



Mortality
and Longevity

2022 Mortality Improvement Survey Report

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2022 Mortality Improvement Survey Report


Reactions to the COVID-19 Pandemic

AUTHOR Ronora E. Stryker, ASA, MAAA
Society of Actuaries Research Institute

Max J. Rudolph, FSA, CFA, CERA, MAAA
Rudolph Financial Consulting, LLC

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2022 Mortality Improvement Survey Report

Reactions to the COVID-19 Pandemic

Executive Summary

The Committee on Life Insurance Mortality and Underwriting Surveys of the Society of Actuaries sent companies a survey in May of 2019 on mortality improvement practices as of year-end 2018. The survey [results](#) were released in January 2022. The survey was completed by respondents prior to the onset of COVID-19. The present report provides an opportunity to update the results for pandemic-based changes and compare the before and after surveys.

The 2022 survey was opened in March 2022 and closed by the end of April. Thirty-five respondent companies participated in this survey, with 29 from the U.S. and six from Canada. This group was further divided between direct writers (26) and reinsurers (nine).

This survey focused on the use of mortality improvement and how it has changed for financial projection and pricing modeling following the initial stages of COVID-19. Details regarding assumptions and opinions on mortality improvement in general were asked of the respondents.

National Association of Insurance Commissioners discussions on mortality improvement factors due to COVID-19 for reserving purposes have taken place, but this survey was conducted before any adjustments reacting to them.

Seventy-four percent (26 of 35) of respondents indicated using durational mortality improvement assumptions in their life and annuity pricing and/or financial projections. Moreover, of those that used durational mortality improvement assumptions, attained age and gender were the top two characteristics in which assumptions varied.

Respondents were asked to indicate the different limitations when applying durational mortality improvement assumptions. The Survey found that the most common lowest and highest attained age to which durational mortality improvement was applied were 0 and about 100, respectively. The lowest and highest durational mortality improvement rate ranged from -1.50% (deterioration) to 2.80% (improvement). The time period in which the mortality improvement rates were applied ranged from 10 to 120 years, but this varied between life (10/120) and annuities (30/120). The most common time period was 20 to 30 years for life; less consensus was seen for annuities. Analysis is provided in Appendix C for instances when highlights are shared in the body of the report.

Durational mortality improvement factors¹ (from Question 9 of the survey, with respondents specifically asked to provide results without any adjustments for COVID-19) were compared with the prior survey. Most companies did not overlap between the two surveys, and in the current survey only a few had adjusted their durational mortality improvement rates because of COVID-19. With this information

¹ Mortality improvement factors multiply the mortality rate by (1-factor) for each year of a projection. For example, for a specific attained age mortality rate of 1%, a 1% mortality improvement factor in year 1 would change the rate to 0.99%.

providing context, the factors were generally the same or lower in 2022, with life products generally reported as having lower mortality improvement factors for both pricing and financial projections, and in both surveys. Annuity products were similar or lower, especially at older attained ages.

The summary results shown in the tables below combine all companies (U.S. and Canada, direct writers and reinsurers), aggregates life products across all risk classes and genders, and aggregates annuity products across both genders. More granular analysis, including splits between direct writers and reinsurers, gender and risk class, is found in Section 5 and Appendix C.

TABLE ES-1 COMPARISON OF MEDIAN RESULTS BETWEEN 2019 AND 2022: LIFE PRODUCTS PRICING

Age	Pricing Year 1		Pricing Year 21	
	2019	2022	2019	2022
35	0.73%	0.65%	0.80%	0.50%
55	1.00%	1.00%	1.00%	0.75%
75	1.03%	1.15%	1.01%	0.63%
95	0.26%	0.35%	0.40%	0.00%

TABLE ES-2 COMPARISON OF MEDIAN RESULTS BETWEEN 2019 AND 2022: LIFE PRODUCTS FINANCIAL PROJECTIONS

Age	Projections Year 1		Projections Year 21	
	2019	2022	2019	2022
35	0.65%	0.60%	0.75%	0.75%
55	0.90%	0.90%	0.79%	0.75%
75	1.00%	1.00%	1.00%	0.75%
95	0.44%	0.40%	0.40%	0.25%

TABLE ES-3 COMPARISON OF MEDIAN RESULTS BETWEEN 2019 AND 2022: ANNUITY PRODUCTS PRICING

Age	Pricing Year 1		Pricing Year 21	
	2019	2022	2019	2022
35	1.00%	1.00%	0.84%	0.88%
55	1.20%	1.20%	1.00%	1.00%
75	1.44%	1.05%	1.30%	1.00%
95	0.40%	0.20%	0.35%	0.20%

TABLE ES-4 COMPARISON OF MEDIAN RESULTS BETWEEN 2019 AND 2022: ANNUITY PRODUCTS
FINANCIAL PROJECTIONS

Age	Projections Year 1		Projections Year 21	
	2019	2022	2019	2022
35	1.00%	1.00%	1.00%	1.00%
55	1.21%	1.00%	1.20%	1.00%
75	1.34%	1.00%	1.30%	1.00%
95	0.40%	0.47%	0.40%	0.30%



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Introduction

The Mortality Improvement Survey, henceforth referred to as the “Survey,” was intended for life and annuity insurers and reinsurers in the U.S. and Canada. The purpose of the Survey was to examine mortality improvement practices considering the pandemic as of year-end 2021 split between life insurance and annuity products, pricing and financial projections, and companies doing business in the U.S. and Canada. With this many splits instances occur where minimal numbers in a category make it impossible to publicly share each of the splits. Where appropriate, the report also compares direct writers and reinsurers.

The report includes sections on the following:

- Country and company information.
- Characteristics of durational mortality improvement assumptions.
- Mortality improvement limitations.
- Opinions on issues impacting durational mortality improvement.
- Sample durational mortality improvement rates.
- Comparison with 2019 results.
- Companies that participated in both surveys.
- Key takeaways.

The Survey was opened in March 2022 and closed by the end of April. Thirty-five companies responded; a complete list of participating companies is given in Section 8.

The definitions used in this Survey can be found in Appendix A, and Survey questions can be found in Appendix B.

Section 1: Country and Company Information

Thirty-five respondents participated in this survey across the U.S. and Canada. Where possible, responses were split by the following:

- Country, which includes Canada and the U.S.
- Company type, which includes direct writer and reinsurer.
- Line of business, which includes life and annuity.
- Function, which includes pricing and financial projection.

1. Indicate for which country/company type you are answering this survey. If you are answering this survey for more than one country or more than one company type, please complete separate surveys for each country/company type.

Table 1

COUNTRY AND TYPE OF INSURER

Country	Direct Company	Reinsurer	Total
Canada	3	3	6
U.S.	23	6	29
Total	26	9	35

Of the 35 participants, 29 (83%) were from the U.S. and 6 (17%) were from Canada. The Survey included 26 (74%) direct insurers and 9 (26%) reinsurers. Not enough data points were present within the four categories (direct writer/reinsurer, U.S./Canada) for many questions to show each of them individually. Attempts have been made to show as many as possible where it makes sense to do so.

2a. Indicate the total number of policies in force at the end of 2021.

Table 2
LIFE PRODUCTS POLICY COUNT

Country	Direct Company	Reinsurer
Canada	3,454,858	7,400,000
U.S.	26,133,010	52,779,485
Total	29,587,868	60,179,485

Although only about one out of four respondents was a reinsurer, those companies represent about two-thirds of the life policies represented in this survey.

Table 3
ANNUITY PRODUCTS POLICY COUNT

Country	Direct Company	Reinsurer
Canada	670,911	0
U.S.	9,135,240	172,000
Total	9,806,151	172,000

U.S. direct companies represent 92% of the annuity policies in this survey.

2b. Indicate if your company is still writing new business.

Table 4
LIFE PRODUCTS NEW BUSINESS

Country	Direct Company (Yes)	Direct Company (No)	Reinsurer (Yes)	Reinsurer (No)	Total
Canada	3	0	3	0	6
U.S.	19	3	5	1	28
Total	22	3	8	1	34

All except one direct writing U.S. company completed this question. For life direct companies, 88% are writing new life business and 89% of reinsurers are.

Table 5
ANNUITY PRODUCTS NEW BUSINESS

Country	Direct Company (Yes)	Direct Company (No)	Reinsurer (Yes)	Reinsurer (No)	Total
Canada	3	0	0	1	4
U.S.	18	5	0	2	25
Total	21	5	0	3	29

Only 83% of respondents answered the question about writing new annuity business. Three of nine reinsurers responded, and none are writing annuity new business.

The Canadian direct writers all continue to write new business, both life and annuity. For the U.S.-based insurers, 86% of the respondents indicated their companies continued to write new life business, and 72% of respondents indicated their companies continued to write annuity business into 2022.

Section 2: Characteristics of Durational Mortality Improvement Assumptions

Durational mortality improvement and deterioration describes the process of projecting the current era’s mortality into the future. As a cohort proceeds in time from policy year to policy year, the mortality rates applicable in each year may be lower (improved) or higher (worsen) than defined by the base mortality table selected for the project.

Mortality is not stable. Many reasons for change continuously interact. Improvement examples could reflect new cancer treatments or discoveries that slow the aging process. Deterioration could be due to new developments such as long COVID or opioid addiction.

Durational mortality improvement or deterioration is an attempt to keep the annual mortality rate of a cohort up to date by applying future trends or expectations for mortality improvement.

The questions answered in Sections 2–4 relate to durational mortality improvement.

3a. Did you use durational mortality improvement for life and annuity pricing and/or financial projections?

Table 6
DURATIONAL MORTALITY IMPROVEMENT USE

Response	Direct Company	Reinsurer	Total
Yes	22	9	31
No	4	0	4
Number of respondents	26	9	35

In total, 89% of the respondents indicated using durational mortality improvement for life and annuity pricing and/or financial projections. A split by company type indicated that 85% of direct insurers and all of the reinsurers used durational mortality improvements in their life and annuity pricing and/or financial projections. Splits were similar within U.S. and Canadian responses. It is assumed that respondents interpreted this question to include both mortality improvement and deterioration (negative improvement).

3b. Indicate by which of the following characteristics your company's durational mortality improvement assumptions varied. Check all that apply.

Table 7

CHARACTERISTICS BY WHICH DURATIONAL MORTALITY IMPROVEMENT VARIED

Characteristic	Direct Company	Reinsurer
Attained age	21	9
Gender	19	8
Duration	11	3
Product	8	0
Smoking status	5	2
Issue age	3	0
Risk class	2	0
Face amount	1	1
Year-of-birth cohort	0	0
Other: Calendar year	5	3
Other: Socioeconomic group	0	1
Other: Line of business	1	0
Other: Projection year	1	0

Attained age and gender were the two most common characteristics used to vary durational mortality improvement assumptions. For direct writers, the third most commonly used characteristic was duration. For reinsurers, the third most common was a tie between duration and calendar year.

Twenty-two direct writers chose at least one of the responses, along with all nine reinsurers.

Future survey authors should consider adding calendar year as a listed option. Even without being prompted it ended up as a top five response for both life and annuity business.

3c. Indicate why your company did not use durational mortality improvement assumptions. Check all that apply.

Table 8

REASONS FOR NOT USING DURATIONAL MORTALITY IMPROVEMENT ASSUMPTIONS

Reason	Pricing Life	Pricing Annuities	Financial Projections Life	Financial Projections Annuities
To be conservative	2		2	
Did not believe it to be needed	1	1	1	1
Limited experience/credibility		1		1
Total respondents	3	2	3	2

Life respondents who did not use durational mortality improvement had various reasons that were consistent across pricing and financial projections. Only four noted that they did not use durational

mortality improvement, and of those, three responded to this question. Recall that all the reinsurers and 85% of direct writers that responded to an earlier question used durational mortality improvement assumptions. Only the three reasons noted in Tables 7 and 8 were chosen. Options not chosen were “Did not believe it to be appropriate,” “Difficult to determine assumptions” and “Creates problems with illustrations.”

The current survey provides similar results to the prior one, conducted prior to the pandemic. Some differences were observed in the reasons not to use durational mortality improvement assumptions, but the low number of responses to this question in each survey makes it difficult to make conclusions.

Section 3: Mortality Improvement Limitations

4. Indicate your company’s limits, if any, for application of durational mortality improvement rates. Rates are expressed as an annual percentage. If there is no limit, “N” for none is listed.

In the “Most common” category, N(6) means that six respondents answered “None.” For the minimum attained age question oftentimes this means the minimum age is 0, but if the company does not issue policies below age 18 they would enter N rather than 18. Results for the minimum age should be reviewed with this in mind because a variety of responses may have all made sense to the respondent. The N responses have been ignored except for the most common category and are included in the number who responded.

Fewer responses were received for the annuity lines than for life, but results seem reasonable even with that understanding. Splits between U.S. and Canada, direct writers and reinsurers were reviewed with a focus on the average result for each question. Some of the splits had only a few responses, but in cases where results are given no obvious differences were found between the groups. More detail can be found in Appendix C.

Table 9

MINIMUM ATTAINED AGE TO APPLY DURATIONAL MORTALITY IMPROVEMENT

Minimum Attained Age	Pricing Life	Pricing Annuities	Financial Projections Life	Financial Projections Annuities
Lowest	0	0	0	0
Highest	31	35	31	57
Average	12	8	14	10
Most common	N(6); 0(7)	N(8); 0(4)	N(7); 0(6)	N(9); 0(4)
Responded	21	15	22	17

More than half of the respondents indicated a minimum attained age at which they begin durational mortality improvement of 0 or they did not have a minimum age.

Table 10
MAXIMUM ATTAINED AGE TO APPLY DURATIONAL MORTALITY IMPROVEMENT

Maximum Attained Age	Pricing Life	Pricing Annuities	Financial Projections Life	Financial Projections Annuities
Lowest	84	95	84	99
Highest	120	120	120	120
Average	103	106	105	109
Most common	N(5); 100(4); 99(3)	N(5); 103(2)	N(6); 99(5)	N(5); 104(3)
Responded	23	15	22	18

The average maximum attained age for both life and annuity respondents was near or above 100.

Table 11
MAXIMUM YEARS TO APPLY DURATIONAL MORTALITY IMPROVEMENT

Maximum Number of Years	Pricing Life	Pricing Annuities	Financial Projections Life	Financial Projections Annuities
Lowest	10	30	10	30
Highest	120	120	120	120
Average	33	65	38	60
Most common	N(5); 20(5)	N(9)	N(7); 30(4)	N(12); 30(2)
Responded	21	14	20	17

Many of the respondents consciously selected None for the maximum number of years to apply the factor, whereas the average of those who included a numerical answer was mid-30s for life and 60s for annuities.

Table 12
MINIMUM DURATIONAL MORTALITY IMPROVEMENT RATE

Minimum Rate	Pricing Life	Pricing Annuities	Financial Projections Life	Financial Projections Annuities
Lowest	-1.50%	0.00%	0.00%	-0.88%
Highest	0.70%	0.50%	0.75%	0.75%
Average	0.08%	0.10%	0.11%	0.09%
Most common	N(4); 0%(9)	N(4); 0%(6)	N(3); 0%(11)	N(4); 0%(7)
Responded	23	16	22	19

The lowest minimum annual mortality improvement rate was 0.0% across life and annuities, excluding annuity financial projections and life pricing, where the rate fell below zero and rates were expected to deteriorate. The highest minimum annual mortality improvement rate varied across line of business and function. Life and annuity financial projection maximums were 0.75%, annuity pricing was 0.50% and life pricing was 0.70%.

Table 13
MAXIMUM DURATIONAL MORTALITY IMPROVEMENT RATE

Maximum Rate	Pricing Life	Pricing Annuities	Financial Projections Life	Financial Projections Annuities
Lowest	0.65%	0.50%	0.75%	0.50%
Highest	2.80%	2.13%	2.80%	2.33%
Average	1.48%	1.41%	1.54%	1.41%
Most common	N(4); 1.50%(4)	N(4); 1.50%(6)	N(3); 1.50%(3)	N(4); 1.50%(8)
Responded	23	16	22	19

The most common result for the maximum annual mortality improvement rate for life and annuity respondents was 1.50% for those who responded. The lowest maximum annual mortality improvement rate for life respondents was 0.65% for pricing and 0.75% for financial projections, and the highest maximum rates were 2.80% across pricing and financial projections. The lowest maximum annual mortality improvement rate for annuity respondents was 0.50% for both pricing and financial projections, and the highest maximum rates were 2.13% for pricing and 2.33% for financial projections.

For those with variable factors, the survey asked for the maximum age where the factor was at least a certain level (note that 100 basis points [bps] is 1%). For the 100 bps level the average maximum attained age was in the 80s, with the highest in the 90s (see Appendix C, Question 4). For smaller levels the results reach to higher average ages.

Table 14
AVERAGE MAXIMUM ATTAINED AGE DURATIONAL MORTALITY IMPROVEMENT RATE EXCEEDS LEVEL

Level	Pricing Life	Pricing Annuities	Financial Projections Life	Financial Projections Annuities
100 basis points	85	82	80	85
75 basis points	86	89	87	90
50 basis points	96	96	97	97
25 basis points	101	100	102	102

5. If your company recently made changes to its durational mortality improvement assumptions due to non-COVID reasons, indicate the method used. Check all that apply.

Some companies (maximum of five across pricing/financial projection splits and the three time horizons) made non-COVID related adjustments to the durational mortality improvement assumptions for life products, with some increasing and some decreasing. Those who made changes included both countries and both types (direct companies and reinsurers).

Seventeen companies for pricing and 18 for financial projections indicated they did not make changes for non-COVID reasons to their annuities.

Options offered for both life and annuity included the following (a table of results can be found in Appendix C):

- Increase all durational mortality improvement assumptions.
- Decrease all durational mortality improvement assumptions.
- Increase a limited number of durational mortality improvement assumptions.
- Decrease a limited number of durational mortality improvement assumptions.

Section 4: Opinions on Issues Impacting Durational Mortality Improvement

6. Rank what you consider to be the top five drivers of future mortality improvement for 2022 (Year 1), 2032 (Year 11) and 2042 (Year 21), with 1 as the top driver for each column.

Respondents were asked to rank their top five drivers of future mortality improvement. The weighting metric awards the top ranked response five points, second ranked is awarded four points and so on. The number of respondents shows how many chose the driver as one of their top five, and the average weight shows how important the driver was to those who chose it. Note that the ranking would differ based on each of the three columns but that the weighted column has been used to determine the top five rankings that are shared in the body of the report. See additional details in Appendix C.

For comparison, in the previous survey the top three weighted drivers of future mortality improvement were the following:

- Life over 5–10 years: cancer, cardiovascular disease, medical advances.
- Life over 20+ years: cancer, medical advances, genetics.
- Annuities over 5–10 years: cancer, cardiovascular disease, access and improvements to health care/medical care.
- Annuities over 20+ years: cancer, medical advances, genetics.

Top movers (improvement) for life products in 2032 and 2042 relative to 2022 include the following:

- Advances in understanding of genetics.
- Advances in the understanding of aging.
- Reductions in mortality from Alzheimer’s disease.
- Precision medicine.
- Advances in the understanding of aging.

Some nuances were found in the life product results. In 2022, for example, these drivers would be weighted lower based on the number of respondents: reductions in mortality from COVID-19 (ranked first by weight but third by count) and access to health care or medical care (sixth drops to seventh).

Drivers that do better when ranked by count include technological advances and advances in understanding of genetics.

In 2032 and 2042 reductions in mortality from COVID-19 received no votes after being top ranked in 2022.

Ranked by weighted average, several unranked risks move up into the top five. Stress, Alzheimer’s disease and technology are among the drivers to watch. Note that some of the weighted average top ranked drivers had a limited number of respondents that chose them.

What follows, for each metric, is the top five choices for each year presented in one chart. The complete results can be viewed in Appendix C, Question 6, Life, and Question 6, Annuity.

Table 15
LIFE DRIVERS BY TOTAL WEIGHTS

Driver	2022	2032	2042
Reductions in mortality from COVID-19	82		
Reductions in mortality from cancer	66	101	80
Medical advances	53	78	63
Reductions in mortality from cardiovascular disease	43	42	
Improvements in health care/medical care	43	42	35
Advances in understanding of genetics		31	51
Advances in the understanding of aging			48

Table 16
LIFE DRIVERS BY RESPONDENTS

Driver	2022	2032	2042
Reductions in mortality from cancer	20	27	22
Medical advances	18	22	17
Reductions in mortality from COVID-19	17		
Reductions in mortality from cardiovascular disease	13	14	
Improvements in health care/medical care	13	15	13
Healthier lifestyle behaviors	13		
Advances in understanding of genetics		13	19
Advances in the understanding of aging			15

Table 17
LIFE DRIVERS BY WEIGHTED AVERAGE

Driver	2022	2032	2042
Reductions in mortality from COVID-19	4.8		
Reduction in levels of stress leading to improved mortality	3.5	5.0	
Reductions in mortality from cancer	3.3	3.7	3.6
Medical advances		3.5	3.7
Reductions in mortality from cardiovascular disease	3.3	3.0	3.3
Improvements in health care/medical care	3.3		
Precision medicine		3.1	
Reductions in mortality from Alzheimer's disease		3.0	
Self-driving cars		3.0	
Artificial intelligence/ augmented reality			4.3
Advances in the understanding of aging			3.2

Overall, fewer responses were received for annuities. The results between life and annuities were similar.

Some nuances are seen in the annuity product results. In 2022, for example, medical advances and healthier lifestyle behaviors are weighted higher based on the number of respondents.

In 2032 and 2042 reductions in mortality from COVID-19 received no votes after being top ranked in 2022.

Top movers in 2032 and 2042 relative to 2022 include advances in understanding of genetics and of aging.

Of drivers that fall in future years, access to health care/medical care and reduction in levels of stress leading to improved mortality stand out.

Table 18
ANNUITY DRIVERS BY TOTAL WEIGHT

Driver	2022	2032	2042
Reductions in mortality from COVID-19	62		
Medical advances	34	56	45
Reductions in mortality from cancer	34	68	55
Access to health care/medical care	30		
Improvements in health care/medical care	29		
Improvements in health care/medical care		10	
Advances in understanding of genetics		11	32
Reductions in mortality from cardiovascular disease		7	
Advances in the understanding of aging		7	26
Healthier lifestyle behaviors			19

Table 19
ANNUITY DRIVERS BY RESPONDENTS

Driver	2022	2032	2042
Reductions in mortality from COVID-19	13		
Medical advances	12	15	12
Reductions in mortality from cancer	10	18	15
Access to health care/medical care	10		
Improvements in health care/medical care	10	10	7
Healthier lifestyle behaviors	10		
Advances in understanding of genetics		11	12
Advances in the understanding of aging		7	10
Reductions in mortality from cardiovascular disease		7	

Table 20
ANNUITY DRIVERS BY WEIGHTED AVERAGE

Driver	2022	2032	2042
Reductions in mortality from COVID-19	4.8		
Reductions in mortality from cardiovascular disease	4.3	3.4	4.0
Reductions in mortality from cancer	3.4	3.8	
Reduction in levels of stress leading to improved mortality	3.3		
Reductions in mortality from Alzheimer’s disease	3.2	3.7	
Medical advances		3.7	3.8
Healthier lifestyle behaviors		3.0	
Artificial intelligence/augmented reality			4.0
Self-driving cars			4.0
Changes in government programs/policy			4.0

7. Rank what you consider to be the top 5 drivers of future mortality deterioration for 2022 (Year 1), 2032 (Year 21), with 1 as the top driver for each column.

For comparison, in the previous survey the top three weighted drivers of future mortality deterioration were the following:

- Life over 5–10 years: opioids, obesity, diabetes.
- Life over 20+ years: obesity, antibiotic-resistant organisms, lifestyle behaviors.
- Annuities over 5–10 years: opioids, diabetes, obesity.
- Annuities over 20+ years: obesity, antibiotic-resistant organisms, lifestyle behaviors.

The rankings and presentation match those for the previous question, where future mortality improvement was queried.

Some nuances were seen in the life product results.

Top movers in 2032 with higher rankings relative to 2022 are stress, diabetes and socioeconomic inequality.

Lower rankings in 2032 occurred for direct (acute) COVID-19, cancer and epidemics/pandemics.

For 2042 life product time horizon, higher rankings relative to 2032 are noted for catastrophes, pollution and antibiotic-resistant organisms.

Lower rankings occurred for opioids, secondary (long) COVID and diabetes.

The following tables show, for each metric, the top five choices for each year presented in one chart. The complete results can be viewed in Appendix C, Question 7, Life, and Question 7, Annuity.

Table 21
LIFE DRIVERS OF MORTALITY DETERIORATION BY TOTAL WEIGHTS

Driver	2022	2032	2042
Opioids	74	51	
Direct (acute) COVID	72		
Obesity	52	62	61
Mental health/depression	43	38	42
Cancer	28		
Epidemics/pandemics	28		
Stress		33	
Diabetes		32	
Catastrophes			32
Socioeconomic inequality			30
Lifestyle behaviors			28

Table 22
LIFE DRIVERS OF MORTALITY DETERIORATION BY RESPONDENTS

Driver	2022	2032	2042
Opioids	22	15	
Direct (acute) COVID	16		
Obesity	16	17	17
Mental health/depression	16	15	15
Epidemics/pandemics	9		9
Stress	9	9	9
Diabetes		11	9
Socioeconomic inequality		9	9
Catastrophes			9

Table 23
LIFE DRIVERS OF MORTALITY DETERIORATION BY AVERAGE WEIGHT

Driver	2022	2032	2042
Direct (acute) COVID	4.5		
Cancer	3.5		4.5
Cardiovascular disease	3.5	4.0	3.7
Obesity	3.2	3.6	
Epidemics/pandemics	3.1		
Lifestyle behaviors		3.9	4.0
Stress		3.7	
Opioids		3.4	
Secondary/long COVID		3.4	
War			5.0
Smoking/vaping			4.0

Some nuances were seen in the annuity product results.

In 2032 and 2042 direct (acute) COVID received no votes after being highly ranked in 2022.

Top movers in 2032 with higher rankings relative to 2022 include lifestyle behaviors, secondary/long COVID and socioeconomic inequality.

Lower rankings in 2032 than 2022 occurred for direct (acute) COVID, cancer, accidents and suicides.

For the 2042 life product time horizon, higher rankings relative to 2032 are noted for socioeconomic inequality, pollution, antibiotic-resistant organisms and catastrophes.

Lower rankings occurred for opioids, secondary/long COVID, diabetes and homicides.

The COVID-19 pandemic and smoking/vaping (COPD) leading to delayed health care were suggested as additional drivers of deteriorating mortality in 2022.

Additional drivers of deteriorating mortality in 2032 for life products included environmental change, including pollution, natural disasters and extreme heat, and war.

Table 24
ANNUITY DRIVERS OF MORTALITY DETERIORATION BY TOTAL WEIGHTS

Driver	2022	2032	2042
Opioids	44	30	
Direct (acute) COVID	41		
Mental health/depression	39	21	25
Obesity	29	35	32
Cancer	26		
Lifestyle behaviors		24	23
Secondary/long COVID		22	
Socioeconomic inequality		21	26
Catastrophes			20

Table 25
ANNUITY DRIVERS OF MORTALITY DETERIORATION BY RESPONDENTS

Driver	2022	2032	2042
Opioids	14	9	
Mental health/depression	14	8	10
Direct (acute) COVID	9		
Obesity	9	10	9
Cancer	7		
Socioeconomic inequality		7	7
Lifestyle behaviors		6	
Secondary/long COVID		6	
Catastrophes			7
Antibiotic-resistant organisms			7

Table 26
ANNUITY DRIVERS OF MORTALITY DETERIORATION BY AVERAGE WEIGHT

Driver	2022	2032	2042
Direct (acute) COVID	4.6		
Cancer	3.7	4.5	4.5
Cardiovascular disease	3.5	4.7	4.7
Diabetes	3.5		
Secondary/long COVID	3.2		
War		5.0	
Homicides		4.0	
Lifestyle behaviors		4.0	3.8
Smoking/vaping			4.0
Socioeconomic inequality			3.7

8. In comparison to 2019 levels, indicate your thoughts on the annualized rate of improvement or deterioration for the following causes of death mortality in 2022 (Year 1), 2032 (Year 11) and 2042 (Year 21).

Twenty-eight companies responded to this question. Each cause of death is assigned by the respondent to one of the following:

- Large (>2.5%) deterioration is assigned –3 points.
- Moderate (1.5%–2.5%) deterioration is assigned –2 points.
- Small (0.5%–1.5%) deterioration is assigned –1 point.
- No improvement or deterioration (–0.5%–0.5%) is assigned 0 points.
- Small (0.5%–1.5%) improvement is assigned 1 point.
- Moderate (1.5%–2.5%) improvement is assigned 2 points.
- Large (>2.5%) improvement is assigned 3 points.

Respondents become more encouraged about mortality improvement as the time horizon lengthens, with each cause of death metric becoming more positive with each time increment.

Looking at the weighted totals across the 28 companies provides a relative ranking (negative is associated with deterioration and positive with improvement) with few ties (typical in per response metrics). Directional results and relative sizes are useful in this context.

Table 27
CAUSE OF DEATH CHANGES BY WEIGHTED TOTALS: NEGATIVE = DETERIORATION, POSITIVE = IMPROVEMENT

Cause of Death	2022	2032	2042
COVID-19	(121)	(7)	7
Opioid/drug overdoses	(118)	(4)	11
Cancer	(75)	29	18
Cardiovascular	(57)	29	29
Accidents excluding drug overdoses	(18)	29	43
Alzheimer's and other dementias	—	29	50
Flu/pneumonia	46	36	71

The ranking of the seven causes of death is stable across the three time horizons. What matters is the same for 2022, 2032 and 2042. What changes is the direction for most causes of death in Year 11 (2032) from deterioration to improvement.

For 2022, over a short-term time horizon, COVID-19 and opioid/drug overdoses dominate the results. Cancer, cardiovascular and accidents excluding drug overdoses also report expected mortality deterioration. Only flu/pneumonia shows an expected improvement relative to 2019 results.

For 2032, COVID-19 and opioid/drug overdoses remain slightly weighted toward mortality deterioration, but flu/pneumonia, accidents excluding drug overdoses, Alzheimer's disease and other dementia, cancer and cardiovascular all net to expectations of mortality improvement. The intermediate time horizon is expected to be mostly stable against 2019 levels, with only cancer and Alzheimer's disease and other dementia seeing even moderate improvement levels, whereas opioids are the only double-digit deterioration cause of death.

For 2042 all causes of death are expected to show improved mortality relative to 2019. Large improvements are expected for cancer, flu/pneumonia and Alzheimer's disease and other dementia.

Viewing the data graphically by year for the 28 respondents provides the reader with the relative importance of changes in future causes of death.

Figure 1
2022 CHANGE IN CAUSE OF DEATH BY NUMBER OF COMPANIES

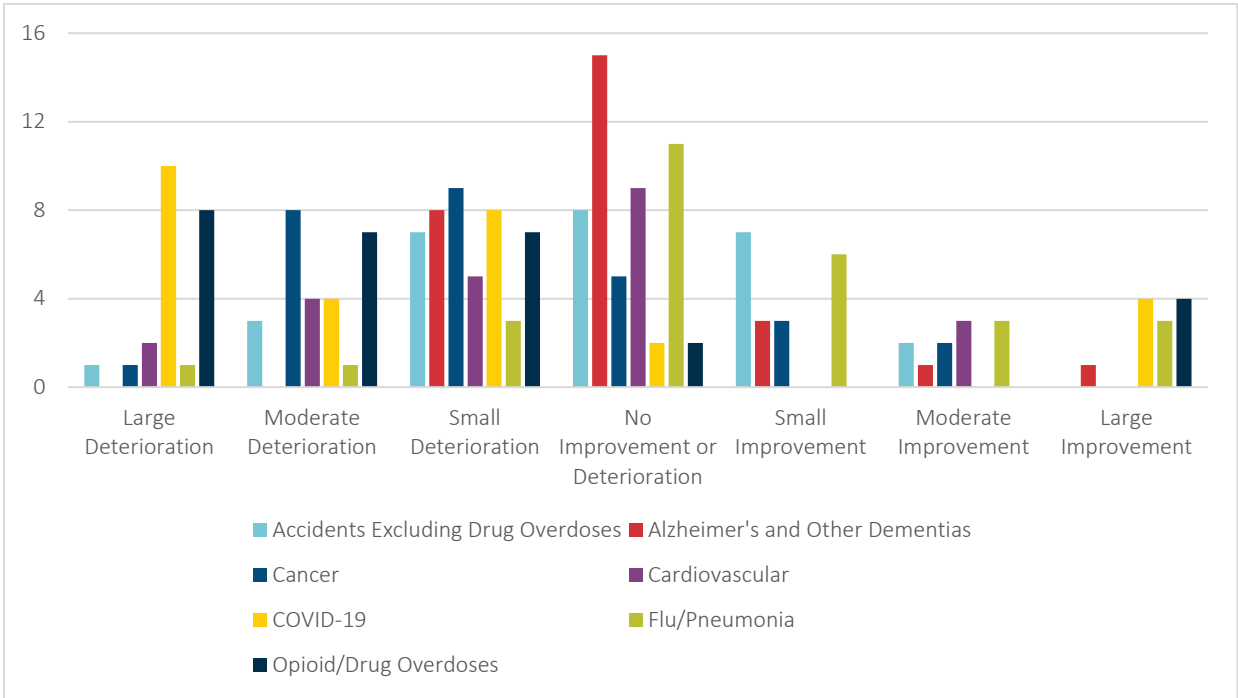


Figure 2
2023 CHANGE IN CAUSE OF DEATH BY NUMBER OF COMPANIES

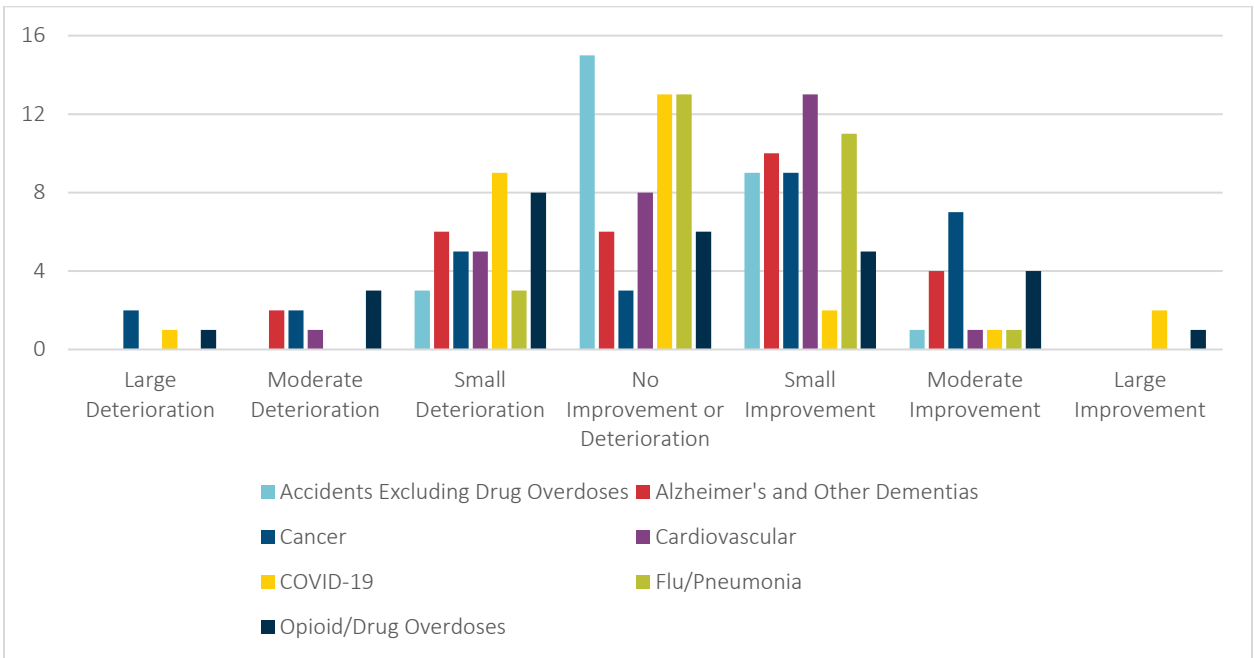
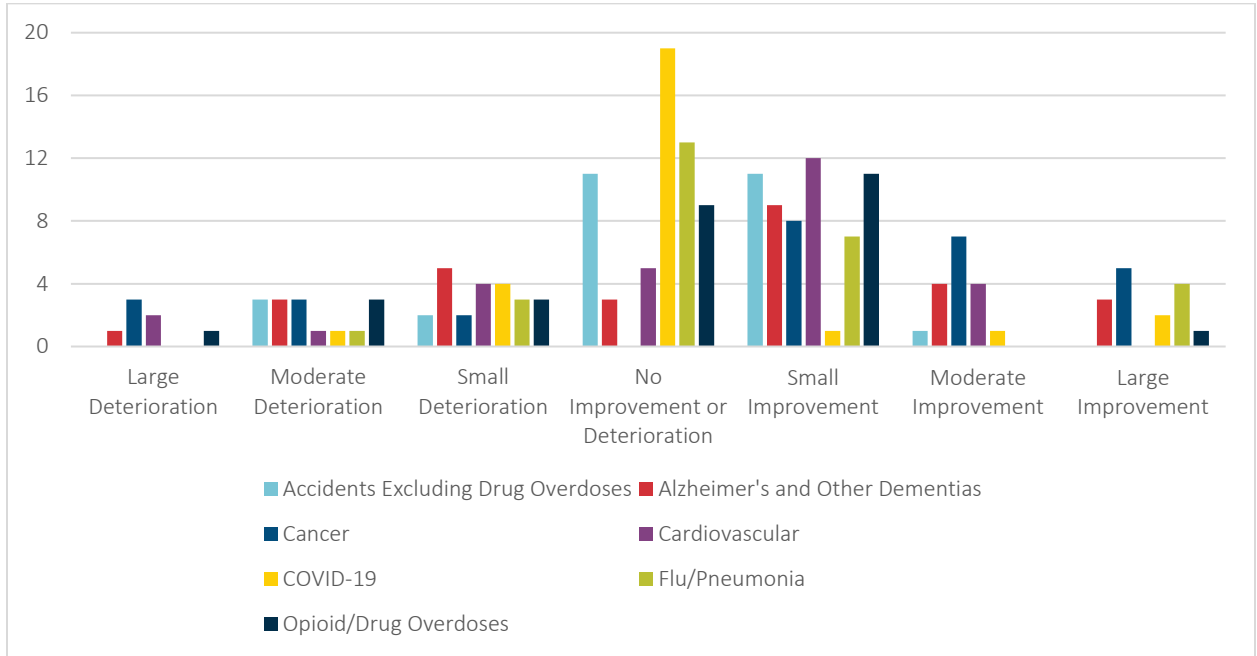
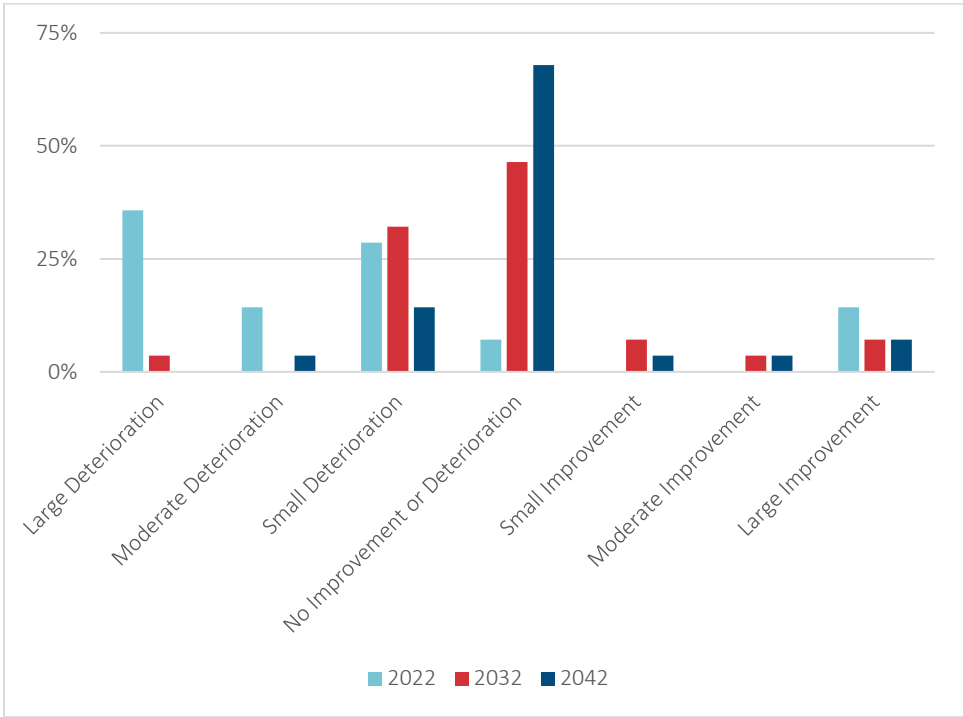


Figure 3
2042 CHANGE IN CAUSE OF DEATH BY NUMBER OF COMPANIES



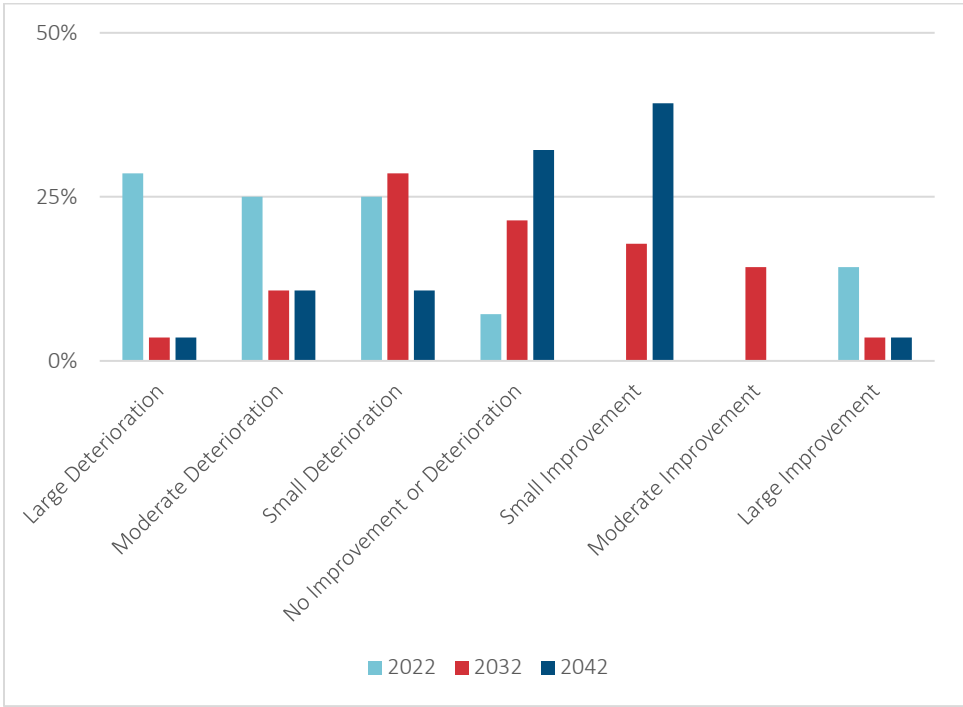
After viewing all the causes of death on one chart for each year, some readers will prefer to see one cause of death across all three years for their analysis to see how responses varied.

Figure 4
ANNUALIZED RATE OF MORTALITY IMPROVEMENT OR DETERIORATION: COVID-19
% OF RESPONSES IN GIVEN YEAR



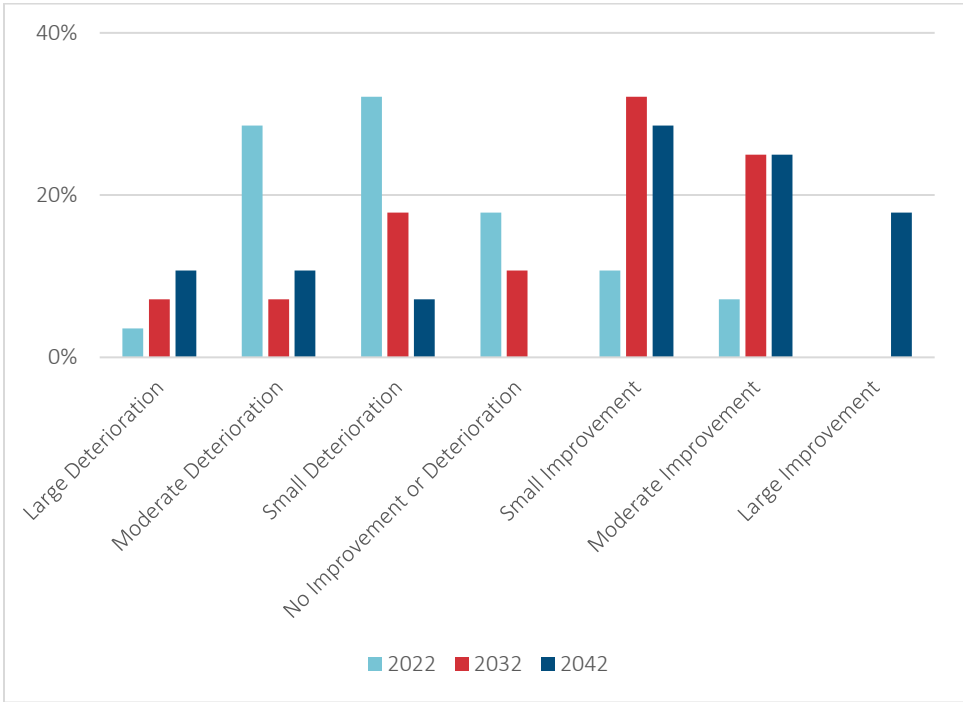
COVID-19 is expected to lead to mortality deterioration in 2022 and be mostly stable during the longer time horizons.

Figure 5
ANNUALIZED RATE OF MORTALITY IMPROVEMENT OR DETERIORATION: OPIOID/DRUG OVERDOSES
% OF RESPONSES IN GIVEN YEAR



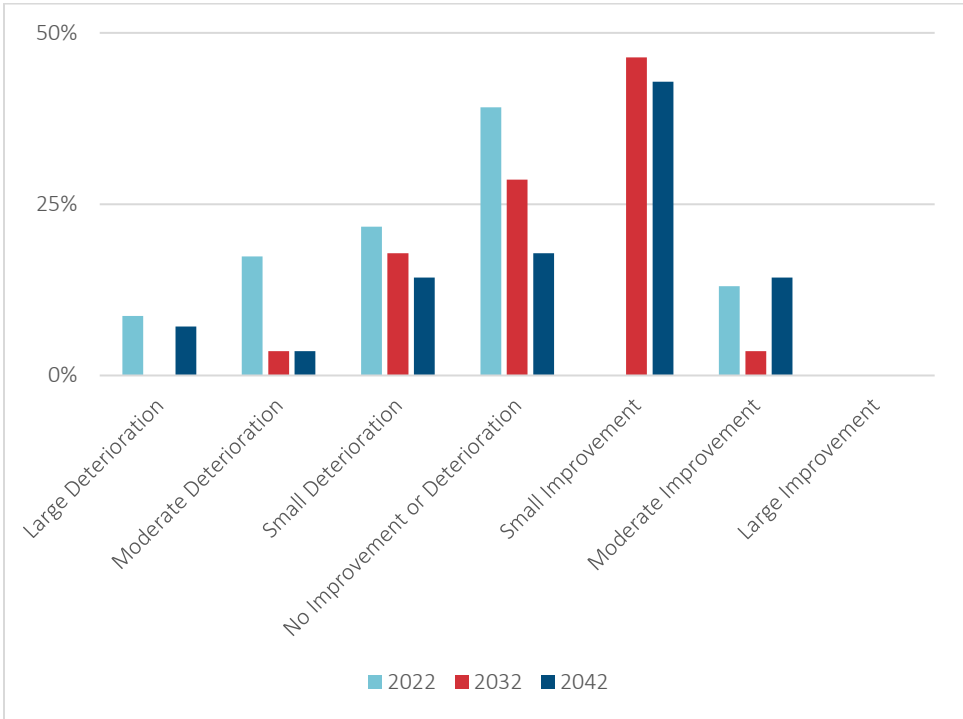
Opioids/drug overdoses are expected to lead to mortality deterioration in 2022 with improving results after that.

Figure 6
ANNUALIZED RATE OF MORTALITY IMPROVEMENT OR DETERIORATION: CANCER
% OF RESPONSES IN GIVEN YEAR



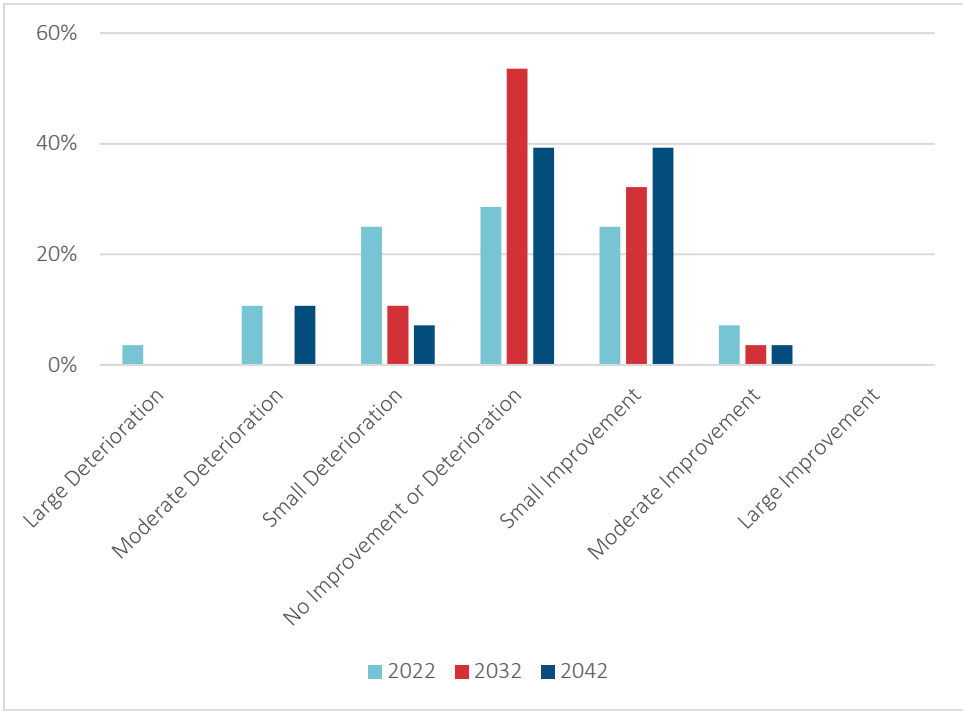
Cancer is expected to have mortality deterioration in 2022 but improved results after that.

Figure 7
ANNUALIZED RATE OF MORTALITY IMPROVEMENT OR DETERIORATION: CARDIOVASCULAR
% OF RESPONSES IN GIVEN YEAR



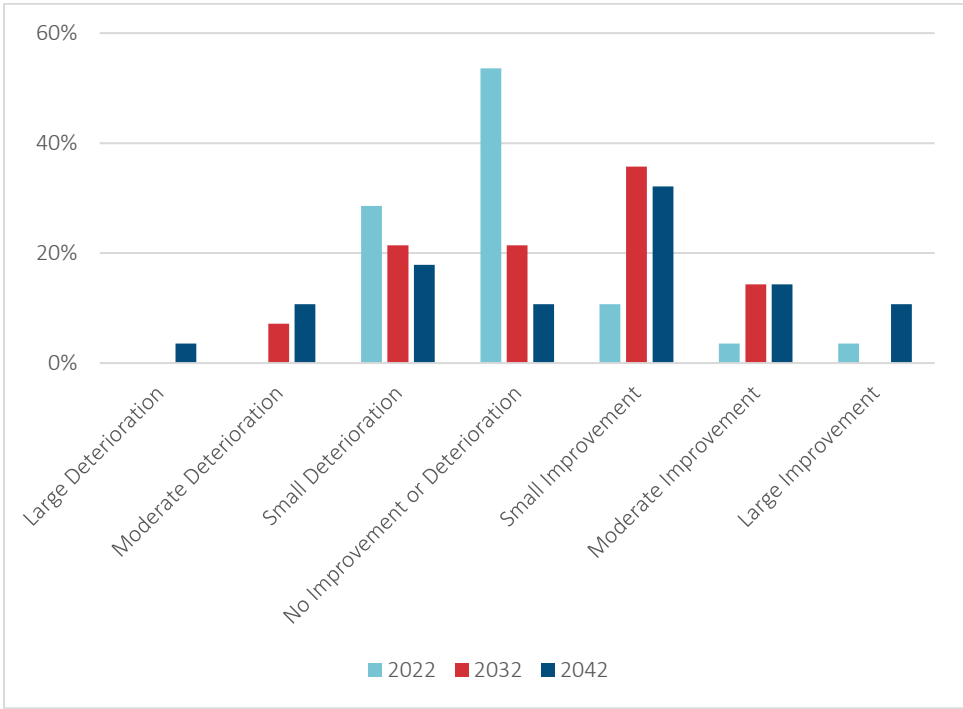
Cardiovascular is expected to have mortality deterioration in 2022 but improved results after that.

Figure 8
ANNUALIZED RATE OF MORTALITY IMPROVEMENT OR DETERIORATION: ACCIDENTS EXCLUDING DRUG OVERDOSES
% OF RESPONSES IN GIVEN YEAR



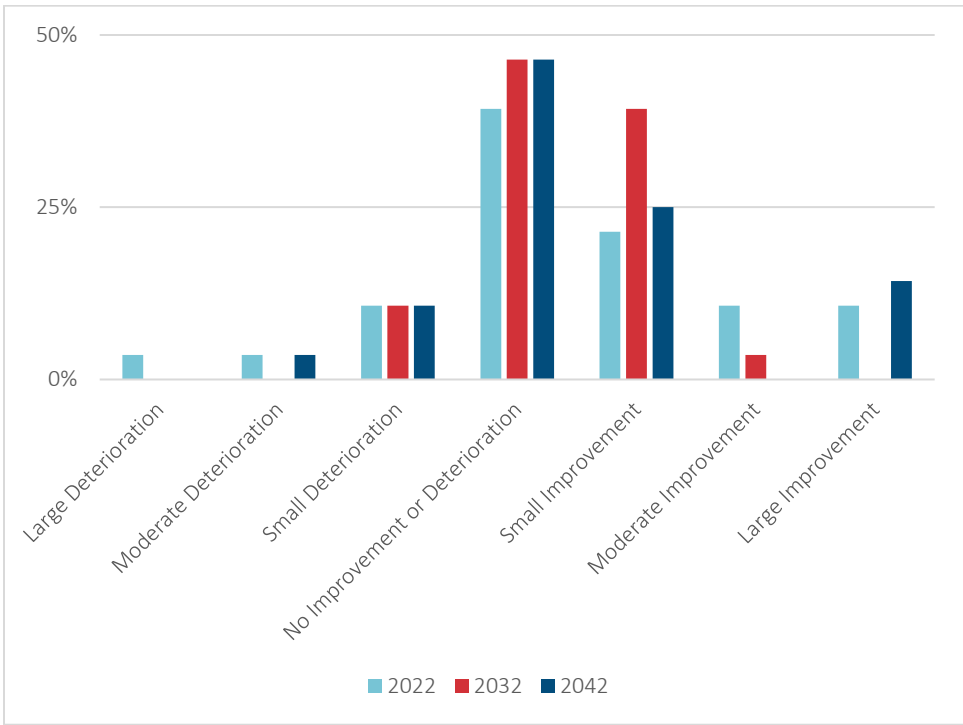
Accidents excluding drug overdoses have a symmetric distribution of results in 2022 and trend to small improvements in expected mortality in future years.

Figure 9
ANNUALIZED RATE OF MORTALITY IMPROVEMENT OR DETERIORATION: ALZHEIMER'S DISEASE AND OTHER DEMENTIAS
% OF RESPONSES IN GIVEN YEAR



Alzheimer’s disease and other dementias show mostly stable mortality in 2022 and fairly broad dispersion of results after that with small improvement the most likely response.

Figure 10
ANNUALIZED RATE OF MORTALITY IMPROVEMENT OR DETERIORATION: FLU/PNEUMONIA
% OF RESPONSES IN GIVEN YEAR



Flu/pneumonia is expected to show stable mortality in all years, leaning toward small improvements.

Section 5: Sample Durational Mortality Improvement Rates

9. Using the durational mortality assumptions for your company's most prevalent life and annuity products, complete the following tables with annual durational mortality improvement rates as of the end of 2021 without any adjustments for COVID-19. Express the rates as a percentage with two decimal places. For example, if the mortality improvement rate was $\frac{3}{4}$ percent, express this as ".75."

The data requested were the following:

- Life
 - Pricing, financial projections.
 - Short-term (2022), intermediate-term (2032), long-term (2042).
 - Male, female.
 - Best preferred nonsmoker, residual standard nonsmoker, best preferred smoker.
 - Attained ages 35, 55, 75, 85, 95.
- Annuities
 - Pricing, financial projections.
 - Short-term (2022), intermediate-term (2032), long-term (2042).
 - Male, female.
 - Attained ages 35, 55, 75, 85, 95.

Respondents were asked about their company durational mortality improvement rates prior to making any adjustments for COVID-19.

To represent the data, "box and whisker" graphs were used. The following explains these graphs:

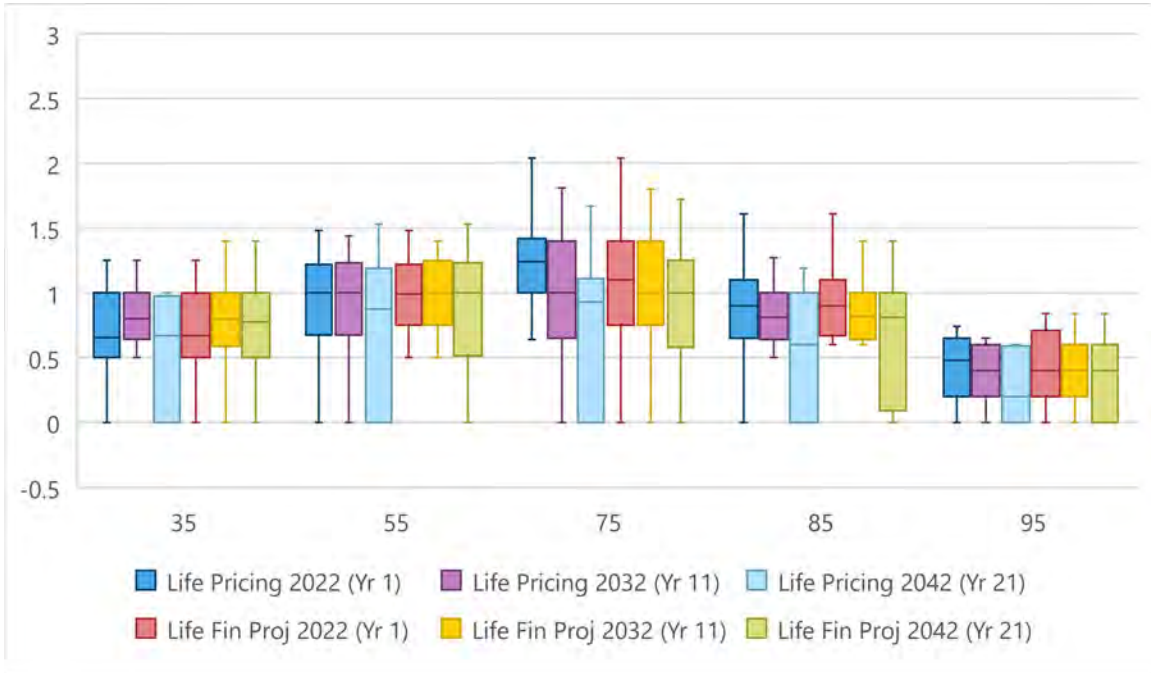
- X represents the average (mean).
- Lines represent maximum, median and minimum.
- Boxes show from the top of the second quartile to the bottom of the third quartile.
- Dots are "outliers" or any values that lie more than one and a half times the length of the box from either end of the box.

The following figures present total data only because insufficient responses were received to show Canadian data separately. Life results were split between direct writers and reinsurers, and then further by gender and three risk classes. Annuity results were split by gender only. For all of the figures, pricing (short-, intermediate- and long-term) and financial projections for Years 1, 11 and 21 are shown for attained ages 35, 55, 75, 85 and 95.

The box and whiskers charts (sometimes called box plots) shown below allow significant information to be shared in one place. For each age and category (e.g., Life Fin Proj 2022, short for Life Financial Projection) a box shows the range from the 25th percentile to the 75th percentile. It also shows outlier data, minimum, maximum and the median. For consistency, each life chart has a maximum of 3% while allowing the minimum to go below zero when appropriate. Some data points were out of range (large positive) for this analysis. Median results appear to be more credible than average (mean) because of these extreme outliers.

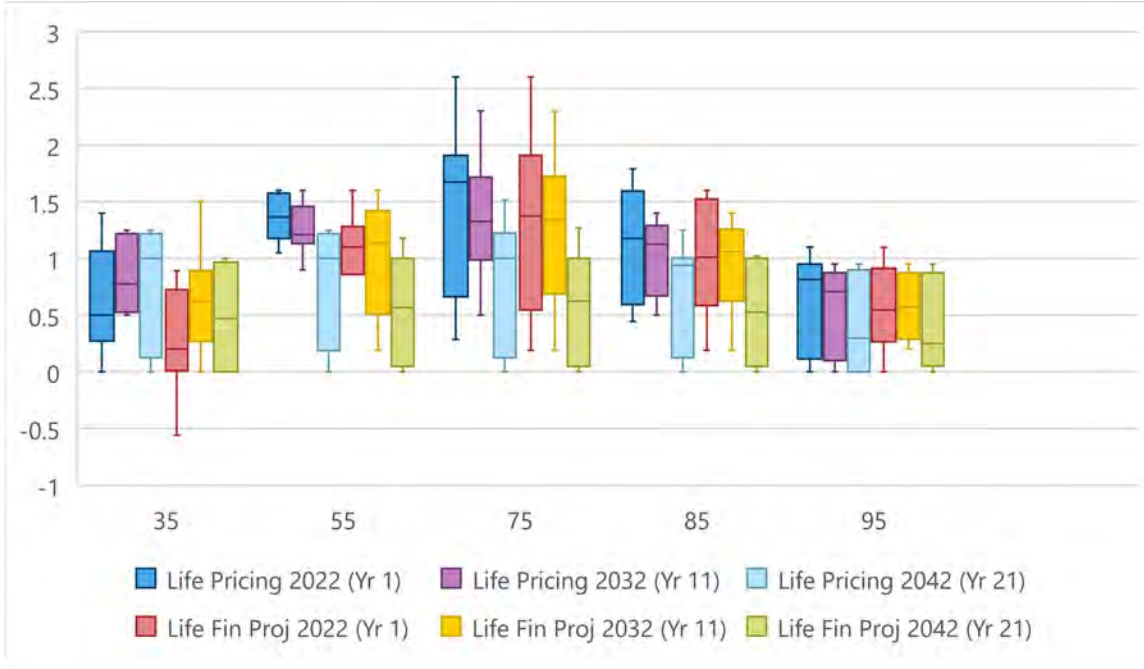
Mortality improvement factors tend to be higher for age 75 and show a symmetrical decrease as attained age increases or decreases. The factors tend to decrease as the time horizon lengthens for both pricing and financial projection purposes. Results are similar between direct writers and reinsurers, although a smaller number of reinsurer respondents leads to a wider dispersion of results.

Figure 11
LIFE MALE, BEST PREFERRED NONSMOKER RISK CLASS, NO ADJUSTMENT FOR COVID-19: DIRECT WRITERS
% MORTALITY IMPROVEMENT FACTOR



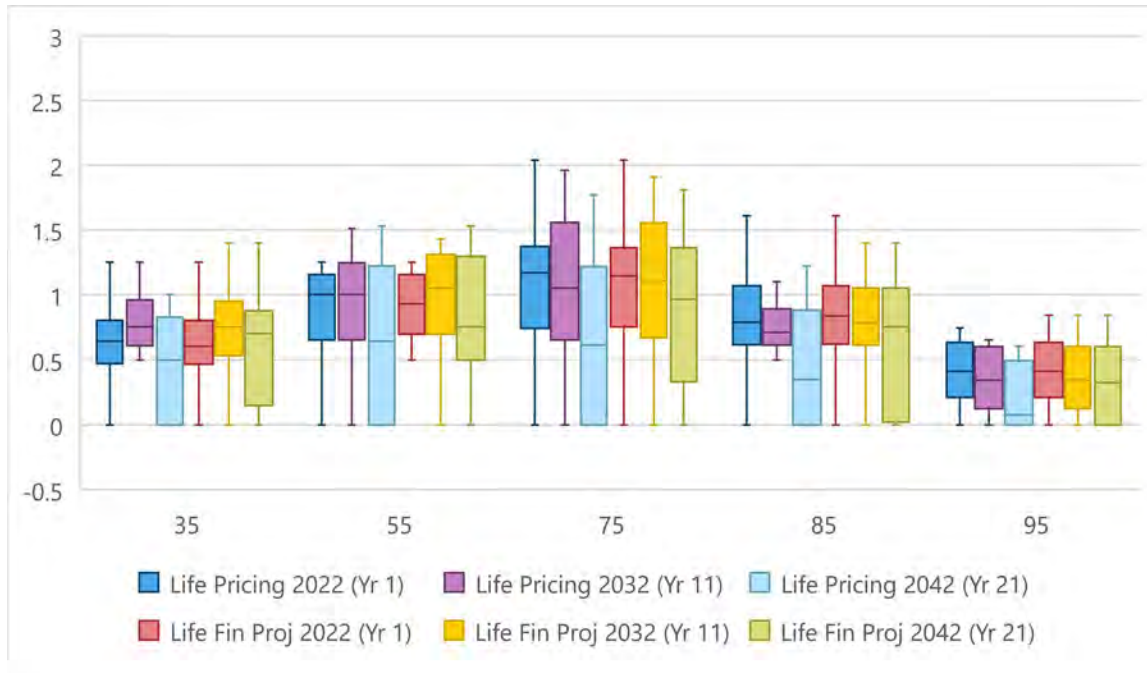
Twenty-one direct writers responded to the Life, Male, Best Preferred Nonsmoker risk class section of the questionnaire. Some extreme (high) outliers were present, so the average (mean) metric is higher than the median. Especially for pricing, in Year 21 more companies have reduced mortality improvement rates.

Figure 12
LIFE MALE, BEST PREFERRED NONSMOKER RISK CLASS, NO ADJUSTMENT FOR COVID-19: REINSURERS
% MORTALITY IMPROVEMENT FACTOR



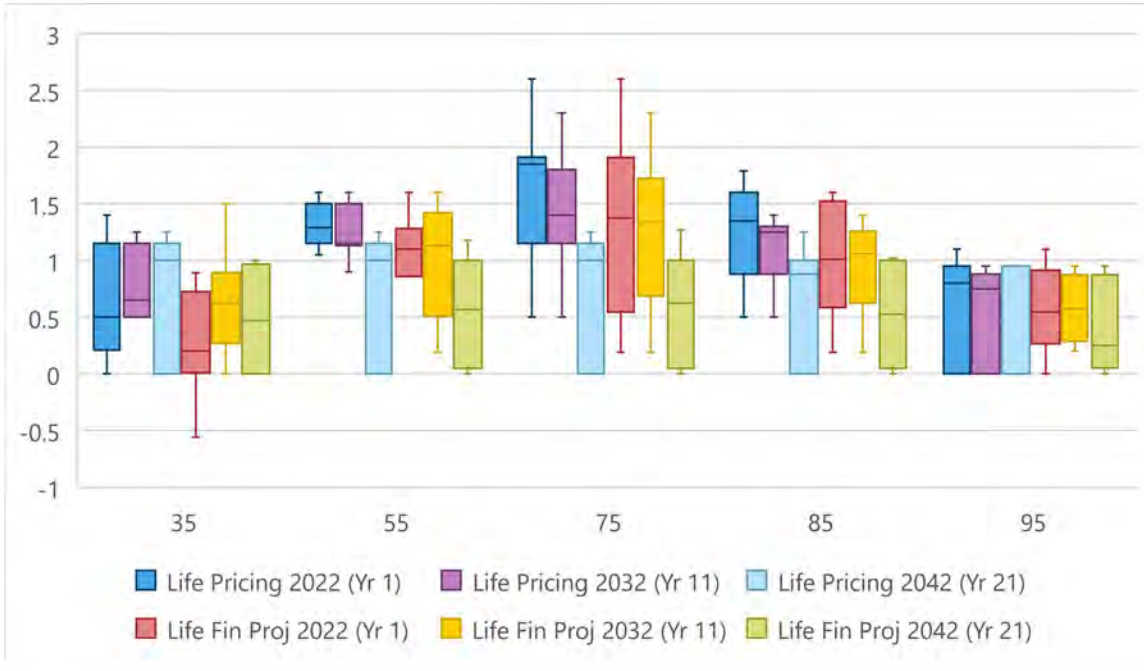
Nine reinsurers responded to the Life, Male, Best Preferred Nonsmoker risk class section of the questionnaire. Results are higher in this risk class for reinsurers than direct writers. Some mortality deterioration factors were reported.

Figure 13
LIFE MALE, RESIDUAL STANDARD NONSMOKER RISK CLASS, NO ADJUSTMENT FOR COVID-19: DIRECT WRITERS
% MORTALITY IMPROVEMENT FACTOR



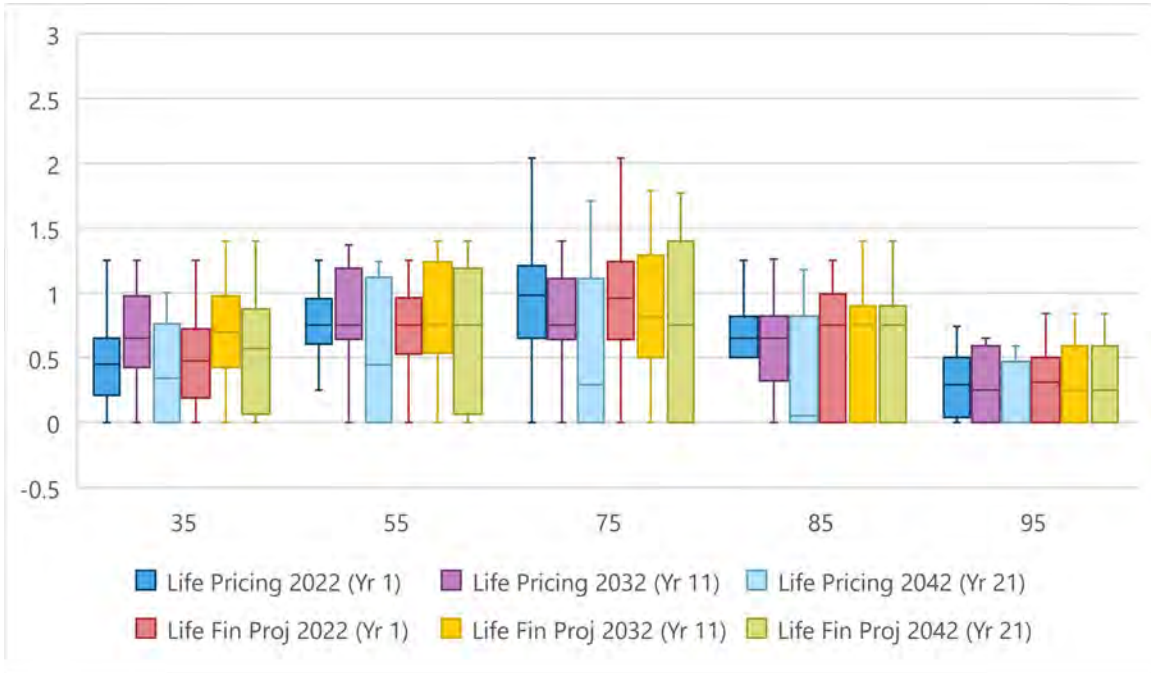
Eighteen direct writers responded to the Life, Male, Residual Standard Nonsmoker risk class section of the questionnaire. Some extreme (high) outliers were present, so the average (mean) metric is higher than the median. Especially for pricing, in Year 21 more companies have taken out mortality improvement rates. Results are similar to the Best Preferred Nonsmoker risk class.

Figure 14
LIFE MALE, RESIDUAL STANDARD NONSMOKER RISK CLASS, NO ADJUSTMENT FOR COVID-19: REINSURERS
% MORTALITY IMPROVEMENT FACTOR



Eight reinsurers responded to the Life, Male, Residual Standard Nonsmoker risk class section of the questionnaire. Results are higher in this risk class for reinsurers than direct writers but similar to the other male nonsmoker question. Some mortality deterioration factors were reported.

Figure 15
LIFE MALE, BEST PREFERRED SMOKER RISK CLASS, NO ADJUSTMENT FOR COVID-19: DIRECT WRITERS
% MORTALITY IMPROVEMENT FACTOR



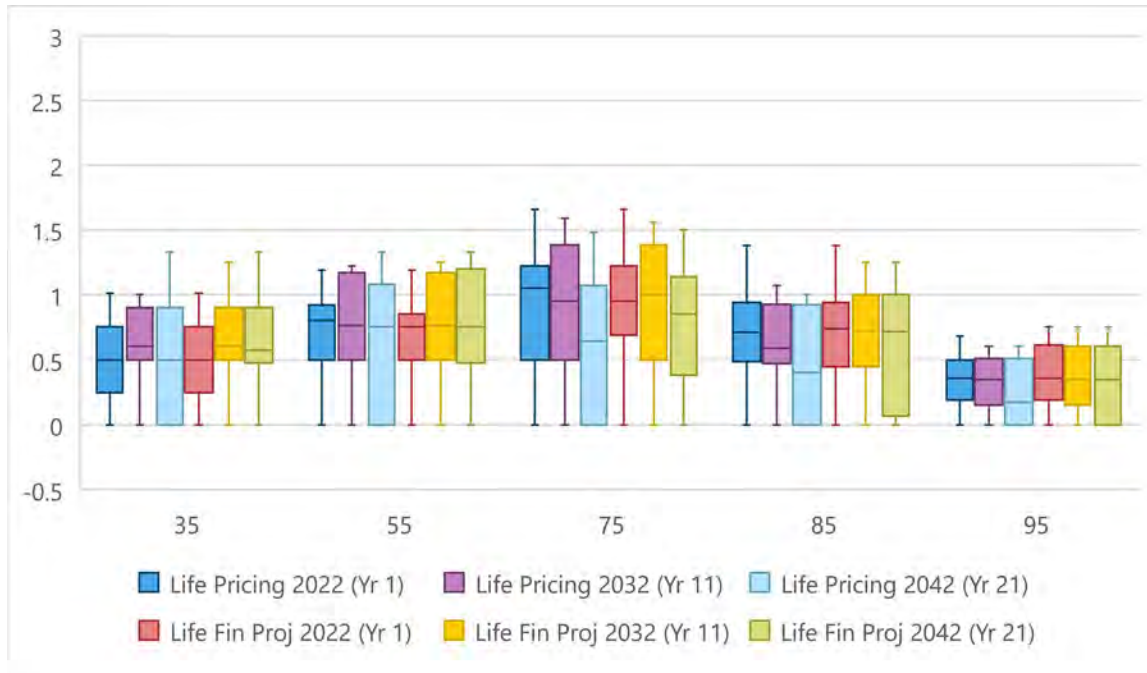
Nineteen direct writers responded to the Life, Male, Best Preferred Smoker risk class section of the questionnaire. Some extreme (high) outliers were present, so the average (mean) metric is higher than the median. More companies have eliminated mortality improvement rates, especially in Year 21. Results are lower than the comparable nonsmoker risk classes.

Figure 16
LIFE MALE, BEST PREFERRED SMOKER RISK CLASS, NO ADJUSTMENT FOR COVID-19: REINSURERS
% MORTALITY IMPROVEMENT FACTOR



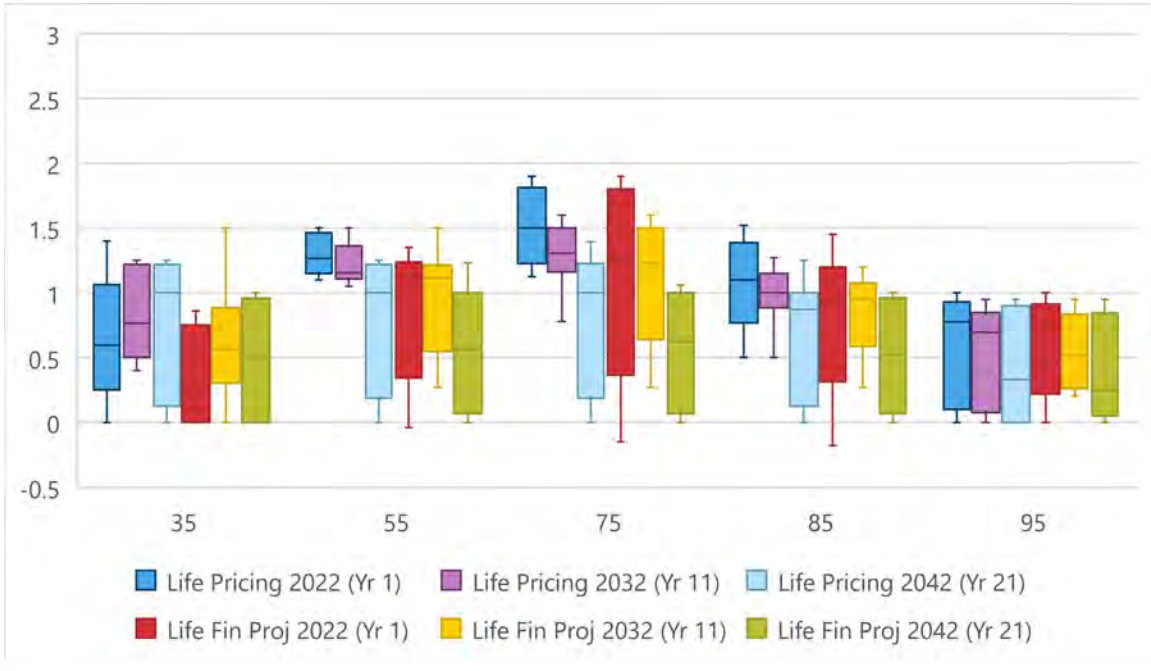
Eight reinsurers responded to the “Life, Male, Best Preferred Smoker Risk Class” section of the questionnaire. Mortality improvement factors are higher in this risk class for reinsurers than direct writers as well as the other male nonsmoker question. Quite a few mortality deterioration factors were reported.

Figure 17
LIFE FEMALE, BEST PREFERRED NONSMOKER RISK CLASS, NO ADJUSTMENT FOR COVID-19: DIRECT WRITERS
% MORTALITY IMPROVEMENT FACTOR



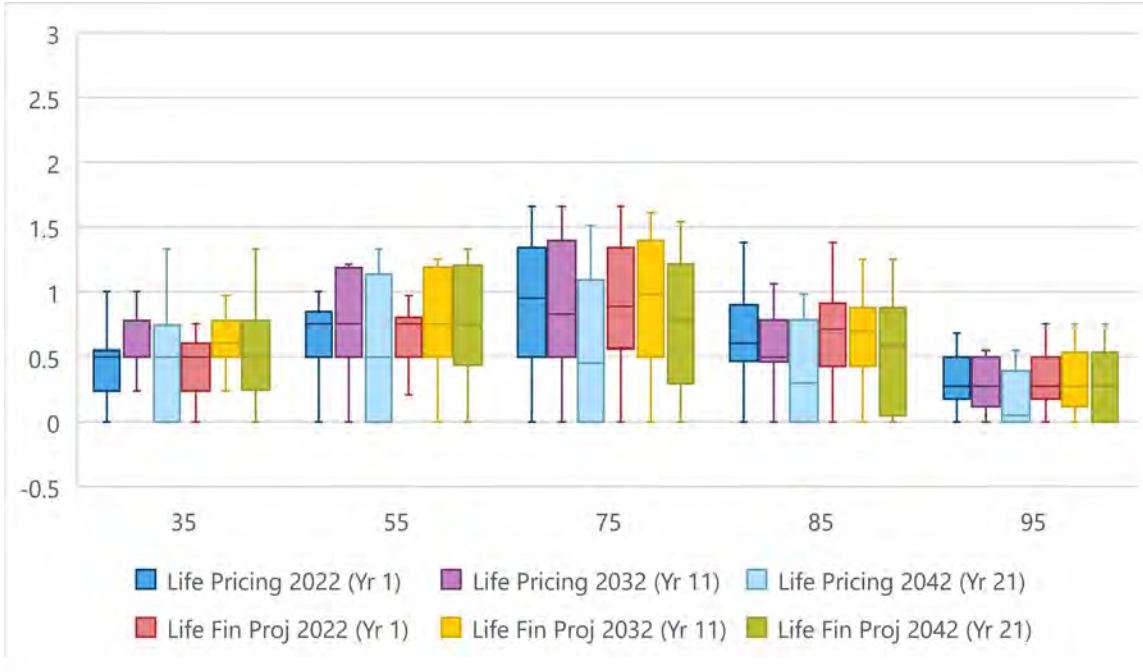
Twenty-one direct writers responded to the “Life, Female, Best Preferred Nonsmoker Risk Class” section of the questionnaire. Some extreme (high) outliers were present, so the average (mean) metric is higher than the median. Especially for pricing, in Year 21 more companies have reduced mortality improvement rates. Improvement rates are similar to the male results for the same risk class.

Figure 18
LIFE FEMALE, BEST PREFERRED NONSMOKER RISK CLASS, NO ADJUSTMENT FOR COVID-19: REINSURERS
% MORTALITY IMPROVEMENT FACTOR



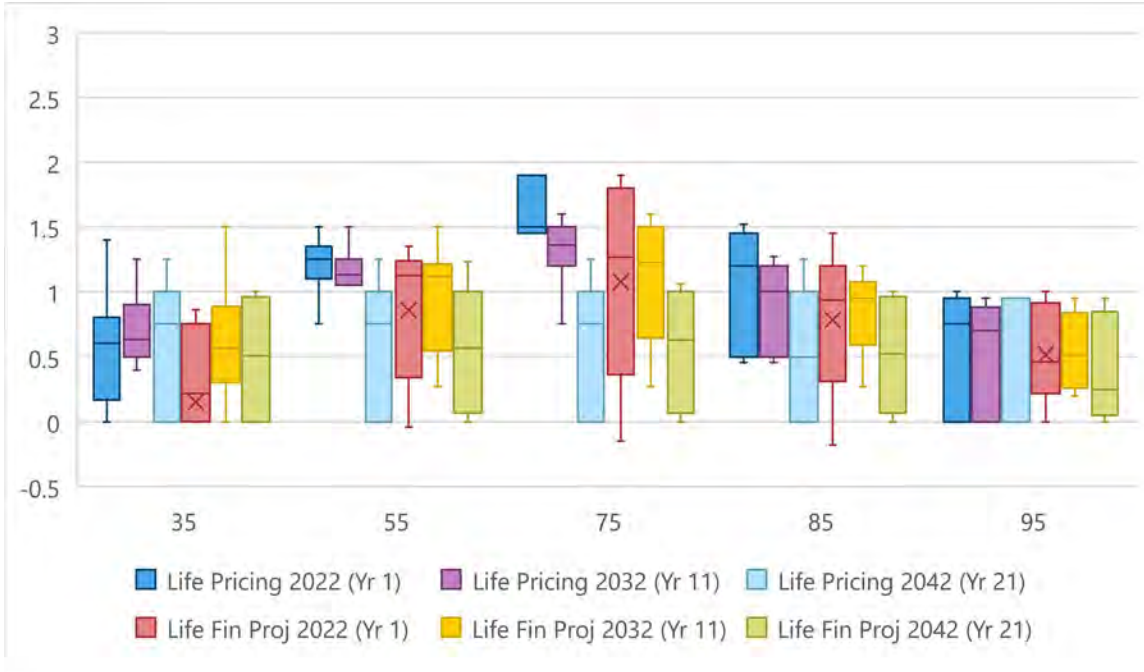
Nine reinsurers responded to the Life, Female, Best Preferred Nonsmoker risk class section of the questionnaire. Some factors were higher in this risk class for reinsurers than direct writers, but results were more volatile. Some mortality deterioration factors were reported.

Figure 19
LIFE FEMALE, RESIDUAL STANDARD NONSMOKER RISK CLASS, NO ADJUSTMENT FOR COVID-19: DIRECT WRITERS
% MORTALITY IMPROVEMENT FACTOR



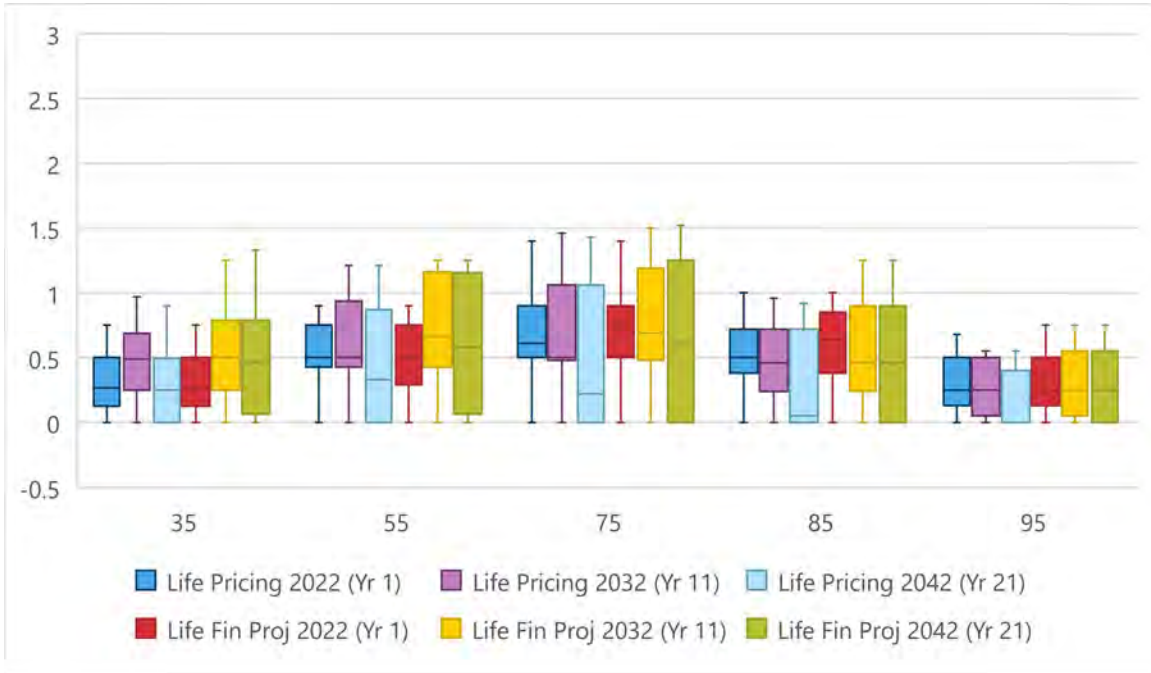
Nineteen direct writers responded to the Life, Female, Residual Standard Nonsmoker risk class section of the questionnaire. Some extreme (high) outliers were present, so the average (mean) metric is higher than the median. Especially for pricing, in Year 21 more companies have reduced mortality improvement rates. Results are similar to the best preferred nonsmoker risk class and to the comparable to the male results for the same risk class.

Figure 20
LIFE FEMALE, RESIDUAL STANDARD NONSMOKER RISK CLASS, NO ADJUSTMENT FOR COVID-19:
REINSURERS
% MORTALITY IMPROVEMENT FACTOR



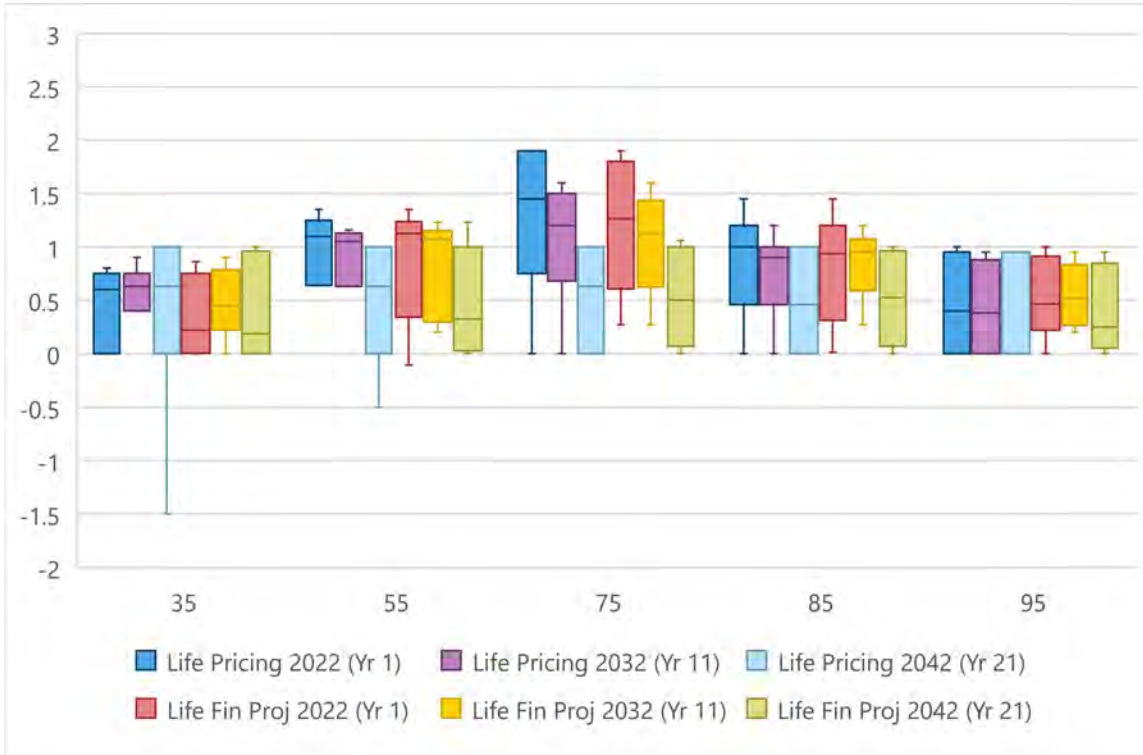
Eight reinsurers responded to the Life, Female, Residual Standard Nonsmoker risk class section of the questionnaire. Most factors are higher in this risk class for reinsurers than direct writers, with more volatility, but similar to the other male nonsmoker risk class. Some mortality deterioration factors were reported.

Figure 21
LIFE FEMALE, BEST PREFERRED SMOKER RISK CLASS, NO ADJUSTMENT FOR COVID-19: DIRECT WRITERS
% MORTALITY IMPROVEMENT FACTOR



Eighteen direct writers responded to the Life, Female, Best Preferred Smoker risk class section of the questionnaire. Some extreme (high) outliers were present, so the average (mean) metric is higher than the median. More companies have reduced mortality improvement rates, especially in later years. Results are lower than the comparable nonsmoker risk classes.

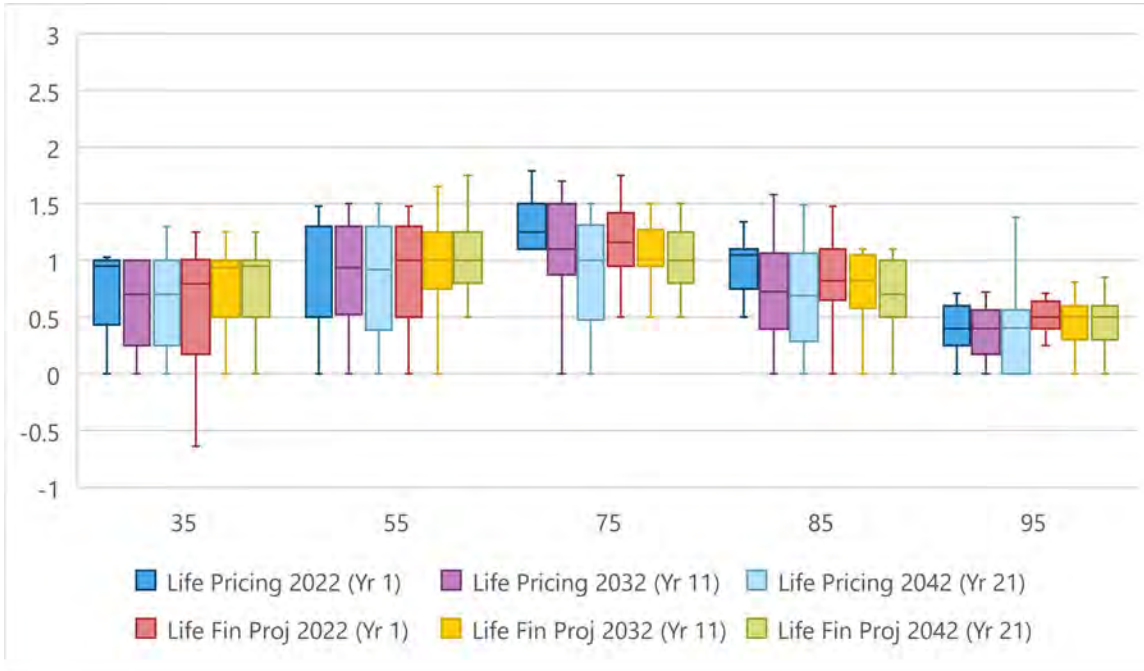
Figure 22
LIFE FEMALE, BEST PREFERRED SMOKER RISK CLASS, NO ADJUSTMENT FOR COVID-19: REINSURERS
% MORTALITY IMPROVEMENT FACTOR



Eight reinsurers responded to the Life, Female, Best Preferred Smoker risk class section of the questionnaire. Mortality improvement factors are higher in this risk class for reinsurers than direct writers as well as the other male nonsmoker question. Some mortality deterioration factors were reported.

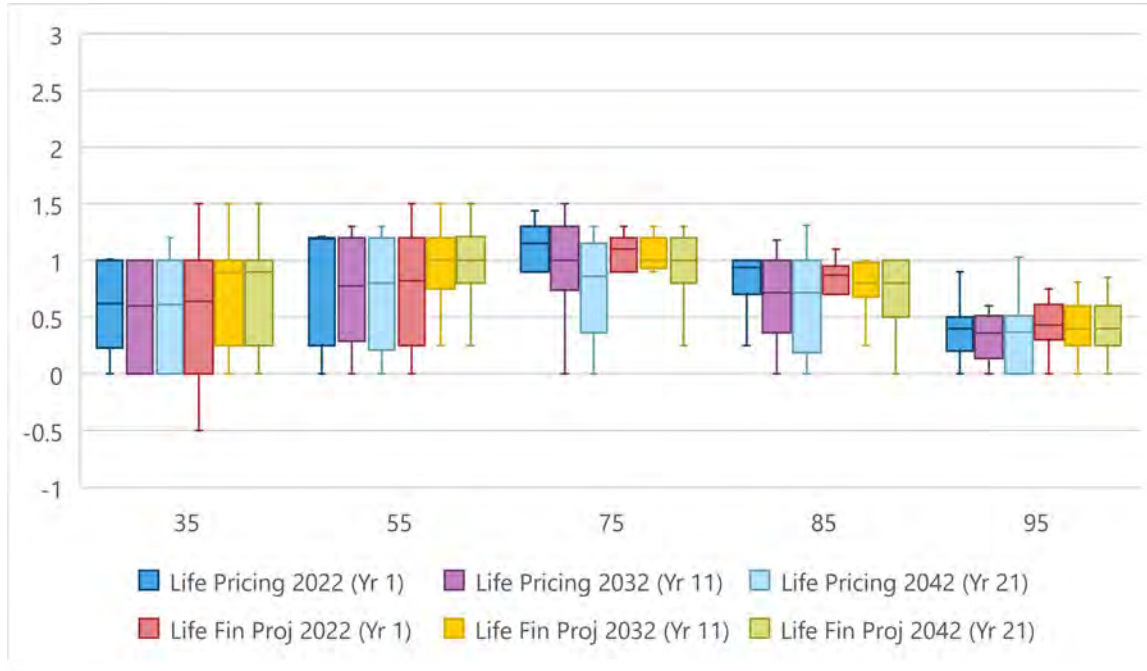
No splits were generated for the annuity product line because of few Canadian and reinsurer respondents. It is conservative to include a mortality improvement factor when modeling a payout annuity. Results are similar or slightly higher when compared to life product factors.

Figure 23
ANNUITIES MALE, NO ADJUSTMENT FOR COVID-19: DIRECT WRITERS AND REINSURERS
% MORTALITY IMPROVEMENT FACTOR



Twenty-one companies responded to the Annuity, Male section of the questionnaire. A few extreme (high) outliers were present, so the average (mean) metric is higher than the median. Relative to the life product results, fewer respondents eliminated mortality improvement factors, although a few in specific instances utilized mortality deterioration factors.

Figure 24
ANNUITIES FEMALE, NO ADJUSTMENT FOR COVID-19: DIRECT WRITERS AND REINSURERS
% MORTALITY IMPROVEMENT FACTOR



Twenty-one companies responded to the Annuity, Female section of the questionnaire. A few extreme (high) outliers were present, so the average (mean) metric is higher than the median. Relative to the male annuity product results, results are similar or slightly lower.

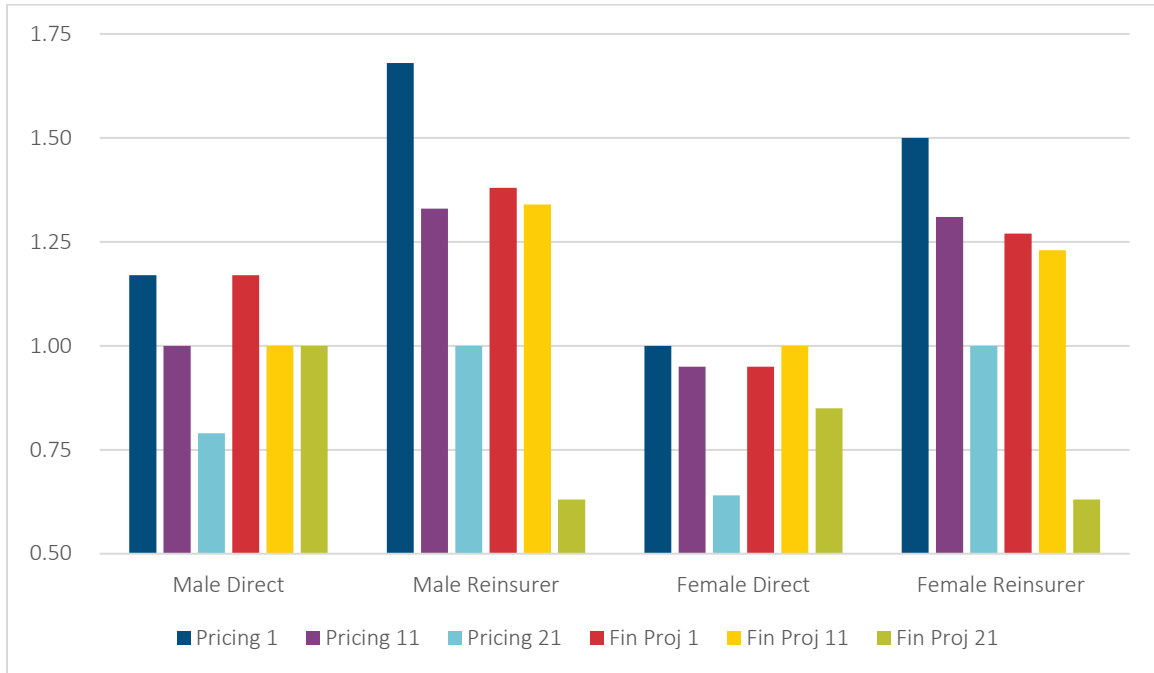
A representative chart may be helpful for the reader. In this table the six combinations of life/annuity and Years 1, 11, and 21 are combined for the best preferred nonsmoker risk class, with the two annuity gender splits shown for comparison. Note that Projections has been shortened to Projctns in Table 28.

Table 28
MORTALITY IMPROVEMENT FACTORS: MEDIAN, ATTAINED AGE 75, U.S. AND CANADA COMBINED

				Pricing Year 1	Pricing Year 11	Pricing Year 21	Financial Projctns Year 1	Financial Projctns Year 11	Financial Projctns Year 21
Life	Male	Best Preferred Nonsmoker	Direct writer	1.17%	1.00%	0.79%	1.17%	1.00%	1.00%
Life	Male	Best Preferred Nonsmoker	Reinsurer	1.68%	1.33%	1.00%	1.38%	1.34%	0.63%
Life	Female	Best Preferred Nonsmoker	Direct writer	1.00%	0.95%	0.64%	0.95%	1.00%	0.85%
Life	Female	Best Preferred Nonsmoker	Reinsurer	1.50%	1.31%	1.00%	1.27%	1.23%	0.63%
Annuity	Male			1.34%	1.10%	1.08%	1.16%	1.06%	1.00%
Annuity	Female			1.16%	1.03%	1.00%	1.15%	1.06%	1.00%

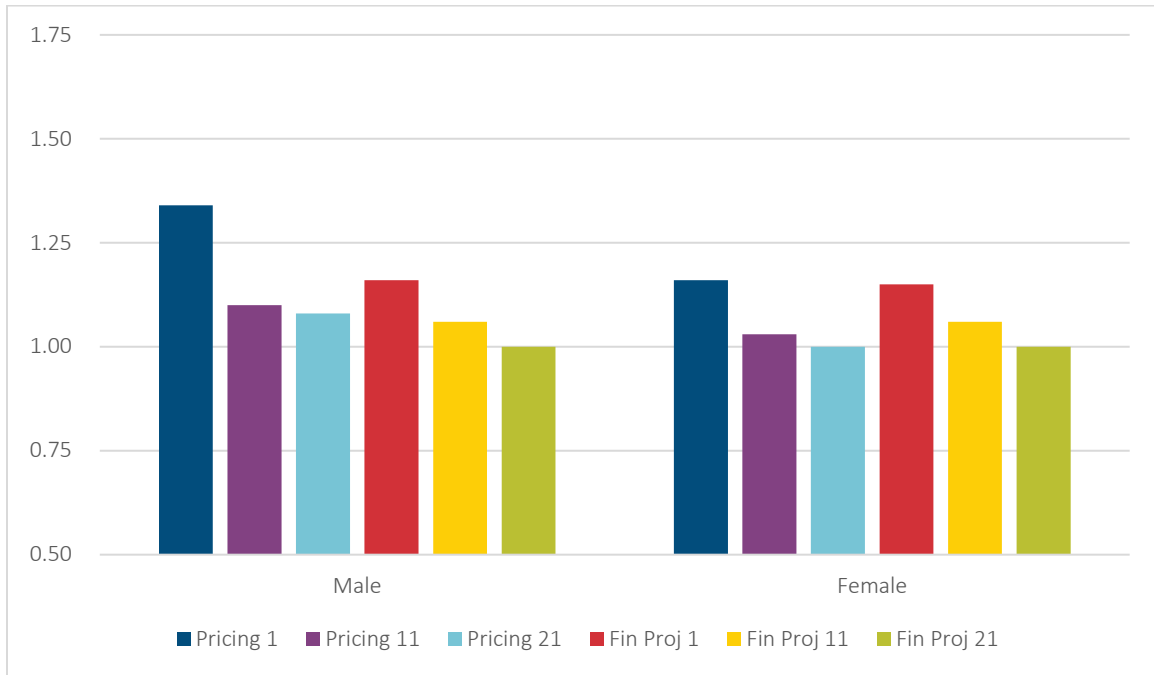
For those who prefer a visual representation across the four best preferred nonsmoker risk class combinations (male/female, direct writer/reinsurer) the following figure is representative. Note that the minimum shown is 0.50%.

Figure 25
LIFE MEDIAN ATTAINED AGE 75 U.S. AND CANADA COMBINED
MORTALITY IMPROVEMENT FACTOR AS %



For this example, results are generally consistent, with male mortality improvement factors higher than female and direct writers lower than reinsurers.

Figure 26
ANNUITY MEDIAN ATTAINED AGE 75 U.S. AND CANADA COMBINED
MORTALITY IMPROVEMENT FACTOR AS %



Similar to life products, male annuity factors are higher than female. Year 1 annuity factors are higher and trend down with duration.

10. For the annual durational improvement rates provided, do you adjust them for COVID-19?

Table 29
ADJUSTMENTS FOR COVID-19 TO ANNUAL DURATIONAL IMPROVEMENT RATES

Response	Number of Responses
Yes	2
No	30
I do not know	1
No response	2
Total	35

At the time of the survey (spring 2022), very few companies (6%: two of 35) had adjusted their durational improvement rates because of COVID-19. Those who answered Yes were directed on to Question 11. The rest went to 10a.

10a. Are you planning on adjusting your durational mortality improvement rates for COVID-19?

Table 30

PLANNED ADJUSTMENTS FOR COVID-19 TO ANNUAL DURATIONAL IMPROVEMENT RATES

Response	Number of Responses
Yes	3
No	24
I do not know	2
No response	6
Total	35

At the time of the survey (spring 2022), three of 27 (11%) had plans to adjust their durational improvement rates because of COVID-19. These are in addition to the two companies reporting that they had already adjusted them (Question 10) because those companies were not directed to complete Question 10a or 10b.

10b. Do you adjust your underlying mortality assumptions for COVID-19?

Table 31

PLANNED ADJUSTMENTS FOR COVID-19 TO UNDERLYING MORTALITY ASSUMPTIONS

Response	Number of Responses
Yes*	10
No	21
I do not know	1
No response	3

*Seven companies provided their loads. Generally, it was only for 2022 and ranged from 5% to 10%, and then 0% for Year 11 and Year 21. The loads did not seem to vary much by attained age. Ten of 31 (32%) have adjusted their underlying mortality at this time due to COVID-19. Those answering Yes to Question 10 were not directed to this question, so the results could be a bit higher than this.

As experience is collected about the pandemic it has become clear that mortality has been impacted not only due to specific COVID-19 deaths but also indirectly as, for example, other infectious diseases, accidents and homicides have also changed. This question could be interpreted as specific to COVID-19 deaths or all deaths during the pandemic (some causes of death higher, some lower).

Companies that adjust their durational improvement rates for COVID-19 (Question 10) were directed to complete Questions 11–14 before submitting their responses. All 35 companies answered Question 10. Based on their responses, only the two companies who answered Yes would fill out Questions 11–14, and the 10 companies who answered yes to Question 10b would fill out Questions 15–17.

Based on the responses to Question 10, two companies were directed to complete Questions 11–14. Only one did, so no detail is provided. The questions are documented here because they are useful for practitioners to consider.

11. Complete the following tables with the annual durational mortality improvement adjustment for COVID-19 as of the end of 2021. Express the adjustment as a percentage with two decimal places. For example, if mortality improvement is reduced by 25 bps, express this as “-.25.” If the reduction is 0, express this as “.00.” If mortality improvement is increased by 25 bps, express this as “.25.”

The complete survey can be found in Appendix B. Separate responses were requested across the following:

- Pricing 2022 (Year 1), pricing 2032 (Year 11), pricing 2042, financial projections 2022 (Year 1), financial projections 2032 (Year 11) and financial projections 2042 (Year 21).
- Life and annuity.
- Attained ages 35, 55 and 75.
- Male, female.

12. Indicate by which of the following characteristics your company’s annual durational mortality improvement COVID-19 adjustment varies. Please select all that apply.

Predefined options included attained age, issue age, duration, face amount, gender, product, smoking status, risk class and year-of-birth cohort.

13. In developing your annual durational mortality improvement COVID-19 adjustments, what are your considerations? Please select all that apply.

Respondents were asked to respond separately for life and annuity products. The predefined choices included the following:

- Change in COVID-19 vaccination/booster rates.
- Change in virulence of current or future COVID-19 strains/variants.
- New COVID-19 medical treatments.
- Change in public adherence to mitigation strategies.
- Better mortality occurs as more and more older, less healthy individuals die from COVID-19 leaving a healthier population than before the pandemic.
- Worse mortality occurs from long COVID and indirect COVID-19 impacts leaving an unhealthier population than before the pandemic.
- Fewer flu deaths compared to pre-pandemic levels.
- COVID-19 becomes endemic.
- Postponement of medical treatment due to COVID-19 resulting in worse mortality.

14. Do you also adjust your underlying mortality assumptions for COVID-19?

Those who filled out Questions 11–14 have completed the survey. The 10 companies that responded Yes to Question 10b were directed to answer Questions 15–17.

15. Complete the following tables with the annual adjustment to your underlying mortality assumptions for COVID-19 as of the end of 2021. Express the adjustment as a percentage with two decimal places. For example, if mortality is increased by 10%, express this as “.10.”

Seven companies of the 10 directed to this question submitted life results. A few responses may have misunderstood the question. The rest of the results were close to zero, and almost all were small positive adjustments, but the data are not definitive so the details are not shared here for either life or annuity.

16. Indicate by which of the following characteristics your company's COVID-19 mortality adjustment varies. Check all that apply.

Table 32

CHARACTERISTICS DRIVING VARIATION FOR COVID-19 MORTALITY ADJUSTMENTS

Characteristic	Yes	No	Total
Duration	6	3	9
Attained age	2	7	9
Gender	2	7	9
Issue age	1	8	9
Product	1	8	9
Other: Calendar year	1	0	1
Did not use a COVID-19 mortality adjustment	1	0	1
Face amount	0	9	9
Smoking status	0	9	9
Risk class	0	9	9
Year-of-birth cohort	0	9	9

The primary adjustment used to adjust for COVID-19 was duration (67%), although attained age and gender were also used by more than one company. One of nine respondents (11%) did not use any COVID-19 mortality adjustments.

17. In developing your COVID-19 mortality adjustments, what are your considerations? Please select all that apply.

Table 33
CONSIDERATIONS FOR COVID-19 MORTALITY ADJUSTMENTS

Consideration	Pricing Life 2022 (Year 1)	Pricing Life 2032 (Year 11)	Pricing Life 2042 (Year 21)	Financial Projections Life 2022 (Year 1)	Financial Projections Life 2032 (Year 11)	Financial Projections Life 2042 (Year 21)
Change in virulence of current or future COVID-19 strains/variants	6			4	1	1
Change in COVID-19 vaccination/booster rates	5			4	1	1
Fewer flu deaths compared to pre-pandemic levels	5			4	1	1
New COVID-19 medical treatments	4			4	1	1
Better mortality occurs as more and more older, less healthy individuals die from COVID-19 leaving a healthier population than pre-pandemic	4			4	1	1
Worse mortality occurs from long COVID and indirect COVID-19 impacts leaving an unhealthier population than pre-pandemic	4	1		2		
COVID-19 becomes endemic	4			3	1	1
Postponement of medical treatment due to COVID-19 resulting in worse mortality	4			4	1	1
Change in public adherence to mitigation strategies	2			1		
Total responses	7	1	0	5	1	1

Mortality adjustments due to COVID-19 for life products focused on the first year for both pricing and financial projections. Eight companies noted at least one response for life products. Two companies completed the annuity product section of this question, so details are not shared here. No differences were seen in the potential responses provided.

Section 6: Comparison with 2019 Results

The previous survey was completed in 2019 (published in 2022), prior to the COVID-19 pandemic. At that time ages 35, 55, 75 and 95 were included, with pricing and financial projections varying between life and annuity products at Year 1 and Year 21. The current survey added age 85 and Year 11 perspectives to Question 9.

The analysis that follows combines male, female and all underwriting splits for life products.

Some extreme (high) values were found throughout the survey that distort the average metric for life products in the current survey, so median results are highlighted. Yellow highlights signify Year 1 results for comparison, and green highlights signify Year 21 results for comparison.

Table 34
2019 RESULTS FOR ALL LIFE PRODUCTS IN YEAR 1: PRICING

Age	Average	Median	25th Percentile	75th Percentile
35	0.69%	0.73%	0.46%	1.00%
55	0.91%	1.00%	0.90%	1.07%
75	1.22%	1.03%	0.71%	1.68%
95	0.45%	0.26%	0.20%	0.73%

Table 35
2019 RESULTS FOR ALL LIFE PRODUCTS IN YEAR 21: PRICING

Age	Average	Median	25th Percentile	75th Percentile
35	0.72%	0.80%	0.50%	1.00%
55	0.85%	1.00%	0.53%	1.18%
75	1.05%	1.01%	0.53%	1.40%
95	0.40%	0.40%	0.20%	0.66%

Table 36
2022 RESULTS FOR ALL LIFE PRODUCTS IN YEAR 1: PRICING

Age	Average	Median	25th Percentile	75th Percentile
35	0.59%	0.65%	0.50%	1.00%
55	0.97%	1.00%	0.83%	1.15%
75	1.21%	1.15%	0.81%	1.60%
85	0.84%	0.92%	0.50%	1.15%
95	0.36%	0.35%	0.00%	0.58%

The Year 1 pricing results are similar for 2022 and 2019 (comparison of Table 34 and Table 36).

Table 37
2022 RESULTS FOR ALL LIFE PRODUCTS IN YEAR 11: PRICING

Age	Average	Median	25th Percentile	75th Percentile
35	0.67%	0.80%	0.50%	1.00%
55	0.96%	1.00%	0.80%	1.15%
75	1.10%	1.00%	0.75%	1.50%
85	0.78%	0.89%	0.50%	1.00%
95	0.31%	0.30%	0.00%	0.58%

No comparable data points are found in the 2019 survey.

Table 38
2022 RESULTS FOR ALL LIFE PRODUCTS IN YEAR 21: PRICING

Age	Average	Median	25th Percentile	75th Percentile
35	0.46%	0.50%	0.00%	1.00%
55	0.59%	0.75%	0.00%	1.00%
75	0.57%	0.63%	0.00%	1.00%
85	0.44%	0.40%	0.00%	0.90%
95	0.13%	0.00%	0.00%	0.20%

The Year 21 pricing results are lower for 2022 than 2019 (comparison of Table 35 and Table 38).

Table 39
2019 RESULTS FOR ALL LIFE PRODUCTS IN YEAR 1: FINANCIAL PROJECTIONS

Age	Average	Median	25th Percentile	75th Percentile
35	0.60%	0.65%	0.17%	1.00%
55	0.83%	0.90%	0.63%	1.07%
75	1.14%	1.00%	0.50%	1.68%
95	0.44%	0.44%	0.02%	0.75%

Table 40
2019 RESULTS FOR ALL LIFE PRODUCTS IN YEAR 21: FINANCIAL PROJECTIONS

Age	Average	Median	25th Percentile	75th Percentile
35	0.66%	0.75%	0.28%	1.03%
55	0.79%	0.79%	0.43%	1.20%
75	0.99%	1.00%	0.55%	1.40%
95	0.42%	0.40%	0.02%	0.74%

This information allows the reader to easily compare specific ages, time horizons and type of projection against a typical result across all the data collected for life products.

Table 41
2022 RESULTS FOR ALL LIFE PRODUCTS IN YEAR 1: FINANCIAL PROJECTIONS

Age	Average	Median	25th Percentile	75th Percentile
35	0.44%	0.60%	0.19%	0.80%
55	0.80%	0.90%	0.50%	1.10%
75	1.03%	1.00%	0.50%	1.47%
85	0.75%	0.92%	0.27%	1.00%
95	0.43%	0.40%	0.20%	0.75%

The Year 1 results are slightly lower for 2022 than 2019 (comparison of Table 39 and Table 41).

Table 42
2022 RESULTS FOR ALL LIFE PRODUCTS IN YEAR 11: FINANCIAL PROJECTIONS

Age	Average	Median	25th Percentile	75th Percentile
35	0.75%	0.80%	0.48%	1.00%
55	0.90%	1.00%	0.69%	1.20%
75	1.10%	1.00%	0.75%	1.50%
85	0.83%	0.95%	0.73%	1.10%
95	0.43%	0.40%	0.24%	0.70%

No comparable data points were found in the 2019 survey.

Table 43
2022 RESULTS FOR ALL LIFE PRODUCTS IN YEAR 21: FINANCIAL PROJECTIONS

Age	Average	Median	25th Percentile	75th Percentile
35	0.56%	0.75%	0.08%	1.00%
55	0.62%	0.75%	0.17%	1.00%
75	0.65%	0.75%	0.19%	1.00%
85	0.55%	0.55%	0.00%	1.00%
95	0.30%	0.25%	0.00%	0.60%

The Year 21 financial projections results are lower for 2022 than 2019 (comparison of Table 40 and Table 43).

Table 44
2019 RESULTS FOR ALL ANNUITY PRODUCTS IN YEAR 1: PRICING

Age	Average	Median	25th Percentile	75th Percentile
35	0.96%	1.00%	0.74%	1.15%
55	1.18%	1.20%	1.05%	1.30%
75	1.48%	1.44%	1.15%	1.94%
95	0.42%	0.40%	0.33%	0.44%

Table 45
2019 RESULTS FOR ALL ANNUITY PRODUCTS IN YEAR 21: PRICING

Age	Average	Median	25th Percentile	75th Percentile
35	0.67%	0.84%	0.09%	1.00%
55	0.83%	1.00%	0.21%	1.24%
75	1.04%	1.30%	0.25%	1.48%
95	0.32%	0.35%	0.07%	0.40%

Table 46
2022 RESULTS FOR ALL ANNUITY PRODUCTS IN YEAR 1: PRICING

Age	Average	Median	25th Percentile	75th Percentile
35	1.02%	1.00%	0.56%	1.02%
55	2.23%	1.20%	0.75%	2.82%
75	2.64%	1.05%	0.68%	3.20%
85	1.52%	0.97%	0.54%	2.04%
95	0.45%	0.20%	0.15%	0.76%

The Year 1 pricing results are similar at younger attained ages and lower at older attained ages for 2022 versus 2019 (comparison of Table 44 and Table 46).

Table 47
2022 RESULTS FOR ALL ANNUITY PRODUCTS IN YEAR 11: PRICING

Age	Average	Median	25th Percentile	75th Percentile
35	0.58%	0.88%	0.00%	1.00%
55	0.75%	1.00%	0.23%	1.05%
75	0.92%	1.00%	0.68%	1.20%
85	0.83%	1.00%	0.54%	1.05%
95	0.33%	0.20%	0.15%	0.60%

No comparable data points were found in the 2019 survey.

Table 48
2022 RESULTS FOR ALL ANNUITY PRODUCTS IN YEAR 21: PRICING

Age	Average	Median	25th Percentile	75th Percentile
35	0.58%	0.88%	0.00%	1.00%
55	0.66%	1.00%	0.03%	1.05%
75	0.78%	1.00%	0.62%	1.00%
85	0.83%	1.00%	0.54%	1.08%
95	0.44%	0.20%	0.15%	0.71%

The Year 21 pricing results are the same or lower for 2022 than 2019 (comparison of Table 45 and Table 48).

Table 49
2019 RESULTS FOR ALL ANNUITY PRODUCTS IN YEAR 1: FINANCIAL PROJECTIONS

Age	Average	Median	25th Percentile	75th Percentile
35	1.05%	1.00%	1.00%	1.31%
55	1.22%	1.21%	1.13%	1.30%
75	1.48%	1.34%	1.30%	1.64%
95	0.47%	0.40%	0.40%	0.44%

Table 50
2019 RESULTS FOR ALL ANNUITY PRODUCTS IN YEAR 21: FINANCIAL PROJECTIONS

Age	Average	Median	25th Percentile	75th Percentile
35	0.95%	1.00%	0.67%	1.36%
55	1.08%	1.20%	1.00%	1.36%
75	1.22%	1.30%	1.25%	1.48%
95	0.41%	0.40%	0.30%	0.40%

Table 51
2022 RESULTS FOR ALL ANNUITY PRODUCTS IN YEAR 1: FINANCIAL PROJECTIONS

Age	Average	Median	25th Percentile	75th Percentile
35	0.64%	1.00%	0.00%	1.02%
55	0.90%	1.00%	0.56%	1.26%
75	0.99%	1.00%	0.90%	1.21%
85	0.85%	0.89%	0.70%	1.03%
95	0.42%	0.47%	0.20%	0.63%

The Year 1 financial projections results are the same or lower for 2022 than 2019 (comparison of Table 49 and Table 51).

Table 52
2022 RESULTS FOR ALL ANNUITY PRODUCTS IN YEAR 11: FINANCIAL PROJECTIONS

Age	Average	Median	25th Percentile	75th Percentile
35	0.80%	1.00%	0.56%	1.00%
55	1.00%	1.00%	0.99%	1.21%
75	0.93%	1.00%	0.97%	1.03%
85	0.75%	0.86%	0.63%	1.00%
95	0.37%	0.30%	0.15%	0.60%

No comparable data points were found in the 2019 survey.

Table 53
2022 RESULTS FOR ALL ANNUITY PRODUCTS IN YEAR 21: FINANCIAL PROJECTIONS

Age	Average	Median	25th Percentile	75th Percentile
35	0.81%	1.00%	0.56%	1.00%
55	1.01%	1.00%	1.00%	1.25%
75	0.84%	1.00%	0.82%	1.00%
85	0.69%	0.86%	0.49%	1.00%
95	0.38%	0.30%	0.15%	0.60%

The Year 21 financial projections results are the same or lower for 2022 than 2019 (comparison of Table 50 and Table 53).

The data were gathered in spring 2022 while the pandemic was evolving and data were being collected and interpreted. Selling new products does not wait for all data to be collected before repricing products, and this analysis provides a snapshot of the thought process. This likely introduces a degree of conservatism in the 2022 results. With some exceptions, the 2022 life product mortality improvement rates are lower than

2019 at higher ages (75 and 95). Exceptions occur for Year 1 life pricing, at which age 35 is lower and ages 75 and 95 are higher, perhaps because of a remaining cohort that is healthier than the same cohort before so many lives were lost during the pandemic. Similar results are seen for annuity products.

Section 7: Companies That Participated in Both Surveys

Fourteen companies participated in both surveys: 12 for life products and eight for annuity products. These numbers are low, but some results can be shared here, and others are included in Appendix C.

The life products are shown for each survey, each risk class, both genders, and ages 35, 55, 75 and 95. Comments should be treated as tendencies rather than conclusions:

- Mortality improvement factors for financial projections and pricing are similar except for younger ages, where pricing factors are generally higher.
- Year 1 factors tend to be lower than Year 21 except at age 95, where they are lower.
- Factors peak at age 75 and are much lower by 95.
- Factors are lower in 2022 than in 2019.
- Very little difference is seen between factors for the two nonsmoker risk classes; it could be that factors vary between smoker and nonsmoker rather than by risk class.
- Life splits are 10 U.S. and two Canadian companies, nine direct writers and three reinsurers.

Table 54

LIFE MALE FINANCIAL PROJECTIONS MEDIAN MORTALITY IMPROVEMENT FACTOR BY RISK CLASS

Year	Life Male	Best Preferred Nonsmoker		Residual Standard Nonsmoker		Best Preferred Smoker	
		2019	2022	2019	2022	2019	2022
Year 1	35	0.71%	0.60%	0.71%	0.60%	0.46%	0.50%
	55	1.00%	0.98%	1.00%	0.98%	0.75%	0.98%
	75	1.40%	1.00%	1.40%	1.00%	0.75%	0.75%
	95	0.44%	0.40%	0.44%	0.45%	0.40%	0.45%
Year 21	35	0.78%	0.75%	0.78%	0.75%	0.71%	0.50%
	55	0.91%	0.75%	0.91%	0.75%	0.75%	0.50%
	75	1.20%	0.75%	1.20%	0.75%	0.88%	0.50%
	95	0.45%	0.25%	0.45%	0.25%	0.40%	0.20%

Table 55
LIFE MALE PRICING MEDIAN MORTALITY IMPROVEMENT FACTOR BY RISK CLASS

Year	Life Male	Best Preferred Nonsmoker		Residual Standard Nonsmoker		Best Preferred Smoker	
		2019	2022	2019	2022	2019	2022
Year 1	35	0.90%	0.73%	0.90%	0.73%	0.71%	0.73%
	55	1.00%	1.08%	1.00%	1.08%	0.90%	1.00%
	75	1.40%	1.28%	1.40%	1.28%	1.00%	1.08%
	95	0.38%	0.38%	0.38%	0.38%	0.20%	0.33%
Year 21	35	0.90%	0.65%	0.90%	0.65%	0.78%	0.40%
	55	1.00%	0.88%	1.00%	0.88%	0.86%	0.75%
	75	1.20%	0.72%	1.20%	0.72%	1.01%	0.19%
	95	0.40%	0.00%	0.40%	0.00%	0.33%	0.00%

Female factors are generally lower in both surveys for all risk classes and ages except for age 95.

Table 56
LIFE FEMALE FINANCIAL PROJECTIONS MEDIAN MORTALITY IMPROVEMENT FACTOR BY RISK CLASS

Year	Life Female	Best Preferred Nonsmoker		Residual Standard Nonsmoker		Best Preferred Smoker	
		2019	2022	2019	2022	2019	2022
Year 1	35	0.65%	0.60%	0.65%	0.60%	0.40%	0.60%
	55	0.90%	0.80%	0.90%	0.80%	0.75%	0.75%
	75	1.38%	1.00%	1.38%	1.00%	0.75%	0.87%
	95	0.44%	0.40%	0.44%	0.40%	0.25%	0.40%
Year 21	35	0.63%	0.75%	0.63%	0.75%	0.38%	0.27%
	55	0.88%	0.75%	0.88%	0.75%	0.69%	0.27%
	75	1.00%	0.75%	1.00%	0.75%	0.88%	0.50%
	95	0.45%	0.25%	0.45%	0.25%	0.34%	0.25%

Table 57
LIFE FEMALE PRICING MEDIAN MORTALITY IMPROVEMENT FACTOR BY RISK CLASS

Year	Life Female	Best Preferred Nonsmoker		Residual Standard Nonsmoker		Best Preferred Smoker	
		2019	2022	2019	2022	2019	2022
Year 1	35	0.73%	0.70%	0.73%	0.68%	0.60%	0.55%
	55	1.00%	1.05%	1.00%	1.00%	0.90%	0.83%
	75	1.38%	1.28%	1.38%	1.28%	1.00%	0.88%
	95	0.44%	0.30%	0.44%	0.30%	0.20%	0.30%
Year 21	35	0.70%	0.65%	0.70%	0.63%	0.60%	0.00%
	55	1.00%	0.88%	1.00%	0.75%	0.84%	0.00%
	75	1.13%	0.78%	1.13%	0.75%	1.02%	0.00%
	95	0.45%	0.00%	0.45%	0.00%	0.25%	0.00%

The annuity product data set is sparse, with eight direct writers, no reinsurers, seven U.S. and one Canadian company. More exceptions to the trends are observed than for the life products.

- Most ages have similar factors between financial projections and pricing, except for age 95, which is lower in many instances for pricing.
- Year 1 financial projections are similar to Year 21 factors.
- Year 21 pricing is lower than Year 1 for many gender and age combinations.
- Factors peak at 75, with results similar at lower ages
- Mortality improvement factors are not consistently higher or lower in the 2022 survey.

Table 58
ANNUITY FINANCIAL PROJECTIONS MEDIAN MORTALITY IMPROVEMENT FACTORS

Year	Annuity	All	All	Male	Male	Female	Female
		2019	2022	2019	2022	2019	2022
Year 1	35	1.00%	1.00%	0.75%	1.00%	1.00%	1.00%
	55	1.21%	1.00%	1.02%	1.00%	1.20%	1.00%
	75	1.34%	1.00%	1.40%	1.00%	1.30%	1.00%
	95	0.40%	0.47%	0.40%	0.50%	0.40%	0.44%
Year 21	35	1.00%	1.00%	0.78%	1.00%	1.00%	1.00%
	55	1.20%	1.00%	0.91%	1.00%	1.20%	1.00%
	75	1.30%	1.00%	1.35%	1.00%	1.30%	1.00%
	95	0.40%	0.30%	0.40%	0.30%	0.39%	0.30%

Table 59
ANNUITY PRICING MEDIAN MORTALITY IMPROVEMENT FACTORS

Year	Annuity	All	All	Male	Male	Female	Female
		2019	2022	2019	2022	2019	2022
Year 1	35	1.00%	1.00%	0.90%	1.00%	1.00%	0.75%
	55	1.20%	1.20%	1.00%	1.30%	1.20%	1.19%
	75	1.44%	1.05%	1.40%	1.10%	1.30%	1.00%
	95	0.40%	0.20%	0.38%	0.20%	0.40%	0.20%
Year 21	35	0.84%	0.88%	0.90%	1.00%	0.68%	0.75%
	55	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
	75	1.30%	1.00%	1.21%	1.00%	1.28%	0.90%
	95	0.35%	0.20%	0.40%	0.20%	0.29%	0.20%

Section 8: Key Takeaways

The results presented in this report aggregate the responses of the 35 insurers that responded to the survey. This is a subset of the industry and may not reflect the practices of those that did not participate. It consciously avoids sharing data specific to any one company and does not represent any individual company. Nevertheless, showing the spread of responses can be helpful to practitioners as they compare their own practice against peers in the industry.

- Mortality improvement factors from 2022 (prior to COVID-19 adjustments) are generally lower than 2019 for life, and lower at older attained ages for annuity products. This may reflect conservatism as the pandemic continues as an event with unknown repercussions.
- Median mortality improvement rates tend to be lower for females than males, especially for life products.
- Mortality improvement factors tend to be higher in Year 1 than in later years, especially for life pricing (Question 9).
- When companies were asked if they had made changes to durational mortality improvement assumptions for non-COVID reasons, most reported that they have not. Those that have include both increases and decreases.
- Companies that adjust durational mortality improvement factors tend to differentiate based on attained age, sex, duration and calendar year.
- Drivers of Life product mortality improvement include (results for annuities were similar):
 - Year 1: COVID-19, cancer and medical advances.

- Year 11: cancer and medical advances.
 - Year 21: cancer, medical advances and genetics.
- Drivers of Life product mortality deterioration include (results for annuities were similar):
 - Year 1: opioids, direct (acute) COVID and obesity.
 - Year 11: obesity and opioids.
 - Year 21: obesity.
- The likelihood of mortality deterioration was high in Year 1, but in Years 11 and 21 mortality improvement was considered likely across nearly all causes (with strongest improvements in cancer related mortality). In addition to COVID-19, opioid/drug overdoses and cancer were the primary reasons for deterioration in Year 1, whereas flu/pneumonia resulted in mortality improvement. In Year 11 slight deterioration was still found in COVID-19 and opioid/drug overdoses, with mortality improvement in other factors led by cancer and cardiovascular causes of death. By Year 21 all causes of death expect mortality improvement, led by flu/pneumonia, Alzheimer's disease and other dementias, and accidents excluding drug overdoses.
- To date, few companies have adjusted their durational mortality improvement rates because of COVID-19.
- Readers of the results from Question 9 should be careful not to draw conclusions when splits are done between direct writers and reinsurers because the number of respondents are small, especially for reinsurers (nine companies). Some observations, however, have been made and guide future hypotheses.



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Section 9: Acknowledgments

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The 35 companies participating in the survey.

Project Oversight Group members:

Jean-Marc Fix, FSA, MAAA

Al Klein, FSA, MAAA

At the Society of Actuaries Research Institute:

Korrel Crawford, Sr. Research Administrator

R. Dale Hall, FSA, MAAA, CERA, CFA, Managing Director of Research

At the Swiss Re Institute:

Priya Dwarakanath, FSA, FIA, MAAA, Senior Vice President, Head Research & Strategic Forecasting L&H

Ian Lennox, FIA, Senior Product Actuary, Senior Products Actuary

Daniel Meier, PhD, Aktuar SAV, Vice President, Life & Health R&D Manager

Florian Rechfeld, PhD, Vice President, Life & Health R&D Manager

Drew Tindall, FSA, MAAA, Senior Vice President, Head Applied R&D Americas

Section 10: List of Participating Companies

AAA Life Insurance Company	Sun Life Financial (U.S.)
Amica Life Insurance Company	Sun Life Financial (Canada)
Athene	Swiss Re (U.S.)
Equitable Life	Swiss Re (Canada)
Farmers New World Life	Symetra
FBL Financial	Talcott Resolution
Fortitude Re	Thrivent Financial
Guardian	USAA
Jackson National Life Insurance	Woodmen of the World
Knights of Columbus (U.S.)	
Knights of Columbus (Canada)	
Lincoln Financial Group	
Manulife/John Hancock (U.S.)	
Manulife/John Hancock (Canada)	
Munich Re U.S. Life	
Munich Re Canada	
Nationwide Financial	
Optimum Re	
Partner Re (U.S.)	
Partner Re (Canada)	
Primerica	
Protective Life Insurance Group	
Prudential Financial	
Royal Neighbors of America	
Sammons Financial Group	
SCOR Global Life Americas	

Appendix A: Definitions

For the purposes of this survey, the following definitions were used:

Accelerated underwriting: This is used with a fully underwritten product. For applicants who meet specific company-defined guidelines, requirements such as examinations, blood and urine could be waived. These guidelines could include predictive models or scores.

Annuities: Includes all individual immediate and deferred annuity products.

Catastrophes: Includes natural and manmade catastrophes.

Durational mortality improvement: Describes the process of projecting the current era's mortality into the future. As a cohort proceeds in time from policy year to policy year, the mortality rates applicable in each year may be lower than defined by the base mortality table selected for the project. Durational mortality improvement is a way of keeping the annual mortality rate of a cohort up to date by applying future trends or expectations for mortality improvement.

Financial projections: Estimates of future financial outcomes for a company. The outcomes are used to develop projections for profit and loss statements, balance sheets, and other cash flow forecasts using best estimate assumptions for mortality, lapse and other relevant financial elements, over short- and/or long-term horizons.

Generational mortality improvement: Describes the process of bringing historical mortality experience up to the current era. For example, if an actuary has an experience study from an observation period ending several years ago, they might want to trend that experience to account for any mortality improvement from the observation period to the current projection date.

Life: Includes all individual fully underwritten term and permanent life insurance products.

Lifestyle behaviors: Includes behaviors such as diet, exercise, smoking, alcohol consumption and drug use.

Opioids: Includes both prescribed and street drugs.

Pollution: Includes air, water and land pollution.

Projection models:

- **CIA:** Canadian Institute of Actuaries. The CIA has developed at least two projection models.
- **CMI:** Continuous Mortality Investigations. These projection models were developed in the U.K. and are used in various countries. At least two CMI projection models are in use.
- **RPEC:** Retirement Plans Experience Committee of the SOA. Starting in 2014, RPEC has released annual updated mortality improvement scales, each based on the underlying RPEC_2014 model.

Smoking/vaping: Includes all forms and uses of tobacco, nicotine and marijuana-based products.

Socioeconomic inequality: Includes education and income levels, access to medical care, exposure to environmental hazards and geographical differences.

Appendix B: Survey

PLEASE RESPOND: MORTALITY IMPROVEMENT SURVEY—DUE MARCH 25, 2022

The Society of Actuaries Research Institute (SOA) is conducting a survey on mortality improvement. This is a follow-up to the [recently released mortality improvement study](#) conducted in 2019 with data as of the end of 2018. Thank you to those companies who participated! The SOA's new study will focus on mortality improvement at the end of 2021 to better understand company business practices in light of COVID-19.

This e-mail is being sent to chief actuaries of life insurance companies in Canada and the U.S. The survey requests information on life and/or annuity lines of business and for pricing and financial projection applications. If you are not the best person at your company to complete this survey, please forward it to the appropriate party or parties and copy Korrel Crawford at kcrawford@soa.org so we know who to follow up with.

You may submit one combined response for both lines of business or separate responses for each line. However, we request that separate responses be completed for each country. **Please coordinate with others at your company, as necessary, to ensure that we do not receive an individual survey response in pieces.**

Responses to the survey will be submitted to the Society of Actuaries Research Institute office and will be kept confidential. Only compiled results will be made available to the volunteer members of the group overseeing the study (POG). Responses will not be identifiable by company name to the POG.

Persons responding to the survey will receive a copy of the final report as soon as it is completed. The report will also later be available on the SOA's website and will be published in other SOA venues. We are targeting a June 2022 release date to address the industry demand for this study. Therefore, the deadline to complete this survey is **Friday, March 25, 2022**.

Ronora Stryker, SOA Research Institute Senior Practice Research Actuary, is the primary contact for any questions regarding this survey and can be reached at rstryker@soa.org. Korrel Crawford, SOA Research Institute Senior Research Administrator, may also be reached for questions at kcrawford@soa.org.

This is the first time we will be comparing mortality improvement survey results during the pandemic to the 2019 pre-pandemic results. We hope that your company will participate in this important survey.

To help us gauge the number of study participants, please respond to kcrawford@soa.org with your company's intention. If interested in participating but unable to meet the deadline, please also let us know when you will be able to provide the information.

SURVEY INTRODUCTION

INTRODUCTION

The Society of Actuaries Research Institute (SOA) is undertaking a survey to learn how companies are reacting to slowdowns in the level of mortality improvement due to COVID-19 and other causes.

This e-mail is being sent to one company representative. If you are not the best person at your company to complete this survey, please forward to the appropriate person and inform us by sending their name and email address to Korrel Crawford at kcrawford@soa.org. If more than one person at your company is required to complete this survey, please coordinate the responses and submit one survey response with your overall results. A copy of the survey questions are found [here](#).

PURPOSE OF THE STUDY

The focus of this survey is on durational (i.e., future) mortality improvement for insured lives. We will be surveying life and annuity insurance companies in Canada and the US. We are interested in similarities and differences, not just among the two countries, but also life and annuities and between pricing and financial projections.

The survey is split into five sections:

- Country and Company Information
- Characteristics of Durational Mortality Improvement Assumptions
- Limitations
- Opinions on Issues Impacting Durational Mortality Improvement
- Sample Durational Mortality Improvement Rates

When answering questions, respond based on the durational mortality improvement assumptions as of the end of 2021.

Responses to the survey will be submitted to the Society of Actuaries Research Institute office and will be kept confidential. Only compiled results will be made available to the volunteer members of the group overseeing the study (POG). Responses will not be identifiable by company name to the POG.

SURVEY REPORT

The report will be publicly available on the SOA website. We are targeting a **June 2022** release date to address the industry demand for this study.

BENEFITS TO CONTRIBUTORS

Contributors will receive an advanced copy of the report before it is posted on the website.

We appreciate your interest and look forward to your responses and sharing the results with you.

IMPORTANT DATES

We request your response, as described in the following sections, no later than **Friday, March 25, 2022**.

If you have any questions, please contact Ronora Stryker, SOA Research Institute Senior Practice Research Actuary at or Korrel Crawford, SOA Research Institute Senior Research Administrator, at kcrawford@soa.org.

DEFINITIONS

For the purposes of this survey, the following definitions will be used:

Annuities: Includes all individual immediate and deferred annuity products.

Catastrophes: Includes natural and man-made catastrophes.

Durational mortality improvement: Durational mortality improvement describes the process of projecting the current era's mortality into the future. As a cohort proceeds in time from policy year to policy year, the mortality rates applicable in each year may be lower than defined by the base mortality table selected for the project. Durational mortality improvement is a way of keeping the annual mortality rate of a cohort up-to-date by applying future trends or expectations for mortality improvement.

Financial projections: Estimates of future financial outcomes for a company. The outcomes are used to develop projections for profit and loss statements, balance sheets, and other cash flow forecasts using best estimate assumptions for mortality, lapse, and other relevant financial elements, over short and/or long-term horizons.

Life: Includes all individual fully underwritten term and permanent life insurance products.

Lifestyle behaviors: Includes behaviors such as diet, exercise, smoking, alcohol consumption, and drug use.

Opioids: Includes both prescribed and street drugs.

Pollution: Includes air, water, and land.

Smoking/vaping: Includes all forms and uses of tobacco, nicotine, and marijuana-based products.

Socioeconomic inequality: Includes education and income levels, access to medical care, exposure to environmental hazards, and geographical differences.

CONTACT INFORMATION

Please fill in the following contact information:

Name:

Company:

Email:

Phone Number:

SURVEY QUESTIONS

SECTION 1—COUNTRY AND COMPANY INFORMATION

1. Indicate for which country/company type you are answering this survey. If you are answering this survey for more than one country or more than one company type, please complete separate surveys for each country/company type.

	Direct Company	Reinsurer	N/A
Canada			
U.S.			

Additional Comments:

- 2a. Indicate the total number of policies in force at the end of 2021.

Life:

Annuities:

There will be a number of questions that ask for responses to both life and annuities. Respond to those questions with answers for the lines of business you have chosen above.

- 2b. Indicate if your company is still writing new business.

	Yes	No	N/A
Life			
Annuities			

Additional Comments:

SECTION 2—CHARACTERISTICS OF DURATIONAL MORTALITY IMPROVEMENT ASSUMPTIONS

Durational mortality improvement describes the process of projecting the current era's mortality into the future. As a cohort proceeds in time from policy year to policy year, the mortality rates applicable in each

year may be lower than defined by the base mortality table selected for the project. Future lower mortality might be indicated by:

- Medical advances in the treatment of diseases,
- Application of research into the factors affecting the aging process, and
- Trends toward healthier lifestyles.

Durational mortality improvement is a way of keeping the annual mortality rate of a cohort up-to-date by applying future trends or expectations for mortality improvement.

The requested information in Sections 2-4 relates to durational mortality improvement.

3a. Did you use **durational mortality improvement** for life and annuity pricing and/or financial projections?

Yes, answer 3b for each category you use it for

No, answer 3c for each category you do not use it for

3b. Indicate by which of the following characteristics your company's durational mortality improvement assumptions varied. Check all that apply.

	Yes	No	N/A
Attained age			
Issue age			
Duration			
Face amount			
Gender			
Product			
Smoking status			
Risk class			
Year-of-birth cohort			
Other 1			
Other 2			
Other 3			
Did not use durational mortality improvement			

3c. Indicate why your company did not use durational mortality improvement assumptions. Check all that apply.

	Pricing Life	Pricing Annuities	Financial Projections Life	Financial Projections Annuities
Did not believe it to be appropriate				
Did not believe it to be needed				
Limited experience/credibility				
To be conservative				
Difficult to determine assumptions				
Creates problems with illustrations				
Other 1				

Other 2				
Other 3				
Used durational mortality improvement				

Additional Comments:

SECTION 3—LIMITATIONS

4. Indicate your company’s limits, if any, for application of durational mortality improvement rates. Express rates as an annual percentage. For example, if the maximum rate is 2½ percent, express this as “2.5.” If there is no limit, indicate “N” for none.

	Pricing Life	Pricing Annuities	Financial Projections Life	Financial Projections Annuities
Minimum attained age for which durational mortality improvement is applied				
Maximum attained age for which durational mortality improvement is applied				
Maximum number of years for which durational mortality improvement is applied				
Maximum attained age for which the durational mortality improvement applied is 100 bps				
Maximum attained age for which the durational mortality improvement applied is 75 bps				
Maximum attained age for which the durational mortality improvement applied is 50 bps				
Maximum attained age for which the durational mortality improvement applied is 25 bps				
Minimum annual improvement rate				
Maximum annual improvement rate				
Other 1				
Other 2				
Other 3				

Additional Comments:

5. If your company recently made changes to its durational mortality improvement assumptions due to non-COVID reasons, indicate the method used. Check all that apply.

LIFE

	Pricing Life 2022 (Year 1)	Pricing Life 2032 (Year 11)	Pricing Life 2042 (Year 21)	Financial Projections Life 2022 (Year 1)	Financial Projections Life 2032 (Year 11)	Financial Projections Life 2042 (Year 21)
Increase all durational mortality improvement assumptions						
Decrease all durational mortality improvement assumptions						
Increase a limited number of durational mortality improvement assumptions						
Decrease a limited number of durational mortality improvement assumptions						
Other 1						
Other 2						
Other 3						
Not applicable (no change was made)						

ANNUITIES

	Pricing Annuities 2022 (Year 1)	Pricing Annuities 2032 (Year 11)	Pricing Annuities 2042 (Year 21)	Financial Projections Annuities 2022 (Year 1)	Financial Projections Annuities 2032 (Year 11)	Financial Projections Annuities 2042 (Year 21)
Increase all durational mortality improvement assumptions						
Decrease all durational mortality improvement assumptions						
Increase a limited number of durational mortality improvement assumptions						
Decrease a limited number of durational mortality improvement assumptions						
Other 1						
Other 2						
Other 3						
Not applicable (no change was made)						

Additional Comments:

SECTION 4—OPINIONS ON ISSUES IMPACTING DURATIONAL MORTALITY IMPROVEMENT

We are looking for your personal opinions on the questions in this section. Feel free to seek the advice of others, but the answers to these questions may or may not reflect your company’s practices.

6. Rank what you consider to be the top 5 drivers of future mortality **improvement** for 2022 (Year 1), 2032 (Year 11) and 2042 (Year 21), with 1 as the top driver for each column.

	Life 2022 (Year 1)	Annuities 2022 (Year 1)	Life 2032 (Year 11)	Annuities 2032 (Year 11)	Life 2042 (Year 21)	Annuities 2042 (Year 21)
Advances in the understanding of aging						
Reductions in mortality from Alzheimer’s disease						
Artificial intelligence/augmented reality						
Reductions in mortality from cancer						
Reductions in mortality from cardiovascular disease						
Reductions in mortality from COVID-19						
Fitness tracking						
Advances in understanding of genetics						
Changes in government programs/policy						
Access to health care/medical care						
Improvements in health care/medical care						
Healthier lifestyle behaviors						
Medical advances						
Precision medicine						
Self-driving cars						
Reduction in socioeconomic differences						
Reduction in levels of stress leading to improved mortality						
Technological advances						
Advances in underwriting methodologies						
Other 1						
Other 2						
Other 3						

Additional Comments:

7. Rank what you consider to be the top 5 drivers of future mortality **deterioration** for 2022 (Year 1), 2032 (Year 11) and 2042 (Year 21), with 1 as the top driver for each column.

	Life 2022 (Year 1)	Annuities 2022 (Year 1)	Life 2032 (Year 11)	Annuities 2032 (Year 11)	Life 2042 (Year 21)	Annuities 2042 (Year 21)
Accidents						
Opioids						
Antibiotic-resistant organisms						
Catastrophes						
Chemicals and hormones in the environment						
Pollution						
Cardiovascular disease						
Cancer						
Direct (acute) COVID-19						
Secondary/long COVID-19						
Diabetes						
Epidemics/pandemics						
Changes in government programs/policy						
Homicides						
Lifestyle behaviors						
Medical errors						
Mental health/depression						
Alzheimer's/dementia						
Obesity						
Stress						
Self-driving cars						
Smoking/vaping						
Suicides						
Socioeconomic inequality						
Technological changes						
Terrorist attacks						
Other 1						
Other 2						
Other 3						

Additional Comments:

8. In comparison to 2019 levels, indicate your thoughts on the annualized rate of improvement or deterioration for the following causes of death mortality in 2022 (Year 1), 2032 (Year 11) and 2042 (Year 21).

	Large (>2.50%) Deterioration	Moderate (1.5%–2.50%) Deterioration	Small (.5% –1.5%) Deterioration	No Improvement or Deterioration (–.5%–.5%)	Small (.5%–1.5%) Improvement	Moderate (1.5%–2.5%) Improvement	Large (>2.5%) Improvement
Cardiovascular in 2022							
Cancer in 2022							
COVID-19 in 2022							
Alzheimer’s and other dementias in 2022							
Accidents excluding drug overdoses in 2022							
Opioid/drug overdoses in 2022							
Flu/pneumonia in 2022							
Cardiovascular in 2032							
Cancer in 2032							
COVID-19 in 2032							
Alzheimer’s and other dementias in 2032							
Accidents excluding drug overdoses in 2032							
Opioid/drug overdoses in 2032							
Flu/pneumonia in 2032							
Cardiovascular in 2042							
Cancer in 2042							
COVID-19 in 2042							
Alzheimer’s and other dementias in 2042							
Accidents excluding drug overdoses in 2042							
Opioid/drug overdoses in 2042							
Flu/pneumonia in 2042							

Additional Comments:

SECTION 5—SAMPLE DURATIONAL MORTALITY IMPROVEMENT RATES

9. Using the durational mortality assumptions for your company’s most prevalent life and annuity products, complete the following tables with annual durational mortality improvement rates as of the end of 2021 **without any adjustments for COVID-19**. Express the rates as a percentage with two decimal places. For example, if the mortality improvement rate was $\frac{3}{4}$ percent, express this as “.75.”

For Life and Annuities Pricing and Financial Projections, enter the rates for Projection years 2022 (Year 1), 2032 (Year 11), and 2042 (Year 21).

For Life Pricing, if your company uses an attained age scale, enter the rates for the gender, risk class, and attained ages shown in the table. If your company uses a select and ultimate scale, enter the ultimate rates for the gender, risk class, and attained ages shown in the table.

For Annuities Pricing, enter the rates for the gender and attained ages shown in the table.

MALE, BEST PREFERRED NONSMOKER RISK CLASS

	Life Pricing 2022 (Year 1)	Life Pricing 2032 (Year 11)	Life Pricing 2042 (Year 21)	Life Financial Projections 2022 (Year 1)	Life Financial Projections 2032 (Year 11)	Life Financial Projections 2042 (Year 21)
Attained age 35						
Attained age 55						
Attained age 75						
Attained age 85						
Attained age 95						

MALE, RESIDUAL STANDARD NONSMOKER RISK CLASS

	Life Pricing 2022 (Year 1)	Life Pricing 2032 (Year 11)	Life Pricing 2042 (Year 21)	Life Financial Projections 2022 (Year 1)	Life Financial Projections 2032 (Year 11)	Life Financial Projections 2042 (Year 21)
Attained age 35						
Attained age 55						
Attained age 75						
Attained age 85						
Attained age 95						

MALE, BEST PREFERRED SMOKER RISK CLASS

	Life Pricing 2022 (Year 1)	Life Pricing 2032 (Year 11)	Life Pricing 2042 (Year 21)	Life Financial Projections 2022 (Year 1)	Life Financial Projections 2032 (Year 11)	Life - Financial Projections 2042 (Year 21)
Attained age 35						
Attained age 55						
Attained age 75						
Attained age 85						
Attained age 95						

FEMALE, BEST PREFERRED NONSMOKER RISK CLASS

	Life Pricing 2022 (Year 1)	Life Pricing 2032 (Year 11)	Life Pricing 2042 (Year 21)	Life Financial Projections 2022 (Year 1)	Life Financial Projections 2032 (Year 11)	Life Financial Projections 2042 (Year 21)
Attained age 35						
Attained age 55						
Attained age 75						
Attained age 85						
Attained age 95						

FEMALE, RESIDUAL STANDARD NONSMOKER RISK CLASS

	Life Pricing 2022 (Year 1)	Life Pricing 2032 (Year 11)	Life Pricing 2042 (Year 21)	Life Financial Projections 2022 (Year 1)	Life Financial Projections 2032 (Year 11)	Life Financial Projections 2042 (Year 21)
Attained age 35						
Attained age 55						
Attained age 75						
Attained age 85						
Attained age 95						

FEMALE, BEST PREFERRED SMOKER RISK CLASS

	Life Pricing 2022 (Year 1)	Life Pricing 2032 (Year 11)	Life Pricing 2042 (Year 21)	Life Financial Projections 2022 (Year 1)	Life Financial Projections 2032 (Year 11)	Life Financial Projections 2042 (Year 21)
Attained age 35						
Attained age 55						
Attained age 75						

Attained age 85						
Attained age 95						

MALE ANNUITIES

	Annuity Pricing 2022 (Year 1)	Annuity Pricing 2032 (Year 11)	Annuity Pricing 2042 (Year 21)	Annuity Financial Projections 2022 (Year 1)	Annuity Financial Projections 2032 (Year 11)	Annuity Financial Projections 2042 (Year 21)
Attained age 35						
Attained age 55						
Attained age 75						
Attained age 85						
Attained age 95						

FEMALE ANNUITIES

	Annuity Pricing 2022 (Year 1)	Annuity Pricing 2032 (Year 11)	Annuity Pricing 2042 (Year 21)	Annuity Financial Projections 2022 (Year 1)	Annuity Financial Projections 2032 (Year 11)	Annuity Financial Projections 2042 (Year 21)
Attained age 35						
Attained age 55						
Attained age 75						
Attained age 85						
Attained age 95						

Additional Comments:

10. For the annual durational improvement rates provided, do you adjust them for COVID-19?

Yes, answer questions 11–14 and then the survey is complete. Please submit your responses to this survey.

No, answer questions 10 a and 10 b below.

10 a. Are you planning on adjusting your durational mortality improvement rates for COVID-19?

- Yes
- No
- I do not know

10 b. Do you adjust your underlying mortality assumptions for COVID-19?

Yes, answer questions 15–17 and then the survey is complete. Please submit your responses to this survey.

No, the survey is complete. Please submit your responses to this survey.

11. Complete the following tables with the annual durational mortality improvement adjustment for **COVID-19 as of the end of 2021**. Express the adjustment as a percentage with two decimal places. For example, if mortality improvement is reduced by 25 bps, express this as “-.25.” If the reduction is 0, express this as “.00.” If mortality improvement is increased by 25 bps, express this as “.25.”

For Life and Annuities Pricing and Financial Projections, enter the adjustment factors for Projection years 1, 11, and 21.

For Life Pricing, if your company uses an attained age scale, enter the adjustment factors for the gender and attained ages shown in the table. If your company uses a select and ultimate scale, enter the ultimate rates for the gender and attained ages shown in the table.

For Annuities Pricing, enter the rates for the gender and attained ages shown in the table.

MALE LIFE

	Life Pricing 2022 (Year 1)	Life Pricing 2032 (Year 11)	Life Pricing 2042 (Year 21)	Life Financial Projections 2022 (Year 1)	Life Financial Projections 2032 (Year 11)	Life Financial Projections 2042 (Year 21)
Attained age 35						
Attained age 55						
Attained age 75						

FEMALE LIFE

	Life Pricing 2022 (Year 1)	Life Pricing 2032 (Year 11)	Life Pricing 2042 (Year 21)	Life Financial Projections 2022 (Year 1)	Life Financial Projections 2032 (Year 11)	Life Financial Projections 2042 (Year 21)
Attained age 35						
Attained age 55						
Attained age 75						

MALE ANNUITY

	Annuity Pricing 2022 (Year 1)	Annuity Pricing 2032 (Year 11)	Annuity Pricing 2042 (Year 21)	Annuity Financial Projections 2022 (Year 1)	Annuity Financial Projections 2032 (Year 11)	Annuity Financial Projections 2042 (Year 21)
Attained age 35						
Attained age 55						
Attained age 75						

FEMALE ANNUITY

	Annuity Pricing 2022 (Year 1)	Annuity Pricing 2032 (Year 11)	Annuity Pricing 2042 (Year 21)	Annuity Financial Projections 2022 (Year 1)	Annuity Financial Projections 2032 (Year 11)	Annuity Financial Projections 2042 (Year 21)
Attained age 35						
Attained age 55						
Attained age 75						

Additional Comments:

12. Indicate by which of the following characteristics your company's annual durational mortality improvement COVID-19 adjustment varies. Please select all that apply.

	Yes	No	N/A
Attained age			
Issue age			
Duration			
Face amount			
Gender			
Product			
Smoking status			
Risk class			
Year-of-birth cohort			
Other 1			
Other 2			
Other 3			
Did not use a COVID-19 mortality adjustment			

13. In developing your annual durational mortality improvement COVID-19 adjustments, what are your considerations? Please select all that apply.

LIFE

	Pricing Life 2022 (Year 1)	Pricing Life 2032 (Year 11)	Pricing Life 2042 (Year 21)	Financial Projections Life 2022 (Year 1)	Financial Projections Life 2032 (Year 11)	Financial Projections Life 2042 (Year 21)
Change in COVID-19 vaccination/booster rates						
Change in virulence of current or future COVID-19 strains/variants						
New COVID-19 medical treatments						
Change in public adherence to mitigation strategies						
Better mortality occurs as more and more older, less healthy individuals die from COVID-19 leaving a healthier population than pre-pandemic						
Worse mortality occurs from long COVID and indirect COVID-19 impacts leaving an unhealthier population than pre-pandemic						
Lower flu deaths compared to pre-pandemic levels						
COVID-19 becomes endemic						
Postponement of medical treatment due to COVID-19 resulting in worse mortality						
Other _____						
Other _____						

ANNUITY

	Pricing Annuity 2022 (Year 1)	Pricing Annuity 2032 (Year 11)	Pricing Annuity 2042 (Year 21)	Financial Projections Annuity 2022 (Year 1)	Financial Projections Annuity 2032 (Year 11)	Financial Projections Annuity 2042 (Year 21)
Change in COVID-19 vaccination/booster rates						
Change in virulence of current or future COVID-19 strains/variants						
New COVID-19 medical treatments						
Change in public adherence to mitigation strategies						
Better mortality occurs as more and more older, less healthy individuals die from COVID-19 leaving a healthier population than pre-pandemic						
Worse mortality occurs from long COVID and indirect COVID-19 impacts leaving an unhealthier population than pre-pandemic						
Lower flu deaths compared to pre-pandemic levels						
COVID-19 becomes endemic						
Postponement of medical treatment due to COVID-19 resulting in worse mortality						
Other _____						
Other _____						

Additional Comments:

14. Do you also adjust your underlying mortality assumptions for COVID-19?

Yes, please submit your responses to this survey.

No, please submit your responses to this survey.

15. Complete the following tables with the annual adjustment to your underlying mortality assumptions **for COVID-19 as of the end of 2021**. Express the adjustment as a percentage with two decimal places. For example, if mortality is increased by 10%, express this as “.10.” If the load is 0%, express this as “.00.” If mortality is reduced by 10%, express it as “-.10.”

For Life and Annuities Pricing and Financial Projections, enter the adjustment factors for Projection years 2022 (Year 1), 2032 (Year 11), and 2042 (Year 21).

For Life Pricing, if your company uses an attained age scale, enter the adjustment factors for the gender and attained ages shown in the table. If your company uses a select and ultimate scale, enter the ultimate rates for the gender and attained ages shown in the table.

For Annuities Pricing, enter the rates for the gender and attained ages shown in the table.

MALE LIFE

	Life Pricing 2022 (Year 1)	Life Pricing 2032 (Year 11)	Life Pricing 2042 (Year 21)	Life Financial Projections 2022 (Year 1)	Life Financial Projections 2032 (Year 11)	Life Financial Projections 2042 (Year 21)
Attained age 35						
Attained age 55						
Attained age 75						

FEMALE LIFE

	Life Pricing 2022 (Year 1)	Life Pricing 2032 (Year 11)	Life Pricing 2042 (Year 21)	Life Financial Projections 2022 (Year 1)	Life Financial Projections 2032 (Year 11)	Life Financial Projections 2042 (Year 21)
Attained age 35						
Attained age 55						
Attained age 75						

MALE ANNUITY

	Annuity Pricing 2022 (Year 1)	Annuity Pricing 2032 (Year 11)	Annuity Pricing 2042 (Year 21)	Annuity Financial Projections 2022 (Year 1)	Annuity Financial Projections 2032 (Year 11)	Annuity Financial Projections 2042 (Year 21)
Attained age 35						
Attained age 55						
Attained age 75						

FEMALE ANNUITY

	Annuity Pricing 2022 (Year 1)	Annuity Pricing 2032 (Year 11)	Annuity Pricing 2042 (Year 21)	Annuity Financial Projections 2022 (Year 1)	Annuity Financial Projections 2032 (Year 11)	Annuity Financial Projections 2042 (Year 21)
Attained age 35						
Attained age 55						
Attained age 75						

Additional Comments:

16. Indicate by which of the following characteristics your company's COVID-19 mortality adjustment varies. Check all that apply.

	Yes	No	N/A
Attained age			
Issue age			
Duration			
Face amount			
Gender			
Product			
Smoking status			
Risk class			
Year-of-birth cohort			
Other 1			
Other 2			
Other 3			
Did not use a COVID-19 mortality adjustment			

17. In developing your COVID-19 mortality adjustments, what are your considerations? Please select all that apply

LIFE

	Pricing Life 2022 (Year 1)	Pricing Life 2032 (Year 11)	Pricing Life 2042 (Year 21)	Financial Projections Life 2022 (Year 1)	Financial Projections Life 2032 (Year 11)	Financial Projections Life 2042 (Year 21)
Change in COVID-19 vaccination/booster rates						
Change in virulence of current or future COVID-19 strains/variants						
New COVID-19 medical treatments						
Change in public adherence to mitigation strategies						
Better mortality occurs as more and more older, less healthy individuals die from COVID-19 leaving a healthier population than pre-pandemic						
Worse mortality occurs from long COVID and indirect COVID-19 impacts leaving an unhealthier population than pre-pandemic						
Lower flu deaths compared to pre-pandemic levels						
COVID-19 becomes endemic						
Postponement of medical treatment due to COVID-19 resulting in worse mortality						
Other _____						
Other _____						

ANNUITY

	Annuity Pricing 2022 (Year 1)	Annuity Pricing 2032 (Year 11)	Annuity Pricing 2042 (Year 21)	Annuity Financial Projections 2022 (Year 1)	Annuity Financial Projections 2032 (Year 11)	Annuity Financial Projections 2042 (Year 21)
Change in COVID-19 vaccination/booster rates						
Change in virulence of current or future COVID-19 strains/variants						
New COVID-19 medical treatments						
Change in public adherence to mitigation strategies						
Better mortality occurs as more and more older, less healthy individuals die from COVID-19 leaving a healthier population than pre-pandemic						
Worse mortality occurs from long COVID and indirect COVID-19 impacts leaving an unhealthier population than pre-pandemic						
Lower flu deaths compared to pre-pandemic levels						
COVID-19 becomes endemic						
Postponement of medical treatment due to COVID-19 resulting in worse mortality						
Other _____						
Other _____						

Additional Comments:

Appendix C: Additional Analysis

QUESTION 4

Question 4 asks about any limitations when applying durational mortality improvement rates. Analysis here focuses on the average as some splits had limited responses. Given that information, none of the splits seem to materially differ from the others.

Respondent Type	Maximum Respondents
Total	23
U.S. only	18
Canada only	5
Direct writers	15
Reinsurers	8
U.S. direct writers	15
U.S. reinsurers	4
Canada direct writers	3
Canada reinsurers	2

Average Minimum Attained Age	Pricing Life	Pricing Annuities	Financial Projections Life	Financial Projections Annuities
Total	12	8	14	10
U.S. only	13	9	15	11
Canada only	9	-	9	-
Direct writers	15	8	15	8
Reinsurers	8	N/A	11	20
U.S. direct writers	17	9	17	10
Canada direct writers	-	-	-	-
U.S. reinsurers	5	N/A	10	20
Canada reinsurers	13	N/A	13	N/A
Average Maximum Attained Age	Pricing Life	Pricing Annuities	Financial Projections Life	Financial Projections Annuities
Total	103	106	105	109
U.S. only	102	106	105	109
Canada only	104	104	106	110
Direct writers	103	106	104	108
Reinsurers	102	N/A	107	119
U.S. direct writers	103	106	104	108
Canada direct writers	102	104	104	110
U.S. reinsurers	100	N/A	108	119

Canada reinsurers	107	N/A	107	N/A
Average Maximum Number of Years	Pricing Life	Pricing Annuities	Financial Projections Life	Financial Projections Annuities
Total	33	65	38	60
U.S. only	35	65	39	60
Canada only	20	N/A	20	N/A
Direct writers	29	65	34	67
Reinsurers	43	N/A	43	30
U.S. direct writers	30	65	34	67
Canada direct writers	20	N/A	N/A	N/A
U.S. reinsurers	49	N/A	49	30
Canada reinsurers	20	N/A	20	N/A
Average Maximum Attained Age 100 bps	Pricing Life	Pricing Annuities	Financial Projections Life	Financial Projections Annuities
Total	85	82	80	85
U.S. only	83	81	78	85
Canada only	91	90	91	86
Direct writers	82	82	76	85
Reinsurers	90	N/A	89	85
U.S. direct writers	82	81	74	85
Canada direct writers	90	90	90	86
U.S. reinsurers	88	N/A	87	85
Canada reinsurers	92	N/A	92	N/A
Average Maximum Attained Age 75 bps	Pricing Life	Pricing Annuities	Financial Projections Life	Financial Projections Annuities
Total	86	89	87	90
U.S. only	84	88	86	89
Canada only	96	94	96	94
Direct writers	83	89	85	90
Reinsurers	94	N/A	94	91
U.S. direct writers	82	88	84	89
Canada direct writers	94	94	94	94
U.S. reinsurers	92	N/A	92	91
Canada reinsurers	97	N/A	97	N/A
Average Maximum Attained Age 50 bps	Pricing Life	Pricing Annuities	Financial Projections Life	Financial Projections Annuities
Total	96	96	97	97
U.S. only	95	96	96	97

Canada only	100	97	99	97
Direct writers	96	96	95	97
Reinsurers	98	N/A	100	100
U.S. direct writers	95	96	95	97
Canada direct writers	99	97	97	97
U.S. reinsurers	96	N/A	99	100
Canada reinsurers	101	N/A	101	N/A
Average Maximum Attained Age 25 bps	Pricing Life	Pricing Annuities	Financial Projections Life	Financial Projections Annuities
Total	101	100	102	102
U.S. only	100	100	102	102
Canada only	102	101	103	101
Direct writers	101	100	102	101
Reinsurers	101	N/A	104	110
U.S. direct writers	101	100	102	101
Canada direct writers	101	101	101	101
U.S. reinsurers	99	N/A	104	110
Canada reinsurers	104	N/A	104	N/A
Average Minimum Annual Improvement Rate	Pricing Life	Pricing Annuities	Financial Projections Life	Financial Projections Annuities
Total	0.08	0.10	0.11	0.09
U.S. only	0.07	0.11	0.14	0.07
Canada only	0.13	—	—	0.25
Direct writers	0.2	0.1	0.2	0.1
Reinsurers	(0.3)	N/A	0.0	0.0
U.S. direct writers	0.22	0.11	0.18	0.07
Canada direct writers	0.25	—	—	0.25
U.S. reinsurers	(0.50)	N/A	0.01	0.02
Canada reinsurers	—	N/A	—	N/A
Average Maximum Annual Improvement Rate	Pricing Life	Pricing Annuities	Financial Projections Life	Financial Projections Annuities
Total	1.48	1.41	1.54	1.41
U.S. only	1.41	1.40	1.44	1.40
Canada only	1.74	1.50	2.10	1.50
Direct writers	1.3	1.4	1.4	1.4
Reinsurers	2.1	N/A	1.9	1.3
U.S. direct writers	1.30	1.40	1.35	1.41
Canada direct writers	1.08	1.50	1.50	1.50
U.S. reinsurers	1.83	N/A	1.72	1.27

Canada reinsurers	2.40	N/A	2.40	N/A
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Maximum Attained Age for Which the Durational Mortality Improvement Applied Is 100 bps	Pricing Life	Pricing Annuities	Financial Projections Life	Financial Projections Annuities
Lowest	53	53	0	81
Highest	94	90	94	90
Average	85	82	80	85
Most common	N(5); 85(3)	N(4); 85(3)	N(4); 85(4)	N(5); 85(4)
Responded	21	15	22	18

For those with variable factors, the survey asked for the maximum age where the factor was at least a certain level (note that 100 bps is 1%). For the 100 bps level the average maximum attained age was in the 80s, with the highest in the 90s. For smaller levels the results reach to higher average ages.

Maximum Attained Age for Which the Durational Mortality Improvement Applied Is 75 bps	Pricing Life	Pricing Annuities	Financial Projections Life	Financial Projections Annuities
Lowest	18	84	18	84
Highest	99	94	99	94
Average	86	89	87	90
Most common	N(4); 90(2)	N(4); 89(3)	N(3); 99(3)	N(7); 94(2)
Responded	21	15	22	18

Maximum Attained Age for Which the Durational Mortality Improvement Applied Is 50 bps	Pricing Life	Pricing Annuities	Financial Projections Life	Financial Projections Annuities
Lowest	84	91	84	91
Highest	119	119	119	119
Average	96	96	97	97
Most common	N(4); 95(2)	N(4); 97(2)	N(3); 97(4)	N(7); 97(3)
Responded	23	15	21	18

Maximum Attained Age for Which the Durational Mortality Improvement Applied Is 25 bps	Pricing Life	Pricing Annuities	Financial Projections Life	Financial Projections Annuities
Lowest	84	94	84	98
Highest	119	119	119	119
Average	101	100	102	102
Most common	N(5); 97, 100(2)	N(4); 98(4)	N(4); 97(3)	N(7); 98(5)
Responded	22	14	20	17

QUESTION 5 LIFE

5. If your company recently made changes to its durational mortality improvement assumptions due to non-COVID reasons, indicate the method used. Check all that apply.

Life: Change	Pricing Life 2022 (Year 1)	Pricing Life 2032 (Year 11)	Pricing Life 2042 (Year 21)	Financial Projections Life 2022 (Year 1)	Financial Projections Life 2032 (Year 11)	Financial Projections Life 2042 (Year 21)
Decrease a limited number of durational mortality improvement assumptions	5	4	4	5	4	4
Increase a limited number of durational mortality improvement assumptions	3	3	2	4	3	2
Decrease all durational mortality improvement assumptions				1	1	
Increase all durational mortality improvement assumptions						
Not applicable (no change was made)	17	17	17	20	21	20

QUESTION 5 ANNUITY

Annuity: Change	Pricing Life 2022 (Year 1)	Pricing Life 2032 (Year 11)	Pricing Life 2042 (Year 21)	Financial Projections Life 2022 (Year 1)	Financial Projections Life 2032 (Year 11)	Financial Projections Life 2042 (Year 21)
Increase all durational mortality improvement assumptions						
Decrease all durational mortality improvement assumptions						
Increase a limited number of durational mortality improvement assumptions						
Decrease a limited number of durational mortality improvement assumptions						
Not applicable (no change was made)	17	17	17	18	18	18

QUESTION 6 LIFE

6. Rank what you consider to be the top 5 drivers of future mortality **improvement** for 2022 (Year 1), 2032 (Year 11) and 2042 (Year 21), with 1 as the top driver for each column.

Driver	Life 2022					Life 2032					Life 2042				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Reductions in mortality from COVID-19	15	1	1												
Reductions in mortality from cancer	6	4	3	4	3	12	6	2	4	3	9	5	1	5	2
Medical advances	2	7	1	4	4	8	4	6		4	7	2	5	2	1
Reductions in mortality from cardiovascular disease	3	2	5	2	1	1	4	5	2	2	1	2	2	2	
Improvements in health care/medical care	3	2	5	2	1	2	3	3	4	3	2	2	2	4	3
Access to health care/medical care		6	1	3	1		1	1	2	1			2	2	1
Healthier lifestyle behaviors		1	3	3	6	1	1	1	4	3	1	1	2	3	
Reduction in levels of stress leading to improved mortality	1	2	2	1		1									2
Advances in underwriting methodologies		2	2	1	2	1				2	1				2
Technological advances			3	1	4		2	3	3		1	2		2	4
Reductions in mortality from Alzheimer's disease		1	1	2	3	3	1	1	1	3	2	1	3		2
Precision medicine		1	2	2		1	2	3	1	1			4	1	
Changes in government programs/policy		2	1		1		2			2		1			1
Advances in the understanding of aging	1		1	1	1		2	3	5	1	3	3	4	4	1
Advances in understanding of genetics				4	2	1	3	1	3	5	1	6	4	2	6
Fitness tracking				1	1					1					1
Reduction in socioeconomic differences					1			1	1					2	
Artificial intelligence/augmented reality									1		1	2			
Self-driving cars								1				2			2

Driver: Life 2022	Weighted	Respondents	Avg Weight
Reductions in mortality from COVID-19	82	17	4.8
Reductions in mortality from cancer	66	20	3.3
Medical advances	53	18	2.9
Reductions in mortality from cardiovascular disease	43	13	3.3
Improvements in health care/medical care	43	13	3.3
Access to health care/medical care	34	11	3.1
Healthier lifestyle behaviors	25	13	1.9
Reduction in levels of stress leading to improved mortality	21	6	3.5
Advances in underwriting methodologies	18	7	2.6
Technological advances	15	8	1.9
Reductions in mortality from Alzheimer's disease	14	7	2.0
Precision medicine	14	5	2.8
Changes in government programs/policy	12	4	3.0
Advances in the understanding of aging	11	4	2.8
Advances in understanding of genetics	10	6	1.7
Fitness tracking	3	2	1.5
Reduction in socioeconomic differences	1	1	1.0
Artificial intelligence/augmented reality	0	0	0
Self-driving cars	0	0	0

Driver: Life 2032	Weighted	Respondents	Avg Weight
Reductions in mortality from cancer	101	27	3.7
Medical advances	78	22	3.5
Reductions in mortality from cardiovascular disease	42	14	3.0
Improvements in health care/medical care	42	15	2.8
Advances in understanding of genetics	31	13	2.4
Advances in the understanding of aging	28	11	2.5
Reductions in mortality from Alzheimer's disease	27	9	3.0
Precision medicine	25	8	3.1
Healthier lifestyle behaviors	23	10	2.3
Technological advances	23	8	2.9
Access to health care/medical care	12	5	2.4
Changes in government programs/policy	10	4	2.5
Advances in underwriting methodologies	7	3	2.3
Reduction in socioeconomic differences	5	2	2.5
Reduction in levels of stress leading to improved mortality	5	1	5.0
Self-driving cars	3	1	3.0
Artificial intelligence/augmented reality	2	1	2.0
Fitness tracking	1	1	1.0
Reductions in mortality from COVID-19	0	0	0

Driver: Life 2042	Weighted	Respondents	Avg Weight
Reductions in mortality from cancer	80	22	3.6
Medical advances	63	17	3.7
Advances in understanding of genetics	51	19	2.7
Advances in the understanding of aging	48	15	3.2
Improvements in health care/medical care	35	13	2.7
Reductions in mortality from Alzheimer's disease	25	8	3.1
Reductions in mortality from cardiovascular disease	23	7	3.3
Healthier lifestyle behaviors	21	7	3.0
Technological advances	21	9	2.3
Precision medicine	14	5	2.8
Artificial intelligence/augmented reality	13	3	4.3
Access to health care/medical care	11	5	2.2
Self-driving cars	10	4	2.5
Advances in underwriting methodologies	7	3	2.3
Changes in government programs/policy	5	2	2.5
Reduction in socioeconomic differences	4	2	2.0
Reduction in levels of stress leading to improved mortality	2	2	1.0
Fitness tracking	1	1	1.0
Reductions in mortality from COVID-19	0	0	0

QUESTION 6 ANNUITIES

6. Rank what you consider to be the top 5 drivers of future mortality **improvement** for 2022 (Year 1), 2032 (Year 11) and 2042 (Year 21), with 1 as the top driver for each column.

Driver	Annuity 2022					Annuity 2032					Annuity 2042				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Reductions in mortality from COVID-19	12			1											
Reductions in mortality from cancer	4	1	2	1	2	7	6	1	2	2	7	3		3	2
Medical advances	1	4	1	4	2	7	1	5		2	5	1	5		1
Access to health care/medical care		5	1	3	1			1	2	1			1	2	1
Improvements in health care/medical care		2	6	1	1	1	3	2	2	2	1		2	2	2
Reductions in mortality from cardiovascular disease	3	2	1			1	3	2		1	1	2	1		
Healthier lifestyle behaviors		1	3	3	3	1	1	1	3		1	1	2	2	
Reduction in levels of stress leading to improved mortality		3	2	1					1						2
Reductions in mortality from Alzheimer's disease	1	1	1		1	1	1		1			1			2
Advances in the understanding of aging		1	1	1	1	1		2	3	1		2	3	4	1
Technological advances		1		1	3		1	1	3		2	1		2	1
Advances in understanding of genetics				3	2	1	2	1	2	5	1	4	1	2	4
Precision medicine			2	1				3		1			3		
Changes in government programs/policy			1		1		2			2		1			
Fitness tracking				1	1					1					1
Advances in underwriting methodologies					2					1					1
Reduction in socioeconomic differences					1				1						2
Artificial intelligence/augmented reality											1	1	1		
Self-driving cars								1		1			2		

Driver: Annuity 2022	Weighted	Respondents	Avg Weight
Reductions in mortality from COVID-19	62	13	4.8
Reductions in mortality from cancer	34	10	3.4
Medical advances	34	12	2.8
Access to health care/medical care	30	10	3.0
Improvements in health care/medical care	29	10	2.9
Reductions in mortality from cardiovascular disease	26	6	4.3
Healthier lifestyle behaviors	22	10	2.2
Reduction in levels of stress leading to improved mortality	20	6	3.3
Reductions in mortality from Alzheimer's disease	13	4	3.2
Advances in the understanding of aging	10	4	2.5
Technological advances	9	5	1.8
Advances in understanding of genetics	8	5	1.6
Precision medicine	8	3	2.7
Changes in government programs/policy	4	2	2.0
Fitness tracking	3	2	1.5
Advances in underwriting methodologies	2	2	1.0
Reduction in socioeconomic differences	1	1	1.0
Artificial intelligence/augmented reality	0	0	0
Self-driving cars	0	0	0

Driver: Annuity 2032	Weighted	Respondents	Avg Weight
Reductions in mortality from cancer	68	18	3.8
Medical advances	56	15	3.7
Improvements in health care/medical care	29	10	2.9
Advances in understanding of genetics	25	11	2.3
Reductions in mortality from cardiovascular disease	24	7	3.4
Advances in the understanding of aging	18	7	2.6
Healthier lifestyle behaviors	18	6	3.0
Technological advances	13	5	2.6
Reductions in mortality from Alzheimer's disease	11	3	3.7
Changes in government programs/policy	10	4	2.5
Precision medicine	10	4	2.5
Access to health care/medical care	8	4	2.0
Self-driving cars	4	2	2.0
Reduction in socioeconomic differences	2	1	2.0
Reduction in levels of stress leading to improved mortality	2	1	2.0
Fitness tracking	1	1	1.0
Advances in underwriting methodologies	1	1	1.0
Artificial intelligence/augmented reality	0	0	0
Reductions in mortality from COVID-19	0	0	0

Driver: Annuity 2042	Weighted	Respondents	Avg Weight
Reductions in mortality from cancer	55	15	3.7
Medical advances	45	12	3.8
Advances in understanding of genetics	32	12	2.7
Advances in the understanding of aging	26	10	2.6
Healthier lifestyle behaviors	19	6	3.2
Technological advances	19	6	3.2
Improvements in health care/medical care	17	7	2.4
Reductions in mortality from cardiovascular disease	16	4	4.0
Artificial intelligence/augmented reality	12	3	4.0
Precision medicine	9	3	3.0
Access to health care/medical care	8	4	2.0
Self-driving cars	8	2	4.0
Reductions in mortality from Alzheimer's disease	6	3	2.0
Changes in government programs/policy	4	1	4.0
Reduction in socioeconomic differences	4	2	2.0
Reduction in levels of stress leading to improved mortality	2	2	1.0
Fitness tracking	1	1	1.0
Advances in underwriting methodologies	1	1	1.0
Reductions in mortality from COVID-19	0	0	0

QUESTION 7 LIFE

7. Rank what you consider to be the top 5 drivers of future mortality **deterioration** for 2022 (Year 1), 2032 (Year 11) and 2042 (Year 21), with 1 as the top driver for each column.

Driver	Life 2022					Life 2032					Life 2042				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Opioids	5	6	5	4	2	5	3	2	3	2	1	2	2	2	1
Direct (acute) COVID	12		4							1					1
Obesity	5		7	2	2	7	4	1	3	2	7	3	3	1	3
Mental health/depression	2	4	2	3	5	1	2	4	5	3	1	5	2	4	3
Cancer	2	3	1	1	1	1	1			2	1	1			
Epidemics/pandemics	2	1	3	2	1	1	2		1	3	2	1	1	3	2
Stress	2	2	1	2	2	3	2	3		1	1	2	3	1	2
Lifestyle behaviors		3	1	3	1	3	1	2	1		4		2	1	
Cardiovascular disease	1	2	2	1		3	2			1	3	1		1	1
Secondary/long COVID		3		3	1	2	1	2	2				1		
Diabetes		4			3	1	4	2	1	3		1	3	3	2
Suicides		1	1	3	3			1		2				2	2
Accidents		1		3	2			1		1					3
Socioeconomic inequality		1	1	1	2	1	2	3	2	1	2	3	1	2	1
Alzheimer's/dementia				2				4	2			3	1	1	1
Homicides			1				1								
Catastrophes					1		4		1	1	3	2	2	1	1

Chemicals and hormones in the environment	1	1	2	1	1	2
Pollution	1	1	1	2	2	1 1 2 3
Antibiotic-resistant organisms	1			1	2	1 3
Changes in government programs/policy			2	2		1 1 2
Medical errors						
Self-driving cars						
Smoking/vaping		1	1		1	
Technological changes						2
Terrorist attacks			2	1	2	2 1

Driver: Life 2022	Weighted	Respondent	Avg Weight
Opioids	74	22	3.4
Direct (acute) COVID	72	16	4.5
Obesity	52	16	3.2
Mental health/depression	43	16	2.7
Cancer	28	8	3.5
Epidemics/pandemics	28	9	3.1
Stress	27	9	3.0
Lifestyle behaviors	22	8	2.8
Cardiovascular disease	21	6	3.5
Secondary/long COVID	19	7	2.7
Diabetes	19	7	2.7
Suicides	16	8	2.0
Accidents	12	6	2.0
Socioeconomic inequality	11	5	2.2
Alzheimer's/dementia	4	2	2.0
Homicides	3	1	3.0
Catastrophes	1	1	1.0
Chemicals and hormones in the environment	1	1	1.0
Pollution	1	1	1.0
Antibiotic-resistant organisms	0	0	0
Changes in government programs/policy	0	0	0
Medical errors	0	0	0
Self-driving cars	0	0	0
Smoking/vaping	0	0	0
Technological changes	0	0	0
Terrorist attacks	0	0	0
Other 1	4	2	2.0

Driver: Life 2032	Weighted	Respondent	Avg Weight
Obesity	62	17	3.6
Opioids	51	15	3.4
Mental health/depression	38	15	2.5
Stress	33	9	3.7
Diabetes	32	11	2.9
Lifestyle behaviors	27	7	3.9
Socioeconomic inequality	27	9	3.0
Cardiovascular disease	24	6	4.0
Secondary/long COVID	24	7	3.4
Catastrophes	19	6	3.2
Epidemics/pandemics	18	7	2.6
Alzheimer's/dementia	16	6	2.7
Pollution	13	6	2.2
Cancer	11	4	2.8
Chemicals and hormones in the environment	8	4	2.0
Terrorist attacks	8	3	2.7
Antibiotic-resistant organisms	6	2	3.0
Changes in government programs/policy	6	4	1.5
Smoking/vaping	6	2	3.0
Suicides	5	3	1.7
Accidents	4	2	2.0
Homicides	4	1	4.0
Direct (acute) COVID	1	1	1.0
Medical errors	0	0	0
Self-driving cars	0	0	0
Technological changes	0	0	0
Other 1	0	0	0
Other 2	5	1	5.0
Other 3	6	2	3.0

Driver: Life 2042	Weighted	Respondents	Avg Weight
Obesity	61	17	3.6
Mental health/depression	42	15	2.8
Catastrophes	32	9	3.6
Socioeconomic inequality	30	9	3.3
Lifestyle behaviors	28	7	4.0
Stress	26	9	2.9
Epidemics/pandemics	25	9	2.8
Opioids	24	8	3.0
Cardiovascular disease	22	6	3.7
Pollution	21	7	3.0
Diabetes	21	9	2.3
Alzheimer's/dementia	18	6	3.0
Antibiotic-resistant organisms	16	6	2.7
Terrorist attacks	16	5	3.2
Cancer	9	2	4.5
Chemicals and hormones in the environment	8	3	2.7
Changes in government programs/policy	7	4	1.8
Suicides	6	4	1.5
Technological changes	6	2	3.0
Smoking/vaping	4	1	4.0
Accidents	3	3	1.0
Secondary/long COVID	3	1	3.0
Direct (acute) COVID	1	1	1.0
Homicides	0	0	0
Medical errors	0	0	0
Self-driving cars	0	0	0
Other 1	0	0	0
Other 2	5	1	5.0
Other 3	0	0	0

QUESTION 7 ANNUITIES

7. Rank what you consider to be the top 5 drivers of future mortality **deterioration** for 2022 (Year 1), 2032 (Year 11) and 2042 (Year 21), with 1 as the top driver for each column.

Driver	Annuity 2022					Annuity 2032					Annuity 2042				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Opioids	2	5	2	3	2	3	1	2	2	1			1		1
Direct (acute) COVID	7		2												
Mental health/depression	2	3	2	4	3	1	1	2	2	2		3	1	4	2
Obesity	3		4		2	4	2	1	1	2	4	1	2		2
Cancer	2	3	1		1	1	1				1	1			
Stress		2	1	3		1	1	2		1	1	1	2		2
Epidemics/pandemics	1	1	1	1	1		2		1	2	1	1	1	1	2
Cardiovascular disease	1	1	1	1		2	1				2	1			
Diabetes	1	2			1		2	1	1	1			2	1	
Secondary/long COVID	1	1		2		2	1	2	1				1		
Accidents		1	1	2	1			1		1					
Suicides		1	1	1	1					1				1	1
Lifestyle behaviors			1	2	2	3	1	1	1		3		2	1	
Socioeconomic inequality			1	1	2		3	2	1	1	1	4	1	1	
Homicides			1				1								
Chemicals and hormones in the environment					1			1	2	1		1		2	
Pollution					1		1	1	1	2	1	1	1	3	
Antibiotic-resistant organisms						1		1		1	2		2		3

Catastrophes	1	2	1	1	1	2	2	1
Changes in government programs/policy		1	1		1			1
Medical errors								
Alzheimer's/dementia		1	2		1		1	1
Self-driving cars								
Smoking/vaping	1		1		1			
Technological changes								
Terrorist attacks		1	1			1	1	

Driver: Annuity 2022	Weighted	Respondents	Avg Weight
Opioids	44	14	3.1
Direct (acute) COVID	41	9	4.6
Mental health/depression	39	14	2.8
Obesity	29	9	3.2
Cancer	26	7	3.7
Stress	17	6	2.8
Epidemics/pandemics	15	5	3.0
Cardiovascular disease	14	4	3.5
Diabetes	14	4	3.5
Secondary/long COVID	13	4	3.2
Accidents	12	5	2.4
Suicides	10	4	2.5
Lifestyle behaviors	9	5	1.8
Socioeconomic inequality	7	4	1.8
Homicides	3	1	3.0
Chemicals and hormones in the environment	1	1	1.0
Pollution	1	1	1.0
Antibiotic-resistant organisms	0	0	0
Catastrophes	0	0	0
Changes in government programs/policy	0	0	0

Medical errors	0	0	0
Alzheimer's/dementia	0	0	0
Self-driving cars	0	0	0
Smoking/vaping	0	0	0
Technological changes	0	0	0
Terrorist attacks	0	0	0
Other 1	4	2	2.0
Other 2	0	0	0
Other 3	0	0	0

The top drivers of future mortality deterioration in 2022 for annuity products, ranked by weights (respondents chose their top five, with 1 awarded 5 points, 2 awarded 4 points and so on), included (for weights above 30, 150% of the average respondents) opioids, direct (acute) COVID and mental health/depression.

Delayed health care due to the COVID-19 pandemic and smoking/vaping (COPD) were suggested as additional drivers of deteriorating mortality in 2022.

Mental health/depression would have an improved ranking if respondent count had been used.

Driver: Annuity 2032	Weighted	Respondents	Avg Weight
Obesity	35	10	3.5
Opioids	30	9	3.3
Lifestyle behaviors	24	6	4.0
Secondary/long COVID	22	6	3.7
Mental health/depression	21	8	2.6
Socioeconomic inequality	21	7	3.0
Stress	16	5	3.2
Cardiovascular disease	14	3	4.7
Diabetes	14	5	2.8
Epidemics/pandemics	12	5	2.4
Pollution	11	5	2.2
Cancer	9	2	4.5
Antibiotic-resistant organisms	9	3	3.0
Catastrophes	9	4	2.2
Chemicals and hormones in the environment	8	4	2.0
Alzheimer's/dementia	7	3	2.3
Smoking/vaping	6	2	3.0
Terrorist attacks	5	2	2.5
Accidents	4	2	2.0
Homicides	4	1	4.0
Changes in government programs/policy	3	2	1.5
Suicides	1	1	1.0
Direct (acute) COVID	0	0	0
Medical errors	0	0	0
Self-driving cars	0	0	0
Technological changes	0	0	0
Other 1	1	1	1.0
Other 2	5	1	5.0
Other 3	0	0	0

The top drivers of future mortality deterioration in 2032 for annuity products were similar to those for life. They included obesity and opioids.

Rankings based on weight and count were very similar.

Additional drivers of deteriorating mortality in 2032 for life products included environmental change, including pollution, natural disasters and extreme heat, and war.

Driver: Annuity 2042	Weighted	Respondents	Avg Weight
Obesity	32	9	3.6
Socioeconomic inequality	26	7	3.7
Mental health/depression	25	10	2.5
Lifestyle behaviors	23	6	3.8
Catastrophes	20	7	2.9
Antibiotic-resistant organisms	19	7	2.7
Pollution	18	6	3.0
Stress	17	6	2.8
Epidemics/pandemics	16	6	2.7
Cardiovascular disease	14	3	4.7
Cancer	9	2	4.5
Diabetes	8	3	2.7
Chemicals and hormones in the environment	8	3	2.7
Alzheimer's/dementia	7	3	2.3
Changes in government programs/policy	5	2	2.5
Terrorist attacks	5	2	2.5
Opioids	4	2	2.0
Smoking/vaping	4	1	4.0
Secondary/long COVID	3	1	3.0
Suicides	3	2	1.5
Direct (acute) COVID	0	0	0
Accidents	0	0	0
Homicides	0	0	0
Medical errors	0	0	0

Self-driving cars	0	0	0
Technological changes	0	0	0
Other 1	1	1	1.0
Other 2	5	1	5.0
Other 3	0	0	0

QUESTION 8

8. In comparison to 2019 levels, indicate your thoughts on the annualized rate of improvement or deterioration for the following causes of death mortality in 2022 (Year 1), 2032 (Year 11) and 2042 (Year 21).

Cause of Death	Year	Large Deterioration	Moderate Deterioration	Small Deterioration	No Improvement or Deterioration	Small Improvement	Moderate Improvement	Large Improvement
COVID-19	2022	36%	14%	29%	7%	0%	0%	14%
Opioid/drug overdoses	2022	29%	25%	25%	7%	0%	0%	14%
Cancer	2022	4%	29%	32%	18%	11%	7%	0%
Cardiovascular	2022	9%	17%	22%	39%	0%	13%	0%
Accidents excluding drug overdoses	2022	4%	11%	25%	29%	25%	7%	0%
Alzheimer's and other dementias	2022	0%	0%	29%	54%	11%	%	4%
Flu/pneumonia	2022	4%	4%	11%	39%	21%	11%	11%
COVID-19	2032	4%	0%	32%	46%	7%	4%	7%
Opioid/drug overdoses	2032	4%	11%	29%	21%	18%	14%	4%
Cardiovascular	2032	0%	4%	18%	29%	46%	4%	0%
Cancer	2032	7%	7%	18%	11%	32%	25%	0%
Alzheimer's and other dementias	2032	0%	7%	21%	21%	36%	14%	0%
Accidents excluding drug overdoses	2032	0%	0%	11%	54%	32%	4%	0%
Flu/pneumonia	2032	0%	0%	11%	46%	39%	4%	0%
Opioid/drug overdoses	2042	4%	11%	11%	32%	39%	0%	4%
COVID-19	2042	0%	4%	14%	68%	4%	4%	7%
Accidents excluding drug overdoses	2042	0%	11%	7%	39%	39%	4%	0%
Cardiovascular	2042	7%	4%	14%	18%	43%	14%	0%
Alzheimer's and other dementias	2042	4%	11%	18%	11%	32%	14%	11%
Flu/pneumonia	2042	0%	4%	11%	46%	25%	0%	14%
Cancer	2042	11%	11%	7%	0%	29%	25%	18%

QUESTION 9

9. Using the durational mortality assumptions for your company's most prevalent life and annuity products, complete the following tables with annual durational mortality improvement rates as of the end of 2021 **without any adjustments for COVID-19**. Express the rates as a percentage with two decimal places. For example, if the mortality improvement rate was $\frac{3}{4}$ percent, express this as ".75."

For Life and Annuities Pricing and Financial Projections, enter the rates for Projection years 2022 (Year 1), 2032 (year 11), and 2042 (Year 21).

For Life Pricing, if your company uses an attained age scale, enter the rates for the gender, risk class, and attained ages shown in the table. If your company uses a select and ultimate scale, enter the ultimate rates for the gender, risk class, and attained ages shown in the table.

For Annuities Pricing, enter the rates for the gender and attained ages shown in the table.

The following aggregates results across any variable that is not listed. In this first chart, for example, all risk classes have been combined.

Male Direct: U.S. Only					
Attained Age	Values	Life		Annuities	
		Pricing	Financial Projections	Pricing	Financial Projections
	Year 1				
35	Average	0.64%	0.65%	1.01%	0.65%
	Median	0.65%	0.64%	1.00%	1.00%
	Percentile 25	0.48%	0.50%	0.50%	0.17%
	Percentile 75	1.00%	0.99%	1.00%	1.00%
55	Average	0.87%	0.86%	1.69%	0.97%
	Median	0.91%	0.91%	1.30%	1.12%
	Percentile 25	0.65%	0.67%	0.80%	0.79%
	Percentile 75	1.00%	1.00%	1.30%	1.30%
75	Average	1.09%	1.04%	2.08%	1.14%
	Median	1.00%	1.00%	1.25%	1.13%
	Percentile 25	0.96%	0.75%	1.10%	0.99%
	Percentile 75	1.25%	1.25%	1.50%	1.50%
85	Average	0.76%	0.75%	1.30%	0.88%
	Median	0.75%	0.82%	1.05%	0.92%
	Percentile 25	0.60%	0.60%	0.82%	0.69%
	Percentile 75	1.00%	1.00%	1.10%	1.10%
95	Average	0.35%	0.39%	0.48%	0.44%
	Median	0.26%	0.30%	0.40%	0.45%
	Percentile 25	0.20%	0.20%	0.20%	0.28%
	Percentile 75	0.60%	0.64%	0.60%	0.62%
	Year 11				
35	Average	0.76%	0.77%	0.74%	0.81%
	Median	0.75%	0.75%	1.00%	1.00%
	Percentile 25	0.57%	0.50%	0.50%	0.65%
	Percentile 75	1.00%	1.00%	1.00%	1.00%
55	Average	0.93%	0.93%	1.05%	1.09%
	Median	1.00%	1.00%	1.24%	1.23%
	Percentile 25	0.67%	0.71%	0.75%	0.98%
	Percentile 75	1.18%	1.20%	1.30%	1.30%
75	Average	0.94%	0.96%	1.16%	1.10%
	Median	1.00%	1.00%	1.10%	1.08%
	Percentile 25	0.65%	0.70%	1.06%	1.00%
	Percentile 75	1.15%	1.27%	1.50%	1.49%
85	Average	0.67%	0.69%	0.81%	0.78%
	Median	0.71%	0.75%	0.82%	0.82%
	Percentile 25	0.58%	0.60%	0.40%	0.63%

	Percentile 75	0.86%	0.90%	1.10%	1.01%
95	Average	0.29%	0.34%	0.36%	0.39%
	Median	0.25%	0.25%	0.40%	0.40%
	Percentile 25	0.10%	0.13%	0.20%	0.20%
	Percentile 75	0.50%	0.59%	0.55%	0.56%
Year 21					
35	Average	0.49%	0.63%	0.76%	0.81%
	Median	0.50%	0.67%	1.00%	1.00%
	Percentile 25	0.00%	0.45%	0.50%	0.65%
	Percentile 75	0.85%	0.90%	1.00%	1.00%
55	Average	0.63%	0.77%	0.99%	1.10%
	Median	0.64%	0.75%	1.24%	1.23%
	Percentile 25	0.00%	0.50%	0.75%	1.00%
	Percentile 75	1.08%	1.16%	1.30%	1.30%
75	Average	0.60%	0.77%	1.04%	1.04%
	Median	0.61%	0.93%	1.10%	1.03%
	Percentile 25	0.00%	0.27%	1.00%	0.99%
	Percentile 75	1.10%	1.11%	1.50%	1.31%
85	Average	0.43%	0.60%	0.77%	0.74%
	Median	0.35%	0.75%	0.82%	0.82%
	Percentile 25	0.00%	0.03%	0.38%	0.58%
	Percentile 75	0.82%	0.90%	1.10%	1.01%
95	Average	0.20%	0.31%	0.42%	0.39%
	Median	0.08%	0.25%	0.40%	0.40%
	Percentile 25	0.00%	0.00%	0.20%	0.20%
	Percentile 75	0.43%	0.59%	0.55%	0.56%
Number of respondents		14	15	11	14

Female Direct: U.S. Only					
Attained Age	Values	Life		Annuities	
		Pricing	Financial Projections	Pricing	Financial Projections
	Year 1				
35	Average	0.48%	0.48%	0.71%	0.65%
	Median	0.50%	0.50%	0.75%	0.88%
	Percentile 25	0.25%	0.25%	0.50%	0.17%
	Percentile 75	0.64%	0.68%	1.00%	1.00%
55	Average	0.67%	0.64%	1.47%	0.90%
	Median	0.75%	0.75%	1.20%	1.00%
	Percentile 25	0.50%	0.50%	0.80%	0.75%
	Percentile 75	0.83%	0.80%	1.20%	1.20%
75	Average	0.88%	0.87%	1.71%	1.03%
	Median	0.90%	0.85%	1.16%	1.13%
	Percentile 25	0.50%	0.50%	0.90%	0.90%
	Percentile 75	1.16%	1.12%	1.30%	1.26%
85	Average	0.62%	0.63%	1.12%	0.83%
	Median	0.50%	0.72%	0.95%	0.92%
	Percentile 25	0.42%	0.42%	0.72%	0.72%
	Percentile 75	0.95%	0.95%	1.00%	1.00%
95	Average	0.30%	0.35%	0.40%	0.41%
	Median	0.25%	0.25%	0.40%	0.40%
	Percentile 25	0.17%	0.19%	0.20%	0.28%
	Percentile 75	0.50%	0.50%	0.50%	0.59%
	Year 11				
35	Average	0.58%	0.62%	0.70%	0.80%
	Median	0.50%	0.50%	0.90%	0.99%
	Percentile 25	0.48%	0.49%	0.50%	0.58%
	Percentile 75	0.80%	0.80%	1.00%	1.00%
55	Average	0.74%	0.76%	0.92%	1.01%
	Median	0.75%	0.75%	1.20%	1.08%
	Percentile 25	0.50%	0.50%	0.75%	0.91%
	Percentile 75	1.00%	1.09%	1.20%	1.20%
75	Average	0.78%	0.81%	1.03%	1.01%
	Median	0.75%	0.83%	1.06%	1.03%
	Percentile 25	0.50%	0.50%	0.90%	0.95%
	Percentile 75	1.06%	1.12%	1.30%	1.23%
85	Average	0.54%	0.58%	0.77%	0.78%
	Median	0.50%	0.67%	0.80%	0.85%

	Percentile 25	0.42%	0.41%	0.71%	0.71%
	Percentile 75	0.72%	0.80%	1.00%	1.00%
95	Average	0.25%	0.31%	0.32%	0.39%
	Median	0.25%	0.25%	0.40%	0.40%
	Percentile 25	0.10%	0.12%	0.20%	0.20%
	Percentile 75	0.40%	0.50%	0.50%	0.56%
	Year 21				
35	Average	0.42%	0.54%	0.72%	0.80%
	Median	0.48%	0.50%	0.90%	1.00%
	Percentile 25	0.00%	0.25%	0.50%	0.58%
	Percentile 75	0.80%	0.80%	1.00%	1.00%
55	Average	0.55%	0.66%	0.90%	1.02%
	Median	0.49%	0.66%	1.20%	1.10%
	Percentile 25	0.00%	0.41%	0.75%	0.95%
	Percentile 75	1.00%	1.10%	1.20%	1.20%
75	Average	0.53%	0.67%	0.92%	0.96%
	Median	0.48%	0.75%	1.00%	1.00%
	Percentile 25	0.00%	0.25%	0.82%	0.90%
	Percentile 75	1.00%	1.06%	1.30%	1.23%
85	Average	0.38%	0.52%	0.75%	0.75%
	Median	0.35%	0.46%	0.80%	0.85%
	Percentile 25	0.00%	0.04%	0.71%	0.71%
	Percentile 75	0.72%	0.80%	1.00%	1.00%
95	Average	0.17%	0.28%	0.36%	0.39%
	Median	0.10%	0.25%	0.40%	0.40%
	Percentile 25	0.00%	0.00%	0.20%	0.20%
	Percentile 75	0.30%	0.50%	0.50%	0.56%
Number of respondents		14	15	11	14

U.S. REINSURER RESULTS

Male Reinsurance: U.S. Only			
Attained Age	Values	Life	
		Pricing	Financial Projections
Year 1			
35	Average	0.38%	0.19%
	Median	0.50%	0.19%
	Percentile 25	0.00%	0.00%
	Percentile 75	0.83%	0.50%
55	Average	1.24%	0.94%
	Median	1.15%	1.05%
	Percentile 25	1.05%	0.86%
	Percentile 75	1.38%	1.25%
75	Average	1.15%	0.99%
	Median	1.15%	1.25%
	Percentile 25	0.50%	0.19%
	Percentile 75	1.70%	1.50%
85	Average	0.86%	0.75%
	Median	0.88%	1.00%
	Percentile 25	0.50%	0.19%
	Percentile 75	1.18%	1.02%
95	Average	0.40%	0.46%
	Median	0.45%	0.45%
	Percentile 25	0.00%	0.25%
Year 11			
35	Average	0.58%	0.65%
	Median	0.60%	0.60%
	Percentile 25	0.50%	0.20%
	Percentile 75	1.15%	0.87%
55	Average	1.11%	0.91%
	Median	1.13%	1.13%
	Percentile 25	0.90%	0.40%
	Percentile 75	1.24%	1.18%
75	Average	1.12%	1.17%
	Median	1.15%	1.27%
	Percentile 25	0.72%	1.00%
	Percentile 75	1.53%	1.50%
85	Average	0.85%	0.91%
	Median	0.88%	1.02%
	Percentile 25	0.55%	1.00%

	Percentile 75	1.13%	1.10%
95	Average	0.36%	0.54%
	Median	0.40%	0.50%
	Percentile 25	0.00%	0.40%
	Percentile 75	0.81%	0.64%
Year 21			
35	Average	0.55%	0.52%
	Median	1.00%	0.75%
	Percentile 25	0.00%	0.10%
	Percentile 75	1.15%	0.87%
55	Average	0.75%	0.59%
	Median	1.00%	0.75%
	Percentile 25	0.25%	0.19%
	Percentile 75	1.15%	1.00%
75	Average	0.69%	0.63%
	Median	1.00%	0.75%
	Percentile 25	0.00%	0.19%
	Percentile 75	1.15%	1.00%
85	Average	0.59%	0.55%
	Median	0.88%	0.55%
	Percentile 25	0.00%	0.19%
	Percentile 75	1.00%	1.00%
95	Average	0.26%	0.41%
	Median	0.00%	0.25%
	Percentile 25	0.00%	0.20%
	Percentile 75	0.77%	0.64%
Number of respondents		5	5

Female Reinsurance: U.S. Only			
Attained Age	Values	Life	
		Pricing	Financial Projections
Year 1			
35	Average	0.35%	0.07%
	Median	0.59%	0.27%
	Percentile 25	0.00%	0.00%
	Percentile 75	0.68%	0.60%
55	Average	1.11%	0.76%
	Median	1.15%	1.15%
	Percentile 25	0.95%	0.27%
	Percentile 75	1.38%	1.20%
75	Average	1.31%	0.97%
	Median	1.50%	1.08%
	Percentile 25	0.94%	0.27%
	Percentile 75	1.70%	1.50%
85	Average	0.78%	0.64%
	Median	0.88%	0.87%
	Percentile 25	0.48%	0.27%
	Percentile 75	1.10%	1.00%
95	Average	0.38%	0.43%
	Median	0.40%	0.40%
	Percentile 25	0.00%	0.25%
Year 11			
35	Average	0.47%	0.62%
	Median	0.50%	0.50%
	Percentile 25	0.40%	0.27%
	Percentile 75	0.75%	0.84%
55	Average	1.01%	0.95%
	Median	1.13%	1.13%
	Percentile 25	0.90%	0.27%
	Percentile 75	1.28%	1.23%
75	Average	1.13%	1.08%
	Median	1.25%	1.25%
	Percentile 25	0.76%	1.00%
	Percentile 75	1.50%	1.50%
85	Average	0.73%	0.82%
	Median	0.90%	0.90%
	Percentile 25	0.48%	0.85%
	Percentile 75	1.00%	1.00%

95	Average	0.34%	0.515
	Median	0.30%	0.50%
	Percentile 25	0.00%	0.30%
	Percentile 75	0.82%	0.53%
Year 21			
35	Average	0.49%	0.53%
	Median	0.75%	0.75%
	Percentile 25	0.00%	0.10%
	Percentile 75	1.00%	0.84%
55	Average	0.61%	0.61%
	Median	0.75%	0.75%
	Percentile 25	0.00%	0.10%
	Percentile 75	1.00%	1.00%
75	Average	0.66%	0.60%
	Median	0.75%	0.75%
	Percentile 25	0.00%	0.27%
	Percentile 75	1.00%	1.00%
85	Average	0.51%	0.53%
	Median	0.50%	0.55%
	Percentile 25	0.00%	0.27%
	Percentile 75	0.94%	0.85%
95	Average	0.27%	0.40%
	Median	0.00%	0.25%
	Percentile 25	0.00%	0.25%
	Percentile 75	0.80%	0.53%
Number of respondents		5	5

QUESTION 9 COMPARISON BETWEEN COMPANIES THAT PARTICIPATED IN BOTH SURVEYS

All companies that participated in both surveys are combined across all risk classes.

Financial Projection	Life	All 2019	All 2022	Male 2019	Male 2022	Female 2019	Female 2022
Year 1	35	0.65%	0.60%	0.71%	0.60%	0.65%	0.60%
	55	0.90%	0.94%	1.00%	0.98%	0.90%	0.80%
	75	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%
	95	0.44%	0.42%	0.44%	0.45%	0.44%	0.40%
Year 21	35	0.75%	0.75%	0.75%	0.75%	0.50%	0.75%
	55	0.79%	0.75%	0.82%	0.75%	0.75%	0.75%
	75	1.00%	0.78%	1.00%	0.75%	0.88%	0.75%
	95	0.40%	0.25%	0.40%	0.25%	0.40%	0.25%

Pricing	Life	All 2019	All 2022	Male 2019	Male 2022	Female 2019	Female 2022
Year 1	35	0.73%	0.60%	0.90%	0.73%	0.65%	0.60%
	55	1.00%	0.90%	1.00%	1.05%	0.95%	1.00%
	75	1.03%	1.00%	1.01%	1.15%	1.04%	1.15%
	95	0.26%	0.40%	0.27%	0.38%	0.25%	0.30%
Year 21	35	0.80%	0.75%	0.90%	0.65%	0.60%	0.50%
	55	1.00%	0.75%	1.00%	0.88%	1.00%	0.75%
	75	1.01%	0.75%	1.01%	0.50%	1.02%	0.75%
	95	0.40%	0.25%	0.40%	0.00%	0.34%	0.00%

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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.

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