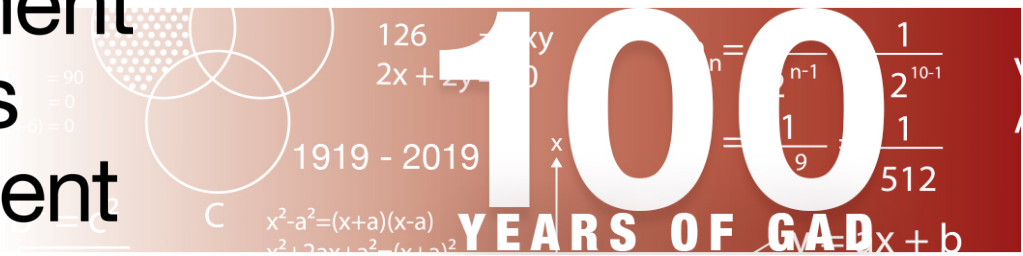
Government Actuary's Department



Armed Forces Pension Scheme (AFPS)

Actuarial valuation as at 31 March 2016
Advice on assumptions

Date: 28 February 2019

Authors: Alan Dorn and Joanne Rigby

Contents

1 Executive summary

This report contains our recommendations for the best estimate assumptions to be set by the Secretary of State for the 2016 valuation of the Armed Forces pension arrangements.

1.1 An actuarial valuation of the Armed Forces pension arrangements[1] (the 'Schemes') is being carried out as at 31 March 2016. The Public Service Pensions (Valuations and Employer Cost Cap) Directions 2014 as amended by the (Amendment) Directions 2018 ("the Directions") require that, unless specified otherwise[2], the assumptions to be adopted for this valuation will be set by the Secretary of State, having obtained advice from the scheme actuary. Direction 19(c) requires the assumptions to be the Secretary of State's best estimates.

1.2 GAD is the appointed scheme actuary to the Schemes. This report sets out GAD's formal advice to the Secretary of State on the actuarial assumptions to be adopted where these are not otherwise specified. The advice covers the assumptions to be set by the Secretary of State. 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 for the future, past experience, both recent and longer term, generally provides the most reliable evidence. However, other known developments and anticipated future events may also influence how assumptions are set. This advice sets out relevant analysis of recent experience and indicates which other factors have been considered in deriving recommendations of best estimate assumptions.

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

- Changes in post-retirement mortality assumptions
- Changes in ill-health retirement assumptions
- Changes in the promotional salary scale for other ranks

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

[1] The Schemes' governing legislation includes: *The Navy, Army and Air Force Pensions (Armed Forces Pension Scheme 1975 And Attributable Benefits Scheme) (Amendment) Warrants 2010, The Armed Forces Pension Scheme Order 2005, The Armed Forces Early Department Payments Scheme Order 2005, The Armed Forces Pension Regulations 2014* (SI 2014/2336) and *The Armed Forces Early Departure Payments Regulations 2014* (SI 2014/2328).

[2] Certain assumptions are specified in the Directions.

1.6 This report was provided to the Secretary of State in draft form in June 2017. It has been signed alongside the formal valuation report. No substantive changes have been made. The Secretary of State has already confirmed to GAD that the actuarial assumptions to be adopted for the valuation should be those set out in this report.

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

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

Assumption	Summary of recommended assumptions	Rationale for recommendation	Approximate impact of proposed change in assumptions (% of pay)	
			Employer contributions (2019-23)	Cost cap
Pensioner baseline mortality[3]	Aligned to standard SAPS table[4,5]	In light of 2012-2016 experience[6].	(0.2%)	(0.1%)
Normal health	110% x S2PXA			
Ill-health (current)	110% x S2PXA			
Ill-health (future)	110% x S2PXA			
Dependants	110% x S2PXA			
Age retirement			No change in assumption	
AFPS 75/05 and other transitionally protected members	Age-dependent rates, with significant allowance for retirements at IP/EDP points and all retiring by age 55.	No change. 2012-16 experience distorted by redundancy exercises so not suitable as a guide to the future.		
New entrants to AFPS 15	Age-dependent rates, with significant allowance for retirements at EDP point and all retiring by age 60.	No change. No relevant evidence so proposal remains in line with 2012 assumptions.		
AFPS 75/05 and other unprotected members	Gradual change between protected and new entrant patterns above	No change. 2012-16 experience distorted by redundancy exercises so not suitable as a guide to the future.		

[3] As directed by HMT, future improvements in mortality are assumed to be in line with those underlying the most recent ONS population projections.
[4] SAPS tables are published by the Actuarial Profession and are based on the experience of self-administered pension schemes from 2004 to 2011. The S2 series has separate standard tables based on experience of members retiring in normal health (S2NXA), in ill health (S2IXA), combined normal and ill health (S2PXA) and for widows (S2DFA).
[5] 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.
[6] In general 50% of the observed difference in experience since the 2012 assumptions were set has been taken into account when resetting assumptions.

Assumption	Summary of recommended assumptions	Rationale for recommendation	Approximate impact of proposed change in assumptions (% of pay)	
			Employer contributions (2019-23)	Cost cap
Ill-health retirement				
Incidence	Age-dependent rates, separate for officers and other ranks	No change. 2012-16 experience distorted by backlog of cases and use of discretion around medical discharges so not suitable as a guide to the future.	(0.8%)	(0.8%)
Split by tier	50% on Tier 1; 25% on Tier 2; 25% on Tier 3	Tier 1 proportion slightly increased from 2012 assumptions to reflect MoD's expectation of more Tier 1 cases. Tier 2/3 split shifted towards Tier 2 in light of 2012-16 experience.		
Withdrawal	Age-dependent rates across all schemes, separate for officers and other ranks	No change. 2012-16 experience distorted by redundancy exercises so not suitable as a guide to the future.	No change in assumption	
Death before retirement	70% of rates from UK Interim Life Tables	No change. Experience broadly similar to previous assumptions and assumption not material.	No change in assumption	
Promotional salary scale	Age-dependent scales, separate for officers and other ranks. Separate scales for 'representative pay' used to calculate AFPS 75 benefits.	OR scale reduced to 85% of 2012 scale. No change to OF scale or to representative pay scales. In light of 2012-2016 experience[7].	(0.2%)	(0.2%)

[7] In general 50% of the observed difference in experience since the 2012 assumptions were set has been taken into account when resetting assumptions.

Assumption	Summary of recommended assumptions	Rationale for recommendation	Approximate impact of proposed change in assumptions (% of pay)	
			Employer contributions (2019-23)	Cost cap
Commutation				
New entrants to AFPS 15	In line with centrally set assumption set out in the Directions. No inverse commutation of EDP lump sum.	No change. No scheme experience available. Inverse commutation of EDP lump sum is cost neutral.		
AFPS 75 and AFPS 05 unprotected	AFPS 15 pension: in line with centrally set assumption. AFPS 75 and AFPS 05: zero commutation. No inverse commutation of EDP lump sum.	No change. No AFPS 15 experience available. Commutation unavailable in AFPS 75 and AFPS 05, except for life and resettlement commutation where terms are set to be cost neutral. Inverse commutation of EDP lump sum is cost neutral.	No change in assumption	
Family statistics				
Proportion married	Officers: 90% (M), 65% (F) at retirement Other ranks: 80% (M), 60% (F) at retirement Consistent assumptions for existing pensioners	Male OR rates reduced to 80% from 85% at 2012 valuation. No change to other rates. In light of 2012-2016 experience[8].	(0.2%)	(0.1%)
Proportion married/partnered[9]	All percentages above increased by 5% of members at retirement (consistent assumptions for existing pensioners)	No change (no evidence)	No change in assumption	
Age difference	Male member 3 years older than partner Female 3 years younger than partner	No change (no evidence)	No change in assumption	
Remarriage and children's pensions	No allowance	No change. Not material. Remarriages after 1 April 2015 no longer result in cessation of spouses' pensions for AFPS 75	No change in assumption	

[8] In general 50% of the observed difference in experience since the 2012 assumptions were set has been taken into account when resetting assumptions.
[9] In AFPS75, dependants' benefit are only paid to legal spouses. In APFS05 and the 2015 scheme, benefits may also be paid to other cohabiting partners who were financially dependent or interdependent.

2 Introduction

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

2.1 An actuarial valuation of the Armed Forces pension arrangements (AFPS or the 'Schemes') is being undertaken as at 31 March 2016. The Public Service Pensions (Valuations and Employer Cost Cap) Directions 2014 as amended by the (Amendment) Directions 2018 ("the Directions") require that, unless specified otherwise[10], the actuarial assumptions to be adopted for this valuation are the responsibility of the Secretary of State, having taken advice from the scheme actuary. Direction 19(c) requires the assumptions to be the Secretary of State's best estimates.

2.2 GAD is the appointed scheme actuary to the Schemes. This report is addressed to the Secretary of State 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 Secretary of State to determine the required best estimate assumptions.

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

- Pensioner mortality
- Age retirement from service
- Ill-health retirement from service
- Voluntary withdrawal from service
- Death before retirement
- Promotional pay progression
- Commutation of pension for cash at retirement
- Family statistics

Appendix B includes other calculation assumptions as required to complete the valuation and Appendix C sets out assumptions made for data uncertainties.

2.4 This report was provided to the Secretary of State in draft form in June 2017. It has been signed alongside the formal valuation report. No substantive changes have been made. The Secretary of State has already confirmed to GAD that the actuarial assumptions to be adopted for the valuation should be those set out in this report.

[10] Certain assumptions are specified in the Directions.

2.5 Defence Business Services (DBS), the Schemes' administrator, supplied data on the experience of the scheme membership over the four-year period to 31 March 2016. We have used this data to analyse the Schemes' experience in order to develop our advice on the assumptions. Our report, *AFPS Actuarial Valuation 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.

2.6 When considering appropriate assumptions for the future, past experience, both recent and longer term, generally provides the most reliable evidence. However, other known developments and anticipated future events may also influence how assumptions are set. This advice sets out relevant analysis of recent experience and indicates which other factors have been considered in deriving recommendations of best estimate assumptions. The Secretary of State should consider whether there is any reason why this approach would be inappropriate.

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

- it is released in full
- the advice is not quoted selectively or partially
- GAD is identified as the source of the report, and
- GAD is notified of such release.

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

3 General considerations

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

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

Directions

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

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

Different populations

3.3 Regulation 113 of the Scheme Regulations[11] requires this actuarial valuation to cover both the scheme established under the Public Service Pensions Act 2013[12] ('AFPS 15') and the previous pension schemes for the armed forces ('pre-2015 schemes'). 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***[13]. 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 AFPS 15 is not expected to have any impact on this group's behaviours
- New members to AFPS 15. These members' retirement behaviours are expected to be heavily influenced by the provisions of AFPS 15
- Members with service in both AFPS 15 and the pre-2015 schemes. Over time, as the proportion of AFPS 15 scheme service increases, the retirement behaviours are expected to become increasingly influenced by the provisions of that scheme.

[11] SI 2014/2336 The Armed Forces Pension Regulations 2014
[12] Public Service Pensions Act 2013
[13] 1 April 2019 to 31 March 2023

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

Relative importance of assumptions

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

Flexible Service

3.7 Flexible Service in the Armed Forces comes into force on 1 April 2019. This will enable service personnel to temporarily reduce their full time commitment, either through part-time working and/or reducing their liability to separated service. This could change the profile of the Armed Forces by enabling members to remain in the Armed Forces for longer. This would affect assumed rates of withdrawal and retirement. However, the current expectation is that the number of members affected will be relatively low. We have not made any allowance in this report for any possible changes as a result of Flexible Service.

Split between regulars and reservists

3.8 We understand that the proportion of active members who are reservists is expected to increase further over the next few years. However, we are not aware of any significant changes expected to the overall profile of the armed forces as a result of the increased proportion of reservists and therefore have made no allowance in this report for this effect.

4 Pensioner mortality

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

Proposed assumptions for 2016 valuation

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

Table 4.1: Recommended mortality assumptions

	2016 valuation		2012 valuation[14]		
Baseline mortality	**Standard table[15]**	**Adjustment**	**Standard table**	**Officer Adjustment**	**Other Rank Adjustment**
Officers					
Retirements in normal health	S2PXA	110%	S1NXA	88%	118%
Current ill-health pensioners	S2PXA	110%	S1NXA	88%	118%
Future ill-health pensioners	S2PXA	110%	S1NXA	88%	118%
Dependants	S2PXA	110%	S1NXA	88%	118%

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

[14] The 2012 valuation assumptions differentiated between officers and other ranks. The equivalent single assumption would have been 110% of S1NXA tables.

[15] SAPS (S2) tables are published by the Actuarial Profession and based on the experience of self-administered pension schemes over the period 2004 to 2011. The 'S2' series includes separate standard tables based on experience of members retiring in normal health (S2NXA) and in ill health (S2IXA) and for female dependants (S2DFA). The S3 series of tables are expected to be released by CMI during December 2018, these updated mortality tables cover experience between 2009 and 2016. Based on the draft S3 tables issued during 2018, GAD have concluded that moving to the S3 tables, once they are released, 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 although we would expect to analyse mortality experience against the S3 tables for future valuations.

Comparison of expected pensioner longevity

4.3 The table below gives a comparison of the resulting life expectancies[16] (allowing for future improvements) assumed and recommended for the 2012 and 2016 valuations. The Directions specify that the future improvement basis for the 2016 valuation should be the ONS 2016 projections.

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

	2016 valuation		2012 valuation	
	Officers	**Other Ranks**	**Officers**	**Other Ranks**
Current pensioners				
Male aged 55	31.5	31.5	34.3	31.5
Male aged 65	21.7	21.7	24.3	21.7
Female aged 55	33.0	33.0	36.9	34.0
Female aged 65	23.3	23.3	26.8	24.2
Future pensioners – current age 40				
Male life expectancy from age 55	33.1	33.1	36.2	33.4
Male life expectancy from age 65	24.1	24.1	27.0	24.4
Female life expectancy from age 55	34.6	34.6	38.7	35.8
Female life expectancy from age 65	25.6	25.6	29.5	26.9

Use of the assumption

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

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

Analysis and setting the assumption

4.5 We have analysed the actual pensioner mortality experience over the four-year period to 31 March 2016 on an 'amounts' basis. An amounts basis weights the experience by the size of each member's pension. To derive an assumption we have compared the actual amounts of pension ceasing on deaths with those expected had the members' experience been in line with the mortality rates in the relevant current SAPS tables ('S2 Tables'). The recommended assumption of baseline pensioner mortality is expressed by reference to suitable adjustments to the rates in the relevant S2 table ('the base table'). The analysis was carried out using ONS 2014 projections, being the set of projections available at the time that the analysis was carried out. Previous analysis carried out by GAD suggested that the impact of using ONS 2014 or 2016 projections for mortality analysis would be minimal.

4.6 The four year period ending on the valuation date showed significant volatility in mortality experience year on year. This is illustrated in table 4.3 below. The figures shown are the ratios of actual to expected death rates with expected rates based on the 2012 valuation assumptions, adjusted as appropriate for each period analysed. This analysis suggests that differing conclusions may have been drawn had the valuation date and inter-valuation period fallen differently. The volatility is believed to be largely a reflection of environmental factors such as weather. As assumptions are intended to reflect long term expectations it is reasonable to seek to smooth out the impact of these short term effects. Our recommendation is that the short term effects should be smoothed out by taking only 50% of the difference in experience since the 2012 valuation.

Table 4.3 – variation in rates of death by scheme year

Year	Males (A/E[17] based on 2012 assumption)	Females (A/E based on 2012 assumption)
2012-13	101.4%	98.2%
2013-14	103.2%	106.2%
2014-15	106.9%	98.6%
2015-16	101.0%	92.9%
Overall	103.2%	98.8%

[17] A/E is the ratio of actual to expected experience – a figure over 100% means that actual experience was heavier than expected and vice versa.

Results of analysis

4.7 The relevant indicators in the data provided were not sufficiently reliable to support separate analysis by normal health/ill health, officers/other ranks or members/dependants. In addition, the number of deaths for females was too small to be statistically credible. Therefore, aggregate analysis was carried out for males only, to determine an overall percentage adjustment to the standard tables. The same percentage adjustment is recommended for males/females (using male and female standard base tables respectively), normal health/ill health, officers/other ranks and members/dependants.

4.8 Table 4.4 sets out the number of pensioner deaths and amount of pension ceasing due to deaths over the intervaluation period. Figures are shown separately for male and female members. In each case these are compared with the expected figures from the 2012 valuation assumption and from the unadjusted 2016 base table.

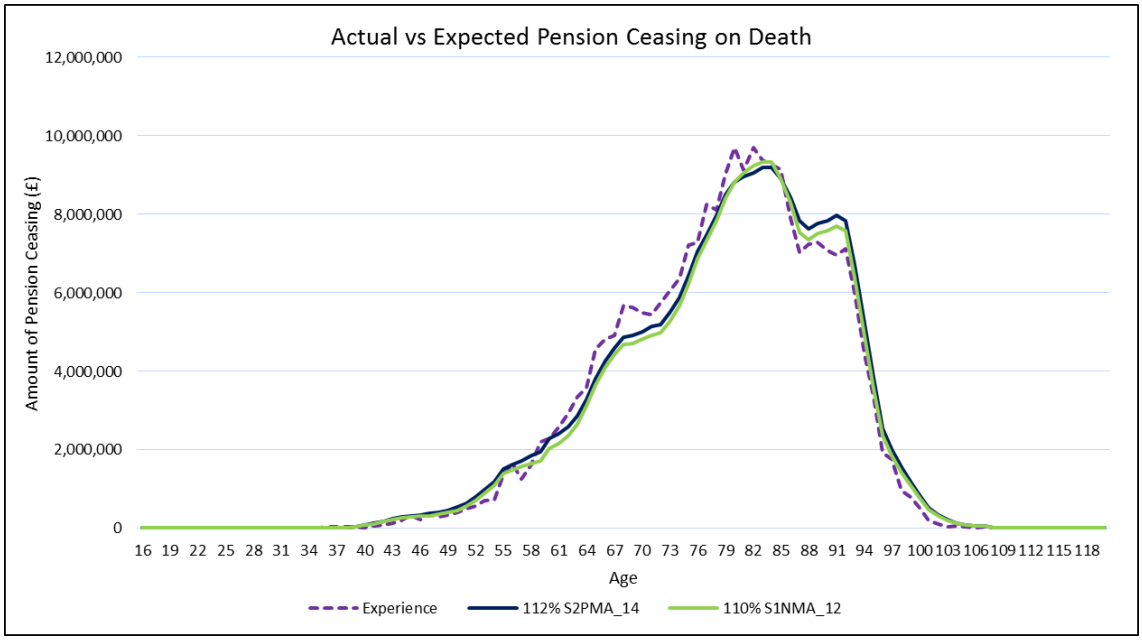
Table 4.4: Pensioner mortality experience 2012-16 (includes dependants)

Category	Number of Pensions ceasing due to death	Pension amount ceasing due to deaths £'000s (pa)	A/E[18] relative to the 2012 valuation assumption	A/E relative to the S2 Base Tables
Males	24,894	249,488	103.2%	111.7%
Females	14,260	54,310	98.8%	99.2%

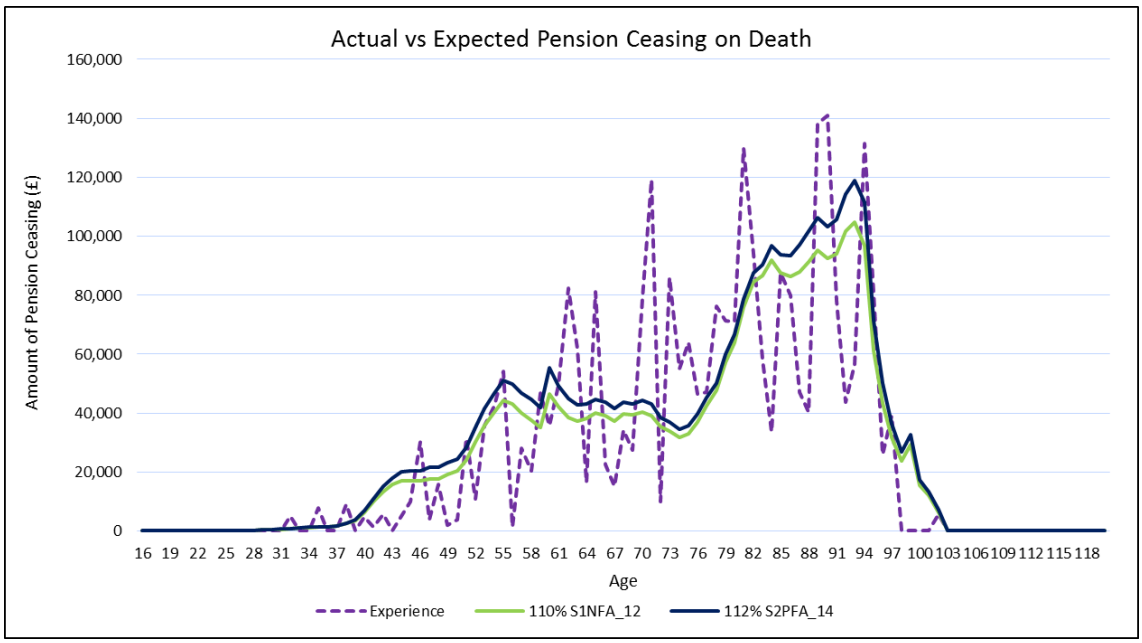
4.9 The charts below show by age, and for males and females separately, a comparison of the actual mortality experience (amount of pension ceasing) over the four year period (purple dashed line) with that expected based on the 2012 valuation assumption (green line) and the best fit to the actual experience based on the most appropriate S2 base table (blue line).

[18] A/E is the ratio of actual to expected experience – a figure over 100% means that actual experience was heavier than expected and vice versa.

Graph 4.1: Male pensioner mortality experience 2012-16



Graph 4.2: Female pensioner mortality experience 2012-16



Comments on analysis

4.10 The chart for females shows that there is not enough experience to derive a robust specific assumption. Instead we are recommending using the female equivalent of the S2 standard table derived from the mortality experience for males. This implicitly assumes that the relative health, socio-economic and other relevant characteristics of female AFPS pensioners, when compared to the pensioner population underlying the S2 tables, will be similar to those of male AFPS pensioners.

4.11 There is much evidence[19] 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. In the 2012 valuation, the data received was insufficient for an amounts analysis. However, to mitigate this issue, separate assumptions were made for officer and other rank mortality, using data from the 2005 valuation when more robust identifiers were available.

4.12 For the 2016 valuation, we have been able to carry out an amounts analysis, and again we do not have robust identifiers to allow separate office and other rank analysis. We are therefore recommending a single set of assumptions across officers and other ranks.

[19] 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*.

5 Age retirement from service

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

Proposed assumptions for 2016 valuation

5.1 We recommend that rates of age retirement are set separately for members who will continue in the existing schemes after April 2015, for new entrants to AFPS 15, and for those who will have service in the AFPS 15 and previous schemes. Sample rates are provided in Appendix A.

Previous valuation assumptions

5.2 The proposed 2016 assumptions are unchanged from those adopted for the previous valuation.

Use of the assumptions

5.3 Age retirement rates specify the rate at which members are assumed to retire on grounds other than ill-health. These rates include rates of retirement with an immediate pension (IP) or Early Departure Payment (EDP) once IP/EDP point has been reached.

5.4 Relatively few service personnel remain in service up to their normal pension age. Most service personnel either withdraw before reaching their IP/EDP point or exit with an IP/EDP before normal pension age. The assumptions for retirement around the IP/EDP point are therefore more financially significant than the assumptions for retirement close to normal pension age.

Analysis and setting the assumption

5.5 To set recommended assumptions for members remaining in the existing schemes we analysed the pattern of age retirements from active membership over the four year period to 31 March 2016 for members of the following schemes:

- Armed Forces Pension Scheme 75 (AFPS 75)
- Armed Forces Pension Scheme 05 (AFPS 05)
- Full Time Reserve Service Pension Scheme (FTRSPS)
- Reserve Forces Pension Scheme (RFPS).

There was insufficient data to perform a credible analysis of the AFPS 05/RFPS or AFPS 15 separately. In total we analysed around 22,800 age retirements (including redundancies) of which around 20,000 related to AFPS 75/FTRS. This analysis compared the number of actual retirements to the expected numbers of retirements under the 2012 assumptions.

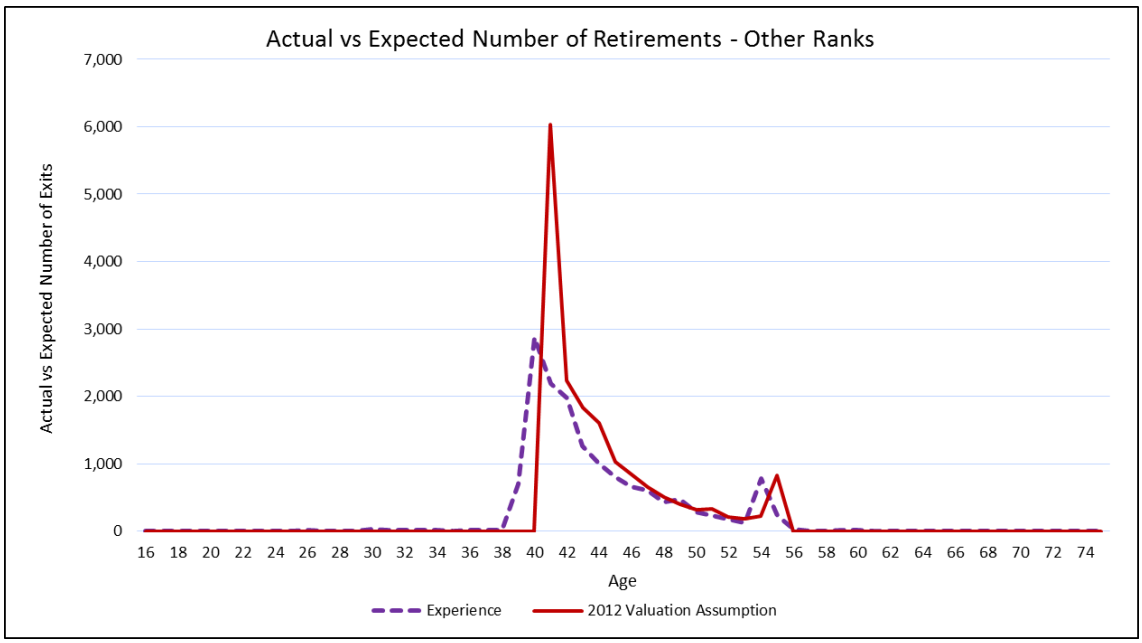
Results of the analysis

5.6 The graphs below show a comparison of the actual intervaluation experience (purple dashed line) with that expected based on the 2012 assumptions (red line) for officers and other ranks, excluding retirements flagged as due to redundancy. As we are proposing retaining the 2012 assumptions, the red line also represents the proposed 2016 assumptions. The graphs are presented both by age and length of service.

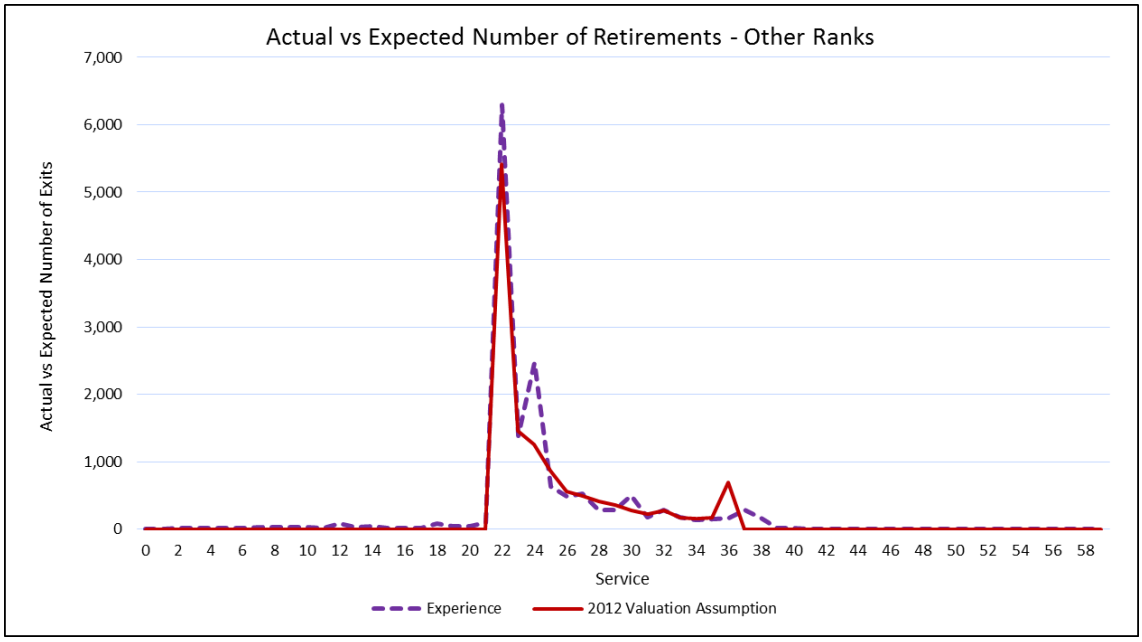
Graph 5.1: Proposed Officer Age Retirement Assumption (excluding redundancies) by age

Graph 5.2: Proposed Officer Age Retirement Assumption (excluding redundancies) by service

Graph 5.3: Proposed Other Rank Age Retirement Assumption (excluding redundancies) by age



Graph 5.4: Proposed Other Rank Age Retirement Assumption (excluding redundancies) by service



Comments on age retirement analysis

5.7 The analysis showed that experience over the period has been broadly in line with the assumptions adopted for the 2012 assessment for other ranks, but somewhat heavier for officers. However, we note this is likely to be distorted by the effects of redundancy exercises in the intervaluation period. (We also note that there is some uncertainty around the reliability and completeness of the redundancy indicators provided with the data.) As the intervaluation experience is not likely to be typical of future periods, it does not provide robust evidence to support a change to the assumed levels of retirements at this valuation.

5.8 There is some evidence of retirements after age 55 and the MoD's view is that there could be an increase in the proportion of members who stay in service after age 55. However, as the numbers of members involved are relatively low, this does not yet provide significant evidence as a guide to future experience, and also is not material to the overall valuation results. We therefore do not propose to make changes to the retirement assumptions after age 55 at this stage.

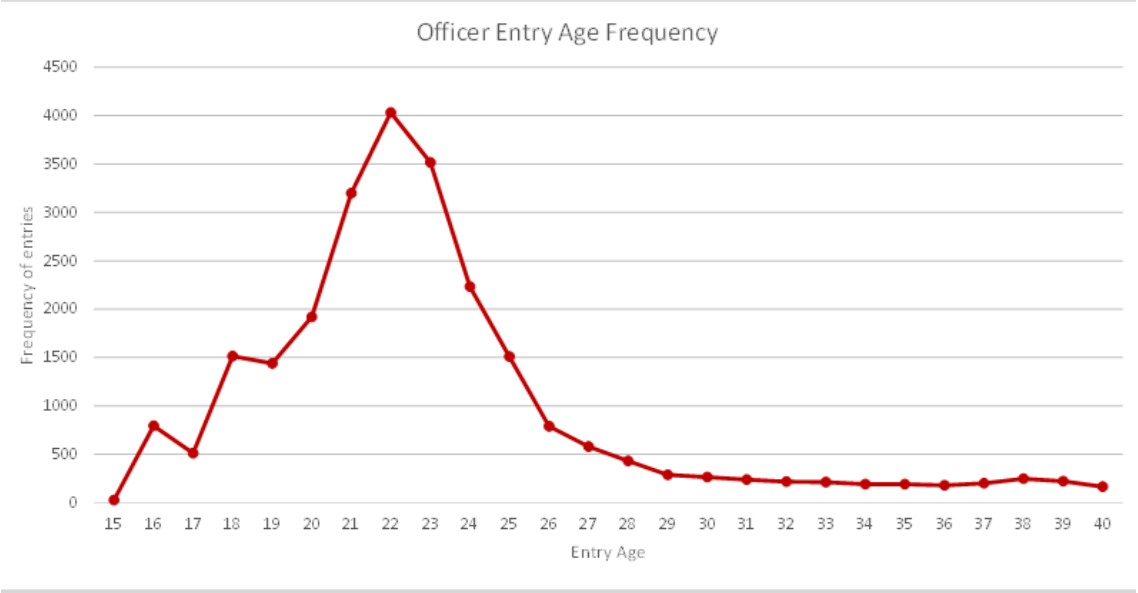
5.9 The MoD has expressed a view that in future there may be higher withdrawals before EDP point and lower levels of EDP retirements. However, there is currently insufficient evidence to justify a change in assumptions.

Entry age

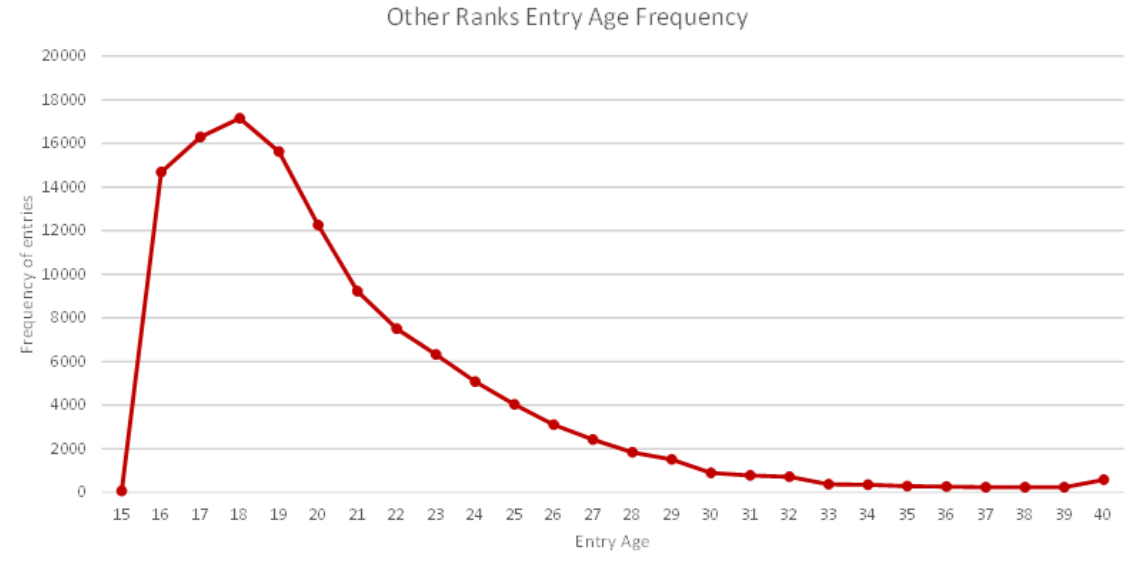
5.10 The proposed assumptions are age-related, but in deriving them we have allowed for the fact that the qualification points for immediate pension and early departure payments (IP/EDP) are age- and service-related. For this purpose average entry ages of 24 for officers and 19 for other ranks have been assumed, based on analysis of entry ages from the 2016 active membership data. These assumptions are unchanged from the 2012 valuation, which is consistent with the views expressed by MoD. While there is a suggestion that typical entry ages may have reduced slightly, there is also a relatively long 'tail' of older joiners, and on balance the evidence does not appear to be significant enough to justify a change in assumptions at this valuation.

5.11 Graphs 5.5 and 5.6 below show the distribution of entry ages from the 2016 data.

Graph 5.5: Officer Entry Age Frequency Chart based on 2016 data



Graph 5.6: Other Rank Entry Age Frequency Chart based on 2016 data



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 separate sets of unisex assumptions for officers and other ranks are used for the incidence of:

- non-attributable ill-health retirement benefits under AFPS 75
- ill-health retirement benefits under Tier 1 in AFPS 05 and AFPS 15
- ill-health retirement benefits under Tiers 2/3 in AFPS 05 and AFPS 15.

The assumed overall incidence peaks at around 1% a year for other ranks and around ½% a year for officers. Sample rates are provided in Appendix A.

6.2 The recommended assumptions reflect that of all those exiting AFPS 05 and AFPS 15 on ill-health grounds, 50% will receive Tier 1 benefits, 25% will receive Tier 2 benefits and 25% will receive Tier 3 benefits.

Previous valuation assumptions

6.3 The proposed 2016 assumptions are unchanged from those adopted for the previous valuation for AFPS 75.

6.4 For AFPS 05 and AFPS 15, there is no change in the assumed overall incidence of ill-health retirement, but the assumptions about the split by tier have been amended. For the 2012 valuation it was assumed that 40% would receive Tier 1 benefits, 20% would receive Tier 2 benefits and 40% would receive Tier 3 benefits.

Use of the assumptions

6.5 Ill-health retirement rates specify the rate at which members are assumed to retire on grounds of ill-health. The assumed eligibility for Tier 1, 2 or 3 awards specifies the benefits which will be provided. The rates of mortality experienced after ill-health retirement are also relevant to the valuation calculations. Post retirement mortality is addressed in Chapter 4.

6.6 Benefits on attributable ill-health retirement in relation to conditions or events after 5 April 2005 are provided under the Armed Forces Compensation Scheme (AFCS), and those in relation to conditions or events before 6 April 2005 are provided under the War Pension Scheme (WPS) or the attributable benefit provisions of AFPS 75. Attributable benefits are outside the scope of this valuation.

Analysis and setting the assumption

6.7 There were around 8,708 ill-health retirements over the four-year period to 31 March 2016 compared to an expected 3,978 retirements based on the 2012 assumptions.

6.8 We have compared the actual rate of ill-health retirements (by rank and age of retirement) to the expected rate from the 2012 actuarial valuation. We have also compared the proportions retiring on each tier to the expected proportions from the 2012 valuation.

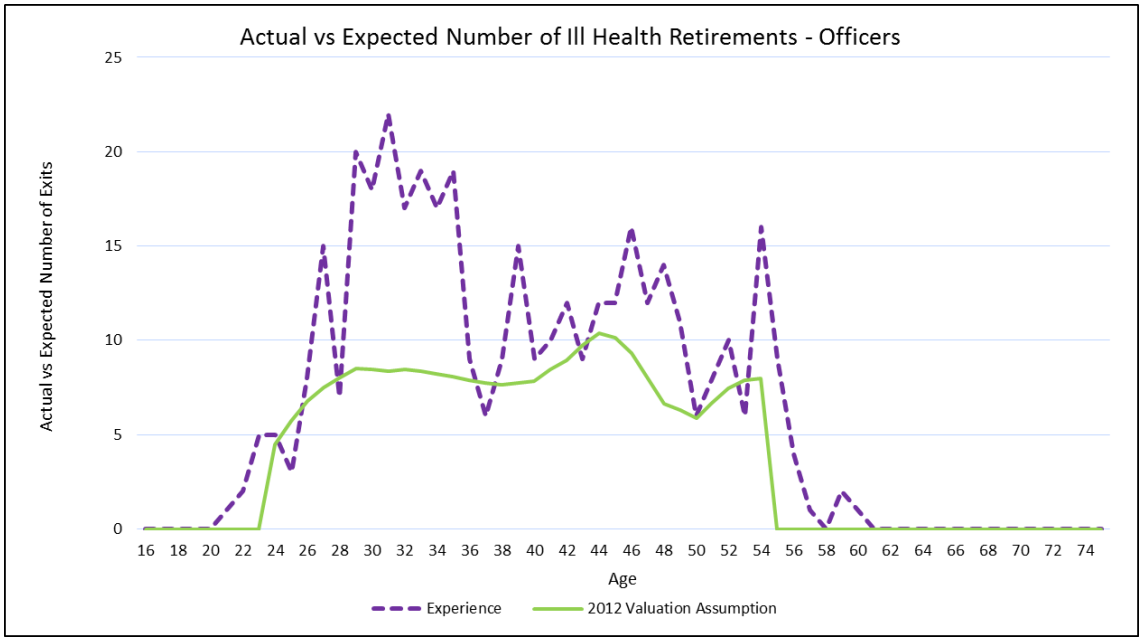
6.9 The number of ill-health retirements in the data received for women was not high enough to give credible support to separate rates for men and women. We therefore recommend that unisex tables continue to be used.

Results of analysis

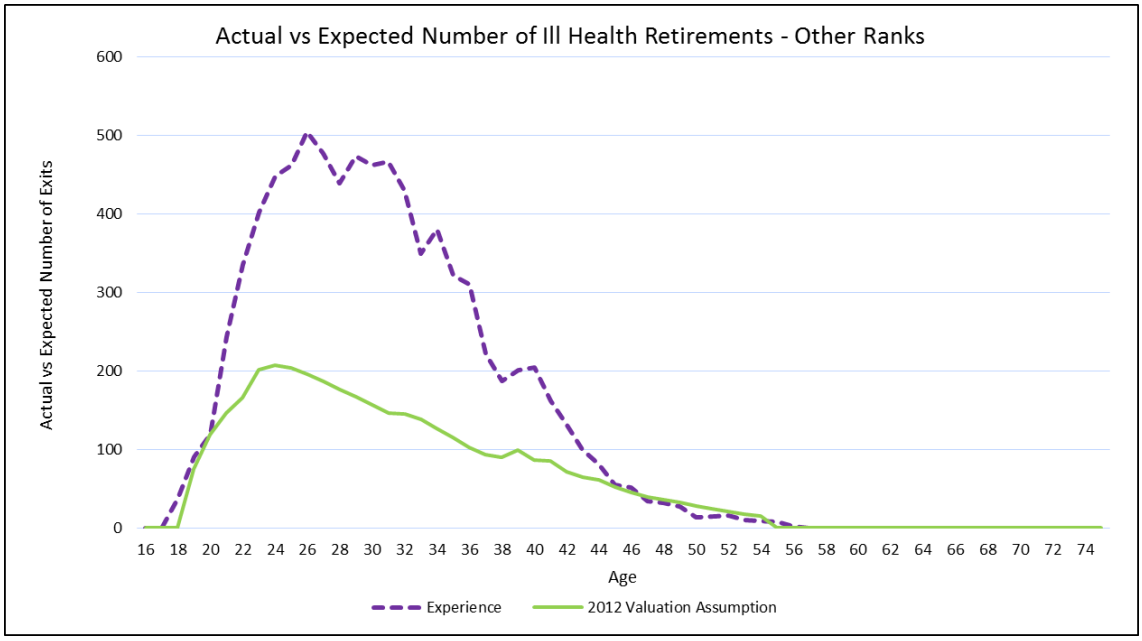
Ill health incidence

6.10 The graphs below compare the actual number of actual ill-health retirements from 2012-16 by age (purple dashed line) with the expected numbers based on 2012 assumptions (green line).

Graph 6.1: Officer ill-health retirement rate experience



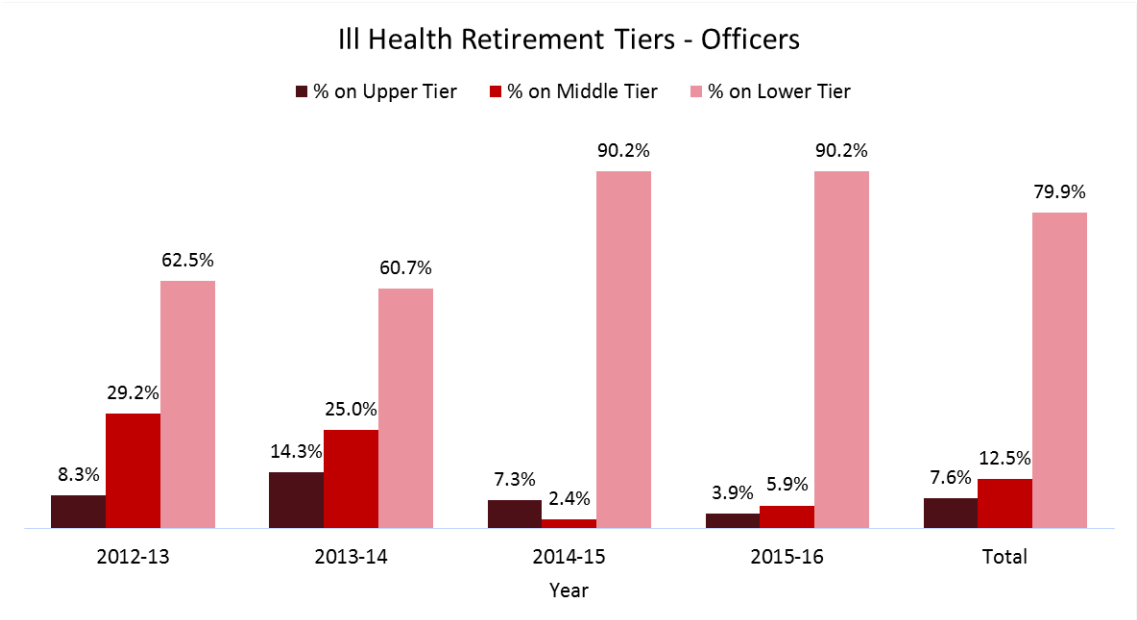
Graph 6.2: Other rank ill-health retirement rate experience



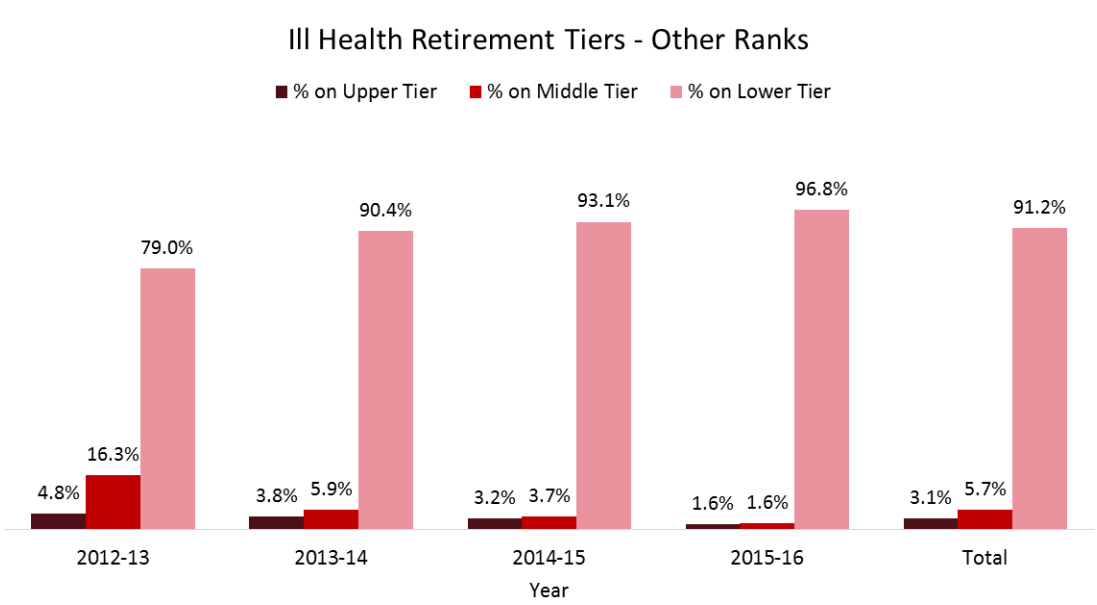
Split between tiers

6.11 The graphs below show the percentage of members retiring on ill-health grounds over the four-year period who qualified for Tier 1, 2 or 3 awards. Tier 1 is the lower tier; tier 2 the middle tier, and tier 3 the upper tier.

Graph 6.3: Officer Tier Retirements



Graph 6.4: Other Rank Tier Retirements



Comments on analysis

6.12 The analysis showed that overall experience over the period has been significantly higher than the assumptions adopted for the 2012 valuation for both officers and other ranks.

6.13 However, evidence from DBS states that this is likely to have been distorted by a backlog of 4,000-5,000 earlier ill-health cases identified in 2009-10, many of which are likely to have been processed in the intervaluation period.

6.14 Evidence from the Army also states that as 2012-16 was a period of workforce reduction, the exercise of discretion around medical discharges is likely to have led to higher levels of discharge than would be typical in periods of stable or increasing workforce size. However, the Army does not have evidence to support any specific assumption for the future.

6.15 The proposal, supported by the views of MoD stakeholders, is that the levels of overall incidence in 2012-16 are unlikely to form a good basis for setting assumptions about the future, and hence that it would be appropriate to retain the assumed levels of overall incidence from the 2012 valuation.

6.16 The 2012-16 experience shows a very high proportion of Tier 1 incidence. This is again likely to be distorted by the points mentioned in 6.13-6.14 above. However, MoD stakeholders have commented that they would expect the majority of ill-health cases arising to be Tier 1. This is consistent with the 2005-12 evidence for AFPS 05 of around 70% Tier 1, noting that this evidence only related to younger service personnel and those who took the offer to transfer from AFPS 75, so will not be fully representative.

6.17 The proposal is to increase the assumed Tier 1 proportion from the previous assumption of 40% to 50%, reflecting the limited evidence available.

6.18 The 2012-16 experience shows around twice as many Tier 2 cases as Tier 3. This evidence is less likely to have been distorted by the exercise of discretion around medical discharge as these are relatively serious cases. The previous assumption was that there would be twice as many Tier 3 cases as Tier 2.

6.19 The proposal is to move the assumed Tier 2/Tier 3 split to 50/50. In line with the general approach, this is halfway between the previous assumption and the 2012-16 experience.

6.20 To make the ill-health assumptions more transparent for future valuations, the proposal is to present separate rates of ill-health retirement for Tier 1 and Tier 2/3. This is reflected in the proposed assumptions in Appendix A.

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 separate sets of unisex assumptions for officers and other ranks are used for the purposes of the valuation, applying equally to those members who remain in the existing schemes and those who join the new scheme. The recommended rates decrease with age and are assumed to be zero from the IP/EDP qualification point (around age 40). Sample rates are provided in Appendix A.

Previous valuation assumptions

7.2 The proposed 2016 assumptions are unchanged from those adopted for the previous valuation.

Use of the assumptions

7.3 Withdrawal rates specify the rate at which members are assumed to leave before normal pension age or IP or EDP point, becoming entitled to either deferred benefits or, for those with less than two years' service, a refund of contributions or a transfer value.

Analysis and setting the assumption

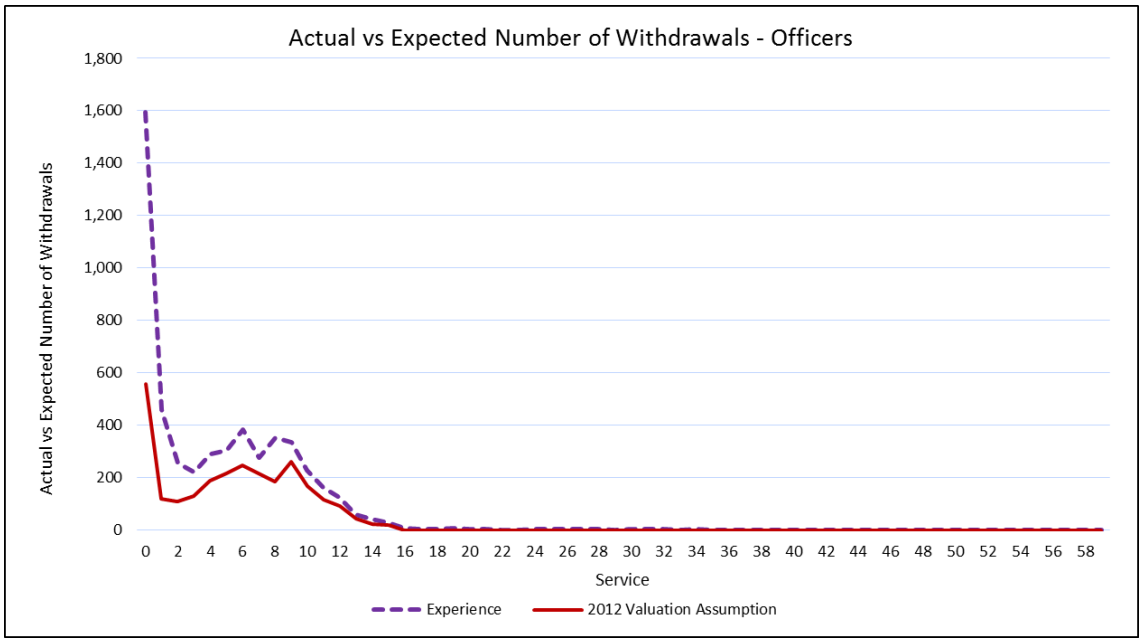
7.4 We have analysed the pattern of withdrawals from active membership over the four year period to 31 March 2016 for AFPS 75 and AFPS 05 combined. There were around 67,800 withdrawals over the period compared to an expected 62,600 withdrawals based on the 2012 assumptions.

7.5 There is very little evidence of members rejoining the Schemes after leaving. For the avoidance of doubt, all members assumed to withdraw are assumed not to rejoin.

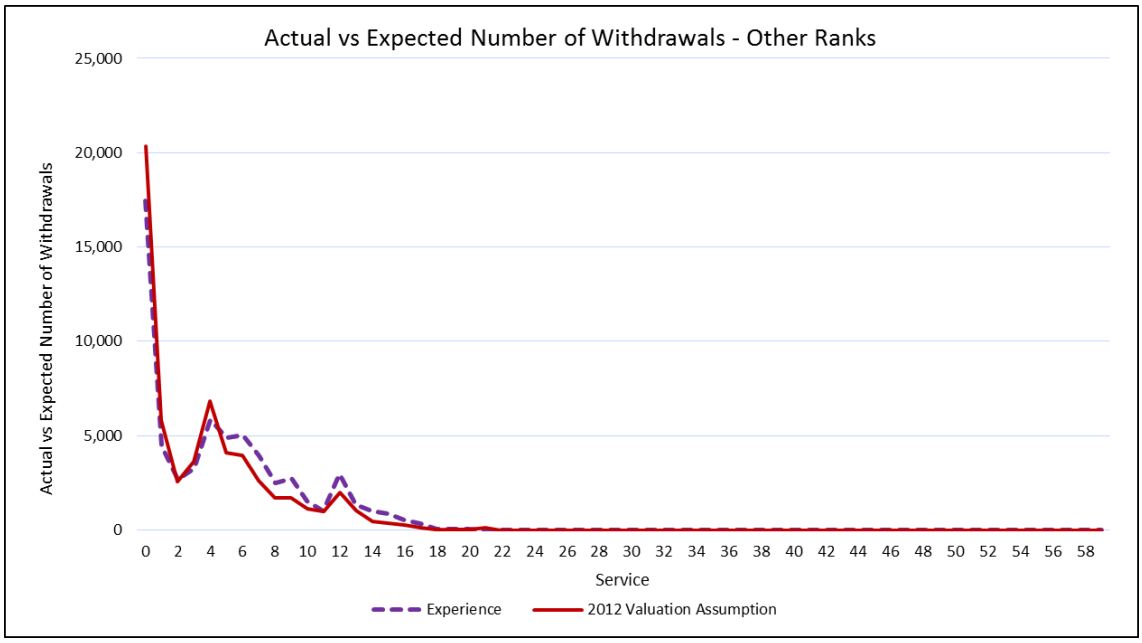
Results of analysis

7.6 The graphs below compare actual withdrawals from 2012-16 in the data provided (dashed purple line) with expected withdrawals based on the 2012 assumptions (red line). The analysis shown is by length of service. For calculation purposes the rates are converted to age-dependant rates using the assumed entry ages of 24 for officers and 19 for other ranks.

Graph 7.1: Proposed officer withdrawal rate assumption



Graph 7.2: Proposed other rank withdrawal rate assumption



Comments on analysis

7.7 Experience appears to be heavier than expected, particularly for officers, but this is likely to be due mainly to significant redundancy exercises during the intervaluation period. It is not possible to split out redundancies from other withdrawals in the data available. Therefore the intervaluation experience is not likely to be suitable as a guide to the future.

7.8 In 2015-16, when no redundancy exercises took place, there were around 9,150 actual withdrawals in total compared with 9,530 expected from the 2012 assumptions. This suggests that the overall level of withdrawals is not significantly out of line with the assumptions (actual = 96% of expected).

7.9 Based on the comments above we do not propose any change to the assumptions at this valuation.

8 Death before retirement

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

Proposed assumptions for 2016 valuation

8.1 We recommend a single set of assumptions (separate for men and women) is used to allow for the possibility of death before retirement, ie applying equally to those members who remain in the existing schemes and those who join the new scheme. Assumed rates of death before retirement increase with age but less than 1% of members are assumed to die each year, even at the highest ages. Sample rates are provided in Appendix A.

Previous valuation assumptions

8.2 The proposed 2016 assumptions are unchanged from 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 during the period between leaving service and drawing benefits. The numbers of deaths observed annually and the recommended rates to be assumed are low, and thus this assumption has relatively little financial significance.

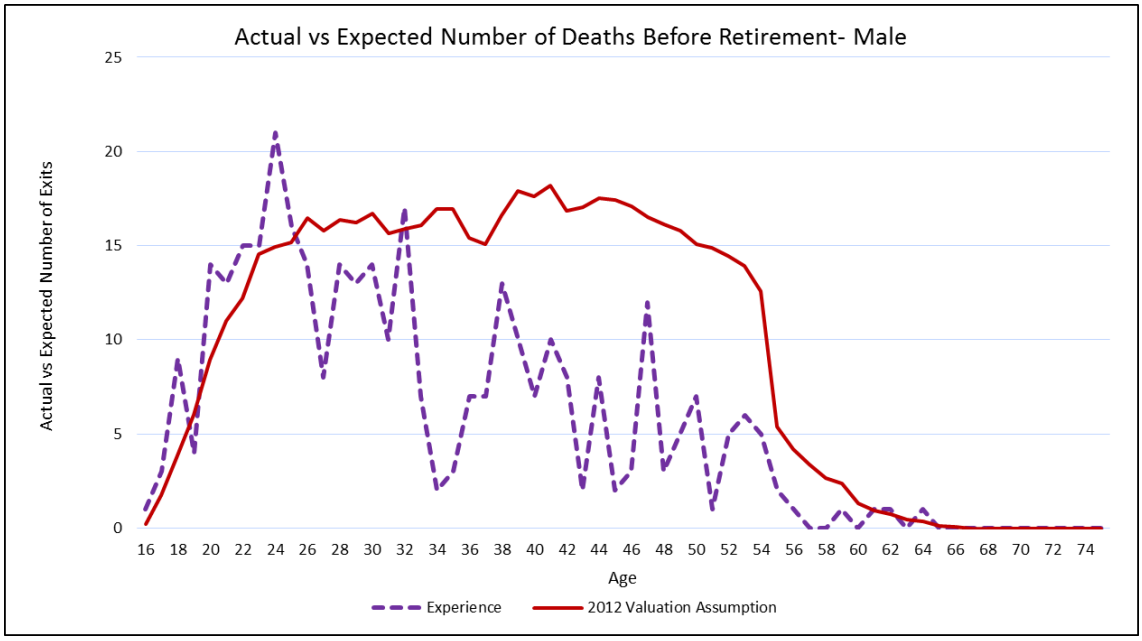
Analysis and setting the assumption

8.4 To formulate a recommended assumption we compared the scheme experience to the expected rates from the 2012 actuarial valuation. In total there were 366 deaths of active members, compared to an expected number of 610 based on the 2012 valuation assumption. Data was only available on deaths of members in active service though the assumption is used for all non-pensioner members.

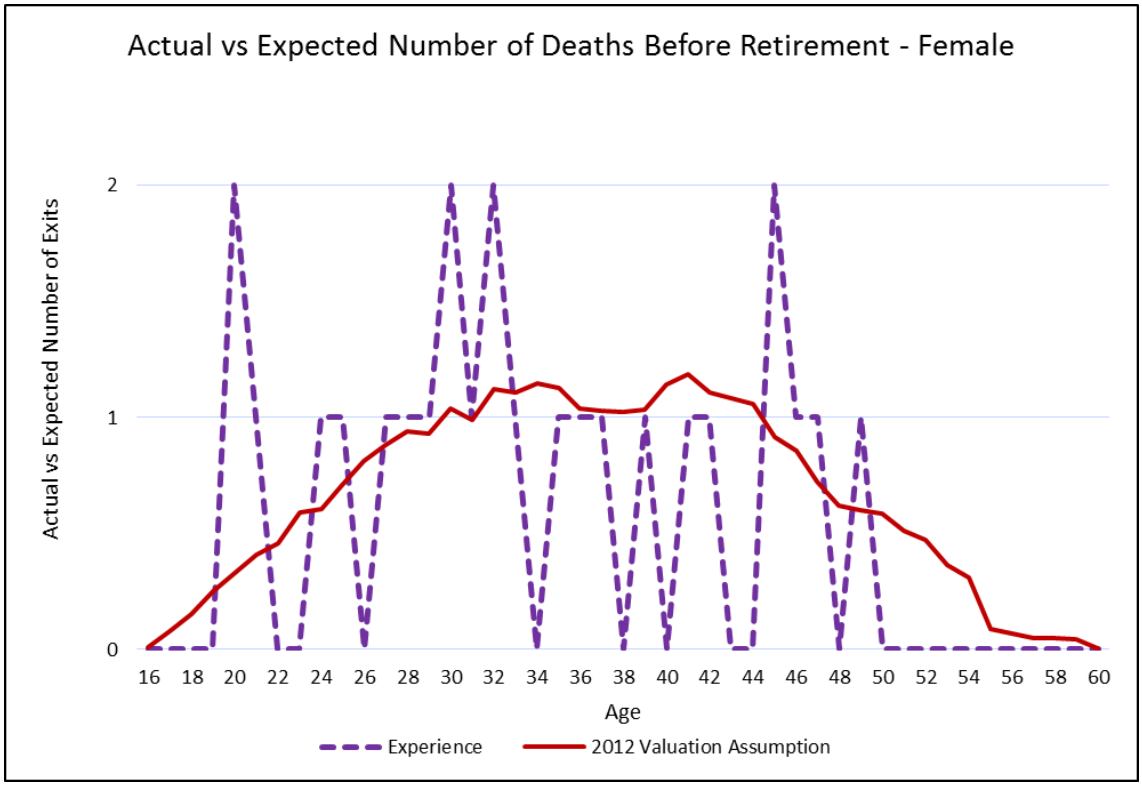
Results of analysis

8.5 The graphs below compare the rates of actual (dashed purple line) and expected (red line) deaths by age for men and women respectively. In each case expected deaths are shown by reference to the 2012 valuation assumptions.

Graph 8.1: Male death before retirement experience 2012-16



Graph 8.2: Female death before retirement experience 2012-16



Comments on death before retirement analysis

8.6 The experience for females is too small to be statistically credible. The actual experience for males is lower than expected. However, given the uncertainty about future levels of conflict and the fact that this assumption is not financially material, we do not recommend any change for this valuation.

9 Promotional pay increases

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

Proposed assumption

9.1 Members' salaries can be considered to increase through a combination of annual general pay awards and promotional/progression pay increases. To calculate an estimate of the level of benefit payable in the future requires assumptions for both these components. The assumption for general pay awards is set out in the Directions. The assumption for promotional pay increases is set by the Secretary of State.

9.2 We recommend that separate sets of unisex assumptions for officers and other ranks are used for the purpose of the valuation, applying equally to those members who remain in the existing schemes and those who join the new scheme. The increases are dependent on members' age and are steeper at younger ages. Sample values from the scales are provided in Appendix A.

9.3 Separate assumptions are needed for pensionable pay (used to determine employer contributions for all schemes and benefits for AFPS 05/RFPS/senior officers in AFPS 75) and 'representative pay' (used to determine pension benefits based on rank for AFPS 75/FTRSPS except for senior officers).

Previous assumption

9.4 For officers, and for representative pay for other ranks, our recommended promotional assumptions are unchanged from those adopted for the 2012 valuation.

9.5 For other ranks our recommended promotional assumptions for pensionable pay are around 85% as steep as those adopted for the 2012 valuation.

Use of the assumption

9.6 For the AFPS 75/FTRSPS and AFPS 05/RFPS schemes, benefits are linked to salary at or near retirement. Members with 10 year transitional protection remained in the old schemes after 31 March 2015 and therefore will continue to have benefits linked to final pensionable pay/representative pay for service beyond this date. Unprotected members started accruing service in AFPS 15 from 1 April 2015. However, the pre-2015 benefits of unprotected members will still be linked to their final pensionable pay/representative pay while they are active members of AFPS 15.

9.7 Future pay progression will be more significant (in terms of expected pension) for those members with 10 year transitional protection because they will continue to have benefits linked to final pensionable pay for service beyond 31 March 2015. The impact of experience differing from the assumptions used is likely to be most material over this and the next valuation cycle as it relates to older existing members. This experience will impact future employer contribution rates and the cost cap mechanism.

Analysis and setting the assumption

9.8 To formulate a recommended assumption we compared the scheme experience to the assumption adopted for the 2012 valuation using a profile analysis. We calculated the implied promotional pay increases by comparing the average pay (representative and pensionable respectively) for each age as at 31 March 2016 to the corresponding average at the next age. These differences are then compared to the assumed promotional increases adopted for the 2012 assessment.

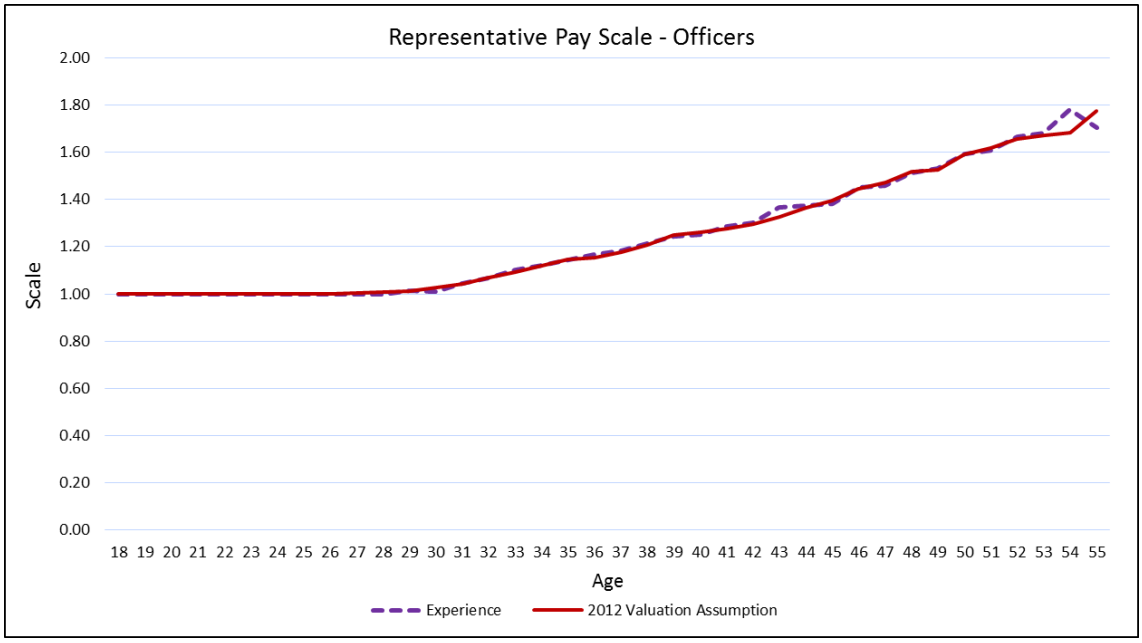
9.9 We have made no allowance for the current period of pay restraint in our analysis as we understand promotional/progression increases have not been significantly affected by this.

9.10 We have separately analysed officer and other rank data. We carried out the analysis on a unisex basis as the evidence for women was less statistically credible and we are not aware of any evidence to suggest significant differences between male and female pay profiles overall.

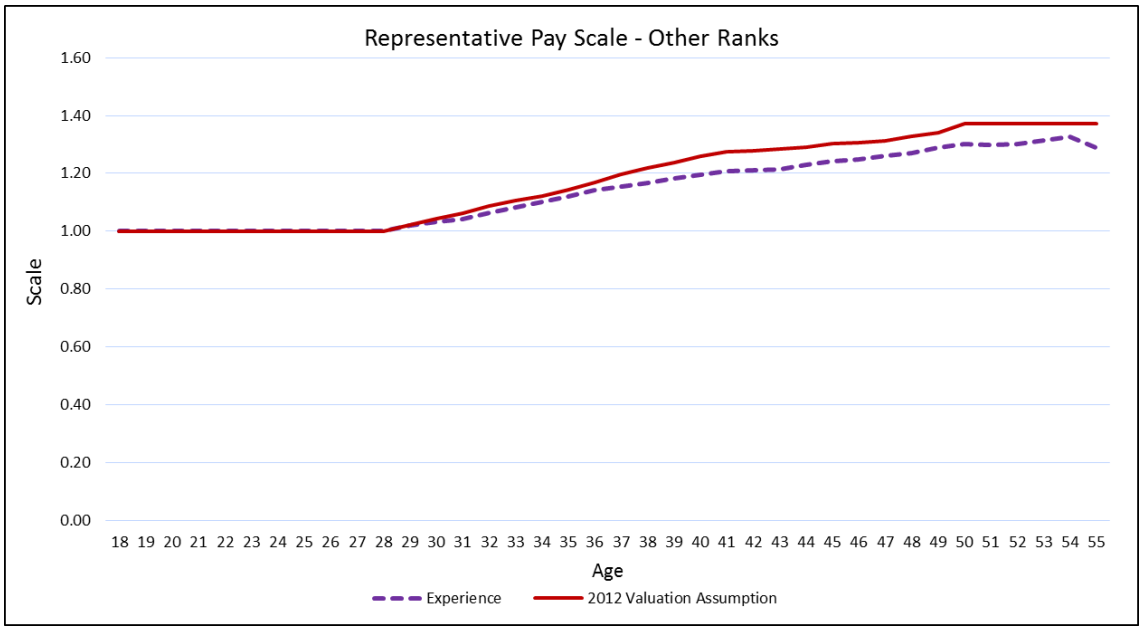
Results of profile analysis

9.11 The graphs below show the implied age related promotional pay scales for officers and other ranks respectively based on the pay profile of all members at the valuation date (dashed purple line). These are compared with the assumed age related promotional scales adopted for the 2012 valuation (red line) for graphs 9.1, 9.2 and 9.3. In graph 9.4, the blue line shows a best fit 2016 assumption and the green line shows the 2012 assumption.

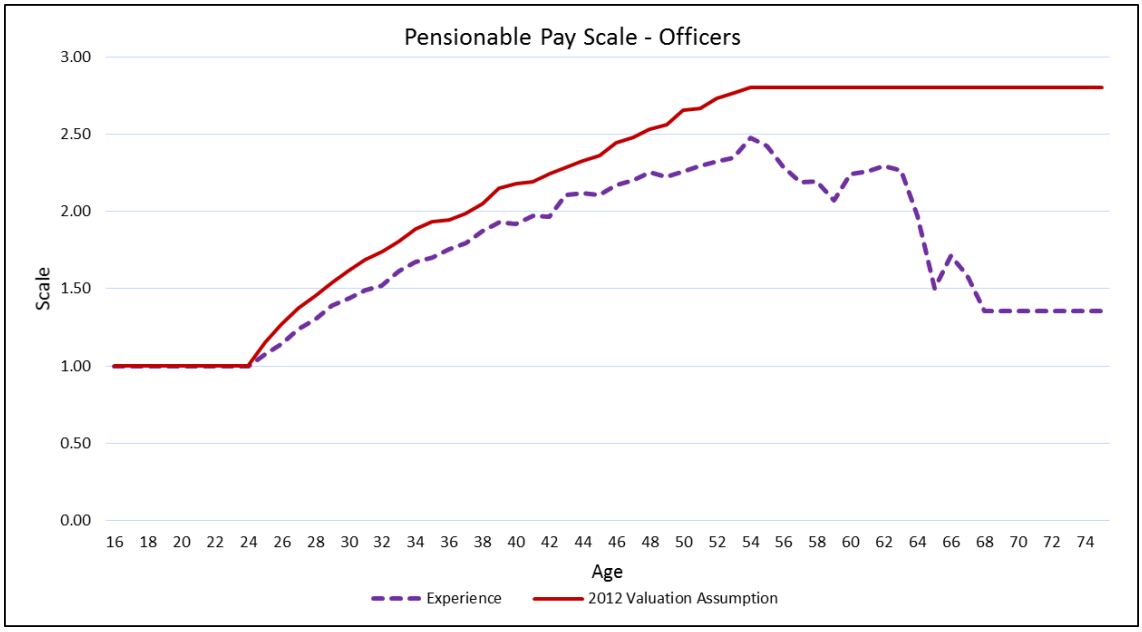
Graph 9.1: Officer representative pay scale



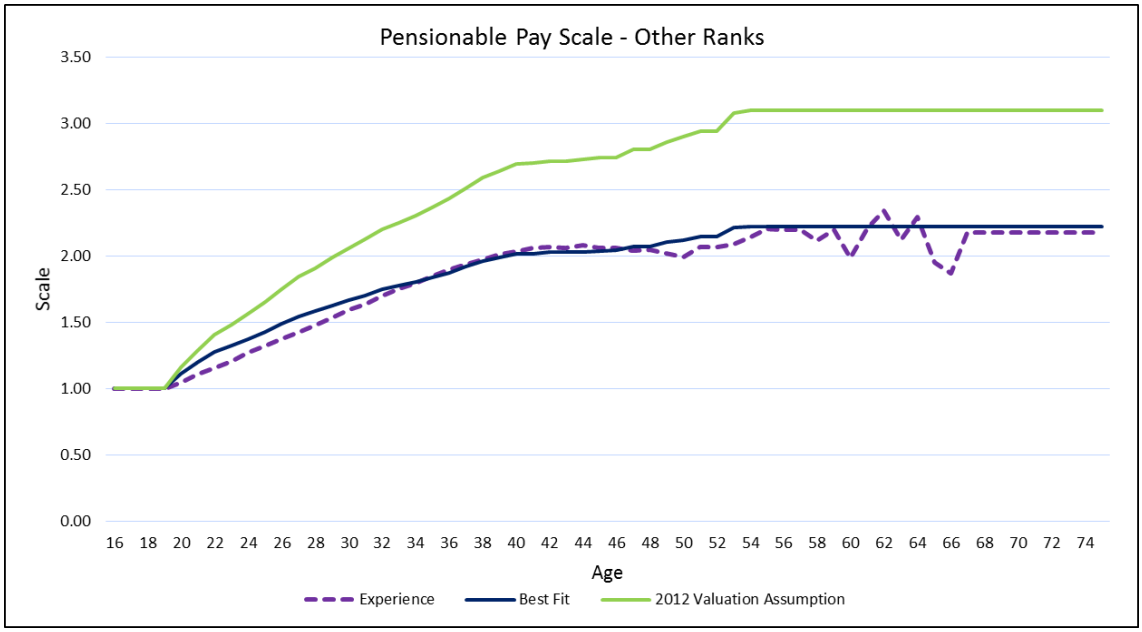
Graph 9.2: Other ranks representative pay scale



Graph 9.3: Officer pensionable pay scale



Graph 9.4: Other ranks pensionable pay scale



Comments on the analysis

9.12 The results of this analysis should be treated with some caution as the analysis is affected by the mixture of members at each age. However, the Armed Forces has reasonably homogeneous patterns of joining and progression by age. In our opinion this analysis therefore gives a broadly reasonable basis for setting assumptions.

9.13 A new Armed Forces pay model has been implemented from 2016 as part of the New Employment Model. We have been informed by MoD that while this may lead to changes in the timings of promotions and progressions, there is no clear evidence to suggest that overall promotional increases over typical full career paths will change significantly as a result. We have therefore based the proposed assumptions on our analysis of past experience.

9.14 The graphs show that the pattern of promotional increases for representative pay implied by the membership profile as at 31 March 2016 were similar to the 2012 assumptions and so we have recommended retaining these for officers and other ranks.

9.15 The graphs show that the pattern of promotional increases for promotional pay implied by the membership profile as at 31 March 2016 were similar to the 2012 assumptions for officers but only around 70% as steep for other ranks.

9.16 For other ranks we therefore recommend adopting lower assumptions. We note that it is not clear if this represents a genuine trend or short-term volatility. We also note the uncertainty around any impact Pay16 may have on promotional pay patterns. For these reasons we recommend taking account of only half the difference in experience since the 2012 valuation, ie adopting rates around 85% as steep as for the 2012 valuation.

10 Commutation of pension for cash at retirement

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

Proposed assumptions for 2016 valuation

10.1 Members of AFPS 15 will be assumed to commute 17.5% of their 2015 scheme pensions for cash as set out in the Directions.

10.2 Other forms of commutation available to members include:

- In AFPS 75, resettlement commutation and life commutation
- In AFPS 05, inverse commutation of scale lump sum for pension
- In AFPS 15, inverse commutation of EDP lump sum for EDP income

Terms for these forms of commutation are set to be cost-neutral to the schemes and so no explicit allowance is proposed.

Previous valuation assumptions

10.3 It was assumed that members commuted 15% of their 2015 scheme pensions for cash in the 2012 valuation as set out in the valuation Directions applicable at that time.

10.4 For the other forms of commutation, the proposed zero allowance is unchanged from the 2012 valuation.

Use of the assumption

10.5 In the AFPS 15, members may commute part of their pension for a lump sum at a rate of £12 for each £1 of pension given up. In this scheme, the assumption about the amount of pension commuted is important because the value of the pension given up, as assessed using the actuarial assumptions underlying the valuation is, on average, more than £12 and so commutation has a significant impact on total liabilities and contribution rates. Differences between assumed and actual commutation experience in AFPS 15 will feed through into the cost cap fund.

11 Family statistics

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

Proposed assumptions for 2016 valuation

11.1 We recommend the following assumptions.

- For officers, 90% of men and 65% of women are assumed to be married at retirement with consistent assumptions for current pensioners.
- For other ranks, 80% of men and 60% of women are assumed to be married at retirement with consistent assumptions for current pensioners.
- For AFPS 05, RFPS and AFPS 15 where dependants' benefits are payable to qualifying partners rather than just legal spouses, an additional 5% of members are assumed to have a qualifying dependant at retirement, with consistent assumptions for current pensioners.
- Men are assumed to be three years older than their partners and women are assumed to be three years younger than their partners.
- On the grounds of materiality, no allowance is made for dependent children's benefits.

Previous valuation assumptions

11.2 The proposed assumptions for proportions married are the same as those adopted for the 2012 valuation for officers and for female other ranks. For male other ranks the proposed assumption of 80% is reduced from the 85% assumed in the 2012 valuation, reflecting 50% of the difference between actual experience and the 2012 assumption.

11.3 The proposed adjustment for qualifying partners in AFPS 05, RFPS and AFPS 15 is unchanged from the 2012 valuation.

11.4 The proposed age differences between members and partners and zero allowance for children's benefits are unchanged from the 2012 valuation.

Use of the assumptions

11.5 Dependants' pensions are provided to qualifying dependants on the death of a member. In some connected schemes, notably AFPS 75, dependants' pensions are payable to legal spouses only. In other connected schemes such as AFPS 05 and AFPS 15, dependants' pensions are payable to qualifying partners as well as to legal spouses. Assumptions are required for the proportion of members who are married or partnered to determine how many dependants' pensions will be paid. Assumptions are required about age differences between members and partners as this affects how long dependants' pensions will be paid for.

11.6 In AFPS 75, a surviving dependant's pension used to cease upon remarriage. However, from 1 April 2015 remarriages no longer result in cessation of spouses' pensions, and applications for ceased pensions to be restored are no longer subject to a means test.

11.7 In AFPS 05 and AFPS 15 scheme benefits continue to be paid following remarriage.

11.8 Benefits may also be payable to dependent children.

Analysis and approach to setting the assumptions

11.9 No data was available about the married or partnered status of recent pensioner deaths. However, marital status indicators were available for the 2016 active membership. We analysed this information to derive assumed proportions married at retirement. We note that while the implied proportions married for women are considerably lower than those for men, the experience for women is relatively limited.

11.10 To formulate a recommended assumption at older ages (for current pensioners) we compared the proportions married at retirement from scheme experience with population proportions married[20]. We then assumed that at older ages the same relationship between scheme and population proportions married would hold. One particular advantage of this approach is that it leads to a straightforward way of setting the assumption for the proportion married or partnered (required for AFPS 05 and AFPS 15 scheme members) by making use of the ONS statistics on cohabitation.

11.11 No data was obtainable on age differences between members and their spouses or partners. The recommended assumption is based on experience in the general population and other occupational pension schemes. It is also consistent with the assumption used for the 2012 valuation. We do not expect this assumption to have a material effect on the valuation results.

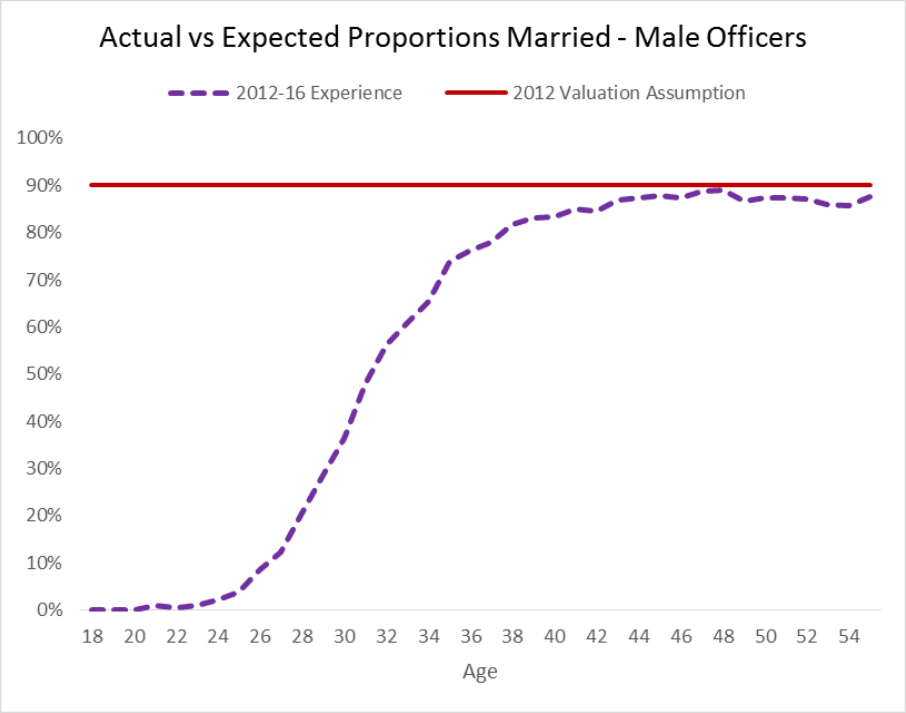
[20] Published by the Office for National Statistics (ONS)

11.12 No data was obtainable for the 2016 valuation on children's pension experience. However, we understand from MoD that the number of children's pension awards has been relatively low in recent years. We recommend that no allowance is made for children's benefits as we do not expect this to have a material effect on the valuation results. This is consistent with the assumption used for the 2012 valuation.

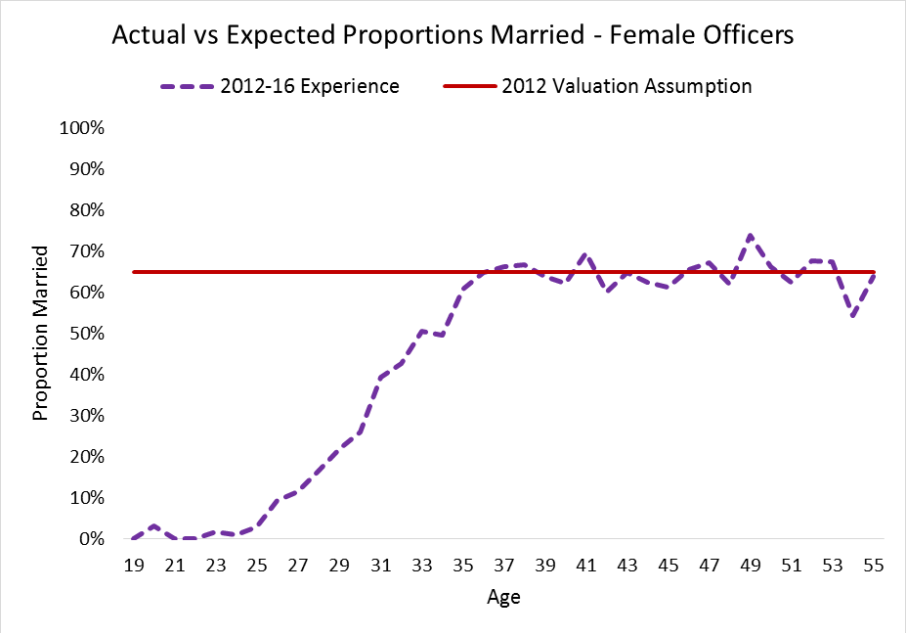
Results of analysis

11.13 The graphs below show actual proportions married by age for active members from the 2016 valuation data (dashed purple line) compared to the 2012 assumption (red line, or green line for male other ranks).

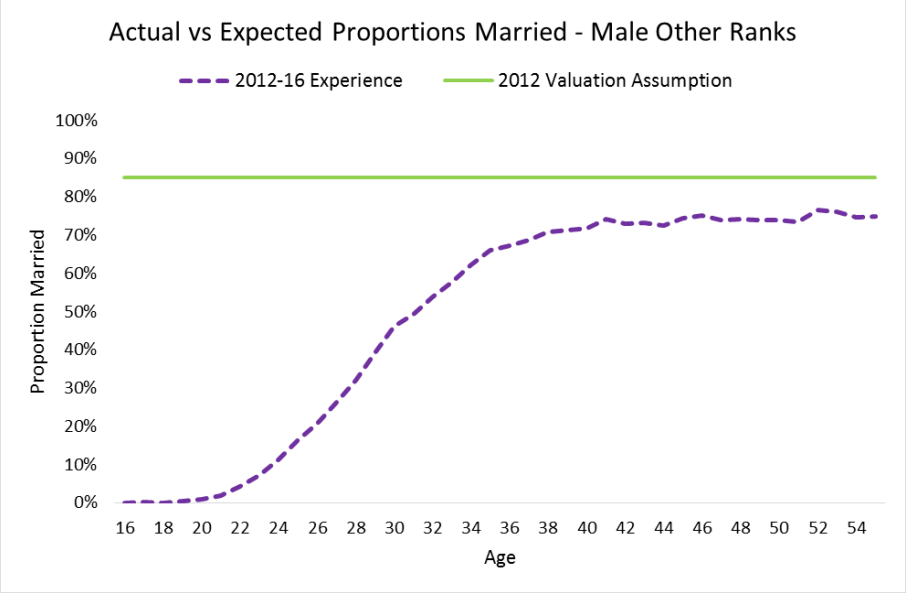
Graph 11.1: Male officer proportion married



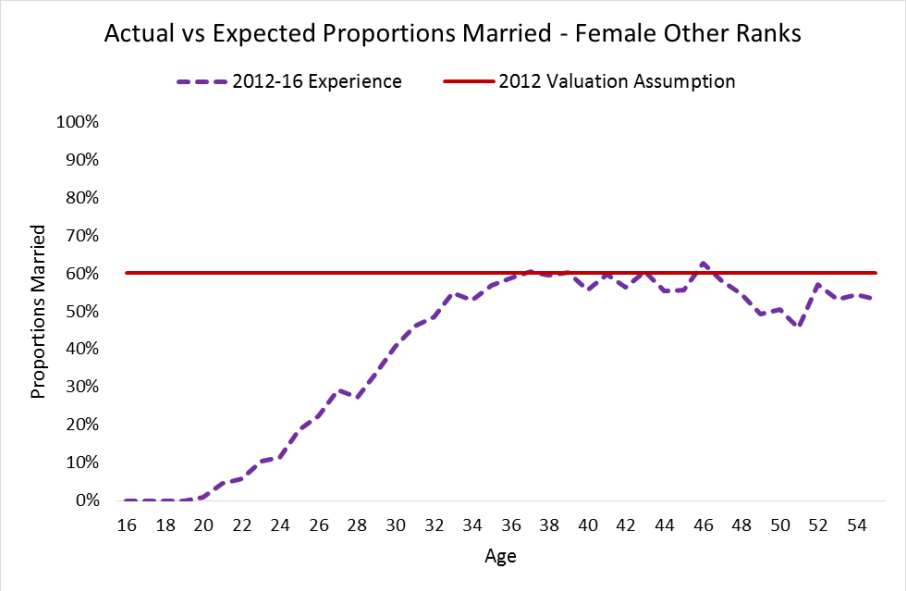
Graph 11.2: Female officer proportion married



Graph 11.3: Male other rank proportion married



Graph 11.4: Female other rank proportion married



Comment on analysis

11.14 The marital status of scheme members close to retirement from the active membership data as at 31 March 2016 is reasonably consistent with the assumptions made for the 2012 valuation.

11.15 However, male other ranks have a lower proportion married at retirement than assumed at the 2012 valuation (around 75% compared to 85%). At this stage it is not clear if this represents a trend or fluctuation over time. We therefore recommend half the difference in experience is reflected in the assumption to be adopted for the 2016 valuation, by reducing the assumption for male other ranks from 85% to 80%.

Appendix A: Details of assumptions

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

Pensioner mortality

Table A1: Baseline mortality assumptions

Baseline mortality	Standard table[21]	Adjustment
Retirements in normal health	S2PXA	110%
Current ill-health pensioners	S2PXA	110%
Future ill-health pensioners	S2PXA	110%
Dependants	S2PXA	110%

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

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

Age retirement from service

Table A2: Age retirement rates for members with 10 year transitional protection

Age	AFPS 75 officers	AFPS 75 other ranks	AFPS 05 officers	AFPS 05 other ranks
40	0.100	0.000	0.000	0.500
41	0.070	0.500	0.000	0.200
42	0.060	0.200	0.230	0.200
43	0.050	0.200	0.050	0.200
44	0.050	0.200	0.050	0.200
45	0.050	0.150	0.050	0.150
46	0.050	0.150	0.050	0.150
47	0.050	0.150	0.050	0.150
48	0.050	0.150	0.050	0.150
49	0.100	0.150	0.100	0.150
50	0.150	0.150	0.150	0.150
51	0.150	0.200	0.150	0.200
52	0.150	0.150	0.150	0.150
53	0.150	0.150	0.150	0.150
54	0.200	0.200	0.200	0.200
55	1.000	1.000	1.000	1.000

Table A3: Age retirement rates for new entrants joining AFPS 15

Age	Officers	Other ranks
40	0.000	0.500
41	0.000	0.200
42	0.000	0.200
43	0.000	0.200
44	0.307	0.200
45	0.050	0.150
46	0.050	0.150
47	0.050	0.150
48	0.050	0.150
49	0.100	0.150
50	0.150	0.150
51	0.150	0.200
52	0.150	0.150
53	0.150	0.150
54	0.200	0.200
55	0.200	0.200
56	0.200	0.200
57	0.200	0.200
58	0.200	0.200
59	0.200	0.200
60	1.000	1.000

Table A4: Age retirement rates members with service in AFPS 75/AFPS 05 and AFPS 15

	AFPS 75 and AFPS 15		AFPS 05 and AFPS 15	
Age	Officers	Other ranks	Officers	Other ranks
40	0.075	0.125	0.000	0.500
41	0.053	0.425	0.000	0.200
42	0.045	0.200	0.058	0.200
43	0.038	0.200	0.013	0.200
44	0.114	0.200	0.243	0.200
45	0.050	0.150	0.050	0.150
46	0.050	0.150	0.050	0.150
47	0.050	0.150	0.050	0.150
48	0.050	0.150	0.050	0.150
49	0.100	0.150	0.100	0.150
50	0.150	0.150	0.150	0.150
51	0.150	0.200	0.150	0.200
52	0.150	0.150	0.150	0.150
53	0.150	0.150	0.150	0.150
54	0.200	0.200	0.200	0.200
55	0.800	0.800	0.400	0.400
56	0.200	0.200	0.200	0.200
57	0.200	0.200	0.200	0.200
58	0.200	0.200	0.200	0.200
59	0.200	0.200	0.200	0.200
60	1.000	1.000	1.000	1.000

Ill-health retirement from service

Table A5: Ill-health retirement rates for all members

Age	Officers			Other ranks		
	AFPS 05 and AFPS 15		AFPS 75	AFPS 05 and AFPS 15		AFPS 75
Age	Tier 1	Tier 2/3		Tier 1	Tier 2/3	
20	0.000	0.000	0.000	0.003	0.003	0.006
25	0.001	0.001	0.002	0.003	0.003	0.006
30	0.001	0.001	0.002	0.003	0.003	0.006
35	0.001	0.001	0.002	0.003	0.003	0.007
40	0.001	0.001	0.002	0.004	0.004	0.007
45	0.001	0.001	0.003	0.004	0.004	0.008
50	0.002	0.002	0.004	0.005	0.005	0.010
55	0.000	0.000	0.000	0.000	0.000	0.000

For AFPS 05 and AFPS 15 Tier 2/3 ill-health retirements, 50% are assumed to be on Tier 2 and 50% on Tier 3.

Withdrawal from service (without entitlement to immediate benefits)

Table A6: Withdrawal rates for all members

Age	Officers	Other ranks
20	0.000	0.125
25	0.020	0.105
30	0.045	0.045
35	0.025	0.020
40	0.005[22]	0.010[23]
45+	0.000	0.000

Death before retirement

Table A7: Death before retirement rates for all members

Age	Males	Females
20	0.0004	0.0002
25	0.0005	0.0002
30	0.0006	0.0003
35	0.0009	0.0004
40	0.0012	0.0007
45	0.0017	0.0010
50	0.0025	0.0017
55	0.0040	0.0025

[22] 0.000 for AFPS 75 members due to IP entitlement
[23] 0.000 for AFPS 05 and AFPS 15 members due to EDP entitlement

Promotional pay increases

Table A7: Promotional salary scales for all members

The salary scale shows assumed pay progression in excess of general wage inflation in comparison to an index base of 100 at entry (age 24 for officers and 19 for other ranks)

Age	AFPS 05, AFPS 15 and AFPS 75 pensionable pay		AFPS 75 representative pay	
	Officers	Other ranks	Officers	Other ranks
20		113		100
25	116	154	100	104
30	161	185	102	117
35	193	209	114	128
40	218	233	126	141
45	236	236	139	145
50	266	248	159	153
55	280	263	177	153
60	280	263	177	153

Commutation of pension for cash at retirement

Members of AFPS 15 are assumed to commute 17.5% of their 2015 scheme pension for cash. No allowance is made for any other commutation options.

Family statistics

Table A8: Recommended proportion married at retirement for future pensioners in AFPS 75

	Officers	Other ranks
Males	90%	80%
Females	65%	60%

Proportions partnered (for AFPS 05 and AFPS 15) are assumed to be 5% higher than proportions married at retirement, with consistent assumptions for current pensioners.

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

Appendix B: Modelling approach and minor assumptions

Active membership projections

B.1 Direction 11[24] requires the actuary to use the 'projected unit methodology' to calculate the valuation results. The valuation results require the calculation of the cost of benefit accrual over periods after the effective date (31 March 2016). The expected cost of benefits provided to members remaining in the pre-2015 schemes under the provisions of transitional protection differs from the expected cost of providing members with benefits in the 2015 scheme. Further the expected cost of providing benefits varies for members with differing benefit provisions within the pre-2015 schemes. This implicitly requires the actuary to estimate the membership to future dates in order to determine the valuation results.

B.2 Since the great majority of members (around 96%) were accruing benefits in the 2015 scheme at the effective date, and further given that the remaining members continuing to accrue benefits in the pre-2015 scheme are expected to rapidly decline to close to nil over the future periods being considered in this valuation, a pragmatic approach to estimating the future membership of each scheme over the relevant future periods is suitable.

B.3 The approach taken has three component assumptions:

- Members of the pre-2015 sections at the valuation date are assumed to retire in line with recent experience.
- The overall profile of the membership in terms of average age and pay distribution is assumed to remain constant over the period.

These assumptions enable the average cost of accrual based on the proportions of members in each scheme in any period to be determined.

- The overall active membership will be in receipt of pensionable pay for each relevant year equal to that assumed by the Ministry of Defence for forecasting purposes.

This assumption is required only to determine any contributions required for past service adjustments.

[24] The Public Service Pensions (Valuations and Employer Cost Cap) Directions 2014, as amended by the Directions 2018.

Grouping of individual active member records

B.4 Individual active members have been grouped together for the purposes of calculating liabilities. This grouping is necessary to accommodate the volume of data within our valuation system. The approach taken to grouping the data has been tested to ensure it does not result in any distortion of the valuation results. The groupings are made for each scheme (i.e. AFPS 75, AFPS 05 or AFPS 15), protection status (i.e. protected or unprotected), between officers and other ranks, and by age nearest birthday at the effective date.

Accrual cost methodology

B.5 When determining the costs of accrual as required by Directions 27(1)(d) and 40(1) the cost for members in each group at each relevant date has been estimated by assuming a stable overall population, by age, over all relevant periods in conjunction with an assumed linear run off of protected groups from the effective date. The cost over each relevant period has been taken as the average of the cost at the start and end of each period. The calculation allows for mortality improvements assuming the calculation date is the midpoint of each period.

B.6 Direction 11 requires use of the projected unit methodology to determine the valuation results. Directions 14, 16 and 17 specify some modifications to the financial assumptions in the short term. An implication of the short term modifications is that the projected unit methodology is expected to result in an increasing standard contribution rate over successive periods. For example the cost of accrual under the pre-2015 schemes over the period 2016 - 2019 is lower than that over the period 2019 - 2023 (ignoring any redistribution of members into the 2015 scheme). This effect is not material for final salary benefits and 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.7 Non-accruing benefits such as lump sums payable on death in service have been recognised only when a benefit payment is expected.

Guaranteed Minimum Pensions (GMPs)

B.8 A global adjustment was applied to reduce the past service liability in respect of estimated GMP entitlements for which provision of post SPA pension increases is not the responsibility of the scheme. The reduction is equivalent to a contribution rate of 0.1% over the 15 year period from the implementation date. This estimation has no impact on the calculation of the employer contribution correction cost.

Earnings cap

B.9 For members joining AFPS 75 or AFPS 05 for pensionable service on or after 1 June 1989, pensionable pay is restricted to the 'earnings cap' (unless they have linked service). There are very few members of these schemes whose earnings are either already above the earnings cap or estimated to exceed the earnings cap by retirement. Therefore we have made no allowance for the earnings cap in the valuation. This approximation is not expected to be material.

Public Service Transfer Club (PSTC)

B.10 Allowance has not been made for the potential additional liabilities arising from inward transfers on PSTC terms. The volumes of transfers have historically been small and if they continue at these levels the financial impact is not expected to be material.

Final pensionable pay

B.11 All liabilities have been based on pensionable pay at the effective date as provided by DBS. 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.

Deferred members above Deferred Pension Age

B12. Those deferred members already above their Deferred Pension Age are assumed to claim their benefits immediately. No liability is valued for deferred members who are seven years or more past Deferred Pension Age, in line with MoD's assumption that they will not claim their benefits.

Dependants' pensions

B.13 No allowance has been taken for short term dependant pensions or children's pensions (other than those already in payment), on ground of immateriality.

Additional voluntary contributions

B.14 Additional voluntary contributions paid on a money purchase basis are separate to the pension scheme and have not been considered for the valuation. Additional voluntary contributions paid in accordance with the pension scheme regulations to secure added service or pension are taken into account as liabilities of the scheme.

Scheme pays

B.15 Members can opt to use the scheme pays facility to pay HMRC for an annual allowance or lifetime allowance tax charge (i.e. the scheme pays the tax charge on behalf of the member for a corresponding reduction to the member's pension). No data was provided on scheme pays debits and no allowance has been made in the valuation for this. We understand that the number of members affected is small and so we do not expect the impact of this approximation to be material.

Other Direction interpretations

Directions 27 and 28 (contribution rates)

B.16 27(1)(a) and 27(1)(c) : Payroll at effective date projected forward (only) in line with valuation earnings assumptions for purposes of spreading the deficit.

B.17 27(1)(b) and 27(1)(d) : See B.3.

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

B.18 Assume that contribution rate required to cover cost of benefits over 2015-16 is the same as the rate required to cover cost of benefits over 2015-19.

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

B.19 See B.3.

Direction 33 – cost cap income

B.20 For the CCNLL element this has been based on the liability discount rate used for the cost cap liabilities at 2016 rather than the investment roll up. The impact is immaterial to the results.

Appendix C: Assumptions made for data uncertainties

Summary

C.1 Whilst comprehensive data was received from Defence Business Services (DBS) for the 2016 valuation, some aspects of the data were incomplete and/or unreliable for certain elements of our valuation calculations.

It has not been possible to fully resolve these data issues in the timescale required for the valuation. Therefore to calculate results for the 2016 valuation of the Scheme requires assumptions in respect of incomplete and/or unreliable individual member records and movements data. The latter is used for setting assumptions and in the calculation of the Net Leavers Liability.

Scheme specific assumptions are determined by the "responsible authority", which is the Secretary of State 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.2 Membership data is provided by Defence Business Services (DBS) for the purpose of the 2016 valuation and we apply checks to these membership records to ensure all key data items are provided and reliable for valuation purposes. Following these checks, it was identified that individual member records at the relevant dates as required for valuation purposes were not fully complete and reliable. We worked with Defence Business Services (DBS) to address a number of these issues, however where critical data items were missing from member records the general approach taken was to exclude that record for calculation purposes with calculations based on the remaining dataset being rated up incorporate an allowance for the excluded records.

C.3 Uprating factors were determined for each membership category where required 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, rank, sex, pay, service) as fully complete records. Some 1% of records were excluded from the 2016 valuation data and around 0.3% of the data provided for the purposes of setting the initial cost cap fund.

C.4 As noted, the approach taken to data omissions is to assume each record with missing data has the same average profile as the complete records and therefore there is a risk that this assumption is not appropriate. The table below indicates the extent to which the valuation results might be incorrect if the approach in fact under/overstates the liability for the omitted members by 10%, which we believe to be a reasonable level to consider.

Table C1: Possible impact of missing data

	Impact of error in assumption for missing data (as % of pay)	
	Uncorrected employer contribution rate	**Employer contribution correction cost**
Actives (uprating applied: 1.8%)	0.1%	0.1%
Deferreds (uprating applied: 1.4%)	0%	nil
Pensioners (uprating applied: 0.1%)	0%	nil

C.5 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.6 Defence Business Services (DBS) 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. retirements or deaths) 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.7 The following material issues were identified which limited our ability to carry out robust analysis of member movements:

> Mortality experience: The relevant indicators in the data provided were not sufficiently reliable to support separate analysis by normal health/ill health, officers/other ranks or members/dependants.

> Retirement experience: There was some uncertainty around the reliability and completeness of the redundancy indicators provided with the data.

> It was not possible to split out redundancies from other withdrawals in the data available.

C.8 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 50% of the difference in experience since the 2012 valuation, for example in recommending the assumption for baseline pensioner mortality.

C.9 It should however be recognised that should more complete movements data become available for future valuations it could result in recommendations regarding appropriate assumptions which lead to greater changes in valuation results than would otherwise be the case. 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.

Net Leavers Liability (NLL)

C.10 The initial cost cap fund is set equal to the liability for active 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. NLL 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.11 To accurately calculate NLL 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 NLL and it was not possible to make assumptions to adjust the data available to provide for a reasonable estimate of NLL to be calculated. In particular, it was not possible to match members in the 2015 and 2016 data.

C.12 For the purposes of determining the 2016 valuation results, we recommend an approach which implicitly makes an assumption that there is no unidentified experience gain or loss arising over the period 2015 to 2016. A risk of this approach is that any upward or downward cost pressure that has occurred over the period but has not been explicitly identified will not be reflected in the 2016 valuation results.

C.13 We expect that the uncertainty introduced by the approach above is not more than 0.1% of pay, although it should be noted that the deficiencies in the membership and movement data discussed above could compound this scale of uncertainty.

C.14 We would not expect significant unidentified experience gains or losses to arise over the one year period 2015 to 2016, although some uncertainty remains, particularly in respect of changes in salary over 2015-16. In addition we have reconciled the surplus or deficit arising over the period 2012-16 with an unexplained item of £0.3 billion, which is equivalent to around 0.4 % of pay. There could only be an unidentified experience gain or loss to arise over the period one year 2015 to 2016 greater than 0.4 % of pay if it was offset by another unidentified experience gain or loss arising in the period 2012-15 (or in 2015-16 in respect of non-active members of the pre-reform schemes).

C.15 For the 2016 valuation, the NLL 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 NLL calculation is not critical for this valuation although it would become so in future valuations when a longer period is considered.

Appendix D: Sensitivity of valuation results to Secretary of State set assumptions

D1. 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.

Sensitivity of valuation results to Secretary of State set assumptions

	Addition to uncorrected employer contribution rate	Addition to employer contribution correction cost[25]
Membership profile: 2 years older on average over implementation period	0.5%	0.5%
Mortality rates: 5%* heavier rates of pensioner mortality	(1.1)%	(0.5)%
Age retirement rates: 5% increase in number of new joiners assumed to reach immediate pension/early departure payment point	1.2%	1.1%
Ill-health retirement: 5%* increase to assumed rates	0.1%	0.1%
Ill-health retirement: 5%* increase in proportion assumed to receive higher tier benefits	0.1%	0.1%
Proportions partnered: 5%* more members assumed to have qualifying partners at death	0.6%	0.2%
Resignations and opt outs: 5%* higher numbers assumed to leave voluntarily before retirement (net of rejoiners)	(0.5)%	(0.5)%
Promotional pay increases: 0.5% higher promotional pay increases than assumed	0.4%	1.0%

* 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.

D2. In each variant of the above table the sensitivity shown is in relation only to the change in assumption described. The impact of a combination of assumption changes will not necessarily equate to the sum of the relevant rows above.

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