Government Actuary's Department

1919 - 2019
100 YEARS OF GAD

Scottish Teachers' Pension Schemes

Actuarial valuation as at 31 March 2016

Report on membership data

Date: 18 February 2019

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Contents

1   Introduction

1.1   This report is addressed to the Scottish Public Pensions Agency (SPPA), acting on behalf of Scottish Ministers. It is also being made available to the Scottish Teachers' Pension Schemes (STPS or 'the Scheme') Scheme Advisory Board (SAB) as part of the consultation process relating to the actuarial valuation of the STPS which is being carried out as at 31 March 2016.

1.2   Pension scheme membership data for the STPS is required for the actuarial valuation of the Scheme as at 31 March 2016, carried out in accordance with The Public Service Pensions (Valuation and Employer Cost Cap) Directions 2014 (as amended) ('the Directions').

1.3   The membership data is used for the following:

> To calculate valuation results including the uncorrected employer contribution rate, the corrected employer contribution rate and the past service liability (membership data as at 31 March 2016)

> To assess the initial cost cap fund (membership data as at 31 March 2015)

> To assess elements of the Scheme's demographic experience in order to recommend assumptions for the valuation (movements data 31 March 2012 to 31 March 2016)

1.4   The results of the valuation are critically dependent on the quality and correctness of the data used. The data provided was not fully correct and complete for all members and approximations have been made to enable valuation calculations to be undertaken.

1.5   The purposes of this report are:

> to discuss and summarise the membership data provided, and any checks and adjustments made to the data;

> to enable users of the valuation report to understand the underlying membership data used in the valuation and any issues relating to it; particularly those issues that may impact on the valuation results; and

> to discuss and summarise the movements data provided and to be used to inform decisions around scheme specific demographic assumptions to be used for the valuation.

1.6   All member data provided and discussed in this report were supplied by SPPA, as the Scheme's administrator. Scheme accounts for the relevant period are publicly available.

1.7   In preparing this report, GAD has relied on data and other information supplied by SPPA as described in this report. Any checks that GAD has made on this data and information are limited to those described in this report, including any checks on the overall reasonableness and consistency of the data. These checks do not represent a full independent audit of the data supplied and do not by themselves confirm or guarantee the overall quality or correctness of the data. In particular, GAD has relied on the general completeness and accuracy of the information supplied without independent verification.

1.8   Summaries of the membership and movements data used for the valuation are provided in section 2 of this report, with further information in Appendices A and B of this report respectively.

1.9   This report outlines the issues with the data that were identified during our analysis of the information provided. 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. In GAD's opinion these adjustments are reasonable and appropriate for the purpose of this actuarial valuation. However, it should be noted that the uncorrected and corrected employer contribution rates in this report might have been different if more reliable data had been available.

1.10   Throughout this report the totals given for summed data may not be exactly the same as the sum of the components shown, due to rounding effects.

1.11   This report should not be reproduced or disseminated to other parties without prior consent. The Government Actuary's Department (GAD) does not accept any liability to third parties, whether or not it has agreed to the disclosure.

1.12   This report has been prepared 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.

2   Summary of data used for the valuation
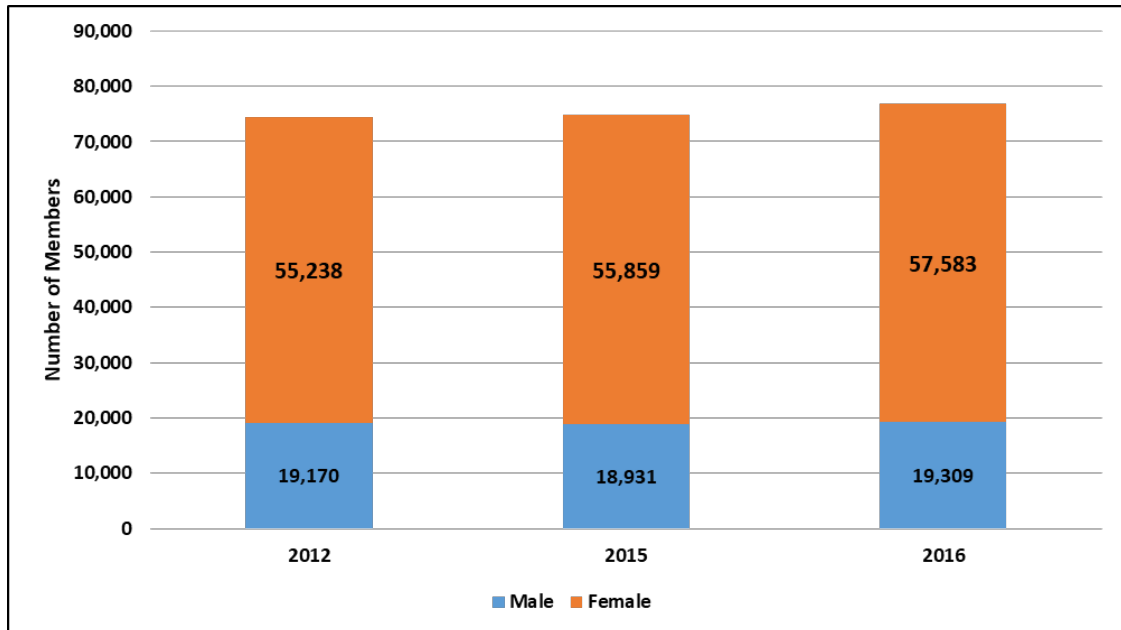
Membership data at 31 March 2016

2.1   The membership data to be used for the purposes of the 2016 valuation are summarised below, together with comparative data at 2015 (for actives only) and as used for the 2012 valuation. Detailed tables are set out in Appendix A.

Chart 2.1: Number of active members

Chart 2.2: Active total pensionable pay (full time pay)
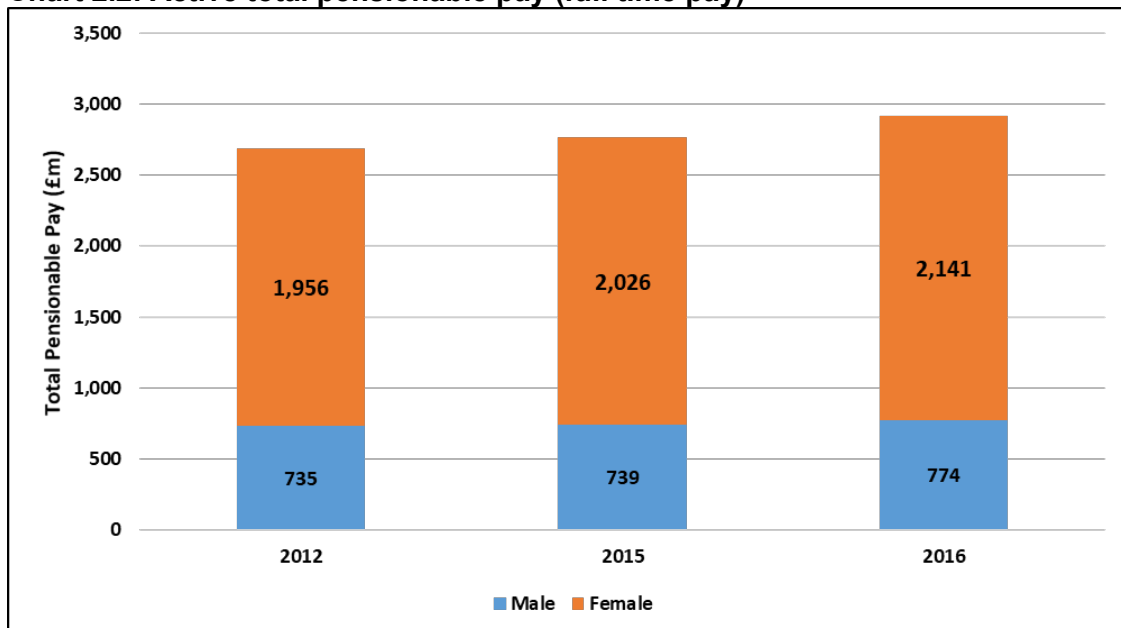
Chart 2.3: Number of deferred members
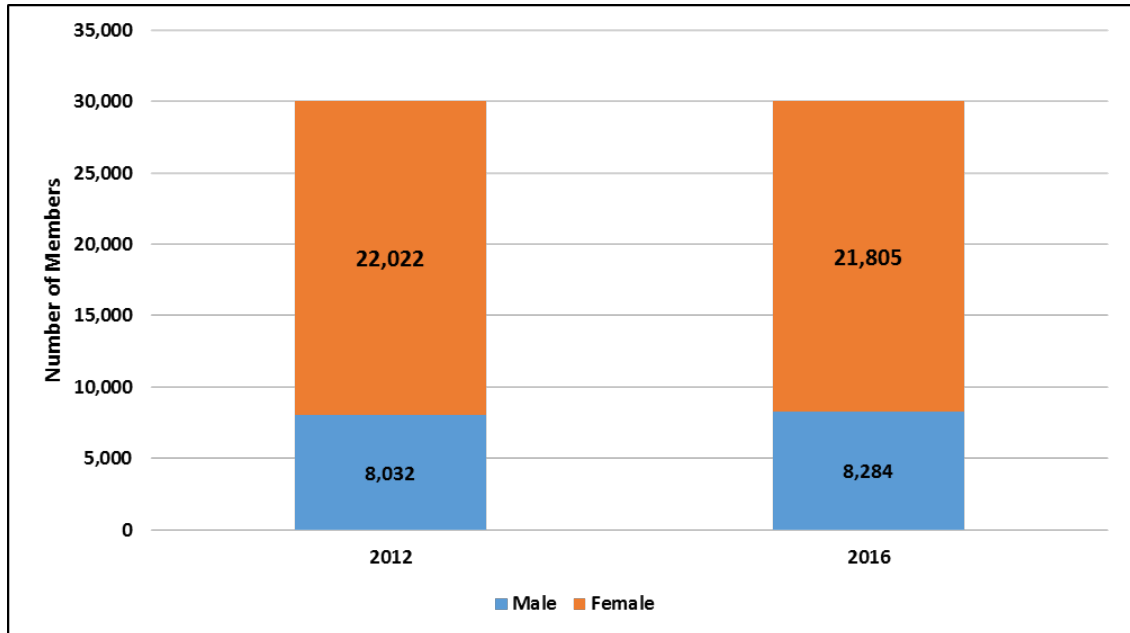
Chart 2.4: Total deferred pension
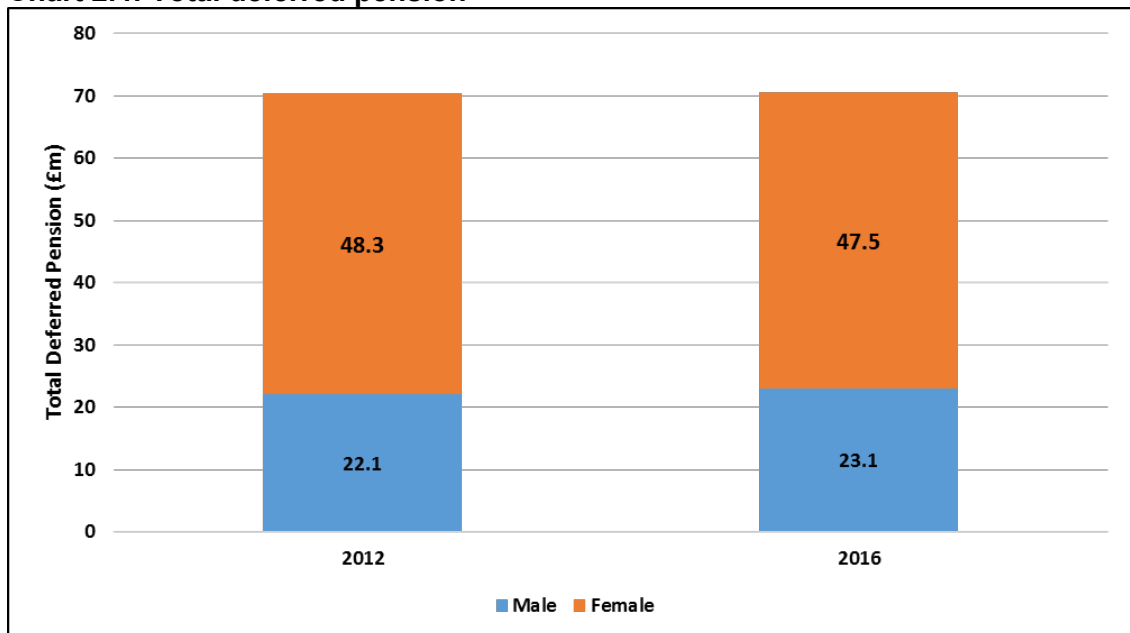
Note: the deferred membership shown above includes all deferred members with preserved benefits in the scheme, including those who are older than their Normal Retirement Age. When assessing the liabilities of the scheme, it is assumed that a proportion of these members is unlikely to claim their pensions.

Chart 2.5: Number of pensioners and dependants
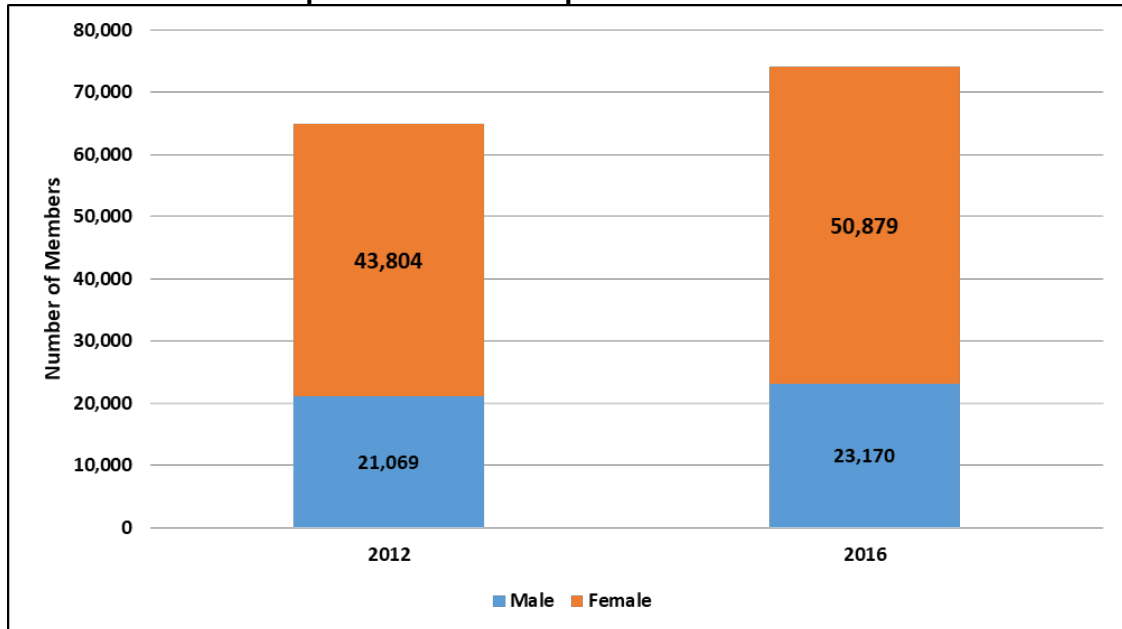
Chart 2.6: Total pension in payment (pensioners and dependants)
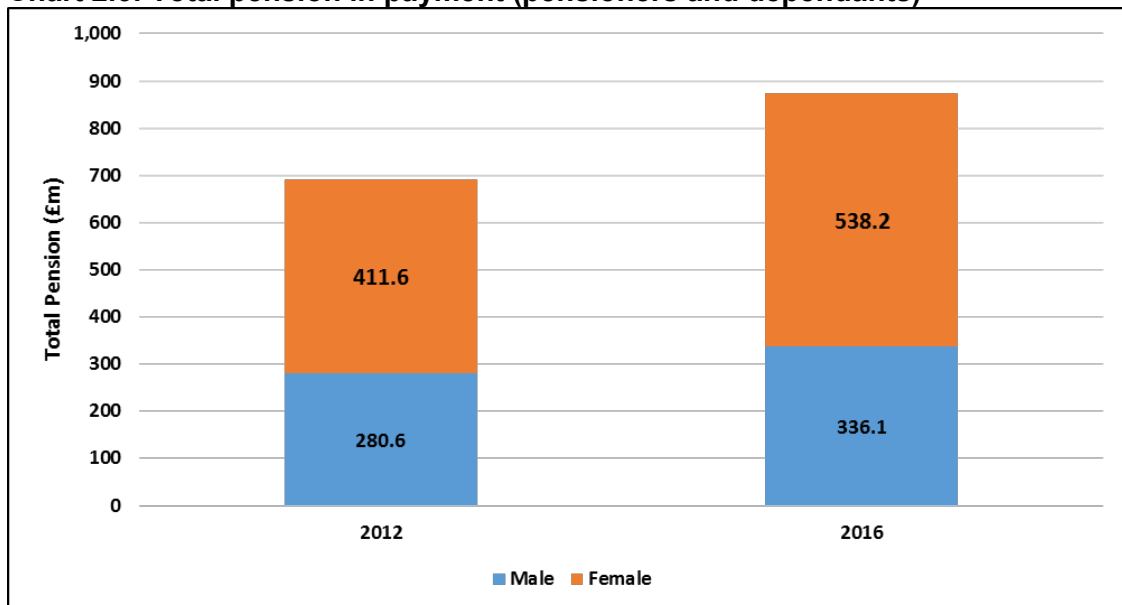
2.2   The data shown in the charts above are as used for valuation purposes, and reflects all adjustments made following analysis of the data provided.

2.3   Over 180,000 records were provided to GAD across all three membership categories (active, deferred and pensioner) as at 31 March 2016.

2.4   Checks were applied to these records to ensure all key data items are provided and reliable for valuation purposes. Records with key data items either missing or unreliable were excluded and remaining data uprated. This approach implicitly assumes that the records with missing/unreliable data have the same average profile as the complete/reliable records. The derivation of the uprating factors and the checks and adjustments applied to the data are explained further in the next section of this report. The overall uprating factors applied to each category of member are shown below with the comparative factors at 2015 and at the 2012 valuation.

Table 2.1: Uprating factors

	Uprating factor 2016	Uprating factor 2015	Uprating factor 2012
Active members	1.01564	1.00687	1.000
Deferred members	1.12030	n/a	1.000
Pensioner members	1.00064	n/a	1.000
Total membership	**1.02527**	**1.00687**	

2.5   Making assumptions about missing data and allowing for known members with unusable data by uprating introduces a degree of uncertainty into the valuation results. It has been necessary to make significant adjustments to the membership data used for the valuation, and even after these adjustments some inconsistencies remain, particularly in relation to the active member data collected as at 31 March 2015. Appendix E provides further details of the checks and adjustments applied to the membership data, and Appendix F gives an indication of the potential level of uncertainty linked to these adjustments. In GAD's opinion these adjustments are reasonable and appropriate for the purpose of this valuation. However, it should be noted that the uncorrected and corrected employer contribution rates might have been different if more reliable data had been available.

Movements data 31 March 2012 to 31 March 2016

The movements data provided is to be used for the purposes of informing the demographic assumptions to be used for the 2016 valuation. The charts below show a reconciliation of the movements between 2012 and 2016. The underlying numbers and some further information is set out in Appendix B.

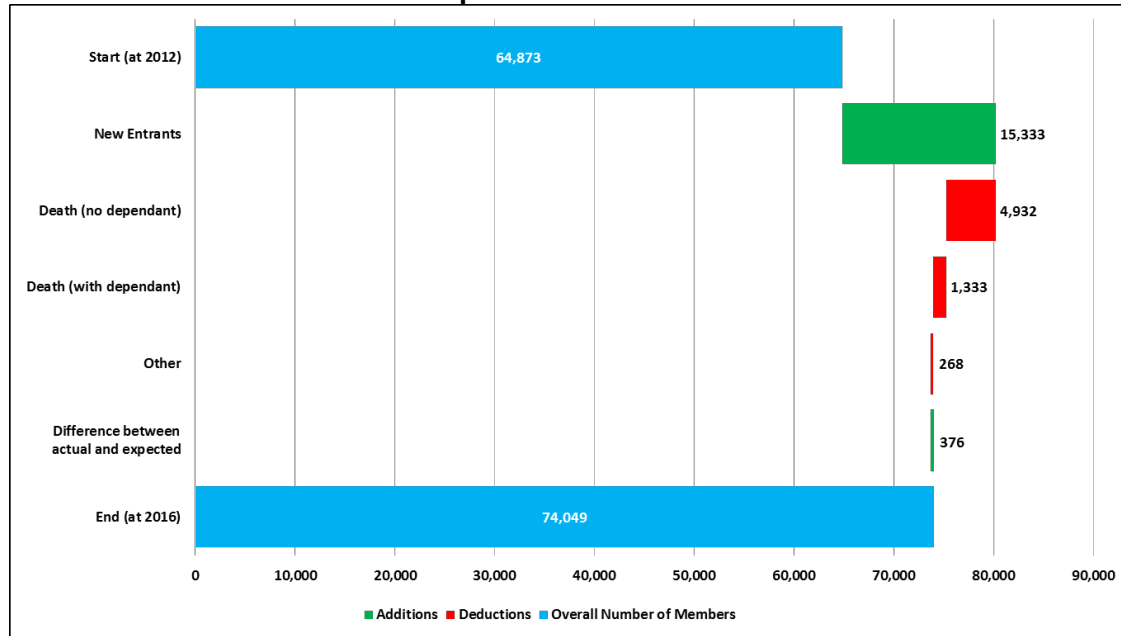**Chart 2.7: Active membership reconciliation**
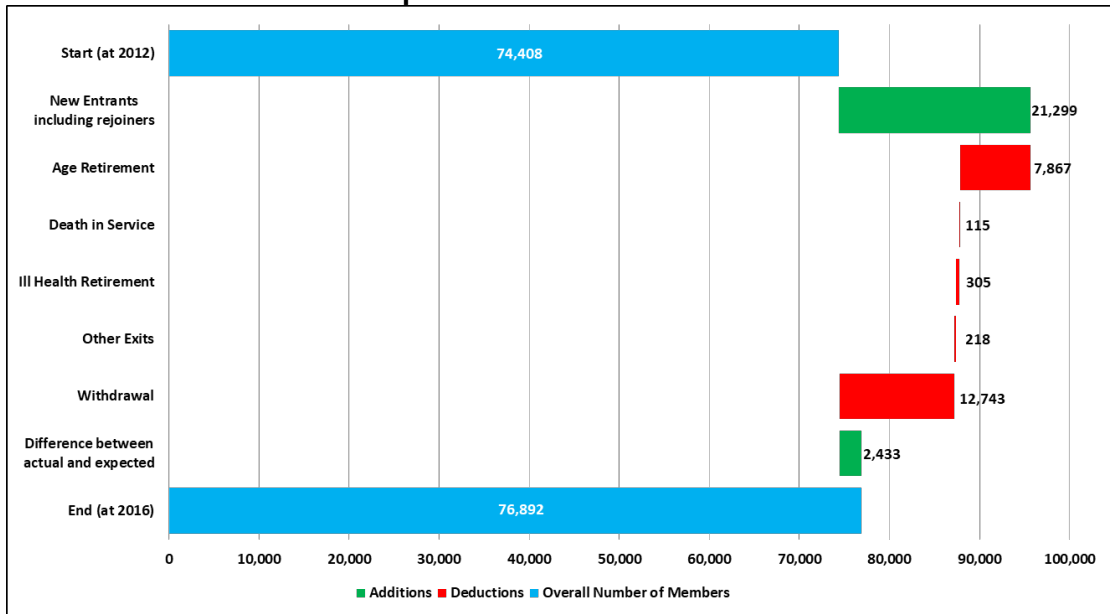
Chart 2.8: Deferred membership reconciliation
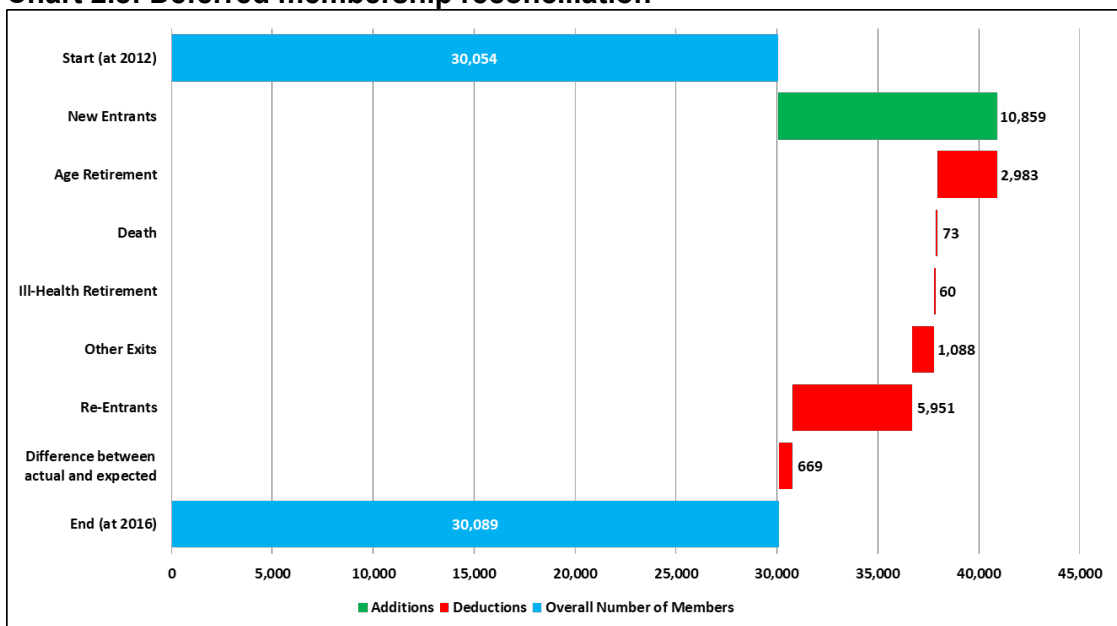
Chart 2.9: Pensioner membership reconciliation

Data quality

2.6   The introduction of the reformed STPS scheme in April 2015 and the requirements of the Directions means data requirements for this valuation were considerably expanded compared with the requirements for the 2012 valuation. SPPA have been required to build a new extraction process to accommodate these requirements whilst also developing the administrative capability to deal with the new scheme. In the circumstances it is understandable that the headline level of completeness of member data has deteriorated since the 2012 valuation. The level of completeness achieved has also required considerable manipulation of data, including cross referencing with prior year data sets and direct intervention to 'correct' identified errors in the extract process. Based on comparisons between data items at different valuation dates for a sample of individual members it was evidenced that there was a systematic error in the data extraction of reckonable service which could be explained by a change in the extraction process. Similarly, we noted inconsistencies between the amounts of deferred pensions for individuals at different dates. Whilst we have taken the view this manipulation is appropriate for the current valuation, it does lead to uncertainty, as set out in Appendix F in the valuations results, and we recommend that timely action is taken to rectify the underlying issues before the 2020 valuation data is due.

2.7   We are not able to identify whether the worsening of valuation data quality is a result of a deterioration in the quality of data held on the administration system. It is more likely to have resulted from problems with the process used to extract that data in a form we can use for valuation purposes. However the administrative changes required to administer the new scheme may have resulted in some delays or misunderstanding at the employer interface which might also account for some deterioration in overall data. Again we recommend that SPPA consider what action may be appropriate to rectify any problems. We have separately supplied detailed reports of the errors arising to assist in this process.

2.8   The issues we have encountered with the data prepared for valuation purposes do not directly imply that the scheme data are of insufficient quality to support the delivery of benefits to members. However, the quality of scheme data and the management of risks associated with data are of paramount importance and are subjects with which the Pensions Regulator is concerned. In this regard you should note that GAD does have regular discussions with the Regulator, on a non-scheme specific basis, to promote a wider understanding of the role of the actuarial valuation as it relates to data quality of the public service pension schemes.

3   Data provided, and checks and adjustments made

Membership data at 31 March 2016 and 31 March 2015

3.1   Individual member data was supplied for all active members, deferred members and current beneficiaries of the Scheme at the valuation date. The individual data items supplied which are critical to the valuation calculations are summarised in Appendix C. The chart below shows the total number of valid records received (i.e. key data items are complete, and suitable for checking), the total number of records after exclusions (those that are valid and pass our checks on the data), and the total number of records after we have applied ratings to the dataset to replace the records which failed our checks. Further details of our rating processes are set out in Appendix E.

Chart 3.1: Summary of data provided and excluded
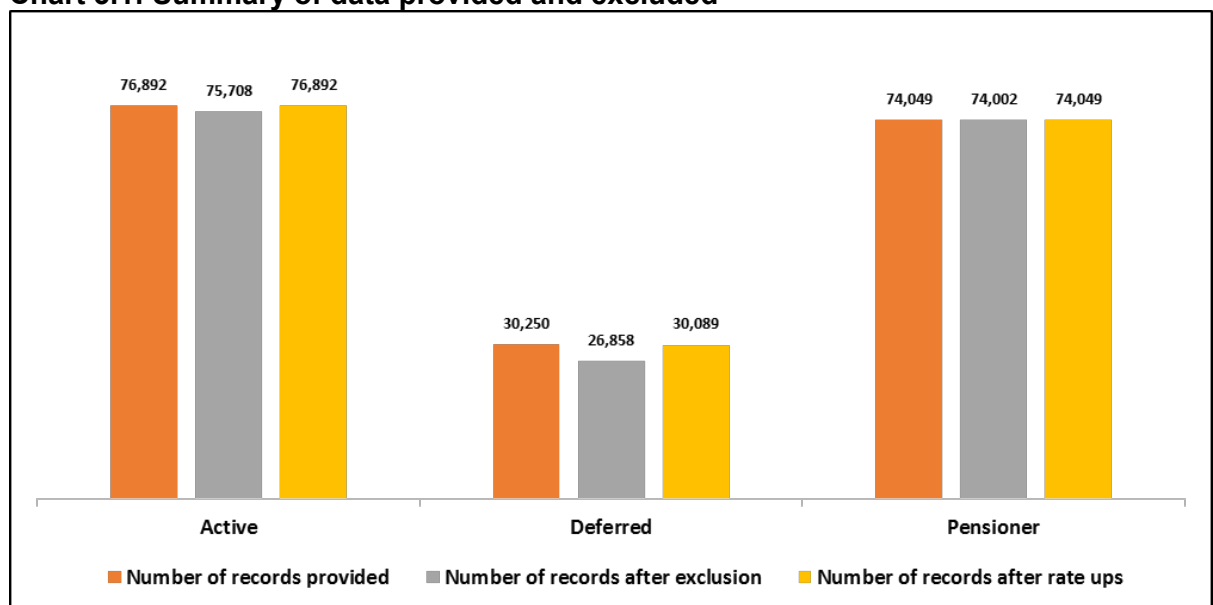
Checks made and adjustments applied

3.2   All key data items were checked against the specification requested, for both completeness and consistency.

3.3   Checks were carried out to determine which records would need to be excluded by applying reasonableness tests. The checks identified a number of areas where adjustments to the data were appropriate. The checks and adjustments applied are summarised in Appendix E.

3.4   Unless otherwise noted, the number of deferred members shown throughout this report includes all deferred members with preserved benefits in the scheme, including those who are older than their Normal Retirement Age. When assessing the liabilities of the scheme, it is assumed that a proportion of these members are unlikely to claim their pensions.

3.5   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 excluded records have the same average profile (i.e. age, sex, pay, service) as included records. Tables 3.1 and 3.2 show the derivation of the uprating factors[1].

Table 3.1 Derivation of uprating factors (31 March 2016)

31-Mar-16	No of records received	Number of valid records (A)	Number of exclusions	Number of members after exclusions (B)	Uprating factor (A/B)
Active members	76,892	76,892	1,184	75,708	1.02
Deferred members	30,250	30,089	3,231	26,858	1.12
Pensioners	74,049	74,049	47	74,002	1.00
Total membership	181,191	181,030	4,462	176,568	1.03

Table 3.2 Derivation of uprating factors (31 March 2015)

31-Mar-15	No of records received	Number of valid records (A)	Number of exclusions	Number of members after exclusions (B)	Uprating factor (A/B)
Active members	75,047	74,791	510	74,281	1.01

Movements data – 31 March 2012 to 31 March 2016

3.6   Individual member movement records were supplied for all members who changed category of membership (i.e. active, deferred or pensioner) between the previous and current valuation dates. The movements data is analysed and used to inform how demographic assumptions of future members' behaviours should be set for the valuation. The key data items provided for member movements are set out in Appendix D.

3.7   Limited checks were applied to movements data, and records were only excluded if key missing data materially impacted the analysis being undertaken. The checks and exclusions are summarised in Appendix G.

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[1] In practice uprating factors are determined for each identifiable valuation group

Accounting information

3.8   Published scheme accounts were available for the full intervaluation period. Certain items of financial accounting information have been used to perform independent checks on the dataset supplied. These checks and the data used are set out in Appendix E.

Benefit information

3.9   A summary of the benefits provided to members of the Scheme is given in Appendix H. SPPA have confirmed that the only uncertainty that they are aware of about the form of benefits that the scheme is liable to provide relates to GMPs. We have allowed for the extension of the interim solution to GMP indexation arrangements, as set out by the UK government in the consultation response issued January 2018, but have made no allowance for any other solution that may be implemented after the extended interim solution ends. We have also made no allowance in the valuation calculations for the possible gender equalisation of GMPs.

Appendix A: Summary of membership data

Table A1: Comparison of active membership as at 31 March 2012 and 31 March 2016

Scheme section (i)	Gender	31 March 2012						31 March 2016						
		Number of members	Full time equivalent pay (£m)	Average full time equivalent pay (£)	Average age (ii)	Average service (iii) (years)	Average total accrued pension (£)	Number of members	Actual pay (£m)	Full time equivalent pay (£m) (iv)	Average full time equivalent pay (iv) (£)	Average age (ii)	Average service (iii) (years)	Average total accrued pension (£)
NPA 60	Male	14,998	603.6	40,244	49.1	18.5	9,320	11,082	437.9	479.1	43,228	50.9	16.9	9,693
	Female	43,738	1,624.5	37,142	47.3	16.2	7,520	34,472	1,139.6	1,372.9	39,826	49.0	15.4	8,116
NPA 65	Male	4,087	128.0	31,311	38.1	3.4	1,780	6,159	184.8	223.2	36,237	39.0	3.9	2,910
	Female	11,127	318.5	28,628	33.8	2.7	1,300	17,718	473.4	600.4	33,884	35.5	3.7	2,570
Mixed Service (i.e. periods of NPA 60 & 65)	Male	85	3.2	37,185	47.6	8.7	4,340	919	28.9	37.6	40,900	52.3	10.5	5,828
	Female	373	12.7	33,968	45.6	8.0	3,630	2,195	55.5	84.4	38,477	49.6	8.6	4,559
Post- 2015 new-entrant	Male							1,148	25.7	34.1	29,666	36.2		248
	Female							3,198	66.7	83.5	26,102	32.6		234
Total		**74,408**	**2,690.5**	**36,158**	**45.6**	**14.5**	**6,610**	**76,892**	**2,412.6**	**2,915.1**	**37,912**	**45.2**	**11.5**	**6,074**

i.   For unprotected members, the section is that applicable prior to April 2015.
ii.   Weighted by full time equivalent pay, except for post-2015 new entrants which are weighted by actual pay.
iii.   Reckonable service for final sections only, weighted by full time equivalent pay.
iv.   Full time equivalent pay not provided for post-2015 new entrant members.

Average amounts calculated excluding members for whom information was not available (i.e. N/A). Pay quoted throughout the Appendix is rate received on valuation date.

Table A2: Final membership data for setting cost cap fund (active membership as at 31 March 2015)

Scheme section (i)	Gender	31 March 2015						
		Number of members	Actual pay (£m)	Full time equivalent pay (£m)	Average full time equivalent pay (£)	Average age (ii)	Average service (iii) (years)	Average total accrued pension (£)
NPA 60	Male	11,473	451.1	479.8	41,882	50.2	16.9	9,078
	Female	35,203	1,175.4	1,359.9	38,631	48.1	15.2	7,509
NPA 65	Male	6,469	187.7	221.2	34,188	38.4	3.8	2,248
	Female	18,382	486.9	582.9	31,711	34.8	3.6	1,985
Mixed Service	Male	998	30.6	38.4	38,866	52.2	11.5	5,819
	Female	2,275	59.1	83.1	36,554	49.3	9.4	4,376
Total		**74,790**	**2,390.8**	**2,765.4**	**36,975**	**45.0**	**11.8**	**5,820**

i. For unprotected members, the section is that applicable prior to April 2015.
ii. Weighted by full time equivalent pay.
iii. Reckonable service for final sections only.

Table A3: Active membership split by protection status as at 31 March 2016

Scheme section (i)	Protection status	Number of members	Actual pay (£m)	Full time equivalent pay (£m) (ii)	Average full time equivalent pay (£)	Average age (iii)	Average service (iv) (years)	Total Career Average section pension (£m)
NPA 60	Protected	15,297	553.4	635.4	41,538	58.7	19.7	n/a
	Unprotected / Tapered (v)	30,257	1,024.1	1,216.6	40,207	44.7	13.7	14.0
NPA 65	Protected	307	8.3	11.9	38,827	61.3	4.9	n/a
	Unprotected / Tapered	23,571	649.9	811.6	34,434	36.1	3.7	10.6
Mixed Service	Protected	596	15.8	23.9	40,140	60.0	11.9	n/a
	Unprotected / Tapered	2,518	68.7	98.1	38,968	48.1	8.5	1.0
Post- 2015 new-entrant	n/a	4,346	92.4	117.5	27,043	33.6	n/a	1.0
Total		**76,892**	**2,412.6**	**2,915.1**	**37,912**	**45.2**	**11.5**	**26.6**

i.   For unprotected members, the section is that applicable prior to April 2015.
ii. Full time equivalent pay not provided for post-2015 new entrant members.
iii. Weighted by full time equivalent pay, except for post-2015 new entrants which are weighted by actual pay.
iv. Reckonable service for final sections only
v.   Once tapered members have transferred into the Career Average section they are included in the Unprotected membership groups above.

Table A4: Comparison of deferred membership as at 31 March 2012 and 2016

Scheme section (i)	Gender	31 March 2012				31 March 2016			
		Number of members (nearest 10)	Total deferred pension (£m pa) (ii)	Average deferred pension (£ pa) (ii)	Average age (iii)	Number of members	Total deferred pension (£m pa) (ii)	Average deferred pension (£ pa) (ii)	Average age (iii)
NPA 60	Male	6,982	21.5	3,079	55.4	6,533	21.2	3,252	56.8
	Female	19,325	46.8	2,422	53.4	17,949	43.8	2,441	55.8
NPA 65	Male	1,028	0.6	549	38.2	1,685	1.6	925	42.8
	Female	2,591	1.3	501	34.0	3,656	3.0	823	37.7
Mixed Service	Male	22	0.0	1,839	47.4	65	0.3	3,964	53.2
	Female	106	0.2	1,853	48.3	197	0.6	3,290	52.6
Post- 2015 new-entrant	Male	N/A	N/A	N/A	N/A	1	0.0	410	42.0
	Female	N/A	N/A	N/A	N/A	3	0.0	81	35.7
Total		**30,054**	**70.4**	**2,343**	**53.5**	**30,089**	**70.5**	**2,344**	**55.0**

i.   For unprotected members, the section is that applicable prior to April 2015.
ii. Including pension increase awarded in April following extract date
iii. Weighted by pension.

The 2012 and 2016 deferred datasets set out above reflect the total membership of the scheme following our data verification checks. For the purposes of calculating scheme liabilities it is assumed that only a proportion of the members, who were over their NPA at the time of the valuation, will ultimately claim their benefits.

Table A5: Comparison of pensioner membership as at 31 March 2012 and 31 March 2016

Type of benefit		31 March 2012				31 March 2016			
		Number of members (nearest 10)	Total pension (£m pa) (i)	Average pension (£ pa) (i)	Average age (ii)	Number of members	Total pension (£m pa) (i)	Average pension (£ pa) (i)	Average age (ii)
Age retirement	Male	17,381	247.4	14,232	69.9	19,143	298.3	15,582	71.1
	Female	34,162	336.6	9,852	69.5	40,971	450.2	10,988	70.0
Ill-health retirement	Male	2,063	28.2	13,677	67.3	1,963	29.7	15,114	70.3
	Female	4,326	47.5	10,974	67.4	4,322	52.5	12,150	70.1
Spouses and other dependants	Male	1,625	5.1	3,111	63.3	2,065	8.1	3,935	66.8
	Female	5,316	27.5	5,181	74.5	5,585	35.5	6,356	76.1
Total		**64,873**	**692.2**	**10,670**	**69.6**	**74,049**	**874.3**	**11,807**	**70.6**

i.   Does not include pension increase in April following extract date in 2012 (2016 increase was 0%).
ii. Weighted by pension.

Chart A6: Active members' full-time equivalent (FTE) pensionable pay by age

TPS Active Membership - analysis of 2012 and 2016 datasets (FTE pay)
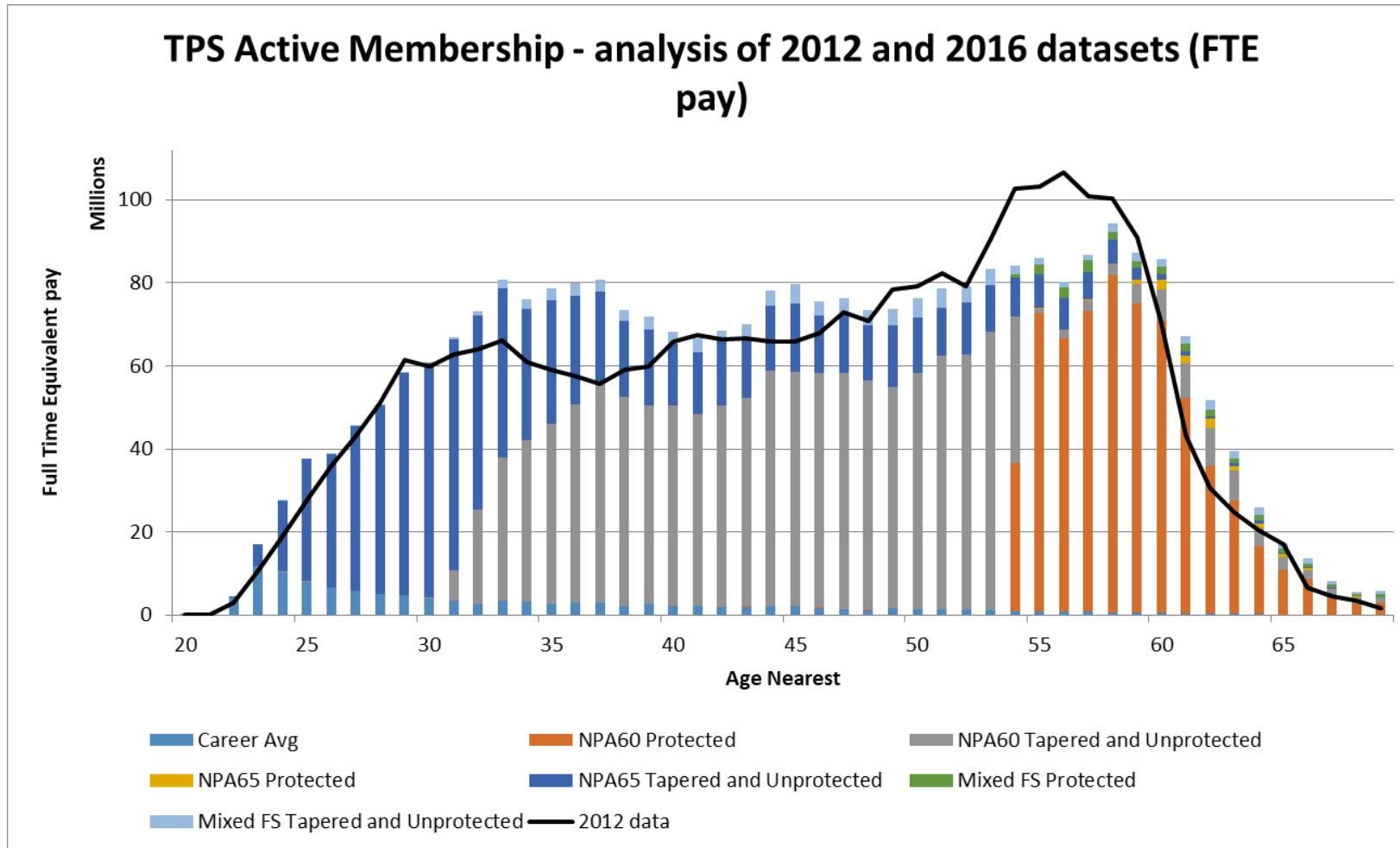
Chart A7: Deferred pension data by age

STPS Deferred Membership - analysis of 2012 and 2016 datasets

Legend: Career Avg — Mixed FS — NPA60 — NPA65 — 2012 data
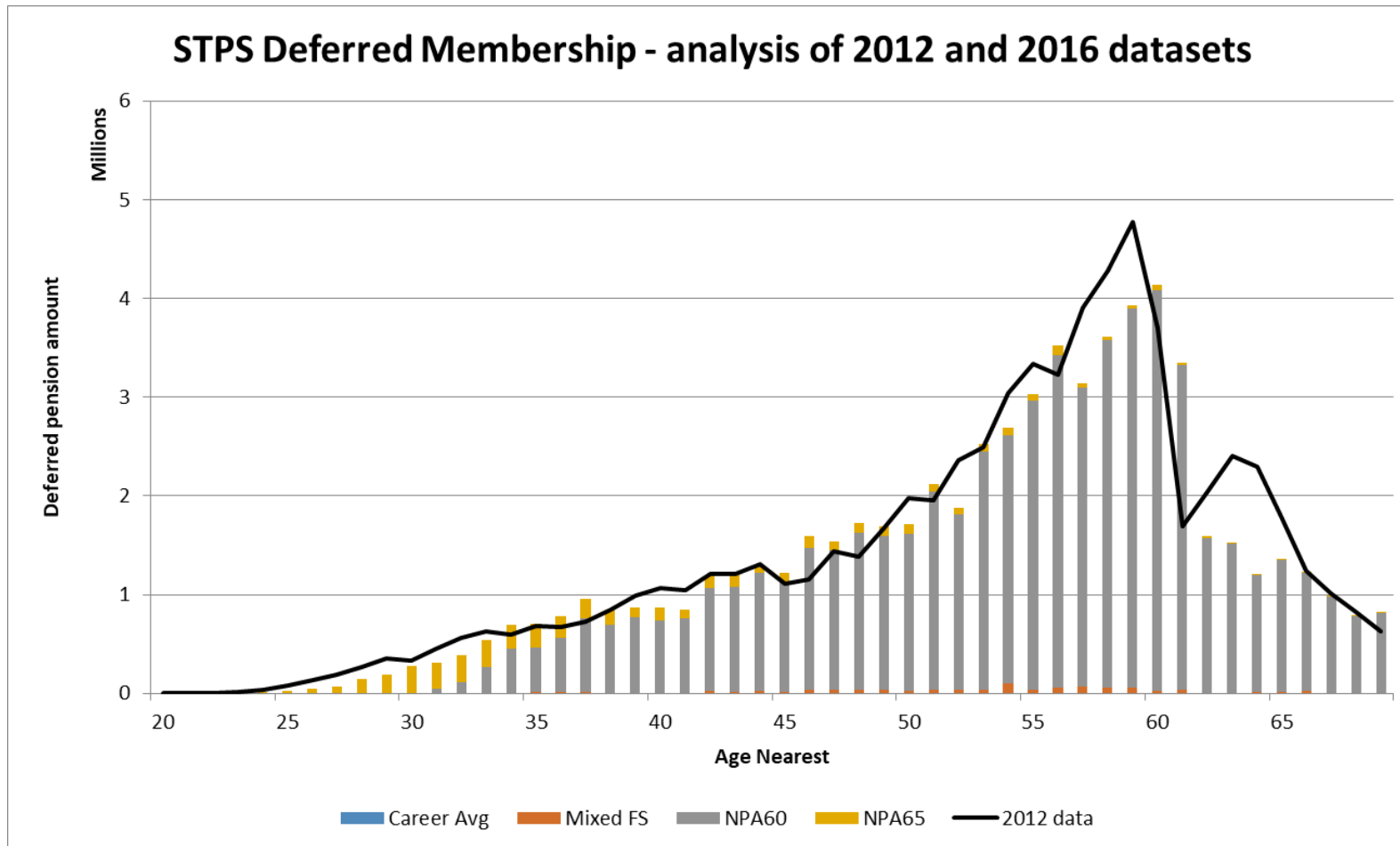
Chart A8: Summary of pension amount by age

STPS Pensioner Membership - analysis of 2012 and 2016 datasets
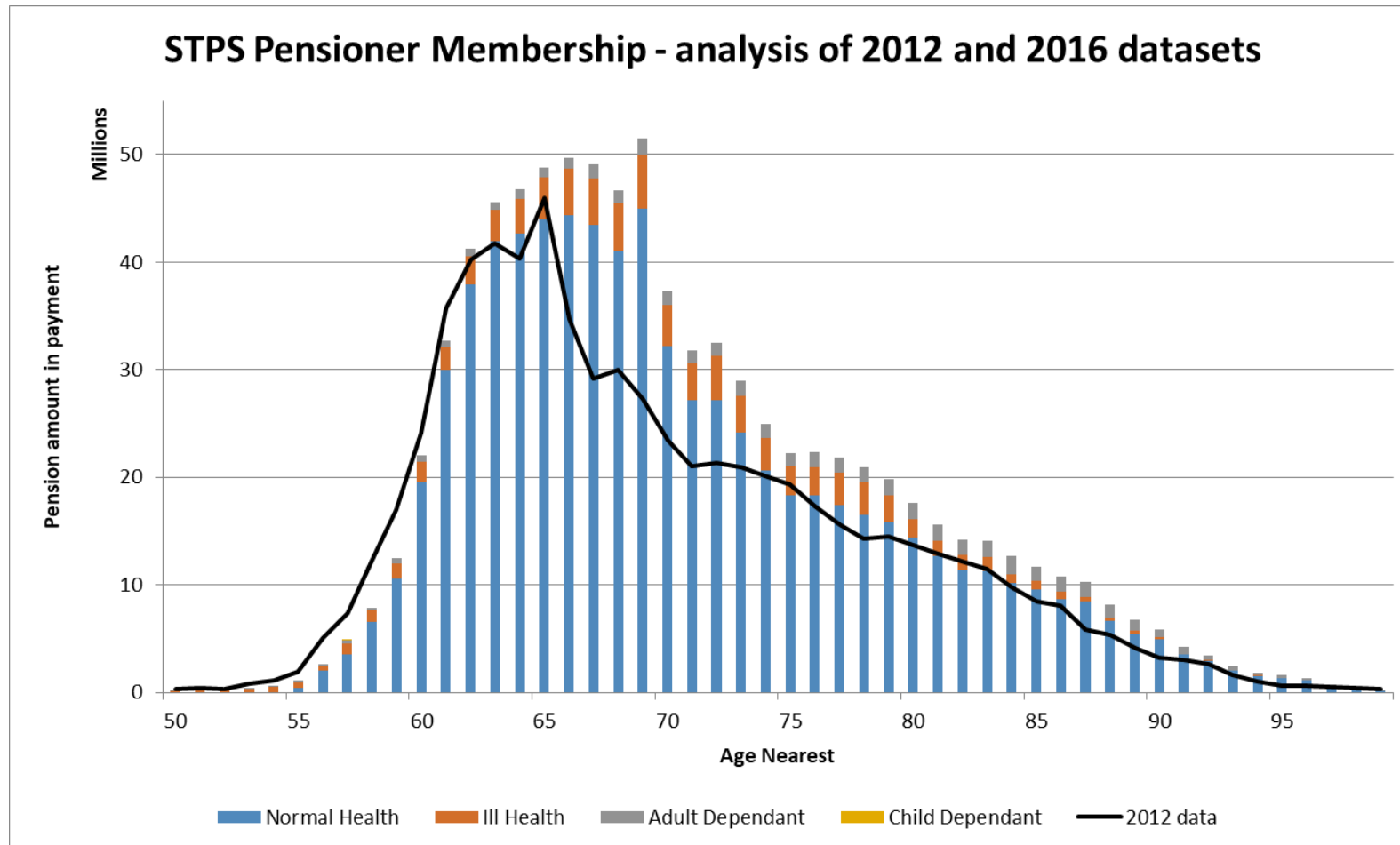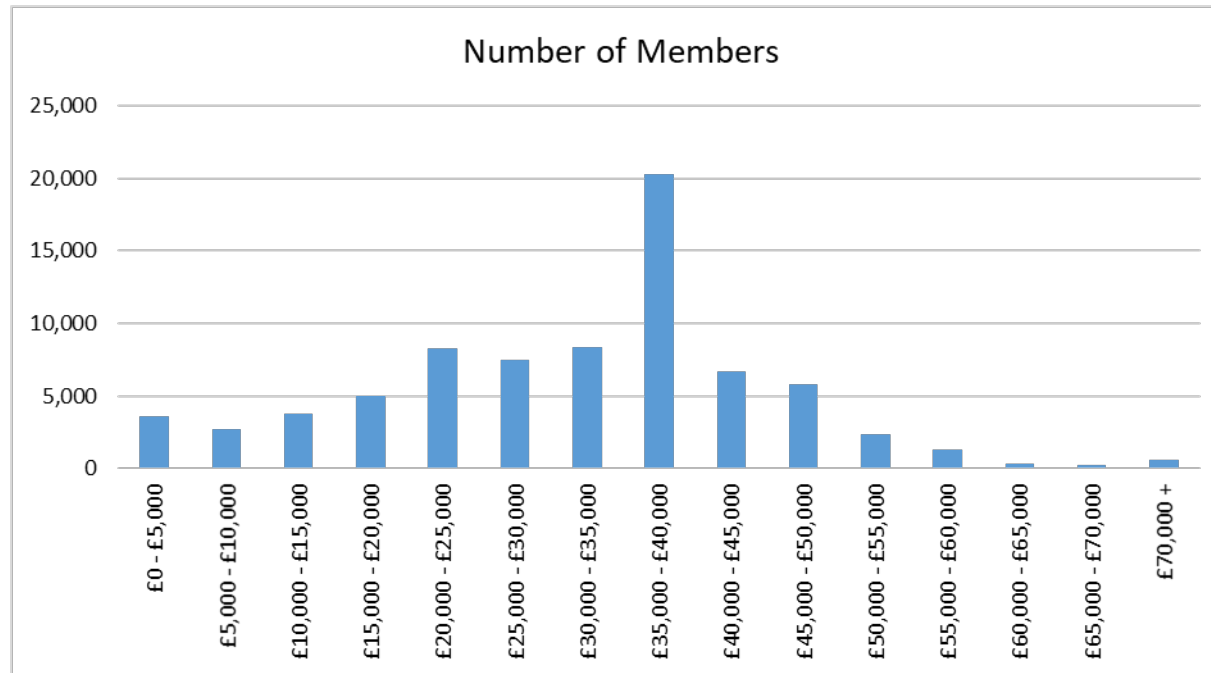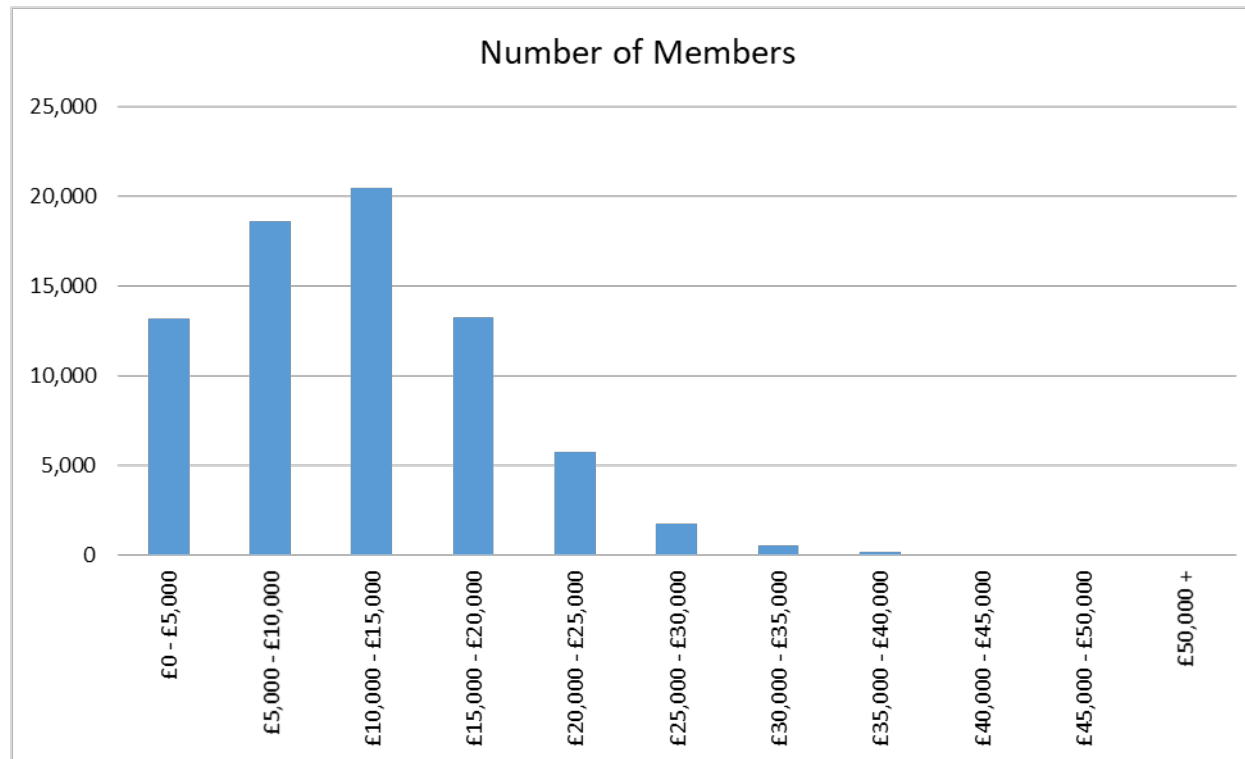
Chart A9: Active membership: Distribution of actual pensionable pay received as at 31 March 2016

Note: See Appendix E for note on comparison of actual pensionable pay against scheme accounting data.

Chart A10: Pensioner membership: Distribution of pension as at 31 March 2016

Appendix B: Summary of movements data 2012-2016

	Reconciliation of membership over intervaluation period 2012-2016	Prior intervaluation period 2009-2012 (nearest 10)
Actives		
Number at start of period Data adjustment	74,408	72,970
Additions		
• New entrants	15,243	17,980
• Rejoiners and re-employed	6,056	3,760
Deductions:		
• Deaths	(115)	(150)
• Retirements	(8,172)	(10,040)
• Withdrawals	(12,743)	(11,040)
• Other exits	(218)	0
Number expected at end of period	74,459	73,480
Valuation data at end of period	76,892	74,410[+]
Deferreds		
Number at start of period	30,054	24,400
Additions		
• New deferreds	10,859	13,820*
Deductions:		
• Deaths	(73)	(140)
• Retirements	(3,043)	(2,120)
• Rejoiners to active	(5,951)	(7,610)*
• Other exits	(1,088)	(440)
Number expected at end of period	30,758	27,910
Valuation data at end of period	30,089	30,050[++]
Pensioners		
Number at start of period	64,873	56,860
Additions		
• New pensioners including new dependants	15,333	13,280
Deductions:		
• Deaths	(6,265)*	(4,450)
• Other cessations	(268)	
Number expected at end of period	73,673	65,690
Valuation data at end of period	74,049	64,870[+++]

* This reflects 1,333 deaths with dependants and 4,932 deaths without dependants

[+] After the exclusion of 1,907 records who failed at least one data check.

[++] After the exclusion of 729 records who failed at least one data check.

[+++] After the exclusion of 86 records who were in receipt of a children's pension (not incapacitated) and aged over 23 at 31 March 2012

Appendix C: Data items – membership data

Key data items are shown below. These are the items where a valid and reasonable data value is required to determine a liability.

Actives

> identifier
> gender
> date of birth
> protection status
> current member section
> previous member section
> date last joined active status
> WTE pensionable pay
> actual annual pensionable pay
> actual annual pensionable earnings
> total NPA 60 reckonable service
> total NPA 65 reckonable service
> CARE pension amount
> CARE pension subject to ERRBO
> ERRBO reduction – years

Deferred

> identifier
> gender
> date of birth
> protection status
> NPA 60 pension with PI
> NPA 65 pension with PI
> NPA 60 spouse's pension with PI
> NPA 65 spouse's pension with PI
> CARE deferred pension

Pensioners and Dependants

> identifier
> dependent identifier
> gender
> date of birth
> pensioner group
> total pension
> total dependent's prospective pension

Appendix D: Data items - movements data

Data were provided separately for each year of the inter-valuation period for active and deferred staff who joined / rejoined / left the Scheme during that year. Data was provided in unique formats for each year, but the following data items tended to be present in each data set:

Actives

a. identifier
b. gender
c. date of birth
d. date of entry
e. method of entry
f. date of exit
g. reason for exit

Deferred

a. identifier
b. gender
c. date of birth
d. date of leaving active service
e. date of exit from deferred status
f. reason for exit

Pensioners

a. identifier
b. gender
c. date of birth
d. pensioner group
e. date pension commenced
f. pension after commutation
g. lump sum paid
h. date of death

Appendix E: Checks and adjustments applied to the membership data

Checks and exclusions

Valid records were excluded for the following reasons, and taken into account by uprating the dataset:

Table E1 – Active members

Reason for Exclusion	Number of exclusions[β]
Age outside reasonable range	1
FTE pay outside reasonable range or missing	308
Post 2015 pension outside reasonable range	51
Reckonable service outside reasonable range or missing	1,012
Unknown scheme section	1,010
Total no of exclusions	**1,184**
Total exclusions for rating up	**1,184**

β if a record fails for more than one reason it is included multiple times in the numbers shown

Table E2 – Deferred members

Reason for Exclusion	Number of exclusions[β]
Age outside reasonable range	77
Missing Date of Birth	3
Exclude pension credit members	161
Unknown scheme section	3,329
Total no of exclusions	**3,392**
Total no of exclusions for rating up	**3,231**

β if a record fails for more than one reason it is included multiple times in the numbers shown

Table E3 – Pensioners

Reason for Exclusion	Number of Members[β]
Member pension outside reasonable range or missing	47
Total no of exclusions	**47**
Total no of exclusions for rating up	**47**

β if a record fails for more than one reason it is included multiple times in the numbers shown

Adjustments applied to data for included members

> The membership data provided as at 31 March 2016 included around 4,600 members who had rejoined service after previously retiring, and so who appeared in both the pensioner and active datasets. Upon examination it was noted that the service provided in these members' active records covered both pre and post retirement employment periods. The pre-retirement service was also included in the pension data provided in that dataset. In order to avoid 'double counting' this liability we amended these members service records to reflect only service earned after re-employment. This has been done approximately using a consistent approach of crediting all these members with 0.5 years final salary service. Other adjustments could potentially be justified depending on views of the typical length of reckonable service assumed to be built up between rejoining and the valuation date.

Reckonable Service is a critical data field which directly contributes to the overall results of the valuation. The extent to which the service adjustment applied does not reflect actual entitlements within the scheme, or there are any other issues present in the reckonable service data, will contribute to uncertainty in the valuation results.

> The service data provided for active members as at 31 March 2015 appeared inconsistent with that in 2012 and 2016. We have therefore amended the 2015 service records for those members present at both 2015 and 2016 valuations, by adjusting the 2016 service record for expected accrual during 2015/16. We have also adjusted the service of rejoining members as described above. We note that these adjustments seem only to have been partially successful, as it appears that there remain outstanding inconsistencies based on our comparison of high-level summary statistics. In order that any remaining inconsistencies between the 2015 and 2016 active datasets do not affect the results of the cost cap analysis, an adjustment has been made to the Cost Cap Net Leavers Liability. Further details of this adjustment are provided in our report on the assumptions adopted for the valuation.

> As part of our validation process for the active membership data, it was necessary to annualise actual pay for some members, and determine members' scheme sections based on service records.

> We noted inconsistencies between the deferred pension amounts provided in the 2012 and 2016 datasets when these items were looked at on an individual basis. However as aggregated summary statistics do not appear materially different, we have not made any adjustment to either set of data.

> The deferred and pensioner data provided did not provide details of the level of contingent benefits payable upon a member's death. These entitlements have been estimated based upon the rules of each section of the scheme (and historical changes of those, based on members' ages).

> The indicators in the pensioner data which are used to determine members' categories, for example whether a member retired in normal or ill-health, were not reliable in all cases. It was therefore necessary to reallocate some members between categories for consistency with other elements of the member's data.

Checks on uprated dataset

Financial accounting information taken from published scheme accounts were used to perform independent checks on the dataset supplied.

Actives as at 31 March 2016

For actives the total actual (ie. part-time adjusted) pensionable payroll in the adjusted actives data was compared with pensionable pay derived from employer contribution payments recorded in the resource accounts. The payroll is 1.5% higher than the amount disclosed in the scheme accounts (derived from employer contributions). This is consistent with a similar analysis which was carried out at the time of the 2012 valuation of the scheme, which also indicated actual pay was 1.5% higher than the equivalent accounting estimate. This is within our acceptable tolerance levels so no rate up pensionable pay was considered. For the

avoidance of doubt, this check will only verify members' actual pay. Unrelated issues associated with FTE pay data would therefore not be identified by this check.

Actives as at 31 March 2015

A similar check was completed on the actives data as at 31 March 2015. The total pensionable payroll in the actual pay data provided for the valuation was 2.0% higher than pensionable pay derived from employer contribution payments recorded in the scheme accounts. This is just within our acceptable tolerance levels, and similar to the 2012 and 2016 equivalent figures, and so no rate up pensionable pay was applied.

Pensioners as at 31 March 2016

For pensioners, the total pensioner payroll in the adjusted pensioner data was compared with total pensions paid during 2015/16 recorded in the resource accounts. The pensioner payroll is 1.4% lower than the amount disclosed in the scheme accounts. We would expect the pensioner payroll in the data to be higher as the accounting figure will be an average over the year, whereas the pension in the membership data reflects the rate payable at the end of the period. This figure is similar to that produced using an equivalent process at the 2012 valuation, where pensionable pay data was less than the scheme accounts by 0.7%. As the data reconciles with the accounts we have not considered making any adjustments.

It was not possible to undertake any independent checks on the deferred data.

Appendix F: Uncertainty in valuation results arising from data deficiencies

Uncertainty associated with exclusion / rating up of the data

The table below indicates the extent to which the valuation results might be incorrect owing to the approach taken to dealing with data deficiencies which resulted in data being excluded and rated up. For each category we illustrate the potential impact on the results were the adjustment applied, which assumes an average liability for each excluded and rated-up member, to prove incorrect and in fact under/overstate the actuarial liability for these members by 10%.

	Impact of error in assumption for missing data	
	Uncorrected employer contribution rate	Employer contribution correction cost
Actives (uprating applied 1.6%)	Less than 0.1%	Less than 0.1%
Deferreds (uprating applied 12.0%)	Less than 0.1%	Less than 0.1%
Pensioners (uprating applied 0.1%)	Less than 0.1%	Less than 0.1%

This analysis suggests that the level of uncertainty introduced into the valuation results, as a consequence of uprating the data, is relatively limited. However it is also important to recognise the uncertainty relating to the data adjustments that we have been required to make as part of the validation process, and the more general issues we have identified around data quality and consistency.

Employer contribution correction cost – uncertainty linked to general data quality issues

The active datasets, and consequential calculated liabilities of the scheme, at 31 March 2015 and 2016 do not align neatly, even after the actions we have taken to refine the datasets outlined in this report. There is also significant uncertainty around the movements data which is used to calculate the Net Leavers Liability required by the Directions. As a consequence, we have had to make various adjustments when performing the Cost Cap calculations, specifically when assessing the Cost Cap Net Leavers Liability. Full details of these adjustments are set out in our report on the assumptions adopted for the valuation.

Whilst it is difficult to precisely quantify the level of uncertainty introduced by these adjustments, we believe the impact may be of the order of ½% of pensionable pay on the employer contribution correction cost.

Uncorrected employer contribution rates - uncertainty linked to general data quality issues

Following the data processing amendments that we have made, as described in this report, we have managed to produce a reconciliation between the scheme liabilities as at 31 March 2012 and 2016. However this reconciliation is quite sensitive to our estimates of the impact of scheme experience, particularly that relating to promotional pay experience over the inter-valuation period. Our ability to accurately estimate the impact of scheme experience over this period is limited by the quality of the movements data provided. The range of plausible estimates that could be reasonably justified, using the data that we hold, could potentially mask outstanding issues with the membership data at either the 2012 or 2016 valuations.

Whilst again it is difficult to precisely quantify the attaching level of uncertainty, we believe this may be of the order of 1% of pensionable pay on the uncorrected employer contribution rate. Full details of our reconciliation of the uncorrected employer contribution rate are set out in our report setting out the results of the valuation.

Appendix G: Checks and adjustments applied to the movements data

Checks were undertaken to ensure all records with sufficient information to assign the movement to the correct category for analysis were taken into account. The following exclusions were applied to records which did not meet this criteria. No further checks were undertaken, other than to attempt to reconcile the movements against the accounts and the membership data at the 2012, 2015 and 2016. We note that whilst we have managed to use the movements data to reconcile between the 2012 and 2016 datasets reasonably well, the patterns of movements underlying these reconciliations vary significantly from year to year, and appear inconsistent. Similarly, comparing the movements each year with the membership statistics in the annual report and accounts shows significant differences between the two data sources. This uncertainty has limited the extent to which we have been able to use this data to analyse the demographic experience of the scheme, and also limits the extent to which we can be confident of any reconciliations of the valuation results.

The actives movements data would generally be used to analyse experience of members who retire, die or leave active service. Only records with sufficient data were used for analysis purposes and this has limited the extent to which we have been able to analyse scheme experience, our report on setting scheme specific demographic assumptions provides further details. The subset of data used, checks applied and resulting numbers of exclusions are shown below.

Table G1 – Active members

Reason for Exclusion	Number
Number of movements from raw non-pensioner data	44,528
Removed exact duplicate records	86
Removed due to missing data items or inconsistent dates for individual member	2,411
Total movements from active status analysed	42,031[*]

*This does not include 516 implied entrants to the membership data as at 31 March 2016 which have been added to the records provided when reconciling membership between 2012 and 2016.

The pensioner movements data would generally be used to analyse mortality experience, family statistics and commutation of pension experience. For these purposes only relevant records and those with sufficient data were used for analysis purposes. Again, this has limited the extent to which we have been able to analyse scheme experience since the last valuation of the scheme. The subset of data used, checks applied and resulting numbers of exclusions are shown below.

Table G2 – Pensioners

Reason for Exclusion	Number
Number of movements in raw data	24,417
Removed assumed duplicates	5
Removed due to inconsistent dates for individual member	2,546
Total movements from pensioner status analysed	21,866

Appendix H: Summary of benefits

The Directions require that the STPS and the new scheme introduced for the teachers' workforce from 1 April 2015 ('the 2015 Scheme') are taken into account in aggregate for the purposes of the current valuation. The summary of benefits provided is shown separately for the STPS and the 2015 Scheme. The criteria by which Scheme membership is determined from 1 April 2015 is also shown.

STPS (for pre-2015 entrants)

The main benefit provisions of the Scheme for each category of member are shown in Table H1.

Table H1: Main benefit provisions of STPS for pre-2015 entrants

	NPA 60 Section	NPA 65 Section
Basis of provision	Final salary	Final salary
Contracted out/in prior to 2016[+]	Contracted out	Contracted out
Normal Pension Age (NPA)	60	65
Pension accrual rate	1/80	1/60
Retirement lump sum accrual rate	3 x pension plus commutation at £12:£1pa	Cash by commutation only (£12: £1pa)
Final pensionable pay	Better of a) last 12 months' pensionable pay b) average of best 3 consecutive years' pensionable pay in last 10 years (revalued in line with the Pensions Increase (PI) Act to date of exit)	
Dependant benefits	50% of member pension (pre-commutation)	37.5% of member pension (pre-commutation)
Ill health pension	Total incapacity benefit – Pension based on actual service plus half of potential service to NPA	
	Incapacity benefit – Pension based on actual service (but no reduction for immediate payment)	
Pension increases	In payment – increased in line with the PI Act, on excess over GMP (for members over GMP payment age)	
	In deferment – total pension increased in line with the PI Act	

[+]future benefits unaffected by contracting-out status

2015 Scheme (for post-2015 entrants and transitional members)

The main benefit provisions of the 2015 Scheme are shown in Table H2.

Table H2: Main benefit provisions of 2015 Scheme

	2015 Scheme
Basis of provision	Career average with revaluation of CPI + 1.6% pa whilst in service
Contracted out/in prior to 2016[+]	Contracted out
Normal Pension Age (NPA)	Higher of a member's State Pension age and 65
Pension accrual rate	1/57
Retirement lump sum accrual rate	Cash by commutation only (£12: £1pa)
Final pensionable pay	Not applicable
Dependant benefits	37.5% of member pension (pre-commutation)
Ill health pension	Total incapacity benefit – incapacity benefit plus 50% prospective service to NPA, multiplied by 1/57 of the member's annual rate of pensionable earnings Incapacity benefit - accrued pension, no reduction
Early retirement	Benefits reduced for early payment. The reduction is actuarially neutral on a deferred benefit basis, except that for retirements directly from active status the reduction applying to the period between age 65 and NPA is 3% a year (up to a maximum of 3 years)
Pension increases	In payment – increased in line with the PI Act, on excess over GMP In deferment – total pension increased in line with the PI Act

[+]benefits unaffected by contracting-out status

Criteria for scheme membership from 1 April 2015

Protected Members

All active members who, as of 1 April 2012, have 10 years or less to their current Normal Pension Age (i.e. NPA 60 section members who are aged 50 and over on 1 April 2012, and NPA 65 and Mixed Service section members who are aged 55 and over on 1 April 2012) saw no change in when they can retire, nor any decrease in the amount of pension they receive at their current Normal Pension Age. This protection was achieved by the member remaining in their current scheme until they retire.

Tapered Members

Active members who, as of 1 April 2012, are within 10 to 13½ years of their Normal Pension Age (i.e. NPA 60 section members who are aged between 46½ and 50 on 1 April 2012, and NPA 65 and Mixed Service section members who are aged between 51½ and 55 on 1 April 2012) had limited protection with linear tapering so that for every month of age that they are beyond 10 years from their Normal Pension Age, they lose 2 months of protection. At the end of the protected period, they will be transferred into the new pension arrangements.

Unprotected members

All other active members transferred to the new arrangements on 1 April 2015.