THE 1960 MODIFICATION OF THE a-1949 TABLE WITH PROJECTION—ACTUARIAL NOTE

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THE a-1949 Table (or Annuity Table for 1949) mortality rates and the Projection Scale B annual rates of decrease in mortality rates were presented in 1949 by W. A. Jenkins and E. A. Lew in their paper, "A New Mortality Basis for Annuities."[1] The authors stated that their paper was written in an attempt to furnish the actuary with a more satisfactory basis for annuity premiums and reserves.

The starting point in the development of the a-1949 Table was the intercompany mortality experience between 1941 and 1946 anniversaries under immediate nonrefund annuities, by number of contracts and excluding the first policy year. Since then, the Committee on Mortality under Ordinary Insurances and Annuities has presented three reports on intercompany mortality experience under immediate annuities. These studies covered the experience between 1946 and 1948 anniversaries, between 1948 and 1953 anniversaries, and between 1953 and 1958 anniversaries.

The purpose of this actuarial note is to review recent trends in immediate nonrefund annuity mortality as exhibited in these intercompany reports and to present a modification of the a-1949 Table with Projection Scale B which reflects these recent mortality trends.

NONREFUND ANNUITY MORTALITY EXPERIENCE

Mr. R. D. Murphy's discussion[2] of the Jenkins-Lew paper included an analysis of the intercompany experience from 1946 to 1948 anniversaries under immediate nonrefund annuities on the basis of the a-1949 Table. Table 1 shows the pertinent ratios of actual to expected deaths that were presented in Mr. Murphy's discussion. The following paragraph is quoted from Mr. Murphy's discussion:[3]

When we compare the 1946 to 1948 experience with the authors' 1949 table we should expect such experience to show ratios in excess of 100%. The short time interval might lead us to expect such a result to a minor degree, but, more importantly, we know that the authors used some degree of conservatism in projecting from the 1943 table to the 1949 table. This expectation is borne out and I think we may conclude that their 1949 table has a reasonable degree of conservatism in it for nonrefund annuities for which it was designed.

[1] *TSA* I, 369.   [2] *TSA* I, 477.   [3] *TSA* I, 479.

On the basis of Mr. Murphy's discussion, it appears reasonable to conclude that, at the time the a-1949 Table was presented, it was considered desirable to have an aggregate mortality margin of about 8% to 10% between the mortality basis used for immediate nonrefund annuities and the actual mortality experience on these annuities. Subsequent data in this note will demonstrate that more rapid improvement in annuity mortality rates than that assumed in Projection Scale B has resulted in a significant reduction in these mortality margins.

The intercompany experience between 1948 and 1953 anniversaries under immediate nonrefund annuities (based on number of contracts and

TABLE 1

INTERCOMPANY MORTALITY EXPERIENCE BETWEEN
1946 AND 1948 ANNIVERSARIES UNDER IMMEDIATE
NONREFUND ANNUITIES

(Expected deaths based on a-1949 Table without Projection—Experience by number of contracts for
second and later contract years)

ATTAINED AGES	RATIOS OF ACTUAL TO EXPECTED DEATHS	
	Males	Females
Under 60..........	144%	168%
60–69.............	128	110
70–79.............	110	108
80–89.............	101 ⎱104%*	110 ⎱107%*
90 and over.......	122 ⎰	91 ⎰
All Ages.......	110%	108%

* Approximate.

excluding the first policy year) on the basis of the a-1949 Table was developed from the data shown in the 1954 Reports of Mortality and Morbidity Experience.[4] Table 2 shows the pertinent ratios of actual to expected deaths.

Since the a-1949 Table represents the assumed level of mortality under immediate nonrefund annuities during the calendar year 1950, and the central point of the experience between 1948 and 1953 anniversaries is December 31, 1950, it is not necessary to adjust the expected deaths used in the above table for any mortality improvement.

The mortality ratios of 98% and 102% shown in Table 2 for all ages combined indicate that the aggregate mortality margin of about 8% to

[4] *TSA* 1954 Reports, 36.

10%, contemplated at the time the *a*-1949 Table was presented, had been practically eliminated by the improvement in mortality between the 1946–48 period and the 1948–53 period. Table 2 also indicates that the mortality ratios at attained ages 80 and over were actually below 100% for both males and females.

The intercompany experience between 1953 and 1958 anniversaries under immediate nonrefund annuities (based on number of contracts and excluding the first policy year) on the basis of the *a*-1949 Table with Projection Scale B was developed from the data shown in the 1959 Reports

TABLE 2

INTERCOMPANY MORTALITY EXPERIENCE BETWEEN
1948 AND 1953 ANNIVERSARIES UNDER IMME-
DIATE NONREFUND ANNUITIES

(Expected deaths based on *a*-1949 Table without Projec-
tion—Experience by number of contracts for
second and later contract years)

ATTAINED AGES	RATIOS OF ACTUAL TO EXPECTED DEATHS	
	Males	Females
Under 60.	99%	115%
60–69.	91	103
70–79.	110	105
80 and over*.	90	99
All Ages.	98%	102%

* Separate ratios for attained ages 80–89 and attained ages 90 and over were not available for the second and later contract years from the published data.

of Mortality and Morbidity Experience.[5] Table 3 shows the pertinent ratios of actual to expected deaths.

The mortality ratios of 103% and 99% shown in Table 3 for all ages combined indicate about the same low mortality margins as those indicated by the 1948–53 experience. Moreover, the mortality ratios at attained ages 80 and over combined were actually below 100% during both the 1948–53 and the 1953–58 periods.

DEVELOPMENT OF THE 1960 MODIFICATION OF THE *a*-1949
TABLE WITH PROJECTION

In order to provide a more satisfactory basis for annuity premiums and reserves, it appears desirable to develop a modification of the *a*-1949

[5] *TSA* 1959 Reports, 67.

Table and of Projection Scale B which would provide margins of about the same level (8%–10%) relative to the 1953–58 experience as those considered appropriate when the a–1949 Table was presented. The first step in the development of such a modification was to reduce the a–1949 Table mortality rates at ages over 80 to reflect the lower mortality experienced at such ages. The modified mortality rates at ages over 80 are equal to the a–1949 Table mortality rates multiplied by a factor, where the factor is 99% at age 81, 98% at age 82, 97% at age 83, etc., to 85% at ages 95 through 108. At the limiting age of the a–1949 Table, *i.e.*, 109, the mortality rate of unity was maintained.

TABLE 3

INTERCOMPANY MORTALITY EXPERIENCE BETWEEN
1953 AND 1958 ANNIVERSARIES UNDER IMME-
DIATE NONREFUND ANNUITIES

(Expected deaths based on a–1949 Table with Projection
Scale B*—Experience by number of contracts for
second and later contract years)

ATTAINED AGES	RATIOS OF ACTUAL TO EXPECTED DEATHS	
	Males	Females
Under 60...........	138%	176%
60–69..............	104	103
70–79..............	109	104
80–89..............	104 } 99%	99 } 96%
90 and over.........	82	88
All Ages.........	103%	99%

* Mortality improvement projected on basis of Projection Scale B
from end of 1950 through the period from 1953 to 1958 anniversaries
(*TSA* 1959 Reports, pp. 72 and 102).

In order to measure the effect of this modification of the a–1949 Table at ages over 80, the expected deaths used in Table 3 were appropriately adjusted. Table 4 shows the intercompany experience between 1953 and 1958 anniversaries with the expected deaths based on the modification of the a–1949 Table described above and Projection Scale B.

As shown by a comparison of Table 4 and Table 3, this modification in mortality rates has resulted in increases in the ratios of actual to expected deaths of 4%–5% for ages 80–89, 11%–13% for ages 90 and over, and 4% for all ages combined.

In view of the significant reduction in mortality ratios at ages 80 and over between the 1946–48 period and the 1953–58 period (see Table 1 and

Table 3), the second step in the development of a modified mortality basis was to review the values of the annual rates of decrease in mortality rates assumed in Projection Scale B at ages 80 and over. Projection Scale B assumes relatively low annual decreases in mortality rates at ages 80 to 89 (grading down from .50% at age 80 to .05% at age 89) and no decreases at ages 90 and over.

It appeared desirable, therefore, to modify Projection Scale B at ages 81 through 108 to reflect the assumption of a uniform annual decrease in mortality rates at each of these ages of .50%, which is the Projection Scale

TABLE 4

INTERCOMPANY MORTALITY EXPERIENCE BETWEEN
1953 AND 1958 ANNIVERSARIES UNDER IMME-
DIATE NONREFUND ANNUITIES

(Expected deaths based on modification of the a-1949 Table* with Projection Scale B†—Experience by number of contracts for second and later contract years)

ATTAINED AGES	RATIOS OF ACTUAL TO EXPECTED DEATHS	
	Males	Females
Under 60	138%	176%
60–69	104	103
70–79	109	104
80–89	109 ⎫ 105%	103 ⎫ 103%
90 and over	93 ⎭	101 ⎭
All Ages	107%	103%

* Mortality rates are those of the a-1949 Table modified at ages 81 through 108 by applying a factor which is 99% at age 81, 98% at age 82, 97% at age 83, etc., to 85% at ages 95 through 108.

† Mortality improvement projected on basis of Projection Scale B from end of 1950 through the period from 1953 to 1958 anniversaries.

B value at age 80. On the basis of the modified a-1949 Table and the modified Projection Scale B, the intercompany experience between 1953 and 1958 anniversaries would produce ratios of actual to expected deaths as shown in Table 5.

In Tables 3, 4 and 5, the ratios of actual to expected deaths for females (all ages) are 4% less than those for males. Since it seemed desirable to have a mortality basis that would produce about the same ratios for both males and females, the third step in the development of a modified mortality basis was to assume that all female mortality rates were in effect reduced by the application of the modified projection rates for a period of five years.

With this five year advance of the year of entry for females over that applicable for males, and with the modifications previously referred to, the intercompany experience between 1953 and 1958 anniversaries under immediate nonrefund annuities (based on number of contracts and excluding the first policy year) would produce ratios of actual to expected deaths as shown in Table 6.

Table 6 shows mortality ratios for all ages combined of 108% for males and 107% for females. Thus, the mortality basis used for the expected

TABLE 5

INTERCOMPANY MORTALITY EXPERIENCE BETWEEN
1953 AND 1958 ANNIVERSARIES UNDER IMME-
DIATE NONREFUND ANNUITIES

(Expected deaths based on modification of the a-1949 Table* and modification of Projection Scale B†—Experience by number of contracts for second and later contract years)

ATTAINED AGES	RATIOS OF ACTUAL TO EXPECTED DEATHS	
	Males	Females
Under 60.........	138%	176%
60–69............	104	103
70–79............	109	104
80–89............	110⎱107%	104⎱104%
90 and over.......	96⎰	103⎰
All Ages.......	108%	104%

* Mortality rates are those of the a-1949 Table modified at ages 81 through 108 by applying a factor which is 99% at age 81, 98% at age 82, 97% at age 83, etc., to 85% at ages 95 through 108.

† Mortality improvement projected on basis of modified Projection Scale B from end of 1950 through the period from 1953 to 1958 anniversaries.

deaths in this table is such that the margins (8% for males and 7% for females) are now at about the same level as the margins (10% for males and 8% for females shown in Table 1 under the 1946–48 experience) considered appropriate when the a-1949 Table was presented. It is felt that the new margins are satisfactory at present.

THE 1960 MODIFICATION OF THE a-1949 TABLE WITH PROJECTION

The specifications for the calculation of the tables of elementary values and commutation columns for The 1960 Modification of the a-1949 Table with Projection are as follows:

1. For ages 81 through 108, the mortality rates of the modified table are equal to those of the *a*–1949 Table multiplied by a factor. This factor is equal to 99% at age 81, 98% at age 82, 97% at age 83, etc., to 85% at ages 95 through 108.
2. At ages 81 through 108, the annual rate of decrease in mortality rate is constant at .50%.
3. At age 109, the rate of mortality is 1 (same as for the *a*–1949 Table) and the annual rate of decrease in mortality rate is zero.
4. At ages 80 and under, the mortality rates and the annual rates of decrease in mortality rates are the same as for the *a*–1949 Table and Projection Scale B.

TABLE 6

INTERCOMPANY MORTALITY EXPERIENCE BETWEEN
1953 AND 1958 ANNIVERSARIES UNDER IMME-
DIATE NONREFUND ANNUITIES

(Expected deaths based on The 1960 Modification of the *a*–1949 Table with Projection*—Experience by number of contracts for second and later contract years)

ATTAINED AGES	RATIOS OF ACTUAL TO EXPECTED DEATHS	
	Males	Females
Under 60..........	138%	187%
60–69.............	104	109
70–79.............	109	108
80–89.............	110⎱107%	107⎱107%
90 and over.......	96⎰	106⎰
All Ages.......	108%	107%

* The *a*-1949 Table and Projection Scale B, after modification of mortality rates and annual rates of decrease in mortality rates at ages 81 and over as described in this note and after the five year advance in year of entry for females, is being designated as "The 1960 Modification of the *a*-1949 Table with Projection."

As the tables of elementary values and commutation columns shown in this note do not directly reflect the effect of the adjustment of female mortality rates, values for females should be calculated by using a year of entry that is five years later than that applicable for males. While the effect of the five year advance in year of entry for females could have been taken into account directly by modifying the *a*–1949 Table mortality rates and commutation columns for females, it seemed desirable not to make any changes at ages 80 and under in the published *a*–1949 Table mortality rates, elementary values (l_x and d_x), and basic commutation

columns (D_x and C_x). This approach has the additional advantage of flexibility, as the tables of elementary values and commutation columns included in this note can readily be used for calculations that do or do not reflect the five year advance in year of entry for females.

REFUND ANNUITY MORTALITY EXPERIENCE

For immediate refund annuities, the ratios of actual to expected deaths for the 1946–48 experience, comparable to the ratios appearing in Table 1 for nonrefund annuities, are shown in Table 7.

Thus the aggregate mortality margins for immediate refund annuities were about 16%–17% at the time the a-1949 Table was presented. It

TABLE 7

INTERCOMPANY MORTALITY EXPERIENCE BETWEEN
1946 AND 1948 ANNIVERSARIES UNDER IMME-
DIATE REFUND ANNUITIES

(Expected deaths based on a-1949 Table without Projec-
tion—Experience by number of contracts for
second and later contract years)

ATTAINED AGES	RATIOS OF ACTUAL TO EXPECTED DEATHS	
	Males	Females
Under 60.........	128%	140%
60–69.............	126	130
70–79.............	124	118
80–89.............	104⎫105%*	112⎫110%*
90 and over........	116⎭	98⎭
All Ages.......	117%	116%

* Approximate.

should be noted, however, that the Jenkins-Lew paper included a section describing how the a-1949 Table with Projection Scale B could be adjusted to reflect the higher mortality experience under refund annuities.[6]

Under the 1953–58 experience for immediate refund annuities, the ratios of actual to expected deaths comparable to the ratios appearing in Table 3 for nonrefund annuities, are shown in Table 8.

The mortality ratios of 114% for males and 106% for females, as shown in Table 8 for the 1953–58 experience on all ages combined, are 3% and 10%, respectively, less than the corresponding ratios shown for the 1946–48 experience in Table 7.

On the basis of The 1960 Modification of the a-1949 Table with Pro-

[6] *TSA* I, 434.

jection (including the five year advance in year of entry for females), the intercompany experience between 1953 and 1958 anniversaries under immediate refund annuities (based on number of contracts and excluding the first policy year) would produce ratios of actual to expected deaths as shown in Table 9.

TABLE 8

INTERCOMPANY MORTALITY EXPERIENCE BETWEEN
1953 AND 1958 ANNIVERSARIES UNDER IMME-
DIATE REFUND ANNUITIES

(Expected deaths based on *a*–1949 Table with Projection
Scale B*—Experience by number of contracts for
second and later contract years)

ATTAINED AGES	RATIOS OF ACTUAL TO EXPECTED DEATHS	
	Males	Females
Under 60.........	149%	164%
60–69.............	144	119
70–79.............	125	113
80–89.............	102⎱101%	104⎱102%
90 and over.......	97⎰	93⎰
All Ages.......	114%	106%

* Mortality improvement projected on basis of Projection Scale B from end of 1950 through the period from 1953 to 1958 anniversaries.

TABLE 9

INTERCOMPANY MORTALITY EXPERIENCE BETWEEN
1953 AND 1958 ANNIVERSARIES UNDER IMME-
DIATE REFUND ANNUITIES

(Expected deaths based on The 1960 Modification of the
a–1949 Table with Projection*—Experience by number
of contracts for second and later contract years)

ATTAINED AGES	RATIOS OF ACTUAL TO EXPECTED DEATHS	
	Males	Females
Under 60.........	149%	174%
60–69.............	144	126
70–79.............	125	117
80–89.............	108⎱109%	113⎱113%
90 and over.......	114⎰	112⎰
All Ages.......	119%	115%

* Including the five year advance in year of entry for females referred to previously.

Table 9 shows mortality ratios for all ages combined of 119% for males and 115% for females on the basis of The 1960 Modification of the a-1949 Table with Projection. Thus, mortality margins (19% for males and 15% for females) for refund annuities are now at about the same level as the 17% and 16% margins under the 1946–48 experience shown in Table 7.

ANNUITY VALUES AND COMMUTATION COLUMNS

Table 10 shows annuity values on the new mortality basis (but omitting all projection) at $2\frac{1}{2}$% interest, in comparison with corresponding annuity values on the unmodified a-1949 Table. Table 11 shows similar annuity values but including projection applicable to annuities issued in 1950.

Table 12 shows the elementary values (*i.e.*, basic mortality rates, number living and number dying) for ages 80 and over on The 1960 Modification of the a-1949 Table with Projection. Table 13 compares the annual rates of decrease in mortality rate assumed in The 1960 Modification of the a-1949 Table with Projection, with those assumed in Projection Scale B. Table 14 shows commutation columns at $2\frac{1}{2}$% and 3% interest for The 1960 Modification of the a-1949 Table with Projection, including projecting commutation columns for applying the annual rates of decrease in mortality rate in accordance with Charles M. Sternhell's paper "Calculation of Approximate Annuity Values on a Mortality Basis That Provides for Future Improvements in Mortality."[7] Table 15 shows joint life annuity values on The 1960 Modification of the a-1949 Table without projection, at $2\frac{1}{2}$% and 3% interest for two lives at equal ages. An approximate method for obtaining joint life annuity values that reflects the effect of projected annual rates of decrease in mortality rates is described in the paper just referred to.[8]

As noted in the paragraph following the specifications, values including the effect of projection should be calculated for females by use of a year of entry that is five years later than that applicable for males.

In this connection it should be noted that the New York Insurance Department approved the use of The 1960 Modification of the a-1949 Table with Projection, employing a 1960 year of entry for males and 1965 year of entry for females, as the mortality basis for the New York Life valuation of individual annuities at the end of 1960.

We wish to thank the Committee on Mortality under Ordinary Insurances and Annuities for making available mortality data on the 1953–58 experience under individual immediate annuities.

[7] *TSA* II, June, 30.   [8] *TSA* II, June, 65.

TABLE 10

LIFE ANNUITY VALUES WITHOUT PROJECTION, AT 2½% INTEREST

| AGE
x | VALUE OF IMMEDIATE LIFE ANNUITY OF ONE PER ANNUM BASED ON | | INCREASE IN ANNUITY VALUE | |
	a-1949 Table without Projection (1)	The 1960 Modification of the a-1949 Table without Projection (2)	Amount $=(2)-(1)$ (3)	% $=(3) \div (1)$ (4)
	Male			
25.......	27.317	27.336	.019	.07%
35.......	24.057	24.083	.026	.11
45.......	20.112	20.145	.033	.16
55.......	15.837	15.881	.044	.28
65.......	11.496	11.563	.067	.58
75.......	7.323	7.445	.122	1.67
85.......	3.923	4.222	.299	7.62
	Female			
25.......	28.890	28.924	.034	.12%
35.......	25.988	26.031	.043	.17
45.......	22.433	22.489	.056	.25
55.......	18.215	18.289	.074	.41
65.......	13.455	13.558	.103	.77
75.......	8.642	8.805	.163	1.89
85.......	4.560	4.886	.326	7.15

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TABLE 11

LIFE ANNUITY VALUES WITH PROJECTION FOR ANNUITIES ISSUED IN 1950, AT 2½% INTEREST

AGE x	VALUE OF IMMEDIATE LIFE ANNUITY OF ONE PER ANNUM BASED ON		INCREASE IN ANNUITY VALUE	
	a-1949 Table with Projection Scale B (1)	The 1960 Modification of the a-1949 Table with Projection* (2)	Amount $=(2)-(1)$ (3)	% $=(3)\div(1)$ (4)
		Male		
25.......	28.370	28.455	.085	.30%
35.......	25.005	25.101	.096	.38
45.......	20.867	20.974	.107	.51
55.......	16.336	16.456	.120	.73
65.......	11.744	11.888	.144	1.23
75.......	7.395	7.593	.198	2.68
85.......	3.927	4.285	.358	9.12
		Female		
25.......	29.685	29.953	.268	.90%
35.......	26.720	27.030	.310	1.16
45.......	23.043	23.393	.350	1.52
55.......	18.649	19.028	.379	2.03
65.......	13.687	14.076	.389	2.84
75.......	8.713	9.104	.391	4.49
85.......	4.564	5.051	.487	10.67

* Including the five year advance in year of entry for females referred to previously.

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TABLE 12

The 1960 Modification of the *a*-1949 Table with Projection
Elementary Values for Ages 80 and Over

Age x	Males			Females		
	l_x	d_x	$1,000q_x$	l_x	d_x	$1,000q_x$
80.....	385.2925	32.9437	85.503	564.6014	34.6750	61.415
81.....	352.3488	32.6476	92.657	529.9264	35.8755	67.699
82.....	319.7012	32.0961	100.394	494.0509	36.8557	74.599
83.....	287.6051	31.2771	108.750	457.1952	37.5659	82.166
84.....	256.3280	30.1857	117.762	419.6293	37.9576	90.455
85.....	226.1423	28.8261	127.469	381.6717	37.9847	99.522
86.....	197.3162	27.2111	137.906	343.6870	37.6076	109.424
87.....	170.1051	25.3644	149.110	306.0794	36.7972	120.221
88.....	144.7407	23.3198	161.114	269.2822	35.5369	131.969
89.....	121.4209	21.1208	173.947	233.7453	33.8290	144.726
90.....	100.3001	18.8200	187.637	199.9163	31.6957	158.545
91.....	81.48010	16.47536	202.201	168.2206	29.1817	173.473
92.....	65.00474	14.14841	217.652	139.0389	26.3550	189.551
93.....	50.85633	11.90013	233.995	112.6839	23.3043	206.811
94.....	38.95620	9.78662	251.221	89.37960	20.13463	225.271
95.....	29.16958	7.85563	269.309	69.24497	16.96017	244.930
96.....	21.31395	6.21630	291.654	52.28480	14.06106	268.932
97.....	15.09765	4.76070	315.327	38.22374	11.26350	294.673
98.....	10.33695	3.51765	340.299	26.96024	8.68492	322.138
99.....	6.819300	2.499403	366.519	18.27532	6.41968	351.276
100.....	4.319897	1.701620	393.903	11.85564	4.52874	381.990
101.....	2.618277	1.105803	422.340	7.326900	3.034318	414.134
102.....	1.512474	.683156	451.681	4.292582	1.920952	447.505
103.....	.8293180	.3995181	481.743	2.371630	1.142749	481.841
104.....	.4297999	.2201895	512.307	1.228881	.635103	516.814
105.....	.2096104	.1138421	543.113	.5937780	.3277892	552.040
106.....	.09576830	.05495875	573.872	.2659888	.1561548	587.073
107.....	.04080955	.02465970	604.263	.1098340	.0682539	621.428
108.....	.01614985	.01023818	633.949	.04158010	.02721788	654.589
109.....	.00591167	.00591167	1,000.000	.01436222	.01436222	1,000.000

Note.—Elementary values for ages 80 and under are the same as for the *a*-1949 Table, as shown in *Annuity Tables* (*a*-1949 Table and Projected Annuity Tables) published in 1952 by the Society of Actuaries.

TABLE 13

Annual Rates of Decrease in Mortality Rate

Attained Age	Rate for Projection Scale B	Rate for The 1960 Modification of the *a*-1949 Table with Projection
0–50.........	1.25%	1.25%
60...........	1.20	1.20
65...........	1.10	1.10
70...........	.95	.95
75...........	.75	.75
80...........	.50	.50
85...........	.25	.50
90–108.......	0	.50
109..........	0	0

TABLE 14

THE 1960 MODIFICATION OF THE *a*-1949 TABLE WITH PROJECTION
STANDARD COMMUTATION COLUMNS
2.5% INTEREST—MALE

Age *x*	D_x	N_x	S_x	C_x	M_x	R_x
0......	1010.4755	34036.0682	916417.9757	3.98273	180.32747	11684.41033
1......	981.8470	33025.5927	882381.9075	1.51348	176.34474	11504.08286
2......	956.3861	32043.7457	849356.3148	.82766	174.83126	11327.73812
3......	932.2319	31087.3596	817312.5691	.65029	174.00360	11152.90686
4......	908.8442	30155.1277	786225.2095	.55594	173.35331	10978.90326
5......	886.1214	29246.2835	756070.0818	.48935	172.79737	10805.54995
6......	864.0193	28360.1621	726823.7983	.44343	172.30802	10632.75258
7......	842.5022	27496.1428	698463.6362	.41095	171.86459	10460.44456
8......	821.5424	26653.6406	670967.4934	.39036	171.45364	10288.57997
9......	801.1145	25832.0982	644313.8528	.37669	171.06328	10117.12633
10......	781.1984	25030.9837	618481.7546	.36812	170.68659	9946.06305
11......	761.7767	24249.7853	593450.7709	.36568	170.31847	9775.37646
12......	742.8311	23488.0086	569200.9856	.36380	169.95279	9605.05799
13......	724.3494	22745.1775	545712.9770	.36179	169.58899	9435.10520
14......	706.3206	22020.8281	522967.7995	.36111	169.22720	9265.51621
15......	688.7321	21314.5075	500946.9714	.36086	168.86609	9096.28901
16......	671.5729	20625.7754	479632.4639	.36100	168.50523	8927.42292
17......	654.8321	19954.2025	459006.6885	.36226	168.14423	8758.91769
18......	638.4983	19299.3704	439052.4860	.36381	167.78197	8590.77346
19......	622.5614	18660.8721	419753.1156	.36622	167.41816	8422.99149
20......	607.0108	18038.3107	401092.2435	.36956	167.05194	8255.57333
21......	591.8361	17431.2999	383053.9328	.37413	166.68238	8088.52139
22......	577.0269	16839.4638	365622.6329	.37940	166.30825	7921.83901
23......	562.5737	16262.4369	348783.1691	.38530	165.92885	7755.53076
24......	548.4671	15699.8632	332520.7322	.39224	165.54355	7589.60191
25......	534.6976	15151.3961	316820.8690	.40062	165.15131	7424.05836
26......	521.2555	14616.6985	301669.4729	.40990	164.75069	7258.90705
27......	508.1321	14095.4430	287052.7744	.42089	164.34079	7094.15636
28......	495.3177	13587.3109	272957.3314	.43300	163.91990	6929.81557
29......	482.8038	13091.9932	259370.0205	.44604	163.48690	6765.89567
30......	470.5821	12609.1894	246278.0273	.46093	163.04086	6602.40877
31......	458.6435	12138.6073	233668.8379	.47746	162.57993	6439.36791
32......	446.9796	11679.9638	221530.2306	.49538	162.10247	6276.78798
33......	435.5823	11232.9842	209850.2668	.51548	161.60709	6114.68551
34......	424.4429	10797.4019	198617.2826	.53708	161.09161	5953.07842
35......	413.5535	10372.9590	187819.8807	.56123	160.55453	5791.98681
36......	402.9056	9959.4055	177446.9217	.58724	159.99330	5631.43228
37......	392.4914	9556.4999	167487.5162	.61533	159.40606	5471.43898
38......	382.3031	9164.0085	157931.0163	.64636	158.79073	5312.03292
39......	372.3323	8781.7054	148767.0078	.68002	158.14437	5153.24219
40......	362.5710	8409.3731	139985.3024	.71630	157.46435	4995.09782
41......	353.0115	8046.8021	131575.9293	.76459	156.74805	4837.63347
42......	343.6369	7693.7906	123529.1272	.83178	155.98346	4680.88542
43......	334.4237	7350.1537	115835.3366	.91484	155.15168	4524.90196
44......	325.3522	7015.7300	108485.1829	1.01162	154.23684	4369.75028
45......	316.4052	6690.3778	101469.4529	1.11900	153.22522	4215.51344
46......	307.5690	6373.9726	94779.0751	1.23508	152.10622	4062.28822
47......	298.8322	6066.4036	88405.1025	1.35773	150.87114	3910.18200
48......	290.1859	5767.5714	82338.6989	1.48517	149.51341	3759.31086
49......	281.6230	5477.3855	76571.1275	1.61554	148.02824	3609.79745
50......	273.1386	5195.7625	71093.7420	1.74730	146.41270	3461.76921
51......	264.7294	4922.6239	65897.9795	1.87945	144.66540	3315.35651
52......	256.3931	4657.8945	60975.3556	2.01062	142.78595	3170.69111
53......	248.1290	4401.5014	56317.4611	2.13997	140.77533	3027.90516
54......	239.9371	4153.3724	51915.9597	2.26642	138.63536	2887.12983

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TABLE 14—*Continued*

STANDARD COMMUTATION COLUMNS
2.5% INTEREST—MALE

Age x	D_x	N_x	S_x	C_x	M_x	R_x
55	231.8186	3913.4353	47762.5873	2.38942	136.36894	2748.49447
56	223.7750	3681.6167	43849.1520	2.50869	133.97952	2612.12553
57	215.8084	3457.8417	40167.5353	2.62339	131.47083	2478.14601
58	207.9214	3242.0333	36709.6936	2.73362	128.84744	2346.67518
59	200.1165	3034.1119	33467.6603	2.83911	126.11382	2217.82774
60	192.3965	2833.9954	30433.5484	2.93983	123.27471	2091.71392
61	184.7641	2641.5989	27599.5530	3.04076	120.33488	1968.43921
62	177.2169	2456.8348	24957.9541	3.14650	117.29412	1848.10433
63	169.7480	2279.6179	22501.1193	3.25684	114.14762	1730.81021
64	162.3510	2109.8699	20221.5014	3.37104	110.89078	1616.66259
65	155.0202	1947.5189	18111.6315	3.48849	107.51974	1505.77181
66	147.7507	1792.4987	16164.1126	3.60800	104.03125	1398.25207
67	140.5390	1644.7480	14371.6139	3.72848	100.42325	1294.22082
68	133.3828	1504.2090	12726.8659	3.84885	96.69477	1193.79757
69	126.2807	1370.8262	11222.6569	3.96731	92.84592	1097.10280
70	119.2334	1244.5455	9851.8307	4.08209	88.87861	1004.25688
71	112.2432	1125.3121	8607.2852	4.19160	84.79652	915.37827
72	105.3145	1013.0689	7481.9731	4.29179	80.60552	830.58175
73	98.45408	907.75438	6468.90424	4.381925	76.313726	749.976231
74	91.67083	809.30030	5561.14986	4.458518	71.931801	673.662505
75	84.97644	717.62947	4751.84956	4.518341	67.473283	601.730704
76	78.38550	632.65303	4034.22009	4.558523	62.954942	534.257421
77	71.91514	554.26753	3401.56706	4.575622	58.396419	471.302479
78	65.58549	482.35239	2847.29953	4.566542	53.820797	412.906060
79	59.41930	416.76690	2364.94714	4.528219	49.254255	359.085263
80	53.44183	357.34760	1948.18024	4.457992	44.726036	309.831008
81	47.68038	303.90577	1590.83264	4.310169	40.268044	265.104972
82	42.20728	256.22539	1286.92687	4.134009	35.957875	224.836928
83	37.04382	214.01811	1030.70148	3.930264	31.823866	188.879053
84	32.21005	176.97429	816.68337	3.700605	27.893602	157.055187
85	27.72383	144.76424	639.70908	3.447732	24.192997	129.161585
86	23.59991	117.04041	494.94484	3.175191	20.745265	104.968588
87	19.84911	93.44050	377.90443	2.887516	17.570074	84.223323
88	16.47747	73.59139	284.46393	2.590006	14.682558	66.653249
89	13.48557	57.11392	210.87254	2.288561	12.092552	51.970691
90	10.86810	43.62835	153.75862	1.989518	9.803991	39.878139
91	8.613503	32.760252	110.130266	1.699180	7.814473	30.074148
92	6.704238	24.146749	77.370014	1.423601	6.115293	22.259675
93	5.117119	17.442511	53.223265	1.168176	4.691692	16.144382
94	3.824135	12.325392	35.780754	.9372717	3.5235159	11.4526900
95	2.793592	8.501257	23.455362	.7339897	2.5862442	7.9291741
96	1.991466	5.707665	14.954105	.5666528	1.8522545	5.3429299
97	1.376241	3.716199	9.246440	.4233816	1.2856017	3.4906754
98	.9192923	2.3399577	5.5302405	.3052038	.8622201	2.2050737
99	.5916667	1.4206654	3.1902828	.2115679	.5570163	1.3428536
100	.3656679	.8289987	1.7696174	.1405245	.3454484	.7858373
101	.2162246	.4633308	.9406187	.08909298	.20492389	.44038892
102	.1218579	.2471062	.4772879	.05369845	.11583091	.23546503
103	.06518730	.12524829	.23018165	.03063758	.06213246	.11963412
104	.03295978	.06006099	.10493336	.01647368	.03149488	.05750166
105	.01568220	.02710121	.04487237	.00830947	.01502120	.02600678
106	.00699024	.01141901	.01777116	.00391366	.00671173	.01098558
107	.00290608	.00442877	.00635215	.00171321	.00279807	.00427385
108	.00112200	.00152269	.00192338	.00069394	.00108486	.00147578
109	.00040069	.00040069	.00040069	.00039092	.00039092	.00039092

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TABLE 14—*Continued*

THE 1960 MODIFICATION OF THE a-1949 TABLE WITH PROJECTION
PROJECTING COMMUTATION COLUMNS
2.5% INTEREST—MALE

Age x	F_x	G_x	H_x	J_x	K_x	Y_x	Z_x
0........	.084709	8.204233	24.5835	1104.5498	33282.8962	15.74316	813.24306
1........	.084659	8.119574	22.9089	1081.6409	32178.3464	15.15985	798.08321
2........	.084638	8.034936	22.2750	1059.3659	31096.7055	14.93577	783.14744
3........	.084627	7.950309	21.9300	1037.4359	30037.3396	14.81200	768.33544
4........	.084619	7.865690	21.6603	1015.7756	28999.9037	14.71381	753.62163
5........	.084611	7.781079	21.4309	994.3447	27984.1281	14.62907	738.99256
6........	.084603	7.696476	21.2301	973.1146	26989.7834	14.55380	724.43876
7........	.084597	7.611879	21.0492	952.0654	26016.6688	14.48499	709.95377
8........	.084591	7.527288	20.8825	931.1829	25064.6034	14.42065	695.53312
9........	.084585	7.442703	20.7252	910.4577	24133.4205	14.35903	681.17409
10........	.084578	7.358125	20.5743	889.8834	23222.9628	14.29908	666.87501
11........	.084573	7.273552	20.4278	869.4556	22333.0794	14.24003	652.63498
12........	.084566	7.188986	20.2833	849.1723	21463.6238	14.18093	638.45405
13........	.084560	7.104426	20.1405	829.0318	20614.4515	14.12169	624.33236
14........	.084554	7.019872	19.9995	809.0323	19785.4197	14.06236	610.27000
15........	.084547	6.935325	19.8598	789.1725	18976.3874	14.00275	596.26725
16........	.084541	6.850784	19.7213	769.4512	18187.2149	13.94279	582.32446
17........	.084533	6.766251	19.5838	749.8674	17417.7637	13.88243	568.44203
18........	.084527	6.681724	19.4469	730.4205	16667.8963	13.82151	554.62052
19........	.084519	6.597205	19.3106	711.1099	15937.4758	13.75999	540.86053
20........	.084512	6.512693	19.1746	691.9353	15226.3659	13.69773	527.16280
21........	.084504	6.428189	19.0386	672.8967	14534.4306	13.63460	513.52820
22........	.084495	6.343694	18.9021	653.9946	13861.5339	13.57039	499.95781
23........	.084488	6.259206	18.7650	635.2296	13207.5393	13.50501	486.45280
24........	.084478	6.174728	18.6271	616.6025	12572.3097	13.43836	473.01444
25........	.084470	6.090258	18.4882	598.1143	11955.7072	13.37029	459.64415
26........	.084459	6.005799	18.3478	579.7665	11357.5929	13.30055	446.34360
27........	.084450	5.921349	18.2057	561.5608	10777.8264	13.22902	433.11458
28........	.084439	5.836910	18.0614	543.4994	10216.2656	13.15541	419.95917
29........	.084428	5.752482	17.9146	525.5848	9672.7662	13.07956	406.87961
30........	.084416	5.668066	17.7652	507.8196	9147.1814	13.00133	393.87828
31........	.084403	5.583663	17.6127	490.2069	8639.3618	12.92043	380.95785
32........	.084390	5.499273	17.4568	472.7501	8149.1549	12.83662	368.12123
33........	.084376	5.414897	17.2971	455.4530	7676.4048	12.74969	355.37154
34........	.084361	5.330536	17.1332	438.3198	7220.9518	12.65932	342.71222
35........	.084344	5.246192	16.9648	421.3550	6782.6320	12.56530	330.14692
36........	.084327	5.161865	16.7914	404.5636	6361.2770	12.46725	317.67967
37........	.084309	5.077556	16.6127	387.9509	5956.7134	12.36492	305.31475
38........	.084288	4.993268	16.4283	371.5226	5568.7625	12.25804	293.05671
39........	.084266	4.909002	16.2377	355.2849	5197.2399	12.14621	280.91050
40........	.084243	4.824759	16.0406	339.2443	4841.9550	12.02911	268.88139
41........	.084218	4.740541	15.8365	323.4078	4502.7107	11.90641	256.97498
42........	.084190	4.656351	15.6225	307.7853	4179.3029	11.77623	245.19875
43........	.084159	4.572192	15.3940	292.3913	3871.5176	11.63555	233.56320
44........	.084124	4.488068	15.1474	277.2439	3579.1263	11.48196	222.08124
45........	.084083	4.403985	14.8800	262.3639	3301.8824	11.31349	210.76775
46........	.084038	4.319947	14.5901	247.7738	3039.5185	11.12875	199.63900
47........	.083987	4.235960	14.2767	233.4971	2791.7447	10.92674	188.71226
48........	.083928	4.152032	13.9394	219.5577	2558.2476	10.70688	178.00538
49........	.083862	4.068170	13.5783	205.9794	2338.6899	10.46892	167.53646
50........	.083788	3.984382	13.1942	192.7852	2132.7105	10.21298	157.32348
51........	.083706	3.900676	12.7881	179.9971	1939.9253	9.93945	147.38403
52........	.083615	3.817061	12.3647	167.6324	1759.9282	9.65125	137.73278
53........	.083514	3.733547	11.9224	155.7100	1592.2958	9.34701	128.38577
54........	.083405	3.650142	11.4668	144.2432	1436.5858	9.03029	119.35548

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TABLE 14—*Continued*

PROJECTING COMMUTATION COLUMNS

2.5% INTEREST—MALE

Age x	F_x	G_x	H_x	J_x	K_x	Y_x	Z_x
55....	.083284	3.566858	10.9962	133.2470	1292.3426	8.69978	110.65570
56....	.083154	3.483704	10.5166	122.7304	1159.0956	8.35950	102.29620
57....	.083013	3.400691	10.0262	112.7042	1036.3652	8.00805	94.28815
58....	.082859	3.317832	9.5312	103.1730	923.6610	7.64979	86.63836
59....	.082695	3.235137	9.0297	94.1433	820.4880	7.28321	79.35515
60....	.082517	3.152620	8.5279	85.6154	726.3447	6.91281	72.44234
61....	.082326	3.070294	8.0235	77.5919	640.7293	6.53697	65.90537
62....	.082124	2.988170	7.5261	70.0658	563.1374	6.16278	59.74259
63....	.081909	2.906261	7.0359	63.0299	493.0716	5.79062	53.95197
64....	.081680	2.824581	6.5534	56.4765	430.0417	5.42091	48.53106
65....	.081436	2.743145	6.0791	50.3974	373.5652	5.05417	43.47689
66....	.081177	2.661968	5.6136	44.7838	323.1678	4.69102	38.78587
67....	.080903	2.581065	5.1618	39.6220	278.3840	4.33550	34.45037
68....	.080611	2.500454	4.7245	34.8975	238.7620	3.98845	30.46192
69....	.080304	2.420150	4.3025	30.5950	203.8645	3.65073	26.81119
70....	.079977	2.340173	3.8967	26.6983	173.2695	3.32326	23.48793
71....	.079632	2.260541	3.5079	23.1904	146.5712	3.00700	20.48093
72....	.079270	2.181271	3.1410	20.0494	123.3808	2.70622	17.77471
73....	.078891	2.102380	2.7967	17.2527	103.3314	2.42179	15.35292
74....	.078494	2.023886	2.4756	14.7771	86.0787	2.15452	13.19840
75....	.078079	1.945807	2.1781	12.5990	71.3016	1.90511	11.29329
76....	.077647	1.868160	1.9046	10.6944	58.7026	1.67414	9.61915
77....	.077204	1.790956	1.6587	9.0357	48.0082	1.46502	8.15413
78....	.076750	1.714206	1.4400	7.5957	38.9725	1.27778	6.87635
79....	.076288	1.637918	1.2478	6.3479	31.3768	1.11220	5.76415
80....	.075823	1.562095	1.0813	5.2666	25.0289	.96781	4.79634
81....	.075355	1.486740	.9392	4.3274	19.7623	.84388	3.95246
82....	.074845	1.411895	.8084	3.5190	15.4349	.72908	3.22338
83....	.074287	1.337608	.6890	2.8300	11.9159	.62369	2.59969
84....	.073676	1.263932	.5810	2.2490	9.0859	.52787	2.07182
85....	.073010	1.190922	.4844	1.76463	6.83687	.44167	1.630149
86....	.072278	1.118644	.39887	1.36576	5.07224	.364995	1.265154
87....	.071479	1.047165	.32413	1.04163	3.70648	.297631	.967523
88....	.070603	.976562	.25965	.78198	2.66485	.239229	.728294
89....	.069642	.906920	.20480	.577180	1.882865	.189322	.538972
90....	.068590	.838330	.158862	.418318	1.305685	.147335	.391637
91....	.067435	.770895	.121028	.297290	.887367	.112603	.279034
92....	.066167	.704728	.090428	.206862	.590077	.084395	.1946386
93....	.064776	.639952	.066165	.140697	.383215	.0619381	.1327005
94....	.063249	.576703	.047340	.093357	.242518	.0444456	.0882549
95....	.061572	.515131	.033079	.060278	.149161	.0311441	.0571108
96....	.059729	.455402	.022561	.0377172	.0888830	.0212979	.0358129
97....	.057669	.397733	.0149099	.0228073	.0511658	.0141117	.0217012
98....	.055368	.342365	.0095215	.0132858	.0283585	.0090340	.0126672
99....	.052788	.289577	.0058573	.0074285	.0150727	.0055705	.00709671
100....	.049895	.239682	.0034591	.0039694	.0076442	.00329715	.00379956
101....	.046645	.193037	.0019535	.00201587	.00367481	.00186610	.00193346
102....	.042990	.150047	.00105016	.00096571	.00165894	.00100533	.00092813
103....	.038872	.111175	.00053429	.00043142	.00069323	.00051258	.00041555
104....	.034223	.076952	.00025514	.00017628	.00026181	.00024533	.00017022
105....	.028971	.047981	.00011279	.00006349	.00008553	.00010873	.00006149
106....	.023028	.024953	.00004492	.00001857	.00002204	.00004344	.00001805
107....	.016294	.008659	.00001510	.00000347	.00000347	.00001466	.00000339
108....	.008659	.000000	.00000347	.00000000	.00000000	.00000339	.00000000
109....	.000000	.000000	.00000000	.00000000	.00000000	.00000000	.00000000

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TABLE 14—*Continued*

THE 1960 MODIFICATION OF THE *a*-1949 TABLE WITH PROJECTION
STANDARD COMMUTATION COLUMNS
2.5% INTEREST—FEMALE

Age *x*	D_x	N_x	S_x	C_x	M_x	R_x
0......	1007.4986	34951.6792	981061.8077	3.15522	155.01864	11023.34330
1......	979.7702	33944.1806	946110.1285	1.29999	151.86342	10868.32466
2......	954.5734	32964.4104	912165.9479	.65466	150.56343	10716.46124
3......	930.6365	32009.8370	879201.5375	.47300	149.90877	10565.89781
4......	907.4650	31079.2005	847191.7005	.37095	149.43577	10415.98904
5......	884.9608	30171.7355	816112.5000	.29266	149.06482	10266.55327
6......	863.0837	29286.7747	785940.7645	.23412	148.77216	10117.48845
7......	841.7988	28423.6910	756653.9898	.19214	148.53804	9968.71629
8......	821.0750	27581.8922	728230.2988	.16583	148.34590	9820.17825
9......	800.8829	26760.8172	700648.4066	.15077	148.18007	9671.83235
10......	781.1984	25959.9343	673887.5894	.14557	148.02930	9523.65228
11......	761.9992	25178.7359	647927.6551	.15466	147.88373	9375.62298
12......	743.2592	24416.7367	622748.9192	.16315	147.72907	9227.73925
13......	724.9678	23673.4775	598332.1825	.17113	147.56592	9080.01018
14......	707.1145	22948.5097	574658.7050	.17938	147.39479	8932.44426
15......	689.6884	22241.3952	551710.1953	.18707	147.21541	8785.04947
16......	672.6797	21551.7068	529468.8001	.19427	147.02834	8637.83406
17......	656.0076	20879.0271	507917.0933	.20165	146.83407	8490.80572
18......	639.8751	20222.9485	487038.0662	.20849	146.63242	8343.97165
19......	624.0599	19583.0734	466815.1177	.21555	146.42393	8197.33923
20......	608.6233	18959.0135	447232.0443	.22327	146.20838	8050.91530
21......	593.5556	18350.3902	428273.0308	.23049	145.98511	7904.70692
22......	578.8481	17756.8346	409922.6406	.23773	145.75462	7758.72181
23......	564.4922	17177.9865	392165.8060	.24564	145.51689	7612.96719
24......	550.4784	16613.4943	374987.8195	.25400	145.27125	7467.45030
25......	536.7981	16063.0159	358374.3252	.26238	145.01725	7322.17905
26......	523.4431	15526.2178	342311.3093	.27118	144.75487	7177.16180
27......	510.4050	15002.7747	326785.0915	.28034	144.48369	7032.40693
28......	497.6758	14492.3697	311782.3168	.29036	144.20335	6887.92324
29......	485.2470	13994.6939	297289.9471	.30111	143.91299	6743.71989
30......	473.1106	13509.4469	283295.2532	.31246	143.61188	6599.80690
31......	461.2588	13036.3363	269785.8063	.32445	143.29942	6456.19502
32......	449.6842	12575.0775	256749.4700	.33783	142.97497	6312.89560
33......	438.3784	12125.3933	244174.3925	.35157	142.63714	6169.92063
34......	427.3347	11687.0149	232048.9992	.36647	142.28557	6027.28349
35......	416.5454	11259.6802	220361.9843	.38281	141.91910	5884.99792
36......	406.0030	10843.1348	209102.3041	.40006	141.53629	5743.07882
37......	395.7004	10437.1318	198259.1693	.41887	141.13623	5601.54253
38......	385.6303	10041.4314	187822.0375	.43904	140.71736	5460.40630
39......	375.7857	9655.8011	177780.6061	.46047	140.27832	5319.68894
40......	366.1597	9280.0154	168124.8050	.48405	139.81785	5179.41062
41......	356.7449	8913.8557	158844.7896	.50954	139.33380	5039.59277
42......	347.5343	8557.1108	149930.9339	.53674	138.82426	4900.25897
43......	338.5211	8209.5765	141373.8231	.56640	138.28752	4761.43471
44......	329.6981	7871.0554	133164.2466	.59795	137.72112	4623.14719
45......	321.0587	7541.3573	125293.1912	.63240	137.12317	4485.42607
46......	312.5956	7220.2986	117751.8339	.66971	136.49077	4348.30290
47......	304.3016	6907.7030	110531.5353	.70983	135.82106	4211.81213
48......	296.1698	6603.4014	103623.8323	.75299	135.11123	4075.99107
49......	288.1931	6307.2316	97020.4309	.79992	134.35824	3940.87984
50......	280.3641	6019.0385	90713.1993	.85040	133.55832	3806.52160
51......	272.6756	5738.6744	84694.1608	.89410	132.70792	3672.96328
52......	265.1309	5465.9988	78955.4864	.94205	131.81382	3540.25536
53......	257.7222	5200.8679	73489.4876	.99493	130.87177	3408.44154
54......	250.4414	4943.1457	68288.6197	1.05308	129.87684	3277.56977

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TABLE 14—*Continued*

STANDARD COMMUTATION COLUMNS

2.5% INTEREST—FEMALE

Age x	D_x	N_x	S_x	C_x	M_x	R_x
55......	243.2799	4692.7043	63345.4740	1.11671	128.82376	3147.69293
56......	236.2296	4449.4244	58652.7697	1.18598	127.70705	3018.86917
57......	229.2819	4213.1948	54203.3453	1.26160	126.52107	2891.16212
58......	222.4281	3983.9129	49990.1505	1.34391	125.25947	2764.64105
59......	215.6591	3761.4848	46006.2376	1.43323	123.91556	2639.38158
60......	208.9659	3545.8257	42244.7528	1.52983	122.48233	2515.46602
61......	202.3393	3336.8598	38698.9271	1.63411	120.95250	2392.98369
62......	195.7701	3134.5205	35362.0673	1.74646	119.31839	2272.03119
63......	189.2488	2938.7504	32227.5468	1.86701	117.57193	2152.71280
64......	182.7659	2749.5016	29288.7964	1.99616	115.70492	2035.14087
65......	176.3121	2566.7357	26539.2948	2.13397	113.70876	1919.43595
66......	169.8778	2390.4236	23972.5591	2.28034	111.57479	1805.72719
67......	163.4541	2220.5458	21582.1355	2.43538	109.29445	1694.15240
68......	157.0320	2057.0917	19361.5897	2.59876	106.85907	1584.85795
69......	150.6032	1900.0597	17304.4980	2.77007	104.26031	1477.99888
70......	144.1599	1749.4565	15404.4383	2.94846	101.49024	1373.73857
71......	137.6953	1605.2966	13654.9818	3.13287	98.54178	1272.24833
72......	131.2041	1467.6013	12049.6852	3.32222	95.40891	1173.70655
73......	124.6817	1336.3972	10582.0839	3.51444	92.08669	1078.29764
74......	118.1263	1211.7155	9245.6867	3.70725	88.57225	986.21095
75......	111.5376	1093.5892	8033.9712	3.89881	84.86470	897.63870
76......	104.9184	982.0516	6940.3820	4.08486	80.96589	812.77400
77......	98.27452	877.13324	5958.33039	4.261859	76.881026	731.808111
78......	91.61572	778.85872	5081.19715	4.425536	72.619167	654.927085
79......	84.95565	687.24300	4302.33843	4.570773	68.193631	582.307918
80......	78.31279	602.28735	3615.09543	4.692274	63.622858	514.114287
81......	71.71045	523.97456	3012.80808	4.736320	58.930584	450.491429
82......	65.22510	452.26411	2488.83352	4.747050	54.194264	391.560845
83......	58.88719	387.03901	2036.56941	4.720512	49.447214	337.366581
84......	52.73040	328.15182	1649.53040	4.653398	44.726702	287.919367
85......	46.79090	275.42142	1321.37858	4.543142	40.073304	243.192665
86......	41.10652	228.63052	1045.95716	4.388330	35.530162	203.119361
87......	35.71559	187.52400	817.32664	4.189041	31.141832	167.589199
88......	30.65544	151.80841	629.80264	3.946894	26.952791	136.447367
89......	25.96085	121.15297	477.99423	3.665568	23.005897	109.494576
90......	21.66209	95.19212	356.84126	3.350646	19.340329	86.488679
91......	17.78310	73.53003	261.64914	3.009643	15.989683	67.148350
92......	14.33972	55.74693	188.11911	2.651817	12.980040	51.158667
93......	11.33815	41.40721	132.37218	2.287667	10.328223	38.178627
94......	8.773948	30.069062	90.964970	1.928308	8.040556	27.850404
95......	6.631641	21.295114	60.895908	1.584671	6.112248	19.809848
96......	4.885223	14.663473	39.600794	1.281749	4.527577	13.697600
97......	3.484322	9.778250	24.937321	1.001693	3.245828	9.170023
98......	2.397645	6.293928	15.159071	.7535345	2.2441349	5.9241948
99......	1.585632	3.896283	8.865143	.5434090	1.4906004	3.6800599
100......	1.003549	2.310651	4.968860	.3739960	.9471914	2.1894595
101......	.6050759	1.3071024	2.6582092	.2444707	.5731954	1.2422681
102......	.3458472	.7020265	1.3511068	.1509936	.3287247	.6690727
103......	.1864184	.3561793	.6490803	.08763324	.17773111	.34034802
104......	.09423839	.16976086	.29290098	.04751583	.09009787	.16261691
105......	.04442406	.07552247	.12314012	.02392571	.04258204	.07251904
106......	.01941483	.03109841	.04761765	.01111992	.01865633	.02993700
107......	.00782138	.01168358	.01651924	.00474187	.00753641	.01128067
108......	.00288874	.00386220	.00483566	.00184482	.00279454	.00374426
109......	.00097346	.00097346	.00097346	.00094972	.00094972	.00094972

TABLE 14—*Continued*

THE 1960 MODIFICATION OF THE a-1949 TABLE WITH PROJECTION
PROJECTING COMMUTATION COLUMNS
2.5% INTEREST—FEMALE

Age x	F_x	G_x	H_x	J_x	K_x	Y_x	Z_x
0	.078823	7.802502	17.8828	852.5964	27399.1378	11.30118	629.63606
1	.078783	7.723719	16.5164	836.0800	26546.5414	10.86368	618.77238
2	.078766	7.644953	15.9552	820.1248	25710.4614	10.68125	608.09113
3	.078757	7.566196	15.6737	804.4511	24890.3366	10.58834	597.50279
4	.078750	7.487446	15.4712	788.9799	24085.8455	10.52047	586.98232
5	.078745	7.408701	15.3131	773.6668	23296.9056	10.46668	576.51564
6	.078741	7.329960	15.1890	758.4778	22523.2388	10.42379	566.09185
7	.078738	7.251222	15.0902	743.3876	21764.7610	10.38914	555.70271
8	.078735	7.172487	15.0095	728.3781	21021.3734	10.36041	545.34230
9	.078732	7.093755	14.9402	713.4379	20292.9953	10.33538	535.00692
10	.078729	7.015026	14.8776	698.5603	19579.5574	10.31240	524.69452
11	.078727	6.936299	14.8175	683.7428	18880.9971	10.29001	514.40451
12	.078725	6.857574	14.7540	668.9888	18197.2543	10.26601	504.13850
13	.078722	6.778852	14.6874	654.3014	17528.2655	10.24047	493.89803
14	.078718	6.700134	14.6180	639.6834	16873.9641	10.21344	483.68459
15	.078716	6.621418	14.5457	625.1377	16234.2807	10.18488	473.49971
16	.078712	6.542706	14.4708	610.6669	15609.1430	10.15485	463.34486
17	.078708	6.463998	14.3935	596.2734	14998.4761	10.12342	453.22144
18	.078705	6.385293	14.3138	581.9596	14402.2027	10.09056	443.13088
19	.078700	6.306593	14.2320	567.7276	13820.2431	10.05632	433.07456
20	.078696	6.227897	14.1481	553.5795	13252.5155	10.02068	423.05388
21	.078691	6.149206	14.0618	539.5177	12698.9360	9.98351	413.07037
22	.078686	6.070520	13.9734	525.5443	12159.4183	9.94489	403.12548
23	.078681	5.991839	13.8830	511.6613	11633.8740	9.90481	393.22067
24	.078675	5.913164	13.7903	497.8710	11122.2127	9.86316	383.35751
25	.078670	5.834494	13.6953	484.1757	10624.3417	9.81985	373.53766
26	.078663	5.755831	13.5980	470.5777	10140.1660	9.77488	363.76278
27	.078656	5.677175	13.4984	457.0793	9669.5883	9.72818	354.03460
28	.078649	5.598526	13.3964	443.6829	9212.5090	9.67968	344.35492
29	.078642	5.519884	13.2917	430.3912	8768.8261	9.62924	334.72568
30	.078634	5.441250	13.1842	417.2070	8338.4349	9.57674	325.14894
31	.078626	5.362624	13.0738	404.1332	7921.2279	9.52207	315.62687
32	.078616	5.284008	12.9604	391.1728	7517.0947	9.46513	306.16174
33	.078607	5.205401	12.8436	378.3292	7125.9219	9.40570	296.75604
34	.078597	5.126804	12.7234	365.6058	6747.5927	9.34372	287.41232
35	.078585	5.048219	12.5996	353.0062	6381.9869	9.27900	278.13332
36	.078574	4.969645	12.4718	340.5344	6028.9807	9.21131	268.92201
37	.078561	4.891084	12.3399	328.1945	5688.4463	9.14052	259.78149
38	.078548	4.812536	12.2036	315.9909	5360.2518	9.06638	250.71511
39	.078533	4.734003	12.0626	303.9283	5044.2609	8.98869	241.72642
40	.078517	4.655486	11.9167	292.0116	4740.3326	8.90727	232.81915
41	.078500	4.576986	11.7655	280.2461	4448.3210	8.82180	223.99735
42	.078482	4.498504	11.6087	268.6374	4168.0749	8.73199	215.26536
43	.078463	4.420041	11.4460	257.1914	3899.4375	8.63762	206.62774
44	.078440	4.341601	11.2770	245.9144	3642.2461	8.53834	198.08940
45	.078418	4.263183	11.1014	234.8130	3396.3317	8.43392	189.65548
46	.078392	4.184791	10.9188	223.8942	3161.5187	8.32396	181.33152
47	.078364	4.106427	10.7288	213.1654	2937.6245	8.20809	173.12343
48	.078335	4.028092	10.5310	202.6344	2724.4591	8.08598	165.03745
49	.078302	3.949790	10.3250	192.3094	2521.8247	7.95727	157.08018
50	.078266	3.871524	10.1103	182.1991	2329.5153	7.82151	149.25867
51	.078228	3.793296	9.8866	172.3125	2147.3162	7.67832	141.58035
52	.078185	3.715111	9.6580	162.6545	1975.0037	7.53028	134.05007
53	.078140	3.636971	9.4223	153.2322	1812.3492	7.37579	126.67428
54	.078092	3.558879	9.1808	144.0514	1659.1170	7.21563	119.45865

TABLE 14—*Continued*

PROJECTING COMMUTATION COLUMNS

2.5% INTEREST—FEMALE

Age x	F_x	G_x	H_x	J_x	K_x	Y_x	Z_x
55.....	.078038	3.480841	8.9309	135.1205	1515.0656	7.04804	112.41061
56.....	.077980	3.402861	8.6743	126.4462	1379.9451	6.87393	105.53668
57.....	.077917	3.324944	8.4084	118.0378	1253.4989	6.69148	98.84520
58.....	.077849	3.247095	8.1350	109.9028	1135.4611	6.50174	92.34346
59.....	.077773	3.169322	7.8514	102.0514	1025.5583	6.30272	86.04074
60.....	.077691	3.091631	7.5596	94.4918	923.5069	6.09569	79.94505
61.....	.077601	3.014030	7.2569	87.2349	829.0151	5.87858	74.06647
62.....	.077501	2.936529	6.9482	80.2867	741.7802	5.65479	68.41168
63.....	.077395	2.859134	6.6336	73.6531	661.4935	5.42434	62.98734
64.....	.077278	2.781856	6.3134	67.3397	587.8404	5.18734	57.80000
65.....	.077152	2.704704	5.9879	61.3518	520.5007	4.94395	52.85605
66.....	.077013	2.627691	5.6576	55.6942	459.1489	4.69443	48.16162
67.....	.076864	2.550827	5.3261	50.3681	403.4547	4.44154	43.72008
68.....	.076702	2.474125	4.9943	45.3738	353.0866	4.18591	39.53417
69.....	.076529	2.397596	4.6632	40.7106	307.7128	3.92832	35.60585
70.....	.076340	2.321256	4.3338	36.3768	267.0022	3.66963	31.93622
71.....	.076137	2.245119	4.0072	32.3696	230.6254	3.41083	28.52539
72.....	.075919	2.169200	3.6883	28.6813	198.2558	3.15580	25.36959
73.....	.075688	2.093512	3.3375	25.3028	169.5745	2.90583	22.46376
74.....	.075440	2.018072	3.0793	22.2235	144.2717	2.66230	19.80146
75.....	.075178	1.942894	2.7921	19.4314	122.0482	2.42658	17.37488
76.....	.074900	1.867994	2.5184	16.9130	102.6168	2.20006	15.17482
77.....	.074608	1.793386	2.2632	14.6498	85.7038	1.98713	13.18769
78.....	.074306	1.719080	2.0277	12.6221	71.0540	1.78910	11.39859
79.....	.073993	1.645087	1.8129	10.8092	58.4319	1.60710	9.79149
80.....	.073673	1.571414	1.6196	9.1896	47.6227	1.44206	8.34943
81.....	.073345	1.498069	1.4482	7.7414	38.4331	1.29467	7.05476
82.....	.072982	1.425087	1.2840	6.4574	30.6917	1.15250	5.90226
83.....	.072579	1.352508	1.1280	5.3294	24.2343	1.01652	4.88574
84.....	.072132	1.280376	.9811	4.3483	18.9049	.88764	3.99810
85.....	.071634	1.208742	.8441	3.5042	14.5566	.76671	3.23139
86.....	.071082	1.137660	.7178	2.7864	11.0524	.65446	2.57693
87.....	.070467	1.067193	.6026	2.1838	8.2660	.55150	2.02543
88.....	.069784	.997409	.4989	1.68486	6.08224	.45827	1.567162
89.....	.069024	.928385	.40679	1.27807	4.39738	.375039	1.192123
90.....	.068178	.860207	.32625	.95182	3.11931	.301863	.890260
91.....	.067236	.792971	.25698	.69484	2.16749	.238603	.651657
92.....	.066186	.726785	.19848	.496362	1.472648	.184917	.466740
93.....	.065017	.661768	.150061	.346301	.976286	.140270	.326470
94.....	.063713	.598055	.110861	.235440	.629985	.103962	.222508
95.....	.062259	.535796	.079901	.155539	.394545	.075161	.147347
96.....	.060638	.475158	.056118	.099421	.239000	.052945	.0944016
97.....	.058798	.416360	.038133	.061288	.139585	.0360779	.0583237
98.....	.056709	.359651	.024986	.036302	.078297	.0237028	.0346209
99.....	.054333	.305318	.015728	.0205739	.0419953	.0149585	.0196624
100.....	.051626	.253692	.0094721	.0111018	.0214214	.0090307	.0106317
101.....	.048535	.205157	.0054325	.0056693	.0103196	.0051915	.00544022
102.....	.045001	.160156	.0029513	.00271797	.00465032	.00282667	.00261355
103.....	.040951	.119205	.00150879	.00120918	.00193235	.00144831	.00116524
104.....	.036301	.082904	.00071948	.00048970	.00072317	.00069221	.00047303
105.....	.030954	.051950	.00031559	.00017411	.00023347	.00030438	.00016865
106.....	.024791	.027159	.00012397	.00005014	.00005936	.00011992	.00004873
107.....	.017683	.009476	.00004092	.00000922	.00000922	.00003973	.00000900
108.....	.009476	.000000	.00000922	.00000000	.00000000	.00000900	.00000000
109.....	.000000	.000000	.00000000	.00000000	.00000000	.00000000	.00000000

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TABLE 14—*Continued*

THE 1960 MODIFICATION OF THE *a*–1949 TABLE WITH PROJECTION
STANDARD COMMUTATION COLUMNS
3% INTEREST—MALE

Age x	D_x	N_x	S_x	C_x	M_x	R_x
0.......	1010.4755	30147.7613	752503.9536	3.96340	132.38537	8230.17068
1.......	977.0808	29137.2858	722356.1923	1.49882	128.42197	8097.78531
2.......	947.1233	28160.2050	693218.9065	.81567	126.92315	7969.36334
3.......	918.7215	27213.0817	665058.7015	.63776	126.10748	7842.44019
4.......	891.3249	26294.3602	637845.6198	.54258	125.46972	7716.33271
5.......	864.8214	25403.0353	611551.2596	.47527	124.92714	7590.86299
6.......	839.1571	24538.2139	586148.2243	.42858	124.45187	7465.93585
7.......	814.2871	23699.0568	561610.0104	.39526	124.02329	7341.48398
8.......	790.1747	22884.7697	537910.9536	.37363	123.62803	7217.46069
9.......	766.7863	22094.5950	515026.1839	.35880	123.25440	7093.83266
10.......	744.0939	21327.8087	492931.5889	.34893	122.89560	6970.57826
11.......	722.0724	20583.7148	471603.7802	.34494	122.54667	6847.68266
12.......	700.6962	19861.6424	451020.0654	.34150	122.20173	6725.13599
13.......	679.9461	19160.9462	431158.4230	.33796	121.86023	6602.93426
14.......	659.8038	18481.0001	411997.4768	.33569	121.52227	6481.07403
15.......	640.2506	17821.1963	393516.4767	.33383	121.18658	6359.55176
16.......	621.2686	17180.9457	375695.2804	.33234	120.85275	6238.36518
17.......	602.8411	16559.6771	358514.3347	.33188	120.52041	6117.51243
18.......	584.9508	15956.8360	341954.6576	.33168	120.18853	5996.99202
19.......	567.5817	15371.8852	325997.8216	.33226	119.85685	5876.80349
20.......	550.7179	14804.3035	310625.9364	.33366	119.52459	5756.94664
21.......	534.3439	14253.5856	295821.6329	.33615	119.19093	5637.42205
22.......	518.4444	13719.2417	281568.0473	.33923	118.85478	5518.23112
23.......	503.0048	13200.7973	267848.8056	.34283	118.51555	5399.37634
24.......	488.0114	12697.7925	254648.0083	.34731	118.17272	5280.86079
25.......	473.4501	12209.7811	241950.2158	.35301	117.82541	5162.68807
26.......	459.3073	11736.3310	229740.4347	.35943	117.47240	5044.86266
27.......	445.5700	11277.0237	218004.1037	.36728	117.11297	4927.39026
28.......	432.2249	10831.4537	206727.0800	.37601	116.74569	4810.27729
29.......	419.2598	10399.2288	195895.6263	.38545	116.36968	4693.53160
30.......	406.6629	9979.9690	185496.3975	.39639	115.98423	4577.16192
31.......	394.4220	9573.3061	175516.4285	.40861	115.58784	4461.17769
32.......	382.5254	9178.8841	165943.1224	.42189	115.17923	4345.58985
33.......	370.9620	8796.3587	156764.2383	.43687	114.75734	4230.41062
34.......	359.7204	8425.3967	147967.8796	.45297	114.32047	4115.65328
35.......	348.7901	8065.6763	139542.4829	.47104	113.86750	4001.33281
36.......	338.1601	7716.8862	131476.8066	.49048	113.39646	3887.46531
37.......	327.8203	7378.7261	123759.9204	.51145	112.90598	3774.06885
38.......	317.7607	7050.9058	116381.1943	.53463	112.39453	3661.16287
39.......	307.9709	6733.1451	109330.2885	.55974	111.85990	3548.76834
40.......	298.4411	6425.1742	102597.1434	.58674	111.30016	3436.90844
41.......	289.1619	6126.7331	96171.9692	.62326	110.71342	3325.60828
42.......	280.1165	5837.5712	90045.2361	.67473	110.09016	3214.89486
43.......	271.2830	5557.4547	84207.6649	.73851	109.41543	3104.80470
44.......	262.6431	5286.1717	78650.2102	.81267	108.67692	2995.38927
45.......	254.1806	5023.5286	73364.0385	.89457	107.86425	2886.71235
46.......	245.8827	4769.3480	68340.5099	.98258	106.96968	2778.84810
47.......	237.7385	4523.4653	63571.1619	1.07491	105.98710	2671.87842
48.......	229.7392	4285.7268	59047.6966	1.17010	104.91219	2565.89132
49.......	221.8776	4055.9876	54761.9698	1.26663	103.74209	2460.97913
50.......	214.1485	3834.1100	50705.9822	1.36328	102.47546	2357.23704
51.......	206.5479	3619.9615	46871.8722	1.45927	101.11218	2254.76158
52.......	199.0727	3413.4136	43251.9107	1.55354	99.65291	2153.64940
53.......	191.7209	3214.3409	39838.4971	1.64546	98.09937	2053.99649
54.......	184.4914	3022.6200	36624.1562	1.73423	96.45391	1955.89712

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TABLE 14—*Continued*

STANDARD COMMUTATION COLUMNS

3% INTEREST—MALE

Age x	D_x	N_x	S_x	C_x	M_x	R_x
55	177.3836	2838.1286	33601.5362	1.81947	94.71968	1859.44321
56	170.3976	2660.7450	30763.4076	1.90101	92.90021	1764.72353
57	163.5336	2490.3474	28102.6626	1.97828	90.99920	1671.82332
58	156.7922	2326.8138	25612.3152	2.05140	89.02092	1580.82412
59	150.1740	2170.0216	23285.5014	2.12022	86.96952	1491.80320
60	143.6798	2019.8476	21115.4798	2.18478	84.84930	1404.83368
61	137.3102	1876.1678	19095.6322	2.24882	82.66452	1319.98438
62	131.0620	1738.8576	17219.4644	2.31572	80.41570	1237.31986
63	124.9290	1607.7956	15480.6068	2.38529	78.09998	1156.90416
64	118.9050	1482.8666	13872.8112	2.45695	75.71469	1078.80418
65	112.9848	1363.9616	12389.9446	2.53021	73.25774	1003.08949
66	107.1637	1250.9768	11025.9830	2.60418	70.72753	929.83175
67	101.4383	1143.8131	9775.0062	2.67808	68.12335	859.10422
68	95.80570	1042.37484	8631.19311	2.751117	65.445266	790.980866
69	90.26412	946.56914	7588.81827	2.822026	62.694149	725.535600
70	84.81305	856.30502	6642.24913	2.889573	59.872123	662.841451
71	79.45319	771.49197	5785.94411	2.952268	56.982550	602.969328
72	74.18675	692.03878	5014.45214	3.008593	54.030282	545.986778
73	69.01738	617.85203	4322.41336	3.056866	51.021689	491.956496
74	63.95030	548.83465	3704.56133	3.095199	47.964823	440.934807
75	58.99247	484.88435	3155.72668	3.121502	44.869624	392.969984
76	54.15274	425.89188	2670.84233	3.133974	41.748122	348.100360
77	49.44150	371.73914	2244.95045	3.130460	38.614148	306.352238
78	44.87100	322.29764	1873.21131	3.109081	35.483688	267.738090
79	40.45499	277.42664	1550.91367	3.068023	32.374607	232.254402
80	36.20867	236.97165	1273.48703	3.005780	29.306584	199.879795
81	32.14827	200.76298	1036.51538	2.892004	26.300804	170.573211
82	28.31991	168.61471	835.75240	2.760340	23.408800	144.272407
83	24.73472	140.29480	667.13769	2.611557	20.648460	120.863607
84	21.40273	115.56008	526.84289	2.447018	18.036903	100.215147
85	18.33233	94.15735	411.28281	2.268739	15.589885	82.178244
86	15.52964	75.82502	317.12546	2.079254	13.321146	66.588359
87	12.99807	60.29538	241.30044	1.881693	11.241892	53.267213
88	10.73779	47.29731	181.00506	1.679623	9.360199	42.025321
89	8.745416	36.559521	133.707754	1.476931	7.680576	32.665122
90	7.013764	27.814105	97.148233	1.277710	6.203645	24.984546
91	5.531770	20.800341	69.334128	1.085951	4.925935	18.780901
92	4.284699	15.268571	48.533787	.9054109	3.8399836	13.8549663
93	3.254491	10.983872	33.265216	.7393542	2.9345727	10.0149827
94	2.420346	7.729381	22.281344	.5903321	2.1952185	7.0804100
95	1.759518	5.309035	14.551963	.4600526	1.6048864	4.8851915
96	1.248218	3.549517	9.242928	.3534445	1.1448338	3.2803051
97	.8584175	2.3012989	5.6934114	.2627984	.7913893	2.1354713
98	.5706166	1.4428814	3.3921125	.1885243	.5285909	1.3440820
99	.3654724	.8722648	1.9492311	.1300510	.3400666	.8154911
100	.2247765	.5067924	1.0769663	.08596128	.21001556	.47542451
101	.1322683	.2820159	.5701739	.05423515	.12405428	.26540895
102	.07418071	.14974762	.28815797	.03253013	.06981913	.14135467
103	.03948998	.07556691	.13841035	.01846992	.03728900	.07153554
104	.01986986	.03607693	.06284344	.00988298	.01881908	.03424654
105	.00940815	.01620707	.02676651	.00496086	.00893610	.01542746
106	.00417326	.00679892	.01055944	.00232517	.00397524	.00649136
107	.00172655	.00262566	.00376602	.00101290	.00165007	.00251612
108	.00066336	.00089911	.00113486	.00040829	.00063717	.00086605
109	.00023575	.00023575	.00023575	.00022888	.00022888	.00022888

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TABLE 14—*Continued*

THE 1960 MODIFICATION OF THE *a*-1949 TABLE WITH PROJECTION
PROJECTING COMMUTATION COLUMNS
3% INTEREST—MALE

Age *x*	F_x	G_x	H_x	J_x	K_x	Y_x	Z_x
0........	.084709	8.204233	18.4967	787.4088	23344.5297	10.60427	541.49778
1........	.084659	8.119574	17.0193	770.3895	22557.1209	10.19367	531.30411
2........	.084638	8.034936	16.4623	753.9272	21786.7314	10.03603	521.26808
3........	.084627	7.950309	16.1603	737.7669	21032.8042	9.94900	511.31908
4........	.084619	7.865690	15.9251	721.8418	20295.0373	9.87999	501.43909
5........	.084611	7.781079	15.7259	706.1159	19573.1955	9.82046	491.61863
6........	.084603	7.696476	15.5522	690.5637	18867.0796	9.76761	481.85102
7........	.084597	7.611879	15.3963	675.1674	18176.5159	9.71931	472.13171
8........	.084591	7.527288	15.2532	659.9142	17501.3485	9.67418	462.45753
9........	.084585	7.442703	15.1186	644.7956	16841.4343	9.63098	452.82655
10........	.084578	7.358125	14.9900	629.8056	16196.6387	9.58896	443.23759
11........	.084573	7.273552	14.8657	614.9399	15566.8331	9.54760	433.68999
12........	.084566	7.188986	14.7435	600.1964	14951.8932	9.50622	424.18377
13........	.084560	7.104426	14.6232	585.5732	14351.6968	9.46477	414.71900
14........	.084554	7.019872	14.5049	571.0683	13766.1236	9.42327	405.29573
15........	.084547	6.935325	14.3881	556.6802	13195.0553	9.38159	395.91414
16........	.084541	6.850784	14.2727	542.4075	12638.3751	9.33969	386.57445
17........	.084533	6.766251	14.1586	528.2489	12095.9676	9.29753	377.27692
18........	.084527	6.681724	14.0454	514.2035	11567.7187	9.25500	368.02192
19........	.084519	6.597205	13.9331	500.2704	11053.5152	9.21207	358.80985
20........	.084512	6.512693	13.8214	486.4490	10553.2448	9.16865	349.64120
21........	.084504	6.428189	13.7102	472.7388	10066.7958	9.12465	340.51655
22........	.084495	6.343694	13.5990	459.1398	9594.0570	9.07992	331.43663
23........	.084488	6.259206	13.4877	445.6521	9134.9172	9.03440	322.40223
24........	.084478	6.174728	13.3762	432.2759	8689.2651	8.98803	313.41420
25........	.084470	6.090258	13.2642	419.0117	8256.9892	8.94069	304.47351
26........	.084459	6.005799	13.1514	405.8603	7837.9775	8.89222	295.58129
27........	.084450	5.921349	13.0377	392.8226	7432.1172	8.84254	286.73875
28........	.084439	5.836910	12.9227	379.8999	7039.2946	8.79145	277.94730
29........	.084428	5.752482	12.8061	367.0938	6659.3947	8.73884	269.20846
30........	.084416	5.668066	12.6879	354.4059	6292.3009	8.68461	260.52385
31........	.084403	5.583663	12.5676	341.8383	5937.8950	8.62857	251.89528
32........	.084390	5.499273	12.4450	329.3933	5596.0567	8.57055	243.32473
33........	.084376	5.414897	12.3200	317.0733	5266.6634	8.51041	234.81432
34........	.084361	5.330536	12.1921	304.8812	4949.5901	8.44793	226.36639
35........	.084344	5.246192	12.0612	292.8200	4644.7089	8.38297	217.98342
36........	.084327	5.161865	11.9268	280.8932	4351.8889	8.31528	209.66814
37........	.084309	5.077556	11.7888	269.1044	4070.9957	8.24469	201.42345
38........	.084288	4.993268	11.6469	257.4575	3801.8913	8.17103	193.25242
39........	.084266	4.909002	11.5008	245.9567	3544.4338	8.09402	185.15840
40........	.084243	4.824759	11.3502	234.6065	3298.4771	8.01345	177.14495
41........	.084218	4.740541	11.1948	223.4117	3063.8706	7.92910	169.21585
42........	.084190	4.656351	11.0324	212.3793	2840.4589	7.83969	161.37616
43........	.084159	4.572192	10.8596	201.5197	2628.0796	7.74316	153.63300
44........	.084124	4.488068	10.6738	190.8459	2426.5599	7.63788	145.99512
45........	.084083	4.403985	10.4730	180.3729	2235.7140	7.52251	138.47261
46........	.084038	4.319947	10.2561	170.1168	2055.3411	7.39614	131.07647
47........	.083987	4.235960	10.0224	160.0944	1885.2243	7.25810	123.81837
48........	.083928	4.152032	9.7717	150.3227	1725.1299	7.10803	116.71034
49........	.083862	4.068170	9.5043	140.8184	1574.8072	6.94580	109.76454
50........	.083788	3.984382	9.2208	131.5976	1433.9888	6.77152	102.99302
51........	.083706	3.900676	8.9221	122.6755	1302.3912	6.58549	96.40753
52........	.083615	3.817061	8.6118	114.0637	1179.7157	6.38973	90.01780
53........	.083514	3.733547	8.2888	105.7749	1065.6520	6.18335	83.83445
54........	.083405	3.650142	7.9572	97.8177	959.8771	5.96878	77.86567

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TABLE 14—*Continued*

PROJECTING COMMUTATION COLUMNS

3% INTEREST—MALE

Age x	F_x	G_x	H_x	J_x	K_x	Y_x	Z_x
55....	.083284	3.566858	7.6159	90.2018	862.0594	5.74518	72.12049
56....	.083154	3.483704	7.2693	82.9325	771.8576	5.51529	66.60520
57....	.083013	3.400691	6.9161	76.0164	688.9251	5.27819	61.32701
58....	.082859	3.317832	6.5609	69.4555	612.9087	5.03685	56.29016
59....	.082695	3.235137	6.2022	63.2533	543.4532	4.79027	51.49989
60....	.082517	3.152620	5.8445	57.4088	480.1999	4.54150	46.95839
61....	.082326	3.070294	5.4863	51.9225	422.7911	4.28947	42.66892
62....	.082124	2.988170	5.1342	46.7883	370.8686	4.03895	38.62997
63....	.081909	2.906261	4.7885	41.9998	324.0803	3.79019	34.83978
64....	.081680	2.824581	4.4494	37.5504	282.0805	3.54348	31.29630
65....	.081436	2.743145	4.1172	33.4332	244.5301	3.29917	27.99713
66....	.081177	2.661968	3.7923	29.6409	211.0969	3.05768	24.93945
67....	.080903	2.581065	3.4781	26.1628	181.4560	2.82169	22.11776
68....	.080611	2.500454	3.1751	22.9877	155.2932	2.59174	19.52602
69....	.080304	2.420150	2.8837	20.1040	132.3055	2.36840	17.15762
70....	.079977	2.340173	2.6045	17.4995	112.2015	2.15226	15.00536
71....	.079632	2.260541	2.3380	15.1615	94.7020	1.94394	13.06142
72....	.079270	2.181271	2.0874	13.0741	79.5405	1.74622	11.31520
73....	.078891	2.102380	1.8531	11.2210	66.4664	1.55965	9.75555
74....	.078494	2.023886	1.6354	9.5856	55.2454	1.38471	8.37084
75....	.078079	1.945807	1.4344	8.1512	45.6598	1.22183	7.14901
76....	.077647	1.868160	1.2503	6.9009	37.5086	1.07134	6.07767
77....	.077204	1.790956	1.0854	5.8155	30.6077	.93541	5.14226
78....	.076750	1.714206	.9392	4.8763	24.7922	.81400	4.32826
79....	.076288	1.637918	.8113	4.0650	19.9159	.70690	3.62136
80....	.075823	1.562095	.7009	3.3641	15.8509	.61375	3.00761
81....	.075355	1.486740	.6070	2.7571	12.4868	.53401	2.47360
82....	.074845	1.411895	.5209	2.2362	9.7297	.46035	2.01325
83....	.074287	1.337608	.4426	1.79362	7.49352	.39291	1.620339
84....	.073676	1.263932	.37207	1.42155	5.69990	.331769	1.288570
85....	.073010	1.190922	.30923	1.11232	4.27835	.276923	1.011647
86....	.072278	1.118644	.25384	.85848	3.16603	.228283	.783364
87....	.071479	1.047165	.20561	.652866	2.307551	.185678	.597686
88....	.070603	.976562	.164167	.488699	1.654685	.148855	.448831
89....	.069642	.906920	.129059	.359640	1.165986	.117487	.331344
90....	.068590	.838330	.099774	.259866	.806346	.091181	.2401625
91....	.067435	.770895	.075752	.184114	.546480	.0694914	.1706711
92....	.066167	.704728	.056403	.127711	.362366	.0519338	.1187373
93....	.064776	.639952	.041124	.086587	.234655	.0380028	.0807345
94....	.063249	.576703	.029318	.057269	.148068	.0271884	.0535461
95....	.061572	.515131	.020412	.0368568	.0907992	.0189933	.0345528
96....	.059729	.455402	.0138710	.0229858	.0539424	.0129482	.0216046
97....	.057669	.397733	.0091333	.0138525	.0309566	.0085519	.0130527
98....	.055368	.342365	.0058107	.0080418	.0171041	.0054568	.00759593
99....	.052788	.289577	.0035610	.0044808	.0090623	.00335349	.00424244
100....	.049895	.239682	.0020949	.00238593	.00458147	.00197814	.00226430
101....	.046645	.193037	.00117846	.00120747	.00219554	.00111569	.00114861
102....	.042990	.150047	.00063104	.00057643	.00098807	.00059895	.00054966
103....	.038872	.111175	.00031980	.00025663	.00041164	.00030431	.00024535
104....	.034223	.076952	.00015212	.00010451	.00015501	.00014514	.00010021
105....	.028971	.047981	.00006699	.00003752	.00005050	.00006411	.00003610
106....	.023028	.024953	.00002658	.00001094	.00001298	.00002553	.00001057
107....	.016294	.008659	.00000890	.00000204	.00000204	.00000859	.00000198
108....	.008659	.000000	.00000204	.00000000	.00000000	.00000198	.00000000
109....	.000000	.000000	.00000000	.00000000	.00000000	.00000000	.00000000

TABLE 14—*Continued*

THE 1960 MODIFICATION OF THE *a*-1949 TABLE WITH PROJECTION
STANDARD COMMUTATION COLUMNS
3% INTEREST—FEMALE

Age *x*	D*x*	N*x*	S*x*	C*x*	M*x*	R*x*
0	1007.4986	30801.8247	798061.7017	3.13990	110.35806	7557.30790
1	975.0141	29794.3261	767259.8770	1.28740	107.21816	7446.94984
2	945.3282	28819.3120	737465.5509	.64517	105.93076	7339.73168
3	917.1492	27873.9838	708646.2389	.46388	105.28559	7233.80092
4	889.9722	26956.8346	680772.2551	.36204	104.82171	7128.51533
5	863.6887	26066.8624	653815.4205	.28424	104.45967	7023.69362
6	838.2485	25203.1737	627748.5581	.22628	104.17543	6919.23395
7	813.6072	24364.9252	602545.3844	.18480	103.94915	6815.05852
8	789.7251	23551.3180	578180.4592	.15872	103.76435	6711.10937
9	766.5646	22761.5929	554629.1412	.14361	103.60563	6607.34502
10	744.0939	21995.0283	531867.5483	.13798	103.46202	6503.73939
11	722.2833	21250.9344	509872.5200	.14589	103.32404	6400.27737
12	701.1000	20528.6511	488621.5856	.15315	103.17815	6296.95333
13	680.5265	19827.5511	468092.9345	.15986	103.02500	6193.77518
14	660.5455	19147.0246	448265.3834	.16676	102.86514	6090.75018
15	641.1395	18486.4791	429118.3588	.17305	102.69838	5987.88504
16	622.2925	17845.3396	410631.8797	.17884	102.52533	5885.18666
17	603.9886	17223.0471	392786.5401	.18474	102.34649	5782.66133
18	586.2120	16619.0585	375563.4930	.19008	102.16175	5680.31484
19	568.9478	16032.8465	358944.4345	.19556	101.97167	5578.15309
20	552.1809	15463.8987	342911.5880	.20158	101.77611	5476.18142
21	535.8964	14911.7178	327447.6893	.20709	101.57453	5374.40531
22	520.0807	14375.8214	312535.9715	.21256	101.36744	5272.83078
23	504.7202	13855.7407	298160.1501	.21857	101.15488	5171.46334
24	489.8010	13351.0205	284304.4094	.22490	100.93631	5070.30846
25	475.3101	12861.2195	270953.3889	.23120	100.71141	4969.37215
26	461.2349	12385.9094	258092.1694	.23779	100.48021	4868.66074
27	447.5631	11924.6745	245706.2600	.24463	100.24242	4768.18053
28	434.2826	11477.1114	233781.5855	.25215	99.99779	4667.93811
29	421.3815	11042.8288	222304.4741	.26021	99.74564	4567.94032
30	408.8480	10621.4473	211261.6453	.26871	99.48543	4468.19468
31	396.6711	10212.5993	200640.1980	.27766	99.21672	4368.70925
32	384.8399	9815.9282	190427.5987	.28771	98.93906	4269.49253
33	373.3433	9431.0883	180611.6705	.29796	98.65135	4170.55347
34	362.1712	9057.7450	171180.5822	.30908	98.35339	4071.90212
35	351.3135	8695.5738	162122.8372	.32129	98.04431	3973.54873
36	340.7598	8344.2603	153427.2634	.33415	97.72302	3875.50442
37	330.5006	8003.5005	145083.0031	.34815	97.38887	3777.78140
38	320.5262	7672.9999	137079.5026	.36315	97.04072	3680.39253
39	310.8273	7352.4737	129406.5027	.37903	96.67757	3583.35181
40	301.3951	7041.6464	122054.0290	.39650	96.29854	3486.67424
41	292.2201	6740.2513	115012.3826	.41535	95.90204	3390.37570
42	283.2935	6448.0312	108272.1313	.43540	95.48669	3294.47366
43	274.6068	6164.7377	101824.1001	.45723	95.05129	3198.98697
44	266.1513	5890.1309	95659.3624	.48035	94.59406	3103.93568
45	257.9190	5623.9796	89769.2315	.50557	94.11371	3009.34162
46	249.9012	5366.0606	84145.2519	.53279	93.60814	2915.22791
47	242.0897	5116.1594	78779.1913	.56197	93.07535	2821.61977
48	234.4766	4874.0697	73663.0319	.59325	92.51338	2728.54442
49	227.0539	4639.5931	68788.9622	.62716	91.92013	2636.03104
50	219.8136	4412.5392	64149.3691	.66350	91.29297	2544.11091
51	212.7477	4192.7256	59736.8299	.69421	90.62947	2452.81794
52	205.8570	3979.9779	55544.1043	.72789	89.93526	2362.18847
53	199.1332	3774.1209	51564.1264	.76502	89.20737	2272.25321
54	192.5682	3574.9877	47790.0055	.80580	88.44235	2183.04584

TABLE 14—*Continued*

STANDARD COMMUTATION COLUMNS
3% INTEREST—FEMALE

Age x	D_x	N_x	S_x	C_x	M_x	R_x
55	186.1536	3382.4195	44215.0178	.85034	87.63655	2094.60349
56	179.8814	3196.2659	40832.5983	.89870	86.78621	2006.96694
57	173.7434	3016.3845	37636.3324	.95136	85.88751	1920.18073
58	167.7315	2842.6411	34619.9479	1.00851	84.93615	1834.29322
59	161.8376	2674.9096	31777.3068	1.07032	83.92764	1749.35707
60	156.0536	2513.0720	29102.3972	1.13692	82.85732	1665.42943
61	150.3714	2357.0184	26589.3252	1.20851	81.72040	1582.57211
62	144.7832	2206.6470	24232.3068	1.28534	80.51189	1500.85171
63	139.2808	2061.8638	22025.6598	1.36738	79.22655	1420.33982
64	133.8567	1922.5830	19963.7960	1.45488	77.85917	1341.11327
65	128.5031	1788.7263	18041.2130	1.54777	76.40429	1263.25410
66	123.2125	1660.2232	16252.4867	1.64590	74.85652	1186.84981
67	117.9779	1537.0107	14592.2635	1.74928	73.21062	1111.99329
68	112.7924	1419.0328	13055.2528	1.85757	71.46134	1038.78267
69	107.6496	1306.2404	11636.2200	1.97040	69.60377	967.32133
70	102.5438	1198.5908	10329.9796	2.08712	67.63337	897.71756
71	97.46995	1096.04699	9131.38875	2.206888	65.546251	830.084192
72	92.42413	998.57704	8035.34176	2.328913	63.339363	764.537941
73	87.40326	906.15291	7036.76472	2.451698	61.010450	701.198578
74	82.40583	818.74965	6130.61181	2.573863	58.558752	640.188128
75	77.43179	736.34382	5311.86216	2.693496	55.984889	581.629376
76	72.48301	658.91203	4575.51834	2.808330	53.291393	525.644487
77	67.56352	586.42902	3916.60631	2.915795	50.483063	472.353094
78	62.67985	518.86550	3330.17729	3.013079	47.567268	421.870031
79	57.84115	456.18565	2811.31179	3.096856	44.554189	374.302763
80	53.05960	398.34450	2355.12614	3.163744	41.457333	329.748574
81	48.35043	345.28490	1956.78164	3.177939	38.293589	288.291241
82	43.76423	296.93447	1611.49674	3.169267	35.115650	249.997652
83	39.31987	253.17024	1314.56227	3.136656	31.945973	214.882002
84	35.03797	213.85037	1061.39203	3.077051	28.809317	182.936029
85	30.94040	178.81240	847.54166	2.989561	25.732266	154.126712
86	27.04966	147.87200	668.72926	2.873671	22.742705	128.394446
87	23.38813	120.82234	520.85726	2.729851	19.869034	105.651741
88	19.97707	97.43421	400.03492	2.559567	17.139183	85.782707
89	16.83565	77.45714	302.60071	2.365587	14.579616	68.643524
90	13.97971	60.62149	225.14357	2.151854	12.214029	54.063908
91	11.42067	46.64178	164.52208	1.923472	10.062175	41.849879
92	9.164560	35.221109	117.880298	1.686557	8.138703	31.787704
93	7.211074	26.056549	82.659189	1.447895	6.452146	23.649001
94	5.553148	18.845475	56.602640	1.214527	5.004251	17.196855
95	4.176879	13.292327	37.757165	.9932456	3.7897239	12.1926039
96	3.061977	9.115448	24.464838	.7994794	2.7964783	8.4028800
97	2.173314	6.053471	15.349390	.6217637	1.9969989	5.6064017
98	1.488249	3.880157	9.295919	.4654581	1.3752352	3.6094028
99	.9794444	2.3919083	5.4157616	.3340342	.9097771	2.2341676
100	.6168826	1.4124639	3.0238533	.2287798	.5757429	1.3243905
101	.3701354	.7955813	1.6113894	.1488210	.3469631	.7486476
102	.2105337	.4254459	.8158081	.09147078	.19814210	.40168452
103	.1129309	.2149122	.3903622	.05282986	.10667132	.20354242
104	.05681178	.10198127	.17545000	.02850595	.05384146	.09687110
105	.02665112	.04516949	.07346873	.01428397	.02533551	.04302964
106	.01159091	.01851837	.02829924	.00660651	.01105154	.01769413
107	.00464680	.00692746	.00978087	.00280354	.00444503	.00664259
108	.00170791	.00228066	.00285341	.00108542	.00164149	.00219756
109	.00057275	.00057275	.00057275	.00055607	.00055607	.00055607

TABLE 14—*Continued*

THE 1960 MODIFICATION OF THE *a*-1949 TABLE WITH PROJECTION
PROJECTING COMMUTATION COLUMNS
3% INTEREST—FEMALE

Age x	F_x	G_x	H_x	J_x	K_x	Y_x	Z_x
0....	.078823	7.802502	13.2631	596.3835	18848.8233	7.45070	410.99176
1....	.078783	7.723719	12.0638	584.3197	18252.4398	7.15093	403.84083
2....	.078766	7.644953	11.5732	572.7465	17668.1201	7.02598	396.81485
3....	.078757	7.566196	11.3281	561.4184	17095.3736	6.96237	389.85248
4....	.078750	7.487446	11.1525	550.2659	16533.9552	6.91592	382.93656
5....	.078745	7.408701	11.0159	539.2500	15983.6893	6.87912	376.05744
6....	.078741	7.329960	10.9091	528.3409	15444.4393	6.84979	369.20765
7....	.078738	7.251222	10.8244	517.5165	14916.0984	6.82610	362.38155
8....	.078735	7.172487	10.7555	506.7610	14398.5819	6.80647	355.57508
9....	.078732	7.093755	10.6966	496.0644	13891.8209	6.78937	348.78571
10....	.078729	7.015026	10.6435	485.4209	13395.7565	6.77368	342.01203
11....	.078727	6.936299	10.5928	474.8281	12910.3356	6.75840	335.25363
12....	.078725	6.857574	10.5394	464.2887	12435.5075	6.74202	328.51161
13....	.078722	6.778852	10.4836	453.8051	11971.2188	6.72460	321.78701
14....	.078718	6.700134	10.4257	443.3794	11517.4137	6.70617	315.08084
15....	.078716	6.621418	10.3656	433.0138	11074.0343	6.68670	308.39414
16....	.078712	6.542706	10.3036	422.7102	10641.0205	6.66624	301.72790
17....	.078708	6.463998	10.2399	412.4703	10218.3103	6.64484	295.08306
18....	.078705	6.385293	10.1744	402.2959	9805.8400	6.62247	288.46059
19....	.078700	6.306593	10.1074	392.1885	9403.5441	6.59917	281.86142
20....	.078696	6.227897	10.0389	382.1496	9011.3556	6.57493	275.28649
21....	.078691	6.149206	9.9688	372.1808	8629.2060	6.54966	268.73683
22....	.078686	6.070520	9.8973	362.2835	8257.0252	6.52342	262.21341
23....	.078681	5.991839	9.8244	352.4591	7894.7417	6.49619	255.71722
24....	.078675	5.913164	9.7499	342.7092	7542.2826	6.46791	249.24931
25....	.078670	5.834494	9.6738	333.0354	7199.5734	6.43851	242.81080
26....	.078663	5.755831	9.5962	323.4392	6866.5380	6.40800	236.40280
27....	.078656	5.677175	9.5170	313.9222	6543.0988	6.37633	230.02647
28....	.078649	5.598526	9.4362	304.4860	6229.1766	6.34346	223.68301
29....	.078642	5.519884	9.3536	295.1324	5924.6906	6.30929	217.37372
30....	.078634	5.441250	9.2691	285.8633	5629.5582	6.27375	211.09997
31....	.078626	5.362624	9.1826	276.6807	5343.6949	6.23675	204.86322
32....	.078616	5.284008	9.0941	267.5866	5067.0142	6.19824	198.66498
33....	.078607	5.205401	9.0033	258.5833	4799.4276	6.15807	192.50693
34....	.078597	5.126804	8.9102	249.6731	4540.8443	6.11620	186.39071
35....	.078585	5.048219	8.8146	240.8585	4291.1712	6.07250	180.31821
36....	.078574	4.969645	8.7163	232.1422	4050.3127	6.02682	174.29139
37....	.078561	4.891084	8.6152	223.5270	3818.1705	5.97908	168.31231
38....	.078548	4.812536	8.5110	215.0160	3594.6435	5.92911	162.38320
39....	.078533	4.734003	8.4036	206.6124	3379.6275	5.87678	156.50642
40....	.078517	4.655486	8.2929	198.3195	3173.0151	5.82197	150.68445
41....	.078500	4.576986	8.1786	190.1409	2974.6956	5.76447	144.91998
42....	.078482	4.498504	8.0604	182.0805	2784.5547	5.70409	139.21589
43....	.078463	4.420041	7.9382	174.1423	2602.4742	5.64069	133.57520
44....	.078440	4.341601	7.8117	166.3306	2428.3319	5.57404	128.00116
45....	.078418	4.263183	7.6808	158.6498	2262.0013	5.50398	122.49718
46....	.078392	4.184791	7.5451	151.1047	2103.3515	5.43026	117.06692
47....	.078364	4.106427	7.4044	143.7003	1952.2468	5.35264	111.71428
48....	.078335	4.028092	7.2584	136.4419	1808.5465	5.27090	106.44338
49....	.078302	3.949790	7.1069	129.3350	1672.1046	5.18481	101.25857
50....	.078266	3.871524	6.9495	122.3855	1542.7696	5.09408	96.16449
51....	.078228	3.793296	6.7861	115.5994	1420.3841	4.99846	91.16603
52....	.078185	3.715111	6.6197	108.9797	1304.7847	4.89968	86.26635
53....	.078140	3.636971	6.4486	102.5311	1195.8050	4.79669	81.46966
54....	.078092	3.558879	6.2739	96.2572	1093.2739	4.69002	76.77964

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TABLE 14—*Continued*

PROJECTING COMMUTATION COLUMNS

3% INTEREST—FEMALE

Age z	F_x	G_x	H_x	J_x	K_x	Y_x	Z_x
55....	.078038	3.480841	6.0938	90.1634	997.0167	4.57850	72.20114
56....	.077980	3.402861	5.9095	84.2539	906.8533	4.46275	67.73839
57....	.077917	3.324944	5.7191	78.5348	822.5994	4.34158	63.39681
58....	.077849	3.247095	5.5240	73.0108	744.0646	4.21569	59.18112
59....	.077773	3.169322	5.3223	67.6885	671.0538	4.08378	55.09734
60....	.077691	3.091631	5.1155	62.5730	603.3653	3.94671	51.15063
61....	.077601	3.014030	4.9017	57.6713	540.7923	3.80313	47.34750
62....	.077501	2.936529	4.6844	52.9869	483.1210	3.65530	43.69220
63....	.077395	2.859134	4.4637	48.5232	430.1341	3.50325	40.18895
64....	.077278	2.781856	4.2398	44.2834	381.6109	3.34707	36.84188
65....	.077152	2.704704	4.0130	40.2704	337.3275	3.18688	33.65500
66....	.077013	2.627691	3.7836	36.4868	297.0571	3.02288	30.63212
67....	.076864	2.550827	3.5542	32.9326	260.5703	2.85689	27.77523
68....	.076702	2.474125	3.3253	29.6073	227.6377	2.68934	25.08589
69....	.076529	2.397596	3.0976	26.5097	198.0304	2.52075	22.56514
70....	.076340	2.321256	2.8719	23.6378	171.5207	2.35170	20.21344
71....	.076137	2.245119	2.6489	20.9889	147.8829	2.18284	18.03060
72....	.075919	2.169200	2.4319	18.5570	126.8940	2.01671	16.01389
73....	.075688	2.093512	2.2218	16.3352	108.3370	1.85416	14.15973
74....	.075440	2.018072	2.0196	14.3156	92.0018	1.69607	12.46366
75....	.075178	1.942894	1.8262	12.4894	77.6862	1.54333	10.92033
76....	.074900	1.867994	1.6426	10.8468	65.1968	1.39683	9.52350
77....	.074608	1.793386	1.4720	9.3748	54.3500	1.25939	8.26411
78....	.074306	1.719080	1.3151	8.0597	44.9752	1.13183	7.13228
79....	.073993	1.645087	1.1725	6.8872	36.9155	1.01484	6.11744
80....	.073673	1.571414	1.0446	5.8426	30.0283	.90899	5.20845
81....	.073345	1.498069	.9316	4.9110	24.1857	.81467	4.39378
82....	.072982	1.425087	.8238	4.0872	19.2747	.72390	3.66988
83....	.072579	1.352508	.7218	3.3654	15.1875	.63729	3.03259
84....	.072132	1.280376	.6261	2.7393	11.8221	.55541	2.47718
85....	.071634	1.208742	.5372	2.2021	9.0828	.47877	1.99841
86....	.071082	1.137660	.4555	1.74661	6.88072	.40782	1.590591
87....	.070467	1.067193	.38127	1.36534	5.13411	.342911	1.247680
88....	.069784	.997409	.31470	1.05064	3.76877	.284300	.963380
89....	.069024	.928385	.25582	.79482	2.71813	.232120	.731260
90....	.068178	.860207	.20453	.590288	1.923310	.186378	.544882
91....	.067236	.792971	.160592	.429696	1.333022	.146952	.397930
92....	.066186	.726785	.123631	.306065	.903326	.113594	.284336
93....	.065017	.661768	.093160	.212905	.597261	.085938	.1983977
94....	.063713	.598055	.068592	.144313	.384356	.0635190	.1348787
95....	.062259	.535796	.049267	.095046	.240043	.0457925	.0890862
96....	.060638	.475158	.034483	.060563	.144997	.0321638	.0569224
97....	.058798	.416360	.023349	.0372136	.0844341	.0218519	.0350705
98....	.056709	.359651	.0152437	.0219699	.0472205	.0143122	.0207583
99....	.054333	.305318	.0095602	.0124097	.0252506	.0090035	.0117548
100....	.051626	.253692	.0057360	.0066737	.0128409	.0054178	.00633696
101....	.048535	.205157	.0032773	.0033964	.0061672	.00310411	.00323285
102....	.045001	.160156	.0017736	.00162279	.00277081	.00168441	.00154844
103....	.040951	.119205	.00090324	.00071955	.00114802	.00086009	.00068835
104....	.036301	.082904	.00042907	.00029048	.00042847	.00040968	.00027867
105....	.030954	.051950	.00018750	.00010298	.00013799	.00017956	.00009911
106....	.024791	.027159	.00007340	.00002958	.00003501	.00007053	.00002858
107....	.017683	.009476	.00002415	.00000543	.00000543	.00002331	.00000527
108....	.009476	.000000	.00000543	.00000000	.00000000	.00000527	.00000000
109....	.000000	.000000	.00000000	.00000000	.00000000	.00000000	.00000000

TABLE 15

THE 1960 MODIFICATION OF THE a-1949 TABLE WITH PROJECTION
JOINT LIFE ANNUITY VALUES FOR EQUAL AGES
WITHOUT PROJECTION OF MORTALITY RATES
a_{xx} AT $2\frac{1}{2}\%$ INTEREST

Age x	Two Males	Two Females	Male and Female	Age x	Two Males	Two Females	Male and Female
0........	30.922	32.291	31.553	40........	19.028	21.717	20.240
1........	30.953	32.311	31.578	41........	18.583	21.320	19.817
2........	30.827	32.209	31.463	42........	18.133	20.917	19.387
3........	30.654	32.061	31.300	43........	17.679	20.508	18.953
4........	30.466	31.897	31.123	44........	17.223	20.093	18.515
5........	30.266	31.722	30.934	45........	16.766	19.672	18.074
6........	30.058	31.537	30.736	46........	16.311	19.246	17.631
7........	29.842	31.343	30.530	47........	15.857	18.814	17.186
8........	29.619	31.142	30.316	48........	15.406	18.377	16.741
9........	29.389	30.934	30.096	49........	14.958	17.935	16.295
10........	29.153	30.719	29.869	50........	14.514	17.488	15.849
11........	28.910	30.499	29.636	51........	14.074	17.038	15.403
12........	28.662	30.275	29.398	52........	13.638	16.581	14.958
13........	28.408	30.046	29.155	53........	13.206	16.120	14.512
14........	28.148	29.812	28.907	54........	12.779	15.655	14.067
15........	27.882	29.573	28.653	55........	12.356	15.186	13.623
16........	27.610	29.329	28.393	56........	11.937	14.713	13.179
17........	27.332	29.080	28.127	57........	11.521	14.237	12.737
18........	27.047	28.826	27.856	58........	11.109	13.759	12.295
19........	26.755	28.566	27.579	59........	10.700	13.279	11.854
20........	26.457	28.301	27.295	60........	10.294	12.799	11.414
21........	26.152	28.030	27.006	61........	9.889	12.318	10.975
22........	25.841	27.754	26.710	62........	9.487	11.837	10.538
23........	25.523	27.472	26.407	63........	9.089	11.358	10.104
24........	25.198	27.184	26.099	64........	8.693	10.881	9.672
25........	24.866	26.890	25.783	65........	8.302	10.407	9.244
26........	24.526	26.590	25.462	66........	7.916	9.937	8.820
27........	24.180	26.283	25.133	67........	7.536	9.472	8.402
28........	23.827	25.971	24.798	68........	7.163	9.012	7.991
29........	23.466	25.652	24.456	69........	6.796	8.559	7.586
30........	23.098	25.327	24.107	70........	6.437	8.113	7.188
31........	22.724	24.995	23.751	71........	6.087	7.676	6.800
32........	22.341	24.657	23.388	72........	5.746	7.248	6.420
33........	21.952	24.312	23.019	73........	5.414	6.830	6.050
34........	21.556	23.961	22.643	74........	5.092	6.424	5.691
35........	21.152	23.603	22.259	75........	4.782	6.030	5.344
36........	20.741	23.239	21.869	76........	4.483	5.648	5.008
37........	20.323	22.868	21.472	77........	4.196	5.281	4.686
38........	19.899	22.491	21.068	78........	3.921	4.928	4.377
39........	19.467	22.107	20.658	79........	3.661	4.591	4.083

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TABLE 15—*Continued*

a_{xx} AT $2\frac{1}{2}\%$ INTEREST

Age x	Two Males	Two Females	Male and Female	Age x	Two Males	Two Females	Male and Female
80.......	3.415	4.271	3.804	95.......	.971	1.090	1.029
81.......	3.186	3.970	3.543	96.......	.865	.960	.911
82.......	2.967	3.681	3.293	97.......	.767	.841	.803
83.......	2.758	3.406	3.055	98.......	.677	.733	.705
84.......	2.558	3.145	2.828	99.......	.595	.635	.615
85.......	2.369	2.896	2.612	100.......	.521	.547	.534
86.......	2.190	2.661	2.408	101.......	.453	.468	.461
87.......	2.020	2.439	2.214	102.......	.392	.398	.395
88.......	1.860	2.230	2.032	103.......	.338	.336	.337
89.......	1.709	2.033	1.861	104.......	.289	.281	.285
90.......	1.566	1.849	1.699	105.......	.246	.233	.240
91.......	1.433	1.677	1.548	106.......	.208	.192	.200
92.......	1.308	1.516	1.406	107.......	.173	.156	.164
93.......	1.190	1.365	1.273	108.......	.131	.116	.123
94.......	1.078	1.224	1.148	109.......	0.	0.	0.

TABLE 15—*Continued*

THE 1960 MODIFICATION OF THE *a*-1949 TABLE WITH PROJECTION
JOINT LIFE ANNUITY VALUES FOR EQUAL AGES
WITHOUT PROJECTION OF MORTALITY RATES
a_{xx} AT 3% INTEREST

Age x	Two Males	Two Females	Male and Female	Age x	Two Males	Two Females	Male and Female
0	27.500	28.533	27.979	40	17.797	20.141	18.858
1	27.555	28.578	28.029	41	17.406	19.801	18.489
2	27.472	28.516	27.954	42	17.008	19.455	18.114
3	27.346	28.413	27.839	43	16.605	19.102	17.734
4	27.207	28.295	27.710	44	16.200	18.743	17.349
5	27.058	28.169	27.571	45	15.793	18.377	16.960
6	26.902	28.034	27.424	46	15.385	18.005	16.567
7	26.738	27.891	27.269	47	14.978	17.627	16.173
8	26.568	27.741	27.108	48	14.572	17.243	15.776
9	26.391	27.585	26.940	49	14.168	16.853	15.377
10	26.209	27.423	26.767	50	13.766	16.458	14.978
11	26.022	27.257	26.589	51	13.367	16.058	14.578
12	25.829	27.086	26.406	52	12.970	15.651	14.176
13	25.630	26.911	26.218	53	12.577	15.239	13.773
14	25.426	26.732	26.025	54	12.186	14.821	13.370
15	25.216	26.548	25.826	55	11.798	14.398	12.966
16	25.001	26.360	25.623	56	11.413	13.970	12.561
17	24.779	26.167	25.414	57	11.031	13.539	12.156
18	24.552	25.969	25.199	58	10.650	13.104	11.751
19	24.318	25.766	24.979	59	10.271	12.665	11.345
20	24.077	25.558	24.753	60	9.894	12.225	10.939
21	23.831	25.344	24.521	61	9.518	11.783	10.533
22	23.578	25.125	24.283	62	9.142	11.340	10.127
23	23.318	24.901	24.039	63	8.769	10.897	9.723
24	23.051	24.671	23.789	64	8.398	10.454	9.320
25	22.777	24.435	23.532	65	8.030	10.013	8.919
26	22.497	24.193	23.269	66	7.666	9.574	8.522
27	22.209	23.946	22.999	67	7.307	9.138	8.128
28	21.914	23.692	22.723	68	6.953	8.706	7.739
29	21.612	23.432	22.439	69	6.605	8.280	7.356
30	21.303	23.165	22.149	70	6.263	7.859	6.980
31	20.986	22.893	21.852	71	5.929	7.445	6.610
32	20.662	22.613	21.548	72	5.602	7.039	6.248
33	20.330	22.328	21.237	73	5.284	6.642	5.895
34	19.991	22.035	20.918	74	4.976	6.254	5.552
35	19.644	21.736	20.593	75	4.677	5.877	5.218
36	19.290	21.431	20.260	76	4.388	5.512	4.896
37	18.928	21.118	19.920	77	4.111	5.159	4.585
38	18.558	20.799	19.573	78	3.846	4.820	4.287
39	18.182	20.473	19.219	79	3.594	4.495	4.003

TABLE 15—*Continued*

a_{xx} AT 3% INTEREST

Age x	Two Males	Two Females	Male and Female	Age x	Two Males	Two Females	Male and Female
80........	3.355	4.186	3.733	95........	.963	1.080	1.020
81........	3.133	3.894	3.480	96........	.858	.952	.903
82........	2.919	3.615	3.237	97........	.761	.834	.797
83........	2.715	3.348	3.005	98........	.672	.727	.699
84........	2.521	3.093	2.784	99........	.591	.631	.610
85........	2.336	2.851	2.574	100........	.517	.543	.530
86........	2.161	2.622	2.374	101........	.450	.465	.458
87........	1.994	2.405	2.185	102........	.390	.395	.393
88........	1.837	2.200	2.006	103........	.336	.333	.335
89........	1.689	2.008	1.838	104........	.287	.279	.283
90........	1.549	1.827	1.680	105........	.245	.232	.238
91........	1.418	1.658	1.531	106........	.207	.191	.199
92........	1.295	1.499	1.392	107........	.172	.155	.163
93........	1.178	1.351	1.261	108........	.130	.116	.123
94........	1.069	1.212	1.137	109........	0.	0.	0.

DISCUSSION OF PRECEDING PAPER

EDWARD A. LEW:

There are just two points I would like to raise in connection with the useful modification of the a-1949 Table with projection which Messrs. Sternhell and Page have produced.

First, I believe it is necessary to emphasize that the only theoretically correct basis for computing immediate annuity rates is from select tables. Messrs. Sternhell and Page have developed their 1960 modification of the a-1949 Table from the aggregate experience for the second and subsequent contract years, much as Mr. Jenkins and I did for the a-1949 Table ultimate. However, the experience under immediate annuities from 1948 to 1958 anniversaries, summarized in Table 1 below, indicates that the effect of select mortality among annuitants has been more important, especially past age 70, than Mr. Jenkins and I brought out in our 1949 paper. More specifically, the experience shows that in the case of non-refund annuities select mortality extends for (a) about one year among males and about three years among females in the sixties, (b) about five years among males and females in the seventies, being distinctly more pronounced among females, and (c) over five years among males and females in the eighties, being quite marked for five years.

I have estimated the effects of select mortality from Table 1 and compared them with the allowances for future mortality improvement suggested by Messrs. Sternhell and Page in their modification of the Jenkins-Lew Projection Scale B. The comparison is shown in Table 2.

Thus the effect of select mortality on immediate annuity values is (1) small in relation to the allowance for future mortality improvement at age 65, (2) comparable with that of the allowance for future mortality improvement at age 75, and (3) many times larger than the allowance for future mortality improvement at age 85.

The second point I would stress is that in my judgment more ado has been made about the ultimate level of mortality under immediate non-refund annuities at attained ages over 80 than can be justified by the nature of the experience data available to us or by the effect on annuity values in the sixties of any reasonable assumptions about the ultimate mortality at attained ages over 80. While the 1948–58 experience for the sixth and subsequent contract years at attained ages 80 and over shows mortality ratios of 96 percent of the a-1949 Table on male nonrefund

TABLE 1

IMMEDIATE ANNUITY EXPERIENCE 1948–58 ANNIVERSARIES
MORTALITY RATIOS ON a-1949 TABLE WITHOUT PROJECTION

ATTAINED AGES	DURATION—CONTRACT YEARS				
	1	2–3	4–5	6 and over	2 and over
Males					
Nonrefund					
60–69	77%	107%	108%	90%	94%
70–79	83	93	96	110	108
80 and over	57	69	77	96	95
Refund					
60–69	103%	125%	117%	134%	131%
70–79	88	111	121	121	120
80 and over	77	82	91	99	99
Females					
Nonrefund					
60–69	70%	73%	104%	104%	101%
70–79	56	77	90	105	103
80 and over	56	50	73	98	97
Refund					
60–69	99%	118%	122%	120%	120%
70–79	62	89	98	112	110
80 and over	48	93	89	103	103

TABLE 2

RELATIVE IMPORTANCE OF SELECT MORTALITY AND
FUTURE IMPROVEMENT IN MORTALITY

	ESTIMATE OF $(a_{[x]} - a_x)$ BASED ON 1960 MODIFICATION OF a-1949 TABLE WITHOUT PROJECTION		FACTOR FOR FUTURE MORTALITY IMPROVEMENT	
	$d = a_{[x]} - a_x$	d as % of a_x	f	f as % of a_x
Males				
Age 65	.068	0.6%	.325	2.8%
Age 75	.233	3.1	.148	2.0
Age 85	.793	18.8	.063	1.5
Females				
Age 65	.149	1.1%	.518	3.8%
Age 75	.397	4.5	.299	3.4
Age 85	1.008	20.6	.165	3.4

annuities and 98 percent on female nonrefund annuities, it should be kept in mind that this experience represents preponderantly annuities issued in the seventies and eighties and includes some select experience. On the other hand, the corresponding experience at attained ages 70–79 was 110% of the a-1949 Table for males and 105% for females; this represents in the main the experience on annuities issued in the sixties. When the survivors of those to whom annuities were issued in the sixties reach their eighties, I expect the mortality in the sixth and subsequent contract years at attained ages 80 and over to increase.

Only 6 percent of the value of a nonrefund annuity at age 65 depends on the ultimate experience at ages 85 and over, so that even a substantial percentage change in the ultimate experience at these advanced ages would have a negligible effect on the annuity value at 65. Of course, at ages over 65, the value of a nonrefund annuity is influenced somewhat more by the ultimate experience at ages 85 and over, but at these ages the effect of select mortality becomes more and more important, eventually outweighing the allowance for future improvement in mortality and such modifications of the mortality at ages 85 and over as have been suggested.

<div align="center">WILMER A. JENKINS:</div>

The authors' development of what is really a new mortality table and a new projection scale can be considered in two distinct parts. The first is their basic mortality table, which is the a-1949 Table strengthened at ages over 80 for both sexes, and additionally for females at all ages. The second is their projection scale, which is Scale B strengthened at ages over 80.

As to the ways the authors strengthened the a-1949 Table, their purpose clearly was to develop a practical tool for everyday use. They were not concerned so much with various scientific accuracies that are usually involved in the construction of a mortality table. Judged from this point of view, it seems to me the authors have done a good job and have developed a table that will be useful in practice. The 1943 Experience Table, upon which Mr. Lew and I based the a-1949 Table, was an excellent representation of the 1941–46 intercompany experience for both sexes and at all ages, but since the a-1949 Table was published my observation has been that in the various published experiences there have been too many indications that the a-1949 Table has become not strong enough today in certain respects, principally at the advanced ages and for female lives. Too often experience mortality ratios of less than 100% have shown up. This, of course, means that since the 1941–46 experience, there have been changes—as there always have been and always will be—in the age

and sex incidence and level of mortality. From their point of view, the authors rightly based their table on the 1953–58 intercompany experience, the latest available.

The authors' modification of the a–1949 Table is also indicated generally by the fact that there has developed a substantial area of actuarial opinion that the a–1949 Table now needs strengthening at the advanced ages. This was indicated in Mr. Bowerman's paper in 1950 and in Mr. McCarter's 1956 paper. This was the only material criticism of the a–1949 Table advanced when the paper was discussed in 1949. In that discussion, Mr. Murphy brought out that there was at that time no statistical basis for this opinion, so that this opinion in that context was in the area of actuarial judgment so hard to demonstrate but frequently valuable. Mr. Lew's and my development of the a–1949 Table and Projection Scale B was, of course, carried out with the full realization that as time passed, new tables and new projection scales, such as those developed by the authors of this paper, would become necessary.

From the more scientific viewpoint usually taken in developing mortality tables, it would have been better perhaps if the authors had developed their new table on a broader basis than only the 1953–58 intercompany experience, because these intercompany experiences have fluctuated considerably from period to period. Moreover, the authors seem to have dealt only with age groups, rather than individual ages, and they developed rather empirical adjustments of the a–1949 Table. Also, Mr. Lew, in his discussion of this paper, indicated that the authors' death rates at advanced ages may be a little too low as ultimate rates because of the immaturity of the 1953–58 experience, coupled with the strong effects of selection among immediate annuities issued at advanced ages and the use of a one-year select period. All of these factors are, of course, pertinent from the usual scientific point of view connected with the preparation of mortality tables.

Mr. Lew emphasized the fact that both the a–1949 Table and the authors' new table are not select tables, and that in computing immediate annuity rates some allowance for selection is essential. I, too, would like to emphasize this point because it seems to be overlooked, or disregarded as a very small matter, by some actuaries. Mr. Lew presented figures indicating that this allowance for selection isn't large at age 65—approximately 1% of the annuity value—but that selection becomes a larger factor at higher ages—about 4% of the annuity value at age 75, and increasing to approximately 20% of the annuity value at age 85. Mr. Lew shows that these effects of selection are about as large as the allowance for future mortality improvement at age 75, and are very much larger at age

85. This cost of selection, of course, must not only be reckoned with for immediate annuities but also provided for at the beginning of any annuity if there is a cash option then available, or any other option by which the mortality risk can be avoided.

Turning to the authors' modification of Projection Scale B, I must admit to some question about the change the authors have made. Of course, a projection scale is in very large measure a matter of opinion. In some respects I agree with what the authors have done, but in other respects I have question.

As to the areas of agreement in regard to their projection scale, I think they were correct in concluding that their projection scale should not follow closely the mortality changes that have occurred in recent years, *e.g.*, between the 1941–46 experience and the 1953–58 experience. The periods have been too short. Some of the changes, such as the continuous and large decrease in female mortality, and the increase in male mortality shown in the latest study, have developed over too short periods to be assumed to represent long-term trends. Moreover, I agree with the authors that Projection Scale B should, in the light of current conditions, probably be strengthened somewhat at the advanced ages. This was the astute opinion stated by Mr. Marshall in discussing Mr. Lew's and my paper in 1949. It was also embodied later in Mr. Peterson's Projection Scale C for group annuities.

There may be some support for this view in a number of British papers and discussions which relate to the so-called "generation theory." There aren't many actuaries who subscribe fully to this theory, and yet there may well be an element of truth in it. In relation to the authors' paper, the practical implication of these discussions is to indicate that, as time passes, we might expect a tendency for the mortality improvements which we have seen at the younger ages to spread gradually—and probably only partially—into the older ages. In other words, if we were to draw a chart of Projection Scale B along a horizontal age axis, we might expect the curve to tend to slide to the right, very gradually and probably to a diminishing degree.

Mr. Peterson's Projection Scale C and these British discussions illustrate my question concerning the authors' projection scale. The authors did not slide the curve to the right; they merely lifted the right end of the curve to a horizontal line at all ages over 80. To me the authors' projection scale would be more logical if it were to show somewhat larger annual rates of mortality improvement at ages 60 to 85 and somewhat smaller rates at ages 95 and over. This would indicate a scale somewhat as shown in the last column in the accompanying table. Looking in a broad way at

ANNUAL RATE OF MORTALITY DECREASE

Age	Scale A	Scale B	Scale C	Sternhell-Page	Suggested Scale
50........	1.60%	1.25%	1.25%	1.25%	1.25%
55........	1.40	1.22	1.25	1.22	1.25
60........	1.20	1.20	1.25	1.20	1.25
65........	1.00	1.10	1.25	1.10	1.25
70........	0.80	0.95	1.25	0.95	1.25
75........	0.60	0.75	1.00	0.75	1.10
80........	0.40	0.50	0.66⅔	0.50	0.90
85........	0.20	0.25	0.33⅓	0.50	0.70
90........	0	0	0	0.50	0.50
95........	0	0	0	0.50	0.30
100........	0	0	0	0.50	0.15
105........	0	0	0	0.50	0

the trends among these various scales and the various causative factors suggests that some day we may adopt for practical purposes a projection scale consisting of one fixed percentage at all ages. The convenience of such a scale was discussed in a paper I presented to the old Society in 1946. Of course, any projection scale is largely a matter of opinion. No doubt, also, the type of projection scale an actuary uses, and in many cases the degree of importance of its use, vary according to the purposes for which it is used. For rather short-term purposes, the authors' projection scale may very well be a satisfactory practical tool.

More important than all the foregoing comments on this paper is a genuine satisfaction that the authors accept and put in practical operation the paramount "fact of life" in relation to annuity mortality: that projections for the future are a practical necessity; that if projections are not used all indications are that rates and reserves will sooner or later develop financial losses which can be of large proportions.

W. C. MCCARTER:

This is a novel approach to the problem of fitting a mortality table to a mortality experience, and it would be interesting to know why the authors chose it in preference to developing a new table directly from the experience. Judging from the care with which the various modifications have been developed, the choice was obviously not made on the basis of this being a short-cut method.

I would agree with the authors that the three principal areas requiring adjustment are the mortality rates and projection scale above 80, and the female mortality table. However, judging by the ratios in Table 6, the modified female table leaves something to be desired. The modified

mortality rates at the young ages are inordinately low, as compared with those at the higher ages where a somewhat larger safety margin would be desirable to protect against continued greater decrease in female mortality as compared with the male.

I would also point out that the 1953–58 experience has proportionately less exposure in the select period than was the case with the 1946–48 experience, and that this tends to inflate the ratios of actual to expected deaths and so overstate the safety margin of the modified table, particularly for female lives.

As the authors have undoubtedly had called to their attention, a revised uniform seniority table is needed for use with the joint life annuity values.

<center>(AUTHORS' REVIEW OF DISCUSSION)</center>

CHARLES M. STERNHELL AND CHARLES H. PAGE:

We would like to thank Messrs. Jenkins, Lew, and McCarter for their discussion of our actuarial note.

Mr. McCarter raises the basic question as to why the authors of this note chose to modify the *a*-1949 Table and Projection Scale B instead of constructing an entirely new mortality table and projection scale. As we and the discussants have indicated, the three principal areas where the *a*–1949 Table and Projection Scale B were inadequate were the mortality rates and projection scale above age 80 and the female mortality table. Furthermore, it appeared to us that, in the light of recent annuity mortality experience, a satisfactory mortality basis could be obtained by merely adjusting the *a*–1949 Table and Projection Scale B. Thus there seemed to be no valid reason to abandon the *a*–1949 Table and Projection Scale B entirely. In other words, we felt that, from a practical point of view, it would be preferable to adjust the *a*–1949 Table and Projection Scale B where modifications were required rather than to undertake a large job similar to the monumental job done by W. A. Jenkins and E. A. Lew in their paper "A New Mortality Basis for Annuities."[1]

Messrs. Jenkins and Lew point out that select mortality is an important factor at the older ages. We agree that select mortality should be considered in determining annuity premium rates. However, our primary purpose was to bring up to date the original *a*-1949 Table and Projection Scale B so that they would be able to perform their function as a basis for annuity premiums and reserves under modern conditions. Thus, we excluded the experience of the first policy year in the construction of "The 1960 Modification of the *a*–1949 Table with Projection" because that was

[1] *TSA* I, 369.

the practice followed in the construction of the *a*-1949 Table and we wanted to keep our deviations from that mortality basis to a minimum.

Moreover, at the older ages, the mortality experience for the early durations is only a small part of the entire mortality experience. Consequently, any modification of the mortality rates at the older ages to eliminate all of the effects of selection would have had relatively little effect on the ultimate mortality rates presented in our note, as indicated in the following table by the small differences at the older ages between mortality ratios for the second and later contract years and for the sixth and later contract years.

INTERCOMPANY MORTALITY EXPERIENCE BETWEEN 1953 AND 1958
ANNIVERSARIES UNDER IMMEDIATE NONREFUND ANNUITIES

(Expected deaths based on The 1960 Modification of the
a-1949 Table with Projection*—Experience
by number of contracts)

ATTAINED AGES	RATIOS OF ACTUAL TO EXPECTED DEATHS			
	Males		Females	
	Second and Later Contract Years	Sixth and Later Contract Years	Second and Later Contract Years	Sixth and Later Contract Years
Under 60............	138%	140%	187%	166%
60–69..............	104	97	109	108
70–79..............	109	110	108	108
80–89..............	110⎱107%	110⎱108%	107⎱107%	108⎱108%
90 and over.........	96⎰	98⎰	106⎰	106⎰
All Ages.............	108%	108%	107%	108%

* Including the five year advance in year of entry for females.

Mr. Jenkins gives a very interesting discussion of projection rates. He suggests that the projection scale should be level until some age like 70, and should then decrease with increase in age. We merely used the age 80 Projection Scale B rate of .005 for all ages 81–108, since the latter ages seemed to be those needing adjustment. As noted by Mr. Jenkins, the knowledge of changes in mortality rates at high ages is too small at the present time to permit precise determination of projection rates.

With regard to the point raised by Mr. McCarter about female mortality rates at ages under 60, we felt that the volume of experience at the younger ages was rather small and that a special modification of the *a*-

1949 mortality rates at these ages was not justified from a practical point of view.

With regard to Mr. McCarter's question about joint life annuity values, it is suggested that equivalent equal ages be obtained in the same way as for the (unmodified) a-1949 Table, and that all other calculations be made by the same procedure as would be used for the (unmodified) a-1949 Table but with the substitution of the new mortality basis. From a few calculations which we have made, it appears that joint life annuity values determined by the suggested method will have errors which are of the same order of magnitude as those for the (unmodified) a-1949 Table.