

## TRANSACTIONS OF SOCIETY OF ACTUARIES 1954 REPORTS

### SECTION II. 1947-53 GROUP CONVERSION MORTALITY AND WITHDRAWAL EXPERIENCE

**T**HIS section presents the results of the investigation of the mortality and withdrawal experience under permanent forms of life insurance policies issued on the attained age basis without medical examination under the Group Life conversion privilege. It covers the experience of the ten contributing companies from policy anniversaries in 1947 to anniversaries in 1953 and is based on amounts of insurance. These ten companies write approximately 85% of all Group Life insurance currently in force and together have contributed 3,268 million dollars of exposure to this study, of which 3,133 million dollars was contributed for the select portion of the study and 135 million dollars was contributed for the ultimate portion. The last study of this type was published in *TASA XLIX*, 515-26, covering the period from anniversaries in 1941 to anniversaries in 1947, and was also based on amounts of insurance.

Excluded from this study are one year preliminary term conversions, conversions under Group Paid-Up or Group Permanent insurance, conversions to monthly or weekly premium forms of insurance other than those classified as Ordinary insurance, and conversions which have been dated back or classified as "not taken." Substandard experience arising from ratings of a nonmedical nature, *e.g.*, occupational ratings, was omitted except for three companies which were unable to eliminate substandard experience from their contributions. Since only about 3% of conversions are issued substandard, the effect on the results is negligible. Conversions resulting from master policy terminations, comprising a small proportion of all conversions, are included in the study. Because of their small number and the administrative difficulty in identifying such conversions, it was decided not to attempt to study them as a separate class. War deaths were included for the net amount of the claim and with no adjustment in the exposure.

The tables used for mortality comparison are the Commissioners 1941 Standard Ordinary Table, and the 1946-1949 Basic Tables (*TSA II*, 505-12). In the 1941-47 study, the American Men Ultimate Table and the Joint 1939-44 Select and Ultimate Tables (*TASA XLVIII*, 239) were used, which should be borne in mind when the two studies are compared.

Table 1 provides a comparison of the mortality experience during the 1947-53 period with the corresponding experience of the 1941-47 study by duration for all ages combined and by ten year age groups for all dura-

tions combined. The contributions of all ten companies are included in the 1947-53 results, whereas only eight of these ten companies contributed to the 1941-47 experience. The two new companies submitted about 3% of the total 1947-53 experience.

TABLE 1  
 1947-53 GROUP CONVERSION STUDY  
 SELECT MORTALITY RATIOS COMPARED WITH THE 1941-47 STUDY  
 BASED ON AMOUNTS OF INSURANCE (IN THOUSANDS OF DOLLARS)  
 RATIO OF ACTUAL DEATHS TO THOSE EXPECTED BY THE CSO MORTALITY TABLE  
 Contributions of Ten Companies

Issue Age	EXPOSED TO RISK 1947-53	ACTUAL DEATHS 1947-53	EXPECTED DEATHS 1947-53	RATIO OF ACTUAL TO EXPECTED DEATHS	
				1947-53	1941-47
10 Year Age Groups, Policy Years 1-15					
15-24	\$ 189,715	\$ 730	\$ 592	123%	180%
25-34	679,058	3,851	3,235	119	142
35-44	938,724	10,715	8,039	133	146
45-54	755,687	18,241	12,635	144	159
55-64	312,816	16,315	10,544	155	159
Over 65	111,341	11,984	7,947	151	160
Total	\$2,987,341	\$61,836	\$42,992	144%	155%
By Policy Year, All Ages Combined					
1	\$ 352,839	\$11,787	\$ 4,774	247%	210%
2	323,493	7,399	4,377	169	171
3	333,635	6,766	4,539	149	160
4	334,461	6,711	4,552	147	154
5	331,293	5,934	4,487	132	140
6	309,236	5,122	4,259	120	146
7	269,187	4,627	3,814	121	120
8	213,634	3,732	3,136	119	138
9	141,987	2,439	2,151	113	119
10	104,123	1,726	1,674	103	142
11	79,827	1,505	1,364	110	126
12	60,276	1,204	1,111	108	126
13	49,979	960	994	97	132
14	43,923	937	904	104	106
15	39,446	986	856	115	92
Total	\$2,987,341	\$61,836	\$42,992	144%	155%

The data by age group show an improvement throughout, being somewhat more marked for ages under 55. However, the comparison of the two studies by policy year presents an unusual result in that a large increase in first year mortality is indicated, accompanied by a second year experience that is practically unchanged and followed by mortality improvement at practically all other durations. This result may be explained by Table 2, which presents the experience of each of the first five durations by year of issue, thus providing a picture of the trend of mortality during the period of the study. The experience of nine companies only is included, since one large company contributed no data for policy years beginning in 1947 and 1948.

An examination of Table 2 reveals that, beginning with the issues of 1949, a sudden upward turn in mortality occurred. This is most evident in the first policy year, but is also borne out by the experience in the 2d, 3d and 4th policy years. The change in level was present in the data of most of the contributing companies, lending confirmation to the result. The difference between the all-years-combined ratios under the CSO portion of Table 2 and the corresponding ratios found in Table 1 is accounted for by the fact that the experience of one company is omitted from the former.

The select mortality experience of all ten companies in 10 year age groups is presented in Table 3 using a 20 year select period. In the 1941-47 study, only the first 15 years were studied separately, but preliminary investigations suggested that evidences of selection continued past the 15th year, which seems confirmed by the final results.

The use of the 1946-49 Basic Tables as a standard for comparison caused some difficulties in that they contain select mortality rates for only the first 15 years and in addition the experience for issue ages 65 and above are combined. For durations 16 through 20, the ultimate rates of the 1946-49 Basic Tables were used in determining the expected deaths. When using the results for these durations, it should be borne in mind that an examination of the ratios of select to ultimate mortality rates comprising the 1946-49 Basic Tables suggests a continuation of the effects of selection beyond the 15th year for the older issue ages. In addition the mortality ratios for the age group 65 and above in this study may be affected by differences in age distribution between the experience included in this study and that underlying the Basic Tables.

The experience is not entirely homogeneous by company, nor, as pointed out previously, by year of issue. For instance, the commission practices of one large company, the same company whose experience is excluded from Table 2, were different from those of the other companies

prior to 1949. A word of caution is extended to those utilizing these data that they represent the average of the experiences of the contributing companies and so reflect the differences among them. However, analysis showed that the experiences of all companies lie within a range of 15% on either side of the average.

Since the data are not homogeneous by year of issue, Table 3A is presented in order to provide mortality ratios corresponding to Table 3 for

TABLE 2  
1947-53 GROUP CONVERSION STUDY  
SELECT MORTALITY RATIOS BY CALENDAR YEAR OF ISSUE FOR POLICY YEARS 1-5  
BASED ON AMOUNTS OF INSURANCE—CONTRIBUTIONS OF NINE COMPANIES

YEAR OF ISSUE	POLICY YEAR				
	1	2	3	4	5
Ratio of Actual Deaths to Those Expected by the 1946-49 Basic Tables					
1943					276%
1944				374%	332
1945			398%	338	304
1946		570%	404	390	339
1947	1036%	630	440	368	337
1948	1019	595	401	396	351
1949	1220	602	473	434	
1950	1240	615	482		
1951	1364	633			
1952	1225				
All Years	1188%	606%	431%	382%	326%
Ratio of Actual Deaths to Those Expected by the CSO Mortality Table					
1943					117%
1944				145%	142
1945			141%	132	131
1946		161%	142	151	145
1947	215%	177	154	142	144
1948	212	168	141	153	150
1949	255	170	166	168	
1950	258	173	168		
1951	283	178			
1952	256				
All Years	247%	171%	151%	148%	139%

**TABLE 3**  
**1947-53 GROUP CONVERSION STUDY**  
**SELECT MORTALITY RATIOS IN 10 YEAR AGE GROUPS**  
**BASED ON AMOUNTS OF INSURANCE—CONTRIBUTIONS OF TEN COMPANIES**

POLICY YEAR	ISSUE AGES						
	15-24	25-34	35-44	45-54	55-64	65 and over	All Ages
Ratios of Actual Deaths to Those Expected by the 1946-49 Basic Tables							
1.....	1016%	1204%	1059%	1048%	1168%	1353%	1184%
2.....	530	664	677	555	611	587	600
3.....	445	542	431	410	416	422	424
4.....	400	521	380	368	365	391	380
5.....	326	443	279	309	292	333	309
6.....	368	296	329	250	249	257	270
7.....	251	220	304	262	249	256	262
8.....	374	326	268	240	233	220	249
9.....	332	296	229	237	218	201	232
10.....	346	228	232	177	202	210	205
11.....	336	231	202	197	222	198	208
12.....	188	159	200	207	209	164	197
13.....	246	159	160	171	176	170	169
14.....	97	159	173	191	130	202	172
15.....	206	125	168	230	125	149	176
16.....	248	147	119	117	140	110	126
17.....	76	162	162	137	85	131	135
18.....	203	220	142	170	115	107	154
19.....	119	139	106	107	114	41	110
20.....	132	119	128	110	79	76	110
Ratios of Actual Deaths to Those Expected by the CSO Mortality Table							
1.....	260%	224%	198%	217%	268%	274%	247%
2.....	156	154	177	162	187	157	169
3.....	146	147	141	154	162	134	149
4.....	134	148	138	155	158	132	147
5.....	110	135	113	145	139	122	132
6.....	119	93	140	123	121	100	120
7.....	78	104	130	129	121	105	121
8.....	116	110	123	126	121	97	119
9.....	101	102	109	127	116	91	113
10.....	104	82	115	99	111	97	103
11.....	103	90	107	118	128	91	110
12.....	60	65	110	129	123	77	108
13.....	80	69	91	110	107	82	97
14.....	34	74	104	129	83	106	104
15.....	79	64	110	166	84	89	115
16.....	94	77	84	94	111	78	91
17.....	30	88	117	110	68	96	99
18.....	81	123	105	137	91	83	114
19.....	49	81	80	86	91	33	83
20.....	57	72	98	88	63	59	83

TABLE 3—Continued  
 1947-53 GROUP CONVERSION STUDY  
 NUMBER OF ACTUAL DEATHS

POLICY YEAR	ISSUE AGES						
	15-24	25-34	35-44	45-54	55-64	65 and over	All Ages
1.....	72	198	439	973	1,701	2,517	5,900
2.....	38	148	393	790	1,238	1,305	3,912
3.....	44	173	394	830	1,062	1,019	3,522
4.....	45	186	424	853	1,036	806	3,350
5.....	48	201	403	868	864	673	3,057
6.....	45	160	506	751	761	493	2,716
7.....	31	150	424	731	674	384	2,394
8.....	37	176	350	611	538	290	2,002
9.....	29	114	235	423	335	188	1,324
10.....	27	97	203	283	229	169	1,008
11.....	19	81	152	233	208	138	831
12.....	9	54	141	185	134	96	619
13.....	11	38	101	161	130	79	520
14.....	6	42	91	145	103	57	444
15.....	11	43	91	159	90	47	441
16.....	7	44	87	107	91	28	364
17.....	4	52	101	112	60	27	356
18.....	9	53	73	116	78	19	348
19.....	7	37	67	103	74	5	293
20.....	8	43	99	119	55	7	331

the issues of 1949 through 1952 alone. It should be appreciated that the first policy year ratios include the data of four years' issues, while the ratios for the fourth policy year are based on only one year's issues. The experience of all ten contributing companies has been included, as in Table 3.

Table 4 presents results of the ultimate mortality study to which seven companies contributed. Mortality ratios are shown according to the CSO Table and the 1946-49 Basic Tables. Again it should be mentioned that under the Basic Tables the ultimate rates are based on experience truncated after 15 years, while the conversion study is truncated after 20 years. There was little variation in the ultimate rates of the seven contributing companies.

Nine companies contributed to the withdrawal part of the study, the results of which are set forth in Table 5. All types of terminations were counted as withdrawals, *i.e.*, lapses, surrenders, term extensions, reduced paid-ups, and maturities, with the exception of one company which was

unable to include term extensions and reduced paid-ups. The withdrawals at policy year  $t$  were taken to be the total withdrawals at mean duration  $t$ , except that for the first year those at mean duration 0 were added. The effect of this is that withdrawals occurring during any calendar year before and after a policy anniversary are averaged together and proper account is thereby taken of the financial effect of withdrawals under policies

TABLE 3A  
1947-53 GROUP CONVERSION STUDY  
SELECT MORTALITY RATIOS IN 10 YEAR AGE GROUPS FOR ISSUES OF 1949-52  
BASED ON AMOUNTS OF INSURANCE--CONTRIBUTIONS OF TEN COMPANIES

POLICY YEAR	ISSUE AGES						
	15-24	25-34	35-44	45-54	55-64	65 and over	All Ages
Ratios of Actual Deaths to Those Expected by the 1949-52 Basic Tables							
1	991%	1254%	1096%	1097%	1236%	1395%	1238%
2	431	686	637	552	658	602	611
3	441	672	458	453	501	449	475
4	77	600	482	374	421	484	433
Ratios of Actual Deaths to Those Expected by the CSO Mortality Table							
1	254%	234%	205%	227%	284%	283%	258%
2	127	160	166	161	201	161	172
3	144	182	150	170	195	142	167
4	25	171	176	158	182	163	168
Number of Actual Deaths							
1	50	143	317	706	1,255	1,958	4,429
2	16	72	190	407	678	781	2,144
3	9	54	111	270	400	446	1,290
4	2	22	61	127	206	220	638

with fractional modes of payment. The withdrawal rates so determined are therefore suitable for use in asset share and other financial calculations. The basis for withdrawal rates in this study differs from that used in the preceding study, in which the withdrawals at duration  $t$  were taken as the mean of the withdrawals at durations  $t - 1$  and  $t$ , with all withdrawals at duration 0 added in the first year. The effect of this change in

**TABLE 4**  
**1947-53 GROUP CONVERSION STUDY**  
**ULTIMATE MORTALITY RATIOS TRUNCATED AT 20 YEARS**  
**BY 10 YEAR AGE GROUPS**  
**BASED ON AMOUNTS OF INSURANCE**  
**Contributions of Seven Companies**

ATTAINED AGE	RATIO OF ACTUAL DEATHS TO THOSE EXPECTED		NUMBER OF ACTUAL DEATHS	AMOUNT EXPOSED (in Thousands)
	By 1946-49 Basic Tables	By CSO Table		
35-44.....	160%	74%	35	\$ 9,474
45-54.....	116	72	239	44,135
55-64.....	110	86	580	48,586
65-74.....	112	89	718	26,729
75-84.....	114	91	395	6,029
85 and over.....	82	67	35	229
All Ages	112%	86%	2,002	\$135,182

**TABLE 5**  
**1947-53 GROUP CONVERSION STUDY**  
**SELECT WITHDRAWAL RATES**  
**BASED ON AMOUNTS OF INSURANCE**  
**Contributions of Nine Companies**

POLICY YEAR	ISSUE AGES			
	Under 45	45-59	60 and over	All Ages
1.....	15.1%	12.3%	9.4%	13.3%
2.....	3.3	3.0	2.5	3.1
3.....	2.5	2.3	2.2	2.4
4.....	2.1	2.0	1.7	2.0
5.....	1.9	1.8	2.0	1.9
6.....	1.7	1.6	1.8	1.7
7.....	1.5	1.5	1.8	1.5
8.....	1.4	1.3	1.5	1.4
9.....	1.3	1.3	2.0	1.4
10.....	1.2	1.1	1.8	1.2
11-15.....	.8	1.2	1.9	1.0
16-19.....	.8	2.0	2.8	1.1
All Years	3.3	3.4	3.6	3.4



method is most marked in the early years and accounts in large part for the higher withdrawal rates shown in this study. However, the 1947-53 withdrawal rates are slightly higher than the 1941-47 withdrawal rates even after making allowance for the difference in method.

The 20th year withdrawal rates were not included in Table 5 because they were affected considerably by maturing endowments. Two companies experienced withdrawal rates considerably higher than the average and one company's results were somewhat lower than the average.

The following companies contributed to the experience for this investigation:

Aetna Life Insurance Company  
Connecticut General Life Insurance Company  
Continental Assurance Company  
Equitable Life Assurance Society  
John Hancock Mutual Life Insurance Company  
Metropolitan Life Insurance Company  
Occidental Life Insurance Company of California  
Prudential Insurance Company of America  
Sun Life Assurance Company of Canada  
The Travelers Insurance Company