Government Actuary's Department

Police pension schemes (Northern Ireland)

Actuarial valuation as at 31 March 2016
Advice on assumptions

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1 Executive summary

This report contains our recommendations for the best estimate assumptions to be set by the Department of Justice for the 2016 valuation of the Police Pension Schemes in Northern Ireland.

1.1 An actuarial valuation of the Police Pension Schemes (Northern Ireland)[1] ('the Schemes'), is being carried out as at 31 March 2016. The Public Service Pensions (Valuations and Employer Cost Cap) Directions (Northern Ireland) 2014 as amended ('the Directions') require that, unless specified otherwise[2], the assumptions to be adopted for this valuation will be set by the Department of Justice ('the Department'), having obtained advice from the scheme actuary. The assumptions must be the Department's best estimates and not include margins for prudence or optimism.

1.2 GAD is the appointed scheme actuary to the Schemes. This report has been commissioned by the Department and sets out GAD's formal advice to the Department on the actuarial assumptions to be adopted where these are not otherwise specified. The advice covers the assumptions to be set by the Department. The main advised assumptions are summarised in Table 1 with further detail in Appendix A.

1.3 This report relates to demographic assumptions ie assumptions about member behaviours. When considering appropriate assumptions, experience (both recent and longer term) generally provides the most reliable evidence when considering best estimates of future experience. Anticipated future events may also influence how assumptions are set. For some assumptions, there are only small amounts of experience that can be analysed in the Schemes. The experience in other larger public service pension schemes, including the police pension schemes in England and Wales, can then provide useful reference. Where there is no reason to believe experience across the memberships of the two schemes is materially different we have also considered the conclusions reached based on the England and Wales schemes' experience[3] in formulating our recommendations for the Schemes.

1.4 This advice sets out relevant analysis of recent experience and indicates which other factors have been considered in deriving recommendations of best estimate assumptions.

1.5 The previous completed actuarial valuation of the Schemes was carried out as at 31 March 2012. Many of the assumptions put forward in this report are the same as adopted for that valuation. The most significant changes are:

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[1] As provided by Royal Ulster Constabulary Pensions Regulations 1988 (as amended) (SR 1988/374), the Police Pension (Northern Ireland) Regulations 2009 (SR 2009/79) and the Police Pensions Regulations (Northern Ireland) 2015 (SR 2015/113)

[2] Certain assumptions are specified in the Directions.

[3] See report *Police pension schemes (England and Wales): Actuarial valuation as at 31 March 2016: Advice on assumptions* dated 28 February 2019.

> Rates of pensioner mortality have been updated to reflect recent experience and changes in population mortality as reflected in updated ONS population projections[4].

> The assumed incidence of ill-health retirement has been updated to align more closely with experience over 2012-2016.

> Normal health retirement rates for protected and tapered 1988 Scheme members reaching 30 years' service have been updated to reflect experience over 2012-2016.

> The amount of pension assumed to be commuted for a cash lump sum at retirement has increased in respect of members with 2015 Scheme service.

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

1.7 The estimated financial impact of changing assumptions is shown in Table 1 below. These have been calculated in an approximate way and are intended to provide a broad indication of the impact and are not definitive.

1.8 This report was provided to the Department in draft form, and was also circulated to the Police Northern Ireland Scheme Advisory Board, in October 2017. It has been signed alongside the formal valuation report. Since the draft version, the main changes have been to update our advice regarding the commutation assumption and to include an additional appendix regarding data uncertainty. The Department has already confirmed to GAD, having consulted with relevant stakeholders, that the actuarial assumptions to be adopted for the valuation should be those set out in this report.

Compliance and quality standards

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

[4] From the 2012 based ONS projections to the 2016 based ONS projections.

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

Assumption	Summary of recommended assumptions	Rationale for recommendation	Magnitude of financial impact of change from 2012 valuation assumptions[5]: Employer contributions (2019-23) – past service impact[6] (% of pay)	Employer contributions (2019-23) – past and future service impact[7] (% of pay)
Pensioner baseline mortality	Aligned to standard SAPS table[8,9]	In light of 2012-16 experience in the England and Wales schemes	+0.8%[10]	+1.0%[10]
Normal health	104% x S2NXA			
Ill-health (current)	142% x S2NXA			
Ill-health (future)	100% x S2IXA			
Dependants	103% x S2NXA			

Age retirement

[5] The financial impacts have been estimated on an approximate basis using the 2012 valuation results and long term financial assumptions, and should only be used as a guide to the approximate size of the impact. Each impact is specific to the change described and a combination of assumption changes will not necessarily equate to the sum of the individual impacts.

[6] Impact on employer contribution rate of spreading change in past service liabilities over 15 years.

[7] Total change in employer contribution rate of spreading past service and allowing for future service impacts.

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

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

[10] As directed by the Northern Ireland Department of Finance, future improvements in mortality assumed to be in line with those underlying the most recent ONS population projections. The financial impact shown relates only to the change in baseline mortality.

Assumption	Summary of recommended assumptions	Rationale for recommendation	Magnitude of financial impact of change from 2012 valuation assumptions[5]	
			Employer contributions (2019-23) – past service impact[6] (% of pay)	Employer contributions (2019-23) – past and future service impact[7] (% of pay)
1988 Scheme protected and tapered	Age and service based rates, with many retiring on reaching 30 years' service and all retiring by age 60	In light of 2012-16 experience in the England and Wales schemes	+0.1%	+0.1%
1988 Scheme unprotected	No retirements before age 55. Age and service based rates, with many retiring at age 55 or 30 years' service if later. For example, for members entering at 20/25/30, 97%/90%/22.5% are assumed to retire at age 55. All assumed to retire by age 60.	1988 Scheme provides a sizeable tax-free lump sum benefit of nearly four times pay (for full service in 1988 Scheme) which can be available before age 55. However, there is a significant disincentive of leaving the 2015 scheme before age 55 (retirement age effectively increases from 60 to SPA). The minimum past service in 2015 for these members is 9 years so the potential lump sum is still a very sizeable amount even if only linked to service up to 2015 from which point accruals will be under the 2015 scheme. So it is reasonable to expect high take-up of age retirement at 55 for such members. There is, however, no relevant evidence yet for Northern Ireland or England and Wales. This assumption is aligned to England and Wales.	No change in assumption.	
2006 Scheme (all members)	Around 29% retire at 55, 2% retire each year between 56 and 59 and about 62% retire at 60.	Proposal makes a reasonable allowance for the take up of benefits at the earliest time at which they become available and is in line with the assumption that was adopted for the 2012 valuation. There is no relevant evidence yet for Northern Ireland or England and Wales. To be kept under review.	No change in assumption.	

Assumption	Summary of recommended assumptions	Rationale for recommendation	Magnitude of financial impact of change from 2012 valuation assumptions[5] Employer contributions (2019-23) – past service impact[6] (% of pay)	Employer contributions (2019-23) – past and future service impact[7] (% of pay)
New entrants from 2015	Around 25% retire at 55 and remainder retire at 60.	No relevant evidence. Proposal makes a reasonable allowance for the take up of benefits at the earliest time at which they become available and is aligned to England and Wales. To be kept under review.	No change in assumption.	
Ill-health retirement				
Incidence	Increasing by age: 0.01%/0.1% (M/F) at age 30, 0.1%/0.4% at age 40, 0.9%/1.3% at age 50, 1.6%/2.1% at age 59	Male rates increased to 106% of 2012 rates. Female rates increased to 114% of 2012 rates. In light of 2012-2016 experience in England and Wales.	Not material.	+0.1%
Upper/lower tier split	50% on upper tier	No change from 2012 assumption.	No change in assumption.	
Withdrawal	Separate age-dependent rates assumed for males and females. Rates are typically between 0.5% and 1.5%.	No change from 2012 assumption. 2012-2016 experience is higher than 2012 assumption but events during 2012-16 suggest it is not expected to be a reliable indicator of future trends.	No change in assumption.	
Death before retirement	Separate age-dependent assumptions for males and females. Less than 0.5% of members are assumed to die each year even at the highest ages.	No change from 2012 assumption.	No change in assumption.	

Assumption	Summary of recommended assumptions	Rationale for recommendation	Magnitude of financial impact of change from 2012 valuation assumptions[5] Employer contributions (2019-23) – past service impact[6] (% of pay)	Magnitude of financial impact of change from 2012 valuation assumptions[5] Employer contributions (2019-23) – past and future service impact[7] (% of pay)
Promotional salary scale	A single unisex service-dependent scale for all members. Steeper at shorter service (around 3%-4% pa) reducing to around 1% pa after 13 years of service.	No change from 2012 assumption. In light of 2012-2016 experience.	No change in assumption.	
Commutation				
1988 Scheme protected	0% of pension commuted	Cost neutral commutation terms	No change in assumption.	
2006 Scheme protected	0% of pension commuted	Commutation unavailable	No change in assumption.	
1988 Scheme unprotected and tapered	0% of 1988 Scheme and 8.75% of 2015 scheme pension commuted	1988 Scheme offers a significantly greater lump sum for pension given up, but experience indicates members will still commute some of their 2015 Scheme pension.	No impact	-0.3%
For all other members the directed commutation assumption of 17.5% of pension applies				

Assumption	Summary of recommended assumptions	Rationale for recommendation	Magnitude of financial impact of change from 2012 valuation assumptions[5]: Employer contributions (2019-23) – past service impact[6] (% of pay)	Magnitude of financial impact of change from 2012 valuation assumptions[5]: Employer contributions (2019-23) – past and future service impact[7] (% of pay)
Family statistics				
Proportion married	80% (M), 75% (F) at retirement (consistent assumptions for existing pensioners)	No change from 2012 assumption. In light of 2012-2016 experience in England and Wales.	No change in assumption.	
Proportion partnered	85% (M), 80% (F) at retirement (consistent assumptions for existing pensioners)	No change from 2012 assumption. In light of 2012-2016 experience in England and Wales.		
Age difference	Male member 3 years older than partner Female 3 years younger than partner	No change from 2012 assumption. In light of 2012-2016 experience in England and Wales.		
Gender of dependant	Opposite gender to member	No change (no evidence)		
Remarriage	No allowance	Provision for cessation on remarriage removed through *Public Service Pensions Act (Northern Ireland) 2014*.		

2 Introduction

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

2.1 An actuarial valuation of the Police Pension Schemes (Northern Ireland) ('the Schemes') is being undertaken as at 31 March 2016. The Public Service Pensions (Valuations and Employer Cost Cap) Directions (Northern Ireland) 2014 (as amended) ('the Directions') require that, unless specified otherwise[11], the actuarial assumptions to be adopted for this valuation are the responsibility of the Department of Justice (Northern Ireland) ('the Department'), having taken advice from the scheme actuary. Direction 19(c) requires the assumptions to be the Department's best estimates.

2.2 GAD is the appointed scheme actuary to the Schemes. This report is addressed to the Department and contains our formal advice on the appropriate assumptions to be adopted for the 2016 valuation, as required by the Directions. The purpose of this advice is to enable the Department to determine the required best estimate assumptions.

2.3 The advice also has regard to HM Treasury's suggested approach[12] for setting assumptions in the absence of direct evidence. This will provide consistency with the approach adopted in Great Britain, which we understand is the preference of the Northern Ireland Department of Finance. We consider this approach to be reasonable but our advice might change if the Northern Ireland Department of Finance provided alternative guidance.

2.4 The advice covers the main assumptions to be set by the Department. In particular, we consider the following sets of demographic assumptions in this report:

> Pensioner mortality

> Age retirement from service

> Ill-health retirement from service

> Voluntary withdrawal from service

> Death before retirement

> Promotional pay progression

> Commutation of pension for cash at retirement

> Family statistics

[11] Certain assumptions are specified in the Directions.
[12] Set out in Annex A of HM Treasury's *Public service pensions: actuarial valuations and the employer cost cap mechanism* dated March 2014.

Appendix B includes details about the modelling approach and other calculation assumptions as required to complete the valuation, Appendix C sets out assumptions made for data uncertainties and Appendix D includes sensitivities around the choice of assumptions set by the Department.

2.5 This report was provided to the Department in draft form, and was also circulated to the Police Northern Ireland Scheme Advisory Board, in October 2017. Since the draft version, the main changes have been to update our advice regarding the commutation assumption and to include an additional appendix regarding data uncertainty. The Department have already confirmed to GAD, having consulted with relevant stakeholders, that the actuarial assumptions to be adopted for the valuation should be those set out in this report.

2.6 The Police Service of Northern Ireland (PSNI) supplied data on the experience of the scheme membership over the four-year period to 31 March 2016. We have used this data to analyse the Schemes' experience in order to develop our advice on the assumptions. Our report, *Police pension schemes (Northern Ireland) Actuarial Valuation at 31 March* 2016*: Report on valuation data* also finalised today, provides information about this data and should be read in conjunction with this advice. The report includes details of the checks carried out on the data, the amendments made to the data and our residual concerns about the quality of the data. In preparing our advice, we have relied upon the general completeness and accuracy of the data provided.

2.7 When considering appropriate assumptions, past experience, both recent and longer term, generally provides the most reliable evidence when considering best estimates of future experience. However, robust analysis of scheme experience will only be possible where there is both sufficient quality, and quantity, of data available. The level of reliance that can be placed on any assumptions derived from this analysis will also vary depending on these two factors. Anticipated future events may also influence how assumptions are set.

2.8 It is generally accepted that larger datasets will be subject to less volatility and statistical variation, and may be less prone to the impact of errors in individual records. For the smallest public service pension schemes it may therefore not be possible to undertake, in isolation, a statistically reliable analysis of that scheme's own experience. For other schemes it may only be possible to complete a reliable analysis of certain aspects of the scheme's own experience. Where appropriate, it may be preferable to consider whether the experience of similar larger schemes might be used when setting assumptions.

2.9 The Schemes in aggregate are a relatively small sized public service pension scheme with around 20,000 members. In this report we propose to set certain assumptions based on an analysis of the scheme's own experience over the four year period from 31 March 2012 to 31 March 2016. Other proposed assumptions have been recommended on the basis of, or in conjunction with, the outcome of the previous analysis carried out for the 31 March 2012 valuation, covering experience over the four year period to that date.

2.10 In some cases the data available to analyse inter-valuation experience for the Schemes is less reliable and complete than corresponding information for the larger police pension schemes in England and Wales ('the E&W Schemes'). Where there is no reason to believe experience across the membership of the two schemes should be materially different we have also considered the conclusions reached based on the E&W Schemes experience[13] in formulating our recommendations for the Schemes. This is consistent with the approach used in previous valuations where in many cases the same assumptions have been used for both schemes.

2.11 This report sets out relevant analysis of recent experience and indicates which other factors have been considered in deriving recommendations of best estimate assumptions. The Department should consider whether there is any reason why the conclusions reached would be inappropriate. We are happy to revisit our advice to take account of any evidence relevant to expected future experience of the Scheme membership.

2.12 For most assumptions considered in this report the experience data available from the Schemes is not sufficient to set a robust assumption. Placing full reliance on the Schemes' recent experience, might lead to assumptions which vary significantly between valuations simply as a result of one-off events or random variation in the experience. This could lead to unstable valuation results. To mitigate this risk we have made use of the experience of the E&W Schemes. We have adopted the following approach where there is insufficient evidence from the Northern Irish Schemes to set a robust assumption directly:

> If the Northern Irish experience is very similar to the experience in England and Wales then the assumption recommended for the E&W Schemes has been recommended for the Northern Irish Schemes as well.

> If the Northern Irish experience differs from England and Wales but the underlying experience in the two regions could reasonably be expected to be the same with the differences resulting only from natural random variation then the assumption recommended for the E&W Schemes has been recommended for the Northern Irish Schemes as well.

> If the difference between the experience in Northern Ireland and England and Wales cannot reasonably be the result of natural random variation then the recommended assumption will reflect the experience in Northern Ireland where that is expected to be the best guide for the future. It may still be possible to make use of the experience in England and Wales if the experience in Northern Ireland has a similar pattern by age but the overall level is higher or lower. This does not mitigate the risk of the assumption changing significantly between valuations but is more appropriate than adopting an assumption which seems clearly inappropriate. (In practice, this did not apply for any of the assumptions considered in this report.)

[13] Police pension schemes (England and Wales): Actuarial valuation as at 31 March 2016: Advice on assumptions dated 28 February 2019.

> If no analysis of Northern Irish experience has been possible due to the lack of credible data then the assumption recommended for the E&W Schemes has been recommended for the Schemes.

2.13 We are content for the Department 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.

2.14 Third parties whose interests may differ from those of the Department should be encouraged to seek their own actuarial advice where appropriate. Other than to the Department, GAD has no liability to any person or third party for any act or omission taken, either in whole or in part, on the basis of this report.

3 General considerations

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

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

Directions

3.2 The advice in this report reflects the requirements of the Directions issued by the Northern Ireland Department of Finance that assumptions should be set as the Department's 'best estimates' of future experience and should contain no margin for prudence or optimism. They should be set having regard to:

> assumptions set for previous valuations

> analysis of demographic experience in the period up to the valuation date

> historic long term trends and emerging evidence which may illustrate long-term trends in the future

> relevant data from any other sources.

Different populations

3.3 The Directions require this actuarial valuation of the Schemes covers both the scheme established under the Public Service Pensions Act (Northern Ireland) 2014[14] ("2015 Scheme") and the previous pension schemes ("pre-2015 schemes"), being the 1988 Scheme and 2006 Scheme. Assumptions appropriate to both the 2015 scheme and the pre-2015 schemes are required for the valuation. The Directions also require assessment of benefit accrual costs over the ***implementation period***[15]. This requires assumptions about anticipated member behaviour and characteristics during 2019 - 2023 as well as assumptions about member behaviour and characteristics in the longer term.

3.4 There are currently 3 distinct groups of members.

> Those with full protection and remaining in the pre-2015 schemes to retirement. The introduction of the 2015 scheme is not expected to have any impact on this group's behaviours

> New members to the 2015 scheme. These members' retirement behaviours are expected to be heavily influenced by the provisions of the 2015 scheme

[14] https://www.legislation.gov.uk/nia/2014/2/pdfs/nia_20140002_en.pdf
[15] 1 April 2019 to 31 March 2023.

> Members with service in both the 2015 scheme and a pre-2015 scheme (including members with tapered protection). Over time, as the proportion of 2015 scheme service increases, the retirement behaviours are expected to become increasingly influenced by the provisions of that scheme.

3.5 Where relevant we indicate in each of the following chapters the relative importance of each set of assumptions to the groups of members identified above.

Relative importance of assumptions

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

4 Pensioner Mortality

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

Proposed assumptions for 2016 valuation

4.1 The assumptions we recommend for baseline pensioner mortality for the 2016 valuation may be summarised by reference to standard mortality tables as follows. The corresponding assumptions for the 2012 valuation are also shown.

Table 4.1: Recommended mortality assumptions

	2012 valuation		2016 valuation	
Baseline mortality	**Standard table[16]**	**Adjustment**	**Standard table[17]**	**Adjustment**
Males				
Retirements in normal health	S1NMA	103%	S2NMA	104%
Current ill-health pensioners	S1NMA	140%	S2NMA	142%
Future ill-health pensioners	S1IMA	100%	S2IMA	100%
Dependants	S1NMA	100%	S2NMA	103%
Females				
Retirements in normal health	S1NFA	103%	S2NFA	104%
Current ill-health pensioners	S1NFA	140%	S2NFA	142%
Future ill-health pensioners	S1IFA	100%	S2IFA	100%
Dependants	S1NFA	100%	S2NFA	103%

*An adjustment of 103% means that mortality rates are 3% higher than in the standard table.

4.2 As specified by the Northern Ireland Department of Finance, future improvements in mortality will be assumed to be in line with those underlying the most recent ONS population projections, ONS-2016.

[16] SAPS (S1) 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).
[17] SAPS (S2) tables are published by the Actuarial Profession and based on the experience of self-administered pension schemes over the period 2004 to 2011. The 'S2' series includes separate standard tables based on experience of members retiring in normal health (S2NXA) and in ill health (S2IXA) and for female dependants (S2DFA). The S3 series of tables were released by CMI on 5 December 2018 and these updated mortality tables cover experience between 2009 and 2016. The final tables are unchanged from the working paper issued during 2018 from which GAD concluded that moving to the S3 tables would have no material impact on the valuation results as a whole. It therefore remains appropriate to use the S2 tables for the current valuation.

Comparison of expected pensioner longevity

4.3 The table below gives a comparison of the resulting life expectancies[18] (allowing for future improvements) assumed for the 2012 valuation and recommended for the 2016 valuation. The life expectancies shown under each column are calculated using the following assumptions:

- The mortality assumption adopted for the 2012 valuation allowing for ONS 2012 future mortality improvements.
- The mortality assumption adopted for the 2012 valuation changed from a 'lives' to 'amounts' basis (see paragraphs 4.8 to 4.13 of the Police E&W Assumptions report).
- As previous column, but with life expectancies calculated from the year 2016, rather than from 2012.
- The proposed mortality assumption for the 2016 valuation allowing for ONS 2016 future mortality improvements (on an 'amounts' basis).

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

Base table:	**2012 assumption (lives)**	**2012 assumption (amounts[19])**	**2012 assumption (amounts[17])**	**2016 assumption (amounts)**
Future mortality improvements:	**ONS 2012**	**ONS 2012**	**ONS 2012**	**ONS 2016**
Effective year for life expectancies:	**2012**	**2012**	**2016**	**2016**
Current normal health pensioners				
Male aged 60	27.8	28.2	28.6	27.3
Male aged 65	22.9	23.2	23.2	22.4
Female aged 60	30.3	30.7	31.1	29.0
Female aged 65	25.4	25.7	26.2	24.1
Future normal health pensioners – current age 45				
Male life expectancy from age 60	29.5	29.9	30.3	28.8
Male life expectancy from age 65	25.1	25.4	25.9	24.3
Female life expectancy from age 60	32.0	32.4	32.8	30.4
Female life expectancy from age 65	27.5	27.9	28.3	25.9

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

[19] At the 2012 valuation it was not possible to carry out an 'amounts' based analysis but sufficient data was available at the 2016 valuation to carry out an 'amounts' based analysis on the 2012-16 data and to show the 2012 valuation assumption on an 'amounts' rather than 'lives' basis, assuming the relationship between the two had been the same in 2012 as in 2016. These columns show the impact of changing the 2012 valuation assumption to an 'amounts' basis. See paragraphs 4.8 to 4.13 of the Police E&W Assumptions report for further details.

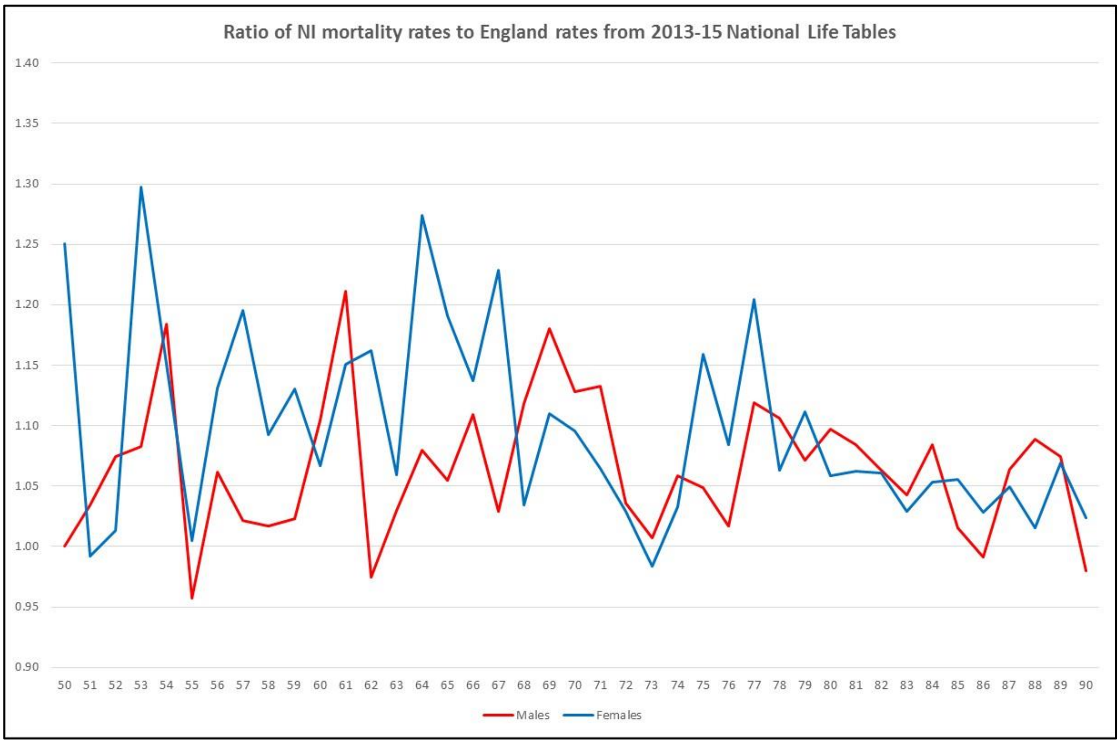
Use of the assumption

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

Comparison of population mortality in Northern Ireland and England

4.5 The chart below illustrates the differences between the aggregate population mortality rates for Northern Ireland compared to England. The relationship is quite volatile over the different ages. Looking at ages 60 and older (as relevant for pensioner mortality), mortality rates for Northern Ireland are generally slightly higher for ages 60 to 70; the ratio then declines in a relatively linear fashion until around age 90 after which mortality rates in Northern Ireland are broadly similar to those in England for males and a little higher for females.

Chart 4.1: Ratio of mortality rates in Northern Ireland to rates in England from 2013-15 Interim Life tables



4.6 Although the aggregate population mortality rates are slightly higher for Northern Ireland compared to England, the experience data for Northern Ireland is quite limited. As a result of this, the experience seen in Northern Ireland over relatively short periods can be expected to be volatile. The overall difference in mortality rates in Northern Ireland and England is not large, so it is appropriate to refer to mortality rates used in England when setting the assumptions for the schemes in Northern Ireland.

Analysis and setting the assumption

4.7 The mortality experience of the Schemes is not sufficient in isolation to set robust assumptions and so we have also considered the experience of the E&W Schemes. The table below sets out the number of deaths for normal health retirements, ill-health retirements and dependants in the NI and E&W Schemes. The analysis is carried out using ONS 2014 projections, being the set of projections available at the time that the analysis was carried out. Previous analysis carried out by GAD suggested that the impact of using ONS 2014 or 2016 projections for mortality analysis would be minimal.

Table 4.3 – Number of deaths in the NI and E&W schemes

Member category	Observed deaths in NI 2012-16	Observed deaths in E&W 2012-16
Males		
Normal health	349	4,340
Ill-health	163	1,608
Dependants	194	2,533

As the experience in the E&W Schemes is significantly greater than that in NI, our proposal for the normal-health, ill-health and dependants mortality assumption is that recommended for the E&W Schemes. The number of observed deaths over 2012-16 in the Schemes is not significantly out of line with expectations.

4.8 The approximate average rate of normal and ill-health pensioner deaths in the Schemes during 2012-16 is 0.9% pa and 0.4% pa respectively. The equivalent figures for the E&W Schemes are 1.0% pa and 0.4% pa respectively. This shows that normal and ill-health pensioner death experience over 2012-16 has been broadly similar across the NI and E&W Schemes.

4.9 There is insufficient data to carry out a credible analysis for female normal-health retirements, female ill-health retirements and male dependants in both the NI and E&W Schemes. For these groups we have proposed use of the same adjustment to standard mortality tables as that applying to members of the opposite sex. We do not expect the incidence of ill-health retirement mortality to significantly differ by scheme and therefore the ill-health analysis is not separated by scheme. This is consistent with the approach adopted at the 2012 valuation.

4.10 For those groups in E&W where a credible analysis is possible, we have analysed the actual pensioner mortality experience over the four-year period to 31 March 2016 on an ‘amounts’ basis. To derive an assumption on an amounts basis we have compared the actual amounts of pension ceasing on deaths with those expected had the members’ experience been in line with the mortality rates in the relevant current SAPS tables (“S2 Tables”). The recommended assumption of baseline pensioner mortality is expressed by reference to suitable adjustments to the rates in the relevant S2 table (“the base table”). Details of this analysis can be found in the draft report Police pension schemes (England and Wales): Actuarial valuation as at 31 March 2016: Advice on assumptions dated 21 July 2017.

Comments on E&W Analysis: Normal Health Pensioner Mortality

4.11 The E&W experience suggests slightly lighter mortality overall than expected based on the 2012 assumption (which is the same as the 2012 assumption for the Schemes). The recommended assumption has been derived by taking an average of the 2012 assumption and the E&W 2012-16 experience, weighted appropriately.

Comments on E&W Analysis: Ill-health Pensioner Mortality

4.12 The E&W experience suggests lighter mortality overall for current ill-health pensioners than expected based on the 2012 assumption (which is the same as the 2012 assumption for the Schemes). The recommended assumption for current ill-health pensioners has been derived by taking an average of the 2012 assumption and the 2012-16 E&W experience weighted appropriately to reflect the amount of credible data available for the analysis.

4.13 For future ill-health retirements we recommend a different assumption compared to that for current ill-health pensioners to reflect an expectation that the mortality experience of future ill-health pensioners will be different from that of current ill-health pensioners. We do not hold sufficient data on those retiring under the current ill-health arrangements in either the NI or E&W Schemes to carry out a credible mortality analysis; therefore a pragmatic approach is needed to setting the assumption for the mortality of future ill-health pensioners. The approach we recommend is to assume mortality is in line with the S2IA tables (which are based on the ill-health experience of certain private sector pension schemes). This may be justified on the grounds that the ill-health criteria in public and private sector pension schemes are now likely to be broadly similar, with ill-health mortality being driven primarily by the illness rather than the type of work undertaken. The relatively low level of ill-health retirement means that the choice of assumption is not particularly material.

Comments on E&W Analysis: Dependant Pensioner Mortality

4.14 The experience suggests slightly heavier mortality than expected based on the 2012 assumption (which is the same as the 2012 assumption for the Schemes). The recommended assumption has been derived by taking an average of the 2012 assumption and the 2012-16 experience weighted appropriately to reflect the amount of credible data available for the analysis.

5 Age retirement from service

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

Proposed assumptions for 2016 valuation

5.1 We recommend that rates of age retirement are set separately for members who continued in the 1988 scheme after April 2015, for new entrants from 1 April 2015 and for those who will have service in the pre-2015 schemes and the 2015 scheme. Sample age retirement rates are provided in Appendix A. This approach to setting assumptions was adopted for the previous valuation. There is not yet any evidence on which to reconsider this approach.

Members remaining in the 1988 scheme after April 2015 (including those in tapering)

5.2 For this category, we recommend that there is an increase in the assumed rate of retirement for those reaching 30 years' service with rates at all other service and age combinations maintaining the 2012 assumption. Both age and service are taken into account in the retirement rates. Many members are assumed to retire on reaching 30 years' service and all are assumed to retire by age 60.

New entrants to the 2015 scheme

5.3 Our recommended assumption is:

- 25% of members reaching age 55 are assumed to retire immediately; and
- all remaining members will retire at age 60.

5.4 The assumption is intended to make a reasonable allowance for the take-up of benefits at the earliest time at which they become available (with reduction for early payment) and is the same assumption that was adopted for the 2012 valuation.

5.5 In the 2015 scheme, an actuarial uplift will be applied to the pension payable on retirement after age 60. Therefore, no allowance is required for late retirement after age 60.

Unprotected members with service in the 1988 and 2015 schemes

5.6 For 1988 Scheme members that joined the scheme before age 30, we recommend assuming no members will retire before age 55. Instead, we recommend assuming that most members will retire at the later of age 55 and reaching 30 years of service.

5.7 For 1988 Scheme members that joined the scheme after age 30 (and so cannot retire before age 55), we recommend maintaining the 2012 assumption which merges between the patterns of retirement for members remaining in the existing scheme and those applying to new entrants to the 2015 scheme as adopted for the 2012 valuation.

Members remaining in the 2006 Scheme or with service in both the 2006 and 2015 schemes

5.8 We recommend merging between the assumed patterns of retirement for 2006 Scheme members in the 2012 valuation and that applying to new entrants to the 2015 scheme. Given the small group, we recommend that all members with 2006 Scheme service are assumed to retire under a single set of assumptions based on their average characteristics.

5.9 The assumptions recommended above are the same as those recommended for the E&W Schemes.

Previous valuation assumptions

5.10 The proposed assumptions are identical in nature and effect to those which were adopted for the 2012 valuation for all categories of members except members remaining in the 1988 Scheme after April 2015 (including those in tapering) where we have recommended an increase in the rate of retirement for those reaching 30 years' service.

Use of the assumption

5.11 Age retirement rates specify the rate at which members are assumed to retire on grounds other than ill-health.

5.12 There are no provisions for early retirement from active service in the 1988 and 2006 schemes. However, in the 2015 Scheme, members will be able to retire from active service from age 55, with an actuarial reduction applied to the pension payable if retirement occurs before age 60. The actuarial reduction is set to give the early retirement pension the same value as deferred benefits payable following withdrawal at the same age (but with reference to payment age 60 rather than the usual deferred payment age of SPA). As the deferred benefits are expected to be less valuable than the benefits payable had the member stayed in service and retired at 60, early retirement will represent a saving to the Scheme.

5.13 In the 1988 and 2006 schemes the pension payable on late retirement is not subject to actuarial adjustment. This means that late retirements from the 1988 or 2006 Scheme typically reduce the costs to the Scheme (ie the value of the benefit payable to a member is typically lower). The rates of retirement of members of the 1988 and 2006 schemes are therefore financially significant assumptions. In the 2015 Scheme, an actuarial uplift will be applied to the pension payable on retirement after age 60. No allowance for late retirement of 2015 Scheme members is therefore proposed.

Analysis and setting the assumption

5.14 For the 2012 valuation we concluded a reasonable process for setting age retirement rates was to recommend:

> assumptions for the group expecting to receive benefits wholly or mainly from the existing schemes (ie those with full protection or continuing in the existing schemes after 31 March 2015 under the taper arrangements) by reference to the recent retirement experience in the Scheme

> assumptions for new entrants to the 2015 Scheme and those expecting to receive benefits mainly from the 2015 Scheme (ie those transferring to the new scheme on 1 April 2015) by considering any relevant evidence. Since the majority of the available experience continues to relate to retirements from the 1988 Scheme, the actual scheme experience is not directly relevant for this purpose. As such, we recommend that rates for this group of members is in line with the assumptions adopted for the 2012 valuation.

5.15 After excluding data that did not appear reliable, there were 827 age retirements in the Schemes over 2012-16, with an average of retirement of 51 years. We have also considered the experience of the E&W Schemes, for which 9,544 retirements were included in the equivalent analysis over 2012-16, with an average age of retirement of 52 years.

5.16 For the Schemes, for the purposes of considering the assumptions appropriate for the first group of members in paragraph 5.14 (ie those continuing in the 1988 Scheme after 31 March 2015) we have considered the proportion of age retirements by age and service over the four-year period to the valuation date compared to those for the E&W Schemes. After excluding data that did not appear reliable, the 2012-16 experience of the Schemes shows around 89% of total retirements occur when officers reach 30 years' service. The equivalent figure for the E&W Schemes is around 89%, compared to an expected proportion of around 77% of retirements at 30 years' service in E&W based on the 2012 assumption.

5.17 We have no reason to believe that there will be a fundamental difference in the future rates of age retirement between the NI and E&W Schemes. In particular, we expect age retirement behaviour in the 1988 Scheme to be driven by the scheme benefit structure rather than any underlying differences between the officer population in NI and E&W. As such, we recommend that age retirements in the Schemes are aligned with the 2016 proposal for the E&W Schemes where for those reaching 30 years' service, an average between the 2012 assumption and the 2012-16 E&W experience has been proposed with rates at all other service and age combinations maintaining the 2012 assumption.

5.18 There is insufficient data in either the NI or E&W Schemes to undertake any analysis of retirements from the 2006 and 2015 Schemes.

6 Ill-health retirement from service

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

Proposed assumptions for 2016 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 those members who remain in the pre-2015 schemes and members of the new scheme. Assumed rates of ill-health increase with age up to around 2% for men and women at the highest ages. Sample rates are provided in Appendix A.

6.2 We also recommend assuming that 50% of members retiring from the 2006 Scheme and the 2015 scheme on ill-health grounds will receive the upper-tier benefit and the remaining 50% will receive the lower-tier benefit.

Previous valuation assumptions

6.3 The proposed 2016 assumptions for the incidence of ill-health retirement are slightly higher than the rates adopted for the previous valuation. They are 106% and 114% for men and women respectively of the 2012 assumption.

6.4 The assumed proportion of members eligible for upper-tier[20] benefits is unchanged from that adopted for the previous valuation.

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 upper or lower tier awards specifies the benefits which will be provided in the 2006 Scheme and 2015 scheme. The ill-health assumptions have a low impact on the overall results. The rates of mortality experienced after ill-health retirement are also relevant to the valuation calculations. Post retirement mortality is addressed in Chapter 4.

Analysis and setting the assumption

Ill health incidence

6.6 After excluding any data that was not credible, there were 163 ill-health retirements in the Schemes over 2012-16, with an average age of ill-health retirement of 48 years.

6.7 As this is a relatively small number of ill-heath retirements, the experience of the Schemes is not sufficient in isolation to set a robust assumption and so we have also considered the experience of the E&W Schemes, for which around 1,730 retirements were included in the equivalent analysis over 2012-16, with an average age on ill-heath retirement of 48 years.

[20] A lower tier award provides for immediate payment of accrued benefits with no actuarial reduction, regardless of age. An upper tier award provides for enhancement of accrued benefits.

6.8 The analysis of the E&W Schemes shows around 11% more men and 28% more women than expected retired on ill-health grounds over the 4-year period. For this reason we recommend that the assumed rates of ill-health retirement for men and women are increased slightly for the purposes of the 2016 valuation. Allowing for some expected fluctuation in experience over periods of time we recommend 50% of the difference in experience is reflected in the revised assumptions ie the rates are set equal to 106% for men and 114% for women of those adopted for the 2012 valuation.

6.9 The 163 ill-heath retirements in NI equates to an approximate average ill-heath rate of 0.59% pa over the four-year period 2012-16. The rate in E&W was 0.45% pa. This shows that ill-health retirement experience has been broadly similar in NI and E&W. The average age of ill-health retirement over 2012-16 was the same in NI and E&W.

6.10 Given the relatively small amount of ill-heath experience for the Schemes and that the experience in E&W was similar, we propose that the ill-health assumption for E&W for the 2016 valuation is also adopted for the Schemes. This is consistent with the structure of the assumptions used at the 2012 valuation, when the same ill-health assumptions were used in NI and in E&W.

Split between ill-health tiers

6.11 We have also analysed the proportion of members with upper-tier benefits when retiring in ill-health during 2012-16. The evidence for the Schemes indicates that all of their ill health retirements were recorded as upper tier. It is possible that retirements have been recorded as upper tier (perhaps by default) regardless of the actual tier of benefits the member received. We do not expect this assumption to have a significant impact on the valuation results.

6.12 Our proposal is to maintain the existing assumption (that 50% of retirements are upper tier) on the basis that the 2012-16 data may not be reliable. This is the same assumption as adopted in E&W. However, we note that this assumption is of low materiality to the overall valuation results.

7 Voluntary withdrawal from service

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

Proposed assumptions for 2016 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, applying equally to those members who remain in the existing scheme and those who join the new scheme. The recommended rates decrease with age and are typically between 0.5% and 1.5% a year. The same rates apply regardless of the length of the member's service, except that no withdrawal will be assumed for members entitled to immediate benefits. Sample rates are provided in Appendix A.

Previous valuation assumptions

7.2 The proposed 2016 assumptions are the same as the rates adopted for the previous valuation.

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.

7.4 There is insufficient evidence to indicate the level of members re-joining the Schemes after leaving. For the avoidance of doubt, all members assumed to withdraw are assumed not to re-join.

7.5 The assumed level of withdrawals is relatively low and hence the assumption is not significantly material to the overall valuation results.

Analysis and setting the assumption

7.6 We have analysed withdrawals from active membership over the four-year period to 31 March 2016. There were a total of 197 withdrawals over the period. This represents an approximate average rate of withdrawal of 0.71% each year over the four-year period. This is within the range of rates adopted for the 2012 assumptions which are typically between 0.5% and 1.5%. As such, we propose to maintain the 2012 assumption which is consistent with the proposal for the E&W Schemes.

8 Death before retirement

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

Proposed assumptions for 2016 valuation

8.1 We recommend a single set of assumptions (separate for men and women) to allow for the possibility of death before retirement. Assumed rates of death before retirement increase with age but fewer than 0.5% of members are assumed to die each year, even at the highest ages. Sample rates are provided in Appendix A.

Previous valuation assumptions

8.2 The proposed 2016 assumptions are the same as those adopted for the previous valuation.

Use of the assumption

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

Analysis and setting the assumption

8.4 After excluding any data that was not credible, there were 14 deaths in service in the Schemes over 2012-16, with an average age at death of 45 years. As set out in paragraph 8.3, the numbers of deaths observed annually are low, and thus this assumption has relatively little financial significance.

8.5 As this is a very small number of deaths, the experience of the Schemes is not sufficient in isolation to set a robust assumption and so we have also considered the experience of the E&W Schemes, for which there were 114 deaths included in the equivalent analysis over 2012-16, with an average age at death of 48 years.

8.6 The 14 deaths in NI equates to an approximate average rate of death 0.05% pa over the four-year period 2012-16. The equivalent rate over the same period in E&W was 0.03% pa. The average age on death over 2012-16 was 3 years earlier in NI than in E&W.

8.7 There is little experience in NI to use as a firm base for this assumption, and the limited experience is similar to that observed in E&W. Therefore, we propose that the E&W assumption is adopted for the 2016 valuation. This is consistent with the structure of the assumptions used at the 2012 valuation, when the same death before retirement assumption was used in NI and in E&W. This also means no change in the assumption from that used for the Schemes in 2012.

9 Promotional pay increases

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

Proposed assumption

9.1 We recommend assuming a single combined scale of promotional increases for men and women. The increases are dependent on members' length of service and are steeper at lower service periods. Sample values from the scale are provided in Appendix A.

Previous assumption

9.2 The assumptions adopted for the 2012 valuation are the same as those recommended for the 2016 valuation.

Use of the assumption

9.3 For members of the 1988 and 2006 schemes, benefits earned in those schemes are linked to pay at or near retirement. Members' pay can increase through a combination of general annual pay awards and promotional increases. To calculate an estimate of the level of benefit payable in the future requires assumptions for both these components. The assumption for general pay awards is directed by the Northern Ireland Department of Finance. The assumption for promotional pay increases is set by the Department.

9.4 Future pay progression will be more significant (in terms of expected pension) for those members with either full or tapered protection because they continue to accrue benefits linked to final pensionable pay for service beyond 31 March 2015.

Analysis and setting the assumption

9.5 To formulate a recommended assumption we compared the scheme experience to the assumption adopted for the 2012 valuation using a 'profile analysis' which considers the overall active membership as at 31 March 2016 and compares average (WTE[21]) pensionable pay at each length of service with that at other lengths of service. This analysis illustrates how average (WTE) pay varies by length of service.

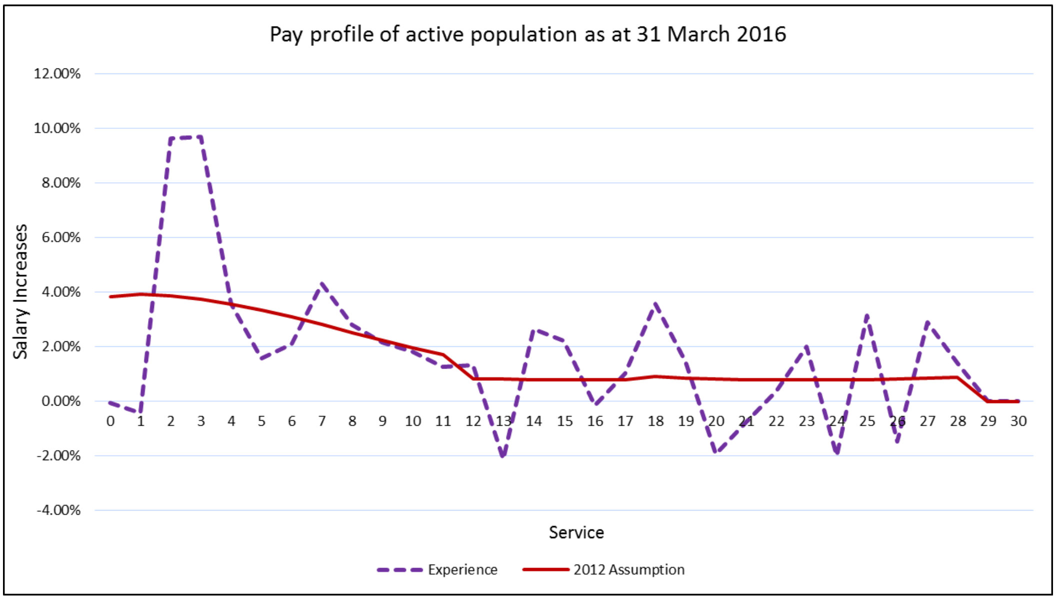
9.6 The profile analysis which has been completed suggests that the 2012 assumption remains appropriate. In the absence of any other evidence, we recommend that the 2012 assumption is maintained for the 2016 valuation.

[21] Whole time equivalent.

Results of analysis

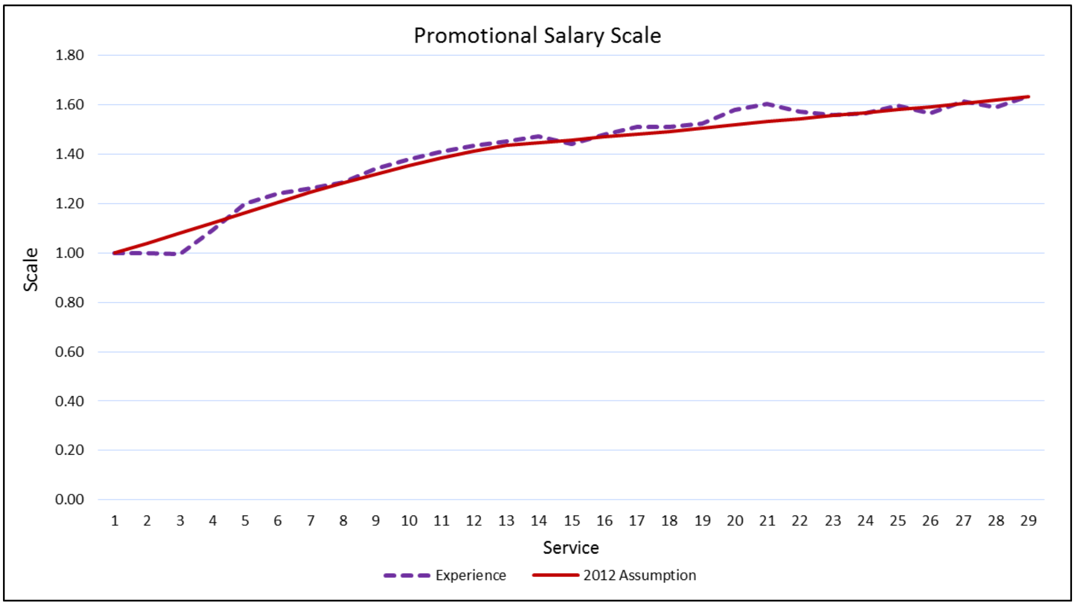
9.7 Graph 9.1 below shows the change in average pay at each service length based on the 'profile analysis' of all members at the valuation date (purple line). This is compared with the assumed increase from the service related promotional scale adopted for the 2012 valuation (red line).

Graph 9.1: Pay profile of active population as at 31 March 2016



9.8 Graph 9.2 below shows the 2012 assumption promotional pay scale against the actual experience of members at 31 March 2016.

Graph 9.2: Average pay at 31 March 2016 vs 2012 valuation assumption



Comments on the analysis

9.9 The results of the analysis show that experience has been broadly in line with the 2012 assumption.

9.10 There is some variation between experience and assumptions at the left hand side of Graph 9.1. However the assumptions at these lower lengths of service are less material to the valuation as those with short service will have small accrued pensions linked to their final salary. In addition, the majority of these people with short service will now be accruing benefits in the 2015 scheme, where the assumption about promotional pay increases is not as relevant.

9.11 Graph 9.2 shows that promotional pay scale experience as at 31 March 2016 closely matches the 2012 assumption. The pay structure is consistent with that proposed for the E&W Schemes.

10 Commutation of pension for cash at retirement

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

Proposed assumptions for 2016 valuation

10.1 We recommend that members are assumed to commute the following proportions of their pensions for cash. The assumptions are the same for men and women.

Table 10.1: Recommended commutation assumption for the 2016 valuation

Member with service in the following schemes	1988/2006 Scheme only	Mixed 1988 and 2015 scheme		Mixed 2006 and 2015 scheme		2015 scheme only
Scheme pension commuted from	**1988/2006**	**1988**	**2015**	**2006**	**2015**	**2015**
All members	0%	0%	8.75%	0%	17.5%[22]	17.5%[23]

Previous valuation assumptions

10.2 The proposed assumptions have been updated since the previous valuation. At the 2012 valuation, no allowance for commutation of 2015 Scheme pension was made for unprotected members of the 1988 Scheme and the HMT directed assumption for 2006 and 2015 Scheme pension (for members without service in other schemes) was that 15% of pension would be commuted.

Use of the assumption

10.3 In the 1988 Scheme, members have the option to commute pension for a cash lump sum at retirement. In the 2006 Scheme, members receive an automatic lump sum but have the option to exchange some of this for higher annual pension payments. Under both schemes the terms under which these options are offered are actuarially equivalent to the benefits (and so the rate of commutation within these schemes is not expected to impact the cost of providing the schemes).

10.4 In the 2015 Scheme, members may commute part of their pension for a lump sum at a rate of £12 for each £1 of pension given up. In this scheme, the assumption about the amount of pension commuted is important because the value of the pension given up, as assessed using the actuarial assumptions underlying the valuation is, on average, more than £12 and so commutation has a significant impact on total liabilities and contribution rates.

[22] Specified by the Northern Ireland Department of Finance Directions.
[23] Specified by the Northern Ireland Department of Finance Directions.

10.5 Differences between assumed and actual commutation experience in the 2015 Scheme will feed through into the cost cap fund but commutation experience in the 1988 Scheme and rates of exchange of lump sum for pension in the 2006 Scheme will not.

Derivation of proposed assumptions

10.6 For the reasons set out in paragraph 10.3, for simplicity no allowance has been made for members commuting 1988 Scheme pension for cash or exchanging 2006 Scheme automatic lump sum for annual pension payments.

10.7 The assumption for commutation of 2015 Scheme pension by new entrants to that scheme and 2006 Scheme members who move across to the 2015 Scheme is directed by the Northern Ireland Department of Finance.

10.8 The recommended assumption for members with mixed 1988 Scheme and 2015 Scheme service is based on reasonable assumptions about the behaviours of these members and data from any comparable experience, in the absence of any direct commutation experience for these members. 1988 Scheme members are not entitled to an automatic lump sum, but they are entitled to commute up to a quarter[24] of their pension on actuarially equivalent terms.

10.9 The terms available in the 1988 Scheme offer a significantly greater lump sum than would be available under the commutation terms of 12:1 offered in the 2015 Scheme. We would expect this to act as a substantial disincentive to commute pension in the 2015 Scheme, especially for those members with significant amounts of service in the 1988 Scheme (where the lump sum available from the 1988 Scheme is large). Even members with the least 1988 Scheme service are likely to be able to commute a lump sum from their 1988 Scheme benefits alone which is as large as the amount of lump sum assumed to be taken by new entrants into the 2015 Scheme. As such, we do not expect that former 1988 Scheme members will commute significant amounts of pension from the 2015 Scheme.

10.10 However, there is some evidence to suggest that a number of members of the 1988 commute pension above the HMRC tax limits. This tax charge can happen because members can commute 25% of pension (generally) and the commutation factors are higher than 20 at some ages. This suggests that members will commute additional pension when the effective terms (after tax) of that additional commutation are much less favourable than for the bulk of the pension they can commute. Therefore, this situation has similarities with the decisions which will be faced by the unprotected 1988 Scheme members, so can inform the proposed assumption.

10.11 We therefore propose that it is assumed that unprotected 1988 Scheme members will commute 8.75% of their 2015 Scheme pension, with this proportion being half of the proportion of 17.5% to be assumed for new entrants to the 2015 Scheme. We do not suggest that any averaging with the previous assumption is carried out in setting this assumption for the 2016 valuation, as the proposed assumption is based on new data that is now available, as opposed to a change in observed behaviours.

[24] In general but alternative limits apply to some members.

11 Family statistics

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

Proposed assumptions for 2016 valuation

11.1 We recommend the following assumptions.

Table 11.1: Recommended proportions married/partnered

	1988 Scheme Proportion married[25]		2006 and 2015 schemes Proportion partnered[26]	
	Males	**Females**	**Males**	**Females**
Current pensioners age 65 or above	100% ONS male proportion married rates	100% ONS female proportion married rates	100% ONS male proportion partnered rates	100% ONS female proportion partnered rates
Current pensioners below age 65	105% ONS male proportion married rates	105% ONS female proportion married rates	105% ONS male proportion partnered rates	105% ONS female proportion partnered rates
Future pensioners at retirement	80%	75%	85%	80%

- Male members are assumed to be three years older than their partners and female members are assumed to be three years younger than their partners
- No allowance is made for remarriage as provisions for cessation of pension on remarriage cease to have effect from 1 July 2014 as a result of Section 30 of the *Public Service Pensions Act 2014 (Northern Ireland)*.
- All dependants are assumed to be the opposite sex to the member.

Previous valuation assumptions

11.2 All family statistic assumptions are the same as those adopted for the 2012 valuation.

Use of the assumptions

[25] The assumptions are the proportion married at the valuation date, for current pensioners, or at retirement, for future pensioners.
[26] The assumptions are the proportion partnered at the valuation date, for current pensioners, or at retirement, for future pensioners.

11.3 Dependants' pensions[27] are provided to qualifying dependants on the death of a member. In the 1988 Scheme, dependants' pensions are payable to legal spouses and civil partners only. In the 2006 and 2015 schemes, dependants' pensions are payable to qualifying partners as well as to legal spouses and civil partners. 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 their spouses/partners as this affects how long dependants' pensions will be paid for.

Analysis and approach to setting the assumptions

11.4 The experience of the Schemes is not sufficient in isolation to set robust assumptions and so we have also considered the experience of the E&W Schemes.

11.5 We have no reason to expect that family circumstances in the Schemes should be substantially different to those in the E&W Schemes. The assumption used for the 2012 valuations were consistent across the two schemes. We recommend that the family statistics assumptions should remain aligned to those proposed for the 2016 valuation of the E&W Schemes, where the proposal is to retain the assumptions adopted for the 2012 valuation.

11.6 For future pensioners, the proportion married/partnered at retirement will be used in our calculations, rather than the proportion married/partnered at the valuation date. We recommend that the assumptions for proportions married/partnered at retirement for future pensioners are the same as the proportions married/partnered at the valuation date for current younger pensioners. For example, about 80% of current male pensioners at all ages below 65 are assumed to be married at the valuation date. For consistency, 80% of future male pensioners will be assumed to be married when they reach retirement.

[27] Pensions are also payable to dependent children on a member's death but the costs are not material overall and we therefore do not intend to make any allowance for them in the valuation.

Appendix A: Details of assumptions

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

Pensioner mortality

Table A1: Baseline mortality assumptions

Baseline mortality	Standard table[28]	Adjustment
Males		
Retirements in normal health	S2NMA	104%
Current ill-health pensioners	S2NMA	142%
Future ill-health pensioners	S2IMA	100%
Dependants	S2NMA	103%
Females		
Retirements in normal health	S2NFA	104%
Current ill-health pensioners	S2NFA	142%
Future ill-health pensioners	S2IFA	100%
Dependants	S2NFA	103%

As specified by the Northern Ireland Department of Finance, future improvements in mortality will be assumed to be in line with those underlying the ONS-2016 population projections.

[28] From the 'S2' series of standard tables published by the CMI and based on the experience of self-administered pension schemes. Separate tables are available based on experience of members retiring in normal and ill-health and for dependants.

Age retirement from service

Table A2: Age retirement rates for 1988 Scheme members with full and tapered protection

Retirement Age	Entry Age		
	20	25	30+
48	-	-	-
49	-	-	-
50	0.800	0.030	-
51	0.550	0.015	-
52	0.400	0.015	-
53	0.400	0.015	-
54	0.400	0.015	-
55	0.400	0.900	0.200
56	0.400	0.550	0.200
57	0.400	0.400	0.200
58	0.400	0.400	0.200
59	0.400	0.400	0.200
60	1.000	1.000	1.000

Table A3: Age retirement rates for 1988 Scheme members with no protection

Retirement Age	Entry Age		
	20	25	30+
55	0.970	0.900	0.225
56	0.400	0.550	0.100
57	0.400	0.400	0.100
58	0.400	0.400	0.100
59	0.400	0.400	0.100
60	1.000	1.000	1.000

Table A4: Age retirement rates for 2006 Scheme members

Retirement Age	All Entry Ages
55	0.292
56	0.033
57	0.033
58	0.033
59	0.033
60	1.000

Table A5: Age retirement rates for new entrants to the 2015 scheme

Retirement Age	All Entry Ages
55	0.250
56	-
57	-
58	-
59	-
60	1.000

Ill-health retirement from service

Table A6: Ill-health retirement rates for all members

Age	Males	Females
20	0.0000	0.0000
25	0.0000	0.0004
30	0.0001	0.0013
35	0.0009	0.0023
40	0.0016	0.0049
45	0.0051	0.0101
50	0.0093	0.0152
55*	0.0136	0.0203
59*	0.0169	0.0245

*rates are zero if above the retirement age of the relevant scheme

Voluntary withdrawal from service

Table A7: Withdrawal rates for all members

Age	Males	Females
20	0.0253	0.0253
25	0.0165	0.0165
30	0.0125	0.0127
35	0.0117	0.0122
40	0.0102	0.0113
45	0.0067	0.0089
50*	0.0050	0.0064
55*	0.0000	0.0000

*rates are zero if eligible to retire

Death before retirement

Table A8: Death before retirement rates for all members

Age	Males	Females
20	0.0002	0.0001
25	0.0002	0.0001
30	0.0003	0.0002
35	0.0004	0.0003
40	0.0005	0.0005
45	0.0007	0.0007
50	0.0010	0.0012
55	0.0017	0.0018
60	0.0025	0.0028
65	0.0040	0.0043

Promotional pay increases

Table A9: Promotional salary scales for all members

The salary scale shows assumed pay progression in excess of general wage inflation in comparison to an index base of 100 at entry.

Service	All members
0	100
5	121
10	141
15	152
20	158
25	164
30	171
35	171
40	171

Commutation of pension for cash at retirement

Table A10: Recommended commutation assumptions for the 2012 valuation

Members are assumed to commute the following proportions of their pensions for cash

Member with service in the following schemes	1988/2006 Scheme only	Mixed 1988 and 2015 scheme		Mixed 2006 and 2015 scheme		2015 scheme only
Scheme pension commuted from	**1988/2006**	**1988**	**2015**	**2006**	**2015**	**2015**
All members	0%	0%	8.75%	0%	17.5%	17.5%

Family statistics

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

	1988 Scheme	2006 Scheme and 2015 Scheme
	Proportion married	**Proportion married or partnered**
Males	80%	85%
Females	75%	80%

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

	1988 Scheme		2006 Scheme and 2015 Scheme	
	Proportion married		Proportion married or partnered	
Age	**Males**	**Females**	**Males**	**Females**
50	80%	75%	85%	80%
60	80%	74%	85%	77%
70	75%	56%	78%	57%
80	63%	28%	64%	28%
90	36%	8%	36%	8%

Males are assumed to be three years older than their female partners.

Appendix B: Modelling approach and minor assumptions

Active membership projections

B.1 Direction 11[29] requires the actuary to use the 'projected unit methodology' to calculate the valuation results. The valuation results require the calculation of the cost of benefit accrual over periods after the effective date (31 March 2016). The expected cost of benefits provided to members remaining in the 1988 and 2006 schemes under the provisions of transitional protection differs from the expected cost of providing members with benefits in the 2015 scheme. Further, the expected cost of providing benefits varies for members in the 1988 and 2006 schemes. This implicitly requires the actuary to estimate the membership at future dates in order to determine the valuation results.

B.2 Since the majority of members (around 61%) were accruing benefits in the 2015 scheme at the effective date, and further, given that the remaining members continuing to accrue benefits in the pre-2015 scheme are expected to rapidly decline to close to nil over the future periods being considered in this valuation, a pragmatic approach to estimating the future membership of each section/scheme over the relevant future periods is suitable.

B.3 The expected cost of accruing benefits over periods after effective date have been determined by assuming an overall stable population (age and pay profile) to end of implementation period. In particular:

> Allow for the protected population to reduce over the projection period (ie to 2023) with a corresponding increase in those accruing benefits in the 2015 Scheme to maintain the stable population. SPA in the projected populations is determined by implied dates of birth and so the SPA mix changes over time despite the assumed stable population.

> Mortality is projected forward to the relevant year of use in all cases.

> The run off of the protected population is broadly linear from the relevant calculation date to the average age at which members of each identified group (eg 1988 Scheme, 2006 Scheme) are expected to retire.

B.4 The expected cost of accruing benefits over periods after the effective date for cost cap purposes has been determined by assuming:

> The aggregate membership has the same age/pay profile over all projection periods (i.e. to 2023) (and assuming all in the 2015 Scheme).

> Allow for the actual membership (assumed) accruing benefits in the 2015 Scheme to change over the projection period (i.e. to 2023). SPA in the projected populations is determined by implied dates of birth and so the SPA mix changes over time despite the assumed stable population.

[29] The Public Service Pensions (Valuations and Employer Cost Cap) Directions (Northern Ireland) 2014 (as amended).

> Mortality is projected forward to the relevant year of use in all cases.

Grouping of individual active member records

B.5 Individual active members have been grouped together for the purposes of calculating liabilities. This grouping is necessary to accommodate the volume of data within our valuation system. The approach taken to grouping the data has been tested to ensure it does not result in any distortion of the valuation results. The groupings are made for protection status (ie protected, tapered or unprotected), section/scheme (ie 1988, 2006, 2015 scheme), sex, age, State Pension age and service.

Accrual cost methodology

B.6 When determining the costs of accrual as required by Directions 27(1)(d) and 40(1) the cost for members in each group at each relevant date (as identified from the membership projections) has been determined for each age and that rate has been applied to the total pensionable pay at each age to determine the average for the membership as a whole at each date. The cost over each relevant period has been taken as the average of the cost at the start and end of each period. The calculation allows for mortality improvements assuming the calculation date is the midpoint of each period.

B.7 Direction 11 requires use of the projected unit methodology to determine the valuation results. Directions 14, 16 and 17 specify some modifications to the financial assumptions in the short term. An implication of the short term modifications is that the projected unit methodology is expected to result in an increasing standard contribution rate over successive periods. For example the cost of accrual under the existing scheme over the period 2015 - 2019 is lower than that over the period 2019 - 2023 (ignoring any redistribution of members between sections and into the 2015 scheme). This effect is not material for final salary benefits and has no effect on the cost cap future service calculation since short term assumptions are explicitly disregarded for this purpose in Direction 40.

B.8 Non-accruing benefits such as lump sums payable on death in service have been recognised only when a benefit payment is expected.

B.9 Members accruing or expecting to accrue benefits at double rate (in the 1988 Scheme) are treated as though the overall expected benefit accrues uniformly over all service.

Guaranteed Minimum Pensions (GMPs)

B.10 A global adjustment was applied to reduce the past service liability in respect of estimated GMP entitlements. The reduction is equivalent to a reduction in the contribution rate of around 1.0% of pensionable pay over the 15 year period from the implementation date. This estimation has no impact on the calculation of the employer contribution correction cost.

Earnings cap

B.11 The earnings cap only applies in limited circumstances in the 1988 Scheme. No allowance has been made for its impact as this would not be material to the valuation results. There is no earnings cap in the 2006 and 2015 schemes.

Public Service Transfer Club (PSTC)

B.12 Allowance has been made for the potential additional liabilities arising from inward transfers on PSTC terms (because the transfer value is usually less than the cost of providing the service credit granted). If volumes of transfers continue at historic levels the financial impact is expected to be equivalent to an employer contribution cost of 0.3% of pay.

General pay increases

B.13 Direction 17 sets out the general pay increases that are to be assumed for valuation purposes.

Final pensionable pay

B.14 All liabilities have been based on pensionable pay at the effective date as provided by administrators. No explicit allowance has been made for the impact of prior years' earnings resulting in higher final pensionable pay for particular members since this effect is not expected to impact a material number of members.

Dependants' pensions

B.15 No allowance has been taken for short term dependant pensions or children's pensions (other than those already in payment), on ground of immateriality.

Expenses

B.16 No allowance has been made for expenses. Expenses are outside the valuation framework.

Early retirement factors

B.17 When modelling retirement from the 2015 Scheme before Normal Pension Age where an actuarial reduction would be applied early retirement factors have been set equal to those which would apply using the long term assumptions under the Directions (applied for the appropriate period before the normal pension age). In the 2015 Scheme, the actuarial reduction is set to give the early retirement pension the same value as deferred benefits payable following withdrawal at the same age (but with reference to payment age 60 rather than the usual deferred payment age of SPA).

B.18 There is no option to retire from active service with actuarially reduced benefits in the 1988 or 2006 schemes.

Added Years

B.19 In certain limited circumstances officers can purchase additional service. The added years data supplied to GAD could not be easily associated with the main pension data for officers who had purchased this option. Further, from the 2012 valuation, added years were deemed not to have a significant impact on the valuation results. As such, a pragmatic approach has been used to model added years in which an adjustment has been applied to increase the overall active members' liability to allow for added years which represents less than 0.1% of past service liability.

Member contribution yield over implementation period

B.20 The average member contribution yield expected over the implementation period is estimated to be 13.5% of pensionable pay. This calculation uses the employee contribution rates for each scheme, as set out in scheme regulations. This compares to an average member contribution yield of 13.7% of pensionable pay that was expected over the period from April 2015 to March 2019.

Lump sum redress in the case of Mr Milne

B.21 Following the Pensions Ombudsman's determination in the case of Mr Milne in May 2015, Government made additional payments to those police officers who retired in the period 1 December 2001 to 30 November 2006.

The Directions state that these costs are to be met by employers through an adjustment to past service costs. Further, the Directions also state that the amounts included in respect of commuted portions and interest shall be adjusted for this purpose as if the Police Service of Northern Ireland and Police Service of Northern Ireland Reserve (Full-Time) (Severance) Regulations 2003, and the Police Service of Northern Ireland Reserve (Full-time) Severance Regulations 2006, had not been made. These regulations govern the Patten Severance scheme which was in place from 2000 to 2011 which overlaps the period related to the Mr Milne case.

Full data is not available to accurately calculate the adjustment related to Severance enhancements and therefore assumptions are required to derive the adjustment to the Milne payments to remove the cost of lump sum redress payments related to Severance scheme enhancements. PSNI provided data on 15 cases for members who were impacted by the Severance scheme and received lump sum redress as a result of the Mr Milne case. The data indicates that on average around 32.1% of lump sum payments for such members relate to enhancements as a result of the Severance scheme. We have extrapolated this data for the overall population impacted to derive the final adjustment.

GAD have relied on confirmation from PSNI that the 15 cases provided have been randomly selected and therefore should be a fair representation of the population affected by both Milne and the Severance scheme.

Other Direction interpretations

Directions 27 and 28 (contribution rates)

B.22 27(1)(a) and 27(1)(c): For the purposes of spreading any past service surplus or deficit, the future payroll estimates provided by the Home Office to OBR (September 2017 return) have been used for the period up to 2019/20 (with the figures adjusted in the years 2020/21 and 2023/24 to convert from OBR pay growth assumptions to valuation assumptions). After 2023/24, payroll has been projected assuming a stable workforce size and using valuation assumptions.

B.23 27(1)(c)(ii) and 28: Member contributions since the effective date based on actual (or expected) yield for past periods and periods up to 31 March 2019. Set equal to the expected contribution yield from April 2019 based on current member contribution rates set out in the scheme regulations. See B.20.

B.24 27(1)(b) and 27(1)(d): see B.3 and B.4.

Directions 28, 31, 32(1), 33(2)(a) (and related) – member contribution yields

B.25 See paragraph B.22.

Direction 32(1) – expected cost of benefits for past periods (for cost cap purposes)

B.26 The contribution rate required to cover cost of benefits over 2015-16 is calculated by considering the membership over the period 2015-16.

Directions 32(1) and 40(1) – expected cost of benefits for future periods (for cost cap purposes)

B.27 See B.4.

Direction 34 – benefits paid from 2015 Scheme during 2015-2016

B.28 Estimated where data unavailable.

Appendix C: Assumptions made for data uncertainties

Summary

C.1 Whilst comprehensive data was received from PSNI for the 2016 valuation, some aspects of the data were incomplete and/or unreliable for certain elements of our valuation calculations.

C.2 It has not been possible to fully resolve these data issues in the timescale required for the valuation. Therefore to calculate results for the 2016 valuation of the Scheme, assumptions are required in respect of incomplete and/or unreliable individual member records and movements data. The latter is used for setting assumptions and in the calculation of the cost cap net leavers liability.

C.3 Scheme specific assumptions are determined by the "responsible authority", which is the Department in the case of the Scheme, and must be set as best estimate assumptions and not include margins for prudence or optimism.

Individual member records

C.4 Membership data is provided by PSNI for the purpose of the 2016 valuation and we apply checks to these membership records to ensure all key data items are provided and reliable for valuation purposes. Following these checks, it was identified that individual member records at the relevant dates as required for valuation purposes were not fully complete and reliable. We worked with PSNI to address a number of these issues. However, where critical data items were missing from member records the general approach taken was to exclude that record for calculation purposes with calculations based on the remaining dataset being rated up incorporate an allowance for the excluded records.

C.5 Uprating factors were determined for each membership category equal to the ratio of known valid records and the number of records with adequate data. Implicitly this uprating approach assumes that the records with omissions or errors have the same average profile (age, sex, pay, service) as fully complete records. Some 0.7% of records were excluded from the 2016 valuation data and around 0.2% of the data provided for the purposes of setting the initial cost cap fund.

C.6 As noted, the approach taken to data omissions is to assume each record with missing data has the same average profile as the complete records and therefore there is a risk that this assumption is not appropriate. The table below indicates the extent to which the valuation results might be incorrect if the approach in fact under/overstates the liability for the omitted members by 10%, which we believe to be a reasonable level to consider.

	Impact of error in assumption for missing data (as % of pay)	
	Uncorrected employer contribution rate	Employer contribution correction cost
Actives (uprating applied: 1.003 for 2016 data, 1.002 for 2015 data)	Not material	Not material
Deferreds (uprating applied: 1.001)	Not material	Not material
Pensioners (uprating applied: 1.011%)	0.1%	0.1%

C.7 The table above illustrates the potential impact if known data omissions are subsequently found to have been handled incorrectly. Since it is not possible to undertake independent checks for all categories of members and a full reconciliation has not been achieved against all prior datasets there is the potential for currently unidentified problems with the data to emerge in future. For example a group of deferred members could be identified where no liability has previously been determined. The impact of such unknowns emerging at subsequent valuations could be considerably more than the sensitivity indicated above.

Movements data

Setting assumptions

C.8 PSNI supplied data on the experience of the scheme membership over the four-year period to 31 March 2016. Fully complete and comprehensive data about members moving status between certain dates (eg leaving active status due to death or retirement) was not able to be provided. Analysis of member movements is needed to inform scheme specific demographic assumptions as scheme-specific experience, both recent and longer term, generally provides the most reliable evidence when considering best estimates of future experience.

C.9 Assumption setting relies on analysis of movements data in consideration with such other relevant information which is available. The setting of demographic assumptions is to some extent subjective and a matter of interpretation. Changes in assumptions may be expected at successive valuations as circumstances change even with full data. Thus the absence of fully complete movements data does not necessarily introduce uncertainty into the valuation results provided there is other relevant information available to inform those assumptions. It is to be expected that there is some volatility in the experience arising from an analysis of movements data. As assumptions are intended to reflect long term expectations it is reasonable to seek to smooth out the impact of these short term effects. A number of the recommendations we make for scheme-specific valuation assumptions smooth out the short term effects by taking only a proportion of the difference in experience since the 2012 valuation, for example in recommending the assumption for baseline pensioner mortality.

C.10 It should however be recognised that should movements data become available for future valuations it could result in recommendations regarding appropriate assumptions which lead to greater changes in valuation results than otherwise. It is difficult to quantify the potential scale of this discontinuity but it could be over +/-1% of pensionable pay on the employer contribution rates. For example, if the number of pensioner deaths was overstated or understated in the data available for setting assumptions for the 2016 valuation but correctly stated at a subsequent valuation, this would have an impact on the mortality assumptions adopted and potentially lead to a large change in the assumption at future valuations and hence a corresponding change in liability and employer cost.

Cost Cap Net Leavers Liability (CCNLL)

C.11 The initial cost cap fund is set equal to the liability for actives members at 31 March 2015. The cost cap mechanism is intended to manage the costs of the reformed scheme and recognise any unexpected experience relating to pre-reformed entitlements of members in service at 1 April 2015, but only to the point at which they leave active service. CCNLL is a quantification of the amount of pre-reformed liabilities which fall out of the cost cap fund at a valuation owing to members which have left service since the previous valuation (or since the initial cost cap fund was set in the case of the 2016 valuation), net of the additional liabilities in respect of members with pre-reformed service who rejoined active membership during 2015-16.

C.12 To accurately calculate CCNLL in accordance with the directions requires full movement data for all members who were active in 2015 and are no longer active at the 2016 valuation. The data available was not fully suitable for calculating the CCNLL and some adjustments were required to provide for a reasonable estimate of CCNLL to be calculated.

C.13 For the purposes of determining the 2016 valuation results, we recommend an approach which implicitly makes an assumption that there is no unidentified experience gain or loss arising over the period 2015 to 2016. A risk of this approach is that any upward or downward cost pressure that has occurred over the period but has not been explicitly identified will not be reflected in the 2016 valuation results.

C.14 We expect that the uncertainty introduced by the approach above is not more than ¼% of pay.

C.15 We would not expect significant unidentified experience gains or losses to arise over the one year period 2015 to 2016, although some uncertainty remains. In addition, we have reconciled the surplus or deficit arising over the period 2012-16 with a small unattributed item.

C.16 For the 2016 valuation, the CCNLL calculation period is only one year, rather than a full four-year valuation. Given the short period over which any gain or loss may have arisen it might reasonably be concluded that the lack of data for the CCNLL calculation is not critical for this valuation although it would become so in future valuations when a longer period is considered.

Appendix D: Sensitivity of valuation results to assumptions set by the Department

D.1 The table below provides an indication of the sensitivity of the valuation results to the particular assumptions under consideration. The figures shown here are also provided in section 4 of the formal valuation report.

Table D1: Sensitivity of valuation results to assumptions set by the Department

	Addition to uncorrected employer contribution rate	Addition to employer contribution correction cost
Membership profile: 2 years older on average over implementation period	1.0%	1.0%
Mortality rates: 5%* heavier rates of pensioner mortality	(2.0)%	(0.9)%
Age retirement rates: All members without full or tapered protection to retire at 55	(0.3)%	(0.7)%
Commutation (other than as directed): all unprotected members of the 1988 Scheme section commute 17.5% of 2015 Scheme pension	(0.8)%	(0.5)%
Ill-health retirement: 5%* increase to assumed rates	0.1%	0.1%
Ill-health retirement: 5%* increase in proportion assumed to receive higher tier benefits	0.0%	0.0%
Proportions partnered: 5%* more members assumed to have qualifying partners at death	1.0%	0.3%
Resignations and opt outs: 5%* higher numbers assumed to leave voluntarily before retirement (net of rejoiners)	0.0%	0.0%
Promotional pay increases: 0.5% higher promotional pay increases than assumed	2.5%	2.2%

* All these represent multiplicative increases to rates, i.e. 5% means rates 1.05 times higher.

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

D.2 In each variant of Table D1 the sensitivity shown is in relation only to the change in the assumption described. The impact of a combination of assumption changes will not necessarily equate to the sum of the relevant rows above.