

**MORTALITY UNDER SETTLEMENT OPTIONS  
AND DEFERRED ANNUITIES**

- A. Does the material under settlement options and deferred annuities recently published in the 1956 Reports Number of the *Transactions* suggest need for change in the present bases and valuation standards for these contracts?
- B. What other conclusions may be drawn from the results of this mortality study? How does this experience compare with that developed from similar studies in other countries?

MR. L. R. MARTIN presented Table 1, which compares the mortality ratios relative to the  $a$ -1949 Table for the intercompany experience between 1950 and 1955 anniversaries with the corresponding ratios for the period between 1945 and 1950 anniversaries. This shows a lower level of mortality in the more recent period in practically every category except the unimportant one of settlements arising from death claims on male lives.

Mr. Martin pointed out that there was practically no mortality improvement for ages 80 and over in the case of optional settlements arising from death claims or from endowment maturities, but that there was some improvement in the case of matured deferred annuities. He suggested that this may give us a little more faith in the mortality rates of the  $a$ -1949 Table for the older ages.

It is likely that the publication of the new experience data will give further impetus to the use of projections in the computation of optional settlement rates. It would not be surprising to see more companies abandon the idea of an age setback in the case of female lives. The preponderance of the settlement option and deferred annuity business is on the lives of females, so a more accurate basis of female mortality would seem desirable, and it is a fairly easy matter to use separate tables.

Currently, single premium annuity rates are more liberal than optional settlement rates in some contracts now maturing. In such a situation the beneficiary will tend to purchase a single premium annuity if a life income is desired. To avoid subjecting the beneficiary to a new purchase, the Connecticut Mutual is granting optional settlement rates on maturing contracts which are somewhat better than could be obtained through the purchase of new single premium annuities. This situation also brings home the fallacy of attempting to offset losses on distant maturities with gains on early maturities.

While the progressive mortality idea is a very helpful one, it must be admitted that our projections are in the realm of the unknown. It seems only the part of wisdom to make some provision as we go along for possible inadequacy in the rates adopted. The Connecticut Mutual has for

TABLE 1

COMPARISON OF MORTALITY IN INTERCOMPANY EXPERIENCE STUDIES  
COVERING TWO PERIODS, 1950 TO 1955 ANNIVERSARIES  
AND 1945 TO 1950 ANNIVERSARIES

(All mortality ratios by amounts of annual income  
and relative to the *a*-1949 Table)

TYPE OF BUSINESS	EXPERIENCE PERIOD	
	1945-50 Anniversaries	1950-55 Anniversaries
Settlements Arising from Death Claims		
Male lives		
Payee elections . . . . .	107%	130%
Nonpayee elections . . . . .	180	166
All elections . . . . .	143%	149%
Female lives		
Payee elections . . . . .	111%	104%
Nonpayee elections . . . . .	124	116
All elections . . . . .	117%	109%
Settlements Arising from Endowment Maturities and Cash Values		
Male lives . . . . .	105%	95%
Female lives . . . . .	96%	86%
Matured Deferred Annuity Contracts		
Male lives		
With guarantee period or refund provision . . . . .	121%	106%
Without guarantee period or refund provision . . . . .	102	78
All contracts . . . . .	119%	103%
Female lives		
With guarantee period or refund provision . . . . .	113%	104%
Without guarantee period or refund provision . . . . .	92	91
All contracts . . . . .	108%	100%

some years maintained a reserve for options not yet matured, and Mr. Martin has found that most similar companies make similar provisions. It may be that such a reserve will become a permanent feature of the optional settlement picture.

MR. R. L. GWILT reported that not as much importance is attached

to settlement options in Great Britain as in the United States, such options being the exception rather than the rule with them. He was sure, however, that options are exercised against the insurance company and that an appropriate provision must be made for this antiselection.

Until recently no mortality statistics relating to annuitants other than those covered by immediate annuity contracts were compiled in Great Britain. They experience a substantially higher level of mortality on their immediate annuity contracts than companies do in America. Their annuity values have to be projected many years into the future in order to get the sort of mortality experienced on this continent at present.

MR. N. M. HUGHES stated that the answer to question A insofar as settlement options are concerned would appear to be yes, but he would not predict that the suggested need for change would be immediately recognized and acted upon. Of the 18 companies which contributed to the recent experience (and which presumably include the companies having the greatest interest in the subject), only 5 have changed their life income amounts since 1949. Some of the others had radically revised their bases some years earlier and probably did not feel it necessary to repeat the performance in the face of the prospect that a still further adjustment might prove advisable before too long.

As for medium size and small companies which did not contribute to the intercompany study, Mr. Hughes reported that on the basis of conversations with officers of some of these companies, he concluded that they could be divided into two groups, (1) those who think that the problem is a very minor one and propose to do nothing at all about it, and (2) those who concede at least a moderate interest in the problem but have doubts as to the nature of the solution.

The first group is by far the largest numerically. The complacency of some companies may be unwarranted if it is founded on the percentage of over-all current claims settled on the life income basis. Recent years have seen a spectacular change in the typical policy issued—it now being of much greater amount and having a large term element, and often sold in connection with programs in which the life income option is stressed. Past experience therefore may be entirely unreliable as a guide to what may be expected in the way of future elections.

In the second group of companies there seems to be general agreement on the basic unsoundness of guaranteeing life income rates for generations, but the officers are not likely to take action until some adequate and acceptable solution of the associated problems can be arrived at which will avoid the necessity of revising bases every few years. If and when a satis-

factory solution is found, Mr. Hughes had no doubts that the second group of companies would avail themselves of it.

MR. E. A. LEW stated that many companies had adopted in recent years new mortality bases for their life income settlement options, which were mainly adaptations of the *a*-1949 Table designed to include a margin for future mortality reductions but without varying the guarantees according to the calendar year in which the income begins.

Mortality ratios for the intercompany 1950-1955 experience under all types of settlement options combined, using the 1937 Standard Annuity Table set back two years as the basis of expected deaths, are as follows:

	By Number of Contracts	By Amounts of Income
Male lives.....	98%	97%
Female lives.....	93%	95%

For males at ages 60 to 69, the mortality ratios on the above basis were only 85% by number and amount, and for females in the important age group of 50 to 69 the ratios ranged from 71% to 78%. Thus it is clear that the 1937 Standard Annuity Table set back two years is no longer a satisfactory measure of even current mortality under life income settlements, particularly for female lives.

Mortality rates for the combined experience relative to the *a*-1949 Table without projection and to this table with Projection B are as follows:

	RELATIVE TO <i>a</i> -1949 TABLE WITHOUT PROJECTION		RELATIVE TO <i>a</i> -1949 TABLE PROJECTION B	
	By Number	By Amounts	By Number	By Amounts
Male lives.....	97%	97%	101%	100%
Female lives.....	103%	105%	106%	108%

It is noteworthy that if we consider the last ten years' mortality experience under life income settlement options, Projection B has overstated the decrease in mortality on male lives but has understated it for female lives. Since we have to provide for mortality improvement over a long period of years in the future, it is still a matter of actuarial judgment whether the last ten years' experience serves as the most significant guide for the future.

As pointed out by Mr. Martin, it is highly significant that at ages 80 and over the mortality ratios on the *a*-1949 Table without projection have been in the range from 104% to 106% for both males and females, by number of contracts and amounts of income. Using the *a*-1949 Table with Projection B, these mortality ratios at ages 80 and over are increased to 106% to 108%. This should dispel any fears, which have been voiced by some, as to the adequacy of the *a*-1949 Table at the advanced ages.

MR. J. F. MACLEAN reported that his company adopted in 1955 the *a*-1949 Table projected thirty years with interest at  $2\frac{1}{2}\%$  as the basis for their settlement option guarantees. These options, though, were made completely participating and a level dividend has been declared based on their mortality experience and 3% interest. The monthly factor for a ten year certain benefit for a male life at age 65 is \$6.00 guaranteed per \$1,000 of proceeds, with an annual dividend of \$8.45.

In addition to the traditional reasons for participating settlement options, they felt that this attack was a natural extension of their termination dividend philosophy. The termination dividend is not paid when the settlement option is elected, but the dividend declared each year thereafter would reflect the actual mortality, interest and expense results.

MR. H. F. GUNDY opened his remarks by calling attention to the growth in the annuity account of life insurance companies. He emphasized that the increased importance that the annuity business was assuming in the operations of the companies on this continent deserved careful consideration of the effect it might have upon future insurance costs, because of the rates being charged for annuities and the reserves being made for the liability which will arise under existing insurance policies and deferred annuity contracts, as well as under contracts now providing income benefits.

In countries other than the United States and Canada it is not general practice to include policy provisions guaranteeing annuity benefits upon death, surrender or maturity, and so mortality data similar to the inter-company study do not seem to exist for other countries.

Table 2 contains some recent data as to the mortality experience of the Sun Life of Canada on Ordinary immediate annuities issued in Great Britain.

Census figures for 1949 indicate that mortality rates at ages over 70 were slightly higher in England and Wales than in the United States, but not enough to account for the distinctly higher rate of mortality among annuitants. The reason for the latter result is probably the fact that annuities have tended to be a more popular form of investment in Great Britain than in the United States, resulting in a broader spread of risk.

Table 3 summarizes the experience during the calendar years 1948 to 1951 on "Pensioners under Life Office Pension Schemes" as published by the Institute of Actuaries (*JIA* 80). Here again a higher mortality level is found among annuitants in Great Britain than in the United States.

TABLE 2

SUN LIFE OF CANADA MORTALITY EXPERIENCE ON IMMEDIATE ANNUITIES  
IN GREAT BRITAIN BETWEEN 1948 AND 1953 ANNIVERSARIES  
BY NUMBER OF CONTRACTS  
(Expected Deaths by the *a*-1949 Table)

AGES	MALES				FEMALES			
	Nonrefund		Refund		Nonrefund		Refund	
	Actual Deaths	Mortality Ratio						
To 69 .....	24	149%	43	131%	41	119%	67	130%
70-79 .....	136	129	95	116	312	140	134	111
80-89 .....	291	130	80	181	696	123	130	124
90 and over .....	54	143	12	160	241	101	35	136
All .....	505	132%	230	139%	1,290	122%	366	121%

TABLE 3

MORTALITY EXPERIENCE IN GREAT  
BRITAIN OF MALE PENSIONERS UNDER  
LIFE OFFICE PENSION SCHEMES, 1948-  
1951

Includes Only Retirements at or after the  
Normal Age Expected by 1946-1950 Group  
Annuity Mortality Table (*TSA* IV)

Ages	Actual Deaths	Mortality Ratio by Lives
65½-69½ .....	1,722	119%
70½-74½ .....	1,005	113
75½-79½ .....	352	114
All .....	3,079	116%

MR. LOUIS GARFIN mentioned that the potential mortality savings on income settlements arising from early retirements under pension trust issues may help to offset excess mortality under the insurance benefits

provided prior to retirement. This is particularly pertinent, of course, in pension trust guaranteed issue arrangements under which sizable amounts of income endowment benefits are issued without evidence of insurability.

Mr. Garfin also presented Table 4, which contains mortality rates at the higher ages in each of 18 different countries, the information being obtained from the United Nations Demographic Year Books. In each case

TABLE 4  
DEATH RATES PER 1,000 AT THE HIGHER AGES BY SEX  
IN SELECTED COUNTRIES FOR SPECIFIED YEARS

COUNTRY	YEAR	MALES				FEMALES			
		65-69	70-74	75-79	80-84	65-69	70-74	75-79	80-84
United States...	1949	43.0	62.6	92.9	138.7	27.5	44.4	70.1	117.8
	1954	41.6	57.0	85.5	127.1	25.2	37.8	63.5	105.3
Canada.....	1949	37.0	56.4	80.8	126.0	26.2	45.0	70.9	110.2
	1955	36.6	53.9	83.2	129.8	22.9	37.8	63.3	105.9
England and Wales.....	1949	43.0	66.7	103.3	159.7	26.5	46.9	79.0	127.8
	1955	44.0	67.7	109.1	168.0	24.3	42.2	72.4	125.6
Australia.....	1947	41.6	61.4	97.2	140.6	26.2	43.1	73.0	122.8
	1955	42.1	65.3	94.7	152.3	23.8	40.5	67.3	117.7
New Zealand...	1948	36.7	56.3	*	*	25.2	40.3	*	*
	1955	37.2	57.4	90.4	129.6	24.4	38.1	69.7	108.9
South Africa....	1948	43.2	62.0	91.5	134.6	27.4	44.8	68.7	116.8
	1950	42.7	59.4	92.7	137.1	28.7	43.0	76.1	119.5
Scotland.....	1950	44.3	72.3	101.9	158.5	32.1	55.9	87.4	133.4
	1955	46.9	70.4	108.6	165.9	30.6	49.7	85.7	138.3
Ireland.....	1946	42.5	65.7	*	*	34.3	56.2	*	*
	1951	43.1	71.3	118.6	196.1	36.1	60.3	104.6	171.7
Northern Ireland.....	1950	37.4	68.7	124.9	204.6	28.8	60.2	96.1	186.0
	1955	42.1	66.2	98.3	143.0	30.2	50.5	78.4	132.6
Sweden.....	1948	30.8	48.7	81.1	136.3	25.9	44.5	74.4	129.5
	1954	30.4	49.9	80.4	135.5	23.4	41.4	71.7	128.1
Norway.....	1949	24.8	43.2	72.7	123.2	20.8	37.5	65.0	115.2
	1954	28.1	43.1	72.7	114.8	18.5	35.1	62.7	110.5
Denmark.....	1949	31.0	50.0	80.1	*	25.8	45.4	76.4	*
	1954	29.8	50.0	82.0	137.7	24.6	43.7	76.7	130.1
Netherlands....	1950	28.5	47.2	79.0	134.5	25.0	43.4	76.2	125.5
	1955	28.6	47.0	80.3	131.3	21.9	40.4	69.8	120.9
Switzerland....	1949	39.4	65.3	104.8	*	29.2	49.7	86.8	*
	1954	38.5	58.1	94.9	150.6	25.0	43.0	76.1	126.5
France.....	1950	38.9	61.3	96.9	157.3	24.2	40.9	70.4	116.5
	1955	38.8	62.4	100.0	167.8	22.2	38.4	69.4	123.2
Belgium.....	1950	40.6	61.1	98.8	157.4	28.0	47.9	80.5	134.0
	1954	38.7	58.6	95.8	153.7	25.6	43.3	76.8	126.0
Finland.....	1949	48.2	69.4	106.8	133.5	34.1	58.6	94.4	151.5
	1955	50.8	72.7	117.4	171.2	29.2	50.7	93.0	154.5
Portugal.....	1949	43.7	74.4	122.9	204.2	28.3	52.0	86.7	182.9
	1955	39.5	65.3	*	*	25.0	43.3	*	*

\* Not available.

the mortality rates are shown for the most recent year available and for about five years earlier. Of the 18 countries, 14 showed general reductions in the female mortality rates in the more recent experience. Seven of these fourteen countries, including the United States white population, also had lower male death rates. The comparisons available from the table not only indicate that there is still room for improvement in mortality at the higher ages in this country, but they make it clear that it is not uncommon to observe increases in male mortality at ages which are quite important in the case of annuity benefits.

Mr. Garfin referred to a paper entitled "Increases in Recent Mortality Rates at High Ages" by Mr. S. W. Caffin published in the March 1957 issue of *Population Studies*, the Journal of Demography published by the London School of Economics. The purpose of the paper was to develop a possible explanation for an increase in mortality observed among Australian males at ages over 60 in studies based on 1933 and 1947 census statistics. The author concluded that the effect of a deferment of deaths can result in increased mortality rates if the number of deaths deferred at successive ages decreases, and the increase in the mortality rates can show up at ages at which deaths are in fact being deferred. This result will occur only in a period of changing mortality where a notable reduction in mortality occurs generally in the population. Once such a reduction becomes permanent, Mr. Caffin concluded, the affected mortality rates may then be expected to follow the general trend again.

MR. ARTHUR PEDOE agreed with Mr. Garfin that there was still room for improvement in mortality at the higher ages in the United States; this was generally accepted. However, he felt it necessary to inform Mr. Garfin that there was no reason for dismay that the population mortality at older ages did not necessarily show a reduction at every successive investigation. This reduction at the older ages was quite a recent phenomenon. In the earliest investigations into population mortality, reductions in mortality occurred consistently at the younger ages without any corresponding decrease at ages over 60. In fact, over certain periods of time in many countries, the mortality over age 60 had shown increases during these same periods.

Mr. Pedoe said that his attention had been drawn to the note by Mr. Caffin on Australian male mortality referred to by Mr. Garfin and he felt some further comment should be made. If with a radix of 10,000 lives at age 60 the deaths at that age are 222 and the deaths deferred for two years, say, are 50, 40, 30, 20 and 10 for ages 60 to 64 respectively, Mr. Caffin points out that the mortality at ages 62, 63 and 64 would be increased. Mr. Pedoe said he considered this as obvious as the multiplication table.

However, he wondered what medical advance or other change would save five times as many lives at age 60 as at age 64 and yet apparently affect males only, for, as shown in Mr. Garfin's Table 4, the mortality for female lives did not increase but decreased substantially. This explanation of increased mortality by the deferment of death of "damaged lives" was totally fallacious, Mr. Pedoe stated, but as it was not down for discussion and had only been referred to incidentally he would not pursue the point. On inquiring further, he learned that mortality at the older ages for insured lives in Australia had been falling in recent years, as had been the case in the United States and Canada.