II. MORTALITY UNDER STRUCTURED
SETTLEMENT ANNUITIES

BACKGROUND

This is the first study of mortality specifically related to structured settlement annuities. The study was originally contemplated by the National Structured Settlement Trade Association, but has been assumed by the Society of Actuaries. Data were initially solicited in 1990 for experience through calendar year 1989.

Because the settlement annuity market is still relatively new and there is no significant experience existing within any single company, all contributors' data are very important. For example, some companies contributed less than five deaths. Only by combining the data of many companies were we able to construct a database from which we could derive statistically reliable information.

The study compared, separately for standard and substandard lives, actual-to-expected mortality based on both a valuation table (1983 Individual Annuity Mortality Table) and a population table (1979–81 U.S. Population), for both males and females, by issue age and attained age, by calendar year of issue, and by duration since issue. In addition, for substandard business, a comparison of actual-to-expected mortality was made on the new "constant extra death (CED) method" required for valuation by NAIC Actuarial Guideline IX-A.

PURPOSES OF THE STUDY

The primary purposes of the study were to:
1. Determine the adequacy of the 1983 IAM table for statutory valuation purposes for structured settlement annuities, both standard and substandard
2. Compare individual company and industry actual-to-expected experience on a rated-age basis with that of NAIC Guideline IX-A, the "constant extra death method" (CED)
3. Help pricing actuaries provide for appropriate mortality levels for both standard and substandard business.

117

ANALYSIS

The study was done on a calendar year basis. Because the contracts are essentially not surrenderable, policy exposures and expected claims from the contract issue date to the end of 1989 can be obtained from the most recent valuation file, provided date of death has been recorded on death claims and is readily available.

Every attempt has been made to exclude certain-only business because there would likely be an underreporting of deaths on such business and there is no real reason to study mortality on such contracts when mortality is not an element in the contract. "Regular retirement annuities" also were excluded because such annuities might be expected to exhibit considerably more antiselection.

Information for the study was obtained on 74,577 contracts from 32 companies. The largest respondent provided approximately 10 percent of the contracts in-force. Another 7 companies each provided more than 5 percent of the contracts in-force. The contributing companies are listed in the appendix.

This initial study combined data from all calendar years through 1989. A significant number of deaths was developed: 816 standard deaths and 575 substandard deaths. The average actual issue ages of the standard and substandard business were 34.9 and 30.0, respectively. The average rated age on substandard was 50.0, and the average rate-up was therefore 20.0 years.

Individual company ratios were examined to determine individual company variations. All ratios that were either less than 50 percent or greater than 200 percent were the result of small exposures and deaths.

Structured settlements do not necessarily have annuity payments in all years. In addition, payments may vary substantially from year to year. Annual income therefore cannot be the measure of exposure. It was desired to base exposure on the life contingent reserve at a recent in-force date (in 1990).

Unfortunately, many of the survey responses did not have this number available and used other proxies such as total gross premium, total reserve at issue or current total statutory reserve. Consequently, the same basis for amount could not be derived for all respondents. Some settlement annuity contracts have a relatively long "certain period," which means that, for any single contract, the portion of the total premium that is life contingent could range from almost nothing to the entire premium or reserve.

The committee therefore decided to conduct the study only on a count basis. As a result, a deficiency of the study is that it does not show any results by relative exposure, that is, no results that are affected by relative size of individual contract exposures. The committee believed that nothing could be done that would reflect the broad industry results on an "amount" basis.

<div align="center">RESULTS</div>

Standard Lives

Table 1 shows the actual-to-expected results by calendar year of study for standard lives. For most study years after 1985, the ratios are significantly greater than 100 percent based on the 1983 table. Note that the overall mortality rate for males, 136 percent, is very close to the female ratio of 138 percent.

Table 2 shows actual-to-expected ratios by attained age. Table 3 shows mortality ratios by issue age. Both tables show mortality ratios in the vicinity of (or below) 100 percent at ages over 65, whereas ratios for younger ages appear to be well above 100 percent. Standard mortality ratios appear to decline with increasing age.

Table 4 shows the results by calendar year of issue. No trends are apparent since the 1989 year of issue had only 9 actual and 12 expected deaths, and the results may be affected by the fact that this is the first contract year of the study in which "paid-for dated-backs" may be causing a problem. Paid-for dated-backs are policies placed in-force some time after the effective date, but are retroactively in-force from the effective date. The annuitant, in effect, has no chance to die during such period because if the annuitant had died, the contract is likely not to be put in-force.

Table 5 shows results by duration since issue. Other than the first duration, no trends are apparent. Again, the low first-duration mortality ratio may be the result of paid-for dated-backs.

In general, Tables 1 to 5 show that in the aggregate, the 1983 IAM Table is sufficient for statutory valuation. For attained ages less than 40, the 1983 table is extremely sufficient, with *margins* in excess of 100 percent, while for attained ages in excess of 65, it may be deficient, when continuing improvement in mortality is considered.

Table 6 is the only table showing mortality ratios for standard lives based upon the 1979–81 Population Table. Population mortality produces ratios that are significantly below 100 percent at most attained ages. The committee

believes that this table shows that as a pricing standard, this table is inappropriate. Some believe that these contracts should exhibit population mortality because they are issued to plaintiffs for their own injury or injury to others. Actually, there seems to be some self-selection by the people accepting these awards, or it may be that the additional income from the awarded benefits leads to mortality that is better than population mortality.

TABLE 1

MORTALITY EXPERIENCE FOR STANDARD LIVES BY CALENDAR YEAR OF STUDY
BASED ON 1983 IAM TABLE

Calendar Year of Study	Male			Female			Total		
	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio
1966–1982	6	7.0	85%	4	4.6	87%	10	11.6	86%
1983	7	10.4	67	13	7.0	187	20	17.4	115
1984	17	20.2	84	12	12.3	97	29	32.6	89
1985	36	36.3	99	37	21.7	171	73	58.0	126
1986	79	52.7	150	42	29.4	143	121	82.1	147
1987	96	65.7	146	39	37.0	105	135	102.7	131
1988	123	83.0	148	62	47.7	130	185	130.6	142
1989	151	102.9	147	92	59.2	155	243	162.1	150
All Study Years	515	378.2	136%	301	218.9	138%	816	597.1	137%

TABLE 2

MORTALITY EXPERIENCE FOR STANDARD LIVES BY ATTAINED AGE
BASED ON 1983 IAM TABLE

Attained Age	Male			Female			Total		
	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio
0–5	3	0.2	1,782%	5	0.1	6,313%	8	0.2	3,232%
6–10	1	2.1	48	8	0.7	1,154	9	2.8	325
11–15	6	2.5	240	2	0.7	282	8	3.2	249
16–20	8	3.3	244	3	1.1	270	11	4.4	251
21–25	17	5.4	314	8	2.1	385	25	7.5	334
26–30	19	7.3	260	9	3.2	280	28	10.5	266
31–35	32	8.4	383	11	4.0	272	43	12.4	347
36–40	33	10.7	309	12	5.1	237	45	15.7	286
41–45	25	16.3	153	11	6.4	172	36	22.7	158
46–50	35	26.2	134	13	8.5	154	48	34.6	139
51–55	50	35.2	142	14	12.2	115	64	47.4	135
56–60	65	49.9	130	24	17.5	137	89	67.4	132
61–65	77	59.3	130	38	23.3	163	115	82.5	139
66–75	77	84.9	91	52	44.0	118	129	128.8	100
76–85	48	44.2	109	50	46.4	108	98	90.6	108
86+	19	22.7	84	41	43.6	94	60	66.3	91
All Ages	515	378.2	136%	301	218.9	138%	816	597.1	137%

TABLE 3

MORTALITY EXPERIENCE FOR STANDARD LIVES BY ISSUE AGE
BASED ON 1983 IAM TABLE

True Issue Age	Male			Female			Total		
	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio
0–5	3	1.0	308%	10	0.4	2,514%	13	1.4	949%
6–10	6	2.5	238	5	0.7	673	11	3.3	337
11–15	5	2.6	194	1	0.8	131	6	3.3	179
16–20	8	4.4	180	5	1.6	314	13	6.0	215
21–25	20	6.7	300	9	2.7	332	29	9.4	309
26–30	34	7.8	436	11	3.7	297	45	11.5	391
31–35	29	9.1	318	10	4.5	220	39	13.6	286
36–40	28	13.1	213	12	5.7	209	40	18.9	212
41–45	30	20.9	143	15	7.3	205	45	28.3	159
46–50	40	30.4	132	14	10.6	132	54	41.0	132
51–55	59	43.4	136	20	14.4	139	79	57.8	137
56–60	80	58.0	138	28	21.2	132	108	79.2	136
61–65	54	58.5	92	38	25.6	148	92	84.2	109
66–75	66	68.4	96	48	42.3	113	114	110.7	103
76–85	38	36.1	105	49	49.7	99	87	85.8	101
86+	15	15.3	98	26	27.5	95	41	42.7	96
All Ages	515	378.2	136%	301	218.9	138%	816	597.1	137%

TABLE 4

MORTALITY EXPERIENCE FOR STANDARD LIVES BY ISSUE YEAR
BASED ON 1983 IAM TABLE

Issue Year	Male			Female			Total		
	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio
1966–1982	97	73.4	132%	71	45.7	155%	168	119.1	141%
1983	65	43.7	149	34	27.0	126	99	70.7	140
1984	96	81.3	118	65'	47.9	136	161	129.2	125
1985	112	81.6	137	61	43.0	142	173	124.6	139
1986	65	41.8	156	27	20.5	131	92	62.3	148
1987	44	25.8	170	26	16.9	154	70	42.7	164
1988	30	23.2	129	14	13.3	106	44	36.5	121
1989	6	7.5	80	3	4.5	66	9	12.0	75
All Study Years	515	378.2	136%	301	218.9	138%	816	597.1	137%

121

TABLE 5

MORTALITY EXPERIENCE FOR STANDARD LIVES BY DURATION OF CONTRACT
BASED ON 1983 IAM TABLE

Duration of Contract	Male			Female			Total		
	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio
0–1	38˜	45.5	84%	27	26.4	102%	65	71.9	90%
1–2	111	80.3	138	58	46.2	126	169	126.5	134
2–3	90	68.9	131	50	39.4	127	140	108.3	129
3–4	92	62.4	147	49	35.0	140	141	97.4	145
4–5	73	52.2	140	50	30.3	165	123	82.5	149
5–6	57	33.8	169	39	20.6	190	96	54.3	177
6–7	30	18.1	166	18	10.9	165	48	29.1	165
7–8	15	10.9	137	7	6.6	106	22	17.5	125
8–9	6	4.1	148	1	2.3	43	7	6.4	110
9–10	2	1.8	113	2	0.9	227	4	2.7	150
10+	1	0.2	413	0	0.3	0	1	0.6	178
All Years	515	378.2	136%	301	218.9	138%	816	597.1	137%

TABLE 6

MORTALITY EXPERIENCE FOR STANDARD LIVES BY ATTAINED AGE
BASED ON 1979–81 POPULATION TABLE

Attained Age	Male			Female			Total		
	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio
0–5	3	1.1	283%	5	0.7	684%	8	1.8	446%
6–10	1	1.9	54	8	1.1	728	9	3.0	304
11–15	6	2.8	212	2	1.1	182	8	3.9	204
16–20	8	10.2	79	3	2.6	115	11	12.8	86
21–25	17	19.2	89	8	4.2	189	25	23.4	107
26–30	19	20.4	93	9	5.6	161	28	26.0	108
31–35	32	19.9	161	11	7.2	153	43	27.1	159
36–40	33	24.9	133	12	10.6	114	45	35.4	127
41–45	25	34.6	72	11	14.7	75	36	49.3	73
46–50	35	50.2	70	13	19.6	66	48	69.8	69
51–55	50	68.4	73	14	27.0	52	64	95.4	67
56–60	65	105.4	62	24	37.5	64	89	142.9	62
61–65	77	132.5	58	38	47.7	80	115	180.2	64
66–75	77	168.9	46	52	80.7	64	129	249.6	52
76–85	48	71.0	68	50	71.2	70	98	142.2	69
86+	19	30.3	63	41	57.3	72	60	87.6	69
All Ages	515	761.7	68%	301	388.6	77%	816	1,150.3	71%

122

Substandard Lives

Two types of substandard rated data were provided: percentage of extra mortality and rated age. The data submitted as percentage of extra mortality covered a very small group of contracts and did not provide adequate exposure to give reasonable mortality results. In addition, any attempt to convert percentage of extra mortality to rated age did not seem fruitful. Consequently, only rated-age experience was studied for substandard lives.

The vast majority of submitted substandard data was on the rated-age basis; that is, a life is actually, say, age 30, but the contract is issued as rated age 50. The contract owner therefore is charged the same premium as a standard life age 50; the contract is "rated" age 50.

Table 7 shows the mortality ratios by calendar year of study for rated-age mortality. No conclusions are apparent by year of study.

TABLE 7

RATED-AGE EXPERIENCE FOR SUBSTANDARD LIVES BY CALENDAR YEAR OF STUDY
BASED ON 1983 IAM TABLE

Calendar Year of Study	Male			Female			Total		
	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio
1966–1982	13	10.5	124%	5	3.9	130%	18	14.4	125%
1983	15	10.9	137	8	4.7	170	23	15.7	147
1984	14	17.3	81	9	7.5	120	23	24.7	93
1985	32	26.4	121	12	11.1	108	44	37.4	118
1986	52	36.7	142	20	16.0	125	72	52.7	137
1987	71	50.0	142	48	23.2	207	119	73.2	163
1988	76	68.1	112	44	32.4	136	120	100.5	119
1989	96	90.1	107	60	42.3	142	156	132.4	118
All Study Years	369	310.0	119%	206	141.1	146%	575	451.0	127%

Table 8 compares mortality on four bases: true-issue-age mortality, rated-age mortality, 75% of rate-up, and true age plus CED. True-issue-age and rated-age mortality are self-explanatory.

The term "75 percent of rate-up" means that if the actual age at issue is 30 and the rated issue age is 50, both of which are about the industry averages, then the rate-up is 20 years. The 75 percent of the rate-up method studied mortality for each individual contract "as if" the rate-up had only been 75 percent of the actual rate-up (15 years of rate-up from true age 30 to rated age 45) instead of the actual rate up of 20 years to age 50 in the example case.

Not knowing in advance how the industry mortality study was going to turn out, and given that there had been concern that industry underwriting of substandard settlement annuity contracts had been overly aggressive, we also studied mortality on the 75 percent of rate-up basis to give an intermediate point between true issue age and rated issue age. Thus, if morality ratios turned out to be lower than expected, actuaries would be able to estimate how much less aggressive underwriting would have to have been to be satisfactory. This concept may be important for individual companies. Each individual company has been furnished its own results as well as those of the industry.

The fourth method studied in Table 8 is "true age plus CED," which is the mortality basis required by NAIC Actuarial Guideline IX-A.

The regulators recognized that to use rated-age reserves would lead to zero reserves at and after the duration equal to 115 (or terminal age of the valuation mortality table) less the rated issue age. For example, there would be minimal reserves in the last durations. Consequently, the regulators, in consultation with the industry, approved the CED reserve method of Guideline IX-A.

Guideline IX-A requires the use of an adjusted mortality table, in which a constant is added to the mortality rates of true attained age such that the life expectancy at issue on the adjusted table is greater than or equal to the average of the expectations of life developed during the underwriting and pricing process. This method has the effect of grading reserves into standard reserves at the end of the valuation mortality table, actual age 115.

Rated-age reserves are usually higher than Guideline IX-A CED reserves at issue. However, because the CED methodology produces a fairly rapidly reducing mortality assumption, CED reserves fairly quickly become significantly larger than rated-age reserves.

The industry is moving from rated-age reserves (generally) to IX-A CED reserves, in accordance with Guideline IX-A's timetable for phasing in: December 31, 1993 for all in-force business. Since Table 8 indicates that

TABLE 8

RATED-AGE EXPERIENCE FOR SUBSTANDARD LIVES BY TRUE AGE, RATED AGE, 75% OF RATE-UP, AND TRUE AGE + CED
BASED ON 1983 IAM TABLE

Rated Issue Age	True Age			75% of Rate-up			Rated Age			True Age + CED		
	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio
Male												
0–10	0	0.0	0%	0	0.0	0%	0	0.1	0%	0	3.2	0%
11–20	3	0.4	689	3	0.5	552	3	0.6	500	3	4.8	63
21–30	13	1.3	987	13	1.7	769	13	2.0	662	13	24.8	52
31–40	18	3.3	539	18	4.6	389	18	6.3	286	18	58.3	31
41–50	48	6.0	803	48	11.6	415	48	20.3	236	48	114.6	42
51–60	60	10.7	561	60	24.2	248	60	39.6	152	60	160.9	37
61–70	89	15.0	595	89	35.1	253	89	65.9	135	89	198.2	45
71–80	84	14.6	575	84	45.0	187	84	93.7	90	84	203.8	41
81+	54	11.8	458	54	40.3	134	54	81.6	66	54	128.7	42
All Ages	369	63.2	584%	369	163.2	226%	369	310.0	119%	369	897.3	41%
Female												
0–10	0	0.0	0%	0	0.0	0%	0	0.0	0%	0	0.1	0%
11–20	1	0.1	1,157	1	0.1	887	1	0.1	726	1	1.9	52
21–30	5	0.4	1,411	5	0.5	982	5	0.6	806	5	16.6	30
31–40	3	0.7	451	3	1.1	284	3	1.4	212	3	20.3	15
41–50	18	1.2	1,453	18	2.4	751	18	4.1	442	18	42.5	42
51–60	23	2.1	1,073	23	4.7	491	23	8.6	266	23	63.1	36
61–70	43	4.0	1,069	43	9.8	439	43	20.5	210	43	92.0	47
71–80	61	5.8	1,048	61	16.9	362	61	41.5	147	61	119.2	51
81+	52	12.4	420	52	30.8	169	52	64.2	81	52	111.1	47
All Ages	206	26.7	771%	206	66.2	311%	206	141.1	146%	206	466.9	44%

TABLE 8—*Continued*

Rated Issue Age	True Age			75% of Rate-up			Rated Age			True Age + CED		
	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio
Total												
0–10	0	0.1	0%	0	0.1	0%	0	0.1	0%	0	3.3	0%
11–20	4	0.5	766	4	0.7	610	4	0.7	543	4	6.7	60
21–30	18	1.7	1,077	18	2.2	819	18	2.6	696	18	41.4	43
31–40	21	4.0	525	21	5.7	369	21	7.7	273	21	78.6	27
41–50	66	7.2	915	66	14.0	473	66	24.4	271	66	157.1	42
51–60	83	12.8	647	83	28.9	287	83	48.2	172	83	224.0	37
61–70	132	19.0	695	132	44.9	294	132	86.4	153	132	290.2	45
71–80	145	20.4	709	145	61.9	234	145	135.2	107	145	323.1	45
81 + ...	106	24.2	439	106	71.1	149	106	145.8	73	106	239.8	44
All Ages	575	89.9	640%	575	229.4	251%	575	451.0	127%	575	1,364.2	42%

the rated-age mortality ratio for the industry is 127 percent of 1983 IAM Table mortality, which is substantially above 100 percent, the committee concludes that industry reserves are not understated.

If both rated-age and CED mortality ratios were below 100 percent, this would probably imply an industry reserve insufficiency, at least from a mortality standpoint. However, this is not the case. For the industry as a whole, underwriting and assignment of rated ages does not seem to have been overly aggressive. For individual companies, the situation may be quite different.

Given that data for each record provided both the true and rated issue ages, it was possible to calculate an approximate CED for each contract. The average CED for the industry was about 26. The average true issue age was 30 (1983 IAM table male 1,000 q_{30} = 0.759). Therefore, the average adjusted 1983 IAM table male 1,000 q_x = 26.759. The average rated age was 50 (1983 IAM table male 1,000 q_{50} = 4.057).

If 100 percent of rated-age mortality is in fact experienced, then actual-to-expected mortality in the first contract year would be 4.057/26.759 ≈ 15 percent on the Guideline IX-A CED basis. If 127 percent of rated-age mortality were actually observed, the Guideline IX-A CED mortality ratio would be expected to be about 19 percent.

In the eleventh contract year, at true attained age 40 (1983 IAM table male 1,000 q_{40} = 1.341) and rated attained age 60 (1983 IAM table male 1,000 q_{60} = 8.338), if 100 percent of rated attained-age mortality is actually observed, then the Guideline IX-A CED mortality ratio would be expected to be 8.338/27.341 ≈ 30 percent. If 127 percent of rated-age mortality is actually observed, the Guideline IX-A CED mortality ratio would be expected to be 39 percent.

Table 8 indicates that the aggregate rated-age mortality ratio was 127 percent for all study years combined, while the estimated industry Guideline IX-A CED mortality ratio was 42 percent, which corresponds to expectations, given the methodology of the calculations.

Table 8 also indicates that below rated age 70, the industry has done a reasonable job of assigning rated ages and industry substandard mortality is acceptable. One area of concern, however, where there has been significant exposure, is rated ages over age 70. The industry has apparently done a much less effective job of underwriting highly rated annuitants.

Table 8 also indicates that female substandard lives (146 percent) have probably been more effectively underwritten than have males (119 percent).

Table 9, which provides ratios similar to those of Table 8, except that it is sorted by true issue age rather than rated issue age, produces similar conclusions. True issue ages under age 50 have been underwritten more effectively than older issue ages.

Table 10, which is sorted by rated attained age, again indicates that underwriting has been much less effective at the highest rated ages: over rated age 75 for males and 85 for females.

Table 11, by issue year, confirms what some have thought: that 1988 was a year of intense underwriting competition.

Table 12, by duration of contract, shows lower mortality ratios at durations beyond 7, but this may be a reflection of the small number of deaths and exposure at the longer durations.

Table 13 shows the results for substandard lives by years of rate-up. A number of groups show mortality ratios below 100 percent, particularly for rate-ups of 21 to 40 years.

Table 14, by true issue age and years of rate-up, is included to given an overview of rate-ups. There is a significant number of deaths (68) for rate-ups of more than 60 years.

Table 15 is the same as Table 14, but based on the 1979–81 Population Mortality Table. The inadequacy of the 1979–81 population table for many issue ages can be seen.

SUMMARY OF CONCLUSIONS

The following results can be drawn from this initial study.

For standard business, the 1983 IAM Table seems more than adequate. However, mortality ratios appear to decline with increasing age. Self-selection is clearly involved at ages over 40. The 1979–81 population mortality table is not a good predictor of expected mortality at ages over 40. There have been no significant differences found by year of study, by year of issue or by sex. Industry reserves for standard business are adequate from a mortality standpoint.

TABLE 9

TRUE-ISSUE-AGE EXPERIENCE FOR SUBSTANDARD LIVES BY TRUE AGE, RATED AGE,
75% OF RATE-UP, AND TRUE AGE + CED
BASED ON 1983 IAM TABLE

True Issue Age	True Age			75% of Rate-up			Rated Age			True Age + CED		
	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio
Male												
0–10	82	1.7	4,913%	82	10.3	793%	82	41.0	200%	82	175.3	47%
11–20	21	1.6	1,311	21	5.4	390	21	15.2	138	21	67.6	31
21–30	46	5.0	914	46	17.1	269	46	40.6	113	46	170.3	27
31–40	45	5.4	841	45	17.3	260	45	33.0	136	45	117.7	38
41–50	48	10.5	456	48	24.0	200	48	39.6	121	48	106.6	45
51–60	72	18.3	392	72	45.0	160	72	75.5	95	72	155.7	46
61–70	42	14.3	293	42	33.7	125	42	51.3	82	42	85.7	49
71–80	12	4.8	252	12	8.6	140	12	11.5	104	12	15.7	76
81+	1	1.5	65	1	1.8	54	1	2.2	46	1	2.7	37
All Ages	369	63.2	584%	369	163.2	226%	369	310.0	119%	369	897.3	41%
Female												
0–10	56	0.5	11,885%	56	4.4	1,273%	56	22.6	248%	56	119.4	47%
11–20	15	0.4	3,431	15	2.1	709	15	8.4	178	15	42.8	35
21–30	12	1.0	1,204	12	3.8	318	12	11.8	102	12	55.0	22
31–40	21	1.3	1,673	21	4.9	426	21	13.3	158	21	54.4	39
41–50	23	2.0	1,153	23	6.9	335	23	15.5	149	23	55.3	42
51–60	28	4.5	617	28	12.1	232	28	22.8	123	28	62.3	45
61–70	25	5.0	499	25	11.7	214	25	19.3	129	25	39.9	63
71–80	17	6.3	268	17	11.2	151	17	15.9	107	17	23.6	72
81+	9	5.7	159	9	9.1	98	9	11.5	78	9	14.3	63
All Ages	206	26.7	771%	206	66.2	311%	206	141.1	146%	206	466.9	44%

TABLE 9—*Continued*

True Issue Age	True Age			75% of Rate-up			Rated Age			True Age + CED		
	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio
Total												
0–10	138	2.1	6,448%	138	14.7	937%	138	63.6	217%	138	294.7	47%
11–20	36	2.0	1,766	36	7.5	480	36	23.7	152	36	110.4	33
21–30	58	6.0	962	58	20.9	277	58	52.4	111	58	225.3	26
31–40	66	6.6	999	66	22.2	297	66	46.3	142	66	172.2	38
41–50	71	12.5	567	71	30.8	230	71	55.1	129	71	161.8	44
51–60	100	22.9	437	100	57.0	175	100	98.2	102	100	218.0	46
61–70	67	19.3	346	67	45.4	148	67	70.6	95	67	125.6	53
71–80	29	11.1	261	29	19.8	146	29	27.5	106	29	39.4	74
81+	10	7.2	139	10	11.0	91	10	13.7	73	10	17.0	59
All Ages	575	89.9	640%	575	229.4	251%	575	451.0	127%	575	1,364.2	42%

TABLE 10

RATED-AGE EXPERIENCE FOR SUBSTANDARD LIVES BY RATED ATTAINED AGE
BASED ON 1983 IAM TABLE

Rated Attained Age	Male			Female			Total		
	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio
0–5	0	0.0	0%	0	0.0	0%	0	0.0	0%
6–10	0	0.0	0	0	0.0	0	0	0.0	0
11–15	0	0.1	0	0	0.0	0	0	0.1	0
16–20	2	0.3	655	0	0.1	0	2	0.4	530
21–25	2	0.5	397	3	0.1	2,108	5	0.6	773
26–30	6	0.9	635	1	0.3	323	7	1.3	558
31–35	13	1.7	766	2	0.5	443	15	2.1	698
36–40	8	2.8	283	2	0.7	305	10	3.5	287
41–45	10	5.3	189	3	1.1	268	13	6.4	203
46–50	25	9.6	260	8	1.9	423	33	11.5	287
51–55	26	14.9	175	13	2.9	448	39	17.8	219
56–60	29	18.7	155	11	4.3	259	40	22.9	174
61–65	43	24.7	174	16	6.3	254	59	31.0	190
66–75	92	79.7	115	47	24.8	190	139	104.5	133
76–85	76	97.5	78	59	49.7	119	135	147.2	92
86+	37	53.2	70	41	48.5	85	78	101.6	77
All Ages	369	310.0	119%	206	141.1	146%	575	451.0	127%

TABLE 11

RATED-AGE EXPERIENCE FOR SUBSTANDARD LIVES BY ISSUE YEAR
BASED ON 1983 IAM TABLE

Issue Year	Male			Female			Total		
	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio
1966–1982	80	83.4	96%	53	34.1	155%	133	117.5	113%
1983	42	37.4	112	16	17.9	89	58	55.2	105
1984	54	38.2	141	25	19.0	132	79	57.2	138
1985	68	43.2	157	25	16.4	153	93	59.6	156
1986	52	37.6	138	29	18.3	159	81	55.8	145
1987	37	33.0	112	32	17.4	184	69	50.3	137
1988	23	27.6	83	18	13.6	133	41	41.2	100
1989	13	9.6	136	8	4.5	176	21	14.1	149
All Study Years	369	310.0	119%	206	141.1	146%	575	451.0	127%

131

TABLE 12

RATED-AGE EXPERIENCE FOR SUBSTANDARD LIVES BY DURATION OF CONTRACT BASED ON 1983 IAM TABLE

Duration of Contract	Male			Female			Total		
	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio
0–1	51	43.6	117%	28	20.3	138%	79	63.9	124%
1–2	88	71.3	123	58	33.4	174	146	104.7	140
2–3	70	54.8	128	39	25.2	155	109	79.9	136
3–4	57	43.1	132	22	19.3	114	79	62.4	127
4–5	43	33.3	129	18	14.5	124	61	47.8	128
5–6	26	24.3	107	18	11.3	159	44	35.6	123
6–7	23	17.9	129	14	8.0	175	37	25.9	143
7–8	6	11.8	51	5	5.0	100	11	16.8	66
8–9	4	6.2	65	3	2.5	119	7	8.7	81
9–10	1	3.0	34	0	1.3	0	1	4.3	23
10 + ...	0	0.8	0	1	0.2	443	1	1.0	99
All Years	369	310.0	119%	206	141.1	146%	575	451.0	127%

TABLE 13

RATED-AGE EXPERIENCE FOR SUBSTANDARD LIVES BY YEARS OF RATE-UP BASED ON 1983 IAM TABLE

Years of Rate-up	Male			Female			Total		
	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio
0–5	31	16.5	188%	14	11.6	121%	45	28.1	160%
6–10	45	34.4	131	28	17.0	164	73	51.4	142
11–15	67	47.4	141	33	22.2	149	100	69.5	144
16–20	50	43.4	115	19	10.8	176	69	54.2	127
21–25	36	37.6	96	10	12.0	84	46	49.5	93
26–30	27	29.5	92	8	9.2	87	35	38.7	91
31–35	12	15.9	75	15	6.5	231	27	22.4	120
36–40	9	13.2	68	6	5.0	120	15	18.2	83
41–45	17	12.2	139	10	7.3	137	27	19.6	138
46–50	9	8.6	105	12	7.0	171	21	15.6	134
51–55	12	8.0	150	12	5.0	241	24	13.0	185
56–60	17	11.8	144	8	5.5	147	25	17.2	145
61–65	7	9.9	70	11	5.7	194	18	15.6	115
66 + ...	30	21.6	139	20	16.4	122	50	38.0	132
All Ages	369	310.0	119%	206	141.1	146%	575	451.0	127%

TABLE 14

RATED-AGE EXPERIENCE FOR SUBSTANDARD LIVES BY TRUE ISSUE AGE
BASED ON 1983 IAM TABLE

True Issue Age	Years of Rate-up											Grand Total
	0–5	6–10	11–15	16–20	21–25	26–30	31–40	41–50	51–60	61–70	71+	
Actual Death Information												
0–10	0	1	1	4	10	3	8	18	33	33	27	138
11–20	2	1	2	2	0	6	3	6	8	4	2	36
21–30	3	7	6	5	9	1	9	11	6	1	0	58
31–40	5	5	14	8	9	6	7	10	1	1	0	66
41–50	5	10	19	11	5	9	8	3	1	0	0	71
51–60	15	19	23	16	10	10	7	0	0	0	0	100
61–70	6	16	23	19	3	0	0	0	0	0	0	67
71–80	4	13	10	2	0	0	0	0	0	0	0	29
81+	5	1	2	2	0	0	0	0	0	0	0	10
All Ages	45	73	100	69	46	35	42	48	49	39	29	575
Expected Death Information												
0–10	0.1	0.3	0.3	0.3	0.5	0.6	2.3	5.5	11.2	19.7	22.7	63.6
11–20	0.2	0.6	0.6	0.6	0.6	1.1	2.3	4.1	5.9	6.3	1.4	23.7
21–30	0.9	1.7	2.7	2.9	3.6	4.6	10.9	10.3	11.4	3.5	0.0	52.4
31–40	1.6	3.4	5.4	4.0	4.4	5.7	9.0	11.4	1.4	0.1	0.0	46.3
41–50	3.5	7.1	8.3	6.7	7.2	8.4	9.8	3.9	0.3	0.0	0.0	55.1
51–60	6.0	12.0	17.1	17.8	22.7	16.3	6.4	0.0	0.0	0.0	0.0	98.2
61–70	5.0	12.5	20.9	20.3	10.0	2.0	0.0	0.0	0.0	0.0	0.0	70.6
71–80	5.1	10.8	9.7	1.3	0.6	0.0	0.0	0.0	0.0	0.0	0.0	27.5
81+	5.5	3.1	4.6	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.7
All Ages	28.1	51.4	69.5	54.2	49.5	38.7	40.6	35.2	30.2	29.6	24.0	451.0

TABLE 14—*Continued*

True Issue Age	Years of Rate-up											Grand Total
	0–5	6–10	11–15	16–20	21–25	26–30	31–40	41–50	51–60	61–70	71+	
	Actual/Expected Ratio											
0–10............	0%	363%	310%	1,198%	2,141%	492%	348%	325%	294%	167%	119%	217%
11–20............	804	171	345	362	0	552	129	148	135	63	146	152
21–30............	320	417	224	172	248	22	83	107	53	29	0	111
31–40............	317	148	257	200	206	106	78	88	69	1,101	0	142
41–50............	142	142	230	165	69	107	82	78	358	0	0	129
51–60............	249	159	135	90	44	61	110	0	0	0	0	102
61–70............	121	128	110	94	30	0	0	0	0	0	0	95
71–80............	78	120	103	160	0	0	0	0	0	0	0	106
81+	90	32	44	470	0	0	0	0	0	0	0	73
All Ages..........	160%	142%	144%	127%	93%	91%	103%	136%	162%	132%	121%	127%

TABLE 15

RATED-AGE EXPERIENCE FOR SUBSTANDARD LIVES BY SEX AND RATED ISSUE AGE
BASED ON 1979–81 POPULATION TABLE

True Issue Age	Years of Rate-up											Grand Total
	0–5	6–10	11–15	16–20	21–25	26–30	31–40	41–50	51–60	61–70	71+	
Actual Death Information												
0–10	0	1	1	4	10	3	8	18	33	33	27	138
11–20	2	1	2	2	0	6	3	6	8	4	2	36
21–30	3	7	6	5	9	1	9	11	6	1	0	58
31–40	5	5	14	8	9	6	7	10	1	1	0	66
41–50	5	10	19	11	5	9	8	3	1	0	0	71
51–60	15	19	23	16	10	10	7	0	0	0	0	100
61–70	6	16	23	19	3	0	0	0	0	0	0	67
71–80	4	13	10	2	0	0	0	0	0	0	0	29
81+	5	1	2	2	0	0	0	0	0	0	0	10
All Ages.	45	73	100	69	46	35	42	48	49	39	29	575
Expected Deaths												
0–10	0.2	0.7	1.0	0.9	1.1	1.4	4.9	11.3	23.6	35.8	34.2	115.1
11–20	0.7	1.6	1.4	1.2	1.4	2.2	4.8	8.5	10.2	9.6	1.8	43.4
21–30	2.2	3.8	5.8	5.9	7.3	9.5	22.7	18.8	17.0	4.8	0.0	97.6
31–40	3.4	6.9	10.9	8.3	9.4	11.8	16.1	17.2	2.1	0.1	0.0	86.2
41–50	7.0	14.7	17.7	13.9	13.4	14.4	14.6	5.2	0.3	0.0	0.0	101.3
51–60	12.8	24.4	31.9	30.8	35.0	23.5	8.9	0.0	0.0	0.0	0.0	167.4
61–70	9.5	21.7	33.0	30.0	14.2	2.6	0.0	0.0	0.0	0.0	0.0	110.9
71–80	7.7	15.5	13.3	1.6	0.7	0.0	0.0	0.0	0.0	0.0	0.0	38.9
81+	7.4	4.0	5.4	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.3
All Ages.	51.0	93.4	120.4	93.1	82.3	65.4	72.1	60.9	53.1	50.3	36.1	778.1

TABLE 15—*Continued*

True Issue Age	Years of Rate-up											Grand Total
	0–5	6–10	11–15	16–20	21–25	26–30	31–40	41–50	51–60	61–70	71 +	
	Actual/Expected Ratio											
0–10.............	0%	139%	101%	450%	916%	222%	163%	160%	140%	92%	79%	120%
11–20.............	269	63	147	160	0	272	62	71	79	42	109	83
21–30.............	135	183	104	85	124	11	40	59	35	21	0	59
31–40.............	147	73	128	97	96	51	43	58	48	879	0	77
41–50.............	71	68	107	79	37	63	55	58	286	0	0	70
51–60.............	117	78	72	52	29	43	79	0	0	0	0	60
61–70.............	63	74	70	63	21	0	0	0	0	0	0	60
71–80.............	52	84	75	123	0	0	0	0	0	0	0	75
81 +.............	68	25	37	386	0	0	0	0	0	0	0	58
All Ages...........	88%	78%	83%	74%	56%	54%	58%	79%	92%	78%	80%	74%

For substandard business, the 1983 IAM table is more conservative for minimal age ratings. Rate-ups beyond 20 years and to the highest ages exhibit lower actual-to-expected ratios, probably due to the competitive underwriting nature of these annuities and not to a deficiency in the 1983 IAM table itself.

The rated ages assigned by the industry seem to have produced reasonable mortality ratios in the aggregate (127 percent). NAIC Guideline IX-A mortality seems low (42 percent), but, as indicated in the body of the report, is slightly better than would be expected given the IX-A CED methodology and the average actual and rated ages of the industry business studied. Industry reserves for substandard business also are adequate from a mortality standpoint.

Since the data included in this report became available to contributors, a number of major participants in the settlement annuity marketplace have acted to limit the maximum years of allowable rate-up, which should have a positive influence on the results of future mortality studies.

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The Individual Annuity Mortality Experience Committee thanks the respondents to this study, who are listed in the Appendix. We also thank Steven A. Smith of First Colony Life and Roger F. Harbin of SAFECO Life for their help, as well as the National Structured Settlement Trade Association for allowing the Society to proceed with this study.

Finally, we have already received responses for future mortality studies and plan on presenting another report in the next *TSA* Reports. The methodology for the study is such that it is very easy for companies to contribute data. All that is needed is an extract of the company's current in-force valuation record, plus a similar record for all inception-to-date deaths. For most companies, all needed information should be available from valuation records. Individual company contributors not only receive industry data and tables well before publication, but also have a mortality study done for their own company data on the same basis.

If you are interested in contributing data, please contact John Avery or Keith Hoffman at the Medical Impairment Bureau, which conducts the study on an anonymous and completely confidential basis, at 617-329-4500.

APPENDIX

STRUCTURED SETTLEMENT CONTRIBUTORS

AIG Domestic Life Companies
Alexander Hamilton Life Insurance Company
Allstate Life Insurance Company
American Mayflower Life Insurance Company of New York
Charter National Life Insurance Company
Chubb Life Insurance Company
CIGNA Corporation
Colonial Penn Annuity & Life Insurance Company
Commercial Union Life Insurance Company of America
Commonwealth Life Insurance Company
Confederation Life Insurance Company
Employers Life Insurance of Wausau
Equitable Life Assurance Society of America
Executive Life Insurance Company of New York
Executive Life Insurance Company
Federal Home Life Insurance Company
Fidelity & Guaranty Life Insurance Company
First Colony Life Insurance Company
GEICO Life Insurance (Garden State)
Hartford Life Insurance Company
Liberty Life Insurance Company of Boston
Metropolitan Life Insurance Company
Mutual of America Life Insurance Company
New York Life Insurance Company
Presidential Life Insurance Company
Prudential Insurance Company of America
SAFECO Life Insurance Company
Transamerica Occidental Life Insurance Company
Travelers Insurance Company
United Pacific Life Insurance Company
USAA Life Insurance Company
Western National Life Insurance Company