POLICYHOLDER BEHAVIOR IN THE TAIL
VARIABLE ANNUITY GUARANTEED BENEFITS SURVEY
2014 RESULTS

Survey Highlights

Five Year Results

- Insurers using dynamic lapse functions for GMDBs have increased from 25% in 2008 to over 55% for the past three consecutive surveys. (Figure 17 on Page 20)
- The percentage of respondents who vary GMWB utilization dynamically dropped from 73% in 2008 to 33% in 2014. (Figure 22 on Page 23)
- The median base assumption lapse rates (Tables on Page 15 and 16) have remained consistent after oscillating over the prior four surveys.

One Year Results

- Enough time has occurred since the financial crisis of 2008 that several companies made comments or chose time frames that excluded it from their most recent lapse studies. (Page 29)
- Differences in tail scenarios, dynamic lapse assumptions, and product features can cause the distribution of lapse assumptions in the tail to vary widely by insurer (e.g., 0% to 20% or more). (Figures 12-16 on Pages 17-19)
- The median cumulative return, measured across the respondent's least tail scenarios, tracks fairly well through the first 14 years compared to the 10^{th} percentile of the American Academy of Actuaries (AAA) pre-packaged scenarios. The increase in the 2014 median cumulative return was a surprise given that many companies have made product changes to reduce risk during the past two years. (Figure 5 on Page 8)
- There is a very wide variation in the description of the least tail scenario (as defined on page 6) across insurers. (Figure 3 on Page 7)
- Median base assumption lapse rates continue to show very little difference across benefit types. (Figure 11 on page 13)

- Over 70% of respondents indicated they changed assumptions since the last survey. This compares to 60% in 2012. (Figure 32 on Page 32)
- Nearly 90% of respondents use dynamic lapses for contracts with guaranteed minimum living benefits. Only two of thirteen (15%) described their function as one-sided. (Figure 18 and Figure 19 on Pages 21 and 22, respectively)
- Half (8 of 16) of respondents made changes to their policyholder behavior assumptions in the tail due to emerging experience since the financial crisis in 2008/2009. (Figure 36 on Page 34)
- 88% (15 of 17) of respondents projected results over at least 30 years (Figure 2 on Page 6), using at least 1,000 scenarios. (Figure 1 on Page 5)
- Over half (11 of 18; 61%) of the companies participating in the survey this year have at least $20 billion of variable annuity total account value with guaranteed benefits. (Figure 37 on Page 35)
- A majority of insurers indicated that best estimates (i.e., professional judgment) and/or company experience were used as one of the sources for tail lapse assumptions. (Figure 30 on Page 30)

It is our hope that this study's report on assumptions will enable actuaries to improve and compare their 'tail' expectations with those assumed by others. Actuaries may use this study to both (a) aid in setting their assumptions and (b) in setting up experience studies to parameterize such dynamic functions, especially from experience gained in "tail" historical periods.

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Acknowledgements

The Society of Actuaries' Policyholder Behavior in the Tail (PBITT) working group gratefully acknowledges Stephen Hodges and Chuck Bremer for all of their efforts in analyzing the survey data and drafting this report.

Special thanks to all of the companies that responded to the survey and provided helpful information. Without their efforts, this survey would not be possible. The identity of survey participants is kept confidential and known only to Society of Actuaries' staff.

The Policyholder Behavior in the Tail group is interested in comments on the survey and results. Please e-mail comments to either Jim Reiskytl, Chair of the Policyholder Behavior in the Tail group, at jimreiskytl@wi.rr.com or Steve Siegel, Society of Actuaries Research Actuary at ssiegel@soa.org.

Background

In late 2005, the Society of Actuaries' Policyholder Behavior in the Tail (PBITT) committee distributed a survey to insurers. The goal of the survey was to gain insight into companies' assumptions of variable annuity policyholder behavior in the tail of the C3 Phase II calculation. Each edition of the survey has had approximately 18-30 responses; however, not every company answered every question. The following sections highlight responses from the 2014 survey and, where applicable, illustrate how answers compare to previous years' results. As a way to judge the credibility of results, most charts indicate how many companies responded to the question for the five most recent survey years.

The latest survey reflects a different response group from that in the prior survey. As a result, some of the changes described below reflect different respondents, not necessarily a change by any given company. While the exact relationships of new versus prior respondents vary by individual question, at the level of the total survey, and considering only those whose identity was revealed, there are 4 new respondents, 14 continuing respondents (to both surveys), and 14 prior respondents that did not participate in the latest survey.

Specifics of C3 Phase II Calculation

Insurers were asked to provide details on their C3 Phase II calculation such as the number of scenarios used, and the length of projection horizon. Every 2014 respondent, as in 2010 and 2012, indicated that at least 1,000 scenarios were used. Few companies used more than 1,000 scenarios (Figure 1). All of the 2014 respondents indicated they projected results over at least 20 years, with 88% (15 of 17) of respondents projecting results 30 years or more (Figure 2).

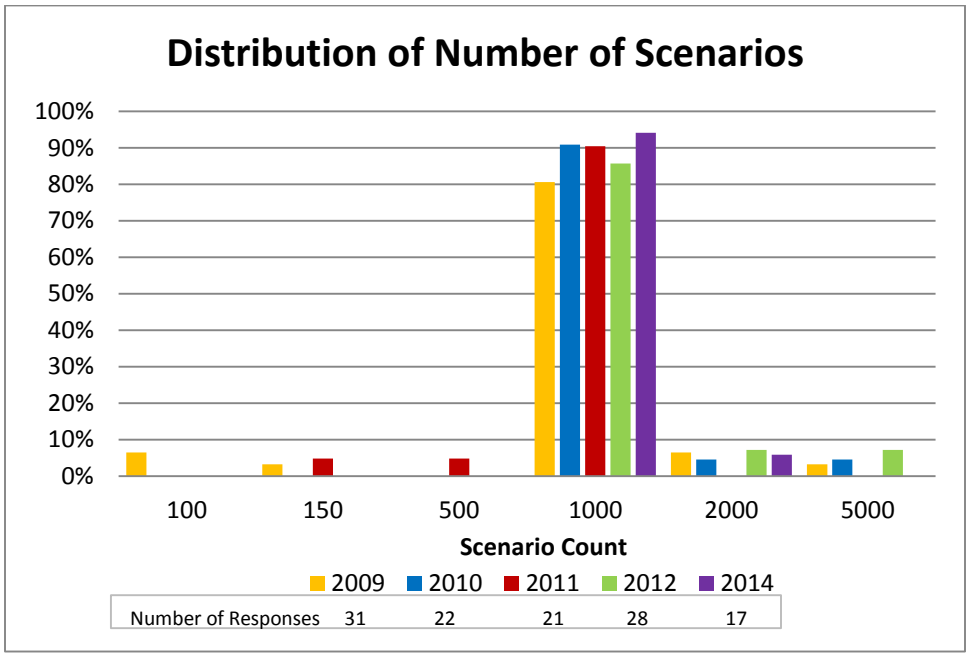

Figure 1

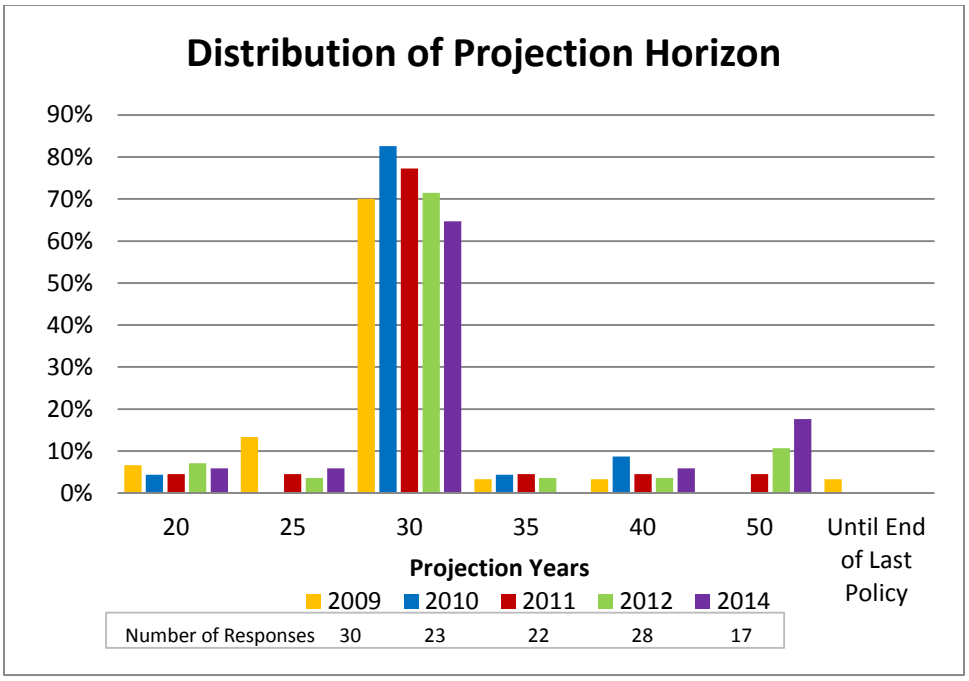

Figure 2

Tail Scenario

Insurers were asked to describe the tail scenario that determines the first negative result of their modified 90 CTE calculation. For example, if the sorted present values for each scenario in the tail were -100, - 90, -50, -30, -15, 5, 20, etc., the scenario the insurer would provide would be the one that produced a present value equal to -15.

Responses varied widely among insurers regarding the description of the tail scenario. Figure 3 below shows each insurer's description of the equity performance in their tail scenario on a cumulative basis. Of the 15 responses, six had negative cumulative returns at the end of the fifteenth projection year. However, only two of those six responses had negative cumulative returns in each of the first 15 years. Three of the 15 responses were positive throughout the whole projection period. The rest of the responses consisted of mixed positive and negative cumulative returns. The average annualized return of the tail scenarios after 15 years was 1.92%.

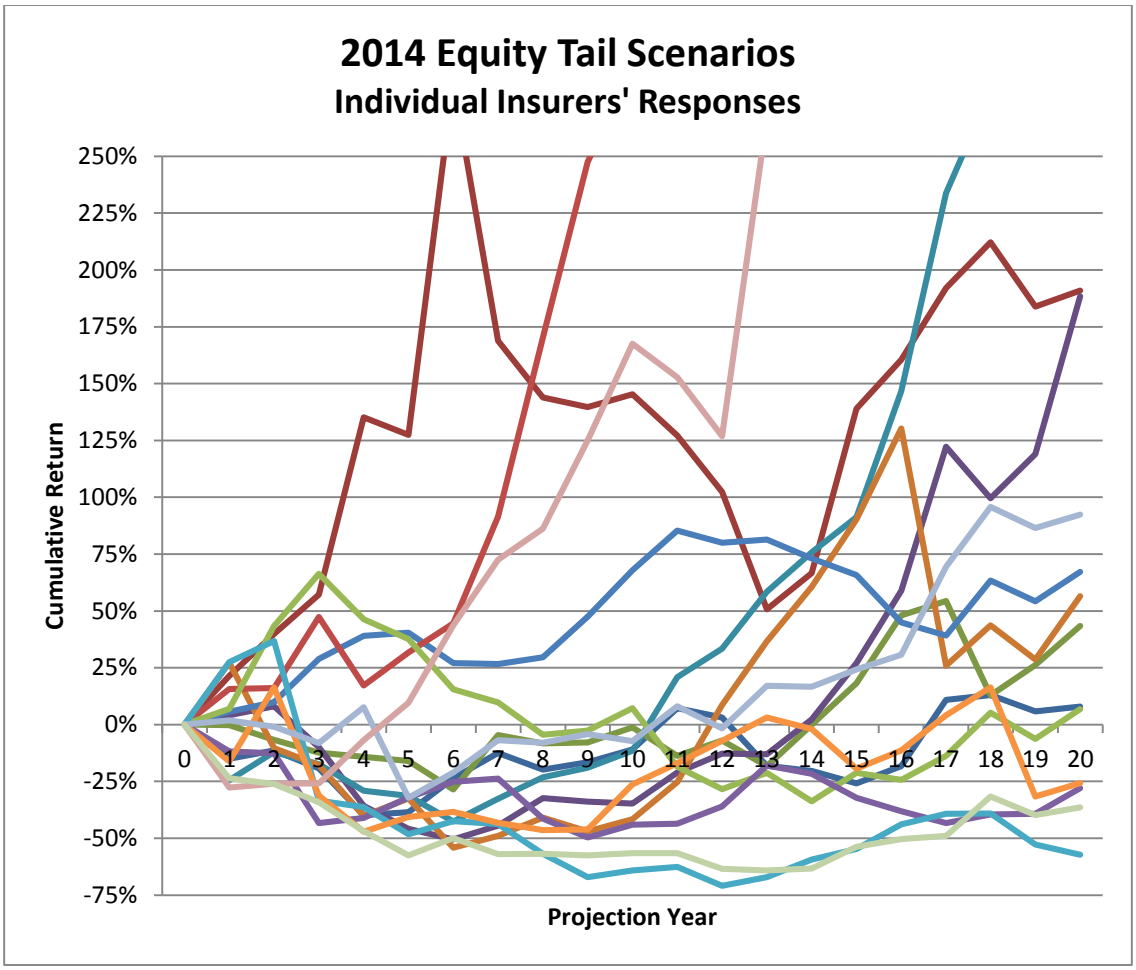

Figure 3

In Figure 4, the median of the 2014 Equity Tail Scenarios (i.e., the line in Figure 3) is plotted against the 10th percentile of the equity returns from the AAA pre-packaged scenario set based on 2005 data (http://www.actuary.org/life/phase2_2.asp). For reference, the medians of insurers' responses from the previous years' surveys are also plotted on the next graph (see Figure 5). Note that the lines in Figure 4 and Figure 5 reference the median (of each survey year) and 10th percentile (of the AAA scenarios) with respect to the cumulative gains at a given duration, rather than representing a particular scenario over all durations. The median of insurers' responses from 2014 has a cumulative return that is somewhat close to the 10th percentile of the AAA pre-packaged scenarios through the first fourteen years.

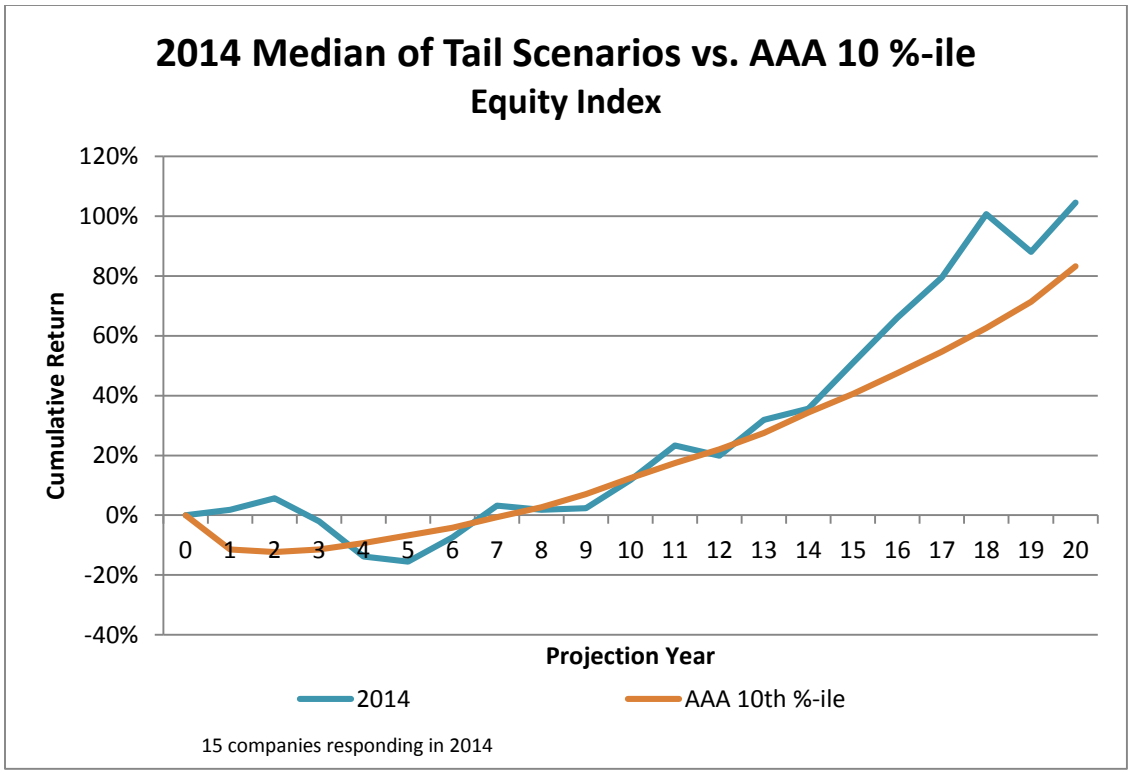

Figure 4

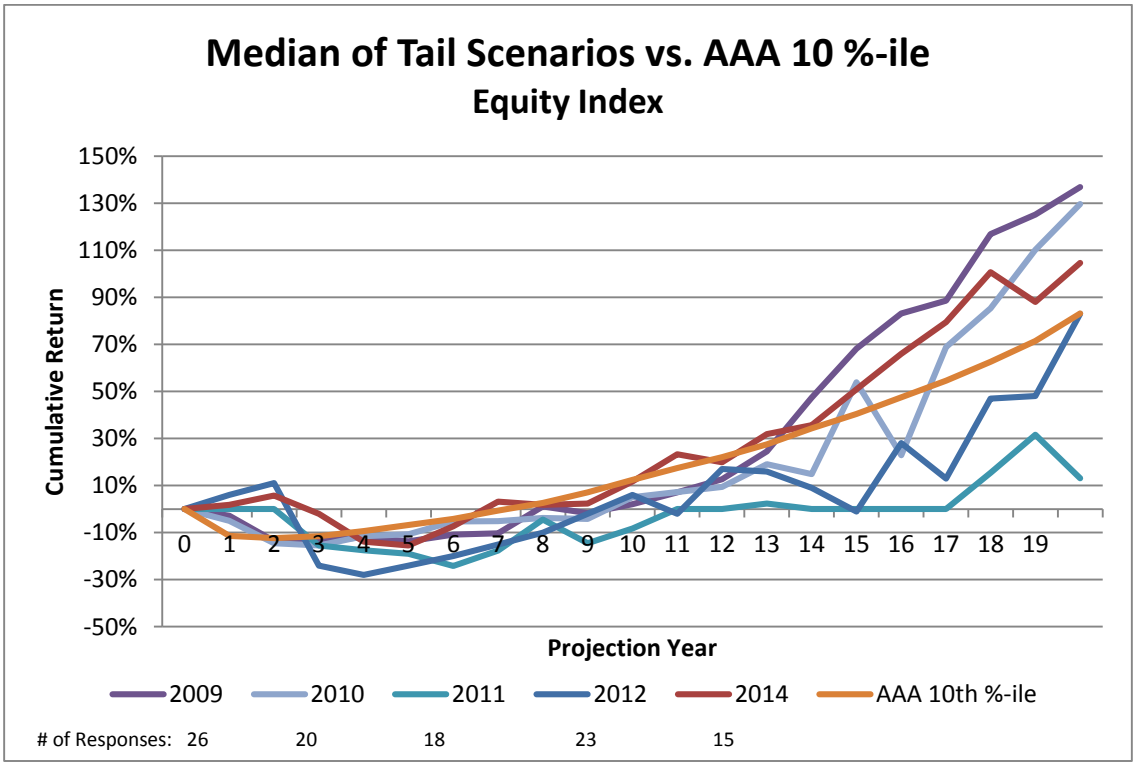

Figure 5

The median response has been fairly stable over the years, particularly in the first five projection years. It was a bit of a surprise that the median tail scenario for 2014 increased given the amount of product derisking that has occurred over the past two years complemented by generally favorable equity performance. The 'lift' in the median tail scenario may suggest that participant companies might need to strengthen capital for scenarios that would not have been considered a tail scenario based on past responses.

Responses may vary from year to year due to changes in products, assumptions or the participating respondents. There were 15 respondents in 2014 compared to 23 respondents for the prior report from 2012.

Base Lapse Assumptions

Insurers were asked to list their base lapse assumption (non-dynamic) at policy years 1, 2, 3, as well as several durations following the surrender charge period. The survey question was enhanced for 2012 in order to provide more clarity around the definition of the end of the surrender charge period. Responses were categorized by benefit type into Death Benefits (GMDB), Accumulation Benefits (GMAB), Income Benefits (GMIB), Withdrawal Benefits (GMWB), and Combination Benefits (Combo).

The following charts list each insurer's response for base lapses for each benefit type.

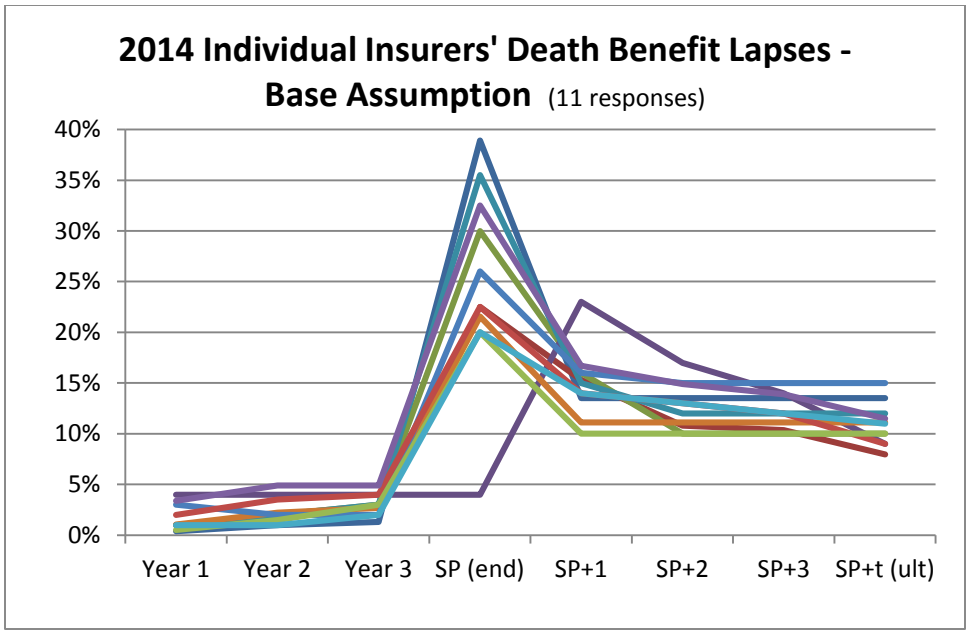

Figure 6

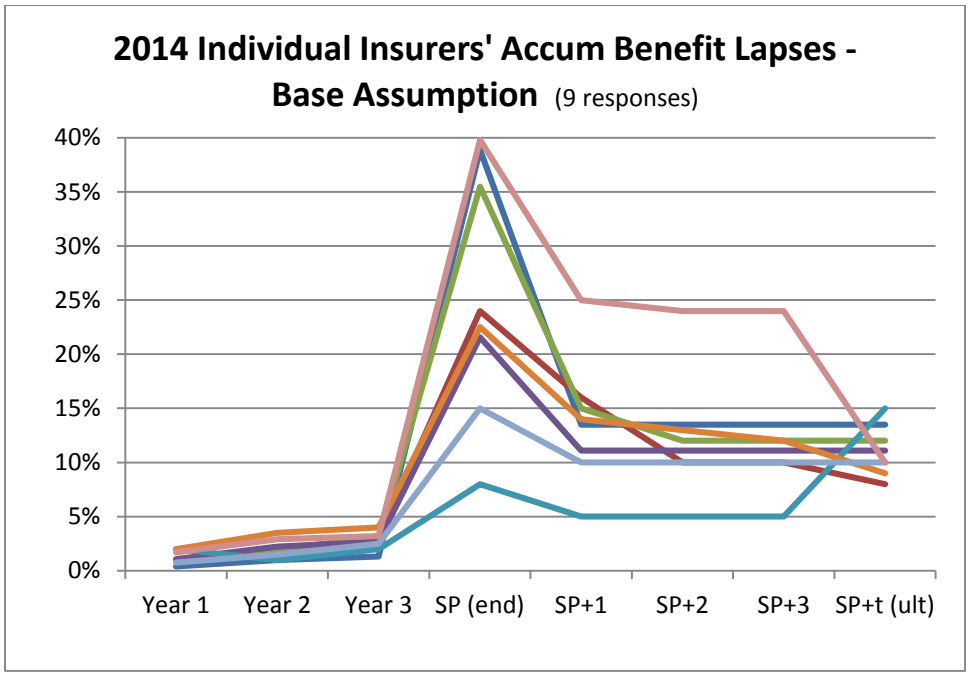

Figure 7

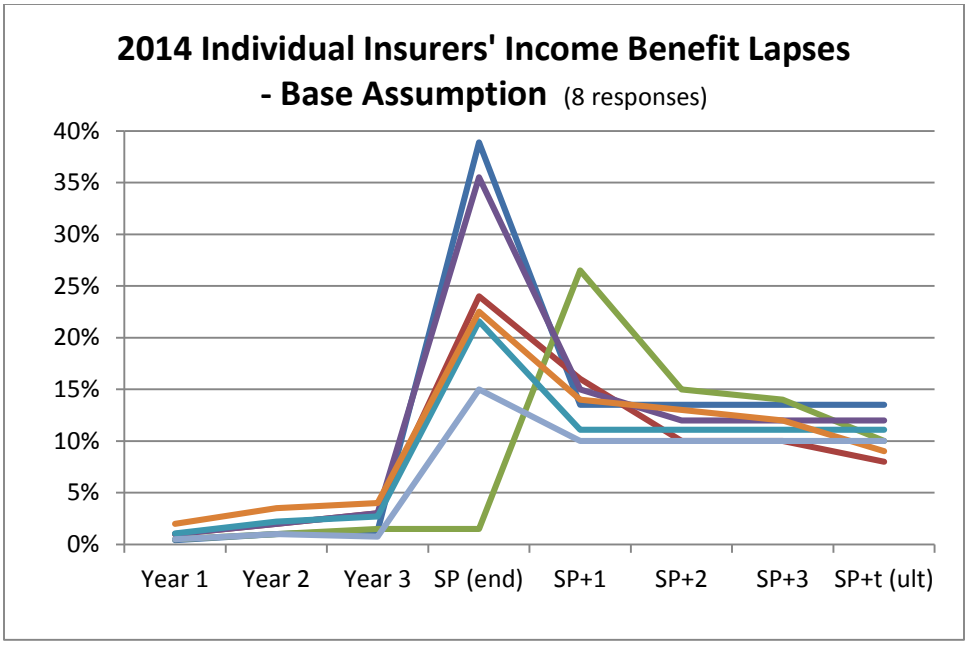

Figure 8

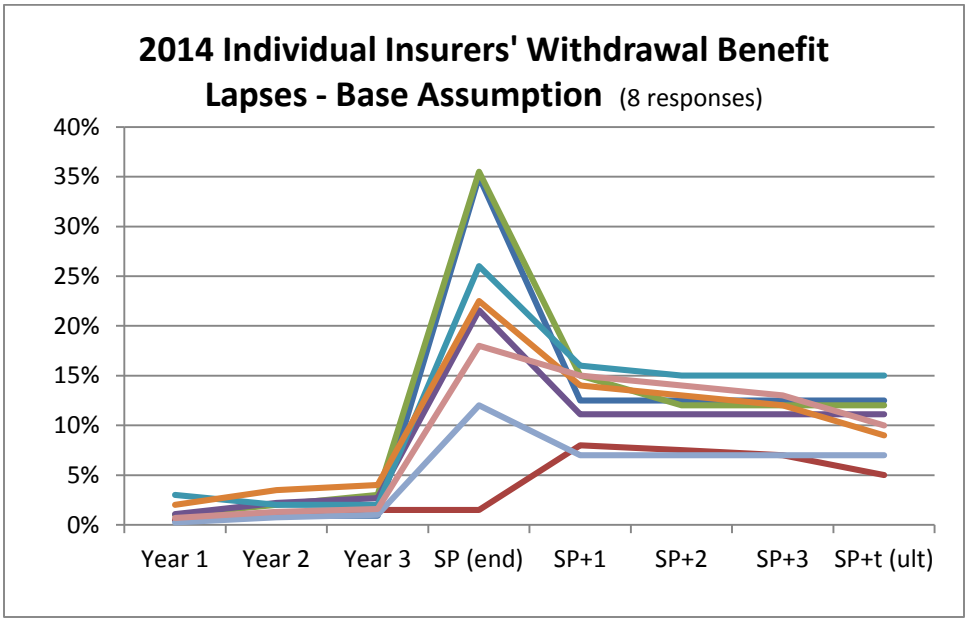

Figure 9

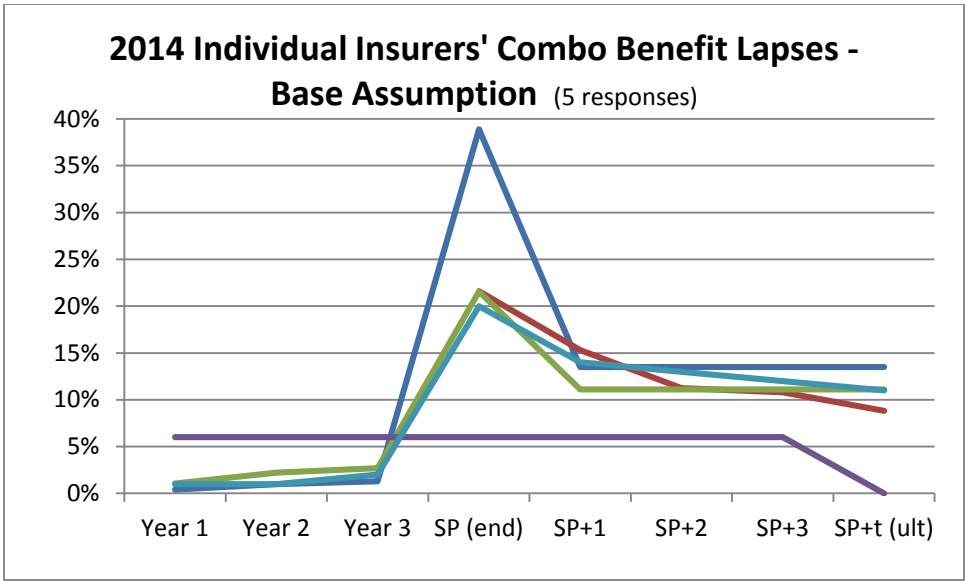
2014 Individual Insurers' Combo Benefit Lapses - Base Assumption (5 responses)
40%
35%
30%
25%
20%
15%
10%
5%
0%
Year 1
Year 2
Year 3
SP (end)
SP+1
SP+2
SP+3
SP+t (ult)

Figure 10

The following graph shows the median lapses by benefit type across all insurers' responses.

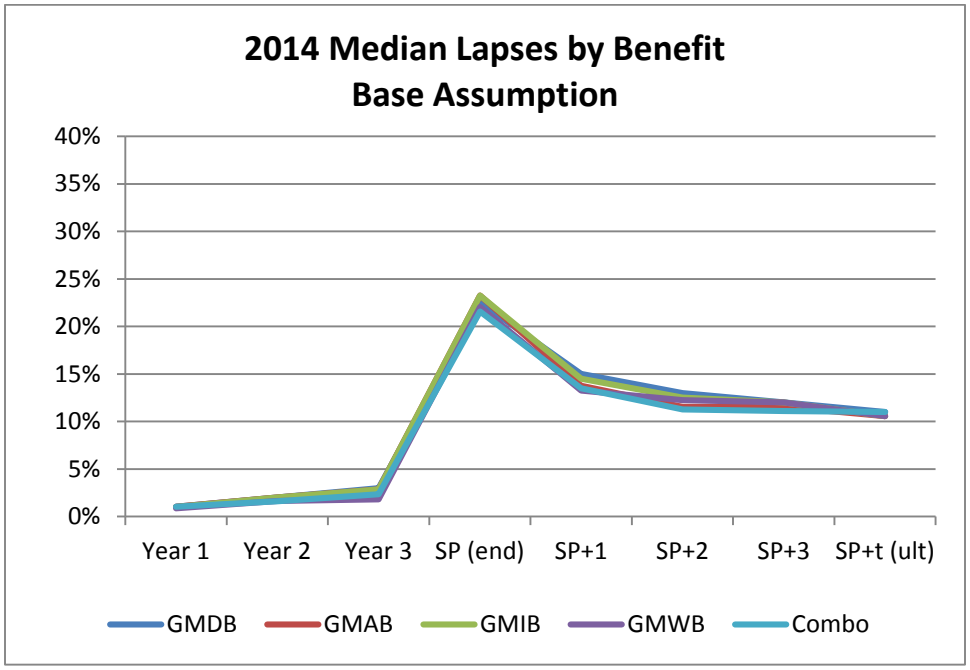

Figure 11

The median base assumption lapse rates show very little difference across benefit types.

Note that the median lapse rates do not reflect any one individual insurer's array (by duration) of lapse rates, but rather reflect the median across all insurers at the given duration. Thus, the median rate used for duration 2 may be from Insurer A while the rate used for duration 3 would be from Insurer B if that is the median data point given for duration 3.

The following tables compare median lapse rates by benefit type for 2009 through 2014. Pages 14-15 illustrate the lapse rates by survey year. Page 16 focuses on the two benefit types for which the most responses were received and makes it easier to review benefit specific assumptions across survey years. The variation across survey years of the median lapse rates at the end of the surrender charge period continues to oscillate.

2009 Median Lapse Rates by Benefit Type

Duration	GMDB	GMAB	GMIB	GMWB	Combo
Year 1	2.0%	1.5%	1.5%	2.0%	1.0%
Year 2	3.0%	3.0%	3.0%	3.0%	2.0%
Year 3	4.0%	4.0%	3.0%	3.5%	2.2%
SP (end)	20.5%	16.9%	21.6%	15.0%	23.0%
SP+1	13.7%	10.5%	17.0%	10.5%	12.1%
SP+2	13.2%	10.5%	15.0%	10.5%	10.6%
SP+3	12.8%	10.5%	15.0%	10.0%	10.4%
SP+t (ult)	11.6%	12.5%	13.5%	10.0%	9.8%
Responses	18	9	7	13	5

2010 Median Lapse Rates by Benefit Type

Duration	GMDB	GMAB	GMIB	GMWB	Combo
Year 1	1.2%	1.0%	1.3%	1.2%	1.5%
Year 2	2.2%	2.0%	1.8%	2.0%	2.1%
Year 3	3.1%	3.0%	2.5%	2.9%	2.3%
SP (end)	24.0%	23.0%	27.0%	24.0%	23.0%
SP+1	12.8%	13.5%	13.5%	13.0%	13.8%
SP+2	12.8%	11.5%	11.2%	12.0%	13.3%
SP+3	11.9%	11.7%	11.2%	11.3%	11.7%
SP+t (ult)	12.0%	11.5%	11.2%	11.8%	11.6%
Responses	14	9	7	10	8

2011 Median Lapse Rates by Benefit Type

Duration	GMDB	GMAB	GMIB	GMWB	Combo
Year 1	1.1%	1.0%	1.5%	1.0%	2.0%
Year 2	2.0%	2.0%	2.0%	2.0%	2.3%
Year 3	3.0%	2.5%	2.1%	2.5%	3.0%
SP (end)	16.4%	11.7%	15.0%	16.0%	22.6%
SP+1	13.5%	18.2%	17.9%	12.5%	20.0%
SP+2	12.5%	15.0%	15.0%	12.0%	15.5%
SP+3	12.5%	14.3%	14.5%	11.0%	14.5%
SP+t (ult)	12.0%	12.0%	12.0%	11.0%	12.0%
Responses	16	8	7	11	9

2012 Median Lapse Rates by Benefit Type

Duration	GMDB	GMAB	GMIB	GMWB	Combo
Year 1	1.3%	1.7%	2.5%	1.5%	1.2%
Year 2	2.3%	2.5%	3.0%	2.3%	2.5%
Year 3	3.0%	3.8%	3.7%	3.3%	3.4%
SP (end)	24.0%	22.9%	22.1%	24.0%	22.7%
SP+1	15.0%	13.3%	12.3%	12.5%	16.0%
SP+2	13.6%	12.8%	11.8%	12.0%	14.5%
SP+3	12.1%	12.5%	11.3%	11.3%	12.5%
SP+t (ult)	11.3%	11.1%	10.6%	10.9%	11.1%
Responses	18	10	10	12	10

2014 Median Lapse Rates by Benefit Type

Duration	GMDB	GMAB	GMIB	GMWB	Combo
Year 1	1.0%	1.0%	1.0%	0.9%	1.0%
Year 2	2.0%	2.0%	2.0%	1.7%	1.6%
Year 3	3.0%	2.9%	2.9%	1.8%	2.4%
SP (end)	22.5%	23.3%	23.3%	22.0%	21.6%
SP+1	15.0%	13.8%	14.5%	13.3%	13.5%
SP+2	13.0%	11.6%	12.5%	12.3%	11.3%
SP+3	12.0%	11.6%	12.0%	12.0%	11.1%
SP+t (ult)	11.0%	10.6%	10.6%	10.6%	11.0%
Responses	16	8	7	11	9

Median Lapse Rates by Year

	GMDB					GMWB				
Duration	2009	2010	2011	2012	2014	2009	2010	2011	2012	2014
Year 1	2.0%	1.2%	1.1%	1.3%	1.0%	2.0%	1.2%	1.0%	1.5%	0.9%
Year 2	3.0%	2.2%	2.0%	2.3%	2.0%	3.0%	2.0%	2.0%	2.3%	1.7%
Year 3	4.0%	3.1%	3.0%	3.0%	3.0%	3.5%	2.9%	2.5%	3.3%	1.8%
SP (end)	20.5%	24.0%	16.4%	24.0%	22.5%	15.0%	24.0%	16.0%	24.0%	22.0%
SP+1	13.7%	12.8%	13.5%	15.0%	15.0%	10.5%	13.0%	12.5%	12.5%	13.3%
SP+2	13.2%	12.8%	12.5%	13.6%	13.0%	10.5%	12.0%	12.0%	12.0%	12.3%
SP+3	12.8%	11.9%	12.5%	12.1%	12.0%	10.0%	11.3%	11.0%	11.3%	12.0%
SP+t (ult)	11.6%	12.0%	12.0%	11.3%	11.0%	10.0%	11.8%	11.0%	11.1%	10.6%
Responses	18	14	16	18	16	13	10	11	12	11

Lapses in the Tail

Insurers were asked to list the lapse rate assumption as applied in the tail scenario for Death, Accumulation, Income, Withdrawal and Combination benefits. As described on Page 6 in the *Tail Scenario* section, the tail scenario is defined as the scenario that gives the first negative result of the insurer's modified 90 CTE calculation when rank ordered. The following charts show tail lapse rates by benefit type for policy years 1 through 20.

Individual company assumptions can be volatile if the underlying tail scenario is volatile and the company assumes a dynamic policyholder response.

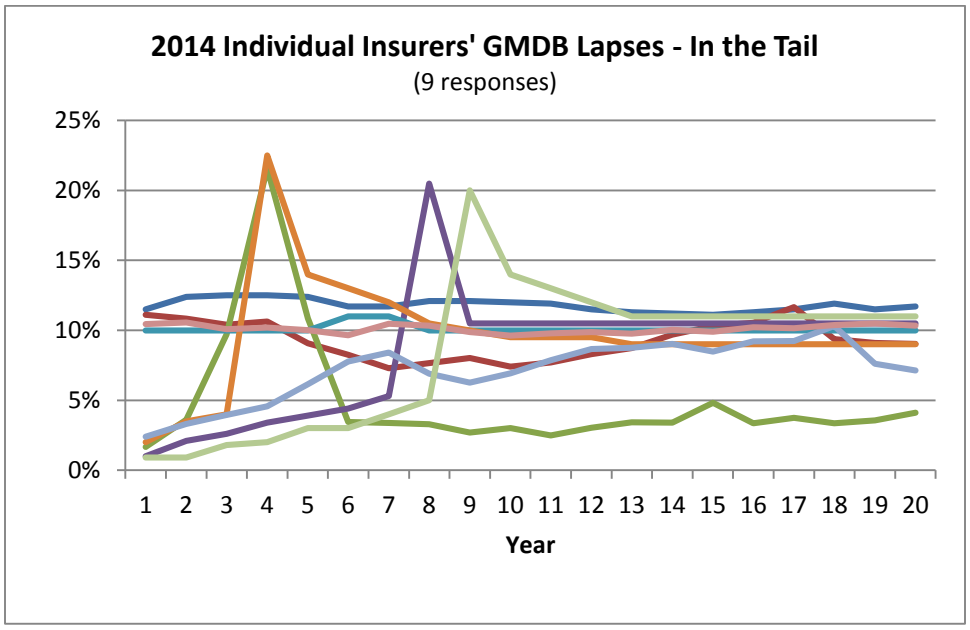

Figure 12

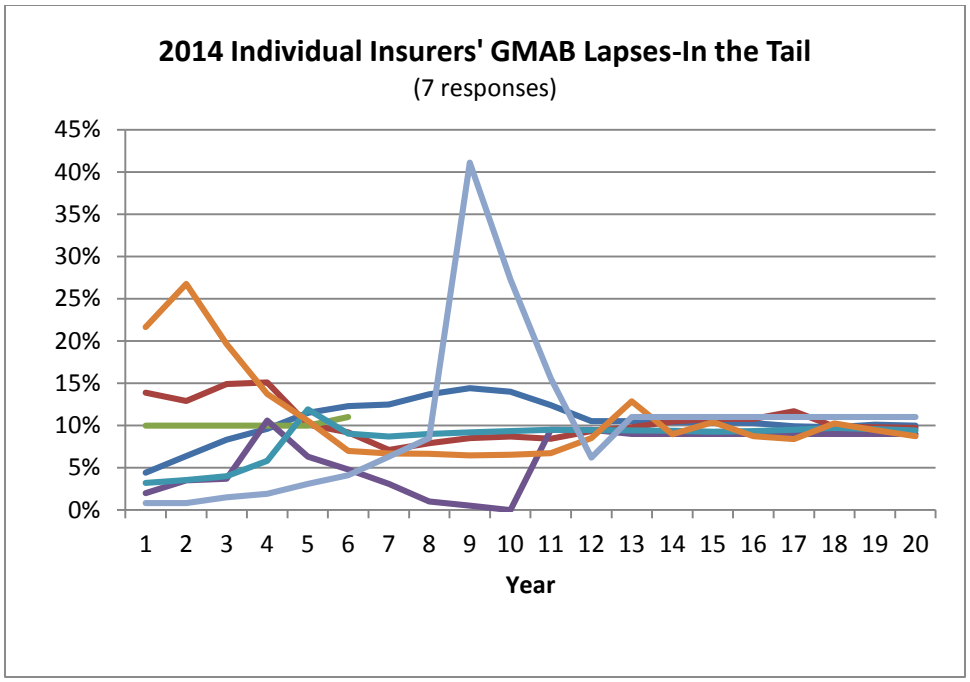

Figure 13

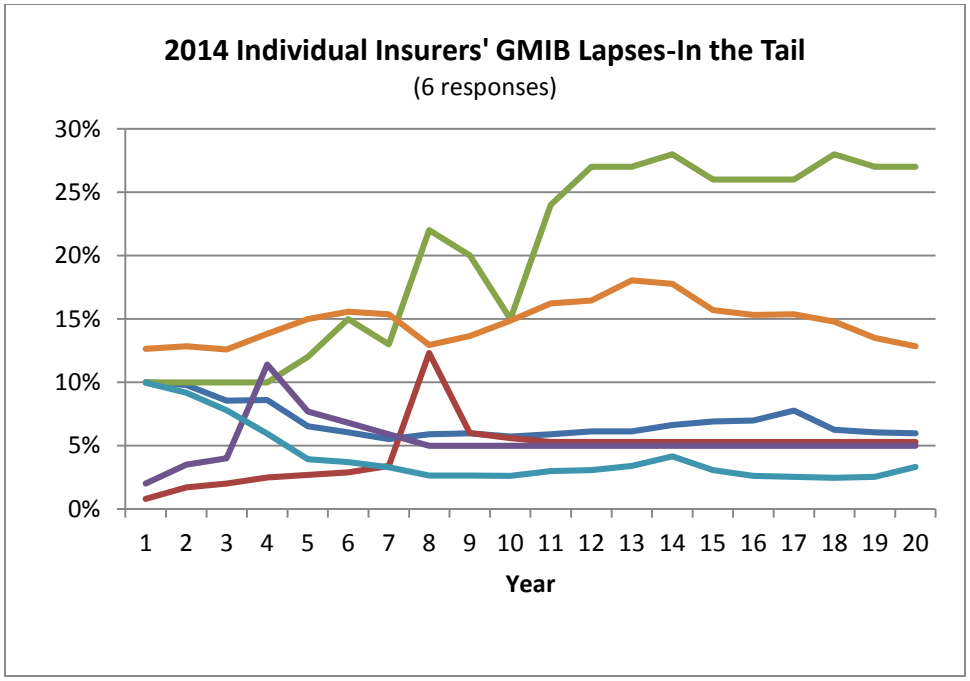

Figure 14

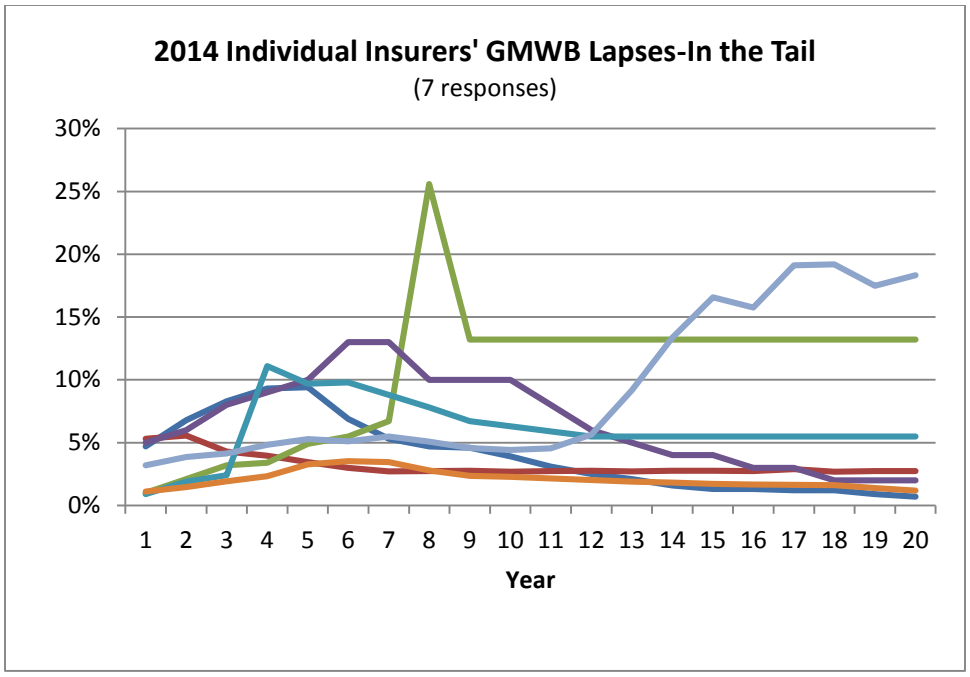

Figure 15

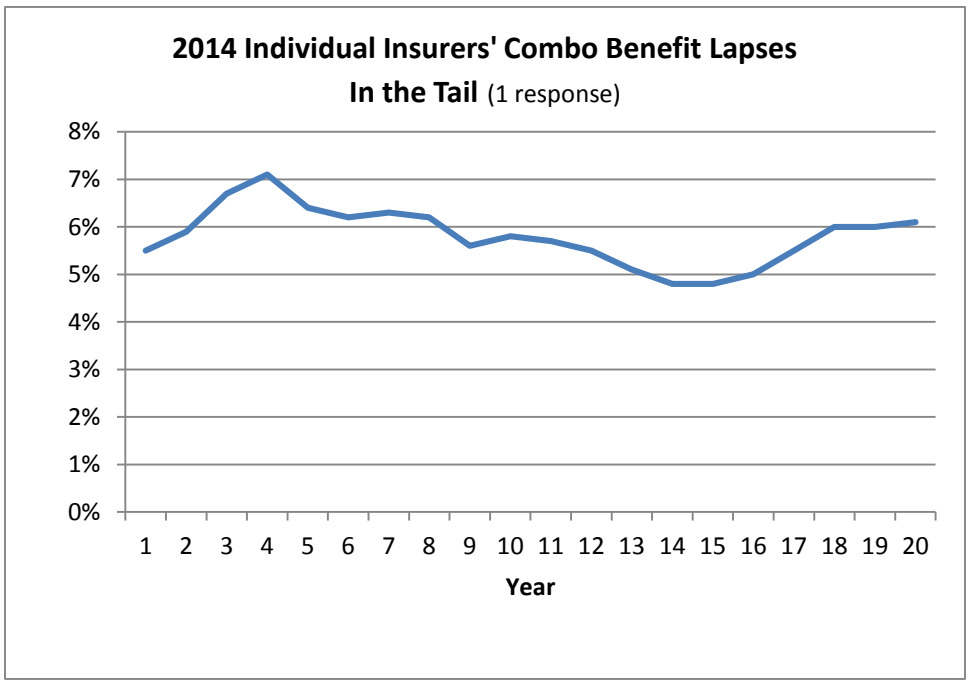

Figure 16

Dynamic Lapses

The following charts show the percentage of insurers that use dynamic lapses for variable annuities with guaranteed minimum death benefits and for variable annuities with guaranteed minimum living benefits.

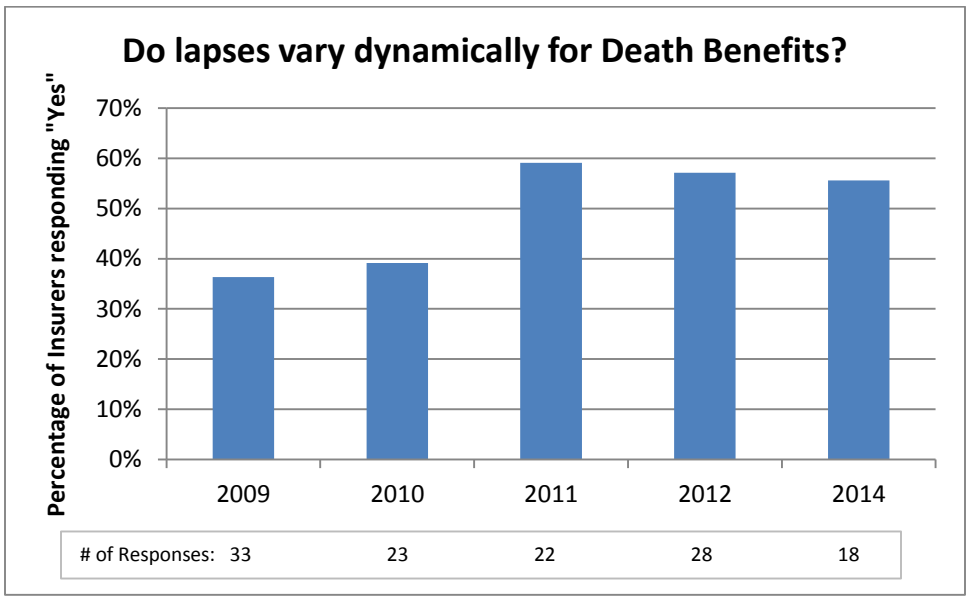

Figure 17

For the third consecutive year, the percentage of the insurers responding "yes" was greater than 55%, meaning that more insurers are using dynamic lapse functions for GMDBs than not. All ten insurers answering in the affirmative provided at least a brief description of their dynamic lapse function for GMDB. All respondents varied the base lapses by applying a scalar to reduce lapses when policies were in-the-money (ITM). In addition to varying lapse rates by ITM-ness, respondents also vary the scalar by duration, product type (dollar-for-dollar vs. pro-rata withdrawals; length of surrender charge schedule), size of premium and age.

Four of these ten companies described lapses that began to reduce from the base level once the ITM-ness exceeded 5% or more. The other companies either did not list their threshold or began reducing lapses at 0% ITM-ness. Eight of the ten companies floor their lapse rate

through the use of a minimum scalar or by declaring a minimum lapse rate. Four of the ten respondents specifically noted the use of a minimum scalar of 50%.

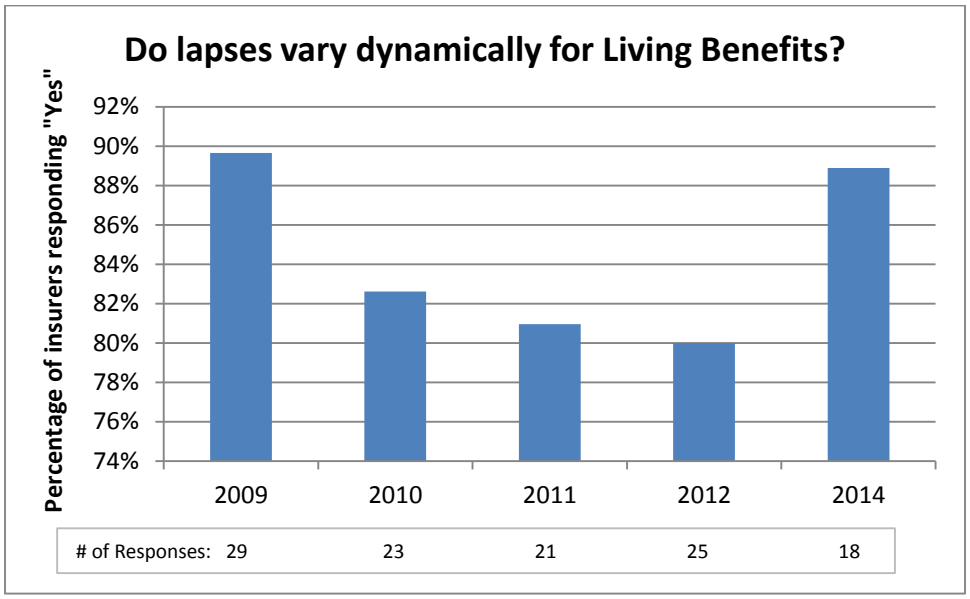

Figure 18

A solid majority of insurers vary lapses dynamically for variable annuities with guaranteed minimum living benefits. The percentage doing so has remained relatively stable in the range of 80-90% for the past five years.

Insurers were also asked to describe their living benefit dynamic lapse function. This question yielded a wide variety of responses; however, most insurers described a one-sided dynamic function that only slows lapses when the guarantee becomes in-the-money. A very small number of insurers described a two-sided dynamic function, where lapses also accelerate when guarantees are out-of-the-money as shown in Figure 19 below.

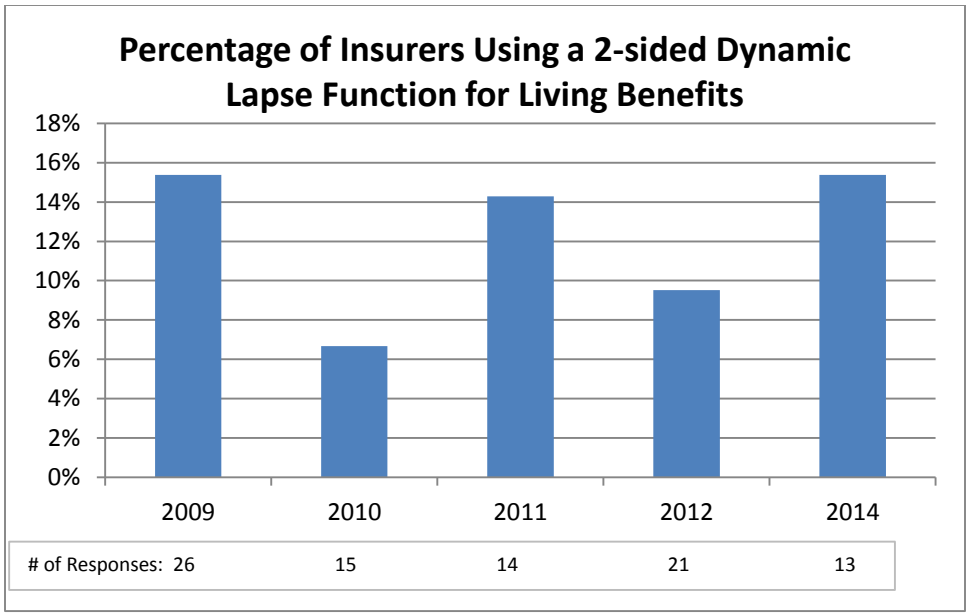

Figure 19

Many insurers described their dynamic lapse function for living benefits in sufficient detail to determine the minimum lapse rate the function would produce, as a percentage of the base lapse rate. Most insurers floor the dynamic lapse function at 0%-33% of base lapses as shown in Figure 20.

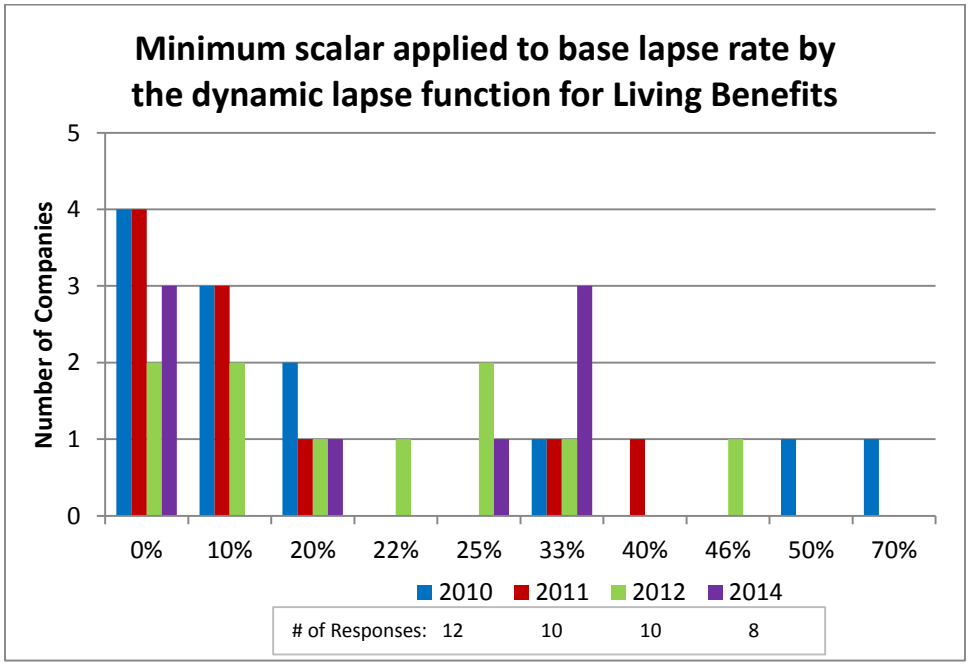

Figure 20

Dynamic Utilization

The following charts show the percentage of insurers who use dynamic utilization functions for Income Benefits and for Withdrawal Benefits.

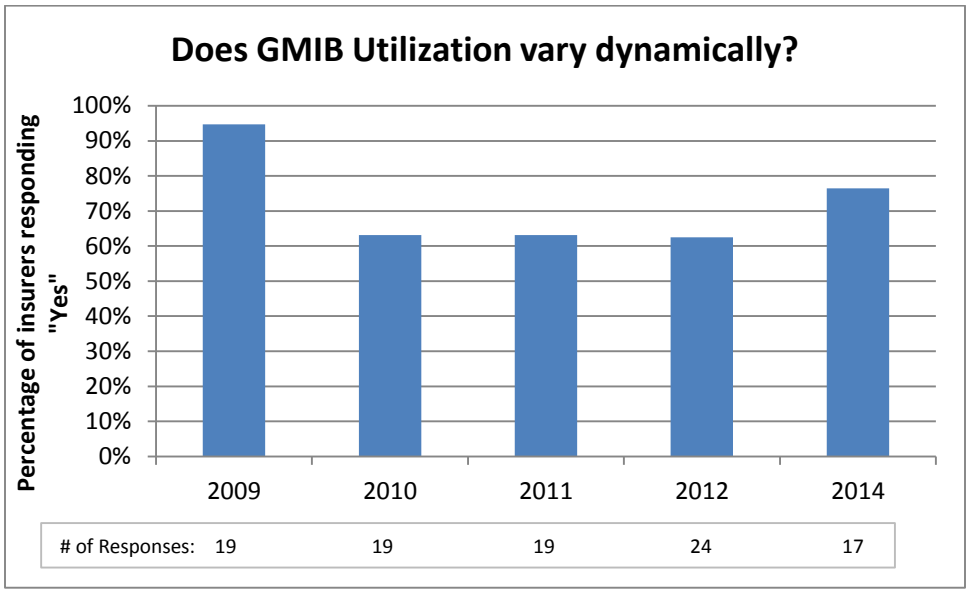

Figure 21

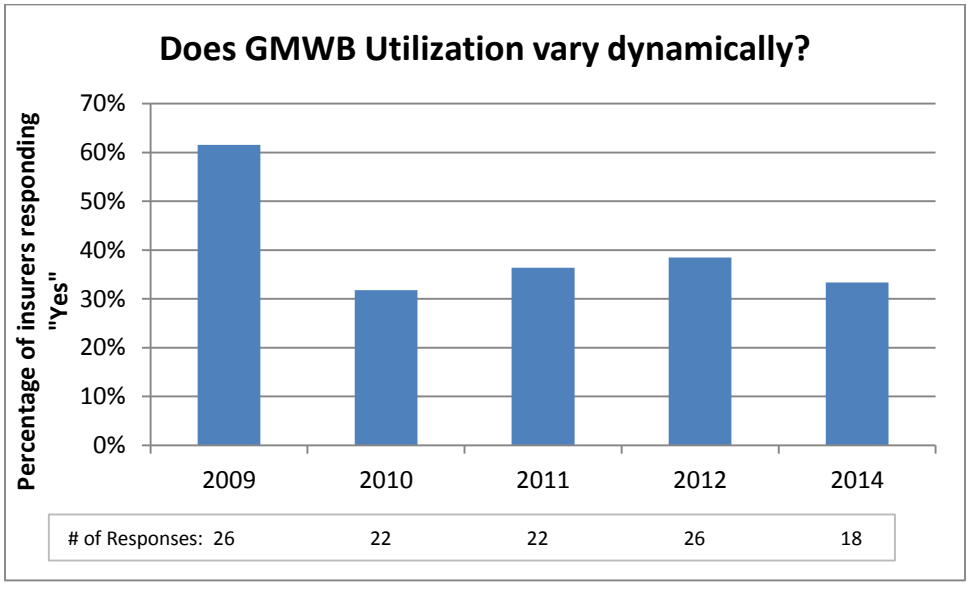

Figure 22

Dynamic Utilization for GMWBs continues to remain in the 30-40% range.

Income and Withdrawal Utilization

Beyond whether their utilization assumptions were dynamic, insurers were also asked to describe their Income and Withdrawal utilization assumptions.

All but one respondent mentioned that ITM-ness, or the relationship of the account value to the guaranteed value, was used as a parameter of GMIB utilization. ITM-ness was more likely to be mentioned than either age or duration. Factors mentioned in the "Other" column included distribution channel and the opportunity to elect annuitization. Insurers were able to list more than one factor, so the percentages will not sum to 100%.

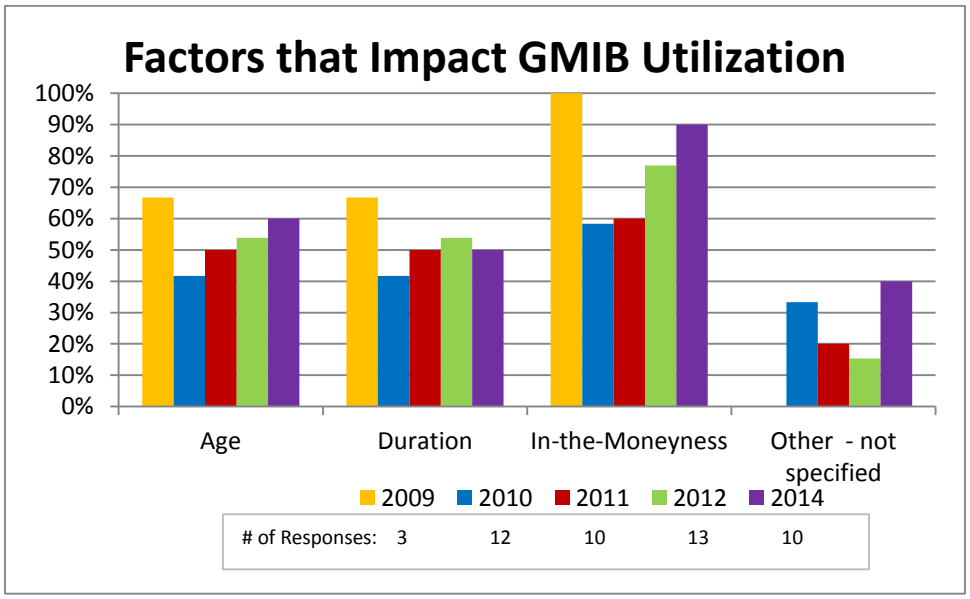

Figure 23

Age and duration continue to be the most common factors used to vary GMWB utilization assumptions (Figure 24). Both age and duration realized slight increases compared to 2012 results. Factors mentioned in the "Other" column included distribution channel, benefit provision, and product differences.

The ITM-ness parameter for GMWB, unlike for GMIB, remained at an extremely low level compared to the other factors. Of the insurers responding "Other", three indicated that GMWB Utilization is impacted by the GMWB design. Two base GMWB utilization partly

on whether the policy is currently taking withdrawals, while another bases it on the distribution channel. Insurers were able to list more than one factor, so the percentages will not sum to 100%.

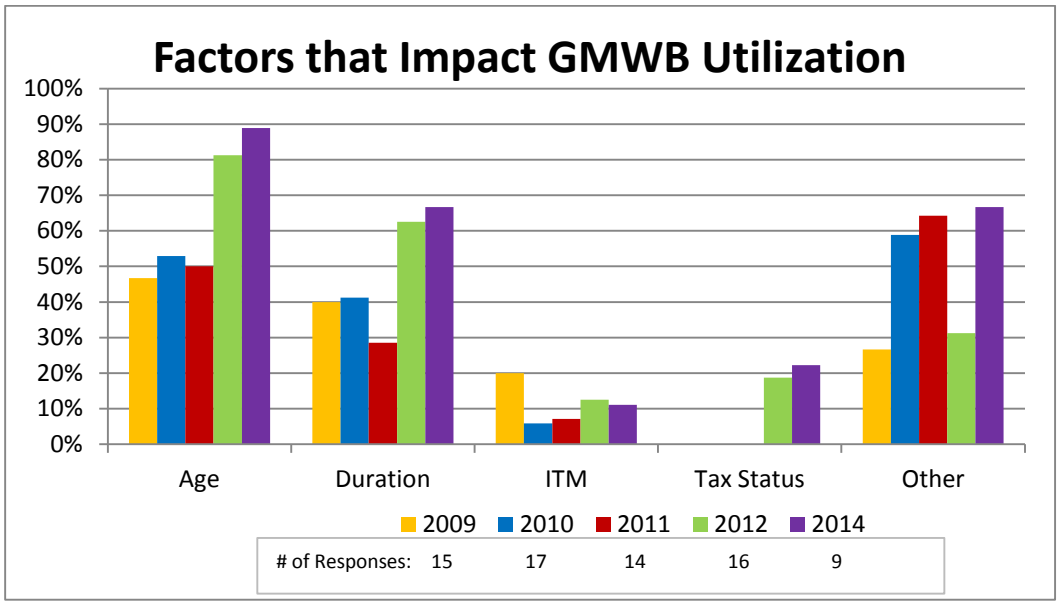

Figure 24

Lapses by Distribution

Insurers were asked several questions about their distribution channels. Over 60% of responses (11 of 18) said that their products were sold through multiple distribution channels. Of those eleven respondents, seven (64%) use three or four distribution channels.

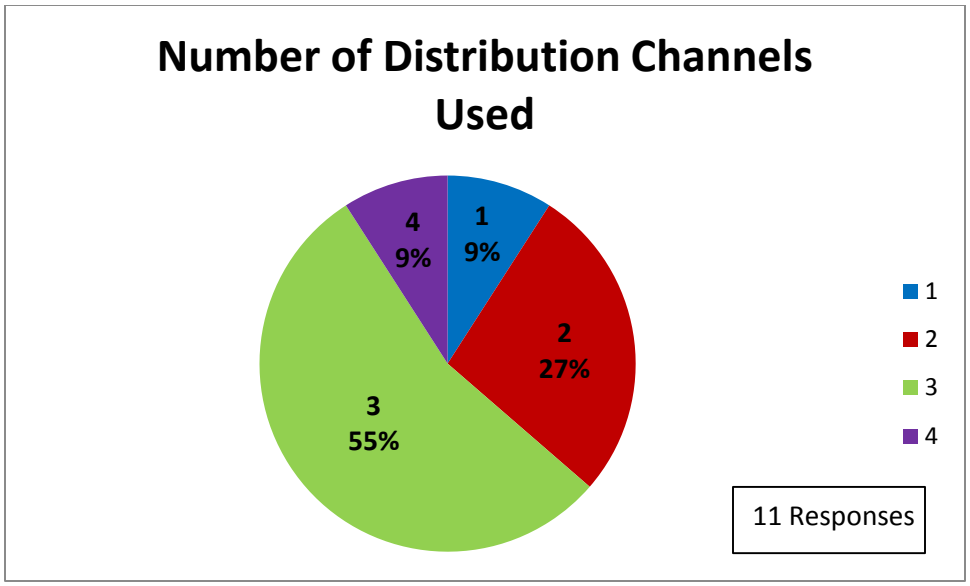

Figure 25

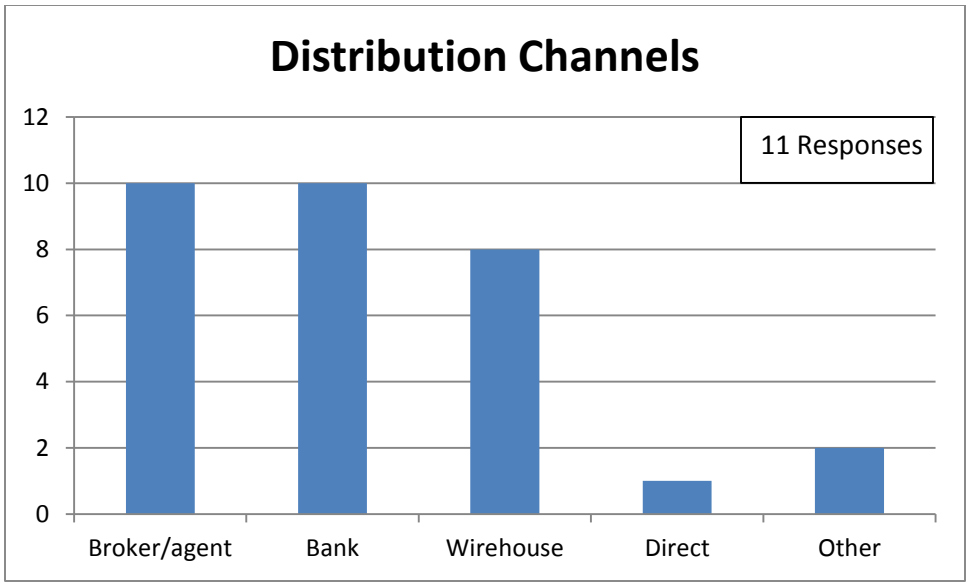

Figure 26

Insurers were asked if their lapses varied by distribution channel. Only 18% (2 of 11) indicated a difference, this number has been similar for the past 5 years. However, many insurers are measuring lapse experience by distribution channel. In 2014, 45% (5 of 11) indicated that they measure by distribution channel which is similar to 2012 but significantly greater than the 23% (3 of 13) in 2011. Similar to the past study, one insurer

commented that lapses from the agent channel are generally lower than those from the bank channel.

Source of Assumptions

Insurers were asked to provide the source they used for their expected lapse assumptions and the frequency of lapse studies performed in the company. However, given investment market volatility since 2008, some companies have had the opportunity to observe and analyze policyholder behavior "in the tail". Therefore, a follow up question was asked specifically about "in the tail" assumptions.

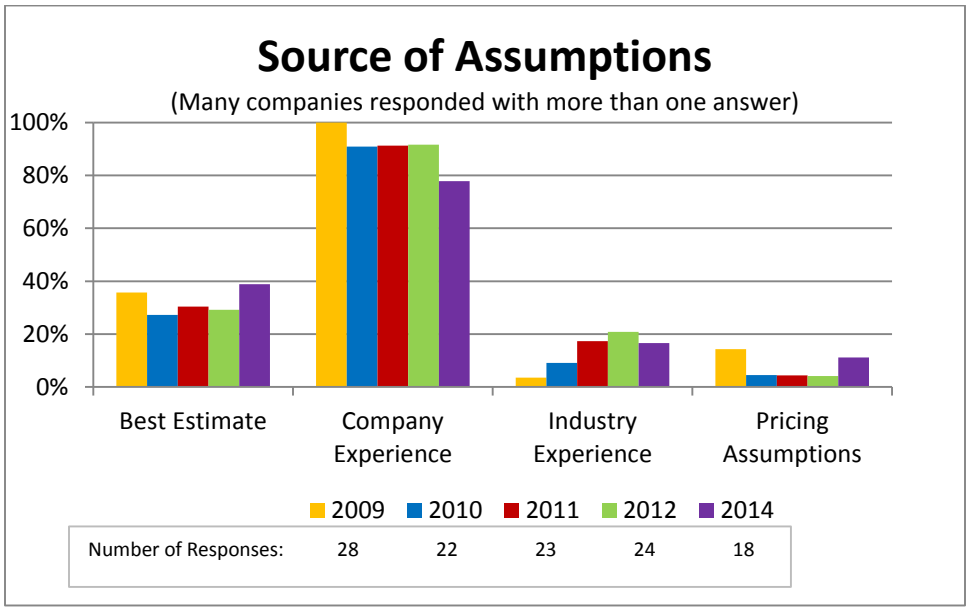

Figure 27

The survey responses show that "company experience studies" continue to be the most popular source of base case assumptions (see Figure 27). Over the past years very few companies indicated the use of industry experience in setting assumptions. The number of companies using industry experience in 2014 remained consistent with the prior two studies.

Most companies that perform experience studies perform them annually (see Figure 28). 72% (13 of 18) respondents perform annual experience studies and 89% (16 of 18) perform

experience studies on an annual or more frequent basis. At least five companies mentioned that they monitor lapse experience much more often (usually monthly) than they perform an official lapse experience study.

It is our hope that with the publication of the forms that assumptions take, we will continue to expand and improve the range of dynamic functions considered as "expected" by actuaries both (a) as they set assumptions in their own work and (b) as they set up experience studies to parameterize such dynamic functions, especially from experience gained in "tail" historical periods.

Collection, analysis, and publication of industry experience would be valuable as a supplement to any company specific experience. Companies of various sizes can be challenged by the statistical credibility available from only their own data, especially in the rare occurrence of a "tail" situation. Aggregation of data makes it easier to see trends otherwise obscured by statistical fluctuations. As with any aggregate industry study, each company needs to be aware of any inherent reasons why its own results may legitimately vary from that of the aggregate industry.

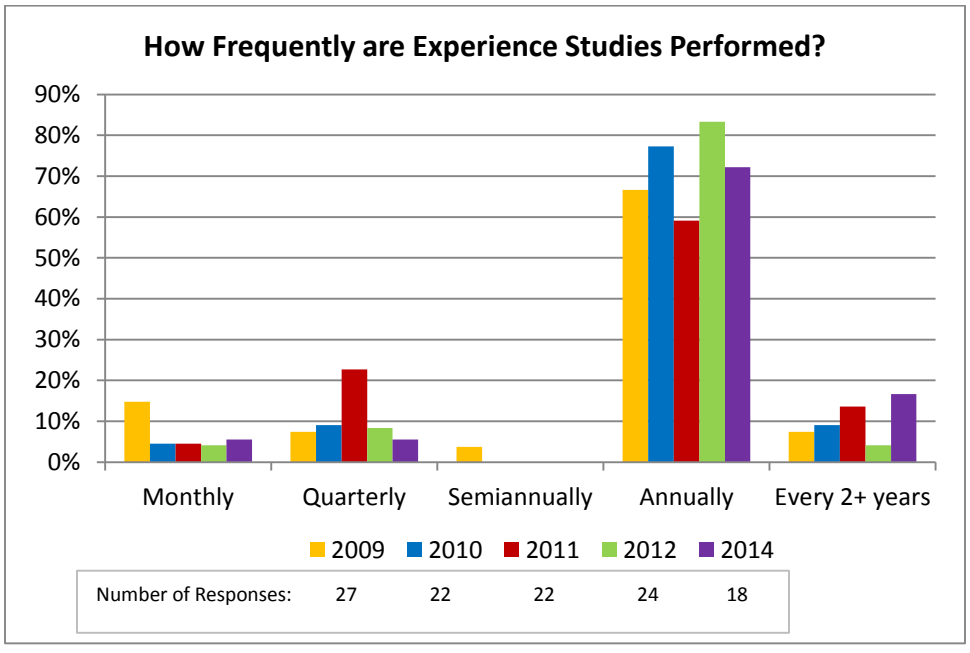

Figure 28

Insurers were asked how many years of data were used in their latest lapse study (Figure 29). Several respondents gave time frames or made comments about using post-2008 date for their lapse study which would have excluded the financial crisis of 2008.

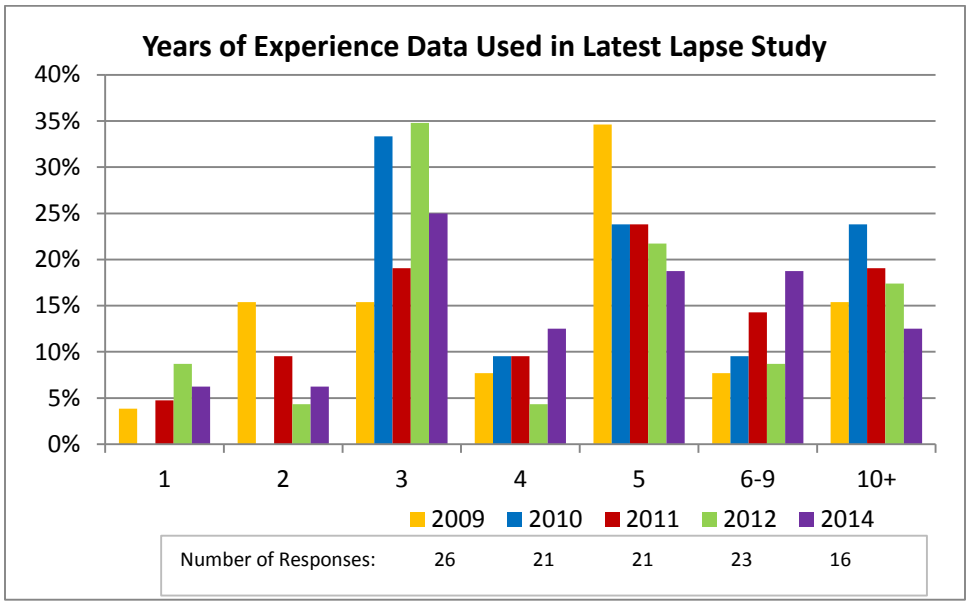

Figure 29

The financial crisis of 2008 spawned two additional questions that have been on the survey since 2010. The first regarded the source of assumptions for "in the tail" lapsation. Insurers were able to include more than one category in their responses. 2014 respondents continue to favor best estimate (59%; 10 of 17) as the primary source for tail lapse assumptions with company experience (53%; 9 of 17) following closely behind (see Figure 30). Only one company (6%) relied in part or in full on industry experience while two companies (12%) referenced their pricing assumptions.

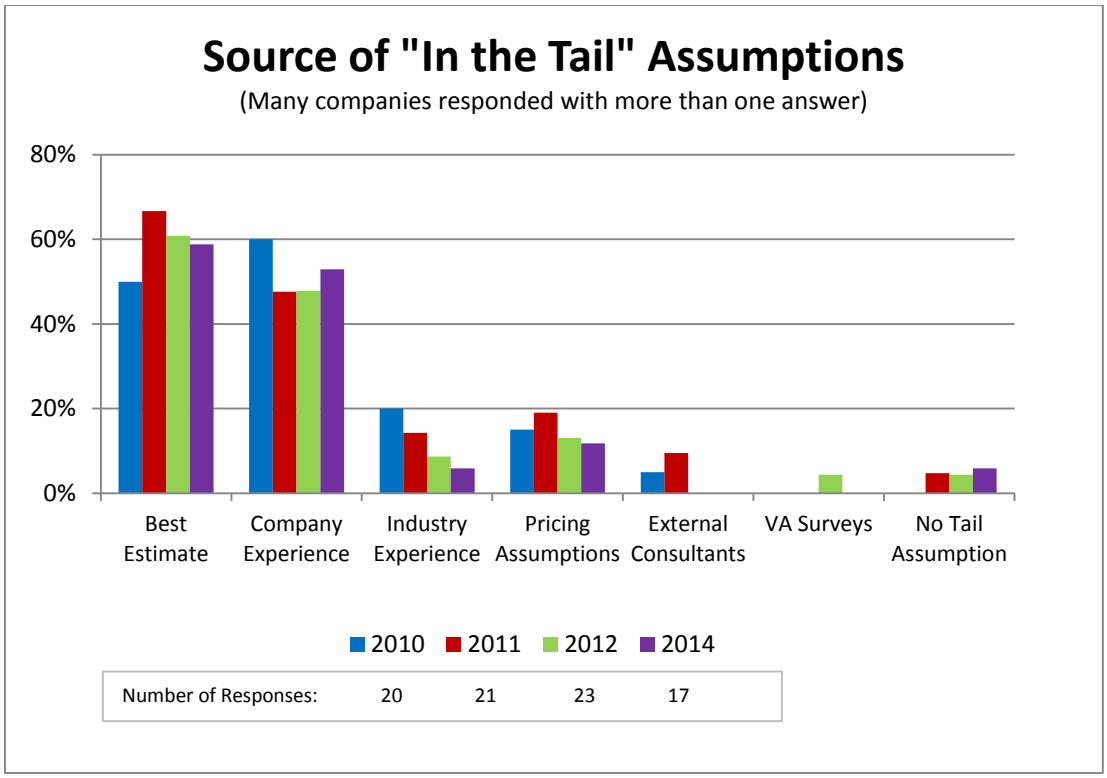

Figure 30

Insurers were also asked, if they were using company experience as a source for "in the tail" lapse rate assumptions, what years were used. Seven of the nine insurers who included company experience as a basis responded, five of them indicating the calendar years of experience that were used. Most included the most recent exposure year and all seven responding used at least three calendar years of experience. Figure 31 compares the source of base assumptions with the "In the Tail" assumptions for 2014.

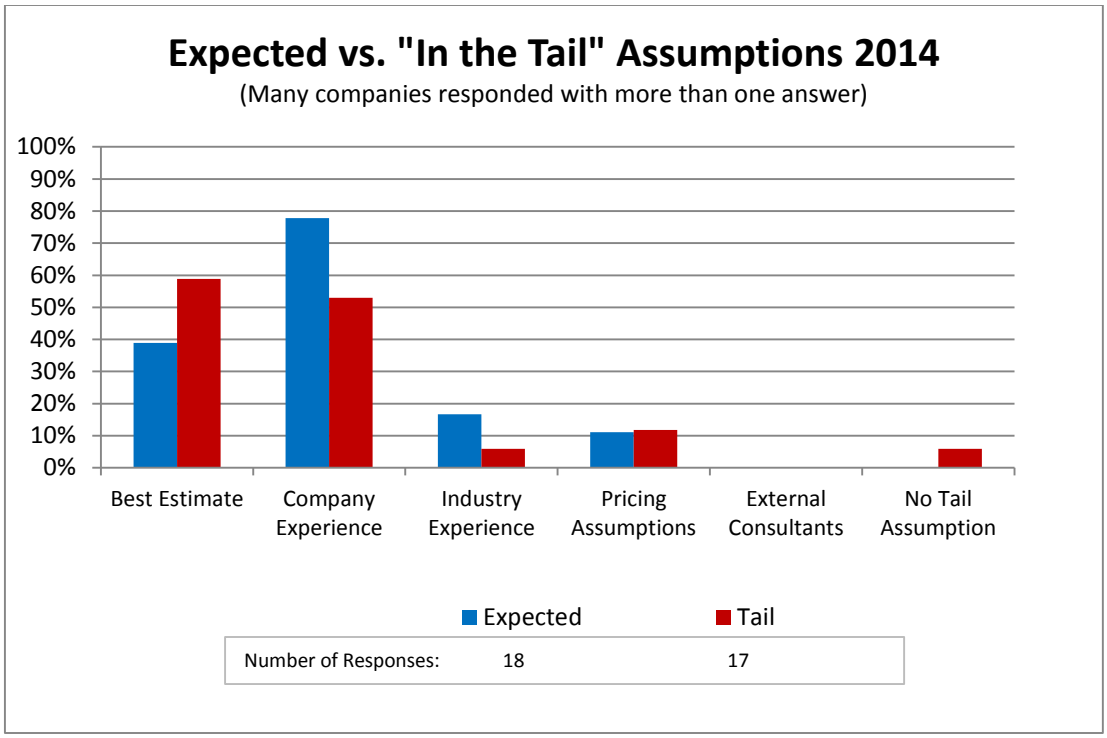

Figure 31

The source of base lapse assumptions differs significantly from the source of "in the tail" assumptions. As one would expect, more reliance is placed on company experience for base assumptions than for assumptions "in the tail." This would be primarily due to most of the actual experience of companies not being in a tail scenario. Lapse assumptions in the tail require more judgement from the actuary. There is a greater reliance on best estimates as well as the use of pricing assumptions and external surveys to set the "in the tail" assumptions.

Changes in Assumptions

Insurers were asked if any of the assumptions previously discussed in the survey were changed from the previous year's analysis. The percentage of respondents indicating that some assumptions were changed increased slightly for 2014 (72%; 13 of 18) when compared to 2012 (60%; 15 of 25).

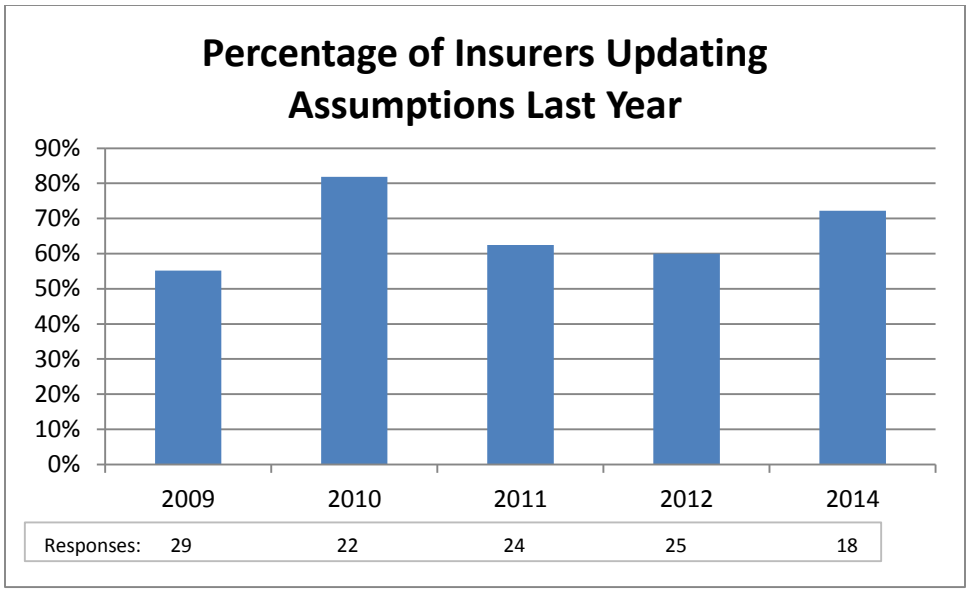

Figure 32

The question went further to ask insurers to describe what was changed in each of three categories: death benefit lapses, living benefit lapses, and living benefit utilization. The charts below (see Figures 33-35) show the percentages of those changing, as allocated among the types of responses. Figure 34 shows that insurers continued to make changes to their dynamic functions for living benefits in 2014. Sixty-two percent (8 of 13) of respondents made changes due to updated experience while over half (7 of 13) changed their dynamic function for living benefit lapse rates. Figure 35 shows that over 90% (11 of 12) of respondents made changes to their living benefit utilization rates due to updated experience.

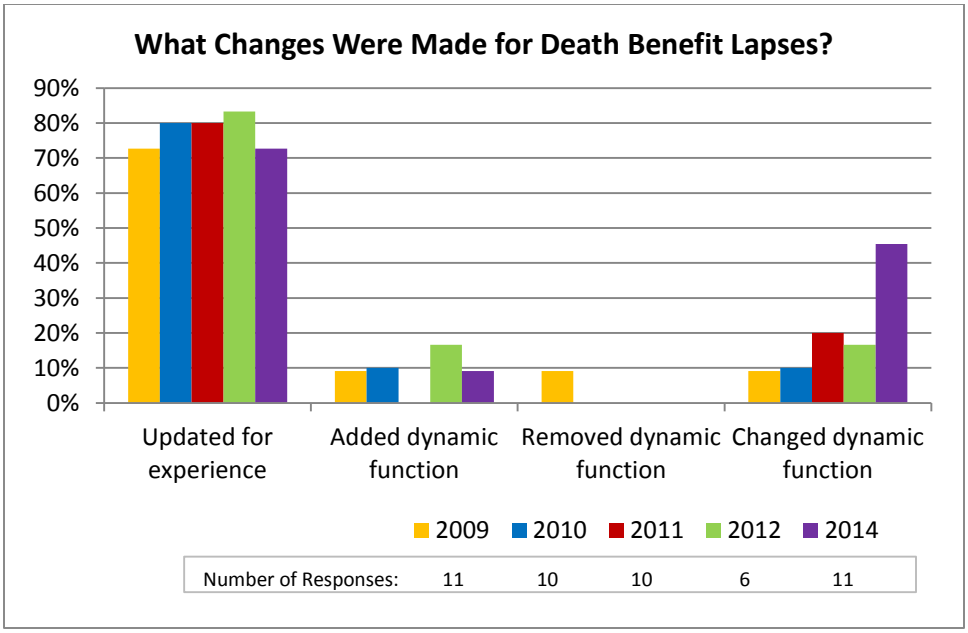

Figure 33

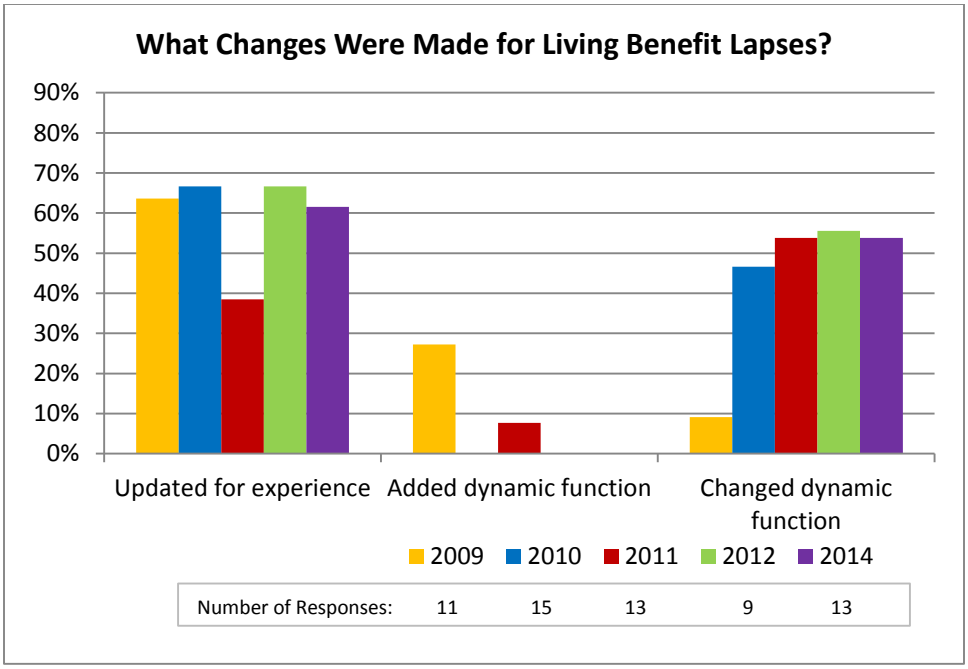

Figure 34

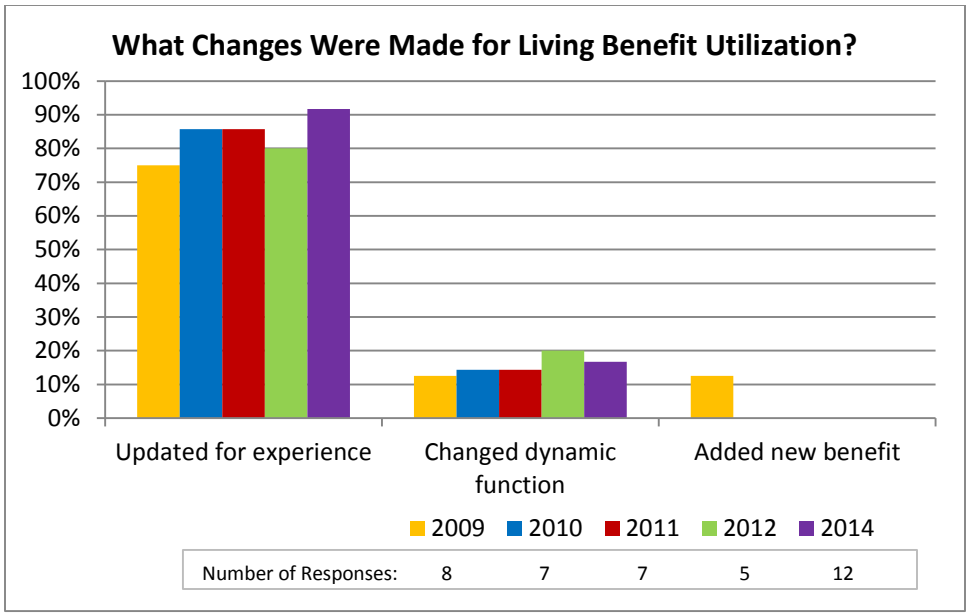

Figure 35

A new question was introduced in the 2012 survey. The new question asked if emerging policyholder behavior experience since 2008 (for many, a "tail" environment) caused a revision in policyholder behavior assumptions in the tail. Thirteen of 16 (81%) respondents indicated that emerging experience did not fit their prior expectations. Eight respondents (50%) made changes to their assumptions based on their experience.

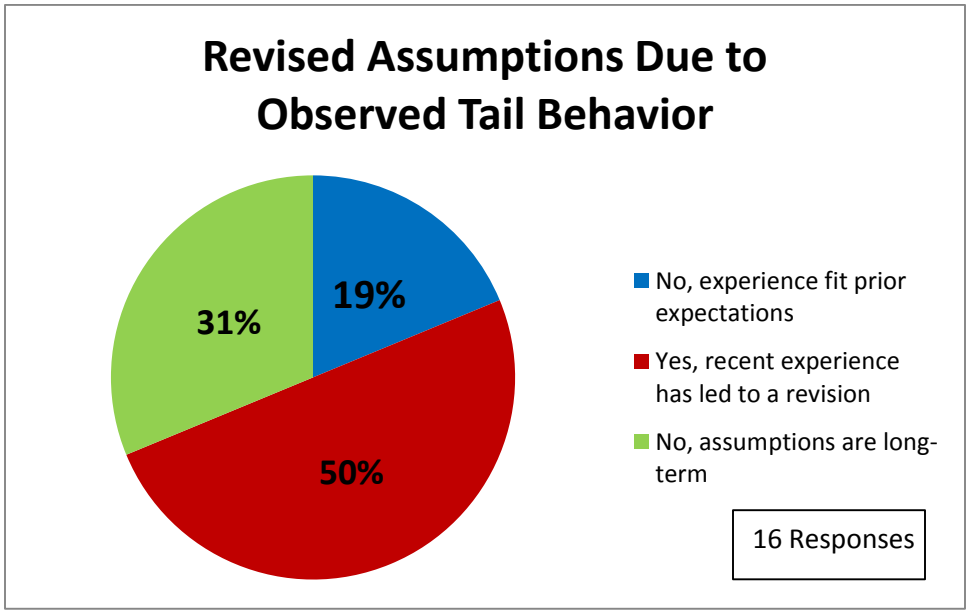

Figure 36

Respondents Profile

The following chart shows the relative size of companies responding to the survey as measured by Total Account Value.

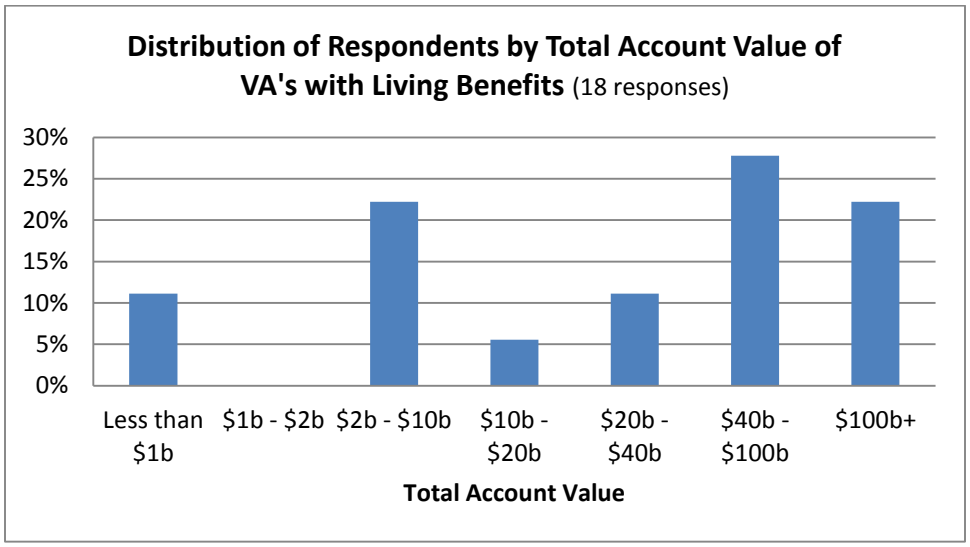

Figure 37