2014-2015 Individual Life Insurance Mortality Experience Report

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Section 1: Purpose of the Study

This study and report have the following primary purposes:

1. Compare recent mortality experience relative to standard industry mortality tables, at a broad level.

2. Provide the actuary with broad insights into the current experience, and industry changes which have impacts on this experience.

3. Provide the underlying data in spreadsheet pivot tables format for further investigation by qualified actuaries. Provide data also in a text delimited format for use with other software tools.

Any comparison of mortality trends should be considered carefully and evaluated with attention to all underlying factors. Results observed may reflect impacts of variables not included in the current analysis, and frequently a deeper dive is necessary for understanding. Multivariate predictive modeling techniques are well suited to help the actuary understand results.

An actuary using this report should make his/her own determination concerning the applicability of this information to his/her individual purpose and use.

Section 2: Acknowledgements and Resources

2.1 Individual Life Experience Committee

The SOA extends its gratitude to the Individual Life Experience Committee (ILEC). The ILEC designed the project, completed/oversaw the analyses and authored and peer reviewed the report. The ILEC members are:

- Tony Phipps (Chair), FSA, MAAA
- Brian Holland (Vice-chair), FSA, MAAA
- Ed Hui (Vice-chair), FSA, MAAA, CFA
- David Baelis, FSA, MAAA
- Mary Bahna-Nolan, FSA, MAAA, CERA
- Tatiana Berezin, FSA, MAAA
- Larry Bruning, FSA, MAAA
- Kathryn Campbell, FSA, MAAA
- Cindy Chen, FSA, MAAA
- Chris Condon, FSA, MAAA
- Jeff Dukes, FSA, MAAA
- Steve Ekblad, FSA, MAAA
- Frans Te Groen, FSA, MAAA
- Ken Klinger, FSA, MAAA, ACAS
- Kevin Larsen, ASA, MAAA
- Hezhong (Mark) Ma, FSA, MAAA
- Tim Morant, FSA, MAAA
- Mark Rosa, ASA, MAAA
- Maureen Shaughnessy, FSA, MAAA

2.2 Other Resources

The SOA contracted with MIB's Actuarial and Statistical Research Group, to collect, validate, and compile the data underlying this report. Mervyn Kopinsky (SOA Experience Studies Actuary), Cindy MacDonald (SOA Senior Experience Studies Actuary), and Korrel Crawford (SOA Senior Research Administrator) supplied SOA staff support.

Section 3: Description of the Data

This section of the report describes the data that was compiled for the SOA's Individual Life Experience Committee (ILEC) to use in the development of the latest mortality study, the 2014-2015 Individual Life Experience Report. Data from the prior ILEC study have been appended to the new experience data to create a composite data set for all years 2009-2015.

The data used in this study is available in Excel pivot tables and also in a text delimited file. More detail on the use and format of these files can be found in Section 5 of this report. With these data files, the reader may pursue their own detailed analysis as desired. The CSV file provided with the 2009-2013 Individual Life Experience Report contains data from the prior study, anniversary years 2002-2009. If an analysis across all years back to 2002 is desired, the user may append those years from that file to the current file.

As with the prior studies of the ILEC, this report examines mortality under standard individually underwritten life insurance and excludes rated, converted, and guaranteed or simplified issued business. For the data underlying this report, the ILEC has relied upon the data integrity of the individual company submissions, and the data validation performed by the statistical agent on behalf of those companies and regulators. It should be noted that the definition of simplified issue has become increasingly blurred in recent years, and may not be consistent across companies.

The data includes experience on direct written business in the U.S., and no assumed reinsurance business is included. The number of companies contributing to the new data is significant. The following table lists the number of companies in each calendar study year 2009-2015. The data for the study years 2009-2015 is organized on a calendar-year basis. These mandatory submissions utilized the VM-51 record format in the Valuation Manual, with submissions being either voluntary or required from the New York Department of Financial Services and the Kansas Insurance Department.

Calendar Year	# Companies	Source
2009	48	NY required, KS voluntary
2010	64	NY required, KS voluntary
2011	82	NY required, KS required
2012	83	NY required, KS required
2013	85	NY required, KS required
2014	93	NY required, KS required
2015	91	NY required, KS required

With the calendar-year method, exposure formulas were used which are consistent with the Balducci assumption. This approach is commonly used in the industry for life insurance mortality studies. The Balducci assumption is used for convenience in tabulation of exposures. It may, in some situations, produce nonsensical results, but these situations tend to occur where there are limited exposures.

Except where noted otherwise, the expected mortality basis used in the calculation of Actual-to-Expected (A/E) ratios in this report is the 2015 Valuation Basic Table (2015 VBT), RR 100. Life insurance writers in

the U.S. issue policies on both an Age Last Birthday (ALB) basis and an Age Nearest Birthday (ANB) basis. The calculation of A/E ratios utilized the version of the expected table consistent with how the company indicated their data was organized. Similarly, the application of smoker-distinct versus composite (uni-smoke) tables relied on the indication made by the submitting company. However, composite tables were used as the expected basis for all business issued prior to 1980, regardless of smoking status indicated, as the ILEC believes smoking as a distinct rating factor to be rare prior to that period. When smoking distinct rates were first introduced, the smoking status field was added to databases. Many companies filled this field for their entire portfolio of previously issued composite smoking policies as smokers. Others defaulted all of that business to non-smokers.

A/E ratios in this report are reported on an amount basis, unless noted otherwise. The actuary should be aware of differences in results on amount basis versus count basis, and the volatility associated with each measure.

Section 4: Discussion

The following sections of this report discuss analysis and trends for particular segments within the data. Section 4.1 compares the information from the newly added study period (2014-2015) to the prior study period (2009-2013). The remaining sections (4.2-4.5) examine the trends for particular segments over a longer term period, from 2009-2015.

As noted previously in this report, A/E results are shown with the 2015 VBT table as the expected table by amount, unless otherwise specified. Please note the 2015 VBT table was developed primarily with experience from 2002-2009, with adjustments and improvement applied as appropriate. Differences between company participation and observation period of the current study and the 2015 VBT experience could be reflected in the results shown below.

The term "improvement" has been used generically within this document when comparing changes or trends in mortality results between study periods, or by study year. The reader should understand that the use of this term does not imply any connection to a formal mortality improvement measure, as the mortality trends observed through the 2009-2015 study years are greatly influenced by differences in mix of business, changes in underwriting, and changes in the companies that contributed data.

4.1 2014-2015 Current Study Years vs 2009-2013 Prior Study Years

The following table shows summaries of the current study period (2014-2015) and the prior study period (2009-2013). This table includes all issue ages, including juveniles.

Observation Year	# Companies	# Claims	$ Claims	# Exposure	$ Exposure
2009	48	249,865	$11.0B	31,322,347	$5,330B
2010	64	412,029	$16.1B	40,190,513	$6,567B
2011	82	563,694	$26.1B	57,118,520	$10,973B
2012	83	537,286	$27.8B	51,036,427	$10,799B
2013	85	554,199	$30.0B	57,373,029	$11,898B
2009-2013		**2,317,073**	**$111.1B**	**237,040,837**	**$45,567B**
2014	93	560,393	$32.8B	57,552,165	$12,450B
2015	91	565,853	$35.5B	57,907,852	$13,078B
2014-2015		**1,126,246**	**$68.3B**	**115,460,017**	**$25,528B**
Total		**3,443,319**	**$179.4B**	**352,500,854**	**$71,095B**

Please note the full data provided and further discussions of the later segments noted in sections 4.2-4.5 are based on observation years 2009-2015, as the ILEC believes the focus on a longer trend is more value added.

When comparing aggregate mortality data from the prior mortality studies' observation periods (2009-2013) to the current observation periods (2014-2015), there are moderate, but clear, improvements exhibited. The following results are based upon looking at the data with the following filters:

- Issue ages 18+
- Exclude term policies in the post-level premium period

The aggregate actual-to-expected (A/E) mortality ratio for the observation period 2009-2013 was 95.8%, while the A/E ratio for the 2014-2015 period is 91.2%. This is a 5% reduction in mortality experience between the two periods. Similar improvement trends can generally be seen when looking at more detailed breakouts of the data.

The graphs below compare actual-to-expected mortality ratios by amount, using the 2015 VBT as the basis for the expected.

While mortality is lower in the current study period (2014-2015) compared to the previous study period for the nonsmokers and unknown smoking class, it increased for the smoker class. The greatest improvement is seen in the nonsmokers who continued to trend more similarly to prior studies. The nonsmoker actual-to-expected (A/E) ratio for the 2014-2015 observation period is 5.5% (1-88.9%/94.1%) lower than what was observed from 2009-2013.
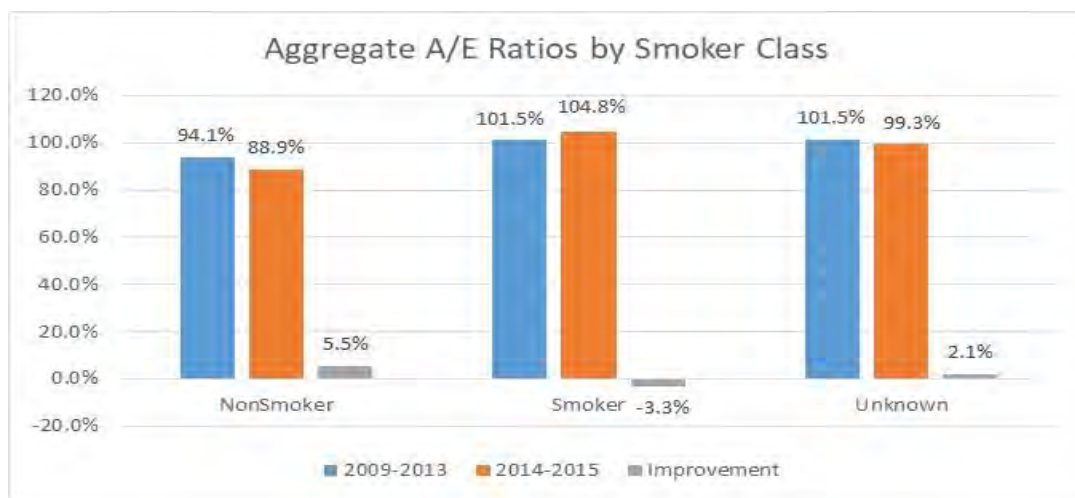
When looking at the data by gender, female mortality A/E ratios decreased by 7.2% compared to the male decrease of 3.6%. The stronger female trend seems counter to long-term population improvement trends by gender over the past 50 years. However as previously mentioned, a much more in-depth analysis of the data is required to understand the underlying drivers of the trend here.
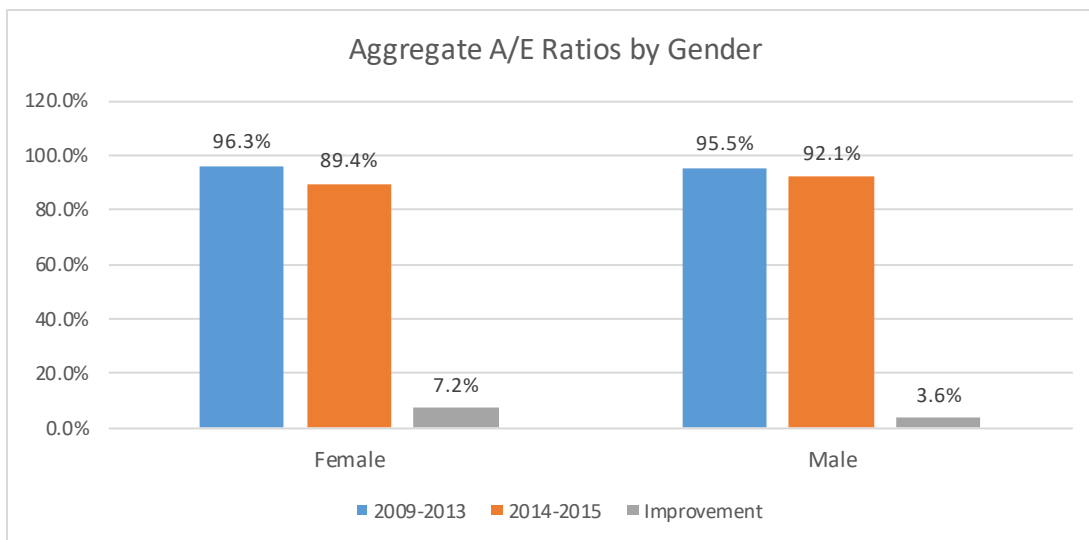
When comparing 2009-2013 to 2014-2015 experience across product types, the data shows lower A/E ratios in 2014-2015 for all product types, with the exception of the 'permanent' (whole life) identifier. With the current data, there is a clear difference in mortality A/E seen between the two categories of universal life (UL) and variable life (VL). The lower mortality exhibited in the SG products may be attributable to possibly lower lapse rates, higher policy size, target market, or other factors. The Other product class improved by 25.8%; however, these results may be more volatile due to a relatively small number of claims compared to the other product types (study period 2009-2013 had 1,335 claims and study period 2014-2015 had 1,393 claims).
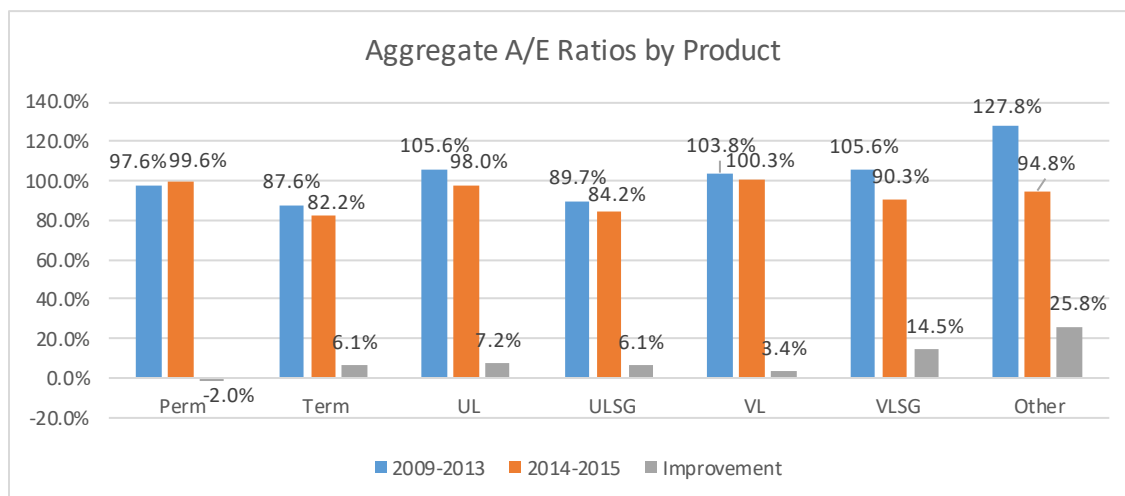
The current data shows consistent, smaller improvement over the younger issue ages and higher improvement for policies issued at age 60 and beyond. Especially for the older issue ages where there were relatively fewer claims and durations to develop the 2015 VBT table, the reader should consider the credibility of the experience and how they expect the deviances to persist for those cohorts of business.

The issue age group 60-69 exhibited worse mortality experience than the overall mortality by 4% (A/E by amount) or 3% (A/E by count). There was a shift toward more large size policies ($1 million and above)

being issued in 2000 and later. In particular, the large size policies issued in 2000-2009 appeared to contribute mostly to the worse mortality experience for this cohort of issue ages.

Aggregate A/E Ratios by Issue Age Group
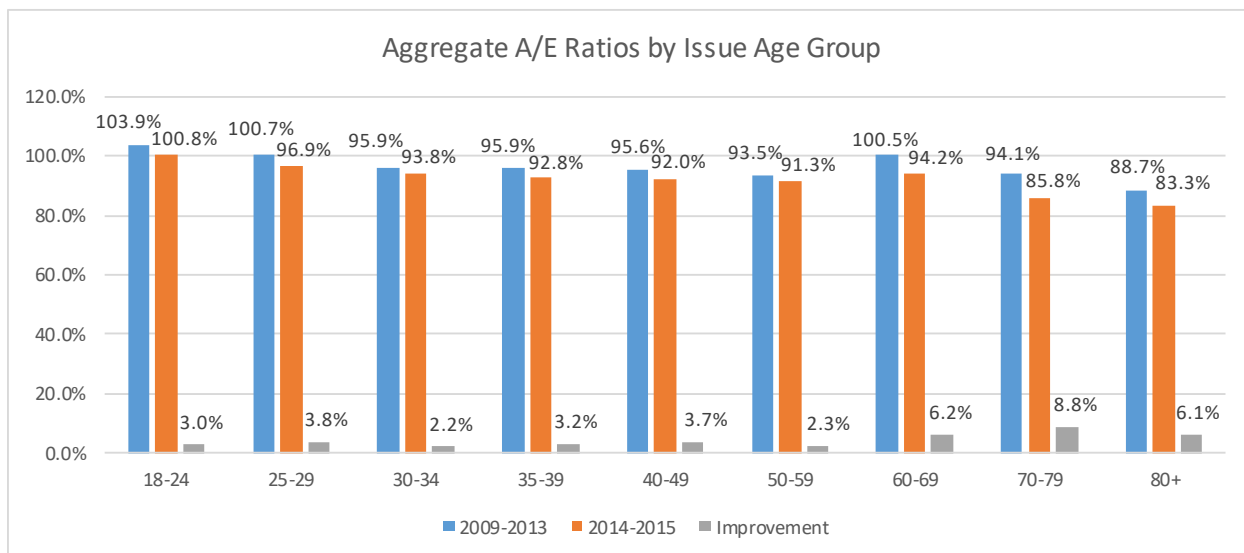
Overall, mortality results were lower in the new observation period for durations 1-2 and 6-20, with the largest decreases in mortality in durations 1, 2, and 11-15 at 16.1%, 10.0%, and 9.7% improvement, respectively. Durations 3-5 and 21+ showed almost no change to slightly worsening mortality compared with the previous observation period (2009-2013). The A/E results remained relatively stable over durations 1-15 (ranging from 81.7%-90.6%) and increased to over 100% by duration 21+.

Aggregate A/E Ratios by Duration Group
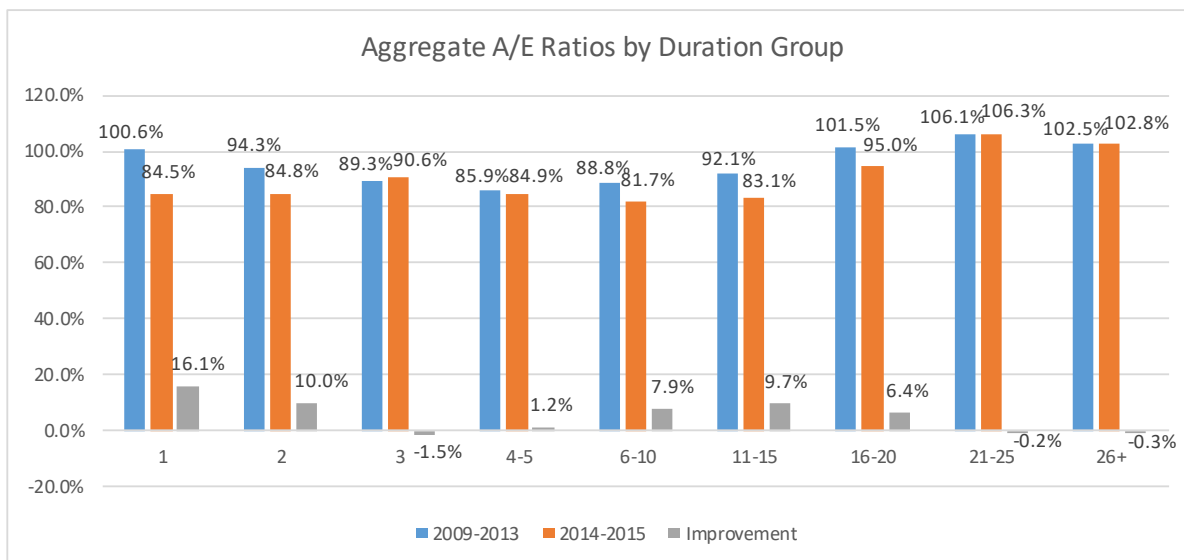
Comparing across different face amount bands shows a generally increasing reduction in A/E ratios with larger face amount bands, with the exception of face amounts at and above $10 million where the reduction lessens. While not shown in this graph, face amounts below $100,000 showed no material change in mortality, with A/E ratios around 112% for both the 2009-2013 period and the most recent observation period (2014-2015). Overall, these results are directionally consistent with US population reports, which have observed a greater decrease in mortality for higher socioeconomic groups.
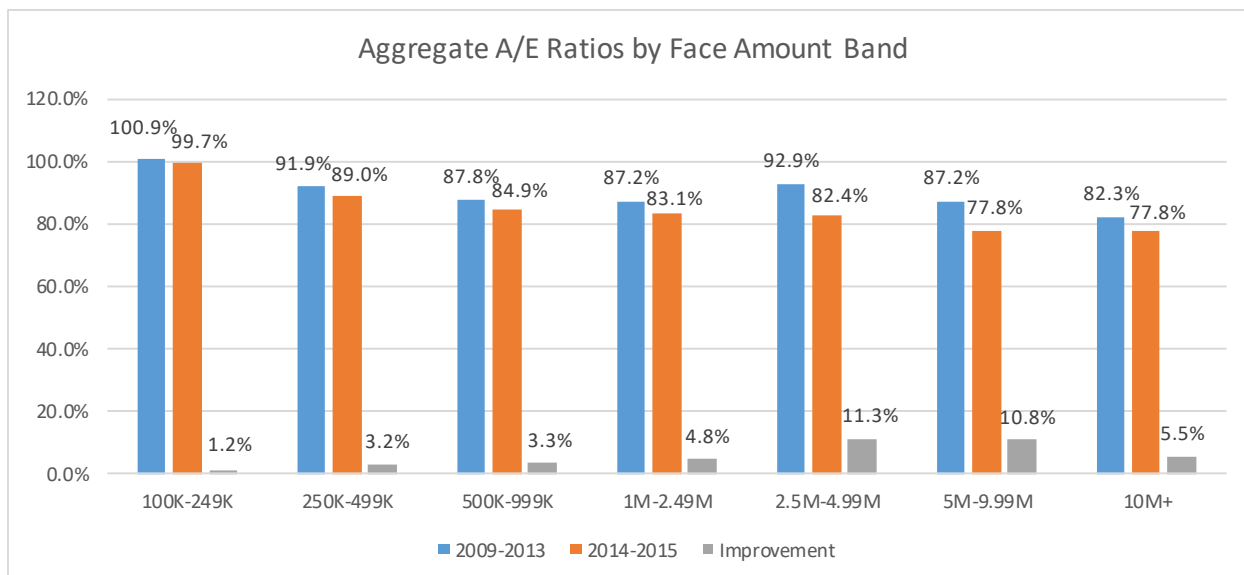
Aggregate A/E Ratios by Face Amount Band

Any comparison of mortality trends should be considered carefully and evaluated with attention to all underlying factors. Results observed may reflect impacts of variables not included in the current analysis, and frequently a deeper dive is necessary for understanding. Multivariate predictive modeling techniques are well suited to help the actuary understand results.

4.2 Preferred Class Analysis

A preliminary analysis of the preferred experience was performed by the SOA in 2015 and 2016. The original report, its update (Part 2), and PowerPoint presentation can be found at https://www.soa.org/research/topics/indiv-mort-exp-study-list/.

Appendices I-L summarize different aspects of the preferred experience based on the final 2009-2015 industry data. The appendices show actual experience using the 2015 VBT as the expected basis.

As in prior studies, companies included two pieces of information for each policy underwritten under a preferred risk structure:

1. The total number of preferred classes in their preferred class structure, and

2. The preferred class rank

The preferred class rank of the policy would be "1" if it qualified for the most restrictive preferred class, "2" for the next most restrictive, and so on up to the total number of classes in their preferred structure. The highest rank would be coded for policies that were classified as standard/residual.

Appendices I-L include data for issue years 1990+, issue ages 18+, and face amounts $100K+. For 2009-2015 observation years, there are $55.1 trillion of exposure and over 198,000 claims. The underlying data also includes policies with face amounts less than $100K and policies issued prior to 1990 calendar year. The majority of these policies have a two-class structure with significant skewness toward the residual class.

Mortality experience from the Post-Level Term period was excluded due to highly anti-selective shock lapse activity. However, the user should be able to analyze mortality deterioration by comparing post-level term mortality with relevant level term or perm results from the provided pivot tables. The ILEC believes that Post-Level Term mortality results will vary greatly by company, as differences in premium pattern, distribution system, and administration practices all have significant impact on lapse and mortality experience.

Appendix J shows results by policy and amount, split by the following categories: gender, issue age, duration, face amount band, observation year, and risk class structure. Overall, the 2009-2015 actual-to-expected ratios (2015 VBT) are 94.0% by policy and 86.6% by amount.

Appendices J, K and L illustrate various interactions between different risk factors – nonsmoker/observation year/risk class structure/class rank (appendix J), nonsmoker/face amount band/risk class structure/class rank/duration (appendix K), and nonsmoker/issue age band/risk class structure/class rank/duration (appendix L).

There are significant mortality differences between risk classes within each preferred class structure. Table PF1 shows all companies experience by smoking status, risk class rank, and various duration groups. There is a notable increase in durations 16-20 for the Risk Class 3(structure)/3(rank), from 87.8% to 105.2%, when compared against previous results. This could be due the limited number of claims of this cell (previously 222 for 2009-2013, currently 1,051 for 2014-2015). The smoker Risk Class 2/2 also had a notable increase in A/E for durations 16-20 from 108.8% to 118.2% (previously 422 claims for 2009-2013, currently 969 for 2014-2015).

Table PF1 - 2009-2015 Experience by Risk Class Structure and Rank, All Companies								
Male & Female, Issue Years 1990+, Issue Ages 18+, Face Amount $100K+								
Expected Basis: 2015 VBT								
Smoker Status	Risk Class		A/E (by Amount)					
	Structure		Duration					
		Rank	1-5	6-10	11-15	16-20	21-25	1-25
NonSmoker	2	1	66.3%	81.2%	80.2%	86.4%	88.4%	81.7%
		2	119.0%	109.3%	115.1%	127.2%	119.6%	116.4%
		Total	88.1%	95.1%	96.0%	101.9%	99.9%	96.8%
	3	1	65.4%	66.6%	66.5%	63.5%		66.0%
		2	75.2%	75.5%	76.7%	79.0%		75.9%
		3	107.5%	100.7%	100.0%	105.2%		101.8%
		Total	86.6%	85.1%	80.8%	76.9%		83.9%
	4	1	68.9%	66.3%	64.6%	59.7%		66.6%
		2	82.9%	78.1%	80.8%	67.7%		80.0%
		3	92.0%	87.4%	101.2%	110.0%		91.8%
		4	116.3%	114.1%	110.2%	113.8%		114.3%
		Total	84.4%	79.2%	78.4%	71.7%		80.6%
Smoker	2	1	77.3%	72.2%	78.5%	103.3%	85.8%	78.3%
		2	95.7%	90.0%	109.4%	118.2%	122.2%	99.3%
		Total	84.8%	79.7%	90.8%	109.0%	101.3%	87.0%

Table PF2 provides the relative experience for preferred plans by risk class structure - how much class specific mortality is better or worse compared to the overall class structure experience. For example, the 75.3% shown for the nonsmoker best class in the two-class structure at durations 1-5 is the ratio of 66.3% (actual A/E ratio for the best class) to 88.1% (overall two-class structure A/E ratio at durations 1-5).

Table PF2 - 2009-2015 Experience by Risk Class Structure and Rank, All Companies								
Male & Female, Issue Years 1990+, Issue Ages 18+, Face Amount $100K+								
Expected Basis: 2015 VBT								
Smoker Status	Risk Class		Ratio* of A/E to A/E for Risk Class Structure (by Amount)					
	Structure	Rank	Duration					
			1-5	6-10	11-15	16-20	21-25	1-25
NonSmoker	2	1	75.3%	85.4%	83.6%	84.8%	88.4%	84.3%
		2	135.0%	114.9%	119.9%	124.9%	119.7%	120.2%
		Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	3	1	75.5%	78.2%	82.3%	82.6%		78.7%
		2	86.8%	88.7%	94.9%	102.7%		90.5%
		3	124.2%	118.3%	123.8%	136.8%		121.4%
		Total	100.0%	100.0%	100.0%	100.0%		100.0%
	4	1	81.6%	83.7%	82.4%	83.2%		82.6%
		2	98.3%	98.5%	103.1%	94.3%		99.2%
		3	109.0%	110.3%	129.2%	153.3%		113.9%
		4	137.8%	144.0%	140.6%	158.6%		141.8%
		Total	100.0%	100.0%	100.0%	100.0%		100.0%
Smoker	2	1	91.1%	90.6%	86.4%	94.7%	84.7%	90.1%
		2	112.8%	113.0%	120.4%	108.4%	120.6%	114.2%
		Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Ratio of the A/E for the risk class rank to the corresponding overall A/E of the risk class structure.

The change in relative mortality factors above provides possible indications of how preferred underwriting wears off, depending on the applicable cohort. The stability of class 1 and relatively small movement in class 2 factors of the two-class structure illustrates the selection effect might persist beyond duration 25. Nonsmoker 3 & 4 class structure results are more volatile, and their credibility is limited for durations 21+. Appendix L provides more detailed results split into three issue age groups: 18-39, 40-59, and 60+.

4.3 Juvenile Business

The Juvenile issue age analysis focuses on policies issued to people age 17 and younger for the new study years 2009-2015. For this analysis, we have excluded experience for:

- Issue ages 18 and above
- Term Business past its level period (Post-Level Term)

Overall, the 2015 VBT A/E ratio by amount came in at 108.7%, with little variation by issue age group, implying a generally good fit of the table. By count, the A/E was lower at 101.8% and had a wider range of A/E ratios, with issue age 0 at 117.4% and the issue age 1-4 group at 87.1%. Except for issue age 0, all

issue age groups had a higher A/E by amount than by count. See Appendix JA for the detailed results on the 2015 VBT expected basis.

Broken down by gender, the A/E ratio by amount was higher for males, at 110.9%, than it was for females, at 101.9%. The relationship by count was reversed with the A/E for males at 101.3% and the A/E for females at 103.5%.

When looking at claims by duration, roughly 93% of the claims occurred in durations 26+. By count, all duration groups have A/E ratios over 100%. By amount, the first three durations and duration group 16-20 are the only duration groups under 100%. Focusing on durations 26+, the attained age pattern generally shows A/E ratios over 100%, both by count and by amount, for attained ages under 70. For attained ages over 70, both the by count and by amount are generally under 100%, except for attained ages at and over 95 where the A/E ratio is 110.0%. There are separate breakdowns in Appendix JA for the select period experience and the ultimate experience.

By face amount, about 49% of the exposure by amount was at or above $100,000, but only 3,051 of the 268,171 claims (or about 1%) was at or above $100,000. Experience by amount for face amounts over $100,000 was better, with A/E ratios generally under 100%.

By observation year, the results by count showed an increasing pattern, with observation year 2009 having the lowest A/E, at 92.8%, and observation year 2015 having the highest A/E, at 106.0% (Table J1). Table J1 shows a distinctly higher count A/E for durations 1-25 (113.2% to 128.5%) compared with durations 26+ at 100.6%. By observation year, durations 26+ follow a generally increasing count-based A/E by observation year (90.4% in 2009 to 104.9% in 2015). A more detailed analysis of younger issue age mortality was published in September 2016 in the report "Younger Issue Age Mortality Analysis." This report can be found on the SOA website at https://www.soa.org/experience-studies/2016/research-younger-age-mortality/.

Table J1 - A/E Ratios by Observation Year by Count Issue Ages 0-17, All Durations Expected Basis: 2015 VBT							
	Duration Group						
Observation Year	1-5	6-10	11-15	16-20	21-25	26+	All durations
2009	148.4%	116.3%	106.1%	113.1%	121.9%	90.4%	92.8%
2010	119.0%	121.3%	121.7%	113.8%	124.0%	93.5%	95.1%
2011	105.1%	115.6%	129.2%	128.7%	135.5%	99.5%	101.2%
2012	95.8%	114.3%	124.0%	106.9%	121.1%	102.8%	103.4%
2013	103.1%	115.1%	118.4%	110.2%	129.5%	102.7%	103.7%
2014	110.8%	111.8%	126.1%	112.5%	128.9%	104.1%	105.1%
2015	114.4%	109.6%	127.5%	121.1%	135.2%	104.9%	106.0%
2009-2015	113.2%	114.8%	122.4%	115.6%	128.5%	100.6%	101.8%

The amount results by observation year and duration are shown in Table J2. The results by observation year across all durations were relatively stable from 2010 to 2013 (105.1% to 107.8%), but there was a

large increase in 2014 and 2015 to 114.7% and 109.2%, respectively. The pattern of increasing A/E by observation year for durations 26+ we observed in the count results is not present by amount.

Table J2 - A/E Ratios by Observation Year by Amount Issue Ages 0-17, All Durations Expected Basis: 2015 VBT							
Observation Year	**Duration Group**						
	1-5	**6-10**	**11-15**	**16-20**	**21-25**	**26+**	**All durations**
2009	123.3%	116.6%	100.0%	95.7%	110.5%	114.0%	110.8%
2010	171.8%	110.6%	104.1%	96.9%	105.0%	103.9%	106.7%
2011	73.5%	112.7%	105.8%	106.8%	117.3%	108.5%	107.8%
2012	82.0%	77.0%	104.5%	82.8%	111.2%	111.2%	105.7%
2013	84.5%	96.4%	105.7%	94.5%	119.9%	105.7%	105.1%
2014	96.6%	298.9%	105.6%	100.4%	124.2%	104.8%	114.7%
2015	92.6%	76.9%	107.5%	101.9%	130.1%	110.1%	109.2%
2009-2015	99.6%	130.3%	105.1%	97.3%	117.9%	108.0%	108.7%

4.4 Older Age Analysis

Older age analysis is often done with regard to the older age markets. For the industry as a whole, this segment of the population was marketed to much more recently, with a significant increase beginning in the early 2000's. For that purpose, it makes sense to focus on policies issued to people age 65 and over. In addition, with the aging of the baby boomer segment, many companies now have a great deal of exposure at older attained ages which was issued many years ago. This indicates an analysis by attained age. Accordingly, we present analysis on each basis separately.

Issue Age 65 and over:

For this analysis, we have excluded:

- Issue Ages below 65
- Term Business past its level premium period (Post-Level Term)

Overall, for the study years 2009-2015, the 2015 VBT A/E was 92.1% by amount and 110.1% by count. At strictly a univariate level, many of the behavior patterns relative to the 2015VBT are reasonably similar between the older issue ages and the entire study. Areas such as a decreasing trend by observation year, decreases at higher face bands, preferred vs residual differentials, and count to amount differences have reasonably similar patterns and for similar reasons. Please see Table OA1 and Appendix A for details. For instance, the behavior of lower mortality by amount than by count is a quite common pattern throughout the study, including at the older issue ages. Distributions are often skewed to higher face amounts when measured by amount rather than count, especially at the earlier durations. These subgroups often have greater levels of underwriting and possibly greater access to health care needs, thereby lowering the mortality for both core and older issue ages.

Results were further examined across all available years by attained age. A common trend of generally decreasing, but variable, mortality was observed. Multiple factors are included in the changes of mortality over time, including mortality improvement, change in mortality deterioration, changes in the average age within the age group, change in the average duration, changes in underwriting, changes in issuing company, etc.

Table OA1 - A/E Ratios by Observation Year by Amount Issue Ages 65+, All Durations Expected Basis: 2015 VBT					
	Attained Age Groups				
Observation Year	**65-69**	**70-79**	**80-89**	**90+**	**65+**
2009	81.1%	88.1%	103.0%	105.8%	99.3%
2010	84.3%	118.4%	98.6%	91.5%	101.4%
2011	78.7%	100.8%	96.5%	92.0%	96.0%
2012	107.8%	96.0%	99.6%	92.8%	97.4%
2013	76.1%	88.3%	91.2%	88.7%	89.7%
2014	76.0%	81.3%	87.2%	84.3%	85.2%
2015	71.9%	87.9%	89.3%	92.3%	89.8%
2009-2015	82.0%	93.0%	93.1%	90.2%	92.1%

Table OA2 shows the A/E ratios by Issue Age and Duration for Issue Years 1990+ and Face Amounts $100K+. There is a general trend of increasing A/E ratio with duration, albeit different cohorts by duration as well. There is also a trend of decreasing A/E ratio with increasing issue age, where the high issue age experience is concentrated more at earlier durations.

Table OA2 - A/E Ratios by Observation Year by Amount Issue Ages 65+, All Durations, Issue Years 1990+, Face Amount $100K+ Expected Basis: 2015 VBT						
	Duration					
Issue Ages Groups	**1-5**	**6-10**	**11-15**	**16-20**	**21-25**	**1-25**
65-69	85.5%	89.3%	103.9%	102.1%	111.7%	97.4%
70-74	91.0%	86.3%	92.5%	103.1%	103.5%	92.6%
75-79	77.9%	86.0%	84.2%	110.7%	92.8%	86.5%
80-84	91.3%	87.9%	88.8%	111.8%		88.9%
85+	72.5%	72.9%	89.9%			75.9%
Total (65+)	85.2%	85.9%	91.2%	104.2%	107.3%	90.1%

It should be noted, when evaluating the mortality at the older issue ages vs the core ages, that there are at least a few areas to consider further; these are areas where the distribution and underwriting are quite different.

1) Older issue ages can often have a higher policy size.
2) Older issue ages can often have shorter duration experience periods.
3) The value of select underwriting wears off sooner at the older issue ages.
4) While difficult to quantify, in some cases underwriting at older issue ages has added cognitive and physical function tests beginning in the mid-late 2000's.

Attained Ages 65 and over:

For this analysis, we have chosen to exclude experience for:

- Attained Ages b-low 65
- Issue Ages below 18
- Term Business past its level premium period (Post-Level Term)

Overall, for this collection of policies, the 2015 VBT A/E ratio by amount is 96.4%, with some variation by attained age group. By count, the A/E ratio was notably higher, at 107.5%, and we saw a wide range of A/E ratios with ages 65-69 at 117.3%, and ages 90+ at 97.6%. See Appendix OA for additional results on the 2015 VBT basis, and comparisons by the 2015 VBT, 2008 VBT, 2001 VBT, and 75-80E expected bases.

As with the experience by older issue age, results for attained ages 65 and over were further examined across all available years by attained age. A common trend of generally decreasing, but variable, mortality was similarly observed for increasing observation years in table OA3. Multiple factors are included in the changes of mortality over time, including mortality improvement, change in mortality deterioration, changes in the average age within the age group, change in the average duration, changes in underwriting, changes in issuing company, etc...

Table OA3 - A/E Ratios by Observation Year by Amount Attained Ages 65+, All Durations Expected Basis: 2015 VBT					
	Attained Age Groups				
Observation Year	**65-69**	**70-79**	**80-89**	**90+**	**65+**
2009	92.1%	97.3%	101.0%	103.9%	98.5%
2010	99.7%	107.0%	99.3%	95.5%	101.3%
2011	99.5%	103.5%	99.4%	93.9%	99.9%
2012	98.0%	98.1%	100.2%	94.7%	98.4%
2013	97.0%	97.8%	96.0%	91.4%	95.9%
2014	90.1%	93.1%	94.1%	88.5%	92.2%
2015	85.9%	97.0%	96.6%	93.3%	94.5%
2009-2015	93.8%	98.5%	97.4%	92.7%	96.4%

Table OA4 has additional filters, excluding face amounts under $100k and issue years prior to 1990, that were applied to the data. Generally, the A/E ratios are lower in this table compared with OA4 (overall

approximately 6% lower), and we still see the trend of generally decreasing mortality with increasing observation year.

Table OA4 - A/E Ratios by Observation Year by Amount Attained Ages 65+, All Durations, Issue Years 1990+, Face Amount $100K+ Expected Basis: 2015 VBT					
	Attained Age Groups				
Observation Year	**65-69**	**70-79**	**80-89**	**90+**	**65+**
2009	82.6%	89.0%	100.2%	103.8%	92.1%
2010	92.9%	107.2%	96.5%	85.0%	98.2%
2011	91.9%	98.4%	95.2%	85.0%	94.2%
2012	90.9%	92.3%	99.2%	92.6%	94.9%
2013	89.1%	89.5%	90.1%	85.7%	89.1%
2014	82.0%	83.7%	88.2%	80.8%	84.7%
2015	77.1%	90.2%	89.7%	91.7%	88.0%
2009-2015	85.6%	91.6%	92.5%	87.4%	90.2%

The data for Table OA5 has similar filters as data in table OA4, but now includes only durations 16+, so focuses on the more contemporary old age, later duration experience. The trend of generally decreasing mortality with increasing observation year is no longer seen in this view.

Table OA5 - A/E Ratios by Observation Year by Amount Attained Ages 65+, Duration 16+, Issue Years 1990+, Face Amount $100K+ Expected Basis: 2015 VBT					
	Attained Age Groups				
Observation Year	**65-69**	**70-79**	**80-89**	**90+**	**65+**
2009	89.7%	96.3%	98.0%	136.3%	100.3%
2010	99.2%	90.3%	87.3%	102.9%	92.0%
2011	100.3%	102.3%	104.1%	108.3%	103.6%
2012	93.8%	89.4%	104.1%	100.3%	97.7%
2013	113.0%	97.1%	94.6%	108.3%	100.4%
2014	94.6%	94.0%	107.1%	102.4%	100.4%
2015	84.3%	96.9%	109.1%	108.5%	100.9%
2009-2015	95.2%	95.4%	102.9%	106.3%	100.0%

4.5 Level Term Products

With the introduction of XXX reserving requirements in the year 2000, the design of term policies changed significantly. Accordingly, differences in mortality experience are expected to emerge by issue

year era. Actuaries should be mindful of premium patterns underlying mortality (and persistency) experience, and the resulting anti-selective behavior in the post-level term (PLT) period.

Appendix H provides experience for 10, 15 and 20-year level premium term products during the level premium period by duration and issue year era, for face amounts $100K+ and issue ages 18 and older. The underlying data source files contain two fields which describe the level term period length, Guaranteed Level Term Period and Anticipated Level Term Period. Guaranteed Level Term period refers to the level period design of the guaranteed premiums. Anticipated Level Term period refers to the level period design of the current (non-guaranteed) premiums. These can be different where some product designs have level premiums guaranteed for a shorter period of time than the current premiums. For years 2009-2011, only Guaranteed Level Term Period data was collected. Appendix H uses Anticipated Level Term Period in years that it is available (2012-2015), otherwise Guaranteed Level Term period is used.

The table shown below is from Appendix H and shows the level term period amount A/E ratios for face amounts $100K+ and issue ages 18 and older. We note a general decreasing trend in amount A/E by duration with the 2010-2015 issue year period having lower mortality relative to the 2000-2009 period.

Appendix H - Experience for term 10, 15 and 20 plans by anticipated level term period and issue year ranges
SOA industry individual life experience in observation periods 2009 - 2015
Term products by level term period and issue year ranges, face amounts ≥ $100K, Issue Age 18+
Expected Basis: 2015 VBT - Primary Table

A/E Ratio by Amount							
Duration							
1	2	3	4-5	6-10	11-15	16-20	All
		82.4%	86.3%	84.7%			84.9%
84.5%	97.4%	80.9%	84.6%	60.4%			85.1%
					86.7%		86.7%
		60.8%	81.0%	84.2%	80.1%		81.9%
92.7%	79.4%	83.5%	82.0%	88.7%			83.7%
					82.0%	80.1%	80.9%
		71.5%	95.4%	79.3%	77.8%	64.1%	79.5%
75.0%	85.0%	84.8%	77.7%	85.4%			81.0%
					83.4%	80.1%	81.8%
		73.9%	89.7%	81.9%	78.4%	64.1%	81.2%
81.4%	88.9%	83.1%	81.0%	76.5%			83.0%
81.4%	88.9%	81.9%	85.5%	81.8%	79.5%	79.0%	81.6%

Section 5: Pivot Tables, Text Files and Use

Several Excel files are provided in conjunction with this report, giving the user the ability to examine the experience in multiple characteristic dimensions. Specifically, four Excel files accompany this report:

1. 2009-15 Aggregate 18+ 2018-06-01.xlsx
2. 2009-15 Preferred 18+ 2018-06-01.xlsx
3. 2009-15 Term 18+ 2018-08-03.xlsx
4. 2009-15 Juvenile 2018-06-01.xlsx – unknown smoker mortality rates were used for all durations

We have also provided a text delimited file that allows the actuary to analyze the data with more granularity than the pivot tables. Certain variables, such as attained age, are shown in more detail and not grouped into quinquennial groups as is the case in the pivot tables. This delimited file can be read into R or other software for more detailed analysis.

These files are located on the SOA website under Research, Experience Studies, Individual Life (www.soa.org/research/topics/indiv-mort-exp-study-list/).

Each Excel file has the following three tabs:

- Pivot Table – generic pivot table with all applicable filters that summarizes underlying experience at a high level
- Filters – description of the fields included in the underlying data
- Assumptions – key assumptions behind exposure calculations and a list of the expected bases

The pivot tables accompanying this report allow the user to analyze experience for the following expected bases:

- The SOA's 1975-80 15-year select and ultimate tables (maximum issue age of 70) with mortality rate extensions to issue age 95. The 1975-80 table was extended in two stages. The extension for issue ages 71 to 87 was published with the 2002-04 study, and the further extension for ages 88 to 99 (and attained ages through 120) was published with the 2005-07 study.
- 2001 VBT
- 2008 VBT, Primary table rates
- 2008 VBT, Limited Underwriting table rates
- 2015 VBT, Primary table rates

The mortality tables have different maximum issue ages. When an actual issue age was older than an expected table's maximum issue age, the expected mortality rates for that older age were determined by using the attained age rates for the maximum issue age actually included in that table.

The pivot tables mentioned above include new experience from 2014-2015 and previously published ILEC data. The observation years refer to the calendar year.

Common Company indicator: set equal to 1 if a company contributed at least 5 out of the 7 years in 2009-2015. This indicator may be used to facilitate a trend analysis with a more uniform set of company contributors.

The underlying data can be separated by insurance plan. However, this experience is very limited for some plans at face amounts greater than $100K during the 2009-2015 period.

In the Appendices to this report, which provide statistics on years 2009-2015, the following standard filters and rules were applied:

- SOA Post-Level Term Indicator: PLT was excluded
- Underlying Expected Table: 2015 VBT
- Face Amount Bands: All

Additional filters were used for specific sections outlined above. For example, preferred experience analysis was limited to issue years 1990+ and face amounts greater than or equal to $100,000.

Section 6: Future Efforts

The primary goals of the ILEC are to provide both key industry experience data and high-level insights of it. As such, a centerpiece is this ILEC report and data. With the experience submission requirements of VM-50 on an annual basis, the goal of this committee is to provide an updated report and data, preferably on an annual basis. The committee recognizes the early difficulties of the new mandatory data submissions for companies new to this process, and we look forward to working closely with the selected statistical agent in continually improving the quality of experience data.

The ILEC has been an active presenter at SOA meetings, and we will continue to present our findings in those settings that facilitate discussion and questions.

Specific future efforts are focused around including persistency to the ILEC data, as well as providing additional insights into: Cause of Death analysis and predictive analytic findings when applied to the ILEC data. Other projects for consideration, subject to resource constraints and data availability, are term conversion mortality, mortality improvement, and waiver of premium experience.

The ILEC works closely with the SOA to determine where ILEC resources would be put to best use, and partnering with other committees and SOA sections as makes sense.

We welcome feedback and any suggestions for improvement in future work products. Any such suggestions may be made by contacting Tony Phipps (Chair), Brian Holland (Vice-chair), Ed Hui (Vice-chair), or Mervyn Kopinsky (SOA).

Section 7: Reliance and Limitations

In preparing this report and the accompanying data files, the ILEC has relied on the integrity of the data as submitted by companies through the mandatory data submissions required by NYDFS and KID. Those data submissions were facilitated and coordinated by the selected Statistical Agent, MIB.

The Statistical Agent on behalf of NYDFS and KID worked with each company independently to validate and verify the accuracy of their data submissions. Many companies submitting data in this process were new to the process of such data submissions. Ultimately, responsibility for data accuracy is placed on the individual company submitters, and the ILEC has relied on that process for the accuracy of its data.

In each situation that involves questionable results or flaws in the data, the ILEC must make the determination of whether the results be published with appropriate disclaimers, or thrown out entirely. In the analysis of the underlying data, some apparent flaws in the data were identified. Except where such flaws produced meaningless results, we have generally chosen to keep the data in this report and identify the anomalies that were observed. In all cases, the individual user of this report and data should apply their own judgment as to the validity of the results.

Some situations encountered, which produced counter-intuitive results, but were kept in the report and data files, are:

1) Paid-Up Additions records are part of the mandatory data submissions. These records were submitted as unique records distinct from the associated base policy, but are not easily separately identified. It is expected that the experience at the lowest face amount bands is impacted by the presence of these records.

2) For some juvenile issue ages (1-4), experience at the very high attained ages (90+) showed unreasonable results and were inconsistent with other issue age groups.

3) Within face amount bands, the difference between A/E by count versus A/E by amount was larger than expected. Past studies had shown when isolating a particular face amount band, the difference is minimal, and this is what would have been expected.

4) Data records with face amounts at or above $100,000 and early policy durations contained an Unknown smoker status. The impact on overall results should be minimal, but the user should be aware of this in more refined analysis.

5) Preferred Risk Class structures were inconsistent in exposures by duration. This suggests lack of uniformity in how preferred class business is defined and classified.

6) Preferred Risk Class exposures are in the data for issue years prior to 1990. As noted in this report, we have chosen to exclude these exposures from any preferred class analysis.

The ILEC looks forward to partnering with the Statistical Agent in continuing to identify these data issues and improve the data validation process for these important industry studies.

About The Society of Actuaries

The Society of Actuaries (SOA), formed in 1949, is one of the largest actuarial professional organizations in the world dedicated to serving 24,000 actuarial members and the public in the United States, Canada and worldwide. In line with the SOA Vision Statement, actuaries act as business leaders who develop and use mathematical models to measure and manage risk in support of financial security for individuals, organizations and the public.

The SOA supports actuaries and advances knowledge through research and education. As part of its work, the SOA seeks to inform public policy development and public understanding through research. The SOA aspires to be a trusted source of objective, data-driven research and analysis with an actuarial perspective for its members, industry, policymakers and the public. This distinct perspective comes from the SOA as an association of actuaries, who have a rigorous formal education and direct experience as practitioners as they perform applied research. The SOA also welcomes the opportunity to partner with other organizations in our work where appropriate.

The SOA has a history of working with public policymakers and regulators in developing historical experience studies and projection techniques as well as individual reports on health care, retirement, and other topics. The SOA's research is intended to aid the work of policymakers and regulators and follow certain core principles:

Objectivity: The SOA's research informs and provides analysis that can be relied upon by other individuals or organizations involved in public policy discussions. The SOA does not take advocacy positions or lobby specific policy proposals.

Quality: The SOA aspires to the highest ethical and quality standards in all of its research and analysis. Our research process is overseen by experienced actuaries and non-actuaries from a range of industry sectors and organizations. A rigorous peer-review process ensures the quality and integrity of our work.

Relevance: The SOA provides timely research on public policy issues. Our research advances actuarial knowledge while providing critical insights on key policy issues, and thereby provides value to stakeholders and decision makers.

Quantification: The SOA leverages the diverse skill sets of actuaries to provide research and findings that are driven by the best available data and methods. Actuaries use detailed modeling to analyze financial risk and provide distinct insight and quantification. Further, actuarial standards require transparency and the disclosure of the assumptions and analytic approach underlying the work.

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