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1 Executive summary

This report contains our recommendations for the best estimate assumptions to be set by Scottish Ministers for the 31 March 2017 valuation of the Local Government Pension Scheme (Scotland).

- 1.1 An actuarial valuation of the Local Government Pension Scheme (Scotland) ('the Scheme') is being undertaken as at 31 March 2017. The Public Service Pension (Valuation and Employer Cost Cap) Directions 2014 as amended ('the Directions') require that, unless specified otherwise¹, the assumptions to be adopted for this valuation will be set by Scottish Ministers, having obtained advice from the scheme actuary. Direction 19(c) requires the assumptions to be Scottish Ministers' best estimates.
- 1.2 GAD is the appointed scheme actuary to the Scheme. This report sets out GAD's formal advice to Scottish Ministers on the actuarial assumptions to be adopted where these are not otherwise specified. The advice covers the assumptions to be set by Scottish Ministers. The main advised assumptions are summarised in Table 1 with further detail in Appendix A. This report was provided to SPPA and the SAB in draft form in October 2018. SPPA has already confirmed to GAD, having consulted with relevant stakeholders, that the actuarial assumptions to be adopted for the valuation should be those set out in this report.
- 1.3 The 2017 valuation is currently paused, following the Court of Appeal judgment that found the transitional protections provided to firefighters and members of the Judiciary give rise to unlawful age discrimination. Government has confirmed that they expect that the difference in treatment will also need to be remedied for LGPS S, and other public service pension schemes². However, the form of remedy is unclear at this stage. Once the implications of this judgement are clear we will consider if there is any reason to update this advice on assumptions.
- 1.4 This report relates to demographic assumptions i.e. assumptions about member behaviours. When considering appropriate assumptions, experience, both recent and longer term, generally provides the most reliable evidence when considering best estimates of future experience. Anticipated future events may also influence how assumptions are set. This advice sets out relevant analysis of recent experience and indicates which other factors have been considered in deriving recommendations of best estimate assumptions.
- 1.5 The previous completed actuarial valuation of the Local Government Pension Scheme (Scotland) was carried out as at 31 March 2014. Some of the assumptions put forward in this report are the same as those adopted for that valuation. The most significant changes are:

¹ Certain assumptions are specified in the Directions.

² <https://www.parliament.uk/business/publications/written-questions-answers-statements/written-statement/Commons/2019-07-15/HCWS1725/>



- Increases to mortality rates for pensioners and dependents (which will reduce assumed life expectancies), based on the experience of the scheme in 2014-17³
- Reductions to death in service assumptions, based on the experience of the scheme in 2014-17
- Changes to assumptions about the proportion of members who are married or partnered at death, reflecting ONS statistics in the absence of credible scheme data
- A reduction in the assumed age gap between Women members and their surviving partners, based on the experience of the scheme in 2014-17

1.6 The following chapters and appendices provide more detail on the advice, supporting analysis and an indication of the magnitude of the financial impact of each assumption on valuation results. They also contain important background information about the context of this advice and its limitations.

1.7 Where the Scheme membership data is not sufficient for the scheme actuary to carry out a robust analysis of that aspect, the Directions require the report to include a statement to that effect. Some of the movements data provided was not considered sufficiently reliable to form a basis for setting assumptions, in particular:

- Age retirement
- Withdrawal
- Proportion married or partnered

In these cases, we have proposed assumptions based on the assumptions set for previous valuations and/or relevant data from other sources.

1.8 This work has been carried out in accordance with the applicable Technical Actuarial Standards: TAS 100 and TAS 300 issued by the Financial Reporting Council (FRC). The FRC sets technical standards for actuarial work in the UK.

³ This relates to the assumed current 'baseline' mortality rates. As directed by HMT, future improvements in mortality assumed to be in line with those underlying the most recent ONS population projections.

Table 1: Summary of recommended assumptions consistent with the 'best estimate' requirement

Assumption	Summary of recommended assumptions	Rationale for recommendation	Approximate magnitude of financial impact on Employer Cost Cap Cost of the Scheme
			% Pensionable pay
Pensioner baseline mortality⁴	Aligned to standard SAPS table ^{5,6}		
Normal health	Males: 122% of S2NMA Females: 117% of S2NFA	Average of assumption based on experience data and 2014 assumption to smooth volatility	-0.2%
Ill-health	Males: 137% of S2IMA Females: 131% of S2IFA	Average of assumption based on experience data and 2014 assumption to smooth volatility	
Dependants	Males: 159% of S2NMA Females: 131% of S2DFA	Reconciliation of the data was poor and so alternative approaches adopted. For women we used the 2014 dependant mortality assumptions, increased in line with the change in the normal health mortality assumptions between the 2014 and 2017 valuation assumptions. For men we used the 2017 normal health mortality assumption, adjusted for the difference between dependant and normal health mortality for LGPS E&W 2016 valuation.	

⁴ As directed by HMT, future improvements in mortality assumed to be in line with those underlying the most recent ONS population projections. The financial impact shown relates only to the change in baseline mortality.

⁵ SAPS tables are published by the Actuarial Profession and are based on the experience of self-administered pension schemes from 2004 to 2011. The S2 series has separate standard tables based on experience of members retiring in normal health (S2NXA), in ill health (S2IXA) and for widows (S2DFA).

⁶ Adjusted to take account of improvements in population mortality between the base year for the tables and the date the future improvements are applied from.

Assumption	Summary of recommended assumptions	Rationale for recommendation	Approximate magnitude of financial impact on Employer Cost Cap Cost of the Scheme
			% Pensionable pay
Age retirement	Retain 2014 assumption (e.g.7% per year retire at ages 60-64 for CRA ⁷ 65)	Unchanged from 2014 assumption as no reliable evidence to suggest the existing assumption is inappropriate	No change in assumption
Ill-health retirement			
Incidence	Men: 0.29% at age 50 roughly doubling every five years up to 65. Women: 0.22% at age 50, increasing to 1.7% at age 65 Rates are zero above NPA	Unchanged from 2014 assumption, and in line with 2014-2017 scheme experience.	No change in assumption
Upper/lower tier split	70% tier1, 30% tier 2.	Unchanged from 2014 assumption, and in line with 2014-2017 scheme experience.	No change in assumption
Withdrawal	Men: 2.9% per year at age 40, decreasing to 0.9% at age 65 Women: 3.8% withdraw per year at age 40 decreasing to 2.0% at ages 55 and above	Unchanged from 2014 assumption as no reliable evidence to suggest the existing assumption is inappropriate	No change in assumption
Death before retirement	Increasing with age, around 0.2%(M)/0.1%(F) a year close to age 50	Average of assumption based on experience data and 2014 assumption to smooth volatility	Immaterial
Promotional salary scale	Unisex age-related promotional increase rates: 1.7% pa at age 30, 0.3% pa at age 45, 0% pa at age 60.	As adopted for the 2014 valuation. The data indicates significantly faster increases than assumptions, however the period is considered to be atypical.	No change in assumption

⁷ Under the rule of 85, some members are able to take unreduced benefits prior to normal pension age (NPA). The age at which this applies is known as Critical Retirement Age (CRA)

Assumption	Summary of recommended assumptions	Rationale for recommendation	Approximate magnitude of financial impact on Employer Cost Cap Cost of the Scheme
			% Pensionable pay
Commutation	Members commute 10% of their pre-09 pension in addition to their automatic lump sum.	Unchanged from 2014 assumption, as no firm evidence to suggest different assumption would be more appropriate	No change in assumption
Family statistics			
Proportion married/partnered	Age dependent: 80%(M)/75%(F) at retirement (consistent assumptions for existing pensioners)	Lack of credible data, so aligned with ONS population statistics.	-0.2%
Age difference	Male member 3 years older than partner Female 2 years younger than partner	Based on experience data	Immaterial
Remarriage	No allowance	Simplification on grounds of materiality	No change in assumption

Table 1: Summary of recommended assumptions consistent with the 'best estimate' requirement

Assumption	Summary of recommended assumptions	Rationale for recommendation	Approximate magnitude of financial impact on Employer Cost Cap Cost of the Scheme
			% Pensionable pay
Pensioner baseline mortality⁸	Aligned to standard SAPS table ^{9,10}		
Normal health	Males: 122% of S2NMA Females: 117% of S2NFA	Average of assumption based on experience data and 2014 assumption to smooth volatility	-0.2%
Ill-health	Males: 137% of S2IMA Females: 131% of S2IFA	Average of assumption based on experience data and 2014 assumption to smooth volatility	
Dependants	Males: 159% of S2NMA Females: 131% of S2DFA	Reconciliation of the data was poor and so alternative approaches adopted. For women we used the 2014 dependant mortality assumptions, increased in line with the change in the normal health mortality assumptions between the 2014 and 2017 valuation assumptions. For men we used the 2017 normal health mortality assumption, adjusted for the difference between dependant and normal health mortality for LGPS E&W 2016 valuation.	

⁸ As directed by HMT, future improvements in mortality assumed to be in line with those underlying the most recent ONS population projections. The financial impact shown relates only to the change in baseline mortality.

⁹ SAPS tables are published by the Actuarial Profession and are based on the experience of self-administered pension schemes from 2004 to 2011. The S2 series has separate standard tables based on experience of members retiring in normal health (S2NXA), in ill health (S2IXA) and for widows (S2DFA).

¹⁰ Adjusted to take account of improvements in population mortality between the base year for the tables and the date the future improvements are applied from.

Assumption	Summary of recommended assumptions	Rationale for recommendation	Approximate magnitude of financial impact on Employer Cost Cap Cost of the Scheme
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Age retirement	Retain 2014 assumption (e.g.7% per year retire at ages 60-64 for CRA ¹¹ 65)	Unchanged from 2014 assumption as no reliable evidence to suggest the existing assumption is inappropriate	No change in assumption
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Incidence	Men: 0.29% at age 50 roughly doubling every five years up to 65. Women: 0.22% at age 50, increasing to 1.7% at age 65 Rates are zero above NPA	Unchanged from 2014 assumption, and in line with 2014-2017 scheme experience.	No change in assumption
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Death before retirement	Increasing with age, around 0.2%(M)/0.1%(F) a year close to age 50	Average of assumption based on experience data and 2014 assumption to smooth volatility	Immaterial
Promotional salary scale	Unisex age-related promotional increase rates: 1.7% pa at age 30, 0.3% pa at age 45, 0% pa at age 60.	As adopted for the 2014 valuation. The data indicates significantly faster increases than assumptions, however the period is considered to be atypical.	No change in assumption

¹¹ Under the rule of 85, some members are able to take unreduced benefits prior to normal pension age (NPA). The age at which this applies is known as Critical Retirement Age (CRA)

Assumption	Summary of recommended assumptions	Rationale for recommendation	Approximate magnitude of financial impact on Employer Cost Cap Cost of the Scheme
			% Pensionable pay
Commutation	Members commute 10% of their pre-09 pension in addition to their automatic lump sum.	Unchanged from 2014 assumption, as no firm evidence to suggest different assumption would be more appropriate	No change in assumption
Family statistics			
Proportion married/partnered	Age dependent: 80%(M)/75%(F) at retirement (consistent assumptions for existing pensioners)	Lack of credible data, so aligned with ONS population statistics.	-0.2%
Age difference	Male member 3 years older than partner Female 2 years younger than partner	Based on experience data	Immaterial
Remarriage	No allowance	Simplification on grounds of materiality	No change in assumption



2 Introduction

This report contains our advice to Scottish Ministers but will be of interest to other parties who should note the limitations.

- 2.1 An actuarial valuation of the Local Government Pension Scheme (Scotland) ('LGPS S' or 'the Scheme') is being undertaken as at 31 March 2017. The Public Service Pensions (Valuations and Employer Cost Cap) Directions 2014 as amended ('the Directions') require that, unless specified otherwise¹², the demographic actuarial assumptions to be adopted for this valuation are the responsibility of Scottish Ministers, having taken advice from the scheme actuary. Direction 19(c) requires the assumptions to be Scottish Ministers' best estimates.
- 2.2 GAD is the appointed scheme actuary to the Scheme. This report is addressed to the Scottish Public Pensions Agency (SPPA) and contains our formal advice on the appropriate assumptions to be adopted for the 2017 valuation, as required by the Directions. The purpose of this advice is to enable Scottish Ministers to determine the required best estimate assumptions.
- 2.3 The advice covers the main assumptions to be set by the Scottish Ministers. In particular, we consider the following sets of demographic assumptions in this report:
- Pensioner mortality
 - Age retirement from service
 - Ill-health retirement from service
 - Voluntary withdrawal from service
 - Death before retirement
 - Promotional pay progression
 - Commutation of pension for cash at retirement
 - Family statistics

Appendix B includes other calculation assumptions as required to complete the valuation, Appendix C discusses assumptions made to deal with data uncertainties and Appendix D gives information on the sensitivity of the valuation results to assumptions set by Scottish Ministers.

- 2.4 It should be noted that the assumptions set out in this report are not the same as those used locally to set employer contributions to the Scheme. Employer contributions are set locally, based on local actuarial advice, and the assumptions made vary between local funds.
- 2.5 This report was provided to SPPA in December 2018. Scottish Ministers consulted with the LGPS S Pension Scheme SAB ('SAB') in accordance with direction 19(b) and based on the draft report.

¹² Certain assumptions are specified in the Directions.



- 2.6 SPPA has already confirmed to GAD, having consulted with relevant stakeholders, that the actuarial assumptions to be adopted for the valuation should be those set out in this report.
- 2.7 Local fund administrators supplied data on the experience of the scheme membership over the three-year period to 31 March 2017. We have used this data to analyse the Scheme's experience in order to develop our advice on the assumptions. Our report, *LGPS S Actuarial Valuation at 31 March 2017: Report on valuation data*, also finalised today, provides information about this data and should be read in conjunction with this advice. The report includes details of the checks carried out on the data, the amendments made to the data and any residual concerns about the quality of the data. In preparing our advice, we have relied upon the general completeness and accuracy of the data provided.
- 2.8 When considering appropriate assumptions, experience, both recent and longer term, generally provides the most reliable evidence when considering best estimates of future experience. Anticipated future events may also influence how assumptions are set. This advice sets out relevant analysis of recent experience and indicates which other factors have been considered in deriving recommendations of best estimate assumptions. Scottish Ministers should consider whether there is any reason why this approach would be inappropriate.
- 2.9 We are content for SPPA to release this report to third parties, provided :
- it is released in full
 - the advice is not quoted selectively or partially
 - GAD is identified as the source of the report, and
 - GAD is notified of such release.
- 2.10 Third parties whose interests may differ from those of Scottish Ministers should be encouraged to seek their own actuarial advice where appropriate. Other than to Scottish Ministers, GAD has no liability to any person or third party for any act or omission taken, either in whole or in part, on the basis of this report.



3 General considerations

This chapter sets out a number of general considerations common to the setting of the different assumptions considered in this report.

- 3.1 The key considerations taken into account in formulating the advice in this report are explained in this section.

Directions

- 3.2 The advice in this report reflects the requirements of the Directions issued by HM Treasury that assumptions should be set as Scottish Ministers' 'best estimates' of future experience and should contain no margin for prudence or optimism. They should be set having regard to:

- assumptions set for previous valuations
- analysis of demographic experience in the period up to the valuation date
- historic long-term trends and emerging evidence which may illustrate long-term trends in the future
- relevant data from any other sources.

Different populations

- 3.3 The Directions require this actuarial valuation to cover both the scheme established under the Public Service Pensions Act 2013 ('2015 Scheme') and the previous pension schemes for local government workers ('Earlier Schemes'). Assumptions appropriate to both the 2015 Scheme and the Earlier Schemes are required for the valuation. The Directions also require assessment of benefit accrual costs over the implementation period¹³ (as defined in the Directions). This requires assumptions about anticipated member behaviour and characteristics during 2020 - 2023 as well as assumptions about member behaviour and characteristics in the longer term.
- 3.4 There are currently 3 distinct groups of members.
- Existing members with membership accrued in the Earlier Schemes for whom the 'Rule of 85' continues to apply for service up to retirement. The introduction of the 2015 Scheme is not expected to have any impact on this group's behaviour.
 - New members to the 2015 scheme. These members' retirement behaviours are expected to be heavily influenced by the provisions of the 2015 Scheme.

¹³ 1 April 2020 to 31 March 2023



- Members who have both service before 1 April 2015 and service after 1 April 2015 without 'rule of 85' protection. Behaviour is likely to be influenced by the provisions of the Earlier Schemes. Over time, as the proportion of 2015 Scheme service increases, the behaviour is expected to become increasingly influenced by the provisions of that scheme.
- 3.5 Where relevant we indicate in each of the following chapters the relative importance of each set of assumptions to each of the three groups of members identified above.

Relative importance of assumptions

- 3.6 The Directions require the valuation results to be estimated to the nearest 0.1% of pensionable payroll. This is a required level of accuracy for a particular calculation and based on a particular set of assumptions. Appendix D provides an indication of the sensitivity of the valuation results to the particular assumptions under consideration.



4 Pensioner Mortality

This chapter sets out our recommendation for the baseline pensioner mortality assumptions and summarises the analysis undertaken in order to inform that recommendation.

- 4.1 The assumptions we recommend for baseline pensioner mortality for the 2017 valuation may be summarised by reference to standard mortality tables as follows. The corresponding assumptions for the 2014 valuation are also shown.

Table 4.1: Recommended mortality assumptions

	2017 valuation	2014 valuation
Baseline mortality	Standard table ¹⁴ and adjustments	Standard table and adjustments
Males		
Retirements in normal health	122% of S2NMA	120% of S2NMA
Ill-health pensioners	137% of S2IMA	132% of S2IMA
Dependants	159% of S2NMA	130% of S2NMA
Females		
Retirements in normal health	117% of S2NFA	114% of S2NFA
Ill-health pensioners	131% of S2IFA	127% of S2IFA
Dependants	131% of S2DFA	128% of S2DFA

- 4.2 As specified by HM Treasury, future improvements in mortality will be assumed to be in line with those underlying the most recent ONS principal population projections for the UK, ONS 2016.

¹⁴ SAPS (S2) tables are published by the Actuarial Profession and based on the experience of self-administered pension schemes over the period 2004 to 2011. The 'S2' series has separate standard tables based on experience of members retiring in normal health (S2NXA) and in ill health (S2IXA) and for female dependants (S2DFA).



Comparison of expected pensioner longevity

4.3 Table 4.2, below, gives a comparison of the resulting life expectancies¹⁵ (allowing for future improvements) assumed and recommended for the 2014 and 2017 valuations. The middle column shows life expectancies on the 2014 base tables but with future improvements based on the ONS 2016 projections. This column is provided to illustrate the impact of the change in allowance for future improvements on expected life expectancy.

Table 4.2: Comparison of life expectancies (years) at the valuation date

Baseline:	2014 valuation	2014 valuation	2017 valuation
Future mortality improvements:	ONS 2012	ONS 2016	ONS 2016
Year of Use:	2014	2014	2017
Current pensioners			
Male aged 60	27.0	26.2	26.1
Male aged 65	22.2	21.4	21.3
Female aged 60	29.7	28.3	28.1
Female aged 65	24.8	23.4	23.3
Future pensioners* – current age 45			
Male life expectancy from age 60	28.7	27.7	27.6
Male life expectancy from age 65	24.3	23.3	23.2
Female life expectancy from age 60	31.3	29.8	29.6
Female life expectancy from age 65	26.9	25.3	25.1

*Year of use is the year of attaining age 60 or 65, respectively.

¹⁵ Cohort life expectancies based on the ages shown as at the valuation date, i.e. allowing for future mortality improvement.



4.4 Note that:

- The change to the assumptions about future improvements in life expectancy (set by the Directions) has a significant impact on expected future life expectancy (compare the 1st and 2nd columns above)
- The change to the base table (set by Scottish Ministers) has a minor impact on expected future life expectancy (compare the 2nd and 3rd columns above)

Use of the assumption

- 4.5 Pensioner mortality is a key valuation assumption and is a measure of how long members retiring in normal or ill-health, or their dependants, expect to live and receive benefits.

Analysis and setting the assumption

- 4.6 We have analysed the actual pensioner mortality experience over the three-year period to 31 March 2017 on an 'amounts' basis. An amounts basis weights the experience by the size of each member's pension. To derive an assumption, we have compared the actual total amounts of pension ceasing on death with that expected had the members' experience been in line with the mortality rates in the relevant current SAPS tables ('S2 tables'). The recommended assumption of baseline pensioner mortality is expressed by reference to suitable adjustments to the rates in the relevant S2 table ('the base table').
- 4.7 The three-year period ending on the valuation date showed significant volatility in mortality experience year on year. This is illustrated in Table 4.3 (for normal health only) below. The figures shown are the ratios of actual to expected death rates with expected rates based on the 2014 valuation assumptions, adjusted as appropriate for each period analysed. This analysis suggests that differing conclusions may have been drawn had the valuation date and inter-valuation period fallen differently. As assumptions are intended to reflect long term expectations it is reasonable to seek to smooth out the impact of these short-term effects. Our recommendation is that the short-term effects should be smoothed out by taking account of only 50% of the difference in experience since the 2014 valuation.



Table 4.3 – Variation in rates of death by scheme year

Year	Normal health males (Actual vs Expected based on 2014 assumption*)	Normal health females (Actual vs Expected based on 2014 assumption*)
2014-15	94.9%	100.8%
2015-16	111.3%	107.7%
2017-17	103.9%	106.2%
Overall	103.6%	105.0%

*2014 baseline with ONS-2014 improvements¹⁶

Results of analysis

- 4.8 Table 4.4 sets out the number of pensioner deaths and amount of pension ceasing over the intervaluation period. Figures are shown separately for males and females retiring in normal or ill-health and for dependants.
- 4.9 For ill-health deaths, we have based our analysis on over-56-year-olds only as data is less credible below that age. The figures for ill-health deaths in table 4.4 include over-56-year-olds only.

Table 4.4: Pensioner mortality experience 2014-17

Category	Number of Pensions ceasing due to death	Pension amount ceasing due to death £'000s (pa)	A/E* relative to the 2014 valuation assumption [†]
Normal Health:			
Males	4,589	30,896	103.6%
Females	3,704	12,460	105.0%
Ill Health:			
Males	2,126	11,570	107.6%
Females	1,609	6,150	107.1%

*A/E is actual amount of pension ceasing on death divided by that expected

[†] With ONS-2014 improvements in each case

¹⁶ The analysis was undertaken before the ONS 2016 projections became available. A similar conclusion would be reached if the analysis was updated to take these later projections into account.



4.10 The proposed assumption is a combination of the previous assumption and the last three years' experience and is based on the latest S2 base tables.

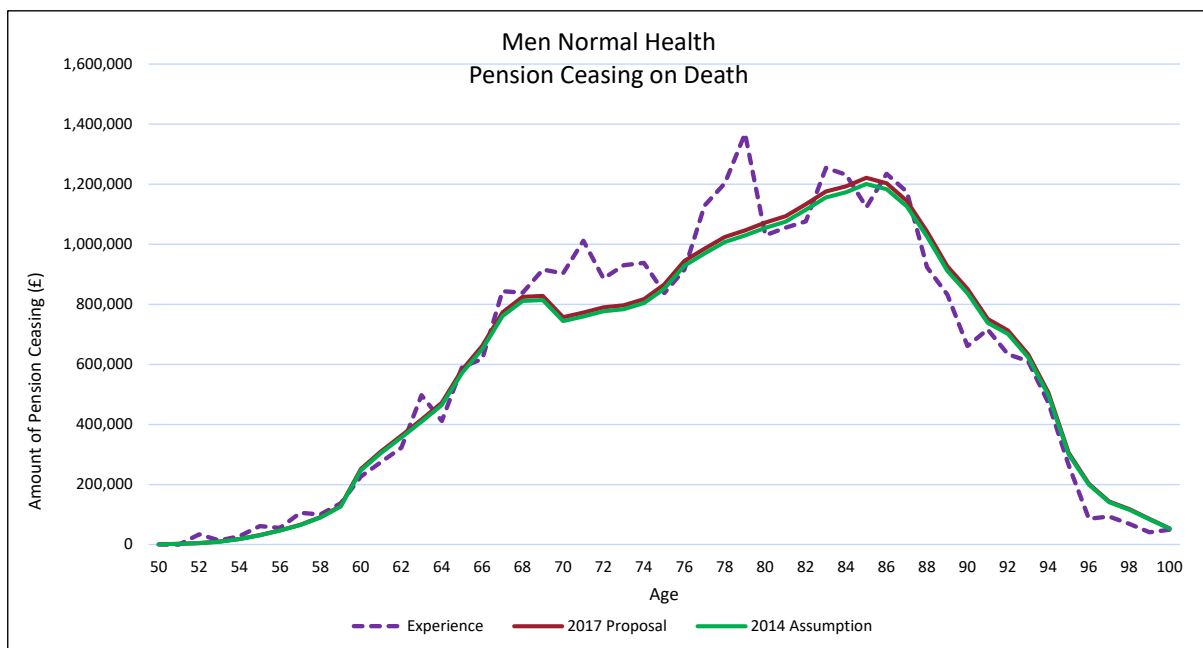
Results of Analysis: Normal Health Pensioner Mortality

4.11 The charts below show by age, and for males and females separately,

- the actual mortality experience (amount of pension ceasing) over the three-year period
- expected pension ceasing based on the 2014 valuation assumption¹⁷
- the proposed assumption¹⁷

4.12 The proposed assumption (red line) in each case is broadly midway between the 2014 assumption (green line) and the experience – reflecting the fact that we are proposing taking into account 50% of the actual mortality experience over 2014-2017 (see paragraph 4.6).

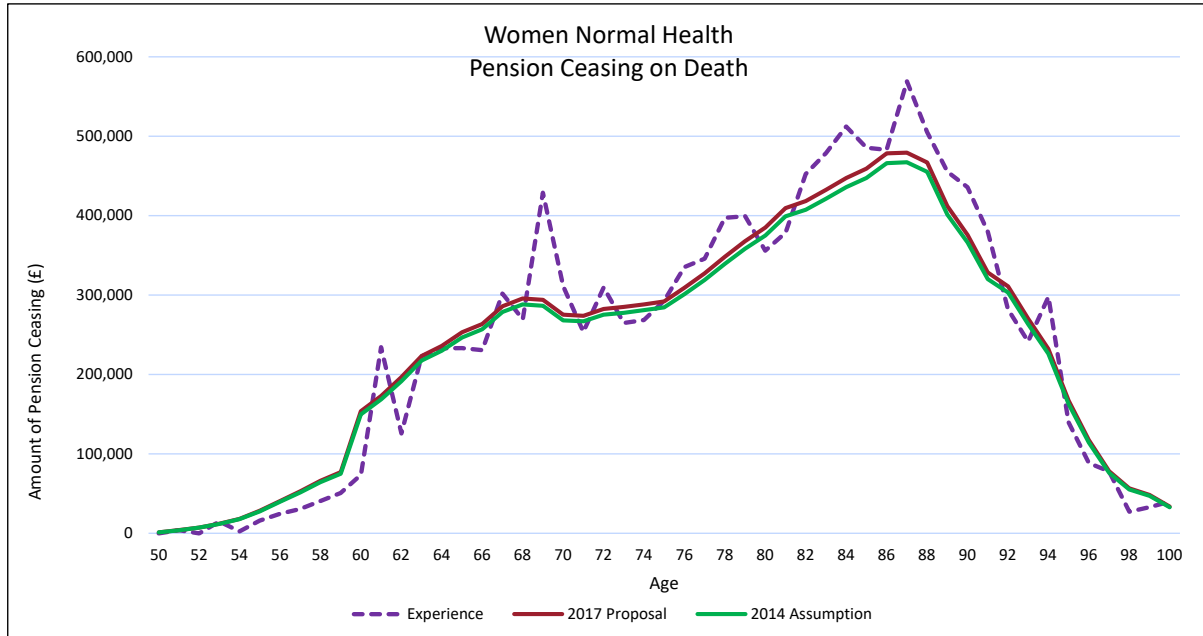
Chart 4.1: Male normal health pensioner mortality experience 2014-17



¹⁷ In each case with ONS-2014 improvements



Chart 4.2: Female normal health pensioner mortality experience 2014-17



Comments on analysis

- 4.1 The 'shape' of the proposed base table is very similar to that of the previous assumption.
- 4.2 Given that the experience showed heavier mortality than was assumed, it can be seen that the proposed assumption results in a slightly larger amount of pension ceasing on death than the assumption from the previous valuation.
- 4.3 Based on our analysis, mortality rates are heavier in LGPS Scotland than LGPS E&W. The rates are on average 20-25% higher. This leads to a life expectancy for LGPS Scotland members of approximately 2-3 years less than their England & Wales counterparts.



Results of Analysis: Ill-Health Pensioner Mortality

4.4 Charts 4.1 and 4.2 are repeated below for ill-health retirees. As for normal health retirements the proposed assumption (red line) in each case is broadly midway between the 2014 assumption (green line) and the experience – reflecting the fact that we are proposing taking into account 50% of the actual mortality experience over 2014-2017.

4.13

Chart 4.3: Male ill-health pensioner mortality experience 2014-17

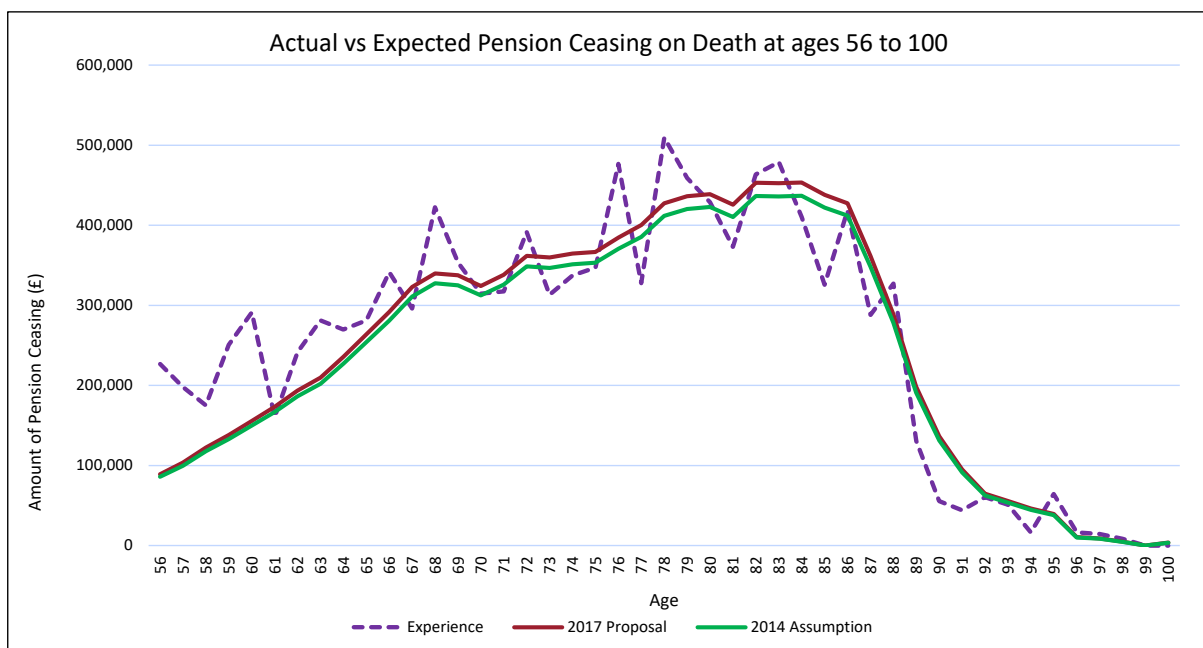
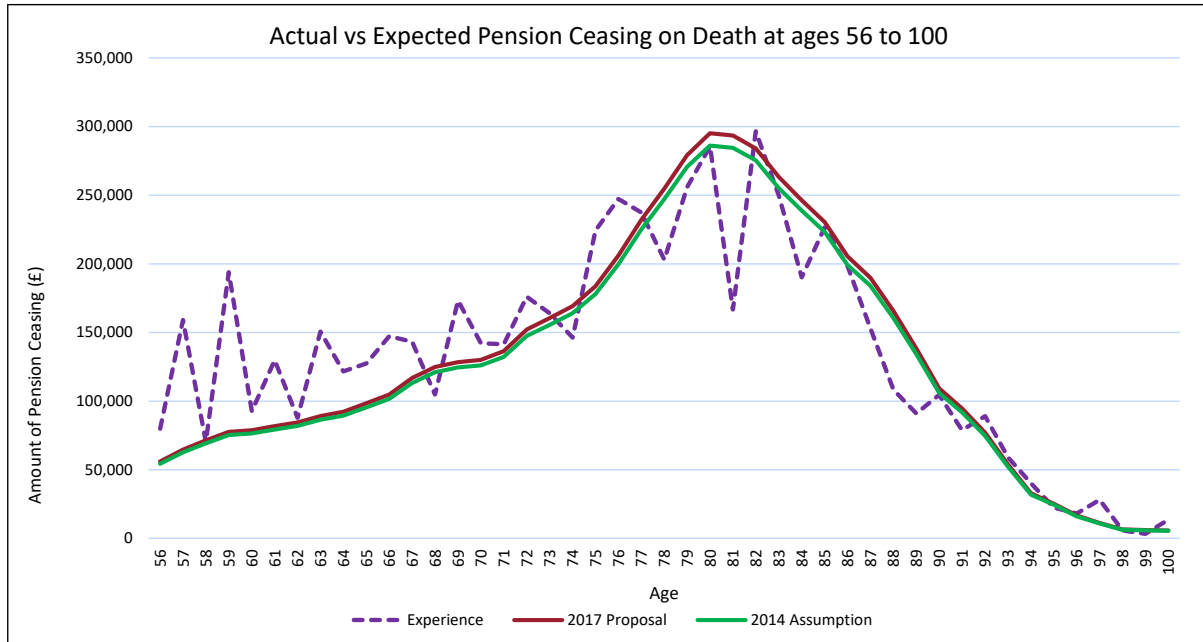




Chart 4.4: Female ill-health pensioner mortality experience 2014-17



Comments on ill-health analysis

- 4.5 For ill-health pensioners, an assumption has been derived by fitting the 2014-2017 experience to a standard table for ages 56 and upwards only. This was because the experience data at ages below age 56 did not give a satisfactory fit against a standard table. We do not consider is an issue worth pursuing further since we expect any impact on the valuation results would be immaterial.
- 4.6 For future ill-health retirements we recommend the same base table as for current ill-health pensioners. We do not hold sufficient data on those retiring under the current (new) ill-health arrangements to carry out a credible mortality analysis relative to previous retirements; therefore a pragmatic approach is needed to setting the assumption for the mortality of future ill-health pensioners.

Dependant Pensioner Mortality

- 4.7 For the 2014 valuation, we derived the assumption for female dependants from an analysis of the scheme experience over 2011-14. For male dependants, the experience was much smaller than for females, and we had concerns over the credibility of the data. We therefore derived the assumption by applying the same relative difference between normal health pensioners and dependants as was used in the E&W 2012 valuation.



- 4.8 For the 2017 valuation we have concerns over the credibility of both female and male data. Reconciliation of the number of dependants from 2014 to 2017 is poor – there is almost a 10% discrepancy between the expected number at 2017 and the actual. To provide comfort for our assumption setting, we analysed the dependant mortality experience of the largest fund (Strathclyde), which does not have a defect on reconciliation. However, the geographical region of Strathclyde is well known to exhibit heavier mortality than Scotland in general, and so that experience cannot be used directly.
- 4.9 As a result, for women we used the 2014 dependant mortality assumptions, increased in line with the change in the normal health mortality assumptions between the 2014 and 2017 valuation assumptions. For men the 2014 assumption was less credible, and so we used the 2017 normal health mortality assumption, adjusted for the difference between dependant and normal health mortality for LGPS E&W 2016 valuation.



5 Age retirement from service

This chapter sets out our recommendation for the assumed patterns of retirement on grounds other than ill-health, and summarises the analysis undertaken in order to inform that recommendation.

Proposed assumptions for 2017 valuation

- 5.1 We recommend that separate assumptions are adopted depending on the member's Critical Retirement Age (CRA, the age at which members can take unreduced benefits under the 'rule of 85'):
- > **CRA 65:** members joining on or after 1 Oct 2006 (including new entrants to 2014 Scheme), and all members not entitled to unreduced benefits before age 65 under the 'Rule of 85'
 - > **CRA 60:** members entitled to unreduced benefits at age 60 under the 'Rule of 85'
 - > **CRA 62:** members entitled to unreduced benefits at between 60 and 65 under the 'Rule of 85' (for simplicity, these members are assumed to have CRA 62)
- 5.2 We recommend the assumptions also reflect the member's NPA in the 2015 scheme, which is equal to the member's State Pension age (SPa), or age 65 if later.
- 5.3 Sample age retirement rates are provided in Appendix A and are unchanged from assumptions adopted for the 2014 valuation of the Scheme.
- 5.4 For members with CRA 60 or 62 and SPA 67 or 68, it is assumed that age retirement patterns will reflect both pre-2014 benefits (with CRA 60 or 62) and post 2014 benefits (with NPA 67 or 68), and the assumed rates are intermediate between those for CRA 60 / CRA 62 and those for new entrants to the 2014 scheme (which are equal to the assumed rates for CRA 65 members).
- 5.5 The recommended assumptions are intended to exclude the incidence of early retirement occurring as a result of redundancy (which is taken as including business efficiency or any similar circumstance in which the employment termination and early payment of benefits is supported by the employer under regulation 29(8) of the 2018 regulations [SSI 2018 No. 141]).

Phased retirements

- 5.6 Phased retirements are not currently a significant feature of the Scheme. In the absence of any evidence of increased uptake of phased retirement we are not recommending an allowance for any change in behaviour. SPPA and other stakeholders may have a view on the likelihood of such an increase and Scottish Ministers may wish to make an allowance on the basis of their evidence. GAD would be happy to analyse any evidence provided.



Use of the assumption

- 5.7 Age retirement rates specify the rate at which members are assumed to retire on grounds other than ill health and therefore potentially include allowance for retirements before and after NPA.
- 5.8 An actuarial reduction is applied to the pension payable on retirement before NPA: the actuarial reduction is set to give the early retirement pension broadly the same value as the deferred benefits payable following withdrawal at the same age.

Financial effect of early and late retirement

- 5.9 The early retirement reductions and late retirement uplifts which apply in the Scheme are intended to mean that, on average, the timing of a given member's retirement does not affect the cost to the scheme of providing their benefits. However, this is not true in all circumstances, and so having an explicit assumption for the spread of retirements will provide a (materially) more accurate reflection of the cost of the Scheme so long as future experience is in line with the assumptions.
- 5.10 There are three principal ways in which the spread of retirements (on grounds other than ill health) affects the financial position of the Scheme (and ultimately the cost cap mechanism). These are:
- members who retire after their CRA but before age 65 do not receive a late retirement uplift. If members defer retirement beyond their CRA in this way this will, other things being equal, reduce the cost of providing benefits
 - the actuarial reduction on early retirement is set at a level to give an early retirement pension, broadly the same value as the deferred benefit for someone leaving at the same age. If more members than expected take early retirement, other things being equal, this will reduce the cost of providing benefits because they are foregoing future (assumed) salary increases to their benefit
 - since commutation terms do not vary by age, then if a member retiring early commutes part of their pension for cash, the cost of providing the benefit is reduced, due to the widening differential between the cost of providing pension and cash
- 5.11 The financial effect of late retirement (i.e. after Normal Pension Age under the 2015 Scheme, and after age 65 under the Earlier Schemes) is much less material and we do not propose to model it explicitly.



Analysis and setting the assumption

5.12 An analysis of retirements over the three-year period ending 31 March 2017 was carried out.

5.13 The experience data was not credible. There were about 16,000 age retirement exits recorded in 2014-17 data, compared with about 9,000 in 2011-14. Almost all the retirements in the period were recorded as being of CRA 65 members, with very few of CRA 60 members. However, the numbers of members in these two groups were in the ratio 2:1, suggesting we should have observed numbers of retirements in a broadly comparable ratio.

5.14 We therefore propose retaining the assumptions from the 2014 valuation. Proposed assumptions (full details are given in Appendix A):

Men: Retain 2014 assumption (7% per year retire at ages 60-64 for CRA65)

Women: Retain 2014 assumption (7% per year retire at ages 60-64 for CRA65)

5.15 To put the proposed assumptions in context, there follows a comparison with assumptions for the 2016 valuations of other schemes.

Chart 5.1A Comparison of age retirement rates - males

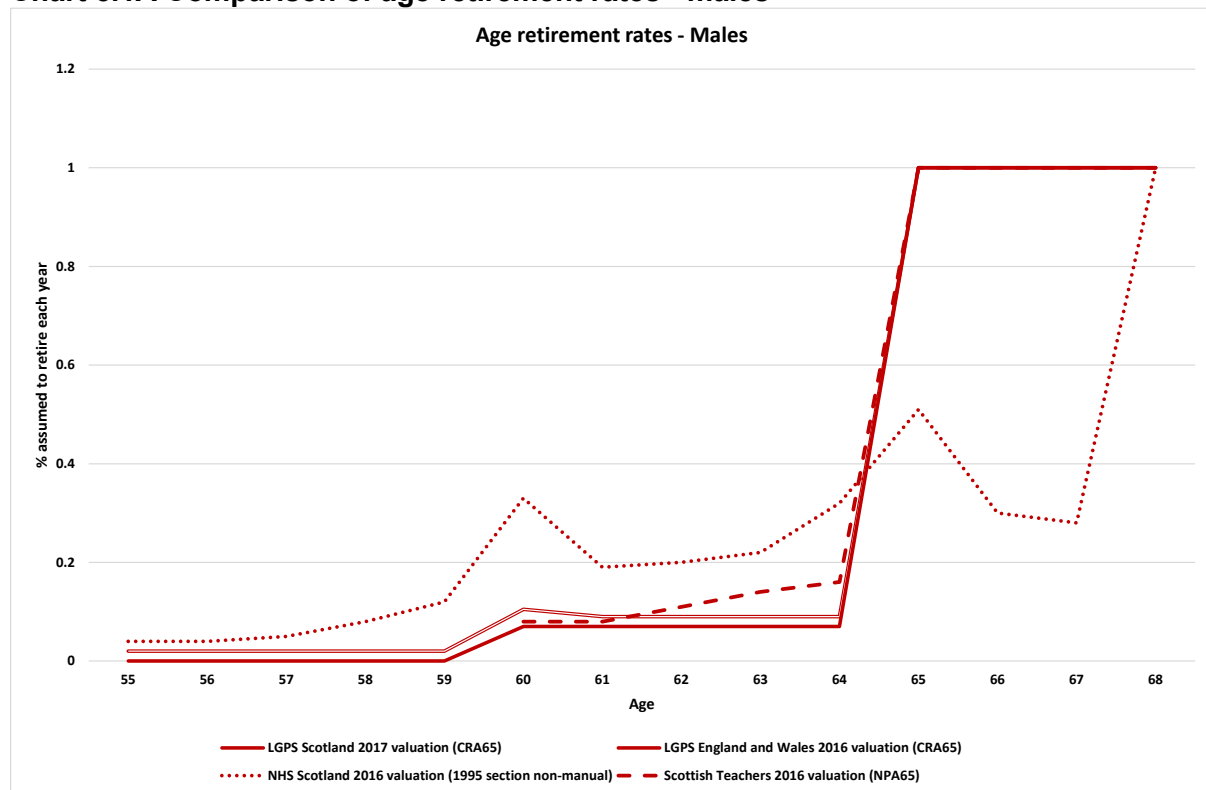
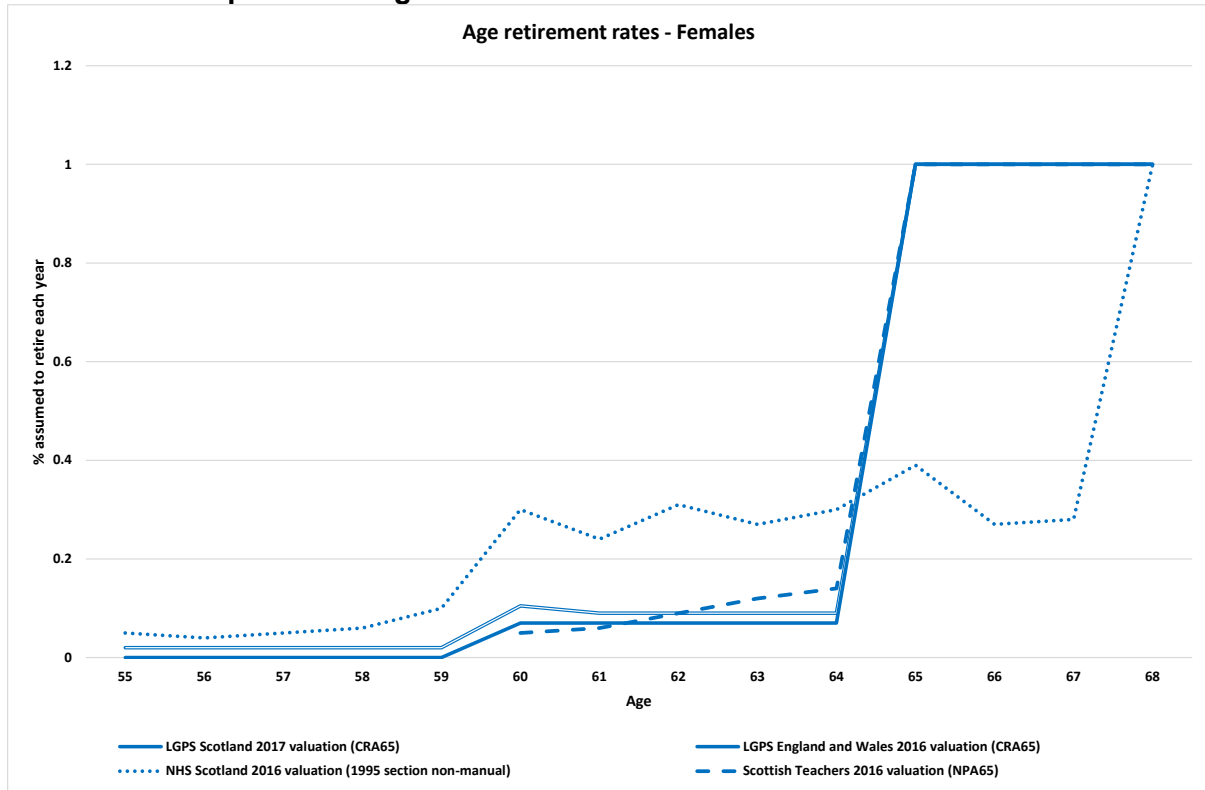




Chart 5.1B Comparison of age retirement rates – females



5.16 We would usually expect lower paid members to be less likely to retire before reaching State Pension age, because there members may need income from the State Pension to supplement their other pensions and saving in retirement. So the patterns seen in the above charts is to be expected.



6 Ill-health retirement from service

This chapter sets out our recommendation for the assumed rates of retirement on grounds of ill-health, and summarises the analysis undertaken in order to inform that recommendation.

Proposed assumptions for 2017 valuation

- 6.1 We recommend that a single set of assumptions (separate for men and women) is used to allow for the incidence of ill-health retirement.
- 6.2 The recommended rates are the same as proposed for the 2014 valuation of the Scheme. Assumed rates of ill-health increase with age, but fewer than 2% of members are assumed to retire on ill-health grounds each year, even at the highest ages. Sample rates are provided in Appendix A.
- 6.3 We also recommend assuming that 70% of members retiring on ill-health grounds will receive the upper-tier (tier 1) benefit and the remainder will receive the lower-tier (tier 2) benefit. This is also unchanged from assumption proposed for the 2014 valuation of the LGPS (Scotland).

Use of the assumptions

- 6.4 Ill-health retirement rates specify the rate at which members are assumed to retire on grounds of ill-health. The assumed eligibility for upper or lower tier awards specifies the benefits which will be provided. The rates of mortality experienced after ill-health retirement are also relevant to the valuation calculations. Post retirement mortality is addressed in Chapter 4.

Analysis and setting the assumption

Ill health incidence

- 6.5 There were just over 2,217 ill-health retirements over the three-year period to 31 March 2017. The split between male and female members is set out in the Table below.

Table 6.1: Number of ill health retirements, 2014 to 2017

Gender	Number of ill health retirements 2014-2017	Number of active members as at 31 March 2014 (000s)	Number of active members as at 31 March 2017 (000s)
Men	837	73,304	73,935
Women	1,380	144,340	154,348

Our analysis of experience between 2014 and 2017 showed the actual number of ill-health retirements was very close to the number expected under the 2014 assumptions.



6.6 Overall, the ratio of actual to expected ill-health retirements was 96.5%. The shape of the incidence of ill-health retirement across the ages was also a close match to the assumptions.

6.7 As part of our analysis for the Scheme, we compared the proposed assumptions with other relevant scheme assumptions.

Chart 6.1A Comparison of ill-health retirement rates - males

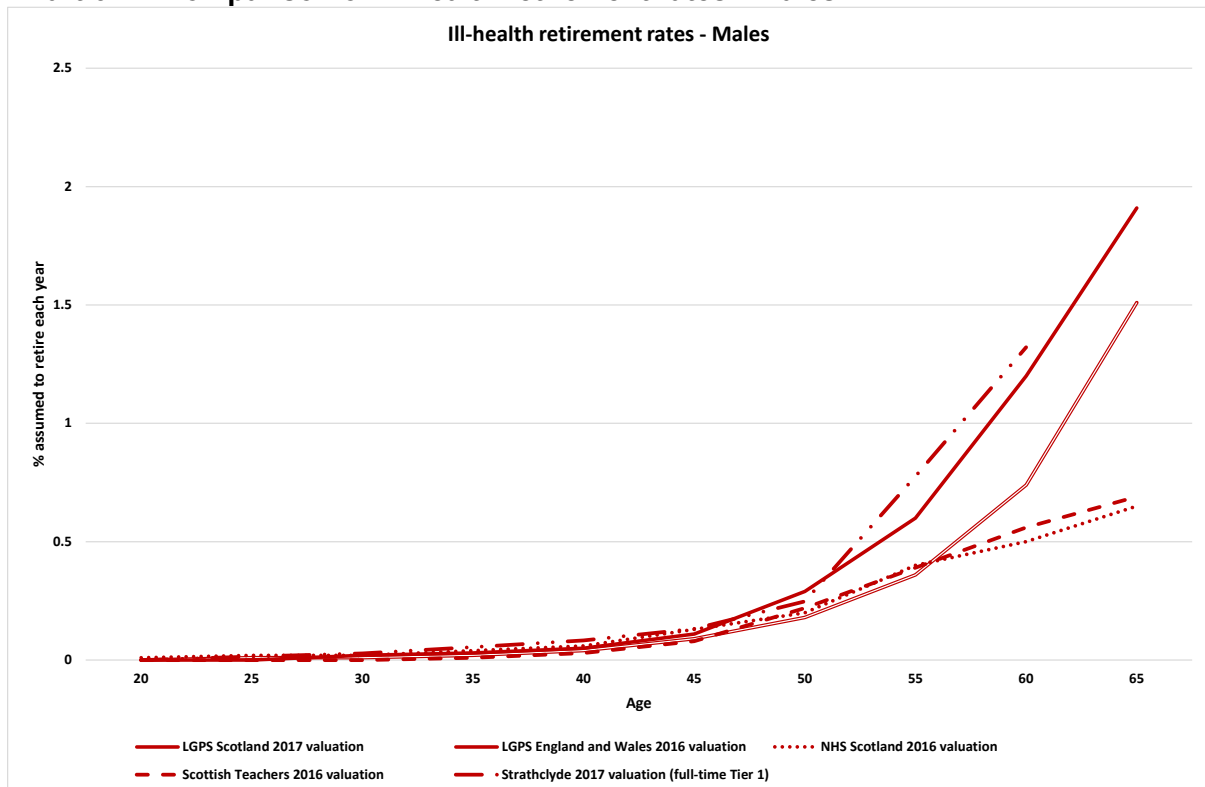
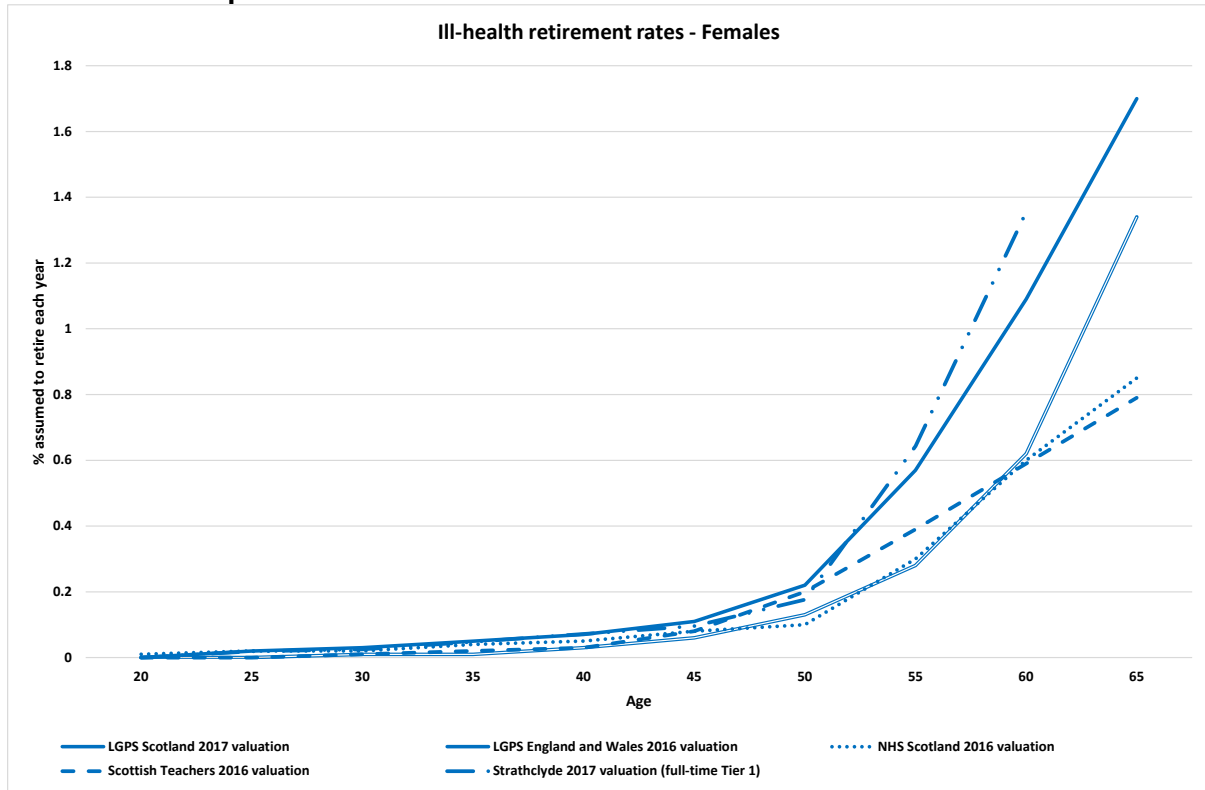




Chart 6.1B Comparison of ill-health retirement rates - females



6.8 Average rates of ill health retirement in the Scheme are approximately 50% higher for men and 70% higher for women than in LGPS (E&W).



Split between tiers

6.9 The Table below shows the percentage of members retiring on ill-health grounds over the four-year period which qualified for upper tier benefits as provided in the data. Over the period 2014-2017 the percentage of upper tier awards averaged at 70%.

Table 6.3: Ill-health retirements on upper tier

	2014/15	2015/16	2016/17	Total
Unisex	72%	70%	69%	70%

6.10 The 2014 valuation assumption was 70% on tier 1 and 30% on tier 2 for both men and women. We recommend no change to this assumption.



7 Voluntary withdrawal from service

This chapter sets out our recommendation for the assumed rates of withdrawal from active service, and summarises the analysis undertaken in order to inform that recommendation.

Proposed assumptions for 2017 valuation

- 7.1 We recommend that a common set of net rates of withdrawal (separate for men and women) are used for the purposes of the valuation, applying equally to those members who remain in the pre-2015 scheme and members of the 2015 scheme.
- 7.2 The recommended rates are the same as proposed for the 2014 valuation of LGPS (Scotland). The recommended rates are net of re-entry within five years and are related to age. The same rates apply regardless of the length of the member's service.

Use of the assumption

- 7.3 Withdrawal rates specify the rate at which members are assumed to leave voluntarily before retirement, becoming entitled to either deferred benefits or, for those with less than two years' service, a refund of contributions. In all cases the withdrawal rates are 'net' rates, i.e. they are intended to reflect the probability of leaving service and not re-joining within five years, and therefore the member's benefits not being linked to their final salary at retirement.

Analysis and setting the assumption

- 7.4 We were unable to analyse age and duration rates of withdrawal over the three-year period ending 31 March 2017 due to data limitations. The experience was distorted by the effect of auto-enrolment causing very large numbers of re-joiners, combined with complexities from the recording of multiple contracts for single members by the administrators. The data for 2014-17 was inconsistent with 2011-14 (about 54,000 exits, in 2014-17, compared with about 31,000 in 2011-14). A large proportion of the members recorded as exiting the scheme in 2014-17 were also recoded as active members in the data as at 31 March 2017.
- 7.5 Without firm evidence that the pattern of withdrawals has materially diverged from that expected under the assumptions proposed for the 2014 LGPS (Scotland) valuation, we therefore propose to retain the 2014 assumption.
- 7.6 As part of our analysis for the Scheme, we compared the proposed assumptions with other relevant scheme assumptions.



Chart 7.1A Comparison of voluntary withdrawal rates - males

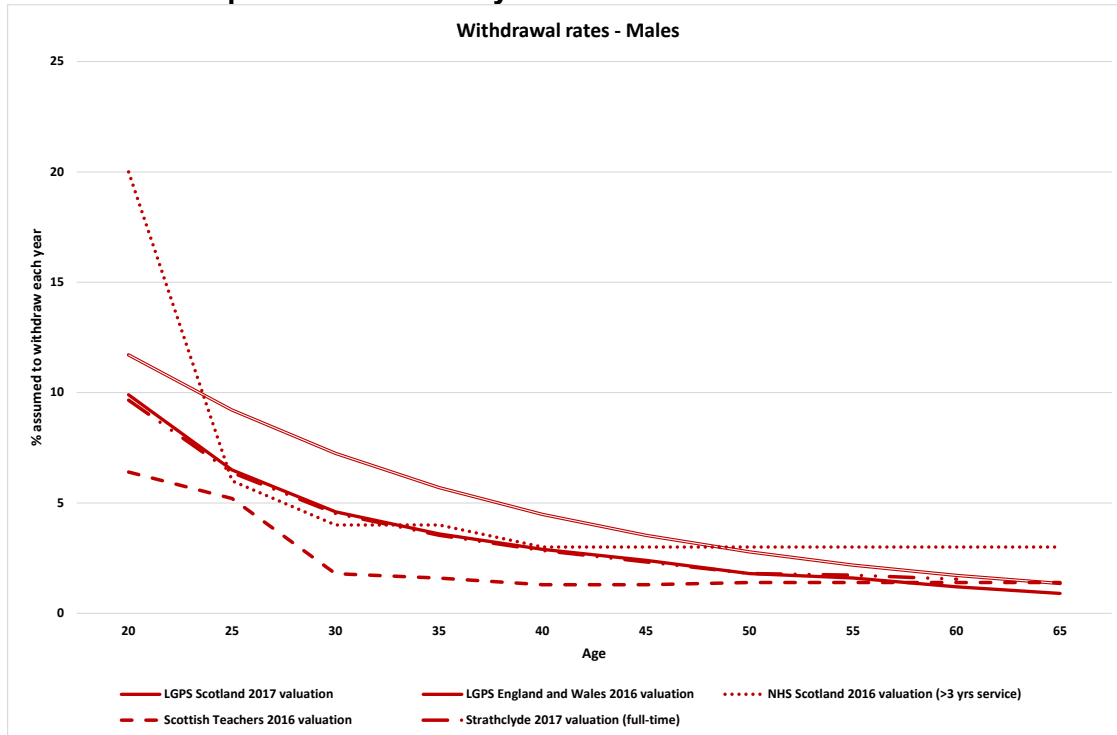
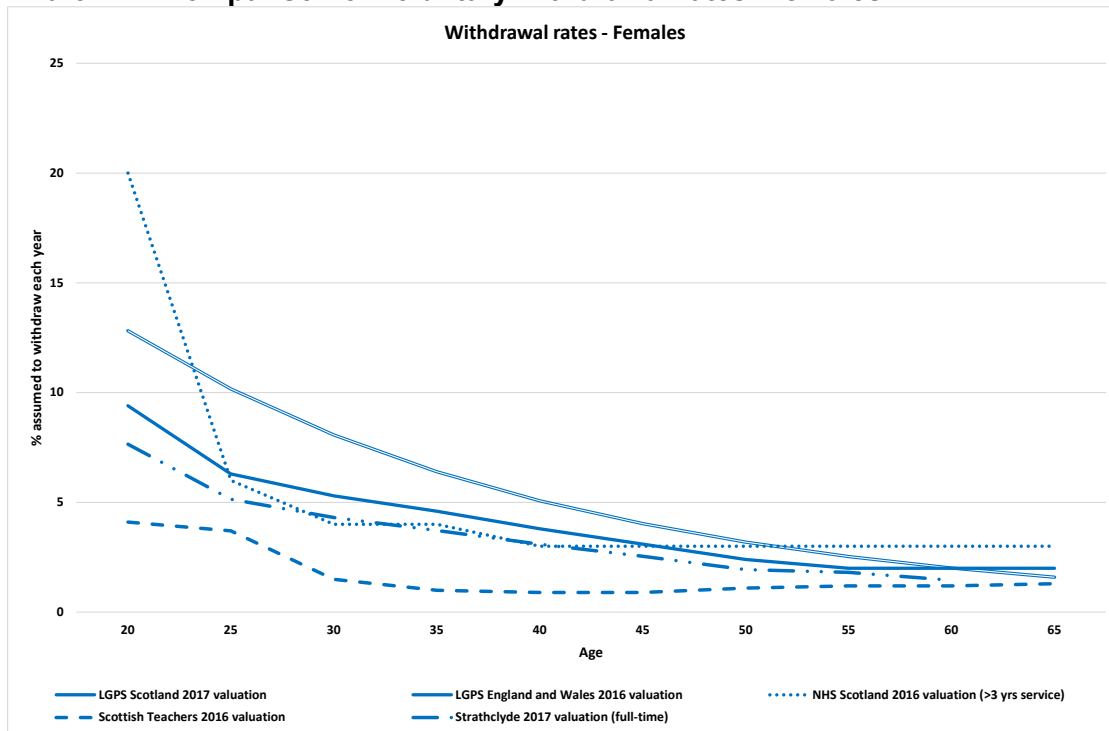


Chart 7.1B Comparison of voluntary withdrawal rates - females





8 Death before retirement

This chapter sets out our recommendation for the assumed rates of death before retirement, and summarises the analysis undertaken in order to inform that recommendation.

Proposed assumptions for 2017 valuation

- 8.1 We recommend decreasing the assumed rates of death before retirement by 8% for men and 17% for women from the rates assumed at the 2014 valuation. The changes apply at all ages. We do not expect a material impact on the valuation results from the changes made.
- 8.2 The rates adopted for the 2014 valuation were based on ONS rates (National Life Tables, Scotland 2011-13), with an appropriate adjustment for men and women separately.
- 8.3 Assumed rates of death before retirement increase with age, but, except at ages beyond 60, less than 0.5% of members are assumed to die each year. Sample rates are provided in Appendix A.

Use of the assumption

- 8.4 Death before retirement rates are used to allow for the possibility of deaths whilst in active service or whilst entitled to a deferred pension. The numbers of deaths observed annually, and the recommended rates to be assumed, are low, and thus this assumption has relatively little financial significance.

Analysis and setting the assumption

- 8.5 There have been around 700 deaths of active members in the scheme over the three-year period to 31 March 2017 – this is significantly fewer than would be expected under the 2014 assumption. The experience in England and Wales was also lower than expected, although not to the same extent.
- 8.6 The experience was volatile over the individual years of the three-year period. For this reason, we smoothed the results of this analysis with the 2014 assumption, by averaging with the 2014 valuation assumption, to arrive at the recommended assumptions above.
- 8.7 Comparison with other assumptions:



Chart 8.1A Comparison of death before retirement rates - males

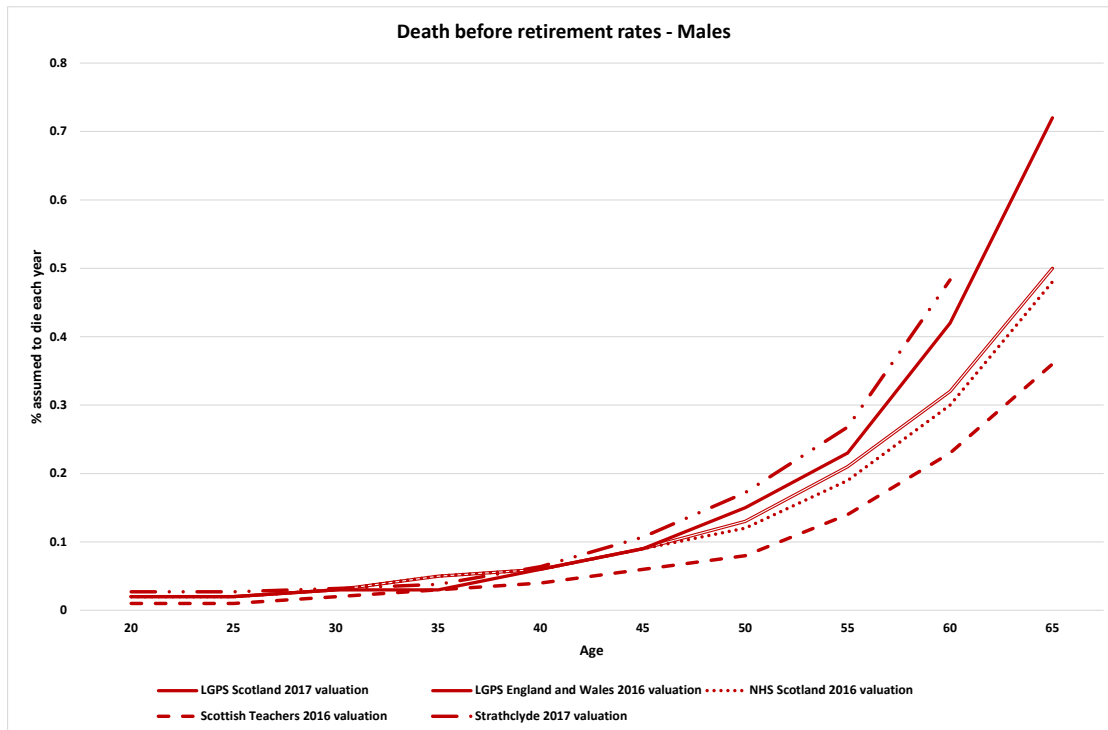
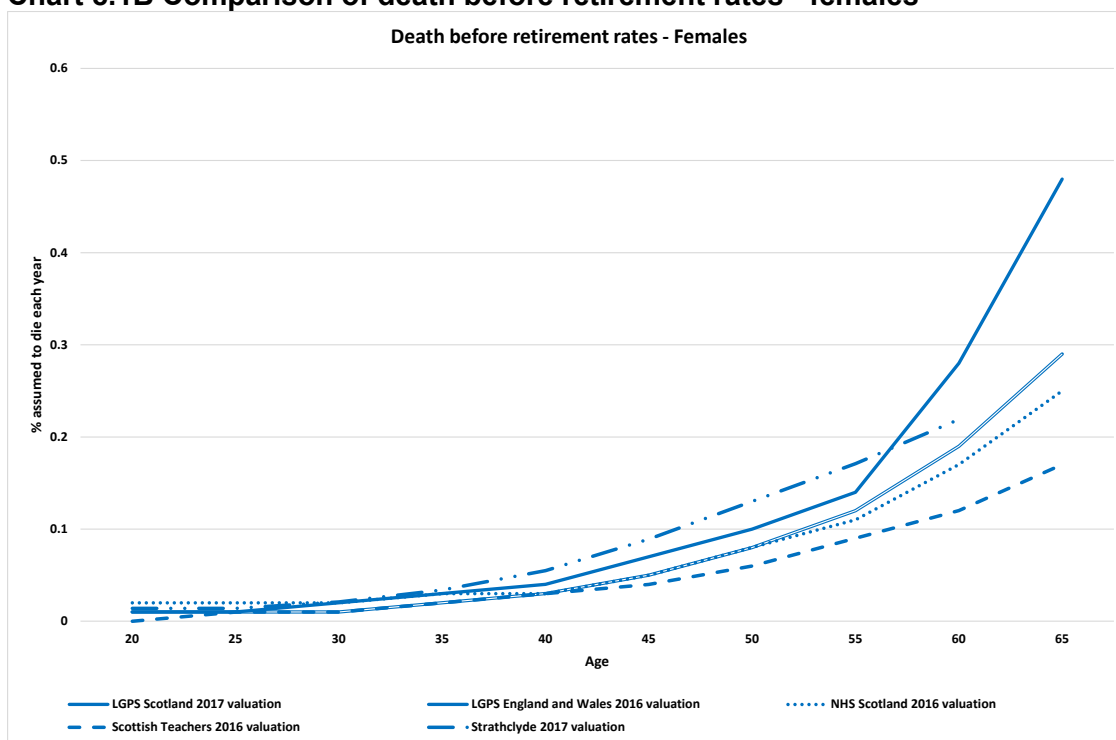


Chart 8.1B Comparison of death before retirement rates - females



8.8 The charts below show the rates of the actual and expected deaths by age for men and women respectively.



Chart 8.2A Male death before retirement experience 2014-17

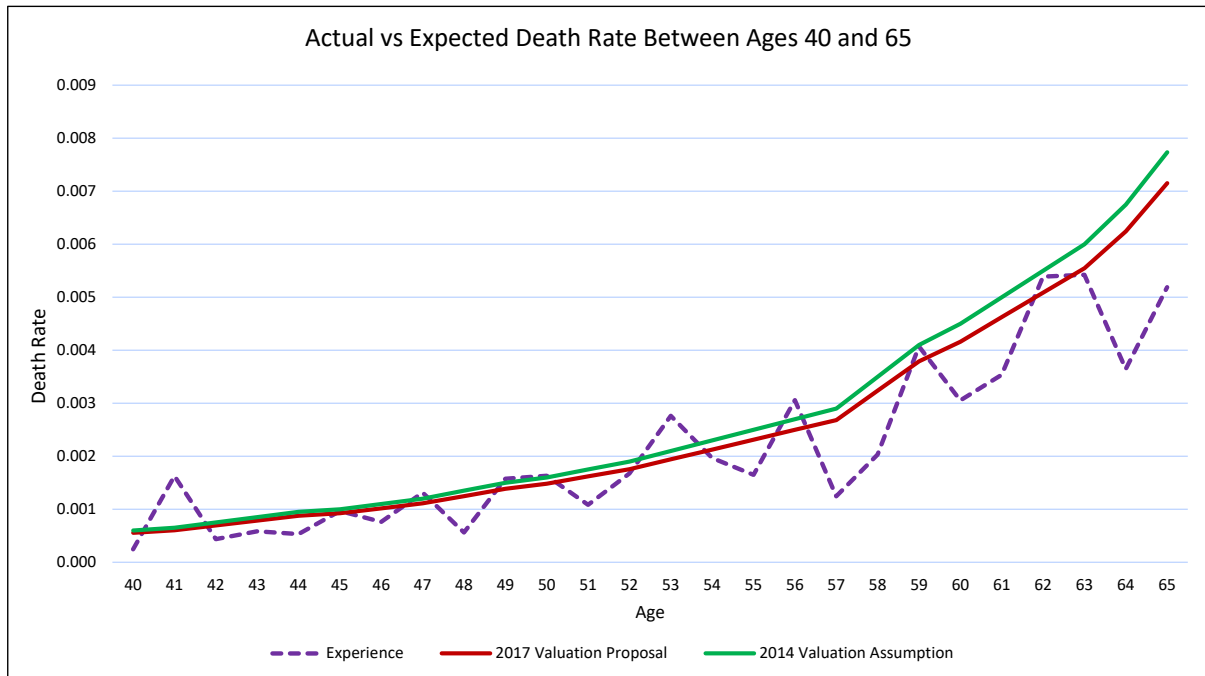
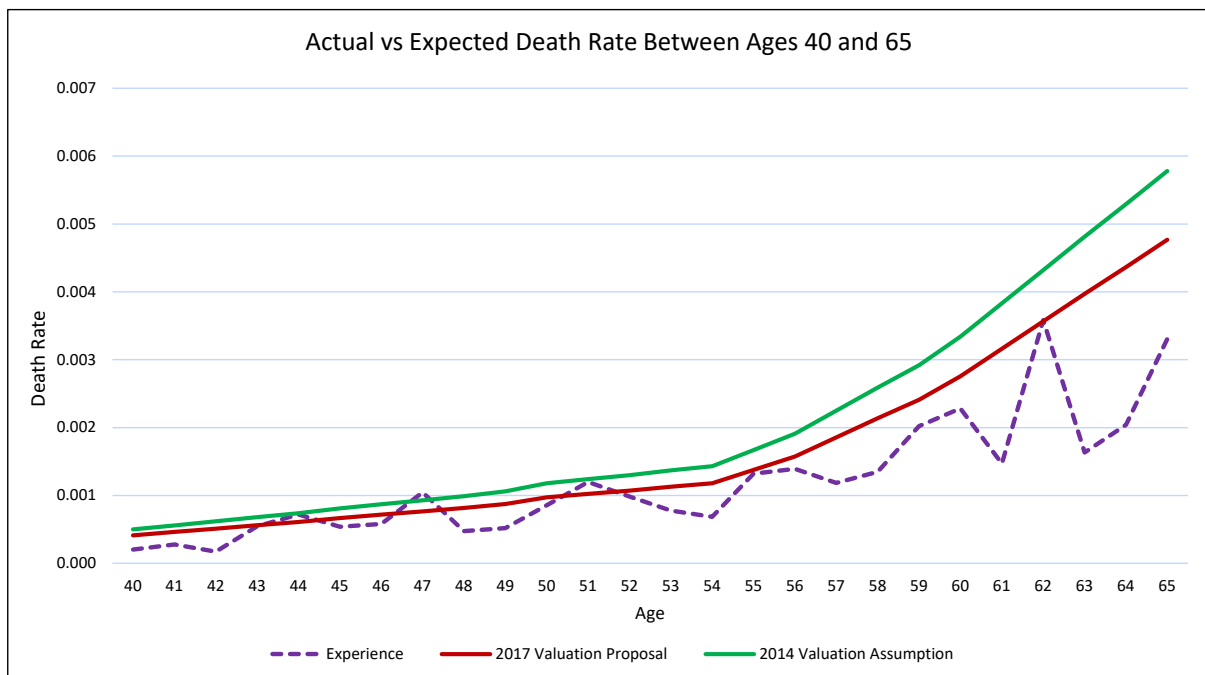


Chart 8.2B Female death before retirement experience 2014-17





9 Promotional pay increases

This chapter sets out our recommendation for the assumed promotional pay increases of active members, and summarises the analysis undertaken in order to inform that recommendation.

Proposed assumption

9.1 We recommend assuming a single scale of promotional increases for men and women separately. The increases depend on age. They are steeper at younger ages. Sample values of the scales are provided in Appendix A.

Previous assumption

9.2 The assumptions recommended for the 2017 valuation are the same as those adopted for the 2014 valuation

Use of the assumption

9.3 Benefits accrued in the pre-2015 scheme are linked to pay at or near retirement. Members' pay can increase through a combination of general annual pay awards and promotional increases. To calculate an estimate of the level of benefit payable in the future requires assumptions for both of these components. The assumption for general pay awards is directed by HMT. The assumption for promotional pay increases is set by Scottish Ministers.

Analysis and setting the assumption

9.4 To formulate a recommended assumption we compared the scheme experience to the assumption adopted for the 2014 valuation. We carried out a starter-ender analysis over the intervaluation period. This considers only those members who were in active membership at both the 2014 and 2017 valuation dates. For these members we calculate their increase in pensionable pay over the period (net of assumed general pay increases) and compare the average increase with that assumed. The rates of assumed increase are based on the members' ages over the intervaluation period and the 2014 valuation assumptions. This analysis illustrates how actual promotional pay increases have impacted members remaining in service over the period. It can form a suitable basis on which to set an age-related pay scale.

Results of profile analysis

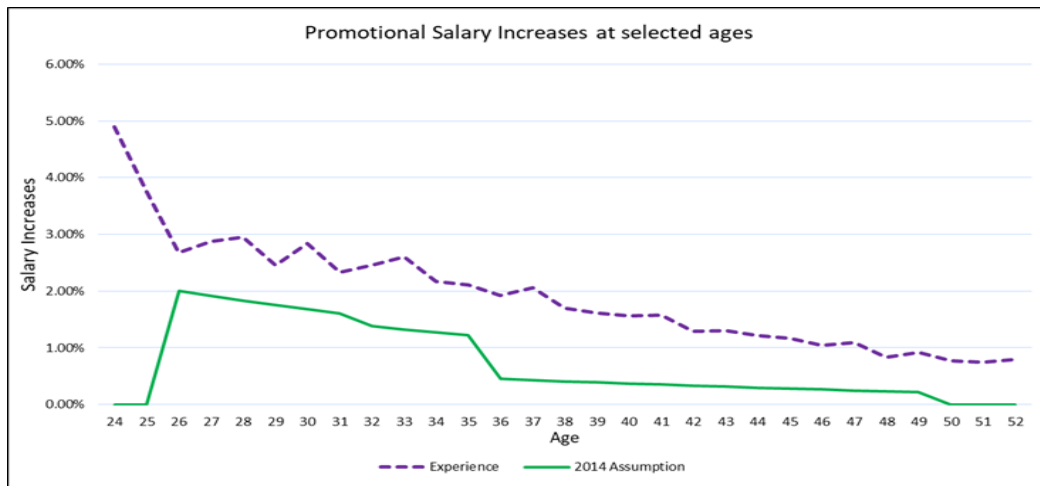
9.4 The graphs of the observed salary increases, over the age range 20 to 65 for males and females, separately, were too volatile to use to set an assumption. However, even with the volatility, the observed pattern was broadly in line with the 2014 valuation assumption.



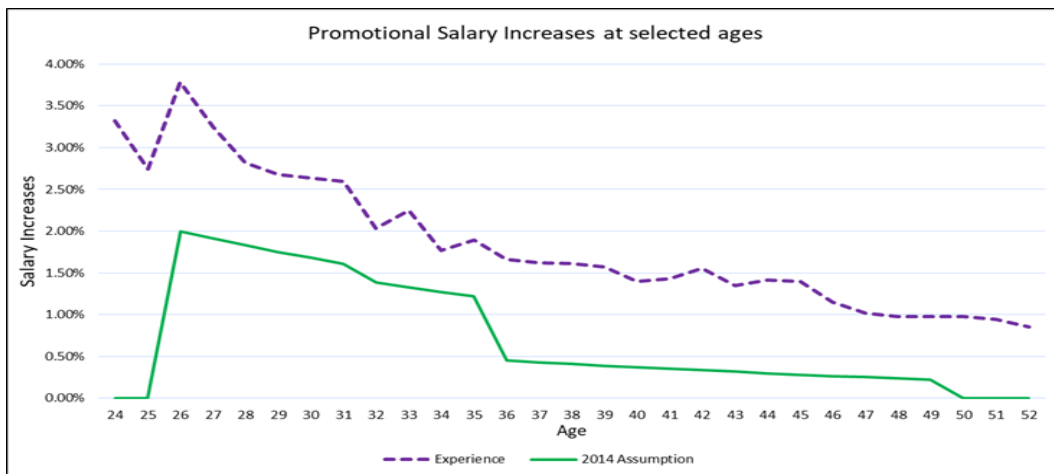
Results of starter/ender analysis

9.4 The graphs below show the implied age-related promotional pay scales for men and women respectively, based on the starter/ender analysis of those members in service at both the 2014 and 2017 valuation dates. These are compared with the assumed age-related promotional scales adopted for the 2014 valuation.

Graph 9.5: Males



Graph 9.6: Females





Comments on the analysis

- 9.5 The results of the analysis should be treated with some caution when considering how to set forward looking assumptions for promotional pay growth.

The experience observed in the starter/ender population will be influenced by practices in place during the intervaluation period. Given the ongoing policy of public service pay restraint it is possible that what we are observing is not a true long-term reflection of the impact of promotional pay scales. The data available is not sufficient to net out factors such as variable forms of non-basic pay and any differential promotional policies followed by employers during the exceptional period.

- 9.6 For the above reasons our recommendation is that no change should be made to the pay scales as assumed for the 2014 valuation.



10 Commutation of pension for cash at retirement

This chapter sets out our recommendation for the assumed level of pension commutation at retirement (where this is not specified in the HM Treasury valuation directions), and summarises the analysis undertaken in order to inform that recommendation.

Proposed assumptions for 2017 valuation

- 10.1 Scottish Ministers are responsible for the commutation assumption for pre-2009 service only; HMT Directions specify the assumption for post-2009 service and this is currently set at 17.5%. For service prior to 31 March 2009, in addition to pension they might choose to commute for cash, members receive an automatic entitlement to a retirement lump sum of 3 times the pension amount before any commutation. For service after this date there is no entitlement to an automatic lump sum, but members can still choose to commute pension if they wish.
- 10.2 We propose the same commutation assumption for males and females in respect of pre-2009 service. This is the same approach as in the 2014 valuation. The assumption adopted at that time was 10% for both males and females, which is the same as was adopted for the 2016 England and Wales valuation (for pre-2008 pension in that case). and is the same as the recommended assumption for the 2017 valuation. Table 10.1 below summarises the assumptions for the 2017 valuation.

4.15 Table 10.1: Recommended commutation assumption for the 2017 valuation

	Pre-2009 service	2009-2014 service ¹⁸	2015 scheme service ¹⁸
Males	10%	17.5%	17.5%
Females	10%	17.5%	17.5%

¹⁸ Specified in HMT Directions



Use of the assumption

10.3 Members may commute part of their pension for a lump sum at a rate of £12 for each £1 of annual pension given up. The assumption is important because the value of the pension given up, as assessed using the actuarial assumptions underlying the valuation is, on average, more than £12 and so commutation has a significant impact on total liabilities, contribution rates and the cost cap. Differences between assumed and actual experience in the 2015 scheme will feed through into the cost cap fund but experience in the pre-2015 schemes will not.

Analysis

10.4 In practice, a member commutes part of their total pension, and does not specify whether the part commuted relates to service before or after 2009. Consequently, it is not possible to analyse definitively the component of experience for which the Scottish Ministers need to make an assumption.

10.5 We conducted an analysis of the commutation behaviour of members who have some pre-2009 service retiring in the period 2014-2017 – this involved around 16,000 cases. The data suggests that around 14.7% of pension is commuted on average.

10.6 Retaining the assumption that 10% of pre-09 pension is commuted is consistent with an average of 14.7% of pension being commuted in total.

10.7 Comparison with other assumptions:

Strathclyde 2017 valuation

50% of future retirements elect to exchange pension for additional tax free cash up to HMRC limits for service to 1 April 2009. This is equivalent to all members commuting 13% of pre-2009 pension.

LGPS England and Wales 2016 valuation:

Pre-2008 service: 10%

NHS Scotland 2016 valuation:

Men: 8%; Women: 11%

Scottish Teachers' 2016 valuation:

Men 10%; Women 10%

10.8 Our proposal is therefore not out of line with the assumptions adopted by comparable schemes.



11 Family statistics

This chapter sets out our recommendation for the assumptions around dependants' pensions for current pensioners, and summarises the analysis undertaken in order to inform that recommendation.

Proposed assumptions for 2017 valuation

11.1 We recommend the following assumptions be adopted for the percentage of members married or partnered at death at each age.

Age	Males	Females
60	80%	75%
70	78%	57%
80	64%	28%
90	36%	8%

11.2 We also recommend :

- men are assumed to be three years older than their partners and women are assumed to be two years younger than their partners
- on the grounds of materiality, no allowance is made for remarriage
- all dependants are assumed to be the opposite sex to the member

Previous valuation assumptions

11.3 The proposed proportion married/partnered assumption is a change from the 2014 assumption where the relevant rates were 80% for men and 70% for women at age 60, with the assumption increasing slightly with age for men and decreasing for women to below 40% at age 80.

11.4 The assumption that male members are 3 years older than their partners is the same as the 2014 assumption. The assumption that female members are only two years younger than their partners is a reduction of one year to the 2014 the age difference assumption.

11.4 We do not expect a material impact on the valuation results from the changes made.



Use of the assumptions

- 11.5 Dependants' pensions¹⁹ are provided on the death of a member. Assumptions are required for the proportion of members who are married or partnered to determine how many dependants' pensions will be paid. Assumptions are required about any age differences between members and partners as this affects how long dependants' pensions will be paid for.
- 11.6 Where the member has no service on or after 1 April 1988, the spouse's pension will cease if the spouse remarries.

Analysis and approach to setting the assumptions

- 11.7 The data we received on pensioners who died during the three-year period to 31 March 2017 was not considered to be sufficiently credible to perform an analysis of proportions married or partnered. For the previous valuation, the experience data was used in setting the assumption; however it was noted that the results of that analysis should be treated with caution due to the appearance of inconsistent recording of death cases and difficulty in ascertaining the level of reliability of the data.
- 11.8 Given the lack of credible data for proportions married or partnered, we propose aligning the assumptions with ONS population projection statistics. This is the same approach as is used in England and Wales.
- 11.9 The data we received on age difference was considered to be a reasonable reflection of the scheme's experience. The age difference assumption from 2014 that males are 3 years older than their partners is consistent with the experience and so we recommend retaining this assumption. The assumption that females are 3 years younger than their partners does not align with the experience and we propose moving to an assumption that they are 2 years younger.
- 11.10 The proposed family statistics assumptions are not out of line with the assumptions adopted for the Strathclyde pension Fund 2017 valuation or the 2016 valuations of the Scottish NHS and the Scottish Teachers' schemes. The proposals are identical to those adopted for the LGPS England and Wales 2016 valuation

¹⁹ Pensions are also payable to dependent children on a member's death but the costs are not material overall.



Appendix A: Details of assumptions

This appendix contains details of the recommended assumptions including sample rates and values.

Pensioner mortality

Table A1: Baseline mortality assumptions

Baseline mortality	2017 valuation	
	Standard table ²⁰	Adjustment
Males		
Retirements in normal health	S2NMA	122%
Ill-health pensioners	S2IMA	137%
Dependants	S2NMA	159%
Females		
Retirements in normal health	S2NFA	117%
Ill-health pensioners	S2IFA	131%
Dependants	S2DFA	131%

HM Treasury specified future improvements in mortality will be assumed to be in line with those underlying the ONS 2016-based population projections.

²⁰ SAPS (S2) tables are published by the Actuarial Profession and based on the experience of self-administered pension schemes over the period 2004 to 2011. The 'S2' series has separate standard tables based on experience of members retiring in normal health (S2NXA) and in ill health (S2IXA) and for female dependants (S2DFA).



Age retirement from service

The tables below show the probability of retirement in the relevant year. Tables A2 and A3 set out in full the rates for members with NPA 67 and 68.

CRA is the age at which members are entitled to unreduced benefits in respect of service up to 31 March 2008 (and for some members, some service after this date).

Table A2: Detailed age retirement rates for members joining on or after 1 Dec 2006, and all members entitled to unreduced benefits between ages 60 and 65 under the 'Rule of 85'

Age	NPA 65	NPA 66	NPA 67	NPA 68
55	0.000	0.000	0.000	0.000
56	0.000	0.000	0.000	0.000
57	0.000	0.000	0.000	0.000
58	0.000	0.000	0.000	0.000
59	0.000	0.000	0.000	0.000
60	0.070	0.000	0.000	0.000
61	0.070	0.070	0.000	0.000
62	0.070	0.070	0.070	0.000
63	0.070	0.070	0.070	0.070
64	0.070	0.070	0.070	0.070
65	1.000	0.070	0.070	0.070
66	1.000	1.000	0.070	0.070
67	1.000	1.000	1.000	0.070
68	1.000	1.000	1.000	1.000



Table A3: Detailed age retirement rates for members entitled to unreduced benefits at age 60 under the rule of 85

Age	NPA 65	NPA 66	NPA 67	NPA 68
55	0.002	0.002	0.001	0.001
56	0.002	0.002	0.001	0.001
57	0.002	0.002	0.001	0.001
58	0.002	0.002	0.001	0.001
59	0.002	0.002	0.001	0.001
60	0.100	0.100	0.059	0.031
61	0.083	0.083	0.050	0.026
62	0.083	0.083	0.078	0.026
63	0.083	0.083	0.078	0.074
64	0.083	0.083	0.078	0.074
65	1.000	0.083	0.078	0.074
66	1.000	1.000	0.078	0.074
67	1.000	1.000	1.000	0.074
68	1.000	1.000	1.000	1.000

Table A4: Ill-health retirement rates for all members

Age	Men %	Women %
20	0.00	0.00
25	0.00	0.02
30	0.02	0.03
35	0.03	0.05
40	0.05	0.07
45	0.11	0.11
50	0.29	0.22
55	0.60	0.57
60	1.20	1.09
65*	1.91	1.70

*rates are zero if above the NPA of the relevant section



Table A5: Percentage of ill-health retirement in Tiers 1 and 2 for all members

Tier 1	Tier 2
70%	30%

Voluntary withdrawal from service

Table A6: Withdrawal rates (net of re-entry within 5 years) for all members

Age	Men %	Women %
20	9.9	9.4
25	6.5	6.3
30	4.6	5.3
35	3.6	4.6
40	2.9	3.8
45	2.4	3.1
50	1.8	2.4
55	1.6	2.0
60	1.2	2.0
65*	0.9	2.0

*rates are zero if above the NPA of the relevant section

Death in service

Table A7: Death in service rates for all members

Age	Men %	Women %
20	0.02	0.01
25	0.02	0.01
30	0.03	0.02
35	0.03	0.03
40	0.06	0.04
45	0.09	0.07
50	0.15	0.10
55	0.23	0.14
60	0.42	0.28
65	0.72	0.48



Promotional pay increases

Table A9: Promotional salary scales* for all members

Age	Men and Women
20	93
25	93
30	100
35	107
40	109
45	111
50	112
55	112
60	112
65	112

* Relative to an index value of 100 at age 30.

Commutation of pension for cash at retirement

Table A10: Commutation of pension for cash at retirement

	Pre-2009 service	2009-2014 service	2015 Scheme service
Men	10%	17.5%	17.5%
Women	10%	17.5%	17.5%



Family statistics

Table A11: Recommended proportion married or partnered at retirement for future pensioners

	Proportion married or partnered at retirement
Men	80%
Women	75%

These are set in line with ONS population projection statistics as per the 2016 LGPS E&W assumptions.

Table A12: Recommended proportion married or partnered for current pensioners (at the valuation date)

Age	Men	Women
60	80%	75%
70	78%	57%
80	64%	28%
90	36%	8%

Men are assumed to be three years older than their partners and women are assumed to be two years younger than their partners.



Appendix B: Modelling approach and minor assumptions

Projected unit methodology

- B.1 Direction 11 requires use of the projected unit methodology (PUM) to determine the valuation results.
- B.2 Under the PUM, the actuarial liability for active members as at the end of the Control Period is calculated taking into account all types of decrement. In such calculations each year's benefit accrual ("unit") is projected from the relevant date up to the assumed date of retirement or other benefit event.

2015 Scheme Benefits

- B.3 Benefits in the 2015 Scheme are linked to Career Average Revalued Earnings (CARE) as opposed to final salary, which was the basis prior to 2015.
- B.4 Under CARE, for a given year's accrual, the benefit is determined using pensionable salary at the time of accrual rather than projected final pensionable salary. Each year's benefit accrual is revalued to retirement in line with the consumer price index (CPI). The final pension is the sum of all the years' revalued benefits.

Determining costs of accrual for future period 2017-20

- B.5 When determining the costs of accrual as required by Directions 27(1)(d) and 53(1) the cost has first been determined at 31 March 2017 and 31 March 2020 based on the (projected) membership of the Scheme and the applicable assumptions at those times. The overall cost of accrual for the period is then determined as the average of those costs.

Valuation of non-accruing benefits

- B.6 Some benefits such as lump sums payable on death in service, or service enhancements on ill-health retirement or on death in service, do not accrue. That is, they are payable when relevant the event (in the examples, death or ill health early retirement) occurs, regardless of the amount of service completed by the member. Accordingly, our methodology values these benefits at the point they are expected to be paid.



Grouping of individual active member records

B.7 Individual active members have been grouped together for the purposes of calculating liabilities. This grouping is necessary to accommodate the volume of data within our valuation system. The approach taken to grouping the data has been tested to ensure it does not result in any distortion of the valuation results. The groupings are made for each section/scheme (i.e. NPA 60, NPA 65 or 2015), protection status (i.e. protected, tapered or unprotected) and based on the following criteria.

<i>Age</i>	<i>Age nearest</i>
<i>Service</i>	<i>Duration (years nearest)</i>

Guaranteed Minimum Pensions (GMPs)

B.8 A global adjustment will be applied to reduce the past service liability in respect of estimated GMP entitlements for which provision of post SPa pension increases is not currently the responsibility of the scheme. This estimation has no impact on the calculation of the cost cap.

Public Service Transfer Club (PSTC)

B.9 Allowance has been made for the potential additional liabilities arising from inward transfers on PSTC terms. The financial impact is expected to be [TBC].

Final pensionable pay

B.10 All liabilities have been based on pensionable pay at the effective date as provided by fund administrators. No explicit allowance has been made for the impact of prior years' earnings resulting in higher final pensionable pay for particular members since this effect is not expected to impact a material number of members.

Dependants' pensions

B.11 No allowance has been taken for short term dependant pensions or children's pensions (other than those already in payment), on ground of immateriality.

Expenses

B.12 No allowance has been made for expenses. Expenses are outside the valuation framework.

Early retirement factors

B.13 When modelling retirement before Normal Pension Age where an actuarial reduction would be applied early retirement factors have been set equal to current factors (applied for the appropriate period before the normal pension age).



Deferred members over NPA

B.14 We will not exclude from the data any deferred members who are over NPA.

Re-entry of members

B.15 Re-entry of members to pensionable service has been modelled by the use of a 'net' withdrawal assumption for active members. This explicitly allows for a proportion of those leaving active service to return. No explicit allowance has been made in the valuation for a proportion of those deferred at the effective date to subsequently re-join. However the analysis undertaken for active members, and the resultant 'net' withdrawal rates include those re-joining from deferred status and hence the valuation of active members implicitly includes some provision for deferred members to return.

Additional voluntary contributions

B.16 Additional voluntary contributions paid to on a money purchase basis have not been considered for the valuation. Additional voluntary contributions paid in accordance with the pension scheme regulations to secure added service or pension are taken into account as liabilities of the scheme.

Scheme pays

B.17 Members can opt to use the scheme pays facility to pay HMRC for an annual allowance or lifetime allowance tax charge (i.e. the scheme pays the tax charge on behalf of the member for a corresponding reduction to the member's pension). Where members have opted to use this facility, a lower liability has been valued for these members, to reflect a scheme pays pension debit. The notional fund allows for actual cash flows and reflects any tax charges paid by the scheme, therefore a corresponding lower notional fund has been valued. The impact of these will broadly net off for valuation purposes.



Appendix C: Sensitivity of valuation results to Scottish Ministers-set assumptions

C1. The table below provides an indication of the sensitivity of the valuation results to the particular assumptions under consideration. This Table is taken from the report on the valuation of the LGPS (Scotland) as at 31 March 2014. The figures quoted are with reference to the 2014 valuation results.

Table C1: Sensitivity of valuation results to Scottish Ministers set assumptions

	Addition to past service liabilities (£billion)	Additional to proposed employer cost cap (% pensionable pay)
New entrant profile* : new joiners assumed 2 years older on average	No impact	+0.4%
Mortality rates* :		
(a) each pensioner subject to mortality rates 5% heavier than assumed ²¹	-0.20	-0.1%
(b) 5% more deaths before retirement than currently assumed	Not material	Not material
Age retirement rates* : active members retire (on average) one year later than currently assumed	-0.20	Not material
Commutation in respect of pre-2008 service* (assumption for post-2008 service is specified in the Directions): all eligible members commute 2% of pension more than assumed	Not material	No impact
Ill health retirements*		
(a) Rate of ill health retirements: 5% more members assumed to retire on ill health grounds than currently assumed	Not material	0.1%
(b) Severity of ill health retirements: 5% more members assumed to receive Tier 1 benefits than currently assumed	No impact	Not material
Members' dependants*		
(a) proportions partnered: 5% more members assumed to have qualifying partners at death	0.10	0.1%

²¹ Broadly speaking this is equivalent to assuming pensioners' life expectation is 0.5 years shorter.



	Addition to past service liabilities (£billion)	Additional to proposed employer cost cap (% pensionable pay)
(b) age difference between member and partner: dependants assumed to be 1 year older than the current assumption	-0.10	-0.1%
Withdrawals* : Withdrawal rates a third higher	-0.20	Not material
Promotional pay increases* : promotional pay increases 0.5% per annum higher on average than assumed	0.80	No impact

* Opposite changes in the assumptions will produce approximately equal and opposite changes in the valuation results.

C2. In each variant of the above table the sensitivity shown is in relation only to the change in assumption described. The impact of a combination of assumption changes will not necessarily equate to the sum of the relevant rows above.