SOCIETY OF ACTUARIES®

Mortality and Longevity

2009 - 2015 High Face Amount Experience Report

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2009 – 2015 High Face Amount Experience Report

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CONTENTS

2009 - 2015 High Face Amount Experience Report

Section 1: Purpose

This study and report have the following primary purposes:

1. Compare recent mortality experience on policies with high face amounts to expectations based on standard industry mortality tables at a broad level. High face amounts are defined as $1 million and higher.

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

3. Provide the underlying data in spreadsheet pivot table format for further analysis.

This report is intended for educational purposes only. Please keep in mind that, while this study has a large amount of exposure, the results may not be representative of the full industry. Also, the results may not be applicable to certain situations for a variety of reasons. Finally, please remember that these are historical results and the past may not be reflective of what will happen in the future. An actuary using this report should make his/her own determination concerning the applicability of this information to his/her individual purpose and use. Any comparison of mortality trends should be considered carefully and evaluated with attention to all underlying factors. Results observed may reflect impacts of variables not included in the current analysis, and frequently a deeper dive is necessary for understanding.

Neither the authors, the Project Oversight Group, their employers, nor the Society of Actuaries shall have any responsibility or liability to any person or entity with respect to damages alleged to have been caused directly or indirectly by the content or the use/misuse of this report.

Section 2: Executive Summary

- Actual to expected ratios by amount have generally been declining by study year with a large decrease occurring in 2013 and a slight upturn in 2015.
- Actual to expected ratios by count have been declining more steadily than by amount, but with a slight upturn in 2015 as well.
- Actual to expected ratios are declining based on issue year grouping, with the majority of claims coming in 2000-2009.
- When reviewing 2000-2009 issue years, it can be seen that actual to expected ratios by both count and amount are lower for issue years 2005-2007 than in the issue years before and after those years.
- Actual to expected ratios generally decrease as face amount increases, except for the $2.5M-$5M face amount band.
- For all ages, actual to expected mortality ratios by policy count and face amount increase between durations 11 and 25 and then come down by duration 26. However, the increase based on face amount is not as steep as the increase based on policy count.
- Term and UL/ULSG have more favorable mortality experience than Whole Life and Variable Life products, possibly due to fewer underwriting exceptions being made or the more refined risk underwriting criteria for Term and UL/ULSG, as there are more policies in the 4 nonsmoker risk class structure in Term and UL/ULSG than in WL and VL.
- The A/E ratio is higher for nonsmokers (83.7%) than for smokers (77.3%) relative to their respective expected tables, although the smoker experience is not statistically credible yet.
- Nonsmoker mortality experience for the 3 nonsmoker risk class structure has lower actual to expected mortality ratios than that for the 2 nonsmoker structure, and the 4 nonsmoker structure, in turn, has lower actual to expected mortality ratios than the 3 nonsmoker structure. One hypothesis is that structures with more risk classes were more attractive to potential customers who could qualify for the better risk classes.
- Generally for both sexes, the more selective risk classes yield lower mortality ratios. One exception is that preferred male smokers and standard male smokers had essentially the same level of actual to expected mortality experience (75.0% vs 74.9%).
- Nonsmoker mortality ratios for the best classes of the 3-class structure and 4-class structure are not substantially different. When males and females are combined, the actual to expected mortality ratio for the best class of the 3-class structure (63.3%) is lower than the actual to expected mortality ratio for the best class of the 4-class structure (65.5%).
- Actual to expected mortality ratios show an increase between attained ages 60 and 90, and then a decrease for attained ages 90+. Notably, the actual to expected mortality ratio for female insureds climbs between 18 and 89. When all face amounts (<$1M and $1M+) are included, a similar pattern is seen for females, but the slope is not as steep.
- Comparing mortality experience for policies with attained ages less than 65 to that for policies with attained ages 65 and over, there is a 5.0% difference overall in actual to expected ratios (80.4% for the former group; 85.4% for the latter). When additionally split by sex and tobacco usage, the differences between less than 65 and 65+ seem to be driven by female nonsmokers. When all face amount bands (<$1M & $1M+) are included, a similar result is observed; the mortality ratio for attained ages less than 65 is 2.9% lower than that for policies with attained ages 65 and over. Once again, the results are driven by female nonsmokers.

Section 3: Data

3.1 DATA DESCRIPTION

This section of the report describes the data that was used. The data, which was compiled for the SOA's Individual Life Experience Committee (ILEC), is the same as was used in the Society of Actuaries' 2014-2015 Individual Life Insurance Mortality Experience Report. For the data underlying this report, the ILEC has relied upon the data integrity of the individual company submissions, and the data validations performed by the statistical agent on behalf of those companies and regulators.

The data used in this study is available in Excel pivot tables and also in text delimited files. These files can be downloaded from this web page - https://www.soa.org/resources/research-reports/2019/2009-2015-individual-life-mortality/. More detail on the use and format of these files can be found in Section 5 of the 2014-2015 report, which is also available on this same web page. With these data files, readers may pursue their own detailed analysis as desired. The CSV file provided with the 2009-2013 Individual Life Experience Report contains data from the prior study, anniversary years 2002-2009. If an analysis across all years back to 2002 is desired, the user may append those years from that file to the most recent file.

As with the prior studies of the ILEC, this report examines mortality under standard individually underwritten life insurance and excludes rated, converted, and guaranteed or simplified issued business. 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 has also been filtered to exclude term policies in the post level premium period. For the purposes of this report, data has been filtered to include only experience for policies with face amounts of $1 million or more, unless noted. Also, the data includes only policies written on a smoker-distinct basis, where there are two or more risk classes within the nonsmoker or smoker structure.

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

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

With the calendar-year method, the exposure formulas used are consistent with the Balducci assumption. This approach is commonly used in the industry for life insurance mortality studies.

The data used in the study include 15.7 million policy years and $24.7 trillion of exposure. The number of death claims is 21,187 with a face amount of $44.9 billion. Expected claims based on the 2015 VBT total 25,209 with a face amount of $53.7 billion.

3.2 A/E CALCULATIONS

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 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.

A/E ratios in this report are shown on both an amount and count basis, as indicated. The actuary should be aware of differences in results on amount basis versus count basis, and the volatility associated with each measure.

Section 4: Mortality Experience

4.1 STUDY YEAR

4.1.1 Study Year Mortality Experience by Amount

Table 4.1.1 shows mortality experience by face amount for study years 2009 through 2015.

Table 4.1.1

STUDY YEAR: MORTALITY RESULTS BY FACE AMOUNT, POLICY SIZE ≥ $1M

Study Year	Exposure ($ Millions)	Average Face ($ Millions)	Actual Claims ($ Millions)	Expected Claims ($ Millions)	A/E Ratio (%)
2009	1,272,945	1.49	1,580	1,669	94.7%
2010	2,077,755	1.55	3,213	3,468	92.7%
2011	3,806,983	1.58	6,746	7,611	88.6%
2012	4,038,864	1.59	7,847	8,824	88.9%
2013	4,117,440	1.57	7,117	8,955	79.5%
2014	4,626,480	1.58	8,865	11,370	78.0%
2015	4,737,589	1.58	9,493	11,842	80.2%
Total	**24,678,054**	**1.57**	**44,861**	**53,738**	**83.5%**

The exposure shows a steady increase over the study period, with a reasonably consistent average face amount by study year since 2011. The A/E ratio dropped over 9% from 2012 to 2013, remaining at the lower level for 2014 and 2015.

4.1.2 Study Year Mortality Experience by Policy Count

Table 4.1.2 shows mortality results by policy count. Similar to amount, total claims generally increase by study year as exposures increase. Overall A/E ratios are declining, with 2013 to 2015 hovering around 80%.

Table 4.1.2

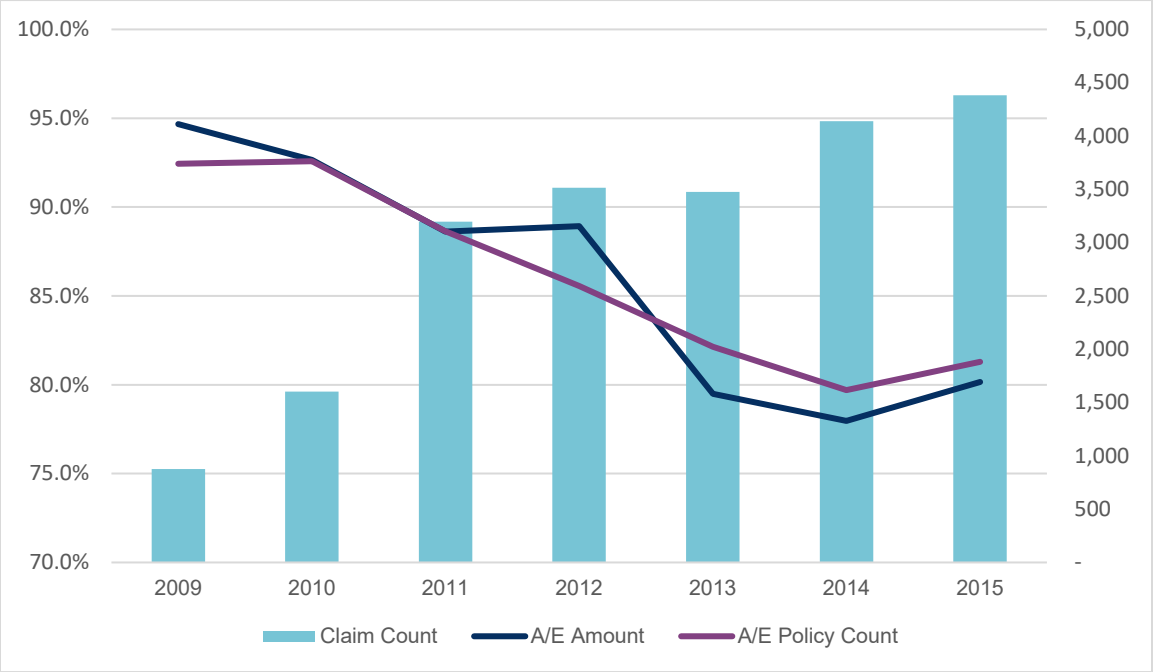
STUDY YEAR: MORTALITY RESULTS BY POLICY COUNT, POLICY SIZE ≥ $1M

Study Year	Exposure	Actual Claims	Expected Claims	A/E Ratio (%)
2009	852,831	876	948	92.4%
2010	1,337,290	1,603	1,731	92.6%
2011	2,412,322	3,196	3,606	88.6%
2012	2,542,283	3,515	4,109	85.6%
2013	2,629,475	3,477	4,233	82.1%
2014	2,922,009	4,138	5,192	79.7%
2015	2,996,625	4,382	5,390	81.3%
Total	**15,692,835**	**21,187**	**25,209**	**84.0%**

Figure 4.1.3 shows A/E ratios by Policy Count and Face Amount. A/E ratios by both amount and policy count showed an uptick in the last observation year, 2015. Face Amount shows more volatility in A/E ratios than Policy Count, which seems reasonable given the size of the policies considered in this study.

Figure 4.1.3

STUDY YEAR: A/E RATIOS BY FACE AMOUNT AND POLICY COUNT, POLICY SIZE ≥ $1M



4.2 ISSUE YEAR

4.2.1 Issue Year Mortality Experience by Amount

Table 4.2.1 shows issue year mortality results by amount. Overall A/E ratios are lower for the 2000 and later issue year blocks than for the pre-1999 blocks. The majority of the exposure is in the 2000-2009 issue year block.

Table 4.2.1

ISSUE YEAR: MORTALITY RESULTS BY FACE AMOUNT, POLICY SIZE ≥ $1M

Issue Year	Exposure ($ Millions)	Average Face ($ Millions)	Actual Claims ($ Millions)	Expected Claims ($ Millions)	A/E Ratio (%)
1980-89	31,013	1.46	434	529	82.1%
1990-99	1,084,540	1.42	6,617	6,667	99.2%
2000-09	15,821,719	1.56	33,823	41,340	81.8%
2010+	7,740,782	1.63	3,988	5,202	76.7%
Total	**24,678,054**	**1.57**	**44,861**	**53,738**	**83.5%**

4.2.2 Issue Year Mortality Experience by Policy Count

Table 4.2.2.1 shows issue year mortality results by policy count. The A/E ratio drops over 10% from the 1990s issue year block to the 2000s issue year block. Claims for the policies issued in the 1980s are not very credible. About 65% of exposure and 70% of claims are in the 2000-2009 issue year block.

Table 4.2.2.1

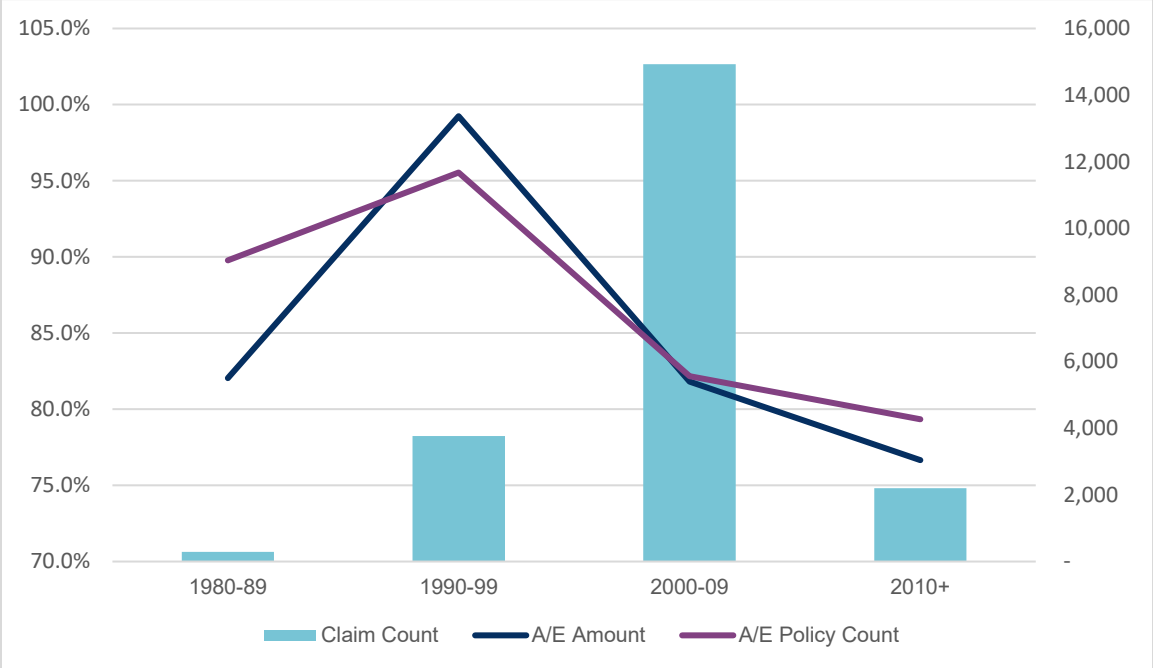
ISSUE YEAR: MORTALITY RESULTS BY POLICY COUNT, POLICY SIZE ≥ $1M

Issue Year	Exposure	Actual Claims	Expected Claims	A/E Ratio (%)
1980-89	21,224	288	321	89.8%
1990-99	765,787	3,766	3,942	95.5%
2000-09	10,157,537	14,927	18,166	82.2%
2010+	4,748,287	2,206	2,780	79.3%
Total	**15,692,835**	**21,187**	**25,209**	**84.0%**

Figure 4.2.2.2 shows A/E ratios by both amount and policy count by issue year grouping. Both A/E ratios spike for the 1990s issues followed by a steep drop for the 2000s issue block.

Figure 4.2.2.2

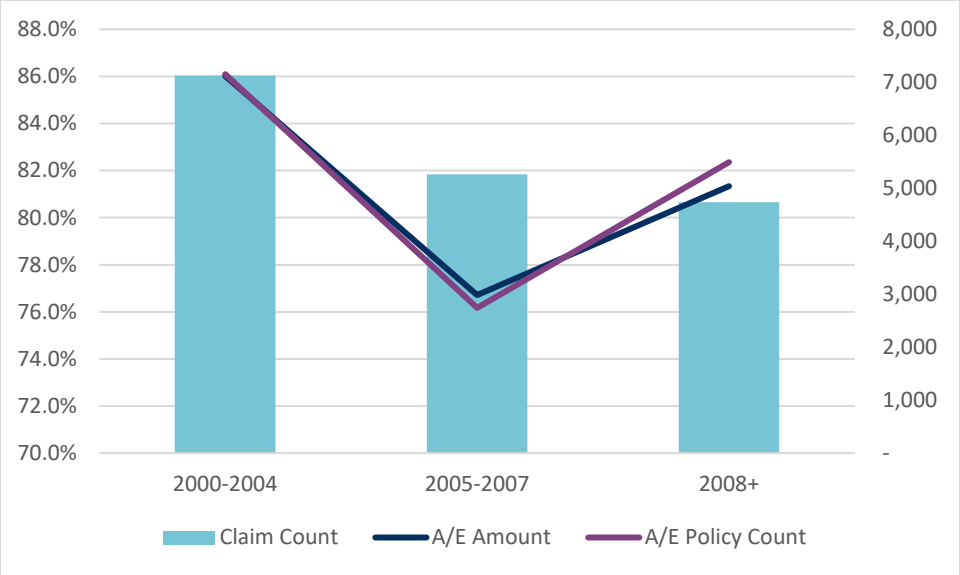
ISSUE YEAR: A/E RATIOS BOTH BY FACE AMOUNT AND POLICY COUNT, POLICY SIZE ≥ $1M



Given the large number of claims for the 2000s issue block, and the smaller number of claims for the 2010 and later issue block, Figure 4.2.2.3 shows a regrouping of policies from 2000 and beyond. A regrouping of issue years shows that A/E ratios for policies issued between 2005 and 2007 are significantly lower than those issued between 2000 and 2004 and 2008 and later.

Figure 4.2.2.3

ISSUE YEAR: A/E RATIOS BOTH BY FACE AMOUNT AND POLICY COUNT FOR 2000+ ISSUES, POLICY SIZE ≥ $1M



The variations of A/E ratios can be seen in Tables 4.2.2.4 and 4.2.2.5.

Table 4.2.2.4

ISSUE YEAR: MORTALITY RESULTS BY FACE AMOUNT WITH ISSUE YEARS 2000-2009 SPLIT, POLICY SIZE ≥ $1M

Issue Year	Exposure ($ Millions)	Average Face ($ Millions)	Actual Claims ($ Millions)	Expected Claims ($ Millions)	A/E Ratio (%)
1980-89	31,013	1.46	434	529	82.1%
1990-99	1,084,540	1.42	6,617	6,667	99.2%
2000-2004	4,593,826	1.48	14,574	16,943	86.0%
2005-2007	6,156,554	1.58	13,930	18,158	76.7%
2008-2009	5,071,339	1.61	5,319	6,240	85.2%
2010+	7,740,782	1.63	3,988	5,202	76.7%
Total	**24,678,054**	**1.57**	**44,861**	**53,738**	**83.5%**

Table 4.2.2.5

ISSUE YEAR: MORTALITY RESULTS BY POLICY COUNT WITH ISSUE YEARS 2000-2009 SPLIT, POLICY SIZE ≥ $1M

Issue Year	Exposure	Actual Claims	Expected Claims	A/E Ratio (%)
1980-89	21,224	288	321	89.8%
1990-99	765,787	3,766	3,942	95.5%
2000-2004	3,095,768	7,132	8,284	86.1%
2005-2007	3,903,649	5,264	6,911	76.2%
2008-2009	3,158,120	2,531	2,971	85.2%
2010+	4,748,287	2,206	2,780	79.3%
Total	**15,692,835**	**21,187**	**25,209**	**84.0%**

There is considerable volatility in the issue year groups. It is difficult and somewhat subjective to determine which issue year groups might be considered outliers and which might not be. As with all tables in this study, review and compare these results and your own company data, keeping in mind that the variations could be driven by a variety of factors that may warrant additional or separate analysis.

4.3 POLICY SIZE

4.3.1 Policy Size Mortality Experience by Amount

Table 4.3.1 shows mortality results by amount for face amount bands starting at $100,000 and above. The A/E ratios generally decrease as face amount increases, with the exception of the $2.5M to $5M band where the A/E ratio is currently above the $500,000 to $1M and $1M to $2.5M bands. A decreasing A/E ratio by amount would be reasonably anticipated due to more underwriting requirements being requested and higher socio-economic status to improve health.

Table 4.3.1

POLICY SIZE: MORTALITY RESULTS BY FACE AMOUNT (FACE AMOUNTS $100,000 AND ABOVE)

Study Year	Exposure ($ Millions)	Average Face ($ Millions)	Actual Claims ($ Millions)	Expected Claims ($ Millions)	A/E Ratio (%)
[100K, 250K)	5,888,828	0.13	13,915	14,039	99.1%
[250K, 500K)	10,893,163	0.29	14,875	16,691	89.1%
[500K, 1M)	13,861,312	0.56	15,611	18,340	85.1%
[1M, 2.5M)	17,048,316	1.21	21,015	25,099	83.7%
[2.5M, 5M)	3,462,563	3.11	7,562	8,614	87.8%
[5M, 10M)	2,247,538	5.59	8,720	10,513	82.9%
[10M, ∞)	1,919,637	13.63	7,564	9,512	79.5%
Total	**55,321,358**	**0.45**	**89,262**	**102,808**	**86.8%**

4.3.2 Policy Size Mortality Experience by Policy Count

Table 4.3.2 shows mortality results by policy count for face amount bands starting at $100,000 and above. The A/E ratios generally decrease but, similar to amount, the A/E ratio for $2.5M to $5M is elevated relative to the other bands that are $500,000 and above.

Table 4.3.2

POLICY SIZE: MORTALITY RESULTS BY POLICY COUNT (FACE AMOUNT $100,000 AND ABOVE)

Study Year	Exposure	Actual Claims	Expected Claims	A/E Ratio (%)
[100K, 250K)	44,206,485	108,758	107,202	101.5%
[250K, 500K)	37,764,689	51,167	56,783	90.1%
[500K, 1M)	24,827,282	27,593	32,234	85.6%
[1M, 2.5M)	14,036,925	16,686	19,932	83.7%
2.5M, 5M)	1,112,825	2,379	2,692	88.4%
[5M, 10M)	402,282	1,530	1,850	82.7%
[10M, ∞)	140,804	592	735	80.5%
Total	**122,491,292**	**208,705**	**221,427**	**94.3%**

4.4 ISSUE AGE

4.4.1 Mortality Experience by Issue Age

Table 4.4.1 shows the mortality experience by issue age group. Older issue ages have higher average face amounts as can be seen by the rising average size by issue age band. Higher A/E ratios are seen by count for 70-79 and 80+, while the highest A/E ratio by amount is 70-79. However, the A/E ratios by amount for 70-79 and 80+ are slightly more favorable than by count indicating better relative mortality at very large face amounts.

Table 4.4.1

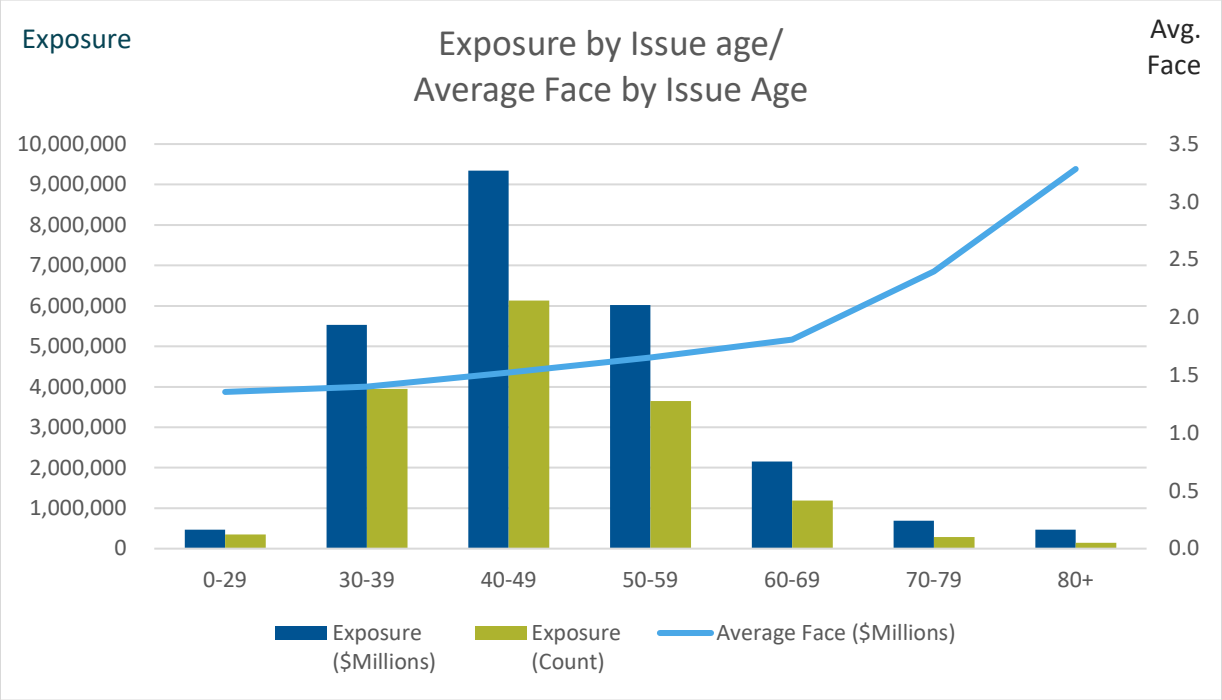
ISSUE AGE: MORTALITY RESULTS BY FACE AMOUNT POLICY SIZE ≥ $1M

Issue Age	Exposure ($Millions)	Average Face ($Millions)	Actual Claims ($Millions)	Expected Claims ($Millions)	A/E Ratio (Amount) (%)	Exposure (Count)	Actual Claims (Count)	Expected Claims (Count)	A/E Ratio (Count) (%)
0-29	472,654	1.4	65	108	60%	348,644	54	76	71%
30-39	5,529,713	1.4	1,193	1,409	85%	3,945,277	813	1,010	81%
40-49	9,342,502	1.5	4,830	5,737	84%	6,133,590	3,060	3,802	80%
50-59	6,023,563	1.7	6,878	8,855	78%	3,645,476	4,361	5,462	80%
60-69	2,149,695	1.8	6,544	8,053	81%	1,189,348	3,625	4,569	79%
70-79	687,842	2.4	6,361	7,310	87%	286,752	2,797	3,111	90%
80+	472,086	3.3	18,991	22,267	85%	143,749	6,477	7,180	90%
Grand Total	**24,678,054**	**1.6**	**44,861**	**53,738**	**83%**	**15,692,835**	**21,187**	**25,209**	**84%**

4.4.2 Total Exposure and Average Face Amount by Issue Age

Figure 4.4.2

ISSUE AGE: EXPOSURE BY FACE AMOUNT AND AVERAGE POLICY SIZE



The highest exposures are found in the 30-59 issue age groups where the insurance need is the highest—to support family, cover mortgage obligations, and aid in college tuition payments. These three issue age groups make up $20.9 trillion and 85% of the exposure.

As previously stated, as insureds age and have higher net worth, the average face amount increases steadily. The average face doubles from $1.5 million in the issue age 40-49 group to $3.3 million in the issue age 80+ group, which is the maximum. This may be due to older individuals who have accumulated more wealth, utilizing the tax advantages that life insurance offers in transferring that wealth to the beneficiaries.

No pronounced pattern or trend of A/E ratios emerged by issue age when looking by face amount. Since all policies were issued for large face amounts, rigorous underwriting was likely involved, so this may not come as a surprise. Additionally, this reflects well on the slope of the 2015 VBT. The A/E ratios at the youngest ages are very favorable, but with limited credibility. However, of note is the fact that the A/E ratios by count do increase at older issue ages. This may imply that, while all the policies are considered large, the very large policies are exhibiting less favorable experience.

4.5 POLICY DURATION

4.5.1 Mortality Experience Issue Age

Table 4.5.1 shows the mortality experience by policy duration by face amount and policy count.

Table 4.5.1

POLICY DURATION: MORTALITY RESULTS BY FACE AMOUNT AND POLICY COUNT

Duration	Exposure ($Millions)	Average Face ($Millions)	Actual Claims ($Millions)	Expected Claims ($Millions)	A/E Ratio (Amount) (%)	Exposure (Count)	Actual Claims (Count)	Expected Claims (Count)	A/E Ratio (Count) (%)
1	2,812,445	1.6	878	1,034	85%	1,731,368	458	556	82%
2	2,741,286	1.6	1,304	1,562	84%	1,688,481	697	822	85%
3	2,641,081	1.6	1,826	2,255	81%	1,630,399	974	1,149	85%
4-5	4,825,330	1.6	5,016	6,358	79%	3,001,760	2,442	2,989	82%
6-10	8,565,626	1.6	21,209	25,787	82%	5,505,018	8,830	10,882	81%
11-15	2,636,869	1.5	10,360	12,390	84%	1,818,191	5,311	6,246	85%
16-20	376,067	1.4	3,094	3,058	101%	264,899	1,750	1,796	97%
21-25	65,434	1.5	954	983	97%	43,286	565	581	97%
26+	13,916	1.5	218	310	70%	9,433	160	189	85%
Total	**24,678,054**	**1.6**	**44,861**	**53,738**	**83%**	**15,692,835**	**21,187**	**25,209**	**84%**

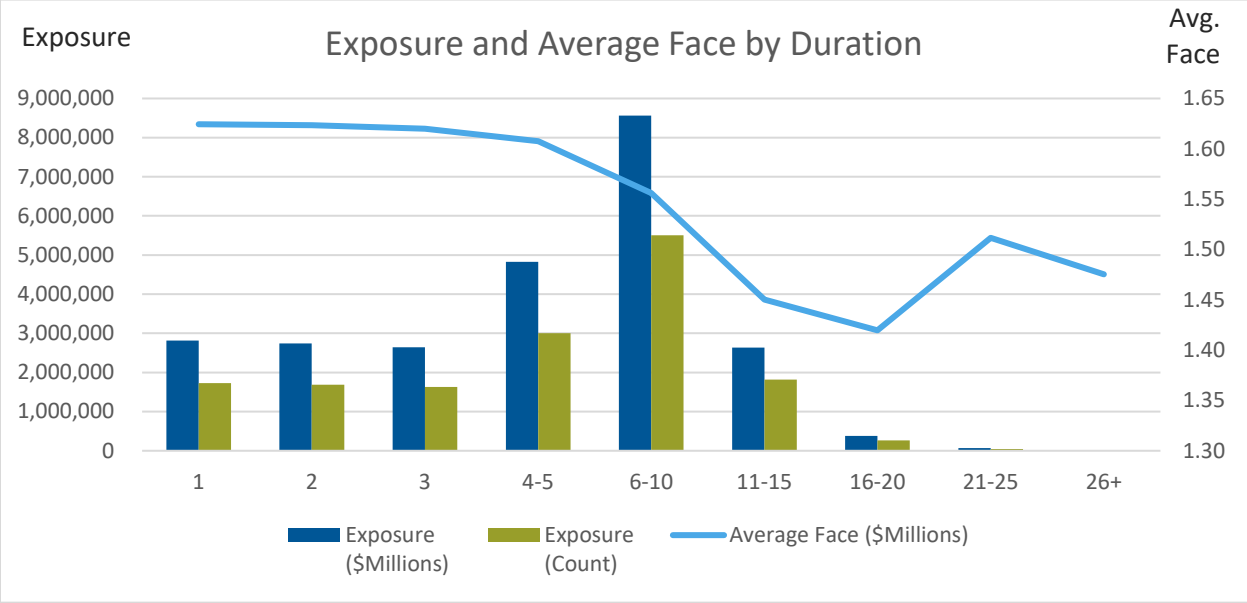
The pattern or trend of A/E ratios are relatively stable for the first 15 durations. However, there is an abrupt change in durations 16 – 25 by both amount and count. This may be due to fewer healthy lives persisting or indicating the slope of the table may be too flat. Additionally, these durations have a slightly smaller average size than the other durational groups, which follows our observation of higher face amounts generally resulting in more favorable mortality experience. The 2015 VBT mortality rates may be too high at the later durations for high face amounts. There is insufficient credibility in durations 26+ to draw any conclusions.

Experience studies often show that mortality rates increase in duration 3, when the contestability and suicide exclusion periods expire. The A/E ratio by both face amount and policy count in this study are stable. This may indicate that the VBT table is doing a reasonable job of reflecting this phenomenon or these policies do not have the same experience as policies with a face amount of less than $1M due to higher socio-economic factors and increased underwriting.

4.5.2 Total Exposure and Average Face Amount by Policy Year

Figure 4.5.2

POLICY DURATION: EXPOSURE BY FACE AMOUNT & AVERAGE SIZE



Of the $24.7 trillion face amount exposure, $21.6 trillion, or 87% is in the first 10 policy years. This may be driven by the fact that approximately 80% of the total exposure is term insurance, which has a shorter coverage period than permanent insurance. Additionally, deaths, lapses, and terminations reduce exposure over time. Various other elements can also impact the lapse and conversion rates such as market interest rates, new product development, client life changes, economic factors, and agent behavior.

The average face generally declines slightly by duration as would be expected since the more recent business (with generally higher face amounts) are weighted more heavily in the earlier durations. It makes intuitive sense that face amounts on newly issued policies would tend to increase over time to keep up with inflation. Additionally, writers may have become more comfortable issuing higher face amounts due to improvements in underwriting techniques. Note that the average face amount scale on the right side of Figure 4.5.2 begins at $1.3M to help illustrate the varying amounts more easily.

4.6 GENDER

4.6.1 Mortality Experience by Gender

Table 4.6.1 shows the gender mortality experience by face amount and policy count data.

Table 4.6.1
GENDER: MORTALITY RESULTS BY FACE AMOUNT & POLICY COUNT

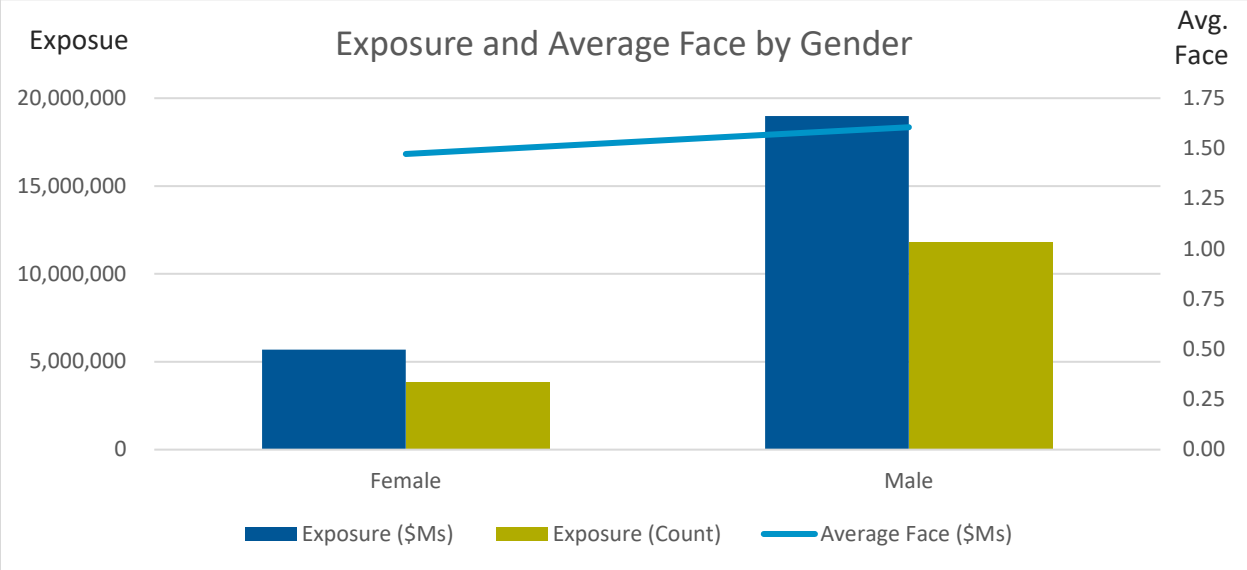
Issue Age	Exposure ($Millions)	Average Face ($Millions)	Actual Claims ($Millions)	Expected Claims ($Millions)	A/E Ratio (Amount) (%)	Exposure (Count)	Actual Claims (Count)	Expected Claims (Count)	A/E Ratio (Count) (%)
Female	5,690,791	1.5	14,978	17,557	85%	3,865,451	6,237	7,210	87%
Male	18,987,264	1.6	29,882	36,182	83%	11,827,384	14,950	17,998	83%
Total	**24,678,054**	**1.6**	**44,861**	**53,738**	**83%**	**15,692,835**	**21,187**	**25,209**	**84%**

Figure 4.6.2 shows that approximately $19 trillion, or slightly over three-quarters of the exposure by amount, was written on males. However, there is a gradual shift occurring towards more female exposure. The percentage of female exposure has increased from 20% in 2009 to 24% in 2014. This may be due to the fact that females purchased lower face amount contracts in the past, and now are in the workforce more and have a need for more insurance coverage.

The average face for $1M+ policies is essentially the same for males and females. The A/E ratios are consistently higher for females by face amount and policy count by gender as seen in Table 4.6.1.

4.6.2 Total Exposure and Average Face Amount by Gender

Figure 4.6.2
GENDER: EXPOSURE BY FACE AMOUNT AND AVERAGE POLICY SIZE



4.7 SMOKING STATUS

4.7.1 Smoking Status Mortality Experience by Amount

Table 4.7.1.1 shows mortality experience by face amount for study years 2009 through 2015. For the purposes of this report, a smoker and a tobacco user are considered to be the same. All policies were issued in 1980 and later, when the smoker/nonsmoker distinction began for most companies.

Table 4.7.1.1

SMOKING STATUS: MORTALITY RESULTS BY AMOUNT, POLICY SIZE ≥ $1M

Smoking Status	Exposure ($ Millions)	Average Face ($ Millions)	Actual Claims ($ Millions)	Expected Claims ($ Millions)	A/E Ratio (%)
Nonsmoker	24,248,730	1.57	43,592	52,097	83.7%
Smoker	429,324	1.57	1,269	1,641	77.3%
Total	**24,678,054**	**1.57**	**44,861**	**53,738**	**83.5%**

Of the insureds in this study, 98% are classified as nonsmokers and only 2% as smokers. There is no difference in the average policy size between smokers and nonsmokers.

The A/E ratio is higher for nonsmokers (83.7%) than for smokers (77.3%) relative to their respective underlying expected table. Further analysis by face band (Table 4.7.1.2) reveals that the A/E ratios are similar between smokers and nonsmokers for the $1M to $2.499M band, and the lower smoker A/E is attributed to fewer claims in the $2.5M+ band. There are only 105 claims in the smoker $2.5M+ cohort, so the lower smoker A/E ratio is not statistically credible.

Table 4.7.1.2

SMOKING STATUS AND FACE BAND: MORTALITY RESULTS BY FACE AMOUNT

Smoking Status & Face Band	Exposure ($ Millions)	Average Face ($ Millions)	Actual Claims ($ Millions)	Expected Claims ($ Millions)	A/E Ratio (%)
Nonsmoker					
[$1M, $2.499]	16,754,790	1.21	20,237	24,169	83.7%
[$2.5M, +]	7,493,940	4.60	23,355	27,928	83.6%
Total NS	**24,248,730**	**1.57**	**43,592**	**52,097**	**83.7%**
Smoker					
[$1M, $2.499]	293,527	1.20	778	930	83.6%
[$2.5M, +]	135,798	4.85	491	711	69.0%
Total Smoker	**429,324**	**1.57**	**1,269**	**1,641**	**77.3%**

4.7.2 Smoking Status Mortality Experience by Policy Count

Table 4.7.2 shows mortality results by policy count. The A/E ratios by policy count are very similar, 84.1% for nonsmokers and 83.0% for smokers. Note that the number of actual claims for smokers is only 738, which is not statistically fully credible.

Table 4.7.2

SMOKING STATUS: MORTALITY RESULTS BY POLICY COUNT, POLICY SIZE ≥ $1M

Smoking Status	Exposure Count	Actual # Claims	Expected # Claims	A/E Ratio (%)
Nonsmoker	15,419,576	20,449	24,319	84.1%
Smoker	273,260	738	889	83.0%
Total	**15,692,835**	**21,187**	**25,209**	**84.0%**

4.8 PRODUCT TYPE

The product types included in this analysis are:

- Term, which includes level premium term, annually renewable term (ART), return of premium (ROP), and other term products;
- Whole life, which includes participating (par), non-par, single premium, and interest sensitive whole life;
- Universal life (UL), both fixed and indexed, which includes cash accumulation, secondary guarantee, and current assumption UL;
- Variable life , which includes variable universal life, variable life, and variable life with secondary guarantees; and
- Other, which includes product types not covered above.

4.8.1 Product Type Mortality Experience by Amount

Table 4.8.1 shows product type mortality results by amount. Term accounts for 79% of the total exposure by amount, followed by UL/ULSG at 12%. Variable Life (5%) and Whole Life (4%) make up the remaining 9%.

The A/E ratios vary by product. Term has the lowest A/E at 79.2%, whereas VL/VLSG has the highest A/E ratio at 103.4%, followed by Whole Life at 95.7%. As the detailed data would show (not demonstrated in the report), both VL/VLSG and Whole life products have a higher percentage of policies in the 2 nonsmoker risk class structure (preferred and standard nonsmoker), whereas Term and UL/ULSG have a higher percentage of exposure in the 4 nonsmoker risk class structure. The more refined risk selection criteria in the 4 nonsmoker risk structure may be a contributing factor to the better mortality experience in Term and UL/ULSG. Term, and ULSG may also have fewer exceptions in underwriting due to the fact that they are pure mortality products with little or no cash value to earn an investment spread. In addition, VL/VLSG tend to have higher lapses than the other products. This lapse behavior may be antiselective (healthier lives are more likely to lapse), which leads to higher A/E for the remaining lives.

Table 4.8.1

PRODUCT TYPE: MORTALITY RESULTS BY FACE AMOUNT

Product Type	Exposure ($ Millions)	Average Face ($ Millions)	Actual Claims ($ Millions)	Expected Claims ($ Millions)	A/E Ratio (%)
Term	19,500,631	1.49	15,627	19,736	79.2%
Whole Life	1,095,809	1.74	2,684	2,804	95.7%
UL / ULSG	2,832,195	2.29	23,378	28,122	83.1%
VL / VLSG	1,180,192	1.72	3,092	2,990	103.4%
Other	69,227	3.49	80	86	92.6%
Total	**24,678,054**	**1.57**	**44,861**	**53,738**	**83.5%**

4.8.2 Product Type Mortality Experience by Policy Count

Table 4.8.2.1 shows product type mortality results by policy count. The A/E ratios by policy count follow the similar pattern as those by face amount, with the exception of “Other” product type, which is negligible.

Table 4.8.2.1

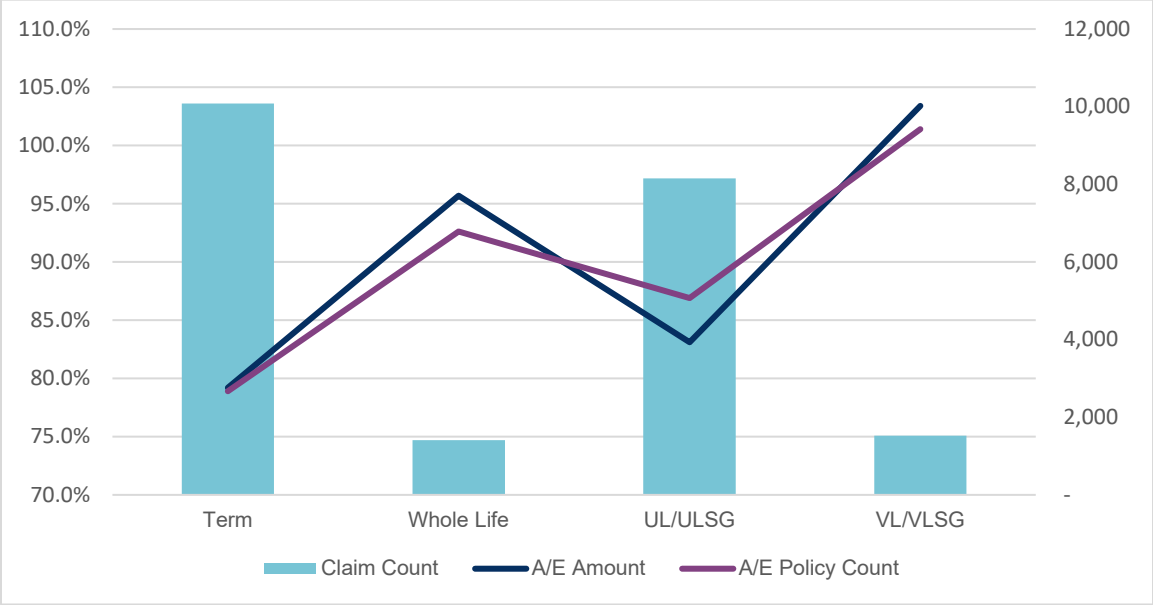
PRODUCT TYPE: MORTALITY RESULTS BY POLICY COUNT

Product Type	Exposure	Actual Claims	Expected Claims	A/E Ratio (%)
Term	13,123,343	10,079	12,779	78.9%
Whole Life	628,637	1,410	1,523	92.6%
UL / ULSG	1,235,474	8,149	9,379	86.9%
VL / VLSG	685,570	1,521	1,500	101.4%
Other	19,812	28	27	104.5%
Total	**15,692,835**	**21,187**	**25,209**	**84.0%**

Figure 4.8.2.2 shows both A/E ratios by face amount and policy count by product type. “Other” product type is omitted from the comparison given its immateriality in exposure.

Figure 4.8.2.2

PRODUCT TYPE: A/E RATIOS BOTH BY FACE AMOUNT AND POLICY COUNT



4.9 SEX, TOBACCO USAGE, AND RISK CLASS

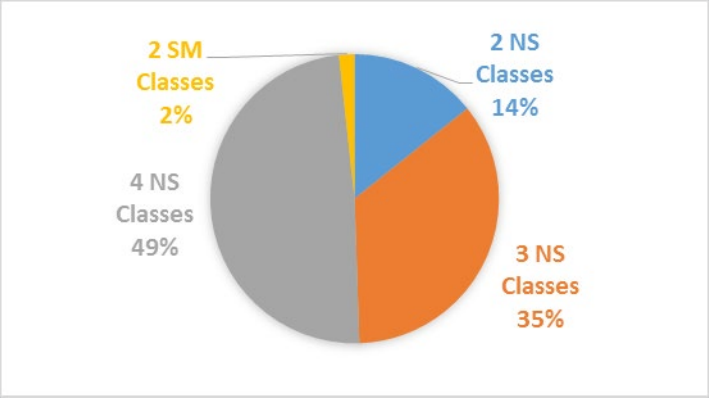
4.9.1 Number of Risk Classes Exposure by Face Amount

The splitting of smokers and nonsmokers into various preferred versus standard risk classes did not come to market until 1987 for some companies. By the early 1990s, virtually all U.S. life insurance companies utilized preferred risk classes so as not to be selected against. The products issued over the years range from two nonsmoker risk class products to three or four nonsmoker risk classes in more recent years. Additionally , the products all contain at least one smoker class.

The pie chart below shows the distribution by exposure amount of the different risk class structures, i.e., the number of nonsmoker and smoker classes. A product with 2 NS classes indicates that the product has a preferred nonsmoker risk class and a standard nonsmoker risk class. Likewise, a product with 3 NS classes means that it contains a super-preferred nonsmoker class, a preferred nonsmoker class, and a standard nonsmoker class. As can be seen, products with 4 NS classes account for nearly half of the total exposure, 3 NS class products account for 35%, and the 2 NS and 2 SM products make up the balance of the exposure (16%).

Figure 4.9.1.

RISK CLASS: FACE AMOUNT EXPOSURE BY NUMBER OF RISK CLASSES



4.9.2 Risk Class Mortality Experience by Amount

Table 4.9.2 illustrates the mortality experience by risk class structure. The higher the number of nonsmoker classes, the more refined the risk selection process usually is. Consequently, the mortality A/E ratio is lower for the structures with more nonsmoker classes. Table 4.9.2 demonstrates this pattern with a 2 NS class product at 94.4%, 3 NS class product at 81.1%, and 4 NS class product at 77.9%. One hypothesis is that structures with more risk classes are more attractive to potential customers who could qualify for the better risk classes. The distribution of business impacts the overall A/E ratio for the class, since most of the preferred class and overall claims for a 4-class structure are in the best nonsmoker class, while most of the preferred class claims for a 3-class structure are in the second best class (Table 4.9.3), while most of the overall claims for a 3-class structure are in the standard class.

Table 4.9.2 also shows mortality results by amount by number of risk classes for nonsmokers and smokers. Note that “2-Class NS – 1” indicates the best nonsmoker risk class in the 2 nonsmoker class structure, and “2-Class NS – 2” indicates the second best nonsmoker risk class (which is the standard nonsmoker class) in the 2 nonsmoker class structure. Likewise, “4-Class NS – 1” is the best nonsmoker class in the 4 nonsmoker structure, and “4-Class NS – 4” is the worst nonsmoker class (standard or residual nonsmoker) in the 4 nonsmoker structure.

As expected, within each risk class structure, the A/E for the best class is lower than that for the second best, and so on and so forth.

Table 4.9.2

RISK CLASS: MORTALITY RESULTS BY FACE AMOUNT

Risk Class	Exposure ($ Millions)	Average Face ($ Millions)	Actual Claims ($ Millions)	Expected Claims ($ Millions)	A/E Ratio (%)
2-Class NS - 1	2,752,172	1.57	6,249	7,700	81.1%
2-Class NS - 2	769,999	1.62	6,391	5,682	112.5%
Total 2-Class NS	**3,522,171**	**1.58**	**12,639**	**13,382**	**94.4%**
3-Class NS - 1	3,899,041	1.50	3,527	5,568	63.3%
3-Class NS - 2	2,555,170	1.63	6,492	8,899	73.0%
3-Class NS - 3	2,232,349	1.64	10,580	10,937	96.7%
Total 3-Class NS	**8,686,559**	**1.57**	**20,599**	**25,404**	**81.1%**
4-Class NS - 1	6,374,002	1.54	3,844	5,870	65.5%
4-Class NS - 2	2,842,102	1.59	2,820	3,684	76.6%
4-Class NS - 3	1,646,589	1.59	1,760	2,046	86.0%
4-Class NS - 4	1,177,307	1.64	1,928	1,711	112.7%
Total 4-Class NS	**12,040,000**	**1.57**	**10,354**	**13,311**	**77.8%**
Total NS	**24,248,730**	**1.57**	**43,592**	**52,097**	**83.7%**
2-Class SM - 1	277,948	1.53	665	893	74.4%
2-Class SM - 2	151,376	1.66	604	748	80.7%
Total 2-Class SM	**429,324**	**1.57**	**1,269**	**1,641**	**77.3%**
Grand Total	**24,678,054**	**1.57**	**44,861**	**53,738**	**83.5%**

4.9.3 Risk Class Mortality Experience by Policy Count

Table 4.9.3.1 shows mortality results by policy count by risk class structure. The A/E ratios show similar patterns to those by face amount.

Table 4.9.3.1

POLICY SIZE: MORTALITY RESULTS BY POLICY COUNT

Risk Class	Exposure	Actual Claims	Expected Claims	A/E Ratio (%)
2-Class NS - 1	1,751,823	2,985	3,714	80.4%
2-Class NS - 2	475,885	2,864	2,458	116.5%
Total 2-Class NS	**2,227,708**	**5,849**	**6,172**	**94.8%**
3-Class NS - 1	2,592,409	1,815	2,969	61.1%
3-Class NS - 2	1,562,886	2,705	3,486	77.6%
3-Class NS - 3	1,360,749	4,034	3,930	102.6%
Total 3-Class NS	**5,516,044**	**8,554**	**10,385**	**82.4%**
4-Class NS - 1	4,132,661	2,282	3,591	63.5%
4-Class NS - 2	1,791,444	1,693	2,128	79.6%
4-Class NS - 3	1,033,639	1,054	1,158	91.0%
4-Class NS - 4	718,080	1,017	886	114.8%
Total 4-Class NS	**7,675,824**	**6,046**	**7,763**	**77.9%**
Total NS	**15,419,576**	**20,449**	**24,319**	**84.1%**
2-Class SM - 1	181,873	394	518	76.1%
2-Class SM - 2	91,386	344	371	92.6%
Total 2-Class SM	**273,260**	**738**	**889**	**83.0%**
Grand Total	**15,692,835**	**21,187**	**25,209**	**84.0%**

Table 4.9.3.2

MORTALITY EXPERIENCE BY SEX, TOBACCO USAGE, CLASS STRUCTURE, AND RANK (A/E BASED ON FACE AMOUNT)

Sex	Tobacco	Structure	Rank	# of Clms	Exposed ($Mils)	Actual ($Mils)	Expected ($Mils)	A/E
F	N	2	1	1,123	723,518	2,637	3,146	83.8%
F	N	2	2	1,232	160,109	2,812	2,374	118.4%
F	**N**	**2**	**All**	**2,355**	**883,628**	**5,449**	**5,520**	**98.7%**
F	N	3	1	472	1,139,898	1,110	1,649	67.3%
F	N	3	2	803	546,555	2,248	3,298	68.2%
F	N	3	3	1,410	482,203	4,056	4,238	95.7%
F	**N**	**3**	**All**	**2,685**	**2,168,656**	**7,414**	**9,185**	**80.7%**
F	N	4	1	453	1,705,211	688	1,099	62.6%
F	N	4	2	218	449,013	404	598	67.5%
F	N	4	3	121	214,643	209	251	83.2%
F	N	4	4	170	185,667	356	344	103.6%
F	**N**	**4**	**All**	**962**	**2,554,535**	**1,656**	**2,291**	**72.3%**
F	**N**	**All**	**All**	**6,002**	**5,606,818**	**14,520**	**16,996**	**85.4%**
F	S	2	1	113	55,670	206	281	73.3%
F	S	2	2	122	28,302	253	280	90.4%
F	**S**	**All**	**All**	**235**	**83,972**	**459**	**561**	**81.8%**
F	**All**	**All**	**All**	**6,237**	**5,690,791**	**14,978**	**17,557**	**85.3%**
M	N	2	1	1,862	2,028,654	3,612	4,555	79.3%
M	N	2	2	1,632	609,890	3,578	3,307	108.2%
M	**N**	**2**	**All**	**3,494**	**2,638,543**	**7,190**	**7,862**	**91.5%**
M	N	3	1	1,343	2,759,143	2,417	3,919	61.7%
M	N	3	2	1,902	2,008,614	4,244	5,601	75.8%
M	N	3	3	2,624	1,750,146	6,524	6,699	97.4%
M	**N**	**3**	**All**	**5,869**	**6,517,904**	**13,186**	**16,219**	**81.3%**
M	N	4	1	1,829	4,668,790	3,157	4,771	66.2%
M	N	4	2	1,475	2,393,088	2,417	3,087	78.3%
M	N	4	3	933	1,431,946	1,551	1,795	86.4%
M	N	4	4	847	991,640	1,572	1,367	115.0%
M	**N**	**4**	**All**	**5,084**	**9,485,464**	**8,697**	**11,020**	**78.9%**
M	**N**	**All**	**All**	**14,447**	**18,641,912**	**29,073**	**35,102**	**82.8%**
M	S	2	1	281	222,278	459	612	74.9%
M	S	2	2	222	123,074	351	468	75.0%
M	**S**	**All**	**All**	**503**	**345,352**	**810**	**1,080**	**74.9%**
M	**All**	**All**	**All**	**14,950**	**18,987,264**	**29,882**	**36,182**	**82.6%**

Table 4.9.3.2 shows the risk class breakdown by sex. Females show less variation in the A/E ratio between the best and second best classes under the 3- and 4-class structures (67.3% vs 68.2% and 62.6% vs 67.5%) relative to males (61.7% vs 75.8% and 66.2% vs 78.3%). Male smokers show less variation in the A/E ratio between classes than females do (74.9% vs 75.0% for males, and 73.3% vs 90.4% for females).

Figure 4.9.3.3

MORTALITY A/E RATIOS BY SEX, TOBACCO, STRUCTURE, AND CLASS

Example: NS 4.2 is the second most selective class in a 4-class nonsmoker structure.

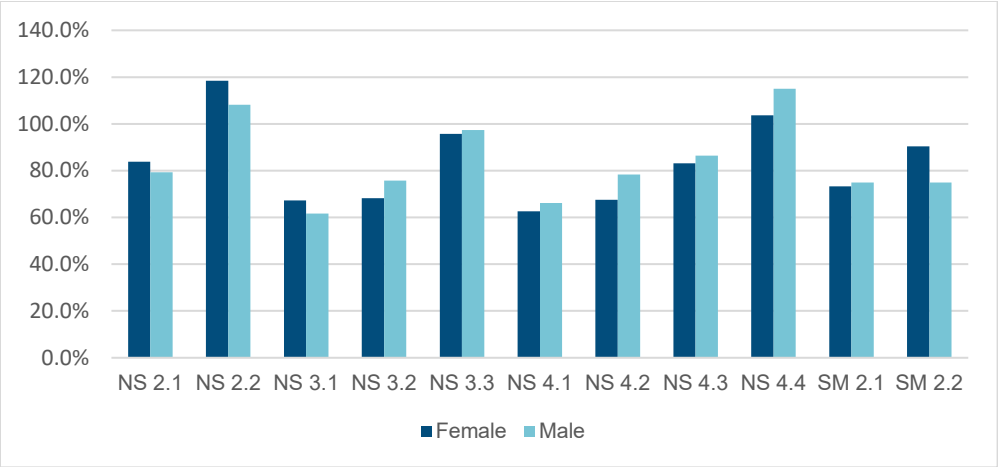


Figure 4.9.3.3 illustrates that generally for both sexes, the more selective risk classes yield lower mortality ratios. One exception is that preferred male smokers (SM2.1) and standard male smokers (SM2.2) have essentially the same level of mortality A/E (75.0% vs 74.9%).

We also have noted that the nonsmoker mortality ratios for the best classes of the 3- and 4-class structures are not substantially different. In fact, when males and females are combined, the mortality ratio for the best class of the 3-class structure (63.3%) is lower than that for the 4-class structure (65.5%).

4.10 ISSUE AGE AND DURATION

4.10.1 Results Based on Policy Count

Results by Issue Age and Duration are reviewed on the basis of face amount and policy count. The first four tables in this section provide the number of exposed policies (Table 4.10.1.1), number of actual death claims (Table 4.10.1.2), number of expected death claims (Table 4.10.1.3), and actual to expected mortality ratio based on policy count (Table 4.10.1.4), by issue age and by duration.

Table 4.10.1.1

EXPOSED POLICY COUNT

Issue Age	01-05	06-10	11-15	16-20	21-25	26+	Total
18-39	4,093,620	2,673,387	872,083	122,890	19,379	4,520	7,785,879
40-49	2,520,005	1,868,787	663,821	94,392	13,629	2,845	5,163,479
50-59	1,071,231	696,031	206,874	31,441	6,597	1,522	2,013,696
60-69	288,106	167,439	49,249	12,021	3,280	516	520,611
70-79	68,362	78,318	22,088	4,021	394	25	173,209
80+	10,684	21,056	4,077	134	7	4	35,962
Total	8,052,008	5,505,018	1,818,191	264,899	43,286	9,433	15,692,835

Table 4.10.1.2

ACTUAL DEATH CLAIMS (POLICY COUNT)

Issue Age	01-05	06-10	11-15	16-20	21-25	26+	Total
18-39	839	1,105	646	173	55	14	2,832
40-49	1,206	1,837	1,107	311	95	41	4,597
50-59	1,104	1,628	938	287	143	54	4,154
60-69	715	1,080	788	512	214	48	3,357
70-79	488	1,839	1,256	433	58	3	4,077
80+	219	1,341	576	34	-	-	2,170
Total	**4,571**	**8,830**	**5,311**	**1,750**	**565**	**160**	**21,187**

Table 4.10.1.3

EXPECTED DEATH CLAIMS (POLICY COUNT)

Issue Age	01-05	06-10	11-15	16-20	21-25	26+	Total
18-39	1,040	1,466	850	198	53	20	3,627
40-49	1,408	2,242	1,435	360	98	36	5,579
50-59	1,409	2,089	1,165	331	145	65	5,204
60-69	851	1,287	818	453	220	58	3,687
70-79	558	2,147	1,350	424	63	8	4,549
80+	250	1,649	628	30	3	2	2,562
Total	**5,515**	**10,882**	**6,246**	**1,796**	**581**	**189**	**25,209**

Cells with less than 50 death claims are not included in Table 4.10.1.4 and Figure 4.10.1.5.

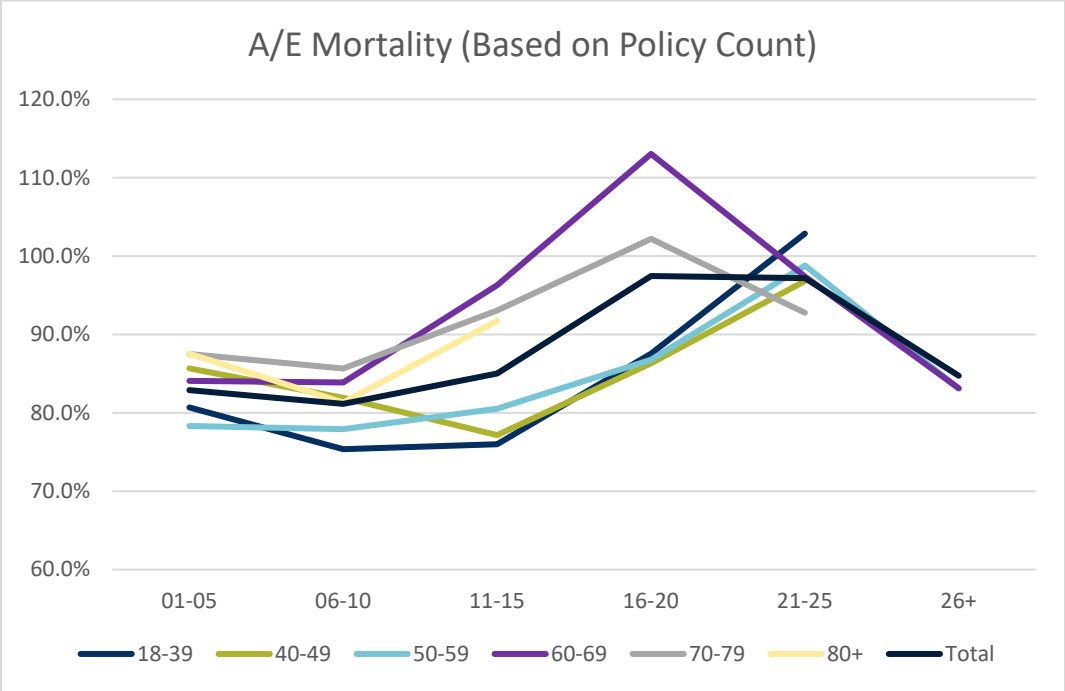
Table 4.10.1.4

ACTUAL / EXPECTED MORTALITY EXPERIENCE (BASED ON FACE POLICY COUNT)

Issue Age	01-05	06-10	11-15	16-20	21-25	26+	Total
18-39	80.7%	75.4%	76.0%	87.5%	102.9%		78.1%
40-49	85.7%	81.9%	77.2%	86.3%	96.8%		82.4%
50-59	78.3%	77.9%	80.5%	86.8%	98.8%	83.1%	79.8%
60-69	84.1%	83.9%	96.3%	113.0%	97.4%		91.1%
70-79	87.5%	85.7%	93.0%	102.2%	92.8%		89.6%
80+	87.6%	81.3%	91.7%				84.7%
Total	**82.9%**	**81.1%**	**85.0%**	**97.5%**	**97.2%**	**84.7%**	**84.0%**

Figure 4.10.1.5

ACTUAL /EXPECTED MORTALITY EXPERIENCE (BASED ON POLICY COUNT)



For all ages, mortality ratios by policy count increase between durations 11 and 25 and then come down by duration 26. This may be a result of the slope of the underlying table being not steep enough between durations 11-25 for face amounts above $1M to maintain a constant percentage of the entire table.

4.10.2 Results based on Face Amount

The four tables in this section summarize exposed face (Table 4.10.2.1), actual death claim amount (Table 4.10.2.2), expected face amount (Table 4.10.2.3), and mortality ratio (Table 4.10.2.4), by issue age group and duration group.

Table 4.10.2.1

EXPOSED FACE AMOUNT (FACE AMOUNT IN MILLIONS)

Issue Age	01-05	06-10	11-15	16-20	21-25	26+	Total
18-39	5,899,005	3,697,963	1,162,090	161,880	27,153	6,145	**10,954,235**
40-49	4,231,888	2,951,425	966,832	133,648	20,633	4,295	**8,308,721**
50-59	2,014,087	1,200,922	335,696	49,949	10,956	2,515	**3,614,125**
60-69	617,914	352,747	101,094	22,257	5,970	894	**1,100,876**
70-79	220,093	284,719	58,503	8,035	713	63	**572,124**
80+	37,154	77,851	12,655	298	11	5	**127,973**
Total	**13,020,142**	**8,565,626**	**2,636,869**	**376,067**	**65,434**	**13,916**	**24,678,054**

Table 4.10.2.2

ACTUAL DEATH CLAIMS (FACE AMOUNT IN MILLIONS)

Issue Age	01-05	06-10	11-15	16-20	21-25	26+	Total
18-39	1,221	1,533	955	245	104	20	4,077
40-49	2,087	2,979	1,604	475	155	53	7,353
50-59	1,889	2,848	1,596	444	223	69	7,069
60-69	1,557	2,363	1,586	937	377	71	6,892
70-79	1,537	6,584	2,968	933	95	6	12,124
80+	734	4,901	1,650	60	-	-	7,346
Total	**9,025**	**21,209**	**10,360**	**3,094**	**954**	**218**	**44,861**

Table 4.10.2.3

EXPECTED DEATH CLAIMS (FACE AMOUNT IN MILLIONS)

Issue Age	01-05	06-10	11-15	16-20	21-25	26+	Total
18-39	1,522	2,056	1,140	260	75	27	5,081
40-49	2,390	3,561	2,098	516	149	55	8,770
50-59	2,639	3,603	1,904	532	244	109	9,031
60-69	1,847	2,738	1,710	844	400	99	7,639
70-79	1,941	7,957	3,601	837	110	18	14,464
80+	871	5,871	1,936	69	4	2	8,754
Total	**11,210**	**25,787**	**12,390**	**3,058**	**983**	**310**	**53,738**

Cells with less than 50 death claims are not included in Table 4.10.2.4 and Figure 4.10.2.5.

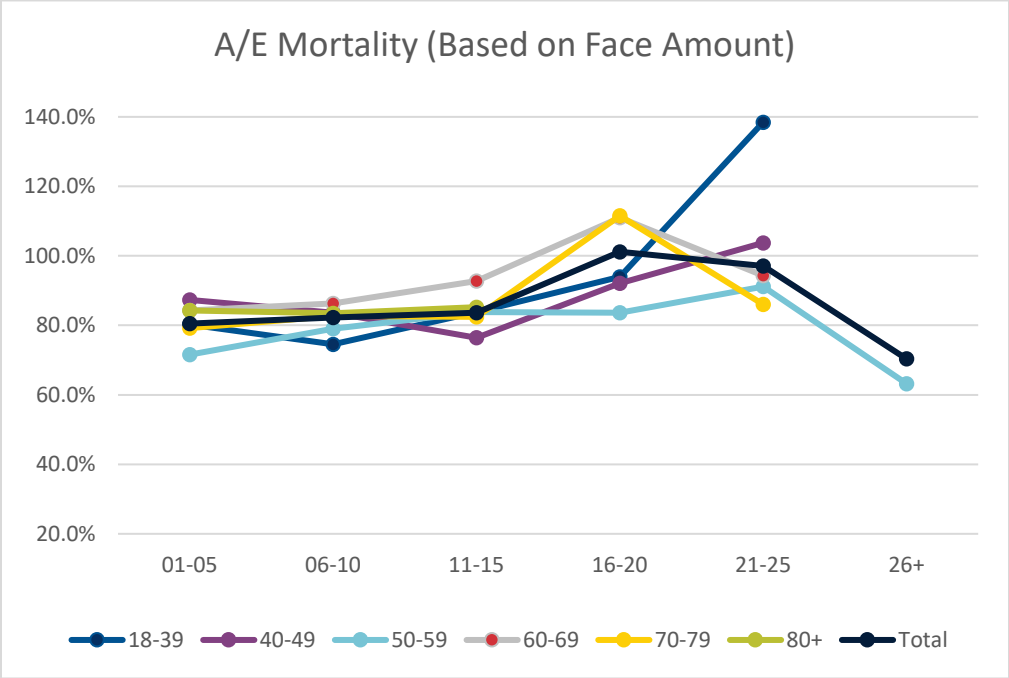
Table 4.10.2.4

ACTUAL / EXPECTED MORTALITY EXPERIENCE (BASED ON FACE AMOUNT)

Issue Age	01-05	06-10	11-15	16-20	21-25	26+	Total
18-39	80.2%	74.6%	83.8%	93.9%	138.4%		80.3%
40-49	87.4%	83.7%	76.4%	92.1%	103.7%		83.8%
50-59	71.6%	79.0%	83.8%	83.6%	91.2%	63.2%	78.3%
60-69	84.3%	86.3%	92.8%	111.0%	94.3%		90.2%
70-79	79.2%	82.7%	82.4%	111.5%	86.0%		83.8%
80+	84.2%	83.5%	85.2%				83.9%
Total	**80.5%**	**82.2%**	**83.6%**	**101.2%**	**97.0%**	**70.4%**	**83.5%**

Figure 4.10.2.5

ACTUAL / EXPECTED MORTALITY EXPERIENCE (BASED ON FACE AMOUNT)



Similar to the policy count chart (Figure 4.10.1.5), an increasing mortality ratio during durations 11 to 25 and then a decline by duration 26 are observed. However, the increase based on face amount is not as steep as the increase based on policy count.

4.11 MORTALITY EXPERIENCE BASED ON ATTAINED AGE

4.11.1 Average Face Amount

Table 4.11.1
AVERAGE FACE AMOUNT BY ATTAINED AGE

Att. Age	Exposed ($Mil)	Exposed (Count)	Average Face ($Mil)
18-39	6,002,367	4,293,920	1.4
40-49	9,342,502	6,133,590	1.5
50-59	6,023,563	3,645,476	1.7
60-69	2,149,695	1,189,348	1.8
70-79	687,842	286,752	2.4
80-89	423,444	127,237	3.3
90+	48,642	16,511	2.9
All	**24,678,054**	**15,692,835**	**1.6**

Average face amount increases with attained age until age 90+, where average face amount is less than that for attained ages 80-89.

4.11.2 Results based on Policy Count

Table 4.11.2 shows little variation in A/E by policy count for attained ages 18-69, where all A/E attained age groups are within 1.5% of each other. Attained ages 70+ show higher A/E ratios, with attained ages 80-89 showing the highest A/E ratio of 92.7%.

Table 4.11.2
MORTALITY EXPERIENCE BY ATTAINED AGE (BASED ON POLICY COUNT)

Att. Age	Exposed	Actual	Expected	A/E
18-39	4,293,920	867	1,085	79.9%
40-49	6,133,590	3,060	3,802	80.5%
50-59	3,645,476	4,361	5,462	79.8%
60-69	1,189,348	3,625	4,569	79.3%
70-79	286,752	2,797	3,111	89.9%
80-89	127,237	4,606	4,971	92.7%
90+	16,511	1,871	2,209	84.7%
All	**15,692,835**	**21,187**	**25,209**	**84.0%**

4.11.3 Results based on Face Amount

Similar to Table 4.11.2, Table 4.11.3.1, which displays A/E ratios based on face amount, also shows a considerable amount of variation by attained age group.

Table 4.11.3.1

MORTALITY EXPERIENCE BY ATTAINED AGE (BASED ON FACE AMOUNT; AMOUNT FIELDS IN $MILLIONS)

Att. Age	Exposed ($M)	Actual ($M)	Expected ($M)	A/E
18-39	6,002,367	1,257	1,516	82.9%
40-49	9,342,502	4,830	5,737	84.2%
50-59	6,023,563	6,878	8,855	77.7%
60-69	2,149,695	6,544	8,053	81.3%
70-79	687,842	6,361	7,310	87.0%
80-89	423,444	13,914	15,852	87.8%
90+	48,642	5,077	6,416	79.1%
All	**24,678,054**	**44,861**	**53,738**	**83.5%**

Figure 4.11.3.2

MORTALITY EXPERIENCE BY ATTAINED AGE

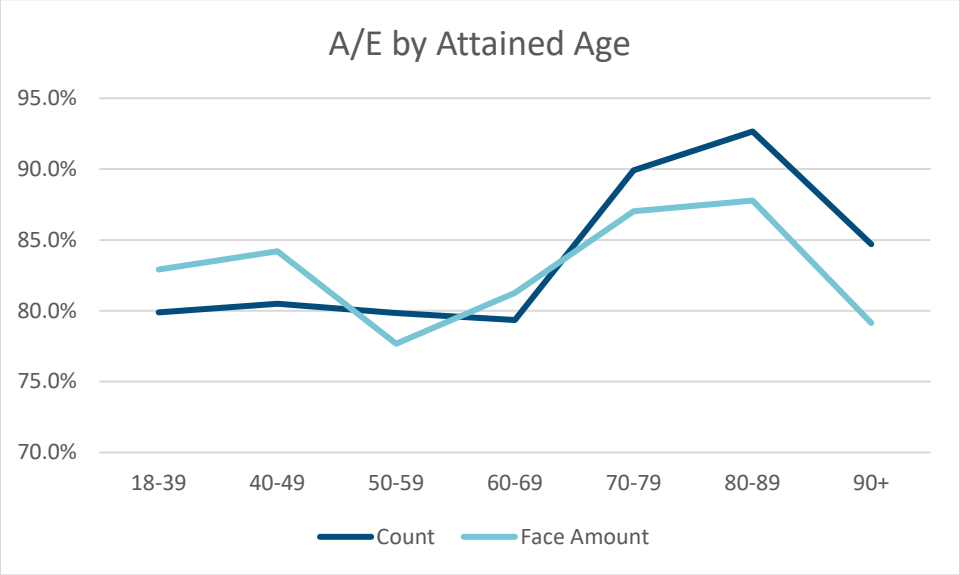


Figure 4.11.3.2 shows mortality ratios increase between attained ages 60 and 90, and then a decrease for attained ages 90+. Further analysis of this trend was done by looking at the results by sex and tobacco usage (see Table 4.11.3.3 and Figure 4.11.3.4).

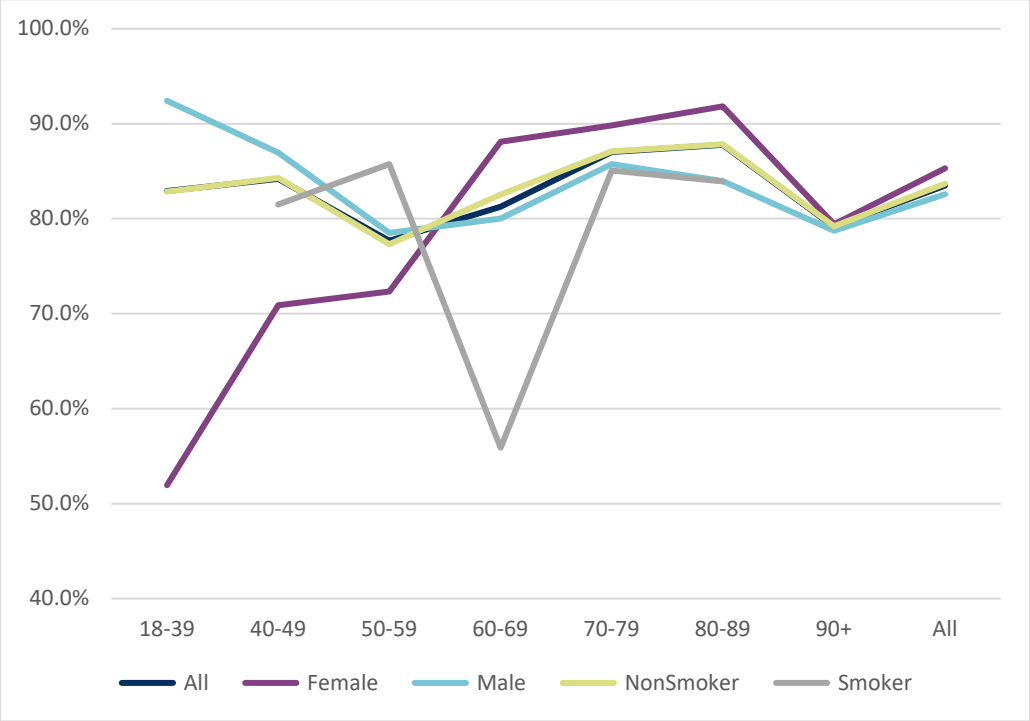
Table 4.11.3.3

MORTALITY EXPERIENCE BY ATTAINED AGE (A/E BASED ON FACE AMOUNT; CLAIM NUMBERS BASED ON POLICY COUNT)

Att. Age	Female		Male		Nonsmoker		Smoker	
	A/E	Clms	A/E	Clms	A/E	Clms	A/E	Clms
18-39	51.9%	160	92.4%	707	82.9%	821	84.0%	46
40-49	70.9%	514	87.0%	2,546	84.3%	2,935	81.5%	125
50-59	72.3%	565	78.5%	3,796	77.3%	4,161	85.7%	200
60-69	88.1%	500	80.0%	3,125	82.5%	3,478	55.9%	147
70-79	89.8%	817	85.7%	1,980	87.1%	2,686	85.1%	111
80-89	91.8%	2,479	83.9%	2,127	87.8%	4,511	83.9%	95
90+	79.4%	1,202	78.7%	669	79.2%	1,857	63.4%	14
All	**85.3%**	**6,237**	**82.6%**	**14,950**	**83.7%**	**20,449**	**77.3%**	**738**

Figure 4.11.3.4

MORTALITY EXPERIENCE BY ATTAINED AGE (BASED ON FACE AMOUNT)



One of the most notable features of Table 4.11.3.3 is the fact that the mortality ratio for female insureds climbs between 18 and 89. Table 4.11.3.5 and Figure 4.11.3.6 show the corresponding chart for all face amounts, wherein similar results can be observed.

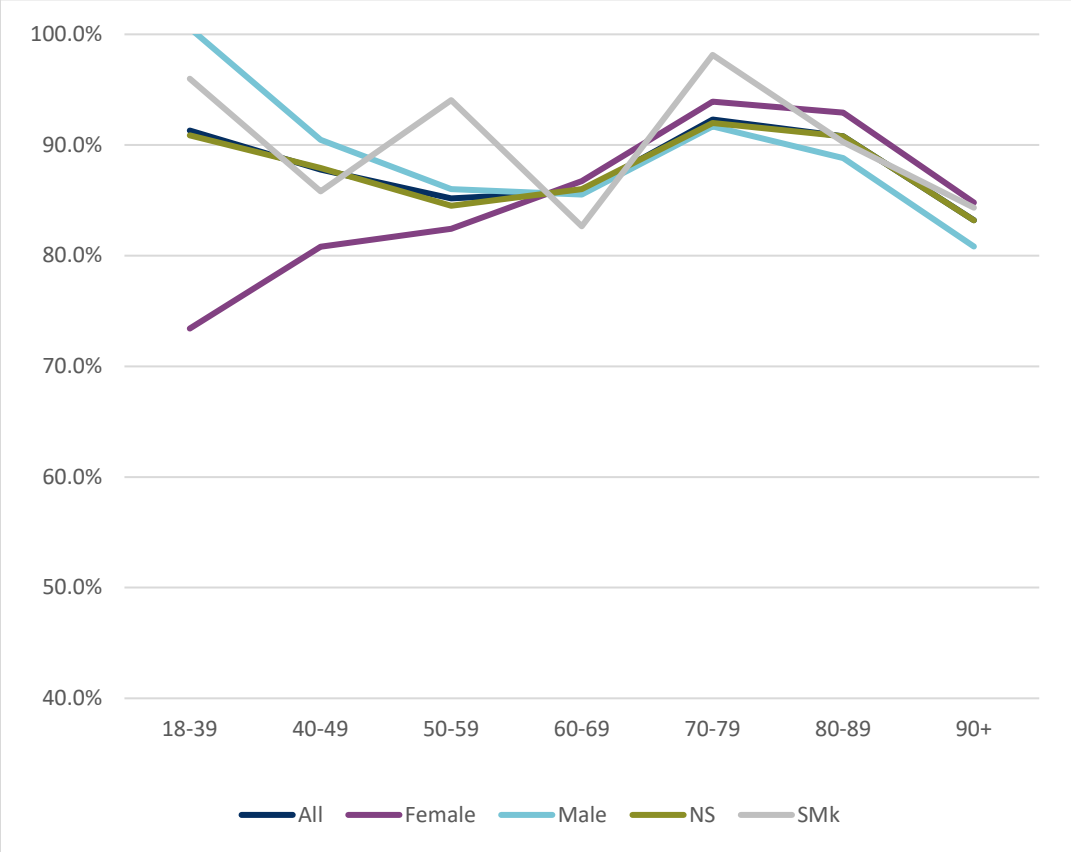
Table 4.11.3.5

MORTALITY EXPERIENCE BY ATTAINED AGE (A/E BASED ON FACE AMOUNT; CLAIM NUMBERS BASED ON POLICY COUNT) FOR ALL FACE AMOUNT

Att. Age	Female		Male		Nonsmoker		Smoker	
	A/E	Claims	A/E	Claims	A/E	Claims	A/E	Claims
18-39	73.4%	4,137	100.6%	7,628	90.9%	10,240	96.0%	1,525
40-49	80.8%	11,033	90.5%	18,076	87.9%	26,058	85.8%	3,051
50-59	82.4%	20,744	86.0%	39,164	84.5%	52,540	94.0%	7,368
60-69	86.7%	23,961	85.5%	53,208	86.0%	67,885	82.7%	9,284
70-79	93.9%	20,486	91.7%	43,821	92.0%	58,768	98.1%	5,539
80-89	92.9%	21,099	88.8%	27,097	90.8%	46,269	90.3%	1,927
90+	84.8%	8,010	80.8%	5,323	83.2%	13,068	84.3%	265
All	**87.5%**	**109,470**	**88.1%**	**194,317**	**87.8%**	**274,828**	**89.9%**	**28,959**

Figure 4.11.3.6

MORTALITY EXPERIENCE BY ATTAINED AGE (BASED ON FACE AMOUNT) FOR ALL FACE AMOUNTS



Note the similar pattern for females, but the increasing A/E is not as steep.

4.11.4 Attained Ages 65 and Over

When comparing mortality experience for policies with attained ages less than 65 to that of policies with attained ages 65 and over, we noticed that there is a 5% difference overall (80.4% for the former group; 85.4% for the latter). We looked at this result in further detail by splitting the data by sex and tobacco usage (see Table 4.11.4.1).

Table 4.11.4.1

MORTALITY EXPERIENCE BY ATTAINED AGE (A/E BASED ON FACE AMOUNT; CLAIM NUMBERS BASED ON POLICY COUNT)

		AA < 65		AA ≥ 65		Diff
Sex	Tobacco	A/E	Clms	A/E	Clms	A/E
Female	Nonsmoker	69.9%	1,391	88.8%	4,611	18.8%
Female	Smoker	83.2%	67	81.4%	168	-1.8%
Male	Nonsmoker	82.4%	8,385	83.2%	6,062	0.7%
Male	Smoker	76.7%	388	70.8%	115	-6.0%
All	**All**	**80.4%**	**10,231**	**85.4%**	**10,956**	**5.0%**

It appears that female nonsmokers are the driver of the attained age difference with an 18.8% spread between the older and younger attained age groups. Looking at the results for all face amount bands, we found a similar result (see Table 4.11.4.2).

Table 4.11.4.2

MORTALITY EXPERIENCE BY ATTAINED AGE (A/E BASED ON FACE AMOUNT; CLAIM NUMBERS BASED ON POLICY COUNT) FOR ALL FACE AMOUNT

		AA < 65		AA ≥ 65		Diff
Sex	Tobacco	A/E	Clms	A/E	Clms	A/E
Female	Nonsmoker	80.6%	43,524	91.1%	56,708	10.5%
Female	Smoker	87.0%	4,693	89.4%	4,545	2.4%
Male	Nonsmoker	87.9%	79,185	87.9%	95,411	0.0%
Male	Smoker	90.6%	12,016	90.6%	7,705	0.0%
All	**All**	**86.4%**	**139,418**	**89.2%**	**164,369**	**2.9%**

For all face amounts, the differential in mortality ratios between attained ages 65+ and attained ages less than 65 is 2.9% (89.2% compared to 85.4%), which is lower than the 5% differential observed for face amounts of $1 million plus, but once again the female nonsmokers are driving the difference.

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