Mortality and Longevity

2019 Individual Life Insurance Mortality Experience Report

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2019 Individual Life Insurance Mortality Experience Report

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Society of Actuaries

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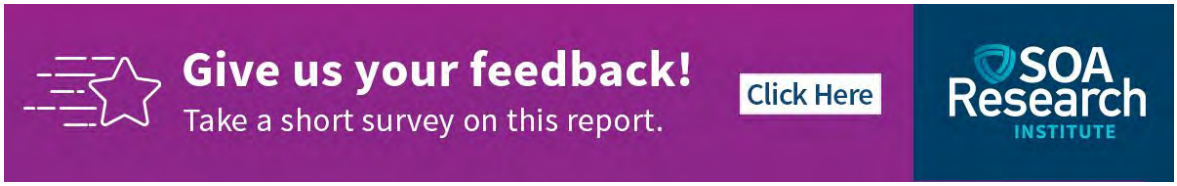


CONTENTS

2019 Individual Life Insurance Mortality Experience Report

Executive Summary

The 2019 Individual Life Experience Committee (ILEC) report presents actual versus expected mortality experience for the observation period 2012-2019, where the expected mortality is the 2015 Valuation Basic Table (2015 VBT) using the base Relative Risk table (RR 100). The A/E results are determined without the application of improvement factors.

Multiple factors contribute to fluctuations in mortality experience over time, including overall population mortality improvement/deterioration, changes in underwriting and policy size, changes in the average age and duration, and changes in issuing companies. This report will explore and update some of these items.

The first step in this process was an exhaustive data validation effort. Although the ILEC always reviews the data for consistency and integrity, this was particularly thorough as a result of changing the statistical agent from Medical Information Bureau (MIB) to the National Association of Insurance Commissioners (NAIC). Additional details of the data validation process are included in Section 2, Section 8, and the exhibits included with this report.

The analysis begins with a high-level review of A/E trends by age, sex, face, and smoker class. These trends are reviewed in more detail by product group, risk class and older age experience in separate sections of this report.

Finally, included with this report are additional resources that actuaries can use to reproduce the results in this report and perform additional analysis using their own tools. These resources and how to access them are provided in Section 7.

Section 1: Purpose of the Study

This study and report have the following primary purposes:

1. Evaluate recent mortality experience relative to the standard industry mortality table, at a high level.

2. Observe general trends in mortality experience by key policy characteristics. Where possible, provide insights into the industry dynamics contributing to the observed trends.

3. Provide the underlying data in various formats (Tableau dashboards and CSV delimited text) for further investigation by qualified actuaries.

Any comparison of mortality trends should be considered carefully and evaluated with attention to all underlying factors. The underlying experience is that of the contributing companies in aggregate and, thus, may or may not reflect the experience of any individual company. Also, the distribution of exposures has changed significantly over time, and observed results may reflect impacts of variables not included in the current analysis. Frequently, a deeper dive is necessary in order to understand the interactions between observed mortality experience and changes in distribution. Multivariate predictive modeling techniques are well suited to help actuaries understand these interactions and interpret results.

Actuaries using this report should make their own determination concerning the applicability of this information to their individual purpose and use.

Section 2: Data Validation

2.1 DESCRIPTION OF THE DATA

This section of the report describes the data compiled for the ILEC for use in developing this mortality study, the 2019 Individual Life Insurance Mortality Experience Report. The data from observation years 2012-2017 from the prior ILEC study have been appended to the 2018-2019 experience data to create a composite dataset for the study period, 2012-2019. The committee removed data from observation years 2009-2011 as they were more limited and less consistent with later years. Also, the observation year 2018 data is now complete and included. The lack of sufficient 2018 data necessitated omitting it from the previous report.

One notable change from earlier reports is that the NAIC now serves as the statistical agent for data collection, the role formerly held by the MIB. While data are broadly consistent between the two agents, this change has led to some differences in the company data included, among other things. The 2018-19 data contains 16 more companies than the 2016-17 data and 9% more overall exposure. About 12% of the 2018-19 exposure and 10% of the claims originate from companies not in the 2016-17 data.

As with the prior ILEC studies, this report examines mortality under standard individually underwritten life insurance and excludes joint, rated, converted, and guaranteed or simplified issue 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 include only direct written business in the U.S.; no assumed reinsurance business is included.

The calendar-year method used exposure formulas consistent with the Balducci assumption. This approach is commonly used in the industry for life insurance mortality studies, and the Balducci assumption is used for convenience in tabulating exposures. This may produce counter-intuitive results in some situations, but these situations tend to occur with limited exposures.

Except where noted otherwise, the expected mortality basis used in calculating Actual-to-Expected (A/E) ratios in this report are the 2015 Valuation Basic Table (2015 VBT), RR 100. Life insurance writers in the U.S. issue policies on an Age Last Birthday (ALB) basis and an Age Nearest Birthday (ANB) basis. The calculation of A/E ratios utilized the expected table version consistent with how the company indicated that its data was organized.

Similarly, the application of smoker-distinct versus composite ('unismoke') tables relied on the indication made by the submitting company. However, composite tables were used as the expected basis for all policies issued before 1981, regardless of smoking status indicated, as the ILEC believes smoking as a distinct rating factor was rare before that time. When smoker-distinct rates were first introduced, the smoking status field was added to databases. Many companies filled in this field for their entire portfolio of previously issued composite smoking policies as smokers, while others defaulted all that business to non-smokers.

A/E ratios in this report are reported on an amount basis unless noted otherwise. Users should be aware of differences in results on an amount basis versus a count basis and the volatility associated with each measure. Unless otherwise noted, references to claim counts are on a by-policy basis.

Below is a breakdown for the 2012-2019 study period for the total (unfiltered) dataset by product type. ULSG and VLSG are Universal Life and Variable Life products with secondary guarantees, respectively. Permanent and universal life insurance were the most significant products sold in the 1980s and early 1990s, while term insurance has significantly dominated sales during the modern era (2000+). Note that juveniles and post-level-term are shown separately from the base product.

Table 2.1
PRODUCT BREAKDOWN OF THE TOTAL DATASET DURING THE STUDY PERIOD

Product	# Claims	$ Claims	# Exposure	$ Exposure
Post-Level-Term	1.4%	2.5%	1.8%	1.4%
Issue Age under 18	8.0%	1.3%	19.5%	3.6%
Permanent	68.0%	25.8%	25.8%	8.3%
Term	6.9%	27.9%	35.3%	69.2%
Universal Life (UL)	10.1%	19.7%	8.7%	5.3%
ULSG	2.3%	16.3%	4.3%	7.1%
Variable Life (VL)	1.6%	4.1%	2.6%	2.6%
VLSG	0.8%	2.2%	1.5%	2.2%
Other	0.9%	0.3%	0.4%	0.2%
Total	100.0%	100.0%	100.0%	100.0%

The table below summarizes data by observation year for the total dataset and includes all products and issue ages, including post-level-term and juvenile policies.

Table 2.2
COMPARISON OF THE TOTAL DATASET DURING THE OBSERVATION YEAR

Observation Year	# Companies	# Claims	$ Claims (Billions)	# Exposure	$ Exposure (Billions)
2012	83	537,286	$27.8	51,036,427	$10,799
2013	85	554,199	$30.0	57,373,029	$11,898
2014	93	560,393	$32.8	57,552,165	$12,450
2015	91	565,853	$35.5	57,907,852	$13,078
2016	91	552,127	$37.2	57,921,762	$13,589
2017	91	558,579	$39.0	57,346,148	$13,884
2018	107	624,284	$43.3	63,036,862	$14,751
2019	107	599,288	$44.4	62,339,007	$15,125
Total	-	4,552,009	$290.0	464,513,072	$105,573

Unless otherwise specified, the results in this report are based on the 'Core' dataset with filters listed below. In certain sections of the report, the data may be further filtered to create a more consistent block of business referred to as the 'Modern' dataset.

Total Filters
Filters: None

Core Filters
Issue Age: >= 18
Post-Level Ind: != PLT

Modern Filters
Filters: Core Filters
Issue Year: >=2000
Face Amount: >= 100k
Product: != Other

The data volumes for each dataset are summarized below for reference.

Table 2.3
COMPARISON OF THE TOTAL VS CORE VS MODERN DATASETS

Dataset	# Claims	$ Claims (Billions)	# Exposure	$ Exposure (Billions)
Total	**4,552,009**	**$290.0**	**464,513,072**	**$105,573**
Core	4,125,283	$279.0	365,681,412	$100,262
Modern	290,123	$141.8	177,118,100	$85,603

2.2 DATA INTEGRITY

The NAIC, on behalf of the Missouri Department of Insurance, 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. Further information about this process and impact on the results can be found in Section 8, Reliances and Limitations.

The ILEC carefully evaluated the data quality of the 2018-2019 experience data received from the NAIC. Since this was the first time that we received data from the NAIC as the new statistical agent, we wanted to know whether and to what extent the newer data was consistent with or diverged from the prior data. Three different approaches to testing the data were performed: a traditional review of the ILEC data consistency, an approach using predictive analytics, and a comparison of insured population mortality improvement with general population experience.

Overall, there did not appear to be unexpected differences between the MIB and NAIC datasets from an exposure perspective by count or amount. While there were some shifts in marginal distributions of exposures, the interdependencies of the exposures either changed very little or changed in ways that were expected.

2.2.1 ILEC DATA CONSISTENCY

This subcommittee explored the consistency of the data for the years 2018-19 with the data from 2016-17 (e.g., the first two years of the NAIC data with last two years of experience from MIB) by comparing the results shown in the appendices available for download with this report. The review was performed using two filters: the data for all companies in 2016-17 compared to the data for all companies in 2018-19 and the common companies for those four years.

An exact set of common companies was not available because we could not obtain a subset of the MIB data for 2016-17 with only the companies that also submitted data to the NAIC in 2018-19. However, the NAIC was able to add a flag to the data in 2018-19 to indicate if it was from a company that had also submitted data to MIB in 2016-17. The volume of experience for the MIB companies in the NAIC data from 2018-19 was within 2% of the volume of data for all MIB companies in 2016-17. We concluded that the NAIC data from companies that had also submitted data to MIB in 2016-17 was a reasonable proxy for a common company comparison with the MIB data from 2016-17.

Each volunteer on the committee reviewed a selection of the appendices, comparing results for all companies from MIB 2016-17 with all companies from the NAIC 2018-19, and separately with the common companies' proxy. The primary metric of comparison was the A/E ratio for each cell in the appendix, and any substantial differences were noted. Claim counts and amounts were also considered where a material difference in A/E ratio was observed. Any substantive issues determined in the data were addressed; any known remaining issues observed in the data have been noted and included in Section 8.

As a final check, the committee volunteers also compared the NAIC data for 2018-19 with the MIB data from 2012-17 by year. We concluded that the NAIC 2018-19 data was consistent with the previous MIB data, and that any observed differences were minor or explainable based on known changes in methodology.

2.2.2 PREDICTIVE ANALYTICS

The committee explored applying predictive analytics and machine learning techniques to search for and describe differences between the data received from the NAIC and MIB. Exploration was carried out in collaboration with data scientists at the NAIC. Our goal was to assess the differences for two aspects of the data: the distribution of exposures and the mortality outcomes.

For exposures, we applied vine copula models. They are intended to flexibly model and describe probability distributions while retaining explainability. Methods from other areas of statistics, artificial intelligence (AI), and machine learning (ML) were rejected for want of transparency, model richness, or feasibility (as in the case of many AI/ML models). Overall, some differences were found in the distribution when moving from the MIB data source to the NAIC data source. However, the majority of the differences are explained by the intensive data quality improvement efforts undertaken by the NAIC.

For mortality outcomes, we used gradient-boosted decision trees. The source of the data, MIB versus NAIC, was set as a predictor variable. The outputs of interest were single-variable feature importance and feature importance for two-way interactions. In general, the source of the data had predictive power similar to random noise, and interactions with other variables showed that there were minor subsets of the data where mortality clearly differed by source. Excluding these small, distinguished subsets, mortality patterns appeared similar across data sources.

Details of the methodologies, findings, and technical information are contained in Exhibit 1 included with this report. Readers are urged to review the Executive Summary and Key Findings to determine whether any differences noted therein are relevant to their analyses.

2.2.3 POPULATION MI CONSISTENCY

To gauge the reasonableness of the transition to the new 2018-2019 NAIC data, we used population mortality improvement (MI) as a proxy. The idea was that the ILEC change in mortality should be similar in magnitude and direction to the population MI. While there are many reasons why the population MI is not an exact predictor of ILEC mortality movement, it was considered a valid sense check. Using actuarial judgement, the group decided that any deviation beyond approximately 3% for each of the calendar years 2018 and 2019 would warrant further investigation.

Given the substantial basis risk of using population MI as a proxy for this specific movement, the team deemed it appropriate to use the movement as a general sense check, but not to specifically hypothesis test whether to accept or reject the new results. Additionally, due to the imperfect nature of the proxy, the comparison was kept at the aggregate level. Details of the methodologies, findings, and technical information are contained in Exhibit 2 included with this report.

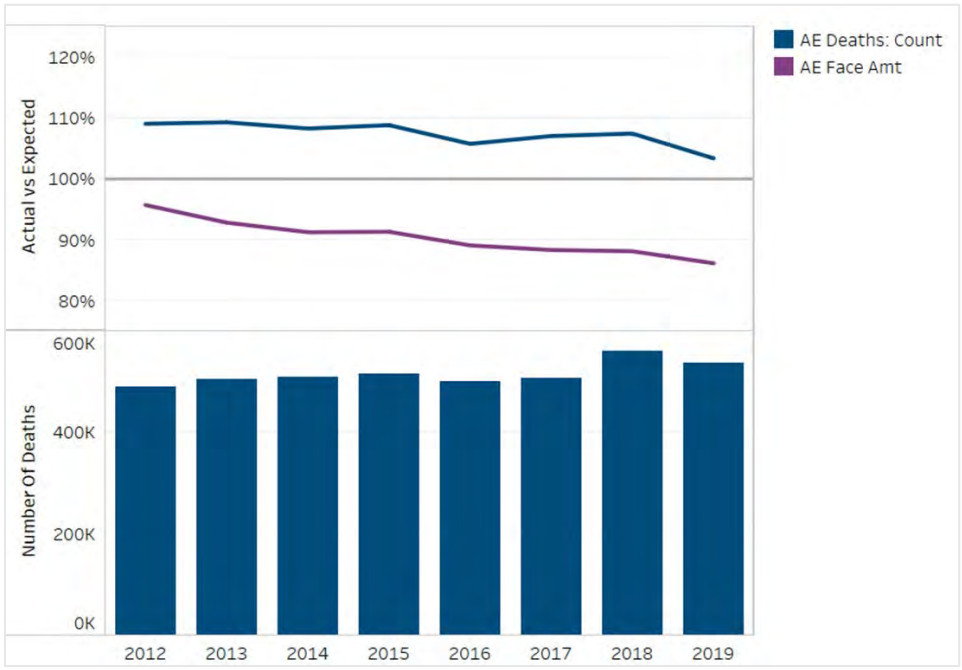
Section 3: High Level Trends

This section of the report includes analysis of mortality trends in aggregate and by segment(s) of potential further interest. The selected segments represent key policy characteristics - gender, smoking status, face amount bands, and issue ages. The main purpose of the analysis is to answer the following questions:

1. What is the prevalent trend over the study period?
2. How does this trend vary for the key segments?
3. Are there any new emerging trends or anomalies that need further investigation?

This section establishes a foundation for the more in-depth analysis in later sections. The first figure focuses on mortality experience for the entire population over the study period and compares results on two different bases – policy count basis and face amount basis.

Figure 3.1
A/E BY OBSERVATION YEAR (CORE DATA)



Observations:

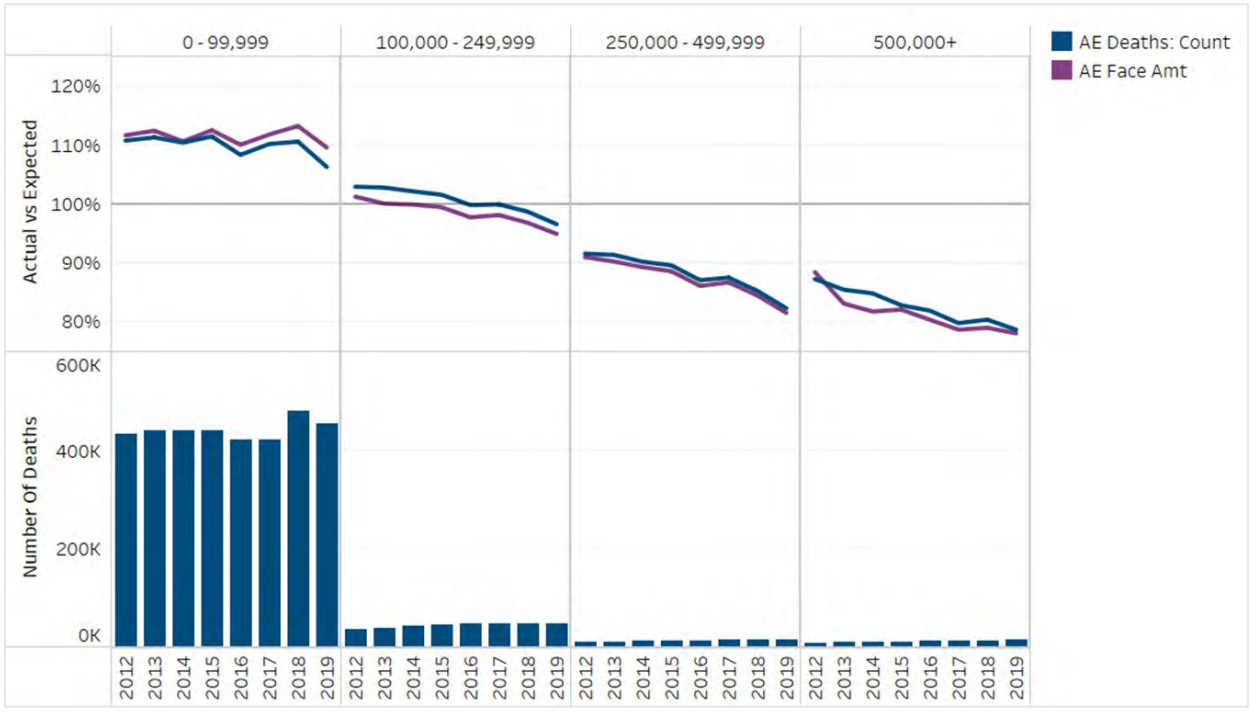
- The number of deaths in the lower portion of the graph illustrates the amount of data available for each calendar year. The amount of data is represented by a standard metric of a number of deaths, which is often used as a measure of credibility. The number of deaths increased by 11% in 2018, when the data source switched from MIB to NAIC submission. While the total number of companies in the NAIC submission is higher (107 versus 91) as indicated in Table 2, the number of claims didn't increase by the same percentage and, in 2019, returned to approximately the same level as in 2017. This is explained by the fact that some of the larger companies in the MIB submission were replaced by a larger number of smaller companies in the NAIC submission.

- The two mortality curves in the upper portion of the graph are calculated on a different basis – Policy Count and Face Amount. The gap between the two curves is explained by the mortality gradient by socioeconomic class, for which face amount size is a proxy, and different underwriting standards. That is, higher socioeconomic classes have lighter mortality and higher face amounts compared to lower socioeconomic classes. The A/E by Count curve gives equal weights to all policies regardless of the size. Since there are fewer large policies, the average is more representative of the experience for lower face amount bands. The A/E by Face Amount curve is heavily weighted towards the large policies and, therefore, is more representative of the experience for high face amount bands.

- The gap between the two mortality curves widens over the study period from 13% to 17%. The gap increases due to the steeper decline of the A/E by Face Amount curve. This may indicate that mortality improvement is more pronounced for larger policies and, by extension, for the population in higher socioeconomic classes.

The purpose of the next figure is to compare mortality trends by face amount band, and in addition, it also tests the explanation for the gap between the two mortality curves.

Figure 3.2
A/E BY FACE AMOUNT AND OBSERVATION YEAR (CORE DATA)



Observations:

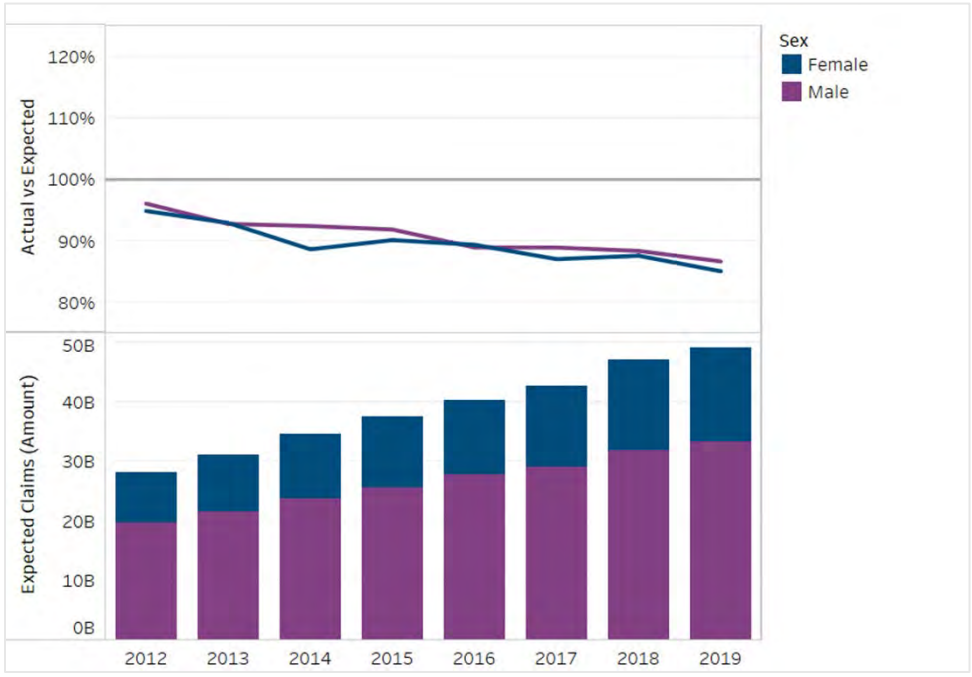
- The gap between the two mortality curves almost disappears when the two metrics are compared by face amount band. At the same time, the significant difference between mortality levels by face amount becomes apparent. This graph provides a proof of the earlier explanation for the gap between the two aggregate Count curves: the mortality curve on the Count basis was weighted more heavily towards the lower band, and, therefore, was higher than average, and the Face Amount curve was more representative of the higher face amount bands and was lower than average.

- The levels of mortality curves vary dramatically between the bands. The difference is more pronounced for the first three bands and almost disappears for $250K-$500K and $500K+ bands. The fact that the gap between the two curves in the $500K+ band is small implies that mortality doesn't continue to improve significantly as policy sizes continue to increase.

- The slope of mortality curves over the observation period decreases as the face amount increases. While the slope of the mortality curve cannot be fully interpreted as a mortality improvement without controlling for many important variables (i.e., age, sex, plan, policy duration), it can still be an important indication that mortality improvement is present. With this assumption in mind, we can observe that $0-$99K band exhibits limited mortality improvement over the study period, while mortality curves for face amounts above $250K exhibit robust mortality improvement.

The next figure compares mortality trends by gender. Gender is an important category for defining mortality expectations and is reflected in the structure of the VBT table. Note that, at this point, the lower portion of the figures in this report will generally switch from Number of Deaths to Expected Claims Amount. This metric is most useful for interpreting relative contributions of different population segments to the total A/E and helps to demonstrate changes in the volume of data by segment over time.

Figure 3.3
A/E BY GENDER AND OBSERVATION YEAR (CORE DATA)



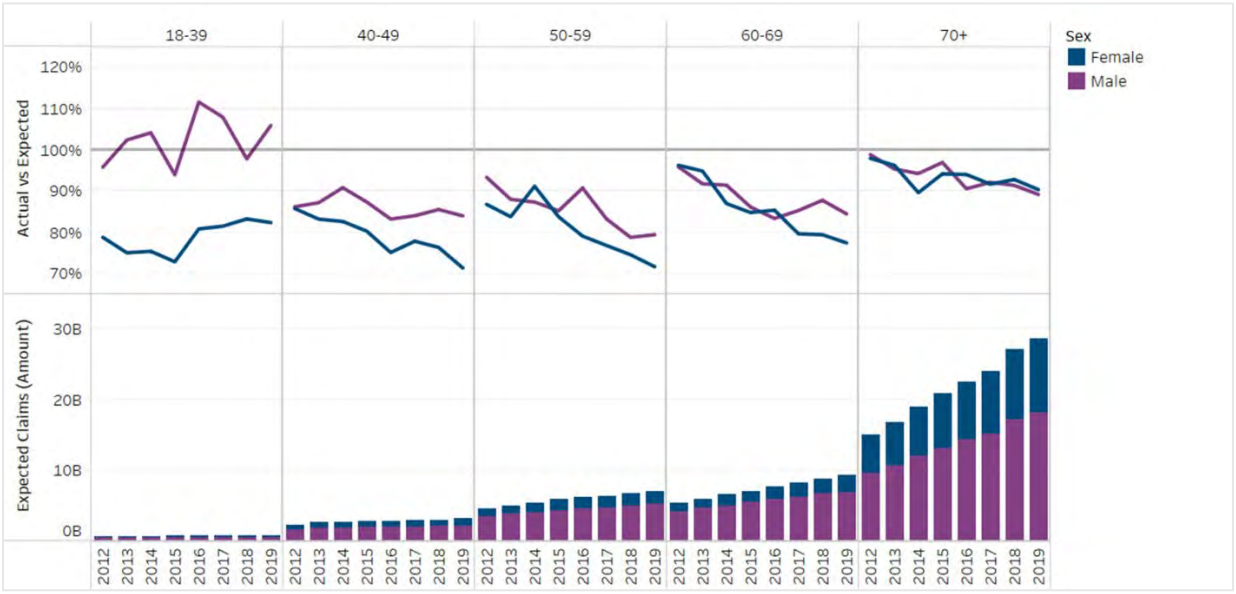
Observations:

- The expected claim amounts by gender over the study period indicate that the proportion of business for females has been increasing gradually over time but is still significantly lower than for males. This is mainly due to the lower average face amounts for women; gender analysis by issue age and issue year would likely show different proportions.

- The shape and level of mortality curves are very similar between the two genders.

The next figure adds another important dimension to the analysis – attained age. It is important to remember as the attained age increases, a broader mix of durations are included in the measure.

Figure 3.4
A/E BY GENDER AND ATTAINED AGE (CORE DATA)



Observations:

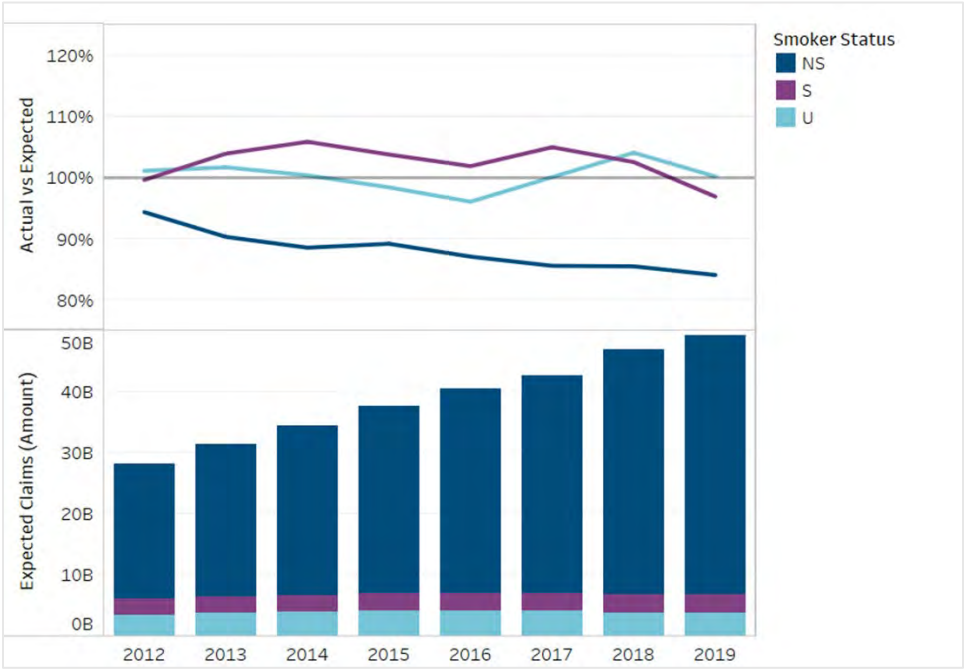
- A/E patterns for traditional issue ages 40 – 69 show relatively consistent patterns of improving mortality over the observation period for both males and females.

- Attained ages 18 – 39 show patterns of a high A/E for males and increasing mortality for females. All of the observations are fully credible by count, except for females in observation period 2012, which had 873 claims.

- Older age mortality (70+) had a higher A/E than ages 40 – 69 with less improvement. We look more closely into older age mortality in Section 6.

The next policy characteristic that has been traditionally important in mortality analysis is smoking status.

Figure 3.5
A/E BY SMOKER STATUS (CORE DATA)



Observations:

- The proportion of smoker business in the total industry data has been declining steadily. Given the small size of this segment, most of the analysis in the rest of this report will focus on Non-Smoker business.

- The A/E level is higher for smokers than for non-smokers. This difference is not a reflection of the higher smoker mortality since experience for the two groups is measured relative to their respective parts of the VBT table. The different level of the curves indicates a different fit of experience to the expectation set in the table – for non-smokers, the average experience is significantly better than VBT expectation, and for smokers, the average experience is worse than VBT, although it shows signs of improvement in the last few years.

- Unismoke experience is comparable to Smoker experience. Composite (unismoke) tables were used as the expected basis for all business issued prior to 1981, regardless of smoking status indicated, as the ILEC believes smoking as a distinct rating factor to be rare prior to that period. The proportion of unismoke reduced from 100% before 1981, averaging around 10% for the remaining decade to 1989, and 1% or less from 1990.

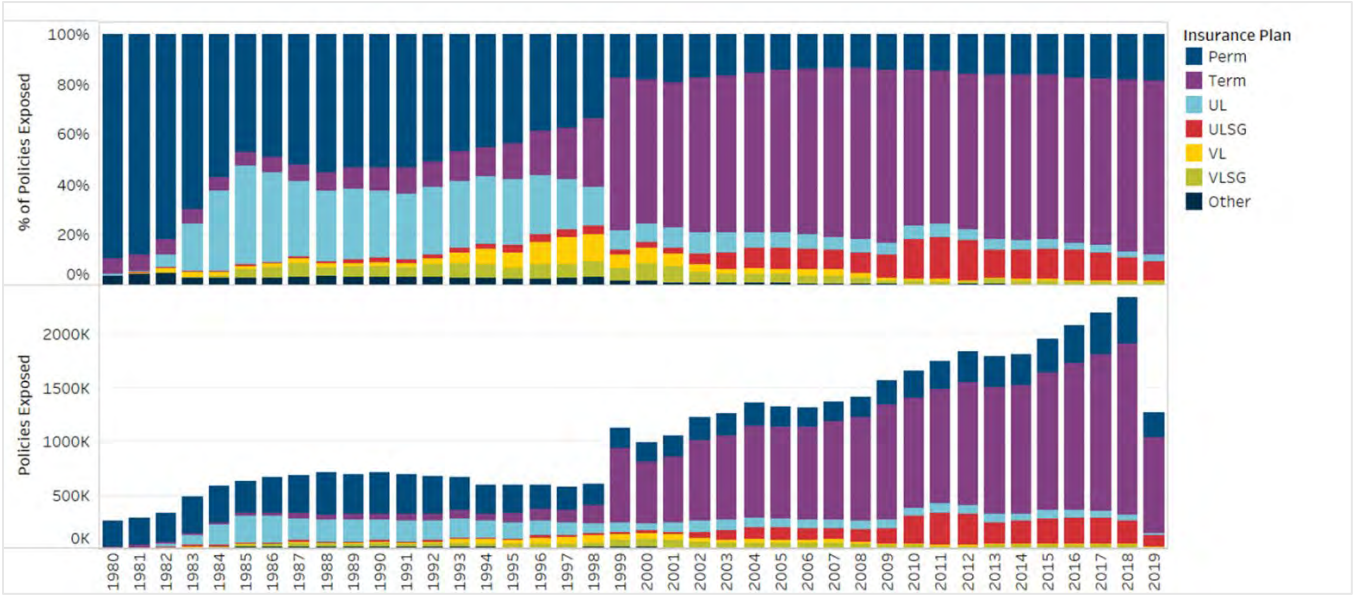
- The slope of smoker and unismoke mortality curves also appear flatter, implying lower overall mortality improvement.

Section 4: Trends by Product Group

Life insurance products have changed substantially over time as financial markets transformed, customer preferences changed, and insurance carriers created innovative new products to compete in the financial services industry. Prior to the 1980s, life insurance sales consisted of mainly permanent type products. In the early 1980's through the late 1990's, UL (UL without a secondary guarantee) became a higher proportion of products sold. Then, in the early 2000's, Term and ULSG (UL with a secondary guarantee) products began to take a greater share of the products sold.

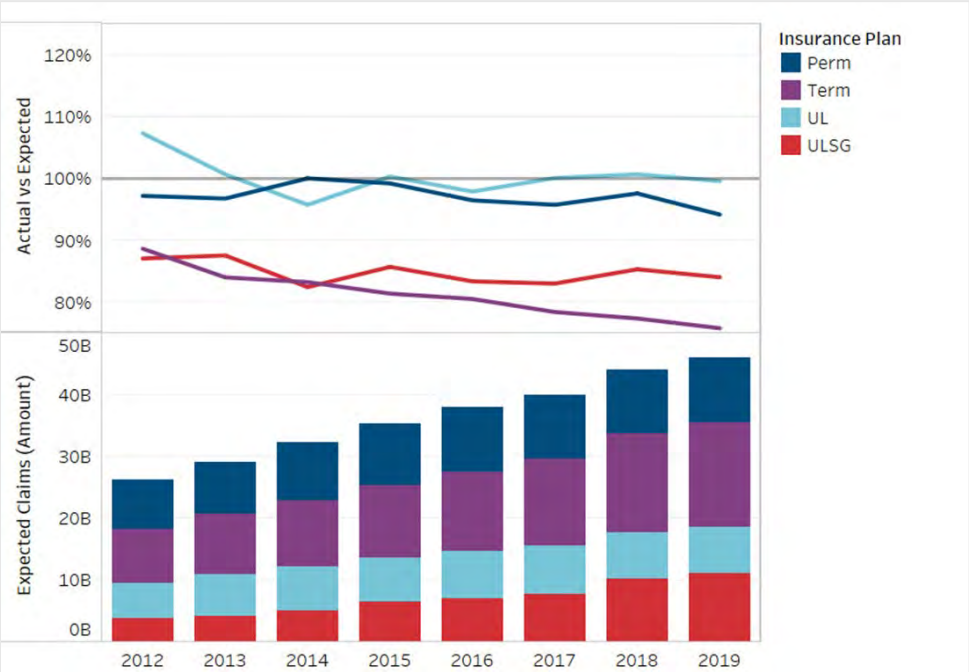
The following figures show the distribution of products by issue year for observation year 2019. The 2019 issue year contains approximately one half of the exposure compared to the other issue years. This is due to policies being issued relatively uniformly during the year and, therefore, policies issued in 2019 will only be exposed on average for half of a year. Note that results are not indicative of the number of policies sold during each issue year, but rather the number of policies that have remained inforce.

Figure 4.1
POLICIES EXPOSED BY PRODUCT AND ISSUE YEARS 1980-2019, OBSERVATION YEAR 2019



This section reviews the experience of mortality by product type to see if there are inherent differences between products. For this section, we focused on Perm, Term, UL and ULSG, which constitute the majority of the exposure during this period.

Figure 4.2
A/E BY PRODUCT AND OBSERVATION YEAR (CORE DATA)

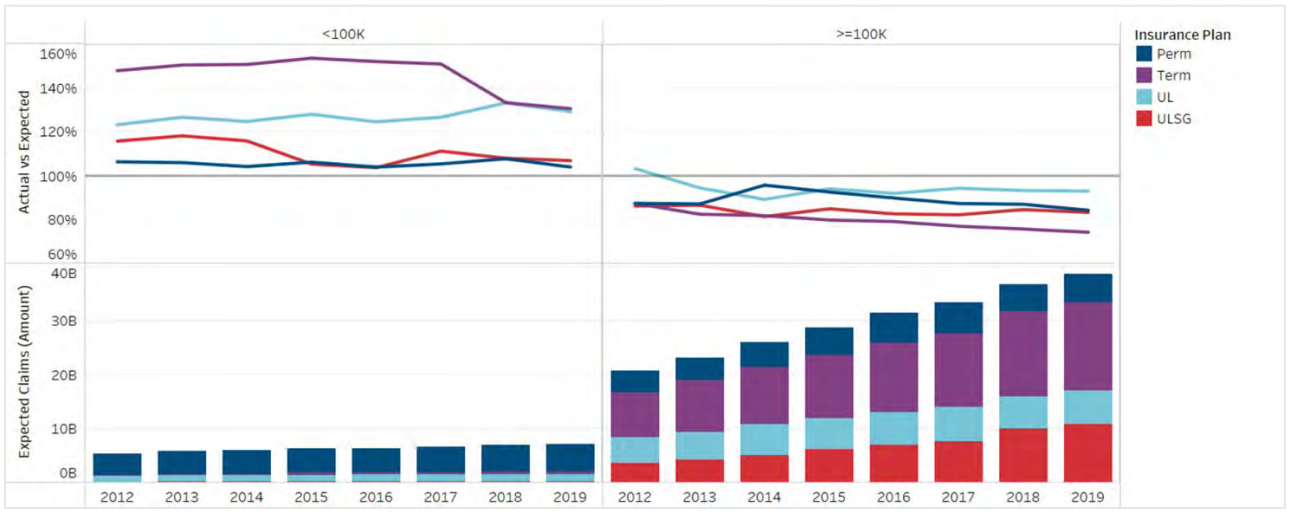


Observations:

- The Term product group has the largest proportion of expected claim amounts in all years. This is due to the generally larger face amounts of Term policies.
- The Term product group has the most pronounced A/E reduction pattern over the observation period.
- In aggregate, Term mortality is significantly lower than Permanent and UL mortality. This is partially due to the larger proportion of high face amount policies in the Term population, which generally has better mortality.
- UL mortality has remained elevated compared to ULSG, Permanent, and Term.
- The trends are largely consistent with what was shown in the 2017 ILEC Mortality Experience Report.

As demonstrated earlier, face amount has a significant impact on the levels and patterns of mortality. To explore impact of face amount on experience by product group, the face amount bands were broken out into two groups [<$100k, >=$100k] and the two groups were added as an additional differentiator to the previous figure. The segmentation at $100k was chosen as many companies have established additional underwriting requirements for face amounts >=$100k and there is also a correlation of higher face amounts to higher socioeconomic status.

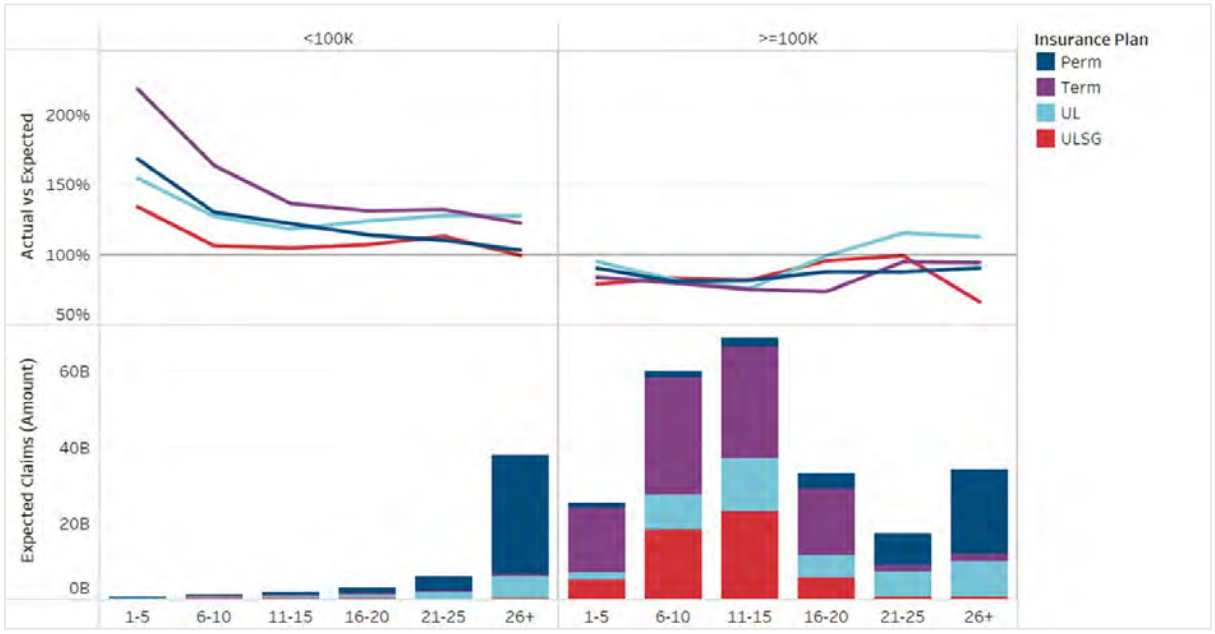
Figure 4.3
A/E BY PRODUCT, FACE AMOUNT, AND OBSERVATION YEAR (CORE DATA)



Observations:

- The lower portion of the graph demonstrates that below $100K, there is very little Term and ULSG business. Most of the lower face amount business is Perm and UL.
- In the >=$100K segment, the growth over the study period came mainly from Term and ULSG product groups.
- Mortality for >=$100k business is significantly lower than for <$100K for all product groups.
- The lower face amount segment did not show a decreasing mortality trend for any products, unlike the higher face amount segment. Several factors may explain why mortality is not decreasing in the lower face amount segment, including anti-selection, opioid-related deaths, accidents, and suicides, which may be more prevalent in this segment of the data.

Figure 4.4
A/E BY PRODUCT, FACE AMOUNT, AND DURATION (CORE DATA)



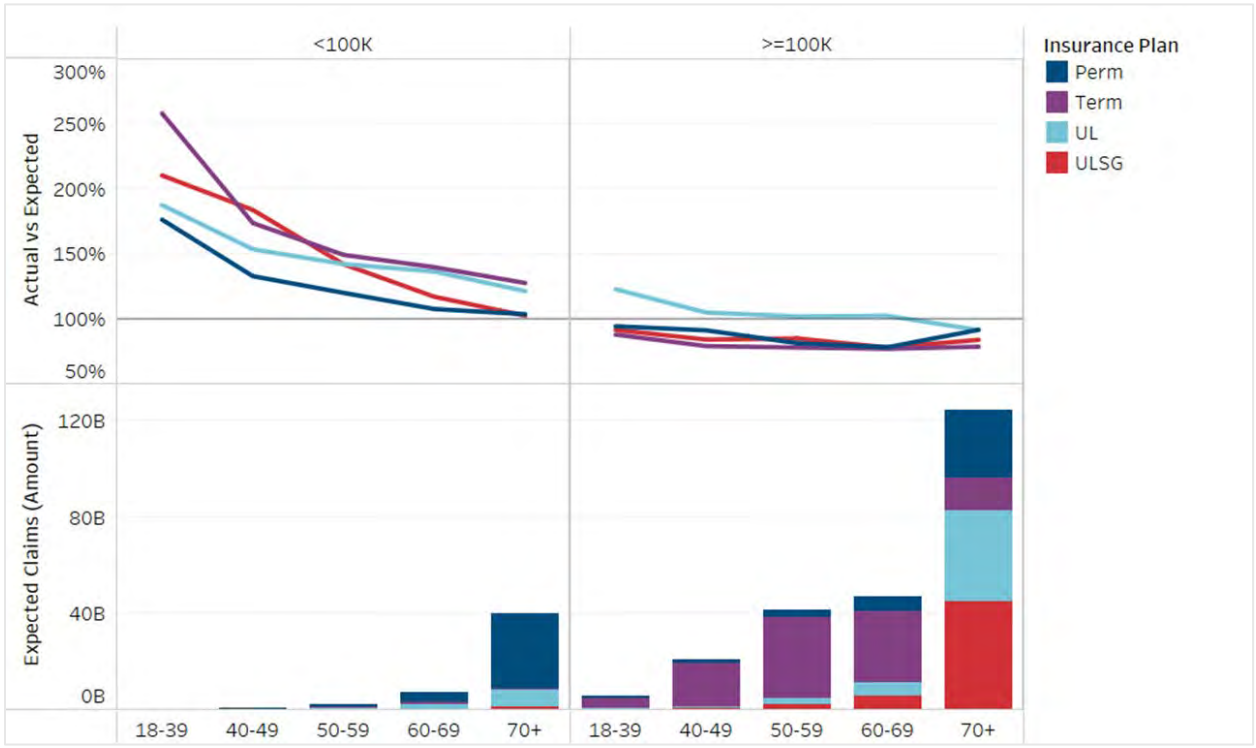
Observations:

- The first graph indicates that in the <$100k segment, the vast majority of the Perm and UL experience is concentrated in durations 26+. In the >=$100K segment, there is a higher concentration of expected claims in the early durations of Term and ULSG business. Term has significant experience in durations 10-15 and 16-20, but mostly disappears in durations 21+, corresponding with 20-year level premium term. In the high face amount segment, perm experience is still concentrated heavily in durations 26+.

- The pattern of higher mortality for lower face amounts continues to be observed by duration but is shown to decrease as duration increases.

- In the >=$100k group, the UL product A/E is seen to increase in durations 21+ (policies issued prior to 2000). This phenomenon may also contribute to the lower mortality improvement for UL seen in figure 4.2.

Figure 4.5
A/E BY PRODUCT, FACE AMOUNT, AND ATTAINED AGE (CORE DATA)



Observations:

- The pattern of higher mortality for lower face amounts continues to be observed by attained age but is shown to decrease significantly as attained ages increase.

- A/E for higher face amounts is somewhat elevated for UL products but is otherwise broadly consistent across attained ages.

This section has shown that from 1980-2019, there have been significant shifts in product sales over time. As will be seen in the next section, policies issued prior to 2000 are also experiencing different mortality expectations than more recent business, where older issued policies have higher mortality. To isolate observations not related to low face amounts or older issued policies, filters were created to analyze views of experience to represent a more 'modern' dataset that reflects a more current, internally consistent risk profile:

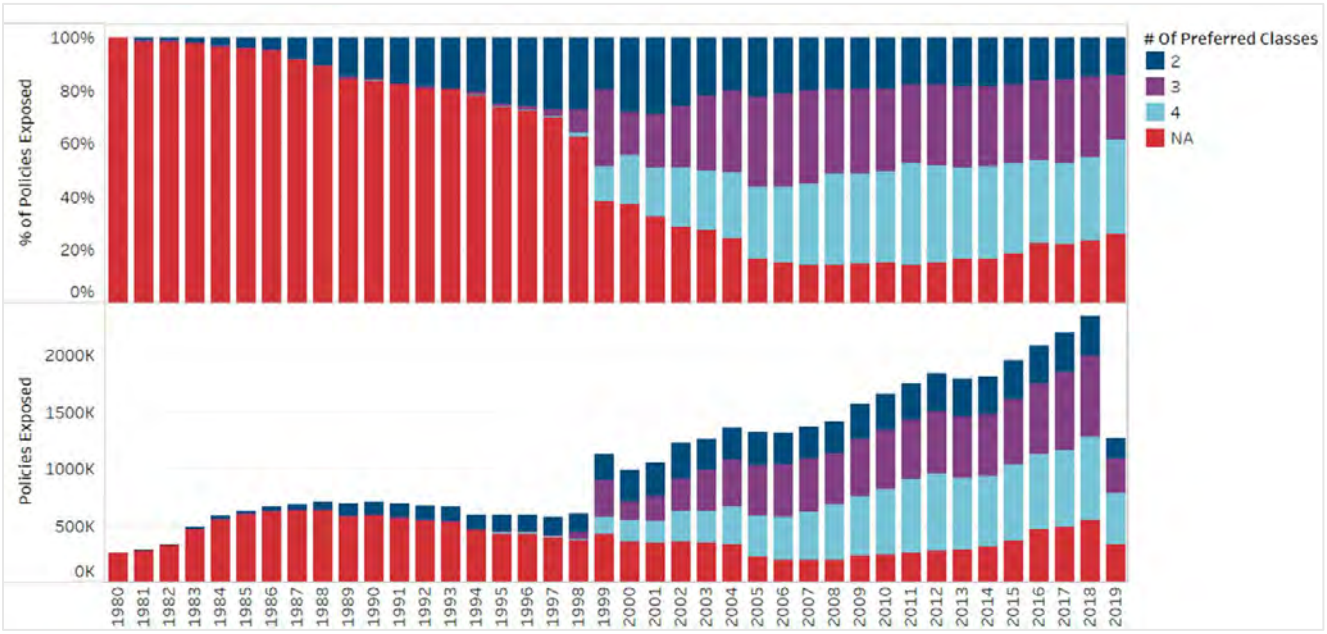
- Issue years 2000 and later
- Face amount greater than or equal to $100,000
- Exclusion of "Other" Insurance Plans

Section 5: Trends by Risk Class

The insurance industry has changed not only the types of products being sold, but also segmented the market into more granular risk classes. Products were primarily sold to two or fewer class systems prior to 1999. The industry began offering more risk class structures, which provided better risk stratification and encouraged competitive pricing but were also subject to anti-selective pressures as healthy policyholders would switch from existing products to less expensive stratified products, leaving the unhealthy lives in the older products.

Figure 5.1

POLICIES EXPOSED BY RISK CLASS AND ISSUE YEAR, OBSERVATION YEAR 2019 (CORE DATA)

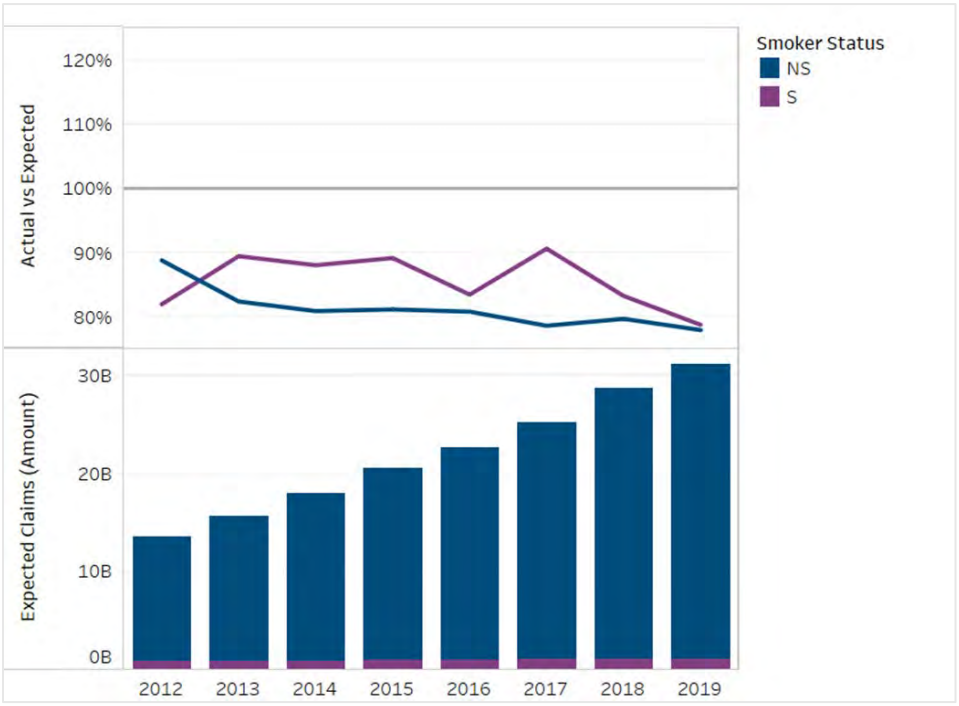


Observations:

- Most of the business issued in years prior to 1999 were sold to 2-class or fewer underwriting systems.
- Starting around 1999, policies were issued to 3- and 4-class underwriting systems, increasing in percentage sold each year until stabilizing around 2008.

The insurance industry experienced a shift in product sales related to smoking status. It was not common in the industry to test for smoking until the early 1980s. The transition from unismoke product offerings to smoker-distinct was rapid during the early 1980s. The number of smokers who are insured continues to be a small percentage (~9%) of the total insured. This is a lower percentage compared to the U.S. population of smokers (~12% as of 2021), although the percentage of smokers in the insurance industry has been more stable compared to the decreasing trend that the U.S. population has seen.

Figure 5.2
A/E BY SMOKER STATUS AND OBSERVATION YEAR (MODERN DATA)



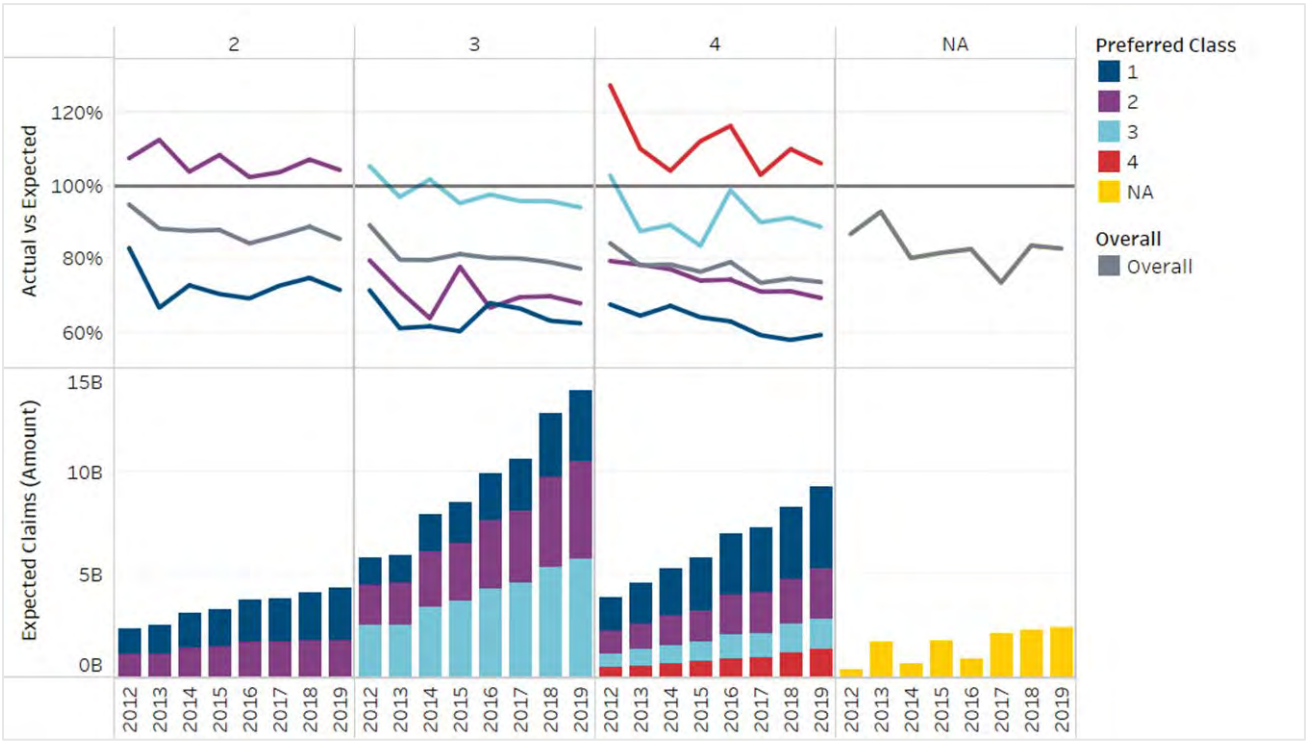
Observations:

- The modern dataset reflects better experience for both smoker and non-smoker classes versus figure 3.5, with substantial improvement in smoker experience versus historical issue periods.

- Most business is sold to non-smokers, where non-smokers continue to have better relative mortality experience.

As the industry segmented the insurance market more granularly by offering products with multiple risk classes, there was more competitive pricing and a different distribution of risk over time. Preferred risks have better mortality when the policy is issued, but questions remain as to whether the effect of selection will wear off over time, and whether and at what point that wear off will eventually stabilize.

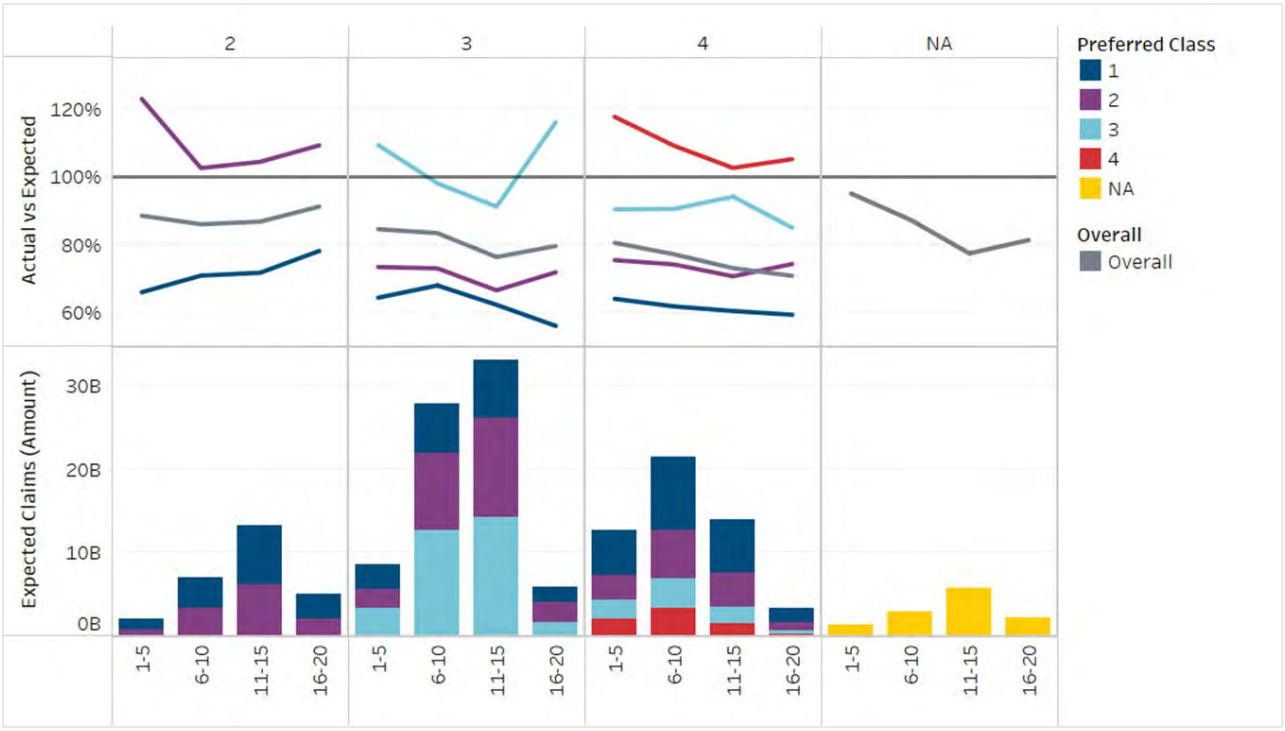
Figure 5.3
A/E BY NUMBER OF PREFERRED CLASSES AND OBSERVATION YEAR: NON-SMOKER (MODERN DATA)



Observations:

- The gray line reflects the overall A/E in order to understand differences by class.
- It can be observed that mortality decreases as the number of risk classes increases. When the risks are stratified more granularly, the preferred risks may be a larger proportion compared to when the risks are less granular. A more granular risk class would give cheaper prices to the best risks.
- The preferred class ranking in a class system seems to be delineated consistently over time. Preferred classes 1 and 2 in a 3-class system have a narrower difference compared to other class structures.

Figure 5.4
A/E BY NUMBER OF PREFERRED CLASSES AND DURATION: NON-SMOKER (MODERN DATA)



Observations:

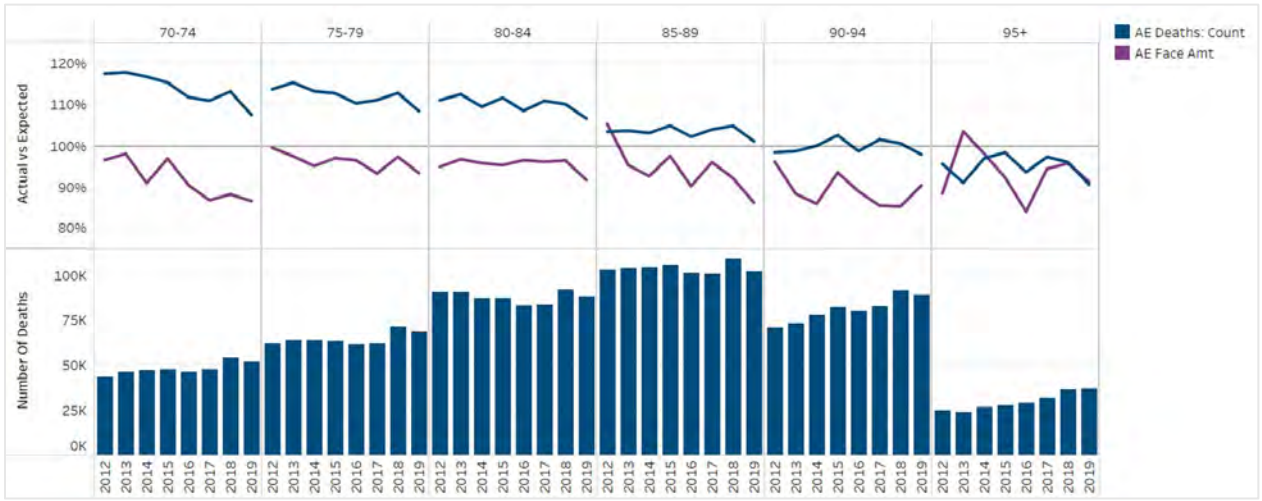
- The durational view shares similar perspectives to figure 5.3 by observation year.
- There isn't a clear trend of mortality convergence by duration for the different underwriting classes as experience is still emerging for later durations (21+). That said, the beneficial impact of preferred underwriting appears to remain through duration 20.

Section 6: Older Age Analysis

Mortality analysis for older age groups, defined here as having an attained age greater than or equal to 70, has historically lacked credible data, particularly when split further into granular segments. As a result, significant judgment has been required for estimating older age mortality experience for the insured population. This section examines mortality trends for older age groups and interactions across various risk characteristics. Previous analysis on older age mortality can be found in the SOA's 2022 Old Age Mortality Experience Study Report.

We first examine A/E results of the core dataset by observation year for five-year attained age groupings by count and amount. Number of Deaths are shown to demonstrate full credibility is attained for all age groups and observation years.

Figure 6.1
MORTALITY EXPERIENCE BY ATTAINED AGE GROUP AND OBSERVATION YEAR (CORE DATA)



Observations:

- A/Es by count for ages 70-89 are consistently higher than 100% of 2015VBT, but approach 100% of 2015VBT as age increases. Almost all observations of A/Es by amount are lower than A/E by count, confirming that lower face amount bands are experiencing worse mortality.
- A/Es by count for ages 70-84 appear to be trending down over time. A similar trend for A/Es by amount is observable for these ages.
- A/Es by count for ages 85-94 appear to have a fairly flat pattern over the observation period, which suggests limited mortality improvement at extreme old ages. A/Es by amount for the same groups are more volatile, as large claims have an outsized impact.

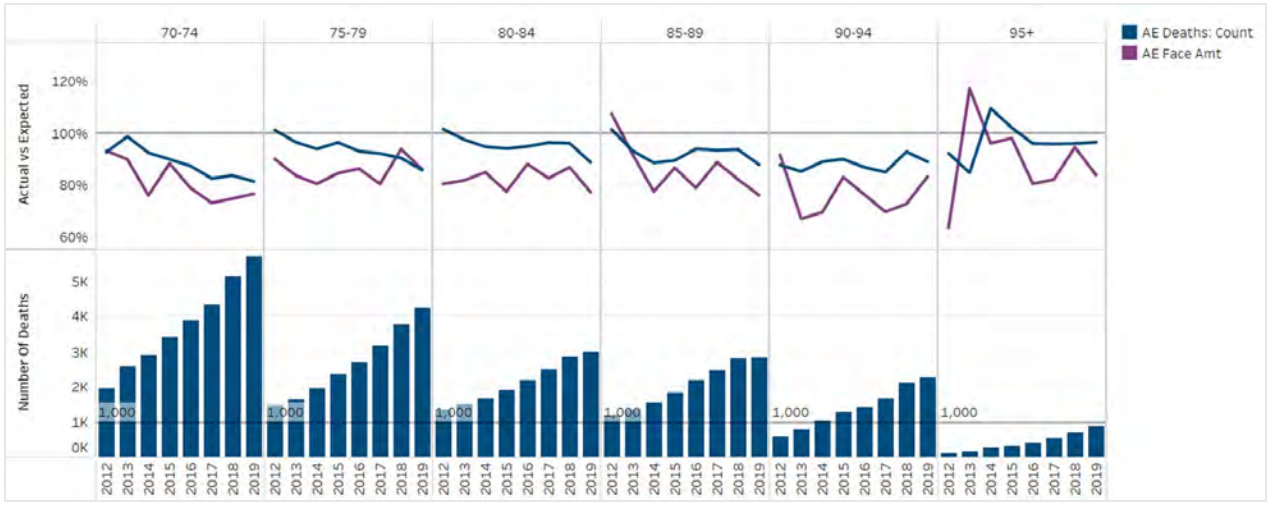
We can attempt to control for some of the expected factors driving observed differences by presenting a separate view of experience using the modern dataset, reflecting changes in product design and the rise of more granular underwriting practices described previously. The modern dataset is defined by the filters below, in addition to the core filters applied to the total dataset:

- Issue years 2000 and later
- Face amount greater than or equal to $100,000

- Exclusion of "Other" Insurance Plans

As a result of the filters, there is a reduction in credibility for the modern dataset relative to the total. However, almost all age group and observation year combinations have at least 1,000 claims. The main exception is age group 95+, which has approximately 100-400 claims for observation years 2012-2016 and approximately 500-900 claims for observation years 2017-2019.

Figure 6.2
MORTALITY EXPERIENCE BY ATTAINED AGE GROUP AND OBSERVATION YEAR (MODERN DATA)



Observations:

- A/Es by count for age groups 70-84 appear to be trending down over time and A/Es for age groups 85+ are generally flatter. This follows a similar pattern as the core dataset.
- In general, A/Es by amount are much more volatile than by count, highlighting the significant impact of large face amount claims at the older ages.
- Almost all observations are below 100%, suggesting that experience for the modern dataset has been more favorable than 100% of the 2015VBT.
- The difference in A/Es between the core dataset and modern dataset generally shrinks as age increases. A/Es by both count and amount for both the modern and total datasets approach convergence for age 95+

Continuing with experience from the modern dataset only, we attempt to highlight areas with noticeable deviations within various risk characteristics for older ages. As expected, there is a clear trend of lower A/Es for the highest face amounts. This may be related to more stringent underwriting requirements for higher face amounts and better mortality outcomes for higher socioeconomic classes.

The next figure presents A/Es for different face amount bands split by issue year era to better reflect changes in old age underwriting programs that occurred in the industry around 2005. Further information on specific underwriting changes can be observed in the SOA's series of Older Age Underwriting Practices Surveys, which were conducted between 2001-2016.

Figure 6.3
MORTALITY EXPERIENCE BY FACE AMOUNT BAND FOR OLDER AGES ACROSS ISSUE ERAS (MODERN DATA)

Observations:

- A/Es from issue years 2006+ exhibit a clear decreasing trend by face amount, with the impact levelling off for face amounts $5M+.
- A/Es from issue years 2000-2005 are relatively flat for face amounts between $250K-$4.999M, with more significant drops in A/E only occurring for face amounts $5M+. This suggests that below a certain level, impacts of socioeconomic class on mortality within the insured life population from earlier issue years may be muted.
- A/Es for both the lowest face amount band, $100Kk-249K, as well as the highest face amount band, $10M+, are similar across the issue year eras, potentially suggesting more limited gains from the underwriting changes between the two eras at these face amounts.

We investigate the trends underlying these curves further by differentiating the same splits by gender in the figure below.

Figure 6.4
MORTALITY EXPERIENCE BY FACE AMOUNT BAND FOR OLDER AGES ACROSS ISSUE ERAS (MODERN DATA)

Observations:

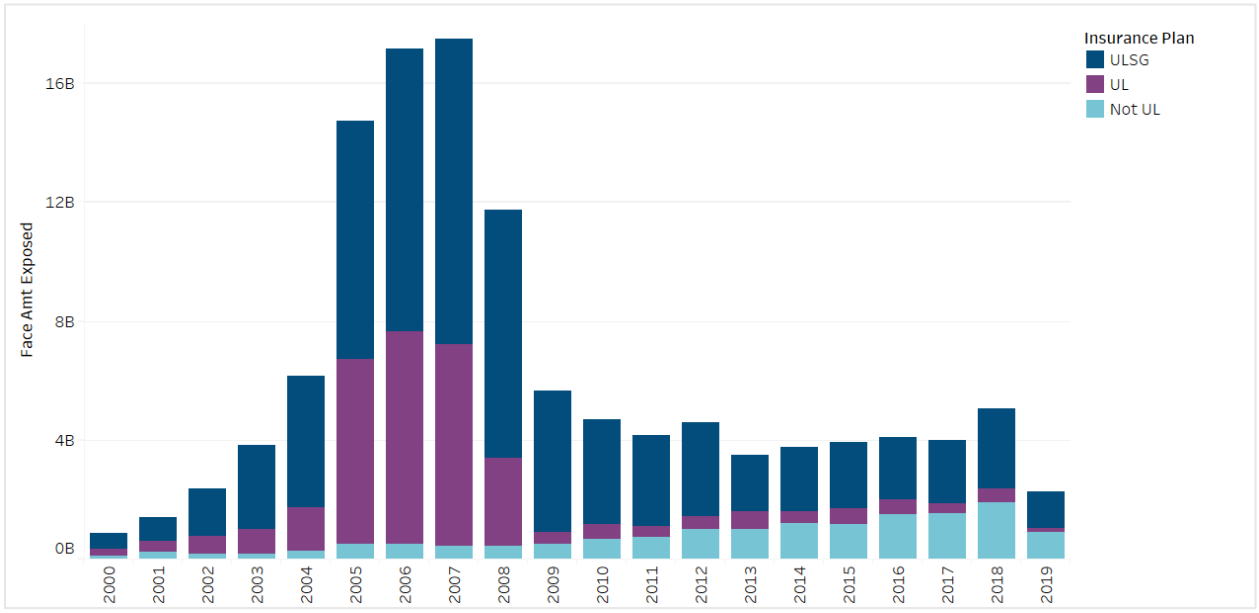
- For face amounts below $5M, Female A/Es show a flat trend across face amount bands for both issue year cohorts. Further, for issue years 2000-05 in particular, this flat Female A/E extends to the lowest band in the modern dataset of $100K-249K. Lower mortality is only observed at face amounts over $5M.
- On the contrary, a decreasing trend by face amount is much more observable for Male A/Es across both issue year cohorts.

We note limited credibility by gender for face amount bands above $2.5M, where A/Es by gender and issue era are based on fewer than 1000 claims for the groups shown. A/Es for $10M+, in particular, are based on only 200-300 claims for each grouping.

In reviewing the modern data, the team observed a significant increase in issues of large face amount policies to older ages during the period 2005-2008, almost exclusively for UL and ULSG products. The figure below shows face amount exposed by issue year for policies $1,000,000 and above at older ages in the modern dataset. Although the time period, products, and face amounts demonstrate some of the hallmarks of STOLI activity, we were unable to conclusively demonstrate this. While we did not observe a clear impact of this spike in sales on the overall mortality experience for this period, the users of this report should consider this exposure accordingly.

Figure 6.5

FACE AMOUNT BY ISSUE YEAR, ISSUE AGES 70+, $1,000,000+ FACE, OBSERVATION YEAR 2019 (MODERN DATA)



Section 7: Additional Resources

The 2019 Individual Life Insurance Mortality Experience Report and related materials are available to download at: https://www.soa.org/resources/research-reports/2024/ilec-mort-2012-19/.

Available items include:

7.1 DOWNLOADABLE PDF'S OF THIS REPORT AND EXHIBITS

- 2019 Individual Life Insurance Mortality Experience Report
- 2019 Individual Life Insurance Mortality Experience Report - Exhibit 1
- 2019 Individual Life Insurance Mortality Experience Report - Exhibit 2
- Vine Copula Models Methodology Details (DistributionalChanges.html)

7.2 APPENDICES FOR THE REPORT

The appendices include a wide variety of univariate and multivariate views of the experience results. The summary sheet describes the contents of each appendix. The results are available in Excel.

- 2012-19 Individual Life Experience Report Appendices

7.3 TAB DELIMITED GROUPED 2012-19 LIFE EXPERIENCE SATA AND FIELD DEFINITIONS

- ILEC 2012-19 Text File
- ILEC 2012-19 Data Dictionary

7.4 INTERACTIVE TABLEAU DASHBOARDS

Views are by: Observation Year, Issue Age, Duration, Attained Age, and Face Amount. Tableau license not required.

- ILEC 2012-19 Tableau Dashboards

Section 8: 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 VM-50 and VM-51 of the Valuation Manual. Those data submissions were facilitated and coordinated by the NAIC. VM-50 Section 2.B.2 designated the NAIC as the Experience Reporting Agent for the Statistical Plan for Mortality beginning January 1, 2020.

The NAIC, on behalf of the Missouri Department of Insurance, 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.

8.1 2018 AND 2019 OBSERVATION YEARS

The following items are notable regarding the data for the 2018 and 2019 observation years:

1. Many companies received feedback from the NAIC regarding inconsistencies in the coding of smoker status and preferred class fields, and final data submissions reflected many corrections. However, this is an area where additional changes will be seen for future observation years (see item 2 below). A clearly defined risk class structure from VM-51 must be present, meaning that if the preferred class structure indicator=1 (i.e., there are preferred classes), then the smoker / non-smoker preferred class structure fields must match the smoker status. In cases where the coding is inconsistent, the risk class structure is mapped to an Unknown category. The examples below illustrate cases of data inconsistencies.

    - Example #1 – The record is coded inconsistently as follows:

      Preferred Class Structure Indicator = 1 (there are preferred classes)
      Smoker Status = Cigarette Smoker
      Number of Classes in Nonsmoker Preferred Class Structure = 3
      Nonsmoker Preferred Class = 1

      In this example, Smoker preferred class fields should have been populated instead of the Nonsmoker preferred class fields. Mapping to an Unknown category will allow these types of inconsistencies to be monitored over time and they are expected to decline as companies improve their processes.

    - Example #2:

      Some companies indicated that they issue Unismoke business with preferred class structures. A limitation of VM-51 is that there are no Unismoke preferred class fields. As a result, it is unclear how to code these policies and companies have taken different approaches. The most common is to assign an Unknown smoker status and populate the Nonsmoker preferred class structure fields. The NAIC mapped these records to the Unknown category, but unlike the previous example, a Valuation Manual amendment would be needed to allow companies to correctly classify this business.

2. A number of companies have completed projects to improve data quality. As a result, the trend of some data fields will change for the 2020 and/or 2021 observation years versus the 2018 and 2019 observation years. The NAIC's review of data submissions for the 2020 and 2021 observation years (which is still in progress), indicates the changes are mainly in two areas:

    - Type of Underwriting Requirements

      For the 2018 and 2019 observation years, some companies coded most of their records as underwriting type 01 (Underwritten, but unknown whether fluid was collected). The NAIC asked whether this could be refined to split records into underwriting type 02 (Underwritten with no fluid collection) and/or type 03 (Underwritten with fluid collected) where appropriate. Companies generally responded that this was possible but would require a project to get the information from an underwriting database. A number of companies completed this work recently and reflected the results in their 2020 and/or 2021 data submissions.

    - Preferred Class Structure Fields

      As noted under item 1 above, the 2018 and 2019 data included inconsistencies in the coding of smoker status and preferred class structure fields. A number of companies have made improvements in this area for the 2020 and/or 2021 observation years.

3. Preferred Risk Class exposures are in the data for issue years prior to 1990. Where this was observed, the NAIC asked companies to verify the accuracy of the data. Many confirmed they issued business under a preferred class structure in the 1980's. However, as noted in this report, we have chosen to exclude these exposures from any preferred class analysis.

4. Paid-Up Additions (PUAs) and One-Year Term (OYT) records are part of the mandatory data submissions. For the 2018 and 2019 observation years, these records were not easy to identify separately. However, a VM-51 amendment reflected in the 2023 version of the Valuation Manual added new plan codes to identify PUA and OYT records. The use of these plan codes is required beginning with the 2021 observation year. Companies were encouraged to use these plan codes on a voluntary basis for the 2020 observation year, and some did so. It is expected that the experience at the lowest face amount bands will be impacted by the presence of these records.

5. For observation years 2019 and prior, juvenile records (issue ages < 18) were assigned qx's based on the 2015 M/F Unismoke VBT table (SOA #3274). However, it is important to note that the data retains the reporting of smoker status provided by the company. Some companies indicated that they have issued smoker/nonsmoker business prior to issue age 18.

6. 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. In many cases, these records represent policies issued to juveniles. Where the NAIC observed large face amounts for juveniles, companies were asked to verify the accuracy of the data. Based on their responses, it appears this is not unusual. Also, some of these records may represent policies issued on a Unismoke basis.

8.2 OBSERVATION YEARS 2017 AND PRIOR (MIB) VERSUS OBSERVATION YEARS 2018 AND 2019

There are known differences between the data for observation years 2017 and prior versus observation years 2018 and 2019. These are discussed below.

1. Consistency of Participating Companies

   For observation years 2017 and prior, year-over-year consistency of the companies participating in data calls was not assured. This changed beginning with the 2018 observation year when VM-50 and VM-51 requirements went into effect. The NAIC selected participating companies according to criteria outlined in VM-51 Section 2.C. with a target to achieve at least 85% of industry claims experience for life insurance business in scope. All companies selected to submit mortality experience data are expected to continue reporting their experience in future years, barring circumstances justifying an exemption. This is intended to ensure consistency of participating companies.

   To help ensure substantial consistency of participants for the 2018 and 2019 observation years versus recent prior observation years, 78 of the 107 selected companies were "common companies," meaning that they were participants in the Kansas or New York data calls prior to the 2018 observation year. The remaining 29 selected companies were new participants starting with the 2018 observation year.

2. Improvement in Usable Data

   For observation years 2017 and prior, data from some participating companies was entirely excluded due to data quality concerns. Due to Valuation Manual requirements, this is no longer the case beginning with the 2018 observation year. VM-50 Section 4.B.11 requires the NAIC to identify "critical indications" and report these to each company. These are defined as indications that, if not corrected or confirmed, would leave a significant degree of doubt whether the affected data should be used in reports to the state insurance regulator and included in industry databases.

   NAIC staff identified both critical and non-critical indications and provided this feedback to companies. VM-50 Section 4.B.13 states the responsibility of companies to respond:

   > "Companies shall acknowledge and respond to reasonability queries from the Experience Reporting Agent. This shall include specific responses to all critical indications provided by the Experience Reporting Agent. Other indications shall be studied for apparent errors, as well as for indications of systematic errors. Corrections for critical indications shall be provided to the Experience Reporting Agent or, when a correction is not feasible, the extent and nature of the error shall be reported to the Experience Reporting Agent."

   For the 2018 and 2019 observation years, data from all participating companies was provided to the ILEC. This was achieved because companies resubmitted data and/or provided responses to questions until the NAIC considered the data provided to the ILEC to be acceptable for each individual company. Companies also signed off on the reasonableness of A/E ratios that the NAIC calculated based on their data. For future observation years, the NAIC expects that data from all participants will continue to be included in the aggregated data files provided to the ILEC.

3. Excluded Companies that Participated in Kansas and New York Data Calls

   A total of 107 companies participated in the Kansas and New York data calls for the 2017 observation year. As noted above, 78 of these companies were selected by the NAIC to provide annual mortality experience data. The remaining 29 companies were not included for the following reasons:

   - Requirement that Companies be Licensed in Missouri

     VM-50 Section 3.B.3 states that "the NAIC will seek to enter into agreements with a group of state insurance departments for the collection of information under statistical plans included in VM-51. The number of states that contract with the Experience Reporting Agent will be based on achieving a target level of industry experience prescribed by VM-51 for each line of business in preparing an industry experience table." The NAIC entered into an agreement with the Missouri Department of Insurance, which achieves the target level of industry experience under VM-51. Since this agreement only covers companies licensed in Missouri, those not licensed there were excluded. These were all small companies.

   - Out of Scope Business

     VM-50 requires companies to reconcile their data submission against company financial data. This serves as a control to demonstrate that only business in scope was submitted. As a result, it was determined that data provided by some companies as part of the New York data call was out of scope for VM-51 data collection. These companies were, therefore, excluded from the NAIC data collection. It is important to note that the New York and NAIC data calls are not identical. New York collects data that is out of scope for VM-51 (e.g., Guaranteed Issue).

   - Exemptions

     For some companies, the data remaining after removing out of scope business was very small. These companies were granted exemptions from data collection.

   - Small Companies

     VM-51 allows a group of companies to exempt an affiliate from data collection if the affiliate's premium is less than $10 million. Nearly all groups elected to do this. Additional exemptions are also allowed, and several were granted.

   - Assumed Business

     Another scope difference relates to reinsurance. In discussions with some companies, it was determined that for the New York and Kansas data calls, data for business assumed from other companies was submitted along with direct written business. The NAIC instructed these companies to submit only their own direct written business, since business assumed is out of scope under VM-51.

4. New Controls Required by VM-50 Beginning with the 2018 Observation Year

   VM-50 prescribes several new controls that may not have been required for companies submitting data prior to 2018. These are described below.

   - Control Totals

     VM-50 Section 4.B.2 requires each submission of data to be balanced against a set of control totals provided by the company. At a minimum, these control totals shall include applicable record counts,

claim counts, amounts insured, and claim amounts. To assist with the reporting of control totals, NAIC staff developed a template companies could use. Although use of this template is not prescribed in the Valuation Manual, nearly all companies elected to use it. The purpose of the control totals is to ensure that the NAIC received a complete file and that the numbers match what the company intended to send.

- Data Reconciliation

  VM-50 Section 4.B.3 requires each company to perform a reconciliation between the data submitted and the company's statistical and financial data and provide an explanation of differences. To assist with this, NAIC staff developed a template companies could use to reconcile against the Exhibit of Life Insurance. Although use of this template is not prescribed in the Valuation Manual, nearly all companies elected to use it. The purpose of this reconciliation is to ensure that all in-scope business has been included in the data file, and that no out-of-scope business was submitted.

5. Treatment of Records in Segments 2 and Higher

   Segment 2 typically represents PUAs, spouse or child riders, or term riders. The treatment of records in segments 2 and higher is materially different for the 2018 and 2019 observation years versus prior observation years. The previous approach did not distinguish between base segment 1 and segments 2+. For segments 2+, the face amount was added to the base segment, and the demographics of the base segment were used (issue date, issue age, gender).

   Data for observation years 2018 and 2019 are separated for segment 1 versus segments 2+. Segments 2+ are rolled up by issue age and gender. The policy exposed indicator is set to 0, so the face amount is counted but there is no additional policy count.

6. For observation years prior to 2018, it was determined that the 2015 VBT Unismoke tables had incorrect qx rates for ages 96 and older. The qx values for ages 96 through 99 were the issue age 95, duration 2+, select rates rather than the ultimate rates at age 96+. This was corrected for observation years 2018 and 2019.

Section 9: Acknowledgments

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Tatiana Berezin, FSA, MAAA (Subgroup Co-chair)

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Dan Reilly

Brian Shade

Jim Stinson

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Korrel Crawford, Senior Research Administrator

Pete Miller, ASA, MAAA, Experience Studies Actuary

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