PERA Local Government Correctional Service Retirement Plan

4-Year Experience Study

July 1, 2019 through June 30, 2023

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June 10, 2024

Public Employees Retirement Association of Minnesota
Local Government Correctional Service Retirement Plan
St. Paul, Minnesota

Dear Trustees of the Local Government Correctional Service Retirement Plan:

The results of the four-year ***actuarial experience study*** of the Local Government Correctional Service Retirement Plan (LGCSRP) are presented in this report. The investigation was conducted for the purpose of updating the actuarial assumptions used in valuing the actuarial liabilities of the Local Government Correctional Service Retirement Plan.

The investigation was based upon the statistical data furnished for annual active member and retired life actuarial valuations concerning members who died, withdrew, became disabled or retired during the four-year period of the study by the Public Employees Retirement Association of Minnesota (PERA). We checked for internal and year-to-year consistency, but did not audit the data. We are not responsible for the accuracy or completeness of the information provided by PERA.

The investigation covered the four-year period from ***July 1, 2019 to June 30, 2023***, and was carried out using generally accepted actuarial principles and techniques.

We believe that the actuarial assumptions recommended in this experience study report represent individually and in the aggregate reasonable estimates of future experience of the Local Government Correctional Service Retirement Plan.

This report should not be relied on for any purpose other than that described above. It was prepared at the request of PERA and is intended for use by the Retirement Association and those designated or approved by the Trustees. This report may be provided to parties other than the Association only in its entirety and only with the permission of the Trustees.

This report has been prepared by actuaries who have substantial experience valuing public employee retirement systems. To the best of our knowledge and belief, the information contained in this report was performed in accordance with Minnesota Statutes Section 356.215 and the requirements of the Standards for Actuarial Work established by the Legislative Commission on Pensions and Retirement. We certify that, to the best of our knowledge, this report is complete and accurate and was made in accordance with standards of practice promulgated by the Actuarial Standards Board.

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Public Employees Retirement Association of Minnesota
Local Government Correctional Service Retirement Plan
June 10, 2024

Bonita J. Wurst and Sheryl L. Christensen are independent of the plan sponsor and are Members of the American Academy of Actuaries (MAAA) and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. In addition, GRS meets the requirements of "approved actuary" under Minnesota Statutes Section 356.215, Subdivision 1, Paragraph (c).

Respectfully submitted,
Gabriel, Roeder, Smith & Company

Bonita J. Wurst, ASA, EA, FCA, MAAA

Sheryl L. Christensen, FSA, EA, FCA, MAAA

BJW/SLC:sc

Actuarial Experience Study
2019 - 2023

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SECTION A

OVERVIEW AND SUMMARY OF RESULTS

Summary of Findings

The four-year period (July 1, 2019 to June 30, 2023) covered by this experience study provided sufficient data to form a basis for recommending changes in some of the assumptions and/or methods used in actuarial valuations of the Local Government Correctional Service Retirement Plan. The recommended changes in actuarial assumptions and methods resulting from this experience study are summarized below:

Recommendations

- Adjust rates of merit and seniority, with proposed rates approximately 14 basis points lower, in total, than that anticipated by the current rates.
- Adjust assumed retirement rates:
  - Increase the rate of assumed unreduced retirements (i.e., Normal Retirement) prior to age 63 and at age 65, 67 and 68; reduce rates at ages 62 and 66; overall results predict more unreduced retirements.
  - Increase the rate of assumed reduced retirements at ages 50, 52 and 54, resulting in more predicted early retirements.
- Change the assumed rates of withdrawal (termination of membership before eligible to retire):
  - The overall impact is an increase in assumed terminations for males and females, with larger increases in termination assumed earlier in the member's career.
- Adjust rates of disability to better fit actual experience:
  - For male members, proposed rates are slightly higher mid-career and also for ages 50 to 54, and lower at ages 60+.
  - For female members, proposed rates are primarily unchanged prior to age 55 and lower for ages 55+.
- Continued use of the Pub-2010 public safety mortality table, with future improvement projected using scale MP-2021.
- Minor changes to the form of payment and age difference assumptions for male and female retirees; minor change to the percent married assumption for female retirees.
- Minor changes to the assumptions made with respect to missing participant data.

The recommendations are summarized on the following pages.

Review of the investment return assumption and actuarial methods is outside the scope of this experience study. Please refer to GRS' General Employees Retirement Plan experience study dated June 29, 2023. This report concluded that the current investment return assumption of 7.0% was within a reasonable range as of the date of the report.

Introduction

Each year as of June 30, the actuarial liabilities of the Association are valued. In order to perform the valuation, assumptions must be made regarding the future experience of the System with regard to the following risk areas:

- Rates of **withdrawal** of active members (leaving before eligible to retire).
- Rates of **disability** among active members.
- Patterns of **pay increases** to active members.
- Rates of **retirement** among active members.
- Rates of **mortality** among active members, retirees, and beneficiaries.
- Long-term rates of **investment return** to be generated by the assets of the System.

Assumptions should be carefully chosen and continually monitored. An unrealistic set of assumptions can lead to:

- Understated costs resulting in either an inability to pay benefits when due, or gradual increases in required contributions as time progresses; and

- Overstated costs resulting in an unnecessarily large burden on the current generation of employers and taxpayers.

All actuarial assumptions are prescribed by Minnesota Statutes, the Legislative Commission on Pensions and Retirement or the PERA Trustees.

A single set of assumptions will not be suitable indefinitely. Things change, and our understanding of things (whether or not they are changing) also changes. The package of assumptions is then adjusted to reflect basic experience trends -- but not random year to year fluctuations. Actuarial assumptions were last revised for the 2021 actuarial valuations based on the results of the most recent experience study and in 2023 to reflect the change to 7.0% interest. Assumptions in effect prior to June 30, 2023 are ignored for purposes of this report.

No single experience period should be given full credibility in the setting of actuarial valuation assumptions. When we see significant differences between what is expected from our assumptions and the actual experience, we generally recommend a change in assumptions that produces results somewhere between the actual and expected experience. In this way, with each experience study the actuarial assumptions become better and better representations of actual experience. Consequently, temporary conditions that might influence a particular experience study period will not unduly influence the choice of long-term assumptions.

We are recommending certain changes in assumptions and methods. The various assumption changes are described on the following pages.

Summary of Decrement Experience
2019 - 2023

Results presented in this exhibit and in the body of the report are liability weighted for retirement, withdrawal and active mortality and benefit weighted for healthy and disabled retiree mortality.

Decrement Risk Area		Actual Number	Expected		
			Present Assumptions	Proposed Assumptions	Change
Unreduced Retirement ($000s)		104,189	81,658	93,040	11,382
Reduced Retirement ($000s)		29,240	24,380	27,885	3,505
Withdrawal, < 3 years of service ($000s)					
Males		44,031	34,560	38,891	4,331
Females		20,300	17,154	18,529	1,375
Withdrawal, >= 3 years of service ($000s)					
Males		79,233	50,704	65,745	15,041
Females		41,582	27,662	35,559	7,897
Disability					
Males		31	29	31	2
Females		17	19	17	(2)
Mortality ($000s)					
Healthy Retired Lives	- Male	458	432	441	9
	- Female	204	176	176	0
Disabled Retired Lives	- Male	147	113	107	(6)
	- Female	47	62	62	-
Active Lives	- Male	2,937	1,947	1,947	-
	- Female	1,439	677	677	-

* *Normal retirements less than age 70. See Section C for full detail.*

In general, increased incidence of withdrawals and lower future salaries result in lower liability and contribution requirements while increased incidence of unreduced retirements result in higher liabilities and contribution requirements. We will follow up with the impact of the proposed changes.

SECTION B

PAY INCREASES

Pay Increases Due to Merit and Seniority

Pay increases granted to active members typically consist of two pieces:

- Payroll growth is an across-the-board, economic type of increase granted to most or all members of the group. This increase is typically tied to inflation or cost-of-living changes; and

- An increase as a result of merit and seniority. This increase is typically related to the performance of an individual and includes promotions and increased years of experience.

For the Local Correctional plan, the general inflation assumption is currently 2.25% and the payroll growth assumption is currently 3.00%.

General inflation, as measured by the change in Consumer Price Index, has averaged about 4.5% over the four-year period ending June 30, 2023. During the 2020 to 2022 calendar year period, the increase in the national average earnings have been about 5.7% (the 2023 national average earnings amount was not available at the time this report was published).

Active membership decreased for the first three years of the study period, from 3,965 as of July 1, 2019 to 3,855 as of July 1, 2020, 3,788 as of July 1, 2021 and 3,564 as of July 1, 2022. Active membership as of July 1, 2023 increased 6.2%, to 3,786 members. Overall, active membership decreased 4.5% over the four-year period. We note that, although active membership decreased, payroll increased 2.7% on average during this period, only slightly less than the assumed annual rate of 3.00%.

A thorough review of general inflation and payroll growth is presented in Section B of the PERA General Employees Retirement Plan experience study report dated June 29, 2023. In that report, we concluded:

> "although current inflation rates are higher than they have been in previous decades, the future outlook … suggest 2.25% continues to be reasonable."
>
> and
>
> "When combined with the 2.25% price inflation assumption, the recommended payroll growth assumption remains at 3.00% ... The recommended payroll growth assumption is appropriate for a stable population."

We recommend maintaining the price inflation assumption of 2.25% and a payroll growth assumption of 3.00% for the Local Government Correctional Service Retirement Plan. These assumptions are supported by experience and are consistent with the assumption used for PERA's General Employees Retirement Plan.

Pay Increases Due to Merit and Seniority

We reviewed the merit and seniority pay increases during the four-year period. For each year, we excluded individual pay increases that were more than 30% and also excluded individual pay increases that were less than -30%. Some occurrences of a negative salary increase are reasonable and expected in a plan that covers part-time employees. While this was a relatively small number of records, the experience distorted the experience of the overall group.

In order to study the merit and seniority portion of the salary increase assumption, it is necessary to separate out the portion attributable to wage inflation. Based on our review of salary experience for LGCSRP members for the period July 1, 2019 through June 30, 2023, we observed that members with longer service averaged approximately a 4.0% annual increase for this period. However, we note average salary for this group of members varied and increased each year in the study period, from 3.1% in 2020 to 5.2% in 2023. For our analysis of the merit and seniority portion of total salary increase, we assumed that the salary increase amount in excess of the total salary increase for the longer-service members (i.e., those with 20 or more years of service) was attributable to wage inflation only. This assumes that once members reach a certain length of service, merit and seniority increases are much less common.

Findings

The assumed wage inflation was 3.00% during the study period. During the four years of the study, we estimate the average actual wage inflation component of pay increases was around 4.0% for members of the Local Government Correctional Service Retirement Plan (based on the average increase for members with 20 or more years of service, as described above). This estimated actual wage inflation of 4.0% was subtracted from the actual pay increases to obtain the estimated merit/seniority portion of the pay increases. It should be noted that the results of the analysis are very sensitive to the estimated wage inflation component.

Gross actual salary increases averaged 5.65% over the four-year period, ranging from 4.30% in 2020 to 7.50% in 2023. After adjusting for the 4.00% average wage inflation for this period, the average net salary increases (i.e., merit and seniority) averaged 1.65%, ranging from 0.30% to 3.50%.

Fiscal Year Ending	Exposures	Gross		Net*	
		Actual	Expected	Actual	Expected
2020	2,702	4.30%	4.82%	0.30%	1.82%
2021	2,741	4.84%	4.87%	0.84%	1.87%
2022	2,334	6.13%	4.79%	2.13%	1.79%
2023	2,261	7.50%	4.79%	3.50%	1.79%
Total	**10,038**	**5.65%**	**4.82%**	**1.65%**	**1.82%**

* *Net Expected increases are equal to Gross Expected increases minus the current assumed wage inflation assumption of 3.00%. Net Actual increases are equal to Gross Actual increases minus the estimated actual wage inflation for the period of 4.00%.*

Pay Increases Due to Merit and Seniority*

Current valuation salary increase rates for members are age-based. In the past, since this plan was created in 1999, age-based rates were appropriate since a member's years of plan service may not have been indicative of the time spent in the career. As we examined patterns of salary increases, the experience has a strong relationship to service. As such, our recommended salary increase rates are service-based (rather than age-based).

Using the techniques described above, observed merit and seniority pay increases were higher than the presently assumed increase during the first year and lower than the current assumption after the first year.

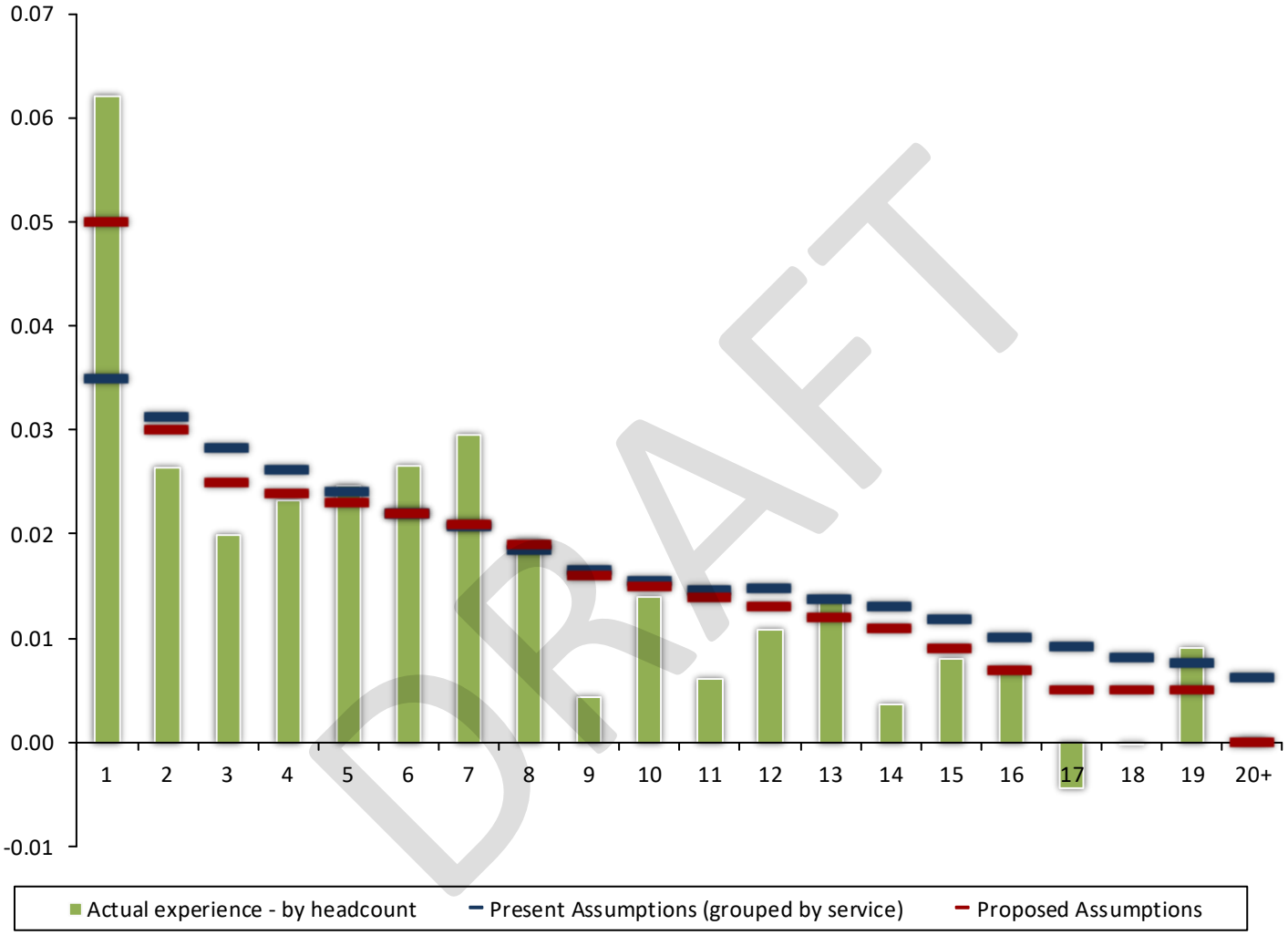
Recommendation

We recommend adjustments to the current merit/seniority pay increase assumption as shown below. Overall, proposed rates are approximately 14 basis points lower than that anticipated by the current rates.

Service Index	Number	Total % Increase			Merit/Seniority % Increase		
			Expected			Expected	
		Actual	Old	New	Actual	Old	New
1	918	10.21 %	6.50 %	8.00 %	6.21 %	3.50 %	5.00 %
2	1,000	6.64 %	6.13 %	6.00 %	2.64 %	3.13 %	3.00 %
3	897	5.99 %	5.84 %	5.50 %	1.99 %	2.84 %	2.50 %
4	746	6.33 %	5.62 %	5.40 %	2.33 %	2.62 %	2.40 %
5	652	6.47 %	5.41 %	5.30 %	2.47 %	2.41 %	2.30 %
6	514	6.66 %	5.19 %	5.20 %	2.66 %	2.19 %	2.20 %
7	430	6.96 %	5.07 %	5.10 %	2.96 %	2.07 %	2.10 %
8	347	5.94 %	4.85 %	4.90 %	1.94 %	1.85 %	1.90 %
9	258	4.43 %	4.66 %	4.60 %	0.43 %	1.66 %	1.60 %
10	224	5.39 %	4.56 %	4.50 %	1.39 %	1.56 %	1.50 %
11	232	4.61 %	4.47 %	4.40 %	0.61 %	1.47 %	1.40 %
12	285	5.07 %	4.48 %	4.30 %	1.07 %	1.48 %	1.30 %
13	320	5.39 %	4.38 %	4.20 %	1.39 %	1.38 %	1.20 %
14	343	4.37 %	4.30 %	4.10 %	0.37 %	1.30 %	1.10 %
15	312	4.80 %	4.19 %	3.90 %	0.80 %	1.19 %	0.90 %
16	279	4.69 %	4.01 %	3.70 %	0.69 %	1.01 %	0.70 %
17	282	3.55 %	3.91 %	3.50 %	(0.45)%	0.91 %	0.50 %
18	281	3.97 %	3.82 %	3.50 %	(0.03)%	0.82 %	0.50 %
19	337	4.91 %	3.76 %	3.50 %	0.91 %	0.76 %	0.50 %
20+	1,381	4.04 %	3.62 %	3.00 %	0.04 %	0.62 %	0.00 %
Total	**10,038**	**5.65%**	**4.82%**	**4.68%**	**1.65%**	**1.82%**	**1.68%**

* *The current salary increase assumption is based on age. Our recommended table is service-based for all years of employment.*

Pay Increases Due to Merit and Seniority



SECTION C

RETIREMENT EXPERIENCE

Liability Weighted Analysis

In most recent experience studies, we have noticed that in order to develop assumptions that reduce the size of the gain or loss in a particular decrement it is necessary to consider the relative magnitude of the liability of the members that decrement, rather than number counts alone. For example, consider a plan with only two members who are both the same age and assume member one has a liability of $10,000 and member two has a liability of $90,000. If one of the members leaves and forfeits all of his or her liability, the net rate of decrement is one out of two for a rate of 50%. However, the net gain or loss to the System will be 10% if member one leaves versus 90% if member two leaves.

As a result, some of our tables include a column entitled 'liability weighted rate' or 'benefit weighted'. This represents the crude rate of decrement on a liability or benefit weighted basis as opposed to strictly a number count basis. The liability weighted rates were found to be most highly correlated with withdrawal and retirement decrements. This makes some intuitive sense, since retirement and termination decisions are often made based on how much the members have to gain or lose if they retire or change jobs, whereas death and disability is typically not a decision at all, rather an event that happens to someone. Comments on specific assumptions are provided on the following pages.

While mortality is not a voluntary human behavior, a recent study by the Society of Actuaries found that mortality experience was highly correlated with education and income. That is, people with higher incomes and higher levels of education tended to live longer than others. As such, we also studied mortality rates on a "benefit weighted" basis. This is discussed in more detail in the mortality section of this report.

Age and Service Unreduced (Normal) Retirement

Findings

The benefit provisions of the Local Government Correctional Service Retirement Plan (LGCSRP) establish the minimum age and service requirements for unreduced or normal retirement. However, the actual cost of retirement is determined when members actually retire. The assumption about timing of retirements is a major ingredient in cost calculations. Note that higher rates of retirement with full benefits generally results in higher computed contributions, and vice versa.

Some members terminate employment with eligibility for retirement but elect to defer the benefit. We included these terminations as retirements for the purposes of this study.

The current assumption ends at age 70; in other words, we assume all members currently under the age of 70 will retire by the age of 70. However, for members currently age 70 or older, we assume retirement one year after the valuation date (effectively 18 months due to mid-year decrementing), as required by the Minnesota Standards for Actuarial Work. As such, members over age 69 are not included in our analysis since these members are assumed to work an additional year and then retire. During the four-year period, there were seven actual retirements at ages 70 and older. We believe assuming 100% retirement at age 70 is an appropriately conservative approach.

We reviewed the experience during the study period. There was a dramatic increase in unreduced retirements for the fiscal year ending June 30, 2022. Overall, on both a population-weighted and liability-weighted basis, the plan experienced more unreduced retirements during fiscal years ending June 30, 2021, 2022 and 2023 than projected by the present assumptions.

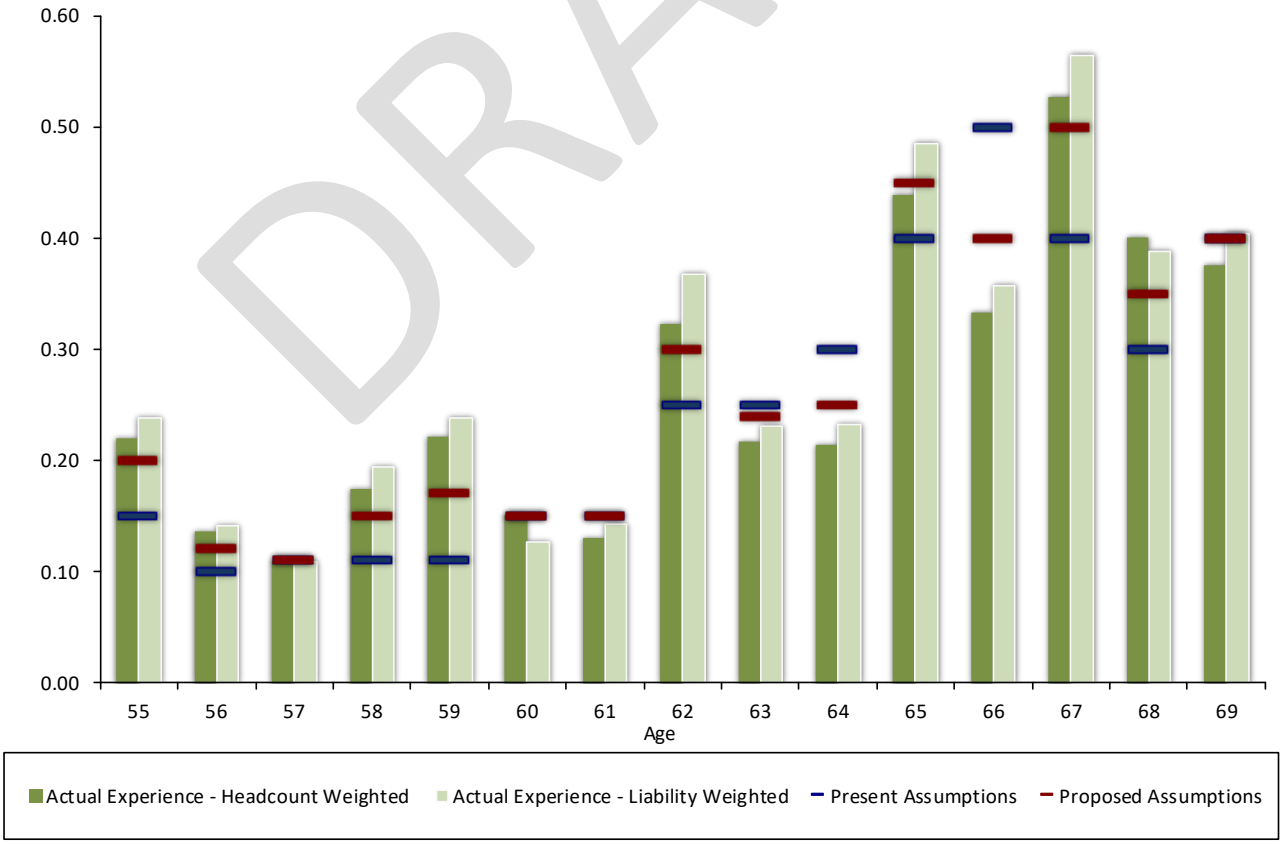
Recommendations

We recommend changes to the retirement rates as indicated on the next page, with more weight given to the last three years of experience. The proposed rates will result in an increase in predicted unreduced retirements but not as much as the liability weighted actual experience suggests. In addition, we recommend the Minnesota Standards for Actuarial Work be modified to remove the requirement that members currently over age 69 delay retirement one year and instead assume these members retire mid-year, the same as members younger than age 70.

Age and Service Unreduced (Normal) Retirement

Age	Actual Retirements ($000s)	Exposure ($000s)	Crude Rates		Rates		Expected Retirements ($000s)		Actuals/Expecteds	
			Population	Liability	Present	Proposed	Present	Proposed	Present	Proposed
55	18,071	76,120	21.93%	23.74%	15.00%	20.00%	11,418	15,224	158.3%	118.7%
56	9,237	65,472	13.61%	14.11%	10.00%	12.00%	6,547	7,857	141.1%	117.6%
57	6,071	55,450	10.92%	10.95%	11.00%	11.00%	6,099	6,099	99.5%	99.5%
58	11,279	58,200	17.42%	19.38%	11.00%	15.00%	6,402	8,730	176.2%	129.2%
59	11,152	46,967	22.08%	23.74%	11.00%	17.00%	5,166	7,984	215.9%	139.7%
60	5,064	39,989	15.04%	12.66%	15.00%	15.00%	5,998	5,998	84.4%	84.4%
61	5,876	41,117	12.98%	14.29%	15.00%	15.00%	6,168	6,168	95.3%	95.3%
62	13,481	36,695	32.20%	36.74%	25.00%	30.00%	9,174	11,008	147.0%	122.5%
63	5,301	23,004	21.69%	23.04%	25.00%	24.00%	5,751	5,521	92.2%	96.0%
64	4,683	20,205	21.43%	23.18%	30.00%	25.00%	6,062	5,051	77.3%	92.7%
65	7,968	16,414	43.94%	48.54%	40.00%	45.00%	6,565	7,386	121.4%	107.9%
66	2,727	7,627	33.33%	35.76%	50.00%	40.00%	3,813	3,051	71.5%	89.4%
67	2,108	3,735	52.63%	56.45%	40.00%	50.00%	1,494	1,867	141.1%	112.9%
68	732	1,890	40.00%	38.75%	30.00%	35.00%	567	661	129.2%	110.7%
69	438	1,084	37.50%	40.37%	40.00%	40.00%	434	434	100.9%	100.9%
70	*	*	N/A	N/A	*	*	N/A	N/A	N/A	N/A
Totals	104,189	493,967	20.39%	21.09%	16.53%	18.84%	81,658	93,040	127.6%	112.0%

* *The current assumption prescribed by the Minnesota Standards for Actuarial Work is that members who have reached 100% retirement eligibility will delay retirement for one year. Therefore, even though there are members that are over age 69, these members are not included in the analysis above since retirement is assumed to be delayed one year. There were seven actual retirements over age 69.*



Reduced Early Retirement

Findings

LGCSRP members may retire with a reduced benefit prior to the attainment of Normal Retirement. We refer to these cases as early retirements.

For retirements prior to July 1, 2019, early retirement benefits reflect augmentation equal to 3% to age 55 (2.50% if hired after June 30, 2006). This augmentation adjustment is phased out over a five-year period starting July 1, 2019, resulting in pure actuarial equivalence for retirements after June 30, 2024. In other words, there is no subsidy for early retirement. Because of the actuarially equivalent early retirement reduction, these members' benefits have about the same value as the deferred benefit to which they would be eligible if they did not request early commencement of the benefit. Higher rates of early retirement generally result in slightly lower computed contributions, and vice versa.

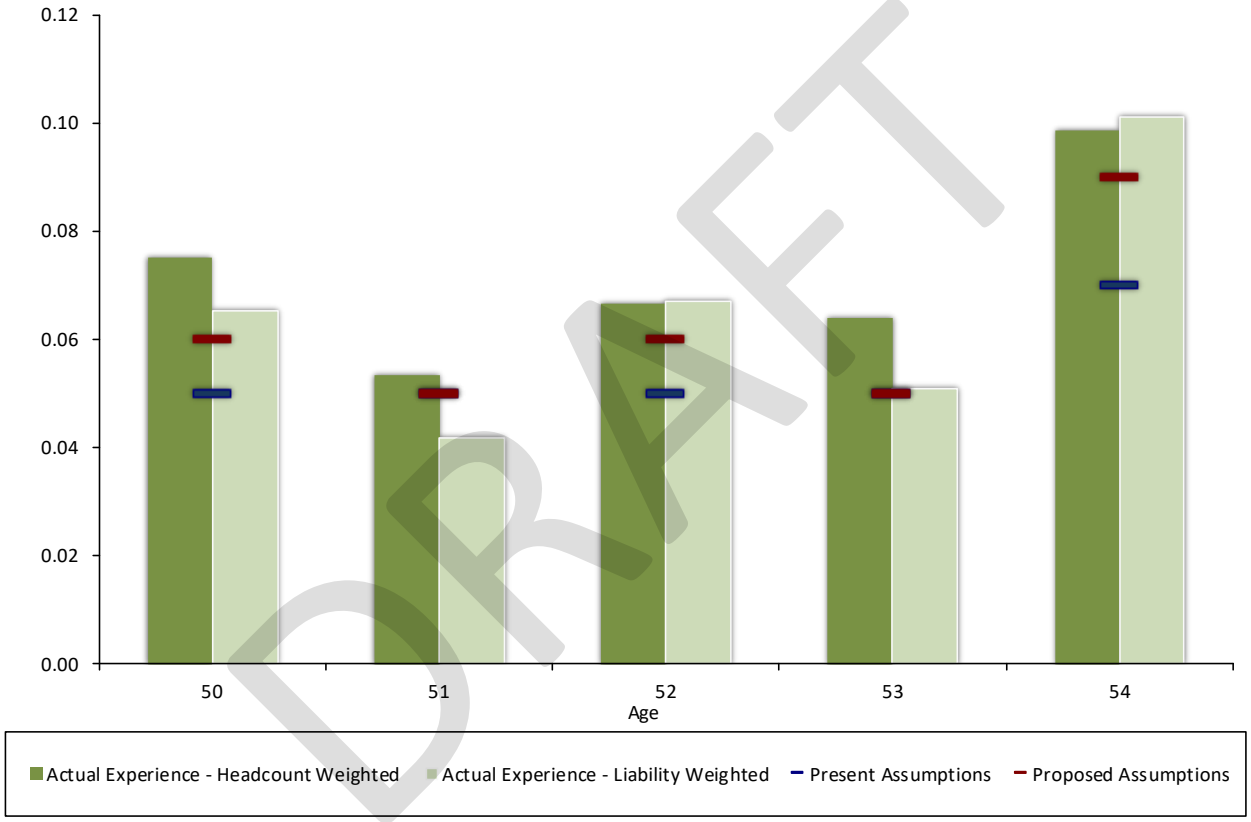
We reviewed the experience during the study period. There was a dramatic increase in early retirements after the first fiscal year. Our recommendation to increase early retirement rates is consistent with the trend of more early retirements, but is less than observed experience due to the changes in early retirement reduction factors described above.

Recommendation

We recommend changes to the Reduced early retirement rates, as indicated on the next page.

Reduced Early Retirement

Age	Actual Retirements ($000s)	Exposure ($000s)	Crude Rates		Rates		Expected Retirements ($000s)		Actuals/Expecteds	
			Population	Liability	Present	Proposed	Present	Proposed	Present	Proposed
50	6,235	95,452	7.50%	6.53%	5.00%	6.00%	4,773	5,727	130.7%	108.9%
51	4,002	95,732	5.34%	4.18%	5.00%	5.00%	4,787	4,787	83.6%	83.6%
52	6,031	89,878	6.67%	6.71%	5.00%	6.00%	4,494	5,393	134.2%	111.8%
53	4,626	90,893	6.39%	5.09%	5.00%	5.00%	4,545	4,545	101.8%	101.8%
54	8,345	82,602	9.88%	10.10%	7.00%	9.00%	5,782	7,434	144.3%	112.3%
Totals	29,240	454,557	7.09%	6.43%	5.36%	6.13%	24,380	27,885	119.9%	104.9%



Retirement from Deferred Status

Members who terminate and meet the following vesting requirements are entitled to either a refund of employee contributions, with interest, or a deferred retirement benefit.

	Vesting if First Hired	
Years of Service	Before 7/1/2010	After 6/30/2010
<3	0%	0%
3 – 4	100	0
5	100	50
6	100	60
7	100	70
8	100	80
9	100	90
10+	100	100

While some members actually elect a refund even if it is less valuable than the deferred annuity, the current valuation assumption is that members will elect a refund only if it is more valuable than the deferred annuity. When a member elects a refund that is less valuable than his or her deferred annuity (or when a member elects the deferred annuity even if the refund is more valuable), the plan experiences a small liability gain. Since the current assumption results in very small gains to the plan, we recommend no change to this assumption.

For those deferred vested members for whom the deferred benefit is more valuable than a refund, the current valuation assumption is that the member will commence benefits at Normal Retirement Age. The benefit is reduced on approximately an actuarially equivalent basis, meaning there is no liability gain or loss to the plan. We recommend no change to this set of assumptions.

SECTION D

WITHDRAWAL EXPERIENCE

Withdrawal Experience

Members who leave active employment, for reasons other than retirement, disability or death, may be eligible for the following payments from the pension trust:

- A refund of employee contributions; or
- A deferred retirement benefit, if they are vested.

Deferred retirement benefits are based on the pay and service credit at the time of withdrawal. The benefit is increased with augmentation (if applicable) from termination until January 1, 2019 and is payable at Normal Retirement (or at Early Retirement with a reduction). Consequently, members who withdraw receive much less from the plan than members who stay in employment until retirement. Higher rates of withdrawal result in lower computed contributions, and vice versa.

Some members are eligible for retirement when they terminate employment but elect to defer the benefit and are consequently reported for the valuation as a termination with a deferred benefit. We included these terminations as retirements for the purposes of this study.

Current valuation termination rates for members are gender-specific and age-based, with higher terminations assumed in the first three years of service. In the past, since this plan was created in 1999, age-based rates were appropriate since a member's years of plan service may not have been indicative of the time spent in the career. As we examined patterns of terminations, we found the experience has a strong relationship to service. As such, our recommended rates are service-based (rather than age-based). The withdrawal assumption review was done on a liability-weighted basis, as described earlier in the report.

Findings

When we reviewed the liability that decremented out of the plan during the prior four-year period, we observed that the plan experienced more liability decrementing from the plan due to terminations than expected. We also note that terminations for members during the 2021-2022 fiscal year were higher than the other years in this study. Due to this volatility, we did not adjust the withdrawal rates as much as we would have otherwise.

Recommendation

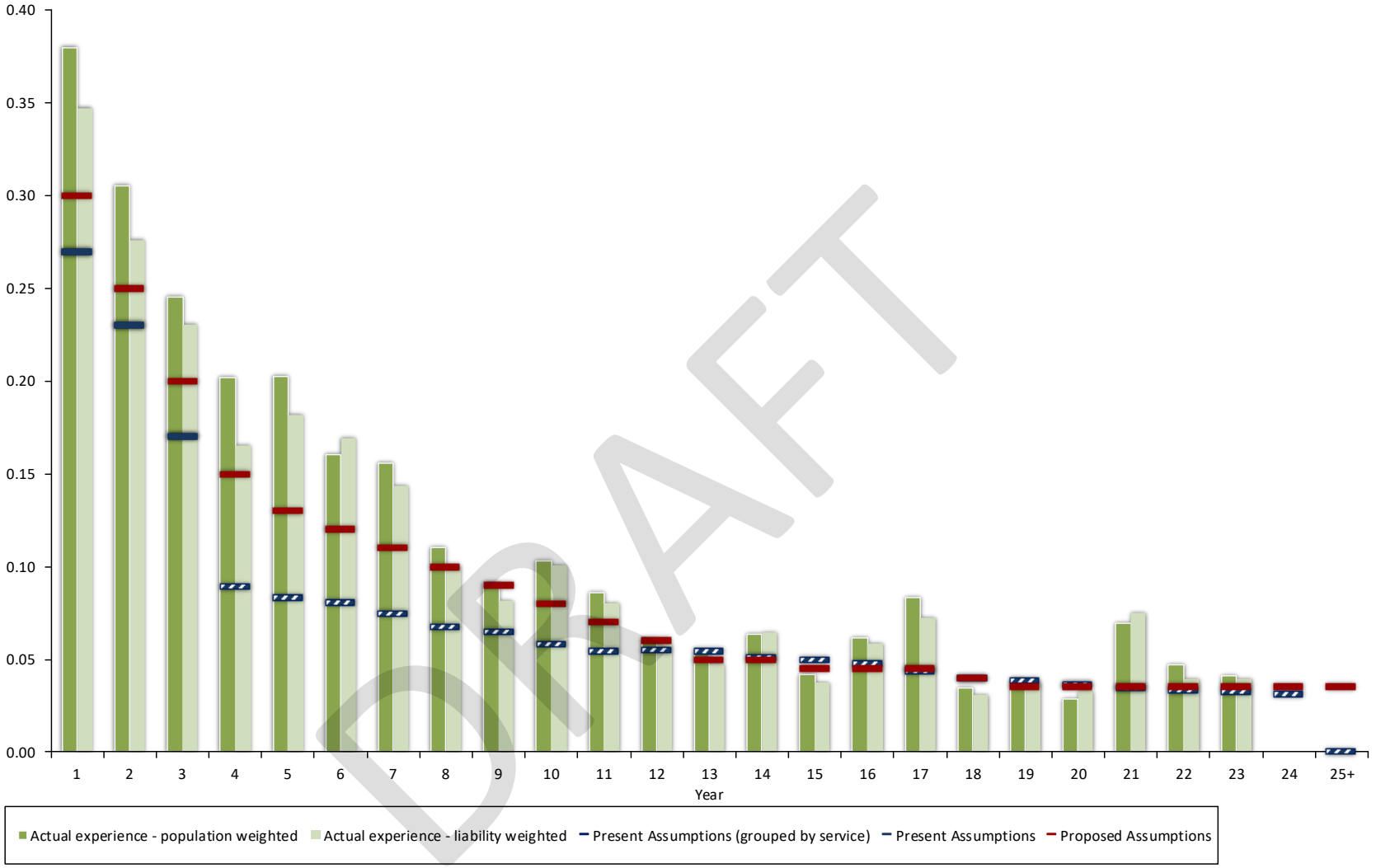
We recommend increased rates of withdrawal as detailed on the next pages.

Withdrawal Experience* – Males

	Liability Weighted ($000s)		Crude Rates		Sample Rates		Liability Weighted ($000s)			
							Expected Withdrawals		Ratio of Actuals/Expecteds	
Year	Withdrawal	Exposure	Population Weighted	Liability Weighted	Present	Proposed	Present	Proposed	Present	Proposed
1	6,630	19,113	38.00%	34.69%	27.00%	30.00%	5,160	5,734	128.5%	115.6%
2	19,204	69,519	30.50%	27.62%	23.00%	25.00%	15,989	17,380	120.1%	110.5%
3	18,198	78,885	24.53%	23.07%	17.00%	20.00%	13,410	15,777	135.7%	115.3%
4	12,585	76,013	20.20%	16.56%	8.95%	15.00%	6,804	11,402	185.0%	110.4%
5	12,234	67,358	20.22%	18.16%	8.36%	13.00%	5,631	8,757	217.3%	139.7%
6	10,271	60,681	16.02%	16.93%	8.04%	12.00%	4,876	7,282	210.6%	141.0%
7	7,646	53,178	15.58%	14.38%	7.49%	11.00%	3,981	5,850	192.1%	130.7%
8	4,730	47,568	11.04%	9.94%	6.76%	10.00%	3,215	4,757	147.1%	99.4%
9	2,896	35,610	9.13%	8.13%	6.49%	9.00%	2,312	3,205	125.2%	90.3%
10	2,966	29,474	10.30%	10.06%	5.86%	8.00%	1,726	2,358	171.8%	125.8%
11	2,025	25,269	8.59%	8.01%	5.45%	7.00%	1,377	1,769	147.1%	114.5%
12	1,649	28,313	6.06%	5.83%	5.50%	6.00%	1,558	1,699	105.9%	97.1%
13	1,928	40,681	5.36%	4.74%	5.40%	5.00%	2,199	2,034	87.7%	94.8%
14	3,212	49,712	6.35%	6.46%	5.12%	5.00%	2,545	2,486	126.2%	129.2%
15	1,979	52,914	4.15%	3.74%	4.96%	4.50%	2,624	2,381	75.4%	83.1%
16	2,707	46,206	6.17%	5.86%	4.78%	4.50%	2,210	2,079	122.5%	130.2%
17	2,967	40,907	8.33%	7.25%	4.37%	4.50%	1,789	1,841	165.9%	161.2%
18	1,169	37,544	3.48%	3.11%	4.01%	4.00%	1,505	1,502	77.7%	77.9%
19	1,317	34,838	3.92%	3.78%	3.83%	3.50%	1,333	1,219	98.8%	108.0%
20	1,240	37,370	2.88%	3.32%	3.64%	3.50%	1,362	1,308	91.0%	94.8%
21	3,633	48,555	6.98%	7.48%	3.43%	3.50%	1,664	1,699	218.3%	213.8%
22	1,312	33,026	4.71%	3.97%	3.35%	3.50%	1,106	1,156	118.6%	113.5%
23	767	19,583	4.08%	3.91%	3.27%	3.50%	640	685	119.8%	111.9%
24	-	7,878	0.00%	0.00%	3.13%	3.50%	246	276	0.0%	0.0%
25+	-	-	0.00%	N/A	N/A	3.50%	-	-	N/A	N/A
Total	**123,264**	**1,040,195**	**19.89%**	**11.85%**	**8.20%**	**10.06%**	**85,262**	**104,636**	**144.6%**	**117.8%**

** The current withdrawal assumption is based on service for the first three years of employment and based on age after three years of service. Our recommended table is service-based for all years of employment.*

Withdrawal Experience* – Males



* *The current withdrawal assumption is based on service for the first three years of employment and based on age after three years of service. Our recommended table is service-based for all years of employment.*

Withdrawal Experience* – Females

Year	Liability Weighted ($000s)		Crude Rates		Sample Rates		Liability Weighted ($000s)			
							Expected Withdrawals		Ratio of Actuals/Expecteds	
	Withdrawal	Exposure	Population Weighted	Liability Weighted	Present	Proposed	Present	Proposed	Present	Proposed
1	3,352	10,488	40.04%	31.96%	27.00%	30.00%	2,832	3,146	118.3%	106.5%
2	9,447	33,616	31.21%	28.10%	23.00%	25.00%	7,732	8,404	122.2%	112.4%
3	7,502	38,771	24.30%	19.35%	17.00%	18.00%	6,591	6,979	113.8%	107.5%
4	5,385	32,516	18.29%	16.56%	9.77%	14.00%	3,176	4,552	169.6%	118.3%
5	5,898	32,578	19.94%	18.10%	9.48%	14.00%	3,090	4,561	190.9%	129.3%
6	3,768	28,020	17.76%	13.45%	9.38%	12.00%	2,628	3,362	143.4%	112.1%
7	3,318	21,822	15.96%	15.20%	8.71%	11.00%	1,901	2,400	174.5%	138.3%
8	1,539	19,787	7.79%	7.78%	8.28%	10.00%	1,637	1,979	94.0%	77.8%
9	1,992	16,661	12.82%	11.96%	7.87%	10.00%	1,311	1,666	151.9%	119.6%
10	3,105	14,298	20.22%	21.72%	7.51%	10.00%	1,074	1,430	289.1%	217.2%
11	1,336	14,020	7.14%	9.53%	7.01%	10.00%	983	1,402	135.9%	95.3%
12	1,978	11,147	16.95%	17.75%	6.69%	10.00%	746	1,115	265.2%	177.4%
13	1,331	14,048	8.82%	9.47%	6.67%	10.00%	937	1,405	142.0%	94.7%
14	1,871	16,948	13.16%	11.04%	6.54%	10.00%	1,108	1,695	168.8%	110.4%
15	1,326	20,063	8.75%	6.61%	6.23%	9.00%	1,250	1,806	106.0%	73.4%
16	1,851	19,818	9.46%	9.34%	5.76%	8.00%	1,141	1,585	162.2%	116.8%
17	2,272	18,114	14.06%	12.54%	5.38%	7.00%	974	1,268	233.3%	179.2%
18	218	16,498	1.85%	1.32%	5.25%	5.00%	866	825	25.2%	26.5%
19	244	16,173	1.96%	1.51%	5.10%	5.00%	825	809	29.5%	30.1%
20	1,687	21,998	9.09%	7.67%	4.86%	5.00%	1,068	1,100	157.9%	153.3%
21	981	29,471	3.66%	3.33%	4.39%	4.00%	1,294	1,179	75.8%	83.2%
22	433	21,762	1.79%	1.99%	4.10%	3.50%	891	762	48.6%	56.8%
23	769	11,909	6.25%	6.46%	4.25%	3.50%	506	417	152.1%	184.5%
24	281	6,882	6.25%	4.08%	3.70%	3.50%	255	241	110.2%	116.6%
25+	-	-	0.00%	N/A	N/A	3.50%	-	-	N/A	N/A
Total	**61,882**	**487,408**	**21.47%**	**12.70%**	**9.19%**	**11.10%**	**44,816**	**54,088**	**138.1%**	**114.4%**

* *The current withdrawal assumption is based on service for the first three years of employment and based on age after three years of service. Our recommended table is service-based for all years of employment.*

Withdrawal Experience* – Females

* *The current withdrawal assumption is based on service for the first three years of employment and based on age after three years of service. Our recommended table is service-based for all years of employment.*

SECTION E

DISABILITY EXPERIENCE

Disability Experience

Local Correctional members who are unable to perform normal duties are eligible to receive a disability benefit. Members must have at least one year of service unless disability is duty-related.

The current disability benefit is equal to 1.9% of average salary for each year of service, with a minimum benefit equal to 19% of average salary (47.5% of average salary if disability is duty-related).

The assumed rates of disability (leaving active service due to injury or illness while not entitled to age and service retirement benefits) are a minor ingredient in cost calculations, since the incidence of disability is low. Higher rates of disability generally result in somewhat higher computed contributions, and vice-versa.

Findings

Members must apply within 18 months from the date public service is terminated and must provide evidence of the inability to perform job-related duties. As such, there could be a delay in the classification of a member as a disability retirement. In fact, over the course of the four-year period, there were approximately 14 members who were reclassified as a disability retirement after first being reported as a termination. In recognition of this process, we included these members in our analysis and recommend rates including these incidences.

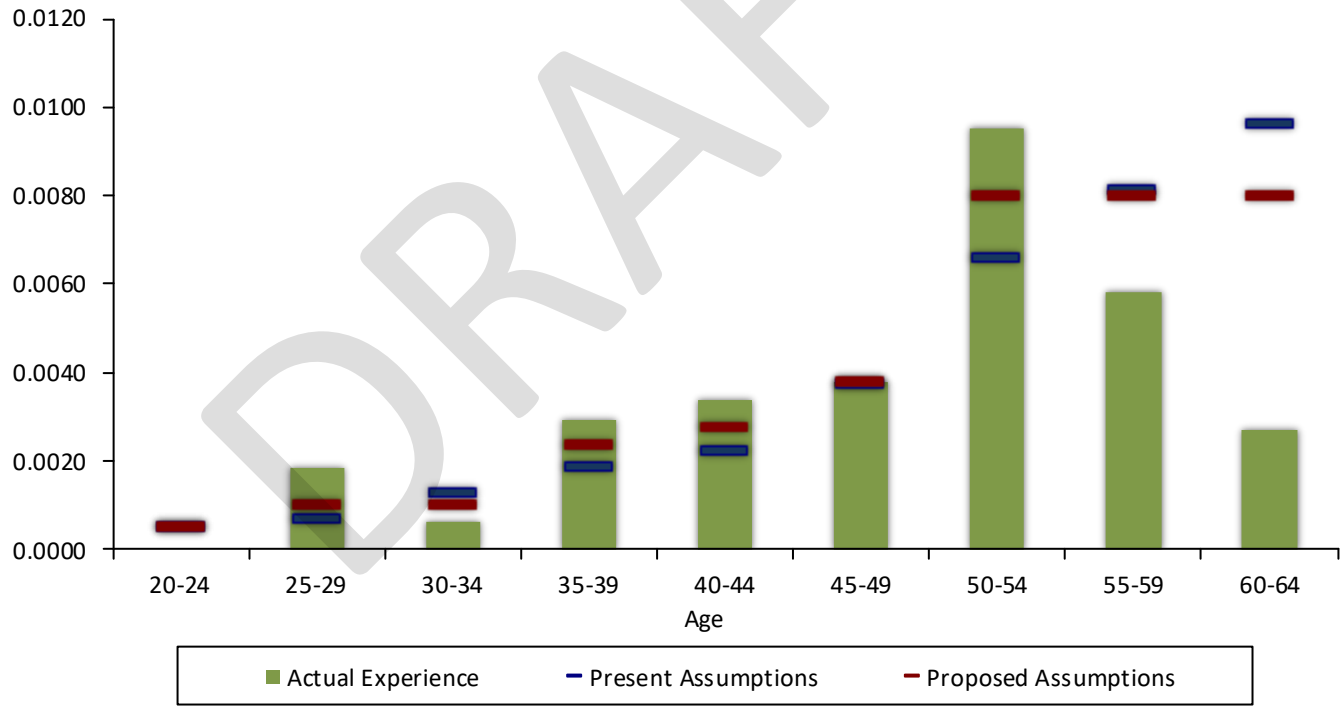
The results of our analysis are shown on the following pages. Overall, the actual number of disability retirements for males (31) is 107% of the number projected by the present assumption (29 – see charts on the following pages). However, we note there were fewer disability retirements than expected for males after age 55. For females, the number of disability retirements (17) is 91 percent of the number projected by the present assumptions (19), but we note one year in the four-year period with substantially more disability retirements than expected and the other three years with far fewer disability retirements than expected. Due to this volatility in the disability retirement experience for females, we recommend no change to the current table for ages younger than 55.

Recommendation

We recommend adopting changes to the disability incidence rates for males, as shown on the next page. For females, we recommend reducing disability incidence rates after age 55.

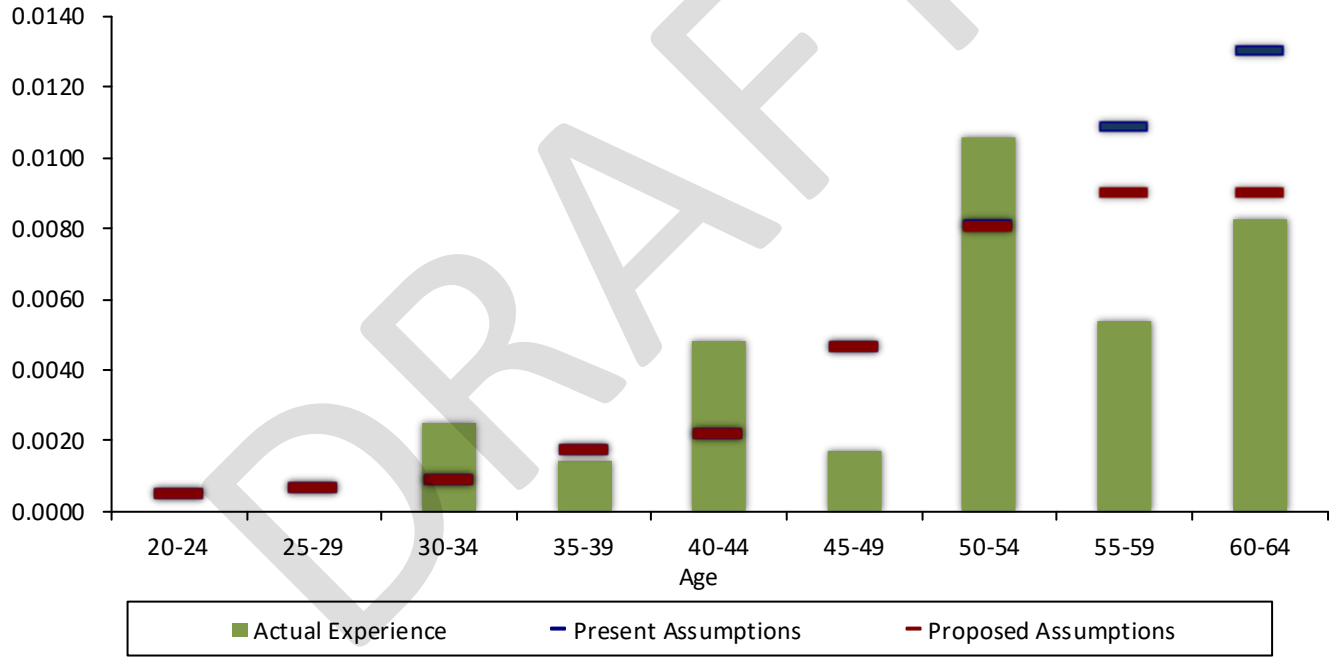
Disability Experience – Males

Age	Population Weighted Disabilities Including Terminations	Population Weighted Exposure	Crude Rates With Terminations	Crude Rates Without Terminations	Sample Rates Present	Sample Rates Proposed	Population Weighted Expected Disabilities Present	Population Weighted Expected Disabilities Proposed	Population Weighted Ratio of Actuals/Expecteds Present	Population Weighted Ratio of Actuals/Expecteds Proposed
Under 20	-	5	0.0000%	0.0000%	0.0400%	0.0500%	0.0	0.0	0.0%	0.0%
20-24	-	756	0.0000%	0.0000%	0.0516%	0.0500%	0.4	0.4	0.0%	0.0%
25-29	3	1,607	0.1867%	0.0622%	0.0687%	0.1000%	1.1	1.6	271.9%	186.7%
30-34	1	1,637	0.0611%	0.0611%	0.1305%	0.1000%	2.1	1.6	46.8%	61.1%
35-39	4	1,374	0.2911%	0.2911%	0.1881%	0.2351%	2.6	3.2	154.8%	123.8%
40-44	4	1,185	0.3376%	0.1688%	0.2230%	0.2765%	2.6	3.3	151.4%	122.1%
45-49	4	1,052	0.3802%	0.1901%	0.3747%	0.3826%	3.9	4.0	101.5%	99.4%
50-54	10	1,050	0.9524%	0.9524%	0.6626%	0.8000%	7.0	8.4	143.7%	119.0%
55-59	4	690	0.5797%	0.5797%	0.8126%	0.8000%	5.6	5.5	71.3%	72.5%
60-64	1	372	0.2688%	0.2688%	0.9615%	0.8000%	3.6	3.0	28.0%	33.6%
Totals	**31**	**9,728**	**0.3187%**	**0.2570%**	**0.2975%**	**0.3192%**	**28.9**	**31.1**	**107.1%**	**99.8%**



Disability Experience – Females

							Population Weighted			
	Population Weighted		Crude Rates		Sample Rates		Expected Disabilities		Ratio of Actuals/Expecteds	
Age	Disabilities Including Termination	Exposure	With Terminations	Without Terminations	Present	Proposed	Present	Proposed	Present	Proposed
Under 20	-	1	0.0000%	0.0000%	0.0400%	0.0400%	0.0	0.0	0.0%	0.0%
20-24	-	474	0.0000%	0.0000%	0.0515%	0.0515%	0.2	0.2	0.0%	0.0%
25-29	-	932	0.0000%	0.0000%	0.0679%	0.0679%	0.6	0.6	0.0%	0.0%
30-34	2	795	0.2516%	0.1258%	0.0912%	0.0912%	0.7	0.7	275.8%	275.8%
35-39	1	691	0.1447%	0.1447%	0.1725%	0.1725%	1.2	1.2	83.9%	83.9%
40-44	3	623	0.4815%	0.3210%	0.2192%	0.2192%	1.4	1.4	219.7%	219.7%
45-49	1	577	0.1733%	0.0000%	0.4696%	0.4696%	2.7	2.7	36.9%	36.9%
50-54	6	567	1.0582%	0.3527%	0.8107%	0.8071%	4.6	4.6	130.5%	131.1%
55-59	2	371	0.5391%	0.5391%	1.0889%	0.9000%	4.0	3.3	49.5%	59.9%
60-64	2	243	0.8230%	0.4115%	1.3000%	0.9000%	3.2	2.2	63.3%	91.4%
Totals	**17**	**5,274**	**0.3223%**	**0.1706%**	**0.3539%**	**0.3218%**	**18.7**	**17.0**	**91.1%**	**100.2%**



SECTION F

MORTALITY EXPERIENCE

Mortality Experience

Post-retirement mortality is an important component in cost calculations and should be updated from time to time to reflect current and expected future longevity improvements. Pre-retirement mortality is a relatively minor component in cost calculations. The frequency of pre-retirement deaths is so low that mortality assumptions based on actual experience can only be produced for very large retirement systems, if at all.

Actuarial Standards of Practice

Actuarial Standards of Practice (ASOP) No. 35 Disclosure Section 4.1.1 states, "The disclosure of the mortality assumption should contain sufficient detail to permit another qualified actuary to understand the provision made for future mortality improvement. If the actuary assumes zero mortality improvement after the measurement date, the actuary should state that no provision was made for future mortality improvement." The current mortality rates used in the valuation include a provision for future mortality improvement.

Mortality Tables and Projection Scales

Prior to the last experience study, the Society of Actuaries published a mortality study that was specific to public sector retirement systems. This is a very comprehensive study and there are numerous mortality tables created for each classification of employee (General members, Public Safety, Teachers, Survivors, Juvenile, headcount-weighted, benefit-weighted, above median, below median).

One of the key findings of the study is that there is a high correlation between longevity and income and education. As such, the SOA highly recommended the use of 'benefit weighted' rates when developing mortality tables. We were able to review LGCSRP retiree and disability mortality on a 'benefit weighted' basis and have shown the results in this section of this report. Consistent with the SOA study, LGCSRP members with higher benefits generally appear to experience longer lifespans, resulting in lower mortality rates.

Fully generational tables, which are utilized for the PERA valuations, help take into account future improvements in mortality that are expected to occur. Typically, the Society of Actuaries updates the projection scale annually; however, no Scale MP-2022 was issued due to skewed mortality experience during the COVID-19 pandemic. The latest published table is called the MP-2021 Projection Scale.

Credibility

Most pension systems will have insufficient data for full credibility in setting a mortality assumption. The general rule of thumb is that approximately 1,000 deaths are required of each gender in the experience period for full credibility with a 90% confidence level. When less than 1,000 deaths occur during the experience study period, partial credibility can be given to the plan's experience based on the actual number of deaths that occurred.

During the four-year period, there were 47 male retiree deaths and 22 female retiree deaths. The healthy retiree mortality experience is not considered to be credible since there were so few deaths. Pre-retirement mortality and disabled retiree experience is also not considered to be credible.

Mortality Experience

Findings

We reviewed the mortality experience during the four-year period. The results are shown on the following pages.

Healthy Retirees

Due to potential anti-selection bias as well as data needs which are outside the scope of the annual valuation process, we did not include beneficiary and survivor mortality experience in our study.

In total, on a benefit weighted basis, the plan experienced more male deaths than expected ($458,000 actual versus $432,000 expected). The actual number of deaths on a benefit weighted basis among retired females ($204,000) was also more than the number projected by the present assumptions ($176,000).

Disabled Retirees

On a benefit weighted basis, the plan experienced more deaths among disabled males ($147,000) as projected by the present assumptions ($113,000). The actual number of deaths on a benefit weighted basis among disabled females ($47,000) was less than the number projected by the present assumptions ($62,000).

Active Members

On a liability weighted basis, the actual amount of deaths among active male members ($2,937,000) was greater than the number projected by the present assumption ($1,947,000). The plan also experienced more deaths on a liability weighted basis among females ($1,439,000) than projected by the present assumptions ($677,000).

Mortality Experience

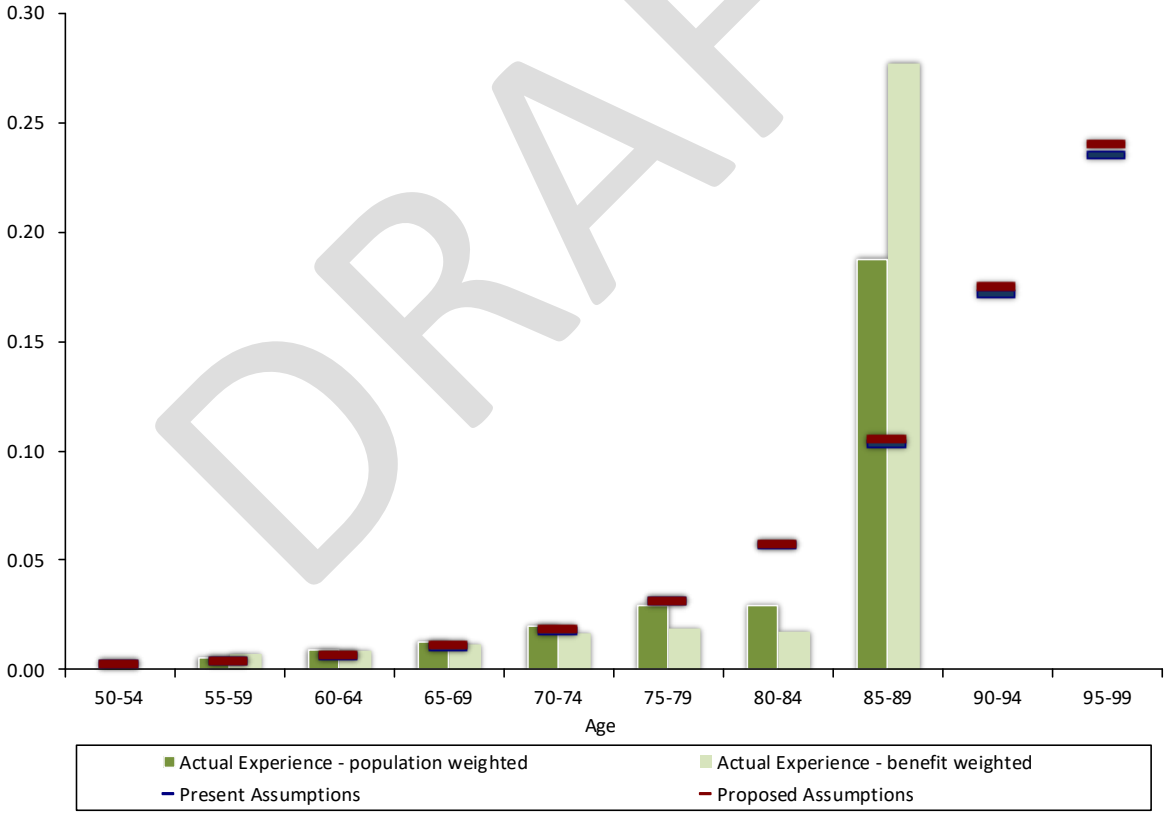
Recommendations

Due to the size of this plan, the experience is not considered credible. We recommend adoption of the following mortality tables (all recommended tables are Benefit Weighted):

Healthy Male Retirees:	Pub-2010 Male Healthy Retired Public Safety Mortality Table, adjusted for mortality improvements using projection scale MP-2021.
Healthy Female Retirees:	Pub-2010 Female Healthy Retired Public Safety Mortality Table, adjusted for mortality improvements using projection scale MP-2021.
Disabled Male Retirees:	Pub-2010 Male Public Safety Disabled Retiree Mortality Table, adjusted for mortality improvements using projection scale MP-2021.
Disabled Female Retirees:	Pub-2010 Female Public Safety Disabled Retiree Mortality Table, adjusted for mortality improvements using projection scale MP-2021.
Male Active Members:	Pub-2010 Male Public Safety Employee Mortality Table adjusted for mortality improvements using projection scale MP-2021.
Female Active Members:	Pub-2010 Female Public Safety Employee Mortality Table adjusted for mortality improvements using projection scale MP-2021.

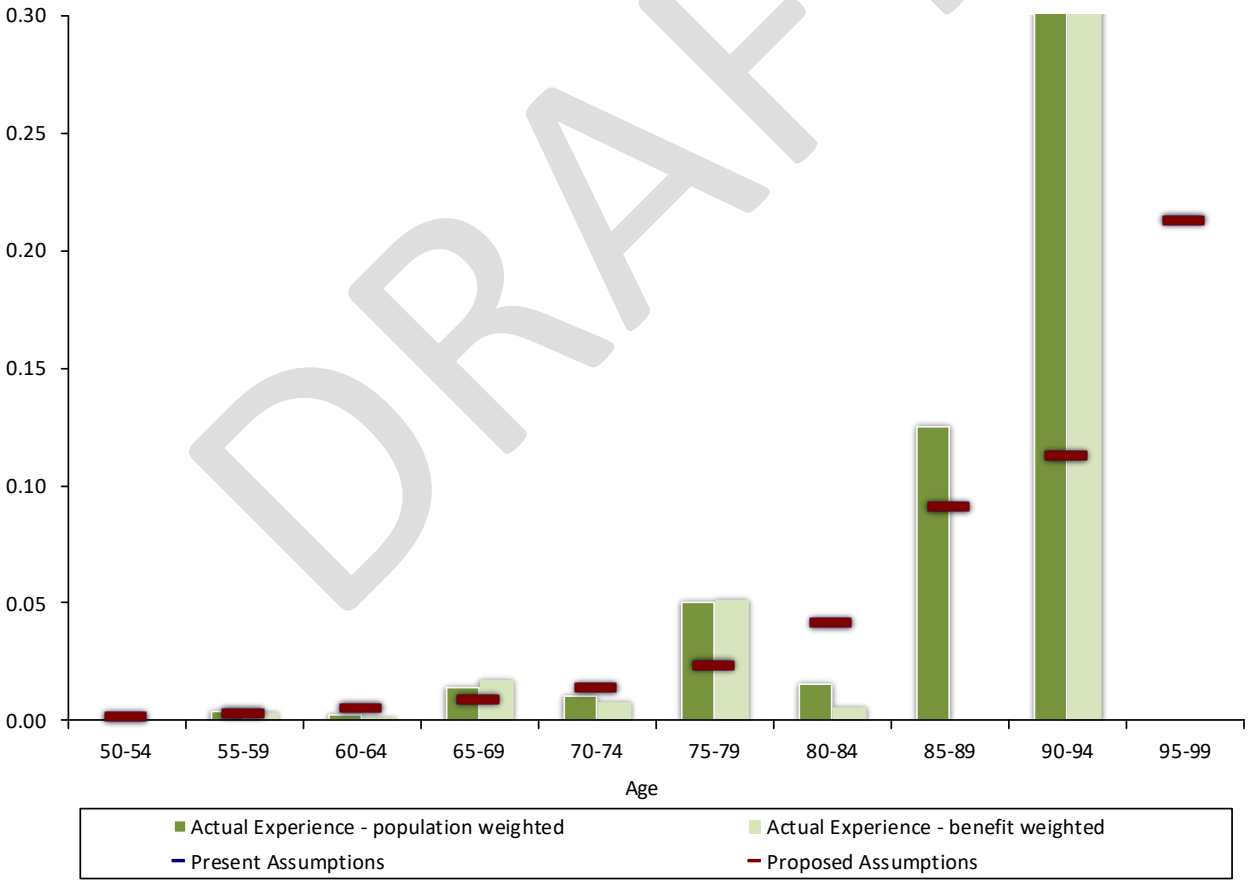
Post-Retirement Mortality Experience
Healthy Males

	Benefit Weighted ($000s)		Crude Rates				Benefit Weighted ($000s)		Ratio of	
			Benefit	Population	Sample Rates		Expected Deaths		Actuals/Expecteds	
Age	Deaths	Exposure	Weighted	Weighted	Present	Proposed	Present	Proposed	Present	Proposed
50-54	-	908	0.0000	0.0000	0.0024	0.0024	2.11	2.15	0.0%	0.0%
55-59	61	8,305	0.0073	0.0056	0.0038	0.0038	31.68	32.33	192.5%	188.7%
60-64	89	10,636	0.0084	0.0087	0.0064	0.0066	70.18	71.62	126.8%	124.3%
65-69	140	11,858	0.0118	0.0128	0.0107	0.0109	125.12	127.67	111.9%	109.7%
70-74	108	6,525	0.0166	0.0200	0.0178	0.0182	112.39	114.69	96.1%	94.2%
75-79	38	2,005	0.0190	0.0291	0.0312	0.0319	59.03	60.24	64.4%	63.1%
80-84	9	513	0.0175	0.0291	0.0568	0.0580	26.88	27.43	33.5%	32.8%
85-89	13	47	0.2766	0.1875	0.1031	0.1052	4.23	4.31	307.6%	301.4%
90-94	-	1	0.0000	0.0000	0.1712	0.1747	0.15	0.15	0.0%	0.0%
95-99	-	-	N/A	N/A	0.2355	0.2403	-	-	N/A	N/A
100+	-	-	N/A	N/A	0.3168	0.3232	-	-	N/A	N/A
Totals	**458**	**40,798**	**0.0112**	**0.0146**	**0.0106**	**0.0108**	**431.77**	**440.58**	**106.1%**	**104.0%**



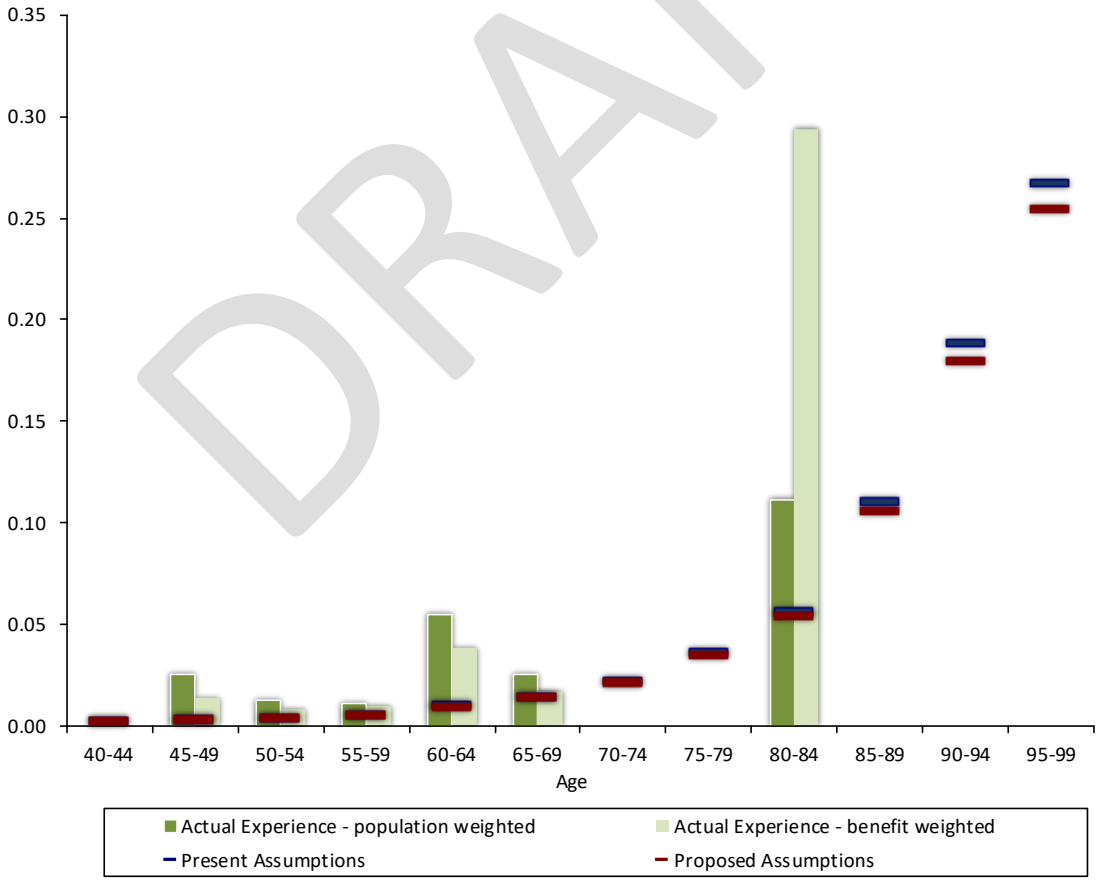
Post-Retirement Mortality Experience
Healthy Females

	Benefit Weighted ($000s)		Crude Rates				Benefit Weighted ($000s)		Ratio of	
			Benefit	Population	Sample Rates		Expected Deaths		Actuals/Expecteds	
Age	Deaths	Exposure	Weighted	Weighted	Present	Proposed	Present	Proposed	Present	Proposed
50-54	-	493	0.0000	0.0000	0.0019	0.0019	0.96	0.96	0.0%	0.0%
55-59	16	4,170	0.0038	0.0036	0.0035	0.0035	14.52	14.52	110.2%	110.2%
60-64	6	5,455	0.0011	0.0025	0.0057	0.0057	31.07	31.07	19.3%	19.3%
65-69	109	6,306	0.0173	0.0142	0.0088	0.0088	55.30	55.30	197.1%	197.1%
70-74	28	3,380	0.0083	0.0106	0.0139	0.0139	47.08	47.08	59.5%	59.5%
75-79	42	811	0.0518	0.0504	0.0237	0.0237	19.25	19.25	218.1%	218.1%
80-84	1	172	0.0058	0.0156	0.0419	0.0419	7.20	7.20	13.9%	13.9%
85-89	-	6	0.0000	0.1250	0.0912	0.0912	0.55	0.55	0.0%	0.0%
90-94	2	2	1.0000	1.0000	0.1125	0.1125	0.22	0.22	889.1%	889.1%
95-99	-	-	N/A	N/A	0.2128	0.2128	-	-	N/A	N/A
100+	-	-	N/A	N/A	0.3121	0.3121	-	-	N/A	N/A
Totals	**204**	**20,795**	**0.0098**	**0.0125**	**0.0085**	**0.0085**	**176.16**	**176.16**	**115.8%**	**115.8%**



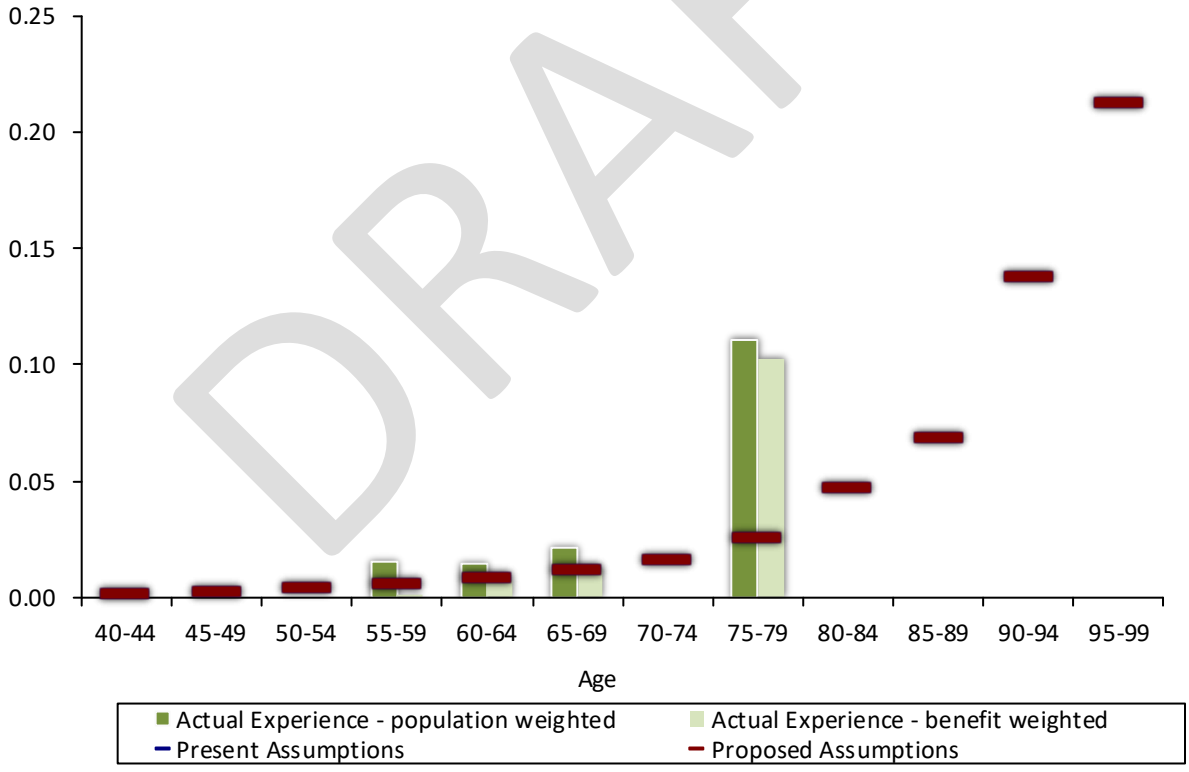
Post-Retirement Mortality Experience
Disabled Males

Age	Benefit Weighted ($000s) Deaths	Exposure	Crude Rates Benefit Weighted	Populatio Weighted	Sample Rates Present	Proposed	Benefit Weighted ($000s) Expected Deaths Present	Proposed	Ratio of Actuals/Expecteds Present	Proposed
<40	-	449	0.00%	0.00%	0.22%	0.21%	1.00	0.95	0.0%	0.0%
40-44	-	578	0.00%	0.00%	0.25%	0.24%	1.46	1.39	0.0%	0.0%
45-49	8	572	1.40%	2.56%	0.30%	0.29%	1.72	1.64	465.7%	489.0%
50-54	15	1,884	0.80%	1.30%	0.40%	0.38%	7.55	7.19	198.6%	208.6%
55-59	16	1,689	0.95%	1.11%	0.58%	0.55%	9.84	9.37	162.6%	170.8%
60-64	61	1,575	3.87%	5.48%	0.99%	0.94%	15.55	14.81	392.3%	411.9%
65-69	22	1,316	1.67%	2.53%	1.45%	1.38%	19.12	18.21	115.0%	120.8%
70-74	-	1,510	0.00%	0.00%	2.23%	2.13%	33.71	32.11	0.0%	0.0%
75-79	-	488	0.00%	0.00%	3.67%	3.50%	17.93	17.08	0.0%	0.0%
80-84	25	85	29.41%	11.11%	5.66%	5.39%	4.81	4.58	519.9%	545.9%
85-89	-	-	N/A	N/A	11.07%	10.54%	-	-	N/A	N/A
90-94	-	-	N/A	N/A	18.85%	17.95%	-	-	N/A	N/A
95-99	-	-	N/A	N/A	26.70%	25.43%	-	-	N/A	N/A
100+	-	-	N/A	N/A	36.70%	34.95%	-	-	N/A	N/A
Totals	**147**	**10,146**	**1.45%**	**1.99%**	**1.11%**	**1.06%**	**112.69**	**107.32**	**130.4%**	**137.0%**



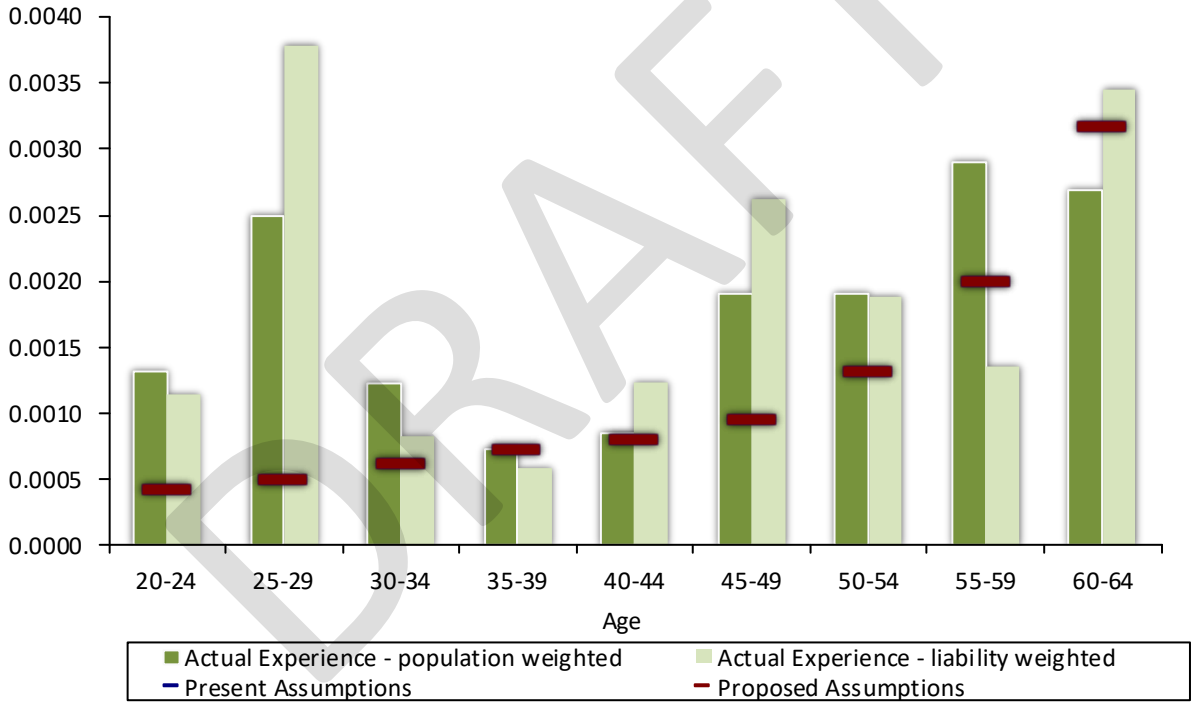
Post-Retirement Mortality Experience
Disabled Females

	Benefit Weighted ($000s)		Crude Rates				Benefit Weighted ($000s)		Ratio of	
			Benefit	Population	Sample Rates		Expected Deaths		Actuals/Expecteds	
Age	Deaths	Exposure	Weighted	Weighted	Present	Proposed	Present	Proposed	Present	Proposed
<40	-	316	0.00%	0.00%	0.17%	0.17%	0.53	0.53	0.0%	0.0%
40-44	-	207	0.00%	0.00%	0.20%	0.20%	0.41	0.41	0.0%	0.0%
45-49	-	384	0.00%	0.00%	0.24%	0.24%	0.92	0.92	0.0%	0.0%
50-54	-	575	0.00%	0.00%	0.37%	0.37%	2.16	2.16	0.0%	0.0%
55-59	2	1,333	0.15%	1.49%	0.58%	0.58%	7.69	7.69	26.0%	26.0%
60-64	10	1,361	0.73%	1.43%	0.84%	0.84%	11.42	11.42	87.6%	87.6%
65-69	12	954	1.26%	2.13%	1.15%	1.15%	10.93	10.93	109.7%	109.7%
70-74	-	1,058	0.00%	0.00%	1.65%	1.65%	17.47	17.47	0.0%	0.0%
75-79	23	224	10.27%	11.11%	2.55%	2.55%	5.72	5.72	402.1%	402.1%
80-84	-	53	0.00%	0.00%	4.68%	4.68%	2.48	2.48	0.0%	0.0%
85-89	-	31	0.00%	0.00%	6.83%	6.83%	2.12	2.12	0.0%	0.0%
90-94	-	-	N/A	N/A	13.82%	13.82%	-	-	N/A	N/A
95-99	-	-	N/A	N/A	21.28%	21.28%	-	-	N/A	N/A
100+	-	-	N/A	N/A	31.21%	31.21%	-	-	N/A	N/A
Totals	**47**	**6,496**	**0.72%**	**1.31%**	**0.95%**	**0.95%**	**61.86**	**61.86**	**76.0%**	**76.0%**



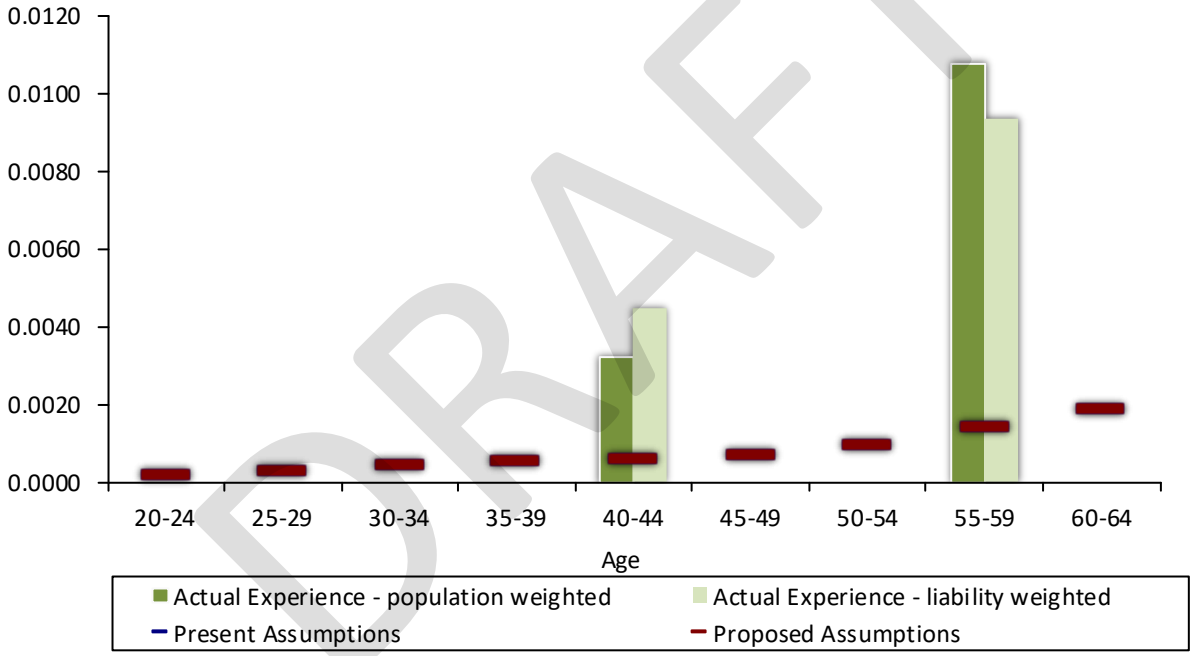
Pre-Retirement Mortality Experience
Healthy Males

Age	Liability Weighted ($000s)		Crude Rates		Sample Rates		Liability Weighted ($000s) Expected Deaths		Ratio of Actuals/Expecteds	
	Deaths	Exposure	Liability Weighted	Population Weighted	Present	Proposed	Present	Proposed	Present	Proposed
Under 20	-	45	0.00%	0.00%	0.04%	0.04%	0.02	0.02	0.0%	0.0%
20-24	23	20,063	0.11%	0.13%	0.04%	0.04%	8.57	8.57	268.3%	268.3%
25-29	366	96,844	0.38%	0.25%	0.05%	0.05%	48.54	48.54	753.9%	753.9%
30-34	134	163,416	0.08%	0.12%	0.06%	0.06%	101.24	101.24	132.4%	132.4%
35-39	122	210,597	0.06%	0.07%	0.07%	0.07%	153.29	153.29	79.6%	79.6%
40-44	304	245,626	0.12%	0.08%	0.08%	0.08%	198.03	198.03	153.5%	153.5%
45-49	749	286,499	0.26%	0.19%	0.10%	0.10%	273.23	273.23	274.1%	274.1%
50-54	607	321,571	0.19%	0.19%	0.13%	0.13%	422.74	422.74	143.6%	143.6%
55-59	288	213,178	0.14%	0.29%	0.20%	0.20%	426.65	426.65	67.5%	67.5%
60-64	344	99,504	0.35%	0.27%	0.32%	0.32%	315.17	315.17	109.1%	109.1%
Totals	**2,937**	**1,657,343**	**0.18%**	**0.16%**	**0.12%**	**0.12%**	**1,947.47**	**1,947.47**	**150.8%**	**150.8%**



Pre-Retirement Mortality Experience
Healthy Females

Age	Liability Weighted ($000s)		Crude Rates		Sample Rates		Liability Weighted ($000s) Expected Deaths		Ratio of Actuals/Expecteds	
	Deaths	Exposure	Liability Weighted	Population Weighted	Present	Proposed	Present	Proposed	Present	Proposed
Under 20	-	-	N/A	0.00%	N/A	N/A	-	-	0.0%	0.0%
20-24	-	10,357	0.00%	0.00%	0.02%	0.02%	2.17	2.17	0.0%	0.0%
25-29	-	43,117	0.00%	0.00%	0.03%	0.03%	12.60	12.60	0.0%	0.0%
30-34	-	67,260	0.00%	0.00%	0.04%	0.04%	28.24	28.24	0.0%	0.0%
35-39	-	89,832	0.00%	0.00%	0.05%	0.05%	47.64	47.64	0.0%	0.0%
40-44	531	118,156	0.45%	0.32%	0.06%	0.06%	70.83	70.83	749.7%	749.7%
45-49	-	145,386	0.00%	0.00%	0.07%	0.07%	103.80	103.80	0.0%	0.0%
50-54	-	155,124	0.00%	0.00%	0.10%	0.10%	150.08	150.08	0.0%	0.0%
55-59	908	97,028	0.94%	1.08%	0.14%	0.14%	139.13	139.13	652.6%	652.6%
60-64	-	64,315	0.00%	0.00%	0.19%	0.19%	122.15	122.15	0.0%	0.0%
Totals	**1,439**	**790,575**	**0.18%**	**0.11%**	**0.09%**	**0.09%**	**676.64**	**676.64**	**212.7%**	**212.7%**



SECTION G

MISCELLANEOUS AND TECHNICAL ASSUMPTIONS

Post-Retirement Benefit Increases

Effective January 1, 2019, benefit increases after retirement equal 100% of the Social Security Cost-of-Living Adjustment, not less than 1.0%, and not more than 2.5%. If the funding status declines to 85% for two consecutive years or 80% for one year, the maximum increase will be lowered to 1.5%. Effective July 1, 2023, the maximum benefit increase will revert back to 2.5%, if the maximum increase is 1.5% and the Plan's funding ratio improves to 85% for two consecutive years on a market value of assets basis.

For valuation purposes, we must make an assumption about future post-retirement benefit increases. The current post-retirement benefit increase assumption is 2.00% based on our analysis in the Local Government Correctional Service Retirement Plan Experience Study dated July 10, 2020.

We examined the capital market inflation assumptions for 13 investment consulting firms based on the GRS Capital Market Assumption Modeler (CMAM). Because GRS is a benefits consulting firm and does not develop or maintain its own capital market expectations, we request and monitor forward-looking expectations developed by several major investment firms. We update our CMAM on an annual basis. The capital market assumptions in the 2024 CMAM are from the following investment firms (in alphabetical order): Aon, Blackrock, BNY Mellon, Callan, Cambridge, JPMorgan, Meketa, Mercer, NEPC, Northern Trust, RVK, Verus, and Wilshire.

The average assumption for inflation was 2.39%, with a range of 2.13% to 2.70%, and the average standard deviation was 1.96% (note that not every investment consulting firm provided a standard deviation). However, the investment consulting firms typically set their assumptions based on a shorter time horizon, while actuaries must make much longer projections.

We normalized these parameters slightly so that they would correspond to the proposed inflation assumption of 2.25%. Then, based on a Monte Carlo simulation (1,000 simulations) of the post-retirement benefit increases as described above, we determined that the following assumption would be appropriate to model the effect of the post-retirement benefit increases as described below:

	Post-Retirement Benefit Increase	Actuarial Assumption
LGCSRP	100% of the Social Security Cost-of-Living Adjustment, not less than 1.0% and not more than 2.5%	2.0% per year

Note that for LGCSRP, the result of the simulation was 1.9%; our recommended actuarial assumption of 2.0% reflects conservatism and minor rounding. The assumptions will be quite sensitive to the inflation assumption, and to its assumed standard deviation.

Post-Retirement Benefit Increases

Actual benefit increases since this plan provision was enacted are summarized in the table below:

Effective Date	Benefit Increase
January 1, 2019	2.5%
January 1, 2020	1.6%
January 1, 2021	1.3%
January 1, 2022	2.5%
January 1, 2023	2.5%
January 1, 2024	2.5%

Recommendation

We recommend no change to the assumed future post-retirement benefit increase.

Marital Status

Married members will frequently make different annuity selections than non-married members. The current valuation assumption is that 75% of members are married. Actual marital status is used for retired members.

Findings

We reviewed the marital status of healthy members retiring from active status during the four-year period. The results are shown below:

Gender	Married New Retirees	Total New Retirees	Crude Rates	Sample Rates		Expected Married Retirees		Ratio of Actual/Expected	
				Present	Proposed	Present	Proposed	Present	Proposed
Males	143	183	78.14%	75.00%	75.00%	137	137	104.2%	104.2%
Females	49	89	55.06%	75.00%	65.00%	67	58	73.4%	84.7%
Total	**192**	**272**	**70.59%**			**204**	**195**	**94.1%**	**98.4%**

The experience shows the number of married new retirees is approximately as expected for males but lower than expected for females.

Recommendation

We recommend maintaining the current marital status assumption for males and lowering the female assumption to 65%.

Age of Survivor

Joint & Survivor annuity benefit amounts are determined based on the member's and survivor's age. Currently, the valuation assumes that male members have a beneficiary three years younger and female members have a beneficiary three years older. This assumption is used to predict the length of expected payments payable to a future survivor.

Findings

We reviewed the ages of married new retirees and their beneficiaries during the four-year period. In cases where a new retiree had a beneficiary that is more than 20 years older or younger, we classified those retirees as unmarried in order to not skew the age difference results.

The results are shown below:

Gender	Married New Retirees	Average Age Difference	Expected Age Difference		Ratio of Actual/Expected	
			Present	Proposed	Present	Proposed
Males	143	1.83	3.00	2.00	61.0%	91.5%
Females	49	-1.84	-3.00	-2.00	61.3%	92.0%
Total	**192**					

The experience shows the age difference of married new retirees is lower than expected for both males and females.

Recommendation

We recommend lowering the current survivor age difference assumption to two years.

Form of Payment

Upon retirement, a member can elect any of the following forms of payment:

- Single-life Annuity – the benefit is paid for the lifetime of the member. No benefit is payable to a beneficiary upon the member's death.
- 25% Joint & Survivor – a reduced benefit is paid for the lifetime of the member. Upon death of the member, 25% of the benefit is paid to a beneficiary. If the beneficiary predeceases the member, the benefit reverts back to the single life annuity amount.
- 50% Joint & Survivor – a reduced benefit is paid for the lifetime of the member. Upon death of the member, 50% of the benefit is paid to a beneficiary. If the beneficiary predeceases the member, the benefit reverts back to the single life annuity amount.
- 75% Joint & Survivor – a reduced benefit is paid for the lifetime of the member. Upon death of the member, 75% of the benefit is paid to a beneficiary. If the beneficiary predeceases the member, the benefit reverts back to the single life annuity amount.
- 100% Joint & Survivor – a reduced benefit is paid for the lifetime of the member. Upon death of the member, 100% of the benefit is paid to a beneficiary. If the beneficiary predeceases the member, the benefit reverts back to the single life annuity amount.

If the member elects a joint & survivor form of payment and the beneficiary predeceases the member, the benefit "bounces back" to the single life annuity at the time of the beneficiary's death. There is no actuarial reduction for the bounce-back feature (i.e., this is subsidized by the plan). In order to capture the cost of this subsidy in the annual valuation, an assumption is made regarding the form of payment elections for future retirees.

Married members retiring from active status are currently assumed to elect annuities as follows:

Males:	10.0% elect 25% Joint & Survivor option
	15.0% elect 50% Joint & Survivor option
	5.0% elect 75% Joint & Survivor option
	50.0% elect 100% Joint & Survivor option
Females:	10.0% elect 25% Joint & Survivor option
	10.0% elect 50% Joint & Survivor option
	5.0% elect 75% Joint & Survivor option
	25.0% elect 100% Joint & Survivor option

Remaining married and unmarried members are assumed to elect the Single-life option.

Findings

We reviewed the benefit elections of married new retirees during the four-year period. The results are shown on the following pages.

We found more married new retirees are electing the 100% joint & survivor options for both males and females.

Recommendation

We recommend changes to the form of payment assumptions as indicated on the next page.

Form of Payment

Male Experience

Form of Payment	Actual Electing Annuity	Married New Retirees	Crude Rates	Sample Rates		Expected Electing Annuity		Ratio of Actuals/Expected	
				Present	Proposed	Present	Proposed	Present	Proposed
Single-life annuity	22	143	15.38%	20.00%	15.00%	28.60	21.45	76.9%	102.6%
25% joint & survivor	11	143	7.69%	10.00%	10.00%	14.30	14.30	76.9%	76.9%
50% joint & Survivor	17	143	11.89%	15.00%	12.50%	21.45	17.88	79.3%	95.1%
75% joint & Survivor	11	143	7.69%	5.00%	7.50%	7.15	10.73	153.8%	102.6%
100% joint & Survivor	82	143	57.34%	50.00%	55.00%	71.50	78.65	114.7%	104.3%
Total	**143**	**143**	**100.00%**	**100.00%**	**100.00%**	**143.00**	**143.00**		

Female Experience

Form of Payment	Actual Electing Annuity	Married New Retirees	Crude Rates	Sample Rates		Expected Electing Annuity		Ratio of Actuals/Expected	
				Present	Proposed	Present	Proposed	Present	Proposed
Single-life annuity	24	49	48.98%	50.00%	50.00%	24.50	24.50	98.0%	98.0%
25% joint & survivor	1	49	2.04%	10.00%	5.00%	4.90	2.45	20.4%	40.8%
50% joint & Survivor	4	49	8.16%	10.00%	10.00%	4.90	4.90	81.6%	81.6%
75% joint & Survivor	2	49	4.08%	5.00%	5.00%	2.45	2.45	81.6%	81.6%
100% joint & Survivor	18	49	36.73%	25.00%	30.00%	12.25	14.70	146.9%	122.4%
Total	**49**	**49**	**100.00%**	**100.00%**	**100.00%**	**49.00**	**49.00**		

Actuarial Equivalent Factors

Early retirement benefits are actuarially equivalent to the benefit payable at Normal Retirement. Joint and Survivor benefits are actuarially equivalent to the Single-life annuity. Effective July 1, 2019, actuarial equivalent factors are based on the RP-2014 mortality table for healthy annuitants for a member turning age 55 in 2021, reflecting projected mortality improvements using Scale MP-2017, male rates multiplied by a factor of 0.96, blended 65% males, 4.88% post-retirement interest and 7.5% pre-retirement interest. Reflecting statutory requirements, joint and survivor factors are based on an interest assumption of 6.5%.

Recommendation

We recommend updating the actuarial equivalent factors to reflect changes in interest and expected mortality and developing an appropriate implementation schedule.

Assumptions for Missing Participant Data

Background

To prepare the annual valuation report, GRS uses and relies on participant data supplied by PERA. In cases where submitted data was missing or incomplete, the following assumptions are currently applied:

Data for active members:

- For members reported with zero or invalid salary (<$100): Salary is set equal to prior year salary, if available, otherwise, high five salary with a 10% load to account for salary increases. If neither pay nor high five salary is available, salary is set to $43,000.
- For members reported without a gender: assume the member is male.
- For members reported with an invalid date of birth: assume the member was hired at age 30.

Data for terminated members:

- For members reported without Credited Service: assume a value equal to elapsed time from hire to termination date; if elapsed time is not available, assume four years.
- For members reported with a termination date: assume termination date is equal to hire date plus credited service; otherwise the valuation date. If reported termination date occurs prior to reported hire date, the two dates are swapped.
- For members reported without an Average Salary: assume Average Salary is $24,000.
- For members reported without a gender: assume male gender.

Data for retired members:

- For members reported without a gender: assume retirees are male and beneficiaries are female.
- Because PERA reclassifies disabled members as retirees once the member reaches Normal Retirement Age, GRS compares the members that PERA reports as retirees to our disabled group from the last valuation. If a member was disabled in the prior valuation, we reclassify that member as a disabled retiree in this year's valuation.

Recommendation

We recommend updating the assumptions for missing participant data as follows:

- *For active members reported with zero or invalid salary (<$100) and prior pay or high five salary is not available: assume salary is equal to the average salary at hire of new members with one to five years of service as of the prior valuation date. This value is $56,000 as of July 1, 2023.*
- *For active members reported with an invalid date of birth: assume the member was hired the same as new members with one to five years of service as of the prior valuation date. This value is 31 years as of July 1, 2023.*
- *For terminated members and Average Salary was not reported or invalid: assume Average Salary equals $64,000.*
- *For terminated members reported without Credited Service: assume a value equal to elapsed time from hire to termination date; if elapsed time is not available, assume four years.*
- *For terminated members reported without a date of birth: assume age 43 at valuation date.*

Proposed Miscellaneous and Technical Assumptions

Background

A number of miscellaneous and technical assumptions are used in the actuarial valuation. The present assumptions are listed on the following page.

The Allowance for Combined Service Annuity assumptions are based on an analysis completed by the LCPR actuary and documented in a report dated October 2016.

Recommendation

Miscellaneous and Technical Assumptions are listed on the next page. We recommend continued use of the other Miscellaneous and Technical Assumptions.

Miscellaneous and Technical Assumptions

Benefit Service	Exact fractional service is used to determine the amount of benefit payable.
Decrement Operation	Withdrawal decrements do not operate during retirement eligibility.
Decrement Timing	Decrements of all types are assumed to occur mid-year.
Eligibility Testing	Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur.
Forfeitures	For vested separations from service, it is assumed that members separating will withdraw their contributions and forfeit an employer financed benefit when the value of member contributions is greater than the value of the employer financed benefit.
Incidence of Contributions	Contributions are assumed to be received on a monthly basis, per the Standards of Actuarial Work.
Liability Adjustments	Liabilities for former members are increased by 33% for vested members and 2% for non-vested members to account for the effect of some participants having eligibility for a Combined Service Annuity.
Pay Increase Timing	Pay increases were assumed to be at the beginning of the fiscal year. This is equivalent to assuming that reported pays represent amounts paid to members during the year ended on the valuation date.
Service Credit Accruals	Members were assumed to accrue one year of service credit per year.

SECTION H

PROPOSED ASSUMPTION LISTING

Proposed Actuarial Assumptions
Based on the 2019-2023 Experience Study

Merit and Seniority Pay Increases

% Merit Increases in Salaries Next Year	
Service Index	Rate
1	5.00%
2	3.00%
3	2.50%
4	2.40%
5	2.30%
6	2.20%
7	2.10%
8	1.90%
9	1.60%
10	1.50%
11	1.40%
12	1.30%
13	1.20%
14	1.10%
15	0.90%
16	0.70%
17	0.50%
18	0.50%
19	0.50%
20+	0.00%

Proposed Actuarial Assumptions
Based on the 2019-2023 Experience Study

Age & Service Retirement Pattern
Unreduced (Normal) Retirement

Age	% Retiring
55	20.0%
56	12.0%
57	11.0%
58	15.0%
59	17.0%
60	15.0%
61	15.0%
62	30.0%
63	24.0%
64	25.0%
65	45.0%
66	40.0%
67	50.0%
68	35.0%
69	40.0%
70+	*

* *The current assumption prescribed by the Minnesota Standards for Actuarial Work is that members who have reached 100% retirement eligibility will delay retirement one year.*

Proposed Actuarial Assumptions
Based on the 2019-2023 Experience Study

Age & Service Retirement Pattern
Reduced (Early) Retirement

Age	% Retiring
50	6.0%
51	5.0%
52	6.0%
53	5.0%
54	9.0%

Proposed Actuarial Assumptions
Based on the 2019-2023 Experience Study

Withdrawal

Year	% Withdrawals	
	Male	Female
1	30.00%	30.00%
2	25.00%	25.00%
3	20.00%	18.00%
4	15.00%	14.00%
5	13.00%	14.00%
6	12.00%	12.00%
7	11.00%	11.00%
8	10.00%	10.00%
9	9.00%	10.00%
10	8.00%	10.00%
11	7.00%	10.00%
12	6.00%	10.00%
13	5.00%	10.00%
14	5.00%	10.00%
15	4.50%	9.00%
16	4.50%	8.00%
17	4.50%	7.00%
18	4.00%	5.00%
19	3.50%	5.00%
20	3.50%	5.00%
21	3.50%	4.00%
22	3.50%	3.50%
23	3.50%	3.50%
24	3.50%	3.50%
25+	3.50%	3.50%

Proposed Actuarial Assumptions
Based on the 2019-2023 Experience Study

Disability Rates

Age	% Becoming Disabled	
	Male	Female
20	0.0500%	0.0400%
21	0.0500%	0.0400%
22	0.0500%	0.0500%
23	0.0500%	0.0500%
24	0.0500%	0.0600%
25	0.1000%	0.0600%
26	0.1000%	0.0600%
27	0.1000%	0.0700%
28	0.1000%	0.0700%
29	0.1000%	0.0800%
30	0.1000%	0.0800%
31	0.1000%	0.0900%
32	0.1000%	0.0900%
33	0.1000%	0.1000%
34	0.1000%	0.1000%
35	0.2250%	0.1650%
36	0.2250%	0.1680%
37	0.2338%	0.1690%
38	0.2425%	0.1800%
39	0.2513%	0.1800%
40	0.2600%	0.1800%
41	0.2688%	0.2000%
42	0.2700%	0.2200%
43	0.2900%	0.2400%
44	0.2980%	0.2600%
45	0.3060%	0.3900%
46	0.3330%	0.4200%
47	0.3690%	0.4600%
48	0.4140%	0.5100%
49	0.5000%	0.5600%
50	0.8000%	0.7000%
51	0.8000%	0.7700%
52	0.8000%	0.8400%
53	0.8000%	0.8500%
54	0.8000%	0.9000%
55+	0.8000%	0.9000%

Proposed Actuarial Assumptions
Based on the 2019-2023 Experience Study

Healthy Post-Retirement Mortality Rates

Age in 2023	% Dying Next Year*	
	Male	Female
50	0.28%	0.20%
51	0.30%	0.21%
52	0.32%	0.23%
53	0.35%	0.24%
54	0.38%	0.26%
55	0.41%	0.28%
56	0.45%	0.30%
57	0.49%	0.32%
58	0.53%	0.35%
59	0.58%	0.37%
60	0.63%	0.40%
61	0.68%	0.43%
62	0.74%	0.46%
63	0.79%	0.50%
64	0.85%	0.54%
65	0.92%	0.58%
66	0.99%	0.63%
67	1.08%	0.69%
68	1.17%	0.76%
69	1.28%	0.84%
70	1.41%	0.93%
71	1.55%	1.03%
72	1.71%	1.15%
73	1.90%	1.30%
74	2.11%	1.46%
75	2.36%	1.64%
76	2.64%	1.86%
77	2.97%	2.10%
78	3.34%	2.37%
79	3.76%	2.69%
80	4.25%	3.05%

Age in 2023	% Dying Next Year*	
	Male	Female
81	4.81%	3.47%
82	5.44%	3.94%
83	6.15%	4.48%
84	6.95%	5.11%
85	7.85%	5.82%
86	8.83%	6.63%
87	9.90%	7.55%
88	11.07%	8.58%
89	12.33%	9.71%
90	13.69%	10.94%
91	15.13%	12.23%
92	16.63%	13.58%
93	18.18%	14.97%
94	19.79%	16.40%
95	21.42%	17.88%
96	23.20%	19.51%
97	25.04%	21.23%
98	26.94%	23.06%
99	28.91%	24.98%
100	30.91%	27.00%
101	32.93%	29.09%
102	34.95%	31.21%
103	36.96%	33.34%
104	38.92%	35.45%
105	40.82%	37.54%
106	42.67%	39.57%
107	44.46%	41.55%
108	46.14%	43.45%
109	47.76%	45.27%
110	49.07%	46.99%

** The rates shown are Pub-2010 mortality for healthy annuitants, Public Safety table, with adjustments, if applicable (see Section F). Rates are adjusted for mortality improvements using Scale MP-2021, from a base year of 2010.*

Proposed Actuarial Assumptions
Based on the 2019-2023 Experience Study

Disabled Post-Retirement Mortality Rates

Age in 2023	% Dying Next Year*	
	Male	Female
20	0.13%	0.06%
21	0.13%	0.06%
22	0.13%	0.07%
23	0.13%	0.07%
24	0.13%	0.07%
25	0.13%	0.08%
26	0.14%	0.09%
27	0.15%	0.10%
28	0.15%	0.11%
29	0.16%	0.11%
30	0.17%	0.12%
31	0.18%	0.13%
32	0.19%	0.14%
33	0.20%	0.15%
34	0.20%	0.16%
35	0.21%	0.17%
36	0.22%	0.18%
37	0.22%	0.18%
38	0.23%	0.19%
39	0.23%	0.19%
40	0.24%	0.20%
41	0.24%	0.20%
42	0.25%	0.20%
43	0.25%	0.21%
44	0.26%	0.21%
45	0.26%	0.22%
46	0.27%	0.23%
47	0.28%	0.23%
48	0.30%	0.25%
49	0.31%	0.26%
50	0.33%	0.28%
51	0.35%	0.30%
52	0.37%	0.33%
53	0.39%	0.37%
54	0.42%	0.41%
55	0.46%	0.45%

Age in 2023	% Dying Next Year*	
	Male	Female
56	0.50%	0.50%
57	0.55%	0.55%
58	0.61%	0.61%
59	0.68%	0.67%
60	0.75%	0.72%
61	0.83%	0.78%
62	0.92%	0.84%
63	1.01%	0.89%
64	1.10%	0.95%
65	1.19%	1.01%
66	1.29%	1.07%
67	1.39%	1.14%
68	1.50%	1.22%
69	1.62%	1.30%
70	1.76%	1.40%
71	1.91%	1.52%
72	2.10%	1.64%
73	2.31%	1.79%
74	2.56%	1.95%
75	2.86%	2.13%
76	3.21%	2.34%
77	3.59%	2.57%
78	4.02%	2.85%
79	4.48%	3.20%
80	4.98%	3.60%
81	5.53%	4.05%
82	6.12%	4.54%
83	6.79%	5.10%
84	7.54%	5.72%
85	8.41%	6.42%
86	9.39%	7.19%
87	10.54%	8.05%
88	11.83%	9.00%
89	13.24%	10.07%
90	14.80%	11.25%

** The rates shown are Pub-2010 mortality for disabled annuitants, Public Safety table, with adjustments, if applicable (see Section F). Rates are adjusted for mortality improvements using Scale MP-2021, from a base year of 2010.*

Proposed Actuarial Assumptions
Based on the 2019-2023 Experience Study

Healthy Pre-Retirement Mortality Rates

Age in 2023	% Dying Next Year*	
	Male	Female
20	0.04%	0.02%
21	0.04%	0.02%
22	0.04%	0.02%
23	0.04%	0.02%
24	0.04%	0.02%
25	0.04%	0.02%
26	0.05%	0.03%
27	0.05%	0.03%
28	0.05%	0.03%
29	0.06%	0.03%
30	0.06%	0.04%
31	0.06%	0.04%
32	0.06%	0.04%
33	0.07%	0.05%
34	0.07%	0.05%
35	0.07%	0.05%
36	0.07%	0.05%
37	0.07%	0.06%
38	0.08%	0.06%
39	0.08%	0.06%
40	0.08%	0.06%
41	0.08%	0.06%
42	0.08%	0.06%
43	0.08%	0.06%
44	0.09%	0.06%
45	0.09%	0.07%

Age in 2023	% Dying Next Year*	
	Male	Female
46	0.09%	0.07%
47	0.10%	0.07%
48	0.10%	0.07%
49	0.11%	0.08%
50	0.11%	0.08%
51	0.12%	0.09%
52	0.13%	0.10%
53	0.14%	0.10%
54	0.15%	0.11%
55	0.17%	0.12%
56	0.18%	0.13%
57	0.20%	0.14%
58	0.22%	0.15%
59	0.25%	0.16%
60	0.27%	0.17%
61	0.30%	0.18%
62	0.32%	0.19%
63	0.35%	0.20%
64	0.38%	0.21%
65	0.41%	0.22%
66	0.46%	0.24%
67	0.51%	0.27%
68	0.57%	0.31%
69	0.63%	0.35%
70	0.71%	0.40%

* *The rates shown are Pub-2010 mortality for employees, Public Safety table, with adjustments, if applicable (see Section F). Rates are adjusted for mortality improvements using Scale MP-2021, from a base year of 2010.*

SECTION I

GLOSSARY

Glossary

The following glossary is intended to provide definitions of a number of terms which are used throughout this report and which are somewhat unique to the discussion of an Experience Study.

Actuarial Decrement. The actual number of decrements which occurred during the study. This number is a straight tabulation of the actual number of occurrences of the particular decrement in question. Normally, the actual number of decrements will be subdivided by age and possibly sex.

Aggregate Assumptions. Assumptions which vary only by sex and/or age. The impact of year of service on the decrement is ignored. All experience is combined by age and/or sex without regard to service. Rates of death and disablement are more appropriate to aggregate measurement in a retirement system.

Crude Rate of Decrement. The rate of decrement determined by dividing the actual number of the respective decrement for that age and sex by the corresponding exposure for that age and sex. The rate is described as a crude rate because no smoothing or elimination of statistical fluctuations has been made. It is indicative of the underlying true rate of the decrement and is the basis used in graduation to obtain the graduated or tabular rate.

Decrements. The decrements are the means by which a member ceases to be a member. For active members, the decrements are death, withdrawal, service retirement, and disability retirement. For retired members, the only decrement is death. The purpose of the Experience Study is to determine the underlying rates of each decrement.

Expected Decrement. This is the number of occurrences of a given decrement expected to occur for a given age and sex based on the number of lives exposed to the risk of the particular decrement and the current assumed rate for that decrement. It may also be referred to as the tabular number of decrements. It is the number of deaths, withdrawals, retirements, or disabilities (whichever is applicable) that would have actually occurred had the actuarial assumptions been exactly realized.

Exposure. The number of lives exposed to a given risk of decrement for a particular age and sex. It represents the number of members who could have potentially died, retired, become disabled, or withdrawn at that particular age and for that particular sex. This term will also be described as "the number exposed to a given risk."

Graduated Rates. Graduation is the mathematical process by which a set of crude rates of a particular type is translated into graduated or tabular rates. The graduation process attempts to smooth out statistical fluctuations and to arrive at a set of rates that adequately fit the underlying actual experience of the crude rates that are being graduated. The graduation process involves smoothing the results, but at the same time trying to fit the results to be consistent with the original data. It requires that the actuary exercise his or her judgment in what the underlying shape of the risk curve should look like.

Interpolated Rates. For the active rates of decrement (death, disability, retirement, and withdrawal), the actuary will develop graduated rates based on quinquennial age groupings (see definition). To arrive at the rates of decrement for ages between two quinquennial ages, the graduated quinquennial rates must be interpolated for these intermediate ages. The interpolated results are arrived at by applying a mathematical interpolation formula to the quinquennial graduated rates.

Glossary

Merit and Seniority Pay Increase Rate. The portion of the total salary scale which varies by service. It reflects the impact of moving up the salary grid in a given year, rather than the increase in the overall grid. It includes the salary increase associated with promotions during the year.

Quinquennial Age Groupings. For the active decrements, it is preferable to group the experience in five-year age groups for graduation and analysis purposes so as to minimize statistical fluctuations resulting from a lack of exposure which may occur for individual ages. Quinquennial age grouping is the five-year age grouping which is used to develop the graduated rates of decrement for active membership. The quinquennial age is the central age of the five-year grouping.

SECTION J

APPENDIX

Appendix – Detailed Experience Analysis

In this section, we present the annual experience for each major assumption that was analyzed for the study. Please note that totals may not sum correctly due to rounding of intermediate results.

Appendix – Detailed Experience Analysis
Salary Increases

2019-2023 Experience

Age	Exposure	Gross Actual Increases	Gross Expected Increases
<25	486	9.74%	9.38%
25-29	1,358	7.84%	6.99%
30-34	1,525	6.65%	5.72%
35-39	1,454	6.15%	5.20%
40-44	1,375	5.41%	4.46%
45-49	1,333	4.66%	3.90%
50-54	1,264	4.31%	3.66%
55-59	756	4.42%	3.33%
60-64	418	3.77%	3.00%
65+	69	1.17%	3.00%
Totals	**10,038**	**5.65%**	**4.82%**

Appendix – Detailed Experience Analysis
Salary Increases

2019-2020 Experience

Age	Exposure	Gross Actual Increases	Gross Expected Increases
<25	137	8.96%	9.32%
25-29	397	6.62%	7.01%
30-34	395	5.70%	5.71%
35-39	380	4.55%	5.19%
40-44	354	4.02%	4.45%
45-49	360	2.38%	3.90%
50-54	331	2.60%	3.66%
55-59	212	4.04%	3.33%
60-64	119	3.54%	3.00%
65+	17	-2.05%	3.00%
Totals	**2,702**	**4.30%**	**4.82%**

2020-2021 Experience

Age	Exposure	Gross Actual Increases	Gross Expected Increases
<25	143	9.39%	9.44%
25-29	394	6.80%	6.99%
30-34	433	5.50%	5.72%
35-39	392	5.51%	5.20%
40-44	350	4.15%	4.46%
45-49	358	4.28%	3.90%
50-54	338	3.90%	3.66%
55-59	209	2.81%	3.31%
60-64	103	2.93%	3.00%
65+	21	0.73%	3.00%
Totals	**2,741**	**4.84%**	**4.87%**

2021-2022 Experience

Age	Exposure	Gross Actual Increases	Gross Expected Increases
<25	104	8.91%	9.25%
25-29	292	8.45%	6.95%
30-34	352	6.17%	5.72%
35-39	351	6.17%	5.19%
40-44	327	6.22%	4.47%
45-49	324	6.05%	3.90%
50-54	301	5.16%	3.66%
55-59	166	4.74%	3.34%
60-64	105	4.23%	3.00%
65+	12	6.59%	3.00%
Totals	**2,334**	**6.13%**	**4.79%**

2022-2023 Experience

Age	Exposure	Gross Actual Increases	Gross Expected Increases
<25	102	11.86%	9.51%
25-29	275	10.15%	7.00%
30-34	345	9.38%	5.73%
35-39	331	8.48%	5.20%
40-44	344	7.11%	4.46%
45-49	291	6.29%	3.90%
50-54	294	5.58%	3.66%
55-59	169	6.42%	3.33%
60-64	91	4.37%	3.00%
65+	19	1.00%	3.00%
Totals	**2,261**	**7.50%**	**4.79%**

Appendix – Detailed Experience Analysis
Retirement*

2019-2023 Experience ($000s)

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
50	6,235	95,452	4,772.6	130.7%
51	4,002	95,732	4,786.6	83.6%
52	6,031	89,878	4,493.9	134.2%
53	4,626	90,893	4,544.6	101.8%
54	8,345	82,602	5,782.1	144.3%
55	18,071	76,120	11,418.0	158.3%
56	9,237	65,472	6,547.2	141.1%
57	6,071	55,450	6,099.5	99.5%
58	11,279	58,200	6,402.0	176.2%
59	11,152	46,967	5,166.3	215.9%
60	5,064	39,989	5,998.4	84.4%
61	5,876	41,117	6,167.5	95.3%
62	13,481	36,695	9,173.7	147.0%
63	5,301	23,004	5,750.9	92.2%
64	4,683	20,205	6,061.6	77.3%
65	7,968	16,414	6,565.5	121.4%
66	2,727	7,627	3,813.3	71.5%
67	2,108	3,735	1,494.0	141.1%
68	732	1,890	567.0	129.2%
69	438	1,084	433.5	100.9%
Totals	**133,429**	**948,524**	**106,038.2**	**125.8%**

** Results are liability weighted.*

Appendix – Detailed Experience Analysis
Retirement*

2019-2020 Experience ($000s)

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
50	1,112	25,130	1,256.5	88.5%
51	170	24,465	1,223.2	13.9%
52	443	13,724	686.2	64.6%
53	1,542	25,772	1,288.6	119.7%
54	1,545	17,880	1,251.6	123.4%
55	3,006	20,988	3,148.3	95.5%
56	1,017	12,936	1,293.6	78.6%
57	1,957	14,397	1,583.6	123.6%
58	3,301	18,012	1,981.3	166.6%
59	1,763	11,646	1,281.0	137.6%
60	1,840	9,455	1,418.3	129.8%
61	1,489	10,378	1,556.7	95.6%
62	3,530	9,644	2,411.0	146.4%
63	616	5,713	1,428.2	43.1%
64	1,407	5,566	1,669.9	84.3%
65	777	2,670	1,067.8	72.8%
66	786	1,830	914.9	85.9%
67	0	491	196.3	0.0%
68	305	443	133.0	229.1%
69	0	282	112.8	0.0%
Totals	**26,606**	**231,421**	**25,902.7**	**102.7%**

2020-2021 Experience ($000s)

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
50	1,818	23,729	1,186.4	153.3%
51	432	25,387	1,269.3	34.0%
52	1,211	25,907	1,295.3	93.5%
53	1,400	14,314	715.7	195.6%
54	1,293	25,909	1,813.6	71.3%
55	4,012	17,476	2,621.4	153.0%
56	3,094	18,588	1,858.8	166.5%
57	1,095	12,452	1,369.7	79.9%
58	2,807	13,289	1,461.8	192.1%
59	2,569	15,578	1,713.6	149.9%
60	321	10,103	1,515.4	21.2%
61	564	8,424	1,263.6	44.7%
62	4,361	9,567	2,391.8	182.3%
63	1,838	6,495	1,623.9	113.2%
64	627	5,401	1,620.2	38.7%
65	3,060	4,455	1,782.0	171.7%
66	447	1,997	998.7	44.7%
67	817	1,103	441.2	185.1%
68	148	476	142.9	103.3%
69	0	146	58.4	0.0%
Totals	**31,913**	**240,797**	**27,143.9**	**117.6%**

** Results are liability weighted.*

Appendix – Detailed Experience Analysis
Retirement*

2021-2022 Experience ($000s)

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
50	2,007	22,942	1,147	174.9%
51	1,569	22,785	1,139	137.8%
52	2,632	26,647	1,332	197.5%
53	1,555	24,788	1,239	125.5%
54	1,951	13,312	932	209.3%
55	7,077	25,494	3,824	185.1%
56	2,755	14,128	1,413	195.0%
57	2,818	16,369	1,801	156.5%
58	3,724	11,866	1,305	285.3%
59	4,614	10,855	1,194	386.4%
60	2,585	13,852	2,078	124.4%
61	1,569	10,176	1,526	102.8%
62	3,713	8,484	2,121	175.0%
63	1,456	5,581	1,395	104.3%
64	1,121	4,989	1,497	74.9%
65	2,897	5,134	2,054	141.1%
66	1,096	1,439	720	152.3%
67	984	1,616	646	152.2%
68	0	297	89	0.0%
69	341	341	136	250.0%
Totals	**46,464**	**241,095**	**27,589**	**168.4%**

2022-2023 Experience ($000s)

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
50	1,298	23,651	1,183	109.8%
51	1,831	23,095	1,155	158.5%
52	1,745	23,600	1,180	147.9%
53	129	26,019	1,301	9.9%
54	3,557	25,500	1,785	199.3%
55	3,976	12,162	1,824	218.0%
56	2,370	19,821	1,982	119.6%
57	202	12,232	1,346	15.0%
58	1,447	15,033	1,654	87.5%
59	2,206	8,888	978	225.6%
60	319	6,579	987	32.3%
61	2,254	12,139	1,821	123.8%
62	1,877	8,999	2,250	83.4%
63	1,392	5,214	1,304	106.8%
64	1,527	4,250	1,275	119.8%
65	1,233	4,155	1,662	74.2%
66	399	2,360	1,180	33.8%
67	308	525	210	146.8%
68	280	673	202	138.6%
69	97	315	126	76.7%
Totals	**28,446**	**235,211**	**25,403**	**112.0%**

** Results are liability weighted.*

Appendix – Detailed Experience Analysis
Withdrawals – first three years*

2019-2023 Experience ($000s)

	Males					Females			
Year	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Year	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected
1	6,630	19,113	5,161	128.5%	1	3,352	10,488	2,832	118.4%
2	19,204	69,519	15,989	120.1%	2	9,447	33,616	7,732	122.2%
3	18,198	78,885	13,410	135.7%	3	7,502	38,771	6,591	113.8%
Totals	**44,031**	**167,516**	**34,560**	**127.4%**	**Totals**	**20,300**	**82,874**	**17,154**	**118.3%**

** Results are liability weighted.*

Appendix – Detailed Experience Analysis
Withdrawals – first three years*

2019-2020 Experience ($000s)

	Males				Females				
Year	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Year	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected
1	1,891	5,522	1,491	126.9%	1	776	2,995	809	95.9%
2	6,096	22,087	5,080	120.0%	2	2,918	10,272	2,363	123.5%
3	5,017	25,515	4,338	115.7%	3	2,065	10,388	1,766	116.9%
Totals	**13,004**	**53,124**	**10,909**	**119.2%**	**Totals**	**5,758**	**23,656**	**4,937**	**116.6%**

2020-2021 Experience ($000s)

	Males				Females				
Year	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Year	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected
1	1,601	5,099	1,377	116.3%	1	860	2,547	688	125.0%
2	4,193	20,106	4,624	90.7%	2	2,267	9,186	2,113	107.3%
3	5,136	22,255	3,783	135.7%	3	1,513	10,381	1,765	85.7%
Totals	**10,929**	**47,460**	**9,784**	**111.7%**	**Totals**	**4,640**	**22,114**	**4,565**	**101.6%**

2021-2022 Experience ($000s)

	Males				Females				
Year	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Year	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected
1	1,552	3,172	856	181.3%	1	840	2,062	557	150.9%
2	4,941	12,634	2,906	170.1%	2	2,355	7,400	1,702	138.4%
3	4,994	17,677	3,005	166.2%	3	2,191	8,893	1,512	144.9%
Totals	**11,488**	**33,483**	**6,767**	**169.8%**	**Totals**	**5,386**	**18,355**	**3,771**	**142.9%**

2022-2023 Experience ($000s)

	Males				Females				
Year	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Year	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected
1	1,586	5,320	1,436	110.4%	1	876	2,884	779	112.5%
2	3,973	14,692	3,379	117.6%	2	1,906	6,758	1,554	122.7%
3	3,051	13,438	2,284	133.5%	3	1,733	9,108	1,548	111.9%
Totals	**8,610**	**33,449**	**7,100**	**121.3%**	**Totals**	**4,515**	**18,750**	**3,881**	**116.3%**

** Results are liability weighted.*

Appendix – Detailed Experience Analysis
Withdrawals – after three years*

2019-2023 Experience

	Males					Females			
Age Group	Actual Withdrawals	Exposure	Expected Withdrawals	Actual/ Expected	Age Group	Actual Withdrawals	Exposure	Expected Withdrawals	Actual/ Expected
Under 20	-	-	-	N/A	Under 20	-	-	-	N/A
20-24	630	2,761	469	134.2%	20-24	309	1,295	220	140.1%
25-29	9,763	51,094	7,147	136.6%	25-29	4,278	23,586	3,623	118.1%
30-34	18,894	124,302	11,204	168.6%	30-34	6,642	51,127	5,620	118.2%
35-39	18,017	183,970	12,515	144.0%	35-39	10,917	78,586	6,205	175.9%
40-44	14,634	227,256	10,263	142.6%	40-44	10,050	110,170	6,433	156.2%
45-49	16,578	277,261	8,995	184.3%	45-49	9,117	134,811	5,437	167.7%
50-54	498	4,863	111	449.1%	50-54	137	4,133	124	110.8%
55+	220	1,173	-	N/A	55+	131	824	-	N/A
Totals	**79,233**	**872,679**	**50,704**	**156.3%**	**Totals**	**41,582**	**404,533**	**27,662**	**150.3%**

** Results are liability weighted.*

Appendix – Detailed Experience Analysis
Withdrawals – after three years*

2019-2020 Experience

	Males				Females				
Age Group	Actual Withdrawals	Exposure	Expected Withdrawals	Actual/ Expected	Age Group	Actual Withdrawals	Exposure	Expected Withdrawals	Actual/ Expected
Under 20	-	-	-	N/A	Under 20	-	-	-	N/A
20-24	85	387	66	129.2%	20-24	-	187	32	0.0%
25-29	1,857	13,899	1,937	95.9%	25-29	1,236	5,715	875	141.2%
30-34	5,273	31,631	2,860	184.4%	30-34	1,438	11,841	1,296	111.0%
35-39	5,723	50,342	3,457	165.5%	35-39	4,592	23,110	1,817	252.8%
40-44	3,931	58,906	2,636	149.1%	40-44	2,853	28,667	1,671	170.7%
45-49	4,028	73,179	2,362	170.6%	45-49	2,429	36,300	1,471	165.1%
50-54	110	885	20	541.4%	50-54	-	1,172	35	0.0%
55+	0	354	-	N/A	55+	-	349	-	N/A
Totals	**21,006**	**229,583**	**13,338**	**157.5%**	**Totals**	**12,548**	**107,339**	**7,197**	**174.4%**

2020-2021 Experience

	Males				Females				
Age Group	Actual Withdrawals	Exposure	Expected Withdrawals	Actual/ Expected	Age Group	Actual Withdrawals	Exposure	Expected Withdrawals	Actual/ Expected
Under 20	-	-	-	N/A	Under 20	-	-	-	N/A
20-24	208	827	141	147.8%	20-24	32	268	46	71.0%
25-29	1,778	15,178	2,131	83.4%	25-29	406	6,709	1,025	39.6%
30-34	3,867	33,360	3,023	127.9%	30-34	1,076	11,866	1,309	82.2%
35-39	3,180	48,464	3,302	96.3%	35-39	1,954	20,830	1,646	118.7%
40-44	3,593	57,659	2,602	138.1%	40-44	2,198	28,732	1,678	131.0%
45-49	2,761	72,209	2,347	117.6%	45-49	999	35,934	1,441	69.4%
50-54	-	1,408	33	0.0%	50-54	48	997	30	161.8%
55+	15	818	-	N/A	55+	86	475	-	N/A
Totals	**15,402**	**229,923**	**13,578**	**113.4%**	**Totals**	**6,801**	**105,811**	**7,175**	**94.8%**

** Results are liability weighted.*

Appendix – Detailed Experience Analysis
Withdrawals – after three years*

2021-2022 Experience

Age Group	Males Actual Withdrawals	Exposure	Expected Withdrawals	Actual/ Expected	Age Group	Females Actual Withdrawals	Exposure	Expected Withdrawals	Actual/ Expected
Under 20	-	-	-	N/A	Under 20	-	-	-	N/A
20-24	300	756	128	233.5%	20-24	126	420	71	175.9%
25-29	4,339	12,070	1,691	256.6%	25-29	1,761	6,059	936	188.2%
30-34	5,674	30,041	2,707	209.6%	30-34	2,735	13,653	1,517	180.4%
35-39	5,672	43,538	2,953	192.1%	35-39	2,619	18,399	1,462	179.2%
40-44	4,729	54,114	2,473	191.2%	40-44	3,150	26,485	1,552	202.9%
45-49	6,098	68,372	2,225	274.1%	45-49	2,790	31,723	1,281	217.8%
50-54	106	951	21	501.4%	50-54	89	1,170	35	253.7%
55+	178	-	-	N/A	55+	44	-	-	N/A
Totals	**27,097**	**209,842**	**12,198**	**222.1%**	**Totals**	**13,315**	**97,908**	**6,854**	**194.3%**

2022-2023 Experience

Age Group	Males Actual Withdrawals	Exposure	Expected Withdrawals	Actual/ Expected	Age Group	Females Actual Withdrawals	Exposure	Expected Withdrawals	Actual/ Expected
Under 20	-	-	-	N/A	Under 20	-	-	-	N/A
20-24	38	793	135	27.9%	20-24	151	420	71	210.7%
25-29	1,789	9,948	1,388	128.9%	25-29	875	5,104	788	111.1%
30-34	4,080	29,269	2,614	156.1%	30-34	1,392	13,767	1,499	92.9%
35-39	3,441	41,625	2,803	122.8%	35-39	1,752	16,247	1,280	136.8%
40-44	2,382	56,578	2,552	93.3%	40-44	1,849	26,286	1,531	120.8%
45-49	3,692	63,500	2,061	179.2%	45-49	2,899	30,855	1,244	233.1%
50-54	282	1,618	37	766.7%	50-54	-	795	24	0.0%
55+	27	-	-	N/A	55+	-	-	-	N/A
Totals	**15,729**	**203,331**	**11,590**	**135.7%**	**Totals**	**8,917**	**93,475**	**6,436**	**138.5%**

** Results are liability weighted.*

Appendix – Detailed Experience Analysis
Disability Retirements

2019-2023 Experience

	Males					Females			
Age Group	Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected	Age Group	Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected
Under 20	-	5	0.0	0.0%	Under 20	-	1	0.0	0.0%
20-24	-	756	0.4	0.0%	20-24	-	474	0.2	0.0%
25-29	3	1,607	1.1	271.9%	25-29	-	932	0.6	0.0%
30-34	1	1,637	2.1	46.8%	30-34	2	795	0.7	275.8%
35-39	4	1,374	2.6	154.8%	35-39	1	691	1.2	83.9%
40-44	4	1,185	2.6	151.4%	40-44	3	623	1.4	219.7%
45-49	4	1,052	3.9	101.5%	45-49	1	577	2.7	36.9%
50-54	10	1,050	7.0	143.7%	50-54	6	567	4.6	130.5%
55-59	4	690	5.6	71.3%	55-59	2	371	4.1	49.2%
60-64	1	372	3.6	28.0%	60-64	2	243	3.2	63.3%
Totals	**31**	**9,728**	**28.9**	**107.1%**	**Totals**	**17**	**5,274**	**18.7**	**91.0%**

Appendix – Detailed Experience Analysis
Disability Retirements

2019-2020 Experience

	Males					Females			
Age Group	Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected	Age Group	Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected
Under 20	-	2	0.0	0.0%	Under 20	-	-	-	N/A
20-24	-	174	0.1	0.0%	20-24	-	105	0.1	0.0%
25-29	1	467	0.3	312.9%	25-29	-	257	0.2	0.0%
30-34	-	428	0.6	0.0%	30-34	-	198	0.2	0.0%
35-39	-	362	0.7	0.0%	35-39	-	186	0.3	0.0%
40-44	-	294	0.7	0.0%	40-44	1	168	0.4	270.0%
45-49	1	276	1.0	96.4%	45-49	-	151	0.7	0.0%
50-54	4	275	1.8	220.3%	50-54	1	137	1.1	90.3%
55-59	2	180	1.5	136.3%	55-59	1	101	1.1	89.9%
60-64	-	98	0.9	0.0%	60-64	-	67	0.9	0.0%
Totals	**8**	**2,556**	**7.6**	**105.7%**	**Totals**	**3**	**1,370**	**4.9**	**61.1%**

2020-2021 Experience

	Males					Females			
Age Group	Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected	Age Group	Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected
Under 20	-	1	0.0	0.0%	Under 20	-	1	0.0	0.0%
20-24	-	185	0.1	0.0%	20-24	-	127	0.1	0.0%
25-29	1	424	0.3	343.8%	25-29	-	226	0.2	0.0%
30-34	-	405	0.5	0.0%	30-34	-	188	0.2	0.0%
35-39	2	352	0.7	302.4%	35-39	-	180	0.3	0.0%
40-44	1	290	0.6	154.9%	40-44	-	151	0.3	0.0%
45-49	1	275	1.0	97.1%	45-49	-	147	0.7	0.0%
50-54	1	274	1.8	55.2%	50-54	-	146	1.2	0.0%
55-59	-	176	1.4	0.0%	55-59	-	101	1.1	0.0%
60-64	1	93	0.9	112.0%	60-64	1	68	0.9	113.1%
Totals	**7**	**2,475**	**7.4**	**94.7%**	**Totals**	**1**	**1,335**	**4.9**	**20.4%**

Appendix – Detailed Experience Analysis
Disability Retirements

2021-2022 Experience

	Males					Females			
Age Group	Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected	Age Group	Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected
Under 20	-	1	0.0	0.0%	Under 20	-	-	-	N/A
20-24	-	181	0.1	0.0%	20-24	-	126	0.1	0.0%
25-29	1	385	0.3	374.8%	25-29	-	244	0.2	0.0%
30-34	-	401	0.5	0.0%	30-34	2	213	0.2	1037.9%
35-39	1	345	0.6	154.1%	35-39	1	166	0.3	349.2%
40-44	2	298	0.7	302.2%	40-44	2	159	0.3	580.7%
45-49	1	263	1.0	101.3%	45-49	1	144	0.7	148.8%
50-54	2	247	1.6	122.6%	50-54	3	141	1.1	262.6%
55-59	1	180	1.5	68.7%	55-59	1	92	1.0	100.4%
60-64	-	98	0.9	0.0%	60-64	1	56	0.7	137.4%
Totals	**8**	**2,399**	**7.2**	**111.0%**	**Totals**	**11**	**1,341**	**4.6**	**239.5%**

2022-2023 Experience

	Males					Females			
Age Group	Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected	Age Group	Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected
Under 20	-	1	0.0	0.0%	Under 20	-	-	-	N/A
20-24	-	216	0.1	0.0%	20-24	-	116	0.1	0.0%
25-29	-	331	0.2	0.0%	25-29	-	205	0.1	0.0%
30-34	1	403	0.5	188.6%	30-34	-	196	0.2	0.0%
35-39	1	315	0.6	168.3%	35-39	-	159	0.3	0.0%
40-44	1	303	0.7	147.6%	40-44	-	145	0.3	0.0%
45-49	1	238	0.9	112.7%	45-49	-	135	0.6	0.0%
50-54	3	254	1.7	176.7%	50-54	2	143	1.2	171.2%
55-59	1	154	1.3	80.0%	55-59	-	77	0.8	0.0%
60-64	-	83	0.8	0.0%	60-64	-	52	0.7	0.0%
Totals	**8**	**2,298**	**6.8**	**118.1%**	**Totals**	**2**	**1,228**	**4.3**	**46.6%**

Appendix – Detailed Experience Analysis
Post-Retirement Mortality*

2019-2023 Experience ($000s)

	Males					Females			
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
50-54	-	908	2.11	0.0%	50-54	-	493	0.96	0.0%
55-59	61	8,305	31.68	192.5%	55-59	16	4,170	14.52	110.2%
60-64	89	10,636	70.18	126.8%	60-64	6	5,455	31.07	19.3%
65-69	140	11,858	125.12	111.9%	65-69	109	6,306	55.30	197.1%
70-74	108	6,525	112.39	96.1%	70-74	28	3,380	47.08	59.5%
75-79	38	2,005	59.03	64.4%	75-79	42	811	19.25	218.1%
80-84	9	513	26.88	33.5%	80-84	1	172	7.20	13.9%
85-89	13	47	4.23	307.6%	85-89	-	6	0.55	0.0%
90-94	-	1	0.15	0.0%	90-94	2	2	0.22	889.1%
95-99	-	-	-	N/A	95-99	-	-	-	N/A
100+	-	-	-	N/A	100+	-	-	-	N/A
Totals	**458**	**40,798**	**431.77**	**106.1%**	**Totals**	**204**	**20,795**	**176.16**	**115.8%**

** Results are benefit weighted.*

Appendix – Detailed Experience Analysis
Post-Retirement Mortality*

2019-2020 Experience ($000s)

	Males					Females			
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
50-54	-	242	0.57	0.0%	50-54	-	154	0.30	0.0%
55-59	20	1,504	5.69	351.5%	55-59	16	888	3.04	525.6%
60-64	-	2,197	14.69	0.0%	60-64	-	951	5.46	0.0%
65-69	8	2,389	25.20	31.7%	65-69	21	1,376	12.02	174.7%
70-74	8	1,201	20.74	38.6%	70-74	17	535	7.45	228.3%
75-79	3	305	9.29	32.3%	75-79	1	128	3.15	31.7%
80-84	5	60	3.38	148.0%	80-84	-	19	0.71	0.0%
85-89	-	3	0.29	0.0%	85-89	-	2	0.16	0.0%
90-94	-	-	-	N/A	90-94	-	-	-	N/A
95-99	-	-	-	N/A	95-99	-	-	-	N/A
100+	-	-	-	N/A	100+	-	-	-	N/A
Totals	**44**	**7,901**	**79.84**	**55.1%**	**Totals**	**55**	**4,053**	**32.29**	**170.3%**

2020-2021 Experience ($000s)

	Males					Females			
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
50-54	-	248	0.60	0.0%	50-54	-	155	0.31	0.0%
55-59	23	1,793	6.77	339.5%	55-59	-	951	3.28	0.0%
60-64	-	2,437	16.08	0.0%	60-64	-	1,279	7.30	0.0%
65-69	26	2,766	29.22	89.0%	65-69	33	1,443	12.64	261.0%
70-74	14	1,456	25.27	55.4%	70-74	10	760	10.34	96.7%
75-79	31	411	12.30	252.1%	75-79	21	171	4.01	523.1%
80-84	-	102	5.16	0.0%	80-84	-	41	1.60	0.0%
85-89	2	14	1.24	161.6%	85-89	-	2	0.18	0.0%
90-94	-	-	-	N/A	90-94	-	-	-	N/A
95-99	-	-	-	N/A	95-99	-	-	-	N/A
100+	-	-	-	N/A	100+	-	-	-	N/A
Totals	**96**	**9,227**	**96.64**	**99.3%**	**Totals**	**64**	**4,802**	**39.67**	**161.3%**

** Results are benefit weighted.*

Appendix – Detailed Experience Analysis
Post-Retirement Mortality*

2021-2022 Experience ($000s)

	Males					Females			
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
50-54	-	214	0.50	0.0%	50-54	-	85	0.16	0.0%
55-59	-	2,275	8.78	0.0%	55-59	-	1,134	3.91	0.0%
60-64	51	2,709	18.09	281.9%	60-64	-	1,491	8.55	0.0%
65-69	60	3,070	32.55	184.3%	65-69	34	1,555	13.66	248.8%
70-74	47	1,763	30.35	154.9%	70-74	-	974	13.55	0.0%
75-79	-	551	16.21	0.0%	75-79	-	191	4.57	0.0%
80-84	4	137	7.11	56.2%	80-84	-	49	2.07	0.0%
85-89	11	19	1.73	637.6%	85-89	-	2	0.20	0.0%
90-94	-	-	-	N/A	90-94	-	-	-	N/A
95-99	-	-	-	N/A	95-99	-	-	-	N/A
100+	-	-	-	N/A	100+	-	-	-	N/A
Totals	**173**	**10,738**	**115.32**	**150.0%**	**Totals**	**34**	**5,481**	**46.68**	**72.8%**

2022-2023 Experience ($000s)

	Males					Females			
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
50-54	-	204	0.45	0.0%	50-54	-	99	0.19	0.0%
55-59	18	2,733	10.43	172.5%	55-59	-	1,197	4.29	0.0%
60-64	38	3,293	21.33	178.2%	60-64	6	1,734	9.76	61.5%
65-69	46	3,633	38.15	120.6%	65-69	21	1,932	16.97	123.7%
70-74	39	2,105	36.04	108.2%	70-74	1	1,111	15.74	6.4%
75-79	4	738	21.24	18.8%	75-79	20	321	7.51	266.1%
80-84	-	214	11.22	0.0%	80-84	1	63	2.82	35.5%
85-89	-	11	0.97	0.0%	85-89	-	-	-	N/A
90-94	-	1	0.15	0.0%	90-94	2	2	0.22	889.1%
95-99	-	-	-	N/A	95-99	-	-	-	N/A
100+	-	-	-	N/A	100+	-	-	-	N/A
Totals	**145**	**12,932**	**139.97**	**103.6%**	**Totals**	**51**	**6,459**	**57.51**	**88.7%**

** Results are benefit weighted.*

Appendix – Detailed Experience Analysis
Disabled Mortality*

2019-2023 Experience ($000s)

	Males					Females			
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
<40	-	449	1.00	0.0%	<40	-	316	0.53	0.0%
40-44	-	578	1.46	0.0%	40-44	-	207	0.41	0.0%
45-49	23	767	2.40	959.2%	45-49	-	444	1.09	0.0%
50-54	16	2,458	10.78	148.5%	50-54	2	949	4.08	49.0%
55-59	-	1,788	13.63	0.0%	55-59	10	1,719	12.01	83.2%
60-64	61	1,780	22.82	267.3%	60-64	12	1,311	13.51	88.8%
65-69	22	1,753	37.87	58.1%	65-69	-	1,242	19.90	0.0%
70-74	25	534	20.37	122.8%	70-74	23	247	6.55	351.3%
75-79	-	39	2.38	0.0%	75-79	-	61	3.77	0.0%
80-84	-	-	-	N/A	80-84	-	-	-	N/A
85-89	-	-	-	N/A	85-89	-	-	-	N/A
90-94	-	-	-	N/A	90-94	-	-	-	N/A
95-99	-	-	-	N/A	95-99	-	-	-	N/A
100+	-	-	-	N/A	100+	-	-	-	N/A
Totals	**147**	**10,146**	**112.69**	**130.4%**	**Totals**	**47**	**6,496**	**61.86**	**76.0%**

** Results are benefit weighted.*

Appendix – Detailed Experience Analysis
Disabled Mortality*

2019-2020 Experience ($000s)

Age Group	Males Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Age Group	Females Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
<40	-	82	0.18	0.0%	<40	-	93	0.16	0.0%
40-44	-	111	0.26	0.0%	40-44	-	25	0.05	0.0%
45-49	-	164	0.49	0.0%	45-49	-	76	0.17	0.0%
50-54	-	552	2.35	0.0%	50-54	-	264	1.06	0.0%
55-59	-	428	3.35	0.0%	55-59	-	434	2.97	0.0%
60-64	19	405	5.13	370.7%	60-64	12	328	3.50	343.0%
65-69	-	393	8.01	0.0%	65-69	-	221	3.42	0.0%
70-74	-	94	3.62	0.0%	70-74	-	48	1.16	0.0%
75-79	-	-	-	N/A	75-79	-	15	0.78	0.0%
80-84	-	-	-	N/A	80-84	-	-	-	N/A
85-89	-	-	-	N/A	85-89	-	-	-	N/A
90-94	-	-	-	N/A	90-94	-	-	-	N/A
95-99	-	-	-	N/A	95-99	-	-	-	N/A
100+	-	-	-	N/A	100+	-	-	-	N/A
Totals	**19**	**2,229**	**23.38**	**81.3%**	**Totals**	**12**	**1,504**	**13.27**	**90.4%**

2020-2021 Experience ($000s)

Age Group	Males Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Age Group	Females Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
<40	-	74	0.17	0.0%	<40	-	46	0.08	0.0%
40-44	-	112	0.28	0.0%	40-44	-	56	0.11	0.0%
45-49	-	223	0.72	0.0%	45-49	-	103	0.24	0.0%
50-54	16	591	2.60	616.3%	50-54	-	248	1.03	0.0%
55-59	-	399	2.98	0.0%	55-59	10	433	2.97	337.2%
60-64	17	493	6.28	270.5%	60-64	-	291	2.95	0.0%
65-69	-	459	9.95	0.0%	65-69	-	329	5.12	0.0%
70-74	-	95	4.05	0.0%	70-74	-	48	1.26	0.0%
75-79	-	-	-	N/A	75-79	-	15	0.87	0.0%
80-84	-	-	-	N/A	80-84	-	-	-	N/A
85-89	-	-	-	N/A	85-89	-	-	-	N/A
90-94	-	-	-	N/A	90-94	-	-	-	N/A
95-99	-	-	-	N/A	95-99	-	-	-	N/A
100+	-	-	-	N/A	100+	-	-	-	N/A
Totals	**33**	**2,446**	**27.01**	**122.2%**	**Totals**	**10**	**1,569**	**14.62**	**68.4%**

** Results are benefit weighted.*

Appendix – Detailed Experience Analysis
Disabled Mortality*

2021-2022 Experience ($000s)

	Males					Females			
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
<40	-	156	0.35	0.0%	<40	-	48	0.09	0.0%
40-44	-	169	0.44	0.0%	40-44	-	48	0.09	0.0%
45-49	-	157	0.50	0.0%	45-49	-	121	0.30	0.0%
50-54	-	621	2.69	0.0%	50-54	-	224	0.98	0.0%
55-59	-	501	3.84	0.0%	55-59	-	439	3.11	0.0%
60-64	-	420	5.52	0.0%	60-64	-	302	3.04	0.0%
65-69	22	459	10.10	217.9%	65-69	-	356	5.69	0.0%
70-74	25	149	5.80	431.1%	70-74	23	73	1.94	1186.1%
75-79	-	13	0.76	0.0%	75-79	-	15	0.97	0.0%
80-84	-	-	-	N/A	80-84	-	-	-	N/A
85-89	-	-	-	N/A	85-89	-	-	-	N/A
90-94	-	-	-	N/A	90-94	-	-	-	N/A
95-99	-	-	-	N/A	95-99	-	-	-	N/A
100+	-	-	-	N/A	100+	-	-	-	N/A
Totals	**47**	**2,645**	**29.99**	**156.7%**	**Totals**	**23**	**1,626**	**16.21**	**141.9%**

2022-2023 Experience ($000s)

	Males					Females			
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
<40	-	137	0.30	0.0%	<40	-	129	0.21	0.0%
40-44	-	186	0.48	0.0%	40-44	-	78	0.16	0.0%
45-49	23	223	0.69	3318.2%	45-49	-	144	0.37	0.0%
50-54	-	694	3.14	0.0%	50-54	2	213	1.01	197.3%
55-59	-	460	3.46	0.0%	55-59	-	413	2.96	0.0%
60-64	25	462	5.89	424.5%	60-64	-	390	4.02	0.0%
65-69	-	442	9.83	0.0%	65-69	-	336	5.67	0.0%
70-74	-	196	6.90	0.0%	70-74	-	78	2.19	0.0%
75-79	-	26	1.62	0.0%	75-79	-	16	1.15	0.0%
80-84	-	-	-	N/A	80-84	-	-	-	N/A
85-89	-	-	-	N/A	85-89	-	-	-	N/A
90-94	-	-	-	N/A	90-94	-	-	-	N/A
95-99	-	-	-	N/A	95-99	-	-	-	N/A
100+	-	-	-	N/A	100+	-	-	-	N/A
Totals	**48**	**2,826**	**32.30**	**148.6%**	**Totals**	**2**	**1,797**	**17.76**	**11.3%**

** Results are benefit weighted.*

Appendix – Detailed Experience Analysis
Pre-Retirement Mortality*

	Males					Females			
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
Under 20	-	45	0	0.0%	Under 20	-	-	-	N/A
20-24	23	20,063	9	268.3%	20-24	-	10,357	2	0.0%
25-29	366	96,844	49	753.9%	25-29	-	43,117	13	0.0%
30-34	134	163,416	101	132.4%	30-34	-	67,260	28	0.0%
35-39	122	210,597	153	79.6%	35-39	-	89,832	48	0.0%
40-44	304	245,626	198	153.5%	40-44	531	118,156	71	749.7%
45-49	749	286,499	273	274.1%	45-49	-	145,386	104	0.0%
50-54	607	321,571	423	143.6%	50-54	-	155,124	150	0.0%
55-59	288	213,178	427	67.5%	55-59	908	97,028	139	652.6%
60-64	344	99,504	315	109.1%	60-64	-	64,315	122	0.0%
Totals	**2,937**	**1,657,343**	**1,947**	**150.8%**	**Totals**	**1,439**	**790,575**	**677**	**212.7%**

** Results are liability weighted.*

Appendix – Detailed Experience Analysis
Pre-Retirement Mortality*

2019-2020 Experience ($000s)

	Males					Females			
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
Under 20	-	32	0	0.0%	Under 20	-	-	-	N/A
20-24	-	5,260	2	0.0%	20-24	-	2,268	0	0.0%
25-29	110	29,866	15	749.0%	25-29	-	11,925	3	0.0%
30-34	48	44,147	26	181.2%	30-34	-	16,147	7	0.0%
35-39	-	58,015	40	0.0%	35-39	-	26,340	14	0.0%
40-44	-	64,200	50	0.0%	40-44	-	30,925	18	0.0%
45-49	255	76,501	72	353.4%	45-49	-	39,697	28	0.0%
50-54	283	79,245	104	271.1%	50-54	-	33,375	33	0.0%
55-59	-	53,045	108	0.0%	55-59	379	27,125	39	962.4%
60-64	-	24,736	79	0.0%	60-64	-	16,681	32	0.0%
Totals	**696**	**435,047**	**497**	**140.0%**	**Totals**	**379**	**204,483**	**175**	**217.0%**

2020-2021 Experience ($000s)

	Males					Females			
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
Under 20	-	12	0	0.0%	Under 20	-	-	-	N/A
20-24	23	5,651	2	953.3%	20-24	-	3,028	1	0.0%
25-29	90	28,146	14	639.4%	25-29	-	11,757	3	0.0%
30-34	-	44,382	27	0.0%	30-34	-	15,929	7	0.0%
35-39	-	56,899	41	0.0%	35-39	-	23,832	13	0.0%
40-44	-	62,374	50	0.0%	40-44	531	30,238	18	2940.6%
45-49	-	74,734	71	0.0%	45-49	-	38,780	28	0.0%
50-54	324	83,434	110	294.7%	50-54	-	37,909	37	0.0%
55-59	110	53,999	109	100.7%	55-59	-	26,032	38	0.0%
60-64	-	24,062	76	0.0%	60-64	-	16,922	32	0.0%
Totals	**547**	**433,693**	**501**	**109.2%**	**Totals**	**531**	**204,427**	**176**	**301.5%**

** Results are liability weighted.*

Appendix – Detailed Experience Analysis
Pre-Retirement Mortality*

2021-2022 Experience ($000s)

	Males					Females			
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
Under 20	-	1	0	0.0%	Under 20	-	-	-	N/A
20-24	-	4,257	2	0.0%	20-24	-	2,548	1	0.0%
25-29	107	21,080	11	998.0%	25-29	-	10,218	3	0.0%
30-34	86	37,134	23	368.8%	30-34	-	17,688	7	0.0%
35-39	-	49,556	37	0.0%	35-39	-	20,814	11	0.0%
40-44	304	57,936	47	643.2%	40-44	-	28,320	17	0.0%
45-49	494	70,309	68	731.4%	45-49	-	34,011	24	0.0%
50-54	-	75,596	98	0.0%	50-54	-	39,490	38	0.0%
55-59	178	56,483	111	160.8%	55-59	336	24,192	34	984.3%
60-64	344	28,143	89	387.7%	60-64	-	15,592	29	0.0%
Totals	**1,513**	**400,495**	**485**	**311.8%**	**Totals**	**336**	**192,873**	**165**	**204.2%**

2022-2023 Experience ($000s)

	Males					Females			
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
Under 20	-	-	-	N/A	Under 20	-	-	-	N/A
20-24	-	4,895	2	0.0%	20-24	-	2,513	1	0.0%
25-29	59	17,752	9	651.1%	25-29	-	9,217	3	0.0%
30-34	-	37,753	24	0.0%	30-34	-	17,496	8	0.0%
35-39	122	46,127	35	348.9%	35-39	-	18,846	10	0.0%
40-44	-	61,116	51	0.0%	40-44	-	28,673	17	0.0%
45-49	-	64,955	63	0.0%	45-49	-	32,898	23	0.0%
50-54	-	83,296	110	0.0%	50-54	-	44,350	43	0.0%
55-59	-	49,651	99	0.0%	55-59	193	19,679	28	694.6%
60-64	-	22,563	71	0.0%	60-64	-	15,120	29	0.0%
Totals	**181**	**388,108**	**464**	**39.0%**	**Totals**	**193**	**188,792**	**161**	**119.6%**

** Results are liability weighted.*