II. 1959–62 JUVENILE EXTENSION OF THE 1955–60 BASIC TABLES

THE 1955–60 Select Basic Tables (*TSA*, *1962 Reports*, 46) did not include rates for issue ages under 10. Data at these ages were first contributed for the year between 1959 and 1960 policy anniversaries, and their volume was insufficient for the development of graduated rates when the 1955–60 Tables were constructed. Since then, the experience of two additional years has become available, and the extension described in this report is based on the experience between 1959 and 1962 policy anniversaries. Data were submitted at issue ages 0, 1, 2–4, and 5–9 for the first fifteen policy years. The names of the seventeen contributing companies and their proportionate contributions to the total exposures are given in Table A at the end of this report.

Separate tables were constructed for male lives, female lives, and both sexes combined. The experience of the fifteen companies which subdivided their data by sex is included in all three tables. The experience of the remaining two companies is included only in the table for both sexes combined. In order to obtain as large a volume of data as possible, medical and nonmedical issues were combined. Almost 80 per cent of the exposure was on nonmedical issues.

The first problem was the choice of an appropriate select period, if any. The fifteen-year select period used in the 1955–60 Select Basic Tables did not seem appropriate for juvenile ages. The results of two tests are presented in Table 1. The upper portion shows the crude mortality rates for attained ages 1–17 at various durations. For the purpose of computing attained ages, ages 3 and 7 were used to represent issue age groups 2–4, and 5–9, respectively.

To the extent that selection by the insurance company is effective, the mortality rate for a given attained age will increase with duration. The upper portion of Table 1 does not indicate a consistent pattern of effective selection. Where there is an increase with duration, it is generally small; in many instances there is actually a decrease.

The lower portion of Table 1 shows mortality rates at attained ages 1–7 with no select period, a one-year select period, and a five-year select period. A dash indicates that data for a meaningful comparison were not available. The maximum difference, which occurs at age 7, is .07 per 1,000 between the rate with no select period and that with a five-year select period.

TABLE 1

TESTS FOR SELECT PERIOD
JUVENILE TABLES
MALE AND FEMALE LIVES COMBINED
CRUDE MORTALITY RATES PER 1,000
COMPARISON OF ATTAINED AGE RATES
AT DIFFERENT DURATIONS*

Attained Age	Issue Age	Duration	Rate	Attained Age	Issue Age	Duration	Rate	Attained Age	Issue Age	Duration	Rate
1	1	1	.66	7	7	1	.27	12	7	6	.18
	0	2	.77		3	5	.25		3	10	.44
					1	7	.39		1	12	.41
2	1	2	.68		0	8	.41		0	13	.28
	0	3	.66								
				8	7	2	.26	13	7	7	.31
3	3	1	.47		3	6	.13		3	11	.37
	1	3	.59		1	8	.40		1	13	.33
	0	4	.54		0	9	.31		0	14	.38
4	3	2	.50	9	7	3	.21	14	7	8	.35
	1	4	.40		3	7	.28		3	12	.38
	0	5	.79		1	9	.24		1	14	.35
					0	10	.26		0	15	.37
5	3	3	.48								
	1	5	.56	10	7	4	.18	15	7	9	.73
	0	6	.41		3	8	.21		3	13	.43
					1	10	.21		1	15	.55
6	3	4	.40		0	11	.31				
	1	6	.54					16	7	10	.47
	0	7	.37	11	7	5	.23		3	14	.79
					3	9	.34				
					1	11	.32	17	7	11	.65
					0	12	.20		3	15	.52

COMPARISON OF ULTIMATE RATES WITH
DIFFERENT SELECT PERIODS

ATTAINED AGE	SELECT PERIOD		
	0 Years	1 Year	5 Years
1	.74	.77	—
3	.53	.56	—
5	.46	—	.41
6	.42	—	.42
7	.33	.36	.40

* "Age" means age nearest birthday.

In view of these results, it was decided that mortality rates on an attained-age basis, disregarding duration since issue, would be satisfactory for issue ages under 10. Accordingly, all the data were combined on this basis, the attained ages for issue age groups 2–4 and 5–9 being calculated as indicated above. A previous report on juvenile mortality (*TASA*, XXXVIII, 205–7 and 587–89) also concluded that the effect of selection could be disregarded at juvenile ages.

Data contributed on an age last birthday basis were excluded at attained ages 0 and 1 (this was also done in Table 1); at higher attained ages, their inclusion had no effect on the crude rates.

It should be noted that issues at age 0 represent an average age somewhat greater than 0. When the X17 Mortality Table (which was later developed into the 1958 CSO Table) was constructed, sampling in one large company gave an average age of 55 days, and the rate was adjusted to a true age 0 basis in that Table (*TSA*, IX, 8–9). A similar adjustment was not considered necessary or desirable for the present purpose as the Basic Tables are intended to facilitate the analysis of mortality trends and to provide companies with a tool for mortality comparisons.

At ages 1–21, the crude rates were graduated by use of a Whittaker-Henderson second difference A Formula, with $a = .5$ for males and both sexes combined, and $a = 2$ for females. At age 0 the following procedure was used:

1. In the male table, the graduated rate was taken as equal to the crude rate.
2. The crude rate for females was higher than that for males. This was believed to be due to large claims because the average female claim at age 0 ($2,210) was higher than at any other age; it was also higher in relation to the average male claim at age 0 ($2,385) than at the other juvenile ages. Accordingly, the average female claim was adjusted to an amount bearing the same ratio to the average male claim at age 0 as the ratio (82.2 per cent) of the average female to the average male claim for all juvenile ages combined. The female claims reduced in this manner were then used to calculate the graduated mortality rate for females at age 0.
3. In the table for both sexes combined, female claims as adjusted in (2) were combined with the unadjusted male claims to produce the graduated rate for age 0.

At age 4, one company whose contribution was not subdivided by sex reported a claim for $200,000. This claim caused a relatively high crude rate of .63 for both sexes combined; the graduated rate produced by the Whittaker-Henderson formula was .56. Both the crude and the graduated rate were higher than the corresponding rates for male lives. Accordingly, the graduated rate at age 4 for both sexes combined was adjusted to .53.

Table 2 shows the crude and graduated rates; U.S. population rates are shown for comparison. For convenience in calculating expected deaths for the annual study of Standard Ordinary mortality, which calls for data on a fifteen-year select and ultimate basis, Table 3 shows the graduated rates in select format. Table 4 shows a test of the graduation.

In order to maintain fidelity to the underlying data, no attempt was made to blend the graduated rates for ages 15–21 with the 1955–60 Ultimate Basic Tables, which have somewhat higher rates at these ages.

TABLE 2

1959–62 JUVENILE AGGREGATE BASIC TABLE
CRUDE AND GRADUATED RATES PER 1,000
1961 U.S. POPULATION RATES SHOWN FOR COMPARISON

ATTAINED AGE NEAREST BIRTHDAY	MALE AND FEMALE LIVES COMBINED		MALE LIVES		FEMALE LIVES		U.S. 1961 OFFICIAL LIFE TABLES	
	Crude	Graduated	Crude	Graduated	Crude	Graduated	White Males	White Females
0	1.83	1.78	1.85	1.85	1.89	1.68	25.4	19.3
1	.74	.74	.85	.86	.54	.52	1.5	1.3
2	.67	.65	.79	.74	.44	.48	1.0	.8
3	.53	.59	.59	.63	.47	.43	.8	.6
4	.63	.53	.52	.54	.38	.39	.7	.5
5	.46	.48	.50	.49	.41	.35	.7	.4
6	.42	.41	.47	.44	.29	.31	.6	.4
7	.33	.34	.38	.37	.27	.28	.5	.4
8	.27	.28	.29	.31	.25	.25	.4	.3
9	.24	.24	.26	.27	.23	.23	.4	.3
10	.23	.23	.28	.27	.15	.22	.4	.3
11	.25	.24	.30	.29	.17	.23	.4	.3
12	.27	.28	.32	.32	.20	.25	.5	.3
13	.35	.34	.37	.38	.29	.27	.6	.3
14	.36	.42	.42	.46	.26	.30	.7	.3
15	.63	.53	.66	.56	.57	.32	.9	.4
16	.57	.58	.58	.63	.46	.32	1.1	.5
17	.60	.61	.69	.72	.19	.32	1.2	.5
18	.57	.68	.80	.85	.26	.32	1.3	.5
19	.92	.81	1.08	.99	.21	.32	1.4	.5
20	.86	.87	1.05	1.02	.33	.33	1.5	.5
21	.89	.91	.95	1.00	.43	.35	1.6	.6

TABLE 3

1959-62 JUVENILE BASIC TABLES
GRADUATED MORTALITY RATES PER 1,000

POLICY YEAR	ISSUE AGE GROUP (NEAREST BIRTHDAY)			
	0	1	2–4	5–9
	MALE AND FEMALE LIVES COMBINED			
1	1.78	.74	.59	.34
2	.74	.65	.53	.28
3	.65	.59	.48	.24
4	.59	.53	.41	.23
5	.53	.48	.34	.24
6	.48	.41	.28	.28
7	.41	.34	.24	.34
8	.34	.28	.23	.42
9	.28	.24	.24	.53
10	.24	.23	.28	.58
11	.23	.24	.34	.61
12	.24	.28	.42	.68
13	.28	.34	.53	.81
14	.34	.42	.58	.87
15	.42	.53	.61	.91
	MALE LIVES			
1	1.85	.86	.63	.37
2	.86	.74	.54	.31
3	.74	.63	.49	.27
4	.63	.54	.44	.27
5	.54	.49	.37	.29
6	.49	.44	.31	.32
7	.44	.37	.27	.38
8	.37	.31	.27	.46
9	.31	.27	.29	.56
10	.27	.27	.32	.63
11	.27	.29	.38	.72
12	.29	.32	.46	.85
13	.32	.38	.56	.99
14	.38	.46	.63	1.02
15	.46	.56	.72	1.00
	FEMALE LIVES			
1	1.68	.52	.43	.28
2	.52	.48	.39	.25
3	.48	.43	.35	.23
4	.43	.39	.31	.22
5	.39	.35	.28	.23
6	.35	.31	.25	.25
7	.31	.28	.23	.27
8	.28	.25	.22	.30
9	.25	.23	.23	.32
10	.23	.22	.25	.32
11	.22	.23	.27	.32
12	.23	.25	.30	.32
13	.25	.27	.32	.32
14	.27	.30	.32	.33
15	.30	.32	.32	.35

TABLE 4

TEST OF GRADUATION OF 1959–62 JUVENILE AGGREGATE TABLES
AMOUNTS TO NEARER DOLLAR

ATTAINED AGE NEAREST BIRTHDAY	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
0	$ 880,801	102.7%	$ 543,751	100.0%	$ 331,550	112.4%
1	562,110	99.4	393,739	98.9	152,371	104.6
2	532,170	102.8	372,670	106.1	132,500	92.2
3	593,604	90.2	394,788	93.3	190,816	108.8
4	702,209	119.1	343,650	95.5	157,559	98.0
5	499,830	95.8	325,641	103.0	167,189	116.3
6	423,078	101.4	280,178	106.6	114,600	94.3
7	466,999	96.9	332,249	102.1	130,250	94.7
8	346,500	97.3	218,500	93.6	107,000	100.8
9	276,461	100.9	161,861	94.8	82,600	99.3
10	241,675	101.4	151,675	105.0	46,000	68.3
11	244,542	103.2	150,974	104.3	47,568	73.3
12	265,538	97.6	154,338	99.9	55,200	80.6
13	324,672	101.6	169,265	97.2	78,407	107.7
14	312,878	86.3	174,878	91.0	67,000	87.6
15	289,500	118.8	160,500	117.4	74,000	177.5
16	186,531	98.9	98,764	92.7	40,527	142.8
17	170,700	98.2	93,000	96.5	14,000	60.3
18	84,000	83.4	55,500	93.9	9,000	79.8
19	131,400	113.1	73,900	109.6	7,000	65.4
20	124,099	98.6	72,099	103.2	11,000	99.7
21	133,596	97.5	68,530	94.7	15,000	124.3
0–5	3,770,724	100.7	2,374,239	99.2	1,131,985	106.4
6–10	1,754,713	99.3	1,144,463	100.7	480,450	93.1
11–15	1,437,130	100.2	809,955	100.9	322,175	99.3
16–21	830,326	98.6	461,793	97.9	96,527	99.8
All	$7,792,893	100.5%	$4,790,450	99.7%	$2,031,137	101.5%

TABLE A

CONTRIBUTING COMPANIES
PROPORTION OF TOTAL EXPOSURES CONTRIBUTED BY EACH

COMPANY	FIRST 15 POLICY YEARS		FIRST 15 POLICY YEARS BY SEX			
	Medical Issues	Non-medical Issues	Medical Issues		Nonmedical Issues	
			Male	Female	Male	Female
Northwestern Mutual	22.5%	.....	18.8%	8.9%	.....	.....
New York Life	21.8	10.9%	18.2	8.6	7.4%	4.7%
Mutual Benefit	11.7	.2	.....	.....	.....	.....
Metropolitan	8.0	28.8	1.9	.8	12.8	9.0
Penn Mutual	6.2	1.4	5.3	2.4	1.0	.6
Prudential	5.8	29.2	5.4	1.7	20.9	11.4
John Hancock	4.5	13.2	3.6	1.9	8.4	6.1
Massachusetts Mutual	4.3	2.2	3.7	1.6	1.4	.9
Sun Life, Canada	2.8	2.9	2.4	1.0	2.0	1.2
Equitable, N.Y.*	2.6	1.8	2.4	.8	1.3	.7
Connecticut General	2.3	.5	1.9	.9	.3	.2
Connecticut Mutual	2.0	.6	1.8	.7	.5	.2
New England Life*	1.4	.5	1.2	.5	.4	.2
Mutual Life, N.Y.	1.3	5.4	1.1	.5	3.7	2.3
Provident Mutual	1.2	.2	.....	.....	.....	.....
Aetna	.9	1.4	.7	.4	1.0	.6
Lincoln National	.7	.8	.6	.3	.5	.3
Total	100.0%	100.0%	69.0%	31.0%	61.6%	38.4%

* Only data for issue age group 5-9 used.