Government Actuary's Department

Local Government Pension Scheme (England and Wales)

Actuarial valuation as at 31 March 2013

Advice on assumptions

Date: 2 February 2015

Authors: Ian Boonin FIA
Michael Scanlon FIA

Contents

1 Executive summary

This report contains our recommendations for the best estimate assumptions to be set by the Secretary of State for Communities and Local Government for the 2013 actuarial valuation of the Local Government Pension Scheme (England & Wales).

1.1 HM Treasury's *The Public Service Pension (Valuation and Employer Cost Cap) Directions 2014* dated 11 March 2014 (as amended) require that an actuarial valuation of the Local Government Pension Scheme (England & Wales) is carried out as at 31 March 2013. The Directions require that, unless otherwise specified in the Directions, the actuarial assumptions to be adopted for this valuation are to be "best estimates" determined by the Secretary of State for Communities and Local Government, having taken advice from the scheme actuary.

1.2 The Government Actuary's Department (GAD) has been appointed by the Department for Communities and Local Government (DCLG) to carry out an actuarial valuation of the Local Government Pension Scheme (England & Wales) ('the Scheme', or LGPS) as at 31 March 2013.

1.3 This report is addressed to the Secretary of State for Communities and Local Government and sets out GAD's formal advice to the Secretary of State on the actuarial assumptions to be adopted for the 2013 valuation, as required by HMT Directions. The advice covers the main assumptions to be set by the Secretary of State and is summarised in Table 1. The advice in this report has been shared and discussed with the shadow Scheme Advisory Board.

1.4 The purpose of this report is to enable the Secretary of State to determine the required best estimate assumptions. Assumptions may also be required in other areas and we will provide separate advice on additional assumptions as required.

1.5 We consider that recent experience generally provides the most reliable evidence when determining best estimates of future experience and we have adopted this approach throughout this advice unless noted otherwise.

1.6 The previous completed actuarial valuation of the LGPS was carried out as at 31 March 2010. Most of the assumptions put forward in this report differ from those used for the 2010 valuation. The most significant changes are likely to be:

- New and later age retirement assumptions for members assumed to join or move to the 2014 Scheme
- Reduction in rates assumed for ill-health retirement from service

1.7 The following chapters and annexes provide more detail on the advice, supporting analysis and the financial impact of the assumptions on the results. They also contain important background information about the context of this advice and its limitations.

1.8 The Secretary of State for Communities and Local Government is now asked to set the actuarial assumptions to be adopted for the valuation as required by the Directions, consulting with HM Treasury as appropriate, and to confirm those assumptions to GAD. We would be happy to provide further analysis to the Secretary of State if required.

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

Assumption	Summary of recommended assumptions	Rationale for recommendation	Approximate financial impact on Employer cost cap of change in assumption:	
			(1) From 2010 basis to that recommended for 2013	(2) From scheme reform basis to that recommended for 2013
Pensioner baseline mortality[1]	Set as standard SAPS tables adjusted by the percentages shown below [2,3]		+0.1%	+0.1%
Normal health	M: 99% x S1NMA; F: 93% x S1NFA	In line with 2010-2013 scheme experience		
Dependants	M: 120% x S1NMA; F: 101% x S1DFA	In line with 2010-2013 scheme experience		
Ill health (current)	M: 104% x S1IMA; F: 106% x S1IFA	In line with 2010-2013 scheme experience for ages 50+ (younger ages did not show compliance with a standard table)		
Ill health (future)	M: 104% x S1IMA; F: 106% x S1IFA	The mortality of future ill-health retirees is proposed at the same level as that for current ill-health retirees.[4]		

[1] As directed by HMT, future improvements in mortality assumed to be in line with those underlying the 2012 ONS principal population projections.

[2] SAPS tables are published by the Actuarial Profession and are based on the experience of self-administered pension schemes over the period 2000 to 2006. The 'S1' series has separate standard tables based on experience of members retiring in normal health (S1NXA) and in ill health (S1IXA) and for female dependants (S1DFA).

[3] Adjusted to take account of improvements in UK population mortality between 2002 (the base year for the tables) and 2012.

[4] The tightening in criteria for approving ill-health retirements in recent years might be expected to lead to increasing mortality among ill-health retirements, on the grounds that future ill-health retirees will, on average, be more severely ill on retirement than current ill-health pensioners. However, the 2010-2013 mortality experience of ill-health pensioners is already higher than the standard tables which reflect the aggregate experience of a wide range of pension schemes, and there is no evidence to support an assumption of mortality even higher than recent experience.

Assumption	Summary of recommended assumptions	Rationale for recommendation	Approximate financial impact on Employer cost cap of change in assumption:	
			(1) From 2010 basis to that recommended for 2013	(2) From scheme reform basis to that recommended for 2013
Age retirement All members joining on or after 1 Oct 2006, and all members not entitled to unreduced benefits before age 65 under the 'Rule of 85'	0.3% (M) or 0.2% (F) retire each year from 55 up to 5 years before NPA, then 9% (M and F) a year prior to NPA: 100% at NPA	Early retirement in line with 2010-2013 experience but excluding the effect of redundancies, expressed in terms of number of years early so as to accommodate the higher NPAs in the 2014 Scheme. This represents a change from the previous valuation at which members were assumed to retire at the earliest age their benefits could be taken unreduced.	not material	not material
Members entitled to unreduced benefits at age 60[5] under the 'Rule of 85'	Members with NPA or 65 or 66 (born before 6 Apr 1960): typically 31% (M) or 30% (F) retire at 60, with 2% (M and F) a year prior to CRA: 17% (M) or 23% (F) a year between CRA and NPA; 100% at NPA. Members with higher NPA (born after 6 Apr 1960): Rates intermediate between the above and those applying to members joining on or after 1 Oct 2006	In line with 2010-2013 experience (excluding redundancies). Retirement age for members with smaller amounts of 2014 Scheme service likely to be consistent with current experience. Retirement age likely to be influenced by both the 2014 Scheme and the Earlier Schemes	N/A	N/A

Assumption	Summary of recommended assumptions	Rationale for recommendation	Approximate financial impact on Employer cost cap of change in assumption:	
			(1) From 2010 basis to that recommended for 2013	(2) From scheme reform basis to that recommended for 2013
Members entitled to unreduced benefits at ages between 60 and 65 under the 'Rule of 85'	Consistent with rates above, but based around unreduced benefits being payable at 62 rather than 60	As above; assuming unreduced benefits are payable at 62 a reasonable simplification	N/A	N/A
Ill-health retirement			-0.4%	not material
Incidence	Increasing by age: male rates are around 0.01% at age 30, 0.1% at age 45, 0.8% at age 60; female rates lower	In line with 2010-2013 experience: not adjusted for further improvements in health		
Tier 1 / 2 / 3 split	77% / 11% / 12% (male and female)	In line with 2010-2013 experience		
Withdrawal	Reducing with age: female rates are around 7% at age 30, 4% at age 45, 2% at age 60, net of 20% re-entry within 5 years; male rates lower; no duration-based assumptions for males or females	In line with 2010-2013 experience and further adjusted for re-entry within 5 years on the evidence of a sample set of funds	not material	not material
Death before retirement	Increasing by age: male rates are around 0.03% at age 30, 0.09% at age 45, 0.32% at age 60; female rates lower	In line with 2010-2013 experience; not adjusted for future improvements in mortality	not material	not material

[5] Such a member may take service up to 31 Mar 2008 unreduced under the 'Rule of 85'; a member born on or before 31 Mar 1960 may have some protection for later service.

Assumption	Summary of recommended assumptions	Rationale for recommendation	Approximate financial impact on Employer cost cap of change in assumption:	
			(1) From 2010 basis to that recommended for 2013	(2) From scheme reform basis to that recommended for 2013
Promotional salary scale	Steeper at younger ages: male rates are around 1.1% at age 30, 0.5% at age 45, 0.0% at age 60; female rates lower	As adopted for 2010 valuation since 2010-2013 experience does not give clear evidence that previous assumption is no longer appropriate	No change in assumption	
Commutation			+0.2%	+0.5%
Pre-2008 service	10% of pension commuted	In line with 2008-2011 experience		
2008-14 service	15% of pension commuted	Specified in HMT Directions		
2014 Scheme service	15% of pension commuted	Specified in HMT Directions		

Assumption	Summary of recommended assumptions	Rationale for recommendation	Approximate financial impact on Employer cost cap of change in assumption:	
			(1) From 2010 basis to that recommended for 2013	(2) From scheme reform basis to that recommended for 2013
Family statistics				
Proportion married/partnered	80% (M), 75% (F) at ages up to 70, with consistent assumptions for existing pensioners and other ages	Equal to 100% of ONS population statistics, in the absence of credible evidence to the contrary: the experience data for 2010-2013 caused concerns over the consistency of recording of death cases, so no scheme-specific experience has been used to set this assumption	-0.2%	-0.1%
Age difference	Male member 3 years older than partner Female member 2 years younger than partner	In line with 2010-2013 experience	not material	not material

2 Introduction

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

2.1 Under section 12 of the Public Service Pensions Act 2013 ('the 2013 Act'), scheme regulations must set an "employer cost cap". This is a rate, expressed as a percentage of pensionable earnings of members of the scheme, to be used for the purpose of measuring changes in the cost of the scheme. The employer cost cap is to be set in accordance with HM Treasury directions.

2.2 HM Treasury's *The Public Service Pension (Valuation and Employer Cost Cap) Directions 2014* dated 11 March 2014 (as amended)[6] (HMT Directions) require that a valuation of the LGPS is carried out as at 31 March 2013 for the purpose of setting the employer cost cap.

2.3 HMT Directions also require an assessment of the Scheme's accrued past service liabilities to be made and an employer contribution rate to be calculated, to enable comparisons between different public sector pension schemes on a consistent basis. However neither of these will affect the operation of the cost control mechanism, and the actual employer contributions will be paid in accordance with each administering authority's rates and adjustments certificate issued under regulation 62 of the Local Government Pension Scheme Regulations 2013. The calculation of the "employer cost cap" at this valuation is therefore the most significant outcome in relation to the operation of the Scheme.

2.4 HMT Directions require that the assumptions to be adopted for this valuation, except for those assumptions specified elsewhere in the Directions, will be set by the Secretary of State for Communities and Local Government, having obtained advice from the scheme actuary [direction 19(a)]. They also require that the assumptions must be the Secretary of State's best estimates and not include margins for prudence or optimism [direction 19(c)].

2.5 GAD has been appointed by DCLG to carry out an actuarial valuation of the LGPS as at 31 March 2013.

2.6 This report is addressed to the Secretary of State for Communities and Local Government ('the Secretary of State') and contains our formal advice on the appropriate assumptions to be adopted for the 2013 valuation, as required by HMT Directions. The purpose of this advice is to enable the Secretary of State to determine the required best estimate assumptions.

2.7 The advice is provided in accordance with HMT Directions. We may revise this advice if material new evidence comes to light.

2.8 The advice also has regard to HMT's preferred approach for setting assumptions in the absence of direct evidence.

[6] https://www.gov.uk/government/publications/public-service-pensions-actuarial-valuations-and-the-employer-cost-cap-mechanism

2.9 The advice covers the main assumptions to be set by the Secretary of State. In particular, we consider eight sets of 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

2.10 Assumptions may also be required in other areas, eg relating to the projections of the membership to 2016-2019. Further details on additional assumptions are explained in our report *Local Government Pension Scheme (England and Wales) Valuation as at 31 March 2013: Report on methodology* dated 2 February 2015.

2.11 The Secretary of State is now asked to set the actuarial assumptions (listed in paragraph 2.9) to be adopted for the valuation as required by HMT Directions, consulting with HM Treasury as appropriate, and to confirm those assumptions to GAD. We would be happy to provide further analysis to the Secretary of State, if required.

2.12 This report should be read in conjunction with our report "The Local Government Pension Scheme (England & Wales) – Actuarial valuations as at 31 March 2013: Report on data used for experience analysis" dated 2 February 2014. That report describes, at section 3, the exclusion of certain funds' data from the analysis and our concerns regarding that exclusion. In preparing our advice, we have relied upon the general completeness and accuracy of the data that has been used, and have assumed that it is representative of the entire Scheme.

2.13 We consider that recent experience generally provides the most reliable evidence when determining best estimates of future experience, and have adopted this approach throughout this advice unless noted otherwise. The Secretary of State should consider whether there is any reason why this approach would be inappropriate. We would be happy to revisit our advice to take account of any evidence relevant to expected future experience of the Scheme membership.

2.14 The report is also being made available to:

- The shadow Scheme Advisory Board as part of the consultation process relating to the valuation of the LGPS; and
- HMT as part of the process for granting their approval to the assumptions proposed by the Secretary of State.

2.15 We are content for the Secretary of State to release this report to third parties, provided that:

- 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.

2.16 Third parties whose interests may differ from those of the Secretary of State should be encouraged to seek their own actuarial advice where appropriate. Other than DCLG, 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.

HMT Directions

3.2 The advice in this report reflects the requirements of HMT Directions that assumptions should be set as the Secretary of State's 'best estimates' of future experience and should not contain margins for prudence or optimism. They should be set having regard to:

- the assumptions set for previous valuations
- the analysis of demographic experience up to the valuation date, taken as experience over the three-year period up to the valuation date for the purposes of our advice
- relevant data from any other source
- emerging evidence about historic long-term trends
- any emerging evidence which may illustrate long-term trends expected in the future.

Setting assumptions where there is insufficient evidence

3.3 Since all the reformed public service schemes have certain characteristics for which there is no, or insufficient, direct evidence on which to base assumptions HMT has issued a document setting out the approach that schemes should take when setting these assumptions. See Annex A of the HMT paper "Public service pensions: actuarial valuations and the employer cost cap mechanism" dated March 2014[7].

Different populations

3.4 HMT Directions require the valuation to cover both the new schemes established under the 2013 Act and any existing schemes which are connected to it. This means the 2013 valuation needs to consider assumptions appropriate to both new entrants to the 2014 Scheme and existing members with membership accrued in the Earlier Schemes (as defined in the Local Government Pension Scheme (Transitional Provisions, Savings and Amendment) Regulations 2014).

[7] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/289366/public_service_pensions_actuarial_valuations_130314.pdf

3.5 From 2014 there will be 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 1 April 2016 and who are expect to retire by that date: the introduction of the 2014 Scheme is not expected to have any impact on this group's behaviour.
- New members to the 2014 Scheme. These members' behaviours are expected to be influenced only by the provisions of the 2014 Scheme.
- Members who have both service before 1 April 2014 and service after 1 April 2014 without 'Rule of 85' protection. Over time, as the proportion of 2014 Scheme service increases, the behaviour is expected to become increasingly influenced by the provisions of that scheme.

Relative importance of assumptions

3.6 HMT Directions require the employer cost cap to be determined to the nearest 0.1% of pensionable payroll. This is the required level of accuracy for the calculations based on a particular set of assumptions, rather than the allowable variation from what experience will show to be the correct result. In each of the remaining chapters in this report we conclude by providing an indication of the impact on the employer cost cap of the change being recommended to the assumptions, first by reference to the assumptions used for the 2010 valuation, and secondly by reference to the assumptions used in the scheme reform analysis (see paragraph 3.10).

3.7 The figures have been calculated using approximate methods and should be used as a guide to the broad magnitude of the impact of the change being considered. Furthermore the impacts of different changes are not independent so the impact of multiple changes will not necessarily be the sum of the individual impacts. Changes are not considered material if their expected impact on the contribution rate is less than 0.05%.

3.8 The assumptions will be used in the assessment of the Scheme's accrued past service liabilities and the calculation of an employer contribution rate. However, the employer contribution rate will not be implemented, so we have not illustrated the impact of the assumptions on the employer contribution rate.

3.9 The assumptions for this valuation will be used in the 2016 valuation to calculate the prior value of the cost cap fund as at 31 March 2014 [Direction 30]. These assumptions will, therefore, have an impact on the future operation of the employer cost cap mechanism.

Scheme reform

3.10 As part of the process of scheme reform, GAD calculated the expected future service cost of the proposed LGPS benefit design from 1 April 2014 as 19.5% of pay. The assumptions underlying that calculation are referred to in this document as 'the scheme reform assumptions'.

4 Pensioner mortality

This chapter sets out our recommendation for the pensioner mortality assumptions, the rationale for those assumptions and their financial impact.

Proposed assumptions for the 2013 valuation

4.1 The assumptions we recommend for baseline pensioner mortality for the 2013 valuation may be summarised as follows:

Table 4.1: Recommended mortality assumptions

Baseline mortality	Standard table[8]	Adjustment
Males		
Retirements in normal health	S1NMA	99%
Current ill-health pensioners	S1IMA	104%
Future ill-health pensioners	S1IMA	104%
Dependants	S1NMA	120%
Females		
Retirements in normal health	S1NFA	93%
Current ill-health pensioners	S1IFA	106%
Future ill-health pensioners	S1IFA	106%
Dependants	S1DFA	101%

4.2 As specified by HM Treasury, future changes in post-retirement mortality will be assumed to be in line with those underlying the 2012 principal population projections published by the Office for National Statistics (ONS).

4.3 For ill-health pensioners, an assumption has been derived by fitting the 2010-2013 experience to a standard table for ages 50 and upwards only. This was because the experience data at ages below age 50 did not give a satisfactory fit against a standard table, especially for females. The impact of the difference between the 2010-2013 experience and the standard tables is relatively minor, however, and is not a matter we consider is worth pursuing further since we expect any impact on the valuation results would be immaterial.

[8] SAPS tables are published by the Actuarial Profession and based on the experience of self-administered pension schemes over the period 2000 to 2006. The 'S1' series has separate standard tables based on experience of members retiring in normal health (S1NXA) and in ill health (S1IXA) and for dependants (S1DFA).

Previous valuation assumptions

4.4 At the 2010 valuation, baseline mortality was similarly based on standard tables with future improvements based on the then most recent ONS population projections.

Comparison of expected pensioner longevity

4.5 The table below gives a comparison of the resulting life expectancies[9] assumed and recommended for the 2010 and 2013 valuations and also that resulting from the scheme reform assumptions.

Table 4.2: Comparison of normal health life expectancies (years)

	2010 valuation	Scheme reform	2013 valuation
Current pensioners			
Male aged 60	28.1	28.2	28.3
Male aged 65	23.2	23.4	23.4
Female aged 60	30.6	30.8	31.4
Female aged 65	25.6	25.8	26.4
Future pensioners – current age 45			
Male life expectancy from age 60	29.5	30.0	30.0
Male life expectancy from age 65	25.1	25.6	25.6
Female life expectancy from age 60	32.1	32.5	33.1
Female life expectancy from age 65	27.6	28.0	28.6

Use of the assumption

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

Results of analysis

4.7 The proposed assumptions are based on an analysis of past mortality experience for the Scheme. We have analysed the pensioner mortality experience over the three-

[9] Cohort life expectancies based on the ages shown as at the valuation date, ie allowing for future mortality improvement .

year period from 1 April 2010 to 31 March 2013 on an 'amounts' basis. An amounts basis weights the experience by the size of each member's pension.

4.8 In order to make a recommendation of the most appropriate base table for pensioner mortality we have compared the actual mortality experience over the three-year period 2010-2013 with that expected based on the most appropriate S1 standard table[10]. This comparison considers the key age ranges for the various types of deaths and identifies what adjustment to the standard table is required to provide the closest comparison with actual experience. The results are as shown in paragraph 4.1. Annex C shows this comparison by age. It should be noted that although the male dependant assumption differs significantly from the standard table, the impact of this element is not significant to the overall results.

Financial impact

4.9 The approximate financial impact of the proposed change to the mortality basis (both baseline and update of the improvement basis) compared to that used a) for the 2010 valuation, and b) for the scheme reform analysis is set out in Table 4.3.

Table 4.3: Approximate financial impact of proposed change in mortality assumptions

	Employer cost cap
Change in mortality basis (baseline and improvements) from 2010 basis to those recommended for 2013	+0.1%
Change in mortality basis (baseline and improvements) from scheme reform basis to those recommended for 2013	+0.1%

[10] Adjusted from the base year for the SAPS 'S1' series standard tables (2002) to those applicable to the period the deaths occurred (2010-2013) by applying adjustments broadly in line with the improvements applying to the UK population over the relevant period.

5 Age retirement from service

This chapter sets out our recommendations for the assumed patterns of retirement on grounds other than ill health, the rationale for those assumptions and their financial impact.

Proposed assumptions for 2013 valuation

5.1 We recommend that rates of age retirement are set separately for different categories of members, and for ages from 55 to NPA. The retirement rates for different categories of members are described below, and full details are contained in Annex D.

5.2 The rates set out in Annex B 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 30(7) of the 2013 regulations).

New entrants to the 2014 Scheme

5.3 We recommend a spread of retirement ages between age 55 and 2014 Scheme NPA, based on early retirements in 2010-2013, expressed in terms of number of years before NPA so as to accommodate the higher NPAs under the 2014 Scheme.

Members not entitled to unreduced benefits before age 65 under the 'Rule of 85'

5.4 This includes all members joining on or after 1 October 2006, and those members who joined before 1 October 2006 but are not entitled to unreduced benefits before age 65 under the 'Rule of 85'. For these members we recommend the same assumptions as for new entrants to the 2014 Scheme. The fact that these members have some benefits payable unreduced from age 65 (rather than NPA) might mean they retire a little earlier than new entrants to the 2014 Scheme, but this has a relatively slight financial impact because early and late retirement factors that are broadly financially neutral apply to service both before and after 2014.

Members entitled to unreduced benefits at age 60 under the 'Rule of 85'

5.5 For members with 2014 Scheme NPA or 65 or 66 (ie those born before 6 Apr 1960), we recommend a spread of retirement ages before and after age 60, based on retirements in 2010-2013. These members have a right to take their benefits from age 60 but the 2010-2013 experience indicates that a significant proportion of such members do not, in fact, elect to do so. To the extent that they defer their retirement after age 60, the scheme's financial position is improved because no late retirement factors apply on retirement before age 65, and the assumptions will anticipate this effect for the proportions of members assumed to retire after age 60.

5.6 For a member with 2014 Scheme NPA greater than 66 (ie born after 6 April 1960), we recommend retirement rates which are intermediate between those applying to members born before 6 April 1960 (paragraph 5.6 above) and those applying to new entrants to the 2014 Scheme (paragraph 5.4 above). This reflects such a member's retirement age being influenced by both the 2014 Scheme and the Earlier Schemes.

Members entitled to unreduced benefits between 60 and 65 under the 'Rule of 85'

5.7 We recommend rates that are consistent with those applying to members entitled to unreduced benefits at age 60 above (paragraphs 5.6 and 5.7), but based around unreduced benefits being payable at 62 rather than 60. We propose assuming that unreduced benefits are payable at 62 on the grounds of simplicity and materiality, as this broadly represents the average age at which benefits are payable unreduced for this group.

Flexible retirements

5.8 Flexible retirements are not currently a significant feature of the scheme. In the absence of any evidence of increased uptake of flexible retirement we are not recommending an explicit assumption for such events. DCLG, the shadow Scheme Advisory Board, and other stakeholders may have a view on the likelihood of such an increase and the Secretary of State may wish to make an allowance on the basis of their evidence. GAD would be happy to analyse any evidence provided. However, it is likely to require a significant uptake of the option before any appreciable financial impact is observed.

Previous valuation assumptions

5.9 The 2010 valuation included the assumption that all members would retire at the earliest date at which their benefits could be taken unreduced as of right. However, the experience over the period 2010-2013 indicates that a significant proportion of members do not take their benefits at the earliest date they are available unreduced.

Use of the assumption

5.10 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.

5.11 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.

5.12 An actuarial uplift is applied for retirement after NPA in the 2014 Scheme, and for retirements after 65 in the Earlier Schemes.

Financial effect of early and late retirement

5.13 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.

5.14 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 65 do not receive an uplift for late retirement. This will (all other things being equal) reduce the cost to the Scheme of providing their benefits.
- All members with final salary service in the Earlier Schemes who retire early effectively give up future salary increases net of inflation (CPI). As we would generally expect average salary increases to be greater than inflation over the long term this also reduces the cost to the Scheme.
- Finally, if a member retires early subject to a reduction and also takes cash by commutation, then (because the commutation terms are the same at all ages and so the reduction is not cost neutral with respect to cash) this also reduces the cost to the Scheme.

5.15 Note that only the third of these effects will directly affect setting the level of the cost cap. However the other two will affect the operation of the cost cap fund so will have an effect on the cost cap mechanism and hence, potentially, on members' future benefits.

5.16 The financial effect of late retirement (ie after Normal Pension Age under the 2014 Scheme, and after age 65 under the Earlier Schemes) is much less material and we do not propose to model it explicitly.

Results of analysis

5.17 We analysed the pattern of age retirements from active membership over the three-year period to 31 March 2013. Further information on the data analysed and the results of that analysis are shown in Annex D.

Financial impact

5.19 The approximate financial impact of the proposed change to the age retirement assumptions compared to those used a) for the 2010 valuation, and b) for the scheme reform analysis is set out in Table 5.1.

Table 5.1: Approximate financial impact of proposed change in age retirement assumptions

	Employer cost cap
Change in age retirement assumptions from 2010 basis to those recommended for 2013	Not material
Change in age retirement assumptions from scheme reform basis to those recommended for 2013	Not material

5.19 The age retirement assumptions do not have a material impact on the employer cost cap because of the design of the 2014 Scheme, which includes actuarially neutral early and late retirement factors. The age retirement assumptions are more significant for the calculation of the liabilities of active members in respect of service before

1 April 2014, and will have an impact on the initial value of the cost cap fund and hence on the future operation of the cost cap mechanism.

6 Ill-health retirement from service

This chapter sets out our recommendation for the assumed rates of retirement on grounds of ill health, the rationale for those assumptions and their financial impact.

Proposed assumptions for 2013 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, ie applying both to existing members who have been members of the 2008 Scheme and to those who join the 2014 Scheme without having any 2008 Scheme membership. Assumed rates of ill-health retirement 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 Annex B.

6.2 We also recommend assuming that 77% of members (both men and women) retiring on ill-health grounds will receive Tier 1 benefits: 11% will receive Tier 2 benefits, and 12% will receive Tier 3 benefits. (Tier 1 provides a higher level of benefit than Tier 2, while Tier 3 provides a benefit for a limited period after which a review takes place.)

Previous valuation assumptions

6.3 The 2013 assumptions for incidence of ill-health early retirement are approximately 66% and 70% of the 2010 assumptions for males and females respectively.

6.4 For the 2010 valuation it was assumed that 70% of those retiring on ill-health grounds would receive Tier 1 benefits; 15% would receive Tier 2 benefits and 15% Tier3 benefits. The change to the proportions shown at paragraph 6.2 above is based on the 2010-2013 scheme experience.

Use of the assumptions

6.5 Ill-health retirement rates specify the rate at which members are assumed to retire on grounds of ill health. The assumed eligibility for Tier 1, 2 or 3 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.

Results of analysis

6.6 We analysed around 8,800 ill-health retirements over the three-year period to 31 March 2013. The analysis compared the numbers of actual retirements to the expected number of retirements under previous valuation assumptions. Details of the analysis are shown in Annex E.

Ill-health retirement rates

6.7 The analysis showed there were substantially fewer ill-health retirements than assumed under the 2010 valuation assumptions. The distribution of retirements was broadly in line with the rates assumed for the 2010 valuation in terms of the age profile of the assumption.

6.8 The recommended ill-health rates have been based on the assumption for the previous valuation but rated down to be in line with recent experience. The rates have also been extended to accommodate higher NPAs.

Split between tiers

6.9 The proportion of awards qualifying for the various Tiers is not markedly different between men and women and is not particularly dependent on age, and we therefore recommend that the proportions shown in paragraph 6.2 are used for all ages and for both males and females.

Financial impact

6.10 The approximate financial impact of the proposed change to the ill-health retirement assumptions compared to those used a) for the 2010 valuation, and b) for the scheme reform analysis is set out in Table 6.1.

Table 6.1: Approximate financial impact of proposed change in ill-health retirement assumptions

	Employer cost cap
Change in ill-health assumptions from 2010 basis to those recommended for 2013	-0.4%
Change in ill-health assumptions from scheme reform basis to those recommended for 2013	not material

7 Voluntary withdrawal from service

This chapter sets out our recommendation for the assumed rates of withdrawal from active service, the rationale for those assumptions and their financial impact.

Proposed assumptions for 2013 valuation

7.1 We recommend that a single set of rates of withdrawal (separate for men and women) is used for the purposes of the valuation ie applying both to existing members who have been members of the 2008 Scheme and to those who join the 2014 Scheme without having any 2008 Scheme membership. The recommended rates are net of re-entry within five years. The same withdrawal rates are proposed regardless of the length of the member's service. Sample rates are provided in Annex B.

Previous valuation assumptions

7.2 At the 2010 valuation, the withdrawal rates assumed did not make allowance for re-entry. The rates are not, therefore, directly comparable to the recommended 2013 assumptions. The change to the net withdrawal approach ties in with the provisions for re-linking service to salary after re-entry in the existing scheme[11]. The 2013 ultimate assumptions are approximately 55% of the 2010 assumptions for both males and females, before any adjustment is made for re-entry to the scheme.

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, ie they are intended to reflect the probability of leaving service and not rejoining within five years, and therefore the member's benefits not being linked to their final salary at retirement in relation to pre-2014 benefits.

Results of analysis

7.4 The calculation of the net withdrawal rates is split into two elements:

- what is the likelihood that a member leaves service; and
- if a member does leave service, what is the likelihood they do not return within five years.

7.5 For the first element, we have analysed the pattern of withdrawals from active membership over the three-year period to 31 March 2013.

7.6 For the second element, we have analysed data from a subset of funds. About 20% of members who left between 2007 and 2012 were also active in 2012. Based on this

[11] From 2015, only members who leave the Scheme and return within five years will have their accrued service in the Earlier Schemes linked to their final salary at retirement.

analysis we recommend making a broad assumption that 20% of all leavers, regardless of their gender or age, will rejoin the scheme within 5 years.

7.7 The recommended net withdrawal rates have been derived by combining the analysis of actual leavers with the assumption regarding rejoiners.

7.8 Recent experience may not be representative of the long term expectation due to prevailing conditions in the wider labour market. However we do not have sufficient information to analyse this effect and it may be partially offset by a lower than typical rate of voluntary exits in a difficult employment environment.

7.9 Further information on the data analysed and the results of that analysis are shown in Annex F.

Financial impact

7.10 The approximate financial impact of the proposed change to the withdrawal rate assumptions compared to those used a) for the 2010 valuation, and b) for the scheme reform analysis, is set out in Table 7.1

Table 7.1: Approximate financial impact of proposed change in withdrawal assumptions

	Employer cost cap
Change in withdrawal assumptions from 2010 basis to those recommended for 2013	not material
Change in withdrawal assumptions from scheme reform basis to those recommended for 2013	not material

7.11 The withdrawal assumptions do not have a material impact on the employer cost cap because of the design of the 2014 Scheme, which provides for revaluation of benefits to be by reference to a change in prices both during a member's service and in deferment after leaving service. The withdrawal assumptions are more significant for the calculation of the liabilities of active members in respect of service before 1 April 2014, and will have an impact on the initial value of the cost cap fund and hence on the future operation of the cost cap mechanism.

8 Death before retirement

This chapter sets out our recommendation for the assumed rates of death before retirement, the rationale for those assumptions and their financial impact.

Proposed assumptions for 2013 valuation

8.1 We recommend a single set of assumptions (separate for men and women) is used to allow for the possibility of death before retirement ie applying both to existing members who have been members of the 2008 Scheme and to those who join the 2014 Scheme without having any 2008 Scheme membership. Assumed rates of death in service increase with age but, except for males at ages beyond 63, remain less than ½% a year. Sample rates are provided in Annex B.

Previous valuation assumptions

8.2 Single sets of rates (separate for men and women) were used for the 2010 valuation to allow for the possibility of death before retirement. The rates were based on experience prior to the valuation date and were higher than those recommended for the 2013 valuation. The 2013 rates are approximately 81% of the 2010 rates for males and 71% of the 2010 rates for females.

Use of the assumption

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

Results of analysis

8.4 We have analysed the deaths of active members over the three-year period to 31 March 2013. The recommended assumptions for both deaths in service and in deferment are based on this analysis. In total there were around 4,100 deaths of active members over the period. The analysis compares the number of actual deaths to the expected number of deaths under the 2010 valuation assumptions and under ONS data on the rates applying to the whole population. Further information on the data analysed and the results of that analysis are shown in Annex G.

8.5 The analysis showed there were significantly fewer deaths than expected. To formulate a recommended assumption we considered what adjustment to the ONS rates would provide the closest comparison with actual experience. The 'best fit' was achieved by taking 37% and 35% of the ONS rates for males and females respectively.

Financial impact

8.6 The approximate financial impact of the proposed change to assumed rates of death before retirement compared to those used a) for the 2010 valuation, and b) for the scheme reform analysis, is set out in Table 8.1.

Table 8.1: Approximate financial impact of proposed change in death before retirement assumptions

	Employer cost cap
Change in death before retirement assumptions from 2010 basis to those recommended for 2013	not material
Change in death before retirement assumptions from scheme reform basis to those recommended for 2013	not material

9 Promotional pay increases

This chapter sets out our recommendation for the assumed promotional pay increases of active members, the rationale for those assumptions and their financial impact.

Proposed assumption

9.1 We recommend assuming separate scales of promotional increases for men and women. The increases are dependent on age and are steeper at younger ages. Sample values of the scales are provided in Annex B.

Previous assumption

9.2 The assumptions used for the 2010 valuation are the same as those recommended for the 2013 valuation.

Use of the assumption

9.3 For members with membership before 1 April 2014, those benefits are linked to salary at, or near, retirement. Members' salaries can increase through a combination of annual general pay awards and promotional pay increases. To calculate an estimate of the level of benefit payable in the future requires assumptions for both these components. The assumption for general pay awards is directed by HMT. The assumption for promotional pay increases is set by the responsible authority.

9.4 For members who join the 2014 Scheme with no membership of the 2008 Scheme, their benefits are not linked to salary near retirement but are entirely derived under the CARE basis. However, their pay levels will affect their own contribution rates.

Results of analysis

9.5 We analysed the pay progression of the membership over the three-year period to 31 March 2013. Details of the analysis are contained in Annex H.

9.6 The analysis of the pay structure of the membership as at 31 March 2013 does not provide a clear picture but does not indicate that the 2010 valuation assumption for promotional pay increases is inappropriate. As there is no compelling evidence to suggest that the promotional pay increase assumptions used previously are no longer appropriate, we do not propose to make any changes to the assumptions used for the 2010 valuation.

Financial impact

9.7 We do not recommend any change to this assumption. It has very little financial impact on the costs of a CARE scheme, or on the employer cost cap. However it does affect the assessment of liabilities and will affect the prior value of the cost cap fund as at 31 March 2014.

10 Commutation of pension for cash at retirement

This chapter sets out our recommendation for the assumed levels of pension commutation at retirement, the rationale for those assumptions and their financial impact

Assumptions for 2013 valuation

10.1 HMT Directions specify the assumption regarding commutation where a member's retirement cash is provided only by commutation and the commutation rate is £12 cash for each £1 p.a. of pension: in this situation the assumption specified is that a member surrenders 15% of his or her pension for a cash sum at retirement.

10.2 For determining a future service contribution rate in relation to the Employer Cost Cap mechanism, the above assumption from the Directions will be relevant. However, where any valuation involving past service is undertaken, the specified assumption is no longer fully applicable because of the 3/80th retirement grant that applied for membership up to 2008. For that service it will be necessary to consider an assumption regarding commutation where a member already has an element of retirement cash provided automatically through the scheme benefit structure.

10.3 Table 10.1 below summarises the assumptions proposed for the 2013 valuation. The 10% rate for pre-2008 service broadly represents members electing to commute around half of the maximum commutable pension after allowing for the 3/80th retirement grant.

Table 10.1: Recommended commutation assumptions for the 2013 valuation

	Pre-2008 service	2008-2014 service[12]	2014 Scheme service[12]
Males	10%	15%	15%
Females	10%	15%	15%

Previous valuation assumptions

10.4 For the 2010 valuation it was assumed that members took half of the maximum tax-free cash sum permitted by HMRC, including any retirement grant to which they were entitled. For post 2008-service, this is equivalent to assuming around 18% of pension is commuted.

Use of the assumption

10.5 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

[12] Specified in HMT Directions.

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 2014 Scheme will feed through into the cost cap fund.

Results of analysis

10.6 The recommended assumption for pre-2008 service is based on experience over the period 2008-2011, which informed the scheme reform assumptions.

10.7 In practice, a member commutes part of their total pension, and does not specify whether the part commuted related to service before or after 2008. More recent data does not necessarily provide better information on the proportion of pre-2008 pension commuted, because the analysis is complicated by increasing amounts of post 2008 service.

Financial impact

10.8 The approximate financial impact of the specified change to the commutation assumptions compared to those used a) for the 2010 valuation, and b) for the scheme reform analysis, is set out in Table 10.2.

Table 10.2: Approximate financial impact of specified change in commutation assumption

	Employer cost cap
Change in commutation assumptions from 2010 basis to those specified for 2013	+0.2%
Change in commutation assumptions from scheme reform basis to those specified for 2013	+0.5%

11 Family statistics

This chapter sets out our recommendation for the assumptions around dependants' pensions, the rationale for those assumptions and their financial impact.

Proposed assumptions for 2013 valuation

11.1 We recommend the following assumptions.

- At ages up to 70, 80% of males and 75% of females are assumed to be married or have a partner to whom a dependant's pension would be payable on their death, with consistent assumptions for current pensioners.
- Male members are assumed to be three years older than their partners and female members are assumed to be two years younger than their partners.
- No allowance is made for remarriage, on the grounds of materiality.

Previous valuation assumptions

11.2 The assumed proportions married/partnered are lower than adopted for the 2010 valuation: at that valuation it was assumed that 85% of males and 80% of females were married or had a qualifying partner at retirement, with consistent assumptions for current pensioners. The age difference is also slightly different compared to the 2010 valuation: at that valuation it was assumed that female members would be 3 years younger than their partners.

Use of the assumption

11.3 Dependants' pensions[13] are provided to qualifying dependants 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 age differences between members and partners as this affects how long dependants' pensions will be paid for.

11.4 Where the member has no service on or after 1 April 1998, the spouse's pension will cease if the spouse remarries. As this only applies to some current pensioners and deferred pensioners, this assumption does not impact the cost cap in any way.

Results of analysis

11.5 Our analysis of the pensioners who died during the three-year period to 31 March 2013 did not yield consistent or convincing proportions of members on whose death a dependant's pension was paid. It is possible that death cases were not consistently recorded among the component funds within the scheme. Therefore we believe that the analysis of the scheme's experience is not suitable for deriving this assumption,

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

and instead the ONS statistics are likely to be a better representation of the scheme's future experience. Details of the analysis made are however contained in Annex I.

11.6 Across a wide range of ages, our analysis showed that dependants (ie spouse, civil partner or partner) of female members are, on average, 2.1 years older than the member, while dependants of male members are, on average, 2.9 years younger than the member. On grounds of simplicity and materiality we recommend rounding these differences to 2 years and 3 years respectively.

Financial impact

11.7 The approximate financial impact of the proposed change to the family statistics assumptions compared to those used a) for the 2010 valuation, and b) for the scheme reform analysis, is set out in Table 11.1.

Table 11.1: Approximate financial impact of proposed changes in family statistics assumptions

	Employer cost cap
Change in dependants' proportions and in age difference assumptions, from 2010 basis to those proposed for 2013	-0.2%
Change in dependants' proportions and in age difference assumptions, from scheme reform basis to those proposed for 2013	-0.1%

The financial impact shown in Table 11.1 arises from the change in the assumed proportions married: the change in assumed age differences between deceased member and their dependant does not have a material impact.

Annex A: Summary of assumptions

Table A1: Summary of recommended assumptions consistent with the 'best estimate' requirement

Assumption	Summary of recommended assumptions	Rationale for recommendation	Approximate financial impact on Employer cost cap of change in assumption:	
			(1) From 2010 basis to that recommended for 2013	(2) From scheme reform basis to that recommended for 2013
Pensioner baseline mortality[14]	Set as standard SAPS tables adjusted by the percentages shown below [15,16]		+0.1%	+0.1%
Normal health	M: 99% x S1NMA; F: 93% x S1NFA	In line with 2010-2013 scheme experience		
Dependants	M: 120% x S1NMA; F: 101% x S1DFA	In line with 2010-2013 scheme experience		
Ill health (current)	M: 104% x S1IMA; F: 106% x S1IFA	In line with 2010-2013 scheme experience for ages 50+ (younger ages did not show compliance with a standard table)		
Ill health (future)	M: 104% x S1IMA; F: 106% x S1IFA	The mortality of future ill-health retirees is proposed at the same level as that for current ill-health retirees.[17]		

[14] As directed by HMT, future improvements in mortality assumed to be in line with those underlying the 2012 ONS principal population projections.

[15] SAPS tables are published by the Actuarial Profession and are based on the experience of self-administered pension schemes over the period 2000 to 2006. The 'S1' series has separate standard tables based on experience of members retiring in normal health (S1NXA) and in ill health (S1IXA) and for female dependants (S1DFA).

[16] Adjusted to take account of improvements in UK population mortality between 2002 (the base year for the tables) and 2012.

[17] The tightening in criteria for approving ill-health retirements in recent years might be expected to lead to increasing mortality among ill-health retirements, on the grounds that future ill-health retirees will, on average, be more severely ill on retirement than current ill-health pensioners. However, the 2010-2013 mortality experience of ill-health pensioners is already higher than the standard tables which reflect the aggregate experience of a wide range of pension schemes, and there is no evidence to support an assumption of mortality even higher than recent experience.

Assumption	Summary of recommended assumptions	Rationale for recommendation	Approximate financial impact on Employer cost cap of change in assumption:	
			(1) From 2010 basis to that recommended for 2013	(2) From scheme reform basis to that recommended for 2013
Age retirement All members joining on or after 1 Oct 2006, and all members not entitled to unreduced benefits before age 65 under the 'Rule of 85'	0.3% (M) or 0.2% (F) retire each year from 55 up to 5 years before NPA, then 9% (M and F) a year prior to NPA: 100% at NPA	Early retirement in line with 2010-2013 experience but excluding the effect of redundancies, expressed in terms of number of years early so as to accommodate the higher NPAs in the 2014 Scheme. This represents a change from the previous valuation at which members were assumed to retire at the earliest age their benefits could be taken unreduced.	not material	not material
Members entitled to unreduced benefits at age 60[18] under the 'Rule of 85'	Members with NPA or 65 or 66 (born before 6 Apr 1960): typically 31% (M) or 30% (F) retire at 60, with 2% (M and F) a year prior to CRA: 17% (M) or 23% (F) a year between CRA and NPA; 100% at NPA. Members with higher NPA (born after 6 Apr 1960): Rates intermediate between the above and those applying to members joining on or after 1 Oct 2006	In line with 2010-2013 experience (excluding redundancies). Retirement age for members with smaller amounts of 2014 Scheme service likely to be consistent with current experience. Retirement age likely to be influenced by both the 2014 Scheme and the Earlier Schemes	N/A	N/A

Assumption	Summary of recommended assumptions	Rationale for recommendation	Approximate financial impact on Employer cost cap of change in assumption:	
			(1) From 2010 basis to that recommended for 2013	(2) From scheme reform basis to that recommended for 2013
Members entitled to unreduced benefits at ages between 60 and 65 under the 'Rule of 85'	Consistent with rates above, but based around unreduced benefits being payable at 62 rather than 60	As above; assuming unreduced benefits are payable at 62 a reasonable simplification	N/A	N/A
Ill-health retirement			-0.4%	not material
Incidence	Increasing by age: male rates are around 0.01% at age 30, 0.1% at age 45, 0.8% at age 60; female rates lower	In line with 2010-2013 experience: not adjusted for further improvements in health		
Tier 1 / 2 / 3 split	77% / 11% / 12% (male and female)	In line with 2010-2013 experience		
Withdrawal	Reducing with age: female rates are around 7% at age 30, 4% at age 45, 2% at age 60, net of 20% re-entry within 5 years; male rates lower; no duration-based assumptions for males or females	In line with 2010-2013 experience and further adjusted for re-entry within 5 years on the evidence of a sample set of funds	not material	not material
Death before retirement	Increasing by age: male rates are around 0.03% at age 30, 0.09% at age 45, 0.32% at age 60; female rates lower	In line with 2010-2013 experience; not adjusted for future improvements in mortality	not material	not material

[18] Such a member may take service up to 31 Mar 2008 unreduced under the 'Rule of 85'; a member born on or before 31 Mar 1960 may have some protection for later service.

Assumption	Summary of recommended assumptions	Rationale for recommendation	Approximate financial impact on Employer cost cap of change in assumption:	
			(1) From 2010 basis to that recommended for 2013	(2) From scheme reform basis to that recommended for 2013
Promotional salary scale	Steeper at younger ages: male rates are around 1.1% at age 30, 0.5% at age 45, 0.0% at age 60; female rates lower	As adopted for 2010 valuation since 2010-2013 experience does not give clear evidence that previous assumption is no longer appropriate	No change in assumption	
Commutation			+0.2%	+0.5%
Pre-2008 service	10% of pension commuted	In line with 2008-2011 experience		
2008-14 service	15% of pension commuted	Specified in HMT Directions		
2014 Scheme service	15% of pension commuted	Specified in HMT Directions		

Assumption	Summary of recommended assumptions	Rationale for recommendation	Approximate financial impact on Employer cost cap of change in assumption:	
			(1) From 2010 basis to that recommended for 2013	(2) From scheme reform basis to that recommended for 2013
Family statistics				
Proportion married/partnered	80% (M), 75% (F) at ages up to 70, with consistent assumptions for existing pensioners and other ages	Equal to 100% of ONS population statistics, in the absence of credible evidence to the contrary: the experience data for 2010-2013 caused concerns over the consistency of recording of death cases, so no scheme-specific experience has been used to set this assumption	-0.2%	-0.1%
Age difference	Male member 3 years older than partner Female member 2 years younger than partner	In line with 2010-2013 experience	not material	not material

Annex B: Details of assumptions

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

Pensioner mortality

Table B1: Baseline mortality assumptions

Baseline mortality	Standard table[19]	Adjustment
Males		
Retirements in normal health	S1NMA	99%
Current ill-health pensioners	S1IMA	104%
Future ill-health pensioners	S1IMA	104%
Dependants	S1NMA	120%
Females		
Retirements in normal health	S1NFA	93%
Current ill-health pensioners	S1IFA	106%
Future ill-health pensioners	S1IFA	106%
Dependants	S1DFA	101%

As specified by HM Treasury, future improvements in mortality will be assumed to be in line with those underlying the 2012 ONS principal population projections for the UK.

Age retirement from service

The tables below show the probability of retirement in the relevant year. Table B2 summarises the rates in Table B3 for all members; it also summarises the rates in Tables B4 and B5 for members with NPA 65 and 66. Tables B4 and B5 set out in full the rates for members with NPA 67 and 68.

[19] From the 'S1' series of standard tables published by the CMI and based on the experience of self-administered pension schemes over the period 2000 to 2006. Separate tables are available based on experience of members retiring in normal and ill health and for dependants.

Table B2: Summary of age retirement assumptions:

	CRA60, NPA65 or 66		CRA61 to 64, NPA65 or 66		CRA65 and new members to 2014 scheme	
	Males	**Females**	**Males**	**Females**	**Males**	**Females**
6+ years early	N/A	N/A	0.003	0.002	0.003	0.002
1 to 5 years early	0.02	0.02	0.02	0.02	0.09	0.09
At CRA	0.31	0.30	0.31	0.30	N/A	N/A
Between CRA and NPA	0.17	0.23	0.17	0.23	N/A	N/A
At NPA	1.00	1.00	1.00	1.00	1.00	1.00

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).

The rates are set out fully in Tables B3, B4 and B5 below.

Table B3: Detailed age retirement rates for 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'

Age	NPA 65		NPA 66		NPA 67		NPA 68	
	Males	**Females**	**Males**	**Females**	**Males**	**Females**	**Males**	**Females**
55	0.003	0.002	0.003	0.002	0.003	0.002	0.003	0.002
56	0.003	0.002	0.003	0.002	0.003	0.002	0.003	0.002
57	0.003	0.002	0.003	0.002	0.003	0.002	0.003	0.002
58	0.003	0.002	0.003	0.002	0.003	0.002	0.003	0.002
59	0.003	0.002	0.003	0.002	0.003	0.002	0.003	0.002
60	0.090	0.090	0.003	0.002	0.003	0.002	0.003	0.002
61	0.090	0.090	0.090	0.090	0.003	0.002	0.003	0.002
62	0.090	0.090	0.090	0.090	0.090	0.090	0.003	0.002
63	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090
64	0.090	0.090	0.090	0.090	0.090	0.090	0.090	0.090
65	1.000	1.000	0.090	0.090	0.090	0.090	0.090	0.090
66	1.000	1.000	1.000	1.000	0.090	0.090	0.090	0.090
67	1.000	1.000	1.000	1.000	1.000	1.000	0.090	0.090
68	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Table B4: 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	
	Males	Females	Males	Females	Males	Females	Males	Females
55	0.020	0.020	0.020	0.020	0.013	0.013	0.008	0.008
56	0.020	0.020	0.020	0.020	0.013	0.013	0.008	0.008
57	0.020	0.020	0.020	0.020	0.013	0.013	0.008	0.008
58	0.020	0.020	0.020	0.020	0.013	0.013	0.008	0.008
59	0.020	0.020	0.020	0.020	0.013	0.013	0.008	0.008
60	0.310	0.300	0.310	0.300	0.186	0.179	0.099	0.095
61	0.170	0.230	0.170	0.230	0.102	0.138	0.055	0.073
62	0.170	0.230	0.170	0.230	0.138	0.173	0.055	0.073
63	0.170	0.230	0.170	0.230	0.138	0.173	0.115	0.134
64	0.170	0.230	0.170	0.230	0.138	0.173	0.115	0.134
65	1.000	1.000	0.170	0.230	0.138	0.173	0.115	0.134
66	1.000	1.000	1.000	1.000	0.138	0.173	0.115	0.134
67	1.000	1.000	1.000	1.000	1.000	1.000	0.115	0.134
68	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Table B5: Detailed age retirement rates for members entitled to unreduced benefits at between 60 and 65 under the 'Rule of 85'

Note: these members are treated as having a CRA of 62 (see paragraph 5.8).

Age	NPA 65		NPA 66		NPA 67		NPA 68	
	Males	Females	Males	Females	Males	Females	Males	Females
55	0.003	0.002	0.003	0.002	0.003	0.002	0.003	0.002
56	0.003	0.002	0.003	0.002	0.003	0.002	0.003	0.002
57	0.020	0.020	0.020	0.020	0.013	0.013	0.008	0.008
58	0.020	0.020	0.020	0.020	0.013	0.013	0.008	0.008
59	0.020	0.020	0.020	0.020	0.013	0.013	0.008	0.008
60	0.020	0.020	0.020	0.020	0.013	0.013	0.008	0.008
61	0.020	0.020	0.020	0.020	0.013	0.013	0.008	0.008
62	0.310	0.300	0.310	0.300	0.221	0.215	0.099	0.095
63	0.170	0.230	0.170	0.230	0.138	0.173	0.115	0.134
64	0.170	0.230	0.170	0.230	0.138	0.173	0.115	0.134
65	1.000	1.000	0.170	0.230	0.138	0.173	0.115	0.134
66	1.000	1.000	1.000	1.000	0.138	0.173	0.115	0.134
67	1.000	1.000	1.000	1.000	1.000	1.000	0.115	0.134
68	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Ill-health retirement from service

Table B6.1: Ill-health retirement rates for all members

Age	Males	Females
20	0.0000	0.0000
25	0.0001	0.0000
30	0.0001	0.0001
35	0.0002	0.0001
40	0.0005	0.0003
45	0.0010	0.0007
50	0.0020	0.0015
55	0.0041	0.0033
60	0.0084	0.0071
65*	0.0171	0.0153

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

Table B6.2: Percentage of ill-health retirement in tiers 1, 2 and 3, for all members

Tier 1	Tier 2	Tier 3
77%	11%	12%

Voluntary withdrawal from service

Table B7: Withdrawal rates (net of re-entry within 5 years) for all members

Age	Males	Females
20	0.1030	0.1144
25	0.0810	0.0908
30	0.0638	0.0720
35	0.0502	0.0571
40	0.0395	0.0453
45	0.0310	0.0359
50	0.0244	0.0285
55	0.0192	0.0226
60	0.0151	0.0179
65*	0.0119	0.0142

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

Death in service

Table B8: Death in service rates for all members

Age	Males	Females
20	0.0002	0.0001
25	0.0002	0.0001
30	0.0003	0.0002
35	0.0005	0.0002
40	0.0006	0.0003
45	0.0009	0.0005
50	0.0013	0.0008
55	0.0021	0.0013
60	0.0032	0.0020
65	0.0051	0.0030

Promotional pay increases

Table B9: Promotional salary scales* for all members

Age	Males	Females
20	90	96
25	92	96
30	100	100
35	105	103
40	109	105
45	112	105
50	115	106
55	115	106
60	115	106
65	115	106

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

Commutation of pension for cash at retirement

Table B10: Commutation of pension for cash at retirement

	Pre-2008 service	2008-2014 service	2014 Scheme service
Males	10%	15%	15%
Females	10%	15%	15%

Family statistics

Table B11: Recommended proportion married or partnered at retirement for future pensioners

	Proportion married or partnered at retirement
Males	80%
Females	75%

Consistent proportions are assumed at higher ages, allowing for the impact of mortality.

Table B12: Recommended proportion married or partnered for current pensioners (at the valuation date)

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

Male members are assumed to be three years older than their partners and female members are assumed to be two years younger than their partners.

Annex C: Analysis of pensioner mortality

Type of analysis

C1 The experience of pensioners has been analysed for three distinct groups: pensioners who retired in normal health; pensioners who retired in ill-health; and pensioners whose pension derived from the death of a Scheme member or pensioner. These analyses are discussed separately below, and the discussions are followed by consideration of improvements in the life expectancy of pensioners.

C2 Mortality can be analysed on either a 'lives' basis or an 'amounts' basis:

- A 'lives' basis gives an equal weighting to every member of the population being analysed.
- An 'amounts' basis weights the experience by the size of each member's pension (with the longevity of those with larger pensions given more of a weighting).

C3 There is much evidence to demonstrate that the size of pension is positively correlated with longevity, ie on average those with bigger pensions live longer. For a population with significant variation in the characteristics of the membership and in the amounts of pension being paid, an amounts mortality analysis is generally expected to show lower rates of mortality than a corresponding lives analysis.

C4 Actuarial valuations are concerned with overall financial impacts and so it is appropriate to set mortality assumptions on an amounts basis where sufficient data is available. Our advice on mortality assumptions for this valuation is based on an amounts analysis.

C5 We have compared the mortality experience of the Scheme in the three-year period to 31 March 2013 with the assumptions proposed for the 2010 valuation. Since these tables do not include allowance for improvements in mortality, in comparing with the LGPS experience we have adjusted the standard tables to those applicable to the period in which the deaths occurred. The adjustments applied are in line with the improvements assumed at the 2010 valuation.

C6 We have also compared the mortality experience of the Scheme in the three-year period to 31 March 2013 with the SAPS tables published by the Actuarial Profession and based on the experience of self-administered pension schemes over the period 2000 to 2006. Since these tables do not include allowance for improvements in mortality, in comparing with the LGPS experience we have adjusted the standard tables to those applicable to the period in which the deaths occurred. The adjustments applied are broadly in line with the improvements applying to the UK population over the relevant period.

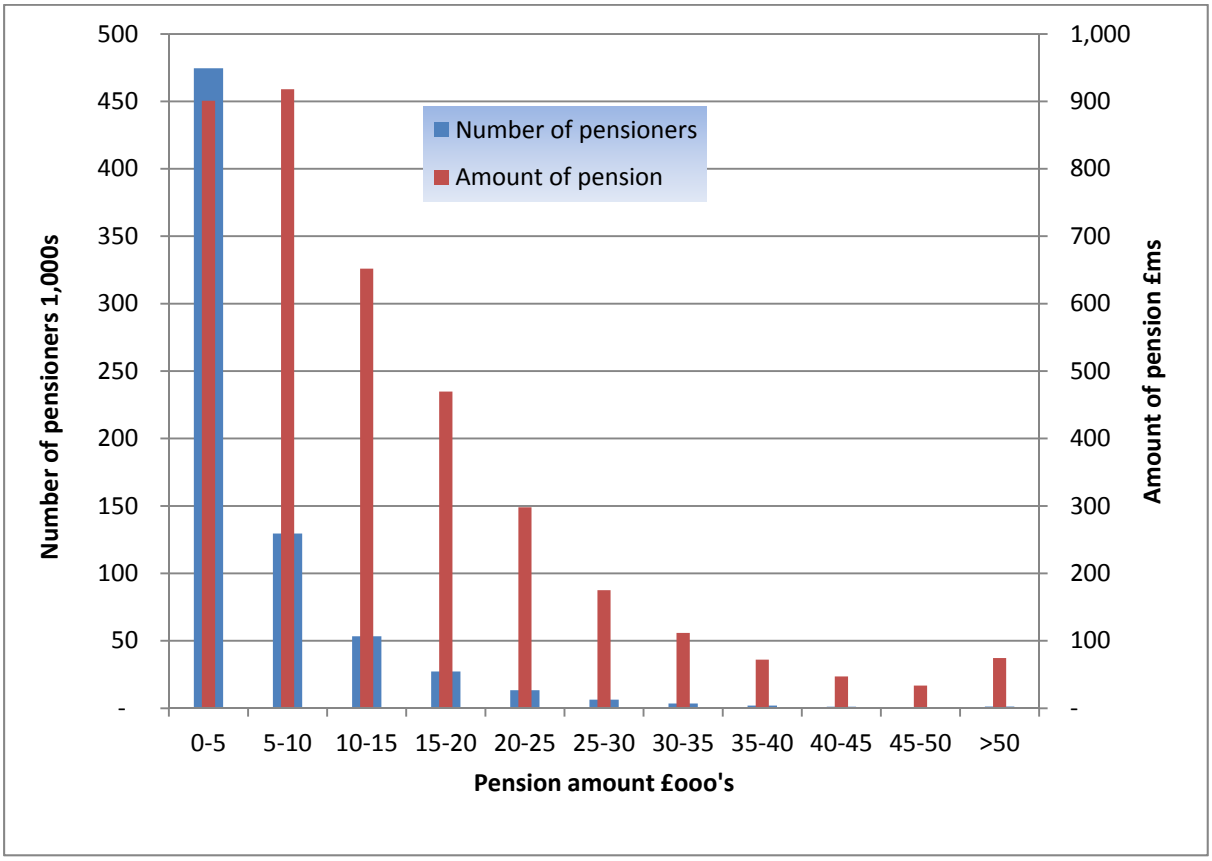
C7 The results of this analysis are shown in tables and graphs. The figures shown in the tables are the total pension amounts ceasing in respect of deaths and the ratios of actual total pension ceasing to the expected amount of pension ceasing under certain sets of assumptions. The number of deaths provides some context to the experience. Where there are more deaths, the experience will be more credible for setting assumptions.

C8 In analysing the mortality we have assumed that the pension figure provided for a pensioner death was the level of pension at the date of death and did not include the pension increases that would have applied subsequently. We have tested this assumption for a small number of funds. This limited analysis indicates that there were some funds which this assumption was correct, but others for which it did not appear to be correct. However this limited analysis did not indicate that ant distortion would have a material impact on the outcome of the mortality analysis.

Background

C9 The following chart illustrates the difference between a 'lives' analysis and an 'amounts' analysis. The blue bars show the distribution of the number of pensioners, by pension amount. The red bars show the total amount of pension payable to these pensioners.

Chart C.1 - Distribution of normal health pensioners by pension size as at 31 March 2013



C10 For example, the first pair of bars shows that there are 475,000 members (from the axis on the left of the chart) with pension in the range £0 to £5,000. The sum of all the pensions in the range £0 to £5,000 comes to £900 million (from the axis on the right of the chart). These members are a large proportion of the total number of pensioners so would be very significant in a 'lives' analysis, but they represent a much smaller proportion of the total amount of pension, so are less significant financially and in an 'amounts' analysis.

C11 The total numbers of actual deaths of each type analysed over the three-year period are as shown in Table C.1 below.

Table C.1 - Number of pensioner deaths over three year period ending 31 March 2013

	Normal health pensioners	Ill-health pensioners	Dependants
Male	26,414	8,563	2,601
Female	20,286	6,004	20,944

Profile of pensioner population and deaths by age

C12 When considering mortality experience it is helpful to understand the age profile of the pensioner population and thus the relative importance which may be attributed to deaths observed at different ages.

C13 The charts below show, for normal health pensioners, the distribution of total pension by age as at 31 March 2013 (chart C.2A) and total pension cessation (chart C.2B) over the three-year period 2010 to 2013. These illustrate that the highest level of pensions are being paid to pensioners in the age range 60 to 70. The highest level of deaths have occurred in the age range 70 to 90. When considering the appropriate mortality basis, the experience over both these age ranges should be considered.

Chart C.2A – distribution of total pension by age for pensioners in normal health

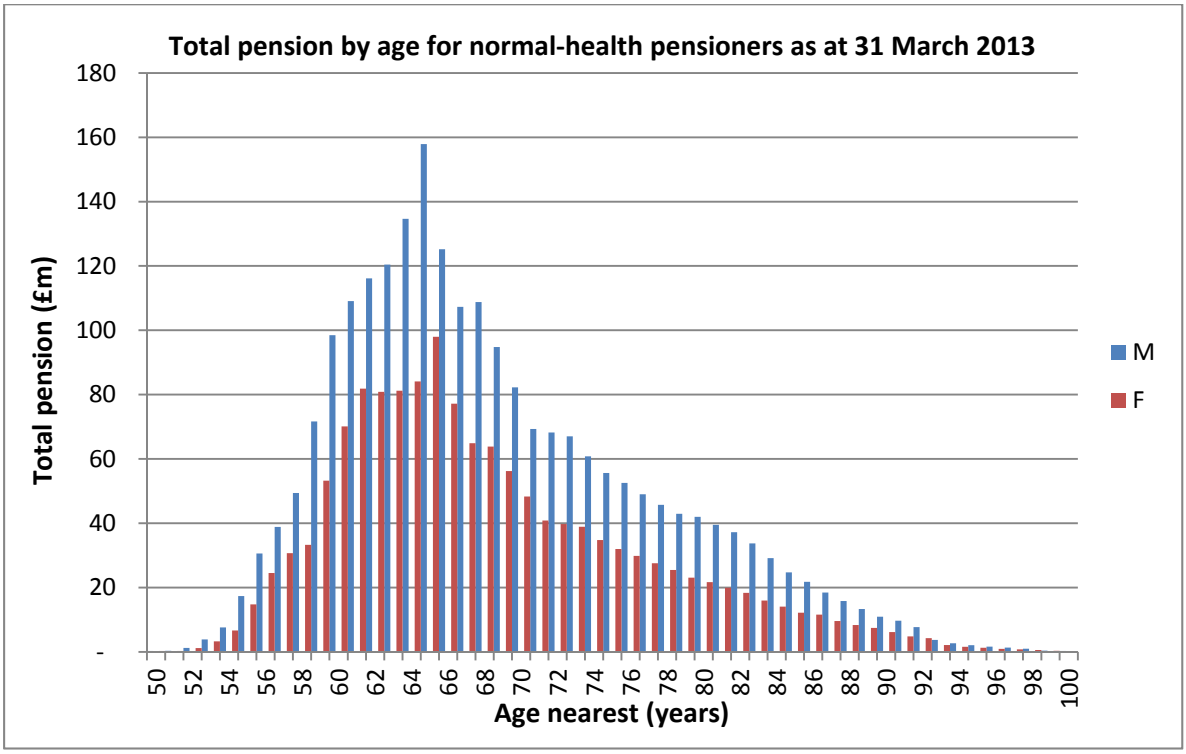
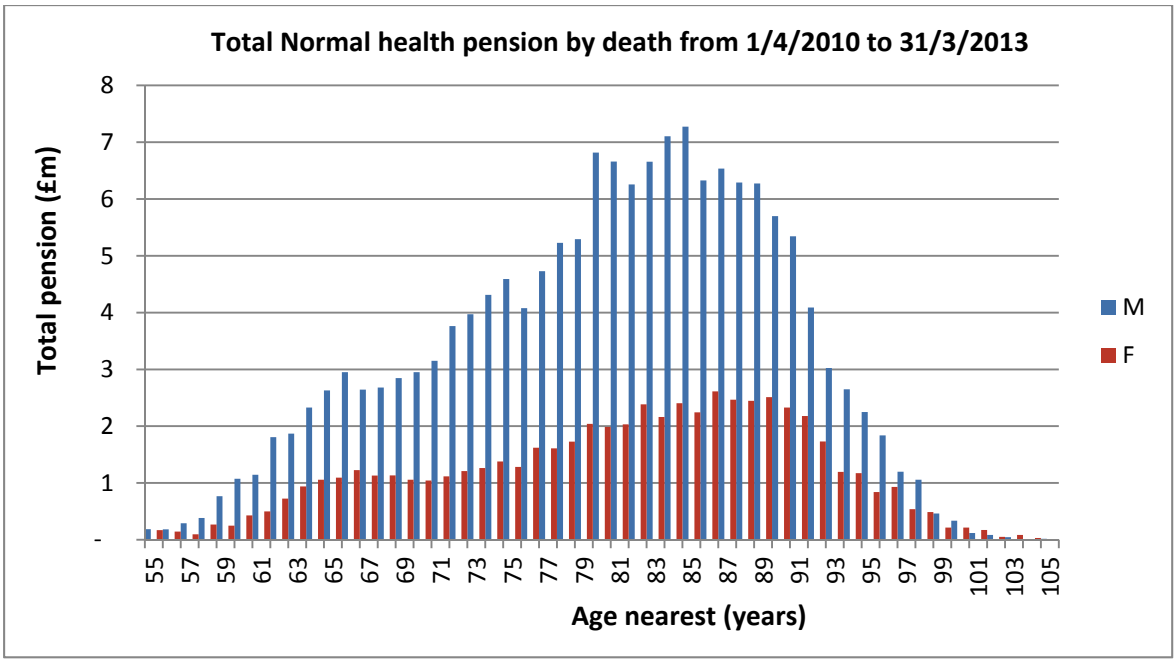


Chart C.2B – distribution of total pension cessation by age for pensioners in normal health



Mortality analysis on an amounts basis: comparison of experience and 'best fit' against S1NXA tables

C14 The charts below show a comparison of the actual mortality experience over the three-year period 2010-2013 with that expected based on the 2010 valuation assumption and the most appropriate SAPS 'S1' series standard table.

Chart C.3A – mortality experience of male age pensioners versus 2013 proposed assumptions and previous 2010 assumptions

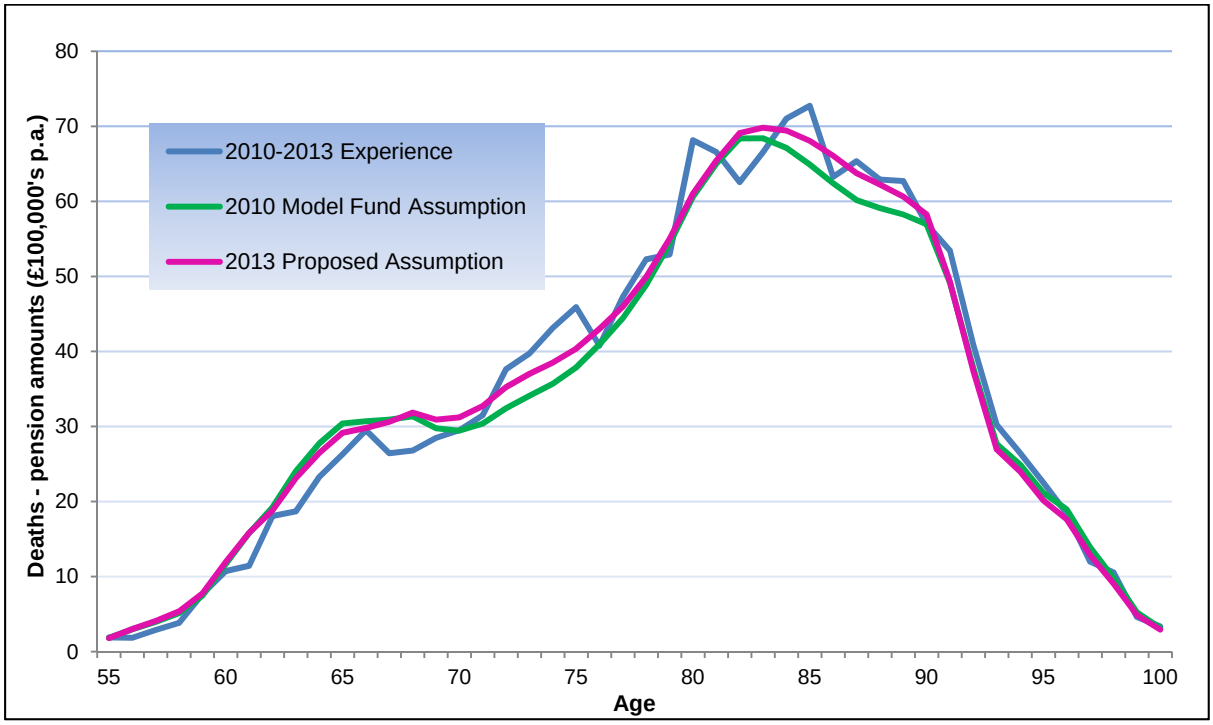


Chart C.3B – mortality experience of female age pensioners versus 2013 proposed assumptions and previous 2010 assumptions

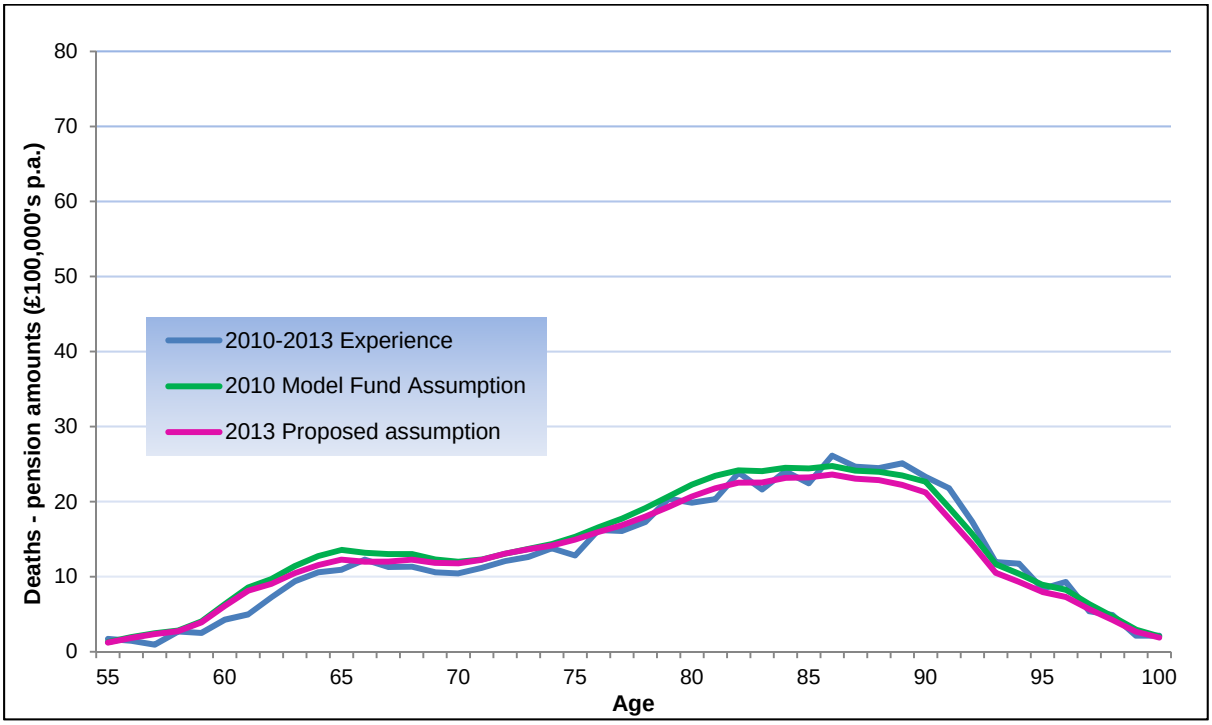


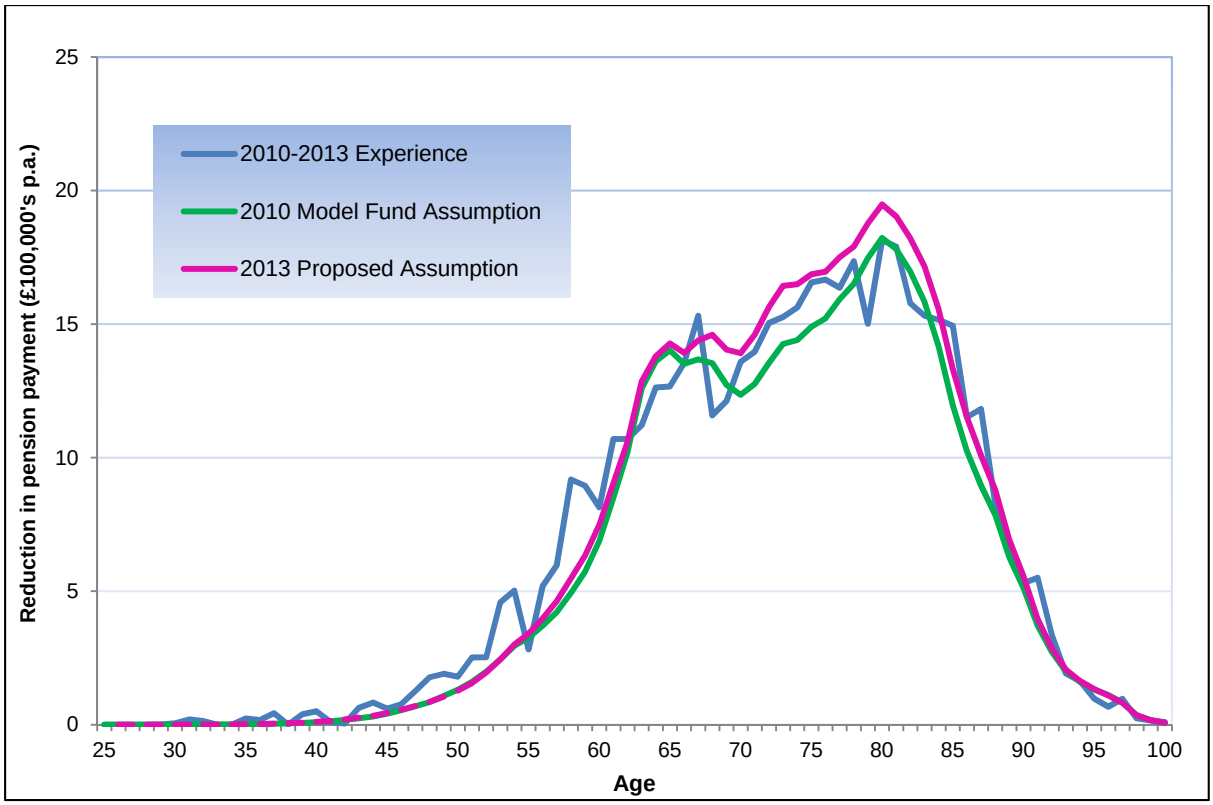
Table C.2A – analysis of male pensioners who retired in normal health

	Pension amounts ceasing due to deaths 2010-13			Ratio of actual to expected	
Age group	Actual experience (£000's p.a.)	Expected, based on 2010 Model Fund assumptions (£000's p.a.)	Expected, based on SAPS standard table (£000's p.a.)	Based on 2010 Model Fund assumptions	Based on SAPS standard table
55 to 59	1,811	2,133	2,234	85%	81%
60 to 64	8,222	9,850	9,755	83%	84%
65 to 69	13,752	15,313	15,452	90%	89%
70 to 74	18,149	16,200	17,717	112%	102%
75 to 79	23,916	22,652	23,765	106%	101%
80 to 84	33,490	32,956	33,957	102%	99%
85 to 89	32,698	30,485	32,536	107%	100%
90 to 94	20,802	19,652	19,866	106%	105%
95 to 99	6,804	6,905	6,553	99%	104%
100 +	631	755	725	84%	87%
Overall	160,275	156,901	162,561	102%	99%

Table C.2B – analysis of female pensioners who retired in normal health

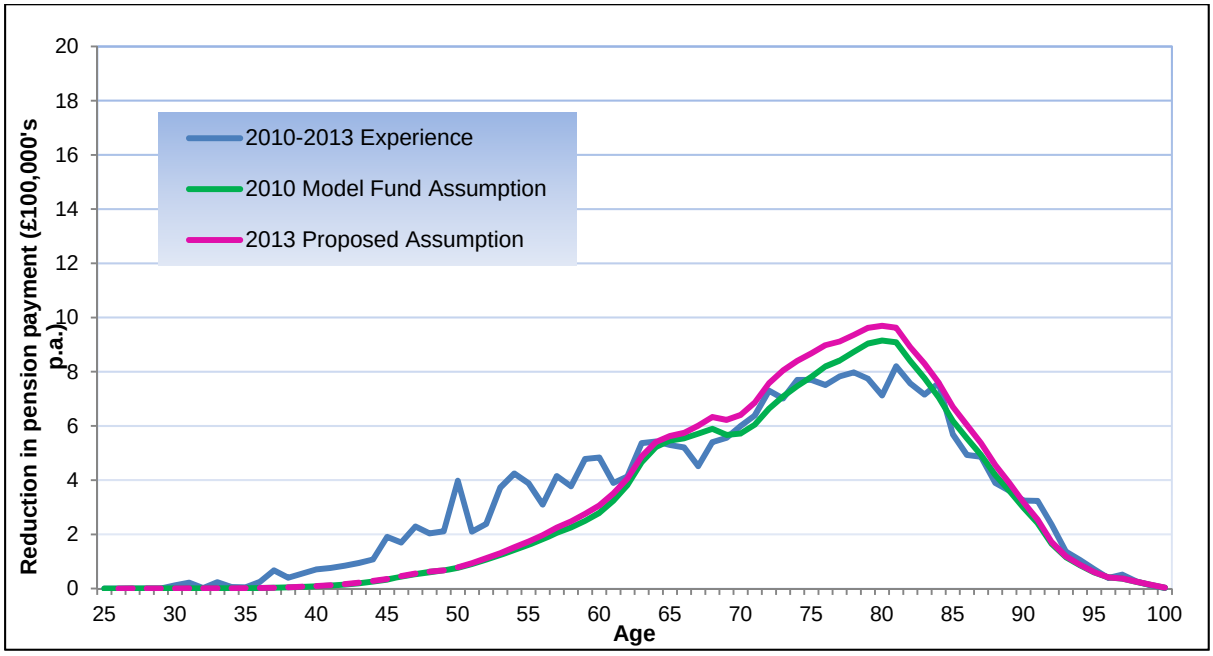
	Pension amounts ceasing due to deaths 2010-13			Ratio of actual to expected	
Age group	Actual experience (£000's p.a.)	Expected, based on 2010 Model Fund assumptions (£000's p.a.)	Expected, based on SAPS standard table (£000's p.a.)	Based on 2010 Model Fund assumptions	Based on SAPS standard table
55 to 59	927	1,253	1,295	74%	72%
60 to 64	3,647	4,873	4,875	75%	75%
65 to 69	5,637	6,506	6,497	87%	87%
70 to 74	6,006	6,534	6,982	92%	86%
75 to 79	8,281	8,944	9,151	93%	90%
80 to 84	10,969	11,846	11,914	93%	92%
85 to 89	12,281	12,074	12,376	102%	99%
90 to 94	8,606	7,960	7,868	108%	109%
95 to 99	3,011	3,115	2,993	97%	101%
100 +	583	574	567	102%	103%
Overall	59,948	63,679	64,519	94%	93%

Chart C.4A – mortality experience of male ill-health pensioners



Note: the 2013 assumption is shown as a broken line at ages below 50 – see paragraph 4.3.

Chart C.4B – mortality experience of female ill-health pensioners



Note: the 2013 assumption is shown as a broken line at ages below 50 – see paragraph 4.3.

Table C.3A – analysis of male pensioners who retired in ill-health

	Pension amounts ceasing due to deaths 2010-13			Ratio to actual to expected	
Age group	Actual experience (£000's p.a.)	Expected, based on 2010 Model Fund assumptions (£000's p.a.)	Expected, based on SAPS standard table (£000's p.a.)	Based on 2010 Model Fund assumptions	Based on SAPS standard table
25 to 29	1	1	1	123%	118%
30 to 34	39	4	4	1032%	1068%
35 to 39	123	20	21	609%	596%
40 to 44	210	96	99	220%	212%
45 to 49	632	357	344	177%	183%
50 to 54	1,645	1,029	976	160%	168%
55 to 59	3,211	2,183	2,277	147%	141%
60 to 64	5,337	5,179	5,136	103%	104%
65 to 69	6,522	6,747	6,804	97%	96%
70 to 74	7,348	6,732	7,362	109%	100%
75 to 79	8,196	8,001	8,406	102%	98%
80 to 84	8,231	8,301	8,543	99%	96%
85 to 89	5,332	4,529	4,836	118%	110%
90 to 94	1,772	1,516	1,536	117%	115%
95 to 99	302	378	359	80%	84%
100 +	10	10	9	98%	103%
Overall (based on members aged 50 and above)					104%

Table C.3B – analysis of female pensioners who retired in ill-health

	Pension amounts ceasing due to deaths 2010-13			Ratio to actual to expected	
Age group	Actual experience (£000's p.a.)	Expected, based on 2010 Model Fund assumptions (£000's p.a.)	Expected, based on SAPS standard table (£000's p.a.)	Based on 2010 Model Fund assumptions	Based on SAPS standard table
25 to 29	0	1	1	0%	0%
30 to 34	64	4	4	1699%	1630%
35 to 39	192	16	17	1180%	1151%
40 to 44	432	79	82	547%	525%
45 to 49	1,004	258	251	390%	399%
50 to 54	1,643	539	535	305%	307%
55 to 59	1,968	1,024	1,057	192%	186%
60 to 64	2,366	1,973	1,974	120%	120%
65 to 69	2,598	2,828	2,827	92%	92%
70 to 74	3,440	3,295	3,521	104%	98%
75 to 79	3,876	4,219	4,320	92%	90%
80 to 84	3,763	4,145	4,166	91%	90%
85 to 89	2,299	2,446	2,508	94%	92%
90 to 94	1,126	907	898	124%	125%
95 to 99	199	175	168	114%	118%
100 +	9	8	8	120%	121%
Overall (based on members aged 50 and above)					106%

Chart C.5A – mortality experience of male dependants

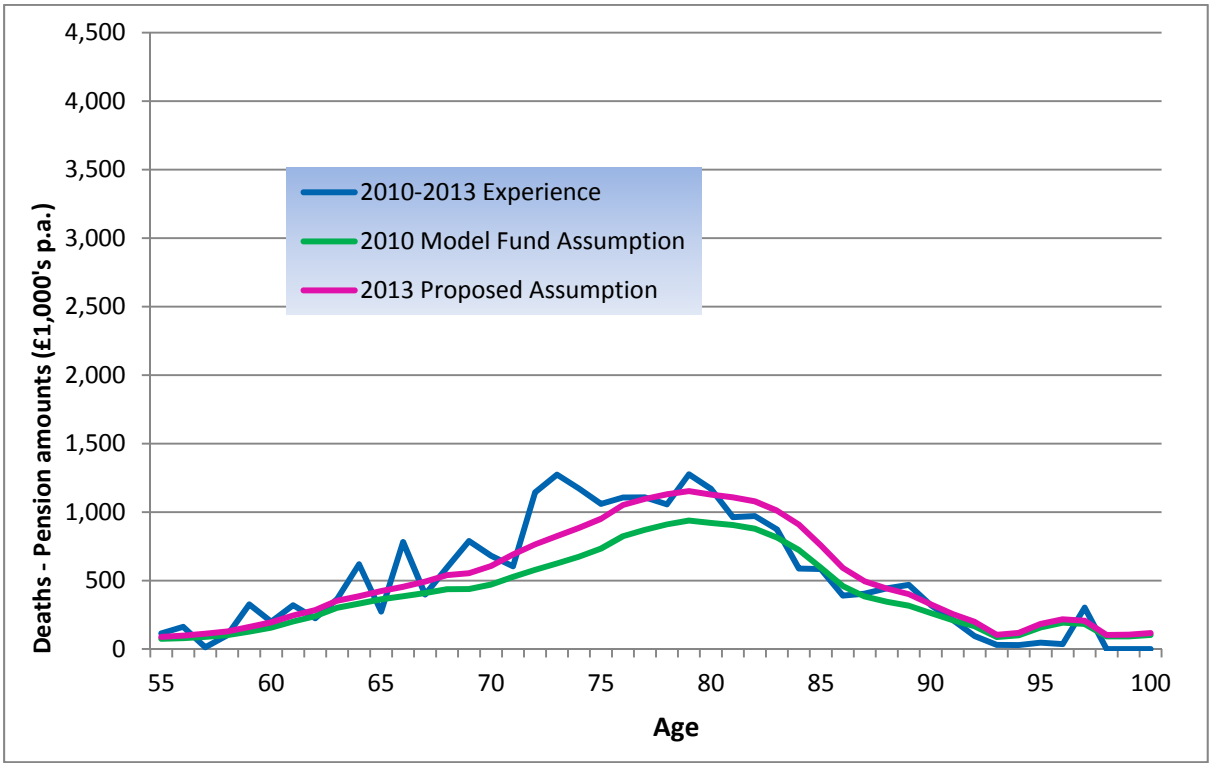


Chart C.5B – mortality experience of female dependants

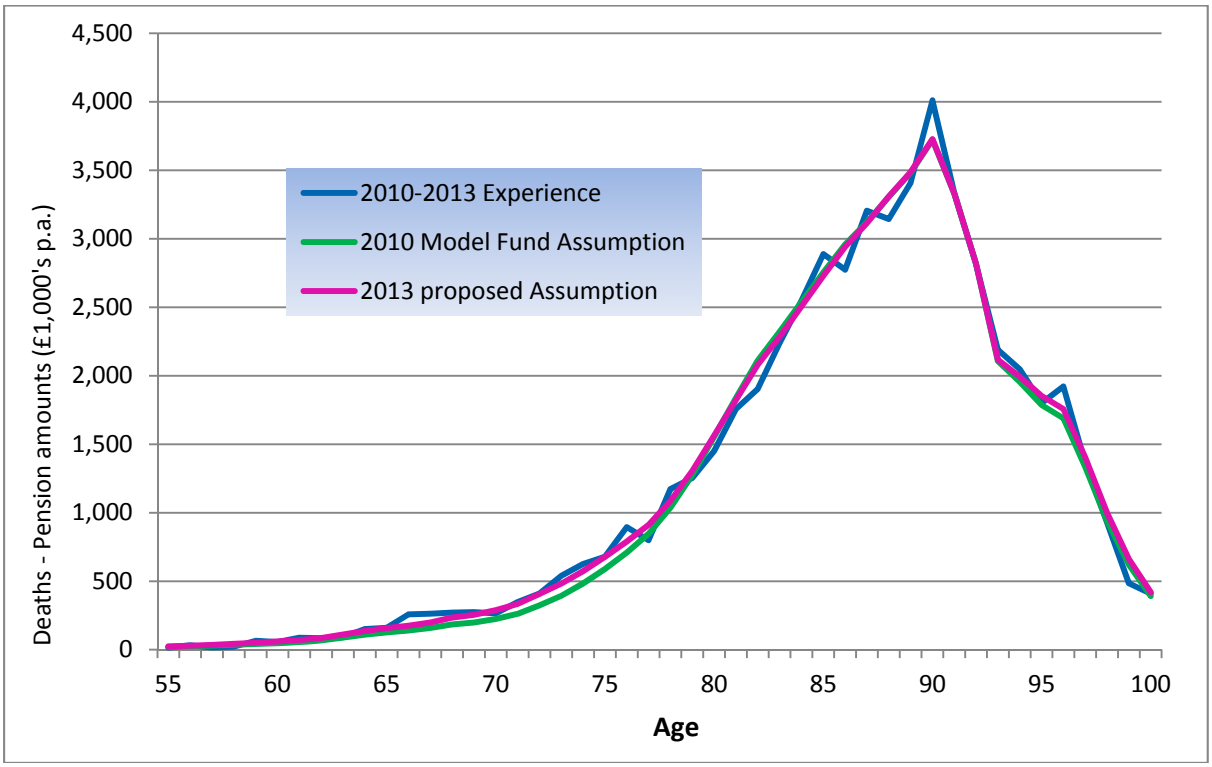


Table C.4A – analysis of male pensioners whose pensions arose as a result of the death of a member or pensioner

	Pension amounts ceasing due to deaths 2010-13			Ratio of actual to expected	
Age group	Actual experience (£000's p.a.)	Expected, based on 2010 Model Fund assumptions (£000's p.a.)	Expected, based on SAPS standard table (£000's p.a.)	Based on 2010 Model Fund assumptions	Based on SAPS standard table
55 to 59	72	47	49	152%	146%
60 to 64	173	123	122	140%	142%
65 to 69	284	203	206	140%	138%
70 to 74	488	288	315	170%	155%
75 to 79	561	428	449	131%	125%
80 to 84	457	424	437	108%	105%
85 to 89	229	210	224	109%	102%
90 to 94	69	83	84	83%	82%
95 to 99	39	72	68	54%	57%
100 +	2	27	26	7%	7%
Overall	2,371	1,900	1,979	125%	120%

Table C.4B – analysis of female pensioners whose pensions arose as a result of the death of a member or pensioner

	Pension amounts ceasing due to deaths 2010-13			Ratio of actual to expected	
Age group	Actual experience (£000's p.a.)	Expected, based on 2010 Model Fund assumptions (£000's p.a.)	Expected, based on SAPS standard table (£000's p.a.)	Based on 2010 Model Fund assumptions	Based on SAPS standard table
55 to 59	152	152	179	100%	85%
60 to 64	470	369	460	127%	102%
65 to 69	1,225	808	1,013	152%	121%
70 to 74	2,190	1,687	2,072	130%	106%
75 to 79	4,798	4,457	4,740	108%	101%
80 to 84	9,897	10,363	10,190	96%	97%
85 to 89	15,420	15,619	15,476	99%	100%
90 to 94	14,404	13,932	13,897	103%	104%
95 to 99	6,500	6,371	6,637	102%	98%
100 +	955	915	1,017	104%	98%
Overall	56,012	54,674	55,681	102%	101%

Annex D: Analysis of age retirement from service

D1 We have analysed the age retirement rates over 2010-2013 and the results are shown below for those who were entitled to take unreduced benefits from age 60 due to the rule of 85 (or earlier in certain circumstances, with the employer's consent) ('CRA 60') and those with who did not benefit from the rule of 85 and so could take unreduced benefits from age 65 ('CRA 65'), separately for males and females. Retirements are shown up to age 65 in each case.

D2 This analysis excludes early retirements due to redundancies. This is on the basis that, in the event of early retirement in circumstances of redundancy, the employer funds the cost of early retirement on a "past service reserve" basis, which broadly equates to the level of assets required to support the member's rights if he/she were to remain in employment. Local fund actuaries have confirmed that the costs are assessed and met on the past service reserve basis, and so no allowance for retirements arising from redundancy is appropriate.

D3 Members retiring before their CRA receive benefits equivalent in value to their deferred benefit entitlement. Members retiring after age 65 receive benefits which are uplifted to reflect their later payment. However, between 60 and 65 no late retirement factors are applied. Therefore if a member has a CRA of less than 65, retirement after their CRA will result in a saving to the scheme.

D4 The 2010 Model Fund valuation assumption was that, for service prior to 1 April 2008, members retire at the earliest age at which they can retire as of right without any reduction to their benefits (with a similar assumption applying to service after 1 April 2008 except that tapered reduction factors apply where relevant). Approximately 1.0% of males with a CRA of 60 retired after age 65, and approximately 0.8% of females with a CRA of 60 retired after age 65.

D5 The charts in this section include members whose CRA was 60 or 65 to the nearest whole age: we have not undertaken a separate analysis for members whose CRA was between 61 and 64: there are significantly fewer such cases and we would not expect the pattern to be dissimilar to that brought out by the CRA 60 charts. These members have been treated as having a CRA of 62 as noted at paragraph 5.8.

D6 The charts below indicate a significant rise in incidence of retirement in the year prior to age 65. However, this effect is likely to be a distortion arising from the data grouping rather than a genuine feature of the scheme's experience.

Chart D.1A – age retirement of males with CRA 65

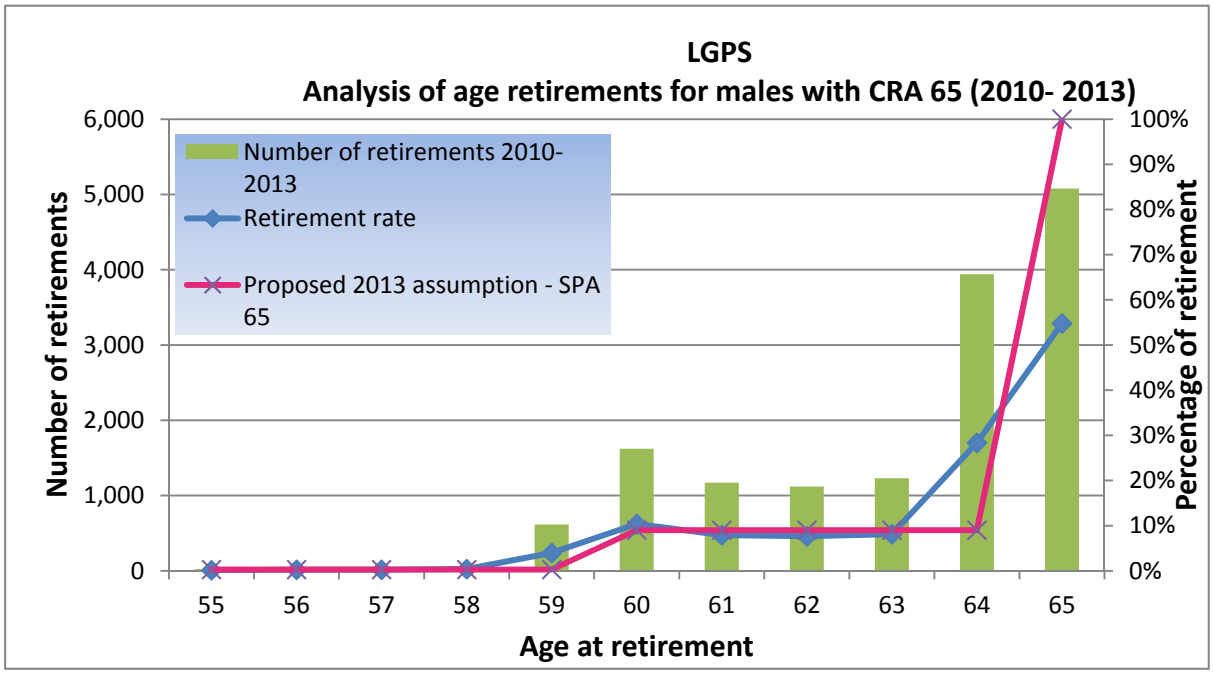


Chart D.1B – age retirement of males with CRA 60

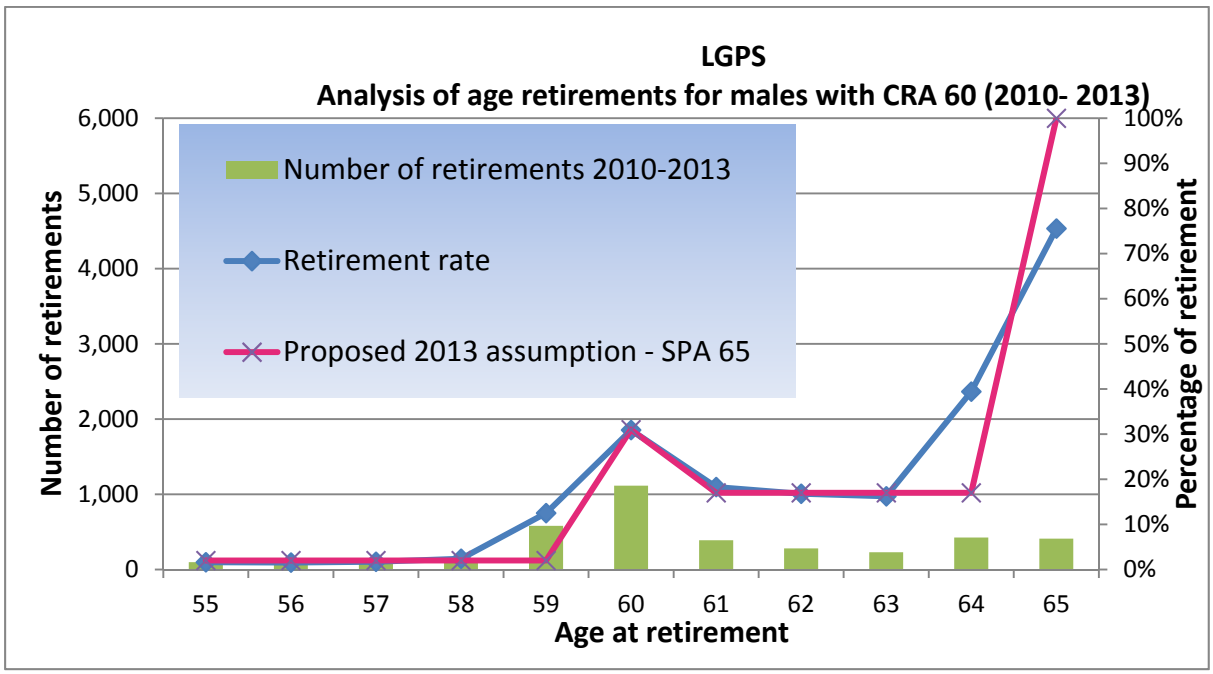


Chart D.2A – age retirement of females with CRA 65

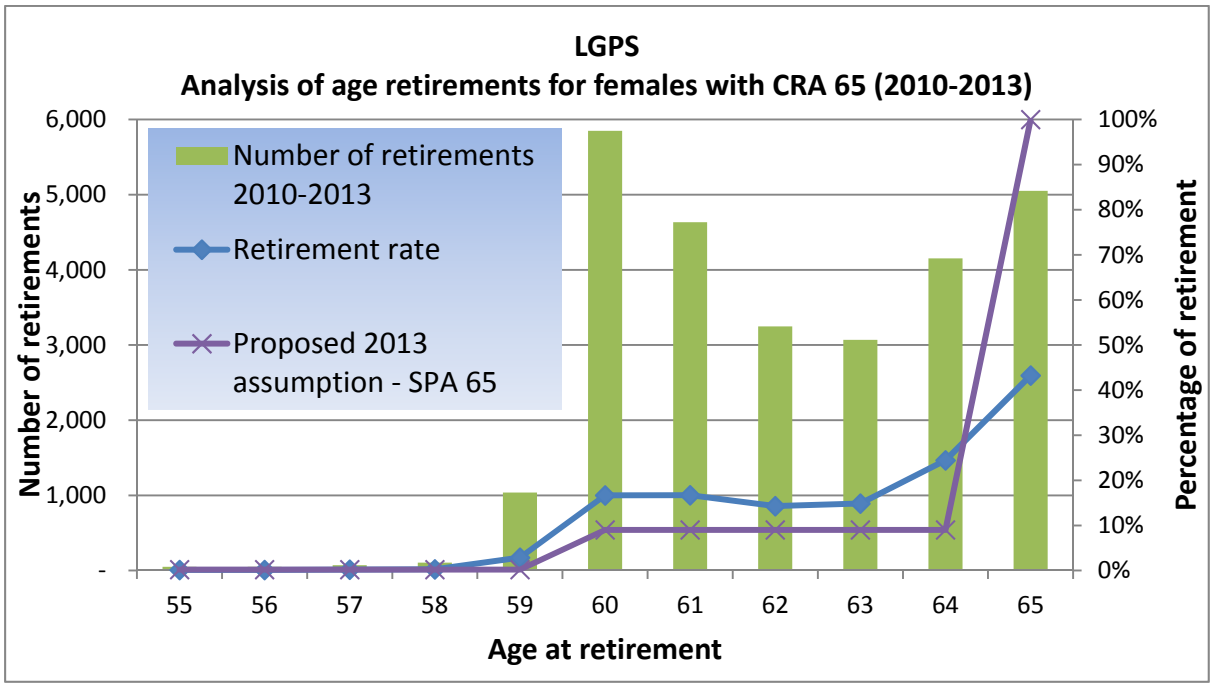
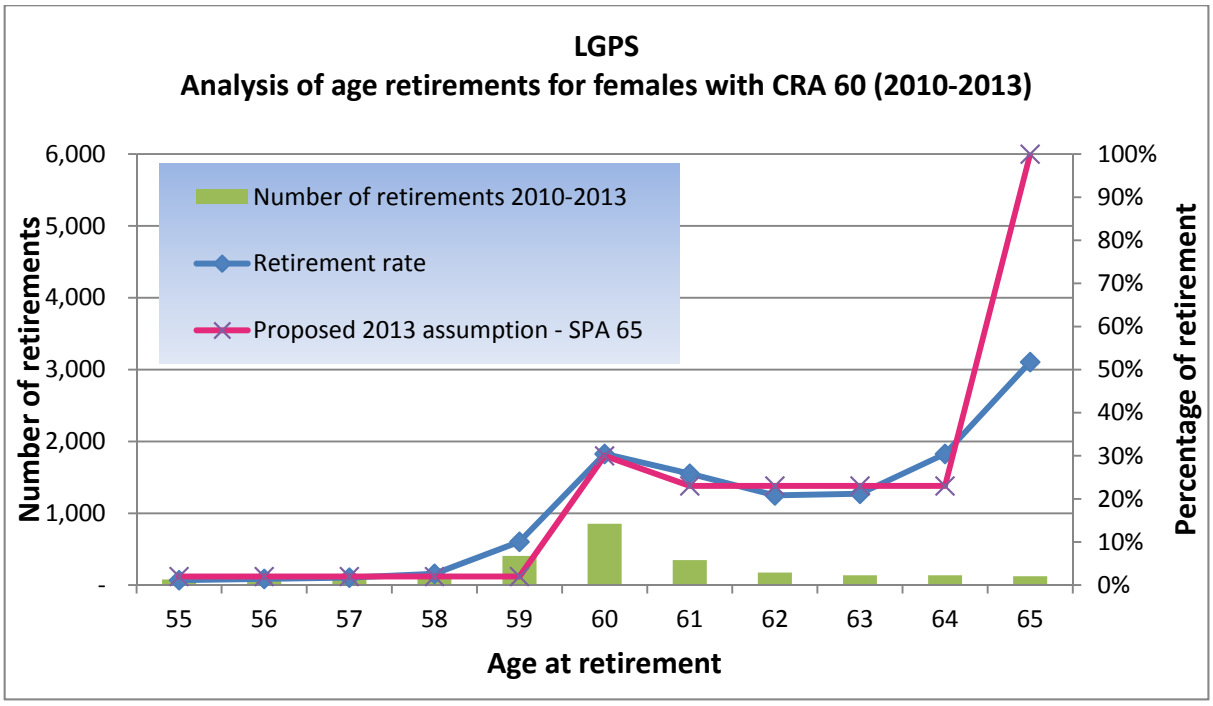


Chart D.2B – age retirement of females with CRA 60



Annex E: Analysis of ill-health retirement from service

Rates of ill-health retirement

E1 We have analysed the pattern of ill-health retirements over the three-year period to 31 March 2013. The analysis compares the actual rate of ill-health retirements to the expected rate of ill-health retirements based on the assumptions for the 2010 valuation.

E2 The tables below show the actual number of ill-health retirements compared with the expected number of ill-health retirements based on the 2010 assumptions, in 5-year age bands.

Table E.1 – Actual versus expected numbers of ill-health retirements among male active members

Age group	Expected number of ill-health retirements 2010-2013	Actual number of ill-health retirements 2010-2013	Ratio of actual to expected ill-health retirements (%)
25 to 29	11	10	88%
30 to 34	26	28	107%
35 to 39	61	60	99%
40 to 44	164	141	86%
45 to 49	407	310	76%
50 to 54	846	627	74%
55 to 59	1,447	949	66%
60 to 64	1,863	1,147	62%
Overall			66%

Table E.2 – Actual versus expected numbers of ill-health retirements among female active members

Age group	Expected number of ill-health retirements 2010-2013	Actual number of ill-health retirements 2010-2013	Ratio of actual to expected ill-health retirements (%)
25 to 29	13	42	286%
30 to 34	37	74	196%
35 to 39	111	144	130%
40 to 44	364	388	99%
45 to 49	878	692	77%
50 to 54	1,599	1,149	70%
55 to 59	2,435	1,765	72%
60 to 64	2,423	1,054	53%
Overall			70%

E3 The charts below show the actual rates of ill-health retirements of members by age for men and women respectively compared with the 2010 valuation assumption. The charts show that the general pattern of ill-health retirement rates by age is similar to the previous assumptions but the actual rates of ill-health retirements have been lower.

Chart E.1 – ill-health retirement rates of male active members

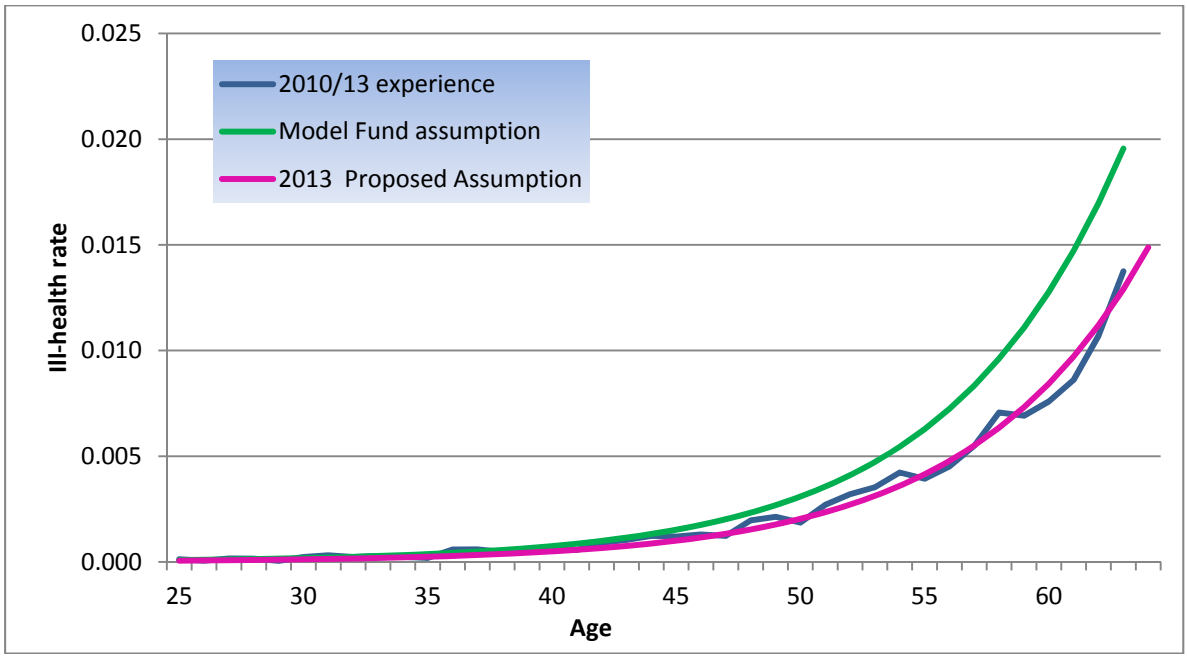
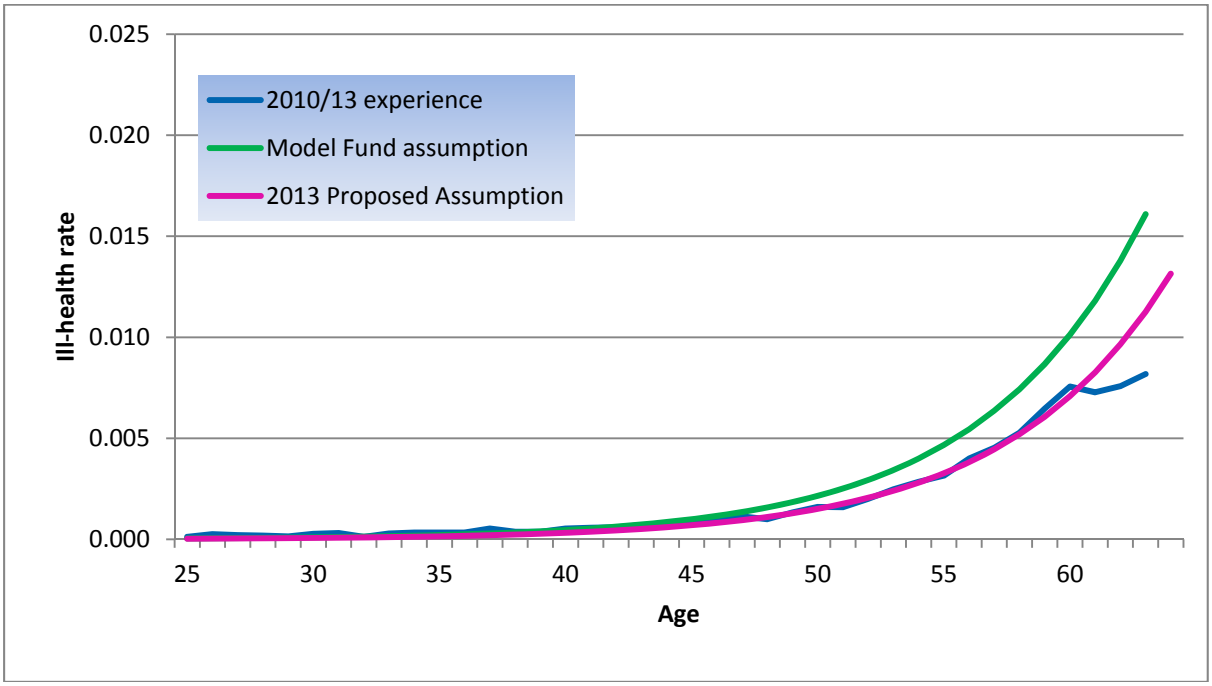


Chart E.2 – ill-health retirement rates of female active members



E4 The charts for both males and females above indicate that the actual experience over the 2010-2013 period has been at a lower level than the 2010 Model Fund valuation assumptions.

E5 Our recommended assumption is that rates of ill-health retirement are in line with the previous assumptions but rated down at all ages to be in line with the experience over 2010-2013.

Distribution of benefit tier on ill-health retirement

E6 The assumption used for the 2010 Model Fund valuation was that 70% of ill-health retirees retire on tier 1 ill-health, 15% retire on tier 2 ill-health and 15% on tier 3 ill-health.

E7 The actual percentages of ill-health retirements in each tier during the years 2010-2013 are shown in Table E.3 below.

Table E.3 – Percentage of ill-health retirement in tiers 1, 2 and 3 by year

Year	Tier 1	Tier 2	Tier 3
2010/11	79%	13%	8%
2011/12	76%	11%	13%
2012/13	76%	8%	16%
Weighted average 2010-2013	77%	11%	12%
2010 Model Fund assumption	70%	15%	15%
2013 Proposed assumption	77%	11%	12%

E8 As can be seen, over the period 2010-2013 there has been a higher level of ill-health retirements in Tier 1 and rather lower levels of retirement in Tiers 2 and 3 compared to the assumption made for the 2010 Model Fund valuation.

E9 Our recommended assumption is that the proportions of ill-health retirements by tier will be the same as the 2010-2013 experience, as shown in Table E.3 above.

Annex F: Analysis of voluntary withdrawal from service

F1 We have analysed the pattern of gross withdrawals over the three-year period to 31 March 2013. The analysis compares the actual rate of withdrawals among members with at least 2 years' service to the expected rate of withdrawals based on the assumptions for the 2010 valuation.

F2 We have not been able to analyse the rejoiner experience among members where the break in membership is below 5 years, but these members retain aggregation rights and, if no allowance were made for rejoiners, the liabilities would be understated. Based on a sample analysis we propose assuming that 20% of those members who leave service with entitlement to a deferred benefit will rejoin the Scheme within 5 years.

F3 Analysis was carried out separately for members with less and more than two years' service. Although there is quite clear evidence that members with shorter service are more likely to withdraw (but with less variation by age), the impact of allowing for this on the valuation results is small. It is clear that members with less than two years' service have relatively little past service liability and so there will be little impact here. We also expect that the simplification would not affect the assessment of the employer cost cap by as much as 0.1% of salaries. Further, if the same approach is used at future valuations the impact would be similar so the simplification is not expected to impact on consideration of whether the cap has been breached.

F4 The tables below set out a comparison of the numbers of actual withdrawals (among members with more than 2 years' service) compared to the numbers of expected withdrawals in 5-year age bands based on the withdrawal assumptions adopted for the 2010 actuarial valuation of the Model Fund.

Table F.1 – Actual versus expected numbers of withdrawals among male active members with over 2 years' service

Age group	Expected number of ultimate withdrawals 2010-2013	Actual number of ultimate withdrawals 2010-2013	Ratio of actual to expected withdrawals (%)
Up to 25	5,398	2,794	52%
25 to 29	11,241	5,771	51%
30 to 34	11,793	5,759	49%
35 to 39	10,742	5,478	51%
40 to 44	11,668	6,427	55%
45 to 49	11,527	6,972	60%
50 to 54	9,409	6,714	71%
55 to 59	6,350	3,238	51%
60 to 64	3,206	1,161	36%
65 +	216	149	69%
Overall	81,549	44,463	55%

Table F.2 – Actual versus expected numbers of withdrawals among female active members with over 2 years' service

Age group	Expected number of ultimate withdrawals 2010-2013	Actual number of ultimate withdrawals 2010-2013	Ratio of actual to expected withdrawals (%)
Up to 25	10,409	4,976	48%
25 to 29	25,218	11,807	47%
30 to 34	31,548	14,433	46%
35 to 39	33,712	17,442	52%
40 to 44	43,492	23,786	55%
45 to 49	41,869	25,827	62%
50 to 54	29,576	21,217	72%
55 to 59	17,000	10,517	62%
60 to 64	5,910	2,476	42%
65 +	358	197	55%
Overall	239,093	132,678	55%

F5 The charts below show the gross withdrawal rates derived from the analysis, together with the rates assumed for the 2010 valuation and the rates that are being recommended for the 2013 valuation. The proposed rates need to be extended to older ages, which will accommodate the anticipated longer working lives of members of the 2014 Scheme. We recommend that the rates are extended by continuing the broadly linear trends seen at the older ages in the analysis.

Chart F.1 – ultimate withdrawal rates of male active members

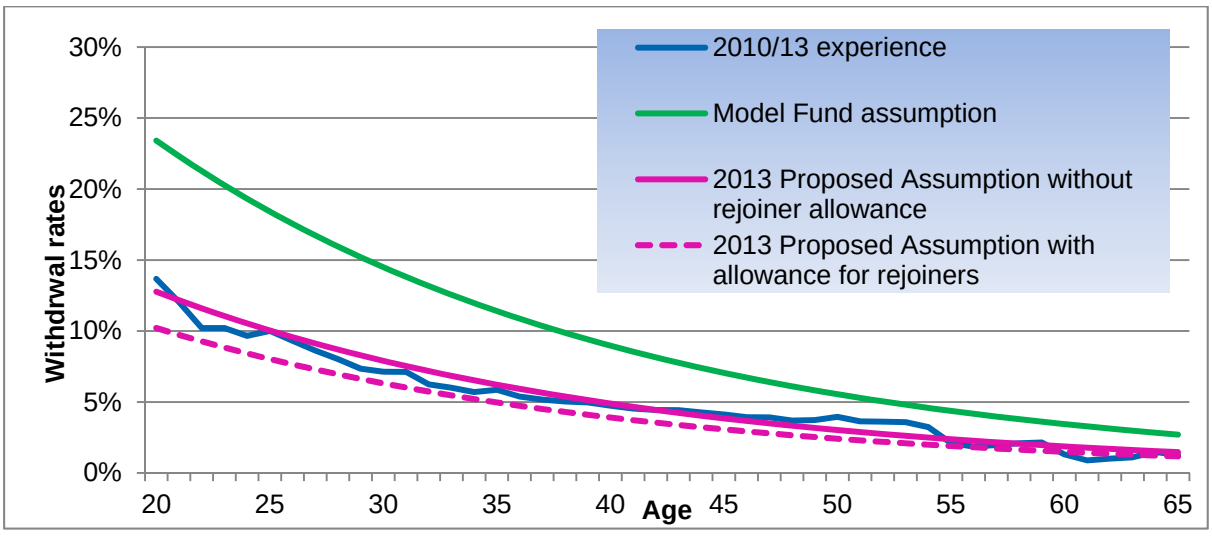
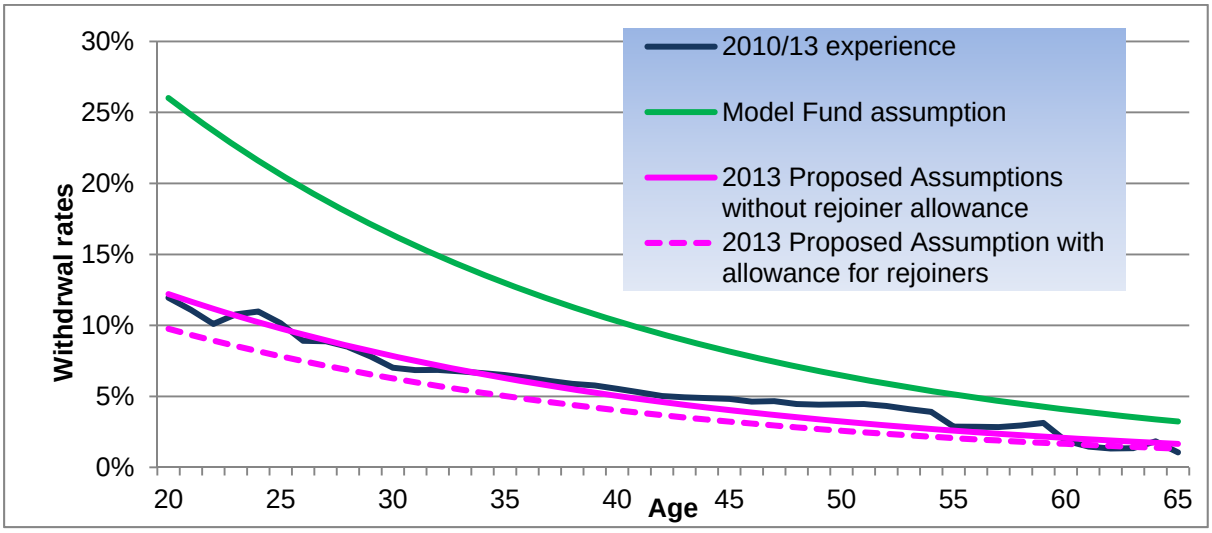


Chart F.2 – ultimate withdrawal rates of female active members



F6 The withdrawal experience among members with less than 2 years' service has also been analysed. These members generally show a higher incidence of withdrawal, with a pattern that is less age-dependent, than members with over 2 years' service. At older ages the withdrawals among members with less than 2 years' service tend to be slightly higher than the 2010 Model Fund assumptions, and slightly lower at the younger ages. However, this variation in experience does not have a significant impact on the employer cost cap mechanism.

F7 The scheme reform assumptions were lower than the 2010 valuation assumptions at ages below 45, and higher at older ages; they are higher than the recommended 2012 valuation assumptions at all ages. The analysis underlying these assumptions considered members with less and more than two years' service together in the same way as the 2010 analysis.

Annex G: Analysis of death in service

G1 The tables below set out a comparison of the numbers of actual deaths in service compared to the numbers of expected deaths in 5-year age bands based separately on a) the mortality assumptions adopted for the 2010 actuarial valuation of the Model Fund, and b) the ONS Interim Life Tables 2008-10.

Table G.1 – Actual versus expected numbers of deaths among male active members

Age group	Expected number of deaths 2010-2013 using 2010 assumptions	Expected number of deaths 2010-2013 using ONS assumptions	Actual number of deaths 2010-2013	Ratio of actual to expected deaths using 2010 assumptions (%)	Ratio of actual to expected deaths using ONS assumptions (%)
25 to 29	26	71	20	78%	28%
30 to 34	33	107	42	127%	39%
35 to 39	50	165	54	109%	33%
40 to 44	103	306	119	116%	39%
45 to 49	207	543	194	94%	36%
50 to 54	366	860	292	80%	34%
55 to 59	554	1,158	448	81%	39%
60 to 64	598	1,136	432	72%	38%
Overall				81%	37%

Table G.2 – Actual versus expected numbers of deaths among female active members

Age group	Expected number of deaths 2010-2013 using 2010 assumptions	Expected number of deaths 2010-2013 using ONS assumptions	Actual number of deaths 2010-2013	Ratio of actual to expected deaths using 2010 assumptions (%)	Ratio of actual to expected deaths using ONS assumptions (%)
25 to 29	33	66	26	79%	40%
30 to 34	64	134	51	80%	38%
35 to 39	130	271	80	62%	30%
40 to 44	304	646	248	82%	38%
45 to 49	550	1,107	400	73%	36%
50 to 54	744	1,527	527	71%	35%
55 to 59	830	1,645	573	69%	35%
60 to 64	526	1,061	377	72%	36%
Overall				71%	35%

G2 The charts below show the rates of the actual and expected deaths by age for men and women respectively.

Chart G.1 – death-in-service rates of male active members

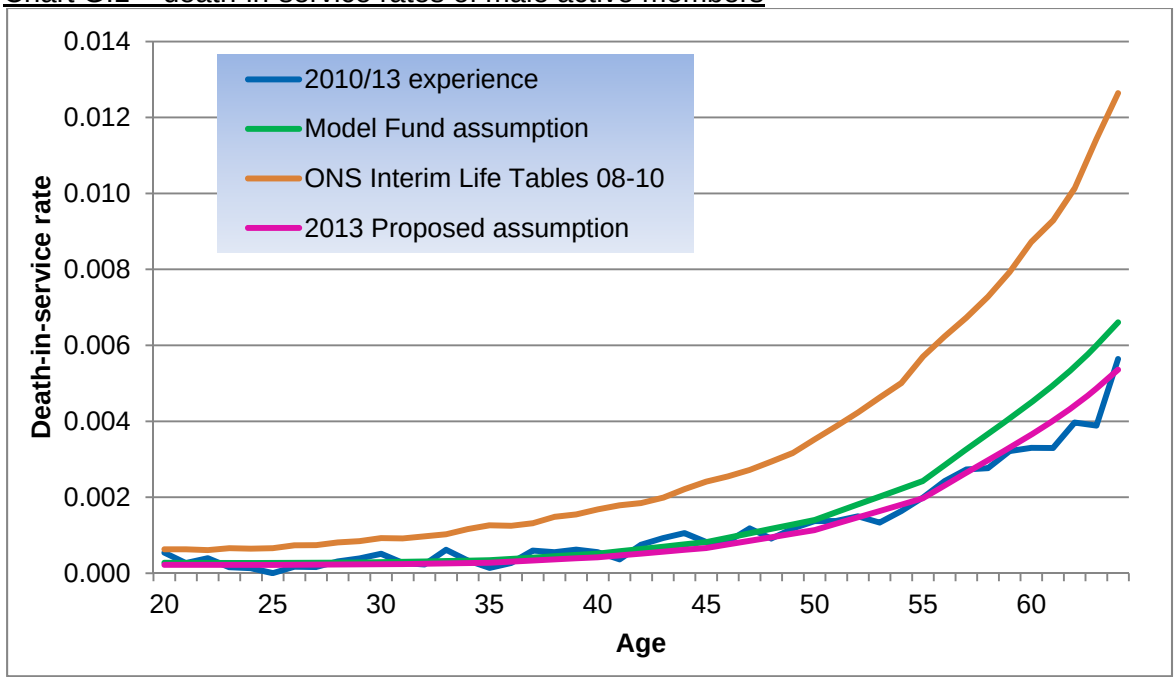
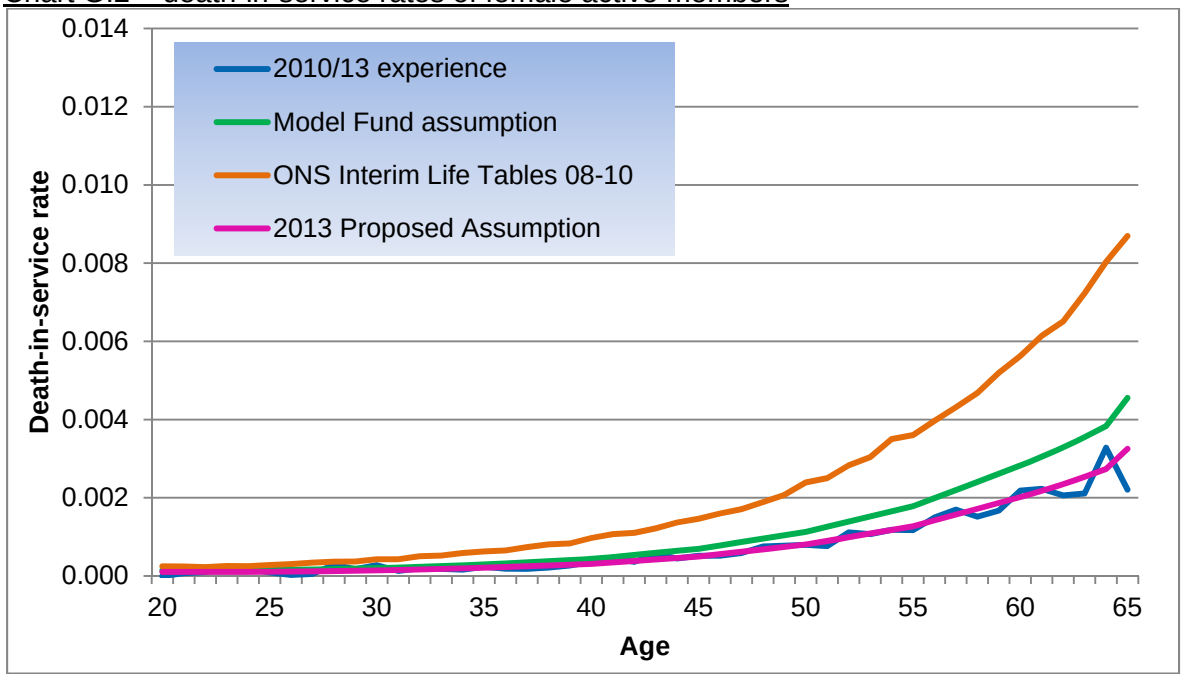


Chart G.2 – death-in-service rates of female active members



G3 Our analysis shows that the death-in-service rates over 2010-2013 were fairly similar to those assumed for the 2010 Model Fund valuation for males aged below 50, but the rates were lower for males aged over 50. The 2010-2013 experience for females suggests lower death-in service rates at all ages compared to those assumed for the 2010 Model Fund valuation; again the differences increase with age.

G4 We recommend assuming rates of 37% and 35% of the ONS rates for males and females respectively for the purposes of the 2013 valuation.

Annex H: Analysis of promotional pay increases

2010-2013 experience

H1 The experience over the three-year period to 31 March 2013 has been analysed in two different ways:

- Tracking the pensionable pay progression of individual members who were in pensionable service over the whole of the period (the "annual increase analysis"); and
- Looking at the profile of the active membership at 31 March 2013 in terms of average pensionable pay at each year of age and comparing that to the next year of age (the "profile analysis").

H2 These analyses are shown together in the following graphs, separately for males and females. In each case, comparison is shown with the promotional salary increases assumed for the 2010 Model Fund valuation.

H3 However, it should be noted that the annual increase analysis (broken line) in these charts includes inflationary as well as promotional pay increases. Ideally inflationary increases should be excluded from this analysis, but we do not have sufficient data to do this. The inflation increases may differ for different employers in the LGPS.

H4 Greater than expected salary growth will result in higher than expected liabilities as in the current scheme benefits are linked to final salary.

Chart H.1 – Annual increase analysis: salary progression 2010-13 for male active members

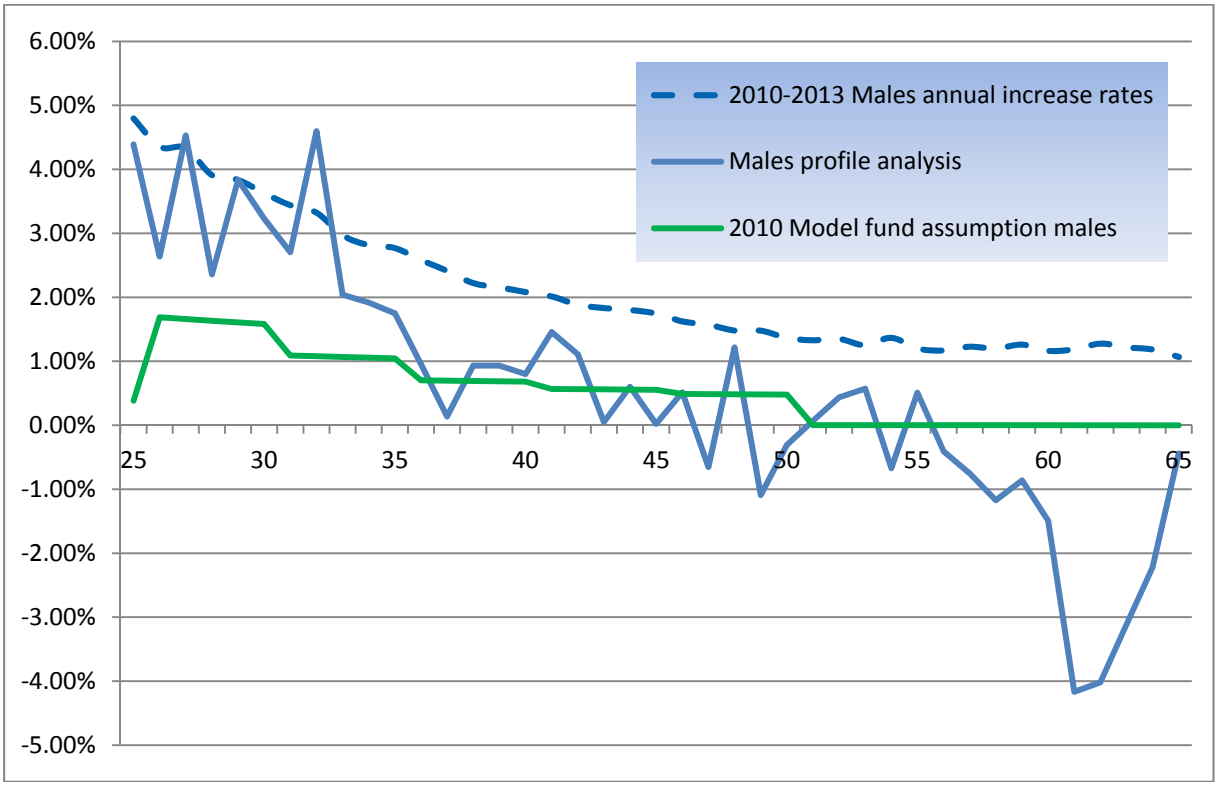
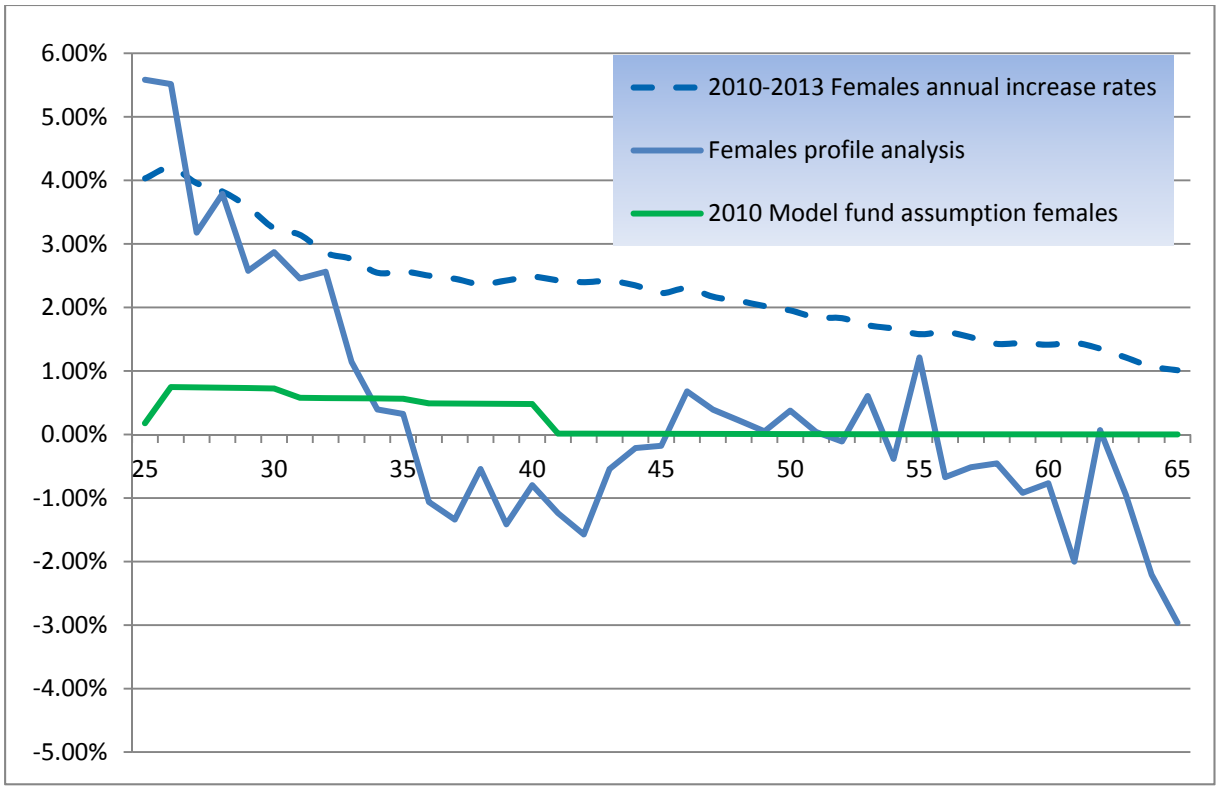


Chart H.2 – Annual increase analysis: salary progression 2010-13 for female active members



H5 The profile analysis lines in each graph are difficult to interpret but indicate a noticeable difference between male and female members in the age range 35 to 45, where the average pensionable pay among female members consistently declines from one year of age to the next (ie the solid blue line is below the zero level in this age range), while among male members there is either a zero or a small positive increase in the same age range: at other ages the experience is not consistently different between male and female members.

H6 The results of this analysis should be treated with some caution since there may be a number of factors leading to the pattern shown, as discussed below.

Annual increase analysis

H7 It is often the case that average pay increases by more than the headline general pay award (usually referred to as 'pay drift'). HMT have included an allowance for drift in their directed general earnings increase assumption. If the promotional salary assumption also includes drift then this will be double counted. The annual increase analysis should therefore be adjusted by estimated pay drift, as well as by inflation increases.

H8 Much of the increase may be driven by younger members with shorter service where pay scales are relatively steep. Applying the average increase to all members is likely

to understate the pay increases for members with less service and overstate for those with more service.

Profile analysis

H9 The analysis is affected by the mixture of members at each age. For example, the group of members at, say, age 30 might better correspond to the members at age 31 with at least a year's service (ie those who were in service at age 30) than the full group at age 31.

H10 There will be effects from members leaving and rejoining. For example, early retirement may lead the average salary of active members aged 55 and above to be lower than the average salary of younger members, as members with higher salaries are thought more likely to take early retirement.

Annex I: Analysis of family statistics

I1 We have analysed two items of family statistics over 2010-2013 based on deaths among pensioners during that period. This analysis provides information regarding the proportions of pensioners in respect of whom a dependant's pension became payable and, in those cases, the difference in age between the pensioner and the dependant.

Proportions married or partnered

Data

I2 The results of this analysis should be treated with some caution, since there appears to have been inconsistent recording of death cases; whether a dependant's pension became payable; and what age the dependant was. There were some funds that recorded a dependant's pension to have been payable in 0% of deaths and a further one fund where the statistic was 100%. We have excluded those funds on the grounds that the data recorded seems implausible. However, there are a number of other funds where the data recorded may not reflect the actual position: it is difficult to be certain as to the level where the recording is plausible, and so we have included all these funds with overall proportions lying between 1% and 99% (actual entries ranged from 1% to 95%), although our expectation is that there is likely to be some distortion in the results caused by inconsistent recording.

Experience

I3 Charts I.1 and I.2 compare the actual proportion married or partnered to that assumed for the 2010 Model Fund valuation. The ONS assumptions are also given for comparison.

I4 If a greater than assumed proportion of members are married or partnered, this will result in more dependants' pensions being payable than assumed and so result in a higher than assumed cost to the scheme.

Chart I.1 – proportion of male members married or partnered

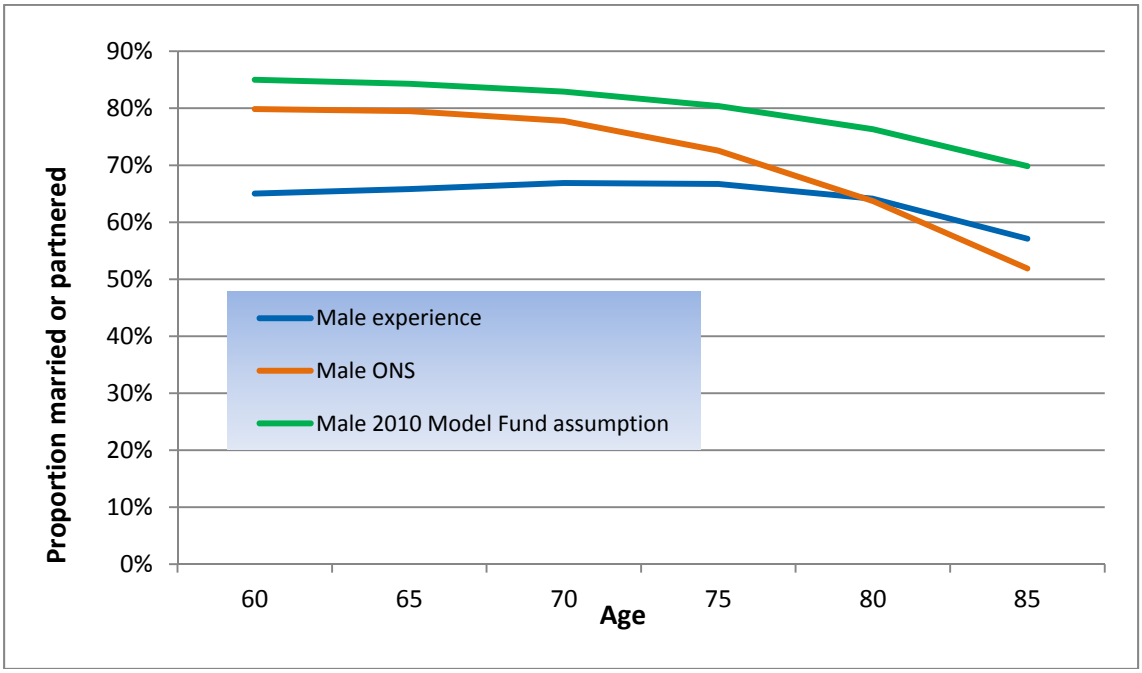
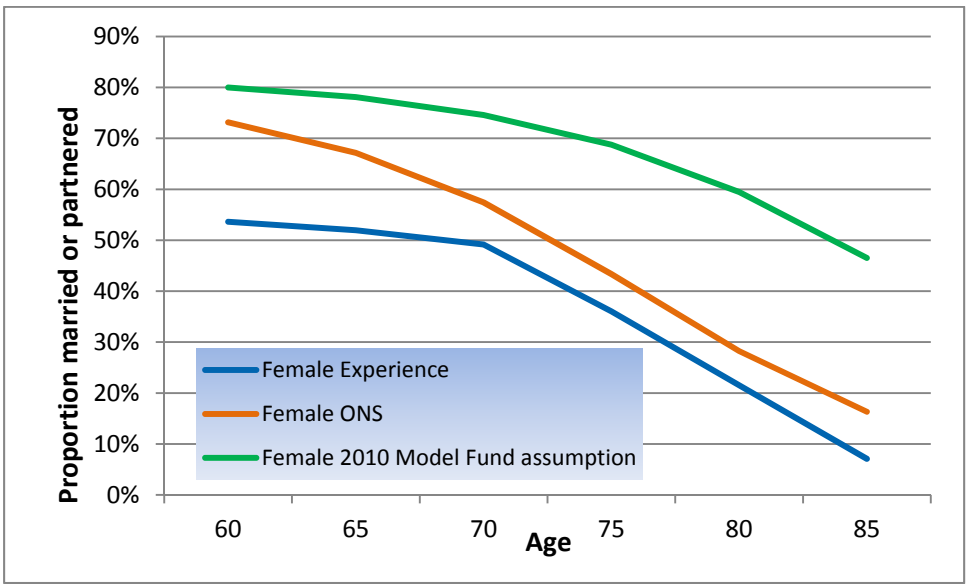


Chart I.2 – proportion of female members married or partnered



I5 The charts above show the experience significantly below the 2010 ONS rates at ages up to around 80 for males, and at all ages for females. However we have noted concerns about the data and therefore we expect that a better representation of likely future experience will be achieved by using the ONS rates (unadjusted) for the 2013 valuation.

Age differences between members and dependant

Data

I6 Although this analysis is based on the same data as that in paragraph I1 above, the inconsistency noted in that paragraph is unlikely to introduce any skewing of the results for this analysis. The average age difference is based on the cases where a record was shown, and these are likely to be a reasonable reflection of the Scheme's experience.

Experience

I7 The data shows that dependants (ie spouse, civil partner or partner) of female members are, on average, 2.1 years older than the member, while dependants of male members are, on average, 2.9 years younger than the member. This conclusion holds across a wide range of ages: while there is some degree of variation this arises mainly at ages where relatively few deaths occur.

Annex J: Record of changes since 4 April 2014 draft

J1 This advice was issued in draft of 4 April 2014, and circulated to the Cost Management and Contributions sub-committee of the shadow Scheme Advisory Board. The table below records the changes made since that draft.

Reference	Comment
Table 1, Chapter 5, Table A1, Annex D	Recommendation for age retirement assumptions exclude the incidence of early retirement occurring as a result of redundancy, following comments from Cost Management and Contributions sub-committee.
Various	No change to the proposed assumption. Minor drafting changes to correct spelling, grammatical and other minor issues, or to clarify previous wording.