

CONTINUOUS MORTALITY INVESTIGATION

IMMEDIATE SINGLE LIFE ANNUITIES FOR TERM CERTAIN AND LIFE THEREAFTER : 1948-56 EXPERIENCE

1. Starting with the year 1948, returns were made by the offices of their data under immediate single-life annuities issued for a term certain and for the remaining lifetime of the annuitant. One of the expected effects of the Finance Act, 1956, was to eliminate the demand for this type of contract, and it was decided to discontinue the collection of data after the end of 1956. Although what follows is a historical report of the mortality experienced under this class of annuity during the nine years for which data were collected, at the same time it may perhaps be regarded as having some bearing on the future to the extent that the data for ordinary immediate annuities may now be expected to include a number of lives who would, but for the 1956 Act, have purchased contracts under the "term certain and life thereafter" class.

2. When it was first decided to collect the data, it was thought probable that the "term certain and life thereafter" class might exhibit heavier mortality than ordinary immediate annuities. Each year, as a routine operation, the expected deaths were calculated according to the $a(f)$ and $a(m)$ tables, and when work on this report was started the information readily available consisted of the actual deaths and the expected deaths on this basis under the class in question for each of the years 1948-56, together with similar information under ordinary immediate annuities for each of the years 1948-52 only. As from 1953 the expected deaths under the ordinary immediate annuities had been calculated only according to the $a(55)$ table and the generation table which was published with it.

3. Before calculating the expected deaths under either class on any other basis it was decided to examine the information which had already been compiled. To enable comparison, as far as possible at this stage, with the ordinary immediate annuities, the "term certain and life thereafter" data for the nine years were divided into two periods 1948-52 and 1953-56, and the experience for these periods and for the nine years combined are shown respectively in Tables 1-3.

A comparison between the experience for 1948-52 and the experience under ordinary immediate annuities for the same period is shown in Table 4.

4. The percentage ratios of actual to expected deaths given in Table 4 exhibit no regular pattern with age, but the ratio $100 A/E$ is lower for the "term certain and life thereafter" class than for the ordinary single-life annuities for all age-groups but one in the male duration 0 experience, for all but one in the male durations 1 and over experience and for all groups in the female durations 1 and over experience. Only in the female duration 0 experience is the picture different, with the ordinary annuities having the lower ratio in four of the seven age-groups, but even here there is no significant difference over the whole range of ages.

5. It seems doubtful whether a really bad life would wish to purchase either type of contract, but if there has been any tendency for worse lives to choose the "term certain and life thereafter" annuities, the preceding paragraph leads to the conclusion that this tendency has been swamped by other forms of class selection—e.g. the selection which might have taken place if prospective annuitants in the higher income groups chose the term certain type for its tax advantages. In the case of the females at duration 0 it has been a matter of cancelling out rather than swamping, while in the case of both sexes at durations 1 and over the comparison may have been distorted if the term certain experience was of appreciably shorter average duration than the ordinary annuity experience; it is, however, interesting to note in this connexion, from Table 3, that over the whole period 1948-56 the experience for "term certain and life thereafter" annuities at durations 2-4 was not very different from the experience at durations 5 and over, and therefore any such duration effect would be of much smaller magnitude than the disparities disclosed by Table 4.

6. In view of these results it seemed doubtful whether any advantage could be derived either from extending the comparison between the two classes according to the $a(f)$ and $a(m)$ tables to include the years 1953-56, or from making the comparison according to the $a(55)$ table. However, the possible implications for the future mentioned in paragraph 1 suggested that it might be useful to examine the data for 1951-54 and 1955-56 according to the generation table published with the $a(55)$ table and compare the results with those given in the report on the experience of ordinary immediate annuitants over the period 1951-54 (*T.F.A.* 25, p. 316). To make the results directly comparable the data for durations 1-4 have been amalgamated, while

for the sake of completeness the "life thereafter" part of the experience—which has only been returned by the offices for all durations combined—has been included in the data for durations 5 and over. It is believed that the "life thereafter" experience would largely have belonged to this duration group, and as it was numerically much smaller than the term certain experience at durations 5 and over it is considered that little distortion is likely to arise.

7. The results of this comparison are shown in Table 5. Apart from the younger ages, at which data were scanty, it will be seen that the percentage ratios are generally lower for the "term certain and life thereafter" annuities than for the ordinary immediate annuities, and this is consistent with the results of the previous comparison given in paragraph 4. In general, the "term certain and life thereafter" experience was much smaller than that of the ordinary annuities, with the result that the percentage ratios of actual deaths to expected deaths for 1951-54 for the two classes combined were little different from the ratios for the ordinary immediate annuities only. An exception to this was the experience of male lives at durations 1-4, where the term certain class included nearly three-eighths of the total actual deaths (and $42\frac{1}{2}\%$ of the total expected deaths), with the result that the ratios for the two classes were very considerably lower than for the ordinary immediate annuities only.

8. It should not be deduced from this note that the experience of ordinary immediate annuities issued since the 1956 Act took effect will necessarily be of lighter mortality than would have occurred if that Act had never been passed. They may well include many lives who would not have purchased annuities of any kind under the old taxation arrangements. It is reasonable to suppose that from 1956 to 1957 there may well have been some change in class selection, giving rise to some discontinuity in the mortality experienced under ordinary immediate annuities, but until the actual results are investigated it is impossible to predict the direction or extent of the discontinuity. All that can be said is that to the extent that lives who would under the old arrangements have chosen the "term certain and life thereafter" class are diverted by the effects of the Act into the ordinary annuity class, the indications are that *to this extent only* some reduction in mortality may be expected.

TABLES 1–5

TABLE 1. Immediate single-life annuities for term certain and life thereafter. All offices 1948-52. Actual deaths compared with the expected deaths according to the *a(f)* and *a(m)* tables (ultimate for durations higher than 0)

Ages	Term certain durations								
	0			1			2		
	Actual deaths	Expected deaths	100A/E	Actual deaths	Expected deaths	100A/E	Actual deaths	Expected deaths	100A/E
Males									
-50	4	.66	152.8	3	1.01	117.4	3	.79	165.0
51-55	—	1.50		1	2.62		5	2.25	
56-60	7	5.04		9	7.44		9	7.26	
61-65	7	13.01		12	22.18	54.1	13	20.83	62.4
66-70	15	21.30	53.8	23	39.01	59.0	29	39.18	74.0
71-75	18	23.57	76.4	27	43.93	61.5	53	42.64	124.3
76-80	19	16.66	114.0	28	31.66	88.4	21	35.75	58.7
81-85	3	5.33		13	12.10		7	13.37	
86-90	2	1.73	70.8	3	3.15	104.1	1	2.52	50.0
91-95	—	—		—	.12		—	.12	
All ages	75	88.80	84.5	119	163.22	72.9	141	164.71	85.6
							124	154.70	80.2
Females									
-50	4	2.17	110.0	1	3.14	50.7	2	2.41	59.5
51-55	3	3.94		4	6.18		4	5.25	
56-60	11	10.26		8	16.32		7	14.19	
61-65	7	19.60	35.7	21	32.94	63.8	16	30.20	53.0
66-70	31	26.84	115.5	34	48.25	70.5	25	46.02	54.3
71-75	35	33.03	106.0	45	58.58	76.8	57	57.40	99.3
76-80	19	26.39	72.0	39	49.33	79.1	31	52.21	59.4
81-85	8	13.77	58.1	16	26.02	61.5	19	29.14	65.2
86-90	7	4.52		4	8.78		6	9.24	
91-95	—	.44	141.1	1	1.38	49.2	1	1.73	63.8
96-100	—	—		—	—		—	—	
All ages	125	140.96	88.7	173	250.92	68.9	168	247.79	67.8
							157	231.74	67.7

Ages	Term certain durations										Life		
	4			5 and over			1 and over			all durations			
	Actual deaths	Expected deaths	100A/E	Actual deaths	Expected deaths	100A/E	Actual deaths	Expected deaths	100A/E	Actual deaths		Expected deaths	100A/E
Males													
-50	1	.47	81.7	1	.46	180.2	8	3.32	122.5	—	—	0.0	
51-55	—	1.13		1	1.20		9	8.85		—	—		
56-60	4	4.52		10	5.00		35	30.27		—	.13		
61-65	13	13.68	95.0	18	16.00	112.5	67	91.14	73.5	—	.36	0.0	
66-70	37	28.96	127.8	41	41.66	98.4	160	184.42	86.8	2	1.26	158.7	
71-75	27	33.17	81.4	36	56.93	63.2	174	216.37	80.4	4	4.63	86.4	
76-80	25	32.65	76.6	57	57.50	99.1	158	192.55	82.1	8	7.68	104.2	
81-85	10	11.70		29	25.41		76	75.05		4	6.82		
86-90	2	4.26	75.2	1	4.22	104.1	10	15.34	91.8	4	2.82	74.8	
91-95	—	—		1	.15		1	.39		—	1.05		
All ages	119	130.54	91.2	195	208.53	93.5	698	821.70	84.9	22	24.75	88.9	
Females													
-50	1	1.23	33.1	—	1.18	43.0	5	9.78	50.8	—	—	0.0	
51-55	1	2.85		1	2.34		10	20.67		—	.03		
56-60	2	8.02		4	8.10		30	58.05		—	.25	232.6	
61-65	13	19.05	68.2	11	21.86	50.3	80	120.43	61.8	1	.43		
66-70	28	33.49	83.6	36	44.93	80.1	151	214.69	70.3	—	1.26	0.0	
71-75	48	43.79	109.6	55	66.11	83.2	242	278.56	86.9	3	2.78	107.9	
76-80	36	44.17	81.5	56	72.66	77.1	200	270.32	74.0	4	5.18	77.2	
81-85	20	27.72	72.2	51	46.79	109.0	127	160.71	79.0	4	10.76	37.2	
86-90	7	8.72		19	20.00		40	55.49		3	5.81		
91-95	1	1.44	76.5	1	2.52	88.2	4	9.72	67.0	1	2.49	63.9	
96-100	—	.30		—	.15		—	.45		2	1.09		
All ages	157	190.78	82.3	234	286.64	81.6	889	1207.87	73.6	18	30.08	59.8	

Term certain durations										Life		
Ages	4			5 and over			1 and over			All durations		
	Actual deaths	Expected deaths	100A/E	Actual deaths	Expected deaths	100A/E	Actual deaths	Expected deaths	100A/E	Actual deaths	Expected deaths	100A/E
Males												
-50	1	.30	50.5	—	.98	63.4	3	2.60	73.9	—	.01	0.0
51-55	—	.77		2	3.05		6	6.71		—	.08	
56-60	1	2.89		9	13.31		16	24.50		—		
61-65	6	9.54	62.9	34	40.27	84.4	58	77.27	75.1	3	.79	379.7
66-70	19	21.91	86.7	75	114.97	65.2	137	201.51	68.0	1	3.41	29.3
71-75	12	29.69	40.4	143	193.74	73.8	201	295.87	67.9	12	17.28	69.4
76-80	22	32.41	67.9	147	191.01	77.0	203	295.27	68.8	35	50.60	69.2
81-85	21	18.71		104	115.17		147	166.75		41	48.13	
86-90	1	3.75	94.4	26	20.23	96.3	34	30.60	90.7	14	17.98	83.0
91-95	—	.84		4	3.78		4	6.67		3	4.82	
96-100	—	—		—	—		—	—		1	.17	
All ages	83	120.81	68.7	544	696.51	78.1	809	1107.75	73.0	110	143.27	76.8
Females												
-50	—	.94	30.8	1	3.59	63.3	2	7.84	64.8	—	.02	0.0
51-55	—	2.27		3	8.00		9	17.33		—	.05	
56-60	3	6.54		20	26.34		39	52.03		—	.39	
61-65	14	17.60	79.5	29	75.54	38.4	73	140.42	52.0	2	1.21	165.3
66-70	19	31.14	61.0	103	167.76	61.4	178	278.62	63.9	8	5.29	151.2
71-75	31	44.27	70.0	224	263.04	85.2	328	412.15	79.6	9	15.23	59.1
76-80	42	48.86	86.0	237	294.01	97.6	424	449.37	94.4	29	39.30	73.8
81-85	30	35.87	83.6	149	202.50	73.6	244	309.97	78.7	50	88.44	56.5
86-90	8	14.15		55	72.86		90	115.06		43	61.53	
91-95	3	3.17	63.5	8	11.54	74.5	13	19.37	76.4	13	21.29	68.9
96-100	—	—		1	1.54		1	1.69		3	2.53	
101-	—	—		—	—		—	—		—	.20	
All ages	150	204.81	73.2	880	1126.72	78.1	1401	1803.85	77.7	157	235.54	66.7

TABLE 3. Immediate single-life annuities for term certain and life thereafter. All offices 1948-56. Actual deaths compared with the expected deaths according to the $a(f)$ and $a(m)$ tables (ultimate for durations higher than 0)

Term certain durations												
Ages	0			1			2			3		
	Actual deaths	Expected deaths	100A/E	Actual deaths	Expected deaths	100A/E	Actual deaths	Expected deaths	100A/E	Actual deaths	Expected deaths	100A/E
Males												
-50	4	.92	129.2	3	1.51	90.2	3	1.26	144.7	2	.94	98.8
51-55	1	2.23		1	3.67		6	3.16		5	2.58	
56-60	8	6.91		10	10.34		12	10.09		5	8.62	
61-65	15	18.94	79.2	19	31.45	60.4	21	29.95	70.1	14	27.52	50.9
66-70	24	32.52	73.8	41	60.52	67.7	44	60.85	72.3	40	57.06	70.1
71-75	28	36.48	76.8	40	67.04	59.7	68	67.14	101.3	49	64.53	75.9
76-80	29	26.46	109.6	37	51.82	71.4	37	60.35	61.3	36	62.08	58.0
81-85	9	9.75		25	21.01		11	23.41		23	27.39	
86-90	6	2.73	123.1	5	5.16	111.4	1	4.60	41.9	8	6.72	88.5
91-95	1	.52		—	.75		—	.64		—	.90	
96-100	—	—		—	—		—	—		—	—	
All ages	125	137.46	90.9	181	253.27	71.5	203	261.45	77.6	182	258.34	70.4
Females												
-50	4	2.87	89.4	1	4.33	53.5	2	3.56	59.4	2	2.79	78.2
51-55	4	5.40		6	8.59		6	7.60		2	6.35	
56-60	12	14.11		12	22.57		11	20.81		17	17.70	
61-65	14	27.87	50.2	28	48.18	58.1	30	46.17	65.0	28	41.45	67.6
66-70	39	40.24	96.9	46	73.39	62.7	46	72.87	63.1	51	69.73	73.1
71-75	52	49.72	104.6	70	89.70	78.0	79	92.41	85.5	63	91.39	68.9
76-80	29	40.72	71.2	60	79.69	75.3	68	88.10	77.2	75	92.20	81.3
81-85	15	22.21	67.5	27	44.88	60.2	47	53.73	87.5	47	59.19	79.4
86-90	14	8.33		11	16.42		14	18.05		16	20.35	
91-95	—	1.13	148.0	1	2.75	62.6	2	2.98	76.1	1	4.69	67.5
96-100	—	—		—	—		—	—		—	—	
101-	—	—		—	—		—	—		—	—	
All ages	183	212.60	86.1	262	390.50	67.1	305	406.28	75.1	302	405.99	74.4

Term certain durations										Life			
Ages	4			5 and over			1 and over				All durations		
	Actual deaths	Expected deaths	100A/E	Actual deaths	Expected deaths	100A/E	Actual deaths	Expected deaths	100A/E		Actual deaths	Expected deaths	100A/E
Males													
-50	2	.77	69.4	1	1.44	95.8	11	5.92	101.0	—	—	0.0	
51-55	—	1.90		3	4.25		15	15.56		—	.01		
56-60	5	7.41		19	18.31		51	54.77		—	.21		
61-65	19	23.22	81.8	52	56.27	92.4	125	168.41	74.2	3	1.15	280.9	
66-70	56	50.87	110.1	116	156.63	74.1	297	385.93	77.0	3	4.67	64.2	
71-75	39	62.86	62.0	179	250.67	71.4	375	512.24	73.2	16	21.91	73.0	
76-80	47	65.06	72.2	204	248.51	82.1	361	487.82	74.0	43	58.28	73.8	
81-85	31	30.41	133	133	140.58		223	242.80		45	54.95		
86-90	3	8.01	86.6	27	24.45	97.7	44	48.94	91.0	18	20.80	81.9	
91-95	—	.84		5	3.93		5	7.06		3	5.87		
96-100	—	—		—	—		—	—		1	.17		
All ages	202	251.35	80.4	739	905.04	81.7	1507	1929.45	78.1	132	168.02	78.6	
Females													
-50	1	2.17	32.0	1	4.77	58.5	7	17.62	57.3	—	.02	0.0	
51-55	1	5.12		4	10.34		19	38.00		—	.08		
56-60	5	14.56		24	34.44		69	110.08		—	.64		
61-65	27	36.65	73.7	40	97.40	41.1	153	293.85	56.7	3	1.64	182.9	
66-70	47	64.63	72.7	139	212.69	65.4	329	493.31	66.7	8	6.55	122.1	
71-75	79	88.06	89.7	279	329.15	84.8	570	690.71	82.5	12	18.01	66.6	
76-80	78	93.03	83.8	343	366.67	93.5	624	719.69	86.7	33	44.48	74.2	
81-85	50	63.59	78.6	200	249.29	80.2	371	470.68	78.8	54	99.20	54.4	
86-90	15	22.87		74	92.86		130	170.55		46	67.40		
91-95	4	4.61	68.4	9	14.06	77.3	17	29.09	73.3	14	23.78	68.4	
96-100	—	.30		1	1.69		1	2.14		5	3.62		
101-	—	—		—	—		—	—		—	.20		
All ages	307	395.59	77.6	1114	1413.36	78.8	2290	3011.72	76.0	175	265.62	65.9	

TABLE 5. Comparison of actual deaths under certain classes of annuity with deaths expected according to the "durations 5 and over" generation table published with the a(55) table

Ages	1951-54 Term certain and life thereafter			1951-54 Ordinary immediate annuities			1951-54 Both classes combined			1955-56 Term certain and life thereafter		
	A	E	100A/E	A	E	100A/E	A	E	100A/E	A	E	100A/E
Males, durations 1-4												
-50	3	.82	365.9	0	.87	0.0	3	1.69	177.5	1	.32	312.5
51-55	8	3.24	246.9	1	1.93	51.8	9	5.17	174.1	1	.98	102.0
56-60	10	11.94	83.8	8	7.25	110.3	18	19.19	93.8	4	3.55	112.7
61-65	37	41.80	88.5	31	24.33	127.4	68	66.13	102.8	13	13.00	100.0
66-70	98	101.19	96.8	104	101.66	102.3	202	202.85	99.6	28	36.83	76.0
71-75	96	122.73	78.2	144	139.13	103.5	240	261.86	91.7	23	47.61	48.3
76-80	76	128.42	59.2	155	164.97	94.0	231	293.39	78.7	29	46.07	62.9
81-85	44	49.96	88.1	133	137.43	96.8	177	187.39	94.5	26	28.05	92.7
86-90	13	15.45	84.1	58	55.32	104.8	71	70.77	100.3	2	4.52	44.2
91-	0	1.72	0.0	15	12.23	122.6	15	13.95	107.5	0	1.50	0.0
All ages	385	477.27	80.7	649	645.12	100.6	1034	1122.39	92.1	127	182.43	69.6
Males, durations 5 and over												
-50	1	.37	270.3	2	1.49	134.2	3	1.86	161.3	0	.22	0.0
51-55	2	1.57	127.4	4	3.09	129.4	6	4.66	128.8	1	.90	111.1
56-60	15	7.35	204.1	19	12.64	150.3	34	19.99	170.1	4	4.91	81.5
61-65	38	25.64	148.2	67	46.95	142.7	105	72.59	144.6	16	17.40	92.0
66-70	75	79.54	94.3	170	165.70	102.6	245	245.24	99.9	33	56.13	58.8
71-75	87	133.28	65.3	442	459.07	96.3	529	592.35	89.3	92	118.67	77.5
76-80	124	149.37	83.0	847	822.17	103.0	971	971.54	99.9	114	135.18	84.3
81-85	69	79.70	86.6	905	910.23	99.4	974	989.93	98.4	100	107.49	93.0
86-90	33	22.22	148.5	613	607.87	100.8	646	630.09	102.5	12	23.88	50.3
91-95	0	3.67	0.0	191	184.92	103.3	191	188.59	101.3	7	5.90	118.6
96-	1	.17	588.2	47	52.15	90.1	48	52.32	91.7	—	—	—
All ages	445	502.88	88.5	3307	3266.28	101.2	3752	3769.16	99.5	379	470.68	80.5

