

**TRANSACTIONS OF SOCIETY OF ACTUARIES
1949 VOL. 1 NO. 1**

**REPORT OF THE COMMITTEE ON MORTALITY UNDER
ORDINARY INSURANCES AND ANNUITIES**

MORTALITY ON POLICIES FOR LARGE AMOUNTS

In 1934 the Joint Committee on Mortality outlined a program for the investigation of the mortality on policies for large amounts issued in 1934 and later. A description of the method of procedure appears in *TASA XXXV*, 347. Twenty of the largest companies were asked to contribute data, and all of them complied with the request. The first report was published in 1937 (*TASA XXXVIII*, 186); subsequent reports appeared in the *Transactions* for each of the years from 1938 to 1942, inclusive. The investigation was suspended during the war. The last study made closed with the policy anniversaries in 1941.

Last year the twenty companies which participated in the previous investigations were asked to resume their contributions and all but one were able to do so. The data were compiled this year and are presented in this report. The type of policy to be included and the form of the investigation remained essentially unchanged, but as it had been found that companies were not all interpreting the original instructions in the same way and that some cases were probably being omitted that should have been included, the definitions were clarified and some slight modifications were introduced. The revised instructions appear as an appendix to this report. Companies were not asked to review the coding or classification of policies already included in their Large Amount files.

The basic requirements for the inclusion of a policy in this study are that it shall be the result of one or more applications to a contributing company for a total of \$50,000 or more on a life during a 90-day period, and that the classification amount of the policy is not less than \$50,000. The definition of "classification amount" and a more complete description of the requirements will be found in the appendix.

The current investigation covers the period between 1941 and 1948 anniversaries, and as in previous investigations is confined to the issues of 1934 and later. The seven policy years observed were subdivided into two periods: 1941 to 1946 policy anniversaries (closing out the war period), and 1946 to 1948 policy anniversaries. The study was by amounts of insurance on a select policy year basis.

The expected deaths have been calculated by use of the crude rates of mortality for corresponding ages at entry, years of issue and years of observation, as derived from the Committee's annual reports on the

mortality under standard Ordinary insurance issues.* Over 90% of the exposures in the current Large Amount investigation were contributed by the sixteen companies which contribute to the standard Ordinary insurance studies. It follows that nine-tenths of the Large Amounts material may be considered to be a subgroup of the material used to test it.

RESULTS OF THE INVESTIGATION

The total amount of exposures in the present investigation is \$15,093,174,000 and the death losses \$72,033,000, exclusive of \$2,981,000 due directly to the war. The war deaths have been excluded from the claims entering into the tables of the report and from the death rates used for computing the expected deaths. However, a separate calculation was made to test the effect of the exclusion, and the results will be described later in the report.

The names of the companies contributing to the experience, and their proportions of the total exposures in the current study (by amounts of insurance) are shown below:

Company	Proportion of Total Exposures	Company	Proportion of Total Exposures
Northwestern Mutual	14%	Connecticut Mutual	4%
Mutual Benefit	10	Penn Mutual	3
Mutual Life	10	Aetna	3
Equitable (N.Y.)	9	Travelers	3
Prudential	9	Connecticut General	2
Massachusetts Mutual	6	Provident Mutual	2
New England Mutual	6	Sun Life	2
New York Life	6	Phoenix Mutual	1
Metropolitan	5	Canada Life	1
John Hancock	4		
			100%

As in prior reports, the data have been subdivided into permanent and term insurance categories, the plan classification at the time of original issue being retained during the life of a policy. The original definition of term insurance has been modified somewhat in order to clarify the treatment of various special policies (see appendix).

The results are summarized in Tables 1, 2 and 3. A distinction by plan of insurance is made in each of these tables. Table 1 analyzes the material

* The proportionate contributions of the companies to the Large Amount investigation are quite different from those made to the standard Ordinary insurance studies. The crude rates of mortality found in the latter studies might be somewhat different if the distribution by companies in those studies were the same as in the Large Amount investigation.

TABLE 1
EXPERIENCE ON LARGE AMOUNT POLICIES BY ENTRY AGE AND PLAN
ISSUES OF 1934 AND LATER
(000 Omitted from Claims)

AGES AT ENTRY	PERMANENT PLANS			TERM PLANS			ALL PLANS		
	Actual Claims	Expected Claims	Mortality Ratio	Actual Claims	Expected Claims	Mortality Ratio	Actual Claims	Expected Claims	Mortality Ratio
Between 1941 and 1946 Policy Anniversaries (War Deaths Excluded from Actual and Expected Claims)									
10-29.....	\$ 1,436 (23)	\$ 1,208	119%	\$ 60 (2)	\$ 81	189%	\$ 1,496 (24)	\$ 1,289	116%
30-39.....	5,723 (93)	5,478	104	1,704 (28)	851		7,427 (116)	6,329	117
40-49.....	15,278 (217)	16,615	92	2,976 (54)	2,956	101	18,254 (255)	19,571	93
50-59.....	13,716 (182)	16,514	83	1,617 (31)	1,872	86	15,333 (205)	18,386	83
60 and over.....	3,186 (57)	3,960	80	50 (1)	72		3,236 (57)	4,032	80
All.....	\$39,339 (559)	\$43,775	90%	\$6,407 (112)	\$5,832	110%	\$45,746 (637)	\$49,607	92%
Between 1946 and 1948 Policy Anniversaries									
10-29.....	\$ 713 (13)	\$ 692	103%	\$ 100 (1)	\$ 49	136%	\$ 813 (14)	\$ 741	110%
30-39.....	3,111 (58)	3,644	85	757 (14)	579		3,868 (65)	4,223	92
40-49.....	9,556 (148)	11,184	85	2,244 (49)	1,923	117	11,800 (182)	13,107	90
50-59.....	7,130 (126)	10,189	70	1,154 (23)	1,097	101	8,284 (144)	11,286	73
60 and over.....	1,522 (26)	2,123	72	0 (0)	50		1,522 (26)	2,173	70
All.....	\$22,032 (356)	\$27,832	79%	\$4,255 (86)	\$3,698	115%	\$26,287 (415)	\$31,530	83%

NOTE.—For basis of expected claims, see text (p. 594). The number of lives involved in the death claims appears in parentheses after the amount figure. The total number of lives is less than the sum of the subdivisions whenever a life appears in more than one subdivision.

TABLE 2
EXPERIENCE ON LARGE AMOUNT POLICIES BY POLICY DURATION AND PLAN
ISSUES OF 1934 AND LATER
(000 Omitted from Claims)

POLICY YEARS	PERMANENT PLANS			TERM PLANS			ALL PLANS		
	Actual Claims	Expected Claims	Mortality Ratio	Actual Claims	Expected Claims	Mortality Ratio	Actual Claims	Expected Claims	Mortality Ratio
Between 1941 and 1946 Policy Anniversaries (War Deaths Excluded from Actual and Expected Claims)									
1 and 2.....	\$ 4,403 (67)	\$ 4,794	92%	\$ 637 (14)	\$ 782	81%	\$ 5,040 (77)	\$ 5,576	90%
3 to 5.....	10,322 (158)	10,908	95	2,223 (38)	1,671	133	12,545 (188)	12,579	100
6 to 10.....	21,325 (320)	24,056	89	3,270 (58)	2,945	111	24,595 (363)	27,001	91
11 and later.....	3,289 (55)	4,017	82	277 (6)	434	*	3,566 (60)	4,451	80
All.....	\$39,339 (559)	\$43,775	90%	\$6,407 (112)	\$5,832	110%	\$45,746 (637)	\$49,607	92%
Between 1946 and 1948 Policy Anniversaries									
1 and 2.....	\$ 2,167 (35)	\$ 2,509	86%	\$ 449 (11)	\$ 561	80%	\$ 2,616 (43)	\$ 3,070	85%
3 to 5.....	4,530 (77)	4,749	95	1,077 (19)	699	154	5,607 (89)	5,448	103
6 to 10.....	7,396 (137)	10,144	73	1,353 (28)	1,291	105	8,749 (156)	11,435	77
11 and later.....	7,939 (136)	10,430	76	1,376 (29)	1,147	120	9,315 (159)	11,577	80
All.....	\$22,032 (356)	\$27,832	79%	\$4,255 (86)	\$3,698	115%	\$26,287 (415)	\$31,530	83%

* Ratio not shown when fewer than ten lives involved in the death claims.

NOTE.—For basis of expected claims, see text (p. 594). The number of lives involved in the death claims appears in parentheses after the amount figure. The total number of lives is less than the sum of the subdivisions whenever a life appears in more than one subdivision.

TABLE 3
EXPERIENCE ON LARGE AMOUNT POLICIES BY CLASSIFICATION AMOUNT AND PLAN
ISSUES OF 1934 AND LATER
(000 Omitted from Claims)

CLASSIFICATION AMOUNT	PERMANENT PLANS			TERM PLANS			ALL PLANS		
	Actual Claims	Expected Claims	Mortality Ratio	Actual Claims	Expected Claims	Mortality Ratio	Actual Claims	Expected Claims	Mortality Ratio
Between 1941 and 1946 Policy Anniversaries (War Deaths Excluded from Actual and Expected Claims)									
\$ 50,000-\$ 99,999	\$ 7,392 (192)	\$ 8,223	90%	\$ 1,725 (42)	\$ 1,237	139%	\$ 9,117 (230)	\$ 9,460	96%
\$100,000-\$199,999	14,222 (259)	15,081	94	1,786 (40)	2,225	80	16,008 (292)	17,306	92
\$200,000-\$499,999	12,897 (145)	14,216	91	2,356 (32)	1,804	131	15,253 (163)	16,020	95
\$500,000 and over	4,828 (24)	6,255	77	540 (9)	566	*	5,368 (29)	6,821	79
All	\$39,339 (559)	\$43,775	90%	\$6,407 (112)	\$5,832	110%	\$45,746 (637)	\$49,607	92%
Between 1946 and 1948 Policy Anniversaries									
\$ 50,000-\$ 99,999	\$ 5,189 (125)	\$ 5,617	92%	\$ 763 (25)	\$ 868	88%	\$ 5,952 (141)	\$ 6,485	92%
\$100,000-\$199,999	8,177 (150)	9,865	83	1,907 (40)	1,480	129	10,084 (182)	11,345	89
\$200,000-\$499,999	7,455 (89)	8,690	86	1,302 (19)	1,044	125	8,757 (102)	9,734	90
\$500,000 and over	1,211 (11)	3,660	33	283 (2)	306	*	1,494 (12)	3,966	38
All	\$22,032 (356)	\$27,832	79%	\$4,255 (86)	\$3,698	115%	\$26,287 (415)	\$31,530	83%

* Ratio not shown when fewer than ten lives involved in the death claims.

NOTE.—For basis of expected claims, see text (p. 594). The number of lives involved in the death claims appears in parentheses after the amount figure. The total number of lives is less than the sum of the subdivisions whenever a life appears in more than one subdivision.

by age at entry, Table 2 by policy duration and Table 3 by classification amount. The number of lives terminated by death is shown in parentheses after the amount of death losses in each category. When combining categories, duplications have been eliminated. It may be noted that the average amount of claim on the term plans between 1946 and 1948 anniversaries is less than \$50,000 per life. This is possible in spite of the fact that a minimum of \$50,000 must be applied for before a policy can get into the study because policies which satisfy this criterion of \$50,000 of application are still included even though the amount issued or the amount taken by the applicant is less than \$50,000.

TABLE 4
COMPARISON OF CURRENT EXPERIENCE WITH 1934-1941 EXPERIENCE
AS REPORTED IN *TASA XLIII*, 124

PLAN OF INSURANCE	1934 TO 1941 ANNIVERSARIES		1941 TO 1946 ANNIVERSARIES		1946 TO 1948 ANNIVERSARIES	
	Death Claims (000 Omitted)	Mor- tality Ratio	Death Claims (000 Omitted)	Mor- tality Ratio	Death Claims (000 Omitted)	Mor- tality Ratio
Permanent.....	\$19,633 (286)	85%	\$39,339 (559)	90%	\$22,032 (356)	79%
Term.....	5,227 (84)	119	6,407 (112)	110	4,255 (86)	115
All.....	\$24,860 (346)	90%	\$45,746 (637)	92%	\$26,287 (415)	83%

NOTE.—The number of lives involved in the death claims appears in parentheses after the amount figure. The total number of lives is less than the sum of the subdivisions whenever a life appears in more than one subdivision.

The experience in the two periods analyzed is quite similar in its overall aspects to that which prevailed prior to 1941 policy anniversaries, as may be seen from Table 4.

The main features of the experience may be listed as follows:

1. The mortality on the whole is satisfactory for permanent plans but is higher than average for term policies. It is to be noted that the expected claims are based on the experience under all plans of insurance combined. The 1946-1948 period produced lower ratios than the 1941-1946 period for permanent policies but somewhat higher ratios for term insurance.

2. The mortality ratios decline with advancing age at entry. The young ages appear to be subject to excess mortality, the excess being moderate for permanent plans but rather pronounced for term plans.

3. There is no particular trend by policy duration. The third to fifth policy year bracket contains the highest ratio in every case.

4. For permanent policies, the only substantial variation by classifica-

tion amount appears to be in the low ratio for the \$500,000 and over bracket. However, the volume of data for this bracket is considerably smaller than for the other classifications. For term insurance, the results for classification amounts under \$500,000 show no consistent variations. The data for \$500,000 and over are very scanty, but there is some indication here also of lower mortality ratios than in the other amount brackets.

To test whether the Large Amount policies tended to produce a greater than average number of war deaths, a separate calculation was made which included the war deaths in the losses and in the crude death rates used for calculating the expected deaths. The net effect was to raise the relative mortality of the permanent plans in the 1941-1946 period from 90% to 91% and of the term plans from 110% to 114%. All plans combined rose from 92% to 94%. For issue ages below 40, where of course the bulk of the war deaths occurred, the inclusion of these deaths raised the permanent plan mortality ratio in the 1941-1946 period from 106% to 110%, and the term plan ratio from 189% to 193%. The fact that the relative mortality ratios for the Large Amount policies were increased by the inclusion of war deaths may merely reflect the probability that the proportion of women in the Large Amounts class is smaller than in the total business.

Causes of Death.—To assist in the interpretation of the underwriting results, the causes of death reported by the contributing companies were analyzed and are presented in Table 5. Rather late in the investigation it was realized that it would be helpful to be able to compare the actual claims, by cause, with the claims that might have materialized if normal mortality had prevailed. For this type of comparison it was necessary to have a cause of death break-down of the crude death rates upon which the expected deaths were based. Cause of death information in connection with the data entering into the Committee's regular annual reports had not been requested from the contributing companies, so that it was necessary to go back to them for this additional information. Because of the time element, the request for the cause of death data was not sent to all of the contributors. Four of the companies with whom the committee communicated were able to furnish the data for the 1941-1946 period and five were able to do so for the 1946-1948 period. These companies had contributed 32% and 41%, respectively, of the exposures to the present Large Amount experience.

Their cause of death data took the form of a tabulation of the number of policies entering into the death claims of the standard medically examined issues of 1934 and later observed between 1941 and 1948 anniversaries. Numbers of policies were requested rather than amounts of

TABLE 5

ANALYSIS OF CAUSES OF DEATH AMONG LARGE AMOUNT POLICIES
EXPERIENCE BETWEEN 1941 AND 1948 POLICY ANNIVERSARIES
(Excluding Deaths Prior to 1946 Policy Anniversaries Which Were Due to War)

CAUSE OF DEATH	1935 INTER-COMPANY CODES	NUMBER OF LIVES WHO DIED	PROPORTION OF ALL DEATHS	ACTUAL CLAIMS (000 OMITTED)	"EXPECTED" CLAIMS* (000 OMITTED)	RATIO OF ACTUAL TO "EXPECTED"
Permanent Plans						
Cancer.....	X1 to X8	161	18%	\$11,338	\$12,031	94%
Tuberculosis.....	17, 18	3	.....	195	1,054	†
Influenza and pneumonia.....	05, 50, 51	19	2	1,025	2,019	51
Cerebral hemorrhage, embolism, etc.....	33	42	5	2,962	4,464	66
Diseases of circulatory system.....	42 to 47	400	44	27,354	31,228	88
Appendicitis.....	60	5	1	220	532	†
Nephritis.....	68	18	2	1,070	1,976	54
Suicide.....	81	42	5	2,580	2,586	100
Other external violence.....	82 to 96	90	10	5,801	5,965	97
All others.....	.....	122	13	8,826	9,752	91
All causes.....	.....	902	100%	\$61,371	\$71,607	86%
Term Plans						
Cancer.....	X1 to X8	39	20%	\$ 2,164	\$ 1,572	138%
Tuberculosis.....	17, 18	0	.....	0	147	†
Influenza and pneumonia.....	05, 50, 51	2	1	150	276	†
Cerebral hemorrhage, embolism, etc.....	33	9	5	393	544	†
Diseases of circulatory system.....	42 to 47	80	41	4,204	4,110	102
Appendicitis.....	60	2	1	150	80	†
Nephritis.....	68	3	2	190	239	†
Suicide.....	81	8	4	534	383	†
Other external violence.....	82 to 96	30	15	1,729	871	199
All others.....	.....	23	11	1,148	1,308	88
All causes.....	.....	196	100%	\$10,662	\$ 9,530	112%

* For basis of expected claims see text (p. 602).

† Ratio not shown when fewer than ten lives involved in the death claims.

insurance because it was expected they would be less subject to statistical fluctuations. The figures were obtained for the period 1941-1946 and 1946-1948 separately. They were classified in the ten cause of death groups shown in Table 5, and each group was subdivided into four issue age and four duration groups, making sixteen "cells" in all for each observation period. The data from the different companies were added together and the percentage distribution by cause of death for the combined data was derived for each "cell." The percentages were then applied to the total amount of expected claims in the comparable "cell" of the experience itself, the same percentages being used for permanent and term plans, and in that way an estimate of the amount of claims to be expected from each of the ten causes of death listed in Table 5 was obtained. While observation period, issue age and duration subdivisions were used in making the calculation, only the combined results are shown in Table 5.

It should be emphasized that the process for deriving the expected deaths by cause is crude and that the experience of the companies who contributed the "expected" data may not be entirely typical of all companies combined. The actual to expected ratios shown in the last column of Table 5 should therefore be regarded as giving only a rough measure of the degree to which a particular cause produced more or fewer claims than would have been produced by the death rates and distribution of claims of the general run of standard medically examined business. For the permanent plans, cancer, suicide, and other external violence, while not above 100% of the expected, appear to have given a poorer experience than the other causes listed. These same causes stand out in the term portion of the analysis; the extra mortality from these three causes is more than sufficient to account for the entire amount of extra mortality experienced in that category. It is noteworthy that circulatory diseases do not seem to have produced extra mortality for the permanent policies and showed a ratio only slightly above 100% for the term plans.

APPENDIX TO REPORT

INSTRUCTIONS RELATING TO INVESTIGATION OF MORTALITY ON POLICIES FOR LARGE AMOUNTS

The policies included in this investigation are policies for large amounts as hereinafter defined, provided the classification amount in each instance is at least \$50,000. The investigation covers the issues of 1934 and later, and is confined to standard medically examined policies. The investigation is by amounts of insurance on a select, policy year basis. The mortality of the large amount policies is analyzed according to (1) term and permanent insurance categories, and (2) the classification amount groups in which the policies belong at the time of issue.

DEFINITION OF TERMS

Policies for Large Amounts.—Policies for large amounts are defined for this study as policies issued by the contributing company as a result of applications for a total of \$50,000 or more on one life during a 90-day period. Requests by the agent for additional or alternate policies are to be considered as applications. Where alternate or additional policies are requested with an understanding that not more than a stated amount will be placed, only the stated amount should be treated as applied for.

It is to be noted that while each policy entering the study must arise from applications to a contributing company within a 90-day period for at least \$50,000 of insurance on one life, the policies actually paid for and entering the experience will often total less than \$50,000 on a life. This can result from a limitation in the amount of issue or from a portion of the insurance being not taken by the applicant. However, in no event should a policy of less than \$50,000 enter the investigation if the classification amount as hereinafter defined is also less than \$50,000.

Single premium policies are to be taken for their face amounts. For policies with decreasing coverage, such as the Family Income policy, the initial amount of the risk should be used in deciding whether a policy belongs in the investigation. When reporting the exposures and death claims on such policies, however, a contributing company may if it desires use a level amount of its own determination in lieu of a decreasing amount. The exposures and claims should of course be reported on the same amount basis.

Term Insurance.—The contributing company is to determine for itself which of its plans are to be treated as term insurance and which as permanent. The original instructions gave as a suggested definition of term insurance "that it is any policy with a premium rate less than 90% of the no profits rate for Ordinary Life, and including all 'half rate' policies." As participating companies may have difficulty with this suggested definition, it is recommended that, with respect to new issues entering the investigation, pure term policies and special step-rate policies with an initial premium that in the first two policy years averages not more than about 50% of the ultimate premium be treated as term insurance, and that other policies be classified as permanent plans. Combinations of permanent and term insurance, such as Family Income, Family Maintenance or Double Protection policies, should be classified as permanent insurance.

The plan classification at the time of original issue is to be retained during the life of the policy. Thus, a term policy converted to permanent insurance would remain in the term category.

Classification Amounts.—Each policy entering the study is to be coded as belonging in a specified classification amount group. The classification amount is defined as the amount the Underwriter considers as likely to be in force on the life, including the amount currently being authorized by the Underwriter for issue by the contributing company and the amount likely to be authorized under any concurrent applications to other companies of which information is

obtained in the course of underwriting the policy. In determining the classification amount, all kinds of individual life insurance—medical or nonmedical, standard or substandard, term or permanent—are to be included and any policies issued but not yet returned as not taken are to be considered as likely to be in force. Group insurance is not counted. For classification amount purposes, a company should follow the procedure it deems most convenient in determining the amount of insurance under policies such as the Family Income. For example, the regular rules for new business underwriting purposes might be used.

The code for the classification amount groups is as follows:

<i>Code</i>	<i>Classification Amount Group</i>
Y.....	\$ 50,000—\$ 74,999
X.....	75,000— 99,999
0.....	100,000— 124,999
1.....	125,000— 149,999
2.....	150,000— 174,999
3.....	175,000— 199,999
4.....	200,000— 249,999
5.....	250,000— 299,999
6.....	300,000— 499,999
7.....	500,000— 749,999
8.....	750,000— 999,999
9.....	1,000,000 and over

These groups are currently not being studied individually, but are being combined in the manner indicated by the spacings in the foregoing table.

EXAMPLES OF CLASSIFICATION

1. \$50,000 is issued in two policies of \$25,000 each to an applicant already insured for \$100,000 in all companies. If both policies are placed each policy will be included in the classification \$150,000. Should one policy be Not-Taken, the remaining \$25,000 will remain in the experience in the \$150,000 classification. If only \$5,000 is placed, the \$5,000 policy would be so included.

2. An applicant already insured for \$100,000 in all companies applies concurrently to two companies for \$50,000 in each. The classification will be determined by the Underwriter's judgment of the amount which will most probably be placed, *i.e.*, \$200,000 in the absence of any known limitation by the companies interested as to what total will be authorized for issue.

3. An applicant insured for \$100,000 in all companies is issued \$50,000 Term. The Term experience should show \$50,000 in the \$150,000 classification. *Vice versa*, \$50,000 of Permanent Insurance issued to an individual carrying \$100,000 Term should be reported for \$50,000 in the \$150,000 classification for permanent plans.

4. A policy for \$40,000 is issued, additional to \$10,000 issued two months prior thereto with no previous insurance in force in any company. After the additional is issued, both policies should be included in the investigation for a classification amount of \$50,000. As regards the first policy, this is not strictly in accordance with the definition that the classification amount is the amount the Underwriter considers as likely to be in force. The reason for taking \$50,000 as the classification amount is the practical one that both policies are reported together after receipt of the additional application, and at that time the information slip set up by the Underwriters will usually show the one classification amount as pertaining to both policies. A company whose papers reflect the true classification amount for the original policy—\$10,000 in the example given—should include only the second policy in the study.

5. An applicant applies for \$50,000 of insurance, but only \$25,000 is issued because of an underwriting limitation. If less than \$25,000 is already in force on his life, the policy would be excluded from the investigation because the classification amount is less than \$50,000. If \$25,000 or more is in force, it would be included for the appropriate classification amount.