

## CONTINUOUS MORTALITY INVESTIGATION

### MORTALITY OF IMMEDIATE ANNUITANTS: EXPERIENCE 1955-68

THE report on the annuitants' experience for 1955-58 contained the caution that:

'The low percentages at duration 0 for 1956-58 should be regarded as a warning that a change may have taken place in the class of life entering the experience and it will be interesting to see whether the statistics for future years confirm this impression.'

Subsequent reports (see the end of this note for references) have distinguished, as far as possible, between annuities purchased before and after the passage of the Finance Act, 1956, and, with this distinction in mind, the offices have, each year, submitted separate data for one additional year of curtate duration, the last year for which such extended data were submitted being 1968 (relating to individual curtate durations up to 10). Since 1968, the select period for the preparation of data has reverted to 5 years, but the ultimate data are still being divided between 'pre-1957' and 'post-1956' purchases. The purpose of this report is to summarize the results of all the years for which the extended data have been submitted. Expected deaths have been calculated throughout on the basis of the 1947 table of annuitant mortality, published on page XVIII of *The a(55) tables for annuitants*. This is an ultimate table derived from the mortality experience of annuitants at durations 5 and over and it has been used in the present report as a common basis for computing the expected deaths at all durations. In consequence, comparison of the percentages of actual to expected deaths by duration should demonstrate the effect of selection on the observed experience.

Table 1 shows percentages of actual to expected deaths at duration 0 for successive periods of time. The experience for 1952-55 has been included for comparative purposes as the last complete period relating to pre-1957 business. (Owing to an alteration of phasing, the year 1955 occurs in two consecutive periods.) For both males and females it can be seen that the mortality experienced fell between 1952-55 and 1955-58 but that it has remained fairly level thereafter. This confirms the conclusion reached in the report published in *J.I.A.* 92, 296 and *T.F.A.* 30, 81.

Table 2 shows the experience at durations 1-4 combined. The data for the first period (1955-58) relate almost entirely to annuities purchased before 1957 and the same pattern emerges as at duration 0, i.e. a sharp fall between the first and second periods, the experience remaining level thereafter.

The main interest, however, lies in the results from the data which have

**Table 1. Annuitants 1952-68, duration 0. Actual deaths and percentages of actual to expected deaths according to the 1947 table of annuitant mortality**

Nearest ages	1952-55		1955-58		1959-62		1963-66		1967-68	
	Deaths	100 A/E								
<b>Males</b>										
41-70	35	92	32	70	51	63	78	75	44	68
71-80	46	65	41	46	77	48	128	73	49	48
81 and over	27	67	38	62	55	50	72	46	49	59
All over 40	108	73	111	57	183	52	278	64	142	57
<b>Females</b>										
41-70	34	51	33	45	45	42	72	53	32	48
71-80	73	62	81	57	109	50	158	56	70	51
81 and over	56	70	75	65	106	57	153	54	95	62
All over 40	163	62	189	57	260	51	383	55	197	55

**Table 2. Annuitants 1955-68, durations 1-4. Actual deaths and percentages of actual to expected deaths according to the 1947 table of annuitant mortality**

Nearest ages	1955-58		1959-62		1963-66		1967-68	
	Deaths	100 A/E						
<b>Males</b>								
41-60	14	185	20	145	24	122	15	164
61-65	15	74	33	76	77	100	32	71
66-70	97	104	132	87	161	75	152	117
71-75	113	88	158	83	207	74	105	71
76-80	134	87	187	68	250	68	139	73
81-85	133	99	188	69	275	72	126	63
86-90	36	58	99	75	156	67	104	79
91 and over	12	88	22	76	60	87	33	59
All over 40	554	90	839	76	1210	74	706	77
<b>Females</b>								
41-60	24	86	22	69	21	53	12	72
61-65	54	85	64	72	108	86	43	64
66-70	107	77	103	58	156	62	115	80
71-75	187	83	210	69	260	63	153	65
76-80	226	74	332	78	456	75	267	80
81-85	221	82	326	80	466	74	260	68
86-90	130	84	186	71	318	80	190	73
91 and over	52	90	101	95	150	88	92	81
All over 40	1001	81	1344	75	1935	73	1132	73

Table 3. Immediate Annuitants 1959-68, durations 1 to 10. Actual deaths and percentages of actual to expected deaths at individual durations, according to the 1947 table of annuitant mortality

Nearest ages	1959-68		1960-68		1961-68		1962-68		1963-68		1964-68		1965-68		1966-68		1967-68		1968		
	Deaths	A/E	Deaths	A/E																	
<b>Mailes</b>																					
41-60	21	140	13	119	11	138	9	158	8	210	4	188	1	188	1	122	1	222	—	—	
61-65	48	85	44	100	27	82	14	57	14	97	9	109	5	97	—	—	1	65	—	—	
66-70	118	79	95	76	109	104	73	91	53	105	24	77	20	93	9	66	8	112	3	140	
71-75	118	68	105	70	105	81	87	76	92	91	72	88	53	86	26	61	25	103	9	122	
76-80	130	55	132	63	138	77	123	83	104	88	71	80	48	72	36	74	39	118	22	132	
81-85	145	65	142	70	123	65	116	70	124	90	95	85	71	82	57	98	32	100	13	87	
86-90	77	64	88	72	78	69	86	83	72	82	58	74	51	78	44	84	42	116	23	155	
91 and over	29	86	24	70	33	84	24	62	30	85	29	108	18	79	17	88	7	48	10	119	
All over 40	686	68	643	72	624	79	532	78	497	90	362	84	267	81	190	79	155	104	80	123	
<b>Females</b>																					
41-60	17	60	14	64	12	70	7	55	6	73	9	187	6	197	2	102	1	101	—	—	
61-65	59	67	52	73	50	88	33	77	24	92	10	65	8	75	5	73	1	27	—	—	
66-70	95	58	80	56	91	77	84	87	51	68	43	80	34	85	24	90	18	123	13	266	
71-75	163	62	155	67	123	62	114	69	94	72	96	95	62	80	39	74	32	100	16	104	
76-80	239	66	230	70	255	86	211	83	184	89	105	65	86	70	99	110	57	106	19	77	
81-85	229	63	234	69	239	76	231	82	218	90	147	76	126	82	100	88	72	99	35	97	
86-90	149	68	176	80	167	80	132	71	146	90	122	89	95	84	67	76	48	82	33	122	
91 and over	78	91	72	81	74	80	84	92	72	88	63	90	64	101	43	86	27	80	14	82	
All over 40	1029	66	1013	70	1011	78	896	79	795	85	595	81	481	83	379	88	256	95	132	104	

been collected for post-1956 annuities at individual durations up to 10. These can be found in Table 3, but the results (including duration 0) for all ages combined are summarized below:

Duration	Percentage of actual to expected deaths with associated standard error	
	Males %	Females %
0	58 ± 2.3	54 ± 1.7
1	68 ± 2.6	66 ± 2.0
2	72 ± 2.8	70 ± 2.3
3	79 ± 3.2	78 ± 2.6
4	78 ± 3.4	79 ± 2.6
5	90 ± 4.0	85 ± 3.0
6	84 ± 4.4	81 ± 3.3
7	81 ± 5.0	83 ± 3.8
8	79 ± 5.7	88 ± 4.5
9	104 ± 8.3	95 ± 6.0
10	123 ± 13.7	104 ± 9.0

The terminal values in this table are somewhat puzzling. The early durations follow a familiar pattern viz. an appreciable increase between durations 0 and 1 followed by smaller increases at durations 2 and 3. Thereafter, for both males and females, the mortality remains fairly level for several durations (in spite of an apparent hump at duration 5 for both sexes). However, after duration 8 for males, and 7 for females, the percentages begin again to climb.

At the long durations the data are necessarily more sparse and the standard errors of the emerging percentages are relatively large. Even so, the increases for the male experience between durations 8 and 10 are statistically significant. In the female experience, the increases are smaller but a trend is clearly discernible.

It is difficult to suggest a satisfactory explanation of these results. As the experience relates to annuitants, there can be no question of selective lapsing, such as is thought to operate among assured lives. In 1968, when the data available for analysis extended only to duration 8, it seemed that the mortality by duration had reached a constant level. Accordingly it was decided to terminate the extended analysis as from 1 January 1969 and to revert to a select period of 5 years with a subdivision of the ultimate section of the data between pre-1957 and post-1956 annuities. It will consequently not be possible to make any further study of the trend at long durations.

Table 4 gives the results for the ultimate section of the experience over the period 1955-68. For the years before 1963 the ultimate section relates to durations 5 and over. For 1963 it relates to durations 6 and over, for 1964 to durations 7 and over, and so on progressively until 1968, when it

Table 4. *Immediate annuities purchased before 1957—Durations 5 and over: Experience 1955–68. Actual deaths and percentages of actual to expected deaths according to the 1947 table of annuitants*

Nearest ages	1955–58		1959–62		1963–66		1967–68	
	Deaths	100 A/E	Deaths	100 A/E	Deaths	100 A/E	Deaths	100 A/E
<b>Males</b>								
41–60	17	117	13	103	12	151	2	77
61–65	66	169	25	94	26	133	5	81
66–70	145	108	106	109	61	104	36	202
71–75	469	112	410	121	194	94	49	93
76–80	755	96	596	91	425	91	146	96
81–95	895	93	888	99	614	89	258	100
86–90	690	95	688	94	632	99	241	100
91 and over	314	104	343	102	374	101	148	87
All over 40	3351	99	3069	99	2338	95	885	98
<b>Females</b>								
41–60	55	97	25	59	13	54	6	94
61–65	133	90	105	101	68	105	14	75
66–70	491	108	333	94	214	99	50	79
71–75	1058	90	883	94	599	91	212	100
76–80	2358	102	1993	98	1469	97	567	102
81–85	3479	107	3321	107	2572	97	908	86
86–90	2860	100	3094	105	2707	100	1192	94
91 and over	1774	106	2107	107	2166	102	1026	98
All over 40	12208	102	11861	103	9808	98	3975	94

relates to durations 11 and over. It is, therefore, very nearly equivalent to the pre-1957 experience and only fails to be exactly equivalent because annuities purchased in 1957 will, on average, be exposed for one half-year at duration 6 in 1963, at duration 7 in 1964 and so on.

The male section of this ultimate experience corresponds fairly closely to the 1947 table and shows no noticeable trend with the passage of time. The female experience, however, shows appreciable reductions in mortality at ages over 80 as between the four-year period 1959–62 and the final period of two years, 1967–68.

The main outcome of the experiment, whereby the select period was progressively extended between the years 1963 and 1968, has been to support the hypothesis that a material change occurred in 1957 in the class of life entering the experience. No doubt the effect of the change varies among offices and each office will make an appropriate rating down in the  $a(55)$  tables in the light of its own experience when determining a basis for practical use.

The next report on annuitant mortality in the regular four-yearly series

will relate to the period 1967-70. This will present results on the new basis, i.e. post-1956 annuities with a 5 year select period plus an ultimate section for durations 5 and over, and pre-1957 annuities in a separate ultimate experience.

For convenience, a list of references follows of earlier notes, from which some of the figures reproduced in this note were taken.

<i>J.I.A.</i>	87,	253	and	<i>T.F.A.</i>	27,	156
„	91,	71	„	„	29,	223
„	92,	296	„	„	30,	81
„	95,	137	„	„	31,	28