

**TRANSACTIONS OF SOCIETY OF ACTUARIES
1968 REPORTS**

**I. EXPERIENCE ON DISABLED LIVES UNDER GROUP
INSURANCE EXTENDED DEATH BENEFIT PROVI-
SIONS OF THE PREMIUM-WAIVER TYPE**

INTRODUCTION

THIS report presents the results of a study of disabilities approved prior to 1965 under group insurance extended death benefit provisions of the premium-waiver type. Disabled life data were furnished by twelve large life companies in the United States and Canada on experience during the decade from 1955 to 1964. Under extended death benefit provisions of this type, total disability is presumed to be permanent after a nine-month waiting period from date of disablement, but proof of continued disability must be furnished annually. For most of the extended death benefit provisions under consideration, disability must have occurred prior to age 60.

The last study by the Society of this benefit was published in the *1949 Report of the Committee on Group Mortality and Morbidity* and covered disabilities approved through 1948. In the 1949 study, experience was analyzed on the basis of age at approval, whereas in the current study experience was analyzed on the basis of age at disablement. The present investigation involves 39,308 disabled lives with a total of \$184,554,000 of insurance. Compared with the 1949 report, this represents a seven-fold increase in the number of disabled lives and an eighteen-fold increase in the amount of insurance in force at approval.

FORM OF THE CONTRIBUTION

The contributing companies submitted a punched card for each disability approved prior to January 1, 1965, and outstanding at any time during the period 1955-64 on an anniversary-to-anniversary (of disablement) basis. The data included the face amount of insurance at approval, the date and age (nearest birthday) of both disablement and approval, the date and mode of termination (if terminated within the period of the study), and sex when known.

Termination of exposure to disablement was by one of four modes: recovery, death, existing disabled at anniversary of disablement in 1965, and "other." The "other" category included principally those disabled lives for whom the face amount became zero because of an age- or retirement-reduction formula.

Disabled life data were contributed by the Aetna Life Insurance Company, Bankers Life Company, Connecticut General Life Insurance Company, Continental Assurance Company, Equitable Life Assurance Society, John Hancock Mutual Life Insurance Company, Lincoln National Life Insurance Company, Metropolitan Life Insurance Company, Occidental Life Insurance Company, Prudential Insurance Company of America, Sun Life Assurance Company of Canada, and The Travelers Insurance Company.

All of one contributor's data and one large case included in another contributor's data arose from a provision based on a six-month waiting period with a strict rather than presumptive definition of disability; this experience was excluded from the study for the first two years of disability. The entire recovery experience of one contributor, which differed significantly from the balance of the data, was also excluded from the study.

Table 1 exhibits the total experience used in the study by age at disablement for both lives and amounts. In comparison with the 1949 study, the proportion of experience (by lives) terminated by death increased to 28 per cent from 21 per cent, and the proportion terminated by recovery decreased to 12 per cent from 16 per cent, reflecting the fact that the experience of the current study is on an older (i.e., more mature) group of disabled lives.

Table 2 shows the average age at disablement by mode of termination and by sex. The average age at disablement by calendar year of disability (not shown in the table) was 48 for calendar years of disability 1945-49, 49 for years 1950-54, 50 for 1955-59, and 51 for 1960-64. (The same trend was noted in ages at approval in the 1949 study.) The average lag from date of disablement to date of approval in the current study was 1.4 years.

ANALYSIS OF BOTH SEXES COMBINED

Tables 3 and 4 exhibit the crude rates by duration and age at disablement for recovery and death, respectively. Duration was measured from date of disablement, and exposure began at date of approval, with disability year 1 measuring experience of the tenth, eleventh, and twelfth months of disability. Exposures and decrements were computed seriatim by an EDP program which produced the crude absolute rates of recovery and death for each age and duration cell. The exposures to recovery of Table 3 are less than the exposures to death of Table 4 because of the elimination of one contributor's entire recovery experience, as noted above.

Examination of the crude rates of recovery and death for both sexes combined in an age-duration grid led to the choice of a ten-year select period. With only 12 per cent of all exposure on recoveries and deaths at

durations more than ten years from disablement, the effects of selection could not be determined reliably beyond ten years.

The crude select and ultimate rates of recovery and death were graduated, as described in the Appendix. After conversion of the graduated rates to probabilities of recovery and death, select and ultimate double decrement tables (Tables 5A and 5B) were constructed. These tables show quarterly probabilities of recovery, death, and termination for the first two years of disability and annual probabilities thereafter. Disabled life annuities may be calculated using the probabilities of termination.

Table 6 presents a summary of crude and graduated rates of recovery

TABLE 1
TOTAL EXPERIENCE CONTRIBUTED TO THE STUDY

Age at Disablement	Existing and Other	Recoveries	Deaths	Total
Lives				
19 and under	24	34	4	62
20-24	197	195	55	447
25-29	403	344	98	845
30-34	692	480	238	1,410
35-39	1,136	613	399	2,148
40-44	1,971	713	730	3,414
45-49	3,298	739	1,390	5,427
50-54	5,897	809	2,800	9,506
55-59	8,887	595	4,726	14,208
60 and up	1,244	56	541	1,841
Total	23,749	4,578	10,981	39,308
Amounts (000 Omitted)				
19 and under	\$ 65	\$ 119	\$ 5	\$ 189
20-24	664	722	192	1,578
25-29	1,564	1,270	363	3,197
30-34	2,897	1,882	887	5,666
35-39	5,014	2,539	1,500	9,053
40-44	9,277	3,053	2,708	15,038
45-49	15,619	3,014	5,794	24,427
50-54	28,677	3,539	11,866	44,082
55-59	45,746	2,557	20,600	68,903
60 and up	9,399	274	2,748	12,421
Total	\$118,922	\$18,969	\$46,663	\$184,554

TABLE 2
AVERAGE AGE AT DISABLEMENT

	Existing and Other	Recovery	Death	Total
By lives.....	51.0	42.9	49.4	50.3
By amounts.....	51.7	43.4	52.5	51.1
	Male	Female	Not Coded	Total
By lives.....	50.8	48.9	50.0	50.3
By amounts.....	51.6	49.2	50.6	51.1

TABLE 3
CRUDE RECOVERY RATES
BOTH SEXES COMBINED

	LIVES			AMOUNTS		
	Exposed	Actual Recoveries	Rate per 1,000	Exposed	Actual Recoveries	Rate per 1,000
Disability year:						
1 (4th qtr.).....	2,236	179	80*	\$ 11,910	\$ 1,167	98*
2.....	18,755	1,391	74	93,605	6,422	69
3.....	22,246	1,185	53	105,350	4,958	47
4.....	18,736	703	38	83,831	2,680	32
5.....	15,271	371	24	64,250	1,439	22
6.....	12,458	248	20	49,130	822	17
7.....	10,134	157	15	37,593	518	14
8.....	8,180	108	13	28,221	353	13
9.....	6,581	86	13	21,161	232	11
10.....	5,299	50	9	16,156	125	8
11 and up.....	16,814	100	6	42,393	253	6
Total.....	136,710	4,578	33	\$553,600	\$18,969	34
Age at disablement:						
19 and under.....	204	34	167	\$ 495	\$ 119	240
20-24.....	1,656	195	118	4,814	722	150
25-29.....	3,202	344	107	10,075	1,270	126
30-34.....	5,221	480	92	18,038	1,882	104
35-39.....	7,377	613	83	25,919	2,539	98
40-44.....	12,067	713	59	45,792	3,053	67
45-49.....	19,381	739	38	75,424	3,014	40
50-54.....	32,761	809	25	134,328	3,539	26
55-59.....	49,383	595	12	208,392	2,557	12
60 and up.....	5,458	56	10	30,323	274	9
Total.....	136,710	4,578	33	\$553,600	\$18,969	34

* Annualized rate.

TABLE 4
CRUDE DEATH RATES
BOTH SEXES COMBINED

	LIVES			AMOUNTS		
	Exposed	Actual Deaths	Rate per 1,000	Exposed	Actual Deaths	Rate per 1,000
Disability year:						
1 (4th qtr.)	2,277	462	203*	\$ 12,115	\$ 2,477	204*
2	19,322	2,310	120	96,476	11,397	118
3	22,814	1,903	83	108,169	8,845	82
4	19,230	1,373	71	86,204	6,270	73
5	15,754	1,102	70	66,262	4,601	69
6	12,868	856	67	50,894	3,656	72
7	10,463	669	64	38,729	2,479	64
8	8,448	529	63	29,101	1,842	63
9	6,775	415	61	21,781	1,390	64
10	5,462	330	60	16,654	1,000	60
11 and up	17,461	1,032	59	43,825	2,706	62
Total	140,874	10,981	78	\$570,210	\$46,663	82
Age at disablement:						
19 and under	187	4	21	\$ 433	\$ 5	12
20-24	1,615	55	34	4,619	192	42
25-29	3,078	98	32	10,181	363	36
30-34	5,123	238	46	17,608	887	50
35-39	7,316	399	55	25,488	1,500	59
40-44	12,163	730	60	45,262	2,708	60
45-49	19,852	1,390	70	77,248	5,794	75
50-54	33,968	2,800	82	139,028	11,866	85
55-59	51,815	4,726	91	218,598	20,600	94
60 and up	5,757	541	94	31,745	2,748	87
Total	140,874	10,981	78	\$570,210	\$46,663	82

* Annualized rate.

TABLE 5A
GRADUATED TERMINATION RATES AND PROBABILITIES
OF RECOVERY AND DEATH
SELECT RATES FOR DISABILITY YEARS 1 TO 10
BASED ON LIVES FOR BOTH SEXES COMBINED

DISABILITY YEAR	AGE AT DISABLEMENT									
	19 and Under	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60 and Up
Termination Rate per Thousand										
1 (4th qtr.)	118	113	110	108	106	99	85	72	55	43
2 (1st qtr.)	115	107	100	95	91	81	69	60	48	40
2 (2d qtr.)	111	99	90	83	78	69	59	50	41	36
2 (3d qtr.)	106	95	83	75	70	61	51	43	36	33
2 (4th qtr.)	102	91	79	71	65	56	46	40	34	33
2 (annual)	369	338	308	287	271	241	207	180	150	135
3	340	277	240	214	196	170	143	121	106	102
4	272	232	194	164	153	130	110	94	93	92
5	203	172	143	121	113	100	88	85	88	88
6	136	114	94	91	90	87	80	82	85	86
7	96	84	73	74	73	73	73	77	83	90
8	71	69	64	65	65	65	66	73	82	94
9	58	57	53	57	60	61	61	70	82	97
10	46	46	43	49	53	54	56	66	81	99
Probability of Recovery (Multiplied by 1,000)										
1 (4th qtr.)	105	90	72	59	49	38	25	16	8	5
2 (1st qtr.)	104	88	71	59	49	36	24	15	7	5
2 (2d qtr.)	102	86	70	57	48	36	24	15	7	5
2 (3d qtr.)	99	85	68	56	47	35	23	14	7	5
2 (4th qtr.)	96	82	66	55	46	34	22	14	7	5
2 (annual)	340	293	239	199	168	126	85	54	26	19
3	322	247	199	162	133	98	63	36	17	12
4	256	207	161	121	102	71	44	23	12	10
5	187	148	112	82	66	45	26	16	8	7
6	120	91	66	56	47	37	22	14	6	6
7	80	63	48	43	35	28	18	12	5	5
8	55	48	40	36	29	24	15	11	5	4
9	42	37	31	29	25	21	13	10	4	3
10	30	28	24	22	20	15	10	8	3	2
Probability of Death (Multiplied by 1,000)										
1 (4th qtr.)	13	23	38	49	57	61	60	56	47	38
2 (1st qtr.)	11	19	29	36	42	45	45	45	41	35
2 (2d qtr.)	9	13	20	26	30	33	35	35	34	31
2 (3d qtr.)	7	10	15	19	23	26	28	29	29	28
2 (4th qtr.)	6	9	13	16	19	22	24	26	27	28
2 (annual)	29	45	69	88	103	115	122	126	124	116
3	18	30	41	52	63	72	80	85	89	90
4	16	25	33	43	51	59	66	71	81	82
5	16	24	31	39	47	55	62	69	80	81
6	16	23	28	35	43	50	58	68	79	80
7	16	21	25	31	38	45	55	65	78	85
8	16	21	24	29	36	41	51	62	77	90
9	16	20	22	28	35	40	48	60	78	94
10	16	18	19	27	33	39	46	58	78	97

TABLE 5B
 GRADUATED TERMINATION RATES AND PROBABILITIES
 OF RECOVERY AND DEATH
 ULTIMATE RATES PER 1,000 FOR DISABILITY YEARS 11 AND OVER
 BASED ON LIVES FOR BOTH SEXES COMBINED

Attained Age	Termination Rate	Recovery Probability	Death Probability	Attained Age	Termination Rate	Recovery Probability	Death Probability
27.....	36	20	16	62.....	63	5	58
28.....	36	20	16	63.....	67	5	62
29.....	36	20	16	64.....	70	4	66
30.....	36	20	16	65.....	73	3	70
31.....	36	20	16	66.....	76	2	74
32.....	36	19	17	67.....	80	2	78
33.....	36	19	17	68.....	85	2	83
34.....	36	19	17	69.....	88	1	87
35.....	36	19	17	70.....	92	1	91
36.....	36	19	17	71.....	96	1	95
37.....	36	18	18	72.....	101	1	100
38.....	37	18	19	73.....	105	1	104
39.....	38	17	21	74.....	111	1	110
40.....	40	17	23	75.....	116	1	115
41.....	40	16	24	76.....	121	0	121
42.....	42	16	26	77.....	128		128
43.....	44	16	28	78.....	135		135
44.....	45	15	30	79.....	143		143
45.....	46	15	31	80.....	152		152
46.....	46	14	32	81.....	161		161
47.....	47	14	33	82.....	171		171
48.....	48	14	34	83.....	181		181
49.....	49	13	36	84.....	192		192
50.....	50	13	37	85.....	203		203
51.....	50	12	38	86.....	215		215
52.....	51	12	39	87.....	227		227
53.....	51	11	40	88.....	240		240
54.....	52	10	42	89.....	254		254
55.....	52	9	43	90.....	270		270
56.....	53	8	45	91.....	288		288
57.....	53	7	46	92.....	308		308
58.....	55	7	48	93.....	331		331
59.....	56	6	50	94.....	359		359
60.....	58	6	52	95.....	393		393
61.....	60	5	55	96.....	443		443
				97.....	530		530
				98.....	710		710
				99.....	1,000		1,000

TABLE 6
SUMMARY OF GRADUATED RATES OF RECOVERY AND DEATH
AND RATIOS OF ACTUAL TO GRADUATED VALUES
EXPERIENCE BY LIVES FOR BOTH SEXES COMBINED

	RECOVERIES					DEATHS				
	Crude Rate per 1,000	Graduated Rate per 1,000	Actual Number	Graduated Number	A/G	Crude Rate per 1,000	Graduated Rate per 1,000	Actual Number	Graduated Number	A/G
Disability year:										
1 (4th qtr.)...	20	20	179	176	1.02	51	52	462	465	0.99
2 (1st qtr.)...	21	20	309	288	1.07	42	42	632	627	1.01
2 (2d qtr.)...	18	19	330	360	0.92	33	33	623	628	0.99
2 (3d qtr.)...	17	19	343	371	0.92	27	28	543	551	0.99
2 (4th qtr.)...	20	18	409	360	1.14	26	25	512	499	1.03
2 (annual)...	74	74	1,391	1,379	1.01	120	119	2,310	2,305	1.00
3.....	53	53	1,185	1,182	1.00	83	84	1,903	1,912	1.00
4.....	38	38	703	705	1.00	71	72	1,373	1,379	1.00
5.....	24	25	371	382	0.97	70	69	1,102	1,092	1.01
6.....	20	19	248	238	1.04	67	67	856	857	1.00
7.....	15	16	157	158	0.99	64	64	669	667	1.00
8.....	13	14	108	115	0.94	63	61	529	515	1.03
9.....	13	12	86	79	1.09	61	59	415	402	1.03
10.....	9	9	50	49	1.02	60	58	330	316	1.04
Total.....	37	37	4,478	4,463	1.00	81	80	9,949	9,915	1.00
11 and up.....	6	6	100	107	0.93	59	61	1,032	1,064	0.97
All durations	33	33	4,578	4,570	1.00	78	78	10,981	10,979	1.00
First Ten Years of Disability Only										
Age at disablement:										
19 and under...	199	216	34	37	0.92	20	20	3	3	1.00
20-24.....	144	165	189	216	0.88	36	31	45	39	1.15
25-29.....	131	129	334	330	1.01	35	40	86	96	0.90
30-34.....	112	110	470	459	1.02	52	51	210	208	1.01
35-39.....	96	94	593	580	1.02	57	61	348	372	0.94
40-44.....	70	69	693	692	1.00	65	69	647	690	0.94
45-49.....	44	44	727	717	1.01	74	75	1,239	1,270	0.98
50-54.....	27	27	800	795	1.01	84	83	2,537	2,502	1.01
55-59.....	13	13	583	581	1.00	92	90	4,330	4,226	1.02
60 and up.....	11	11	55	56	0.98	93	94	504	509	0.99
Total.....	37	37	4,478	4,463	1.00	81	80	9,949	9,915	1.00

and death, as well as actual to graduated ratios. The close agreement of the actual with the graduated values indicates the graduation is satisfactory.

Tables 7A and 7B show disabled life reserves at 3 and 3½ per cent by lives for quinquennial groups at disability years 1-10 and for all attained ages beyond disability year 10 on the graduated basis. The decreases in reserve at some points during the first two years of disability reflect the sharply decreasing mortality rates at the early durations.

Table 8 presents a comparison of actual experience by amounts with expected experience. The expected amounts were calculated by applying the graduated select rates of recovery and death, by lives, to the corresponding exposures by amounts. The actual to expected ratios indicate that the experience by amounts is not significantly different from the experience by lives and that the graduated probabilities in Table 5, based on lives, are also appropriate for amounts.

ANALYSIS BY SEX

Table 9 shows the distribution of experience by sex and mode of termination. About 56 per cent of the total experience was on lives coded "male," and about 9 per cent was on lives coded "female," with 35 per cent not coded by sex. Approximately 28 per cent of the lives coded "male" and 20 per cent of the lives coded "female" terminated by death. The corresponding percentages for recoveries showed little variation between males and females.

Table 10 exhibits the crude recovery and death rates by age and duration for males and females. The average recovery rate was the same for both sexes, but the average death rate was significantly lower for females than for males because of better female mortality experience at ages 40 and over.

Table 11 presents actual to expected ratios for the data coded by sex. The expected values for males and females were obtained by applying the graduated rates by lives for both sexes combined to the corresponding life-years of exposure by sex. For males, the actual to expected ratios for recoveries and deaths are generally close to the ratios for both sexes combined. This result might be expected since a very large proportion of all the data is on male lives. The actual to expected ratios for males indicate that the probabilities of Table 5 are appropriate for male lives with little or no adjustment.

For females the actual to expected ratios of Table 11 indicate slightly lower recovery rates than for both sexes combined, and significantly lower death rates at the ages and durations with heavy exposure. The total actu-

TABLE 7A
 DISABLED LIFE RESERVES PER \$1,000 OF INSURANCE*
 AT 3 PER CENT
 BASED ON GRADUATION BY LIVES FOR BOTH SEXES COMBINED

DURATION FROM DISABLEMENT	AGE AT DISABLEMENT									
	19 and Under	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60 and Up
At disablement.....	\$102	\$166	\$246	\$322	\$389	\$466	\$553	\$628	\$697	\$720
3 quarters.....	105	169	251	329	398	477	566	642	713	736
1 year.....	105	166	242	317	384	465	557	636	710	735
5 quarters.....	107	166	239	313	380	461	555	634	709	735
6 quarters.....	111	172	242	315	382	463	557	635	709	736
7 quarters.....	117	180	250	323	389	470	562	639	711	738
2 years.....	125	190	259	330	399	478	568	643	713	740
3.....	168	229	297	370	433	506	589	657	722	748
4.....	215	274	339	405	467	531	608	668	731	758
5.....	258	312	371	430	489	547	618	677	738	768
6.....	289	337	391	449	506	562	629	685	744	777
7.....	312	356	408	466	521	576	640	694	751	786
8.....	328	371	423	482	536	591	651	705	759	795
9.....	342	384	437	497	550	606	663	716	766	802

DURATION 10 AND BEYOND

Attained Age	Reserve	Attained Age	Reserve	Attained Age	Reserve
27.....	\$353	52.....	\$618	76.....	\$837
28.....	360	53.....	630	77.....	844
29.....	368	54.....	642	78.....	850
30.....	377	55.....	653	79.....	856
31.....	386	56.....	664	80.....	861
32.....	396	57.....	675	81.....	867
33.....	405	58.....	685	82.....	873
34.....	416	59.....	696	83.....	878
35.....	426	60.....	707	84.....	883
36.....	438	61.....	717	85.....	888
37.....	450	62.....	728	86.....	893
38.....	462	63.....	738	87.....	898
39.....	475	64.....	748	88.....	902
40.....	487	65.....	758	89.....	907
41.....	498	66.....	766	90.....	912
42.....	509	67.....	774	91.....	917
43.....	521	68.....	782	92.....	922
44.....	532	69.....	789	93.....	927
45.....	542	70.....	796	94.....	933
46.....	553	71.....	803	95.....	939
47.....	563	72.....	810	96.....	946
48.....	574	73.....	816	97.....	954
49.....	585	74.....	823	98.....	963
50.....	596	75.....	830	99.....	971
51.....	607				

* Curtate functions, that is, claims assumed payable at the end of the year of death.

TABLE 7B
DISABLED LIFE RESERVES PER \$1,000 OF INSURANCE*
AT 3½ PER CENT
BASED ON GRADUATION BY LIVES FOR BOTH SEXES COMBINED

DURATION FROM DISABLEMENT	AGE AT DISABLEMENT									
	19 and Under	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60 and Up
At disablement.....	\$ 95	\$157	\$235	\$308	\$372	\$446	\$530	\$601	\$669	\$691
3 quarters.....	98	161	241	316	382	458	544	617	687	710
1 year.....	97	158	230	302	367	445	533	610	683	708
5 quarters.....	100	157	226	297	361	440	530	607	681	708
6 quarters.....	103	161	228	298	363	441	531	608	681	708
7 quarters.....	109	168	234	305	369	446	535	610	682	710
2 years.....	116	177	243	314	378	453	540	614	684	711
3.....	154	212	276	347	408	478	559	626	693	720
4.....	197	253	314	378	438	501	576	637	701	730
5.....	236	287	343	400	458	515	586	645	708	739
6.....	264	309	361	418	474	529	596	653	714	750
7.....	285	327	376	433	488	542	606	662	721	759
8.....	300	340	390	448	502	557	617	673	729	768
9.....	312	352	403	463	515	571	629	684	737	776

DURATION 10 AND BEYOND

Attained Age	Reserve	Attained Age	Reserve	Attained Age	Reserve
27.....	\$322	52.....	\$583	77.....	\$821
28.....	329	53.....	595	78.....	828
29.....	337	54.....	607	79.....	835
30.....	345	55.....	618	80.....	842
31.....	354	56.....	630	81.....	848
32.....	364	57.....	641	82.....	854
33.....	373	58.....	652	83.....	860
34.....	382	59.....	663	84.....	866
35.....	393	60.....	674	85.....	871
36.....	404	61.....	685	86.....	877
37.....	416	62.....	696	87.....	882
38.....	428	63.....	709	88.....	888
39.....	441	64.....	718	89.....	893
40.....	452	65.....	728	90.....	899
41.....	464	66.....	737	91.....	904
42.....	475	67.....	745	92.....	910
43.....	486	68.....	754	93.....	916
44.....	497	69.....	762	94.....	923
45.....	507	70.....	769	95.....	929
46.....	518	71.....	777	96.....	937
47.....	528	72.....	784	97.....	947
48.....	539	73.....	792	98.....	957
49.....	550	74.....	799	99.....	966
50.....	561	75.....	807		
51.....	572	76.....	815		

* Curtate functions, that is, claims assumed payable at the end of the year of death.

TABLE 8
SUMMARY OF ACTUAL TO EXPECTED RATIOS BY AMOUNTS
EXPECTED VALUES BASED ON GRADUATED RATES
BY LIVES FOR BOTH SEXES COMBINED

DISABILITY YEAR	RECOVERIES			DEATHS		
	Actual Amount (000)	Expected Amount (000)	A/E	Actual Amount (000)	Expected Amount (000)	A/E
1 (4th qtr.)	\$ 1,167	\$ 894	1.31	\$ 2,477	\$ 2,455	1.01
2	6,422	6,487	0.99	11,397	11,594	0.98
3	4,958	5,258	0.94	8,845	9,137	0.97
4	2,680	2,958	0.91	6,270	6,238	1.01
5	1,439	1,508	0.95	4,601	4,638	0.99
6	822	890	0.92	3,656	3,430	1.07
7	518	553	0.94	2,479	2,499	0.99
8	353	372	0.95	1,842	1,802	1.02
9	232	243	0.96	1,390	1,313	1.06
10	125	145	0.86	1,000	974	1.03
Total	\$18,716	\$19,308	0.97	\$43,957	\$44,080	1.00

Age at Disablement	First Ten Years of Disability Only					
	Actual Amount (000)	Expected Amount (000)	A/E	Actual Amount (000)	Expected Amount (000)	A/E
19 and under	\$ 119	\$ 114	1.04	\$ 4	\$ 8	0.50
20-24	704	753	0.93	179	127	1.41
25-29	1,248	1,280	0.98	335	365	0.92
30-34	1,851	1,851	1.00	828	824	1.00
35-39	2,493	2,344	1.06	1,384	1,481	0.93
40-44	3,015	3,055	0.99	2,527	2,966	0.85
45-49	2,978	3,215	0.93	5,393	5,509	0.98
50-54	3,509	3,586	0.98	11,090	10,913	1.02
55-59	2,525	2,755	0.92	19,581	18,941	1.03
60 and up	274	355	0.77	2,636	2,946	0.89
Total	\$18,716	\$19,308	0.97	\$43,957	\$44,080	1.00

TABLE 9
EXPERIENCE BY SEX

	Existing and Other	Recoveries	Deaths	Total
Lives				
Coded male	13,164	2,503	6,143	21,810
Coded female	2,515	444	726	3,685
Not coded	8,070	1,631	4,112	13,813
Total	23,749	4,578	10,981	39,308
Amounts (000 Omitted)				
Coded male	\$ 73,541	\$11,639	\$29,138	\$114,318
Coded female	10,235	1,708	2,685	14,628
Not coded	35,146	5,622	14,840	55,608
Total	\$118,922	\$18,969	\$46,663	\$184,554

TABLE 10
CRUDE RECOVERY AND DEATH RATES BY SEX
EXPERIENCE BY LIVES

	RECOVERY RATE PER 1,000			DEATH RATE PER 1,000		
	All Data	Coded Male	Coded Female	All Data	Coded Male	Coded Female
Disability year:						
1 (4th qtr.)	80	110	73*	203	216	275*
2	74	79	74	120	122	114
3	53	51	60	83	85	58
4	38	35	38	71	73	44
5	24	23	29	70	73	36
6	20	19	19	67	71	34
7	15	13	15*	64	64	36*
8	13	12	11*	63	67	42*
9	13	12	14*	61	65	40*
10	9	6	4*	60	63	30*
11 and over	6	5	5	59	63	25
Total	33	34	34	78	81	54
Age at disable- ment:						
19 and under	167*	187*	300*	21*	25*	37*
20-24	118	124*	104*	34	25*	46*
25-29	107	132	89*	32	35	34*
30-34	92	99	102*	46	48	48*
35-39	83	91	72*	55	54	52*
40-44	59	69	49	60	66	46
45-49	38	42	32	70	77	51
50-54	25	26	25	82	84	55
55-59	12	12	12	91	92	60
60 and up	10	9	8*	94	92	63*
Total	33	34	34	78	81	54

* Rate based on exposure less than 1,000 life-years.

TABLE 11
SUMMARY OF ACTUAL TO EXPECTED RATIOS BY SEX
EXPECTED VALUES BASED ON GRADUATED RATES BY LIVES
FOR BOTH SEXES COMBINED
EXPERIENCE BY LIVES

DISABILITY YEAR	ACTUAL TO EXPECTED RATIOS FOR RECOVERIES			ACTUAL TO EXPECTED RATIOS FOR DEATHS		
	Both Sexes	Male	Female	Both Sexes	Male	Female
1 (4th qtr.)	1.02	1.44	0.82*	0.99	1.06	1.34*
2	1.01	1.17	0.93	1.00	1.01	0.97
3	1.00	0.99	0.98	1.00	1.01	0.71
4	1.00	0.99	0.86	1.00	1.01	0.64
5	0.97	0.94	1.02	1.01	1.04	0.53
6	1.04	1.06	0.88	1.00	1.06	0.53
7	0.99	0.86	0.89*	1.00	0.99	0.59*
8	0.94	0.95	0.72*	1.03	1.08	0.72*
9	1.09	1.06	1.14*	1.03	1.06	0.69*
10	1.02	0.74	0.40*	1.04	1.05	0.52*
Total	1.00	1.05	0.92	1.00	1.02	0.75

Age at Disablement	First Ten Years of Disability Only					
	Both Sexes	Male	Female	Both Sexes	Male	Female
19 and under	0.92*	0.88*	1.46*	1.00*	1.32*	2.11*
20-24	0.88	0.87*	0.70*	1.15	0.77*	1.77*
25-29	1.01	1.13	0.86*	0.90	0.90	1.08*
30-34	1.02	1.04	1.01*	1.01	1.06	1.10*
35-39	1.02	1.09	0.90*	0.94	0.90	1.00*
40-44	1.00	1.11	0.84	0.94	1.01	0.76
45-49	1.01	1.06	0.89	0.98	1.04	0.77
50-54	1.01	1.05	1.04	1.01	1.04	0.72
55-59	1.00	1.02	1.00	1.02	1.03	0.70
60 and up	0.98	0.93	0.92*	0.99	1.01	0.43*
Total	1.00	1.05	0.92	1.00	1.02	0.75

* Exposure less than 1,000 life-years.

al to expected ratio for female deaths suggests that probabilities of death for females can be obtained by taking 75 per cent of the probabilities of death in Table 5.

APPENDIX

To graduate the select rates for both recoveries and deaths, a Whittaker-Henderson graduation process, available as an IBM 7080 computer program, was first applied to each of the ten durations, cutting across the quinquennial age groupings. The resulting rates were then graduated by the same program for each age group, cutting across the ten durations. The graduated ultimate recovery and death rates were obtained by the same program, with the assumption of no recoveries after attained age 75 and with the death rates extended from age 76 to the end of the table. The death rates from age 76 to age 100 are the 1958 CSO male mortality rates plus a constant 42 per 1,000; this constant was chosen to produce a smooth joining with the graduated rates for ages 70-75. The select rates at durations 8 and 9 were adjusted to blend smoothly into the ultimate rates, and further minor adjustments were made at ages less than 20 and greater than 59, where the data were sparse.

For each quinquennial age grouping except the two extremes, the average age at disablement was within 0.3 year of the central age of the quinquennium, and the average age ten years later maintained the same relationship, indicating no bias from using quinquennial groupings for the select period and from blending quinquennial select ages into an ultimate table. For the 19 and under grouping, the average age at disablement was 18.8 years, and the average age ten years later was 28.6 years; for the 60 and up grouping, the corresponding ages were 60.7 and 69.1 years.