

Report
of the
Society of Actuaries
Mortality Table Construction
Survey Subcommittee

June 2007



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Introduction

This report presents the results of the survey conducted by the Society of Actuaries Mortality and Underwriting Survey Committee in July 2006 about the methods used to develop pricing mortality tables for fully underwritten life insurance. Only U.S. business was considered.

The objective of the survey was to gain an understanding of companies' base mortality tables and the adjustments that were made to arrive at the final tables used in pricing, including whether or not mortality improvement was assumed.

Mortality rates for a few issue ages and limited durations were requested to help analyze the impact of underwriting selection. To ensure confidentiality, the report contains only results based on the ratios, not the rates themselves.

We asked for information related to a company's practices for their predominant product sold in 2006. Sixty-four companies responded to the survey.

Caveat and Disclaimer

While we anticipate and hope that the results prove useful for the industry, there are caveats which must be made:

- The data the Survey Subcommittee received was relied upon as accurate.
- The data the Survey Subcommittee received, while fairly comprehensive, is by no means a look at the whole industry.
- The results are indicative of responding companies' practices for products sold in 2006. Practices may have changed since the survey was conducted.

This survey is published by the Society of Actuaries (the SOA) and contains information based on input from companies engaged in the U.S. life insurance industry. The SOA and the participating companies do not recommend, encourage or endorse any particular use of the information reported in this survey. The SOA makes no warranty, guarantee or representation whatsoever and assumes no liability or responsibility in connection with the use or misuse of this survey.

The Survey Subcommittee thanks all of the companies that participated in this survey. We also thank those who helped us review this document and offered helpful suggestions and comments. Finally, the Survey Subcommittee thanks a number of the Society of Actuaries staff for their help in completing this project, especially Jack Luff and Korrel Crawford, without whose help this could not have been completed.

Comments on this report and suggestions for future surveys are welcome and can be addressed to the Mortality and Underwriting Survey Committee c/o The Society of Actuaries.

Mortality Table Construction Survey Subcommittee

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Executive Summary

- Sixty-four companies responded to the survey including ten reinsurers.
- Fifty-seven percent of the respondents indicated that level premium term was their predominant product in 2006.
- The Society of Actuaries 1975-80 Basic Table ('75-80 table) was used by 42% of the respondents as the underlying basis for developing their pricing mortality assumption, while 33% of the respondents used the 2001 Valuation Basic Table (2001 VBT).
- Approximately two-thirds of the respondents indicated using either a 25-year or 15-year select period in their company's pricing mortality table.
- Most respondents made modifications to their base mortality tables used for pricing, using their own mortality experience, industry studies and data from reinsurers. Modifications were typically made with respect to risk class, smoking status, policy duration, age, sex, policy size and updating experience to the current pricing period.
- Various ratios were computed in order to analyze the impact of both underwriting selection and underlying mortality slope built into respondents' pricing mortality tables. Issue ages 25, 50 and 75 were reviewed for 15- and 25-year select periods.

Select to Ultimate Ratios

The select to ultimate ratios show the effect of initial underwriting on mortality and how quickly the effects wear off by duration. For both the 15- and 25-year select periods, issue age 75 showed the greatest selection effect in the first policy year and the steepest grading by duration.

Select Grading Ratios

The select grading ratios show how quickly the mortality grades from issue age to the end of the select period. For the 15-year select period, the issue age 25 ratios showed a relatively flat slope during the first 11 policy years, whereas the slopes for issue ages 50 and 75 were much steeper. For the 25-year select period, the average ratios showed a much steeper grading for all issue ages.

Best Preferred to Residual Class Ratios

The best preferred to residual class ratios show the relative mortality of preferred risks and the extent to which this persists by duration. For both the 15- and 25-year select periods, the average ratios for the first 11 and 21 years, respectively, were relatively flat at 50%-62% for issue ages 25 and 50. For issue age 75, the average ratios graded up slightly over the select period. A comparison was made to the 2001 Preferred VBT Tables which also showed a similar pattern of the ratios for issue ages 25 and 50. For issue age 75, the slope of the ratio in the 2001 Preferred VBT Tables was much steeper at the later years.

- The average annual mortality improvement for the male nonsmoker best class at issue age 50 was approximately 1% for durations 1-10, grading down by duration thereafter. These results are not materially different from those found in the 2003 Mortality Improvement Survey.

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General

This survey requested information from U.S. life insurance companies with respect to their fully underwritten life insurance line of business only. The questions in this section were used to provide background information and to further analyze the subsequent sections. However, to ensure confidentiality, results were not shown if individual companies could be identified or if only one or two companies responded in a particular way.

What was the total face amount of your company's life insurance inforce (before reinsurance) as of year-end 2005?

Table 1

Life Insurance Inforce	% of Respondents
\$100 billion and higher	47%
\$50 - 99 billion	8%
\$15 - 49 billion	17%
Less than \$15 billion	28%
Total # of Respondents	64

What was the total face amount (before reinsurance) of your company's life insurance sales for 2005?

Table 2

Life Insurance Sales (Face Amount)	% of Respondents
\$50 billion and higher	17%
\$6 - 49 billion	28%
\$1 - 5 billion	31%
\$100 - 999 million	11%
Less than \$100 million	13%
Total # of Respondents	62

What is your company's primary line of business?

Table 3

Primary Line of Business	% of Respondents
Direct Writer	83%
Reinsurer	17%
Total # of Respondents	64

Base Table and Modifications

What is your predominant product for new sales in 2006? (Reinsurers were asked to indicate their predominant underlying reinsured product)

Table 4

Predominant Product	% of Respondents
Level Premium term	57%
Universal Life / Variable Universal Life	23%
Whole life	9%
Universal life with secondary guarantees	8%
Other	3%
Total # of Respondents	64

Note: Companies were asked to answer the remaining survey questions based on the company's predominant product.

What mortality rate table do you use as the underlying basis for your company's pricing assumption? (Respondents were asked to check all that applied.)

Table 5

Mortality Table	% of Respondents
Society of Actuaries 1975 – 80 Basic Table	42%
2001 Valuation Basic Table	33%
Own company's experience	17%
Society of Actuaries 1990 – 95 Basic Table	6%
Society of Actuaries 1985 – 90 Basic Table	3%
2001 CSO	3%
Other	3%
Total # of Respondents	64

Other tables used included:

- *Tillinghast Older Age Study*
- *Bragg Life Tables*

Why did you choose that table? (Respondents were asked to check all that applied)

Table 6

Reason	% of Respondents
Best reflects our business	50%
Maintains continuity with pricing assumptions	42%
Consistent with reinsurers/retrocessionaires' experience	36%
Relationship of select to ultimate mortality best reflects anticipated future experience	25%
Consistent with what other companies are doing	9%
Consistent with ceding companies' experience	3%
Recommended by consultant	3%
Most up to date industry table	3%
Other	3%
Total # of Respondents	64

Other reasons included:

- *Used in SOA study;*
- *Reasonable starting point;*
- *Addresses the concern over the slope of the 2001 VBT.*

Modifications

In determining your final pricing mortality table, do you make modifications to the base table described in question 2 above for any of the following items?

Table 7

Item	% of Respondents
Risk class	95%
Smoking status	84%
Policy duration	72%
Age	67%
Sex	66%
Policy size	66%
Update experience to current pricing period	58%
Target market	18%
Conversions from term to permanent	16%
Distribution channel	12%
Differences during and after the contestable period	7%
Reclassification of smokers to nonsmokers	2%
Other	22%
Total # of Respondents	64

Following are the “Other” responses to what modifications are made to base pricing mortality tables:

- *Lapse rates;*
- *Adjust from experience based on assessed ratings to pricing based on issued rating using actual data for concessions;*
- *Blood tested;*
- *Transition from NS/SM split to NT/TO split;*
- *Underwriting basis – e.g. full underwriting vs. simplified underwriting;*
- *Modest mortality improvements based on qualitative opinion of ceding company underwriting quality;*
- *By product – permanent products vs. term products;*
- *Quality of ceding company’s underwriting – age/amount limits for blood testing – tightness of preferred criteria;*
- *Basic table is starting point and as reinsurer is adjusted for company experience mortality, product design, distribution system and company specific factors of cedant.*

If you answered yes to making modifications for conversions from term to permanent, do you reflect the associated mortality in:

Table 8

Where mortality is reflected for conversions from term to permanent	% of Respondents
The converted permanent product	67%
The original term product	22%
Both the original term and converted permanent product	11%
Total # of Respondents	9

What is the source of information that you use to make these modifications? (Respondents were asked to check all that apply.)

Table 9

Source of Information	% of Respondents
Our own mortality experience	84%
Industry studies	61%
Reinsurers	61%
Consultants	22%
Ceding company experience	7%
Population / insured mortality	3%
Total # of Respondents	61

How frequently are the modifications reviewed?

Table 10

Frequency of Review of Modifications	% of Respondents
More frequently than annually	8%
Annually	45%
Every 2 to 3 years	21%
When new products are developed	26%
Ad hoc reviews, less frequently than annually	2%
Total # of Respondents	62

Percentages total more than 100% since one respondent gave more than one answer.

Table Structure

The objective of this section was to gain an understanding of companies' base tables and the adjustments that were made to arrive at the final tables used in pricing, including whether or not mortality improvement was assumed. To analyze the impact of underwriting selection, mortality rates were requested for issue ages 25, 50 and 75 at durations 1, 6, 11, 16, 21 and 26, as well as for quinquennial attained ages from 25 to 105. Various ratios were computed from these rates to analyze:

- The effects of initial underwriting on mortality and how quickly these effects wear-off by policy year, ($q_{[x]+t} / q_{x+t}$, where $q_{[x]+t}$ = mortality rate for issue age x at duration t and q_{x+t} = mortality rate at attained age $x + t$)
- How quickly mortality generally grades from the rate at issue age to the rate at the end of the select period, ($q_{[x]+t} / q_{x+s}$, where s = select period)
- The relative mortality improvement of preferred risks and the extent to which preferred persists by policy year ($q_{[x]+t}^P / q_{[x]+t}^R$, where P = preferred, R = residual standard)

These ratios are presented in the following subsections within this section:

1. Select to Ultimate Ratios
2. Select Grading Period
3. Best Preferred Class to Residual Class Ratios

Respondents were asked to provide the length of the select period of their company's pricing mortality table for issue ages 25, 50 and 75.

Table 11

Length of Select Period	% of Respondents		
	Issue Age 25	Issue Age 50	Issue Age 75
10 years	0%	2%	2%
15 years	33%	32%	25%
20 years	5%	3%	13%
25 years	43%	44%	35%
30 years	6%	6%	3%
Greater than 30 years	9%	8%	2%
Not applicable	2%	2%	11%
Other	2%	3%	9%
Total # of Respondents	63		

The Other category included:

- Responses of less than 10 years for some issue ages;
- Responses that indicated a totally select table (no ultimate attained age rates).

For all three issue ages (25, 50, 75), the largest number of respondents (35%-44%) indicated that their base pricing table had a select period of 25 years. The next largest number of respondents (25%-33%) indicated a select period of 15 years. Thirteen respondents have shorter select periods for issue age 75, compared to issue ages 25 and 50. Seven respondents indicated "not applicable" as the select period for issue age 75 and did not provide any further information for that age.

1. Select to Ultimate Ratios

For the respondents who indicated that the select period was 15 or 25 years, the Subcommittee further analyzed the data by calculating the ratios of select period mortality to attained age ultimate mortality. This was done to determine how much ultimate attained age mortality was reduced by underwriting selection and how quickly this selection wore off.

Tables 12-23 below show, by policy duration, the minimum and maximum ratio and average of the ratios for issue ages 25, 50 and 75.

Evident in Tables 12-24 below are results that are counterintuitive and may be considered anomalous. For example, one would not expect a select to ultimate ratio in excess of 100% at any point during the select period. Most of these anomalies came from inconsistencies between the length of the select period indicated by respondents in one survey question and the length of the select period indicated by the rates themselves. The Subcommittee did not try to interpret the length of any respondent's select period from

the rate data that was supplied. Rather, we analyzed the mortality rates for all of the respondents that indicated a select period of 15 or 25 years. Since removing the respondents with these apparent anomalies did not change the message of the ratio averages, they were left in the results below. For example, if they had been removed for issue age 50 in Table 13 below, the averages for duration 1, 6 and 11 would have been 37.2%, 64.5% and 77.5%, respectively.

15-Year Select Period – Male Nonsmoker Preferred Best Class

The average ratios in Tables 12-14 show that the effect of initial underwriting was assumed to be the least for issue age 25 and the greatest for issue age 75. For issue age 25, underwriting reduced expected mortality to 50.2% of the corresponding ultimate attained age 25 mortality rate. For issue age 75, underwriting reduced expected mortality to 31.3% of the attained age 75 rate. The reduction graded off during the 15-year select period. By duration 6 (attained ages 30, 55, 80), mortality had increased to approximately the same level for all three issue ages (61.8%, 62.5% and 61.4% of ultimate, respectively).

For comparison purposes, the Subcommittee also calculated select to ultimate ratios using the '75-80 table (male age nearest birthday) with the Tillinghast extension for issue age 75.

Table 12
15-Year Select Period - Male Nonsmoker Preferred Best Class
Issue Age 25 – Select to Ultimate Ratios

Ratio	Duration		
	1	6	11
Maximum	75.0%	83.9%	103.2%
Minimum	24.9%	27.1%	28.6%
Average	50.2%	61.8%	81.1%
SOA '75 - 80	53.7%	66.7%	82.1%
Total # of Respondents	16		

Table 13
15-Year Select Period - Male Nonsmoker Preferred Best Class
Issue Age 50 – Select to Ultimate Ratios

Ratio	Duration		
	1	6	11
Maximum	46.0%	72.1%	84.6%
Minimum	26.1%	35.2%	31.7%
Average	37.3%	62.5%	74.7%
SOA '75 - 80	38.2%	67.0%	78.2%
Total # of Respondents	18		

Table 14
15-Year Select Period - Male Nonsmoker Preferred Best Class
Issue Age 75 – Select to Ultimate Ratios

Ratio	Duration		
	1	6	11
Maximum	75.6%	89.5%	104.7%
Minimum	18.5%	47.3%	60.0%
Average	31.3%	61.4%	72.5%
SOA '75 - 80	25.0%	59.0%	64.0%
Total # of Respondents	14		

15-Year Select Period - Male Nonsmoker Residual Class

The average ratios in Tables 15-17 show that the effect of initial underwriting was assumed to be the least for issue age 25 and the greatest for issue age 75. For issue age 25, underwriting reduced expected mortality to 54.1% of the corresponding ultimate attained age 25 mortality rate. For issue age 75, underwriting reduced expected mortality to 33.3% of the attained age 75 rate. The reduction graded off during the 15-year select period. By duration 6 (attained ages 30, 55, 80), mortality had increased to approximately the same level for all three issue ages (67.7%, 68.2% and 68.0% of ultimate, respectively).

For comparison purposes, the Subcommittee also calculated select to ultimate ratios using the '75-80 table (male age nearest birthday) with the Tillinghast extension for issue age 75.

Table 15
15-Year Select Period - Male Nonsmoker Residual Class
Issue Age 25 – Select to Ultimate Ratios

Ratio	Duration		
	1	6	11
Maximum	75.0%	85.2%	108.7%
Minimum	40.0%	38.3%	51.4%
Average	54.1%	67.7%	86.5%
SOA '75 - 80	53.7%	66.7%	82.1%
Total # of Respondents	16		

Table 16
15-Year Select Period - Male Nonsmoker Residual Class
Issue Age 50 – Select to Ultimate Ratios

Ratio	Duration		
	1	6	11
Maximum	61.5%	89.4%	104.0%
Minimum	32.5%	57.5%	56.9%
Average	42.3%	68.2%	78.5%
SOA '75 – 80	38.2%	67.0%	78.2%
Total # of Respondents	18		

Table 17
15-Year Select Period - Male Nonsmoker Residual Class
Issue Age 75 – Select to Ultimate Ratios

Ratio	Duration		
	1	6	11
Maximum	51.3%	82.8%	104.6%
Minimum	25.0%	53.6%	63.3%
Average	33.3%	68.0%	78.2%
SOA '75 - 80	25.0%	59.0%	64.0%
Total # of Respondents	14		

25-Year Select Period - Male Nonsmoker Preferred Best Class

The average ratios in Tables 18-20 below show that the effect of initial underwriting was assumed to be the least for issue age 25 and the greatest for issue age 75. For issue age 25, underwriting reduced expected mortality to 40.2% of the corresponding ultimate attained age 25 mortality rate. For issue age 75, underwriting reduced expected mortality to 28.1% of the attained age 75 rate. The reduction graded off during the 25-year select period.

For comparison purposes, the Subcommittee also calculated select to ultimate ratios using the 2001 Valuation Basic Table.

Table 18
25-Year Select Period - Male Nonsmoker Preferred Best Class
Issue Age 25 – Select to Ultimate Ratios

Ratio	Duration				
	1	6	11	16	21
Maximum	60.7%	71.4%	103.9%	109.5%	108.5%
Minimum	22.9%	37.7%	43.1%	51.6%	77.2%
Average	40.2%	56.0%	67.7%	84.6%	94.6%
2001 VBT	40.7%	64.0%	80.5%	99.1%	100.0%
Total # of Respondents	17				

Table 19
25-Year Select Period - Male Nonsmoker Preferred Best Class
Issue Age 50 – Select to Ultimate Ratios

Ratio	Duration				
	1	6	11	16	21
Maximum	67.0%	87.9%	99.6%	104.1%	106.6%
Minimum	12.9%	21.0%	29.2%	38.3%	51.4%
Average	32.9%	55.8%	71.5%	80.8%	85.3%
2001 VBT	32.5%	57.5%	77.7%	87.8%	91.4%
Total # of Respondents	23				

Table 20
25-Year Select Period - Male Nonsmoker Preferred Best Class
Issue Age 75 – Select to Ultimate Ratios

Ratio	Duration				
	1	6	11	16	21
Maximum	47.3%	74.6%	113.0%	131.4%	132.5%
Minimum	10.2%	28.7%	40.9%	49.2%	61.7%
Average	28.1%	48.6%	69.4%	86.5%	95.7%
2001 VBT	29.9%	48.2%	65.9%	91.6%	99.9%
Total # of Respondents	20				

25-Year Select Period - Male Nonsmoker Residual Class

The average ratios in Tables 21-23 show that the effect of initial underwriting was assumed to be the least for issue age 25 and the greatest for issue age 75. For issue age 25, underwriting at issue reduced expected mortality to 45.7% of the corresponding ultimate attained age 25 mortality rate. For issue age 75, underwriting reduced expected mortality to 30.6% of the attained age 75 rate. The reduction graded off during the 25-year select period. By duration 11 (attained ages 35, 60, 85) mortality had increased to approximately the same level for all three issue ages (76.3%, 77.4% and 75.6% of ultimate, respectively).

For comparison purposes, the Subcommittee also calculated select to ultimate ratios using the 2001 Valuation Basic Table.

Table 21
25-Year Select Period - Male Nonsmoker Residual Class
Issue Age 25 – Select to Ultimate Ratios

Ratio	Duration				
	1	6	11	16	21
Maximum	64.8%	103.1%	113.9%	140.3%	110.5%
Minimum	25.0%	40.7%	49.0%	58.7%	67.1%
Average	45.7%	64.0%	76.3%	93.0%	97.5%
2001 VBT	40.7%	64.0%	80.5%	99.1%	100.0%
Total # of Respondents	20				

Table 22
25-Year Select Period - Male Nonsmoker Residual Class
Issue Age 50 – Select to Ultimate Ratios

Ratio	Duration				
	1	6	11	16	21
Maximum	58.3%	87.8%	103.3%	105.7%	106.0%
Minimum	21.3%	37.1%	51.0%	57.5%	69.4%
Average	36.5%	62.0%	77.4%	86.5%	89.8%
2001 VBT	32.5%	57.5%	77.7%	87.8%	91.4%
Total # of Respondents	23				

Table 23
25-Year Select Period - Male Nonsmoker Residual Class
Issue Age 75 – Select to Ultimate Ratios

Ratio	Duration				
	1	6	11	16	21
Maximum	47.7%	82.1%	110.3%	128.3%	129.4%
Minimum	19.0%	31.5%	45.0%	60.3%	81.1%
Average	30.6%	53.8%	75.6%	91.4%	99.5%
2001 VBT	29.9%	48.2%	65.9%	91.6%	99.9%
Total # of Respondents	20				

2. Select Grading Ratios

The Subcommittee also calculated the ratio of select period mortality rates by duration to the rate at the end of the select period. Rather than indicating the effect of the underwriting process on attained age mortality, these ratios indicate the “slope” of the mortality curve over the select period.

Tables 24-35 below show, by policy duration, the minimum and maximum ratio, and the average of the ratios for issue ages 25, 50 and 75.

15-Year Select Period - Male Nonsmoker Preferred Best Class

Issue age 25 average ratios show a relatively flat slope grading from 42.0% to 62.3% during the first 11 policy years. On the other hand, the slopes of issue ages 50 and 75 are much steeper, grading from approximately 8% to 45% during the first 11 policy years.

Table 24
15-Year Select Period - Male Nonsmoker Preferred Best Class
Issue Age 25 – Select Grading Ratios

Ratio	Duration		
	1	6	11
Maximum	66.7%	60.0%	86.8%
Minimum	20.8%	17.7%	23.1%
Average	42.0%	46.1%	62.3%
SOA '75 - 80	46.2%	48.7%	61.5%
Total # of Respondents	16		

Table 25
15-Year Select Period - Male Nonsmoker Preferred Best Class
Issue Age 50 – Select Grading Ratios

Ratio	Duration		
	1	6	11
Maximum	10.7%	29.1%	53.9%
Minimum	6.4%	15.2%	23.3%
Average	8.5%	23.2%	44.8%
SOA '75 - 80	8.7%	25.0%	47.7%
Total # of Respondents	18		

Table 26
15-Year Select Period - Male Nonsmoker Preferred Best Class
Issue Age 75 – Select Grading Ratios

Ratio	Duration		
	1	6	11
Maximum	19.4%	35.0%	69.2%
Minimum	3.4%	10.8%	30.8%
Average	7.3%	23.2%	44.7%
SOA '75 - 80	6.8%	25.5%	42.5%
Total # of Respondents	13		

15-Year Select Period - Male Nonsmoker Residual Class

Issue age 25 average ratios show a relatively flat slope grading from 47.3% to 66.5% during the first 11 policy years. On the other hand, the slopes of issue ages 50 and 75 are much steeper, grading from approximately 9% to 49% during the first 11 policy years.

Table 27
15-Year Select Period - Male Nonsmoker Residual Class
Issue Age 25 – Select Grading Ratios

Ratio	Duration		
	1	6	11
Maximum	79.8%	79.9%	93.2%
Minimum	29.9%	31.5%	41.5%
Average	47.3%	51.3%	66.5%
SOA '75 - 80	46.2%	48.7%	61.5%
Total # of Respondents	16		

Table 28
15-Year Select Period - Male Nonsmoker Residual Class
Issue Age 50 – Select Grading Ratios

Ratio	Duration		
	1	6	11
Maximum	16.9%	31.8%	56.2%
Minimum	6.5%	19.5%	41.8%
Average	9.6%	25.0%	47.4%
SOA '75 - 80	8.7%	25.0%	47.7%
Total # of Respondents	18		

Table 29
15-Year Select Period - Male Nonsmoker Residual Class
Issue Age 75 – Select Grading Ratios

Ratio	Duration		
	1	6	11
Maximum	12.8%	35.0%	69.2%
Minimum	5.9%	19.6%	37.8%
Average	8.0%	25.9%	48.8%
SOA '75 - 80	6.8%	25.5%	42.5%
Total # of Respondents	14		

25-Year Select Period - Male Nonsmoker Preferred Best Class

Compared to the 15-year select period, the average ratios show a much steeper grading over the longer select period from 13% to 64% for issue age 25 and from 3% to 51% and 66% for issue ages 50 and 75, respectively.

Table 30
25-Year Select Period - Male Nonsmoker Preferred Best Class
Issue Age 25 – Select Grading Ratios

Ratio	Duration				
	1	6	11	16	21
Maximum	20.7%	30.5%	32.9%	53.4%	72.0%
Minimum	7.0%	11.7%	12.5%	25.2%	54.3%
Average	13.2%	19.8%	25.3%	40.0%	64.2%
2001 VBT	12.8%	20.1%	25.5%	42.0%	69.7%
Total # of Respondents	23				

Table 31
25-Year Select Period - Male Nonsmoker Preferred Best Class
Issue Age 50 – Select Grading Ratios

Ratio	Duration				
	1	6	11	16	21
Maximum	5.8%	12.7%	26.0%	43.8%	67.4%
Minimum	1.1%	2.7%	7.0%	14.5%	30.9%
Average	2.6%	7.5%	15.9%	30.5%	51.2%
2001 VBT	2.5%	7.4%	16.6%	33.3%	54.5%
Total # of Respondents	23				

Table 32
25-Year Select Period - Male Nonsmoker Preferred Best Class
Issue Age 75 – Select Grading Ratios

Ratio	Duration				
	1	6	11	16	21
Maximum	4.7%	13.3%	33.3%	52.5%	85.1%
Minimum	1.2%	5.1%	10.9%	20.3%	40.9%
Average	2.6%	7.9%	18.9%	38.9%	65.8%
2001 VBT	3.4%	9.3%	21.3%	48.1%	75.0%
Total # of Respondents	20				

25-Year Select Period - Male Nonsmoker Residual Class

Compared to the 15-year select period, the average ratios show a much steeper grading from 15% to 67% for issue age 25 and from 3% to 54% and 72% for issue ages 50 and 75, respectively.

Table 33
25-Year Select Period - Male Nonsmoker Residual Class
Issue Age 25 – Select Grading Ratios

Ratio	Duration				
	1	6	11	16	21
Maximum	25.7%	30.8%	35.5%	53.4%	77.6%
Minimum	8.0%	12.5%	16.6%	27.6%	54.7%
Average	14.9%	22.2%	27.9%	43.4%	67.7%
2001 VBT	12.8%	20.1%	25.5%	42.0%	69.7%
Total # of Respondents	22				

Table 34
25-Year Select Period - Male Nonsmoker Residual Class
Issue Age 50 – Select Grading Ratios

Ratio	Duration				
	1	6	11	16	21
Maximum	5.8%	12.8%	26.0%	43.8%	67.4%
Minimum	1.6%	4.8%	11.0%	21.8%	44.5%
Average	3.0%	8.6%	17.5%	33.2%	54.3%
2001 VBT	2.5%	7.4%	16.6%	33.3%	54.5%
Total # of Respondents	23				

Table 35
25-Year Select Period - Male Nonsmoker Residual Class
Issue Age 75 – Select Grading Ratios

Ratio	Duration				
	1	6	11	16	21
Maximum	5.4%	13.7%	33.3%	52.5%	79.9%
Minimum	2.2%	6.4%	15.2%	32.6%	57.2%
Average	3.4%	10.0%	23.1%	44.9%	72.4%
2001 VBT	3.4%	9.3%	21.3%	48.1%	75.0%
Total # of Respondents	23				

3. Best Preferred Class to Residual Class Ratios

The Subcommittee calculated the ratio of best preferred mortality to the corresponding residual class mortality. These ratios indicated the mortality relationship between the two classes when the policies were issued and how the relationship was expected to change as the policies matured.

Tables 36-41 below show, by policy duration, the minimum and maximum ratio, and the average of the ratios for issue ages 25, 50 and 75.

15-Year Select Period

For all issue ages, the average ratios were relatively flat at 50%-60% for the first 11 years.

For comparison purposes, the Subcommittee also calculated super preferred to residual class (standard nonsmoker) mortality ratios for the 2001 VBT Preferred Class Structure Mortality Tables (“interim solution” table, male age nearest birthday). This too showed the slope of the ratios for the first 11 years to be relatively flat.

Table 36
15-Year Select Period
Issue Age 25 – Best Preferred to Residual Class Ratios

Ratio	Duration		
	1	6	11
Maximum	67.7%	71.0%	78.4%
Minimum	36.6%	34.9%	37.7%
Average	54.2%	54.4%	56.1%
2001 Preferred VBT	43.9%	43.8%	42.7%
Total # of Respondents	19		

Table 37
15-Year Select Period
Issue Age 50 – Best Preferred to Residual Class Ratios

Ratio	Duration		
	1	6	11
Maximum	68.4%	72.1%	76.2%
Minimum	28.2%	37.7%	37.7%
Average	53.6%	54.5%	55.3%
2001 Preferred VBT	43.3%	42.9%	42.8%
Total # of Respondents	18		

Table 38
15-Year Select Period
Issue Age 75 – Best Preferred to Residual Class Ratios

Ratio	Duration		
	1	6	11
Maximum	67.7%	70.3%	78.8%
Minimum	20.8%	42.0%	46.7%
Average	51.5%	54.5%	58.2%
2001 Preferred VBT	42.7%	42.7%	43.5%
Total # of Respondents	13		

25-Year Select Period

For issue ages 25 and 50, the average ratios were relatively flat at 55% - 62% for the first 21 years. For issue age 75, the average grades up slightly from 62% - 73% over 21 years.

For comparison purposes, the Subcommittee also calculated super preferred to residual class (standard nonsmoker) mortality ratios for the 2001 VBT Preferred Class Structure Mortality Tables (“interim solution” table, male age nearest birthday). This too showed the slope of the ratios for the first 21 years to be relatively flat for issue ages 25 and 50.

Table 39
25-Year Select Period
Issue Age 25 – Best Preferred to Residual Class Ratios

Ratio	Duration				
	1	6	11	16	21
Maximum	77.3%	77.3%	79.7%	86.2%	92.8%
Minimum	41.2%	41.3%	41.3%	37.6%	37.7%
Average	56.2%	55.9%	56.4%	57.5%	59.6%
2001 VBT	43.9%	43.8%	42.7%	43.0%	42.9%
Total # of Respondents	23				

Table 40
25-Year Select Period
Issue Age 50 – Best Preferred to Residual Class Ratios

Ratio	Duration				
	1	6	11	16	21
Maximum	77.3%	77.3%	79.6%	86.1%	92.9%
Minimum	41.3%	42.0%	42.0%	42.0%	42.0%
Average	55.7%	57.5%	57.9%	59.2%	61.6%
2001 VBT	43.3%	42.9%	42.8%	42.3%	47.2%
Total # of Respondents	24				

Table 41
25-Year Select Period
Issue Age 75 – Best Preferred to Residual Class Ratios

Ratio	Duration				
	1	6	11	16	21
Maximum	86.3%	86.3%	86.3%	100.0%	100.0%
Minimum	42.0%	42.0%	42.0%	42.0%	42.0%
Average	62.4%	63.5%	65.6%	69.0%	72.9%
2001 VBT	42.7%	42.7%	43.5%	61.8%	100.0%
Total # of Respondents	21				

Mortality Improvement

Do you modify your pricing mortality tables to make explicit adjustments for future mortality improvements?

Table 42

Adjust for Future Mortality Improvement?	% of Respondents
Yes	39%
No	61%
Total # of Respondents	64

Thirty-nine percent of the respondents indicated that they assumed some level of future improvement. In the 2003 SOA Mortality Improvement Survey, 25% of the 67 respondents reported using future mortality improvements (in the 2003 Survey, these were referred to as “durational” improvements). Note that the 2003 Survey was based on data gathered during 2000 and, of course, had a different pool of respondents.

How many policy years does future improvement persist for each of the following issue ages? Please give your answers for your male nonsmoker best preferred class.

Table 43

Years of Future Improvement	Issue Age 25	Issue Age 50	Issue Age 75
0	8%	0%	4%
5	0%	0%	4%
10	20%	20%	26%
15	16%	24%	22%
20	32%	32%	22%
25	4%	4%	17%
30	12%	12%	4%
50	0%	4%	0%
75/Lifetime	8%	4%	0%
Total # of Respondents	25	25	23
Median	20	20	15
Average	21.4	21.6	16.1

Respondents seem to approach mortality improvement similarly for issue ages 25 and 50 using on average between 20 and 21 years, while tending to use a shorter improvement period of 16 years for issue age 75. Nevertheless, five respondents reported using 25 or 30 years of improvement for issue age 75, implying that improvements apply all the way to attained age 100 or beyond.

The first question in the Table Structure section asked for the select period respondents used in their pricing mortality table. When comparing the responses to that question to the responses to this question, it was interesting to note that, of the 25 respondents who shared the length of time they assume future improvements will occur (see Table 43), eight had a longer improvement period than the corresponding select period of their pricing mortality table (see Table 11), at least for some issue ages. The number of years beyond the select period during which further improvement was assumed ranged from 1 to 10 years in these cases.

What is the improvement factor by duration for male nonsmoker best class, issue age 50?

Table 44

	Duration						
	1	5	6	10	11	20	21
Minimum	0.00%	0.50%	0.50%	0.50%	0.00%	0.00%	0.00%
Maximum	2.00%	2.00%	2.00%	2.00%	2.00%	1.05%	1.05%
Average	0.73%	1.06%	1.06%	1.05%	0.92%	0.51%	0.32%
Median	1.00%	1.00%	1.00%	1.00%	1.00%	0.70%	0.00%
Total # of Respondents	25						

In the 2003 SOA Mortality Improvement Survey, a similar question asked what the improvement factors were for durations 1-10, without specifying an underwriting class. The responses ranged from 0.5% to 2.0%, with an average of 0.89%; the responses in this survey do not differ materially.

How often is your mortality improvement assumption reviewed for possible adjustment?

Table 45

Frequency of review of mortality improvement assumption	% of Respondents
More frequently than annually	0%
Annually	31%
Every 2 to 3 years	42%
When new products are developed	15%
Other	12%
Total # of Respondents	26

Note that one respondent answered this question even though they reported not using future mortality improvements; hence, the number of respondents is greater than the number of responses of “Yes” to the first question in this section.

The “other” comments included:

- *As new industry data is released that warrants re-evaluation;*
- *No experience, first product to utilize;*
- *Less frequently than 3 years.*

Appendix 1

List of Contributing Companies

ACE Tempest Life Re USA	Midland National Life Insurance Company
AGL Life Assurance Company	Minnesota Life Insurance Company
AIG American General	Modern Woodmen of America
Alfa Life Insurance Corporation	MTL Insurance
Allstate Financial	Nationwide Financial
American Family Life Insurance Company	New York Life Insurance Company
Americo Financial Life and Annuity Insurance Company	North American Company for Life & Health
Ameritas Life Insurance Corporation/UNIFI	Northwestern Mutual
AmerUs Group	Optimum Re
Boston Mutual LIC	Pacific Guardian Life Insurance
Cincinnati Life Insurance Company	Pacific Life Insurance Company
Columbus Life Insurance Company	Penn Mutual Life Insurance Company
Combined Insurance Company of America	Phoenix Life Insurance Company
Erie Family Life Insurance Company	Physicians Mutual Insurance Company
Fairmont Specialty Insurance Company	Primerica Life Insurance Company
Farm Bureau Life	Prudential Financial
Farmers New World Life Insurance Company	RGA Reinsurance Company
Federal Life Insurance Company (Mutual)	Shelter Life Insurance Company
Fidelity Investments Life Insurance Company	Shenandoah Life Insurance Company
General Reinsurance Corporation	State Farm Life Insurance Company
Generali USA Life Reassurance Company	Sun Life Financial
Genworth Financial	Swiss Re Life & Health
Guardian Life Insurance Company	Symetra Financial
Horace Mann Insurance Companies	The Baltimore Life Insurance Company
Illinois Mutual Life Insurance Company	Thrivent Financial for Lutherans
Jackson National Life Insurance Company	TIAA-CREF
John Hancock Life Insurance Company	Transamerica Occidental Life
Kansas City Life Insurance Company	Union Central Life Insurance Company
Lincoln Financial Group	USAA Life Insurance Company
Manulife Financial	Western-Southern Life Insurance Company
Munich American Reassurance Company	Wilton Re
	Woodmen of the World Life Insurance Society
	XL Re Life America