

**Continuous Mortality Investigation
Self-administered Pension Schemes Mortality Committee**

Working Paper 29

An analysis of the results of the mortality of male and female pensioners of self-administered pension schemes for the period 2000 to 2004 based on data collected by 30 June 2006

October 2007

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1 Introduction

- 1.1 This Working Paper is one of a series of papers that set out the results of the SAPS mortality investigation. The first such paper was issued in March 2004 as Working Paper 4 and gave results for the period 2000 to 2002 based on data collected to February 2004. This was followed in October 2004 by Working Paper 9 that looked in greater detail at the data used for Working Paper 4. It concentrated mainly on male data but looked at various aspects of the data, including the mortality experienced by male pensioners in four amount bands.
- 1.2 In October 2005 the CMI published Working Paper 17 that examined the experience over the period 2000 to 2003 based on data collected to May 2005. This paper did not contain detailed analysis other than looking at 100A/E against the PML92, PMA92, PFL92 and PFA92 tables, again splitting the male data in four amount bands, using the short cohort projections for both year of exposure and calendar year 2000.
- 1.3 In July 2006 the SAPS investigation formally became part of the CMI. Prior to that, work was carried out by the Technical Support and Research Committee of the Actuarial Profession's Pensions Board.
- 1.4 This Working Paper analyses data over the period 2000 to 2004 and is based on data collected to June 2006. It contains more extensive analysis than that in Working Paper 9 and, as for Working Paper 17, Excel files of the data analysed are available showing 100A/E for all categories of data and for males and females split into amount bands. The comparisons have been made against the PML92, PMA92, PFL92 and PFA92 tables, using the short cohort projections for year of exposure and against the "00" Series Normal retirement and Combined retirement tables without any projection.
- 1.5 The Working Paper has been delayed as various inconsistencies have been spotted in the data. As a result of investigations, a number of schemes with significant questions as to the reliability of the data have been excluded from this analysis. It will be noticed that the exposures for 2000 and 2001 have both reduced compared with those in Working Paper 17, although overall exposures have increased. The Committee is confident that it now has a much better set of data to analyse and from which to draw conclusions than before this investigative work was carried out and that the delay caused is more than justified by the results achieved.
- 1.6 As part of the current investigation, a change has been made to the amounts bandings that were previously used for males. The groupings used in the earlier Working Papers were chosen to provide statistically meaningful amounts of data in each category. The investigations now carried out suggest that the lowest male group can better be split into two sub-groups, which may each be more homogeneous than in combined form.

- 1.7 This Working Paper was released in draft form to all CMI members who contribute towards the cost of the investigation in March 2007. The SAPS Committee is now pleased to make the Working Paper publicly available. A summary of feedback received on the draft paper is given in section 8.
- 1.8 The Committee intends to issue a further experience report and some graduations of the data received by 30 June 2007 later in 2007.

2 Data

2.1 Data summaries

The following tables summarise the data over the five year period 2000 to 2004.

Table A

	Males Lives	Males Amounts (£'000)	Average Amounts (Males) (£ pa)*	Females Lives	Females Amounts (£'000)	Average Amounts (Females) (£ pa)*
Exposure						
2000	490,203	3,126,432	6,378	350,703	936,397	2,670
2001	809,734	4,921,894	6,078	642,916	1,644,229	2,557
2002	894,410	5,652,122	6,319	736,815	1,955,447	2,654
2003	534,993	3,102,195	5,799	485,365	1,239,846	2,554
2004	249,609	1,556,324	6,235	201,962	550,974	2,728
All	2,978,949	18,358,967	6,163	2,417,761	6,326,894	2,617
Deaths						
2000	17,981	79,555	4,424	12,490	27,815	2,227
2001	29,980	129,391	4,316	21,537	47,314	2,197
2002	33,681	152,038	4,514	26,390	61,241	2,321
2003	20,349	82,370	4,048	15,817	34,132	2,158
2004	10,549	41,642	3,948	7,340	17,587	2,396
All	112,540	484,996	4,310	83,574	188,088	2,251

*Note: Average pensions vary in different years of exposure and death. The SAPS Committee does not know why this is. It may be a phenomenon that will change when fuller data is received for more recent years.

Table B

	100A/E based on "92" Series tables with short cohort (C = year of exposure)					
	Males Lives	Males Amounts		Females Lives	Females Amounts	
100A/E						
2000	120	126		117	125	
2001	123	130		118	127	
2002	125	133		126	136	
2003	123	129		121	124	
2004	128	131		126	131	
All	124	130		122	129	

Table C

100A/E based on “00” Series Normal retirement tables						
	Males Lives	Males Amounts		Females Lives	Females Amounts	
100A/E						
2000	119	119		112	114	
2001	117	119		109	113	
2002	115	117		114	117	
2003	110	110		106	104	
2004	112	109		107	107	
All	115	116		110	112	

The following two tables show the same data summarised by pensioner type for the five year period 2000 to 2004.

Table D - Males

		Number or amount ETR	Number or amount of deaths	100A/E	
				“92” Series short cohort (C = year of exposure)	“00” Series Normal retirement tables
				2000-04	2000-04
Lives	Normal	1,215,494	46,267	119	112
	Ill-health	212,729	7,115	202	185
	Combined	1,478,102	56,023	121	112
	Dependant	61,113	2,538	128	119
	Unknown	11,511	597	125	118
	All	2,978,949	112,540	124	115
Amounts (£’000)	Normal	8,442,873	223,343	125	112
	Ill-health	1,108,599	30,350	258	216
	Combined	8,666,861	226,735	127	112
	Dependant	97,579	3,315	153	136
	Unknown	43,055	1,253	120	108
	All	18,358,967	484,996	130	116

Table E – Females

		Number or amount ETR	Number or amount of deaths	100A/E	
				“92” Series short cohort (C = year of exposure)	“00” Series Normal retirement tables
				2000-04	2000-04
Lives	Normal	619,402	16,776	118	106
	Ill-health	134,482	2,557	194	173
	Combined	612,159	14,913	118	106
	Dependant	1,042,423	48,982	122	110
	Unknown	9,295	346	127	116
	All	2,417,761	83,574	122	110
Amounts (£’000)	Normal	1,663,302	39,049	127	111
	Ill-health	421,344	7,077	228	197
	Combined	1,601,759	35,307	130	112
	Dependant	2,625,554	106,241	126	109
	Unknown	14,935	413	132	117
	All	6,326,894	188,088	129	112

2.2 Overall levels of mortality compared with the “92” Series

The overall levels of actual to expected on both lives and amount bases and for males and females have not changed significantly since the Working Paper 17 analysis.

The male lives and female experiences have been less consistent year on year, which could be as a result of variability in each of the experiences on a year by year, which may be a result of different schemes being in the underlying data year by year.

The four sets of numbers are illustrated graphically below:

Chart 1

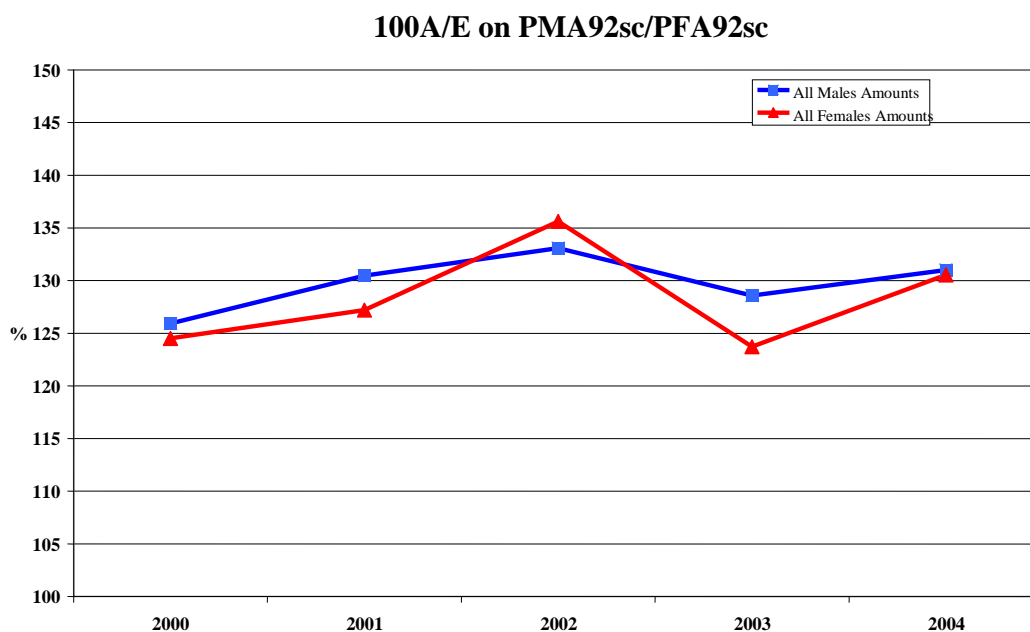
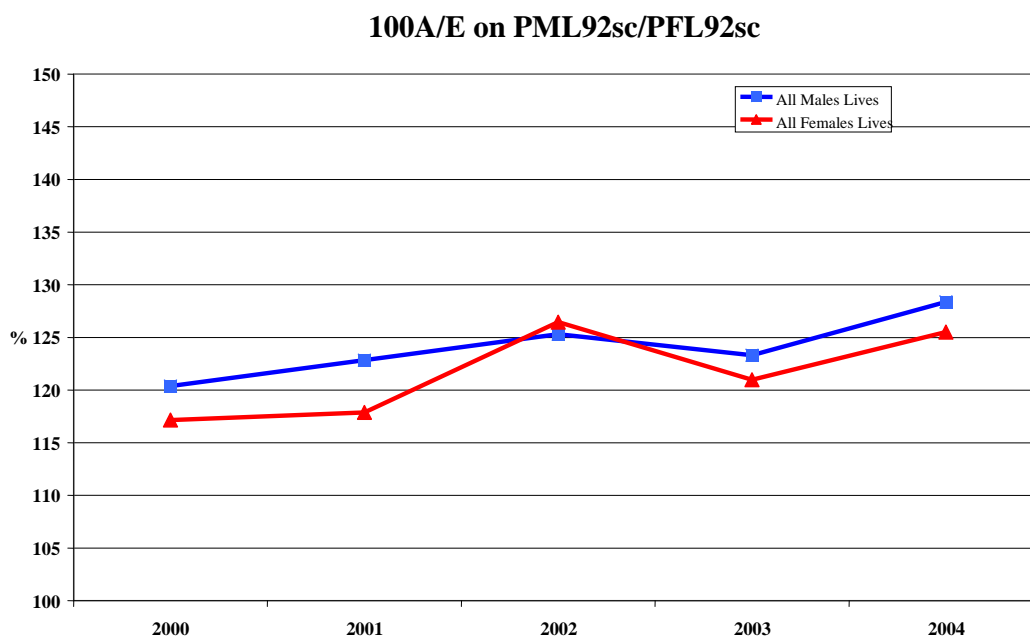


Chart 2



Looking in more detail at various sets of data underlying the above shows a more fluctuating picture. The following charts compare male ‘Normal Retirements’ (that is non-ill-health retirements within schemes where ill-health retirees are separately identified) and ‘Combined Retirements’ (that is schemes that cannot separate ill-health retirees) for both males and females. As females dependants are such a large class, they have been added to the female comparison.

Chart 3

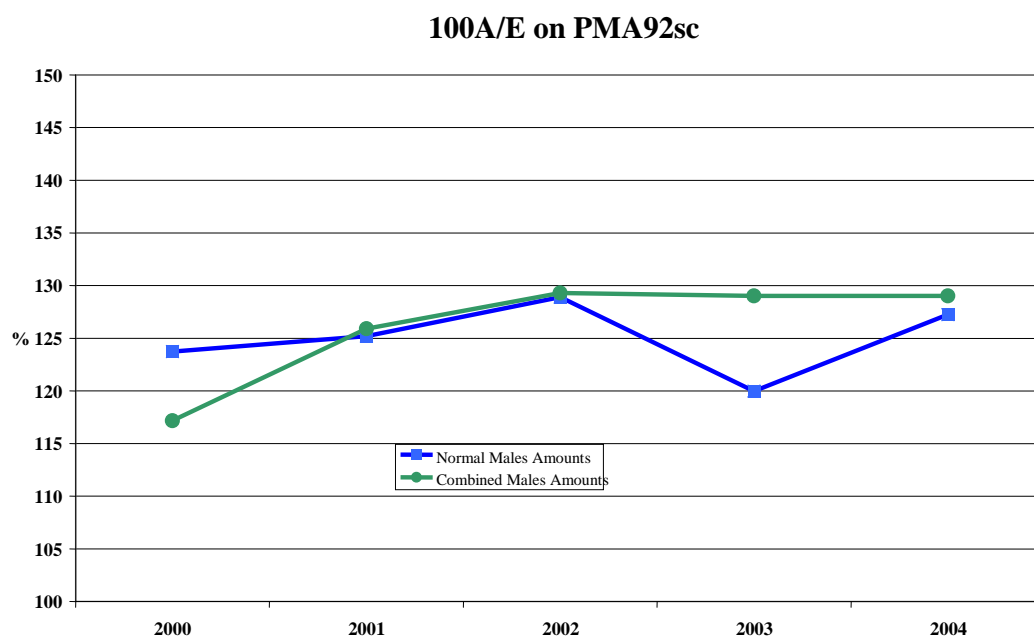


Chart 4

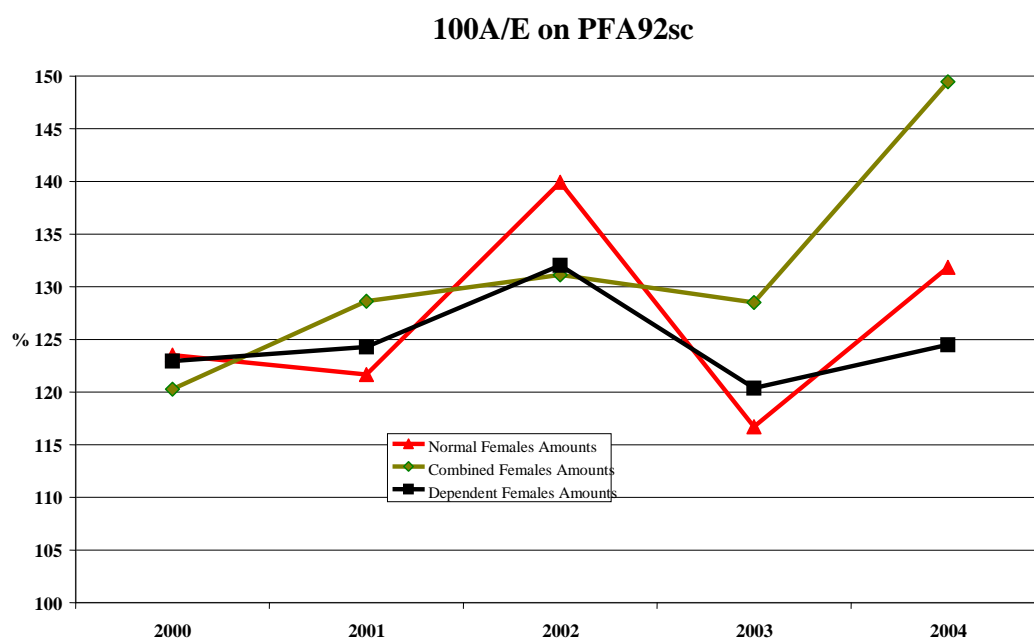


Chart 5

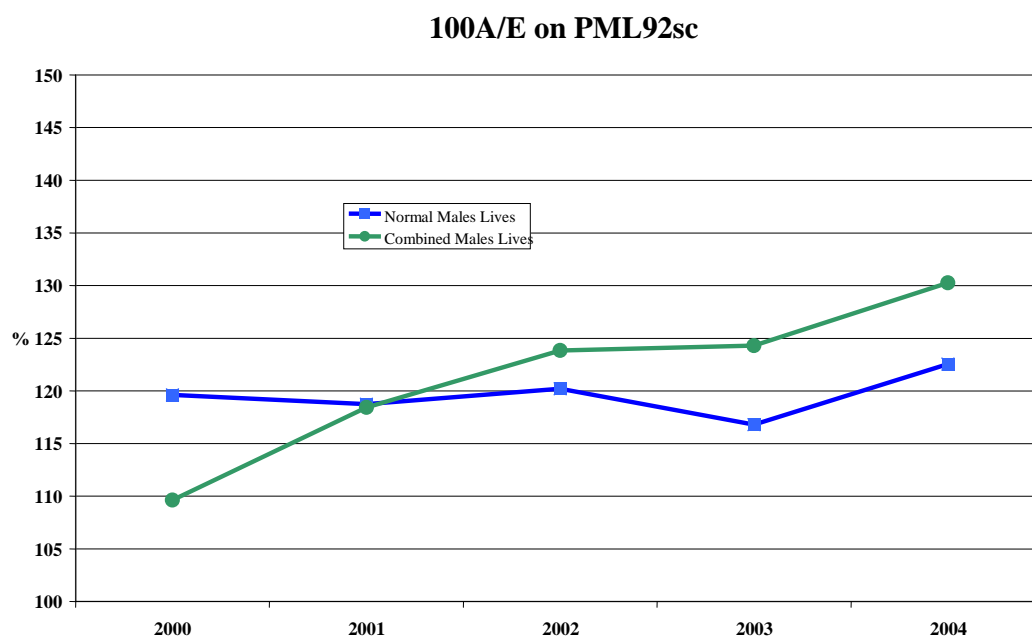
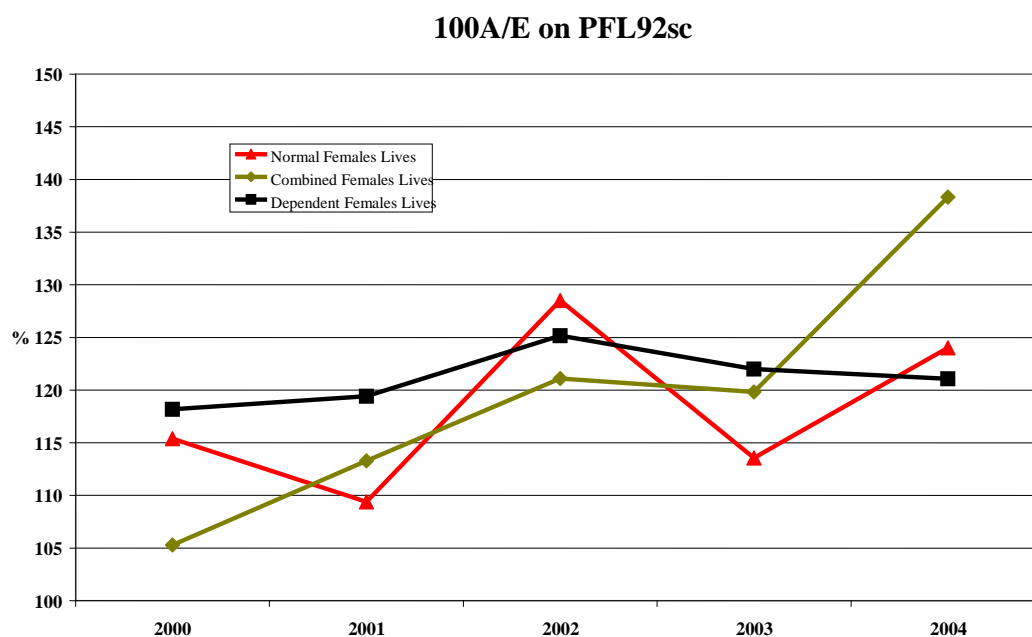


Chart 6



It can be seen that, as might be expected, mortality levels for ‘combined retirees’ is generally higher than for ‘normal retirees’ but that this is not true for all cases in all years. This may be because those schemes that separate ill-health from healthy retirees tend to be the larger schemes that are more ‘blue collar’ in nature and so have, on the whole, higher than average mortality.

2.3 Overall levels of mortality compared with the “00” Series Normal retirement tables

Measuring against a fixed table demonstrates possible year on year trends. The following charts show the year on year changes for all male and all female groups on both amounts and lives bases:

Chart 7

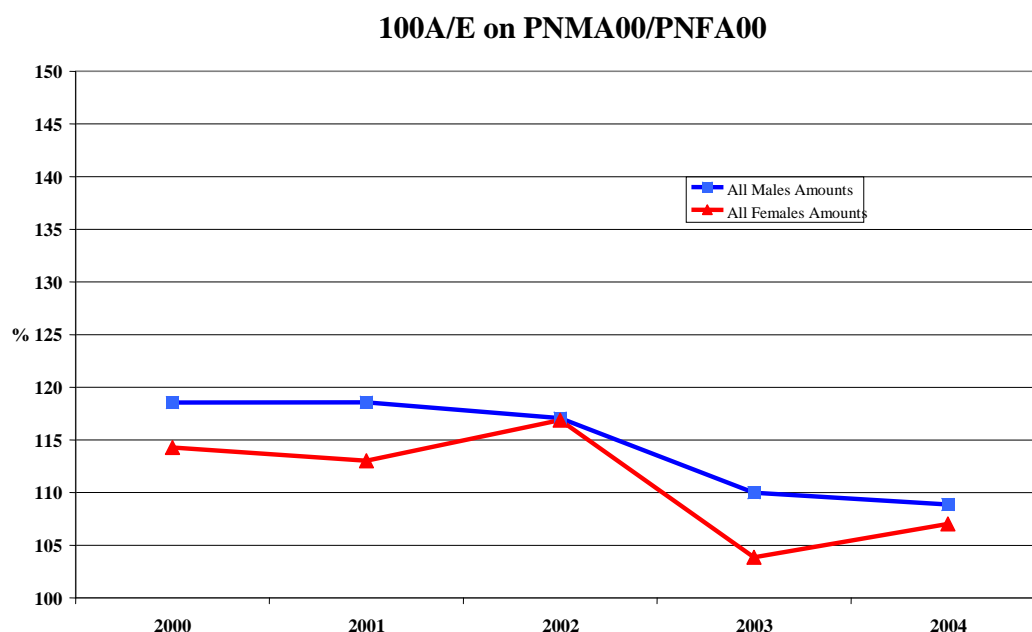
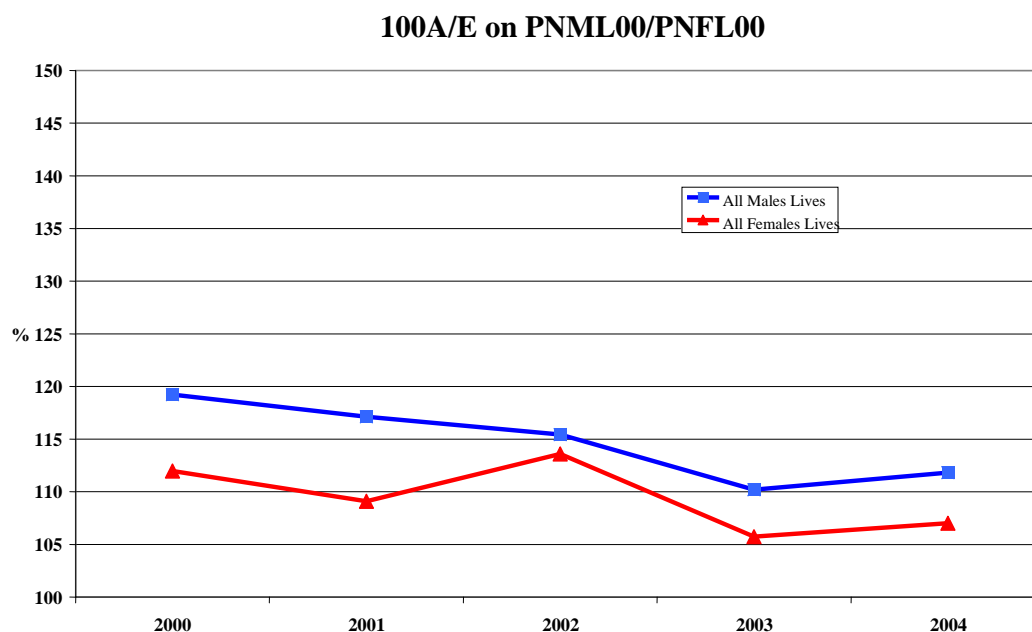


Chart 8



There is no evidence from the above that amounts and lives experiences are improving at different rates for both males and females over the period. A future Working Paper will look at these in more detail and will also look at female

dependants separately to establish whether this dataset is exhibiting mortality rates that are significantly different to the female pensioner member dataset.

3 Insured pensioner mortality comparison

- 3.1 The datasets for the current analysis are different from those used for the recently published “00” Series pensioner mortality tables as the “00” Series is based on insured pensioner lives. The following tables gives a comparison of the two datasets:

Table F

	“00” Series Life Office Pensioners Dataset*	SAPS Dataset
ETR: Male lives	1,596,686	2,978,949
ETR: Male amounts (£’000)	3,904,571	18,358,967
Average male ETR pension (£ pa)	2,445	6,163
ETR: Female lives (other than female dependants)	662,722	1,375,339
ETR: Female amounts (other than female dependants) (£’000)	804,991	3,701,340
Average ETR female pension (other than female dependants) (£ pa)	1,215	2,691
ETR: Female dependant lives	249,605	1,042,422
ETR: Female dependant amounts (£’000)	450,522	2,625,554
Average ETR female dependant pension (£ pa)	1,805	2,519

*From CMI WP8. Male pensioner and male dependant lives/amounts have been aggregated in this table.

The most notable features are the larger size of the SAPS dataset, the significantly higher average pension amounts and the proportionately much larger female dependant dataset.

- 3.2 Sample graduations of mortality curves of the SAPS data against corresponding “00” Series tables show that, as expected, the SAPS data is exhibiting heavier mortality at most ages for male, female, amounts and lives bases. This will be examined in more detail in a subsequent SAPS Working Paper.

4 Analysis of results by amount – males

4.1 Analysis of all males against PMA92sc/PML92sc

The following graphs show the 100A/E for all males (including dependants) on both an amounts and a lives basis when compared to the corresponding “92” Series table with the short cohort projection to the calendar year of exposure.

Chart 9

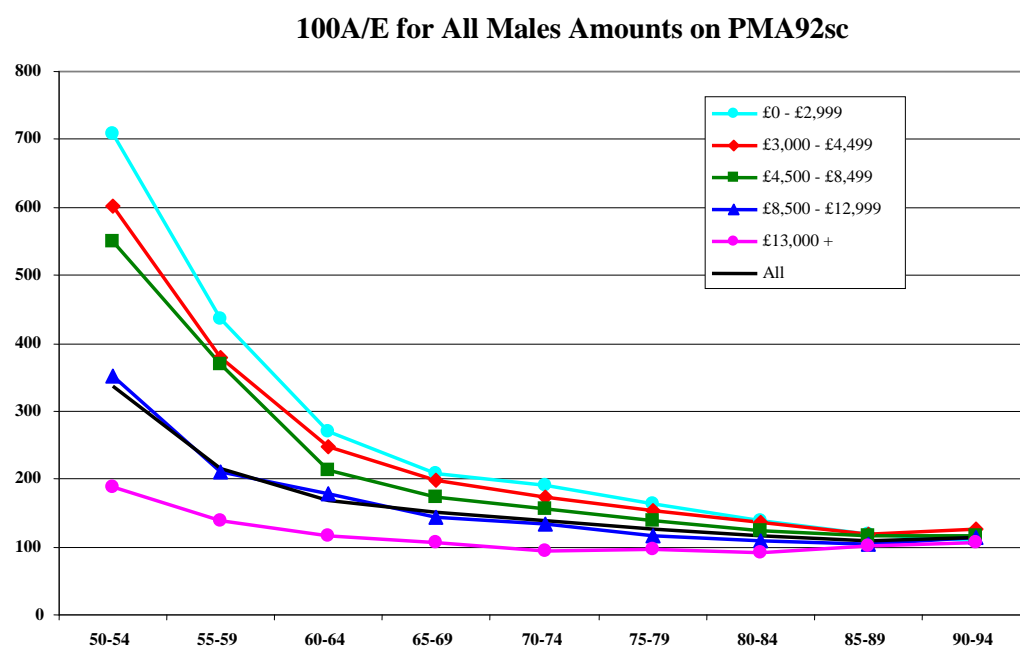
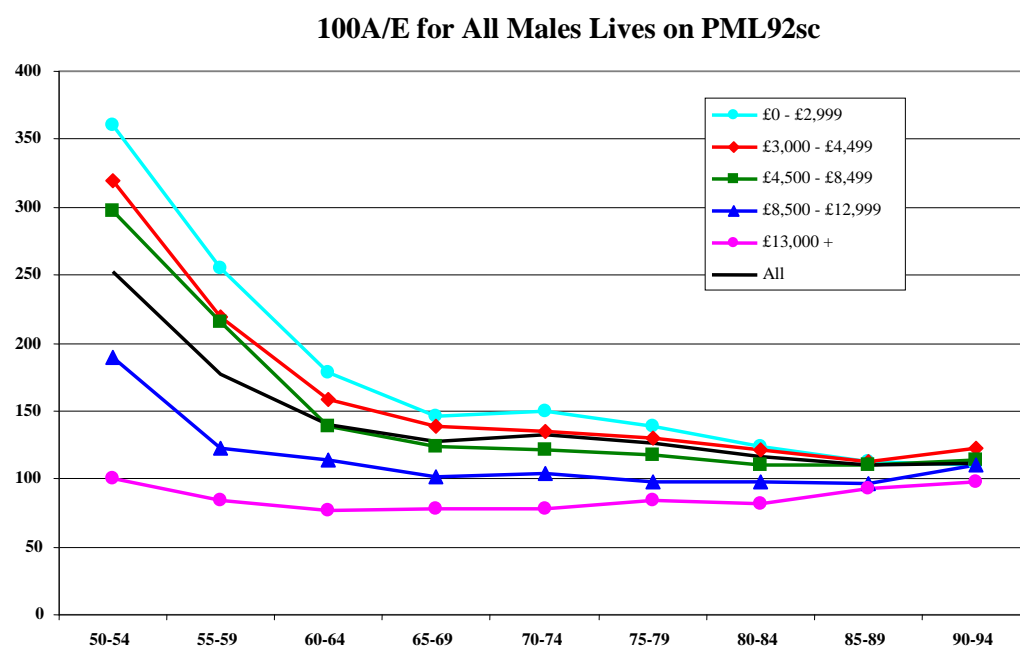


Chart 10



It is evident, particularly on the amounts table, that the experience at young ages is very significantly heavier than the “92” Series table with the short cohort projection. More detailed comment is made later, in conjunction with comparison against the “00” Series table.

In order to allow comparison of these results against those disclosed in previous working papers, the following tables set out a summary of key data for male lives.

Table G

All Male lives with pension under £4,500 pa				
Age group	Exposed to risk	Actual deaths	100A/E PML92sc	100A/E PML92sc from WP17
60-64	194,817	2,913	171	151
65-69	322,712	6,783	144	138
70-74	337,300	12,314	146	147
75-79	298,138	18,186	137	135
80-84	188,034	17,904	123	122
85-89	79,222	11,698	113	115

All Male lives with pension £4,500 pa - £8,499 pa				
Age group	Exposed to risk	Actual deaths	100A/E PML92sc	100 A/EPML92sc from WP17
60-64	124,898	1,516	139	158
65-69	145,098	2,619	124	129
70-74	111,269	3,347	122	119
75-79	76,385	3,993	117	114
80-84	46,062	3,958	110	109
85-89	20,088	2,898	110	107

All Male lives with pension £8,500 pa - £12,999 pa				
Age group	Exposed to risk	Actual deaths	100A/E PML92sc	100A/E PML92sc from WP17
60-64	75,626	739	114	116
65-69	65,625	967	102	101
70-74	48,799	1,261	104	105
75-79	35,505	1,559	98	97
80-84	20,825	1,584	98	93
85-89	8,596	1,093	97	92

All Male lives with pension £13,000 pa or above				
Age group	Exposed to risk	Actual deaths	100A/E PML92sc	100A/E PML92sc from WP17
60-64	71,090	468	77	74
65-69	57,176	647	78	73
70-74	43,273	836	78	75
75-79	30,225	1,122	84	80
80-84	16,575	1,055	82	78
85-89	7,098	873	93	87

The 100A/Es observed in the over £13,000 pension band are slightly higher in each age group than previously. There has been a noticeable increase in 100A/E for the 60-64 age group in the under £4,500 pension band, and a noticeable decrease for that age band in the £4,500-£8,499 pension band. However the general pattern of 100A/Es is similar to that observed in Working Paper 17.

4.2 Analysis of all males against PCMA00/PCML00

The all males data has also been compared against the “00” Series base tables. As this dataset contains all males, the comparison has been made against the ‘combined’ version of the “00” Series base tables.

Chart 11

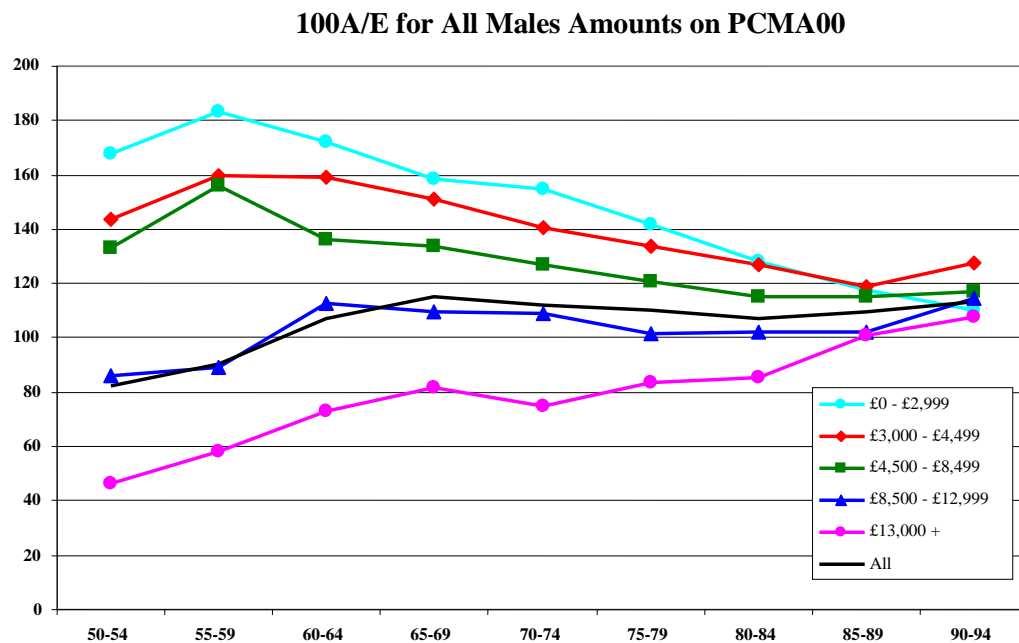
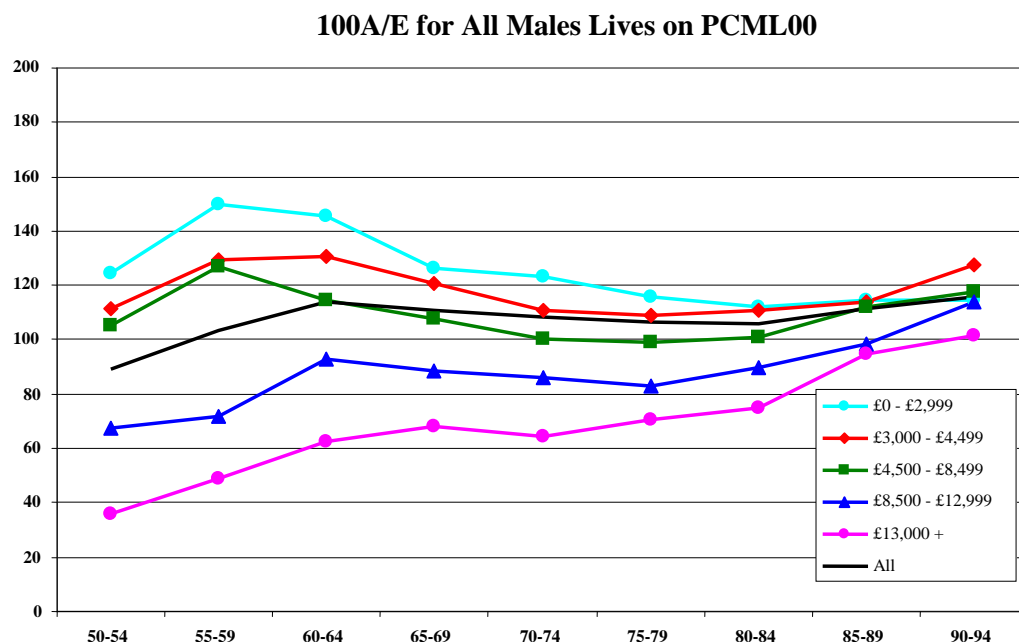


Chart 12



Above age 60, almost all the overall 100A/Es (combining all pension size bands) remain within the range 105-115. Below age 60 there is a noticeable decrease in overall 100A/E, suggesting the shape of the table does not fit this data as well at young ages. However, overall the ‘combined’ “00” Series base tables appear to provide a better fit to the data than the “92” Series (with short cohort adjustment) did.

As expected, the pension size has a clear effect. Lighter mortality is experienced in the larger pension bands, with the effect being greatest at younger ages. There is clear evidence that the “amounts effect” diminishes very significantly at the highest ages.

The data underlying the above charts is summarised below.

Table H

All Males with pension under £3,000 pa						
	Amounts			Lives		
Age group	Exposed to risk (£'000)	Actual deaths (£'000)	100A/E PCMA00	Exposed to risk	Actual deaths	100A/E PCML00
50-54	54,675	529	168	35,800	334	124
55-59	95,938	1,156	183	62,428	766	150
60-64	198,789	2,974	172	128,661	1,989	146
65-69	342,731	7,356	159	223,011	4,755	126
70-74	391,148	14,482	155	250,817	9,449	123
75-79	336,558	20,508	142	240,288	14,857	116
80-84	192,960	18,332	128	154,652	14,755	112
85-89	83,759	12,237	117	65,740	9,715	114
90-94	23,725	4,753	110	16,697	3,501	115
All above	1,720,283	82,328	137	1,178,094	60,121	118

All Males with pension £3,000 pa - £4,499 pa						
	Amounts			Lives		
Age group	Exposed to risk (£'000)	Actual deaths (£'000)	100A/E PCMA00	Exposed to risk	Actual deaths	100A/E PCML00
50-54	78,300	649	144	21,056	176	111
55-59	135,549	1,421	160	36,199	383	129
60-64	247,071	3,431	159	66,155	924	131
65-69	369,738	7,513	151	99,701	2,028	121
70-74	318,412	10,515	141	86,483	2,865	111
75-79	213,333	12,246	134	57,850	3,329	109
80-84	123,077	11,582	127	33,383	3,149	111
85-89	49,935	7,340	119	13,482	1,983	114
90-94	13,314	3,135	128	3,594	846	127
All above	1,548,728	57,833	135	417,903	15,683	114

All Males with pension £4,500 pa - £8,499 pa						
	Amounts			Lives		
Age group	Exposed to risk (£'000)	Actual deaths (£'000)	100A/E PCMA00	Exposed to risk	Actual deaths	100A/E PCML00
50-54	248,057	1,914	133	39,000	308	105
55-59	490,904	5,024	156	76,467	796	127
60-64	790,482	9,326	136	124,898	1,516	114
65-69	898,431	16,032	134	145,098	2,619	108
70-74	686,786	20,434	127	111,269	3,347	100
75-79	471,676	24,426	121	76,385	3,993	99
80-84	285,519	24,418	115	46,062	3,958	101
85-89	124,511	17,789	115	20,088	2,898	112
90-94	37,225	7,996	117	5,997	1,300	118
All above	4,033,592	127,359	123	645,265	20,735	105

All Males with pension £8,500 pa - £12,999 pa						
	Amounts			Lives		
Age group	Exposed to risk (£'000)	Actual deaths (£'000)	100A/E PCMA00	Exposed to risk	Actual deaths	100A/E PCML00
50-54	317,477	1,577	86	30,008	152	67
55-59	642,138	3,754	89	60,951	359	72
60-64	789,719	7,653	113	75,626	739	93
65-69	682,845	9,963	110	65,625	967	89
70-74	507,530	13,051	109	48,799	1,261	86
75-79	369,523	16,113	101	35,505	1,559	83
80-84	217,017	16,468	102	20,825	1,584	90
85-89	89,891	11,387	102	8,596	1,093	99
90-94	27,435	5,766	114	2,647	555	114
All above	3,643,574	85,731	105	348,581	8,269	89

All Males with pension £13,000 pa or above						
	Amounts			Lives		
Age group	Exposed to risk (£'000)	Actual deaths (£'000)	100A/E PCMA00	Exposed to risk	Actual deaths	100A/E PCML00
50-54	647,452	1,733	46	31,797	86	36
55-59	1,540,277	5,844	58	67,676	271	49
60-64	1,551,860	9,686	73	71,090	468	63
65-69	1,258,349	13,728	82	57,176	647	68
70-74	938,446	16,491	75	43,273	836	64
75-79	648,581	23,242	84	30,225	1,122	70
80-84	354,206	22,456	86	16,575	1,055	75
85-89	154,441	19,437	101	7,098	873	95
90-94	49,414	9,799	108	2,289	427	101
All above	7,143,027	122,416	83	327,200	5,785	71

4.3 Analysis of normal males against PNMA00/PNML00

The ‘normal’ subset of males data is large and expected to be relatively homogeneous compared to the ‘All males’ dataset. It has therefore been investigated separately to seek to identify any additional features. As this subset should contain only normal health retirements, it has been compared to the ‘normal’ ‘00’ Series base tables.

Chart 13

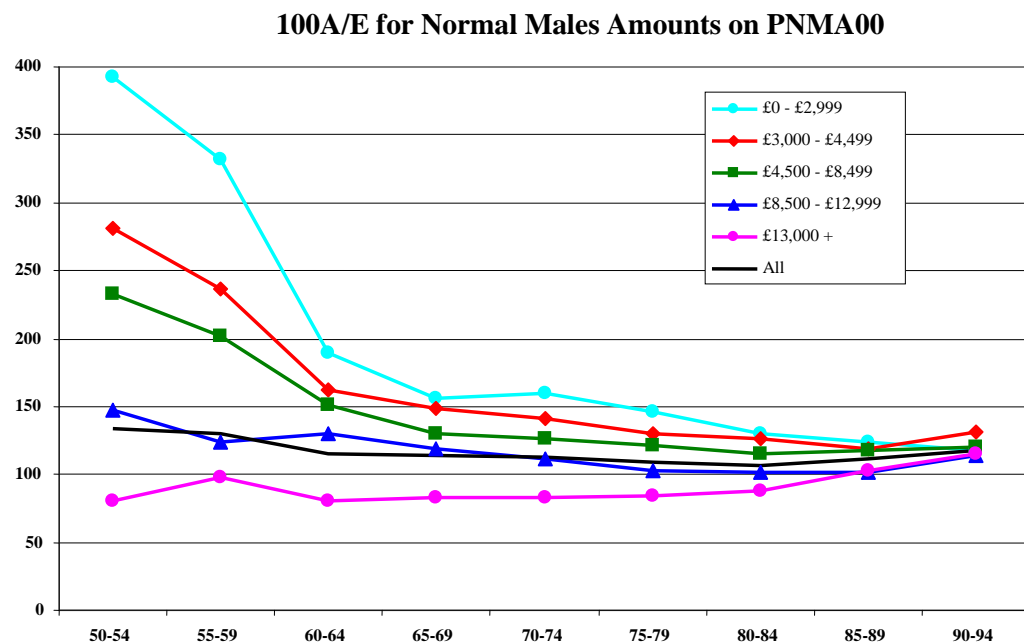
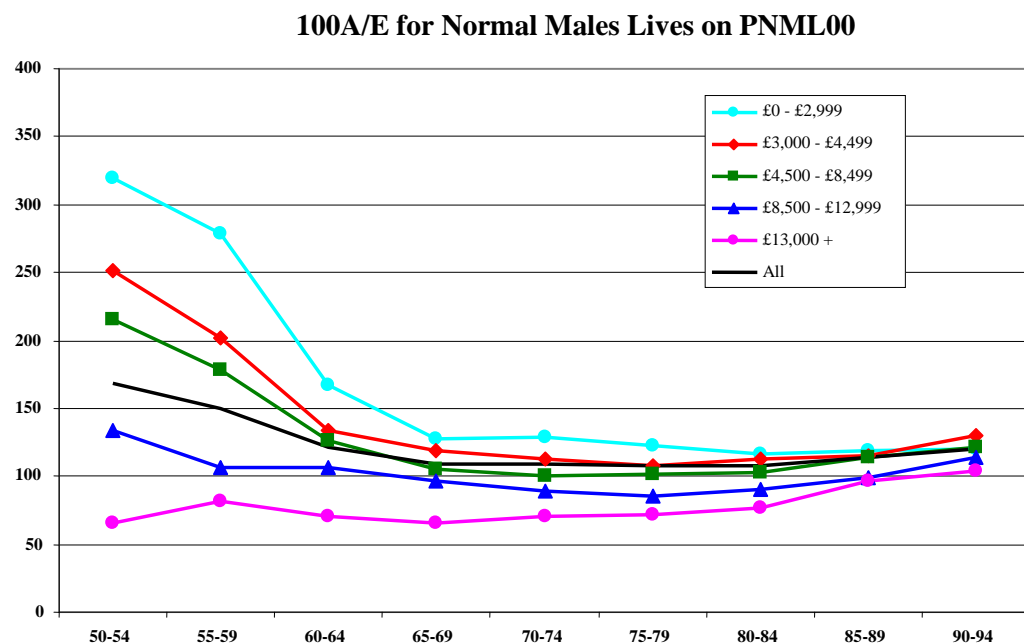


Chart 14



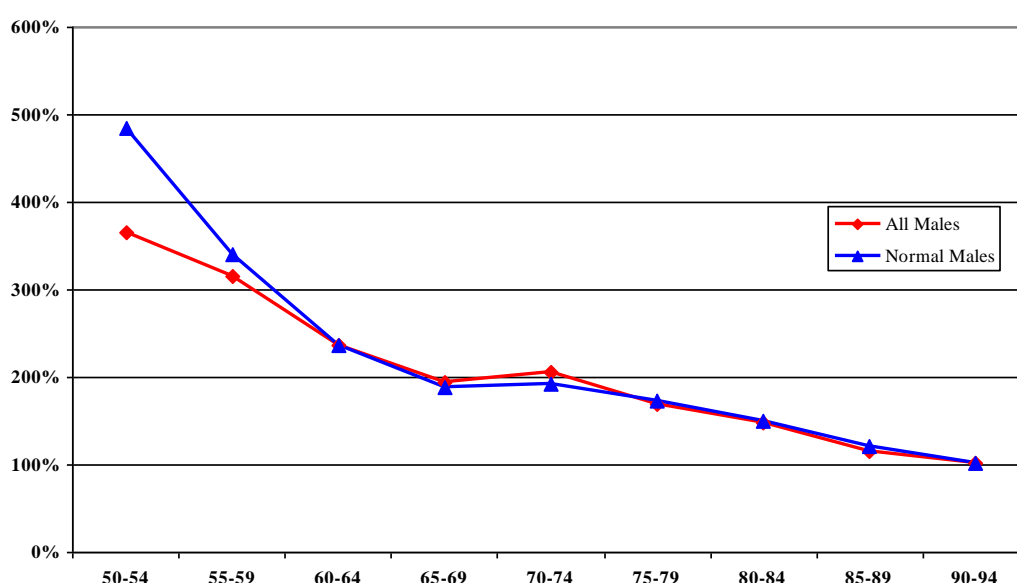
The first feature to note is the high 100A/Es at young ages, both for the lower pension bands, and in the overall data (combining all pension size bands). This is driven in part by the choice of the ‘normal’ ‘00’ Series base table as the comparator

(it being blended into the AMC00 table at younger ages). The above graphs suggest that the ‘normal’ “00” Series base tables do not fit this dataset particularly well at young ages, as was also the case with the life office data.

The chart below shows the ratio of the observed q_x (on an amounts basis) for the highest and lowest amount bands (ie a measure of the relationship between amount of pension and mortality). The relationship between the amount of pension and mortality below age 60 appears slightly stronger for normal males than for all males. At older ages the relationship between the amount of pension and mortality appears similar for normal males and all males.

Chart 15

Ratio of crude Amounts Q_x for £0 - £2,999 band vs £13,000+ band



The data underlying the above charts is summarised below.

Table I

Normal Males with pension under £3,000 pa						
Age group	Amounts			Lives		
	Exposed to risk (£'000)	Actual deaths (£'000)	100A/E PNMA00	Exposed to risk	Actual deaths	100A/E PNML00
50-54	15,448	136	392	9,686	79	320
55-59	29,428	387	331	18,731	243	279
60-64	66,481	943	190	44,313	668	167
65-69	127,439	2,551	156	84,022	1,717	128
70-74	140,249	5,135	160	88,515	3,284	129
75-79	131,691	8,183	146	87,138	5,501	123
80-84	84,635	8,166	130	59,129	5,727	116
85-89	38,175	5,841	124	26,419	4,032	119
90-94	10,058	2,175	118	7,053	1,560	121
All above	643,604	33,517	140	425,007	22,811	123

Normal Males with pension £3,000 pa - £4,499 pa						
	Amounts			Lives		
Age group	Exposed to risk (£'000)	Actual deaths (£'000)	100A/E PNMA00	Exposed to risk	Actual deaths	100A/E PNML00
50-54	21,157	136	282	5,689	37	251
55-59	43,072	403	236	11,427	107	202
60-64	78,468	955	162	20,959	256	133
65-69	126,863	2,405	148	34,213	647	118
70-74	121,870	3,911	141	32,945	1,063	113
75-79	95,768	5,246	130	25,951	1,427	108
80-84	57,202	5,359	126	15,539	1,458	113
85-89	24,201	3,572	119	6,571	967	115
90-94	6,404	1,548	131	1,732	416	130
All above	575,005	23,535	133	155,026	6,378	115

Normal Males with pension £4,500 pa - £8,499 pa						
	Amounts			Lives		
Age group	Exposed to risk (£'000)	Actual deaths (£'000)	100A/E PNMA00	Exposed to risk	Actual deaths	100A/E PNML00
50-54	99,002	531	233	14,998	84	215
55-59	204,641	1,635	202	31,160	258	179
60-64	307,011	3,424	151	47,541	539	126
65-69	361,892	6,009	130	57,456	963	105
70-74	310,776	8,856	126	49,656	1,423	101
75-79	229,160	11,705	121	36,591	1,881	101
80-84	138,593	11,849	115	21,942	1,878	102
85-89	65,053	9,432	117	10,343	1,514	115
90-94	18,529	4,080	120	3,010	669	121
All above	1,734,657	57,520	124	272,698	9,209	108

Normal Males with pension £8,500 pa - £12,999 pa						
	Amounts			Lives		
Age group	Exposed to risk (£'000)	Actual deaths (£'000)	100A/E PNMA00	Exposed to risk	Actual deaths	100A/E PNML00
50-54	186,814	634	147	17,559	61	133
55-59	358,920	1,739	124	33,996	167	107
60-64	411,804	3,884	130	39,386	373	107
65-69	338,209	5,106	119	32,549	493	96
70-74	263,383	6,657	112	25,376	644	89
75-79	201,655	8,734	103	19,391	847	86
80-84	118,699	8,906	101	11,354	852	90
85-89	48,728	6,109	102	4,654	588	99
90-94	12,363	2,569	114	1,190	247	114
All above	1,940,576	44,337	109	185,454	4,272	94

Normal Males with pension £13,000 pa or above						
Age group	Amounts			Lives		
	Exposed to risk (£'000)	Actual deaths (£'000)	100A/E PNMA00	Exposed to risk	Actual deaths	100A/E PNML00
50-54	364,948	682	81	19,097	33	66
55-59	728,684	2,772	97	36,012	135	82
60-64	771,452	4,500	80	37,202	233	71
65-69	594,595	6,225	83	28,449	293	65
70-74	461,755	8,727	83	21,959	441	70
75-79	331,231	11,634	84	16,061	580	71
80-84	173,610	11,271	87	8,457	543	77
85-89	78,516	10,116	103	3,587	446	97
90-94	24,167	5,098	115	1,103	210	104
All above	3,528,959	61,025	89	171,926	2,914	77

5 Analysis of results by amounts – females

5.1 Analysis of all females against PFA92sc/PFL92sc

The following graphs show the 100A/E for all females (including dependants) on both an amounts and a lives basis when compared to the corresponding “92” Series table with the short cohort projection to the calendar year of exposure.

Chart 16

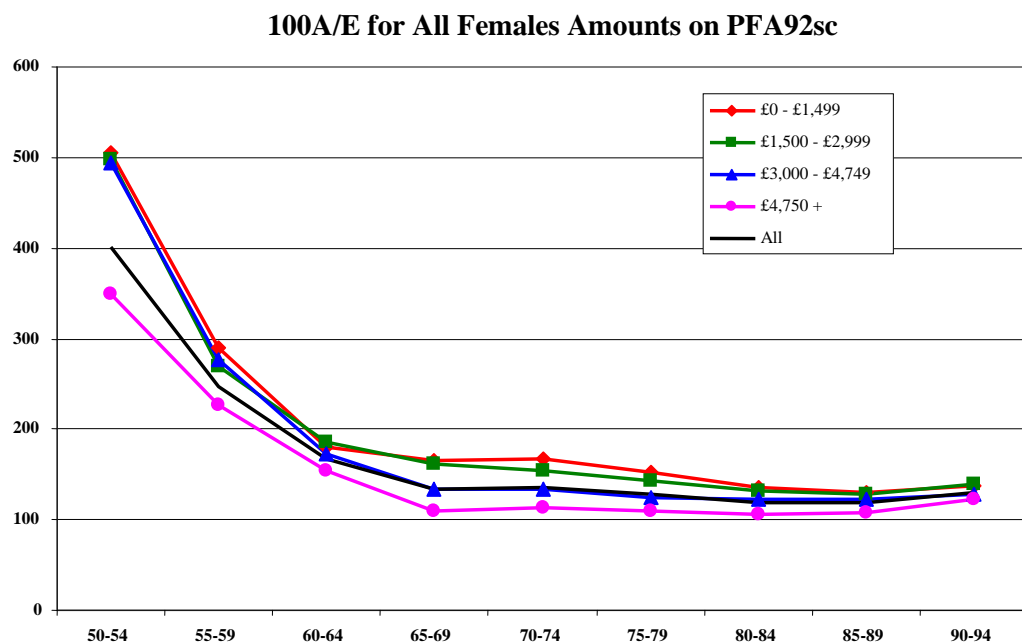
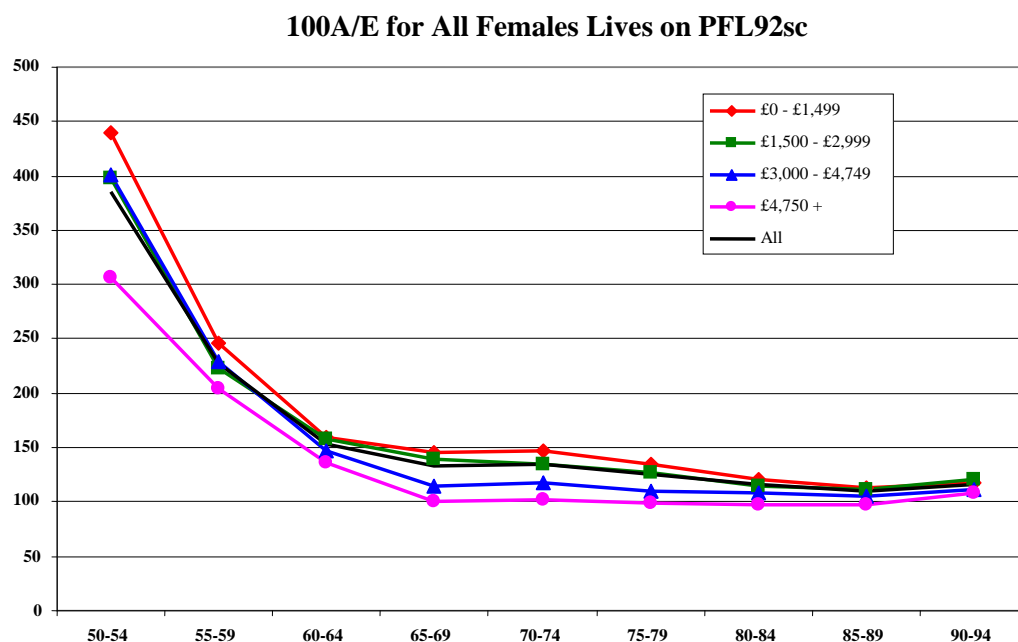


Chart 17



As for males, it is evident that the experience at young ages is very significantly heavier than the “92” Series table with the short cohort projection. More detailed comment is made later, in conjunction with comparison against the “00” Series table.

5.2 Analysis of all females against PCFA00/PCFL00

The all females data has also been compared against the “00” Series base tables. As this dataset contains all females, the comparison has been made against the ‘combined’ version of the “00” Series base tables.

Chart 18

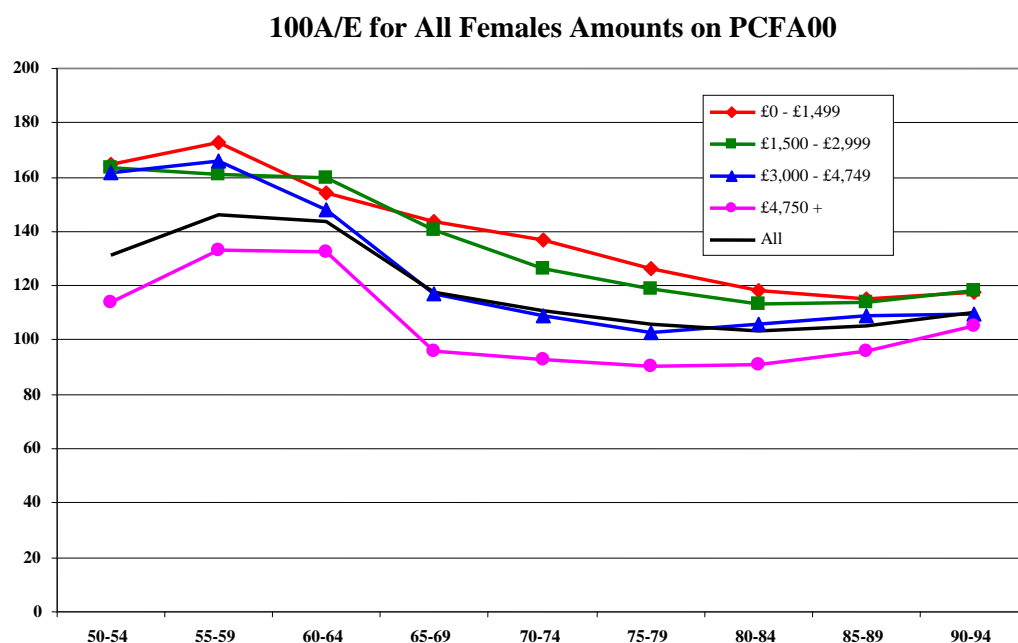
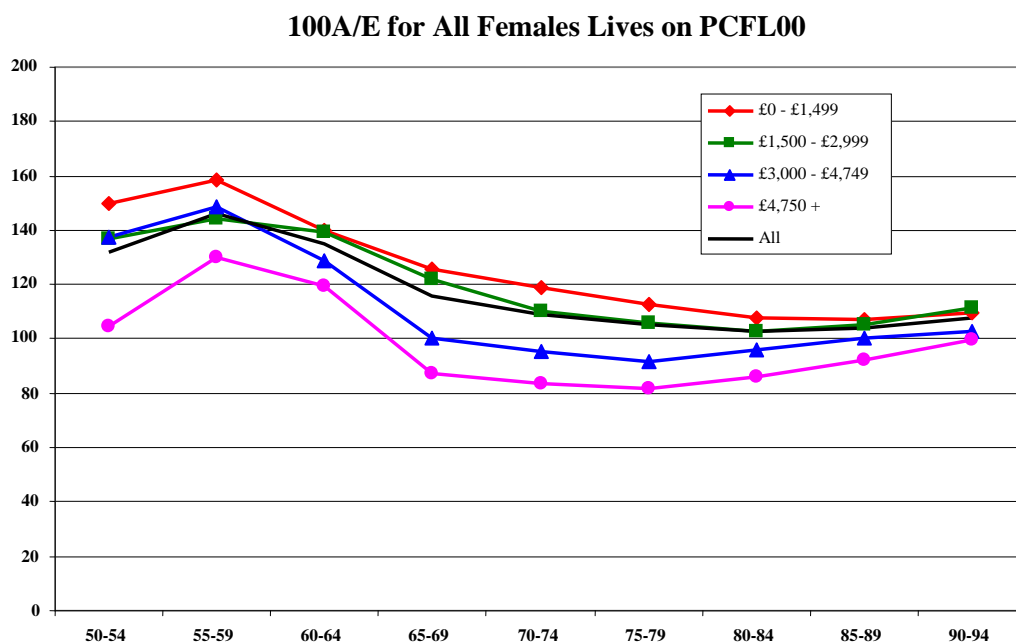


Chart 19



As for males, the 100A/Es at younger ages deviate from the trend seen at higher ages. The 100A/Es in the 55-59 and 60-64 age groups appear relatively high and the 100A/Es in the 50-54 age group appear relatively low. These features are particularly noticeable in the over £4,750 pension band. The reason for this is not known. However, overall the ‘combined’ “00” Series base tables appear to provide a better fit to the data than the “92” Series (with short cohort adjustment) did.

As anticipated, the pension size has a clear effect. Lighter mortality is experienced in the larger pension bands, with the effect in general being greater at younger ages.

The differential between the bands appears to be smaller than for males. In the youngest age group the differential is around 40-50% for females, whereas it is around 250% for males. This difference may in part be due to the levels at which the bands are set for males and females.

Whereas the differential decreases rapidly at higher ages for males, the differential is more constant for females. For example in the 65-69 and 70-74 age bands the differential remains 40-50% for females, but has decreased to around 100% for males.

The data underlying the above charts is summarised below.

Table J

All Females with pension under £1,500 pa						
	Amounts			Lives		
Age group	Exposed to risk (£'000)	Actual deaths (£'000)	100A/E PCFA00	Exposed to risk	Actual deaths	100A/E PCFL00
50-54	20,044	131	165	26,842	185	150
55-59	41,492	292	173	53,554	381	159
60-64	104,749	837	154	142,726	1,180	140
65-69	132,652	1,698	144	171,418	2,221	126
70-74	157,739	3,659	137	199,055	4,579	119
75-79	167,323	6,606	126	212,769	8,442	113
80-84	134,821	8,607	118	174,284	11,204	108
85-89	68,752	7,343	115	88,621	9,477	107
90-94	23,437	4,087	117	29,690	5,128	110
All above	851,009	33,260	123	1,098,959	42,797	112

All Females with pension £1,500 pa - £2,999 pa						
	Amounts			Lives		
Age group	Exposed to risk (£'000)	Actual deaths (£'000)	100A/E PCFA00	Exposed to risk	Actual deaths	100A/E PCFL00
50-54	42,848	278	164	19,384	122	137
55-59	94,054	616	161	42,664	276	144
60-64	185,787	1,540	160	85,550	706	139
65-69	230,347	2,883	141	106,645	1,337	122
70-74	244,397	5,168	126	114,275	2,418	110
75-79	224,573	8,309	119	105,457	3,908	106
80-84	159,562	9,746	113	75,189	4,582	103
85-89	79,326	8,382	114	37,291	3,943	105
90-94	30,264	5,328	118	14,092	2,483	112
All above	1,291,157	42,250	120	600,546	19,775	109

All Females with pension £3,000 pa - £4,749 pa						
	Amounts			Lives		
Age group	Exposed to risk (£'000)	Actual deaths (£'000)	100A/E PCFA00	Exposed to risk	Actual deaths	100A/E PCFL00
50-54	55,292	355	162	14,568	92	137
55-59	117,023	790	166	30,897	206	149
60-64	194,358	1,487	148	51,532	392	129
65-69	218,259	2,257	117	58,123	597	100
70-74	204,363	3,712	109	54,664	999	96
75-79	174,980	5,599	103	46,758	1,497	92
80-84	126,930	7,260	106	33,867	1,938	96
85-89	67,927	6,883	109	18,147	1,826	100
90-94	27,990	4,560	109	7,518	1,220	103
All above	1,187,123	32,903	110	316,074	8,767	99

All Females with pension £4,750 pa or above						
Age group	Amounts			Lives		
	Exposed to risk (£'000)	Actual deaths (£'000)	100A/E PCFA00	Exposed to risk	Actual deaths	100A/E PCFL00
50-54	210,873	950	114	23,262	112	105
55-59	370,451	2,003	133	42,292	247	130
60-64	429,108	2,911	132	52,837	371	120
65-69	417,036	3,531	96	52,253	464	87
70-74	396,696	6,162	93	49,067	788	84
75-79	388,101	10,988	91	47,058	1,357	82
80-84	308,015	15,145	91	36,328	1,873	86
85-89	176,880	15,943	96	20,107	1,879	92
90-94	75,184	11,730	105	8,401	1,325	100
All above	2,772,342	69,364	97	331,606	8,416	91

5.3 Analysis of normal females against PNFA00/PNFL00

As for males, the ‘normal’ subset of females data is large and expected to be relatively homogeneous compared to the ‘All females’ dataset. It has therefore been investigated separately to seek to identify any additional features. As this subset should contain only normal health retirements, it has been compared to the ‘normal’ ‘00’ Series base tables.

Chart 20

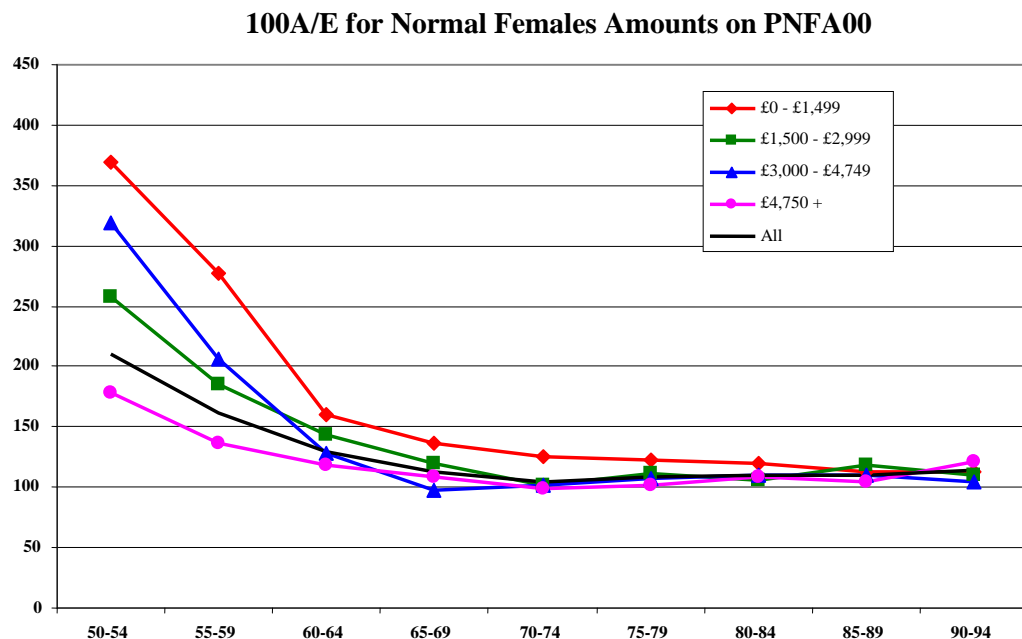
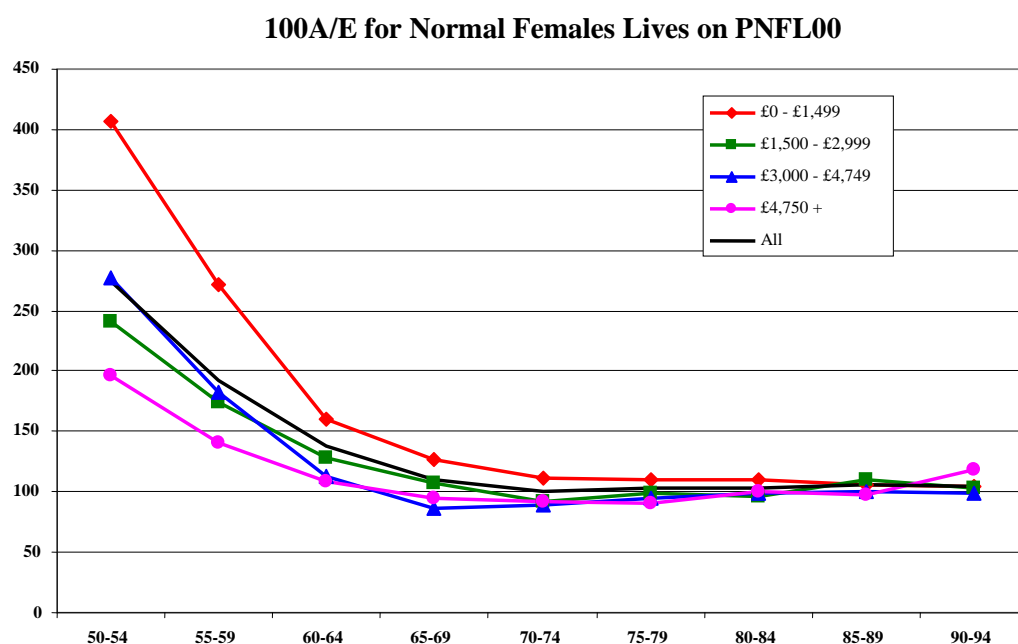


Chart 21

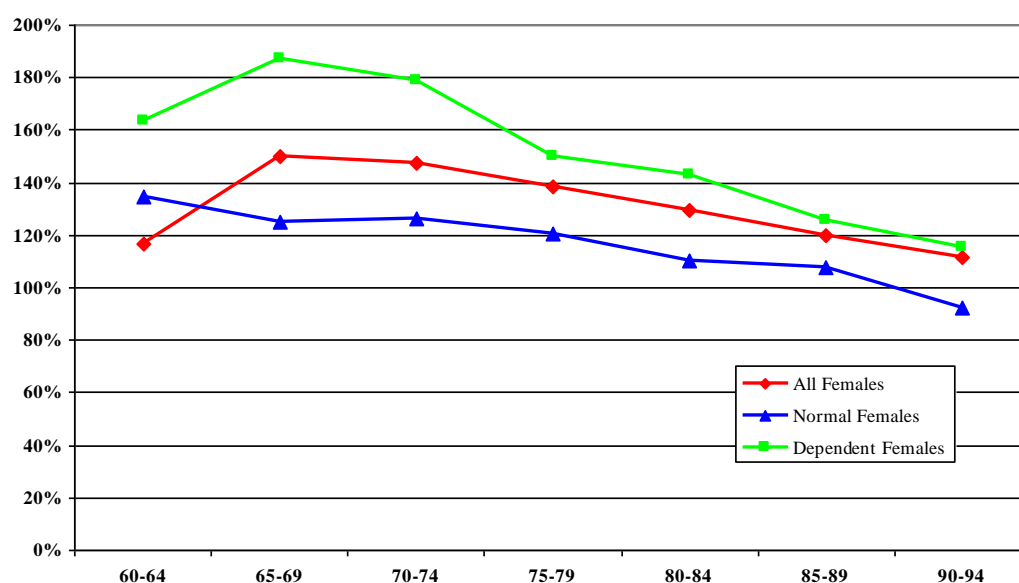


In common with males, the 100A/Es are particularly high at young ages, both for the lower pension bands, and in the overall data (combining all pension size bands). This is driven in part by the choice of the ‘normal’ “00” Series base table as the comparator (it being blended into the AFC00 table at younger ages). The above graphs suggest that the ‘normal’ “00” Series base tables do not fit this dataset particularly well at young ages.

The chart below shows the ratio of the observed q_x (on an amounts basis) for the highest and lowest amount bands (ie a measure of the effect of amount of pension on mortality). At older ages the effect of the amount of pension on mortality appears smaller for normal females than for all females.

Chart 22

Ratio of crude Amounts Qx for £0 - £1,499 band vs £4,750+ band



The data underlying the above charts is summarised below.

Table K

Normal Females with pension under £1,500 pa						
Age group	Amounts			Lives		
	Exposed to risk (£'000)	Actual deaths (£'000)	100A/E PNFA00	Exposed to risk	Actual deaths	100A/E PNFL00
50-54	3,580	24	370	4,812	39	407
55-59	8,964	73	277	11,848	104	272
60-64	36,341	281	160	52,743	457	160
65-69	41,211	477	136	56,608	686	126
70-74	39,107	793	125	51,969	1,057	111
75-79	35,081	1,288	122	45,193	1,677	110
80-84	24,609	1,551	120	31,650	2,018	109
85-89	10,804	1,106	112	13,843	1,444	106
90-94	3,214	533	112	4,063	660	104
All above	202,911	6,126	122	272,730	8,142	113

Normal Females with pension £1,500 pa - £2,999 pa						
	Amounts			Lives		
Age group	Exposed to risk (£'000)	Actual deaths (£'000)	100A/E PNFA00	Exposed to risk	Actual deaths	100A/E PNFL00
50-54	6,964	33	258	3,121	15	240
55-59	19,920	109	186	8,991	51	175
60-64	54,803	382	143	25,119	177	129
65-69	68,596	705	120	31,541	329	108
70-74	67,356	1,114	102	31,124	523	92
75-79	58,220	1,948	111	26,971	904	99
80-84	35,858	1,989	106	16,762	926	96
85-89	14,552	1,578	118	6,810	748	111
90-94	4,749	778	111	2,212	359	103
All above	331,018	8,636	113	152,651	4,032	102

Normal Females with pension £3,000 pa - £4,749 pa						
	Amounts			Lives		
Age group	Exposed to risk (£'000)	Actual deaths (£'000)	100A/E PNFA00	Exposed to risk	Actual deaths	100A/E PNFL00
50-54	11,072	65	319	2,892	16	277
55-59	31,664	193	207	8,275	49	182
60-64	65,829	408	128	17,404	107	113
65-69	74,920	621	97	19,897	165	86
70-74	64,766	1,053	102	17,317	281	90
75-79	48,822	1,564	107	13,075	416	95
80-84	29,832	1,710	109	7,986	460	99
85-89	14,042	1,417	110	3,743	375	101
90-94	5,102	795	105	1,362	212	99
All above	346,049	7,825	109	91,951	2,081	98

Normal Females with pension £4,750 pa or above						
	Amounts			Lives		
Age group	Exposed to risk (£'000)	Actual deaths (£'000)	100A/E PNFA00	Exposed to risk	Actual deaths	100A/E PNFL00
50-54	66,273	216	179	6,918	27	197
55-59	122,843	486	137	14,041	63	140
60-64	150,255	856	119	19,186	113	109
65-69	132,563	1,223	109	17,730	160	94
70-74	107,500	1,711	99	14,578	245	93
75-79	94,308	2,889	101	12,523	385	91
80-84	62,197	3,555	109	8,252	479	100
85-89	28,749	2,758	104	3,737	364	98
90-94	8,754	1,531	121	1,109	201	118
All above	773,442	15,224	108	98,074	2,037	100

5.4 Analysis of dependent females against PCFA00/PCFL00

For females, the largest dataset relates to dependants. It has therefore been investigated separately to seek to identify any additional features and has been compared to the ‘normal’ “00” Series base tables.

While it is the largest female dataset, there is little data for the 50-54 and 55-59 age groups. Therefore the following graphs omit those age groups.

Chart 23

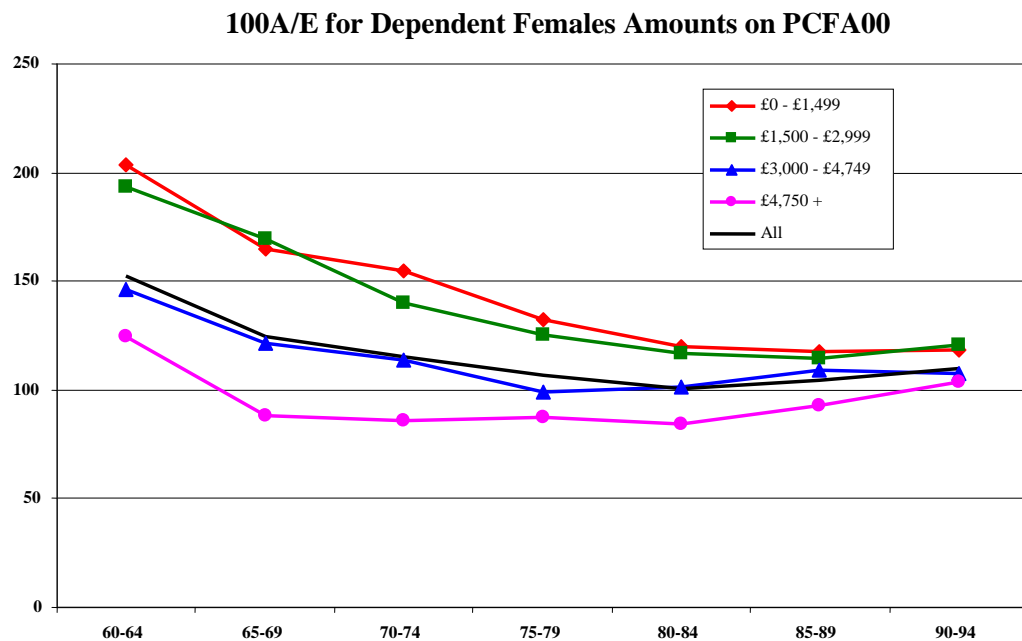
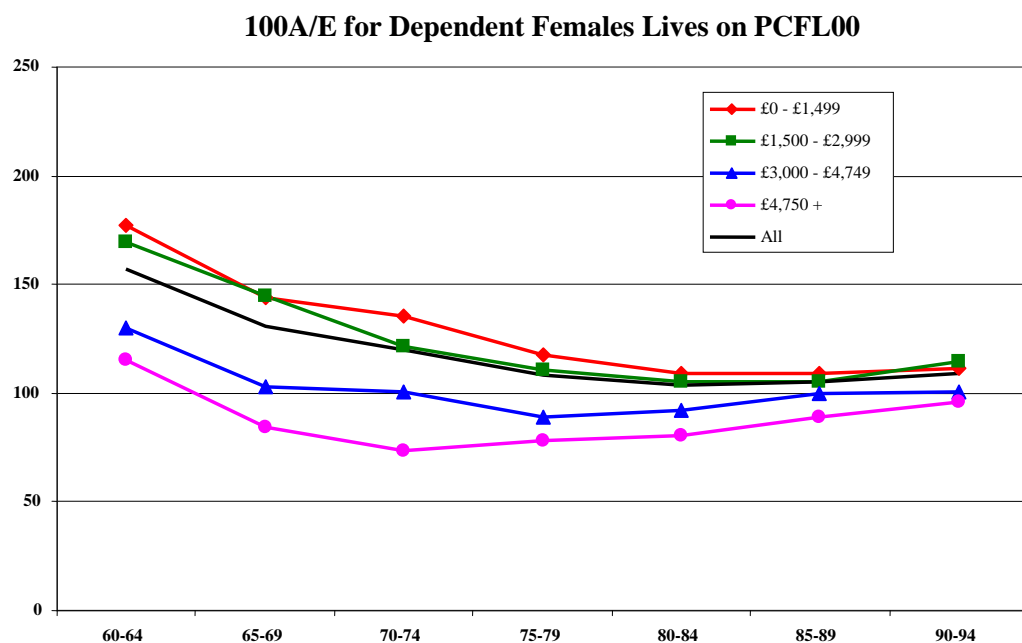


Chart 24



As expected, the graphs demonstrate higher 100A/Es for dependent females receiving smaller pension amounts. This is particularly evident at younger ages.

As shown previously in chart 22, the separation between bands appears greater for dependent females than for all females, although there is relatively little difference between the two lower pension amount bands.

For dependent females in the lower two pension amount bands, the mortality rates at younger ages are heavier than for all females. At higher ages, and for dependent females in the higher two pension amount bands, the mortality rates appear close to those for all females.

It should be borne in mind that the dependent females data examines the mortality experience of dependent females once in receipt of pension only. It does not provide evidence of the mortality of contingent dependants before they become dependants.

The data underlying the above charts is summarised below (including data for age groups 50-54 and 55-59 excluded from the charts).

Table L

Dependent Females with pension under £1,500 pa						
Age group	Amounts			Lives		
	Exposed to risk (£'000)	Actual deaths (£'000)	100A/E PCFA00	Exposed to risk	Actual deaths	100A/E PCFL00
50-54	6,136	40	166	7,895	53	146
55-59	12,144	72	146	14,908	86	128
60-64	22,083	236	203	26,733	284	177
65-69	41,430	623	165	49,619	752	144
70-74	72,662	1,926	154	86,632	2,305	135
75-79	95,301	3,968	132	116,690	4,890	118
80-84	86,883	5,655	120	110,109	7,214	109
85-89	48,591	5,291	117	61,841	6,749	109
90-94	17,199	3,031	119	21,585	3,788	111
All above	402,429	20,842	126	496,012	26,121	114

Dependent Females with pension £1,500 pa - £2,999 pa						
Age group	Amounts			Lives		
	Exposed to risk (£'000)	Actual deaths (£'000)	100A/E PCFA00	Exposed to risk	Actual deaths	100A/E PCFL00
50-54	14,714	67	115	6,726	31	100
55-59	27,460	169	151	12,551	76	135
60-64	47,070	477	194	21,708	220	169
65-69	76,265	1,170	170	35,605	541	145
70-74	109,032	2,585	140	51,484	1,218	122
75-79	120,379	4,723	125	57,034	2,228	111
80-84	97,439	6,157	117	46,134	2,906	106
85-89	53,835	5,730	114	25,357	2,688	105
90-94	20,791	3,738	121	9,727	1,752	114
All above	566,985	24,815	124	266,325	11,660	112

Dependent Females with pension £3,000 pa - £4,749 pa						
	Amounts			Lives		
Age group	Exposed to risk (£'000)	Actual deaths (£'000)	100A/E PCFA00	Exposed to risk	Actual deaths	100A/E PCFL00
50-54	16,561	64	97	4,358	17	85
55-59	29,139	167	141	7,725	45	130
60-64	44,274	337	146	11,769	91	130
65-69	63,096	690	122	16,799	180	103
70-74	81,443	1,570	114	21,788	427	101
75-79	89,797	2,792	99	24,009	754	89
80-84	74,808	4,124	102	19,989	1,103	92
85-89	41,984	4,252	109	11,292	1,135	100
90-94	17,461	2,811	108	4,729	754	101
All above	458,563	16,807	107	122,458	4,506	97

Dependent Females with pension £4,750 pa or above						
	Amounts			Lives		
Age group	Exposed to risk (£'000)	Actual deaths (£'000)	100A/E PCFA00	Exposed to risk	Actual deaths	100A/E PCFL00
50-54	40,738	72	44	4,727	9	41
55-59	70,018	389	137	8,109	45	124
60-64	98,920	639	124	11,424	78	115
65-69	135,608	1,076	88	15,548	136	84
70-74	180,395	2,637	86	20,749	297	74
75-79	211,018	5,806	88	24,163	667	78
80-84	191,210	8,757	84	21,333	1,030	81
85-89	116,592	10,189	93	12,419	1,124	89
90-94	51,080	7,857	103	5,386	817	96
All above	1,095,580	37,422	92	123,858	4,203	85

6 Analysis of results by industry classification

6.1 A summary of the results is given below. Only industry classifications with more than five schemes have been included. The following table shows those industries that have been analysed.

Table M

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

6.2 The classifications used in this paper are in accordance with the coding guide at the date of submission of the data and is based on FT classifications current to December 2005. From December 2005 the FT classifications were amended and the coding guide has now been amended to reflect the current FT classification system. An exercise is being carried out to update historic data to the new industry classifications and so it is hoped that future analyses can be based on the new coding guide.

6.3 A summary of the results for these sectors for all males and females is given below.

Table N

Sector	Lives or Amounts	100A/E “92” Series short cohort (C=year of exposure) (M/F)	100A/E “00” Series Normal retirement tables (M/F)	100A/E “00” Series Combined retirement tables (M/F)
Basic Industries	Lives	131/131	125/121	118/118
Basic Industries	Amounts	136/138	124/122	118/120
General Industries	Lives	126/129	116/116	111/113
General Industries	Amounts	133/139	116/120	111/116
Cyclical Consumer Goods	Lives	123/121	111/107	107/103
Cyclical Consumer Goods	Amounts	132/137	113/116	107/112
Non-Cyclical Consumer Goods	Lives	118/119	107/107	102/104
Non-Cyclical Consumer Goods	Amounts	128/131	111/112	105/109
Cyclical Services	Lives	126/127	119/116	112/113
Cyclical Services	Amounts	137/140	124/122	118/119
Utilities	Lives	124/112	116/103	106/98
Utilities	Amounts	124/109	109/97	99/92
IT	Lives	116/118	110/109	101/106
IT	Amounts	128/130	114/117	104/112
Financials	Lives	102/102	96/93	89/90
Financials	Amounts	109/113	98/98	92/95
Local Authorities	Lives	127/120	117/108	110/104
Local Authorities	Amounts	134/132	119/114	113/110
Miscellaneous	Lives	99/98	95/90	92/88
Miscellaneous	Amounts	108/107	100/93	97/91

6.4 Generally, the pattern of experience is largely as might be expected, with those sectors with more blue collar workers experiencing heavier mortality than industries with more white collar workers. The Financial sector has the lightest mortality whilst Basic Industries has the heaviest mortality.

6.5 In some sectors there is very little difference between the lives and amounts experiences whilst others show greater differences. The differences can be positive or negative (though in more cases the amounts comparison is greater than the lives comparison) – the comparison is being made against the lives/amount differences in

the life office pensioner population. As we can say very little about this population, few conclusions can be drawn. Differences are greater on the “92” Series experience compared to the “00” Series experience. This gives more insight into the changing insured pensioner population than anything else.

6.6 The female differences follow the same pattern by sector as the male experiences. The greatest differences, where female mortality is relatively heavier, are in the IT sector and the greatest differences, where female mortality is relatively lighter, are in the Utilities sector.

6.7 The above statistics need to be understood in the context of the overall population sizes of the data. These are as follows:

Table O

Sector	Sex	ETR Lives	ETR Amounts (£'000 pa)	Average pension (£ pa)
Basic Industries	Males	337,132	1,968,933	5,840
Basic Industries	Females	216,700	541,444	2,499
General Industries	Males	396,935	1,658,373	4,178
General Industries	Females	231,064	406,651	1,760
Cyclical Consumer Goods	Males	239,687	837,932	3,496
Cyclical Consumer Goods	Females	210,989	342,728	1,624
Non-Cyclical Consumer Goods	Males	230,992	1,488,871	6,446
Non-Cyclical Consumer Goods	Females	198,784	477,296	2,401
Cyclical Services	Males	548,692	3,099,483	5,649
Cyclical Services	Females	333,202	757,690	2,274
Utilities	Males	47,032	408,694	8,690
Utilities	Females	23,202	104,012	4,483
IT	Males	335,207	3,232,076	9,642
IT	Females	243,381	887,047	3,645
Financials	Males	105,862	1,426,032	13,471
Financials	Females	99,673	554,986	5,568
Local Authorities	Males	610,466	3,086,705	5,056
Local Authorities	Females	784,531	1,892,768	2,413
Miscellaneous	Males	11,297	62,267	5,512
Miscellaneous	Females	9,975	32,189	3,227

There are large variations within sectors as well as between sectors, so users of the data must be wary of making unjustified conclusions regarding individual schemes.

6.8 It is interesting to see the inverse correlation between average pension size and mortality experience. For males, using 100A/E on the “92” Series short cohort amounts basis we have:

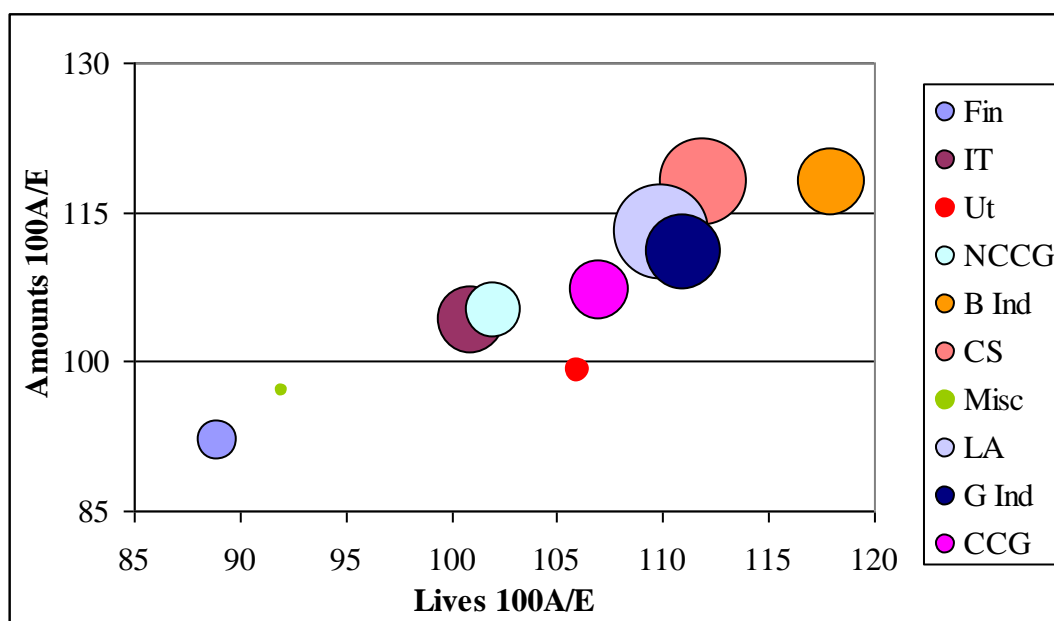
Table P

Sector	Average pension (male) £ pa	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

The overall 100A/E on this basis is 130 (from Table B). The ‘Miscellaneous’ grouping is very small and no conclusions can in any event be drawn from this grouping of schemes (such as charities) that do not fit into any of the Sector categories. Otherwise, the four Sectors with lighter than average mortality are all, as expected, in the top half of the table. The Financial Sector, with very high average pensions, has significantly lighter mortality than any other Sector.

This is illustrated by the following bubble chart that has the Sectors ordered by decreasing average male pension amounts, the size of the bubble determined by the male lives exposed to risk and the 100A/E values those from the “00” Series Combined retirement tables comparison.

Chart 25



7. Ill-health experience

7.1 The table below shows the exposed to risk and 100A/E over all ages for the SAPS ill-health retirement data. The graphs then compare the data in five year age bands against the “00” Series Early retirement tables.

	Exposed to Risk lives/£'000pa	100A/E on PML92sc (C=year of exposure)	100A/E “00” Series Normal retirement tables	100A/E “00” Series Early retirement tables
Male lives	212,729	202	185	150
Male amounts	1,108,599	258	216	179
Female lives	134,482	194	173	138
Female amounts	421,344	228	197	150

Chart 26

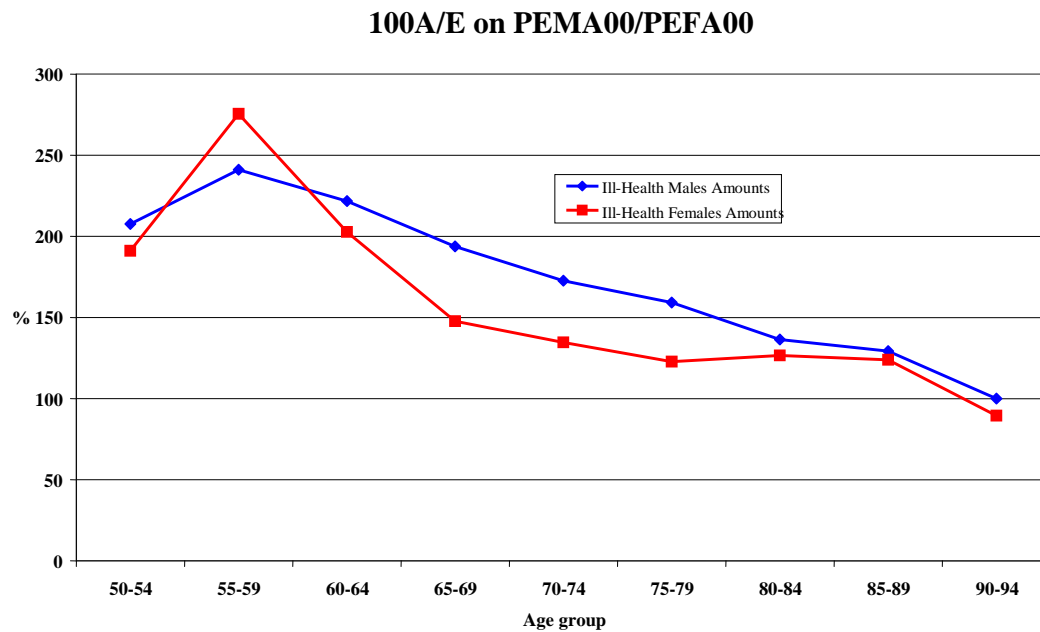
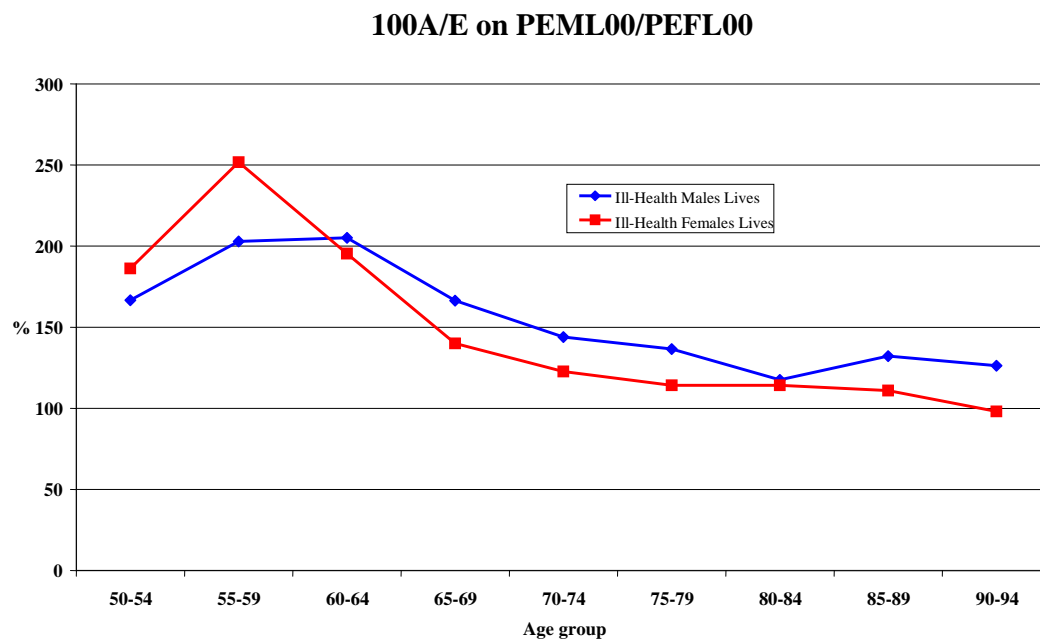


Chart 27



As expected, the SAPS mortality rates are higher than the “00” Series Early retirement rates at all ages bands shown apart from the highest. This is due to the “00” Series data including normal health early retirees whereas the SAPS ill-health data excludes them.

8. Feedback on the draft Working Paper

- 8.1 This Working Paper was initially released in draft form to CMI SAPS members. This was intended to provide a tangible benefit to those organisations that support the SAPS investigation in that they had access to the results before they were made publicly available. However, it also presented an opportunity for a ‘consultation’ period on the draft Working Paper.
- 8.2 Other than a few minor typographical and presentational corrections, no substantive changes have been made to the Working Paper. For completeness, a summary of the main areas of feedback received along with the Committee’s response is given below.
- 8.3 Further comment was requested on mortality improvements experienced in the SAPS investigation. The Committee intends to look at this during 2008 with a view to publishing a paper on mortality improvements in the SAPS data.
- 8.4 A number of correspondents have requested further comment and more detailed analyses on the mortality experience split by industry type. The Committee agrees that this could provide very useful results, and indeed could warrant a study in its own right. No changes have been made to this Working Paper, but it is hoped to provide further analyses at a later date.
- 8.5 In light of the feedback received, the Committee has prioritised its future work and intends to produce the following items over the course of the next year:
 - i) Experience Working Paper on data submitted to 30/6/2007
 - ii) Graduation Working Paper
 - iii) Analysis of improvements
 - iv) Analysis by industry sector