

MORTALITY EXPERIENCE OF THE NEW ENGLAND
LIFE ON POLICIES ISSUED IN PENSION TRUSTS
FOR INDIVIDUALS NORMALLY UNINSURABLE

JOHN L. STEARNS

IN CONNECTION with individually underwritten Pension Trusts, the substandard risks may be taken care of by a so-called "Graded" or "Graduated" policy, whereby the death benefit is the reserve plus a proportion of the risk. This proportion is one-half the risk for a case rated 200%, one-tenth of the risk for a case rated 1,000%. The New England Life established the practice, about eight years ago, of accepting in a single class all applicants who had been declined at the highest regular rating, including them in a single class rated 1,000%. More recently, a grading lower than 1,000% has been applied at issue ages above age 50.

During the years 1947 through 1954, 3,517 policies were issued to these normally uninsurable risks. Most of the policies issued were on the Retirement Income at 65 plan; however, some of the later issues were on the Life Paid-up at 85 basis written to terminate at the time the individual retired. A mortality study has been made, carrying the exposure from issue to the 1955 policy anniversary.

Because of the very high rate of mortality, an exposure of this sort quickly develops sufficient material to be significant. An analysis of results would be somewhat equivalent to following the mortality history of the rejections arising from a given block of business; however, it differs from a study of business normally rejected in that many of the policies would never have been applied for. The expected deaths have been calculated both on the 1946-1949 Select Basic Table and on the CSO Table.

In studying the results shown in Table 1, we wish to call attention to the difference in ratio by number of policies and by amount for issue age 39 and under. This arose from one death claim with a face amount of \$100,000. There was no other policy in the death claims for even half of this amount. As a matter of fact, only 6 policies were over \$25,000 face amount out of the 255 policy claims. It is interesting to note that the large death claim just mentioned involved the payment of \$15,000,¹ including reserve of \$5,524.

The expected mortality has been computed on the face amount of the policies. We have made a mathematical test and find that because the

¹ This amount is based on a calculation per \$1,000 forced to the nearest dollar.

TABLE 1

ISSUE AGE	EXPOSURE	ACTUAL DEATHS	1946-1949 SELECT BASIC TABLE		CSO TABLE	
			Expected Deaths	Mortality Ratio	Expected Deaths	Mortality Ratio
BY NUMBER OF POLICIES						
39 and under..	1,913	20	2.42	827%	9.25	216%
40-49.....	4,052	88	12.37	712	39.07	225
50-59.....	3,918	115	24.99	460	75.01	153
60 and over...	644	32	8.02	399	23.22	138
All Ages..	10,527	255	47.80	533%	146.55	174%
BY FACE AMOUNT OF INSURANCE						
39 and under..	\$ 8,441,265	\$ 171,028	\$ 10,658	1,605%	\$ 40,786	390%
40-49.....	17,271,438	327,419	52,624	622	166,330	197
50-59.....	17,291,845	438,438	110,538	397	330,789	133
60 and over...	3,942,802	225,196	48,579	464	142,129	158
All Ages..	\$46,947,350	\$1,162,081	\$222,399	523%	\$680,034	171%

POLICY YEAR	EXPOSURE	ACTUAL DEATHS	1946-1949 SELECT BASIC TABLE		CSO TABLE	
			Expected Deaths	Mortality Ratio	Expected Deaths	Mortality Ratio
BY NUMBER OF POLICIES						
1.....	3,499	79	9.40	840%	43.53	181%
2.....	2,697	66	10.65	620	36.26	182
3.....	1,875	46	10.24	449	27.34	168
4.....	1,233	32	8.04	398	19.27	166
5-8.....	1,223	32	9.47	338	20.15	159
All Years.	10,527	255	47.80	533%	146.55	174%
BY FACE AMOUNT OF INSURANCE						
1.....	\$15,656,731	\$ 323,020	\$ 44,307	729%	\$203,999	158%
2.....	11,883,008	329,011	49,491	665	167,520	196
3.....	8,454,198	268,037	47,835	560	127,375	210
4.....	5,273,214	133,206	34,753	383	83,260	160
5-8.....	5,680,199	108,807	46,013	236	97,880	111
All Years.	\$46,947,350	\$1,162,081	\$222,399	523%	\$680,034	171%

exposure is of such short duration and heavily weighted in the early years, the difference between the over-all ratio obtained on the face amount and the ratio obtained on the risk basis was small.

We have reason to believe that the mortality of the New England Life on standard medically examined lives is consistent with the results shown in the Reports of the Committee on Mortality—that is to say, somewhat lower than the 1946–1949 Select Basic Table.

In judging the significance of the results from a financial viewpoint it should be kept in mind that these policies were issued with standard pre-

TABLE 2
CAUSES OF DEATH

	Number of Policies	Number of Lives	Face Amount of Insurance	Percentage Distribution by Amount
Cancer and Leukemia	33	28	\$ 142,686	12.3%
Diabetes Mellitus	4	2	6,250	.5
Coronary Artery Disease including Oc- clusion, Thrombosis and Embolism . . .	90	65	556,831	47.9
Congestive Failure and Other Cardiac Conditions	22	17	74,599	6.4
Cerebrovascular Accident (Cerebral Hemorrhage or Thrombosis)	35	26	92,780	8.0
Arteriosclerosis and Other Vascular . . .	12	10	31,447	2.7
Hypertension	14	11	28,717	2.5
Gastro-intestinal Disorders, including Cirrhosis of the Liver	16	12	56,631	4.9
Nephritis and Renal Failure	10	8	44,260	3.8
Other Genito-urinary Disorders	4	2	15,915	1.4
Violent	4	3	19,045	1.6
Miscellaneous Diseases	11	11	92,920	8.0
Total	255	195	\$1,162,081	100.0%

miums and values and received standard dividends. The result of this practice is that the mortality in respect to the Basic Table, reasonably near the New England Life experience, can be compared to the 1,000% to indicate the adequacy of the mortality assumption.

Analysis of the actual deaths by cause of death is shown in Table 2.

If we add together the percentages in the table from the third through the seventh line, we obtain a total of 67.5%. This combination might be said to correspond with the title "Diseases of the Heart and Circulatory System" which appears in the Mortality Report of the Committee on Mortality under Ordinary Insurances on page 3 of the 1955 Reports, where the highest percentage in any of the age groups was about 50%. The natural inference would be that the larger percentage of heart deaths

was due to the fact that a group such as this, which normally would be declined, would have a large percentage of heart impairments.

We investigated the principal cause of rating of every even-numbered policy issued from 1948 through 1953, included in the study, although it

TABLE 3
REASONS FOR RATING

	Number of Policies	Face Amount of Insurance	Percentage Distribution by Amount
Pulmonary Tuberculosis and Other Respiratory Disorders	26	\$ 85,400	1.3%
Cancer	48	208,900	3.1
Diabetes Mellitus, Definite or Suspected	102	428,100	6.4
Nervous Disorders	39	140,000	2.1
Cardiovascular			
<i>a</i>) Coronary Artery Disease			
i. With Cardiovascular-renal Complications	53	259,200	3.9
ii. Without Significant Complications	114	720,200	10.8
<i>b</i>) Severe Hypertension, Systolic 180 and Over or Diastolic 110 and Over			
i. With Complications	217	1,068,200	16.0
ii. Without Complications	259	954,600	14.3
<i>c</i>) Cerebrovascular Accidents	13	68,100	1.0
<i>d</i>) Heart Murmurs			
i. With Moderate Hypertension	79	291,200	4.4
ii. Without Hypertension	54	234,200	3.5
<i>e</i>) Moderate Hypertension (145-179/90-109) with or without Other Associated Impairments	228	891,700	13.4
<i>f</i>) Miscellaneous Cardiovascular	104	501,600	7.5
Gastro-intestinal Disorders	43	223,500	3.4
Genito-urinary Disorders	34	183,600	2.8
Miscellaneous	105	411,400	6.1
Total	1,518	\$6,669,900	100.0%

was realized that a person who was uninsurable in any classification might well have many impairments. The result of this investigation, which appears in Table 3, shows that the reason for rating from cardiovascular causes was 74.8%, which is higher than the percentage quoted above for the deaths.

DISCUSSION OF PRECEDING PAPER

GEORGE L. HOGEMAN:

Mr. Stearns' paper supplies data in an area where little is known. It is therefore a most valuable addition to actuarial statistics.

Under one of its pension trust cases covering executives, supervisors and foremen, the Aetna Life Insurance Company has, since 1944, issued retirement annuities maturing at age 65 to applicants age 35 or over who were not acceptable within the regular substandard classifications. For years of issue 1944 through 1949, the upper limit of the regular substandard classifications was 300%, and for 1950 and later years it was 500%.

Table 1 shows results of retirement annuity issues of 1944 through 1953 exposed to the 1954 anniversary. The expected deaths and mortality ratios have been calculated on the 1946-1949 Select Basic Table. In issuing retirement annuities, \$10.00 monthly income was substituted for each \$1,000 of insurance applied for. The amount of insurance applied for is used as the "face amount of insurance" in Table 1.

The over-all mortality ratio for this block of business is about four or five times the corresponding figure for standard medically examined issues.

In comparing these ratios with those of the New England Life, the following points should be remembered: (1) the lower average policy size; (2) the fact that the eligibility rules permitted the inclusion of a large proportion of employees in the middle salary brackets; and (3) the inclusion, during half the issue period, of applicants ratable between 300% and 500%.

In comparing these risks with a normal group of declinable applicants, it should be remembered that all of these individuals were actually at work at the time of application.

Three analyses of the actual deaths by cause of death have been made. The first is shown in Table 2 and corresponds with Mr. Stearns' Table 2.

The second analysis shows the relative importance of diseases of the heart and circulatory system (using Mr. Stearns' grouping) by duration at death. The percentages remain remarkably constant for the different durations.

The third analysis shows the distribution of deaths by age at death, separately for "Heart and Circulatory" and "Other."

TABLE 1

	Exposure	Actual Deaths	Expected Deaths	Mortality Ratio
BY NUMBER OF POLICIES				
<i>Issue Age</i>				
35-39.....	1,057	8	2.178	367.3%
40-49.....	3,393	49	13.132	373.1
50-59.....	1,898	48	15.568	308.3
60-64.....	149	7	1.738	402.8
All Ages..	6,497	112	32.616	343.4%
BY FACE AMOUNT OF INSURANCE				
35-39.....	\$ 2,346,403	\$ 22,489	\$ 4,682	480.3%
40-49.....	6,532,394	107,393	25,233	425.6
50-59.....	3,721,366	107,299	30,570	351.0
60-64.....	205,395	7,000	2,472	283.2
All Ages..	\$12,805,558	\$244,181	\$62,957	387.9%
BY NUMBER OF POLICIES				
<i>Policy Year</i>				
1.....	1,450	15	3.479	431.2%
2.....	1,197	31	4.193	739.3
3.....	990	19	4.738	401.0
4.....	807	10	4.633	215.8
5-8.....	1,704	29	12.341	235.0
9-10.....	349	8	3.232	247.5
All Years..	6,497	112	32.616	343.4%
BY FACE AMOUNT OF INSURANCE				
1.....	\$ 2,896,625	\$ 25,358	\$ 6,511	389.5%
2.....	2,348,381	64,544	7,921	814.8
3.....	1,882,783	38,935	8,799	442.5
4.....	1,558,691	49,658	8,830	562.4
5-8.....	3,320,564	53,591	23,096	232.0
9-10.....	798,514	12,095	7,800	155.1
All Years..	\$12,805,558	\$244,181	\$62,957	387.9%

TABLE 2

Cause of Death	Number of Policies	Number of Lives
Cancer and Leukemia.....	8	8
Diabetes Mellitus.....	0	0
Coronary Artery Disease including Occlusion, Thrombosis and Embolism.....	52	40
Congestive Failure and Other Cardiac Conditions.....	10	9
Cerebrovascular Accident (Cerebral Hemorrhage or Thrombosis).....	12	10
Arteriosclerosis and Other Vascular.....	2	2
Hypertension.....	4	4
Gastro-intestinal Disorders, including Cirrhosis of the Liver..	5	1
Nephritis and Renal Failure.....	12	5
Other Genito-urinary Disorders.....	0	0
Violent.....	0	0
Miscellaneous Diseases.....	7	7
Total.....	112	86

TABLE 3
CAUSE OF DEATH BY POLICY YEAR (BY POLICIES)

POLICY YEAR OF DEATH	HEART AND CIRCULATORY		OTHER		TOTAL
	Number	Percent	Number	Percent	
1.....	10	71%	4	29%	14
2.....	25	78	7	22	32
3.....	13	72	5	28	18
4.....	7	64	4	36	11
5.....	7	64	4	36	11
6.....	5	63	3	37	8
7.....	6	75	2	25	8
8.....	3	100	0	0	3
9.....	1	33	2	67	3
10.....	3	75	1	25	4
All Years	80	71%	32	29%	112

TABLE 4
CAUSE OF DEATH BY AGE AT DEATH (BY LIVES)

AGE AT DEATH	HEART AND CIRCULATORY		OTHER		TOTAL
	Number	Percent	Number	Percent	
35-39.....	1	50%	1	50%	2
40-44.....	4	57	3	43	7
45-49.....	12	71	5	29	17
50-54.....	6	60	4	40	10
55-59.....	21	84	4	16	25
60-64.....	21	84	4	16	25
All Ages	65	76%	21	24%	86

(AUTHOR'S REVIEW OF DISCUSSION)

JOHN L. STEARNS:

I want to thank Mr. Hogeman for his contribution on this subject. Although his figures do not cover exactly the same area, they do suggest the same conclusions as the New England Life figures, namely that the mortality is quite satisfactory when the entrants are qualified by being members of a pension trust.

Inquiries from some readers of this paper suggest that there may be some general interest in an analysis of the mortality trend by duration for younger and older issue ages separately. The table on the following page gives a breakdown between issue ages below 50 and those age 50 and over, showing that the downward trend by duration applies to both groups.

POLICY YEAR	EXPOSURE	ACTUAL DEATHS	1946-1949 SELECT BASIC TABLE	
			Expected Deaths	Mortality Ratio
By NUMBER OF POLICIES Issue Ages 20-49				
1.....	1,987	32	2.90	1,103%
2.....	1,514	35	3.24	1,080
3.....	1,036	17	2.98	570
4.....	690	13	2.36	551
5-8.....	738	11	3.30	333
All Years..	5,965	108	14.78	731%
Issue Ages 50 and over				
1.....	1,512	47	6.51	722%
2.....	1,183	31	7.40	419
3.....	839	29	7.26	399
4.....	543	19	5.68	335
5-8.....	485	21	6.17	340
All Years..	4,562	147	33.02	445%
By FACE AMOUNT OF INSURANCE Issue Ages 20-49				
1.....	8,607,627	123,242	12,514	985%
2.....	6,444,025	130,238	13,646	954
3.....	4,512,616	148,575	12,794	1,161
4.....	2,853,975	60,683	9,675	627
5-8.....	3,294,460	35,709	14,653	244
All Years..	25,712,703	498,447	63,282	788%
Issue Ages 50 and over				
1.....	7,049,104	199,778	31,793	628%
2.....	5,438,983	198,773	35,845	555
3.....	3,941,582	119,462	35,041	341
4.....	2,419,239	72,523	25,078	289
5-8.....	2,385,739	73,098	31,360	233
All Years..	21,234,647	663,634	159,117	417%