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126  $xy$   $n = \frac{1}{n-1}$   $2^{10-1}$   
 $2x + 2y = 0$   $\frac{1}{9}$   $\frac{1}{512}$   
1919 - 2019  $x$   
 $x^2 - a^2 = (x+a)(x-a)$   $x^2 + 2ax + a^2 = (x+a)^2$   $x + b$

## Firefighters' Pension Schemes (Northern Ireland)

Actuarial valuation as at 31 March 2016  
Advice on assumptions

Date: 11 March 2019  
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## Contents

<b>1</b>	<b>Executive summary</b>	<b>2</b>
<b>2</b>	<b>Introduction</b>	<b>9</b>
<b>3</b>	<b>General considerations</b>	<b>13</b>
<b>4</b>	<b>Pensioner Mortality</b>	<b>16</b>
<b>5</b>	<b>Age retirement from service</b>	<b>22</b>
<b>6</b>	<b>Ill-health retirement from service</b>	<b>26</b>
<b>7</b>	<b>Voluntary withdrawal from service</b>	<b>29</b>
<b>8</b>	<b>Death before retirement</b>	<b>32</b>
<b>9</b>	<b>Promotional pay increases</b>	<b>33</b>
<b>10</b>	<b>Commutation of pension for cash at retirement</b>	<b>36</b>
<b>11</b>	<b>Family statistics</b>	<b>39</b>
	<b>Appendix A: Details of assumptions</b>	<b>41</b>
	<b>Appendix B: Modelling approach and minor assumptions</b>	<b>48</b>
	<b>Appendix C: Assumptions made for data uncertainties</b>	<b>53</b>
	<b>Appendix D: Relative importance of assumptions</b>	<b>56</b>
	<b>Appendix E: Assumptions for Special members at 31 March 2015</b>	<b>57</b>



## 1 Executive summary

*This report contains our recommendations for the best estimate assumptions to be set by the Department of Health (NI) for the 2016 valuation of the Firefighters' Pension Schemes (Northern Ireland) ('the Schemes').*

- 1.1 An actuarial valuation of the Firefighters' Pension Schemes (Northern Ireland)<sup>1</sup> ('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<sup>2</sup>, the assumptions to be adopted for this valuation will be set by the Department of Health (NI) ('the Department'), 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 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.
- 1.4 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 Firefighters' Pension Schemes in England ('the England Schemes'), 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 Schemes' experience<sup>3</sup> in formulating our recommendations for the Schemes.
- 1.5 This advice sets out relevant analysis of recent experience and indicates which other factors have been considered in deriving recommendations of best estimate assumptions.

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<sup>1</sup> As provided by The Firefighters' Pension Scheme Order (Northern Ireland) 2007 (SR 2007/144) (as amended), The New Firefighters' Pension Scheme Order (Northern Ireland) 2007 (SR 2007/215) (as amended) and The Firefighters' Pension Scheme Regulations (Northern Ireland) 2015 (SR 2015/78) (as amended).

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

<sup>3</sup> See report *Firefighters' Pension Schemes (England): Actuarial valuation as at 31 March 2016: Advice on assumptions*, dated 28 February 2019.



- 1.6 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 changes are:
- > Rates of pensioner mortality have been updated to reflect recent experience (and the DoF directed assumption for future changes in mortality has been updated to reflect changes in population mortality resulting from updated ONS population projections<sup>4</sup>).
  - > Age retirement (ie normal health) retirement rates for members with FPS 2007 Scheme benefits have been updated to allow for experience over 2012-2016 and to maintain alignment with the equivalent assumption being proposed in England.
  - > Ill-health retirement rates and the proportion of ill-health retirements that are provided on an upper-tier basis have been updated to allow for experience in Northern Ireland over 2012-16.
  - > 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.
- 1.7 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.
- 1.8 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.
- 1.9 This report was provided to the Department in draft form, and was also circulated to the Firefighters' Pension Scheme Advisory Board in Northern Ireland, in November 2017. Since the draft version, the main changes have been to update our advice regarding the commutation assumption and to include two additional appendices regarding assumptions for data uncertainty and Special members. This report has been signed alongside the formal valuation 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.

### **Compliance and quality standards**

- 1.10 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.

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<sup>4</sup> 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 <sup>5</sup>	Summary of recommended assumptions	Rationale for recommendation	Magnitude of financial impact of change from 2012 valuation assumptions <sup>6</sup>	
			Employer contributions (2019-23) – past service impact <sup>7</sup> (% of pay)	Employer contributions (2019-23) – past and future service impact <sup>8</sup> (% of pay)
<b>Pensioner baseline mortality</b>	Aligned to standard SAPS table <sup>9,10</sup>			
Current pensioners (normal and ill-health)	113% x S2NMA	Insufficient evidence. Informed by wider analysis of mortality in England.	+0.8% <sup>11</sup>	+1.1% <sup>11</sup>
Future pensioners (normal and ill health)	113% x S2NMA			
Dependants	100% x S2DFA			

<sup>5</sup> In general, our recommendations are for the same assumptions to be used for males and females. As 98% of members are male, there is insufficient data to analyse female members separately, other than for dependant pensioners who are mostly female.

<sup>6</sup> 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.

<sup>7</sup> Impact on uncorrected employer contribution rate of spreading change in past service liabilities over 15 years.

<sup>8</sup> Total change in employer rate of spreading past service and allowing for future service impacts.

<sup>9</sup> SAPS tables are published by the Actuarial Profession and the S2 series is based on the experience of self-administered pension schemes from 2004 to 2011. The S2 series has separate standard tables, including those based on experience of members retiring in normal health (S2NMA), in ill-health (S2IMA) and for widows (S2DFA).

<sup>10</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>11</sup> As directed by DoF, 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 <sup>5</sup>	Summary of recommended assumptions	Rationale for recommendation	Magnitude of financial impact of change from 2012 valuation assumptions <sup>6</sup>	
			Employer contributions (2019-23) – past service impact <sup>7</sup> (% of pay)	Employer contributions (2019-23) – past and future service impact <sup>8</sup> (% of pay)
<b>Age retirement</b>				
FPS 2007 Scheme protected, tapered and unprotected members with more than 16 years' service at March 2012	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 and informed by wider analysis of age retirement in England.	Not material	Not material
FPS 2007 Scheme unprotected members with less than 16 years' service at March 2012	No retirements before age 55. Age and service based rates, with many retiring at age 55. All assumed to retire by age 60.	Based on the assumption for the protected group, but with no allowance for retirement before age 55. There is, however, no relevant evidence yet.	Not material	Not material
Standard NFPS 2007 Scheme (protected, tapered and unprotected)	All retire at age 60.	Insufficient evidence. Informed by wider analysis of age retirement in England.	No change in assumption.	
Special NFPS 2007 Scheme members (protected, tapered and unprotected)	All retire at age 55.	Insufficient evidence. Proposal allows for the full take up of benefits at the earliest time at which they become available on an unreduced basis in the modified scheme.	New assumption.	
FPS 2015 Scheme - new entrants	All retire at age 55.	Normal pension age in the FPS 2015 Scheme.	No change in assumption.	



Assumption <sup>5</sup>	Summary of recommended assumptions	Rationale for recommendation	Magnitude of financial impact of change from 2012 valuation assumptions <sup>6</sup>	
			Employer contributions (2019-23) – past service impact <sup>7</sup> (% of pay)	Employer contributions (2019-23) – past and future service impact <sup>8</sup> (% of pay)
<b>Ill-health retirement</b>				
Incidence	Same assumptions for males and females. Increasing by age: around 0.10% at age 30, 0.40% at age 40 and 1.60% at age 50.	In light of 2012-16 experience in Northern Ireland. Proposed rate is three times that assumed in England.		Not material
Upper/lower-tier split	20% on upper-tier.	In light of 2012-16 experience in Northern Ireland.		
<b>Withdrawal</b>				
Regulars (and Special retained)	Same assumptions for males and females. Decreases with age: 0.80% at age 25, 0.25% at age 45.	No change from 2012 assumption in light of 2012-16 experience.	No change in assumption (new assumption for Special retained).	
Standard retained	Three times the regular withdrawal rates.			
<b>Death before retirement</b>	Same assumption for males and females. Increasing by age: 0.02% at age 30, about 0.04% at age 40, 0.08% at age 50.	Same as the assumption proposed for England and no change from 2012 assumption. Very small amount of experience over 2012-16 in Northern Ireland.	No change in assumption.	



Assumption <sup>5</sup>	Summary of recommended assumptions	Rationale for recommendation	Magnitude of financial impact of change from 2012 valuation assumptions <sup>6</sup>	
			Employer contributions (2019-23) – past service impact <sup>7</sup> (% of pay)	Employer contributions (2019-23) – past and future service impact <sup>8</sup> (% of pay)
<b>Promotional salary scale</b>				
Regular firefighters	Service based scale: large increases for first four years, 0.7% a year for next 8 years, then about 1.2% a year up to 30 years, with a lower increase thereafter.	No change from 2012 assumption in light of 2012-16 experience.	No change in assumption.	
Retained firefighters (including Special members)	Age related scale: about 1% a year up to age 50, 0.4% a year thereafter.	No change from 2012 assumption in light of 2012-16 experience.	No change in assumption.	
<b>Commutation</b>				
FPS 2007 Scheme - protected	0% of pension commuted.	Cost neutral commutation terms.	No change in assumption.	
NFPS 2007 Scheme (Special retained) - protected	0% of pension commuted.	In line with FPS 2007 Scheme assumption.	New assumption.	
FPS 2007 Scheme - unprotected and tapered	0% of FPS 2007 Scheme and 8.75% of FPS 2015 Scheme pension commuted.	FPS 2007 Scheme offers a significantly greater lump sum for pension given up, but experience indicates members will still commute some of their 2015 Scheme pension.	Not material	-0.3%





Assumption <sup>5</sup>	Summary of recommended assumptions	Rationale for recommendation	Magnitude of financial impact of change from 2012 valuation assumptions <sup>6</sup>	
			Employer contributions (2019-23) – past service impact <sup>7</sup> (% of pay)	Employer contributions (2019-23) – past and future service impact <sup>8</sup> (% of pay)
NFPS 2007 Scheme (Special retained) - unprotected and tapered	0% of Special NFPS 2007 Scheme and 8.75% of FPS 2015 Scheme pension commuted.	Updated as per the assumption for FPS 2007 Scheme unprotected and tapered members.		New assumption.
For all other members the directed commutation assumption of 17.5% of pension applies.				
<b>Family statistics</b>				
Proportion married	75% at retirement (consistent assumptions for existing pensioners).	Same as the assumption proposed for England and no change from 2012 assumption.		
Proportion partnered	80% at retirement (consistent assumptions for existing pensioners).	Same as the assumption proposed for England and no change from 2012 assumption.		No change in assumptions.
Age difference	Males 3 years older than partner.	Same as the assumption proposed for England and no change from 2012 assumption.		
Remarriage	No allowance.	No change (no evidence).		



## 2 Introduction

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

- 2.1 An actuarial valuation of the Firefighters' 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<sup>12</sup>, the actuarial assumptions to be adopted for this valuation are the responsibility of the Department of Health (NI) ('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<sup>13</sup> for setting assumptions in the absence of direct evidence, for schemes in Great Britain. This will provide consistency across the United Kingdom, which we understand is the preference of the Department of Finance (NI) ('DoF'). We consider this to be reasonable but our advice might change if DoF provide 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

<sup>12</sup> Certain assumptions are specified in the Directions.

<sup>13</sup> 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, Appendix D includes sensitivities around the choice of assumptions set by the Department and Appendix E sets out assumptions for the calculation of the prior value of the cost cap fund in respect of Special retained members of the NFPS 2007 Scheme as at 31 March 2015.

- 2.5 This report was provided to the Department in draft form, and was also circulated to the Firefighters' Pension Scheme Advisory Board in Northern Ireland, in November 2017. Since the draft version, the main changes have been to update our advice regarding the commutation assumption and to include two additional appendices regarding assumptions for data uncertainty and Special members. This report has been signed alongside the formal valuation 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.
- 2.6 Northern Ireland Fire and Rescue Service (NIFRS), who administer the Schemes, supplied data on the experience of the membership of the Schemes 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, *Firefighters' Pension Schemes (Northern Ireland) Actuarial Valuation as at 31 March 2016: Report on membership 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. However, robust analysis of scheme experience will only be possible where there is both sufficient quality, and quantity, of data. The level of reliance that can be placed on any assumptions derived from the 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 small public service pension scheme with around 3,000 members. In this advice we propose to set certain assumptions based on an analysis of the scheme's own experience. 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 Firefighters' Pension Schemes in England ('the England 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 England Schemes experience<sup>14</sup> 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.
- 2.10 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. The Department should consider whether there is any reason why the approach taken to setting the assumptions would be inappropriate.
- 2.11 For a number of 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 England Schemes. We have adopted the following approach where there is insufficient evidence from the Schemes to set a robust assumption directly:
- > If the experience in Northern Ireland is very similar to the experience in England then the assumption recommended for the England Schemes has been recommended for the Schemes as well.
  - > If the experience in Northern Ireland differs from England 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 England Schemes has been recommended for the Schemes as well.

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<sup>14</sup> See report *Firefighters' Pension Schemes (England): Actuarial valuation as at 31 March 2016: Advice on assumptions*, dated 28 February 2019.



- > If the difference between the experience in Northern Ireland and England 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 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, in our view, is more sensible than adopting an assumption which seems clearly inappropriate.
- > If no analysis of Northern Irish experience has been possible due to the lack of credible data then the assumption recommended for the England Schemes has been recommended for the Schemes.

2.12 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.

2.13 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 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; and
- > 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<sup>15</sup> ("FPS 2015 Scheme") and the previous pension schemes ("pre-2015 schemes"), being the FPS 2007 Scheme and NFPS 2007 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**<sup>16</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 schemes to retirement. The introduction of the FPS 2015 Scheme is not expected to have any impact on this group's behaviours.
  - > New members to the FPS 2015 Scheme. These members' retirement behaviours are expected to be heavily influenced by the provisions of the FPS 2015 Scheme.

<sup>15</sup> [https://www.legislation.gov.uk/nia/2014/2/pdfs/nia\\_20140002\\_en.pdf](https://www.legislation.gov.uk/nia/2014/2/pdfs/nia_20140002_en.pdf)

<sup>16</sup> 1 April 2019 to 31 March 2023.



- > Members with service in both the FPS 2015 Scheme and a pre-2015 scheme (including members with tapered protection). Over time, as the proportion of FPS 2015 Scheme service increases, the retirement behaviours are expected to become increasingly influenced by the provisions of that scheme.
- 3.5 Within the NFPS 2007 Scheme and FPS 2015 Scheme, members are separately identified as either regular firefighters or retained firefighters. There are no retained firefighter members of the FPS 2007 Scheme.
- 3.6 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**

- 3.7 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.

### **Males and Females**

- 3.8 There are relatively few female firefighters (ie 1% of pensioner members and 3% of active members are female) and as such it is not possible to perform any separate robust experience analysis for females. Our analysis therefore covers male members only. We recommend that the same assumptions are used for male and female firefighters in any given sub-group, based on the analysis of the males in the sub-group. We do not expect the use of different assumptions for females would have a material impact on the valuation results.
- 3.9 The only exception is for dependant pensioners, who are nearly all females. Therefore, the analysis and proposed assumption for these members is based entirely on an analysis of the females in this sub-group.

### **Special Retained Members**

- 3.10 An amendment<sup>17</sup> to the NFPS 2007 Scheme regulations made in January 2015 introduced a modified section of the NFPS 2007 Scheme for retained firefighters who were employed during the period 1 July 2000 to 5 April 2006 to provide them with access to a pension scheme (known as 'Special' members). The Special members could purchase past pensionable service in the modified section of the NFPS 2007 Scheme from the date their service began or from 1 July 2000, if later.

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<sup>17</sup> [http://www.legislation.gov.uk/nisr/2015/9/pdfs/nisr\\_20150009\\_en.pdf](http://www.legislation.gov.uk/nisr/2015/9/pdfs/nisr_20150009_en.pdf)



- 3.11 Special members were not present in the 2012 valuation, so there are no existing assumptions for them. Therefore, we have considered assumptions for these members in this report and set out in the relevant sections where assumptions for Special members differ from those for standard NFPS 2007 members for use in the 2016 valuation.
- 3.12 We have also considered assumptions for Special members for the purposes of calculating the prior value of the cost cap fund as at 31 March 2015. The Directions require that the assumptions used for this purpose are the assumptions adopted at the 2012 valuation. As no such assumptions already exist for Special members, we have set out proposed assumptions for these members in Appendix E that are consistent with those adopted for standard retained members at the 2012 valuation.





## 4 Pensioner Mortality

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

- 4.1 The assumptions we recommend for baseline pensioner mortality for the 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	2012 valuation		2016 valuation	
	Standard table <sup>18</sup>	Adjustment*	Standard table <sup>19</sup>	Adjustment*
Current normal and ill-health pensioners	S1NMA	113%	S2NMA	113%
Future normal health pensioners	S1NMA	107%	S2NMA	113%
Future ill-health pensioners	S1IMA	100%	S2NMA	113%
Dependants	S1DFA	100%	S2DFA	100%

\*An adjustment of 113% means that mortality rates are 13% higher than in the standard table.

- 4.2 DoF has indicated that future improvements in mortality will be assumed to be in line with those underlying the most recent ONS population projections, ONS-2016.

<sup>18</sup> 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 including males retiring in normal health (S1NMA), males retiring in ill-health (S1IMA) and for female dependants (S1DFA).

<sup>19</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 includes separate standard tables based on experience of male members retiring in normal health (S2NMA) and in ill-health (S2IMA) 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 likely 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<sup>20</sup> (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, which allows for ONS 2012 future mortality improvements.
- > The mortality assumption adopted for the 2012 valuation changed from a 'lives' to 'amounts' basis (see paragraphs 4.11 to 4.15).
- > As previous column, but with life expectancies calculated from the year 2016, rather than from 2012.
- > As previous column, but using ONS 2016, rather than ONS 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 <sup>21</sup> )	2012 assumption (amounts <sup>21</sup> )	2012 assumption (amounts <sup>21</sup> )	2016 assumption (amounts)
Future mortality improvements:	ONS 2012	ONS 2012	ONS 2012	ONS 2016	ONS 2016
Effective year for life expectancies:	2012	2012	2016	2016	2016
<b>Current pensioners (normal and ill-health)</b>					
Member aged 50	37.2	37.5	38.0	36.7	36.8
Member aged 55	31.9	32.3	32.8	31.5	31.6
Member aged 60	27.0	27.3	27.7	26.5	26.6
Member aged 65	22.1	22.4	22.9	21.7	21.7
<b>Future pensioners (normal and ill-health) – current age 45<sup>22</sup></b>					
Member life expectancy from age 50	37.8	38.2	38.7	37.2	37.4
Member life expectancy from age 55	33.2	33.5	34.0	32.6	32.7
Member life expectancy from age 60	28.7	29.0	29.4	28.0	28.1
Member life expectancy from age 65	24.3	24.6	25.0	23.6	23.7

<sup>20</sup> Cohort life expectancies based on ages shown in the effective year, ie allowing for future mortality improvement.

<sup>21</sup> At the 2012 valuation of the England Schemes, 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 shows the impact of changing the 2012 valuation assumption to an 'amounts' basis. See paragraphs 4.11 to 4.15 for further details.

<sup>22</sup> Life expectancies for future pensions based (on a combined health basis) on 2012 valuation assumptions use 113% of S1NMA base table to follow an approach consistent to the proposed 2016 assumptions.



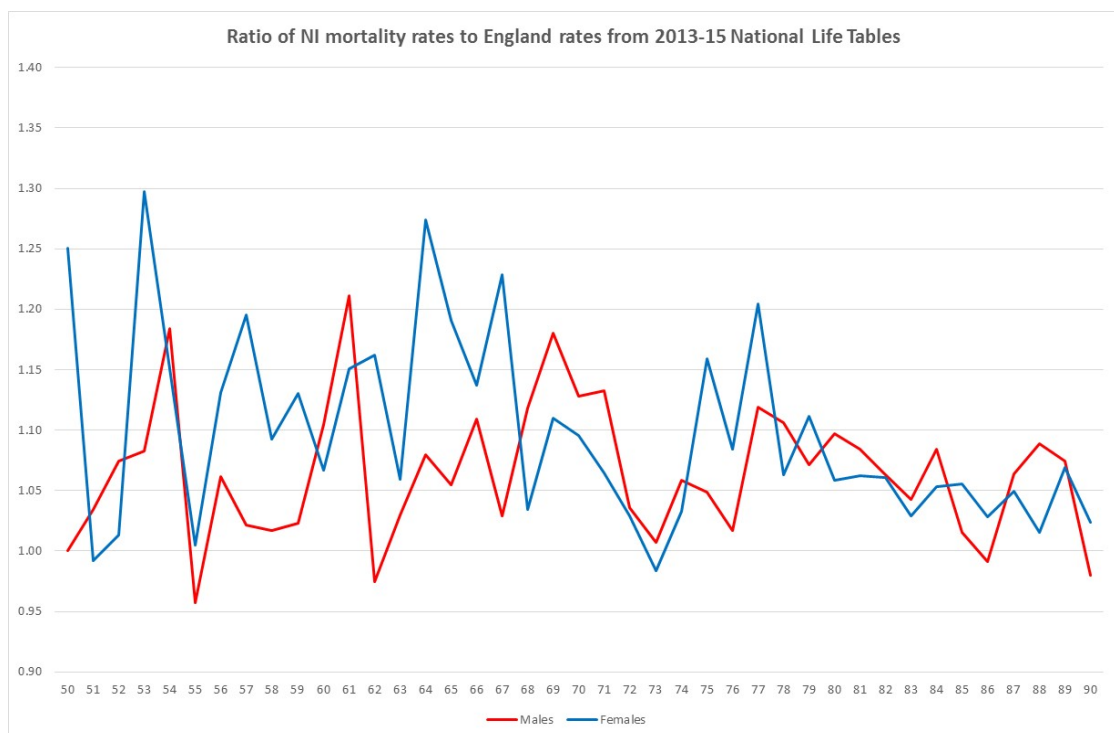
## Use of the assumption

- 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, are expected 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 England Schemes. The table below sets out the number of deaths for pensioner and dependants included in the analysis in Northern Ireland and in England. 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 analysis in Northern Ireland and England**

Member category	Deaths in Northern Ireland 2012 - 2016	Deaths in England* 2012 - 2016
Male pensioner (Normal and Ill-health retirements)	31	1,489
Female dependants	18	500

\* Note that the analysis in England excluded data from 17 fire authorities for the pensioner analysis (representing about 25% of pensioners) and excluded data from 28 fire authorities for the dependant analysis (representing about 50% of dependants).

- 4.8 As the experience in the England Schemes is significantly greater than that in Northern Ireland, our proposal for the mortality assumptions for the Schemes is to use the same mortality assumption as is proposed for the England Schemes for the 2016 valuation. This is similar to the approach taken for the 2012 valuation when the mortality assumption for the Schemes was set to be the same as for the England Schemes.
- 4.9 In line with the proposals for the England Schemes, we recommend that the mortality assumption for future pensioners, for both normal and ill-health retirement, is the same as the assumption proposed for current pensioners. This is a change from the 2012 approach which used:
- > 100% of a standard ill-health mortality table for future ill-health retirements; and
  - > an adjusted standard normal health mortality table, with the adjustment calculated such that the combination of expected future normal and ill-health retirements would have the same mortality as the assumption for current pensioners (both normal and ill-health).
- 4.10 This change in approach is not expected to have a material impact on the valuation results, but has the advantage that it is easier to understand and is consistent with the approach taken by other public sector pension schemes which use a combined normal and ill-health mortality assumption for current pensioners.



### 'Amounts' analysis vs 'lives' analysis

- 4.11 Provided adequate data is available, mortality can be analysed on either a 'lives' basis or an 'amounts' basis:
- > A lives basis gives an equal weighting to every member of the population being analysed.
  - > An amounts basis weights the experience by the size of each member's pension (with the longevity of those with larger pensions given more of a weighting).
- 4.12 There is much evidence<sup>23</sup> to demonstrate that the size of pension is positively correlated with longevity, ie on average those with bigger pensions live longer. For a population with significant variation in the characteristics of the membership and in the amounts of pension being paid, an amounts mortality analysis is generally expected to show lower rates of mortality than a corresponding lives analysis.
- 4.13 Where possible it is usually preferable to use an amounts analysis rather than a lives analysis to set the mortality assumption for an actuarial valuation as in an amounts analysis the weighting given to different members' mortality experience more closely reflects the relative size of their financial liabilities to the pension scheme.
- 4.14 At the 2012 valuation it was not possible to complete an amounts analysis as data on pension amounts at death was not available. Therefore, a lives analysis was done and this was used to set the assumptions which were adopted for the valuation. GAD's *Advice on assumptions* report dated 13 March 2015 included the following comment:
- ... we have carried out our analysis on a 'lives' basis, which considers the number of deaths without weighting by pension amount. We consider this to be a reasonable method for the Schemes, as the underlying population is largely homogeneous, and so pension amounts are less widely spread than would be the case in a more diverse scheme. However, if the amounts data were available it is possible that analysis could lead to different mortality assumptions.*
- 4.15 For the 2016 valuation of the England Schemes, which is being used as a reference to propose a mortality assumption for the Schemes, it has been possible to do an amounts analysis and a lives analysis. A conclusion of this analysis, was to assume that the difference between a lives and an amounts analysis at the 2012 valuation would have been in the region of a 4% adjustment to the standard table (ie it was assumed that the 2012 assumption was 109% of the S1NMA table, rather than 113% of S1NMA which was actually used for the 2012 valuation).

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<sup>23</sup> For example see CMI self-administered Pension Schemes Mortality Committee, Working Paper 65: *Analysis of the mortality experience of pensioners of self-administered pension schemes for the period 2004 to 2011, April 2013.*



### Comments on the analysis of the England Schemes

- 4.16 We analysed the pensioner mortality experience for the England Schemes over 2012-16 on an 'amounts' basis, after removing some fire authorities from the analysis if the data about deaths did not appear credible.
- 4.17 To derive an assumption on an amounts basis we 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 report Firefighters' Pension Scheme (England): Actuarial valuation as at 31 March 2016: Advice on assumptions, dated 28 February 2019.
- 4.18 The experience of the England Schemes over 2012-16 suggests lower levels of mortality overall than expected based on the 2012 assumption (which was the same as the 2012 assumption for the Schemes) for normal and ill health pensioners.
- 4.19 The proposed assumption for the England Schemes was derived by taking an average of the 2012 assumption (converted from a 'lives' to an 'amounts' basis) and the England experience over 2012-16. A 2/3:1/3 weighting of the 2012 assumption and the 2012-16 experience has been used. This approach:
- > makes allowance for the relative amounts of mortality data underlying the 2012 assumption and the 2012-16 analysis;
  - > helps reduce volatility from relatively large changes in the mortality assumption from one valuation to the next; and
  - > helps to reduce the risk that the mortality assumption is significantly impacted by any deaths that might have been underreported in the mortality data over 2012-16.
- 4.20 For dependants, the experience over 2012-16 was broadly in line with that expected from the 2012 assumption (which is the same as the 2012 assumption for the Schemes) and also close to that which would be expected from the standard S2 table for dependants. Therefore, the proposed assumption for dependants in the England Schemes was 100% of the S2DFA table.



## 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 the following groups of members:
- > FPS 2007 Scheme members who have full protection, tapered protection or are unprotected but have significant FPS 2007 service (greater than 16 years' service at 31 March 2012).
  - > Unprotected FPS 2007 Scheme members with less than 16 years' service at 31 March 2012.
  - > Members with any standard NFPS 2007 Scheme service (ie including protected, tapered and unprotected members).
  - > Special members with any modified NFPS 2007 Scheme service (ie including protected, tapered and unprotected members).
  - > FPS 2015 Scheme members with no previous service in the pre-2015 schemes.

Sample age retirement rates are provided in Appendix A. This approach to setting assumptions was adopted for the previous valuation (other than for the new assumption for Special members). There is not yet any evidence on which to reconsider this approach.

### **Members with FPS 2007 Scheme service**

- 5.2 For protected members (who will remain in the FPS 2007 Scheme until retirement), we recommend maintaining the 2012 assumption for all members except those listed in paragraph 5.3 for whom we recommend that an adjustment is made to reflect experience in England between 2012 and 2016. 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.
- 5.3 The groups of members for whom we recommend a change to the retirement assumption are:
- > Members reaching age 50 with less than 30 years' service (we recommend increasing retirement rates for these members).
  - > Members reaching age 55 with less than 30 years' service (we recommend decreasing retirement rates for these members).





- 5.4 For members with taper protection and unprotected members with more than 16 years' service (at March 2012), we recommend the same assumption as for protected members above. This is consistent with the approach taken in 2012 and reflects an expectation for the FPS 2007 Scheme benefits, rather than FPS 2015 Scheme benefits, to drive member behaviours.
- 5.5 For unprotected members with less than 16 years' service (at March 2012), we recommend maintaining the approach used to set the 2012 assumptions with allowance for the adjustments made in paragraph 5.3. This is consistent with the approach taken in 2012 and reflects an expectation for the FPS 2015 Scheme benefits to have greater influence over member behaviours, in particular the normal pension age of 55 in the FPS 2015 Scheme. The retirement rates for this group assume no members retire before age 55 and most members retire at age 55. For example, for members who joined before age 25, about 99% are assumed to retire at age 55, and for members joining at age 30 (and over) about 40% are assumed to retire at age 55.

***Members with standard NFPS 2007 Scheme service***

- 5.6 We recommend that members with standard NFPS 2007 Scheme service are assumed to retire at age 60. This applies to protected members, members with tapered protection and unprotected members who have joined the FPS 2015 Scheme.

***Special Retained Members***

- 5.7 Under the pension arrangements of the modified section of the NFPS 2007 Scheme, all Special retained members are eligible to retire at age 55 with an unreduced pension. Therefore, we propose that protected Special members take up their benefits at age 55, with this being the earliest available opportunity to draw on an unreduced pension.
- 5.8 We propose that unprotected and tapered Special members are also assumed to retire at age 55 in the FPS 2015 Scheme, as that is the pension age in the FPS 2015 Scheme.

***New entrants to the FPS 2015 Scheme***

- 5.9 We recommend that members of the FPS 2015 Scheme are assumed to retire at age 55, as that is the pension age in the FPS 2015 Scheme. Retirement before age 55 is not permitted (in normal health). Pensions on retirement from active service after age 55 are increased by a cost neutral late retirement factor, so assuming that members retire after age 55 would not have a material impact on the valuation results.





### ***Deferred Members***

- 5.10 We recommend it is assumed that deferred members will take their pension at their deferred pension age. Deferred members can take a reduced pension before deferred pension age, but the reduction is actuarially neutral so allowance for this would not have a material impact on the valuation results.

### **Previous valuation assumptions**

- 5.11 The proposed assumptions are identical in nature and effect to those which were adopted for the 2012 valuation for all categories of members except for some FPS 2007 Scheme members. The changes recommended for these members are described in paragraph 5.3. There are also new assumptions for the Special retained members.

### **Use of the assumption**

- 5.12 Age retirement rates specify the rate at which members are assumed to retire on grounds other than ill-health and therefore potentially include allowance for retirements before or after Normal Pension Age.
- 5.13 In the FPS 2007 Scheme, members can retire on an unreduced pension once they have completed 25 years' service if they are aged 50 or over, and most members can retire from age 55 regardless of service. There is no actuarially reduced early retirement option.
- 5.14 Standard members in the NFPS 2007 Scheme can retire unreduced at age 60 from active service and from age 65 if deferred members. Standard active members can take actuarially reduced early retirement from age 55 up to age 60; the reduced pension is with reference to a pension payable from age 65.
- 5.15 Special members in the NFPS 2007 Scheme can retire unreduced at age 55 from active service and from age 60 if deferred members.
- 5.16 Active members in the FPS 2015 Scheme have a Normal Pension Age of 55, with no option to retire earlier (in normal health). Deferred pensions are payable from State Pension Age for deferred members.

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

- 5.17 For the purposes of considering the assumptions appropriate for members of the FPS 2007 Scheme, we have considered the experience of these members in the Schemes over 2012-16. After excluding any data that was not credible, there were 55 such retirements, with an average age on retirement of 53 years.
- 5.18 As this is a relatively small number of retirements, the experience of the Schemes is not sufficient in isolation to set a robust detailed age and service based assumption for retirements from the FPS 2007 Scheme. Therefore, we have also considered the experience of the England Schemes, for which 2,668 retirements were included in the equivalent analysis over 2012-16, with an average age on retirement of 52 years.



- 5.19 Given the relatively small amount of retirement experience for the Schemes, we recommend that the proposed retirement assumption for members of the 1992 Scheme in England for the 2016 valuation is also adopted for the equivalent members of the FPS 2007 Scheme. In doing so we note that the benefit structure of both the 1992 Scheme and the FPS 2007 Scheme are very similar, meaning that retirement patterns should be comparable, and the average age on retirement in the England Schemes was similar to that in Northern Ireland over the analysis period. This approach is consistent with the structure of the assumptions used at the 2012 valuation, when the retirement assumption used for the Schemes was the same as that used for the England Schemes for this group of members.
- 5.20 There is insufficient data to undertake any meaningful analysis of retirements in the NFPS 2007 Scheme (standard and Special) or in the FPS 2015 Scheme. As most of the available retirement experience continues to relate to retirements from the FPS 2007 Scheme, the actual scheme experience is not directly relevant for this purpose. As such, we recommend that the retirement assumption from the 2012 valuation is maintained for these members.



## 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 is used for all members 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 FPS 2015 Scheme. Assumed rates of ill-health increase with age but less than 3.5% of members are assumed to retire on ill-health grounds each year, even at the highest ages. The ill-health rates are three times those that are proposed for the England Schemes. Sample rates are provided in Appendix A.
- 6.2 We also recommend assuming that 20% of members retiring on ill-health grounds will receive the upper-tier benefits and the remaining 80% will receive the lower-tier benefits.

### Previous valuation assumptions

- 6.3 The proposed 2016 assumptions are different to those that were used for the 2012 valuation. The 2012 valuation assumption was for ill-health rates to be two times those applying for the England Schemes and 40% of members retiring in ill-health were assumed to receive upper-tier benefits, with the remaining 60% assumed to receive lower-tier benefits. The equivalent assumptions for the England Schemes, on which the assumption for the Schemes is based, remained unchanged from the 2012 to the 2016 valuation.

### Use of the assumptions

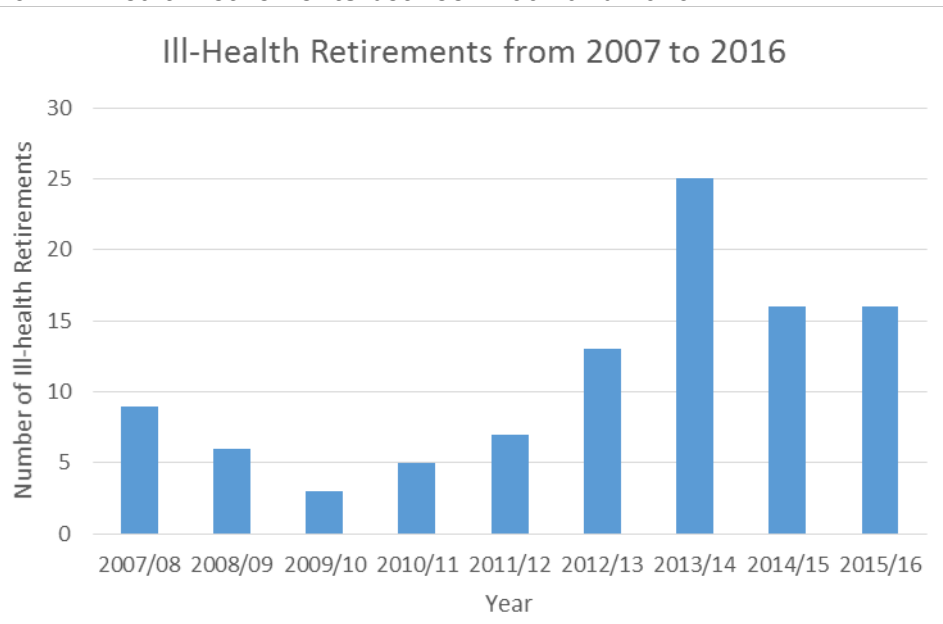
- 6.4 Ill-health retirement rates specify the rate at which members are assumed to retire on grounds of ill-health. The assumed eligibility for upper or lower-tier awards specifies the benefits which will be provided. The ill-health assumptions have a low impact on the overall results. The rates of mortality 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

- 6.5 After excluding any data that was not credible, there were 70 ill-health retirements in the Schemes over 2012-16, with an average age on ill-health retirement of 48 years.
- 6.6 This was an increase in ill-health retirements over 2012-16, when compared to the experience over 2007-2012 that was analysed at the 2012 valuation, when there was 30 ill-health retirements from the Schemes. Graph 6.1 shows the number of ill-health retirements each year from 2007 to 2016.

**Graph 6.1: Ill-health retirements between 2007 and 2016**



- 6.7 As this is a relatively small number of ill-health 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 England Schemes, for which 244 retirements were included in the equivalent analysis over 2012-16, with an average age on ill-health retirement of 49 years.
- 6.8 The 70 ill-health retirements in Northern Ireland equates to an approximate average ill-health rate of 1.1% pa over the four-year period 2012-16. The equivalent rate over the same period in the England Schemes was 0.25% pa.
- 6.9 At the 2012 valuation, the assumption for the rate of ill-health retirement was set to be two times the assumption for the England Schemes. The comparison of the average ill-health rate in Northern Ireland and England over 2012-16 continues to show that the rate of ill-health retirements is higher in Northern Ireland than in England. We can also note the ill health retirement assumption proposed for most other public service pension schemes in Northern Ireland for the 2016 valuations is higher than the England (or England and Wales) equivalent. Therefore, we recommend that the assumption for the Schemes at the 2016 valuation continues to be set at a higher level than that proposed for the England Schemes.



- 6.10 The number of ill-health retirements has increased since the previous valuation and so has the difference between the average rate of ill-health retirement in Northern Ireland and in England (being about four times the England rate over 2012-16). However, the actual numbers to analyse are very low, so are subject to considerable random fluctuations each year, such that caution should be taken in making changes to the assumption based solely on this analysis.
- 6.11 We have therefore asked NIFRS for their comments on the recent pattern of ill-health retirements. NIFRS have informed us that there was a delay in processing some ill-health retirements during the period 2007-12, meaning that the number of ill-health retirements over that period was lower than would otherwise have been the case. A backlog of cases was then processed and NIFRS expect that ill-health retirements will continue at around 20 cases a year going forward.
- 6.12 On the basis that the higher number of ill-health retirements over the period 2012-16 is considered to be more representative of the numbers going forward, we propose that the assumption for the rate of ill-health retirements is increased at the 2016 valuation. Applying a smoothing approach, such that the new assumption is half way between the 2012 assumption and that implied by the 2012-2016 experience, results in a proposed assumption for the rate of ill-health retirement to be three times the assumption proposed for the England Schemes at the 2016 valuation.
- 6.13 This smoothing approach helps to reduce volatility in results from one valuation to the next and is the general approach being taken by other public service pension schemes at the 2016 valuations. It also makes some allowance for any distortion from the backlog of ill-health cases that were processed after 2007-12.

#### **Analysis and setting the assumption - Split between ill-health tiers**

- 6.14 The valuation data that we received for ill-health retirements over the period 2012-16 did not differentiate between upper-tier and lower-tier benefits. NIFRS provided additional information that showed that there was an average of one upper-tier ill-health retirement each year over the period 2012-16. This equates to an upper-tier proportion of around 5% of all ill-health cases over that period.
- 6.15 Applying a smoothing approach, as described in paragraphs 6.12 and 6.13, we propose that the assumption for the proportion of upper-tier benefits is reduced to 20% for the 2016 valuation, from 40% at the 2012 valuation.



## 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 for the purposes of the 2016 valuation separate withdrawal rates are used for regular and standard retained members. We propose that Special retained members are assumed to withdraw at the same rate as regular firefighters.
- 7.2 These withdrawal rates would apply equally to those members who remain in the pre-2015 schemes and those who join the FPS 2015 Scheme.
- 7.3 The recommended rates decrease with age; for regular firefighters they are 0.8% at age 25 and 0.25% at age 45. Withdrawal rates for standard retained firefighters are three times the regular firefighter rates.
- 7.4 Sample rates are provided in Appendix A. 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 retirement benefits.

### Previous valuation assumptions

- 7.5 The proposed 2016 assumptions are the same as those adopted for the previous valuation, other than the new assumption for Special retained members who were not present in the 2012 valuation.

### Use of the assumption

- 7.6 Withdrawal rates specify the rate at which members are assumed to leave voluntarily before retirement (including opting out), becoming entitled to either deferred benefits or, for those with less than 3 months' service, a refund of contributions, or choosing to transfer the value of their pension out of the Schemes.
- 7.7 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.



## Analysis and setting the assumption

- 7.8 After excluding any data that was not credible, there were 58 withdrawals in the Schemes over 2012-16, with an average age on withdrawal of 41 years. A breakdown of these withdrawals by scheme is set out in Table 7.1 below, along with the average withdrawal rate and the expected rate using the 2012 valuation assumptions (both calculated on an approximate basis). Those members who moved to the FPS 2015 Scheme before leaving have been allocated to their pre-2015 scheme in this table.

**Table 7.1 – Withdrawals over 2012-16 vs expected**

Scheme	Number of withdrawals	Average annual withdrawal rate	Expected average annual withdrawal rate
FPS 2007 Scheme	9	0.3%	0.4%
NFPS 2007 Scheme - Regular	9	1.0%	0.7%*
NFPS 2007 Scheme - Retained	40	1.4%	1.3%
<b>Total</b>	<b>58</b>	<b>0.9%</b>	<b>0.8%</b>

\* Regular firefighters in both the FPS 2007 and NFPS 2007 schemes have the same withdrawal assumption. The expected average rate for regular members of the NFPS 2007 Scheme is higher than for the FPS 2007 Scheme in the table above, because the average age of the NFPS 2007 members is lower, and assumed withdrawal rates are higher at younger ages.

- 7.9 The number of withdrawals on which firm conclusions can be based is clearly very low, but it can be noted that the overall withdrawal rate is similar to that expected, and so is the withdrawal rate for retained members who make up most of the withdrawals over the period.
- 7.10 The assumption for withdrawal rates of regular members in the Schemes was 75% of the assumption used for regular members of the England Schemes at the 2012 valuation, based on the analysis carried out at the time. The withdrawal assumption for retained members was also lower in Northern Ireland at the 2012 valuation, being three times the rate of regular members, compared to nine times the rate of regular members being assumed for the England Schemes.
- 7.11 A lower withdrawal rate in Northern Ireland continues to be a feature of the experience over the period 2012-16. As such, in our view it is not appropriate to adopt the withdrawal assumption being proposed for the England Schemes. This relationship between withdrawal rates in Northern Ireland and England (or England and Wales) is also observed in other public service pensions schemes in Northern Ireland.



- 7.12 Given that the small amount of withdrawal experience in Northern Ireland is similar to the assumption made in 2012 and that withdrawal rates continue to be lower in Northern Ireland than in England, we propose that the 2012 assumption is maintained for use in the Schemes at the 2016 valuation.
- 7.13 The proposed withdrawal rate at the 2016 valuation of the England Schemes is also unchanged from the 2012 valuation assumption used in England. Therefore, under our proposed assumptions for the Schemes, the same relativities to the England assumptions, as described in paragraph 7.10, continue to apply at 2016.
- 7.14 There was insufficient data to perform a credible analysis on the withdrawal rates from the FPS 2015 Scheme, separately from the pre-2015 schemes. We propose that members are assumed to withdraw at the same rates adopted for the NFPS 2007 Scheme. This is consistent with the approach at the 2012 valuation.
- 7.15 There was insufficient data to perform a credible analysis of the withdrawal rates for Special retained members of the NFPS 2007 Scheme. As these members are accruing benefits similar in value to those from the FPS 2007 Scheme and, by definition, have already been retained firefighters for at least 10 years (ie since before April 2006), we expect that they may be more likely to withdraw at lower rates, closer to those assumed for regular firefighters. Therefore, we propose that the withdrawal assumption for regular firefighters is adopted for the Special retained members.
- 7.16 There was insufficient data to perform a credible analysis on withdrawal rates of female firefighters. We propose that the same withdrawal rates are adopted for both male and female members.





## 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 for all members 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 before retirement 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 7 deaths in service in the Schemes over 2012-16, with an average age at death of 45 years.
- 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 England Schemes, for which there were 47 deaths included in the equivalent analysis over 2012-16, with an average age at death of 47 years.
- 8.6 There is little experience in Northern Ireland to use as a firm base for this assumption. Therefore, we propose that the England 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 Northern Ireland and in England. 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 assumptions for 2016 valuation

- 9.1 We recommend assuming separate scales of promotional increases for regular firefighters and retained firefighters. The increases for regular firefighters are dependent on service and are steeper at shorter durations of service. The increases for retained firefighters are assumed to be dependent on age. Sample values from the scale are provided in Appendix A.
- 9.2 We recommend assuming that promotional pay increases for Special retained members are equal to those of standard retained members.

### Previous assumption

- 9.3 For both regular and retained firefighters the assumption adopted for the 2012 valuation is the same as that recommended for the 2016 valuation. There was no assumption for Special retained members in the 2012 valuation, as these members did not exist in 2012.

### Use of the assumption

- 9.4 For members of the (final salary) FPS 2007 and NFPS 2007 schemes, their benefits are linked to pay at or near retirement. Their pay will generally increase through a combination of general annual pay awards, promotional increases and any ad-hoc adjustments (eg due to any changes in crewing arrangements). To calculate an estimate of the level of benefit payable in the future requires assumptions for each of these components. The assumption for general pay awards is directed by DoF. The assumption for promotional pay increases, and any other ad-hoc increases is set by the Department.
- 9.5 The impact on the cost of the Schemes of future pay increases will be more significant 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

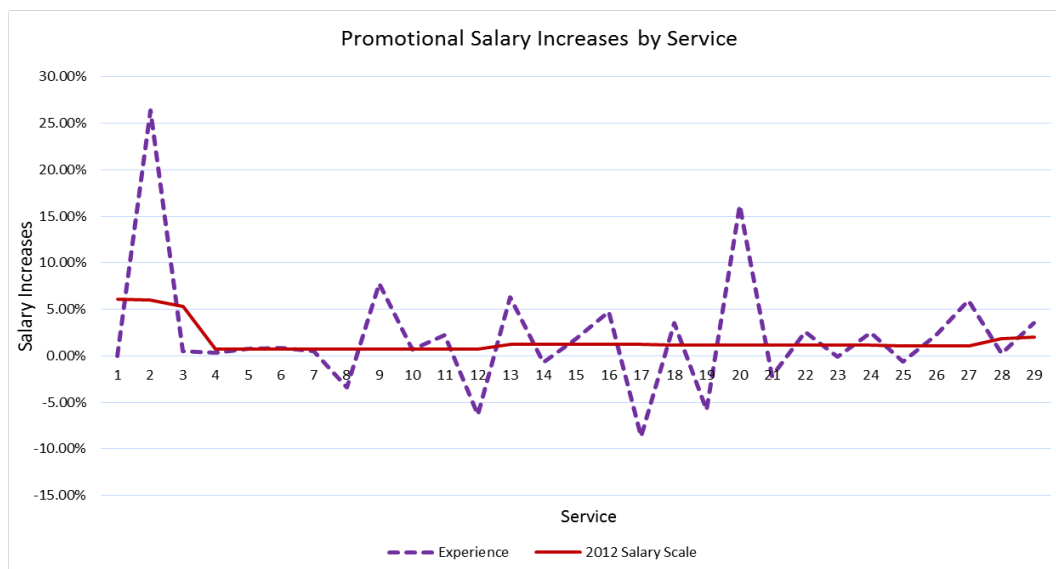
- 9.6 To formulate a recommended assumption for promotional pay increases, we compared the scheme data to the assumption adopted for the 2012 valuation using a 'profile analysis'. For regular members, the profile analysis considers the overall active membership as at 31 March 2016 and compares average (WTE<sup>24</sup>) 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. The profile analysis for retained firefighters is based on age rather than length of service. These differences in pay at each service length/age are then compared to the assumed promotional increases adopted for the 2012 valuation. The results of both profile analyses are discussed below.
- 9.7 We have made no explicit allowance for the current period of pay restraint in our analysis, on the basis that promotional/progression increases have not been significantly affected by this.

## Results of profile analysis for promotional pay increases

### Regular firefighter members

- 9.8 Graph 9.1 shows the change in average WTE pay for regular firefighters at each service length based on the 'profile analysis' of 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: Change in average WTE pay at each service length for active population as at 31 March 2016 – Regular Firefighters**



<sup>24</sup> Whole-time equivalent



### Retained firefighter members

- 9.9 Graph 9.2 shows the change in average WTE pay of retained firefighters at each age based on the 'profile analysis' of members at the valuation date (purple line). This is compared with the assumed increase from the age related promotional scale adopted for the 2012 valuation (red line).

**Graph 9.2: Change in average WTE pay at each age for active population as at 31 March 2016 – Retained Firefighters**



### Comments on the analysis

- 9.10 The results of this analysis should be treated with some caution as the analysis is affected by the mixture of members at each service length and age. However, the profile analysis in Graph 9.1 and Graph 9.2 shows that experience has been broadly in line with the 2012 assumption. We therefore propose that the 2012 assumptions are maintained for regular and retained members. This also maintains the same assumption as is proposed for the England Schemes for the 2016 valuation.
- 9.11 There is some variation between experience and assumptions at the early years of service and age in both graphs. However, the assumption at these points is less material to the valuation, as members with lower amounts of service have small accrued pensions linked to their final salary. In addition, the majority of these members will now be accruing benefits in the FPS 2015 scheme, for which the assumption about promotional pay increases is much less significant.
- 9.12 We understand that there are currently no planned changes to NIFRS that might impact future levels of pensionable pay. As such, no additional assumption for ad-hoc increases in pensionable pay is required.



## 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 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	FPS 2007 Scheme only	NFPS 2007 Scheme only	NFPS 2007 Scheme (Special Retained Members) only	FPS 2015 Scheme only
Scheme pension commuted from	FPS 2007	NFPS 2007	Modified NFPS 2007	FPS 2015
<b>All members</b>	0%	17.5% <sup>25</sup>	0%	17.5% <sup>25</sup>

Member with service in the following schemes	Mixed FPS 2007 Scheme and 2015 Scheme		Mixed NFPS 2007 Scheme and 2015 Scheme		Mixed NFPS 2007 Scheme (Special Retained) and 2015 Scheme	
	FPS 2007	FPS 2015	NFPS 2007	FPS 2015	Modified NFPS 2007	FPS 2015
<b>All members</b>	0%	8.75%	17.5% <sup>25</sup>	17.5% <sup>25</sup>	0%	8.75%

### 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 FPS 2007 Scheme and the DoF directed assumption for NFPS 2007 and 2015 Scheme pension (for members without service in other schemes) was that 15% of pension would be commuted. There were no assumptions for Special retained members as they were not present at the previous valuation.

<sup>25</sup> Specified by DoF Directions



### **Use of the assumption**

- 10.3 In the FPS 2007 Scheme, members have the option to commute pension for a cash lump sum at retirement. The terms under which this option is offered is such that the valuation of the benefits would be the same whether or not the allowance was made for member exercising these options. As such, for simplicity no allowance for members exercising these options is proposed for the valuation.
- 10.4 Commutation factors for Special retained members are fixed and were set to reflect the commutation rates in the FPS 2007 Scheme on the day before the amendment order to introduce the modified scheme was made. As Special retained members make up a small proportion of total liabilities of the Schemes and because the commutation factors are similar to the FPS 2007 Scheme factors, we propose that no allowance for Special members commuting pension for a cash lump sum at retirement is adopted for the 2016 valuation. This is consistent with the approach for FPS 2007 Scheme members. We do not expect this assumption to materially impact the valuation.
- 10.5 In the standard NFPS 2007 Scheme and the FPS 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, up to a limit of 25% of their pension. For these members, the assumption regarding 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.
- 10.6 Differences between assumed and actual commutation experience in the NFPS 2007 and FPS 2015 Scheme will feed through into the cost cap fund, but commutation experience in the FPS 2007 Scheme will not.

### **Derivation of proposed assumptions**

- 10.7 For the reasons set out in paragraph 10.3 and 10.4, for simplicity no allowance has been made for members commuting FPS 2007 Scheme, or modified NFPS 2007 Scheme, pension for cash.
- 10.8 The assumption for commutation of standard NFPS 2007 Scheme and FPS 2015 Scheme pension by members without service in other schemes is directed by DoF.
- 10.9 The recommended assumption for members with mixed FPS 2007 Scheme and FPS 2015 Scheme service is set by considering the potential behaviours of these members and data from any comparable experience, in the absence of any direct commutation experience for these members.



- 10.10 FPS 2007 Scheme members are entitled to commute up to a quarter of their pension on actuarially equivalent terms (in general – alternative limits apply to some members). The terms available in the FPS 2007 Scheme offer a significantly greater lump sum than would be available under the commutation terms of 12:1 offered in the FPS 2015 Scheme. We would expect this to act as a substantial disincentive to commute pension in the FPS 2015 Scheme, especially for those members with significant amounts of service in the FPS 2007 Scheme (where the lump sum available from the FPS 2007 Scheme is large). As such, we do not expect that former FPS 2007 Scheme members will commute significant amounts of pension from the FPS 2015 Scheme.
- 10.11 However, there is some evidence (in respect of firefighters in England) to suggest that a number of members retiring from the FPS 2007 Scheme 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 that they can commute. Therefore, this situation has similarities with the decision to commute FPS 2015 Scheme pension for unprotected FPS 2007 Scheme members, so can inform the proposed assumption.
- 10.12 We therefore propose that it is assumed that unprotected FPS 2007 Scheme members will commute 8.75% of their FPS 2015 Scheme pension. This is half of the proportion of 17.5% to be assumed for new entrants to the FPS 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. As such, the proposal to use half of the DoF directed assumption of 17.5% is based on the analysis of the new data, with some rounding to reflect the amount of data underlying the analysis.
- 10.13 Likewise, we propose that unprotected Special retained NFPS 2007 Scheme members will commute 8.75% of their 2015 Scheme pension for the same reasons.



## 11 Family statistics

*This chapter sets out our recommendation for the assumptions for 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**

	FPS 2007 Scheme	NFPS 2007 Scheme and FPS 2015 Scheme
	Proportion married <sup>26</sup>	Proportion partnered <sup>26</sup>
<b>Age</b>		
<b>50</b>	75%	80%
<b>60</b>	75%	80%
<b>70</b>	75%	78%
<b>80</b>	63%	64%
<b>90</b>	36%	36%
<b>Current pensioners (sample)</b>		
<b>Future pensioners at retirement</b>	75%	80%

- > Members are assumed to be three years older than their partners.
- > No allowance is made for remarriage on the grounds of materiality.
- > 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.

<sup>26</sup> The assumptions are the proportion married/proportion partnered at the valuation date, for current pensioners, or at retirement, for future pensioners.





### **Use of the assumptions**

- 11.3 Dependants' pensions<sup>27</sup> are provided to qualifying dependants on the death of a member. In the FPS 2007 Scheme, dependants' pensions are payable to legal spouses and civil partners only. In the NFPS 2007 Scheme and FPS 2015 Scheme, 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 England Schemes.
- 11.5 We have no reason to expect that family circumstances in the Schemes should be substantially different to those in the England 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 England Schemes, where the proposal is to retain the assumptions adopted for the 2012 valuation.

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<sup>27</sup> Pensions are also payable to dependant children on a member's death but the costs of future children's pensions 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**

<b>Baseline mortality</b>	<b>Standard table<sup>28</sup></b>	<b>Adjustment</b>
Current pensioners in normal health and ill-health	S2NMA	113%
Future pensioners in normal health and ill-health	S2NMA	113%
Dependants	S2DFA	100%

DoF has indicated that future improvements in mortality will be assumed to be in line with those underlying the ONS-2016 projections.

<sup>28</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, including those based on experience of members retiring in normal health, ill-health and for dependants.



**Age retirement from service**

**Table A2: Age retirement rates for FPS 2007 Scheme full protection members, tapered protection members and unprotected members with more than 16 years' service at 31 March 2012**

<i>Age at joining</i>	<i>18</i>	<i>19</i>	<i>20</i>	<i>21</i>	<i>22</i>	<i>23</i>	<i>24</i>	<i>25</i>	<i>26</i>	<i>27</i>	<i>28</i>	<i>29</i>	<i>30 and over</i>
<b>Age</b>													
<b>50</b>	0.795	0.795	0.795	0.250	0.250	0.250	0.250	0.250	0.000	0.000	0.000	0.000	0.000
<b>51</b>	0.490	0.490	0.490	0.795	0.020	0.020	0.020	0.020	0.050	0.000	0.000	0.000	0.000
<b>52</b>	0.490	0.490	0.490	0.490	0.915	0.020	0.020	0.020	0.020	0.050	0.000	0.000	0.000
<b>53</b>	0.490	0.490	0.490	0.490	0.490	0.975	0.020	0.020	0.020	0.020	0.050	0.000	0.000
<b>54</b>	0.490	0.490	0.490	0.490	0.490	0.490	0.975	0.020	0.020	0.020	0.020	0.050	0.000
<b>55</b>	0.660	0.660	0.660	0.680	0.705	0.725	0.750	0.975	0.410	0.410	0.410	0.410	0.410
<b>56</b>	0.655	0.655	0.655	0.655	0.655	0.655	0.655	0.655	0.975	0.410	0.410	0.410	0.410
<b>57</b>	0.655	0.655	0.655	0.655	0.655	0.655	0.655	0.655	0.655	0.975	0.410	0.410	0.410
<b>58</b>	0.655	0.655	0.655	0.655	0.655	0.655	0.655	0.655	0.655	0.655	0.975	0.410	0.410
<b>59</b>	0.655	0.655	0.655	0.655	0.655	0.655	0.655	0.655	0.655	0.655	0.655	0.975	0.410
<b>60 and over</b>	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000



**Table A3: Age retirement rates for FPS 2007 Scheme unprotected members with less than 16 years' service at 31 March 2012**

<i>Age at joining</i>	<i>18</i>	<i>19</i>	<i>20</i>	<i>21</i>	<i>22</i>	<i>23</i>	<i>24</i>	<i>25</i>	<i>26</i>	<i>27</i>	<i>28</i>	<i>29</i>	<i>30 and over</i>
<b>Age</b>													
<b>50</b>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<b>51</b>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<b>52</b>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<b>53</b>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<b>54</b>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
<b>55</b>	0.995	0.995	0.995	0.993	0.995	0.997	0.996	0.983	0.472	0.462	0.451	0.440	0.410
<b>56</b>	0.655	0.655	0.655	0.655	0.655	0.655	0.655	0.655	0.975	0.410	0.410	0.410	0.410
<b>57</b>	0.655	0.655	0.655	0.655	0.655	0.655	0.655	0.655	0.655	0.975	0.410	0.410	0.410
<b>58</b>	0.655	0.655	0.655	0.655	0.655	0.655	0.655	0.655	0.655	0.655	0.975	0.410	0.410
<b>59</b>	0.655	0.655	0.655	0.655	0.655	0.655	0.655	0.655	0.655	0.655	0.655	0.975	0.410
<b>60 and over</b>	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000



**Table A4: Age retirement rates for NFPS 2007 Scheme members and new entrants to the FPS 2015 Scheme**

Retirement Age	NFPS 2007 Scheme Standard (protected and unprotected)	NFPS 2007 Scheme Special (protected and unprotected)	FPS 2015 Scheme (new entrants)
55	-	1.00	1.00
56	-	-	-
57	-	-	-
58	-	-	-
59	-	-	-
60	1.00	-	-

**III-health retirement from service**

**Table A5: III-health retirement rates for all members**

Age	III-health retirement rate
20	0.00024
25	0.00048
30	0.00093
35	0.00189
40	0.00384
45	0.00780
50	0.01578
55*	0.03069
59*	0.03417

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



## Voluntary withdrawal from service

**Table A6: Withdrawal rates for all members**

Age	Withdrawal rate	
	Regular Firefighters and Special Retained Firefighters	Standard Retained Firefighters
20	0.007928	0.023850
25	0.007928	0.023850
30	0.007928	0.023850
35	0.007380	0.022050
40	0.004598	0.013725
45	0.002558	0.007650
50	0.001418*	0.004275
55	0.000000	0.000000

\* Rates are zero at age 50 if the member is eligible to retire on an unreduced pension

## Death before retirement

**Table A7: Death before retirement rates for all members**

Age	Death before retirement
20	0.00014
25	0.00015
30	0.00021
35	0.00028
40	0.00038
45	0.00054
50	0.00079
55	0.00128
60	0.00196
65	0.00308



## Promotional pay increases

**Table A8: Promotional salary scales for Regular firefighter members**

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

Service (years)	Promotional Pay for Regular Firefighters
0	100.0
5	140.4
10	145.4
15	152.2
20	161.6
25	171.1
30	183.6
35	190.1
40	190.1

**Table A9: Promotional salary scales for Retained firefighter members (standard and Special)**

The proposed salary scale shows assumed pay progression in excess of general wage inflation with an index base of 100 at age 18.

Age	Promotional Pay for Retained Firefighters
20	102.2
25	107.7
30	113.2
35	118.7
40	124.2
45	129.7
50	135.2
55	137.7
60	140.2
65	142.7



## Commutation of pension for cash at retirement

**Table A10: Recommended commutation assumptions for the 2016 valuation**

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

Member with service in the following schemes	FPS 2007 Scheme only	NFPS 2007 Scheme only	NFPS 2007 Scheme (Special Retained Members) only	FPS 2015 Scheme only
Scheme pension commuted from	FPS 2007	NFPS 2007	Modified NFPS 2007	FPS 2015
<b>All members</b>	0%	17.5%	0%	17.5%

Member with service in the following schemes	Mixed FPS 2007 Scheme and FPS 2015 Scheme		Mixed NFPS 2007 Scheme and FPS 2015 Scheme		Mixed NFPS 2007 Scheme (Special Retained) and FPS 2015 Scheme	
	FPS 2007	FPS 2015	NFPS 2007	FPS 2015	Modified NFPS 2007	FPS 2015
<b>All members</b>	0%	8.75%	17.5%	17.5%	0%	8.75%

## Family statistics

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

Proportion married	Proportion married or partnered
75%	80%

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

Age	Proportion married	Proportion married or partnered
50	75%	80%
60	75%	80%
70	75%	78%
80	63%	64%
90	36%	36%

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<sup>29</sup> 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 FPS 2007 Scheme and NFPS 2007 Scheme under the provisions of transitional protection differs from the expected cost of providing members with benefits in the FPS 2015 Scheme. Further, the expected cost of providing benefits varies for members in the FPS 2007 Scheme and NFPS 2007 Scheme. 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 60%) were accruing benefits in the FPS 2015 Scheme at the effective date, and further, given that the remaining members continuing to accrue benefits in the pre-2015 schemes 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 FPS 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 FPS 2007 Scheme, NFPS 2007 Scheme, Special NFPS 2007 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).

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<sup>29</sup> The Public Service Pensions (Valuations and Employer Cost Cap) Directions (Northern Ireland) 2014 (as amended).



- > Allow for the actual membership (assumed) accruing benefits in the FPS 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 protection status (ie protected, tapered or unprotected), section/scheme (ie FPS 2007 Scheme, NFPS 2007 Scheme, FPS 2015 Scheme and Modified NFPS 2007 Scheme), age, State Pension age and service.

### **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 over the period 2015 - 2019 is lower than that over the period 2019 - 2023 (ignoring any redistribution of members into the FPS 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 (in the FPS 2007 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 for which provision of post SPA pension increases is not the responsibility of the scheme. The reduction is equivalent to a reduction in the contribution rate of around 0.3% 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.

### **Public Service Transfer Club (PSTC)**

- B.11 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 0.6% of pensionable pay.

### **General pay increases**

- B.12 Direction 17 sets out the general pay increases that are to be assumed for valuation purposes.

### **Final pensionable pay**

- B.13 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.14 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.15 No allowance has been made for expenses. Expenses are outside the valuation framework.

### **Early retirement factors**

- B.16 There is no allowance made for early retirement with actuarially reduced benefits from any of the schemes so no early retirement factors are required for the valuation calculations.



### **Re-entry of members**

- B.17 Re-entry of members to pensionable service has been modelled by the use of a 'net' withdrawal assumption for active members. This explicitly allows for a proportion of those leaving active service to return. No explicit allowance has been made in the valuation for a proportion of those deferred at the effective date to subsequently rejoin. However the analysis undertaken for active members, and the resultant 'net' withdrawal rates include those rejoining from deferred status and hence the valuation of active members implicitly includes some provision for deferred members to return.

### **Added Years**

- B.18 In certain limited circumstances firefighters can purchase additional service. However, added years were deemed not to have a material impact on the valuation results and therefore no adjustment has been applied to the liabilities to allow for these.

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

- B.19 The average member contribution yield expected over the implementation period is estimated to be 13.0% 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 13.2% of pensionable pay that was expected over the period from April 2015 to March 2019.

### **Treatment of Special retained members of the NFPS 2007 Scheme**

- B.20 Special retained members of the NFPS 2007 Scheme generally took up their options to purchase past service during the year 2015/16. For the purposes of the calculation of the prior value of the cost cap fund at 31 March 2015, having taken instruction from the Department, the following approach has been taken.
- > All Special members are treated as being in pensionable service at 31 March 2015 and therefore part of the scheme membership at that date; and
  - > Liabilities of Special members at 31 March 2015 include all Special service that Special members have elected to purchase, net of the present value of any future employee contributions that are payable towards that service.
- B.21 The calculation of past service liabilities at 31 March 2016 for Special members paying by periodic contributions allows for their full past service to be recognised, net of the present value of any outstanding employee contributions at that date.



### **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 payroll at the effective date has been projected forward assuming a stable workforce size and in line with valuation earnings 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 expected contribution yield from April 2019 based on current member contribution rates set out in scheme regulations. See B.19.
- 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.23.

#### *Direction 30 – Prior value of the cost cap fund*

- B.26 Liabilities in respect of past service for Special members of the NFPS 2007 Scheme is included in the liabilities as at 31 March 2015, as described in paragraph B.20.

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

- B.27 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.28 See B.4.

#### *Direction 34 – benefits paid from FPS 2015 Scheme during 2015-2016*

- B.29 Estimated where data unavailable.



## Appendix C: Assumptions made for data uncertainties

### Summary

- C.1 Whilst comprehensive data was received from NIFRS 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 Schemes, 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 was provided by NIFRS for the purpose of the 2016 valuation and we applied 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 NIFRS to address some 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 1% of records were excluded from the 2016 valuation data and around 3% of the records 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 next table 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: 1.01 for 2016 data, 1.03 for 2015 data)	Not material	Not material
Deferreds (uprating applied: 1.02)	Not material	nil
Pensioners (uprating applied: 1.00)	Not material	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 NIFRS 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. 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 suitable for calculating CCNLL and it was not possible to make assumptions to adjust the data available to provide for a reasonable estimate of CCNLL to be calculated. The data available for the CCNLL calculation was particularly complex to use due to the adjustment for members re-joining the Schemes and the significant number of members with multiple data records in both the 2015 and 2016 data sets.
- C.13 For the purposes of determining the 2016 valuation results, we have adopted 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 ½% 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: Relative importance of assumptions

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	0.2%	0.2%
Mortality rates: 5%* heavier rates of pensioner mortality	(1.1)%	(0.5)%
Age retirement rates: All new entrants to the 2015 Scheme retire one year later at age 56	0.0%	0.0%
Commutation (other than as directed) all unprotected members of the FPS 2007 Scheme commute 17.5% of 2015 Scheme pension	(0.5)%	(0.3)%
Ill-health retirement: 5%* increase to assumed rates	0.1%	0.0%
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	0.6%	0.3%
Resignations and opt outs: 5%* higher numbers assumed to leave voluntarily before retirement (net of rejoiners)	(0.1)%	(0.0)%
Promotional pay increases: 0.5% higher promotional pay increases than assumed	2.2%	1.9%

\* 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.



## Appendix E: Assumptions for Special members at 31 March 2015

E.1 Advice on assumptions for Special members of the NFPS 2007 Scheme for use in the 2016 valuation is provided in the main body of this report.

E.2 Assumptions for Special members are also required in order to calculate the prior value of the cost cap fund as at 31 March 2015. The Directions require that the assumptions used for this purpose are the assumptions adopted at the 2012 valuation. As the Special members were not present at the 2012 valuation, there are no existing assumptions for them.

E.3 We propose that the assumptions adopted for this purpose are as set out below.

- > Age retirement from service: Assume all retire at age 55.

For the 2016 valuation, it has been assumed that all Special members (including unprotected and taper protected Special members) will retire at age 55. There is no reason to believe that we would have come to a different conclusion if we had advised on this assumption at the 2012 valuation. Therefore, we propose that all Special members are assumed to retire at age 55.

- > Voluntary withdrawal from service: Use the same assumption as per members of the FPS 2007 Scheme.

For the 2016 valuation, it has been assumed that Special members will withdraw from service in line with the assumption for members of the FPS 2007 Scheme. There is no reason to believe that we would have come to a different conclusion if we had advised on this assumption at the 2012 valuation. Therefore, we propose that Special members withdraw in line with the assumption for FPS 2007 Scheme members from the 2012 valuation (which remained unchanged at the 2016 valuation).

- > Commutation of pension for cash at retirement: Use the same assumption as per members of the FPS 2007 Scheme.

For the 2016 valuation, it has been assumed that Special members will commute in line with members of the FPS 2007 Scheme. There is no reason to believe we would have come to a different conclusion if we had advised on this assumption at the 2012 valuation. Therefore, we propose that Special members commute pension in line with the assumption used for FPS 2007 Scheme members at the 2012 valuation (which is different from the assumption for FPS 2007 Scheme members at the 2016 valuation).

- > Other assumptions: Use the same assumptions as per standard retained members.

For the 2016 valuation, all other assumptions for Special members have been set to be the same as for standard retained members. There is no reason to believe we would have come to a different conclusion if we had advised on these assumptions at the 2012 valuation. Therefore, we propose all other assumptions are set to be those used for standard retained members at the 2012 valuation.