

**TRANSACTIONS OF SOCIETY OF ACTUARIES
1997-98 REPORTS**

**REINSURANCE INTERCOMPANY MORTALITY STUDY
FOR LARGE AMOUNTS
(1995 EXPERIENCE)**

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DESCRIPTION OF THE STUDY

Observation Period and Policy Issue Years

This report covers the experience for calendar year 1995 and the earliest issue year for all policies reported by participants was 1960.

Policies Included in the Study

Policies for large amounts are those with a total (direct) face amount of \$1 million or more, where the residence of the insured at issue is the U.S., and the currency of the policy is in U.S. dollars. This study includes only single life policies and exposure which is equal to the net amount at risk reinsured to the participants.

Exposure Calculation

The net amount at risk is assumed to be level throughout the exposure period and is either the most current information or the recorded face amount as at the end of 1995, depending on the company's reporting method.

For a policy in force through the study year, two exposure records are created. One reflects the fraction of the year between the prior December 31 and the policy anniversary. The other reflects the fraction of the year between the policy anniversary and December 31 of the study year. Obviously these two fractions sum to one. The difference between the two records is in the policy duration.

For policies withdrawing during the study year, one or two exposure records will be created, depending on whether the withdrawal is after the anniversary or not. The exposure fraction is calculated consistent with the in-force situation. Fractions would not sum to one in this case except for withdrawals occurring on December 31 of the study year.

For death claims, one or two exposure records will be created, depending on whether the death occurs before the anniversary or not. Note the difference in treatment of exact anniversary deaths and withdrawals. The exposure will be one for the record reflecting the period in which the death occurs.

*Sponsored by the Society of Actuaries Reinsurance Council and Manulife Reinsurance

Hence, the total exposure will be greater than one for policies with post and anniversary deaths.

For policies issued in the study year, one exposure record will be created consistent with the rest of the exposure calculations. Hence, a policy issued on January 1 of the study year will contribute one day less than a full year's exposure to the study, while one issued on December 31 of the study year will be included in the study, but with a zero exposure value.

Expected Deaths

Expected deaths in the study are based on 100% of the Society of Actuaries A75-80 Basic Select and Ultimate Tables (pages 205-227 of *TSA XXXVIII*, 1986). The tables vary by sex and age type (age nearest birthday and age last birthday).

The A75-80 Basic Tables were extended to issue age 90, and the resulting tables were used to calculate the expected mortality for issue ages over 70. In the 1990 study, the ultimate attained age was 100. Study years 1991 and later extended this ultimate age to 105 using the constant difference pattern implicit in the values at age 100 and immediately prior. These modifications to the A75-80 Basic Tables for issue ages over 70 are not material to the overall mortality ratios because of the low exposure at these ages.

For substandard risks, the appropriate base table was increased by the appropriate substandard rating.

Actual Deaths

Actual claims are the amounts actually paid by the reinsurer. In the case of contestable claims, the actual claim amount is that actually paid out, if any.

Other Comments

Underwriting status refers to the standard and substandard categories. Preferred and nonpreferred risks are treated as regular risks. Reinsurance status refers to how the participating company receives the business based on automatic, facultative, and shopped categories.

Participants in the Study

For a complete list of participants in the study, see Appendix A. In the 1995 study, 11 of the 17 participants from 1994 remained, and two new participants entered.

Products Included in the Study

Permanent plans include whole life, limited pay plans, and other permanent plans. Universal life plans are interest-sensitive plans with a cash value buildup. Term plans include re-entry, level, and decreasing type plans.

HIGHLIGHTS OF THE STUDY (1995)

Overall Experience

The experience underlying the year 1995 data (see Tables 1–4) is based on a total exposure of \$78 billion and claims of \$140 million. The total 1995 exposure by number is 242,614 policies and 312 deaths.

Eleven of the seventeen participants from the 1994 study remained, and two new participants entered. There is an 8% increase in business from the previous 11 participants and 25% from the new participants.

The overall mortality ratio by amounts for the 1995 study is 50.6% (47.1% in 1994). The overall mortality ratio by number for the 1995 study is 51.4% (49.7% in 1994).

Experience by Sex

A total of 88% of the total exposure by amount was from policies issued on male lives, consistent with 1994.

The mortality ratio by amount for males is 49.0% and for females, 61.4%. The 1994 report showed that females had a lower ratio by amount of 4% and 15% higher by number over males.

The mortality ratio by number for males is 48.8% and for females, 74.4%.

Experience by Issue Age

More than 83% by number and 89% by amount of the claims occurred between the issue ages 40 and 69 where the exposures by number and by amounts are 61% and 66%, respectively. The issue age groups 40 to 49, 50 to 59, and 60 to 69 years old show mortality ratios by amount of 77.0%, 39.1%, and 62.8%, respectively. An unusually large number of expensive claims occurred in the 40–49 age group in 1995 with 18 large misadventure claims totaling \$13.1 million and 5 large claims of unknown cause totaling \$6.2 million.

Experience by Policy Years

The mortality ratio by amount for policy years 1–5 are between 11% and 37% below the overall ratio, except for duration 4. Fourteen large

TABLE 1
TRENDS IN MORTALITY RATIOS BY NUMBER OF POLICIES
MORTALITY RATIOS BASED ON THE 1975-80 BASIC TABLES

Categories	1987	1988	1989	1990	1991	1992	1993*	1994	1995	1987-95
Sex										
Male	65.0%	59.7%	50.8%	85.3%	72.4%	68.4%	59.6%	48.2%	48.8%	59.6%
Female	166.7	70.1	90.5	78.3	76.2	73.9	77.3	62.7	74.4	75.5
All	72.7%	60.5%	54.3%	84.7%	72.8%	69.0%	61.4%	49.7%	51.4%	61.1%
Issue Ages										
Less than 20	0.0%	0.0%	0.0%	552.5%	0.0%	0.0%	0.0%	0.0%	0.0%	63.5%
20-29	0.0	0.0	0.0	300.7	95.0	41.5	78.2	115.6	215.4	128.1
30-39	101.5	126.6	74.6	63.3	65.1	52.7	66.0	26.2	29.7	48.1
40-49	72.0	53.1	53.2	61.0	94.3	64.2	57.4	39.5	51.0	57.1
50-59	96.2	84.1	82.4	102.3	70.3	70.6	59.2	67.0	53.9	70.0
60-69	69.2	37.6	33.8	103.4	60.9	91.6	77.0	63.7	69.4	71.7
70-79	9.3	22.0	17.4	57.4	46.8	53.4	37.3	24.3	35.2	36.1
80 and Over	0.0	0.0	0.0	53.1	55.1	0.0	0.0	44.9	21.4	23.3
All	72.7%	60.5%	54.3%	84.7%	72.8%	69.0%	61.4%	49.7%	51.4%	61.1%
Policy Years										
1	65.3%	95.3%	46.9%	68.0%	94.2%	57.0%	76.5%	39.9%	51.5%	61.8%
2	54.8	46.2	49.3	60.3	73.9	64.4	34.0	34.6	36.4	47.3
3	83.0	41.2	62.1	63.8	80.6	72.5	63.4	33.7	45.8	56.4
4	54.4	76.6	60.7	59.3	33.3	42.0	52.2	51.7	70.8	55.6
5	65.2	47.6	35.7	68.5	66.6	27.1	48.6	61.3	17.6	44.9
6-10	98.3	75.2	63.9	112.2	74.1	95.3	62.2	57.9	68.8	74.3
11-15	165.6	0.0	36.4	131.3	68.0	36.2	142.1	92.6	60.4	84.6
16 and Over†	55.0	95.9	80.9	208.5	0.0	529.6	120.0	51.5	67.0	133.9
All	72.7%	60.5%	54.3%	84.7%	72.8%	69.0%	61.4%	49.7%	51.4%	61.1%
Classification Amounts										
\$1,000,000-\$2,999,999	78.3%	59.8%	52.7%	83.7%	74.3%	69.4%	59.5%	51.0%	49.7%	60.8%
\$3,000,000-\$4,999,999	35.1	46.9	30.8	91.9	63.5	72.7	71.0	33.2	68.0	60.4
\$5,000,000 and Over	50.1	102.8	130.4	88.0	61.8	57.9	81.3	45.6	66.9	69.3
All	72.7%	60.5%	54.3%	84.7%	72.8%	69.0%	61.4%	49.7%	51.4%	61.1%

*An error was found in the 1993 data. This affected the expected claim by number only. The previous reported mortality ratio for 1993 was 62.7%.

†The ultimate expected mortality rates for duration 16 and over was found to be deficient for all study years prior to 1994, thus overstating the mortality ratios for those years. The overstatement was under 0.5% per year.

TABLE 1—Continued

Categories	1987	1988	1989	1990	1991	1992	1993*	1994	1995	1987-95
Smoking Status										
Nonsmoker	73.7%	48.4%	52.8%	59.8%	69.3%	58.3%	52.8%	47.1%	47.9%	53.3%
Smoker	102.5	79.8	152.3	135.6	141.5	164.6	108.9	74.6	120.9	119.9
Aggregate	68.4	71.5	41.5	123.1	65.1	80.7	103.3	58.5	35.0	76.0
All	72.7%	60.5%	54.3%	84.7%	72.8%	69.0%	61.4%	49.7%	51.4%	61.1%
Underwriting Status										
Standard	72.3%	63.2%	53.2%	81.6%	70.2%	69.9%	59.6%	49.0%	50.7%	60.0%
Substandard	75.7	45.1	60.2	104.7	89.8	62.5	77.2	55.7	60.1	70.5
All	72.7%	60.5%	54.3%	84.7%	72.8%	69.0%	61.4%	49.7%	51.4%	61.1%
Reinsurance Status										
Automatic	53.4%	36.8%	30.4%	75.6%	70.9%	64.6%	56.0%	48.8%	49.5%	55.7%
Facultative	86.1	76.1	70.1	101.0	77.3	78.8	78.9	53.2	62.6	75.2
Shopped	0.0	34.6	54.6	33.6	0.0	0.0	0.0	0.0	0.0	30.2
All	72.7%	60.5%	54.3%	84.7%	72.8%	69.0%	61.4%	49.7%	51.4%	61.1%
Plan of Insurance										
Whole Life					56.4%	65.5%	147.4%	77.9%	51.2%	
Term					72.9	53.8	45.6	42.7	49.1	
Universal Life					62.0	95.8	74.8	57.1	42.6	
Unknown					79.7	76.9	53.7	49.8	61.2	
All					72.8%	69.0%	61.4%	49.7%	51.4%	
Reinsurance Method										
Coinsurance					82.8%	45.0%	56.8%	35.6%	52.1%	
Modified Coinsurance					65.3	0.0	0.0	0.0	0.0	
Yearly Renewable Term					69.0	66.9	64.8	51.4	51.3	
Unknown					62.1	212.1	0.0	610.2	0.0	
All					72.8%	69.0%	61.4%	49.7%	51.4%	

*An error was found in the 1993 data. This affected the expected claim by number only. The previous reported mortality ratio for 1993 was 62.7%.

TABLE 2
TRENDS IN MORTALITY RATIOS BY AMOUNT (000's)
MORTALITY RATIOS BASED ON THE 1975-80 BASIC TABLES

Categories	1987	1988	1989	1990	1991	1992	1993*	1994	1995	1987-95
Sex										
Male	59.6%	55.5%	58.8%	73.8%	69.4%	66.9%	59.3%	47.5%	49.0%	59.7%
Female	87.8	213.7	49.1	94.7	71.2	66.9	67.7	43.5	61.4	76.2
All	62.0%	70.0%	57.9%	75.8%	69.6%	66.9%	60.3%	47.1%	50.6%	61.5%
Issue Ages										
Less than 20	0.0%	0.0%	0.0%	435.7%	0.0%	0.0%	0.0%	0.0%	0.0%	40.6%
20-29	0.0	0.0	0.0	112.2	15.6	1.4	34.0	69.7	298.8	68.9
30-39	111.7	329.1	67.4	57.5	54.9	65.5	72.6	30.0	20.3	75.7
40-49	65.2	60.9	46.3	45.0	104.6	67.0	55.0	51.7	77.0	64.0
50-59	78.5	77.3	82.3	97.5	57.9	64.2	65.4	47.4	39.1	66.4
60-69	53.2	22.7	66.3	100.5	40.1	87.6	62.6	58.6	62.8	63.0
70-79	4.8	13.7	10.8	29.2	99.3	40.1	42.0	18.0	14.1	28.9
80 and Over	0.0	0.0	0.0	163.1	12.1	0.0	0.0	116.3	1.0	30.1
All	62.0%	70.0%	57.9%	75.8%	69.6%	66.9%	60.3%	47.1%	50.6%	61.5%
Policy Years										
1	53.1%	108.2%	52.6%	86.0%	107.8%	69.0%	61.5%	26.4%	39.2%	66.0%
2	64.5	30.5	67.5	41.6	73.1	62.7	43.3	27.3	36.2	50.2
3	60.4	24.8	55.7	31.1	76.7	102.7	66.7	39.4	27.7	54.9
4	63.5	91.3	63.2	69.5	17.7	26.3	58.2	41.7	102.5	59.1
5	54.4	36.5	43.6	77.1	51.1	12.7	40.5	41.9	13.0	39.6
6-10	60.5	144.6	66.5	95.8	79.9	79.6	63.9	58.7	63.1	75.0
11-15	141.1	0.0	36.8	107.8	67.5	51.3	102.5	72.0	47.8	68.0
16 and Over†	31.5	57.7	47.0	252.9	0.0	767.7	30.6	63.9	64.8	124.8
All	62.0%	70.0%	57.9%	75.8%	69.6%	66.9%	60.3%	47.1%	50.6%	61.5%
Classification Amounts										
\$1,000,000-\$2,999,999	76.0%	58.9%	48.3%	74.1%	67.5%	71.3%	62.6%	55.8%	48.3%	61.7%
\$3,000,000-\$4,999,999	38.2	42.8	28.7	67.4	52.3	76.9	48.8	23.0	44.9	47.2
\$5,000,000 and Over	37.5	143.7	125.7	90.0	93.3	40.3	60.5	29.9	65.4	75.0
All	62.0%	70.0%	57.9%	75.8%	69.6%	66.9%	60.3%	47.1%	50.6%	61.5%

*An error was found in the 1993 data. This affected the expected claim amount only. The previous reported mortality ratio for 1993 was 65.7%.

†The ultimate expected mortality rates for duration 16 and over was found to be deficient for all study years prior to 1994, thus overstating the mortality ratios for those years. The overstatement was under 0.5% per year.

TABLE 2—Continued

Categories	1987	1988	1989	1990	1991	1992	1993*	1994	1995	1987-95
Smoking Status										
Nonsmoker	68.8%	47.3%	52.2%	57.5%	60.9%	58.7%	51.5%	45.0%	44.5%	52.6%
Smoker	114.4	44.0	153.8	137.3	136.1	116.5	126.6	76.3	156.1	119.1
Aggregate	48.4	102.1	50.0	99.5	75.2	81.9	90.0	45.4	34.7	72.5
All	62.0%	70.0%	57.9%	75.8%	69.6%	66.9%	60.3%	47.1%	50.6%	61.5%
Underwriting Status										
Standard	62.8%	73.8%	55.6%	75.4%	67.3%	69.8%	62.6%	48.6%	51.2%	62.2%
Substandard	56.6	46.9	71.3	77.8	80.8	50.4	46.0	37.6	46.9	57.3
All	62.0%	70.0%	57.9%	75.8%	69.6%	66.9%	60.3%	47.1%	50.6%	61.5%
Reinsurance Status										
Automatic	49.4%	39.5%	41.7%	67.4%	54.2%	57.5%	59.7%	54.8%	45.1%	52.8%
Facultative	71.1	87.8	65.8	82.5	80.7	73.6	60.8	40.3	56.6	68.3
Shopped	0.0	23.5	63.7	30.3	0.0	0.0	0.0	0.0	0.0	32.4
All	62.0%	70.0%	57.9%	75.8%	69.6%	66.9%	60.3%	47.1%	50.6%	61.5%
Plan of Insurance										
Whole Life					53.7%	56.2%	119.9%	64.3%	34.2%	
Term					90.9	56.8	45.6	42.9	58.1	
Universal Life					47.2	100.9	63.0	47.6	33.0	
Unknown					68.8	67.1	47.8	42.3	69.8	
All					69.6%	66.9%	60.3%	47.1%	50.6%	
Reinsurance Method										
Coinsurance					114.0%	61.8%	46.7%	37.8%	57.5%	
Modified Coinsurance					36.5	0.0	0.0	0.0	0.0	
Yearly Renewable Term					57.7	65.1	67.1	45.4	47.0	
Unknown					38.8	106.1	0.0	694.9	0.0	
All					69.6%	66.9%	60.3%	47.1%	50.6%	

*An error was found in the 1993 data. This affected the expected claim amount only. The previous reported mortality ratio for 1993 was 65.7%.

TABLE 3
1995 EXPERIENCE BY NUMBER OF POLICIES
MORTALITY RATIOS BASED ON THE 1975-80 BASIC TABLES

Categories	Exposure	Actual Claims	Expected Claims	Mortality Ratio
Sex				
Male	218,418	266	544.78	48.8%
Female	24,196	46	61.87	74.4
All	242,614	312	606.64	51.4%
Issue Ages				
Less than 20	428	0	0.27	0.0%
20-29	5,829	9	4.18	215.4
30-39	86,882	26	87.57	29.7
40-49	97,147	103	201.95	51.0
50-59	39,842	88	163.18	53.9
60-69	10,616	69	99.37	69.4
70-79	1,797	16	45.44	35.2
80 and Over	73	1	4.68	21.4
All	242,614	312	606.64	51.4%
Policy Years				
1	73,176	51	99.12	51.5%
2	53,826	35	96.20	36.4
3	38,981	42	91.77	45.8
4	25,498	54	76.30	70.8
5	18,855	12	68.12	17.6
6-10	29,384	98	142.47	68.8
11-15	2,725	17	28.17	60.4
16 and Over	168	3	4.48	67.0
All	242,614	312	606.64	51.4%
Classification Amounts				
\$1,000,000-\$2,999,999	225,280	272	547.43	49.7%
\$3,000,000-\$4,999,999	11,130	25	36.77	68.0
\$5,000,000 and Over	6,204	15	22.44	66.9
All	242,614	312	606.64	51.4%
Smoking status				
Nonsmoker	225,311	264	550.69	47.9%
Smoker	13,007	40	33.10	120.9
Aggregate	4,296	8	22.86	35.0
All	242,614	312	606.64	51.4%
Underwriting Status				
Standard	236,610	283	558.42	50.7%
Substandard	6,004	29	48.22	60.1
All	242,614	312	606.64	51.4%
Reinsurance Status				
Automatic	226,928	255	515.56	49.5%
Facultative	15,686	57	91.08	62.6
Shopped	0	0	0.00	0.0
All	242,614	312	606.64	51.4%
Plan of Insurance				
Whole Life	7,778	18	35.14	51.2%
Term	147,840	145	295.22	49.1
Universal Life	24,800	46	107.91	42.6
Unknown	62,195	103	168.37	61.2
All	242,614	312	606.64	51.4%
Reinsurance Method				
Coinsurance	167,995	173	331.81	52.1%
Modified Coinsurance	18	0	0.28	0.0
Yearly Renewable Term	73,832	139	270.83	51.3
Unknown	770	0	3.72	0.0
All	242,614	312	606.64	51.4%

TABLE 4
1995 EXPERIENCE BY AMOUNT (000's)
MORTALITY RATIOS BASED ON THE 1975-80 BASIC TABLES

Categories	Exposure	Actual Claims	Expected Claims	Mortality Ratio
Sex				
Male	69,155,213	118,236	241,059	49.0%
Female	9,292,007	21,435	34,913	61.4
All	78,447,221	139,670	275,972	50.6%
Issue Ages				
Less than 20	229,391	0	129	0.0%
20-29	2,279,142	5,143	1,721	298.8
30-39	22,670,522	5,304	26,104	20.3
40-49	30,358,973	56,031	72,791	77.0
50-59	16,104,199	30,270	77,421	39.1
60-69	5,599,798	37,955	60,397	62.8
70-79	1,168,557	4,943	35,017	14.1
80 and Over	36,639	25	2,391	1.0
All	78,447,221	139,670	275,972	50.6%
Policy Years				
1	19,633,375	12,724	32,455	39.2%
2	14,559,133	12,076	33,331	36.2
3	11,509,788	9,393	33,868	27.7
4	8,786,422	34,123	33,283	102.5
5	6,893,247	4,058	31,265	13.0
6-10	15,020,652	55,670	88,179	63.1
11-15	1,963,914	10,272	21,501	47.8
16 and Over	80,690	1,354	2,089	64.8
All	78,447,221	139,670	275,972	50.6%
Classification Amounts				
\$1,000,000-\$2,999,999	57,205,231	92,831	192,185	48.3%
\$3,000,000-\$4,999,999	9,897,224	17,402	38,753	44.9
\$5,000,000 and Over	11,344,766	29,437	45,034	65.4
All	78,447,221	139,670	275,972	50.6%
Smoking Status				
Nonsmoker	71,171,479	108,950	244,747	44.5%
Smoker	4,693,890	25,561	16,375	156.1
Aggregate	2,581,852	5,160	14,850	34.7
All	78,447,221	139,670	275,972	50.6%
Underwriting Status				
Standard	74,738,444	122,642	239,665	51.2%
Substandard	3,708,777	17,029	36,306	46.9
All	78,447,221	139,670	275,972	50.6%
Reinsurance Status				
Automatic	53,976,737	64,629	143,319	45.1%
Facultative	24,470,484	75,042	132,653	56.6
Shopped	0	0	0	0.0
All	78,447,221	139,670	275,972	50.6%
Plan of Insurance				
Whole Life	7,725,891	14,941	43,745	34.2%
Term	42,361,873	64,527	111,023	58.1
Universal Life	12,185,630	21,895	66,303	33.0
Unknown	16,173,827	38,307	54,900	69.8
All	78,447,221	139,670	275,972	50.6%
Reinsurance Method				
Coinsurance	40,478,542	59,447	103,337	57.5%
Modified Coinsurance	19,554	0	262	0.0
Yearly Renewable Term	37,578,011	80,223	170,625	47.0
Unknown	371,114	0	1,747	0.0
All	78,447,221	139,670	275,972	50.6%

misadventure claims totaling \$9.8 million as well as 5 large cardiovascular claims totaling \$9.5 million occurred in policy year 4. Offsetting this was a very low number of claims in duration 5. Six large claims of unknown cause totaling \$6.6 million are in the 6-10 duration.

Experience by Classification Amount

The experience by classification amount in the study is calculated using one record per policy. If the experience was calculated using one record per life, several claims would move to the \$3 to \$5 million and \$5 million and over classification. The \$3 to \$5 million band has the lowest mortality ratio by amount at 44.9% and the \$5 million and over band has the highest at 65.4%.

Historically, the \$3 to \$5 million band had the lowest ratios relative to the other bands in six out of eight years.

A total of 312 claims were reported. When analyzing each claim individually, it was possible to observe that a high number of deaths involved multiple policies.

Experience by Smoking Status

The overall mortality ratio by amount for nonsmoker is 44.5% (45.0% in 1994). The ratio for smoker is 156.1% (76.3% in 1994). We obtain such a difference in the mortality ratios because the A75-80 Basic Tables are not differentiated by smoking status. The expected level of mortality for smoker is roughly 2.5 times the mortality for nonsmoker.

The exposures for nonsmoker, smoker, and aggregate are 91%, 6%, and 3%, respectively. Of the nonsmokers, 77%, 18%, and 5% are regular, preferred, nonpreferred class. Of the smokers, they are 85%, 9%, and 7%, respectively.

Experience by Underwriting Status

The mortality ratio by amount for standard policies is 51.2% (48.6% in 1994). This ratio is 46.9% (37.5% in 1994) for substandard policies.

The exposure by amount accounts for 95.3% and 4.7%, respectively, similar to the 1994 percentages.

Experience by Reinsurance Status

The mortality experience for facultative business is higher than the mortality experience for automatic business, consistent with all previous years except 1994.

The overall large amount mortality ratio for policies reinsured automatically is 45.1%. For policies reinsured facultatively the ratio is 56.6%.

The exposure amounts are \$54.0 billion (69.0%) for automatic business, \$24.5 billion (31.0%) for facultative business. The exposure percentages are higher than 1994. There was no shopped business exposure in 1995. Shopped policies are defined as those sent facultatively to one or more reinsurers to obtain the most competitive underwriting assessment.

Experience by Plan of Insurance

The plan of insurance was provided for 180,419 policies (74.4%) compared to 68.9% in 1994. These policies were grouped as universal life (24,800 policies; 13.7%), whole life (7,778; 4.3%), and term (147,840; 81.9%). Universal life plans had the lowest mortality ratio by amount at 33.0%.

Experience by Method of Reinsurance

The method of reinsurance was provided for 241,844 policies, almost 100%, similar to 1994. These were grouped as yearly renewable term (73,832 policies), coinsurance (167,995), and modified coinsurance (18). The mortality ratio by amount was 47.0% for yearly renewable term, which is slightly higher than 1994, and the ratio for coinsurance was 57.5%, which is much higher than 1994.

Experience by Level of Retention

The level of retention of the ceding company was provided for 100,915 policies (45.5%; 39.6% in 1994). These were grouped as full retention (91,445 policies), partial retention (5,643), and no retention (3,827).

HIGHLIGHTS OF THE STUDY (1987–1995)

Overall Experience

The experience underlying the years 1987–95 data (see Tables 5 and 6) are based on a total exposure of \$596.9 billion and claims of \$1.3 billion. The total 1987–95 exposure by number is 968,991 policies and 1,698 deaths.

Two large claims of \$13.3 million and \$21 million occurred in 1988. These two claims were both females in the age group 30–39 and the duration group 6–10. In 1990, there was one large suicide claim of \$29.5 million for a male in the 50–59 group in durations 6–10. In 1991, three large aviation claims totaling \$42.5 million occurred in duration 1, which were males in

TABLE 5
 1987-95 EXPERIENCE BY NUMBER OF POLICIES
 MORTALITY RATIOS BASED ON THE 1975-80 BASIC TABLES

Categories	Exposure	Actual Claims	Expected Claims	Mortality Ratio
Sex				
Male	872,184	1,493	2,505.40	59.6%
Female	96,807	205	271.51	75.5
All	968,991	1,698	2,776.91	61.1%
Issue Ages				
Less than 20	2,655	1	1.57	63.5%
20-29	24,489	23	17.95	128.1
30-39	303,906	154	319.87	48.1
40-49	391,120	479	838.29	57.1
50-59	182,568	568	811.01	70.0
60-69	55,831	384	535.67	71.7
70-79	8,192	85	235.36	36.1
80 and Over	230	4	17.17	23.3
All	968,991	1,698	2,776.90	61.1%
Policy Years				
1	271,141	243	393.26	61.8%
2	211,863	201	424.94	47.3
3	153,654	233	413.05	56.4
4	108,640	201	361.80	55.6
5	76,751	137	305.13	44.9
6-10	133,562	535	719.83	74.3
11-15	11,786	111	131.26	84.6
16 and Over	1,593	37	27.63	133.9
All	968,991	1,698	2,776.90	61.1%
Classification Amounts				
\$1,000,000-\$2,999,999	876,497	1,479	2,433.69	60.8%
\$3,000,000-\$4,999,999	57,088	127	210.40	60.4
\$5,000,000 and Over	35,405	92	132.81	69.3
All	968,991	1,698	2,776.90	61.1%
Smoking Status				
Nonsmoker	797,808	1,144	2,145.04	53.3%
Smoker	57,319	201	167.64	119.9
Aggregate	113,864	353	464.22	76.0
All	968,991	1,698	2,776.90	61.1%
Underwriting Status				
Standard	933,732	1,485	2,474.78	60.0%
Substandard	35,259	213	302.12	70.5
All	968,991	1,698	2,776.90	61.1%
Reinsurance Status				
Automatic	799,476	1,100	1,974.08	55.7%
Facultative	166,071	594	789.55	75.2
Shopped	3,444	4	13.27	30.2
All	968,991	1,698	2,776.90	61.1%

TABLE 6
1987-95 EXPERIENCE BY AMOUNT (000's)
MORTALITY RATIOS BASED ON THE 1975-80 BASIC TABLES

Categories	Exposure	Actual Claims	Expected Claims	Mortality Ratio
Sex				
Male	531,225,437	1,133,927	1,900,300	59.7%
Female	65,718,989	177,813	233,423	76.2
All	596,944,426	1,311,740	2,133,723	61.5%
Issue Ages				
Less than 20	2,947,373	733	1,803	40.6%
20-29	16,992,765	8,790	12,761	68.9
30-39	150,134,194	134,817	178,113	75.7
40-49	236,211,912	361,957	565,134	64.0
50-59	137,323,357	443,860	668,701	66.4
60-69	46,010,702	290,088	460,237	63.0
70-79	7,131,266	66,846	231,529	28.9
80 and Over	192,858	4,647	15,444	30.1
All	596,944,427	1,311,740	2,133,723	61.5%
Policy Years				
1	127,043,073	150,496	228,179	66.0%
2	115,254,056	140,549	279,833	50.2
3	97,131,087	168,818	307,757	54.9
4	77,626,288	173,834	294,051	59.1
5	59,650,591	104,664	264,061	39.6
6-10	109,302,547	472,651	629,821	75.0
11-15	9,845,275	73,785	108,431	68.0
16 and Over*	1,091,510	26,944	21,590	124.8
All	596,944,427	1,311,740	2,133,723	61.5%
Classification Amounts				
\$1,000,000-\$2,999,999	403,762,511	873,037	1,415,696	61.7%
\$3,000,000-\$4,999,999	94,089,864	169,801	359,493	47.2
\$5,000,000 and Over	99,122,051	268,901	358,533	75.0
All	596,974,427	1,311,740	2,133,723	61.5%
Smoking Status				
Nonsmoker	448,982,811	799,272	1,519,245	52.6%
Smoker	41,824,825	171,376	143,942	119.1
Aggregate	106,166,791	341,092	470,536	72.5
All	596,974,427	1,311,740	2,133,723	61.5%
Underwriting Status				
Standard	562,468,007	1,133,451	1,822,558	62.2%
Substandard	34,476,420	178,289	311,165	57.3
All	596,944,427	1,311,740	2,133,723	61.5%
Reinsurance Status				
Automatic	303,337,730	458,278	868,348	52.8%
Facultative	284,302,581	843,526	1,234,665	68.3
Shopped	9,304,116	9,936	30,710	32.4
All	596,944,427	1,311,740	2,133,723	61.5%

*The ultimate expected mortality rates for duration 16 and over was found to be deficient for all study years prior to 1994, thus overstating the mortality ratios for those years. The overstatement was under 0.5% per year.

the 40-49 age group. In 1992, there were five large cancer claims and one cardiovascular claim, all males in various age groups, totaling \$59.2 million in durations 6-10.

The overall mortality ratio by amounts for the 1987-95 study is 61.5%. The overall mortality ratio by number for the 1987-95 study is 61.1%.

The mortality ratios reflect the data correction for durations 16 and over in the 1994 study year, and the revised mortality ratios for the 1993 study year. However, no corrections were made for the durations 16 and over for all study years prior to 1994. The duration 16 and over impact on mortality ratio is approximately 0.5% per study year.

Experience by Sex

A total of 89% of the total exposure by amount was from policies issued on male lives. The mortality ratio by amount for males is 59.7%. The mortality ratio by amount for females is 76.2%. The mortality ratios by number are 59.6% and 75.5% for males and females, respectively.

Experience by Issue Age

The age groups 20 to 29, 30 to 39, 40 to 49, and 50 to 59 years old show the highest mortality ratios with 68.9%, 75.7%, 64.0%, and 66.4%, respectively. The high mortality ratio for the age group 20 to 29 is attributed mainly to the large number of misadventure claims in 1994 and 1995. Furthermore, the exposure at these ages is limited, so results will be variable. The high mortality ratio for the age group 30-39 is explained mainly by the two large claims that occurred in 1988. The age group 40-49 had large aviation claims in 1991, cancer claims in 1992, and large overall claims in 1995. The age groups 50-59 and 60-69 had cancer claims in 1992 as well.

Other age groups did not have poor claims experience.

Experience by Policy Years

The mortality ratio is high at duration 1 (66.0%) due to the aviation claims and varies between 50% and 60% in years 2-4. The mortality ratios for other durations fluctuate between 40% at duration 5 and 125% at duration 16 and over. The mortality ratio at durations 6-10 is still high at 75% due to large claims over the years.

Experience by Classification Amount

As stated previously, the experience by classification amount in the study is calculated using one record per policy. If the experience was calculated

using one record per life, several claims would move to the \$3 to \$5 million and \$5 million and over classification amount.

A total of 1,698 claims were reported. When analyzing each claim individually, it was possible to observe that a high number of deaths involved multiple policies.

Claims experience in the \$5 million and over band has been gradually decreasing, whereas other bands were fluctuating. However, the \$3–5 million band remains to have the lowest ratios.

Experience by Smoking Status

The overall mortality ratio for nonsmoker is 52.6%. The ratio for smoker is 119.1%. Again, we obtain such a difference in the mortality ratios because the 1975–80 Basic U.S. tables are not differentiated by smoking status. The expected level of mortality for smoker is roughly 2.5 times the mortality for nonsmoker.

The exposures for nonsmoker, smoker, and aggregate are 75%, 7%, and 18%, respectively.

Experience by Underwriting Status

The mortality ratio by amount for standard policies is 62.2%. This ratio is 57.3% for substandard policies. A total of 94% of exposures by amount is standard rated.

Experience by Reinsurance Status

The mortality ratio by amount for policies reinsured automatically is 52.8%. For policies reinsured facultatively the ratio is 68.3%. Only four claims were reported for shopped business.

The exposure amounts are \$303.3 billion (50.8%) for automatic business, \$284.3 billion (47.6%) for facultative business, and \$9.3 billion (1.6%) for shopped business. There was more automatic business in 1995, thus narrowing the exposure gap by amount between automatic and facultative cases.

CLAIMS ANALYSIS

A total of 13 companies submitted data for this mortality study. This study included the year 1995 mortality experience. A total of 312 claims were submitted. The cause of death was provided for all claims, except 14.

Tables 7-12 show the number of claims and the percentage of claims for each cause of death reported. At least one death occurred in each claim category.

The following seven categories list the different causes of death included in the analysis:

Category	Cause of Death
"Misadventure"	Homicide Suicide Aviation Motor Vehicle Other Accident
Circulatory	Cardiovascular Cerebrovascular
All Respiratory	Respiratory Pneumonia
Cancer	Cancer
AIDS	AIDS
Other	Digestive Endocrine Genitourinary System Nervous System (Other than Cerebrovascular) Other Disease
Unknown	Unknown or Not Provided

Experience by Cause of Death

A total of 312 claims are included in the claims analysis. Of those, 129 (41.3%; 45.8% in 1994) are Cancer deaths; 56 (17.9%, 21.7% in 1994) are Circulatory deaths. A total of 69 claims (22%) are reported in the "Misadventure" category. Of those, 16 (5.1%; 7.6% in 1994) are Suicide; 8 (2.6%; 1.4% in 1994) are Aviation; 8 (2.6%, 1.7% in 1994) are Homicide; 14 (4.5%, 1.8% in 1994) are Motor Vehicle, and 23 (7.4%; 4.7% in 1994) are Other Accident. Six AIDS claims are reported.

Experience by Sex

A total of 266 claims are male deaths. This represents 85% of all claims. The exposure by number on male lives is 90.0% of the total exposure. A total of 15 of the 16 suicide claims are reported on male lives. This represents

5.6% (8.7% in 1994) of all male claims. A total of 66 of the 69 claims in the "Misadventure" category were reported on male lives. A total of 102 of the 129 (79.1%, 84.3% in 1994) Cancer claims are male deaths. A total of 46 of the 56 (82.1%, 86.6% in 1994) Circulatory claims are reported for male lives.

Experience by Issue Age

For the 30–39 ages, the leading causes of death are Misadventure (34.6%) and Cancer (15.4%). For the 40–49 ages, Circulatory (17.4%), Misadventure (33.0%), and Cancer (35.0%) are the leading causes of death. A total of 55 (80%) Misadventure (20 Other Accident) deaths are in the 30–59 age groups. Circulatory and Cancer deaths are mostly 40 and over.

Experience by Policy Years

Some 71% of the Misadventure claims occur at durations 1–5, and 26% at durations 6–10. About 35% of the Circulatory claims occur in durations 1–2 and average about 15% of all deaths over durations 3–15. Cancer deaths represent approximately 40–50% of all deaths by duration. AIDS claims are in durations 1 and 6–10.

Experience by Classification Amount

Some 47% of the claims in \$5 million and over band are Cancer deaths. Most of the claims (272; 87%) occur in the \$1–3 million band. Of those, 21% are Misadventure, 18% Circulatory, and 43% Cancer. In the \$3–5 million band, 24% are Cancer, 16% are Circulatory, and 20% are Motor Vehicle Accident deaths.

Experience by Underwriting Status

Over 94% of the Cancer claims and over 84% of Circulatory claims are Standard policies. All Motor Vehicle Accidents, Aviation, and Other Accident deaths were underwritten as Standard.

Experience by Reinsurance Status

Over 73% of Circulatory and Cancer deaths and 90% of Misadventure deaths are reinsured automatically.

Experience by Smoking Status

Over 43% Nonsmoker and 33% Smoker deaths are Cancer. Cardiovascular deaths account for 15% and 20% in the nonsmoker and smoker classes, respectively.

TABLE 7

NUMBER OF CLAIMS FOR EACH CAUSE OF DEATH BY SEX AND ISSUE AGES

Category	All	Male	Female	Issue Ages							
				Less than 20	20-29	30-39	40-49	50-59	60-69	70-79	80 and Over
Other Accident	23	21	2	0	0	4	11	5	2	1	0
Homicide	8	8	0	0	0	1	4	1	1	1	0
Suicide	16	15	1	0	3	3	7	1	2	0	0
Aviation	8	8	0	0	1	0	5	2	0	0	0
Motor Vehicle	14	14	0	0	2	1	7	3	1	0	0
"Misadventure"	69	66	3	0	6	9	34	12	6	2	0
Cardiovascular	52	42	10	0	0	5	17	18	8	4	0
Cerebrovascular	4	4	0	0	0	0	1	0	3	0	0
Circulatory	56	46	10	0	0	5	18	18	11	4	0
Respiratory	9	5	4	0	0	0	0	5	3	0	1
Pneumonia	7	6	1	0	1	3	1	1	0	1	0
All Respiratory	16	11	5	0	1	3	1	6	3	1	1
Cancer	129	102	27	0	0	4	36	46	37	6	0
AIDS	6	6	0	0	1	1	4	0	0	0	0
Other Disease	10	9	1	0	0	1	3	2	4	0	0
Digestive	4	4	0	0	0	1	1	0	2	0	0
Endocrine	1	1	0	0	0	0	0	0	1	0	0
Genitourinary	2	2	0	0	0	0	0	1	1	0	0
Nervous System	5	5	0	0	1	0	1	1	2	0	0
Other	22	21	1	0	1	2	5	4	10	0	0
Unknown	14	14	0	0	0	2	5	2	2	3	0
All	312	266	46	0	9	26	103	88	69	16	1

TABLE 8

NUMBER OF CLAIMS FOR EACH CAUSE OF DEATH BY POLICY YEARS AND CLASSIFICATION AMOUNT

Category	Policy Years								Amounts		
	1	2	3	4	5	6-10	11-15	16 and Over	\$1-3 M	\$3-5 M	\$5 M and Over
Other Accident	5	6	2	1	0	8	1	0	22	1	0
Homicide	3	0	1	1	0	2	1	0	7	0	1
Suicide	6	1	3	2	0	4	0	0	14	2	0
Aviation	1	1	2	2	1	1	0	0	8	0	0
Motor Vehicle	2	1	0	8	0	3	0	0	7	5	2
“Misadventure”	17	9	8	14	1	18	2	0	58	8	3
Cardiovascular	13	7	2	5	3	19	2	1	46	4	2
Cerebrovascular	0	0	0	4	0	0	0	0	4	0	0
Circulatory	13	7	2	9	3	19	2	1	50	4	2
Respiratory	1	1	1	0	0	4	2	0	9	0	0
Pneumonia	1	1	3	1	0	1	0	0	6	1	0
All Respiratory	2	2	4	1	0	5	2	0	15	1	0
Cancer	9	17	25	24	7	37	9	1	116	6	7
AIDS	3	0	0	0	0	3	0	0	5	1	0
Other Disease	2	0	0	4	0	3	1	0	6	2	2
Digestive	0	0	0	0	0	3	0	1	4	0	0
Endocrine	0	0	0	1	0	0	0	0	1	0	0
Genitourinary	0	0	0	0	1	1	0	0	2	0	0
Nervous System	1	0	1	0	0	3	0	0	4	1	0
Other	3	0	1	5	1	10	1	1	17	3	2
Unknown	4	0	2	1	0	6	1	0	11	2	1
All	51	35	42	54	12	98	17	3	272	25	15

TABLE 9
 NUMBER OF CLAIMS FOR EACH CAUSE OF DEATH
 BY SMOKING, UNDERWRITING, AND REINSURANCE STATUS

Category	Smoking Status			Underwriting Status		Reinsurance Status		
	Nonsmoker	Smoker	Aggregate	Standard	Substandard	Automatic	Facultative	Shopped
Other Accident	20	2	1	23	0	23	0	0
Homicide	7	1	0	7	1	5	3	0
Suicide	16	0	0	14	2	15	1	0
Aviation	8	0	0	8	0	8	0	0
Motor Vehicle	14	0	0	14	0	11	3	0
"Misadventure"	65	3	1	66	3	62	7	0
Cardiovascular	40	8	4	43	9	37	15	0
Cerebrovascular	3	1	0	4	0	4	0	0
Circulatory	43	9	4	47	9	41	15	0
Respiratory	5	4	0	5	4	9	0	0
Pneumonia	7	0	0	7	0	7	0	0
All Respiratory	12	4	0	12	4	16	0	0
Cancer	114	13	2	121	8	103	26	0
AIDS	6	0	0	6	0	6	0	0
Other Disease	6	4	0	8	2	8	2	0
Digestive	1	3	0	4	0	3	1	0
Endocrine	1	0	0	1	0	1	0	0
Genitourinary	2	0	0	2	0	2	0	0
Nervous System	4	0	1	4	1	3	2	0
Other	14	7	1	19	3	17	5	0
Unknown	10	4	0	12	2	10	4	0
All	264	40	8	283	29	255	57	0

APPENDIX A
LIST OF PARTICIPANTS
1995 INTERCOMPANY MORTALITY STUDY

Allianz Life Insurance Company of North America
American United Life Insurance Company
Business Men's Assurance Company of America
Continental Assurance Company (RE)
Employers Reassurance Corporation

Equitable Life Assurance Society (RE)
Life Reassurance Corporation of America
Manufacturers Life Insurance Company (RE)
Munich American RE
Mutual Life of Canada (US)

Reinsurance Group of America Incorporated (US)
Reinsurance Group of America Incorporated (Canada)
Security Life of Denver

APPENDIX B

TABLE B-1

LIST OF LARGE CLAIMS OVER \$5 MILLION ON ONE LIFE FOR THE PERIOD 1995

Claim	Direct Face Amount	Sex	Age Group	Policy Year	Smoking Class	Rating	Cause of Death
1	5.00 M	Female	40-49	6-10	Nonsmoker	100%	Cancer
2	5.00 M	Male	40-49	1	Nonsmoker	100	Homicide
3	5.00 M	Male	40-49	4	Nonsmoker	100	Cardiovascular
4	10.00 M	Male	40-49	4	Nonsmoker	100	Motor Vehicle
5	10.00 M	Male	40-49	4	Nonsmoker	100	Motor Vehicle
6	5.00 M	Male	40-49	6-10	Nonsmoker	100	Unknown
7	6.00 M	Male	40-49	6-10	Nonsmoker	100	Cancer
8	5.00 M	Male	50-59	4	Nonsmoker	100	Cancer
9	10.00 M	Male	50-59	4	Smoker	100	Cancer
10	5.00 M	Male	50-59	6-10	Nonsmoker	100	Other Disease
11	6.28 M	Female	60-69	2	Nonsmoker	100	Cardiovascular
12	5.00 M	Male	60-69	2	Nonsmoker	100	Cancer
13	5.00 M	Male	60-69	2	Nonsmoker	100	Cancer
14	5.00 M	Male	60-69	2	Nonsmoker	100	Cancer
15	5.00 M	Male	60-69	4	Nonsmoker	100	Other Disease

TABLE B-2

LIST OF LARGE CLAIMS OVER \$5 MILLION ON ONE LIFE FOR THE PERIOD 1987-94

Claim	Direct Face Amount	Sex	Age Group	Policy Year	Smoking Class	Rating	Cause of Death
1	6.50 M	Male	20-29	11-15, 16 and Over	Aggregate	100%	Suicide
2	5.00 M	Female	30-39	6-10	Nonsmoker	100	Suicide
3	13.30 M	Female	30-39	6-10	Aggregate	100	
4	21.00 M	Female	30-39	6-10	Aggregate	100	
5	8.00 M	Male	30-39	2-4	Nonsmoker	100	
6	11.00 M	Male	30-39	6-10	Aggregate	100	Cardiovascular
7	5.00 M	Male	30-39	11-15	Aggregate	100	Cardiovascular
8	5.00 M	Male	40-49	1	Smoker	100	Cardiovascular
9	5.00 M	Male	40-49	1	Aggregate	100	Cardiovascular
10	5.00 M	Male	40-49	1	Aggregate	100	Cardiovascular
11	5.00 M	Male	40-49	1	Smoker	100	Cardiovascular
12	5.00 M	Male	40-49	1	Smoker	250	
13	5.50 M	Male	40-49	1	Nonsmoker	100	
14	8.70 M	Male	40-49	1	Nonsmoker	100	
15	12.50 M	Male	40-49	1	Aggregate	100	Aviation
16	15.00 M	Male	40-49	1	Nonsmoker	100	Aviation
17	15.00 M	Male	40-49	1	Nonsmoker	100	Aviation
18	7.50 M	Male	40-49	3	Nonsmoker	100	Aviation
19	5.00 M	Male	40-49	4	Nonsmoker	100	Unknown
20	8.00 M	Male	40-49	4	Aggregate	100	Cerebrovascular
21	5.00 M	Male	40-49	5	Nonsmoker	100	Cancer
22	5.00 M	Male	40-49	6-10	Nonsmoker	100	Other Accident
23	7.50 M	Male	40-49	6-10	Nonsmoker	100	Cancer
24	10.00 M	Male	40-49	6-10	Nonsmoker	100	Cancer
25	14.36 M	Male	40-49	6-10	Smoker	175	Cardiovascular
26	11.25 M	Male	40-49	16 and Over	Aggregate	100	Nervous System
27	9.00 M	Female	50-59	4	Nonsmoker	100	Cancer
28	6.42 M	Female	50-59	16 and Over	Aggregate	100	Unknown
29	5.00 M	Male	50-59	1	Nonsmoker	100	Other Accident
30	9.00 M	Male	50-59	1	Nonsmoker	200	Cancer
31	5.00 M	Male	50-59	1	Smoker	100	
32	9.75 M	Male	50-59	3	Nonsmoker	100	
33	10.84 M	Male	50-59	3	Aggregate	150	AIDS
34	5.00 M	Male	50-59	4	Nonsmoker	200	Cardiovascular
35	5.00 M	Male	50-59	4	Nonsmoker	100	Pneumonia
36	6.00 M	Male	50-59	4	Nonsmoker	100	Respiratory
37	15.80 M	Male	50-59	4-5	Nonsmoker	100, 175	
38	9.00 M	Male	50-59	5	Aggregate	100	
39	5.00 M	Male	50-59	6-10	Nonsmoker	200	Cardiovascular
40	5.00 M	Male	50-59	6-10	Nonsmoker	175	Endocrine
41	5.00 M	Male	50-59	6-10	Nonsmoker	175	Cardiovascular
42	5.00 M	Male	50-59	6-10	Aggregate	100	Cardiovascular
43	6.00 M	Male	50-59	6-10	Nonsmoker	100	Cancer
44	6.12 M	Male	50-59	6-10	Nonsmoker	100	Cancer
45	7.65 M	Male	50-59	6-10	Nonsmoker	250	Cardiovascular
46	9.12 M	Male	50-59	6-10	Smoker	100	Cancer
47	9.12 M	Male	50-59	6-10	Smoker	100	Cancer
48	10.00 M	Male	50-59	6-10	Nonsmoker	100	
49	10.81 M	Male	50-59	6-10	Aggregate	100	Cardiovascular
50	29.50 M	Male	50-59	6-10	Aggregate	100	Suicide
51	38.39 M	Male	50-59	6-10	Nonsmoker	100	Cardiovascular

TABLE B-2—Continued

Claim	Direct Face Amount	Sex	Age Group	Policy Year	Smoking Class	Rating	Cause of Death
52	7.12 M	Male	50-59	11-15	Aggregate	100	Cardiovascular
53	9.31 M	Male	50-59	16 and Over	Aggregate	100	Unknown
54	6.00 M	Female	60-69	6-10	Nonsmoker	100	Nervous System
55	10.00 M	Female	60-69	6-10	Nonsmoker	100	Cancer
56	9.00 M	Female	60-69	11-15	Aggregate	100	Cancer
57	5.00 M	Male	60-69	1	Nonsmoker	300	Cardiovascular
58	6.00 M	Male	60-69	1	Nonsmoker	150	Unknown
59	5.00 M	Male	60-69	2	Nonsmoker	300	Cardiovascular
60	5.00 M	Male	60-69	2	Nonsmoker	100	Cardiovascular
61	7.50 M	Male	60-69	2	Nonsmoker	175	
62	6.18 M	Male	60-69	3	Nonsmoker	100	Suicide
63	6.18 M	Male	60-69	3	Nonsmoker	100	Suicide
64*	5.00 M	Male	60-69	4	Nonsmoker	100	Cancer
65	5.00 M	Male	60-69	4	Aggregate	100	Cancer
66	6.20 M	Male	60-69	4	Nonsmoker	100	
67	5.00 M	Male	60-69	6-10	Aggregate	100	
68	5.00 M	Male	60-69	6-10	Nonsmoker	100	Cancer
69	9.25 M	Male	60-69	6-10	Aggregate	100	
70	10.00 M	Male	60-69	6-10	Nonsmoker	100	Cancer
71	10.00 M	Male	60-69	6-10	Nonsmoker	100	Cancer
72	10.00 M	Male	60-69	6-10	Nonsmoker	100	Cancer
73	10.43 M	Male	60-69	6-10	Nonsmoker	100	Unknown
74	18.00 M	Male	60-69	6-10	Nonsmoker	100	Cancer
75	18.00 M	Male	60-69	6-10	Nonsmoker	100	Cancer
76	9.00 M	Male	60-69	11-15	Aggregate	100	Cancer
77	15.26 M	Female	70-79	5	Nonsmoker	100	Cancer
78	7.50 M	Female	70-79	6-10	Aggregate	100	Cancer
79	7.50 M	Male	70-79	2	Nonsmoker	100	Other Disease
80	5.00 M	Male	70-79	6-10	Aggregate	100	Cardiovascular

*We are attempting to confirm the validity of this direct face amount. The reinsured face amount and claim were approximately \$385,000, and did not have a significant impact on the overall mortality ratio.

APPENDIX C
STANDARD DEVIATIONS

In the interest of readability, this report does not contain standard deviation of the numerous mortality ratios that are quoted.

Standard deviation can be obtained by the use of the following formula:

$$\text{Standard Deviation of Mortality Ratio} = \frac{\text{Mortality Ratio}}{\sqrt{\text{Actual Number of Deaths}}}$$

It is necessary to use the number of deaths in this formula even when the mortality ratio involved is based on an amount of insurance. The range of virtual certainty is plus or minus three times the standard deviation. Plus or minus the standard deviation itself indicates 68% likelihood. This assumes a normal distribution whereas the formula is binomial.

The mortality ratios for the 1995 and the 1987-95 experience by amount of insurance and their standard deviations are shown on the following pages.

TABLE C-1
 STANDARD DEVIATIONS* FOR THE PERIOD 1995
 MORTALITY RATIOS BASED ON THE 1975-80 BASIC TABLES

Categories	Actual Claims	Mortality Ratio	Standard Deviation
All Combined	312	50.6%	2.87
Sex			
Male	266	49.0%	3.01
Female	46	61.4	9.05
Issue Ages			
40-49	103	77.0%	7.58
50-59	88	39.1	4.17
60-69	69	62.8	7.57
Policy Years			
1	51	39.2%	5.49
2	35	36.2	6.12
3	42	27.7	4.28
4	54	102.5	13.95
5	12	13.0	3.75
6-10	98	63.1	6.38
Classification Amounts			
\$1,000,000-\$2,999,999	272	48.3%	2.93
Smoking Status			
Nonsmoker	264	44.5%	2.74
Smoker	40	156.1	24.68
Underwriting Status			
Standard	283	51.2%	3.04
Reinsurance Status			
Automatic	255	45.1%	2.82
Facultative	57	56.6	7.49
Plan of Insurance			
Whole Life	18	34.2%	8.05
Term	145	58.1	4.83
Universal Life	46	33.0	4.87
Unknown	103	69.8	6.88
Reinsurance Method			
Coinsurance	173	57.5%	4.37
Yearly Renewable Term	139	47.0	3.99
Unknown	0	0.0	N/A

*Standard deviation calculations are done for cases in which at least 35 deaths are observed.

TABLE C-2
 STANDARD DEVIATIONS* FOR THE PERIOD 1987-95
 MORTALITY RATIOS BASED ON THE 1975-80 BASIC TABLES

Categories	Actual Claims	Mortality Ratio	Standard Deviation
All Combined	1,698	61.5%	1.49
Sex			
Male	1,493	59.7%	1.54
Female	205	76.2	5.32
Issue Ages			
30-39	154	75.7%	6.10
40-49	479	64.0	2.93
50-59	568	66.4	2.79
60-69	384	63.0	3.22
70-79	85	28.9	3.13
Policy Years			
1	243	66.0%	4.23
2	201	50.2	3.54
3	233	54.9	3.59
4	201	59.1	4.17
5	137	39.6	3.39
6-10	535	75.0	3.24
11-15	111	68.0	6.46
16 and Over	37	124.8	20.52
Classification Amounts			
\$1,000,000-\$2,999,999	1,479	61.7%	1.60
\$3,000,000-\$4,999,999	127	47.2	4.19
\$5,000,000 and Over	92	75.0	7.82
Smoking Status			
Nonsmoker	1,144	52.6%	1.56
Smoker	201	119.1	8.40
Aggregate	353	72.5	3.86
Underwriting Status			
Standard	1,485	62.2%	1.61
Substandard	213	57.3	3.93
Reinsurance Status			
Automatic	1,100	52.8%	1.59
Facultative	594	68.3	2.80

*Standard deviation calculations are done for cases in which at least 35 deaths are observed.

APPENDIX D

TABLE D-1

1995 EXPERIENCE BY NUMBER OF POLICIES
MORTALITY RATIOS BASED ON THE 1975-80 BASIC TABLES

Policy Years	Exposure	Actual Claims	Expected Claims	Mortality Ratio
Issue Ages 30-39				
1	27,089	4	17.66	22.6%
2	20,295	3	16.07	18.7
3	14,059	5	14.62	34.2
4	8,660	0	10.59	0.0
5	6,222	2	8.62	23.2
6-10	9,732	10	17.40	57.5
11-15	793	2	2.38	84.0
16 and Over	32	0	0.23	0.0
All	86,882	26	88.00	29.7%
Issue Ages 40-49				
1	28,466	25	32.14	77.8%
2	21,318	12	34.41	34.9
3	16,065	10	34.49	29.0
4	10,720	19	27.48	69.2
5	7,886	4	23.23	17.2
6-10	11,716	28	43.57	64.3
11-15	916	3	5.79	51.8
16 and Over	60	2	0.86	231.5
All	97,147	103	201.95	51.0%
Issue Ages 50-59				
1	12,137	10	26.49	37.7%
2	8,627	4	25.79	15.5
3	6,308	22	23.74	92.7
4	4,215	13	19.68	66.1
5	3,088	2	17.26	11.6
6-10	4,807	30	39.15	76.6
11-15	614	6	9.25	64.9
16 and Over	45	1	1.82	55.0
All	39,842	88	163.18	53.9%
Issue Ages 60-69				
1	2,878	3	11.79	25.4%
2	1,945	15	11.65	128.8
3	1,518	3	13.04	23.0
4	1,198	19	12.41	153.2
5	1,072	2	12.67	15.8
6-10	1,776	25	29.46	84.9
11-15	211	2	6.99	28.6
16 and Over	18	0	1.36	0.0
All	10,616	69	99.37	69.4%

TABLE D-2
 1995 EXPERIENCE BY AMOUNT (000's)
 MORTALITY RATIOS BASED ON THE 1975-80 BASIC TABLES

Policy Years	Exposure	Actual Claims	Expected Claims	Mortality Ratio
Issue Ages 30-39				
1	5,858,026	460	3,878	11.8%
2	4,352,551	280	3,526	8.0
3	3,387,527	1,345	3,575	37.6
4	2,519,218	0	3,119	0.0
5	1,906,913	625	2,693	23.2
6-10	4,111,983	2,286	7,656	29.9
11-15	521,279	308	1,572	19.6
16 and Over	13,024	0	85	0.0
All	22,670,522	5,304	26,104	20.3%
Issue Ages 40-49				
1	7,552,926	3,303	8,786	37.6%
2	5,641,403	3,303	9,422	35.1
3	4,556,602	1,885	10,050	18.8
4	3,382,964	15,413	8,925	172.7
5	2,728,064	456	8,297	5.5
6-10	5,805,428	27,320	22,651	120.6
11-15	663,748	3,797	4,314	88.0
16 and Over	27,838	554	346	160.2
All	30,358,973	56,031	72,791	77.0%
Issue Ages 50-59				
1	4,104,315	2,482	9,234	26.9%
2	3,036,445	589	9,248	6.4
3	2,320,171	3,714	8,944	41.5
4	1,807,082	6,683	8,732	76.5
5	1,321,365	160	7,589	2.1
6-10	3,016,693	13,110	25,759	50.9
11-15	474,128	2,732	7,096	38.5
16 and Over	23,999	800	818	97.8
All	16,104,199	30,270	77,421	39.1%
Issue Ages 60-69				
1	1,241,383	1,544	5,353	28.8%
2	939,777	7,866	6,006	131.0
3	744,123	1,943	6,706	29.0
4	683,189	11,757	7,641	153.9
5	605,265	2,045	7,508	27.2
6-10	1,190,069	12,125	20,029	60.5
11-15	185,396	676	6,410	10.5
16 and Over	10,597	0	744	0.0
All	5,599,798	37,955	60,397	62.8%

APPENDIX E

TABLE E-1

1995 EXPERIENCE BY NUMBER OF POLICIES
MORTALITY RATIOS BASED ON THE 1975-80 BASIC TABLES

Plan of Insurance by Policy Years	Exposure	Actual Claims	Expected Claims	Mortality Ratio
Whole Life				
1	1,002	0	2.18	0.0%
2	1,000	1	2.99	33.4
3	841	1	3.02	33.1
4	1,090	5	4.08	122.7
5	924	2	3.82	52.4
6-10	2,545	6	13.01	46.1
11-15	346	3	4.96	60.5
16 and Over	30	0	1.08	0.0
All	7,778	18	35.00	51.2%
Term				
1	47,133	28	54.69	51.2%
2	35,274	19	55.26	34.4
3	25,553	21	53.71	39.1
4	15,221	28	40.73	68.7
5	10,444	6	32.66	18.4
6-10	13,485	33	51.09	64.6
11-15	678	9	6.04	149.0
16 and Over	54	1	1.03	96.6
All	147,840	145	295.00	49.1%
Universal Life				
1	5,544	2	11.26	17.8%
2	3,678	5	9.80	51.0
3	2,755	4	10.11	39.6
4	2,542	8	11.08	72.2
5	2,568	0	13.66	0.0
6-10	6,768	24	43.07	55.7
11-15	939	2	8.86	22.6
16 and Over	6	1	0.07	1,443.0
All	24,800	46	108.00	42.6%
Unknown				
1	19,496	21	31.00	67.7%
2	13,875	10	28.15	35.5
3	9,833	16	24.93	64.2
4	6,645	13	20.41	63.7
5	4,920	4	17.99	22.2
6-10	6,586	35	35.30	99.2
11-15	762	3	8.30	36.1
16 and Over	79	1	2.29	43.6
All	62,195	103	168.00	61.2%

TABLE E-2
 1995 EXPERIENCE BY AMOUNT ('000's)
 MORTALITY RATIOS BASED ON THE 1975-80 BASIC TABLES

Plan of Insurance by Policy Years	Exposure	Actual Claims	Expected Claims	Mortality Ratio
Whole Life				
1	876,617	0	2,262.34	0.0%
2	951,231	302	3,959.78	7.6
3	819,004	1,000	3,664.88	27.3
4	999,085	3,826	5,019.78	76.2
5	836,116	1,870	4,604.11	40.6
6-10	2,850,561	6,168	18,179.86	33.9
11-15	382,483	1,776	5,614.69	31.6
16 and Over	10,794	0	439.66	0.0
All	7,725,891	14,941	43,745.00	34.2%
Term				
1	11,530,917	8,288	15,667	52.9%
2	8,605,058	6,707	15,920	42.1
3	7,040,312	3,006	16,838	17.9
4	4,887,366	21,395	14,723	145.3
5	3,518,753	1,697	12,227	13.9
6-10	6,196,916	16,955	29,604	57.3
11-15	565,583	6,198	5,768	107.4
16 and Over	16,967	280	275	101.8
All	42,361,873	64,527	111,023	58.1%
Universal Life				
1	2,321,222	874	5,759	15.2%
2	1,807,650	2,829	6,096	46.4
3	1,428,797	1,580	6,875	23.0
4	1,298,238	2,900	7,503	38.7
5	1,375,928	0	9,473	0.0
6-10	3,464,685	12,847	26,016	49.4
11-15	483,421	591	4,526	13.1
16 and Over	5,688	274	56	493.3
All	12,185,630	21,895	66,303	33.0%
Unknown				
1	4,904,619	3,561	8,767	40.6%
2	3,195,194	2,238	7,356	30.4
3	2,221,675	3,807	6,491	58.7
4	1,601,733	6,002	6,038	99.4
5	1,162,450	491	4,960	9.9
6-10	2,508,489	19,701	14,379	137.0
11-15	532,426	1,707	5,592	30.5
16 and Over	47,241	800	1,319	60.7
All	16,173,827	38,307	54,900	69.8%