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2017 Individual Life Insurance Mortality Experience Report

Mortality and Longevity

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2017 Individual Life Insurance Mortality Experience Report

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2017 Individual Life Insurance Mortality Experience Report

Section 1: Purpose of the Study

This study and report have the following primary purposes:

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

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

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

Any comparison of mortality trends should be considered carefully and evaluated with attention to all underlying factors. The experience is that of the contributing companies in aggregate and, thus, may or may not reflect the experience of any individual company. Also, distribution exposures have changed over time and results observed may reflect impacts of variables not included in the current analysis. 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 their own determination concerning the applicability of this information to their individual purpose and use.

Section 2: 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 2017 Individual Life Insurance Mortality 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 2009-2017.

There are plans and further initiatives by the ILEC to materially shorten the lag between the exposure and release of the ILEC experience data. While the initiative was partly delayed due to COVID-19, an accelerated timeline has been set by the NAIC, the statistical agent for experience year 2018 and forward.

The data used in this study is available in Excel pivot tables, a Tableau dashboard, and a delimited text file. More detail on the use and format of these files can be found in Section 4 of this report. With these data files, the reader may pursue their own detailed analysis as desired. The CSV file provided with the 2009-2016 Individual Life Insurance Mortality Experience Report contains data from the prior study.

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 that contributed data is significant. The following table lists the number of companies in each calendar study year 2009-2017. The data for the study years 2009-2017 is organized on a calendar-year basis. Those 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. Data for calendar year 2018 was much more limited than prior years, and so was excluded from this report. Future reports should be able to include 2018 data when that information is provided as planned in future years by the NAIC, who will be taking over the statistical agent role and providing the information directly to the Society of Actuaries.

Table 1

NUMBER OF COMPANIES SUBMITTING DATA

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
2016	91	NY required, KS required
2017	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 the 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 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. 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 an amount basis versus count basis, and the volatility associated with each measure. Unless otherwise noted, references to claim counts are on a by policy basis.

Unless otherwise noted, the results presented in this report are based upon looking at the data with the following filters:

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

The following table summarizes the amount of data that was used in the current study (2017) and the prior study (2016) by experience year. This table includes all issue ages, including juveniles.

Table 2

COMPARISON OF AVAILABLE DATA DURING THE STUDY PERIOD

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
2014	93	560,393	$32.8B	57,552,165	$12,450B
2015	91	565,853	$35.5B	57,907,852	$13,078B
2016	91	552,127	$37.2B	57,921,762	$13,589B
2009-2016		3,995,446	$216.6B	410,422,616	$84,684B
2017	91	558,579	$39.0B	57,346,148	$13,884B
Total		**4,554,025**	**$255.5B**	**467,768,764**	**$98,568B**

Section 3: Discussion

This section of the report includes analysis of the mortality trends in aggregate and for segment(s) of potential further interest. The purpose of the analysis is to identify emerging changes in mortality in the key population subsegments and provide broad insights into some of the most common questions about mortality relationships faced by the practitioners.

Section 3.1 reviews the high-level trends after adding experience data for year 2017 to the data set for the period 2009-2016. Section 3.2 examines differences in mortality patterns by Product Group, where product groups are defined as Perm (Whole Life and closely related products), Term, and UL. Section 3.3 dives into mortality differences by Risk Class. Section 3.4 takes a closer look at older age (attained age >65) mortality. Section 3.5 continues to examine the recent trend of worsening mortality of the millennial and younger generations. Beyond this report, the subgroup will be focusing more attention towards accelerating the rollout of experience data and reporting of upcoming experience years.

As noted previously in this report, A/E results shown in this report are calculated on a face amount basis with the 2015 VBT table used for expected amounts. Every graph in this section that shows A/E results is accompanied by a graph indicating shifts in the underlying population. The main metric used for reflecting population composition is the expected claim amounts, which captures both volume of business and age/gender composition without the volatility typical for actual claims. Depending on the focus of the graph, the expected claim amounts are shown in terms of actual amounts or proportions of the total. Note that calculation of the expected claim amounts does not use mortality improvement.

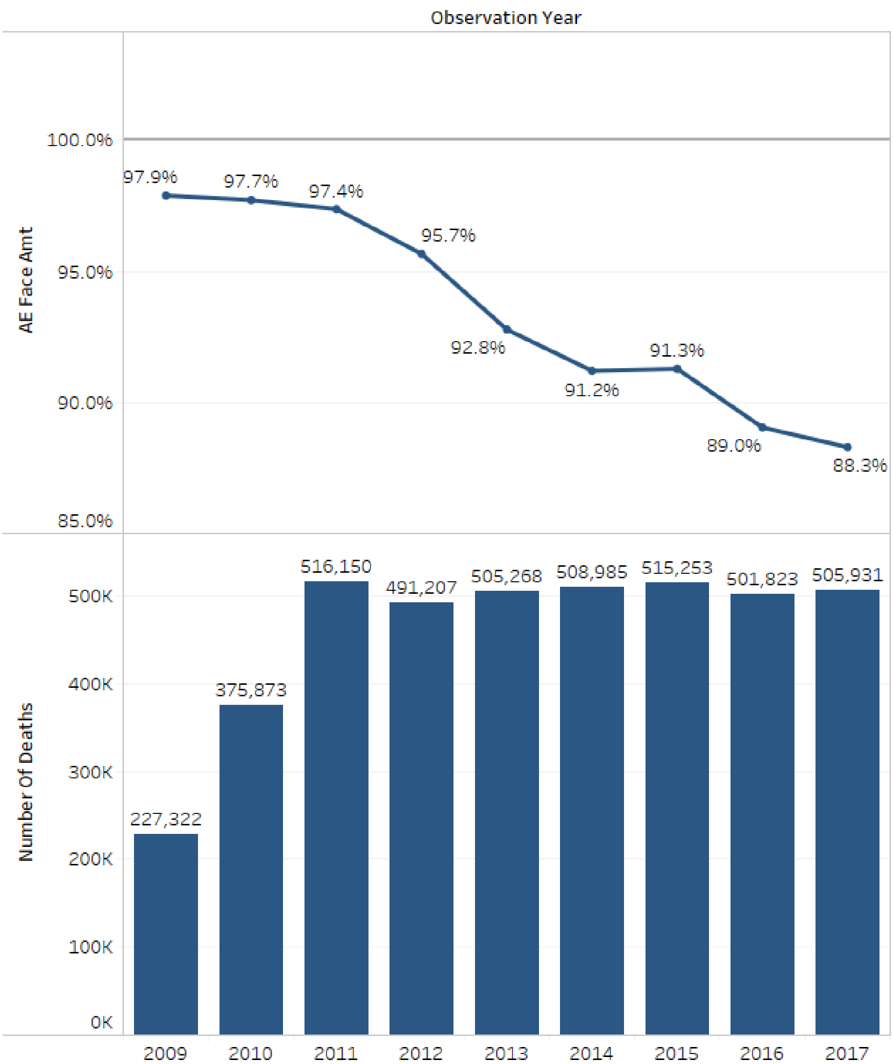
Please note the 2015 VBT table was developed primarily with experience from 2002-2009, with adjustments and improvement applied as appropriate. Differences in company participation between the 2015 VBT experience and the current study may be contributing to the deviation of the actual mortality experience from the expected.

The terms "improvement" and "disimprovement" have been used generically within this document when comparing changes or trends in mortality results over time. The reader should understand that the use of this term does <u>not</u> imply any connection to a formal mortality improvement measure, as the mortality trends observed through the 2009-2016 study years are also greatly influenced by differences in mix of business, changes in underwriting, and changes in the companies that contributed data, among other items

3.1 HIGH LEVEL TRENDS FOR 2017 STUDY YEAR VS 2009-2016 STUDY YEARS

The first step in the analysis is to observe the trend in aggregate mortality experience by calendar year. The graph below shows fully aggregated A/E mortality ratios by face amount for the full study period, 2009-2017. The lower section of the graph shows the actual number of deaths contributing to the A/E calculation.

Figure 1
AGGREGATE MORTALITY EXPERIENCE BY OBSERVATION YEAR



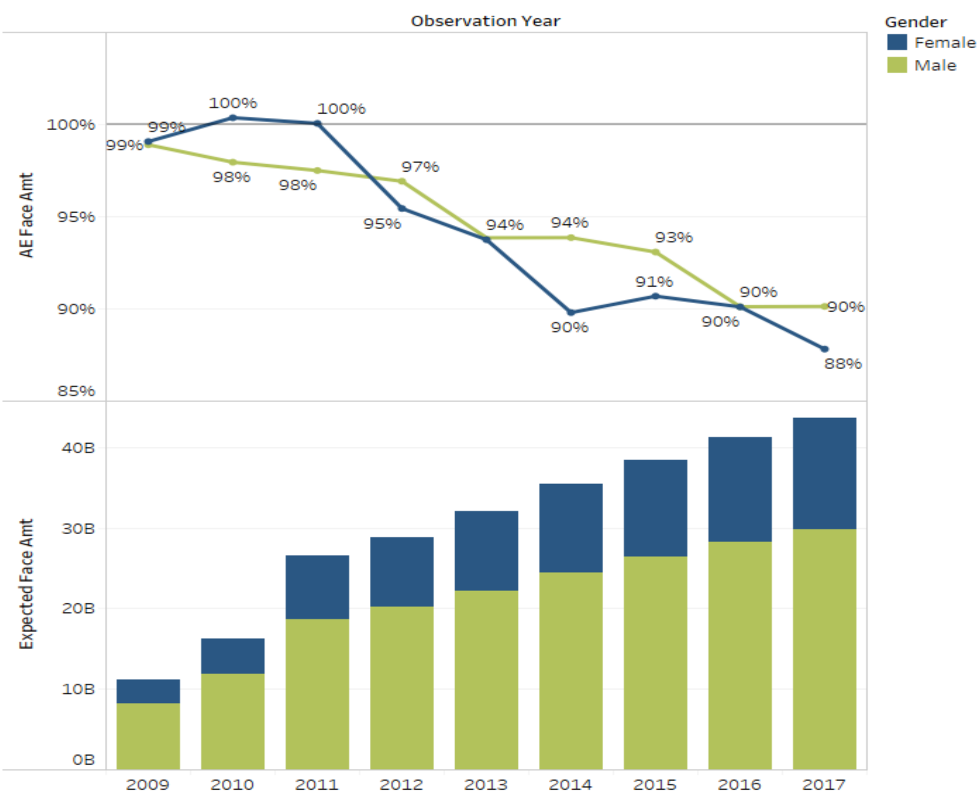
Observations:

- The actual number of deaths portion of the graph illustrates the amount of data available for each calendar year. The amount of data in this graph is captured in a standard metric of the number of deaths, which is often used as a measure of credibility. The number of deaths in the given observation period increased significantly between years 2009 and 2011. The increase appears to be proportional to the increase in the number of contributing companies as summarized in Figure 2. The number of contributing companies increased again in 2014, but the number of deaths didn't seem to increase. There are many plausible explanations for this dynamic, but the committee does not get company-level information in order to determine what has driven the numbers.

- The aggregate mortality A/E ratios decline slowly and steadily between 2011 and 2017.
- Contrary to some recent mortality observations for general population (https://www.soa.org/resources/research-reports/2019/us-pop-mort-prev-2018-exp/) this graph doesn't indicate a mortality deterioration (increase) trend. This may be explained by the nature of the insured population, which has a higher proportion of educated, employed and affluent individuals. It is also possible that the decreasing trend is a result of population shift in the direction of the lower mortality segments, such as better risk classes. The analysis in later sections of this report revisits mortality improvement / disimprovement patterns on the subsegment level to better control for the distribution shift factor in the aggregate trend.

In addition to an analysis by observed year, an analysis by gender was performed. Note that in this and subsequent graphs, the lower part of the graph shows expected face amounts for each year as they provide a better representation of claim distribution.

Figure 2
MORTALITY EXPERIENCE BY GENDER



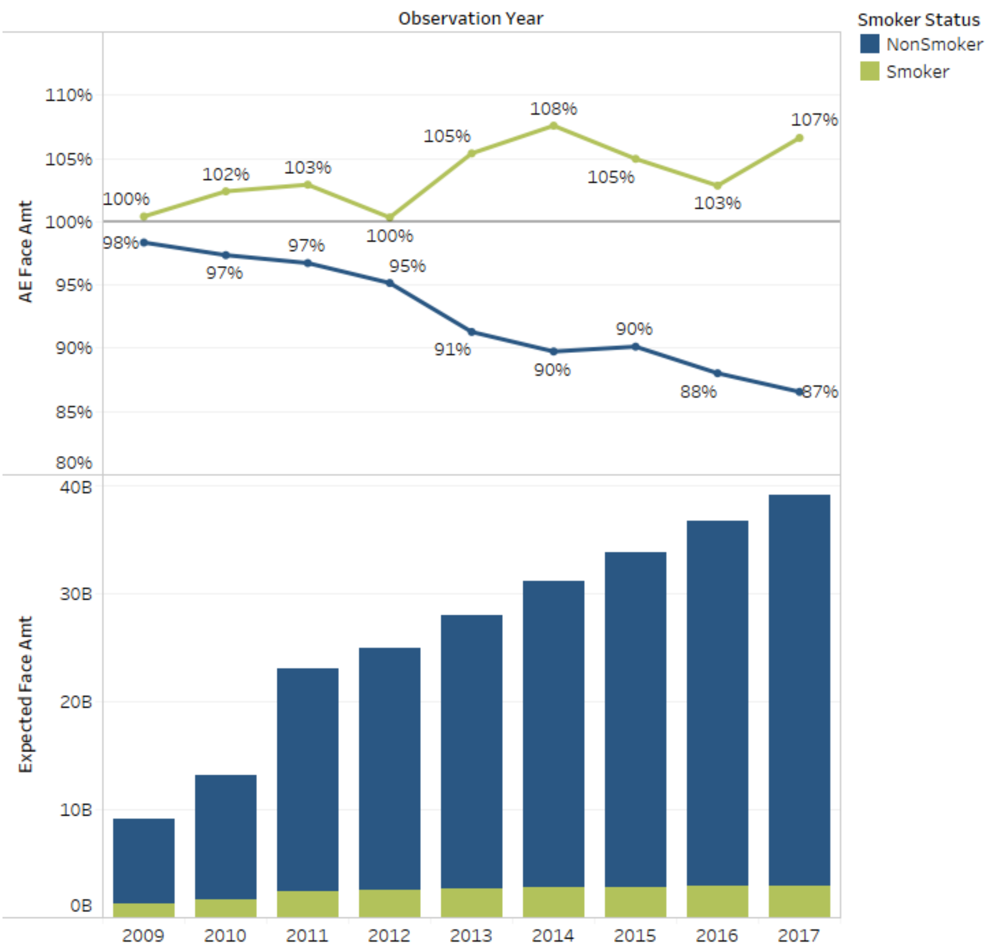
Observations:

- The expected claim amount portion of the graph indicates that the relative distribution of females increased over time as the amount of male expected claims grew at a slower rate than the amount of female expected claims.
- The A/E ratios for both males and females declined by about the same percentage between the beginning and the end of the study period, but the pattern of the female mortality curve is not as smooth. This, in part, can be explained by a smaller amount of data for the female population, which contributes to more volatility. Overall,

the graph doesn't indicate that mortality for one of the genders has a very different improvement / disimprovement pattern.

The next natural data split is by smoker status since this is still one of the two main dimensions in the standard actuarial tables.

Figure 3
MORTALITY EXPERIENCE BY SMOKER CLASS



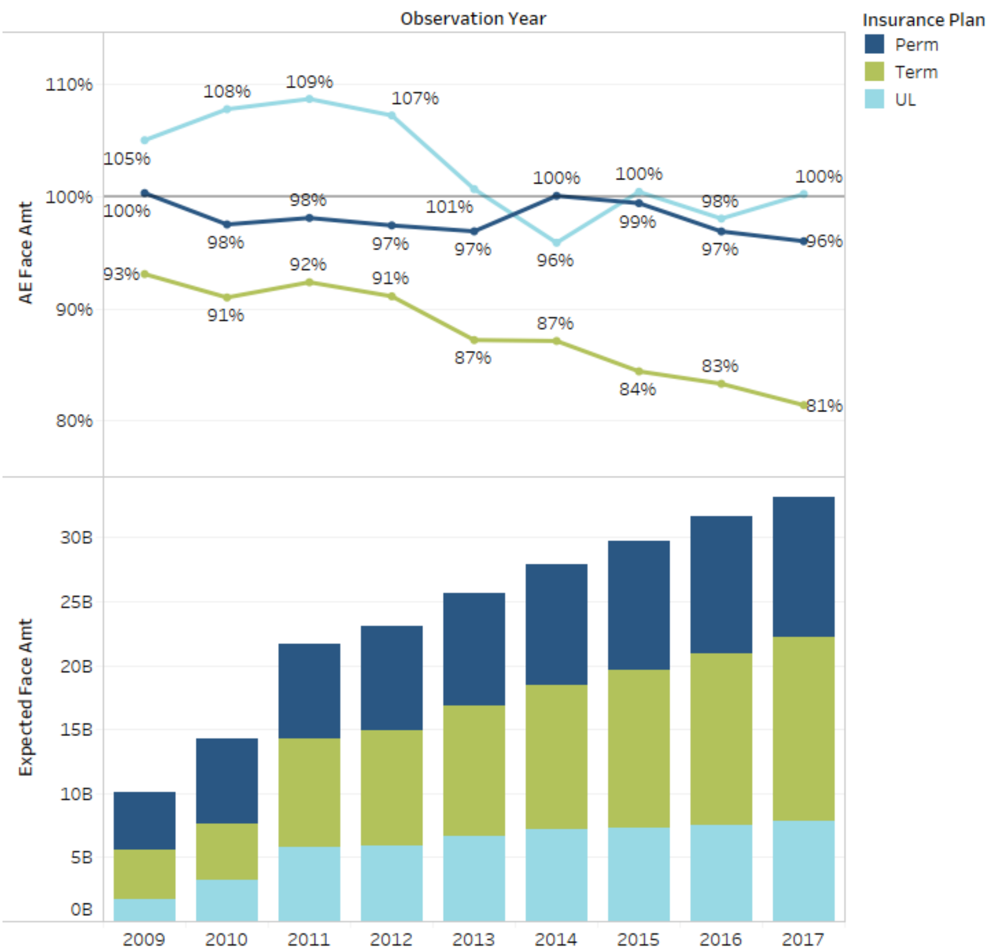
Observations:

- Smoker classes represent a very low percentage of the total population and the percentage is decreasing over the observation period.
- At the beginning of the observation period, both smoker and non-smoker segments have A/E ratios of close to 100%, but the non-smoker population demonstrated a continuously decreasing trend over the whole observation period, while the smoker population has a mildly increasing trend. This may suggest that the segments of the general population that have been experiencing negative shifts in mortality due to known recent societal problems, such as the opioid epidemic, are present to a higher extent in the smoking population. However, additional work would be needed to validate this suggestion.

3.2 TRENDS BY PRODUCT GROUP

This subsection examines the question frequently raised by the practitioners – is there an inherent difference in mortality between different product groups and, if so, in what segments are they concentrated? The first graph in this section examines the difference in aggregate mortality by product group.

Figure 4
MORTALITY EXPERIENCE BY PRODUCT *



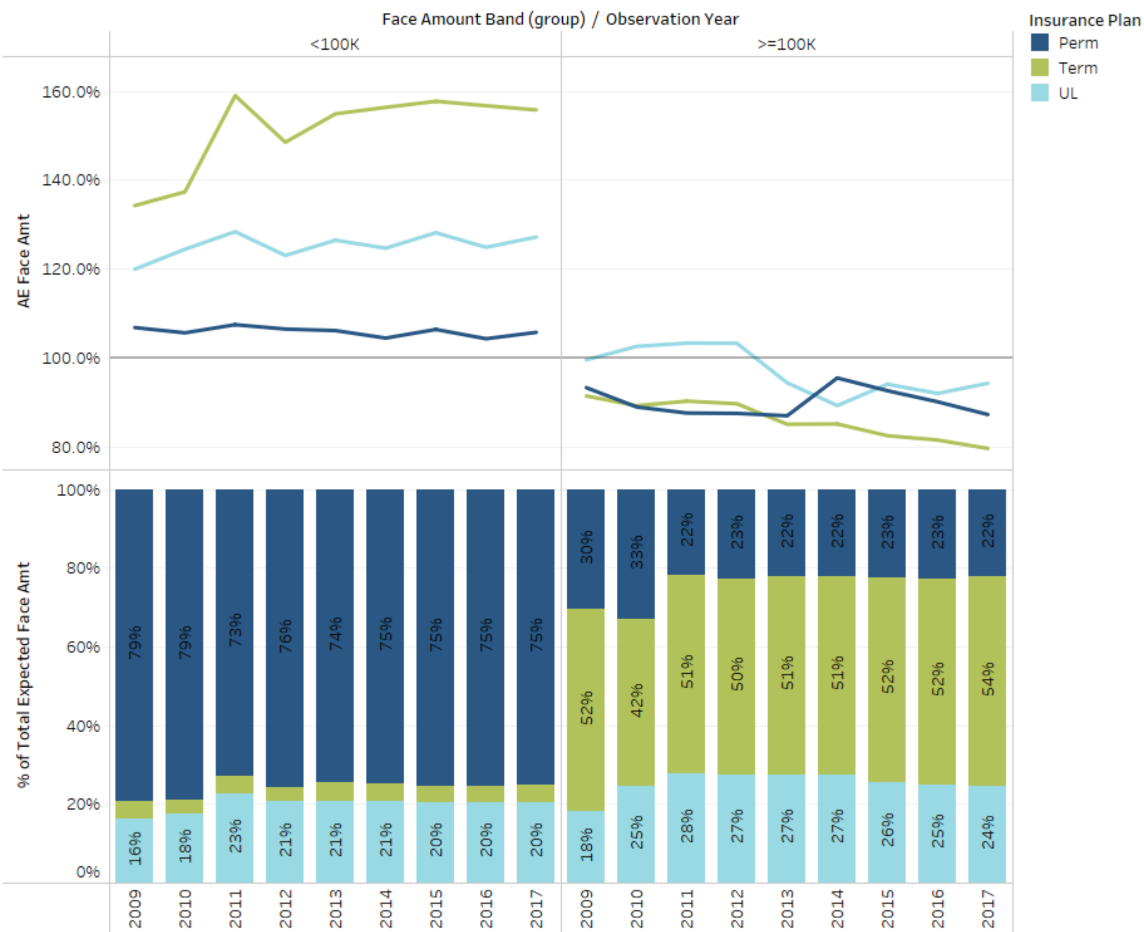
* Note that the "Perm" segment is also referenced as WL (Whole Life) throughout this report. (Additional details can be found on the Plan Code Mapping tab of the data specifications that accompany this report.)

Observations:

- The Term product group has the largest proportion of expected claims in all years. This is due to the generally larger face amounts of Term policies.
- In aggregate, Term mortality is significantly lower than WL and UL mortality. The main explanation for this, as will be shown later, appears to be due to the larger proportion of the high face amount policies in the Term population, which generally has better mortality.
- The Term product group also has the most pronounced A/E reduction pattern; there is a much smaller A/E reduction for WL and UL.
- The levels of mortality for the WL and UL product groups are very similar beginning in the year 2013. Prior to that, UL mortality is significantly higher.

Since distribution by face amount band is a significant factor in explaining mortality differences by Product Group, the next graph adds a Face Amount dimension to the previous data view by splitting it around the $100K Face Amount level. Most companies significantly enhance their underwriting requirements for policies above $100K; therefore, it is reasonable to expect higher levels of anti-selection for smaller policies. The smaller policies could also reflect the potentially higher mortality effect of the lower socio-economic class.

Figure 5
MORTALITY EXPERIENCE BY PRODUCT AND FACE AMOUNT



Observations:

- As is demonstrated in the lower portion of the graph, the distribution of the Term business is skewed very heavily towards higher face amounts. The distribution of UL business is slightly skewed towards larger face amounts. The WL business has significantly higher representation in the low face amount segment.
- For all products, there is a very pronounced difference between mortality for low and high face amount segments. As was discussed earlier, the larger representation of Term business in the high face amount segment to a large extent explains the lower overall Term mortality.
- In the lower Face amount segment, there is a pronounced mortality difference between the three product groups. It is possible that less stringent underwriting requirements allow not only for higher anti-selection

across the board, but also for more self-selection by product type. For example, individuals that have an acute need for protection might steer towards cheaper products.

- In the higher face amount segment, the difference between Term and other products is less pronounced than in the aggregate view in Figure 4. There is still a stable 15%-20% difference between UL and Term product groups, but WL appears to be very similar to Term in all years prior to 2014. The shift in WL mortality in 2014 is a little unusual and can potentially be explained by the shift in contributing companies that occurred in 2014.
- In the lower face amount segment, we don't see mortality improvement patterns for any of the products But, in the high face amount segment, WL exhibits a mortality decrease in two separate intervals – 2009-2013 and 2014-2017. UL also demonstrates a more pronounced overall mortality decrease in the higher face amount segment than in the lower face amount segment. If reasons for decreasing mortality improvement – such as obesity and opioid addiction - are more represented in the lower face amount population, this could explain this result.

The next graph revisits the previous graph, but this time it lays out mortality experience by policy duration rather than by calendar year.

Figure 6

MORTALITY EXPERIENCE BY PRODUCT, FACE AMOUNT, AND DURATION

Observations:

- Consistent with Figure 5 in the low face amount segment, the Term mortality curve is higher than the other two products. This is likely due to anti-selection, with the impact being much higher in early durations and then wearing off, but it remains higher for all the durations shown. For whole life, mortality improves continuously into the later durations, reaching almost a 100% level by duration 30. Universal life product group mortality remains at a stable high level in durations 10+.
- In the high Face Amount segment, it becomes apparent that all higher than expected UL mortality observed in Figures 4 and 5 is concentrated in late durations. The Term mortality curve has an upward tail in late durations, but that almost appears as a spillover from Post-Level Term cases which were misidentified in the data submission. The number of these cases is very small and shouldn't impact other conclusions of the analysis in this report. However, this odd dynamic was brought to the attention of the statistical agent for further review.
- Once Term mortality is split into subgroups by face amount and duration, the difference in A/E appears more muted compared to the previous two graphs.

The purpose of the next graph is to glean to what extent the difference in product mortality could be attributed to the difference in age distribution. The graph adds the attained age dimension to the previous graph. If age distribution is the main cause for the difference in aggregate product mortality, then we might expect matching levels of mortality for all products within the age groups, but varying levels of mortality between the age groups.

Figure 7a

MORTALITY EXPERIENCE BY PRODUCT, FACE AMOUNT, AND ATTAINED AGE GROUP (FACE < 100K)

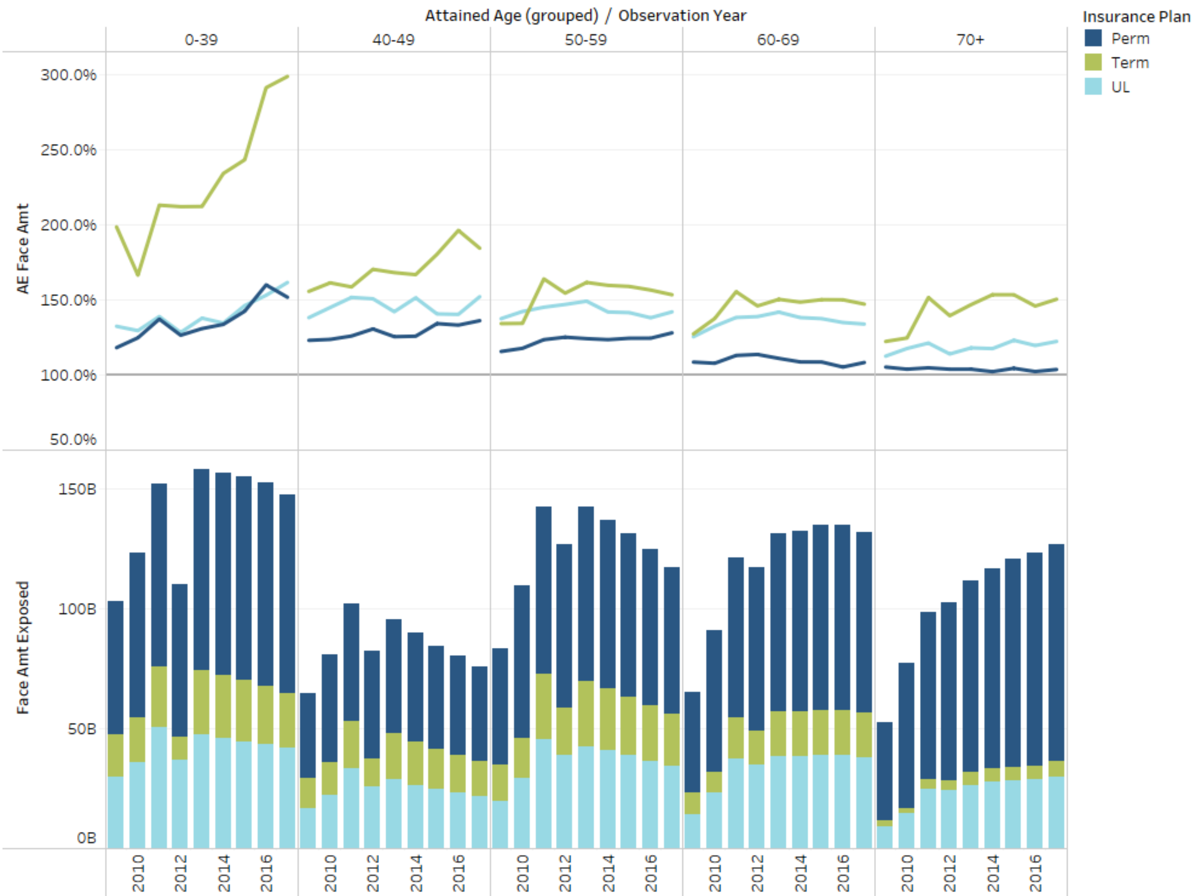
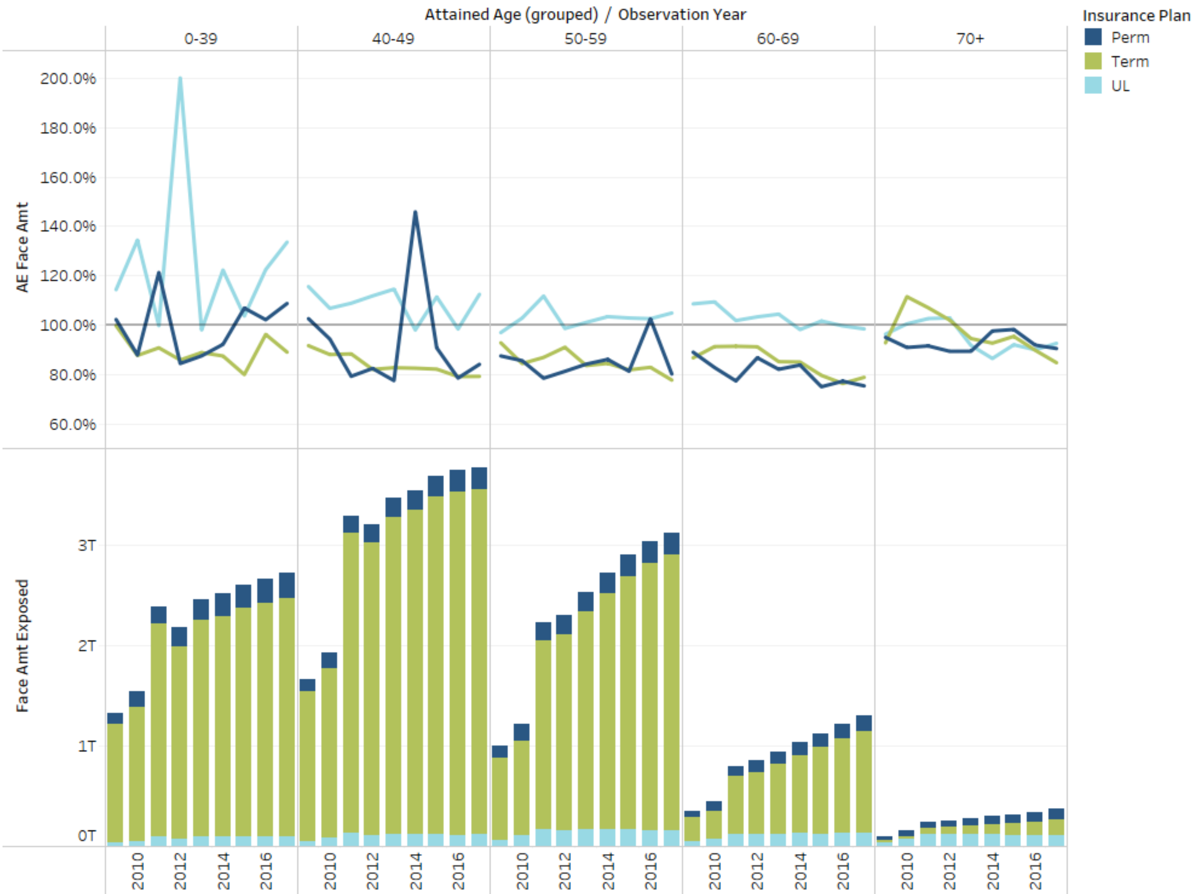


Figure 7b

MORTALITY EXPERIENCE BY PRODUCT, FACE AMOUNT, AND ATTAINED AGE GROUP (FACE >= 100K)

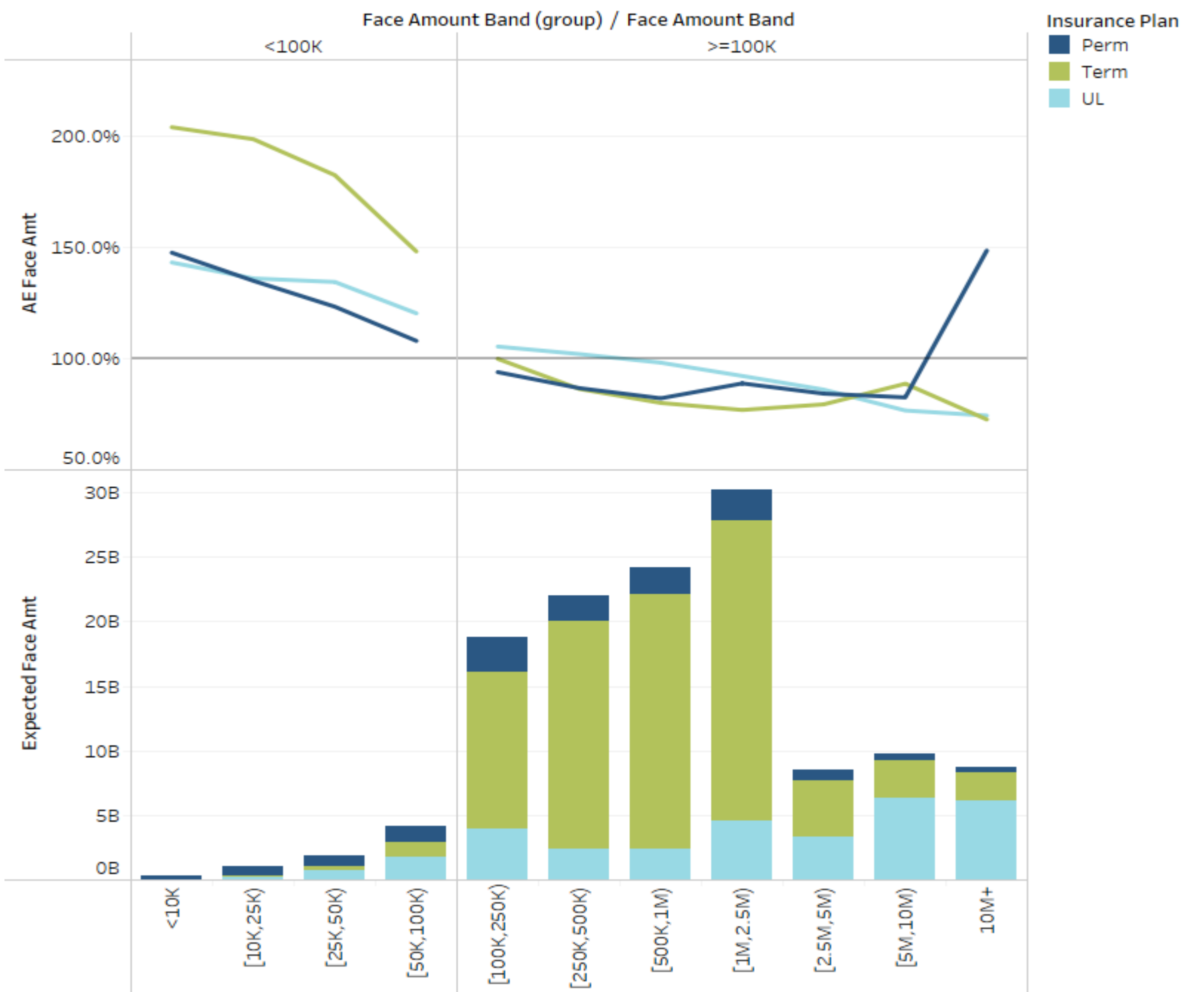


Observations:

- In the low Face Amount segment, Term mortality is clearly higher for all age groups. This suggests that distribution by age is not the main cause of the overall higher Term mortality. But it is also clear that Term mortality is especially high for younger ages. For the age groups 20-29 and 30-39, term mortality has a potential disimprovement pattern.
- Also, in the low Face Amount segment, we can observe that UL mortality is higher than WL in age groups older than 40. At the younger ages, there doesn't seem to be any difference between UL and WL for this view. Overall, we also have indications that the difference between UL and WL mortality may not be materially driven by age distribution.
- For the high face amount segment, the difference between Term and UL is present in all age groups and, therefore, it appears that it cannot be attributed to the age distribution. However, the difference between Term and WL is barely noticeable and, therefore, we can probably assume that age distribution is a significant factor in explaining the difference in the previous two graphs.

The next graph explores the difference between the product groups by face amount. The objective is the same as before – to glean whether the experience from the following view suggests further investigation into whether a difference actually exists. If the difference between products for each band is minimal, while the difference between bands is pronounced, a different distribution can impact the overall comparison.

Figure 8
MORTALITY EXPERIENCE BY PRODUCT AND FACE AMOUNT



Observations:

- For low face amounts, the difference between Term and other products is very significant and stable through all bands. The difference between UL and WL is also fairly clear in bands over $25K.
- In the high Face Amount section, WL and Term seem to overlap in face bands under $1M. For face amount bands over $1M, the differences get blurred. UL mortality seems clearly higher than Term and WL between $100K and $1M for this subgroup view against the VBT15 table

3.3 TRENDS BY RISK CLASS

Over the last 30 years, the life insurance industry underwent a dramatic evolution of the risk class structure. From the early 1980s, the number of non-substandard risk classes slowly increased from one to three or four for many companies. At this time, a sufficient amount of experience has been accumulated to evaluate mortality experience for these different risk class structures. This section of the report explores the surface of the following questions:

- How does mortality differentiation vary for different risk class structures?
- Does mortality differentiation between the risk classes wears off over time and to what extent?

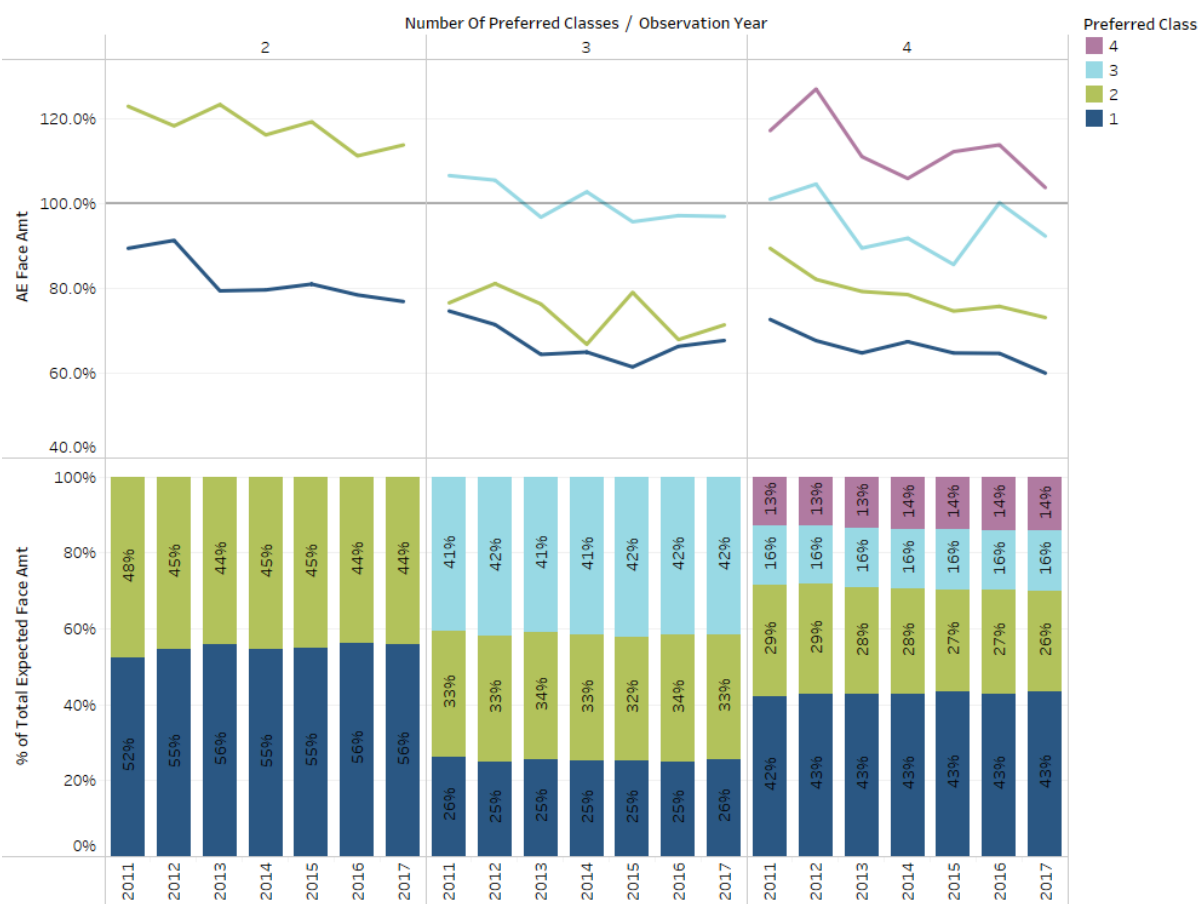
Beyond what is in the data, the user must also consider items that are out of the scope of this report, such as:

- How the proliferation of preferred affected the mortality by class for those issue years.
- Changing preferred and standard criteria
- Table shave eras
- Life settlement dynamics

The SOA data includes experience by risk class structure – specifically, it includes a number of non-smoker risk classes under which every policy was issued. The next graph summarizes mortality for three different risk class structure – two, three, and four non-smoker classes – and tracks it by calendar year. Note that population distribution by risk class is shown for each risk class structure.

Figure 9

MORTALITY EXPERIENCE BY RISK CLASS STRUCTURE (NON-SMOKERS)

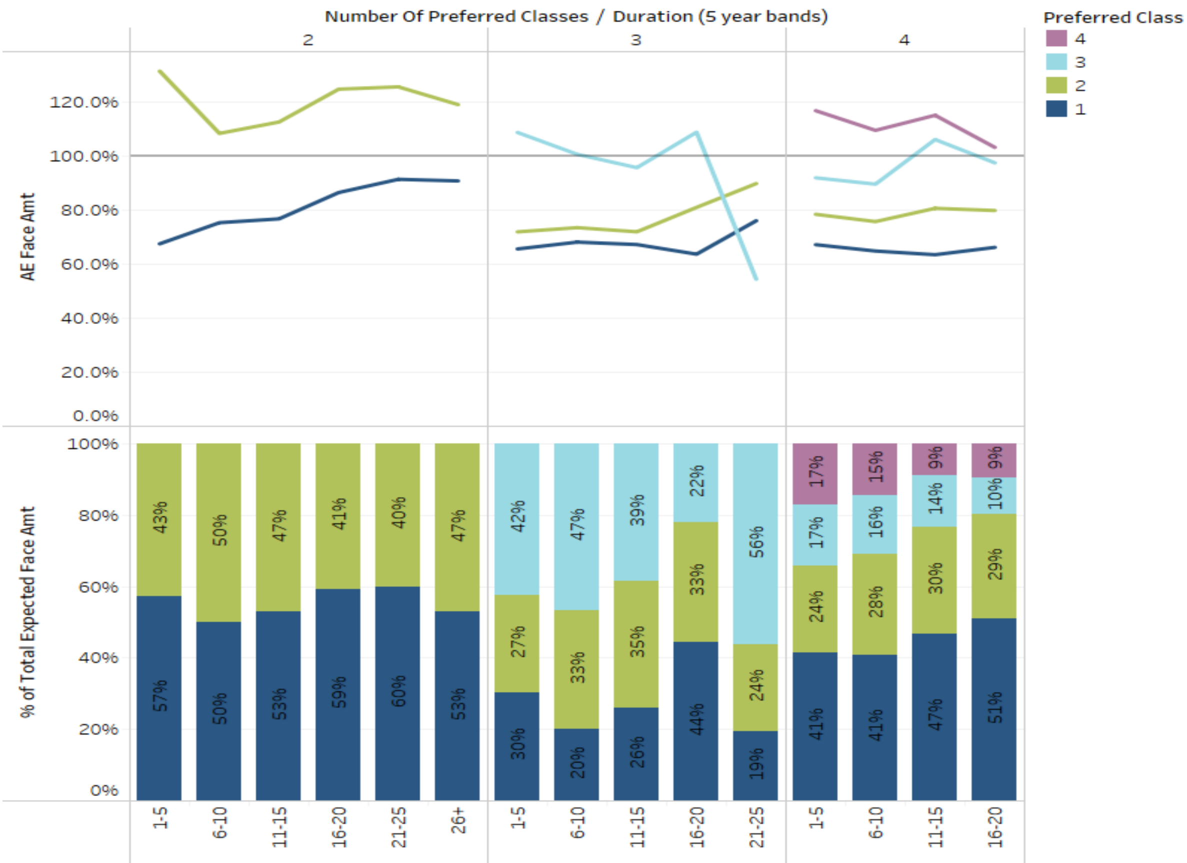


Observations:

- According to this graph the change in the risk class structure progressed as follows:
    - Between the two risk class structure and the three class structure, the distribution of the worst class remained almost the same and the better class was split into two and
    - Between the three risk class structure and the four risk class structure, the distribution of the best class increased significantly, the distribution of the second best class remained almost the same, and the remaining percentage was split into two small classes.
- Note that since the distribution here is measured in terms of expected claims, and mortality rate is higher for worse classes, the distribution on the exposure basis would be shifted more towards better classes.
- The mortality differentiation in the four risk class structure meets desired characteristics for a risk class structure – the mortality curves are clearly separated and spread at even distance from one another. The two risk class structure has similar experience, but the risk class structure doesn't have sufficient differentiation between the two better classes.

The next graph tracks the same experience as in the previous graph by duration to observe convergence patterns. The standard assumption in the industry has been that the mortality for risk classes should converge over time as underwriting wears off. This graph begins to examine this assumption for the provided aggregate views. Further analysis is recommended to determine whether the relationship would still hold across other variables on a multivariate basis, i.e., with other characteristics being equal.

Figure 10
MORTALITY EXPERIENCE BY RISK CLASS STRUCTURE AND DURATION (NON-SMOKERS)



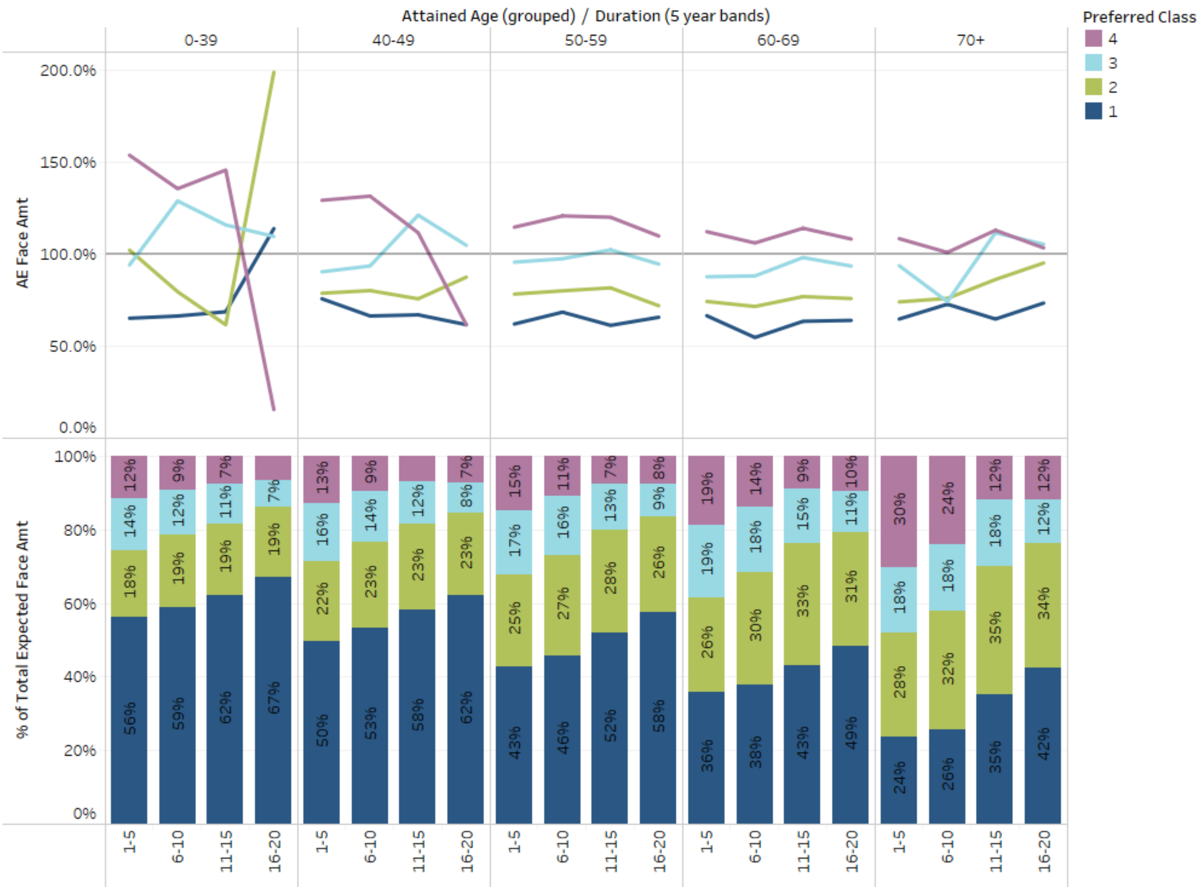
Observations:

- In the two risk class structure, the better risk class mortality appears to narrow with the worse class over time.
- In the three risk class structure, the two better classes don't show signs of convergence until duration 11, while the worst class begins the convergence pattern from the very beginning. In durations 16+, we see general signs of convergence.
- In the four risk class structure, the better risks remain at their lower levels of mortality through duration 20. This supports a theory that risk selection may not have a regular wear-off pattern. Better risks are selected based on the characteristics that may have long-term effects and influence mortality levels for long periods of time.

The next graph goes a little deeper still – it attempts to determine if, for the four risk class structure, convergence patterns vary by age. The general hypothesis is that, for older ages, the effect of class selection is more difficult to achieve and sustain over a period of time.

Figure 11

MORTALITY EXPERIENCE BY RISK CLASS STRUCTURE, ATTAINED AGE GROUP, AND DURATION (NON-SMOKERS)



Observations:

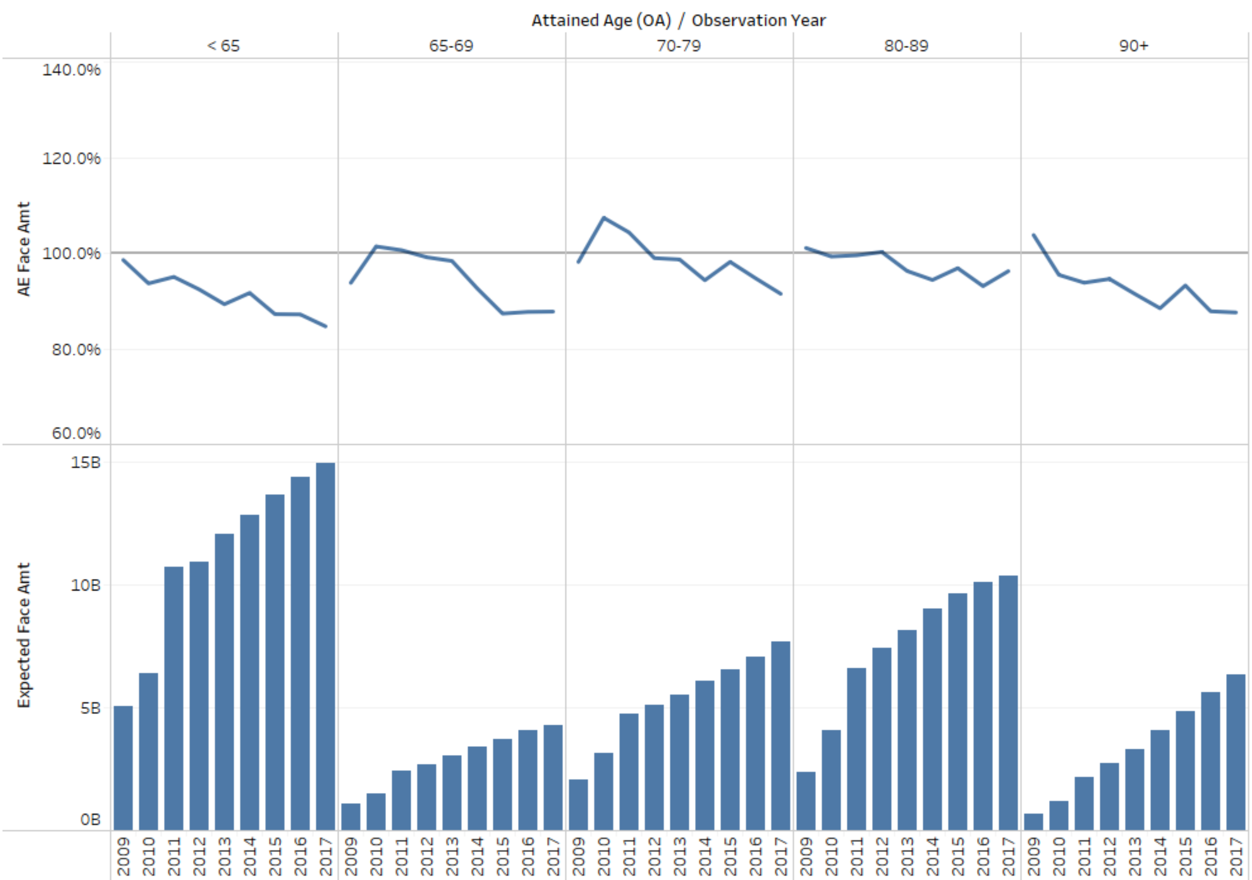
- The main observation is that, for all ages with a reasonable amount of data – between 40 and 80 – there are no clear signs of convergence between risk classes based on these views. For ages 80-89 (not shown), we see a sharp disimprovement in the late durations. This indicates that risk class selection may not wear off until very old, attained ages.
- An additional observation is that the worst risk class has a more pronounced difference from the other three classes at younger ages – at older ages, it's overall level is more similar to the remainder of the population.

3.4 OLDER AGE ANALYSIS

An older age analysis is often done to provide special insights into experience for the older age population. For the industry as a whole, this segment was marketed to much more recently, with a significant increase beginning in the early 2000's. In addition, with the aging of the baby boomer population, many companies now have a great deal of exposure at older attained ages from policies issued many years ago. This results in their being sufficient data available for analysis by attained age as well.

Results for this subgroup were further examined across all observation years by attained age. A common trend of generally decreasing A/E ratios was observed. Multiple factors contribute to the changes of mortality over time, including changes in the average duration, changes in policy size, changes in underwriting, mortality improvement/deterioration, changes in the average age within the age group, changes in issuing company, etc.

Figure 12
MORTALITY EXPERIENCE BY ATTAINED AGE GROUP



Observations:

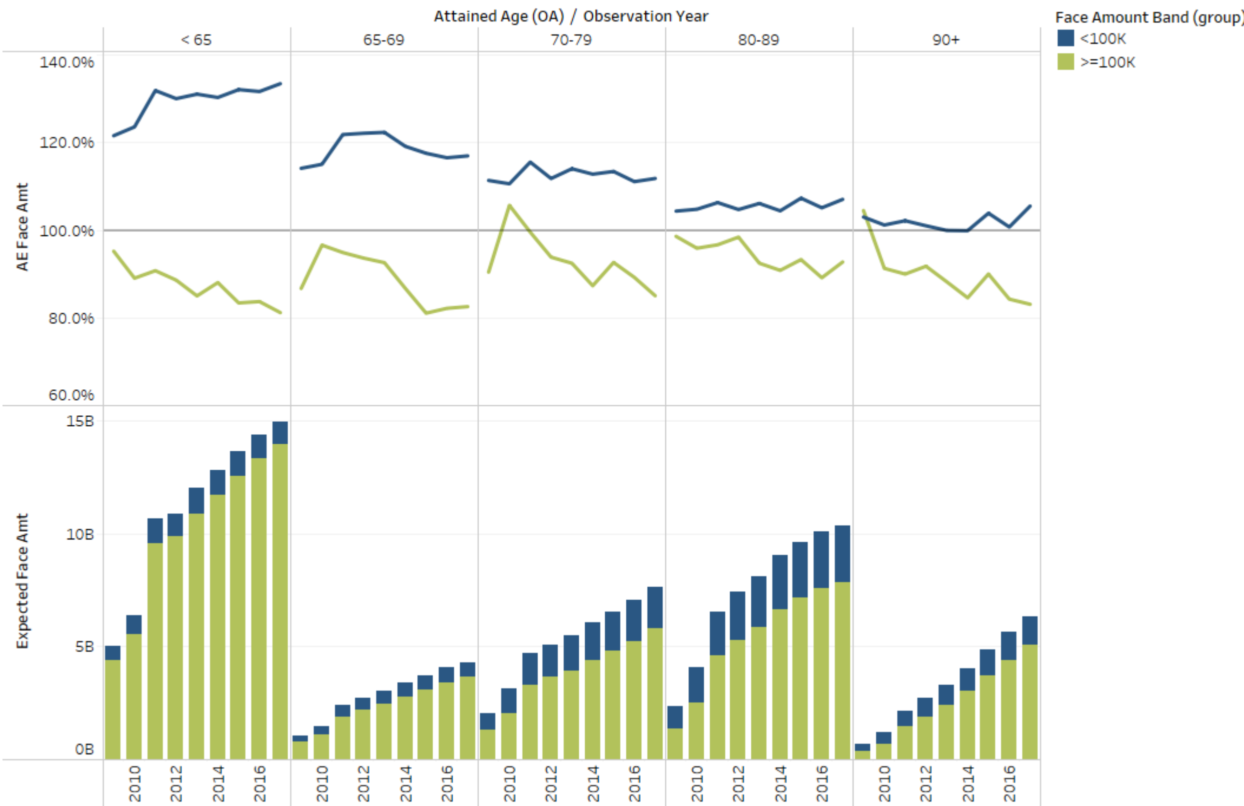
- In terms of the death claim amounts for ages 65+, attained ages 80-89 have the highest distribution and probably most experience, which is reasonable given a high mortality rate at these ages. At ages 90+, there is less experience, which also makes sense given that there is less remaining exposure after age 89.
- Older attained ages seem to exhibit a fairly good fit to the VBT table for this aggregate view – they all have smaller deviations from the 100% line than attained ages <65.

- Older attained ages demonstrate some level of decreasing A/E during the study period, but the slope is less pronounced than for attained ages <65.

The next graph explores the gap between mortality for low and high face amounts by age group. It begins to examine the question of how anti-selection, due to less stringent underwriting among other factors, affects older ages.

Figure 13

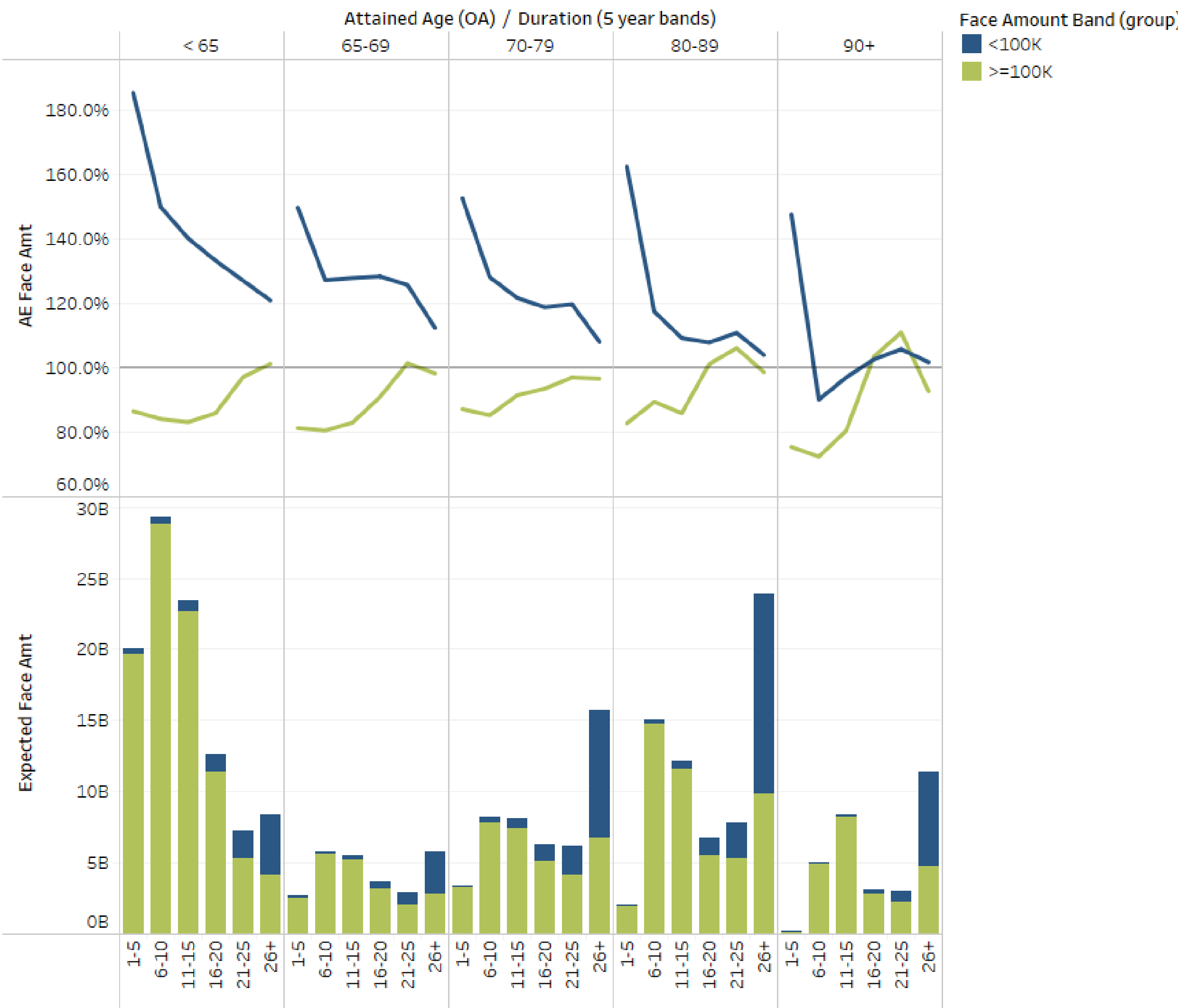
MORTALITY EXPERIENCE BY ATTAINED AGE GROUP, FACE AMOUNT, AND OBSERVATION YEAR



Observations:

- For low face amounts, the actual to expected mortality level declines significantly by age. One possible explanation is that the level of anti-selection is less pronounced at older ages.
- For higher face amounts, there is a less clear relationship between actual to expected mortality levels and age.
- Overall, there appears to be less differentiation between low and high face amount mortality for older ages.

Figure 14
MORTALITY EXPERIENCE BY ATTAINED AGE GROUP, FACE AMOUNT, AND DURATION



3.5 YOUNGER GEN-X/OLDER MILLENNIAL POPULATION EXPERIENCE

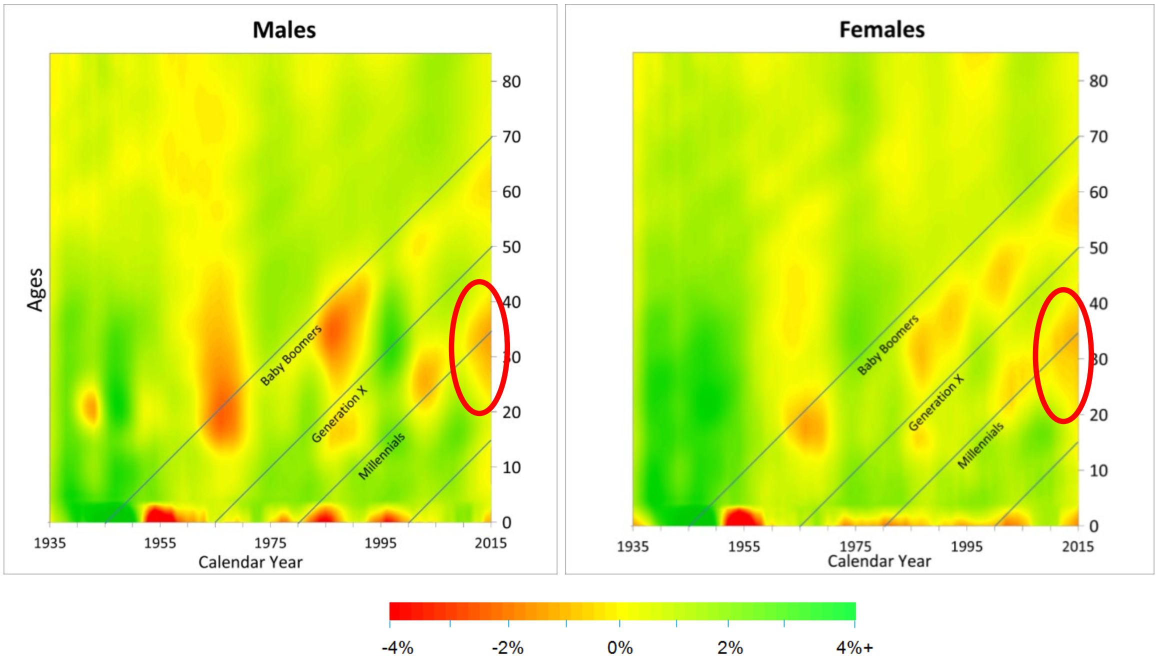
We have repeated our analysis from last year's report for this population group. No additional updates have been made at this time.

A disconcerting trend in the U.S. population since around 2010 has been the deterioration of mortality for younger Gen-X and older Millennial cohorts. This can be seen in the following heatmap, based on U.S. Human Mortality Database (HMD)[1] experience smoothed by averaging over five years and five ages.

[1] Human Mortality Database. University of California, Berkeley (USA) and Max Planck Institute for Demographic Research (Germany). Available at www.mortality.org or www.humanmortality.de (data downloaded on 9/25/2017).

Figure 15

HEAT MAP SHOWING MORTALITY IMPROVEMENT BY BIRTH COHORT



In fact, as a quick indication of how dire the mortality improvement was for the group, taking just the arithmetic average of U.S. HMD male mortality improvement for ages 25-39 in year 2015 produces a mortality improvement rate of -10.8%.

As for what may be causing the aforementioned mortality deterioration, by examining the leading causes of death in the U.S. population, we see opioid deaths (which are the leading contributor to 'unintentional injury' deaths), as well as suicides, are the leading contributors to deaths for said cohorts. This provides an indication the deaths are more behavioral than physiological.

Figure 16
LEADING CAUSES OF DEATH

10 Leading Causes of Death by Age Group, United States – 2015

Rank	<1	1-4	5-9	10-14	15-24	25-34	35-44	45-54	55-64	65+	Total
1	Congenital Anomalies 4,825	Unintentional Injury 1,235	Unintentional Injury 755	Unintentional Injury 763	Unintentional Injury 12,514	Unintentional Injury 19,795	Unintentional Injury 17,818	Malignant Neoplasms 43,054	Malignant Neoplasms 116,122	Heart Disease 507,138	Heart Disease 633,842
2	Short Gestation 4,084	Congenital Anomalies 435	Malignant Neoplasms 437	Malignant Neoplasms 428	Suicide 5,491	Suicide 6,947	Malignant Neoplasms 10,909	Heart Disease 34,248	Heart Disease 76,872	Malignant Neoplasms 419,389	Malignant Neoplasms 595,930
3	SIDS 1,568	Homicide 369	Congenital Anomalies 181	Suicide 409	Homicide 4,733	Homicide 4,863	Heart Disease 10,387	Unintentional Injury 21,499	Unintentional Injury 19,488	Chronic Low. Respiratory Disease 131,804	Chronic Low. Respiratory Disease 155,041
4	Maternal Pregnancy Comp. 1,522	Malignant Neoplasms 354	Homicide 140	Homicide 158	Malignant Neoplasms 1,469	Malignant Neoplasms 3,704	Suicide 6,936	Liver Disease 8,874	Chronic Low. Respiratory Disease 17,457	Cerebro-vascular 120,156	Unintentional Injury 146,571
5	Unintentional Injury 1,291	Heart Disease 147	Heart Disease 85	Congenital Anomalies 156	Heart Disease 997	Heart Disease 3,522	Homicide 2,895	Suicide 8,751	Diabetes Mellitus 14,166	Alzheimer's Disease 109,495	Cerebro-vascular 140,323
6	Placenta Cord. Membranes 910	Influenza & Pneumonia 88	Chronic Low. Respiratory Disease 80	Heart Disease 125	Congenital Anomalies 386	Liver Disease 844	Liver Disease 2,861	Diabetes Mellitus 6,212	Liver Disease 13,278	Diabetes Mellitus 56,142	Alzheimer's Disease 110,561
7	Bacterial Sepsis 599	Septicemia 54	Influenza & Pneumonia 44	Chronic Low Respiratory Disease 93	Chronic Low Respiratory Disease 202	Diabetes Mellitus 798	Diabetes Mellitus 1,986	Cerebro-vascular 5,307	Cerebro-vascular 12,116	Unintentional Injury 51,395	Diabetes Mellitus 79,535
8	Respiratory Distress 462	Perinatal Period 50	Cerebro-vascular 42	Cerebro-vascular 42	Diabetes Mellitus 196	Cerebro-vascular 567	Cerebro-vascular 1,788	Chronic Low. Respiratory Disease 4,345	Suicide 7,739	Influenza & Pneumonia 48,774	Influenza & Pneumonia 57,062
9	Circulatory System Disease 428	Cerebro-vascular 42	Benign Neoplasms 39	Influenza & Pneumonia 39	Influenza & Pneumonia 184	HIV 529	HIV 1,055	Septicemia 2,542	Septicemia 5,774	Nephritis 41,258	Nephritis 49,959
10	Neonatal Hemorrhage 406	Chronic Low Respiratory Disease 40	Septicemia 31	Two Tied: Benign Neo./Septicemia 33	Cerebro-vascular 166	Congenital Anomalies 443	Septicemia 829	Nephritis 2,124	Nephritis 5,452	Septicemia 30,817	Suicide 44,193

Data Source: National Vital Statistics System, National Center for Health Statistics, CDC.
Produced by: National Center for Injury Prevention and Control, CDC using WISQARS™.

Centers for Disease Control and Prevention
National Center for Injury Prevention and Control

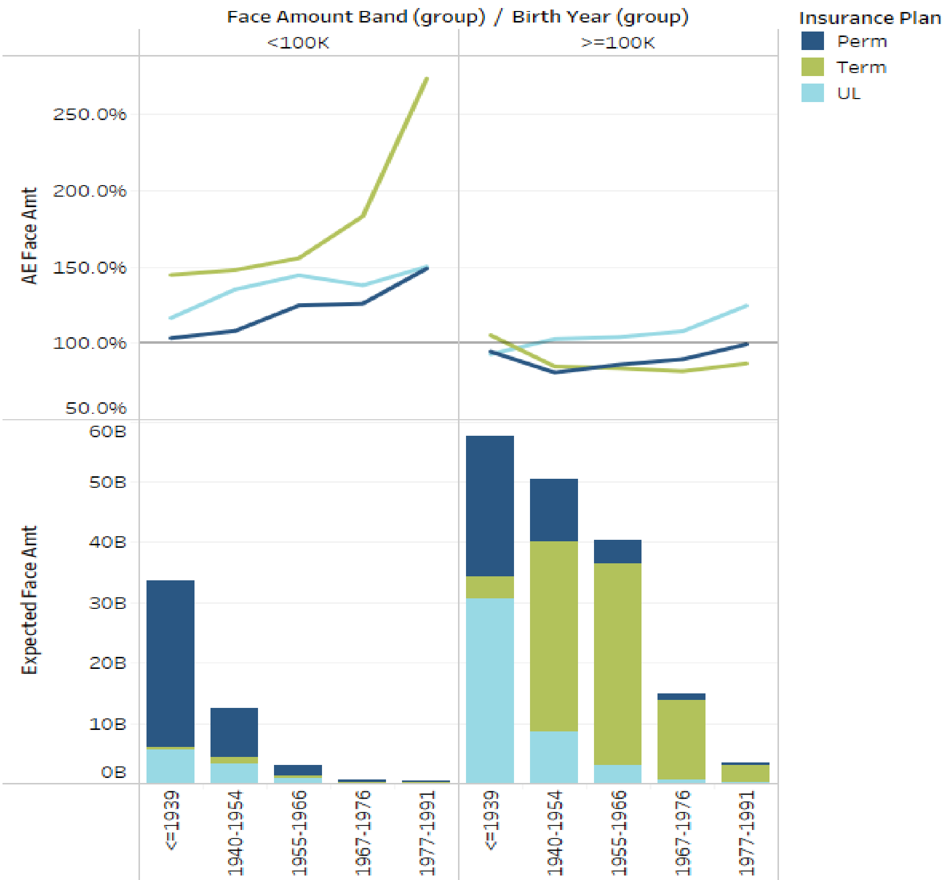
Looking beyond 2015 to U.S. population data up to 2019, it appears as though mortality disimprovement for older Millennials and younger Gen-X peaked around 2015. Since then, the improvement rate for said cohort has improved relative to around 2015. However, the current age group 35-44 in 2019 still experienced mortality disimprovement.

3.6 ANALYSIS BY GENERATION

The analysis in this section focuses on identifying similar trends in the SOA data and pinpointing blocks of business where these trends are most prevalent. The first graph looks at the mortality levels by generation as defined by intervals of birth years. The graph also groups experience by face amount band and splits it by product type. This layout provides for a better connection of this analysis with the previous sections of the report.

Figure 17

MORTALITY EXPERIENCE BY GENERATION AND FACE AMOUNT BAND



Observations:

- The sharply increasing curves for face amount bands - $10-25K, $25-50K, and $50-100K provide an indication of the potentially higher mortality experience for young adults, against the 15VBT table.
- For higher face amount bands, we see a small uptick in mortality for young adults, but it is very small in comparison with the swing for low face amount bands.
- The high young adult mortality seems to be concentrated in the Term product group. As we concluded from our earlier analysis – this product, given its lower price, could be more attractive for anti-selective types of sales in absence of rigorous underwriting.
- Products other than Term – UL and WL - also have an increasing mortality pattern by generation – the youngest generation, for low face amount bands, has A/Es at around 150%.
- For the lowest bands, there is also a sign of high UL mortality for the older generations. This may be reflective of the recent years' reports about increased deaths of despair among middle aged men.

Section 4: 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. ILEC 2009-18 Aggregate 18+ 20210528.xlsx
2. ILEC 2009-18 Preferred 18+ 20210528.xlsx
3. ILEC 2009-18 Term 18+ 20210528.xlsx
4. ILEC 2009-18 Juvenile 20210528.xlsx

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 aggregated into quinquennial groups as is the case in the pivot tables. This delimited file can be read into R, Python, or other software for more detailed analysis.

These files are located on the SOA web page accompanying this report.

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 for 2017 and 2018 along with previously published ILEC data. The observation years refer to the calendar year.

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 2009-2018 period.

In the appendices to this report, which provide statistics on years 2009-2018, 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 5: 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 subgroup is to provide an updated report and data on a frequent and expedited 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 Ed Hui (Chair), Philip Adams (Vice-chair), Tatiana Berezin (Vice-chair), or Mervyn Kopinsky (SOA).

Section 6: 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 the New York Department of Financial Services (NYDFS) and the Kansas Insurance Department (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 prior 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 prior and current 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 easy to identify separately. 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 was 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.

Section 7: Acknowledgments

Report Subgroup, Individual Life Experience Committee

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

Philip Adams, FSA, MAAA

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

Dale Chudnow, FSA, MAAA

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The following associates helped prepare the exhibits for this report:

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Winston He, ASA

Other Resources

The SOA contracted with MIB's Actuarial and Statistical Research Group, to collect, validate, and compile the data underlying this report.

At the Society of Actuaries:

Korrel Crawford, Senior Research Administrator

Mervyn Kopinsky, FSA, EA, MAAA, Senior Experience Studies Actuary

Cindy MacDonald, FSA, MAAA, CERA, Senior Director, Experience Studies

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