

**AN EXTENSION OF THE 1975-80 BASIC  
SELECT AND ULTIMATE MORTALITY TABLES,  
MALE AND FEMALE—ACTUARIAL NOTE**

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ABSTRACT

This paper presents a complete set of select mortality rates, for all issue ages, derived from the rates (generally for five-year issue age groupings) presented on pages 56-57 and 79-80 of the *1982 Reports of the Transactions of the Society of Actuaries*. The paper explains the method by which these rates were developed, and the rationale underlying the use of that method. The main purpose is to provide a convenient source of basic data for actuaries called upon to make calculations based on individual issue ages or central ages other than those implicitly presented in the *1982 Reports* tables.

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INTRODUCTION

The *1982 Reports* displays male and female mortality rates which, together, constitute the 1975-80 Select and Ultimate Basic Tables (or the 1975-80 Basic Tables, for short). Age-nearest-birthday rates for males are presented on page 56, and similar rates for females are presented on page 57. Corresponding age-last-birthday rates are made available on pages 79 and 80. Ultimate mortality rates follow on pages 58 and 81, respectively.

While the use of these mortality rates is subject to many caveats (ably discussed in a paper similar to this one presented by O. David Green III, in *TSA XXIX*, 171, in connection with the predecessor tables for 1965-70), the fact remains that, for many actuaries, the rates serve as a take-off point, or at least a reference, in the computation of gross premiums, reserves according to generally accepted accounting principles (GAAP), and expected claims, and also for profitability studies. Because the tables present select rates for five-year issue age groupings, such as 5-9, 10-14, and so on, up to 65-69, a certain degree of inconvenience results for those practitioners who wish to use quinquennial issue ages such as 0, 5, 10, 15, and so on, or those who may wish to use rates for a specific issue age. Moreover, when referring to a table in an actuarial report which strictly complies with ethical

standards on disclosure, it is obviously more convenient to refer to a complete source of rates, such as the one presented here, than to attach to the report a bulky appendix containing the complete set of rates used by the actuary. In brief, there is a certain amount of comfort and convenience in having complete select mortality rates, for every issue age, available in printed form in one place. Actuaries are free to use their own professional judgment in adapting these rates to the task at hand. (The absence of a division between smoker and nonsmoker rates, in these tables, should be noted particularly. For some actuaries, it may detract from their usefulness.)

#### DERIVATION OF INDIVIDUAL SELECT MORTALITY RATES

In deriving those rates not shown in the tables presented in the *1982 Reports*, I proceeded from the following postulates:

1. The ultimate rates are likely to possess the greatest credibility (as resting upon the experience with the greatest exposure) and can serve both as a point of reference and as a ceiling for the mortality rates of persons with the same attained age but still in the select period.
2. The select rates published in the *1982 Reports* and available as a starting point serve as a measure of the effect of selection upon the ultimate rates. Hence, in a case where the ultimate rate is 2.40 and the select rate is 1.80, it can be held that the factor which best describes the effect of selection is 75 percent (as the select mortality rate is 75 percent of the ultimate mortality rate for the same attained age).
3. The effect of the selection process is unlikely to change drastically from one issue age to the next, and it is not unreasonable to assume a linear progression from the selection factors for one quinquennial age grouping to those for the next one, particularly since the select rates for the quinquennial groupings have themselves been scientifically graduated. Hence, to use an example, where the select factor at duration 5 for issue age 42 is 82 percent, and the select factor at duration 5 for issue age 47 is 75 percent, the select factor at duration 5 for issue age 45 can be computed (by linear interpolation) as being 77.8 percent.
4. As a matter of logic, where persons have the same attained age, the mortality rate for those selected the most recently should never exceed that of those selected earlier (i.e., less recently). The rates published in the *1982 Reports* follow this rule. Between successive age groupings, a further rule could be adopted in the computer program used to produce the individual rates shown in the present tables: for a given attained age, no select mortality rate can be smaller than the rate for the same attained age, in the next higher quinquennial age grouping.

The focus of the computational process by which the present tables were derived is on the effect of selection upon the ultimate rates, not on the rates themselves. Aside from obvious practical considerations, it was thought

important to avoid what some have referred to as "delusive exactness" through the use of esoteric formulas. It may be wise to emphasize that no two insurers experience the same mortality; no two calendar years' experience is ever quite the same; and a great many factors, some understood and some not, influence mortality over time. Hence, there is no perfect mortality table.

As the reader may have surmised from the postulates listed previously, the rates presented in the *1982 Reports* were left intact, and each missing rate was developed by multiplying the interpolated selection factor by the ultimate mortality rate for the applicable attained age, before being rounded to the nearest cent per 1,000 and subjected to the consistency tests described in postulate 4.

It may be helpful to go through an example—the derivation of the select rate of 1.28 for male issue age (nearest birthday) 35 and policy year 5.

1. It was first noted that the nearest select rates available from the *1982 Reports* tables are for central issue ages 32 and 37.
2. The select rate of 1.00 for male issue age 32 and policy year 5 was compared to the ultimate rate of 1.22 for the corresponding attained age 36, to produce a selection factor of .81967.
3. The select rate of 1.58 for male issue age 37 and policy year 5 was compared to the ultimate rate of 1.70 for the corresponding attained age 41, to produce a selection factor of .92941.
4. The policy year 5 selection factors for issue ages 32 and 37 were linearly interpolated to produce a selection factor of .88551, deemed applicable to issue age 35.
5. The new selection factor was applied to the 1.45 rate for attained age 39 (corresponding to issue age 35 and policy year 5), to produce a rate of 1.28 when rounded to the nearest second decimal.
6. This 1.28 rate was compared with the 1.28 rate for issue age 32, policy year 8 (which it is not allowed to exceed) and with the 1.15 rate for issue age 37, policy year 3 (below which it is not allowed to fall) and, meeting these criteria, was allowed to stand.

An exception to this procedure should be noted. The published rates for issue ages 70 and above theoretically cover such a wide age band that it might be dangerous, or at least professionally uncomfortable, to use them. Hence, the selection factors derived for issue age 67, or more precisely the age grouping 65–69, were used in deriving the select mortality rates for issue ages 68 to 70.

If the committee which produced the tables shown in the *1982 Reports* had not developed its own age-last-birthday mortality rates, it would have made sense to derive select age-last-birthday rates for individual issue ages

from corresponding age-nearest-birthday rates by traditional actuarial methods. Since age-last-birthday rates are provided in the *1982 Reports*, it was thought best to preserve them and use them "as is" in the tables presented here. (To have done otherwise would have, to some degree, "undone" what the committee did, mostly for the sake of delusive exactness.)

#### CONCLUSION

This utilitarian project, modest as it is, should be of benefit to the many in our profession who need, at least occasionally, a convenient reference to the 1975-80 Basic Tables for individual issue ages.

TABLE 1

1975-80 BASIC SELECT AND ULTIMATE MORTALITY TABLES

15-YEAR SELECT AND ULTIMATE MORTALITY RATES, INTERPOLATION OF RATES OF THE 1982 REPORTS OF THE TRANSACTIONS OF THE SOCIETY OF ACTUARIES\*  
MALE, AGE-NEAREST-BIRTHDAY, 1,000 $q_x$ 

Age	Policy Year															Ultimate	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Rate	Age
0	1.23	0.74	0.48	0.43	0.38	0.34	0.33	0.29	0.27	0.27	0.25	0.28	0.31	0.38	0.54	0.68	15
1	0.49	0.47	0.42	0.36	0.28	0.23	0.22	0.22	0.24	0.24	0.27	0.30	0.38	0.54	0.68	1.01	16
2	0.35	0.37	0.33	0.28	0.23	0.22	0.21	0.24	0.24	0.27	0.30	0.37	0.54	0.68	1.01	1.14	17
3	0.35	0.29	0.25	0.23	0.22	0.20	0.22	0.24	0.27	0.30	0.37	0.53	0.68	1.01	1.14	1.22	18
4	0.29	0.25	0.23	0.22	0.20	0.22	0.24	0.27	0.30	0.36	0.52	0.66	0.99	1.11	1.22	1.31	19
5	0.25	0.23	0.22	0.20	0.22	0.24	0.27	0.30	0.36	0.50	0.66	0.96	1.09	1.16	1.31	1.37	20
6	0.23	0.22	0.20	0.22	0.24	0.27	0.30	0.36	0.50	0.66	0.94	1.07	1.14	1.21	1.37	1.40	21
7	0.19	0.20	0.22	0.24	0.27	0.30	0.35	0.50	0.66	0.87	1.05	1.13	1.19	1.23	1.40	1.41	22
8	0.18	0.21	0.21	0.27	0.29	0.35	0.50	0.66	0.87	1.05	1.13	1.19	1.23	1.30	1.39	1.40	23
9	0.19	0.20	0.24	0.29	0.35	0.50	0.66	0.87	1.05	1.13	1.19	1.23	1.30	1.35	1.36	1.38	24
10	0.18	0.22	0.27	0.35	0.50	0.66	0.87	1.05	1.13	1.19	1.23	1.30	1.35	1.36	1.32	1.34	25
11	0.20	0.25	0.34	0.50	0.66	0.87	1.05	1.13	1.19	1.23	1.30	1.35	1.36	1.30	1.27	1.29	26
12	0.23	0.32	0.50	0.66	0.87	1.05	1.13	1.19	1.23	1.30	1.35	1.36	1.30	1.25	1.20	1.24	27
13	0.30	0.46	0.63	0.87	1.05	1.12	1.19	1.22	1.24	1.28	1.31	1.30	1.25	1.20	1.16	1.20	28
14	0.44	0.59	0.87	1.05	1.12	1.17	1.22	1.23	1.23	1.24	1.26	1.25	1.19	1.16	1.13	1.17	29
15	0.58	0.87	1.05	1.12	1.17	1.21	1.23	1.22	1.20	1.20	1.19	1.18	1.13	1.12	1.11	1.14	30
16	0.87	1.05	1.12	1.17	1.21	1.20	1.21	1.19	1.16	1.14	1.12	1.12	1.09	1.09	1.09	1.12	31
17	1.05	1.12	1.17	1.21	1.20	1.18	1.18	1.15	1.11	1.07	1.05	1.06	1.05	1.06	1.08	1.11	32
18	1.03	1.10	1.13	1.15	1.14	1.11	1.11	1.07	1.04	1.01	1.00	1.02	1.01	1.03	1.07	1.12	33
19	1.00	1.05	1.06	1.07	1.05	1.04	1.02	0.98	0.96	0.95	0.97	0.97	0.98	1.01	1.07	1.14	34

\*See 1982 Reports page 56.

TABLE 1—Continued

Age	Policy Year															Ultimate	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Rate	Age
20	0.93	0.97	0.97	0.97	0.97	0.95	0.93	0.90	0.90	0.91	0.93	0.94	0.96	1.01	1.08	1.17	35
21	0.84	0.87	0.87	0.87	0.87	0.86	0.85	0.83	0.85	0.86	0.90	0.92	0.96	1.02	1.11	1.22	36
22	0.73	0.76	0.76	0.76	0.77	0.77	0.77	0.77	0.80	0.83	0.88	0.91	0.96	1.04	1.15	1.28	37
23	0.73	0.76	0.75	0.75	0.75	0.76	0.77	0.77	0.80	0.84	0.90	0.94	1.00	1.10	1.21	1.36	38
24	0.73	0.74	0.73	0.73	0.74	0.76	0.77	0.78	0.82	0.87	0.93	0.97	1.05	1.17	1.29	1.45	39
25	0.72	0.72	0.72	0.72	0.74	0.76	0.77	0.79	0.84	0.90	0.96	1.03	1.12	1.25	1.38	1.56	40
26	0.70	0.70	0.71	0.72	0.73	0.76	0.78	0.82	0.88	0.95	1.02	1.09	1.20	1.35	1.49	1.70	41
27	0.68	0.68	0.70	0.71	0.73	0.77	0.81	0.86	0.92	1.01	1.08	1.17	1.30	1.47	1.63	1.87	42
28	0.66	0.68	0.71	0.73	0.76	0.81	0.86	0.92	1.00	1.08	1.17	1.28	1.42	1.61	1.81	2.07	43
29	0.65	0.68	0.73	0.76	0.81	0.86	0.92	1.00	1.08	1.17	1.28	1.42	1.58	1.81	2.03	2.31	44
30	0.64	0.68	0.76	0.81	0.86	0.92	1.00	1.08	1.17	1.28	1.42	1.58	1.81	2.03	2.26	2.58	45
31	0.63	0.69	0.79	0.86	0.92	1.00	1.08	1.17	1.28	1.42	1.58	1.81	2.03	2.26	2.53	2.89	46
32	0.63	0.71	0.84	0.92	1.00	1.08	1.17	1.28	1.40	1.58	1.81	2.03	2.26	2.53	2.83	3.24	47
33	0.63	0.72	0.88	0.98	1.08	1.17	1.28	1.40	1.58	1.78	2.01	2.25	2.53	2.83	3.17	3.61	48
34	0.63	0.73	0.93	1.05	1.17	1.28	1.40	1.58	1.78	2.01	2.24	2.53	2.81	3.16	3.54	4.02	49
35	0.63	0.76	0.99	1.14	1.28	1.40	1.58	1.78	2.01	2.24	2.53	2.80	3.13	3.52	3.94	4.45	50
36	0.65	0.79	1.06	1.25	1.40	1.58	1.78	2.01	2.24	2.53	2.80	3.10	3.48	3.91	4.36	4.92	51
37	0.67	0.84	1.15	1.37	1.58	1.78	2.01	2.24	2.53	2.80	3.08	3.43	3.86	4.32	4.82	5.44	52
38	0.70	0.89	1.23	1.47	1.70	1.91	2.16	2.41	2.72	3.04	3.35	3.76	4.25	4.78	5.33	6.00	53
39	0.74	0.95	1.33	1.59	1.83	2.07	2.33	2.60	2.93	3.27	3.64	4.10	4.67	5.28	5.88	6.61	54

TABLE 1—Continued

Age	Policy Year															Ultimate	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Rate	Age
40	0.79	1.02	1.45	1.73	2.00	2.23	2.51	2.79	3.13	3.51	3.94	4.47	5.13	5.82	6.48	7.27	55
41	0.85	1.11	1.59	1.90	2.17	2.42	2.70	2.98	3.33	3.75	4.24	4.86	5.62	6.41	7.12	8.01	56
42	0.92	1.22	1.76	2.09	2.37	2.62	2.89	3.18	3.52	3.99	4.57	5.28	6.15	7.05	7.85	8.82	57
43	0.99	1.37	1.92	2.30	2.61	2.88	3.18	3.47	3.83	4.33	4.96	5.71	6.63	7.61	8.50	9.73	58
44	1.08	1.53	2.11	2.52	2.86	3.17	3.47	3.79	4.17	4.70	5.37	6.16	7.16	8.20	9.22	10.75	59
45	1.17	1.72	2.31	2.75	3.13	3.47	3.79	4.14	4.56	5.08	5.80	6.66	7.73	8.85	10.02	11.89	60
46	1.28	1.94	2.51	3.00	3.40	3.78	4.14	4.56	4.91	5.48	6.28	7.19	8.35	9.56	10.89	13.17	61
47	1.39	2.17	2.73	3.25	3.69	4.13	4.56	4.89	5.31	5.93	6.79	7.78	9.03	10.34	11.85	14.57	62
48	1.49	2.27	2.84	3.40	3.90	4.38	4.87	5.28	5.80	6.49	7.53	8.64	9.94	11.30	12.79	16.07	63
49	1.60	2.35	2.95	3.54	4.09	4.62	5.18	5.70	6.33	7.12	8.36	9.60	10.96	12.32	13.75	17.71	64
50	1.70	2.42	3.04	3.66	4.29	4.87	5.51	6.15	6.93	7.83	9.30	10.69	12.06	13.40	14.77	19.50	65
51	1.80	2.48	3.12	3.77	4.47	5.12	5.86	6.65	7.59	8.61	10.35	11.89	13.24	14.56	15.83	21.47	66
52	1.90	2.52	3.17	3.85	4.65	5.38	6.23	7.20	8.32	9.48	11.51	13.18	14.52	15.80	16.96	23.65	67
53	2.06	2.75	3.46	4.23	5.08	5.90	6.84	7.89	9.11	10.43	12.63	14.52	15.80	16.96	19.16	26.05	68
54	2.23	2.99	3.78	4.64	5.57	6.47	7.52	8.66	9.96	11.44	13.85	15.80	16.96	19.16	21.62	28.69	69
55	2.41	3.27	4.12	5.10	6.11	7.11	8.27	9.50	10.86	12.54	15.17	16.96	19.16	21.62	24.39	31.57	70
56	2.61	3.56	4.51	5.61	6.71	7.83	9.09	10.38	11.83	13.73	16.62	19.16	21.62	24.39	27.47	34.68	71
57	2.82	3.89	4.94	6.18	7.38	8.60	9.96	11.33	12.87	15.03	18.21	21.36	24.39	27.15	30.87	38.00	72
58	2.96	4.13	5.44	6.74	8.10	9.20	10.59	12.05	13.66	15.94	19.22	22.43	25.64	28.58	32.76	41.60	73
59	3.10	4.37	6.00	7.34	8.87	9.82	11.23	12.79	14.47	16.88	20.25	23.49	26.85	29.94	34.70	45.54	74

TABLE 1—Continued

Age	Policy Year															Ultimate	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Rate	Age
60	3.23	4.63	6.61	7.97	9.71	10.46	11.89	13.57	15.32	17.85	21.28	24.48	27.97	31.28	36.71	49.90	75
61	3.37	4.89	7.26	8.64	10.46	11.59	12.58	14.38	16.18	18.82	22.26	25.39	29.04	32.61	38.82	54.71	76
62	3.50	5.14	7.97	9.36	11.59	11.83	13.29	15.21	17.05	19.77	23.18	26.21	30.06	33.93	41.03	60.03	77
63	3.89	5.77	8.74	10.48	11.83	13.29	15.21	17.05	20.11	22.42	25.79	28.87	33.14	37.75	44.66	65.85	78
64	4.32	6.47	9.57	11.73	13.29	15.21	17.05	20.11	22.42	25.79	28.69	32.93	36.55	42.02	48.60	72.18	79
65	4.80	7.26	10.50	13.13	15.21	17.05	20.11	22.42	25.79	28.69	32.93	35.12	40.34	46.75	52.83	79.02	80
66	5.32	8.14	11.51	14.69	17.05	20.11	22.42	25.79	28.69	32.93	34.69	38.78	44.51	51.97	57.68	86.36	81
67	5.91	9.12	12.62	16.42	20.11	22.42	25.79	28.69	32.93	34.47	38.42	42.80	49.08	57.68	62.18	94.12	82
68	6.51	10.04	13.89	18.04	22.04	24.54	28.23	31.44	34.47	37.82	42.14	46.91	53.73	62.18	67.77	102.35	83
69	7.17	11.05	15.25	19.76	24.12	26.87	30.94	34.47	37.82	41.49	46.20	51.36	58.72	67.77	73.69	111.41	84
70	7.89	12.14	16.72	21.64	26.41	29.44	33.92	37.82	41.49	45.48	50.57	56.13	64.00	73.69	80.22	121.31	85
Ultimate Rates for Advanced Attained Ages																	
Age	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100		
Rate	132.05	143.63	156.05	169.12	182.61	196.52	210.85	225.60	240.77	256.36	272.37	288.80	305.65	322.92	340.61		



TABLE 2

## 1975-80 BASIC SELECT AND ULTIMATE MORTALITY TABLES

15-YEAR SELECT AND ULTIMATE MORTALITY RATES, INTERPOLATION OF RATES OF THE 1982 REPORTS OF THE TRANSACTIONS OF THE SOCIETY OF ACTUARIES\*  
FEMALE, AGE-NEAREST-BIRTHDAY, 1,000  $q_x$ 

Age	Policy Year															Ultimate	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Rate	Age
0	0.93	0.34	0.30	0.27	0.24	0.22	0.20	0.18	0.18	0.18	0.19	0.21	0.24	0.27	0.32	0.36	15
1	0.34	0.30	0.27	0.24	0.22	0.20	0.18	0.18	0.18	0.19	0.21	0.24	0.27	0.32	0.36	0.40	16
2	0.28	0.27	0.24	0.22	0.20	0.18	0.18	0.18	0.19	0.21	0.24	0.27	0.32	0.36	0.40	0.44	17
3	0.24	0.24	0.22	0.20	0.18	0.18	0.18	0.19	0.21	0.24	0.27	0.32	0.36	0.40	0.44	0.47	18
4	0.22	0.22	0.20	0.18	0.18	0.18	0.19	0.21	0.24	0.27	0.32	0.36	0.40	0.44	0.47	0.49	19
5	0.20	0.20	0.18	0.18	0.18	0.19	0.21	0.24	0.27	0.32	0.36	0.40	0.44	0.47	0.49	0.51	20
6	0.19	0.18	0.18	0.18	0.19	0.21	0.24	0.27	0.32	0.36	0.40	0.44	0.47	0.49	0.51	0.52	21
7	0.17	0.18	0.18	0.19	0.21	0.24	0.27	0.32	0.36	0.40	0.44	0.47	0.49	0.51	0.52	0.53	22
8	0.16	0.18	0.19	0.21	0.24	0.27	0.32	0.36	0.40	0.44	0.47	0.49	0.51	0.52	0.53	0.53	23
9	0.16	0.19	0.21	0.24	0.27	0.32	0.36	0.40	0.44	0.47	0.49	0.51	0.52	0.53	0.53	0.53	24
10	0.16	0.21	0.24	0.27	0.32	0.36	0.40	0.44	0.47	0.49	0.51	0.52	0.53	0.53	0.53	0.53	25
11	0.17	0.24	0.27	0.32	0.36	0.40	0.44	0.47	0.49	0.51	0.52	0.53	0.53	0.53	0.53	0.53	26
12	0.18	0.27	0.32	0.36	0.40	0.44	0.47	0.49	0.51	0.52	0.53	0.53	0.53	0.53	0.53	0.53	27
13	0.21	0.31	0.35	0.38	0.42	0.45	0.47	0.49	0.52	0.53	0.53	0.53	0.53	0.53	0.53	0.53	28
14	0.25	0.33	0.37	0.40	0.43	0.45	0.47	0.48	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	29
15	0.28	0.35	0.39	0.41	0.43	0.45	0.46	0.48	0.53	0.53	0.53	0.53	0.53	0.53	0.54	0.55	30
16	0.32	0.37	0.39	0.41	0.42	0.43	0.45	0.46	0.53	0.53	0.53	0.53	0.53	0.54	0.55	0.58	31
17	0.36	0.37	0.39	0.40	0.41	0.42	0.43	0.44	0.53	0.53	0.53	0.53	0.54	0.55	0.58	0.61	32
18	0.36	0.37	0.39	0.40	0.41	0.42	0.43	0.44	0.51	0.52	0.53	0.54	0.55	0.58	0.61	0.65	33
19	0.36	0.37	0.39	0.40	0.41	0.42	0.43	0.44	0.50	0.50	0.54	0.55	0.58	0.61	0.65	0.70	34

\* See 1982 Reports page 57.

TABLE 2—Continued

Age	Policy Year															Ultimate	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Rate	Age
20	0.35	0.36	0.38	0.39	0.41	0.41	0.43	0.44	0.48	0.50	0.55	0.58	0.61	0.65	0.70	0.77	35
21	0.34	0.36	0.37	0.39	0.40	0.41	0.43	0.44	0.47	0.49	0.58	0.61	0.65	0.70	0.77	0.84	36
22	0.32	0.34	0.36	0.38	0.40	0.41	0.43	0.45	0.46	0.50	0.61	0.65	0.70	0.77	0.84	0.93	37
23	0.32	0.34	0.37	0.39	0.41	0.42	0.45	0.46	0.50	0.55	0.65	0.70	0.77	0.84	0.93	1.03	38
24	0.31	0.34	0.38	0.40	0.42	0.45	0.46	0.50	0.55	0.59	0.70	0.77	0.84	0.93	1.03	1.15	39
25	0.31	0.35	0.39	0.41	0.44	0.46	0.50	0.55	0.59	0.63	0.77	0.84	0.93	1.03	1.15	1.29	40
26	0.30	0.35	0.39	0.43	0.46	0.50	0.55	0.59	0.63	0.69	0.84	0.93	1.03	1.15	1.29	1.45	41
27	0.30	0.35	0.41	0.45	0.50	0.55	0.59	0.63	0.66	0.76	0.93	1.03	1.15	1.29	1.45	1.62	42
28	0.31	0.36	0.42	0.48	0.53	0.59	0.63	0.66	0.76	0.86	1.03	1.15	1.29	1.45	1.62	1.79	43
29	0.32	0.37	0.44	0.51	0.57	0.63	0.66	0.76	0.86	0.97	1.15	1.29	1.45	1.62	1.79	1.96	44
30	0.33	0.39	0.47	0.54	0.62	0.66	0.76	0.86	0.97	1.08	1.29	1.45	1.62	1.79	1.96	2.14	45
31	0.35	0.41	0.50	0.59	0.66	0.76	0.86	0.97	1.08	1.19	1.45	1.62	1.79	1.96	2.14	2.33	46
32	0.38	0.44	0.54	0.65	0.76	0.86	0.97	1.08	1.19	1.31	1.62	1.79	1.96	2.14	2.33	2.52	47
33	0.39	0.46	0.57	0.69	0.82	0.93	1.07	1.19	1.31	1.48	1.77	1.94	2.12	2.33	2.52	2.72	48
34	0.41	0.49	0.60	0.74	0.88	1.02	1.18	1.31	1.48	1.64	1.92	2.10	2.30	2.51	2.72	2.93	49
35	0.43	0.51	0.63	0.79	0.95	1.12	1.30	1.48	1.64	1.81	2.07	2.27	2.46	2.71	2.92	3.17	50
36	0.45	0.54	0.67	0.85	1.04	1.23	1.43	1.63	1.81	2.00	2.23	2.43	2.64	2.92	3.16	3.43	51
37	0.48	0.58	0.71	0.92	1.13	1.35	1.56	1.77	1.98	2.19	2.39	2.60	2.82	3.15	3.42	3.71	52
38	0.51	0.64	0.80	1.04	1.26	1.49	1.70	1.92	2.14	2.35	2.56	2.78	3.02	3.38	3.66	4.04	53
39	0.55	0.72	0.89	1.16	1.39	1.63	1.85	2.08	2.30	2.52	2.74	2.98	3.23	3.62	3.94	4.40	54

TABLE 2—Continued

Age	Policy Year															Ultimate	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Rate	Age
40	0.60	0.80	1.00	1.28	1.52	1.78	2.01	2.24	2.46	2.69	2.94	3.19	3.46	3.91	4.25	4.80	55
41	0.65	0.89	1.10	1.41	1.66	1.94	2.17	2.41	2.63	2.89	3.15	3.42	3.72	4.23	4.58	5.23	56
42	0.70	0.98	1.20	1.54	1.80	2.10	2.33	2.58	2.83	3.10	3.38	3.69	4.01	4.57	4.94	5.70	57
43	0.76	1.05	1.29	1.63	1.90	2.20	2.45	2.74	3.01	3.31	3.64	3.98	4.34	4.94	5.37	6.22	58
44	0.81	1.12	1.39	1.71	2.00	2.30	2.59	2.90	3.21	3.55	3.92	4.30	4.69	5.37	5.85	6.78	59
45	0.86	1.19	1.48	1.79	2.10	2.42	2.73	3.07	3.43	3.82	4.23	4.64	5.07	5.83	6.36	7.37	60
46	0.91	1.26	1.58	1.86	2.22	2.53	2.88	3.28	3.67	4.11	4.55	5.01	5.49	6.32	6.89	8.00	61
47	0.96	1.33	1.68	1.95	2.34	2.65	3.06	3.49	3.94	4.41	4.90	5.41	5.94	6.84	7.46	8.67	62
48	1.00	1.39	1.76	2.04	2.45	2.82	3.27	3.76	4.20	4.70	5.23	5.77	6.31	7.25	7.88	9.38	63
49	1.05	1.46	1.83	2.13	2.58	3.00	3.50	4.04	4.48	5.02	5.57	6.13	6.70	7.67	8.30	10.15	64
50	1.10	1.53	1.91	2.24	2.72	3.20	3.74	4.35	4.78	5.34	5.92	6.50	7.09	8.09	8.75	10.99	65
51	1.15	1.60	2.01	2.35	2.86	3.40	4.00	4.68	5.09	5.67	6.28	6.88	7.49	8.53	9.21	11.91	66
52	1.20	1.68	2.10	2.47	3.01	3.61	4.28	5.03	5.40	6.01	6.64	7.27	7.91	9.00	9.70	12.92	67
53	1.26	1.76	2.22	2.65	3.23	3.87	4.57	5.34	5.77	6.41	7.05	7.75	8.47	9.68	10.50	14.03	68
54	1.32	1.85	2.35	2.84	3.47	4.15	4.87	5.65	6.15	6.81	7.49	8.26	9.07	10.43	11.37	15.25	69
55	1.38	1.93	2.48	3.05	3.72	4.43	5.18	5.97	6.55	7.25	7.96	8.81	9.72	11.24	12.33	16.63	70
56	1.45	2.02	2.62	3.27	3.97	4.72	5.50	6.29	6.97	7.71	8.46	9.40	10.43	12.13	13.41	18.21	71
57	1.51	2.11	2.76	3.49	4.24	5.02	5.82	6.62	7.42	8.21	9.00	10.04	11.20	13.13	14.65	20.04	72
58	1.63	2.29	2.99	3.76	4.54	5.34	6.18	7.03	7.88	8.71	9.76	10.86	12.11	14.18	15.84	22.17	73
59	1.75	2.48	3.24	4.04	4.85	5.69	6.57	7.46	8.36	9.25	10.60	11.79	13.14	15.40	17.21	24.65	74

TABLE 2—Continued

Age	Policy Year															Ultimate	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Rate	Age
60	1.88	2.68	3.50	4.34	5.18	6.06	6.98	7.93	8.89	9.83	11.55	12.85	14.33	16.80	18.78	27.53	75
61	2.01	2.90	3.77	4.66	5.54	6.45	7.42	8.43	9.45	10.47	12.64	14.08	15.70	18.42	20.59	30.86	76
62	2.15	3.12	4.07	5.01	5.93	6.88	7.90	8.97	10.07	11.19	13.90	15.50	17.30	20.28	22.64	34.69	77
63	2.27	3.27	4.26	5.24	6.21	7.22	8.30	9.49	10.75	12.11	15.04	16.80	18.79	22.08	24.73	39.07	78
64	2.40	3.43	4.46	5.48	6.50	7.57	8.75	10.07	11.53	13.17	16.34	18.28	20.47	24.09	27.05	44.00	79
65	2.53	3.59	4.66	5.73	6.80	7.95	9.24	10.72	12.43	14.38	17.83	19.94	22.34	26.30	29.55	49.48	80
66	2.67	3.76	4.88	5.99	7.12	8.37	9.80	11.47	13.45	15.78	19.51	21.81	24.41	28.69	32.20	55.51	81
67	2.82	3.94	5.10	6.27	7.48	8.85	10.43	12.32	14.61	17.37	21.40	23.87	26.64	31.21	34.98	62.09	82
68	3.06	4.28	5.56	6.87	8.23	9.79	11.60	13.76	16.38	19.53	23.87	26.64	29.96	34.98	39.13	69.22	83
69	3.33	4.67	6.09	7.56	9.11	10.89	12.95	15.42	18.41	21.99	26.64	29.96	33.61	39.13	43.62	76.90	84
70	3.63	5.11	6.70	8.36	10.13	12.16	14.52	17.34	20.73	24.77	29.96	33.61	37.59	43.62	48.46	85.13	85

  

Ultimate Rates for Advanced Attained Ages																
Age	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	
Rate	93.91	103.24	113.12	123.55	134.53	146.06	158.14	170.77	183.95	197.68	211.96	226.79	242.17	258.10	274.58	

TABLE 3

## 1975-80 BASIC SELECT AND ULTIMATE MORTALITY TABLES

15-YEAR SELECT AND ULTIMATE MORTALITY RATES, INTERPOLATION OF RATES OF THE 1982 REPORTS OF THE TRANSACTIONS OF THE SOCIETY OF ACTUARIES\*  
MALE, AGE-LAST-BIRTHDAY, 1,000 $q_x$ 

Age	Policy Year															Ultimate	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Rate	Age
0	1.12	0.70	0.47	0.42	0.37	0.32	0.31	0.28	0.27	0.27	0.28	0.33	0.38	0.46	0.66	0.85	15
1	0.46	0.43	0.38	0.33	0.27	0.23	0.23	0.23	0.25	0.28	0.33	0.38	0.46	0.66	0.80	1.08	16
2	0.34	0.35	0.31	0.26	0.23	0.23	0.23	0.25	0.28	0.33	0.38	0.46	0.62	0.80	1.04	1.18	17
3	0.33	0.28	0.25	0.23	0.23	0.21	0.25	0.28	0.33	0.38	0.44	0.61	0.74	1.04	1.17	1.27	18
4	0.28	0.24	0.23	0.23	0.21	0.25	0.28	0.33	0.38	0.44	0.61	0.74	0.95	1.11	1.26	1.34	19
5	0.23	0.23	0.23	0.21	0.25	0.28	0.33	0.38	0.43	0.61	0.74	0.95	1.08	1.17	1.32	1.39	20
6	0.22	0.22	0.21	0.25	0.28	0.33	0.38	0.43	0.58	0.74	0.95	1.08	1.15	1.21	1.36	1.41	21
7	0.19	0.21	0.25	0.28	0.33	0.38	0.43	0.57	0.72	0.91	1.08	1.15	1.20	1.23	1.38	1.41	22
8	0.19	0.21	0.26	0.32	0.37	0.43	0.57	0.72	0.91	1.06	1.15	1.20	1.23	1.28	1.37	1.39	23
9	0.20	0.23	0.30	0.36	0.43	0.57	0.72	0.91	1.06	1.14	1.20	1.23	1.28	1.32	1.34	1.36	24
10	0.21	0.27	0.34	0.42	0.57	0.72	0.91	1.06	1.14	1.19	1.23	1.28	1.32	1.33	1.30	1.32	25
11	0.26	0.32	0.40	0.57	0.72	0.91	1.06	1.14	1.19	1.23	1.28	1.32	1.33	1.28	1.25	1.27	26
12	0.31	0.40	0.57	0.72	0.90	1.06	1.14	1.19	1.22	1.28	1.32	1.33	1.28	1.23	1.19	1.22	27
13	0.38	0.57	0.72	0.90	1.02	1.12	1.18	1.21	1.22	1.26	1.28	1.28	1.23	1.18	1.15	1.19	28
14	0.55	0.72	0.90	1.02	1.08	1.16	1.20	1.21	1.20	1.22	1.22	1.22	1.17	1.14	1.13	1.16	29
15	0.72	0.90	1.02	1.08	1.13	1.17	1.20	1.19	1.17	1.17	1.16	1.16	1.12	1.11	1.11	1.13	30
16	0.90	1.02	1.08	1.13	1.17	1.17	1.18	1.15	1.13	1.11	1.10	1.09	1.08	1.09	1.09	1.12	31
17	1.02	1.08	1.13	1.17	1.16	1.14	1.14	1.11	1.08	1.05	1.03	1.05	1.04	1.06	1.09	1.12	32
18	1.01	1.06	1.09	1.11	1.10	1.07	1.07	1.04	1.01	0.99	0.99	1.01	1.00	1.04	1.09	1.13	33
19	0.97	1.01	1.02	1.04	1.02	1.00	0.99	0.96	0.95	0.95	0.96	0.97	0.98	1.03	1.09	1.16	34

\*See 1982 Reports page 79.

TABLE 3—Continued

Age	Policy Year															Ultimate	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Rate	Age
20	0.91	0.94	0.94	0.95	0.94	0.93	0.91	0.89	0.90	0.91	0.93	0.95	0.98	1.03	1.12	1.20	35
21	0.83	0.85	0.85	0.86	0.86	0.85	0.83	0.86	0.86	0.87	0.91	0.94	0.97	1.05	1.16	1.25	36
22	0.73	0.75	0.75	0.76	0.77	0.77	0.77	0.78	0.81	0.85	0.90	0.94	0.99	1.08	1.20	1.32	37
23	0.73	0.74	0.74	0.75	0.76	0.77	0.77	0.78	0.82	0.87	0.92	0.98	1.04	1.14	1.27	1.41	38
24	0.73	0.73	0.73	0.74	0.76	0.77	0.78	0.80	0.84	0.90	0.96	1.03	1.10	1.22	1.36	1.51	39
25	0.71	0.71	0.72	0.74	0.75	0.77	0.80	0.82	0.87	0.95	1.01	1.09	1.18	1.33	1.47	1.63	40
26	0.70	0.69	0.71	0.73	0.75	0.78	0.82	0.85	0.92	1.00	1.07	1.16	1.29	1.44	1.59	1.79	41
27	0.68	0.68	0.71	0.73	0.76	0.80	0.85	0.90	0.97	1.07	1.15	1.26	1.40	1.58	1.75	1.97	42
28	0.66	0.68	0.72	0.76	0.80	0.84	0.90	0.97	1.06	1.15	1.26	1.38	1.53	1.74	1.94	2.19	43
29	0.65	0.68	0.75	0.80	0.84	0.90	0.97	1.06	1.15	1.26	1.38	1.52	1.70	1.94	2.17	2.45	44
30	0.63	0.68	0.78	0.84	0.90	0.97	1.06	1.15	1.25	1.38	1.52	1.70	1.94	2.17	2.42	2.74	45
31	0.63	0.70	0.82	0.90	0.97	1.06	1.15	1.25	1.38	1.52	1.70	1.94	2.17	2.42	2.71	3.07	46
32	0.63	0.72	0.87	0.97	1.06	1.15	1.25	1.38	1.51	1.70	1.94	2.17	2.42	2.71	3.03	3.43	47
33	0.63	0.74	0.91	1.03	1.14	1.25	1.36	1.50	1.67	1.87	2.14	2.41	2.69	3.03	3.39	3.82	48
34	0.64	0.76	0.96	1.11	1.24	1.36	1.49	1.66	1.86	2.10	2.37	2.67	3.00	3.38	3.77	4.24	49
35	0.65	0.79	1.03	1.20	1.35	1.49	1.66	1.86	2.10	2.33	2.63	2.96	3.34	3.75	4.19	4.69	50
36	0.67	0.83	1.12	1.31	1.49	1.66	1.86	2.10	2.33	2.63	2.92	3.28	3.70	4.16	4.63	5.18	51
37	0.70	0.88	1.21	1.44	1.66	1.86	2.10	2.33	2.63	2.92	3.23	3.62	4.09	4.59	5.12	5.72	52
38	0.74	0.94	1.29	1.55	1.78	2.01	2.27	2.52	2.84	3.16	3.52	3.96	4.49	5.06	5.64	6.31	53
39	0.78	1.00	1.40	1.68	1.93	2.18	2.45	2.72	3.06	3.41	3.82	4.31	4.92	5.57	6.22	6.94	54

TABLE 3—Continued

Age	Policy Year															Ultimate	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Rate	Age
40	0.83	1.09	1.53	1.83	2.11	2.36	2.65	2.93	3.27	3.67	4.12	4.69	5.39	6.13	6.82	7.64	55
41	0.89	1.20	1.68	2.01	2.29	2.56	2.86	3.14	3.49	3.92	4.45	5.09	5.90	6.72	7.50	8.42	56
42	0.97	1.32	1.86	2.21	2.50	2.77	3.06	3.35	3.70	4.18	4.79	5.53	6.44	7.38	8.25	9.28	57
43	1.05	1.46	2.02	2.41	2.74	3.04	3.35	3.66	4.03	4.55	5.21	5.99	6.96	7.97	8.93	10.24	58
44	1.14	1.62	2.20	2.63	2.98	3.32	3.66	3.98	4.39	4.94	5.66	6.50	7.54	8.60	9.67	11.32	59
45	1.23	1.81	2.39	2.85	3.24	3.61	3.98	4.34	4.77	5.35	6.15	7.06	8.16	9.30	10.49	12.53	60
46	1.33	2.00	2.58	3.08	3.51	3.92	4.34	4.73	5.17	5.80	6.68	7.66	8.83	10.06	11.39	13.87	61
47	1.44	2.21	2.77	3.31	3.79	4.26	4.73	5.12	5.61	6.29	7.26	8.32	9.58	10.89	12.36	15.32	62
48	1.55	2.32	2.90	3.48	4.02	4.53	5.06	5.54	6.13	6.89	8.04	9.23	10.57	11.94	13.41	16.89	63
49	1.66	2.42	3.03	3.64	4.24	4.81	5.41	5.99	6.69	7.55	8.91	10.26	11.67	13.06	14.53	18.61	64
50	1.77	2.51	3.15	3.80	4.46	5.09	5.78	6.48	7.31	8.30	9.90	11.41	12.85	14.25	15.72	20.49	65
51	1.88	2.59	3.26	3.94	4.69	5.39	6.18	7.02	8.01	9.13	10.99	12.65	14.12	15.54	16.98	22.56	66
52	1.99	2.66	3.35	4.08	4.92	5.70	6.60	7.61	8.78	10.04	12.18	14.00	15.51	16.94	18.35	24.85	67
53	2.15	2.89	3.66	4.47	5.38	6.22	7.22	8.32	9.57	10.98	13.29	15.31	16.94	18.35	20.53	27.37	68
54	2.31	3.13	4.00	4.90	5.89	6.81	7.90	9.09	10.42	11.98	14.48	16.73	18.35	20.53	22.96	30.13	69
55	2.49	3.40	4.37	5.37	6.47	7.46	8.65	9.91	11.31	13.06	15.77	18.29	20.53	22.85	25.67	33.13	70
56	2.68	3.70	4.78	5.91	7.10	8.16	9.44	10.78	12.26	14.23	17.18	19.99	22.70	25.23	28.65	36.34	71
57	2.89	4.02	5.24	6.50	7.80	8.92	10.29	11.72	13.29	15.50	18.71	21.85	24.96	27.83	31.89	39.80	72
58	3.05	4.30	5.78	7.12	8.58	9.62	11.05	12.58	14.24	16.56	19.88	23.10	26.39	29.47	33.93	43.57	73
59	3.22	4.60	6.37	7.78	9.42	10.36	11.84	13.48	15.26	17.68	21.09	24.35	27.80	31.11	36.05	47.72	74

TABLE 3—Continued

Age	Policy Year															Ultimate	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Rate	Age
60	3.40	4.91	7.01	8.49	10.34	11.15	12.69	14.45	16.34	18.85	22.31	25.55	29.18	32.79	38.29	52.31	75
61	3.57	5.22	7.69	9.25	11.15	12.44	13.59	15.48	17.47	20.04	23.51	26.72	30.56	34.52	40.66	57.37	76
62	3.74	5.54	8.44	10.07	12.44	12.89	14.54	16.56	18.64	21.24	24.70	27.87	31.96	36.31	43.15	62.94	77
63	4.15	6.18	9.21	11.19	12.89	14.50	16.42	18.63	21.03	23.56	27.15	30.60	35.16	40.29	47.22	69.02	78
64	4.59	6.88	10.04	12.43	14.50	16.29	18.52	20.91	23.56	26.17	29.85	33.67	38.70	44.72	51.64	75.60	79
65	5.08	7.66	10.96	13.82	16.29	18.27	20.82	23.41	26.17	29.29	33.67	36.95	42.60	49.60	56.42	82.69	80
66	5.63	8.53	11.96	15.34	18.27	20.62	23.35	26.17	29.29	33.67	36.18	40.63	46.88	54.95	61.55	90.24	81
67	6.23	9.50	13.04	17.02	20.62	22.82	26.17	29.29	33.67	35.69	39.85	44.66	51.53	60.78	66.99	98.24	82
68	6.86	10.46	14.34	18.67	22.58	24.98	28.66	32.11	35.69	39.16	43.70	48.92	56.36	66.33	72.93	106.88	83
69	7.55	11.50	15.73	20.45	24.72	27.36	31.42	35.21	39.16	42.94	47.87	53.51	61.51	72.21	79.34	116.36	84
70	8.31	12.61	17.23	22.38	27.08	29.99	34.46	38.63	42.94	47.03	52.35	58.39	66.96	78.56	86.38	126.68	85

  

Ultimate Rates for Advanced Attained Ages																	
Age	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100		
Rate	137.84	149.84	162.59	175.87	189.57	203.69	218.23	233.19	248.57	264.37	280.59	297.23	314.29	331.77	349.67		



TABLE 4

1975-80 BASIC SELECT AND ULTIMATE MORTALITY TABLES  
 15-YEAR SELECT AND ULTIMATE MORTALITY RATES, INTERPOLATION OF RATES OF THE 1982 REPORTS OF THE TRANSACTIONS OF THE SOCIETY OF ACTUARIES\*  
 FEMALE, AGE-LAST-BIRTHDAY, 1,000q<sub>x</sub>

Age	Policy Year															Ultimate	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Rate	Age
0	0.84	0.33	0.30	0.27	0.24	0.22	0.20	0.18	0.19	0.19	0.21	0.23	0.26	0.29	0.34	0.38	15
1	0.32	0.29	0.26	0.23	0.22	0.20	0.18	0.19	0.19	0.21	0.23	0.26	0.29	0.34	0.38	0.42	16
2	0.27	0.26	0.23	0.22	0.20	0.18	0.19	0.19	0.21	0.23	0.26	0.29	0.34	0.38	0.42	0.46	17
3	0.23	0.23	0.22	0.20	0.18	0.19	0.19	0.21	0.23	0.26	0.29	0.34	0.38	0.41	0.45	0.48	18
4	0.21	0.21	0.20	0.18	0.19	0.19	0.21	0.23	0.26	0.29	0.34	0.38	0.41	0.45	0.48	0.50	19
5	0.20	0.20	0.18	0.19	0.19	0.21	0.23	0.26	0.29	0.34	0.38	0.41	0.45	0.48	0.49	0.52	20
6	0.18	0.18	0.19	0.19	0.21	0.23	0.26	0.29	0.34	0.38	0.41	0.45	0.48	0.49	0.51	0.53	21
7	0.17	0.19	0.19	0.21	0.23	0.26	0.29	0.34	0.38	0.41	0.45	0.48	0.49	0.51	0.52	0.53	22
8	0.17	0.19	0.21	0.23	0.26	0.29	0.34	0.38	0.41	0.45	0.47	0.49	0.51	0.52	0.53	0.53	23
9	0.17	0.21	0.23	0.25	0.28	0.33	0.38	0.41	0.45	0.47	0.49	0.51	0.52	0.53	0.53	0.53	24
10	0.18	0.23	0.25	0.28	0.33	0.37	0.41	0.45	0.47	0.49	0.51	0.52	0.53	0.53	0.53	0.53	25
11	0.18	0.25	0.28	0.33	0.37	0.41	0.45	0.47	0.49	0.51	0.52	0.53	0.53	0.53	0.53	0.53	26
12	0.20	0.28	0.33	0.36	0.40	0.44	0.47	0.49	0.51	0.52	0.53	0.53	0.53	0.53	0.54	0.53	27
13	0.22	0.32	0.35	0.38	0.42	0.44	0.47	0.49	0.52	0.52	0.53	0.53	0.53	0.53	0.54	0.54	28
14	0.26	0.34	0.38	0.40	0.42	0.45	0.47	0.49	0.52	0.52	0.53	0.53	0.53	0.54	0.54	0.55	29
15	0.30	0.36	0.39	0.40	0.42	0.45	0.47	0.47	0.52	0.53	0.53	0.53	0.54	0.54	0.56	0.57	30
16	0.33	0.37	0.39	0.40	0.42	0.44	0.45	0.46	0.52	0.53	0.53	0.54	0.54	0.56	0.57	0.60	31
17	0.36	0.37	0.39	0.40	0.41	0.42	0.43	0.44	0.52	0.53	0.54	0.54	0.56	0.57	0.61	0.63	32
18	0.36	0.37	0.40	0.40	0.41	0.42	0.43	0.44	0.51	0.52	0.54	0.55	0.57	0.60	0.64	0.68	33
19	0.36	0.37	0.40	0.40	0.41	0.42	0.43	0.45	0.49	0.51	0.55	0.57	0.60	0.64	0.69	0.74	34

\* See 1982 Reports page 80.

TABLE 4—Continued

Age	Policy Year															Ultimate	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Rate	Age
20	0.35	0.37	0.39	0.40	0.41	0.42	0.44	0.45	0.48	0.51	0.57	0.60	0.64	0.69	0.75	0.81	35
21	0.34	0.35	0.38	0.39	0.41	0.42	0.44	0.46	0.48	0.52	0.60	0.64	0.69	0.75	0.82	0.89	36
22	0.32	0.34	0.37	0.39	0.41	0.42	0.45	0.47	0.48	0.53	0.64	0.69	0.75	0.82	0.90	0.98	37
23	0.32	0.34	0.38	0.40	0.42	0.44	0.47	0.48	0.53	0.58	0.69	0.75	0.82	0.90	1.00	1.09	38
24	0.32	0.35	0.38	0.41	0.44	0.46	0.48	0.53	0.58	0.63	0.75	0.82	0.90	1.00	1.11	1.22	39
25	0.31	0.35	0.39	0.43	0.46	0.48	0.53	0.58	0.63	0.68	0.82	0.90	1.00	1.11	1.23	1.37	40
26	0.31	0.35	0.41	0.44	0.48	0.53	0.58	0.63	0.68	0.74	0.90	1.00	1.11	1.23	1.38	1.54	41
27	0.31	0.36	0.42	0.47	0.53	0.58	0.63	0.68	0.71	0.82	1.00	1.11	1.23	1.38	1.54	1.71	42
28	0.32	0.37	0.43	0.50	0.56	0.63	0.68	0.71	0.80	0.91	1.11	1.23	1.38	1.54	1.71	1.88	43
29	0.33	0.38	0.46	0.52	0.60	0.68	0.71	0.80	0.91	1.03	1.23	1.38	1.54	1.71	1.88	2.05	44
30	0.35	0.40	0.48	0.57	0.66	0.71	0.80	0.91	1.03	1.15	1.38	1.54	1.71	1.88	2.05	2.24	45
31	0.37	0.42	0.52	0.62	0.71	0.80	0.91	1.03	1.15	1.27	1.54	1.71	1.88	2.05	2.24	2.43	46
32	0.39	0.45	0.56	0.68	0.80	0.91	1.03	1.15	1.27	1.40	1.70	1.87	2.05	2.24	2.44	2.62	47
33	0.41	0.48	0.59	0.73	0.86	0.99	1.14	1.27	1.40	1.56	1.85	2.02	2.22	2.43	2.62	2.83	48
34	0.43	0.51	0.63	0.77	0.93	1.09	1.25	1.40	1.56	1.73	2.00	2.19	2.39	2.62	2.83	3.05	49
35	0.45	0.54	0.66	0.83	1.01	1.20	1.39	1.56	1.73	1.90	2.17	2.36	2.56	2.82	3.05	3.30	50
36	0.47	0.58	0.71	0.90	1.10	1.32	1.52	1.71	1.90	2.09	2.33	2.53	2.75	3.04	3.30	3.57	51
37	0.50	0.62	0.76	0.98	1.20	1.43	1.64	1.85	2.07	2.28	2.49	2.71	2.94	3.29	3.57	3.88	52
38	0.54	0.69	0.85	1.10	1.33	1.57	1.78	2.01	2.23	2.44	2.67	2.89	3.15	3.53	3.84	4.22	53
39	0.58	0.76	0.95	1.22	1.45	1.70	1.93	2.17	2.39	2.62	2.85	3.10	3.37	3.80	4.13	4.60	54

TABLE 4—Continued

Age	Policy Year															Ultimate	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Rate	Age
40	0.63	0.85	1.05	1.33	1.58	1.86	2.08	2.32	2.56	2.80	3.06	3.33	3.62	4.10	4.46	5.02	55
41	0.68	0.94	1.15	1.45	1.71	2.01	2.23	2.49	2.74	3.01	3.28	3.58	3.90	4.44	4.81	5.47	56
42	0.73	1.02	1.25	1.58	1.85	2.16	2.40	2.67	2.94	3.23	3.53	3.86	4.20	4.80	5.19	5.96	57
43	0.78	1.09	1.35	1.67	1.95	2.27	2.53	2.83	3.13	3.46	3.79	4.16	4.54	5.19	5.62	6.50	58
44	0.83	1.16	1.44	1.74	2.06	2.37	2.67	3.01	3.34	3.70	4.08	4.49	4.89	5.61	6.09	7.08	59
45	0.89	1.23	1.53	1.83	2.16	2.49	2.83	3.20	3.57	3.97	4.39	4.83	5.28	6.07	6.60	7.69	60
46	0.93	1.30	1.62	1.91	2.28	2.61	3.00	3.41	3.82	4.26	4.72	5.20	5.70	6.55	7.12	8.34	61
47	0.98	1.37	1.72	2.00	2.41	2.75	3.18	3.64	4.09	4.57	5.07	5.60	6.14	7.06	7.68	9.03	62
48	1.03	1.43	1.80	2.10	2.54	2.92	3.40	3.91	4.36	4.87	5.41	5.97	6.53	7.50	8.14	9.77	63
49	1.07	1.50	1.88	2.21	2.68	3.11	3.64	4.20	4.65	5.20	5.77	6.35	6.94	7.94	8.61	10.57	64
50	1.12	1.56	1.97	2.32	2.82	3.32	3.89	4.51	4.96	5.54	6.13	6.74	7.36	8.41	9.10	11.45	65
51	1.17	1.64	2.07	2.44	2.98	3.53	4.15	4.84	5.28	5.88	6.50	7.14	7.79	8.89	9.63	12.42	66
52	1.23	1.72	2.17	2.57	3.13	3.75	4.43	5.19	5.60	6.23	6.88	7.55	8.24	9.41	10.20	13.48	67
53	1.29	1.81	2.30	2.76	3.36	4.02	4.73	5.51	5.98	6.63	7.33	8.06	8.84	10.14	11.03	14.64	68
54	1.36	1.91	2.44	2.96	3.61	4.31	5.04	5.83	6.37	7.06	7.81	8.62	9.49	10.93	11.94	15.94	69
55	1.43	2.01	2.58	3.18	3.87	4.60	5.36	6.16	6.78	7.50	8.33	9.23	10.20	11.80	12.96	17.42	70
56	1.50	2.11	2.74	3.41	4.13	4.90	5.69	6.51	7.22	7.99	8.89	9.88	10.96	12.76	14.12	19.13	71
57	1.57	2.21	2.89	3.64	4.41	5.21	6.03	6.86	7.69	8.51	9.49	10.59	11.81	13.85	15.45	21.11	72
58	1.69	2.39	3.12	3.91	4.71	5.54	6.40	7.28	8.17	9.05	10.28	11.45	12.76	14.97	16.71	23.41	73
59	1.82	2.58	3.36	4.19	5.02	5.88	6.79	7.74	8.69	9.63	11.16	12.42	13.85	16.25	18.16	26.09	74

TABLE 4—Continued

Age	Policy Year															Ultimate	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Rate	Age
60	1.94	2.77	3.61	4.48	5.35	6.25	7.21	8.22	9.24	10.27	12.16	13.55	15.11	17.72	19.83	29.20	75
61	2.08	2.98	3.88	4.80	5.70	6.65	7.67	8.74	9.84	10.99	13.31	14.84	16.55	19.42	21.73	32.78	76
62	2.22	3.20	4.17	5.14	6.09	7.08	8.15	9.31	10.52	11.81	14.65	16.34	18.23	21.37	23.87	36.88	77
63	2.36	3.38	4.40	5.42	6.42	7.47	8.61	9.88	11.24	12.74	15.86	17.73	19.83	23.30	26.11	41.54	78
64	2.51	3.58	4.65	5.72	6.77	7.89	9.12	10.52	12.06	13.80	17.25	19.31	21.63	25.45	28.57	46.74	79
65	2.67	3.79	4.91	6.03	7.15	8.35	9.70	11.24	13.00	15.01	18.83	21.08	23.62	27.79	31.21	52.50	80
66	2.84	4.01	5.19	6.37	7.57	8.88	10.36	12.07	14.06	16.40	20.61	23.04	25.79	30.30	34.00	58.80	81
67	3.03	4.24	5.49	6.75	8.04	9.48	11.10	13.00	15.26	17.95	22.58	25.19	28.11	32.93	36.89	65.66	82
68	3.29	4.62	6.00	7.41	8.87	10.51	12.37	14.55	17.13	20.20	25.19	28.11	31.57	36.88	41.19	73.06	83
69	3.58	5.05	6.59	8.18	9.84	11.72	13.85	16.33	19.27	22.75	28.11	31.57	35.36	41.18	45.84	81.02	84
70	3.92	5.54	7.27	9.07	10.97	13.11	15.54	18.38	21.71	25.59	31.57	35.36	39.49	45.83	50.83	89.52	85

  

Ultimate Rates for Advanced Attained Ages															
Age	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
Rate	98.58	108.18	118.34	129.04	140.30	152.10	164.46	177.36	190.82	204.82	219.38	234.48	250.14	266.34	283.10

## DISCUSSION OF PRECEDING PAPER

O. DAVID GREEN III:

Many satisfactions accrue to those who offer papers for publication, not the least of which is the thought that you have begun a tradition. It is with some of this pride that I read and appreciated Mr. Paquin's work in these extensions of the 1975–80 Basic Tables.

One of the caveats mentioned in this paper is so obvious as to be considered simple—yet it may be overlooked in haste. This thought bears repeating lest we tend to wander off into our actuarially perfect world:

no two insurers experience the same mortality; no two calendar years' experience is ever quite the same; and a great many factors, some understood and some not, influence mortality over time. Hence, there is no perfect mortality table.

Our education and training provides us with many tools with which this type of work can be duplicated. The differing techniques do result in different tables which, in themselves, are constant reminders of the importance of the preceding caveat. For example, Roland G. Anderson and I had developed some extended 1975–80 basic tables following the same techniques employed in *TSA XXIX*, 171. Our tables hardly duplicate those in this paper, but they do contain, of course, the same underlying patterns. Profit studies and generally accepted accounting principles reserves calculated according to the different tables produce different results—but the differences are negligible. Of far greater importance are the adjustments we introduce for underwriting selection, anticipated future improvement, smoker/nonsmoker differentials, and the like.

Mr. Anderson and I observed two findings in the basic data prepared by the Committee on Ordinary Insurance and Annuities.

1. One aspect of Table 8 (Ratios of Select to Ultimate Mortality Rates) seemed strange. When the ratios are expanded to three decimals, the terminal digit is biased in the case of the Male Lives ratios, as follows:

THIRD DIGIT	THIRD DIGIT FREQUENCY	
	Male Lives	Female Lives
0.....	98	14
1.....	16	15
2.....	8	16
3.....	14	24
4.....	6	17
5.....	1	14
6.....	2	15
7.....	10	17
8.....	12	13
9.....	13	13

(Issue Age Groups under 15-19 have been excluded. Also excluded are those cells where the ratio is 1.00.)

What kind of graduation produces this type of bias? We do not recall having stumbled across this anomaly.

- As was observed ten years ago, the effects of selection appear to remain well beyond policy year 15 at issue ages 45 and over. A constant select period obviously is not proper, for some of the younger issue age groups show selection wearing off inside the fifteenth policy year. It is our contention that the Society needs to change its rules for submitting data for these tables. The selection period should be expanded to at least twenty years. We understand that some of the contributing companies may not be able to comply with this request. If so, are their data significant, and/or are there other companies that could be substituted?

Compilation of mortality statistics and the ensuing development of mortality tables is one of the very important tasks carried out by the Society of Actuaries. Since most life insurance companies and a majority of actuaries are not in a position to have their own experience data, it is imperative that the Society's data be as complete as possible.

(AUTHOR'S REVIEW OF DISCUSSION)

CLAUDE Y. PAQUIN:

One could look at this actuarial note in three distinct ways.

First of all, it does provide, in one convenient place, complete historical sets of modern mortality rates applicable to that branch of life insurance known as Ordinary. Between the time the publication of the paper was announced and its actual release date, I received requests from many actuaries who expressed an immediate need for an advance copy. I was happy to honor these requests, which indicate to me that the paper met a practical professional need and was timely.

Not only did the paper present a useful collection of mortality rates, but it exposed a practical method of deriving complete select rates from quinquennial groupings.

Finally, the paper afforded an opportunity to comment upon the work of the committee which prepared the original noninterpolated tables. This is an opportunity not furnished in the *Reports* volume of the *Transactions*, where the committee's work first appeared.

The discussion of Mr. Green, for which I am grateful, indicates that the paper's rates pass the practical test, and it thus indirectly sanctions both the rates and the method which produced them. I am sorry to see that Mr. Anderson and Mr. Green had done work which, unbeknownst to me, duplicated mine somewhat. Their work was not in vain, because it inspired comments which may prove beneficial to the Committee on Ordinary Insurance and Annuities.

Mr. Green asserts that the compilation of mortality statistics and the development of mortality tables is an important task for the Society. I personally am not so sure that this task is properly the Society's and that there is not a certain amount of freeloading on the part of those insurers that do not compile and analyze their own data. I would say that people who use the Society's tables are in the debt of those who make it possible for those tables to be published, including especially the unsung heroes who staff the Committee on Ordinary Insurance and Annuities. I tip my hat to them.

It goes virtually without saying that the mortality rates presented here are not chiseled in stone and must be used with intelligence. These are select rates, and where the pool of insureds can be materially affected by special inducements, the exposed population can change and so can the number of deaths relative to that population. In the early 1980s, some insurers were stung by unexpectedly adverse mortality on plans described as select-and-ultimate term and revertible term. If the lives in good health are induced to leave the pool of insureds, as they were with these plans, it is no wonder that the remaining insureds exhibit mortality rates well above those shown in Society tables and prepared from experience on more orthodox business. Not only is there no perfect mortality table, as Mr. Green emphasizes, but the ones we have must not be used by rote, lest we delude ourselves. I am honored to see Mr. Green grace this paper with his discussion. It is reassuring and provides food for thought.

