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Self-administered Pension Schemes Mortality Committee

Working Paper 61

An investigation into the mortality experience by industry classification of pensioners of self-administered pension schemes

February 2015

This paper was originally issued in May 2012. This version was issued in February 2015, incorporating the following revisions:

- Some of the figures in Table G on page 19 have been corrected to make them consistent with Figure 13 on the same page.
- An explanatory comment has been added beneath Figure 6 on page 12.

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1. Introduction

1.1 This paper was released to SAPS Members in January 2012.

1.2 Industry classification information has been collected in respect of each scheme submitted to the SAPS Mortality investigation, since its commencement in 2001, providing high level information about the underlying industry sector in which pensioners were employed.

1.3 To date there have been two different industry classifications used for SAPS data. The original classifications were updated in 2007 to bring them into line with the FTSE Actuaries Industry Sectors, which have followed the Industry Classification Benchmark system since 31/12/2005. Appendix A and Appendix B provide more information about the two classifications.

1.4 To maintain continuity between the data submitted prior to the classification update and that submitted after, an exercise was carried out to map the old scheme industry classifications to one of the new classifications. Consequently, a consistent coding exists for all schemes submitted to the investigation. Where multiple submissions have been sent for particular schemes covering different investigation periods, known as 'continuation' data, we have tried to ensure that consistent industry codes are being used in each submission.

1.5 The first analysis of mortality experience by industry classification was carried out by the SAPS Mortality Committee ("the Committee") and published in Working Paper 29, in October 2007. The data underlying this analysis was that submitted by 30 June 2006, covering the period 2000 to 2004, and used the original set of industry classifications. A summary of the results of this analysis is presented in Section 2 of this paper.

1.6 The Committee is aware of practitioners' interest in pensioner mortality experience by industry sector and so an updated analysis has been carried out. The data underlying this analysis is that submitted by 30 June 2010, covering the period 2002 to 2009. This was also the data underlying the annual experience analysis presented in Working Paper 51, published in May 2011, and the analysis of mortality improvements presented in Working Paper 53 published in July 2011.

1.7 Section 3 of this paper presents summary results of mortality experience by industry classification, in a similar format to the previous analysis in Working Paper 29. Additionally, this paper seeks to provide practitioners with information regarding the variability of the mortality experience within the various industry classifications. Section 4 considers the variability of mortality experience between industry classifications by constructing confidence intervals. Section 5 then examines the variability within each industry classification with the aid of box and whisker graphs.

1.8 It is likely that some of the variation in experience across industry sector could be a consequence of the limited information in respect of the industry sector that is collected for each scheme. Providing a single high level industry code for each scheme may result in the following:

- Each industry code combines a number of industry sub-sectors and it is not possible to split these out to compare the experience of the underlying sub-sectors.
- Some schemes may relate to companies that cover a number of different industries. Companies may change the sector that they operate in as their business evolves over time.
- The range of staff within a scheme, classified under a single industry code, may vary considerably.

1.9 Insofar as the principles are applicable, this paper complies with the material requirements of the principles in the Board for Actuarial Standards' TAS D and TAS M, in respect of CMI SAPS data.

2. Summary of results presented in Working Paper 29

2.1 A summary of the results presented in Working Paper 29, published in October 2007, is included in this section. The data underlying this analysis was that submitted by 30 June 2006, covering the period 2000 to 2004.

2.2 The industry classifications underlying the analysis were based on those specified when the investigation first started; see Appendix A for more information about these. Results were presented for all industry classifications containing more than five schemes, which amounted to 10 out of a possible 13 classifications. Table A summarises the industry classifications that were analysed and the number of schemes contained within these classifications.

Table A

Industry Type	Number of Schemes
Basic Industries	14
General Industries	55
Cyclical Consumer Goods	17
Non-Cyclical Consumer Goods	25
Cyclical Services	17
Utilities	7
IT	8
Financials	23
Local Authorities	56
Miscellaneous	8
Total	230

2.3 The industry classifications that were excluded from the analysis, due to them having too few schemes, were; Resources, Non-cyclical Services and Public Sector (Excluding Local Authorities).

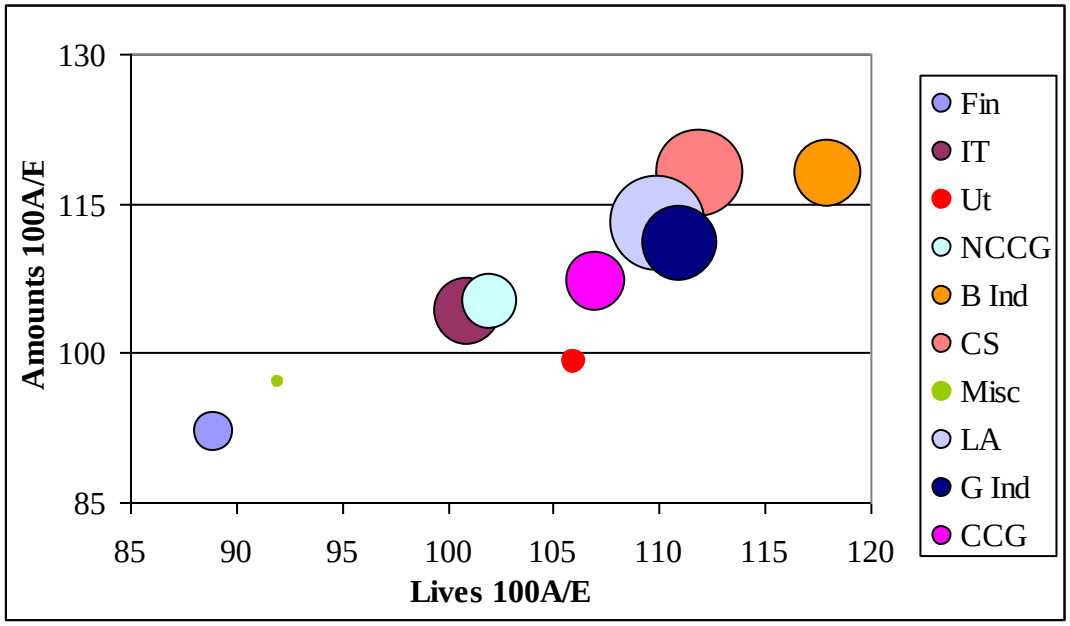
2.4 A high level analysis of the relative mortality experience for the remaining industry categories was presented and demonstrated that generally sectors with more blue collar workers tended to experience heavier mortality than sectors with more white collar workers. A summary of the mortality experience and the average pension, for males, by industry category, presented in Working Paper 29, has been reproduced in Table B.

Table B

Sector	Average pension (male) £ p.a.	100A/E "92" Series short cohort (C=year of exposure) (Amounts)
Financials	13,471	109
IT	9,642	128
Utilities	8,690	124
Non-Cyclical Consumer Goods	6,446	128
Basic Industries	5,840	136
Cyclical Services	5,649	137
Miscellaneous	5,512	108
Local Authorities	5,056	134
General Industries	4,178	133
Cyclical Consumer Goods	3,496	132

2.5 Figure 1, originally presented in Working Paper 29, compares the mortality experience, for males, for the different industry sectors. The size of each bubble is determined by the Lives exposed to risk and the 100A/E values are based on the "00" Series Combined retirement tables. The industry sectors have been ordered by decreasing average pension amounts in the key.

Figure 1 - 100A/Es Lives vs 100A/Es Amounts basis by industry – Male Pensioners



3. Summary of results

3.1 This section presents high level results of the latest mortality experience by industry classification using data submitted by 30 June 2010, covering the period 2002 to 2009.

3.2 The industry classifications in this paper are consistent with those in the current Coding Guide based on the FTSE Actuaries Industry Sectors, which have followed the Industry Classification Benchmark system since 31/12/2005. Appendix B summarises the 13 industry classifications that are used and the SAPS Coding Guide provides more detailed information about the sub-categories within these classifications.

3.3 The SAPS industry for each scheme is chosen by the data contributor. If the company is quoted then it is straightforward for the contributor to map to the SAPS industry code, otherwise if the industry type is known then they will select the most appropriate code. If it is not possible to identify the industry then the miscellaneous code is used. The inclusion of a scheme within a particular industry classification relies on the codes provided in the scheme data that is submitted.

3.4 The CMI undertakes to keep the experience of individual schemes confidential. An analysis of the experience for a specific industry class is only presented in this paper if the following criteria are met:

- Five or more schemes are included within the classification; and
- Contribution to overall exposure within the classification is spread across a number of schemes, i.e. the overall exposure is not overwhelmingly from a single scheme.

For the previous analysis this meant that 3 industries were not presented in the analysis. Due to the increase in the volume of data since then, all the industries now have more than 5 schemes but the "Public Sector excluding Local Authority" industry category is dominated by one scheme so has not been analysed in this paper. For each of the industries whose experience is analysed in this paper, no single scheme accounts for more than 80% of exposure.

3.5 However, some other industries are dominated by a small number of companies whose identities might be inferred. The Committee therefore decided not to publish detailed figures for the exposed to risk or the number of deaths by industry. Inclusion of this data might have allowed readers to deduce whether a particular scheme has been included in the investigation and to infer some indication of its mortality experience. Instead, Figures 2 to 4 show a schematic representation of the volume of data analysed for each industry.

3.6 Furthermore, individual schemes with fewer than 500 pensioners have been excluded from the analysis due to the variability of results for such small schemes. The majority were submitted by the PPF, which provided data in a single submission.

3.7 Table C summarises the number of schemes within each industry classification analysed in this paper.

Table C – Industry classification and number of schemes analysed

Industry Code	Sector	Number of Schemes
51	Oil and Gas	6
52	Basic Materials	34
53	Industrials	101
54	Consumer Goods	75
55	Health Care	7
56	Consumer Services	45
57	Telecommunications	6
58	Utilities	20
59	Financials	47
60	Technology	13
62	Local Authority	67
63	Miscellaneous	31
	Total	452

3.8 It is useful when considering the results presented in this paper to be mindful of the volume of data within each industry classification. Figures 2 to 4 show the proportion of the exposed to risk underlying the analysis presented in Working Paper 51 that each industry classification represents. This is shown for Male Pensioners, Female Pensioners and Female Dependants. Note that the Male Dependants data has not been analysed in this paper due to the low volume of data. The pie charts show that a proportion of the exposed to risk analysed in Working Paper 51 has not been included in this investigation. This represents those industry classifications that have been excluded, as noted in paragraph 3.5, as well as those schemes with fewer than 500 current pensioners.

3.9 Table D summarises the mortality experience, for Male Pensioners, Females Pensioners and Female Dependants, in each industry classification. The 100A/Es have been derived using the "S1" Series Pensioner and Dependants tables, as appropriate. 100A/Es derived using the "00" Series Normal Retirement tables are presented in Appendix C, for consistency with the previous industry analysis, but are not used in any of the analyses presented later in this paper.

3.10 Figures 5 to 7 present graphically a comparison of the mortality experience by industry classification and provide an indication of the comparative sizes of the datasets underlying each classification.

Figure 2: Exposed to risk by industry classification – Male Pensioners

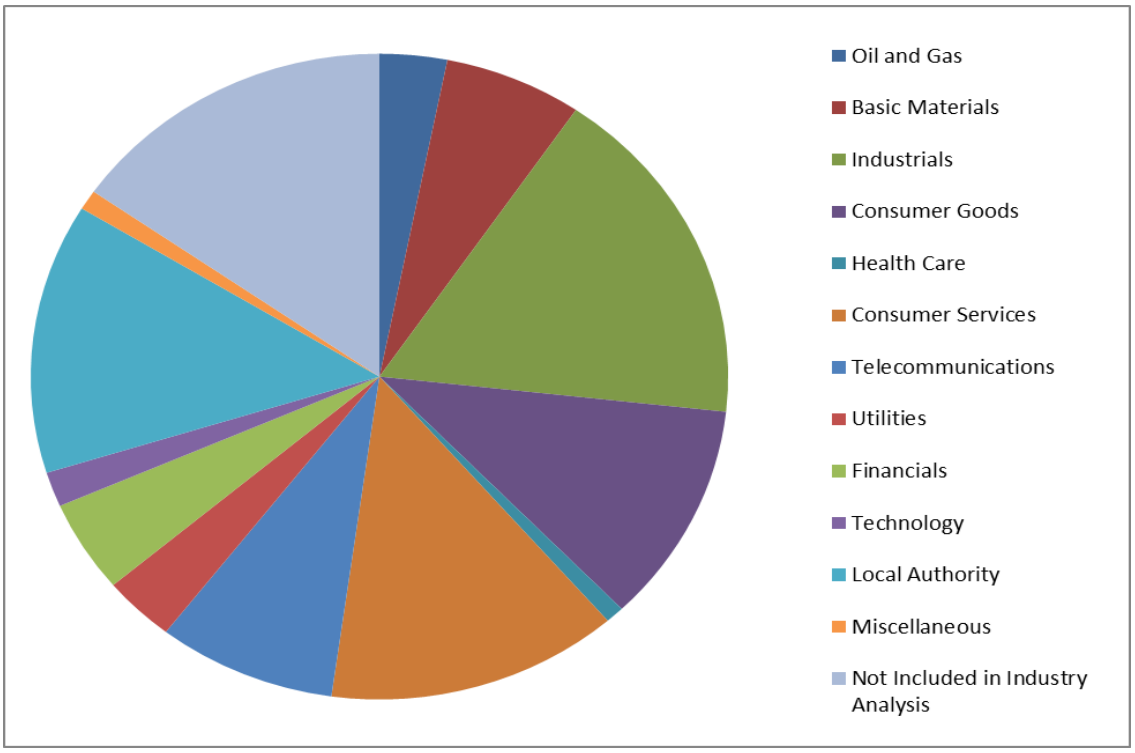


Figure 3: Exposed to risk by industry classification – Female Pensioners

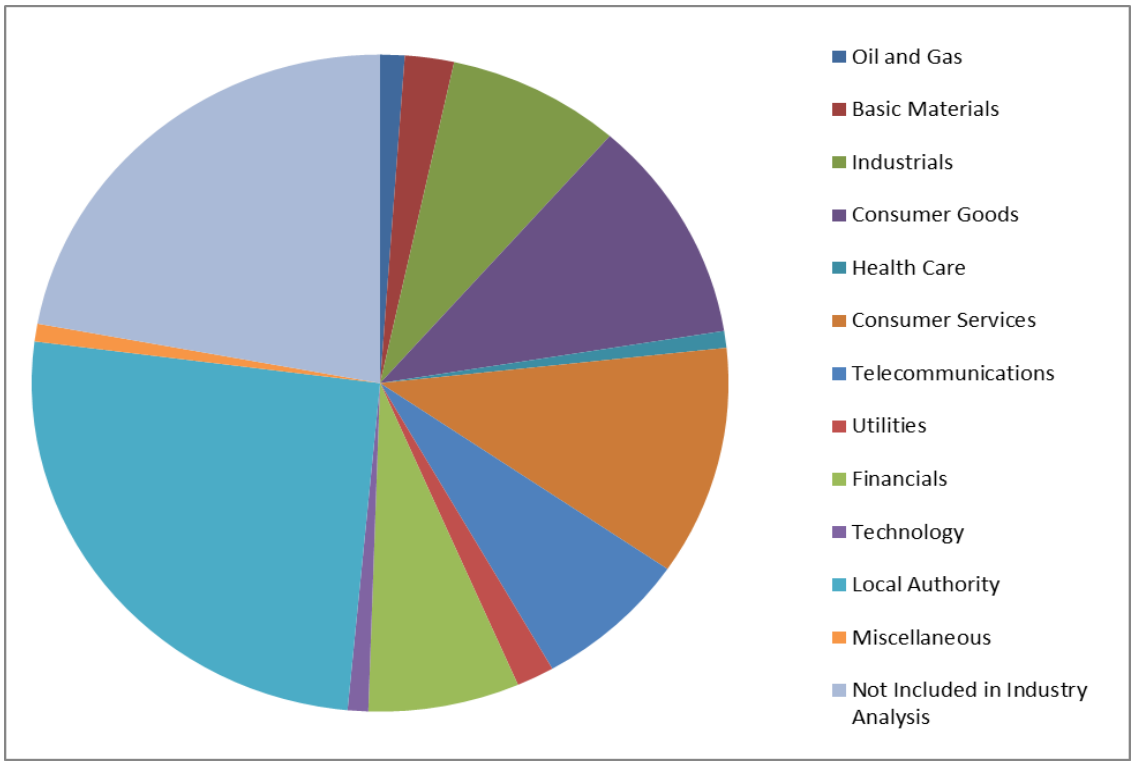


Figure 4: Exposed to risk by industry classification – Female Dependants

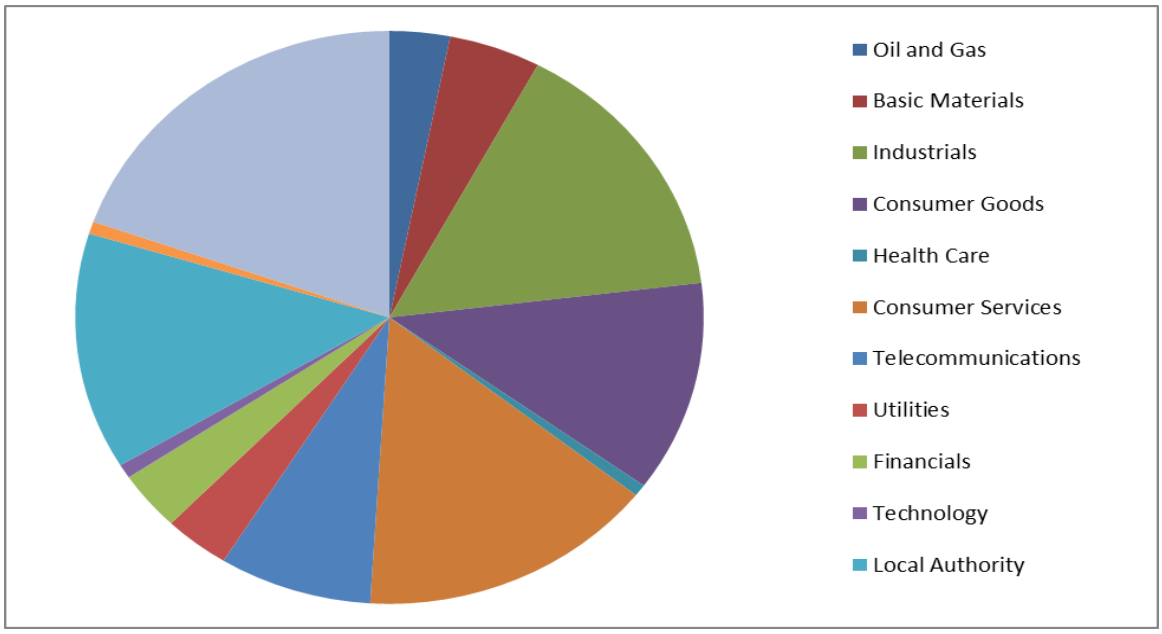


Table D: 100A/E results for Males and Females for each industry classification

Industry Code	Sector	Lives or amounts	100A/E S1 All Pensioners		100A/E S1 Dependants
			Male Pensioners	Female Pensioners	Female Dependants
51	Oil and Gas	Lives	85	91	94
		Amounts	91	91	96
52	Basic Materials	Lives	99	103	102
		Amounts	101	103	100
53	Industrials	Lives	92	99	95
		Amounts	96	104	100
54	Consumer Goods	Lives	96	105	96
		Amounts	98	106	102
55	Health Care	Lives	85	89	87
		Amounts	83	90	80
56	Consumer Services	Lives	96	96	98
		Amounts	98	104	101
57	Telecommunications	Lives	84	92	91
		Amounts	89	99	93
58	Utilities	Lives	87	84	98
		Amounts	93	90	104
59	Financials	Lives	76	81	84
		Amounts	82	92	88
60	Technology	Lives	79	95	90
		Amounts	89	116	87
62	Local Authority	Lives	98	93	95
		Amounts	103	98	98
63	Miscellaneous	Lives	88	83	79
		Amounts	92	84	81
	Overall (WP51)	Lives	90	93	92
		Amounts	92	97	94

3.11 The "overall" 100A/Es are consistent with those presented in Working Paper 51, which analysed the mortality experience, over the period 2002 to 2009, of pensioners in the data submitted to 30 June 2010. Note that the "overall" figures are based on data for all schemes with exposure during the period 2002 to 2009, including those with fewer than 500 pensioners.

3.12 Figures 5, 6 and 7 compare the 100A/Es on a Lives and Amounts basis, based on "S1" Series Pensioner and Dependants tables, as appropriate, for each industry sector. The size of the bubble is determined by the Lives exposed to risk. These charts are consistent with the presentation used for the chart in Working Paper 29.

3.13 Please note that the scales differ for many of the graphs in this section.

Figure 5: 100A/Es Lives vs 100A/Es Amounts basis by industry – Male Pensioners

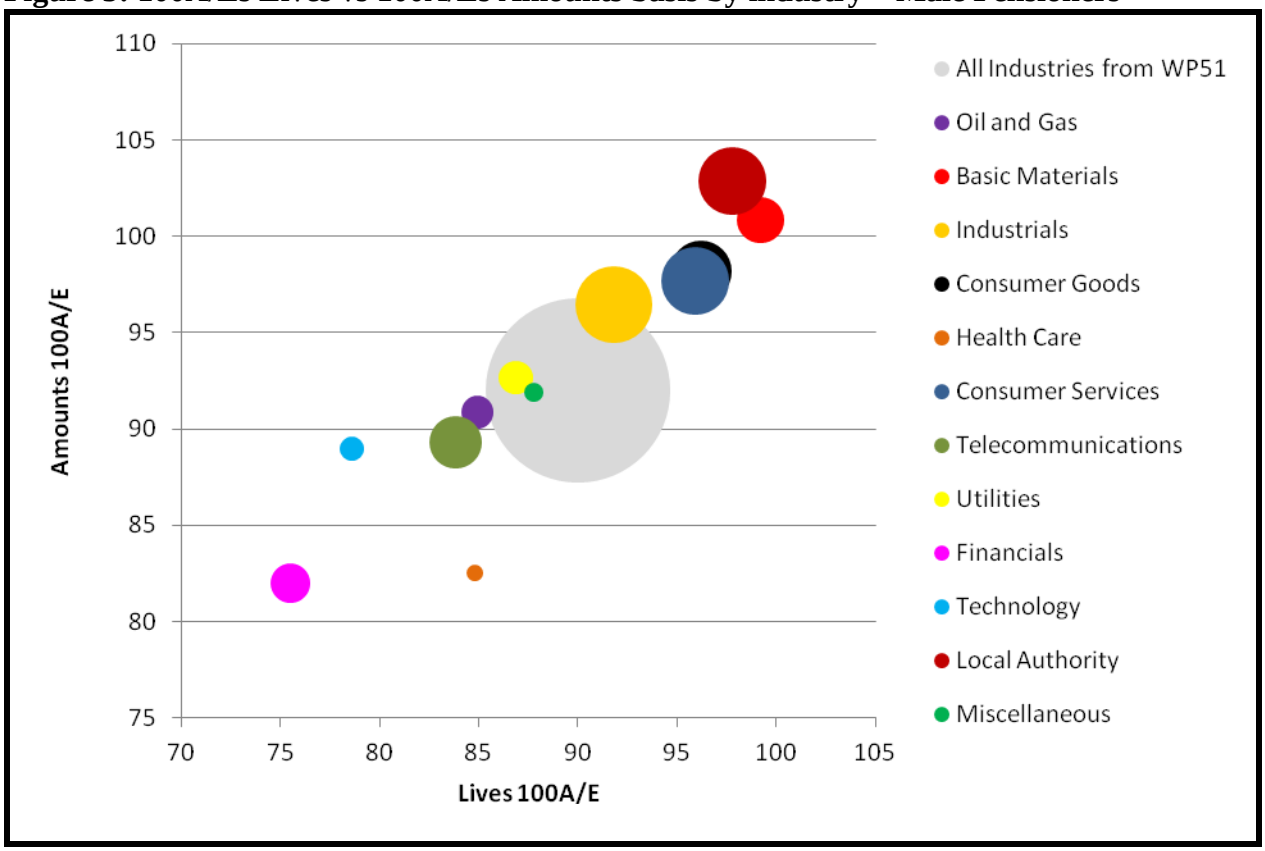
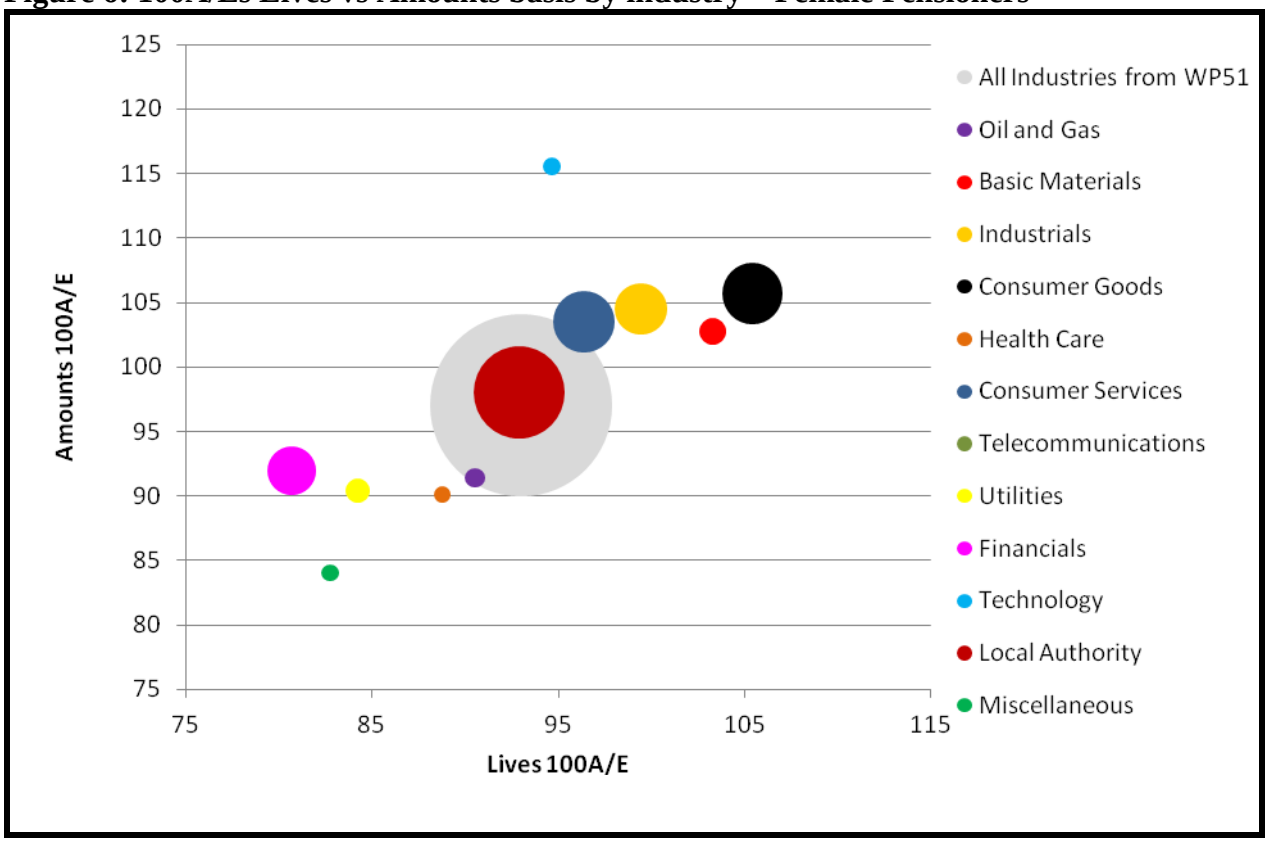
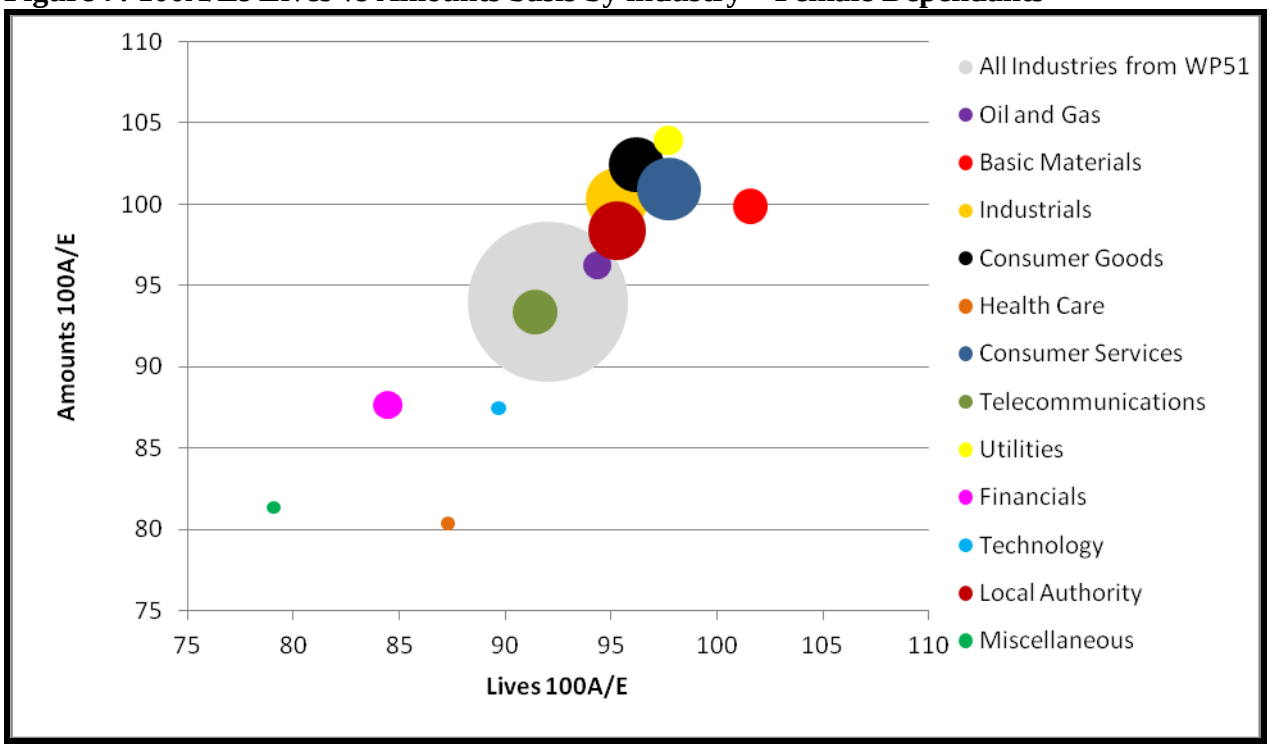


Figure 6: 100A/Es Lives vs Amounts basis by industry – Female Pensioners



Note: The green Telecommunications bubble is hidden behind the red Local Authority bubble

Figure 7: 100A/Es Lives vs Amounts basis by industry – Female Dependants



3.14 The results in figures 5, 6 and 7 appear to be consistent with those presented in Working Paper 29 and indicate that there may be a relationship between the mortality experience and the amount of pension that is received.

3.15 The format of the charts above is consistent with those presented in Working Paper 29. However, it may also be interesting for readers to see 100A/Es for each industry sector presented against the average pension amount. Figures 8, 9 and 10 present these results, on an Amounts basis.

Figure 8: 100A/Es on Amounts basis vs average pension by industry – Male Pensioners

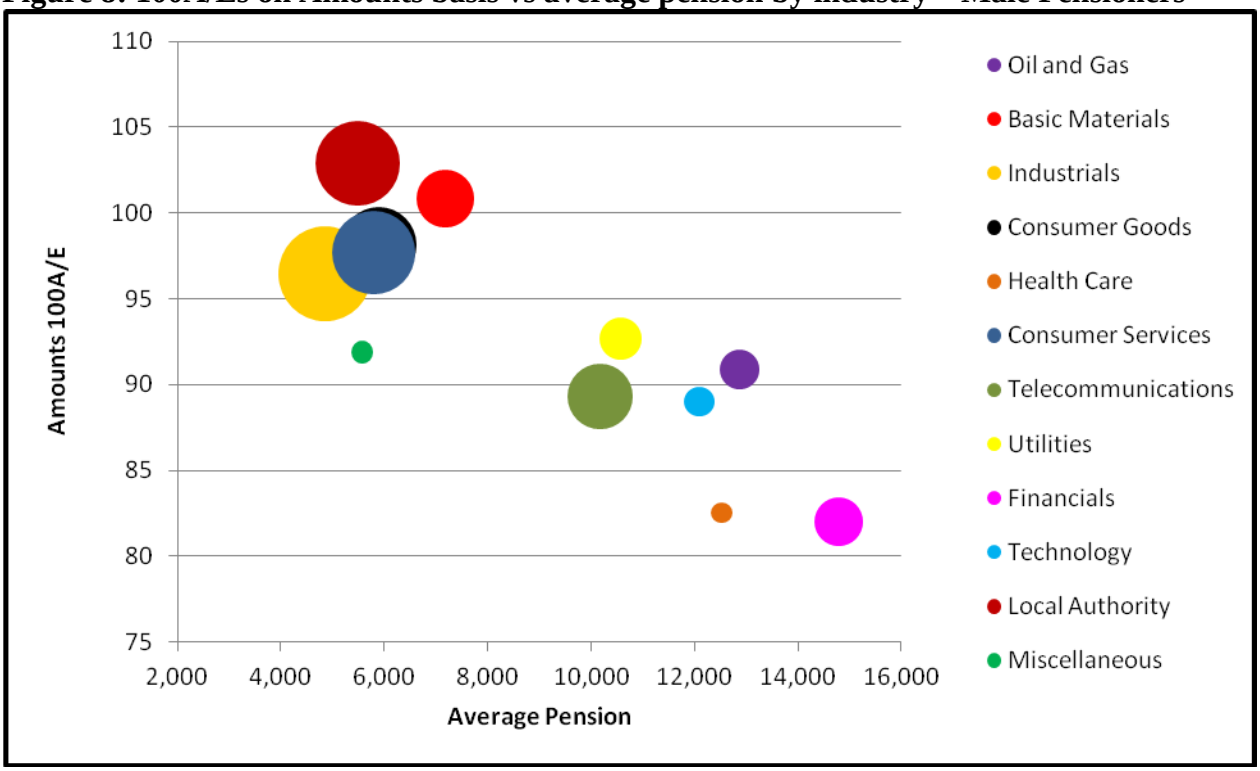


Figure 9: 100A/Es on Amounts basis vs average pension by industry – Female Pensioners

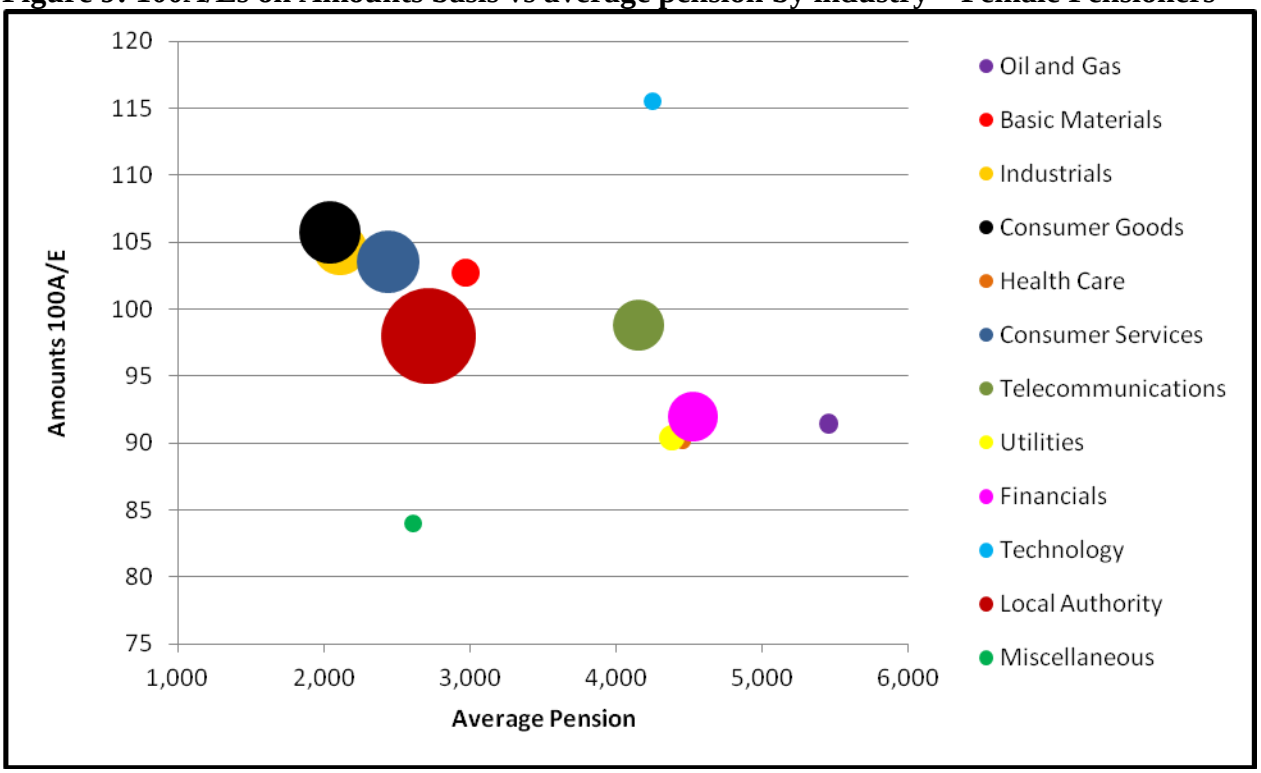
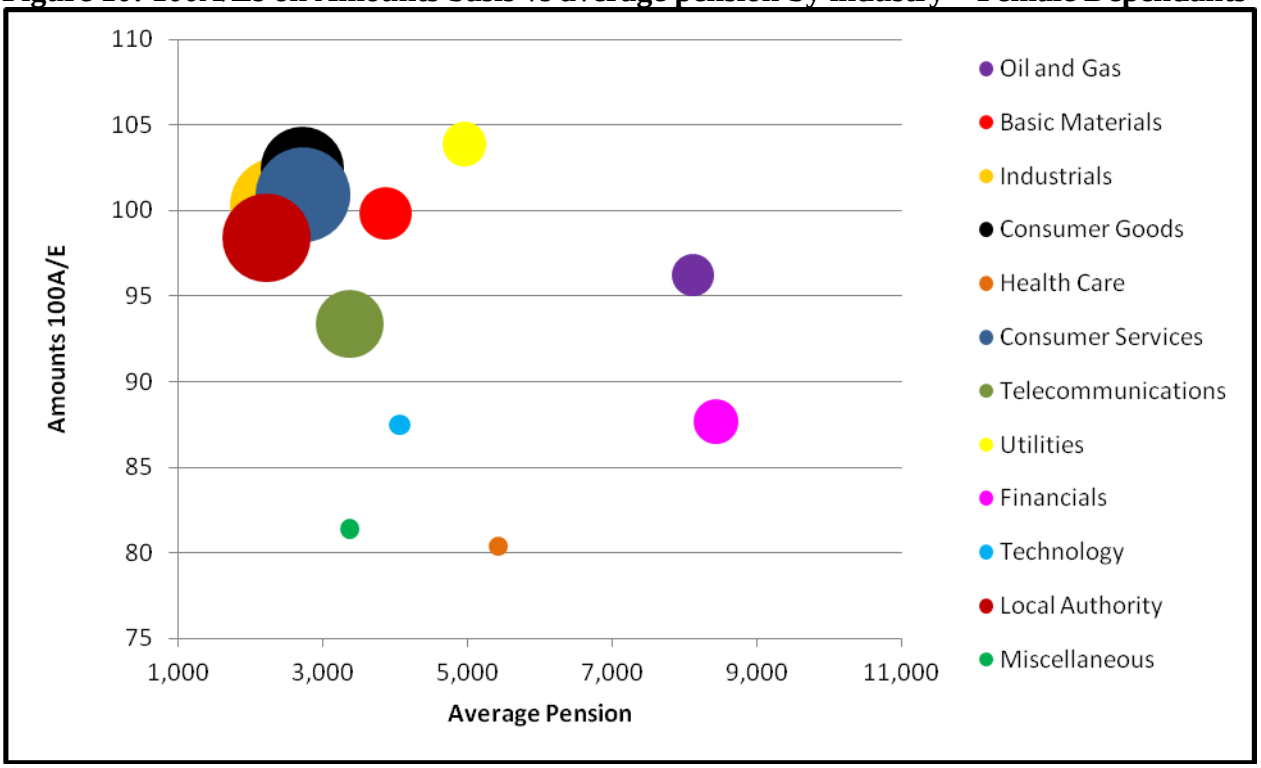


Figure 10: 100A/Es on Amounts basis vs average pension by industry – Female Dependants



3.16 The experience for Male and Female Pensioners appears to show that the mortality experience gets lighter as the average pension amount increases. This pattern is less pronounced for the Female Dependants.

3.17 These graphs indicate that the financial sector appears to experience lighter mortality than the majority of other industry categories and the average pension amount for this sector is generally higher, for all the pensioner categories.

3.18 Further analysis has been carried out (presented in section 6) to attempt to determine whether the apparent differences between industries can be explained solely by different pension amounts, or whether there is an observable 'industry affect'.

3.19 For the industry categories where the exposure is smallest the results presented are likely to be less reliable and experience greater variation within the experience of the underlying schemes. For all pensioner types this includes the miscellaneous and health care industry groups. For female pensioners and dependants the exposure for the technology industry group is small and, additionally, for female pensioners the exposure for the oil and gas and utilities industry groups is also low.

4. Variation in Results – Confidence Intervals

4.1 In Working Paper 29 it was noted that there were large variations in the results within industry sectors and that users should be wary of this when applying the results of the analysis to individual schemes. However, no illustration of the variation was provided.

4.1 This Section provides some quantification of the range of, or uncertainty around, the differences in mortality experience results between different industry classifications. This has been addressed by calculating 95% confidence intervals, in this Section. Section 5 examines the range of mortality experience results within each industry classification, using box and whisker graphs.

4.2 For each industry category the 95% confidence intervals of the 100A/Es, for each pensioner type analysed in this paper, are estimated using the formulae below.

$$Standard\ Deviation = {}^{\sqrt{A}}/_{E} \times 100$$

$$CI = \left[\frac{100A}{E} - 1.96 \times s.d., \frac{100A}{E} + 1.96 \times s.d.\right]$$

Where A is the actual number of deaths and E is the expected number of deaths, based on the comparison table that has been chosen. This formula assumes that the distribution of the number of deaths can be approximated by a normal distribution.

4.3 The following tables provide approximate 95% confidence intervals for the male and female lives-weighted mortality experience, by industry classification. A chart follows each table and presents the results graphically.

Table E: 95% confidence intervals by industry classification – Male Pensioners

Industry Code	Sector	95% CI
51	Oil and Gas	83% to 87%
52	Basic Materials	98% to 100%
53	Industrials	91% to 93%
54	Consumer Goods	95% to 97%
55	Health Care	82% to 88%
56	Consumer Services	95% to 97%
57	Telecommunications	83% to 85%
58	Utilities	85% to 89%
59	Financials	74% to 77%
60	Technology	76% to 81%
62	Local Authority	97% to 99%
63	Miscellaneous	85% to 91%
	All Industries	90% to 91%

Figure 11: 95% confidence intervals by industry classification – Male Pensioners

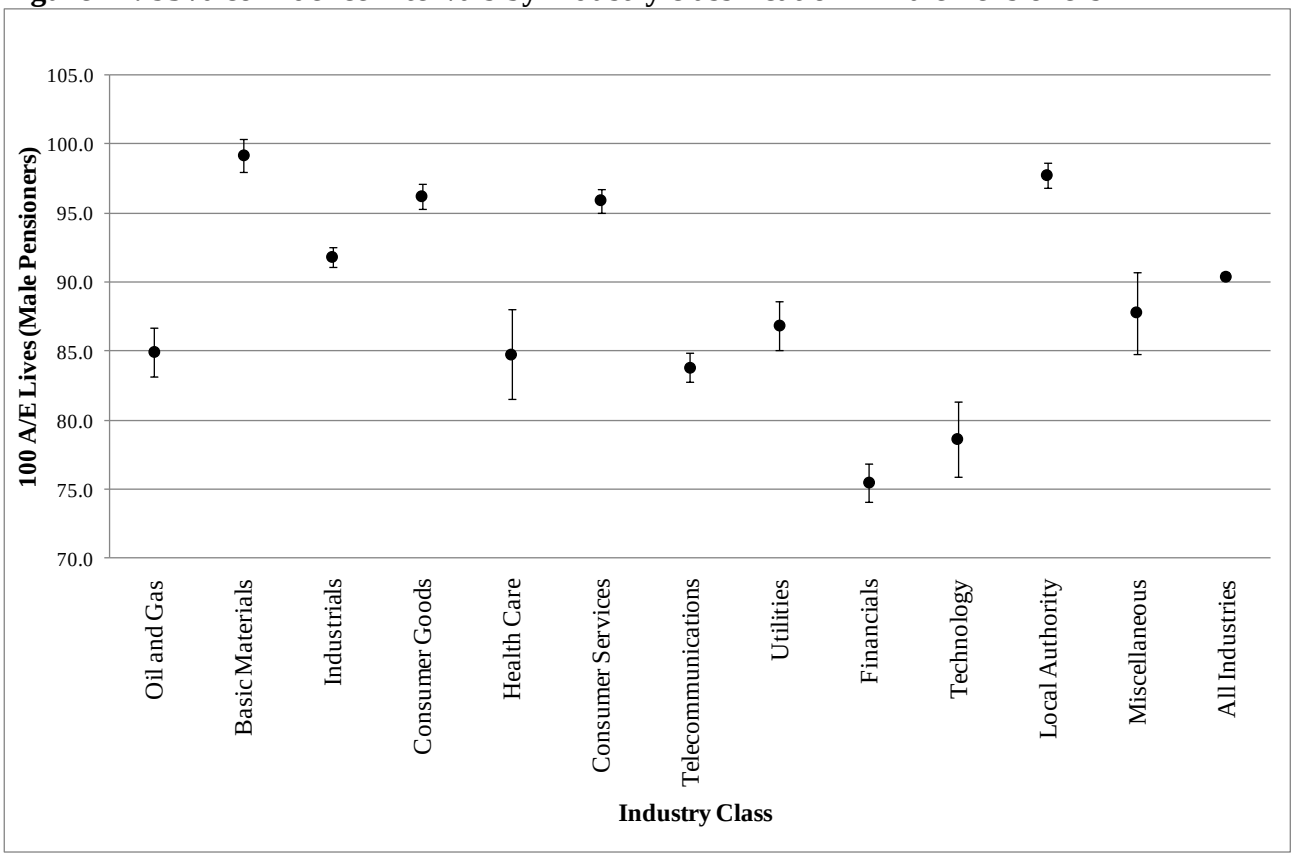


Table F: 95% confidence intervals by industry classification – Female Pensioners

Industry Code	Sector	95% CI
51	Oil and Gas	86% to 96%
52	Basic Materials	100% to 106%
53	Industrials	98% to 101%
54	Consumer Goods	104% to 107%
55	Health Care	83% to 94%
56	Consumer Services	95% to 98%
57	Telecommunications	91% to 94%
58	Utilities	80% to 88%
59	Financials	79% to 83%
60	Technology	88% to 101%
62	Local Authority	92% to 94%
63	Miscellaneous	78% to 88%
	All Industries	92% to 93%

Figure 12: 95% confidence intervals by industry classification – Female Pensioners

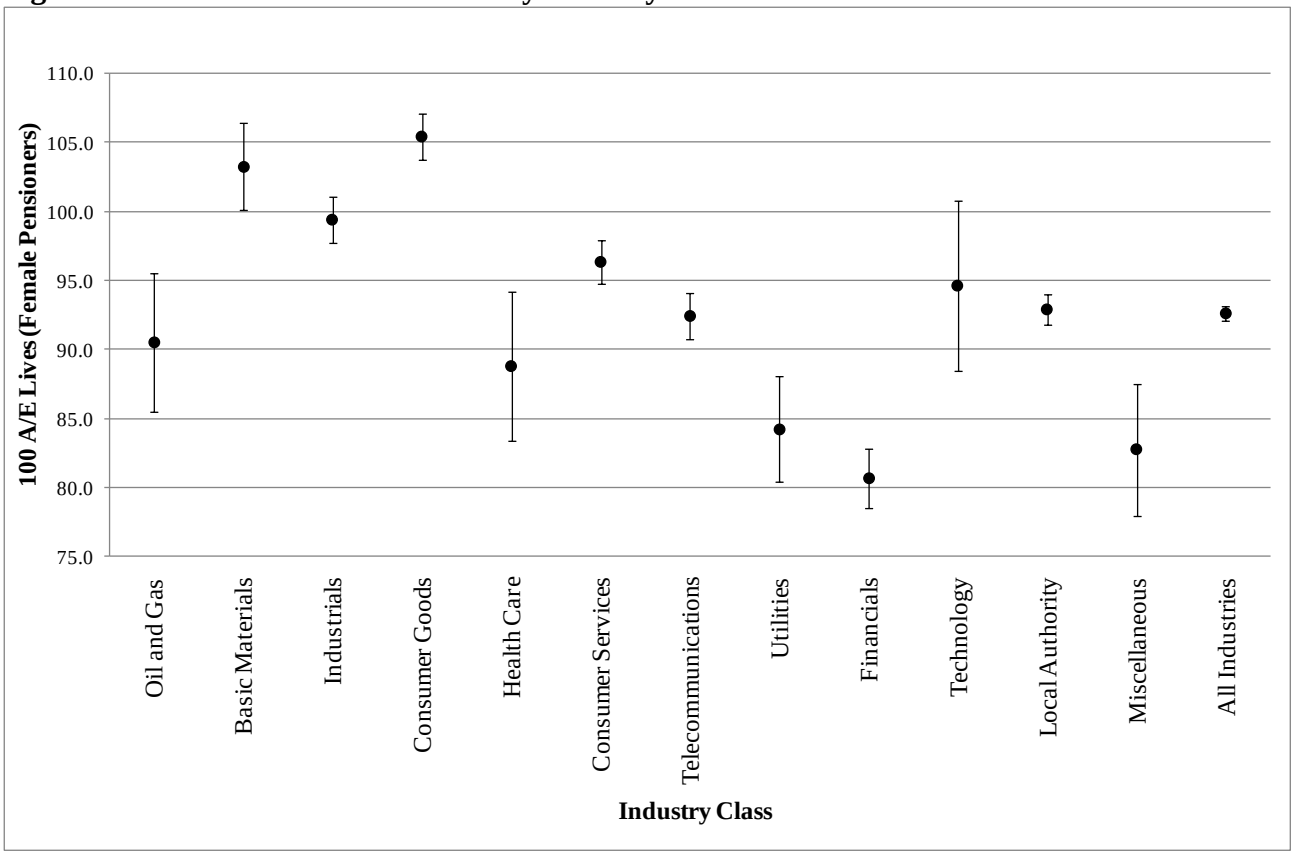
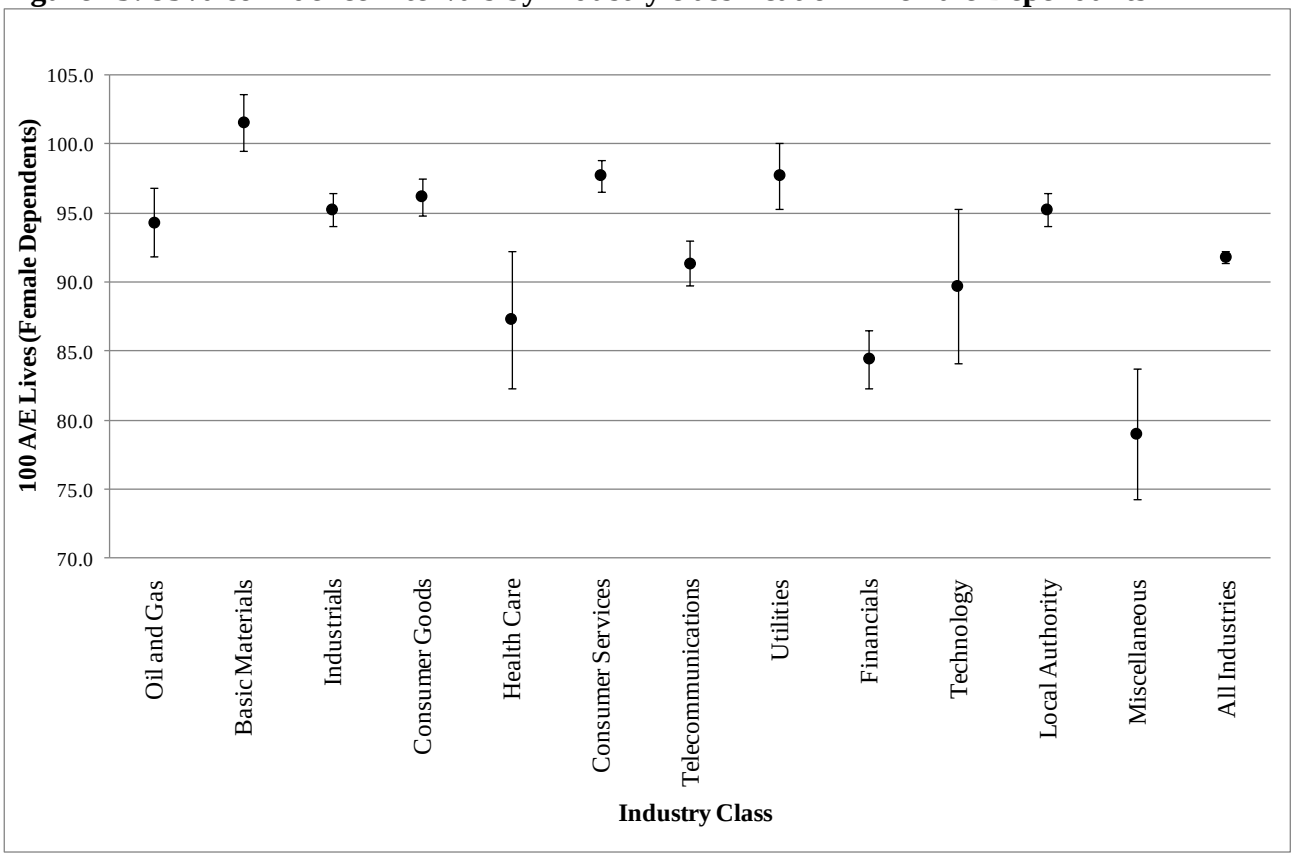


Table G: 95% confidence intervals by industry classification – Female Dependants

Industry Code	Sector	95% CI
51	Oil and Gas	92% to 97%
52	Basic Materials	100% to 104%
53	Industrials	94% to 96%
54	Consumer Goods	95% to 98%
55	Health Care	82% to 92%
56	Consumer Services	97% to 99%
57	Telecommunications	90% to 93%
58	Utilities	95% to 100%
59	Financials	82% to 87%
60	Technology	84% to 95%
62	Local Authority	94% to 97%
63	Miscellaneous	74% to 84%
	All Industries	92% to 92%

Figure 13: 95% confidence intervals by industry classification – Female Dependants



4.4 Estimates on an Amounts basis are dependent on the distribution of pension amounts across the pensioners, and amongst those who died, and are therefore more volatile; consequently, we expect an amounts-weighted confidence interval to be larger than the lives-weighted confidence interval.

5. Variation in Results – Box and Whisker

5.1 This Section indicates the range of uncertainty around the mortality experience within each industry classification using box and whisker graphs.

5.2 The following box and whisker graphs summarise the range in the 100A/Es for the schemes underlying each industry classification, where the "box" represents the range from the 25th to the 75th percentiles (with the mid-point being the median result), and the "whiskers" span from the 5th to the 95th percentiles. The extremities have not been included, in order to avoid distorting the graph. The key figures in each of the graphs have also been summarised in tabular form.

5.3 The calculation of the value used for the P^{th} percentile is as follows:

$$\frac{P}{100} \times (n-1) + 1$$

Where n is the number of schemes underlying the industry classification in question.

5.4 If the value calculated is not an integer then the following example demonstrates the calculation performed. The 25th Percentile of 12 observations is calculated as the 3.25th value, using the equation above, thus to find the 25th percentile the equation is:

$$3rd\ Value + 0.25 \times (4th\ Value - 3rd\ Value)$$

5.5 Results are shown separately on Lives and Amounts bases, compared to the appropriate "S1" table.

Figure 14: Variation of 100A/Es (Lives) by industry classification – Male Pensioners

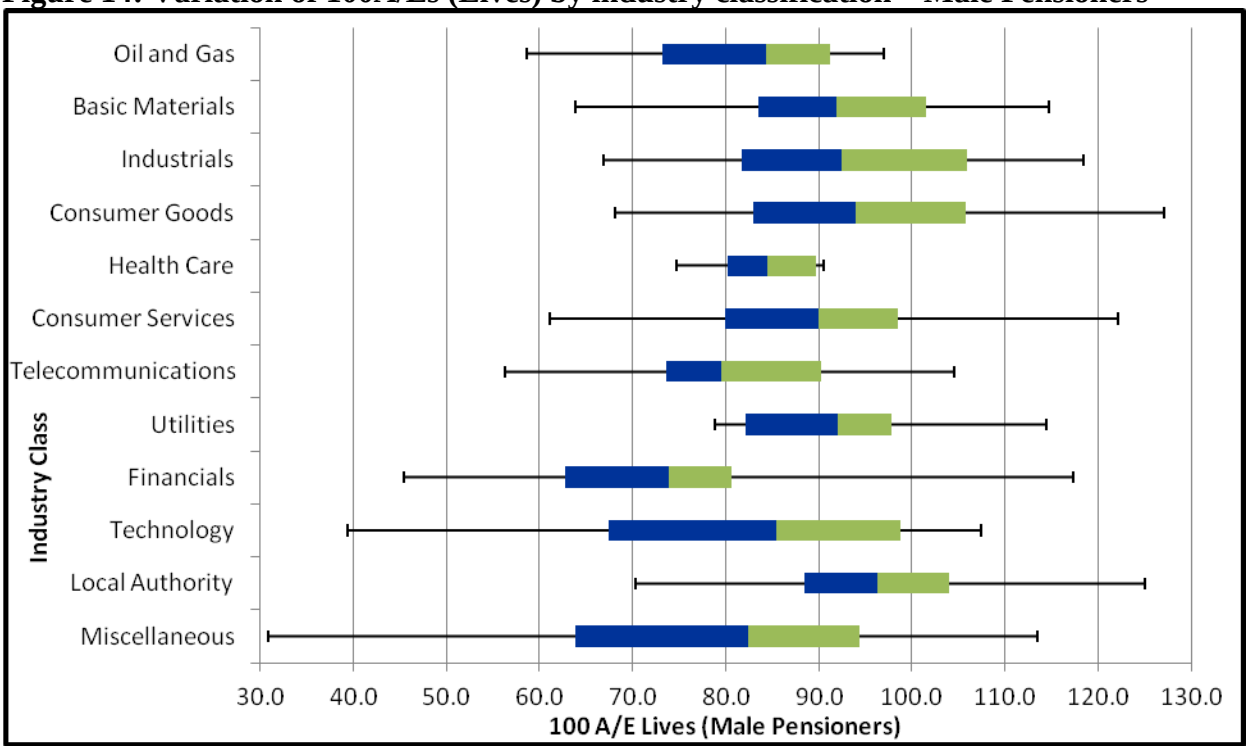


Table H: Variation of 100A/Es (Lives) by industry classification – Male Pensioners

Industry	5th Percentile	25th Percentile	Median	75th Percentile	95th Percentile	Mean
Oil and Gas	59	73	84	91	97	85
Basic Materials	64	84	92	102	115	99
Industrials	67	82	92	106	118	92
Consumer Goods	68	83	94	106	127	96
Health Care	75	80	84	90	91	85
Consumer Services	61	80	90	99	122	96
Telecommunications	56	74	80	90	105	84
Utilities	79	82	92	98	114	87
Financials	45	63	74	81	117	76
Technology	39	67	85	99	107	79
Local Authority	70	88	96	104	125	98
Miscellaneous	31	64	82	94	113	88

5.6 The percentile results are determined using the 100A/Es for the individual schemes underlying each industry category. The mean 100A/Es reflect the overall 100A/Es for each industry category as a whole.

Figure 15: Variation of 100A/Es (Amounts) by industry classification – Male Pensioners

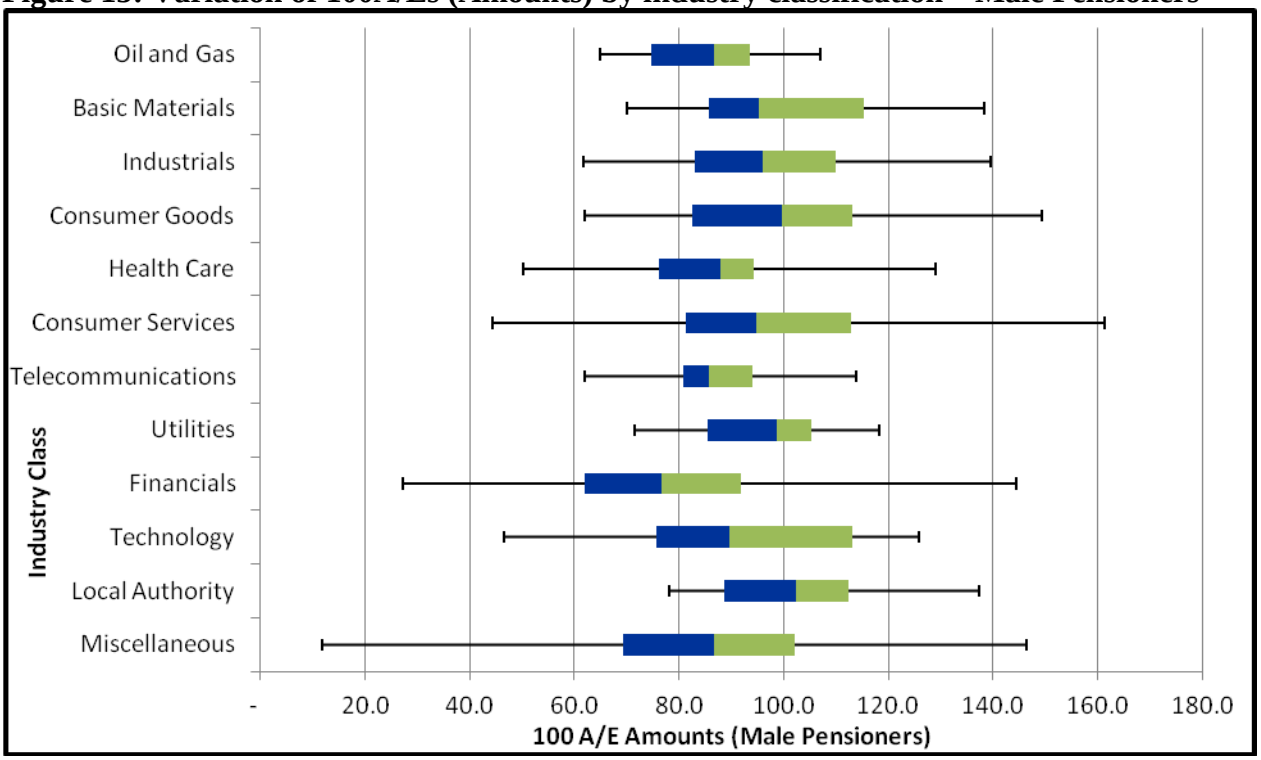


Table I: Variation of 100A/Es (Amounts) by industry classification – Male Pensioners

Industry	5th Percentile	25th Percentile	Median	75th Percentile	95th Percentile	Mean
Oil and Gas	65	75	87	94	107	91
Basic Materials	70	86	95	115	138	101
Industrials	62	83	96	110	139	96
Consumer Goods	62	83	100	113	149	98
Health Care	50	76	88	94	129	83
Consumer Services	44	81	95	113	161	98
Telecommunications	62	81	86	94	114	89
Utilities	72	86	99	105	118	93
Financials	27	62	77	92	145	82
Technology	47	76	90	113	126	89
Local Authority	78	89	102	112	137	103
Miscellaneous	12	69	87	102	146	92

Figure 16: Variation of 100A/Es (Lives) by industry classification – Female Pensioners

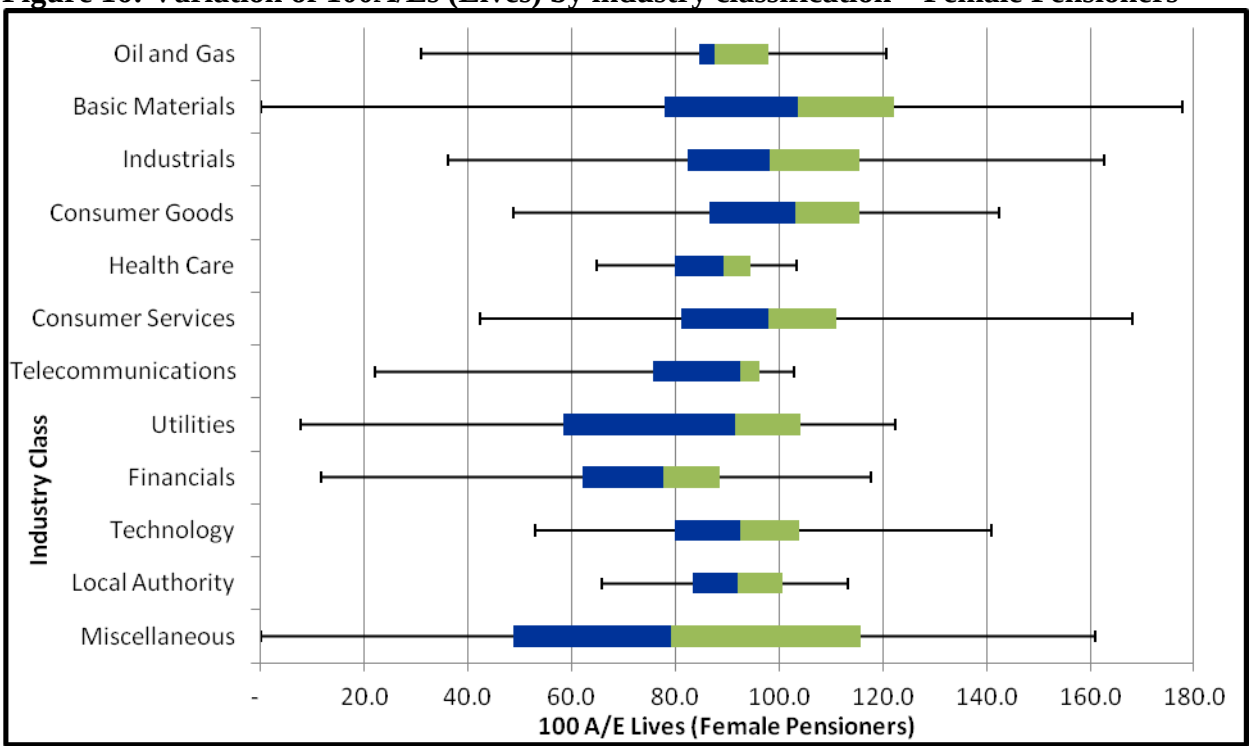


Table J: Variation of 100A/Es (Lives) by industry classification – Female Pensioners

Industry	5th Percentile	25th Percentile	Median	75th Percentile	95th Percentile	Mean
Oil and Gas	31	85	88	98	121	91
Basic Materials	-	78	104	122	178	103
Industrials	36	82	98	116	163	99
Consumer Goods	49	87	103	116	143	105
Health Care	65	80	89	95	104	89
Consumer Services	42	81	98	111	168	96
Telecommunications	22	76	92	96	103	92
Utilities	8	59	92	104	122	84
Financials	12	62	78	89	118	81
Technology	53	80	92	104	141	95
Local Authority	66	83	92	101	113	93
Miscellaneous	-	49	79	116	161	83

5.7 For a couple of industry categories there is at least one scheme where there are no deaths and in these cases it is not possible to determine the 5th percentile. These cases have arisen for schemes that have a very low number of Female Pensioners. The data analysed consists only of schemes with more than 500 current beneficiaries overall, some of which do happen to have a very low number of members falling into particular categories. This issue also affects the results for Female Dependants, as can be seen below.

Figure 17: Variation of 100A/Es (Amounts) by industry classification – Female Pensioners

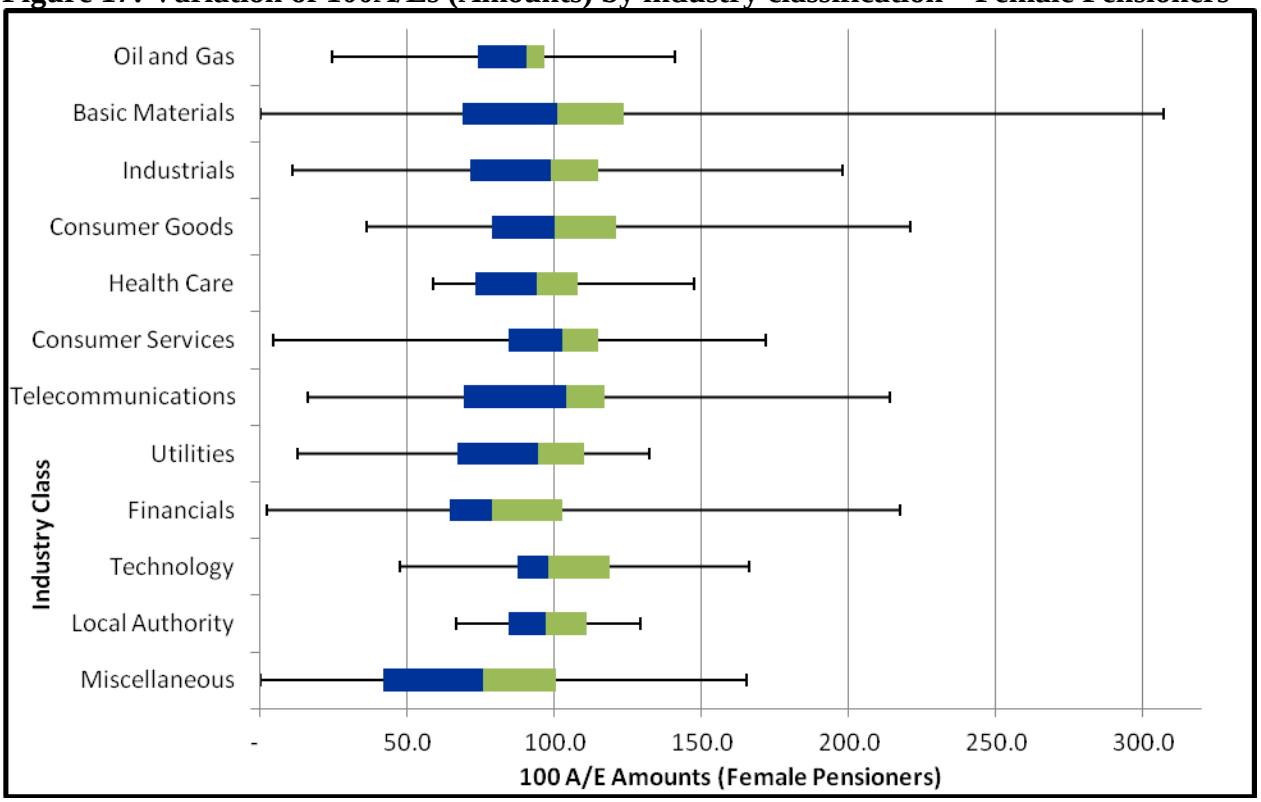


Table K: Variation of 100A/Es (Amounts) by industry classification – Female Pensioners

Industry	5th Percentile	25th Percentile	Median	75th Percentile	95th Percentile	Mean
Oil and Gas	25	74	90	97	141	91
Basic Materials	-	69	101	124	307	103
Industrials	11	72	99	115	198	104
Consumer Goods	36	79	100	121	221	106
Health Care	59	73	94	108	147	90
Consumer Services	5	84	103	115	172	104
Telecommunications	16	69	104	117	214	99
Utilities	13	67	94	110	132	90
Financials	2	65	79	103	217	92
Technology	48	88	98	119	166	116
Local Authority	67	85	97	111	129	98
Miscellaneous	-	42	76	100	165	84

Figure 18: Variation of 100A/Es (Lives) by industry classification – Female Dependants

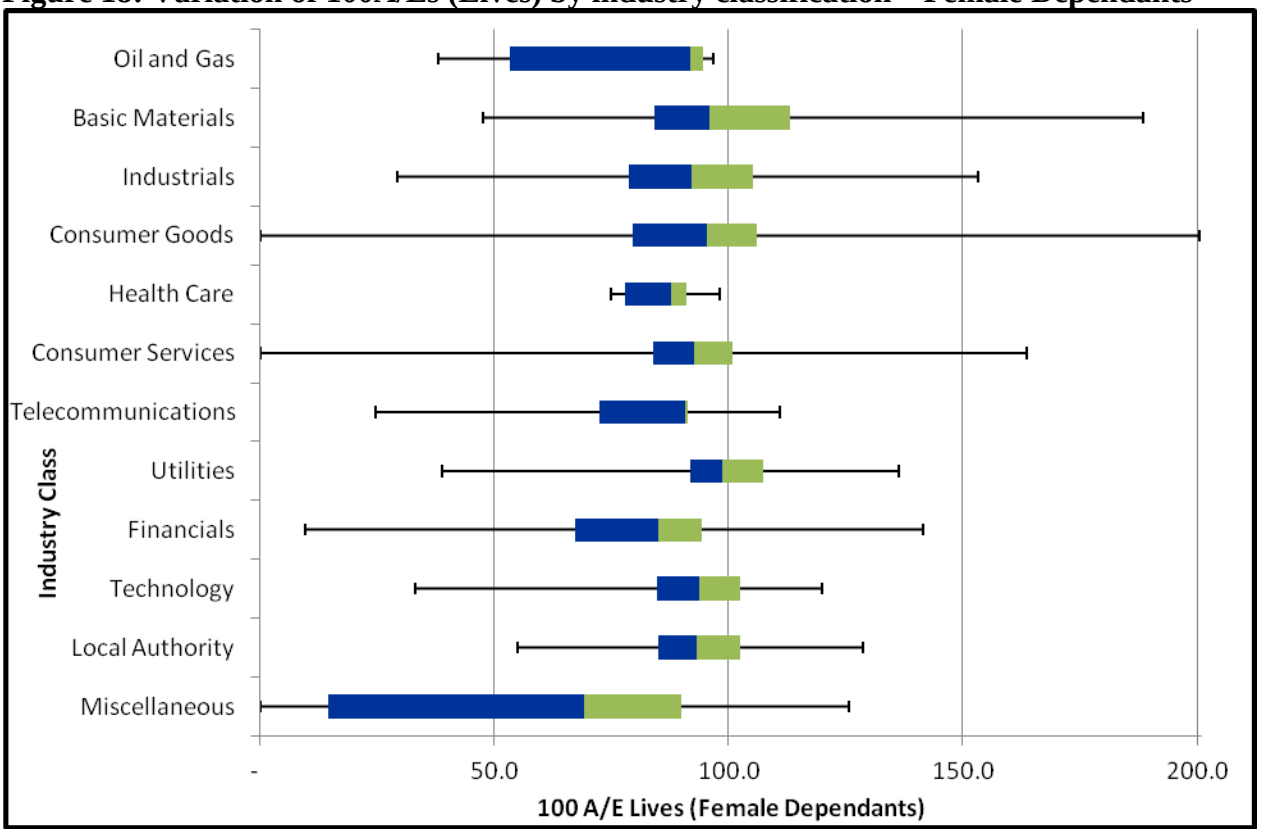


Table L: Variation of 100A/Es (Lives) by industry classification – Female Dependants

Industry	5th Percentile	25th Percentile	Median	75th Percentile	95th Percentile	Mean
Oil and Gas	38	53	92	95	97	94
Basic Materials	48	84	96	113	188	102
Industrials	29	79	92	105	153	95
Consumer Goods	-	80	96	106	200	96
Health Care	75	78	88	91	98	87
Consumer Services	-	84	93	101	164	98
Telecommunications	25	72	91	91	111	91
Utilities	39	92	99	107	136	98
Financials	10	67	85	94	142	84
Technology	33	85	94	102	120	90
Local Authority	55	85	93	103	129	95
Miscellaneous	-	15	69	90	126	79

Figure 19: Variation of 100A/Es (Amounts) by industry classification – Female Dependants

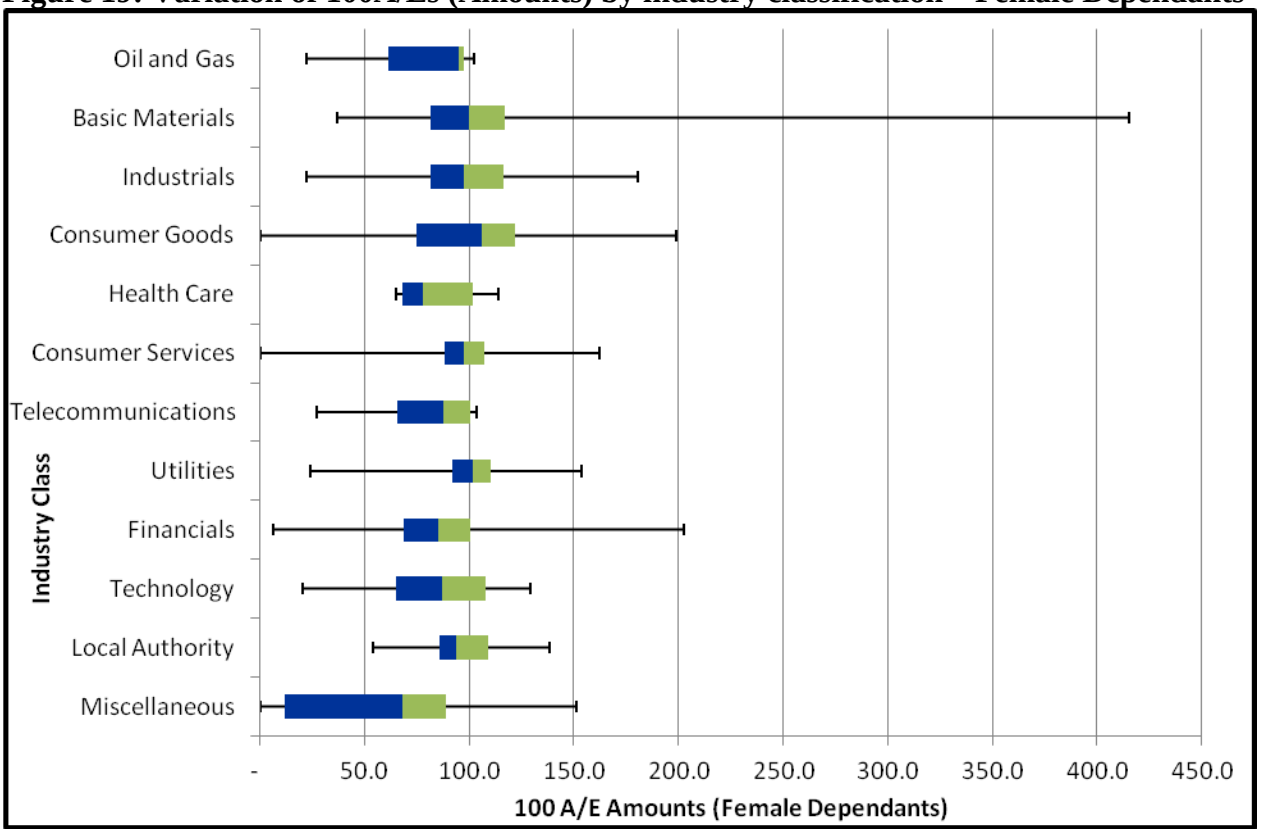


Table M: Variation of 100A/Es (Amounts) by industry classification – Female Dependants

Industry	5th Percentile	25th Percentile	Median	75th Percentile	95th Percentile	Mean
Oil and Gas	22	61	95	98	102	96
Basic Materials	37	82	100	117	415	100
Industrials	22	82	98	116	181	100
Consumer Goods	-	75	106	122	199	102
Health Care	65	68	78	102	114	80
Consumer Services	-	88	98	107	162	101
Telecommunications	27	66	88	100	104	93
Utilities	24	92	102	110	154	104
Financials	6	69	85	101	203	88
Technology	20	65	87	108	129	87
Local Authority	54	86	94	109	138	98
Miscellaneous	-	12	68	89	151	81

6. Investigation of amount and industry affect

6.1 Particularly for male pensioners, the differences in 100A/Es by industry look as if they can largely be explained by different average pension amounts. For example, the industry with the lightest mortality experience overall is Financials, and this also has the largest average pension amount. The Committee decided to investigate whether the data contained evidence to indicate that 'industry' could also be an explanatory variable (either directly or by proxy).

6.2 The most obvious test to use seemed to be a two factor analysis of variance (ANOVA), using a table of 100A/Es calculated for each amounts category and each industry where the SAPS committee had sufficient data to include it in this analysis. However, an ANOVA relies on several assumptions, in particular that the variance of each observation is the same. Figures 2 to 4 illustrated that the exposed to risk in each industry varies considerably. Consequently, we have no grounds on which to claim that the variance in the 100A/E observed is the same and hence any ANOVA we were to carry out on the whole data set would not provide statistically reliable outcomes.

6.3 Table N shows the 100A/Es for Male Pensioner Lives. The industries are shown in order of increasing average pension amount for Male Pensioners.

Table N: 100A/E results (Lives) for different pension bands – Male Pensioners

Industry	Annual pension amount							
	All	Up to £1,500	£1,500 to £3,000	£3,000 to £4,500	£4,500 to £8,500	£8,500 to £13,000	£13,000 to £25,000	Over £25,000
Industrials	92	97	95	93	88	78	68	56
Local Authority	98	101	107	109	97	78	65	60
Miscellaneous	88	99	91	92	84	64	70	60
Consumer Services	96	104	107	96	88	77	70	59
Consumer Goods	96	105	99	95	91	78	70	62
Basic Materials	99	112	109	106	96	84	68	61
Telecommunications	84	102	97	100	90	79	62	52
Utilities	87	101	106	98	92	79	69	58
Technology	79	101	90	88	74	62	60	72
Health Care	85	101	100	89	88	85	63	54
Oil and Gas	85	81	103	100	96	83	74	60
Financials	76	87	81	79	81	81	69	61

6.4 In the first place the Committee carried out some simple tests on the data, looking at differences within each industry and within each amount band, and considered whether there were consistent patterns in any industries. Although, as expected, the 100A/Es more or less consistently get smaller as amount increases, in all industry classes, looking at the data in the first part of Table N does not seem to reveal any consistent patterns by industry. Even if there were, differences in exposure between each sub-category could easily be an explanation.

6.5 For information, the Committee did carry out an ANOVA on subgroups of the Male Pensioner Lives data where the exposure seemed relatively uniform. The two groups considered were Consumer Services, Consumer Goods, Local Authority and Industrials, for average pension amounts less than £13,000, and Health Care, Technology and Miscellaneous, for average

pension amounts less than £25,000. Since the analysis is so speculative we do not reproduce the results here but, in both cases, although amounts did appear to be an explanatory variable, industry did not.

6.6 We carried out a similar analysis for Female Pensioner Lives. Table O summarises the data used. The industries are shown in order of increasing average pension amount for Female Pensioners.

Table O: 100A/E results (lives basis) for different pension bands – Female Pensioners

Industry	Annual pension amount						
	All	Up to £750	£750 to £1,500	£1,500 to £3,000	£3,000 to £4,750	£4,750 to £8,000	Over £8,000
Consumer Goods	105	108	108	105	105	94	74
Industrials	99	104	97	97	94	101	89
Consumer Services	96	96	96	100	101	91	88
Miscellaneous	83	80	84	88	92	76	49
Local Authority	93	96	95	92	92	88	85
Basic Materials	103	110	110	99	102	91	84
Telecommunications	92	103	95	92	88	93	89
Technology	95	95	95	91	97	89	114
Utilities	84	79	82	89	84	84	78
Health Care	89	102	87	87	80	87	80
Financials	81	80	75	83	90	71	85
Oil and Gas	91	102	98	94	87	91	77

6.7 Again the exposed to risk varies considerably between each sub group and so we did not feel it appropriate to carry out an ANOVA test on the whole dataset. However, as with the Male Pensioners, we looked at two sub groups where there was more consistency in the exposed to risk. These were Health Care, Miscellaneous, Technology and Oil and Gas, for amounts less than £8,000 and Financials, Industrials, Telecommunications, Consumer Services and Consumer Goods, for amounts greater than £3,000. In both cases, the ANOVA suggested not only that there was no evidence to suggest that industry was an explanatory variable, but also that amounts was not explanatory.

6.8 The first sub group includes both outliers in Figure 9, so that chart seems to support the conclusion of this analysis, with no clear patterns either by amount or by industry emerging from the data. However, the industries in the second sub group fall amongst those in Figure 9 where there seems to be a strong amounts influence, so it is harder to draw any comparison in this case.

6.9 Unfortunately, based on the data we have considered in this investigation and on the analysis carried out here, it is not possible to infer any information about mortality experience from industry class. Perhaps, given the heterogeneity observed within industry groups in section 5, this is not surprising. However, the analysis does not rule out the possibility that more detailed knowledge of a particular industry or scheme membership could include information that would help determine appropriate mortality assumptions to use.

7. Conclusion and Next Steps

7.1 The investigations the Committee has carried out using the SAPS mortality experience data segregated by industry classification continue to indicate that there are differences in experience between each industry group. However, as was apparent in previous investigations, it is possible that the differences can be explained by differences in the average pension amount in each industry (see Table B).

7.2 To try and understand the differences between each industry, the Committee has published some additional analysis in this working paper, relative to that published previously (in Working Paper 29).

7.3 First the Committee looked at the degree of heterogeneity in the experience in each industry group, to understand the extent to which the overall average experience appeared representative of the group. The box and whisker charts in section 5 indicate that, whilst some industries (for example, Health Care) appear to have a relatively homogenous mix of schemes, others (for example, Basic Materials) seem to cover a wider population.

7.4 As a result, users should be careful about applying the result of the summary, average, comparison of actual to expected experience to a particular scheme, particularly where the employer falls into an industry group that appears, based on the data submitted to the committee, to have populations with material heterogeneity.

7.5 The exposure in each industry, indicated by the pie charts in Figures 2 to 4, and the size of the confidence intervals, in Figures 11 to 13, also provide information about the extent to which the summary statistic can be relied on: so, for example, in the Health Care industry group because only a relatively small dataset has been provided by schemes categorised less reliability can be given to the results than for, say, the Local Authority grouping, where there is a very large dataset.

7.6 The Committee also tried to analyse the extent to which differences in experience between each dataset can be explained by difference in pension amounts, and how much by differences between industries. Unfortunately, because the datasets for each industry group, particularly once summarised by pension amount, have very different exposures it was not possible to carry out analyses on the statistical significance.

7.7 This analysis went further than the analysis published in Working Paper 29, and the data used in Working Paper 29 was divided using different industry classes, so the results are not directly comparable. However, overall the results from the dataset analysed in this working paper are very similar to the results in Working Paper 29: in particular, groups with higher average pension amounts generally seem to experience lighter mortality on average than those with lower pension amounts.

Appendix A: Old industry classifications

The following table summarises the 13 industry classifications that were originally specified in the Coding Guide for the SAPS Mortality investigation and were used in data submitted up until 2007. Appendix B provides details of the industry classifications that are currently requested.

These classifications were broadly in line with the FTSE Actuaries Industry Sectors when the investigation first started.

01	Resources
02	Basic Industries
03	General Industries
04	Cyclical Consumer Goods
05	Non-cyclical Consumer Goods
06	Cyclical Services
07	Non-cyclical Services
08	Utilities
09	Information Technology
10	Financials
11	Government/Civil Service
12	Local Authority
13	Miscellaneous

Appendix B: Current industry classifications

The following table summarises the 13 industry classifications that are currently specified in the Coding Guide for the SAPS Mortality investigation and have been used in data submitted since 2007.

The industry classifications were updated in 2007 to bring them broadly in line with the FTSE Actuaries Industry Sectors, which have followed the Industry Classification Benchmark system since 31/12/2005.

51	Oil and Gas
52	Basic Materials
53	Industrials
54	Consumer Goods
55	Health Care
56	Consumer Services
57	Telecommunications
58	Utilities
59	Financials
60	Technology
61	Public Sector Excluding Local Authorities
62	Local Authority
63	Miscellaneous

The Coding Guide was also amended to provide additional guidance on how to choose the most appropriate code, including providing a detailed breakdown of each of the high level codes. For more information please click on the following link to access the latest version of the Coding Guide from the CMI section of the Profession's website http://www.actuaries.org.uk/research-and-resources/documents/cmi-self-administered-pension-scheme-mortality-investigation-coding.

Appendix C: 100A/Es by industry classification

Industry Code	Sector	Lives or amounts	100A/E "00" Series Normal Retirements		
			Male Pensioners	Female Pensioners	Female Dependants
51	Oil and Gas	Lives	96	98	103
		Amounts	98	101	102
52	Basic Materials	Lives	110	109	110
		Amounts	108	110	106
53	Industrials	Lives	102	105	104
		Amounts	103	112	107
54	Consumer Goods	Lives	107	112	105
		Amounts	106	116	109
55	Health Care	Lives	95	95	95
		Amounts	89	101	86
56	Consumer Services	Lives	107	103	106
		Amounts	104	113	107
57	Telecommunications	Lives	94	97	100
		Amounts	97	106	100
58	Utilities	Lives	98	90	106
		Amounts	100	98	109
59	Financials	Lives	85	89	92
		Amounts	89	103	93
60	Technology	Lives	90	103	100
		Amounts	99	136	96
62	Local Authority	Lives	109	100	104
		Amounts	111	108	105
63	Miscellaneous	Lives	98	89	86
		Amounts	99	91	87
	Overall (WP51)	Lives	101	98	100
		Amounts	99	105	100