ANALYSIS OF MORTALITY EXPERIENCE
UNDER
VARIABLE AND FIXED INDIVIDUAL ANNUITIES
DURING THE DEFERRED (ACCUMULATION) PERIOD

From Contract Anniversaries in 1991 to Anniversaries in 1995

Robert J. Johansen, Chair
Task Force on Mortality Guarantees in Variable Products

Parturient montes, nascetur ridiculus mus.
Horace.

8-2006

ABSTRACT

This study of mortality on deferred Variable annuities over the period 1991-1995 was designed to test the adequacy of the 1994 MGDB Valuation Mortality Table to cover presumed extra mortality on Variable annuities (VAs) with Substantial Minimum Guaranteed Death Benefits (MGDBs) as compared with VAs with Minimal MGDBs. A parallel study of Fixed Annuity experience was carried out as a control. The small number (9) of data contributors and an imbalance because of three large companies created problems of preserving confidentiality of contributed data and raised questions as to whether the study represents the industry as a whole. In any case, the study does not support a finding of higher mortality on VAs with Substantial MGDBs.

Expected deaths were computed also on the Annuity 2000 Table. The results raise questions as to its continuing safety as a valuation table for individual annuities.

The study also shows that mortality levels on Qualified NonPension Trust business are significantly lower than on Nonqualified business.

PURPOSE AND DESIGN OF THE STUDY

The study was conducted under the auspices of the Society of Actuaries Task Force on Mortality Guarantees in Variable Products[1] at the request of the National Association of Insurance Commissioners Life and Health Actuarial Task Force (LHATF). The purpose of the study was to test the adequacy of the 1994 MGDB Valuation Mortality Table to cover possible adverse selection by annuitants who were not in good health at issue or later. It was thought that such annuitants would be attracted to a VA with a Substantial MGDB as a hedge in the event of untimely death during a period of economic stringency. The instructions (Appendix A) to contributing companies did not define

[1] Initially: Thomas A. Campbell, Abraham S. Gootzeit, Robert J. Johansen (Chair), Michael W. Pado, Stephen J. Preston (Vice-Chair), Timothy J. Ruark; Final: Jeffery N. Altman, Thomas A. Campbell, Peter J. Gourley, Robert J. Johansen (Chair), Michael W. Pado (Vice-Chair).

"Minimal" or "Substantial"; rather, examples were listed, viz., "Account Value" for Minimal and "Ratchet," "Reset" and "Roll Up" for Substantial MGDB. In addition, the study was structured to yield as a by-product a test as to whether the mortality experience under Qualified NonPension Trust business was lower than that under Nonqualified business as suggested in the paper, Review of Adequacy of 1983 Individual Annuity Mortality Table.[2] This hypothesis was suggested as an explanation for the reversal in the 1976—86 annuity mortality study of the historic finding that refund mortality is higher than nonrefund reflecting selection of nonrefund annuities by healthier lives.

Ostensibly, this is a report of the Task Force on Mortality Guarantees in Variable Products. It is rather a paper written by the Chair and submitted to the other members of the Task Force for review. There are several reasons why this is a paper and not a Task Force Report: one is the need to preserve confidentiality as discussed below, another is the inclusion of the test of the hypothesis originated by the Chair that lower mortality levels would be experienced on Qualified NonPension trust business than on Nonqualified and a third is what are essentially opinions expressed as to the reliability and suitability of the results of the study.

The Task Force members have been asked to agree only that this report/paper be submitted for publication. It does not seem fair to hold them responsible for conclusions drawn from worksheets they have not seen. Jack Luff, Experience Studies Actuary on the Society of Actuaries Staff, has been asked to check the tables in this report against the Excel worksheets and to review the factual statements in the paper. The author takes full responsibility for the opinions and interpretations expressed in the paper.

The mortality study, by number of contracts, covers the period from contract anniversaries in 1991 to anniversaries in 1995, on Variable Annuity (VA) contracts during the accumulation period. As a control, a corresponding study was constructed of the experience on fixed annuities. Categories of business to be studied were: Qualified NonPension Trust, Nonqualified, Pension Trust and Qualification Status Unknown. Expected deaths were computed on the 1994 MGDB table and on the Annuity 2000 Table.

A set of instructions (Appendix A) was sent to the twenty companies issuing individual Variable Annuities that had indicated they could contribute to a study of mortality of annuitants during the accumulation period, i.e., prior to annuitization. Only nine companies contributed data[3]. Of the nine, seven contributed to the Variable Annuity

[2]For a discussion on the split between Qualified NonPension Trust and Nonqualified, see Johansen, Robert J., Review of Adequacy of 1983 Individual Annuity Mortality Table, TSA, 1995, Vol. XLVII, p. 211.
[3] AEGON USA Inc., IDS Life Insurance Co., Integrity Life Insurance Co., Keyport Life Insurance Co., Lutheran Brotherhood, New York Life Insurance Co., Northwestern Mutual Life Insurance Co., Teachers Insurance & Annuity Assn, Variable Annuity Life Insurance Co.

Study and seven to the Fixed Annuity Study. The Variable Annuity exposures totaled 10.6 million contract years; the Fixed Annuity, 9.1 million contract years. The three largest contributors to the Variable Annuity Study accounted for a very significant part of the total exposures. The three largest contributors to the Fixed Annuity Study accounted for a somewhat smaller, but still significant, percentage of the total exposures.

Furthermore, the imbalance created by the preponderance of experience from the three large companies was worsened when the experience was analyzed with respect to various categories of the data. The imbalance created two inherent problems.

The first problem was how to preserve the confidentiality of the data contributed by the large companies while still providing some useful mortality analyses as originally intended. Several methods were tried to lessen the effects of the imbalance, but were found to be ineffective. The second problem was rather obvious: the results of the study might not represent a broad section of the industry. The second problem will be discussed later in this report as part of the review of the reliability of the data.

In order to preserve confidentiality of the contributed data, the published report does not include the usual tabulations of exposures, expected deaths and actual deaths. Nor are detailed mortality ratios by duration group and age group shown. It is customary in experience studies to include the proportions of the experience or parts of it contributed by each company. These are also omitted.

For each category studied, the tables show age-weighted mortality ratios for contract years 1, 2-5, 6-10 and 1-10. While this may be considered as diminishing the usefulness of the data, the usefulness has already been diminished because of the small number of contributors and the imbalance of the contributions. On the other hand, the use of age-weighted mortality ratios adjusts for the much larger proportion of exposures at advanced ages in the Minimal MGDB experience, enhancing the comparability of the mortality ratios.

Please note that references to the imbalance of the contributions refer to a fact. The Task Force is grateful to those companies that contributed data to the study and made this report possible.

A description of the calculation of the weights, the resulting weights and an outline of the process of age weighting appear in Appendix C.

The study was designed to compare the mortality experience on VAs with Substantial MGDB v. VAs with Minimal MGDB. Since the data for VAs with Substantial MGDB were virtually nil at durations beyond 10, the tables of age-weighted mortality ratios include only experience for duration groups 1, 2-5, 6-10 and 1-10.

The weighted mortality ratios permit drawing broad conclusions as to the suitability of the 1994 MGDB Valuation Table[4] for valuing MGDB benefits. Mortality ratios based on the Annuity 2000 Table provide an indication as to the suitability of the 2000 Table for the valuation of individual annuities. Ratios less than 100 percent based on the 1994 MGDB Table would be favorable since the risk is excessive death claims. Ratios in excess of 100 percent based on the Annuity 2000 Table would be favorable.

The variable and fixed annuity experiences were to be submitted split among Qualified NonPension Trust business, Pension Trust business, Nonqualified business[5] and Qualified Status Unknown.

The Pension Trust business contributed to the study was too small to permit any kind of detailed analysis, while the Qualification Status Unknown data was nil. Consequently, the published study discusses only two kinds of individual annuity business: Qualified NonPension Trust business and Nonqualified business.

ANALYSIS OF DEFERRED PERIOD ANNUITY MORTALITY EXPERIENCE
Based on the 1994 MGDB Mortality Table

As noted earlier, the main purpose of this study was to test the hypothesis that persons who were impaired at issue or became impaired after issue would be attracted to VAs with Substantial MGDB provisions in order to assure that any investment losses existing at the time of death would be made whole.

If a significant number of impaired applicants purchased Variable Annuities with Substantial Guaranteed Minimum Death Benefits, we would expect to find relatively higher mortality in the early contract years and higher mortality, generally, on contracts with Substantial MGDBs than on contracts with Minimal MGDBs. Neither of these effects was observed. On the other hand, if there were annuitant type selection, we would expect lower mortality in the early durations and we would not expect higher mortality on contracts with substantial MGDBs. (Since the first contract year experience on Minimal MGDB contracts was rather small, we should also compare the mortality ratios for contract years 2-5 combined.) Mortality for contracts with substantial MGDBs is, in fact, generally lower than for contracts with minimal MGDBs.

During the period studied, marketing of VAs with Minimal MGDB was being phased out while marketing of VAs with Substantial MGDB was being phased in. Consequently, exposures in the early contract years are more heavily weighted toward contracts with Substantial MGDB while, in the later contract years, the reverse is found. This is

[4] See Appendix B for a description of the 1994 MGDB valuation mortality table.
[5] In previous studies of individual annuity experience, only pension trust business had been split out.

illustrated in Table 1, below, based on exposures for all issue ages combined for the respective contract year groups shown in the Table 1 heading. Similar uneven distributions would likely be found within the duration groups so that VAs with Substantial MGDB would be heavier in the earlier years, while VAs with Minimal MGDB would be heavier at the higher durations within each duration group. Considering that there is some continuing effect of selection and that there is usually some year-to-year mortality improvement, we might expect the Substantial MGDB mortality level to be somewhat lower than the Minimal MGDB. To some extent then, the Minimal and Substantial experiences are not strictly comparable. While this could diminish the study's effectiveness, the differences in mortality levels are, for the most part, quite substantial as shown in Table 2.

TABLE 1

DEMONSTRATION OF ISSUE VARIATIONS IN EARLY AND LATER DURATIONS

Ratios Are Based on Exposures for All Issue Ages Combined for Contract Year Groups Compared

	MALE LIVES			FEMALE LIVES		
	CONTRACT YEAR GROUPS					
	1/1-5	1-5/1-10	6-10/1-10	1/1-5	1-5/1-10	6-10/1-10
QUALIFIED NONPENSION TRUST BUSINESS						
VARIABLE ANNUITIES						
SUBST	27.0%	82.5%	17.5%	26.6%	81.7%	18.3%
MIN	16.3	53.7	46.3	16.3	57.1	42.9
TOT	19.8	60.7	39.3	19.6	63.1	36.9
FIXED ANNUITIES						
TOT	26.4	69.8	30.2	27.4	73.9	26.1
NONQUALIFIED BUSINESS						
VARIABLE ANNUITIES						
SUBST	30.9%	83.8%	16.2%	31.9%	83.8%	16.2%
MIN	23.7	42.6	57.4	23.0	42.5	57.5
TOT	30.0	74.4	25.6	31.0	76.1	23.9
FIXED ANNUITIES						
TOT	21.0	69.4	30.6	21.8	71.9	28.1

Table 2 below shows age-weighted mortality ratios, based on the 1994 MGDB Mortality Table, separately for male and female data. Since the substantial MGDB VA experience did not extend beyond the tenth contract year, mortality ratios are shown only for durations 1, 2-5, 6-10 and 1-10.

The Fixed Annuity experience, included as a control, indicates that the VA experience is reasonably in line with the Fixed Annuity experience for Qualified business. For the most part, the Nonqualified Fixed Annuity experience is notably higher than the Nonqualified VA experience. See also Table 3 for a comparison of Fixed Annuity business with Total VA business.

TABLE 2

AGE WEIGHTED MORTALITY RATIOS ON 1994 MGDB VALUATION MORTALITY TABLE

	Male Lives			Female Lives		
Contract Year Group	Variable Subst'l MGDB	Variable Minimal MGDB	Fixed Annuity	Variable Subst'l MGDB	Variable Minimal MGDB	Fixed Annuity
			QUALIFIED NONPENSION TRUST BUSINESS			
1	29%	41%	31%	28%	54%	29%
2-5	46	60	60	52	66	64
6-10	43	61	63	52	71	71
1-10	42%	59%	57%	47%	68%	60%
			NONQUALIFIED BUSINESS			
1	37%	55%	43%	40%	47%	88%
2-5	53	74	83	76	90	147
6-10	45	71	102	69	90	144
1-10	47%	72%	83%	65%	86%	136%

Generally, Qualified NonPension Trust business experienced lower mortality than Nonqualified business, a result that had been anticipated when setting the design for the study. The lower mortality probably results from a large proportion of 403(b) contracts on teachers and on professionals employed by non-profit organizations. According to several studies published by the National Center for Health Statistics, those who are more highly educated experience significantly lower mortality than the less educated. The results may explain the apparent anomaly in the 1981-86 annuity

study where refund experience showed lower mortality than nonrefund business; 403(b) contracts would likely be more heavily represented in the refund experience.

The author suggests that future studies of mortality of individual annuitants in the payout phase provide for Qualified NonPension Trust business as a separate category from Nonqualified. Each group should in turn be separated into refund and nonrefund business.

ANALYSIS OF DEFERRED PERIOD ANNUITY MORTALITY EXPERIENCE
Based on the Annuity 2000 Valuation Mortality Table

Table 3 below has been included to provide a guide as to the continuing suitability of the Annuity 2000 individual annuity valuation table.

TABLE 3

AGE-WEIGHTED MORTALITY RATIOS ON ANNUITY 2000 VALUATION MORTALITY TABLE

	Male Lives				Female Lives			
Contract Year Group	VA Subst MGDB	VA Min MGDB	VA Total	Fixed Annuity	VA Subst MGDB	VA Min MGDB	VA Total	Fixed Annuity
QUALIFIED NONPENSION TRUST BUSINESS								
1	40%	56%	48%	43%	37%	70%	50%	39%
2-5	63	82	75	83	68	85	78	84
6-10	59	84	81	86	69	93	90	94
1-10	57%	81%	74%	78%	62%	88%	80%	79%
11 & Over	NA	80%	NA	98%	NA	99%	NA	111%
NONQUALIFIED BUSINESS								
1	52%	76%	55%	59%	53%	62%	55%	118%
2-5	73	102	77	115	101	120	103	198
6-10	62	98	79	142	92	121	107	193
1-10	65%	99%	73%	115%	87%	115%	92%	183%
11 & Over	NA	118%	NA	152%	NA	156%	NA	193%

NA = Not Available

A column for Total Variable Annuity experience has been included in Table 3 to permit a more complete evaluation of the suitability of the Annuity 2000 table and mortality ratios for durations 11 and over have been shown where available.

Based on the data in Table 3 and considering that the experience is about ten years old, one cannot say with confidence that the Annuity 2000 Table will continue to be safe. However, this experience is based on annuities in the deferred period; different results may be obtained from the experience on annuities in the payout phase. Because of the small number of contributing companies and the imbalance discussed earlier in this report, there are reservations as to whether the results of this study are representative of the industry as a whole – industry mortality ratios may be higher. A new study of annuitant mortality experience is currently (2006) underway as noted later in this report.

HOW RELIABLE IS THE STUDY? DOES IT REPRESENT THE INDUSTRY?

The usual measure of reliability of a mortality study is the number of deaths in the various cells. When age-weighted mortality ratios are produced, it is necessary to review the original data cells. As expected, smaller numbers of deaths were found at younger ages reflecting lower probabilities of death; at the earlier durations of the Minimal MGDB business, which was being phased out during the period of the study, and at the later durations and very high ages of the Substantial MGDB business, which was being phased in during the same period. In most of the other cells, the deaths numbered in the hundreds. Consequently, it is safe to say that the results are sufficiently reliable to permit drawing the conclusions in the following section.

Considering that two or three very large companies provided the preponderance of the data for the three categories: VAs with Minimal MGDB, VAs with Substantial MGDB and Fixed Annuities, it cannot be assumed that the study represents the experience of the industry as a whole. On the other hand, there is no justification for assuming it does not. It is, however, quite reasonable to draw some conclusions from the study as outlined in the following “Conclusions” section.

CONCLUSIONS

The study was undertaken primarily to test whether the mortality under VAs with Substantial MGDBs would exceed that under Minimal MGDB business. The assumption is that persons with impaired longevity would be attracted to VAs with Substantial MGDB or that persons who became impaired would be more likely to persist. Under these assumptions, we should not find the usual lower mortality in the first year indicative of annuitant self-selection. Further, the VAs with Substantial MGDB would experience higher mortality than VAs with Minimal MGDB. (Recall that,

historically, nonrefund annuities in the payout phase had experienced lower mortality than refund reflecting self-selection by those who considered themselves likely to live longer.)

The study shows that, for both Qualified NonPension Trust business and Nonqualified business, VAs with Substantial MGDB experienced lower mortality than VAs with Minimal MGDB. Part of this difference probably arises from the VAs with Substantial MGDB being more heavily weighted toward the earlier durations in the 2 – 5 and 6 – 10 groups. The first contract year in both experiences showed the usual effects of selection by healthy lives. There is no evidence that Substantial MGDB business experienced worse mortality.

A conclusion can also be drawn that Qualified NonPension Trust business experiences lower mortality than Nonqualified business. As noted earlier, the expectation of this difference was the reason for requesting this split in the study. Both the VA business and the Fixed Annuity business exhibited this characteristic.

At the time of publication of this report (2006), the Individual Annuity Experience Committee's Subgroup on Individual Payout Annuity Experience (Bill Albright, Chair) is conducting an extensive study of recent intercompany mortality experience on individual annuities and structured settlement annuities. Contributing companies were asked to provide experience data separately for Qualified and Nonqualified business and separately for Fixed and Variable annuities. Further, a Committee to Develop a New Basis for Individual Annuity Valuation is being organized to produce one or more individual annuity mortality tables.

ACKNOWLEDGMENTS

The Task Force expresses its gratitude to those companies that contributed their data and made this study possible. The Task Force also wishes to express special thanks to Keith Hoffman, Sr. Program Mgr., Center for Medico-Actuarial Statistics, MIB for guiding companies in contributing data to a study that pioneered in unusual aspects of annuity mortality investigations and for his patience in trying ways to minimize the effects of the imbalance caused by the inclusion of the three large companies. Thanks are due also to Jack Luff, Experience Studies Actuary at the Society of Actuaries office for his suggestions in bringing the report to a conclusion and for final checking of the report.

POST SCRIPT

The author is not aware of any other intercompany study of the mortality of individual annuitants during the deferral (accumulation) period. In the past, mortality rates at ages

prior to retirement needed for individual annuity valuation mortality tables have been obtained from other sources such as group annuity active lives, experience on clerical employees (1949 individual annuity tables) or a large municipal employee group as used in construction of the 1971 group and individual annuity tables. This study of variable and fixed annuity experience during the deferral period suggests the use of deferred annuity experience at ages below 65 in the construction of future individual annuity mortality tables.

APPENDIX A

INSTRUCTIONS TO CONTRIBUTING COMPANIES

Please see separate document.

APPENDIX B

DESCRIPTION OF 1994 MGDB MORTALITY TABLE

The 1994 table was created for use in the MGDB valuation reserve formula (Guideline 34) developed by the American Academy of Actuaries MGDB Work Group and was adopted by the NAIC in 1997.

The original concept behind the 1994 MGDB table was that it should cover possible life insurance type adverse selection by annuitants in poor health seeking to benefit from a substantial MGDB. (The 1980 CSO Table had been suggested initially.) Adverse experience could also arise if there was a sharp drop in the stock market and the healthier lives cashed out their contracts, leaving impaired lives with substantial death benefits.

The 1994 MGDB Mortality Table was constructed by adding a 10 percent loading to the 1994 Group Annuity Basic Table and then graduating the resulting rates. The 1994 Group table was based on:

Ages 25-65: Civil Service Retirement System, active and retired
Ages 65-95: Group Annuity experience
Over Age 95: Social Security mortality rates

The 1994 Group Annuity Basic Table was chosen partly because there seemed to be little likelihood of selection by the persons in the underlying experiences except that employed persons have been found to have lower mortality than the general population.

APPENDIX C

DISCUSSION OF CALCULATION OF AGE-WEIGHTED MORTALITY RATIOS

As noted in the body of this report, age-weighted (age-adjusted) mortality ratios were used in reporting the results to afford some measure of confidentiality to data contributed by three large companies. The use of age-weighted mortality ratios is advantageous in its own right – it permits direct comparison of ratios from VAs with substantial MGDB, VAs with minimal MGDB, Fixed annuities and also Qualified as compared with Nonqualified. These ratios are directly comparable because, as computed, they have the same distribution by age group.

To obtain the weights, exposures of all Qualified Variable Annuities were totaled by attained age groups Under 40, 40-49, 50-59, 60-69, 70-79 and 80 & Up. The total for each age group was divided by the total of all ages combined to form a "standard" population adding to one million. Weights were computed separately for males and females.

An early and probably universally used standard for many years was the England and Wales standard million. United States Vital Statistics reports by cause of death for all ages combined used the 1940 census as the basis for a standard million. The 1940 standard was recently replaced by a projected 2000 Census standard population. The weights used for this report are shown below.

	WEIGHTS	
AGE GROUP	MALES	FEMALES
Under 40	370,094	390,860
40—49	323,158	333,570
50—59	204,055	200,116
60—69	92,899	69,798
70—79	9,633	5,538
80 & Up	161	118
ALL	1,000,000	1,000,000

"Actual" and "Expected" deaths on an age-weighted basis were computed separately for each duration group: 1, 2-5, 6-10 and 1-10. An actual death rate and expected death rate were computed for each age group-duration group cell in each of the categories studied. These age groups were those for which the data had been initially compiled (see table above). Note that the 1-10 data are not obtained by adding the 1, 2-5 and 6-10 data together.