

TRANSACTIONS OF SOCIETY OF ACTUARIES 1962 REPORTS

II. 1955-1960 BASIC TABLES

THE last basic tables prepared by the Committee on Mortality for the purpose of making comparisons under Ordinary insurance were the 1946-1949 Basic Tables, published in TSA, II, 505-512. In recent years mortality on Standard Ordinary issues has been at a level of about 85 per cent of these tables in the aggregate. In view of this improvement, and in order to provide for the first time separate tables for male and female lives as well as tables for both sexes combined, the Committee decided to proceed with the construction of new tables. The tables are based on the data included in the annual reports on inter-company mortality under Standard Ordinary insurance issues.

Six tables were constructed: select tables for the first 15 policy years, and ultimate tables for the 16th and later policy years, each for male lives, female lives, and both sexes combined. All select tables and the ultimate tables for both sexes combined were based on experience between 1955 and 1960 policy anniversaries; ultimate experience by sex was available only between 1957 and 1960 policy anniversaries.

Sixteen companies contributed to the experience for both sexes combined; 14 companies contributed to the sex-distinct experience in the select period, but some of them could not split their contributions by sex for the entire period 1955-1960; 6 companies contributed to the sex-distinct ultimate experience. Considerable difficulty was experienced in the construction of the tables for female lives because of the relatively small volume of data.

The select tables for issue age groups 25-29 and over are based on the experience under medical issues only. For the younger issue age groups, however, both medical and nonmedical issues were included to obtain a larger volume of data. (The mortality rates for these age groups are so low that any difference between medical and nonmedical issues may be considered negligible.) The ultimate tables at all ages are based on the experience under medical and nonmedical issues combined.

It should be noted that the select and ultimate tables were derived from different bodies of data, underwritten in different periods. The ultimate rates, therefore, do not necessarily represent the level to which the select rates will rise after the effects of selection have worn off.

The purpose of these new tables is to facilitate the analysis of future mortality trends in the material which enters into the Committee's annual reports and to provide companies with a tool for mortality comparisons

of various kinds. Any such use should recognize the tables for what they are—a representation of composite experience in 1955-1960 of companies with different underwriting practices and different characteristics of their business.

SELECT TABLES (TABLE 1)

The basic formula used in the graduation of the three select tables was a Whittaker-Henderson second difference A formula for age groups 10-14 to 65-69. Because of the small amount of data available, age group 70 and over was graduated separately, as described below.

Male and Female Lives Combined

Total claims underlying the mortality rates for this table were \$1,073,859,000, an average of \$5,507,000 per age-duration cell. This was more than twice the amount of claims that entered into the 1946-1949 Select Basic Table. Because of the purpose for which the table is intended, a value of $a = 0.50$ was used as the Whittaker-Henderson constant, emphasizing fit over smoothness.

The graduation process was essentially the same as that used for the 1946-1949 Select Basic Table, except that it was carried out on the crude rates rather than on the mortality ratios to a basic table. The first step was to graduate, for each duration separately, the crude rates for the age groups at that duration. To improve the fidelity to the original data, an adjustment factor equal to

$$\frac{\text{Average amount of total death claims per age-duration cell} \\ + \text{Actual claims in cell}}{\text{Average amount of total death claims per age-duration cell} \\ + \text{Tabular claims in cell}}$$

was then applied to the rates for each age-duration cell resulting from this first graduation. Following this adjustment, the same Whittaker-Henderson formula was used to regraduate, for each age group separately, the durational rates for that age group. Where necessary, the graduated rates were further adjusted empirically and by linear transformations to prevent them from exceeding the ultimate rates and to improve the fit. These adjustments occurred mainly at the younger ages.

Because of the small volume of data, graduation by a Whittaker-Henderson formula proved unsatisfactory for age group 70 and over. Instead, the ratio of the select rate for this age group at each duration to the ultimate rate at the corresponding attained age (assuming a representative age of 72 for age group 70 and over) was extrapolated from the ratios for age groups 60-64 and 65-69. These ratios were graduated

TABLE 1
1955-1960 SELECT BASIC TABLES
GRADUATED MORTALITY RATES PER 1,000

POLICY YEAR	ISSUE AGE GROUP												
	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70 and Over
MALE AND FEMALE LIVES COMBINED													
1.....	.35	.75	.66	.52	.61	.91	1.45	2.11	2.95	4.22	6.27	8.99	13.01
2.....	.47	.82	.68	.65	.73	1.17	1.96	2.93	4.47	6.26	9.14	12.73	18.62
3.....	.55	.86	.77	.80	.92	1.47	2.45	3.79	5.90	8.58	12.50	15.86	23.38
4.....	.60	.90	.78	.83	1.02	1.72	2.86	4.46	6.90	10.08	15.55	18.97	28.36
5.....	.67	.91	.78	.83	1.12	1.97	3.15	4.91	7.39	10.97	17.02	22.65	35.94
6.....	.75	.91	.79	.86	1.26	2.24	3.70	5.71	8.85	12.65	18.40	26.07	53.42
7.....	.82	.92	.80	.95	1.45	2.60	4.30	6.86	10.70	15.20	20.31	29.06	53.42
8.....	.86	.92	.82	1.04	1.70	2.93	4.83	7.55	11.56	16.40	22.67	31.45	64.00
9.....	.90	.93	.87	1.17	1.99	3.33	5.39	8.21	12.54	17.71	25.70	36.15	75.73
10.....	.92	.94	.92	1.31	2.29	3.82	6.04	9.03	13.87	20.17	29.45	42.78	88.04
11.....	.92	.95	.92	1.19	2.62	4.36	6.84	10.10	15.22	23.23	34.25	51.00	99.07
12.....	.93	.96	1.07	1.71	2.94	4.89	7.67	11.52	17.13	26.81	40.00	57.93	113.92
13.....	.95	.98	1.16	1.92	3.32	5.44	8.70	13.39	19.71	30.31	44.36	62.89	126.03
14.....	.97	.99	1.26	2.12	3.74	6.18	9.74	15.28	22.42	34.53	47.90	66.93	135.00
15.....	.99	1.01	1.36	2.34	4.18	7.10	10.56	17.29	24.94	38.20	51.58	72.94	146.03
MALE LIVES													
1.....	.45	.80	.70	.53	.62	.92	1.52	2.15	3.23	4.34	6.71	10.19	14.80
2.....	.53	.94	.75	.66	.76	1.18	2.04	2.97	4.58	6.34	9.56	14.21	19.45
3.....	.65	1.01	.81	.81	.93	1.50	2.49	3.82	6.13	8.72	13.12	18.09	24.23
4.....	.73	1.01	.84	.85	1.04	1.74	2.96	4.56	7.21	10.50	16.35	21.29	29.31
5.....	.82	1.02	.84	.87	1.13	1.99	3.32	5.22	7.91	11.55	17.70	24.50	37.12
6.....	.88	1.02	.84	.90	1.30	2.27	3.91	5.97	9.48	13.30	18.71	26.59	45.94
7.....	.94	1.04	.86	.96	1.46	2.61	4.36	6.90	11.08	15.56	20.34	29.10	55.46
8.....	.99	1.07	.90	1.05	1.72	2.94	4.86	7.66	12.10	17.10	22.70	31.51	65.98
9.....	1.04	1.09	.95	1.18	2.00	3.34	5.40	8.35	13.08	18.69	25.72	36.20	77.37
10.....	1.06	1.12	1.01	1.33	2.32	3.83	6.10	9.25	14.45	21.16	29.31	42.89	90.02
11.....	1.10	1.12	1.07	1.50	2.63	4.37	6.92	10.44	15.84	23.89	34.82	51.33	102.03
12.....	1.12	1.12	1.16	1.74	2.96	4.94	7.72	11.84	17.70	27.21	41.47	58.04	115.98
13.....	1.16	1.13	1.28	1.97	3.38	5.46	8.74	13.70	20.24	30.66	46.04	63.02	127.97
14.....	1.18	1.15	1.41	2.19	3.95	6.22	9.77	15.70	22.88	34.85	49.32	68.05	136.91
15.....	1.21	1.22	1.52	2.45	4.56	7.26	10.65	17.82	25.08	38.62	52.10	74.06	147.48
FEMALE LIVES													
1.....	.11	.21	.31	.32	.45	.51	.73	1.17	1.41	2.22	3.21	5.12	7.40
2.....	.15	.25	.39	.40	.59	.76	1.13	1.58	2.00	3.30	4.96	7.91	10.00
3.....	.19	.34	.48	.48	.75	1.01	1.57	2.28	2.85	4.59	7.21	10.13	12.79
4.....	.22	.36	.52	.53	.86	1.25	1.95	2.67	3.52	5.47	8.84	13.46	15.89
5.....	.25	.38	.54	.57	.93	1.40	2.20	3.04	4.05	6.03	10.16	15.98	20.64
6.....	.29	.39	.56	.62	1.04	1.60	2.51	3.48	4.57	6.48	11.40	18.22	26.18
7.....	.33	.41	.58	.67	1.18	1.91	2.81	3.95	5.33	7.27	12.80	20.50	32.39
8.....	.36	.42	.60	.71	1.32	2.10	3.05	4.33	5.77	7.86	13.77	22.72	39.46
9.....	.37	.44	.62	.78	1.46	2.29	3.29	4.74	6.33	8.81	14.74	24.95	47.35
10.....	.38	.45	.65	.84	1.62	2.45	3.53	5.17	6.67	10.23	15.80	27.46	56.35
11.....	.40	.46	.69	.92	1.77	2.61	3.76	5.62	7.87	12.47	17.40	29.16	65.30
12.....	.41	.47	.75	.99	1.95	2.72	3.99	6.08	8.87	14.26	19.66	31.09	75.85
13.....	.43	.49	.80	1.09	2.14	2.83	4.65	6.92	10.27	16.75	22.16	34.07	85.48
14.....	.45	.52	.90	1.22	2.37	2.93	5.25	7.58	11.67	18.35	24.37	36.70	93.51
15.....	.47	.57	1.02	1.37	2.64	3.20	5.79	8.89	13.37	20.16	26.86	38.81	103.24

graphically and applied to the ultimate rates. The resulting rates were lowered at the later durations to improve the fit.

Male Lives

Total claims amounted to \$719,063,000, an average of \$3,688,000 per age-duration cell. The graduation process, including the constant $a = 0.50$ and the method of graduating age group 70 and over, was exactly the same as for both sexes combined. Final adjustments were made in several instances to make the male rates higher than the rates for both sexes combined in the corresponding age-duration cells.

Female Lives

Because of the small amount of claims (\$38,627,000, an average of \$198,000 per age-duration cell), it was necessary to give greater emphasis to smoothness than in the case of the other tables. Accordingly, a constant of $a = 2$ was used. Moreover, in order to reduce the effect of fluctuations, the graduation process was applied to the ratios of the crude female mortality rates at ages 10-69 to the 1946-1949 Basic Table rates rather than to the crude rates themselves. These ratios were graduated in the manner described above for the other tables.

Because of the large fluctuations in the crude data, the resulting mortality rates produced an unsatisfactory fit for several age groups and durations. A satisfactory fit was considered more important for the age groups than for the durations, and the fit for these age groups was improved by linear transformations and empirical adjustments. It was not possible to improve the fit for the durations as well without sacrificing smoothness.

Since the total amount of claims for age group 70 and over was only \$23,000 for the 15 policy years, it was impossible to graduate the crude data. The rates shown were obtained by applying percentages ranging from 50 per cent in the first policy year to 70 per cent in the 15th policy year to the male rates for this age group. These relationships are consistent with the ratio of female to male select rates at duration 1 for ages 65-69, and the ratio of female to male ultimate rates at the attained age corresponding to duration 15 of ages 70 and over.

ULTIMATE TABLES (TABLE 2)

The ultimate tables were also graduated by using a Whittaker-Henderson second difference A formula. The experience used in the construction of the tables included crude rates for individual ages 15-95. Rates for ages under 25 were not included in the 1946-1949 Ultimate Basic Table.

TABLE 2
 ULTIMATE BASIC TABLES
 GRADUATED MORTALITY RATES PER 1,000
 MALE AND FEMALE LIVES COMBINED (1955-1960 EXPERIENCE)
 MALE LIVES (1957-1960 EXPERIENCE)
 FEMALE LIVES (1957-1960 EXPERIENCE)

Attained Age	Male and Female Lives Combined	Male Lives	Female Lives	Attained Age	Male and Female Lives Combined	Male Lives	Female Lives
15	.61	.73	.36	55	10.66	11.00	5.67
16	.68	.87	.36	56	11.73	12.06	6.16
17	.74	1.02	.37	57	12.91	13.26	6.70
18	.81	1.18	.38	58	14.24	14.60	7.27
19	.86	1.29	.40	59	15.71	16.06	7.87
20	.90	1.37	.41	60	17.31	17.69	8.52
21	.94	1.46	.44	61	19.02	19.55	9.21
22	.95	1.52	.48	62	20.90	21.61	10.00
23	.96	1.47	.53	63	22.95	23.75	10.83
24	.98	1.52	.60	64	25.15	25.83	11.81
25	1.00	1.25	.66	65	27.52	27.99	13.07
26	1.02	1.22	.70	66	30.04	30.34	14.72
27	1.04	1.19	.70	67	32.71	33.04	16.80
28	1.05	1.17	.70	68	35.56	35.92	19.28
29	1.05	1.13	.71	69	38.88	39.27	22.28
30	1.06	1.15	.75	70	42.47	42.90	25.69
31	1.07	1.22	.83	71	45.99	46.45	29.43
32	1.10	1.28	.93	72	49.46	49.96	33.43
33	1.16	1.32	1.04	73	53.19	53.72	37.30
34	1.22	1.34	1.14	74	57.58	58.16	40.72
35	1.31	1.40	1.21	75	62.73	63.36	43.59
36	1.42	1.49	1.23	76	68.36	69.04	46.36
37	1.53	1.60	1.25	77	74.35	75.09	49.38
38	1.68	1.75	1.29	78	81.16	81.98	53.45
39	1.85	1.91	1.37	79	88.79	89.68	59.01
40	2.07	2.12	1.47	80	96.72	97.68	66.03
41	2.33	2.36	1.59	81	104.38	105.42	73.80
42	2.62	2.66	1.74	82	112.28	113.40	79.38
43	2.95	3.02	1.91	83	121.68	122.90	86.03
44	3.31	3.45	2.10	84	133.66	135.00	94.50
45	3.73	3.96	2.32	85	147.69	149.17	107.40
46	4.22	4.51	2.58	86	164.30	165.94	122.80
47	4.74	5.09	2.88	87	180.32	182.12	138.41
48	5.31	5.71	3.20	88	194.76	196.71	153.43
49	5.96	6.34	3.52	89	211.14	213.26	170.61
50	6.61	6.94	3.84	90	227.38	229.66	188.32
51	7.29	7.56	4.15	91	244.54	246.98	207.47
52	8.02	8.32	4.48	92	259.43	262.03	225.34
53	8.82	9.20	4.84	93	274.05	276.79	243.58
54	9.69	10.09	5.23	94	299.03	302.02	271.82
				95	334.98	338.33	311.26

Male and Female Lives Combined

Total claims amounted to \$2,909,158,000. This compares with a total of \$958,798,000 which entered into the 1946-1949 Ultimate Basic Table.

Graduations were performed using $a = 1$ and $a = 2$. The resulting rates based on $a = 1$ were satisfactory except at ages under 32, where they produced an irregular pattern of increases and decreases with age. For this reason, rates based on $a = 2$ were used at these ages.

Male Lives

Total claims amounted to \$491,785,000. A value of $a = 1$ was used. The decrease in the graduated rates from ages 22 to 29 is a true feature of the experience, due to a decrease in the accidental death rate among males in this age range.

The graduated rates first computed for male lives were lower than the rates for male and female lives combined at all but three ages above 65. Probably the reason for this unexpected result, which is also apparent in the crude rates, is that the experience of the six companies which contributed to the ultimate sex-distinct experience differed from that of the other ten companies included in the ultimate experience for both sexes combined. Since such a relationship between the two tables would not be reasonable, the male rates at ages over 65 were increased to 101 per cent of the rates for males and females combined at the corresponding ages. This percentage was chosen by considering the relation of female and male mortality and the proportion of female data in the sex-distinct experience. The relatively poor fit for age groups 85-89 and 90-95 is due to this adjustment.

Female Lives

Since total claims amounted to only \$28,003,000, a value of $a = 2$ was used.

At ages 80-89 the graduated female rates were unreasonably high in relation to the male rates. This resulted from the fact that the underlying experience at ages 85-89 showed higher mortality for females than for males. At ages 90 and over the graduated female rates actually decreased. In order to eliminate these anomalies and be reasonably consistent with population data at ages over 80, female rates were taken to be 70 per cent of the adjusted male rates at ages 81-84, and this ratio was increased by 2 percentage points at each age thereafter. The poor fit at ages 85-95 is due to this adjustment.

OTHER COMMENTS

Tables 3-6 show tests of fit of the graduation. Tables 7 and 8 show the crude mortality rates. Tables 9 and 10 show the actual death claims.

TABLE 3
TEST OF GRADUATION OF 1955-1960 SELECT BASIC TABLE
MALE AND FEMALE LIVES COMBINED
UNIT 1,000

POLICY YEAR GROUP	ISSUE AGE GROUP					
	10-29	30-39	40-49	50-59	60 and Over	All
Actual Claims						
1- 2.....	\$ 32,254	\$ 34,499	\$ 45,476	\$ 24,558	\$ 6,055	\$ 142,842
3- 5.....	32,247	51,495	77,870	48,761	12,870	223,243
6-10.....	34,952	82,584	125,751	74,793	13,548	331,628
11-15.....	34,463	104,466	150,094	75,623	11,500	376,146
All....	\$133,916	\$273,044	\$399,191	\$223,735	\$ 43,973	\$1,073,859
Ratios of Actual to Tabular Claims						
1- 2.....	99.9%	98.9%	100.5%	98.7%	98.3%	99.6%
3- 5.....	102.9	100.8	100.4	99.5	102.3	100.8
6-10.....	98.4	99.7	100.4	100.4	99.2	100.0
11-15.....	97.9	101.3	100.6	98.6	98.0	100.1
All....	99.7%	100.4%	100.5%	99.4%	99.6%	100.1%

POLICY YEAR	BY POLICY YEAR ALL ISSUE AGE GROUPS COMBINED		ISSUE AGE GROUP	BY ISSUE AGE GROUP ALL DURATIONS COMBINED	
	Actual Claims	Ratio of Actual to Tabular Claims		Actual Claims	Ratio of Actual to Tabular Claims
1.....	\$ 70,181	101.2%	10-14....	\$ 7,169	99.5%
2.....	72,661	98.1	15-19....	25,621	101.7
3.....	79,457	101.8	20-24....	48,695	101.0
4.....	76,859	102.8	25-29....	52,431	97.6
5.....	66,927	97.4	30-34....	103,829	99.8
6.....	63,186	97.9	35-39....	169,215	100.8
7.....	66,601	102.7	40-44....	209,170	100.7
8.....	64,146	100.6	45-49....	190,021	100.3
9.....	65,734	98.6	50-54....	142,870	100.1
10.....	71,961	100.0	55-59....	80,865	98.3
11.....	73,245	100.8	60-64....	33,770	98.7
12.....	75,864	99.3	65-69....	9,274	101.9
13.....	78,626	99.7	70 and over	929	113.0
14.....	95,470	100.4			
15.....	72,941	100.1			
All....	\$1,073,859	100.1%	All....	\$1,073,859	100.1%

TABLE 4
TEST OF GRADUATION OF 1955-1960 SELECT BASIC TABLE
MALE LIVES
UNIT 1,000

POLICY YEAR GROUP	ISSUE AGE GROUP					
	10-29	30-39	40-49	50-59	60 and Over	All
Actual Claims						
1- 2.....	\$ 24,567	\$ 26,328	\$ 35,372	\$ 18,742	\$ 4,733	\$109,742
3- 5.....	24,236	40,199	60,228	38,777	10,454	173,894
6-10.....	19,906	51,499	82,165	51,981	8,662	214,213
11-15.....	15,610	58,520	92,102	47,902	7,080	221,214
All.....	\$ 84,319	\$176,546	\$269,867	\$157,402	\$ 30,929	\$719,063
Ratios of Actual to Tabular Claims						
1- 2.....	99.2%	97.5%	101.9%	97.7%	97.7%	99.3%
3- 5.....	102.6	101.0	99.2	100.8	103.6	100.7
6-10.....	99.1	99.8	99.5	100.8	97.5	99.8
11-15.....	98.1	101.8	100.5	98.5	98.3	100.1
All.....	99.9%	100.4%	100.1%	99.7%	99.7%	100.0%

POLICY YEAR	BY POLICY YEAR ALL ISSUE AGE GROUPS COMBINED		ISSUE AGE GROUP	BY ISSUE AGE GROUP ALL DURATIONS COMBINED	
	Actual Claims	Ratio of Actual to Tabular Claims		Actual Claims	Ratio of Actual to Tabular Claims
1.....	\$ 52,828	100.5%	10-14.....	\$ 4,567	102.1%
2.....	56,914	98.2	15-19.....	15,689	101.5
3.....	61,635	102.0	20-24.....	31,014	101.1
4.....	59,673	102.4	25-29.....	33,049	97.8
5.....	52,586	97.4	30-34.....	66,899	100.1
6.....	47,504	98.7	35-39.....	109,647	100.5
7.....	45,400	102.5	40-44.....	140,275	100.3
8.....	40,450	99.4	45-49.....	129,592	99.8
9.....	38,716	97.6	50-54.....	100,629	100.4
10.....	42,143	100.5	55-59.....	56,773	98.6
11.....	43,357	100.8	60-64.....	23,781	99.9
12.....	45,442	100.3	65-69.....	6,581	99.1
13.....	46,305	98.9	70 and over.	567	97.4
14.....	44,309	100.1			
15.....	41,801	100.8			
All.....	\$719,063	100.0%	All.....	\$719,063	100.0%

TABLE 5
TEST OF GRADUATION OF 1955-1960 SELECT BASIC TABLE
FEMALE LIVES
UNIT 1,000

POLICY YEAR GROUP	ISSUE AGE GROUP					
	10-29	30-39	40-49	50-59	60 and Over	All
Actual Claims						
1- 2.....	\$ 870	\$ 681	\$ 1,534	\$1,112	\$ 353	\$ 4,550
3- 5.....	1,363	1,501	3,427	2,317	871	9,479
6-10.....	1,687	2,109	4,592	2,793	859	12,040
11-15.....	2,025	2,563	4,397	3,115	458	12,558
All.....	\$5,945	\$6,854	\$13,950	\$9,337	\$2,541	\$38,627
Ratios of Actual to Tabular Claims						
1- 2.....	103.27%	91.8%	98.4%	99.9%	81.5%	97.0%
3- 5.....	101.0	108.1	103.0	97.4	98.8	101.6
6-10.....	102.7	101.2	102.7	96.1	109.8	101.3
11-15.....	98.3	98.9	94.9	109.9	95.2	99.7
All.....	100.9%	100.7%	99.7%	101.1%	98.6%	100.3%

POLICY YEAR	BY POLICY YEAR ALL ISSUE AGE GROUPS COMBINED		ISSUE AGE GROUP	BY ISSUE AGE GROUP ALL DURATIONS COMBINED	
	Actual Claims	Ratio of Actual to Tabular Claims		Actual Claims	Ratio of Actual to Tabular Claims
1.....	\$ 2,146	100.8%	10-14.....	\$ 449	100.9%
2.....	2,404	93.9	15-19.....	1,282	102.6
3.....	3,225	106.3	20-24.....	2,974	101.2
4.....	3,457	108.5	25-29.....	1,240	98.3
5.....	2,797	90.0	30-34.....	2,686	102.1
6.....	2,511	91.8	35-39.....	4,168	99.9
7.....	2,930	116.6	40-44.....	6,919	101.0
8.....	2,137	95.3	45-49.....	7,031	98.5
9.....	2,357	108.8	50-54.....	5,492	99.4
10.....	2,105	94.5	55-59.....	3,845	103.7
11.....	2,040	90.3	60-64.....	1,892	98.1
12.....	2,238	93.4	65-69.....	626	104.3
13.....	2,852	109.4	70 and over.	23	46.0
14.....	2,657	101.1			
15.....	2,771	102.7			
All.....	\$38,627	100.3%	All....	\$38,627	100.3%

Table 11 shows the ratios of the select to the ultimate graduated mortality rates for the "central" ages of the groups, as defined in the footnote to the table. Where necessary, the select rates were decreased so that these ratios would not exceed 1.00; otherwise, no attempt was made to graduate the ratios.

The crude select and ultimate data did not exhibit a smooth pattern of relationships of female to male mortality rates, and such a pattern is lacking in the graduated rates. Previous analyses (*1958 Reports*, p. 138)

TABLE 6
TESTS OF GRADUATION OF ULTIMATE BASIC TABLES
UNIT 1,000

ATTAINED AGE GROUP	MALE AND FEMALE LIVES COMBINED		MALE LIVES		FEMALE LIVES	
	Actual Claims	Ratio of Actual to Tabular Claims	Actual Claims	Ratio of Actual to Tabular Claims	Actual Claims	Ratio of Actual to Tabular Claims
15-19	\$ 813	98.5%	\$ 252	101.6%		
20-24	459	100.0	141	95.3		
25-29	1,570	101.9	303	100.0		
30-34	4,532	98.7	810	100.2		
35-39	14,304	99.7	2,251	100.2		
40-44	42,326	100.1	7,190	98.5		
45-49	104,829	100.2	19,825	100.9		
50-54	208,360	99.9	38,755	100.6		
55-59	330,774	99.9	58,308	99.8		
60-64	465,766	100.0	79,991	99.6		
65-69	516,178	99.5	85,145	98.3		
70-74	493,959	100.4	80,837	98.1		
75-79	372,735	100.0	61,106	98.2		
80-84	230,747	100.9	37,737	99.0		
85-89	94,735	99.5	14,680	90.4		
90-95	27,071	99.9	4,454	87.6		
All	\$2,909,158	100.0%	\$491,785	98.6%		
15-24	\$ 1,272	99.1%	\$ 393	99.2%	\$ 105	98.1%
25-34	6,102	99.5	1,113	100.2	294	97.7
35-44	56,630	100.0	9,441	98.9	1,762	101.7
45-54	313,189	100.0	58,580	100.7	4,262	99.9
55-64	796,540	100.0	138,299	99.7	6,277	102.3
65-74	1,010,137	99.9	165,982	98.2	7,734	100.1
75-84	603,482	100.3	98,843	98.5	5,669	99.5
85-95	121,806	99.6	19,134	89.8	1,900	127.9
All	\$2,909,158	100.0%	\$491,785	98.6%	\$28,003	102.0%

also showed considerable irregularity in the ratio of female to male mortality. Since an attempt to impose a smooth pattern would have produced a worse fit, no such attempt was made except as noted above for the ultimate rates at ages over 80.

TABLE 7
1955-1960 SELECT EXPERIENCE CRUDE
MORTALITY RATES PER 1,000

POLICY YEAR	ISSUE AGE GROUP												
	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70 and Over
MALE AND FEMALE LIVES COMBINED													
1	.28	.75	.69	.52	.59	.92	1.42	2.08	3.33	4.31	6.52	8.70	10.36
2	.21	.87	.70	.59	.73	1.14	2.08	2.87	4.29	5.20	8.18	14.33	23.86
3	.74	.92	.80	.82	.96	1.53	2.34	3.85	6.06	9.39	10.33	16.56	21.56
4	.51	1.07	.79	.80	.98	1.72	2.99	4.52	7.23	9.78	20.84	16.22	19.57
5	.67	.91	.80	.53	1.04	2.04	3.10	4.94	6.58	10.30	16.02	23.77	8.48
6	.77	.83	.82	.80	1.23	2.21	3.84	5.52	8.92	10.95	16.67	32.35	28.25
7	.97	.91	.82	.91	1.39	2.55	4.27	7.24	11.38	17.51	19.75	32.78	78.09
8	.91	.98	.81	1.02	1.71	3.01	4.90	7.54	11.50	16.39	22.28	29.59	84.39
9	.91	.88	.85	1.15	2.05	3.27	5.42	8.17	12.08	15.05	28.90	36.27	210.10
10	.99	1.02	.88	1.22	2.30	3.85	5.93	8.96	14.70	20.62	25.66	43.24	206.63
11	1.20	.79	1.01	1.42	2.68	4.47	7.17	10.13	14.90	22.98	29.88	53.35	114.86
12	.91	.92	.99	1.72	2.90	5.13	7.51	11.28	16.39	27.95	38.28	69.73	153.57
13	.95	1.03	1.07	1.94	3.37	5.28	8.72	13.88	19.64	27.18	47.31	55.98	92.31
14	.88	.88	1.26	2.10	3.82	6.07	10.12	14.99	22.13	36.45	47.73	58.09	439.25
15	.99	1.02	1.29	2.32	4.23	7.39	10.25	17.58	24.51	38.48	47.75	78.03	90.40
MALE LIVES													
1	.31	.80	.74	.52	.61	.95	1.47	2.15	3.36	4.31	7.19	9.60	11.68
2	.24	.99	.73	.62	.73	1.12	2.25	2.91	4.51	5.52	7.97	16.84	27.76
3	1.00	1.00	.87	.80	.97	1.58	2.36	3.84	6.64	9.40	10.75	17.84	26.23
4	.64	1.20	.82	.84	1.02	1.75	3.02	4.60	7.45	10.22	22.60	16.40	18.86
5	.81	.98	.87	.87	1.06	1.99	3.20	5.28	7.16	11.19	17.76	24.80	8.51
6	.87	.95	.86	.82	1.33	2.27	4.25	5.57	9.48	11.49	17.34	29.54	24.65
7	1.04	.98	.90	1.01	1.48	2.57	4.18	7.09	12.08	17.26	21.71	27.81	82.31
8	1.15	1.20	.87	.99	1.55	2.93	4.97	7.69	12.04	17.75	19.61	28.98	80.29
9	1.00	1.04	.94	1.15	2.08	3.30	5.26	8.15	12.40	16.50	29.64	31.30	158.25
10	1.28	1.22	1.01	1.26	2.46	3.77	6.06	8.94	15.20	22.68	24.48	42.22	196.20
11	1.86	.80	1.09	1.35	2.72	4.36	7.25	10.70	15.61	23.30	31.23	49.66	118.42
12	1.08	1.09	1.04	1.76	2.89	5.55	7.55	11.64	16.94	27.47	41.06	72.57	128.20
13	1.24	1.37	1.13	2.10	3.34	5.12	8.81	14.00	19.94	27.18	51.58	51.10	95.81
14	.90	.88	1.50	2.09	4.20	6.12	9.70	15.58	23.13	36.16	48.95	64.39	269.56
15	1.24	1.42	1.37	2.41	4.73	7.58	10.43	18.32	24.53	39.88	43.75	87.45	90.16
FEMALE LIVES													
1	.07	.30	.35	.34	.59	.56	.80	1.18	1.40	1.42	2.12	3.09	3.62
2	.10	.22	.41	.20	.49	.46	.80	1.80	2.11	4.01	5.22	5.47	9.33
3	.24	.38	.50	.48	.70	1.10	1.87	2.31	2.71	6.39	8.39	2.98	1.97
4	.26	.32	.45	.49	.74	1.25	2.33	2.39	4.30	6.00	15.16	15.03	10.57
5	.23	.38	.54	.75	.88	2.04	2.00	3.05	2.42	4.41	3.37	17.78	0.00
6	.31	.26	.58	.73	1.03	1.30	1.70	3.39	5.44	3.62	12.14	30.71	20.30
7	.66	.41	.55	.35	1.08	1.89	4.03	4.07	7.32	7.45	8.93	88.30	0.00
8	.16	.42	.62	.71	1.18	2.11	2.94	4.32	4.80	6.94	18.68	3.59	0.00
9	.32	.35	.74	.87	2.06	3.36	4.19	5.39	5.62	3.73	13.88	3.20	62.50
10	.37	.76	.61	1.08	.86	2.50	2.60	5.67	7.28	9.06	10.77	9.51	0.00
11	.33	.36	.58	.72	2.49	2.51	4.15	3.90	4.65	13.20	17.74	10.17	111.11
12	.23	.47	.88	1.17	2.07	2.27	3.50	3.88	8.70	16.52	20.32	86.48	125.00
13	.20	.48	.85	.97	2.62	2.65	3.45	8.28	15.21	25.33	14.20	49.62	0.00
14	.79	.69	.93	1.21	1.67	2.17	6.75	6.75	11.14	25.36	13.32	18.52	166.67
15	.50	.45	.89	1.35	3.62	3.25	5.51	9.46	10.13	29.49	35.15	26.48	0.00

TABLE 8
 ULTIMATE EXPERIENCE
 CRUDE MORTALITY RATES PER 1,000
 MALE AND FEMALE LIVES COMBINED (1955-1960 EXPERIENCE)
 MALE LIVES (1957-1960 EXPERIENCE)
 FEMALE LIVES (1957-1960 EXPERIENCE)

Attained Age	Male and Female Lives Combined	Male Lives	Female Lives	Attained Age	Male and Female Lives Combined	Male Lives	Female Lives
15	.58	.75	.39	55	10.73	10.68	5.43
16	.65	.89	.35	56	11.73	12.05	6.02
17	.71	.79	.31	57	12.82	13.22	7.20
18	.83	1.46	.44	58	14.20	14.79	7.48
19	.89	1.34	.52	59	15.73	16.17	7.39
20	.93	1.11	.44	60	17.47	17.30	9.37
21	1.07	1.36	.31	61	18.93	19.41	7.79
22	.97	1.84	.27	62	20.74	21.44	12.64
23	.84	1.91	.47	63	23.14	24.64	10.85
24	.90	.69	.40	64	25.03	25.29	12.12
25	.88	1.26	1.20	65	27.50	29.26	11.57
26	1.18	1.32	.86	66	30.19	28.34	13.22
27	1.05	1.13	.85	67	33.47	33.95	19.86
28	1.31	1.47	.60	68	34.12	35.01	14.90
29	.86	.87	.51	69	38.42	36.82	23.05
30	1.06	.99	.52	70	43.58	44.50	25.43
31	.99	1.41	.56	71	46.85	46.66	24.43
32	1.11	1.23	.89	72	49.76	47.96	34.02
33	1.24	1.56	1.35	73	52.23	49.53	41.52
34	1.14	1.14	.94	74	56.45	56.60	50.66
35	1.35	1.36	2.20	75	63.27	63.96	41.52
36	1.46	1.61	1.05	76	70.00	64.83	54.48
37	1.50	1.44	.90	77	72.98	70.82	43.34
38	1.70	1.90	1.08	78	79.62	84.90	44.48
39	1.79	1.86	1.41	79	88.65	88.30	74.98
40	2.06	2.10	1.52	80	99.90	101.25	61.20
41	2.40	2.44	1.49	81	106.70	95.92	80.34
42	2.56	2.57	1.80	82	111.64	113.95	74.68
43	3.06	3.06	2.09	83	116.93	118.39	67.90
44	3.23	3.25	2.04	84	136.73	140.96	99.54
45	3.66	4.10	2.27	85	136.64	128.90	152.04
46	4.34	4.51	2.20	86	170.79	158.60	204.43
47	4.70	5.06	2.94	87	193.94	168.37	151.99
48	5.14	5.63	3.18	88	177.85	160.46	136.06
49	6.14	6.54	3.82	89	220.60	207.48	415.87
50	6.66	7.25	4.40	90	214.70	236.24	161.29
51	7.23	7.06	3.62	91	260.03	197.08	97.48
52	8.05	8.14	4.38	92	285.40	268.87	116.77
53	8.81	9.53	5.50	93	243.87	157.78	282.51
54	9.64	10.37	4.66	94	264.48	203.46	7.63
				95	367.91	278.30	155.56

TABLE 9
1955-1960 SELECT EXPERIENCE
ACTUAL DEATH CLAIMS
UNIT 1,000

POLICY YEAR	ISSUE AGE GROUP												
	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70 and Over
MALE AND FEMALE LIVES COMBINED													
1.....	\$365	\$3,970	\$9,208	\$4,647	\$7,008	\$10,113	\$11,196	\$9,336	\$7,509	\$4,128	\$1,997	\$644	\$60
2.....	229	3,233	6,307	4,295	7,149	10,229	13,886	11,058	8,455	4,466	2,304	943	107
3.....	718	2,656	5,192	4,895	7,670	11,316	13,168	12,820	10,326	7,060	2,583	968	85
4.....	430	2,431	3,608	3,864	6,255	10,432	14,127	13,128	10,676	6,505	4,585	759	59
5.....	487	1,799	2,874	3,293	5,481	10,341	12,369	12,258	8,296	5,898	2,894	915	22
6.....	479	1,420	2,516	2,689	5,420	9,361	12,693	11,296	9,221	5,068	2,283	757	43
7.....	530	1,371	2,291	2,719	5,289	9,477	12,329	12,832	10,105	6,759	2,172	655	72
8.....	458	1,316	2,105	2,782	5,899	10,040	12,764	11,781	9,058	5,405	1,999	479	60
9.....	455	1,155	2,175	3,023	6,794	10,461	13,487	11,896	9,068	4,435	2,160	496	129
10.....	504	1,273	2,396	3,295	7,643	12,200	14,332	12,341	10,411	5,323	1,688	474	81
11.....	622	924	2,351	3,265	7,885	12,865	15,895	14,195	9,633	4,818	1,666	492	34
12.....	493	1,051	2,014	3,477	7,781	13,784	15,777	13,628	9,934	5,414	1,906	562	43
13.....	510	1,140	1,930	3,514	8,120	12,963	16,788	15,587	10,787	4,818	2,060	385	24
14.....	444	879	1,965	3,349	7,845	12,542	16,280	14,385	10,013	5,561	1,781	343	94
15.....	456	1,003	1,763	3,324	7,590	13,091	14,079	14,880	9,378	5,267	1,692	402	16
MALE LIVES													
1.....	\$237	\$2,856	\$6,933	\$3,472	\$5,302	\$7,717	\$8,473	\$7,113	\$5,543	\$3,025	\$1,596	\$512	\$49
2.....	161	2,458	4,907	3,543	5,531	7,778	11,368	8,418	6,642	3,532	1,652	830	94
3.....	583	1,824	4,158	3,715	5,977	8,989	10,103	9,636	8,483	5,294	2,009	783	81
4.....	332	1,645	2,608	3,130	5,047	8,139	10,863	10,088	8,300	5,120	3,779	578	44
5.....	358	1,155	2,096	2,632	4,333	7,714	9,700	9,838	6,789	4,791	2,439	724	17
6.....	316	914	1,589	1,948	4,211	6,914	10,127	8,259	7,055	3,818	1,731	594	28
7.....	311	767	1,341	1,934	3,732	6,404	8,187	8,641	7,368	4,637	1,659	372	47
8.....	297	757	1,081	1,561	3,243	6,027	8,170	7,804	6,184	3,885	1,108	300	33
9.....	239	576	1,021	1,573	3,855	6,052	7,758	7,257	5,800	3,024	1,267	247	47
10.....	298	614	1,109	1,660	4,385	6,676	8,550	7,412	6,623	3,587	936	262	31
11.....	440	359	995	1,505	4,312	7,156	9,621	8,292	6,288	3,054	1,036	281	18
12.....	262	473	828	1,686	4,159	8,524	9,529	8,659	6,418	3,301	1,219	364	20
13.....	296	543	860	1,770	4,294	7,203	10,181	9,701	6,865	3,003	1,354	219	16
14.....	195	297	908	1,475	4,426	7,140	9,355	9,208	6,553	3,396	1,086	239	31
15.....	242	451	580	1,445	4,092	7,214	8,290	9,266	5,718	3,306	910	276	11
FEMALE LIVES													
1.....	\$14	\$147	\$257	\$71	\$186	\$213	\$345	\$383	\$273	\$137	\$84	\$33	\$3
2.....	18	87	240	36	132	150	301	505	364	338	180	47	6
3.....	37	129	244	78	160	302	602	568	368	473	238	25	1
4.....	39	101	201	73	152	300	654	526	565	388	359	94	5
5.....	31	105	224	101	159	428	494	583	273	250	68	81	0
6.....	35	59	200	84	151	217	338	507	494	151	173	98	4
7.....	62	77	161	35	134	268	661	498	538	246	93	157	0
8.....	13	65	155	66	126	255	405	428	279	183	158	4	0
9.....	23	46	162	78	208	377	517	470	289	84	99	3	1
10.....	27	102	136	101	89	284	303	465	353	176	61	8	0
11.....	24	50	131	68	255	287	461	293	196	187	81	6	1
12.....	18	70	212	115	214	261	381	286	334	227	80	39	1
13.....	16	75	215	97	268	305	361	578	543	333	48	13	0
14.....	58	105	228	116	160	225	637	419	344	315	44	5	1
15.....	34	64	208	121	292	296	459	522	279	357	126	13	0

TABLE 10
 ULTIMATE EXPERIENCE
 ACTUAL DEATH CLAIMS
 UNIT 1,000
 MALE AND FEMALE LIVES COMBINED (1955-1960 EXPERIENCE)
 MALE LIVES (1957-1960 EXPERIENCE)
 FEMALE LIVES (1957-1960 EXPERIENCE)

Attained Age	Male and Female Lives Combined	Male Lives	Female Lives	Attained Age	Male and Female Lives Combined	Male Lives	Female Lives
15.....	\$ 156	\$ 46	\$ 20	55.....	\$ 56,109	\$ 9,821	\$ 510
16.....	189	56	18	56.....	60,407	10,818	535
17.....	167	39	12	57.....	65,104	11,561	625
18.....	157	56	13	58.....	71,173	12,584	629
19.....	144	55	16	59.....	77,981	13,524	602
20.....	118	35	10	60.....	82,137	13,722	649
21.....	101	27	4	61.....	87,154	15,030	526
22.....	86	33	3	62.....	92,840	16,022	811
23.....	74	34	5	63.....	100,449	17,773	677
24.....	80	12	4	64.....	103,186	17,444	713
25.....	163	42	18	65.....	101,070	17,877	582
26.....	273	53	15	66.....	103,853	16,140	612
27.....	303	56	17	67.....	106,778	17,691	842
28.....	465	90	14	68.....	100,063	16,963	564
29.....	366	62	13	69.....	104,414	16,474	806
30.....	585	89	15	70.....	108,216	18,244	803
31.....	660	154	19	71.....	104,751	17,079	710
32.....	868	159	37	72.....	99,757	15,808	844
33.....	1,151	226	77	73.....	93,074	14,801	942
34.....	1,268	182	69	74.....	88,161	14,905	1,029
35.....	1,780	258	192	75.....	85,514	14,508	720
36.....	2,248	362	102	76.....	81,846	12,628	838
37.....	2,696	388	97	77.....	72,944	11,693	548
38.....	3,480	593	124	78.....	68,024	11,898	471
39.....	4,100	650	165	79.....	64,407	10,379	706
40.....	5,283	846	180	80.....	60,835	10,146	507
41.....	6,893	1,144	182	81.....	53,332	7,959	621
42.....	8,005	1,346	217	82.....	44,730	7,700	486
43.....	10,392	1,785	254	83.....	37,757	6,196	361
44.....	11,753	2,069	249	84.....	34,093	5,736	411
45.....	14,197	2,794	278	85.....	25,119	3,860	433
46.....	17,745	3,231	271	86.....	24,017	3,723	406
47.....	20,316	3,820	357	87.....	20,194	2,955	233
48.....	23,383	4,488	382	88.....	13,354	2,123	163
49.....	29,188	5,492	457	89.....	12,051	2,019	435
50.....	32,895	6,360	518	90.....	8,041	1,623	75
51.....	36,772	6,402	419	91.....	7,186	944	31
52.....	41,656	7,435	495	92.....	5,360	1,008	39
53.....	46,201	8,840	603	93.....	2,904	361	63
54.....	50,836	9,718	482	94.....	1,899	282	1
				95.....	1,681	236	21

TABLE 11
RATIOS OF 1955-1960 SELECT BASIC TABLE MORTALITY RATES TO
ULTIMATE BASIC TABLE RATES*

POLICY YEAR	ISSUE AGE GROUP											
	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69
	MALE AND FEMALE LIVES COMBINED											
1	1.000	.695	.500	.550	.595	.560	.450	.375	.336	.314	.279	
2	1.000	.701	.619	.624	.696	.671	.558	.516	.452	.417	.364	
3	.989	.778	.762	.742	.795	.749	.643	.620	.562	.520	.415	
4	.968	.989	.772	.783	.767	.831	.775	.682	.659	.599	.591	.454
5	.971	.968	.757	.769	.778	.845	.755	.680	.641	.593	.591	.500
6	1.000	.958	.760	.768	.808	.855	.789	.718	.698	.622	.586	.535
7	1.000	.958	.762	.805	.848	.881	.819	.785	.766	.680	.595	.554
8	.989	.939	.781	.832	.899	.885	.820	.786	.750	.670	.609	.555
9	.989	.930	.821	.873	.939	.893	.824	.777	.738	.661	.632	.586
10	.979	.922	.852	.903	.958	.905	.837	.777	.742	.689	.666	.636
11	.968	.913	.884	.949	.974	.920	.860	.790	.742	.728	.718	.697
12	.969	.914	.907	.988	.974	.921	.878	.816	.760	.772	.779	.726
13	.969	.933	.928	1.000	.979	.913	.906	.861	.798	.800	.801	.721
14	.970	.934	.940	.986	.976	.935	.922	.891	.829	.834	.796	.704
15	.971	.935	.938	.967	.968	.974	.909	.917	.844	.850	.787	.709
MALE LIVES												
1	.762	.467	.449	.481	.575	.578	.427	.395	.336	.326	.314	
2	.783	.524	.569	.576	.674	.685	.526	.508	.446	.422	.402	
3	.771	.623	.711	.689	.785	.730	.608	.619	.558	.529	.469	
4	.961	.727	.677	.726	.732	.821	.757	.663	.666	.610	.608	.505
5	.911	.694	.694	.702	.748	.843	.744	.696	.668	.608	.607	.536
6	.838	.675	.712	.698	.798	.853	.777	.725	.728	.634	.590	.540
7	.783	.722	.741	.722	.820	.864	.772	.757	.773	.673	.590	.549
8	.756	.817	.789	.772	.882	.852	.774	.766	.767	.678	.604	.550
9	.748	.879	.812	.825	.922	.843	.785	.765	.753	.684	.626	.581
10	.721	.926	.815	.875	.959	.849	.813	.774	.753	.714	.660	.632
11	.728	.941	.829	.915	.963	.859	.840	.795	.747	.741	.722	.692
12	.778	.966	.872	.967	.952	.865	.847	.818	.759	.776	.800	.720
13	.885	1.000	.941	1.000	.952	.861	.874	.861	.797	.801	.823	.715
14	.952	.991	.986	1.000	.971	.896	.896	.830	.834	.812	.708	
15	1.000	.992	1.000	1.000	.985	.960	.891	.920	.840	.851	.787	.713
FEMALE LIVES												
1	.568	.620	.457	.474	.408	.422	.411	.320	.339	.334	.313	
2	.658	.709	.571	.557	.589	.598	.498	.419	.465	.476	.421	
3	.850	.774	.667	.652	.737	.755	.653	.553	.597	.637	.467	
4	.611	.857	.776	.688	.711	.850	.848	.701	.631	.657	.711	.538
5	.694	.844	.771	.663	.756	.881	.863	.738	.668	.670	.731	.557
6	.784	.796	.800	.646	.825	.920	.881	.782	.693	.664	.723	.558
7	.868	.759	.829	.626	.901	1.000	.886	.823	.744	.687	.710	.561
8	.900	.689	.833	.612	.950	1.000	.874	.834	.745	.682	.663	.567
9	.881	.657	.805	.639	.980	.987	.864	.842	.754	.694	.615	.580
10	.844	.643	.756	.677	1.000	.950	.857	.846	.735	.719	.573	.599
11	.816	.657	.719	.730	1.000	.906	.845	.845	.800	.771	.554	.598
12	.759	.671	.701	.756	1.000	.850	.831	.843	.832	.769	.556	.591
13	.705	.681	.690	.779	1.000	.804	.896	.886	.885	.783	.568	.588
14	.672	.675	.738	.808	1.000	.763	.933	.897	.910	.744	.578	.552
15	.671	.671	.823	.840	1.000	.771	.948	.973	.929	.712	.597	.534

* The ultimate basic table mortality rates were taken at the "Central" attained ages for the respective age group, obtained by adding the policy duration less 1 to the "Central" issue ages appearing in TASA XLVIII, 260.