SOCIETY OF ACTUARIES® LIMRA® RGA TAI

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

July 2021

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

AUTHORS   Individual Life COVID-19 Project Work Group

SPONSORS   LIMRA
Reinsurance Group of America
Society of Actuaries
TAI

CONTENTS

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 second public release from this collaboration and contains the results of an excess mortality analysis for the first three quarters of 2020. Data from 31 companies representing approximately 68% of the industry face amount inforce have been included in the analyses in this report. A total of 2.8 million death claims from individual life policies from 2015 through September 30, 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.

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 12 explore the experience results by various attributes, including attained age, sex, underwriting class and smoker status, face amount, duration, product type, geographic region, and underwriting method.

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 provide comparisons of insured lives experience against overall U.S. population experience. The Work Group purposely deferred the inclusion of a population comparison to the next report to complete a more thorough and proper analysis and not delay the release of this report. Additionally, it was desired to use data for the full year of 2020. A cause of death analysis will also be added in subsequent reports.

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 2.78 million deaths from life insurance policies covering the period January 1, 2015 to September 30, 2020. Tables 1 and 2 provide a breakdown of these deaths by sex and attained age group. The fourth quarter 2020 observations are not included in this report and are shown as blanks.

Table 1
SUMMARY OF CLAIMS BY SEX

Quarter	Year	Quarter 1 Exposure Count	Quarter 1 Claim Count	Quarter 2 Exposure Count	Quarter 2 Claim Count	Quarter 3 Exposure Count	Quarter 3 Claim Count	Quarter 4 Exposure Count	Quarter 4 Claim Count
Male	2015	5,748,425	82,991	5,820,002	73,309	5,887,317	70,221	5,891,297	77,442
	2016	5,759,691	78,271	5,778,947	71,772	5,855,051	70,088	5,867,608	77,577
	2017	5,681,015	80,146	5,760,126	70,907	5,835,561	69,401	5,845,794	77,296
	2018	5,654,868	80,021	5,733,334	70,341	5,809,035	68,202	5,818,425	75,783
	2019	5,627,079	76,620	5,698,979	70,935	5,766,194	68,676	5,769,527	72,257
	2020	5,638,688	75,597	5,664,816	79,502	5,753,251	72,531		
Female	2015	4,513,160	49,699	4,584,772	44,114	4,649,199	41,976	4,663,802	45,207
	2016	4,588,076	48,225	4,619,705	43,695	4,692,831	42,833	4,714,634	47,434
	2017	4,592,073	50,136	4,671,608	44,575	4,744,190	42,709	4,763,642	47,701
	2018	4,634,541	50,881	4,713,722	44,328	4,787,580	42,931	4,806,245	47,158
	2019	4,674,279	49,353	4,747,564	45,789	4,814,033	43,784	4,826,874	47,293
	2020	4,742,921	49,713	4,780,510	52,575	4,870,297	47,428		

Table 2
SUMMARY OF CLAIMS BY ATTAINED AGE

Age Group	Year	Quarter 1		Quarter 2		Quarter 3		Quarter 4	
		Exposure Count	Claim Count	Exposure Count	Claim Count	Exposure Count	Claim Count	Exposure Count	Claim Count
[0-24]	2015	947,803	349	955,281	381	960,067	392	953,683	395
	2016	940,463	404	940,753	374	948,040	390	944,344	379
	2017	922,744	386	932,536	374	939,930	348	935,694	381
	2018	912,453	319	921,759	339	929,497	340	925,724	318
	2019	902,311	318	909,858	341	915,324	315	910,016	348
	2020	897,451	329	898,414	342	911,277	365		
[25-44]	2015	2,590,902	2,035	2,614,579	2,043	2,635,302	1,989	2,627,324	2,060
	2016	2,592,750	2,112	2,595,764	2,021	2,623,003	2,235	2,621,437	2,172
	2017	2,565,351	2,099	2,599,748	2,158	2,631,919	2,060	2,633,462	2,102
	2018	2,577,890	2,022	2,616,080	2,083	2,651,703	2,098	2,655,979	2,114
	2019	2,601,351	2,059	2,636,844	2,154	2,669,091	2,073	2,671,168	2,005
	2020	2,645,753	2,133	2,664,032	2,360	2,710,521	2,362		
[45-64]	2015	4,153,214	17,004	4,197,618	16,031	4,238,844	15,601	4,234,108	15,776
	2016	4,170,667	16,675	4,176,198	15,693	4,221,592	15,296	4,220,167	15,854
	2017	4,111,966	16,016	4,156,332	15,125	4,196,929	15,252	4,190,347	15,729
	2018	4,076,824	16,090	4,117,612	14,842	4,155,931	14,741	4,146,168	15,486
	2019	4,031,125	15,522	4,066,898	14,878	4,098,715	14,580	4,084,675	14,972
	2020	4,010,586	15,443	4,011,593	16,566	4,056,866	15,270		
[65-84]	2015	2,200,863	59,816	2,252,580	54,024	2,301,955	52,120	2,327,803	55,334
	2016	2,274,684	58,042	2,304,909	53,457	2,358,958	52,613	2,388,282	56,530
	2017	2,311,017	60,040	2,365,900	54,238	2,418,836	52,823	2,446,757	56,934
	2018	2,365,817	60,629	2,420,599	54,324	2,474,079	53,162	2,500,723	57,245
	2019	2,416,581	59,614	2,468,740	55,637	2,518,891	53,930	2,541,708	56,964
	2020	2,479,463	60,691	2,511,477	63,528	2,570,276	59,180		
[85+)	2015	369,968	53,506	385,864	44,950	401,480	42,101	413,284	49,096
	2016	370,255	49,276	382,052	43,931	397,297	42,397	408,991	50,095
	2017	362,926	51,747	378,122	43,599	393,025	41,636	404,037	49,857
	2018	357,232	51,848	371,795	43,088	386,180	40,799	396,828	47,785
	2019	350,694	48,468	364,890	43,719	378,877	41,572	389,481	45,264
	2020	348,968	46,722	360,401	49,287	375,186	42,786		

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

- The number of claims spiked significantly in the second quarter of 2020 as compared to prior trends, following a relatively flat level of claims in the first quarter. During the third quarter, there was a continued level of higher claims, but not to the same extent as during the second quarter. Mortality ratios for fully underwritten business were 14% higher than the expected trend line in the second quarter of 2020.

- Consistent with the results of our COVID claim analysis report released in March of 2021, excess mortality impacted some areas of business more than others. For example, the preferred non-smoker risk class had higher excess mortality than the standard non-smoker risk class despite having better mortality experience overall. Similarly, business in the select period had similar or higher excess mortality than business at the end or beyond the select period. These results are likely driven by a lower mortality base for preferred business. This can be explored more in future reports.

- During the third quarter of 2020, attained ages below 45 tended to experience the steepest mortality increases.

- During the first and second quarters of 2020, high face amount policies fared no better than low face amount policies. By the third quarter, the policies with face amounts above $500,000 showed lower mortality ratios than policies with face amounts below $500,000.

- While we expected to see a noticeable spike in claims in the New York and New Jersey region in the second quarter of 2020, it was somewhat surprising to see results in that region essentially return to normal by August. In Region 4 (Southeast) and Region 6 (Texas and surrounding states), there continued to be a much stronger impact of COVID-19 throughout the third quarter than for the other eight regions in the country.

- During the second quarter of 2020, there was no significant variation in excess mortality by product type while, in the third quarter of 2020, term and whole life tended to have slightly lower levels of excess mortality than universal life and variable universal life products.

Section 3: Methodology

The analyses included in this report were based on reported claims submitted by participating companies through at least the end of 2020, with most submissions including reported data through the end of March 2021. Deaths occurring after September 30, 2020 were omitted from the analyses to minimize distortions due to reporting lags. Any deaths prior to September 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 first three 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 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 the first, second, and third quarters for fully underwritten business are shown here. 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 to 2020.

Figure 1
ACTUAL VS EXPECTED RELATIVE MORTALITY RATIOS – FULLY UNDERWRITTEN BUSINESS
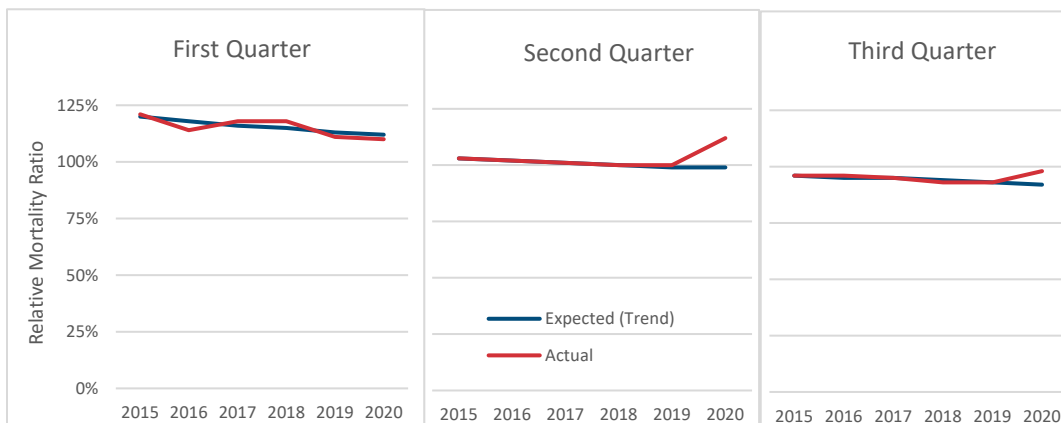
The 2020 Expected Relative Mortality Ratios were developed independently for each relevant subsegment of the experience. For example, separate 2020 Expected Relative Mortality Ratios were developed for each quarter and face amount group and then compared against the 2020 Actual Relative Mortality Ratios. 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. Appendix A contains 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 allows 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 are 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

Section 4: Overview of Fully Underwritten Business

This section reviews the excess mortality for the overall, fully underwritten business in each of the first three quarters 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 first quarter 2020 was 2% below its expected level. The second quarter of 2020 saw the highest mortality level with excess mortality of 14%. In the third quarter of 2020, the excess mortality decreased to a level of 7%.

Figure 2

2020 RATIO OF ACTUAL TO EXPECTED RELATIVE MORTALITY RATIOS -- FULLY UNDERWRITTEN BY QUARTER
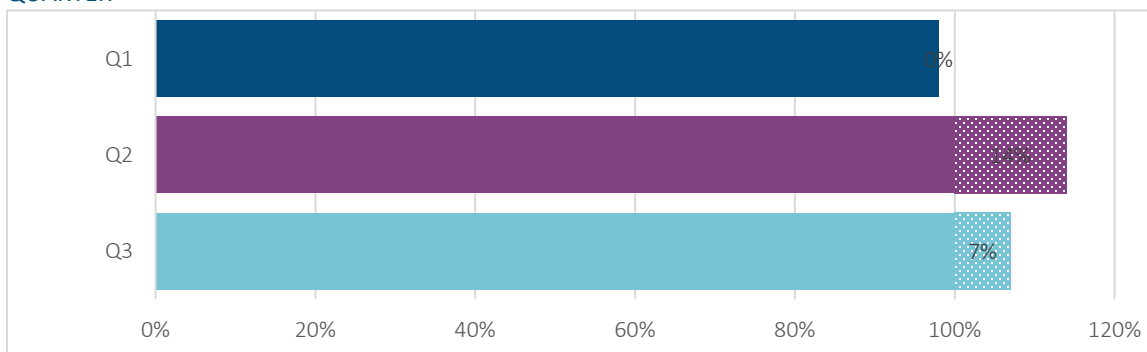
The above analysis was based on a robust number of fully underwritten claims, which ranged between 76,000 and 96,000 in each quarter from the beginning of 2015 to the third quarter of 2020.

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 quarters one, two and three. The Actual Relative Mortality Ratios have more volatility around their Expected Relative Mortality Ratios (trend line) in the first quarter, while the second and third 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 quarter of 2020 was higher than in any of the prior five years, and the third quarter Actual Relative Mortality Ratio in 2020 was close to levels seen in 2015.

Figure 3

ACTUAL AND EXPECTED RELATIVE MORTALITY RATIOS – FULLY UNDERWRITTEN BUSINESS
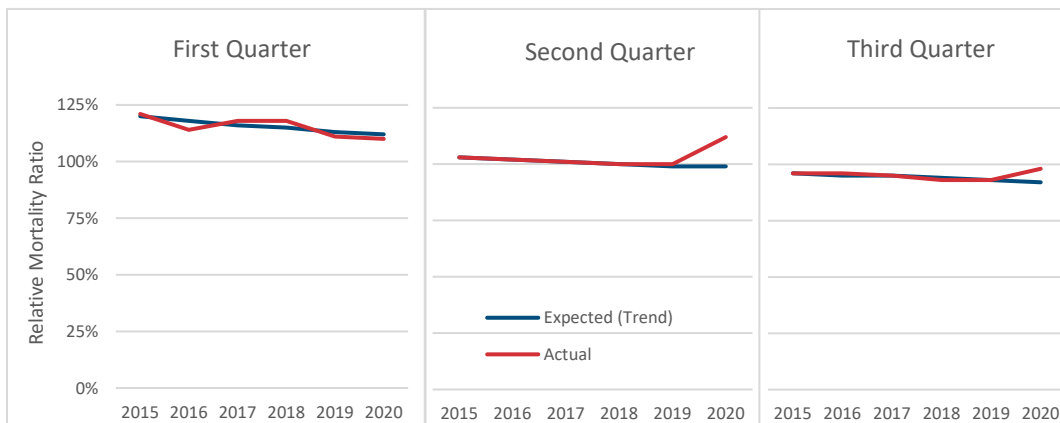
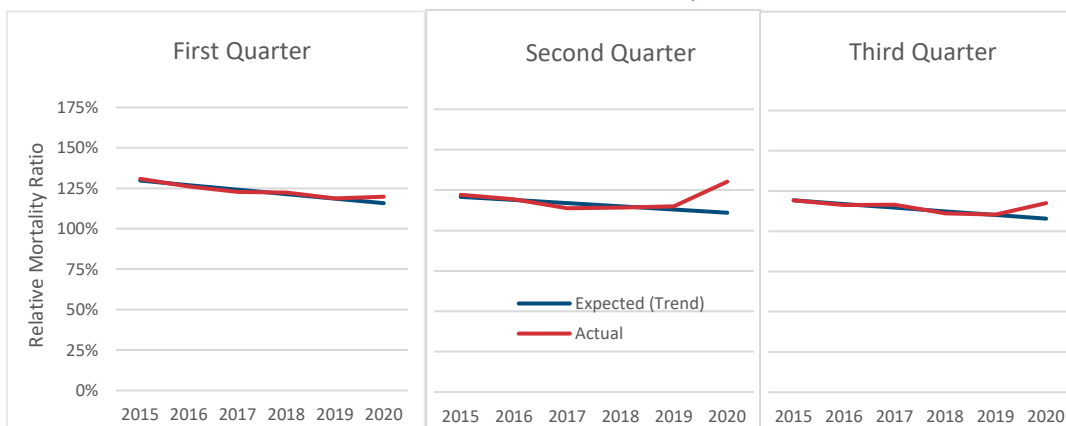# Section 5: Fully Underwritten by Attained Age and Sex

Fully underwritten business was segmented by sex (all, male, and female) and five distinct attained age groups: 0-24; 25-44; 45-64; 65-84; and 85+. The excess mortality for males and females are shown in Figure 4. The second quarter of 2020 was the highest quarter for attained age groups above 45 with excess mortality of 13-17%. Ages below 45 saw the largest excesses in the third quarter with ages 0-24 having the highest with excess mortality of 25% for males and 34% for females. By the third quarter, mortality for those over 85 was close to expected levels with a 4-5% excess level. Death counts for ages 0-24 were in the range of 75-300 deaths per quarter, so the 25% and 34% excess mortality in quarter three is based on a relatively small number of claims. Death counts were greater than 1,000 per quarter for most sex and age group combinations. Exceptions include males, ages 0-24, with 200-300 deaths; females, ages 0-24, with 75 to 100 deaths; and females, ages 25-44, with 500-700 deaths.

Figure 4

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

Similar to the overall analysis, a decreasing trend of Expected Relative Mortality Ratios across 2015-2020 and across all three 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 5, and for males, ages 85+, in Figure 6[2]. 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 6 shows the lower absolute levels of excess mortality in all three quarters of 2020 in ages 85+ versus the levels for ages 45-64 in Figure 5.

Figure 5

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

Figure 6

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

---
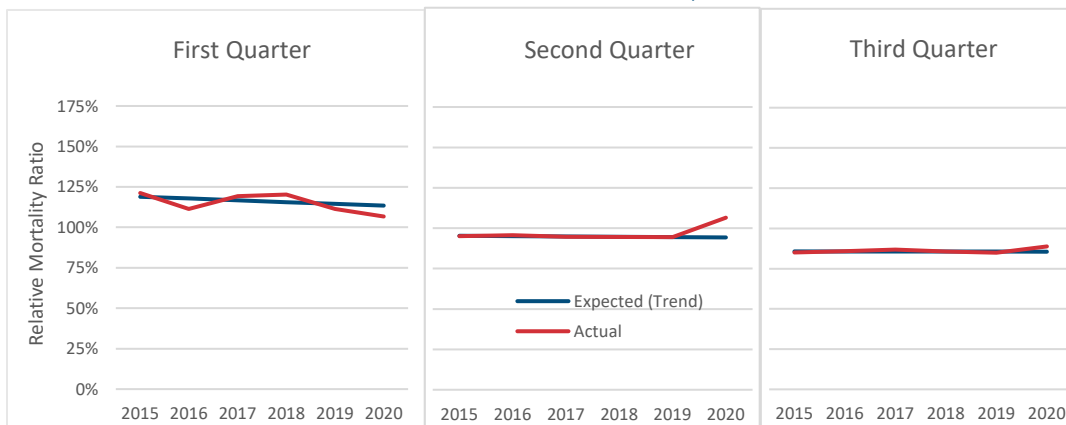
[2] The Actual and Expected Relative Mortality Ratios used to develop all excess mortality values can be found in Appendix A.

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. About 96% of the claims in the aggregate segment were in durations 21 and above. The excess mortality for the five underwriting classes for the first three quarters of 2020 is shown in Figure 7. The second quarter of 2020 was the highest quarter for all classes except preferred smoker, although this was the one segment with slightly less credible death counts of about 400 per quarter. The preferred non-smoker class had higher Actual to Expected Relative Mortality Ratios than the standard classes in all quarters. This does not imply that actual raw mortality increases were higher for preferred versus standard classes, just the percentage increase over a lower level of baseline mortality.

Figure 7

2020 RATIO OF ACTUAL TO EXPECTED RELATIVE MORTALITY RATIOS -- FULLY UNDERWRITTEN BY UNDERWRITING CLASS AND QUARTER
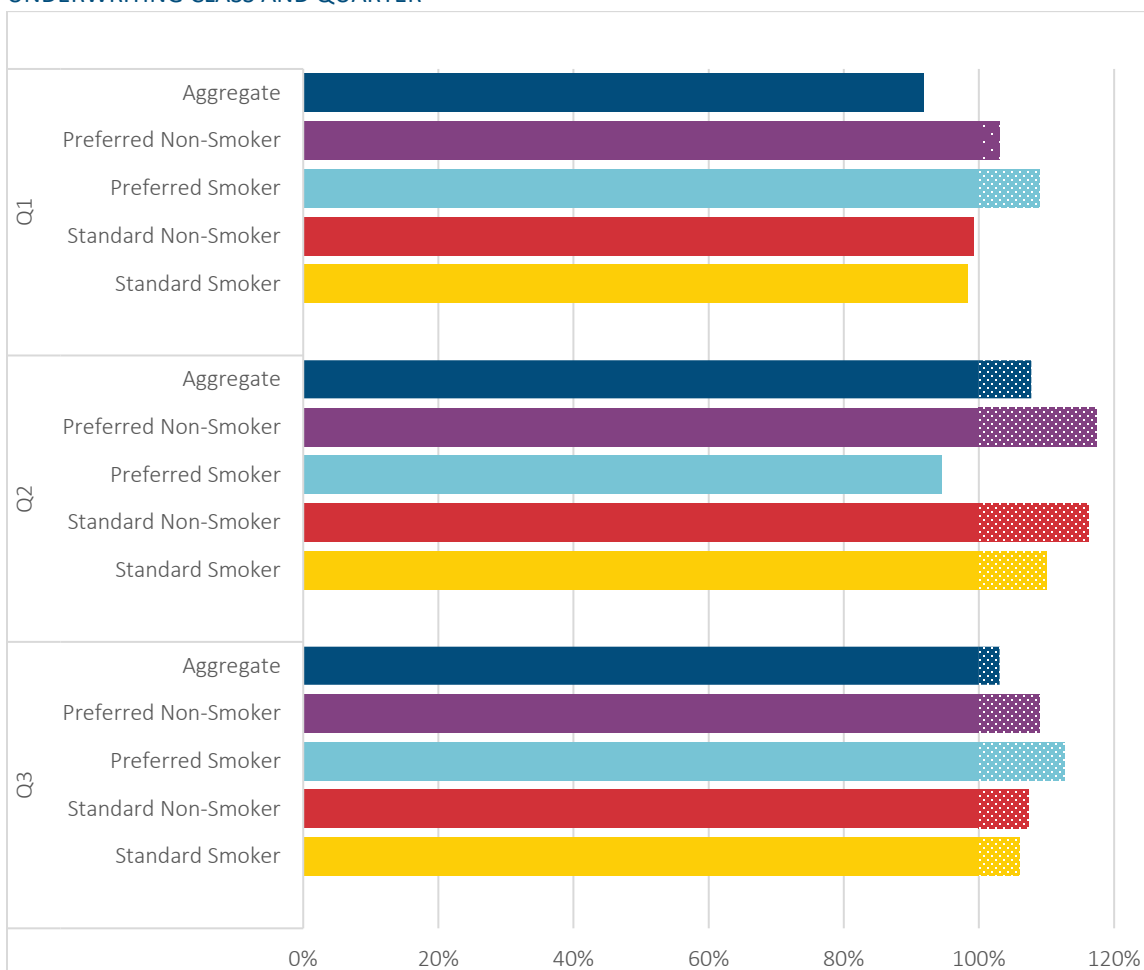
The Actual and Expected Relative Mortality Ratios used to develop excess mortality values for the preferred non-smoker, standard non-smoker, and standard smoker classes are shown in Figure 8. The trend lines are flatter in the standard classes than in the preferred classes. Trend lines appear to line 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. Credibility of the results is high with 5,000-6,000 claims per quarter in the preferred non-smoker segment, 40,000-50,000 deaths per quarter in the standard non-smoker segment, and 16,000- 20,000 deaths per quarter in the standard smoker segment. Even though the excess mortality is higher in the preferred non-smoker class than the standard non-smoker class, the difference between the actual ratio and the expected rate was greater in the standard non-smoker class (18 percentage points) than the preferred non-smoker class (13 percentage points)

Figure 8
ACTUAL AND EXPECTED RELATIVE MORTALITY RATIOS – PREFERRED NON-SMOKER, STANDARD NON-SMOKER, AND STANDARD SMOKER CLASSES
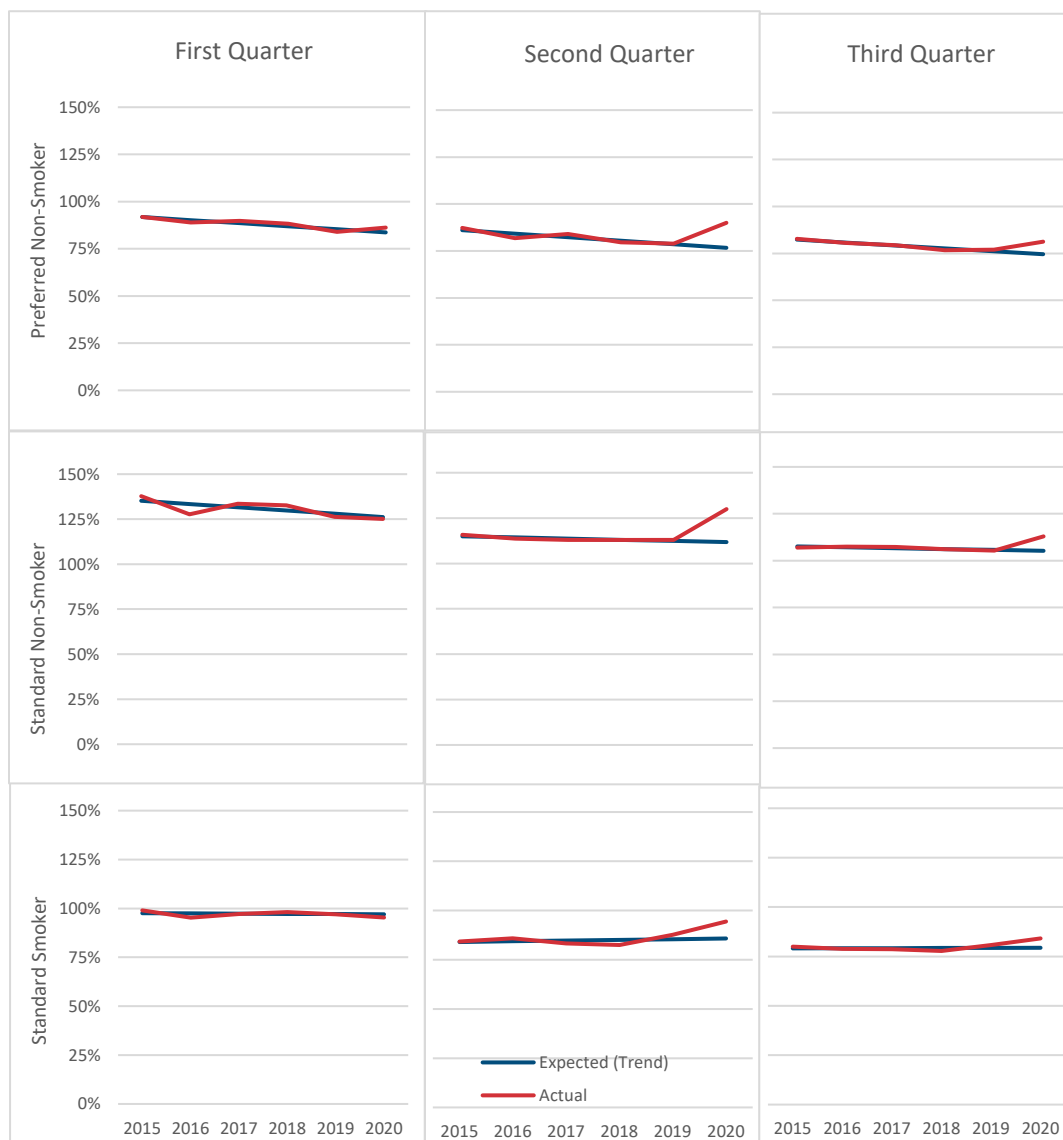
Section 7: Fully Underwritten by Face Amount

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 the first three quarters of 2020 is shown in Figure 9. Face amounts above $500,000 saw higher excess mortality in the first quarter than policies with lower face amounts. The second quarter had the highest levels of excess mortality, with 7-16%, for all the face amount groups. The $1,000,000+ face amount group had the best experience in the third quarter with an actual level 5% lower than the expected level. All face amount groups except the $1,000,000+ group had death counts above 1,000, with the under $100,000 group containing between 60,000 and 82,000 deaths per quarter. The number of deaths per quarter for the $1,000,000+ face amount group was between 800 and 1,300. As shown more clearly in Figure 10 and the appendix, even if the percentage increase over trend is higher in the second quarter for the $1,000,000 and larger face amount band, the starting baseline is much lower.

Figure 9
2020 RATIO OF ACTUAL TO EXPECTED RELATIVE MORTALITY RATIOS – FULLY UNDERWRITTEN BY FACE AMOUNT AND QUARTER
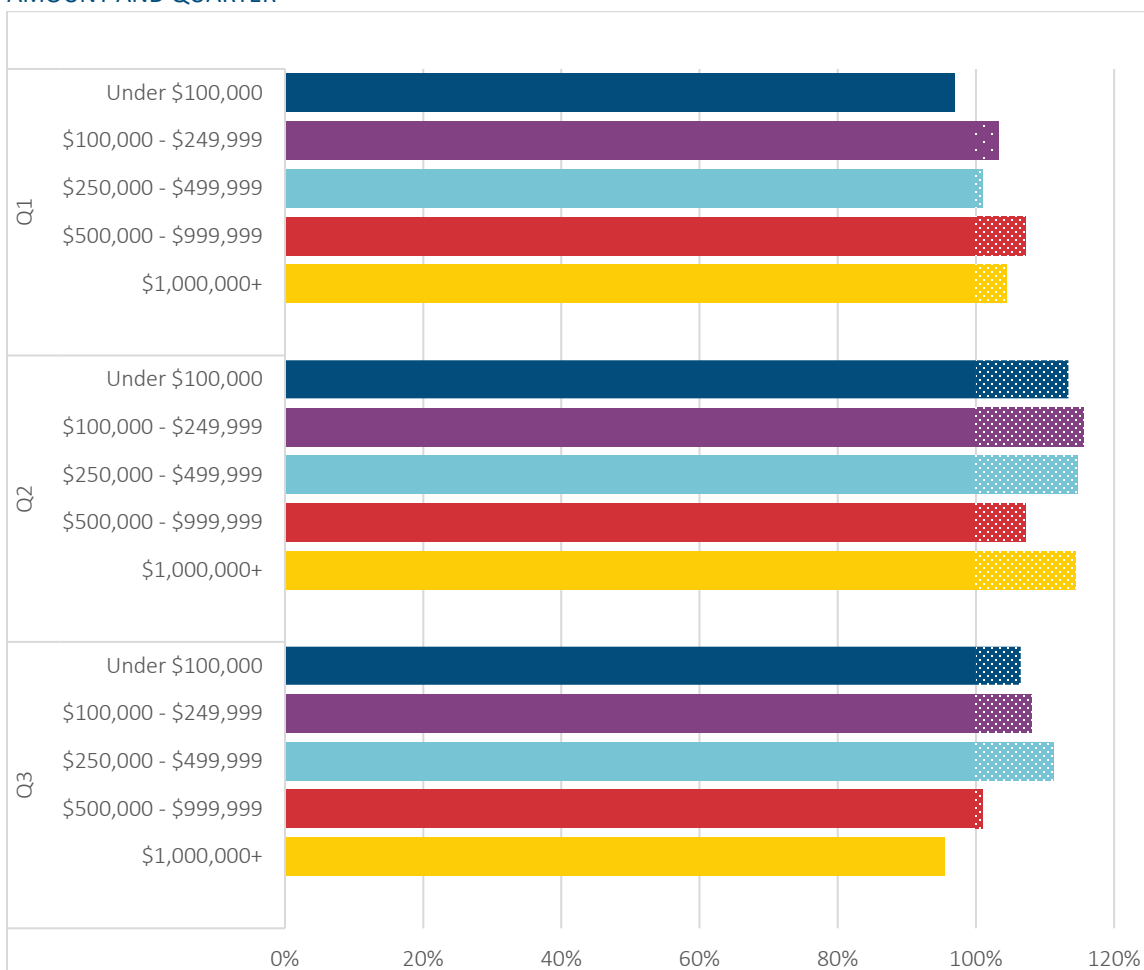
The Actual and Expected Relative Mortality Ratios used to develop excess mortality values for the under $100,000 and $1,000,000+ face amount groups are shown in Figure 10 to highlight the difference in the levels between these two groups[3]. The first quarter trend line for the $1,000,000+ group is about 35% lower than the trend line for the under $100,000 group. The trend lines do decrease from 2015-2019 and across the three quarters, similar to patterns found in most other subsegments. Even with different levels of trend lines, in the third quarter q, the $1,000,000+ group had mortality 5% below expected, while the under $100,000 group had a 7% excess mortality.

Figure 10

ACTUAL AND EXPECTED RELATIVE MORTALITY RATIOS – UNDER $100,000 AND $1,000,000+ FACE AMOUNTS

---
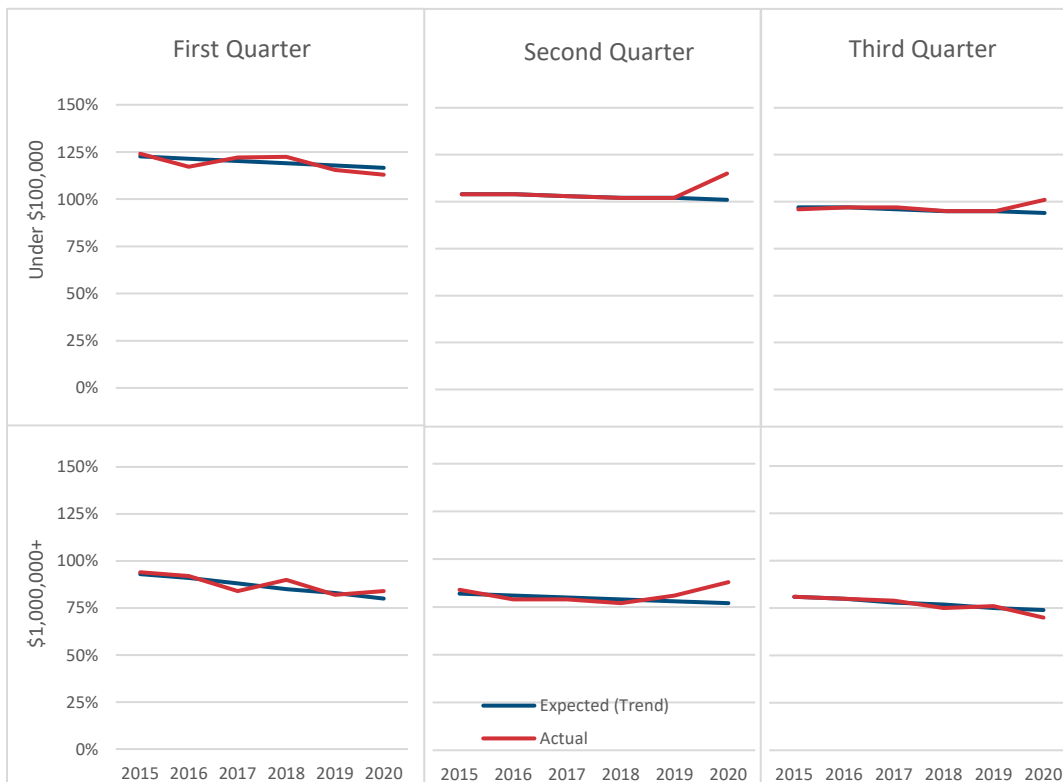
[3] The Actual and Expected Relative Mortality Ratios used to develop all excess mortality values can be found in Appendix A

Section 8: Underwriting Method and Duration

Results by duration do not have much impact on excess mortality. Durations have been banded as 01 – 02, 03 – 05, 06 – 10, 11 – 15, 16 – 21 and 21+. Figures 11, 12, and 13 show the results for Fully Underwritten, Simplified Issue, and Guaranteed Issue. Generally, the second quarter shows the highest A/E's, which is consistent with other results in this study.

Overall, durations 11 – 15 appear to have been most impacted by COVID. The Work Group investigated this duration by product type to see if the increased excess mortality might be due in part to post-level term impacts, but all product types were similarly impacted in this duration. It is also somewhat surprising that, for the fully underwritten policies, there appears to be lower excess mortality at higher durations where the impact of underwriting has essentially disappeared – i.e. recent underwriting decisions appear to have little protective value regarding excess COVID-19 deaths.

Guaranteed Issue business exhibits the highest relative mortality ratios. Note that, for Guaranteed Issue business in general, the experience for newer policies tends to be worse than for older policies since many of the unhealthier risks inherent in this underwriting method are no longer included in the later durations. This makes it more difficult to compare more recent experience against the 2015-2019 baseline because of changes in the mix of business during the time period. It's difficult to separate the impact of this changing business mix from COVID-19 impacts without a substantially deeper analysis.
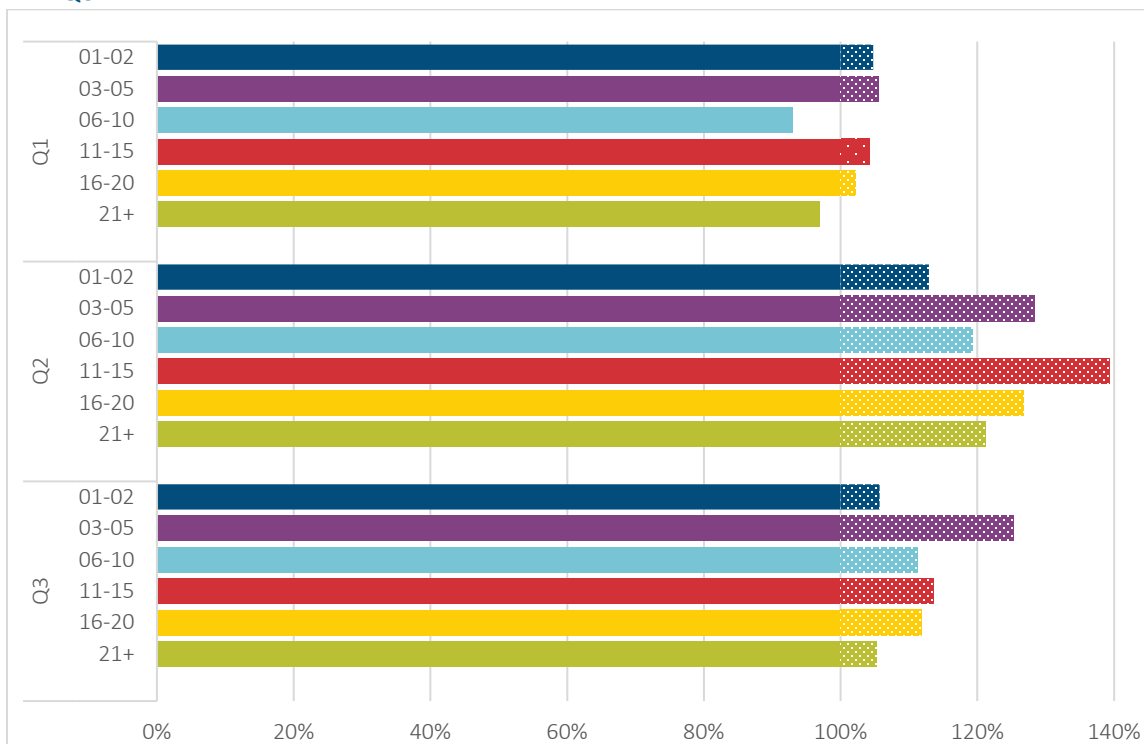
Figure 11

2020 RATIO OF ACTUAL TO EXPECTED RELATIVE MORTALITY RATIOS -- FULLY UNDERWRITTEN BY DURATION AND QUARTER
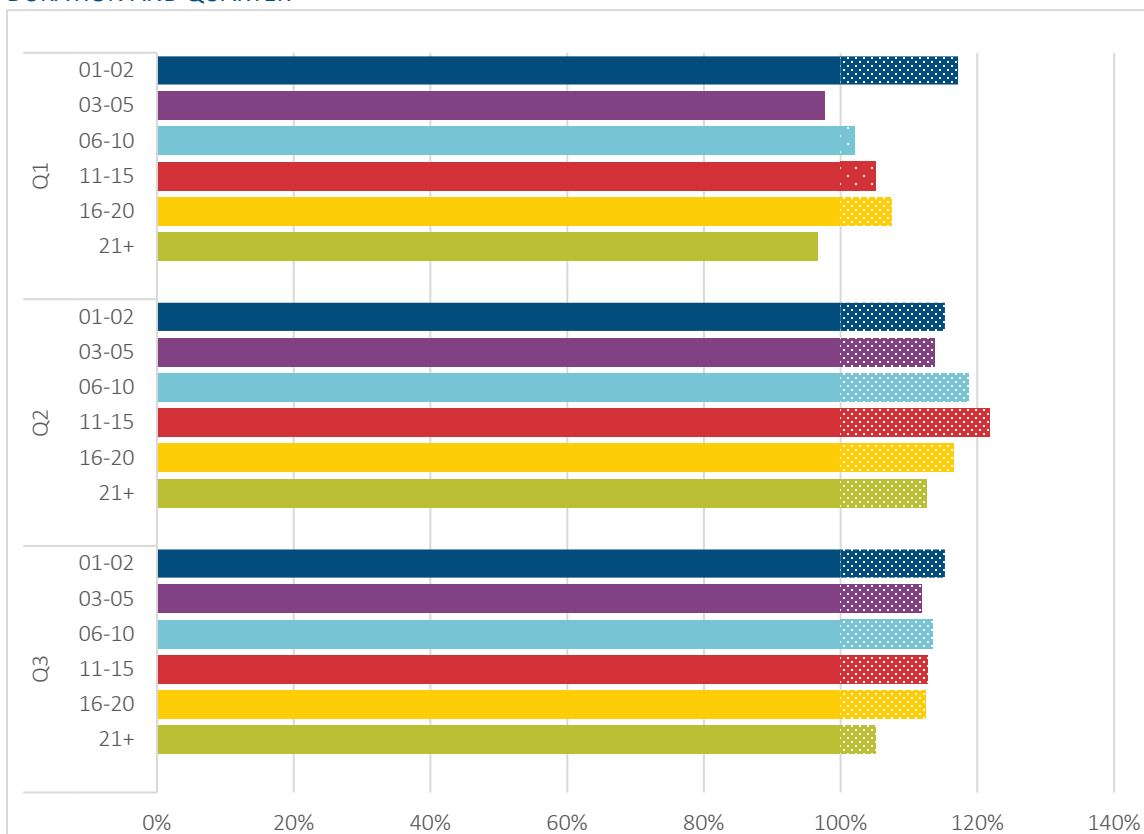
Figure 12

2020 RATIO OF ACTUAL TO EXPECTED RELATIVE MORTALITY RATIOS -- SIMPLIFIED ISSUE BY DURATION AND QUARTER
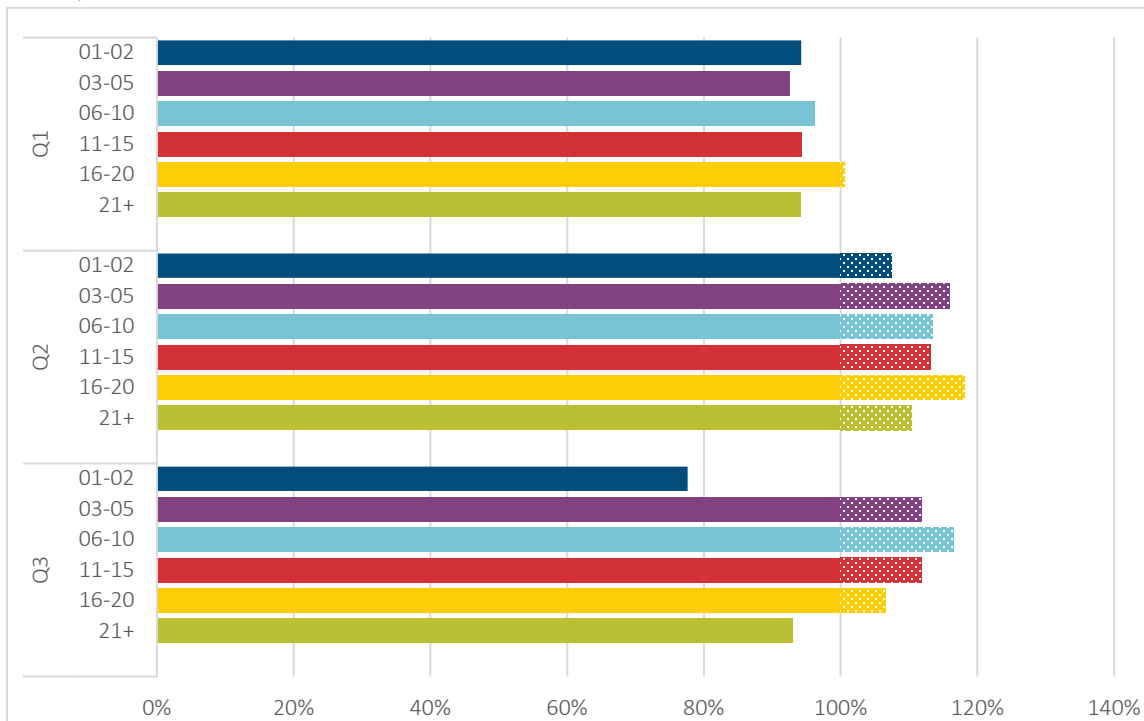
Figure 13

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

Note that when banded by duration, the actual mortality results decrease extremely closely to the trend lines, showing that the trend appears to closely match the actual results. For Guaranteed Issue, we have the unusual situation where some trend lines slope upwards. This is likely more an artifact of changes in the mix of business as opposed to the actual mortality experience. As noted above, mortality on newly issued Guaranteed Issue business tends to be heavier than on the older business, and we believe that, with each following calendar year included in the study, more new Guaranteed Issue business will have been included in the data, resulting in an apparent mortality deterioration.

As with Figures 11, 12 and 13, the impact of COVID is far more noticeable in quarters two and three than in quarter one. Fully underwritten business in durations 03 – 05 and durations 11 – 15 are shown below. Durations 11 – 15 were chosen since that data is highly credible.

Figure 14
ACTUAL AND EXPECTED RELATIVE MORTALITY RATIOS – FULLY UNDERWRITTEN, DURATIONS 03 - 05
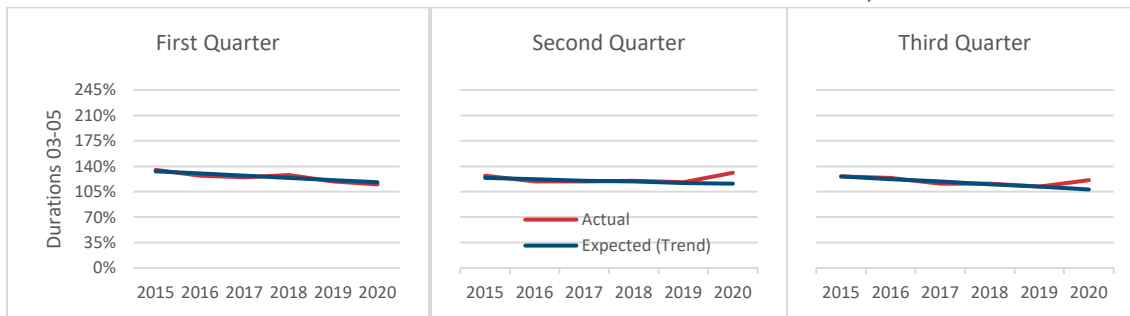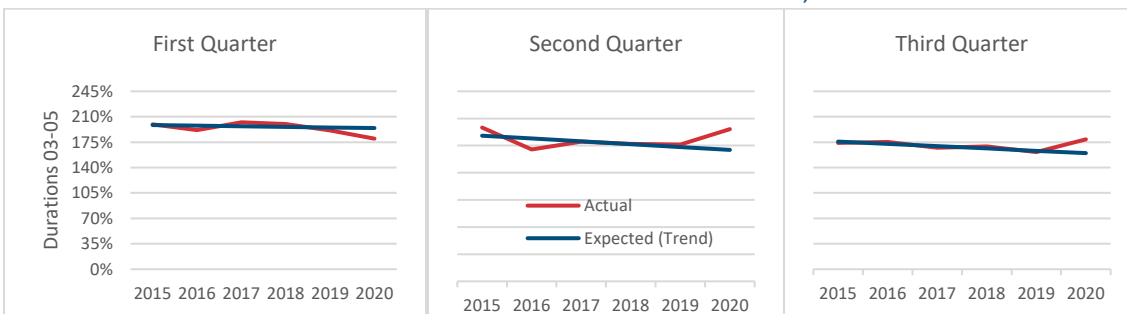
Figure 15
ACTUAL AND EXPECTED RELATIVE MORTALITY RATIOS – FULLY UNDERWRITTEN, DURATIONS 11 – 15
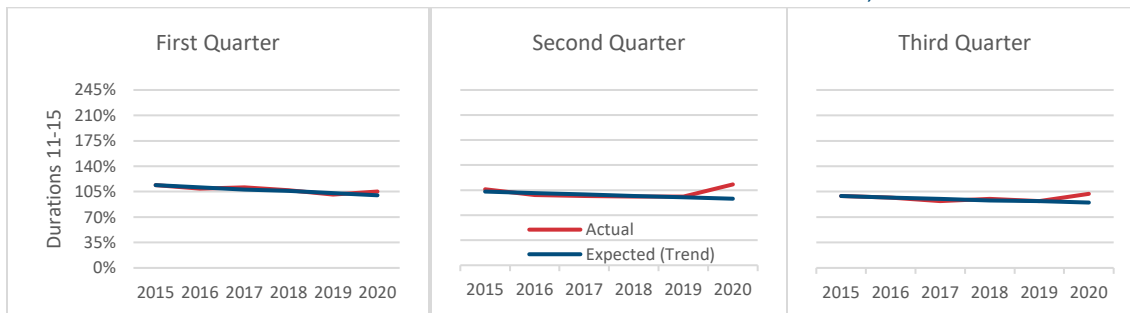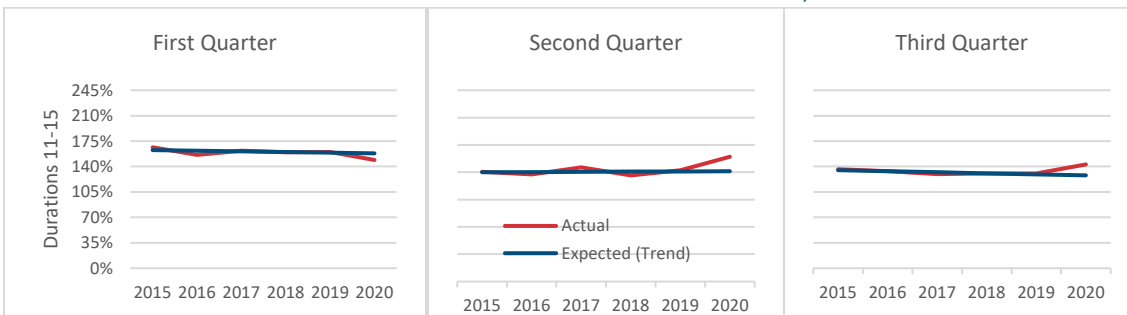
The Simplified Issue results tend to be more variable than the fully underwritten ones; however, the increase in quarters two and three from COVID remains very noticeable.

Figure 16

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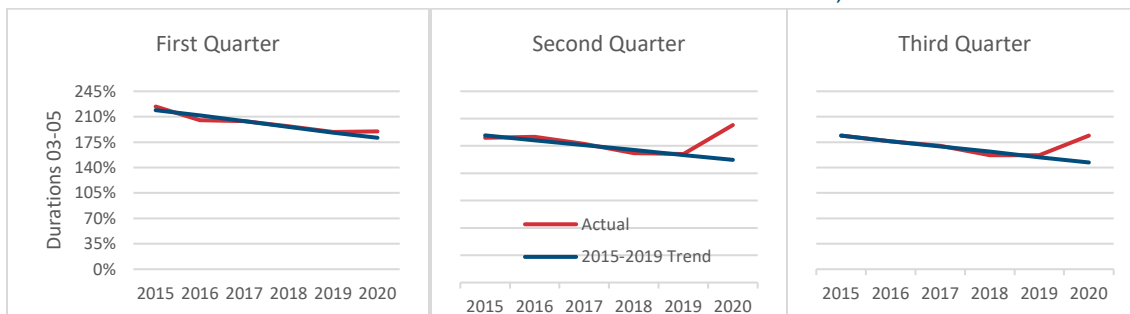

Figure 17

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

For Guaranteed Issue business, durations 03-05 are shown below for comparison, along with durations 06-10 as an example of a situation where the trend line from 2015 – 2020 slopes upwards.

Figure 18
ACTUAL AND EXPECTED RELATIVE MORTALITY RATIOS – GUARANTEED ISSUE, DURATIONS 03 - 05
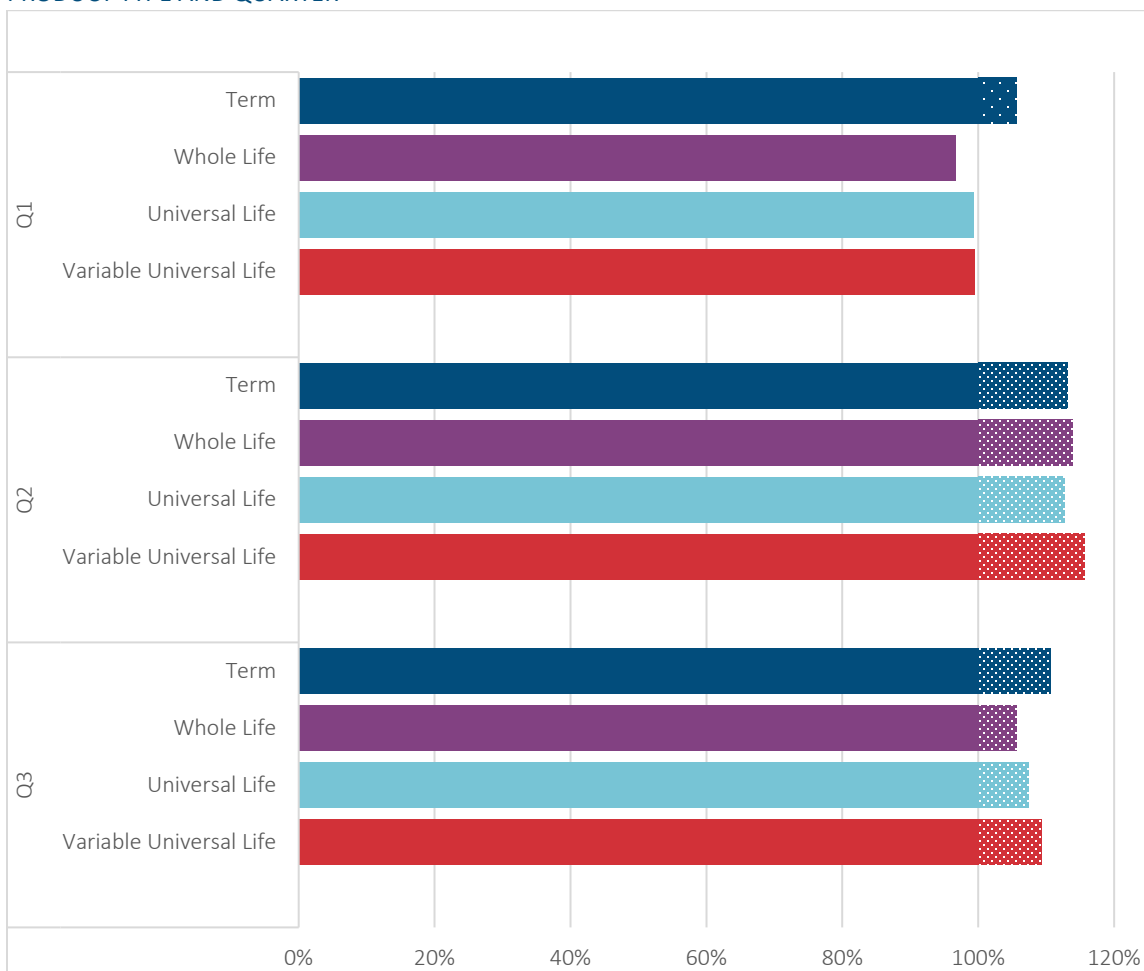

Figure 19
ACTUAL AND EXPECTED RELATIVE MORTALITY RATIOS – GUARANTEED ISSUE, DURATIONS 06-10
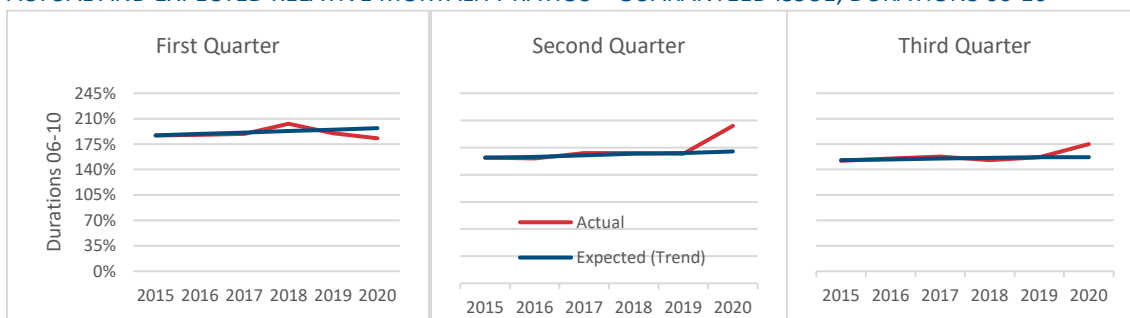
Section 9: Fully Underwritten by Product Type

There was not much variation in results when viewed by product type. The figures below show the results when split by Term, Whole Life, Universal Life, and Variable Universal Life. Most of the second and third quarter results are consistent between the product types, with most of the variability by product type appearing in the first quarter results.

Figure 20

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

The results by calendar year again show a strong and consistent trend by product type. We have included only Term and Whole Life. The results for the other product types are similar.

Figure 21

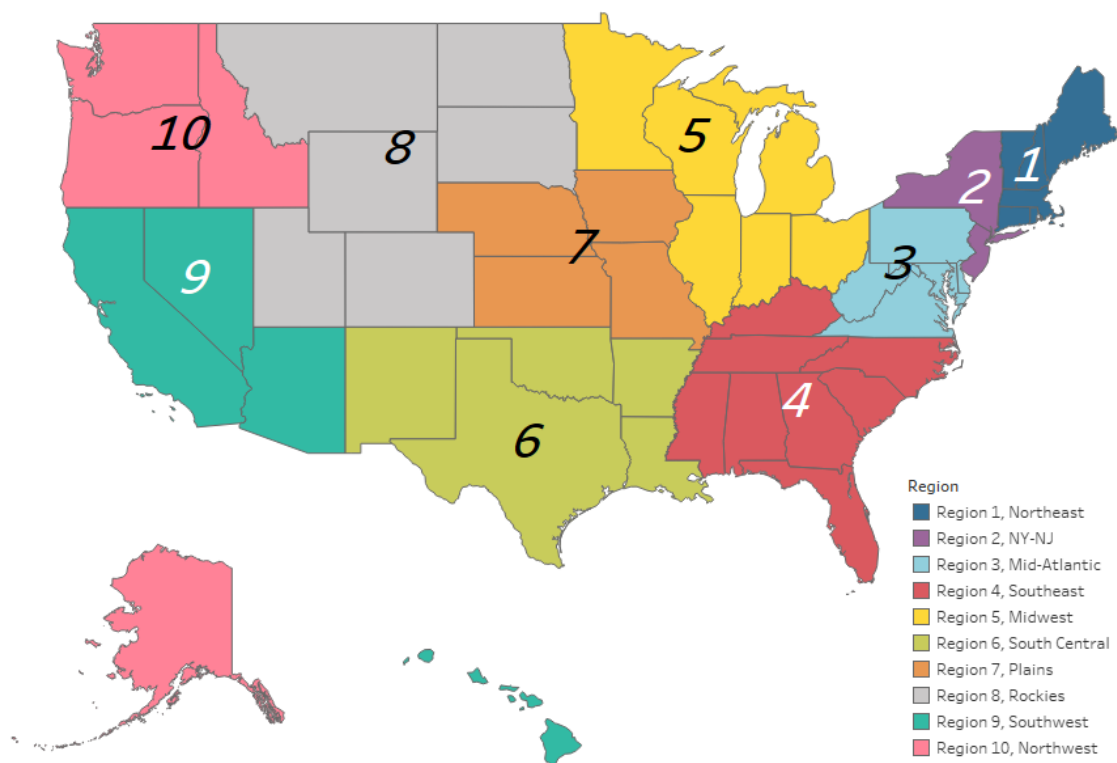ACTUAL AND EXPECTED RELATIVE MORTALITY RATIOS – TERM
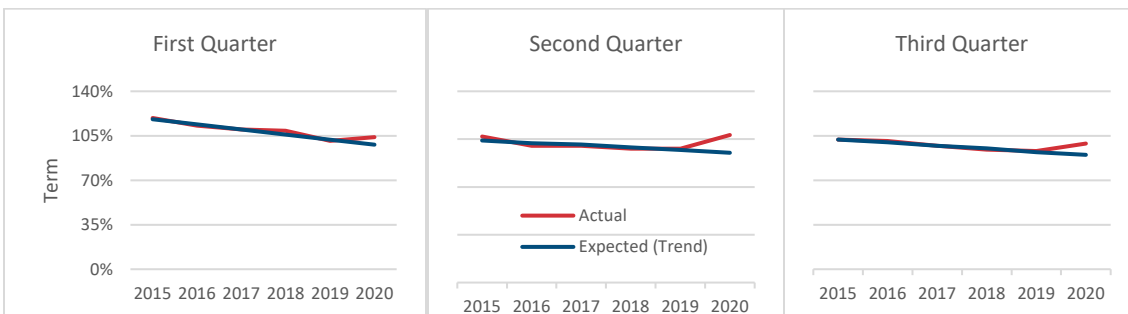
Figure 22

ACTUAL AND EXPECTED RELATIVE MORTALITY RATIOS – WHOLE LIFE
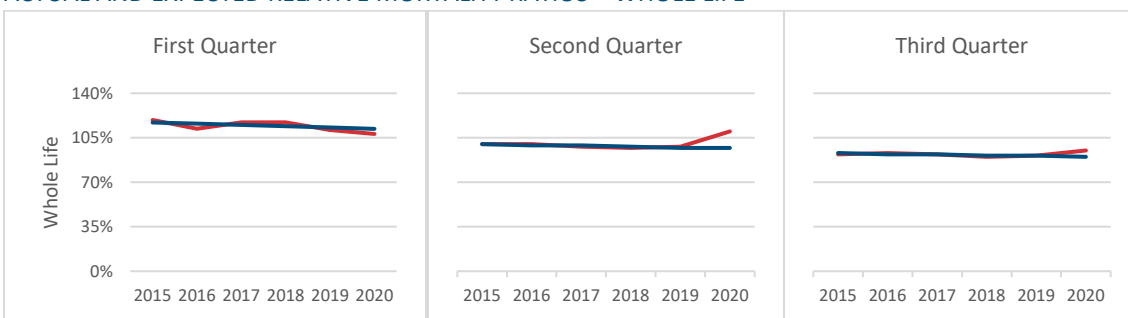
## Section 10: Fully Underwritten by Geographic Region

When analyzed by geographic area, some interesting observations can be made. Results by quarter are shown by region in Figures 23, 24 and 25. For this analysis, the United States has been divided into ten geographic regions as follows:

- Region I, 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 23

2020 RATIO OF ACTUAL TO EXPECTED RELATIVE MORTALITY RATIOS BY QUARTER AND GEOGRAPHIC
REGION
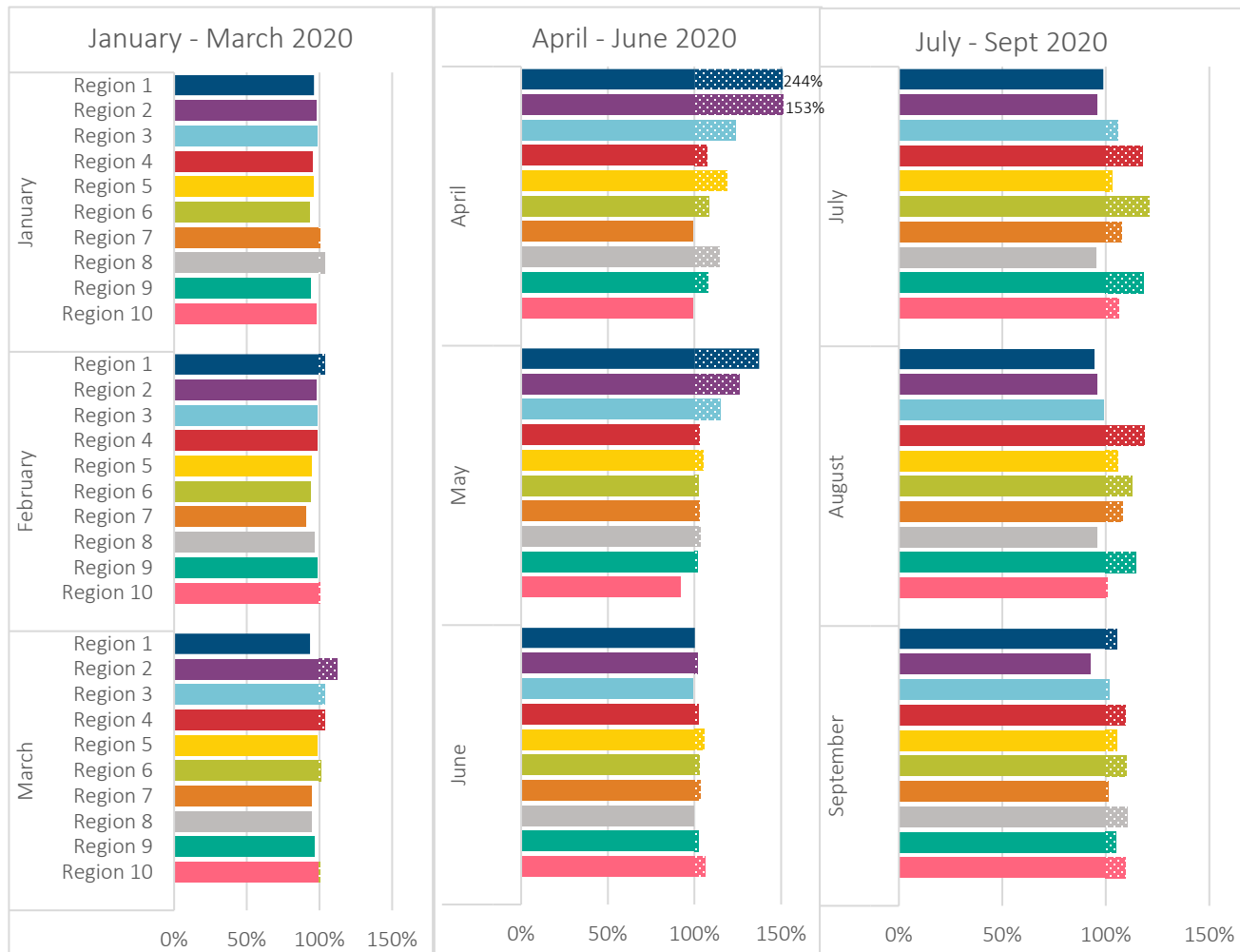
Another way to look at this data is in grid format. The figure below shows the results by region by month from January to September. A/E's above 120% are shown in red, between 110% and 120% in purple, and below 95% in blue.

Figure 24

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

Code	Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Region 1	Northeast	96%	103%	94%	153%	137%	100%	99%	95%	105%
Region 2	NY-NJ	98%	98%	112%	244%	126%	102%	96%	96%	93%
Region 3	Mid-Atlantic	98%	98%	103%	123%	115%	99%	106%	99%	102%
Region 4	Southeast	95%	99%	103%	107%	103%	102%	118%	119%	110%
Region 5	North Central	96%	94%	99%	118%	105%	106%	103%	106%	106%
Region 6	Texas and surrounding states	93%	94%	101%	108%	102%	103%	121%	113%	110%
Region 7	Plains	100%	90%	95%	99%	103%	104%	108%	108%	101%
Region 8	Northern Plains	104%	96%	95%	114%	103%	100%	95%	96%	110%
Region 9	California+	94%	98%	96%	108%	102%	102%	118%	114%	105%
Region 10	Washington+	98%	100%	101%	99%	92%	106%	106%	101%	109%

Some observations worth noting about the above results:

- The results for Region 2 (New York and New Jersey), and to a much lesser extent Region 1 (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont) 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 these states the hardest. It is informative, too, that the numbers decreased as quickly as they did in May and June, returning to more normal levels. We plan to thoroughly explore a comparison of insured lives against population by region in the next report.

- Regions 4 and 6, and to a lesser extent Region 9, are noteworthy for having substantially higher death rates than most other regions starting in May and continuing to September.

The observations above are also very striking when viewed as A/E's on the trend graphs by quarter. We show below Regions 2, 4, and 6 as having markedly different patterns in the way COVID played out for these regions.

Figure 25
ACTUAL AND EXPECTED RELATIVE MORTALITY RATIOS -- GEOGRAPHIC REGIONS 2, 4, AND 6
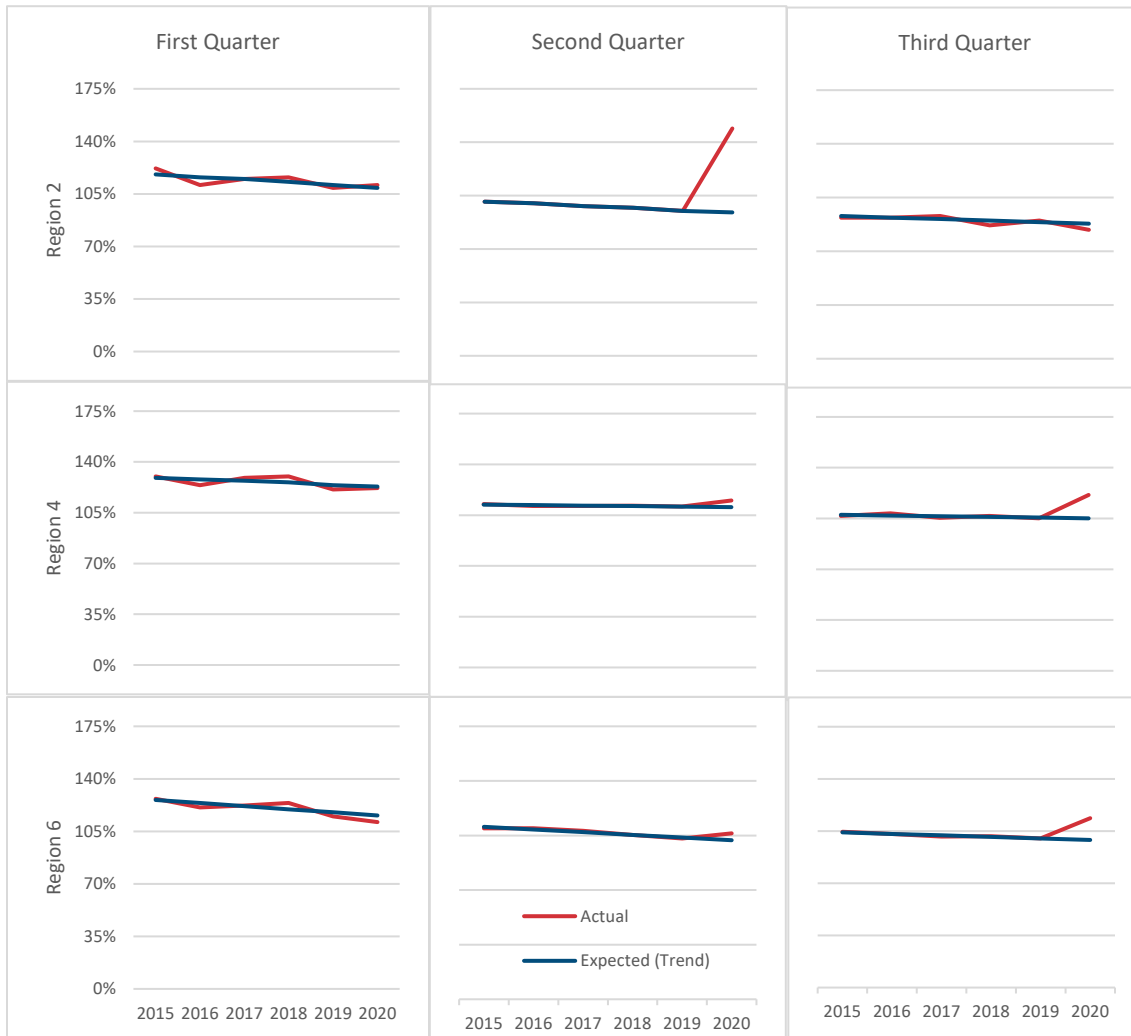
Section 11: Guaranteed Issue, Simplified Issue, and Conversions

In this section, we look at the results by underwriting method and have included conversions here as well. For Simplified Issue, there were between 13,000 and 18,000 deaths per quarter while, for conversions, there were only between 2,000 and 3,500 deaths per quarter. For Guaranteed Issue, there were between 16,000 and 22,000 deaths per quarter. While the number of Guaranteed Issue deaths is quite large, it bears repeating from Section 9 that the Guaranteed Issue results are likely driven by a significant change in the mix of business between 2015 and 2020.

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

Figure 26 shows little variation in results by underwriting type, noting there are fewer claims for the conversion experience. The authors did not see any distinguishing results by calendar year so those results are not shown here.

Figure 26

2020 RATIO OF ACTUAL TO EXPECTED RELATIVE MORTALITY RATIOS BY UNDERWRITING METHOD AND QUARTER
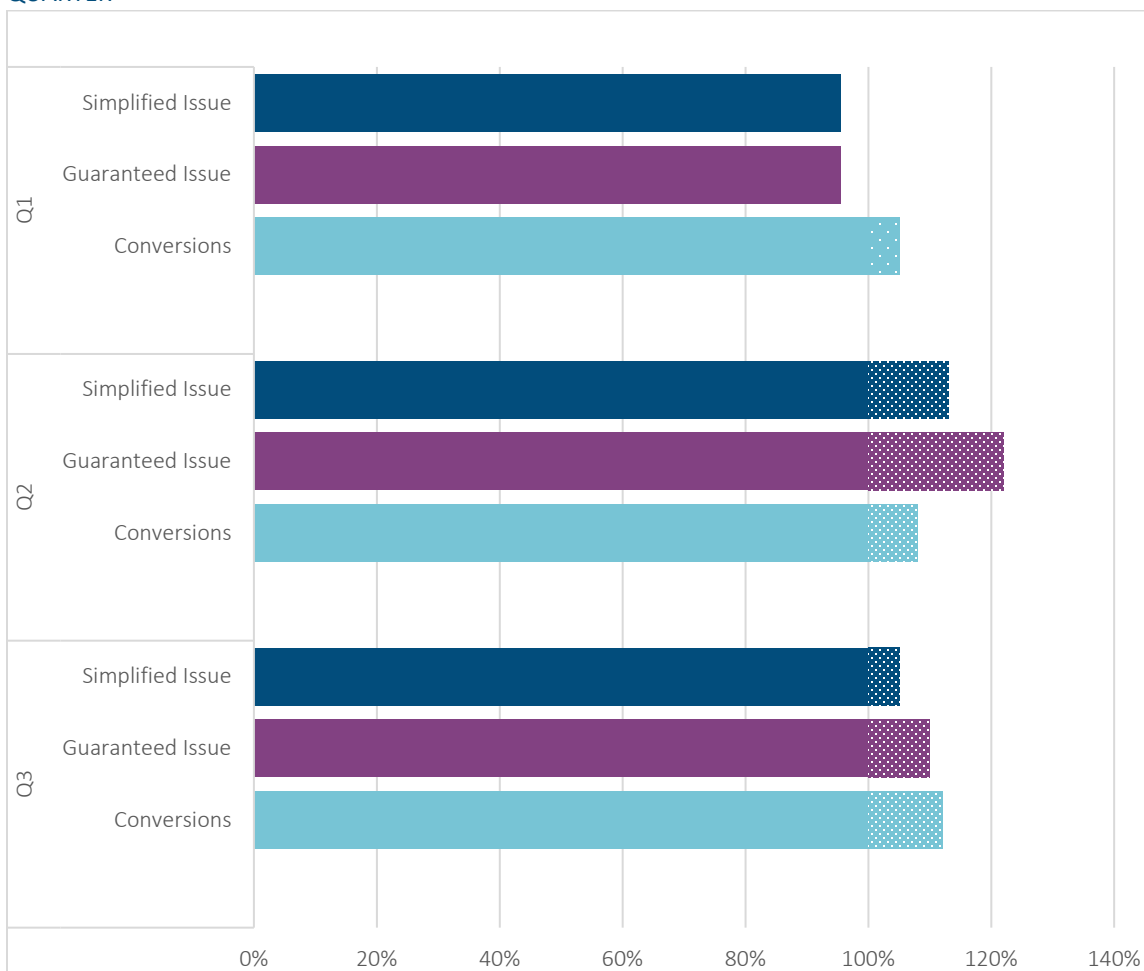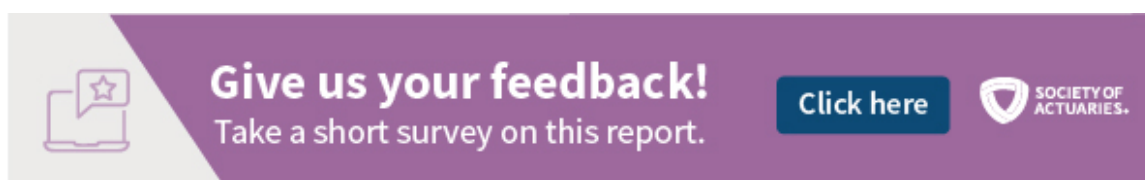
Section 12: Reliances and Limitations

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 reported data as of December 2020 or later. Deaths occurring after September 30, 2020 have been omitted from the analysis to minimize distortions due to reporting lags. Any deaths prior to September 2020 that were not reported by December 30 may potentially impact the analysis, but the authors feel the impact will likely be small.

The analysis of 2020 experience is 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.

Section 14: Acknowledgments

LIMRA, RGA, the SOA, and TAI would like to acknowledge the Individual Life COVID-19 Project Work Group. Without their efforts, this project could not have come to fruition.

Adam Busa (LIMRA)

Korrel Crawford (SOA)

Jyoti Gupta (TAI)

Steve Helfer (TAI)

Mary Kate Hoerichs (LIMRA)

Tao Huang, ASA (RGA)

Mervyn Kopinsky, FSA, EA, MAAA (SOA)

Cynthia MacDonald, FSA, MAAA (SOA)

Jake Maynard (RGA)

Jason McKinley, FSA (RGA)

Pete Miller, ASA, MAAA (SOA)

Marianne Purushotham, FSA, MAAA (LIMRA)

Scott Rushing, FSA, MAAA (RGA)

Ryan Shubert, FSA (RGA)

LIMRA, RGA, the SOA, and TAI would also like to acknowledge the following individuals for their contributions in the success of this effort.

Kathryn Cox, FSA (RGA)

Ben Maska (TAI)

Pete Murphy (TAI)

Shweta Pejathaya (RGA)

Mike Skelley (TAI)

Rich Tallon (TAI)

Section 15: List of Participating Companies

AIG Life
Ameritas Life Insurance Corp.
Amica Life
Baltimore 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
State Farm Life
Symetra
The Independent Order of Foresters
Thrivent Financial
Western & Southern
Woodmen Life

Appendix A

2020 RATIO OF ACTUAL TO EXPECTED RELATIVE MORTALITY RATIOS BY UNDERWRITING TYPE AND QUARTER
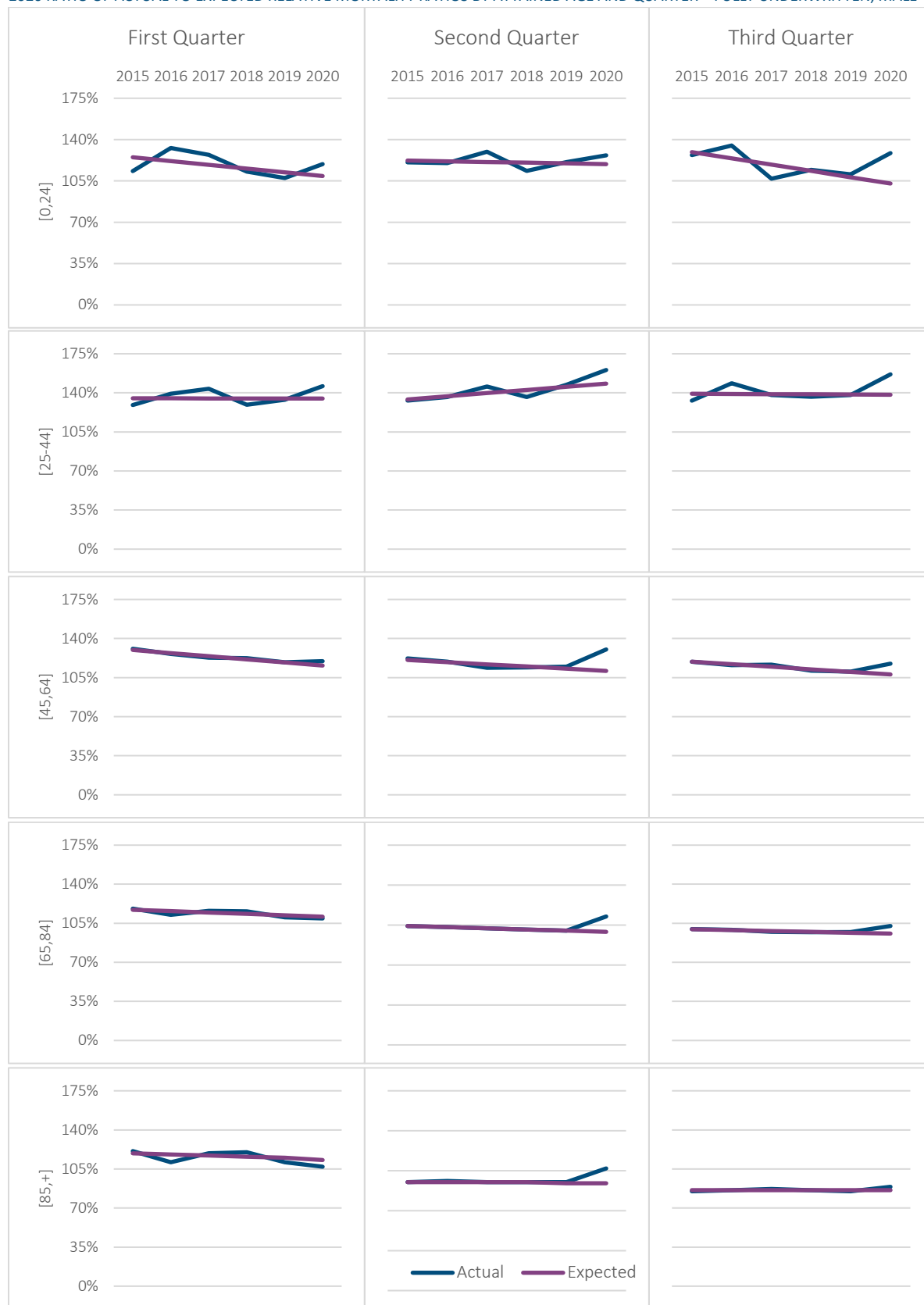
2020 RATIO OF ACTUAL TO EXPECTED RELATIVE MORTALITY RATIOS BY ATTAINED AGE AND QUARTER – FULLY UNDERWRITTEN

2020 RATIO OF ACTUAL TO EXPECTED RELATIVE MORTALITY RATIOS BY ATTAINED AGE AND QUARTER – FULLY UNDERWRITTEN, FEMALE
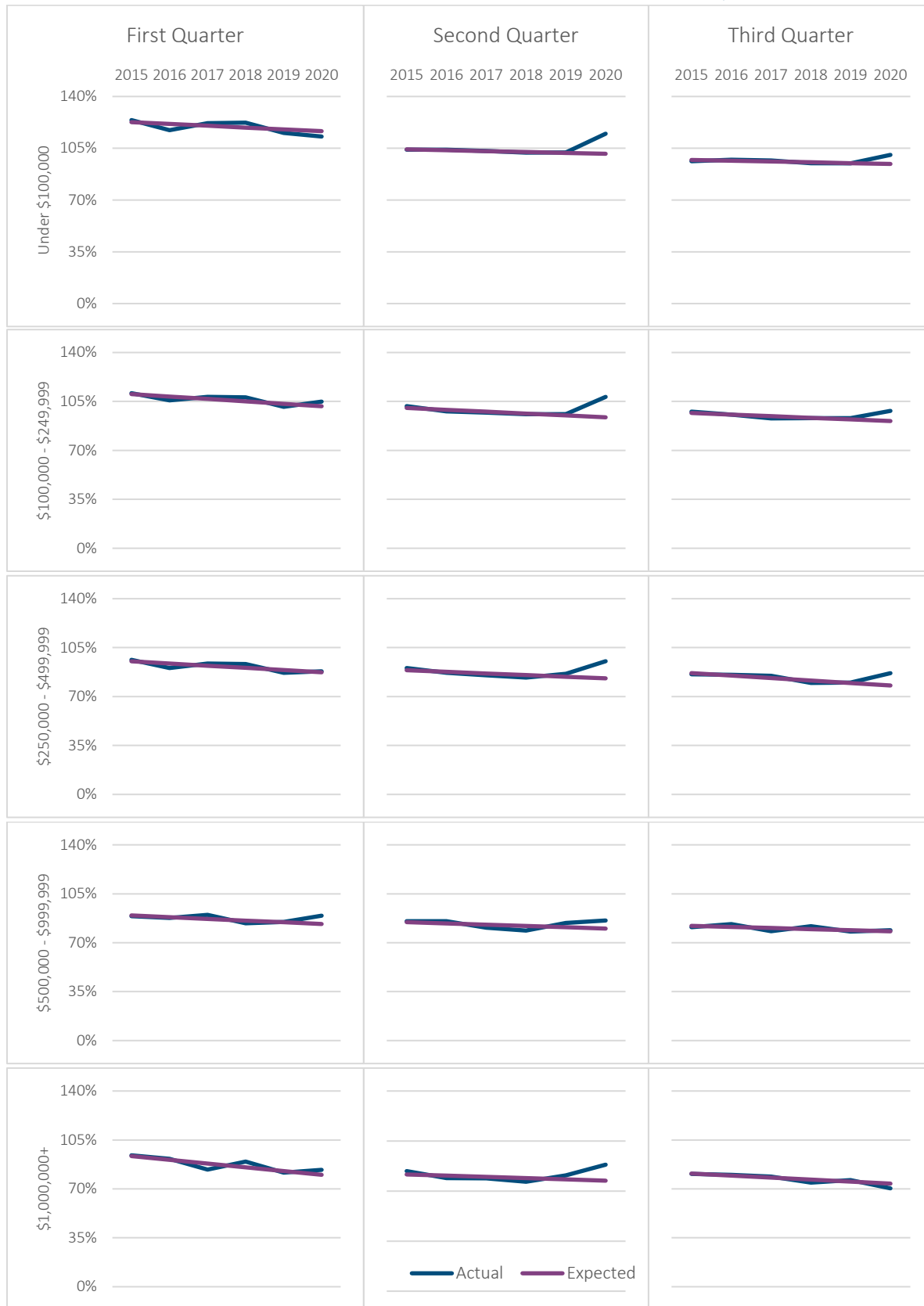
2020 RATIO OF ACTUAL TO EXPECTED RELATIVE MORTALITY RATIOS BY ATTAINED AGE AND QUARTER – FULLY UNDERWRITTEN, MALE

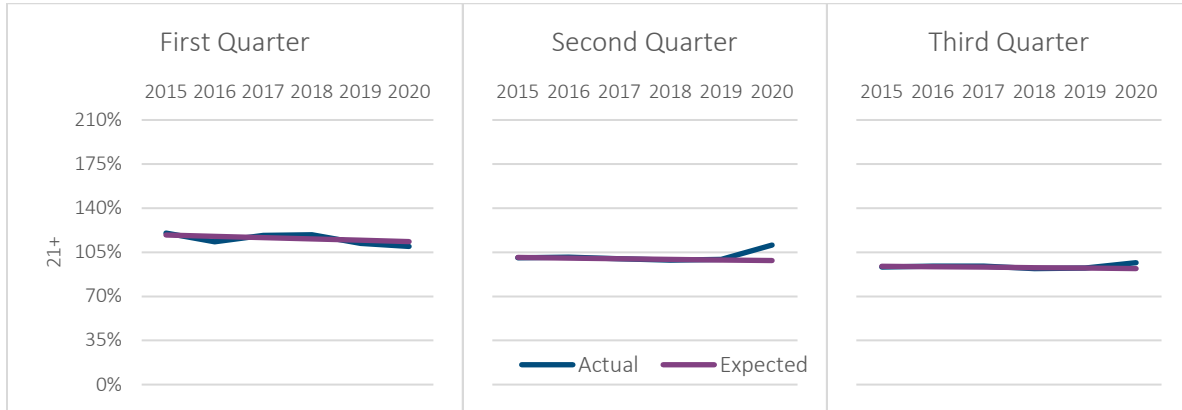**2020 RATIO OF ACTUAL TO EXPECTED RELATIVE MORTALITY RATIOS BY UNDERWRITING CLASS AND QUARTER – FULLY UNDERWRITTEN**

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

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

2020 RATIO OF ACTUAL TO EXPECTED RELATIVE MORTALITY RATIOS BY POLICY DURATION AND QUARTER – FULLY UNDERWRITTEN - CONTINUED
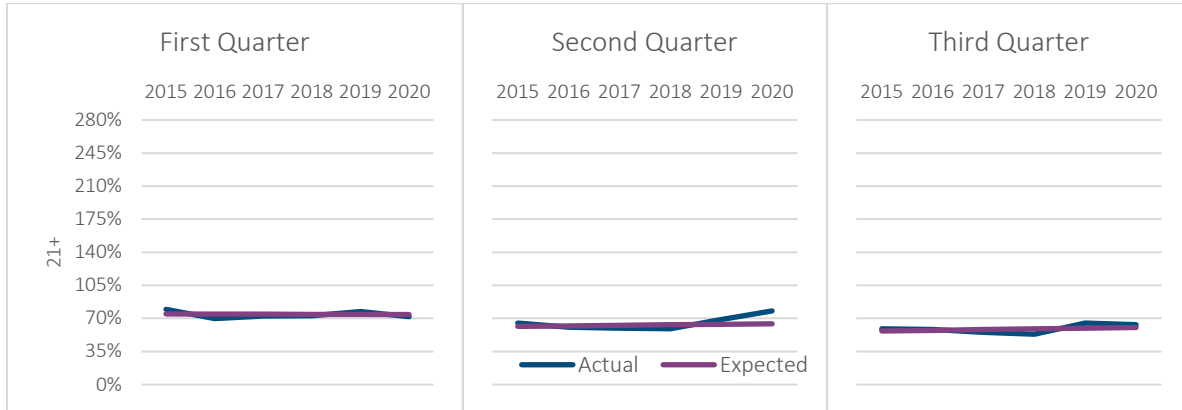
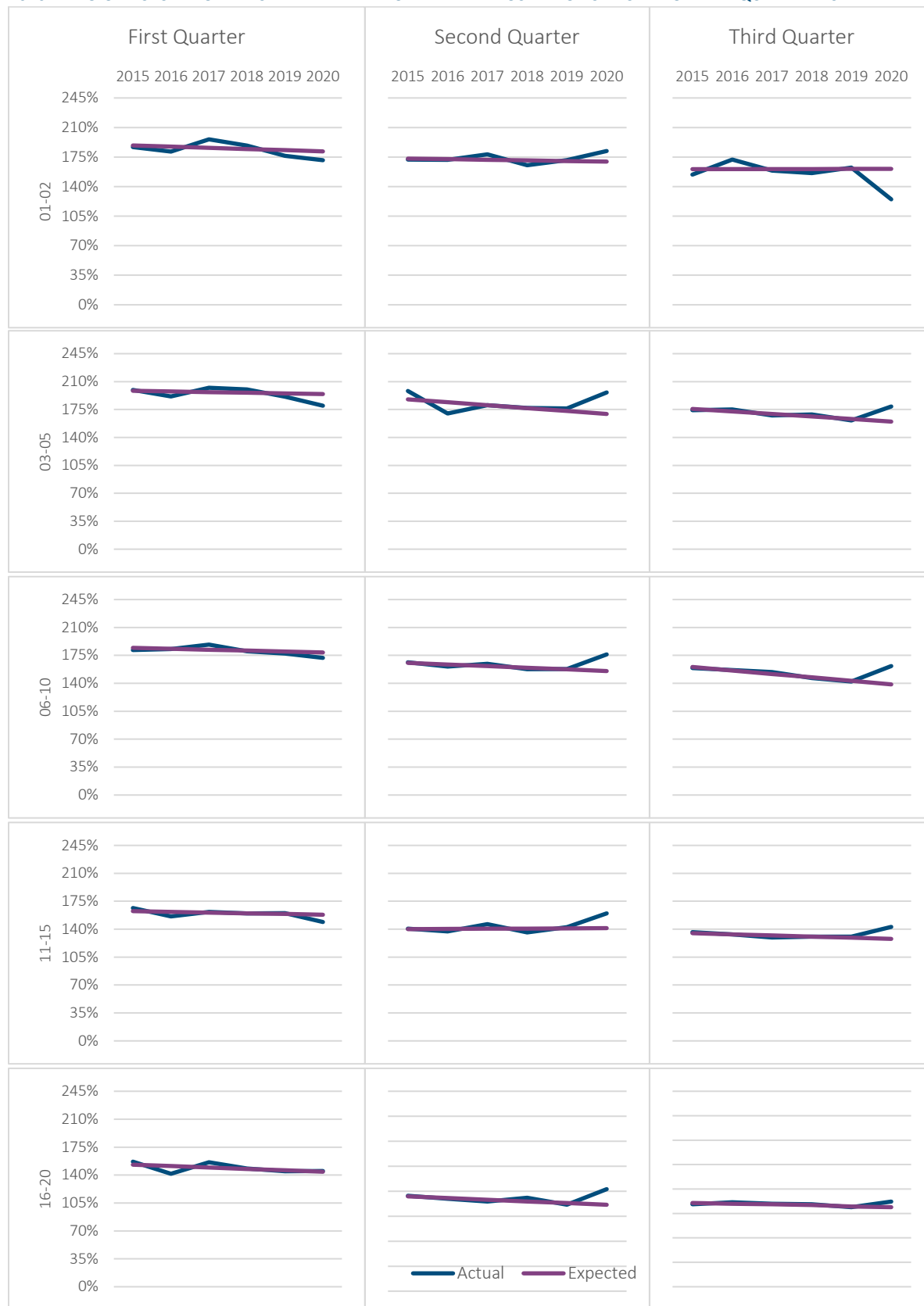2020 RATIO OF ACTUAL TO EXPECTED RELATIVE MORTALITY RATIOS BY POLICY DURATION AND QUARTER – GUARANTEED ISSUE
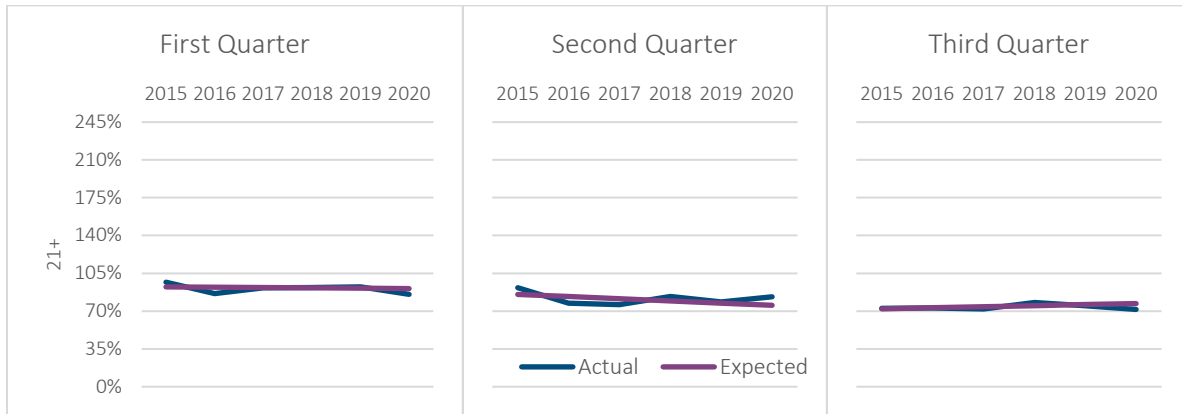
2020 RATIO OF ACTUAL TO EXPECTED RELATIVE MORTALITY RATIOS BY POLICY DURATION AND QUARTER – GUARANTEED ISSUE - CONTINUED

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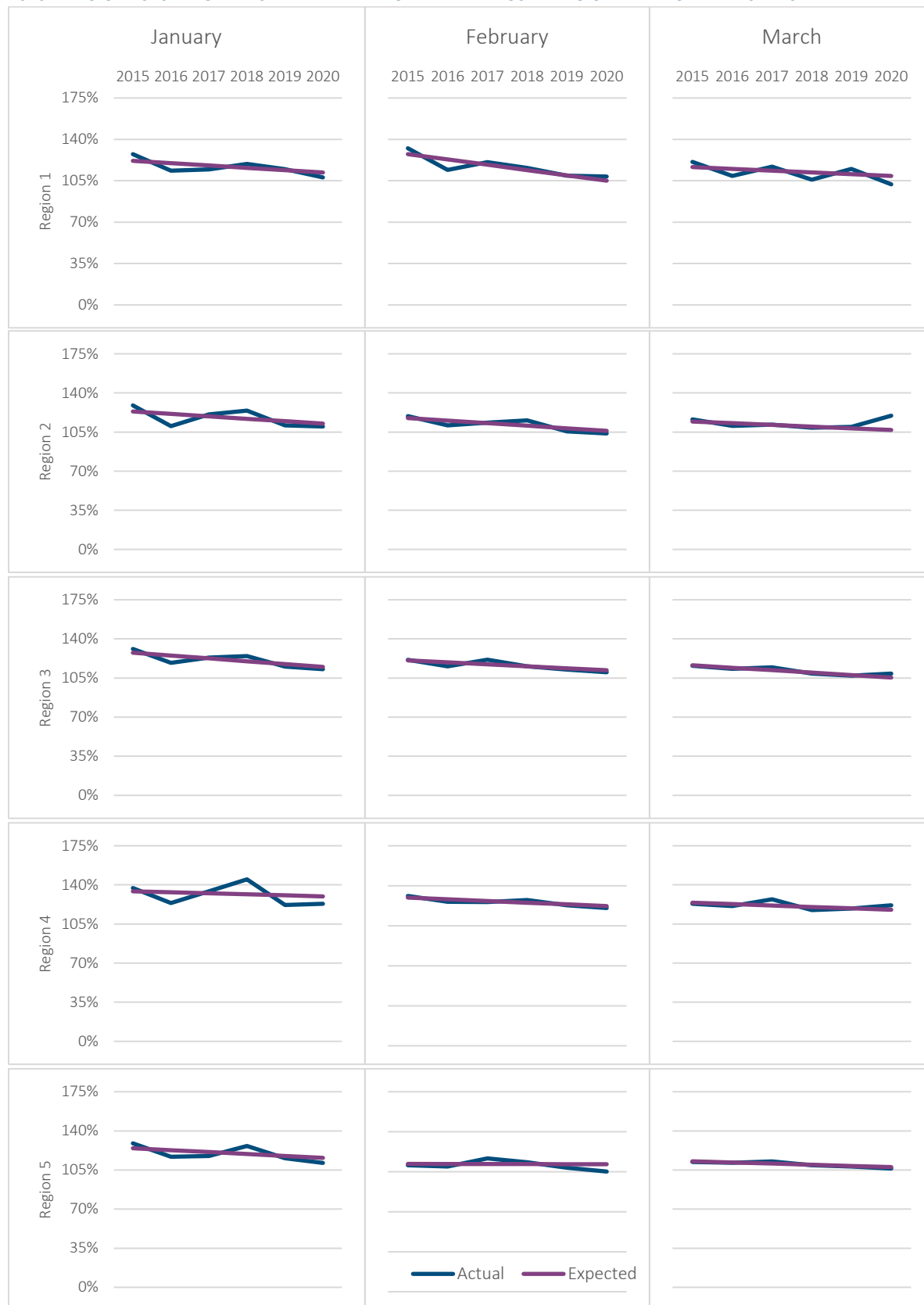
2020 RATIO OF ACTUAL TO EXPECTED RELATIVE MORTALITY RATIOS BY POLICY DURATION AND QUARTER –
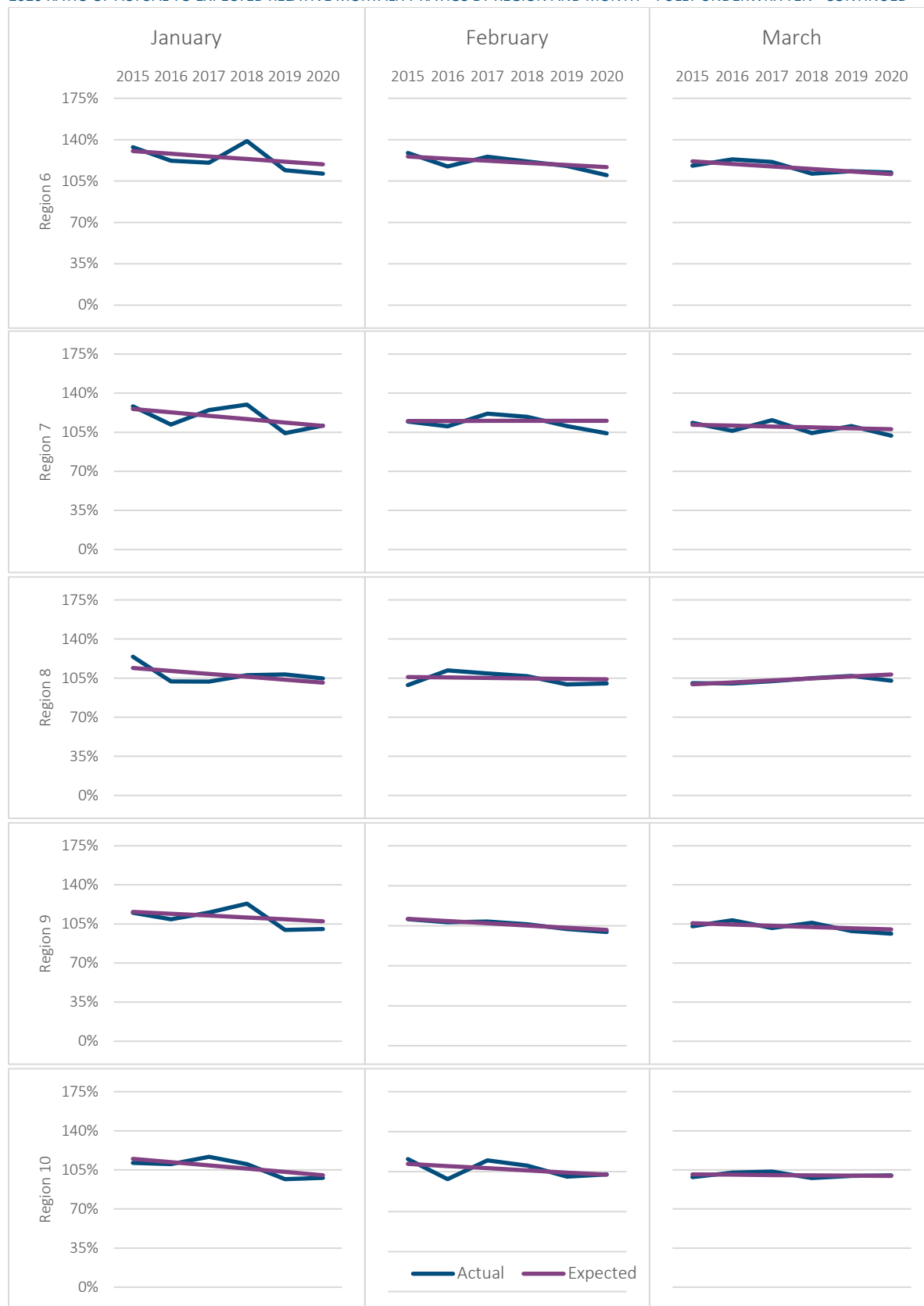SIMPLIFIED ISSUE - CONTINUED

2020 RATIO OF ACTUAL TO EXPECTED RELATIVE MORTALITY RATIOS BY PRODUCT TYPE AND QUARTER – FULLY UNDERWRITTEN

2020 RATIO OF ACTUAL TO EXPECTED RELATIVE MORTALITY RATIOS BY REGION AND MONTH – FULLY UNDERWRITTEN

2020 RATIO OF ACTUAL TO EXPECTED RELATIVE MORTALITY RATIOS BY REGION AND MONTH – FULLY UNDERWRITTEN - CONTINUED

2020 RATIO OF ACTUAL TO EXPECTED RELATIVE MORTALITY RATIOS BY REGION AND MONTH – FULLY UNDERWRITTEN - CONTINUED
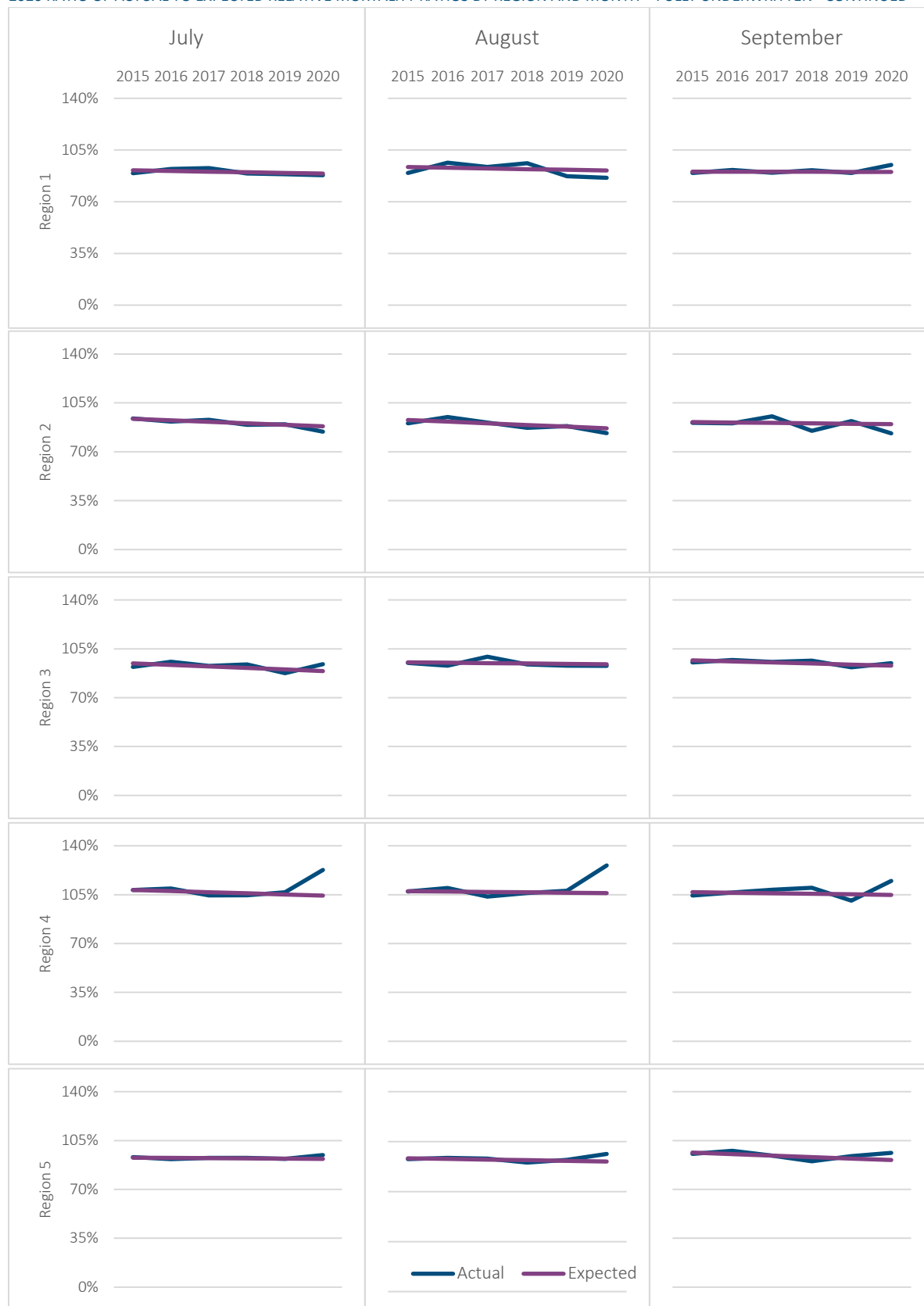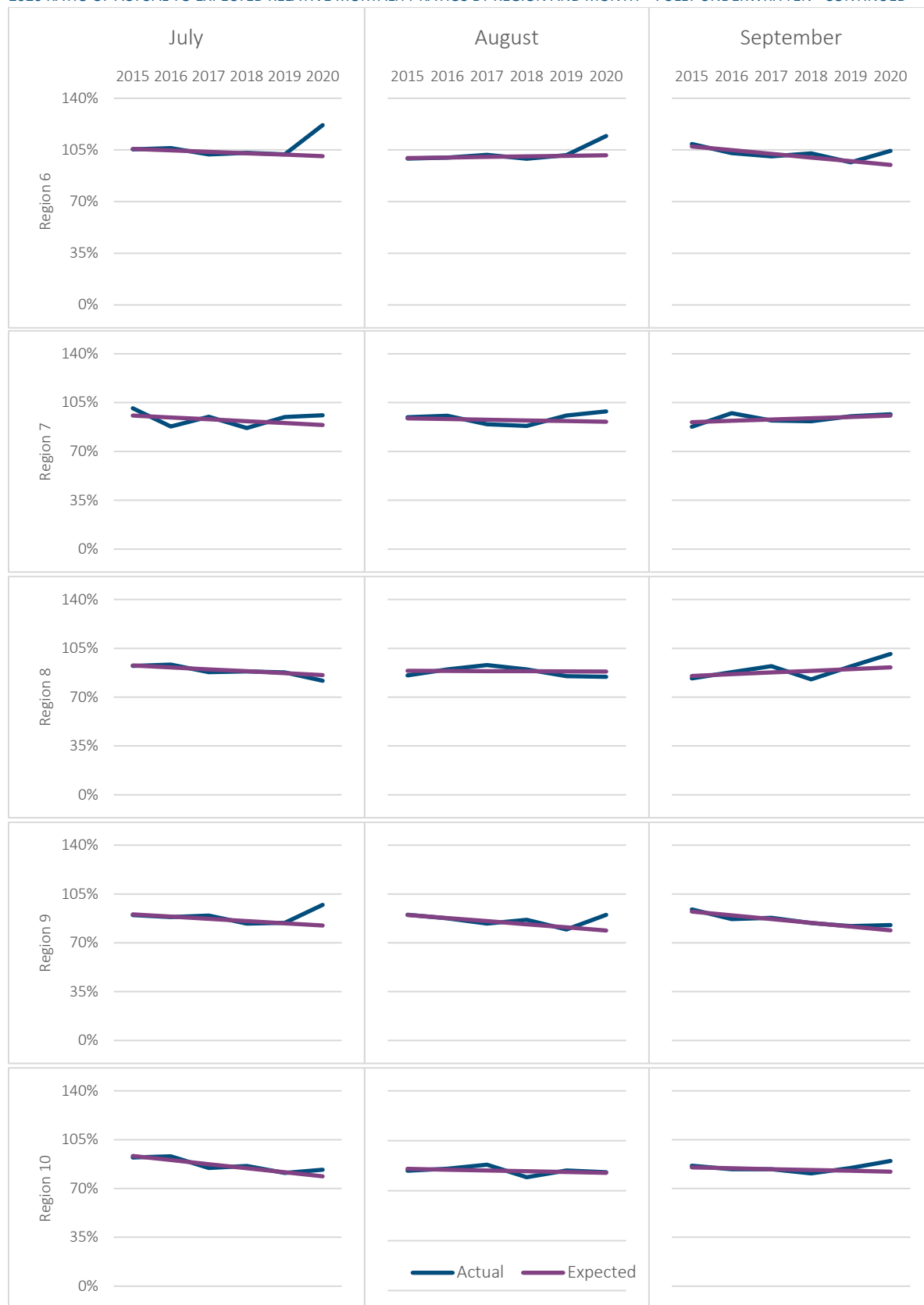
2020 RATIO OF ACTUAL TO EXPECTED RELATIVE MORTALITY RATIOS BY REGION AND MONTH – FULLY UNDERWRITTEN - CONTINUED

2020 RATIO OF ACTUAL TO EXPECTED RELATIVE MORTALITY RATIOS BY REGION AND MONTH – FULLY UNDERWRITTEN - CONTINUED

2020 RATIO OF ACTUAL TO EXPECTED RELATIVE MORTALITY RATIOS BY REGION AND MONTH – FULLY UNDERWRITTEN - CONTINUED

About Reinsurance Group of America

Reinsurance Group of America, Incorporated (RGA), a Fortune 500 company, is among the leading global providers of life reinsurance and financial solutions, with approximately $3.5 trillion of life reinsurance in force and assets of $84.7 billion as of December 31, 2020. Founded in 1973, RGA today is recognized for its deep technical expertise in risk and capital management, innovative solutions, and commitment to serving its clients. With headquarters in St. Louis, Missouri, and operations around the world, RGA delivers expert solutions in individual life reinsurance, individual living benefits reinsurance, group reinsurance, health reinsurance, facultative underwriting, product development, and financial solutions. To learn more about RGA and its businesses, visit the Company's website at www.rgare.com.

About TAI

Improving Administrative Efficiency While Reducing Operational and Financial Risk

Over 115 clients worldwide and over 90% of the top 50 insurers in North America trust TAI software for their life reinsurance administration.

A dedicated team of reinsurance experts who have performed over 100 engagements to support insurers and reinsurers in full-time administration, identifying treaty data discrepancies, system projects, and analyzing operational processes and compliance.

About LIMRA

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.

Visit LIMRA at www.limra.com.

About The Society of Actuaries

With roots dating back to 1889, the Society of Actuaries (SOA) is the world's largest actuarial professional organization with more than 31,000 members. Through research and education, the SOA's mission is to advance actuarial knowledge and to enhance the ability of actuaries to provide expert advice and relevant solutions for financial, business and societal challenges. The SOA's vision is for actuaries to be the leading professionals in the measurement and management of risk.

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

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

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

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

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

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

Society of Actuaries
475 N. Martingale Road, Suite 600
Schaumburg, Illinois 60173
www.SOA.org