

## THE EFFECTS OF MORTALITY ON INDIVIDUAL ANNUITIES

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### I. INTRODUCTION

The purpose of this paper is to illustrate the effects of mortality on the pricing and valuation of individual immediate annuities. Historical annuity mortality experience gathered from the *Transactions* is reviewed to provide a basis for projecting future annuity mortality improvement. Marginal effects of mortality on the pricing of an idealized model office of immediate annuities issued over a 20-year period are examined.

Considerations in the underwriting of substandard annuities and their effects on pricing and valuation of structured settlement annuities also are presented.

### II. HISTORICAL EXPERIENCE

#### *The 1940s*

“In order to know where you are going, examine from whence you come” has always been sage advice. A review of the findings on annuity mortality presented in actuarial literature will set the stage for our examination of the effects of variations in mortality experience.

Jenkins and Lew, in their landmark paper “A New Mortality Basis for Annuities” [12], presented the Joint Mortality Committee’s experience on immediate nonrefund annuities from 1941 to 1946 anniversaries as the basis for the 1943 Experience Table. This table was the foundation for the construction of the Annuity Table for 1949, which included conservatively estimated changes in mortality between 1943 and 1949. Both tables provide for a one-year select mortality period.

Jenkins and Lew introduced the concept of projecting anticipated future mortality experience in pricing and valuation in order to recognize continuing trends in mortality improvement as well as medical advances that promote longevity. They reviewed principal North American long-term mortality statistics from insurance and population sources to determine average yearly rates of decrease in mortality by decennial age groups, and elicited the informed opinion of many authorities in the fields of population, public health, geriatric medicine, and medical specialists on what could be expected in the future. The results of their work formed the basis for two mortality projection scales.

The first scale, Projection Scale A, assumes a continuation of the rates of mortality decrease determined by Jenkins and Lew in their studies. The second scale, Projection Scale B, assumes a prospective viewpoint, reflecting their moderately conservative conclusions on how future mortality improvements will occur, independent of past experience. Jenkins and Lew derived Projection Scale B by assuming smaller rates of decrease in mortality at the younger ages and somewhat higher rates of decrease at ages over 60. Younger-age mortality was assumed to have run its course of improvement, while older-age mortality was assumed to be subject to efforts to reduce mortality from cardiovascular-renal diseases, cancer, and new medical discoveries and techniques.

Using Projection Scale B, Jenkins and Lew derived two forecasted tables, the Annuity Table for 1959 and the Annuity Table for 1979, to represent conservative estimates of annuity mortality that would likely be in effect 10 and 30 years after 1949, respectively. Comparison of mortality rates under the conservatively loaded 1937 Standard Annuity Table with the authors' tables, with and without projection, reveals the change that had been occurring and was projected to occur over the years. Table 1 compares male and female mortality rates from these tables at selected ages.

TABLE 1  
COMPARISON OF MORTALITY RATES ( $1000q_x$ )  
FROM 1937 STANDARD ANNUITY, 1943 EXPERIENCE TABLE (ULTIMATE),  
AND ANNUITY TABLE FOR 1949 (ULTIMATE)

Age $x$	1937 Standard Annuity	1943 Experience Table	Annuity Table for 1949	Annuity Table for 1959	Annuity Table for 1979
Male					
15 ....	1.262	0.800	0.537	0.474	0.368
35 ....	2.981	1.779	1.391	1.227	0.954
55 ....	13.554	12.876	10.565	9.316	7.244
75 ....	60.464	60.248	54.501	50.743	43.978
95 ....	248.059	332.413	316.834	316.834	316.834
Female					
15 ....	1.257	0.432	0.278	0.245	0.191
35 ....	2.065	1.266	0.942	0.831	0.646
55 ....	9.288	5.920	4.705	4.149	3.226
75 ....	41.758	41.267	35.829	33.360	28.918
95 ....	177.138	300.501	288.153	288.153	288.153

At ages up to 94, mortality rates under the Annuity Tables for 1959 and 1979 show decreasing improvement when compared to rates under the 1943

Experience Table. At ages 95 and older, mortality rates under the Annuity Tables for 1959 and 1979 were assumed to be the same as those under the Annuity Table for 1949, with grading at ages 88 to 94.

Annuitant mortality can be divided into three groups: ages below 40, ages 40–60, and ages over 60. Jenkins and Lew indicate that for ages below 60, improvement in mortality rates have a relatively minor effect on immediate life annuity values. Therefore, they conclude that mortality improvement at ages 60 and older will have the controlling effect on annuity values, with cardiovascular-renal disease being the major contributor to higher death rates. They show that even partial improvement in this area could produce significant reduction in mortality rates.

Jenkins and Lew proposed Projection Scale B as the most reasonable basis for projecting mortality improvement up to age 90. They assume no future improvement in mortality for ages 90 and over.

Within a year after publication of the Jenkins and Lew paper, Bowerman [3] proposed modifications to the 1949 tables, including lower death rates at ages 89 and older in order not to exceed population and insured life mortality rates for the same time period, and extending the tables to age 120. Bowerman indicates that intercompany annuity data at advanced ages were sparse and population data provided a firmer basis for deriving advanced-age annuity mortality than that used by Jenkins and Lew. An extension of the British A1924–29 insured life experience table was used to extend Bowerman's table beyond age 109 when population figures ran out.

Peterson, in his paper "Group Annuity Mortality" [17], indicates that other actuaries also have questioned the assumption that there will be no further improvement in longevity beyond age 89.

### *The 1950s*

These impressions also were borne out by facts. In 1961, Sternhell and Page presented their paper "The 1960 Modification of the  $\alpha$ -1949 Table with Projection—Actuarial Note" [21]. The authors reviewed three intercompany immediate annuities mortality studies prepared by the Committee on Mortality under Ordinary Insurance and Annuities. These studies covered experience between 1946 and 1948, 1948 and 1953, and 1953 and 1958 anniversaries. Aggregate mortality margins in the  $\alpha$ -1949 Table had just about disappeared based upon the improved experience exhibited both between 1948 and 1953 anniversaries and 1953 and 1958 anniversaries. Mortality improvement at ages 80 and over in both these studies was evident, especially for females.

Sternhell and Page therefore proposed modification of the *a*-1949 Table and of Projection Scale B to reflect the latest improvement in mortality and to restore the *a*-1949 Table margins. Table 2 compares the annual rates of decrease in mortality rates assumed by Jenkins and Lew under Projection Scale B with the 1960 Modification of the *a*-1949 Table with Projection assumed by Sternhell and Page.

TABLE 2  
ANNUAL RATES OF DECREASE IN MORTALITY RATE\*

Attained Age	Rate for Projection Scale B	Rate for the 1960 Modification of the <i>a</i> -1949 Table with Projection	Jenkins Suggested Projection Scale
0-50 .....	1.25%	1.25%	1.25%
60 .....	1.20	1.20	1.25
65 .....	1.10	1.10	1.25
70 .....	0.95	0.95	1.25
75 .....	0.75	0.75	1.10
80 .....	0.50	0.50	0.90
85 .....	0.25	0.50	0.70
90 .....	0	0.50	0.50
95 .....	0	0.50	0.30
100 .....	0	0.50	0.15
105-108 .....	0	0.50	0
109 .....	0	0	0

\*Rates at intermediate ages are derived by straight-line interpolation.

It is interesting to note Lew's comments in his discussion of the Sternhell and Page paper. Lew shows that the effects of select mortality are more important than the effects of future improvement in mortality, especially past age 70, in computing immediate annuity rates. He also questions the attention given to the ultimate level of mortality rates at attained ages over 80 in view of the nature of the experience data available. In his discussion, Jenkins recommends that Sternhell and Page should have assumed somewhat larger annual rates of mortality improvement at ages 60-85 and somewhat smaller rates at ages 95 and over, as shown in the last column of Table 2. Jenkins points out that projections of future mortality rates are a practical necessity. Without them, rates and reserves will sooner or later produce financial losses that can be sizable.

*The 1960s*

Lew makes a far-reaching comment [13] in 1969, based upon his review of intercompany experience [7] covering the period from 1963 to 1967 anniversaries. This experience showed further declines in ultimate mortality, which again eliminated margins in the Sternhell and Page modified *a*-1949 Table. He points out that decreases in annuitant mortality may occur because of a change in the character of our customers.

Further details on the intercompany experience study covering the period from 1963 to 1967 anniversaries are provided by Cherry in his paper "The 1971 Individual Annuity Mortality Table," published in 1971 [6]. The need for this table, to be used for valuing annuities, arose because of surplus strains produced by new money interest rates used in pricing annuities that were higher than the maximum 3-1/2% interest rate permitted for valuation of annuities. A new table, the 1963 Experience Table, was constructed as the basis for the valuation table.

The new 1963 Experience Table was developed by combining the experience under immediate annuities, life income settlements and matured deferred annuities based upon the combined intercompany mortality studies of immediate annuities from 1963 to 1967 anniversaries and of settlement annuities from 1960 to 1965 anniversaries. Lew had commented that annuity mortality is more significantly affected by amounts of annual income than by number of contracts, so the new experience table was derived on this basis.

Mortality rates for males and females under the 1963 Experience Table are less than those under the Annuity Table for 1949. A mixed result appears when rates under the 1963 Experience Table are compared with those under the Annuity Table for 1959. All male rates, except at age 95, are lower under the Annuity Table for 1959 — and would be more so if that table had been projected to 1963. Only female ages around the middle 50s are lower under the Annuity Table for 1959. Settlement option annuity rates exhibit aggregate mortality improvements somewhat larger than those for immediate annuities. Blending them with immediate annuity rates and introducing group annuity mortality at ages 50 and below calls for caution in comparing the 1963 Experience Table with tables generated earlier.

Cherry analyzed average annual rates of decrease in mortality separately on immediate annuities and settlement annuities based upon prior experience studies compared to the present studies. He concludes that Projection Scale B is a fairly good representation of historical improvements and that it also

provides a reasonable set of assumptions for projecting future mortality decreases over the next 20 years.

### *The 1970s*

Projection Scale B, originally propounded by Jenkins and Lew in 1949, appeared in 1971 to be a reasonable gauge of future mortality improvement over the next 20 years. But mortality improved at such a pace that in 1980 a committee was formed to again study annuitant mortality and the need for a new valuation table. The results of the committee's work were presented in the *Transactions* as a paper titled "Report of the Committee to Recommend a New Mortality Basis for Individual Annuity Valuation (Derivation of the 1983 Table  $\alpha$ )," which was published in 1981 [18].

The committee determined from 1971–76 annuity mortality experience that a new valuation table was needed for the 1980s and that recent improvement in mortality at the high ages required replacement of Projection Scale B. Other sources of mortality at the higher ages, such as U.S. population mortality, confirmed this improvement.

The committee came to the same conclusions as the committee preparing the 1971 IAM valuation table: that the 1983 Table  $\alpha$  for valuation should also be based on:

- The total experience under immediate refund and nonrefund annuities, matured deferred annuities and settlement options (Only pension trust issues were excluded.)
- Amounts of income rather than number of contracts
- Inclusion of all durations in the experience studies, that is, an aggregate table, which would be safer for a valuation table than an ultimate mortality table
- Sex-distinct mortality tables, to avoid the problem of companies having varying male-female business distributions from that assumed in developing the valuation table, either at issue or at a later time
- A limiting age of 115 at which  $q_x = 1$
- Mortality rates below age 50 from a source other than the experience studies.

Construction of the 1983 Table  $\alpha$  first required development of the 1973 Experience Table. Data were compiled based upon the Society's 1971–76 annuity mortality study, yielding usable mortality rates only at ages over 50. Graduation of rates reduced usable rates to ages over 60 only. Therefore, the committee took 1971 IAM Table mortality rates at ages 47 and under, backing out the 10% load factor, which would be added later to rates at all ages under the new experience table, the 1971–76 graduated rates at ages 67 and over, and used a cubic curve to connect the two sets of mortality

rates. A regraduation of these rates produced the 1973 Experience Table. Table 3 compares these rates with the 1963 Experience Table rates and includes 1983 Basic Table rates for future discussion.

TABLE 3  
COMPARISON OF MORTALITY RATES ( $1000q_x$ )

Age $x$	1963 Experience Table ( $1000q_x$ )	1973 Experience Table		1983 Basic Table	
		$1000q_x$	Ratio to 1963 Experience Table	$1000q_x$	Ratio to 1973 Experience Table
Males					
7 ....	0.457	0.448	0.980	0.370	0.826
17 ....	0.518	0.507	0.979	0.508	1.002
27 ....	0.775	0.759	0.979	0.756	0.996
37 ....	1.468	1.422	0.969	1.146	0.806
47 ....	4.253	4.155	0.977	3.343	0.805
57 ....	11.817	9.601	0.812	7.658	0.798
67 ....	25.647	21.682	0.845	17.467	0.806
77 ....	61.574	57.261	0.930	47.272	0.826
87 ....	145.608	138.957	0.954	119.894	0.863
97 ....	377.968	281.058	0.744	243.467	0.866
107 ....	734.383	568.770	0.774	518.120	0.911
Females					
7 ....	0.197	0.180	0.914	0.149	0.828
17 ....	0.266	0.240	0.902	0.239	0.996
27 ....	0.475	0.433	0.912	0.431	0.995
37 ....	0.915	0.832	0.909	0.673	0.809
47 ....	2.018	1.850	0.917	1.500	0.811
57 ....	5.981	4.801	0.803	3.832	0.798
67 ....	13.386	12.664	0.946	10.012	0.791
77 ....	40.587	34.574	0.852	28.433	0.822
87 ....	128.843	104.173	0.809	90.907	0.873
97 ....	268.911	254.797	0.948	220.718	0.866
107 ....	499.209	484.418	0.970	451.160	0.931

The committee worked to develop projection factors over the period 1973–1983 that, when applied to the 1973 Experience Table, would produce the 1983 Basic Table. When loaded 10%, this table would be the desired 1983  $\alpha$  valuation table. Suitable data for a projection were unavailable, yet it was recognized that there was a substantial drop in mortality since 1968, especially at older ages, and therefore improvement rates derived from prior annuity experience were inappropriate to apply over the 1973–1983 period. Because U.S. white population improvement rates tended to follow annuity and settlement option experience over the period covered by the 1963 Experience Table data, the committee used this experience, incorporating Medicare experience to some degree, in deriving its own single set of projection

factors for males and females for 1973–1983. Sex-distinct projection factors were derived for projecting mortality beyond 1983. The reason for hesitating to use Medicare experience improvement rates at higher ages is that the data were available only for white and nonwhite lives combined.

Table 4 compares the 1973–83 projection factors with those of Projection B developed by Jenkins and Lew as well as a scale later suggested by Jenkins.

TABLE 4  
COMPARISON OF IMPROVEMENT FACTORS (INTERPOLATED\*)

Age	Projection B	Jenkins' Suggested Scale	1973–1983 Assumed Factors
7	1.25%	1.25%	2.00%
12–27	1.25	1.25	0
32	1.25	1.25	1.00
37–50	1.25	1.25	2.25
60	1.20	1.25	2.25
65	1.10	1.25	2.25
70	0.95	1.25	2.25
75	0.75	1.10	2.10
80	0.50	0.90	1.85
85	0.25	0.70	1.60
90	0	0.50	1.60
95	0	0.30	1.60

\*Straight-line interpolation for ages not shown.

Mortality experience has caused prior estimates of improvement rates, which were reasonable based upon medical and social developments around 1950 and 1960, to be woefully inadequate according to such developments over the ensuing 10–20 years. The 1973–1983 Assumed Factors at ages 65 and older are more than double those under Projection B and the 1.60 rate continues beyond age 90, while the Projection B rates assume no improvement for ages 90 and above. Jenkins' suggested scale was an improvement, but the committee's rates exceed twice Jenkins' rates at ages 80 and older.

The 1973–1983 period has resulted in an approximately overall 10–15 percent decrease in mortality rates for both sexes according to the committee's assumptions. The 1963–1973 period resulted in an approximately 10 percent decrease in mortality rates.

### *The Early 1980s*

Controversy abounds regarding the future trend of mortality improvement in the early 1980s for the elderly, although there is agreement that other

age-group segments will experience mortality improvement. The committee reviewed literature on the topic of aging with the following results.

- In his article "Aging, Natural Death and the Compression of Mortality" [9], Fries comments that whereas chronic disease may be postponed so that more people live longer to reach the expected length of life (about age 85), the total length of life is fixed for all practical purposes because of the loss of organ reserve with increasing age so the body cannot restore itself after a health threat. We may expect decreases in mortality, but they will lessen with increasing age.

Yet, recent decreases in U.S. white population mortality and Medicare experience are in contradiction to Fries' viewpoint.

- In their article "The Recent Decline in Mortality of the Extreme Aged: An Analysis of Statistical Data" [19], which relies on intercensal estimates of U.S. population in the 1970s, Rosenwaike, Yaffe and Sagi disagree with the idea that there may only be little improvement in the extremely aged mortality rates.

The committee questions some of Rosenwaike et al.'s analyses, which were based upon Medicare experience compared with Census Bureau population estimates, thinking that some of the substantial drop in mortality for the over-age-85 group is probably due to age misstatements and other errors.

- The authors above share an opinion that the sharp downturn in cardiovascular disease mortality is due to a single cause: controlling heart disease risk factors, plus more effective emergency, acute and long-term care for patients with cardiovascular disease.

Another writer, Stallones [20], concludes that there is no single cause or combination of causes that accounts for the decline in ischemic heart disease.

In his discussion "Mortality Trend in Hypertension, United States, 1950-1976" [2] Borhani comments that "mortality from hypertension and hypertensive heart disease has declined steadily and dramatically since 1950." He believes the underlying cause to be a much increased public awareness of hypertension and an increase in the rate of adequate treatment of this ailment.

- Analysis of the major causes of death among U.S. white population between 1968 and 1978 by the Statistical Bureau of the Metropolitan Life Insurance Company corroborated the opinions on heart and circulatory deaths and also showed substantial decreases for several other causes of death.

The committee indicates that the distribution by cause of death for annuitants would differ from that of the U.S. population, but no such annuitant analysis is available. Hence, any set of future mortality improvement factors must be based on their relationship to changes by cause of death.

Agreement on future trends in mortality for annuitants is difficult to reach. Conjecture will become more the method of analysis because of an expected paucity of data. Several companies contributing data to the Society's Committee on Mortality under Ordinary Insurance and Annuities have, because

of the expense, ceased their contributions. This committee expected to complete a study of annuitant mortality over the 1976–81 period some time during 1987, but a report is still forthcoming.

### III. THE PRESENT

#### *The Middle and Later 1980s — Traditional Annuitant Mortality*

Our historical review of annuitant mortality has taught us that longevity is inexorably extending. Although one may quibble about the rate of extension and its effect on various age groups, mortality projection factors obviously are a necessity in both the adequate pricing of annuities and their valuation. For valuation, we can use a conservatively constructed static mortality table because reserve strengthening can occur prospectively, but non-participating annuity pricing must anticipate mortality improvements dynamically.

Several factors could soon cause a decrease in annuity mortality improvement for fixed-benefit annuities as a group. Heretofore, this group was somewhat homogeneous and was characterized by its ability to antiselect in its purchase of an annuity, thereby outliving insured lives and the general U.S. population of the same age. Such antiselection should not be expected to abate.

Tax laws of the U.S. favor the purchase of deferred annuities as a means by which an individual can defer tax on the interest income declared by the insurer under such an annuity. Insurers have received a very large amount of premium over the last five to six years, and the public continues to purchase this product. Eventually, these amounts will be annuitized with limited antiselection. In addition, the Tax Reform Act of 1986 requires a minimum amount of withdrawal each year from the Individual Retirement Account funds of every person over the age of 70-1/2. Even a small percentage of such withdrawals via annuitization for a life annuity would result in a large group of annuitants who have not antiselected.

Since the early 1980s, a new and burgeoning group of annuity contracts has been characterized by a complete lack of antiselection. The contract usually is the result of a settlement by a casualty insurer in a personal injury case and is known as a structured settlement annuity. A complete description of this line of business is provided by a panel discussion published in the *Record* under the title "Immediate Annuities and Structured Settlements" [11]. Structured settlement annuitants are not deciding to purchase or not to purchase an annuity because of their own feelings about their longevity.

Other economic realities and pressures prevail at the time of settlement with the casualty insurer. The socioeconomic status of such annuitants might be expected to differ from that of an individual electing to purchase an annuity.

The mortality to be expected from structured settlement annuitants would be more akin to the mortality expected from the U.S. population. Unless a separate class for the structured settlement group is established when studying annuitant mortality, an attenuation of the mortality improvement rates exhibited by the combined groups could reasonably be expected. This fact, plus the anticipation that future intercompany annuity mortality studies may not be produced, forces us to base annuity projection factors on some modification of U.S. population mortality improvements when pricing annuities for the last half of the 1980s and beyond. As stated by the committee recommending 1983 Table *a* for valuation,

“Any set of future improvement rates must take into consideration that there will be periods of retrogression and no improvement in addition to periods of greater than average improvement.”

Indeed, the committee developed Projection Scale G for 1983 and beyond for just these reasons.

Projection Scale G assumes that the prime forces affecting annuitant mortality are the same as those affecting the U.S. population; that is, the focus on mortality improvement factors must be based upon their relationship to changes by cause of death, especially because we can reasonably assume that there will be no increasing annuitant antiselection when purchasing annuities. A projection of future U.S. mortality using cause-of-death analyses of the U.S. population by the U.S. Department of Health and Human Services [1] formed the basis of the committee's Projection Scale G development. The committee took these cause-of-death rates and converted them to an all-cause basis to develop Projection Scale G. Since that study in 1980, the Social Security Administration (SSA) has published *Actuarial Study No. 87*, in September 1982 [8]. *Actuarial Study No. 87* not only presents mortality rates of the U.S. population for 1980 based upon the latest statistics then available, but also projects mortality out to the year 2050 with a mortality table being developed for the beginning of each decade. In their analysis, the SSA actuaries examined mortality improvements during 1968–78 for ten major groups of causes of death and then considered how new diagnostic and surgical techniques, environmental conditions, improvements in nutrition, incidence of violence, treatment of causes of diseases, prenatal care improvements, incidence of abortion, cigarette smoking, drug misuse, and

value of life conception changes would affect future improvements in mortality. The AIDS epidemic was not factored into the projection.

Annual percentage improvements in central death rates by sex and cause of death for the years 2007 and later were postulated. Prior to 2007, mortality improvement was assumed to change gradually from historical improvements observed during 1968–78. Mortality tables for each decade were prepared based upon the projected mortality. Table 5 compares the improvement rates shown in the committee's report under its Table 21 [18, page 719] with the improvement rates shown in the SSA's Study [8, page 15] and with the committee's Projection G factor applicable to the central age.

Note that the annual improvement rates shown in the committee's Table 21 were derived by projecting 1977 U.S. population mortality rates over a ten-year period utilizing the SSA's Alternative II assumptions from *Actuarial Study No. 82*. The annual improvement rates shown in our Table 5 were derived by the SSA actuaries after analyzing improvements in central death rates during 1968–78 by age, sex and cause of death and then developing calendar-year U.S. Life Tables for decennial years beginning with 1990 and ending with 2050.

Table 5 reveals the diversity of results when the SSA improvement rates are compared with those derived by the committee. For males they range from 110 percent, 41 percent, and 62 percent increases at central ages 0, 2, and 7, respectively, to 40 percent and 86 percent increases at central ages 77 and 82, respectively. Other central age increases are more in the 0–25 percent range, with three central ages showing a lower improvement rate under *Actuarial Study No. 87*. Ratios for females are similar but less pronounced; for example, the central ages 0 and 82 ratios are only 88 percent and 23 percent, respectively. Other female central age ratio increases are closer to 10 percent, except for central ages 32 and 37. These ratios indicate a general assumption of greater mortality improvement at almost all ages, especially the youngest and oldest central ages, when the latest study is compared with the previous study, for both sexes.

It is informative to compare the Projection G improvement factors with the other improvement factors shown in Table 5. Mortality improvement rates exhibited at almost all ages in its derived study of U.S. population improvement rates were reduced by the committee, especially at male central ages 12 to 32. The latest SSA study indicates a continuation of mortality improvement in the U.S. population. However, remember that we are dealing with improvement in mortality rates of individual annuitants who already

TABLE 5  
 COMPARISON OF U.S. POPULATION ANNUAL MORTALITY IMPROVEMENT RATES  
 UNDER SOCIAL SECURITY ADMINISTRATION'S *Actuarial Study No. 87*  
 AND THE SOCIETY'S COMMITTEE DERIVING 1983 TABLE  $\alpha$

Age	Central Age	Males				Females			
		<i>SSA Actuarial Study No. 87</i>	Committee Deriving 1983 Table $\alpha$	Ratio*	Projection G	<i>SSA Actuarial Study No. 87</i>	Committee Deriving 1983 Table $\alpha$	Ratio*	Projection G
0.....	0	5.08%	2.42%	2.10	—	4.67%	2.49%	1.88	—
1-4.....	2	2.87	2.03	1.41	—	3.45	2.36	1.46	—
5-9.....	7	3.28	2.02	1.62	1.50	3.46	2.47	1.40	1.50
10-14.....	12	2.16	1.78	1.21	0.25	2.59	2.50	1.04	1.00
15-19.....	17	1.40	1.23	1.14	0.20	1.69	1.81	0.93	0.50
20-24.....	22	1.44	1.16	1.24	0.10	1.77	1.94	0.91	0.50
25-29.....	27	1.11	1.43	0.78	0.10	2.62	2.49	1.05	0.75
30-34.....	32	2.21	1.87	1.18	0.75	3.76	2.78	1.35	1.25
35-39.....	37	2.66	2.30	1.16	1.00	4.01	2.90	1.38	2.25
40-44.....	42	2.69	2.54	1.06	2.00	3.00	2.70	1.11	2.25
45-49.....	47	2.38	2.53	0.94	1.75	2.53	2.27	1.11	2.00
50-54.....	52	2.16	2.35	0.92	1.75	2.07	1.97	1.05	2.00
55-59.....	57	2.55	2.12	1.20	1.50	2.00	1.70	1.18	1.75
60-64.....	62	2.00	1.84	1.09	1.50	1.51	1.62	0.93	1.75
65-69.....	67	1.58	1.56	1.01	1.50	1.67	1.64	1.02	1.75
70-74.....	72	1.51	1.27	1.19	1.25	2.30	1.77	1.30	1.75
75-79.....	77	1.43	1.02	1.40	1.25	2.56	1.93	1.33	1.50
80-84.....	82	1.54	0.83	1.86	1.25	2.60	2.11	1.23	1.50
85-89.....	87	1.56	N.G.	—	1.25	2.43	N.G.	—	1.50
90-94.....	92	1.59	N.G.	—	1.00	1.96	N.G.	—	1.25

\**SSA Actuarial Study No. 87* result divided by Committee Deriving 1983 Table  $\alpha$  result.  
 N.G. — not given.

exhibit greater longevity than that of the U.S. population. Hence, as previously discussed, U.S. population rates of mortality improvement can be expected to exceed that of the individual annuity population group.

When a study is produced ten years hence, we will probably find that neither the assumptions under *SSA Actuarial Study No. 87* nor Projection G have been accurate. The question is, how inaccurate will they be? There is no specific answer to this question, especially because the homogeneity of the individual annuity class will change as discussed above. Therefore, I believe, a range of individual annuity mortality improvement projection scales is appropriate, to be represented by Projection I and Projection J. The following assumptions are arbitrary and are intended to indicate the effect on annuities of this range of projection factors.

In deriving these scales, we conservatively assume that, for annuity pricing purposes, both the *SSA Actuarial Study No. 87* and Projection G understate mortality improvement by 10 percent. We further assume that Projection I and Projection J lie between the adjusted aforementioned scales. Projection I is assumed to be equal to Projection G as adjusted plus 15 percent for males and 10 percent for females of the difference between the adjusted scales, except that for male central ages 12 to 32 inclusive the 15 percent factor is 10 percent. Projection J is assumed to be the average of the adjusted scales, except that for central ages 12 to 32 inclusive, Projection J equals Projection G as adjusted plus 20 percent of the difference between the adjusted scales. Projection I and Projection J values are then rounded. Table 6 shows the derivation of Projection I and Projection J. Table 7 compares Projection G with Projection I and Projection J. The resulting ratios imply that these latter two projection scales would produce significantly different effects on a portfolio of issued annuities. However, that may not necessarily be the case, depending upon the certain periods involved in the portfolio of annuities issued.

Other assumptions can obviously be made, and each assumption will produce its own effect on a portfolio of issued annuities. The effects on pricing of assuming Projection Scales I and J are studied later in this paper. We can then see how significantly different the effects on pricing of a Projection Scale J assumption are from the effects on pricing of a Projection Scale I assumption. If, in the opinion of the actuary performing such a study, the resulting premiums are not conservative enough or are too conservative, the actuary can modify the projection scale assumption and apply it in accordance with the procedures discussed in Section IV of this paper to produce gross premiums that incorporate mortality improvement in pricing.

TABLE 6  
DERIVATION OF PROJECTION I AND PROJECTION J

Males						
Central Age	(1) 110% of Study No. 87	(2) 110% of Projection G	(3) Projection I 0.15(1) + 0.85(2)	(4) Projection J 0.5(1) + 0.5(2)	(5) Final Projection I	(6) Final Projection
0	5.59%	0	0.84%	2.80%	0.85%	2.80%
2	3.16	0	0.47	1.58	0.50	1.60
7	3.61	1.65%	1.94	2.63	2.00	2.60
12	2.38	0.28	0.49*	0.70†	0.50	0.70
17	1.54	0.22	0.35*	0.48†	0.35	0.50
22	1.58	0.11	0.26*	0.40†	0.25	0.40
27	1.22	0.11	0.22*	0.33†	0.20	0.35
32	2.43	0.83	0.99*	1.15†	1.00	1.15
37	2.93	2.20	2.31	2.57	2.30	2.60
42	2.96	2.20	2.31	2.58	2.30	2.60
47	2.62	1.93	2.03	2.28	2.00	2.30
52	2.38	1.93	2.00	2.16	2.00	2.20
57	2.81	1.65	1.82	2.23	1.80	2.20
62	2.20	1.65	1.73	1.93	1.75	1.90
67	1.74	1.65	1.66	1.70	1.65	1.75
72	1.66	1.38	1.42	1.52	1.40	1.50
77	1.57	1.38	1.41	1.48	1.40	1.50
82	1.69	1.38	1.43	1.54	1.40	1.50
87	1.72	1.38	1.43	1.55	1.40	1.50
92	1.75	1.10	1.29	1.43	1.30	1.50
97	N.G.	1.10	1.16‡	1.30‡	1.15	1.30

  

Females						
Central Age	(1) 110% of Study No. 87	(2) 110% of Projection G	(3) Projection I 0.10(1) + 0.90(2)	(4) Projection J 0.5(1) + 0.5(2)	(5) Final Projection I	(6) Final Projection
0	5.14%	0	0.51%	2.57%	0.50%	2.60%
2	3.80	0	0.38	1.90	0.40	1.90
7	3.81	1.65%	1.87	2.73	1.90	2.75
12	2.85	1.10	1.28	1.45	1.25	1.45
17	1.86	0.55	0.68	0.81	0.70	0.80
22	1.95	0.55	0.69	0.83	0.70	0.80
27	2.88	0.83	1.04	1.24	1.00	1.25
32	4.14	1.38	1.66	1.93	1.65	1.95
37	4.41	2.48	2.67	3.45	2.65	3.45
42	3.30	2.48	2.56	2.89	2.55	2.90
47	2.78	2.20	2.26	2.49	2.25	2.50
52	2.28	2.20	2.21	2.24	2.20	2.25
57	2.20	1.93	1.96	2.07	1.95	2.10
62	1.66	1.93	1.90	1.80	1.90	1.80
67	1.84	1.93	1.92	1.89	1.90	1.90
72	2.53	1.93	1.99	2.23	2.00	2.25
77	2.82	1.65	1.77	2.24	1.75	2.25
82	2.86	1.65	1.77	2.26	1.75	2.25
87	2.67	1.65	1.75	2.16	1.75	2.15
92	2.16	1.38	1.46	1.77	1.45	1.75
97	N.G.	1.38	1.43‡	1.65‡	1.45	1.65

\*0.10 × (1) + 0.90 × (2).

†0.20 × (1) + 0.80 × (2).

‡Assumed.

N.G. — not given.

**TABLE 7**  
**COMPARISON OF PROJECTION G WITH PROJECTION I AND PROJECTION J**

Central Age	Projection			Ratios	
	G	I	J	Proj. I/Proj. G	Proj. J/Proj. G
<b>Males</b>					
0.....	—	0.85%	2.80%	—	—
2.....	—	0.50	1.60	—	—
7.....	1.50%	2.00	2.60	133%	173%
12.....	0.25	0.50	0.70	200	280
17.....	0.20	0.35	0.50	175	250
22.....	0.10	0.25	0.40	250	400
27.....	0.10	0.20	0.35	200	350
32.....	0.75	1.00	1.15	133	153
37.....	2.00	2.30	2.60	115	130
42.....	2.00	2.30	2.60	115	130
47.....	1.75	2.00	2.30	114	131
52.....	1.75	2.00	2.20	114	126
57.....	1.50	1.80	2.20	120	147
62.....	1.50	1.75	1.90	117	127
67.....	1.50	1.65	1.75	110	117
72.....	1.25	1.40	1.50	112	120
77.....	1.25	1.40	1.50	112	120
82.....	1.25	1.40	1.50	112	120
87.....	1.25	1.40	1.50	112	120
92.....	1.00	1.30	1.50	130	150
97.....	1.00	1.15	1.30	115	130
<b>Females</b>					
0.....	—	0.50%	2.60%	—	—
2.....	—	0.40	1.90	—	—
7.....	1.50%	1.90	2.75	127%	183%
12.....	1.00	1.25	1.45	125	145
17.....	0.50	0.70	0.80	140	160
22.....	0.50	0.70	0.80	140	160
27.....	0.75	1.00	1.25	133	167
32.....	1.25	1.65	1.95	132	156
37.....	2.25	2.65	3.45	118	153
42.....	2.25	2.55	2.90	113	129
47.....	2.00	2.25	2.50	113	125
52.....	2.00	2.20	2.25	110	113
57.....	1.75	1.95	2.10	111	120
62.....	1.75	1.90	1.80	109	103
67.....	1.75	1.90	1.90	109	109
72.....	1.75	2.00	2.25	114	129
77.....	1.50	1.75	2.25	117	150
82.....	1.50	1.75	2.25	117	150
87.....	1.50	1.75	2.15	117	143
92.....	1.25	1.45	1.75	116	140
97.....	1.25	1.45	1.65	116	132

*The Middle and Later 1980s — U.S. Population Mortality*

In view of the dramatic growth in sales of structured settlement annuities, the recent underlying mortality trends of the U.S. population should also be examined.

Table 8 compares the values of  $1000q_x$ , separately for the all races males and all races females at quinquennial ages under the most recent mortality tables published by the National Center for Health Statistics and the SSA in *Actuarial Study No. 87*. Mortality rates under the "U.S. Decennial Life Tables for 1979–81" were published in 1985 [15] and those under the "Vital Statistics of the United States 1982" Table were published in 1986 [16]. Mortality rates under the 1980 Life Table and 1990 Life Table were taken directly from *Actuarial Study No. 87*. Mortality rates for the 1987 Life Table were calculated by linear interpolation between the 1980 and 1990 Life Tables.

The improvement in U.S. population longevity when comparing the complete U.S. Decennial Life Table for 1979–81 mortality rates with those of the 1980 Life Table can be summarized as shown in Table 9.

Overall, the U.S. Decennial Life Table for 1979–81 shows mortality rates about the same or slightly lower than the mortality rates under the 1980 Life Table, until age 95, after which mortality rates under the former table are significantly lower.

Although Life Tables are based upon a sampling of deaths during the study year, whereas U.S. Decennial Life Tables are based upon the entire decennial census data, this comparison indicates that either type of table mortality rates can be used as a basis for estimating mortality, without materially affecting or masking the emerging improvement in mortality rates.

The Vital Statistics of the United States 1982 Table, when compared to the 1980 Life Table, shows mortality rates at most ages that are significantly lower — from 5 percent to 15 percent — for males and females, mostly 5–10 percent above age 40. This may be contrasted with the generally 1–5 percent reduction under the U.S. Decennial Life Table for 1979–81.

The close range of the ratios in Table 10 for the 1987 Life Table compared to the Vital Statistics of the United States 1982 Table at quinquennial ages seems to confirm the consistency between these tables. That is, the 1987 Life Table reasonably reflects additional expected mortality improvement over the period 1982–1987, and therefore the 1987 Life Table can be used to represent *current* expected mortality of the U.S. population.



TABLE 8 — Continued

(1) Age	Values of 1000q <sub>x</sub>				Ratios to 1980 Life Table						
	(2) 1980 Life Table	(3) U.S. Dec. Life Table for 1979-1981	(4) Vital Stat. of the U.S. 1982 Table	(5) 1987 Life Table	(6) 1990 Life Table	(7) (3)/(2)	(8) (4)/(2)	(9) (5)/(2)	(10) (6)/(2)	(11) Age	
0	11.22	11.20	10.23	9.37	8.57	0.9982	0.9118	0.8351	0.7638	0	
5	0.30	0.31	0.30	0.24	0.22	1.0333	1.0000	0.8000	0.7333	5	
10	0.20	0.18	0.17	0.17	0.15	0.9000	0.8500	0.8500	0.7500	10	
15	0.40	0.40	0.37	0.36	0.34	1.0000	0.9250	0.9000	0.8500	15	
20	0.58	0.58	0.54	0.52	0.49	1.0000	0.9310	0.8966	0.8448	20	
25	0.65	0.65	0.60	0.59	0.56	1.0000	0.9231	0.9077	0.8615	25	
30	0.75	0.75	0.71	0.64	0.59	1.0000	0.9467	0.8533	0.7867	30	
35	0.98	1.04	0.95	0.78	0.69	1.0612	0.9694	0.7959	0.7041	35	
40	1.61	1.63	1.49	1.35	1.24	1.0124	0.9255	0.8385	0.7702	40	
45	2.66	2.62	2.45	2.28	2.11	0.9850	0.9211	0.8571	0.7932	45	
50	4.13	4.16	3.96	3.63	3.42	1.0073	0.9588	0.8789	0.8281	50	
55	6.32	6.27	6.12	5.63	5.33	0.9921	0.9684	0.8908	0.8434	55	
60	9.52	9.47	9.33	8.83	8.54	0.9947	0.9800	0.9275	0.8971	60	
65	14.55	14.27	14.16	13.60	13.19	0.9808	0.9732	0.9347	0.9065	65	
70	22.03	21.69	21.33	19.87	18.94	0.9846	0.9682	0.9020	0.8597	70	
75	34.32	33.88	32.99	29.81	27.87	0.9872	0.9612	0.8686	0.8121	75	
80	56.15	56.22	52.85	47.87	44.32	1.0012	0.9412	0.8525	0.7893	80	
85	93.52	94.09	85.21	79.21	73.08	1.0061	0.9061	0.8470	0.7814	85	
90	149.48	146.61	131.56	131.56	123.88	0.9808	0.9808	0.8801	0.8287	90	
95	224.28	218.23	207.67	207.67	200.55	0.9730	0.9730	0.9259	0.8942	95	
100	297.13	281.76	278.50	278.50	270.51	0.9483	0.9483	0.9373	0.9104	100	
105	379.22	328.17	355.44	355.44	345.25	0.8654	0.8654	0.9373	0.9104	105	
110	483.99	447.93	447.93	447.93	432.47	1.0000	1.0000	0.9255	0.8936	110	
115	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1.0000	1.0000	1.0000	1.0000	115	

Females

TABLE 9  
 SOCIAL SECURITY ADMINISTRATION'S 1980 LIFE TABLE  
 VERSUS U.S. DECENNIAL LIFE TABLE FOR 1979-81  
 COMPARISON OF  $1000q_x$  VALUES

Males		Females	
Age Category	Comment	Age Category	Comment
0-14 . . . . .	Almost no difference	0-14 . . . . .	Varying reductions from 4.5% to 14%
15-21 . . . . .	1979-81 Table shows 4%-8% lower rates	15-32 . . . . .	Generally the same rates wavering up or down by 1%-2%
22-49 . . . . .	Almost no difference or at most a 2% reduction in mortality rate	33-41 . . . . .	Increased mortality rates from 1.2% to 8.7%
50-58 . . . . .	2%-4% lower rates under 1979-81 Table	42-92 . . . . .	Generally the same rates or 1.5%-3.5% lower
59-64 . . . . .	Almost no difference	93-100 . . . . .	1.8%-5.2% lower rates
65-80 . . . . .	1.5%-4.5% lower rates under 1979-81 Table	101-109 . . . . .	6.3%-23% lower rates
81-96 . . . . .	Almost no difference		
97-109 . . . . .	A steadily increasing reduction in mortality from 1.5% to 18.9%		

TABLE 10  
 COMPARISON OF  $1000q_x$  VALUES  
 UNDER THE 1987 LIFE TABLE  
 WITH THE VITAL STATISTICS  
 OF THE UNITED STATES 1982 TABLE  
 AT QUINQUENNIAL AGES

Age	1987 Life Table	
	Male Ratio	Female Ratio
0 . . . . .	0.903	0.916
5 . . . . .	0.875	0.800
10 . . . . .	0.857	1.000
15 . . . . .	0.989	0.973
20 . . . . .	1.000	0.963
25 . . . . .	1.063	0.983
30 . . . . .	0.972	0.901
35 . . . . .	0.916	0.821
40 . . . . .	0.945	0.906
45 . . . . .	0.932	0.931
50 . . . . .	0.948	0.917
55 . . . . .	0.914	0.920
60 . . . . .	0.909	0.946
65 . . . . .	0.965	0.960
70 . . . . .	0.978	0.932
75 . . . . .	0.971	0.904
80 . . . . .	0.956	0.906
84 . . . . .	0.972	0.871

This can be seen more clearly by comparing values of  $1000q_x$  under the 1980 Life Table projected two years to 1982 using the mortality improvement rates (MIR) over the period 1980–1990 determined by the formula

$$\text{MIR} = 1 - \left[ \frac{1990 \text{ Life Table } 1000q_x \text{ Value}}{1980 \text{ Life Table } 1000q_x \text{ Value}} \right]^{1/10}$$

with values of  $1000q_x$  under the Vital Statistics of the United States 1982 Table.

Table 11 shows the  $1000q_x$  values under these tables and their ratios. Mortality rates for females at central ages 52 or older are almost identical, with variations of 2–5 percent for younger central ages. Males show variations in rates of 0–4 percent at central ages 52 or older and 0–11 percent at younger central ages.

TABLE 11

COMPARISON OF 1980 LIFE TABLE VALUES OF  $1000q_x$  PROJECTED TO 1982 USING THE MORTALITY IMPROVEMENT RATE OVER THE PERIOD 1980 TO 1990 WITH  $1000q_x$  VALUES FROM THE VITAL STATISTICS OF THE UNITED STATES 1982 TABLE

Central Age	Males			Females		
	1980 Life Table Projected to 1982	Vital Stat. of the U.S. 1982 Table	Ratio Vital Stat. 1982 Table to Projected 1982 L.T.	1980 Life Table Projected to 1982	Vital Stat. of the U.S. 1982 Table	Ratio Vital Stat. 1982 Table to Projected 1982 L.T.
2 . . . .	0.72	0.66	0.917	0.53	0.56	1.057
7 . . . .	0.32	0.34	1.063	0.24	0.22	0.917
12 . . . .	0.29	0.27	0.931	0.20	0.19	0.950
17 . . . .	1.44	1.30	0.903	0.51	0.49	0.961
22 . . . .	1.97	1.76	0.893	0.59	0.56	0.949
27 . . . .	1.95	1.73	0.887	0.67	0.62	0.925
32 . . . .	1.87	1.87	1.000	0.77	0.79	1.026
37 . . . .	2.31	2.21	0.957	1.07	1.11	1.037
42 . . . .	3.47	3.27	0.942	1.91	1.81	0.948
47 . . . .	5.60	5.40	0.964	3.06	2.98	0.974
52 . . . .	9.23	8.86	0.960	4.74	4.74	1.000
57 . . . .	13.96	13.73	0.984	7.25	7.24	0.999
62 . . . .	21.09	20.92	0.992	11.03	11.02	0.999
67 . . . .	33.63	32.12	0.955	16.92	16.72	0.988
72 . . . .	49.06	47.03	0.959	25.32	25.19	0.995
77 . . . .	72.02	69.65	0.967	39.84	39.66	0.995
82 . . . .	103.74	101.22	0.996	65.65	65.10	0.992

Of great import is the fact that when these MIR values are applied to the 1980 Life Table to project a 1987 Life Table, thus establishing a connection between the 1980 Life Table, Vital Statistics of the United States 1982 Table

and 1987 Life Table, the resulting mortality rates are very close to the linearly interpolated 1987 Life Table values shown in Table 8. Our linearly interpolated mortality rates are always higher. Simplicity of calculation, in this case, has not sacrificed accuracy in the resulting rates, although they could have been somewhat more conservative from a pricing viewpoint.

The appropriateness of mortality rates in the 1987 Life Table for advanced ages is confirmed in that the projected mortality experience shown under the 1987 Life Table for ages 66 and older, which reflects expected improvements since 1980, is consistent with the graduated Medicare probabilities of death within one year developed by Wilkin in his 1981 paper "Recent Trends in the Mortality of the Aged" [22]. His tables are based on Medicare data covering the period 1968-78 and present separate mortality scales for each year from 1968 to 1978 (preliminary figures only for 1978).

Table 12 shows a comparison of Wilkin's rates for 1977 with the 1987 Life Table rates, together with the average annual percentage decline over the period 1968-1978 shown in Wilkin's paper and the 1987 Medicare experience mortality rates that would have emerged if his rate of decline continued from 1968-1978 until 1987. Because Wilkin's mortality rates are presented at half-ages, for example, 65.5, 66.5, and so on, we used straight-line interpolation to determine his mortality rates at exact ages, 66, 67, and so on.

TABLE 12  
COMPARISON OF MORTALITY RATES  
1977 MEDICARE EXPERIENCE VS. 1987 LIFE TABLE

Age	Medicare Experience			1000q, 1987 Life Table	Ratio Life Tables to Medicare Experience Table 1987
	1977 1000q, Mortality Rate	Average Annual Percent Decline 1968-1978	Projected 1000q, Mortality Rate to 1987		
Males					
66.....	32.22	1.525%	27.63	28.93	104.7%
71.....	47.76	1.465	41.21	42.66	103.5
76.....	69.57	1.355	60.70	62.48	102.9
81.....	99.86	1.495	85.90	89.67	104.4
86.....	145.06	1.480	124.97	133.69	107.0
91.....	204.39	1.410	177.33	189.03	106.6
96.....	251.94	1.605	214.30	255.56	119.3
Females					
66.....	15.48	1.460%	13.36	14.80	110.8%
71.....	23.86	2.090	19.32	21.49	111.2
76.....	38.22	2.535	29.57	32.64	110.4
81.....	63.27	2.635	48.44	53.01	109.4
86.....	104.20	2.390	81.81	87.68	107.2
91.....	163.01	1.890	134.69	145.08	107.7
96.....	221.97	1.800	185.10	223.51	120.8

Obviously, we would not expect a projected mortality improvement rate under Medicare experience to operate accurately over a period of almost 20 years. A ratio of approximately 104 percent for males and 109 percent for females, at ages 66–91, when comparing the Life Table for 1987 with projected Medicare mortality rates during these years, nevertheless tends to confirm the agreement in resulting mortality rates between these tables. Therefore, we can assume that the projected 1987 Life Table represents current mortality experience of the U.S. population. Ratios of 119–121 percent at age 96 may be the result of a paucity of Medicare data at such advanced age. This does not detract from the overall conclusion reached above.

#### IV. THE EFFECT OF MORTALITY ON ANNUITY PRICING

##### *Traditional Annuities*

An insurer's gain or loss from mortality over the lifetime of a block of nonparticipating immediate annuity issues is locked in at the time of issue. Interest earnings and expenses each contribute their share of the gain or loss as the block of issues ages over time, but can be affected by an insurer's actions over this period. This paper explores the contribution of mortality alone toward the gain or loss on blocks of fixed single-premium, single life immediate annuities that have been issued by a large insurer over the period 1966–1986 inclusive. Such exploration uses historical rates of longevity as well as the projection of such rates into the future, which have been discussed in previous sections. The financial effect of mortality rate variations is then determined.

Theoretically, we would want data from the new annuity issues of each issue year showing date of issue, plan, sex, issue age, modal income, state of issue, and gross single premium. Knowing the date and state of issue generally fixes the rate scale applicable in calculating the gross premium and the rate of any premium tax. One could calculate a "mortality gross premium" by eliminating the expense element, policy fee, and premium tax and assuming the pricing interest rates. Thus, the mortality gross premium equals the present value of benefits discounted at the gross premium pricing scale mortality and interest rates.

What if mortality rates vary from the rates assumed in pricing? If we knew the survival rates experienced each year for all lives in the block of issues, by historical analysis and by assumption of projected mortality from the present we could determine the present value of benefits discounted at the

gross premium pricing scale interest rates and the "experience" (at least to the present, and then projected) mortality rates. When subtracted from the present value of benefits under the gross premium mortality pricing basis, such value indicates the gain or loss arising from mortality.

Gains or losses from mortality could be analyzed for specific calendar-year periods or for specific contract durations, if such amounts are significant in the aggregate, by calculating the difference between appropriate portions of the two premiums described above over the periods selected. The effect of variations in assumed experience mortality rates on the mortality gross premium could be calculated for the issue-year blocks. We explore the effect of two sets of experience mortality rate assumptions on such blocks.

As a practical matter, a less-than-optimum amount of the theoretically desirable new annuity issues data was available from this company for the period 1966–1986. This thwarts the idea of data consistency whereby, for example, gross premiums are reasonably related to the annual income benefits for a plan-sex-age cell. The data available were therefore adjusted to eliminate inconsistencies.

The result was plan-sex-age data with premiums consistent with the applicable pricing rate scale and annual income benefits purchased. As a result of the modifications and adjustments, the issue-year data blocks represent a generalized model for the following analyses of the effects of mortality on annuity pricing.

Table A in Appendix I shows the idealized plan-sex-age grouping data of number of contracts, annual income, and adjusted gross single premiums by issue year that make up the model. This table also shows the mortality gross premium at issue corresponding to the adjusted gross single premium at issue. Table B shows the actuarial assumptions for mortality and interest applicable by issue year used to calculate mortality gross premiums. These assumptions, combined with expense assumptions, also are used to calculate adjusted gross premiums for each issue-year block.

We know the attained-age mortality rates assumed to be in effect during any issue year. They are expressed by the pricing mortality table used to calculate the mortality gross premiums for that issue year. A snapshot of attained-age mortality rates that can be assumed to be in effect during 1973 and 1983 is provided by the 1973 Experience Table and 1983 Basic Table mortality rates, some of which are shown in Table 3. Of course, these two tables can be replaced by other experience tables developed by individual companies whose actual annuity mortality experience deviates in a sufficient degree from the intercompany experience. Whichever tables are used, their

corresponding rates at any attained age can be used to calculate a yearly mortality improvement factor. These factors, when applied to the preceding table mortality rates, generate a set of mortality tables for each intervening year. Yearly mortality rates for any sex-specific issue age can then be taken as those mortality rates along the diagonal of rates when age and year are advanced one at a time. In this way, any sex-distinct issue age for any issue year is assigned a string of mortality rates from issue.

An example will clarify the principle involved. Consider a 1970 issue to a male age 45. The rates from ages 45–65 under the 1969 Company Modified Annuity Table, the 1973 Experience Table, and the 1983 Basic Table are shown in Table 13.

TABLE 13  
MALE 1000 $q_x$  VALUES UNDER VARIOUS ANNUITY TABLES

Attained Age	(1) 1969 Co. Mod. Annuity*	(2) 1973 Experience	(3) 1983 Basic	Mortality Improvement Rates	
				(4) 1973/1969†	(5) 1983/1973‡
45.....	3.625	3.289	2.657	3.190%	2.111%
46.....	4.116	3.709	2.988	3.411	2.138
47.....	4.657	4.155	3.343	3.731	2.151
48.....	5.246	4.622	3.718	4.133	2.153
49.....	5.880	5.107	4.110	4.589	2.148
50.....	6.557	5.613	4.518	5.050	2.147
51.....	7.111	6.138	4.938	4.786	2.152
52.....	7.676	6.684	5.370	4.508	2.165
53.....	8.250	7.250	5.811	4.216	2.188
54.....	8.829	7.831	6.260	3.920	2.214
55.....	9.415	8.420	6.718	3.655	2.233
56.....	10.240	9.012	7.184	4.169	2.242
57.....	11.103	9.601	7.658	4.729	2.236
58.....	12.009	10.188	8.146	5.334	2.212
59.....	12.959	10.810	8.671	5.865	2.181
60.....	13.957	11.511	9.266	6.221	2.146
61.....	15.032	12.336	9.961	6.376	2.116
62.....	16.217	13.328	10.787	6.331	2.093
63.....	17.525	14.527	11.769	6.062	2.083
64.....	18.965	15.951	12.920	5.606	2.085
65.....	20.554	17.610	14.248	5.022	2.096

\*Developed by the large company.

†For the period 1970–1973.

‡For the period 1973–1983.

The mortality improvement rates (MIR), also shown in Table 13, were calculated for 1970 issues at each attained age  $X$  by using the formulas:

$$\text{MIR} = 1 - \left[ \frac{1973 \text{ Table } q_x}{1969 \text{ Table } q_x} \right]^{1/3}$$

and

$$\text{MIR} = 1 - \left[ \frac{1983 \text{ Table } q_x}{1973 \text{ Table } q_x} \right]^{1/10}$$

based upon the number of years involved between the tables. Note that this produces a different set of MIR factors by issue year even though the pricing mortality table may not have changed. Thus, a 1969 issue would require an exponent of 1/4 in the first formula and retain an exponent of 1/10 in the second formula. This is consistent with the actuarial pricing assumption that the same mortality table represents current mortality over several issue years. Blending, after issue, into the 1973 or 1983 tables therefore would occur at a faster pace by modifying the exponent as described above.

Applying the MIR factors to the mortality rates shown in columns (1) and (2) of Table 13 produces the mortality tables for years 1970–1983 shown in Table 14. The string of mortality rates covering years 1970–1983 for our 45-year-old male therefore would be taken as those rates shown for age 45 in 1970, age 46 in 1971, age 47 in 1972, until age 58 in 1983, that is, 3.625, 3.976, 4.316, until 8.146.

Future mortality rates beyond 1983 would be determined by a table of projection factors applied to the mortality rates determined to be extant in 1983. For our study of the 1966–1986 issue blocks, we have assumed Projection Scale I and Projection Scale J from Table 7 to represent rates of mortality improvement beyond the year 1983. Table A in Appendix I shows the mortality gross premiums calculated under both these projection scales.

Out of all the issue-year block plan-sex cells in Table A, only two cells show mortality gross premiums based upon a projection scale to be less than the mortality gross premium at issue. Issue years 1966–1979 show, for each issue year, projection scale-based mortality gross premiums for all plan-sex cells combined that exceed the mortality gross premiums at issue by 2.71 percent to 4.85 percent under Projection Scale I and by 2.83 percent to 4.93 percent under Projection Scale J. Plan-sex cells for issue years 1980–1986 show that projection scale-based mortality gross premiums are no more than 1.03 percent greater than the mortality gross premiums at issue. Details by issue year are shown in Table 15, which is an extract from the data of Table A in Appendix I. These results for issue years 1966–1979 are significant and indicate that original pricing did not adequately account for mortality improvement according to the combination of assumptions inherent in the 1973 and 1983 experience mortality tables and in Projection Scales I and J. Thus, unless a company with such a mix of issues consistently maintains an

TABLE 14  
SPECIMEN 1000q<sub>x</sub> MORTALITY RATES FOR ISSUE YEAR 1970

Attained Age	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
45	3.625	3.509	3.397	3.289	3.220	3.152	3.085	3.020	2.956	2.894	2.833	2.773	2.714	2.657
46	4.116	3.976	3.840	3.709	3.630	3.552	3.476	3.402	3.329	3.258	3.188	3.120	3.053	2.988
47	4.657	4.483	4.316	4.155	4.066	3.978	3.893	3.809	3.727	3.647	3.568	3.492	3.416	3.343
48	5.246	5.029	4.821	4.622	4.522	4.425	4.330	4.237	4.145	4.056	3.969	3.883	3.800	3.718
49	5.880	5.610	5.353	5.107	4.997	4.890	4.785	4.682	4.581	4.483	4.387	4.292	4.200	4.110
50	6.557	6.226	5.912	5.613	5.493	5.375	5.259	5.146	5.036	4.928	4.822	4.718	4.617	4.518
51	7.111	6.771	6.447	6.138	6.006	5.877	5.750	5.626	5.505	5.387	5.271	5.158	5.047	4.938
52	7.676	7.330	7.000	6.684	6.539	6.398	6.259	6.124	5.991	5.861	5.734	5.610	5.489	5.370
53	8.250	7.902	7.569	7.250	7.091	6.936	6.784	6.636	6.491	6.349	6.210	6.074	5.941	5.811
54	8.829	8.483	8.150	7.831	7.658	7.488	7.322	7.160	7.002	6.847	6.695	6.547	6.402	6.260
55	9.415	9.071	8.739	8.420	8.232	8.048	7.868	7.693	7.521	7.353	7.189	7.028	6.871	6.718
56	10.240	9.813	9.404	9.012	8.810	8.613	8.419	8.231	8.046	7.866	7.690	7.517	7.349	7.184
57	11.103	10.578	10.078	9.601	9.386	9.176	8.971	8.771	8.575	8.383	8.196	8.012	7.833	7.658
58	12.009	11.368	10.762	10.188	9.963	9.742	9.527	9.316	9.110	8.908	8.711	8.519	8.330	8.146

actual-to-expected mortality ratio relative to intercompany mortality of much more than 100 percent, its expected profits will be spent to provide unanticipated benefits to surviving annuitants.

TABLE 15  
COMPARISON OF MORTALITY GROSS PREMIUMS  
BASED ON PROJECTION SCALES I AND J  
WITH SUCH PREMIUMS CHARGED AT ISSUE  
TOTAL ALL ISSUES IN ALTERNATE ISSUE YEARS

Issue Year	Mortality Table Year*	(1) Mortality Gross Premium at Issue	(2) Mortality Gross Premium Projection I	(3) Mortality Gross Premium Projection J	(4) Ratio (2)/(1)	(5) Ratio (3)/(1)
1966 . . . . .	1965	19,573,461	20,351,457	20,361,920	1.0397	1.0403
1968 . . . . .	1965	23,956,252	25,041,288	25,063,669	1.0453	1.0462
1970 . . . . .	1969	17,710,693	18,286,843	18,302,070	1.0325	1.0334
1972 . . . . .	1969	21,790,082	22,577,135	22,600,281	1.0361	1.0372
1974 . . . . .	1974	18,193,370	18,740,831	18,771,039	1.0301	1.0318
1976 . . . . .	1974	24,979,968	25,822,745	25,865,913	1.0337	1.0355
1978 . . . . .	1974	19,901,731	20,569,055	20,607,095	1.0335	1.0354
1980 . . . . .	1979	7,827,423	7,895,868	7,907,867	1.0087	1.0103
1982 . . . . .	1981	16,509,576	16,549,083	16,581,833	1.0024	1.0044
1984 . . . . .	1981	19,354,998	19,501,118	19,543,675	1.0075	1.0097
1986 . . . . .	1981	21,531,495	21,703,278	21,749,738	1.0080	1.0101

\*Year of Company Modified Annuity Table used in pricing.

Projection Scale J is apparently similar in its effect on annuity pricing, based upon the issue blocks studied, to Projection Scale I. No meaningful conclusions would be reached under Projection Scale J results that would not be reached by utilizing Projection Scale I results. Note, however, that this result is a function of the distribution of issues within attained-age cells. The bulk of issues in our model are at ages 60–80.

Mortality improvement at attained ages over 80 for issues at ages 60–80 is not as significant as that for attained ages at issue of 50–70, for example. Tables C and D of Appendix I show details at the issue age level that produce the data summarized in Table A. As stated previously, a substitute scale for Projection Scale J, for example, could be utilized in the derivation of mortality gross premiums that show significantly different results from the mortality gross premiums derived under a Projection Scale I assumption. Such an exercise may answer the question, “What degree of mortality improvement, by age bands, produces a meaningful change in mortality gross premiums when compared to Projection Scale I mortality gross premiums?”

The mortality gross premium ratios shown in Table 15, by virtue of their saw-tooth progression, illustrate the effect on pricing of the static mortality table assumption. Use of a static 1965 Company Modified Annuity Table assumption for mortality in pricing during each year from 1966 to 1969 does not adequately recognize mortality improvement. The variance between assumed and actually emerging mortality, according to intercompany mortality experience, becomes greater with each passing year that the 1965 Table is used in pricing. When the 1969 Table is introduced in 1970, the mortality gross premiums for 1970 include provision for that portion of emerging improvement in longevity as is provided for in the static 1969 Table, which will also turn out to be inadequate with the passage of time. A similar situation emerges during the issue-years 1971–1973, with slight exception for 1973, as well as during the issue years of 1975–1979 following the introduction of the 1974 Table in 1974, with exceptions for issue years 1977–1979. Note from Table C of Appendix I that the majority of annual income issued by attained age for all plan-sex cells has shifted to the 70–89 age group for issue years 1977–1979 from the 60–79 age group in prior issue years. The effect on pricing of mortality improvement at attained ages over 80 is less pronounced than for younger attained ages, as previously noted.

Mortality gross premiums for issue years 1980–1986 from Table 15, assuming Projection Scales I or J, are only slightly higher than the corresponding mortality gross premiums at issue. This is because introduction of the static 1979 Table in 1980, and then the static 1981 Table in 1982, contains enough margin to anticipate the mortality improvements inherent in Projection Scales I and J. Table 16 compares male mortality rates at issue age 65 for a 1969 issue and a 1982 issue. The 1969 issue is based upon the static 1965 Table for pricing, and mortality improvement is based upon the 1973 Table, 1983 Table and Projection Scale I. The 1982 issue is based upon the static 1981 Table for pricing, and mortality improvement is based upon the 1983 Table and Projection Scale I.

The proportion that the difference in mortality rates for the 1969 issue bears to the static attained-age rate increases steadily, reaching almost 31 percent of the static rate at age 92. The comparable proportions under the 1982 issue are lower for each attained age except age 66, turn negative at attained ages 83–87, and reach a maximum of 12.4 percent at age 92. Comparisons at other issue ages for issue years prior to 1980 would yield results similar to those shown in Table 16, because the curve of static 1981 table mortality rates is not always higher than the curve of projected mortality

TABLE 16  
 COMPARISON OF  $1000q_x$  VALUES  
 UNDER STATIC AND MORTALITY IMPROVEMENT BASES  
 STARTING AT MALE AGE 65  
 FOR AN ISSUE OF 1969 AND AN ISSUE OF 1982  
 SHOWING THE PROPORTION THAT THE DIFFERENCE IN RATES  
 BEARS TO THE ATTAINED AGE STATIC RATE

Attained Age	1969 Issue		Proportion	1982 Issue		Proportion
	1965 Table	Projection Scale I		1981 Table	Projection Scale I	
65 . . . . .	21.182	21.182	0	15.490	15.490	0
68 . . . . .	27.161	24.842	0.08538	19.837	18.758	0.05439
71 . . . . .	35.146	31.466	0.10471	25.904	24.497	0.05432
74 . . . . .	45.780	39.322	0.14107	34.240	31.622	0.07646
77 . . . . .	59.889	49.120	0.17982	44.331	41.056	0.07388
80 . . . . .	78.519	62.248	0.20722	56.847	54.830	0.03548
83 . . . . .	102.955	79.610	0.22675	72.200	73.153	-0.01320
86 . . . . .	134.052	100.046	0.25368	92.671	95.903	-0.03488
89 . . . . .	172.052	121.773	0.29223	125.388	121.773	0.02883
92 . . . . .	219.297	151.517	0.30908	173.019	151.517	0.12428

rates, but rather remains close to or comes below the latter curve at some attained-age groups.

Tables 17 and 18 compare the ratios of mortality gross premiums based on Projection Scales I and J with such premiums charged at issue, separately by plan and sex, so that any variations from or similarities to the ratios shown in Table 15 for all issues combined, as well as separately by sex and by plan, can be noted.

TABLE 17  
 MORTALITY GROSS PREMIUM RATIOS DERIVED  
 BY COMPARING SUCH PREMIUMS BASED ON PROJECTION SCALE I  
 WITH SUCH PREMIUMS CHARGED AT ISSUE

Issue Year	Mortality Table Year	Life Only M and F Combined	10 CC Only M and F Combined	Males Only Life and 10 CC Combined	Females Only Life and 10 CC Combined	All Plans for M and F Combined
1966 . . . . .	1965	1.0481	1.0361	1.0320	1.0462	1.0397
1968 . . . . .	1965	1.0551	1.0416	1.0374	1.0499	1.0453
1970 . . . . .	1969	1.0250	1.0353	1.0260	1.0370	1.0325
1972 . . . . .	1969	1.0271	1.0385	1.0327	1.0387	1.0361
1974 . . . . .	1974	1.0256	1.0314	1.0293	1.0307	1.0301
1976 . . . . .	1974	1.0290	1.0351	1.0346	1.0328	1.0337
1978 . . . . .	1974	1.0293	1.0350	1.0296	1.0373	1.0335
1980 . . . . .	1979	1.0044	1.0096	1.0156	1.0021	1.0087
1982 . . . . .	1981	0.9967	1.0037	1.0004	1.0043	1.0024
1984 . . . . .	1981	1.0094	1.0072	1.0072	1.0079	1.0075
1986 . . . . .	1981	1.0118	1.0073	1.0064	1.0090	1.0080

TABLE 18  
MORTALITY GROSS PREMIUM RATIOS DERIVED  
BY COMPARING SUCH PREMIUMS BASED ON PROJECTION SCALE J  
WITH SUCH PREMIUMS CHARGED AT ISSUE

Issue Year	Mortality Table Year	Life Only M and F Combined	10 CC Only M and F Combined	Males Only Life and 10 CC Combined	Females Only Life and 10 CC Combined	All Plans for M and F Combined
1966.....	1965	1.0490	1.0365	1.0323	1.0469	1.0403
1968.....	1965	1.0562	1.0425	1.0376	1.0513	1.0462
1970.....	1969	1.0261	1.0361	1.0265	1.0382	1.0334
1972.....	1969	1.0283	1.0395	1.0333	1.0401	1.0372
1974.....	1974	1.0270	1.0331	1.0300	1.0329	1.0318
1976.....	1974	1.0310	1.0368	1.0357	1.0353	1.0355
1978.....	1974	1.0317	1.0368	1.0306	1.0402	1.0354
1980.....	1979	1.0066	1.0110	1.0163	1.0045	1.0103
1982.....	1981	0.9992	1.0056	1.0017	1.0070	1.0044
1984.....	1981	1.0128	1.0092	1.0084	1.0110	1.0097
1986.....	1981	1.0156	1.0092	1.0075	1.0119	1.0101

Life only ratios would be expected to be greater than 10-CC plan ratios because of the accounting for mortality improvement during contract years 1-10. This holds true in Table 17, however, only for issue years 1966-1969 and 1983-1986. Reference to Table C of Appendix I shows that the company has applied age setbacks in the pricing of life only annuities at ages 65 or older during issue years 1970-1979. This anticipation of mortality improvement for life only annuities causes the ratios for a 10-CC plan to exceed those required for a life only annuity, because part of the Projection Scale improved longevity is already included in the static mortality rates used in pricing. The average ratios for years 1980-1986 are so close that differences in central issue ages within the life only and 10-CC plan, coupled with the proximity and intertwining of the mortality curve based upon mortality improvement to the static 1979 and 1981 tables pricing mortality curves, cause the relationship between the life only ratio and the 10-CC ratio to alternate positions between issue years 1980-1982 and 1983-1986.

When life and 10-CC plans are combined, male only ratios would be expected to be lower than the ratios for these plans issued to females, because the Projection Scale I and J factors are so much greater for females. Indeed, except for issue years 1975, 1976, 1980, and 1981, this is the case, as shown in Table 17, thus reflecting the greater mortality improvement for females in proportionately larger mortality gross premiums relative to those premiums at issue than would be required for males. These exception years

arise also because of the close interplay between central issue ages and the relationship of the static mortality and projection mortality curves.

From a historical perspective, we can conclude that the profits anticipated on the issue blocks of 1966–1979 have been ephemeral, if annuity mortality experience is similar to the results shown in intercompany experience studies. Use of a static mortality table assumption over a period of time erodes the profits inherent in pricing when there is meaningful improvement in longevity.

The issues of 1980–1986 also show encroachment on anticipated profit margins but not to the degree as that emerging for prior years' issues, only because mortality improvement has not been as dramatic relative to the modifications of the 1971 IAM table adopted by the company and because these recent issue years have not experienced the mortality improvement evidenced in prior years. Will such improvement come about? History can repeat itself. But nonparticipating fixed-income annuities already issued cannot be modified to counter any emerging mortality improvement.

The picture is clear: Mortality improvement must be anticipated to an even greater degree for nonparticipating fixed-income annuities than has been assumed in the past, with limited anticipation of the effects of the AIDS epidemic. To what degree is up to the judgment of the company.

### *Structured Settlement Annuities*

Our analysis of traditional annuities has shown how significant the mortality contribution can be to gains and losses. The mortality effects on pricing structured settlement annuities are even more crucial because of the competitiveness of this marketplace. Margins are squeezed because of the open competitiveness generated by the brokers selling these annuities. Usually, the carrier with the lowest price is awarded the contract as long as that insurer is rated A or better by the A.M. Best Company. Mortality contributions to gains therefore must be reasonable, and investment bailouts should not be expected.

Mortality improvement must be anticipated in pricing structured settlement annuities for the same reasons as traditional annuities. The projected mortality rates of the U.S. population for each decade from 1990 to 2050, as shown in *Actuarial Study No. 87*, show that marked reductions in mortality are expected in the next 20 years, with a slower rate of improvement thereafter. This can be seen from an excerpt of  $1000q_x$  values from these tables, as shown in Table 19.

TABLE 19  
COMPARISON OF 1000 $q_x$   
UNDER LIFE TABLES FOR THE U.S.: 1980-2050

Calendar Year	1000 $q_x$ at Age					
	0	20	40	60	80	100
Males						
1980 .....	14.04	1.90	3.04	18.52	91.99	329.11
1990 .....	10.49	1.49	2.41	15.05	79.70	292.16
2000 .....	9.85	1.38	2.09	13.55	74.65	266.42
2010 .....	9.31	1.36	2.02	13.00	71.52	252.90
2020 .....	8.81	1.36	1.97	12.50	68.58	240.72
2030 .....	8.34	1.35	1.93	12.02	65.82	229.23
2040 .....	7.90	1.35	1.88	11.58	63.21	218.40
2050 .....	7.50	1.34	1.84	11.15	60.75	208.18
Females						
1980 .....	11.22	0.58	1.61	9.52	56.15	297.13
1990 .....	8.57	0.49	1.24	8.54	44.32	270.51
2000 .....	7.92	0.48	1.06	8.03	39.06	247.41
2010 .....	7.46	0.48	1.02	7.72	36.95	233.36
2020 .....	7.03	0.48	0.99	7.42	35.05	220.61
2030 .....	6.64	0.47	0.96	7.13	33.26	208.60
2040 .....	6.27	0.47	0.93	6.86	31.58	197.28
2050 .....	5.93	0.47	0.91	6.60	30.00	186.62

The effect of pricing structured settlement annuities under a current static mortality table, as opposed to using mortality tables that anticipate mortality improvement, is shown in Table 20. To create the tables that assume mortality improvement, we first took the 1980, 1990, and 2000 Life Tables by sex shown in *Actuarial Study No. 87* and derived MIR factors at each attained age  $x$ , separately for males and females, by using the formulas:

$$\text{MIR} = 1 - \left[ \frac{‘1980 + t’ \text{ Life Table } q_x}{‘1980 + s’ \text{ Life Table } q_x} \right]^{1/10}$$

where  $t = 10, 20$  and  $s = 0, 10$ . MIR values were applied to the respective life tables to produce life tables for each year from 1980 to 1990 and from 1990 to 2000.

Development of a 1987 gross premium scale based upon mortality improvement would assume that mortality rates for a given issue age and sex would be equal to those selected from the life tables of 1980 to 2000, starting with the 1000 $q_x$  value at the issue age selected in the 1987 Life Table for the appropriate sex and proceeding for successive year 1000 $q_x$  values by advancing one age and life table at a time for each value selected. For female

TABLE 20  
COMPARISON OF STRUCTURED SETTLEMENT  
MORTALITY GROSS PREMIUMS  
UNDER VARIOUS MORTALITY TABLE ASSUMPTIONS

Issue Age	1980	1987	1992	1997	Mortality Improvement		
	Life Table	Life Table	Life Table	Life Table	1987-2000	1987-2010	1987-2020
Life Annuity—Male							
0 .....	141,000	141,600	141,900	142,100	141,900	141,900	141,900
20 .....	138,000	138,700	139,100	139,300	139,300	139,400	139,500
40 .....	126,400	127,900	128,700	129,200	129,200	129,400	129,500
60 .....	97,000	99,400	100,800	101,700	101,100	101,300	101,300
80 .....	54,700	57,400	59,000	60,000	58,700	58,700	58,700
Life Annuity—Female							
0 .....	142,500	142,900	143,100	143,200	143,000	143,100	143,100
20 .....	141,300	141,700	141,900	142,000	142,100	142,100	142,200
40 .....	132,500	133,500	134,100	134,400	134,400	134,600	134,700
60 .....	109,900	111,900	113,000	113,800	113,800	114,000	114,100
80 .....	65,600	69,900	72,400	74,000	72,200	72,200	72,200
10-Year Certain and Life Annuity—Male							
0 .....	142,200	142,600	142,800	142,900	142,800	142,800	142,900
20 .....	138,700	139,300	139,600	139,800	139,800	139,900	140,000
40 .....	127,700	129,000	129,700	130,100	130,200	130,400	130,500
60 .....	104,600	106,200	107,200	107,800	107,700	107,800	107,900
80 .....	83,700	84,500	85,000	85,400	85,200	85,200	85,200
10-Year Certain and Life Annuity—Female							
0 .....	143,400	143,700	143,800	143,900	143,800	143,800	143,800
20 .....	141,500	141,800	142,000	142,100	142,200	142,300	142,300
40 .....	133,200	134,100	134,600	134,900	135,000	135,100	135,300
60 .....	113,900	115,600	116,600	117,300	117,400	117,700	117,700
80 .....	86,700	88,300	89,300	90,000	89,700	89,700	89,700
20-Year Certain and Life Annuity—Male							
0 .....	142,800	143,100	143,300	143,400	143,400	143,400	143,400
20 .....	139,600	140,100	140,400	140,500	140,600	140,700	140,800
40 .....	130,600	131,500	132,000	132,300	132,500	132,700	132,800
60 .....	118,100	118,800	119,100	119,400	119,400	119,600	119,600
80 .....	114,000	114,100	114,100	114,100	114,100	114,200	114,200
20-Year Certain and Life Annuity—Female							
0 .....	143,900	144,100	144,200	144,200	144,200	144,200	144,200
20 .....	141,800	142,100	142,300	142,400	142,400	142,500	142,600
40 .....	134,800	135,500	135,900	136,100	136,200	136,400	136,500
60 .....	121,800	122,800	123,500	123,900	124,100	124,300	124,400
80 .....	114,100	114,200	114,300	114,400	114,400	114,400	114,400

TABLE 20 — Continued

Issue Age	1980	1987	1992	1997	Mortality Improvement		
	Life Table	Life Table	Life Table	Life Table	1987-2000	1987-2010	1987-2020
Life Annuity with Annual 3 Percent Cost-of-Living Adjustment—Male							
0 .....	223,800	225,600	226,400	226,900	226,700	227,000	227,200
20 .....	208,000	210,100	211,200	211,900	212,100	212,600	213,000
40 .....	174,800	178,200	180,000	181,200	181,400	182,000	182,400
60 .....	119,800	123,800	126,000	127,500	126,800	127,200	127,300
80 .....	60,700	64,100	66,100	67,500	65,900	65,900	65,900
Life Annuity with Annual 3 Percent Cost of Living Adjustment—Female							
0 .....	229,600	230,900	231,600	231,900	231,800	232,000	232,200
20 .....	218,000	219,500	220,400	220,900	221,200	221,600	222,000
40 .....	189,700	192,300	193,800	194,800	195,000	195,700	196,200
60 .....	141,100	144,900	147,200	148,600	148,900	149,500	149,800
80 .....	74,300	79,900	83,100	85,300	83,100	83,200	83,200
10-Year Certain and Life Annuity with Annual 3 Percent Cost-of-Living Adjustment—Male							
0 .....	225,100	226,700	227,400	227,900	227,800	228,100	228,300
20 .....	208,800	210,800	211,900	212,600	212,800	213,300	213,600
40 .....	176,400	179,500	181,300	182,400	182,600	183,300	183,700
60 .....	129,000	131,900	133,700	134,800	134,700	135,100	135,200
80 .....	95,000	96,100	96,900	97,400	97,200	97,200	97,200
10-Year Certain and Life Annuity with Annual 3 Percent Cost-of-Living Adjustment—Female							
0 .....	230,700	231,800	232,400	232,700	232,700	232,900	233,100
20 .....	218,300	219,700	220,600	221,100	221,400	221,800	222,100
40 .....	190,600	193,100	194,500	195,400	195,700	196,400	196,900
60 .....	145,900	149,400	151,500	152,800	153,200	153,900	154,200
80 .....	99,300	101,700	103,200	104,400	103,900	104,000	104,000
20-Year Certain and Life Annuity with Annual 3 Percent Cost-of-Living Adjustment—Male							
0 .....	226,200	227,500	228,200	228,600	228,700	228,900	229,100
20 .....	210,200	212,100	213,100	213,700	214,000	214,500	214,800
40 .....	181,100	183,600	185,000	185,800	186,200	186,800	187,200
60 .....	150,000	151,400	152,300	152,900	153,000	153,400	153,500
80 .....	141,300	141,400	141,400	141,500	141,500	141,500	141,500
20-Year Certain and Life Annuity with Annual 3 Percent Cost-of-Living Adjustment—Female							
0 .....	231,500	232,500	233,000	233,300	233,300	233,500	233,700
20 .....	218,800	220,200	221,000	221,500	221,800	222,200	222,500
40 .....	193,100	195,200	196,500	197,300	197,700	198,400	198,900
60 .....	158,200	160,700	162,200	163,200	163,600	164,300	164,500
80 .....	141,500	141,700	141,800	141,900	142,000	142,000	142,000

TABLE 20 — Continued

Issue Age	1980 Life Table	1987 Life Table	1992 Life Table	1997 Life Table	Mortality Improvement		
					1987-2000	1987-2010	1987-2020
<b>Life Annuity with Annual 5 Percent Cost-of-Living Adjustment—Male</b>							
0 .....	351,300	356,100	358,600	360,000	360,100	361,100	362,000
20 .....	301,400	306,500	309,300	311,000	311,800	313,100	314,300
40 .....	229,400	235,500	238,900	241,100	241,600	243,100	244,100
60 .....	141,200	146,800	150,000	152,100	151,400	152,100	152,300
80 .....	65,400	69,400	71,800	73,400	71,600	71,700	71,700
<b>Life Annuity with Annual 5 Percent Cost-of-Living Adjustment—Female</b>							
0 .....	370,200	374,100	376,200	377,500	377,600	378,600	379,500
20 .....	326,100	330,300	332,700	334,300	335,200	336,600	337,800
40 .....	257,900	263,400	266,500	268,700	269,400	271,100	272,400
60 .....	171,800	178,000	181,600	184,000	184,600	185,900	186,400
80 .....	81,300	88,000	91,900	94,600	92,100	92,300	92,300
<b>10-Year Certain and Life Annuity with Annual 5 Percent Cost-of-Living Adjustment—Male</b>							
0 .....	352,800	357,300	359,700	361,100	361,400	362,300	363,200
20 .....	302,300	307,300	310,000	311,700	312,500	313,900	315,000
40 .....	231,200	237,000	240,300	242,400	243,100	244,600	245,500
60 .....	151,500	156,000	158,600	160,400	160,300	161,000	161,200
80 .....	103,700	105,200	106,200	106,900	106,600	106,700	106,700
<b>10-Year Certain and Life Annuity with Annual 5 Percent Cost-of-Living Adjustment—Female</b>							
0 .....	371,400	375,100	377,100	378,300	378,600	379,600	380,500
20 .....	326,300	330,500	332,900	334,500	335,400	336,800	338,100
40 .....	258,900	264,200	267,300	269,400	270,200	271,900	273,200
60 .....	177,200	183,000	186,400	188,700	189,500	190,800	191,300
80 .....	109,300	112,500	114,500	116,000	115,400	115,600	115,600
<b>20-Year Certain and Life Annuity with Annual 5 Percent Cost-of-Living Adjustment—Male</b>							
0 .....	354,500	358,800	361,100	362,400	362,800	363,800	364,700
20 .....	304,600	309,400	312,000	313,700	314,500	315,800	317,000
40 .....	237,800	242,800	245,700	247,500	248,300	249,700	250,700
60 .....	180,200	182,700	184,200	185,200	185,400	186,100	186,300
80 .....	165,900	166,000	166,100	166,100	166,200	166,200	166,200
<b>20-Year Certain and Life Annuity with Annual 5 Percent Cost-of-Living Adjustment—Female</b>							
0 .....	372,800	376,300	378,200	379,400	379,800	380,800	381,700
20 .....	327,400	331,500	333,800	335,400	336,300	337,700	338,900
40 .....	262,600	267,500	270,400	272,300	273,200	274,900	276,100
60 .....	194,200	198,600	201,300	203,100	203,900	205,200	205,700
80 .....	166,200	166,400	166,700	166,900	166,900	167,000	167,000

issue age 40, as an example from Table 21, values of  $1000q_x$  for 1987 to 1991 would be 1.34, 1.49, 1.64, 1.76, and 1.90, respectively.

TABLE 21  
VALUES FOR FEMALES OF  $1000q_x$   
UNDER VARIOUS LIFE TABLES

Attained Age	Female $1000q_x$					
	Life Table for the Year					
	1980	1987	1988	1989	1990	1991
40.....	1.61	1.34	1.31	1.27	1.24	1.22
41.....	1.80	1.52	1.49	1.45	1.42	1.40
42.....	2.00	1.71	1.67	1.64	1.60	1.58
43.....	2.21	1.88	1.84	1.80	1.76	1.73
44.....	2.42	2.07	2.02	1.97	1.93	1.90
45.....	2.66	2.26	2.21	2.16	2.11	2.08

Mortality rates during the years 2001 and thereafter can be derived either by extending this method through the development of 2001 to 2010 Life Tables or by assuming no further mortality improvement beyond 2000 and using the 2001 Life Table as an ultimate mortality table. We have taken both these courses in our analysis.

Table 19 showed that meaningful improvement in mortality rates can still be anticipated after the year 2000. We have therefore made the following mortality table assumptions in deriving the mortality gross premiums:

Basis	Mortality Table
A	1980 Life Table
B	1987 Life Table
C	1992 Life Table
D	1997 Life Table
E	Composite 1987-2000, Ultimate 2001 Life Table thereafter
F	Composite 1987-2010, Ultimate 2011 Life Table thereafter
G	Composite 1987-2020, Ultimate 2021 Life Table thereafter

Mortality gross premium rates are derived by using the mortality assumptions above at issue ages 0, 20, 40, 60, 80 for a life only, 10-year certain and life, and 20-year certain and life annuity providing \$1,000 per month to a male and a female at a 0 percent, 3 percent, and 5 percent annual cost-of-living adjustment in benefit and the following interest rate assumption:

Cost-of-Living Adjustment	No. of Years Initial 9% Rate is Guaranteed	Ultimate Interest Rate Thereafter
0%	20	7%
3	17	7
5	15	7

As a practical matter, note that pricing gross premiums would probably be developed by using a static mortality table assumption and of course would include a loading for expenses, contingencies, and profit. If mortality improvement were to be included, the basic characteristic of such premium scale would be that present values calculated under the static table would approximate the present values calculated by using the composite mortality table that recognized mortality improvement, under the same assumption for investment yields. This approximation simplifies gross premium calculation and is similar in concept to a whole life premium replacing a set of yearly renewable term premiums.

Mortality basis A has been included in Table 20 because it approximates the underlying static mortality assumption for structured settlement annuity pricing by a number of companies. If the static mortality assumption had been the 1987 Life Table, meaningful mortality premium increases emerge starting at the ages shown in Table 22. This table also shows the mortality gross premiums and the percentage increases at these ages. Admittedly, the 1 percent benchmark is subjective. However, the results for any reasonably chosen percentage increase in premium will be similar to those of Table 22.

Table 23 shows the ratio of mortality gross premium rates under various mortality assumptions to either the 1980 Life Table or the 1987 Life Table. Consider that a pricing benchmark value of profits on an annuity is often about 4 percent of premium when reviewing the ratios in Table 23.

With ratios at some plan-age cells exceeding 10 percent, and many of them in the 3–4 percent range, the 1980 Life Table is clearly inappropriate today for pricing structured settlement annuities. The 1987 Life Table, although a derived mortality table emanating from the projected 1990 Life Table, would account for past mortality improvement but does not provide for future mortality improvement. We now consider the effects of pricing structured settlement annuities assuming ongoing mortality improvement.

At first, we assume that mortality improves until the year 2000 inclusive and that the 2001 Life Table represents ultimate mortality for each year after 2000. Subsequently, we advance the mortality improvement periods to 2010

TABLE 22  
MORTALITY GROSS PREMIUMS AND THEIR PERCENTAGE INCREASE  
AT AGES FOR WHICH THE PERCENTAGE INCREASE IS FIRST AT LEAST ABOUT 1%  
WHERE PRICING ASSUMES 1980 LIFE TABLE AND 1987 LIFE TABLE MORTALITY

COLA	Plan	Age	1980 Life Table	1987 Life Table	Percentage Increase
Males					
0	Life annuity	40	126,400	127,900	1.19%
0	10-Year certain and life	40	127,700	129,000	1.02
0	20-Year certain and life	None	—	—	—
3%	Life annuity	20	208,000	210,100	1.01
3	10-Year certain and life	20	208,800	210,800	0.96
3	20-Year certain and life	20	210,200	212,100	0.90
5	Life annuity	0	351,300	356,100	1.37
5	10-Year certain and life	0	352,800	357,300	1.28
5	20-Year certain and life	0	354,500	358,800	1.21
Females					
0	Life annuity	60	109,900	111,900	1.82%
0	10-Year certain and life	60	113,900	115,600	1.49
0	20-Year certain and life	None	—	—	—
3%	Life annuity	40	189,700	192,300	1.37
3	10-Year certain and life	40	190,600	193,100	1.31
3	20-Year certain and life	40	193,100	195,200	1.09
5	Life annuity	0	370,200	374,100	1.05
5	10-Year certain and life	0	371,400	375,100	1.00
5	20-Year certain and life	0	372,800	376,300	0.94

and 2020, with ultimate mortality being assumed to follow the 2011 and 2021 Life Tables in respective subsequent years. We will compare mortality gross premium ratios under these assumptions to 1987 Life Table mortality gross premiums to detect meaningful changes in mortality gross premiums.

Table 24 shows the ages at which meaningful mortality gross premium increases emerge under our 1 percent benchmark together with the mortality gross premiums themselves and the respective percentage increases in premiums at these ages.

The tables show that mortality improvement must be assumed in pricing structured settlement annuities. The only mitigating fact is that structured settlement annuities are more often issued at younger issue ages, with a guarantee period of at least 20 years and no cost-of-living adjustment. Only a model office study by a company would indicate the overall effect on profits of mortality improvement.

The question then remains, how far into the future should we assume that mortality improvement will occur? Analysis of the cells for which structured settlement annuities are usually sold, that is, those involving at least a 20-year guarantee period, reveals that despite competitive forces, which will

TABLE 23

COMPARISON OF STRUCTURED SETTLEMENT  
MORTALITY GROSS SINGLE PREMIUM RATIOS  
UNDER VARIOUS MORTALITY TABLE ASSUMPTIONS  
AND ORIGINAL MORTALITY GROSS SINGLE PREMIUM SCALES

Issue Age	1987	1992	1997	1992	1997	Mortality Improvement		
	Life Table	Life Table	Life Table	Life Table	Life Table	1987-2000	1987-2010	1987-2020
	Compared to 1980 Life Table			Compared to 1987 Life Table		Compared to 1987 Life Table		
Life Annuity - Male								
0	1.0043	1.0064	1.0078	1.0021	1.0035	1.0021	1.0021	1.0021
20	1.0051	1.0080	1.0094	1.0029	1.0043	1.0043	1.0050	1.0058
40	1.0119	1.0182	1.0222	1.0063	1.0102	1.0102	1.0117	1.0125
60	1.0247	1.0392	1.0485	1.0141	1.0231	1.0171	1.0191	1.0191
80	1.0494	1.0786	1.0969	1.0279	1.0453	1.0226	1.0226	1.0226
Life Annuity - Female								
0	1.0028	1.0042	1.0049	1.0014	1.0021	1.0007	1.0014	1.0014
20	1.0028	1.0042	1.0050	1.0014	1.0021	1.0028	1.0028	1.0035
40	1.0075	1.0121	1.0143	1.0045	1.0067	1.0067	1.0082	1.0090
60	1.0182	1.0282	1.0355	1.0096	1.0170	1.0170	1.0188	1.0197
80	1.0655	1.1037	1.1280	1.0358	1.0587	1.0329	1.0329	1.0329
10-Year Certain and Life Annuity - Male								
0	1.0028	1.0042	1.0049	1.0014	1.0021	1.0014	1.0014	1.0021
20	1.0043	1.0065	1.0079	1.0022	1.0036	1.0036	1.0043	1.0050
40	1.0102	1.0157	1.0188	1.0054	1.0085	1.0093	1.0109	1.0116
60	1.0153	1.0249	1.0306	1.0094	1.0151	1.0141	1.0151	1.0160
80	1.0096	1.0155	1.0203	1.0059	1.0107	1.0083	1.0083	1.0083
10-Year Certain and Life Annuity - Female								
0	1.0021	1.0028	1.0035	1.0007	1.0014	1.0007	1.0007	1.0007
20	1.0021	1.0035	1.0042	1.0014	1.0021	1.0028	1.0035	1.0035
40	1.0068	1.0105	1.0128	1.0037	1.0060	1.0067	1.0075	1.0089
60	1.0149	1.0237	1.0299	1.0087	1.0147	1.0156	1.0182	1.0182
80	1.0185	1.0300	1.0381	1.0113	1.0193	1.0159	1.0159	1.0159
20-Year Certain and Life Annuity - Male								
0	1.0021	1.0035	1.0042	1.0014	1.0021	1.0021	1.0021	1.0021
20	1.0036	1.0057	1.0064	1.0021	1.0029	1.0036	1.0043	1.0050
40	1.0069	1.0107	1.0130	1.0038	1.0061	1.0076	1.0091	1.0099
60	1.0059	1.0085	1.0110	1.0025	1.0051	1.0051	1.0067	1.0067
80	1.0009	1.0009	1.0009	1.0000	1.0000	1.0000	1.0009	1.0009
20-Year Certain and Life Annuity - Female								
0	1.0014	1.0021	1.0021	1.0007	1.0007	1.0007	1.0007	1.0007
20	1.0021	1.0035	1.0042	1.0014	1.0021	1.0021	1.0028	1.0035
40	1.0052	1.0082	1.0096	1.0030	1.0044	1.0052	1.0066	1.0074
60	1.0082	1.0140	1.0172	1.0057	1.0090	1.0106	1.0122	1.0130
80	1.0009	1.0018	1.0026	1.0009	1.0018	1.0018	1.0018	1.0018

TABLE 23 — Continued

Issue Age	1987	1992	1997	1992	1997	Mortality Improvement		
	Life Table	Life Table	Life Table	Life Table	Life Table	1987-2000	1987-2010	1987-2020
	Compared to 1980 Life Table			Compared to 1987 Life Table		Compared to 1987 Life Table		
Life Annuity with Annual 3 Percent Cost-of-Living Adjustment — Male								
0 .....	1.0080	1.0116	1.0139	1.0035	1.0058	1.0049	1.0062	1.0071
20 .....	1.0101	1.0154	1.0188	1.0052	1.0086	1.0095	1.0119	1.0138
40 .....	1.0195	1.0297	1.0366	1.0101	1.0168	1.0180	1.0213	1.0236
60 .....	1.0334	1.0518	1.0643	1.0178	1.0299	1.0242	1.0275	1.0283
80 .....	1.0560	1.0890	1.1120	1.0312	1.0530	1.0281	1.0281	1.0281
Life Annuity with Annual 3 Percent Cost-of-Living Adjustment — Female								
0 .....	1.0057	1.0087	1.0100	1.0030	1.0043	1.0039	1.0048	1.0056
20 .....	1.0069	1.0110	1.0133	1.0041	1.0064	1.0077	1.0096	1.0114
40 .....	1.0137	1.0216	1.0269	1.0078	1.0130	1.0140	1.0177	1.0203
60 .....	1.0269	1.0432	1.0532	1.0159	1.0255	1.0276	1.0317	1.0338
80 .....	1.0754	1.1184	1.1480	1.0401	1.0676	1.0401	1.0413	1.0413
10-Year Certain and Life Annuity with Annual 3 Percent Cost-of-Living Adjustment — Male								
0 .....	1.0071	1.0102	1.0124	1.0031	1.0053	1.0049	1.0062	1.0071
20 .....	1.0096	1.0148	1.0182	1.0052	1.0085	1.0095	1.0119	1.0133
40 .....	1.0176	1.0278	1.0340	1.0100	1.0162	1.0173	1.0212	1.0234
60 .....	1.0225	1.0364	1.0450	1.0136	1.0220	1.0212	1.0243	1.0250
80 .....	1.0116	1.0200	1.0253	1.0083	1.0135	1.0114	1.0114	1.0114
10-Year Certain and Life Annuity with Annual 3 Percent Cost-of-Living Adjustment — Female								
0 .....	1.0048	1.0074	1.0087	1.0026	1.0039	1.0039	1.0047	1.0056
20 .....	1.0064	1.0105	1.0128	1.0041	1.0064	1.0077	1.0096	1.0109
40 .....	1.0131	1.0205	1.0252	1.0073	1.0119	1.0135	1.0171	1.0197
60 .....	1.0240	1.0384	1.0473	1.0141	1.0228	1.0254	1.0301	1.0321
80 .....	1.0242	1.0393	1.0514	1.0147	1.0265	1.0216	1.0226	1.0226
20-Year Certain and Life Annuity with Annual 3 Percent Cost-of-Living Adjustment — Male								
0 .....	1.0057	1.0088	1.0106	1.0031	1.0048	1.0053	1.0062	1.0070
20 .....	1.0090	1.0138	1.0167	1.0047	1.0075	1.0090	1.0113	1.0127
40 .....	1.0138	1.0215	1.0260	1.0076	1.0120	1.0142	1.0174	1.0196
60 .....	1.0093	1.0153	1.0193	1.0059	1.0099	1.0106	1.0132	1.0139
80 .....	1.0007	1.0007	1.0014	1.0000	1.0007	1.0007	1.0007	1.0007
20-Year Certain and Life Annuity with Annual 3 Percent Cost-of-Living Adjustment — Female								
0 .....	1.0043	1.0065	1.0078	1.0022	1.0034	1.0034	1.0043	1.0052
20 .....	1.0064	1.0101	1.0123	1.0036	1.0059	1.0073	1.0091	1.0104
40 .....	1.0109	1.0176	1.0218	1.0067	1.0108	1.0128	1.0164	1.0190
60 .....	1.0158	1.0253	1.0316	1.0093	1.0156	1.0180	1.0224	1.0236
80 .....	1.0014	1.0021	1.0028	1.0007	1.0014	1.0021	1.0021	1.0021

TABLE 23 — *Continued*

Issue Age	1987	1992	1997	1992	1997	Mortality Improvement		
	Life Table	Life Table	Life Table	Life Table	Life Table	1987-2000	1987-2010	1987-2020
	Compared to 1980 Life Table			Compared to 1987 Life Table		Compared to 1987 Life Table		
Life Annuity with Annual 5 Percent Cost-of-Living Adjustment — Male								
0 .....	1.0137	1.0208	1.0248	1.0070	1.0110	1.0112	1.0140	1.0166
20 .....	1.0169	1.0262	1.0319	1.0091	1.0147	1.0173	1.0215	1.0254
40 .....	1.0266	1.0414	1.0510	1.0144	1.0238	1.0259	1.0323	1.0365
60 .....	1.0397	1.0623	1.0772	1.0218	1.0361	1.0313	1.0361	1.0375
80 .....	1.0612	1.0979	1.1223	1.0346	1.0576	1.0317	1.0331	1.0331
Life Annuity with Annual 5 Percent Cost-of-Living Adjustment — Female								
0 .....	1.0105	1.0162	1.0197	1.0056	1.0091	1.0094	1.0120	1.0144
20 .....	1.0129	1.0202	1.0251	1.0073	1.0121	1.0148	1.0191	1.0227
40 .....	1.0213	1.0333	1.0419	1.0118	1.0201	1.0228	1.0292	1.0342
60 .....	1.0361	1.0570	1.0710	1.0202	1.0337	1.0371	1.0444	1.0472
80 .....	1.0824	1.1304	1.1636	1.0443	1.0750	1.0466	1.0489	1.0489
10-Year Certain and Life Annuity with Annual 5 Percent Cost-of-Living Adjustment — Male								
0 .....	1.0128	1.0196	1.0235	1.0067	1.0106	1.0115	1.0140	1.0165
20 .....	1.0165	1.0255	1.0311	1.0088	1.0143	1.0169	1.0215	1.0251
40 .....	1.0251	1.0394	1.0484	1.0139	1.0228	1.0257	1.0321	1.0359
60 .....	1.0297	1.0469	1.0587	1.0167	1.0282	1.0276	1.0321	1.0333
80 .....	1.0145	1.0241	1.0309	1.0095	1.0162	1.0133	1.0143	1.0143
10-Year Certain and Life Annuity with Annual 5 Percent Cost-of-Living Adjustment — Female								
0 .....	1.0100	1.0153	1.0186	1.0053	1.0085	1.0093	1.0120	1.0144
20 .....	1.0129	1.0202	1.0251	1.0073	1.0121	1.0148	1.0191	1.0230
40 .....	1.0205	1.0324	1.0406	1.0117	1.0197	1.0227	1.0291	1.0341
60 .....	1.0327	1.0519	1.0649	1.0186	1.0311	1.0355	1.0426	1.0454
80 .....	1.0293	1.0476	1.0613	1.0178	1.0311	1.0258	1.0276	1.0276
20-Year Certain and Life Annuity with Annual 5 Percent Cost-of-Living Adjustment — Male								
0 .....	1.0121	1.0186	1.0223	1.0064	1.0100	1.0111	1.0139	1.0164
20 .....	1.0158	1.0243	1.0299	1.0084	1.0139	1.0165	1.0207	1.0246
40 .....	1.0210	1.0332	1.0408	1.0119	1.0194	1.0227	1.0284	1.0325
60 .....	1.0139	1.0222	1.0277	1.0082	1.0137	1.0148	1.0186	1.0197
80 .....	1.0006	1.0012	1.0012	1.0006	1.0006	1.0012	1.0012	1.0012
20-Year Certain and Life Annuity with Annual 5 Percent Cost-of-Living Adjustment — Female								
0 .....	1.0094	1.0145	1.0177	1.0050	1.0082	1.0093	1.0120	1.0144
20 .....	1.0125	1.0195	1.0244	1.0069	1.0118	1.0145	1.0187	1.0223
40 .....	1.0187	1.0297	1.0369	1.0108	1.0179	1.0213	1.0277	1.0321
60 .....	1.0227	1.0366	1.0458	1.0136	1.0227	1.0267	1.0332	1.0358
80 .....	1.0012	1.0030	1.0042	1.0018	1.0030	1.0030	1.0036	1.0036

TABLE 24  
MORTALITY GROSS PREMIUMS AND THEIR PERCENTAGE INCREASE  
AT AGES FOR WHICH THE PERCENTAGE INCREASE IS FIRST AT LEAST ABOUT 1%  
WHEN PRICING ASSUMES 1987 LIFE TABLE STATIC MORTALITY  
AND MORTALITY IMPROVEMENT DURING 1987-2000

COLA	Plan	Age	1987 Life Table	Mortality Improvement 1987-2000	Percentage Increase
Males					
0	Life annuity	40	127,900	129,200	1.02%
0	10-Year certain and life	40	129,000	130,200	0.93
0	20-Year certain and life	None	—	—	—
3%	Life annuity	20	210,100	212,100	0.95
3	10-Year certain and life	20	210,800	212,800	0.95
3	20-Year certain and life	20*	212,100	214,000	0.90
5	Life annuity	0	356,100	360,100	1.12
5	10-Year certain and life	0	357,300	361,400	1.15
5	20-Year certain and life	0*	358,800	362,800	1.11
Females					
0	Life annuity	60	111,900	113,800	1.70%
0	10-Year certain and life	60	115,600	117,400	1.56
0	20-Year certain and life	60*	122,800	124,100	1.06
3%	Life annuity	40	192,300	195,000	1.40
3	10-Year certain and life	40	193,100	195,700	1.35
3	20-Year certain and life	40*	195,200	197,700	1.28
5	Life annuity	0	374,100	377,600	0.94
5	10-Year certain and life	0	375,100	378,600	0.93
5	20-Year certain and life	0*	376,300	379,800	0.93

\*Percentage increase at some higher age becomes nonmeaningful for this cell, although percentage increase may be rising for some ages before falling.

soon be addressed, it is prudent to assume mortality improvement until the year 2020, inclusive. This is shown in Table 25, which summarizes by plan, sex and age the relationship of the 1987-2010 mortality improvement ratios from Table 23 to the 1987-2000 mortality improvement and 1987-2020 mortality improvement ratios.

Out of the 90 cells in Table 25, 27 show the 1987-2010 mortality improvement ratio to be equal to the 1987-2020 mortality improvement ratio, while for 18 cells they are meaningfully above the average of the 1987-2000 and 1987-2020 mortality improvement ratios. That leaves half the cells with ratios under the 1987-2010 mortality improvement assumption equal to or slightly higher than the average of the ratios under the 1987-2000 and 1987-2020 mortality improvement assumptions.

Out of the 30 cells involving a 20-year certain period, 13 belong in the former category. Thus, the remaining 17 cells, which are at issue ages 0, 20, and 40 (except for two of them), represent the cells at which structured

settlement annuities are usually sold. I believe those cells should be priced to reflect mortality improvement out to the year 2020.

For simplicity in pricing structured settlement annuities, especially for purposes of pricing substandard annuities under the age-rating method, it may be desirable to price from a static mortality table assumption. Such a static mortality table should produce gross single premiums that are reasonably close to those produced by an assumption of mortality improvement from 1987 to 2020, inclusive.

TABLE 25  
RELATIONSHIP OF PREMIUM RATIOS  
UNDER A 1987-2010 MORTALITY IMPROVEMENT ASSUMPTION  
TO PREMIUM RATIOS UNDER 1987-2000 MORTALITY IMPROVEMENT  
AND 1987-2020 MORTALITY IMPROVEMENT

Issue Age	Plan	Male	Female
0 Percent Annual Cost-of-Living Adjustment			
0	Life annuity	Same	2010-2020
20	Life annuity	Middle	2000-2010
40	Life annuity	About middle	About middle
60	Life annuity	2010-2020	About middle
80	Life annuity	Same	Same
0	10-Year certain and life	2000-2010	Same
20	10-Year certain and life	Middle	2010-2020
40	10-Year certain and life	About middle	About middle
60	10-Year certain and life	Middle	2010-2020
80	10-Year certain and life	Same	Same
0	20-Year certain and life	Same	Same
20	20-Year certain and life	Middle	Middle
40	20-Year certain and life	About middle	About middle
60	20-Year certain and life	2010-2020	About middle
80	20-Year certain and life	2010-2020	Same
3 Percent Annual Cost-of-Living Adjustment			
0	Life annuity	About middle	Middle
20	Life annuity	About middle	Middle
40	Life annuity	About middle	About middle
60	Life annuity	Above middle	Above middle
80	Life annuity	Same	2010-2020
0	10-Year certain and life	Middle	Middle
20	10-Year certain and life	About middle	Middle
40	10-Year certain and life	Above middle	Middle
60	10-Year certain and life	Above middle	Above middle
80	10-Year certain and life	Same	2010-2020
0	20-Year certain and life	Middle	Middle
20	20-Year certain and life	About middle	Middle
40	20-Year certain and life	About middle	About middle
60	20-Year certain and life	Above middle	Above middle
80	20-Year certain and life	Same	Same

TABLE 25 — *Continued*

Issue Age	Plan	Male	Female
5 Percent Cost-of-Living Adjustment			
0 .....	Life annuity	Middle	Middle
20 .....	Life annuity	Middle	Middle
40 .....	Life annuity	Above middle	Above middle
60 .....	Life annuity	Above middle	Above middle
80 .....	Life annuity	2010–2020	2010–2020
0 .....	10-Year certain and life	Middle	Middle
20 .....	10-Year certain and life	Above middle	Middle
40 .....	10-Year certain and life	Above middle	Above middle
60 .....	10-Year certain and life	Above middle	Above middle
80 .....	10-Year certain and life	2010–2020	2010–2020
0 .....	20-Year certain and life	Middle	Middle
20 .....	20-Year certain and life	Middle	Middle
40 .....	20-Year certain and life	Middle	Middle
60 .....	20-Year certain and life	Above middle	Above middle
80 .....	20-Year certain and life	Same	2010–2020

## Key:

- Same — The ratios under all three mortality improvement assumptions are the same.
- Middle — The 1987–2010 mortality improvement ratio equals the average of the 1987–2000 and 1987–2020 mortality improvement ratios.
- About middle — The 1987–2010 mortality improvement ratio is slightly higher than the average of the 1987–2000 and 1987–2020 mortality improvement ratios.
- Above middle — The 1987–2010 mortality improvement ratio is meaningfully closer to the 1987–2020 mortality improvement ratio than it is to the average of the 1987–2000 and 1987–2020 mortality improvement ratios.
- 2000–2010 — The 1987–2010 mortality improvement ratio is the same as the 1987–2000 mortality improvement ratio but less than the 1987–2020 mortality ratio.
- 2010–2020 — The 1987–2010 mortality improvement ratio is the same as the 1987–2020 mortality improvement ratio but greater than the 1987–2000 mortality improvement ratio.

Table 26 compares the mortality gross premiums, before loading, derived under the static mortality assumptions of 1992, 1997, and 2002 Life Tables and mortality improvement from 1987 to 2020, inclusive.

The static 2002 Life Table premiums obviously reproduce the premiums derived assuming 1987–2020 mortality improvement with the greatest fidelity. More than 75 percent of the 90 cells in Table 26 show the 2002 Life Table premium to be the most appropriate.

TABLE 26  
MORTALITY GROSS PREMIUMS  
UNDER VARIOUS MORTALITY ASSUMPTIONS

Issue Age	COLA	Plan	1992 Life Table	1997 Life Table	2002 Life Table	Mortality Improvement 1987-2020
Males						
0 . . . .	0	Life annuity	141,900	142,100	142,200	141,900
20 . . . .	0	Life annuity	139,100	139,300	139,400	139,500
40 . . . .	0	Life annuity	128,700	129,200	129,600	129,500
60 . . . .	0	Life annuity	100,800	101,700	102,400	101,300
80 . . . .	0	Life annuity	59,000	60,000	60,900	58,700
0 . . . .	0	10-Year certain and life	142,800	142,900	143,000	142,900
20 . . . .	0	10-Year certain and life	139,600	139,800	139,900	140,000
40 . . . .	0	10-Year certain and life	129,700	130,100	130,500	130,500
60 . . . .	0	10-Year certain and life	107,200	107,800	108,300	107,900
80 . . . .	0	10-Year certain and life	85,000	85,400	85,700	85,200
0 . . . .	0	20-Year certain and life	143,300	143,400	143,400	143,400
20 . . . .	0	20-Year certain and life	140,400	140,500	140,600	140,500
40 . . . .	0	20-Year certain and life	132,000	132,300	132,600	132,800
60 . . . .	0	20-Year certain and life	119,100	119,400	119,600	119,600
80 . . . .	0	20-Year certain and life	114,100	114,100	114,200	114,200
0 . . . .	3%	Life annuity	226,400	226,900	227,200	227,200
20 . . . .	3	Life annuity	211,200	211,900	212,400	213,000
40 . . . .	3	Life annuity	180,000	181,200	182,100	182,400
60 . . . .	3	Life annuity	126,000	127,500	128,600	127,300
80 . . . .	3	Life annuity	66,100	67,500	68,600	65,900
0 . . . .	3	10-Year certain and life	227,400	227,900	228,200	228,300
20 . . . .	3	10-Year certain and life	211,900	212,600	213,000	213,600
40 . . . .	3	10-Year certain and life	181,300	182,400	183,200	183,700
60 . . . .	3	10-Year certain and life	133,700	134,800	135,700	135,200
80 . . . .	3	10-Year certain and life	96,900	97,400	97,900	97,200
0 . . . .	3	20-Year certain and life	228,200	228,600	228,900	229,100
20 . . . .	3	20-Year certain and life	213,100	213,700	214,200	214,800
40 . . . .	3	20-Year certain and life	185,000	185,800	186,500	187,200
60 . . . .	3	20-Year certain and life	152,300	152,900	153,400	153,500
80 . . . .	3	20-Year certain and life	141,400	141,500	141,500	141,500
0 . . . .	5%	Life annuity	358,600	360,000	361,100	362,000
20 . . . .	5	Life annuity	309,300	311,000	312,400	314,300
40 . . . .	5	Life annuity	238,900	241,100	242,800	244,100
60 . . . .	5	Life annuity	150,000	152,100	153,800	152,300
80 . . . .	5	Life annuity	71,800	73,400	74,800	71,700
0 . . . .	5	10-Year certain and life	359,700	361,100	362,100	363,200
20 . . . .	5	10-Year certain and life	310,000	311,700	313,100	315,000
40 . . . .	5	10-Year certain and life	240,300	242,400	244,100	245,500
60 . . . .	5	10-Year certain and life	158,600	160,400	161,800	161,200
80 . . . .	5	10-Year certain and life	106,200	106,900	107,600	106,700
0 . . . .	5	20-Year certain and life	361,100	362,400	363,400	364,700
20 . . . .	5	20-Year certain and life	312,000	313,700	314,900	317,000
40 . . . .	5	20-Year certain and life	245,700	247,500	249,000	250,700
60 . . . .	5	20-Year certain and life	184,200	185,200	186,000	186,300
80 . . . .	5	20-Year certain and life	166,100	166,100	166,200	166,200

TABLE 26 — Continued

Issue Age	COLA	Plan	1992 Life Table	1997 Life Table	2002 Life Table	Mortality Improvement 1987-2020
Females						
0 . . . .	0	Life annuity	143,100	143,200	143,300	143,100
20 . . . .	0	Life annuity	141,900	142,000	142,100	142,200
40 . . . .	0	Life annuity	134,100	134,400	134,700	134,700
60 . . . .	0	Life annuity	113,000	113,800	114,400	114,100
80 . . . .	0	Life annuity	72,400	74,000	75,300	72,200
0 . . . .	0	10-Year certain and life	143,800	143,900	143,900	143,800
20 . . . .	0	10-Year certain and life	142,000	142,100	142,200	142,300
40 . . . .	0	10-Year certain and life	134,600	134,900	135,100	135,300
60 . . . .	0	10-Year certain and life	116,600	117,300	117,800	117,700
80 . . . .	0	10-Year certain and life	89,300	90,000	90,600	89,700
0 . . . .	0	20-Year certain and life	144,200	144,200	144,300	144,200
20 . . . .	0	20-Year certain and life	142,300	142,400	142,500	142,600
40 . . . .	0	20-Year certain and life	135,900	136,100	136,300	136,500
60 . . . .	0	20-Year certain and life	123,500	123,900	124,200	124,400
80 . . . .	0	20-Year certain and life	114,300	114,400	114,400	114,400
0 . . . .	3%	Life annuity	231,600	231,900	232,200	232,200
20 . . . .	3	Life annuity	220,400	220,900	221,300	222,000
40 . . . .	3	Life annuity	193,800	194,800	195,600	196,200
60 . . . .	3	Life annuity	147,200	148,600	149,800	149,800
80 . . . .	3	Life annuity	83,100	85,300	87,100	83,200
0 . . . .	3	10-Year certain and life	232,400	232,700	233,000	233,100
20 . . . .	3	10-Year certain and life	220,600	221,100	221,500	222,100
40 . . . .	3	10-Year certain and life	194,500	195,400	196,200	196,900
60 . . . .	3	10-Year certain and life	151,500	152,800	153,900	154,200
80 . . . .	3	10-Year certain and life	103,200	104,400	105,300	104,000
0 . . . .	3	20-Year certain and life	233,000	233,300	233,500	233,700
20 . . . .	3	20-Year certain and life	221,000	221,500	221,900	222,500
40 . . . .	3	20-Year certain and life	196,500	197,300	198,000	198,900
60 . . . .	3	20-Year certain and life	162,200	163,200	164,000	164,500
80 . . . .	3	20-Year certain and life	141,800	141,900	142,100	142,000
0 . . . .	5%	Life annuity	376,200	377,500	378,500	379,500
20 . . . .	5	Life annuity	332,700	334,300	335,500	337,800
40 . . . .	5	Life annuity	266,500	268,700	270,300	272,400
60 . . . .	5	Life annuity	181,600	184,000	186,000	186,400
80 . . . .	5	Life annuity	91,900	94,600	96,800	92,300
0 . . . .	5	10-Year certain and life	377,100	378,300	379,300	380,500
20 . . . .	5	10-Year certain and life	332,900	334,500	335,800	338,100
40 . . . .	5	10-Year certain and life	267,300	269,400	271,000	273,200
60 . . . .	5	10-Year certain and life	186,400	188,700	190,600	191,300
80 . . . .	5	10-Year certain and life	114,500	116,000	117,300	115,600
0 . . . .	5	20-Year certain and life	378,200	379,400	380,400	381,700
20 . . . .	5	20-Year certain and life	333,800	335,400	336,600	338,900
40 . . . .	5	20-Year certain and life	270,400	272,300	273,800	276,100
60 . . . .	5	20-Year certain and life	201,300	203,100	204,600	205,700
80 . . . .	5	20-Year certain and life	166,700	166,900	167,100	167,000

We now compare the mortality gross single premiums based upon a 2002 Life Table mortality assumption with those based upon a 1987 Life Table mortality assumption. Results are shown in Table 27. Significant premium increases are required for both males and females at almost all ages where a cost-of-living adjustment in benefit is to be provided. This segment of annuity benefit types cannot be ignored.

TABLE 27  
PERCENTAGE INCREASE IN MORTALITY GROSS SINGLE PREMIUMS  
UNDER A 2002 LIFE TABLE MORTALITY ASSUMPTION  
OVER THOSE UNDER A 1987 LIFE TABLE MORTALITY ASSUMPTION

COLA	Plan	Ratio of Mortality Gross Premiums				
		Age 0	Age 20	Age 40	Age 60	Age 80
Males						
0	Life annuity	0.42%	0.50%	1.33%	3.02%	6.10%
	10-Year certain and life	0.28	0.43	1.16	1.98	1.42
	20-Year certain and life	0.21	0.36	0.84	0.67	0.09
3%	Life annuity	0.71	1.09	2.19	3.88	7.02
	10-Year certain and life	0.66	1.04	2.06	2.88	1.87
	20-Year certain and life	0.62	0.99	1.58	1.32	.07
5%	Life annuity	1.40	1.92	3.10	4.77	7.78
	10-Year certain and life	1.34	1.89	3.00	3.72	2.28
	20-Year certain and life	1.28	1.78	2.55	1.81	0.12
Females						
0	Life annuity	0.28%	0.28%	0.90%	2.23%	7.73%
	10-Year certain and life	0.14	0.28	0.75	1.90	2.60
	20-Year certain and life	0.14	0.28	0.59	1.14	0.18
3%	Life annuity	0.56	0.82	1.72	3.38	9.01
	10-Year certain and life	0.52	0.82	1.61	3.01	3.54
	20-Year certain and life	0.43	0.77	1.43	2.05	0.28
5%	Life annuity	1.18	1.57	2.62	4.49	10.00
	10-Year certain and life	1.12	1.60	2.57	4.15	4.27
	20-Year certain and life	1.09	1.54	2.36	3.02	0.42

Profit is not the only criterion that determines the resulting gross premium scale promulgated by the company. Competitiveness plays an important part.

We can cite the effects on competitiveness from another study in which actual structured settlement gross premiums were compared with 17 competitor insurance companies' premium scales in effect during April 1987. Although the basic data for the rates tested are not the same as those described in this paper, the relative change in competitive position is informative. Table 28 shows the change in competitive position when gross premiums

originally based upon a 1980 Life Table mortality assumption are changed to assume either 1987 Life Table mortality or mortality improvement over the period 1987–2000, inclusive, for a 20-year certain and life annuity issued to a male at standard age 25, 45 or 65. Also shown is the effect of mortality improvement assumptions on pricing COLA annuities and the resulting relatively larger movement in competitive position.

TABLE 28  
CHANGE IN RELATIVE COMPETITIVE POSITION DURING APRIL 1987  
WHEN 1980 LIFE TABLE MORTALITY IS REPLACED  
BY EITHER 1987 LIFE TABLE MORTALITY  
OR MORTALITY IMPROVEMENT OVER THE YEARS 1987–2000  
UNDER A 20-YEAR CERTAIN AND LIFE ANNUITY

Age	COLA	1987 Life Table	1995 Life Table
25	0	-3	-4
	3%	-3	-3
	6	-1	-1
45	0	-3	-4
	3	-3	-5
	6	-4	-5
65	0	-1	-1
	3	-3	-3
	6	-1	-1

The purchasers of structured settlement annuities maintain that price, that is, lowest premium, is the driving force in the sale of these annuities, coupled with safety and security of the issuing company. These are conflicting forces. Based upon the analyses above, a company's safety and security can be ascertained based upon financial statistics for that company extant today. What will a company's safety and security position be, for example, 20 years from now, however, if it writes a good portion of COLA structured settlement annuities but does not assume mortality improvement? This question, of course, also applies to annuities without COLA benefits.

#### V. MORTALITY AND UNDERWRITING

##### *Traditional Annuities*

Traditional fixed-income annuities are not usually bought by individuals with impaired longevity. Normally, it is the individual who expects to live longer than average who purchases an annuity. Substandard annuities, being

relatively rare, have been underwritten by the traditional life underwriter who must exercise a reverse judgment in determining the increased benefit to be paid.

No elaborate underwriting manuals or procedures have been established for the substandard individuals wishing to purchase an annuity. The underwriter would use best judgment in determining a percentage of extra mortality to be experienced by the proposed annuitant, and then a reduced premium for the requested benefit may be calculated by the pricing formula utilizing the lower survival rates, or an age rating system may be used whereby the premium at an older age is used to determine the annuity cost for the proposed annuitant.

This may be an acceptable procedure for traditional fixed-income annuities because of its negligible effect on a company's overall profits. Any cost arising from underestimation of longevity can be viewed as an agency accommodation to the field force who write annuities. This picture has changed in the last five years because of structured settlement annuities.

### *Structured Settlement Annuities*

Structured settlement annuities most often are purchased for the benefit of individuals who have suffered personal injury. A meaningful number of cases are issued on a life with expected substandard mortality.

Although only up to about 5 percent of the structured settlement annuities issued by a company may involve substandard annuitants, a large number of requests to price substandard annuities are usually received. This arises from extensive shopping for the lowest premium by brokers. Consequently, an insurance company that is active today in the structured settlement line of business will find itself with one or more underwriters and possibly a medical director engaged full-time in underwriting substandard annuities.

Procedures for underwriting substandard annuities in structured settlement situations are similar to those for substandard traditional fixed-income annuities. The underwriter evaluates each case subjectively based upon years of experience in underwriting for life insurance coverages. Individual judgment by the underwriter is a key element in the underwriting of each substandard annuity.

Under one method of rating substandard annuities, ratings may be internally expressed as additional mortality percentages for pricing purposes, as discussed under traditional annuities underwriting, but the prevalent method is expressed by using the age rating method. This latter method is practical

for use by brokers because it allows them to utilize a company's published standard annuity rate tables.

When the pricing actuary decides on the mortality table to be used in calculating structured settlement annuity rate scales, standard life expectancies by sex based on that table are determined. In evaluating a substandard annuity case, the underwriter estimates the life expectancy and uses the table to determine the attained age, by sex, for which the life expectancy is closest to the estimate. That age is the rated age. Table 29 illustrates a life expectancy table that has been used in substandard structured settlement annuity pricing.

TABLE 29  
LIFE EXPECTANCY [14]

Age	Male	Female	Age	Male	Female
0.....	70.2	77.8	45.....	29.1	35.2
5.....	66.3	73.8	50.....	24.8	30.7
10.....	61.5	68.9	55.....	20.8	26.4
15.....	56.5	64.0	60.....	17.2	22.3
20.....	52.0	59.1	65.....	14.0	18.4
25.....	47.5	54.3	70.....	11.1	14.8
30.....	42.8	49.5	75.....	8.6	11.5
35.....	38.2	44.6	80.....	6.7	8.8
40.....	33.6	39.9	85.....	5.3	6.7

Table 30 illustrates the range of age ratings actually quoted by companies for a particular type of injury. Usually the same medical information is furnished to all companies from whom a substandard annuity quote is requested. This author can cite one factual situation, however, in which the original submission of a 1/2-inch-thick set of medical papers resulted in a 5-year rating up of the true age. Subsequently, a single-sheet letter was received on this case. As a result of this one page, the 5-year rating up was changed to a 45-year rating up in age! The figures in Table 30 represent selected quotes for illustration. More than seven companies quoted on these cases, and Company A is not necessarily the same company on each case.

This spread in ages reflects substantial individual judgment on the part of a company's underwriter and/or medical director. The difference in resulting premiums between companies is vast, even allowing for standard pricing differences. Although premiums for substandard annuities are a very small portion of the total structured settlement annuity premiums a company may

TABLE 30  
 RANGE OF AGE RATINGS  
 ON SELECTED SUBSTANDARD STRUCTURED SETTLEMENT ANNUITIES  
 ACTUALLY QUOTED BY DIFFERENT INSURERS

True Age of Proposed Annuitant	Rated Age Quoted by Company							Total Spread in Quoted Ages
	A	B	C	D	E	F	G	
7	7	10	13	13	16	20	26	19 years
9	36	40	45	55	64	66	67	31 years
4	12	20	23	32	38	42	54	42 years
7	11	30	46	50	51	63	64	53 years
8	8	18	37	45	61	65	69	61 years

collect, the potential loss of profits can be great because of the volumes involved in this category of business. Elaboration on the factors considered in underwriting substandard annuities will be revealing. Because this is a sensitive and proprietary area for companies, the dearth of information available precludes a complete examination of this topic.

Substandard structured settlement annuity quotes most often arise from the following causes: brain injuries, mental retardation, and spinal cord injuries. Less often occurring injuries include: birth trauma, burns, cerebral palsy, vascular disease, and vegetative state. Other injuries are classified as miscellaneous because there are so many of them, and each one represents a very small portion of the totality of injury types underwritten. They can include: cancer, cardiovascular problems, diabetes, drug overdose, encephalopathy, psychiatric disorders, pulmonary problems, renal failure, seizures, stroke, and systemic problems.

Life insurance underwriting practices can be introduced in evaluating substandard annuity risks. After criteria to be considered in underwriting are established, a debit system can be utilized to assign to each criterion a range of debits reflecting the gamut of optimum to most adverse situations for the criterion. A range of total debits then would translate into an effect on life expectancy.

Analyzed in Table 31 are the injuries most frequently evaluated in underwriting. The criteria as well as the debits are illustrative. They do not represent the current practice or actual debits of any particular company but show the range of interrelating criteria and the room for subjective interpretation. Often, it may be a combination of information, which cannot be analyzed by individual components, that carries more weight.

TABLE 31  
INJURIES MOST FREQUENTLY EVALUATED IN UNDERWRITING

Criterion	Range of Debits and Credits
<b>Brain Injury</b>	
Cause of Injury	
Traumatic accident	-50 to 0
Birth trauma	-25 to 0
Anoxia (oxygen deprivation)	-25 to 0
Type of Injury	
Closed	
Mental retardation	-20 to 0
Concussion	-5 to 0
Fracture (with or without operation)	-20 to 0
Open wound (with or without operation)	-20 to 0
Extent of recovery	
Residual impairments	
Seizures	-15 to -5
Coma level (deep, moderate, vegetative)	-60 to -15
Cognitive deficits	
Walk	-15 to 0
Talk	-5 to 0
Mental level	-50 to 0
Daily living activities	
Wash	-5 to 0
Feed	-10 to 0
Clothe	-5 to 0
Bowel and bladder control	-15 to 0
Catheter need	-10 to -5
Duration Since Injury	-15 to 0
Age at Time of Injury	
0-1 years	-15 to 0
2-5 years	-4 to 0
6-10 years	-3 to 0
11-20 years	-2 to 0
21-50 years	-1 to 0
51 or more years	-9 to 0
Environment	
Good family support	0 to 0*
Noncaring family	-10 to 0
Ward of the state, no family	-20 to 0
Health care facility	0 to 0*
Home care	0 to 0*
Currency of Data from Present Date to Date of History or Onset of Injury†	
More than 1 year old	-5 to 0
Within 6-12 months	-3 to 0
Within 6 months	-1 to 0
Total Debits	Percentage Decrease in Life Expectancy‡
-100 to -80	75%-85%
-79 to -60	60%-75%
-59 to -40	40%-60%
-39 to -25	15%-40%
-24 to -15	10%-15%
-14 to 0	0%-10%

TABLE 31 — *Continued*

Criterion	Range of Debits
Mental Retardation (Expanded Details from Brain Injury Criteria)	
Cause of Injury	
Birth trauma	-25 to 0
Anoxia (oxygen deprivation)	-25 to 0
Duration Since Injury	
Within 6 months	-15 to 0
Within 1 year	-10 to 0
1-2 years	-7 to 0
3-6 years	-5 to 0
Over 6 years	-2 to 0
Age at Time of Injury	
0-1 years	-15 to 0
2-5 years	-4 to 0
6-10 years	-3 to 0
Over 10 years	-2 to 0
Degree of Retardation	
Profound	-20 to -15
Severe	-15 to -10
Moderate	-10 to -5
Mild	-5 to 0
Borderline	-3 to 0
Skill Deprivation	
Walking	-15 to 0
Feeding	-10 to 0
Language	-5 to 0
Ability to work	-5 to 0
Medical Problems	
Microcephaly	-15 to -5
Pneumonias	-15 to -5
Seizures	-10 to 0
Incontinence	-5 to 0
Hydrocephalus shunt	-10 to -5
Gag-reflex	-20 to 0
Environment	
Good family support	0 to 0*
Noncaring family	-10 to 0
Ward of the state, no family	-20 to 0
Health care facility	0 to 0*
Home care	0 to 0*
Works some time	0 to 0*
Currency of Data from Present Date to Date of History or Onset of Injury†	
More than 1 year old	-10 to -5
Within 12 months	-5 to 0
Total Debits	Percentage Decrease in Life Expectancy‡
-100 to -75	80%-90%
-74 to -55	60%-80%
-54 to -40	45%-60%
-39 to -30	35%-45%
-29 to -20	25%-35%
-19 to -10	10%-25%
-9 to 0	0%-10%

TABLE 31 — *Continued*

Criterion	Range of Debits
Spinal Cord Injuries	
Cause of Injury	
Traumatic	-5 to 0
Other	-2 to 0
Type of Injury	
Injured disc	-3 to 0
Quadriparesis	-2 to 0
Quadriplegia	-10 to -3
Paraparesis	-2 to 0
Paraplegia	-5 to -2
Complete paralysis	-5 to -2
Incomplete paralysis	-2 to 0
Operation	
Not required	0 to 0
Required (based on cause and type)	-15 to 0
Medical problems	
Blood pressure/blood clots	-10 to -5
Psychosocial	-3 to 0
Spasticity	-5 to 0
Recurrent ulcers	-10 to 0
Support mechanisms	
Bowels	-10 to 0
Urinary	
Need Foley catheter	-10 to 0
Infections	-15 to -5
Renal	-20 to -10
Breathing	
Need respirator	-15 to 0
Spasticity	-5 to 0
Osteomyelitis/scoliosis	-5 to 0
Duration since injury	
0-1 years	-10 to 0
1-2 years	-8 to 0
2-5 years	-5 to 0
Over 5 years	-1 to 0
Age at Time of Injury	
0-5 years	-10 to 0
6-10 years	-8 to 0
11-20 years	-6 to 0
21-40 years	-10 to 0
Over 40 years	-15 to -5
Environment	
Good family support	0 to 0*
Noncaring family	0 to 0*
Ward of the state, no family	-5 to 0
Health care facility	-2 to -1
Home care	0 to 0*
Currency of Data from Present Date to Date of History or Onset of Injury†	
More than 1 year old	-5 to 0
Within 6-12 months	-2 to 0
Within 6 months	-1 to 0

TABLE 31 — *Continued*

Total Debits	Percentage Decrease in Life Expectancy*
- 70 to - 50	40%-50%
- 49 to - 30	30%-40%
- 29 to - 15	20%-30%
- 14 to - 5	10%-20%
- 4 to 0	0%-10%

\*Consider in the overall picture but no specific debits or credits.

†Date of onset, age of annuitant, recency or completeness of data are all considered simultaneously.

‡Total debits may also be expressed as number of years reduction in life expectancy or a multiple mortality rating determined from underwriting manuals used in rating life insurance applicants.

As might be expected, the debits assigned to common criteria between injury types, as well as the percentage decrease in life expectancy for the same range of total debits within injury types, are not the same.

Whether a company has established an underwriting network similar to the examples above or not, the underwriter in effect evaluates each case based upon the relationships in these examples, albeit through mental considerations for the most part. Therefore, the result is also expected: diversity of conclusions by individual underwriters.

A contributing cause to this diversity also can be found in the underlying studies of a particular injury that are available to the underwriter. Because many such injuries would result in a declination of life insurance coverage, the structured settlement annuity line of business is only about five years old, and only about 15–20 companies are writing this business, there are not extensive statistical data. Too often the available statistical data are more than 15 years old and are based upon treatment in the 1940s to 1960s, which does not take into account improved medical care, or the data are based upon a small number of lives.

For example, a paper titled “Survival in Traumatic Spinal Cord Injury” by Geisler, Jousse, Wynne-Jones, and Breithaupt [10] refers to a 1960 and 1973 study of 1,501 traumatic spinal injured patients rehabilitated between 1945 and 1953 and presents an updated 1980 study of 1,478 such patients discharged from a Canadian hospital as of December 31, 1980. On exposure from January 1974 to December 1980, the 1,478 lives accounted for 7,794 life-years and 194 deaths.

According to the 1975–77 Ontario population mortality tables, 75.7 deaths were expected over that time period. These results must be further broken down into subcategories as shown in Table 32.

TABLE 32  
RESULTS OF 1980 STUDY OF TRAUMATIC SPINAL INJURED PATIENTS

Category	Complete Tetraplegic	Partial Tetraplegic	Complete Paraplegic	Partial Paraplegic	Total
Lives					
Male	205	336	340	371	1,252
Female	<u>26</u>	<u>60</u>	<u>82</u>	<u>58</u>	<u>226</u>
Total	231	396	422	429	1,478
Total life-years	1,174.5	2,138	2,420	2,064.5	7,797
Total actual deaths	33	48	55	58	194
Total expected deaths	4.3	22.9	17.3	31.2	75.7

Articles providing injury-specific studies are hard to find, and when they do surface, they are based upon what might be termed a dearth of information. From this type of information, underwriting considerations must be formulated and conclusions reached.

The underwriting of substandard annuities today obviously is more of an art than a science. This can greatly affect the profitability of the structured settlement line of business because of the wide ranging results that underwriting can have on the mortality assumption.

#### VI. MORTALITY AND PRICING SUBSTANDARD ANNUITIES

Two methods of pricing substandard annuities, whether of the traditional or structured settlement type, have been mentioned: rating up the issue age using life expectancies, and using multiple annuity mortality table values of  $1000q_x$  at each attained age. As a corollary to the latter method, one may assume additional deaths added to the tabular number of deaths at each attained age before calculating  $1000q_x$  values. Of course, the results of these last two methods then can be translated into a corresponding rated issue age for use by the field force in calculating the premium for various annuity forms of benefit. One rated age may be offered for all annuity forms for simplicity of use by the field force.

It is informative to examine the effect on pricing caused by variations in age ratings offered by different insurers. We examine this effect from the viewpoint of a single insurer who offers each of the age ratings used by competing insurers. In that way we can utilize the single insurer's rate tables to note the resulting reduction in price as the rated age increases. In practice, from the viewpoint of the broker quoting prices for the client, variations in price from our results will occur because of the differences in standard premium scales declared by each insurer.

Assume that the broker is seeking a quote for a substandard male age 7 for whom one of the following annuity forms will be purchased: life annuity, 20-year certain and life annuity, 30-year certain and life annuity, at \$1000 per month, each with either a 0 percent, 3 percent, or 6 percent cost-of-living adjustment. Suppose further that the insurer receives the age ratings for this individual of ages 18, 29, 40, 51, 62. Table 33 shows the total gross single premiums that this insurer would charge under a gross premium scale that was in use at the time the quote was requested.

TABLE 33  
GROSS SINGLE PREMIUM FOR A \$1000-PER-MONTH ANNUITY  
TO A MALE AGE 7 AT VARIOUS AGE RATINGS UNDER SEVERAL ANNUITY PLANS

Pricing Age	Life Annuity		20-Year Certain and Life		30-Year Certain and Life	
	Gross Premium	Ratio to Standard Age Premium	Gross Premium	Ratio to Standard Age Premium	Gross Premium	Ratio to Standard Age Premium
0 Percent Cost-of-Living Adjustment						
7 .....	\$148,800	100.0%	\$149,400	100.0%	\$149,900	100.0%
18 .....	145,500	97.8	147,200	98.5	148,100	98.8
29 .....	141,400	95.0	143,500	96.1	145,300	96.9
40 .....	132,400	89.0	137,400	92.0	141,600	94.5
51 .....	117,300	78.8	129,900	86.9	138,500	92.4
62 .....	96,200	64.7	123,800	82.9	137,200	91.5
3 Percent Cost-of-Living Adjustment						
7 .....	\$227,500	100.0%	\$228,400	100.0%	\$229,600	100.0%
18 .....	216,600	95.2	219,000	95.9	220,900	96.2
29 .....	202,900	89.2	205,900	90.1	209,800	91.4
40 .....	181,000	79.6	188,300	82.4	197,300	85.9
51 .....	151,400	66.5	169,600	74.3	188,000	81.9
62 .....	116,800	51.3	155,700	68.2	184,400	80.3
6 Percent Cost-of-Living Adjustment						
7 .....	\$430,300	100.0%	\$431,700	100.0%	\$434,300	100.0%
18 .....	382,100	88.8	385,600	89.3	389,700	89.7
29 .....	331,000	76.9	335,400	77.7	343,600	79.1
40 .....	270,800	62.9	281,600	65.2	300,900	69.3
51 .....	207,100	48.1	233,800	54.2	272,800	62.8
62 .....	146,500	34.0	202,700	47.0	262,900	60.5

As expected, the ratio of age-rated gross premiums to standard-age gross premiums decreases with increasing certain period. For COLA plans, the ratio is significantly lower than for corresponding fixed-benefit payment plans. For example, a 20-year certain and life annuity with 0 percent COLA shows a ratio of 92.0 percent at rated age 40. The corresponding 3 percent COLA ratio is 82.4 percent, while for a similar 6 percent COLA annuity, the ratio is 65.2 percent.

Consider 4 percent of gross premium to represent the present value of profits. A 20-year certain and life annuity reaches 96.1 percent of the standard premium at rated age 29 for a 0 percent COLA. A 95.9 percent ratio is reached at rated age 18 for a 3 percent COLA, while a 96.2 percent ratio is reached at rated age 11 for a 6 percent COLA, although this is not shown in Table 33. This implies that age ratings older than these three carry the potential to wipe out expected profits. If Table 29 were used to determine rated ages, our proposed substandard annuitant, according to the rated ages shown in Table 33, would be expected to survive for the number of years shown below:

Issue Age	Life Expectancy (years)
7	64.4
18	53.8
29	43.8
40	33.6
51	24.0
62	15.8

Thus, for example, if a 3 percent COLA 20-year certain and life annuity were purchased, survival beyond the guarantee period under an age 62 age rating would involve greater loss to the company in each year of survival than if survival lasted beyond 24 years under an age 51 rating, because of the larger premium collected at issue age 51.

Although the analysis above is just an example, the conclusion is clear: Unless a high overall confidence level applies, the potential for loss on substandard business is great where very substantial age ratings are offered.

Underwriters and actuaries must be cognizant of the possibility of significant mortality improvement in impaired lives arising from improved medical care or scientific breakthroughs, in addition to projected mortality decreases for standard lives. For example, if persons with spinal cord injuries were to become productive members of society, their longevity would be increased. This is not beyond the realm of imagination with the advent of computers that can be commanded even by quadriplegics. The potential for insurance company loss is great.

## VII. MORTALITY AND VALUATION

*Standard Lives*

Marginal effects on the valuation of both traditional and structured settlement fixed-income annuities generated by substituting the 1983-*a* mortality table in place of the 1971 IAM mortality table were illustrated in the *Transactions* in 1981 [18]. These effects paled compared to the reduction in valuation reserves for such annuities permitted by increased valuation interest rates described in the 1980 amendments to the NAIC Valuation Law, which has been adopted by all 50 states and the District of Columbia. In view of the effects of mortality improvement on annuity pricing, however, it would perhaps be appropriate to consider the use of projection factors in annuity valuation as well, without further comment in this paper.

However, one aspect of mortality warrants elaborate discussion about its effect on valuation reserves: substandard lives.

*Substandard Lives*

The burgeoning premium volume for substandard structured settlement annuities can have a material effect on reserves. The five methods used by companies to determine the mortality rates in reserve calculations are listed below, with the first two probably being the most prevalent. Substandard annuity reserves are determined as:

1. The reserve for a standard life at the true age of the substandard life.
2. The reserve for a standard life at the substandard life's rated up age used in pricing the annuity.
3. The reserve at the true age of the substandard life using multiple mortality table  $q_x$  values reflecting the underwriter's evaluation of extra mortality to be expected.
4. The reserve at the true age of the substandard life using that constant number of deaths added at each attained age to the valuation mortality table number of deaths that will reproduce the life expectancy of the annuitant used in pricing the annuity.
5. The reserve at the true age of the substandard life using mortality rates graded over a predetermined number of years from the pricing mortality table rate to the standard valuation mortality table rate.

Method 1, the most conservative, makes no allowance at any duration for the greater probability of the substandard annuitant's death. Such a method produces the greatest surplus strain and noncompetitive premiums to pay for additional capital requirements.

Method 2, the least conservative, makes full allowance at all durations of the greater probability of the substandard annuitant's death. This method produces the least surplus strain and adopts the full judgment of the underwriter in assessing future longevity. The extreme situation can arise that the annuitant has outlived the period for which reserves are calculable under the valuation mortality table. Lesser degrees of underreserving at earlier durations also occur under this method.

Consider the child at birth who is assessed a 70-year rate up in age by the underwriter. Reserve factors for issue age 70 would run out after 45 years if the limiting age of the table is taken as 116. Improvement in medical care, excellent home care, or even a misassessment of the seriousness of the injury whether by error or by inappropriate statistical guides could result in the annuitant surviving beyond age 45. Reserve factors during the 45-year period also would be inadequate by failing to account for survival beyond true age 45 for this annuitant.

Method 3 incorporates the underwriter's judgment in assessing the severity of the mortality risk by determining the adjustment factors to standard mortality rates that are needed commencing with the true issue age. Surplus strain is thereby reduced. This method is still subject, however, to the accuracy of the underwriter's assessment and the degree of annuitants' increased longevity above that contemplated by the assessment. To the degree that the multiple mortality table rating correctly assesses the probability of death, reserves released would follow the release of risk. Reserves would be held during the entire lifetime of the annuitant, although their sufficiency may be subject to question.

Method 4 is similar to method 3 except that constant extra deaths are added at each attained age to the tabular number of deaths at such ages, instead of dealing with a multiple of standard mortality rates. Reduction in surplus strain runs off more quickly under method 4 than under method 3. Method 4 also avoids the problem of table runoff, so that the annuitant will not outlive the reserve.

Method 5, a blend of two methods, incorporates the underwriter's judgment in assessing the severity of the mortality risk, by starting with pricing basis mortality rates, thereby alleviating surplus strain. Underwriting liberalizations can be attenuated by grading such mortality rates into the standard valuation table mortality rates over a specified but shorter time period, for example, 5 or 10 years. From a competition viewpoint, this method would not be as appropriate for a company just entering this line of business because the surplus strain would be longer-lasting than if method 2 were used. Yet,

some companies may not wish to adopt the least conservative reserving method, method 2.

From a regulatory viewpoint, method 5 represents the ideal way to tailor the reserving method with the confidence attached to underwriting practices as well as other individual company characteristics.

Actual experience, when compared to an underwriter's estimate of expected longevity over the annuitant's lifetime, can have a significant effect on the adequacy of substandard reserves for a company writing a good portion of COLA annuities. A periodic review of the valuation file of structured settlement annuities is a must to ensure that each surviving annuitant's contract has a reasonable reserve established for it, especially for COLA annuities in which relatively large benefit amounts are payable to annuitants who may reach advanced age.

In establishing a substandard reserve basis, a degree of conservatism is warranted because of the skimpy statistical data used in promulgating underwriting guidelines and the competitive nature of this line of business.

#### VIII. SURVEY OF STRUCTURED SETTLEMENT ANNUITY CHARACTERISTICS

Because structured settlement annuities are relatively new, their characteristics may be vastly different than those of traditional annuities. With this in mind, companies thought to be writing structured settlement annuities were polled to determine specific information on this class of business. Where information may have touched on proprietary topics, the data were requested in such form as to be useful but to protect confidentiality. Responses were received from 15 companies, although not all these companies answered all questions. Appendix II summarizes the responses.

Traditional fixed-income annuities are normally issued to male, female, and joint lives. The proportion of joint life issues may, from traditional annuity experience, be expected to lie in the 20-40 percent range. With 13 out of 15 companies responding that they issue joint life annuities, it is noteworthy that none of these companies has received more than 3.7 percent of its premium involving life contingencies as joint life, and only eight of these companies reported any joint life premium. Five companies did not respond, and the other two companies actually received either less than 0.1 percent of premium for joint life annuities or received no such premium at all. The arithmetic average proportion of joint life premium for those eight companies is closer to 2.5 percent.

As a proportion of total premiums, including premiums not involving life contingencies, the largest proportion is 3.0 percent, and the average for the

nine companies reporting is about 1.6 percent. On a number-of-lives basis, the largest proportion of contracts sold as joint life annuities is 2.0 percent, while the average proportion for the ten companies reporting is about 1 percent. Joint life structured settlement annuities represent a very small portion of total sales.

Note from the response to question 2 that males have purchased 43.6–63.0 percent of the structured annuities when measured on a lives basis, for an average of 57.5 percent. On the basis of amount of premiums involving life contingencies, the range becomes 51.2–68.0 percent, for an average of 58.5 percent. If premiums not involving life contingencies are to be included in the calculations, the companies reporting show a range of 50.5–70.0 percent, for an average of 60.7 percent. This 57–61 percent average ratio is in the same range as that for traditional fixed-income annuities, especially if we set that range at 40–80 percent to accommodate the distribution of the larger number of companies that write traditional fixed-income annuities. Even a 50–70 percent range contains the structured annuities proportion sold to males.

Question 3 provides an important piece of information in the consideration of mortality effects on structured settlement annuities. If such annuities are more often than not issued with long certain periods, then the effect of underestimating mortality improvement is greatly mitigated, as previously discussed. On a number-of-lives basis, 13 reporting companies show that between 2 percent and 28.1 percent of their contracts are straight-life annuity forms with no guarantee period. Company B, with the 28.1 percent proportion, and Company C, with 22.0 percent, issue about twice as many pure life annuities than the third-highest reporting company, with a 12.6 percent proportion. The average proportion of life annuities issued is 8.8 percent including Company B and Company C and 5.9 percent if Company B and Company C are excluded.

Annuities certain are about four times as likely to be written with a 10-year guarantee period than with a period of 1–9 years, Company K results excluded. This factor increases to about five if the Company A result is excluded. A guarantee period of 20 years is about six times as likely to be written as a period of 11–19 years. Question 3 also reveals that an average of about 87.0 percent of life contingent annuities have guarantee periods of 10 years or more, while an average of about 66.3 percent of such annuities have guarantee periods of 20 years or more.

Table 34 compares analogous figures derived from question 3 on an amount-of-premium basis with those just indicated on a number-of-lives basis.

TABLE 34

ANALYSIS OF STRUCTURED SETTLEMENT LIFE CONTINGENT ANNUITIES  
AND THEIR ANNUITY CERTAIN GUARANTEE PERIODS  
BY LIVES AND AMOUNT OF PREMIUM

Basis	Average Proportion of Issues by			
	Number of Lives	Ratio	Amount of Premium	Ratio
Life Only				
All 13 companies	8.8%		7.0%	
Excluding Companies B and C	5.9		4.1	
Certain Period — All 12 Companies				
1-9 years	4.0		2.5	
10 years	15.3	3.8	14.7	5.9
11-19 years	5.5		4.0	
20 years	32.6	6.0	30.7	7.7
10 or more years	87.0		90.4	
20 or more years	66.3		71.7	

The analysis above includes annuity contracts issued to both standard and substandard lives. Examination of the responses to question 4 reveals that for a small number of companies, substandard annuities are a minor portion of their total. Companies J and L are examples when analyzed on the basis of premium income. Companies I and K can be added when analyzed on a number-of-lives basis. Most other companies write a substantial proportion of premium on substandard lives. Examples of these are Companies A, B, D, G, and M. Thus, of the nine companies writing substandard business, four write insignificant amounts of substandard annuity, while five write significant amounts. Company A, for that matter, writes more substandard business than standard: at a 6:1 ratio on an amount-of-premium basis!

Requests to break out the substandard annuity portion by both including and excluding annuity certain and lump-sum benefits not involving life contingencies was intended as an accommodation to those companies unable to break out their data to exclude no life contingency issues.

An extensive amount of shopping via substandard annuity rating requests is the norm in this line of business. Question 5 is intended to reveal success ratios in issuing annuities on the lives of substandard annuitants for whom a rating is offered. Unfortunately, only six companies responded to this question, presumably because many companies do not make the effort to ascertain this information. Except for Company J, a maximum of 6 percent of the rated cases end up as a sold annuity, when considering only life contingent annuities sold. That maximum rate of cases sold is only 4 percent,

when all structured settlement annuities sold form the denominator of the ratio. Company J sold 15 percent of the cases for which it rendered a quote — truly extraordinary.

Question 6 is intended to determine the prevalent true issue age categories of the structured settlement annuities sold, whether on a standard or sub-standard basis. Responses are on a number-of-lives and on an amount-of-premium basis, considering life contingent annuities only and separately all structured annuities. The number of companies responding in the format requested is shown in Table 35. Company K was unable to determine the proportion of annuities sold by the requested age categories, so its results for this question are not included in the study.

TABLE 35  
NUMBER OF COMPANIES RESPONDING TO QUESTION 6

	Number of Lives	Amount of Premium
Life contingent annuities only	9	10
All structured annuities	11	10

Table 36 shows the proportionate distribution of issues by age groups under each of the four categories, based upon the arithmetic average of the reported proportions in each age grouping cell. More statistically valid methods to analyze these data are not available, in keeping with the concept of maintaining confidentiality.

Considering life contingent annuities only, the following observations can be made:

- Proportions by issue age groups are similar whether measured by number of lives or amount of premiums, until age 60.
- The 20–29 age grouping cell contains the largest group of issues under both methods of measurement.
- At least 85 percent of all issues are below 60.
- More than 50 percent of all issues are at ages below 40 on a number-of-lives basis.
- Just less than 50 percent of all issues are at ages below 30 on an amount-of-premium basis.
- Just about 50 percent of all issues are between the ages of 20 and 50 on a number-of-lives basis.
- More than 55 percent of all issues are between the ages of 20 and 50 on an amount-of-premium basis.
- Only about 5 percent of all issues are at ages 70 or older on a number-of-lives basis.

TABLE 36  
ANALYSIS OF STRUCTURED SETTLEMENT ANNUITY  
TRUE ISSUE AGE GROUPINGS  
BASED ON AVERAGE OF REPORTED PROPORTIONS IN EACH CELL

Issue Age Group	Proportion of Issues in Age Grouping			
	By Number of Lives		By Amount of Premium	
	Life and C&L Annuities Only	All Annuities Combined	Life and C&L Annuities Only	All Annuities Combined
0-9	9.8%	19.6%	12.7%	14.7%
10-19	13.0	21.2	12.1	14.3
20-29	20.4	16.4	22.9	20.6
30-39	12.0	14.3	16.8	17.3
40-49	17.1	11.9	18.1	15.5
50-59	11.6	9.2	9.5	10.4
60-69	11.0	4.2	5.9	3.9
70-79	3.9	2.2	1.6	2.6
80-89	1.1	0.5	0.4	0.3
90-99	0.1	0	0	0
Unknown	0	0.5	0	0.4
Total	100.0%	100.0%	100.0%	100.0%

- Only about 2 percent of all issues are at ages 70 or older on an amount-of-premium basis.

Considering all annuities combined, the following observations can be made:

- Proportions by issue age groups are similar whether measured by number of lives or amount of premium for all issue age groups except 10-19.
- The 10-19 age grouping cell contains the largest group of issues on a number-of-lives basis, and the 20-29 age grouping cell takes its place on an amount-of-premium basis.
- At least 90 percent of all issues are below age 60.
- More than 50 percent of all issues are at ages below 30 on a number-of-lives basis (more than 70 percent are below age 40).
- Just about 50 percent of all issues are at ages below 30 on an amount-of-premium basis (more than 65 percent are below age 40).
- More than 40 percent of all issues are between the ages of 20 and 50 on a number-of-lives basis.
- More than 50 percent of all issues are between the ages of 20 and 50 on an amount-of-premium basis.
- Only about 3 percent of all issues are at ages 70 or older under both methods of measurement.

Obviously, variations from the average statistics quoted above will be evidenced by individual company data. For example, Company I is the only

company to show less than 50 percent of issues to be below age 40. The result is not confirmed by the total of all annuities data for this cell. However, these overall results should be useful benchmarks by which to measure a company's individual experience.

Thirteen companies responded to question 7 by indicating the mortality table basis in their structured settlement annuity pricing. Six companies used some form of the 1979-81 U.S. Population mortality table (one company blended it with the 1971 IAM table and another with 1983 Table *a*), while two companies used a blend of the 1971 GAM and 1983 GAM tables and two companies used some form of 1971 IAM table without blending. One company used the 1980 U.S. Population table and another used 1983 Table *a* without blending. The remaining responding company used its own experience table on a select and ultimate basis, mentioning explicitly that mortality improvement was included. Of course, modifications of the tables by the other companies comprise some degree of estimating mortality improvement. Diversity in assumptions for mortality appears to be the norm.

Although five methods of valuing substandard annuities were discussed in Section VII, the 12 companies who responded to question 8 indicated that they used four of those age-mortality bases in pricing such annuities, thereby excluding the constant addition of death at each age method. Nine of these companies price such annuities by using life expectancies determined from a rated age. Simplicity of use for the broker in the field tends to make this the most popular pricing method. Company J determines price based upon the annuitant's true age by using multiple annuity tables. Company N uses rated age in pricing on either a life expectancy basis or by converting from an issue age multiple annuity table calculation, depending upon the decision of the underwriter to determine which method was more appropriate. Company M prices annuities on a rated age basis by converting from an issue age calculation based on either multiple annuity tables or additional deaths added to each age, again depending upon the underwriter's decision.

The underlying mortality table for pricing standard structured settlement annuities also is used to price substandard annuities, as indicated by each of the 13 companies writing such annuities who responded to question 9. A degree of consistency in rates is retained by this choice of underlying mortality table.

The responses to question 10 regarding valuation of substandard annuities are worth noting. Seven of these companies use the method that produces the least surplus strain — standard reserve at pricing age. Only three companies use the method that produces the greatest surplus strain — standard

reserve at true age. Companies D and L base reserves on multiple mortality annuity tables at the annuitant's true age. Company J grades mortality over a period that varies by plan from the pricing mortality basis to standard mortality.

Table 37 compares the pricing and valuation basis for each company responding to questions 8 and 10. This table reveals the correlation between pricing by rated age using life expectancies and valuation using standard reserves at the pricing age. Six companies follow this method. Companies D and L use a multiple annuity table at true age instead. Companies A and O use a standard table reserve at true age for valuation. Companies J and M do not use this pricing basis, and Company K did not indicate its pricing basis.

TABLE 37  
COMPARISON OF PRICING AND VALUATION BASES  
FOR COMPANIES RESPONDING TO QUESTIONS 8 AND 10

Company	Pricing by Rated Age Using Life Expectancies	Valuation by		Standard Table Reserve at True Age	Pricing by True* Age Using Multiple Annuity Tables	Valuation by Mortality Graded over a Given Period from Pricing Mortality to Standard Mortality*
		Standard Reserve at Pricing Age	Multiple Annuity at True Age			
A	X			X		
B	X	X				
C	Not applicable	—				
D	X		X			
E	X	X				
F	X	X				
G	X	X				
H		Not applicable	—			
I	X	X				
J					X	X - years vary
K	N.R.	X				
L	X		X			
M				X	X†	
N	X‡	X				
O	X			X		

N.R. = No response to the question.

\*Rated age for Company M and Company N.

†Company M also prices on an additional death at each age basis.

‡Company N also prices on a multiple annuity table basis.

Surplus strain for a company writing structured settlement annuities is affected not only by how it values its substandard annuities, but also by how

it values lump sum and annuity certain payments that do not involve survivorship, as well as increasing benefit (COLA) plans. Questions 11 and 12 elicited responses on how the above contract provisions were valued. Twelve out of 15 companies responded that they value these benefits as single premium immediate annuities, thus providing for the highest valuation interest rate (9.25 percent in 1986, 8.00 percent in 1987). Immediate annuities provide for commencement of benefit payments within 13 months of the contract's issue or purchase date (under New York State law).

Weighting factors for plan types A, B or C, based upon a guarantee duration that produces interest rates varying between 6-1/2 percent and 8 percent during 1987, must be used for annuities with benefit commencement deferred more than 13 months. The period between the contract date of issue or purchase and the commencement date of benefit payments determines which weighting factor by plan type is applicable.

Valuation interest rates are further affected by increasing benefit payments or lump sum payments in a calendar year whose sum of all benefits exceeds the prior year sum of all benefits by 15 percent if valuation is on an aggregate basis, or by 10 percent for each contract valued on a seriatim basis (under New York State law). Aggregate method refers to a determination of the sum of future benefits payable at each attained age for all lives covered under all contracts, for all issue years combined. The other allowable valuation basis, seriatim, refers to a determination of the sum of future benefits payable at each attained age for each life individually, even though there may be more than one life covered under a single contract and even if there is more than one form of benefit payable to that life. Single-premium immediate annuity valuation interest rates may not be used to value the excess amounts, aggregate or seriatim, if the above percentage excesses apply. Weighting factors must be used in such cases to determine the valuation interest rate applicable to such excess benefit payments.

Companies J, K and O, having indicated that they value annuities certain and lump sums as separate contracts, would have to use the lower interest rates in their statutory valuation of lump sum benefits.

This statutory reserve method for issues of 1984-1987 will require a recalculation for federal tax reserve purposes under Section 807(c) of the 1954 Internal Revenue Code. Section 807(c) requires annuity certain and nonlife contingent lump sum benefit payments tax reserves to equal the present value

of future benefits by discounting at an appropriate rate of interest. Quoting from Section 807(c), the

“appropriate rate of interest for any obligation is the higher of the prevailing State assumed interest rate . . . or the rate of interest assumed by the company . . . in determining the guaranteed benefit.”

The gross premium interest rate assumption will always exceed the maximum statutory valuation interest rate. Thus, tax reserves for these benefits will always be less than statutory reserves, producing greater surplus strain and lost investment income on funds paid out in income taxes on the difference in increases between these reserves. Statutory provisions require the use of a lower valuation interest rate. From questionnaire responses, apparently more companies use the higher interest rate in statutory valuation. Information regarding tax reserves was not requested in the questionnaire. It is clear from Section 807(c), however, that an even higher interest rate is required for tax reserve calculations.

The Omnibus Budget Reconciliation Act of 1987 (OBRA) affects the federal taxation of annuity issues starting in 1988 by requiring lower tax reserves than those produced under previous tax law. OBRA mandates the use of the CARVM valuation method to determine federal tax reserves, independent of the statutory reserve valuation method used, and prescribes the tax valuation interest rate that must be used. This rate may not be less than the statutory valuation interest rate.

The federal valuation interest rate is defined as the greater of the prevailing interest rate (PIR) and the applicable federal rate (AFR). PIR is the highest interest rate allowed by at least 26 states. AFR is the annual rate determined by averaging the applicable federal mid-term rates at the beginning of each calendar month in the 60-month period immediately preceding the calendar year for which the determination is made (excluding months before August 1986). This produces a 1988 federal tax valuation interest rate of 7.77 percent. Such a change in federal tax reserves requires prospective repricing of annuities because of its effect on the Gain From Operations.

All companies except Company L treat increasing benefit contracts as level benefit plans, according to their response to question 12. They therefore would use the highest permitted statutory valuation interest rate to value these contracts, subject to the adjustment in interest rates for excess of benefit payments by calendar-year comparison explained above. Company L indicated that it varies its statutory valuation interest rate depending upon the

COLA rate used to determine benefits. Such resulting rates may not exceed the maximum valuation interest rates prescribed by statute.

Underlying the comments in this paper on structured settlement annuities is the fact that this new line of business, with its own characteristics, must be based upon a broader foundation of experience studies — for standard mortality as well as for substandard mortality. Question 13 reveals that only four out of the 15 responding companies are prepared at this time to participate in a mortality study of structured settlement annuities. Participation capabilities of nine other writers of this line of business would be deferred from 1 to 8 years in the future, with two companies being unable at this time to determine when such participation would be possible. Company O would agree to participate if the effort involved was cost-justified.

Such a response is not unexpected. Gearing up for this new line of business by using existing systems or by creating new systems may sometimes be crude or just expedient and require refinement — with possible inability to recapture prior data for inclusion into a more refined system. Suffice it to say that no meaningful studies of the structured settlement annuity line of business can be expected for at least 2 or 3 years if the responding companies are representative of the other companies writing this line of annuities.

Question 14 requested companies to list the 10 most prevalent types of substandard cases for which quotes are requested. All 13 companies writing substandard annuities responded. Each listing reflected a different distribution of injury types, as shown in Appendix II. Although some types were among a company's top 10, the percentage for that company was small enough to warrant listing that injury under "miscellaneous" for purposes of the question 15 summary chart. Some injuries are shown separately because of the meaningful proportion they represent within a company. For example, cerebral palsy could have been combined with birth trauma, as could mental retardation.

The major categories of injury types for all companies combined are discussed in the mortality and underwriting section. Question 14 responses reveal, however, how many categories are described by individual companies as "major" that contain proportions of 10% or less. Of the 73 proportions shown for all 13 companies, there are 36 proportions equal to 10 percent or less. Another approach is to examine the proportions exactly as reported in response to question 14 without regard to labeling specific injury types. Table 38 shows these proportions, specifically identifying the "miscellaneous" or "other" category.

TABLE 38  
 PROPORTION OF INJURY TYPES BY RESPONDING COMPANY  
 MOST FREQUENTLY UNDERWRITTEN  
 FOR SUBSTANDARD STRUCTURED SETTLEMENT ANNUITIES

Company	Proportions Reported in Category											
	1	2	3	4	5	6	7	8	9	10	11	12
A	40%	30%	5%	10%	15%							
B	60	20	10	5	5M							
C	N.A.											
D	N.R.											
E	25	17	14	2	1	41M						
F	5	15	10	15	5	50M						
G	17	13	14	3	20	6	5	2	6	4	2	8M
H	N.A.											
I	20	17	11	8	4	3	3	2	2	2	28M	
J	33	33	10	3	7	7	3	3	1M			
K	70	20	10M									
L	31.3	18.5	10.8	9.2	4.6	3.1	3.1	1.5	1.5	1.0	15.4M	
M	19	18	12	8	7	6	6	5	5	4	10M	
N	50	15	5	30M								
O	28.5	28.5	38	5M								

N.A. = not applicable.

N.R. = No response to the question.

M = Miscellaneous or other.

Of the 76 proportions shown in Table 38 after excluding those 11 coded M for miscellaneous, 44 proportions represent injury types comprising 10% or less of a company's total injury types underwritten. Of the 11 miscellaneous proportions, seven companies show miscellaneous proportions of 10% or more, the highest three percentages being 30 percent, 41 percent and 50 percent! Clearly, this shows the diversity of the types of cases being underwritten.

One may wonder whether reliable statistics can be gathered from such a splintering of information. It may turn out that only the three to four most prevalent injury types could be subject to intercompany study.

Companies B, I and L furnished technical references used to evaluate substandard annuities, as requested by question 16. These sources are shown in Appendix II. The paper "The Medical Underwriting of Substandard Life Annuities" [5] contains a listing of references to papers on this topic. Further references can be found in the paper "The Epidemiology of Severe Injuries in Structured Settlement Applicants" [4], which studied 6,461 cases of individuals applying for substandard structured settlement annuities to describe the epidemiologic characteristics of their injuries.

Five companies requested elaboration on aspects of the structured settlement line that were not covered in the questionnaire, at the invitation of question 17. These requests are shown in Appendix II. The comments below relate to these requests. Those questions not covered here either require discussion beyond the scope of this paper (for example, other than mortality pricing assumptions), relate to proprietary information, or are covered in the text of this paper.

Company B's question on asset/liability matching was submitted prior to the Society of Actuaries meeting in May 1987. A panel of vendors discussed their software packages on asset/liability matching at that meeting. The presentation included a handout paper that compared the salient features of each package.

This author has not heard of any commercially developed software usable for administrative processing in the structured settlement line.

Table 30, which is only illustrative of rated ages being quoted, apparently indicates that there is no real maximum age for substandard ratings. Whatever age rating is warranted by the projected life expectancy according to the medical criteria will be quoted, without "loading" for recoveries and so on.

#### IX. CONCLUSIONS

Estimation of mortality for annuity pricing purposes took a quantum leap in 1949 with the publication of the Jenkins and Lew paper. Subsequent experience mortality tables have shown that development of mortality improvement factors is still an art rather than a science. This paper has attempted to show that conservative mortality improvement factors are a necessity in pricing annuities, based upon historical events. However, there is no making up for past underestimations of mortality in the development of non-participating annuity products. Investment income gains can no longer be relied upon to offset mortality losses due to competitive pricing pressures and the potential of losses in this area due to investment complexities.

Structured settlement annuities pricing is subject to intense competitive pressure. Substandard annuities pricing carries the potential to produce mortality losses that may wipe out the gains on a larger block of standard annuity issues. The foundation for including substandard annuity mortality in the pricing process is relatively weak from an actuarial viewpoint. Cautious pricing of this aspect of structured settlement annuities is recommended.

The author hopes that more of the companies writing structured settlement annuities will be able to submit their data to enhance the value of the questionnaire included in this paper, as well as participate in expanding the information available on this line of business.

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## APPENDIX I

### TABLE A1

FIXED IMMEDIATE ANNUITIES  
MORTALITY GROSS SINGLE PREMIUMS (NO LOADING)  
ASSUMING 1965 COMPANY MORTALITY TABLE  
WITH MORTALITY IMPROVEMENT BASED ON EXPERIENCE TABLES AND PROJECTION SCALES I AND J

Sex	Plan	Number of Contracts	Annual Income	Annual Income Distribution	Adjusted Single Premium	Mortality Gross Premium		
						At Issue	Projection I	Projection J
For Issues of 1966; with Interest of 4.75 Percent for the First 15 Years and 3.5 Percent Thereafter								
Male	Life	223	306,400	44.6%	2,686,540	2,521,695	2,619,939	2,622,193
Female	Life	296	380,400	55.4	3,609,500	3,388,787	3,575,128	3,577,701
Subtotal		<u>519</u>	<u>686,800</u>	34.1	6,296,040	5,910,482	6,195,067	6,199,894
Male	10 CC	505	630,700	47.5	6,735,212	6,366,039	6,551,999	6,552,682
Female	10 CC	606	697,500	52.5	7,730,105	7,296,940	7,604,391	7,609,344
Subtotal		<u>1,111</u>	<u>1,328,200</u>	65.9	14,465,317	13,662,979	14,156,390	14,162,026
Subtotal male		728	937,100	46.5	9,421,752	8,887,734	9,171,938	9,174,875
Subtotal female		902	1,077,900	53.5	11,339,605	10,685,727	11,179,519	11,187,045
Total all issues		<u>1,630</u>	<u>2,015,000</u>	100.0%	20,761,357	19,573,461	20,351,457	20,361,920
For Issues of 1967; with Interest of 5 Percent for the First 12 Years and 3.75 Percent Thereafter								
Male	Life	204	313,100	41.5%	2,713,390	2,547,103	2,656,673	2,657,774
Female	Life	360	441,700	58.5	4,141,761	3,888,220	4,116,385	4,120,456
Subtotal		<u>564</u>	<u>754,800</u>	30.2	6,855,151	6,435,323	6,773,058	6,778,230
Male	10 CC	477	689,300	39.5	7,263,950	6,872,433	7,089,671	7,092,371
Female	10 CC	953	1,055,900	60.5	11,540,004	10,909,389	11,395,988	11,409,793
Subtotal		<u>1,430</u>	<u>1,745,200</u>	69.8	18,803,954	17,781,822	18,485,659	18,502,164
Subtotal male		681	1,002,400	40.1	9,977,340	9,419,536	9,746,344	9,750,145
Subtotal female		1,313	1,497,600	59.9	15,681,765	14,797,609	15,512,373	15,530,249
Total all issues		<u>1,994</u>	<u>2,500,000</u>	100.0%	25,659,105	24,217,145	25,258,717	25,280,394

TABLE A1 — Continued

Sex	Plan	Number of Contracts	Annual Income	Annual Income Distribution	Adjusted Single Premium	Mortality Gross Premium		
						At Issue	Projection I	Projection J
For Issues of 1968; with Interest of 5.5 Percent for the First 13 Years and 3.75 Percent Thereafter								
Male	Life	220	343,200	43.1%	2,926,251	2,705,952	2,831,261	2,832,557
Female	Life	399	453,300	56.9	4,184,202	3,861,970	4,098,372	4,104,299
Subtotal		619	796,500	31.2	7,110,453	6,567,922	6,929,633	6,936,856
Male	10 CC	473	633,800	36.0	6,490,573	6,125,218	6,330,115	6,330,549
Female	10 CC	1,001	1,126,100	64.0	11,952,867	11,263,112	11,781,540	11,796,264
Subtotal		1,474	1,759,900	68.8	18,443,440	17,388,330	18,111,655	18,126,813
Subtotal male		693	977,000	38.2	9,416,824	8,831,170	9,161,376	9,163,106
Subtotal female		1,400	1,579,400	61.8	16,137,069	15,125,082	15,879,912	15,900,563
Total all issues		2,093	2,556,400	100.0%	25,553,893	23,956,252	25,041,288	25,063,669
For Issues of 1969; with Interest of 5.7 Percent for the First 13 Years and 3.75 Percent Thereafter								
Male	Life	151	199,800	33.4%	1,684,327	1,557,265	1,635,900	1,636,654
Female	Life	302	398,300	66.6	3,635,007	3,352,915	3,574,621	3,578,292
Subtotal		453	598,100	27.1	5,319,334	4,910,180	5,210,521	5,214,946
Male	10 CC	431	543,900	33.8	5,505,974	5,195,547	5,382,743	5,384,656
Female	10 CC	971	1,066,200	66.2	11,180,024	10,536,255	11,050,720	11,060,547
Subtotal		1,402	1,610,100	72.9	16,685,998	15,731,802	16,433,463	16,445,203
Subtotal male		582	743,700	33.7	7,190,301	6,752,812	7,018,643	7,021,310
Subtotal female		1,273	1,464,500	66.3	14,815,031	13,889,170	14,625,341	14,638,839
Total all issues		1,855	2,208,200	100.0%	22,005,332	20,641,982	21,643,984	21,660,149

TABLE A2  
 FIXED IMMEDIATE ANNUITIES  
 MORTALITY GROSS SINGLE PREMIUMS (NO LOADING)  
 ASSUMING 1969 COMPANY MORTALITY TABLE  
 WITH MORTALITY IMPROVEMENT BASED ON EXPERIENCE TABLES AND PROJECTION SCALES I AND J

Sex	Plan	Number of Contracts	Annual Income	Annual Income Distribution	Adjusted Single Premium	Mortality Gross Premium		
						At Issue	Projection I	Projection J
<i>For Issues of 1970; with Interest of 7 Percent for the First 16 Years and 3.25 Percent Thereafter</i>								
Male	Life	144	262,200	42.7%	2,093,306	1,955,147	1,985,827	1,986,749
Female	Life	251	351,400	57.3	3,013,105	2,814,938	2,903,403	2,907,843
Subtotal		395	613,600	30.0	5,106,411	4,770,085	4,889,230	4,894,592
Male	10 CC	375	596,600	41.7	5,660,984	5,286,989	5,444,788	5,447,041
Female	10 CC	679	835,800	58.3	8,195,268	7,653,619	7,952,825	7,960,437
Subtotal		1,054	1,432,400	70.0	13,856,252	12,940,608	13,397,613	13,407,478
Subtotal male		519	858,800	42.0	7,754,290	7,242,136	7,430,615	7,433,790
Subtotal female		930	1,187,200	58.0	11,208,373	10,468,557	10,856,228	10,868,280
Total all issues		1,449	2,046,000	100.0%	18,962,663	17,710,693	18,286,843	18,302,070
<i>For Issues of 1971; with Interest of 7 Percent for the First 16 Years and 3.25 Percent Thereafter</i>								
Male	Life	178	339,300	42.8%	2,813,842	2,628,637	2,693,551	2,694,745
Female	Life	303	453,600	57.2	3,738,795	3,492,285	3,596,322	3,602,053
Subtotal		481	792,900	25.3	6,552,637	6,120,922	6,289,873	6,296,798
Male	10 CC	557	1,117,300	47.6	10,868,516	10,153,842	10,510,411	10,514,787
Female	10 CC	870	1,228,400	52.4	11,413,553	10,659,675	11,059,837	11,070,750
Subtotal		1,427	2,345,700	74.7	22,282,069	20,813,517	21,570,248	21,585,537
Subtotal male		735	1,456,600	46.4	13,682,358	12,782,479	13,203,962	13,209,532
Subtotal female		1,173	1,682,000	53.6	15,152,348	14,151,960	14,656,159	14,672,803
Total all issues		1,908	3,138,600	100.0%	28,834,706	26,934,439	27,860,121	27,882,335

TABLE A2 -- Continued

Sex	Plan	Number of Contracts	Annual Income	Annual Income Distribution	Adjusted Single Premium	Mortality Gross Premium		
						At Issue	Projection I	Projection J
For Issues of 1972; with Interest of 6.75 Percent for the First 16 Years and 3.25 Percent Thereafter								
Male	Life	173	314,700	52.5%	2,535,420	2,368,596	2,422,661	2,424,977
Female	Life	228	284,300	47.5	2,289,540	2,138,568	2,206,626	2,209,784
Subtotal		401	599,000	23.4	4,824,960	4,507,164	4,629,287	4,634,761
Male	10 CC	472	780,200	39.8	7,499,496	7,005,466	7,258,226	7,260,970
Female	10 CC	858	1,182,300	60.2	11,003,317	10,277,452	10,689,622	10,704,550
Subtotal		1,330	1,962,500	76.6	18,502,813	17,282,918	17,947,848	17,965,520
Subtotal male		645	1,094,900	42.7	10,034,916	9,374,062	9,680,887	9,685,947
Subtotal female		1,086	1,466,600	57.3	13,292,857	12,416,020	12,896,248	12,914,334
Total all issues		1,731	2,561,500	100.0%	23,327,773	21,790,082	22,577,135	22,600,281
For Issues of 1973; with Interest of 7 Percent for the First 16 Years and 3.25 Percent Thereafter								
Male	Life	166	374,200	45.2%	3,063,496	2,862,109	2,950,239	2,952,993
Female	Life	223	453,400	54.8	3,685,089	3,442,569	3,544,521	3,551,259
Subtotal		389	827,600	30.3	6,748,585	6,304,678	6,494,760	6,504,252
Male	10 CC	494	924,800	48.6	8,608,772	8,039,967	8,313,853	8,320,289
Female	10 CC	709	978,400	51.4	8,885,537	8,299,883	8,615,287	8,626,547
Subtotal		1,203	1,903,200	69.7	17,494,309	16,339,850	16,929,140	16,946,836
Subtotal male		660	1,299,000	47.6	11,672,268	10,902,076	11,264,092	11,273,282
Subtotal female		932	1,431,800	52.4	12,570,626	11,742,452	12,159,808	12,177,806
Total all issues		1,592	2,730,800	100.0%	24,242,894	22,644,528	23,423,900	23,451,088

TABLE A3  
 FIXED IMMEDIATE ANNUITIES  
 MORTALITY GROSS SINGLE PREMIUMS (NO LOADING)  
 ASSUMING 1974 COMPANY MORTALITY TABLE  
 WITH MORTALITY IMPROVEMENT BASED ON EXPERIENCE TABLES AND PROJECTION SCALES I AND J

Sex	Plan	Number of Contracts	Annual Income	Annual Income Distribution	Adjusted Single Premium	Mortality Gross Premium		
						At Issue	Projection I	Projection J
For Issues of 1974; with Interest of 7.5 Percent for the First 14 Years and 5.25 Percent Thereafter								
Male	Life	141	260,900	48.7%	2,029,948	1,897,255	1,942,877	1,943,757
Female	Life	181	274,900	51.3	2,323,905	2,172,041	2,230,502	2,235,526
Subtotal		322	535,800	25.1	4,353,853	4,069,296	4,173,379	4,179,283
Male	10 CC	386	637,300	39.9	5,880,939	5,497,006	5,667,842	5,672,530
Female	10 CC	596	961,900	60.1	9,227,218	8,627,068	8,899,610	8,919,226
Subtotal		982	1,599,200	74.9	15,108,157	14,124,074	14,567,452	14,591,756
Subtotal male		527	898,200	42.1	7,910,887	7,394,261	7,610,719	7,616,287
Subtotal female		777	1,236,800	57.9	11,551,123	10,799,109	11,130,112	11,154,752
Total all issues		1,304	2,135,000	100.0%	19,462,010	18,193,370	18,740,831	18,771,039
For Issues of 1975; with Interest of 7.5 Percent for the First 14 Years and 5.25 Percent Thereafter								
Male	Life	140	344,500	52.7%	2,581,288	2,413,928	2,466,111	2,468,667
Female	Life	189	309,600	47.3	2,328,886	2,179,613	2,227,625	2,232,325
Subtotal		329	654,100	27.6	4,910,174	4,593,541	4,693,736	4,700,992
Male	10 CC	458	823,000	48.0	8,634,566	8,046,284	8,367,463	8,373,744
Female	10 CC	574	890,800	52.0	7,945,813	7,439,196	7,672,569	7,682,912
Subtotal		1,032	1,713,800	72.4	16,580,379	15,485,480	16,040,032	16,056,656
Subtotal male		598	1,167,500	49.3	11,215,854	10,460,212	10,833,574	10,842,411
Subtotal female		763	1,200,400	50.7	10,274,699	9,618,809	9,900,194	9,915,237
Total all issues		1,361	2,367,900	100.0%	21,490,553	20,079,021	20,733,768	20,757,648

TABLE A3 — Continued

Sex	Plan	Number of Contracts	Annual Income	Annual Income Distribution	Adjusted Single Premium	Mortality Gross Premium		
						At Issue	Projection I	Projection J
For Issues of 1976; with Interest of 7.5 Percent for the First 14 Years and 5.25 Percent Thereafter								
Male	Life	178	395,200	52.4%	3,139,317	2,932,536	3,017,881	3,022,609
Female	Life	215	358,600	47.6	2,874,406	2,687,390	2,764,853	2,771,392
Subtotal		393	753,800	25.3	6,013,723	5,619,926	5,782,734	5,794,001
Male	10 CC	463	1,111,200	50.0	10,574,022	9,875,096	10,233,189	10,241,671
Female	10 CC	612	1,112,000	50.0	10,134,125	9,484,946	9,806,822	9,830,241
Subtotal		1,075	2,223,200	74.7	20,708,147	19,360,042	20,040,011	20,071,912
Subtotal male		641	1,506,400	50.6	13,713,339	12,807,632	13,251,070	13,264,280
Subtotal female		827	1,470,600	49.4	13,008,531	12,172,336	12,571,675	12,601,633
Total all issues		1,468	2,977,000	100.0%	26,721,870	24,979,968	25,822,745	25,865,913
For Issues of 1977; with Interest of 7.5 Percent for the First 14 Years and 5.25 Percent Thereafter								
Male	Life	241	541,614	54.2%	3,640,253	3,405,940	3,451,109	3,454,570
Female	Life	266	458,061	45.8	3,186,489	2,983,875	3,064,575	3,073,148
Subtotal		507	999,675	27.0	6,826,742	6,389,815	6,515,684	6,527,718
Male	10 CC	595	1,351,413	50.0	11,215,239	10,505,027	10,780,973	10,787,060
Female	10 CC	683	1,351,412	50.0	11,388,210	10,672,466	11,018,180	11,033,160
Subtotal		1,278	2,702,825	73.0	22,603,449	21,177,493	21,799,153	21,820,220
Subtotal male		836	1,893,027	51.1	14,855,492	13,910,967	14,232,082	14,241,630
Subtotal female		949	1,809,473	48.9	14,574,699	13,656,341	14,082,755	14,106,308
Total all issues		1,785	3,702,500	100.0%	29,430,191	27,567,308	28,314,837	28,347,938

TABLE A3 — Continued

Sex	Plan	Number of Contracts	Annual Income	Annual Income Distribution	Adjusted Single Premium	Mortality Gross Premium		
						At Issue	Projection I	Projection J
For Issues of 1978; with Interest of 7.5 Percent for the First 14 Years and 5.25 Percent Thereafter								
Male	Life	161	409,600	52.8%	2,756,080	2,578,251	2,633,699	2,636,341
Female	Life	179	366,200	47.2	2,785,018	2,605,847	2,702,318	2,711,861
Subtotal		340	775,800	30.1	5,541,098	5,184,098	5,336,017	5,348,202
Male	10 CC	445	902,900	50.2	7,743,046	7,248,351	7,483,952	7,490,974
Female	10 CC	525	896,700	49.8	7,977,057	7,469,282	7,749,086	7,767,919
Subtotal		970	1,799,600	69.9	15,720,103	14,717,633	15,233,038	15,258,893
Subtotal male		606	1,312,500	51.0	10,499,126	9,826,602	10,117,651	10,127,315
Subtotal female		704	1,262,900	49.0	10,762,075	10,075,129	10,451,404	10,479,780
Total all issues		1,310	2,575,400	100.0%	21,261,201	19,901,731	20,569,055	20,607,095
For Issues of 1979; with Interest of 7.5 Percent for the First 14 Years and 5.25 Percent Thereafter								
Male	Life	79	145,402	57.9%	953,218	891,627	899,596	900,622
Female	Life	101	105,639	42.1	756,512	708,078	728,761	731,492
Subtotal		180	251,041	23.0	1,709,730	1,599,705	1,628,357	1,632,114
Male	10 CC	194	405,096	48.2	3,398,471	3,182,182	3,278,239	3,282,056
Female	10 CC	249	435,349	51.8	3,754,488	3,516,973	3,645,756	3,654,919
Subtotal		443	840,445	77.0	7,152,959	6,699,155	6,923,995	6,936,975
Subtotal male		273	550,498	50.4	4,351,689	4,073,809	4,177,835	4,182,678
Subtotal female		350	540,988	49.6	4,511,000	4,225,051	4,374,517	4,386,411
Total all issues		623	1,091,486	100.0%	8,862,689	8,298,860	8,552,352	8,569,089

TABLE A4

FIXED IMMEDIATE ANNUITIES  
MORTALITY GROSS SINGLE PREMIUMS (NO LOADING)  
ASSUMING 1979 COMPANY MORTALITY TABLE

WITH MORTALITY IMPROVEMENT BASED ON EXPERIENCE TABLES AND PROJECTION SCALES I AND J

Sex	Plan	Number of Contracts	Annual Income	Annual Income Distribution	Adjusted Single Premium	Mortality Gross Premium		
						At Issue	Projection I	Projection J
For Issues of 1980; with Interest of 9.22 Percent for the First 14 Years and 6.97 Percent Thereafter								
Male	Life	53	122,088	56.0%	728,952	683,954	694,838	695,946
Female	Life	69	95,926	44.0	646,324	606,300	601,079	602,802
Subtotal		122	218,014	19.5	1,375,276	1,290,254	1,295,917	1,298,748
Male	10 CC	171	446,403	49.6	3,374,987	3,167,674	3,216,746	3,218,341
Female	10 CC	220	453,604	50.4	3,589,306	3,369,495	3,383,205	3,390,778
Subtotal		391	900,007	80.5	6,964,293	6,537,169	6,599,951	6,609,119
Subtotal male		224	568,491	50.8	4,103,939	3,851,628	3,911,584	3,914,287
Subtotal female		289	549,530	49.2	4,235,630	3,975,795	3,984,284	3,993,580
Total all issues		513	1,118,021	100.0%	8,339,569	7,827,423	7,895,868	7,907,867
For Issues of 1981; with Interest of 9.22 Percent for the First 14 Years and 6.97 Percent Thereafter								
Male	Life	35	141,565	57.9%	815,326	765,280	759,865	760,989
Female	Life	46	102,848	42.1	660,603	619,758	610,811	613,146
Subtotal		81	244,413	26.8	1,475,929	1,385,038	1,370,676	1,374,135
Male	10 CC	108	320,136	48.0	2,419,051	2,270,562	2,305,402	2,307,937
Female	10 CC	139	346,536	52.0	2,794,094	2,622,350	2,632,730	2,638,211
Subtotal		247	666,672	73.2	5,213,145	4,892,912	4,938,132	4,946,148
Subtotal male		143	461,701	50.7	3,234,377	3,035,842	3,065,267	3,068,926
Subtotal female		185	449,384	49.3	3,454,697	3,242,108	3,243,541	3,251,357
Total all issues		328	911,085	100.0%	6,689,074	6,277,950	6,308,808	6,320,283

TABLE A5

FIXED IMMEDIATE ANNUITIES  
MORTALITY GROSS SINGLE PREMIUMS (NO LOADING)  
ASSUMING 1981 COMPANY MORTALITY TABLE

WITH MORTALITY IMPROVEMENT BASED ON EXPERIENCE TABLES AND PROJECTION SCALES I AND J

Sex	Plan	Number of Contracts	Annual Income	Annual Income Distribution	Adjusted Single Premium	Mortality Gross Premium		
						At Issue	Projection I	Projection J
For Issues of 1982; with Interest of 11.45 Percent for the First 14 Years and 9.2 Percent Thereafter								
Male	Life	81	371,128	67.6%	2,168,285	2,027,468	2,011,155	2,014,246
Female	Life	92	177,810	32.4	1,198,867	1,120,165	1,126,182	1,130,956
Subtotal		173	548,938	22.8	3,367,152	3,147,633	3,137,337	3,145,202
Male	10 CC	206	847,246	45.6	6,484,186	6,058,984	6,078,556	6,085,567
Female	10 CC	250	1,011,887	54.4	7,813,013	7,302,959	7,333,190	7,351,064
Subtotal		456	1,859,133	77.2	14,297,199	13,361,943	13,411,746	13,436,631
Subtotal male		287	1,218,374	50.6	8,652,471	8,086,452	8,089,711	8,099,813
Subtotal female		342	1,189,697	49.4	9,011,880	8,423,124	8,459,372	8,482,020
Total all issues		629	2,408,071	100.0%	17,664,351	16,509,576	16,549,083	16,581,833
For Issues of 1983; with Interest of 11.45 Percent for the First 14 Years and 9.2 Percent Thereafter								
Male	Life	67	219,672	49.2%	1,415,657	1,322,097	1,331,875	1,334,383
Female	Life	87	227,085	50.8	1,524,596	1,424,230	1,442,967	1,448,923
Subtotal		154	446,757	15.5	2,940,253	2,746,327	2,774,842	2,783,306
Male	10 CC	246	1,212,740	49.9	9,886,637	9,228,184	9,286,094	9,295,360
Female	10 CC	312	1,218,236	50.1	9,875,695	9,221,334	9,294,614	9,323,994
Subtotal		558	2,430,976	84.5	19,762,332	18,449,518	18,580,708	18,619,354
Subtotal male		313	1,432,412	49.8	11,302,294	10,550,281	10,617,969	10,629,743
Subtotal female		399	1,445,321	50.2	11,400,291	10,645,564	10,737,581	10,772,917
Total all issues		712	2,877,733	100.0%	22,702,585	21,195,845	21,355,550	21,402,660

TABLE A5 — Continued

Sex	Plan	Number of Contracts	Annual Income	Annual Income Distribution	Adjusted Single Premium	Mortality Gross Premium		
						At Issue	Projection I	Projection J
For Issues of 1984; with Interest of 11.45 Percent for the First 14 Years and 9.2 Percent Thereafter								
Male	Life	60	285,383	55.2%	1,745,857	1,631,579	1,645,666	1,649,081
Female	Life	88	231,749	44.8	1,605,435	1,499,814	1,515,309	1,522,337
Subtotal		148	517,132	19.6	3,351,292	3,131,393	3,160,975	3,171,418
Male	10 CC	222	1,017,965	48.0	8,546,158	7,971,687	8,026,834	8,035,124
Female	10 CC	303	1,101,800	52.0	8,835,168	8,251,918	8,313,309	8,337,133
Subtotal		525	2,119,765	80.4	17,381,326	16,223,605	16,340,143	16,372,257
Subtotal male		282	1,303,348	49.4	10,292,015	9,603,266	9,672,500	9,684,205
Subtotal female		391	1,333,549	50.6	10,440,603	9,751,732	9,828,618	9,859,470
Total all issues		673	2,636,897	100.0%	20,732,618	19,354,998	19,501,118	19,543,675
For Issues of 1985; with Interest of 11.45 Percent for the First 14 Years and 9.2 Percent Thereafter								
Male	Life	81	458,909	57.9%	2,740,620	2,561,936	2,581,554	2,586,421
Female	Life	121	333,908	42.1	2,233,317	2,086,371	2,119,153	2,129,545
Subtotal		202	792,817	21.6	4,973,937	4,648,307	4,700,707	4,715,966
Male	10 CC	246	1,323,483	46.0	10,459,775	9,766,557	9,825,207	9,834,061
Female	10 CC	345	1,553,655	54.0	11,794,574	11,023,622	11,113,642	11,149,010
Subtotal		591	2,877,138	78.4	22,254,349	20,790,179	20,938,849	20,983,071
Subtotal male		327	1,782,392	48.6	13,200,395	12,328,493	12,406,761	12,420,482
Subtotal female		466	1,887,563	51.4	14,027,891	13,109,993	13,232,795	13,278,555
Total all issues		793	3,669,955	100.0%	27,228,286	25,438,486	25,639,556	25,699,037

TABLE A5 -- Continued

Sex	Plan	Number of Contracts	Annual Income	Annual Income Distribution	Adjusted Single Premium	Mortality Gross Premium		
						At Issue	Projection 1	Projection 2
For Issues of 1986, with Interest of 11.45 Percent for the First 14 Years and 9.2 Percent Thereafter								
Male	Life	93	271,322	51.6%	1,714,916	1,602,485	1,618,211	1,621,020
Female	Life	94	254,074	48.4	1,761,822	1,645,596	1,668,272	1,677,595
Subtotal		187	525,396	17.3	3,476,738	3,248,081	3,286,483	3,298,615
Male	10 CC	232	941,556	37.6	7,454,777	6,961,527	7,000,535	7,007,313
Female	10 CC	338	1,562,059	62.4	12,113,315	11,321,887	11,416,260	11,443,810
Subtotal		570	2,503,615	82.7	19,568,092	18,283,414	18,416,795	18,451,123
Subtotal male		325	1,212,878	40.0	9,169,693	8,564,012	8,618,746	8,628,333
Subtotal female		432	1,816,133	60.0	13,875,137	12,967,483	13,084,532	13,121,405
Total all issues		757	3,029,011	100.0%	23,044,830	21,531,495	21,703,278	21,749,738

TABLE B  
 ADJUSTED GROSS PREMIUM AND MORTALITY GROSS PREMIUM  
 ACTUARIAL ASSUMPTIONS FOR MORTALITY AND INTEREST

Inclusive Issue Years		Mortality Table	Interest Rates		
From	To		Initial Rate	for Years	Rate Thereafter
1966	1971	1965 Company Modified Annuity Table	4.75%	1-15	3.50%
1967		1965 Company Modified Annuity Table	5.00	1-12	3.75
1968		1965 Company Modified Annuity Table	5.50	1-13	3.75
1969		1965 Company Modified Annuity Table	5.70	1-13	3.75
1970		1969 Company Modified Annuity Table	7.00	1-16	3.25
1972		1969 Company Modified Annuity Table	6.75	1-16	3.25
1973		1969 Company Modified Annuity Table	7.00	1-16	3.25
1974	1979	1974 Company Modified Annuity Table	7.50	1-14	5.25
1980	1981	1979 Company Modified Annuity Table	9.22	1-14	6.97
1982	1986	1981 Company Modified Annuity Table	11.45	1-14	9.20

TABLE C1  
GROSS SINGLE PREMIUMS  
ASSUMING 1965 COMPANY MORTALITY TABLE

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1966; with Interest of 4.75 Percent for the First 15 Years and 3.5 Percent Thereafter									
Male	Life	45	45.00	4	5,209	7.50%	2,102	91,244	84,410
Male	Life	55	55.00	11	14,707	7.00	1,738	213,006	198,051
Male	Life	65	65.00	76	104,176	6.00	1,329	1,153,749	1,084,607
Male	Life	75	75.00	92	126,543	6.00	920	970,163	911,822
Male	Life	85	85.00	39	53,927	6.00	556	249,862	234,802
Male	Life	92	92.00	1	1,838	6.00	556	8,516	8,003
Subtotal				223	306,400			2,686,540	2,521,695
Male	10 CC	45	45.00	9	10,722	7.50	2,127	190,047	175,755
Male	10 CC	55	55.00	24	30,274	6.90	1,792	452,092	420,931
Male	10 CC	65	65.00	172	214,438	5.60	1,442	2,576,830	2,431,795
Male	10 CC	75	75.00	208	260,479	5.20	1,166	2,530,988	2,399,885
Male	10 CC	85	85.00	89	111,003	4.80	1,030	952,776	906,762
Male	10 CC	92	92.00	3	3,784	4.80	1,030	32,479	30,911
Subtotal				505	630,700			6,735,212	6,366,039

TABLE C1 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1966; with Interest of 4.75 Percent for the First 15 Years and 3.5 Percent Thereafter									
Female	Life	45	45.00	4	4,945	7.50%	2,296	94,614	87,505
Female	Life	55	55.00	12	15,216	7.00	1,951	247,387	230,074
Female	Life	65	65.00	79	101,567	6.00	1,518	1,284,823	1,207,623
Female	Life	75	75.00	137	176,125	6.00	1,057	1,551,368	1,457,915
Female	Life	85	85.00	60	77,602	6.00	627	405,470	381,368
Female	Life	92	92.00	4	4,945	6.00	627	25,838	24,302
Subtotal				296	380,400			3,609,500	3,388,787
Female	10 CC	45	45.00	8	9,068	7.50	2,308	174,408	161,315
Female	10 CC	55	55.00	24	27,900	7.00	1,977	459,653	427,526
Female	10 CC	65	65.00	162	186,232	5.80	1,583	2,456,710	2,313,764
Female	10 CC	75	75.00	280	322,942	5.40	1,236	3,326,303	3,147,332
Female	10 CC	85	85.00	124	142,290	5.00	1,041	1,234,366	1,172,294
Female	10 CC	92	92.00	8	9,068	5.00	1,041	78,665	74,709
Subtotal				606	697,500			7,730,105	7,296,940
Subtotal life				519	686,800			6,296,040	5,910,482
Subtotal 10 CC				1,111	1,328,200			14,465,317	13,662,979
Subtotal male				728	937,100			9,421,752	8,887,734
Subtotal female				902	1,077,900			11,339,605	10,685,727
Total all issues				1,630	2,015,000			20,761,357	19,573,461

TABLE C1 -- Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1967; with Interest of 5 Percent for the First 12 Years and 3.75 Percent Thereafter									
Male	Life	45	45.00	4	5,323	7.50%	2,067	91,689	84,829
Male	Life	55	55.00	10	15,029	7.00	1,714	214,664	199,584
Male	Life	65	65.00	69	106,454	6.00	1,313	1,164,784	1,094,904
Male	Life	75	75.00	84	129,310	6.00	910	980,601	921,712
Male	Life	85	85.00	36	55,105	6.00	551	253,024	237,960
Male	Life	92	92.00	1	1,879	6.00	551	8,628	8,114
Subtotal				204	313,100			2,713,390	2,547,103
Male	10 CC	45	45.00	8	11,718	7.50	2,091	204,186	188,899
Male	10 CC	55	55.00	23	33,086	6.90	1,767	487,191	453,626
Male	10 CC	65	65.00	162	234,362	5.35	1,420	2,773,284	2,624,748
Male	10 CC	75	75.00	197	284,681	5.15	1,152	2,732,938	2,591,894
Male	10 CC	85	85.00	84	121,317	4.95	1,020	1,031,195	979,860
Male	10 CC	92	92.00	3	4,136	4.95	1,020	35,156	33,406
Subtotal				477	689,300			7,263,950	6,872,433

TABLE C1 -- Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1967; with Interest of 5 Percent for the First 12 Years and 3.75 Percent Thereafter									
Female	Life	45	45.00	5	5,742	7.50%	2,254	107,854	99,779
Female	Life	55	55.00	14	17,668	7.00	1,922	282,982	263,205
Female	Life	65	65.00	96	117,934	6.00	1,499	1,473,192	1,384,609
Female	Life	75	75.00	167	204,507	6.00	1,045	1,780,915	1,673,736
Female	Life	85	85.00	73	90,107	6.00	622	467,055	438,921
Female	Life	92	92.00	5	5,742	6.00	622	29,763	27,970
Subtotal				360	441,700			4,141,761	3,888,220
Female	10 CC	45	45.00	12	13,727	7.50	2,266	259,212	239,800
Female	10 CC	55	55.00	38	42,236	7.00	1,948	685,631	637,632
Female	10 CC	65	65.00	255	281,925	5.55	1,558	3,660,326	3,458,105
Female	10 CC	75	75.00	441	488,882	5.20	1,219	4,966,226	4,707,513
Female	10 CC	85	85.00	195	215,403	5.20	1,031	1,850,671	1,754,528
Female	10 CC	92	92.00	12	13,727	5.20	1,031	117,938	111,811
Subtotal				953	1,055,900			11,540,004	10,909,389
Subtotal life				564	754,800			6,855,151	6,435,323
Subtotal 10 CC				1,430	1,745,200			18,803,954	17,781,822
Subtotal male				681	1,002,400			9,977,340	9,419,536
Subtotal female				1,313	1,497,600			15,681,765	14,797,609
Total all issues				1,994	2,500,000			25,659,105	24,217,145

TABLE C1 — *Continued*

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1968; with Interest of 5.5 Percent for the First 13 Years and 3.75 Percent Thereafter									
Male	Life	45	45.00	4	5,834	8.60%	1,997	97,087	88,747
Male	Life	55	55.00	10	16,474	7.75	1,656	227,341	209,752
Male	Life	65	65.00	75	116,688	6.10	1,269	1,233,976	1,158,304
Male	Life	75	75.00	91	141,742	7.60	902	1,065,427	983,940
Male	Life	85	85.00	39	60,403	12.30	581	292,451	256,467
Male	Life	92	92.00	<u>1</u>	<u>2,059</u>	12.30	581	<u>9,969</u>	<u>8,742</u>
Subtotal				220	<u>343,200</u>			<u>2,926,251</u>	<u>2,705,952</u>
Male	10 CC	45	45.00	8	10,775	8.60	2,021	181,469	165,829
Male	10 CC	55	55.00	23	30,422	7.65	1,709	433,260	400,025
Male	10 CC	65	65.00	161	215,492	5.70	1,376	2,470,975	2,329,953
Male	10 CC	75	75.00	195	261,759	5.30	1,122	2,447,447	2,318,669
Male	10 CC	85	85.00	83	111,549	4.90	996	925,857	880,716
Male	10 CC	92	92.00	<u>3</u>	<u>3,803</u>	4.90	996	<u>31,565</u>	<u>30,026</u>
Subtotal				473	<u>633,800</u>			<u>6,490,573</u>	<u>6,125,218</u>

TABLE C1 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1968; with Interest of 5.5 Percent for the First 13 Years and 3.75 Percent Thereafter									
Female	Life	45	45.00	5	5,893	8.60%	2,174	106,762	97,559
Female	Life	55	55.00	16	18,132	7.75	1,853	279,988	258,311
Female	Life	65	65.00	107	121,031	6.10	1,444	1,456,406	1,367,342
Female	Life	75	75.00	185	209,878	7.60	1,032	1,804,951	1,668,270
Female	Life	85	85.00	81	92,473	12.30	654	503,978	442,302
Female	Life	92	92.00	5	5,893	12.30	654	32,117	28,186
Subtotal				399	453,300			4,184,202	3,861,970
Female	10 CC	45	45.00	13	14,639	8.60	2,185	266,552	243,652
Female	10 CC	55	55.00	40	45,044	7.75	1,878	704,939	650,398
Female	10 CC	65	65.00	267	300,669	5.90	1,506	3,773,396	3,549,728
Female	10 CC	75	75.00	464	521,385	5.50	1,187	5,157,367	4,874,238
Female	10 CC	85	85.00	204	229,724	5.10	1,007	1,927,767	1,828,572
Female	10 CC	92	92.00	13	14,639	5.10	1,007	122,846	116,524
Subtotal				1,001	1,126,100			11,952,867	11,263,112
Subtotal life				619	796,500			7,110,453	6,567,922
Subtotal 10 CC				1,474	1,759,900			18,443,440	17,388,330
Subtotal male				693	977,000			9,416,824	8,831,170
Subtotal female				1,400	1,579,400			16,137,069	15,125,082
Total all issues				2,093	2,556,400			25,553,893	23,956,252

TABLE C1 — *Continued*

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1969; with Interest of 5.7 Percent for the First 13 Years and 3.75 Percent Thereafter									
Male	Life	45	45.00	3	3,397	8.60%	1,965	55,626	50,838
Male	Life	55	55.00	7	9,590	7.75	1,632	130,424	120,285
Male	Life	65	65.00	51	67,932	6.10	1,252	708,757	665,653
Male	Life	75	75.00	62	82,517	7.60	893	614,064	567,110
Male	Life	85	85.00	27	35,165	12.60	579	169,671	148,322
Male	Life	92	92.00	1	1,199	12.60	579	5,785	5,057
Subtotal				151	199,800			1,684,327	1,557,265
Male	10 CC	45	45.00	7	9,246	8.60	1,988	153,175	139,994
Male	10 CC	55	55.00	21	26,107	7.65	1,683	366,151	338,197
Male	10 CC	65	65.00	146	184,926	5.70	1,358	2,092,746	1,973,796
Male	10 CC	75	75.00	178	224,631	5.30	1,111	2,079,709	1,968,985
Male	10 CC	85	85.00	76	95,727	4.90	987	787,355	749,043
Male	10 CC	92	92.00	3	3,263	4.90	987	26,838	25,532
Subtotal				431	543,900			5,505,974	5,195,547

TABLE C1 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1969; with Interest of 5.7 Percent for the First 13 Years and 3.75 Percent Thereafter									
Female	Life	45	45.00	4	5,178	8.60	2,137	92,212	84,282
Female	Life	55	55.00	12	15,932	7.75	1,824	242,166	223,410
Female	Life	65	65.00	81	106,346	6.10	1,424	1,261,973	1,184,858
Female	Life	75	75.00	140	184,413	7.60	1,021	1,569,047	1,449,905
Female	Life	85	85.00	61	81,253	12.60	652	441,475	385,870
Female	Life	92	92.00	4	5,178	12.60	652	28,134	24,590
Subtotal				302	398,300			3,635,007	3,352,915
Female	10 CC	45	45.00	13	13,861	8.60	2,149	248,227	226,830
Female	10 CC	55	55.00	39	42,648	7.75	1,849	657,135	606,166
Female	10 CC	65	65.00	259	284,675	5.90	1,485	3,522,853	3,314,649
Female	10 CC	75	75.00	449	493,650	5.50	1,174	4,829,543	4,563,614
Female	10 CC	85	85.00	198	217,505	5.10	997	1,807,104	1,715,662
Female	10 CC	92	92.00	13	13,861	5.10	997	115,162	109,334
Subtotal				971	1,066,200			11,180,024	10,536,255
Subtotal life				453	598,100			5,319,334	4,910,180
Subtotal 10 CC				1,402	1,610,100			16,685,998	15,731,802
Subtotal male				582	743,700			7,190,301	6,752,812
Subtotal female				1,273	1,464,500			14,815,031	13,889,170
Total all issues				1,855	2,208,200			22,005,332	20,641,982

TABLE C2  
GROSS SINGLE PREMIUMS  
ASSUMING 1969 COMPANY MORTALITY TABLE

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1970; with Interest of 7 Percent for the First 16 Years and 3.25 Percent Thereafter									
Male	Life	45	45.00	2	4,457	6.60%	1,710	63,512	59,333
Male	Life	55	55.00	7	12,586	6.60	1,452	152,291	142,235
Male	Life	65	65.00	49	89,148	6.60	1,158	860,278	803,688
Male	Life	75	74.01	60	108,289	6.60	869	784,193	732,233
Male	Life	85	83.01	25	46,147	6.60	586	225,351	210,483
Male	Life	92	83.01	1	1,573	6.60	586	7,681	7,175
Subtotal				144	262,200			2,093,306	1,955,147
Male	10 CC	45	45.00	6	10,142	6.60	1,731	146,298	136,641
Male	10 CC	55	55.00	18	28,637	6.60	1,499	357,724	334,165
Male	10 CC	65	65.00	128	202,844	6.60	1,259	2,128,172	1,987,758
Male	10 CC	75	75.00	155	246,396	6.60	1,056	2,168,285	2,024,740
Male	10 CC	85	85.00	66	105,001	6.60	951	832,133	777,187
Male	10 CC	92	92.00	2	3,580	6.60	951	28,372	26,498
Subtotal				375	596,600			5,660,984	5,286,989

TABLE C2 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1970; with Interest of 7 Percent for the First 16 Years and 3.25 Percent Thereafter									
Female	Life	45	45.00	3	4,568	6.60	1,857	70,690	66,024
Female	Life	55	55.00	10	14,056	6.60	1,618	189,522	176,983
Female	Life	65	65.00	67	93,824	6.60	1,312	1,025,809	958,228
Female	Life	75	74.50	117	162,698	6.60	972	1,317,854	1,231,276
Female	Life	85	83.50	51	71,686	6.60	644	384,715	359,518
Female	Life	92	83.50	3	4,568	6.60	644	24,515	22,909
Subtotal				251	351,400			3,013,105	2,814,938
Female	10 CC	45	45.00	9	10,865	6.60	1,867	169,041	157,905
Female	10 CC	55	55.00	27	33,432	6.60	1,639	456,625	426,404
Female	10 CC	65	65.00	181	223,159	6.60	1,367	2,542,153	2,374,525
Female	10 CC	75	75.00	314	386,976	6.60	1,110	3,579,528	3,342,902
Female	10 CC	85	85.00	139	170,503	6.60	958	1,361,182	1,270,897
Female	10 CC	92	92.00	9	10,865	6.60	958	86,739	80,986
Subtotal				679	835,800			8,195,268	7,653,619
Subtotal life				395	613,600			5,106,411	4,770,085
Subtotal 10 CC				1,054	1,432,400			13,856,252	12,940,608
Subtotal male				519	858,800			7,754,290	7,242,136
Subtotal female				930	1,187,200			11,208,373	10,468,557
Total all issues				1,449	2,046,000			18,962,663	17,710,693

TABLE C2 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1971; with Interest of 7 Percent for the First 16 Years and 3.25 Percent Thereafter									
Male	Life	46	46.00	3	5,768	6.60%	1,685	80,992	75,669
Male	Life	54	54.00	9	16,286	6.60	1,479	200,725	187,507
Male	Life	65	65.00	61	115,362	6.60	1,158	1,113,243	1,040,012
Male	Life	74	73.10	73	140,131	6.60	898	1,048,647	979,714
Male	Life	80	78.50	31	59,717	6.60	724	360,293	336,449
Male	Life	92	83.01	1	2,036	6.60	586	9,942	9,286
Subtotal				178	339,300			2,813,842	2,628,637
Male	10 CC	49	49.00	10	18,994	6.60	1,640	259,585	242,433
Male	10 CC	54	54.00	27	53,630	6.60	1,523	680,654	635,786
Male	10 CC	67	67.00	189	379,882	6.60	1,213	3,839,974	3,587,158
Male	10 CC	70	70.00	230	461,445	6.60	1,148	4,414,491	4,124,454
Male	10 CC	80	80.00	98	196,645	6.60	989	1,620,683	1,514,390
Male	10 CC	92	92.00	3	6,704	6.60	951	53,129	49,621
Subtotal				557	1,117,300			10,868,516	10,153,842

TABLE C2 -- Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1971; with Interest of 7 Percent for the First 16 Years and 3.25 Percent Thereafter									
Female	Life	46	46.00	4	5,897	6.60	1,835	90,175	84,240
Female	Life	58	58.00	12	18,144	6.60	1,534	231,941	216,621
Female	Life	66	65.95	81	121,111	6.60	1,280	1,291,851	1,206,317
Female	Life	79	78.10	140	210,017	6.60	840	1,470,119	1,373,873
Female	Life	80	79.00	62	92,534	6.60	808	623,062	581,659
Female	Life	92	83.50	4	5,897	6.60	644	31,647	29,575
Subtotal				303	453,600			3,738,795	3,492,285
Female	10 CC	46	46.00	11	15,969	6.60	1,846	245,656	229,503
Female	10 CC	58	58.00	35	49,136	6.60	1,561	639,177	596,845
Female	10 CC	68	68.00	232	327,983	6.60	1,284	3,509,418	3,278,675
Female	10 CC	79	79.00	403	568,749	6.60	1,032	4,891,241	4,567,741
Female	10 CC	85	85.00	178	250,594	6.60	958	2,000,575	1,867,881
Female	10 CC	92	92.00	11	15,969	6.60	958	127,486	119,030
Subtotal				870	1,228,400			11,413,553	10,659,675
Subtotal life				481	792,900			6,552,637	6,120,922
Subtotal 10 CC				1,427	2,345,700			22,282,069	20,813,517
Subtotal male				735	1,456,600			13,682,358	12,782,479
Subtotal female				1,173	1,682,000			15,152,348	14,151,960
Total all issues				1,908	3,138,600			28,834,706	26,934,439

TABLE C2 – *Continued*

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1972; with Interest of 6.75 Percent for the First 16 Years and 3.25 Percent Thereafter									
Male	Life	47	47.00	3	5,350	6.60%	1,696	75,613	70,637
Male	Life	56	56.00	8	15,106	6.60	1,452	182,783	170,704
Male	Life	68	67.70	59	106,998	6.60	1,089	971,007	907,188
Male	Life	74	73.10	72	129,971	6.60	910	985,613	920,693
Male	Life	82	80.30	30	55,387	6.60	674	311,090	290,681
Male	Life	92	83.00	1	1,888	6.60	592	9,314	8,693
Subtotal				173	314,700			2,535,420	2,368,596
Male	10 CC	46	46.00	8	13,263	6.60	1,746	192,977	180,202
Male	10 CC	56	56.00	23	37,450	6.60	1,504	469,373	438,306
Male	10 CC	65	65.00	160	265,268	6.60	1,280	2,829,525	2,642,244
Male	10 CC	75	75.00	195	322,223	6.60	1,069	2,870,470	2,682,214
Male	10 CC	85	85.00	83	137,315	6.60	961	1,099,664	1,027,474
Male	10 CC	92	92.00	3	4,681	6.60	961	37,487	35,026
Subtotal				472	780,200			7,499,496	7,005,466

TABLE C2 — *Continued*

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1972; with Interest of 6.75 Percent for the First 16 Years and 3.25 Percent Thereafter									
Female	Life	49	49.00	3	3,696	6.60	1,807	55,656	51,990
Female	Life	52	52.00	9	11,372	6.60	1,732	164,136	153,345
Female	Life	67	66.90	61	75,908	6.60	1,268	802,095	749,363
Female	Life	79	78.10	106	131,631	6.60	851	933,483	871,546
Female	Life	85	83.50	46	57,997	6.60	650	314,150	293,613
Female	Life	92	83.50	3	3,696	6.60	650	20,020	18,711
Subtotal				228	284,300			2,289,540	2,138,568
Female	10 CC	47	47.00	11	15,369	6.60	1,867	239,116	223,317
Female	10 CC	56	56.00	10	14,188	6.60	1,647	194,730	181,846
Female	10 CC	67	67.00	189	260,106	6.60	1,334	2,891,512	2,701,024
Female	10 CC	78	78.00	438	602,973	6.60	1,063	5,341,336	4,988,305
Female	10 CC	85	85.00	206	283,752	6.60	968	2,288,933	2,138,406
Female	10 CC	92	92.00	4	5,912	6.60	968	47,690	44,554
Subtotal				858	1,182,300			11,003,317	10,277,452
Subtotal life				401	599,000			4,824,960	4,507,164
Subtotal 10 CC				1,330	1,962,500			18,502,813	17,282,918
Subtotal male				645	1,094,900			10,034,916	9,374,062
Subtotal female				1,086	1,466,600			13,292,857	12,416,020
Total all issues				1,731	2,561,500			23,327,773	21,790,082

TABLE C2 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1973; with Interest of 7 Percent for the First 16 Years and 3.25 Percent Thereafter									
Male	Life	44	44.00	3	6,362	6.60%	1,735	91,984	85,910
Male	Life	55	55.00	8	17,961	6.60	1,452	217,328	202,979
Male	Life	65	65.00	56	127,228	6.60	1,158	1,227,750	1,146,987
Male	Life	73	72.20	69	154,545	6.60	927	1,193,860	1,115,600
Male	Life	85	83.01	29	65,859	6.60	586	321,611	300,393
Male	Life	92	83.01	1	2,245	6.60	586	10,963	10,240
Subtotal				166	374,200			3,063,496	2,862,109
Male	10 CC	44	44.00	8	15,722	6.60	1,753	229,672	214,560
Male	10 CC	54	54.00	24	44,390	6.60	1,523	563,383	526,245
Male	10 CC	68	68.00	168	314,432	6.60	1,191	3,120,738	2,914,772
Male	10 CC	75	75.00	204	381,942	6.60	1,056	3,361,090	3,138,579
Male	10 CC	85	85.00	87	162,765	6.60	951	1,289,913	1,204,739
Male	10 CC	92	92.00	3	5,549	6.60	951	43,976	41,072
Subtotal				494	924,800			8,608,772	8,039,967

TABLE C2 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1973; with Interest of 7 Percent for the First 16 Years and 3.25 Percent Thereafter									
Female	Life	46	46.00	3	5,894	6.60%	1,835	90,129	84,198
Female	Life	54	54.00	9	18,136	6.60	1,644	248,463	232,104
Female	Life	66	65.95	60	121,058	6.60	1,280	1,291,285	1,205,789
Female	Life	78	77.20	103	209,924	6.60	873	1,527,197	1,427,045
Female	Life	85	83.50	45	92,494	6.60	644	496,384	463,874
Female	Life	92	83.50	3	5,894	6.60	644	31,631	29,559
Subtotal				223	453,400			3,685,089	3,442,569
Female	10 CC	46	46.00	8	10,762	6.60	1,846	165,555	154,669
Female	10 CC	56	56.00	8	10,762	6.60	1,613	144,659	135,121
Female	10 CC	67	67.00	130	179,047	6.60	1,312	1,957,581	1,827,895
Female	10 CC	78	78.00	390	538,120	6.60	1,049	4,704,066	4,395,452
Female	10 CC	85	85.00	170	234,816	6.60	958	1,874,614	1,750,274
Female	10 CC	92	92.00	3	4,893	6.60	958	39,062	36,422
Subtotal				709	978,400			8,885,537	8,299,883
Subtotal life				389	827,600			6,748,585	6,304,678
Subtotal 10 CC				1,203	1,903,200			17,494,309	16,339,850
Subtotal male				660	1,299,000			11,672,268	10,902,076
Subtotal female				932	1,431,800			12,570,626	11,742,452
Total all issues				1,592	2,730,800			24,242,894	22,644,528

TABLE C3  
GROSS SINGLE PREMIUMS  
ASSUMING 1974 COMPANY MORTALITY TABLE

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1974; with Interest of 7.5 Percent for the First 14 Years and 5.25 Percent Thereafter									
Male	Life	45	44.85	2	4,435	7.50%	1,605	59,318	54,857
Male	Life	55	54.85	7	12,523	7.20	1,396	145,684	135,235
Male	Life	65	64.85	48	88,706	6.60	1,132	836,793	781,821
Male	Life	75	74.40	58	107,752	6.40	844	757,856	709,464
Male	Life	85	83.00	25	45,919	6.20	582	222,707	208,763
Male	Life	92	83.00	1	1,565	6.20	582	7,590	7,115
Subtotal				141	260,900			2,029,948	1,897,255
Male	10 CC	45	45.00	7	10,834	7.50	1,622	146,440	135,458
Male	10 CC	55	55.00	19	30,590	7.20	1,438	366,570	340,096
Male	10 CC	65	65.00	131	216,682	6.60	1,223	2,208,351	2,062,361
Male	10 CC	75	75.00	159	263,205	6.40	1,032	2,263,563	2,118,695
Male	10 CC	85	85.00	68	112,165	6.20	927	866,475	812,689
Male	10 CC	92	92.00	2	3,824	6.20	927	29,540	27,707
Subtotal				386	637,300			5,880,939	5,497,006

TABLE C3 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1974; with Interest of 7.5 Percent for the First 14 Years and 5.25 Percent Thereafter									
Female	Life	45	44.85	2	3,574	7.50	1,726	51,406	47,557
Female	Life	55	54.85	7	10,996	7.20	1,553	142,307	132,058
Female	Life	65	64.85	49	73,398	6.60	1,293	790,863	738,456
Female	Life	75	74.70	84	127,278	6.40	967	1,025,649	959,687
Female	Life	85	84.10	37	56,080	6.20	631	294,887	276,652
Female	Life	92	84.10	2	3,574	6.20	631	18,793	17,631
Subtotal				181	274,900			2,323,905	2,172,041
Female	10 CC	45	45.00	8	12,505	7.50	1,734	180,697	167,160
Female	10 CC	55	55.00	24	38,476	7.20	1,568	502,753	466,605
Female	10 CC	65	65.00	159	256,827	6.60	1,335	2,857,200	2,668,247
Female	10 CC	75	75.00	276	445,359	6.40	1,094	4,060,190	3,798,996
Female	10 CC	85	85.00	121	196,228	6.20	935	1,528,943	1,434,635
Female	10 CC	92	92.00	8	12,505	6.20	935	97,435	91,425
Subtotal				596	961,900			9,227,218	8,627,068
Subtotal life				322	535,800			4,353,853	4,069,296
Subtotal 10 CC				982	1,599,200			15,108,157	14,124,074
Subtotal male				527	898,200			7,910,887	7,394,261
Subtotal female				777	1,236,800			11,551,123	10,799,109
Total all issues				1,304	2,135,000			19,462,010	18,193,370

TABLE C3 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1975; with Interest of 7.5 Percent for the First 14 Years and 5.25 Percent Thereafter									
Male	Life	46	45.85	1	3,858	7.50%	1,586	50,990	47,161
Male	Life	57	56.85	8	18,500	7.08	1,348	207,817	193,046
Male	Life	68	67.73	51	124,399	6.54	1,048	1,086,418	1,015,769
Male	Life	76	75.26	57	141,452	6.38	817	963,052	902,035
Male	Life	85	83.00	21	51,813	6.20	582	251,293	235,559
Male	Life	92	83.00	2	4,478	6.20	582	21,718	20,358
Subtotal				140	344,500			2,581,288	2,413,928
Male	10 CC	42	42.00	34	60,079	7.50	1,670	836,099	773,462
Male	10 CC	53	53.00	78	139,910	7.32	1,478	1,723,225	1,597,177
Male	10 CC	63	63.00	197	353,890	6.72	1,266	3,733,540	3,483,726
Male	10 CC	73	73.00	121	218,095	6.44	1,065	1,935,593	1,811,235
Male	10 CC	81	81.00	27	49,380	6.28	956	393,394	368,758
Male	10 CC	92	92.00	1	1,646	6.20	927	12,715	11,926
Subtotal				458	823,000			8,634,566	8,046,284

TABLE C3 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1975; with Interest of 7.5 Percent for the First 14 Years and 5.25 Percent Thereafter									
Female	Life	47	46.85	3	3,467	7.50	1,697	49,029	45,355
Female	Life	58	57.85	6	10,434	7.02	1,485	129,121	120,081
Female	Life	69	68.81	45	74,304	6.52	1,168	723,226	676,163
Female	Life	78	77.52	82	133,902	6.34	867	967,442	906,396
Female	Life	85	84.10	49	80,682	6.20	631	424,253	398,018
Female	Life	92	84.10	4	6,811	6.20	631	35,815	33,600
Subtotal				189	309,600			2,328,886	2,179,613
Female	10 CC	48	48.00	4	5,523	7.50	1,692	77,874	72,030
Female	10 CC	57	57.00	23	35,632	7.08	1,526	453,120	421,112
Female	10 CC	68	68.00	98	152,505	6.54	1,260	1,601,303	1,496,549
Female	10 CC	78	78.00	304	472,124	6.34	1,032	4,060,266	3,804,400
Female	10 CC	85	85.00	141	218,335	6.20	935	1,701,194	1,596,260
Female	10 CC	92	92.00	4	6,681	6.20	935	52,056	48,845
Subtotal				574	890,800			7,945,813	7,439,196
Subtotal life				329	654,100			4,910,174	4,593,541
Subtotal 10 CC				1,032	1,713,800			16,580,379	15,485,480
Subtotal male				598	1,167,500			11,215,854	10,460,212
Subtotal female				763	1,200,400			10,274,699	9,618,809
Total all issues				1,361	2,367,900			21,490,553	20,079,021

TABLE C3 — *Continued*

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1976; with Interest of 7.5 Percent for the First 14 Years and 5.25 Percent Thereafter									
Male	Life	48	47.85	8	18,179	7.50%	1,547	234,358	216,811
Male	Life	58	57.85	9	20,946	7.02	1,323	230,930	214,638
Male	Life	64	63.85	62	136,739	6.66	1,161	1,322,950	1,234,937
Male	Life	76	75.26	66	147,014	6.38	817	1,000,920	937,504
Male	Life	85	83.01	31	68,765	6.20	581	332,937	312,482
Male	Life	92	83.01	2	3,557	6.20	581	17,222	16,164
Subtotal				178	395,200			3,139,317	2,932,536
Male	10 CC	47	47.00	21	51,115	7.50	1,588	676,422	625,853
Male	10 CC	54	54.00	25	58,894	7.26	1,458	715,562	663,638
Male	10 CC	63	63.00	160	384,475	6.72	1,266	4,056,211	3,784,807
Male	10 CC	75	75.00	172	413,366	6.40	1,032	3,554,948	3,327,431
Male	10 CC	85	85.00	81	193,349	6.20	927	1,493,621	1,400,905
Male	10 CC	92	92.00	4	10,001	6.20	927	77,258	72,462
Subtotal				463	1,111,200			10,574,022	9,875,096

TABLE C3 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1976; with Interest of 7.5 Percent for the First 14 Years and 5.25 Percent Thereafter									
Female	Life	49	48.85	3	4,303	7.50	1,666	59,740	55,258
Female	Life	52	51.85	10	16,854	7.38	1,613	226,546	209,849
Female	Life	68	67.82	53	88,574	6.54	1,200	885,740	828,027
Female	Life	77	76.58	105	174,997	6.36	901	1,313,936	1,229,833
Female	Life	85	84.10	40	66,700	6.20	631	350,731	329,042
Female	Life	92	84.10	4	7,172	6.20	631	37,713	35,381
Subtotal				215	358,600			2,874,406	2,687,390
Female	10 CC	45	45.00	2	889	7.50	1,734	12,846	11,884
Female	10 CC	57	57.00	36	65,608	7.08	1,526	834,315	775,379
Female	10 CC	67	67.00	135	245,530	6.56	1,285	2,629,217	2,456,630
Female	10 CC	78	78.00	289	525,309	6.34	1,032	4,517,657	4,232,968
Female	10 CC	85	85.00	147	266,880	6.20	935	2,079,440	1,951,176
Female	10 CC	92	92.00	3	7,784	6.20	935	60,650	56,909
Subtotal				612	1,112,000			10,134,125	9,484,946
Subtotal life				393	753,800			6,013,723	5,619,926
Subtotal 10 CC				1,075	2,223,200			20,708,147	19,360,042
Subtotal male				641	1,506,400			13,713,339	12,807,632
Subtotal female				827	1,470,600			13,008,531	12,172,336
Total all issues				1,468	2,977,000			26,721,870	24,979,968

TABLE C3 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1977; with Interest of 7.5 Percent for the First 14 Years and 5.25 Percent Thereafter									
Male	Life	45	44.85	2	4,333	7.50%	1,605	57,954	53,596
Male	Life	57	56.85	6	12,999	7.08	1,348	146,022	135,644
Male	Life	65	64.85	52	116,447	6.60	1,132	1,098,483	1,026,320
Male	Life	78	76.98	106	237,227	6.34	764	1,510,345	1,414,739
Male	Life	85	83.00	74	165,192	6.20	582	801,181	751,018
Male	Life	92	83.00	<u>1</u>	<u>5,416</u>	6.20	582	<u>26,268</u>	<u>24,623</u>
Subtotal				241	541,614			3,640,253	3,405,940
Male	10 CC	45	45.00	5	10,811	7.50	1,622	146,129	135,171
Male	10 CC	56	56.00	11	24,325	7.14	1,417	287,238	266,708
Male	10 CC	68	68.00	80	182,441	6.54	1,160	1,763,596	1,648,917
Male	10 CC	78	78.00	221	502,050	6.34	989	4,137,729	3,876,642
Male	10 CC	85	85.00	274	621,650	6.20	927	4,802,246	4,504,149
Male	10 CC	92	92.00	<u>4</u>	<u>10,136</u>	6.20	927	<u>78,301</u>	<u>73,440</u>
Subtotal				595	1,351,413			11,215,239	10,505,027

TABLE C3 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1977; with Interest of 7.5 Percent for the First 14 Years and 5.25 Percent Thereafter									
Female	Life	45	44.85	1	2,290	7.50	1,726	32,938	30,472
Female	Life	55	54.85	2	3,206	7.20	1,553	41,491	38,503
Female	Life	67	66.83	45	77,870	6.56	1,232	799,465	746,898
Female	Life	78	77.52	101	174,063	6.34	867	1,257,605	1,178,250
Female	Life	85	84.10	113	193,760	6.20	631	1,018,855	955,851
Female	Life	92	84.10	4	6,872	6.20	631	36,135	33,901
Subtotal				266	458,061			3,186,489	2,983,875
Female	10 CC	45	45.00	2	4,054	7.50	1,734	58,580	54,191
Female	10 CC	55	55.00	5	10,811	7.20	1,568	141,264	131,107
Female	10 CC	68	68.00	51	100,004	6.54	1,260	1,050,042	981,351
Female	10 CC	78	78.00	315	623,001	6.34	1,032	5,357,809	5,020,175
Female	10 CC	85	85.00	307	608,135	6.20	935	4,738,385	4,446,111
Female	10 CC	92	92.00	3	5,407	6.20	935	42,130	39,531
Subtotal				683	1,351,412			11,388,210	10,672,466
Subtotal life				507	999,675			6,826,742	6,389,815
Subtotal 10 CC				1,278	2,702,825			22,603,449	21,177,493
Subtotal male				836	1,893,027			14,855,492	13,910,967
Subtotal female				949	1,809,473			14,574,699	13,656,341
Total all issues				1,785	3,702,500			29,430,191	27,567,308

TABLE C3 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1978; with Interest of 7.5 Percent for the First 14 Years and 5.25 Percent Thereafter									
Male	Life	35	34.85	0	0	7.50%	1,764	0	0
Male	Life	46	45.85	1	410	7.50	1,586	5,419	5,012
Male	Life	56	55.85	8	20,480	7.14	1,372	234,155	217,475
Male	Life	67	66.77	32	81,920	6.56	1,077	735,232	686,866
Male	Life	78	76.98	76	193,413	6.34	764	1,231,396	1,153,448
Male	Life	85	83.00	44	113,377	6.20	582	549,878	515,450
Subtotal				161	409,600			2,756,080	2,578,251
Male	10 CC	45	45.00	1	903	7.50	1,622	12,206	11,290
Male	10 CC	57	57.00	18	36,116	7.08	1,396	420,149	390,373
Male	10 CC	67	67.00	93	189,609	6.56	1,181	1,866,069	1,743,641
Male	10 CC	78	78.00	210	426,620	6.34	989	3,516,060	3,294,200
Male	10 CC	85	85.00	123	249,652	6.20	927	1,928,562	1,808,847
Male	10 CC	92	92.00	0	0	6.20	927	0	0
Subtotal				445	902,900			7,743,046	7,248,351

TABLE C3 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1978; with Interest of 7.5 Percent for the First 14 Years and 5.25 Percent Thereafter									
Female	Life	45	44.85	2	4,761	7.50	1,726	68,479	63,352
Female	Life	57	56.85	4	9,155	7.08	1,509	115,124	106,959
Female	Life	66	65.84	37	75,071	6.58	1,263	790,122	737,889
Female	Life	78	77.52	88	179,804	6.34	867	1,299,084	1,217,112
Female	Life	85	84.10	47	95,212	6.20	631	500,656	469,697
Female	Life	92	84.10	1	2,197	6.20	631	11,553	10,838
Subtotal				179	366,200			2,785,018	2,605,847
Female	10 CC	47	47.00	5	8,967	7.50	1,706	127,481	117,953
Female	10 CC	56	56.00	7	11,657	7.14	1,548	150,375	139,598
Female	10 CC	67	67.00	100	170,373	6.56	1,285	1,824,411	1,704,653
Female	10 CC	78	78.00	272	465,387	6.34	1,032	4,002,328	3,750,113
Female	10 CC	85	85.00	137	233,142	6.20	935	1,816,565	1,704,515
Female	10 CC	92	92.00	4	7,174	6.20	935	55,897	52,450
Subtotal				525	896,700			7,977,057	7,469,282
Subtotal life				340	775,800			5,541,098	5,184,098
Subtotal 10 CC				970	1,799,600			15,720,103	14,717,633
Subtotal male				606	1,312,500			10,499,126	9,826,602
Subtotal female				704	1,262,900			10,762,075	10,075,129
Total all issues				1,310	2,575,400			21,261,201	19,901,731

TABLE C3 -- *Continued*

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1979; with Interest of 7.5 Percent for the First 14 Years and 5.25 Percent Thereafter									
Male	Life	46	45.85	1	1,454	7.50%	1,586	19,217	17,774
Male	Life	56	55.85	4	6,805	7.14	1,372	77,804	72,262
Male	Life	67	66.77	15	26,899	6.56	1,077	241,419	225,537
Male	Life	78	76.98	29	52,810	6.34	764	336,224	314,940
Male	Life	85	83.00	27	49,437	6.20	582	239,769	224,757
Male	Life	92	93.00	3	7,997	6.20	582	38,785	36,357
Subtotal				79	145,402			953,218	891,627
Male	10 CC	45	45.00	1	2,836	7.50	1,622	38,333	35,459
Male	10 CC	56	56.00	8	15,799	7.14	1,417	186,560	173,226
Male	10 CC	67	67.00	22	46,181	6.56	1,181	454,498	424,680
Male	10 CC	78	78.00	84	175,001	6.34	989	1,442,300	1,351,292
Male	10 CC	85	85.00	74	153,531	6.20	927	1,186,027	1,112,405
Male	10 CC	92	92.00	5	11,748	6.20	927	90,753	85,120
Subtotal				194	405,096			3,398,471	3,182,182

TABLE C3 - Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1979; with Interest of 7.5 Percent for the First 14 Years and 5.25 Percent Thereafter									
Female	Life	45	44.85	1	528	7.50	1,726	7,594	7,026
Female	Life	57	56.85	4	4,965	7.08	1,509	62,435	58,007
Female	Life	67	66.83	27	14,451	6.56	1,232	148,364	138,608
Female	Life	78	77.52	47	44,495	6.34	867	321,476	301,191
Female	Life	85	84.10	21	36,762	6.20	631	193,307	181,353
Female	Life	92	84.10	1	4,438	6.20	631	23,336	21,893
Subtotal				101	105,639			756,512	708,078
Female	10 CC	45	45.00	1	1,306	7.50	1,734	18,872	17,458
Female	10 CC	55	55.00	6	10,448	7.20	1,568	136,521	126,705
Female	10 CC	67	67.00	26	46,147	6.56	1,285	494,157	461,720
Female	10 CC	78	78.00	116	202,873	6.34	1,032	1,744,708	1,634,761
Female	10 CC	85	85.00	97	169,786	6.20	935	1,322,916	1,241,316
Female	10 CC	92	92.00	3	4,789	6.20	935	37,314	35,013
Subtotal				249	435,349			3,754,488	3,516,973
Subtotal life				180	251,041			1,709,730	1,599,705
Subtotal 10 CC				443	840,445			7,152,959	6,699,155
Subtotal male				273	550,498			4,351,689	4,073,809
Subtotal female				350	540,988			4,511,000	4,225,051
Total all issues				623	1,091,486			8,862,689	8,298,860

TABLE C4  
GROSS SINGLE PREMIUMS  
ASSUMING 1979 COMPANY MORTALITY TABLE

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1980; with Interest of 9.22 Percent for the First 14 Years and 6.97 Percent Thereafter									
Male	Life	45	45.00	2	4,395	6.50%	1,375	50,359	47,072
Male	Life	55	55.00	2	4,884	6.50	1,242	50,549	47,273
Male	Life	67	67.00	7	17,092	6.32	1,013	144,285	135,137
Male	Life	78	78.00	17	38,909	6.16	724	234,751	220,313
Male	Life	85	85.00	22	50,703	6.05	526	222,248	208,995
Male	Life	92	92.00	3	6,105	6.05	526	26,760	25,164
Subtotal				53	122,088			728,952	683,954
Male	10 CC	45	45.00	1	3,125	6.50	1,387	36,120	33,766
Male	10 CC	57	57.00	3	5,134	6.47	1,247	53,351	49,885
Male	10 CC	68	68.00	11	29,016	6.31	1,076	260,177	243,698
Male	10 CC	78	78.00	59	154,098	6.16	926	1,189,123	1,115,606
Male	10 CC	85	85.00	93	243,290	6.05	864	1,751,688	1,645,324
Male	10 CC	92	92.00	4	11,740	6.05	864	84,528	79,395
Subtotal				171	446,403			3,374,987	3,167,674

TABLE C4 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1980; with Interest of 9.22 Percent for the First 14 Years and 6.97 Percent Thereafter									
Female	Life	45	45.00	1	1,919	6.50	1,451	23,204	21,700
Female	Life	56	56.00	3	4,796	6.48	1,334	53,316	49,873
Female	Life	67	67.00	10	12,470	6.32	1,144	118,881	111,324
Female	Life	78	78.00	22	29,977	6.16	841	210,089	197,170
Female	Life	85	85.00	29	41,008	6.05	618	211,191	198,387
Female	Life	92	92.00	4	5,756	6.05	618	29,643	27,846
Subtotal				69	95,926			646,324	606,300
Female	10 CC	45	45.00	2	3,628	6.50	1,455	43,990	41,125
Female	10 CC	57	57.00	2	3,629	6.47	1,335	40,373	37,769
Female	10 CC	67	67.00	14	29,031	6.32	1,181	285,713	267,597
Female	10 CC	78	78.00	84	172,370	6.16	975	1,400,506	1,314,330
Female	10 CC	85	85.00	114	235,874	6.05	891	1,751,364	1,645,390
Female	10 CC	92	92.00	4	9,072	6.05	891	67,360	63,284
Subtotal				220	453,604			3,589,306	3,369,495
Subtotal life				122	218,014			1,375,276	1,290,254
Subtotal 10 CC				391	900,007			6,964,293	6,537,169
Subtotal male				224	568,491			4,103,939	3,851,628
Subtotal female				289	549,530			4,235,630	3,975,795
Total all issues				513	1,118,021			8,339,569	7,827,423

TABLE C4 — *Continued*

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1981; with Interest of 9.22 Percent for the First 14 Years and 6.97 Percent Thereafter									
Male	Life	45	45.00	1	2,407	6.50%	1,375	27,580	25,780
Male	Life	55	55.00	1	5,379	6.50	1,242	55,673	52,065
Male	Life	66	66.00	3	13,449	6.34	1,036	116,110	108,714
Male	Life	77	77.00	12	47,000	6.17	752	294,533	276,459
Male	Life	85	85.00	13	50,680	6.05	526	222,147	208,900
Male	Life	92	92.00	5	22,650	6.05	526	99,283	93,362
Subtotal				35	141,565			815,326	765,280
Male	10 CC	45	45.00	1	1,537	6.50	1,387	17,765	16,607
Male	10 CC	55	55.00	3	7,683	6.50	1,274	81,568	76,246
Male	10 CC	67	67.00	6	17,607	6.32	1,092	160,224	150,127
Male	10 CC	78	78.00	31	92,263	6.16	926	711,963	667,946
Male	10 CC	85	85.00	62	185,039	6.05	864	1,332,281	1,251,384
Male	10 CC	92	92.00	5	16,007	6.05	864	115,250	108,252
Subtotal				108	320,136			2,419,051	2,270,562

TABLE C4 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1981; with Interest of 9.22 Percent for the First 14 Years and 6.97 Percent Thereafter									
Female	Life	45	45.00	1	1,337	6.50	1,451	16,167	15,119
Female	Life	55	55.00	1	3,085	6.50	1,348	34,655	32,405
Female	Life	67	67.00	3	6,171	6.32	1,144	58,830	55,090
Female	Life	77	77.00	16	35,688	6.17	873	259,630	243,486
Female	Life	85	85.00	21	47,310	6.05	618	243,647	228,875
Female	Life	92	92.00	4	9,257	6.05	618	47,674	44,783
Subtotal				46	102,848			660,603	619,758
Female	10 CC	45	45.00	2	4,505	6.50	1,455	54,623	51,066
Female	10 CC	55	55.00	6	13,861	6.50	1,360	157,091	146,887
Female	10 CC	67	67.00	13	31,188	6.32	1,181	306,942	287,480
Female	10 CC	78	78.00	40	100,495	6.16	975	816,522	766,279
Female	10 CC	85	85.00	74	185,397	6.05	891	1,376,573	1,293,277
Female	10 CC	92	92.00	4	11,090	6.05	891	82,343	77,361
Subtotal				139	346,536			2,794,094	2,622,350
Subtotal life				81	244,413			1,475,929	1,385,038
Subtotal 10 CC				247	666,672			5,213,145	4,892,912
Subtotal male				143	461,701			3,234,377	3,035,842
Subtotal female				185	449,384			3,454,697	3,242,108
Total all issues				328	911,085			6,689,074	6,277,950

TABLE C5  
GROSS SINGLE PREMIUMS  
ASSUMING 1981 COMPANY MORTALITY TABLE

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1982; with Interest of 11.45 Percent for the First 14 Years and 9.2 Percent Thereafter									
Male	Life	15	15.00	0	0	6.90%	1,231	0	0
Male	Life	25	25.00	0	0	6.90	1,219	0	0
Male	Life	35	35.00	0	0	6.90	1,193	0	0
Male	Life	45	45.00	0	0	6.90	1,142	0	0
Male	Life	50	50.00	2	2,533	6.90	1,104	23,304	21,698
Male	Life	65	65.00	25	63,256	6.70	932	491,288	458,372
Male	Life	76	76.00	37	179,014	6.49	731	1,090,494	1,019,826
Male	Life	85	85.00	17	126,325	6.40	535	563,199	527,572
Male	Life	92	92.00	0	0	6.40	535	0	0
Subtotal				81	371,128			2,168,285	2,027,468
Male	10 CC	17	17.00	1	1,200	6.90	1,230	12,300	11,452
Male	10 CC	26	26.00	1	2,500	6.90	1,218	25,375	23,633
Male	10 CC	36	36.00	2	19,837	6.90	1,193	197,213	183,606
Male	10 CC	45	45.00	2	12,075	6.90	1,152	115,920	107,953
Male	10 CC	56	56.00	9	28,147	6.88	1,078	252,854	235,377
Male	10 CC	66	66.00	77	315,743	6.68	980	2,578,568	2,407,423
Male	10 CC	76	76.00	72	295,504	6.49	874	2,152,254	2,012,819
Male	10 CC	85	85.00	41	169,881	6.40	801	1,133,956	1,061,974
Male	10 CC	92	92.00	1	2,359	6.40	801	15,746	14,747
Subtotal				206	847,246			6,484,186	6,058,984

TABLE C5 -- Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1982; with Interest of 11.45 Percent for the First 14 Years and 9.2 Percent Thereafter									
Female	Life	15	15.00	0	0	6.90	1,238	0	0
Female	Life	25	25.00	0	0	6.90	1,232	0	0
Female	Life	35	35.00	1	1,067	6.90	1,218	10,830	10,080
Female	Life	45	45.00	0	0	6.90	1,188	0	0
Female	Life	55	55.00	1	1,131	6.90	1,128	10,631	9,900
Female	Life	66	66.00	24	46,499	6.68	1,007	390,204	364,130
Female	Life	76	76.00	45	86,424	6.49	810	583,362	545,427
Female	Life	85	85.00	21	42,689	6.40	573	203,840	190,628
Female	Life	92	92.00	0	0	6.40	573	0	0
Subtotal				92	177,810			1,198,867	1,120,165
Female	10 CC	17	17.00	1	2,995	6.90	1,237	30,873	28,749
Female	10 CC	26	26.00	1	5,707	6.90	1,231	58,544	54,499
Female	10 CC	36	36.00	3	11,475	6.90	1,217	116,376	108,309
Female	10 CC	45	45.00	7	29,669	6.90	1,191	294,465	274,170
Female	10 CC	56	56.00	18	72,370	6.88	1,131	682,087	635,306
Female	10 CC	66	66.00	55	221,866	6.68	1,036	1,915,443	1,788,186
Female	10 CC	78	78.00	87	352,916	6.47	877	2,579,228	2,413,715
Female	10 CC	85	85.00	68	275,881	6.40	814	1,871,393	1,752,265
Female	10 CC	92	92.00	10	39,008	6.40	814	264,604	247,760
Subtotal				250	1,011,887			7,813,013	7,302,959
Subtotal life				173	548,938			3,367,152	3,147,633
Subtotal 10 CC				456	1,859,133			14,297,199	13,361,943
Subtotal male				287	1,218,374			8,652,471	8,086,452
Subtotal female				342	1,189,697			9,011,880	8,423,124
Total all issues				629	2,408,071			17,664,351	16,509,576

TABLE C5 - Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1983; with Interest of 11.45 Percent for the First 14 Years and 9.2 Percent Thereafter									
Male	Life	10	10.00	1	10,851	6.90%	1,235	111,675	103,936
Male	Life	45	45.00	0	0	6.90	1,142	0	0
Male	Life	56	56.00	4	5,058	6.90	1,048	44,173	41,131
Male	Life	64	64.00	18	42,839	6.68	947	338,071	315,404
Male	Life	74	74.00	26	79,817	6.52	771	512,824	479,167
Male	Life	82	82.00	18	81,107	6.43	605	408,914	382,459
Male	Life	92	92.00	0	0	6.40	535	0	0
Subtotal				67	219,672			1,415,657	1,322,097
Male	10 CC	17	17.00	6	86,844	6.90	1,230	890,151	828,764
Male	10 CC	25	25.00	0	0	6.90	1,220	0	0
Male	10 CC	35	35.00	0	0	6.90	1,196	0	0
Male	10 CC	45	45.00	3	15,911	6.90	1,152	152,746	142,248
Male	10 CC	55	55.00	8	43,283	6.90	1,086	391,711	364,643
Male	10 CC	62	62.00	126	640,945	6.76	1,022	5,458,715	5,091,147
Male	10 CC	77	77.00	63	288,353	6.48	864	2,076,142	1,942,431
Male	10 CC	85	85.00	39	123,372	6.40	801	823,508	771,233
Male	10 CC	92	92.00	1	14,032	6.40	801	93,664	87,718
Subtotal				246	1,212,740			9,886,637	9,228,184

TABLE C5 — *Continued*

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
<i>For Issues of 1983; with Interest of 11.45 Percent for the First 14 Years and 9.2 Percent Thereafter</i>									
Female	Life	35	35.00	0	0	6.90	1,218	0	0
Female	Life	45	45.00	0	0	6.90	1,188	0	0
Female	Life	52	52.00	4	8,179	6.90	1,151	78,450	73,018
Female	Life	63	63.00	22	42,077	6.74	1,047	367,122	342,396
Female	Life	73	73.00	28	92,026	6.49	879	674,090	630,128
Female	Life	85	85.00	33	84,803	6.40	573	404,934	378,688
Female	Life	92	92.00	0	0	6.40	573	0	0
Subtotal				87	227,085			1,524,596	1,424,230
Female	10 CC	18	18.00	1	2,153	6.90	1,237	22,194	20,658
Female	10 CC	28	28.00	2	11,807	6.90	1,229	120,923	112,561
Female	10 CC	36	36.00	4	41,565	6.90	1,217	421,538	392,318
Female	10 CC	43	43.00	1	4,126	6.90	1,198	41,191	38,356
Female	10 CC	56	56.00	18	75,910	6.88	1,131	715,452	666,383
Female	10 CC	65	65.00	89	338,731	6.70	1,048	2,958,251	2,760,137
Female	10 CC	73	73.00	132	480,004	6.54	944	3,776,031	3,528,240
Female	10 CC	83	83.00	62	254,766	6.42	828	1,757,885	1,644,412
Female	10 CC	92	92.00	3	9,174	6.40	814	62,230	58,269
Subtotal				312	1,218,236			9,875,695	9,221,334
Subtotal life				154	446,757			2,940,253	2,746,327
Subtotal 10 CC				558	2,430,976			19,762,332	18,449,518
Subtotal male				313	1,432,412			11,302,294	10,550,281
Subtotal female				399	1,445,321			11,400,291	10,645,564
Total all issues				712	2,877,733			22,702,585	21,195,845

TABLE C5 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1984; with Interest of 11.45 Percent for the First 14 Years and 9.2 Percent Thereafter									
Male	Life	35	35.00	0	0	6.90%	1,193	0	0
Male	Life	45	45.00	0	0	6.90	1,142	0	0
Male	Life	56	56.00	3	5,903	6.88	1,048	51,553	48,003
Male	Life	63	63.00	10	51,654	6.74	962	414,093	386,055
Male	Life	75	75.00	25	124,455	6.50	751	778,881	728,106
Male	Life	83	83.00	21	103,322	6.42	582	501,112	469,210
Male	Life	92	92.00	1	49	6.40	535	218	205
Subtotal				60	285,383			1,745,857	1,631,579
Male	10 CC	18	18.00	2	18,446	6.90	1,229	188,918	175,898
Male	10 CC	33	33.00	5	49,371	6.90	1,203	494,944	460,616
Male	10 CC	44	44.00	1	77,447	6.90	1,158	747,364	695,652
Male	10 CC	53	53.00	6	196,793	6.90	1,101	1,805,576	1,681,125
Male	10 CC	63	63.00	90	287,839	6.74	1,012	2,427,442	2,264,121
Male	10 CC	72	72.00	86	297,032	6.56	915	2,264,869	2,117,049
Male	10 CC	83	83.00	29	86,527	6.42	814	586,941	549,033
Male	10 CC	92	92.00	3	4,510	6.40	801	30,104	28,193
Subtotal				222	1,017,965			8,546,158	7,971,687

TABLE C5 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1984; with Interest of 11.45 Percent for the First 14 Years and 9.2 Percent Thereafter									
Female	Life	35	35.00	0	0	6.90	1,218	0	0
Female	Life	45	45.00	0	0	6.90	1,188	0	0
Female	Life	56	56.00	2	7,905	6.88	1,120	73,780	68,682
Female	Life	62	62.00	19	50,268	6.76	1,059	443,615	413,596
Female	Life	75	75.00	28	97,735	6.50	834	679,258	634,992
Female	Life	82	82.00	31	69,963	6.43	653	380,715	356,296
Female	Life	92	92.00	8	5,878	6.40	573	28,067	26,248
Subtotal				88	231,749			1,605,435	1,499,814
Female	10 CC	15	15.00	0	0	6.90	1,238	0	0
Female	10 CC	25	25.00	1	2,596	6.90	1,232	26,652	24,809
Female	10 CC	47	47.00	7	56,219	6.90	1,183	554,226	515,959
Female	10 CC	56	56.00	15	61,349	6.88	1,131	578,214	538,558
Female	10 CC	63	63.00	107	320,459	6.74	1,070	2,857,426	2,664,226
Female	10 CC	75	75.00	111	392,549	6.50	916	2,996,457	2,802,169
Female	10 CC	85	85.00	59	263,276	6.40	814	1,785,889	1,672,204
Female	10 CC	92	92.00	3	5,352	6.40	814	36,304	33,993
Subtotal				303	1,101,800			8,835,168	8,251,918
Subtotal life				148	517,132			3,351,292	3,131,393
Subtotal 10 CC				525	2,199,765			17,381,326	16,223,605
Subtotal male				282	1,303,348			10,292,015	9,603,266
Subtotal female				391	1,333,549			10,440,603	9,751,732
Total all issues				673	2,636,897			20,732,618	19,354,998

TABLE C5 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1983; with Interest of 11.45 Percent for the First 14 Years and 9.2 Percent Thereafter									
Male	Life	15	15.00	0	0	6.90%	1,231	0	0
Male	Life	25	25.00	0	0	6.90	1,219	0	0
Male	Life	35	35.00	1	3,070	6.90	1,193	30,521	28,423
Male	Life	46	46.00	4	6,741	6.90	1,135	63,759	59,358
Male	Life	55	55.00	3	5,980	6.66	1,058	52,724	49,105
Male	Life	67	67.00	18	51,329	6.48	900	384,968	359,253
Male	Life	77	77.00	37	314,947	6.40	711	1,866,061	1,744,881
Male	Life	85	85.00	18	76,842	6.40	535	342,587	320,916
Male	Life	92	92.00	0	0		535	0	0
Subtotal				81	458,909			2,740,620	2,561,936
Male	10 CC	5	5.00	0	0	6.90	1,237	0	0
Male	10 CC	16	16.00	5	50,941	6.90	1,231	522,570	486,482
Male	10 CC	26	26.00	3	92,856	6.90	1,218	942,488	877,789
Male	10 CC	36	36.00	3	93,147	6.90	1,193	926,036	862,146
Male	10 CC	46	46.00	5	95,291	6.90	1,147	910,823	847,754
Male	10 CC	57	57.00	13	93,676	6.86	1,069	834,497	777,330
Male	10 CC	67	67.00	95	107,864	6.66	970	871,901	813,518
Male	10 CC	78	78.00	89	400,352	6.47	855	2,852,508	2,667,566
Male	10 CC	85	85.00	31	365,533	6.40	801	2,439,933	2,285,048
Male	10 CC	92	92.00	2	23,823	6.40	801	159,019	148,924
Subtotal				246	1,323,483			10,459,775	9,766,557

TABLE C5 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1985; with Interest of 11.45 Percent for the First 14 Years and 9.2 Percent Thereafter									
Female	Life	15	15.00	0	0	6.90	1,238	0	0
Female	Life	25	25.00	0	0	6.90	1,232	0	0
Female	Life	35	35.00	0	0	6.90	1,218	0	0
Female	Life	45	45.00	0	0	6.90	1,188	0	0
Female	Life	56	56.00	12	11,364	6.88	1,120	106,064	98,735
Female	Life	66	66.00	47	92,239	6.68	1,007	774,039	722,316
Female	Life	76	76.00	39	128,358	6.49	810	866,417	810,075
Female	Life	85	85.00	23	101,947	6.40	573	486,797	455,245
Female	Life	92	92.00	0	0	6.40	573	0	0
Subtotal				121	333,908			2,233,317	2,086,371
Female	10 CC	5	5.00	1	5,785	6.90	1,241	59,827	55,706
Female	10 CC	15	15.00	3	29,986	6.90	1,238	309,356	288,047
Female	10 CC	25	25.00	4	21,484	6.90	1,232	220,569	205,318
Female	10 CC	35	35.00	3	36,119	6.90	1,219	366,909	341,460
Female	10 CC	45	45.00	10	46,610	6.90	1,191	462,604	430,721
Female	10 CC	57	57.00	12	51,271	6.86	1,124	480,238	447,162
Female	10 CC	67	67.00	117	170,902	6.66	1,024	1,458,364	1,361,573
Female	10 CC	78	78.00	117	612,777	6.47	877	4,478,379	4,190,995
Female	10 CC	84	84.00	76	560,077	6.41	821	3,831,860	3,584,222
Subtotal		92	92.00	2	18,644	6.40	814	126,468	118,418
				345	1,553,655			11,794,574	11,023,622
Subtotal life				202	792,817			4,973,937	4,648,307
Subtotal 10 CC				591	2,877,138			22,254,349	20,790,179
Subtotal male				327	1,782,392			13,200,395	12,328,493
Subtotal female				466	1,887,563			14,027,891	13,109,993
Total all issues				793	3,669,955			27,228,286	25,438,486

TABLE C5 — *Continued*

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1986; with Interest of 11.45 Percent for the First 14 Years and 9.2 Percent Thereafter									
Male	Life	5	5.00	0	0	6.90%	1,237	0	0
Male	Life	19	19.00	1	3,995	6.90	1,227	40,849	38,042
Male	Life	25	25.00	0	0	6.90	1,219	0	0
Male	Life	35	35.00	0	0	6.90	1,193	0	0
Male	Life	45	45.00	0	0	6.90	1,142	0	0
Male	Life	57	57.00	4	11,764	6.86	1,037	101,661	94,690
Male	Life	66	66.00	30	61,522	6.68	916	469,618	438,350
Male	Life	75	75.00	37	124,300	6.50	751	777,911	727,200
Male	Life	84	84.00	21	69,741	6.41	559	324,877	304,203
Male	Life	92	92.00	0	0	6.40	535	0	0
Subtotal				93	271,322			1,714,916	1,602,485
Male	10 CC	5	5.00	5	36,460	6.90	1,237	375,842	349,938
Male	10 CC	16	16.00	8	48,632	6.90	1,231	498,883	464,431
Male	10 CC	26	26.00	7	25,149	6.90	1,218	255,262	237,739
Male	10 CC	36	36.00	5	13,279	6.90	1,193	132,015	122,907
Male	10 CC	48	48.00	11	70,024	6.90	1,135	662,310	616,493
Male	10 CC	57	57.00	5	31,071	6.86	1,069	276,791	257,829
Male	10 CC	68	68.00	69	235,399	6.64	959	1,881,230	1,755,830
Male	10 CC	77	77.00	75	301,241	6.48	864	2,168,935	2,029,248
Male	10 CC	85	85.00	44	175,581	6.40	801	1,172,003	1,097,606
Male	10 CC	92	92.00	3	4,720	6.40	801	31,506	29,506
Subtotal				232	941,556			7,454,777	6,961,527

TABLE C5 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Load Percent	Factor with Load	Premium	
		True	Calc.					With Load	No Load
For Issues of 1986; with Interest of 11.45 Percent for the First 14 Years and 9.2 Percent Thereafter									
Female	Life	5	5.00	0	0	6.90	1,242	0	0
Female	Life	15	15.00	0	0	6.90	1,238	0	0
Female	Life	26	26.00	0	0	6.90	1,231	0	0
Female	Life	35	35.00	0	0	6.90	1,218	0	0
Female	Life	45	45.00	0	0	6.90	1,188	0	0
Female	Life	51	51.00	3	1,771	6.90	1,157	17,075	15,901
Female	Life	64	64.00	27	81,644	6.72	1,035	704,180	656,542
Female	Life	75	75.00	48	96,563	6.50	834	671,113	627,378
Female	Life	84	84.00	15	72,212	6.41	599	360,458	337,362
Female	Life	92	92.00	1	1,884	6.40	573	8,996	8,413
Subtotal				94	254,074			1,761,822	1,645,596
Female	10 CC	5	5.00	6	15,621	6.90	1,241	161,547	150,421
Female	10 CC	15	15.00	7	30,320	6.90	1,238	312,801	291,255
Female	10 CC	25	25.00	7	24,089	6.90	1,232	247,314	230,214
Female	10 CC	35	35.00	8	34,943	6.90	1,219	354,963	330,342
Female	10 CC	45	45.00	4	14,448	6.90	1,191	143,396	133,513
Female	10 CC	57	57.00	12	30,101	6.86	1,124	281,946	262,527
Female	10 CC	67	67.00	84	458,949	6.66	1,024	3,916,365	3,656,437
Female	10 CC	78	78.00	112	431,386	6.47	877	3,152,713	2,950,399
Female	10 CC	85	85.00	96	515,714	6.40	814	3,498,260	3,275,570
Female	10 CC	92	92.00	2	6,488	6.40	814	44,010	41,209
Subtotal				338	1,562,059			12,113,315	11,321,887
Subtotal life				187	525,396			3,476,738	3,248,081
Subtotal 10 CC				570	2,503,615			19,568,092	18,283,414
Subtotal male				325	1,212,878			9,169,693	8,564,012
Subtotal female				432	1,816,133			13,875,137	12,967,483
Total all issues				757	3,029,011			23,044,830	21,531,495

TABLE D1

MORTALITY GROSS SINGLE PREMIUMS (NO LOADING)  
 ASSUMING 1965 COMPANY MORTALITY TABLE  
 WITH MORTALITY IMPROVEMENT BASED ON EXPERIENCE TABLES AND PROJECTION SCALES I AND J

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1966; with Interest of 4.75 Percent for the First 15 Years and 3.5 Percent Thereafter									
Male	Life	45	45.00	4	5,209	2,054	2,056	89,161	89,248
Male	Life	55	55.00	11	14,707	1,715	1,717	210,188	210,433
Male	Life	65	65.00	76	104,176	1,305	1,306	1,132,914	1,133,782
Male	Life	75	75.00	92	126,543	891	892	939,582	940,636
Male	Life	85	85.00	39	53,927	540	540	242,672	242,672
Male	Life	92	92.00	1	1,838	354	354	5,422	5,422
Subtotal				223	306,400			2,619,939	2,622,193
Male	10 CC	45	45.00	9	10,722	2,075	2,077	185,401	185,580
Male	10 CC	55	55.00	24	30,274	1,763	1,765	444,776	445,280
Male	10 CC	65	65.00	172	214,438	1,413	1,413	2,525,007	2,525,007
Male	10 CC	75	75.00	208	260,479	1,129	1,129	2,450,673	2,450,673
Male	10 CC	85	85.00	89	111,003	990	990	915,775	915,775
Male	10 CC	92	92.00	3	3,784	963	963	30,367	30,367
Subtotal				505	630,700			6,551,999	6,552,682

TABLE D1 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1966; with Interest of 4.75 Percent for the First 15 Years and 3.5 Percent Thereafter									
Female	Life	45	45.00	4	4,945	2,223	2,229	91,606	91,853
Female	Life	55	55.00	12	15,216	1,917	1,922	243,076	243,710
Female	Life	65	65.00	79	101,567	1,518	1,520	1,284,823	1,286,515
Female	Life	75	75.00	137	176,125	1,049	1,049	1,539,626	1,539,626
Female	Life	85	85.00	60	77,602	619	619	400,297	400,297
Female	Life	92	92.00	4	4,945	381	381	15,700	15,700
Subtotal				296	380,400			3,575,128	3,577,701
Female	10 CC	45	45.00	8	9,068	2,233	2,239	168,740	169,194
Female	10 CC	55	55.00	24	27,900	1,940	1,946	451,050	452,445
Female	10 CC	65	65.00	162	186,232	1,578	1,580	2,448,951	2,452,055
Female	10 CC	75	75.00	280	322,942	1,215	1,215	3,269,788	3,269,788
Female	10 CC	85	85.00	124	142,290	1,006	1,006	1,192,865	1,192,865
Female	10 CC	92	92.00	8	9,068	966	966	72,997	72,977
Subtotal				606	697,500			7,604,391	7,609,344
Subtotal life				519	686,800			6,195,067	6,199,894
Subtotal 10 CC				1,111	1,328,200			14,156,390	14,162,026
Subtotal male				728	937,100			9,171,938	9,174,875
Subtotal female				902	1,077,900			11,179,519	11,187,045
Total all issues				1,630	2,015,000			20,351,457	20,361,920

TABLE D1 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1967; with Interest of 5 Percent for the First 12 Years and 3.75 Percent Thereafter									
Male	Life	45	45.00	4	5,323	2,021	2,023	89,648	89,737
Male	Life	55	55.00	10	15,029	1,696	1,697	212,410	212,535
Male	Life	65	65.00	69	106,454	1,295	1,296	1,148,816	1,149,703
Male	Life	75	75.00	84	129,310	885	885	953,661	953,661
Male	Life	85	85.00	36	55,105	537	537	246,595	246,595
Male	Life	92	92.00	1	1,879	354	354	5,543	5,543
Subtotal				204	313,100			2,656,673	2,657,774
Male	10 CC	45	45.00	8	11,718	2,041	2,043	199,304	199,499
Male	10 CC	55	55.00	23	33,086	1,742	1,744	480,298	480,850
Male	10 CC	65	65.00	162	234,362	1,400	1,401	2,734,223	2,736,176
Male	10 CC	75	75.00	197	284,681	1,118	1,118	2,652,278	2,652,278
Male	10 CC	85	85.00	84	121,317	980	980	990,756	990,756
Male	10 CC	92	92.00	3	4,136	952	952	32,812	32,812
Subtotal				477	689,300			7,089,671	7,092,371

TABLE D1 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For issues of 1967; with Interest of 5 Percent for the First 12 Years and 3.75 Percent Thereafter									
Female	Life	45	45.00	5	5,742	2,182	2,187	104,409	104,648
Female	Life	55	55.00	14	17,668	1,890	1,896	278,271	279,154
Female	Life	65	65.00	96	117,934	1,503	1,506	1,477,123	1,480,072
Female	Life	75	75.00	167	204,507	1,042	1,042	1,775,802	1,775,802
Female	Life	85	85.00	73	90,107	616	616	462,549	462,549
Female	Life	92	92.00	5	5,742	381	381	18,231	18,231
Subtotal				360	441,700			4,116,385	4,120,456
Female	10 CC	45	45.00	12	13,727	2,192	2,197	250,747	251,318
Female	10 CC	55	55.00	38	42,236	1,913	1,919	673,312	675,424
Female	10 CC	65	65.00	255	281,925	1,562	1,565	3,669,724	3,676,772
Female	10 CC	75	75.00	441	488,882	1,204	1,205	4,905,116	4,909,190
Female	10 CC	85	85.00	195	215,403	996	996	1,787,845	1,787,845
Female	10 CC	92	92.00	12	13,727	955	955	109,244	109,244
Subtotal				953	1,055,900			11,395,988	11,409,793
Subtotal life				564	754,800			6,773,058	6,778,230
Subtotal 10 CC				1,430	1,745,200			18,485,659	18,502,164
Subtotal male				681	1,002,400			9,746,344	9,750,145
Subtotal female				1,313	1,497,600			15,512,373	15,530,249
Total all issues				1,994	2,500,000			25,258,717	25,280,394

TABLE D1 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1968; with Interest of 5.5 Percent for the First 13 Years and 3.75 Percent Thereafter									
Male	Life	45	45.00	4	5,834	1,930	1,931	93,830	93,879
Male	Life	55	55.00	10	16,474	1,628	1,630	223,497	223,772
Male	Life	65	65.00	75	116,688	1,254	1,255	1,219,390	1,220,362
Male	Life	75	75.00	91	141,742	865	865	1,021,724	1,021,724
Male	Life	85	85.00	39	60,403	530	530	266,780	266,780
Male	Life	92	92.00	1	2,059	352	352	6,040	6,040
Subtotal				220	343,200			2,831,261	2,832,557
Male	10 CC	45	45.00	8	10,775	1,949	1,951	175,004	175,184
Male	10 CC	55	55.00	23	30,422	1,673	1,674	424,133	424,387
Male	10 CC	65	65.00	161	215,492	1,355	1,355	2,433,264	2,433,264
Male	10 CC	75	75.00	195	261,759	1,090	1,090	2,377,644	2,377,644
Male	10 CC	85	85.00	83	111,549	958	958	890,533	890,533
Male	10 CC	92	92.00	3	3,803	932	932	29,537	29,537
Subtotal				473	633,800			6,330,115	6,330,549

TABLE D1 — *Continued*

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1968; with Interest of 5.5 Percent for the First 13 Years and 3.75 Percent Thereafter									
Female	Life	45	45.00	5	5,893	2,079	2,084	102,096	102,342
Female	Life	55	55.00	16	18,132	1,808	1,814	273,189	274,095
Female	Life	65	65.00	107	121,031	1,449	1,452	1,461,449	1,464,475
Female	Life	75	75.00	185	209,878	1,015	1,016	1,775,218	1,776,967
Female	Life	85	85.00	81	92,473	607	607	467,759	467,759
Female	Life	92	92.00	5	5,893	380	380	18,661	18,661
Subtotal				399	453,300			4,098,372	4,104,299
Female	10 CC	45	45.00	13	14,639	2,088	2,093	254,719	255,329
Female	10 CC	55	55.00	40	45,044	1,830	1,836	686,921	689,173
Female	10 CC	65	65.00	267	300,669	1,506	1,509	3,773,396	3,780,913
Female	10 CC	75	75.00	464	521,385	1,171	1,172	5,087,849	5,092,194
Female	10 CC	85	85.00	204	229,724	974	974	1,864,593	1,864,593
Female	10 CC	92	92.00	13	14,639	935	935	114,062	114,062
Subtotal				1,001	1,126,100			11,781,540	11,796,264
Subtotal life				619	796,500			6,929,633	6,936,856
Subtotal 10 CC				1,474	1,759,900			18,111,655	18,126,813
Subtotal male				693	977,000			9,161,376	9,163,106
Subtotal female				1,400	1,579,400			15,879,912	15,900,563
Total all issues				2,023	2,556,400			25,041,288	25,063,669

TABLE D1 — *Continued*

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1969; with Interest of 5.7 Percent for the First 13 Years and 3.75 Percent Thereafter									
Male	Life	45	45.00	3	3,397	1,901	1,902	53,814	53,842
Male	Life	55	55.00	7	9,590	1,608	1,610	128,506	128,666
Male	Life	65	65.00	51	67,932	1,243	1,244	703,662	704,228
Male	Life	75	75.00	62	82,517	860	860	591,372	591,372
Male	Life	85	85.00	27	35,165	529	529	155,019	155,019
Male	Life	92	92.00	1	1,199	353	353	3,527	3,527
Subtotal				<u>151</u>	<u>199,800</u>			<u>1,635,900</u>	<u>1,636,654</u>
Male	10 CC	45	45.00	7	9,246	1,920	1,922	147,936	148,090
Male	10 CC	55	55.00	21	26,107	1,652	1,653	359,406	359,624
Male	10 CC	65	65.00	146	184,926	1,342	1,343	2,068,089	2,069,630
Male	10 CC	75	75.00	178	224,631	1,081	1,081	2,023,551	2,023,551
Male	10 CC	85	85.00	76	95,727	951	951	758,636	758,636
Male	10 CC	92	92.00	3	3,263	924	924	25,125	25,125
Subtotal				<u>431</u>	<u>543,900</u>			<u>5,382,743</u>	<u>5,384,656</u>

TABLE D1 — *Continued*

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1969; with Interest of 5.7 Percent for the First 13 Years and 3.75 Percent Thereafter									
Female	Life	45	45.00	4	5,178	2,045	2,050	88,242	88,458
Female	Life	55	55.00	12	15,932	1,782	1,788	236,590	237,387
Female	Life	65	65.00	81	106,346	1,434	1,437	1,270,835	1,273,493
Female	Life	75	75.00	140	184,413	1,010	1,010	1,552,143	1,552,143
Female	Life	85	85.00	61	81,253	606	606	410,328	410,328
Female	Life	92	92.00	4	5,178	382	382	16,483	16,483
Subtotal				302	398,300			3,574,621	3,578,292
Female	10 CC	45	45.00	13	13,861	2,054	2,059	237,254	237,832
Female	10 CC	55	55.00	39	42,648	1,804	1,810	641,142	643,274
Female	10 CC	65	65.00	259	284,675	1,489	1,492	3,532,342	3,539,459
Female	10 CC	75	75.00	449	493,650	1,162	1,162	4,780,178	4,780,178
Female	10 CC	85	85.00	198	217,505	967	967	1,752,728	1,752,728
Female	10 CC	92	92.00	13	13,861	927	927	107,076	107,076
Subtotal				971	1,066,200			11,050,720	11,060,547
Subtotal life				453	598,100			5,210,521	5,214,946
Subtotal 10 CC				1,402	1,610,100			16,433,463	16,445,203
Subtotal male				582	743,700			7,018,643	7,021,310
Subtotal female				1,273	1,464,500			14,625,341	14,638,839
Total all issues				1,855	2,208,200			21,643,984	21,660,149

TABLE D2

MORTALITY GROSS SINGLE PREMIUMS (NO LOADING)  
 ASSUMING 1969 COMPANY MORTALITY TABLE  
 WITH MORTALITY IMPROVEMENT BASED ON EXPERIENCE TABLES AND PROJECTION SCALES I AND J

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1970; with Interest of 7 Percent for the First 16 Years and 3.25 Percent Thereafter									
Male	Life	45	45.00	2	4,457	1,682	1,684	62,472	62,547
Male	Life	55	55.00	7	12,586	1,438	1,439	150,822	150,927
Male	Life	65	65.00	49	89,148	1,135	1,136	843,192	843,934
Male	Life	75	75.00	60	108,289	807	807	728,244	728,244
Male	Life	85	85.00	25	46,147	511	511	196,509	196,509
Male	Life	92	92.00	1	1,573	350	350	4,588	4,588
Subtotal				144	262,200			1,985,827	1,986,749
Male	10 CC	45	45.00	6	10,142	1,700	1,701	143,678	143,763
Male	10 CC	55	55.00	18	28,637	1,476	1,478	352,235	352,712
Male	10 CC	65	65.00	128	202,844	1,223	1,224	2,067,318	2,069,009
Male	10 CC	75	75.00	155	246,396	1,008	1,008	2,069,726	2,069,726
Male	10 CC	85	85.00	66	105,001	898	898	785,757	785,757
Male	10 CC	92	92.00	2	3,580	874	874	26,074	26,074
Subtotal				375	596,600			5,444,788	5,447,041

TABLE D2 — *Continued*

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1970; with Interest of 7 Percent for the First 16 Years and 3.25 Percent Thereafter									
Female	Life	45	45.00	3	4,568	1,805	1,809	68,710	68,863
Female	Life	55	55.00	10	14,056	1,582	1,587	185,305	185,891
Female	Life	65	65.00	67	93,824	1,294	1,297	1,011,735	1,014,081
Female	Life	75	75.00	117	162,698	940	941	1,274,468	1,275,823
Female	Life	85	85.00	51	71,686	534	584	348,872	348,872
Female	Life	92	92.00	3	4,568	376	376	14,313	14,313
Subtotal				251	351,400			2,903,403	2,907,843
Female	10 CC	45	45.00	9	10,865	1,813	1,817	164,152	164,514
Female	10 CC	55	55.00	27	33,432	1,601	1,607	446,039	447,710
Female	10 CC	65	65.00	181	223,159	1,343	1,346	2,497,521	2,503,100
Female	10 CC	75	75.00	314	386,976	1,076	1,076	3,469,885	3,469,885
Female	10 CC	85	85.00	139	170,503	912	912	1,295,823	1,295,823
Female	10 CC	92	92.00	9	10,865	877	877	79,405	79,405
Subtotal				679	835,800			7,952,825	7,960,437
Subtotal life				395	613,600			4,889,230	4,894,592
Subtotal 10 CC				1,054	1,432,400			13,397,613	13,407,478
Subtotal male				519	858,800			7,430,615	7,433,790
Subtotal female				930	1,187,200			10,856,228	10,868,280
Total all issues				1,449	2,046,000			18,286,843	18,302,070

TABLE D2 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1971 with Interest of 7 Percent for the First 16 Years and 3.25 Percent Thereafter									
Male	Life	46	46.00	3	5,768	1,662	1,664	79,887	79,983
Male	Life	54	54.00	9	16,286	1,468	1,469	199,232	199,368
Male	Life	65	65.00	61	115,362	1,141	1,142	1,096,900	1,097,862
Male	Life	74	74.00	73	140,131	844	844	985,588	985,588
Male	Life	80	80.00	31	59,717	655	655	325,955	325,955
Male	Life	92	92.00	1	2,036	353	353	5,989	5,989
Subtotal				178	339,300			2,693,551	2,694,745
Male	10 CC	49	49.00	10	18,994	1,616	1,618	255,786	256,102
Male	10 CC	54	54.00	27	53,630	1,503	1,505	671,716	672,610
Male	10 CC	67	67.00	189	379,882	1,178	1,179	3,729,175	3,732,341
Male	10 CC	70	70.00	230	461,445	1,109	1,109	4,264,521	4,264,521
Male	10 CC	80	80.00	98	196,645	940	940	1,540,386	1,540,386
Male	10 CC	92	92.00	3	6,704	874	874	48,827	48,827
Subtotal				557	1,117,300			10,510,411	10,514,787

TABLE D2 — *Continued*

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1971; with Interest of 7 Percent for the First 16 Years and 3.25 Percent Thereafter									
Female	Life	46	46.00	4	5,897	1,787	1,791	87,816	88,013
Female	Life	58	58.00	12	18,144	1,507	1,512	227,858	228,614
Female	Life	66	66.00	81	121,111	1,266	1,269	1,277,721	1,280,749
Female	Life	79	79.00	140	210,017	798	799	1,396,613	1,398,363
Female	Life	80	80.00	62	92,534	762	762	587,591	587,591
Female	Life	92	92.00	4	5,897	381	381	18,723	18,723
Subtotal				303	453,600			3,596,322	3,602,053
Female	10 CC	46	46.00	11	15,969	1,795	1,800	238,870	239,535
Female	10 CC	58	58.00	35	49,136	1,531	1,536	626,893	628,941
Female	10 CC	68	68.00	232	327,983	1,264	1,267	3,454,754	3,462,954
Female	10 CC	79	79.00	403	568,749	995	995	4,715,877	4,715,877
Female	10 CC	85	85.00	178	250,594	913	913	1,906,603	1,906,603
Female	10 CC	92	92.00	11	15,969	878	878	116,840	116,840
Subtotal				870	1,228,400			11,059,837	11,070,750
Subtotal life				481	792,900			6,289,873	6,296,798
Subtotal 10 CC				1,427	2,345,700			21,570,248	21,585,537
Subtotal male				735	1,456,600			13,203,962	13,209,532
Subtotal female				1,173	1,682,000			14,656,159	14,672,803
Total all issues				1,908	3,138,600			27,860,121	27,882,335

TABLE D2 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1972; with Interest of 6.75 Percent for the First 16 Years and 3.25 Percent Thereafter									
Male	Life	47	47.00	3	5,350	1,679	1,681	74,855	74,945
Male	Life	56	56.00	8	15,106	1,448	1,450	182,279	182,531
Male	Life	68	68.00	59	106,998	1,064	1,065	948,716	949,607
Male	Life	74	74.00	72	129,971	860	861	931,459	932,542
Male	Life	82	82.00	30	55,387	606	606	279,704	279,704
Male	Life	92	92.00	1	1,888	359	359	5,648	5,648
Subtotal				173	314,700			2,422,661	2,424,977
Male	10 CC	46	46.00	8	13,263	1,721	1,723	190,214	190,435
Male	10 CC	56	56.00	23	37,450	1,489	1,490	464,692	465,004
Male	10 CC	65	65.00	160	265,268	1,253	1,254	2,769,840	2,772,051
Male	10 CC	75	75.00	195	322,223	1,027	1,027	2,757,692	2,757,692
Male	10 CC	85	85.00	83	137,315	910	910	1,041,305	1,041,305
Male	10 CC	92	92.00	3	4,681	884	884	34,483	34,483
Subtotal				472	780,200			7,258,226	7,260,970

TABLE D2 — *Continued*

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1972; with Interest of 6.75 Percent for the First 16 Years and 3.25 Percent Thereafter									
Female	Life	49	49.00	3	3,696	1,766	1,771	54,393	54,547
Female	Life	52	52.00	9	11,372	1,697	1,702	160,819	161,293
Female	Life	67	67.00	61	75,908	1,260	1,264	797,034	799,564
Female	Life	79	79.00	106	131,631	814	814	892,897	892,897
Female	Life	85	85.00	46	57,997	599	599	289,502	289,502
Female	Life	92	92.00	3	3,696	389	389	11,981	11,981
Subtotal				228	284,300			2,206,626	2,209,784
Female	10 CC	47	47.00	11	15,369	1,819	1,824	232,968	233,609
Female	10 CC	56	56.00	10	14,188	1,617	1,622	191,183	191,774
Female	10 CC	67	67.00	189	260,106	1,319	1,323	2,858,998	2,867,669
Female	10 CC	78	78.00	438	602,973	1,030	1,031	5,175,518	5,180,543
Female	10 CC	85	85.00	206	283,752	925	925	2,187,255	2,187,255
Female	10 CC	92	92.00	4	5,912	887	887	43,700	43,700
Subtotal				858	1,182,300			10,689,622	10,704,550
Subtotal life				401	599,000			4,629,287	4,634,761
Subtotal 10 CC				1,330	1,962,500			17,947,848	17,965,520
Subtotal male				645	1,094,900			9,680,887	9,685,947
Subtotal female				1,086	1,466,600			12,896,248	12,914,334
Total all issues				1,731	2,561,500			22,577,135	22,600,281

TABLE D2 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1973; with Interest of 7 Percent for the First 16 Years and 3.25 Percent Thereafter									
Male	Life	44	44.00	3	6,362	1,709	1,711	90,605	90,712
Male	Life	55	55.00	8	17,961	1,441	1,443	215,682	215,981
Male	Life	65	65.00	56	127,228	1,145	1,146	1,213,967	1,215,027
Male	Life	73	73.00	69	154,545	885	886	1,139,769	1,141,057
Male	Life	85	85.00	29	65,859	517	517	283,743	283,743
Male	Life	92	92.00	1	2,245	346	346	6,473	6,473
Subtotal				166	374,200			2,950,239	2,952,993
Male	10 CC	44	44.00	8	15,722	1,724	1,726	225,873	226,135
Male	10 CC	54	54.00	24	44,390	1,505	1,506	556,725	557,095
Male	10 CC	68	68.00	168	314,432	1,160	1,161	3,039,509	3,042,130
Male	10 CC	75	75.00	204	381,942	1,015	1,016	3,230,593	3,233,776
Male	10 CC	85	85.00	87	162,765	900	900	1,220,738	1,220,738
Male	10 CC	92	92.00	3	5,549	874	874	40,415	40,415
Subtotal				494	924,800			8,313,853	8,320,289

TABLE D2 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1973; with Interest of 7 Percent for the First 16 Years and 3.25 Percent Thereafter									
Female	Life	46	46.00	3	5,894	1,787	1,791	87,771	87,968
Female	Life	54	54.00	9	18,136	1,614	1,619	243,929	244,685
Female	Life	66	66.00	60	121,058	1,272	1,276	1,283,215	1,287,250
Female	Life	78	78.00	103	209,924	835	836	1,460,721	1,462,471
Female	Life	85	85.00	45	92,494	585	585	450,908	450,908
Female	Life	92	92.00	3	5,894	366	366	17,977	17,977
Subtotal				223	453,400			3,544,521	3,551,259
Female	10 CC	46	46.00	8	10,762	1,796	1,800	161,071	161,430
Female	10 CC	56	56.00	8	10,762	1,585	1,590	142,148	142,597
Female	10 CC	67	67.00	130	179,047	1,296	1,300	1,933,708	1,939,676
Female	10 CC	78	78.00	390	538,120	1,016	1,017	4,556,083	4,560,567
Female	10 CC	85	85.00	170	234,816	913	913	1,786,558	1,786,558
Female	10 CC	92	92.00	3	4,893	876	876	35,719	35,719
Subtotal				709	978,400			8,615,287	8,626,547
Subtotal life				389	827,600			6,494,760	6,504,252
Subtotal 10 CC				1,203	1,903,200			16,929,140	16,946,836
Subtotal male				660	1,299,000			11,264,092	11,273,282
Subtotal female				932	1,431,800			12,159,808	12,177,806
Total all issues				1,592	2,730,800			23,423,900	23,451,088

TABLE D3

MORTALITY GROSS SINGLE PREMIUMS (NO LOADING)  
 ASSUMING 1974 COMPANY MORTALITY TABLE  
 WITH MORTALITY IMPROVEMENT BASED ON EXPERIENCE TABLES AND PROJECTION SCALES I AND J

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1974 with Interest of 7.5 Percent for the First 14 Years and 5.25 Percent Thereafter									
Male	Life	45	45.00	2	4,435	1,543	1,544	57,027	57,064
Male	Life	55	55.00	7	12,523	1,358	1,359	141,719	141,823
Male	Life	65	65.00	48	88,706	1,106	1,107	817,574	818,313
Male	Life	75	75.00	58	107,752	807	807	724,632	724,632
Male	Life	85	85.00	25	45,919	516	516	197,452	197,452
Male	Life	92	92.00	1	1,565	343	343	4,473	4,473
Subtotal				141	260,900			1,942,877	1,943,757
Male	10 CC	45	45.00	7	10,834	1,559	1,561	140,752	140,932
Male	10 CC	55	55.00	19	30,590	1,394	1,396	355,354	355,864
Male	10 CC	65	65.00	131	216,682	1,188	1,189	2,145,152	2,146,957
Male	10 CC	75	75.00	159	263,205	992	993	2,175,828	2,178,021
Male	10 CC	85	85.00	68	112,165	881	881	823,478	823,478
Male	10 CC	92	92.00	2	3,824	856	856	27,278	27,278
Subtotal				386	637,300			5,667,842	5,672,530

TABLE D3 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1974 with Interest of 5.5 Percent for the First 14 Years and 5.25 Percent Thereafter									
Female	Life	45	45.00	2	3,574	1,630	1,633	48,547	48,636
Female	Life	55	55.00	7	10,996	1,480	1,484	135,617	135,984
Female	Life	65	65.00	49	73,398	1,254	1,258	767,009	769,456
Female	Life	75	75.00	84	127,278	935	937	991,708	993,829
Female	Life	85	85.00	37	56,080	592	592	276,661	276,661
Female	Life	92	92.00	2	3,574	368	368	10,960	10,960
Subtotal				181	274,900			2,230,502	2,235,526
Female	10 CC	45	45.00	8	12,505	1,639	1,641	170,797	171,006
Female	10 CC	55	55.00	24	38,476	1,496	1,500	479,667	480,950
Female	10 CC	65	65.00	159	256,827	1,295	1,300	2,771,591	2,782,293
Female	10 CC	75	75.00	276	445,359	1,057	1,059	3,922,871	3,930,293
Female	10 CC	85	85.00	121	196,228	896	896	1,465,169	1,465,169
Female	10 CC	92	92.00	8	12,505	859	859	89,515	89,515
Subtotal				596	961,900			8,899,610	8,919,226
Subtotal life				322	535,800			4,173,379	4,179,283
Subtotal 10 CC				982	1,599,200			14,567,452	14,591,756
Subtotal male				527	898,200			7,610,719	7,616,287
Subtotal female				777	1,236,800			11,130,112	11,154,752
Total all issues				1,304	2,135,000			18,740,831	18,771,039

TABLE D3 -- Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1975; with Interest of 7.5 Percent for the First 14 Years and 5.25 Percent Thereafter									
Male	Life	46	46.00	1	3,858	1,528	1,529	49,125	49,157
Male	Life	57	57.00	8	18,500	1,315	1,317	202,729	203,038
Male	Life	68	68.00	51	124,399	1,022	1,023	1,059,465	1,060,501
Male	Life	76	76.00	57	141,452	779	780	918,259	919,438
Male	Life	85	85.00	21	51,813	518	518	223,659	223,659
Male	Life	92	92.00	2	4,478	345	345	12,874	12,874
Subtotal				140	344,500			2,466,111	2,468,667
Male	10 CC	42	42.00	34	60,079	1,602	1,604	802,055	803,056
Male	10 CC	53	53.00	78	139,910	1,433	1,435	1,670,759	1,673,090
Male	10 CC	63	63.00	197	353,890	1,233	1,234	3,636,220	3,639,169
Male	10 CC	73	73.00	121	218,095	1,029	1,029	1,870,165	1,870,165
Male	10 CC	81	81.00	27	49,380	915	915	376,523	376,523
Male	10 CC	92	92.00	1	1,646	856	856	11,741	11,741
Subtotal				458	823,000			8,367,463	8,373,744

TABLE D3 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1975; with Interest of 7.5 Percent for the First 14 Years and 5.25 Percent Thereafter									
Female	Life	47	47.00	3	3,467	1,605	1,608	46,371	46,458
Female	Life	58	58.00	6	10,434	1,424	1,428	123,817	124,165
Female	Life	69	69.00	45	74,304	1,139	1,143	705,269	707,746
Female	Life	78	78.00	82	133,902	835	836	931,735	932,851
Female	Life	85	85.00	49	80,682	594	595	399,376	400,048
Female	Life	92	92.00	4	6,811	371	371	21,057	21,057
Subtotal				189	309,600			2,227,625	2,232,325
Female	10 CC	48	48.00	4	5,523	1,601	1,604	73,686	73,824
Female	10 CC	57	57.00	23	35,632	1,463	1,467	434,413	435,601
Female	10 CC	68	68.00	98	152,505	1,226	1,230	1,558,093	1,563,176
Female	10 CC	78	78.00	304	472,124	998	999	3,926,498	3,930,432
Female	10 CC	85	85.00	141	218,335	897	897	1,632,054	1,632,054
Female	10 CC	92	92.00	4	6,681	859	859	47,825	47,825
Subtotal				574	890,800			7,672,569	7,682,912
Subtotal life				329	654,100			4,693,736	4,700,992
Subtotal 10 CC				1,032	1,713,800			16,040,032	16,056,656
Subtotal male				598	1,167,500			10,833,574	10,842,411
Subtotal female				763	1,200,400			9,900,194	9,915,237
Total all issues				1,361	2,367,900			20,733,768	20,757,648

TABLE D3 — *Continued*

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1976; with Interest of 7.5 Percent for the First 14 Years and 5.25 Percent Thereafter									
Male	Life	48	48.00	8	18,179	1,495	1,497	226,480	226,783
Male	Life	58	58.00	9	20,946	1,295	1,297	226,042	226,391
Male	Life	64	64.00	62	136,739	1,140	1,142	1,299,021	1,301,299
Male	Life	76	76.00	66	147,014	782	783	958,041	959,266
Male	Life	85	85.00	31	68,765	520	521	297,982	298,555
Male	Life	92	92.00	2	3,557	348	348	10,315	10,315
Subtotal				178	395,200			3,017,881	3,022,609
Male	10 CC	47	47.00	21	51,115	1,532	1,534	652,568	653,420
Male	10 CC	54	54.00	25	58,894	1,417	1,419	695,440	696,422
Male	10 CC	63	63.00	160	384,475	1,236	1,237	3,960,093	3,963,296
Male	10 CC	75	75.00	172	413,366	996	997	3,430,938	3,434,383
Male	10 CC	85	85.00	81	193,349	883	883	1,422,726	1,422,726
Male	10 CC	92	92.00	4	10,001	857	857	71,424	71,424
Subtotal				463	1,111,200			10,233,189	10,241,671

TABLE D3 — *Continued*

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1976; with Interest of 7.5 Percent for the First 14 Years and 5.25 Percent Thereafter									
Female	Life	49	49.00	3	4,303	1,578	1,581	56,584	56,692
Female	Life	52	52.00	10	16,854	1,532	1,536	215,169	215,731
Female	Life	68	68.00	53	88,574	1,173	1,177	865,811	868,763
Female	Life	77	77.00	105	174,997	873	875	1,273,103	1,276,020
Female	Life	85	85.00	40	66,700	597	597	331,833	331,833
Female	Life	92	92.00	4	7,172	374	374	22,353	22,353
Subtotal				215	358,600			2,764,853	2,771,392
Female	10 CC	45	45.00	2	889	1,640	1,643	12,150	12,172
Female	10 CC	57	57.00	36	65,608	1,464	1,468	800,418	802,605
Female	10 CC	67	67.00	135	245,530	1,253	1,258	2,563,742	2,573,973
Female	10 CC	78	78.00	289	525,309	1,000	1,002	4,377,575	4,386,330
Female	10 CC	85	85.00	147	266,880	898	899	1,997,152	1,999,376
Female	10 CC	92	92.00	3	7,784	860	860	55,785	55,785
Subtotal				612	1,112,000			9,806,822	9,830,241
Subtotal life				393	753,800			5,782,734	5,794,001
Subtotal 10 CC				1,075	2,223,200			20,040,011	20,071,912
Subtotal male				641	1,506,400			13,251,070	13,264,280
Subtotal female				827	1,470,600			12,571,675	12,601,633
Total all issues				1,468	2,977,000			25,822,745	25,865,913

TABLE D3 -- Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1977; with Interest of 7.5 Percent for the First 14 Years and 5.25 Percent Thereafter									
Male	Life	45	45.00	2	4,333	1,548	1,549	55,896	55,932
Male	Life	57	57.00	6	12,999	1,322	1,323	143,206	143,314
Male	Life	65	65.00	52	116,447	1,116	1,118	1,082,957	1,084,898
Male	Life	78	78.00	106	237,227	725	725	1,433,246	1,433,246
Male	Life	85	85.00	74	165,192	523	524	719,962	721,338
Male	Life	92	92.00	1	5,416	351	351	15,842	15,842
Subtotal				241	541,614			3,451,109	3,454,570
Male	10 CC	45	45.00	5	10,811	1,563	1,565	140,813	140,993
Male	10 CC	56	56.00	11	24,325	1,382	1,383	280,143	280,346
Male	10 CC	68	68.00	80	182,441	1,132	1,133	1,721,027	1,722,547
Male	10 CC	78	78.00	221	502,050	953	954	3,987,114	3,991,298
Male	10 CC	85	85.00	274	621,650	884	884	4,579,488	4,579,488
Male	10 CC	92	92.00	4	10,136	857	857	72,388	72,388
Subtotal				595	1,351,413			10,780,973	10,787,060

TABLE D3 — *Continued*

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1977; with Interest of 7.5 Percent for the First 14 Years and 5.25 Percent Thereafter									
Female	Life	45	45.00	1	2,290	1,633	1,636	31,163	31,220
Female	Life	55	55.00	2	3,206	1,483	1,487	39,621	39,728
Female	Life	67	67.00	45	77,870	1,205	1,211	781,945	785,838
Female	Life	78	78.00	101	174,063	842	844	1,221,342	1,224,243
Female	Life	85	85.00	113	193,760	600	601	968,800	970,415
Female	Life	92	92.00	4	6,872	379	379	21,704	21,704
Subtotal				266	458,061			3,064,575	3,073,148
Female	10 CC	45	45.00	2	4,054	1,641	1,643	55,438	55,506
Female	10 CC	55	55.00	5	10,811	1,499	1,503	135,047	135,408
Female	10 CC	68	68.00	51	100,004	1,231	1,236	1,025,874	1,030,041
Female	10 CC	78	78.00	315	623,001	1,002	1,004	5,202,058	5,212,442
Female	10 CC	85	85.00	307	608,135	900	900	4,561,013	4,561,013
Female	10 CC	92	92.00	3	5,407	860	860	38,750	38,750
Subtotal				683	1,351,412			11,018,180	11,033,160
Subtotal life				507	999,675			6,515,684	6,527,718
Subtotal 10 CC				1,278	2,702,825			21,799,153	21,820,220
Subtotal male				836	1,893,027			14,232,082	14,241,630
Subtotal female				949	1,809,473			14,082,755	14,106,308
Total all issues				1,785	3,702,500			28,314,837	28,347,938

TABLE D3 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1978; with Interest of 7.5 Percent for the First 14 Years and 5.25 Percent Thereafter									
Male	Life	35	35.00	0	0	1,681	1,683	0	0
Male	Life	46	46.00	1	410	1,533	1,535	5,238	5,245
Male	Life	56	56.00	8	20,480	1,347	1,349	229,888	230,229
Male	Life	67	67.00	32	81,920	1,063	1,064	725,675	726,357
Male	Life	78	78.00	76	193,413	729	730	1,174,984	1,176,596
Male	Life	85	85.00	44	113,377	527	527	497,914	497,914
Subtotal				161	409,600			2,633,699	2,636,341
Male	10 CC	45	45.00	1	903	1,565	1,566	11,777	11,784
Male	10 CC	57	57.00	18	36,116	1,365	1,366	410,820	411,120
Male	10 CC	67	67.00	93	189,609	1,155	1,157	1,824,987	1,828,147
Male	10 CC	78	78.00	210	426,620	955	956	3,395,184	3,398,739
Male	10 CC	85	85.00	123	249,652	885	885	1,841,184	1,841,184
Male	10 CC	92	92.00	0	0	857	857	0	0
Subtotal				445	902,900			7,483,952	7,490,974

TABLE D3 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1978; with Interest of 7.5 Percent for the First 14 Years and 5.25 Percent Thereafter									
Female	Life	45	45.00	2	4,761	1,634	1,637	64,829	64,948
Female	Life	57	57.00	4	9,155	1,447	1,452	110,394	110,776
Female	Life	66	66.00	37	75,071	1,236	1,242	773,231	776,985
Female	Life	78	78.00	88	179,804	846	849	1,267,618	1,272,113
Female	Life	85	85.00	47	95,212	604	605	479,234	480,027
Female	Life	92	92.00	1	2,197	383	383	7,012	7,012
Subtotal				179	366,200			2,702,318	2,711,861
Female	10 CC	47	47.00	5	8,967	1,617	1,620	120,830	121,055
Female	10 CC	56	56.00	7	11,657	1,483	1,487	144,061	144,450
Female	10 CC	67	67.00	100	170,373	1,257	1,263	1,784,657	1,793,176
Female	10 CC	78	78.00	272	465,387	1,005	1,007	3,897,616	3,905,373
Female	10 CC	85	85.00	137	233,142	901	902	1,750,508	1,752,451
Female	10 CC	92	92.00	4	7,174	860	860	51,414	51,414
Subtotal				525	896,700			7,749,086	7,767,919
Subtotal life				340	775,800			5,336,017	5,348,202
Subtotal 10 CC				970	1,799,600			15,233,038	15,258,893
Subtotal male				606	1,312,500			10,117,651	10,127,315
Subtotal female				704	1,262,900			10,451,404	10,479,780
Total all issues				1,310	2,575,400			20,569,055	20,607,095

TABLE D3 -- Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1979; with Interest of 7.5 Percent for the First 14 Years and 5.25 Percent Thereafter									
Male	Life	46	46.00	1	1,454	1,535	1,537	18,599	18,623
Male	Life	56	56.00	4	6,805	1,350	1,352	76,556	76,670
Male	Life	67	67.00	15	26,899	1,067	1,069	239,177	239,625
Male	Life	78	78.00	29	52,810	733	734	322,581	323,021
Male	Life	85	85.00	27	49,437	531	531	218,759	218,759
Male	Life	92	92.00	3	7,997	359	359	23,924	23,924
Subtotal				79	145,402			899,596	900,622
Male	10 CC	45	45.00	1	2,836	1,566	1,568	37,010	37,057
Male	10 CC	56	56.00	8	15,799	1,386	1,388	182,478	182,742
Male	10 CC	67	67.00	22	46,181	1,158	1,160	445,647	446,416
Male	10 CC	78	78.00	84	175,001	957	958	1,395,633	1,397,091
Male	10 CC	85	85.00	74	153,531	886	887	1,133,571	1,134,850
Male	10 CC	92	92.00	5	11,748	857	857	83,900	83,900
Subtotal				194	405,096			3,278,239	3,282,056

TABLE D3 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1979; with Interest of 7.5 Percent for the First 14 Years and 5.25 Percent Thereafter									
Female	Life	45	45.00	1	528	1,635	1,638	7,194	7,207
Female	Life	57	57.00	4	4,965	1,448	1,453	59,911	60,118
Female	Life	67	67.00	27	14,451	1,211	1,217	145,835	146,557
Female	Life	78	78.00	47	44,495	850	854	315,173	316,656
Female	Life	85	85.00	21	36,762	608	609	186,261	186,567
Female	Life	92	92.00	1	4,438	389	389	14,387	14,387
Subtotal				101	105,639			728,761	731,492
Female	10 CC	45	45.00	1	1,306	1,643	1,645	17,881	17,903
Female	10 CC	55	55.00	6	10,448	1,501	1,505	130,687	131,035
Female	10 CC	67	67.00	26	46,147	1,259	1,265	484,159	486,466
Female	10 CC	78	78.00	116	202,873	1,007	1,010	1,702,443	1,707,514
Female	10 CC	85	85.00	97	169,786	902	903	1,276,225	1,277,640
Female	10 CC	92	92.00	3	4,789	861	861	34,361	34,361
Subtotal				249	435,349			3,645,756	3,654,919
Subtotal life				180	251,041			1,628,357	1,632,114
Subtotal 10 CC				443	840,445			6,923,995	6,936,975
Subtotal male				273	550,498			4,177,835	4,182,678
Subtotal female				350	540,988			4,374,517	4,386,411
Total all issues				623	1,091,486			8,552,352	8,569,089

TABLE D4

MORTALITY GROSS SINGLE PREMIUMS (NO LOADING)  
 ASSUMING 1979 COMPANY MORTALITY TABLE  
 WITH MORTALITY IMPROVEMENT BASED ON EXPERIENCE TABLES AND PROJECTION SCALES I AND J

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
<i>For Issues of 1980; with Interest of 9.22 Percent for the First 14 Years and 6.97 Percent Thereafter</i>									
Male	Life	45	45.00	2	4,395	1,302	1,303	47,686	47,722
Male	Life	55	55.00	2	4,884	1,184	1,185	48,189	48,230
Male	Life	67	67.00	7	17,092	963	965	137,163	137,448
Male	Life	78	78.00	17	38,909	694	695	225,024	225,348
Male	Life	85	85.00	22	50,703	518	519	218,868	219,290
Male	Life	92	92.00	3	6,105	352	352	17,908	17,908
Subtotal				53	122,088			694,838	695,946
Male	10 CC	45	45.00	1	3,125	1,313	1,314	34,193	34,219
Male	10 CC	57	57.00	3	5,134	1,186	1,187	50,741	50,784
Male	10 CC	68	68.00	11	29,016	1,022	1,023	247,120	247,361
Male	10 CC	78	78.00	59	154,098	883	884	1,133,904	1,135,189
Male	10 CC	85	85.00	93	243,290	825	825	1,672,619	1,672,619
Male	10 CC	92	92.00	4	11,740	799	799	78,169	78,169
Subtotal				171	446,403			3,216,746	3,218,341

TABLE D4 -- *Continued*

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1980; with Interest of 9.22 Percent for the First 14 Years and 6.97 Percent Thereafter									
Female	Life	45	45.00	1	1,919	1,356	1,358	21,685	21,717
Female	Life	56	56.00	3	4,796	1,251	1,253	49,998	50,078
Female	Life	67	67.00	10	12,470	1,073	1,078	111,503	112,022
Female	Life	78	78.00	22	29,977	796	799	198,847	199,597
Female	Life	85	85.00	29	41,008	584	585	199,572	199,914
Female	Life	92	92.00	4	5,756	406	406	19,474	19,474
Subtotal				69	95,926			601,079	602,802
Female	10 CC	45	45.00	2	3,628	1,361	1,362	41,148	41,178
Female	10 CC	57	57.00	2	3,629	1,253	1,255	37,893	37,953
Female	10 CC	67	67.00	14	29,031	1,112	1,117	269,021	270,230
Female	10 CC	78	78.00	84	172,370	924	927	1,327,249	1,331,558
Female	10 CC	85	85.00	114	235,874	838	839	1,647,187	1,649,152
Female	10 CC	92	92.00	4	9,072	803	803	60,707	60,707
Subtotal				220	453,604			3,383,205	3,390,778
Subtotal life				122	218,014			1,295,917	1,298,748
Subtotal 10 CC				391	900,007			6,599,951	6,609,119
Subtotal male				224	568,491			3,911,584	3,914,287
Subtotal female				289	549,530			3,984,284	3,993,580
Total all issues				513	1,118,021			7,895,868	7,907,867

TABLE D4 — *Continued*

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1981; with Interest of 9.22 Percent for the First 14 Years and 6.97 Percent Thereafter									
Male	Life	45	45.00	1	2,407	1,302	1,304	26,116	26,156
Male	Life	55	55.00	1	5,379	1,186	1,187	53,162	53,207
Male	Life	66	66.00	3	13,449	987	989	110,618	110,842
Male	Life	77	77.00	12	47,000	722	723	282,783	283,175
Male	Life	85	85.00	13	50,680	520	521	219,613	220,036
Male	Life	92	92.00	5	22,650	358	358	67,573	67,573
Subtotal				35	141,565			759,865	760,989
Male	10 CC	45	45.00	1	1,537	1,314	1,315	16,830	16,843
Male	10 CC	55	55.00	3	7,683	1,212	1,213	77,598	77,662
Male	10 CC	67	67.00	6	17,607	1,039	1,040	152,447	152,594
Male	10 CC	78	78.00	31	92,263	884	885	679,671	680,440
Male	10 CC	85	85.00	62	185,039	825	826	1,272,143	1,273,685
Male	10 CC	92	92.00	5	16,007	800	800	106,713	106,713
Subtotal				108	320,136			2,305,402	2,307,937

TABLE D4 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1981; with Interest of 9.22 Percent for the First 14 Years and 6.97 Percent Thereafter									
Female	Life	45	45.00	1	1,337	1,356	1,358	15,108	15,130
Female	Life	55	55.00	1	3,085	1,263	1,266	32,470	32,547
Female	Life	67	67.00	3	6,171	1,074	1,079	55,230	55,488
Female	Life	77	77.00	16	35,688	826	830	245,652	246,842
Female	Life	85	85.00	21	47,310	586	588	231,031	231,819
Female	Life	92	92.00	4	9,257	406	406	31,320	31,320
Subtotal				46	102,848			610,811	613,146
Female	10 CC	45	45.00	2	4,505	1,361	1,362	51,094	51,132
Female	10 CC	55	55.00	6	13,861	1,275	1,278	147,273	147,620
Female	10 CC	67	67.00	13	31,188	1,113	1,117	289,269	290,308
Female	10 CC	78	78.00	40	100,495	925	928	774,649	777,161
Female	10 CC	85	85.00	74	185,397	839	840	1,296,234	1,297,779
Female	10 CC	92	92.00	4	11,090	803	803	74,211	74,211
Subtotal				139	346,536			2,632,730	2,638,211
Subtotal life				81	244,413			1,370,676	1,374,135
Subtotal 10 CC				247	666,672			4,938,132	4,946,148
Subtotal male				143	461,701			3,065,267	3,068,926
Subtotal female				185	449,384			3,243,541	3,251,357
Total all issues				328	911,085			6,308,808	6,320,283

TABLE D5  
MORTALITY GROSS SINGLE PREMIUMS (NO LOADING)  
ASSUMING 1981 COMPANY MORTALITY TABLE  
WITH MORTALITY IMPROVEMENT BASED ON EXPERIENCE TABLES AND PROJECTION SCALES I AND J

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1982; with Interest of 11.45 Percent for the First 14 Years and 9.2 Percent Thereafter									
Male	Life	15	15.00	0	0	1,146	1,146	0	0
Male	Life	25	25.00	0	0	1,137	1,137	0	0
Male	Life	35	35.00	0	0	1,116	1,117	0	0
Male	Life	45	45.00	0	0	1,073	1,073	0	0
Male	Life	50	50.00	2	2,533	1,040	1,041	21,953	21,974
Male	Life	65	65.00	25	63,256	878	879	462,823	463,350
Male	Life	76	76.00	37	179,014	676	677	1,008,446	1,009,937
Male	Life	85	85.00	17	126,325	492	493	517,933	518,985
Male	Life	92	92.00	0	0	357	357	0	0
Subtotal				81	371,128			2,011,155	2,014,246
Male	10 CC	17	17.00	1	1,200	1,146	1,146	11,460	11,460
Male	10 CC	26	26.00	1	2,500	1,137	1,137	23,688	23,688
Male	10 CC	36	36.00	2	19,837	1,116	1,117	184,484	184,649
Male	10 CC	45	45.00	2	12,075	1,082	1,083	108,876	108,977
Male	10 CC	56	56.00	9	28,147	1,015	1,016	238,077	238,311
Male	10 CC	66	66.00	77	315,743	920	921	2,420,696	2,423,328
Male	10 CC	76	76.00	72	295,504	816	817	2,009,427	2,011,890
Male	10 CC	85	85.00	41	169,881	754	755	1,067,419	1,068,835
Male	10 CC	92	92.00	1	2,359	734	734	14,429	14,429
Subtotal				206	847,246			6,078,556	6,085,567

TABLE D5 — *Continued*

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1982; with Interest of 11.45 Percent for the First 14 Years and 9.2 Percent Thereafter									
Female	Life	15	15.00	0	0	1,152	1,152	0	0
Female	Life	25	25.00	0	0	1,146	1,146	0	0
Female	Life	35	35.00	1	1,067	1,133	1,133	10,074	10,074
Female	Life	45	45.00	0	0	1,105	1,106	0	0
Female	Life	55	55.00	1	1,131	1,051	1,053	9,906	9,925
Female	Life	66	66.00	24	46,499	940	943	364,242	365,405
Female	Life	76	76.00	45	86,424	762	766	548,792	551,673
Female	Life	85	85.00	21	42,689	543	545	193,168	193,879
Female	Life	92	92.00	0	0	384	384	0	0
Subtotal				92	177,810			1,126,182	1,130,956
Female	10 CC	17	17.00	1	2,995	1,151	1,151	28,727	28,727
Female	10 CC	26	26.00	1	5,707	1,145	1,145	54,454	54,454
Female	10 CC	36	36.00	3	11,475	1,132	1,132	108,248	108,248
Female	10 CC	45	45.00	7	29,669	1,109	1,109	274,191	274,191
Female	10 CC	56	56.00	18	72,370	1,055	1,057	636,253	637,459
Female	10 CC	66	66.00	55	221,866	971	974	1,795,266	1,800,812
Female	10 CC	78	78.00	87	352,916	829	832	2,438,061	2,446,884
Female	10 CC	85	85.00	68	275,881	765	766	1,758,741	1,761,040
Female	10 CC	92	92.00	10	39,008	736	736	239,249	239,249
Subtotal				250	1,011,887			7,333,190	7,351,064
Subtotal life				173	548,938			3,137,337	3,145,202
Subtotal 10 CC				456	1,859,133			13,411,746	13,436,631
Subtotal male				287	1,218,374			8,089,711	8,099,813
Subtotal female				342	1,189,697			8,459,372	8,482,020
Total all issues				629	2,408,071			16,549,083	16,581,833

TABLE D5 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1983; with Interest of 11.45 Percent for the First 14 Years and 9.2 Percent Thereafter									
Male	Life	10	10.00	1	10,851	1,149	1,150	103,898	103,989
Male	Life	45	45.00	0	0	1,073	1,074	0	0
Male	Life	56	56.00	4	5,058	989	990	41,686	41,729
Male	Life	64	64.00	18	42,839	893	894	318,794	319,151
Male	Life	74	74.00	26	79,817	724	725	481,563	482,228
Male	Life	82	82.00	18	81,107	571	573	385,934	387,286
Male	Life	92	92.00	0	0	349	350	0	0
Subtotal				67	219,672			1,331,875	1,334,383
Male	10 CC	17	17.00	6	86,844	1,146	1,146	829,360	829,360
Male	10 CC	25	25.00	0	0	1,138	1,139	0	0
Male	10 CC	35	35.00	0	0	1,119	1,120	0	0
Male	10 CC	45	45.00	3	15,911	1,082	1,083	143,464	143,597
Male	10 CC	55	55.00	8	43,283	1,022	1,023	368,627	368,988
Male	10 CC	62	62.00	126	640,945	961	962	5,132,901	5,138,242
Male	10 CC	77	77.00	63	288,353	811	812	1,948,786	1,951,189
Male	10 CC	85	85.00	39	123,372	756	757	777,244	778,272
Male	10 CC	92	92.00	1	14,032	733	733	85,712	85,712
Subtotal				246	1,212,740			9,286,094	9,295,360

TABLE D5 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1983; with Interest of 11.45 Percent for the First 14 Years and 9.2 Percent Thereafter									
Female	Life	35	35.00	0	0	1,133	1,134	0	0
Female	Life	45	45.00	0	0	1,107	1,108	0	0
Female	Life	52	52.00	4	8,179	1,074	1,075	73,202	73,270
Female	Life	63	63.00	22	42,077	982	984	344,330	345,031
Female	Life	73	73.00	28	92,026	834	838	639,581	642,648
Female	Life	85	85.00	33	84,803	546	549	385,854	387,974
Female	Life	92	92.00	0	0	392	393	0	0
Subtotal				87	227,085			1,442,967	1,448,923
Female	10 CC	18	18.00	1	2,153	1,151	1,151	20,651	20,651
Female	10 CC	28	28.00	2	11,807	1,144	1,144	112,560	112,560
Female	10 CC	36	36.00	4	41,565	1,133	1,133	392,443	392,443
Female	10 CC	43	43.00	1	4,126	1,116	1,117	38,372	38,406
Female	10 CC	56	56.00	18	75,910	1,057	1,058	668,641	669,273
Female	10 CC	65	65.00	89	338,731	984	987	2,777,594	2,786,062
Female	10 CC	73	73.00	132	480,004	893	897	3,572,030	3,588,030
Female	10 CC	83	83.00	62	254,766	780	782	1,655,979	1,660,225
Female	10 CC	92	92.00	3	9,174	737	737	56,344	56,344
Subtotal				312	1,218,236			9,294,614	9,323,994
Subtotal life				154	446,757			2,774,842	2,783,306
Subtotal 10 CC				558	2,430,976			18,580,708	18,619,354
Subtotal male				313	1,432,412			10,617,969	10,629,743
Subtotal female				399	1,445,321			10,737,581	10,772,917
Total all issues				712	2,877,733			21,355,550	21,402,660

TABLE D5 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1984; with Interest of 11.45 Percent for the First 14 Years and 9.2 Percent Thereafter									
Male	Life	35	35.00	0	0	1,117	1,117	0	0
Male	Life	45	45.00	0	0	1,074	1,074	0	0
Male	Life	56	56.00	3	5,903	989	990	48,651	48,700
Male	Life	63	63.00	10	51,654	907	908	390,418	390,849
Male	Life	75	75.00	25	124,455	705	707	731,173	733,247
Male	Life	83	83.00	21	103,322	552	553	475,281	476,142
Male	Life	92	92.00	1	49	350	351	143	143
Subtotal				60	285,383			1,645,666	1,649,081
Male	10 CC	18	18.00	2	18,446	1,145	1,145	176,006	176,006
Male	10 CC	33	33.00	5	49,371	1,124	1,125	462,442	462,853
Male	10 CC	44	44.00	1	77,447	1,087	1,088	701,541	702,186
Male	10 CC	53	53.00	6	196,793	1,037	1,038	1,700,620	1,702,259
Male	10 CC	63	63.00	90	287,839	951	952	2,281,124	2,283,523
Male	10 CC	72	72.00	86	297,032	858	859	2,123,779	2,126,254
Male	10 CC	83	83.00	29	86,527	768	769	553,773	554,494
Male	10 CC	92	92.00	3	4,510	733	733	27,549	27,549
Subtotal				222	1,017,965			8,026,834	8,035,124

TABLE D5 — Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1984; with Interest of 11.45 Percent for the First 14 Years and 9.2 Percent Thereafter									
Female	Life	35	35.00	0	0	1,133	1,134	0	0
Female	Life	45	45.00	0	0	1,107	1,108	0	0
Female	Life	56	56.00	2	7,905	1,046	1,048	68,905	69,037
Female	Life	62	62.00	19	50,268	992	995	415,549	416,806
Female	Life	75	75.00	28	97,735	794	798	646,680	649,938
Female	Life	82	82.00	31	69,963	626	630	364,974	367,306
Female	Life	92	92.00	8	5,878	392	393	19,201	19,250
Subtotal				88	231,749			1,515,309	1,522,337
Female	10 CC	15	15.00	0	0	1,152	1,152	0	0
Female	10 CC	25	25.00	1	2,596	1,146	1,147	24,792	24,813
Female	10 CC	47	47.00	7	56,219	1,103	1,103	516,746	516,746
Female	10 CC	56	56.00	15	61,349	1,057	1,058	540,382	540,894
Female	10 CC	63	63.00	107	320,459	1,003	1,006	2,678,503	2,686,515
Female	10 CC	75	75.00	111	392,549	868	872	2,839,438	2,852,523
Female	10 CC	85	85.00	59	263,276	766	767	1,680,578	1,682,772
Female	10 CC	92	92.00	3	5,352	737	737	32,870	32,870
Subtotal				303	1,101,800			8,313,309	8,337,133
Subtotal life				148	517,132			3,160,975	3,171,418
Subtotal 10 CC				525	2,119,765			16,340,143	16,372,257
Subtotal male				282	1,303,348			9,672,500	9,684,205
Subtotal female				391	1,333,549			9,828,618	9,859,470
Total all issues				673	2,636,897			19,501,118	19,543,675

TABLE D5 -- Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1985; with Interest of 11.45 Percent for the First 14 Years and 9.2 Percent Thereafter									
Male	Life	15	15.00	0	0	1,147	1,147	0	0
Male	Life	25	25.00	0	0	1,137	1,138	0	0
Male	Life	35	35.00	1	3,070	1,117	1,117	28,577	28,577
Male	Life	46	46.00	4	6,741	1,068	1,069	59,995	60,051
Male	Life	55	55.00	3	5,980	1,000	1,001	49,833	49,883
Male	Life	67	67.00	18	51,329	848	850	362,725	363,580
Male	Life	77	77.00	37	314,947	668	669	1,753,205	1,755,830
Male	Life	85	85.00	18	76,842	511	513	327,219	328,500
Male	Life	92	92.00	0	0	352	353	0	0
Subtotal				81	458,909			2,581,554	2,586,421
Male	10 CC	5	5.00	0	0	1,152	1,152	0	0
Male	10 CC	16	16.00	5	50,941	1,147	1,147	486,911	486,911
Male	10 CC	26	26.00	3	92,856	1,137	1,137	879,811	879,811
Male	10 CC	36	36.00	3	93,147	1,117	1,117	867,043	867,043
Male	10 CC	46	46.00	5	95,291	1,078	1,079	856,031	856,825
Male	10 CC	57	57.00	13	93,676	1,007	1,008	786,098	786,878
Male	10 CC	67	67.00	95	107,864	911	912	818,868	819,766
Male	10 CC	78	78.00	89	400,352	803	804	2,679,022	2,682,358
Male	10 CC	85	85.00	31	365,533	757	758	2,305,904	2,308,950
Male	10 CC	92	92.00	2	23,823	733	733	145,519	145,519
Subtotal				246	1,323,483			9,825,207	9,834,061

TABLE D5 — *Continued*

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1985; with Interest of 11.45 Percent for the First 14 Years and 9.2 Percent Thereafter									
Female	Life	15	15.00	0	0	1,152	1,152	0	0
Female	Life	25	25.00	0	0	1,146	1,146	0	0
Female	Life	35	35.00	0	0	1,133	1,134	0	0
Female	Life	45	45.00	0	0	1,107	1,107	0	0
Female	Life	56	56.00	12	11,364	1,046	1,048	99,056	99,246
Female	Life	66	66.00	47	92,239	947	950	727,919	730,225
Female	Life	76	76.00	39	128,358	772	777	825,770	831,118
Female	Life	85	85.00	23	101,947	549	552	466,408	468,956
Female	Life	92	92.00	0	0	392	393	0	0
Subtotal				121	333,908			2,119,153	2,129,545
Female	10 CC	5	5.00	1	5,785	1,155	1,155	55,681	55,681
Female	10 CC	15	15.00	3	29,986	1,152	1,152	287,866	287,866
Female	10 CC	25	25.00	4	21,484	1,146	1,147	205,172	205,351
Female	10 CC	35	35.00	3	36,119	1,134	1,135	341,325	341,626
Female	10 CC	45	45.00	10	46,610	1,110	1,110	431,143	431,143
Female	10 CC	57	57.00	12	51,271	1,050	1,052	448,621	449,476
Female	10 CC	67	67.00	117	170,902	964	967	1,372,913	1,377,185
Female	10 CC	78	78.00	117	612,777	832	836	4,248,587	4,269,013
Female	10 CC	84	84.00	76	560,077	773	775	3,607,829	3,617,164
Female	10 CC	92	92.00	2	18,644	737	737	114,505	114,505
Subtotal				345	1,553,655			11,113,642	11,149,010
Subtotal life				202	792,817			4,700,707	4,715,966
Subtotal 10 CC				591	2,877,138			20,938,849	20,983,071
Subtotal male				327	1,782,392			12,406,761	12,420,482
Subtotal female				466	1,887,563			13,232,795	13,278,555
Total all issues				793	3,669,955			25,639,556	25,699,037

TABLE D5 -- Continued

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1986; with Interest of 11.45 Percent for the First 14 Years and 9.2 Percent Thereafter									
Male	Life	5	5.00	0	0	1,151	1,151	0	0
Male	Life	19	19.00	1	3,995	1,144	1,144	38,086	38,086
Male	Life	25	25.00	0	0	1,137	1,137	0	0
Male	Life	35	35.00	0	0	1,117	1,117	0	0
Male	Life	45	45.00	0	0	1,074	1,075	0	0
Male	Life	57	57.00	4	11,764	981	982	96,171	96,269
Male	Life	66	66.00	30	61,522	865	866	443,471	443,984
Male	Life	75	75.00	37	124,300	706	707	731,298	732,334
Male	Life	84	84.00	21	69,741	532	534	309,185	310,347
Male	Life	92	92.00	0	0	354	354	0	0
Subtotal				93	271,322			1,618,211	1,621,020
Male	10 CC	5	5.00	5	36,460	1,152	1,152	350,016	350,016
Male	10 CC	16	16.00	8	48,632	1,147	1,147	464,841	464,841
Male	10 CC	26	26.00	7	25,149	1,137	1,137	238,287	238,287
Male	10 CC	36	36.00	5	13,279	1,117	1,117	123,605	123,605
Male	10 CC	48	48.00	11	70,024	1,068	1,069	623,214	623,797
Male	10 CC	57	57.00	5	31,071	1,007	1,008	260,737	260,996
Male	10 CC	68	68.00	69	235,399	901	902	1,767,454	1,769,416
Male	10 CC	77	77.00	75	301,241	811	812	2,035,887	2,038,397
Male	10 CC	85	85.00	44	175,581	757	758	1,107,623	1,109,087
Male	10 CC	92	92.00	3	4,720	734	734	28,871	28,871
Subtotal				232	941,556			7,000,535	7,007,313

TABLE D5 — *Continued*

Sex	Plan	Age		Number of Contracts	Annual Income	Factor		Premium	
		True	Calc.			Projection I	Projection J	Projection I	Projection J
For Issues of 1986; with Interest of 11.45 Percent for the First 14 Years and 9.2 Percent Thereafter									
Female	Life	5	5.00	0	0	1,155	1,155	0	0
Female	Life	15	15.00	0	0	1,152	1,152	0	0
Female	Life	26	26.00	0	0	1,145	1,146	0	0
Female	Life	35	35.00	0	0	1,133	1,134	0	0
Female	Life	45	45.00	0	0	1,107	1,107	0	0
Female	Life	51	51.00	3	1,771	1,080	1,081	15,939	15,954
Female	Life	64	64.00	27	81,644	971	974	660,636	662,677
Female	Life	75	75.00	48	96,563	794	800	638,925	643,753
Female	Life	84	84.00	15	72,212	576	580	346,618	349,025
Female	Life	92	92.00	1	1,884	392	394	6,154	6,186
Subtotal				94	254,074			1,668,272	1,677,595
Female	10 CC	5	5.00	6	15,621	1,155	1,155	150,352	150,352
Female	10 CC	15	15.00	7	30,320	1,152	1,152	291,072	291,072
Female	10 CC	25	25.00	7	24,089	1,146	1,147	230,050	230,251
Female	10 CC	35	35.00	8	34,943	1,134	1,135	330,211	330,503
Female	10 CC	45	45.00	4	14,448	1,110	1,110	133,644	133,644
Female	10 CC	57	57.00	12	30,101	1,050	1,052	263,384	263,885
Female	10 CC	67	67.00	84	458,949	964	967	3,686,890	3,698,364
Female	10 CC	78	78.00	112	431,386	833	836	2,994,538	3,005,322
Female	10 CC	85	85.00	96	515,714	767	768	3,296,272	3,300,570
Female	10 CC	92	92.00	2	6,488	737	737	39,847	39,847
Subtotal				338	1,562,059			11,416,260	11,443,810
Subtotal life				187	525,396			3,286,483	3,298,615
Subtotal 10 CC				570	2,503,615			18,416,795	18,451,123
Subtotal male				325	1,212,878			8,618,746	8,628,333
Subtotal female				432	1,816,133			13,084,532	13,121,405
Total all issues				757	3,029,011			21,703,278	21,749,738

APPENDIX II  
SUMMARY OF QUESTIONNAIRE RESPONSES

Companies have been coded with the letters A to O. They retain their assigned code throughout all the responses shown.

*1. Do you issue Joint Life Structured Settlement Annuities?*

Out of 15 responses, 13 companies indicated they issue Joint Life annuities. Companies A and C indicated they do not issue such annuities.

*2. What is the sex distribution of Structured Settlement Annuities you issue?*

Company	No. of Lives Proportion				Amount of Premium Proportion Excluding Not Involving Life Premiums			Amount of Premium Proportion Including Not Involving Life Premiums			
	Male	Female	Joint	Unknown	Male	Female	Joint	Male	Female	Joint	Unknown
A	61.5%	38.5%	0	—	62.9%	37.1%	0	66.9%	33.1%	0	—
B	63.0	35.0	2.0%	—	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	—
C	56.0	44.0	0	—	68.0	32.0	0	66.0	34.0	0	—
D	N.R.	N.R.	N.R.	—	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	—
E	43.6	55.6	0.8	—	55.6	42.6	1.8%	50.5	48.3	1.2%	—
F	59.1	39.8	1.1	—	57.9	39.7	2.4	59.9	38.5	1.6	—
G	54.4	42.6	1.1	1.9	51.2	45.1	3.7	53.7	41.7	2.5	2.1%
H	57.9	41.7	0.4	—	56.4	42.9	0.7	59.6	40.0	0.4	—
I	62.0	37.0	1.0	—	55.0	43.0	2.0	61.0	37.0	2.0	—
J	62.2	37.4	0.4	—	58.7	39.6	1.7	70.0	29.8	0.2	—
K	N.R.	N.R.	N.R.	—	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	—
L	55.4	43.5	1.1	—	55.3	41.6	3.1	59.3	38.5	2.2	—
M	60.0	39.0	1.0	—	64.0	35.0	1.0	63.0	36.0	1.0	—
N	N.R.	N.R.	N.R.	—	N.R.	N.R.	N.R.	65.0	35.0	0	—
O	55.0	44.0	1.0	—	N.R.	N.R.	N.R.	53.0	44.0	3.0	—

N.R. = No response to the question.

3. *What portion of the Structured Settlement Annuities involving life contingencies that you issue contains an annuity certain period of:*

Company	Number of Years in Annuity Certain Period								
	0	1-9	10	11-19	20	21-29	30	31-39	40 or more
Number of Lives Proportion									
A	5.1%	15.4%	12.8%	5.1%	38.5%	2.6%	17.9%	0	2.6%
B	28.1	5.3	26.2	7.0	24.6	1.8	7.0	0	0
C	22.0	0	27.0	0	31.0	0	15.0	2.0%	3.0
D	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
E	7.7	1.7	9.7	5.6	36.9	4.7	25.8	1.3	6.6
F	5.4	1.6	9.0	6.1	33.6	5.4	27.8	1.6	9.5
G	12.6	2.8	21.7	5.6	30.7	3.5	21.0	0	2.1
H	0	2.5	18.8	7.3	49.0	9.8	9.2	1.8	1.6
I	5.2	2.6	11.2	8.6	18.8	9.8	17.2	8.4	18.2
J	5.6	7.0	14.1	7.0	56.4	0	9.9	0	0
L	7.5	2.0	9.5	8.2	28.6	8.2	27.2	2.0	6.8
M	2.0	0	16.0	5.0	36.0	3.0	23.0	0	15.0
N	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
O	7.0	7.0	7.0	0	7.0	14.0	30.0	14.0	14.0
	0	1-10	11-20	21 or more					
K	6.8%	10.7%	43.8%	38.7%					
Amount of Premium Proportion									
A	4.0%	16.9%	14.9%	1.4%	32.0%	0.5%	29.8%	0	0.5%
B	31.0	2.0	29.5	8.7	24.0	0.4	4.4	0	0
C	15.0	0	12.0	0	36.0	0	27.0	4.0%	6.0
D	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
E	6.5	1.7	6.5	4.6	37.0	5.8	27.9	1.8	8.2
F	4.3	1.3	6.4	5.2	30.4	6.0	34.4	1.6	10.4
G	8.5	0.8	12.5	6.9	34.5	17.0	19.1	0	0.7
H	0	1.4	10.1	7.1	46.7	14.5	14.5	2.0	3.7
I	2.1	1.3	7.1	5.4	18.8	8.0	19.9	7.8	29.6
J	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
L	9.7	1.0	7.9	7.5	27.0	6.0	32.1	1.0	7.8
M	1.0	0	18.0	1.0	30.0	6.0	19.0	0	25.0
N	0	0	50.0	0	50.0	0	0	0	0
O	4.0	3.0	1.0	0	2.0	9.0	47.0	22.0	12.0
	0	1-10	11-20	21 or more					
K	4.6%	6.0%	37.5%	51.9%					

4. *What portion of all issues is on substandard lives?*

Company	Number of Lives				Amount of Premium				This Information Is for the Period
	Including Annuities Certain and Lump Sums		Excluding Annuities Certain and Lump Sums		Including Annuities Certain and Lump Sums		Excluding Annuities Certain and Lump Sums		
	Standard Lives	Sub- standard Lives	Standard Lives	Sub- standard Lives	Standard Lives	Sub- standard Lives	Standard Lives	Sub- standard Lives	
A	70.7%	29.3%	41.2%	58.8%	58.9%	41.1%	15.5%	84.5%	Feb. '82 to present
B	75.0	25.0	N.R.	N.R.	56.0	44.0	N.R.	N.R.	Jan. '86 to 3/31/87
C	100.0	0	100.0	0	100.0	0	100.0	0	Not given
D	87.0	13.0	70.0	30.0	55.0	45.0	44.0	56.0	1984-1986
E	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
F	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
G	85.1	14.9	70.8	29.2	60.8	39.2	49.2	50.8	1981-1986
H	100.0	0	100.0	0	100.0	0	100.0	0	Not given
I	90.0	10.0	N.R.	N.R.	82.0	18.0	N.R.	N.R.	Aug. '85 to 12/31/86
J	98.0	2.0	99.0	1.0	96.0	4.0	96.0	4.0	Jan. '86 to 12/31/86
K	91.5	8.5	N.R.	N.R.	80.6	19.4	N.R.	N.R.	Jan. '86 to 12/31/86
L	96.6	3.4	91.2	8.8	95.3	4.7	93.0	7.0	Nov. '82 to 4/30/87
M	76.0	24.0	54.0	46.0	62.0	38.0	46.0	54.0	Jan. '86 to 12/31/86
N	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.
O	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.	N.R.

N.R. = No response to the question.

5. *What portion of substandard quotes you made during that period were actually sold?*

Company	If Annuities Certain and Lump Sums Were Included with Standard Lives	If Annuities Certain and Lump Sums Were Excluded from Standard Lives
A	3.0%	N.R.
B	3.0%	N.R.
C	Not applicable	Not applicable
D	N.R.	N.R.
E	N.R.	N.R.
F	N.R.	N.R.
G	N.R.	3.3%
H	Not applicable	Not applicable
I	N.R.	4.0
J	15.0	15.0
K	1.5	N.R.
L	4.0	6.0
M	3.0	N.R.
N	N.R.	N.R.
O	N.R.	N.R.

N.R. = No response to the question.

6. *What is the true age distribution of Structured Settlement Annuities you issued during this period (i.e., either use true age for age-rated lives or leave them out)?*

Company	Age										Unknown
	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	
Number of Lives Proportion Based on Annuities with Life Contingencies Only											
A	10.7%	14.3%	28.6%	7.1%	14.3%	10.7%	7.1%	3.6%	3.6%	0%	
B	N.R.	N.R.									
C	8.0	19.0	18.0	22.0	11.0	15.0	6.0	1.0	0	0	
D	N.R.	N.R.									
E	N.R.	N.R.									
F	N.R.	N.R.									
G	13.4	12.2	18.6	16.5	13.6	12.7	9.1	2.1	1.3	0.5	
H	5.5	7.3	14.5	10.9	18.2	9.1	23.6	7.3	3.6	0	
I	3.3	0	3.3	0	23.3	16.8	33.3	20.0	0	0	
J	5.6	11.3	22.5	15.5	16.9	11.3	14.1	1.4	1.4	0	
L	12.9	16.3	20.4	17.0	15.0	13.6	4.8	0	0	0	
M	22.0	15.0	22.0	12.0	20.0	8.0	1.0	0	0	0	
N	N.R.	N.R.									
O	7.0	21.5	36.0	7.0	21.5	7.0	0	0	0	0	
K	0-20		21-35		36-50		51-65		66 or older		
	58.7%		20.1%		13.2%		6.7%		1.3%		
Number of Lives Proportion Based on All Structured Settlement Annuities Including Annuity Certain and Lump Sum Only Annuities											
A	31.3%	21.8%	18.7%	4.7%	9.4%	7.8%	3.1%	1.6%	1.6%	0%	0%
B	N.R.	N.R.	N.R.								
C	7.0	20.0	15.0	21.0	8.0	18.0	7.0	4.0	0	0	0
D	N.R.	N.R.	N.R.								
E	30.2	22.5	16.3	12.5	8.9	6.3	2.2	0.5	0.5	0.1	0
F	25.3	23.5	14.1	15.3	11.4	6.9	2.6	0.4	0.4	0.1	0
G	19.5	20.4	14.5	13.2	10.7	8.9	5.4	1.3	0.6	0.2	5.3
H	15.6	15.9	15.3	15.3	15.5	11.4	6.6	3.9	0.5	0	0
I	15.0	22.6	10.7	14.2	12.0	7.5	5.8	11.4	0.8	0	0
J	8.2	28.0	16.8	20.0	12.3	7.5	6.6	0.4	0.2	0	0
L	19.1	23.6	15.1	13.8	12.7	9.6	4.8	0.8	0.5	0	0
M	25.0	23.0	25.0	9.0	12.0	5.0	1.0	0	0	0	0
N	N.R.	N.R.	N.R.								
O	19.4	12.0	19.4	18.1	18.1	12.0	1.0	0	0	0	0
K	0-20		21-35		36-50		51-65		66 or older		
	67.2%		15.8%		10.4%		5.5%		1.1%		

N.R. = No response to the question.

6. — *Continued*

Company	Age										Unknown
	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99	
Amount of Premium Proportion Based on Annuities with Life Contingencies Only											
A	12.9%	9.2%	40.6%	11.4%	13.6%	8.8%	2.7%	0.2%	0.6%	0%	
B	N.R.	N.R.									
C	8.0	19.0	18.0	22.0	11.0	16.0	5.0	1.0	0	0	
D	N.R.	N.R.									
E	22.9	12.2	23.2	18.9	11.9	7.2	2.9	0.6	0.2	0	
F	14.2	17.4	22.0	22.8	14.6	6.5	1.9	0.5	0.1	0	
G	21.9	15.7	22.4	15.8	11.3	8.1	3.5	0.5	0.4	0.4	
H	4.3	4.8	21.5	9.0	20.4	9.8	22.7	4.5	3.0	0	
I	3.4	0	19.1	0	38.1	17.6	13.0	8.8	0	0	
J	N.R.	N.R.									
L	13.9	16.0	22.8	15.4	16.6	9.5	5.8	0	0	0	
M	22.0	12.0	24.0	15.0	21.0	5.0	1.0	0	0	0	
N	N.R.	N.R.									
O	3.0	15.0	15.0	38.0	23.0	6.0	0	0	0	0	
K	0-20		21-35		36-50		51-65		66 or older		
	32.7%		34.2%		21.9%		10.0%		1.2%		
Amount of Premium Proportion Based on All Structured Settlement Annuities Including Annuity Certain and Lump Sum Only Annuities											
A	18.0%	11.0%	28.0%	8.3%	9.8%	22.6%	1.8%	0.1%	0.4%	0%	0%
B	N.R.	N.R.	N.R.								
C	7.0	20.0	15.0	21.0	8.0	18.0	7.0	4.0	0	0	0
D	N.R.	N.R.	N.R.								
E	25.8	15.4	20.5	16.7	10.9	6.9	2.9	0.5	0.4	0	0
F	16.6	18.2	18.8	20.6	14.4	7.8	2.6	0.7	0.2	0.1	0
G	20.1	15.7	20.3	15.2	10.7	9.2	3.7	0.9	0.3	0.1	3.8
H	11.2	12.5	18.8	17.1	15.8	11.1	4.5	8.5	0.5	0	0
I	10.8	13.2	15.6	19.8	19.4	7.3	5.1	7.4	1.4	0	0
J	N.R.	N.R.	N.R.								
L	13.9	17.2	17.7	17.5	15.1	8.2	6.9	3.4	0.1	0	0
M	18.0	11.0	29.0	13.0	24.0	4.0	1.0	0	0	0	0
N	N.R.	N.R.	N.R.								
O	6.0	9.0	22.0	24.0	27.0	9.0	3.0	0	0	0	0
K	0-20		21-35		36-50		51-65		66 or older		
	46.4%		26.7%		18.1%		7.8%		1.0%		

N.R. = No response to the question.

## 7. What underlying mortality table is used in pricing standard annuities?

Company	1979-81 U.S. Pop.	1983 Table $\alpha$	1971 GAM	1983 GAM	1971 IAM	1980 U.S. Pop.	Other	Modified	Comment	Information for the Year
A	X	X						X	Blended	1987
B	X							X		1987
C	X									1986-87
D	X							X	With mortality improvement	1987
E			X	X					Blended	1987
F			X	X					Blended	1987
G					X				Set forward $n$ years	1981-86
H	N.R.									N.R.
I					X	X				1985-87
J										1986
K	N.R.									N.R.
L		X						X		1986
M	X									1987
N	X				X				Blended Company 1981 Annuity with mortality improvement, 10-year S & U	1982-86
O										

N.R. = No response to the question.

## 8. How are your substandard annuities currently priced?

Company	Rated Age Using Life Expectancies	True Age Using Multiple Annuity Tables	Rated Age Using Multiple Annuity Tables	Rated Age Using Additional Deaths Added at Each Age
A	X			
B	X			
C	Not applicable			
D	X			
E	X			
F	X			
G	X			
H	Not applicable			
I	X			
J		X		
K	N.R.			
L	X			
M			X	
N	X		X	X
O	X			

N.R. = No response to the question.

9. *Is a different table used to price substandard annuities (other than by the multiple table or additional death method)?*

All companies writing substandard responded that the same table is used to price substandard annuities.

10. *How do you value substandard annuities?*

Company	Standard Reserve		Multiple Mortality Annuity Table at True Age	Mortality Graded over a Given Period from Pricing Mortality to Standard Mortality
	at True Age	at Pricing Age		
A	X			X - years vary
B		X		
C	Not applicable			
D			X	
E		X		
F		X		
G		X		
H	Not applicable			
I		X		
J				
K		X		
L			X	
M	X			
N		X		
O	X			

11. *How are lump sums and certain annuities valued?*

Answers combined with those from question 12; see below.

12. *How are annuities with increasing benefit payments valued?*

Company	Value Lump Sums and Certain Annuities		Value Increasing Benefit Annuities Same as Life Benefit Plans
	Same As Life Annuities	As Separate Contracts	
A	X		X
B	X		X
C	X		X
D	X		X
E	X		X
F	X		X
G	X		X
H	X		X
I	X		X
J		X	X
K		X	X
L	X		Interest rate varies with COLA %
M	X		X
N	X		X
O		X	X

N.R. = No response to the question.

13. *Will you be in a position to contribute data to a mortality study of structured settlement annuities?*

Company	Never	Yes	in <i>X</i> Years	<i>X</i> Equals	Other
A			X	?	
B			X	2	
C	X				
D			X	2	
E			X	3	
F			X	3	
G		X			
H		X			
I			X	8	
J			X	?	
K			X	3-5	
L		X			
M		X			
N			X	1-3	
O					X, i.e., if cost-justified

14. List the 10 most prevalent types of substandard cases for which you are asked to provide quotes and show the proportion each type bears to all the types you receive for quotes (e.g., brain damage, burns, etc.).

This information is for the period \_\_\_\_\_

Company	Birth Trauma	Brain Injury-Closed Head-Encephalopathy	Burns	Cancer-Sarcoma	Cerebral Palsy	Comatose	Diabetes	Drug Overdose	Heart-Cardiac
A		30.0%	10.0%						
B	20.0%								
C	Not applicable								
D	N.R.								
E		14.0	1.0						
F		15.0	5.0						
G	17.0	23.0	5.0						4.0%
H	Not applicable								
I		20.0	4.0	2.0%	11.0%		2.0%		
J		33.0		3.0				3.0%	3.0
K		70.0							
L	10.8	18.5	1.0						3.1
M		7.0	5.0		6.0	4.0%			8.0
N		50.0			5.0				
O		28.5							

Company	Mental Retardation	Miscellaneous	Neurological	Psychiatric	Pulmonary	Renal Failure	Seizures	Spinal Cord-Quadriplegia-Paraplegia-Back
A	15.0%	5.0%						40.0%
B		80.0						
C	Not applicable							
D								
E	17.0	41.0						25.0
F	10.0	50.0						15.0
G		16.0		6.0%	2.0%			27.0
H	Not applicable							
I		28.0		3.0	2.0			17.0
J		1.0				7.0%		43.0
K		10.0						20.0
L		18.4	31.3%					16.9
M	19.0	10.0					5.0%	36.0
N		30.0						15.0
O		5.0						28.5

## 14. — Continued

Company	Stroke	Systemic	Vascular	Vegetative State
A	Not applicable			2.0%
B				
C				
D				
E				
F	Not applicable	3.0%	8.0%	5.0
G				
H				
I				
J				
K			38.0	
L				
M				
N				
O				

N.R. = No response to the question.

15. *What criteria do you evaluate in underwriting the prevalent types of substandard cases you mentioned in question 14?*

Three companies submitted a response to this question — in a form too limited in nature to be of value here. See Section V for a discussion of the underwriting criteria applicable to the most prevalent injury types.

16. *To the extent you are able to share this information, please furnish statistical sources used in evaluating the prevalent types of substandard cases you mentioned in question 14 (and a copy of the paper, if possible).*

As an example, for Spinal Cord Injury one could mention *Spinal Cord Injury Statistics* by J.S. Young, P.E. Burns, A.M. Bowen and R. McCutchen, Good Samaritan Medical Center, Phoenix, Arizona, August 1982.

Company B:

*Guides to the Evaluation of Permanent Impairment*, American Medical Association, 1977

*Cerebral Palsy*. . . , Robert Grever, et al., *Neurology* 1985; 35: 900-903

*Mortality of Workers Certified by Pneumoconiosis Panels as Having Asbestosis*, G. Berry Bart, *J. Ind Med* 1981; 38: 130-137

Company I:

Statistical sources are not used.

Company L:

No specific studies or sources are used at this time. The review is usually conducted by an underwriter who will depend upon General Underwriting manuals and work experience in order to arrive at an evaluation. The company Medical Director is consulted when deemed appropriate.

17. *Are there any specific aspects of the underwriting, pricing and valuation of structured settlement annuities that you would like to see included in the paper? If yes, please elaborate.*

Company B:

1. Any known software available for asset/liability matching use.
2. Anyone using purchased software for administration processing.
3. How are profits recognized in the valuation process?
4. Investment yield assumptions used in the pricing formula.
5. Any differences in mortality and interest rate assumptions between pricing and valuation.
6. Total Structured Premiums in 1986; percent increase over 1985.
7. Maximum additions to age for substandard, if any.

Company C:

1. What do other companies use for age rate-ups on substandard lives? Who performs this function?
2. How is an annuity contract with a series of lump sum amounts valued?
3. How is a life annuity with first payment deferred more than one year valued?

Company H:

1. Investment assumptions.
2. Mortality assumptions.

Company L:

1. General overview of underwriting criteria for substandard evaluation.
2. Pricing for lump sums when they represent the major portion of the cost.
3. Pricing differentials for Deferred-Immediates:

From a valuation viewpoint

From an investment viewpoint.

Company N:

1. How should structured settlements be valued?
  - each benefit segment separately
  - by contract
  - by case
  - by issue year (i.e., group).
2. Should certain annuities be valued on a different basis than benefits involving life contingencies (see section 807c of the Stark-Moore Tax Act)?

## DISCUSSION OF PRECEDING PAPER

VICTOR MODUGNO:

Mr. Teitelbaum is to be congratulated on this outstanding addition to actuarial literature. Although his paper is concerned with the effect of mortality on individual annuities, in most cases variations in investment earnings are more important than mortality experience. The annuity cash flows are fixed and generally of longer duration than the investment cash flow, which may be shortened even more as interest rates decrease. Thus there is a reinvestment risk for the net cash flow under these annuities.

To illustrate the relative sensitivity of investment earnings versus mortality variation, the following table compares a 1 percent decrease in future investment earnings to a 1 percent per year improvement in mortality for each year in the future at all ages using the 1983 GAM at 10 percent.

Age	1%/Year Mortality Improvement	1% Decrease in Investment Earnings
40	+0.8%	+9.2%
65	+2.0	+6.4
80	+2.5	+3.3

Those insurers who wrote immediate annuity business in the 1960s and 1970s made money regardless of how inadequate their mortality assumptions turned out to be, while those who wrote this business in the 1980s are likely to lose money no matter how conservative their mortality assumptions are. This is due to a secular upward trend in interest rates during the postwar period that peaked in the early 1980s. The long bond (the 30-year Treasury) yield rose from less than 3 percent in the early 1950s to more than 14 percent in the early 1980s. Since then, rates have come down significantly, and some economists are predicting that the rate on the long bond will average 6 percent or less during the 1990s.

Thus the unanticipated improvement in mortality in the 1970s and 1980s was more than offset by the unanticipated increase in interest rates. To illustrate this, I did an asset liability projection using a 1966 issue (1965 Company Mortality at 4.75 percent for 15 years, 3.5 percent) and a 1986 issue (1981 Company Table at 11.45 percent for 14 years, 9.2 percent thereafter) from Table B in Appendix I. Male age 55 life annuity was used for the liability with a 20-year bond yielding 2.5 percent over the pricing rate

(callable at par in five years if interest rates fall) as the asset. The rate for reinvestment in the 1990s was assumed to be 8 percent. The actual mortality experience was assumed to be the 1983 GAM, which would make the 1965 table inadequate and the 1981 table conservative. The 1986 issue had a loss equal to 1 percent of premium, while the 1966 issue had a profit equal to 16 percent of premium on a present value basis. This is due to the reinvestment at maturity of the bond for the 1966 issue at a higher rate and the early call and reinvestment of the bond at a lower rate for the 1986 issue.

Indeed, some regulators have become uncomfortable with the high interest rates underlying immediate annuity reserves under the dynamic valuation law for issues in the early to mid-1980s and are demanding asset/liability studies to demonstrate solvency of this block of business. I was surprised to see that the mortality assumption for valuation could be determined using the age rating used in pricing. Reserve strain could be avoided by using an age rating system off the 1983 IAM in pricing and setting up reserves for this block of business.

Except for extremely old age immediate annuity or substandard structured settlement annuity, it is the investment performance and not the underwriting experience that is the prime determinant of the profitability of annuity business.

(AUTHOR'S REVIEW OF DISCUSSION)

NAFTALI TEITELBAUM:

Victor Modugno, in his response, illustrates another principle already familiar to actuaries, which complements the sage advice with which I commenced this paper, "In order to know where you are going, examine from whence you come." He shows that the actuary must be aware of and state all salient assumptions in his or her product.

When I began work on the paper, it was in an environment in which interest rates were high and fluctuating, thereby causing frequent publication of new annuity gross premium scales—with seemingly no necessity to modify mortality assumptions. Therefore, this paper focused solely on the effects of mortality, albeit its relatively smaller effect on pricing when compared to the effects of interest rate variations. Mr. Modugno's comments are a welcome balance to the paper because he describes the effects of the prime determinant of annuity profitability. For this I am grateful to him. Starting from this point, however, my paper exhorts actuaries not to forget the effects of mortality in the pricing of annuities.

Mr. Modugno mentions his surprise at the reference I made to using the pricing age-rating of an annuity when valuing that annuity. That method has now been curtailed by New York State, which requires that substandard annuity reserves now grade to standard reserves by the end of the twentieth year, for 1987 and 1988 issues by year-end 1988 and for all other issue years by year-end 1990.

This could have the effect in New York State, depending upon issue age and the pricing age-rating, of increasing yearly costs by 3-4 percent of the single premium to provide for the needed increase in reserves. Such cost will exceed the cost of a 1 percent drop in interest yield. New issues should, of course, be priced to reflect this added cost of doing business.

The NAIC has not proposed such a requirement, but is instead expected to adopt a method that would produce lower substandard issue reserves than those required by New York State. Under the expected NAIC method, substandard annuity reserves for each duration would be calculated at true issue age assuming constant extra deaths added to standard valuation mortality rates. The present value of benefits at issue on that basis would be the same as that assuming pricing rated age at issue and only standard valuation mortality.

Clearly, mortality is not dead!

