Select Period Mortality Survey

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1. BACKGROUND

The Society of Actuaries (SOA) has been completing mortality studies for many years to help the industry understand the level of insured mortality based on many parameters such as age, duration, product type, type of underwriting, and policy size. Beginning about 1980, the industry began pricing using a smoker/nonsmoker distinction and, beginning in the late 1980s/early 1990s, preferred risk class distinctions. The earliest SOA mortality tables that are still used today are the 1975–80 Basic Tables, which were built with a 15-year select period. The most recent are the 2001 and 2008 Valuation Basic Tables (VBT) which were built with a 25-year select period for most issue ages, and grade to a 2-year select period at issue age 90. Current preliminary work on the 2014 VBT shows that the select period may change again.

Companies often develop pricing mortality assumptions by comparing their own individual company experience to that of a standard industry mortality table and by creating adjustments/multiples to that standard industry table to reflect their own experience. Multiples generally vary based on issue age, gender, and risk class. They may also vary by length of guarantee periods, product, policy size band, or other parameters. The level and slope of mortality assumptions vary from company to company.

One item of interest with the move to preferred risk class underwriting is how long the underwriting (i.e., the select period) will last. To date, no definitive answers exist because preferred experience is just becoming available beyond the 20th year. Therefore, there is an interest in the mortality assumptions that companies are making for the entire select period.

The SOA was interested in studying select period mortality assumptions to help determine, among other things, the length of the select period, the slope of select period mortality, and the "wearing off of preferred" underwriting. Milliman was engaged by the SOA to conduct a survey of select period mortality assumptions used in pricing life insurance products to gain a better understanding of industry practice on these issues.

This project was sponsored by the SOA's Product Development Section and the Committee on Life Insurance Research. The researchers would like to thank the participating companies for taking time to complete the survey and acknowledge the members of the project oversight group, who provided guidance and feedback critical to the success of the project:

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2. EXECUTIVE SUMMARY

Life insurance companies were solicited in early 2013 to provide mortality assumptions and to answer other questions to help gain a better understanding of select period mortality assumptions used in pricing. Twenty-nine companies responded to the survey. The list of the participating companies can be found in Appendix A and a copy of the survey can be found in Appendix B.

2.1. Select Period Mortality Questions

The survey contained 10 questions, and the responses are summarized below.

The 2001 VBT is the most popular underlying mortality table, used by nine companies for both term products (10-year and 20-year level premium term [T10 and T20]) and by 10 companies for both universal life products (universal life [UL] and universal life with secondary guarantees [ULSG]). This represented 31 percent of the term respondents and 38 percent of the UL respondents. For whole life (WL), the most common basis was company experience, used by seven (44 percent) of the WL respondents.

Age nearest is the most popular age basis used, ranging from 56 to 73 percent of responses depending on the product.

For term products, 59 percent of the companies use four nontobacco risk classes. The rest of the term respondents use three risk classes. For UL, ULSG, and WL, the majority, 56–62 percent, use three nontobacco risk classes.

Across all products, at least 90 percent of the participants use two risk classes for tobacco pricing.

Several companies provided comments limiting the number of risk classes below a certain face amount and above a certain issue age or extending the number above a certain face amount.

The 25-year select period was the most common length of select period across all products and issue ages, except for WL at issue age 75 where 15- and 25-year tied as the most prevalent. Some companies use a shorter select period, some use a longer select period, and some define their select period to a specific attained age.

The "wearing off of preferred" assumptions vary considerably company to company—likely because of the lack of standardized set of assumptions or publically available experience data. Companies begin and end their "wearing off of preferred" assumptions in one of three ways:

- At a specific attained age (most popular)
- At a specific duration
- At the earlier (or later) of a specific age and duration.

Fourteen companies indicated using explicit generational mortality improvement assumptions for T10. Six of these indicated varying it by gender, and five indicated varying the assumptions

by age and five by tobacco use. The annual assumption was typically 0.5–1.0 percent. Assumptions for other products were similar.

For T10, 21 companies indicated using durational mortality improvement assumptions. Seventeen companies varied the assumptions by gender (female had lower improvement factors), and seven varied the assumptions by tobacco class (tobacco had lower improvement factors). The durational mortality improvement assumptions were generally applied for a certain period of time (e.g., 10, 15, and 20 years were the most common) or until a certain attained age. The level of improvement assumed was typically about 1.0 percent for the male nontobacco class and 0.5 percent for the female nontobacco class, with tobacco class generally lower by 0.25–0.50 percent. Other products had similar results.

All but one company indicated updating mortality assumptions on at least one of their products over the last two years. Term assumptions were most commonly updated over the last two years by 59 percent of the respondents, followed by ULSG updated by 50 percent of the respondents.

2.2. Select Period Mortality Assumptions

In general, a wide range of duration 1 mortality assumptions were provided. The widest range of assumptions was at issue age 75 and the narrowest range was at issue age 65. By product, term had the lowest duration 1 mortality assumptions, followed by UL and then WL.

In comparing the ratio of the select period mortality rates to the duration 26 mortality rate, the steepest slopes were generally found for the following:

- Issue age 65
- Females (for issue ages 35, 65, and 75)
- Best preferred nontobacco risk class
- $1,000,000 ($1MM) face amount
- ULSG (term was not studied due to the level premium period ending before duration 26).

In comparing the ratio of duration one to the same age ultimate mortality rates, the following lists the observations by category:

- Issue age: Age 35 had the highest ratio. Age 65 had the lowest ratio.
- Gender: The male ratio was generally lower than that for females at ages 35 and 45 and higher than females for ages 65 and 75.
- Risk class: The best preferred nontobacco risk class had the lowest ratio. The residual standard tobacco risk class had the highest ratio.
- Policy size: The ratio for $1MM was lower than that for $100,000 ($100K).

The mortality rates for each of the provided durations were divided into the duration 1 mortality rate. This analysis was done for two cells:

- T20, $1MM face, male, best preferred nontobacco risk class, issue age 45
- UL, $100K face, male, best preferred nontobacco risk class, issue age 65.

For T20, the 90th percentile closely follows the 2008 VBT during the first 11 durations. Around the 14th duration, the 75th percentile tracks the 2008 VBT. This means that most companies have assumptions below that of the 2008 VBT, which is not surprising because recent mortality experience has shown to be less than the 2008 VBT.

For UL, the 25th percentile closely follows the 2008 VBT during the first nine durations and durations 20 and higher. In this situation, more companies are using an assumption greater than the 2008 VBT. This may be due to the policy size of $100K, which typically has higher mortality experience than $1MM.

The consistency of mortality rate rankings between companies was studied on a duration by duration basis to determine the stability of the company rankings across the durations. It was found that the consistency varied depending on the cell studied. The male mortality rate rankings were found to be more consistent than the female rankings. Also the younger age mortality rate rankings were generally more stable than the older age rankings. There was no discernible pattern by risk class.

3. INTRODUCTION

A select period mortality survey was designed by Milliman and finalized with the help of the project oversight group. The surveys were mailed in April 2013, responses were received the following three months, and responses were compiled during third quarter of 2013. Twenty-nine companies responded to the survey, although some companies did not respond to all questions. The participating companies are shown in Appendix A. The survey is shown in Appendix B.

The survey was based on the most popular products sold in 2012; most popular was defined as the products with the highest premium volume.

The first part of the survey contained ten mortality-assumption–related questions. The following list represents a high-level summary of the main topic of each question:

1. Underlying mortality table used for pricing
2. Number of nontobacco and tobacco risk classes
3. Length of the select period used in pricing
4. How the length of the select period varies
5. "Wearing off of preferred" assumptions
6. Explicit generational mortality improvements
7. Implicit generational mortality improvements
8. Durational mortality improvements
9. Assumption effective dates
10. Other relevant data.

The survey then requested pricing mortality assumptions for a number of parameters. These parameters were chosen to limit the total amount of data requested, yet provide meaningful results. The parameters were the following:

- Issue age (4): 35, 45, 65, and 75
- Duration (11): 1, 2, 3, 5, 6, 10, 11, 20, 21, 25, and 26
- Gender (2): Male and female
- Risk class (3): Best preferred nontobacco (BPNT), residual nontobacco (RNT), and residual tobacco (RT)
- Face amount (2): $100K and $1MM
- Product (5): T10, T20, UL, ULSG, and WL

The primary objective of this research is to better understand the current level, slope, and length of select period mortality assumed by life insurance companies today. Another objective is to understand how the assumptions differ by issue age, duration, gender, risk class, policy size, and product. The goal was not to help companies set their mortality assumptions, but rather to show the variety of assumptions in the marketplace today and to provide insights into practices used for setting these assumptions. The SOA was also interested in learning more about other mortality related assumptions, such as mortality improvement (generational and durational) and the "wearing off of preferred".

The report summarizes the key findings from the survey and is divided into a number of sections and subsections:

- Limitations and caveats of the work
- A brief history of select period mortality
- An analysis of the results of the 10 questions. The results are summarized by length of select period, number of risk classes, mortality improvements, and "wearing off of preferred".
- An analysis of the pricing mortality assumptions provided by the participating companies. The analysis of select period pricing mortality assumptions is done in a variety of ways, and each of the parameters mentioned above is reviewed for differences.

The report concludes with some observations and a discussion of the supplemental Excel workbook provided with this report. Finally, the appendices provide the list of participating companies and a copy of the original survey.

Throughout the report, the terms mortality "rates" and "assumptions" will be used interchangeably. Either term refers to the mortality rate assumptions provided by the participating companies.

4. LIMITATIONS ON DATA AND ANALYSIS

In performing the work on this project, Milliman relied upon the data and information provided to us by the participants. We reviewed the data and information provided to us for reasonableness but did not perform any additional reviews or detailed audits. We have, therefore, relied upon each participant to provide us with accurate and complete data. If the underlying data or information provided by the participant was inaccurate and/or incomplete, then the results of this analysis will likewise be inaccurate and/or incomplete.

At times, interpretations of the data were necessary. There are generally multiple ways to interpret the same data. It is recommended that readers do their own thorough analysis before making decisions whether to implement any changes based on the information contained in this report. Also, it is recommended that readers thoroughly review the supplements provided. The authors, Milliman, and the SOA will not be held responsible for any adverse consequences resulting from actions taken as a result of this report.

Finally, it should be recognized that the companies that participated in this survey may or may not be representative of the industry and that another company's results may or may not be reflective of the companies that participated in this survey.

5. SELECT PERIOD MORTALITY QUESTIONS

This section contains the results from 10 questions that were asked about the select period mortality assumptions. A high-level summary of the main topic of each question is shown below:

1. Underlying mortality table used for pricing
2. Number of nontobacco and tobacco risk classes
3. Length of the select period
4. How the length of the select period varies
5. "Wearing off of preferred" assumptions
6. Explicit generational mortality improvements
7. Implicit generational mortality improvements
8. Durational mortality improvements
9. Assumption effective dates
10. Other relevant data.

The following subsections summarize the responses to these questions. One company of the 29 participants relies heavily on their reinsurer for their mortality assumptions and thus could not provide all the details requested regarding the development of their rates.

5.1. Underlying Mortality Table

Each participant was asked to provide the underlying mortality table used to price each of the five products. They were also asked to provide any additional information, such as whether the table used was the select and ultimate or ultimate only version and whether the table used was on an age last or age nearest basis.

The following tables provide a summary of the responses. Table 5.1.1 provides the underlying table. Table 5.1.2 provides information on whether select and ultimate or ultimate only was used. Table 5.1.3 provides the age basis.

Table 5.1.1 shows that the 2001 VBT and company experience are the most common underlying mortality tables used to price the term products. The 2001 VBT is the most common underlying table used for the UL products, with company experience coming in second. Company experience is used most often for WL pricing, with the 1975–80 Basic and 2001 VBT tied for second.

The respondents that used the 2008 VBT were asked to provide which version(s) of the tables was (were) used. The smoker distinct versions were used by all of these participants except one. That participant uses different relative risk versions based on risk class, with the percentages ranging from 70 to 130 percent for nontobacco users and from 80 percent (interpolated) to 125 percent for tobacco users.

Participants using the 1975–80 Basic tables were asked to identify the version of the table extension used in pricing each product. The responses indicated that most every available extension is used. Not one stood out as most popular among the group. The answers were Manulife, Milliman, Swiss Re, Tillinghast, male/female, and did not know.

Table 5.1.1 Base Mortality Tables

Mortality Table	Number of Participants				
	T10	T20	UL	ULSG	WL
2008 VBT	5	5	4	4	1
2001 VBT*	9	9	10	10	4
1975–80 Basic	5	5	4	2	4
Company Experience**	9	9	8	9	7
Other (1985–90 Basic)	1	1	0	1	0
Total	**29**	**29**	**26**	**26**	**16**

* Includes one participant with 2001 CSO (UL, ULSG) and one with
   2001 VBT preferred (all products).

** Includes company experience blended with 2001 VBT for one
   participant, 2008 VBT for another, and both 2001 and 2008 VBT for
   another.

Table 5.1.2 shows that all but two of the participants indicated using an underlying mortality table with a select period for their pricing. The two companies that do not use a select and

ultimate underlying table are using either their own company developed tables or the 1975–80 Basic table ultimate mortality.

Table 5.1.2 Select and Ultimate vs. Ultimate Mortality

	Number of Participants				
Mortality Type	T10	T20	UL	ULSG	WL
S&U	27	27	24	25	14
Ultimate	2	2	2	1	2
Total	**29**	**29**	**26**	**26**	**16**

Age nearest birthday is the most popular age basis used, ranging from 56 to 73 percent of responses depending on the product. Results are shown in Table 5.1.3.

Table 5.1.3 Age Last vs. Age Nearest Birthday Mortality

	Number of Participants				
Age Birthday Type	T10	T20	UL	ULSG	WL
ALB	8	8	10	7	7
ANB	21	21	16	19	9
Total	**29**	**29**	**26**	**26**	**16**

5.2. Risk Classes

Each participant was asked to supply the number of pricing risk classes used for both tobacco and nontobacco users. Nontobacco risk classes are shown in Table 5.2.1 and tobacco risk classes are shown in Table 5.2.2.

Table 5.2.1 shows that for the term products, 59 percent of the participants use four nontobacco risk classes. The remaining term respondents use three risk classes. For UL, ULSG, and WL, the majority, 56–62 percent, use three nontobacco risk classes. The next most popular number of nontobacco risk classes was four for these products.

Table 5.2.2 shows the use of two risk classes is the most common for tobacco pricing; 90 percent or more of the companies indicated this, depending on product.

Several companies provided comments limiting the number of risk classes below a certain face amount and above a certain issue age or extending the number above a certain face amount. One company noted that the residual class may contain rated cases up to a certain table.

Table 5.2.1 Nontobacco Risk Class Structures

Number of Nontobacco Risk Classes	Number of Participants				
	T10	T20	UL	ULSG	WL
1					
2			1		
3	12	12	15	16	9
4	17	17	10	10	7
Total	**29**	**29**	**26**	**26**	**16**

Table 5.2.2 Tobacco Risk Class Structures

Number of Tobacco Risk Classes	Number of Participants				
	T10	T20	UL	ULSG	WL
1	3	3	2	1	1
2	26	26	24	25	15
Total	**29**	**29**	**26**	**26**	**16**

5.3. Length of Select Period

Participants were asked to supply the length of the select period assumed by product for the four issue ages used in the survey. The results are split between term products (Table 5.3.1) and permanent products (Table 5.3.2).

Twenty-five years is the most common length of select period for all products. For WL issue age 75, a select period of 15 years was tied with 25 years as most prevalent.

Many companies use a shorter select period for age 75 than for the other issues ages. The usage of select periods of 10, 15, and 20 years is more common at issue age 75 than at the younger ages across all permanent products.

Three companies use select periods of 30 years or greater. The select periods above 30 run to attained age 90 or 95.

One company defines its select period as the lesser of 25 years or 97 less the issue age.

The participants were also asked to describe how the length of the select period varies by different product and policyholder characteristics such as risk class, policy size, and gender, and if it follows the pattern of any specific mortality table. Of the 29 companies, 24 provided responses for the T10 product. Of these 24, nine do not vary the select period by any attributes, six follow the pattern of an industry table, and 10 use a shorter select period above a certain attained age (the last two are not mutually exclusive). The other products followed a similar pattern of responses. T10 was discussed since it had the most responses.

Table 5.3.1 Length of Select Period Used for Term Products

Product	Number of Participants by Issue Age							
	T10				T20			
Select Period	35	45	65	75	35	45	65	75
10	3	3	3	4	0	0	0	1
15	3	2	3	5	3	2	3	4
20	0	0	0	4	3	3	3	6
21–24	0	1	0	3	0	1	0	2
25	18	18	18	9	18	18	17	8
30	1	1	2	0	1	1	2	0
31+	2	2	1	0	2	2	1	0
Total	**27**	**27**	**27**	**25**	**27**	**27**	**26**	**21**

Table 5.3.2 Length of Select Period Used for UL, ULSG, and WL Products

	Number of Participants by Issue Age											
Product	UL				ULSG				WL			
Select Period	35	45	65	75	35	45	65	75	35	45	65	75
10	0	0	0	1	0	0	0	1	0	0	0	1
15	3	2	3	5	4	3	4	6	4	3	4	4
20	0	0	0	4	0	0	0	2	0	0	0	3
21–24	0	1	0	2	0	1	0	3	0	1	0	2
25	18	18	18	12	18	18	18	12	9	9	9	4
30	1	1	2	0	1	1	1	0	1	1	1	0
31+	2	2	1	0	1	1	1	0	0	0	0	0
Total	**24**	**24**	**24**	**24**	**24**	**24**	**24**	**24**	**14**	**14**	**14**	**14**

5.4. "Wearing Off of Preferred"

Each participant was asked to provide details related to their "wearing off of preferred" mortality assumptions used in pricing the five products. The following questions were asked:

- When does the "wearing off of preferred" begin?
- When does it end?
- How does it vary by product duration and/or attained age?

"Wearing off of preferred" describes the pattern of convergence over time between the mortality for the better preferred risk classes and the mortality for the worse risk classes. This happens because, over time, underwriting selection "wears off" on the better preferred risk classes while the worst risks of the worse risk classes die off, leaving overall healthier lives within this group.

Participants provided a variety of responses on how the "wearing off of preferred" begins and ends. Tables 5.4.1 for T10 and 5.4.2 for UL summarize the various methods used for the "wearing off of preferred" assumptions. T10 and UL had the most responses, but T20 and ULSG had responses similar to those of their respective counterparts. Several companies indicated that they do not use a "wearing off of preferred" assumption and others did not respond (10 for T10 and eight for UL).

The following is a summary of the methods used for the beginning of the "wearing off of preferred" period by some of the companies participating in the survey:

- A specific attained age is used by 10 of the T10 participants and 13 of the UL participants. The earliest attained age that the "wearing off of preferred" begins is 52, the latest attained age is 110, and average is attained age 83.
- A specific duration, either duration 16 or 26, is used by two T10 and UL participants.
- The earlier (or later) of a specific attained age and duration is used by seven and six T10 and UL companies, respectively.

The following assumptions are used for the ending point of the "wearing off of preferred":

- A specific attained age is used by 15 of the T10 participants and 17 of the UL participants. The earliest attained age that the "wearing off of preferred" ends is 90, the latest attained age is 120, and the average is attained age 104.
- A specific duration (20, 25, or 45) is used by three T10 and UL participants.
- The earlier (or later) of a specific attained age and duration is used by one T10 and one UL company.

Some additional information was provided by several companies. Three companies assume that a percentage of the preferred factor will wear off. This percentage varied from 50 to 80 percent.

Table 5.4.1 "Wearing Off of Preferred" for 10-Year Level Premium Term

T10	Number of Participants	
Criteria	Begin "Wearing Off"	End "Wearing Off"
By Age	10	15
By Duration	2	3
By Age and Duration	7	1
NA or No "Wearing Off"	10	10
Total	**29**	**29**

Table 5.4.2 "Wearing Off of Preferred" for Universal Life

UL	Number of Participants	
Criteria	Begin "Wearing Off"	End "Wearing Off"
By Age	13	17
By Duration	2	3
By Age and Duration	6	1
NA or No "Wearing Off"	8	8
Total	**29**	**29**

5.5. Generational Mortality Improvement

Mortality tables and assumptions are typically developed based on past experience. In order to properly reflect the past experience for current use, a mortality improvement assumption is often applied from the time of the experience study (or other data) to when the mortality is going to be used. Typically the generational (or past) mortality improvement assumption runs from the midpoint of the past study (or other data) to the current date. This mortality improvement assumption is also typically built into the current mortality assumptions either implicitly, by using more aggressive than expected mortality rates, or explicitly.

Participants were asked to provide the implicit and explicit assumptions used to update their mortality tables for generational mortality improvements.

None of the participants mentioned using any sort of implicit generational mortality improvements. Of the 29 participants who offer T10, seven companies indicated that they do not use generational mortality improvement, while another eight did not provide a response.

For the remaining 14 companies who use explicit generational improvements for their T10 product, six companies indicated using a different improvement assumption for males versus females, where the female improvements were lower than the male improvements in all cases. Five companies vary the generational mortality improvement assumptions by either issue or attained age, and five vary it by tobacco class. Four companies provided rather detailed tables or unique algorithms for the application of generational mortality improvements. In general, the generational mortality improvements ranged between 0.50 and 1.00 percent per year, although there were several outliers.

The other products followed a similar pattern of responses. T10 was discussed since it contained the most responses.

5.6. Durational Mortality Improvement

Durational (or future) mortality improvement runs from the current date into the future. It is typically an explicit mortality improvement assumption for future years that may vary by age, gender, risk class, etc. It may be applied for only a limited number of years or may last forever.

Participants were asked to provide details related to their use of durational mortality improvement in pricing their products. Of the 29 survey participants who completed the question part of the survey for the T10 product, three stated that they do not use durational mortality improvements and five did not provide any durational mortality improvement assumptions.

Of the 21 companies who offer T10 and use duration mortality improvements, 17 companies indicated using a different durational mortality improvement assumption for males versus females. In all cases, the female durational mortality improvement assumptions were lower than those assumed for the males. Seven of these companies used female factors that were half of the male factors.

Of these same 21 companies, seven vary the factors by tobacco class. The tobacco factors were lower than the nontobacco factors. The average durational mortality improvement assumption for the male nontobacco class was about 1.00 percent. For the female nontobacco class, it was about 0.50 percent. The tobacco factors were generally lower by 0.25 to 0.50 percent.

All companies (with one possible exception) use mortality improvement factors that are applied for a certain period of time, such as for 10, 15, or 20 years or up until a certain age. A few companies provided complete attained age and calendar year tables of factors for each product.

T10 was discussed since it contained the most responses. The other products followed a similar pattern of responses.

5.7. Assumption Effective Date

For each product, participants were asked to provide the effective date of the mortality assumptions they reported to us. Results are summarized in Table 5.7.1.

Over the last two years, 66 percent of the participants updated their pricing mortality assumptions for at least one product. Fifty-nine percent of the term participants indicated updating their pricing mortality assumptions over the last two years. Thirty-five percent updated their UL products, 50 percent their ULSG products, and 41 percent indicated updating their WL products over the last two years.

Over the last three years, 75 percent of the participants have updated their pricing mortality assumptions for at least one product. Over the last five years, 90 percent have updated their pricing mortality assumptions for at least one product. All companies except one indicated updating their mortality assumptions within the past 10 years.

Four companies stated that their assumptions are reviewed annually. In these cases, the effective year is not necessarily 2013 since the reviews may not have required a change to the current assumptions. Three companies mentioned that they would be updating their mortality rates in the near future (from May 2013). One company stated that their UL and WL rates will be updated to match the more recent term assumptions during the next repricing of those products. Another participant stated they were in the process of updating their mortality rates, but the effective date fell outside of the April 1, 2013, deadline stipulated in the survey form. Another company said they were going through a mortality review process that could result in significant changes to their assumptions.

Table 5.7.1 Mortality Assumption Effective Date

| Calendar Year | Number of Participants | | | | |
	T10	T20	UL	ULSG	WL
2003			1	1	1
2006	1	1	1	1	2
2007	3	3	3	2	2
2008			2	1	
2009	1	1	3	2	2
2010	2	2	1	1	
2011	5	5	6	5	3
2012	11	11	5	9	4
2013	6	6	4	4	3
Total	**29**	**29**	**26**	**26**	**17**

6. PRICING MORTALITY ASSUMPTIONS

Companies were asked to provide their mortality assumptions, expressed as mortality rates per thousand, for every combination of the following parameters:

- Issue age: 35, 45, 65, and 75
- Duration: 1, 2, 3, 5, 6, 10, 11, 20, 21, 25, and 26
- Gender: Male and female
- Risk class: Best preferred nontobacco, residual standard nontobacco, and residual standard tobacco
- Face amount: $100K and $1MM
- Product: T10, T20, UL, ULSG, and WL.

The participating companies were asked to provide any important information related to the mortality assumptions provided in this survey. Two companies mentioned that their rates are not banded, thus the rates listed for both the $100K and $1MM bands are the same for these companies. Many companies were unable to provide ultimate rates for attained age 35 and sometimes 45 because their lowest issue ages and length of select period did not allow for this. For example, if a company's youngest issue age was 21 and they used a 25-year select period, the youngest ultimate age would be 46.

The assumptions were analyzed in the following ways:

- Duration 1 mortality rates
- Ratios of the select period mortality rates to the 26th duration mortality rates
- Ratios of the duration 1 mortality to duration 26 mortality, split by select period group (products with less than a 25-year select period, products with exactly a 25-year select period, and products with greater than a 25-year select period)
- Ratios of the duration 1 mortality rate to the ultimate mortality rate at the same age
- Normalized ratios of duration x to duration 1 mortality rates
- A heat map showing the change in rank of the UL mortality assumptions.

The 50th percentile results were determined for each cell and were used for each of the analyses listed above. The 50th percentile represents the rates or ratios for the company in the exact middle of the results for each cell. If there were an even number of companies, the results of the middle two companies were averaged. Each cell can be represented by a different company or a blend of a two companies' rates depending on where their rates fall by product, age, class, duration, risk class, or size.

For the first analysis, the 10th, 50th, and 90th percentiles are provided to give an indication of the spread of mortality results. Also, in the graphs of the normalized ratios, five different percentiles are provided. The full range of results was not provided to protect companies from having their assumptions identified. The focus of the analyses is on the differences between the parameters listed above.

Also, in some of the analyses, the SOA 2008 Valuation Basic Table Relative Risk (RR) 100 select and ultimate tables (2008 VBT) will be referenced. This is done for comparison purposes or as another point of reference. The 2008 VBT was used rather than the most commonly used 2001 VBT because it is the latest industry mortality table.

6.1. Duration 1 Mortality Assumptions

The duration 1 mortality assumptions serve as a point of reference for all other analysis done in the report. The other analyses often include ratios involving duration 1, so this information helps provide a frame of reference for the other analyses.

Table 6.1.1a shows the 50th percentile mortality rate per 1,000 for each cell. Tables 6.1.1b and 6.1.1c show the 10th and 90th percentiles as well to help provide a range of the rates for the group of participants. Figure 6.1.1 provides a comparison for one cell at all four ages of the duration 1 mortality rates for the 10th, 50th, and 90th percentiles. Table 6.1.2 lists the 2008 VBT rates for the same four issue ages. Table 6.1.3 shows the number of participants that provided assumptions for each of the cells. Other percentiles can be found in the supplemental Excel workbook provided with this report.

The mortality rate assumption pattern at the 50th percentile follows the expected relationships. Duration 1 mortality rates increase with increasing issue age, the male rates are higher than the female rates, and the $100K band rates are greater than or equal to the $1MM band rates. Also, the best preferred nontobacco risk class rates are lower than the residual standard nontobacco risk class rates, which are lower than the residual standard tobacco risk class rates.

Most participants indicated use of identical or similar assumptions for the T10 and T20 products and for UL and ULSG products.

By product, the T10 and T20 plans had the lowest 50th percentile rates, followed by ULSG, UL, and then WL. The T10 and T20 rates are similar at the younger ages, but for issue age 75, the T10 rates are consistently higher than the corresponding T20 rates. This could be due to the mix of companies providing results at issue age 75 (fewer companies provided assumptions at issue age 75) compared to younger issue ages.

The ULSG rates are likely less than the UL rates because of the better expected persistency on ULSG. WL has the highest first year rates of all the products, likely because these products are older and are more often written at smaller face amounts where the mortality experience is typically not as favorable.

There is a wide range of assumptions among the participating companies. For example, for ULSG, male, best preferred nontobacco, at $1MM, the rates range from 0.0882 (10th percentile) to 0.1631 (90th percentile) at issue age 35 and from 2.4537 (10th percentile) to 5.1558 (90th percentile) at issue age 75. The 90th percentile rates are 85 percent higher than the 10th percentile at issue age 35 and 110 percent higher at issue age 75.

For the male, best preferred nontobacco class, at the $1MM band for the 10-year level term, the ratios of 90th percentile to 10th percentiles were compared. Issue age 65 has the smallest ratio (1.2167/0.09010 = 1.35), and issue age 75 has the largest ratio (5.0460/2.5453 = 1.98). The percentiles can be found in Table 6.1.1b, and this can be seen visually in Figure 6.1.1.

The smallest ratio at issue age 65 may be due to the following:

- Companies having more credible mortality experience at issue age 65 than at the other issue ages
- Mortality being a bigger driver of pricing results at issue age 65 than 35 or 45.

The largest ratio at issue age 75 may be due to the following:

- A lack of certainty among the companies on assumptions at the oldest ages studied
- Less of a desire to be competitive at issue age 75 by some companies.

2008 VBT rates are shown in Table 6.1.2. In all cases, the duration 1 best preferred nontobacco risk class rates are lower than the 2008 VBT rates; they are 62 percent of the 2008 VBT nonsmoker rates on average for the cells shown. The residual standard nontobacco risk class rates are closer to the 2008 VBT nonsmoker rates but still exceed the 2008 VBT rates. They are 113 percent of the 2008 VBT nonsmoker rates on average. The residual standard tobacco rates are close to the 2008 VBT smoker rates, only 103 percent of the 2008 VBT smoker rates on average. The differences vary greatly by cell, so it is suggested that any analysis be done on each cell individually. For instance, the range for the best preferred nontobacco risk class is from 12 to 53 percent lower than the 2008 VBT nonsmoker rates.

Table 6.1.3 shows the number of participants represented in each mortality cell. One company does not offer the best preferred nontobacco risk class at the $100K band for T10 and T20. Several companies do not offer level premium term at age 75. Some companies do not offer T20 at age 65. The only cell count variance between UL, ULSG, and WL exists for ULSG at age 75 for the best preferred nontobacco risk class.

Table 6.1.1a Duration 1 Mortality Rates: 50th Percentile, All Products

Rates per 1000	$100K						$1MM					
Age	M, BPNT	M, RNT	M, RT	F, BPNT	F, RNT	F, RT	M, BPNT	M, RNT	M, RT	F, BPNT	F, RNT	F, RT
	10-Year Term											
35	0.1322	0.2379	0.5518	0.0945	0.1757	0.3750	0.1247	0.2219	0.5102	0.0896	0.1630	0.3407
45	0.2500	0.4430	1.1782	0.1869	0.3242	0.9170	0.2221	0.4072	1.0670	0.1732	0.3105	0.8482
65	1.1813	2.1447	6.0868	0.7500	1.3911	3.9454	1.0793	1.9510	5.5314	0.6815	1.2404	3.6500
75	3.8150	7.0600	18.2808	2.5086	4.2300	10.0974	3.5243	5.7946	15.7452	2.3116	4.2300	9.9347
Age	20-Year Term											
35	0.1335	0.2402	0.5536	0.0950	0.1764	0.3616	0.1262	0.2237	0.5262	0.0891	0.1635	0.3392
45	0.2493	0.4451	1.1459	0.1866	0.3240	0.9004	0.2233	0.4120	1.0808	0.1701	0.3149	0.8556
65	1.1322	2.1100	5.9706	0.7500	1.3668	3.7914	1.0082	1.9054	5.1410	0.6851	1.2108	3.5972
75	3.6154	6.1864	16.3134	2.4072	4.1697	9.8078	3.1447	5.3994	14.0663	2.1804	3.9642	8.5467
Age	Universal Life											
35	0.1465	0.2609	0.6028	0.1071	0.1855	0.3922	0.1304	0.2419	0.5602	0.0927	0.1687	0.3611
45	0.2519	0.4792	1.2400	0.2142	0.3890	1.0412	0.2300	0.4562	1.1634	0.1999	0.3409	0.9198
65	1.2104	2.2500	6.2032	0.7500	1.4727	4.0185	1.1252	2.0784	5.4720	0.6851	1.3232	3.9867
75	4.1997	7.5225	18.7942	2.5086	4.2300	10.5800	3.6217	6.9979	17.6114	2.3116	4.2300	10.0694
Age	Universal Life with Secondary Guarantees											
35	0.1216	0.2421	0.5587	0.1000	0.1690	0.3671	0.1197	0.2200	0.5100	0.0900	0.1676	0.3500
45	0.2423	0.4562	1.1459	0.1743	0.3218	0.8625	0.2162	0.4198	1.0500	0.1666	0.3124	0.8556
65	1.1813	2.1753	5.7912	0.6714	1.3149	3.8989	1.1017	1.9800	5.1118	0.6668	1.2175	3.7000
75	4.0074	7.0600	17.4402	2.3977	4.0500	10.1355	3.4950	5.9344	15.3536	2.2567	3.7671	9.9188
Age	Whole Life											
35	0.1600	0.2853	0.6022	0.1100	0.1986	0.3889	0.1304	0.2600	0.5859	0.0914	0.1800	0.3744
45	0.2895	0.5269	1.3001	0.2205	0.3910	0.9933	0.2500	0.4805	1.1792	0.2028	0.3510	0.9682
65	1.2200	2.2500	6.2200	0.7612	1.3860	4.0100	1.1514	2.1199	5.8420	0.7209	1.3860	3.7000
75	4.4850	7.3146	18.7942	2.5684	4.6584	11.0366	4.2578	6.8946	16.7208	2.4164	4.6584	10.5800

Table 6.1.1b Duration 1 Mortality Rates: Male, 10th and 90th Percentiles

Rates per 1000	$100K						$1MM					
	10th Percentile			90th Percentile			10th Percentile			90th Percentile		
	BPNT	RNT	RT	BPNT	RNT	RT	BPNT	RNT	RT	BPNT	RNT	RT
Age	10-Year Term											
35	0.1140	0.2087	0.4140	0.1792	0.3116	0.7310	0.1037	0.1816	0.3751	0.1550	0.3005	0.6740
45	0.1773	0.3364	0.9128	0.3021	0.5831	1.4772	0.1602	0.3251	0.8321	0.2963	0.5450	1.4621
65	0.9787	1.7704	4.5831	1.3460	2.5140	8.1030	0.9010	1.5690	4.0510	1.2167	2.3763	7.3046
75	2.8487	4.8946	10.5359	5.3700	9.7863	22.3973	2.5453	4.4458	10.3949	5.0460	8.6313	20.8132
Age	20-Year Term											
35	0.1129	0.2011	0.4120	0.1714	0.3116	0.7380	0.1006	0.1805	0.3701	0.1556	0.3003	0.6792
45	0.1793	0.3419	0.9397	0.3000	0.5842	1.4776	0.1690	0.3128	0.8276	0.2853	0.5500	1.4575
65	0.9589	1.7236	4.3919	1.3201	2.5465	7.4664	0.8917	1.5335	3.8950	1.2181	2.3630	6.4580
75	2.5688	4.3997	9.8700	5.3458	9.6354	22.6108	2.3649	4.3949	9.7420	4.3690	8.5824	21.6677
Age	Universal Life											
35	0.1142	0.2151	0.4260	0.2021	0.3461	0.8896	0.0954	0.1884	0.3723	0.1664	0.2904	0.7077
45	0.1734	0.3329	0.8981	0.3399	0.6140	1.7044	0.1708	0.3331	0.8673	0.3133	0.5702	1.4660
65	0.9823	1.8999	4.9197	1.4291	2.9082	9.4268	0.8462	1.5348	4.2375	1.3028	2.6017	7.9330
75	2.8746	5.3111	13.0146	5.7755	10.0243	25.1573	2.6188	4.4547	10.9353	5.4307	8.6661	22.2392
Age	Universal Life with Secondary Guarantees											
35	0.0973	0.1827	0.3733	0.1901	0.3198	0.7053	0.0882	0.1656	0.3009	0.1631	0.2944	0.6856
45	0.1641	0.3233	0.8489	0.3032	0.5747	1.4650	0.1650	0.3174	0.7541	0.2977	0.5587	1.3794
65	0.8850	1.6881	4.5601	1.3198	2.5393	7.8745	0.7814	1.3423	4.1322	1.2455	2.4939	7.3098
75	2.6652	4.7253	11.0157	5.3700	9.6356	23.8431	2.4537	4.2590	10.3091	5.1558	8.6661	21.4450
Age	Whole Life											
35	0.1168	0.2137	0.4261	0.2136	0.3329	0.8896	0.0975	0.1812	0.3704	0.1818	0.3178	0.8764
45	0.1791	0.3476	0.9529	0.3337	0.6039	1.6178	0.1746	0.3375	0.8337	0.3242	0.6039	1.6178
65	1.0048	1.7816	5.3483	1.6283	2.5700	8.2001	0.8702	1.5232	4.3006	1.3775	2.5700	8.2001
75	2.9411	5.2963	14.0605	7.9544	13.1050	30.4491	2.8707	5.2177	11.2545	7.0064	12.7330	30.4491

Table 6.1.1c Duration 1 Mortality Rates: Female, 10th and 90th Percentiles

Rates per 1000	$100K						$1MM					
	10th Percentile			90th Percentile			10th Percentile			90th Percentile		
	BPNT	RNT	RT	BPNT	RNT	RT	BPNT	RNT	RT	BPNT	RNT	RT
Age	10-Year Term											
35	0.0810	0.1378	0.3063	0.1195	0.2126	0.4891	0.0704	0.1244	0.2924	0.1101	0.2105	0.4352
45	0.1394	0.2574	0.6661	0.2347	0.4543	1.0913	0.1332	0.2313	0.5948	0.2230	0.4082	1.0624
65	0.5576	0.9896	2.2987	1.0961	1.9103	4.9632	0.5503	1.0124	2.1471	0.9648	1.6930	4.6918
75	1.6242	2.8134	6.0552	3.5174	6.2020	13.0543	1.5877	2.8134	5.7278	3.2567	5.9381	12.4234
Age	20-Year Term											
35	0.0765	0.1320	0.2988	0.1149	0.2126	0.4963	0.0703	0.1196	0.2789	0.1104	0.2041	0.4398
45	0.1389	0.2571	0.6615	0.2351	0.4551	1.0965	0.1331	0.2308	0.5886	0.2137	0.4109	1.0632
65	0.5533	0.9892	2.2837	1.0278	1.8775	4.6215	0.5441	1.0028	2.0573	0.9619	1.6900	4.4187
75	1.5999	2.7956	5.8634	3.3909	6.0885	12.6604	1.4977	2.7731	5.6500	3.2026	5.9991	11.3887
Age	Universal Life											
35	0.0822	0.1542	0.3165	0.1384	0.2464	0.5228	0.0710	0.1328	0.2922	0.1172	0.2101	0.4508
45	0.1461	0.2609	0.6807	0.2807	0.5003	1.2014	0.1349	0.2608	0.6545	0.2488	0.4505	1.0922
65	0.6001	1.0229	2.3171	1.2495	2.1326	5.8161	0.5719	1.0229	2.1533	1.0827	1.7612	4.9346
75	1.7769	2.9363	6.9218	3.9448	6.8452	15.9501	1.7057	2.9080	6.4073	3.4934	5.9381	13.3766
Age	Universal Life with Secondary Guarantees											
35	0.0701	0.1150	0.2487	0.1287	0.2335	0.4703	0.0622	0.1025	0.2083	0.1148	0.2099	0.4256
45	0.1373	0.2404	0.4757	0.2496	0.4645	1.0816	0.1209	0.2213	0.4391	0.2278	0.4428	1.0389
65	0.5549	0.9442	2.2991	1.1462	1.9567	5.2276	0.4713	0.7896	2.1533	1.0277	1.6960	4.4758
75	1.6789	2.8126	5.8317	3.5297	6.4299	13.6582	1.5621	2.7211	5.8317	3.2242	5.9269	12.4819
Age	Whole Life											
35	0.0826	0.1614	0.3200	0.1438	0.2400	0.5688	0.0737	0.1327	0.2712	0.1252	0.2280	0.5688
45	0.1486	0.2652	0.6955	0.2851	0.4960	1.1680	0.1410	0.2652	0.6774	0.2369	0.4900	1.1410
65	0.6001	1.0826	2.7928	1.5502	2.1000	5.6377	0.6001	1.0826	2.7767	1.1889	1.8570	4.8978
75	1.8748	2.9700	7.7877	5.0980	6.9455	16.6000	1.8748	2.9700	6.9340	3.9626	6.4761	14.0988

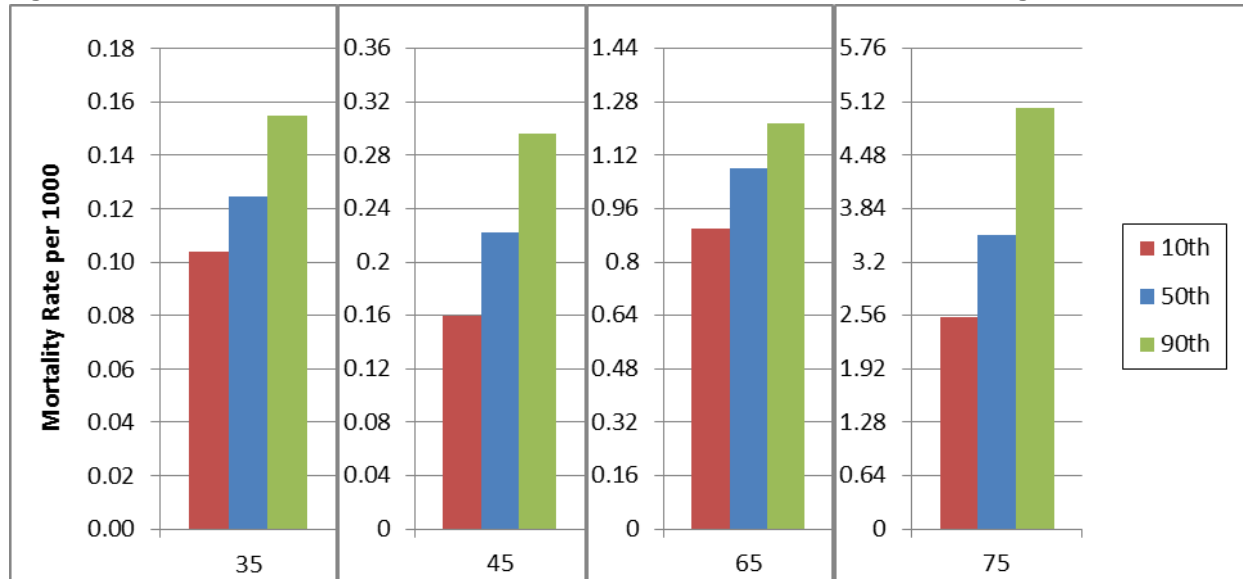## Figure 6.1.1 10-Year Level Premium Term: $1MM Face, Male, Best Preferred, Issue Ages 35, 45, 65, 75

Table 6.1.2 2008 VBT Relative Risk 100 Mortality Rates

Per 1,000	Duration 1			
Age	MNS	MSM	FNS	FSM
35	0.22	0.51	0.16	0.35
45	0.33	1.11	0.26	0.63
65	2.14	7.46	1.19	3.98
75	6.65	18.75	4.02	10.21

Table 6.1.3 Number of Participants: All Products

	$100K						$1MM					
	M, BPNT	M, RNT	M, RT	F, BPNT	F, RNT	F, RT	M, BPNT	M, RNT	M, RT	F, BPNT	F, RNT	F, RT
Age	10-Year Term											
35	27	28	28	27	28	28	28	28	28	28	28	28
45	27	28	28	27	28	28	28	28	28	28	28	28
65	27	28	28	27	28	28	28	28	28	28	28	28
75	25	25	24	25	25	24	25	25	24	25	25	24
Age	20-Year Term											
35	26	27	27	26	27	27	27	27	27	27	27	27
45	26	27	27	26	27	27	27	27	27	27	27	27
65	25	25	24	25	25	24	25	25	24	25	25	24
75	20	20	20	20	20	20	20	20	20	20	20	20
Age	Universal Life											
35	25	25	25	25	25	25	25	25	25	25	25	25
45	25	25	25	25	25	25	25	25	25	25	25	25
65	25	25	25	25	25	25	25	25	25	25	25	25
75	25	25	25	25	25	25	25	25	25	25	25	25
Age	Universal Life with Secondary Guarantees											
35	25	25	25	25	25	25	25	25	25	25	25	25
45	25	25	25	25	25	25	25	25	25	25	25	25
65	25	25	25	25	25	25	25	25	25	25	25	25
75	24	25	25	24	25	25	24	25	25	24	25	25
Age	Whole Life											
35	15	15	15	15	15	15	15	15	15	15	15	15
45	15	15	15	15	15	15	15	15	15	15	15	15
65	15	15	15	15	15	15	15	15	15	15	15	15
75	15	15	15	15	15	15	15	15	15	15	15	15

6.2. Ratio of Select Period Mortality Rates to Duration 26 Mortality Rates

In each section going forward, the rates or ratios presented, unless otherwise specified, will be based on the 50th percentile results. As mentioned earlier, assumptions for other percentiles can be found in the accompanying Excel workbook.

This section compares the slope of the mortality assumptions by looking at the ratios of the select period mortality rates to the duration 26 mortality rate.

All companies make an adjustment to level premium term mortality assumptions for the post–level premium period. Because there were inconsistencies in the way those assumptions were reported, the level premium term products were excluded from this particular analysis.

Table 6.2.1a through Table 6.2.3b show the results by product, UL (Tables 6.2.1a and b), ULSG (Tables 6.2.2a and b), and WL (Tables 6.2.3a and b). The "a" figures for each product show the male results for the best preferred nontobacco risk class, the residual standard nontobacco risk class, and the residual standard tobacco risk class. The "b" figures for each product show the female results for each of these risk classes. Tables 6.2.4a and b show the ratio of the select period mortality rates to duration 26 mortality rate for the 2008 VBT by gender and smoking status for comparison purposes.

By issue age, the slope is steepest for issue age 65 across all product, gender, risk class, and policy size combinations. This was also true for the 2008 VBT nonsmokers (for both genders), but for smokers, issue age 45 had the steepest slope. Issue age 35 had the flattest slope for the nontobacco risk classes, and issue age 75 had the flattest slope for the residual standard tobacco risk class. This pattern held for the 2008 VBT, except for the female smokers where issue age 35 had the flattest slope.

Females generally have a steeper slope than males for issue ages 35, 65, and 75 while males have a steeper slope for issue age 45. There were a couple exceptions:

- On ULSG, the female slope was steeper than that for males for the residual standard tobacco risk class at issue age 45.
- On WL, the male slope was steeper than that for females for the nontobacco risk classes for issue age 65.

By risk class, the best preferred nontobacco risk class had the steepest slope followed by the residual standard nontobacco risk class, and the residual standard tobacco risk class generally had the flattest slope. The exception to this is for female issue age 35 across all products and male issue age 35 for WL, where the residual standard tobacco risk class is steeper than the residual standard nontobacco risk class. Interestingly, this pattern holds with the 2008 VBT as well; that is, the nonsmoker slopes are steeper than the smoker slopes across all combinations, except for female issue age 35.

By policy size, for all product, issue age, gender, and risk class combinations, the slope for the $1MM assumptions was either similar or steeper than that for the $100K assumptions.

By product, ULSG has a steeper slope than both UL and WL for all issue age, gender, risk class, and policy size combinations, except for UL issue age 75 for male best preferred nontobacco at $1MM. UL has a steeper slope than WL for male nontobacco at all issue ages and policy sizes. For male tobacco and female both nontobacco and tobacco, the slopes varied between UL and WL.

Table 6.2.1a Ratio of Duration x to Duration 26 Mortality: UL, Male

	Universal Life							
	50th Percentile							
	$100K				$1MM			
Duration	35	45	65	75	35	45	65	75
	Male Best Preferred Nontobacco							
1	4.3%	2.7%	1.3%	1.9%	4.2%	2.7%	1.2%	1.6%
2	5.7%	3.9%	2.3%	2.7%	5.8%	3.8%	2.1%	2.5%
3	7.2%	5.0%	3.2%	3.6%	7.2%	5.0%	3.0%	3.5%
5	9.3%	6.9%	5.0%	5.6%	9.1%	6.9%	4.5%	5.5%
6	10.4%	7.9%	5.8%	6.9%	10.1%	7.9%	5.4%	6.4%
10	16.6%	13.6%	9.8%	13.6%	16.5%	13.6%	9.7%	13.0%
11	19.2%	15.4%	11.7%	16.0%	19.1%	15.6%	11.5%	15.2%
20	49.4%	46.3%	44.8%	60.9%	49.0%	46.3%	45.5%	57.3%
21	55.2%	51.4%	51.6%	66.0%	55.2%	51.4%	51.8%	64.8%
25	87.0%	86.4%	88.8%	92.3%	86.7%	86.4%	88.0%	92.3%
26	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	Male Residual Nontobacco							
1	4.5%	3.0%	1.8%	2.9%	4.3%	3.0%	1.7%	2.6%
2	6.3%	4.3%	3.1%	4.2%	6.0%	4.2%	2.8%	3.8%
3	8.0%	5.6%	4.2%	5.7%	7.6%	5.5%	4.0%	5.7%
5	10.0%	7.7%	6.6%	8.1%	9.8%	7.6%	6.3%	8.1%
6	11.3%	9.0%	7.8%	9.6%	10.9%	8.7%	7.6%	9.5%
10	17.6%	15.4%	13.3%	18.0%	17.6%	15.4%	12.6%	17.7%
11	20.1%	17.7%	15.1%	20.6%	20.1%	17.7%	14.7%	20.3%
20	52.0%	50.7%	51.4%	64.5%	50.9%	50.8%	50.0%	64.2%
21	56.8%	56.5%	57.9%	69.5%	56.8%	56.5%	56.7%	69.0%
25	87.6%	87.4%	90.0%	93.4%	87.6%	87.4%	90.0%	93.2%
26	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	Male Residual Tobacco							
1	4.6%	3.9%	3.7%	5.8%	4.6%	3.9%	3.4%	5.4%
2	6.2%	5.5%	5.8%	8.1%	6.1%	5.5%	5.7%	7.6%
3	8.2%	7.3%	8.0%	10.3%	8.2%	7.3%	8.0%	10.3%
5	10.4%	9.9%	11.4%	13.4%	10.4%	9.9%	11.3%	13.0%
6	11.8%	11.6%	12.9%	15.2%	11.7%	11.5%	12.6%	14.7%
10	18.7%	19.0%	20.0%	25.8%	18.7%	19.0%	19.9%	25.6%
11	21.6%	21.4%	22.7%	28.8%	21.6%	21.4%	22.1%	28.1%
20	56.0%	56.1%	56.4%	72.2%	55.8%	56.1%	54.6%	70.1%
21	61.9%	61.8%	61.7%	76.8%	61.6%	61.8%	60.0%	75.6%
25	89.6%	89.6%	91.4%	95.0%	89.5%	89.6%	91.4%	94.9%
26	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 6.2.1b Ratio of Duration *x* to Duration 26 Mortality: UL, Female

	Universal Life							
	50th Percentile							
	$100K				$1MM			
Duration	35	45	65	75	35	45	65	75
	Female Best Preferred Nontobacco							
1	3.7%	3.0%	1.2%	1.5%	3.7%	3.0%	1.2%	1.3%
2	4.9%	4.1%	2.2%	1.9%	4.8%	4.1%	2.1%	1.8%
3	5.6%	5.7%	2.9%	2.7%	5.6%	5.7%	2.9%	2.6%
5	7.4%	8.4%	4.1%	4.3%	7.4%	8.3%	3.8%	4.0%
6	8.9%	9.4%	5.0%	5.2%	8.8%	9.4%	4.5%	5.1%
10	16.0%	15.9%	9.6%	12.3%	16.0%	15.5%	9.6%	11.6%
11	18.3%	18.1%	11.2%	14.8%	18.3%	17.7%	11.2%	14.7%
20	50.9%	51.8%	43.1%	53.7%	50.9%	51.5%	43.1%	52.5%
21	55.9%	57.0%	50.4%	59.7%	55.9%	56.9%	50.4%	59.3%
25	89.5%	88.7%	85.5%	89.8%	89.4%	88.7%	85.5%	89.8%
26	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	Female Residual Nontobacco							
1	4.0%	3.3%	1.5%	1.9%	4.0%	3.3%	1.5%	1.8%
2	5.3%	4.5%	3.2%	3.0%	5.1%	4.4%	3.0%	2.7%
3	6.1%	6.7%	4.0%	4.0%	6.1%	6.0%	3.8%	3.6%
5	8.7%	9.1%	5.9%	6.2%	8.1%	8.9%	5.7%	5.7%
6	10.3%	10.7%	7.0%	7.3%	9.6%	10.6%	6.4%	7.1%
10	17.3%	19.1%	13.1%	16.8%	17.3%	19.2%	13.3%	15.3%
11	19.6%	21.6%	15.2%	19.6%	19.6%	22.1%	15.2%	18.5%
20	53.6%	55.5%	49.8%	57.4%	53.4%	55.5%	49.8%	56.2%
21	59.5%	61.3%	55.4%	63.2%	59.5%	61.3%	55.4%	62.3%
25	90.6%	90.7%	88.7%	91.3%	90.5%	90.7%	88.2%	90.9%
26	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	Female Residual Tobacco							
1	3.6%	4.0%	3.0%	4.1%	3.6%	3.9%	3.0%	4.0%
2	4.7%	5.7%	5.3%	5.2%	4.6%	5.7%	5.3%	5.2%
3	6.0%	7.6%	6.5%	6.9%	5.8%	7.6%	6.7%	6.9%
5	8.8%	10.8%	8.8%	10.1%	8.4%	10.8%	8.8%	9.6%
6	10.2%	12.5%	10.7%	11.7%	10.0%	12.3%	10.7%	11.7%
10	17.3%	21.5%	19.6%	22.7%	17.3%	21.5%	19.6%	22.3%
11	19.9%	24.3%	22.0%	26.3%	19.9%	24.4%	22.0%	25.5%
20	57.4%	57.9%	55.8%	61.3%	55.6%	57.9%	53.9%	61.3%
21	63.2%	63.3%	61.5%	67.6%	61.3%	63.3%	61.0%	65.7%
25	91.5%	91.3%	91.0%	91.6%	91.6%	91.6%	90.3%	92.2%
26	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 6.2.2a Ratio of Duration *x* to Duration 26 Mortality: ULSG, Male

	Universal Life with Secondary Guarantees							
	50th Percentile							
	$100K				$1MM			
Duration	35	45	65	75	35	45	65	75
Male Best Preferred Nontobacco								
1	4.1%	2.7%	1.3%	1.8%	4.1%	2.7%	1.2%	1.7%
2	5.9%	3.9%	2.3%	2.7%	5.9%	3.9%	2.2%	2.6%
3	7.2%	5.0%	3.3%	3.7%	7.2%	5.1%	3.3%	3.6%
5	9.6%	6.9%	5.0%	5.6%	9.6%	7.1%	4.6%	5.5%
6	10.4%	7.9%	5.8%	6.9%	10.4%	8.4%	5.6%	6.5%
10	16.8%	13.8%	10.3%	13.3%	16.5%	13.8%	9.8%	12.3%
11	19.3%	15.9%	12.2%	16.0%	19.3%	15.9%	11.7%	14.7%
20	49.0%	47.1%	44.4%	59.4%	49.0%	47.1%	44.3%	57.2%
21	55.2%	51.4%	51.4%	65.5%	55.2%	52.4%	51.4%	64.7%
25	87.0%	86.1%	87.9%	92.2%	87.0%	86.3%	87.6%	92.2%
26	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Male Residual Nontobacco								
1	4.3%	3.0%	1.8%	2.6%	4.3%	3.0%	1.7%	2.6%
2	6.3%	4.3%	3.1%	4.2%	6.2%	4.3%	2.9%	3.7%
3	8.0%	5.8%	4.3%	5.7%	7.8%	5.6%	4.1%	5.7%
5	10.0%	8.1%	6.6%	7.8%	10.0%	7.8%	6.3%	7.6%
6	11.5%	9.0%	7.7%	9.1%	11.5%	9.2%	7.6%	8.5%
10	17.7%	16.1%	13.7%	17.6%	17.6%	16.0%	12.8%	17.0%
11	20.1%	17.8%	15.4%	20.7%	20.1%	17.8%	15.1%	20.2%
20	51.9%	50.2%	51.4%	64.0%	51.3%	50.2%	50.0%	64.0%
21	57.0%	56.5%	57.6%	69.0%	56.9%	56.5%	56.7%	69.0%
25	87.6%	87.4%	89.9%	93.4%	87.6%	87.4%	89.6%	93.2%
26	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Male Residual Tobacco								
1	4.3%	3.8%	3.5%	5.4%	4.3%	3.8%	3.2%	5.3%
2	6.2%	5.5%	5.7%	7.8%	6.2%	5.5%	5.5%	7.3%
3	8.0%	7.2%	7.8%	10.2%	8.0%	7.2%	7.7%	10.2%
5	10.4%	9.9%	11.0%	13.2%	10.4%	9.9%	10.8%	12.8%
6	11.8%	11.5%	12.7%	15.0%	11.8%	11.5%	12.5%	14.6%
10	18.6%	19.0%	19.8%	24.9%	18.6%	19.0%	19.2%	24.7%
11	21.1%	21.4%	21.7%	28.1%	21.1%	21.4%	21.4%	27.7%
20	55.8%	56.1%	55.5%	72.2%	55.4%	56.1%	54.3%	70.1%
21	61.8%	61.8%	61.5%	76.3%	61.4%	61.8%	60.0%	75.5%
25	89.2%	89.8%	91.4%	94.9%	89.2%	89.8%	91.4%	94.9%
26	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 6.2.2b Ratio of Duration *x* to Duration 26 Mortality: ULSG, Female

	Universal Life with Secondary Guarantees							
	50th Percentile							
	$100K				$1MM			
Duration	35	45	65	75	35	45	65	75
	Female Best Preferred Nontobacco							
1	3.6%	2.9%	1.1%	1.3%	3.6%	2.9%	1.1%	1.3%
2	5.0%	4.3%	2.2%	1.9%	5.0%	4.3%	2.1%	1.9%
3	5.8%	5.7%	3.0%	2.7%	5.8%	5.7%	2.9%	2.6%
5	7.7%	8.4%	4.3%	4.3%	7.7%	8.3%	4.0%	4.1%
6	9.5%	9.4%	5.0%	5.4%	9.5%	9.4%	4.9%	5.1%
10	16.8%	17.0%	9.7%	12.2%	16.8%	16.6%	9.6%	12.0%
11	19.4%	19.4%	11.8%	14.9%	19.4%	18.9%	11.3%	14.9%
20	49.7%	51.8%	43.0%	53.5%	49.7%	51.3%	43.0%	51.3%
21	55.3%	56.8%	50.4%	59.5%	55.3%	56.8%	50.4%	58.4%
25	89.1%	88.7%	86.7%	89.8%	89.1%	88.6%	86.4%	89.8%
26	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	Female Residual Nontobacco							
1	3.9%	3.3%	1.5%	1.8%	3.8%	3.3%	1.5%	1.7%
2	5.3%	4.5%	3.0%	2.7%	5.3%	4.5%	3.0%	2.7%
3	6.9%	6.0%	4.1%	3.8%	6.9%	6.0%	4.1%	3.5%
5	9.1%	9.2%	5.8%	5.7%	9.4%	9.2%	5.8%	5.7%
6	10.9%	11.0%	6.9%	7.0%	11.1%	10.9%	6.8%	7.0%
10	19.4%	19.8%	12.5%	15.1%	18.2%	19.8%	12.5%	15.1%
11	22.1%	22.4%	14.4%	18.5%	20.5%	22.4%	14.3%	18.5%
20	53.6%	54.6%	47.3%	56.7%	53.4%	54.6%	47.3%	55.0%
21	59.5%	58.5%	54.5%	62.6%	59.5%	58.5%	54.5%	60.3%
25	90.3%	90.1%	88.7%	90.9%	90.2%	90.1%	88.2%	90.7%
26	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	Female Residual Tobacco							
1	3.6%	3.6%	2.8%	4.0%	3.5%	3.6%	2.8%	3.8%
2	4.6%	5.6%	4.9%	5.2%	4.6%	5.6%	4.9%	5.1%
3	6.2%	7.3%	6.5%	6.6%	5.8%	7.3%	6.5%	6.5%
5	8.5%	10.9%	8.8%	9.7%	8.5%	10.9%	8.8%	9.4%
6	10.0%	12.9%	10.7%	11.7%	10.0%	12.9%	10.7%	11.6%
10	17.2%	21.8%	18.8%	21.7%	17.0%	21.9%	18.7%	21.4%
11	19.6%	25.2%	21.7%	25.7%	19.6%	25.2%	20.7%	24.9%
20	55.7%	57.9%	53.9%	61.3%	55.4%	57.9%	53.9%	61.3%
21	61.8%	63.3%	60.3%	66.2%	61.3%	63.3%	60.3%	65.3%
25	91.5%	91.3%	91.7%	91.6%	91.5%	91.5%	91.3%	91.6%
26	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 6.2.3a Ratio of Duration *x* to Duration 26 Mortality: WL, Male

	Whole Life							
	50th Percentile							
	$100K				$1MM			
Duration	35	45	65	75	35	45	65	75
Male Best Preferred Nontobacco								
1	4.4%	2.8%	1.3%	2.2%	4.3%	2.8%	1.2%	2.2%
2	5.7%	4.0%	2.3%	3.4%	5.9%	4.0%	2.2%	3.0%
3	7.4%	5.0%	3.3%	4.4%	7.4%	5.0%	3.3%	3.8%
5	9.6%	7.1%	5.1%	6.1%	9.6%	6.9%	4.5%	5.7%
6	10.9%	7.8%	6.0%	7.2%	10.6%	7.8%	5.3%	6.6%
10	17.5%	13.4%	10.0%	13.8%	17.5%	13.4%	10.0%	13.0%
11	19.5%	15.0%	11.7%	16.1%	19.5%	15.0%	11.7%	15.9%
20	51.1%	48.2%	44.3%	57.5%	50.9%	48.1%	44.3%	57.2%
21	57.3%	54.3%	51.0%	65.2%	56.7%	54.3%	51.4%	64.8%
25	88.8%	87.5%	88.8%	92.3%	88.0%	87.5%	87.9%	92.3%
26	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Male Residual Nontobacco								
1	4.9%	3.1%	1.8%	3.0%	4.7%	3.1%	1.8%	2.9%
2	6.4%	4.7%	2.9%	4.2%	6.4%	4.7%	2.9%	4.2%
3	8.2%	5.8%	4.6%	5.7%	8.2%	5.8%	4.6%	5.7%
5	10.5%	8.3%	6.9%	8.8%	10.2%	7.7%	6.6%	8.5%
6	11.8%	9.4%	7.9%	10.4%	11.4%	8.7%	7.7%	9.9%
10	18.6%	16.0%	14.0%	18.1%	18.6%	16.0%	14.0%	17.6%
11	21.0%	17.8%	15.8%	20.8%	21.0%	17.8%	15.8%	20.2%
20	54.3%	51.2%	48.1%	62.1%	52.6%	51.9%	47.2%	62.0%
21	60.3%	57.0%	53.7%	68.7%	58.7%	58.1%	53.6%	68.2%
25	90.1%	89.4%	88.9%	93.4%	88.8%	89.3%	88.5%	93.2%
26	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Male Residual Tobacco								
1	4.3%	3.9%	3.7%	5.8%	4.3%	3.9%	3.2%	5.8%
2	6.1%	5.5%	5.7%	8.3%	6.0%	5.5%	5.7%	8.0%
3	7.8%	7.4%	8.7%	10.9%	7.8%	7.4%	8.7%	10.9%
5	10.6%	10.2%	11.8%	14.4%	10.4%	9.9%	11.8%	13.4%
6	11.9%	11.9%	13.4%	16.3%	11.9%	11.7%	13.2%	15.0%
10	18.8%	18.1%	19.2%	25.2%	18.8%	17.9%	18.5%	25.0%
11	21.7%	21.1%	21.5%	29.9%	21.6%	21.1%	20.5%	28.8%
20	55.6%	56.6%	55.6%	71.1%	55.4%	56.6%	54.7%	69.4%
21	61.6%	62.1%	61.5%	75.6%	61.3%	62.1%	60.5%	75.2%
25	90.3%	90.9%	91.2%	94.9%	90.3%	90.9%	91.2%	94.8%
26	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 6.2.3b Ratio of Duration *x* to Duration 26 Mortality: WL, Female

	Whole Life							
	50th Percentile							
	$100K				$1MM			
Duration	35	45	65	75	35	45	65	75
Female Best Preferred Nontobacco								
1	3.6%	2.9%	1.3%	1.7%	3.6%	2.9%	1.3%	1.5%
2	4.9%	4.4%	2.3%	2.0%	4.9%	4.3%	2.2%	1.9%
3	5.6%	5.6%	3.2%	2.7%	5.6%	5.3%	3.2%	2.6%
5	7.6%	8.0%	4.5%	4.3%	7.4%	7.8%	3.9%	4.1%
6	9.0%	9.4%	5.2%	5.4%	8.9%	9.4%	4.5%	5.2%
10	16.0%	15.4%	10.1%	13.1%	16.0%	15.4%	9.8%	12.7%
11	18.3%	17.4%	11.8%	15.6%	18.3%	17.3%	11.7%	15.2%
20	49.7%	50.1%	44.0%	53.2%	49.7%	50.1%	44.0%	51.3%
21	55.3%	56.2%	50.8%	59.4%	55.3%	56.2%	50.8%	58.0%
25	89.1%	89.5%	87.1%	90.3%	89.1%	89.5%	86.8%	90.3%
26	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Female Residual Nontobacco								
1	4.6%	3.3%	1.9%	2.5%	4.0%	3.3%	1.9%	2.5%
2	5.6%	4.5%	3.3%	3.2%	5.6%	4.5%	3.3%	2.8%
3	6.9%	6.0%	4.2%	4.0%	6.5%	6.0%	4.2%	3.6%
5	9.7%	9.1%	5.9%	6.2%	8.2%	8.6%	5.8%	5.7%
6	10.6%	10.7%	7.0%	7.3%	9.8%	10.3%	6.8%	7.1%
10	17.3%	18.8%	13.6%	17.3%	17.3%	18.7%	13.6%	16.3%
11	19.3%	21.4%	15.6%	20.1%	19.3%	21.4%	15.6%	19.6%
20	53.4%	52.4%	47.3%	57.5%	53.4%	53.0%	47.2%	56.4%
21	57.9%	58.4%	54.0%	63.2%	57.9%	59.0%	54.0%	62.7%
25	90.2%	90.7%	88.9%	91.3%	90.2%	90.7%	88.7%	90.8%
26	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Female Residual Tobacco								
1	3.7%	4.1%	2.8%	4.5%	3.4%	4.1%	2.8%	4.1%
2	5.1%	5.9%	4.9%	5.2%	4.9%	5.9%	4.9%	5.2%
3	6.3%	7.9%	6.5%	6.9%	6.3%	7.9%	6.5%	6.8%
5	8.8%	10.9%	9.0%	10.1%	8.4%	10.9%	9.0%	9.4%
6	10.4%	12.9%	10.7%	12.1%	10.0%	12.3%	9.9%	11.6%
10	17.0%	21.8%	18.8%	23.1%	17.0%	21.8%	18.7%	22.0%
11	19.6%	24.7%	22.0%	27.1%	19.6%	24.7%	20.7%	25.6%
20	55.7%	58.5%	54.9%	62.9%	54.3%	58.4%	54.6%	61.9%
21	61.8%	63.8%	61.5%	68.7%	60.7%	63.9%	61.4%	67.1%
25	91.5%	91.5%	91.3%	92.2%	91.5%	91.7%	91.3%	92.7%
26	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 6.2.4a Ratio of Duration _x_ to Duration 26 Mortality: 2008 VBT RR100, Male

Duration	50th Percentile							
	MNS				MSM			
	35	45	65	75	35	45	65	75
1	4.0%	2.2%	1.5%	2.0%	4.0%	3.1%	3.8%	5.0%
2	5.9%	3.5%	2.4%	3.1%	6.1%	4.6%	5.6%	6.9%
3	7.0%	4.8%	3.3%	4.2%	7.0%	5.9%	7.3%	8.6%
5	8.1%	6.9%	5.1%	6.8%	8.2%	8.2%	10.5%	12.1%
6	9.0%	7.9%	6.2%	8.2%	8.8%	9.4%	12.0%	14.0%
10	16.5%	13.8%	11.8%	15.7%	15.9%	16.3%	19.2%	23.2%
11	19.3%	15.9%	13.6%	19.1%	18.6%	18.3%	21.4%	27.5%
20	49.4%	42.9%	43.9%	64.0%	48.4%	43.6%	52.0%	72.2%
21	54.0%	48.1%	51.1%	69.0%	53.3%	49.3%	58.6%	76.3%
25	84.9%	85.3%	88.9%	93.0%	84.5%	86.2%	91.1%	94.9%
26	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 6.2.4b Ratio of Duration _x_ to Duration 26 Mortality: 2008 VBT RR100, Female

Duration	50th Percentile							
	FNS				FSM			
	35	45	65	75	35	45	65	75
1	3.7%	2.2%	1.1%	1.5%	3.6%	2.3%	2.7%	3.3%
2	5.1%	3.0%	2.0%	2.5%	4.6%	3.9%	4.8%	5.2%
3	5.8%	4.3%	2.9%	3.5%	5.5%	5.4%	6.9%	6.9%
5	7.4%	6.5%	4.8%	5.7%	7.3%	7.8%	10.7%	10.1%
6	8.8%	7.7%	5.7%	7.0%	8.6%	9.2%	12.3%	11.7%
10	16.0%	14.3%	10.5%	13.7%	15.6%	17.2%	18.6%	19.8%
11	18.1%	16.2%	12.1%	17.1%	17.9%	19.6%	20.4%	24.1%
20	44.2%	38.8%	43.0%	55.0%	50.3%	45.0%	50.8%	61.3%
21	49.1%	44.3%	51.1%	59.6%	55.7%	50.1%	58.7%	65.3%
25	84.0%	84.2%	90.3%	89.8%	83.3%	84.7%	92.5%	91.6%
26	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

6.3. Ratio of Duration 1 to Duration 26 Mortality Rates by Select Period Group

This section presents the ratio of duration 1 mortality rates to duration 26 mortality rates broken down by select period group:

- Select period less than 25 years (range was 10–23)
- 25-year select periods
- Select period greater than 25 years (range was 30–60 years).

The purpose of this analysis was to try to determine whether shorter select periods had steeper or flatter slopes as they reached the ultimate period sooner than longer select period designs. However, it should be pointed out that by only comparing durations 1 and 26, this cannot definitively be done because some companies that have a shorter select period, for example, may have a steep select period and flat ultimate period, or vice versa, either one of which may lead to a wrong conclusion when only durations 1 and 26 are observed. With that caveat, it was still decided to make these observations.

Table 6.3.1 shows the results for the less than 25-year select period, 25-year select period, and greater than 25-year select period, respectively. Again, results are not shown for the level premium term plans because of the inconsistent reporting beyond the level premium period.

Certain cells did not have enough data to do this analysis. Where this was the case, the table shows "Not enough data." Cells with three or more companies were considered to be sufficient and are shown in the tables. Table 6.3.2 shows the 2008 VBT ratios as a point of reference.

The UL product did not have enough companies providing assumptions at the younger issue ages (35, 45, and 65) with a select period shorter than 25 years to show results. At issue age 75, 11 companies provided assumptions for these cells and the select periods tended not to extend beyond age 100. For a select period greater than 25 years, a sufficient number of companies provided assumptions at these younger issue ages (35, 45, and 65) but not at age issue 75. Data was not provided by a sufficient number of companies for ULSG or WL at any age.

First, in comparing the UL select periods of less than 25 years, only issue age 75 was available for comparison. The slope of the less than 25-year select period was steeper than that of the 25-year select period for issue age 75. Also, the slope of the greater than 25-year select period was flatter than the slope of the 25-year select period for issue ages 35 and 45 and generally steeper for issue age 65.

Comparisons for ULSG and WL were only between the slopes of the less than 25-year select period and the 25-year select period. In general, for both ULSG and WL, the 25-year select period has a steeper slope for the nontobacco risk classes and issue ages 35, 45, and 65, while the less than 25-year select period has a steeper slope for the residual standard tobacco risk class and issue age 75.

One would expect these mortality ratios to be higher for the products that have select periods greater than 25 years over those with select periods of 25 years of less. Since the select period

extends longer than 25 years, the duration 26 mortality rate could be expected to be lower than the duration 26 mortality rate for a 25-year select period. For the UL product at issue ages 35 and 45, the mortality ratios for select periods over 25 years are equal or greater to the 25-year select period counterpart. At issue age 65, this is not the case. A larger group of companies (16–17) make up the 25-year select period data, while only four companies are represented in the issue age 65 cells with select periods greater than 25 years. This disconnect in mix of companies is the likely cause of this unexpected result.

It should be noted that this comparison was made to duration 26 in all instances. If it was done to the end of the select period, it is possible that results may have been different.

Table 6.3.2 shows the results for the 2008 VBT. The 2008 VBT ratios are similar to the participant data for the 25-year select period. The largest differences appear to be at issue age 45 across all cells and at issue age 75 for the residual standard nontobacco and residual standard tobacco risk classes. In these cases, the participant ratios are higher than the 2008 VBT, implying a flatter slope.

Table 6.3.1 Duration 1 to Duration 26 Mortality: 50th Percentile

	$100K						$1MM					
	M PBNT	M RNT	M RT	F PBNT	F RNT	F RT	M PBNT	M RNT	M RT	F PBNT	F RNT	F RT
Select Period Less Than 25 Years												
Age	Universal Life											
35–65	Not enough data						Not enough data					
75	1.5%	2.6%	5.1%	1.0%	1.6%	3.3%	1.5%	2.4%	4.7%	1.0%	1.6%	3.3%
Age	Universal Life with Secondary Guarantees											
35	5.1%	5.6%	3.9%	5.4%	5.9%	3.5%	4.6%	4.6%	3.6%	4.7%	4.9%	3.5%
45	3.2%	3.7%	3.2%	3.5%	4.2%	3.9%	3.0%	3.5%	3.2%	3.3%	4.0%	3.9%
65	1.6%	2.4%	3.3%	1.7%	2.0%	2.7%	1.5%	2.1%	2.8%	1.6%	1.9%	2.6%
75	1.8%	2.9%	5.3%	1.2%	1.9%	4.3%	1.5%	2.6%	5.1%	1.2%	1.8%	4.0%
Age	Whole Life											
35	5.2%	5.7%	4.0%	5.5%	5.9%	4.3%	4.7%	4.6%	3.7%	4.9%	4.9%	4.0%
45	3.2%	3.7%	3.2%	3.6%	4.2%	4.3%	3.0%	3.5%	3.2%	3.4%	4.0%	4.3%
65	1.7%	2.5%	3.3%	1.7%	2.0%	2.7%	1.6%	2.3%	2.8%	1.6%	1.9%	2.6%
75	1.8%	2.7%	5.0%	1.1%	1.9%	3.3%	1.6%	2.6%	4.2%	1.0%	1.7%	3.3%
25-Year Select Period												
Age	Universal Life											
35	4.1%	4.3%	4.6%	3.6%	3.8%	3.6%	4.0%	4.3%	4.6%	3.6%	3.7%	3.6%
45	2.7%	2.9%	3.9%	3.0%	3.2%	3.8%	2.7%	2.9%	3.9%	3.1%	3.2%	3.8%
65	1.3%	1.8%	3.7%	1.1%	1.4%	3.0%	1.2%	1.6%	3.4%	1.1%	1.5%	3.0%
75	2.2%	3.0%	6.2%	1.7%	2.2%	4.3%	2.2%	3.0%	6.2%	1.6%	2.2%	4.3%
Age	Universal Life with Secondary Guarantees											
35	4.1%	4.2%	4.3%	3.6%	3.7%	3.6%	4.0%	4.2%	4.3%	3.6%	3.6%	3.5%
45	2.7%	2.9%	3.8%	2.9%	3.2%	3.5%	2.7%	2.9%	3.8%	2.9%	3.2%	3.5%
65	1.4%	1.7%	3.5%	1.1%	1.4%	2.8%	1.4%	1.7%	3.4%	1.1%	1.4%	2.8%
75	2.0%	2.5%	5.9%	1.5%	1.6%	3.7%	2.0%	2.5%	5.8%	1.5%	1.6%	3.6%
Age	Whole Life											
35	4.2%	4.2%	4.2%	3.5%	3.4%	3.4%	4.2%	4.2%	4.2%	3.4%	3.5%	3.4%
45	2.7%	2.9%	3.9%	2.7%	3.1%	3.8%	2.7%	2.9%	3.9%	2.7%	3.1%	3.8%
65	1.1%	1.6%	3.1%	1.1%	1.5%	2.8%	1.1%	1.6%	3.1%	1.1%	1.5%	2.8%
75	2.4%	3.0%	6.2%	1.7%	2.2%	4.3%	2.4%	3.0%	6.2%	1.7%	2.2%	4.3%
Select Period Greater than 25 Years												
Age	Universal Life											
35	4.9%	6.0%	4.7%	4.1%	5.9%	4.5%	5.4%	5.9%	4.6%	4.2%	5.9%	4.6%
45	2.7%	4.0%	4.0%	3.5%	5.0%	4.4%	2.8%	4.0%	4.0%	3.5%	5.1%	4.4%
65	1.0%	1.7%	3.1%	1.0%	1.6%	2.6%	1.0%	1.8%	3.1%	1.0%	1.6%	2.6%
75	Not enough data						Not enough data					
Age	Universal Life with Secondary Guarantees, Whole Life											
35–75	Not enough data						Not enough data					

Table 6.3.2 Duration 1 to Duration 26 Mortality: 2008 VBT RR100

Age	MNS	MSM	FNS	FSM
35	4.0%	4.0%	3.7%	3.6%
45	2.2%	3.1%	2.2%	2.3%
65	1.5%	3.8%	1.1%	2.7%
75	2.0%	5.0%	1.5%	3.3%

6.4. Ratio of Duration 1 to Same Age Ultimate Mortality Rates

Participants were asked to also share their ultimate mortality rates at the four requested ages. Ratios were calculated for the duration 1 (issue age) mortality rate to the ultimate mortality rate at the same age. Table 6.4.1 shows these ratios. The ultimate rates for the level premium term products appeared to be reasonable so these products are included for this analysis. Table 6.4.2 shows the same ratios for the 2008 VBT.

The higher the ratio in this analysis, the closer the initial rate is to the ultimate rate and the smaller the discount that was assumed for underwriting.

By age, 35 had the highest ratio, and 65 had the lowest ratio across all combinations. The likely reason age 35 had the highest ratio is that underwriting at the younger ages has a smaller impact on mortality. The likely reason age 65 had a lower ratio than age 75 is that issue age 75 typically has a shorter select period than issue age 65.

By gender, the pattern was consistent between products. For age 45, the male ratio was lower than the female slope, and the opposite was true for age 65. Except for the best preferred nontobacco risk class, age 35 generally followed the same pattern as age 45 (i.e., males having the lower ratio), and again, except for the preferred nontobacco risk class, age 75 generally followed the same pattern as 65 (i.e., females having the lower ratio). This consistency is likely due to the pattern observed in the industry standard tables.

By risk class, the best preferred nontobacco risk class had the lowest ratio, and the residual standard tobacco risk class had the highest ratio. This is not surprising because the best preferred nontobacco risk class has the lowest mortality at issue, and the residual standard tobacco risk class has the highest mortality among the risk classes. Also, there is some convergence in mortality rates by risk class over time.

By policy size, the ratio for $1MM was lower than that for $100K, again because of the initial lower expectation of mortality for the $1MM policy size.

By product, results were generally similar between the level premium term products. The level premium term ratios were generally lower than the UL. The UL, ULSG, and WL had some similar patterns with more exceptions than the level premium term products.

Ratios for the 2008 VBT are shown in Table 6.4.2. Age 35 is blank because there are no age 35 ultimate rates in the 2008 VBT. The males have higher ratios than females at the older issue ages, 65 and 75, but lower ratios at issue age 45. The smokers have higher ratios than the nonsmokers. These observations are similar to the pattern of the mortality assumptions described above.

Table 6.4.1 Ratio of Duration 1 to Same Age Ultimate Mortality: 50th Percentile

	$100K						$1MM					
	M, BPNT	M, RNT	M, RT	F, BPNT	F, RNT	F, RT	M, BPNT	M, RNT	M, RT	F, BPNT	F, RNT	F, RT
Age	10-Year Term											
35	34.1%	34.4%	40.3%	32.7%	35.6%	42.6%	33.3%	34.3%	40.3%	32.4%	35.5%	42.0%
45	24.5%	28.4%	32.6%	30.1%	33.8%	37.3%	23.6%	28.3%	32.3%	29.2%	33.8%	37.2%
65	18.2%	22.3%	24.9%	17.3%	19.5%	23.5%	18.6%	21.6%	25.0%	16.6%	18.7%	23.4%
75	21.4%	28.5%	32.8%	22.3%	24.6%	26.3%	21.3%	23.6%	31.3%	22.3%	23.6%	26.3%
Age	20-Year Term											
35	33.3%	34.1%	36.9%	32.0%	34.7%	38.5%	33.2%	33.9%	36.9%	31.3%	34.7%	38.1%
45	24.7%	28.3%	32.1%	29.9%	32.5%	37.5%	23.7%	27.6%	31.9%	28.7%	32.5%	37.4%
65	17.9%	22.3%	25.2%	17.1%	20.7%	23.6%	17.9%	21.6%	25.2%	16.1%	19.1%	23.6%
75	21.4%	28.5%	31.9%	22.3%	24.6%	26.3%	21.3%	25.0%	30.0%	22.3%	24.3%	24.9%
Age	Universal Life											
35	34.3%	35.4%	44.4%	32.7%	37.5%	43.1%	33.4%	34.8%	44.4%	31.6%	36.3%	42.4%
45	27.1%	31.3%	34.2%	30.2%	35.8%	39.3%	29.5%	31.6%	34.2%	31.4%	35.7%	39.9%
65	20.6%	24.0%	31.9%	19.7%	20.9%	24.5%	19.8%	23.9%	29.5%	17.6%	20.9%	24.5%
75	24.0%	30.0%	35.5%	22.3%	28.7%	28.3%	22.2%	28.8%	33.3%	22.3%	28.0%	28.3%
Age	Universal Life with Secondary Guarantees											
35	32.9%	34.3%	44.1%	34.3%	38.4%	45.8%	22.6%	33.4%	44.1%	32.0%	36.4%	45.8%
45	27.8%	31.2%	34.4%	31.1%	33.8%	37.7%	28.3%	31.2%	34.4%	31.1%	33.8%	37.7%
65	21.7%	24.0%	32.2%	18.6%	20.9%	25.0%	21.4%	23.9%	29.8%	17.6%	20.8%	24.7%
75	24.0%	29.0%	34.4%	23.1%	26.1%	28.9%	22.2%	26.6%	33.0%	22.8%	26.0%	28.7%
Age	Whole Life											
35	27.6%	40.7%	42.8%	31.3%	35.9%	46.8%	20.3%	37.4%	42.8%	31.3%	34.4%	42.3%
45	25.9%	30.9%	32.1%	29.7%	33.3%	38.5%	28.0%	30.9%	31.9%	30.3%	33.3%	38.5%
65	21.2%	23.2%	30.3%	19.8%	21.3%	24.0%	20.3%	22.7%	27.9%	17.8%	20.4%	24.0%
75	27.5%	30.1%	37.5%	22.7%	26.5%	30.0%	27.5%	30.1%	36.7%	22.7%	25.9%	29.4%

Table 6.4.2 Ratio of Duration 1 to Same Age Ultimate Mortality: 2008 VBT RR100

Age	MNS	MSM	FNS	FSM
35				
45	18.1%	27.7%	26.0%	29.6%
65	24.0%	34.9%	17.5%	25.0%
75	24.9%	32.8%	19.3%	22.5%

6.5. Normalized Ratios of Duration *x* to Duration 1 Mortality Rates

As was seen earlier in the report, duration 1 mortality rate assumptions vary company to company. For this analysis, the mortality rates from other durations are divided by the duration 1 mortality rate. Using these ratios "normalizes" the other durations' mortality rates. In other words, it no longer matters the level of the duration 1 mortality rate, but rather the movement from the duration 1 mortality rate is what matters and is observed in this section.

Graphs were developed for two specific cells to compare the slopes of the mortality rates across various percentiles and relative to 2008 VBT. The cells are the following:

- 20-year level premium term, $1MM face, male, best preferred nontobacco risk class, issue age 45 (Figure 6.5.1)
- Universal life, $100K face, male, best preferred nontobacco risk class, issue age 65 (Figure 6.5.2).

For the durations where the mortality rates were not requested, the values were linearly interpolated to complete the graphs. For the T20, the graph shows 20 durations. For the UL product, the graph shows 26 durations. In each case, the second graph shown is a subset of the first to better show the magnitude of the ratios at the earlier durations (1–11). Each figure shows the 10th, 25th, 50th, 75th, and 90th percentile of the ratios as well as the average and the 2008 VBT ratios.

For T20, the average and 50th percentile lines are very similar, as would be expected. The 90th percentile closely follows the 2008 VBT during the first 11 durations and then the 90th percentile diverges. Around the 14th duration, the 75th percentile tracks the 2008 VBT. This means that most companies have assumptions below that of the 2008 VBT, which is not surprising because recent mortality experience has shown to be less steep than the 2008 VBT.

For UL, the average and 50th percentile lines are also similar, but the average tends to be lower at durations 6 and beyond. A lower average than the 50th percentile implies that at least some of the companies below average are much further below the average than some of the companies above the average are above it. The 25th percentile closely follows the 2008 VBT during the first nine durations and durations 20 and higher. In these situations, more companies are using an assumption steeper than the 2008 VBT. This may be due to the $100K policy size which typically has higher early duration mortality experience than $1MM.
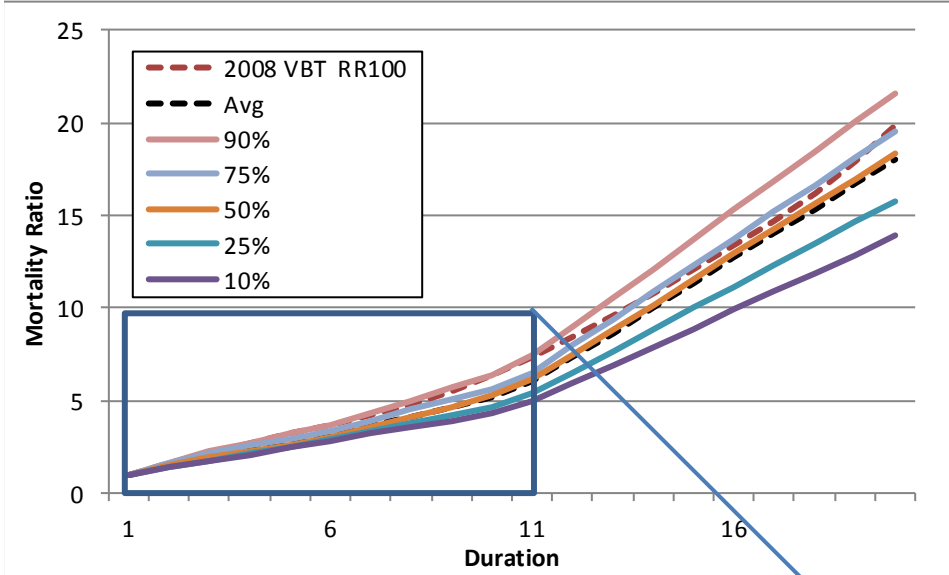
For T20, the difference between the 2008 VBT and the average widens until about duration 11 and then becomes smaller thereafter. For the UL, the two remain close together until about duration 13 and then they separate.

Figure 6.5.1

20-Year Term - $1MM Face - Male, Best Preferred Nontobacco, Age 45

Duration x to Duration 1 Mortality Ratios - Durations 1-20

(percentiles)

Duration x to Duration 1 Mortality Ratios - Durations 1-11
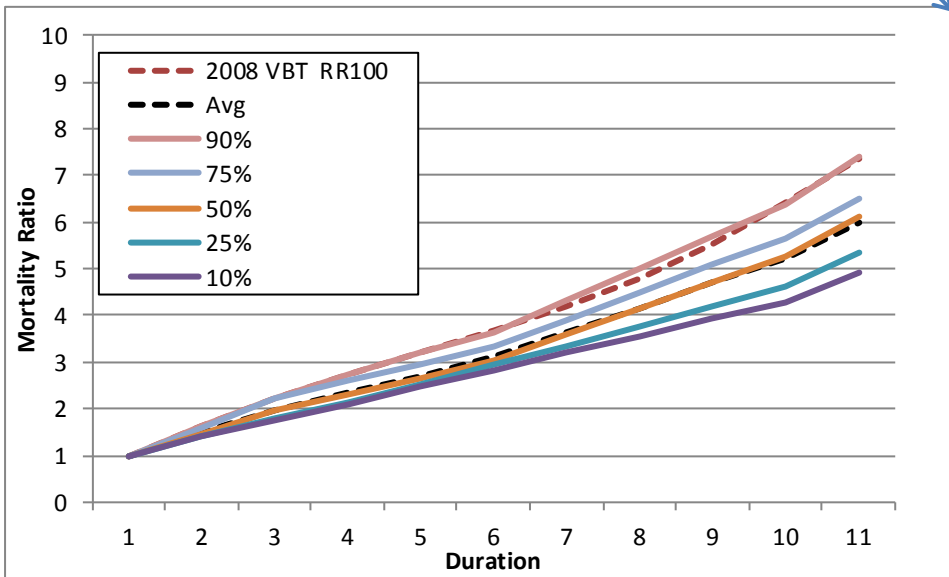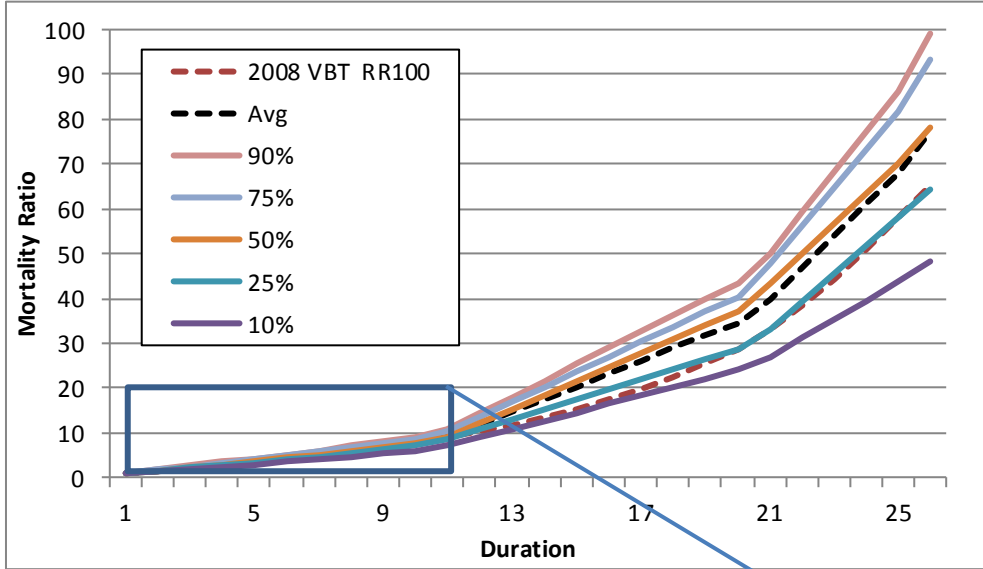
(percentiles)

Figure 6.5.2

Universal LIfe - $100K Face - Male, Best Preferred Nontobacco, Age 65

Duration x to Duration 1 Mortality Ratios - Durations 1-26

(percentiles)

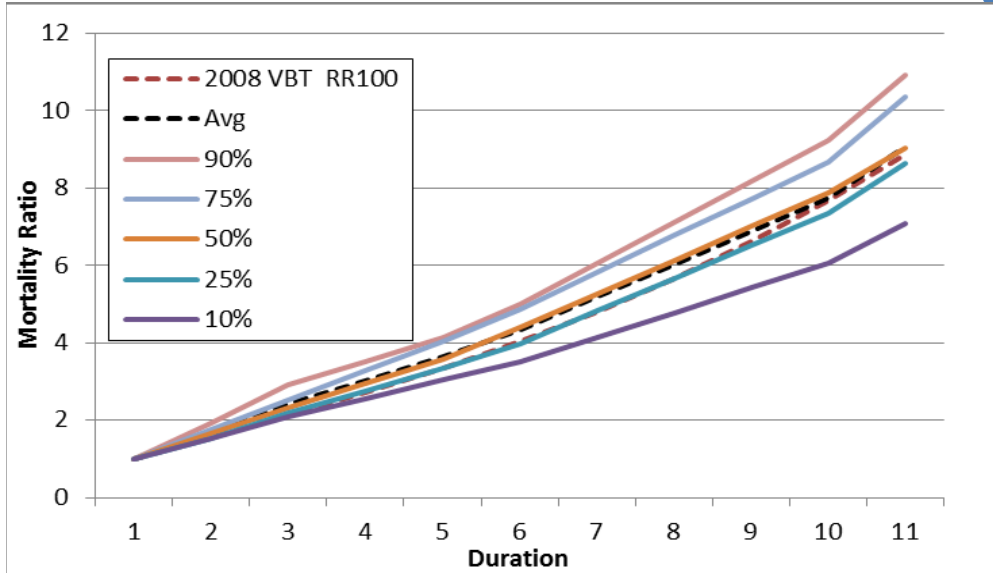**Duration x to Duration 1 Mortality Ratios - Durations 1-11**

(percentiles)

6.6. Ranking Charts

The ranking charts are heat maps. One of the purposes of heat map analysis is to determine whether the individual company assumptions are consistent or fluctuate by duration relative to all other companies.

Table 6.6.1 is one sample of 24 ranking charts that can be found in the supplemental Excel workbook provided with this report. The other 23 cells can be found in the workbook. This sample is for UL, best preferred nontobacco risk class, issue age 35, at $1MM. The ranks are shown for the mortality rates provided by each participating company. For each duration, every mortality rate was ranked 1 through 25 for the 25 companies that supplied rates for UL. The number 1 was assigned to the lowest mortality rate and the number 25 to the highest rate. The companies were then placed into quintile groupings based on rank. The lowest five ranks were assigned to group 1, the next five lowest were assigned to group 2, and so on. Dark green represents group 1 (lowest mortality), dark red represents group 5 (highest mortality), and white represents group 3 (middle mortality).

Companies 13 and 25 are consistently found in the lowest pricing mortality groups in this heat map, while companies 9, 10, 18, 22, and 23 are consistently in the highest groups. These companies show consistency or stability over the durations. Stability for this analysis is defined as having rates in two consecutive ranking groups. It should be noted that this is not a perfect comparison because one company could be considered stable when it moves from being the best company in group 1 to the worst company in group 2 (a movement of 10 positions), while a company that moved from the worst company in group 1 to the best company in group 3 (a movement of only seven positions) would be considered not stable because it moved by three ranking groups.

Company 25 does not fit this definition of stability. It has a consistent rank of 1 but the jump to rank 3 in duration 2 disqualifies it. Twelve of the 25 companies maintained a relatively stable rate position relative to the competition for this specific cell. They are companies 4, 7–11, 13–14, 18–19, and 22–23. Since not all durations are illustrated, each company may or may not maintain that consistency in the missing durations. However, the results of this analysis imply most companies set mortality assumptions that are typically lower, average, or higher across all durations relative to the other companies.

Another figure was created from the ranked data to summarize the consistency for each cell. Table 6.6.2 shows the results for UL. The description column provides the gender, issue age, and risk class. Each number in columns 3 through 7 represents the number of participants that fall into each category. The "One Group Rank Movement" column provides a count of participants where the group ranking moved one or fewer spots across all durations, meaning the ranking stayed at 1 and 2, 2 and 3, 3 and 4, 4 and 5, or at the same group ranking for all durations. Cell 1, the male issue age 35 best preferred nontobacco risk class, represents the cell shown in the heat map above in Table 6.6.1. As previously mentioned for this cell, 12 out of 25 companies (nearly half) maintained relatively consistent group rankings across the provided durations.

The "Low," "Medium," and "High Group Rank" columns provide the magnitude of the rankings and their stability. Low means the company's pricing mortality assumptions are in the lowest groups (1 or 2), High means they are in the highest groups (4 or 5), and Medium means they are in either groups 2 and 3 or groups 3 and 4. Thus for cell 1, eight of the 12 (two-thirds) of the companies that were considered stable were among the companies with the highest group ranking mortality assumptions.

Table 6.6.2 shows the male mortality rate group rankings remain more consistent than the female rankings. Male cells have a higher number than the corresponding female cells in all but three of the "One Group Rank Movement" cells, and in each of those three cells, the number for males and females is the same. The younger age mortality rate group rankings are generally more stable than the older age rankings. There is no discernible pattern by risk class or by low, medium, or high group ranks.

The "One or Two Group Rank Changes" column represents the number of companies where the group ranking changed fewer than three times from duration to duration for those companies that had one group rank movement. Thus for cell 1, six of the 12 "One Group Rank Movement" companies had only two or fewer group rank changes across all durations: 7, 10, 13, 18, 22, and 23.

Table 6.6.1 Mortality Rate Group Rank Heat Map: UL, $1MM, Male, Best Preferred NT, Age 35

Company	Duration										
	1	2	3	5	6	10	11	20	21	25	26
1	5	3	3	1	2	1	1	1	1	2	2
2	2	3	2	2	1	3	3	3	3	3	3
3	1	2	3	4	4	2	2	4	4	4	4
4	2	3	2	2	2	3	3	3	3	3	2
5	3	1	2	2	2	2	2	2	2	1	1
6	4	1	4	3	3	2	1	2	2	3	4
7	4	4	4	4	4	4	4	4	4	3	3
8	3	4	3	4	4	4	4	4	4	4	3
9	4	5	4	5	5	5	5	5	5	5	5
10	4	5	5	5	5	5	5	5	5	5	5
11	2	2	3	3	3	2	2	2	2	3	3
12	2	2	1	1	1	2	3	2	2	2	3
13	1	1	1	1	1	1	1	1	1	1	1
14	5	4	5	4	4	4	4	4	4	4	4
15	1	1	4	3	3	1	1	1	1	1	1
16	1	1	1	2	2	3	3	4	4	5	5
17	2	3	1	1	1	3	3	2	2	2	2
18	5	5	5	5	5	5	5	5	5	4	5
19	3	2	2	2	3	3	2	3	3	2	2
20	3	2	2	3	2	1	2	3	3	4	4
21	3	4	3	3	3	4	4	1	1	1	1
22	5	5	5	5	5	5	5	5	5	5	4
23	4	5	5	5	5	5	5	5	5	5	5
24	5	4	4	4	4	4	4	3	3	2	2
25	1	3	1	1	1	1	1	1	1	1	1

Table 6.6.2 Mortality Rate Group Rank Movement Summary: UL

UL Rank Summary		Number of Participants with:				
Cell	Description	One Group Rank Movement	Low Group Rank	Medium Group Rank	High Group Rank	One or Two Group Rank Changes
1	M 35 BPNT	12	1	3	8	6
2	M 35 RNT	10	5	1	4	2
3	M 35 RT	10	3	1	6	8
4	F 35 BPNT	7	2	1	4	6
5	F 35 RNT	3	2	0	1	3
6	F 35 RT	6	3	0	3	4
7	M 45 BPNT	7	2	0	5	7
8	M 45 RNT	8	5	0	3	5
9	M 45 RT	11	4	2	5	6
10	F 45 BPNT	7	2	1	4	5
11	F 45 RNT	5	0	0	5	5
12	F 45 RT	10	4	1	5	8
13	M 65 BPNT	7	4	1	2	7
14	M 65 RNT	5	2	0	3	5
15	M 65 RT	4	1	0	3	4
16	F 65 BPNT	5	3	0	2	4
17	F 65 RNT	5	2	2	1	1
18	F 65 RT	4	0	0	4	2
19	M 75 BPNT	5	3	1	1	3
20	M 75 RNT	7	3	1	3	3
21	M 75 RT	7	0	2	5	3
22	F 75 BPNT	0	0	0	0	0
23	F 75 RNT	5	2	0	3	3
24	F 75 RT	2	1	0	1	2

7. SUPPLEMENTAL EXCEL WORKBOOK

A supplemental Excel workbook is provided with this report. In most cases, the minimum, maximum, average, and 10th, 25th, 50th, 75th, and 90th percentiles are provided along with the number of observations. The report focuses on analyzing the 50th percentiles and in some cases, may discuss observations at the other percentiles. Much of the analysis can be done by the reader. The authors encourage the reader to share any insights or observations not noted by the authors. The supplemental Excel workbook contains more specifics about its contents and how it is to be used. It is recommended that the user read all instructions provided in the workbook before using any of the data.

8. FINAL REMARKS

The goal of this study was to provide an independent analysis of the select period mortality and related assumptions currently used in the life insurance industry. It was not to make a recommendation as to the tables or assumptions to use.

As shown early in the report, a wide range of mortality assumptions were used by the contributing companies. There are many reasons for this, such as differences in target markets, the use of different underwriting tools and approaches, and different anticipated mortality experience. The report also showed differences in assumptions and slopes of mortality among and within the various categories studied (i.e., issue age, duration, gender, risk class, policy size, and product). Further detail can be studied in the supplemental Excel workbook.

An example of one of the differences is that although some companies have higher actual mortality experience at $1MM than $100K, most of these companies do not reflect this increased mortality in their assumptions. However, a couple of the participants do reflect this difference, which may lead to seemingly surprising results for some cells.

Another section of the report showed differences in the underlying mortality table used and different approaches to modifying the mortality assumptions through mortality improvement and the "wearing off of preferred".

This report and supplemental Excel workbook are intended to provide the reader with insights and guidance as to some new potentially different methods and practices for setting mortality assumptions. It is important to consider the slope of the mortality assumptions as well as the level and to confirm that the adjustments are appropriate for the future. Readers should determine mortality assumptions based on their company's own unique circumstances. Consider looking at an individual company's current experience, determining the reasons why mortality may be higher or lower than the current experience (or both), and involving as many areas in the company as possible to make the final decision. Actuaries can solicit input from underwriters, medical departments, claims managers, and field representatives as well.

The authors and the SOA would appreciate readers passing along any significant findings made subsequent to reading this report. Similarly, if a reader has any ideas for improving this study for the next time, please pass suggestions along as well. Finally, the authors are grateful to the SOA for the opportunity to provide this research and to the project oversight group for their helpful comments on the design and completion of the survey and this report.

APPENDIX A – Participating Companies

APPENDIX A – Participating Companies

Allstate Life Insurance Company
American National Insurance Company
Aviva USA
AXA Equitable Life Insurance Company
Erie Family Life Insurance Company
FBL Financial Group, Inc.
Genworth Financial
Government Personnel Mutual
Guardian
ING
John Hancock Life Insurance Company
Kansas City Life Insurance Company
Legal & General America
Lincoln Financial Group
Mutual of Omaha
Nationwide Financial
New York Life Insurance Company
Ohio National Life Insurance Company
Pacific Life Insurance Company
The Penn Mutual Life Insurance Company
Protective
Prudential
RiverSource Life Insurance Company
SFG Member Companies—Midland National Life and North American Company for Life and Health
Symetra Financial
TIAA-CREF
Transamerica Life Insurance Company
USAA Life Company
Woodmen of the World Life Insurance Society

APPENDIX B – Survey

APPENDIX B – Survey

SOA Select Period Mortality Study

Introduction:

Milliman has been contracted by the Society of Actuaries to conduct a survey to help the industry better understand the current U.S. life insurance practices regarding select period mortality assumptions used in pricing. This worksheet is provided to supply sample pricing mortality assumptions and mortality adjustment factors (i.e. mortality improvement assumptions) for certain ages, risk classes, and products. **All data provided will remain strictly confidential** and will only be presented in aggregate. Company names will only be shown in a list of participants in the published report.

We are seeking the answers to ten (10) questions and data for five (5) product categories. The questions are in the tab called *Questions*. The data for each product is to be provided in a separate tab (see below for more information). The format within each product sheet is identical. The specific cells were chosen so as to provide enough information to study while not requiring complete disclosure of pricing mortality assumptions. Our goal is to collect enough select period information to understand the level, slope, and the "wearing off" of select period mortality assumptions. For each product, please provide data on your most popular product in that category. "Most popular" should be determined by 2012 sales volume. If you have replaced this product with a new one in 2013, please provide data on the new product. Please use assumptions effective April 1, 2013.

For purposes of this study, mortality improvements can refer to either generational or durational improvements. Generational mortality improvements are applied to a mortality table in order to bring it forward to the current date. Durational mortality improvements are improvements that are used from the current date forward. We are assuming that your generational mortality improvements (if any) are already incorporated into your pricing assumptions. If this is not the case, please let us know.

The five products are:

Sheet:	Product Description
T10	10-Year Level Term
T20	20-Year Level Term
UL	Universal Life without Secondary Guarantees
ULSG	Universal Life with Secondary Guarantees
WL	Whole Life

The cell characteristics include:

Characteristic:	Values	Comments:
gender	male (M) female (F)	
risk class	best preferred nonsmoker (no tobacco use) - (B-NS)	
	residual nonsmoker (no tobacco use) - (R-NS)	Residual refers to the NS class with the highest mortality assumption, excluding substandard.
	residual smoker (tobacco user) - (R-SM)	Residual refers to the SM class with the highest mortality assumption, excluding substandard
issue ages	35, 45, 65, 75	
durations	1, 2, 3, 5, 6, 10, 11, 20, 21, 25, 26	Note there are eleven (11) durations, but they are not all consecutive.
face bands	$100,000 (100K) $1,000,000 (1M)	

Instructions:

1. Please complete the following **contact information** in case we have any follow-up questions. In this and all other places in the workbook, please only update cells with a yellow background and blue font or drop down box, leaving the formatting as is.

Company Name:	company
Contact Name:	contact
Contact Phone Number:	phone
Contact Email Address:	email

2. Please complete the *Questions* tab containing 10 general **questions** regarding your select mortality and mortality improvement assumptions.

3. Please provide **select period mortality assumption** data in the product tabs using one of the two options outlined below.

    Option 1:   Complete the five (5) *xxx_Mort* sheets for the durations outlined therein (where **xxx** is the sheet abbreviation for each product described above). If any portion of the mortality assumptions is the same by gender, product, face band, etc., you can copy them to the other sections of the spreadsheet rather than re-type them since the layout for each is the same.

        a. Each sheet contains a comment section (cell R8). Please provide any clarifying comments for the specific product in this section of the sheet.

        b. If your company does not offer any of the specific products listed, please type "Not Applicable" in the comments section of that sheet and leave the rest of it blank.

    Option 2:   Complete the *Opt2 tab* for all five products for durations 1-26 and the first ultimate duration. If any portion of the mortality assumptions is the same by gender, product, face band, etc., you can copy them to the other sections of this tab rather than re-type them since the layout for each is the same. We are providing this option in case it is easier for you to just provide us with all of your rates rather than picking and choosing certain ones. If you provide the rates in this format, we will only use the rates we need for this project (yellow shading) and ignore the rest (blue shading).

APPENDIX B – Survey

4. **Questions** can be addressed to either:

Al Klein	or	Michelle Krysiak
(312) 499-5731		(312) 499-5686
al.klein@milliman.com		michelle.krysiak@milliman.com

5. Please **email your completed workbook** by **Friday, May 17, 2013** to:

Al Klein
al.klein@milliman.com

APPENDIX B – Survey

SOA Select Period Mortality Study

If any question does not apply to **your assumptions**, please place *"N/A"* in the **comment section for that question**.

For purposes of this study, mortality improvements can refer to either generational or durational improvements. Generational mortality improvements are applied to a mortality table in order to bring it forward to the current date. Durational mortality improvements are improvements that are used from the current date forward. We are assuming that your generational mortality improvements (if any) are already incorporated into your pricing assumptions. If this is not the case, please let us know.

General Questions:

1. Which underlying **industry table** is the basis for your pricing mortality assumptions?

a. Please place an "X" next to the appropriate table - one per product/column.

	T10	T20	UL	ULSG	WL
2008 VBT *					
2001 VBT					
1990-95 Basic					
1975-80 Basic **					
Company Experience					
Other ***					

	T10	T20	UL	ULSG	WL
b. Select & Ultimate or Ultimate (S&U or ULT)					
c. Age Last or Age Nearest Birthday (ALB or ANB)					

* If using 2008 VBT, please indicate the **version** being used:

Please place an "X" next to the appropriate table - one per product/column (light yellow).	T10	T20	UL	ULSG	WL
Primary table - smoker distinct					
Primary table - composite / uni-smoker / smoking unknown					
Relative Risk table					
If using the Relative Risk (RR) tables, please indicate the RR table being used in the following two rows.					
Relative Risk Nonsmoker Percentage (70-160, multiple of 10)					
Relative Risk Smoker Percentage (75-150, multiple of 25)					
Other Name or Description:					
Don't Know					

** If using 75-80 Basic, please indicate the **extension** being used by placing an "X" in the appropriate box:

	T10	T20	UL	ULSG	WL
Manulife					
Milliman					
SOA					
Tillinghast					
Other Name or Description:					
Don't Know					

*** If using some "Other" table (1.a.), please indicate the **table** being used:

T10	
T20	
UL	
ULSG	
WL	

Please provide any other comments relative to this question.

APPENDIX B – Survey

2. Please list the **number of risk classes** you have for the products used in this study.

	Nonsmoker / No Tobacco Use	Smoker / Tobacco User
T10		
T20		
UL		
ULSG		
WL		

Please provide any other comments relative to this question.

3. What do you assume for the **length of your select period** for the following issue ages?

Issue Age	T10	T20	UL	ULSG	WL
35					
45					
65					
75					

Please provide any other comments relative to this question.

4. Describe how the **length of your select period varies** by age, risk class, gender, policy size, etc. (e.g. Does it follow the pattern of 2008VBT where older ages have shorter select periods?)

T10	
T20	
UL	
ULSG	
WL	

Please provide any other comments relative to this question.

5. Explain assumptions used in **wearing off of preferred**. Please tell us at which attained ages or durations wearing off of preferred begins and ends, the proportion (or level) that wears off, any differences by risk class, gender, age, etc., and/or the philosophy used for this assumption.

	Beginning (att age / dur)	Ending (att age / dur)	Other Specifics (proportion, differences, philosophy)
T10			
T20			
UL			
ULSG			
WL			

Please provide any other comments relative to this question.

6. Explain the *explicit* **generational mortality improvement** assumptions contained in the pricing assumptions. Include the percentages used, how long they last, and how they vary by age, gender, risk class, etc. Feel free to build your own tables in a new tab if that is easier to demonstrate the assumptions. If you do, please indicate here to "See tab GEN IMPROVE".

T10	
T20	
UL	
ULSG	
WL	

Please provide any other comments relative to this question.

7. Explain any *__implicit__* **generational mortality improvement** assumptions contained in the pricing assumptions (e.g., changes to profit targets or profit margins, conservative mortality assumptions, etc.).

T10	
T20	
UL	
ULSG	
WL	

Please provide any other comments relative to this question.

8. Explain any **durational (future) mortality improvement** assumptions you currently use (as of April 1, 2013). Include the percentages used, how long they last, and how they vary by age, gender, risk class, etc. Feel free to build your own tables in a new tab if that is easier to demonstrate the assumptions. If you do, please indicate here to "See tab DUR IMPROVE".

T10	
T20	
UL	
ULSG	
WL	

Please provide any other comments relative to this question.

APPENDIX B – Survey

9. When were your pricing mortality assumptions last updated?

	Date (mm/yyyy)
T10	
T20	
UL	
ULSG	
WL	

Please provide any other comments relative to this question.

10. Provide any other comments relevant to this study or your data submission.

APPENDIX B – Survey

SOA Select Period Mortality Study
Pricing Mortality Rates   **company**
10-Year Level Term

Instructions:

If you do not offer this product type, please write "Not Applicable" in the Comments section (cell R8) and move to the next tab.

Only items with yellow background and blue font or drop downs require input.

Please provide the baseline (not adjusted for post-level period increases) pricing mortality assumptions as of March 1, 2013 BEFORE any applicable durational (**future**) mortality improvement factors for the product listed in cell A3, if applicable. Our preference is for the assumptions to be expressed as an annual mortality rate per $1,000. However, if it is easier to express as a percentage of a standard industry table, please indicate the table in cell I12, if you are using a S&U or Ultimate only version in cell I13, and whether the table is ALB or ANB in cell M13. Finally use the Comments box (cell R8) to provide any other information that is needed to derive the correct mortality rate or to help us better understand your data.

Please note that only limited ages, durations, risk classes, and policy sizes are being requested. Also note that we are requesting the attained age ultimate period rate for each of the four issue ages. Each section is set up in the same format so items can be copied and pasted from one section to the next, if appropriate.

Optional:	Underlying Mortality Table (if percentages of this table shown below):		
	Please specify if Select and Ultimate (S&U) or Ultimate (Ult) Only.	Please specify if ANB or ALB.	

Male - $100K

Best Preferred Nonsmoker or Nontobacco

	Duration											Ultimate Period	
Issue Age	1	2	3	5	6	10	11	20	21	25	26	Att. Age	Rate
35	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	35	1,000.00
45	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	45	1,000.00
65	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	65	1,000.00
75	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	75	1,000.00

Residual Nonsmoker or Nontobacco

	Duration											Ultimate Period	
Issue Age	1	2	3	5	6	10	11	20	21	25	26	Att. Age	Rate
35	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	35	1,000.00
45	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	45	1,000.00
65	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	65	1,000.00
75	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	75	1,000.00

Residual Smoker or Tobacco Use

	Duration											Ultimate Period	
Issue Age	1	2	3	5	6	10	11	20	21	25	26	Att. Age	Rate
35	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	35	1,000.00
45	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	45	1,000.00
65	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	65	1,000.00
75	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	75	1,000.00

Male - $1M

Best Preferred Nonsmoker or Nontobacco

	Duration											Ultimate Period	
Issue Age	1	2	3	5	6	10	11	20	21	25	26	Att. Age	Rate
35	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	35	1,000.00
45	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	45	1,000.00
65	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	65	1,000.00
75	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	75	1,000.00

Residual Nonsmoker or Nontobacco

	Duration											Ultimate Period	
Issue Age	1	2	3	5	6	10	11	20	21	25	26	Att. Age	Rate
35	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	35	1,000.00
45	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	45	1,000.00
65	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	65	1,000.00
75	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	75	1,000.00

Residual Smoker or Tobacco Use

	Duration											Ultimate Period	
Issue Age	1	2	3	5	6	10	11	20	21	25	26	Att. Age	Rate
35	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	35	1,000.00
45	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	45	1,000.00
65	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	65	1,000.00
75	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	75	1,000.00

SOA Select Period Mortality Study
Pricing Mortality Rates   **company**
10-Year Level Term

Comments:

Please provide comments here, if needed.

Questions can be addressed to either:
Al Klein   or   Michelle Krysiak
(312) 499-5731   (312) 499-5686
al.klein@milliman.com   michelle.krysiak@milliman.com

Female - $100K

Best Preferred Nonsmoker or Nontobacco

Issue Age	1	2	3	5	6	10	11	20	21	25	26	Att. Age	Rate
				Duration								Ultimate Period	
35	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	35	1,000.00
45	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	45	1,000.00
65	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	65	1,000.00
75	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	75	1,000.00

Residual Nonsmoker or Nontobacco

Issue Age	1	2	3	5	6	10	11	20	21	25	26	Att. Age	Rate
				Duration								Ultimate Period	
35	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	35	1,000.00
45	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	45	1,000.00
65	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	65	1,000.00
75	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	75	1,000.00

Residual Smoker or Tobacco Use

Issue Age	1	2	3	5	6	10	11	20	21	25	26	Att. Age	Rate
				Duration								Ultimate Period	
35	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	35	1,000.00
45	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	45	1,000.00
65	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	65	1,000.00
75	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	75	1,000.00

Female - $1M

Best Preferred Nonsmoker or Nontobacco

Issue Age	1	2	3	5	6	10	11	20	21	25	26	Att. Age	Rate
				Duration								Ultimate Period	
35	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	35	1,000.00
45	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	45	1,000.00
65	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	65	1,000.00
75	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	75	1,000.00

Residual Nonsmoker or Nontobacco

Issue Age	1	2	3	5	6	10	11	20	21	25	26	Att. Age	Rate
				Duration								Ultimate Period	
35	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	35	1,000.00
45	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	45	1,000.00
65	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	65	1,000.00
75	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	75	1,000.00

Residual Smoker or Tobacco Use

Issue Age	1	2	3	5	6	10	11	20	21	25	26	Att. Age	Rate
				Duration								Ultimate Period	
35	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	35	1,000.00
45	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	45	1,000.00
65	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	65	1,000.00
75	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00	75	1,000.00