SOA Research Institute LIMRA RGA TAI

Mortality and Longevity

U.S. Individual Life COVID-19 Mortality Experience Study – Fourth Quarter 2020 Update

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U.S. Individual Life COVID-19 Mortality Experience Study – Fourth Quarter 2020 Update

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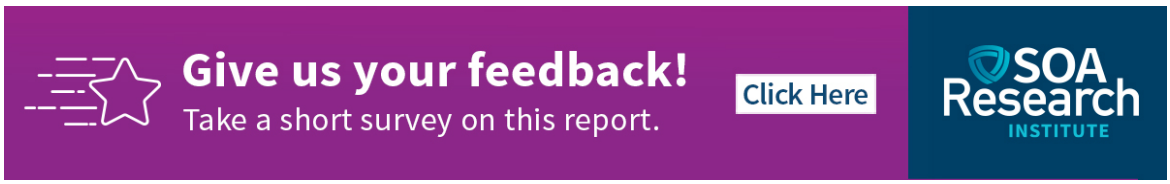

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U.S. Individual Life COVID-19 Mortality Experience Study Analysis

Section 1: Introduction

LIMRA, Reinsurance Group of America (RGA), the Society of Actuaries (SOA), and TAI have collaborated on an ongoing effort to analyze the impact of COVID-19 on the individual life insurance industry's mortality experience and share the emerging results with the insurance industry and the public. The Individual Life COVID-19 Project Work Group (Work Group) was formed as a collaboration of LIMRA, RGA, the SOA, and TAI to design, implement, and create the study and to produce and distribute a variety of analyses.

This report is the third public release from this collaboration and contains the results of an excess mortality analysis for the four quarters of 2020. Data from 31 companies representing approximately 72% of the industry's face amount inforce have been included in the analyses in this report. A total of 2.9 million death claims from individual life policies from 2015 through December 31, 2020 make up the basis of the analyses. The Work Group focused on subsegments of experience where there were a credible number of deaths of 1,000 or more and any areas discussed in this report with less than 1,000 are noted.

Additionally, this report includes a comparison of the mortality impact of COVID-19 on insured lives versus the general population. The prior reports in this series focused on insured lives only.

Some notable observations from the report are summarized in section 2. Important assumptions and methodologies, including the development of the trend lines used to analyze 2020 actual experience, are covered in section 3. Sections 4 through 10 explore the individual life insured mortality experience results by various attributes, including attained age, sex, underwriting class and smoker status, face amount, duration, geographic region, and underwriting method. Section 11 examines additional deaths per 1,000 for the insured population across various subsegments of the data. Section 12 contains an analysis of U.S. general population results as compared to the individual life insured population.

The Work Group expects to receive ongoing data submissions from the 31 participating companies, plus additional companies, during the remainder of 2021. In an effort to continue to supply the industry and public with the latest mortality information on individual life insurance, the Work Group plans to issue future updates as more industry data becomes available. The Work Group also plans to include additional analyses in each future report. The next report will include a cause of death analysis.

A set of Tableau dashboards[1] that can reproduce many of the graphs in this report has been included with the release of this report. This report focuses on directional relationships of the variables to excess mortality but, if desired, the dashboards will allow the user to see the data values behind the graphs in this report.

[1] https://www.soa.org/resources/experience-studies/2021/covid-19-life-mortality-study/

Section 2: Executive Summary

The data collected for this study included 2.88 million deaths from life insurance policies covering the period January 1, 2015 to December 31, 2020. Tables 1 and 2 provide a breakdown of these deaths by sex and attained age group.

Table 1

SUMMARY OF QUARTERLY CLAIMS BY SEX

		Quarter 1		Quarter 2		Quarter 3		Quarter 4	
Quarter	**Year**	**Exposure Count**	**Claim Count**	**Exposure Count**	**Claim Count**	**Exposure Count**	**Claim Count**	**Exposure Count**	**Claim Count**
Male	2015	5,802,821	81,748	5,875,801	72,342	5,944,647	69,315	5,949,621	76,462
	2016	5,818,967	77,168	5,838,435	70,827	5,915,316	69,185	5,928,254	76,570
	2017	5,742,032	79,116	5,822,308	70,149	5,899,052	68,426	5,910,334	76,177
	2018	5,720,153	78,942	5,799,921	69,411	5,877,146	67,305	5,887,781	74,967
	2019	5,696,784	75,902	5,769,657	70,124	5,837,765	68,056	5,840,952	71,708
	2020	5,709,229	75,257	5,734,910	80,082	5,822,920	74,745	5,843,406	88,646
Female	2015	4,521,084	47,839	4,594,336	42,597	4,660,597	40,651	4,676,959	43,810
	2016	4,604,192	46,637	4,636,819	42,268	4,710,842	41,377	4,733,515	45,888
	2017	4,613,214	48,398	4,694,033	43,026	4,767,833	41,269	4,788,672	46,165
	2018	4,662,051	49,237	4,742,572	43,012	4,817,869	41,699	4,838,274	45,806
	2019	4,708,329	47,951	4,782,855	44,500	4,850,500	42,798	4,863,910	45,979
	2020	4,780,901	48,550	4,818,772	52,365	4,908,690	48,546	4,938,339	55,911
Total	2015	10,323,905	129,587	10,470,137	114,939	10,605,243	109,966	10,626,581	120,272
	2016	10,423,158	123,805	10,475,254	113,095	10,626,158	110,562	10,661,769	122,458
	2017	10,355,246	127,514	10,516,341	113,175	10,666,885	109,695	10,699,006	122,342
	2018	10,382,204	128,179	10,542,493	112,423	10,695,014	109,004	10,726,056	120,773
	2019	10,405,113	123,853	10,552,512	114,624	10,688,265	110,854	10,704,861	117,687
	2020	10,490,130	123,807	10,553,682	132,447	10,731,610	123,291	10,781,745	**144,557**

Table 2

SUMMARY OF CLAIMS BY ATTAINED AGE

		Quarter 1		Quarter 2		Quarter 3		Quarter 4	
Age Group	Year	Exposure Count	Claim Count	Exposure Count	Claim Count	Exposure Count	Claim Count	Exposure Count	Claim Count
[0-24]	2015	904,975	338	913,509	367	919,480	368	914,900	381
	2016	903,878	399	905,345	357	913,287	365	910,616	362
	2017	891,124	375	901,714	356	909,978	336	907,173	352
	2018	886,257	305	896,473	328	905,286	344	903,013	301
	2019	880,599	314	888,308	336	893,962	316	888,899	342
	2020	876,456	337	877,148	344	889,276	390	890,940	349
[25-44]	2015	2,638,348	2,059	2,662,312	2,078	2,683,394	1,991	2,675,169	2,075
	2016	2,639,630	2,122	2,642,114	2,013	2,669,171	2,245	2,667,094	2,186
	2017	2,609,879	2,090	2,644,909	2,146	2,677,613	2,085	2,679,485	2,130
	2018	2,623,398	2,020	2,662,214	2,093	2,698,585	2,125	2,703,693	2,132
	2019	2,649,099	2,078	2,685,416	2,166	2,718,458	2,095	2,720,600	2,051
	2020	2,693,990	2,217	2,711,145	2,424	2,756,777	2,578	2,771,178	2,575
[45-64]	2015	4,267,554	17,201	4,314,358	16,329	4,358,070	15,969	4,354,486	16,115
	2016	4,290,271	16,948	4,296,731	16,092	4,344,298	15,538	4,343,751	16,154
	2017	4,233,432	16,278	4,279,886	15,431	4,322,579	15,482	4,316,695	15,977
	2018	4,200,726	16,417	4,243,708	15,155	4,284,064	15,010	4,274,977	15,859
	2019	4,157,477	15,800	4,195,214	15,211	4,228,899	14,975	4,214,976	15,390
	2020	4,139,208	15,942	4,141,291	17,364	4,188,501	16,631	4,185,793	18,240
[65-84]	2015	2,160,949	58,656	2,212,514	53,024	2,261,775	51,268	2,288,138	54,364
	2016	2,236,790	57,041	2,267,141	52,498	2,320,865	51,736	2,350,499	55,797
	2017	2,275,087	59,082	2,329,515	53,456	2,382,078	51,857	2,410,395	55,975
	2018	2,331,376	59,667	2,385,635	53,548	2,438,808	52,505	2,465,835	56,461
	2019	2,383,563	58,975	2,435,554	54,835	2,485,481	53,384	2,508,662	56,323
	2020	2,447,703	60,297	2,480,284	63,931	2,539,018	61,064	2,565,902	71,858
[85+)	2015	352,079	51,333	367,444	43,141	382,525	40,370	393,888	47,337
	2016	352,590	47,295	363,922	42,135	378,537	40,678	389,810	47,959
	2017	345,724	49,689	360,317	41,786	374,637	39,935	385,258	47,908
	2018	340,446	49,770	354,462	41,299	368,270	39,020	378,539	46,020
	2019	334,376	46,686	348,019	42,076	361,465	40,084	371,724	43,581
	2020	332,774	45,014	343,813	48,384	358,037	42,628	367,932	51,535

The following are some of the more notable observations from the analyses detailed in this report:

Individual Life Insured Excess Mortality Analysis

- The fourth quarter of 2020 realized the largest number of quarterly claims over 2015-2020 with 144,500. This was 9% greater than the second quarter, which had 132,000 claims.
- Fully underwritten business realized 12% excess mortality in 2020. Mortality ratios for fully underwritten business peaked at 22% higher than the expected trend line in the fourth quarter of 2020.
- Attained ages above 25 saw their largest mortality increases in the fourth quarter of 2020. The next worst quarter was the second for ages above 45 but the third for ages 25-44.
- Excess mortality peaked in the fourth quarter for all underwriting classes. Unlike the prior report, preferred non-smoker and standard non-smoker had similar results.
- By the fourth quarter, all face amount bands exhibited excess mortality over 20%.
- The Northeast and New York/New Jersey regions saw very high mortality in April and May of 2020, but it was somewhat surprising to see the results in those regions and most other regions essentially return to normal in June. However, mortality increased in all regions in the second half of 2020 and seven regions peaked in December.

Additional Deaths Analysis: Insured Population

- Males and females exhibited relatively similar additional deaths per 1,000 in 2020 for ages 40 and over, where exposure was largest. The exception was the fourth quarter, where males showed materially greater additional mortality than females.
- As might be expected, standard risk classes exhibited greater additional mortality than preferred classes for ages 40 and over.
- At ages 75-94, the standard classes had the greatest additional deaths per 1,000, followed by substandard, and then finally aggregate.
- Smokers usually experienced greater additional mortality in 2020 than non-smokers for ages 40 and older. However, the difference in levels of additional mortality between smokers and non-smokers was much less material than the difference between the preferred and standard risk classes.

Comparison of Insured to General Population Mortality

- Relative to the general population, fully insured lives generally had slightly favorable experience in the first quarter, significantly better in the second quarter, and then continued to have better than typical relative experience in the third and fourth quarters.
- The experience for policies with face amounts above $500,000 was substantially better when compared against the general population, especially in the second and third quarters.
- While the relationship of the insured to population seems to indicate a move in favor of the insured population during the pandemic versus prior periods, that move was even more pronounced in the New York/New Jersey region in the second quarter when experience was at its worst in any region/quarter combination.

Section 3: Methodology

The analyses included in this report were based on reported claims submitted by participating companies through June 2021. Deaths occurring after December 31, 2020 were omitted from the analyses to minimize distortions due to reporting lags. Any deaths prior to December 2020 that were not yet shared by company contributors at the time of this report may impact the analysis, but the authors feel the impact will likely be minimal.

The primary goal of this report was to communicate industry mortality experience before and during the pandemic and to share the level of excess mortality observed in the four quarters of 2020 for various subsegments of the data relative to an expected mortality trend based on the five calendar years prior to the pandemic. The expected mortality trend is a very important assumption in any pandemic-related 2020 excess mortality analysis. Once determined, actual 2020 mortality is compared against this expected level of mortality for 2020 to determine the excess mortality.

Definitions

Several definitions are useful to better understand this report:

- Relative Mortality Tables: industry tables used in the study; for this study, they are the 2015 Smoker Distinct, Select and Ultimate Valuation Basic Table (VBT) for fully underwritten business and the 2008 Limited Underwriting Table (VBTLU) for Guaranteed Issue (GI), Simplified Issue (SI), and Conversions.

- Actual Relative Mortality Ratio: calculated as the actual death counts in a period divided by expected deaths, based on the Relative Mortality Tables.

- Expected Relative Mortality Ratio: for years 2015 to 2019, the values in the linear trend line are determined from the 2015-2019 Actual Relative Mortality Ratios. The trend line was extended into 2020 to obtain the 2020 Expected Relative Mortality Ratio. A separate trend line and set of Expected Relative Mortality Ratios were developed for each of quarters one, two and three, and for each subsegment of the data.

- Trend line: the set of Expected Relative Mortality Ratios for years 2015 to 2020.

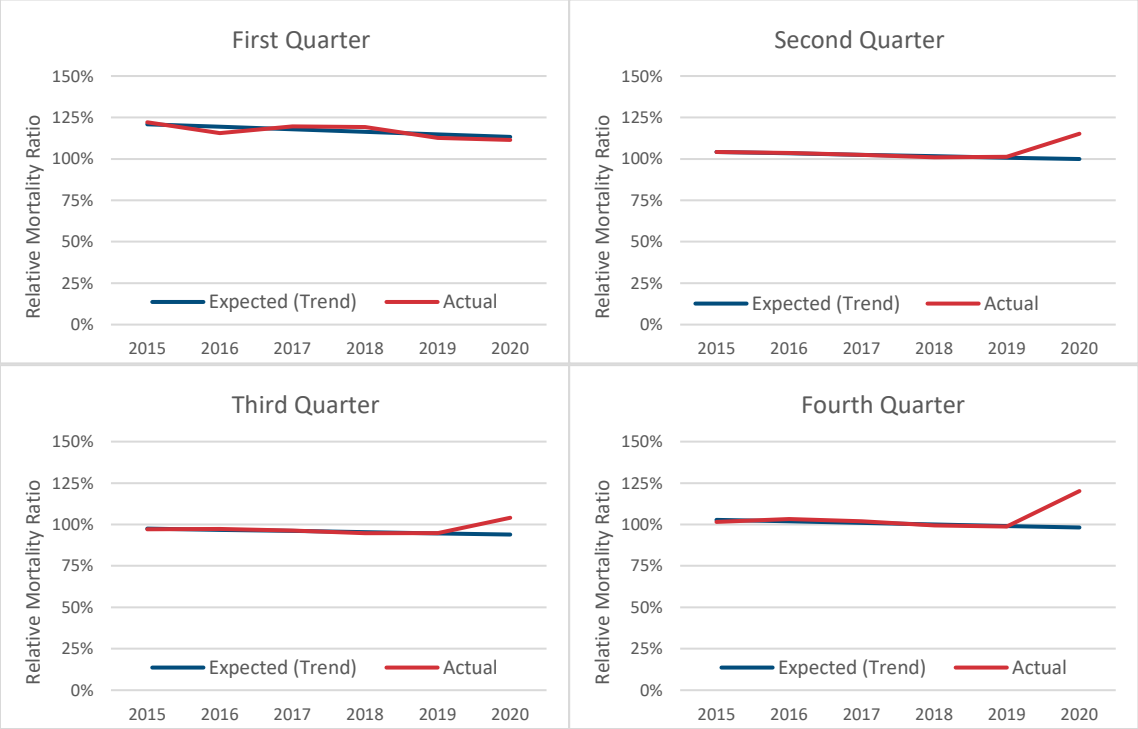
- Actual to Expected Relative Mortality Ratio: the ratio of the 2020 Actual Relative Mortality Ratio to the Expected Relative Mortality Ratio.

- Excess Mortality: the "extra mortality" observed in each of the first three quarters of 2020 expressed as a percentage. It is calculated as the Actual to Expected Relative Mortality Ratio minus one.

Actual death counts were used in the Actual Relative Mortality Ratios, but the mortality rates used to determine expected deaths were amount-based. Figure 1 provides an example of the development of the Actual and Expected Relative Mortality Ratios for the overall fully underwritten business. The Actual (red line) and Expected (blue line) Relative Mortality Ratios for each quarter in 2020 for fully underwritten business are shown. The Expected Relative Ratios were determined from the 2015-2019 Actual Relative Mortality Ratios and extended into 2020 to obtain the 2020 Expected Relative Mortality Ratios. The 2020 Actual Relative Mortality Ratios and the 2020 Expected Relative Mortality Ratios were then used to determine the excess mortality in each quarter of 2020. In general, the Actual Relative Mortality Ratios from 2015 to 2019, particularly in the data segments with higher death counts, showed a distinct close-to-linear decrease between 2015 and 2019. We are not aware of any trends, outside of COVID, that would cause us concern regarding the extension of this trend line into 2020.

Figure 1

ACTUAL VERSUS EXPECTED RELATIVE MORTALITY RATIOS – FULLY UNDERWRITTEN BUSINESS



The 2020 Expected Relative Mortality Ratios were developed independently for each relevant subsegment of the experience. For example, separate 2020 Expected Relative Mortality Ratios were developed for each quarter and face amount group and then compared against the 2020 Actual Relative Mortality Ratios. Additional subsets of trends lines were developed by sex, attained age group, underwriting class and smoker status, duration, product type, geographic region, and underwriting method. The Tableau dashboards that accompany this report contain the graphs of all the Actual and Expected Relative Mortality Ratios used in this report. The inclusion of all these graphs allows the user to assess for themselves the appropriateness of the trend line in any of the 2020 excess mortality results.

The decision to complete the excess mortality analysis by quarter was made because 2020 population mortality results showed very different levels of mortality by quarter. It also eliminated the need to incorporate explicit seasonality adjustments. Completing the analysis separately by quarter allowed for a deeper analysis into the 2020 experience.

After examining various subsegments of business, it was felt that the development of a trend line was more appropriate than using an average of the Actual Relative Mortality Ratios over a period of time, such as 2015-2019, or a single year ratio, such as 2019. The use of recent trends captures emerging trends in factors such as mortality improvement or mix of business.

Only single life, base policies were included for the purposes of this analysis. Various categories of policies were excluded from our analysis:

- Joint life policies
- Policy riders
- Policies with residences outside of the U.S.
- Policies issued prior to 1950

3.1 Methodology for Examining Differences in the Increase in Death Rate (Qx) among Insured Population Subsegments

Section 11 of this report examines differences in the level of increase in underlying death rates among different subsegments of the insured population, for example, smokers versus non-smokers and variations by geographic region. The death rates in section 11 were age/sex-adjusted using the 2015-2020 insured experience data.

A meaningful comparison of the added mortality within population subsegments during the pandemic requires age/sex standardization. Age distributions within subsegments of the insured population can vary considerably; non-smokers skew much older than smokers, for example. Likewise, the distribution of males and females in the insured population is quite different compared to the general population. To account for these concerns, the standard distribution against which the rates of death were calculated incorporate both age and sex.

Because this report is focused on differences brought on during the pandemic, a similar methodology was applied for this analysis as described above for sections 4 through 10. That is, the age/sex-adjusted Qx's were projected into 2020 based on results from 2015-2019 to determine an expected trend. Then, the actual age/sex-adjusted Qx differences from the expected trend were calculated for 2020 to estimate the additional mortality.

Calculation Approach

Three age/sex distributions were created using all exposures in the study:

- Ages 5-39 (males and females)
- Ages 40-74 (males and females)
- Ages 75-94 (males and females)[2]

3.2 Methodology for Comparisons between Insured Business and the General Population.

The comparison of the experience of insured lives to the general population is discussed in section 12. This comparison required establishing an expected basis for general population mortality. That work required the consolidation of a large amount of data related to the general population mortality experience going back to 2015. This data had not been needed for our prior report, which looked only at the impact of COVID-19 on insured lives. The comparisons included here also required a different approach than the remainder of this report since all comparisons here are relative to general population mortality. More detail on the creation of the population table is provided in Appendix A. Below is a summary of the approach that explains the percentages that appear in the tables in section 12.

[2] Note on age group limitations: the U.S. population and U.S. death estimates that are available for 2020 for ages under 5 and over 94 could not be applied in a reasonable way to extend estimates of mortality rates, so the minimum and maximum age endpoints are ages 5 and 94 for the purposes of this analysis.

Calculation Approach

Each cell in the tables in the population comparison section shows the following Actual to Expected Ratio:

{Actual Insured Deaths / Expected Insured Deaths Using Population Mortality Rates}

We calculated the expected population deaths by:

- Creating a complete estimate of population mortality rates, ages 5-94, that varies by age, sex, region and month for every month from January 2015 through December 2020, largely relying on CDC data (see Appendix A for details, including links to the relevant source data).
- Applying these rates to the insured exposures in the study to create an expected basis for the general population comparisons in this section.[3]

A key limitation for this analysis is the lack of select factors in the underlying population table. The results in section 12 are not altered to account for this in any way.

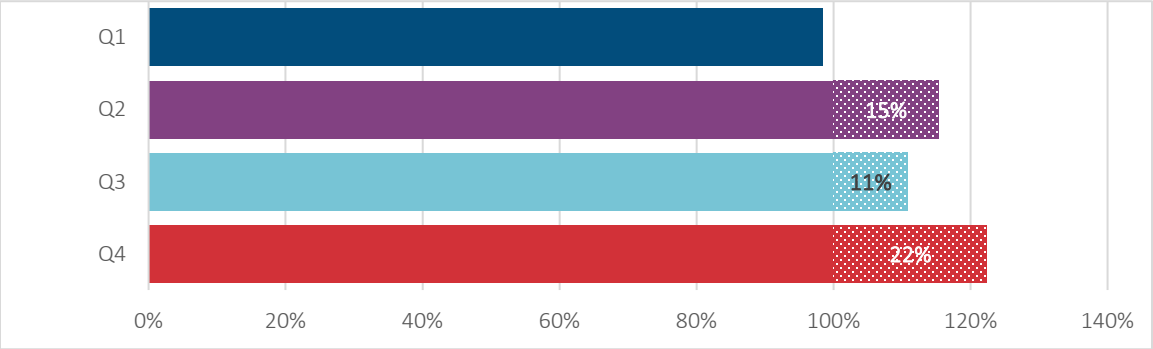
[3] The underlying mortality rates in the expected population table change over time, so the added step of trending into 2020 that is essential for analyzing the A/E results on the static VBT bases is not necessary here as this is not a comparison of excess insured deaths to excess population deaths where the trending on both the insured and population pieces would be needed.

Section 4: Overview of Fully Underwritten Business

This section reviews the excess mortality for the overall, fully underwritten business in each quarter of 2020. Figure 2 shows the ratio of the Actual Relative Mortality Ratio divided by the Expected Relative Mortality Ratio. Any portion of this ratio above 100% is considered excess mortality and is indicated by the cross-hatched portion of each bar in the chart. The experience in the first quarter of 2020 was 2% below its expected level. In the other three quarters of 2020, the mortality levels were all in excess of the expected levels at 15%, 11%, and 22%, respectively.

Figure 2

2020 RATIO OF ACTUAL TO EXPECTED RELATIVE MORTALITY RATIOS -- FULLY UNDERWRITTEN BY QUARTER

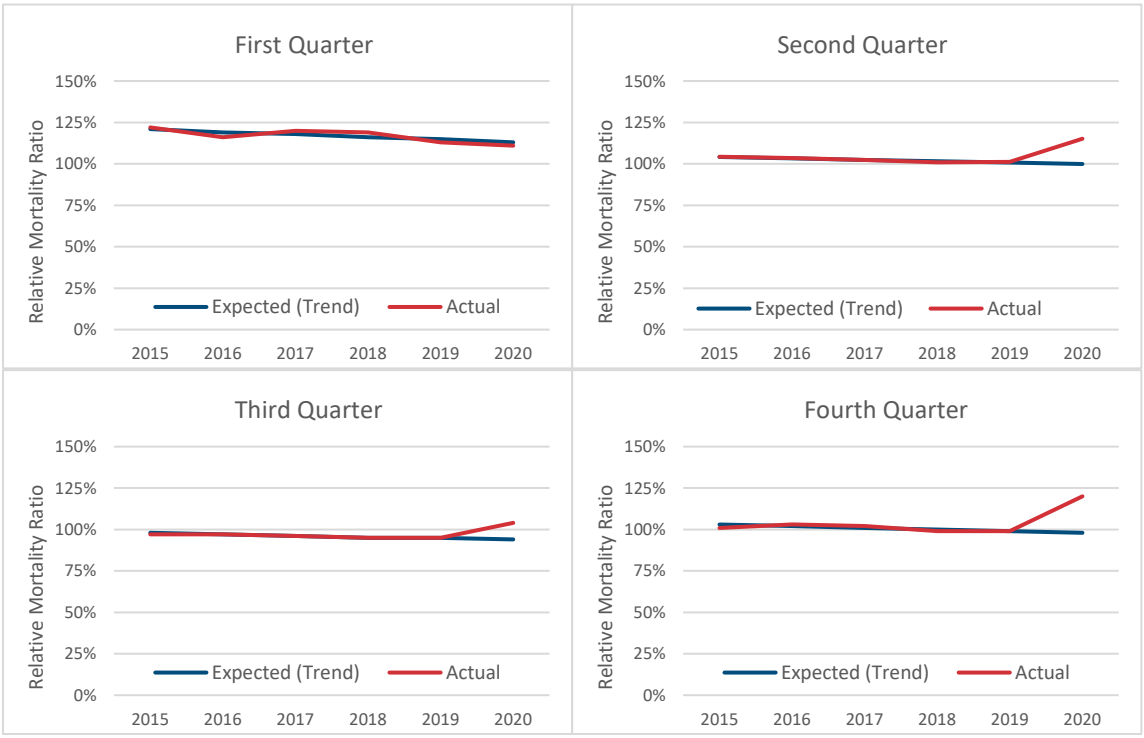


The above analysis was based on a robust number of fully underwritten claims, which ranged between 76,000 and 98,000 in each quarter from the beginning of 2015 to the fourth quarter of 2020.

The Expected Relative Mortality Ratios used to develop the excess mortality results are shown in Figure 3. Here, the trend lines show a pattern of improving mortality from 2015 to 2019 for all four quarters. The Actual Relative Mortality Ratios have more volatility around their Expected Relative Mortality Ratios (trend line) in the first quarter, while the second, third, and fourth quarter trend lines are very close to the Actual Relative Mortality Ratios. In addition, the relative level of mortality can be seen between quarters, with the first quarter having the highest level of mortality. Figure 3 also shows how the Actual Relative Mortality Ratio in the second, third, and fourth quarters of 2020 were higher than in any of the prior five years.

Figure 3

ACTUAL AND EXPECTED RELATIVE MORTALITY RATIOS – FULLY UNDERWRITTEN BUSINESS



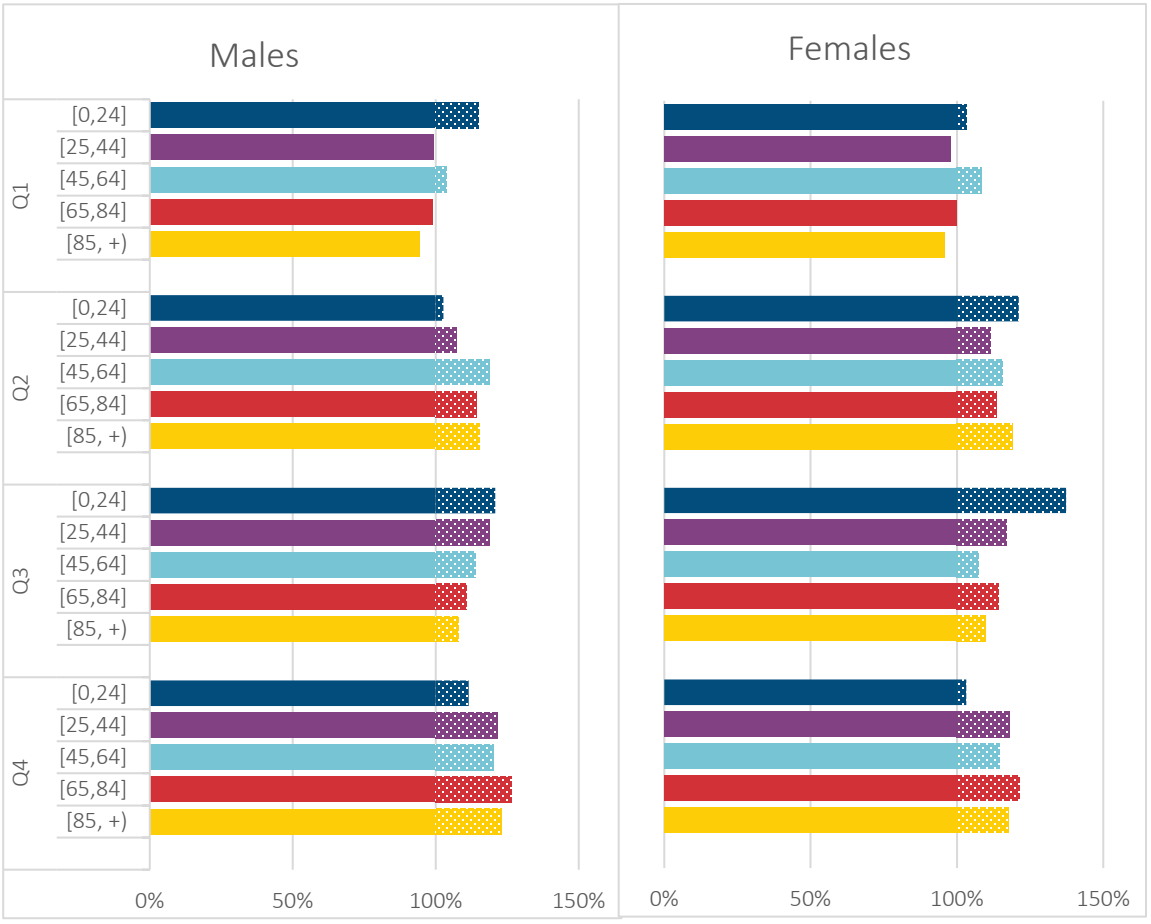
Section 5: Fully Underwritten by Attained Age and Sex

Fully underwritten business was segmented by sex (male and female) and five distinct attained age groups: 0-24; 25-44; 45-64; 65-84; and 85+. The excess mortality for both males and females is shown in Figure 4. For males, the fourth quarter of 2020 was the highest quarter for attained age groups above 25 with excess mortality of 20-27%. For females, the second quarter was the highest for age groups 45-54 and 85+, and the fourth quarter was the highest for age groups 25-44 and 65-84.

In general, for attained age groups 25 and higher, the fourth quarter had the highest excess mortality of 21-27%. The second quarter saw the second highest excess mortality for ages 45 and above. The third quarter was the second highest quarter for age group 25-44. Age group 0-24 saw the largest excesses in the third quarter, with excess mortality of 21% for males and 37% for females; however, death counts here were low and ranged from 75-100 deaths per quarter. Death counts were greater than 3,000 per quarter for all age groups above 45. Age group 25-44 had 500-700 deaths.

Figure 4

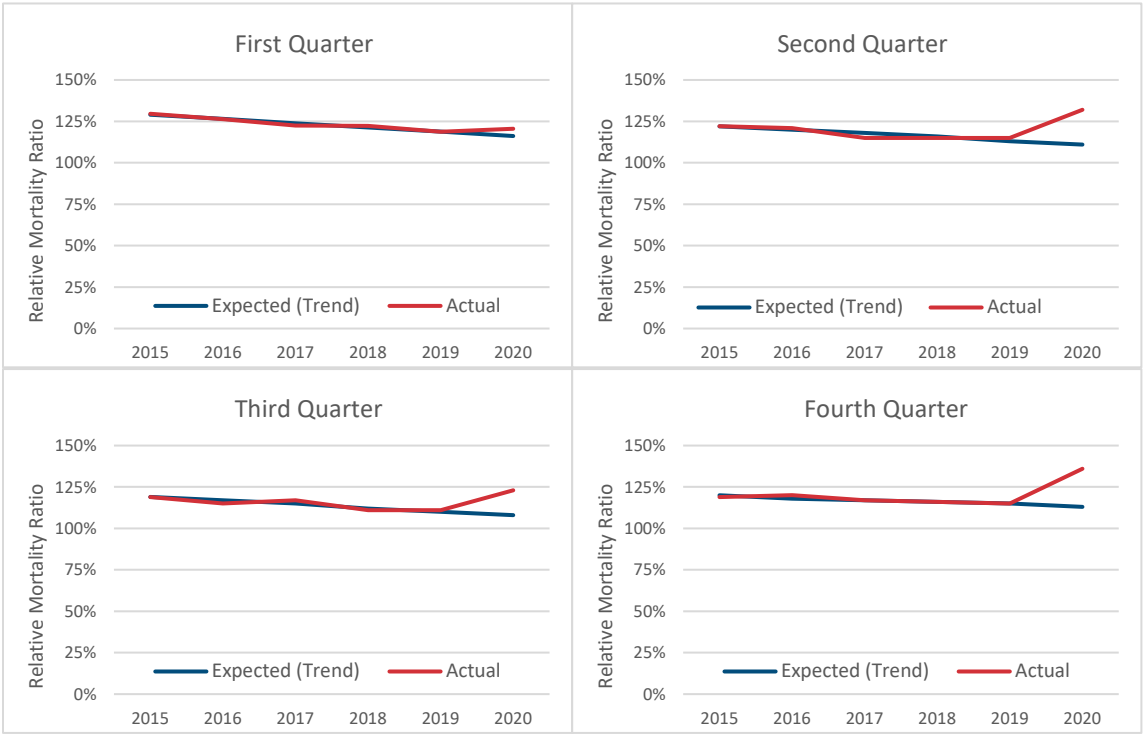
2020 RATIO OF ACTUAL TO EXPECTED RELATIVE MORTALITY RATIOS -- FULLY UNDERWRITTEN, BY SEX, ATTAINED AGE AND QUARTER



Comparable to the overall analysis, a decreasing trend of Expected Relative Mortality Ratios across 2015-2019 and across all four quarters can be seen in almost all sex/age groups. As an example, the Actual and Expected Relative Mortality Ratios for males, ages 45-64, are shown in Figure 5a, and for males, ages 85+, in Figure 5b[4]. For ages 85+, the higher and more volatile level of Actual Relative Mortality Ratios can be seen in the first quarter and is influenced by the varying severity of past influenza seasons. Also, Figure 5b shows lower absolute levels of excess mortality in the first three quarters of 2020 in ages 85+ versus the levels for ages 45-64 in Figure 5a.

Figure 5a

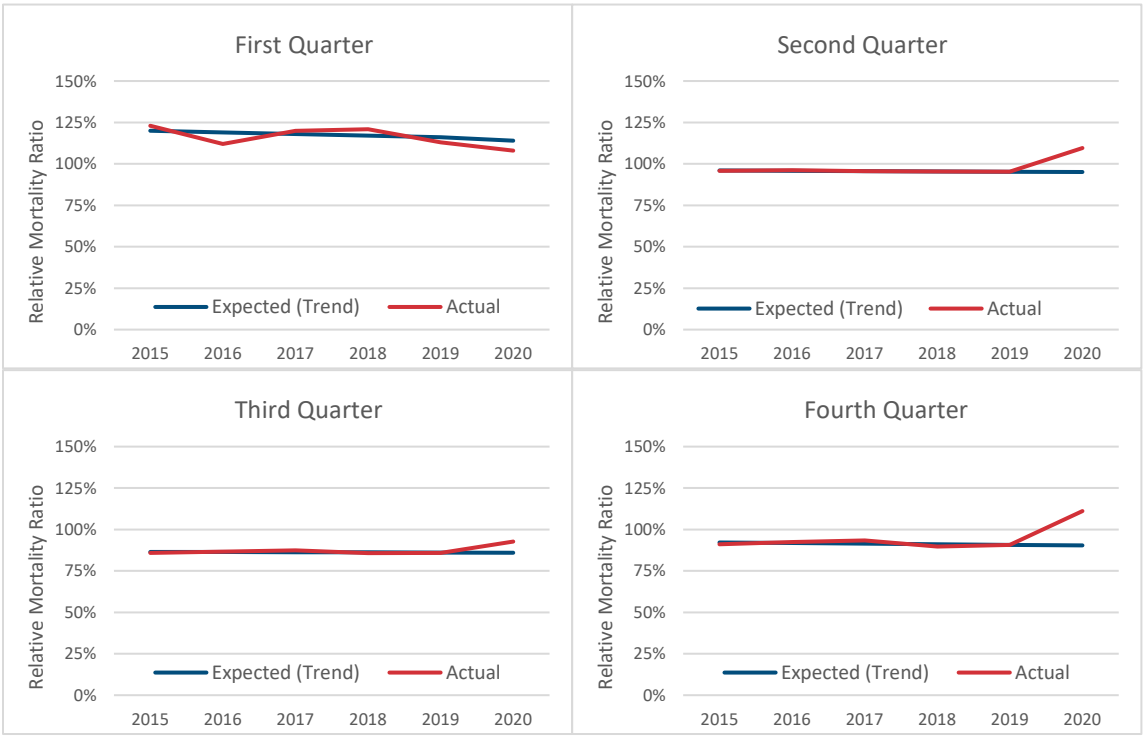
ACTUAL AND EXPECTED RELATIVE MORTALITY RATIOS – MALES, ATTAINED AGES 45-64



[4] The Actual and Expected Relative Mortality Ratios used to develop all excess mortality values can be found in the Tableau dashboards that accompany this report.

Figure 5b

ACTUAL AND EXPECTED RELATIVE MORTALITY RATIOS – MALES, ATTAINED AGES 85+



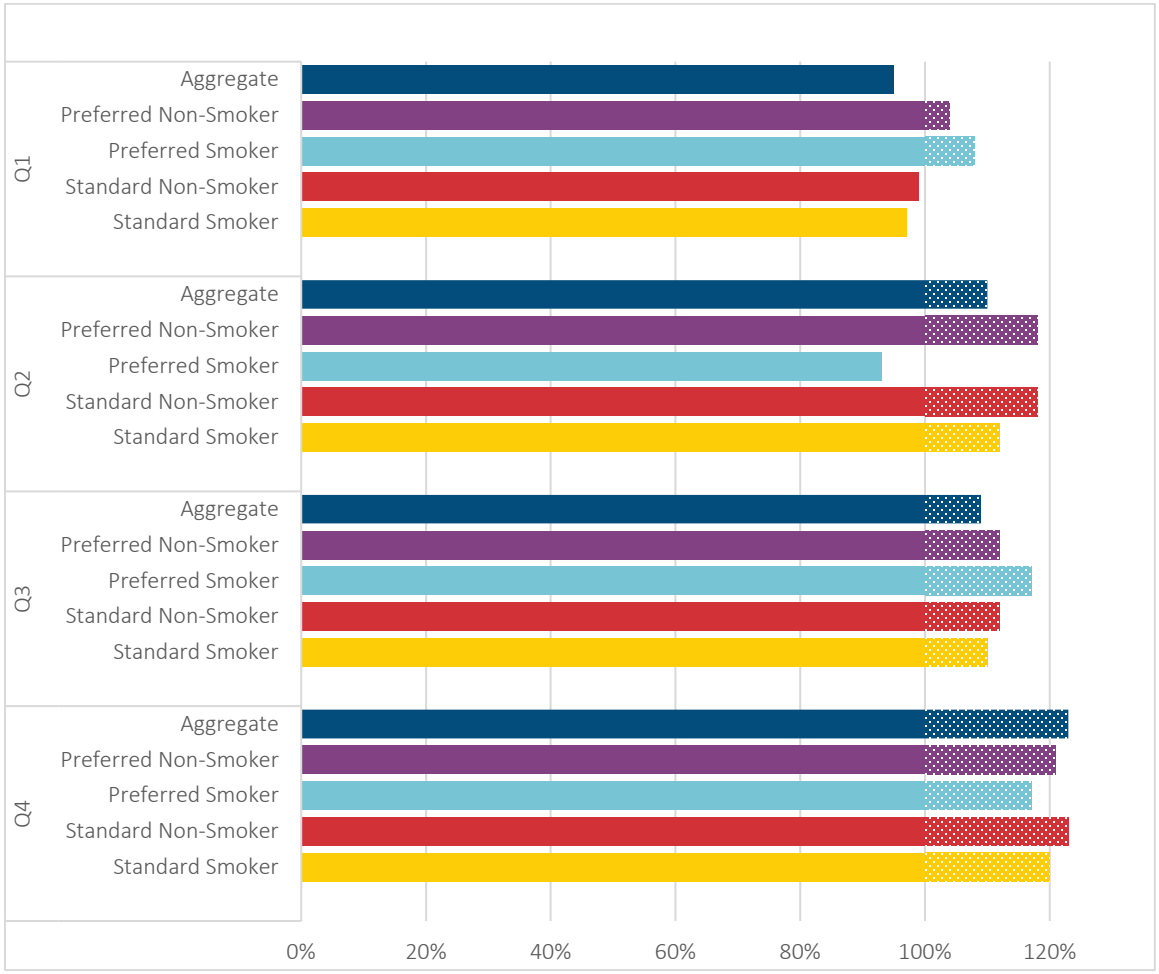
Section 6: Fully Underwritten by Underwriting Class

Fully underwritten business was segmented into five underwriting classes: aggregate; preferred non-smoker; preferred smoker; standard non-smoker; and standard smoker. The 'aggregate' segment includes business not classified as preferred/standard or smoker/non-smoker and mostly includes older business written before the preferred and smoker distinct underwriting structures were introduced. The excess mortality for the five underwriting classes for the four quarters of 2020 is shown in Figure 6. The fourth quarter of 2020 was the highest quarter for all classes except preferred smoker where the excess mortality was the same for the third and fourth quarters.

The preferred smoker segment only had 400-500 deaths per quarter, which may help to explain its volatile results. Elsewhere, credibility is high with 5,000-8,000 claims per quarter in the preferred non-smoker segment, 40,000-54,000 deaths per quarter in the standard non-smoker segment, and 15,000-20,000 deaths per quarter in the standard smoker segment.

Figure 6

2020 RATIO OF ACTUAL TO EXPECTED RELATIVE MORTALITY RATIOS -- FULLY UNDERWRITTEN BY UNDERWRITING CLASS AND QUARTER



The Actual and Expected Relative Mortality Ratios used to develop excess mortality values for the preferred non-smoker, standard non-smoker, and standard smoker classes are shown in Figure 7a, 7b, and 7c. The trend lines are flatter in the standard classes than in the preferred classes. Trend lines appear to line up well with Actual Relative Mortality Ratios everywhere except in quarter one for the standard non-smoker Actual Relative Mortality Ratios and, here, 2016 is the only year that appears to be significantly lower than the trend line.

Figure 7a

ACTUAL AND EXPECTED RELATIVE MORTALITY RATIOS – PREFERRED NON-SMOKER CLASS

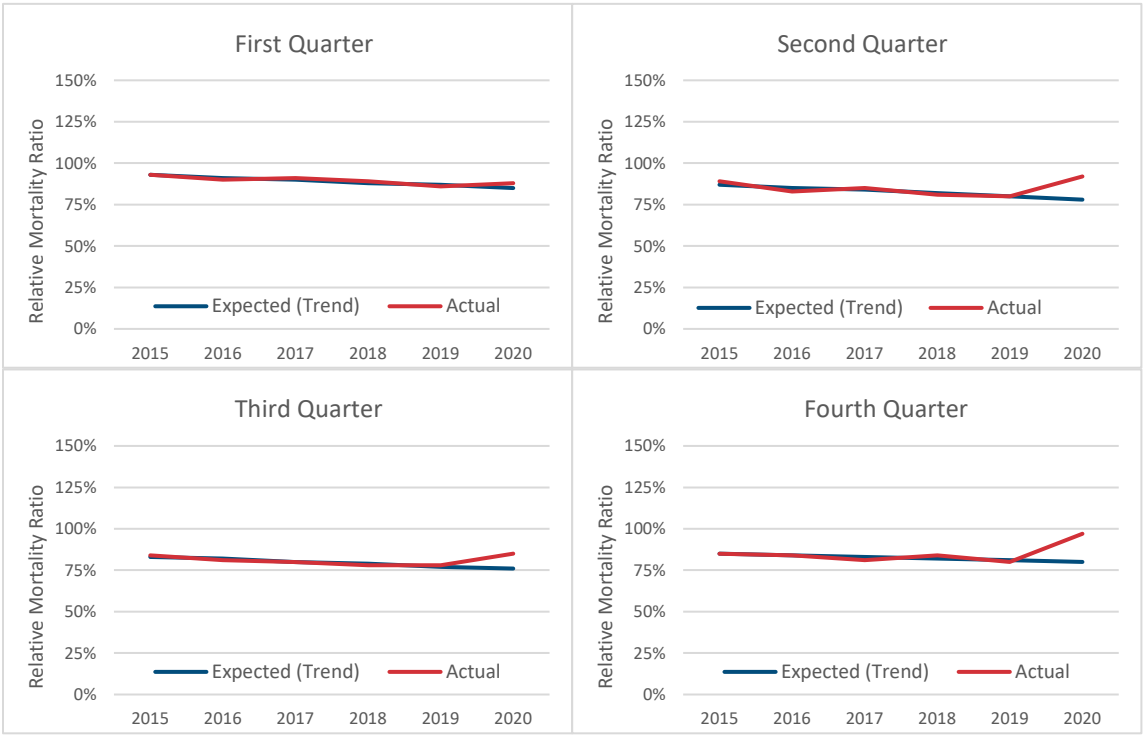


Figure 7b

ACTUAL AND EXPECTED RELATIVE MORTALITY RATIOS – STANDARD NON-SMOKER CLASS

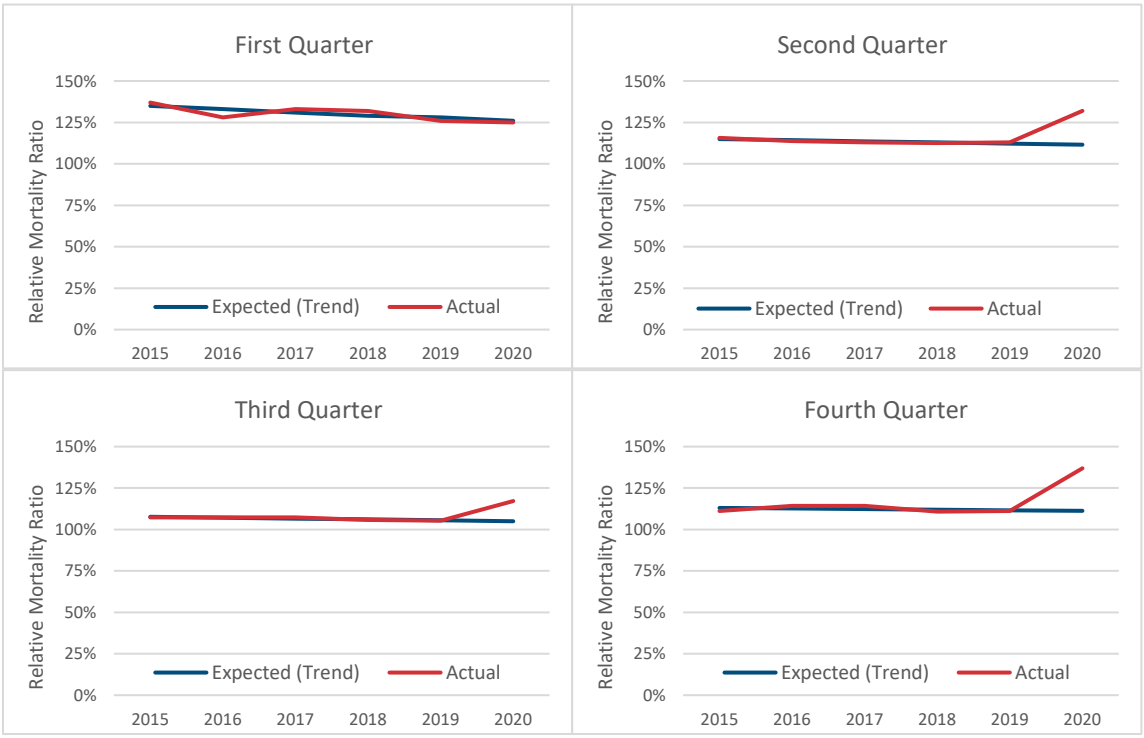
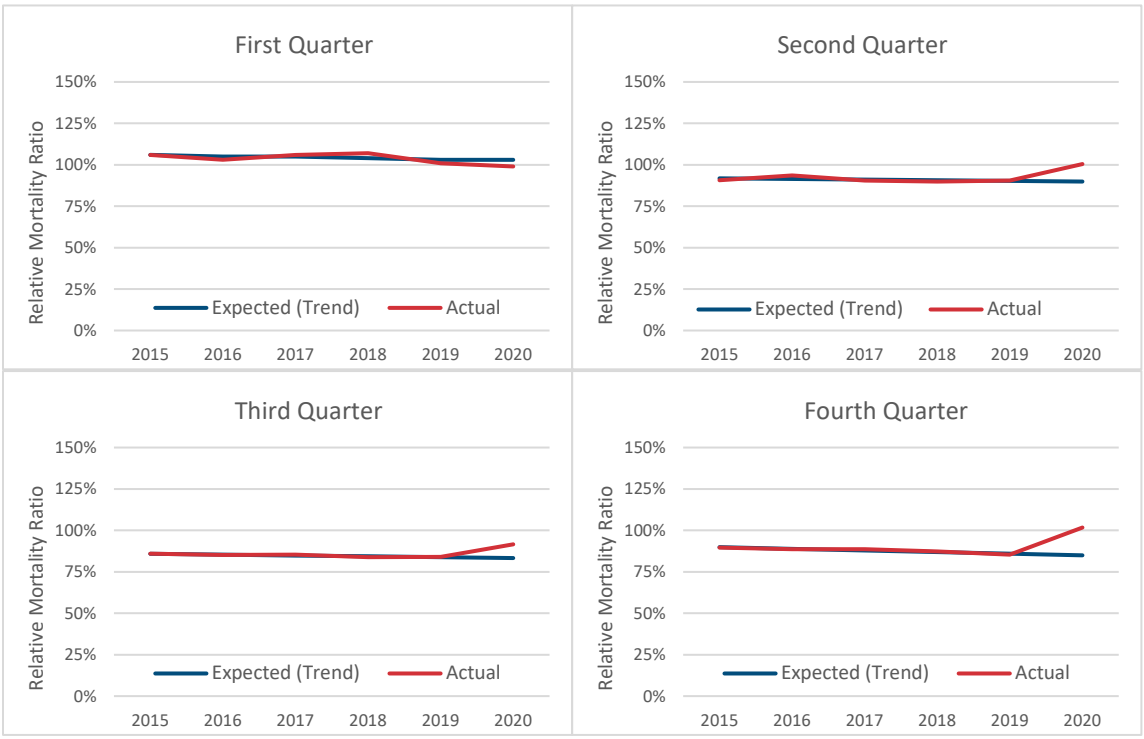


Figure 7c

ACTUAL AND EXPECTED RELATIVE MORTALITY RATIOS – STANDARD SMOKER CLASS



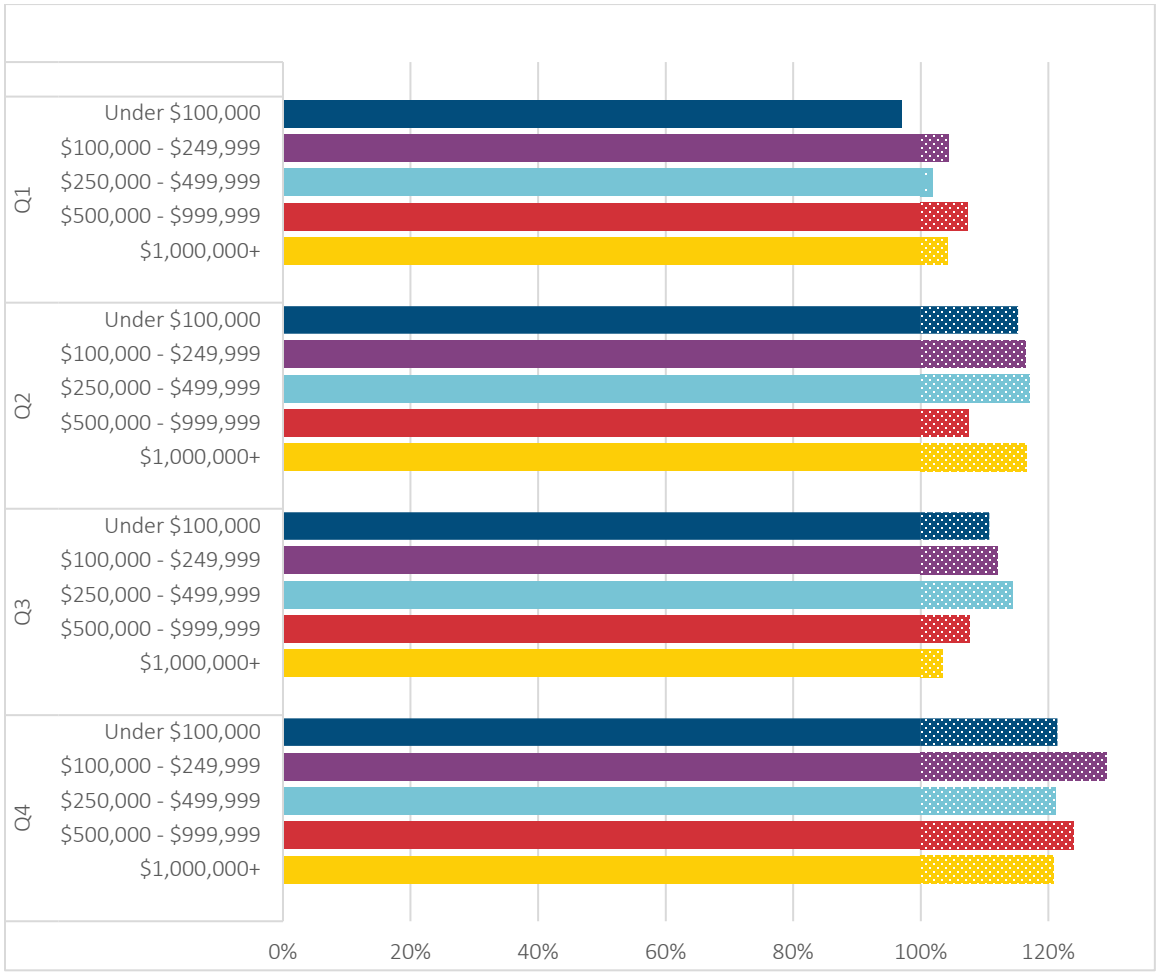
Section 7: Fully Underwritten by Face Amount

Fully underwritten business was segmented into five face amount groupings: under $100,000; $100,000-$249,999; $250,000-$499,999; $500,000-$999,999; and $1,000,000+. The excess mortality for each quarter in 2020 is shown in Figure 8. Face amounts above $500,000 mostly saw higher excess mortality in the first quarter than policies with lower face amounts. The fourth quarter had the highest levels of excess mortality, with 21-29% for all the face amount groups. The $1,000,000+ face amount group had the best experience in the third quarter with an excess level of only 3% over trend and tied for the best in the fourth quarter with $250,000-$499,999 and under $100,000, with an excess level of 21%.

All face amount groups except the $1,000,000+ for 2015 and 2016 had death counts above 1,000, with the under $100,000 group containing between 60,000 and 79,000 deaths per quarter. The number of deaths per quarter for the $1,000,000+ face amount group was between 900 and 1,500. As shown more clearly in Figure 8 and the Tableau dashboards, even though the percentage increases over trend are similar in the $1,000,000+ band and lower face amount bands in the second and fourth quarters, the starting baseline is much lower in the $1,000,000+ band.

Figure 8

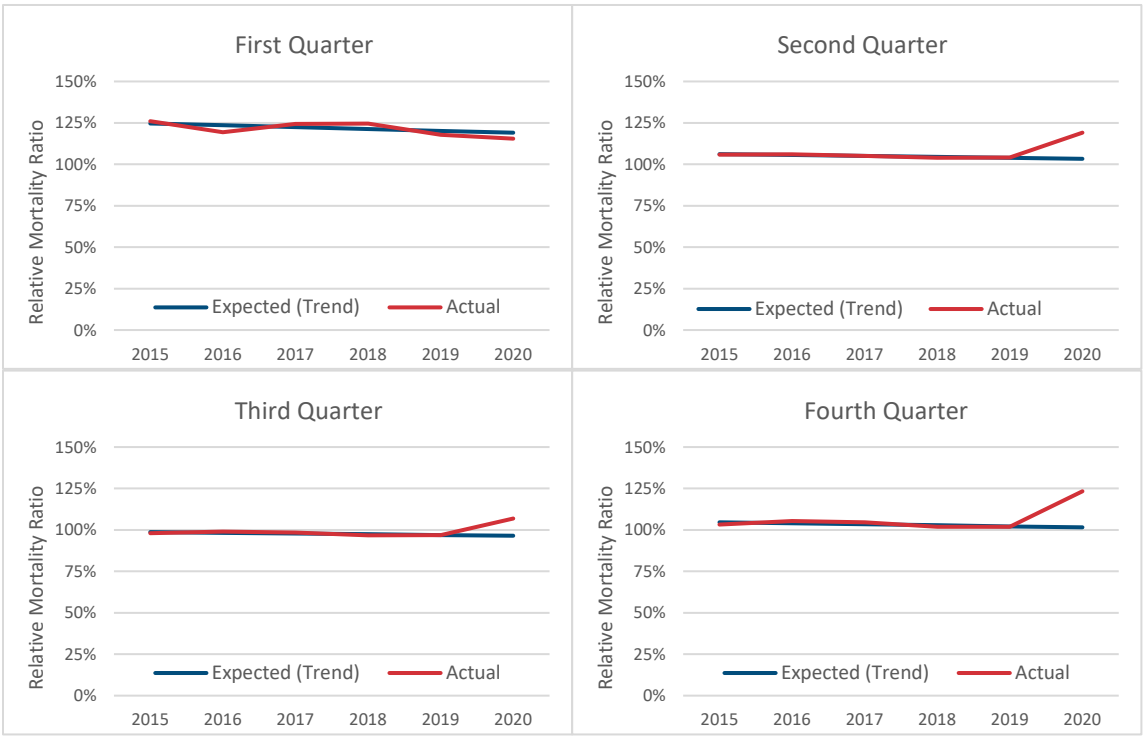
2020 RATIO OF ACTUAL TO EXPECTED RELATIVE MORTALITY RATIOS – FULLY UNDERWRITTEN BY FACE AMOUNT AND QUARTER



The Actual and Expected Relative Mortality Ratios for the under $100,000 and $1,000,000+ face amount groups are shown in Figures 9a and 9b to highlight the difference in the levels between these two groups[5]. The trend lines for the $1,000,000+ group are about 20% to 30% lower than their comparable trend line for the under $100,000 group. The trend lines in both groups decrease over the study period, as they do in most other subsegments. Even with different expectations in the fourth quarter, both the $1,000,000+ and the $100,000 group have 21% excess mortality.

Figure 9a

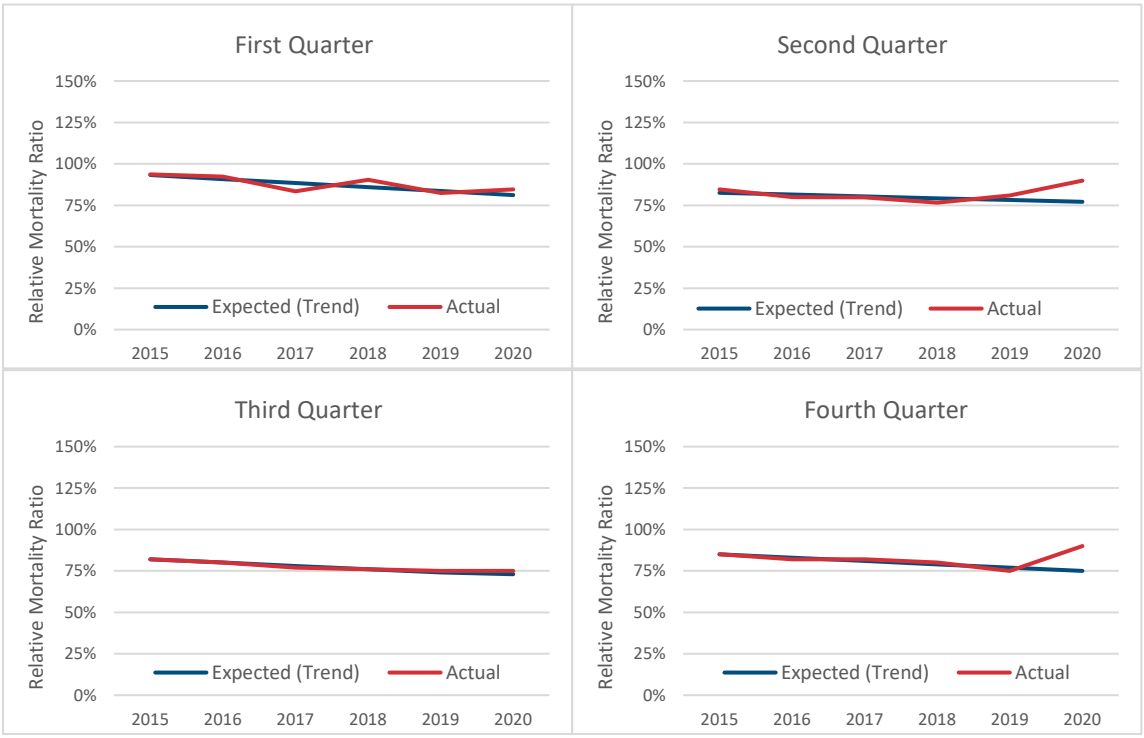
ACTUAL AND EXPECTED RELATIVE MORTALITY RATIOS – UNDER $100,000



[5] The Actual and Expected Relative Mortality Ratios used to develop all excess mortality values can be found in the Tableau dashboards that accompany this report.

Figure 9b

ACTUAL AND EXPECTED RELATIVE MORTALITY RATIOS – $1,000,000+ FACE AMOUNT



Section 8: Underwriting Method and Conversions

In this section, we look at the results by the three underwriting methods: Fully Underwritten, Simplified Issue and Guaranteed Issue, as well as Conversions. Excess mortality results were fairly consistent across these four categories in all but the fourth quarter, where the Guaranteed Issue result was slightly lower. The Fully Underwritten results were based on 76,000 to 98,000 deaths per quarter. For Simplified Issue, there were between 13,000 and 22,000 deaths per quarter while, for conversions, there were between 1,000 and 3,000 deaths per quarter. For Guaranteed Issue, there were between 16,000 and 23,000 deaths per quarter.

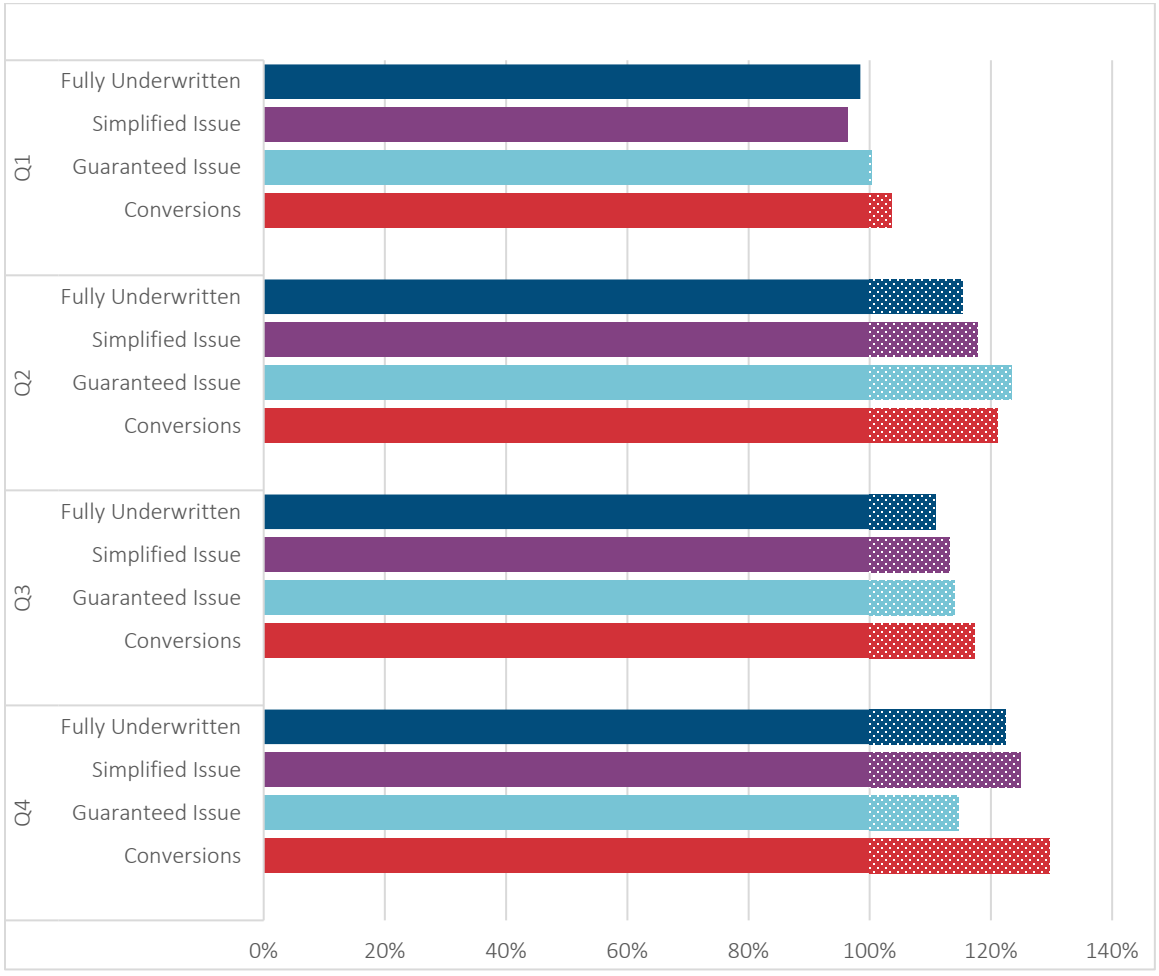
As shown in Figure 10, Simplified Issue had higher excess mortality than Fully Underwritten in all but quarter one and Conversions were higher than Simplified Issue in all quarters. These three categories realized their highest excesses in the second and fourth quarters.

The results for Guaranteed Issue are mixed relative to the other three categories and difficult to interpret. Here we see Guaranteed Issue with the largest excess of all four categories in the second quarter and the smallest excess in the fourth quarter. A change in the mix of business may be a driver of this unusual experience but would require more advanced analytics, which was beyond the scope of this report.

While the study data includes an Accelerated Underwriting category, there were insufficient deaths to allow any meaningful analysis.

Figure 10

2020 RATIO OF ACTUAL TO EXPECTED RELATIVE MORTALITY RATIOS BY UNDERWRITING METHOD AND QUARTER



Section 9: Underwriting Method and Duration

Fully Underwritten, Simplified Issue and Guaranteed Issue business results were reviewed by duration. Durations have been banded as 01 – 02, 03 – 05, 06 – 10, 11 – 15, 16 – 21 and 21+. All duration groups contained more than 1,000 claims per quarter except Fully Underwritten durations 1-2 and Guaranteed Issue durations 16-20, where there were at least 700 claims per quarter. Excess mortality moved more or less consistently across durations within each underwriting method. The fourth quarter had the highest excess mortality in all durations for Fully Underwritten and Simplified Issue.

As shown in Figure 11 for Fully Underwritten business, excess mortality was fairly consistent by quarter across policy durations, except for the first quarter. In quarter one, excess mortality for durations 01 – 02 was noticeably higher than the other durations and may indicate the protective value of a recent underwriting decision was diminished early in the pandemic. It's unclear why durations 03 – 05 generally have lower excess mortality. Excess mortality appeared as early as quarter one in four of the six duration groups. The fourth quarter showed the highest excess for all durations.

Figure 11

2020 RATIO OF ACTUAL TO EXPECTED RELATIVE MORTALITY RATIOS -- FULLY UNDERWRITTEN BY DURATION AND QUARTER

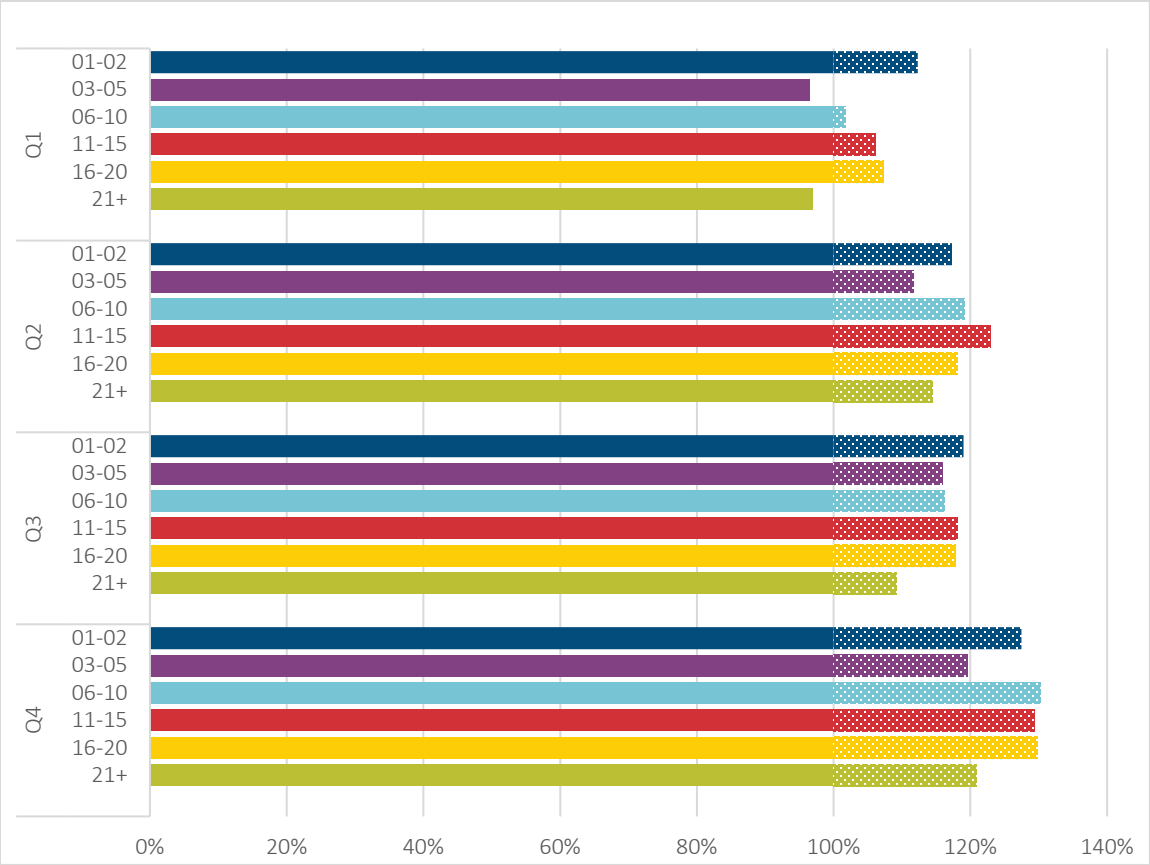


Figure 12 shows Simplified Issue results by duration. Significant excess mortality did not show up until the second quarter. Again, durations 01-02 appear higher on average, while durations 03-05 stand out from the surrounding durations as being lower. The fourth quarter showed the highest excess for all durations

Figure 12

2020 RATIO OF ACTUAL TO EXPECTED RELATIVE MORTALITY RATIOS -- SIMPLIFIED ISSUE BY DURATION AND QUARTER

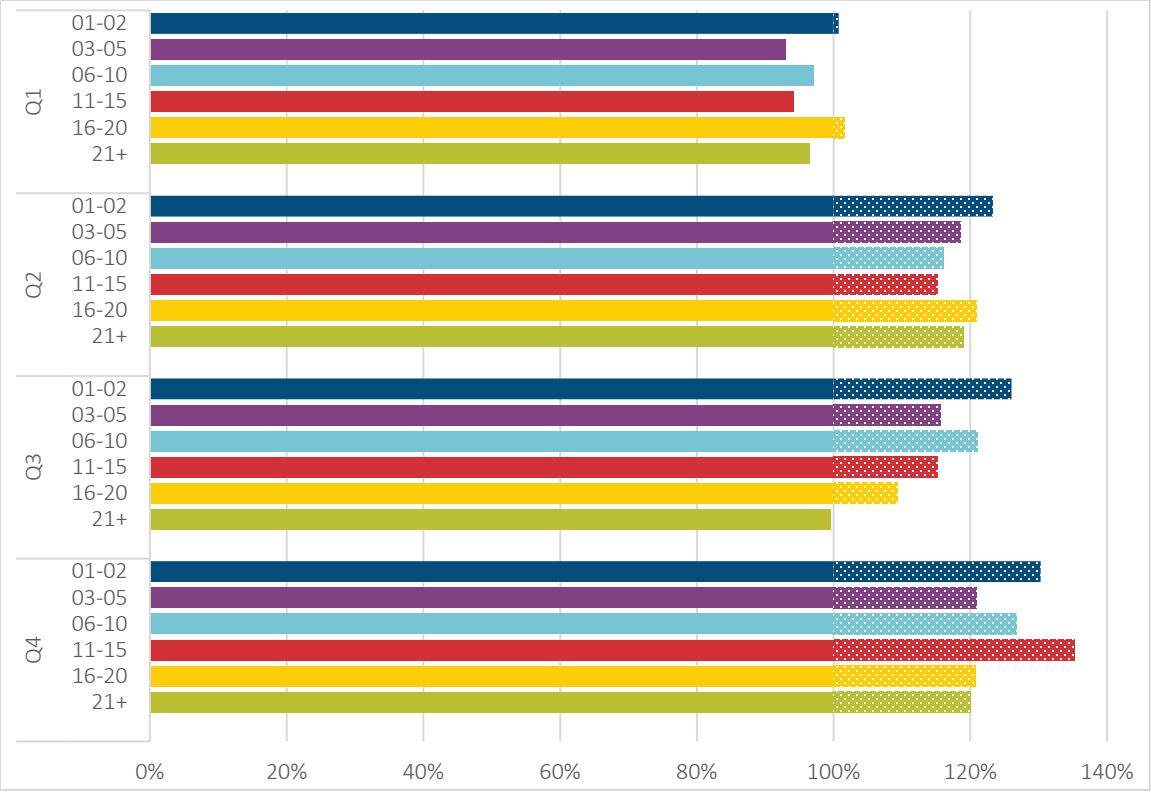
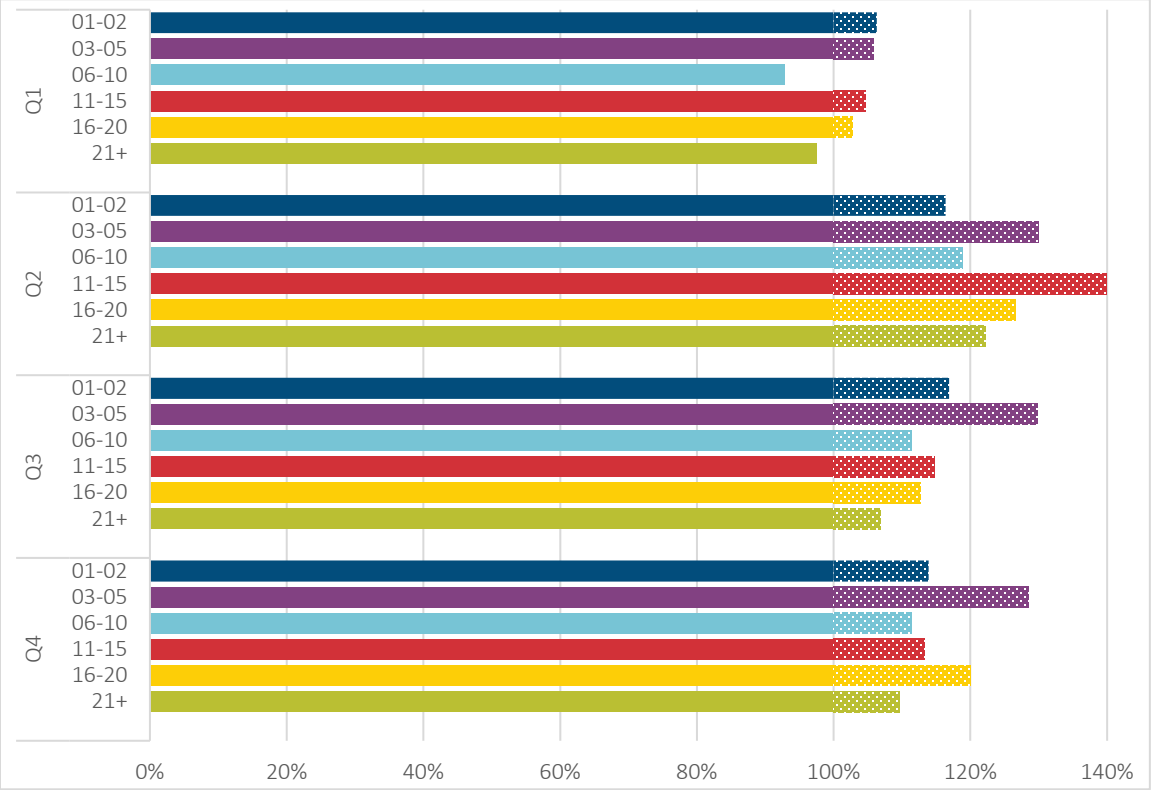


Figure 13 shows Guaranteed Issue results by duration. Excess mortality appeared as early as the first quarter in most of the durations. The second quarter had the highest excess mortality of all durations and differed from Fully Underwritten and Simplified Issue. Excess mortality was not as consistent across durations as in the Fully Underwritten and Simplified Issue blocks. Durations 01-02 and 03-05 do not show the same excess patterns as noted for fully underwritten and simplified issue business. It's not clear why that's the case. As noted in section 8, deeper analysis would be required to understand the underlying drivers, but that is beyond the scope of this report.

Figure 13

2020 RATIO OF ACTUAL TO EXPECTED RELATIVE MORTALITY RATIOS -- GUARANTEED ISSUE BY DURATION AND QUARTER



The Actual and Expected Relative Mortality Ratios for durations 03 – 05 and durations 11 – 15 for all three underwriting method types are shown in Figures 14a through 16b. As with Figures 11, 12 and 13, the impact of COVID is far more noticeable in quarters two through four than in quarter one.

Fully Underwritten business is shown below for two selected duration groups. Note that when banded by duration, the actual mortality results through 2019 closely follow the trend lines.

Figure 14a

ACTUAL AND EXPECTED RELATIVE MORTALITY RATIOS – FULLY UNDERWRITTEN, DURATIONS 03 – 05

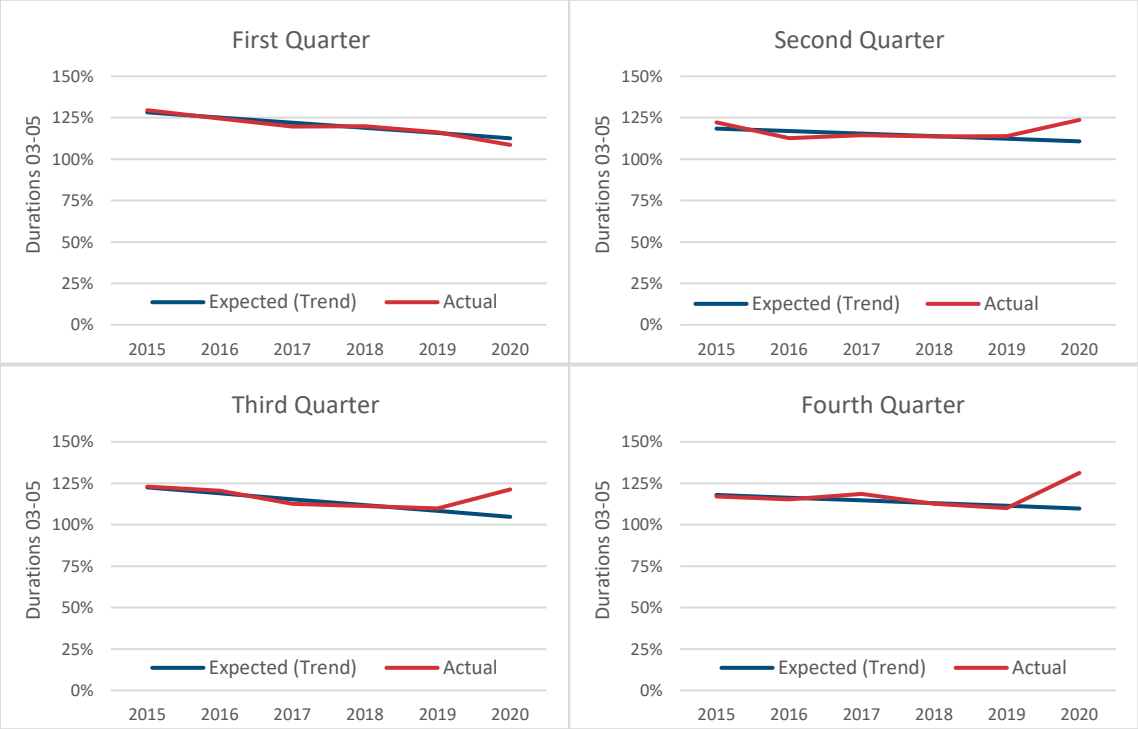
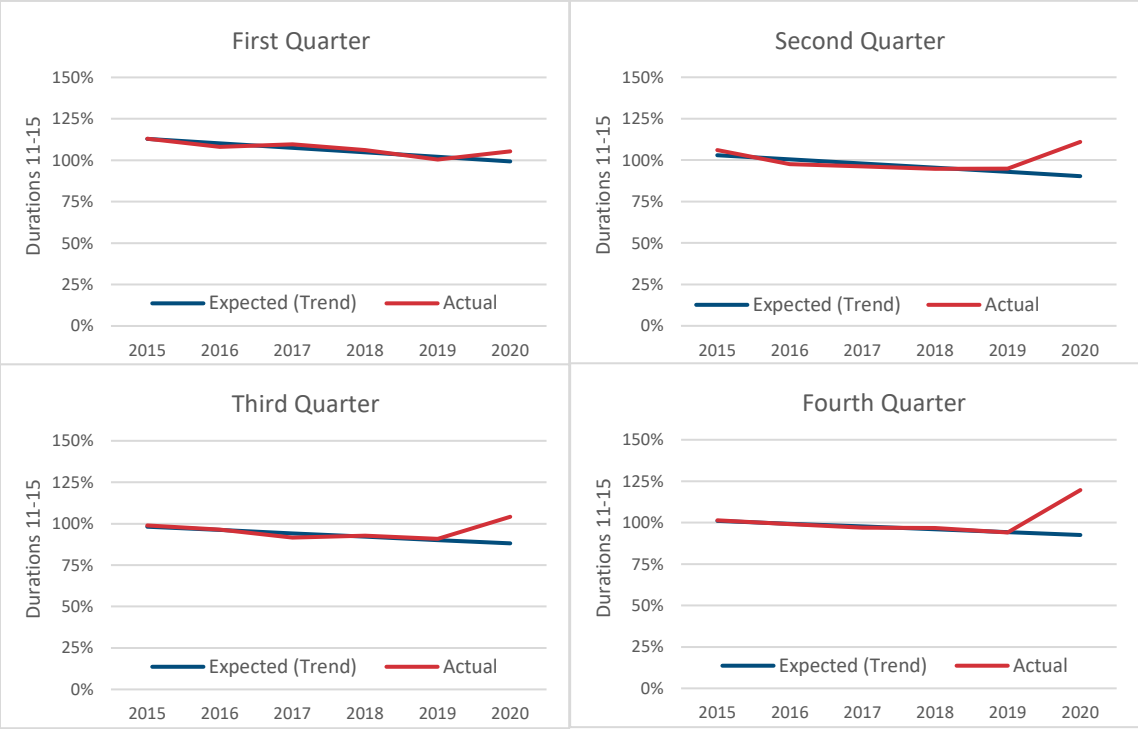


Figure 14b

ACTUAL AND EXPECTED RELATIVE MORTALITY RATIOS – FULLY UNDERWRITTEN, DURATIONS 11 – 15



The Simplified Issue results for two selected duration groups shown in Figures 15a and 15b tend to be more variable than the fully underwritten ones; however, the increase in quarters two, three and four from COVID remains very noticeable.

Figure 15a

ACTUAL AND EXPECTED RELATIVE MORTALITY RATIOS – SIMPLIFIED ISSUE, DURATIONS 03 – 05

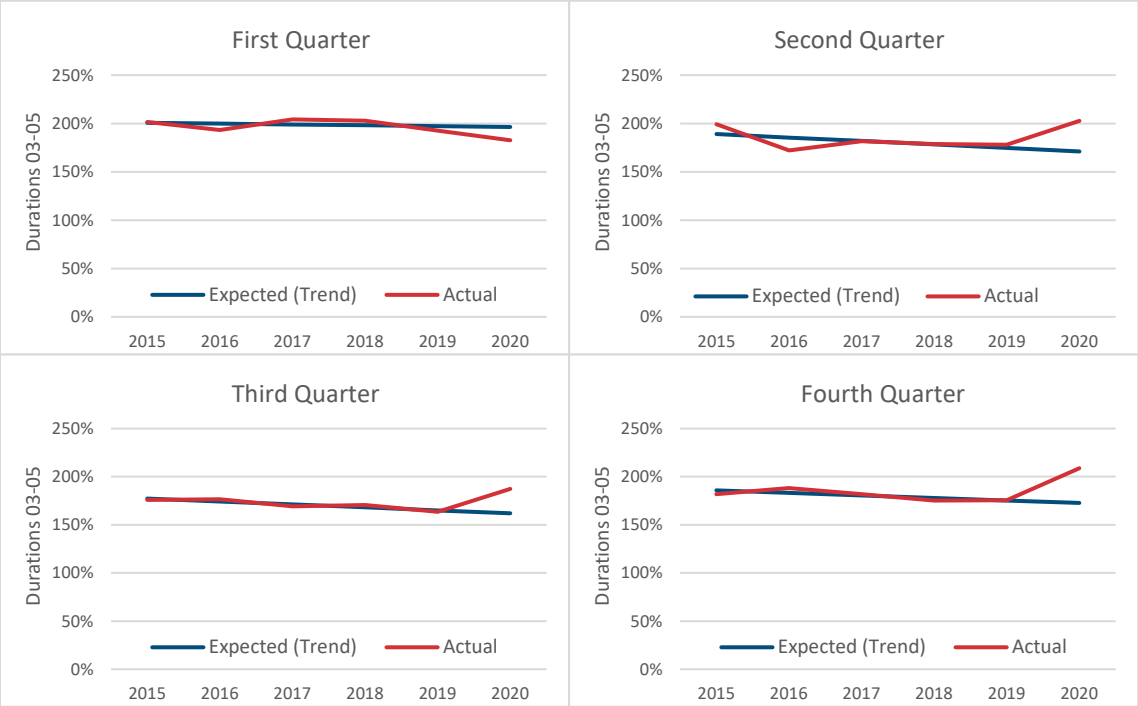
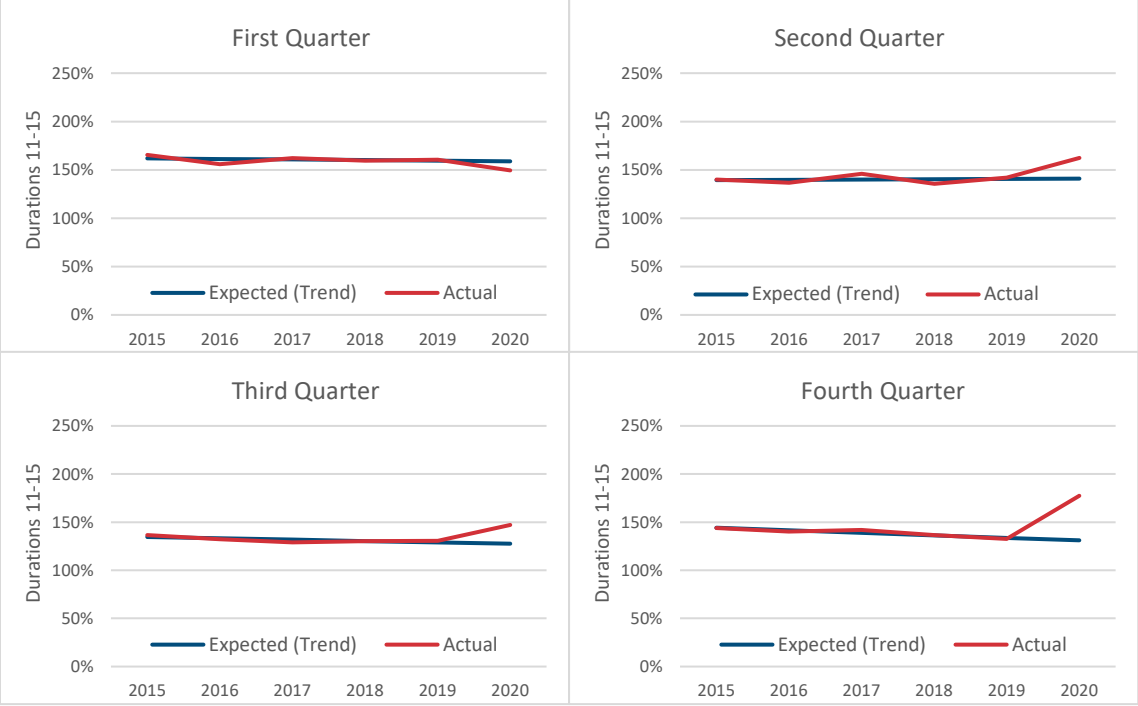


Figure 15b

ACTUAL AND EXPECTED RELATIVE MORTALITY RATIOS – SIMPLIFIED ISSUE, DURATIONS 11 – 15



The Guaranteed Issue results for two selected duration groups are shown below; the absolute difference between actual and expected narrowed in the third and fourth quarters for durations 11-15.

Figure 16a

ACTUAL AND EXPECTED RELATIVE MORTALITY RATIOS – GUARANTEED ISSUE, DURATIONS 03 - 05

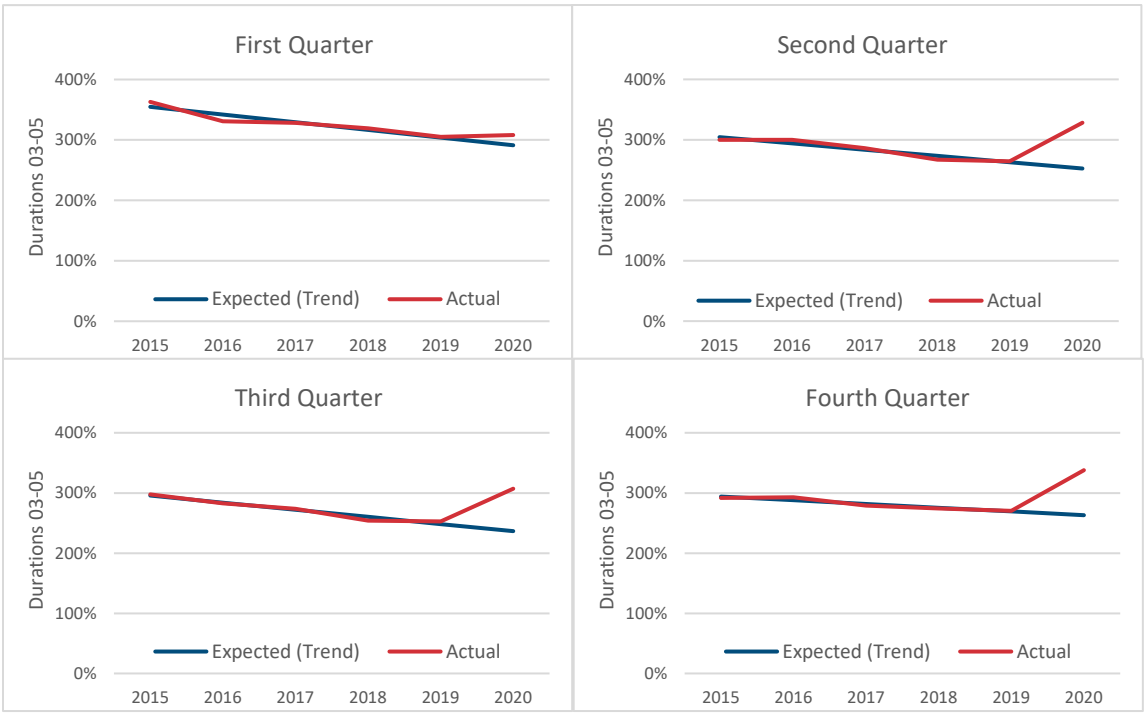
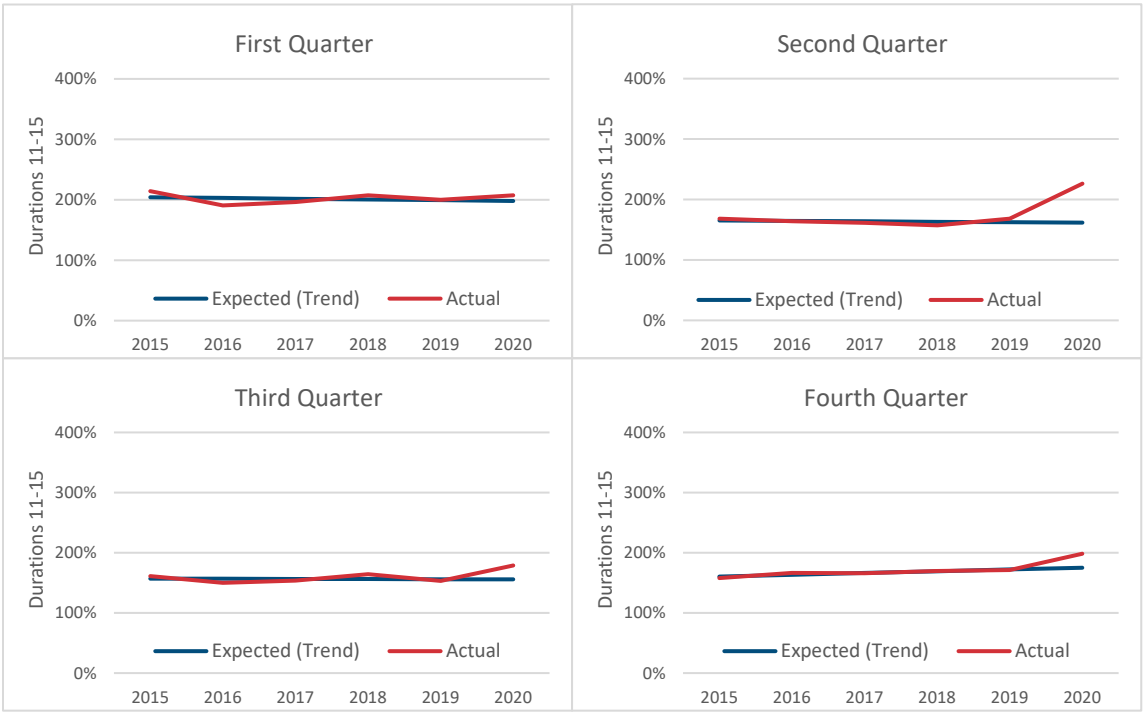


Figure 16b

ACTUAL AND EXPECTED RELATIVE MORTALITY RATIOS – GUARANTEED ISSUE, DURATIONS 11-15



Section 10: Fully Underwritten by Geographic Region

When analyzed by geographic area, some interesting observations can be made. Results by month are shown by region in Figures 17 and 18. For this analysis, the United States has been divided into ten geographic regions as follows:

- Region 1, Northeast: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont
- Region 2, NY-NJ: New Jersey, New York, Puerto Rico, U.S. Virgin Islands
- Region 3, Mid-Atlantic: Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, West Virginia
- Region 4, Southeast: Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee
- Region 5, Midwest: Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin
- Region 6, South Central: Arkansas, Louisiana, New Mexico, Oklahoma, Texas
- Region 7, Plaines: Iowa, Kansas, Missouri, Nebraska
- Region 8, Rockies: Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming
- Region 9, Southwest: Arizona, California, Hawaii, Nevada, American Samoa, Guam, Northern Mariana Islands
- Region 10, Northwest: Alaska, Idaho, Oregon, Washington

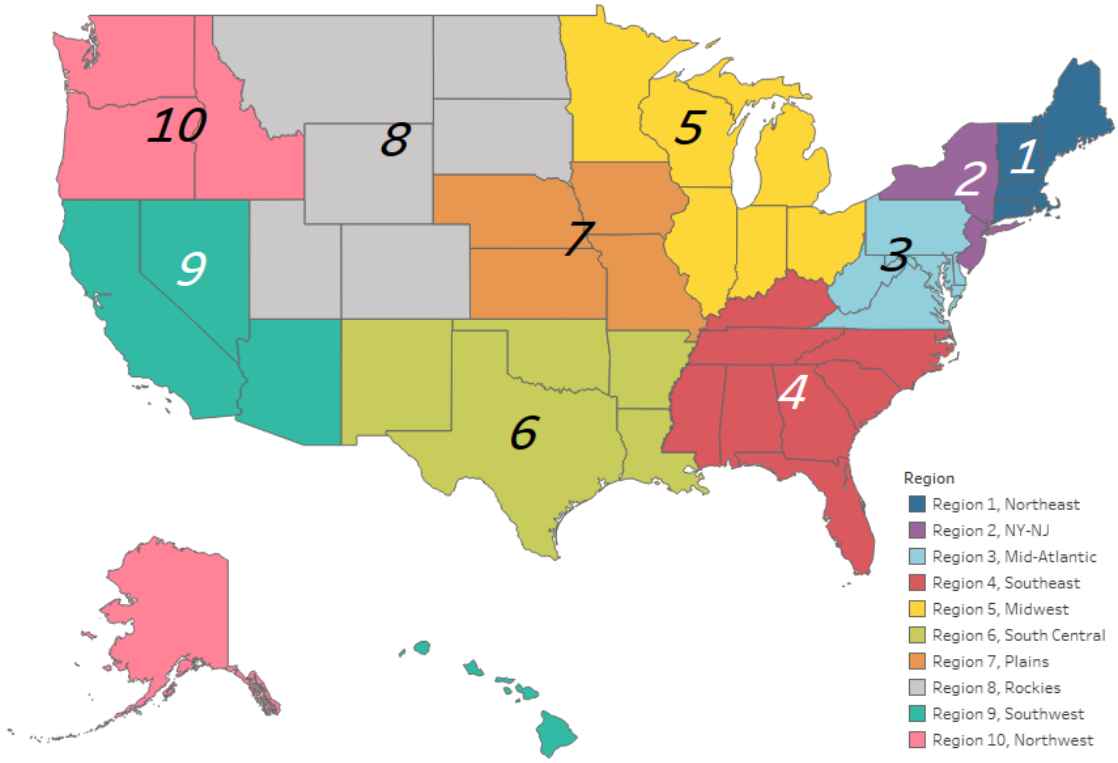


Figure 17

2020 RATIO OF ACTUAL TO EXPECTED RELATIVE MORTALITY RATIOS BY MONTH AND GEOGRAPHIC REGION

Another way to look at this data is in grid format. The figure below shows the results by region by month from January to December 2020. A/E's above 120% are shown in red, between 110% and 120% in purple, and below 95% in blue.

Figure 18

2020 RATIO OF ACTUAL TO EXPECTED RELATIVE MORTALITY RATIOS BY GEOGRAPHIC REGION AND MONTH

Region	Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Northeast	97%	103%	93%	156%	139%	101%	102%	98%	108%	90%	105%	114%
2	NY-NJ	97%	97%	111%	245%	127%	103%	98%	100%	98%	103%	104%	122%
3	Mid-Atlantic	101%	99%	101%	126%	116%	103%	107%	103%	108%	105%	113%	148%
4	Southeast	95%	100%	103%	109%	104%	103%	121%	123%	116%	112%	118%	136%
5	Midwest	96%	97%	99%	119%	108%	105%	107%	110%	109%	114%	134%	141%
6	South Central	92%	97%	103%	109%	107%	107%	125%	118%	118%	115%	118%	142%
7	Plains	98%	92%	97%	99%	101%	103%	109%	111%	103%	115%	138%	144%
8	Rockies	90%	95%	96%	115%	101%	102%	97%	100%	118%	119%	135%	150%
9	Southwest	95%	99%	96%	109%	104%	106%	121%	119%	116%	108%	114%	152%
10	Northwest	97%	99%	105%	97%	97%	113%	107%	107%	111%	102%	121%	116%

Some observations worth noting about the above results:

- The results for New York/New Jersey, and to a lesser extent the Northeast in April and May, are extremely high versus other regions, which is consistent with the focus on COVID-19 when it initially broke out and hit those areas the hardest.

- By June, mortality dropped close to expected levels in all regions except the Northwest. But in July, the Southeast, South Central, and Southwest jumped to excess levels above 20%.

- Excess mortality generally increased in all regions in the second half of 2020 and peaked in most regions in December. December was the month with the highest excess mortality for the majority of the regions.

- Aside from the April peaks in the Northeast and NY-NJ, the Rockies and the Southwest realized the highest excess mortality in any month with a 50% excess mortality in December

- Values outside of the 95% to 105% range were unusual in prior year-months, occurring only about 6% of the time. By that standard, January and February 2020 were indicative of a very good flu season. This observation also indicates just how remarkable the experience in the Northeast region was in October for the insured population.

The observations above are also very striking when viewed as A/E's on the trend graphs by quarter. Figures 19a, 19b and 19c show regions 2, 9, and 10 as having markedly different patterns in the way COVID played out for those regions.

Figure 19a

ACTUAL AND EXPECTED RELATIVE MORTALITY RATIOS -- GEOGRAPHIC REGION 2

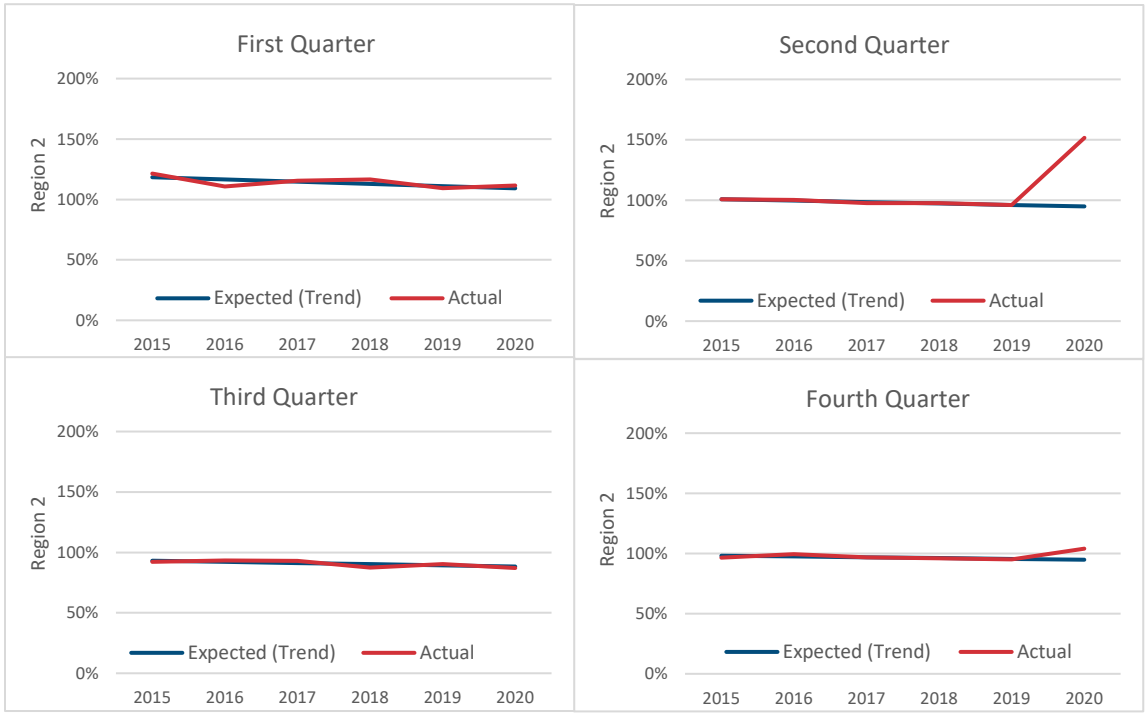


Figure 19b

ACTUAL AND EXPECTED RELATIVE MORTALITY RATIOS -- GEOGRAPHIC REGION 9

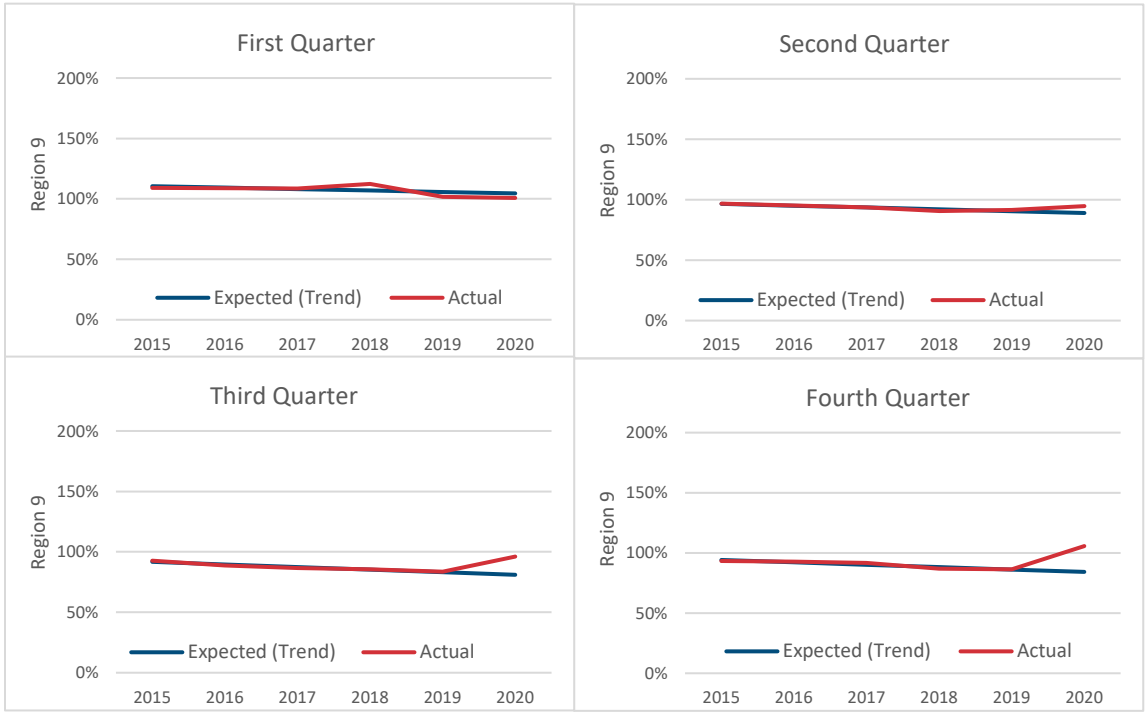
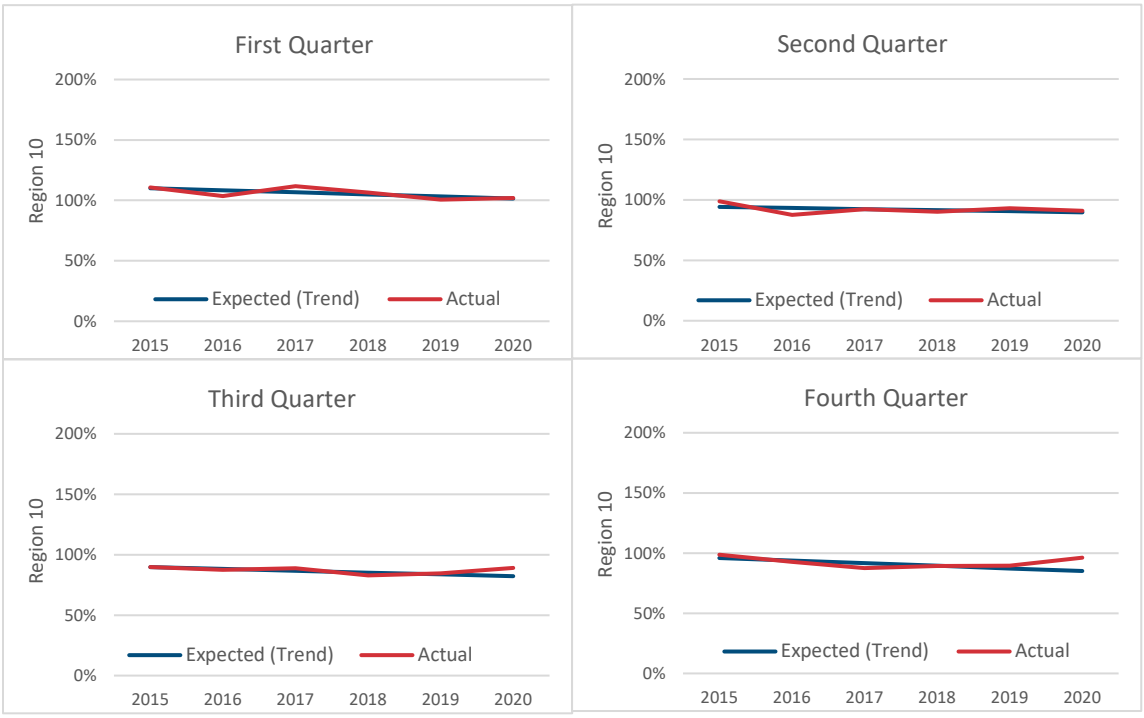


Figure 19c

ACTUAL AND EXPECTED RELATIVE MORTALITY RATIOS -- GEOGRAPHIC REGION 10



Section 11: Additional 2020 Age- and Sex-Standardized Rates of Death

This section is new to this series of reports. It provides information on the level of Qx increases and adds perspective to the ratios in sections 4 – 10. The analysis below presents an analysis of additional deaths per 1,000 for different subsegments of the insured population, with expected levels based on a projection of prior period trends into 2020. Subsegments examined include gender, underwriting class, smoker status, geographic region, face amount band, and policy year.

Note that the insured population included in this analysis is fully underwritten business only. Business issued under a guaranteed issue or simplified issue method is excluded.

The approach used to calculate the information in this section was outlined in section 3. Comparisons in this section against the overall U.S. population rely on a population table created for the study and described in Appendix A.

The figures in this section examine the additional per 1,000 increase in raw mortality rates over expected mortality rates – where the expected mortality rates are those projected for 2020 based on trends from the five-year period prior to 2020.

The objective here was to determine absolute severity among comparative populations available in the study, so this section of the report examines, after standardizing rates of death along age and sex, which subgroups had more additional deaths per 1,000 during the period of the pandemic in 2020.

Additional Mortality by Sex

Figures 20a, 20b and 20c show estimated additional mortality for females and males within the standardized age groups.

Beginning in the second quarter, mortality rates spiked significantly over the expected trend and this continued through the remainder of 2020, with the fourth quarter exhibiting the largest increases in most of the graphs shown below.

Males and females exhibited relatively similar additional mortality in 2020 for ages 40 and over, where exposure is the largest. The exception is in the fourth quarter, where males showed materially greater additional mortality than females. This pattern will continue to be monitored as we include 2021 in future reports.

Figure 20a

2020 ACTUAL AND EXPECTED MORTALITY RATES BY QUARTER AND SEX, AGES 5 TO 39

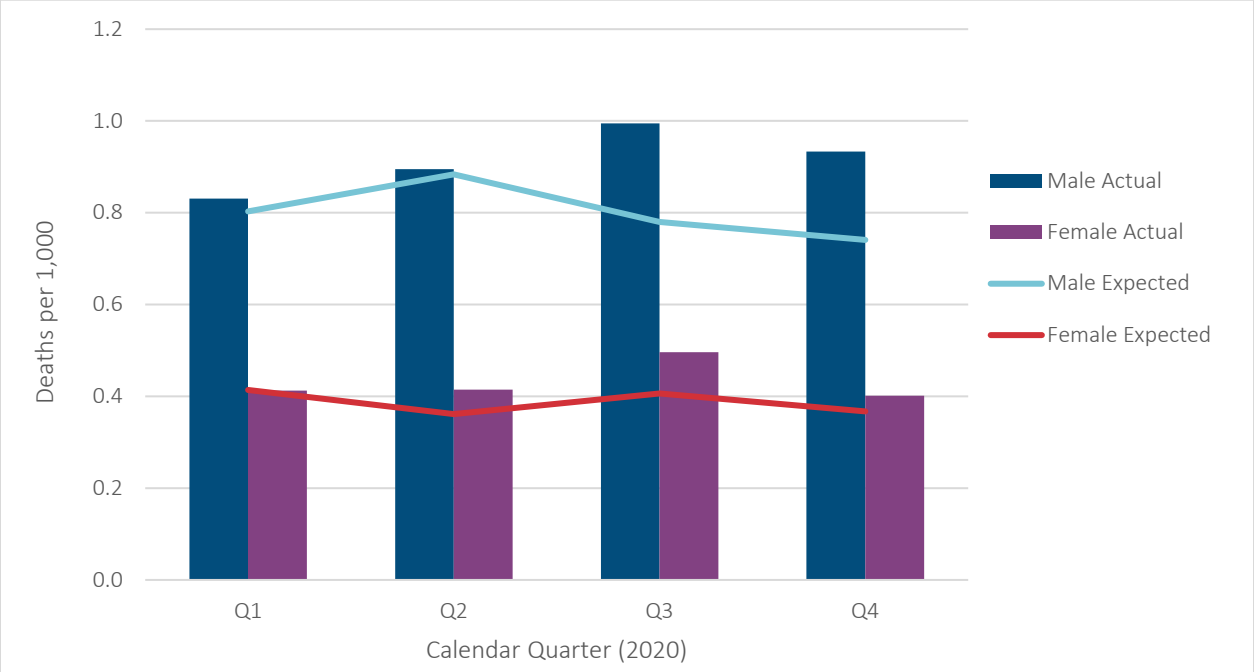


Figure 20b

2020 ACTUAL AND EXPECTED MORTALITY RATES BY QUARTER AND SEX, AGES 40 TO 74

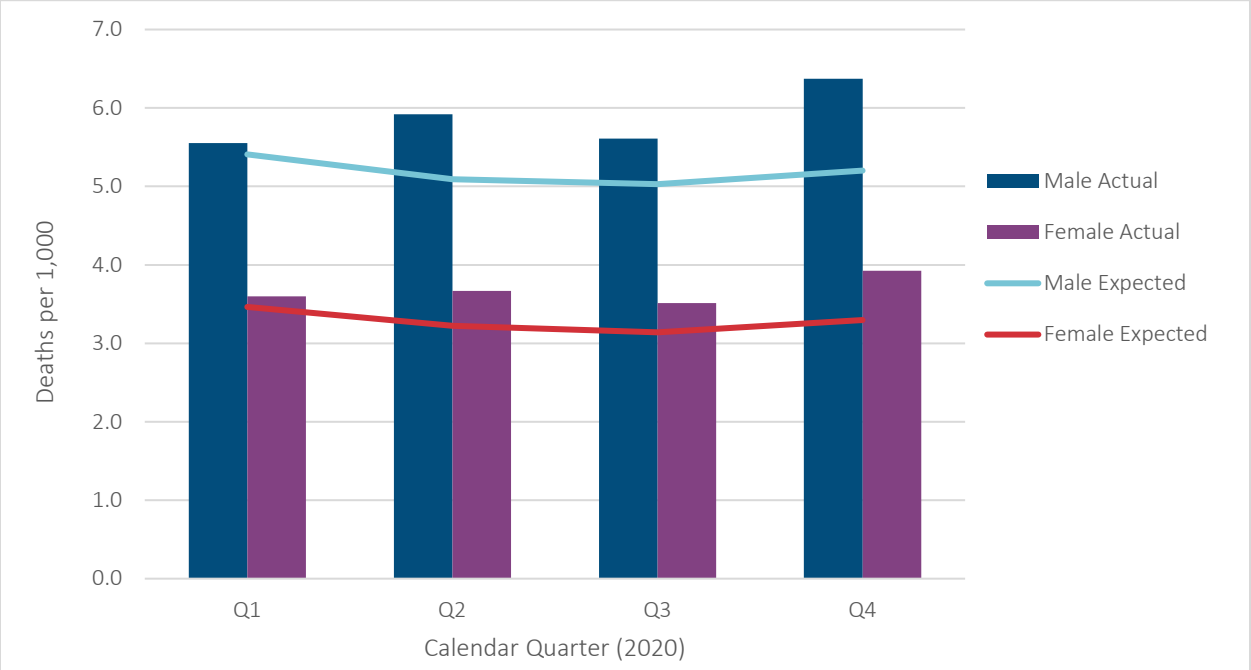


Figure 20c

2020 ACTUAL AND EXPECTED MORTALITY RATES BY QUARTER AND SEX, AGES 75 TO 94

Additional Mortality by Risk Class

Figures 21a and 21b show additional mortality per 1,000 for the preferred and standard risk classes. As might be expected, standard risk classes exhibited greater additional mortality than preferred classes for ages 40 and over in quarters two through four of 2020. We note though that, when measured as a percentage increase and not by absolute numbers, the increases are roughly in line with one another.

Figure 21a

2020 ACTUAL AND EXPECTED MORTALITY RATES BY QUARTER AND RISK CLASS, AGES 40 TO 74

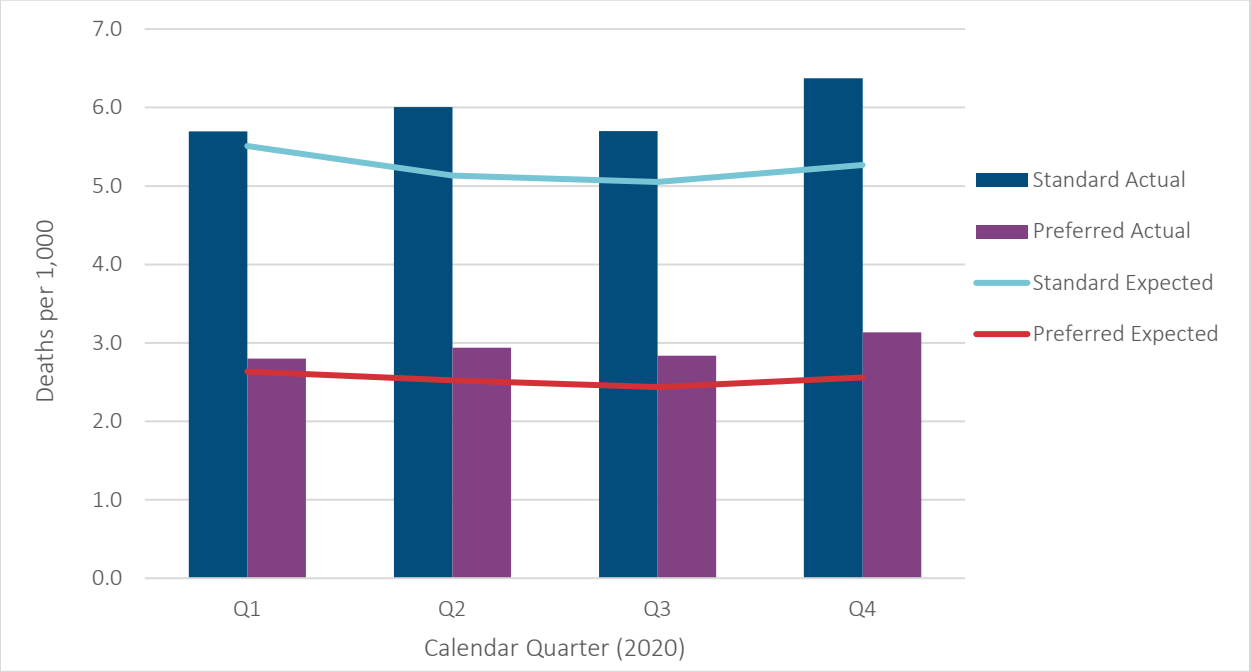
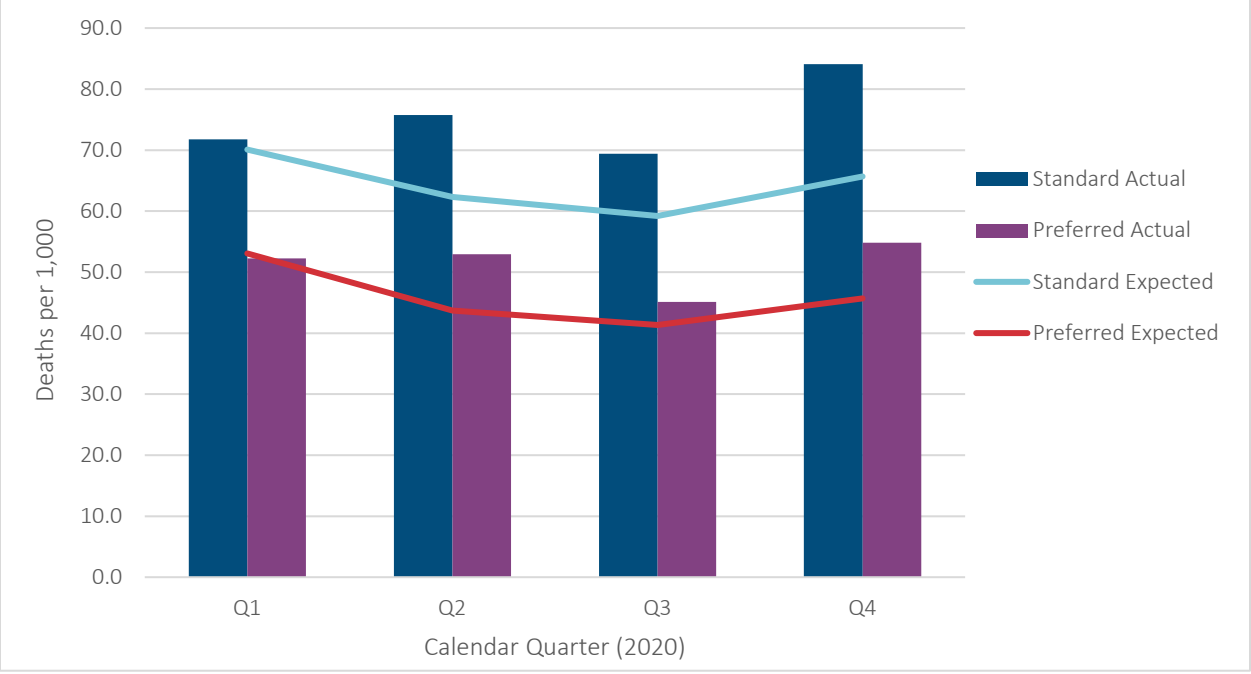


Figure 21b

2020 ACTUAL AND EXPECTED MORTALITY RATES BY QUARTER AND RISK CLASS, AGES 75 TO 94



Figures 22a and 22b below compare additional mortality for the standard, aggregate and substandard classes.

Note that the standard risk classes have significantly more exposure in the study than either the aggregate or substandard classes. At ages 75-94, the standard classes had greater additional mortality per 1,000, followed by substandard, and then finally aggregate. For younger ages, the substandard classes exhibited the greatest increases in mortality per 1,000.

However, for all quarters of 2020, for the younger ages, the standard classes experienced slightly greater additional mortality than the aggregate classes.

Figure 22a

2020 ACTUAL AND EXPECTED MORTALITY RATES BY QUARTER AND RISK CLASS, AGES 40 TO 74

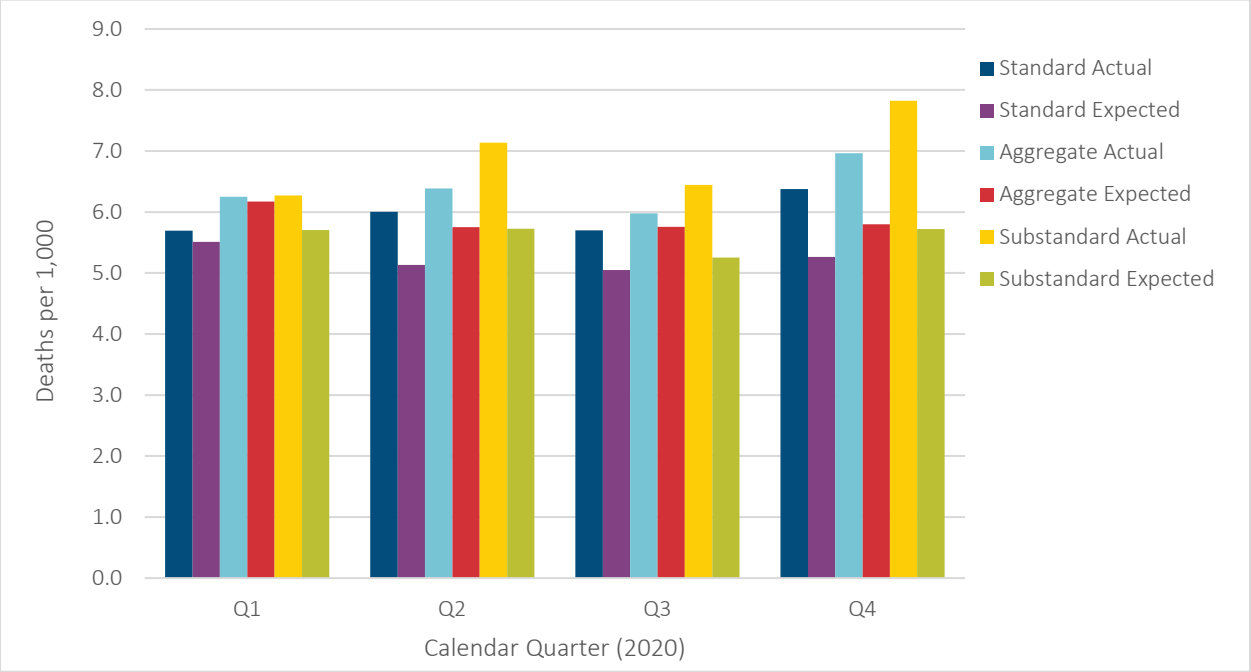
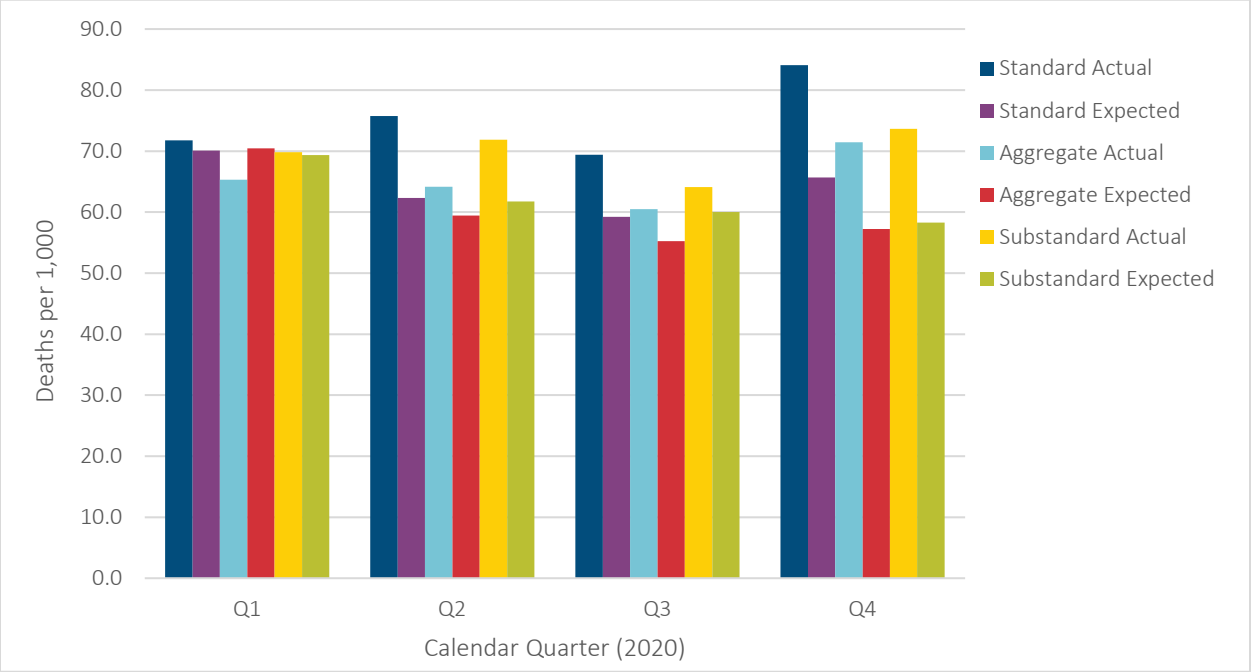


Figure 22b

2020 ACTUAL AND EXPECTED MORTALITY RATES BY QUARTER AND RISK CLASS, AGES 75 TO 94



Additional Mortality by Smoker Status

Figures 23a and 23b show the additional mortality per 1,000 for smokers and non-smokers separately. Smokers experienced greater additional mortality in 2020 than non-smokers for all age and quarter splits for ages 40 and older. However, the difference in levels of additional mortality between smokers and non-smokers was much less material than the difference between the preferred and standard risk classes, indicating that smoker status does not account for a large portion of the difference in the risk class results overall.

Figure 23a

2020 ACTUAL AND EXPECTED MORTALITY RATES BY QUARTER AND SMOKER STATUS, AGES 40 TO 74

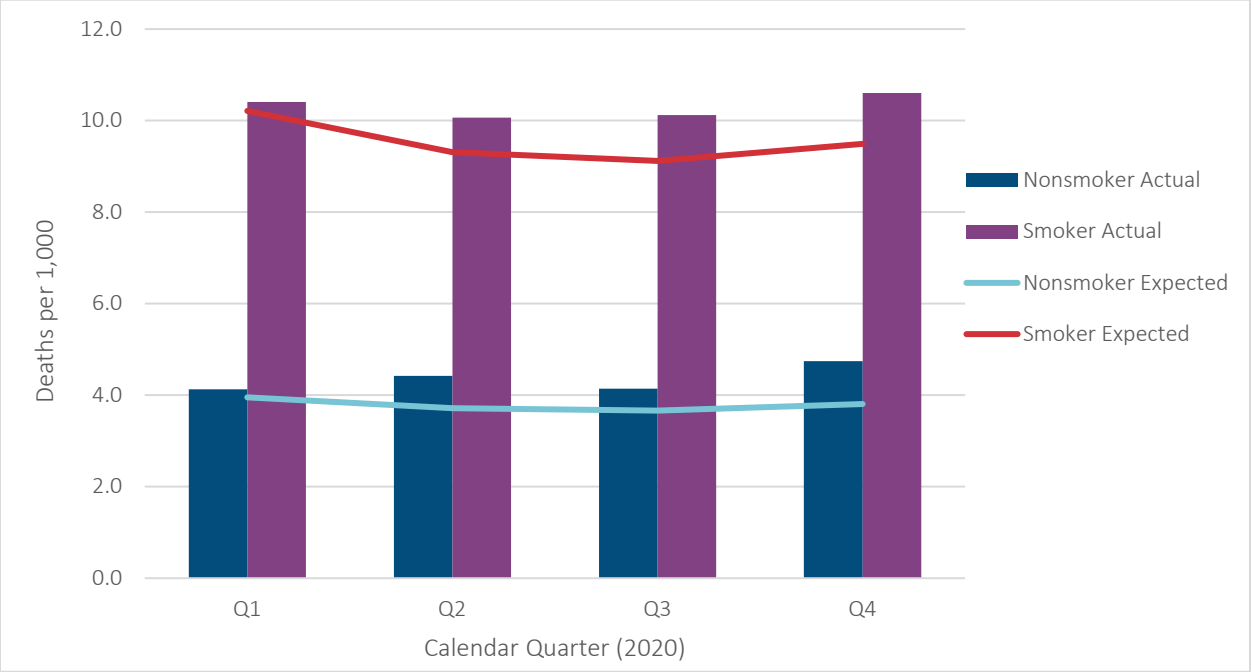
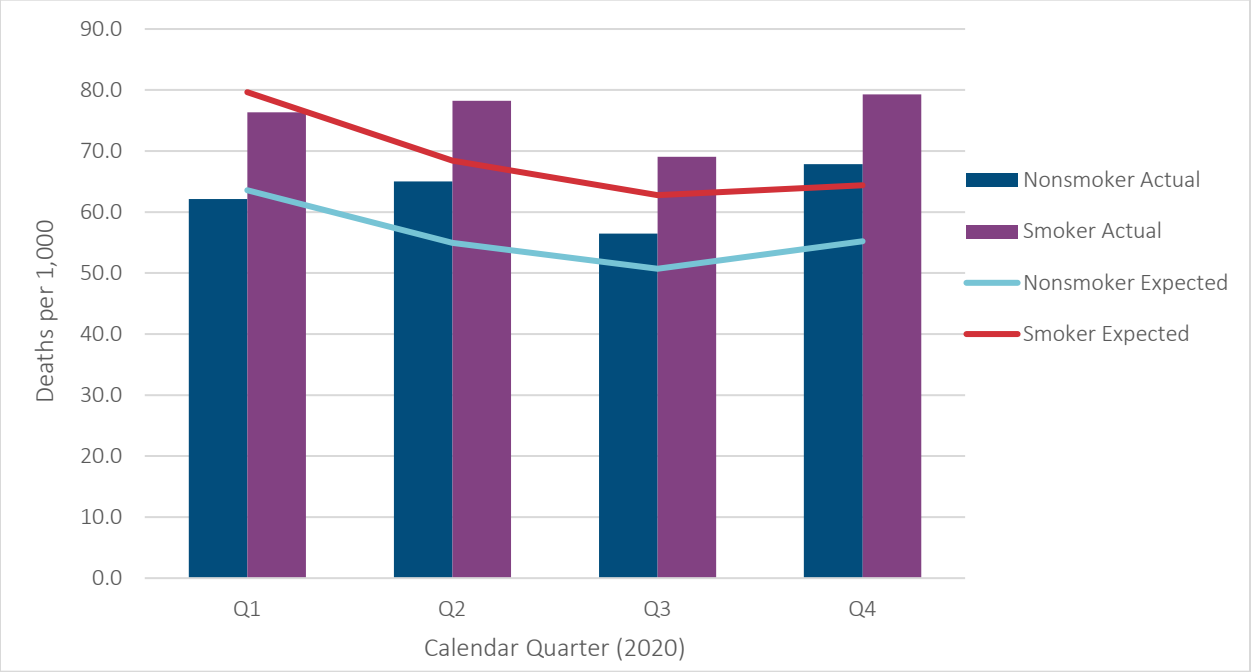


Figure 23b

2020 ACTUAL AND EXPECTED MORTALITY RATES BY QUARTER AND SMOKER STATUS, AGES 75 TO 94



Additional Mortality by Face Amount Band

Figures 24a and 24b show additional mortality by face amount band. A few items of note:

- For the age 40-74 group, as might be expected assuming a strong correlation between face amount size and socioeconomic status, the greatest additional mortality was seen at the lowest face amount bands (under $100K and $100K-$249K). For face amount bands over $250K, measured by the rates per thousand as shown, the excess mortality seen in quarters two through four was not significantly greater (and in some cases less) than quarter one. However, when measured on a percentage basis, it's not clear that the higher face bands fared better than the lower face amounts.
- For the age 75-94 group, excess mortality was clearer across all three quarters.
- For both age groups and for all face amount bands, the greatest excess mortality was experienced in the fourth quarter.

Figure 24a

2020 ACTUAL AND EXPECTED MORTALITY RATES BY QUARTER AND FACE AMOUNT, AGES 40 TO 74

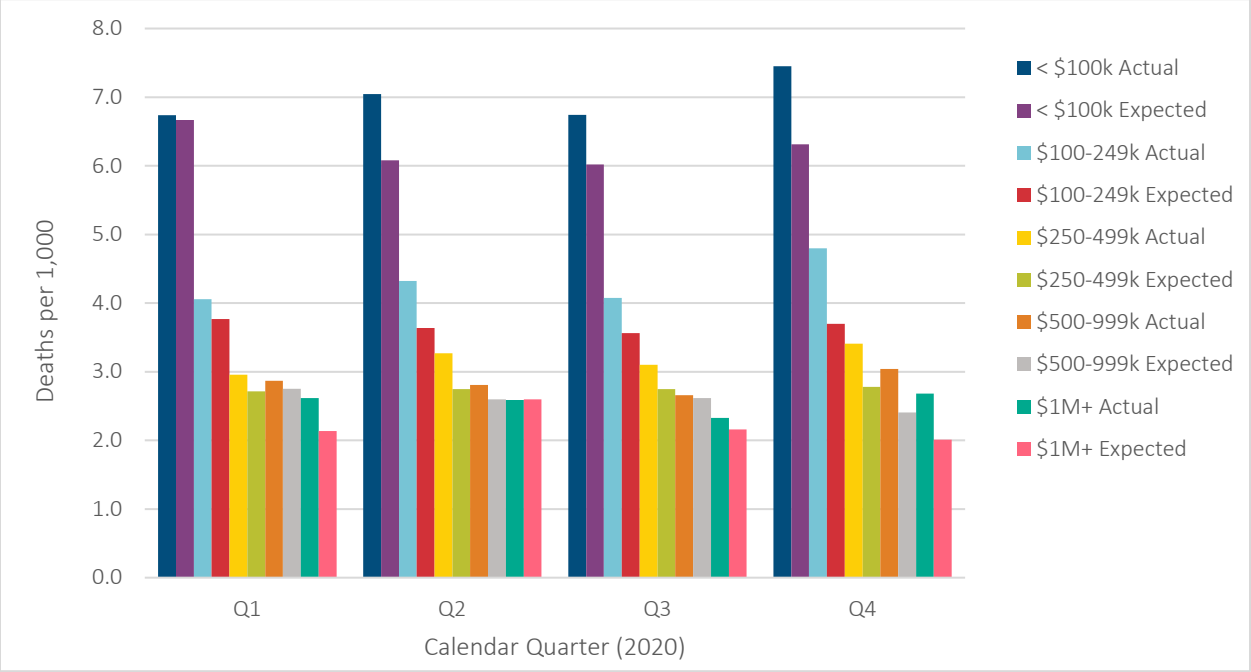
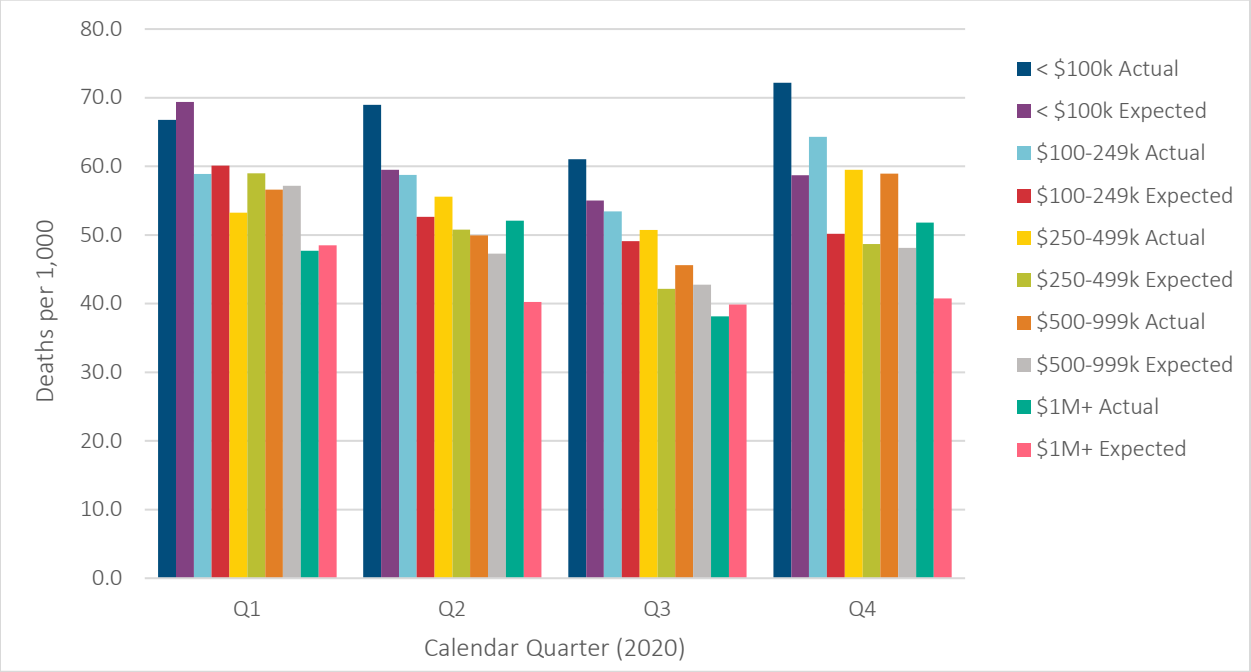


Figure 24b

2020 ACTUAL AND EXPECTED MORTALITY RATES BY QUARTER AND FACE AMOUNT, AGES 75 TO 94



Additional Mortality by Duration

Figures 25a and 25b show the additional mortality by policy duration group. Note that, for the 40-74 age group, there was greater excess mortality in the later policy durations (durations 6 and later) than in the earlier durations (1-5) for quarters two through four of 2020. For the attained age 75-94 group, there is no clear pattern by policy duration with greater levels of excess mortality at most durations as compared to the younger group. For the age 75 to 94 graphs, there was insufficient data for durations less than 5, so those bars are not shown.

Figure 25a

2020 ACTUAL AND EXPECTED MORTALITY RATES BY QUARTER AND POLICY DURATION, AGES 40 TO 74

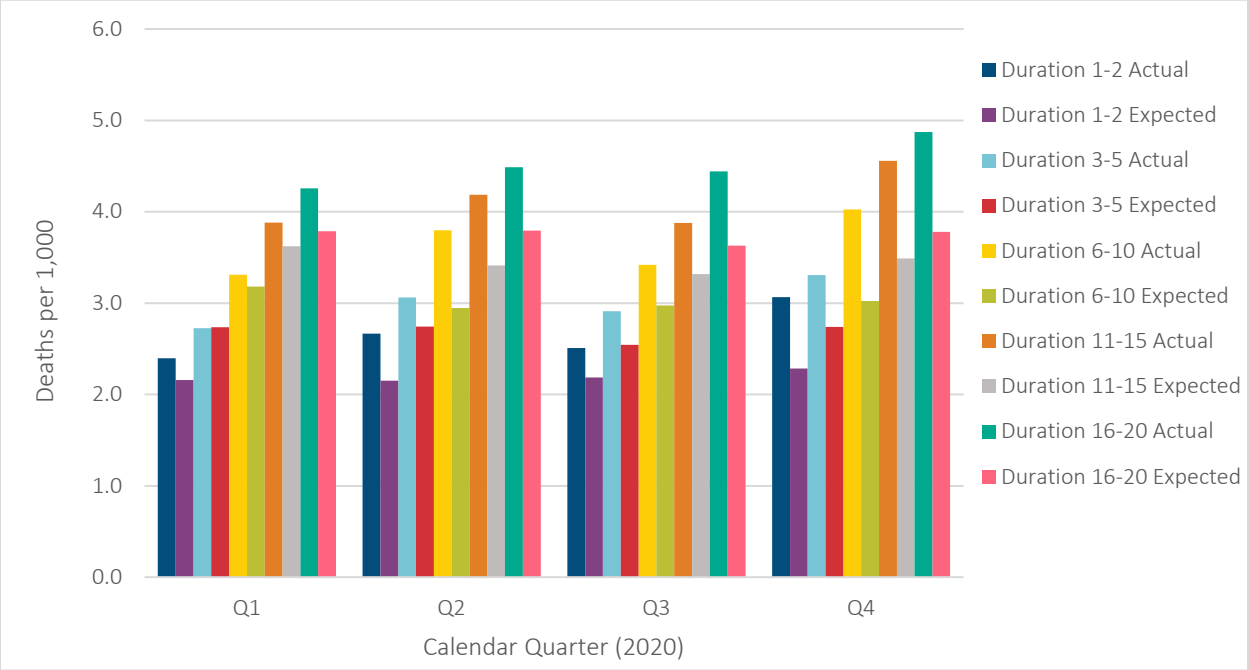
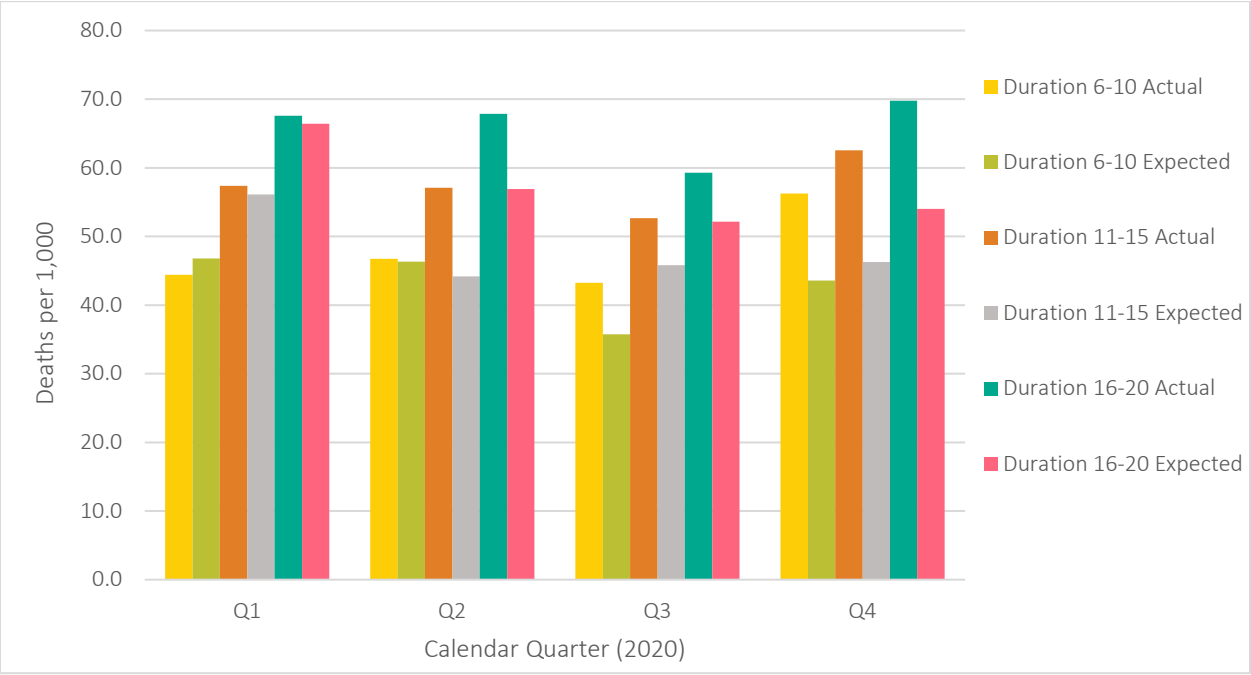


Figure 25b

2020 ACTUAL AND EXPECTED MORTALITY RATES BY QUARTER AND POLICY DURATION, AGES 75 TO 94



Additional Mortality by Geographic Region

Figures 26a and 26b show the additional mortality by geographic region for both the insured and general populations for 2020.

For ages 40-74, starting in quarter two, nearly all regions showed greater excess mortality for the general population than the insured population with the greatest difference seen for Region two in quarter two. For quarter three, Region two returned closer to quarter one levels, while there were spikes seen in Regions four and six. Then, for quarter four, again the magnitude of excess mortality was more similar across regions but greater than quarter two.

The pattern seen for ages 40-74 is similar to that seen for ages 75-94.

Figure 26a

2020 ACTUAL AND EXPECTED MORTALITY RATES BY REGION, AGES 40 TO 74

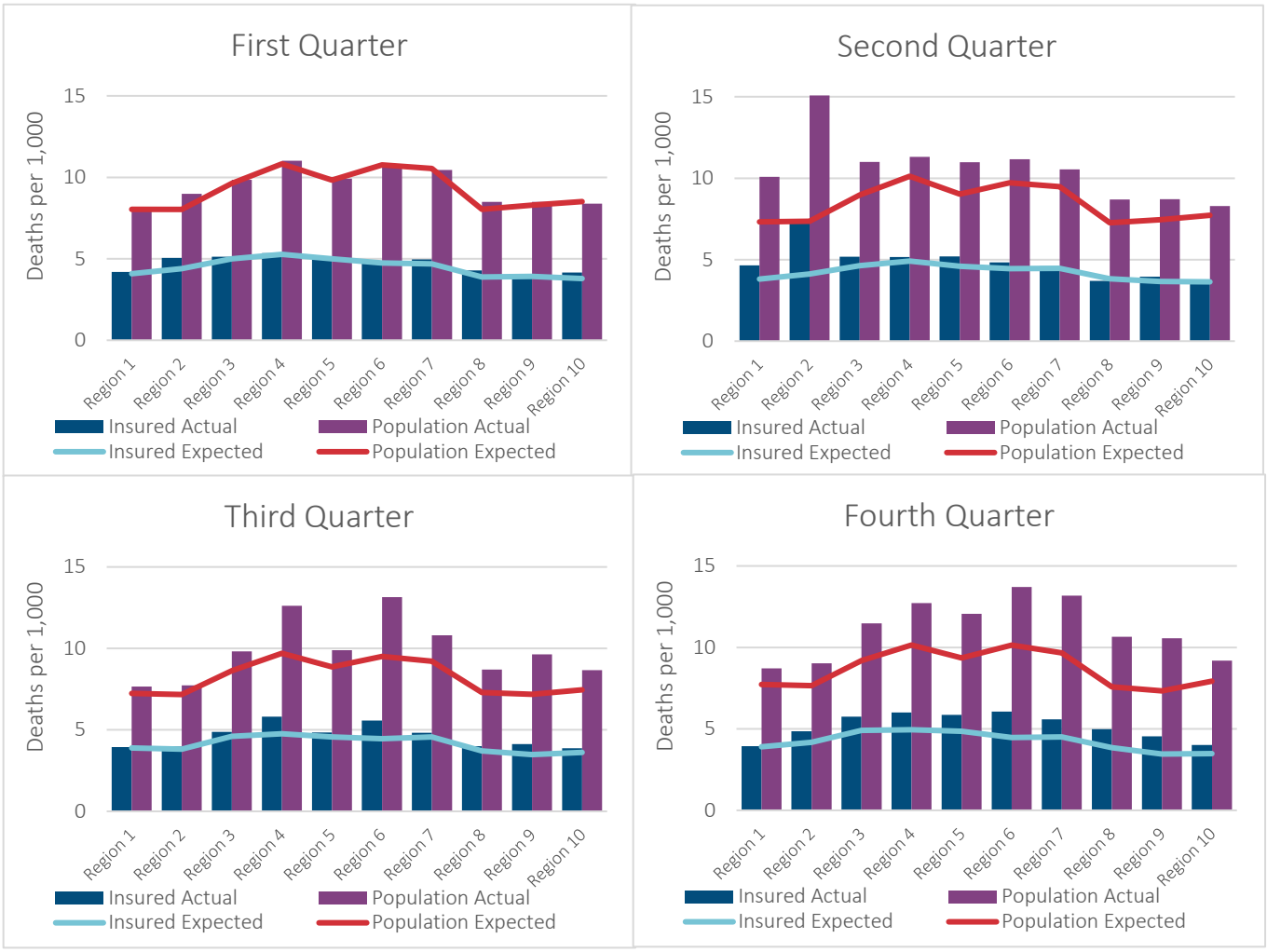
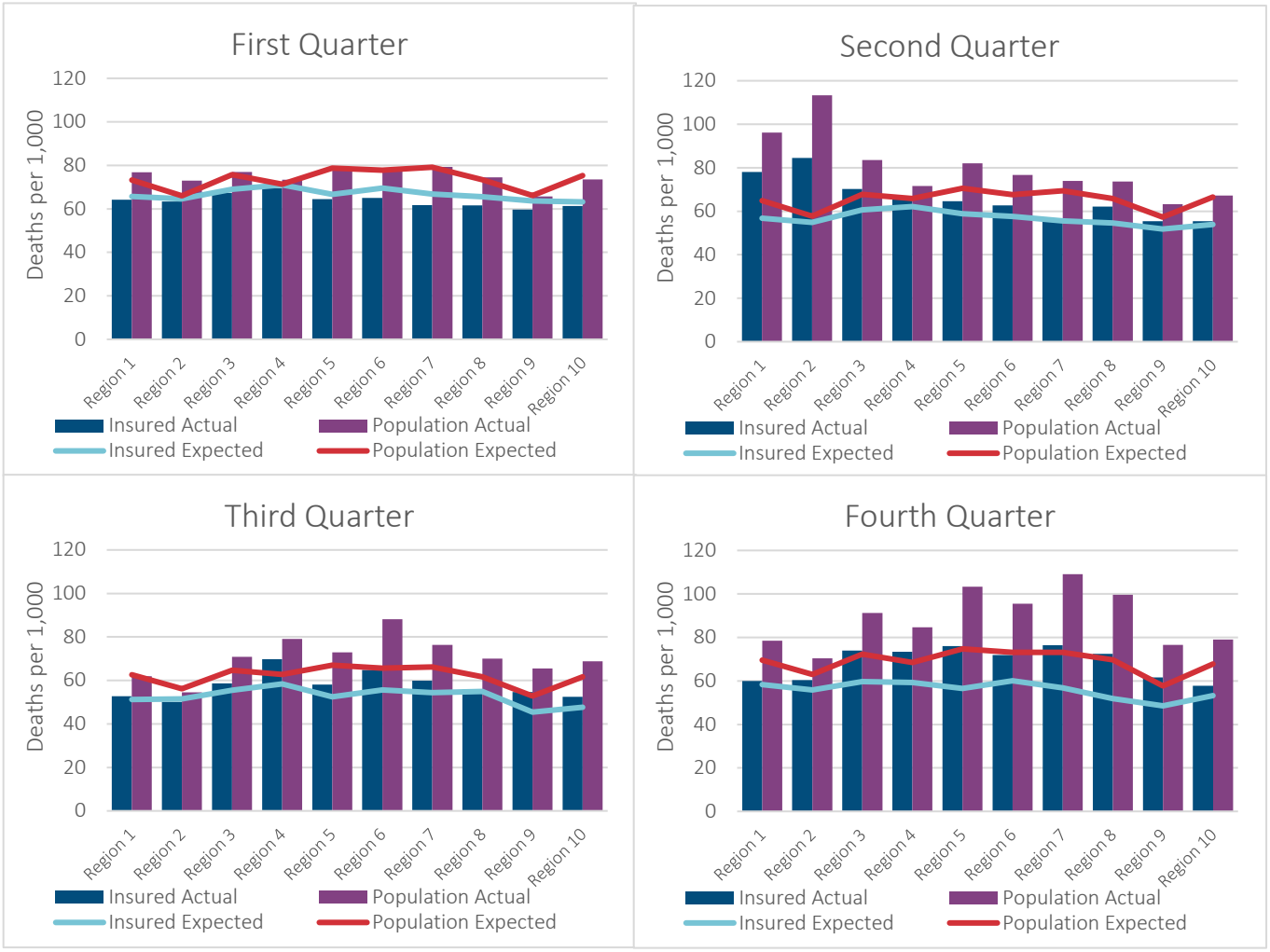


Figure 26b

2020 ACTUAL AND EXPECTED MORTALITY RATES BY REGION, AGES 75 TO 94



Section 12: Insured Population vs General Population Comparison

This section is also new to this series of reports. The goal was to compare how COVID-19 impacted the mortality for insured business versus how it impacted the overall U.S. population. The approach used to calculate the information in this section was outlined in section 3, and more information is available in Appendix A. As noted in that section, the tables below show the experience of insured business against a population "expected" table that varies by age, sex, region and month. The development of a population basis that changes by month has the advantage of including improvement within the table. Thus, there is no need to trend the results into 2020 to account for improvement.

However, the population basis does not account for select factors in any way. The lack of select factors needs to be accounted for when interpreting results in this section.

The comparisons of insured lives to population mortality were relatively consistent over a wide range of data cuts. Focusing on the differences between 2019 and 2020, in general:

- During the first quarter of 2020, insured mortality did not deteriorate as much as the general population.
- During the second quarter, COVID-19 had substantially less impact on the overall mortality for insured lives than for the general population.
- For the third and fourth quarters, the insured lives continued to be noticeably less impacted by COVID-19 than the general population. The potential of incurred but not reported claims in both the study data and the underlying population table added a measure of uncertainty to conclusions around the second half of 2020.

Table 3 compares the overall results for the fully underwritten insured population with the general population. A lower ratio in the 2020 line versus the ratios for the quarter directly above it indicates that the insured population relatively did better during the quarter. A higher ratio indicates that the particular data cut was more severely impacted by COVID-19 than the general population.

Table 3

RATIO OF INSURED TO POPULATION EXPERIENCE – ALL FULLY UNDERWRITTEN BUSINESS

	Calendar Quarter			
Year	Q1	Q2	Q3	Q4
2015	73%	71%	69%	69%
2016	72%	70%	69%	68%
2017	72%	69%	68%	67%
2018	71%	69%	68%	67%
2019	**70%**	**69%**	**68%**	**66%**
2020	**68%**	**63%**	**64%**	**63%**

Note that, for all quarters, the 2020 results for insured lives were better than for the population in general. Most notably, results for the second quarter, when COVID-19 initially had the greatest impact, showed the best relative mortality experience for the insured population versus the general population (69% ratio in 2019 Q2 versus 63% ratio in 2020 Q2).

The overall results shown above are similar for most of the different segmentations of the data that are examined below.

Table 4 shows the results broken down by age and sex. The data for ages 5 – 24 was very thin so we did not focus on that block in our analysis. Consistent with the overall results above, for all the age and sex groupings 25 and older shown below, the 2020 experience for the insured business was significantly less impacted by COVID-19 than the general population.

Table 4

RATIO OF INSURED TO POPULATION EXPERIENCE – FULLY UNDERWRITTEN BY AGE AND SEX

		Sex / Calendar Quarter (Q#)									
		Male						Female			
Attained Age	Year	Q1	Q2	Q3	Q4	Attained Age	Year	Q1	Q2	Q3	Q4
25-44	2015	44%	45%	43%	47%	25-44	2015	50%	47%	42%	44%
	2016	44%	42%	45%	42%		2016	46%	43%	47%	47%
	2017	42%	43%	41%	42%		2017	44%	46%	43%	47%
	2018	40%	41%	41%	43%		2018	44%	47%	45%	44%
	2019	**41%**	**45%**	**40%**	**40%**		**2019**	**47%**	**42%**	**42%**	**40%**
	2020	**41%**	**36%**	**37%**	**39%**		**2020**	**42%**	**40%**	**42%**	**39%**
45-64	2015	46%	46%	46%	45%	45-64	2015	50%	52%	49%	49%
	2016	45%	45%	43%	44%		2016	49%	49%	48%	48%
	2017	43%	43%	44%	42%		2017	47%	48%	48%	46%
	2018	41%	42%	41%	42%		2018	46%	46%	47%	47%
	2019	**41%**	**42%**	**42%**	**42%**		**2019**	**44%**	**46%**	**46%**	**45%**
	2020	**40%**	**37%**	**38%**	**38%**		**2020**	**45%**	**42%**	**40%**	**41%**
65-84	2015	74%	73%	73%	73%	65-84	2015	79%	78%	75%	76%
	2016	73%	73%	73%	72%		2016	78%	76%	76%	75%
	2017	74%	72%	71%	69%		2017	77%	75%	75%	75%
	2018	71%	71%	71%	70%		2018	75%	75%	73%	73%
	2019	**71%**	**70%**	**71%**	**68%**		**2019**	**75%**	**75%**	**73%**	**71%**
	2020	**69%**	**64%**	**67%**	**65%**		**2020**	**73%**	**69%**	**71%**	**68%**
85-94	2015	91%	85%	82%	80%	85-94	2015	91%	90%	89%	86%
	2016	92%	88%	84%	79%		2016	94%	92%	89%	89%
	2017	94%	88%	86%	81%		2017	95%	92%	90%	87%
	2018	95%	90%	86%	81%		2018	97%	92%	90%	86%
	2019	**96%**	**91%**	**87%**	**83%**		**2019**	**95%**	**93%**	**90%**	**89%**
	2020	**92%**	**86%**	**86%**	**80%**		**2020**	**88%**	**88%**	**86%**	**80%**

Table 5 shows the results by underwriting class. The patterns largely replicated those that were seen for the fully underwritten business overall, where the second quarter experience for the insured population appears to be the most favorable versus the general population. Also, note that the difference in experience between the insured and general populations in 2020 versus prior years was greater for smokers than for non-smokers for both the preferred and standard classes.

Table 5

RATIO OF INSURED TO POPULATION EXPERIENCE – FULLY UNDERWRITTEN BY UNDERWRITING CLASS

Underwriting Class	Smoker Status	Year	Calendar Quarter (Q#)			
			Q1	Q2	Q3	Q4
Preferred	Non-Smoker	2015	32%	33%	32%	32%
		2016	32%	31%	32%	31%
		2017	32%	33%	32%	31%
		2018	31%	32%	31%	33%
		2019	**32%**	**32%**	**32%**	**32%**
		2020	**32%**	**29%**	**29%**	**30%**
	Smoker	2015	80%	84%	89%	78%
		2016	80%	77%	80%	77%
		2017	71%	80%	77%	80%
		2018	76%	77%	78%	76%
		2019	**81%**	**81%**	**77%**	**71%**
		2020	**80%**	**58%**	**69%**	**64%**
Standard	Non-Smoker	2015	72%	69%	68%	67%
		2016	70%	69%	67%	67%
		2017	71%	68%	68%	67%
		2018	70%	69%	68%	67%
		2019	**70%**	**69%**	**68%**	**67%**
		2020	**68%**	**65%**	**66%**	**65%**
	Smoker	2015	103%	101%	101%	99%
		2016	105%	105%	100%	95%
		2017	106%	102%	101%	96%
		2018	106%	104%	102%	98%
		2019	**106%**	**104%**	**102%**	**97%**
		2020	**103%**	**95%**	**98%**	**90%**

Consistent with prior mortality studies, overall the relative experience of higher face amount policies was better than for lower face amount policies, both during the period of COVID-19 and in prior years as shown in Table 6 below. However, the COVID impact in 2020 appears to be better for the higher face amount classes ($500K and above) than for the smaller face amount classes (under $500K).

Table 6

RATIO OF INSURED TO POPULATION EXPERIENCE – FULLY UNDERWRITTEN BY FACE AMOUNT

Face Amount Band	Year	Calendar Quarter (Q#)			
		Q1	Q2	Q3	Q4
< $100,000	2015	84%	82%	80%	80%
	2016	85%	83%	81%	79%
	2017	86%	83%	81%	79%
	2018	85%	83%	81%	80%
	2019	**86%**	**83%**	**82%**	**80%**
	2020	**82%**	**78%**	**79%**	**76%**
$100,000-$249,999	2015	50%	50%	51%	50%
	2016	49%	49%	50%	49%
	2017	50%	50%	49%	49%
	2018	49%	50%	50%	49%
	2019	**49%**	**51%**	**52%**	**49%**
	2020	**50%**	**47%**	**48%**	**50%**
$250,000-$499,999	2015	36%	36%	36%	35%
	2016	34%	35%	35%	35%
	2017	35%	35%	36%	35%
	2018	35%	35%	35%	36%
	2019	**34%**	**37%**	**36%**	**35%**
	2020	**35%**	**34%**	**34%**	**34%**
$500,000-$999,999	2015	30%	31%	30%	30%
	2016	30%	31%	31%	30%
	2017	31%	30%	30%	29%
	2018	28%	30%	31%	31%
	2019	**30%**	**32%**	**30%**	**29%**
	2020	**31%**	**26%**	**27%**	**28%**
$1,000,000+	2015	31%	31%	31%	31%
	2016	31%	29%	30%	29%
	2017	28%	29%	29%	30%
	2018	31%	29%	29%	30%
	2019	**29%**	**31%**	**29%**	**28%**
	2020	**28%**	**25%**	**23%**	**26%**

The results by region (the region coding is described in section 10 in detail above and repeated graphically below) in in Table 7 largely follow the results for the insured business. One interesting observation is that, while New York and New Jersey were impacted very heavily by the pandemic during the second quarter, the insured population in those states appears to have been far less impacted than the general population in those states. (Note the huge drop in the relative percentage in 2020 for the second quarter for region 2, versus the prior five-year experience – 76% in 2019 versus 61% in 2020.)

We note also that the percentages in Table 7 line up well with insurance coverage in the United States, where the highest percentage of life insurance ownership is in the Northeast, followed by California and Florida, with the South have the lowest ownership.

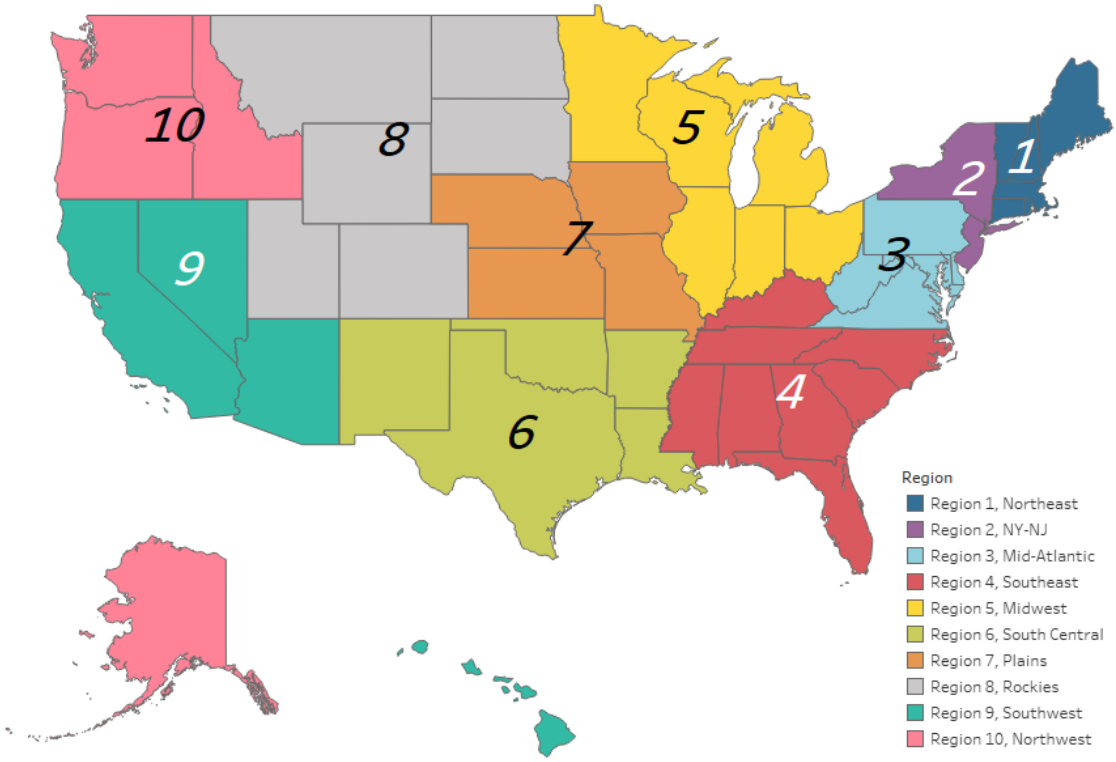


Table 7

RATIO OF INSURED TO POPULATION EXPERIENCE – FULLY UNDERWRITTEN BY REGION

Region	Year	Calendar Quarter (Q#)				Region	Year	Calendar Quarter (Q#)			
		Q1	Q2	Q3	Q4			Q1	Q2	Q3	Q4
Region 1	2015	77%	73%	68%	72%	Region 6	2015	66%	66%	65%	66%
	2016	74%	72%	73%	69%		2016	67%	66%	64%	65%
	2017	75%	73%	70%	68%		2017	66%	65%	64%	62%
	2018	73%	72%	70%	70%		2018	64%	63%	63%	63%
	2019	**74%**	**72%**	**68%**	**69%**		**2019**	**64%**	**63%**	**63%**	**63%**
	2020	**70%**	**66%**	**70%**	**63%**		**2020**	**61%**	**59%**	**56%**	**58%**
Region 2	2015	80%	78%	76%	75%	Region 7	2015	70%	69%	66%	64%
	2016	78%	78%	76%	74%		2016	71%	70%	66%	66%
	2017	80%	77%	76%	74%		2017	71%	67%	67%	66%
	2018	79%	77%	71%	73%		2018	67%	65%	64%	63%
	2019	**77%**	**76%**	**75%**	**73%**		**2019**	**67%**	**67%**	**69%**	**64%**
	2020	**72%**	**61%**	**71%**	**70%**		**2020**	**64%**	**61%**	**63%**	**59%**
Region 3	2015	75%	72%	71%	69%	Region 8	2015	73%	69%	67%	68%
	2016	76%	73%	70%	69%		2016	71%	70%	67%	68%
	2017	75%	71%	71%	69%		2017	69%	70%	69%	66%
	2018	73%	71%	72%	69%		2018	70%	67%	66%	67%
	2019	**74%**	**72%**	**68%**	**68%**		**2019**	**70%**	**68%**	**69%**	**62%**
	2020	**71%**	**66%**	**67%**	**67%**		**2020**	**65%**	**62%**	**62%**	**60%**
Region 4	2015	71%	70%	68%	68%	Region 9	2015	73%	73%	73%	69%
	2016	70%	69%	69%	69%		2016	72%	71%	70%	69%
	2017	72%	69%	67%	67%		2017	73%	69%	68%	67%
	2018	71%	69%	69%	67%		2018	73%	69%	68%	67%
	2019	**70%**	**68%**	**68%**	**66%**		**2019**	**69%**	**69%**	**67%**	**65%**
	2020	**69%**	**66%**	**65%**	**66%**		**2020**	**67%**	**63%**	**60%**	**60%**
Region 5	2015	71%	69%	68%	68%	Region 10	2015	71%	68%	65%	67%
	2016	70%	69%	67%	66%		2016	67%	61%	65%	63%
	2017	70%	67%	67%	65%		2017	67%	66%	66%	59%
	2018	69%	68%	65%	65%		2018	68%	64%	61%	63%
	2019	**69%**	**69%**	**66%**	**65%**		**2019**	**64%**	**65%**	**64%**	**64%**
	2020	**67%**	**63%**	**65%**	**63%**		**2020**	**67%**	**62%**	**59%**	**58%**

Section 13: Reliance and Limitations

The Individual Life COVID-19 Project Work Group would like to stress that, due to delays in the reporting and recording of claim information in the insured data, the more recent data submitted for this research is considered preliminary and will change with subsequent data submissions.

The analyses in this report are based on data submissions from 31 individual life insurance companies with data reported as of June 30, 2021. Deaths occurring after December 31, 2020 were omitted from the analysis to minimize distortions due to reporting lags. Any deaths prior to December 2020 that were not reported by June 30, 2021 may potentially impact the analysis, but the authors feel the impact will likely be small.

The analysis of 2020 experience was based on the development of excess mortality from 'Actual Relative Mortality Ratios' and 'Expected Relative Mortality Ratios 'as explained in section 3. It is important for the reader to understand the development of the trend lines and excess mortality before incorporating any conclusions around the results stated in this report into any other application or process.

Even though the Actual Relative Mortality Ratios were determined by taking actual death counts and dividing them by expected deaths, they should not be interpreted as actual to expected ratios. Actual death counts were used in the Actual Relative Mortality Ratios, but the mortality rates used to determine expected deaths were amount-based. The Actual Relative Mortality Ratios were developed solely for the determination of excess mortality. See section 3 for more details.

We also analyzed general population data as described in Appendix A. When analyzing this data, there was frequently missing data and various data inconsistencies. We have worked around as many of these data deficiencies as possible, but revisions to the general population data from any of the services that provided these data could result in substantial changes to those sections of the report that use the population data.

Section 14: Acknowledgments

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Shweta Pejathaya (RGA)

Mike Skelley (TAI)

Rich Tallon (TAI)

Section 15: List of Participating Companies

AIG Life
Allstate
Ameritas Life Insurance Corp.
Amica Life
CNO Financial Group
Equitable
Global Atlantic Financial Group
Government Personnel Mutual Life
Kansas City Life
Lincoln Financial
MetLife
Mutual of Omaha
Mutual Trust
Nationwide
New York Life Insurance Company
Northwestern Mutual
OneAmerica
Pacific Life
Pan-American Life
Pavonia Life Insurance Co of MI (Global Bankers)
Principal Financial Group
Protective Life
Prudential Financial
Sammons Financial
SBLI
Securian Financial
State Farm Life
Symetra
The Independent Order of Foresters
Western & Southern
Woodmen Life

Appendix A: Description of the Analysis of the Population Data

Section 3 provided a high-level description of how the general population data was analyzed to compare the impact of COVID-19 on the general population versus its impact on the insured population (shown in section 12). We provide more detail below as to the steps that were taken to analyze the general population data in a way that would make it comparable to the fully insured data used in this and prior reports.

We created a complete estimate of population mortality rates, ages 5-94, that varies by age, sex, region and month for every month from January 2015 through December 2020, largely relying on CDC data. We then used these rates to create the expected values to be used in the A/E ratio for the insured population. The A/E ratios were then calculated as the actual counts of deaths (from CDC WONDER) divided by the expected deaths.

During the course of this work we relied on the following sources:

- CDC WONDER, multiple cause of death database
  - https://wonder.cdc.gov/mcd-icd10.html
- CDC Provisional COVID-19 Deaths by Sex and Age
  - https://data.cdc.gov/NCHS/Provisional-COVID-19-Deaths-by-Sex-and-Age/9bhg-hcku/data
    - Last accessed August 19, 2021
- The Human Mortality Database
  - https://www.mortality.org/
- Federal Reserve Economic Data, population by month
  - https://fred.stlouisfed.org/categories/104
- CDC natality rates
  - https://www.cdc.gov/nchs/products/vsus/vsus_1980_2003.htm
  - Only used 2003 and assumed similar daily/monthly patterns persisted

An immediate issue with estimating deaths and populations across individual age, sex, region, and month is that a combination of factors is not available in complete form in any available data set for the study period. The basic strategy to overcome these limitations and combine available data into reasonable estimates is detailed below.

The target output for years 2015-2019 was to be a match of death rates by age band and region in each year against CDC WONDER's official results.

The WONDER database has a number of limitations that we needed to work around:

- Only grouped population totals for ages 85 and older
- Censors both death and population data if there are fewer than 10 deaths in a cell
- Does not provide population estimates by month
- 2020 is not available yet

The following approaches were taken to resolve these limitations:

- Limit: Only grouped population totals for ages 85 and older
  - CDC WONDER has an "85+" age band with annual populations.
  - The Human Mortality Database estimates populations by individual age for all years in the study. We regressed the "85+" CDC population total over the corresponding annual age curve in the Human Mortality Database in order to overcome this limitation.
- Limit: Censors both death and population data if there are fewer than 10 deaths in a cell
  - For deaths: We estimated distributions within individual age bands from surrounding available data, including preceding and following years where available.

    - For populations: Ultimately, the populations needed to match the CDC values in 2015-2019 when aggregated over regions or age bands. Censored population values were typically backed into by a process similar to the process described above for deaths, by looking at surrounding data.
- Limit: Does not provide population estimates by month
    - The Federal Reserve provides general population estimates by month, but with no age or regional splits. But this gives useful guidance around how the populations should vary across months.
    - For further guidance, the Natality rates by month were converted to daily rates (making this easier to apply to Leap Years) to understand how ages in populations typically change over the course of a year. The natality information guided the initial split of populations, which was then trued up against the overall annual Federal Reserve estimates.
- Limit: 2020 data is not available
    - Deaths:
        - CDC Provisional data was downloaded by age band, state (converted to region later), month and sex from the CDC Provisional COVID-19 Deaths by Sex and Age website.
        - Patterns of deaths by individual age, sex and region from prior years (sourced from CDC WONDER) were calculated and applied to stratify the age bands into individual ages. Double exponential smoothing was used to correct data artifacts – specifically, CDC WONDER data usually has an odd spike around age 71 in their monthly data that was possibly assigning "unknown" age deaths into a generic "average" age. Because the target table the working group needed is a best estimate across individual ages, smoothing here seemed to be a more appropriate choice to achieve that goal than not smoothing.
    - Populations
        - Simple two-degree polynomial equations based on 2015-2019 population combinations by age, sex and region were extended to estimate 2020 populations. These annual individual age, sex, and region populations were then split into monthly 2020 populations (accounting for typical natality, etc. as discussed in the prior Limit section).

Once all the adjustments described above had been made, we confirmed that the results were reasonable. It was straightforward to determine accuracy for the results from 2015 through 2019. We simply aggregated them at levels where a direct comparison to CDC WONDER data was available. These checks were successful in indicating, with a high degree of confidence, that the 2015-2019 mortality results by age, sex, region and month adhered closely to published results.

Results for 2020 cannot truly be checked until the official 2020 results are published. However, the death counts and death rates do closely match the aggregated values from the CDC provisional data available when the data for the table was completed in August.

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Established in 1916, LIMRA is a research and professional development not-for-profit trade association for the financial services industry. More than 600 insurance and financial services organizations around the world rely on LIMRA's research and educational solutions to help them make bottom-line decisions with greater confidence. Companies look to LIMRA for its unique ability to help them understand their customers, markets, distribution channels and competitors and leverage that knowledge to develop realistic business solutions.

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About The Society of Actuaries Research Institute

Serving as the research arm of the Society of Actuaries (SOA), the SOA Research Institute provides objective, data-driven research bringing together tried and true practices and future-focused approaches to address societal challenges and your business needs. The Institute provides trusted knowledge, extensive experience and new technologies to help effectively identify, predict and manage risks.

Representing the thousands of actuaries who help conduct critical research, the SOA Research Institute provides clarity and solutions on risks and societal challenges. The Institute connects actuaries, academics, employers, the insurance industry, regulators, research partners, foundations and research institutions, sponsors and non-governmental organizations, building an effective network which provides support, knowledge and expertise regarding the management of risk to benefit the industry and the public.

Managed by experienced actuaries and research experts from a broad range of industries, the SOA Research Institute creates, funds, develops and distributes research to elevate actuaries as leaders in measuring and managing risk. These efforts include studies, essay collections, webcasts, research papers, survey reports, and original research on topics impacting society.

Harnessing its peer-reviewed research, leading-edge technologies, new data tools and innovative practices, the Institute seeks to understand the underlying causes of risk and the possible outcomes. The Institute develops objective research spanning a variety of topics with its strategic research programs: aging and retirement; actuarial innovation and technology; mortality and longevity; diversity, equity and inclusion; health care cost trends; and catastrophe and climate risk. The Institute has a large volume of topical research available, including an expanding collection of international and market-specific research, experience studies, models and timely research.

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