

# Longevity trends

Does one size fit all?

June 2017

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The PLSA would like to thank Club Vita, and in particular Steve Hood, Steven Baxter and Conor O'Reilly for their time, insight and commitment to this project. We would also like to thank our all of our members who provided essential data and background to this research project.

The PLSA would also like to thank the members of the project steering group including:

- Huw Evans, BESTrustees (Chair of steering group)
- David Curtis, Law Debenture
- Khurram Khan, Pension Insurance Corporation
- Jackie Wells, Independent Consultant
- Andy Young OBE, The Pensions Regulator

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The Pensions and Lifetime Savings Association (PLSA) and Club Vita LLP (CV LLP) have provided to the UK pensions industry both an understanding of how differently longevity has been improving for different groups of defined benefit (DB) pensioners (such as those at different ends of the deprivation spectrum) and materials that pension schemes, and their advisors, can use in practice to better inform the assumptions that are adopted for longevity trends (together, the “Research”). The Research is based upon the PLSA and CV LLP’s understanding of legislation and events as at May 2017 and therefore may be subject to change. The Research is the PLSA and CV LLP’s understanding of how longevity has been improving for different groups of DB pensioners and is not, nor is it intended to be, specific to the circumstances of any particular pension scheme.

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### **Pension Scheme trustee or sponsor and want to know more?**

*We recommend that you speak with your appointed longevity consultant and/or other professional advisers should you have any queries in relation to applying the research findings within your scheme.*

*Alternatively please contact Joe Dabrowski, Head of Governance & Investment of the PLSA at [joe.dabrowski@plsa.co.uk](mailto:joe.dabrowski@plsa.co.uk) or Steven Baxter of Club Vita LLP at [steven.baxter@clubvita.co.uk](mailto:steven.baxter@clubvita.co.uk), who will be pleased to discuss any of the issues highlighted by this research in greater detail.*

### **Media enquiries**

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# Executive foreword

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There has been much debate in the pensions press over the outlook for longevity. Trustees of Defined Benefit (DB) pension schemes are faced with tough decisions to make. At a national level four out of the last five years have bucked the prevailing trend for strong improvements. Standard actuarial projections have down-rated the outlook for future longevity in response to this; and questions have been raised whether DB schemes should be funding for future, uncertain, increases in longevity.

The reason for the recent slowdown remains unclear – it could be due to a variety of factors including lifestyle, effectiveness of the flu jab and changes to health and social care. Consequently many schemes are reluctant to down-rate their funding needs, especially where they are bound by a regulatory duty to ensure they are funded using prudent principles.

To help schemes understand these recent trends, Club Vita and the Pensions and Lifetime Savings Association (PLSA) are launching a second longevity report – entitled – Does one size fit all?

Based upon analysis of 2.5 million pensioners drawn from over 200 pension schemes we are able to illustrate how recent trends have affected different groups; dividing members into three groups for men (Hard-Pressed, Making-Do and Comfortable) and two for women (Hard-Pressed and Making-Do/Comfortable) based on DB pension income and postcode.

Our latest report shows that the recent slowdown is being mirrored in DB pension schemes – but only amongst the lower income pensioners (our 'Hard-Pressed' and 'Making-Do' groups). These pensioners have seen little, if any, increases in longevity since 2011.

But the majority of DB pension schemes the liabilities are concentrated amongst the more affluent men. Often, over half of the liabilities of a pension scheme will be in this 'Comfortable' group. This group appear to have been resilient to the events of recent years. Their life expectancy has been increasing at a steady pace

throughout the last fifteen years; equivalent to 8 weeks of extra life expectancy, each and every year.

For schemes entering funding debates this information is important. This will provide a more nuanced evidence base than general data or generic data models and so help better decision making and scheme management. It enables them to react to recent trends in a way which is appropriate to their circumstances.

For example, schemes whose liabilities are dominated by lower income pensioners may find that the recent slowdown applies to them, but the majority of schemes may see a more familiar picture of steadily rising longevity. Gone perhaps is the day of 'one size fits all' for longevity projections.

As a broad guide, schemes using the previously published PLSA longevity trends model, or older versions of the CMI (Continuous Mortality Investigation – 2014 or earlier) projections will find that moving to the latest edition of the PLSA longevity trends model reduces liabilities. However, for those using the latest version of the CMI projections (2016) moving to the latest edition of the PLSA longevity trends model will find it increases liabilities.

Of course schemes also have to take a view on the outlook for longevity many decades into the future. This requires taking a more subjective view on what future trends might emerge, and being aware of the sensitivity of key strategic funding decisions to alternative views. To help trustees understand these sensitivities our report includes a selection of scenarios based on real world 'what-ifs'.

We hope that this report helps all those involved with DB pension schemes base their longevity assumptions on a better understanding of emerging longevity trends.



**Graham Vidler**  
Director of External Affairs

# I. Introduction

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Recent months have seen considerable debate on the outlook for future longevity improvements. Some commentators have even challenged whether pension scheme trustees should be making any allowance for future improvements when assessing the funding requirements for their pension obligations. Certainly the last couple of years have seen a greater number of older people dying than anticipated.

At the national level, life expectancy has barely risen since 2012, but this hides a much subtler pattern across socio-economic groups. With most pension schemes having a disproportionate amount of liabilities concentrated in a small number of higher net worth individuals, understanding the socio-economic dynamics of longevity trends has never been more important.

## The PLSA longevity trends model

The publication of the PLSA longevity trends model in 2014 was a key moment for pension schemes seeking to understand how longevity was changing for their members. For the first time schemes had access to credible information that longevity had changed differently for different groups of defined benefit (DB) pension scheme members. Drawing upon data from Club Vita (see Appendix A) we explored longevity trends for three different socio-economic groups – our Comfortable, Making-Do and Hard-Pressed pensioners.

Broadly speaking the **Comfortable** are the more affluent pensioners (with DB income in excess of £7,500 p.a.). Those living in areas of high deprivation are the **Hard-Pressed** whilst those living in areas of lower deprivation **Making-Do**.

Between 2000 and 2010, 'Comfortable' men saw a **slower increase** in life expectancy than the average DB pensioner, whilst the 'Hard-Pressed' group saw a **faster increase**. For women, while only two member groups could be formed, the same effect was observed.

Whilst we did not seek to explore the reasons behind these findings, we noted that the key drivers could include the delayed reductions in smoking rates amongst shorter-lived pensioners and efforts, sponsored by previous governments, to reduce social inequality. Our original report was very well received by PLSA members and the wider pensions industry.

In this report we explore what has happened to these groups since 2010. For example, have each of the groups experienced the recent slow-down or have some groups been more resilient? We also provide further insights into the individuals in each group – looking at the lifestyle and health of the 'typical' person in each group.

## Projecting future longevity

Pensions planning – be it the funding of DB pension schemes or determining the level of pension pot an individual needs to accumulate within a defined contribution (DC) arrangement – requires the projection of how long we anticipate individuals will live for.

Our 2017 longevity trends model calibrates projections of longevity to each of the socio-economic groups (VitaSegments – see Sections 3–5) developed by Club Vita. These projections use an industry standard model and are described in detail in Section 6. Alongside this ‘base projection’ for each group we also publish eight illustrative scenarios (Section 7).

The purpose of these scenarios is not to test our powers of prediction, but rather to provide schemes with a means to understand the uncertainty in predicting longevity and thus:

- provide context for ‘prudence’ in setting funding assumptions; and
- explore the funding and cashflow outcomes if longevity changed differently to that predicted. For example, what would happen if life expectancies were to keep increasing like they had done in the early 2000s, or, rather than increasing, reduced to levels seen a number of decades ago?

The hope is that schemes will be able to use the information provided in this report to have constructive and engaging discussions on longevity with their advisors. To support this we provide two case studies on how schemes have been using this information in practice (Section 8).

## Socio-economic groups

We use three socio-economic groups for men and two for women.



The groups for men are based upon a combination of pension amount and the deprivation of the area in which they live.

VITASEGMENTS		Deprivation of the area				
		High deprivation		Low deprivation		
Pension	< £5k p.a.	Hard-Pressed	Hard-Pressed	Making-Do	Making-Do	Making-Do
	£5k - £7.5k p.a.	Hard-Pressed	Hard-Pressed	Making-Do	Making-Do	Comfortable
	>£7.5k p.a.	Hard-Pressed	Comfortable	Comfortable	Comfortable	Comfortable

■ Hard-Pressed    ■ Making-Do    ■ Comfortable



For women pension income is (currently) less predictive of differences in longevity groups leading to two socio-economic groups based upon the deprivation of where they live.

VITASEGMENTS		Deprivation of the area				
		High deprivation		Low deprivation		
		Hard-Pressed	Hard-Pressed	Making-Do/Comfortable	Making-Do/Comfortable	Making-Do/Comfortable

■ Hard-Pressed    ■ Making-Do/Comfortable

More information on the formation of these groups is provided in Section 3

1. For those familiar with the nuances of life expectancy statistics we use period life expectancies throughout i.e. based upon the observed numbers dying at each age. These do not allow for future changes and so how long someone may ultimately live for.

## 2. Recent longevity trends

The last few years have been described by many commentators as a ‘fascinating period for longevity’. At the national level four out of the last five years have bucked the prevailing trend for strong improvements, leading to considerable debate as to whether we have entered a new era of sustained lower improvements, or whether we have simply had a few bad years come along together.

Much of the variation we see from one year to the next arises from seasonal mortality – how harsh the winter is, and the effectiveness of the seasonal flu vaccine. To capture a single winter in each year, the chart below looks at the numbers of deaths (expressed as a weekly average) between the middle of one year and the middle of the next.

A consequence of the shape of birth and death patterns in the UK is that each year there are more older people and the population gets on average a little bit older. All else being equal this would lead to the bars in the chart below rising over time. Yet prior to 2012/13 the deaths had been on a very steady downward trajectory (blue line) and life expectancy had been rising fast. Since then there have been four clear ‘off trend years’.

The first of these was in 2012/13. At the time this was attributed to an extended period of dull and wintry weather, and a harsh cold snap in February and March 2013.

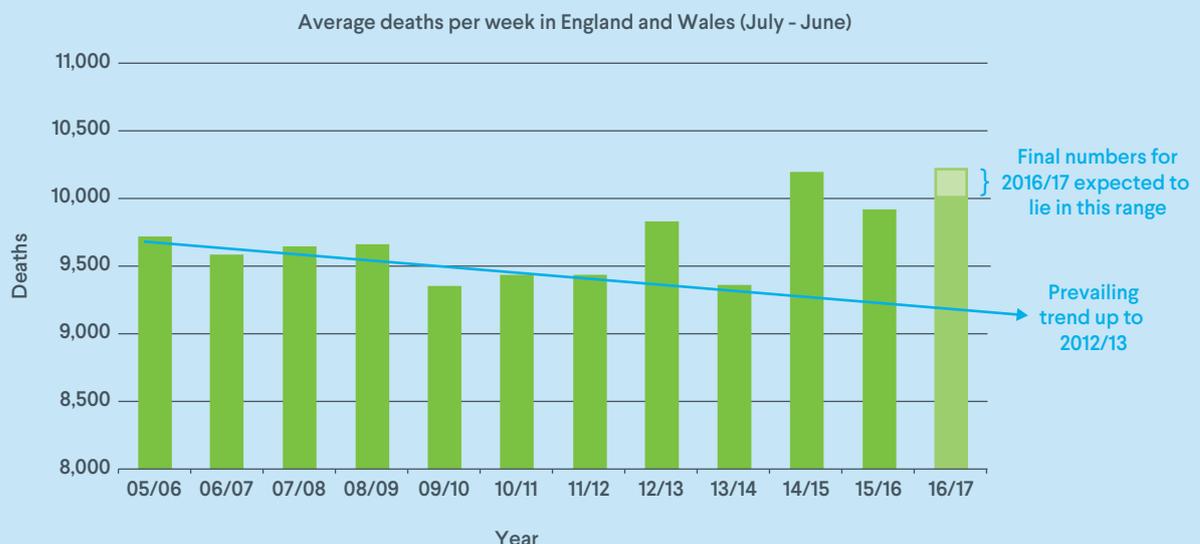
Whilst 2013/14 seemed to be a bounce-back, a further increase in numbers of deaths was observed over 2014/15. This was initially attributed to the winter flu. The flu vaccine provided to vulnerable people (mainly the elderly, pregnant women and young children) offered little protection against the flu strain prevailing in the early months of 2015.

Whilst we can’t be entirely sure of the cause of the 2012/13 and 2014/15 spikes, the indications are that they are related to what could be described as ‘one-off’ external events. Accordingly most commentators cautioned against reading too much in to them when projecting future longevity trends.

However, it is difficult to point to similar one-off reasons for the elevated numbers of deaths observed in 2015/16 and 2016/17. Commentators to date have identified two potential areas that require further investigation:

- Austerity
- Alzheimer’s and dementia

albeit there may be other relevant factors.



Source: Club Vita analysis based upon data from ONS. The final numbers for 2016/2017 will not be known until later in 2017 and so have been estimated based upon observed deaths up to week ending 12 May 2017. The lower part of the bar is the estimated out-turn if deaths for the remaining weeks are based on the lowest we have seen in each corresponding week over the past 10 years. Lighter addition to the top of the bar is based on deaths following the worst experience seen in the last 10 years.

## The austerity dimension

One suggestion is that changes in our approach to health and social care, driven by increasing demand and reduced resources in times of austerity, may be influencing longevity experience.

It is, of course, next to impossible to find evidence of such a direct relationship or establish causality. However, there is an increasing body of circumstantial evidence which it is difficult to ignore, including:

- Analysis by Nuffield Trust and the Health Foundation highlighting how austerity reductions in local authority budgets have led to material spending reductions (in both nominal and real terms) on social, residential and home care, between 2009/10 and 2012/13<sup>2</sup>. This has been against a backdrop of increased demands for services as the population ages. The authors conclude that “It is highly likely that reduced spending on social care for older adults is having a negative effect on the health and wellbeing of users and carers, but poor linkage between health and social care data at a national level means that it is currently difficult to quantify the impact”.
- Research highlighting an association (although not necessary causation) between austerity reductions in Pension Credit and social care spending and recent rises in mortality amongst those aged 85 and older<sup>3</sup>.
- The Kings Fund reporting on how financing pressures have impacted the NHS<sup>4</sup>. This noted how district nursing - which many older people rely on - is one of the areas most acutely impacted.

- Analysis by 2020 Delivery highlighting how the increase in hospitals declaring major incidents in the 2016/17 winter is likely to be more than can be explained by the elevated winter disease burden and liable to be due in some part to a decline in NHS performance<sup>5</sup>.

It remains to be seen how long it will take for any impacts of austerity to be fully felt (to the extent this is yet to be the case) and indeed whether Brexit will lead to further tough economic decisions, or be a stimulus for growth. Indeed recent budgets have already increased spending (in part raised via council tax levies) in response to the pressures being faced by the social care system.

In light of this we explore in Section 7 a scenario where some combination of austerity, Brexit and general economic outlook lead to a period of sustained lower economic growth. This ‘**Low for Longer**’ scenario assumes that longevity improvements will be slow for a number of years.

This is of course not the only possible outlook. For those interested in a scenario which treats the recent slower improvements as more of a ‘blip’ (for example because it turns out to be unrelated to austerity or other factors such as post election economic policy / Brexit offset any austerity effects) we would direct you to the ‘**Health Cascade**’ scenario in Section 7.

“ If austerity measures are influencing recent longevity trends then it would seem likely that different groups of pensioners may be responding differently to these challenges – since some will have greater access to alternative resources to buffer them from changes in the social care system. ”

2. Focus on: social care for older people. Nuffield Trust and the Health Foundation (2014)

3. Austerity and old-age mortality in England: a longitudinal cross-local area analysis 2007-2013. Loopstra et al. Journal of the Royal Society of Medicine (2016)

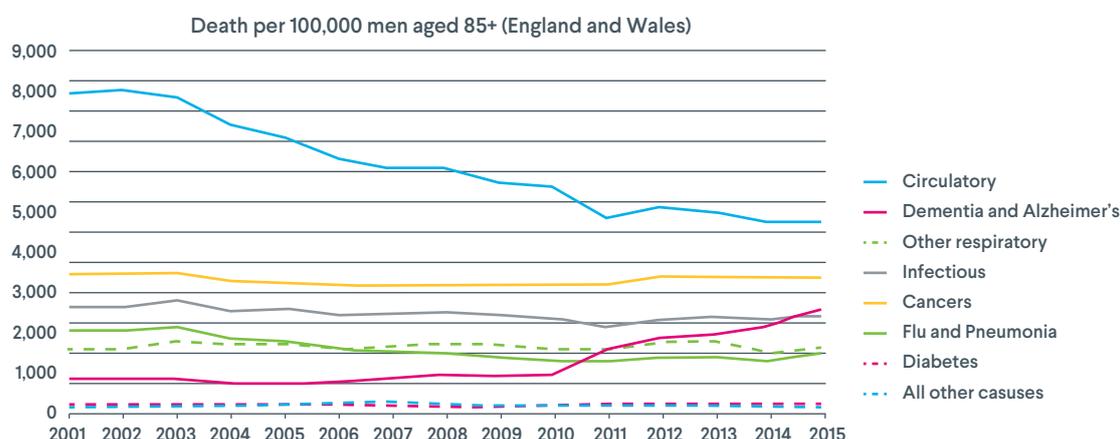
4. Understanding NHS financial pressures – How are they affecting patient care. The Kings Fund (2017)

5. NHS Winter Pressures, Winter Mortality and the “Amplification Effect” of NHS Performance. 2020 Delivery (2017)

## Rise in Alzheimer's and dementia

Life expectancy trends tend to be heavily influenced by what is happening amongst older individuals – particular those aged in their late 70s, 80s and 90s.

Recent years have also seen a noticeable rise in deaths from Alzheimer's and dementia – more than can be simply attributed to an ageing population. This is illustrated in the chart below showing deaths per 100,000 men aged 85 and over in England & Wales, split by cause of death. (A similar picture is seen for men 75 and over and for women.)



Source: Club Vita analysis of ONS and WHO data.

It is noticeable that the rise in Alzheimer's and dementia deaths has happened at the same time as both the slow-down in longevity and austerity. Identifying cause-and-effect is challenging though.

Perhaps the contraction in social care budgets has had a disproportionate impact on Alzheimer's and dementia sufferers? For example dementia is one of the more costly illnesses as a consequence of its social care and healthcare costs<sup>6</sup>.

Or, it may be simply coincidence. For example, changes to coding of causes of death and incentives to both diagnose and recognise dementia as a cause of death will undoubtedly have played a part.

We can notice how circulatory disease drops in the chart in 2011, and dementia and Alzheimer's rises. A major contributor to this was a change in the classification of deaths due to vascular dementia – up to and including 2010 they were classified as circulatory diseases in this chart, from 2011 onwards they were reclassified as dementia deaths<sup>7</sup>.

In 2013/14 incentives were put in place to encourage diagnosis of dementia amongst those with emergency or unplanned hospital care<sup>8</sup>; whilst in September 2014 a £55

incentive was introduced for GPs to diagnose dementia (a scheme which – under criticism – ceased in March 2015)<sup>9</sup>. Most recently, NHS England has specified an ambition to ensure that two-thirds of the estimated number believed to have dementia receive a diagnosis.

If Alzheimer's or dementia are the driving factor then it is natural to ask whether this will be impacting all members of pension schemes alike. The answer to this is not clear. Some research studies<sup>10</sup> have shown that both attaining a higher level of education and affluence result in lower risk of dementia. However, these individuals may have also adopted healthier lifestyles and so have materially reduced risk of death by cardio-vascular disease and cancer<sup>11</sup> i.e. Alzheimer's and dementia may represent a larger part of their total mortality.

In light of Alzheimer's and dementia being a possible driver behind recent trends we have developed an example scenario in Section 7 (Alzheimer's & Dementia Wave). That scenario considers a situation where Alzheimer's and dementia mortality continues to rise, before a material intervention happens which causes these deaths to fall. Of course this is just one scenario and we imagine that schemes may wish to explore alternatives, for example if Alzheimer's and dementia mortality continues to rise.

6. Mental Health in an age of austerity, Knapp, EBMH Notebook

7. See for example Deaths Registered in England and Wales (Series DR); 2013 (ONS, 2014)

8. Provisional analysis of death registrations: 2015, ONS

9. See for example [www.gponline.com/gps-maintain-dementia-diagnosis-levels-following-pay-per-diagnosis-scheme/mental-health/alzheimers-dementia/article/1393623](http://www.gponline.com/gps-maintain-dementia-diagnosis-levels-following-pay-per-diagnosis-scheme/mental-health/alzheimers-dementia/article/1393623)

10. See for example New Insights into the Dementia Epidemic (Larson et al, NEJM)

11. See for example Cancer Research UK

# 3. Grouping pensioners

To explore longevity trends within DB pension schemes we have placed men into one of three distinct longevity trend groups (“VitaSegments”) and women into one of two distinct groups. This follows the same approach as adopted in the 2014 Longevity Trends Model<sup>12</sup>.

For both men and women the groups are based upon two overriding principles:

- Usefulness:** It is essential that the PLSA members are able to readily use the longevity trends model. This means any analysis we do is restricted to data items which all pension schemes can access.
- Insightful:** The groups generated need to provide meaningful insights. This means that they need to be formed of ‘similar’ individuals and demonstrate clear differences in longevity and longevity trends.

## The groups

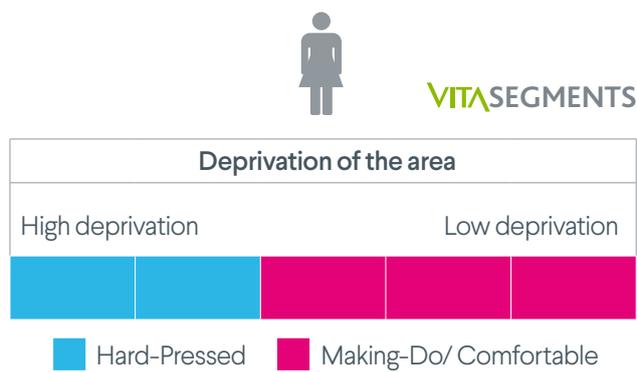
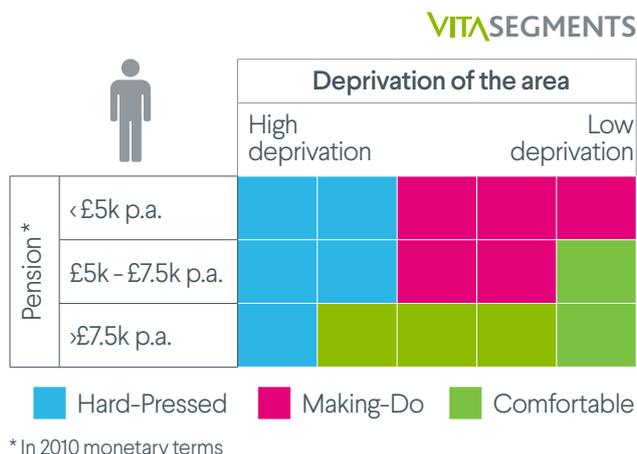
The segmentation for men uses:

- Pension amount:** The last available amount of pension in payment, rebased to a common date of 1st January 2010 to adjust for inflation.
- Postcode:** This is used to identify the relative level of deprivation (see below) associated with the area in which the member lives.

Historical pension earnings patterns and part time working means that for the generation of older women analysed here, their DB pension is not very informative of their affluence<sup>13</sup>. As a consequence purely the postcode-based deprivation is used for women and we are (currently) only able to use two groups for women.

Deprivation scores published by the UK statistical agencies are not comparable between England, Scotland, Wales and Northern Ireland. Club Vita has rebased these to enable the local areas to be allocated into five groups ranging from the most deprived 20%, to the least deprived 20% of areas<sup>14</sup>.

The resulting groups are shown below.



Group	Characterisation
Hard-Pressed	Living in more deprived areas and generally with lower levels of retirement income.
Making-Do	Modest retirement income levels and living in areas of average to low levels of deprivation.
Comfortable	Higher levels of retirement income (over £7,500 p.a. unless living in the least deprived 20% parts of the UK when this can be reduced to £5,000 p.a.). This group naturally includes some pensioners with retirement incomes much higher than £7,500 p.a.

12. Club Vita have validated that the approach remains appropriate in light of the additional data now available.

13. Although the early indications are that this is rapidly changing amongst more recent generations of women retiring.

14. A file containing details of the resulting deprivation quintile for each postcode is available from the Club Vita website.

## Mix between the groups

Although not by design, it turns out that there is a roughly equal number of DB pensioner men in each of the three groups<sup>15</sup>, with around 60% of the women in the Making-Do/Comfortable group.

However, the actual mix varies markedly from scheme to scheme:

- some schemes have over half of their members in the Hard-Pressed group; and
- some schemes have over 80% of their members in the Comfortable group

Furthermore, even if a scheme has a broadly equal mix in terms of numbers of members, over 60% of the liabilities will tend to be concentrated in the Comfortable group<sup>16</sup>.

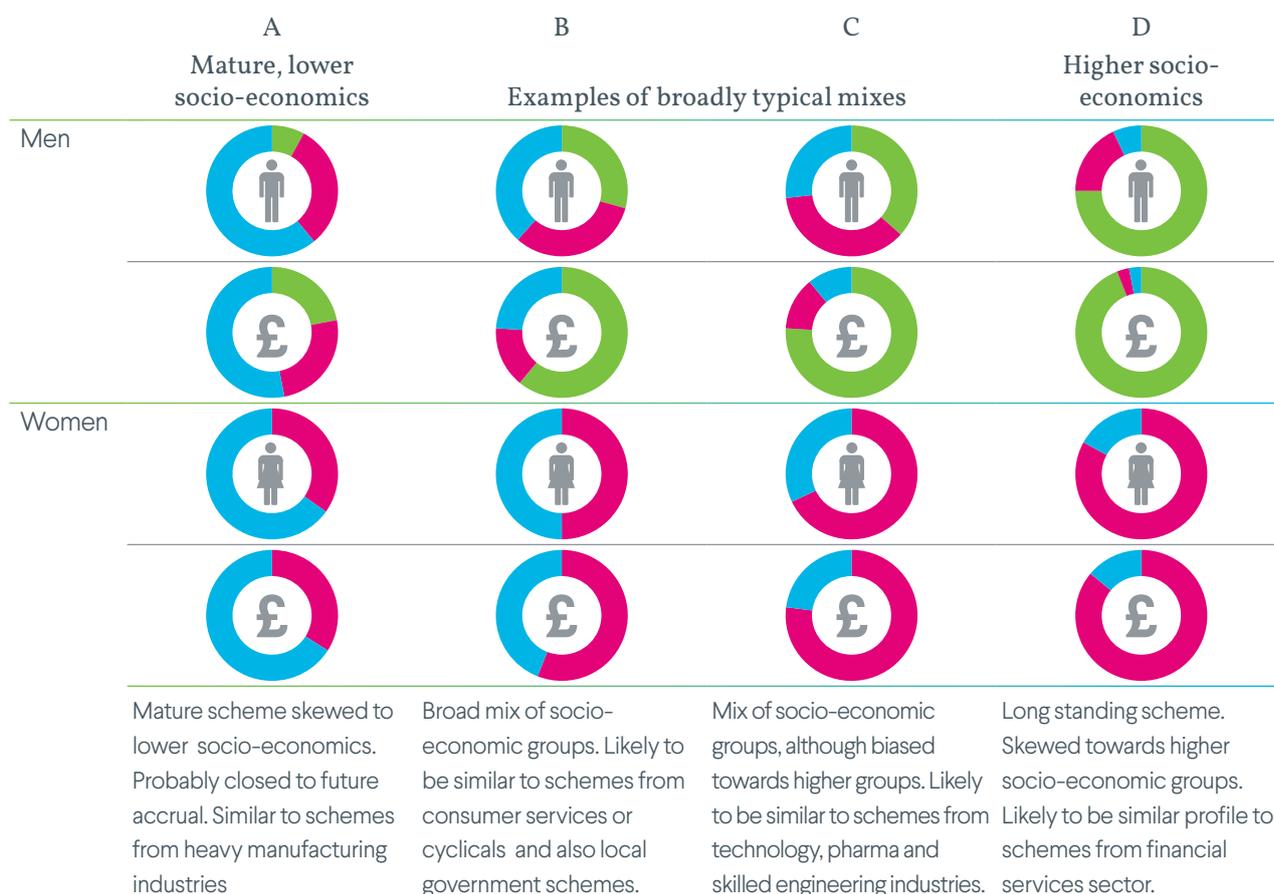
## Illustrative schemes

In order to illustrate the impact of using the socio-economic groups it is helpful to consider some example schemes. Using the Club Vita data we have designed the four example schemes shown in the graphic below.

Based upon the mixes and age profiles seen within Club Vita, and including both pensioner and non-pensioners members, they are designed to be broadly representative of the range of UK DB pension schemes.

We will use these schemes to illustrate the impact of various longevity projections later in this report – with this in mind you may wish to select the one which sounds most like your scheme to focus on.

Fuller details of these example schemes (including age profile) can be found in the Technical Appendix published alongside the original longevity trends model.



### How do I find out more about how the longevity groups were constructed?

Full details of the methods used to construct the VitaSegments are documented in the Technical Appendix accompanying the first release of the longevity trends model. This can be downloaded from the Club Vita website.

Club Vita have rerun the analysis underpinning the formation of the groups to reflect the experience up to 2015. That analysis confirms that the groups used previously continue to be appropriate.

15. Applies within Club Vita and assumed by extrapolation and representativeness of Club Vita to apply more generally.

16. Over time this proportion is also likely to grow given the higher survival rates amongst the Comfortable group.

# 4. Exploring the Longevity Trend Groupings

The VitaSegments longevity trend groups are constructed using the information in the Club Vita dataset. The data includes a range of important factors that might predict life expectancy such as affluence and socio-demographics. However, it does not hold any information on individual's lifestyle habits nor personal circumstances that would help us build up a picture of the characteristics of the VitaSegments. In order to provide more colour on the groups we have looked at the English Longitudinal Study of Ageing (ELSA). This helps us to:

1. deepen our understanding of why the groups have historically had different life expectancy expectations; and
2. form a view as to whether this is likely to continue in future.

ELSA began in 2002. It is a large scale study of people aged 50 and over and their partners, living in private households in England. The same group of respondents have been interviewed at two-yearly intervals known as 'waves'. The interviews ask a wide variety of questions which enable the study to measure changes in their health, economic and social circumstances covering such areas as:

- Household and individual demographics
- Health – physical and psychosocial
- Social care (from wave 6)
- Work and pensions
- Income and assets
- Housing
- Cognitive function
- Social participation
- Walking speed

We have based our analysis on the anonymised data for the Wave 7 (the most recent wave) respondents. This contains data that was collected over the period 1 June 2014 to 31 May 2015 from a total of 9,670 individuals. NatCen (who manage the ELSA dataset) have kindly supplied additional information on the deprivation quintile of the area in which each individual lives. This, combined with information in the dataset on an individual's pension income has enabled us to map the individuals on to the VitaSegments.

The ELSA data includes a representative sample of individuals aged 50 and over. In order to make direct comparisons to the data underpinning our analysis we have restricted our attention to the 3,694 individuals who met the criteria that:

- they are retired; and
- they are in receipt of a DB pension.

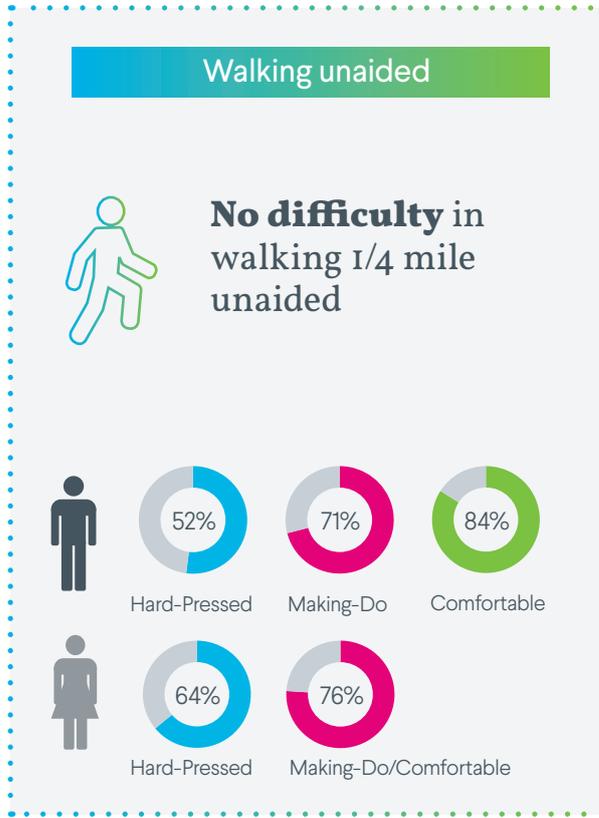
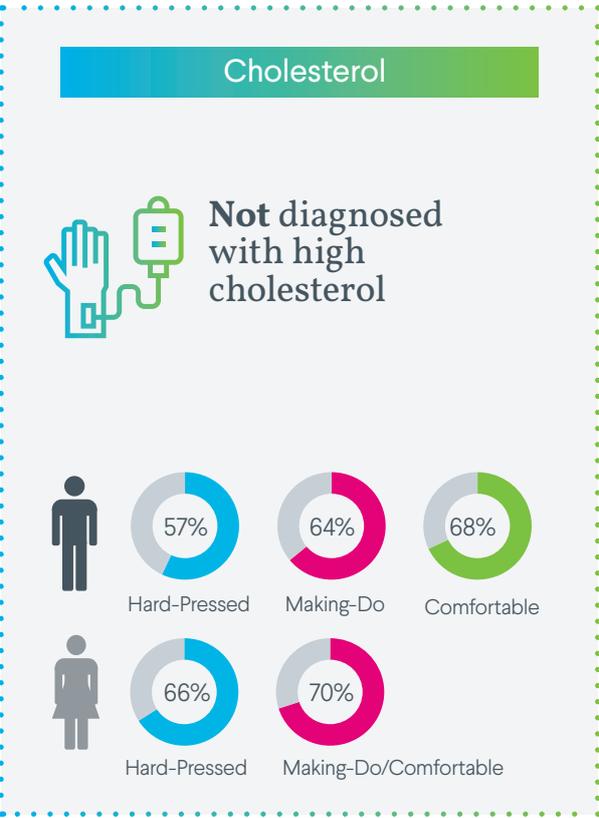
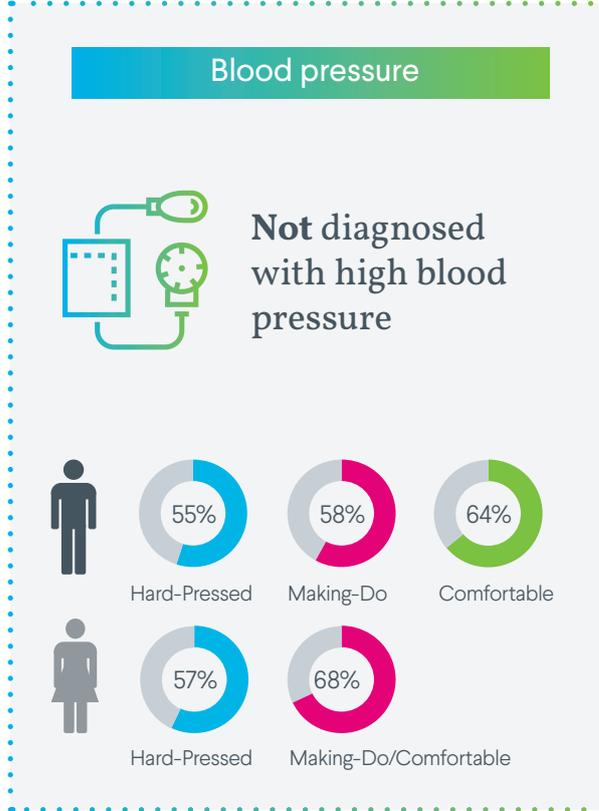
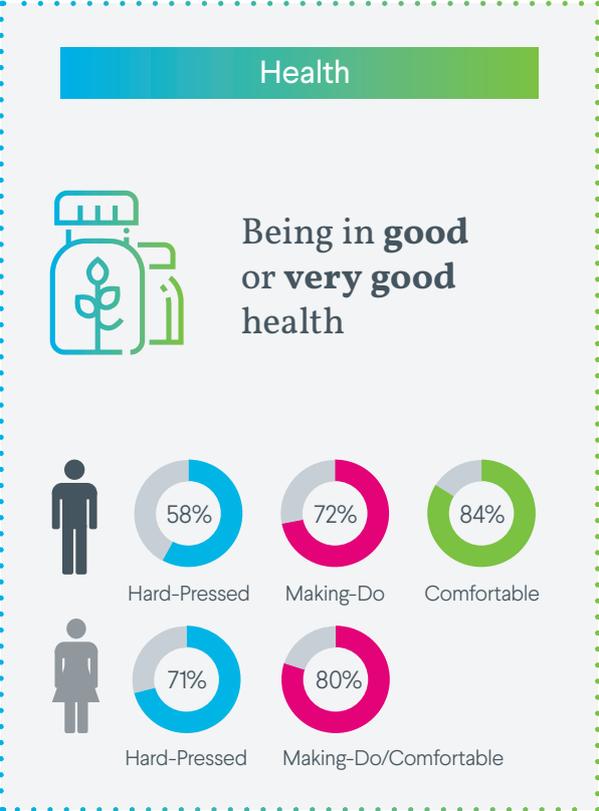
We have carried out a number of checks to ensure that the resulting individuals are likely to be representative of people in the VitaSegments including verifying that the datasets have a similar age distribution (both in aggregate and for each VitaSegment). However, it is notable that a higher proportion of the men in ELSA (63%) are allocated to the Comfortable group than we see in Club Vita (30%). One reason for this is the use of pension income when allocating individuals to the Comfortable group. Within ELSA the pension is the total across all (non-state) pensions ie can include multiple DB and potentially some additional DC pensions. However, when we filter on men with only one DB pension we continue to see a bias towards the Comfortable group within ELSA. This suggests any bias is simply a feature of the ELSA sample rather than a material concern.

The graphics on the following pages show clear differences in health, lifestyle and care characteristics between the groups – with the Comfortable group of men consistently scoring higher than the Hard-Pressed, with the Making-Do in between (with the Making-Do/Comfortable women scoring higher than the Hard-Pressed women). In each case a higher number is likely to correlate with better health and so higher life expectancies.

These differences will impact both current longevity and the prospects for future improvements. For example, 84% of the Comfortable men report themselves as being in good or very good health, compared to just 58% of the Hard-Pressed men. This helps explain the higher current life expectancy for Comfortable men seen in the next section.

The data were made available through the UK Data Archive. ELSA was developed by a team of researchers based at the NatCen Social Research, University College London and the Institute for Fiscal Studies. The data were collected by NatCen Social Research. The funding is provided by the National Institute of Aging in the United States, and a consortium of UK government departments co-ordinated by the Office for National Statistics. The developers and funders of ELSA and the Archive do not bear any responsibility for the analyses or interpretations presented here.

# Health



# Lifestyle

## Moderate exercise



**Often do moderate exercise**



Hard-Pressed



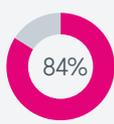
Making-Do



Comfortable



Hard-Pressed

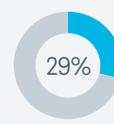


Making-Do/Comfortable

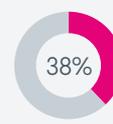
## Vigorous exercise



**Often do vigorous exercise**



Hard-Pressed



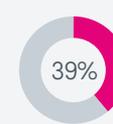
Making-Do



Comfortable



Hard-Pressed



Making-Do/Comfortable

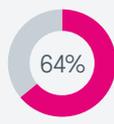
## Quit smoking



**Ex-smokers**



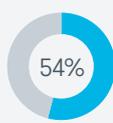
Hard-Pressed



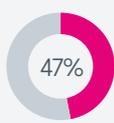
Making-Do



Comfortable



Hard-Pressed



Making-Do/Comfortable

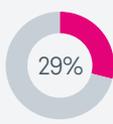
## Never smoked



**Never smoked**



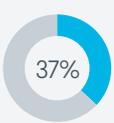
Hard-Pressed



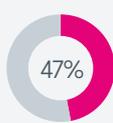
Making-Do



Comfortable



Hard-Pressed



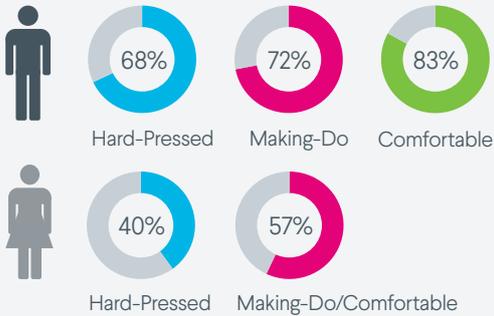
Making-Do/Comfortable

# Care, support & finances

## Married



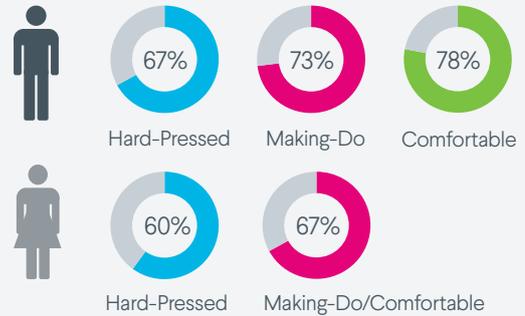
Married or in civil partnership



## Companionship



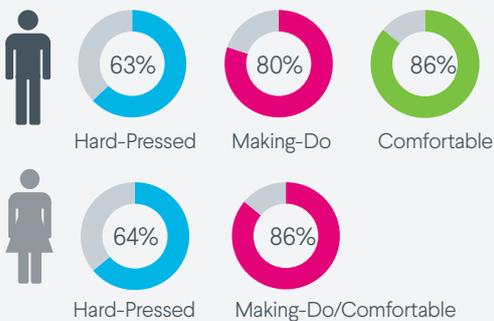
Rarely feel they lack companionship



## Residential house



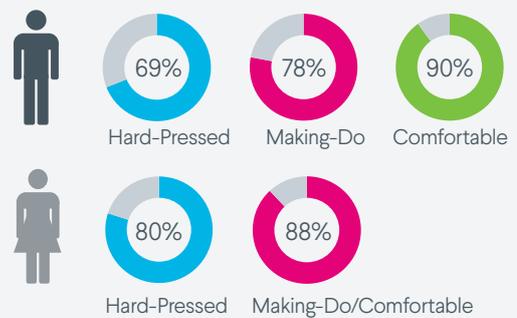
Own their home outright



## No benefits



Not likely to be receiving benefits (exc. state pensions)



# 5. Longevity trends by VitaSegment

In this update to the longevity trends model we have analysed how longevity has changed over the period 2000 to 2015 for DB pensioners in the UK – in aggregate and within their VitaSegments.

## Men

In recent years longevity has gone up very little across DB pensioner men. Since 2010 the average pensioner man's life expectancy has increased by 0.5 years compared to 0.9 years and 1.3 years in the two previous 5 year periods. Whilst this has been broadly in line with what we have seen at the national population level, there has been a very different picture by socio-economic group as the chart below shows.

The chart looks at how life expectancy from age 65 for each of the **Hard-Pressed**, **Making-Do** and **Comfortable** groups has changed since 2000. The overall picture (i.e. DB pensioners as a whole<sup>17</sup>) is shown for comparison in grey.

The points in the chart are the life expectancies based upon the numbers dying at each age for that specific year. The dashed line is based upon a three year average of the deaths in order to provide a sense of the general trend.

Life expectancy has been consistently highest for the Comfortable group. This is unsurprising given their health and lifestyle characteristics identified from the ELSA data – they are more likely to be in good/very good health and exercise often.

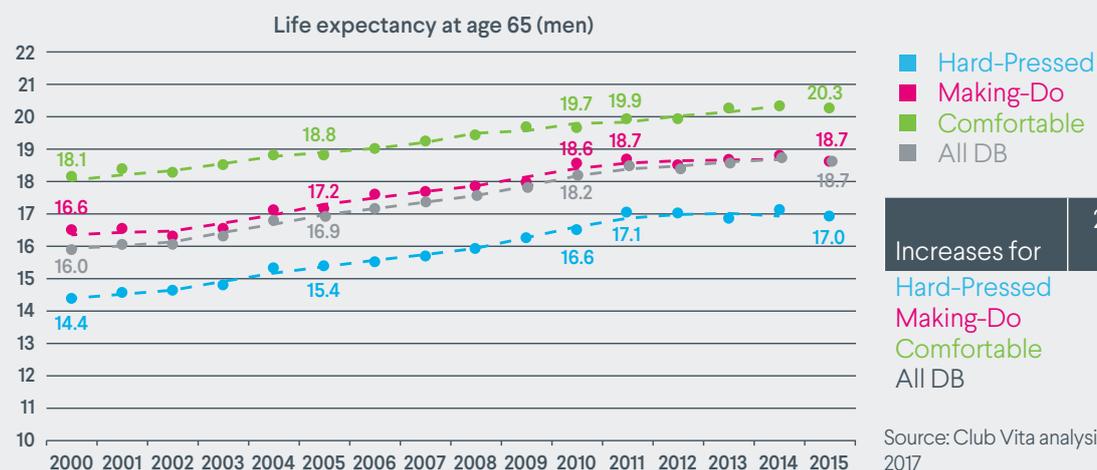
Over time the life expectancies have increased for all three groups. However, there are marked differences between the groups.

### In particular, since 2011

- **Life expectancy has remained level at around 17 years for Hard-Pressed and 18.7 years for Making-Do**
- **In contrast life expectancy has continued to increase for the Comfortable group rising from 19.9 to 20.3 years**

More generally we see that:

- Through the period 2000 to 2015 the comfortable group has seen very steady increases equivalent to 8 weeks of extra life expectancy each and every year.
- In contrast the Hard-Pressed and Making-Do groups have been more prone to periods of faster and slower increases.
- Over 2000–2005 the Hard-Pressed narrowed the gap in longevity, gaining 1.0 years of life expectancy, compared to a rise of 0.6 and 0.7 years for the Making-Do and Comfortable groups respectively.
- Over 2005–2010 the Making-Do group gained 1.4 years of life expectancy (from 17.2 to 18.6). The Hard-Pressed group gained 1.2 years of life expectancy.
- Overall, the increase in life expectancy between 2000 and 2015 has been greatest for Hard-Pressed.



Increases for	2000-2005	2005-2010	2010-2015
Hard-Pressed	1.0	1.2	0.4
Making-Do	0.6	1.4	0.1
Comfortable	0.7	0.9	0.6
All DB	0.9	1.3	0.5

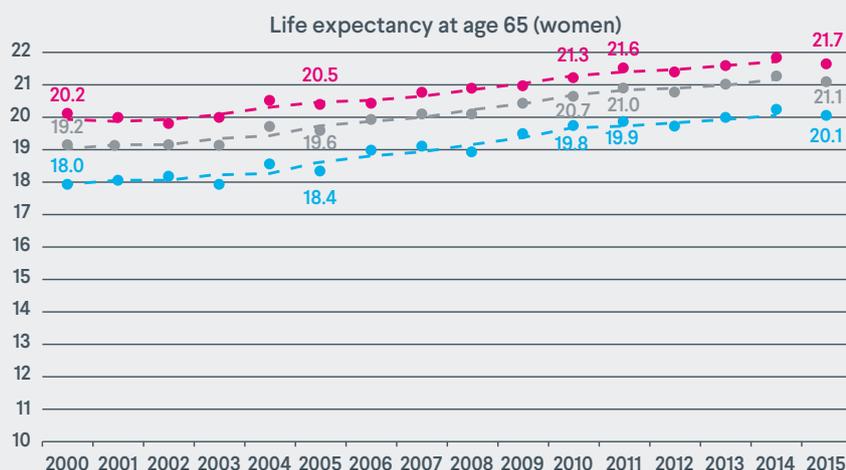
Source: Club Vita analysis for PLSA longevity trends report 2017

17. The All DB pensioners line is based on the dataset as a whole with each life contributing equally. In practice DB pension scheme liabilities are skewed towards the Comfortable group.

# Women

The chart below provides the comparable picture for women.

- Between 2000 and 2005 both groups saw similar increases in life expectancy – the Making-Do/Comfortable gained 0.3 years rising from 20.2 years to 20.5 years; while the Hard-Pressed gained 0.4 years rising from 18.0 years to 18.4 years.
- Between 2005 and 2010 the Hard-Pressed closed the longevity gap – gaining 1.4 years compared to 0.8 years for the Making-Do/Comfortable group.



■ Hard-Pressed  
■ Making-Do/Comfortable  
■ All DB

Increases for	2000–2005	2005–2010	2010–2015
Hard-Pressed	0.4	1.4	0.3
Making-Do/Comfortable	0.3	0.8	0.4
All DB	0.4	1.1	0.4

Source: Club Vita analysis for PLSA longevity trends report 2017

## ‘Improvement’ rates

In the next section we explore the standard model used by most schemes for projecting longevity trends into the future.

That model re-expresses these charts in terms of how much mortality rates have been improving (falling) year on year. By way of comparison we therefore re-express the changes in life expectancy in this currency in the tables below.

For example your actuary may refer to using a long term rate of 1.5% p.a. – this means that they are assuming that these improvement rates will stabilise at 1.5% p.a.

## Men

Male group	Annualised male mortality improvement (age-standardised)		
	2000–2005	2005–2010	2010–2015
England and 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%)
Comfortable	2.4% (± 1.1%)	2.1% (± 0.8%)	2.1% (± 0.7%)
Making-Do	2.2% (± 0.8%)	3.2% (± 0.5%)	0.9% (± 0.6%)
Hard-Pressed	2.5% (± 0.7%)	2.9% (± 0.5%)	1.0% (± 0.6%)

## Women

Female group	Annualised female mortality improvement (age-standardised)		
	2000–2005	2005–2010	2010–2015
England and Wales	1.6% (± 0.1%)	2.4% (± 0.1%)	0.3% (± 0.1%)
Club Vita	0.7% (± 0.5%)	2.7% (± 0.3%)	0.6% (± 0.3%)
Making-Do/Comfortable	0.7% (± 0.7%)	2.1% (± 0.5%)	0.5% (± 0.5%)
Hard-Pressed	0.6% (± 0.8%)	3.2% (± 0.5%)	0.7% (± 0.6%)

When looking at these tables note that the numbers in brackets represent a 95% confidence interval and provide an indication of how certain we can be about the level of improvements.

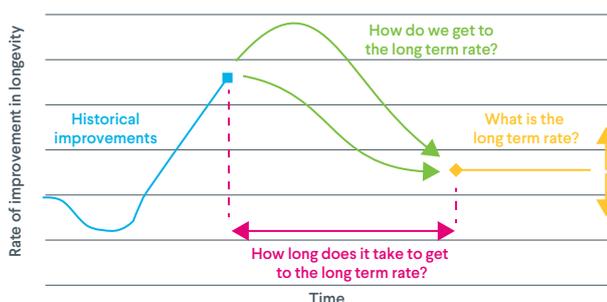
# 6. Projecting future trends

When funding for longevity schemes need to make an assumption about the 'baseline' longevity (i.e. the current life expectancy of their members) and then overlay an allowance for future longevity trends,

The 'baseline' longevity assumption is typically tailored to the scheme's membership. For example, blue collar schemes reflect a lower average life expectancy amongst their members than white collar schemes.

In contrast though, most pension schemes base their longevity trend assumption on a standard model published by the Continuous Mortality Investigation (CMI) with little or no tailoring to each scheme's circumstances.

The CMI model smooths through recent historical improvements to identify a 'launching off' point. The projections then blend from this launching off point to a level of reductions in mortality (the chance of dying at each age) which the user believes is sustainable, known as the 'long term rate' (see schematic below).



The projections used for funding by most DB pension schemes are based upon 'launching off' from improvements calibrated to mortality patterns of the England & Wales population. However, this data contains many people who have never had a DB pension. More acutely, it ignores the concentration of liabilities in the higher socio-economic groups who may be experiencing different improvements. For example the resilient Comfortable group have recently been experiencing a higher level of improvements than the England & Wales population as a whole.

The PLSA longevity trends model uses the CMI model, but recalibrates the 'historical improvements' to Club Vita's VitaSegments. When first published in 2014 it highlighted how:

- Reflecting the trends seen in DB pension schemes tended to increase pension scheme liabilities by around 1%;
- The impact was greatest for the Hard-Pressed and Making-Do groups.

There have been two crucial developments since our first longevity trends model.

Firstly, the publication of a material update to the standard CMI model. This is noteworthy as these latest projections launch off from the recent lower improvements. Typically this results in a reduction in the value placed on pension scheme liabilities of between 2% and 3% relative to the previous CMI model.

Secondly, since 2011 there has been a very noticeable slow-down in longevity trends for the Hard-Pressed and Making-Do groups, whilst the Comfortable group has maintained a steady rate of improvement.

“ For those considering moving onto the latest CMI projections, be wary that this is liable to launch off from materially lower improvements than seen recently for the Comfortable group who typically dominate ”

A key decision therefore is the extent to which schemes wish to allow for this recent slow-down in experience when considering future improvements. In other words, do we think that the drivers for recent experience are likely to persist over time, or are they more short term?

For the purposes of illustration we have updated the model so it treats (some of) the recent slow-down seen for the less affluent groups as indicative of something which will persist for a number of years. For more affluent members the update effectively assumes that they will continue to see steady improvements<sup>18</sup>.

The graphics on the following page illustrate visually how reflecting the trends specific to each group feeds into the projections of life expectancies for each group.

In each case we show, in dotted lines, how life expectancy would be expected to evolve after 2015 if future improvements were assumed to be in line with the CMI projections based on E&W population data (i.e. the typical view underpinning pension scheme valuations)<sup>19</sup>.

The solid lines show the (smoothed) historical life expectancies and, from 2016 onwards, projections based upon the observed experience of that group up to 2015.

We can see from the charts that for men:

- For Hard-Pressed men, life expectancy at age 65 could rise from 17.0 in 2015 to 20.5 in 2040.
- For Making-Do men, life expectancy at age 65 could rise from 18.7 in 2015 to 21.9 in 2040.
- For Comfortable men, life expectancy at age 65 could rise from 20.3 in 2015 to 23.5 in 2040.

For women, by 2040 the gap between the Hard-Pressed and Making-Do/Comfortable is projected to have decreased by 0.2 years.

### Impact on pension scheme funding

The actual impact for any individual scheme will depend on the mix of the groups within the scheme, the scheme's age profile and such factors as the financial assumptions used for valuations and the existing improvement trend assumption. We can, however, use the four example schemes introduced earlier to illustrate the potential impact.

### Why does the longevity trends model give higher projected life expectancy than the typical projection for men?

The charts on the following page show that the longevity trends model gives higher projections of life expectancy at age 65 than the 'typical projection' used by many schemes. This is the case for all of the longevity trend groups. The primary reason for this is that the longevity trends model is focussed on the experience seen amongst DB pensioners. It has been fitted by focussing on the patterns seen at the ages most relevant to DB pension schemes i.e. ages 60 plus. In contrast, the 'typical projection' is calibrated across a much wider age range (ages 20 plus) – inevitably sacrificing some quality of fit to the oldest ages in order to capture the patterns at younger ages, and leading to considerable judgement being applied in setting the launching off point. This need for judgement is avoided in the longevity trends model.

Whilst the life expectancies for men are higher at age 65 under the longevity trends model, this is not the case at older ages (or for women beyond 2040). This is because the longevity trends model recognises that the recent slow-down has impacted particularly acutely at the older ages, and allows (some of) this recent slowdown to persist into the future.

We illustrate on the next page the impact of adopting the latest longevity trends model compared to a 'typical' funding assumption (2015 edition of the CMI model). The impact is generally broadly neutral. This is a consequence of the longevity trends model projecting stronger improvements for men than the typical funding projection shown in the charts for those in their 60s and 70s, but reflecting the recent slower improvements at older ages. This means that, whilst the value of pensions payable to men is increased under the longevity trends model, there is an offsetting reduction in the value of the pensions payable to their spouses (and to older pensioners in general).

For example, under the longevity trends model pensions payable to Comfortable men aged 65 **increase** in value by around 2% (and 1% or less for the Hard-Pressed group) compared to the typical projection.

18. We have captured the slow-down up to the end of 2015. Information on 2016 experience in DB pension schemes will be published in Club Vita's VitalStatistics later in 2017.

19. For these purposes we need to pick which version of the CMI model is 'typical' i.e. the launch off point. We have used CMI 2015 with a long term rate of 1.5% p.a.. We have used the same long term rate in the projections based on the VitaSegments, including retaining the shape with age used in the 'typical' projections. (Note that the default setting of the new CMI model modifies this.)

In contrast pensions payable to Making-Do/Comfortable women aged 75 and over typically **decrease** in value by around 1½% compared to the typical projection. A consequence of this is that the results for a particular scheme will depend heavily on the age and gender mix of the membership, and the socio-economic make-up, as well as what you think the longer-term outlook is for each of the groups (see Section 7).

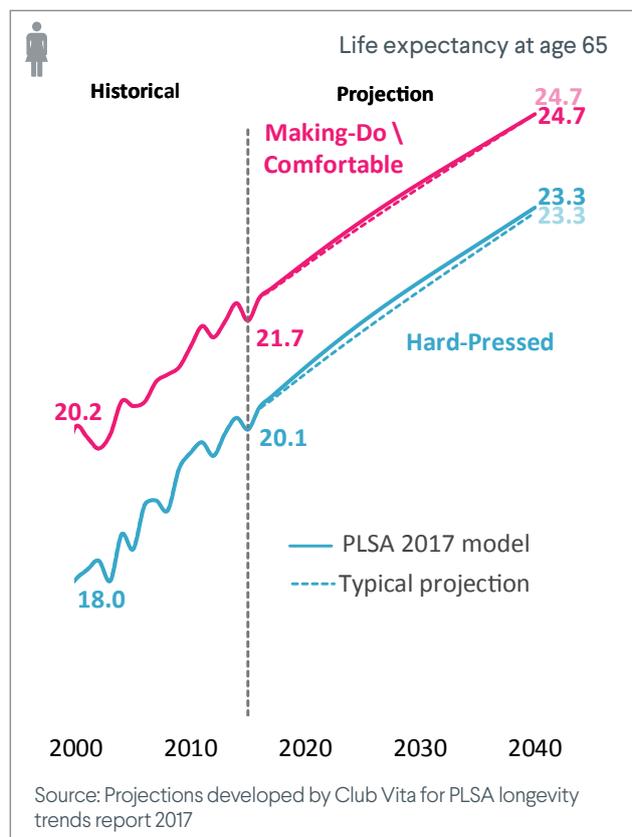
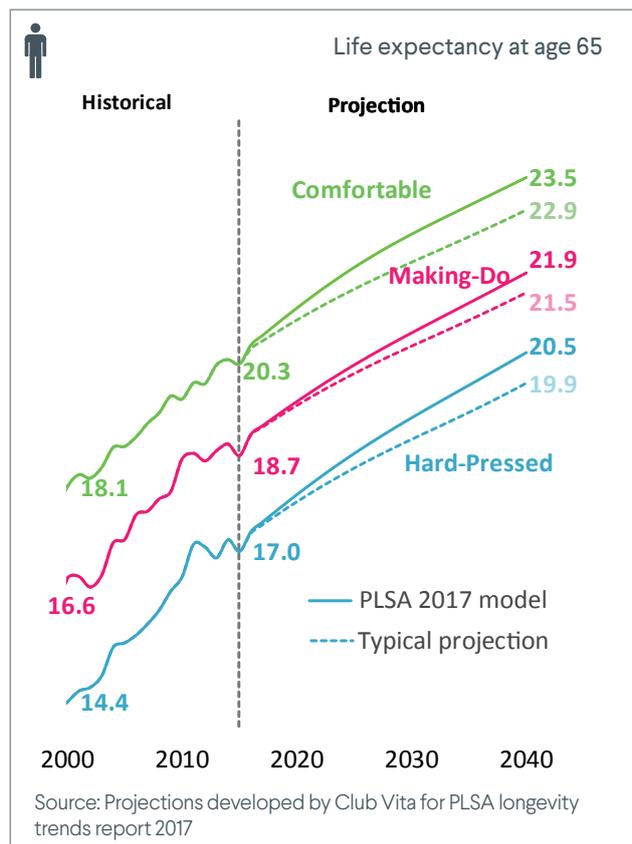
### What if my existing assumption is different to the typical projection?

We appreciate though that many schemes will be using a different version of the model to the typical projection used here. As a broad guide for schemes:

- **using older versions of the CMI model (2014 or earlier)** you will have yet to reflect any of the recent slow-down in longevity trends and so moving to our latest longevity trends model will tend to reduce liabilities.
- **using the latest version of the CMI model (2016)** this assumes that the recent slow-down in longevity has impacted all members rather than just the Hard-Pressed and Making-Do groups. Moving to the latest longevity trends model will tend to **increase** liabilities compared to CMI 2016<sup>20</sup>.
- **using the latest ONS projections ('2014-based')** then you will be using a higher launch off point, a different shape, and a lower long term outlook than the typical projections shown here. The broad impact of reflecting the recent trends by socio-economic group, but retaining other features of the ONS based projections, is liable to lead to a reduction in liabilities. This is primarily due to the latest longevity trends model capturing more of the recent slow-down in the launch off point, particularly at the older ages.

### Impact on our example schemes

Mature, lower socio-economics	0.0%
Broadly typical (consumer services / cyclical / also local government schemes)	-0.2%
Broadly typical (technology / pharma / skilled engineering)	-0.1%
Higher socio-economics	-0.2%



Note: Typical projection is CMI 2015 with 1.5% long term rate. Earlier versions of CMI model give higher projections whilst CMI 2016 gives lower projections than this typical projection.

20. Typically there will be an increase of around 2% of moving from CMI 2016 to the longevity trends model. This is broadly split 1% for the revised launching-off points and 1% for a change to the shape of the long term rate with age (we have retained the old shape, as adopted in previous versions of the CMI model, in the longevity trends model so that we are simply updating projections for longevity group specific starting rates).

# How does the 2017 longevity trends model compare to that published in 2014?

A natural question to ask is how the 2017 longevity trends model compares to that which we published in 2014.

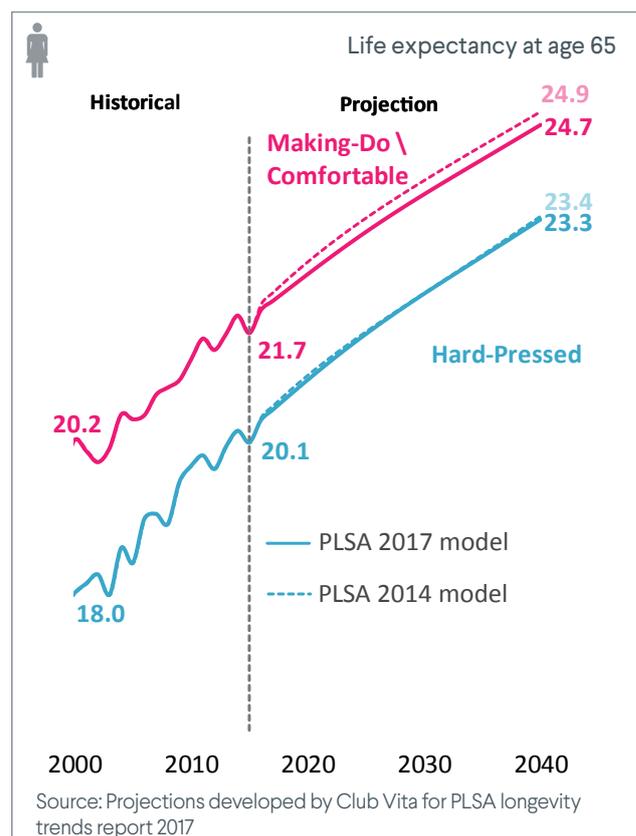
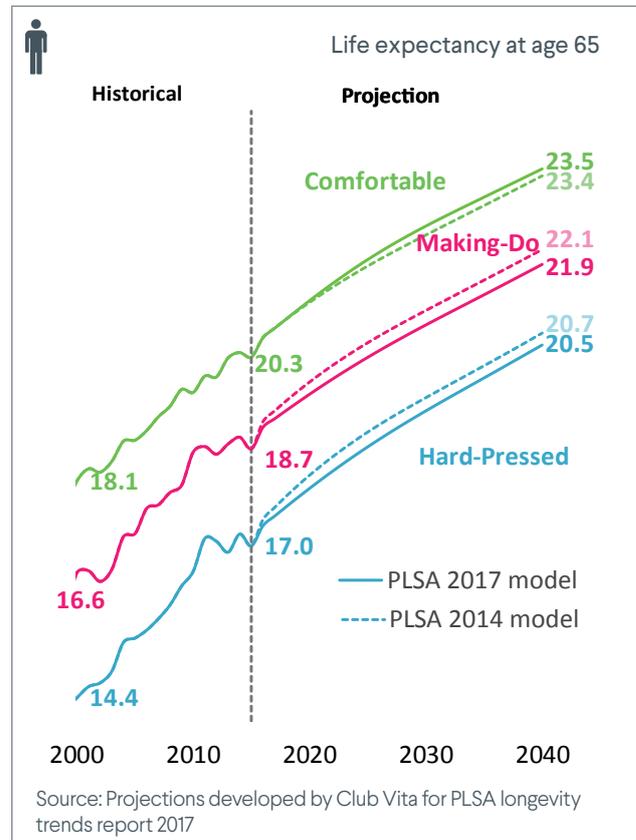
The new model primarily differs in launching off from a slower level of improvements for the Hard-Pressed and Making-Do groups. This leads to lower projections for future life expectancy for these groups.

In contrast the Comfortable men have experienced very stable improvements over recent years. Reflecting the latest data has limited impact on the projections for this group.

This stability amongst the projections for the lives which dominate the liabilities of many schemes means that for the illustrative schemes adopting the 2017 version of the longevity trends model has modest impact if already using the 2014 model.

## Impact on our example schemes

Mature, lower socio-economics	<b>-1.5%</b>
Broadly typical (consumer services / cyclical / also local government schemes)	<b>-1.2%</b>
Broadly typical (technology / pharma / skilled engineering)	<b>-1.2%</b>
Higher socio-economics	<b>-1.1%</b>



# 7. Future Health Scenarios

In our 2014 report we introduced a series of health scenarios for future life expectancy. The scenarios included two which assumed low/negative future increases, two which assumed relatively high future increases, and two more 'central' assumptions. In each case we created a 'real world' narrative around the scenario.

We have updated these scenarios for the passage of time. In most instances this simply means launching the scenarios off from 2015.

We have also taken the opportunity to review the scenarios and introduced two new scenarios in light of the uncertainty surrounding recent trends:

- **Low for longer:** This scenario considers the impact of sustained low economic growth / austerity on longevity, and how this may impact the socio-economic groups differently. It can be thought of as building on the 'austerity dimension' discussion earlier.
- **Alzheimer's & Dementia wave:** This scenario builds on the recent rise in numbers of deaths attributed to Alzheimer's & dementia noted earlier. It continues this rise for a few years, before a period of rapid decline as a result of successful interventions / cure.

Conceptually, the eight resulting scenarios can be considered to span a spectrum from declines in life expectancy through to material increases. They include two scenarios 'Low for Longer' and 'Health Cascade' which specifically capture continued resilience / strong

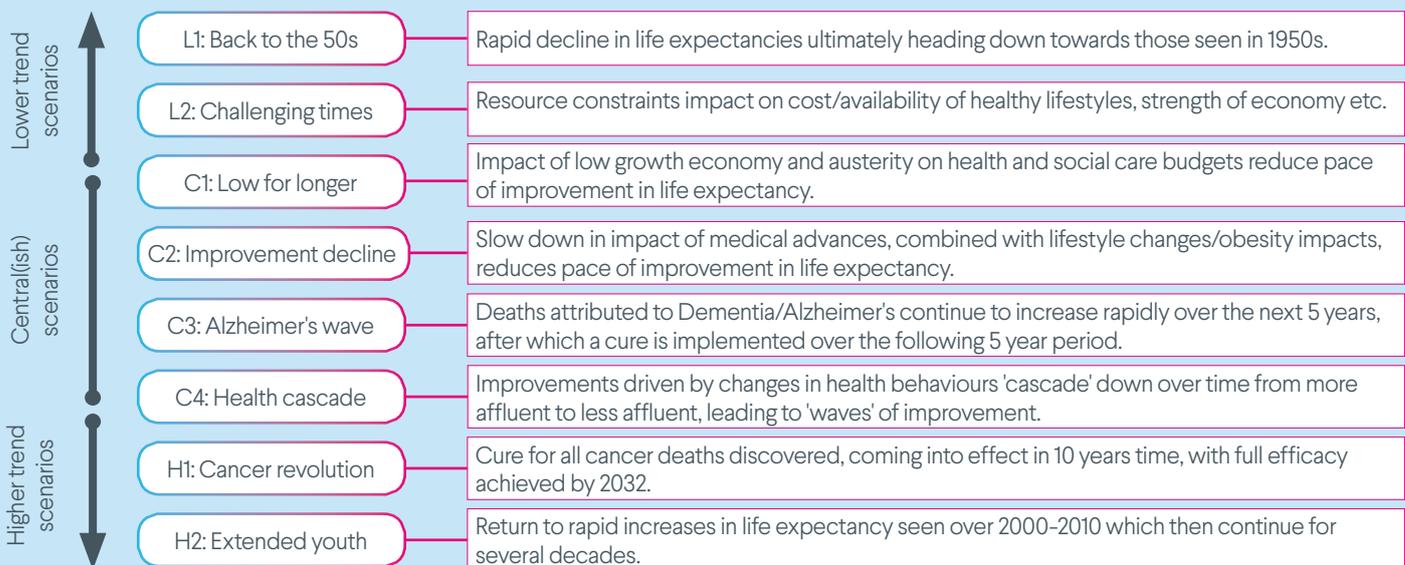
improvements for the 'Comfortable' group. Note though that these scenarios are purely for illustration and do not represent the full range of possible futures. From example, the possibility of sustained increases faster than seen historically falls outside of the range.

The following pages provide a brief description of each of the scenarios alongside the resulting life expectancy projections. We start with the four central(ish) scenarios before considering the four lower and higher trend scenarios. In each case a benchmark 'typical projection' is provided by way of comparison.

To help you gauge the likely impact of each on your scheme we show the results of each scenario on the four example schemes introduced earlier. The impacts are compared to using a 'typical' projection. Naturally, the precise impact for your scheme will depend on your current funding assumption, the mix of members in your scheme and the financial assumptions you adopt for funding so you may wish to consult your advisors to help find out the results for your scheme.

The scenarios represent a broad range of possible longevity outcomes, with the results indicating:

- a wide range of potential life expectancies at 65 ; by the 2040s these range from lower than seen in 2010 to exceeding age 90.
- liability impacts ranging from a reduction of around 18% through to increases of 10% or more.



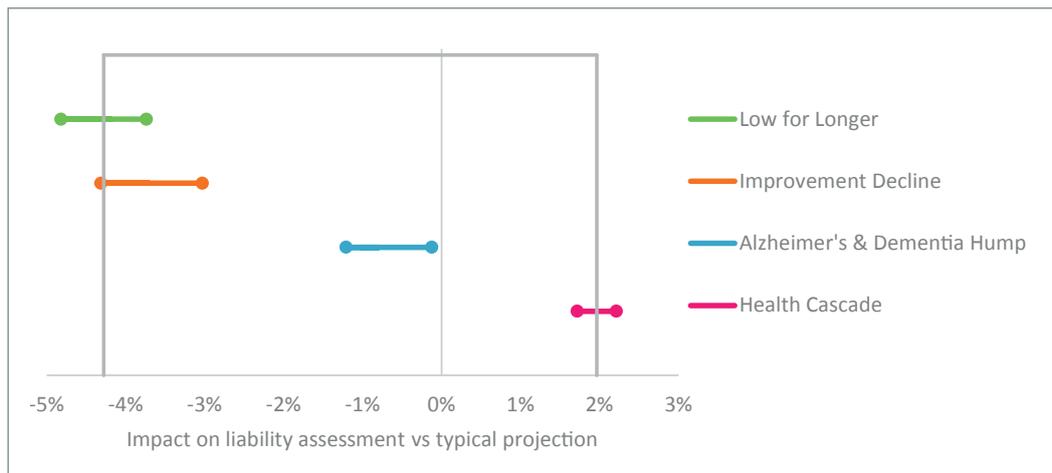
## Central(ish) scenarios

Of particular note are the results for our four central(ish) scenarios. These are scenarios broadly in keeping with what many DB pension schemes use for funding purposes. The graphic below summarises the results for these four scenarios.

The broad spread between scenarios for any given scheme is around 6%. In contrast the variation within any given scenario can be around 1½%.

This highlights the importance of considering the socio-economic mix of a pension scheme's membership when setting the funding assumption.

Full details of the way we have calibrated the scenarios, and any refinements to the way we have done this compared to the 2014 model are set out in our accompanying booklet 'A guide to the PLSA longevity trends model Scenarios'.



Note: Typical projection is CMI 2015 with 1.5% long term rate. Earlier versions of CMI model give higher projections whilst CMI 2016 gives lower projections than this typical projection.

### Does the recent experience help choose a scenario?

*With the 2010-2015 experience now available to us, a natural question to ask is whether this strongly supports one of the scenarios. Although no one scenario is a perfect match for recent experience the 'improvement decline' scenario appears to be the closest match. Whether it will be a good match in future remains to be seen though, since that scenario assumes the slow-down is the start of a new (sustained) period of slower improvements.*

*More information on the comparison of the scenarios to the 2010-2015 experience can be found in our accompanying FAQs document.*

Note that we do not suggest that some of these scenarios are more likely than others, that they represent a best estimate or even place outer boundaries on what we might experience in the future. The purpose of sharing these scenarios is purely to support more informed discussions between the key stakeholders in managing pension schemes – trustees, sponsoring companies and their advisors and service providers.

# C1: Low for Longer

We noted earlier (section 2) the concern that the current slow-down in longevity trends may be being caused by austerity and contracted social care budgets impacting the health outcomes for older people.

This scenario considers the potential for a prolonged period of low economic growth and budgetary restraint. This could be for example as a result of stagnation following austerity and a shift to a low growth economy (akin to that seen for example in Japan).

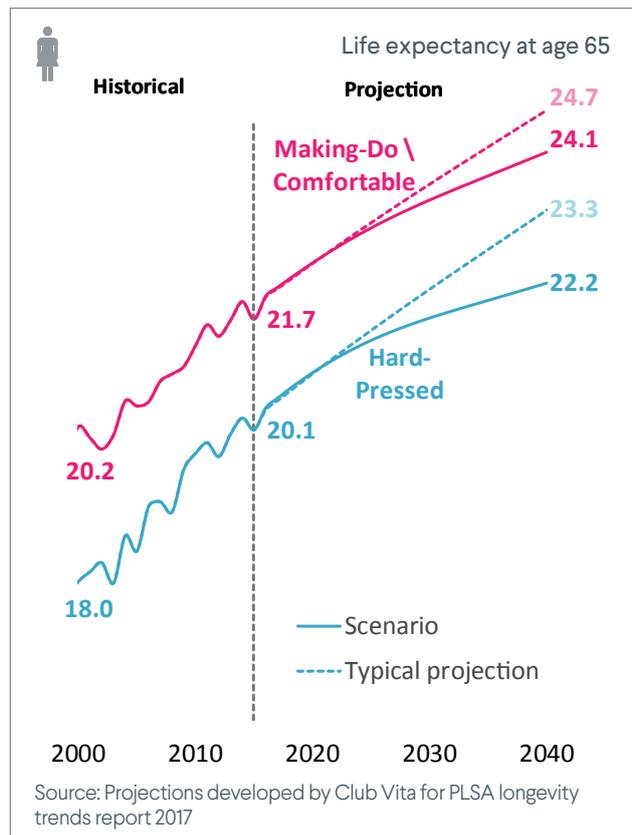
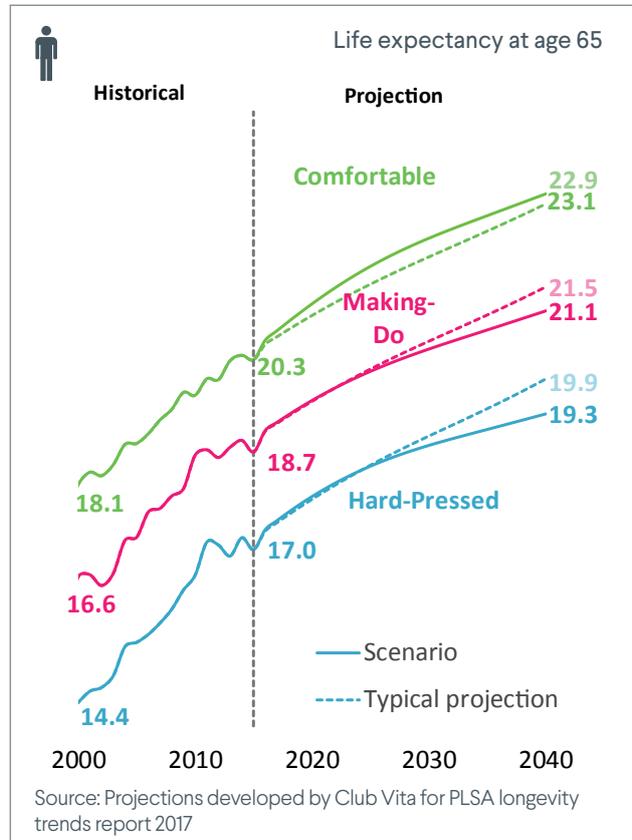
Under this scenario we assume that long term improvements are lower than typically assumed particularly for the lower socio-economic groups reflecting a slow-down in the level of sustainable improvements compared to the average over the last 60-70 years. We assume that this will impact the socio-economic groups differently, with the Hard-Pressed most impacted and seeing very modest improvements in life expectancy. In contrast the Comfortable group continues to exhibit greater resilience, and so experience the greatest improvements.

Whilst this scenario focusses on the outcome for longevity, were the circumstances described to happen then there is likely to be material impacts on a pension scheme's investments and the outlook for gilt yields. This is a scenario that schemes may wish to use in combination with stressing their investment assumptions.

## Impact on our example schemes

Mature, lower socio-economics	<b>-4.2%</b>
Broadly typical (consumer services / cyclical / also local government schemes)	<b>-4.8%</b>
Broadly typical (technology / pharma / skilled engineering)	<b>-3.7%</b>
Higher socio-economics	<b>-3.7%</b>

Central(ish) scenario



Note: Typical projection is CMI 2015 with 1.5% long term rate. Earlier versions of CMI model give higher projections whilst CMI 2016 gives lower projections than this typical projection.

# C2: Improvement Decline

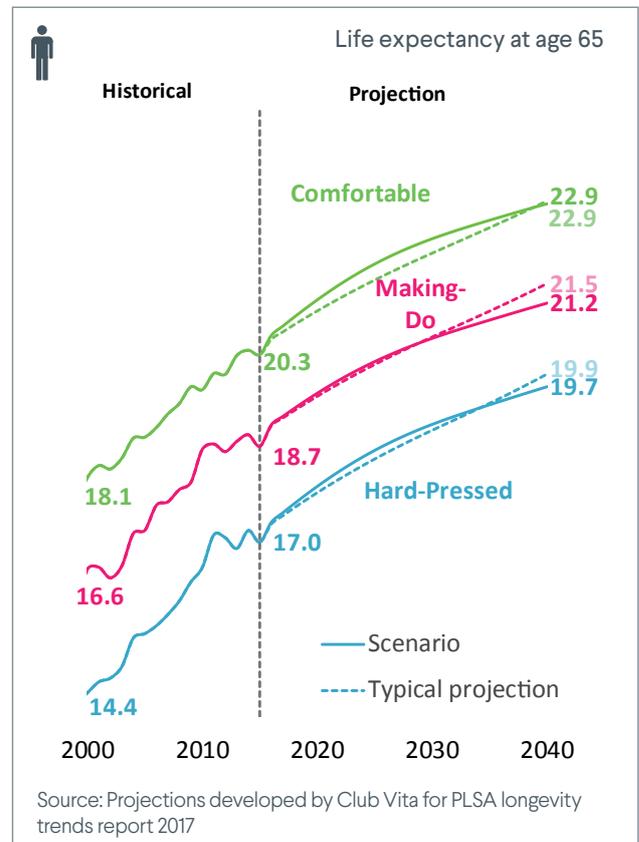
In this scenario we assume that improvements will diminish over time, as the frequency and impact of medical advances diminish, coupled with rising obesity and other detrimental lifestyle factors. This means that the 'golden cohort' of individuals born between the wars continues to exhibit faster improvements in longevity than those born later.

The benefits of the healthy behaviours (smoking cessation) and introduction of the NHS are inherited by subsequent generations.

However you can only give up smoking once. For subsequent generations, medical advances, and benefits of health interventions such as screening are assumed to provide a driver for some continued improvements, but the behaviours and lifestyle of younger cohorts throughout their life course result in longevity improvements slowing almost to stagnation.

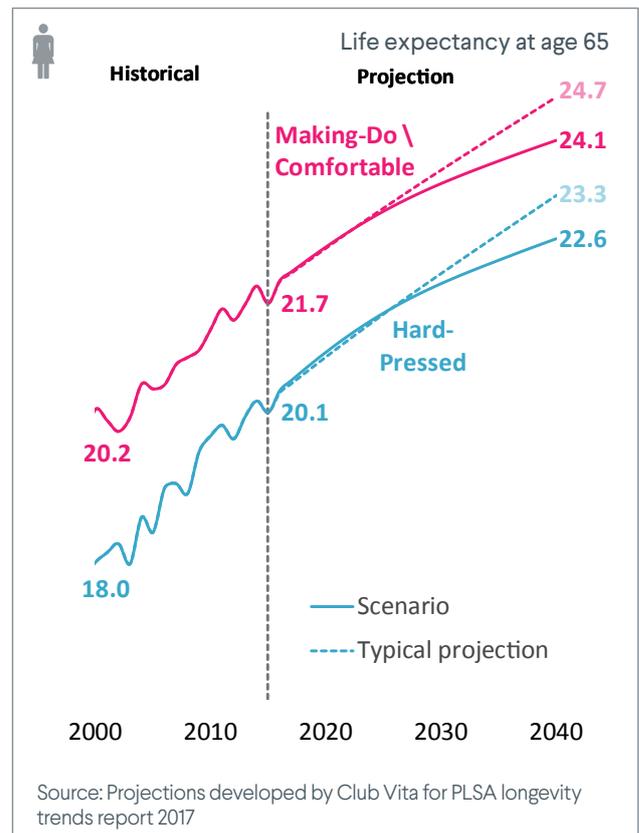
Specifically, long term improvements for the post WW2 birth generations drop to around 9 months per decade (compared to the long run historical average of 1 year per decade).

Central(ish) scenario



## Impact on our example schemes

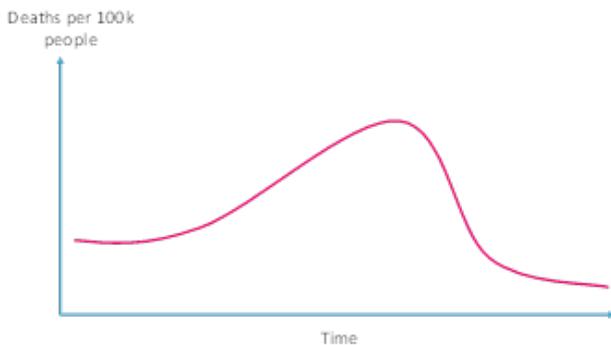
Mature, lower socio-economics	-3.0%
Broadly typical (consumer services / cyclical / also local government schemes)	-4.3%
Broadly typical (technology / pharma / skilled engineering)	-3.7%
Higher socio-economics	-3.9%



Note: Typical projection is CMI 2015 with 1.5% long term rate. Earlier versions of CMI model give higher projections whilst CMI 2016 gives lower projections than this typical projection

# C3: Alzheimer's & Dementia Wave

The essence of this scenario is that Alzheimer's and dementia mortality, having been on the increase, peaks and then declines, following a 'humped shape'. A similar picture has been seen historically with cardiovascular disease and is plausible in the same sense that as we combat one cause of death another rises in prominence which we then turn our attention to.



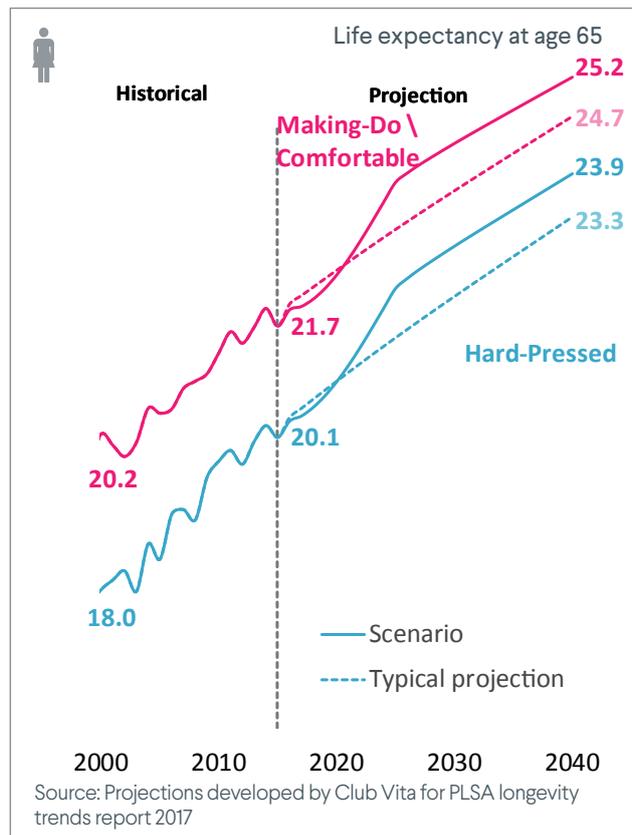
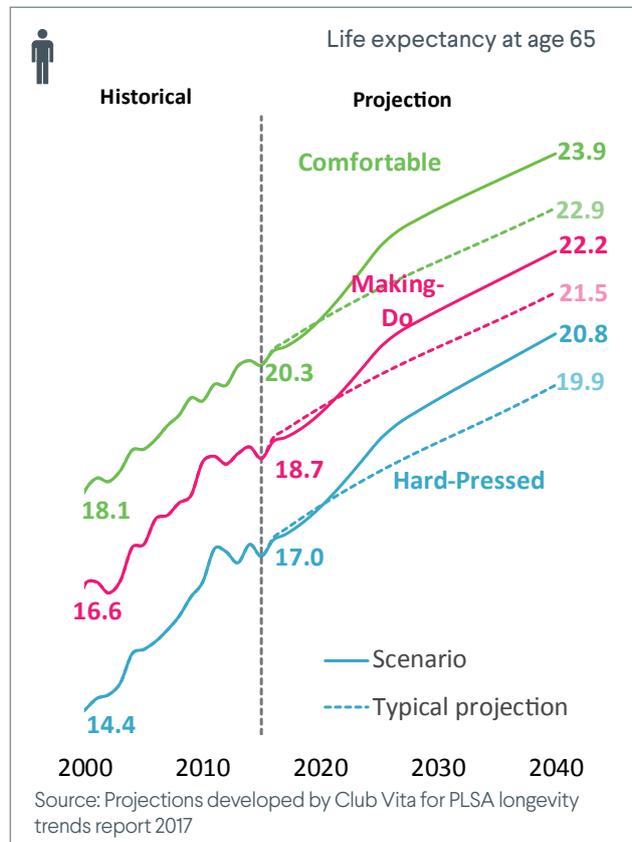
Although not specific as to the intervention which causes the hump this may be some combination of lifestyle and dietary changes (both believed to have links to Alzheimer's and dementia<sup>21</sup>) and medical interventions. For example the second most common type of dementia is vascular dementia; some experts believe this will naturally fall as the generation who have better cardiovascular health enter the older population.

Mortality from each of the other causes of death are assumed to decline in line with the base projection.

## Impact on our example schemes

Mature, lower socio-economics	<b>-0.1%</b>
Broadly typical (consumer services / cyclical / also local government schemes)	<b>-1.2%</b>
Broadly typical (technology / pharma / skilled engineering)	<b>-0.8%</b>
Higher socio-economics	<b>-1.0%</b>

Central(ish) scenario



Note: Typical projection is CMI 2015 with 1.5% long term rate. Earlier versions of CMI model give higher projections whilst CMI 2016 gives lower projections than this typical projection.

21. See for example Dietary Patterns and Risk of Dementia, Cao et al (Molecular Neurobiology, 2016)

# C4: Health Cascade

Recent improvements in life expectancy for the 'golden cohort' (the generation born between the two world wars) are believed to be driven by a number of behavioural changes (such as smoking cessation) and medical interventions (including free access to 24/7 medical care via the NHS).

A theory (supported by data from the ONS on smoking cessation) is that uptake of such behaviours and services 'cascades' through society with the most educated (proxied by our Comfortable group) adopting the behaviours first and most fully. As the benefits of these behaviours become more evident so they 'cascade' through society, leading to periods of divergence followed by convergence between the socio-economic groups.

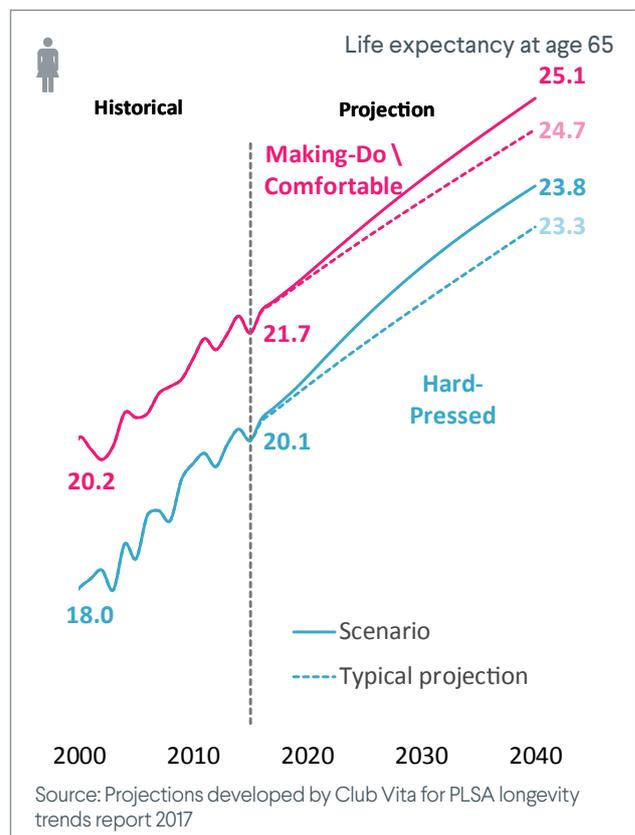
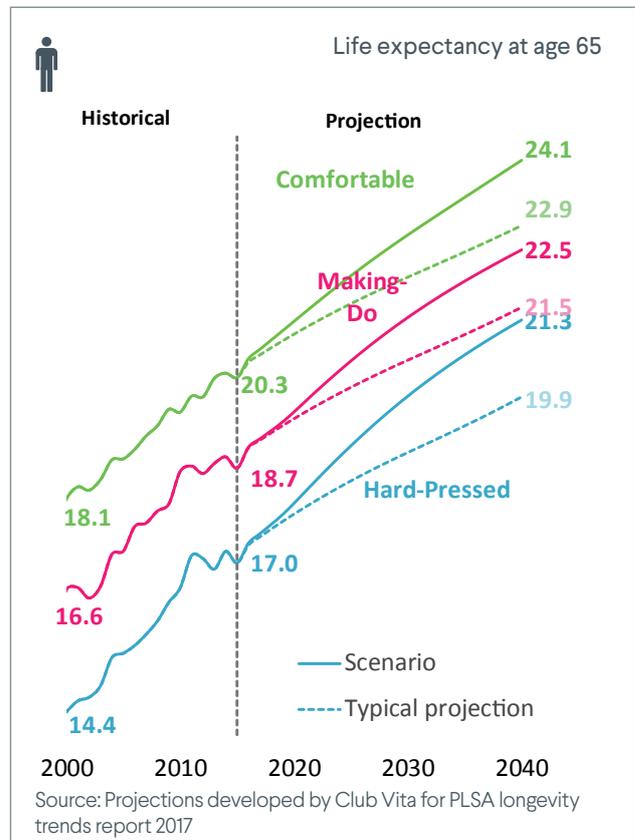
This 'health cascade' is reflected in this scenario. In the immediate short term the pace of longevity improvements is highest for the Comfortable group leading to continued divergence in life expectancy. Over the course of the next 5-10 years the pattern reverts to convergence as the effects of austerity wanes and the 'cascading' effect of lifestyle factors such as smoking cessation work through the Hard-Pressed and Making-Do groups.

We also reflect that, longer term, new medical therapies / behavioural changes are likely to be accessed by the Comfortable group, leading to a slightly faster reduction in their mortality and so ultimately a return to divergence in life expectancy.

## Impact on our example schemes

Mature, lower socio-economics	<b>1.7%</b>
Broadly typical (consumer services / cyclical / also local government schemes)	<b>1.9%</b>
Broadly typical (technology / pharma / skilled engineering)	<b>2.2%</b>
Higher socio-economics	<b>2.2%</b>

Central(ish) scenario



Note: Typical projection is CMI 2015 with 1.5% long term rate. Earlier versions of CMI model give higher projections whilst CMI 2016 gives lower projections than this typical projection.

# L1: Back to the 50s

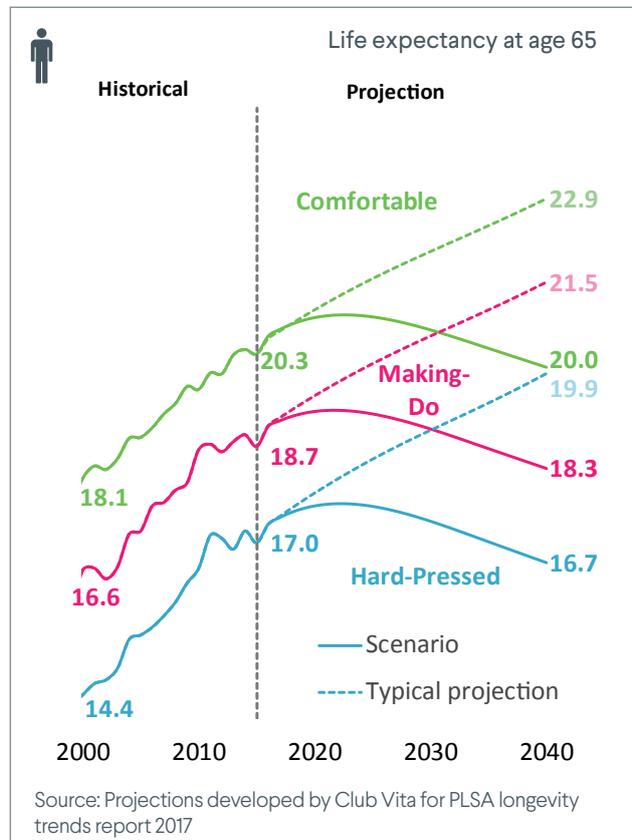
One of the great success stories of the 20th century was the rapid improvement in health outcomes and commensurate rise in life expectancy.

With modern medicine and technology advances we are naturally inclined to assume life expectancy will continue to rise. However this has not always been the case. We also see several examples internationally of how political change can lead to dramatic changes in life expectancy, for example Russia post-Glasnost.

For this scenario we have assumed that mortality rates will rise in the future (and so life expectancy will fall), and that this will happen very soon e.g. by the end of this decade.

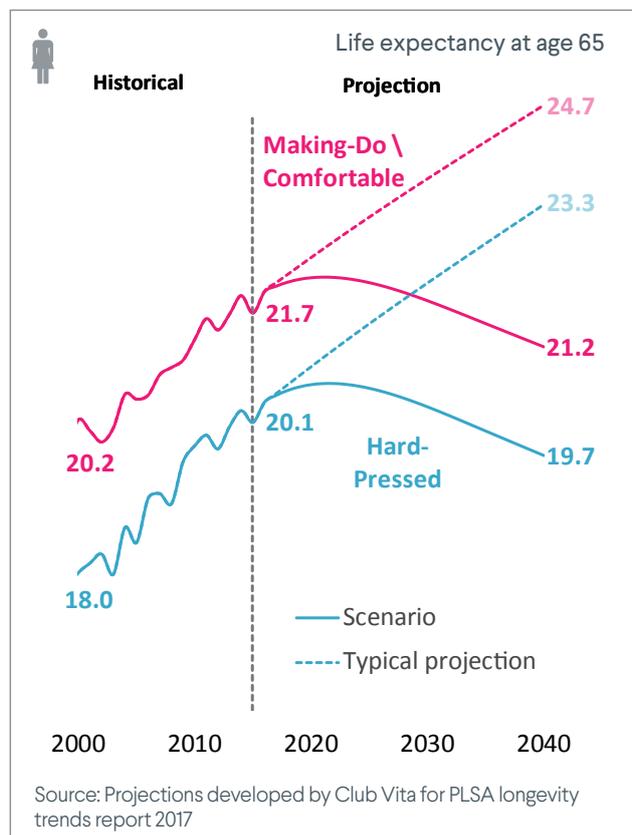
Given the dramatic changes involved in this scenario we do not offer a very specific narrative. However it could involve a combination of a number of societal and health changes, possibly including widespread antibiotic resistance, obesity, severe austerity impacting the NHS (possibly to point of dissolution), severe resource constraints (oil and rare earth metals) impacting heating / access to imported fruit and veg / medical equipment.

## Lower trend scenario



## Impact on our example schemes

Mature, lower socio-economics	<b>-14.5%</b>
Broadly typical (consumer services / cyclical / also local government schemes)	<b>-17.7%</b>
Broadly typical (technology / pharma / skilled engineering)	<b>-16.2%</b>
Higher socio-economics	<b>-16.7%</b>



Note: Typical projection is CMI 2015 with 1.5% long term rate. Earlier versions of CMI model give higher projections whilst CMI 2016 gives lower projections than this typical projection.

# L2: Challenging Times

In this scenario we consider the implications of climate change and finite resources, for example, fossil fuels. We consider the possibility that we have reached 'peak oil flow' and that the availability of oil will become a constraint to economies in the future. A consequence of this could be increasing fuel prices, leading to severe constraints in NHS funding. Alongside this, reduced access / increased cost of imported food stocks could have a detrimental impact on health outcomes through for example, greater difficulty in maintaining healthy fruit and vegetable rich diets throughout the year.

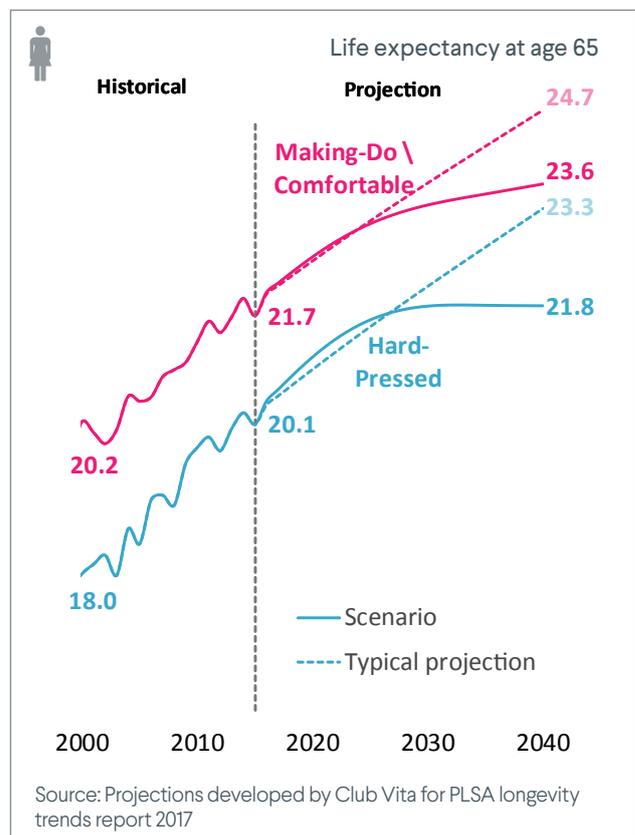
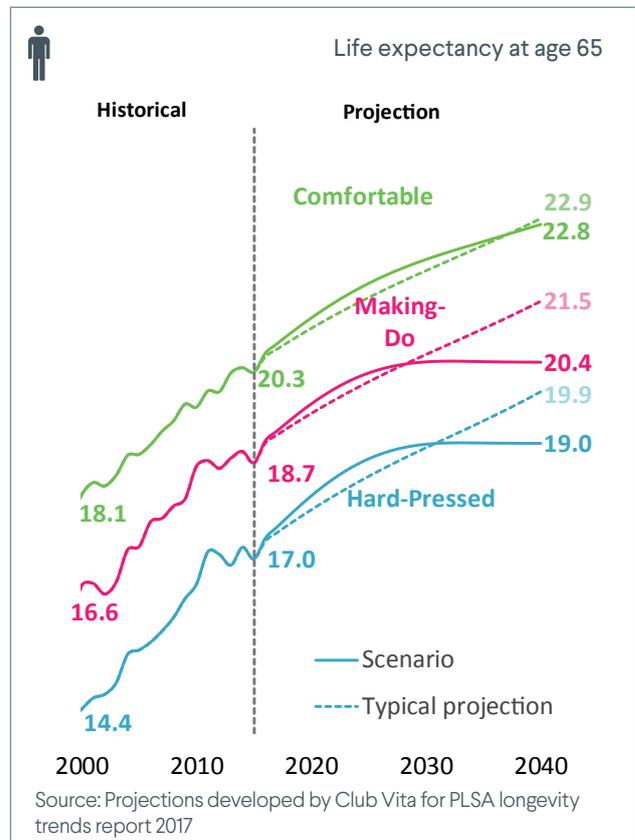
We reflect this by assuming that a significant proportion of the Hard-Pressed and Making-Do groups are unable to afford or access their basic needs (heating, fuel, medicine) and that this leads to life expectancy ceasing to improve. In contrast we assume that resource constraint impacts are less severe on average for the Comfortable group, meaning that this scenario leads to longevity improvements that are below the long-term trend, but above zero for this group.

Whilst this scenario focusses on the longevity outcome, were the circumstances described to come to pass then there is likely to be material impacts on a pension scheme's investments and the outlook for gilt yields. This is a scenario that schemes may wish to use in combination with stressing their investment assumptions.

## Impact on our example schemes

Mature, lower socio-economics	<b>-6.0%</b>
Broadly typical (consumer services / cyclical / also local government schemes)	<b>-7.4%</b>
Broadly typical (technology / pharma / skilled engineering)	<b>-5.9%</b>
Higher socio-economics	<b>-5.9%</b>

Lower trend scenario



Note: Typical projection is CMI 2015 with 1.5% long term rate. Earlier versions of CMI model give higher projections whilst CMI 2016 gives lower projections than this typical projection.

# H1: Cancer Revolution

When projecting mortality improvements using scenarios, a common suggestion involves a significant cause of death (typically, but not always, cancer) being eradicated.

Very broadly speaking, in the UK population as a whole, cancer accounts for around 20% of deaths below age 55, 40% between ages 55 and 79 and 25% at age 80 and above (which we assume are the same for each of the Comfortable, Making-Do and Hard-Pressed groups).

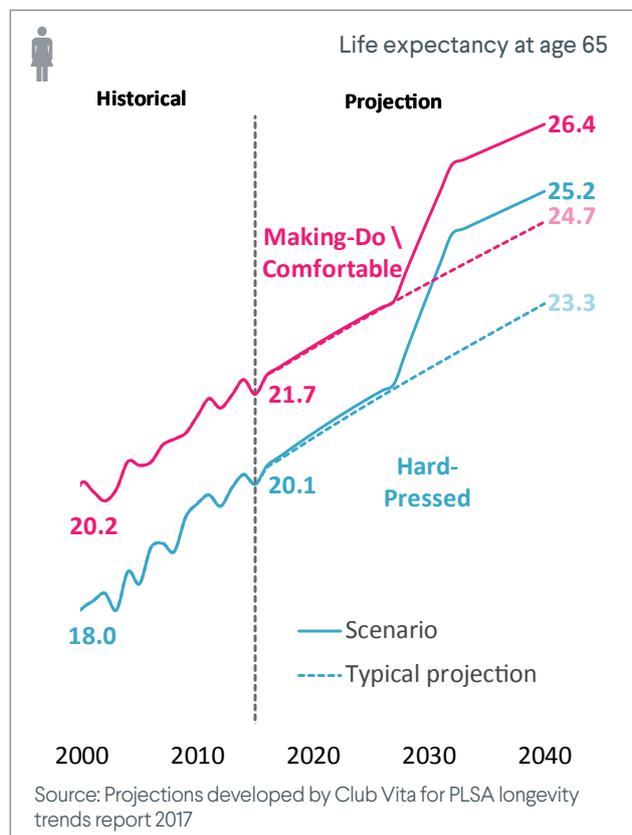
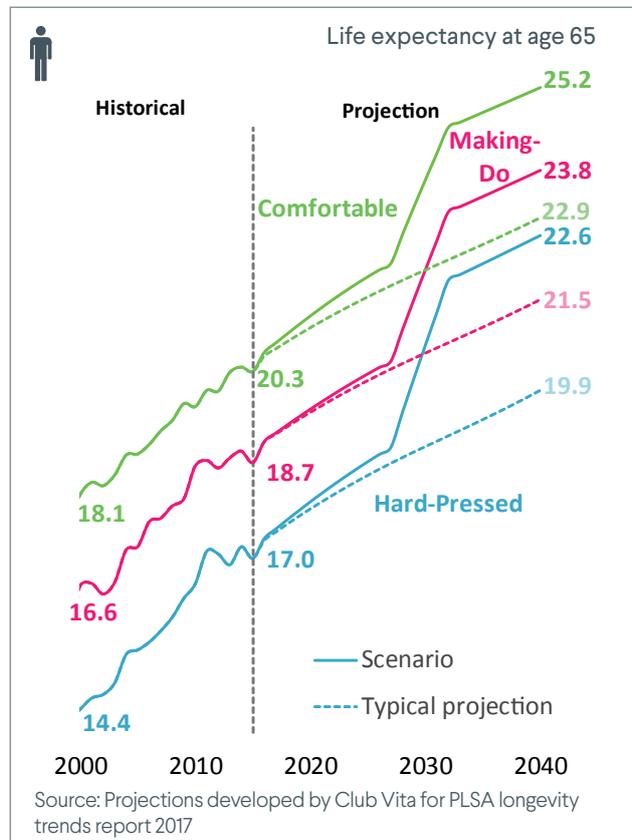
In this scenario, we allow for the lead time for drug testing and approval – and so assume that a ‘cure for cancer’ becomes available in ten years’ time, with full uptake five years thereafter (2032).

Older individuals are more likely to have multiple diseases – put rather grimly if we eliminate cancer then you would ultimately die of something else. Consequently, we have assumed that, whilst cancer is eradicated as a cause of death, the reduction in mortality is less than implied by the percentages above because some people who would previously have died of cancer die of another cause relatively soon afterward. We have also assumed that the long-term rate of improvement ‘post-cancer’ is slightly lower than it would have been ‘pre-cancer’, as part of the previously assumed long term rate is likely to have been driven by some gradual reductions in cancer.

## Impact on our example schemes

Mature, lower socio-economics	<b>5.8%</b>
Broadly typical (consumer services / cyclical / also local government schemes)	<b>5.7%</b>
Broadly typical (technology / pharma / skilled engineering)	<b>5.4%</b>
Higher socio-economics	<b>5.3%</b>

### Higher trend scenario



Note: Typical projection is CMI 2015 with 1.5% long term rate. Earlier versions of CMI model give higher projections whilst CMI 2016 gives lower projections than this typical projection.

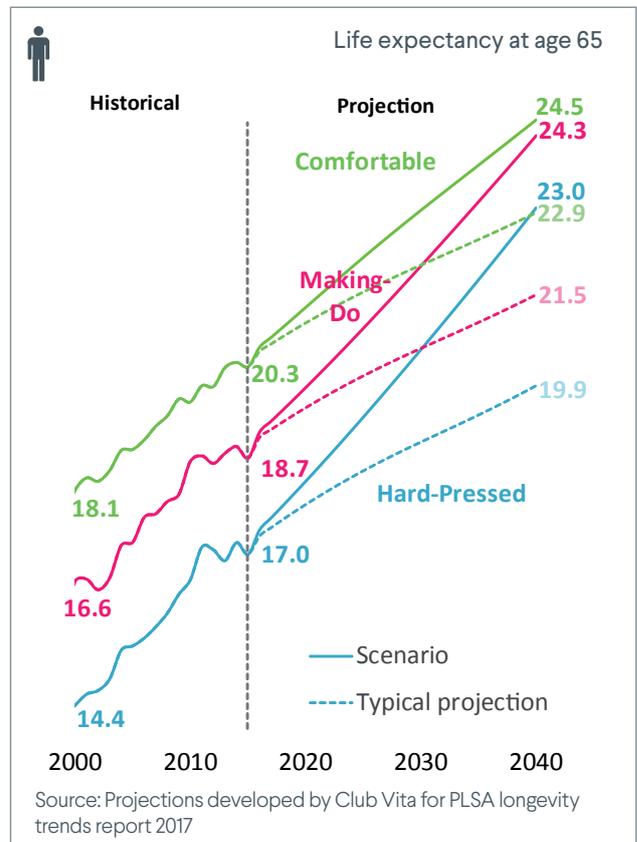
# H2: Extended Youth

The 2000s saw a decade of strong improvements in life expectancy across all of the socio-economic groups, with the Hard-Pressed narrowing the longevity gap on the 'comfortable' by 0.6 years.

In this scenario we consider the possibility that the low improvements seen in the 2010s thus far are a 'blip' and that some combination of factors will lead to the improvements seen between 2000 and 2010 being sustainable over the longer term.

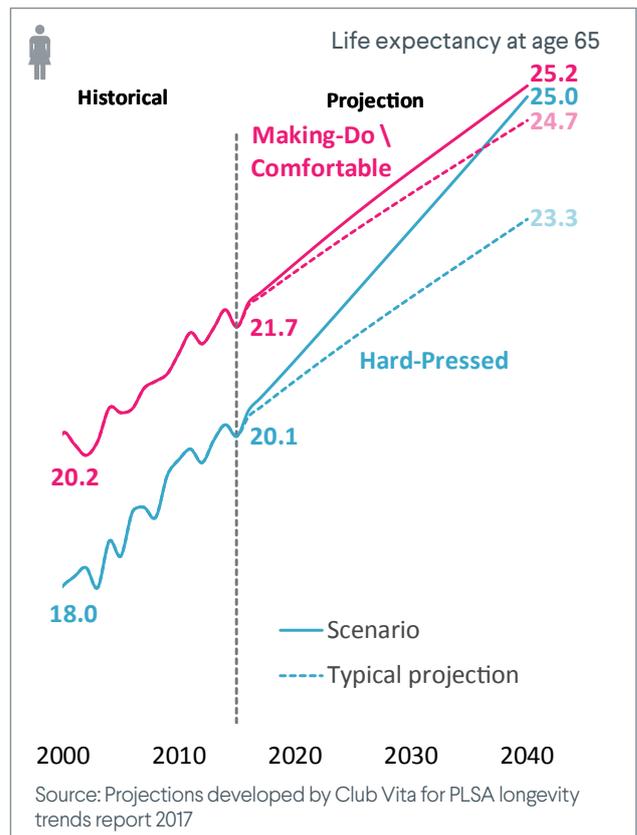
Just as it would have been hard to predict the last 40 years of strong improvements back in 1970 - let alone the catalysts - we do not offer a very specific narrative for this scenario; however possible contributory factors could be a combination of highly successful screening programs, poly-pills, smart pills aimed to improve drug adherence, ageing medicine breakthroughs increasing survivorship from the multiple diseases of later life, increased later life activity and exercise and reduced obesity.

Higher trend scenario



## Impact on our example schemes

Mature, lower socio-economics	10.1%
Broadly typical (consumer services / cyclical / also local government schemes)	9.4%
Broadly typical (technology / pharma / skilled engineering)	7.4%
Higher socio-economics	6.5%



Note: Typical projection is CMI 2015 with 1.5% long term rate. Earlier versions of CMI model give higher projections whilst CMI 2016 gives lower projections than this typical projection.

# 8. Using the PLSA longevity trends model

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The PLSA longevity trends model has been built with our members in mind. All pension schemes should hold the pension amount and postcode information needed to assign members to the Comfortable, Making-Do and Hard-Pressed' groups. Details of the deprivation group for each postcode can be downloaded directly from the Club Vita website without any need to be a member of Club Vita. The Case Study "**Using the longevity trends model**" on the following page illustrates this process.

When we first published the model we encouraged all schemes to discuss their longevity trend assumptions with their advisers in light of the findings of our research. We believe this remains the case and when doing so it may be useful for trustees/pension managers to have the following questions in mind:

1. What starting point is being used for the longevity trend assumption? Is the starting point based on the national (England & Wales) population information or has it been adjusted for DB pensioner experience?
2. How much of my pension scheme liabilities are concentrated in the Comfortable group of pensioners?
3. If we were to use the longevity groups set out in the PLSA longevity trends model, what would be the impact on scheme liabilities?
4. How would our funding and investment strategies change if longevity trends developed in line with one of the longevity scenarios?

The first edition of the model was very well received by PLSA members and the wider pensions industry. Many pension schemes have embraced these insights and have integrated these into the way they look at longevity trends. Our second case study "**Informed decision making using the longevity trends model Scenarios**" draws on how schemes are using the longevity scenarios to inform their decision making.

## Case Study 1: Using the longevity trends model

A pension scheme only needs a small amount of easily accessible data to begin making use of the longevity trends model; namely the sex, pension amount and postcode of each member.

Member	Sex	Pension	Postcode
A	M	£8,000	XY12 4FG
B	F	£2,500	XY11 6TF
c	M	£1,250	XY5 9RS
...	...	...	...

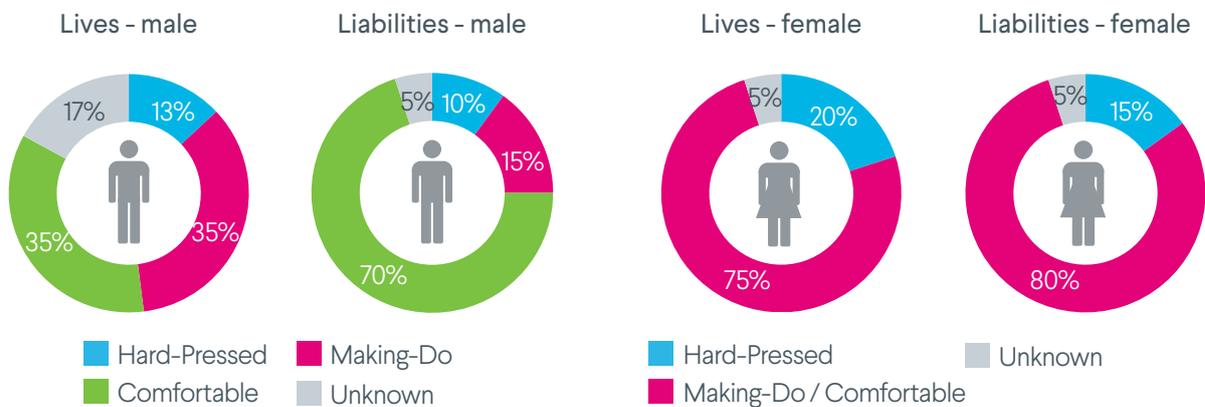
The postcode is needed to identify the deprivation of the area where the member lives. As part of determining the groupings Club Vita produced a deprivation index which is directly comparable across the UK – merging the individual indices for England, Scotland, Wales and Northern Ireland. This information is available to download from the Club Vita website<sup>24</sup>.

The pension is needed for men – and should be rebased to 1 January 2010 to allow for inflation.

Using just these two bits of information any pension scheme can identify whether a member belongs to Comfortable, Making-Do or Hard-Pressed groups. (For those schemes in Club Vita they will do this automatically for you.)

Once you have this information you can use it to establish how your membership is split between each group – noting that it is much more relevant to measure the breakdown of your members by liability amount (or pension amount as a proxy for this) rather than on a headcount basis. An example is shown below.

For this scheme it is clear that the vast majority of the liabilities are concentrated in the Comfortable group.



## Case Study 2: Informed decision making using the longevity trends model Scenarios

In managing their liabilities schemes will have spent many hours exploring the volatility of asset values and the impact of that volatility on their ability to pay benefits in full to members. But how often have schemes applied the same focus to longevity?

The longevity trends model allows schemes to explore the outcomes if longevity does not follow the path set by their existing assumption. By virtue of the scenarios being presented as 'real world narratives' a picture is painted of a possible scenario and its impact on longevity enabling all parties to engage with the scenarios.

There are a number of different ways that schemes have been using these scenarios to inform their decision making but they all start with the scheme taking a broad view on how likely, or unlikely, they feel each outcome is.

Example view of scenarios taken by a scheme

Likely	Plausible but unlikely	Unlikely
Low for longer	Cancer revolution	Extended youth
Alzheimer's & Dementia wave		
Health cascade		

Starting with these views a scheme might (in order of trustee decision making, rather than importance)...

### 1 Sense test funding assumptions

How does your current assumption for how longevity will change compare to the range of outcomes you feel is likely?

If it is at the top of the range you might be comfortable that you are funding using prudent principles.

By contrast, if your assumption is at the bottom of the range then this could suggest that some strengthening may be required.

### 2 Investigate the resilience of their funding plans

Setting an assumption for future longevity changes is a highly subjective exercise, and actual longevity experience will turn out to be different. Given this some schemes like to test the resilience of their funding plan to alternate scenarios for future longevity – particularly where there is a concentration of liabilities within certain socio-economic groups.

If the plan is resilient under the range of likely scenarios then this can provide comfort. Where it is not then tweaks to the funding and risk management plan of the scheme can be investigated.

### 3 Sense test investment decisions

Many schemes adopt liability-driven investment (LDI) strategies. These are based upon holding assets which broadly track any changes in the schemes liabilities and are usually constructed from an understanding of the projected cashflows for the scheme.

These cashflows are based on one particular projection for future longevity. By comparing cashflows under alternative scenarios that the scheme views as likely, schemes can appreciate the sensitivities in their LDI strategy and whether it is appropriate to de-risk longevity.

### 4 Assess the value of longevity de-risking

Increasingly schemes are looking to bring more certainty to their funding and investment strategies. For many this can involve buy-ins for some of the members, or entering into longevity swaps to provide greater certainty to the cashflows they are managing against. These actions come with a cost though – a premium is paid to an insurer to provide this certainty. By comparing what you are being charged against the assumptions you believe are plausible, you can assess whether the insurance represents good value for the risk it is removing.

# Want to read more

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This paper is intended as a high level summary of the results of our collaborative research into longevity trends. If you want to know more, including much of the technical detail of the research that we have carried out, you can find this at:

- [www.plsa.co.uk/longevity-model](http://www.plsa.co.uk/longevity-model)
- [www.clubvita.co.uk/Home/LongevityResources](http://www.clubvita.co.uk/Home/LongevityResources)

**These sites include a range of additional documentation and supporting information including:**

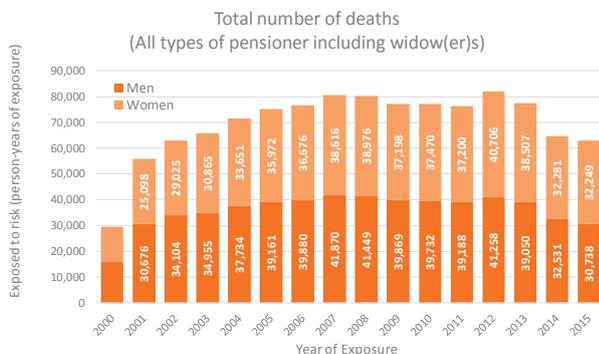
- *'A guide to the PLSA longevity trends model Scenarios': This provides additional information on how we have calibrated the eight scenarios shown here, including the information necessary for your actuarial advisor to replicate these*
- *Frequently asked questions: This provides a summary of the questions we are most commonly asked about the research*
- *Deprivation quintiles: A file enabling you to look up the deprivation quintile applicable to your pension scheme's membership via their postcodes*
- *Technical Document: Produced to accompany our original research report this document sets out the details of the research we have carried out and is written with an informed audience in mind.*

# Appendix A

## The data underpinning the research

All analysis contained within this paper is based on Club Vita's data set as processed at February 2017. This dataset is collated from over 200 occupational DB pension schemes and tracks over 2.5 million pensioners across a wide range of occupations and throughout the UK.

The charts below summarise the total number of pensioners/dependants and deaths (respectively) found within the Club Vita dataset, over the period studied.

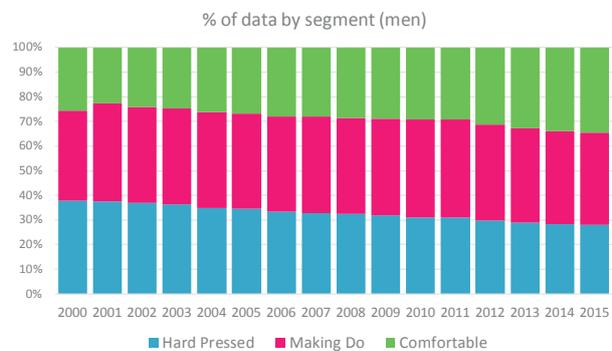


Pensioner numbers vary from year to year, owing to the composition of schemes within the data evolving over time. For example some schemes are able to supply data covering historical membership movements and deaths back into the early 1990s. Others have undergone changes in administration systems which mean that the important records of historical deaths are only available for more recent years.

Club Vita applies a number of quality checks to the data it collects. As a consequence, not all of the data shown above is able to be used in the analysis presented in this paper – for example there may be concerns with the

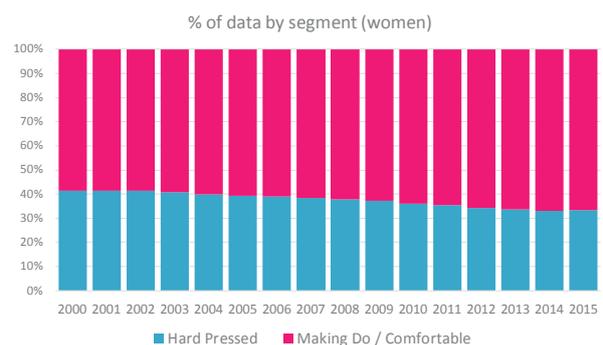
reliability of the pension and postcode fields, or in some cases schemes may be from industries with very specific health circumstances and so would prevent the analysis from being representative if included. We use over 65% of the data shown above in the analysis used here.

Given the filtering applied to the data, and the potential for some schemes to only contribute for part of the period under question it is important to verify the balance of socio-economic mix over the period. The charts below show the split of our data across the VitaSegments:



Broadly speaking, data coverage for men is split fairly evenly across the three VitaSegments, with a slight drift towards Comfortable group. Over time this drift is to be expected – partly owing to the greater opportunities to have accrued sufficient service for a high pension amongst more recent retirees, and partly owing to the 'survivorship' bias whereby the Comfortable men tend to be longer lived.

For women, we see approximately 60% of the data in the Making-Do/Comfortable group and 40% in Hard-ressed. Again there is some drift over time.



**PENSIONS AND  
LIFETIME SAVINGS  
ASSOCIATION**

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Disclaimer: The material included in this publication is not intended to be advice on any specific matter. While every effort has been made to ensure the accuracy of the information in this report, the Pensions and Lifetime Savings Association and Club Vita LLP accept no liability or responsibility for inaccuracies that may appear.

June 2017