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INTRODUCTION

The Executive Committee of the Continuous Mortality Investigation Bureau of the Institute of Actuaries and Faculty of Actuaries has pleasure in presenting this, the nineteenth number of its reports.

This report was first published on the Institute and Faculty website in September 2000 with the printed report being distributed some time afterwards. This was also the case with the last two C.M.I. Reports and this method of communication seems set to continue being both timely and cost effective.

The papers contained in this report are mostly devoted to the mortality experience of the 1995-98 quadrennium.

The first four papers record the mortality experience of assured lives, annuitants and pensioners for that quadrennium. These papers follow the style adopted in *C.M.I.R.* **16** with the tables placed at the end of each of the relevant sections. Section and table numbers are such that they can be followed from this C.M.I. Report back to *C.M.I.R.* **16**. In each case the comparison basis used in this report is the appropriate table from both the "92" and "80" Series of mortality tables. This dual comparison provides a link with previous quadrennial reports, which will allow comparisons to be made with the experience of future quadrennia where we expect to use only the "92" Series as the comparison basis.

The fifth paper details the 1995-98 experience of smokers and non-smokers. This experience is growing quickly and trends are difficult to discern but yet again it confirms the wide differential in the mortality experience of these two classes of lives.

Based on the 1991-94 experience of pensioners of pension schemes underwritten by life offices, the sixth paper contains a description of a new mortality table based on the combined experience of those who retired at or after the normal retirement age and those who retired earlier. This table is not designated as one of the standard tables under the "92" Series but is included here as an experience guide for the contributing offices. It is not considered appropriate to apply the "92" Series mortality projection factors to this table since those factors are not suitable for use with lives that retired early.

The last paper gives details of the extension of the AM92, AF92, TM92 and TF92 tables to ages below 17, the previous lowest age applicable to these tables. An updated parameter file for the Standard Tables Program that includes these ages can be downloaded from the Faculty and Institute website.

The publication of the 1995-98 experience was anticipated in the introduction to *C.M.I.R.* **16**, which mentions a target date for this report of April 2000. In the

event it was not possible to meet that target. However, the publication timetable for this report has still been the quickest ever for a C.M.I.B. quadrennium experience, being produced two years after the previous such report and only six months since the last quadrennium data was collected.

None of this would have been achieved without the work of the Secretariat, the contributing offices that submit the data and the members of the Executive Committee and Sub-Committees who give so much of their time to the service of the profession. My thanks go to them all.

September 2000

P J Nowell
Chairman, Executive Committee

CONTENTS

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THE MORTALITY OF HOLDERS OF PERMANENT (WHOLE LIFE AND ENDOWMENT) POLICIES OF ASSURANCE 1995-98

This report follows the format of *C.M.I.R.* **16**, which reported on the experience of 1991-94. In particular, in order to allow easy cross referencing to that report, most table, section and paragraph numbers follow the numbering used in *C.M.I.R.* **16**. As with that report, this report contains commentaries on three sets of data. Section 1 covers male holders of permanent (whole life and endowment) policies of assurance issued in the United Kingdom. The policies are divided into six sub-sets relating to the type of product, the degree of underwriting and whether they were issued on a single or a joint life basis. Section 2 covers female policyholders, similarly subdivided into six sub-sets. Section 3 relates to policies written in the Republic of Ireland, subdivided by sex.

The exposed to risk and deaths over the last three quadrennia are shown for each sub-group in Table ASS 0.1. This, and subsequent tables relating to the text, will be found on pp 11 to 36. The effect of smoking on mortality for this class of business is covered in a separate report on pp 101 to 118.

The term "standard medical evidence" relates to policies where the life assured has undergone a full medical examination or has completed a comprehensive health questionnaire, with or without a Medical Attendant's Report. "Minimum medical evidence" relates to policies issued after the completion of a short proposal form containing a small number of questions. "Guaranteed acceptance" relates to policies issued with no medical evidence at all.

1. MALE LIVES COVERED BY POLICIES ISSUED IN THE UNITED KINGDOM

The six experiences included in this section are:

1.1 Non-linked assurances on single lives, based on standard medical evidence.
1.2 Unit-linked assurances on single lives, based on standard medical evidence.
1.3 Joint life first death assurances, based on standard medical evidence.
1.4 Assurances on single lives based on minimum medical evidence.
1.5 Assurances on joint lives based on minimum medical evidence.
1.6 Guaranteed acceptance assurances on single lives.

Each of the experiences is compared against both the AM80 and the AM92

tables. Using a standard comparison basis throughout the report helps point up the differences between the experiences. On this occasion the "92" Series of mortality tables is available for the first time for use in a report on the experience of a quadrennium. Both the AM80 and AM92 tables have been used as comparison bases in order to provide a "bridge" between future and past comparisons. The AM80 table was used as the comparison basis in part 1 of *C.M.I.R.* **16**, which reported on the mortality experience of 1991-94, the previous quadrennium.

The summary table, ASS 1.0.1, shows, for each investigation, the number of actual deaths at durations 2 and over as a percentage of the number expected according to the AM92 table. Table ASS 1.0.2 shows the same information but uses the AM80 table to calculate the expected number of deaths. In *C.M.I.R.* **16** the equivalent table showed that, apart from the guaranteed acceptance group, above age 45 the experiences were similar. Four years later this feature cannot be seen and the linked standard medical evidence group now exhibits much higher mortality than the other groups. Unlike them, the mortality experience of the linked group has not improved since 1991-94.

As well as the detailed reports covering recent experience, Section 1.1. also contains a note showing a longer term perspective detailing trends back to the quadrennium 1959-62.

1.1 *Non-linked assurances on single lives, based on standard medical evidence*
This investigation (together with that into the mortality of immediate annuitants) is the longest running of those carried out by the Bureau. It is also, in terms of the number of policies covered, by far the largest. As can be seen from Table ASS 0.1, the long term fall in the exposed to risk, noted in *C.M.I.R.* **14** and *C.M.I.R.* **16**, has continued into the quadrennium 1995-98.

In the main the decline is due to insufficient new business to replace that going out of the experience through deaths, maturities, surrenders and lapses. The list of offices contributing to the experience over the years has been generally stable, although over the latest quadrennium there has been the loss of a handful of small contributors and not all contributors were able to make returns for each year of the quadrennium. The reasons for the decline appear complex and are being investigated further. They include a decline in market share of the offices that contribute data to the investigations and a continued shift away from traditional with profits business towards newer style critical illness and term assurance contracts.

In addition to the decline in the exposed to risk the global crude mortality rate has increased during a time that mortality rates have been improving. This shows that the experience is ageing as it declines.

Quadrennium	Crude Mortality Rate
1983-86	0.003973
1987-90	0.004196
1991-94	0.004248
1995-98	0.004519

Table ASS 1.1.1a shows for the whole data the actual deaths in 1995-98 and the ratio of the actual deaths to those expected using the AM92 table and the AM80 table. Corresponding ratios for 1987-90 and 1991-94 are also shown, but with only the AM80 table as the comparison basis. At durations 2 and over it can be seen from the table that the mortality experienced by policyholders has continued to fall at all ages. This is now a long established trend. In most age groups the number of actual deaths is around 90% of the number expected according to the AM92 table.

At duration 1 the ratios of actual to expected deaths vary by age group but overall there has been little change in the experience when compared with the previous quadrennium.

At duration 0, overall mortality is at much the same level as in the previous quadrennium although below age 30 the number of actual deaths is much higher than that expected. The deterioration from 1991-94 to 1995-98 in mortality in the age group 51-55 is offset by some improvement in the age group 46-50.

Data can still be submitted split by medical status if an office wishes to do so. However, in the annual returns to offices results are, by default, reported split by smoker rather than medical status. Offices that did not indicate smoker status were presented with combined results. Few, if any, offices have subsequently requested reports showing the results split by medical status. In this report we do show in tables ASS 1.1.1b and ASS 1.1.1c results split by medical status, but do not intend to do so in the future.

Table ASS 1.1.2a shows, age group by age group, percentage ratios of actual deaths to those which would be expected using as a comparison basis the AM92 table back to 1959-62. Table ASS 1.1.2b shows similar information but the mortality comparison basis is AM80. For 1983-86 and earlier, these have been calculated by using 'bridging factors' derived from the report for the 1983-86 quadrennium (*C.M.I.R.* **11**), which showed 100A/E ratios using both the AM80 and A1967-70 mortality tables as comparison bases, and from the report for the 1971-74 quadrennium (*C.M.I.R.* **3**), which showed 100A/E ratios using both the A1967-70 and the A1949-52 mortality tables as comparison bases. Although there is necessarily an element of approximation in these

calculations, it is likely that the errors are small. The results at very high ages should obviously be interpreted with caution.

From the table the steady improvement in mortality can be clearly seen. Between ages 40 and 65 the observed mortality rates in 1995-98 are less than half those observed in 1959-62. Above age 65 the improvement tapers off but is still substantial. Below age 40, mortality has also improved since 1991-94, reversing the stability in mortality rates seen at these ages in the 1991-94 and 1987-90 quadrennia. Looking at the trend for all ages it can be seen that the improvements in mortality since 1979-82 have been greater than in previous quadrennia. Prior to 1979-82 the 100A/E ratio improved by about 6% between each quadrennia but has improved by about 10% between quadrennia since that time.

1.2 *Unit-linked assurances on single lives, based on standard medical evidence*
Table ASS 1.2.1 shows, for the whole data, the deaths in 1995-98 and the ratios of actual deaths to those expected using the AM92 and AM80 tables, together with corresponding ratios for 1991-94 and 1987-90 but based only on the AM80 table. For duration 0 and duration 1, the level of mortality recorded in 1995-98 was much lower than that recorded in 1991-94, which had shown a surprising increase compared to the previous quadrennium. *C.M.I.R.* **16** suggested that the results for 1991-94 were somewhat spurious and the latest experience would seem to confirm this. It is also notable that at duration 0 the number of deaths in 1995-98 (61) has fallen sharply since 1991-94 (345). A similar but less rapid decline in the number of deaths has occurred at duration 1. For durations 2 and over, the ratio of actual to expected deaths, based on the AM80 table, in 1995-98 for all ages is almost the same as for 1991-94 and this is also true for the 46 to 80 age group. For age groups outside this range such comparisons show a mixed picture but for ages 26 to 35 there has been a marked improvement in mortality from the curiously high levels experienced in 1991-94. The comparison with the AM92 tables shows that the 1995-98 experience is of a different shape to that mortality table.

Overall the mortality of this group is higher than that of the non-linked section of the data whereas, for 1991-94, *C.M.I.R.* **16** noted that the mortality of these two experiences was similar.

1.3 *Joint life first death assurances, based on standard medical evidence*
The policies included in this investigation are those where payment is made on the occurrence of the first death only. It is also limited to policies set up on one male and one female life. As time has passed, in some cases, one of the lives has been deleted from the policy, the other life remaining in the experience on a single life basis.

Table ASS 1.3.1 shows the analyses for this group. As in the non-linked experience, the changes in the level of mortality recorded vary according to age and over time. In general there is a continuing fall in the mortality recorded over the three most recent quadrennia. The mortality of those in the joint life investigation in 1995-98 was lower than the non-linked investigation and substantially lower than the linked investigation. At ages above 60, this was also generally the case in earlier quadrennia. Below that age the mortality experienced in the joint life investigation generally fell between that of the linked and non-linked single life investigations.

This investigation demonstrates much lighter mortality than that of the AM92 table.

At duration 0, and as noted in *C.M.I.R.* **16**, the rates of mortality for males in the joint life experience in 1995-98 were well below those experienced in either the linked or the non-linked single life experience. It is difficult to discern clear patterns over time.

At duration 1 also, the mortality level in the joint life experience in 1995-98 was, overall, well below that in either of the single life experiences, although the pattern by age groups was not so clear. Again, it is difficult to discern patterns over time. This comment was also made in *C.M.I.R.* **16**.

1.4 *Assurances on single lives, based on minimum medical evidence*

The analyses for this group are shown in Table ASS 1.4.1. The investigation started only on 1 January 1985. Overall the level of mortality experienced by this group at durations 2 and over has, over time, been consistently above that observed in the fully underwritten, single life experience. In each quadrennia, 1987-90, 1991-94 and 1995-98, there has been a difference of between 8 and 12 in the values of the 100A/E ratios relative to the AM80 table. This difference has varied by age but in all age groups, except 31 to 35, the mortality experience of 1995-98 was above that of the fully underwritten group. The greatest difference observed was between the ages 41 to 50.

At durations 0 and 1 there is little experience in 1995-98 but at duration 1, where the number of deaths recorded was 21, the mortality experience was substantially heavier than that found in the single life, fully medically underwritten group. This feature was noted in the 1987-90 experience recorded in *C.M.I.R.* **14** and in the 1991-94 experience recorded in *C.M.I.R.* **16**.

1.5 *Assurances on joint lives, based on minimum medical evidence*

The experience for this group is to be found in Table ASS 1.5.1.

At durations 2 and over the mortality recorded in this group is broadly similar in pattern to that recorded in the joint life fully underwritten group, albeit at

a slightly higher level. Up to age 35 the level of mortality is below that found in the corresponding single life investigations. Both of these features were seen in the 1991-94 and 1987-90 quadrennia.

1.6 *Guaranteed acceptance assurances written on single lives*

The experience for this group is shown in Table ASS 1.6.1. A notable feature of the data is the increased number of deaths recorded during 1995-98 compared with the 1991-94 experience, particularly at ages over 65, together with a significant fall in the exposed to risk at durations 2 and over. While the number of offices that have contributed to this investigation has remained relatively stable over the two quadrennia, it is apparent that there has been a change in the experience, with business now being sold at older ages. This means that results should be interpreted with caution, and comparisons with previous quadrennia may not be valid.

With this warning in mind, it can be seen that although the level of mortality recorded has fallen over the three quadrennia shown, the level observed in 1995-98 is still, in almost every age group, well above that recorded at durations 2 and over in both the fully medically underwritten and the minimum evidence investigations. This observation was first made in *C.M.I.R.* **16**.

2. FEMALE LIVES COVERED BY POLICIES ISSUED IN THE UNITED KINGDOM

This section covers six different experiences, corresponding to those for male lives reviewed in Section 1.

The experiences are:

2.1 Non-linked assurances on single lives, based on standard medical evidence.
2.2 Unit-linked assurances on single lives, based on standard medical evidence.
2.3 Joint life first death assurances, based on standard medical evidence.
2.4 Assurances on single lives, based on minimum medical evidence.
2.5 Assurances on joint lives, based on minimum medical evidence.
2.6 Guaranteed acceptance assurances on single lives.

Each of the experiences is compared against the AF92 and the AF80 table. The summary table, ASS 2.0.1, shows, for each investigation, the number of actual deaths at durations 2 and over as a percentage of the number expected according to the AF92 table. Table ASS 2.0.2 shows the same information but uses the

AF80 table of mortality as the comparison basis. As with males, the guaranteed acceptance and linked assurance groups exhibit much higher mortality than the other groups and the similarity in experience above age 45, noted in *C.M.I.R.* **16**, is not so apparent.

As well as the detailed reports covering recent experience, Section 2.1 also contains a note showing a longer term perspective detailing trends back to the quadrennium 1975-78, the first quadrennium for which data on female policyholders are available.

2.1 *Non-linked assurances on single lives, based on standard medical evidence*
In contrast to the male experience, the amount of exposed to risk has been reasonably stable over recent quadrennia. However, the same feature of an increasing global crude mortality rate, and hence ageing experience, has been observed.

Quadrennium	Crude Mortality Rate
1983-86	0.001764
1987-90	0.002085
1991-94	0.002156
1995-98	0.002488

Table ASS 2.1.1a shows for the whole data the actual deaths in 1995-98 and the ratio of the actual deaths to those expected using the AF92 and AF80 tables. Corresponding ratios based on the AF80 table are also shown for 1991-94 and 1987-90.

From the table it can be seen that, at durations 2 and over, the level of mortality recorded in this investigation has, overall, continued the fall noted in previous quadrennia. Closer inspection shows that the fall is largest at the youngest ages, but at ages above 75 the mortality experience was worse than in 1991-94. This is in contrast to the 1991-94 experience where mortality improved at all ages. It is also in contrast to the 1987-90 and 1983-86 quadrennia where mortality up to age 45 or so was stable with improvements being noted at the older end of the age scale. The comparison with the AF92 table shows that this mortality table understates the number of expected deaths at the older ages.

At duration 1 there has been an increase in the level of mortality recorded compared with the previous quadrennia. This is most noticeable at the higher ages where the majority of the deaths have been seen. At ages 26 to 45 there has been a large improvement in mortality but the number of deaths is low and this result may be spurious.

At duration 0 there has also been an increase in the level of mortality recorded

with the all age 100A/E ratio being 19 percentage points above that for 1991-94. As with duration 1, this increase is most marked at the older ages with deaths in the 76 to 85 age group being almost twice that expected on the new AF92 table.

Although not reported in the 'own experience' results presented to offices, the policies in this section are subdivided into those issued on a 'medical' basis and those issued on a 'non-medical' basis. In this report, however, we do present the results split in this way in tables ASS 2.1.1b and ASS 2.1.1c. The proportion of medical business in this class of business has historically been lower for females than for males, and that is still the case. As was noted in Section 1.1 we do not intend to present results divided in this way in future.

Table ASS 2.1.2a shows, by age group, percentage ratios of actual deaths to those that would be expected using the AF92 table as a comparison basis. For 1991-94 and earlier these have been calculated using bridging factors derived from table ASS 2.1.1a and applied to the 100A/E ratios given in table ASS 2.1.2 of *C.M.I.R.* **16**.

The stability in mortality up to age 45 seen in earlier quadrennia and reported in *C.M.I.R.* **16** is not apparent in 1995-98. Overall there is continued steady improvement in observed mortality over the six quadrennia shown.

Table ASS 2.1.2b shows the same information as table ASS 2.1.2a but the comparison basis is AF80.

It can be seen from the ASS 2.1.2 tables that female mortality has not improved as quickly as male mortality.

2.2 *Unit-linked assurances on single lives, standard medical evidence*

The experience for 1995-98 is shown in Table ASS 2.2.1. At durations 2 and over the level of mortality observed is higher than that of the non-linked experience and particularly so in the age group 31 to 60 and above age 81. For this group, mortality is higher than that seen in 1991-94 and this feature is most noticeable in the 31 to 60 age group.

At duration 1 the level of mortality observed in the linked experience is heavier than that found in the non-linked experience. This is a continuing feature of this investigation. There is too little data at duration 0 to enable any meaningful conclusions to be drawn.

2.3 *Joint life assurances, standard medical evidence*

As was noted in Section 1.3, the commentary on the corresponding experience of male lives, the policies included in this investigation are those where payment is made on the occurrence of the first death only and are restricted to policies set up on one male and one female life.

The experience for 1995-98 is shown in Table ASS 2.3.1. At durations 2 and

over the mortality observed in the three quadrennia shown has remained fairly stable. In all three it is well below that observed in both the linked and the non-linked single life investigations. Looking at this table in *C.M.I.R.* **16** shows that this comment can be extended to include the 1983-86 period. It seems odd that such stability should be observed over such a long period when other investigations show clear evidence of mortality improvements.

At durations 0 and 1, also, the joint life experience has almost always been well below that of the corresponding single life experiences.

2.4 *Assurances on single lives, based on minimum medical evidence*

The experience for this group is shown in Table ASS 2.4.1.

As was the case in the 1991-94 quadrennium, the level of mortality recorded in the minimum evidence experience for 1995-98 at durations 2 and over is, for all ages combined, above that found in the standard experience. Although this contrasts with what was found in the previous quadrennium, it is what would logically be expected.

At durations 0 and 1 the numbers of deaths are too small for any reliable conclusions to be drawn.

2.5 *Assurances on joint lives, based on minimum medical evidence*

The experience is shown in Table ASS 2.5.1.

At durations 2 and over the joint life experience is lighter than the corresponding single life experience. This is true virtually throughout the age range.

The numbers of deaths at durations 0 and 1 are too small to allow any reliable conclusions to be drawn.

2.6 *Guaranteed acceptance assurances issued on single lives*

As was noted for the male experience in Section 1.6, there appears to be a change in the data submitted to this investigation with business now being sold at older ages. Care is therefore required when interpreting the results, particularly when comparing them with previous quadrennia. In any case, the number of deaths is small allowing little scope for detailed analysis. Table ASS 2.6.1 gives the experience available. All that can be safely said is that the mortality suffered by this group is, overall, heavier than that suffered by other female policy holders in the investigations conducted by the Bureau.

3. POLICIES OF ASSURANCE ISSUED IN THE REPUBLIC OF IRELAND

This section contains commentary on the experience of holders of non-linked standard medical evidence policies of assurance written in the Republic of

Ireland. As was reported in *C.M.I.R.* **16**, the number of offices contributing to the Irish experiences in recent years has declined and the exposed to risk has been falling steadily. The situation is exacerbated by the fact that most business written in Ireland is now on a unit-linked basis for which the Bureau does not currently run an investigation. However, the male investigation still includes a substantial number of deaths and it is therefore worthwhile reporting on the experience of these policies. The viability of this investigation is perhaps becoming questionable. The female investigation is small, but is included for completeness.

3.1 *Assurances on male lives*

This long established investigation is now a mature experience, with very little new business coming in. Table ASS 3.1.1 shows the analysis for 1995-98, together with results for the two previous quadrennia. The improvement in mortality between quadrennia, noted in the last report (*C.M.I.R.* **16**) has continued. At durations 2 and over the improvement can be seen in almost all age groups. The mortality experience for policies written in Ireland has normally been heavier than that for policies written in the U.K. However, in the 1995-98 quadrennium the two experiences are very similar at all ages except 41 to 50 where the Irish experience is much lighter than the UK's. Overall there is little difference between the two experiences.

3.2 *Assurances on female lives*

This experience is very small with only 47,000 policies in the exposed to risk and a total of 81 deaths. The analyses are shown in Table ASS 3.2.1.

4. CONCLUSION

The reports on the permanent assurance investigations cover a wide range of experiences. Each has its own peculiarities and, sometimes, oddities. From time to time it is suggested that an investigation be closed or certain investigations be amalgamated. However, with the exception of one or two very small investigations, each provides useful information on a particular facet of the insurance market. The Executive Committee hopes that this continues to be of value to those involved in the day to day operation of the business.

The continued fall in the size of the investigations is a matter of concern and the Executive Committee is addressing the reasons for this.

Table ASS 0.1. Permanent (whole life and endowment) assurances, combined, all durations: exposed to risk and deaths.

Investigation	1995-98		1991-94		1987-90		1983-86	
	Exposed to risk (000)	Actual deaths	Exposed to risk (000)	Actual deaths	Exposed to risk (000)	Actual deaths	Exposed to risk (000)	Actual deaths
Males, UK								
Non-linked, standard evidence	11,394	51,487	15,191	64,536	18,568	77,906	23,134	91,910
Linked, standard evidence	1,624	5,889	1,771	7,184	1,109	3,736	1,492	5,077
Joint life first death, standard evidence	3,019	5,303	2,810	4,292	1,743	2,434	741	873
Minimum evidence	2,096	4,101	2,126	2,920	1,810	1,865	279	260
Joint life first death, minimum evidence	2,023	3,142	1,664	1,877	1,883	1,546	300	165
Guaranteed acceptance business	136	1,125	177	431	307	606	261	391
Total	**20,292**	**71,047**	**23,739**	**81,240**	**25,420**	**88,093**	**26,207**	**98,676**
Females, UK								
Non-linked, standard evidence	5,208	12,956	5,587	12,047	5,102	10,639	5,507	9,715
Linked, standard evidence	1,155	3,011	1,077	2,964	497	1,382	517	2,095
Joint life first death, standard evidence	2,994	2,883	2,766	2,139	1,707	1,072	741	363
Minimum evidence	765	1,147	665	612	551	292	56	17
Joint life first death, minimum evidence	2,021	1,687	1,657	999	1,850	726	300	81
Guaranteed acceptance business	61	467	60	100	101	132	77	69
Total	**12,204**	**22,151**	**11,812**	**18,861**	**9,808**	**14,243**	**7,198**	**12,340**
Males, Republic of Ireland								
Non-linked, standard evidence	**151**	**629**	**308**	**1,320**	**536**	**2,126**	**843**	**3,868**
Females, Republic of Ireland								
Non-linked, standard evidence	**47**	**82**	**65**	**87**	**91**	**105**	**123**	**203**

Table ASS 1.0.1. Permanent assurances, males, 1995-98, combined, durations 2 and over: actual deaths as a percentage of those expected using the AM92 table.

Age group (nearest ages)	Standard medical evidence			Minimum medical evidence		Guaranteed acceptance
	Non-linked	Linked	Joint life	Single life	Joint life	
26-30	90	86	71	90	61	60*
31-35	91	83	69	87	87	
36-40	94	111	78	103	81	167
41-45	94	132	85	117	98	112
46-50	91	119	86	105	98	87
51-55	90	121	90	100	104	89
56-60	89	114	93	97	96	120
61-65	88	106	92	92	84	111

* Ratio based on fewer than 10 actual deaths.

Table ASS 1.0.2. Permanent assurances, males, 1995-98, combined, durations 2 and over: actual deaths as a percentage of those expected using the AM80 table.

Age group (nearest ages)	Standard medical evidence			Minimum medical evidence		Guaranteed acceptance
	Non-linked	Linked	Joint life	Single life	Joint life	
26-30	90	86	72	91	62	61*
31-35	94	86	71	90	89	
36-40	83	98	69	92	72	148
41-45	69	98	63	87	72	83
46-50	60	79	57	70	65	58
51-55	58	78	58	65	67	57
56-60	59	76	61	64	63	79
61-65	61	73	64	63	57	76

* Ratio based on fewer than 10 actual deaths.

Table ASS 1.1.1a. Permanent assurances (non-linked), males, 1995-98, standard medical evidence, all data: actual deaths and ratios of actual deaths to those expected using the AM92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the AM80 table.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using AM92)	100A/E 1995-98 (using AM80)	100A/E 1991-94 (using AM80)	100A/E 1987-90 (using AM80)
Duration 0					
16-20	7	132*	79*	156	115
21-25	23	170	138	115	104
26-30	27	127	132	99	144
31-35	23	104	116	122	111
36-40	23	102	102	98	127
41-45	26	98	84	75	97
46-50	37	85	68	82	97
51-55	69	121	98	80	85
56-60	58	94	82	81	78
61-65	75	86	83	107	106
66-70	99	97	104	107	76
71-75	71	88	108	120	98
76-80	39	97	132	153	106
16-80	577	99	97	99	98
Duration 1					
16-20	7	109*	74*	92	118
21-25	12	67	58	82	95
26-30	28	97	103	96	87
31-35	38	128	142	99	121
36-40	19	64	60	99	110
41-45	33	91	72	73	87
46-50	48	79	60	96	82
51-55	80	94	75	81	85
56-60	103	107	96	89	77
61-65	102	83	84	100	88
66-70	173	95	107	99	99
71-75	118	94	119	123	120
76-80	69	92	125	137	139
16-80	830	93	93	95	92

• Ratio based on fewer than 10 actual deaths.

Table ASS 1.1.1a. (continued)

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using AM92)	100A/E 1995-98 (using AM80)	100A/E 1991-94 (using AM80)	100A/E 1987-90 (using AM80)
Durations 2+					
16-20	11	87	58	106	86
21-25	123	113	94	89	94
26-30	254	90	90	92	88
31-35	453	91	94	108	104
36-40	728	94	83	94	89
41-45	1,443	94	69	73	80
46-50	3,474	91	60	67	78
51-55	5,691	90	58	65	74
56-60	7,860	89	59	64	75
61-65	8,600	88	61	72	82
66-70	4,762	91	66	72	78
71-75	4,867	92	70	76	82
76-80	4,367	92	73	79	87
81-85	3,890	96	78	84	88
86-90	2,429	95	80	82	86
91-95	919	83	71	78	75
16-95	49,871	91	65	72	80

Table ASS 1.1.1b. Permanent assurances (non-linked), males, 1995-98, medical data: actual deaths and ratios of actual deaths to those expected using the AM92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the AM80 table.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using AM92)	100A/E 1995-98 (using AM80)	100A/E 1991-94 (using AM80)	100A/E 1987-90 (using AM80)
Duration 0					
All ages	36	112	116	94	84
Duration 1					
All ages	56	117	125	84	85
Durations 2+					
21-30	18	129	125	106	65
31-35	42	174	180	153	124
36-40	45	133	118	80	99
41-45	106	121	88	89	96
46-50	298	94	62	73	77
51-55	586	91	59	65	71
56-60	928	88	58	60	69
61-65	1,111	81	56	68	74
66-70	781	80	58	69	72
71-75	1,196	85	65	69	79
76-80	1,495	87	69	74	85
81-85	1,686	90	73	82	86
86-90	1,447	98	82	83	86
91-95	560	87	75	79	78
21-95	10,299	88	67	72	78

Table ASS 1.1.1c. Permanent assurances (non-linked), males, 1995-98, non-medical data: actual deaths and ratios of actual deaths to those expected using the AM92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the AM80 table.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using AM92)	100A/E 1995-98 (using AM80)	100A/E 1991-94 (using AM80)	100A/E 1987-90 (using AM80)
Duration 0					
21-30	48	143	134	104	122
31-40	43	100	106	103	119
41-50	55	82	67	80	97
51-60	115	101	85	80	83
61-70	167	93	95	109	96
71-80	106	95	121	136	108
21-80	534	97	96	98	98
Duration 1					
21-30	39	87	84	87	90
31-40	54	95	96	96	114
41-50	76	82	63	86	84
51-60	176	102	86	85	81
61-70	253	87	94	101	97
71-80	172	93	121	134	145
21-80	770	91	92	96	91
Durations 2+					
21-25	116	110	92	87	93
26-30	239	89	89	94	88
31-35	409	87	90	107	103
36-40	675	92	81	95	88
41-45	1,314	92	68	72	78
46-50	3,087	90	60	67	78
51-55	4,939	90	58	64	75
56-60	6,671	89	59	65	77
61-65	7,214	89	61	73	85
66-70	3,818	93	68	73	82
71-75	3,459	95	73	81	86
76-80	2,558	96	76	84	89
81-85	1,788	101	82	89	90
86-90	632	93	77	78	81
91-95	195	78	67	84	64
21-95	37,114	91	65	71	80

Table ASS 1.1.2a. Permanent assurances (non-linked), males, standard medical evidence, all data, durations 2 and over: actual deaths 1959-98 as a percentage of those expected using the AM92 table.

Age group (nearest ages)	Quadrennium									
	1959-62	*1963-66*	*1967-70*	*1971-74*	*1975-78*	*1979-82*	*1983-86*	*1987-90*	*1991-94*	*1995-98*
21-25	174	150	141	126	118	121	103	113	107	113
26-30	122	128	114	116	101	98	101	88	92	90
31-35	135	129	115	110	104	100	98	101	105	91
36-40	158	158	142	134	130	114	108	100	106	94
41-45	182	186	174	159	146	133	121	108	99	94
46-50	196	196	191	179	161	148	134	118	101	91
51-55	203	198	189	182	171	155	132	114	100	90
56-60	202	196	185	170	158	150	133	114	97	89
61-65	*198*	*195*	*178*	*165*	*155*	*144*	*136*	*118*	*104*	*88*
66-70	175	173	164	150	140	129	118	107	99	91
71-75	161	162	159	151	139	132	114	108	100	92
76-80	161	156	148	144	143	134	119	110	100	92
81-85	153	146	139	136	130	128	119	108	103	96
86-90	145	142	130	130	127	115	112	103	98	95
91-95	134	128	118	112	119	104	99	88	91	83
96-100	115	101	111	101	89	65	68	55	43	46
All ages[+]	186	182	172	161	151	141	127	113	100	90
Number of deaths[+]	91,297	96,973	94,271	93,008	91,884	90,941	88,442	75,095	61,806	50,069

[+] Figures contain a small number of deaths recorded at ages under 21 or over 100.

Table ASS 1.1.2b. Permanent assurances (non-linked), males, standard medical evidence, all data, durations 2 and over: actual deaths 1959-98 as a percentage of those expected using the AM80 table.

Age group (nearest ages)	Quadrennium									
	1959-62	1963-66	1967-70	1971-74	1975-78	1979-82	1983-86	1987-90	1991-94	1995-98
21-25	145	125	117	105	98	101	86	94	89	94
26-30	122	128	114	116	101	98	101	88	92	90
31-35	139	133	118	113	107	103	101	104	108	94
36-40	140	140	126	119	115	101	96	89	94	83
41-45	134	137	128	117	108	98	89	80	73	69
46-50	130	130	127	119	107	98	89	78	67	60
51-55	132	129	123	118	111	101	86	74	65	58
56-60	133	129	122	112	104	99	88	75	64	59
61-65	137	135	123	114	107	100	94	82	72	61
66-70	127	126	119	109	102	94	86	78	72	66
71-75	122	123	121	115	106	100	87	82	76	70
76-80	127	123	117	114	113	106	94	87	79	73
81-85	125	119	113	111	106	104	97	88	84	78
86-90	121	119	109	109	106	96	94	86	82	80
91-95	115	110	101	96	102	89	85	75	78	71
96-100	102	89	98	89	79	57	60	49	38	40
All ages[+]	132	129	122	114	107	100	90	80	71	65
Number of deaths[+]	91,297	96,973	94,271	93,008	91,884	90,941	88,442	75,095	61,806	50,069

[+] Figures contain a small number of deaths recorded at ages under 21 or over 100.

Table ASS 1.2.1. Linked contracts of life assurance, males, 1995-98, standard medical evidence, all data: actual deaths and ratios of actual deaths to those expected using the AM92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the AM80 table.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using AM92)	100A/E 1995-98 (using AM80)	100A/E 1991-94 (using AM80)	100A/E 1987-90 (using AM80)
Duration 0					
16-30	13	102	97	153	104
31-45	17	55	54	112	79
46-60	25	86	70	140	92
61-75	2	17*	18*	146	146
76-90	4	222*	333*	268	161
16-90	61	71	66	139	109
Duration 1					
16-30	15	89	87	125	78
31-45	23	53	49	102	79
46-60	73	115	94	98	91
61-75	28	81	86	127	121
76-90	5	152*	217*	230	200
16-90	144	89	82	111	101
Durations 2+					
16-25	20	102	84	81	93
26-30	65	86	86	109	71
31-35	103	83	86	120	91
36-40	168	111	98	88	77
41-45	270	132	98	91	59
46-50	435	119	79	81	70
51-55	674	121	78	76	60
56-60	969	114	76	74	62
61-65	1,100	106	73	75	71
66-70	918	100	73	77	64
71-75	549	94	72	71	68
76-80	200	83	65	81	80
81-85	133	94	77	65	95
86-90	52	71	60	81	74
91-95	22	90	77	100	136
16-95	5,678	106	76	77	68

* Ratio based on fewer than 10 actual deaths.

Table ASS 1.3.1. Joint life first death assurances, males, 1995-98, standard medical evidence, all data: actual deaths and ratios of actual deaths to those expected using the AM92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the AM80 table.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using AM92)	100A/E 1995-98 (using AM80)	100A/E 1991-94 (using AM80)	100A/E 1987-90 (using AM80)
Duration 0					
21-30	9	59*	59*	77	79
31-35	11	59	66	77	97
36-40	10	45	45	86	96
41-45	10	43	37	71	67
46-50	13	47	38	61	90
51-55	19	89	72	88	88
56-60	11	67	58	74	103
21-60	83	57	52	75	88
Duration 1					
21-30	14	71	73	88	58
31-35	24	94	105	99	91
36-40	22	74	69	62	81
41-45	16	50	40	99	76
46-50	28	71	54	76	81
51-55	20	62	49	80	78
56-60	12	47	42	80	71
21-60	136	66	58	83	76
Durations 2+					
21-25	9	125*	108*	62	32*
26-30	58	71	72	66	83
31-35	167	69	71	81	69
36-40	323	78	69	70	84
41-45	516	85	63	67	66
46-50	783	86	57	71	69
51-55	877	90	58	70	66
56-60	916	93	61	68	65
61-65	938	92	64	69	74
66-70	345	83	60	62	66
71-75	91	71	54	61	56
76-80	29	76	60	67	81*
21-80	5,052	87	61	69	69

* Ratio based on fewer than 10 actual deaths.

Table ASS 1.4.1. Minimum evidence assurances written on one life only, males, 1995-98, all data: actual deaths and ratios of actual deaths to those expected using the AM92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the AM80 table.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using AM92)	100A/E 1995-98 (using AM80)	100A/E 1991-94 (using AM80)	100A/E 1987-90 (using AM80)
Duration 0					
All ages	7	76*	69*	131	118
Duration 1					
All ages	21	126	112	114	106
Durations 2+					
21-25	6	73*	63*	87	51
26-30	83	90	91	91	118
31-35	242	87	90	124	119
36-40	346	103	92	119	109
41-45	423	117	87	88	87
46-50	601	105	70	71	78
51-55	740	100	65	71	72
56-60	654	97	64	69	64
61-65	297	92	63	71	165
66-70	153	96	70	68	125*
71-75	205	108	83	96	-
76-80	154	105	83	88	-
81-85	119	103	84	94	-
86-90	50	111	93	-	-
21-90	4,073	101	73	84	90

* Ratio based on fewer than 10 actual deaths.

Table ASS 1.5.1. Minimum evidence assurances written on one male life and one female life, males, 1995-98, all data: actual deaths and ratios of actual deaths to those expected using the AM92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the AM80 table.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using AM92)	100A/E 1995-98 (using AM80)	100A/E 1991-94 (using AM80)	100A/E 1987-90 (using AM80)
Duration 0					
All ages	7	141*	130*	109	102
Duration 1					
All ages	13	86	76	92	82
Durations 2+					
21-25	5	152*	132*	65*	41
26-30	30	61	62	66	74
31-35	173	87	89	84	91
36-40	281	81	72	82	87
41-45	463	98	72	73	73
46-50	704	98	65	76	78
51-55	818	104	67	68	54
56-60	547	96	63	65	-
61-65	88	84	57	69*	-
21-65	3,109	96	68	74	75

* Ratio based on fewer than 10 actual deaths.

Table 1.6.1. Guaranteed acceptance assurances, males, 1995-98, all data: actual deaths and ratios of actual deaths to those expected using the AM92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the AM80 table.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using AM92)	100A/E 1995-98 (using AM80)	100A/E 1991-94 (using AM80)	100A/E 1987-90 (using AM80)
Duration 0					
56-60	12	462	400	-	-
61-65	31	295	287	61*	-
66-70	62	222	241	128	-
71-75	71	176	216	127	-
76-80	85	193	265	95	-
81-85	3	130*	188*	667*	-
56-85	264	207	249	113	-
Duration 1					
56-60	5	333*	294*	-	-
61-65	18	265	269	-	-
66-70	34	164	188	-	-
71-75	35	119	151	-	-
76-80	39	113	154	-	-
81-85	7	94*	132*	-	-
56-85	138	137	172	-	-
Durations 2 +					
36-40	34	167	148	126	135
41-45	32	112	83	116	132
46-50	38	87	58	88	109
51-55	50	89	57	87	104
56-60	82	120	79	78	106
61-65	61	111	76	72	93
66-70	85	155	113	73*	125*
71-75	127	139	106	143*	167*
76-80	133	117	93	-	-
81-85	75	103	84	-	-
36-85	717	119	87	92	114

* Ratio based on fewer than 10 actual deaths.

Table ASS 2.0.1. Permanent assurances, females, 1995-98, combined, durations 2 and over: actual deaths as a percentage of those expected using the AF92 table.

Age group (nearest ages)	Standard medical evidence			Minimum medical evidence		Guaranteed acceptance
	Non-linked	Linked	Joint life	Single life	Joint life	
26-30	88	60	68	108	62	155*
31-35	85	101	84	88	67	
36-40	91	144	85	103	88	
41-45	92	144	84	107	80	137
46-50	96	148	87	99	85	115
51-55	94	136	86	100	90	115
56-60	90	103	77	83	83	138
61-65	89	84	90	97	107	150

* Ratio based on fewer than 10 actual deaths.

Table ASS 2.0.2. Permanent assurances, females, 1995-98, combined, durations 2 and over: actual deaths as a percentage of those expected using the AF80 table.

Age group (nearest ages)	Standard medical evidence			Minimum medical evidence		Guaranteed acceptance
	Non-linked	Linked	Joint life	Single life	Joint life	
26-30	83	56	64	101	58	138*
31-35	78	93	77	81	61	
36-40	80	127	75	91	77	
41-45	78	122	71	90	67	116
46-50	78	120	71	81	70	94
51-55	75	108	68	80	72	92
56-60	71	81	61	66	65	109
61-65	69	66	70	76	84	117

* Ratio based on fewer than 10 actual deaths.

Table ASS 2.1.1a. Permanent assurances (non-linked), females, 1995-98, standard medical evidence, all data: actual deaths and ratios of actual deaths to those expected using the AF92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the AF80 table.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using AF92)	100A/E 1995-98 (using AF80)	100A/E 1991-94 (using AF80)	100A/E 1987-90 (using AF80)
Duration 0					
16-25	9	188*	117*	127	101
26-35	10	60	53	74	91
36-45	16	59	49	70	80
46-55	65	111	85	75	69
56-65	107	132	111	88	89
66-75	104	124	127	123	106
76-85	48	194	226	84	149
16-85	359	121	107	88	87
Duration 1					
16-25	10	167	105	57	111
26-35	16	62	51	80	84
36-45	30	67	53	66	89
46-55	104	109	77	75	83
56-65	138	112	73	73	77
66-75	165	129	83	61	81
76-85	67	149	97	71	66
16-85	530	113	77	70	81
Durations 2+					
16-20	2	65*	38*	111*	80*
21-25	20	64	51	70	84
26-30	90	88	83	84	94
31-35	179	85	78	91	92
36-40	323	91	80	91	99
41-45	563	92	78	89	99
46-50	1,060	96	78	88	95
51-55	1,419	94	75	81	86
56-60	1,640	90	71	77	88
61-65	1,458	89	69	75	82
66-70	1,222	87	68	73	81
71-75	1,243	95	75	80	78
76-80	1,104	103	81	77	83
81-85	1,033	112	89	85	91
86-90	491	114	91	81	94
91-95	179	110	90	84	82
16-95	12,026	95	76	80	87

* Ratio based on fewer than 10 actual deaths.

Table ASS 2.1.1b. Permanent assurances (non-linked), females, 1995-98, medical data: actual deaths and ratios of actual deaths to those expected using the AF92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the AF80 table.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using AF92)	100A/E 1995-98 (using AF80)	100A/E 1991-94 (using AF80)	100A/E 1987-90 (using AF80)
Duration 0					
All ages	31	153	144	80	86
Duration 1					
All ages	63	196	131	70	58
Durations 2+					
26-35	17	132	121	175	173
36-40	22	154	136	198	160
41-45	48	168	141	120	132
46-50	69	113	93	100	89
51-55	123	130	103	123	98
56-60	151	121	95	92	89
61-65	116	95	75	75	78
66-70	97	76	60	63	70
71-75	175	90	70	70	68
76-80	259	100	79	62	76
81-85	331	106	84	76	85
86-90	306	113	91	68	78
91-95	112	105	86	64	87
26-95	1,826	106	84	76	82

Table ASS 2.1.1c. Permanent assurances (non-linked), females, 1995-98, non-medical data: actual deaths and ratios of actual deaths to those expected using the AF92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the AF80 table.

Age group (nearest ages)	Actual deaths 1995-98	*100A/E* 1995-98 (using AF92)	*100A/E* 1995-98 (using AF80)	*100A/E* 1991-94 (using AF80)	*100A/E* 1987-90 (using AF80)
Duration 0					
16-25	9	191*	122*	112	104
26-35	10	62	56	78	87
36-45	14	54	44	66	77
46-55	61	110	84	75	70
56-65	100	131	110	91	87
66-75	92	118	120	128	119
76-85	43	213	249	92	177
16-85	329	119	105	89	87
Duration 1					
16-25	9	155*	98*	60	110
26-35	13	52	43	74	82
36-45	27	63	50	66	86
46-55	87	97	68	76	82
56-65	127	110	72	72	78
66-75	152	128	82	62	90
76-85	52	137	89	77	85
16-85	467	107	73	70	84
Durations 2+					
16-25	21	64	49	76	75
26-30	83	85	80	84	95
31-35	166	83	76	91	88
36-40	296	88	78	88	97
41-45	511	89	75	88	96
46-50	969	94	77	88	95
51-55	1,269	91	73	78	84
56-60	1,458	88	69	75	87
61-65	1,310	88	69	75	82
66-70	1,108	88	69	74	85
71-75	1,030	96	76	83	84
76-80	775	102	80	84	89
81-85	637	116	92	89	101
86-90	120	112	90	96	116
91-95	37	126	103	109	62
16-95	9,790	93	74	80	88

* Ratio based on fewer than 10 actual deaths.

ASS 2.1.2a. Permanent assurances (non-linked), females, standard medical evidence, all data, durations 2 and over: actual deaths 1975-98 as a percentage of those expected using the AF92 table.

Age group (nearest ages)	Quadrennium					
	1975-78	1979-82	1983-86	1987-90	1991-94	1995-98
21-25	132	116	107	106	88	64
26-30	138	108	95	100	89	88
31-35	117	107	96	100	99	85
36-40	131	102	102	112	103	91
41-45	151	116	113	117	105	92
46-50	156	128	128	116	107	96
51-55	146	138	115	107	101	94
56-60	134	129	112	112	98	90
61-65	132	117	117	104	95	89
66-70	122	113	99	104	94	87
71-75	133	116	101	99	102	95
76-80	155	118	106	106	98	103
81-85	152	169	137	115	107	112
86-90	148	143	165	116	100	114
91-95				102	104	110
All ages[+]	141	125	115	109	100	95
Number of deaths[+]	4,666	6,368	8,571	9,610	10,830	12,066

[+] Figures contain a small number of deaths recorded at ages under 21 or over 95.

ASS 2.1.2b. Permanent assurances (non-linked), females, standard medical evidence, all data, durations 2 and over: actual deaths 1975-98 as a percentage of those expected using the AF80 table.

Age group (nearest ages)	Quadrennium					
	1975-78	1979-82	1983-86	1987-90	1991-94	1995-98
21-25	105	92	85	84	70	51
26-30	130	102	90	94	84	83
31-35	108	98	88	92	91	78
36-40	116	90	90	99	91	80
41-45	128	98	96	99	89	78
46-50	128	105	105	95	88	78
51-55	117	111	92	86	81	75
56-60	105	101	88	88	77	71
61-65	104	92	92	82	75	69
66-70	95	88	77	81	73	68
71-75	104	91	79	78	80	75
76-80	122	93	83	83	77	81
81-85	121	134	109	91	85	89
86-90	120	116	134	94	81	91
91-95				82	84	90
All ages[+]	113	100	92	87	80	75
Number of deaths[+]	4,666	6,368	8,571	9,610	10,830	12,066

[+] Figures contain a small number of deaths recorded at ages under 21 or over 95.

ASS 2.2.1. Linked contracts of life assurance, females, 1995-98, standard medical evidence, all data: actual deaths and ratios of actual deaths to those expected using the AF92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the AF80 table.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using AF92)	100A/E 1995-98 (using AF80)	100A/E 1991-94 (using AF80)	100A/E 1987-90 (using AF80)
Duration 0					
16-30	6	143*	113*	56*	115*
31-45	6	52*	45*	149	97
46-60	10	96	75	132	102
61-75	4	75*	71*	86	116
76-90	3	158*	200*	182	356
16-90	29	88	74	120	152
Duration 1					
16-30	3	53*	39*	168	113*
31-45	22	115	94	122	80
46-60	40	161	110	72	71
61-75	19	115	74	92	92
76-90	3	103*	68*	127	99
16-90	87	126	90	94	85
Durations 2+					
16-25	5	86*	68*	173	34*
26-30	17	60	56	125	113*
31-35	58	101	93	88	127
36-40	116	144	127	86	81
41-45	166	144	122	123	68
46-50	282	148	120	85	75
51-55	373	136	108	79	72
56-60	399	103	81	77	86
61-65	373	84	66	74	66
66-70	392	86	67	71	69
71-75	256	95	74	70	52
76-80	110	96	76	84	97
81-85	124	127	101	78	119
86-90	120	148	119	114	120
91-95	74	144	117	105	105
16-95	2,865	108	86	80	79

* Ratio based on fewer than 10 actual deaths.

ASS 2.3.1. Joint life first death assurances, females, 1995-98, standard medical evidence, all data: actual deaths and ratios of actual deaths to those expected using the AF92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the AF80 table.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using AF92)	100A/E 1995-98 (using AF80)	100A/E 1991-94 (using AF80)	100A/E 1987-90 (using AF80)
Duration 0					
21-35	6	36*	31*	66	76
36-50	17	51	41	66	59
51-65	8	57*	45*	105	61
21-65	31	48	40	73	64
Duration 1					
21-35	29	116	95	57	69
36-50	46	87	67	91	51
51-65	17	76	51	74	50
21-65	92	91	70	78	55
Durations 2+					
21-25	16	208	170	66	19*
26-30	46	68	64	59	54
31-35	166	84	77	68	75
36-40	291	85	75	73	79
41-45	397	84	71	70	71
46-50	537	87	71	82	62
51-55	483	86	68	76	70
56-60	374	77	61	64	77
61-65	306	90	70	64	72
66-70	115	92	72	46	42
71-75	22	62	48	86	71*
21-75	2,753	85	70	71	70

* Ratio based on fewer than 10 actual deaths.

ASS 2.4.1 Minimum evidence assurances written on one life only, females, 1995-98, all data: actual deaths and ratios of actual deaths to those expected using the AF92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the AF80 table.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using AF92)	100A/E 1995-98 (using AF80)	100A/E 1991-94 (using AF80)	100A/E 1987-90 (using AF80)
Duration 0					
All ages	3	108*	87*	126	106
Duration 1					
All ages	9	139*	106*	86	94
Durations 2+					
21-30	21	102	95	118	85
31-35	53	88	81	98	91
36-40	92	103	91	105	89
41-45	120	107	90	80	70
46-50	167	99	81	91	82
51-55	196	100	80	90	73
56-60	131	83	66	65	69*
61-65	71	97	76	130	111*
66-70	53	97	76	56	-
71-75	64	95	74	50	-
76-80	64	110	87	54	-
81-85	79	143	114	117	-
86-90	24	94	75	-	-
21-90	1,135	100	81	89	81

* Ratio based on fewer than 10 actual deaths.

ASS 2.5.1. Minimum evidence assurances written on one male life and one female life, females, 1995-98, all data: actual deaths and ratios of actual deaths to those expected using the AF92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the AF80 table.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using AF92)	100A/E 1995-98 (using AF80)	100A/E 1991-94 (using AF80)	100A/E 1987-90 (using AF80)
Duration 0					
All ages	2	97*	79*	90	70
Duration 1					
All ages	2	28*	22*	57	69
Durations 2+					
26-30	28	62	58	67	52
31-35	112	67	61	81	59
36-40	243	88	77	72	75
41-45	295	80	67	80	85
46-50	422	85	70	78	78
51-55	386	90	72	67	51
56-60	165	83	65	69	111*
61-65	29	107	84	125*	1,000*
21-65	1,680	83	70	75	72

* Ratio based on fewer than 10 actual deaths.

ASS 2.6.1. Guaranteed acceptance assurances, females, 1995-98, all data: actual deaths and ratios of actual deaths to those expected using the AF92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the AF80 table.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using AF92)	100A/E 1995-98 (using AF80)	100A/E 1991-94 (using AF80)	100A/E 1987-90 (using AF80)
Duration 0					
61-65	15	306	268	176*	-
66-70	21	212	205	121*	-
71-75	30	211	230	22*	-
76-80	27	178	208	75*	-
61-80	93	210	222	81	-
Duration 1					
61-65	8	250*	163*	-	-
66-70	21	313	201	-	-
71-75	24	228	147	-	-
76-80	17	144	93	-	-
61-80	70	217	141	-	-
Durations 2+					
36-40	9	188*	167*	116	88
41-45	12	137	116	97	97
46-50	15	115	94	95	111
51-55	19	115	92	93	130
56-60	26	138	109	91	104
61-65	31	150	117	47*	125*
66-70	39	144	112	250*	-
71-75	56	126	99	-	-
76-80	53	93	73	-	-
81-85	29	85	67	-	-
36-85	289	118	93	93	109

* Ratio based on fewer than 10 actual deaths.

ASS 3.1.1. Permanent assurances (non-linked), policies issued in the Republic of Ireland, males, 1995-98, standard medical evidence, all data: actual deaths and ratios of actual deaths to those expected using the AM92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the AM80 table.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using AM92)	100A/E 1995-98 (using AM80)	100A/E 1991-94 (using AM80)	100A/E 1987-90 (using AM80)
Duration 0					
All ages	2	24*	22*	82	87
Duration 1					
All ages	5	93*	83*	84	93
Durations 2+					
21-40	18	95	89	78	81
41-45	16	72	53	63	89
46-50	37	72	48	54	100
51-55	76	86	56	64	84
56-60	108	91	60	69	82
61-65	121	90	62	79	97
66-70	60	97	70	83	95
71-75	61	109	83	85	96
76-80	43	84	67	116	97
81-85	37	96	78	110	67
86-90	30	113	94	118	74
91-95	12	126	108	65	103
21-95	619	91	65	78	89

* Ratio based on fewer than 10 actual deaths.

ASS 3.2.1 Permanent assurances (non-linked), policies issued in the Republic of Ireland, females, 1995-98, standard medical evidence, all data: actual deaths and ratios of actual deaths to those expected using the AF92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the AF80 table.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using AF92)	100A/E 1995-98 (using AF80)	100A/E 1991-94 (using AF80)	100A/E 1987-90 (using AF80)
Duration 0					
All ages	1	34*	28*	129*	72*
Duration 1					
All ages	1	61*	44*	87*	52*
Durations 2+					
21-40	6	88*	78*	60*	81
41-50	8	54*	45*	64	93
51-60	21	89	71	76	84
61-70	14	75	59	65	83
71-90	30	265	210	79	51*
21-90	79	105	84	70	81

* Ratio based on fewer than 10 actual deaths.

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THE MORTALITY OF HOLDERS OF TEMPORARY ASSURANCES ISSUED IN THE UNITED KINGDOM, 1995-98

This report contains commentaries on the mortality experiences of holders of traditional, standalone temporary assurance policies for both males and females. It includes brief reports on the mortality of holders of temporary assurance policies effected in conjunction with personal pension policies under Section 637(1) of the ICTA 1988.

1. TEMPORARY ASSURANCES ON MALE LIVES

1.1 *Traditional standalone policies written on standard medical evidence*

The policies included in this group are subdivided into those issued after a full medical examination ('medical') and those issued after the completion of a comprehensive medical questionnaire, with or without a medical attendant's report ('non-medical'). Tables TEMP 1.1.1a, TEMP 1.1.1b and TEMP 1.1.1c show the experience, respectively, for all the data, for the medical data and for the non-medical data. For 1995-98 the comparison bases are the TM92 and the TM80 tables. The results for the two previous quadrennia are given using the TM80 table as the comparison basis.

Looking at the duration 0 experience detailed in TEMP 1.1.1a, overall there has been a steady improvement in the level of mortality recorded over the three quadrennia shown although there are variations by age. In 1995-98 the mortality experience of the age group 46-60 is very low when compared with the previous quadrennia.

At durations 1 to 4 there has, in general, been an improvement in the mortality recorded in 1995-98 at all ages. The deterioration in mortality at ages up to 30 noted in *C.M.I.R.* **16** for the three preceding quadrennia is not evident in 1995-98 data.

At durations 5 and over there has also been an improvement in mortality at all ages except the age group 71-75. Again, the deterioration previously noted in the experience at ages below age 35 is not apparent in 1995-98. The recorded mortality is well below that expected on the TM92 table.

The comparison bases in table TEMP 1.1.2 are AM92 and AM80 for 1995-98 and AM80 for 1991-94. From this table it can be seen that at durations 0 and 1 temporary assurance mortality experience is well below that of standard evidence permanent assurances.

At durations 2 and over, above age 40 the two experiences are similar in shape but, apart from the age group 71-75, the temporary assurance 100A/E ratios are about 5 percent below those for the permanent assurance experience.

This feature was also seen in the 1991-94 experience. Below age 40 the mortality experience of the temporary assurances is well below that of the permanent assurances and well below that recorded in the 1991-94 experience at the same ages.

1.2 *Assurances effected in conjunction with personal pensions under Section 637(1) of the ICTA 1988*

The experience is shown in table TEMP 1.2.1. The investigation was started on 1 January 1989 and 1991-94 was the first full quadrennium for which data was available. In the 1995-98 experience the greater number of deaths at durations 5 and over shows the growing maturity of the investigation. The total number of deaths is, however, still relatively small and does not allow firm conclusions to be drawn. However, when compared with the standalone category, the indications are that the experience is reasonably similar at duration 0, is mixed at durations 1 to 4 and is lower at durations 5 and over.

2. TEMPORARY ASSURANCES ON FEMALE LIVES

2.1 *Traditional standalone policies written on standard medical evidence*

The experience is shown in table TEMP 2.1.1.

At duration 0 a consistent overall improvement in the level of mortality experienced has been recorded. However, the number of deaths is small and too much should not be read into this.

At durations 1 to 4 the 1995-98 experience shows an improvement in mortality in most age groups and is very light up to age 45. This reverses the small deterioration seen in the three previous quadrennia and reported in *C.M.I.R.* **16**.

At durations 5 and over there has been a gentle improvement in mortality over the three quadrennia. However, comparing age groups there is little evidence of a clear pattern in the experience recorded. The 100A/E ratios calculated on the TF92 mortality table show that this table understated mortality in 1995-98 at ages over age 60.

Table TEMP 2.1.2 compares the experience of the temporary assurance data with that of the permanent assurances. At durations 0 and 1 the temporary assurance mortality experience is well below that of standard evidence permanent assurances.

At durations 2 and over the temporary assurances mortality experience is lower up to age 55 but is generally higher above that age. When looking at the comparisons for the whole age range the two experiences are broadly similar.

2.2 *Assurances effected in conjunction with personal pensions under Section 637(1) of the ICTA 1988*

The experience is shown in table TEMP 2.2.1. The number of deaths is too small for any significant conclusions to be drawn.

Table TEMP 1.1.1a. Temporary assurances, males, 1995-98, all data: actual deaths and ratios of actual deaths to those expected using the TM92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the TM80 table.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using TM92)	100A/E 1995-98 (using TM80)	100A/E 1991-94 (using TM80)	100A/E 1987-90 (using TM80)
Duration 0					
16-30	20	71	92	88	108
31-45	73	77	70	88	102
46-60	99	57	44	79	89
61-75	51	77	85	115	91
16-75	243	67	59	87	95
Durations 1-4					
21-25	12	74	88	139	127
26-30	39	68	89	128	101
31-35	51	58	68	99	105
36-40	75	67	66	94	101
41-45	127	84	65	86	70
46-50	214	87	62	73	77
51-55	238	81	58	68	71
56-60	217	84	64	72	82
61-65	159	82	68	85	90
66-70	106	92	85	101	81
71-75	63	110	113	119	76
76-80	19	84	97	69	169
21-80	1,320	82	67	82	82
Durations 5+					
26-30	14	71	81	93	103
31-35	51	77	87	111	108
36-40	142	86	84	94	96
41-45	355	92	71	80	81
46-50	743	82	55	71	71
51-55	1,119	93	60	64	73
56-60	1,044	85	57	63	76
61-65	863	85	59	69	78
66-70	386	88	67	81	78
71-75	253	108	90	82	84
76-80	95	96	87	96	70
26-80	5,065	88	62	70	77

Table TEMP 1.1.1b. Temporary assurances, males, 1995-98, medical data: actual deaths and ratios of actual deaths to those expected using the TM92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the TM80 table.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using TM92)	100A/E 1995-98 (using TM80)	100A/E 1991-94 (using TM80)	100A/E 1987-90 (using TM80)
Duration 0					
All ages	32	60	56	75	67
Durations 1-4					
26-35	4	78*	95*	98*	144
36-45	18	90	76	103	67
46-55	43	64	46	60	70
56-65	52	50	39	62	82
66-75	47	78	75	91	73
26-75	164	64	52	72	77
Durations 5+					
31-40	9	70*	70*	72	133
41-45	33	103	79	90	86
46-50	72	70	47	81	63
51-55	145	92	60	59	75
56-60	116	62	41	61	66
61-65	135	70	49	58	75
66-70	72	64	49	70	78
71-75	52	70	58	70	93
76-80	32	82	75	96	70
31-80	666	73	52	67	75

* Ratio based on fewer than 10 actual deaths.

Table TEMP 1.1.1c. Temporary assurances, males, 1995-98, non-medical data: actual deaths and ratios of actual deaths to those expected using the TM92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the TM80 table.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using TM92)	100A/E 1995-98 (using TM80)	100A/E 1991-94 (using TM80)	100A/E 1987-90 (using TM80)
Duration 0					
All ages	207	68	60	91	101
Durations 1-4					
26-35	86	62	76	111	101
36-45	180	75	64	86	81
46-55	403	87	62	72	75
56-65	318	93	73	82	85
66-75	122	111	106	119	80
26-75	1,109	86	70	84	81
Durations 5+					
26-30	14	73	84	87	98
31-35	47	75	85	111	106
36-40	136	89	86	95	93
41-45	313	90	70	79	80
46-50	645	82	56	70	74
51-55	942	93	60	64	72
56-60	902	91	60	63	78
61-65	695	88	62	73	80
66-70	297	95	72	88	78
71-75	198	129	107	95	101
76-80	57	98	89	104	100*
26-80	4,246	91	64	71	78

* Ratio based on fewer than 10 actual deaths.

Table TEMP 1.1.2. Temporary assurances, males, 1995-98, all data: comparison of temporary assurance mortality with that for permanent assurances using the AM92 and AM80 tables for both data sets, together with the 1991-94 equivalent using the AM80 table.

Age group (nearest ages)	1995-98 100A/E (AM92)		1995-98 100A/E (AM80)		1991-94 100A/E (AM80)	
	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent
Duration 0						
21-80	60	98	54	97	79	98
Duration 1						
21-80	63	92	56	93	68	96
Durations 2+						
21-25	89*	113	76*	94	107	89
26-30	69	90	69	90	106	92
31-35	72	91	74	94	99	108
36-40	80	94	71	83	83	94
41-45	88	94	65	69	76	73
46-50	81	91	54	60	67	67
51-55	88	90	57	58	61	65
56-60	82	89	54	59	60	64
61-65	80	88	55	61	65	72
66-70	83	91	60	66	72	72
71-75	100	92	77	70	72	76
76-80	89	92	70	73	67	79
21-80	84	90	58	63	67	70

* Ratio based on fewer than 10 actual deaths.

Table TEMP 1.2.1. Temporary assurances effected under section 637(1) of the ICTA 1988 (i.e. in conjunction with personal pensions), males, 1995-98, all data: actual deaths and ratios of actual deaths to those expected using the TM92 table, together with comparisons of 1995-98, 1991-94 and 1989-90 using the TM80 table.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using TM92)	100A/E 1995-98 (using TM80)	100A/E 1991-94 (using TM80)	100A/E 1989-90 (using TM80)
Duration 0					
All ages	39	72	63	86	55
Durations 1-4					
21-30	14	80	101	88	
31-35	13	56	65	97	
36-40	29	102	101	107	
41-45	34	92	72	79	
46-50	49	87	61	78	
51-55	51	87	63	95	
56-60	38	80	61	78	
61-65	18	68	56	130	
21-65	246	83	67	89	56
Durations 5+					
21-30	5	70*	81*		
31-35	16	69	77		
36-40	31	77	75		
41-45	32	57	44		
46-50	59	76	51		
51-55	47	59	38		
56-60	41	70	46		
61-65	22	60	42		
21-65	253	67	49	57	-

* Ratio based on fewer than 10 actual deaths.

Table TEMP 2.1.1. Temporary assurances, females, 1995-98, all data: actual deaths and ratios of actual deaths to those expected using the TF92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the AF80 table.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using TM92)	100A/E 1995-98 (using TM80)	100A/E 1991-94 (using TM80)	100A/E 1987-90 (using TM80)
Duration 0					
All ages	72	84	56	65	70
Durations 1-4					
21-25	3	48*	37*	88	61*
26-30	17	57	50	51	90
31-35	31	54	47	87	84
36-40	55	73	59	76	63
41-45	63	72	55	83	69
46-50	100	93	68	81	71
51-55	90	95	68	77	75
56-60	58	87	62	52	60
61-65	47	102	72	80	99
66-70	38	117	84	103	76
71-75	20	93	68	47	71
76-80	12	66	49	91	50*
21-80	534	83	63	76	72
Durations 5+					
26-30	9	74*	78*	81	55*
31-35	53	97	93	88	114
36-40	110	87	76	80	81
41-45	179	81	65	81	93
46-50	292	95	74	73	90
51-55	250	100	75	87	71
56-60	185	102	76	74	83
61-65	128	107	80	81	56
66-70	95	123	94	74	91
71-75	58	94	73	84	24*
76-80	37	111	89	56	75*
26-80	1,396	96	76	79	84

* Ratio based on fewer than 10 actual deaths.

Table TEMP 2.1.2. Temporary assurances, females, 1995-98, all data: comparison of temporary assurance mortality with that for permanent assurances using the AF92 and AF80 tables for both data sets, together with the 1991-94 equivalent using the AF80 table.

Age group (nearest ages)	1995-98 100A/E (AM92)		1995-98 100A/E (AM80)		1991-94 100A/E (AM80)	
	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent
Duration 0						
21-80	67	120	56	106	65	88
Duration 1						
21-80	91	113	67	77	76	71
Durations 2+						
21-25	45*	64	37*	51	95*	70
26-30	73	88	69	83	63	84
31-35	75	85	69	78	91	91
36-40	80	91	71	80	81	91
41-45	74	92	63	78	80	89
46-50	88	96	72	78	75	88
51-55	92	94	73	75	84	81
56-60	93	90	73	71	68	77
61-65	97	89	76	69	80	75
66-70	116	87	90	68	86	73
71-75	84	95	66	75	70	80
76-80	101	103	80	81	63	77
21-80	88	92	72	74	78	79

* Ratio based on fewer than 10 actual deaths.

Table TEMP 2.2.1. Temporary assurances effected under section 637(1) of the ICTA 1988 (i.e. in conjunction with personal pensions), females, 1995-98, all data: actual deaths and ratios of actual deaths to those expected using the TF92 table, together with comparisons of 1995-98, 1991-94 and 1989-90 using the AF80 table.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using TM92)	100A/E 1995-98 (using TM80)	100A/E 1991-94 (using TM80)	100A/E 1989-90 (using TM80)
Duration 0					
All ages	10	114	73	65*	38*
Durations 1-4					
All ages	72	107	80	54	30*
Durations 5+					
All ages	42	72	57	87*	-

* Ratio based on fewer than 10 actual deaths.

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THE MORTALITY OF IMMEDIATE ANNUITANTS, HOLDERS OF RETIREMENT ANNUITY POLICIES, AND HOLDERS OF PERSONAL PENSION PLANS 1995-98

The first part of this report contains analyses of the mortality of immediate annuitants over the quadrennium 1995-98. This is followed by commentaries on the experience of holders of retirement annuity contracts written under Chapter III of Part XIV of the ICTA 1988 and of personal pension policies issued under Chapter IV of Part XIV of the same Act. The final part of the report, on pp 53 to 72, contains all the tables referred to in the earlier parts.

Table ANN 0.1 shows the development of these investigations over recent quadrennia for all ages and durations combined. It should be noted that the number of offices contributing data over this period has not been stable and that in the 1991-94 quadrennium, in particular, a number of substantial offices did not contribute data for every year. Nevertheless, the pattern of the results year by year over this quadrennium does not appear to be affected by the presence or absence in the experience of data from particular offices.

The equivalent table to ANN 0.1 in *C.M.I.R.* **16** is numbered ANN 7. That table was produced in the context of a discussion of which investigations should be used to produce Standard tables of mortality. See section 7, page 50 of *C.M.I.R.* **16**. Since similar considerations still apply it was decided to produce this table in the same format as that used in *C.M.I.R.* **16**. Note that the "92" Series of tables did not include a table for personal pensions.

The size of the personal pensions investigation is growing rapidly. Measured by amount of exposed to risk, it is now significantly larger than the immediate annuitant investigation – more than six times for males. The policies covered by the investigation are still of relatively short duration and the experience may not be indicative of that to be expected in a mature experience.

1. MALE IMMEDIATE ANNUITANTS

Table ANN 1.1a shows the experience for 1995-98, on the basis of lives, using the projected rates for calendar year 2020 from the IML92 mortality table. Using the IM80 table projected to 2010, table ANN 1.1a also gives comparisons for the experiences of 1995-98, 1991-1994 and 1987-90. Table ANN 1.1b shows similar information but for the mortality experiences measured by amounts.

Between 1991-94 and 1995-98, at durations 1 and over, there was some

improvement in overall mortality and this is consistent between lives and amounts. However, this improvement was not as great as that observed between the two previous quadrennia, 1987-90 and 1991-94.

Table ANN 1.2a compares the experience measured on a lives basis in each year from 1983 to 1998 at durations 1 and over with that expected according to the base (1992) rates of the IML92 table. This shows a consistent fall in the level of mortality recorded over the years 1990 to 1998, following a number of years of relatively stable experience. 1994 and 1998 are the only years in that nine year period that do not continue the downward trend but in each case the levels in those years do not exceed the mortality experience applicable two years earlier.

Table ANN 1.2b shows, for amounts, similar information to table ANN 1.2a but the comparison basis is the base (1992) rates of the IMA92 table. These results show a similar pattern of improving mortality over the past eight years.

Table ANN 1.2c shows the lives experience between 1992 and 1998 compared with the IML92 table projected to the relevant calendar year. This shows how this experience compares with the projected mortality improvement factors underlying IML92 table. Table ANN 1.2d shows similar information for the amounts experience. With the exception of 1997 (where the lives experience shows relatively light mortality), for both data sets the projected rates reflect the actual experience reasonably well.

2. FEMALE IMMEDIATE ANNUITANTS

The experience recorded for female annuitants is shown in tables ANN 2.1a and ANN 2.1b (lives and amounts respectively) using as a comparison basis for 1995-98 the projected rates for calendar year 2020 from the IFL92 or IFA92 tables respectively. Corresponding figures for 1987-90, 1991-94 and 1995-98 are also shown using the IF80 table projected to 2010 as the comparison basis.

At durations 1 and over a comparison of the levels of mortality between 1991-94 and 1995-98 on both a lives and an amounts basis shows that the experience has been relatively stable. At ages below 75 in most age groups the mortality on an amounts basis is well below that on a lives basis. This feature has been present over the last three quadrennia. Since the numbers of deaths at these ages are relatively small, too much should not be read into this.

At duration 0 it is difficult to discern any real pattern, except to say that the improvement in mortality at younger ages over the past quadrennium can be observed here too.

Table ANN 2.2a compares the experience at durations 1 and over on a lives basis for each year from 1983 to 1998 with that expected according to the base (1992) rates of the IFL92 table. Table ANN 2.2b shows similar information for

the amounts experience. Both tables show the general improvement in mortality over the period although this feature varies year by year and between age groups.

Table ANN 2.2c is similar to ANN 2.2a but compares the experience at durations 1 and over on a lives basis with that expected according to the projected rates for each calendar year from the IFL92 table. Table ANN 2.2d shows the same information for the amounts experience. Across the whole age range the projections look reasonable, but there are wide variations by age.

3. MALE HOLDERS OF RETIREMENT ANNUITY CONTRACTS

The experience of male holders of retirement annuity contracts in 1995-98 is shown in tables ANN 3.1a and ANN 3.1b for policies in deferment and in payment respectively. The 'in deferment' mortality is compared against the ultimate rates from the AM92 table. The 'in payment' mortality is compared against the projected ultimate rates for the calendar year 2020 from the RMV92 table. To allow comparison with previous quadrennia tables ANN 3.1a and ANN 3.1b also show comparisons with the equivalent "80" Series mortality tables.

The combined 1995-98 experience of policies in deferment and policies in payment, compared with the projected ultimate rates for calendar year 2020 from the IML92 table, is shown in table ANN 3.2a. Comparative figures for 1987-90 and 1991-94 are also shown. In addition, for 1995-98 only, there is a comparison against the projected rates for 1996 from the IML92 table. Similar information is shown in table ANN 3.2b but here the comparison basis is the RMV92 table projected to 2020 and 1996 respectively.

From table ANN 3.1a a steady improvement in mortality between 1991-94 and 1995-98 can be seen at ages above 35. It can be seen that below age 60 the mortality experience is not dissimilar to that for assured lives. However, at ages over 60 the retirement annuitant policyholders experience much lighter mortality in deferment than assured lives, indicating that the less healthy lives have almost certainly transferred to the in payment section.

Table ANN 3.1b shows clearly that the mortality suffered by the retirees at the younger ages is extremely heavy. This confirms the view from the previous paragraph that at these ages there is selective retirement of the less healthy lives.

In general for the 'in payment' group there has been continued substantial improvement in the level of mortality recorded. At ages over 75 it is well below the level found in the immediate annuitant investigation. This feature has been present in earlier quadrennia. It should be noted that, above age 75 in 1995-98, the mortality recorded was generally close to that projected for calendar year 2010 in the IM80 table.

The combined experience, detailed in table ANN 3.2a, shows some interesting features. Combining the in deferment and in payment sections suppresses the effect of selective early retirement and gives a smooth progression of the 100 A/E ratios through the age range. It should be noted that, above age 70, the mortality recorded was below that projected for the calendar year 1996 in the IML92 table. The difference increases with age. Below age 70 the reverse pattern is seen. Table ANN 3.2b shows the same information as table ANN 3.2a but uses RMV92 projected to 1996 and 2020 respectively as the comparison basis. Table ANN 3.2b clearly shows that, at ages below 60, the combined experience is much lighter than the projected rates of this mortality table, which cannot be used to predict mortality at the youngest ages in deferment with any degree of confidence.

4. FEMALE HOLDERS OF RETIREMENT ANNUITY CONTRACTS

The experience of female holders of retirement annuity contracts in 1995-98 is shown in tables ANN 4.1a and ANN 4.1b for policies in deferment and in payment respectively. The in deferment mortality is compared against the ultimate rates from the AF92 table. The in payment mortality is compared against the rates for the calendar year 2020 from the RFV92 table. For comparison with earlier quadrennia 100A/E ratios are shown for 1987-90, 1991-94 and 1995-98 using AF80 as the in deferment comparison basis and using the calendar year 2010 projected rates from the IF80 table as the in payment comparison basis.

From table ANN 4.1a it can be seen that for the in deferment section there has been some small improvement in the mortality experienced at all ages but this is not consistent at all age groups. The mortality experience of age group 46-50 is high compared to the other age groups and this feature was apparent for this age group in the previous quadrennium.

From table ANN 4.1b it can be seen that the mortality suffered by the youngest retirees is very heavy. This bears out the view that those retiring early will be the less healthy lives. Overall there has been significant improvement between 1991-94 and 1995-98 in the level of mortality experienced in the in payment section. Inspection of the individual age groups reveals a fairly consistent pattern throughout the range.

The combined 1995-98 experience of the in deferment and the in payment policies, compared with the projected rates for the calendar year 2020 from the IFL92 table is shown in table ANN 4.2a. Comparative figures for 1987-90 and 1991-94 are also shown. In addition, for 1995-98 only, there is a comparison against the projected rates for 1996 from the IFL92 table. Table ANN 4.2a shows that mortality at ages below 65 is much heavier than the comparison

basis, much more so than in the equivalent males experience. Above that age the mortality experience is lighter than that of the immediate annuitant investigation.

Table ANN 4.2b details the combined experience compared with the RFV92 table. As was the case with the males, this table is clearly not appropriate as a basis for projecting mortality rates at ages up to 60. The fit is clearly much better above that age and above age 70 the 100A/E ratios are all just below 100.

5. MALE HOLDERS OF PERSONAL PENSION CONTRACTS

The experience of male holders of personal pension contracts is shown in tables ANN 5.1a and ANN 5.1b for policies in deferment and in payment respectively. For all quadrennia shown, the in deferment mortality is compared against the ultimate rates from the AM80 table. For 1995-98 only the AM92 table is also used. Similarly, the in payment mortality is compared against the projected ultimate rates for calendar year 2010 from the IM80 table and, for 1995-98 only, against the projected rates for 2020 from the RMV92 table.

Table ANN 5.1a shows that in deferment the mortality experienced is very similar to that found among retirement annuitants in deferment. The rates are not very different from those found among assured lives at ages up to 60. Above that age the rates compared to assured lives are very light. The same observations were made in *C.M.I.R.* **16** when describing the 1991-94 experience.

Again, as was the case in 1991-94, the in payment experience (table ANN 5.1b) shows that the mortality recorded is well below that of retirement annuitants in payment. There is, however, a similar pattern with relatively heavy mortality at the younger ages. Personal pensions were introduced only in 1988, so the policies studied will all still be of relatively short duration. Too much should therefore not be read into the experience recorded so far even though similar features have been apparent over two successive quadrennia; several factors could be operating which may influence the experience in these early years.

6. FEMALE HOLDERS OF PERSONAL PENSION CONTRACTS

The experience of female holders of personal pension contracts is shown in tables ANN 6.1a and ANN 6.1b for policies in deferment and in payment respectively. The in deferment mortality is compared against the ultimate rates from the AF80 table. The in payment mortality is compared against the projected rates for the calendar year 2010 from the IF80 table. For 1995-98 only the experiences are compared with the AF92 table (table ANN 6.1a only) and the projected rates for the calendar year 2020 from the RFV92 table (table ANN 6.1b only).

Table ANN 6.1a shows that the in deferment mortality experienced by personal pension contract holders is similar to that observed among retirement annuity contract holders. This comment was also made about the male experience. This changed the position seen in the 1991-94 quadrennium where holders of retirement annuity contracts suffered higher mortality than that experienced by holders of personal pension contracts.

The mortality recorded for personal pensions in payment (table ANN 6.1b) is, age group for age group, considerably lighter than that recorded among the retirement annuitants, reflecting the pattern observed among their male counterparts. The same cautions as to the possibility of special factors operating apply here also.

Table ANN 0.1. Immediate annuitants (lives), retirement annuitants and personal pensioners: all ages and durations combined: exposed to risk and deaths over recent quadrennia.

		1995-98	1991-94	1987-90	1983-86
Males					
	Immediate annuitants				
	Exposed to risk (000)	31	40	50	53
	Deaths	2,263	2,990	4,060	4,066
	Crude death rate	0.074	0.075	0.081	0.076
	Retirement annuities in deferment				
	Exposed to risk (000)	3,795	4,511	6,358	4,791
	Deaths	12,721	14,664	18,720	17,235
	Crude death rate	0.003	0.003	0.003	0.004
	Retirement annuities in payment				
	Exposed to risk (000)	638	641	648	411
	Deaths	19,030	20,200	22,731	15,563
	Crude death rate	0.030	0.032	0.035	0.038
	Personal pensions in deferment*				
	Exposed to risk (000)	6,043	3,831	1,332	-
	Deaths	10,467	5,827	1,107	-
	Crude death rate	0.002	0.002	0.001	-
	Personal pensions in payment*				
	Exposed to risk (000)	207	50	2	-
	Deaths	2,420	564	25	-
	Crude death rate	0.012	0.011	0.013	-

* Investigation started 1 January 1989.

Table ANN 0.1. (continued)

		1995-98	1991-94	1987-90	1983-86
Females					
	Immediate annuitants				
	Exposed to risk (000)	52	74	101	119
	Deaths	4,475	6,009	7,752	8,566
	Crude death rate	0.086	0.082	0.076	0.072
	Retirement annuities in deferment				
	Exposed to risk (000)	672	829	1,097	682
	Deaths	1,590	1,671	2,002	1,547
	Crude death rate	0.002	0.002	0.002	0.002
	Retirement annuities in payment				
	Exposed to risk (000)	156	151	134	74
	Deaths	2,535	2,695	2,345	1,451
	Crude death rate	0.016	0.018	0.018	0.020
	Personal pensions in deferment*				
	Exposed to risk (000)	2,998	1,883	593	-
	Deaths	2,774	1,251	201	-
	Crude death rate	0.001	0.001	0.000	-
	Personal pensions in payment*				
	Exposed to risk (000)	84	20	0.6	-
	Deaths	459	110	2	-
	Crude death rate	0.005	0.006	0.003	-

* Investigation started 1 January 1989.

Table ANN 1.1a. Immediate annuitants, males, lives, 1995-98, all data: actual deaths and ratios of actual deaths to those expected using the projected rates for calendar year 2020 from the IML92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the IM80 table projected to calendar year 2010.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using IML92C20)	100A/E 1995-98 (using IM80C10)	100A/E 1991-94 (using IM80C10)	100A/E 1987-90 (using IM80C10)
Duration 0					
61-70	7	179*	69*	73	161
71-75	6	136*	78*	114	119
76-80	12	131	96	98	131
81-85	19	122	103	120	132
86-90	20	136	123	99	100
61-90	64	134	98	103	128
Durations 1+					
61-65	8	154*	66*	100	135
66-70	56	168	88	92	131
71-75	137	156	98	92	124
76-80	238	126	91	107	126
81-85	513	120	97	108	123
86-90	676	120	104	106	110
91-95	465	118	106	113	104
96-100	85	96	88	107	112
61-100	2,178	122	100	107	118

* Ratio based on fewer than 10 actual deaths.

Table ANN 1.1b. Immediate annuitants, males, amounts, 1995-98, all data: actual deaths and ratios of actual deaths to those expected using the projected rates for calendar year 2020 from the IMA92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the IM80 table projected to calendar year 2010.

Age group (nearest ages)	Actual deaths 1995-98 (£000 pa)	100A/E 1995-98 (using IMA92C20)	100A/E 1995-98 (using IM80C10)	100A/E 1991-94 (using IM80C10)	100A/E 1987-90 (using IM80C10)
Duration 0					
61-70	14	139*	58*	69	151
71-75	26	125*	77*	103	143
76-80	85	204	159	55	108
81-85	65	79	70	107	113
86-90	120	125	119	145	150
61-90	309	124	102	105	126
Durations 1+					
61-65	17	153*	64*	90	95
66-70	109	182	92	85	138
71-75	178	118	72	87	108
76-80	391	109	77	96	108
81-85	1,034	110	86	101	118
86-90	1,777	135	114	101	116
91-95	1,004	130	114	114	114
96-100	162	94	83	143	131
61-100	4,671	123	99	103	116

* Ratio based on fewer than 10 actual deaths.

Table ANN 1.2a. Immediate annuitants, males, durations 1 and over, lives, 1983-98: actual deaths for individual years expressed as a percentage of those expected using the base (1992) rates from the IML92 table.

Age group (nearest ages)	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
61-65	317	250	200*	194*	194*	167*	150*	100*	48*	229*	118*	40*	32*	69*	138*	45*
66-70	136	119	172	157	124	161	152	112	102	108	83	83	96	91	98	78*
71-75	113	119	121	116	118	106	141	115	106	91	69	88	90	120	61	116
76-80	104	125	118	119	126	121	111	117	109	89	101	100	104	91	75	60
81-85	119	110	123	110	114	112	112	115	109	94	87	103	101	94	73	82
86-90	109	100	125	113	99	111	103	92	103	94	94	101	87	100	101	99
91-95	108	103	109	109	89	82	109	110	102	126	104	97	108	89	85	121
96-100	97	116	68	143	107	99	104	129	87	111	108	121	84	96	71	93
61-100	112	113	120	116	110	109	112	109	105	100	94	100	97	96	84	95

* Ratio based on fewer than 10 actual deaths.

Table ANN 1.2b. Immediate annuitants, males, durations 1 and over, amounts, 1983-98: actual deaths for individual years expressed as a percentage of those expected using the base (1992) rates from the IMA92 table.

Age group (nearest ages)	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
61-65	312	341	110*	307*	248*	198*	53*	40*	11*	100*	252*	7*	22*	91*	98*	76*
66-70	140	123	246	177	75	169	248	81	82	137	73	73	142	92	87	65*
71-75	98	114	131	103	107	104	138	78	76	128	82	69	54	90	41	112
76-80	93	136	131	167	132	95	102	90	134	74	87	62	110	73	69	38
81-85	104	107	108	83	148	85	105	117	103	109	83	88	101	90	66	67
86-90	103	92	123	118	155	96	96	101	108	101	86	89	87	113	132	99
91-95	94	116	108	159	93	113	105	129	116	106	106	113	108	107	93	132
96-100	78	102	24	100	76	181	130	138	165	68	196	127	71	128	71	66
61-100	100	112	116	123	132	102	107	108	111	101	96	90	96	101	93	91

• Ratio based on fewer than 10 actual deaths.

Table ANN 1.2c. Immediate annuitants, males, durations 1 and over, lives, 1992-98: actual deaths for individual years expressed as a percentage of those expected using the projected rates for the relevant calendar year from the IML92 table.

Age group (nearest ages)	1992	1993	1994	1995	1996	1997	1998
61-65	229*	121*	42*	36*	77*	160*	56*
66-70	108	85	88	103	101	111	90*
71-75	91	71	92	95	130	67	131
76-80	89	103	103	109	97	81	66
81-85	94	88	105	105	99	77	89
86-90	94	95	103	90	104	106	105
91-95	126	105	98	111	92	88	126
96-100	111	109	122	85	97	72	96
61-100	100	95	102	100	101	89	102

• Ratio based on fewer than 10 actual deaths.

Table ANN 1.2d. Immediate annuitants, males, durations 1 and over, amounts, 1992-98: actual deaths for individual years expressed as a percentage of those expected using the projected rates for the relevant calendar year from the IMA92 table.

Age group (nearest ages)	1992	1993	1994	1995	1996	1997	1998
61-65	100*	260*	7*	24*	103*	114*	91*
66-70	137	75	77	153	101	99	76*
71-75	128	84	71	58	98	46	126
76-80	74	88	64	116	78	75	42
81-85	109	84	91	105	95	70	72
86-90	101	87	91	90	118	138	105
91-95	106	107	115	111	110	96	138
96-100	68	197	128	72	130	73	68
61-100	101	97	92	99	105	99	97

• Ratio based on fewer than 10 actual deaths.

Table ANN 2.1a. Immediate annuitants, females, lives, 1995-98, all data: actual deaths and ratios of actual deaths to those expected using the projected rates for calendar year 2020 from the IFL92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the IF80 table projected to calendar year 2010.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using IFL92C20)	100A/E 1995-98 (using IF80C10)	100A/E 1991-94 (using IF80C10)	100A/E 1987-90 (using IF80C10)
Duration 0					
71-75	4	108*	63*	94*	87
76-80	12	122	81	72	125
81-85	21	99	72	76	99
86-90	24	108	82	100	84
91-95	17	123	99	136	106
96-100	4	133*	118*	190	78
71-100	82	111	82	98	99
Durations 1+					
61-65	11	379	164	122	212
66-70	24	178	95	132	136
71-75	87	174	111	111	123
76-80	214	130	95	97	109
81-85	653	125	101	107	112
86-90	1,338	123	104	104	109
91-95	1,340	118	105	109	106
96-100	594	114	110	109	109
61-100	4,261	122	104	106	110

* Ratio based on fewer than 10 actual deaths.

Table ANN 2.1b. Immediate annuitants, females, amounts, 1995-98, all data: actual deaths and ratios of actual deaths to those expected using the projected rates for calendar year 2020 from the IFA92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the IF80 table projected to calendar year 2010.

Age group (nearest ages)	Actual deaths 1995-98 (£000 pa)	100A/E 1995-98 (using IFA92C20)	100A/E 1995-98 (using IF80C10)	100A/E 1991-94 (using IF80C10)	100A/E 1987-90 (using IF80C10)
Duration 0					
71-75	5	41*	22*	49*	66
76-80	51	132	89	85	96
81-85	81	75	60	87	116
86-90	121	85	74	117	79
91-95	106	102	97	130	113
96-100	37	116*	119*	147	87
71-100	402	92	77	108	97
Durations 1+					
61-65	11	390	106	111	164
66-70	28	176	68	71	125
71-75	216	268	138	90	112
76-80	402	127	83	94	97
81-85	1,393	128	99	103	101
86-90	2,864	116	99	103	109
91-95	2,848	120	112	117	113
96-100	970	105	106	109	117
61-100	8,732	120	103	106	108

* Ratio based on fewer than 10 actual deaths.

Table ANN 2.2a. Immediate annuitants, females, durations 1 and over, lives, 1983-98: actual deaths for individual years expressed as a percentage of those expected using the base (1992) rates from the IFL92 table.

Age group (nearest ages)	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
61-65	200*	179*	333	207*	320*	43*	286*	269*	154*	174*	87*	125*	111*	188*	333*	91*
66-70	159	139	129	142	148	141	153	114	174	106*	123	127*	77*	145	67*	100*
71-75	136	125	148	113	115	108	123	129	115	96	110	105	114	103	102	111
76-80	116	111	108	98	94	120	93	103	100	93	67	97	95	95	81	78
81-85	116	112	106	118	101	104	107	105	111	86	91	107	86	112	84	90
86-90	123	99	117	109	104	100	102	108	104	111	85	93	93	98	99	108
91-95	120	104	119	105	111	99	101	93	101	100	105	110	104	101	98	97
96-100	117	107	106	108	95	106	108	99	100	108	95	107	97	109	109	94
61-100	120	107	114	110	104	103	104	103	104	101	93	103	96	103	97	98

• Ratio based on fewer than 10 actual deaths.

Table ANN 2.2b. Immediate annuitants, females, durations 1 and over, amounts, 1983-98: actual deaths for individual years expressed as a percentage of those expected using the base (1992) rates from the IFA92 table.

Age group (nearest ages)	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
61-65	296*	219*	351	206*	452*	21*	304*	345*	56*	334*	251*	60*	41*	151*	460*	40*
66-70	232	175	106	183	126	309	129	176	139	52*	105	117*	28*	135	99*	155*
71-75	141	129	149	127	180	168	80	120	118	102	81	134	220	79	78	311
76-80	129	110	106	105	124	99	90	99	111	82	95	105	92	103	74	77
81-85	127	107	112	138	98	107	101	85	116	87	84	109	98	126	80	76
86-90	129	99	106	120	103	88	104	110	99	114	84	92	78	100	100	94
91-95	127	90	116	100	138	88	95	100	100	104	97	124	112	85	90	121
96-100	125	102	123	81	114	107	89	110	88	112	103	91	79	106	114	77
61-100	129	102	113	115	116	98	98	102	103	103	90	105	94	100	94	101

* Ratio based on fewer than 10 actual deaths.

Table ANN 2.2c. Immediate annuitants, females, durations 1 and over, lives, 1992-98: actual deaths for individual years expressed as a percentage of those expected using the projected rates for the relevant calendar year from the IFL92 table.

Age group (nearest ages)	1992	1993	1994	1995	1996	1997	1998
61-65	174*	87*	133*	118*	214*	385*	111*
66-70	106*	127	133*	83*	161	75*	118*
71-75	96	112	110	122	112	112	125
76-80	93	68	100	99	102	88	86
81-85	86	92	109	89	118	90	97
86-90	111	86	95	96	102	104	114
91-95	100	106	112	106	104	102	101
96-100	108	95	108	99	111	112	96
61-100	101	94	105	99	107	101	104

• Ratio based on fewer than 10 actual deaths.

Table ANN 2.2d. Immediate annuitants, females, durations 1 and over, amounts, 1992-98: actual deaths for individual years expressed as a percentage of those expected using the projected rates for the relevant calendar year from the IFA92 table.

Age group (nearest ages)	1992	1993	1994	1995	1996	1997	1998
61-65	334*	259*	64*	45*	170*	535*	47*
66-70	52*	108	123*	30*	149	112*	180*
71-75	102	83	139	234	86	86	351
76-80	82	97	109	97	109	80	85
81-85	87	85	112	102	133	86	82
86-90	114	85	93	81	104	105	100
91-95	104	98	126	114	87	93	126
96-100	112	104	92	81	108	117	79
61-100	103	91	107	97	104	98	106

• Ratio based on fewer than 10 actual deaths.

Table ANN 3.1a. Retirement annuity policies in deferment, males, 1995-98: actual deaths and ratios of actual deaths to those expected using the ultimate rates from the AM92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the AM80 table.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using AM92)	100A/E 1995-98 (using AM80)	100A/E 1991-94 (using AM80)	100A/E 1987-90 (using AM80)
21-25	2	250*	222*	77	61
26-30	23	110	111	84	73
31-35	105	92	94	94	100
36-40	271	91	80	90	86
41-45	665	107	78	79	79
46-50	1,481	99	66	73	75
51-55	2,344	92	59	69	72
56-60	3,200	86	57	65	72
61-65	3,328	81	56	63	70
66-70	947	66	48	56	54
71-75	329	62	47	56	50
21-75	12,695	85	58	67	71

* Ratio based on fewer than 10 actual deaths.

Table ANN 3.1b. Retirement annuity policies in payment, males, 1995-98: actual deaths and ratios of actual deaths to those expected using the rates for the calendar year 2020 from the RMV92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the ultimate rates for the calendar year 2010 from the IM80 table.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using RMV92C20)	100A/E 1995-98 (using IM80C10)	100A/E 1991-94 (using IM80C10)	100A/E 1987-90 (using IM80C10)
51-55	112	166	342	627	1,017
56-60	331	255	259	344	414
61-65	1,623	186	124	139	164
66-70	4,045	160	94	104	122
71-75	4,445	154	95	105	117
76-80	3,668	141	96	99	112
81-85	2,887	131	97	99	112
86-90	1,477	124	96	101	104
91-95	338	104	82	97	95
96-100	31	75	58	76	88
51-100	18,957	147	99	107	121

Table ANN 3.2a. Retirement annuity policies in deferment and in payment combined, males, 1995-98: actual deaths and ratios of actual deaths to those expected using the ultimate rates from the IML92 table for the calendar year 1996, together with comparisons of 1995-98, 1991-94 and 1987-90 for the calendar year 2020.

Age group (nearest ages)	Actual deaths[φ] 1995-98	100A/E 1995-98 (using IML92C96)	100A/E 1995-98 (using IML92C20)	100A/E 1991-94 (using IML92C20)	100A/E 1987-90 (using IML92C20)
21-30	25	131	275	209	177
31-35	107	106	224	224	233
36-40	274	104	219	245	237
41-45	672	123	258	262	259
46-50	1,541	118	248	270	278
51-55	2,456	109	230	271	278
56-60	3,531	106	223	254	279
61-65	4,951	106	202	228	255
66-70	4,992	100	167	185	217
71-75	4,774	98	147	165	180
76-80	3,668	97	134	137	156
81-85	2,887	94	120	123	140
86-90	1,477	92	111	117	120
91-95	338	79	90	108	106
96-100	31	58	64	83	98
21-100	31,724	101	164	183	206

[φ] Includes deaths among retirees at ages below 50. Note that this means that the total number of actual deaths is greater than the sum of those shown in tables ANN 3.1a and ANN 3.1b.

Table ANN 3.2b. Retirement annuity policies in deferment and in payment combined, males, 1995-98: actual deaths and ratios of actual deaths to those expected using the ultimate rates from the RMV92 table for the calendar year 1996, together with comparisons of 1995-98, 1991-94 and 1987-90 for the calendar year 2020.

Age group (nearest ages)	Actual deaths[φ] 1995-98	100A/E 1995-98 (using RMV92C96)	100A/E 1995-98 (using RMV92C20)	100A/E 1991-94 (using RMV92C20)	100A/E 1987-90 (using RMV92C20)
21-30	25	2	4	3	2
31-35	107	2	4	4	4
36-40	274	3	6	6	6
41-45	672	5	11	11	11
46-50	1,541	10	21	22	23
51-55	2,456	18	39	46	47
56-60	3,531	36	76	87	95
61-65	4,951	64	123	139	156
66-70	4,992	87	146	162	184
71-75	4,774	99	149	167	182
76-80	3,668	102	141	145	164
81-85	2,887	102	131	134	152
86-90	1,477	103	124	131	134
91-95	338	91	104	123	121
96-100	31	68	75	97	115
21-100	31,724	33	64	58	50

[φ] Includes deaths among retirees at ages below 50. Note that this means that the total number of actual deaths is greater than the sum of those shown in tables ANN 3.1a and ANN 3.1b.

Table ANN 4.1a. Retirement annuity policies in deferment, females, 1995-98: actual deaths and ratios of actual deaths to those expected using the ultimate rates from the AF92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the AF80 table.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using AF92)	100A/E 1995-98 (using AF80)	100A/E 1991-94 (using AF80)	100A/E 1987-90 (using AF80)
31-35	7	52*	48*	82	86
36-40	30	82	72	78	81
41-45	79	99	83	81	78
46-50	239	120	97	90	75
51-55	323	90	72	78	78
56-60	488	93	73	65	82
61-65	252	70	55	65	72
66-70	132	80	63	58	59
71-75	39	71	55	56	66
31-75	1,589	89	70	72	76

* Ratio based on fewer than 10 actual deaths.

Table ANN 4.1b. Retirement annuity policies in payment, females, 1995-98: actual deaths and ratios of actual deaths to those expected using the rates for the calendar year 2020 from the RFV92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the ultimate rates for the calendar year 2010 from the IF80 table.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using RFV92C20)	100A/E 1995-98 (using IF80C10)	100A/E 1991-94 (using IF80C10)	100A/E 1987-90 (using IF80C10)
51-55	22	225	500	875	1,000
56-60	57	246	252	425	322
61-65	262	150	107	150	146
66-70	468	154	97	108	115
71-75	538	147	95	103	103
76-80	465	135	92	95	106
81-85	375	124	88	103	99
86-90	240	115	85	114	94
91-95	79	114	90	93	89
96-100	16	102	91	79	83*
51-100	2,522	139	95	112	112

* Ratio based on fewer than 10 actual deaths.

Table ANN 4.2a. Retirement annuity policies in deferment and in payment combined, females, 1995-98: actual deaths and ratios of actual deaths to those expected using the ultimate rates from the IFL92 table for the calendar year 1996, together with comparisons of 1995-98, 1991-94 and 1987-90 for the calendar year 2020.

Age group (nearest ages)	Actual deaths$^{\phi}$ 1995-98	100A/E 1995-98 (using IFL92C96)	100A/E 1995-98 (using IFL92C20)	100A/E 1991-94 (using IFL92C20)	100A/E 1987-90 (using IFL92C20)
21-40	38	119	252	287	274
41-45	82	217	458	442	415
46-50	248	270	568	523	431
51-55	345	190	399	439	429
56-60	545	171	359	348	403
61-65	514	116	220	291	298
66-70	600	107	179	192	204
71-75	577	97	146	160	159
76-80	465	92	126	130	147
81-85	375	86	110	129	124
86-90	240	83	100	135	112
91-95	79	88	101	105	102
96-100	16	87	95	83	89*
21-100	4,124	115	178	205	220

$^{\phi}$ Includes deaths among retirees at ages below 50. Note that this means that the total number of actual deaths is greater than the sum of those shown in tables ANN 4.1a and ANN 4.1b.

* Ratio based on fewer than 10 actual deaths.

Table ANN 4.2b. Retirement annuity policies in deferment and in payment combined, females, 1995-98: actual deaths and ratios of actual deaths to those expected using the ultimate rates from the RFV92 table for the calendar year 1996, together with comparisons of 1995-98, 1991-94 and 1987-90 for the calendar year 2020.

Age group (nearest ages)	Actual deaths[φ] 1995-98	100A/E 1995-98 (using RFV92C96)	100A/E 1995-98 (using RFV92C20)	100A/E 1991-94 (using RFV92C20)	100A/E 1987-90 (using RFV92C20)
21-40	38	2	4	4	4
41-45	82	6	13	13	12
46-50	248	15	32	29	24
51-55	345	24	50	55	53
56-60	545	50	105	101	116
61-65	514	66	103	166	169
66-70	600	89	149	159	169
71-75	577	95	144	157	157
76-80	465	98	135	140	158
81-85	375	97	124	145	140
86-90	240	95	115	155	128
91-95	79	99	114	118	115
96-100	16	93	102	88	95*
21-100	4,124	38	71	61	47

[φ] Includes deaths among retirees at ages below 50. Note that this means that the total number of actual deaths is greater than the sum of those shown in tables ANN 4.1a and ANN 4.1b.

* Ratio based on fewer than 10 actual deaths.

Table ANN 5.1a. Personal pension policies in deferment, males, 1995-98: actual deaths and ratios of actual deaths to those expected using the ultimate rates from the AM92 table, together with comparisons of 1995-98, 1991-94 and 1989-90 using the AM80 table.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using AM92)	100A/E 1995-98 (using AM80)	100A/E 1991-94 (using AM80)	100A/E 1989-90 (using AM80)
21–25	118	91	77	97	40
26–30	414	96	96	85	63
31–35	513	80	83	95	43
36–40	736	95	85	84	57
41–45	1,036	102	76	78	41
46–50	1,701	101	67	70	46
51–55	1,917	91	59	67	42
56–60	1,838	87	58	63	41
61–65	1,502	75	52	57	40
66–70	464	56	41	47	29
71–75	211	56	43	43	15
21–75	10,450	87	62	69	42

Table ANN 5.1b. Personal pension policies in payment, males, 1995-98: actual deaths and ratios of actual deaths to those expected using the rates for the calendar year 2020 from the RMV92 table, together with comparisons of 1995-98, 1991-94 and 1989-90 using the ultimate rates for the calendar year 2010 from the IM80 table.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using RMV92C20)	100A/E 1995-98 (using IM80C10)	100A/E 1991-94 (using IM80C10)	100A/E 1989-90 (using IM80C10)
51-55	178	81	170	167	
56-60	321	124	132	131	140
61-65	533	123	84	95	
66-70	826	119	71	78	97
71-75	344	101	62	66	
76-80	149	100	67	54	-
51-80	2,351	112	80	90	112

Table ANN 6.1a. Personal pension policies in deferment, females, 1995-98: actual deaths and ratios of actual deaths to those expected using the ultimate rates from the AF92 table, together with comparisons of 1995-98, 1991-94 and 1989-90 using the AF80 table.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using AF92)	100A/E 1995-98 (using AF80)	100A/E 1991-94 (using AF80)	100A/E 1989-90 (using AF80)
21-25	52	120	97	67	54
26-30	125	74	69	58	38
31-35	215	88	81	82	22*
36-40	279	102	90	76	26
41-45	381	104	88	76	41
46-50	544	101	82	71	44
51-55	453	81	65	66	46
56-60	439	91	71	51	50
61-65	204	80	63	49	46
66-70	51	47	36	40	34*
71-75	28	63	49	44*	47*
21-75	2,771	90	74	65	41

* Ratio based on fewer than 10 actual deaths.

Table ANN 6.1b. Personal pension policies in payment, females, 1995-98: actual deaths and ratios of actual deaths to those expected using the rates for the calendar year 2020 from the RFV92 table, together with comparisons of 1995-98, 1991-94 and 1989-90 using the ultimate rates for the calendar year 2010 from the IF80 table.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using RFV92C20)	100A/E 1995-98 (using IF80C10)	100A/E 1991-94 (using IF80C10)	100A/E 1989-90 (using IF80C10)
51-55	66	122	284	234	
56-60	82	122	133	182	
61-65	153	125	92	85	
66-70	80	101	64	95	
71-75	36	89	57	56*	
76-80	15	72	48	104*	
51-80	432	112	92	113	75*

* Ratio based on fewer than 10 actual deaths.

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THE MORTALITY OF PENSIONERS IN INSURED GROUP PENSION SCHEMES 1995-98

This report contains commentaries on the experience recorded over 1995-98 for male and female pensioners, and for widows and widowers of pensioners. As has always been the case in the C.M.I.B. investigations, the pensioners concerned are those covered by schemes under which the benefits are insured through life offices. The tables supporting the text can be found on pp 78 to 100.

When comparing results for the quadrennium 1995-98 with those for earlier quadrennia, it should be noted that, while the list of contributors to the investigations has remained largely unchanged over many years, a handful of offices were not able to contribute for every year of the 1995-98 quadrennium.

The experiences are divided into those where the pensioner retired at or after the normal age (referred to for simplicity as 'normal' retirements) and those who retired before the normal age (referred to as 'early' retirements). Up until the mid-1980s this was more or less equivalent to a split between healthy retirements and ill health retirements. Since the mid-1980s, however, an increasing proportion of healthy lives have been retiring early. This could have two effects.

Firstly, the mortality experienced by early retirees would be expected to improve relative to that of normal retirees. There is some evidence that this may be happening at ages up to 60. In time this phenomenon could work up into the higher age groups.

Secondly, the fact that a number of healthy lives are now entering the early retirement group means that the normal retirement group is missing a substantial number of persons who would, in other circumstances, have been included in it. This raises the question as to whether these 'missing' people are typical of the group as a whole or whether, once they are removed, we are left with experience that exhibits different characteristics from those previously observed. These remarks simply highlight the fact that these are complex experiences where a number of inter-related factors are very probably operating. Due consideration should be given to all these factors when relying on the results from the experiences to select a basis for use in connection with any individual portfolio.

1. MALE PENSIONERS

Tables PEN 1.1a, PEN 1.2a and PEN 1.3a give the experience for the quadrennium 1995-98 on the basis of lives for, respectively, normal retirements, early retirements and all retirements combined. Tables PEN 1.1b, PEN 1.2b and PEN 1.3b give the corresponding experience on the basis of amounts. Each

table uses as a comparison basis the projected mortality rates for the calendar year 2010 from the PMA80 table. Each table also uses, for 1995-98 only, a comparison basis of the projected mortality rates for the 2020 calendar year from the PML92 or PMA92 tables, as appropriate. A comparison of the actual experience for normal retirements year by year from 1983, amounts and lives, against the rates for the calendar year 1992 from the same two mortality tables can be found in tables PEN 1.4a and PEN 1.4b. Tables PEN 1.4c and PEN 1.4d show a comparison for each calendar year since 1992 with the projected rates for those years from, as appropriate, the PML92 or PMA92 mortality tables. Tables PEN 1.5a and PEN 1.5b show the size of the experiences together with the average pensions in payment.

From tables PEN 1.1a and PEN 1.1b it can be seen that the fall in levels of male pensioner mortality, noted over previous quadrennia, has continued. This improvement has been fairly consistent across all age groups although there is some evidence that the improvements have been greatest at the younger ages. It is also notable that the improvement between 1991-94 and 1995-98 is greater than in other recent successive quadrennia. This improvement has been much more marked than that seen in the immediate annuitants investigation. A continuing feature of the experience that can be clearly seen from comparison between the two tables is the gap between the levels of mortality recorded on a lives basis and on an amounts basis, the amounts basis mortality being significantly lighter. The gap is reasonably stable over time. Looked at age group by age group the gap is largest at the young ages and decreases as age increases.

Just how far the experience has improved over the period from 1983 to 1998 can be seen in tables PEN 1.4a and PEN 1.4b, where the actual deaths year by year (on a lives and an amounts basis respectively) are compared with those expected using the 1992 calendar year base rates from PML92 or PMA92 as appropriate. A comparison with the "92" Series mortality rates projected to each year between 1992 and 1998 can be seen in tables PEN 1.4c and PEN 1.4d.

Although the ratios do not run smoothly, the overall trend of improving mortality in the experience of pensioners who are normal retirements can be clearly seen in tables PEN 1.4a and PEN 1.4b. The seven-year period from 1992 to 1998 covered by tables PEN 1.4c and PEN 1.4d is too short to draw any firm conclusions about divergences from the projected mortality rates although it can be seen that the 100A/E ratios are below 100 in most cases and they appear to be trending downwards.

The experience of pensioners who retired before the normal age is shown in tables PEN 1.2a and PEN 1.2b (lives and amounts respectively). As would be expected, the overall level of mortality is considerably heavier than that of pensioners retiring at or after the normal age; the difference is greatest at the

younger ages and tails off as age increases. This pattern has been consistent over a number of quadrennia, although the size of the differential has narrowed slightly in the 1995-98 quadrennium. With an increasing number of healthy retirees in the early retirement exposed to risk, we might expect the differential to fall, but so far the slight change in the latest quadrennium is the only evidence of this. The gap between the experience as measured by lives and amounts, observed among normal retirees, is present here also and is of a similar size.

Tables PEN 1.3a and PEN 1.3b (lives and amounts respectively) give the experience for all pensioners combined.

Tables PEN 1.5a and PEN 1.5b show the size of the data, on a normal retirements and an early retirements basis respectively, together with average pensions per annum. A long-standing feature is the substantial rise in the amount of average pensions, quadrennium by quadrennium. This feature was evident in the all age normal retirement data for 1995-98 but not in age groups below 70. A similar feature can be seen in the early retirement data where the 1995-98 experience shows lower average amounts for ages below 66. Average pensions for normal retirees were, in almost all cases, age for age greater than those for early retirees. Also, within each age group (except at the oldest ages) average pensions among the exposed to risk were greater than those for pensioners in the same group who had died. Both features have been noted before and form part of a now expected pattern.

2. FEMALE PENSIONERS

Tables PEN 2.1a, PEN 2.2a and PEN 2.3a, respectively, give the experience for the quadrennium 1995-98 on the basis of lives for normal retirements, early retirements and all retirements combined. Tables PEN 2.1b, PEN 2.2b and PEN 2.3b give the corresponding experience on the basis of amounts. Each table uses as a comparison the projected mortality rates for the calendar year 2010 from the PFA80 table. Each results table also uses, for 1995-98 only, a comparison basis of the projected mortality rates for the 2020 calendar year from the PFL92 or PFA92 mortality table, as appropriate. Tables PEN 2.4a and PEN 2.4b show, for normal retirements on an amounts or on a lives basis, year by year comparisons against the PFL92 or PFA92, as appropriate, mortality rates for the calendar year 1992. Tables PEN 2.4c and PEN 2.4d show the same information but, rather than use a fixed mortality rate comparison basis for each year, uses mortality rates that are projected to the same calendar year as used when collecting the data. Tables PEN 2.5a and PEN 2.5b show the size of the experiences together with the average pensions in payment.

In tables PEN 2.1a and PEN 2.1b it can be seen that the improvement in mortality among those retiring at or above the normal age, which was noted over earlier quadrennia, has continued into the current quadrennium. The gap between the level of mortality recorded on a lives basis and that recorded on an amounts basis, noted in the male experience, is present in the female experience also. It is smaller among the females than among the males.

The experience, on a lives and an amounts basis, measured against the projected rates year by year and shown in tables PEN 2.4c and PEN 2.4d, indicates that, overall, the projections issued with the PFA92 table are not unreasonable. Looked at age group by age group the experience is more volatile than the male experience and it is difficult to identify persistent trends.

The mortality experience of pensioners retiring before the normal age is shown in tables PEN 2.2a and PEN 2.2b (lives and amounts respectively). The improvement in mortality for this group, noted over previous quadrennia, has continued. Even so, the mortality level is still considerably higher than that recorded for normal retirees. On an age by age basis the difference is greatest at the younger ages and tails off as age increases, disappearing altogether by the mid 70s or so. As is the case with normal retirees, the gap between the experience on a lives basis and the experience on an amounts basis is smaller than the corresponding gap recorded in the male experience. All of these comments were made in *C.M.I.R.* **16** when reporting on the experience of 1991-94.

The level of mortality recorded for all pensioners combined shown in tables PEN 2.3a and PEN 2.3b (lives and amounts respectively) is, as would be expected, between that of the normal retirees and the early retirees.

The exposed to risk and deaths, on the basis of both lives and amounts, is shown for normal retirements in table PEN 2.5a and for early retirements in table PEN 2.5b, both of which also give average pensions. As was seen in the male experience, average pensions have continued to rise over time, as was noted in earlier quadrennia. They are, however, lower on average than those payable to their male counterparts. This almost certainly reflects the lower average salaries earned by women and a shorter than average period of qualifying service. Following the established pattern, average pensions paid to the normal retirees were, in almost all cases, age for age greater than those paid to the early retirees. Also, average pensions among the exposed to risk were generally greater than those for pensioners who had died.

3. WIDOWS OF PENSIONERS

Tables PEN 3.1a and PEN 3.1b show the mortality experience of pensioners' widows over the quadrennium 1995-98 on the basis of lives and amounts respec-

tively. Comparisons are shown on four bases. WA80 and PFA80 are used for each of 1987-90, 1991-94 and 1995-98 and in each case the projected rates for calendar year 2010 are used. For 1995-98 only, WL92 and PFL92 for lives and WA92 and PFA92 for amounts are also used and in these cases the calendar year of projection is 2020.

As can be seen from the tables, the mortality experienced by this group continues to improve. For all ages combined, on both a lives and an amounts basis, it is still heavier than that experienced by women drawing pensions in their own right who retired at or after their normal age. However, the excess is age related. For ages 41 to 80 the widows' mortality is the heavier, the difference tapering off as age increases. At ages over 80 the mortality of women drawing pensions in their own right is higher than that for widows.

4. WIDOWERS OF PENSIONERS

The experience for widowers is shown in tables PEN 4.1a and PEN 4.1b utilising the projected rates for the calendar year 2010 from the PMA80 table as a comparison basis. For 1995-98 only, the PML92 and PMA92 mortality rates projected to the calendar year 2020 are also used as a comparison basis. The experience is still very limited with only 136 deaths in total. On the lives basis there seems to have been some mortality improvement in almost all age groups. A similar but less clear pattern is observed for the amounts basis, a not unexpected result. The experience is still too small to allow firm conclusions to be drawn, apart from the overall indication that widowers experience heavier mortality than males drawing pensions in their own right.

Table PEN 1.1a. Pensioners, males, normal retirements, lives, 1995-98: actual deaths and ratios of actual deaths to those expected using the projected rates for calendar year 2020 from the PML92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the PMA80 table projected to calendar year 2010.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using PML92C20)	100A/E 1995-98 (using PMA80C10)	100A/E 1991-94 (using PMA80C10)	100A/E 1987-90 (using PMA80C10)
51-55	23	338	161	203	333
56-60	74	220	118	181	197
61-65	539	166	105	135	166
66-70	3,446	139	99	126	140
71-75	6,782	140	108	125	138
76-80	9,550	126	103	121	129
81-85	14,080	121	103	116	122
86-90	9,586	116	101	111	114
91-95	3,832	114	102	105	109
96-100	634	107	96	88	96
51-100	48,546	124	103	118	127

Table PEN 1.1b. Pensioners, males, normal retirements, amounts, 1995-98: actual deaths and ratios of actual deaths to those expected using the projected rates for calendar year 2020 from the PMA92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the PMA80 table projected to calendar year 2010.

Age group (nearest ages)	Actual deaths 1995-98 (£000 pa)	100A/E 1995-98 (using PMA92C20)	100A/E 1995-98 (using PMA80C10)	100A/E 1991-94 (using PMA80C10)	100A/E 1987-90 (using PMA80C10)
51-55	29	426	108	80	207
56-60	322	572	180	101	66
61-65	1,084	182	75	93	117
66-70	5,237	166	84	93	107
71-75	9,886	144	87	96	111
76-80	12,035	133	91	99	106
81-85	11,530	117	89	101	103
86-90	5,765	117	95	118	110
91-95	1,548	110	95	105	105
96-100	220	116	102	90	104
51-100	47,657	132	89	99	108

Table PEN 1.2a. Pensioners, males, early retirements, lives, 1995-98: actual deaths and ratios of actual deaths to those expected using the projected rates for calendar year 2020 from the PML92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the PMA80 table projected to calendar year 2010.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using PML92C20)	100A/E 1995-98 (using PMA80C10)	100A/E 1991-94 (using PMA80C10)	100A/E 1987-90 (using PMA80C10)	Ratio Early/ Normal[φ]
51-55	150	470	222	295	301	1.39
56-60	364	287	153	243	277	1.30
61-65	1,062	222	139	178	207	1.34
66-70	2,343	183	130	164	178	1.32
71-75	4,311	162	125	147	157	1.16
76-80	5,038	141	115	127	135	1.12
81-85	3,936	127	107	110	120	1.05
86-90	2,159	119	104	101	107	1.03
91-95	521	113	101	95	92	0.99
96-100	55	125	112	83	103	1.17
51-100	19,939	147	117	135	155	1.19

[φ] Ratio of 100A/E for early retirements to 100A/E for normal retirements 1995-98 using PML92C20 as the comparison basis.

Table PEN 1.2b. Pensioners, males, early retirements, amounts, 1995-98: actual deaths and ratios of actual deaths to those expected using the projected rates for calendar year 2020 from the PMA92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the PMA80 table projected to calendar year 2010.

Age group (nearest ages)	Actual deaths 1995-98 (£000 pa)	100A/E 1995-98 (using PMA92C20)	100A/E 1995-98 (using PMA80C10)	100A/E 1991-94 (using PMA80C10)	100A/E 1987-90 (using PMA80C10)	Ratio Early/ Normal[φ]
51-55	209	1,090	275	183	180	2.56
56-60	404	343	107	165	217	0.60
61-65	1,688	252	102	127	149	1.38
66-70	4,330	189	96	112	143	1.14
71-75	5,756	145	87	113	134	1.01
76-80	5,483	137	94	112	121	1.03
81-85	3,171	128	97	100	117	1.09
86-90	1,135	116	95	97	102	0.99
91-95	188	106	91	103	85	0.96
96-100	11	121	107	62	111	1.04
51-100	22,376	152	94	114	139	1.15

[φ] Ratio of 100A/E for early retirements to 100A/E for normal retirements 1995-98 using PMA92C20 as the comparison basis.

Table PEN 1.3a. Pensioners, males, normal and early retirements combined, lives, 1995-98: actual deaths and ratios of actual deaths to those expected using the projected rates for calendar year 2020 from the PML92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the PMA80 table projected to calendar year 2010.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using PML92C20)	100A/E 1995-98 (using PMA80C10)	100A/E 1991-94 (using PMA80C10)	100A/E 1987-90 (using PMA80C10)
51-55	173	447	212	272	304
56-60	438	273	146	226	269
61-65	1,601	199	126	161	196
66-70	5,789	154	109	139	155
71-75	11,093	148	114	132	143
76-80	14,588	131	107	122	130
81-85	18,016	122	104	115	121
86-90	11,745	117	102	110	113
91-95	4,353	114	102	105	108
96-100	689	108	97	88	96
51-100	68,485	130	107	122	134

Table PEN 1.3b. Pensioners, males, normal and early retirements combined, amounts, 1995-98: actual deaths and ratios of actual deaths to those expected using the projected rates for calendar year 2020 from the PMA92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the PMA80 table projected to calendar year 2010.

Age group (nearest ages)	Actual deaths 1995-98 (£000 pa)	100A/E 1995-98 (using PMA92C20)	100A/E 1995-98 (using PMA80C10)	100A/E 1991-94 (using PMA80C10)	100A/E 1987-90 (using PMA80C10)
51-55	238	915	231	132	185
56-60	726	417	130	137	193
61-65	2,772	219	89	110	138
66-70	9,567	176	89	99	120
71-75	15,642	144	87	101	117
76-80	17,519	134	92	102	109
81-85	14,702	120	91	101	105
86-90	6,900	117	95	115	109
91-95	1,736	109	94	105	104
96-100	231	116	102	88	104
51-100	70,033	138	91	103	117

Table PEN 1.4a. Pensioners, males, normal retirements, lives, 1983-98: actual deaths for individual years expressed as a percentage of those expected using the base (1992) rates from the PML92 table.

Age group (nearest ages)	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
61-65	133	122	146	122	138	124	120	114	115	96	98	104	88	80	72	77
66-70	126	120	116	112	114	109	102	101	105	99	94	88	80	79	69	72
71-75	120	117	116	109	115	114	107	100	99	103	98	96	95	86	79	82
76-80	116	112	115	111	110	108	105	104	105	99	100	95	91	89	81	82
81-85	114	116	115	110	113	105	104	103	103	103	102	95	94	90	88	88
86-90	116	107	113	112	108	105	104	100	103	102	102	96	98	96	89	89
91-95	113	103	113	100	104	107	106	98	101	99	100	103	102	96	96	94
96-100	88	115	119	111	95	102	98	101	101	78	84	91	119	77	89	100
61-100	118	115	116	110	112	109	105	102	103	101	100	95	94	89	84	86

Table PEN 1.4b. Pensioners, males, normal retirements, amounts, 1983-98: actual deaths for individual years expressed as a percentage of those expected using the base (1992) rates from the PMA92 table.

Age group (nearest ages)	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
61-65	155	181	172	187	123	137	133	162	107	105	113	109	100	88	83	58
66-70	139	144	135	120	114	123	120	103	116	102	93	88	96	91	92	74
71-75	123	123	125	111	121	109	114	108	98	103	94	102	104	85	80	82
76-80	126	111	110	117	109	107	104	100	108	94	95	85	97	91	83	90
81-85	122	123	115	106	107	97	104	91	110	97	95	92	88	92	85	84
86-90	121	111	114	109	115	110	104	101	135	125	111	97	109	91	87	88
91-95	111	117	127	104	104	96	119	88	113	124	91	96	102	101	100	76
96-100	122	105	154	88	108	116	113	84	120	91	66	92	140	76	108	97
61-100	128	125	123	116	114	110	111	103	109	101	96	93	98	90	85	85

Table PEN 1.4c. Pensioners, males, normal retirements, lives, 1992-98: actual deaths for individual years expressed as a percentage of those expected using the projected rates for the relevant calendar year from the PML92 table.

Age group (nearest ages)	1992	1993	1994	1995	1996	1997	1998
61-65	96	101	111	96	90	83	91
66-70	99	97	92	87	87	78	84
71-75	103	100	100	101	93	88	93
76-80	99	101	99	96	95	87	90
81-85	103	104	97	97	94	94	95
86-90	102	104	98	101	100	93	94
91-95	99	101	105	105	99	99	98
96-100	78	84	92	121	79	91	103
61-100	101	102	98	98	95	90	93

Table PEN 1.4d. Pensioners, males, normal retirements, amounts, 1992-98: actual deaths for individual years expressed as a percentage of those expected using the projected rates for the relevant calendar year from the PMA92 table.

Age group (nearest ages)	1992	1993	1994	1995	1996	1997	1998
61-65	105	116	116	110	99	96	69
66-70	102	95	93	104	101	105	86
71-75	103	96	107	111	92	89	93
76-80	94	97	88	102	97	90	100
81-85	97	96	95	91	97	91	91
86-90	125	112	99	112	95	92	94
91-95	124	92	98	104	104	104	80
96-100	91	67	93	142	77	110	99
61-100	101	98	97	103	96	93	93

Table PEN 1.5a. Pensioners, males, normal retirements, 1995-98: exposed to risk, deaths and average pensions.

	Exposed to risk			Deaths		
Age group (nearest ages)	Lives	Amounts (£000 pa)	Average Pension (£pa)	Lives	Amounts (£000 pa)	Average Pension (£pa)
51-55	4,277	7,998	1,870	23	29	1,276
56-60	10,683	30,195	2,827	74	322	4,351
61-65	46,747	135,337	2,895	539	1,084	2,011
66-70	186,613	332,914	1,784	3,446	5,237	1,520
71-75	186,187	340,180	1,827	6,782	9,886	1,458
76-80	161,140	233,588	1,450	9,550	12,035	1,260
81-85	147,052	140,884	958	14,080	11,530	819
86-90	67,335	43,603	648	9,586	5,765	601
91-95	18,645	8,148	437	3,832	1,548	404
96-100	2,404	783	326	634	220	347
51-100	831,083	1,273,629	1,532	48,546	47,657	982

Table PEN 1.5b. Pensioners, males, early retirements, 1995-98: exposed to risk, deaths and average pensions.

	Exposed to risk			Deaths		
Age group (nearest ages)	Lives	Amounts (£000 pa)	Average Pension (£pa)	Lives	Amounts (£000 pa)	Average Pension (£pa)
51-55	20,033	22,395	1,118	150	209	1,393
56-60	41,238	64,603	1,567	364	404	1,111
61-65	73,543	156,886	2,133	1,062	1,688	1,590
66-70	95,443	239,601	2,510	2,343	4,330	1,848
71-75	101,874	198,876	1,952	4,311	5,756	1,335
76-80	77,758	105,855	1,361	5,038	5,483	1,088
81-85	39,867	36,125	906	3,936	3,171	806
86-90	14,868	8,655	582	2,159	1,135	526
91-95	2,606	1,054	404	521	188	361
96-100	180	39	214	55	11	205
51-100	467,410	834,088	1,784	19,939	22,376	1,122

Table PEN 2.1a. Pensioners, females, normal retirements, lives, 1995-98: actual deaths and ratios of actual deaths to those expected using the projected rates for calendar year 2020 from the PFL92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the PFA80 table projected to calendar year 2010.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using PFL92C20)	100A/E 1995-98 (using PFA80C10)	100A/E 1991-94 (using PFA80C10)	100A/E 1987-90 (using PFA80C10)
51-55	9	333*	164*	321	267*
56-60	36	194	111	218	201
61-65	297	145	101	164	179
66-70	834	160	135	160	168
71-75	1,500	130	118	143	152
76-80	2,348	129	114	124	128
81-85	2,716	124	106	117	117
86-90	2,643	124	108	108	115
91-95	1,500	119	111	117	120
96-100	390	108	111	122	127
51-100	12,273	127	112	125	132

* Ratio based on fewer than 10 actual deaths.

Table PEN 2.1b. Pensioners, females, normal retirements, amounts, 1995-98: actual deaths and ratios of actual deaths to those expected using the projected rates for calendar year 2020 from the PFA92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the PFA80 table projected to calendar year 2010.

Age group (nearest ages)	Actual deaths 1995-98 (£000 pa)	100A/E 1995-98 (using PFA92C20)	100A/E 1995-98 (using PFA80C10)	100A/E 1991-94 (using PFA80C10)	100A/E 1987-90 (using PFA80C10)
51-55	3	106*	42*	309	926*
56-60	64	325	156	112	130
61-65	288	142	85	147	166
66-70	957	157	116	128	132
71-75	1,299	116	92	141	123
76-80	1,703	138	108	101	121
81-85	1,166	121	91	103	110
86-90	908	146	111	101	113
91-95	340	136	109	119	130
96-100	62	94	83	136	128
51-100	6,790	133	101	120	127

* Ratio based on fewer than 10 actual deaths.

Table PEN 2.2a. Pensioners, females, early retirements, lives, 1995-98: actual deaths and ratios of actual deaths to those expected using the projected rates for calendar year 2020 from the PFL92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the PFA80 table projected to calendar year 2010.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using PFL92C20)	100A/E 1995-98 (using PFA80C10)	100A/E 1991-94 (using PFA80C10)	100A/E 1987-90 (using PFA80C10)	Ratio Early/ Normal[φ]
51-55	43	483	234	314	317	1.45
56-60	126	332	187	270	257	1.71
61-65	226	202	140	218	227	1.39
66-70	444	193	163	178	217	1.21
71-75	728	172	156	157	160	1.32
76-80	537	129	114	127	126	1.00
81-85	462	125	107	102	116	1.01
86-90	315	124	107	109	111	1.00
91-95	140	119	110	100	115	1.00
96-100	23	92	95	142	73*	0.85
51-100	3,044	153	131	144	167	1.20

[φ] Ratio of 100A/E for early retirements to 100A/E for normal retirements 1995-98 using PFL92C20 as the comparison basis.

* Ratio based on fewer than 10 actual deaths.

Table PEN 2.2b. Pensioners, females, early retirements, amounts, 1995-98: actual deaths and ratios of actual deaths to those expected using the projected rates for calendar year 2020 from the PFA92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the PFA80 table projected to calendar year 2010.

Age group (nearest ages)	Actual deaths 1995-98 (£000 pa)	100A/E 1995-98 (using PFA92C20)	100A/E 1995-98 (using PFA80C10)	100A/E 1991-94 (using PFA80C10)	100A/E 1987-90 (using PFA80C10)	Ratio Early/ Normal[φ]
51-55	42	672	267	501	171	6.34
56-60	83	256	122	279	173	0.79
61-65	558	520	308	199	203	3.66
66-70	347	175	128	144	173	1.11
71-75	412	163	129	128	131	1.41
76-80	222	130	101	135	94	0.94
81-85	120	110	83	84	90	0.91
86-90	62	127	96	107	123	0.87
91-95	33	234	187	71	173	1.72
96-100	1	110	97	113	100*	1.17
51-100	1,879	200	145	157	157	1.50

[φ] Ratio of 100A/E for early retirements to 100A/E for normal retirements 1995-98 using PFA92C20 as the comparison basis.

* Ratio based on fewer than 10 actual deaths.

Table PEN 2.3a. Pensioners, females, normal and early retirements combined, lives, 1995-98: actual deaths and ratios of actual deaths to those expected using the projected rates for calendar year 2020 from the PFL92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the PFA80 table projected to calendar year 2010.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using PFL92C20)	100A/E 1995-98 (using PFA80C10)	100A/E 1991-94 (using PFA80C10)	100A/E 1987-90 (using PFA80C10)
51-55	52	448	218	316	308
56-60	162	287	162	250	242
61-65	523	165	114	181	196
66-70	1,278	170	144	165	179
71-75	2,228	141	128	145	153
76-80	2,885	129	114	125	128
81-85	3,178	124	106	115	117
86-90	2,958	124	108	108	115
91-95	1,640	119	111	116	119
96-100	413	107	110	124	124
51-100	15,317	131	115	128	137

Table PEN 2.3b. Pensioners, females, normal and early retirements combined, amounts, 1995-98: actual deaths and ratios of actual deaths to those expected using the projected rates for calendar year 2020 from the PFA92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the PFA80 table projected to calendar year 2010.

Age group (nearest ages)	Actual deaths 1995-98 (£000 pa)	100A/E 1995-98 (using PFA92C20)	100A/E 1995-98 (using PFA80C10)	100A/E 1991-94 (using PFA80C10)	100A/E 1987-90 (using PFA80C10)
51-55	45	480	191	407	339
56-60	146	282	134	202	159
61-65	846	273	162	159	176
66-70	1,304	162	119	131	140
71-75	1,711	124	99	139	124
76-80	1,924	137	107	104	119
81-85	1,286	120	90	102	109
86-90	971	145	110	102	114
91-95	373	141	114	117	132
96-100	63	95	83	134	127
51-100	8,669	144	108	126	132

Table PEN 2.4a. Pensioners, females, normal retirements, lives, 1983-98: actual deaths for individual years expressed as a percentage of those expected using the base (1992) rates from the PFL92 table.

Age group (nearest ages)	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
61-65	132	139	134	108	124	131	126	92	116	141	88	94	75	66	51	85
66-70	116	107	101	97	116	108	104	101	109	107	92	98	79	85	94	92
71-75	100	94	95	97	109	94	108	101	103	106	90	85	90	76	67	90
76-80	107	98	99	96	99	95	100	100	102	99	89	91	99	86	84	82
81-85	101	103	106	109	97	101	103	99	109	109	94	93	96	94	91	87
86-90	115	99	106	115	105	104	106	108	108	106	96	90	100	104	92	102
91-95	102	142	122	121	106	108	123	106	120	111	102	100	108	99	92	108
96-100	94*	92	106	115	90	123	119	106	118	101	103	103	103	85	108	92
61-100	108	104	104	104	105	102	106	102	108	107	93	92	96	90	86	92

* Ratio based on fewer than 10 actual deaths.

Table PEN 2.4b. Pensioners, females, normal retirements, amounts, 1983-98: actual deaths for individual years expressed as a percentage of those expected using the base (1992) rates from the PFA92 table.

Age group (nearest ages)	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
61-65	151	155	144	99	159	145	114	102	97	128	99	134	70	77	44	87
66-70	149	100	86	80	126	103	93	75	98	128	72	73	66	84	94	107
71-75	96	97	102	96	97	80	104	97	85	115	105	104	85	71	55	75
76-80	102	113	107	80	98	96	113	110	109	76	82	82	101	95	80	101
81-85	100	100	110	95	106	109	118	96	129	101	75	111	93	88	81	97
86-90	142	114	125	119	111	111	121	132	135	114	97	90	97	142	124	102
91-95	102	215	154	109	150	139	134	134	145	123	125	110	145	107	101	114
96-100	91*	218	144	113	111	139	161	101	231	151	86	89	106	99	96	53
61-100	118	114	110	92	115	105	109	99	106	109	89	96	89	90	79	95

* Ratio based on fewer than 10 actual deaths.

Table PEN 2.4c. Pensioners, females, normal retirements, lives, 1992-98: actual deaths for individual years expressed as a percentage of those expected using the projected rates for the relevant calendar year from the PFL92 table.

Age group (nearest ages)	1992	1993	1994	1995	1996	1997	1998
61-65	141	91	100	83	75	59	102
66-70	107	94	103	85	94	106	107
71-75	106	92	88	96	82	74	101
76-80	99	91	95	104	92	91	90
81-85	109	95	96	100	99	97	94
86-90	106	97	91	103	108	97	108
91-95	111	103	102	110	102	95	112
96-100	101	103	104	104	87	110	94
61-100	107	95	95	100	96	92	100

Table PEN 2.4d. Pensioners, females, normal retirements, amounts, 1992-98: actual deaths for individual years expressed as a percentage of those expected using the projected rates for the relevant calendar year from the PFA92 table.

Age group (nearest ages)	1992	1993	1994	1995	1996	1997	1998
61-65	128	102	142	76	87	52	104
66-70	128	74	76	71	93	107	124
71-75	115	107	108	91	77	61	85
76-80	76	83	85	106	102	87	112
81-85	101	76	114	97	93	86	105
86-90	114	98	92	100	148	131	108
91-95	123	126	111	148	110	105	118
96-100	151	87	90	107	101	99	55
61-100	109	91	100	94	97	87	105

Table PEN 2.5a. Pensioners, females, normal retirements, 1995-98: exposed to risk, deaths and average pensions.

Age group (nearest ages)	Exposed to risk			Deaths		
	Lives	Amounts (£000 pa)	Average Pension (£pa)	Lives	Amounts (£000 pa)	Average Pension (£pa)
51-55	2,807	4,158	1,482	9	3	380
56-60	9,332	11,917	1,277	36	64	1,772
61-65	53,306	60,802	1,141	297	288	970
66-70	63,833	85,311	1,336	834	957	1,147
71-75	69,590	79,119	1,137	1,500	1,299	866
76-80	60,612	47,310	781	2,348	1,703	725
81-85	40,615	20,714	510	2,716	1,166	429
86-90	23,824	8,071	339	2,643	908	344
91-95	9,044	2,075	229	1,500	340	227
96-100	1,779	380	214	390	62	159
51-100	334,740	319,858	956	12,273	6,790	553

Table PEN 2.5b. Pensioners, females, early retirements, 1995-98: exposed to risk, deaths and average pensions.

Age group (nearest ages)	Exposed to risk			Deaths		
	Lives	Amounts (£000 pa)	Average Pension (£pa)	Lives	Amounts (£000 pa)	Average Pension (£pa)
51-55	9,222	7,889	855	43	42	978
56-60	20,512	20,493	999	126	83	656
61-65	29,431	32,877	1,117	226	558	2,468
66-70	28,244	28,516	1,010	444	347	782
71-75	26,130	18,210	697	728	412	566
76-80	14,110	6,698	475	537	222	413
81-85	6,917	2,341	338	462	120	259
86-90	2,879	648	225	315	62	198
91-95	848	121	143	140	33	236
96-100	123	7	57	23	1	59
51-100	138,415	117,801	851	3,044	1,879	617

Table PEN 3.1a. Widows, lives, 1995-98: actual deaths and ratios of actual deaths to those expected using the projected rates for calendar year 2020 from the WL92 and PFL92 tables, together with comparisons of 1995-98, 1991-94 and 1987-90 using the WA80 and PFA80 tables projected to calendar year 2010.

Age group (nearest ages)	Actual deaths 1995-98	100A/E WL92C20 1995-98	100A/E PFL92C20 1995-98	100A/E using WA80C10			100A/E using PFA80C10		
				1995-98	1991-94	1987-90	1995-98	1991-94	1987-90
41-50	10	161	526	141	167	229	208	250	339
51-55	24	199	480	158	152	172	232	224	253
56-60	58	201	381	147	208	157	214	302	228
61-65	128	142	215	105	146	148	150	210	213
66-70	502	173	217	131	144	132	185	204	187
71-75	1,023	140	152	106	125	125	138	163	163
76-80	1,568	137	134	103	112	105	119	128	122
81-85	1,740	131	120	97	99	113	103	105	120
86-90	1,088	129	115	93	97	100	99	104	107
91-95	463	133	119	100	79	103	110	87	114
96-100	75	103	95	89	97	109	98	106	120
41-100	6,679	136	133	102	112	117	116	130	140

Table PEN 3.1b. Widows, amounts, 1995-98: actual deaths and ratios of actual deaths to those expected using the projected rates for calendar year 2020 from the WA92 and PFA92 tables, together with comparisons of 1995-98, 1991-94 and 1987-90 using the WA80 and PFA80 tables projected to calendar year 2010.

Age group (nearest ages)	Actual deaths 1995-98	100A/E WL92C20 1995-98	100A/E PFL92C20 1995-98	100A/E using WA80C10			100A/E using PFA80C10		
				1995-98	1991-94	1987-90	1995-98	1991-94	1987-90
41-50	18	147	493	108	135	206	160	201	307
51-55	32	140	351	94	177	198	138	260	291
56-60	58	120	231	75	194	110	109	283	159
61-65	210	167	257	107	138	182	154	197	261
66-70	543	148	189	98	115	107	139	163	152
71-75	1,081	129	142	87	121	99	113	158	129
76-80	1,642	137	137	93	95	97	107	109	112
81-85	1,795	138	131	93	87	99	99	93	105
86-90	1,217	156	147	105	99	109	112	105	117
91-95	336	137	132	96	84	71	106	93	78
96-100	37	87	89	72	121	131	79	132	144
41-100	6,970	140	144	94	106	109	109	127	135

Table PEN 3.2. Widows, 1995-98: exposed to risk, deaths and average pensions.

Age group (nearest ages)	Exposed to risk			Deaths		
	Lives	Amounts (£000 pa)	Average Pension (£pa)	Lives	Amounts (£000 pa)	Average Pension (£pa)
51-55	5,306	12,047	2,270	24	32	1,348
56-60	8,290	16,260	1,961	58	58	995
61-65	15,026	24,395	1,624	128	210	1,640
66-70	27,508	39,830	1,448	502	543	1,083
71-75	40,457	52,216	1,291	1,023	1,081	1,057
76-80	38,569	45,016	1,167	1,568	1,642	1,047
81-85	27,079	29,066	1,073	1,740	1,795	1,032
86-90	10,800	10,751	995	1,088	1,217	1,118
91-95	2,827	2,180	771	463	336	726
96-100	392	241	617	75	37	495
51-100	176,254	232,001	1,316	6,669	6,952	1,042

Table PEN 4.1a. Widowers, lives, 1995-98: actual deaths and ratios of actual deaths to those expected using the projected rates for calendar year 2020 from the PML92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the PMA80 tables projected to calendar year 2010.

Age group (nearest ages)	Actual deaths 1995-98	100A/E 1995-98 (using PML92C20)	100A/E 1995-98 (using PMA80C10)	100A/E 1991-94 (using PMA80C10)	100A/E 1987-90 (using PMA80C10)
61-65	9	310*	191*	250*	296*
66-70	16	165	118	191	179
71-75	45	170	132	157	170
76-80	40	108	88	127	190
81-85	15	44	37	81*	303
86-90	11	80	70	170*	333
61-90	136	110	89	151	237

* Ratio based on fewer than 10 actual deaths.

Table PEN 4.1b. Widowers, amounts, 1995-98: actual deaths and ratios of actual deaths to those expected using the projected rates for calendar year 2020 from the PMA92 table, together with comparisons of 1995-98, 1991-94 and 1987-90 using the PMA80 tables projected to calendar year 2010.

Age group (nearest ages)	Actual deaths 1995-98 (£000 pa)	100A/E 1995-98 (using PMA92C20)	100A/E 1995-98 (using PMA80C10)	100A/E 1991-94 (using PMA80C10)	100A/E 1987-90 (using PMA80C10)
61-65	12	600*	242*	142*	166*
66-70	14	196	99	139	87
71-75	41	236	144	38	147
76-80	40	170	116	230	85
81-85	22	75	57	62*	168
86-90	16	132	109	72*	260
61-90	145	159	107	114	136

* Ratio based on fewer than 10 actual deaths.

Table PEN 4.2. Widowers, 1995-98: exposed to risk, deaths and average pensions.

	Exposed to risk			Deaths		
Age group (nearest ages)	Lives	Amounts (£000 pa)	Average Pension (£pa)	Lives	Amounts (£000 pa)	Average Pension (£pa)
51-55	213	391	1,834	4	10	2,509
56-60	330	447	1,355	7	4	594
61-65	452	478	1,059	9	12	1,322
66-70	720	763	1,059	16	14	890
71-75	998	818	820	45	41	913
76-80	806	627	779	40	40	1,003
81-85	436	417	956	15	22	1,448
86-90	115	105	918	11	16	1,488
91-95	25	45	1,853	4	2	542
96-100	5	4	706	1	1	673
51-100	4,099	4,096	999	152	162	1,069

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THE MORTALITY OF SMOKERS AND NON-SMOKERS 1995-1998

The investigation by the Bureau into the comparative mortality of smokers and non-smokers was started on 1 January 1988 and a report on the experience for 1988-90 was published in *C.M.I.R.* **14**. The present report, for the period 1995-98, is therefore only the second to cover data for a full quadrennium. The first was in *C.M.I.R.* **16**, which reported on the experience for 1991-94. The offices which contribute data split by smoking status form a subset of all the contributing offices.

Number of offices contributing in period[φ]	Investigation		
	Permanent Assurances	Temporary Assurances	Joint Life Assurances
Smoker differentiated data			
1995-98	10(6)	17(9)	5(3)
1991-94	9(6)	17(9)	5(3)
1988-90	6(4)	9(5)	-
All data			
1995-98	31(20)	28(18)	11(8)
1991-94	39(31)	35(28)	10(9)
1988-90	40(35)	34(31)	8(6)

[φ] For each period the number in brackets is the number of offices which contributed data throughout the relevant period.

Table SMOK 0.1 shows the development of the exposed to risk in each of the investigations.

The categorisation of the data into 'smoker' and 'non-smoker' is linked primarily to the terms upon which the policies were issued. 'Non-smokers' are those where preferential terms have been offered on account of their non-smoking status. This may be a monetary or percentage reduction against the standard premium or the use of an age deduction when determining the premium rate. 'Smokers' are those whose smoking habits do not conform to the criteria for non-smoking terms.

The definition of 'non-smoker' may vary from office to office and may be changing over time but it is likely that the majority of this business was written on the basis that the proposer has not smoked cigarettes for at least twelve months prior to the date of the proposal. At the shorter durations a stricter definition may be in use by many offices. For 'smokers' there is no information on

the number of cigarettes smoked but very heavy smokers will probably have been rated or declined, and so fall outside this investigation.

The report includes sections, for both males and females, on the experience of holders of permanent (whole life and endowment) assurances, temporary assurances on single lives, and joint life first death assurances.

1. ASSURANCES ON MALE LIVES

1.1 *Permanent assurances*

The exposed to risk over the quadrennium was 591,936 in the smoker category and 1,969,309 in the non-smoker category, a ratio of 3.3 to 1 in favour of non-smokers compared with ratios of 2.9 and 2.2 to 1 in 1991-94 and 1988-90 respectively.

The experiences for 1995-98 and 1991-94 are shown in tables SMOK 1.1a and SMOK 1.1b respectively. In each case the comparison basis is the AM92 table. At duration 0 and at duration 1 the 1995-98 smoker mortality experience is broadly similar to that recorded in 1991-94 while, comparing the same two periods, higher levels of mortality have been observed in the latest non-smoker experience. Consequently, for both these durations, the Excess Mortality Index is lower in 1995-98 than was the case in 1991-94. At durations 2 and over the mortality rate observed for all ages in the smoker experience is higher in 1995-98 than in 1991-94 although when comparing individual age groups the results are mixed. At the same duration in the non-smoker experience for all ages combined the mortality rates are similar in the two quadrennia. However, below age 80 the experience of 1995-98 is lighter than that of 1991-94 with the reverse being true at older ages. The resulting values of the Excess Mortality Index are generally higher in 1995-98 than in 1991-94.

The improvement in mortality between 1991-94 and 1995-98 that has been observed in the main combined assured lives experiences (see pp 1 to 36) is not apparent at any duration in either the smoker or non-smoker experiences when making similar comparisons between the same two periods. This feature was noted in *C.M.I.R.* **16**, which reported on the smoker and non-smoker experiences of 1991-94 compared to those of 1988-90. *C.M.I.R.* **16** suggested reasons for this observation that may still be valid.

> *"This may partly be explained by the increasing average duration of the policies in force in the smoker and non-smoker investigation, compared to a more stable durational distribution in the combined investigation. It could also be partly due to the different mix of offices in the smoker and non-smoker investigation. It may also be the case that the improvement in the aggregate mortality of all insured lives is due, in part, to the reduced proportion of lives who smoke."*

A further feature that should be noted is the underlying change in the amount of exposed to risk between 1995-98 and 1991-94. Table ASS 0.1 shows a reduction of 25% in the exposed to risk of the main males assured lives investigation whilst SMOK 0.1 shows the equivalent non-smoker experience exposed to risk increasing by some 45%. Given this, it is difficult to draw any firm conclusions about the underlying comparative mortality trends in the smoker investigations and the results reported here should be used with care.

1.2 *Temporary assurances*

The exposed to risk for smokers was 307,271 and for non-smokers was 1,351,892, a ratio of 4.4 to 1 compared to 4.7 to 1 in 1991-94. The results for 1995-98 and 1991-94 are shown in tables SMOK 1.2a and SMOK 1.2b respectively. In each case the comparison basis is the TM92 table.

At all durations the levels of mortality seen in 1995-98 in both the smoker and non-smoker experiences have improved over the levels observed in 1991-94. At duration 0 and at durations 5 and over the mortality differential between smokers and non-smokers, as measured by the Excess Mortality Index, is lower in 1995-98 than in 1991-94. At durations 1 to 4 the reverse is true with the Excess Mortality Index being higher in 1995-98.

1.3 *Joint life first death assurances*

The exposed to risk for smokers was 275,078 and for non-smokers was 908,051, a ratio of 3.3 to 1 compared to 3.4 to 1 in 1991-94. The experiences for 1995-98 and 1991-94 are shown in table SMOK 1.3a and SMOK 1.3b respectively. The comparison basis is the AM92 table.

At durations 2 and over a very similar pattern of results is seen in this experience to that observed in the permanent assurances, although the Excess Mortality Index for 1995-98 has fallen slightly from its 1991-94 level. At duration 0 and at duration 1 the experience is small and, other than the observation that mortality rates for smokers are higher than rates for non-smokers, little can be said.

2. ASSURANCES ON FEMALE LIVES

2.1 *Permanent assurances*

The exposed to risk for smokers was 467,765 and for non-smokers was 1,823,148. The ratio of exposed to risk of the non-smoker category to the smoker category is 3.9 to 1 in favour of non-smokers. The corresponding ratio in 1991-94 was 3.8 to 1 and in 1988-90 was 3.2 to 1. The experiences for 1995-98 and 1991-94 are shown in tables SMOK 2.1a and SMOK 2.1b respectively. The comparison basis is the AF92 table.

There has been a noticeable deterioration in mortality at duration 0 and at duration 1 in 1995-98 when compared with 1991-94 in both the smoker and non-smoker experiences. When comparing the experience of the same quadrennia at durations 2 and over a smaller deterioration in the smoker mortality rates can be seen, but the non-smoker rates are broadly unchanged. At duration 1 and durations 2 and over the Excess Mortality Index has increased in 1995-98 compared with 1991-94 but at duration 0 the reverse applies.

2.2 *Temporary assurances*

The exposed to risk for smokers was 245,957 and for non-smokers was 1,063,271, a ratio of 4.3 to 1 compared to 4.0 to 1 in 1991-94. The results are shown in tables SMOK 2.2a and SMOK 2.2b for 1995-98 and 1991-94 respectively. The comparison basis is the TF92 table. In previous reports (see *C.M.I.R.* **16** for 1991-94 and *C.M.I.R.* **14** for 1988-90) it had been observed that, in contrast to the male experience, the Excess Mortality Index was, at all durations, significantly lower for temporary assurances than for permanent assurances. It is interesting to note that, for 1995-98, this feature is no longer evident at duration 0 and durations 5 and over.

2.3 *Joint life first death assurances*

The exposed to risk for smokers was 209,134 and for non-smokers was 975,791, a ratio of 4.7 to 1 compared to 5.0 to 1 in 1991-94. The experience for 1995-98 is shown in table SMOK 2.3a, with table SMOK 2.3b showing the 1991-94 experience. The comparison basis is the AF92 table. This experience is now larger than in 1991-94 but the overall results are similar to that experience. Apart from duration 0, where the number of deaths is small, the Excess Mortality Index is lower overall for the joint life experience than for the corresponding single life experience.

3. CONCLUSION

Table SMOK 3.1 shows summary results for the 1995-98 quadrennium and compares them with the equivalent results for the 1991-94 period. The six experiences making up this investigation are each large enough to provide statistically meaningful results. When examining these experiences and comparing them with the undifferentiated experiences the different mix of offices and the increasing average duration of the policies in force must be borne in mind. However, the conclusion to the 1988-90 report in *C.M.I.R.* **14** "that, for this data pool at least, smoking as an indicator is linked to a very serious additional mortality risk" remains inescapable.

SMOK 0.1. Amounts of exposed to risk for the periods 1995-98, 1991-94 and 1988-90 for smokers and non-smokers.

	Exposed to Risk		
Investigation	1995-98	1991-94	1988-90
Males, smoker			
Permanent, single life assurances	591,936	473,454	326,227
Temporary assurances	307,271	225,220	72,078
Joint life assurances	275,078	199,916	-
Females, smoker			
Permanent, single life assurances	467,765	284,229	152,793
Temporary assurances	245,957	175,980	38,312
Joint life assurances	209,134	146,924	-
Males, non-smoker			
Permanent, single life assurances	1,969,309	1,358,771	706,896
Temporary assurances	1,351,892	1,057,648	201,242
Joint life assurances	908,051	680,360	-
Females, non-smoker			
Permanent, single life assurances	1,823,148	1,067,012	481,702
Temporary assurances	1,063,271	696,428	125,642
Joint life assurances	975,791	735,674	-

SMOK 1.1a. Permanent assurances (non-linked), males, full underwriting, 1995-98: actual deaths for smokers and non-smokers and ratios of actual deaths to those expected using the AM92 table.

Age group (nearest ages)	Smokers		Non-smokers		Excess Mortality Index[φ] (per cent)
	Actual deaths	100A/E	Actual deaths	100A/E	
Duration 0					
21-50	27	160	51	99	62
51-60	38	229	30	77	197
61-70	47	177	66	89	99
71-80	16	145	42	94	54
21-80	128	180	189	90	100
Duration 1					
21-50	29	137	53	72	90
51-60	51	223	50	79	182
61-70	61	150	103	85	76
71-80	29	169	72	95	78
21-80	170	167	278	83	101
Durations 2+					
21-30	31	100	135	87	15
31-35	47	125	144	94	33
36-40	71	150	134	75	100
41-45	97	133	170	71	87
46-50	206	135	312	72	88
51-55	376	146	478	74	97
56-60	494	137	592	65	111
61-65	522	132	704	67	97
66-70	434	147	658	69	113
71-75	335	142	691	73	95
76-80	181	142	451	75	89
81-85	102	118	312	93	27
86-90	47	120	95	82	46
21-90	2,943	138	4,876	73	89

[φ] The percentage by which the Standardised Mortality Ratio for smokers exceeds the corresponding ratio for non-smokers, i.e. 100 x (100A/E Smokers / 100A/E Non-smokers – 1).

SMOK 1.1b. Permanent assurances (non-linked), males, full underwriting, 1991-94: actual deaths for smokers and non-smokers and ratios of actual deaths to those expected using the AM92 table.

Age group (nearest ages)	Smokers		Non-smokers		Excess Mortality Index[ϕ] (per cent)
	Actual deaths	100A/E	Actual deaths	100A/E	
Duration 0					
21-50	39	142	64	70	103
51-60	34	187	39	64	192
61-70	40	226	57	83	172
71-80	8	167*	19	69	142
21-80	121	177	179	72	146
Duration 1					
21-50	52	169	86	82	106
51-60	38	150	60	70	114
61-70	41	171	58	60	185
71-80	12	174	31	73	138
21-80	143	165	235	71	132
Durations 2+					
21-30	32	130	102	94	38
31-35	32	142	78	94	51
36-40	39	121	88	88	38
41-45	95	148	142	87	70
46-50	198	163	193	77	112
51-55	196	112	261	77	45
56-60	319	124	358	68	82
61-65	325	129	348	70	84
66-70	161	118	272	69	71
71-75	124	141	237	74	91
76-80	75	117	152	72	63
81-85	55	114	96	75	52
86-90	32	93	18	58	60
21-90	1,683	127	2,345	74	72

[ϕ] The percentage by which the Standardised Mortality Ratio for smokers exceeds the corresponding ratio for non-smokers, i.e. 100 x (100A/E Smokers / 100A/E Non-smokers – 1).

* Ratio based on fewer than 10 actual deaths.

SMOK 1.2a. Temporary assurances, males, full underwriting, 1995-98: actual deaths for smokers and non-smokers and ratios of actual deaths to those expected using the TM92 table.

Age group (nearest ages)	Smokers		Non-smokers		Excess Mortality Index[φ] (per cent)
	Actual deaths	100A/E	Actual deaths	100A/E	
Duration 0					
26-40	12	80	33	67	19
41-55	21	93	53	48	94
56-70	13	105	57	73	44
26-70	46	92	143	60	53
Durations 1-4					
26-30	13	130	19	59	120
31-35	14	94	27	51	84
36-40	14	81	48	67	21
41-45	32	145	61	61	138
46-50	72	222	96	57	289
51-55	58	159	129	63	152
56-60	54	176	115	61	189
61-65	28	131	109	77	70
66-70	35	267	53	63	324
71-75	13	220	39	91	142
26-75	333	163	696	64	155
Durations 5+					
26-35	16	158	24	64	147
36-40	25	158	52	80	98
41-45	29	106	86	73	45
46-50	59	124	158	67	85
51-55	102	165	216	69	139
56-60	83	137	234	70	96
61-65	71	146	187	65	125
66-70	33	141	99	75	88
71-75	15	170	53	79	115
26-75	433	142	1,109	70	103

[φ] The percentage by which the Standardised Mortality Ratio for smokers exceeds the corresponding ratio for non-smokers, i.e. 100 x (100A/E Smokers / 100A/E Non-smokers – 1).

SMOK 1.2b. Temporary assurances, males, full underwriting, 1991-94: actual deaths for smokers and non-smokers and ratios of actual deaths to those expected using the TM92 table.

Age group (nearest ages)	Smokers		Non-smokers		Excess Mortality Index[ϕ] (per cent)
	Actual deaths	100A/E	Actual deaths	100A/E	
Duration 0					
26-40	12	95	26	65	46
41-55	33	142	100	93	53
56-70	22	163	56	70	133
26-70	67	136	182	80	70
Durations 1-4					
26-30	12	138	23	84	64
31-35	16	128	30	69	86
36-40	20	123	55	90	37
41-45	40	166	97	94	77
46-50	57	175	130	86	103
51-55	62	199	121	77	158
56-60	48	178	116	71	151
61-65	42	203	102	83	145
66-70	21	212	52	74	186
71-75	9	237*	30	87	172
26-75	327	175	756	81	116
Durations 5+					
26-35	12	130	23	73	78
36-40	19	162	46	102	59
41-45	35	178	66	80	123
46-50	53	183	113	83	120
51-55	48	157	111	72	118
56-60	64	198	111	59	236
61-65	45	154	129	80	93
66-70	24	186	71	94	98
71-75	16	348	24	59	490
26-75	316	176	694	76	132

[ϕ] The percentage by which the Standardised Mortality Ratio for smokers exceeds the corresponding ratio for non-smokers, i.e. 100 x (100A/E Smokers / 100A/E Non-smokers − 1).

* Ratio based on fewer than 10 actual deaths.

SMOK 1.3a. Joint life first death assurances, males, full underwriting, 1995-98: actual deaths for smokers and non-smokers and ratios of actual deaths to those expected using the AM92 table.

Age group (nearest ages)	Smokers		Non-smokers		Excess Mortality Index[φ] (per cent)
	Actual deaths	100A/E	Actual deaths	100A/E	
Duration 0					
21-70	23	82	44	53	55
Duration 1					
21-70	43	114	71	60	90
Durations 2+					
31-35	12	74	36	59	25
36-40	35	114	79	67	70
41-45	70	149	99	58	157
46-50	85	117	166	66	77
51-55	124	143	178	66	117
56-60	167	134	245	75	79
61-65	226	139	261	68	104
66-70	93	133	105	66	102
31-70	812	133	1,169	67	99

[φ] The percentage by which the Standardised Mortality Ratio for smokers exceeds the corresponding ratio for non-smokers, i.e. 100 x (100A/E Smokers / 100A/E Non-smokers – 1).

SMOK 1.3b. Joint life first death assurances, males, full underwriting, 1991-94: actual deaths for smokers and non-smokers and ratios of actual deaths to those expected using the AM92 table.

Age group (nearest ages)	Smokers		Non-smokers		Excess Mortality Index[φ] (per cent)
	Actual deaths	*100A/E*	*Actual deaths*	*100A/E*	
Duration 0					
21-70	39	163	45	57	186
Duration 1					
21-70	43	134	91	81	65
Durations 2+					
31-35	24	177	40	69	157
36-40	21	98	57	72	36
41-45	59	184	68	61	202
46-50	55	134	125	93	44
51-55	92	160	131	87	84
56-60	178	156	178	69	126
61-65	146	156	135	74	111
66-70	34	136	37	72	89
31-70	609	153	771	75	104

[φ] The percentage by which the Standardised Mortality Ratio for smokers exceeds the corresponding ratio for non-smokers, i.e. 100 x (100A/E Smokers / 100A/E Non-smokers – 1).

SMOK 2.1a. Permanent assurances (non-linked), females, full underwriting, 1995-98: actual deaths for smokers and non-smokers and ratios of actual deaths to those expected using the AF92 table.

Age group (nearest ages)	Smokers		Non-smokers		Excess Mortality Index[φ] (per cent)
	Actual deaths	100A/E	Actual deaths	100A/E	
Duration 0					
21-50	9	99*	22	76	30
51-60	28	280	29	107	162
61-70	34	296	46	118	151
71-80	16	302	44	159	90
21-80	87	242	141	115	110
Duration 1					
21-50	24	171	30	61	180
51-60	32	213	45	100	113
61-70	49	280	67	108	159
71-80	20	247	63	146	69
21-80	125	229	205	103	122
Durations 2+					
26-35	38	134	93	74	81
36-40	33	114	89	73	56
41-45	63	132	137	75	76
46-50	154	167	265	80	109
51-55	196	138	342	72	92
56-60	254	156	411	72	117
61-65	251	170	392	70	143
66-70	221	166	337	63	163
71-75	184	183	341	75	144
76-80	102	181	263	83	118
81-85	72	180	248	92	96
26-85	1,568	160	2,918	74	116

[φ] The percentage by which the Standardised Mortality Ratio for smokers exceeds the corresponding ratio for non-smokers, i.e. 100 x (100A/E Smokers / 100A/E Non-smokers – 1).

* Ratio based on fewer than 10 actual deaths.

SMOK 2.1b. Permanent assurances (non-linked), females, full underwriting, 1991-94: actual deaths for smokers and non-smokers and ratios of actual deaths to those expected using the AF92 table.

Age group (nearest ages)	Smokers		Non-smokers		Excess Mortality Index[φ] (per cent)
	Actual deaths	100A/E	Actual deaths	100A/E	
Duration 0					
21-50	24	166	25	50	232
51-60	22	216	31	87	148
61-70	22	262	40	122	115
71-80	7	241*	23	129	87
21-80	75	209	119	87	140
Duration 1					
21-50	21	119	45	72	65
51-60	30	217	36	74	193
61-70	19	173	36	86	101
71-80	6	158*	20	88	80
21-80	76	165	137	78	112
Durations 2+					
26-35	17	116	58	96	21
36-40	18	122	45	82	49
41-45	30	113	62	66	71
46-50	74	172	99	68	153
51-55	76	133	147	78	71
56-60	101	151	170	74	104
61-65	105	182	141	70	160
66-70	70	157	94	57	175
71-75	45	156	110	83	88
76-80	20	88	83	68	29
81-85	25	147	96	85	73
26-85	581	148	1,105	73	103

[φ] The percentage by which the Standardised Mortality Ratio for smokers exceeds the corresponding ratio for non-smokers, i.e. 100 x (*100A/E Smokers / 100A/E Non-smokers – 1*).

• Ratio based on fewer than 10 actual deaths.

SMOK 2.2a. Temporary assurances, females, full underwriting, 1995-98: actual deaths for smokers and non-smokers and ratios of actual deaths to those expected using the TF92 table.

Age group (nearest ages)	Smokers		Non-smokers		Excess Mortality Index[φ] (per cent)
	Actual deaths	100A/E	Actual deaths	100A/E	
Duration 0					
21-65	22	169	43	83	104
Durations 1-4					
21-40	24	89	65	56	59
41-50	39	132	94	71	86
51-60	37	138	81	75	84
61-70	22	177	45	83	113
21-70	122	127	285	70	81
Durations 5+					
31-40	27	143	71	81	77
41-50	63	159	156	81	96
51-60	65	179	119	76	136
61-70	39	225	52	77	192
31-70	194	173	398	79	119

[φ] The percentage by which the Standardised Mortality Ratio for smokers exceeds the corresponding ratio for non-smokers, i.e. 100 x (100A/E Smokers / 100A/E Non-smokers – 1).

SMOK 2.2b. Temporary assurances, females, full underwriting, 1991-94: actual deaths for smokers and non-smokers and ratios of actual deaths to those expected using the TF92 table.

Age group (nearest ages)	Smokers		Non-smokers		Excess Mortality Index[φ] (per cent)
	Actual deaths	100A/E	Actual deaths	100A/E	
Duration 0					
21-65	19	157	38	88	78
Durations 1-4					
21-40	21	101	55	67	51
41-50	33	157	69	83	89
51-60	24	136	48	76	79
61-70	17	189	33	82	130
21-70	95	138	205	76	82
Durations 5+					
31-40	14	121	35	70	73
41-50	24	117	82	88	33
51-60	28	187	58	96	95
61-70	14	187	25	85	120
31-70	80	147	200	86	71

[φ] The percentage by which the Standardised Mortality Ratio for smokers exceeds the corresponding ratio for non-smokers, i.e. 100 x (100A/E Smokers / 100A/E Non-smokers – 1).

SMOK 2.3b. Joint life first death assurances, females, full underwriting, 1995-98: actual deaths for smokers and non-smokers and ratios of actual deaths to those expected using the AF92 table.

Age group (nearest ages)	Smokers		Non-smokers		Excess Mortality Index[φ] (per cent)
	Actual deaths	100A/E	Actual deaths	100A/E	
Duration 0					
21-70	12	130	17	47	177
Duration 1					
21-70	25	182	49	89	104
Durations 2+					
31-35	12	115	41	72	60
36-40	30	154	73	68	126
41-45	30	107	111	77	39
46-50	46	117	118	64	83
51-55	65	147	130	72	104
56-60	52	104	109	59	76
61-65	67	165	93	65	154
66-70	23	161	41	77	109
31-70	325	132	716	68	94

[φ] The percentage by which the Standardised Mortality Ratio for smokers exceeds the corresponding ratio for non-smokers, i.e. 100 x (100A/E Smokers / 100A/E Non-smokers – 1).

SMOK 2.3b. Joint life first death assurances, females, full underwriting, 1991-94: actual deaths for smokers and non-smokers and ratios of actual deaths to those expected using the AF92 table.

Age group (nearest ages)	Smokers		Non-smokers		Excess Mortality Index$^{\phi}$ (per cent)
	Actual deaths	100A/E	Actual deaths	100A/E	
Duration 0					
21-70	19	244	23	69	254
Duration 1					
21-70	19	168	49	96	75
Durations 2+					
31-35	7	89*	26	55	62
36-40	17	141	34	51	176
41-45	14	79	66	72	10
46-50	35	153	92	90	70
51-55	36	119	81	72	65
56-60	49	134	85	66	103
61-65	21	107	49	76	41
66-70	5	114*	9	57*	100
31-70	184	122	442	70	74

$^{\phi}$ The percentage by which the Standardised Mortality Ratio for smokers exceeds the corresponding ratio for non-smokers, i.e. 100 x (100A/E Smokers / 100A/E Non-smokers – 1).

* Ratio based on fewer than 10 actual deaths.

SMOK 3.1. Values of the Excess Mortality Index and ratios of actual deaths to those expected using the relevant "92" Series tables for the quadrennia 1995-98 and 1991-94.

	Smokers 100A/E		Non-smokers 100A/E		Excess Mortality Index	
	1995-98	1991-94	1995-98	1991-94	1995-98	1991-94
Permanent assurances, males, all ages*						
Duration 0	180	183	90	75	100	144
Duration 1	166	162	83	71	100	128
Durations 2 and over	137	127	73	74	88	72
Permanent assurances, females, all ages**						
Duration 0	240	210	117	89	105	136
Duration 1	226	163	102	77	122	112
Durations 2 and over	159	145	76	73	109	99
Temporary assurances, males, all ages***						
Duration 0	90	135	60	79	50	71
Durations 1-4	162	174	64	80	153	118
Durations 5 and over	142	177	70	76	103	133
Temporary assurances, females, all ages****						
Duration 0	157	158	76	81	107	95
Durations 1-4	131	140	69	74	90	89
Durations 5 and over	175	145	78	80	124	81
Joint life first death, males, all ages*						
Duration 0	82	165	54	57	56	195
Duration 1	114	133	59	80	93	66
Durations 2 and over	132	151	68	75	94	101
Joint life first death, females, all ages**						
Duration 0	141	243	50	68	182	257
Duration 1	182	167	88	97	107	72
Durations 2 and over	132	122	69	69	91	77

* Expected deaths based on the AM92 table.
** Expected deaths based on the AF92 table.
*** Expected deaths based on the TM92 table.
**** Expected deaths based on the TF92 table.

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TABLES OF MORTALITY FOR PENSIONERS COMBINED BASED ON THE 1991-94 EXPERIENCE

1. INTRODUCTION

1.1 The C.M.I. Bureau conducts investigations into the mortality of life office pensioners subdivided into two classes: those retiring at or after the normal retirement age for the relevant pension scheme ("Normals"), and those who retire before that age ("Earlies"). In *C.M.I.R.* **13**, 77-85 ("Mortality tables based on the Combined Pensioners experience, 1979-82") the Committee published a graduation of the mortality experience of the combined data, that is, putting together the data for Normals and for Earlies into a "Combined" experience. Subsequent to the graduation of the data for 1991-94 for Normals published in *C.M.I.R.* **16**, 113-141 ("Proposed new tables for life office pensioners, normal, male and female, based on the 1991-94 experiences"), the Committee decided that tables for the Combined, based on the 1991-94 experience, would be useful. This report describes the graduation of these tables.

1.2 Whereas a mortality table for Normal Pensioners is useful for assessing the value of an annuity to a pensioner who retires at the normal retirement age of the pension scheme, and may be assumed to be in reasonably good health at that time, a mortality table for Combined Pensioners is useful for valuing a portfolio of pensions, regardless of when they commenced, and whether the pensioners retired before, at or after the normal retirement age of the scheme.

1.3 The investigations for both Normals and Earlies are subdivided by Males and Females, and are carried out for both Lives and Amounts data. These experiences can therefore form the basis of the tables for the Combined, just as they did for the Normals.

1.4 It should be noted that the tables described in this report are not designated as Standard tables in the "92" Series and are grouped with the other non-Standard tables detailed in Appendix B of *C.M.I.R.* **16**.

2. THE DATA

2.1 Table 1 gives an overview of the amount of data for 1991-94, showing the exposed to risk and numbers of deaths for Normals, Earlies and Combined. It can be seen that the Earlies provide about half the exposed to risk of the Normals for Males, and about one third of the deaths (being on average younger,

Table 1. Pensioners, Normal, Early and Combined, Males and Females, Lives and Amounts: central exposed to risk and deaths.

	Normal	Early	Combined
Males			
Lives			
Central exposed	989,283.9	484,250.5	1,473,534.4
Deaths	63,614	22,344	85,958
Amounts			
Central exposed	1,379,231,516.2	757,363,502.5	2,136,595,018.7
Deaths	46,124,571	19,595,649	65,720,220
Females			
Lives			
Central exposed	354,628.5	119,041.1	473,669.6
Deaths	13,272	2,750	16,022
Amounts			
Central exposed	289,720,365.4	84,476,027.1	374,196,392.5
Deaths	5,620,576	1,188,352	6,808,928

their average mortality rate is lower). For females the fractions are smaller, about one third and one fifth.

2.2 Table 2 shows the overall age ranges of the data, for Early, Normal and Combined. Naturally there are many more lives at younger ages among the Earlies (and hence among the Combined) than among the Normals, but they are still rather sparse below about age 40.

Table 2. Age ranges.

	Range of data	Exposed ≥ 100	Deaths ≥ 10
Males			
Normal	25-108	50-100	57-101
Early	10-108	45-94	52-94
Combined	10-108	36-100	50-101
Females			
Normal	25-108	44-98	60-100
Early	10-103	45-93	57-94
Combined	10-108	39-99	53-100

Table 3. Average amounts per life per annum, Normal, Early and Combined.

	Normal	Early	Combined
Males	£1,394.17	£1,563.99	£1,449.98
Females	£816.97	£709.64	£789.99

2.3 Table 3 shows the average amount of pension per life, for Normals, Earlies and Combined. Note that the average amount per life for the Males Earlies is rather higher than for Males Normals, whereas the reverse is true for Females. Possible considerations are: the Earlies are younger and have retired more recently; on the other hand Earlies have accrued fewer years service than Normals. These factors may work in opposite directions, and presumably act to a different degree for Males and Females.

2.4 The exposed to risk and numbers of deaths for the Amounts data are both divided by the corresponding average amount per life before the graduation process is carried out. This scales the data so that statistical tests can be carried out more appropriately.

3. COMPARISON WITH NORMALS

3.1 Table 4 shows the values of 100 A/E when the experiences for Earlies and Combined are compared with those expected according to the corresponding new tables for Normals based on the 1991-94 experiences, considering Males Lives, Males Amounts, Females Lives and Females Amounts respectively.

Table 4. Values of 100 A/E when the experience for Early and Combined is compared with the corresponding tables for Normals, Pxx92Base, (xx = ML, MA, FL, FA).

	Lives	Amounts
Males		
Early	111.52	118.25
Combined	102.76	104.85
Females		
Early	109.65	125.58
Combined	101.55	103.77

3.2 The ratios for Earlies are about 10% higher for Lives and about 20-25% higher for Amounts, whereas for the Combined they are less than 5% higher. This conceals the fact that the rates for Earlies (and hence Combined) at younger ages are very much higher than the rates for Normals. The excess reduces so that above about age 75 for Males and 70 for Females there is little difference between the experiences for Earlies and for Normals.

4. PRELIMINARY GRADUATIONS

4.1 In the first place GM(r,s) formulae for various values of r and s were tried for each investigation. Table 5 shows the values of minus the log likelihood for each part of the experience for these graduations. In many cases, especially for higher values of r and s, the resulting shape of the curve of mortality rates was quite unreasonable, and it would not have been desirable to use that formula.

5. THE APPROACH USED

5.1 It was considered desirable that the graduated rates for the Combined should bear a close relationship with those for the Normals at higher ages, diverging from these only at younger ages. The graduated rates for the Normals were constructed using a GM(2,3) formula:

$$\mu_x = a_1 + a_2 t + \exp\{b_1 + b_2 t + b_3(2t^2 - 1)\}$$

where $t = (x - 70)/50$. In fitting the formula for the Normals the values of a_1, a_2 and b_3 were chosen so that the mortality rates at the highest ages bore a satis-

Table 5. Values of minus the log likelihood for various formulae.

	Males		Females	
GM(r,s)	Lives	Amounts	Lives	Amounts
(0,2)	309,750.90	188,775.69	64,030.89	40,195.29
(0,3)	309,703.93	188,774.32	64,030.66	40,161.39
(1,2)	309,750.89	188,770.06	64,025.76	40,155.07
(0,4)	309,598.10	188,728.46	64,012.76	40,156.63
(1,3)	309,597.18	188,732.28	64,012.54	40,154.71
(2,2)	309,620.50	188,744.71	64,019.77	40,155.01
(0,5)	309,598.10	188,727.56	64,011.24	40,156.18
(1,4)	309,597.18	188,728.23	64,011.19	40,154.64
(2,3)	309,595.46	188,732.09	64,011.19	40,154.49

factory relationship to each other, and the rates at the youngest ages were plausible, having regard to rates for Permanent Assurances at those ages; then the values of b_1 and b_2 were chosen so as to maximise the likelihood subject to these constraints.

5.2 In accordance with the usual practice, the observations below age 17 were omitted from the graduation.

5.3 A convenient way of keeping the rates for Combined close to those for Normals at high ages was to fix the values of b_2 and b_3 to be the same as those for Normals, and then to maximise the likelihood allowing the values for a_1, a_2 and b_1 to vary. This provided a satisfactory fit to the data for all experiences and a satisfactory shape of curve for all experiences except Females Amounts, for which the resulting rates were much higher than those for Lives at young ages (Amounts rates being lower than Lives rates elsewhere).

5.4 The rates for Females Amounts were therefore adjusted by fixing the value of a_2 as well as those of b_2 and b_3, putting $100a_2 = -0.8$. The parameter of a_2 controls the (downward) slope of the curve of mortality rates at the younger ages. The resulting mortality rates are quite close to those for Normals at ages above about 70, but are much higher than those for Normals at younger ages. Each table has a high value of q_x at age 17, with the values falling to a minimum between ages 48 and 51 and then rising. However, the "dip" is not excessive, with the minimum value of q_x being over 49% of the value at age 17 in each case.

5.5 The usual statistics for these graduations are shown in Table 6 and values of q_x at decennial ages, together with percentage standard errors, are shown in Table 7. Values of q_x for ages from 17 to 120 are shown in Table 12, and graphed in Figure 1.

5.6 The log likelihood for the chosen graduation is, of course, worsened by fixing two or three of the parameters and optimising on the remaining three or two parameters, as compared with the unconstrained log likelihood when all five parameters are optimised, as shown in Table 5. The deterioration is shown in Table 6; the amount is rather large for Females Amounts, but not excessive for the other tables.

5.7 All the graduations "fail" the χ^2 test, but this is so usual with the C.M.I. experiences, especially for Amounts data, that it is hardly remarkable. For three

out of the four tables one or more of the other statistical tests is outside the desirable limits, so the graduation might appear to be unsatisfactory. Thus the value of the T-ratio for the first correlation coefficient in the serial correlation test for Males Lives is 3.72 and that for Males Amounts is 3.66, both highly significant when compared with a unit normal distribution. Further, for Males Amounts the p-value for the runs test is 0.0015, and the p-value for the Kolmogorov-Smirnov test is 0.0095, both below 1%. Then for Females Amounts the p-value for the Kolmogorov-Smirnov test is 0.0005, below 1 per mille. However, inspection of the detailed results shows that the problems are exaggerated by the presence of a few large deviations of the same sign in sequence, and none indicates a serious misgraduation.

5.8 Figures 2 and 3 show, for Males Lives and Females Lives respectively, the observed mortality rates, the observed (actual) value of μ_x for each age, along with the 2.5% and 97.5% "gates" (confidence intervals based on the observed rates – see Forfar, McCutcheon & Wilkie, "On graduation by mathematical formula", *J.I.A.* **115**, 1-149 (1988) and *T.F.A.* **41**, 97-269, Section 2.6 (1990)), and the graduated values of μ_x from 17 to 120. The row of values for the observed at 0.0002 and the 2.5% gates at 0.00015 represent observed zeros. One can see that there is very little doubt about where the graduated rates should be at the pensioner ages, but that the gates are very wide at younger ages, and the graduated rates run more or less "down the middle".

6. COMPARISONS

6.1 Various comparisons of the graduation rates for Pensioners Combined, with one another and with other tables, are shown in Tables 8 to 11. In Table 8 are shown ratios of Females to Males (for Lives and Amounts), and Amounts to Lives (for Males and Females). These are also graphed in Figure 4. We can see that the rates for Females are comfortably below those for Males, except at the very highest ages for Lives (which is a feature also of the Pensioners Normal tables). We can also see that the rates for Amounts are consistently below those for Lives, throughout, though they get very close at age 100 for Males.

6.2 In Table 9 are shown ratios of the Pensioners Combined with Pensioners Normal (PML92Base, PMA92Base, PFL92Base, and PFA92Base). These are also graphed in Figure 5. We can see that the rates for Combined are enormously higher than those for Normals at younger ages, being about 25 times those for the Normals for Males and over 40 times for Females, whereas the rates are almost the same for Combined and Normals at ages above 70-75.

6.3 In Table 10 are shown ratios of the Pensioners Combined rates for 1991-94 with those projected for 1992 from the 1979-82 base rates for Pensioners Combined, i.e. PCxx80C92. These are also graphed in Figure 6. We can see that for Males the new rates are consistently below the projected rates, whereas for Females they are higher than the projected rates at younger ages (up to about 35) and early pensioner ages (65-75). The latter feature is also true for the Normals as compared with Pxx80C92.

6.4 In Table 11 are shown ratios of the Pensioners Combined Lives rates to the rates for Retirement Annuitants Vested for 1991-94 (see *C.M.I.R.* **17**, 172-174). These are also graphed in Figure 7. The rates for Vested can also be taken to represent the experience for early retirements of some kind. It is interesting to note that the graduated experience for the Pensioners Combined is much lower than that for Retirement Annuitants Vested, being about one third of the level. However, one should note that there is considerable uncertainty about the correct level of rates for both experiences. The percentage standard errors quoted in Table 7 may underestimate the true position considerably, because they are based on the model with certain parameters fixed.

Table 6. Pensioners, Combined, Males and Females, Lives and Amounts: statistics for graduations of μ_x = GM(2,3).

Sex	Males		Females	
	Lives	Amounts	Lives	Amounts
Values of parameters:				
$100a_1$	0.132485	0.120232	0.004971	0.056703
T-ratio	2.78	3.30	0.09	2.59
$100a_2$	−1.408421	−0.837306	−1.147043	−0.8
T-ratio	−6.32	−5.16	−4.91	
b_1	−4.656925	−5.385535	−4.945963	−5.272928
T-ratio	−421.9	−423.6	−262.1	−329.6
b_2	5.629188	6.622746	5.884075	5.982521
b_3	−1.2	−1.6	−1.0	−1.15
−Log likelihood	309,603.31	188,745.79	64,019.46	40,185.19
deterioration (see text)	7.85	13.70	8.27	30.70
Sign test: p(pos)	0.6009	0.5000	0.2135	0.7865
Runs test: p(runs)	0.0988	0.0015	0.4383	0.0336
K-S test: $p(KS)$	0.2705	0.0095	0.3558	0.0005
Serial correlation test				
T-ratio 1	3.72	3.66	1.23	0.05
T-ratio 2	1.88	1.48	0.60	1.38
T-ratio 3	0.38	−1.00	0.31	−0.73
χ^2 test:				
χ^2	117.2	261.24	116.58	627.08
Degrees of freedom	56	52	52	52
p(χ^2)	0.000003	0.000000	0.000001	0.000000

Table 7. Pensioners, Combined, Males and Females, Lives and Amounts: specimen values of q_x and percentage standard errors.

Sex	Males		Females	
	Lives	Amounts	Lives	Amounts
Age 20	0.015163	0.009448	0.011349	0.008456
percentage s.e.	3.23	4.12	4.96	2.59
Age 30	0.012456	0.007803	0.009123	0.006897
percentage s.e.	3.90	4.89	6.06	3.17
Age 40	0.010078	0.006273	0.007092	0.005485
percentage s.e.	4.79	5.99	7.67	4.00
Age 50	0.009213	0.005508	0.005944	0.004784
percentage s.e.	5.20	6.73	9.03	4.59
Age 60	0.013831	0.008507	0.008081	0.006850
percentage s.e.	3.43	4.29	6.55	3.20
Age 70	0.033953	0.025057	0.020238	0.017532
percentage s.e.	1.36	1.42	2.57	1.24
Age 80	0.086877	0.075650	0.056882	0.049065
percentage s.e.	0.50	0.45	0.88	0.43
Age 90	0.187241	0.179682	0.138908	0.117666
percentage s.e.	0.21	0.17	0.33	0.17
Age 100	0.324838	0.321687	0.277961	0.229212
percentage s.e.	0.10	0.08	0.14	0.07
Age 110	0.458656	0.444853	0.452369	0.362182
percentage s.e.	0.06	0.05	0.06	0.04

Table 8. Pensioners Combined: ratios of values of q_x in proposed Tables: comparison of rates for Females and Males, and Lives and Amounts.

	Females/Males		Amounts/Lives	
Age	Lives	Amounts	Males	Females
20	0.7485	0.8950	0.6231	0.7451
25	0.7414	0.8896	0.6250	0.7500
30	0.7324	0.8839	0.6264	0.7560
35	0.7205	0.8785	0.6263	0.7636
40	0.7037	0.8744	0.6224	0.7734
45	0.6791	0.8723	0.6124	0.7867
50	0.6452	0.8686	0.5979	0.8048
55	0.6084	0.8497	0.5922	0.8270
60	0.5843	0.8052	0.6151	0.8477
65	0.5814	0.7484	0.6688	0.8609
70	0.5961	0.6997	0.7380	0.8663
75	0.6216	0.6664	0.8080	0.8663
80	0.6547	0.6486	0.8708	0.8626
85	0.6948	0.6450	0.9221	0.8560
90	0.7419	0.6549	0.9596	0.8471
95	0.7958	0.6776	0.9822	0.8364
100	0.8557	0.7125	0.9903	0.8246
105	0.9199	0.7585	0.9855	0.8125
110	0.9863	0.8142	0.9699	0.8006
115	1.0532	0.8790	0.9454	0.7890
120	1.1203	0.9540	0.9125	0.7770

Table 9. Pensioners Combined: ratios of values of q_x in proposed Tables: comparison with Pensioners Normal, Pxx92Base (xx = ML, MA, FL, FA).

	Males		Females	
Age	Lives	Amounts	Lives	Amounts
20	24.3387	27.7882	44.6811	41.6552
25	24.0750	25.8919	40.4229	37.7833
30	22.5244	23.4324	33.7889	31.7834
35	18.4909	19.6246	24.4242	23.4030
40	12.3354	14.1603	14.7137	14.3586
45	6.8183	8.2729	7.6236	7.5106
50	3.5668	4.1886	3.8029	3.7640
55	2.0550	2.2212	2.0837	2.0721
60	1.4181	1.4385	1.3816	1.3797
65	1.1594	1.1507	1.1128	1.1098
70	1.0563	1.0484	1.0178	1.0093
75	1.0167	1.0134	0.9897	0.9750
80	1.0027	1.0025	0.9860	0.9658
85	0.9989	1.0000	0.9901	0.9658
90	0.9988	1.0001	0.9957	0.9687
95	0.9998	1.0008	1.0006	0.9721
100	1.0009	1.0015	1.0043	0.9754
105	1.0017	1.0018	1.0068	0.9782
110	1.0021	1.0019	1.0081	0.9805
115	1.0022	1.0017	1.0086	0.9822
120	1.0019	1.0011	1.0086	0.9835

Table 10. Pensioners Combined: ratios of values of q_x in proposed Tables: comparison with projected rates PCxx80C92 (xx = ML, MA, FL, FA).

	Males		Females	
Age	Lives	Amounts	Lives	Amounts
20	0.9292	0.7444	1.5682	1.2865
25	0.8453	0.6793	1.4132	1.1669
30	0.7632	0.6148	1.2606	1.0493
35	0.6854	0.5520	1.1136	0.9364
40	0.6170	0.4939	0.9793	0.8343
45	0.5681	0.4477	0.8705	0.7556
50	0.5558	0.4282	0.8104	0.7235
55	0.6032	0.4611	0.8314	0.7738
60	0.7220	0.5719	0.9535	0.9334
65	0.8509	0.7206	1.0909	1.1072
70	0.9292	0.8356	1.1410	1.1480
75	0.9384	0.8792	1.0795	1.0410
80	0.9249	0.8909	0.9861	0.9172
85	0.9328	0.9159	0.9218	0.8514
90	0.9735	0.9476	0.8951	0.8453
95	0.9561	0.9468	0.9017	0.8959
100	0.9127	0.9108	0.9663	0.9402
105	0.8533	0.8468	0.9784	0.9293
110	0.7872	0.7682	0.9445	0.8727
115	0.7373	0.7006	0.8998	0.8051
120	0.6905	0.6326	0.8433	0.7261

Table 11. Pensioners Combined: ratios of values of q_x in proposed Tables: comparison with Retirement Annuitants Vested, RxV92Base (x = M, F).

Age	Males	Females
20	0.3124	0.2888
25	0.3151	0.2963
30	0.3192	0.3067
35	0.3263	0.3219
40	0.3400	0.3464
45	0.3691	0.3900
50	0.4337	0.4759
55	0.5714	0.6491
60	0.8204	0.9395
65	1.1318	1.2262
70	1.3405	1.3501
75	1.3786	1.3665
80	1.3624	1.3404
85	1.3275	1.2729
90	1.2695	1.1659
95	1.1917	1.0334
100	1.1018	0.8954
105	1.0085	0.7724
110	0.9195	0.6817
115	0.8397	0.6355
120	0.7705	0.6379

Table 12. Values of q_x for proposed Pensioners Combined 1991-94 Tables.

	Males		Females	
Age	Lives	Amounts	Lives	Amounts
17	0.015990	0.009945	0.012025	0.008929
18	0.015714	0.009779	0.011799	0.008771
19	0.015439	0.009614	0.011574	0.008613
20	0.015163	0.009448	0.011349	0.008456
21	0.014889	0.009283	0.011123	0.008298
22	0.014614	0.009117	0.010899	0.008141
23	0.014340	0.008952	0.010674	0.007984
24	0.014067	0.008787	0.010450	0.007827
25	0.013795	0.008622	0.010227	0.007670
26	0.013524	0.008457	0.010004	0.007514
27	0.013254	0.008293	0.009782	0.007359
28	0.012986	0.008129	0.009561	0.007204
29	0.012720	0.007966	0.009341	0.007050
30	0.012456	0.007803	0.009123	0.006897
31	0.012194	0.007641	0.008906	0.006746
32	0.011936	0.007480	0.008691	0.006595
33	0.011682	0.007321	0.008478	0.006447
34	0.011432	0.007163	0.008268	0.006300
35	0.011187	0.007006	0.008060	0.006155
36	0.010948	0.006853	0.007857	0.006014
37	0.010717	0.006702	0.007657	0.005875
38	0.010493	0.006554	0.007463	0.005741
39	0.010280	0.006411	0.007274	0.005610
40	0.010078	0.006273	0.007092	0.005485
41	0.009888	0.006140	0.006917	0.005366
42	0.009714	0.006015	0.006751	0.005254
43	0.009558	0.005899	0.006595	0.005150
44	0.009421	0.005793	0.006451	0.005056
45	0.009307	0.005700	0.006320	0.004972
46	0.009219	0.005620	0.006205	0.004901
47	0.009162	0.005558	0.006107	0.004845
48	0.009138	0.005517	0.006028	0.004804
49	0.009154	0.005498	0.005973	0.004783
50	0.009213	0.005508	0.005944	0.004784
51	0.009322	0.005550	0.005944	0.004809
52	0.009488	0.005629	0.005978	0.004862
53	0.009716	0.005752	0.006049	0.004947
54	0.010015	0.005925	0.006163	0.005068

Table 12. (continued)

Age	Males		Females	
	Lives	Amounts	Lives	Amounts
55	0.010394	0.006155	0.006324	0.005230
56	0.010862	0.006452	0.006540	0.005438
57	0.011428	0.006824	0.006816	0.005697
58	0.012103	0.007283	0.007159	0.006014
59	0.012900	0.007840	0.007578	0.006396
60	0.013831	0.008507	0.008081	0.006850
61	0.014910	0.009300	0.008677	0.007385
62	0.016152	0.010233	0.009377	0.008008
63	0.017571	0.011324	0.010192	0.008731
64	0.019184	0.012590	0.011133	0.009563
65	0.021008	0.014051	0.012215	0.010516
66	0.023062	0.015728	0.013450	0.011601
67	0.025364	0.017644	0.014853	0.012831
68	0.027933	0.019820	0.016441	0.014220
69	0.030789	0.022283	0.018230	0.015782
70	0.033953	0.025057	0.020238	0.017532
71	0.037445	0.028169	0.022484	0.019485
72	0.041286	0.031644	0.024987	0.021659
73	0.045496	0.035510	0.027768	0.024069
74	0.050095	0.039794	0.030849	0.026733
75	0.055103	0.044522	0.034251	0.029670
76	0.060538	0.049719	0.037996	0.032897
77	0.066418	0.055410	0.042109	0.036432
78	0.072759	0.061615	0.046612	0.040293
79	0.079574	0.068356	0.051529	0.044498
80	0.086877	0.075650	0.056882	0.049065
81	0.094676	0.083509	0.062695	0.054010
82	0.102979	0.091945	0.068989	0.059349
83	0.111789	0.100961	0.075787	0.065097
84	0.121107	0.110559	0.083108	0.071267
85	0.130929	0.120734	0.090971	0.077872
86	0.141251	0.131475	0.099392	0.084920
87	0.152059	0.142766	0.108386	0.092420
88	0.163340	0.154584	0.117964	0.100376
89	0.175075	0.166901	0.128137	0.108792

Table 12. (continued)

	Males		Females	
Age	Lives	Amounts	Lives	Amounts
90	0.187241	0.179682	0.138908	0.117666
91	0.199810	0.192887	0.150281	0.126997
92	0.212751	0.206468	0.162253	0.136775
93	0.226030	0.220375	0.174819	0.146993
94	0.239608	0.234552	0.187968	0.157635
95	0.253442	0.248937	0.201686	0.168686
96	0.267490	0.263468	0.215953	0.180124
97	0.281703	0.278077	0.230745	0.191924
98	0.296032	0.292696	0.246033	0.204060
99	0.310428	0.307256	0.261784	0.216501
100	0.324838	0.321687	0.277961	0.229212
101	0.339210	0.335920	0.294520	0.242157
102	0.353493	0.349887	0.311417	0.255297
103	0.367635	0.363523	0.328603	0.268590
104	0.381585	0.376765	0.346025	0.281993
105	0.395294	0.389553	0.363629	0.295461
106	0.408716	0.401831	0.381358	0.308950
107	0.421804	0.413545	0.399155	0.322413
108	0.434516	0.424649	0.416961	0.335803
109	0.446813	0.435099	0.434719	0.349074
110	0.458656	0.444853	0.452369	0.362182
111	0.470012	0.453878	0.469856	0.375081
112	0.480849	0.462142	0.487124	0.387729
113	0.491139	0.469617	0.504120	0.400085
114	0.500857	0.476281	0.520796	0.412109
115	0.509980	0.482111	0.537105	0.423763
116	0.518489	0.487093	0.553002	0.435014
117	0.526367	0.491212	0.568450	0.445827
118	0.533597	0.494456	0.583412	0.456174
119	0.540169	0.496818	0.597858	0.466027
120	0.546071	0.498290	0.611759	0.475360

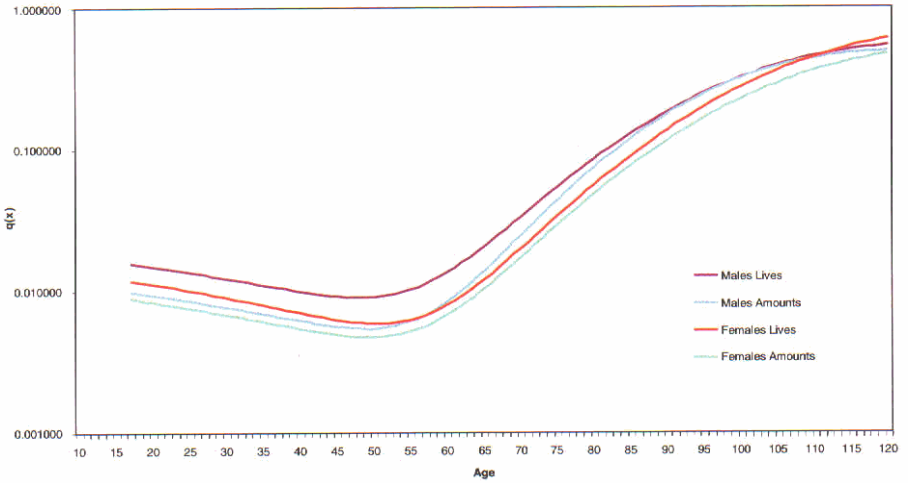

Figure 1. Pensioners Combined, 1991-94: values of graduated q(x).

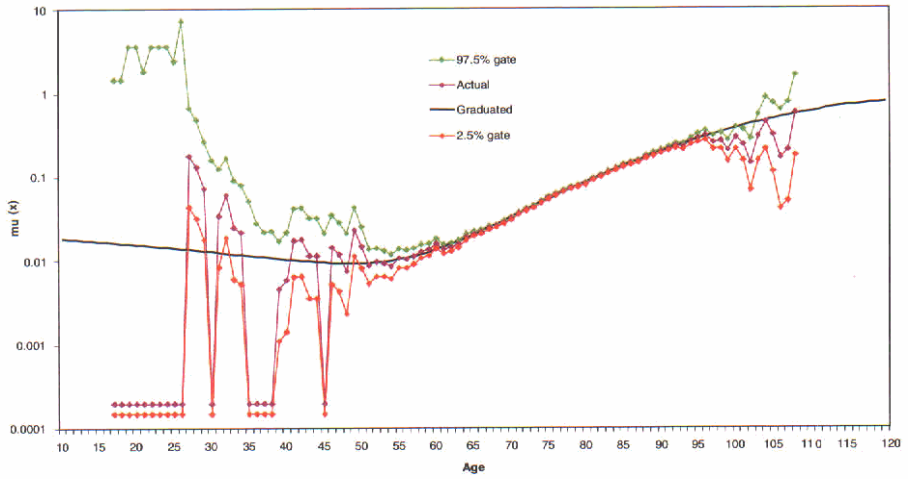

Figure 2. Pensioners Combined Males Lives, "gates".

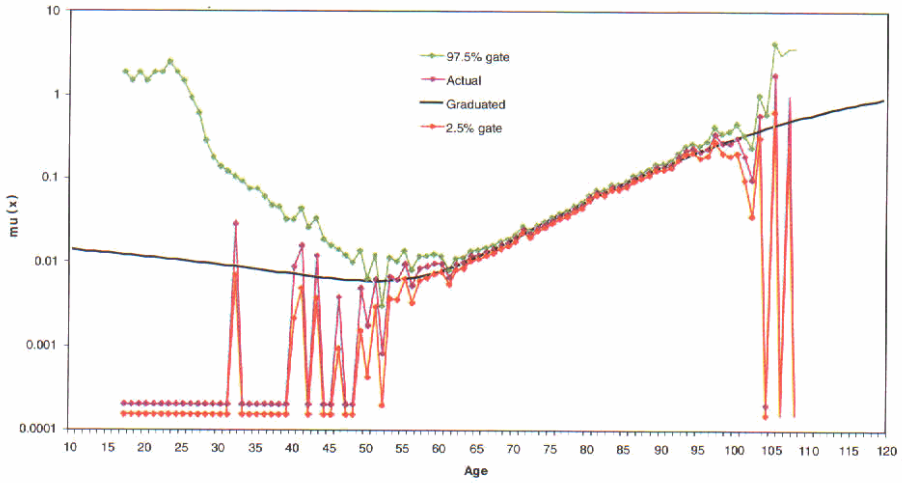

Figure 3. Pensioners Combined Females Lives, "gates".

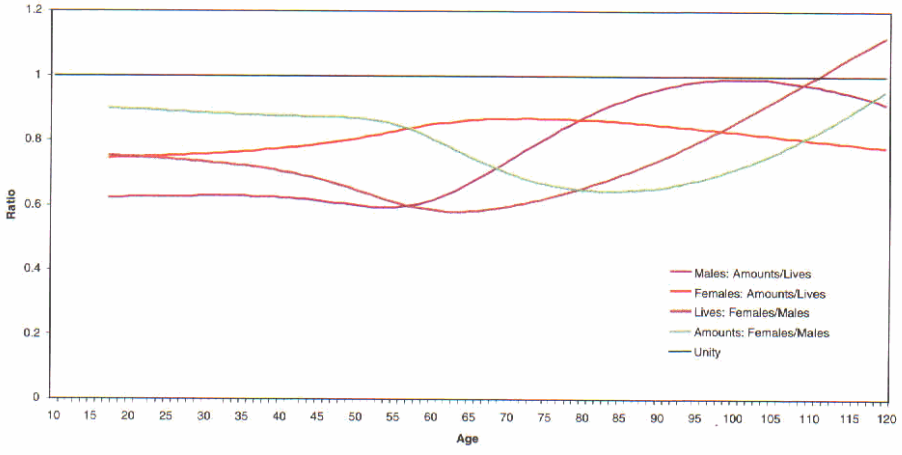

Figure 4. Comparison of Pensioners Combined 1991-94 graduated rates: Amounts/Lives and Females/Males.

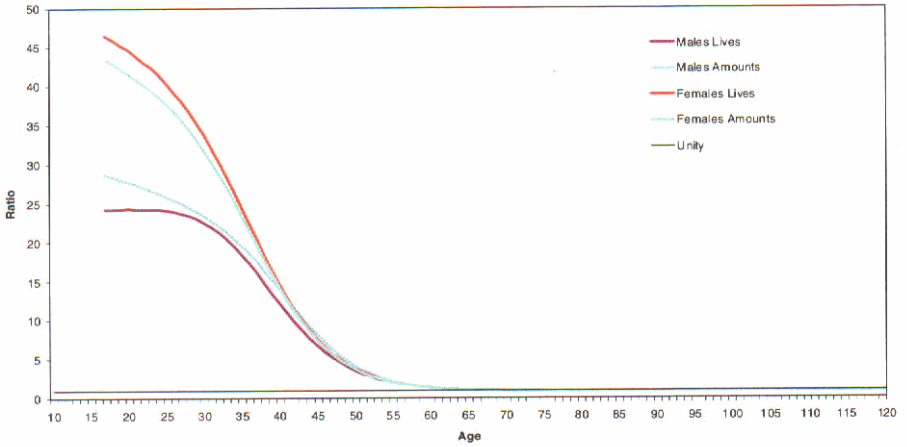

Figure 5. Pensioners Combined, 1991-94: comparison of values of q(x) with those for Pensioners Normal, 1991-94.

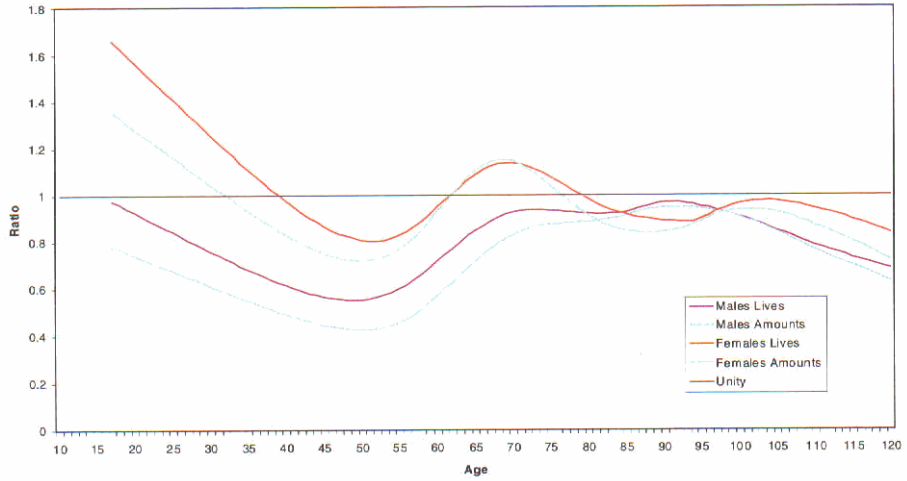

Figure 6. Pensioners Combined, 1991-94: comparison of values of q(x) with those for Pxx80C92.

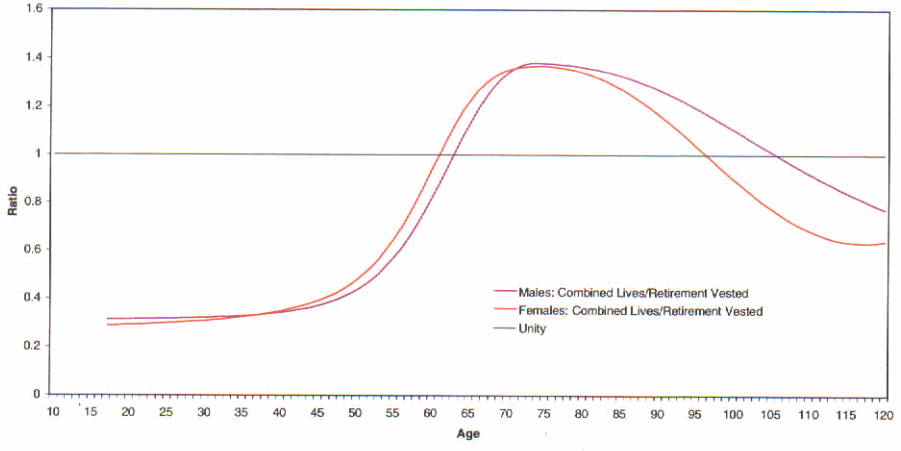

Figure 7. Pensioners Combined, 1991-94: comparison of values of q(x) for Lives with those for Retirement Annuitants Vested.

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EXTENSION TO YOUNG AGES OF THE "92" SERIES TABLES FOR ASSURED LIVES

1. INTRODUCTION

The published rates of mortality in the "92" Series tables for assured lives were based on the graduated rates from age 17 upwards. Below that age, for the experiences of both permanent and temporary assurances, the available data were too sparse to provide a basis for realistic mortality rates for assured lives.

It is, however, convenient for certain purposes to have available mortality rates for assured lives at childhood ages. For this reason the Committee has therefore extended the assured lives tables down to age 0. These extensions have been carried out having regard to population mortality at young ages.

The "92" Series was the first set of tables produced by the Committee which included a table based on the experience of temporary assurances effected on female lives. It is interesting to note that, for each sex, from age 17 until the mid thirties the ultimate rates of mortality for the temporary assurance table are greater than those for the permanent assurance table. The differences in the rates of mortality at age 17 are illustrated in Table 1 below, which shows the value of 1,000,000 q_{17} for each of the assured lives tables.

Table 1.

Mortality Table	$10^6 \cdot q_{17}$
AM92	600
TM92	846
AF92	172
TF92	227

Although for each sex these differences are in absolute terms very small indeed, the Committee has produced separate extensions for the four assured lives tables – in order to ensure a reasonably smooth progression in the rates of mortality for each table.

Mortality rates for assured lives are generally lower than those for the general population. The extent of the current differences between the mortality of the two groups may be seen by comparing the "92" Series rates with those of the

ELT 15 tables. (The two sets of tables relate to approximately the same time period.) At age 17, however, for male temporary assurances the ultimate rate of mortality is 12.8% greater than the corresponding ELT 15 value. This may be seen from the following table, which (for each experience) expresses the value of q_{17} as a multiple of q_{17}^{ELT15} for the appropriate sex.

Table 2.

Experience	Males	Females
Permanent Assurances	0.8000	0.5548
Temporary Assurances	1.1280	0.7323

(The value shown is q_{17}/q_{17}^{ELT15} where q_{17} denotes the graduated rate of mortality for the relevant experience.)

2. DETERMINATION OF THE RATES OF MORTALITY FOR AGES 1 TO 16

For each of the extended tables the rate of mortality at age 1 was set equal to the ELT 15 value (for the appropriate sex). Between age 1 and age 17 the assured lives rates were blended into the population rates as follows.

For $x = 1, 2, 3, \ldots, 17$ the ratio of the mortality rate at age x in the extended assured lives table to the corresponding ELT15 rate of mortality is denoted by r_x. For each experience the value of r_1 was set equal to 1 while the value of r_{17} was obtained from Table 2 above. (Thus, for male permanent assurances, $r_{17} = 0.8$.) Then, for $x = 2, 3, 4, \ldots, 16$, the value of r_x was obtained by linear interpolation between the known values of r_1 and r_{17}. The 'extended' rate of mortality at age x was then calculated as $r_x \cdot q_x^{ELT15}$.

For females, in order to avoid minor irregularities in the progression of the mortality rates, a further very small adjustment was made to the results of the above calculations.

3. DETERMINATION OF THE RATES OF MORTALITY FOR AGE 0

For each of the extended assured lives tables the rate of mortality at age 0 is based on population mortality – adjusted, however, to remove the effect of relatively high mortality in the first 28 days of life.

Let $t = \frac{28}{365}$. To calculate q_0 an estimate was first made of the value of ${}_tq_0$ on the basis of population mortality. This estimate was then 'scaled up' by the

factor $\frac{365}{337}$ to obtain an annual rate for inclusion in the table. The procedure adopted is described below.

It is readily verified that for any mortality table

$$ {}_{m}q_{x+n} = \frac{{}_{n+m}q_x - {}_{n}q_x}{1 - {}_{n}q_x} $$

Thus

$$ {}_{1-t}q_{x+t} = \frac{q_x - {}_{t}q_x}{1 - {}_{t}q_x} $$

$$ = q_x \cdot \left(\frac{1 - \frac{{}_{t}q_x}{q_x}}{1 - \frac{{}_{t}q_x}{q_x} \cdot q_x} \right) $$

In particular,

$$ {}_{1-t}q_t = q_0 \cdot \left(\frac{1 - \frac{{}_{t}q_0}{q_0}}{1 - \frac{{}_{t}q_0}{q_0} \cdot q_0} \right) \qquad (1) $$

If both q_0 and $\frac{{}_{t}q_0}{q_0}$ are known, this last equation may be used to determine ${}_{1-t}q_t$. For the ELT 15 tables, which are based on the three-year period 1990-1992, the value of $\frac{{}_{t}q_0}{q_0}$ may be estimated as the proportion of infant deaths in these years which occur in the first 28 days of life. For males this proportion is 0.5938 (5213 deaths out of a total of 8779 infant deaths). For females the corresponding proportion is 0.6194 (i.e. 4015/6482). On the basis of the ELT15 values for q_0 of 0.00814 and 0.00632 (for males and females respectively) the values of ${}_{1-t}q_t$ (obtained from equation (1) above) are 0.003323 and 0.002415. When these are scaled up by the factor $\frac{365}{337}$, the resulting values of q_0 for the extended tables are obtained as 0.003599 (for males) and 0.002615 (for females).

The rates of mortality for the extension of the assured lives tables are shown below.

Table 3. Values of 1,000,000 q_x for the extended assured lives tables.

Age x	Mortality Table			
	AM92	AF92	TM92	TF92
0	3,599	2,615	3,599	2,615
1	620	550	620	550
2	375	292	383	295
3	293	208	305	213
4	231	165	246	171
5	209	142	227	149
6	188	129	208	137
7	176	117	199	126
8	164	113	190	124
9	162	101	192	113
10	160	101	193	110
11	158	101	194	117
12	164	101	207	118
13	196	101	252	120
14	243	115	320	141
15	330	134	445	168
16	423	151	582	195

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CORRIGENDA

C.M.I.R. **16**, 52 Table ANN 1.1a

The column of 100 A/E for 1991-94 at duration 0 should read:

Age group (nearest ages)	100 A/E 1991-94
Duration 0	
61-70	73
71-75	114
76-80	98
81-85	120
86-90	99
61-90	103

C.M.I.R. **18**, 149

The caption to the Figure should begin "Figure C8" not "Female C8".

C.M.I.R. **18**, 151

The following Keywords should have been included between the authors' names and the Abstract:

KEYWORDS

PHI; Terminations; Company; Generalized Linear model; Credibility model

C.M.I.R. **18**, 174

Figure B2 is incorrect. The correct Figure B2 is reproduced below:

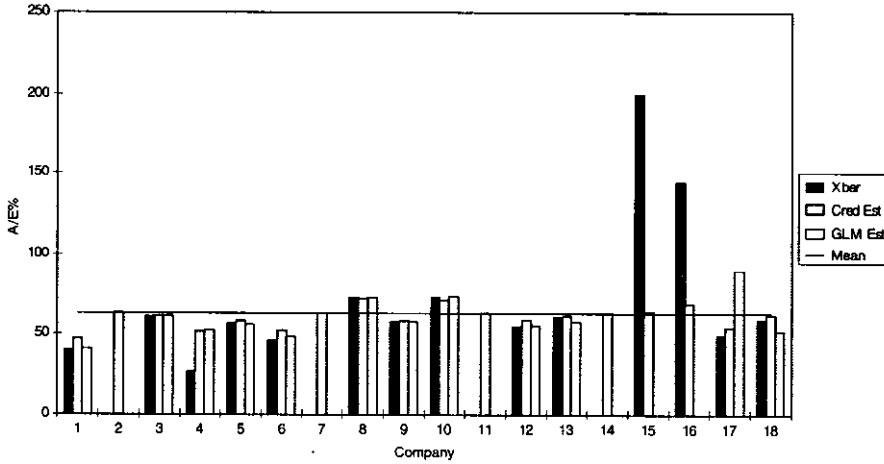

Figure B2. Males and females, deferred period 4 weeks, recoveries.

CONTINUOUS MORTALITY INVESTIGATION REPORTS

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