



# Government Actuary's Department



## Northern Ireland Civil Service Pension Schemes

Actuarial valuation as at 31 March 2016  
Advice on assumptions

Date: 11 March 2019  
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## 1 Executive summary

*This report contains our recommendations for the best estimate assumptions to be set by the Northern Ireland Department of Finance for the 2016 valuation of the Northern Ireland Civil Service Pension Schemes.*

- 1.1 An actuarial valuation of the Northern Ireland Civil Service Pension Schemes<sup>1</sup> ('the Schemes' or 'NICSPS'), is being carried out as at 31 March 2016. The Public Service Pension (Valuation and Employer Cost Cap) Directions 2014 as amended ("the Directions") require that, unless specified otherwise<sup>2</sup>, the assumptions to be adopted for this valuation will be set by the Northern Ireland Department of Finance ('the Department' or 'DoF NI'), having obtained advice from the scheme actuary. Direction 19(c) requires the assumptions to be the Department's best estimates.
- 1.2 GAD is the appointed scheme actuary to the Schemes. This report 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. The advice contained in this report has been shared and discussed with the NICSPS Scheme Advisory Board ('NICSSAB').
- 1.3 This report relates to demographic assumptions i.e. assumptions about member behaviours. When considering appropriate assumptions experience, both recent and longer term, generally provides the most reliable evidence when considering best estimates of future experience. Anticipated future events may also influence how assumptions are set. This advice sets out relevant analysis of recent experience and indicates which other factors have been considered in deriving recommendations of best estimate assumptions.
- 1.4 The previous completed actuarial valuation of the NICSPS 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:
  - > Reduced life expectancies for pensioners (combined normal and ill health).
  - > Increase in rates of ill-health retirement.
- 1.5 The following chapters and appendices provide more detail on the advice, supporting analysis and an indication of the magnitude of financial impact of each assumptions on valuation results. They also contain important background information about the context of this advice and its limitations.

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<sup>1</sup> As provided under the rules of The Principal Civil Service Pension Scheme (Northern Ireland) and The Public Service (Civil Servants and Others) Pensions Regulations (Northern Ireland) 2014 (SR 2014/290).

<sup>2</sup> Certain assumptions are specified in the Directions.



- 1.6 Where the Schemes' membership data is not sufficient for the scheme actuary to carry out a robust analysis of that aspect, the Directions require the report to include a statement to that effect. For all assumptions, the data was not considered sufficient to form a basis for setting assumptions in isolation. For many assumptions, the data was not considered reliable as a result of distortions caused by significant redundancy programmes over the intervaluation period. As in previous valuations our advice has been informed by the analysis undertaken for the larger Civil Service Pension Schemes in Great Britain ('CSPS (GB)') and other available information.
- 1.7 This report was provided to the Department in draft form, and was also circulated to the Scheme's member and employer representatives, in December 2017. It has been signed alongside the formal valuation report. No substantive changes have been made. 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.
- 1.8 This work has been carried out in accordance with the applicable Technical Actuarial Standards: TAS 100 and TAS 300 issued by the Financial Reporting Council (FRC). The FRC sets technical standards for actuarial work in the UK.



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

Assumption	Summary of recommended assumptions	Rationale for recommendation	Approximate impact of proposed change in assumptions (% of pay)	
			Employer contributions (2019-23)	Employer contribution correction cost
<b>Pensioner baseline mortality<sup>3</sup></b>	Aligned to standard SAPS table <sup>4,5</sup>	In line with the equivalent CPCS (GB) assumptions and adjusted to reflect the general population mortality differential between Great Britain and Northern Ireland.	(0.3%) <sup>6</sup>	(0.3%) <sup>6</sup>
Normal health	110% x S2NXA			
Ill-health	110% x S2NXA			
Dependants	124% x S2NMA (M) 106% x S2DFA (F)			
<b>Age retirement</b>				
Final salary sections (protected)	M: About 30% retire by age 60, 65% between ages 60 and 65, and the remainder between 65 and 70 F: About 45% retire by age 60, 50% between ages 60 and 65, and the remainder between 65 and 70	Unchanged from 2012. Experience is potentially distorted by redundancies so not suitable as a guide to the future.	No change in assumption	
Final salary sections (unprotected and tapered)	Retirements spread between age 60 and State Pension Age	Unchanged from 2012 due to lack of scheme experience on which to amend this assumption.	No change in assumption	

<sup>3</sup> HM Treasury has indicated that future improvements in mortality will be assumed to be in line with those underlying the most recent ONS population projections.

<sup>4</sup> SAPS tables are published by the UK 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).

<sup>5</sup> 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.

<sup>6</sup> Aggregate change in baseline mortality only. Excludes any impact from the change in assumed future mortality improvements.

Assumption	Summary of recommended assumptions	Rationale for recommendation	Approximate impact of proposed change in assumptions (% of pay)	
			Employer contributions (2019-23)	Employer contribution correction cost
<b>Age retirement (continued)</b>				
Nuvos section (protected)	All members retire at age 65	Unchanged from 2012. Actuarial adjustment on retirement before and after age 65 is broadly cost neutral.	No change in assumption	
Nuvos section (unprotected and tapered)	Retirements spread between age 65 and State Pension Age	Unchanged from 2012 due to lack of scheme experience on which to amend this assumption.	No change in assumption	
New entrants from 2015	Retirements spread between age 60 and State Pension Age	Unchanged from 2012 due to lack of scheme experience on which to amend this assumption.	No change in assumption	
<b>Ill-health retirement</b>				
Incidence	Increasing by age, around 0.4% pa at age 50 increasing to around 1.2% pa at age 60	In line with equivalent CSPS (GB) assumptions but twice as high to reflect the higher incidence of ill-health retirements experienced in NICSPS.	0.4%	0.4%
Upper/lower tier split	42% (M), 67% (F) on upper tier	In line with equivalent CSPS (GB) assumptions due to lack of scheme experience on which to amend this assumption.	No change in assumption	
<b>Withdrawal</b>	Rates are net of re-entry and do not include any allowance for early retirement. Generally above 1.5% pa (M) and 2% (F) at ages less than 30, falling to around 1% pa between the ages of 30 and 40 and then increasing to around 2% for both males and females as they approach retirement ages.	In line with CSPS (GB) salary band 2 assumptions, but scaled down by 40%. Rates are unchanged from 2012 as experience is potentially distorted by redundancies so not suitable as a guide to the future.	No change in assumption	
<b>Death before retirement</b>	Increasing by age, around 0.3% (M) and 0.2% (F) pa close to age 60	In line with equivalent CSPS (GB) assumptions due to lack of scheme experience on which to amend this assumption.	Immaterial	Immaterial



Assumption	Summary of recommended assumptions	Rationale for recommendation	Approximate impact of proposed change in assumptions (% of pay)	
			Employer contributions (2019-23)	Employer contribution correction cost
<b>Promotional salary scale</b>	M: 4.5% pa at age 25, 0.9% at age 45 and 0.2% above age 60. F: 5.6% pa at age 25, 0.8% at age 45 and 0% above age 60.	In line with CSPS (GB) salary band 2 assumptions. Rates are unchanged from 2012 as experience is potentially distorted by redundancies so not suitable as a guide to the future.	No change in assumption	
<b>Commutation</b>				
Classic members	5.4% of pension commuted	In line with equivalent CSPS (GB) assumption due to lack of scheme experience on which to amend this assumption.	Immaterial	Immaterial
<b>Family statistics</b>				
Proportion married/partnered	68% (M) and 50% (F) at retirement for Classic members. 73% (M) and 50% (F) at retirement for non-Classic members. Consistent assumption for existing pensioners.	In line with equivalent CSPS (GB) assumptions due to lack of scheme experience on which to amend this assumption.	Immaterial	Immaterial
Age difference	Male member 3 years older than partner Female 2 years younger than partner	In line with equivalent CSPS (GB) assumptions due to lack of scheme experience on which to amend this assumption.	No change in assumption	
Remarriage	No allowance	In line with equivalent CSPS (GB) assumptions due to lack of scheme experience on which to amend this assumption.	No change in assumption	



## 2 Introduction

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

- 2.1 An actuarial valuation of the Northern Ireland Civil Service Pension Schemes ('the Schemes' or 'NICSPS'), is being carried out as at 31 March 2016. The Public Service Pensions (Valuations and Employer Cost Cap) Directions 2014 as amended by the (Amendment) Directions 2018 ("the Directions") require that, unless specified otherwise<sup>7</sup>, the assumptions to be adopted for this valuation will be set by the DoF NI, having obtained 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 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
- 2.4 Appendix B includes other calculation assumptions as required to complete the valuation and Appendix C sets out assumptions made for data uncertainties.
- 2.5 This report was provided to the Department in draft form in December 2017. The Department have consulted with the NICSPS SAB in accordance with direction 19(b) and based on the draft report. No substantive changes have been made in finalising the report. 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.

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<sup>7</sup> Certain assumptions are specified in the Directions.





- 2.6 The Department 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 Scheme's experience in order to develop our advice on the assumptions. Our report, *Northern Ireland Civil Service Pension Schemes: 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 experience, both recent and longer term, generally provides the most reliable evidence when considering best estimates of future experience. In some cases the data available to analyse inter-valuation experience for the NICSPS is less reliable (due to the smaller membership size) and complete than corresponding information for the Civil Service Pension Schemes in Great Britain (CSPS (GB)). 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 CSPS (GB) experience<sup>8</sup> in formulating our recommendations for the NICSPS. This is consistent with the approach used in previous valuations where in many cases the same assumptions have been used for both schemes. Anticipated future events may also influence how assumptions are set. This advice sets out relevant analysis of recent experience and indicates which other factors have been considered in deriving recommendations of best estimate assumptions.
- 2.8 For the 2012 valuation the assumptions which differed for the NICSPS and the CSPS (GB) were:
- > Pensioner baseline mortality: members of the NICSPS were assumed to have higher rates of mortality than CSPS (GB) to reflect the general population mortality differential between Great Britain and Northern Ireland.
  - > Age retirement from service: slightly different patterns of age retirement were assumed for members of the NICSPS compared to those assumed for CSPS (GB) based on the Scheme's own experience.
  - > Rates of ill health retirement: members of the NICSPS were generally assumed to experience higher rates of ill health than members of CSPS (GB), but the pattern by age was assumed to follow that in GB.
  - > Rates of early withdrawal: members of the NICSPS were assumed to have a lower rate of withdrawal before retirement than for CSPS (GB), but the pattern by age was assumed to follow that in GB.
- 2.9 The Department has not indicated that the previous approach taken to setting the assumptions would be inappropriate for this valuation.

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<sup>8</sup> As set out in the "Civil Service Pension Schemes: Actuarial Valuation at 31 March 2016: Advice on assumptions" report.



- 2.10 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.
- 2.11 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 DoF 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 Regulation 158 of the Scheme Regulations<sup>9</sup> require this actuarial valuation to cover both the scheme established under the Public Service Pensions Act (Northern Ireland) 2014<sup>10</sup> ("2015 scheme") and the previous pension scheme for Civil Servants in Northern Ireland ("pre-2015 scheme"). Assumptions appropriate to both the 2015 scheme and the pre-2015 scheme are required for the valuation. The Directions also require assessment of benefit accrual costs over the **implementation period**<sup>11</sup>. 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 scheme 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

<sup>9</sup> SR 2014/290

<sup>10</sup> Public Service Pensions Act (Northern Ireland) 2014.

<sup>11</sup> 1 April 2019 to 31 March 2023.



- > Members with service in both the 2015 scheme and 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**

Baseline mortality	2016 valuation		2012 valuation	
	Standard table <sup>12</sup>	Adjustment	Standard table	Adjustment
<b>Males</b>				
Retirements in normal health	S2NMA	110%	S1NMA	99%
Retirements in ill-health	S2NMA	110%	S1IMA	105%
Dependants	S2NMA	124%	S1NMA	118%
<b>Females</b>				
Retirements in normal health	S2NFA	110%	S1NFA	102%
Retirements in ill-health	S2NFA	110%	S1IFA	111%
Dependants	S2DFA	106%	S1DFA	99%

- 4.2 As specified by DoF NI, future improvements in mortality will be assumed to be in line with those underlying the most recent ONS population projections, ONS-2016.

<sup>12</sup> SAPS (S2) tables are published by the Actuarial Profession and based on the experience of self-administered pension schemes over the period 2004 to 2011. The 'S2' series has separate standard tables based on experience of members retiring in normal health (S2NXA) and in ill health (S2IXA) and for female dependants (S2DFA). The S3 series of tables were released by CMI in December 2018, these updated mortality tables cover experience between 2009 and 2016. GAD have concluded that moving to the S3 tables would have no material impact on either our analysis of mortality or the valuation results as a whole. It therefore remains appropriate to use the S2 tables for the current valuation although we would expect to transition to the S3 tables for future if this is appropriate.



- 4.3 These assumptions have been derived by considering the assumptions that have been adopted for the 2016 CSPA (GB) valuation and applying a 6% uplift to the mortality rates to reflect higher general population mortality in Northern Ireland when compared against Great Britain. This is the same approach used to derive the 2012 valuation assumption.

#### Comparison of expected pensioner longevity

- 4.4 The table below gives a comparison of the resulting life expectancies<sup>13</sup> (allowing for future improvements) assumed and recommended for the 2012 and 2016 valuations, and the recommended assumption for the 2016 CSPA (GB) valuation. The life expectancies assumed for the 2012 valuation are those for members retiring in normal health only, whereas the life expectancies recommended for the 2016 valuations are the combined life expectancies for members retiring in normal and ill health. The Directions specify that the future improvement basis for the 2016 valuation should be the ONS 2016 projections.

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

Baseline:	2012 (NI) valuation (normal health)	2016 (NI) valuation (combined normal / ill health)	2016 (GB) valuation (combined normal / ill health)
<b>Current pensioners</b>			
Male aged 60	28.2	26.8	27.3
Male aged 65	23.2	21.9	22.4
Female aged 60	30.4	28.5	29.0
Female aged 65	25.5	23.6	24.1
<b>Future pensioners – current age 45</b>			
Male life expectancy from age 60	29.9	28.3	28.8
Male life expectancy from age 65	25.4	23.9	24.3
Female life expectancy from age 60	32.1	30.0	30.4
Female life expectancy from age 65	27.6	25.5	25.9

<sup>13</sup> Cohort life expectancies based on the ages shown as at the valuation date, i.e. allowing for future mortality improvement.



- 4.5 The change in baseline mortality assumption (including moving from separate normal and ill health mortality assumptions to combined normal and ill health assumptions) will reduce the uncorrected employer contribution rate and employer contribution correction cost by around 0.3% of pensionable pay.

#### **Analysis and setting the assumption**

- 4.6 We have analysed the actual pensioner mortality experience over the four-year period to 31 March 2016 on an 'amounts' basis. An amounts basis weights the experience by the size of each member's pension. 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.
- 4.7 Due to data issues<sup>14</sup>, it has not been possible to undertake a separate analysis for pensioners in normal health and ill-health. Our analysis was therefore undertaken on the combined normal health and ill-health mortality experience over the four year period. In order to provide a comparison with the 2012 valuation it was necessary to determine combined 2012 mortality assumptions, which were determined using approximate methods only for the purposes of this analysis.
- 4.8 In line with the approach taken for the 2012 valuation as well as considering the analysis of the deaths as provided we also considered the similar analysis carried out for the CSPS (GB). In formulating our advice we additionally referred to general population statistics which demonstrate the differences between aggregate population mortality rates for Northern Ireland and Great Britain.
- 4.9 When setting the baseline pensioner mortality assumption we recommend the assumption is expressed both by reference to suitable adjustments to the rates in a suitable reference table - the relevant S2 table ("the base table") and, if appropriate, by reference to suitable adjustments to the CSPS (GB) basis.

#### **Results of the analysis**

- 4.10 The four year period ending on the valuation date showed significant volatility in mortality experience year on year. This is illustrated in Table 4.3 below. The figures shown are the ratios of actual to expected death rates with expected rates based on the combined 2012 valuation assumptions, adjusted as appropriate for each period analysed.

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<sup>14</sup> See *Northern Ireland Civil Service Pension Schemes: Actuarial valuation as at 31 March 2016: Report on membership data with today's date*.



**Table 4.3: Variation in rates of death by scheme year**

Years	Combined health males (A/E based on 2012 assumption*)	Combined health females (A/E based on 2012 assumption*)
2012-13	101.9%	101.3%
2013-14	108.2%	98.8%
2014-15	88.3%	97.6%
2015-16	114.8%	105.0%

\*2012 combined mortality baseline with ONS-2014 improvements.

- 4.11 The analysis suggests that this volatility could lead to differing conclusions being drawn had the valuation date and inter-valuation period fallen differently.
- 4.12 In our view the NICSPS experience data is not sufficiently robust to set a long-term assumption for the scheme. For this reason we recommend that alternative data sources are used for the purposes of informing the mortality assumptions for the 2016 valuation.
- 4.13 We have therefore considered the analysis carried out for setting the 2016 valuation assumptions for the CSPS (GB), as well as general population statistics which demonstrate the differences between aggregate population mortality rates for Northern Ireland and Great Britain. This is the same approach as was used to derive the 2012 valuation assumption.

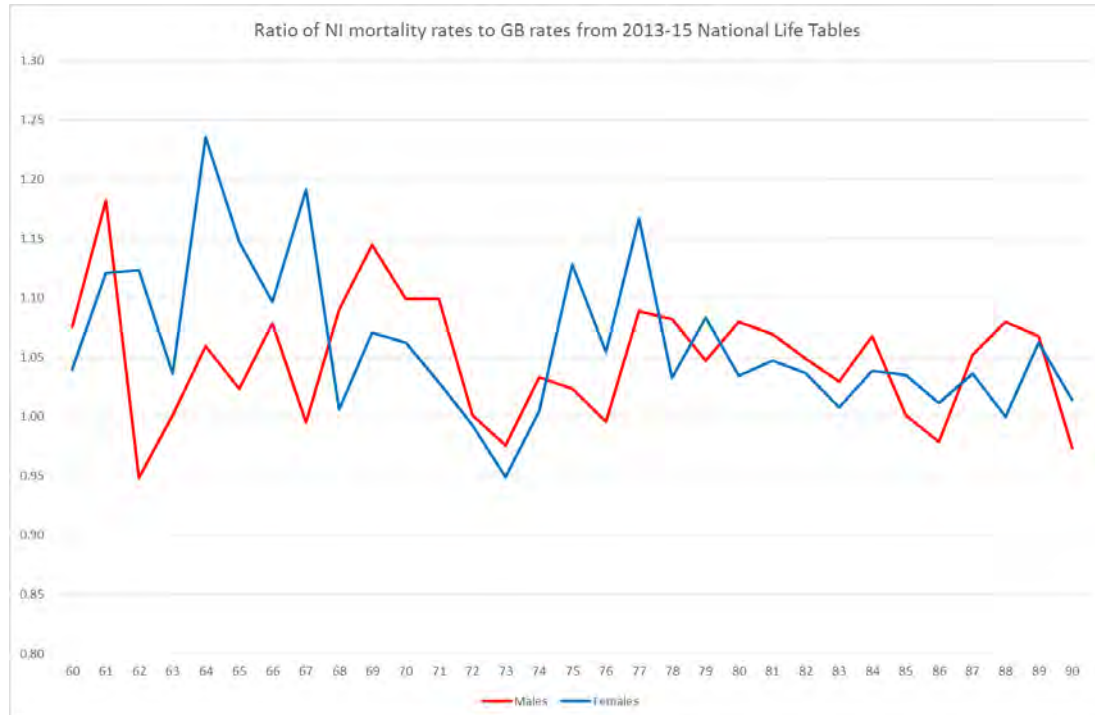
#### **Comparison of population mortality in NI v GB**

- 4.14 The differences between the aggregate population mortality rates in Northern Ireland and Great Britain are shown in Chart 4.1. The comparison remains similar to that taken into account in setting the 2012 assumption. 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 Great Britain for males and a little higher for females. Overall, mortality rates for males are around 5% higher in Northern Ireland than in Great Britain and mortality rates for females are around 6% higher.





**Graph 4.1: Ratio of Northern Irish mortality rates to Great British rates from 2013-15 Interim Life tables**



#### Comments on analysis

- 4.15 For the 2012 valuation, the results of our analysis and comparison with other sources of information led us to recommend that the pensioner mortality assumption for NICSPS should be that mortality rates are 6% higher than that for CSPS (GB) pensioners.
- 4.16 Our analysis of aggregate population mortality rates in Northern Ireland and Great Britain shows that the difference in mortality rates is between 5% and 6%. This is close to the differential of 6% adopted for the 2012 valuation. Therefore, taking into account the limited analysis that can be carried out with the available experience data, we recommend the retention of pensioner mortality assumptions that are 6% heavier than those recommended for the CSPS (GB).
- 4.17 The above recommendation differs to that for other Public Service Pension Schemes in Northern Ireland (such as those for teachers, NHS, firefighters and police), for which the mortality assumption is generally aligned with that in England (or Wales as appropriate), in part due to the similarities between the workforces in each region. Given that the workforce for the civil service is less homogeneous (the workforce in each region depends largely on the civil service functions being carried out in each region), less weight has been put on this feature when recommending the mortality assumption for the NICSPS, and more weight has been put on differences between the aggregate population mortality rates in Northern Ireland and Great Britain, and maintaining consistency with the approach taken in the 2012 valuation.



## 5 Age retirement from service

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

### Proposed assumptions for 2016 valuation

- 5.1 We do not propose any changes to the 2012 valuation assumptions.

### Use of the assumption

- 5.2 Age retirement rates specify the rate at which members are assumed to retire on grounds other than ill-health. In all sections of the existing scheme and in the 2015 scheme an actuarial reduction is applied to the pension payable on retirement before NPA. An actuarial uplift is applied for retirement after NPA in the Nuvos section and the 2015 scheme. However, in the non-Nuvos final salary sections the pension payable on retirement after NPA is not subject to actuarial adjustment. This means pensions paid from the final salary sections on retirement after NPA are typically less costly to the scheme (i.e. the value of the benefit payable to a member is typically lower) than a pension paid at or before NPA. The rates of retirement of members of the final salary sections at or after NPA are therefore the most financially significant components of the assumption.

### Analysis and setting the assumption

- 5.3 Over the inter-valuation period there has been a significant reduction in the membership of the NICSPS due to redundancies. It has not been possible to reliably separate out age retirements which have arisen due to the redundancies over this period. Furthermore, the redundancy programmes are expected to have had a material impact on member behaviour over the period. For these reasons the analysis of age retirement experience over the period is in our opinion unreliable for setting a long term assumption for age retirements for the 2016 valuation.
- 5.4 The analysis of experience for the 2012 valuation of the schemes showed that retirement patterns in the NICSPS were materially different to those for CSPS (GB). Therefore, we do not consider setting an assumption for NICSPS based on the experience of the larger CSPS (GB) to be appropriate.
- 5.5 In the absence of robust evidence that retirement patterns have changed, we recommend that the 2012 valuation assumptions are retained.



## 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 recommended adopting rates which are aligned to the rates proposed for the 2016 valuation of the CSPS (GB), but twice as high to take account of the higher rates of ill-health retirement that have been seen for members of the NICSPS in comparison with CSPS (GB) members. When compared to the assumption adopted for the 2012 valuation, the new recommended ill-health rates are around 40% higher for male members and 22% higher for female members. This change allows for broadly 50% of the difference in experience since the 2012 valuation.
- 6.2 We recommend no change to the split between tiers: 42% of males and 67% of females should be assumed to receive upper-tier benefits.
- 6.3 The proposed change in ill-health rates will increase the uncorrected employer contribution rate and the employer contribution correction cost by around 0.4% of pensionable pay.

### Use of the assumption

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

### Analysis and setting the assumption

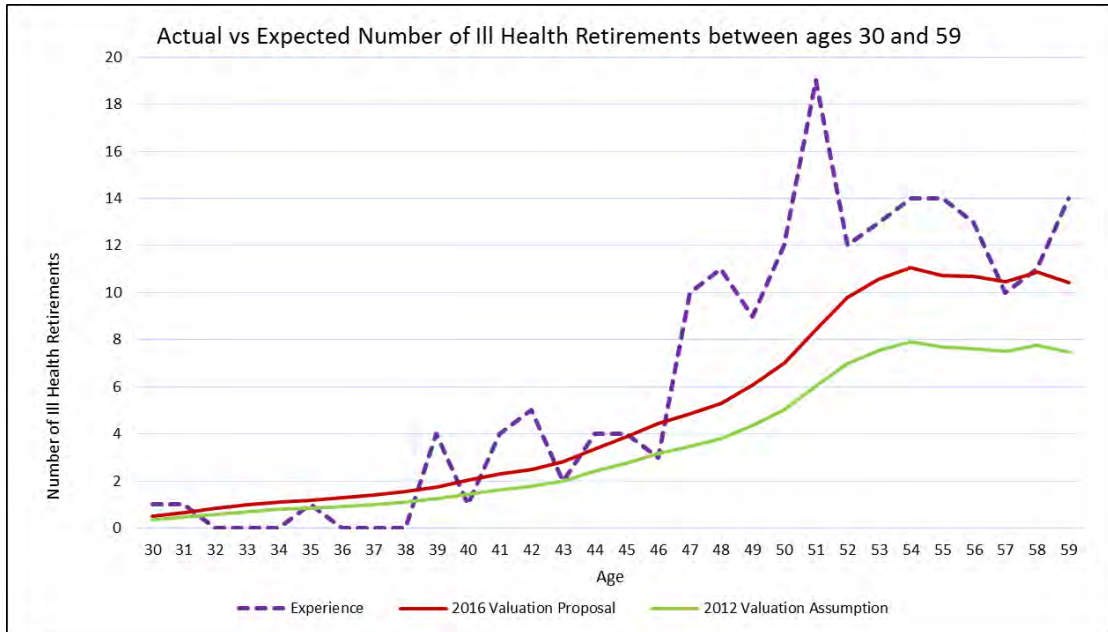
- 6.5 There were around 430 ill-health retirements in the scheme over the three-year period to 31 March 2015. There was a noticeable decrease of the number of ill health retirements for the 2015-16 period (in which around 10% of the membership left through redundancy) suggesting there may be gaps in the data. We have therefore not considered this year in our analysis. We have compared the actual rate of ill-health retirements (by gender and age at retirement) to the expected rate from the 2012 actuarial valuation and the recommended assumption has been based on this comparison.

### Results of analysis

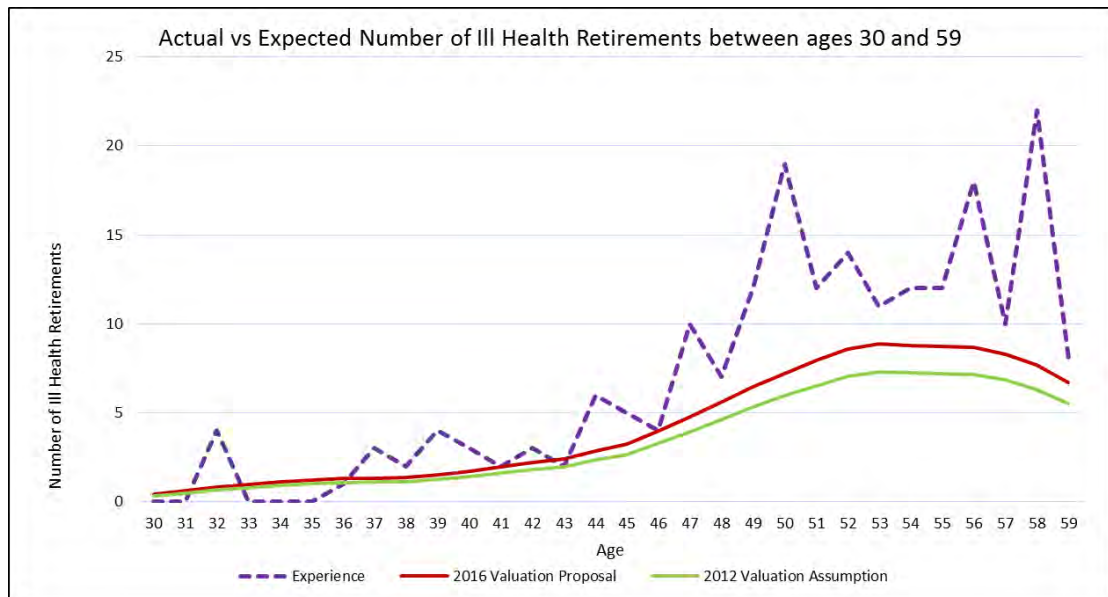
- 6.6 The graphs below show a comparison of the actual ill-health retirement experience over the four year period with that expected based on the 2012 valuation assumption and the proposed 2016 valuation assumption.



**Graph 6.1: Proposed male ill-health retirement rate assumption**



**Graph 6.2: Proposed female ill-health retirement rate assumption**





### **Comments on analysis**

- 6.7 The above charts show that actual experience is significantly higher than the 2012 assumption for both male and female members. In total, there were around two thirds more ill-health retirements than expected using the 2012 assumption.
- 6.8 However, as there is a relatively small number of member movements on which to base the analysis we would expect a reasonable level of volatility from period to period. As assumptions are intended to reflect long term expectations it is reasonable to seek to smooth out the impact of this short term volatility. Our recommendation is that this smoothing should be implemented by allowing for broadly half of the difference in experience since the 2012 valuation.
- 6.9 As a result, we recommend increasing the rates of ill-health retirement assumed in the 2012 valuation by about 40% for male members and 22% for female members. The resulting rates are aligned to the rates proposed for the 2016 valuation of the CSPS (GB), but twice as high.

### **Split between tiers**

- 6.10 Upper and lower tier ill-health is relevant to all non-Classic sections of the scheme. We did not have sufficient data to analyse the split between upper and lower tier ill-health retirements. As a result, we recommend no change to the 2012 assumption that 42% of male ill-health retirements and 67% of female ill-health retirements are on the upper tier. This assumption is aligned to the assumption adopted for the 2016 valuation of CSPS (GB).
- 6.11 It is possible that the increased incidence of ill-health retirements in Northern Ireland will lead to differences in the split between tiers but we do not have sufficient data to determine this.



## 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 do not propose any changes to the 2012 valuation assumptions, other than to align the rates of withdrawal for prison officers with reserved rights with the rest of the membership.
- 7.2 The rates of withdrawal are aligned to those adopted for salary band 2 members in the 2016 valuation of the CSPS (GB) for the scheme, but scaled down by 40% to reflect the lower withdrawal experience in the NICSPS.

### Use of the assumption

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

### Analysis and setting the assumption

- 7.4 It has not been possible to carry out a robust withdrawal analysis using the valuation data. Over the inter-valuation period there has been a significant reduction in the membership of the NICSPS due to redundancies. It has not been possible to separate out withdrawals which have arisen due the redundancies over this period. Furthermore, the redundancy programmes are expected to have a material impact on member behaviour over the period. For these reasons, in our opinion the analysis is not reliable for setting a long term assumption for withdrawals for the 2016 valuation.
- 7.5 There has also been significant volatility in withdrawal rates over the four year period to 31 March 2016, which are likely to result from changes in member behaviour as a consequence of the significant redundancy programmes over the period. This is illustrated in Table 7.1 below.



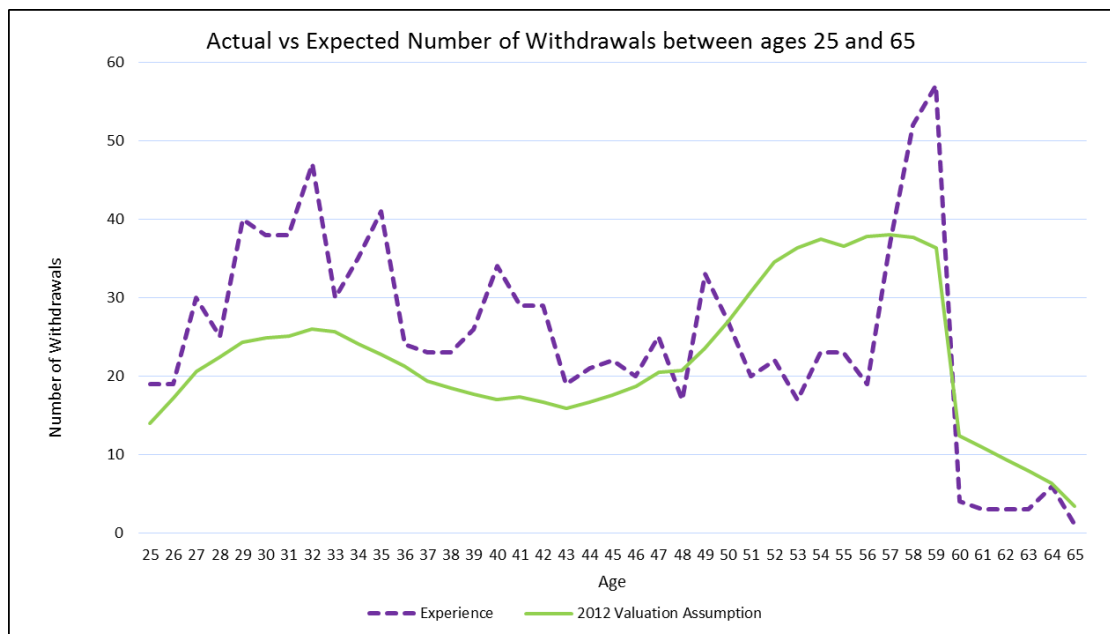
**Table 7.1: Number of withdrawals by scheme year**

Years	Males	Females
2012-13	105	128
2013-14	106	110
2014-15	81	83
2015-16	751	1,102

### Results of analysis

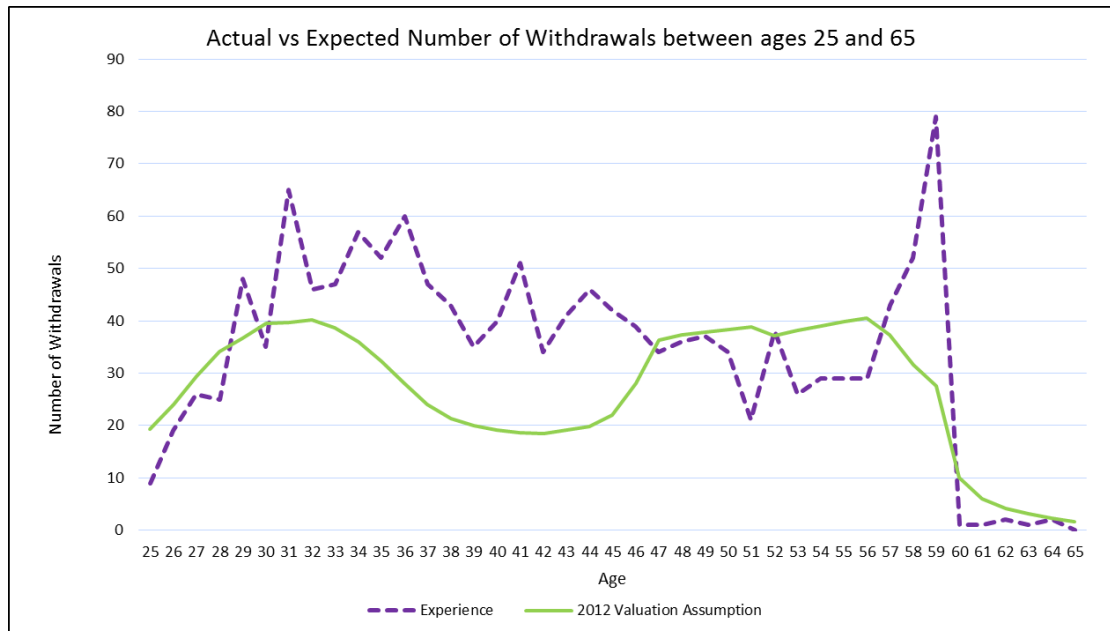
7.6 The graphs below show the gross withdrawal rates derived from the experience data provided, together with the expected rates based on the 2012 assumption.

**Graph 7.1: Male withdrawal experience 2012-16**





**Graph 7.2: Female withdrawal experience 2012-16**



### Additional comments on analysis

- 7.7 The rates for prison officers with reserved rights were previously aligned to the rates for pre-Fresh Start prison officers in the 2012 CSPA (GB) valuation (without adjustment). However, prison officers with reserved rights now represent a very small proportion of the overall scheme membership (around 0.5% of the active membership as at 31 March 2016). Therefore there is insufficient experience data to set a long term assumption either the NICSPA or CSPA (GB), and so we recommend that this group is assumed to withdraw at the same rates as the rest of the membership (which is in line with the recommended approach for the CSPA (GB)).





## 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 reducing the assumed rates of death in service by 11% for both males and females so that the assumed rates remain aligned with those adopted for the 2016 valuation of the CSPA (GB). The changes apply at all ages.
- 8.2 We do not expect a material impact on the valuation results from the changes made.

### 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.

### Results of analysis

- 8.4 There were only 85 deaths of active members reported in the movements data over the intervalation period. Given the small numbers involved it is not appropriate to set a scheme specific assumption based on scheme data only. We recommend this assumption continues to be set equal to the assumption proposed for the CSPA (GB) 2016 valuation.



## 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 assumptions for 2016 valuation

- 8.5 We recommend no changes to the promotional pay increase assumptions.
- 8.6 The assumption is aligned with the assumption adopted for Salary Band 2 members of the CSPA (GB) for the 2016 valuation, which also remains unchanged from the 2012 valuation assumption.

### Use of the assumption

- 9.1 Most of the benefits built up in the pre-2015 scheme sections are linked to salary at, or near, retirement. Members' salaries can increase through a combination of annual general pay awards and promotional, or other increases, to pensionable pay. To calculate an estimate of the level of benefit payable in the future requires assumptions for both these components. We understand that the assumption for general pay awards are directed by DoF NI. This advice covers the assumption for promotional, and other pay increases.
- 9.2 Future pay progression will be more significant (in terms of expected pension) for those members with either full or tapered protection because they will continue to have benefits linked to final pensionable pay for service beyond 31 March 2015. A significant proportion of the past service liability for active members relates to members with full or tapered protection and thus the impact of experience differing from the assumptions used is likely to be most material over the next couple of valuation cycles as it relates to older existing members. This experience will impact future valuation results.

### Analysis and setting the assumption

- 9.3 When considering the assumption for non-general pay growth we compared a 'profile analysis' of the scheme experience to the assumption adopted for the 2012 valuation. This analysis considers the overall active membership and compares average (FTE<sup>15</sup>) pensionable pay at each year of age with that at other ages. This analysis illustrates how (average FTE) pay varies by age and may form a suitable means of setting an age related pay scale.

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<sup>15</sup> Full-time equivalent pay.

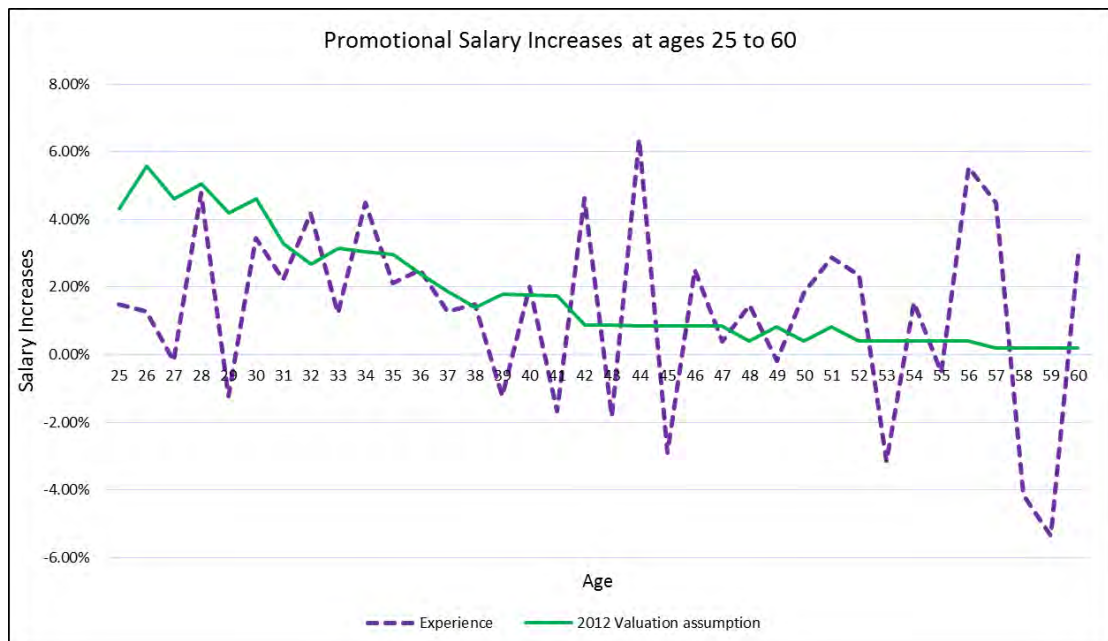


- 9.4 For this analysis only pensionable pay as at 31 March 2015 is considered, due to issues with the membership data at 31 March 2016, and an expectation that the significant (more than 10%) reduction in workforce in 2015-16, in part due to the large redundancy exercise, will lead to distortions in the profile analysis at 31 March 2016.
- 9.5 A starter/ender analysis may also be helpful when considering the assumption for non-general pay growth, but due to data limitations we were unable to undertake this type of analysis. This analysis considers only those members who were in active membership at both the 2012 and 2016 valuation dates and compares the increase in their pensionable pay (FTE) over the period (net of assumed general pay increases) with that assumed. The rates of assumed increase are based on the members' ages over the intervaluation period and the 2012 valuation assumptions. This analysis can illustrate how actual promotional pay increases (or rather actual non-general increases) have impacted the rates of earnings of members remaining in service over the intervaluation period.

### Results of profile analysis

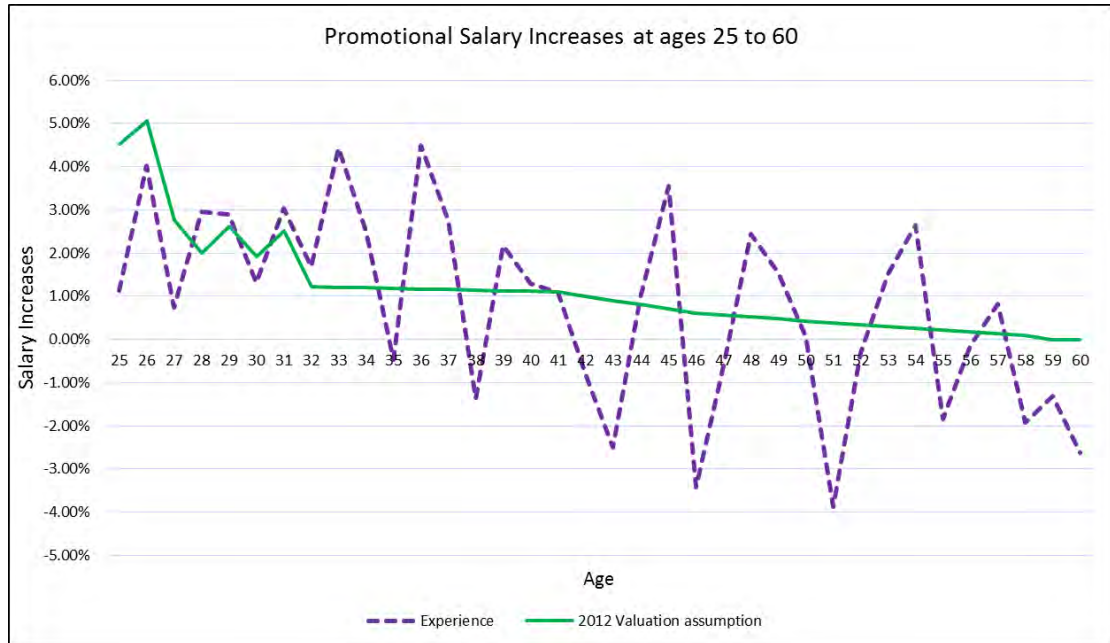
- 9.6 The graphs below show the implied age related promotional pay scales for men and women respectively based on the pay profile of all members at 31 March 2015. This has been calculated as the salary at a particular age compared to the salary for the previous age, as a proxy for promotional salary increases. The actual profile is compared with the assumed age related promotional scales adopted for the 2012 valuation.

**Graph 9.1: Male Salary Increases**





**Graph 9.2: Female Salary Increases**



**Comments on the analysis**

- 9.7 The profile analysis shows significant volatility for both male and female members.
- 9.8 Furthermore, the results of the profile analysis should be treated with some caution when considering how to set forward looking assumptions for promotional pay growth. The population at each age is not homogeneous thus the analysis could be distorted by a changing mix of members and different behaviours at different ages and therefore may not be purely due to promotional salary increases. Further, when considering the appropriate forward looking assumption for non-general pay growth due account should be taken of how this interrelates to the directed assumption for general pay growth.
- 9.9 It is likely that a number of factors have contributed to intervaluation pay growth at an individual level, likely influenced by both the general pay restraint policy and member behaviours. In this light our view is that the analysis available is not sufficient to suggest a change to the 2012 valuation assumptions is appropriate.



## 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 DoF valuation directions), and summarises the analysis undertaken in order to inform that recommendation.*

### Proposed assumptions for 2016 valuation

- 10.1 We recommend increasing the commutation assumption for Classic members from 5.0% to 5.4% so that the assumed rate remains aligned with the assumption adopted for the 2016 valuation of the CSPA (GB). The assumption for all other sections is specified in the DoF NI directions (currently 17.5% of pension).

### Use of the assumption

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

### Results of the Analysis

- 10.3 Owing to data limitations it has not been possible to analyse recent commutation experience.
- 10.4 We have no reason to expect that commutation experience in the NICSPA should be substantially different to that in the CSPA (GB) given that the schemes have the same benefit structure and similar retirement patterns. The assumptions used for the 2012 valuations were consistent across the two schemes. We therefore recommend that the commutation assumption should remain aligned to that proposed for the 2016 valuation of the CSPA (GB).



## 11 Family statistics

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

### Proposed assumptions for 2016 valuation

11.1 We recommend the following assumptions:

- > Classic members are assumed to be married broadly in line with 97.5% of the 2012 actuarial assumption for males and 91.5% of the 2012 actuarial assumption for females. This is equivalent to around 68% of males and 50% of females being assumed to be married at retirement. Consistent assumptions are proposed for current and future pensioners.
- > Non-Classic members are assumed to be married/partnered broadly in line with 97.5% of the 2012 actuarial assumption for males and 91.5% of the 2012 actuarial assumption for females. This is equivalent to around 73% of males and 50% of females being assumed to have a qualifying partner at retirement. Consistent assumptions are proposed for current and future pensioners.
- > Male members are assumed to be 3 years older than their partners and female members are assumed to be 2 years younger than their partners. This is consistent with the 2012 assumptions.
- > No allowance is made for remarriage on the grounds of materiality. This is consistent with the 2012 assumptions.

11.2 The recommended assumptions are aligned with those proposed for the CSPS (GB) in all cases. We do not expect a material impact on the valuation results from the changes made.

### Use of the assumption

11.3 Dependants' pensions<sup>16</sup> are provided to qualifying dependants on the death of a member. The scheme's benefit provisions for dependants differ according to which section a member belongs to. For Premium, Classic Plus and Nuvos a pension is payable to a qualifying partner as well as to a legal spouse and civil partners. For Classic only legal spouses and civil partners are eligible for a survivor's pension. Assumptions are required for the proportion of members who are married or partnered to determine how many dependants' pensions will be paid. Assumptions are required about age differences between members and partners as this affects how long dependants' pensions will be paid for.

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<sup>16</sup> Pensions are also payable to dependent children on a member's death but the costs are not material overall.



## **Analysis and approach to setting the assumptions**

### ***a) Proportions married/partnered***

- 11.4 We do not have sufficient data to perform a credible analysis of proportions married or partnered.
- 11.5 We do not have any evidence that the proportion of the overall population who are married or cohabiting is significantly different between Northern Ireland and Great Britain. We also do not have any evidence that the population of NICSPS who are married or cohabiting is significantly different from that of CSPS (GB). Therefore we recommend that the assumptions that have been proposed for the 2016 valuation of the CSPS (GB) are adopted.
- 11.6 The proposed assumptions assume that a lower proportion of members die with a dependant than the assumptions adopted for the 2012 valuation.

### ***b) Age difference between member and spouse/partner***

- 11.7 We do not have sufficient data to perform a credible analysis of the age difference between a member and spouse.
- 11.8 As a result, we recommend no change to the 2012 assumption that male members are 3 years older than their spouse or partner and female members are 2 years younger than their spouse or partner. This assumption is aligned to the assumption adopted for the 2016 valuation of CSPS (GB).



## Appendix A: Details of assumptions

A.1 This appendix contains details of the recommended assumptions including sample rates and values.

### Pensioner mortality

**Table A1: Baseline mortality assumptions**

Baseline mortality	Standard table <sup>17</sup>	Adjustment
<b>Males</b>		
Retirements in normal health	S2NMA	110%
Current ill-health pensioners	S2NMA	110%
Future ill-health pensioners	S2NMA	110%
Dependants	S2NMA	124%
<b>Females</b>		
Retirements in normal health	S2NFA	110%
Current ill-health pensioners	S2NFA	110%
Future ill-health pensioners	S2NFA	110%
Dependants	S2DFA	106%

A.2 As specified by DoF NI, future improvements in mortality will be assumed to be in line with those underlying the ONS 2016-based population projections.

<sup>17</sup> 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 members with full protection in Classic, Premium, and Classic Plus**

Age	Males	Females
55	0.02	0.04
56	0.03	0.05
57	0.05	0.08
58	0.06	0.09
59	0.15	0.19
60	0.31	0.38
61	0.16	0.23
62	0.16	0.20
63	0.16	0.20
64	0.31	0.27
65	0.48	0.42
66	0.18	0.21
67	0.20	0.30
68	0.35	0.20
69	0.40	0.20
70	1.00	1.00

A.3 Nuvos members with full protection are assumed to retire at age 65.

**Table A4: Age retirement rates for new entrants to the 2015 scheme**

Age	SPA 65		SPA 66		SPA 67		SPA 68	
	Males	Females	Males	Females	Males	Females	Males	Females
60	0.02	0.04	0.02	0.04	0.02	0.04	0.02	0.04
61	0.03	0.05	0.02	0.04	0.02	0.04	0.02	0.04
62	0.05	0.08	0.03	0.05	0.02	0.04	0.02	0.04
63	0.06	0.09	0.05	0.08	0.03	0.05	0.02	0.04
64	0.15	0.19	0.06	0.09	0.05	0.08	0.03	0.05
65	1.00	1.00	0.15	0.19	0.06	0.09	0.05	0.08
66	1.00	1.00	1.00	1.00	0.15	0.19	0.06	0.09
67	1.00	1.00	1.00	1.00	1.00	1.00	0.15	0.19
68	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00



**Table A5: Age retirement rates for Members with service in existing and 2015 schemes**

Age	SPA 65		SPA 66		SPA 67		SPA 68	
	Males	Females	Males	Females	Males	Females	Males	Females
60	0.31	0.38	0.31	0.38	0.31	0.38	0.17	0.21
61	0.16	0.23	0.16	0.23	0.16	0.23	0.09	0.14
62	0.16	0.20	0.16	0.20	0.09	0.12	0.09	0.12
63	0.16	0.20	0.16	0.20	0.10	0.13	0.09	0.12
64	0.31	0.27	0.06	0.09	0.05	0.08	0.03	0.05
65	1.00	1.00	0.15	0.19	0.06	0.09	0.05	0.08
66	1.00	1.00	1.00	1.00	0.15	0.19	0.06	0.09
67	1.00	1.00	1.00	1.00	1.00	1.00	0.15	0.19
68	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

**Table A6: Age retirement rates for Nuvos members with service in existing and 2015 schemes**

Age	SPA 65		SPA 66		SPA 67		SPA 68	
	Males	Females	Males	Females	Males	Females	Males	Females
65	1.00	1.00	0.15	0.19	0.06	0.09	0.05	0.08
66	1.00	1.00	1.00	1.00	0.15	0.19	0.06	0.09
67	1.00	1.00	1.00	1.00	1.00	1.00	0.15	0.19
68	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00



### Ill-health retirement from service

**Table A7: Ill-health retirement rates for all members**

Age	All salary bands	
	Males	Females
20	0.0002	0.0002
25	0.0002	0.0002
30	0.0004	0.0003
35	0.0010	0.0007
40	0.0016	0.0012
45	0.0026	0.0019
50	0.0041	0.0037
55	0.0073	0.0063
60	0.0116	0.0115
65*	0.0158	0.0162

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

- A.4 In all scheme sections other than Classic, 42% of male ill-health retirements and 67% of female ill-health retirements are assumed to qualify for upper tier awards. There is a single tier for ill-health retirements in Classic so no assumption is needed.

### Voluntary withdrawal from service

**Table A8: Withdrawal rates (net of re-entry)**

Age	All salary bands	
	Males	Females
20	0.036	0.035
25	0.023	0.030
30	0.016	0.021
35	0.013	0.014
40	0.010	0.010
45	0.009	0.010
50	0.012	0.015
55	0.018	0.021

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



### Death before retirement

**Table A9: Death before retirement rates for all members**

Age	Males	Females
20	0.0003	0.0001
25	0.0003	0.0001
30	0.0004	0.0002
35	0.0004	0.0003
40	0.0006	0.0004
45	0.0009	0.0006
50	0.0012	0.0010
55	0.0020	0.0014
60	0.0031	0.0022
65	0.0049	0.0035

### Promotional pay increases

**Table A10: Promotional salary scales for all members**

Age	Males	Females
20	110.7	120.4
25	134.1	158.8
30	169.1	187.6
35	199.4	203.2
40	221.0	215.2
45	234.8	226.0
50	243.8	232.6
55	249.8	236.6
60	253.3	238.0
65	255.8	238.0

### Commutation of pension for cash at retirement

**Table A11: Recommended commutation assumptions for the 2016 valuation**

	Classic	Non-Classic <sup>18</sup>	2015 scheme service <sup>18</sup>
<b>Males</b>	5.4%	17.5%	17.5%
<b>Females</b>	5.4%	17.5%	17.5%

<sup>18</sup> Specified by DoF Directions



- A.5 Classic Plus members are assumed to commute 17.5% of their post 1 October 2002 pension.

**Family statistics**

**Table A12: Recommended proportion married or partnered at retirement for future pensioners**

	Classic members	Non-Classic members
	Proportion married	Proportion married or partnered
<b>Males</b>	68%	73%
<b>Females</b>	50%	50%

**Table A13: Proposed proportion married or partnered for current pensioners (at the valuation date)**

Age	Classic members		Non-classic members	
	Males	Females	Males	Females
50	70%	51%	74%	53%
60	70%	51%	74%	53%
70	69%	41%	72%	42%
80	59%	20%	59%	20%
90	33%	5%	33%	5%

- A.6 Male members are assumed to be 3 years older than their partners and female members are assumed to be 2 years younger than their partners.



## Appendix B: Modelling approach and minor assumptions

### Active membership projections

- B.1 Direction 11 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 pre-2015 scheme 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 with differing benefit provisions within the pre-2015 scheme (notably for members with differing normal pension ages). This implicitly requires the actuary to estimate the membership to future dates in order to determine the valuation results.
- B.2 Since the majority of members (around 70%) 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 the effective date have been determined by assuming an overall stable population (age and pay profile) to the 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 NPA 60 and 65 members) 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.
  - > 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 each section/scheme (i.e. Classic, Classic Plus, Premium, Nuvos or Alpha) and protection status (i.e. protected, tapered or unprotected), and are also based on the following criteria.

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

### Accrual cost methodology

- B.6 See B.3 and B.4. The cost over each relevant period has been taken as the average of the cost at the start and end 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 for the pre-2015 scheme over the period 2016 - 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 immaterial for final salary benefits but has no effect on the cost cap future service cost 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 (Prison Officers after completion of 20 years' service) 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 for which provision of post SPA pension increases is not the responsibility of the scheme. The reduction is equivalent to a contribution rate of 0.9% 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 For members joining pensionable service on or after 1 June 1989 pensionable pay is restricted to an 'earnings cap' unless they are members of the Nuvos section of the scheme (unless they have linked service). Due to the way in which individual active member data is grouped for valuation purposes it is not possible to directly restrict pay in the valuation system. However, there are very few such members of the scheme whose earnings are either already above the earnings cap or estimated to exceed the earnings cap by retirement. The earnings cap has therefore not been allowed for.

### **Public Service Transfer Club (PSTC) and re-joiner aggregation costs**

- B.12 Allowance will be made for the potential additional liabilities arising from inward transfers on PSTC terms and additional benefits arising due to linkage of service for re-joiners.
- B.13 We have made an addition to the value of future benefit accrual of 0.2% of pensionable pay, to cover the estimated costs arising from PSTC transfers-in. This is in line with the adjustment made in respect of PCSPS (GB). This adjustment applies to the calculation of the valuation results, and is decrease compared to the assumption adopted for the 2012 valuation (0.3% of pensionable pay).
- B.14 In the longer term, PSTC transfers will increasingly be transfers of career average benefits, and it is likely that PSTC costs to the Scheme will fall over time.
- B.15 No allowance has been made for the cost of the additional benefits arising when a member re-joins the PCSPS (NI) and links their current and previous periods of pensionable service. This approach is in line with that for PCSPS (GB), and is a change compared to the assumption adopted for the 2012 valuation, which was that the cost of the additional benefits arising are equivalent to about 0.2% of pensionable pay. These costs do not apply to the calculation of the employer contribution correction cost.
- B.16 Re-entry of current active members to pensionable service in future has been modelled by the use of a 'net' withdrawal assumption. This explicitly allows for a proportion of those leaving active service to return.

### **Expenses**

- B.17 The current employer contribution rate includes an additional 0.25% of pensionable pay in respect of the central administration expenses of the scheme. The same addition will be made to the corrected employer contribution rate required from 2019 at the same level.

### **Final pensionable pay**

- B.18 All liabilities have been based on pensionable pay at the effective date as provided by the administrator. 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.19 No allowance has been made for short term dependant pensions or children's pensions (other than those already in payment), on grounds of immateriality.

### **Early retirement factors**

- B.20 When modelling retirement before Normal Pension Age where an actuarial reduction would be applied early retirement factors have been set equal to current factors (applied for the appropriate period before the normal pension age).

### **Additional voluntary contributions**

- B.21 Additional voluntary contributions paid to on a money purchase basis are paid in accordance with Regulations which are separate to the pension scheme regulations and have not been considered for the valuation. Additional voluntary contributions paid in accordance with the pension scheme regulations to secure added service or pension are taken into account as liabilities of the scheme.

### **Scheme pays**

- B.22 Members can opt to use the scheme pays facility to pay HMRC for an annual allowance or lifetime allowance tax charge (i.e. the scheme pays the tax charge on behalf of the member for a corresponding reduction to the member's pension). Where members have opted to use this facility a lower liability has been valued for these members, to reflect a scheme pays pension debit. The notional fund allows for actual cash flows and reflects any tax charges paid by the scheme, therefore a corresponding lower notional fund has been valued. The impact of these will broadly net off for valuation purposes.

### **Member contribution yield over implementation period**

- B.23 DoF NI have confirmed that they are targeting a new member contribution yield of 5.5% from 1 April 2019, and that we should assume an average contribution yield over the implementation period of 5.5%.

### **Other Direction interpretations**

#### *Directions 27 and 28 (contribution rates)*

- B.24 27(1)(a) and 27(1)(c) : Payroll at effective date projected forward (only) in line with valuation earnings assumptions for purposes of spreading the deficit.
- B.25 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 target contribution yield from April 2019. See B.23.
- B.26 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.27 See paragraph B.23.



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

- B.28 Assume that contribution rate required to cover cost of benefits over 2015-16 is the same as the rate required to cover cost of benefits over 2015-19.

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

- B.29 See B.4.

*Direction 33 – cost cap income*

- B.30 For the CCNLL element this has been based on the liability discount rate used for the cost cap liabilities at 2016 rather than the investment roll up. The impact is immaterial to the results.



## Appendix C: Assumptions made for data uncertainties

### Summary

- C.1 Whilst comprehensive data was received from the Department 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 requires assumptions 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 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 the Department 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 the Department to address a number of these issues, however where critical data items were missing from member records or not considered to be reliable 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 4% of records were excluded from the 2016 valuation data and around 1% 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.



Membership group	Uprating applied	Impact of error in assumption for missing data (% of pay)	
		Uncorrected employer contribution rate	Employer contribution correction cost
Actives	8%	0.3%	0.3%
Deferreds	1%	<0.05%	nil
Pensioners	0%	nil	nil

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 The Department 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 (e.g. 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. The recommendation we have made for the rates of ill health retirements (and the recommendations for the GB scheme specific assumptions which have also been recommended for NI in the absence of robust NI data) smooth out the short term effects by taking only 50% of the difference in experience since the 2012 valuation.

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 Liabilities (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. The 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 suitable for calculating the CCNLL, and so cashflow data taken from the scheme accounts was used to supplement and adjust the data available to provide for a reasonable estimate of CCNLL to be calculated.
- C.13 An alternative would be to adopt 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 If we had adopted the alternative approach to setting the CCNLL, then the employer contribution correction cost would have been 0.1% of pensionable pay different from under the recommended approach. This level of uncertainty relating to the CCNLL is in addition to the uncertainty associated with the scheme's individual membership data, as set out in paragraph C.6 above.
- 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 only 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 fully complete 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 <sup>19</sup>
Membership profile: 2 years older on average over implementation period	1.1%	1.1%
Mortality rates: 5%* heavier rates of pensioner mortality	(0.8)%	(0.5)%
Age retirement rates: members without full protection to retire (on average) one year later than currently assumed	(0.3)%	(0.2)%
Commutation (other than as directed) all eligible members of Classic commute 2% of pension more than assumed	(0.1)%	(0.1)%
Ill-health retirement: 5%* increase to assumed rates	0.0%	0.0%
Ill-health retirement: 5%* increase in proportion assumed to receive higher tier benefits	0.1%	0.1%
Proportions partnered: 5%* more members assumed to have qualifying partners at death	0.2%	0.2%
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	1.7%	1.3%

\* 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 the above table the sensitivity shown is in relation only to the change in assumptions described. The impact of a combination of assumption changes will not necessarily equate to the sum of the relevant rows above.

<sup>19</sup> The sensitivity of the employer contribution correction cost shown in the table allows for any offsetting expected from resulting changes to the cost cap difference, for items defined as "employer costs" in HM Treasury's 2014 paper Public Service Pensions: actuarial valuations and the employer cost cap mechanism.