

Minnesota Judges Retirement Fund

Four-Year Experience Study

July 1, 2019 through June 30, 2023





July 16, 2024

Minnesota State Retirement System
Judges Retirement Fund
St. Paul, Minnesota

Dear Board of Directors:

The results of the four-year **actuarial experience study** of the Judges Retirement Fund (JRF) 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 Judges Retirement Fund.

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 Minnesota State Retirement System (MSRS). 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 MSRS.

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 Judges Retirement Fund.

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

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.

Board of Directors
Minnesota State Retirement System
Judges Retirement Fund
July 16, 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

Table of Contents

Item	Section
Overview and Summary of Results	A
Pay Increases	B
Retirement Experience	C
Withdrawal Experience	D
Disability Experience	E
Mortality Experience	F
Miscellaneous and Technical Assumptions	G
Proposed Assumption Listing	H
Glossary	I
Appendix	J

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 the actuarial valuations of the Judges Retirement Fund. The recommended changes in actuarial assumptions and methods resulting from this experience study are summarized below:

Recommendations

- Adjust assumed retirement rates:
 - Increase the rate of assumed unreduced retirements (i.e., Normal Retirement) at ages 67 and 68. For Tier 1 Judges, increase the retirement rate at age 65 and decrease at age 66. For Tier 2 Judges, increase the rate of assumed unreduced retirements at age 66. The overall impact is more predicted unreduced retirements.
 - Minor changes to the rates of assumed early retirements. For Tier 2 Judges, reduce the assumed rate of early retirement at age 65. The overall impact is fewer predicted early retirements.
- Change the mortality table from the Pub-2010 General Mortality tables to the Pub-2010 General Mortality, Above Median Income, mortality tables. In addition, update the mortality projection scale to MP-2021.
- 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' State Employees Retirement Fund 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 System 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 MSRS Board of Directors.

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 revised for the 2021 actuarial valuation 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

Decrement Risk Area	Actual Number	Expected		
		Present Assumptions	Proposed Assumptions	Change
<i>Unreduced Retirement (\$000s)</i>	41,674	30,285	35,368	5,083
<i>Reduced Retirement (\$000s)</i>	7,932	10,199	9,114	(1,085)
<i>Withdrawal (\$000s)</i>	2,514	0	0	-
<i>Disability</i>	1	1.3	1.3	-
<i>Mortality (\$000s)</i>				
Healthy Retired Lives** - Male	2,505	2,737	2,542	(195)
- Female	516	425	409	(16)
Disabled Retired Lives** - Male	270	246	245	(1)
- Female	0	18	18	-
Active Lives** - Male	0	822	711	(111)
- Female	959	481	427	(54)

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

** Adjustments to fit plan experience are limited due to a lack of credible data (deaths).

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

SECTION B

PAY INCREASES

Pay Increases

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

- 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 Judges fund, the general inflation assumption is currently 2.25% and the payroll growth assumption is currently 2.50%.

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 average increase in the national average earnings has been about 5.7% (the 2023 national average earnings amount was not available at the time this report was published).

In the Judges Plan, total payroll increased 2.1% per year, on average, during the four year experience study period.

A thorough review of general inflation and payroll growth is presented in Section B of the MSRS State Employees Retirement Fund 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 payroll growth assumption of 2.50% for the Judges Fund. These assumptions are supported by experience and the inflation assumption is consistent with the assumption used for MSRS' State Employees Retirement Fund.

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%. While this was a relatively small number of records, the experience distorted the experience of the overall group.

The current assumption is salaries increase 2.50% each year.

Pay Increases

Findings

Actual salary increases tend to be consistent for all members each year and not dependent on age or service, which indicates merit and seniority does not influence wages. The Minnesota Legislature sets the compensation for Judges. Over the study period, legislated increases were 2.5% (2020), 2.5% (2021), 0.0% (2022) and 0.0% (2023), for an average increase of 1.24%.

Actual increases are indicated in the table below. Gross actual salary increases averaged 1.5% over the four-year period, ranging from 3.27% in 2020 to -2.97% in 2023. It is our understanding there was an extra paycheck paid in 2022 which skews the actual increases paid in 2022 and 2023. If an adjustment were made for this extra paycheck, actual increases in 2022 would have been -1.1% and 0.8% in 2022 and 2023, respectively. Actual average increases during this period are slightly different than the legislated increase due to changes in assignment and data anomalies.

Fiscal Year Ending	Exposures	Gross	
		Expected	Actual
2020	300	2.50%	3.27%
2021	301	2.50%	3.31%
2022	291	2.50%	2.70%
2023	302	2.50%	-2.97%
Total	1,194	2.50%	1.50%

We note that legislated increases for 2024 and 2025 are 9.0% and 6.0%, respectively. These increases will be recognized as actuarial losses in the 2024 and 2025 valuations.

Recommendation

We recommend continuation of the present salary increase assumption of 2.50%, which is consistent with the recommended payroll growth assumption.

SECTION C

RETIREMENT EXPERIENCE

Liability-Weighted Analysis

Our experience with similar systems has shown that sometimes the use of assumptions based solely on counts of people retiring or terminating employment does not always reduce the size of the gain or loss in a particular decrement. Sometimes this can be due to the relative magnitude of the actuarial accrued liability of the members that decrement, rather than number counts alone. Consistent with recent experience studies for other MSRS plans, we have used “liability-weighted rate” for certain decrements. This represents the crude rate of decrement on a liability-weighted basis as opposed to strictly a number count basis. The liability-weighted rates were found to be more highly correlated with withdrawal and retirement decrements (particularly with reduced retirement) than with the population related rates. 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 are typically not decisions at all but rather events that happen. 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 Judges Retirement Fund (JRF) 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 Normal Retirement benefit is determined as follows:

Tier 1: First appointed as a Judge before July 1, 2013:

- (a) 2.70% of Average Salary for each year of Allowable Service prior to July 1, 1980; and
- (b) 3.20% of Average Salary for each year of Allowable Service after June 30, 1980
(Maximum benefit is equal to 76.80% of Average Salary)

Tier 2: First appointed as a Judge after June 30, 2013:

- (a) 3.20% of Average Salary for each year of Allowable Service prior to January 1, 2014; plus
- (b) 2.50% of Average Salary for each year of Allowable Service after December 31, 2013

Tier 1 members are eligible for unreduced retirement at age 65 while Tier 2 members are eligible for unreduced retirement at age 66. Tier 2 members that met the retirement eligibility requirement at age 65 over the period of the study are included in the Early Retirement experience.

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, there are no Exposures for ages 70 and older since the valuation assumption is that all of these members work an additional year and then retire. During the four-year period, there were 13 actual retirements at age 70 and 0 over age 70. We believe assuming 100% retirement at age 70 is an appropriate approach and reflects the statutory age 70 mandatory retirement age.

Overall, on a liability-weighted basis, the plan experienced more unreduced retirements than projected by the present assumptions, but the results varied by age.

Recommendations

We recommend adjusting the assumed unreduced retirement rates to reflect observed experience, as shown on the next page. In addition, we recommend the Minnesota Standards for Actuarial Work be modified to remove the requirement that members currently age 70 delay retirement one year and instead assume these members retire mid-year following the valuation date, the same as members younger than age 70.

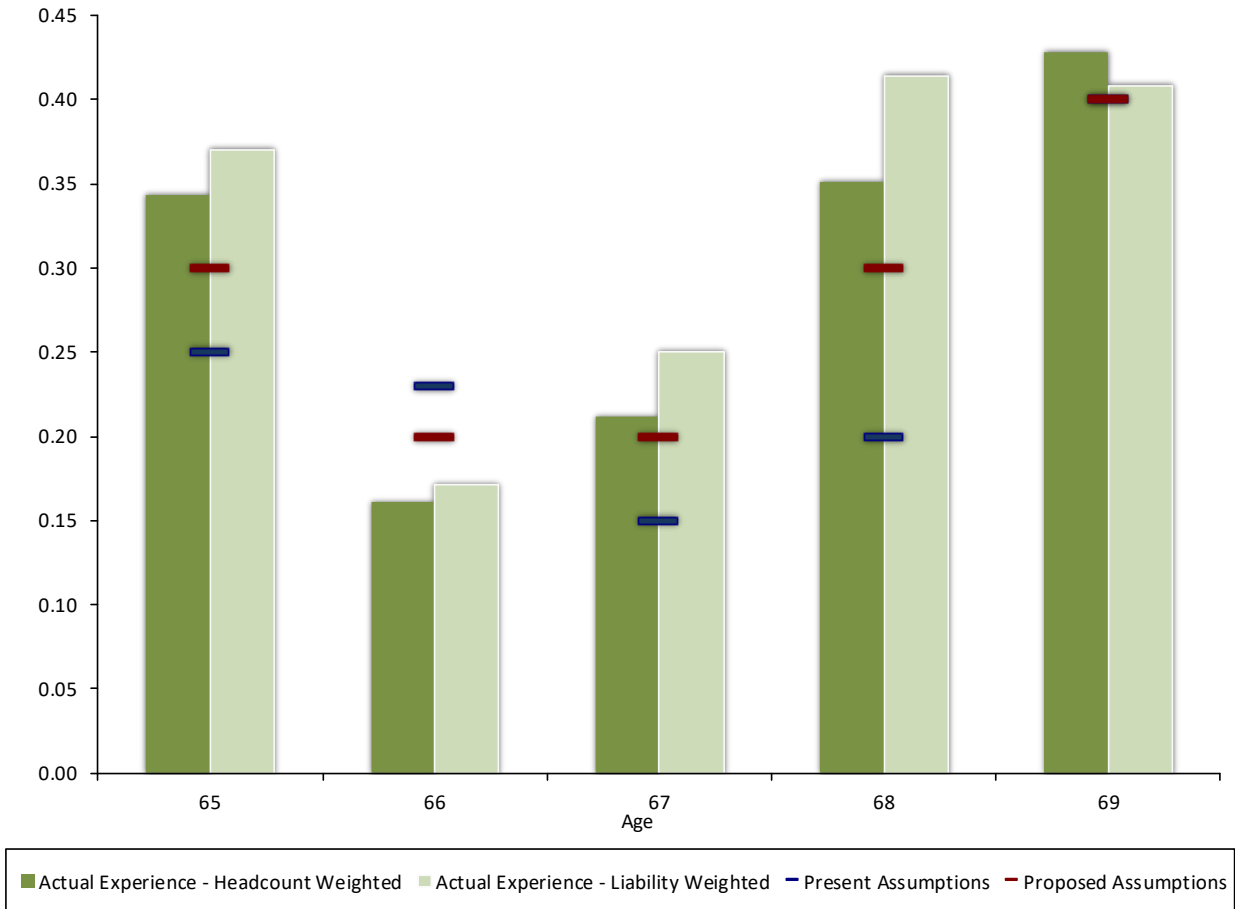
Age and Service Unreduced (Normal) Retirement

Age	Actual Retirements (\$000s)	Exposure (\$000s)	Crude Rates		Rates		Expected Retirements (\$000s)		Actuals/Expecteds	
			Population	Liability	Present	Proposed	Present	Proposed	Present	Proposed
65 [^]	11,345	30,608	34.38%	37.07%	25.00%	30.00%	7,652	9,182	144.3%	120.3%
66 ^{&}	4,566	26,633	16.13%	17.15%	23.00%	20.00%	6,126	5,327	74.5%	85.7%
67	6,815	27,238	21.21%	25.02%	15.00%	20.00%	4,086	5,448	166.8%	125.1%
68	12,371	29,903	35.14%	41.37%	20.00%	30.00%	5,981	8,971	206.9%	137.9%
69	6,577	16,102	42.86%	40.84%	40.00%	40.00%	6,441	6,441	102.1%	102.1%
70	*	*	N/A	N/A	*	*	N/A	N/A	N/A	N/A
Totals	41,674	130,484	29.22%	31.94%	23.21%	27.11%	30,285	35,368	137.6%	117.8%

[^] Members appointed prior to July 1, 2013.

[&] Proposed rate shown in the table at age 66 is for members appointed prior to July 1, 2013; for members appointed on or after July 1, 2013, the proposed rate at age 66, the first year of eligibility for unreduced benefits, is 30.00%.

* 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 age 70, these members are not included in the Exposures since retirement is assumed to be delayed one year. There were 13 actual retirements at age 70.



Reduced Early Retirement

Findings

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

Early retirement benefits are equal to the normal retirement benefit with a reduction equal to 0.50% for each month the member is under Normal Retirement Age (age 65 for Judges appointed prior to July 1, 2013 and age 66 for Judges appointed after June 30, 2013).

Generally, higher rates of early retirement generally result in slightly lower computed contributions, and vice versa.

We reviewed the experience during the study period. On a liability-weighted basis, there were fewer early retirements than expected.

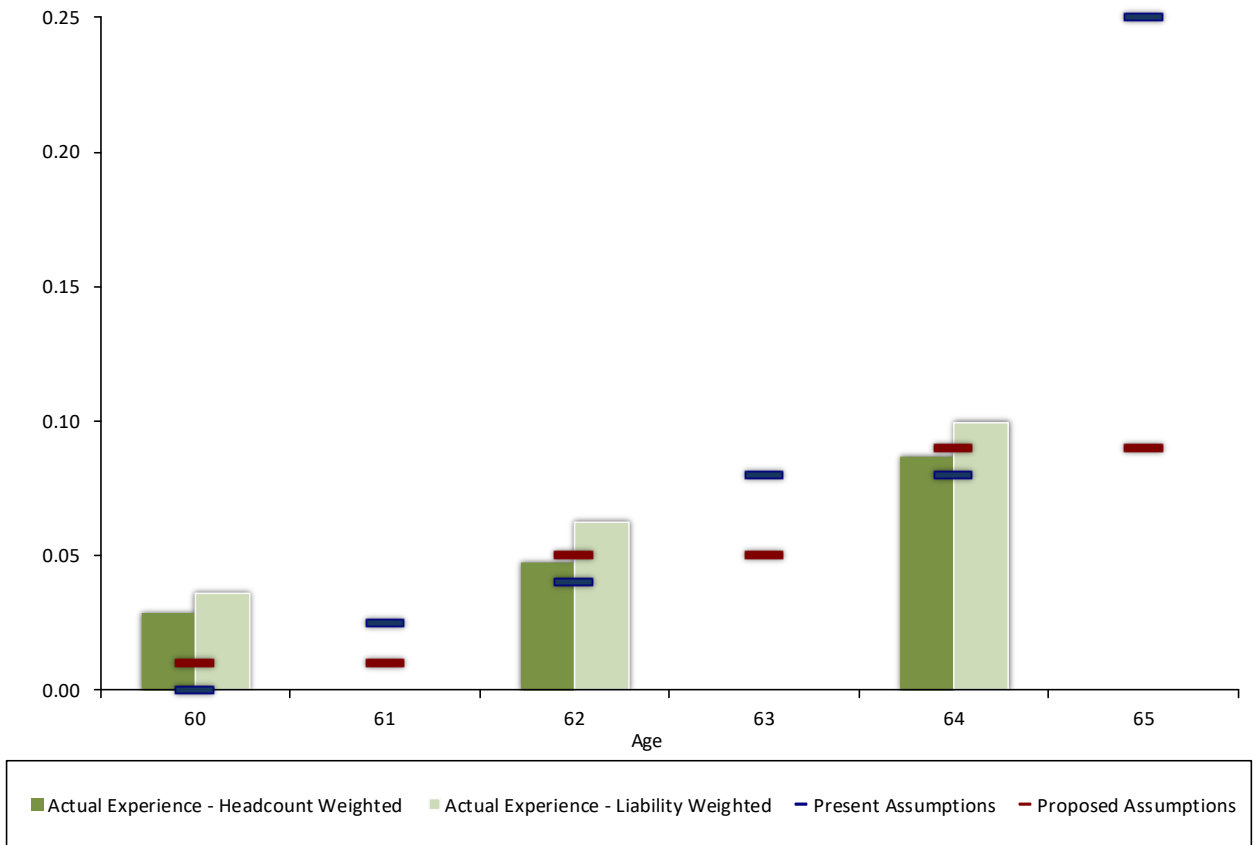
Recommendation

We recommend a change in early retirement rates, as indicated on the next page. The proposed rates predict fewer early retirements.

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
60	994	27,718	2.86%	3.59%	0.00%	1.00%	-	277	N/A	358.7%
61	-	48,571	0.00%	0.00%	2.50%	1.00%	1,214	486	0.0%	0.0%
62	3,000	48,160	4.76%	6.23%	4.00%	5.00%	1,926	2,408	155.7%	124.6%
63	-	45,956	0.00%	0.00%	8.00%	5.00%	3,677	2,298	0.0%	0.0%
64	3,938	39,672	8.70%	9.93%	8.00%	9.00%	3,174	3,570	124.1%	110.3%
65 [^]	-	831	0.00%	0.00%	25.00%	9.00%	208	75	0.0%	0.0%
Totals	7,932	210,910	2.97%	3.76%	4.84%	4.32%	10,199	9,114	77.8%	87.0%

[^] Members appointed on or after July 1, 2013.



Retirement from Deferred Status

Members who terminate and have five years of service are entitled to either a refund of employee contributions, with interest, or a deferred retirement benefit.

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 the member's 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 0.50% per month, meaning this assumption would generate a small actuarial loss if retirement occurs prior to Normal Retirement Age. 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 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.

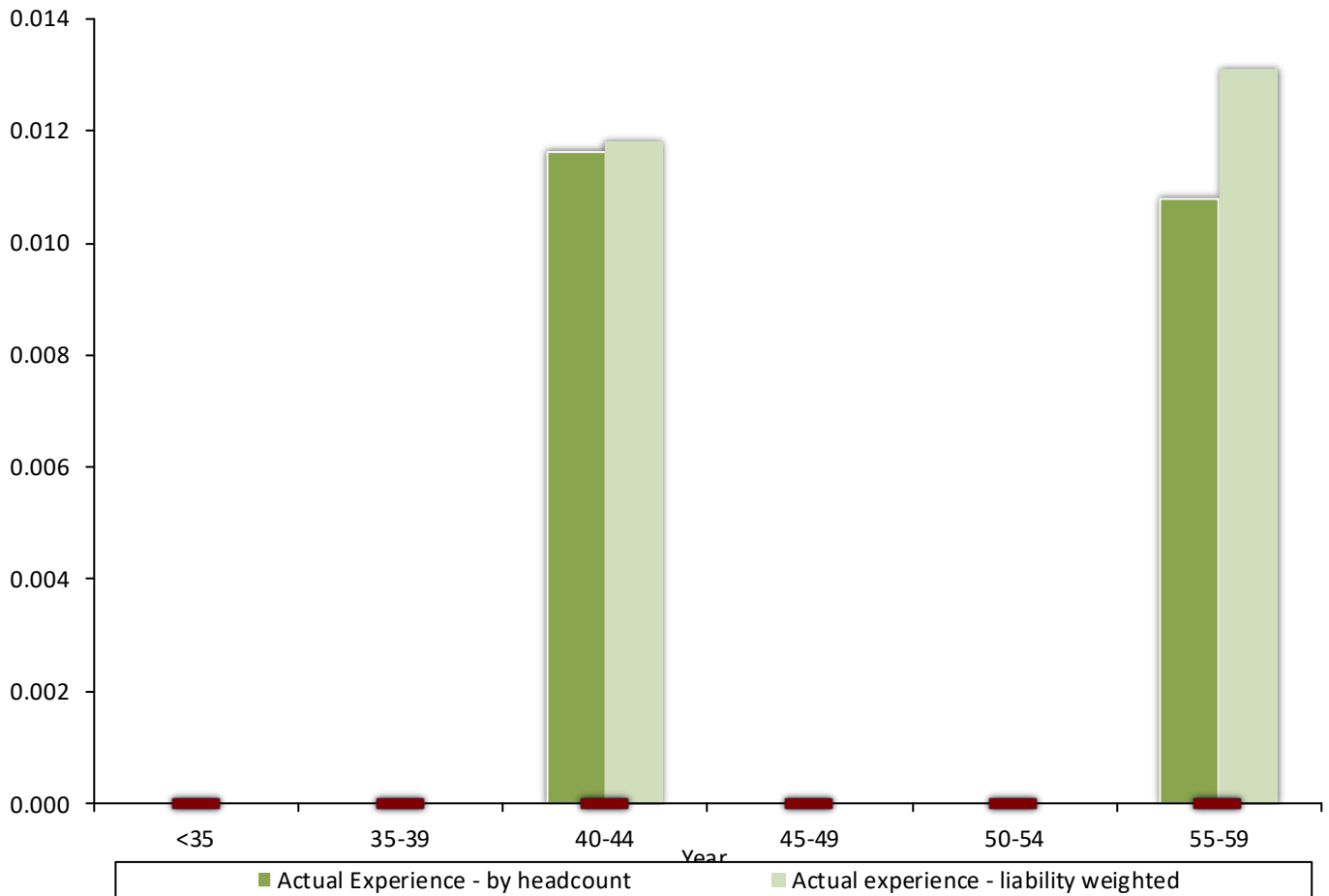
Our current valuation assumptions are that no members terminate prior to retirement. The actual number of terminations prior to retirement has historically been very low, consistent with the findings in this report. If there are terminations, they will result in small actuarial gains.

Recommendation

We recommend continuation of the current assumption that no members terminate prior to retirement eligibility.

Withdrawal Experience – Males and Females

Age	Liability Weighted (\$000s)		Crude Rates		Sample Rates		Expected Withdrawals		Ratio of Actuals/Expecteds	
	Withdrawals	Exposure	Population Weighted	Liability Weighted	Present	Proposed	Present	Proposed	Present	Proposed
<35	-	-	N/A	N/A	0.0000	0.0000	-	-	N/A	N/A
35-39	-	3,654	0.0000	0.0000	0.0000	0.0000	-	-	N/A	N/A
40-44	338	28,601	0.0116	0.0118	0.0000	0.0000	-	-	N/A	N/A
45-49	-	67,809	0.0000	0.0000	0.0000	0.0000	-	-	N/A	N/A
50-54	-	123,835	0.0000	0.0000	0.0000	0.0000	-	-	N/A	N/A
55-59	2,176	165,970	0.0108	0.0131	0.0000	0.0000	-	-	N/A	N/A
Totals	2,514	389,870	0.0059	0.0064	0.0000	0.0000	-	-	N/A	N/A



SECTION E

DISABILITY EXPERIENCE

Disability Experience

Judges who are unable to perform normal duties are eligible to receive a disability benefit. Disability benefits are not paid by the Fund during the first year; instead, salary is continued for one year but not beyond age 70. Member contributions continue and Allowable Service is earned. If disability continues after the first year (or age 70 if earlier), the larger of 25.00% of Average Salary and the Normal Retirement benefit (without reduction) is paid.

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

The process of qualifying for a disability benefit requires some burden of proof. This process may result in a member being reported as a termination or withdrawal while the disability application is being reviewed. We reviewed termination experience for the JRF over the course of the four-year period and found there were no members who were reclassified as a disability retirement after first being reported as a termination.

We reviewed the disability experience during the four-year period. The results are shown on the following pages. There was one disability retirement during the past four years.

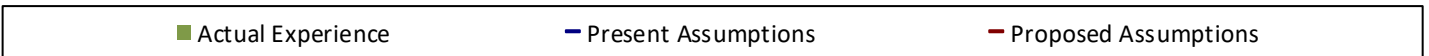
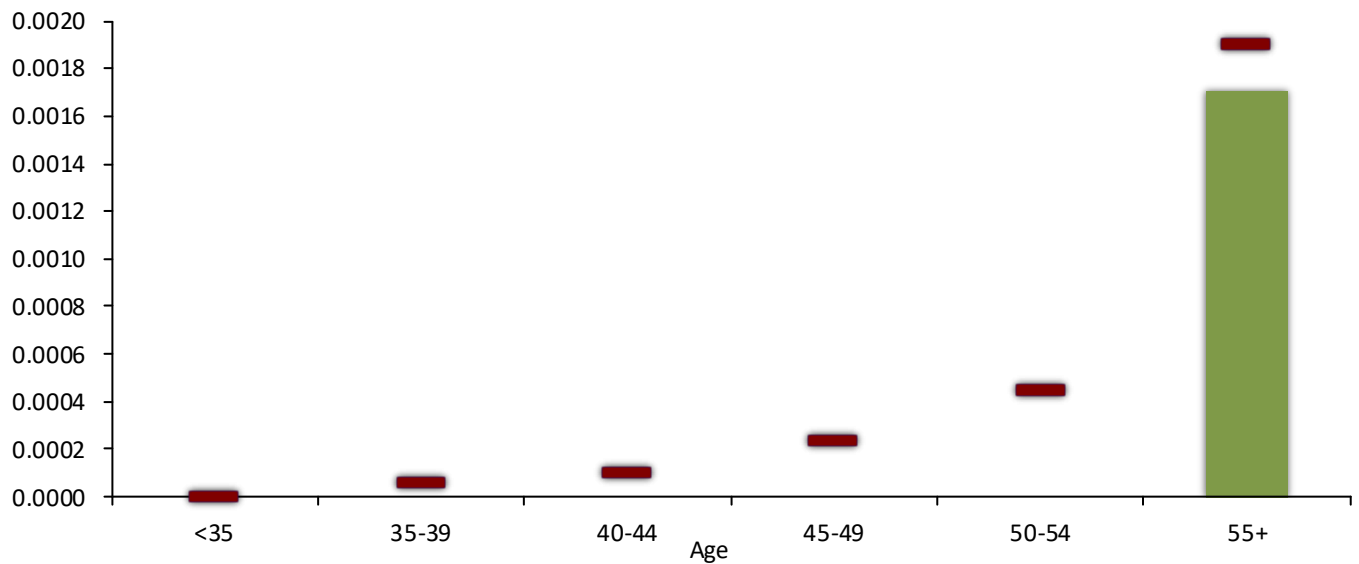
Recommendation

We recommend maintaining the current rates of disability for all members.

Disability Experience Males and Females

Age	Population Weighted		Crude Rates	Sample Rates		Population Weighted			
	Disabilities	Exposure		Present	Proposed	Expected Disabilities		Ratio of Actuals/Expecteds	
						Present	Proposed	Present	Proposed
<35	-	-	N/A	0.0000%	0.0000%	-	-	N/A	N/A
35-39	-	13	0.0000%	0.0060%	0.0060%	0.0	0.0	0.0%	0.0%
40-44	-	86	0.0000%	0.0104%	0.0104%	0.0	0.0	0.0%	0.0%
45-49	-	166	0.0000%	0.0233%	0.0233%	0.0	0.0	0.0%	0.0%
50-54	-	250	0.0000%	0.0445%	0.0445%	0.1	0.1	0.0%	0.0%
55+	1	586	0.1706%	0.1900%	0.1900%	1.1	1.1	89.8%	89.8%
Totals	1	1,101	0.0908%	0.1156%	0.1156%	1.3	1.3	78.5%	78.5%

* Sample rates taken from the mid-point of the age group.



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 income, below median income).

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 the JRF retiree and disability mortality on a “benefit-weighted” basis and have shown the results in this section. Consistent with the SOA study, JRF members with higher benefits generally appear to experience longer lifespans, resulting in lower mortality rates.

Fully generational tables, which are utilized for the MSRS 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 32 male retiree deaths and 7 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 fewer male deaths than expected (\$2,505,000 actual versus \$2,737,000 expected) and more female deaths than expected (\$516,000 actual versus \$425,000 expected).

Disabled Retirees

On a benefit-weighted basis, the plan experienced more deaths among disabled males (\$270,000) than projected by the present assumptions (\$246,000). The actual number of deaths on a benefit-weighted basis among disabled females (\$0) was less than the number projected by the present assumptions (\$18,000).

Active Members

On a liability-weighted basis, the actual number of male deaths among active members (\$0) was less than the number projected by the present assumption (\$822,000). The plan experienced more deaths on a liability-weighted basis among females (\$959,000) than projected by the present assumptions (\$481,000).

Mortality Experience

Recommendations

Due to the size of this plan, the experience is not considered credible. As such, we recommend adoption of the Pub-2010 mortality tables. All recommended tables are Benefit-Weighted.

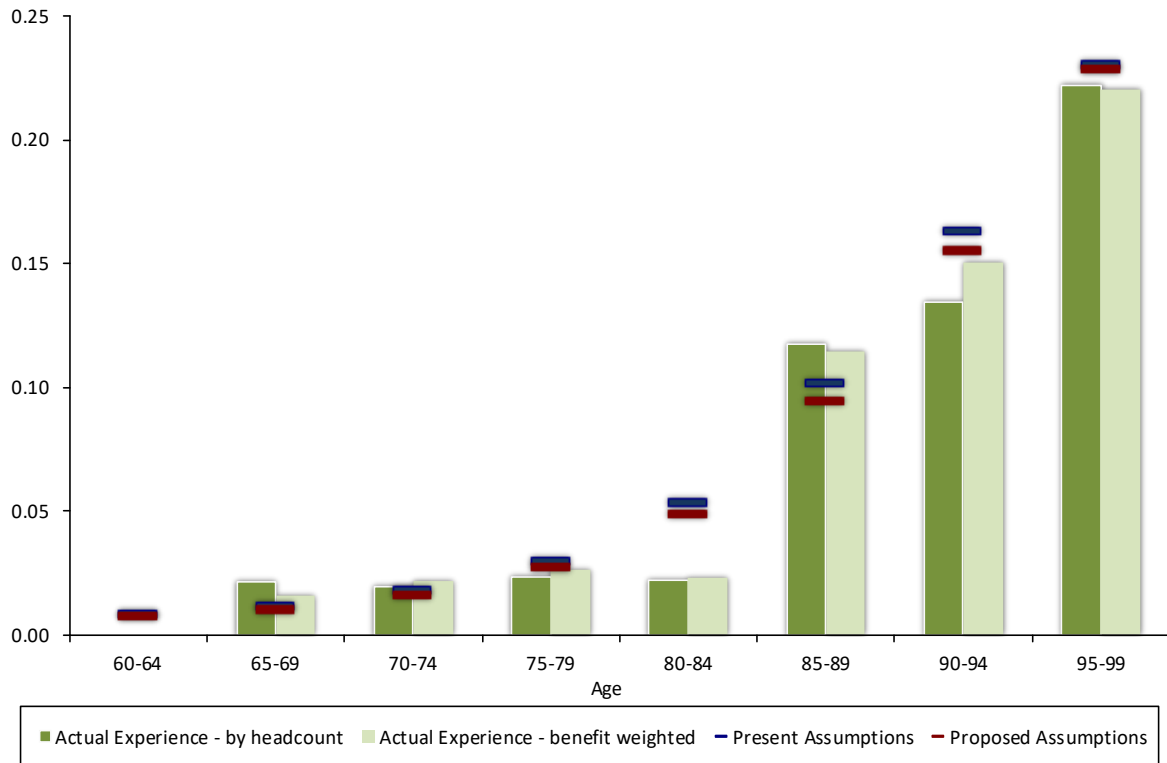
We recommend adoption of the following mortality tables:

Healthy Male Retirees:	Pub-2010 Male Healthy Retired General, Above Median Income, Mortality Table adjusted for mortality improvements using projection scale MP-2021.
Healthy Female Retirees:	Pub-2010 Female Healthy Retired General Mortality Table, Above Median Income, adjusted for mortality improvements using projection scale MP-2021.
Disabled Male Retirees:	Pub-2010 Male General Disabled Retiree Mortality Table, adjusted for mortality improvements using projection scale MP-2021.
Disabled Female Retirees:	Pub-2010 Female General Disabled Retiree Mortality Table, adjusted for mortality improvements using projection scale MP-2021.
Male Active Members:	Pub-2010 Male General, Above Median Income, Mortality Table adjusted for mortality improvements using projection scale MP-2021.
Female Active Members:	Pub-2010 Female General, Above Median Income, Mortality Table adjusted for mortality improvements using projection scale MP-2021.

We reviewed both the Pub-2010 General and General Above Median Income mortality tables and found the Above Median Income mortality rates to be a better fit for male retirees and approximately the same fit for female retirees. Although the recommended pre-retirement mortality tables appear to not be a good fit based on the plan's actual experience, the plan's experience is not considered to be credible, as noted earlier in this report. The number of active member and disabled retiree deaths during the four-year period was very low (0 male deaths and 1 female death among active members).

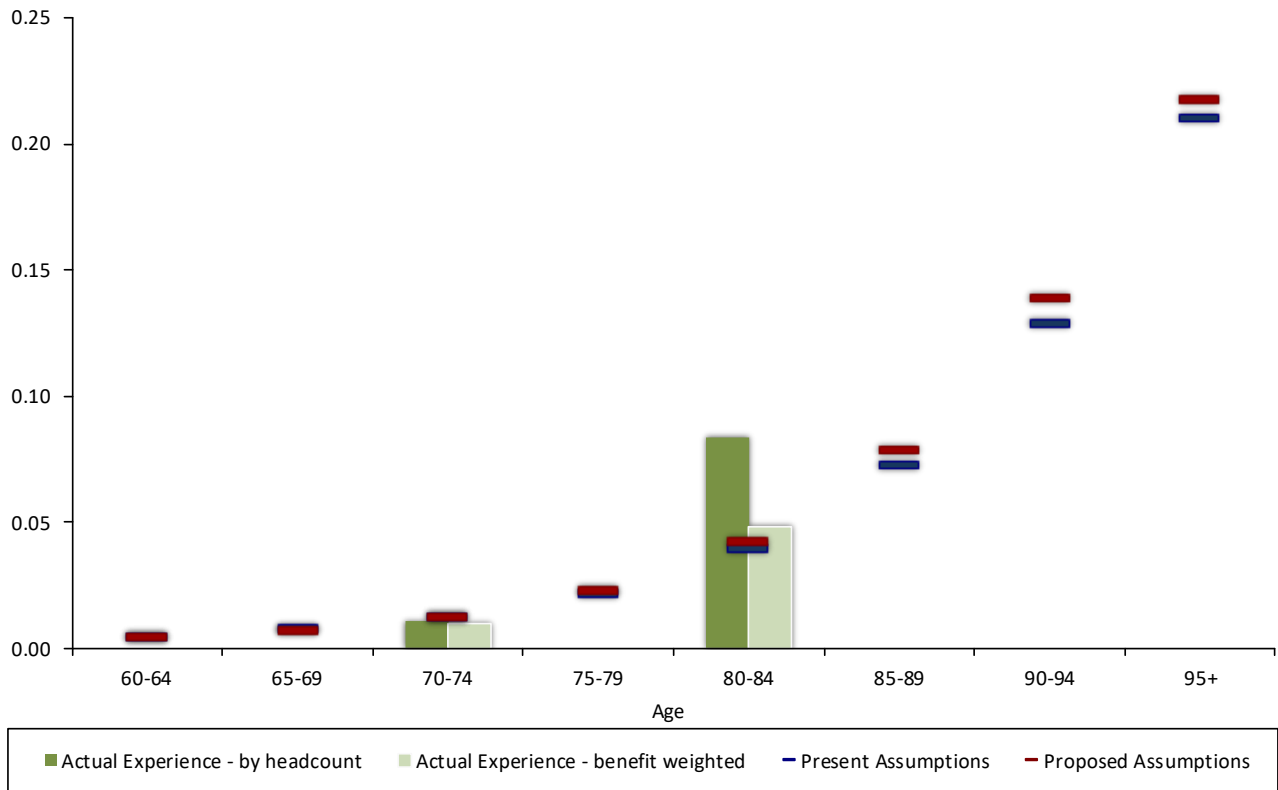
Post-Retirement Mortality Experience Healthy Males

Age	Benefit Weighted (\$000s)		Crude Rates		Sample Rates		Benefit Weighted (\$000s)		Ratio of Actuals/Expecteds	
	Deaths	Exposure	Benefit Weighted	Headcount Weighted	Expected Deaths		Actuals/Expecteds			
					Present	Proposed	Present	Proposed		
60-64	-	288	0.0000	0.0000	0.0084	0.0075	2	2	0.0%	0.0%
65-69	151	9,470	0.0159	0.0216	0.0115	0.0103	109	98	139.1%	154.3%
70-74	490	22,451	0.0218	0.0193	0.0179	0.0161	401	361	122.2%	135.6%
75-79	403	15,466	0.0261	0.0235	0.0300	0.0272	464	420	86.9%	95.9%
80-84	211	9,303	0.0227	0.0221	0.0533	0.0489	496	455	42.5%	46.3%
85-89	426	3,723	0.1144	0.1176	0.1016	0.0946	378	352	112.7%	120.9%
90-94	654	4,349	0.1504	0.1346	0.1631	0.1555	709	676	92.2%	96.7%
95-99	170	771	0.2205	0.2222	0.2306	0.2289	178	177	95.6%	96.3%
100+	-	-	N/A	N/A	0.4294	0.4303	-	-	N/A	N/A
Totals	2,505	65,821	0.0381	0.0350	0.0416	0.0386	2,737	2,542	91.5%	98.5%



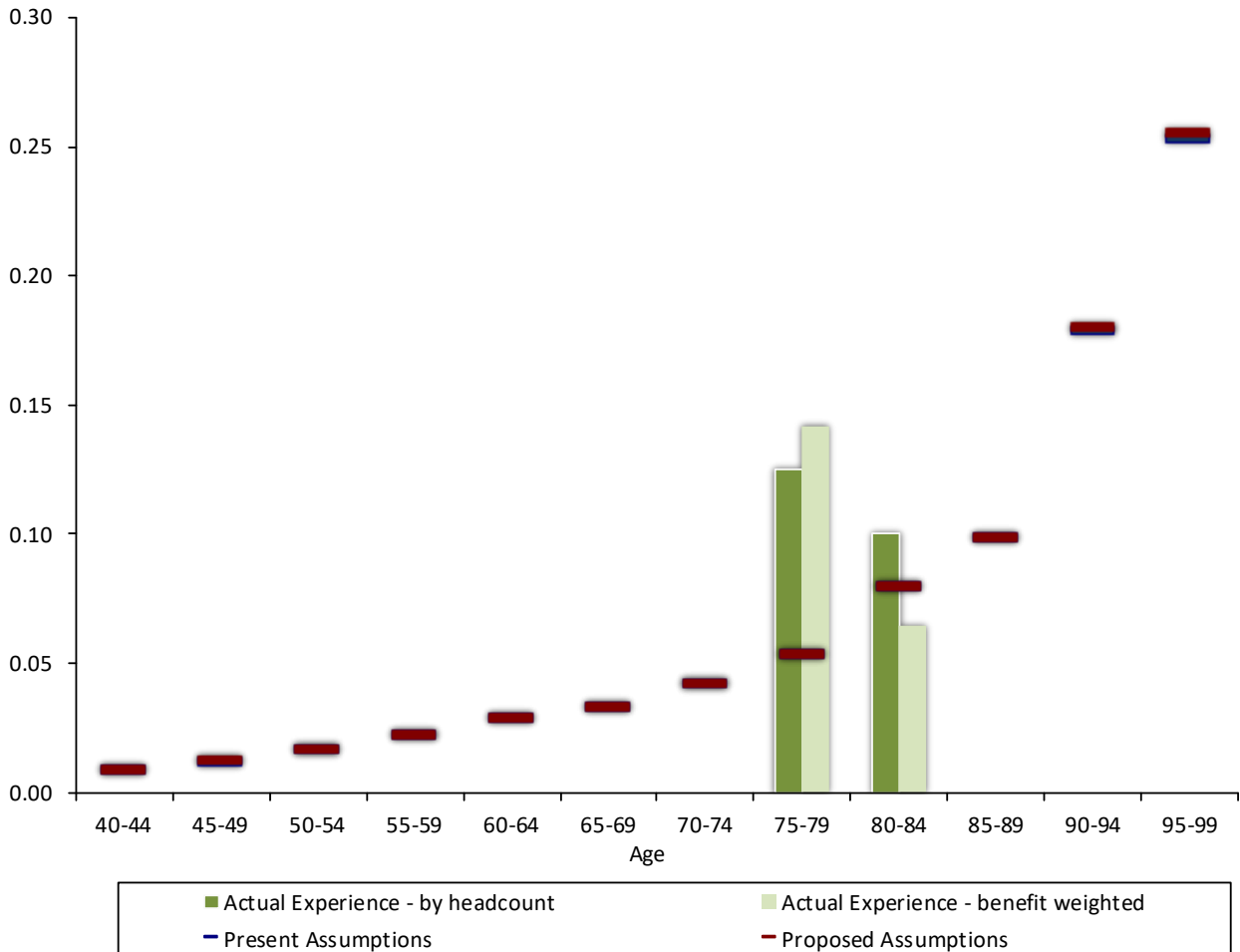
Post-Retirement Mortality Experience Healthy Females

Age	Benefit Weighted (\$000s)		Crude Rates		Sample Rates		Benefit Weighted (\$000s)		Ratio of Actuals/Expecteds	
	Deaths	Exposure	Benefit Weighted	Headcount Weighted	Sample Rates		Expected Deaths		Actuals/Expecteds	
					Present	Proposed	Present	Proposed	Present	Proposed
60-64	-	612	0.0000	0.0000	0.0051	0.0049	3	3	0.0%	0.0%
65-69	-	5,297	0.0000	0.0000	0.0074	0.0071	39	38	0.0%	0.0%
70-74	89	7,334	0.0121	0.0089	0.0125	0.0119	92	87	97.2%	102.0%
75-79	-	5,229	0.0000	0.0000	0.0199	0.0190	104	99	0.0%	0.0%
80-84	45	907	0.0496	0.0833	0.0396	0.0381	36	35	125.3%	130.2%
85-89	212	954	0.2222	0.1818	0.0751	0.0728	72	69	296.0%	305.1%
90-94	145	583	0.2487	0.2222	0.1209	0.1182	71	69	205.6%	210.5%
95-99	25	49	0.5102	0.5000	0.1863	0.1855	9	9	273.8%	275.1%
100+	-	-	N/A	N/A	0.4064	0.4063	-	-	N/A	N/A
Totals	516	20,990	0.0246	0.0231	0.0203	0.0195	425	409	121.3%	126.1%



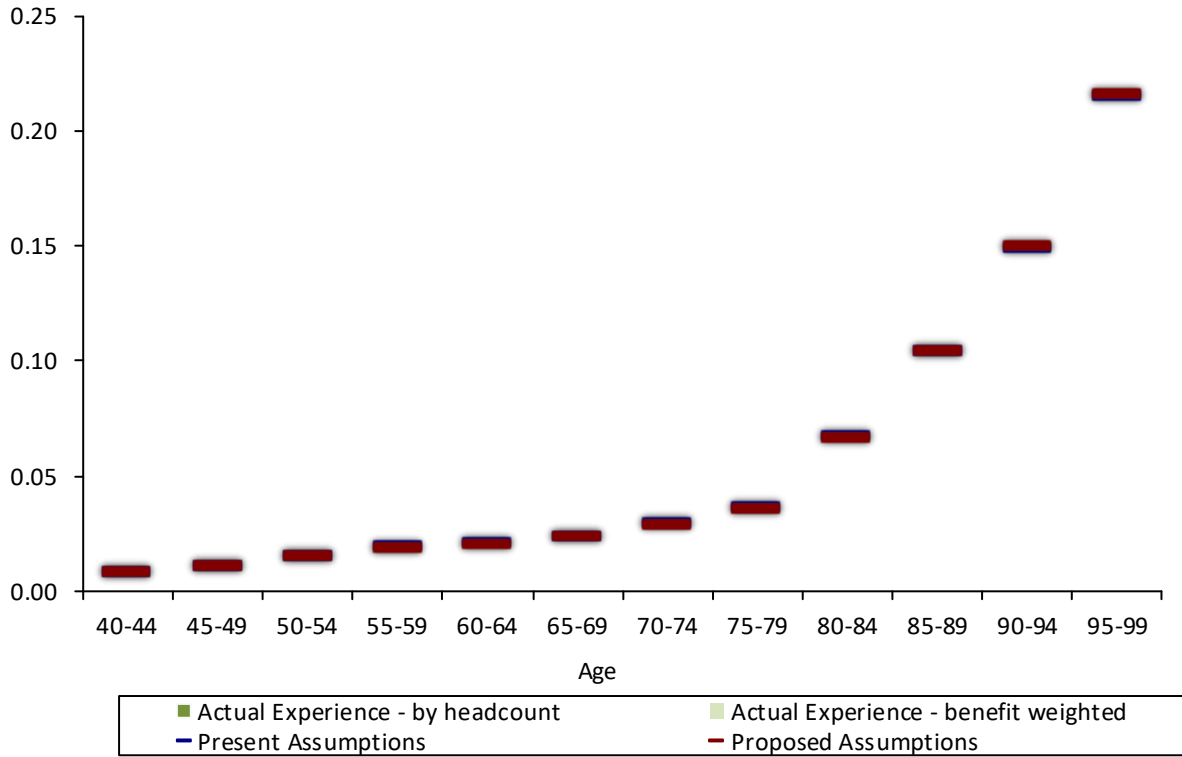
Post-Retirement Mortality Experience Disabled Males

Age	Benefit Weighted (\$000s)		Crude Rates		Sample Rates		Benefit Weighted (\$000s)		Ratio of	
	Deaths	Exposure	Benefit Weighted	Headcount Weighted			Expected Deaths		Actuals/Expecteds	
					Present	Proposed	Present	Proposed	Present	Proposed
40-44	-	-	N/A	N/A	0.90%	0.93%	-	-	N/A	N/A
45-49	-	-	N/A	N/A	1.20%	1.22%	-	-	N/A	N/A
50-54	-	-	N/A	N/A	1.71%	1.71%	-	-	N/A	N/A
55-59	-	-	N/A	N/A	2.27%	2.26%	-	-	N/A	N/A
60-64	-	103	0.00%	0.00%	2.87%	2.88%	3	3	0.0%	0.0%
65-69	-	238	0.00%	0.00%	3.33%	3.33%	8	8	0.0%	0.0%
70-74	-	553	0.00%	0.00%	4.24%	4.20%	23	23	0.0%	0.0%
75-79	170	1,201	14.15%	12.50%	5.37%	5.32%	65	64	263.4%	265.8%
80-84	100	1,557	6.42%	10.00%	8.00%	7.96%	125	124	80.3%	80.6%
85-89	-	232	0.00%	0.00%	9.87%	9.88%	23	23	0.0%	0.0%
90-94	-	-	N/A	N/A	17.90%	18.04%	-	-	N/A	N/A
95-99	-	-	N/A	N/A	25.35%	25.55%	-	-	N/A	N/A
100+	-	-	N/A	N/A	42.94%	43.03%	-	-	N/A	N/A
Totals	270	3,884	6.95%	8.00%	6.34%	6.31%	246	245	109.6%	110.2%



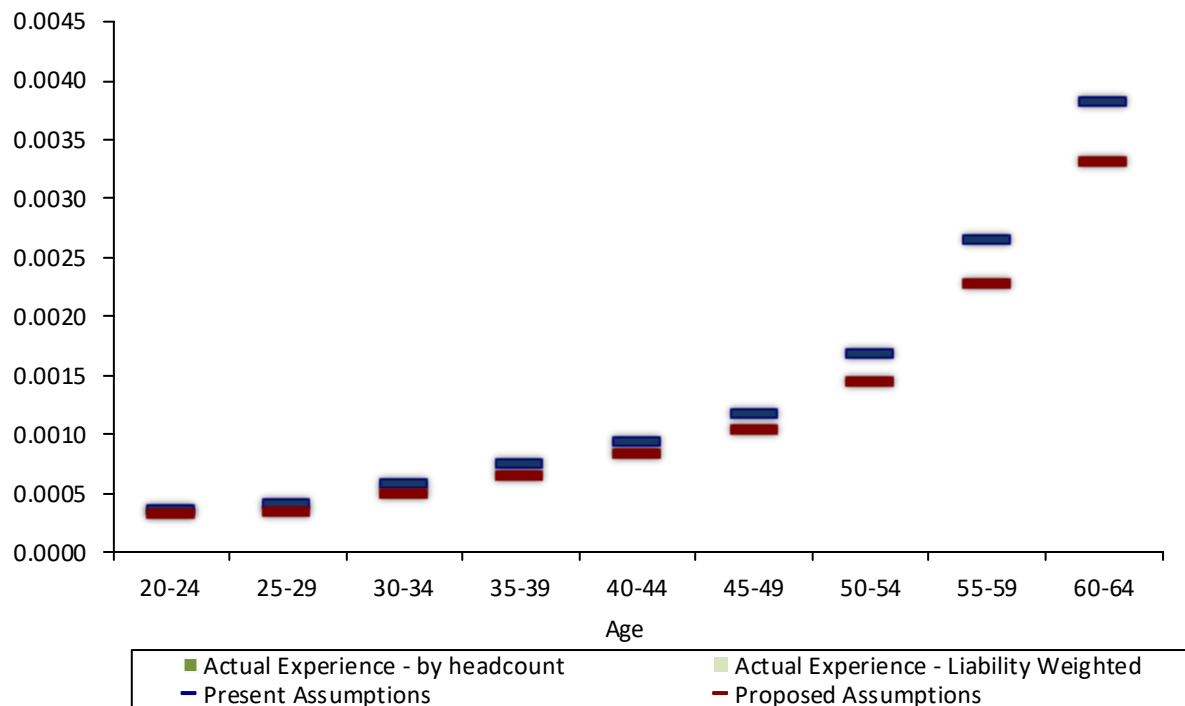
Post-Retirement Mortality Experience Disabled Females

Age	Benefit Weighted (\$000s)		Crude Rates		Sample Rates		Benefit Weighted (\$000s)		Ratio of	
	Deaths	Exposure	Benefit Weighted	Headcount Weighted			Expected Deaths		Actuals/Expecteds	
					Present	Proposed	Present	Proposed	Present	Proposed
40-44	-	-	N/A	N/A	0.83%	0.81%	-	-	N/A	N/A
45-49	-	-	N/A	N/A	1.13%	1.10%	-	-	N/A	N/A
50-54	-	-	N/A	N/A	1.57%	1.50%	-	-	N/A	N/A
55-59	-	-	N/A	N/A	1.94%	1.88%	-	-	N/A	N/A
60-64	-	-	N/A	N/A	2.12%	2.09%	-	-	N/A	N/A
65-69	-	105	0.00%	0.00%	2.41%	2.37%	3	2	0.0%	0.0%
70-74	-	317	0.00%	0.00%	3.00%	2.95%	10	9	0.0%	0.0%
75-79	-	159	0.00%	0.00%	3.70%	3.64%	6	6	0.0%	0.0%
80-84	-	-	N/A	N/A	6.78%	6.73%	-	-	N/A	N/A
85-89	-	-	N/A	N/A	10.49%	10.50%	-	-	N/A	N/A
90-94	-	-	N/A	N/A	14.97%	15.05%	-	-	N/A	N/A
95-99	-	-	N/A	N/A	21.57%	21.61%	-	-	N/A	N/A
100+	-	-	N/A	N/A	40.64%	40.63%	-	-	N/A	N/A
Totals	-	581	0.00%	0.00%	3.09%	3.03%	18	18	0.0%	0.0%



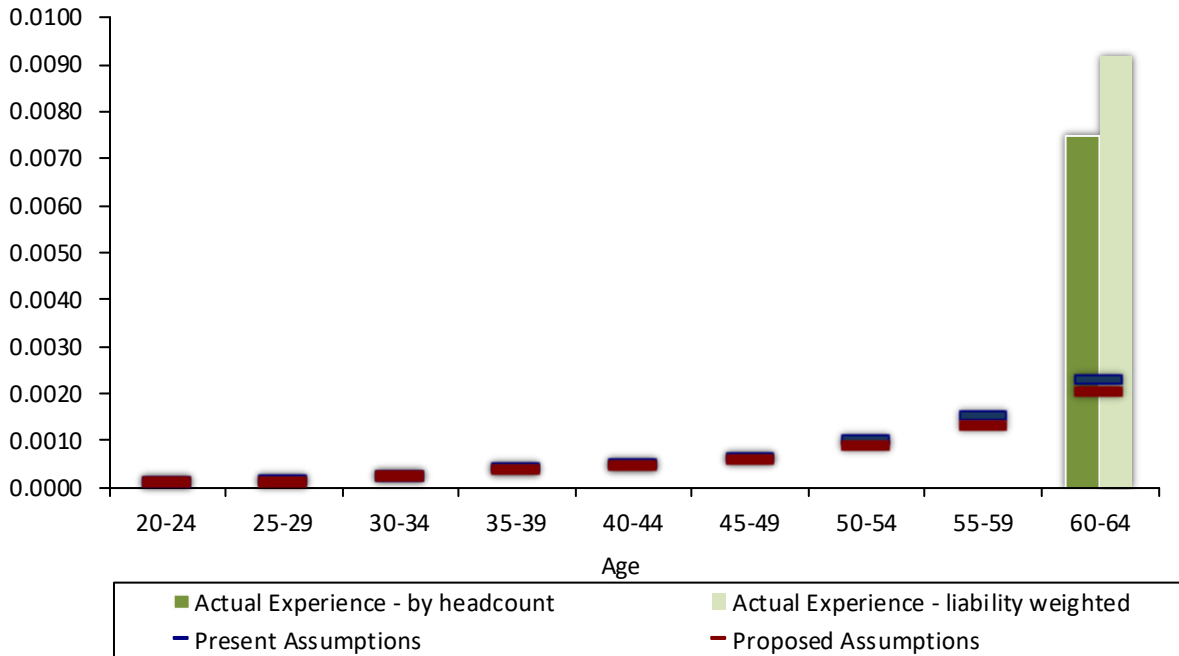
Pre-Retirement Mortality Experience Healthy Males

Age	Liability Weighted (\$000s)		Crude Rates		Sample Rates		Liability Weighted (\$000s)		Ratio of Actuals/Expecteds	
	Deaths	Exposure	Liability Weighted	Population Weighted	Sample Rates		Expected Deaths		Ratio of Actuals/Expecteds	
					Present	Proposed	Present	Proposed	Present	Proposed
Under 20	-	-	N/A	N/A	0.01%	0.01%	-	-	N/A	N/A
20-24	-	-	N/A	N/A	0.04%	0.03%	-	-	N/A	N/A
25-29	-	-	N/A	N/A	0.04%	0.03%	-	-	N/A	N/A
30-34	-	-	N/A	N/A	0.06%	0.05%	-	-	N/A	N/A
35-39	-	235	0.00%	0.00%	0.07%	0.07%	0	0	0.0%	0.0%
40-44	-	6,636	0.00%	0.00%	0.09%	0.08%	6	5	0.0%	0.0%
45-49	-	28,443	0.00%	0.00%	0.12%	0.10%	33	29	0.0%	0.0%
50-54	-	48,717	0.00%	0.00%	0.17%	0.15%	82	71	0.0%	0.0%
55-59	-	80,321	0.00%	0.00%	0.26%	0.23%	213	183	0.0%	0.0%
60-64	-	127,185	0.00%	0.00%	0.38%	0.33%	487	422	0.0%	0.0%
Totals	-	291,537	0.00%	0.00%	0.28%	0.24%	822	711	0.0%	0.0%



Pre-Retirement Mortality Experience Healthy Females

Age	Liability Weighted (\$000s)		Crude Rates		Sample Rates		Liability Weighted (\$000s)		Ratio of Actuals/Expecteds	
	Deaths	Exposure	Liability Weighted	Population Weighted	Sample Rates		Expected Deaths		Actuals/Expecteds	
					Present	Proposed	Present	Proposed	Present	Proposed
Under 20	-	-	N/A	N/A	0.00%	0.00%	-	-	0.0%	0.0%
20-24	-	-	N/A	N/A	0.01%	0.01%	-	-	N/A	N/A
25-29	-	-	N/A	N/A	0.01%	0.01%	-	-	N/A	N/A
30-34	-	-	N/A	N/A	0.02%	0.02%	-	-	N/A	N/A
35-39	-	3,419	0.00%	0.00%	0.04%	0.04%	1	1	0.0%	0.0%
40-44	-	21,964	0.00%	0.00%	0.05%	0.04%	11	10	0.0%	0.0%
45-49	-	39,364	0.00%	0.00%	0.06%	0.06%	25	22	0.0%	0.0%
50-54	-	75,118	0.00%	0.00%	0.10%	0.09%	75	65	0.0%	0.0%
55-59	-	85,651	0.00%	0.00%	0.15%	0.13%	129	114	0.0%	0.0%
60-64	959	104,475	0.92%	0.75%	0.23%	0.21%	240	215	400.3%	446.2%
Totals	959	329,991	0.29%	0.17%	0.15%	0.13%	481	427	199.4%	224.5%



SECTION G

MISCELLANEOUS AND TECHNICAL ASSUMPTIONS

Marital Status and Age of Survivor

Marital Status

Married members will frequently make different annuity selections than non-married members. We use marital status as provided by MSRS.

Age of Survivor

Actual age difference as provided by MSRS is used for most members. If spouse age is not provided, we assume male members have a beneficiary three years younger and female members have a beneficiary two years older.

Recommendation

Due to the size of the Judges plan, we recommend basing the age difference assumption on the State Employees Retirement Fund experience (male members have a beneficiary two years younger and female members have a beneficiary two years older).

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 (other than a refund of remaining employee contributions, if applicable) is payable to a beneficiary upon the member's death.
- **15-Year Certain & Life** – a reduced benefit is paid for the lifetime of the member. If the member dies before 180 payments have been made, the benefit continues to be paid to a beneficiary until 180 payments have been made.
- **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.

* *Joint & Survivor optional forms are available with and without bounceback on an actuarially equivalent basis. If the member does not elect the benefit with the bounceback, the benefit is unchanged if the beneficiary predeceases the member.*

We currently assume all members elect a life annuity. Since all optional forms are determined on an actuarial equivalent basis, we are not proposing a change to this assumption.

Actuarial Equivalent Factors

Joint and Survivor benefits are actuarially equivalent to the Single-life annuity. Effective July 1, 2019 and phased in over a 24-month period, actuarial equivalent factors are based on the RP-2014 mortality table for healthy annuitants, reflecting projected mortality improvements for a member turning age 66 in 2021 using Scale MP-2017, white collar adjustment, blended 70% males, 5.65% post-retirement interest and 7.50% 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 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 MSRS. 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, salary is set to \$131,000.
- For members reported with zero or invalid service (<0): service is set to 0 years.
- For members reported without a gender: assume the member is female.

Data for retired members:

- For members reported without a gender: assume retirees are male and beneficiaries are female.
- For members reported without a benefit: no adjustment is made.
- For members reported with a bounceback annuity and an unreasonable reduction factor (<.5 or >1), a factor of 0.80, 0.85, and 0.90 is assumed for the 100%, 75% and 50% joint and survivor annuity, respectively.

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 is not available: assume salary is equal to the salary for a District Court Judge, as determined by Minnesota statute. This value is \$169,264 as of July 1, 2023.*
- *For active members reported with an invalid date of birth: assume member was hired at the same age as new members with one to five years of service as of the last projection required by the Legislative Commission on Pensions and Retirement. This value is 48 years as of July 1, 2022.*

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.

Recommendation

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

Miscellaneous and Technical Assumptions

<i>Benefit Service</i>	Exact fractional service is used to determine the amount of benefit payable.
<i>Decrement Operation</i>	Withdrawal decrements do not operate during retirement eligibility.
<i>Decrement Timing</i>	Decrements of all types are assumed to occur mid-year.
<i>Eligibility Testing</i>	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.
<i>Forfeitures</i>	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.
<i>Incidence of Contributions</i>	Contributions are assumed to be received on a monthly basis, per the Standards of Actuarial Work.
<i>Pay Increase Timing</i>	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.
<i>Service Credit Accruals</i>	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

We recommend continuing the present payroll growth and salary increase assumptions of 2.50%. Since the recommended inflation assumption is 2.25%, the implied real wage growth is 0.25%.

Proposed Actuarial Assumptions Based on the 2019-2023 Experience Study

Age and Service Retirement Pattern Unreduced (Normal) Retirement

Age	% Retiring
65 [^]	30.0%
66 ^{&}	20.0%
67	20.0%
68	30.0%
69	40.0%
70+ [*]	100.0%

- [^] Members appointed prior to July 1, 2013.
- [&] Proposed rate shown in the table is for members appointed prior to July 1, 2013; for members appointed on or after July 1, 2013, the proposed rate at age 66, the first year of eligibility for unreduced benefits, is 30.0%.
- ^{*} 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 and Service Retirement Pattern Reduced (Early) Retirement

Age	% Retiring
60	1.0%
61	1.0%
62	5.0%
63	5.0%
64	9.0%
65 [^]	9.0%

[^] Members appointed on or after July 1, 2013.

Proposed Actuarial Assumptions Based on the 2019-2023 Experience Study

Withdrawal

We recommend no change to the current assumption of 0.0%.

Proposed Actuarial Assumptions Based on the 2019-2023 Experience Study

Disability Rates

Age	% Becoming Disabled	
	Male	Female
20	0.0000%	0.0000%
21	0.0000%	0.0000%
22	0.0000%	0.0000%
23	0.0000%	0.0000%
24	0.0000%	0.0000%
25	0.0000%	0.0000%
26	0.0000%	0.0000%
27	0.0000%	0.0000%
28	0.0000%	0.0000%
29	0.0000%	0.0000%
30	0.0000%	0.0000%
31	0.0000%	0.0000%
32	0.0000%	0.0000%
33	0.0000%	0.0000%
34	0.0000%	0.0000%
35	0.0000%	0.0000%
36	0.0060%	0.0060%
37	0.0060%	0.0060%
38	0.0060%	0.0060%
39	0.0060%	0.0060%
40	0.0060%	0.0060%
41	0.0060%	0.0060%
42	0.0120%	0.0120%
43	0.0120%	0.0120%
44	0.0120%	0.0120%
45	0.0180%	0.0180%
46	0.0180%	0.0180%
47	0.0240%	0.0240%
48	0.0240%	0.0240%
49	0.0300%	0.0300%
50	0.0300%	0.0300%
51	0.0360%	0.0360%
52	0.0420%	0.0420%
53	0.0480%	0.0480%
54	0.0600%	0.0600%
55	0.0720%	0.0720%
56	0.0900%	0.0900%
57	0.1080%	0.1080%
58	0.1320%	0.1320%
59	0.1560%	0.1560%
60	0.1860%	0.1860%
61	0.2220%	0.2220%
62	0.2640%	0.2640%
63	0.3120%	0.3120%
64	0.3660%	0.3660%
65+	0.0000%	0.0000%

Proposed Actuarial Assumptions Based on the 2019-2023 Experience Study

Healthy Post-Retirement Mortality Rates

Age in 2023	% Dying Next Year*		Age in 2023	% Dying Next Year*	
	Male	Female		Male	Female
50	0.25%	0.19%	81	4.43%	3.36%
51	0.27%	0.20%	82	5.02%	3.82%
52	0.29%	0.22%	83	5.69%	4.35%
53	0.31%	0.23%	84	6.44%	4.95%
54	0.34%	0.25%	85	7.27%	5.64%
55	0.37%	0.27%	86	8.20%	6.43%
56	0.40%	0.29%	87	9.21%	7.32%
57	0.44%	0.31%	88	10.31%	8.32%
58	0.48%	0.33%	89	11.51%	9.42%
59	0.52%	0.36%	90	12.80%	10.60%
60	0.56%	0.38%	91	14.20%	11.88%
61	0.61%	0.41%	92	15.72%	13.22%
62	0.66%	0.45%	93	17.35%	14.64%
63	0.71%	0.48%	94	19.08%	16.11%
64	0.76%	0.52%	95	20.87%	17.66%
65	0.82%	0.57%	96	22.81%	19.36%
66	0.89%	0.62%	97	24.81%	21.14%
67	0.97%	0.67%	98	26.83%	23.01%
68	1.06%	0.74%	99	28.87%	24.97%
69	1.16%	0.81%	100	30.91%	27.00%
70	1.27%	0.90%	101	32.93%	29.09%
71	1.41%	1.00%	102	34.95%	31.21%
72	1.55%	1.12%	103	36.96%	33.34%
73	1.73%	1.26%	104	38.92%	35.45%
74	1.93%	1.41%	105	40.82%	37.54%
75	2.15%	1.60%	106	42.67%	39.57%
76	2.41%	1.80%	107	44.46%	41.55%
77	2.72%	2.04%	108	46.14%	43.45%
78	3.06%	2.30%	109	47.76%	45.27%
79	3.45%	2.61%	110	49.07%	46.99%
80	3.91%	2.96%			

* The rates shown are Pub-2010 mortality for healthy annuitants, General table, Above Median Income (see Section F). Recommended rates include mortality improvements using projection scale MP-2021.

Proposed Actuarial Assumptions Based on the 2019-2023 Experience Study

Disabled Post-Retirement Mortality Rates

Age in 2023	% Dying Next Year*		Age in 2023	% Dying Next Year*	
	Male	Female		Male	Female
20	0.43%	0.25%	56	2.13%	1.79%
21	0.41%	0.24%	57	2.24%	1.87%
22	0.38%	0.22%	58	2.35%	1.93%
23	0.35%	0.21%	59	2.46%	1.98%
24	0.33%	0.20%	60	2.56%	2.02%
25	0.33%	0.20%	61	2.66%	2.05%
26	0.36%	0.23%	62	2.76%	2.08%
27	0.39%	0.25%	63	2.86%	2.10%
28	0.42%	0.29%	64	2.96%	2.12%
29	0.46%	0.32%	65	3.06%	2.15%
30	0.50%	0.36%	66	3.16%	2.18%
31	0.54%	0.40%	67	3.26%	2.23%
32	0.58%	0.44%	68	3.36%	2.30%
33	0.62%	0.48%	69	3.48%	2.38%
34	0.66%	0.52%	70	3.60%	2.50%
35	0.70%	0.56%	71	3.74%	2.63%
36	0.73%	0.60%	72	3.91%	2.80%
37	0.77%	0.64%	73	4.10%	3.00%
38	0.81%	0.68%	74	4.33%	3.23%
39	0.84%	0.72%	75	4.59%	3.50%
40	0.88%	0.75%	76	4.88%	3.80%
41	0.91%	0.79%	77	5.23%	4.14%
42	0.95%	0.82%	78	5.61%	4.53%
43	0.99%	0.86%	79	6.05%	4.97%
44	1.04%	0.91%	80	6.54%	5.46%
45	1.10%	0.96%	81	7.09%	6.00%
46	1.16%	1.02%	82	7.70%	6.59%
47	1.23%	1.08%	83	8.36%	7.25%
48	1.32%	1.16%	84	9.09%	7.96%
49	1.41%	1.25%	85	9.88%	8.75%
50	1.51%	1.35%	86	10.72%	9.57%
51	1.60%	1.41%	87	11.62%	10.41%
52	1.69%	1.47%	88	12.60%	11.26%
53	1.79%	1.55%	89	13.82%	12.13%
54	1.90%	1.63%	90	15.17%	13.01%
55	2.01%	1.71%			

* The rates shown are Pub-2010 mortality for disabled annuitants, General table, with adjustments, if applicable (see Section F). Recommended rates include mortality improvements using projection scale MP-2021.

Proposed Actuarial Assumptions Based on the 2019-2023 Experience Study

Healthy Pre-Retirement Mortality Rates

Age in 2023	% Dying Next Year*		Age in 2023	% Dying Next Year*	
	Male	Female		Male	Female
20	0.04%	0.01%	46	0.10%	0.05%
21	0.04%	0.01%	47	0.10%	0.06%
22	0.03%	0.01%	48	0.11%	0.06%
23	0.03%	0.01%	49	0.11%	0.06%
24	0.03%	0.01%	50	0.12%	0.07%
25	0.03%	0.01%	51	0.13%	0.08%
26	0.03%	0.01%	52	0.14%	0.08%
27	0.03%	0.01%	53	0.15%	0.09%
28	0.04%	0.01%	54	0.17%	0.10%
29	0.04%	0.02%	55	0.18%	0.11%
30	0.04%	0.02%	56	0.20%	0.12%
31	0.05%	0.02%	57	0.22%	0.13%
32	0.05%	0.02%	58	0.24%	0.15%
33	0.05%	0.03%	59	0.26%	0.16%
34	0.06%	0.03%	60	0.28%	0.17%
35	0.06%	0.03%	61	0.31%	0.19%
36	0.07%	0.03%	62	0.33%	0.20%
37	0.07%	0.03%	63	0.36%	0.22%
38	0.07%	0.04%	64	0.38%	0.24%
39	0.07%	0.04%	65	0.41%	0.26%
40	0.08%	0.04%	66	0.43%	0.28%
41	0.08%	0.04%	67	0.46%	0.30%
42	0.08%	0.04%	68	0.49%	0.33%
43	0.09%	0.05%	69	0.52%	0.36%
44	0.09%	0.05%	70	0.56%	0.39%
45	0.09%	0.05%			

* The rates shown are Pub-2010 mortality for employees, General table, Above Median Income (see Section F). Recommended rates include mortality improvements using projection scale MP-2021.

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. Results are based on liability-weighted experience for withdrawal, retirement and pre-retirement mortality, benefit-weighted for post-retirement and disabled mortality, and population-weighted for all other analysis. Please note that totals may not sum correctly due to rounding of intermediate results.

Appendix – Detailed Experience Analysis Salary Increases

2019-2023 Experience

Year	Exposure	Prior Year	Current Year	Gross Actual Increases	Gross Expected Increases
1	119	18,226,479	19,565,432	7.35%	2.50%
2	90	14,715,325	14,895,398	1.22%	2.50%
3	95	15,580,850	15,739,706	1.02%	2.50%
4	82	13,559,368	13,602,961	0.32%	2.50%
5	77	12,643,197	12,747,878	0.83%	2.50%
6	79	12,941,228	13,008,853	0.52%	2.50%
7	76	12,366,194	12,593,517	1.84%	2.50%
8	79	12,989,985	13,138,679	1.14%	2.50%
9	67	11,083,508	11,147,736	0.58%	2.50%
10	52	8,614,516	8,643,813	0.34%	2.50%
11	40	6,574,669	6,645,525	1.08%	2.50%
12	42	6,914,814	6,976,999	0.90%	2.50%
13	43	7,051,301	7,119,739	0.97%	2.50%
14	44	7,270,286	7,360,700	1.24%	2.50%
15	39	6,450,120	6,527,813	1.20%	2.50%
16	30	5,050,859	5,051,598	0.01%	2.50%
17	23	3,863,244	3,851,046	-0.32%	2.50%
18	20	3,257,101	3,315,486	1.79%	2.50%
19	21	3,422,164	3,474,673	1.53%	2.50%
20	17	2,832,933	2,869,088	1.28%	2.50%
21	16	2,680,843	2,690,424	0.36%	2.50%
22	11	1,841,219	1,855,747	0.79%	2.50%
23	9	1,515,364	1,536,094	1.37%	2.50%
24	5	888,638	880,709	-0.89%	2.50%
25+	18	2,989,595	3,020,974	1.05%	2.50%
Totals	1,194	195,323,800	198,260,588	1.50%	2.50%

Appendix – Detailed Experience Analysis Salary Increases

2019-2020 Experience

Year	Exposure	Prior Year	Current Year	Gross Actual Increases	Gross Expected Increases
1	38	5,639,245	6,132,620	8.75%	2.50%
2	20	3,164,098	3,243,191	2.50%	2.50%
3	25	3,949,993	4,048,732	2.50%	2.50%
4	9	1,424,870	1,460,488	2.50%	2.50%
5	23	3,625,376	3,716,000	2.50%	2.50%
6	23	3,635,635	3,734,502	2.72%	2.50%
7	23	3,635,635	3,726,515	2.50%	2.50%
8	13	2,043,327	2,094,404	2.50%	2.50%
9	13	2,051,184	2,102,458	2.50%	2.50%
10	9	1,414,611	1,449,972	2.50%	2.50%
11	12	1,924,782	1,974,947	2.61%	2.50%
12	11	1,752,540	1,798,551	2.63%	2.50%
13	16	2,540,987	2,594,199	2.09%	2.50%
14	12	1,934,694	1,991,111	2.92%	2.50%
15	8	1,265,339	1,296,918	2.50%	2.50%
16	2	314,358	322,216	2.50%	2.50%
17	8	1,288,209	1,320,411	2.50%	2.50%
18	9	1,424,870	1,460,488	2.50%	2.50%
19	8	1,275,548	1,307,434	2.50%	2.50%
20	1	157,179	161,108	2.50%	2.50%
21	5	828,431	853,353	3.01%	2.50%
22	3	481,796	493,840	2.50%	2.50%
23	3	489,653	493,840	0.86%	2.50%
24	0	0	0	N/A	2.50%
25+	6	948,993	977,164	2.97%	2.50%
Totals	300	47,211,353	48,754,462	3.27%	2.50%

Appendix – Detailed Experience Analysis Salary Increases

2020-2021 Experience

Year	Exposure	Prior Year	Current Year	Gross Actual Increases	Gross Expected Increases
1	29	4,363,816	4,808,515	10.19%	2.50%
2	29	4,682,648	4,808,933	2.70%	2.50%
3	20	3,243,191	3,324,276	2.50%	2.50%
4	25	4,048,732	4,149,958	2.50%	2.50%
5	9	1,460,488	1,497,003	2.50%	2.50%
6	22	3,554,892	3,643,771	2.50%	2.50%
7	22	3,552,363	3,654,550	2.88%	2.50%
8	23	3,726,515	3,847,595	3.25%	2.50%
9	13	2,094,404	2,155,023	2.89%	2.50%
10	12	1,941,350	1,998,142	2.93%	2.50%
11	9	1,449,972	1,486,224	2.50%	2.50%
12	12	1,974,947	2,025,122	2.54%	2.50%
13	10	1,629,388	1,653,410	1.47%	2.50%
14	14	2,282,336	2,339,193	2.49%	2.50%
15	11	1,830,003	1,875,756	2.50%	2.50%
16	6	974,702	999,071	2.50%	2.50%
17	1	161,108	165,136	2.50%	2.50%
18	7	1,159,303	1,188,287	2.50%	2.50%
19	8	1,299,380	1,331,867	2.50%	2.50%
20	7	1,135,810	1,162,937	2.39%	2.50%
21	1	161,108	165,136	2.50%	2.50%
22	4	686,495	703,658	2.50%	2.50%
23	3	493,840	507,587	2.78%	2.50%
24	0	0	0	N/A	2.50%
25+	4	654,948	678,074	3.53%	2.50%
Totals	301	48,561,739	50,169,224	3.31%	2.50%

Appendix – Detailed Experience Analysis Salary Increases

2021-2022 Experience

Year	Exposure	Prior Year	Current Year	Gross Actual Increases	Gross Expected Increases
1	22	3,525,330	3,723,808	5.63%	2.50%
2	22	3,652,563	3,743,869	2.50%	2.50%
3	28	4,643,797	4,761,490	2.53%	2.50%
4	20	3,324,276	3,407,375	2.50%	2.50%
5	25	4,149,958	4,253,698	2.50%	2.50%
6	9	1,497,003	1,534,425	2.50%	2.50%
7	22	3,643,771	3,734,857	2.50%	2.50%
8	22	3,654,550	3,754,997	2.75%	2.50%
9	20	3,352,187	3,437,932	2.56%	2.50%
10	12	1,989,887	2,048,092	2.93%	2.50%
11	10	1,659,615	1,701,103	2.50%	2.50%
12	9	1,486,224	1,523,376	2.50%	2.50%
13	9	1,526,814	1,564,982	2.50%	2.50%
14	9	1,488,274	1,523,376	2.36%	2.50%
15	12	2,000,666	2,051,179	2.52%	2.50%
16	10	1,710,620	1,753,383	2.50%	2.50%
17	4	660,544	677,056	2.50%	2.50%
18	1	165,136	177,726	7.62%	2.50%
19	5	847,236	835,372	-1.40%	2.50%
20	6	1,001,595	1,026,633	2.50%	2.50%
21	5	833,935	846,320	1.49%	2.50%
22	1	165,136	169,264	2.50%	2.50%
23	2	362,607	371,672	2.50%	2.50%
24	3	516,966	529,890	2.50%	2.50%
25+	3	506,187	518,841	2.50%	2.50%
Totals	291	48,364,877	49,670,716	2.70%	2.50%

Appendix – Detailed Experience Analysis Salary Increases

2022-2023 Experience

Year	Exposure	Prior Year	Current Year	Gross Actual Increases	Gross Expected Increases
1	30	4,698,088	4,900,489	4.31%	2.50%
2	19	3,216,016	3,099,405	-3.63%	2.50%
3	22	3,743,869	3,605,208	-3.70%	2.50%
4	28	4,761,490	4,585,140	-3.70%	2.50%
5	20	3,407,375	3,281,177	-3.70%	2.50%
6	25	4,253,698	4,096,155	-3.70%	2.50%
7	9	1,534,425	1,477,595	-3.70%	2.50%
8	21	3,565,593	3,441,683	-3.48%	2.50%
9	21	3,585,733	3,452,323	-3.72%	2.50%
10	19	3,268,668	3,147,607	-3.70%	2.50%
11	9	1,540,300	1,483,251	-3.70%	2.50%
12	10	1,701,103	1,629,950	-4.18%	2.50%
13	8	1,354,112	1,307,148	-3.47%	2.50%
14	9	1,564,982	1,507,020	-3.70%	2.50%
15	8	1,354,112	1,303,960	-3.70%	2.50%
16	12	2,051,179	1,976,928	-3.62%	2.50%
17	10	1,753,383	1,688,443	-3.70%	2.50%
18	3	507,792	488,985	-3.70%	2.50%
19	0	0	0	N/A	2.50%
20	3	538,349	518,410	-3.70%	2.50%
21	5	857,369	825,615	-3.70%	2.50%
22	3	507,792	488,985	-3.70%	2.50%
23	1	169,264	162,995	-3.70%	2.50%
24	2	371,672	350,819	-5.61%	2.50%
25+	5	879,467	846,895	-3.70%	2.50%
Totals	302	51,185,831	49,666,186	-2.97%	2.50%

Appendix – Detailed Experience Analysis Retirements

2019-2023 Experience (\$000s)

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
60	994	27,718	0	N/A
61	0	48,571	1,214	0.0%
62	3,000	48,160	1,926	155.7%
63	0	45,956	3,677	0.0%
64	3,938	39,672	3,174	124.1%
65	11,345	31,439	7,860	144.3%
66	4,566	26,633	6,126	74.5%
67	6,815	27,238	4,086	166.8%
68	12,371	29,903	5,981	206.9%
69	6,577	16,102	6,441	102.1%
Totals	49,605	341,394	40,483	122.5%

Appendix – Detailed Experience Analysis Retirements

2019-2020 Experience (\$000s)

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
60	0	11,346	0	N/A
61	0	10,899	272	0.0%
62	0	8,359	334	0.0%
63	0	8,437	675	0.0%
64	1,202	8,723	698	172.3%
65	2,107	8,030	2,007	105.0%
66	1,553	9,251	2,128	73.0%
67	2,037	10,149	1,522	133.8%
68	1,483	8,433	1,687	88.0%
69	0	1,437	575	0.0%
Totals	8,383	85,064	9,899	84.7%

2020-2021 Experience (\$000s)

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
60	994	5,503	0	N/A
61	0	17,214	430	0.0%
62	0	12,080	483	0.0%
63	0	9,404	752	0.0%
64	958	9,077	726	131.9%
65	2,112	8,067	2,017	104.7%
66	0	6,566	1,510	0.0%
67	524	7,413	1,112	47.1%
68	4,968	8,715	1,743	285.1%
69	3,542	7,423	2,969	119.3%
Totals	13,098	91,462	11,743	111.5%

Appendix – Detailed Experience Analysis Retirements

2021-2022 Experience (\$000s)

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
60	0	7,064	0	N/A
61	0	9,143	229	0.0%
62	3,000	17,522	701	428.0%
63	0	12,420	994	0.0%
64	1,777	8,493	679	261.6%
65	3,699	8,249	2,062	179.4%
66	3,013	5,999	1,380	218.3%
67	1,138	6,559	984	115.6%
68	3,757	6,961	1,392	269.8%
69	1,825	3,824	1,530	119.3%
Totals	18,208	86,232	9,950	183.0%

2022-2023 Experience (\$000s)

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
60	0	3,806	0	N/A
61	0	11,316	283	0.0%
62	0	10,199	408	0.0%
63	0	15,694	1,256	0.0%
64	0	13,380	1,070	0.0%
65	3,427	7,094	1,773	193.2%
66	0	4,816	1,108	0.0%
67	3,117	3,117	468	666.7%
68	2,163	5,795	1,159	186.6%
69	1,210	3,419	1,367	88.5%
Totals	9,916	78,635	8,892	111.5%

Appendix – Detailed Experience Analysis Terminations

2019-2023 Experience (\$000s)

Year	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected
<35	-	-	-	N/A
35-39	-	3,654	-	N/A
40-44	338	28,601	-	N/A
45-49	-	67,809	-	N/A
50-54	-	123,835	-	N/A
55-59	2,176	165,970	-	N/A
Totals	2,514	389,870	-	N/A

Appendix – Detailed Experience Analysis Terminations

2019-2020 Experience (\$000s)

Year	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected
<35	-	-	-	N/A
35-39	-	1,127	-	N/A
40-44	-	7,568	-	N/A
45-49	-	15,737	-	N/A
50-54	-	33,571	-	N/A
55-59	-	38,497	-	N/A
Totals	-	96,501	-	N/A

2020-2021 Experience (\$000s)

Year	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected
<35	-	-	-	N/A
35-39	-	1,122	-	N/A
40-44	-	7,155	-	N/A
45-49	-	16,449	-	N/A
50-54	-	33,363	-	N/A
55-59	825	41,376	-	N/A
Totals	825	99,465	-	N/A

Appendix – Detailed Experience Analysis Terminations

2021-2022 Experience (\$000s)

Year	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected
<35	-	-	-	N/A
35-39	-	886	-	N/A
40-44	338	5,874	-	N/A
45-49	-	17,723	-	N/A
50-54	-	27,583	-	N/A
55-59	-	42,010	-	N/A
Totals	338	94,076	-	N/A

2022-2023 Experience (\$000s)

Year	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected
<35	-	-	-	N/A
35-39	-	519	-	N/A
40-44	-	8,004	-	N/A
45-49	-	17,900	-	N/A
50-54	-	29,318	-	N/A
55-59	1,351	44,087	-	N/A
Totals	1,351	99,828	-	N/A

Appendix – Detailed Experience Analysis Disability Retirements

2019-2023 Experience					
Age Group	Actual Disabilities	Exposure	Expected Disabilities	Actual/Expected	
Under 20	-	-	-	N/A	
20-24	-	-	-	N/A	
25-29	-	-	-	N/A	
30-34	-	-	-	N/A	
35-39	-	13	0.0	0.0%	
40-44	-	86	0.0	0.0%	
45-49	-	166	0.0	0.0%	
50-54	-	250	0.1	0.0%	
55+	1	586	1.1	93.3%	
Totals	1	1,101	1.3	78.5%	

Appendix – Detailed Experience Analysis Disability Retirements

2019-2020 Experience

Age Group	Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected
Under 20	-	-	-	N/A
20-24	-	-	-	N/A
25-29	-	-	-	N/A
30-34	-	-	-	N/A
35-39	-	4	0.0	0.0%
40-44	-	22	0.0	0.0%
45-49	-	38	0.0	0.0%
50-54	-	67	0.0	0.0%
55+	-	133	0.2	0.0%
Totals	-	264	0.3	0.0%

2020-2021 Experience

Age Group	Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected
Under 20	-	-	-	N/A
20-24	-	-	-	N/A
25-29	-	-	-	N/A
30-34	-	-	-	N/A
35-39	-	4	0.0	0.0%
40-44	-	21	0.0	0.0%
45-49	-	39	0.0	0.0%
50-54	-	66	0.0	0.0%
55+	1	143	0.3	385.6%
Totals	1	273	0.3	320.6%

Appendix – Detailed Experience Analysis Disability Retirements

2021-2022 Experience

Age Group	Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected
Under 20	-	-	-	N/A
20-24	-	-	-	N/A
25-29	-	-	-	N/A
30-34	-	-	-	N/A
35-39	-	3	0.0	0.0%
40-44	-	18	0.0	0.0%
45-49	-	44	0.0	0.0%
50-54	-	57	0.0	0.0%
55+	-	154	0.3	0.0%
Totals	-	276	0.3	0.0%

2022-2023 Experience

Age Group	Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected
Under 20	-	-	-	N/A
20-24	-	-	-	N/A
25-29	-	-	-	N/A
30-34	-	-	-	N/A
35-39	-	2	0.0	0.0%
40-44	-	25	0.0	0.0%
45-49	-	45	0.0	0.0%
50-54	-	60	0.0	0.0%
55+	-	156	0.3	0.0%
Totals	-	288	0.3	0.0%

Appendix – Detailed Experience Analysis Post-Retirement Mortality

2019-2023 Experience (\$000s)

Age Group	Males				Age Group	Females			
	Actual Deaths	Exposure	Expected Deaths	Actual/Expected		Actual Deaths	Exposure	Expected Deaths	Actual/Expected
50-54	-	-	-	N/A	50-54	-	-	-	N/A
55-59	-	-	-	N/A	55-59	-	25	0	0.0%
60-64	-	288	2	0.0%	60-64	-	612	3	0.0%
65-69	151	9,470	109	139.1%	65-69	-	5,297	39	0.0%
70-74	490	22,451	401	122.2%	70-74	89	7,334	92	97.2%
75-79	403	15,466	464	86.9%	75-79	-	5,229	104	0.0%
80-84	211	9,303	496	42.5%	80-84	45	907	36	125.3%
85-89	426	3,723	378	112.7%	85-89	212	954	72	296.0%
90-94	654	4,349	709	92.2%	90-94	145	583	71	205.6%
95-99	170	771	178	95.6%	95-99	25	49	9	273.8%
100+	-	-	-	N/A	100+	-	-	-	N/A
Totals	2,505	65,821	2,737	91.5%	Totals	516	20,990	425	121.3%

Appendix – Detailed Experience Analysis Post-Retirement Mortality

2019-2020 Experience (\$000s)

Age Group	Males				Age Group	Females			
	Actual Deaths	Exposure	Expected Deaths	Actual/Expected		Actual Deaths	Exposure	Expected Deaths	Actual/Expected
50-54	-	-	-	N/A	50-54	-	-	-	N/A
55-59	-	-	-	N/A	55-59	-	25	0	0.0%
60-64	-	55	0	0.0%	60-64	-	192	1	0.0%
65-69	91	2,793	32	285.1%	65-69	-	1,001	7	0.0%
70-74	246	5,855	104	237.1%	70-74	-	2,138	27	0.0%
75-79	130	3,265	102	127.9%	75-79	-	558	11	0.0%
80-84	-	1,792	96	0.0%	80-84	-	200	8	0.0%
85-89	127	1,243	135	93.9%	85-89	-	248	19	0.0%
90-94	173	921	150	115.1%	90-94	-	116	14	0.0%
95-99	66	140	31	210.0%	95-99	-	-	-	N/A
100+	-	-	-	N/A	100+	-	-	-	N/A
Totals	833	16,064	650	128.1%	Totals	-	4,478	88	0.0%

2020-2021 Experience (\$000s)

Age Group	Males				Age Group	Females			
	Actual Deaths	Exposure	Expected Deaths	Actual/Expected		Actual Deaths	Exposure	Expected Deaths	Actual/Expected
50-54	-	-	-	N/A	50-54	-	-	-	N/A
55-59	-	-	-	N/A	55-59	-	-	-	N/A
60-64	-	64	1	0.0%	60-64	-	135	1	0.0%
65-69	60	2,282	26	230.7%	65-69	-	1,338	10	0.0%
70-74	-	5,783	103	0.0%	70-74	-	1,773	23	0.0%
75-79	106	3,823	119	89.0%	75-79	-	1,155	23	0.0%
80-84	171	1,924	103	165.3%	80-84	-	143	6	0.0%
85-89	101	909	93	108.2%	85-89	-	263	20	0.0%
90-94	380	1,269	203	187.6%	90-94	94	167	21	450.9%
95-99	-	75	19	0.0%	95-99	-	-	-	N/A
100+	-	-	-	N/A	100+	-	-	-	N/A
Totals	818	16,129	667	122.7%	Totals	94	4,974	103	91.1%



Appendix – Detailed Experience Analysis Post-Retirement Mortality

2021-2022 Experience (\$000s)

Age Group	Males				Age Group	Females			
	Actual Deaths	Exposure	Expected Deaths	Actual/Expected		Actual Deaths	Exposure	Expected Deaths	Actual/Expected
50-54	-	-	-	N/A	50-54	-	-	-	N/A
55-59	-	-	-	N/A	55-59	-	-	-	N/A
60-64	-	-	-	N/A	60-64	-	36	0	0.0%
65-69	-	2,085	24	0.0%	65-69	-	1,607	12	0.0%
70-74	244	5,718	103	236.4%	70-74	-	1,605	21	0.0%
75-79	167	3,808	111	149.9%	75-79	-	1,451	28	0.0%
80-84	-	2,576	133	0.0%	80-84	-	331	13	0.0%
85-89	55	869	83	65.9%	85-89	-	169	12	0.0%
90-94	-	1,159	196	0.0%	90-94	-	149	17	0.0%
95-99	-	76	20	0.0%	95-99	-	24	4	0.0%
100+	-	-	-	N/A	100+	-	-	-	N/A
Totals	466	16,291	671	69.5%	Totals	-	5,372	107	0.0%

2022-2023 Experience (\$000s)

Age Group	Males				Age Group	Females			
	Actual Deaths	Exposure	Expected Deaths	Actual/Expected		Actual Deaths	Exposure	Expected Deaths	Actual/Expected
50-54	-	-	-	N/A	50-54	-	-	-	N/A
55-59	-	-	-	N/A	55-59	-	-	-	N/A
60-64	-	169	1	0.0%	60-64	-	249	1	0.0%
65-69	-	2,310	27	0.0%	65-69	-	1,351	10	0.0%
70-74	-	5,095	91	0.0%	70-74	89	1,818	21	426.1%
75-79	-	4,570	131	0.0%	75-79	-	2,065	42	0.0%
80-84	40	3,011	164	24.4%	80-84	45	233	9	522.6%
85-89	143	702	66	216.3%	85-89	212	274	20	1061.2%
90-94	101	1,000	161	62.9%	90-94	51	151	19	268.5%
95-99	104	480	107	97.0%	95-99	25	25	5	515.8%
100+	-	-	-	N/A	100+	-	-	-	N/A
Totals	388	17,337	749	51.8%	Totals	422	6,166	127	333.4%

Appendix – Detailed Experience Analysis Pre-Retirement Mortality

2019-2023 Experience (\$000s)

Age Group	Males				Age Group	Females			
	Actual Deaths	Exposure	Expected Deaths	Actual/Expected		Actual Deaths	Exposure	Expected Deaths	Actual/Expected
Under 20	-	-	-	N/A	Under 20	-	-	-	N/A
20-24	-	-	-	N/A	20-24	-	-	-	N/A
25-29	-	-	-	N/A	25-29	-	-	-	N/A
30-34	-	-	-	N/A	30-34	-	-	-	N/A
35-39	-	235	0	0.0%	35-39	-	3,419	1	0.0%
40-44	-	6,636	6	0.0%	40-44	-	21,964	11	0.0%
45-49	-	28,443	33	0.0%	45-49	-	39,364	25	0.0%
50-54	-	48,717	82	0.0%	50-54	-	75,118	75	0.0%
55-59	-	80,321	213	0.0%	55-59	-	85,651	129	0.0%
60-64	-	127,185	487	0.0%	60-64	959	104,475	240	400.3%
Totals	-	291,537	822	0.0%	Totals	959	329,991	481	199.4%

Appendix – Detailed Experience Analysis Pre-Retirement Mortality

2019-2020 Experience (\$000s)

Age Group	Males				Age Group	Females			
	Actual Deaths	Exposure	Expected Deaths	Actual/Expected		Actual Deaths	Exposure	Expected Deaths	Actual/Expected
Under 20	-	-	-	N/A	Under 20	-	-	-	N/A
20-24	-	-	-	N/A	20-24	-	-	-	N/A
25-29	-	-	-	N/A	25-29	-	-	-	N/A
30-34	-	-	-	N/A	30-34	-	-	-	N/A
35-39	-	-	-	N/A	35-39	-	1,126	0	0.0%
40-44	-	2,366	2	0.0%	40-44	-	5,201	2	0.0%
45-49	-	5,865	7	0.0%	45-49	-	9,872	6	0.0%
50-54	-	12,351	21	0.0%	50-54	-	21,220	22	0.0%
55-59	-	22,116	59	0.0%	55-59	-	16,383	26	0.0%
60-64	-	29,251	110	0.0%	60-64	-	24,322	55	0.0%
Totals	-	71,949	199	0.0%	Totals	-	78,124	112	0.0%

2020-2021 Experience (\$000s)

Age Group	Males				Age Group	Females			
	Actual Deaths	Exposure	Expected Deaths	Actual/Expected		Actual Deaths	Exposure	Expected Deaths	Actual/Expected
Under 20	-	-	-	N/A	Under 20	-	-	-	N/A
20-24	-	-	-	N/A	20-24	-	-	-	N/A
25-29	-	-	-	N/A	25-29	-	-	-	N/A
30-34	-	-	-	N/A	30-34	-	-	-	N/A
35-39	-	-	-	N/A	35-39	-	1,123	0	0.0%
40-44	-	1,664	2	0.0%	40-44	-	5,490	3	0.0%
45-49	-	7,318	8	0.0%	45-49	-	9,132	6	0.0%
50-54	-	13,469	23	0.0%	50-54	-	19,893	20	0.0%
55-59	-	21,642	58	0.0%	55-59	-	19,734	30	0.0%
60-64	-	32,316	125	0.0%	60-64	-	26,017	58	0.0%
Totals	-	76,409	216	0.0%	Totals	-	81,389	117	0.0%

Appendix – Detailed Experience Analysis Pre-Retirement Mortality

2021-2022 Experience (\$000s)

Age Group	Males				Age Group	Females			
	Actual Deaths	Exposure	Expected Deaths	Actual/Expected		Actual Deaths	Exposure	Expected Deaths	Actual/Expected
Under 20	-	-	-	N/A	Under 20	-	-	-	N/A
20-24	-	-	-	N/A	20-24	-	-	-	N/A
25-29	-	-	-	N/A	25-29	-	-	-	N/A
30-34	-	-	-	N/A	30-34	-	-	-	N/A
35-39	-	-	-	N/A	35-39	-	886	0	0.0%
40-44	-	650	1	0.0%	40-44	-	5,225	3	0.0%
45-49	-	8,537	10	0.0%	45-49	-	9,184	6	0.0%
50-54	-	10,684	18	0.0%	50-54	-	16,901	17	0.0%
55-59	-	19,480	52	0.0%	55-59	-	22,530	33	0.0%
60-64	-	30,876	118	0.0%	60-64	-	28,245	65	0.0%
Totals	-	70,227	199	0.0%	Totals	-	82,971	123	0.0%

2022-2023 Experience (\$000s)

Age Group	Males				Age Group	Females			
	Actual Deaths	Exposure	Expected Deaths	Actual/Expected		Actual Deaths	Exposure	Expected Deaths	Actual/Expected
Under 20	-	-	-	N/A	Under 20	-	-	-	N/A
20-24	-	-	-	N/A	20-24	-	-	-	N/A
25-29	-	-	-	N/A	25-29	-	-	-	N/A
30-34	-	-	-	N/A	30-34	-	-	-	N/A
35-39	-	235	0	0.0%	35-39	-	284	0	0.0%
40-44	-	1,956	2	0.0%	40-44	-	6,048	3	0.0%
45-49	-	6,723	8	0.0%	45-49	-	11,176	7	0.0%
50-54	-	12,213	20	0.0%	50-54	-	17,104	17	0.0%
55-59	-	17,083	44	0.0%	55-59	-	27,004	40	0.0%
60-64	-	34,742	134	0.0%	60-64	959	25,891	61	1566.6%
Totals	-	72,952	208	0.0%	Totals	959	87,507	128	746.9%

Appendix – Detailed Experience Analysis Disabled Mortality

2019-2023 Experience (\$000s)

Age Group	Males				Age Group	Females			
	Actual Deaths	Exposure	Expected Deaths	Actual/Expected		Actual Deaths	Exposure	Expected Deaths	Actual/Expected
40-44	-	-	-	N/A	40-44	-	-	-	N/A
45-49	-	-	-	N/A	45-49	-	-	-	N/A
50-54	-	-	-	N/A	50-54	-	-	-	N/A
55-59	-	-	-	N/A	55-59	-	-	-	N/A
60-64	-	-	-	N/A	60-64	-	-	-	N/A
65-69	-	103	3	0.0%	65-69	-	-	-	N/A
70-74	-	238	8	0.0%	70-74	-	159	4	0.0%
75-79	-	874	38	0.0%	75-79	-	356	11	0.0%
80-84	170	1,072	62	272.6%	80-84	-	66	3	0.0%
85-89	100	1,597	135	74.3%	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	270	3,884	246	109.6%	Totals	-	581	18	0.0%

Appendix – Detailed Experience Analysis Disabled Mortality

2019-2020 Experience (\$000s)

Age Group	Males				Age Group	Females			
	Actual Deaths	Exposure	Expected Deaths	Actual/Expected		Actual Deaths	Exposure	Expected Deaths	Actual/Expected
40-44	-	-	-	N/A	40-44	-	-	-	N/A
45-49	-	-	-	N/A	45-49	-	-	-	N/A
50-54	-	-	-	N/A	50-54	-	-	-	N/A
55-59	-	-	-	N/A	55-59	-	-	-	N/A
60-64	-	-	-	N/A	60-64	-	-	-	N/A
65-69	-	-	-	N/A	65-69	-	-	-	N/A
70-74	-	58	2	0.0%	70-74	-	52	1	0.0%
75-79	-	312	13	0.0%	75-79	-	89	3	0.0%
80-84	-	258	15	0.0%	80-84	-	-	-	N/A
85-89	-	334	26	0.0%	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	-	962	56	0.0%	Totals	-	141	4	0.0%

2020-2021 Experience (\$000s)

Age Group	Males				Age Group	Females			
	Actual Deaths	Exposure	Expected Deaths	Actual/Expected		Actual Deaths	Exposure	Expected Deaths	Actual/Expected
40-44	-	-	-	N/A	40-44	-	-	-	N/A
45-49	-	-	-	N/A	45-49	-	-	-	N/A
50-54	-	-	-	N/A	50-54	-	-	-	N/A
55-59	-	-	-	N/A	55-59	-	-	-	N/A
60-64	-	-	-	N/A	60-64	-	-	-	N/A
65-69	-	-	-	N/A	65-69	-	-	-	N/A
70-74	-	59	2	0.0%	70-74	-	53	1	0.0%
75-79	-	248	11	0.0%	75-79	-	92	3	0.0%
80-84	-	331	20	0.0%	80-84	-	-	-	N/A
85-89	45	341	29	157.3%	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	45	979	61	73.3%	Totals	-	145	4	0.0%

Appendix – Detailed Experience Analysis Disabled Mortality

2021-2022 Experience (\$000s)

Age Group	Males				Age Group	Females			
	Actual Deaths	Exposure	Expected Deaths	Actual/Expected		Actual Deaths	Exposure	Expected Deaths	Actual/Expected
40-44	-	-	-	N/A	40-44	-	-	-	N/A
45-49	-	-	-	N/A	45-49	-	-	-	N/A
50-54	-	-	-	N/A	50-54	-	-	-	N/A
55-59	-	-	-	N/A	55-59	-	-	-	N/A
60-64	-	-	-	N/A	60-64	-	-	-	N/A
65-69	-	103	3	0.0%	65-69	-	-	-	N/A
70-74	-	60	2	0.0%	70-74	-	54	1	0.0%
75-79	-	156	7	0.0%	75-79	-	93	3	0.0%
80-84	72	313	18	402.1%	80-84	-	-	-	N/A
85-89	-	420	36	0.0%	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	72	1,052	65	110.1%	Totals	-	147	5	0.0%

2022-2023 Experience (\$000s)

Age Group	Males				Age Group	Females			
	Actual Deaths	Exposure	Expected Deaths	Actual/Expected		Actual Deaths	Exposure	Expected Deaths	Actual/Expected
40-44	-	-	-	N/A	40-44	-	-	-	N/A
45-49	-	-	-	N/A	45-49	-	-	-	N/A
50-54	-	-	-	N/A	50-54	-	-	-	N/A
55-59	-	-	-	N/A	55-59	-	-	-	N/A
60-64	-	-	-	N/A	60-64	-	-	-	N/A
65-69	-	-	-	N/A	65-69	-	-	-	N/A
70-74	-	61	2	0.0%	70-74	-	-	-	N/A
75-79	-	158	7	0.0%	75-79	-	82	2	0.0%
80-84	98	170	9	1058.7%	80-84	-	66	3	0.0%
85-89	55	502	44	124.1%	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	153	891	63	242.7%	Totals	-	148	5	0.0%