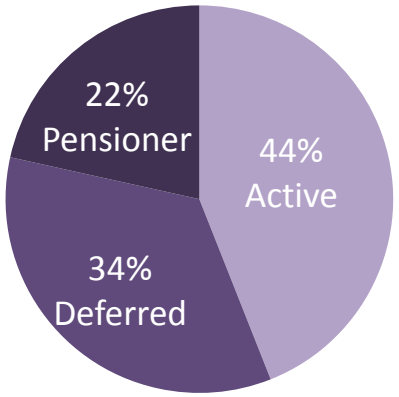
[1)] 31 March 2015 (Annual Report)
[2)] Technical Provisions basis
[3)] Number of spouses and dependents currently receiving a pension (included in above) is 11,661, of which 968 are children

The plan is open with a growing membership

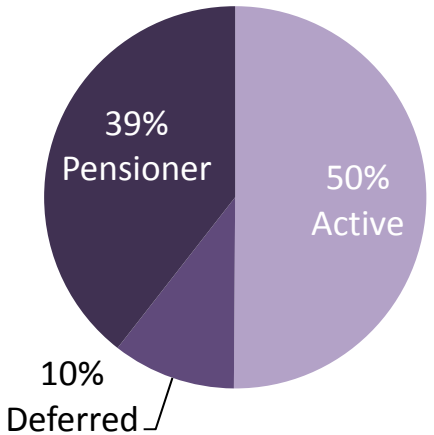
Evolution of membership 2011-15 ('000) [1)]



Composition by member numbers



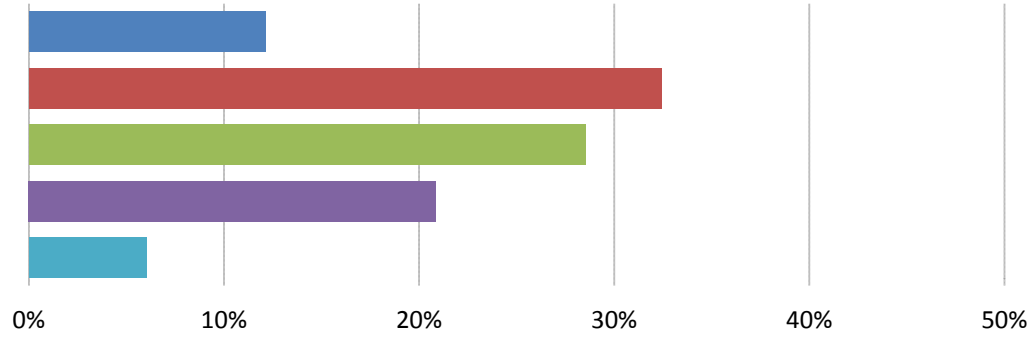
Composition by liability



[1)] 31 March 2015 (Annual Report). Current spouse and dependent beneficiaries are included within "pensioners"

Age profile of USS members[1)]

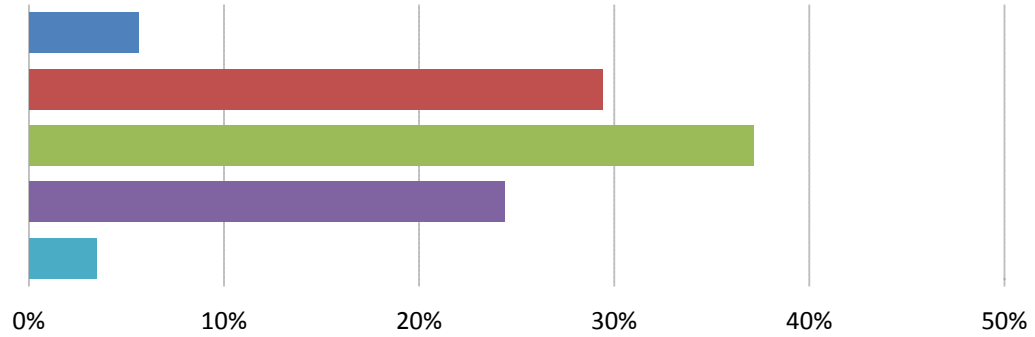
Actives	
30 & Under	12.1%
31 - 40	32.4%
41 – 50	28.5%
51 – 60	20.9%
61 & Over	6.0%



Average age

44 years

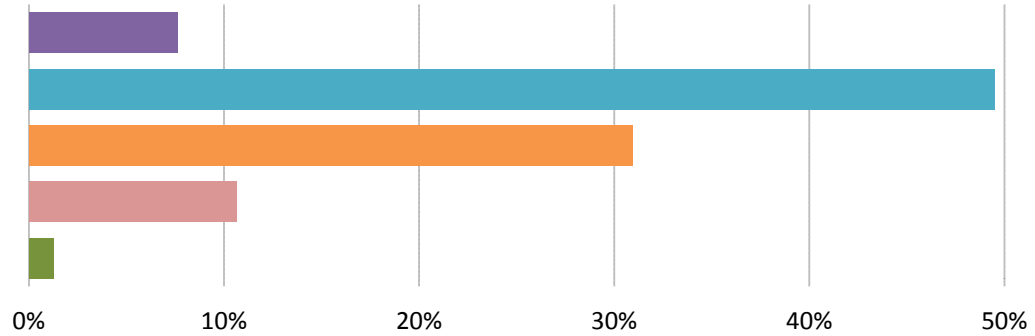
Deferreds	
30 & Under	5.6%
31 - 40	29.4%
41 – 50	37.1%
51 – 60	24.4%
61 & Over	3.5%



Average age

45 years

Pensioners	
60 & Under	7.6%
61 – 70	49.5%
71 – 80	31.0%
81 – 90	10.7%
91 & Over	1.3%



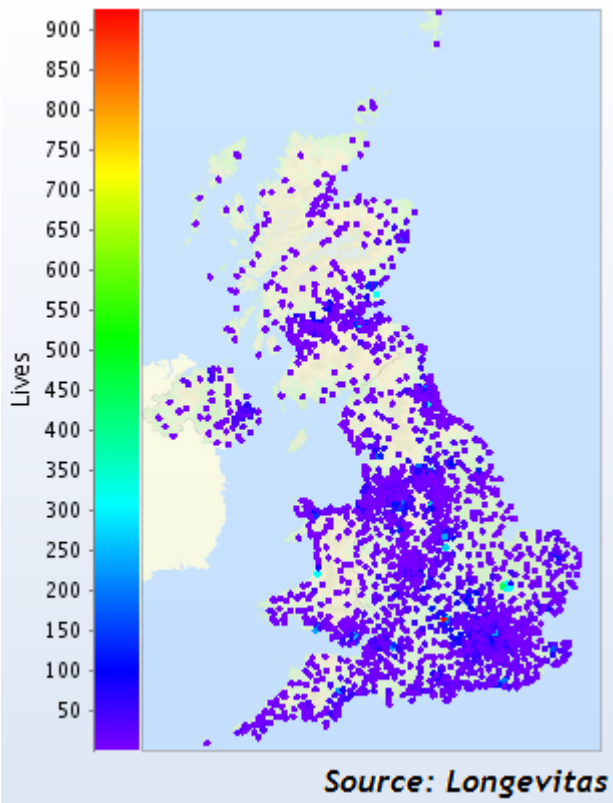
Average age

71 years

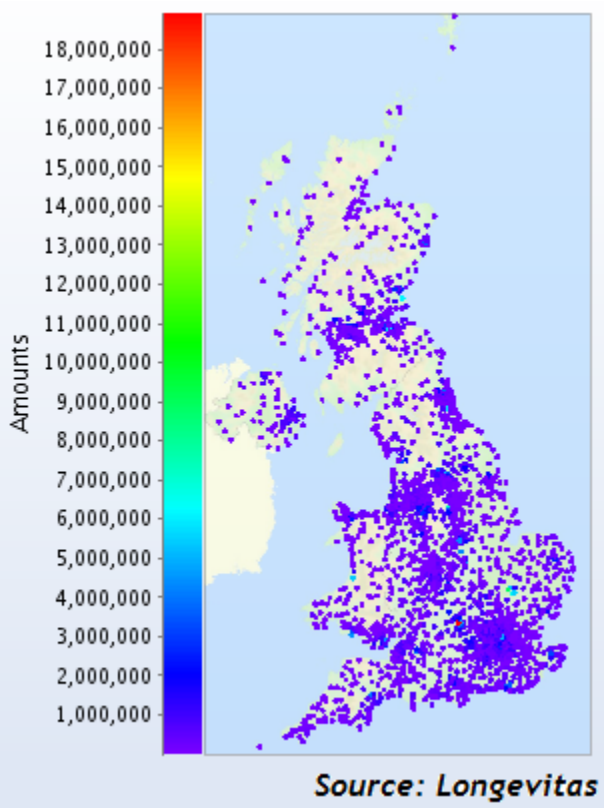
[1)] 31 March 2015 (Annual Report)

Membership of the pension plan is geographically diverse (with some concentrations)…

Lives[1)]



Pension amounts[1)]



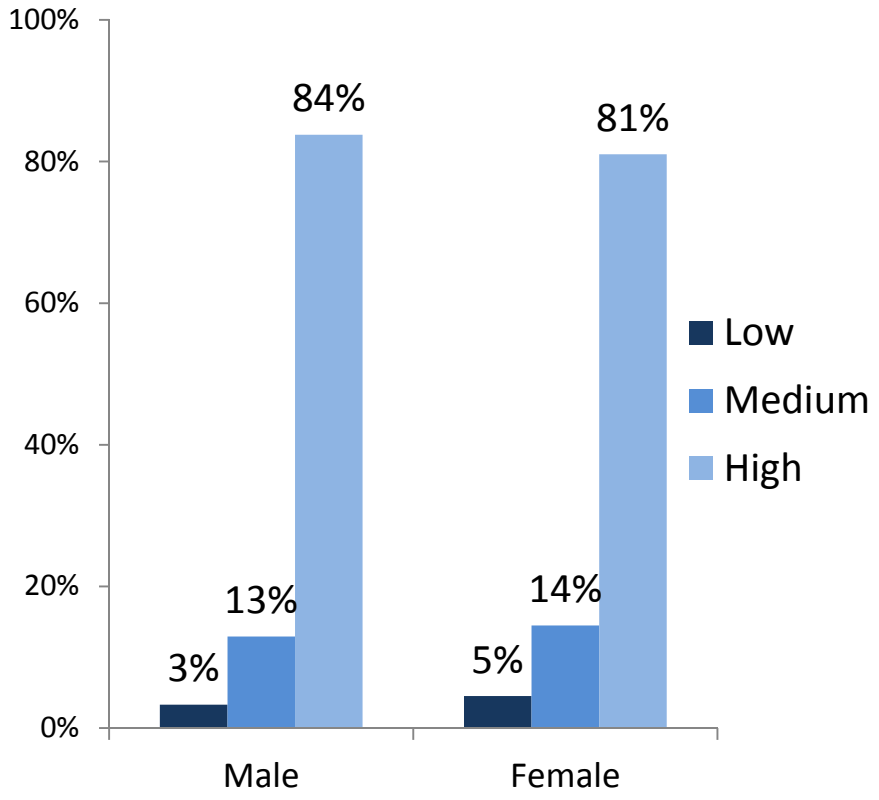
[1)] Based on longevity analysis for the 2011 valuation, using data from 2005-10

...but relatively homogeneous in many ways

Factors

- Common industry
- Similar occupation
- Differences in socio-economic class (or lifestyle) are relatively small

Socio-economic grouping of pensioners [1)]



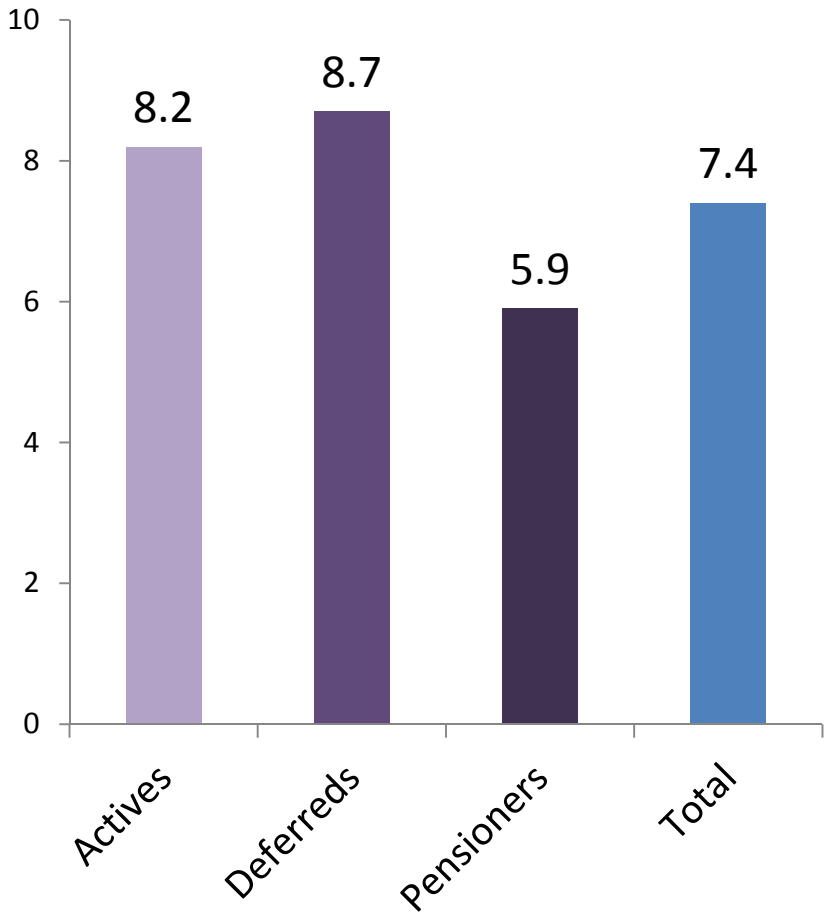
[1)] Source: Mercer. Based on longevity analysis for the 2011 valuation

Mortality impact on the pension liability is measured using *"q-duration"*

- **Mortality "q-duration"[1]:**
  The percentage increase in the value of a pension liability if mortality improvements are higher than expected by 1% per year compounded

- Measure of **longevity trend risk**

q-duration of USS [2]



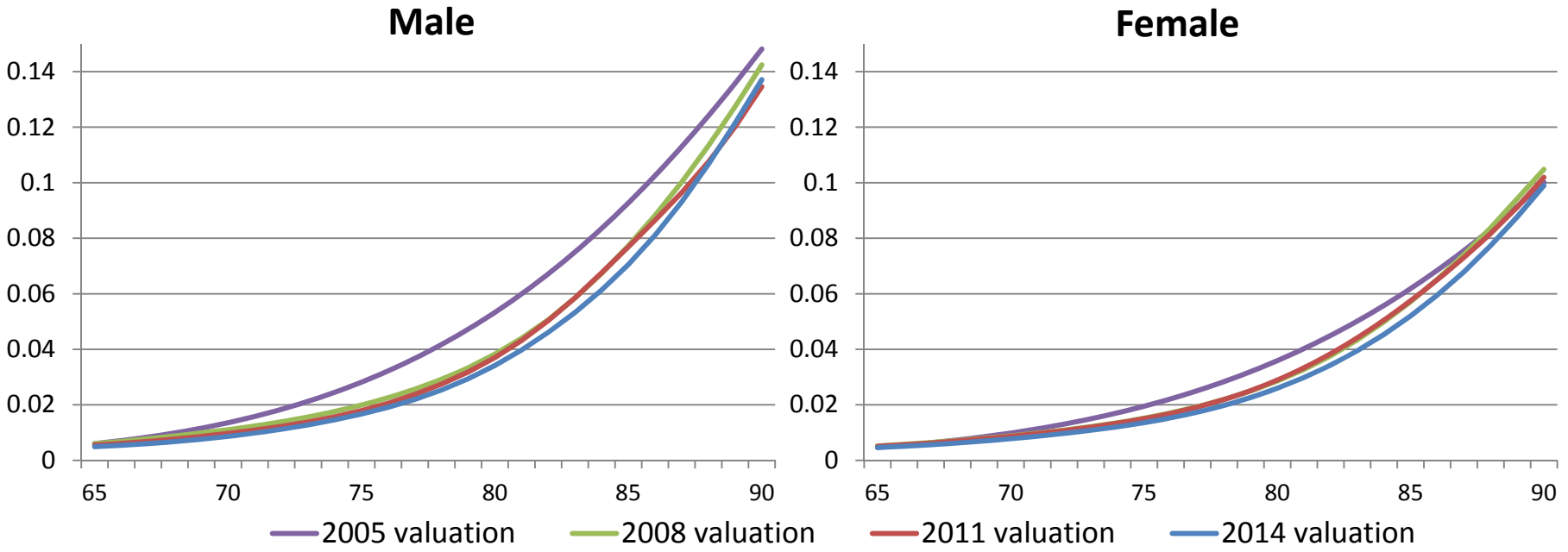
[1] Source: Coughlan et al. (2008) Asia-Pacific Journal of Risk and Insurance 3 (1): 65-88.
[2] Source: Mercer. Based on 2014 valuation data.

Agenda

- USS background and profile
- **Mortality tables for actuarial valuations**
- USS mortality experience
- Conclusions

Historical mortality tables imply a 12% increase in age-65 male life expectancy over 9 years

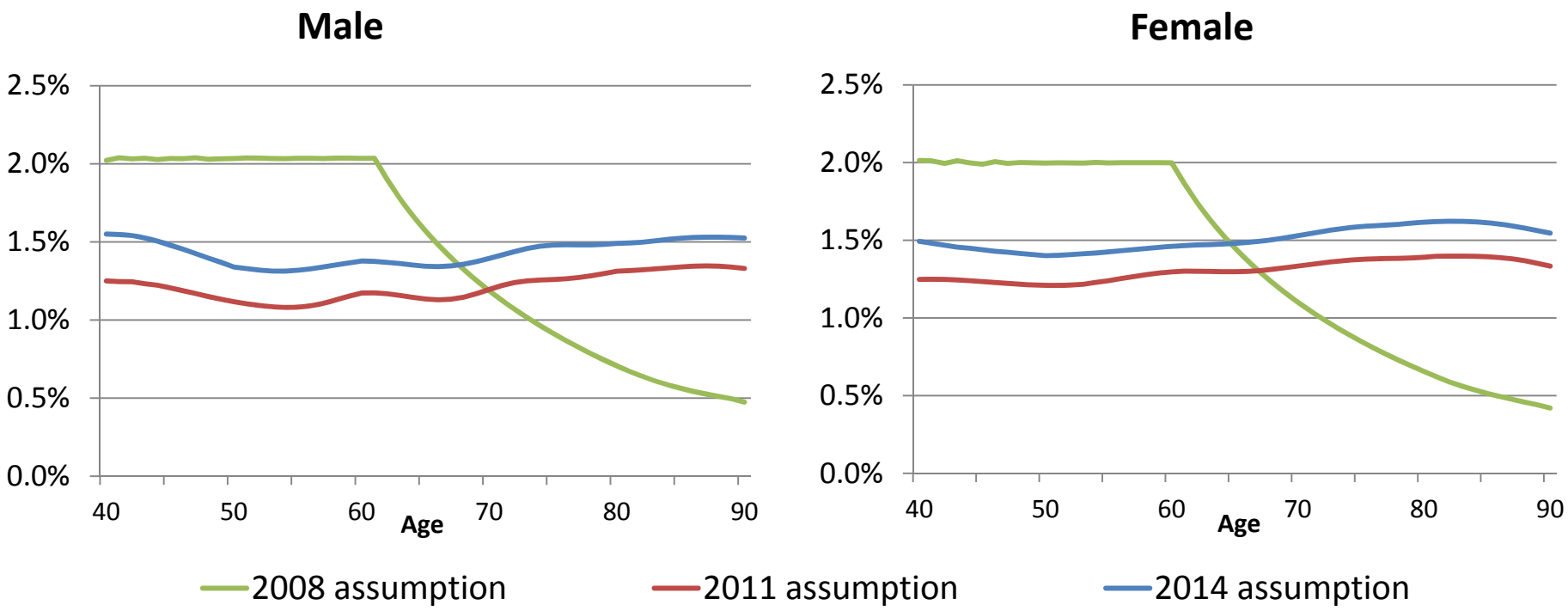
Base mortality assumptions (q_x)



Period (curtate) life expectancy at 65 (LE_{65})		Male	Female
2005	PA92 C=2020	19.3	22.3
2008	PA92 YOB (-1 rating for males)	20.8	23.0
2011	S1NA "Light" YOB (-1 females)	21.2	23.0
2014	(98% m / 99% f) S1NA "Light" YOB (-1 females)	21.6	23.5

Assumed mortality improvements: Continued future reductions in mortality rates even at high ages

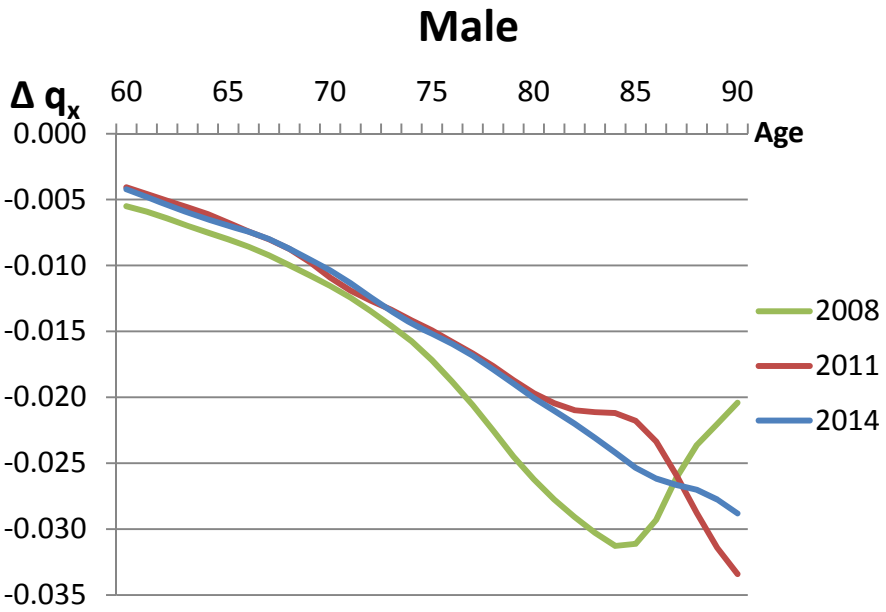
Average improvement assumption over 50 year period from 2014 (% pa)

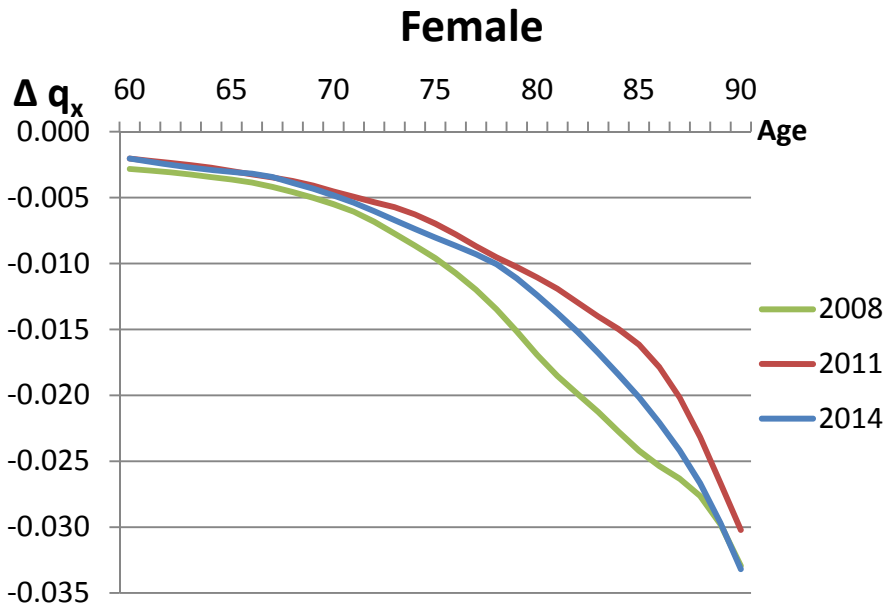


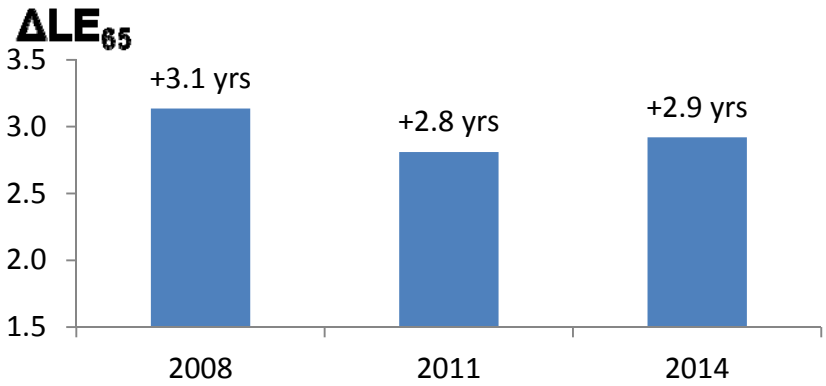
- 2008 assumption: Medium Cohort improvements
- 2011 assumption: CMI 2009 improvements with long term rate of 1.25% p.a.
- 2014 assumption: CMI 2014 improvements with long term rate of 1.5% p.a.

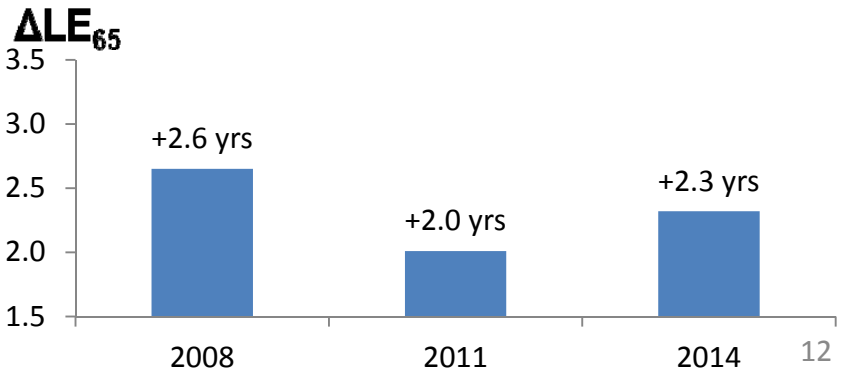
Academics live longer!

Difference in q_x and LE: USS base mortality table – National population mortality



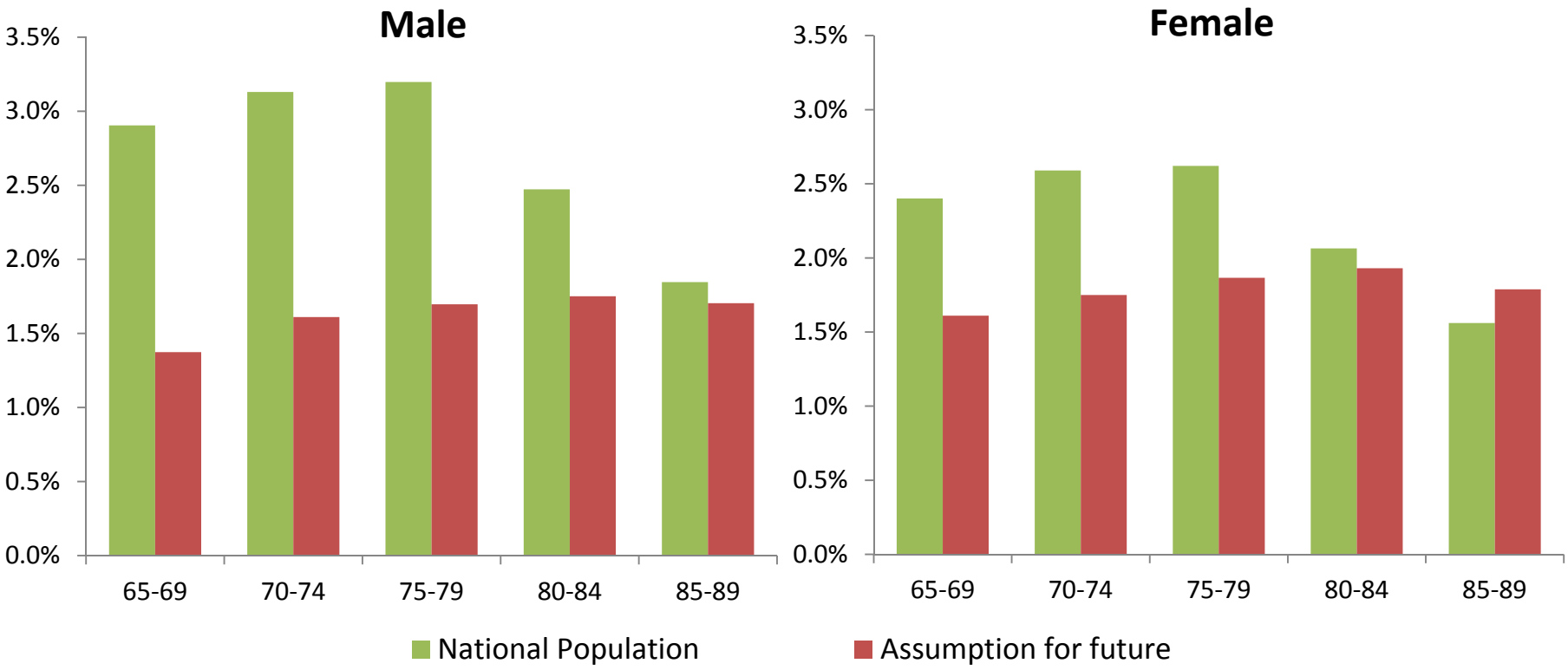






Current (2014) assumption for future mortality improvements vs National population (2001-14)

Mortality improvements: Assumption vs National population (% pa)



- Assumed improvements over next 15 years significantly lower than observed, except at higher ages.
- This reflects expected reversion to long term historical levels due to factors such as the stabilisation of factors impacting mortality, e.g., smoking, increase in medical costs, etc.

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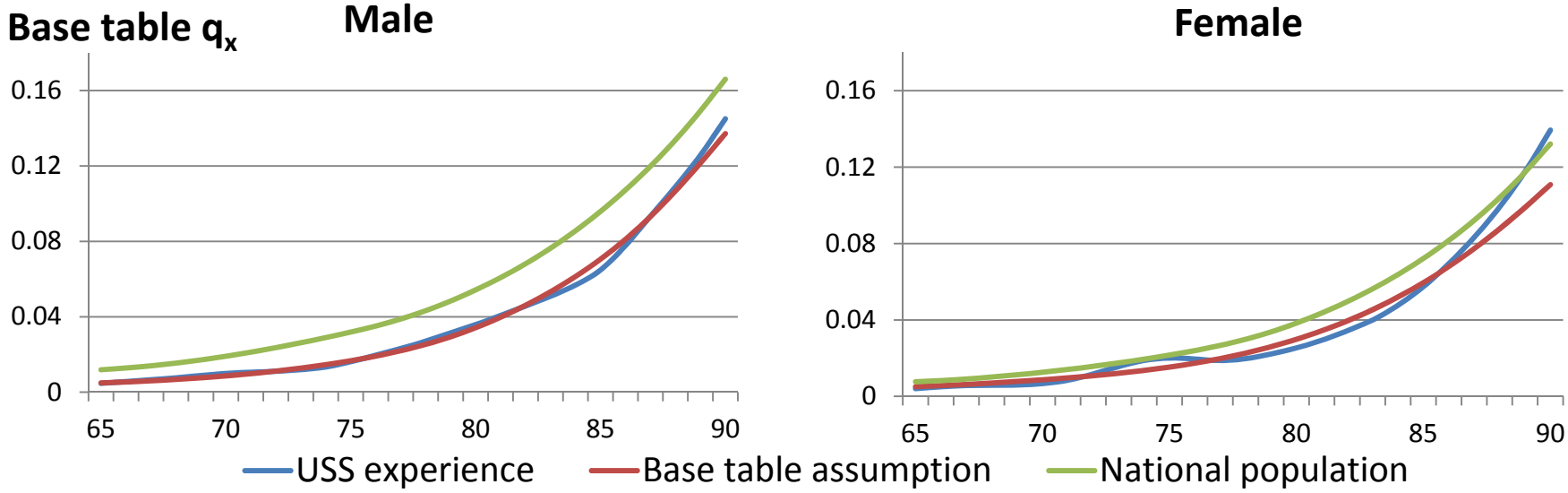
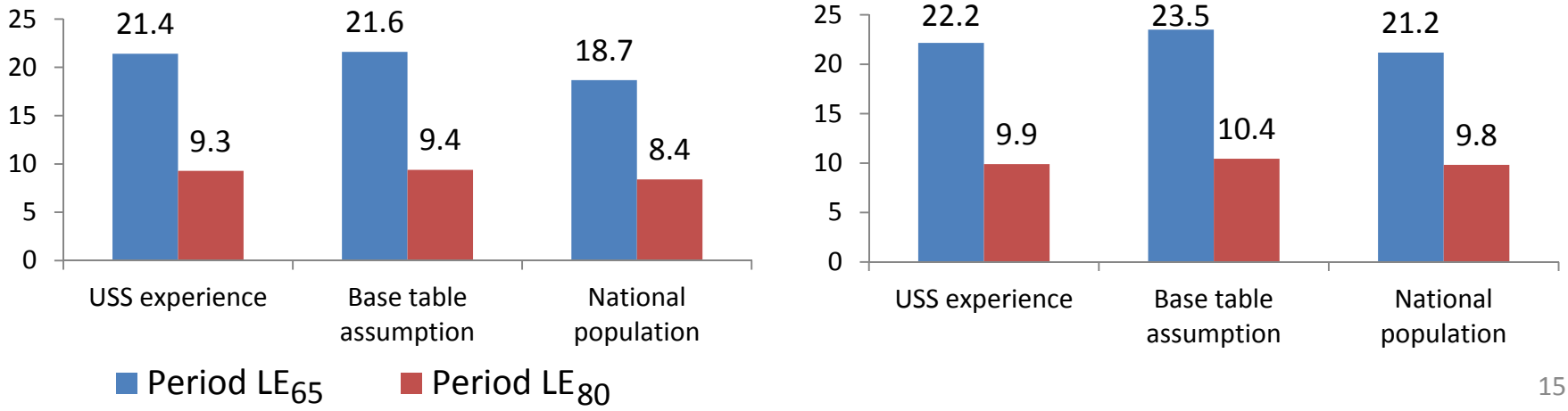
How does the latest USS experience compare?

Latest experience for the 2014/15 reporting year

Base table q_x

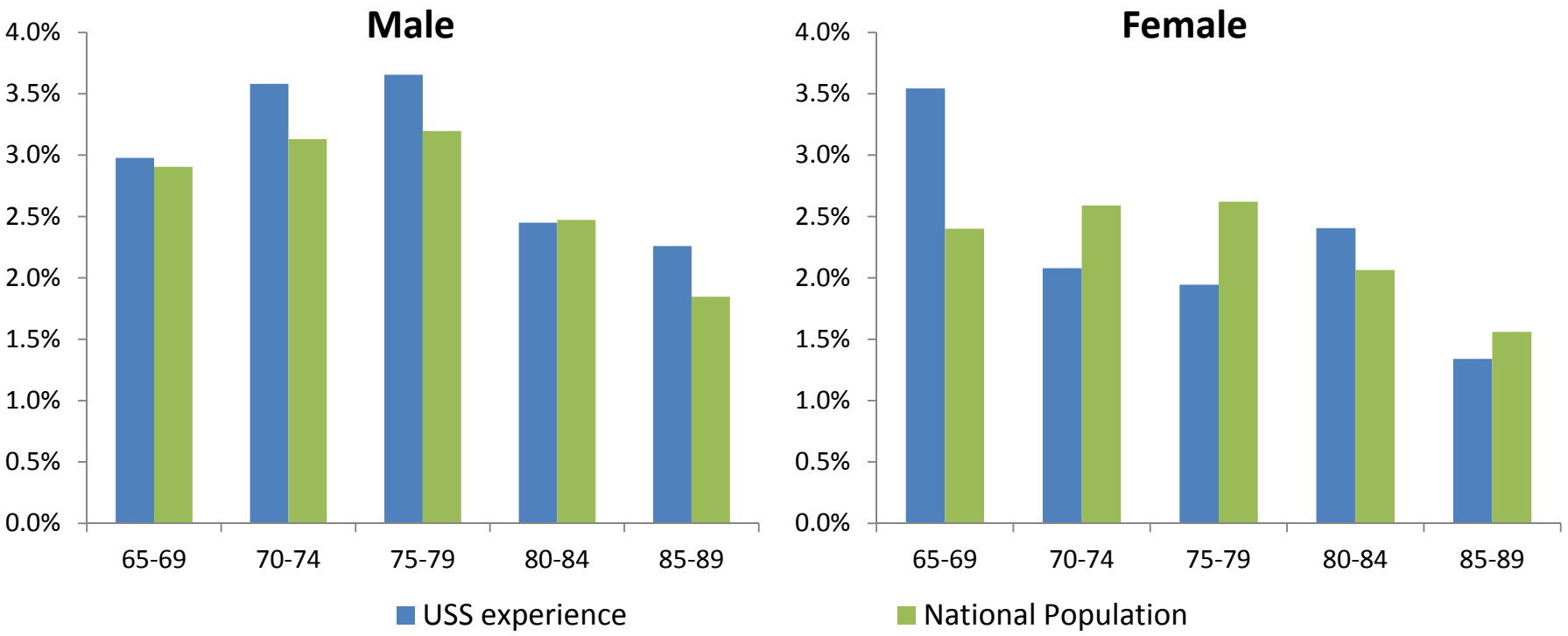


Period LE



Comparing realised USS improvements 2001-15 vs National population

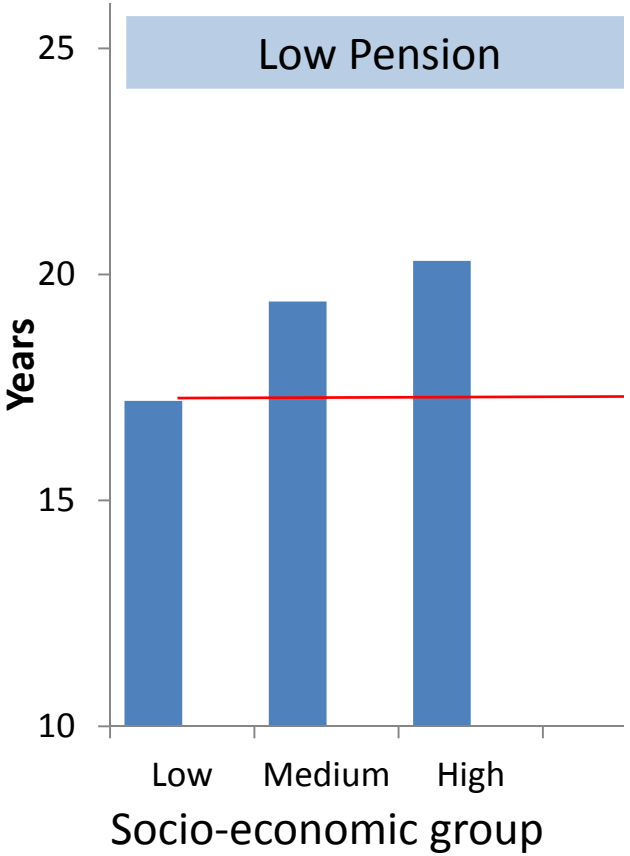
Annualised improvements: USS 2001-15 experience (based on 2001-08 vs. 2008-15)



- Male pensioner mortality improvements slightly higher than national population
- Female pensioner mortality improvements more variable

Two key drivers of USS life expectancy are socio-economic status and pension amount

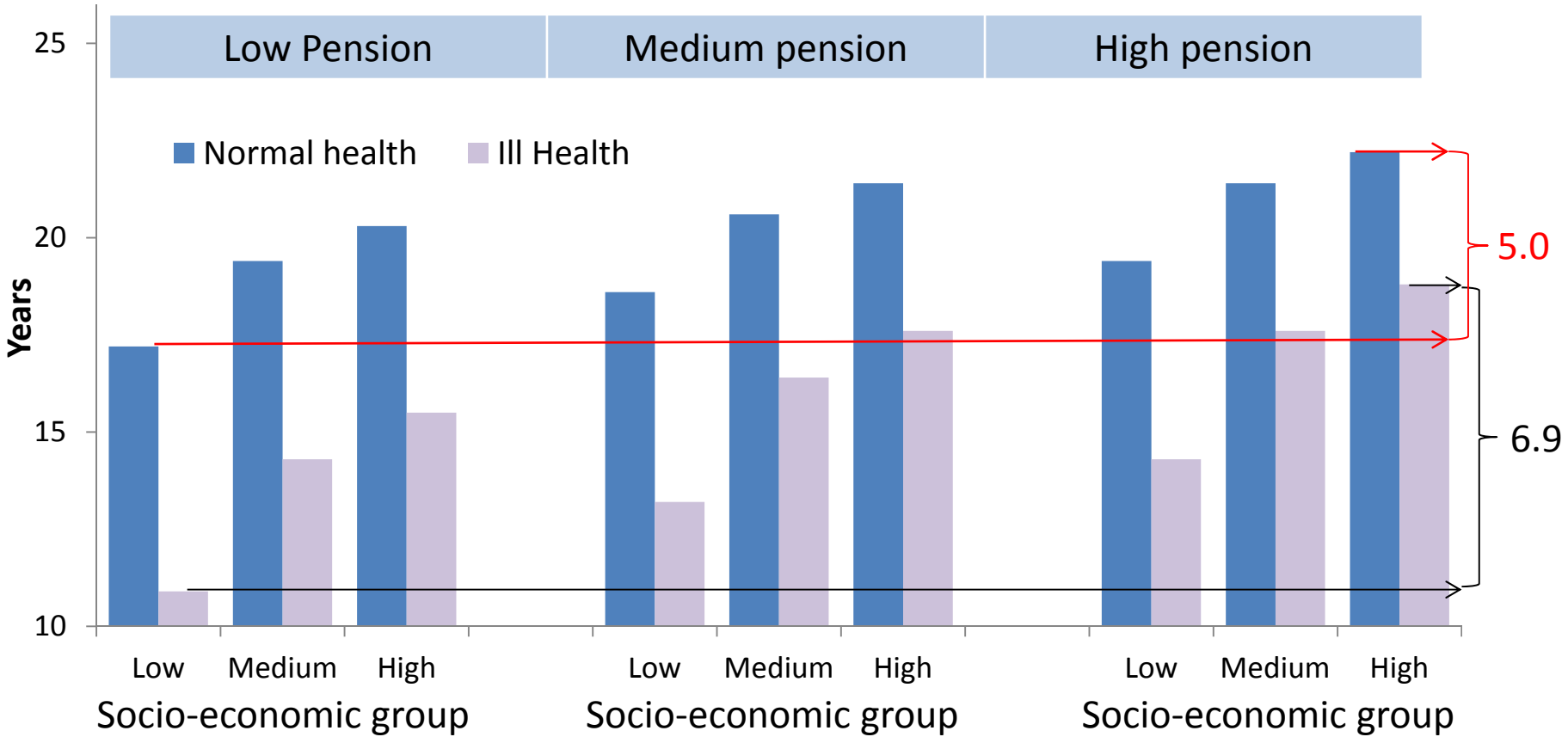
Male life expectancy from age 65[1)]



[1)] Source: Mercer. Based on 2011 valuation longevity analysis

For ill-health retirees life expectancy is much lower with much greater variation

Male life expectancy from age 65[1)]

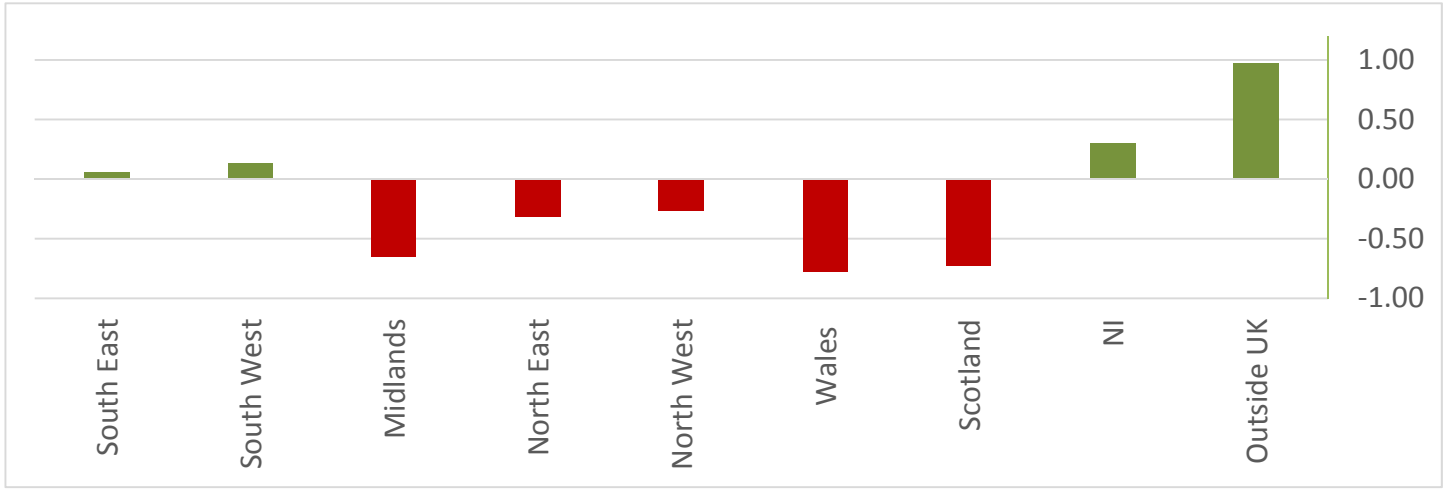


[1)] Source: Mercer. Based on 2011 valuation longevity analysis

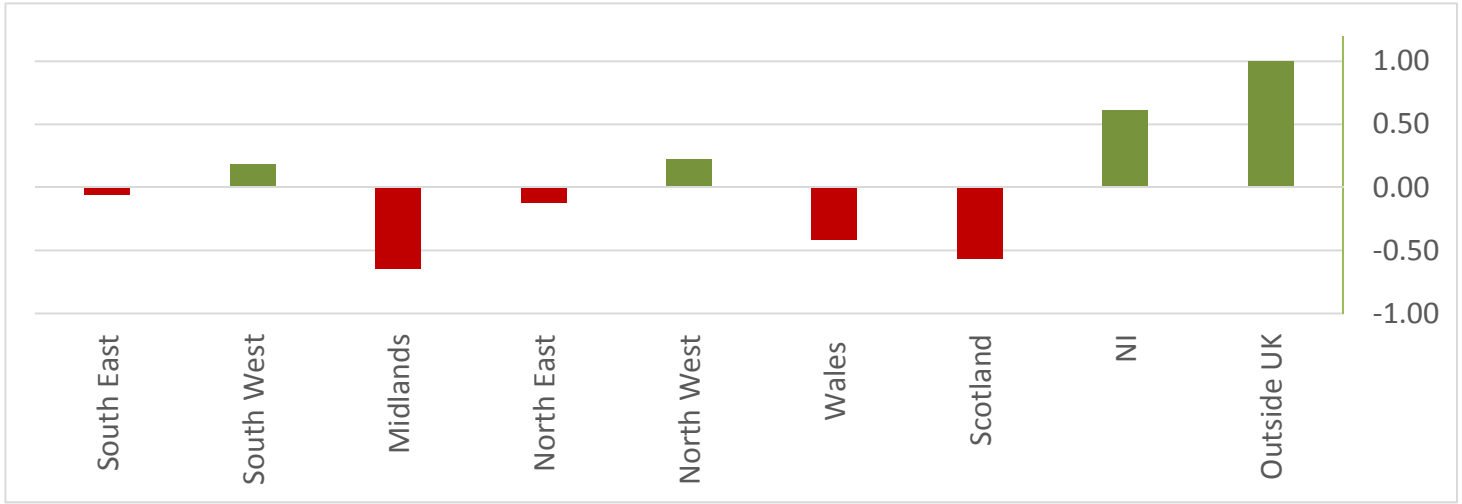
Breakdown by geography over 2001-2015

Difference in life expectancy for total membership (males + females)

Δ LE_{65}



Δ LE_{80}

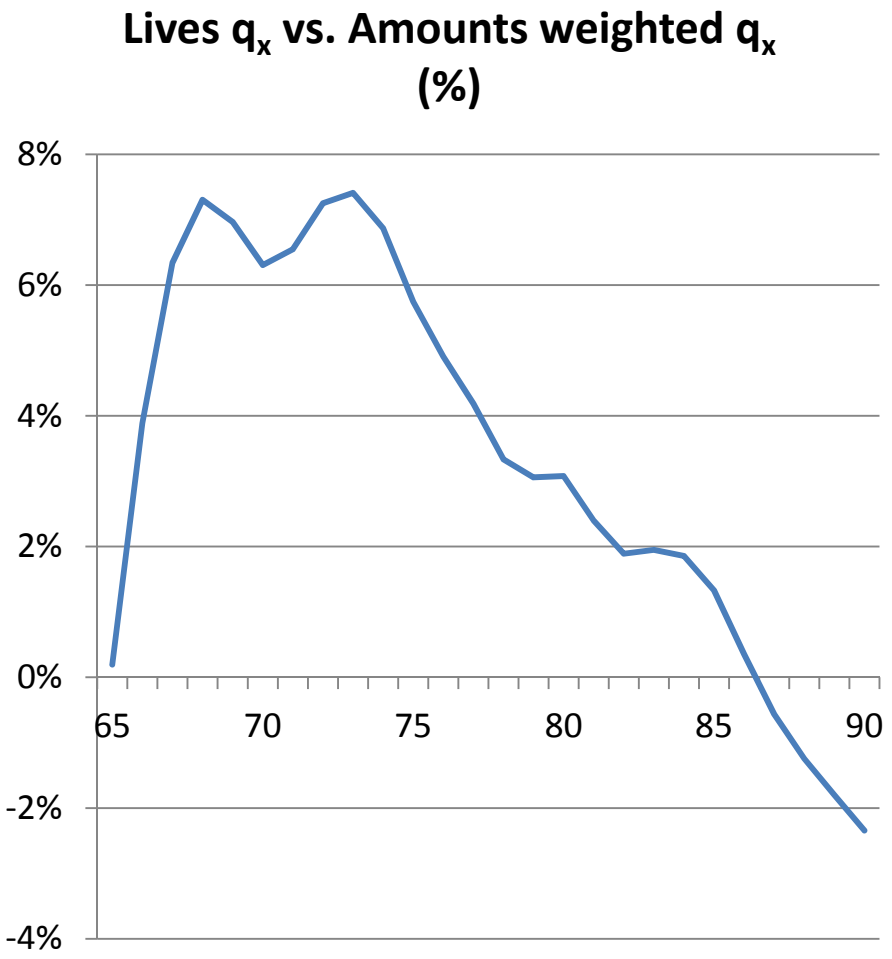


Lives vs pension amounts: It does make a difference

Life expectancy [1] (unisex)	LE_{65}
Using lives	20.8
Weighted by pension amounts	21.0

- Amounts are more relevant to pension liabilities
- Mortality rates over 2001-2015 have been similar but are slightly higher when weighted by lives
  - Members with higher pensions live longer, but this reverses at higher ages

Relative difference in mortality rates[1]



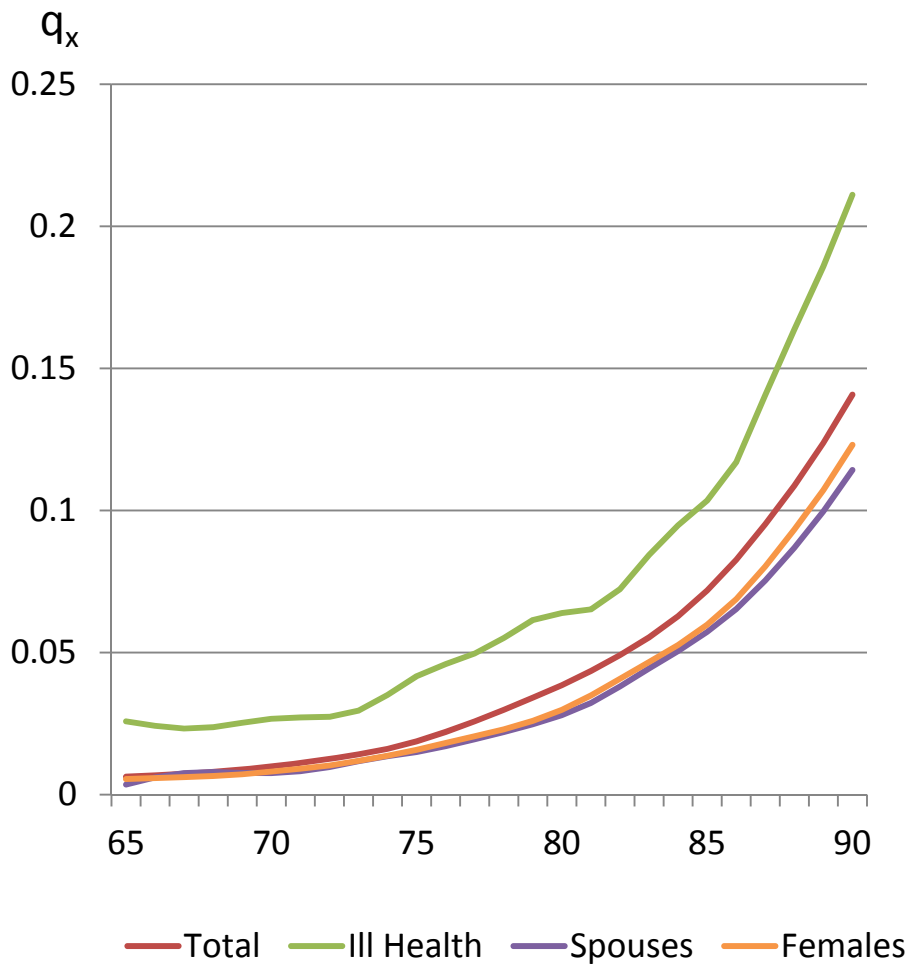
[1] Based on 2001-2015 data

Variations across different sub-populations are small, except for ill-health retirees

Life expectancy[1)]	LE_{65}	LE_{80}
Total	21.0	9.1
Females only	22.2	10.0
Spouses only	22.6	10.3
Ill health retirees	16.2	7.2

- Spouses (majority female) have longer life expectancy than average for females
- Ill health retirees have much higher rates of mortality at all ages (no convergence)

Sub-group mortality rates[1)]



[1)] Based on 2001-2015 data

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Take aways

- Academics do live longer
  - Mortality rates are lower than the national population
  - Mortality improvements have been slightly higher than the national population
- Demographic profile of academics is:
  - Geographically diverse
  - Concentrated in higher socio-economic groups
- Variations in life expectancy within the membership are relatively modest
  - Except for ill-health retirements