

Public Employees' Retirement Board
May 14, 2026

Topic: Adoption of 2026 Experience Study Assumptions and Methods

Staff Recommendation: Staff recommends that the Board approve and adopt the economic, demographic, and actuarial method assumptions recommended in the 2026 Actuarial Experience Study for all MPERA systems, as summarized in Sections A–G below, effective with the June 30, 2026 actuarial valuations.

Board Motion:

I move that the Board uphold the staff recommendation.

Or

I move that the Board deny the staff recommendation.

Moved by

Seconded by

Section A – Economic Assumptions (All Systems)

The Board’s actuary has recommended updating certain economic assumptions based on the 2026 actuarial experience study.

Key Economic Assumptions:

All Systems		
Assumption	Current	Proposed
Price Inflation	2.75%	2.75%
Investment Return	7.30%	7.30%
Real Wage Growth	0.75%	1.00%
General Wage Growth	3.50%	3.75%

Payroll Growth By System:

System	Payroll Growth (Current)	Payroll Growth (Proposed)
JRS	3.25%	2.25%
HPORS	3.25%	3.00%
All Other Systems	3.25%	3.25%

Section B – Mortality Assumptions

The experience study recommends updating mortality tables for PERS, JRS and the public safety systems to more current PUB-2016 base tables with generational MP-2021 improvements.

PERS and JRS mortality assumptions:

PERS and JRS		
Group	Current Assumption	Proposed Assumption
Active Members	PUB-2010 General Amount-Weighted Employee Mortality, projected to 2021 for males and females; generational MP-2021.	PUB-2016 General Amount-Weighted Employee Mortality; generational MP-2021.
Disabled Members	PUB-2010 General Amount-Weighted Disabled Retiree Mortality, ages set forward 1 year for males and females.	PUB-2016 General Amount-Weighted Disabled Retiree Mortality, ages set forward 1 year for males and females.
Contingent Survivors	PUB-2010 General Amount-Weighted Contingent Survivor Mortality, projected to 2021, ages set forward 1 year; generational MP-2021.	PUB-2016 General Amount-Weighted Contingent Survivor Mortality, ages set forward 1 year; generational MP-2021.
Retired Healthy Members	PUB-2010 General Amount-Weighted Healthy Retiree Mortality, projected to 2021, ages set forward 1 year; 104% (males), 103% (females); generational MP-2021.	PUB-2016 General Amount-Weighted Healthy Retiree Mortality, with ages set forward 1 year and further adjusted 104% (males), 103% (females) in PERS only; in JRS, ages are set forward 1 year for males with no additional adjustments; generational MP-2021.

Public safety system mortality assumptions (SRS, GWPORS, HPORS, MPORS, FURS, VFCA):

SRS, GWPORS, HPORS, MPORS, FURS, and VFCA		
Group	Current Assumption	Proposed Assumption
Active Members	PUB-2010 Public Safety Amount-Weighted Employee Mortality for males and females; generational MP-2021.	PUB-2016 Public Safety Amount-Weighted Employee Mortality for males and females; generational MP-2021.
Disabled Members	PUB-2010 Public Safety Amount-Weighted Disabled Retiree Mortality, ages set forward 1 year for males; generational MP-2021.	PUB-2016 Public Safety Amount-Weighted Disabled Retiree Mortality, ages set forward 2 years for males.
Contingent Survivors	PUB-2010 Public Safety Amount-Weighted Contingent Survivor Mortality, ages set forward 1 year for males; generational MP-2021.	PUB-2016 Public Safety Amount-Weighted Contingent Survivor Mortality, ages set forward 2 years for males; generational MP-2021.
Retired Healthy Members	PUB-2010 Safety Amount-Weighted Healthy Retiree Mortality, ages set forward 1 year; 105% (males), 100% (females); generational MP-2021.	PUB-2016 Public Safety Amount-Weighted Healthy Retiree Mortality, ages set forward 2 years for males; generational MP-2021.

Section C – Withdrawal and Disability Assumptions

The experience study recommends revised termination (withdrawal) and disability rates by system based on observed experience over the last five years, and assumes no terminations, other than for retirement, death or disability for JRS.

PERS withdrawal assumptions:

Withdrawal Rates Per 1,000 Members By Service										
SERVICE										
0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11
350	270	180	140	110	110	100	90	80	70	65
11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20+	
60	55	50	50	45	40	35	30	28	25	

SRS withdrawal assumptions:

Withdrawal Rates Per 1,000 Members By Service											
SERVICE											
0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-10	10-13	13-15	15+
260	230	200	180	150	130	110	100	90	80	70	45

GWORS withdrawal assumptions:

Withdrawal Rates Per 1,000 Members By Service								
SERVICE								
0-1	1-2	2-3	3-4	4-5	5-8	8-12	12-17	17+
300	250	180	150	130	100	80	50	30

HPORS withdrawal assumptions:

Withdrawal Rates Per 1,000 Members By Service				
SERVICE				
0-1	1-4	4-10	10-15	15+
120	75	55	30	10

MPORS withdrawal assumptions:

Withdrawal Rates Per 1,000 Members By Service							
SERVICE							
0-1	1-2	2-3	3-4	4-8	8-11	11-15	15+
160	130	100	80	70	50	30	20

Section C – (Cont’d) Withdrawal and Disability Assumptions

The experience study recommends revised termination (withdrawal) and disability rates by system based on observed experience over the last five years, and assumes no terminations, other than for retirement, death or disability for JRS.

FURS withdrawal assumptions:

Withdrawal Rates Per 1,000 Members By Service								
SERVICE								
0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-15	15+
80	100	60	50	45	40	30	20	15

VFCA withdrawal assumptions:

Withdrawal Rates Per 1,000 Members By Service					
SERVICE					
0-8	8-9	9-10	10-14	14-26	26 & Over
230	200	170	150	130	100

PERS and JRS disability rate assumptions:

Disability Rates Per 1,000 Members By Age									
AGE									
22	27	32	37	42	47	52	57	60	62
0.00	0.04	0.04	0.04	0.16	0.40	0.71	1.00	1.44	0.00

Public safety system disability rate assumptions (SRS, GWPORS, HPORS, MPORS, FURS, VFCA):

Disability Rates Per 1,000 Members By Age									
AGE									
22	27	32	37	42	47	52	57	62	
0.00	1.1	1.1	1.1	3.7	3.7	3.7	3.6	0.00	

Section D – Salary Increase Assumptions

The experience study recommends revised salary increase rates (merit and longevity) by age and/or service for each system based on observed experience over the last five years.

PERS:

Assumed Salary Increases (Merit & Longevity Rates Plus 3.75% General Wage Growth)										
SERVICE										
	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-15	16+
Merit & Longevity	6.25%	4.75%	3.75%	3.25%	2.75%	2.25%	1.75%	1.25%	0.75%	0.25%
Total Increase	10.0%	8.50%	7.50%	7.00%	6.50%	6.00%	5.50%	5.00%	4.50%	4.00%

JRS:

Assumed Salary Increases (3.75% General Wage Growth Only)	
	All Ages and Years of Service
Merit & Longevity	N/A
Total Increase	3.75

Public safety system salary increase assumptions (SRS, GWPORS, HPORS, MPORS, FURS):

Assumed Salary Increases (Merit & Longevity Rates Plus 3.75% General Wage Growth)									
SERVICE									
	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9
Merit & Longevity	10.25	5.25	4.25	3.25	3.00	2.75	2.50	2.25	2.15
Total Increase	14.00	9.00	8.00	7.00	6.75	6.50	6.25	6.00	5.90
	9-10	10-11	11-12	12-13	13-14	14-15	15-16	17	17+
Merit & Longevity	2.05	1.95	1.85	1.75	1.65	1.55	1.45	1.35	1.25
Total Increase	5.80	5.70	5.60	5.50	5.40	5.30	5.20	5.10	5.00

Section E – Retirement Rate Assumptions

The experience study recommends revised retirement rates by age and/or service for each system based on observed experience over the last five years.

PERS:

Retirement Rates Per 1,000 Members By Age and Service									
Service	AGE								
	<50	50-54	55	56	57	58	59	60	61
< 30 Years	0	45	45	55	60	60	60	70	93
30+ Years / 60 w/ 25 Years	100	180	200	200	200	200	200	200	200
Service	62	63	64	65	66	67	68	69	70+
< 30 Years	93	150	150	150	300	300	350	270	1,000
30+ Years / 60 w/ 25 Years	200	200	200	420	380	350	350	250	1,000

SRS:

Retirement Rates Per 1,000 Members By Age and Service	
Service	Under Age 65
< 20 years	0
20 years	410
21+ years	210
Service	Age 65+
< 20 years	0
20 years	410
21+ years	210

HPORS:

Retirement Rates Per 1,000 Members By Age and Service	
Service	Under Age 60
< 20 years	0
20-22 years	500
23+ years	400
Service	Age 60+
< 20 years	1,000
20-22 years	1,000
23+ years	1,000

FURS:

Retirement Rates Per 1,000 Members By Age and Service	
Service	Under Age 65
< 20 years	0
20 years	160
21-25 years	130
25+ years	240
Service	Age 65+
< 20 years	1,000
20 years	1,000
21+ years	1,000
25+ years	1,000

MPORS:

Retirement Rates Per 1,000 Members By Age and Service	
Service	Under Age 65
< 20 years	0
20 years	550
21-24 years	320
25 years	450
26+	190
Service	Age 65+
< 20 years	1,000
20 years	1,000
21-24 years	1,000
25 years	1,000
26+	1,000

Section E – (Cont’d) Retirement Rate Assumptions

The experience study recommends revised retirement rates by age and/or service for each system based on observed experience over the last five years.

GWPORS:

Retirement Rates Per 1,000 Members By Age and Service	
Service	Under Age 65
< 20 years	0
20 years	370
21 years	330
22 years	270
23+	250
Service	Age 65+
< 20 years	1,000
20 years	1,000
21 years	1,000
22 years	1,000
23+	1,000

VFCA:

Retirement Rates Per 1,000 Members By Age and Service	
AGE	10-19 Years of Service
< 55	0
55-56	0
57-60	0
60-69	200
70+	1,000
AGE	20+ Years of Service
< 55	0
55-56	320
57-60	250
60-69	250
70+	1,000

JRS:

Assumed Retirement Rates Per 1,000 Members By Service						
AGE						
60	61	62	63	64	65-69	70+
100	100	100	100	100	200	100

Section F – Election of a Deferred Benefit or Refund

The experience study recommends maintaining the same election of a deferred benefit or refund assumption for all systems based on observed experience over the last five years.

Current Assumption: Members will select the most valuable option (refund or deferred benefit)

Section G – Actuarial Methods

The experience study recommends maintaining the same actuarial methods to value each system based on observed experience over the last five years.

Actuarial Cost Method: Entry Age Normal

Asset Valuation Method: Four-year smoothed market

Amortization of UAAL: Level percent of payroll over the amortization period as a single base

MONTANA PUBLIC EMPLOYEE RETIREMENT ADMINISTRATION



**Experience Study for
the Five-Year Period
Ending June 30, 2025**

Prepared April 2026



April 28, 2026

Public Employees' Retirement Board
100 North Park, Suite 200
Melena, MT 59620-0139

Dear Members of the Board:

It is a pleasure to submit this report of our investigation of the experience of the Montana Public Employee Retirement Administration (MPERA) for the five-year period ending June 30, 2025. The study was based on the data submitted by MPERA for the annual valuations. In preparing this report we relied, without audit, on the data provided.

The purpose of this report is to present the results of our review of the actuarial methods and assumptions used in the actuarial valuations of MPERA. With the Board's approval of the recommendations in this report, these assumptions and methods would first be used in the June 30, 2026 actuarial valuation.

We hereby certify that, to the best of our knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices which are consistent with the principles prescribed by the Actuarial Standards Board (ASB) and the Code of Professional Conduct and Qualification Standards for Statements of Actuarial Opinion of the American Academy of Actuaries. We further certify that, in our opinion, the assumptions developed in this report satisfy Actuarial Standards of Practice, in particular, No. 27 (Selection of Assumptions for Measuring Pension Obligations).

The experience studies for each system include all active members, retired members and beneficiaries of deceased members. The mortality experience was studied separately for pre-retirement, post-retirement and disability and also separately for males and females. Incidences of withdrawal, disability, retirement and compensation increases were investigated without regard to gender.

This report shows comparisons between the actual and expected cases of separation from active service, actual and expected number of deaths, and actual and expected salary increases. Tables and graphs are used to show the actual decrement rates, the expected decrement rates and, where applicable, the proposed decrement rates.

The newly proposed rates of decrement for all nine systems are shown in Appendix D of this report. In the actuary's professional judgment, the recommended rates are suitable for use until further experience indicates that modifications are needed.



Actuarial assumptions are used to measure and budget future costs. Changing assumptions will not change the actual cost of future benefits. Once the assumptions have been adopted, the actuarial valuation measures the adequacy of the contributions rates set in Montana State Law.

The impact of the COVID-19 pandemic likely influenced both economic and demographic experience during the study period. When reviewing and analyzing the data, the impact of the COVID-19 pandemic was taken into consideration in developing any recommended assumptions.

In order to prepare the results in this report, we have utilized actuarial models that were developed to measure liabilities and develop actuarial costs. These models include tools that we have produced and tested, along with commercially available valuation software that we have reviewed to confirm the appropriateness and accuracy of the output. In utilizing these models, we develop and use input parameters and assumptions about future contingent events along with recognized actuarial approaches to develop the needed results. Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period); and changes in plan provisions or applicable law.

The experience study was performed by, and under the supervision of, independent actuaries who are members of the American Academy of Actuaries with experience in performing valuations for public retirement systems. The undersigned meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

Respectfully submitted,

Todd B. Green ASA, EA, FCA, MAAA
President

Bryan Hoge, FSA, EA, FCA, MAAA
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TABLE OF CONTENTS

Section	
I.	Summary of Results 1
II.	Economic Assumptions 6
III.	Demographic Assumptions..... 22
	• Rates of Withdrawal..... 24
	• Election of a Deferred Annuity or Refund..... 32
	• Rates of Disability Retirement..... 33
	• Rates of Service Retirement 36
	• Rates of Mortality 48
	• Rates of Salary Increase..... 59
	• Miscellaneous Assumptions..... 63
IV.	Actuarial Methods..... 64
Appendix	
A.	Historical June CPI (U) Index 65
B.	Capital Market Assumptions and Asset Allocation 66
C.	Social Security Administration Wage Index 67
D.	Summary of Recommended Actuarial Assumptions 68



SECTION I – SUMMARY OF RESULTS

This investigation covers the five-year period ending June 30, 2025. The purpose of an actuarial valuation is to provide a timely best estimate of the ultimate costs of a retirement system. Actuarial valuations of the Montana Public Employees Retirement Administration’s nine plans are prepared annually to determine the actuarial recommended contribution, funded status, and amortization periods necessary to achieve a 100% funded status. The valuations require the use of certain assumptions with respect to the occurrence of future events, such as rates of death, termination of employment, retirement age, and salary changes to estimate the obligations of the system.

The basic purpose of an experience study is to determine whether the actuarial assumptions currently in use have adequately anticipated the actual emerging experience. This information, along with the professional judgment of system personnel and advisors, is used to evaluate the appropriateness of continued use of the current actuarial assumptions. When analyzing experience and assumptions, it is important to recognize that actual experience is reported in the short term while assumptions are intended to be long-term estimates of experience. Therefore, actual experience is expected to vary from study period to study period, without necessarily indicating a change in assumptions is needed.

At the request of the Board, Cavanaugh Macdonald Consulting, LLC (CavMac), performed a study of the experience for the five-year period ending June 30, 2025. This report presents the results, analysis, and resulting recommendations of our study. It is anticipated that the changes will first be reflected in the June 30, 2026 actuarial valuations.

These assumptions have been developed in accordance with generally recognized and accepted actuarial principles and practices that are consistent with the applicable Actuarial Standards of Practice adopted by the Actuarial Standards Board (ASB). While the recommended assumptions represent our best estimate of future experience, there are other reasonable assumption sets that could be supported by the results of this experience study. Those other sets of reasonable assumptions could produce liabilities and costs that are either higher or lower.

The impact of the COVID-19 pandemic likely had an effect on both economic and demographic experience during the study period. When reviewing and analyzing the data, the impact of the COVID-19 pandemic was taken into consideration in developing recommended assumptions.

Our Philosophy

Similar to an actuarial valuation, the calculation of actual and expected experience is a fairly mechanical process, and differences between actuaries in this area are generally minor. However, the setting of assumptions differs, as it is more art than science. In this report, we have recommended changes to certain assumptions. To explain our thought process, we offer a brief summary of our philosophy:





SECTION I – SUMMARY OF RESULTS

- **Don't Overreact:** When we see significant changes in experience and deem it credible, we generally do not adjust our rates to reflect the entire difference. We will typically recommend rates somewhere between the old rates and the new experience. If the experience during the next study period shows the same result, we will probably recognize the trend at that point in time or at least move further in the direction of the observed experience. On the other hand, if experience returns closer to its prior level, we will not have overreacted, possibly causing volatility in the actuarial contribution rate.
- **Anticipate Trends:** If there is an identified trend that is expected to continue, we believe that this should be recognized. An example is the retiree mortality assumption. It is an established trend that people are living longer. Therefore, we believe the best estimate of liabilities in the valuation should reflect the expected increase in life expectancy.
- **Simplify:** In general, we attempt to identify which factors are significant and eliminate or ignore the ones that do not materially improve the accuracy of the liability projections.

We analyzed experience for each of the five years individually as well as in aggregate. If any of the experience in certain years appeared to be an outlier, the credibility of that experience was reduced in evaluating the current assumptions and proposing changes. A portion of this study period was during the COVID-19 pandemic. We are aware that the behavior and experiences of the members during this period were likely affected and, therefore, are not necessarily representative of a long-term trend. Our recommendations for changes to the assumptions were influenced by this awareness.

Following are summaries of findings and recommendations regarding assumptions utilized by the MPERA plans. Explanations of the recommendations are found in the sections that follow.

Recommended Economic Assumption Changes

Economic assumptions are some of the most visible and significant assumptions used in the valuation process. The items in the broad economy modeled by these assumptions can be very volatile over short periods of time, as clearly seen in the economic downturn and the rebound that occurred during the COVID-19 pandemic. Our goal is to try to find the emerging long-term trends in the midst of this volatility so that we can then apply reasonable assumptions.





SECTION I – SUMMARY OF RESULTS

The following table summarizes the current and proposed economic assumptions.

Assumption	Current	Proposed
Price Inflation	2.75%	2.75%
Investment Return	7.30%	7.30%
Real Wage Growth	0.75%	1.00%
General Wage Growth	3.50%	3.75%
Payroll Growth *	3.25%	3.25%

*Payroll Growth is proposed to be 3.00% for Highway Patrol Officers' Retirement System and 2.25% for Judges' Retirement System

As the table indicates, we are recommending no change to the price inflation assumption or the investment return assumption. We are recommending an increase in the real wage growth assumption from 0.75% to 1.00% which increases the general wage growth assumption from 3.50% to 3.75% (price inflation plus real wage growth). Finally, we are recommending a decrease in the payroll growth assumption from 3.25% to 3.00% for Highway Patrol Officer's Retirement System and to 2.25% for the Judges' Retirement System.

Recommended Demographic Assumption Changes

The table below lists the recommended demographic assumption changes based on experience during the last five years.

Retirement Plan	Assumption Changes
Public Employees' Retirement System	Mortality, Retirement, Withdrawal, Merit Scale
Public Employees' Retirement System Long-Term Disability Plan	Mortality, Retirement, Withdrawal, Merit Scale
Judges' Retirement System	Mortality
Sheriffs' Retirement System	Mortality, Retirement, Withdrawal, Merit Scale
Game Wardens' and Peace Officers' Retirement System	Mortality, Retirement, Withdrawal, Merit Scale
Highway Patrol Officers' Retirement System	Mortality, Retirement, Withdrawal, Merit Scale
Municipal Police Officers' Retirement System	Mortality, Retirement, Withdrawal, Merit Scale
Firefighters' United Retirement System	Mortality, Retirement, Withdrawal, Merit Scale
Volunteer Firefighters' Compensation Act	Mortality, Retirement, Withdrawal





SECTION I – SUMMARY OF RESULTS

Recommended Method Changes

We are not recommending any changes to the current actuarial methods.

Financial Impact

The financial impact of the suggested assumption changes was estimated by performing additional valuations using the June 30, 2025 valuation. The following tables highlight the impact of the recommended changes noted above on the unfunded actuarial accrued liability (UAAL), funded status, and amortization period for the nine System as of June 30, 2025.

When this set of assumptions is formally used, for the first time, in the June 30, 2026 valuation, we expect the relative impact to be similar to the results shown here. However, the actual impact may vary due to underlying changes that occur between valuation dates. Of particular note is that the comparability may be affected by the actual investment return experience during the year ending June 30, 2026.

Impact of Changes on the Unfunded Actuarial Accrued Liability

Retirement Plan	Before Changes	After Changes	Change
Public Employees' Retirement System	\$2,551,626,554	\$2,625,197,500	\$73,570,946
Public Employees' Retirement System Long-Term Disability Plan	(10,937,715)	(10,918,088)	\$19,627
Judges' Retirement System	(65,471,518)	(65,505,376)	(\$33,858)
Sheriffs' Retirement System	131,511,698	136,083,574	\$4,571,876
Game Wardens' and Peace Officers' Retirement System	31,112,992	35,831,032	\$4,718,040
Highway Patrol Officers' Retirement System	72,357,558	71,696,360	(\$661,198)
Municipal Police Officers' Retirement System	229,982,936	233,351,395	\$3,368,459
Firefighters' United Retirement System	144,839,872	146,274,033	\$1,434,161
Volunteer Firefighters' Compensation Act	(365,884)	(533,050)	(\$167,166)



SECTION I – SUMMARY OF RESULTS



Impact of Changes on the Funding Ratio

Retirement Plan	Before Changes	After Changes	Change
Public Employees' Retirement System	74.48%	73.93%	(0.55)%
Public Employees' Retirement System Long-Term Disability Plan	809.05%	798.89%	(10.16)%
Judges' Retirement System	183.77%	183.85%	0.08%
Sheriffs' Retirement System	81.94%	81.43%	(0.51)%
Game Wardens' and Peace Officers' Retirement System	92.33%	91.27%	(1.06)%
Highway Patrol Officers' Retirement System	76.31%	76.48%	0.17%
Municipal Police Officers' Retirement System	74.60%	74.32%	(0.28)%
Firefighters' United Retirement System	84.18%	84.04%	(0.14)%
Volunteer Firefighters' Compensation Act	100.62%	100.90%	0.28%

Impact of Changes on the Amortization Period

Retirement Plan	Before Changes	After Changes	Change
Public Employees' Retirement System	23	27	4
Public Employees' Retirement System Long-Term Disability Plan	0	0	No Change
Judges' Retirement System	0	0	No Change
Sheriffs' Retirement System	17	20	3
Game Wardens' and Peace Officers' Retirement System	16	22	6
Highway Patrol Officers' Retirement System	22	25	3
Municipal Police Officers' Retirement System	18	23	5
Firefighters' United Retirement System	8	8	No Change
Volunteer Firefighters' Compensation Act	0	0	No Change





SECTION II – ECONOMIC ASSUMPTIONS

The economic assumptions used in the MPERA valuations include price inflation, long-term investment return, general wage growth (the across-the-board portion of salary increases), and payroll growth. Unlike demographic assumptions, economic assumptions do not lend themselves to analysis based heavily upon internal historical patterns, because they are influenced more by external forces which are difficult to accurately predict over the long term. The investment return and salary increase assumptions are generally selected on the basis of expectations in an inflation-free environment and then increased by the long-term expectation for price inflation, called the “building block” approach.

ACTUARIAL STANDARD OF PRACTICE NUMBER 27

Guidance regarding the selection of economic assumptions for measuring pension obligations is provided by Actuarial Standard of Practice (ASOP) No. 27, *Selection of Assumptions for Measuring Pension Obligations*. Because no one knows what the future holds, the best an actuary can do is to use professional judgment to estimate possible future economic outcomes. These estimates are based on a mixture of past experience, future expectations, and professional judgment.

ASOP 27 requires the actuary to select a “reasonable” assumption. For this purpose, an assumption is reasonable if it has the following characteristics:

- a. it is appropriate for the purpose of the measurement;
- b. it reflects the actuary’s professional judgement;
- c. it takes into account historical and current economic data that is relevant as of the measurement date;
- d. it reflects the actuary’s estimate of future experience, the actuary’s observation of the estimates inherent in market data, or a combination thereof; and
- e. it has no significant bias (i.e., it is neither significantly optimistic nor pessimistic) except when provisions for adverse deviation or plan provisions that are difficult to measure are included.

With respect to relevant data, the standard recommends the actuary review appropriate recent and long-term historical economic data but advises the actuary not to give undue weight to recent experience. Furthermore, it advises the actuary to consider that some historical economic data may not be appropriate for use in developing assumptions for future periods due to changes in the underlying environment. In addition, with respect to any particular valuation, each economic assumption should be consistent with all other economic assumptions over the measurement period.

ASOP 27 recognizes that economic data and analyses are available from a variety of sources, including investment advisors, economists, and other professionals. The actuary is permitted to incorporate the views of experts, but the selection or advice must reflect the actuary’s professional judgment.





SECTION II – ECONOMIC ASSUMPTIONS

The standard also notes that “the actuary should also recognize that different actuaries will apply professional judgment and may choose different reasonable assumptions.” As a result, a range of reasonable assumptions may develop both for an individual actuary and across actuarial practice. For this study, we have selected a single set of recommended economic assumptions, but there are other sets of economic assumption that would also be reasonable.

The remainder of this section of the report will address the relevant types of economic assumptions used in the actuarial valuation to determine the obligations of MPERA. In our opinion, the economic assumptions proposed in this report have been developed in accordance with ASOP No. 27.

The following table summarizes the current and proposed economic assumptions:

Assumption	Current	Proposed
Price Inflation	2.75%	2.75%
Investment Return	7.30%	7.30%
Real Wage Growth	0.75%	1.00%
General Wage Growth	3.50%	3.75%
Payroll Growth *	3.25%	3.25%

*Payroll Growth is proposed to be 3.00% for Highway Patrol Officers’ Retirement System and 2.25% for Judges’ Retirement System





SECTION II – ECONOMIC ASSUMPTIONS

Price Inflation

Background: Price inflation is typically measured by the annual increase in the Consumer Price Index (CPI). This assumption underlies most of the other economic assumptions, either directly or indirectly. The current assumption for price inflation is 2.75% per year.

Future price inflation is used directly in developing the actuarial assumption for cost-of-living increases since they are based on the change in the Consumer Price Index (CPI). Inflation is used indirectly in the development of the assumptions for investment return and general wage increase, which also impacts individual salary increases and payroll growth. Under ASOP 27, the price inflation assumption must be consistent among all economic assumptions.

Past Experience: The Consumer Price Index, US City Average, All Urban Consumers, CPI (U), has been used as the basis for reviewing historical levels of price inflation. The level of that index in June of each of the last 50 years is provided in Appendix A.

In analyzing this data, average rates of inflation have been determined by measuring the compound growth rate of the CPI (U) over various time periods ending June 30th. The results are as follows:

Period	Number of Years	Annualized Rate of Inflation	Annual Standard Deviation
1926 – 2025	99	2.96%	4.00%
1965 – 2025	60	3.95%	2.88%
1975 – 2025	50	3.65%	2.833%
1985 – 2025	40	2.78%	1.74%
1995 – 2025	30	2.53%	1.86%
2005 – 2025	20	2.56%	2.23%
2015 – 2025	10	3.06%	2.49%
2020 - 2025	5	4.58%	2.72%

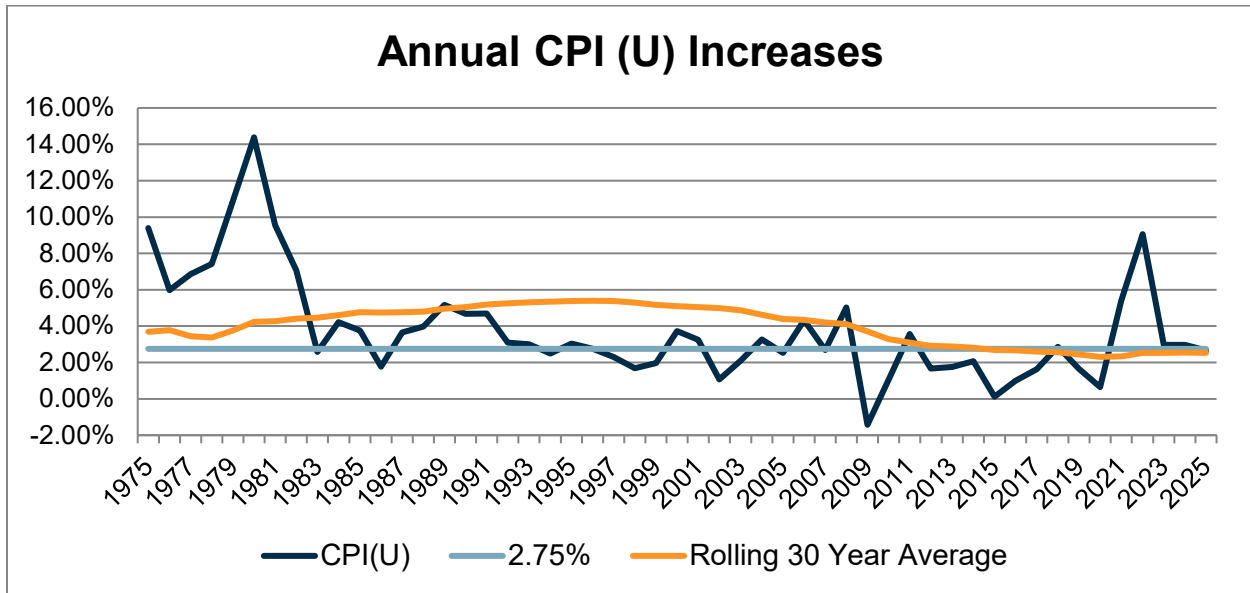
Over the last 30 years, the average annual rate of increase in the CPI-U has been just over 2.50%. The average annual rate of increase has been higher over the more recent past, being 3.06% over the last 10 years and 4.58% over the past 5 years. We should add that since 1926, the average annual rate of inflation was 2.96%.





SECTION II – ECONOMIC ASSUMPTIONS

The following graph illustrates the historical annual change in price inflation, measured as of June 30 for each of the last 50 years, the current 2.75% assumption, as well as the 30-year rolling average.



Additional information to consider is obtained from measuring the spread on inflation protected treasury bills (TIPS) and from the prevailing economic forecasts. The spread between the nominal yield on treasury securities and the inflation indexed nominal yield on TIPS of the same maturity is referred to as the “breakeven rate of inflation” and represents the bond market’s expectation of inflation over the period to maturity. The table below provides the calculation of the breakeven rate of inflation as of June 30, 2025 over various periods.

Years to Maturity	Bond Nominal Yield	TIPS Nominal Yield	Breakeven Rate of Inflation
10	4.24%	1.95%	2.29%
20	4.79%	2.32%	2.47%
30	4.78%	2.51%	2.27%

As this data indicates, the bond market is anticipating inflation of 2.3% to 2.5% for both the short and long term, however, we note that measures can move fairly significantly over just a few months.





SECTION II – ECONOMIC ASSUMPTIONS

Although many economists forecast lower inflation than the assumptions used by retirement systems, they are generally looking at a shorter time horizon (10 years) than is appropriate for a pension valuation. To consider a longer, similar time frame, we looked at the expected increase in the CPI by the Office of the Chief Actuary for the Social Security Administration. In the most recent report (June 2025), the projected average annual increase in the CPI over the next 75 years was estimated to be 2.4%, under the intermediate (best estimate) cost assumption. The range of price inflation used in the Social Security 75-year modeling, which includes a low and a high-cost scenario, in addition to the intermediate cost projection, was 1.8% to 3.0%.

Horizon Actuarial Services, LLC publishes a survey of capital market assumptions obtained from various investment consultants. The 2025 Horizon Survey, published in August of 2025, includes the assumptions, including the expected rate of inflation, for twenty-seven advisors who develop longer-term assumptions (20 years or more). The Survey showed a range of expected inflation for the next 20 years, for these consultants, of 2.2% to 2.7%, with a median of 2.4%. Inflation over a shorter time horizon (and including another 15 consultants), for the next 10 years, was very similar range of 2.0% to 2.9%, with a median of 2.4%.

Another source to consider in setting this assumption is a quarterly survey of the Society of Professional Forecasters that is conducted by the Philadelphia Federal Reserve of economists. Their most recent forecast (first quarter of 2026) was for inflation over the next ten years (2026 to 2035) to average 2.30%.

Recommendation: It is difficult to accurately predict inflation. We realize many of the projections above expect inflation to be slightly lower than the current assumption of 2.75%. However, as of the writing of this report, inflation has once again increased to over 3.0% and the recent past has shown higher inflation than what was projected from economic professionals. Based on the recent volatility in inflation, **we recommend no adjustments and retaining the current price inflation assumption of 2.75%.**

Price Inflation Assumption	
Current	2.75%
Recommended	2.75%





SECTION II – ECONOMIC ASSUMPTIONS

Investment Return

Background: The investment return assumption reflects the anticipated returns on the current and future assets. It is one of the primary determinants in the allocation of the expected cost of the System’s benefits, providing a discount of the estimated future benefit payments to reflect the time value of money. It is also the most powerful assumption used in the valuation process with small changes producing significant changes to the valuation results. Generally, the investment return assumption should be set with consideration of the asset allocation policy, expected long-term real rates of return on the specific asset classes, the underlying price inflation rate, and investment and administrative expenses.

The long-term relationship between price inflation and investment return, recognized by economists, is that the investor demands a more or less level “real return” – the excess of actual investment return over price inflation. If inflation rates are expected to be high, investment return rates are also expected to be high, while lower inflation rates are expected to result in lower expected investment returns, at least in the long run.

The current investment return assumption is 7.30% and is composed of two components. The first component is price inflation (as previously discussed, this assumption is currently 2.75%). Any excess return over price inflation is referred to as the real rate of return. The current assumption for the real rate of return, which is heavily driven by the System’s asset allocation and capital market assumptions, is 4.55%. The return is net of investment and administrative expenses.

Recent Experience: The actuarial value of assets of the System is developed using a widely accepted asset-smoothing methodology that fully recognizes investment gains and losses over a four-year period. The recent experience for the retirement funds over the last ten years is shown in the following tables.





SECTION II – ECONOMIC ASSUMPTIONS

The charts below show the actual fiscal year (June 30) net returns for the MPERA portfolio for the last 10 years for market and actuarial values of assets. Despite significant volatility in the results from year to year, the actual geometric (compound) return was between 7.43% and 7.90% for market returns and between 7.53% and 7.92% for actuarial returns.

Market Value Rate of Return								
Year Ending 6/30	PERS	JRS	SRS	GWPORS	HPORS	MPORS	FURS	VFCA
2016	2.02%	2.06%	2.06%	2.11%	2.04%	2.13%	2.15%	1.84%
2017	11.93%	11.91%	11.95%	11.92%	11.87%	11.56%	11.56%	11.51%
2018	8.90%	8.88%	8.83%	8.81%	8.86%	8.65%	8.63%	8.68%
2019	5.65%	5.64%	5.70%	5.72%	5.63%	5.42%	5.44%	5.41%
2020	2.73%	2.72%	2.71%	2.70%	2.66%	2.65%	2.64%	2.66%
2021	27.80%	27.69%	27.82%	27.66%	27.80%	27.07%	27.04%	26.93%
2022	(4.18)%	(4.21)%	(4.26)%	(4.30)%	(4.24)%	(4.21)%	(4.24)%	(3.98)%
2023	8.35%	8.39%	8.56%	8.40%	8.37%	8.21%	8.27%	7.41%
2024	8.94%	8.99%	9.03%	9.08%	9.05%	8.95%	8.96%	7.93%
2025	9.39%	9.43%	9.40%	9.39%	9.42%	9.15%	9.14%	8.49%
Average	7.87%	7.87%	7.90%	7.87%	7.87%	7.69%	7.69%	7.43%

Actuarial Value Rate of Return								
Year Ending 6/30	PERS	JRS	SRS	GWPORS	HPORS	MPORS	FURS	VFCA
2016	9.27%	8.64%	8.66%	8.42%	8.76%	8.37%	8.33%	8.30%
2017	8.08%	8.22%	8.23%	8.15%	8.25%	8.01%	8.00%	7.89%
2018	6.69%	6.89%	6.92%	7.01%	6.84%	6.81%	6.84%	6.59%
2019	7.06%	7.22%	7.24%	7.28%	7.18%	7.05%	7.07%	6.93%
2020	7.11%	7.08%	7.04%	6.99%	7.06%	6.81%	6.79%	6.87%
2021	10.76%	10.77%	10.81%	10.80%	10.72%	10.50%	10.52%	10.44%
2022	8.16%	8.11%	8.11%	8.07%	8.09%	7.87%	7.85%	7.89%
2023	7.55%	7.49%	7.50%	7.41%	7.48%	7.27%	7.24%	7.13%
2024	9.03%	8.94%	8.85%	8.66%	8.81%	8.65%	8.60%	8.25%
2025	5.44%	5.55%	5.87%	6.07%	5.93%	5.62%	5.73%	5.07%
Average	7.91%	7.88%	7.92%	7.88%	7.90%	7.69%	7.69%	7.53%



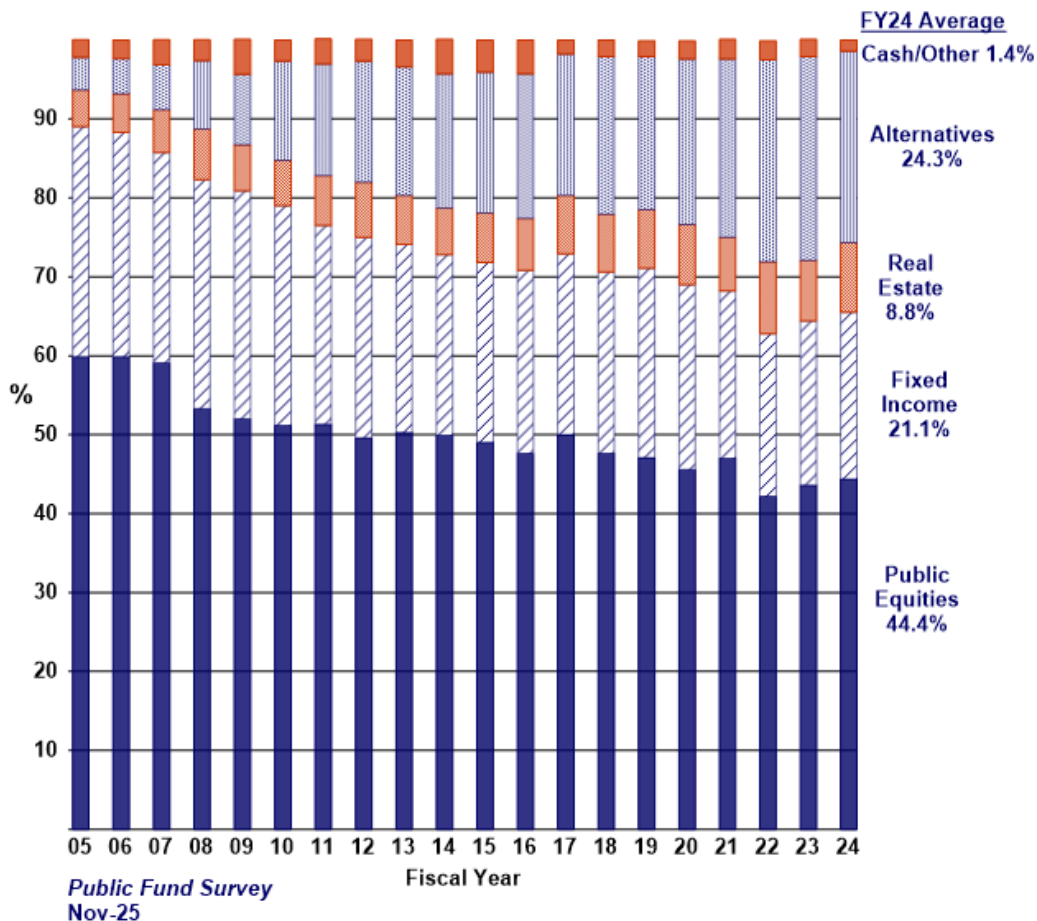


SECTION II – ECONOMIC ASSUMPTIONS

Peer System Comparison

While we do not recommend the selection of an investment return assumption based on the assumptions used by other systems, it does provide another set of relevant information to consider. The following graph shows the change in the distribution of the investment return assumption from fiscal year 2005 through 2024 for the 120+ large public retirement systems included in the National Association of State Retirement Administrators (NASRA) Public Fund Survey. The assumed rate of return is heavily influenced by each systems' asset allocation. The average asset allocation for the systems in the Public Fund Survey is 1.4% cash, 44.4% equities, 21.1% fixed income, 8.8% real estate, and 24.3% alternative investments which has an impact on the expected return of the systems. Note the increased allocation to alternative investment classes since 2005.

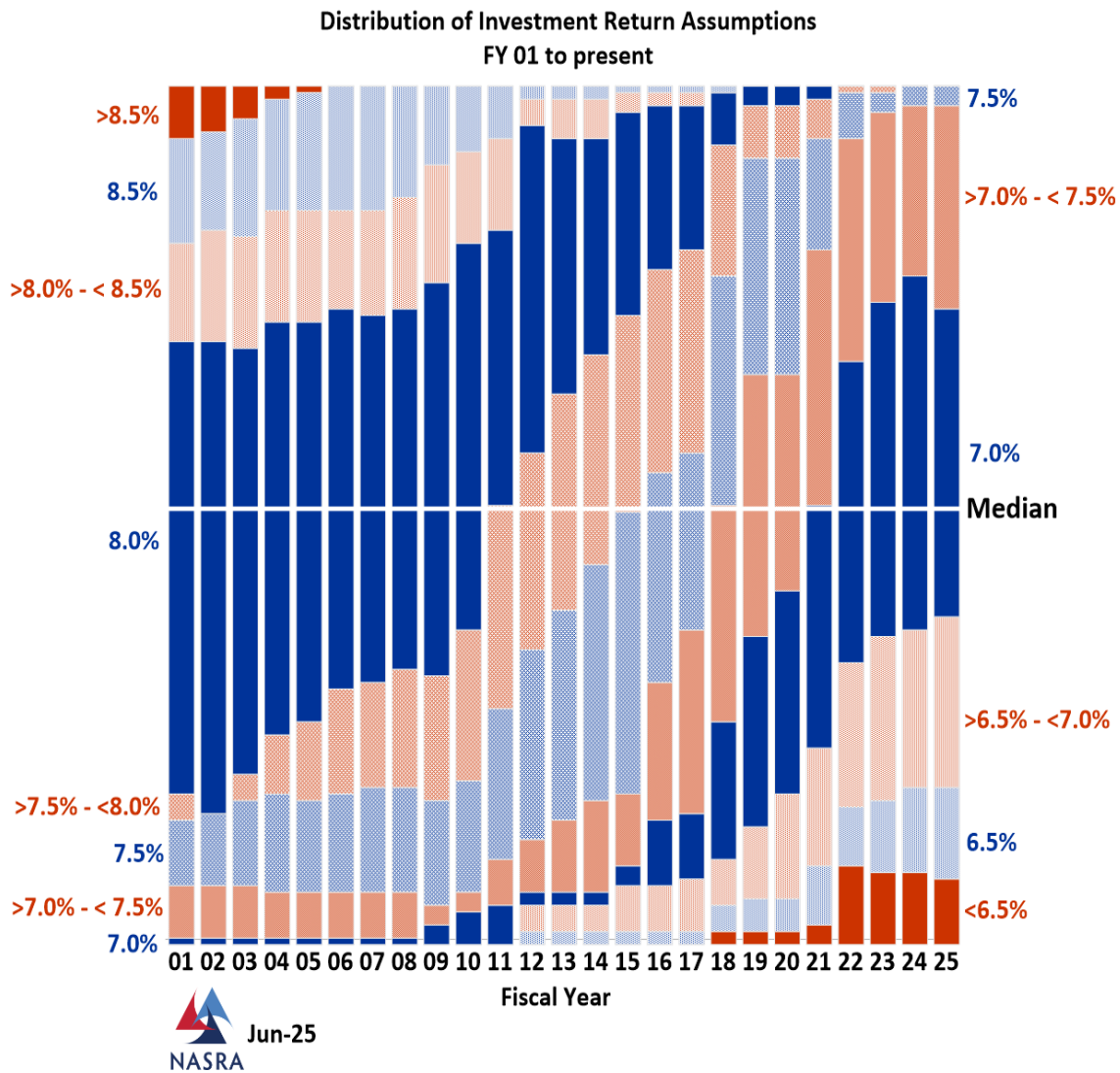
The chart below shows the asset allocation for funds surveyed in the *Public Fund Survey* since 2005.



SECTION II – ECONOMIC ASSUMPTIONS



Below is a graph published by NASRA that shows the decreases in the investment return assumptions used by public plans over the last several years.



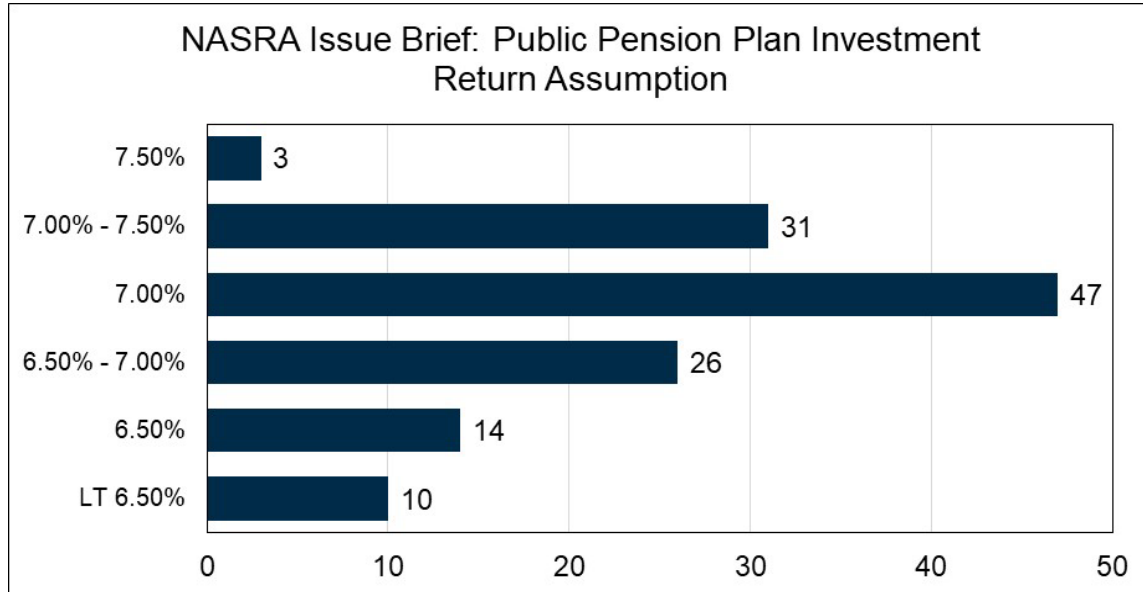
It is worth noting that the median investment return assumption has been stable at 7.00% the past three years after falling from 8.00% during the 2010's. The average investment return assumption is also close to 7.00%, sitting at 6.91%





SECTION II – ECONOMIC ASSUMPTIONS

The following graph shows the change in the distribution of the investment return assumption from fiscal year 2001 through December of 2024 for 120+ large public retirement systems included in the National Association of State Retirement Administrators (NASRA) Public System Survey. It is worth noting that the median investment return assumption is 7.00%.



Capital Market Assumption Analysis: The capital market assumptions and asset allocations used in this analysis are shown in Appendix B. The basis for the analysis is the *Survey of Capital Market Assumptions: 2025 Edition* published by Horizon Actuarial Services, LLC. The System’s asset allocation provides an expected range of real rates of return over various time horizons.

Below are the expected range of real rates of return over various time horizons.

Time Span In Years	Mean Return	Standard Deviation	Real Returns by Percentile				
			5 th	25 th	50 th	75 th	95 th
1	5.76%	12.13%	-12.93%	-2.72%	5.08%	13.50%	26.80%
5	5.21	5.38	-3.40	1.52	5.08	8.76	14.24
10	5.15	3.80	-0.99	2.55	5.08	7.67	11.51
20	5.11	2.69	0.75	3.28	5.08	6.90	9.59
30	5.10	2.19	1.53	3.61	5.08	6.57	8.74
50	5.09	1.70	2.32	3.94	5.08	6.23	7.91





SECTION II – ECONOMIC ASSUMPTIONS

The percentile ranks are the outcomes based on the log normal random variable distribution that produce returns of less than the return at that particular percentile level over the time span. Thus, for the 20-year time span, 5% of the resulting real rates of return were below 0.75% and 95% were above that. As the time span increases, the results begin to merge. Over a 50-year time span, the result indicate there is a 25% chance that real return will be above 6.23% and a 25% chance they will be below 3.94%. In other words, there is a 50% chance the real returns will be between 3.94% and 6.23%. Over a 50-year time span, the results indicate the median long-term real rate of return is 5.08%.

We should also note that the Horizon Survey was published in the fall of 2025 and is based on capital market assumptions from early 2025. We have seen in early 2026 a number of investment consultants lowering their capital market assumptions for 2026 and beyond compared to what they expected going into 2025. Therefore, while we believe the Horizon Survey is a valuable tool, we recognize the 2026 Horizon Survey will likely provide lower expected real returns.

Long Term Perspective

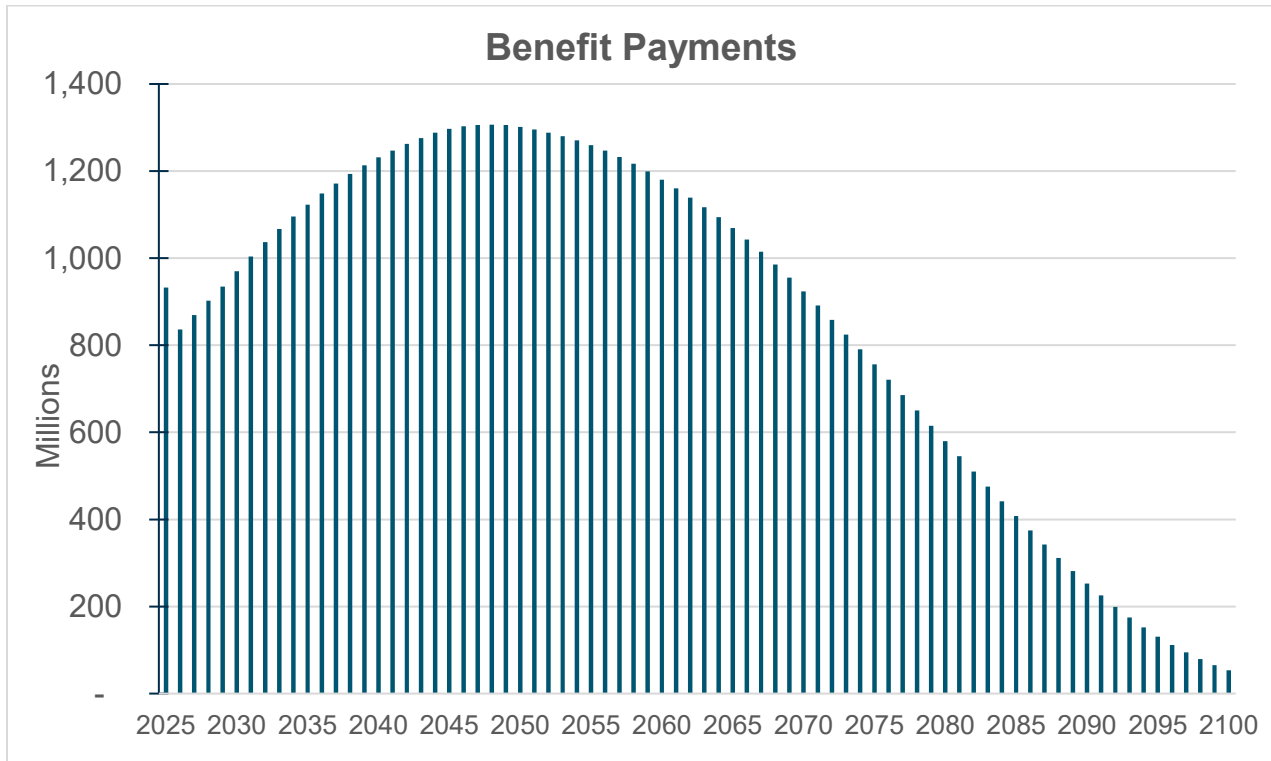
Because the economy is constantly changing, assumptions about what may occur in the near term are volatile. Asset managers and investment consultants usually focus on this near-term horizon in order to make prudent choices regarding how to invest the trust funds (asset allocation). For actuarial calculations, we typically consider very long periods of time as some current employees will still be receiving benefit payments more than 60 years from now. For example, a newly-hired member who is 25 years old may work for 30 years, to age 55, and live another 30 years, to age 85. The retirement system would receive contributions for the first 30 years and then pay out benefits for the next 30 years. During the entire 60-year period, MPERA is investing assets on behalf of the member. In addition, in an open ongoing system like MPERA, the stream of benefit payments is continually increasing as new hires replace current members who leave covered employment due to death, termination of employment, and retirement.

The following graph illustrates the long duration of the expected benefit payments for current members on June 30, 2025.





SECTION II – ECONOMIC ASSUMPTIONS



Investment Expenses

The investment return is assumed to be net of all investment-related expenses. The capital market assumptions are net of investment expenses; therefore, a separate investment expense assumption is not necessary.

Administrative Expenses

Currently, the investment return is assumed to be net of investment expenses and administrative expenses. The investment return information we have been provided is net of investment-related expenses only, so administrative expenses also need to be reflected. The table below compares, for the last five years, the administrative expense levels during the fiscal year to the market value of assets for the System at the end of the fiscal years.

FY Ending June 30	Administrative Expenses	Market Value of Assets	Expense Ratio
2021	\$6,892,166	\$9,516,857,085	0.07%
2022	5,852,785	8,848,775,865	0.07
2023	6,552,466	9,294,227,134	0.07
2024	6,887,873	9,927,609,658	0.07
2025	7,016,626	10,549,731,478	0.07





SECTION II – ECONOMIC ASSUMPTIONS

Since June 30, 2021, the expense ratio averaged 0.07%. We recommend a long-term administrative expense ratio of 0.07% be included in the net investment return assumption.

Recommendation: Using the building block approach of ASOP No. 27 and the projection results outlined above, we recommend an investment return assumption of the 50th percentile real returns over the 50-year time span, with a margin for potential adverse deviation, plus the recommended inflation assumption less the recommended expense ratio assumptions. The following table details the 25th, 50th and 75th percentile ranges.

Item	25 th Percentile	50 th Percentile	75 th Percentile
Real Rate of Return	3.94%	5.08%	6.23%
Inflation	2.75	2.75	2.75
Administrative Expenses	<u>(0.07)</u>	<u>(0.07)</u>	<u>(0.07)</u>
Net Investment Return	6.62%	7.76%	8.91%

The current assumed rate of return of 7.30% is higher than the average assumed rate of return compared with its peer group of other public retirement systems. In addition, we have seen many of those systems systematically lower their assumed rate of return over the past decade to a median return of 7.00%.

The March 31, 2026 Quarterly Investment Performance Analysis prepared for the Montana Board of Investments indicated an annual market value asset return since the inception date of July 1, 1994 was 8.34%. The return on the market value of assets for the 20-year period ended March 31, 2026 is 7.03% which could indicate a downward trend of annualized historical returns in the future.

While the 2025 Horizon Survey showed a 50th percentile net return of 7.76%, as mentioned previously, most 2026 capital market assumptions that we have seen have been lower than 2025, but the 2026 Horizon Survey is not yet available. In addition, ASOP 27 allows the actuary to select an assumption that provides some margin for adverse deviation. **We recommend the assumed rate of return, net of both investment and administrative expenses, remain unchanged at 7.30%.** By not increasing the investment return assumption, we are essentially providing for some margin of adverse deviation (almost a 60% chance of meeting or exceeding the 7.30% assumed rate of return).





SECTION II – ECONOMIC ASSUMPTIONS

Wage Inflation

Background: The assumed future increases in salaries consist of an inflation component and a component for promotion and longevity, often called merit increases. Merit increases are generally age and/or service related and will be studied in the demographic assumption section of the report. Wage inflation normally is above price inflation, which reflects the overall return on labor in the economy. The current wage inflation assumption is 3.50%, or 0.75% above price inflation.

Past Experience: The Social Security Administration publishes data on wage growth in the United States. Appendix C shows the last 50 calendar years’ data. As we did in our analysis of inflation, we show the wage inflation and a comparison with the price inflation over various time periods. Since wage data is only available through 2024, we use that year as the end point.

Period	Wage Inflation	Price Inflation	Real Wage Growth
2014-2024	4.16%	2.85%	1.31%
2004-2024	3.42%	2.57%	0.85%
1994-2024	3.66%	2.53%	1.13%
1984-2024	3.73%	2.80%	0.93%
1974-2024	4.42%	3.77%	0.65%
1964-2024	4.65%	3.93%	0.72%

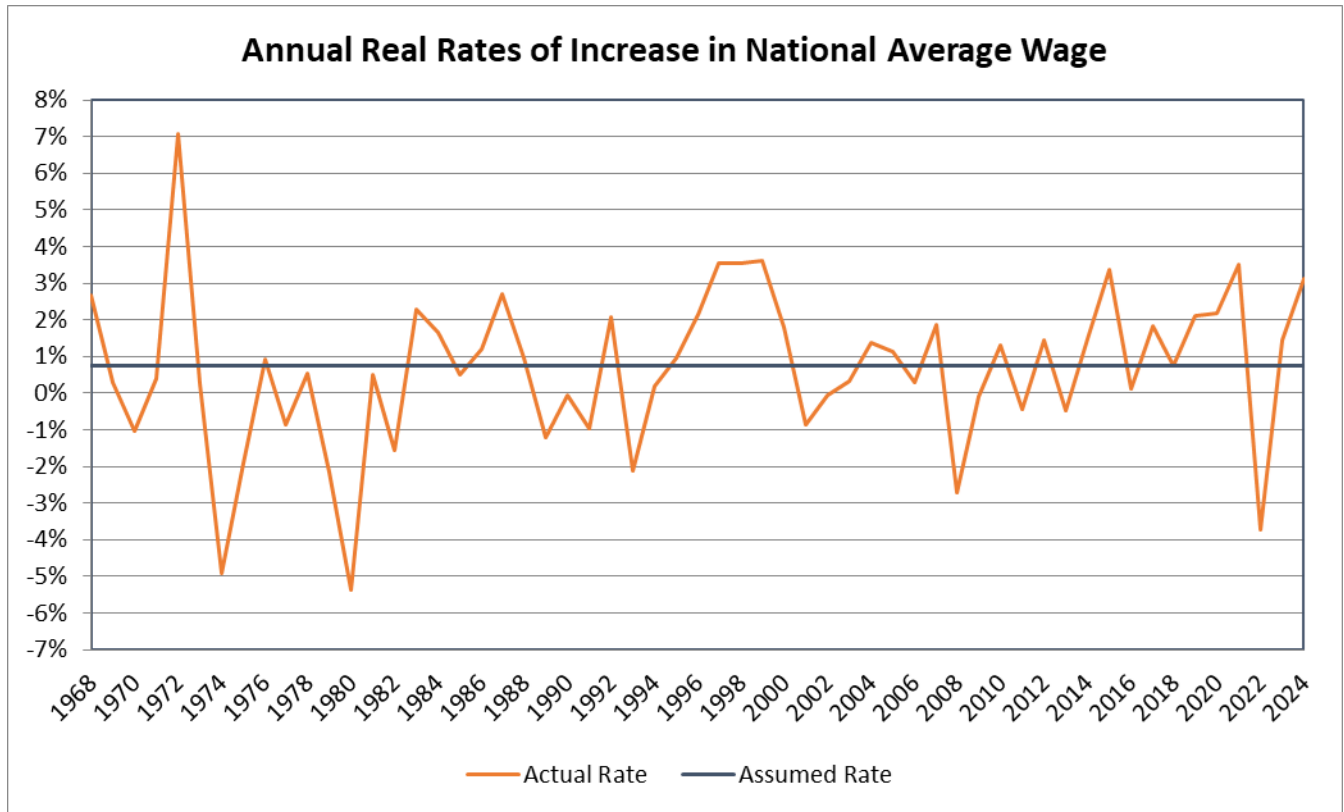
Historically, general wage inflation has nearly always exceeded price inflation, at least over longer periods of time. Since 1951, when the National Average Wage Index from the Social Security System began, wage inflation in the general economy has been around 1.0% higher than price inflation. In the last ten years, general wage inflation has been about 1.31% higher than price inflation, and in the last thirty years, general wage inflation has been about 1.13% higher than price inflation. Because the National Average Wage is based on all wage earners in the country, it can be influenced by the mix of jobs (full-time vs. part-time, manufacturing vs. service, etc.) as well as by changes in some segments of the workforce that are not seen in all segments (e.g., regional changes or growth in computer technology). Further, if compensation is shifted between wages and benefits, the wage index would not accurately reflect increases in total compensation.

The graph on the following page shows the annual increases in real wage growth over the entire 50-year period.





SECTION II – ECONOMIC ASSUMPTIONS



Recommendation: Based on the data reviewed and our future outlook, we recommend increasing the real wage growth from 0.75% to 1.00%. With the 2.75% price inflation assumption, this would increase the wage inflation assumption to 3.75%.

Wage Inflation Assumption	
Current	3.50%
Recommended	
Real Wage Growth	1.00%
Inflation	<u>2.75%</u>
Total	3.75%





SECTION II – ECONOMIC ASSUMPTIONS

Payroll Growth

Background: Amortization payments on the unfunded actuarial accrued liability are currently determined as a level percent of payroll. Therefore, an assumption is required to model future annual increases in total covered payroll. *Note that this assumption only impacts the calculation of the UAAL contribution rate and does not directly impact the funded ratio or the amount of the UAAL.*

The payroll growth assumption is impacted by three factors:

- (1) the size of the group (number of active members),
- (2) the general wage increase assumption, and
- (3) historical growth in total payroll.

With stable active memberships, the payroll growth assumption would generally be set equal to the wage growth assumption, currently 3.75%. Total Payroll Growth Assumption reflects the expected change in the aggregate covered payroll of the entire active membership from one year to the next. It is driven not only by individual salary increases but also by changes in the composition and size of the workforce — including new hires entering the plan, terminations and retirements leaving the plan, and shifts in the demographic mix of active members. Because newer entrants typically earn less than mid-career or senior employees, workforce turnover and hiring patterns can cause total payroll to grow at a different rate than any individual member's salary.

As another point of analysis, we compared the wage growth assumption to the systems' actual covered payroll experience over the 5-year and 10-year period ending June 30, 2025. Over this period, aggregate covered payroll grew at average annual rates as shown below:

	PERS	SRS	MPORS	HPORS	FURS	GWPORS	JRS
5-Year Average	5.39%	6.94%	5.72%	3.53%	9.13%	5.78%	2.38%
10-Year Average	3.71%	5.76%	5.20%	2.50%	7.34%	4.77%	3.28%

While year-to-year payroll growth exhibited some volatility, for most systems the long-term trend came in at or above the previously assumed rate of 3.25%. HPORS and JRS exhibited covered payroll over the 10-year period that was below the assumed 3.25%. **We recommend reducing the payroll growth assumption from 3.25% to 3.00% prospectively for HPORS, reducing from 3.25% to 2.25% for JRS and retaining the current assumption of 3.25% for all other plans.**





SECTION III – DEMOGRAPHIC ASSUMPTIONS

Actuarial Standard of Practice (ASOP) No. 27 provides guidance to actuaries regarding the selection of assumptions for measuring pension obligations. Each individual demographic assumption should satisfy the criteria of ASOP 27. In selecting demographic assumptions, the actuary should also consider: the internal consistency between the assumptions, materiality, cost effectiveness, and the combined effect of all assumptions. At each measurement date, the actuary should consider whether the selected assumptions continue to be reasonable, but the actuary is not required to do a complete assumption study at each measurement date. In our opinion, the demographic assumptions recommended in this report have been developed in accordance with ASOP 27.

There are several demographic assumptions used in the actuarial valuations performed for the Montana Public Employee Retirement Administration. They are:

- Rates of Withdrawal
- Rates of Disability Retirement
- Rates of Service Retirement
- Rates of Post-Retirement Mortality
- Rates of Salary Increase for Merit and Promotions

The purpose of a study of demographic experience is to compare what actually happened to the membership during the study period (July 1, 2020 through June 30, 2025) with what was expected to happen based on the assumptions used in the most recent actuarial valuations.

Studies of demographic experience generally involve three steps:

- First, the number of members changing membership status, called decrements, during the study is tabulated by age, duration, sex, group, and membership class (active, retired, etc.).
- Next, the number of members expected to change status is calculated by multiplying certain membership statistics, called exposure, by the expected rates of decrement.
- Finally, actual decrements are compared with expected decrements. These comparisons, called the actual to expected ratios (A/E Ratio) are expressed as percentages.
 - The System's experience was liability weighted for observed incidents of withdrawal, retirement, and pre- and post- mortality. When performing a liability weighted analysis, the actuarial liability attributed to the number of actual decrements is compared to the actuarial liability attributed to the number of expected decrements. The System's experience for disability retirements was analyzed on a count basis because there is generally little to no correlation between a member becoming disabled and their salary or service.





SECTION III – DEMOGRAPHIC ASSUMPTIONS

If the actual experience differs significantly from the overall expected results, or if the pattern of actual decrements, or rates of decrement, by age, gender, or service does not follow the expected pattern, new assumptions are recommended. Recommended changes usually do not follow the exact actual experience during the observation period. Judgment is required to extrapolate future experience from past trends and current member behavior. In addition, non-recurring events, such as early retirement windows, need to be taken into account in determining the weight to give to recent experience.

The remainder of this section presents the results of the demographic study. We have prepared tables that show a comparison of the actual and expected decrements and the overall ratio of actual to expected results under the current assumptions. If a change is being proposed, the revised actual to expected ratios are shown as well.

Higher paid members typically have a greater liability compared to members who are lower paid. As a result, decrement rates (withdrawal, disability, retirement) for members with higher compensation levels and higher service will have a greater influence on the liabilities of the System. As a result, we liability weighted the experience to better reflect the impact of the current assumption on liability measures. The exposures, actual and expected liabilities are approximated using our valuation software. In most cases, we find the liability-weighted experience to better correlate to the impact of actual and expected rates of decrement on the valuation results.

The exposed liabilities shown in the following sections are the total liabilities subject to decrement rates based upon the benefit recipient's age or service during the experience period. When recommending assumptions changes, it is important to recognize actual experience in areas of higher exposures versus areas of lower exposures when recommending changes to the assumed retirement rates.

The graphs shown in the following sections include (i) the actual rates of decrement for employees by age/service during the study period, (ii) the current assumed rates of decrement, (iii) the recommended assumed rates of decrement and (iv) the amount of exposed liability at each age or year of service.





SECTION III – DEMOGRAPHIC ASSUMPTIONS

RATES OF WITHDRAWAL

It is not anticipated that all members will become eligible for a retirement benefit. Some members will terminate due to resignation or dismissal prior to becoming eligible for a retirement benefit. The rates of withdrawal adopted by the Board are used to determine the expected number of separations from active service that will occur prior to attaining the eligibility requirement for a retirement benefit as a result of resignation or dismissal. The investigation of withdrawal rates only includes members who have not become eligible for a retirement benefit during the experience period.

The current assumption utilizes a service-based approach that sets the withdrawal rates based on years of service for all but JRS, which has no withdrawal assumption.

The table below shows the withdrawal experience for each of the Systems. In general, there were more withdrawals during the experience periods, except for VFCA, which experienced fewer withdrawals than anticipated. A ratio that is greater than 100% indicates that there were more withdrawals during the experience period than were anticipated by the assumption. A ratio of less than 100% indicates that there were less withdrawals during the experience period than were anticipated by the assumption.

	Actual	Expected	A/E Ratio
PERS	554,415,576	536,001,823	103.44%
JRS	N/A	N/A	N/A
HPORS	19,342,686	13,404,408	144.30%
SRS	121,244,228	108,843,402	111.39%
GWPORS	66,821,622	57,027,712	117.17%
MPORS	97,935,820	73,004,130	134.15%
FURS	54,029,014	34,900,003	154.81%
VFCA	4,915,596	5,197,232	94.58%

The complete tables of recommended withdrawal rates are shown in Appendix D.



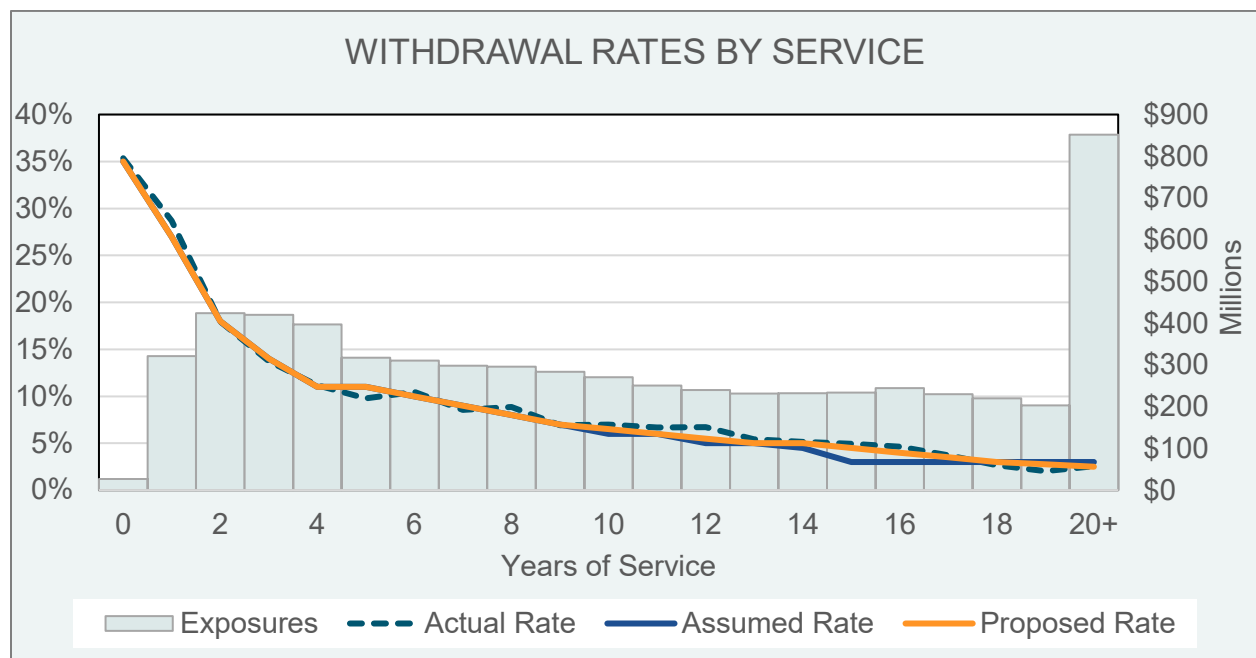


SECTION III – DEMOGRAPHIC ASSUMPTIONS

PERS Members

The analysis of the liability weighted actual withdrawal experience over the five-year period indicates an overall actual/expected ratio of 103.4%. The table below illustrates the liability weighted actual/expected ratio for PERS members based on the recommended assumption.

	Actual	Expected	A/E Ratio
PERS	554,415,576	542,057,203	102.28%



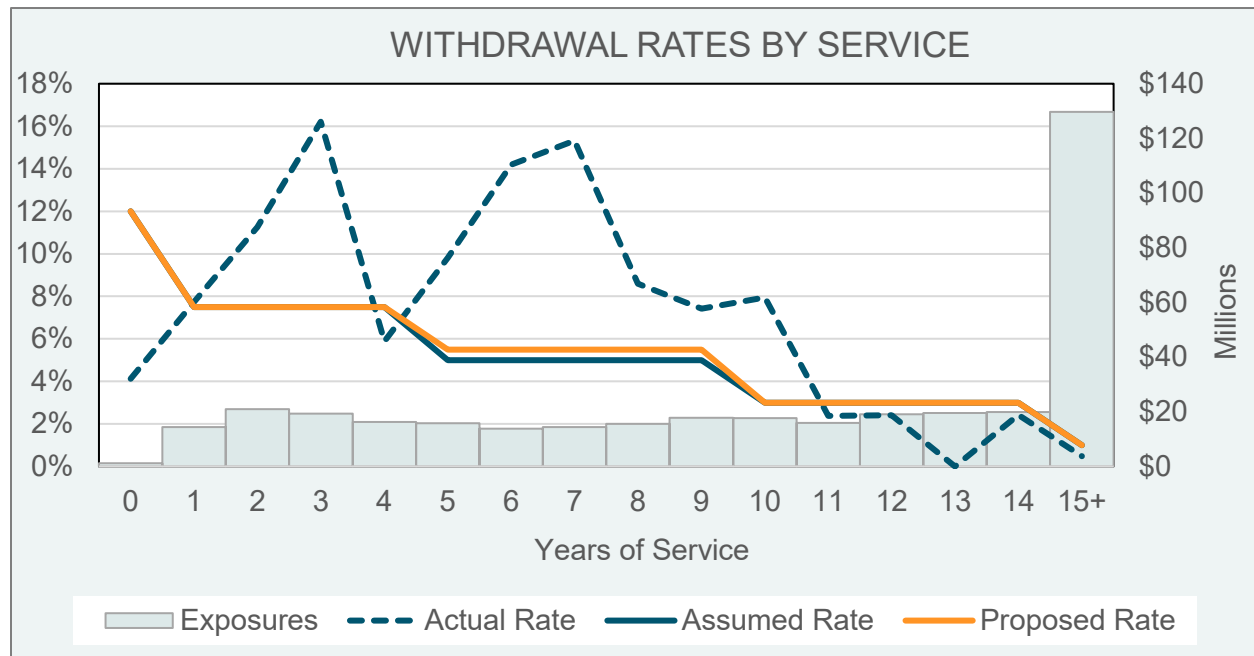


SECTION III – DEMOGRAPHIC ASSUMPTIONS

HPORS Members

The analysis of the liability weighted actual withdrawal experience over the five-year period indicates an overall actual/expected ratio of 144.3%. The table below illustrates the liability weighted actual/expected ratio for HPORS members based on the recommended assumption.

	Actual	Expected	A/E Ratio
HPORS	19,342,686	13,791,258	140.25%



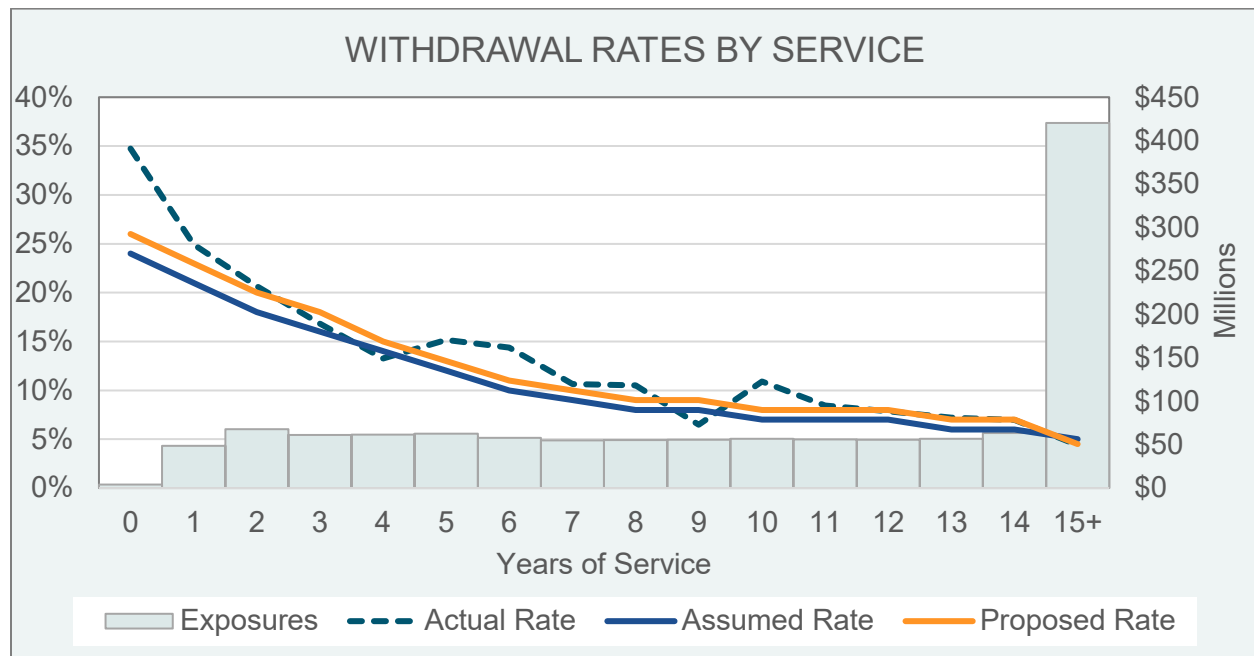


SECTION III – DEMOGRAPHIC ASSUMPTIONS

SRS Members

The analysis of actual withdrawals from active service yielded an actual/expected ratio of 111.4%. The table below illustrates the liability weighted actual/expected ratio for SRS members based on the recommended assumption.

	Actual	Expected	A/E Ratio
SRS	121,244,228	115,649,566	104.84%



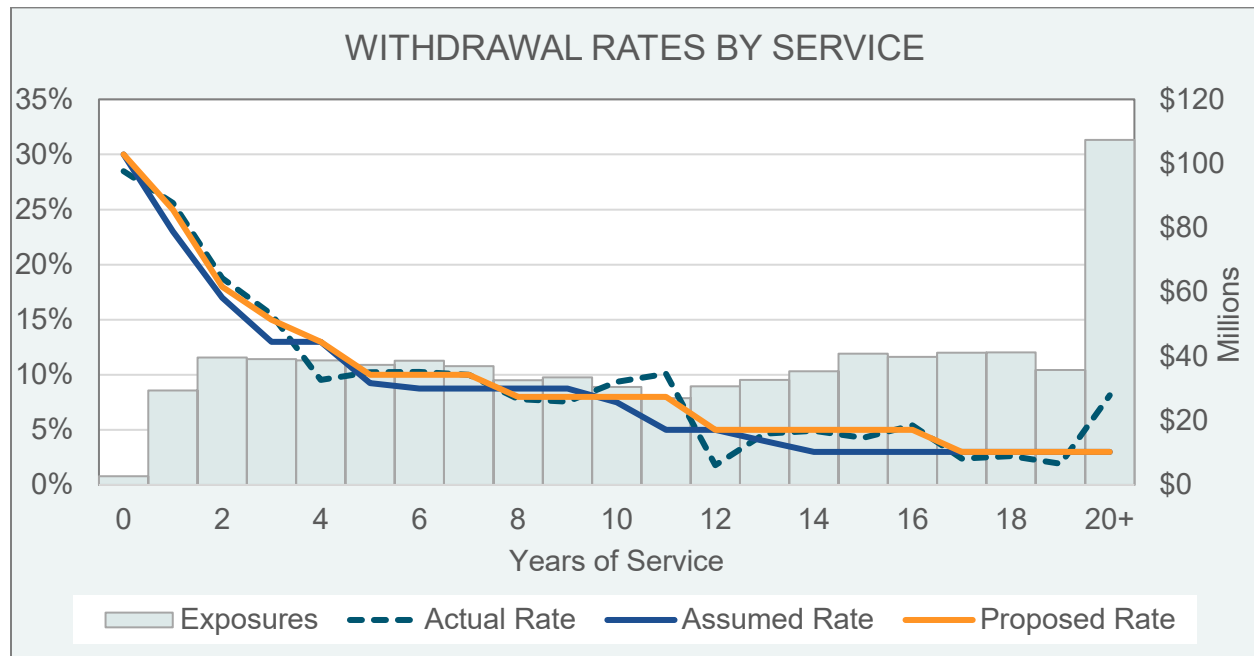


SECTION III – DEMOGRAPHIC ASSUMPTIONS

GWPORS Members

The analysis of actual withdrawals from active service yielded an actual/expected ratio of 117.2%. The table below illustrates the liability weighted actual/expected ratio for GWPORS members based on the recommended assumption.

	Actual	Expected	A/E Ratio
GWPORS	66,821,622	62,320,728	107.22%



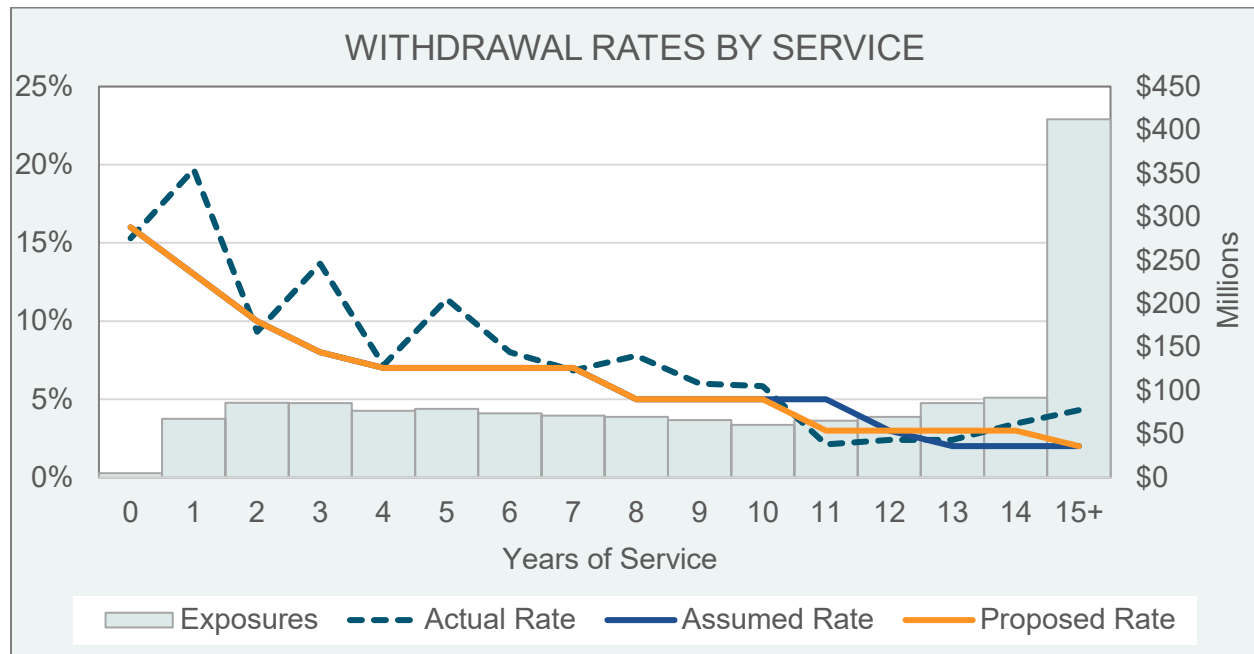


SECTION III – DEMOGRAPHIC ASSUMPTIONS

MPORS Members

The analysis of actual withdrawals from active service yielded an actual/expected ratio of 134.2%. The table below illustrates the liability weighted actual/expected ratio for MPORS members based on the recommended assumption.

	Actual	Expected	A/E Ratio
MPORS	97,935,820	73,470,357	133.30%



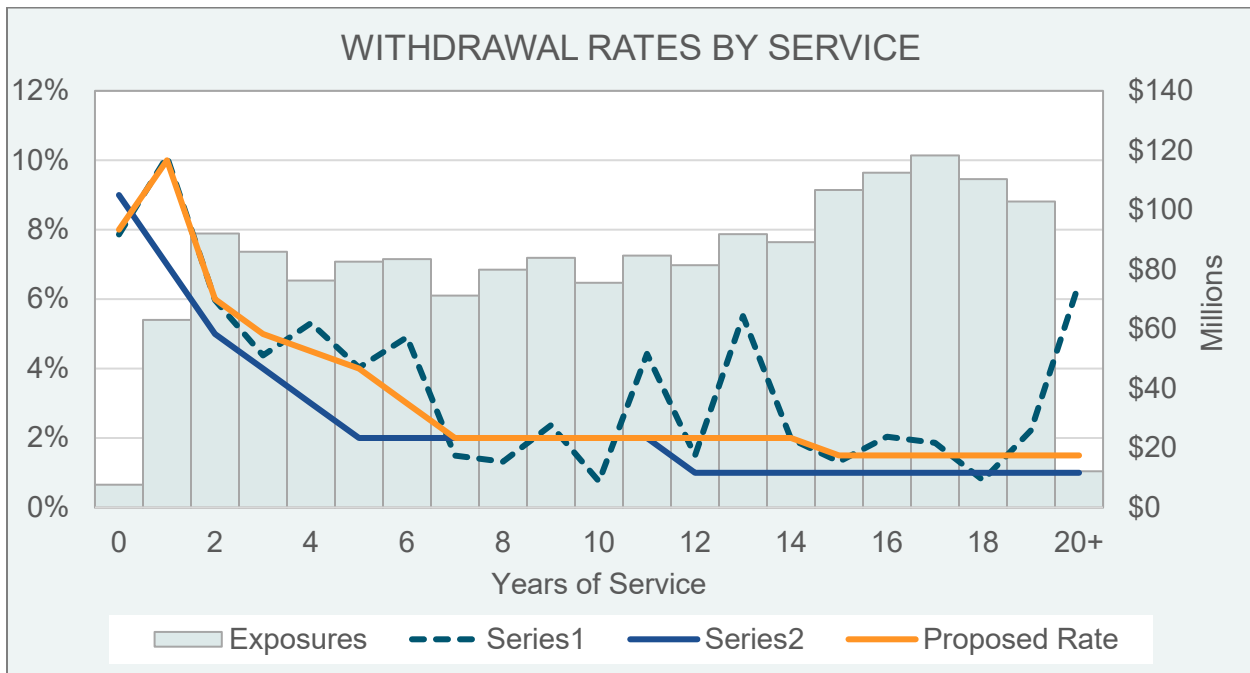


SECTION III – DEMOGRAPHIC ASSUMPTIONS

FURS Members

The analysis of actual withdrawals from active service yielded an actual/expected ratio of 154.8%. The table below illustrates the liability weighted actual/expected ratio for FURS members based on the recommended assumption.

	Actual	Expected	A/E Ratio
FURS	54,029,014	46,949,973	115.08%



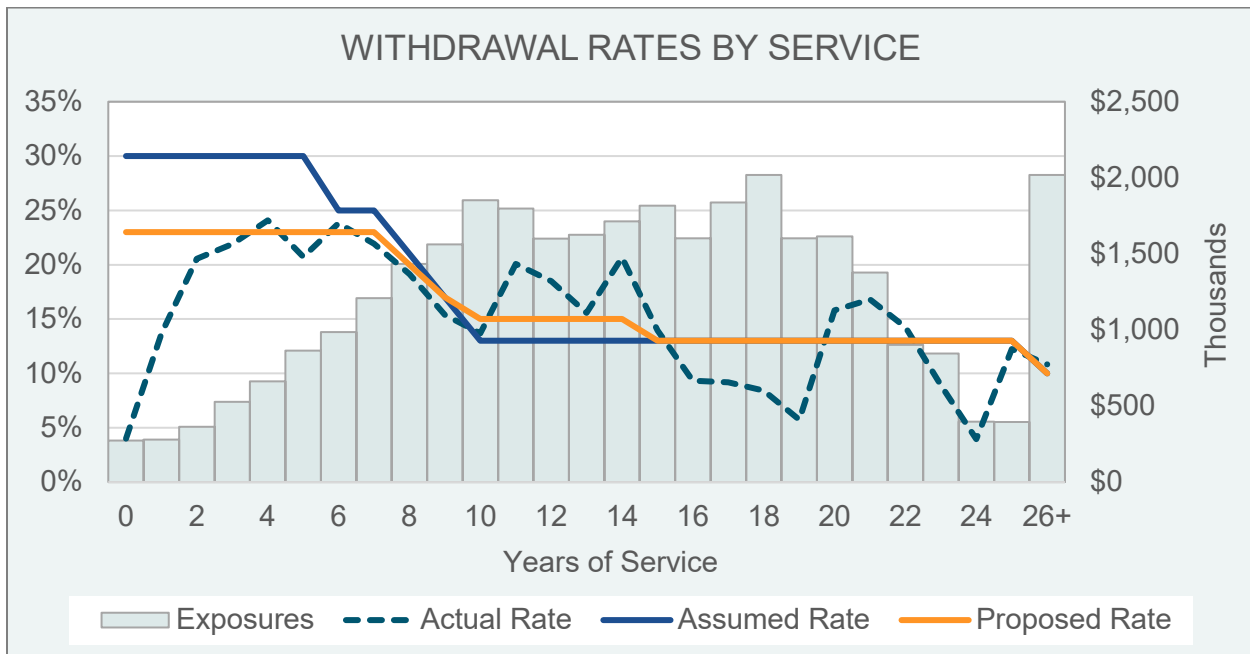


SECTION III – DEMOGRAPHIC ASSUMPTIONS

VFCA Members

The analysis of actual withdrawals from active service yielded an actual/expected ratio of 94.6%. The table below illustrates the liability weighted actual/expected ratio for FURS members based on the recommended assumption.

	Actual	Expected	A/E Ratio
VFCA	4,915,596	5,102,895	96.33%





SECTION III – DEMOGRAPHIC ASSUMPTIONS

ELECTION OF A DEFERRED ANNUITY OR REFUND

This assumption is applicable to contributory plans where members make mandatory contributions as part of the funding of the plan. Some vested members who terminate active employment will elect to receive a distribution of their member account balance, thereby forfeiting their right to receive monthly benefits in the future while others leave their contributions with the plan and ultimately receive a monthly benefit. The current assumption is that members of JRS, HPORS and MPORS who withdraw after becoming vested will not elect a refund of their employee contributions with interest. For members of the other systems that have member contributions, the assumption is that the member will elect the most valuable option, i.e., the option with the higher present value (using the valuation assumptions for investment return and mortality). At this time, **we do not recommend changing these assumptions.**





SECTION III – DEMOGRAPHIC ASSUMPTIONS

RATES OF DISABILITY RETIREMENT

The rates of disability retirement used in the actuarial valuation project the percentage of employees who are expected to become disabled each year and begin receiving a disability retirement benefit. All members qualify for a disability retirement benefit upon employment, with the exception of PERS members, who must have at least 5 years of service. Due to the limited data and as was done in the prior experience study, disabilities for the public safety plans were combined to provide more credible data. The table below shows the disability experience for each of the Systems. In general, there were fewer disability retirements during the experience period.

	Actual	Expected	A/E Ratio
PERS & JRS	33	532	6.21%
Public Safety	30	45	67.23%



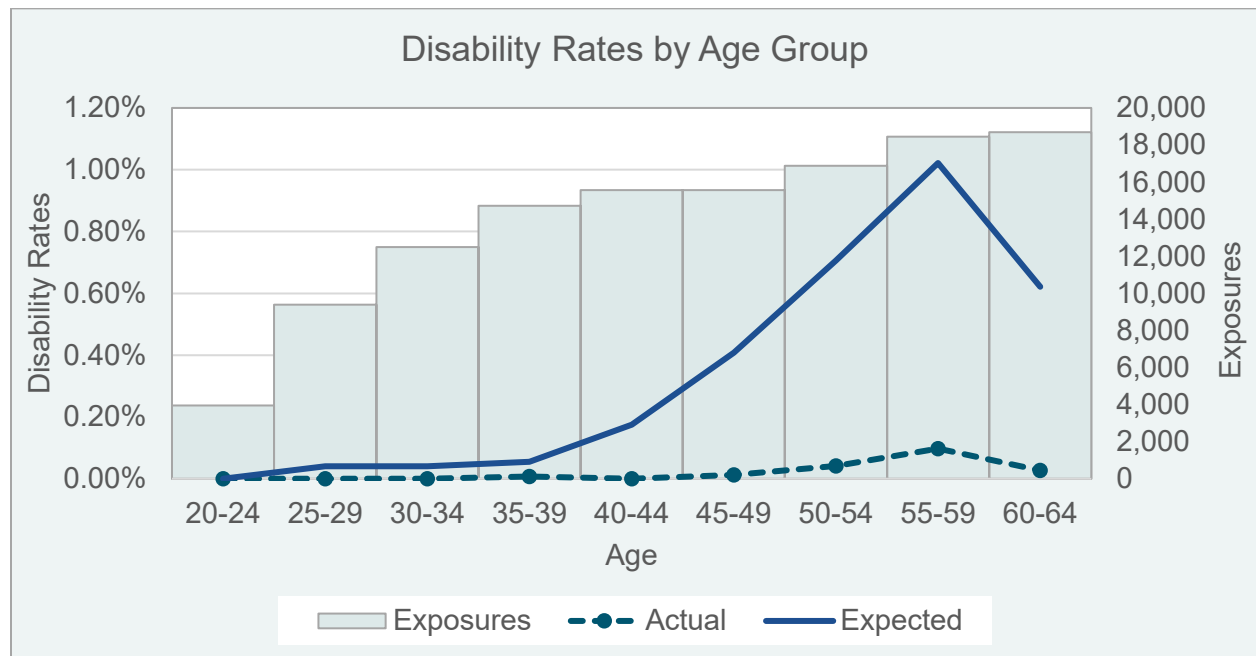


SECTION III – DEMOGRAPHIC ASSUMPTIONS

PERS and JRS

The analysis yields an actual/expected ratio of 6.21% over the experience period. A ratio of 6.21% indicates that the current assumption is overestimating the number of disability retirements. However, based on the actuarial valuations during this study period, there have been more actuarial losses than gains experienced. We believe this is the case because while the incidence of disability is fairly low, when a member becomes disabled, the resulting liability loss can skew the data.

We are recommending no change to the current disability rates but will monitor this assumption closely in future experience studies.



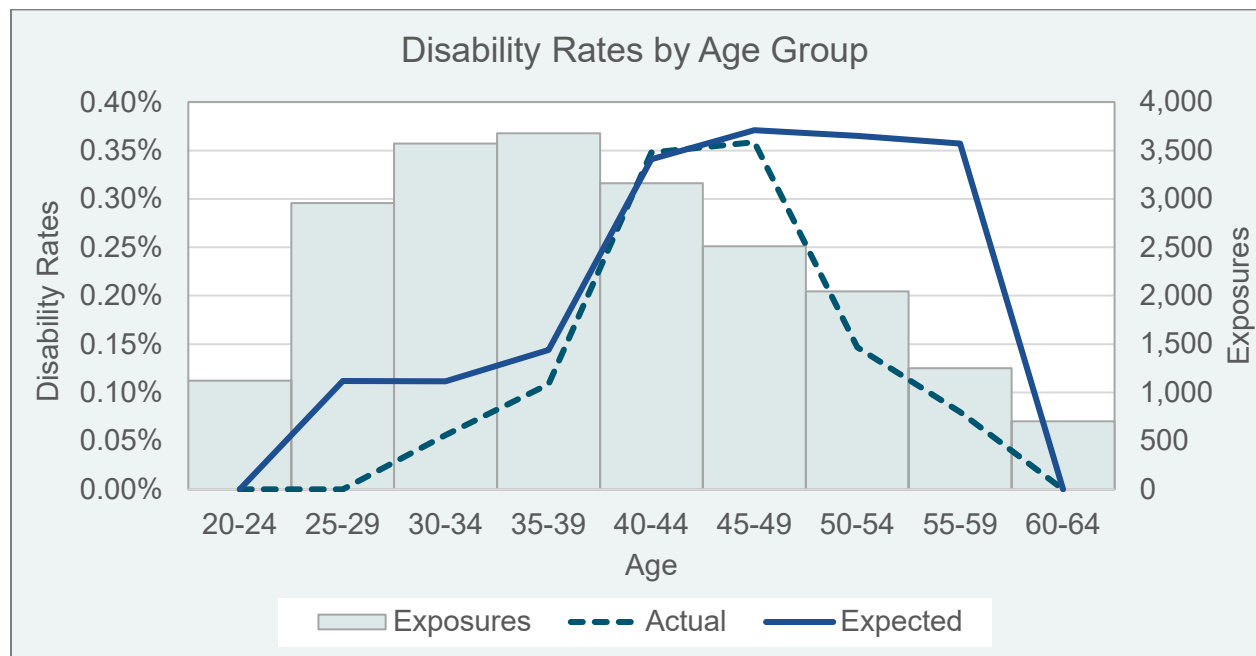


SECTION III – DEMOGRAPHIC ASSUMPTIONS

Public Safety Members (FURS, GWPORS, HPORS, MPORS, and SRS)

The analysis of the combined Public Safety members yields an actual/expected ratio of 67.2% over the experience period. A ratio of 67.2% indicates that the current assumption is overestimating the number of disability retirements. However, similar to PERS and JRS, based on the actuarial valuations during this study period, there have been more actuarial losses than gains experienced. We believe this is the case because while the incidence of disability is fairly low, when a member becomes disabled, the resulting liability loss can skew the data.

We are recommending no change to the current disability rates but will monitor this assumption closely in future experience studies.





SECTION III – DEMOGRAPHIC ASSUMPTIONS

RATES OF SERVICE RETIREMENT

The retirement rates used in the actuarial valuation project the percentage of employees who are expected to retire during the upcoming year.

The table below shows the liability weighted experience for all the Systems.

	Actual	Expected	A/E Ratio
PERS	1,613,203,453	1,518,206,628	106.26%
JRS	6,833,666	10,534,643	64.87%
HPORS	34,280,805	32,876,955	104.27%
SRS	97,540,815	98,058,100	99.47%
GWPORS	75,493,020	72,187,920	104.58%
MPORS	86,264,716	72,226,958	119.44%
FURS	110,535,472	127,468,425	86.72%
VFCA	4,335,383	5,250,406	82.57%

PERS Members

For members who began participation prior to July 1, 2011, PERS provides an unreduced retirement benefit upon obtaining age 60 and with at least five years of membership service, age 65 or any age with 30 or more years of membership service. PERS also provides a reduced benefit to members who retire upon obtaining age 50 with at least 5 years of membership service or any age with at least 25 years of membership service (but below 30 years). The normal retirement benefit is reduced by 6.0% per year for the first five years and 3.6% per year for the next five years for each year the member is younger than age 65 or has less than 30 years of service, whichever is smaller.

For members who began participation on or after July 1, 2011, PERS provides an unreduced retirement benefit upon obtaining age 65 and with at least five years of membership service or age 70. PERS also provides a reduced benefit to members who retire upon obtaining age 55 with at least 5 years of service. The early retirement benefit is the actuarial equivalent benefit of the normal retirement benefit payable at age 65.

The retirement experience was analyzed for two groups of members who qualified for a retirement benefit during the experience period. The first group included members with had obtained less than 30 years of service. The second group included members who had obtained 30 years of service or had obtained age 60 with 25 years of service. The analysis of the actual retirement experience over the five-year period yielded an actual/expected ratio of 106.3%. An actual/expected ratio that is greater than 100% indicates that more members have retired during





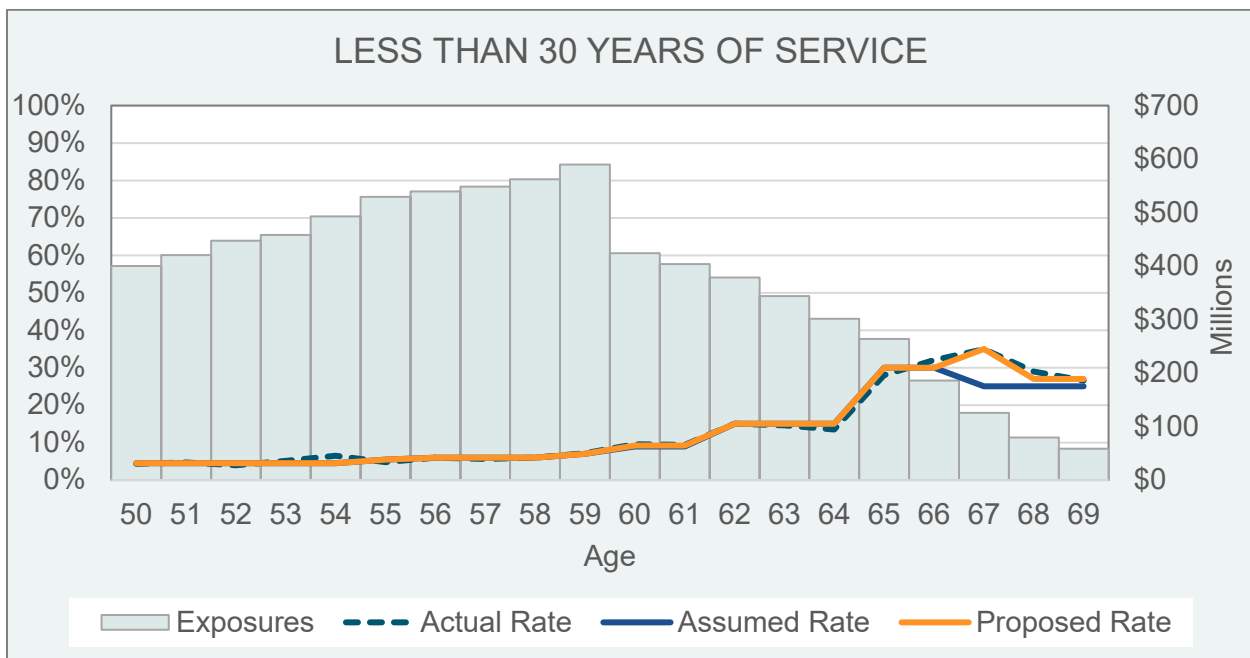
SECTION III – DEMOGRAPHIC ASSUMPTIONS

the experience period than anticipated. We recommend adjusting the assumed rates of retirement for PERS members to reflect recent experience.

The table below illustrates the liability weighted actual/expected ratio for PERS members based on the recommended assumption.

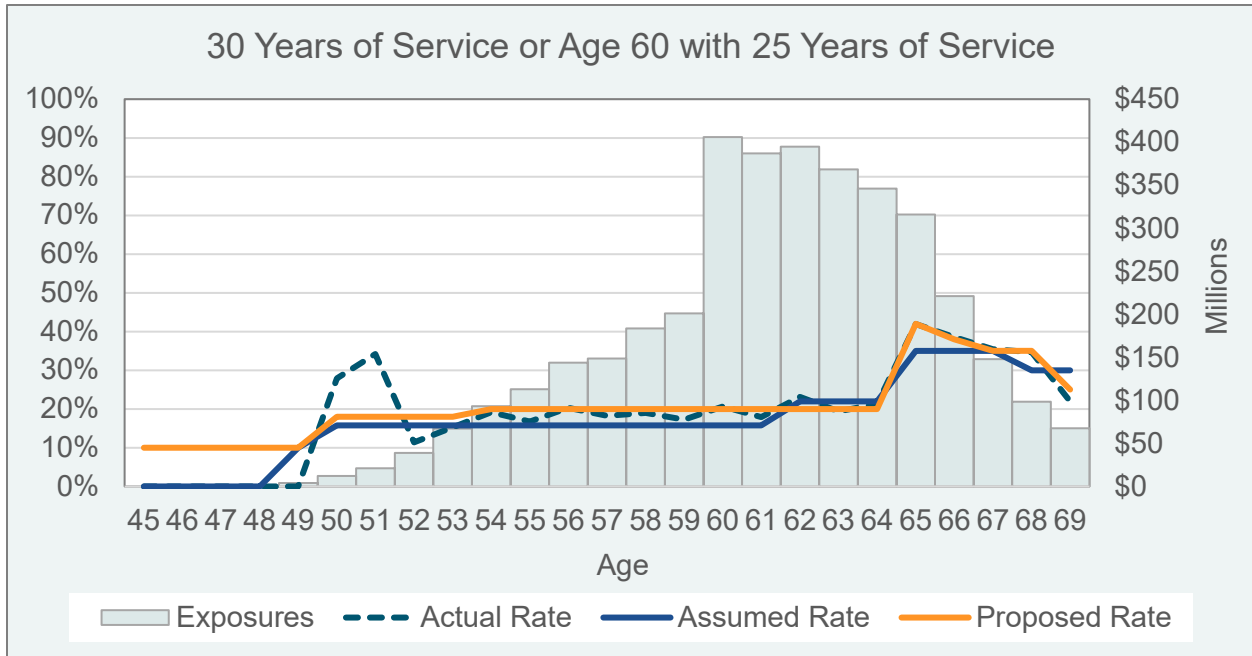
	Actual	Expected	A/E Ratio
PERS	1,613,203,453	1,618,043,779	99.70%

PERS - Service Retirements





PERS - Service Retirements





SECTION III – DEMOGRAPHIC ASSUMPTIONS

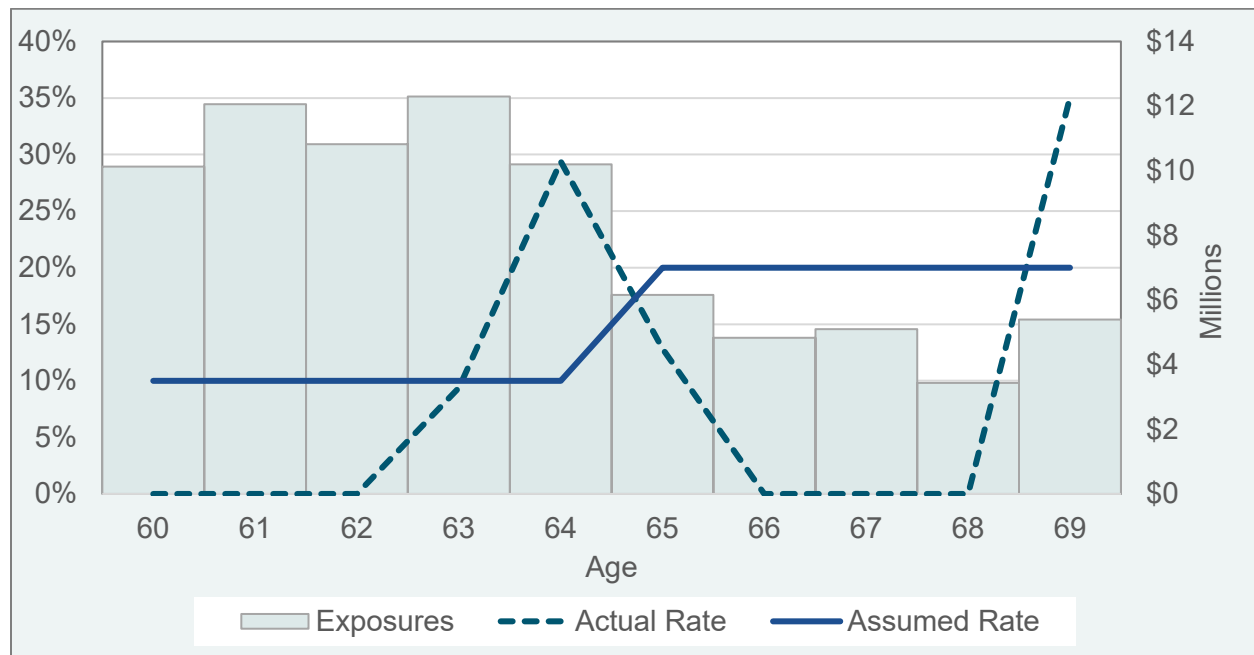
JRS Members

JRS provides an unreduced retirement benefit upon obtaining age 60 with at least five years of membership service.

It is currently assumed these members will begin retiring at the attainment of age 60.

Retirement analysis was based on age for members who qualified for retirement benefit during the experience period. The analysis of the actual retirement experience yields an actual/expected ratio of 64.9%. An actual/expected ratio that is less than 100% indicates that fewer than the assumed amounts of members have retired during the experience period. The data reflects that the current assumption in general fits the actual experience and does not warrant a change.

JRS - Service Retirements





SECTION III – DEMOGRAPHIC ASSUMPTIONS

HPORS Members

HPORS provides an unreduced retirement benefit upon the completion of 20 years of membership service for members hired prior to July 1, 2023 and upon the completion of 20 years of membership service and at least age 50 for members hired on or after July 1, 2023. HPORS also provides actuarially reduced benefits (from age 60) to members hired before July 1, 2013 who retire before reaching normal retirement age with at least five years of membership service, as well as to members hired after July 1, 2013 who retire before reaching normal retirement age with at least 10 years of membership service.

It is currently assumed that HPORS members will begin retiring upon obtaining any age with 20 years of membership service or upon obtaining age 60 and 5 years of service.

HPORS includes a Deferred Retirement Option Plan (DROP). A member is eligible to enter the DROP upon obtaining 20 years of service. The DROP allows active members to accumulate their retirement benefit with interest while continuing to remain employed for up to 60 months. If a member chooses the DROP, the DROP member's monthly retirement benefit along with the required member contributions are accumulated in a hypothetical DROP account. Upon exiting the DROP, the member will begin receiving directly, their monthly retirement allowance, which was determined on the date they entered the DROP and will receive their DROP account balance accumulated with interest as a lump sum. The assumed rates of retirement reflect retirement experience for both DROP and non-DROP eligible members.

The retirement experience was analyzed for members based on their total service. The analysis of the actual retirement experience yields an actual/expected ratio of 104.3%. An actual/expected ratio that is greater than 100% indicates that more than the assumed amounts of members have retired during the experience period. We recommend changing the assumed rates of retirement for HPORS to reflect recent experience.

The table below illustrates the liability weighted actual/expected ratio for HPORS members based on the recommended assumption.

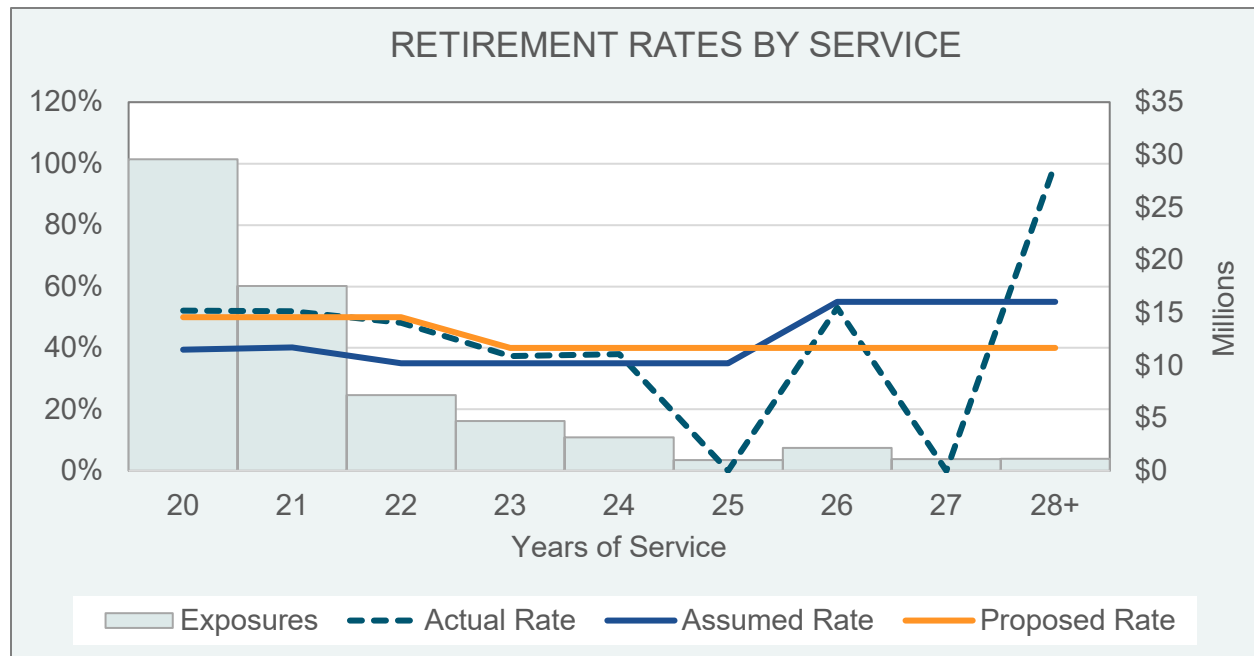
	Actual	Expected	A/E Ratio
HPORS	34,280,805	32,463,335	105.60%





SECTION III – DEMOGRAPHIC ASSUMPTIONS

HPORS - Service Retirements



For this experience study, only members hired prior to July 1, 2023 were studied. Members hired on or after July 1, 2023 have no retirement experience at this point, so we propose using the same retirement assumption for the new tier but starting at age 50.

SRS Members

SRS provides an unreduced retirement benefit upon the completion of 20 years of membership service for members hired prior to July 1, 2023 and upon the completion of 20 years of membership service and at least age 50 for members hired on or after July 1, 2023. SRS also provides an actuarially reduced benefit (from age 60 or the attainment of 20 years of service) to members who retire upon obtaining age 50 with at least five years of membership service.

It is currently assumed that these members will begin retiring upon obtaining any age with 20 years of membership service or upon obtaining age 65 and 5 years of service.

The retirement experience was based on members who obtained 20 years of service or age 65 and five years of service during the experience period. The analysis yielded an actual/expected ratio of 99.5%. An actual/expected ratio that is less than 100% indicates that fewer than the assumed amounts of members have retired during the experience period. We recommend changing the assumed rates of retirement for SRS to reflect recent experience.

The table below illustrates the liability weighted actual/expected ratio for SRS members based on the recommended assumption.

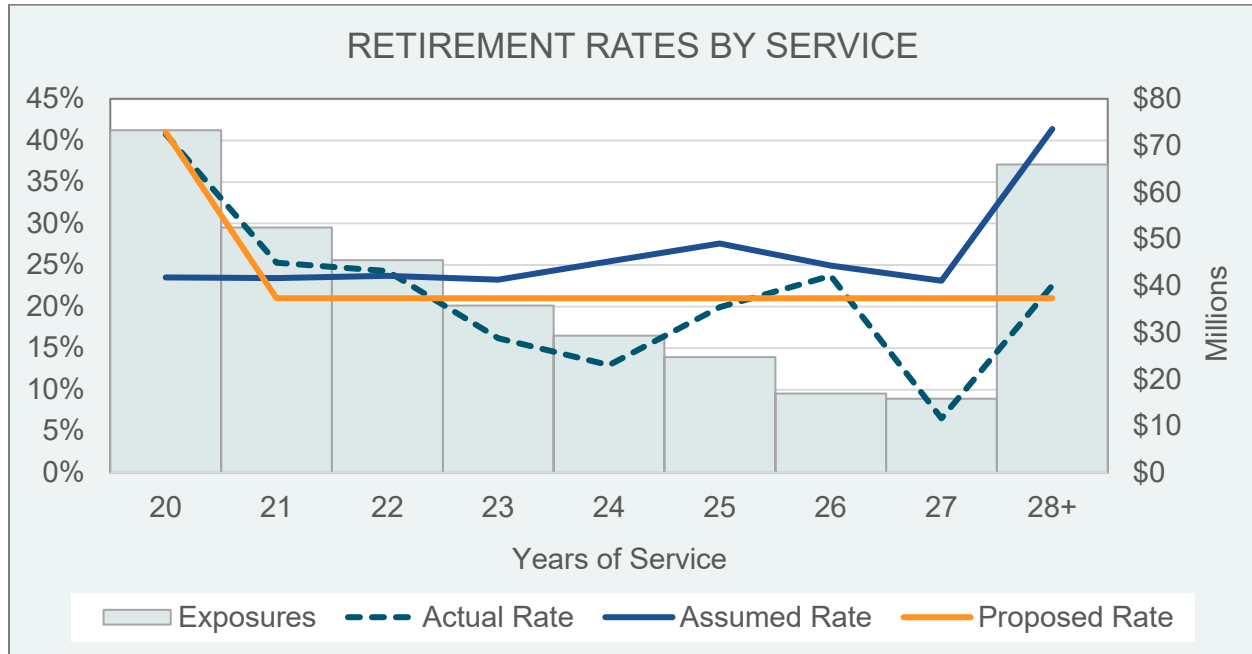




SECTION III – DEMOGRAPHIC ASSUMPTIONS

	Actual	Expected	A/E Ratio
SRS	97,540,815	90,208,777	108.13%

SRS - Service Retirements



For this experience study, only members hired prior to July 1, 2023 were studied. Members hired on or after July 1, 2023 have no retirement experience at this point, so we propose using the same retirement assumption for the new tier but starting at age 50.

GWPORS Members

GWPORS provides an unreduced retirement benefit upon obtaining age 50 and with at least 20 years of membership service or obtaining age 55 with at least 5 years of service. It is currently assumed these members will begin retiring upon the earlier of obtaining age 50 with 20 years of membership service or age 55 with 5 years of membership service.

The retirement experience was analyzed for all members who qualified for a retirement benefit based on their years of service during the experience period. The analysis of the actual retirement experience yields an actual/expected ratio of 104.6%. An actual/expected ratio that is greater than 100% indicates that more than the assumed amounts of members have retired during the experience period. We recommend changing the assumed rates of retirement for GWPORS members at all years of service to reflect recent experience and provide a better fit of the observed experience.



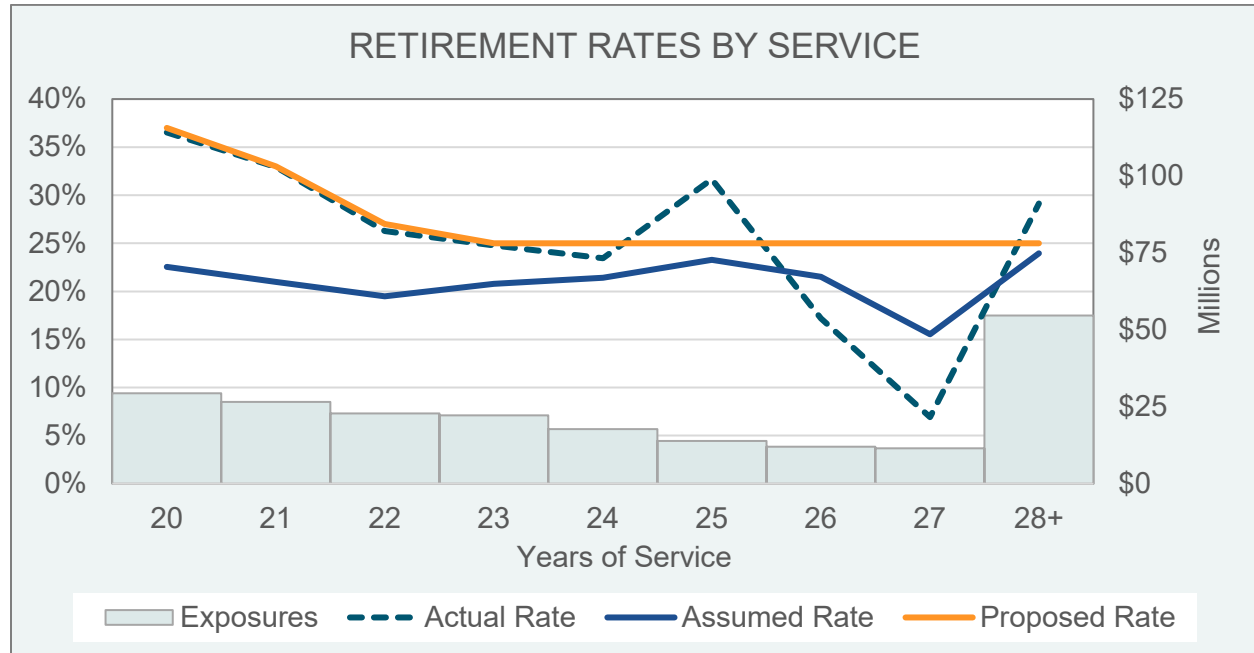


SECTION III – DEMOGRAPHIC ASSUMPTIONS

The table below illustrates the liability weighted actual/expected ratio for GWPORS members based on the recommended assumption.

	Actual	Expected	A/E Ratio
GWPORS	75,493,020	76,182,888	99.09%

GWPORS - Service Retirements



MPORS Members

MPORS provides an unreduced retirement benefit upon obtaining age 50 and with at least 5 years of membership service or any age with at least 20 years of membership service. It is currently assumed these members will begin retiring upon the earlier of obtaining 20 years of membership service, regardless of age, or age 65 with at least 5 years of service.

MPORS includes a Deferred Retirement Option Plan (DROP). A member is eligible to enter the DROP upon obtaining 20 years of service. The DROP allows active members to accumulate their retirement benefit with interest while continuing to remain employed for up to 60 months. If a member chooses the DROP, the DROP member's monthly retirement benefit, including cost-of-living increases, are accumulated in a hypothetical DROP account. Upon exiting the DROP, the member will begin receiving directly, their monthly retirement allowance which was determined on the date they entered the DROP, including increases for cost-of-living adjustments, and will





SECTION III – DEMOGRAPHIC ASSUMPTIONS

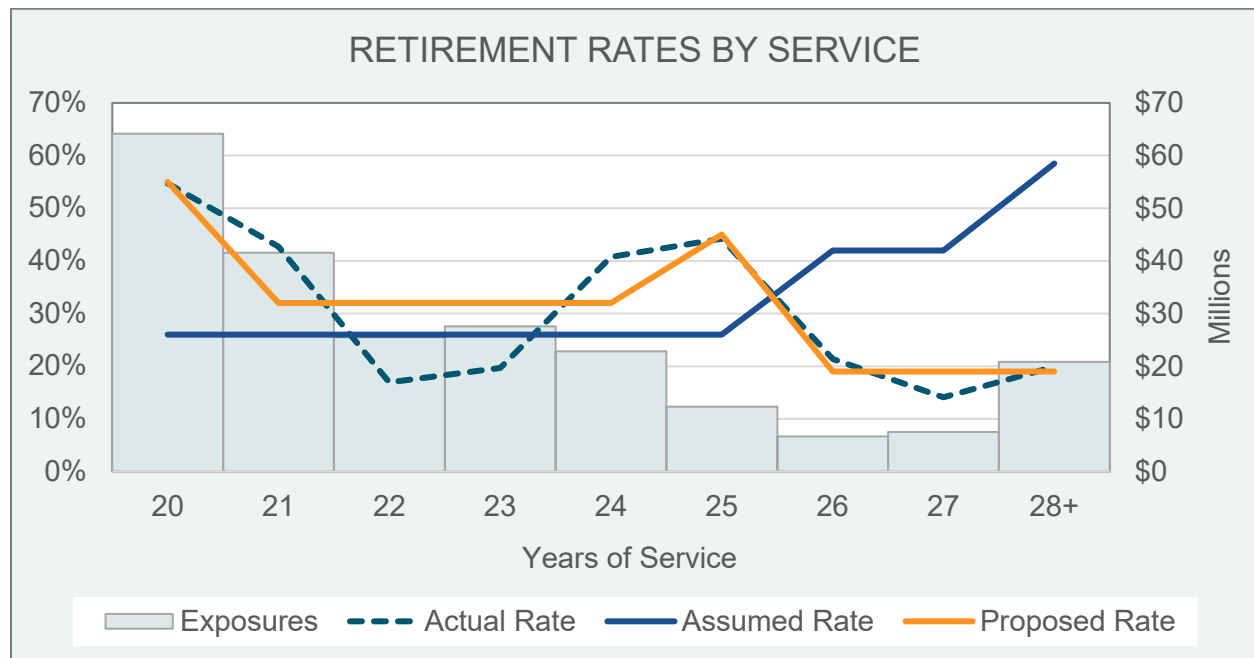
receive their DROP account balance accumulated with interest as a lump sum. The assumed rates of retirement reflect retirement experience for both DROP and non-DROP eligible members.

The retirement experience was analyzed for members based on their total service. The analysis of the actual retirement experience yields an actual/expected ratio of 119.4%. An actual/expected ratio that is greater than 100% indicates that more than the assumed amounts of members have retired during the experience period. We recommend changing the assumed rates of retirement for MPORS members at this time.

The table below illustrates the liability weighted actual/expected ratio for MPORS members based on the recommended assumption.

	Actual	Expected	A/E Ratio
MPORS	86,264,716	86,402,872	99.84%

MPORS - Service Retirements





SECTION III – DEMOGRAPHIC ASSUMPTIONS

FURS Members

FURS provides an unreduced retirement benefit upon obtaining 20 years of membership service, regardless of age. FURS also provides an unreduced early retirement benefit to members who retire upon obtaining age 50 with at least 5 years of membership service.

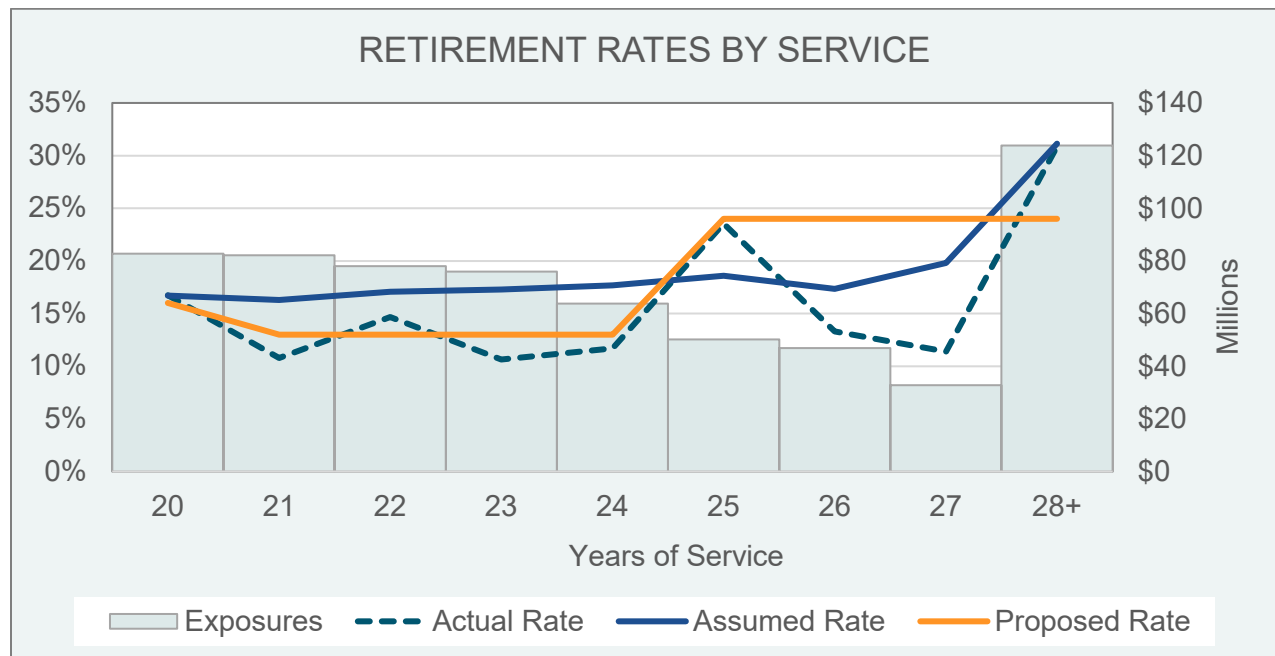
It is currently assumed these members will begin retiring upon obtaining 20 years of membership service, regardless of age, or age 63 with 5 years of membership service.

Retirement experience was analyzed by age for members with 20 or more years of service. The analysis of the actual retirement experience yields an actual/expected ratio of 86.7%. An actual/expected ratio that is less than 100% indicates that fewer than the assumed amounts of members have retired during the experience period. We recommend changing the assumed rates of retirement for FURS to reflect recent experience and provide a better fit of the observed experience.

The table below illustrates the liability weighted actual/expected ratio for FURS members based on the recommended assumption.

	Actual	Expected	A/E Ratio
FURS	110,535,472	113,122,091	97.71%

FURS - Service Retirements





SECTION III – DEMOGRAPHIC ASSUMPTIONS

VFCA Members

VFCA provides a retirement benefit upon obtaining age 55 with at least 20 years of membership service or a partial retirement benefit upon obtaining age 60 with at least 10 years of membership service.

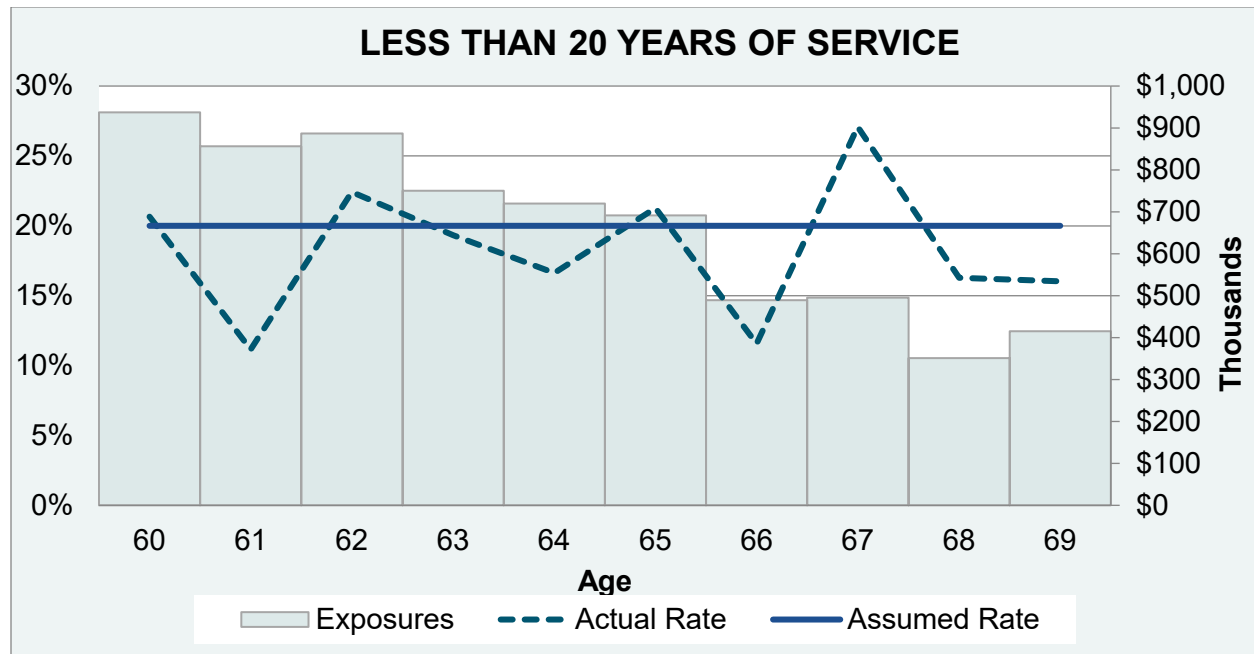
It is currently assumed these members will begin retiring upon the earlier of obtaining age 55 with 20 years of membership service or age 60 with 10 years of membership service.

The retirement experience was analyzed for two groups of members who qualified for a retirement benefit during the experience period. The first group included those that retired with less than 20 years of service and the second group included those that retired with 20 or more years of service. The analysis of the actual retirement experience yields an actual/expected ratio of 82.6%. An actual/expected ratio less than 100% indicates that the current assumption overestimated the number of retirements during the experience period. We recommend changing the current assumed retirement rates for VFCA.

The table below illustrates the headcount weighted actual/expected ratio for VFCA members based on the recommended assumption.

	Actual	Expected	A/E Ratio
VFCA	4,335,383	4,592,320	94.41%

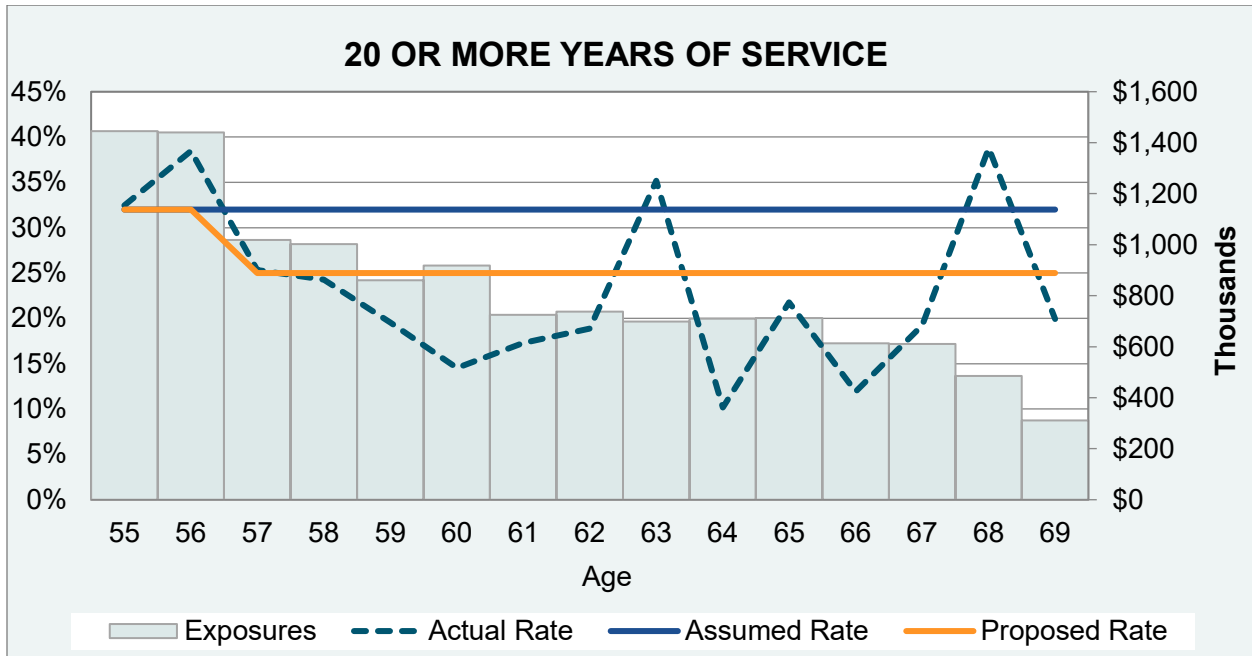
VFCA - Service Retirements



SECTION III – DEMOGRAPHIC ASSUMPTIONS



VFCA - Service Retirements





SECTION III – DEMOGRAPHIC ASSUMPTIONS

RATES OF MORTALITY

One of the most important demographic assumptions in the valuation is mortality because it defines the expectation for how long benefit payments will be made. The longer members live, the greater the true cost of future benefit obligations will be.

For many years, rates of mortality have been declining, meaning people, in general, are living longer. Consequently, we anticipate that mortality tables will need to be updated periodically. Because of potential differences in mortality, we break down our study by gender (males and females) and by status (healthy retirees, beneficiaries, disabled retirees, and active members).

Because of the substantial amount of data required to construct a mortality table, actuaries usually rely on standard tables published by the Society of Actuaries (SOA). Actuaries often use various adjustments to these published mortality tables to better match the observed mortality rates of a specific group. The first of these adjustments can be an age adjustment that is either a “set back” or a “set forward.” A one-year age set back treats all members as if they were one year younger than they truly are when applying the rates in the mortality table. So, a one-year age set back would treat a 61-year-old retiree as if she will exhibit the mortality of a 60-year-old in the standard mortality table. The second adjustment that can be used is to “scale” a mortality table by multiplying the probabilities of death by factors less than 100% (to reflect better mortality) or factors greater than 100% (to reflect poorer mortality). Scaling factors can be applied to an entire table or a portion of the table. Of course, if needed, actuaries may use both methods to develop an appropriate table to model the mortality of the specific plan population.

In 2019, the SOA released a family of mortality tables named the Pub-2010 tables. While prior pension mortality tables had been based solely on private corporate and union retirement plans, these new tables were based entirely on public sector plan data. These tables were split by three membership types: Public Safety, Teachers, and General Employees to reflect the observed differences in mortality patterns related to the three groups. Tables were further split for healthy retirees, disabled retirees, contingent beneficiaries, and employees. There were also versions of these tables for above and below median annuity values. In May of 2025, the SOA released an updated set of mortality tables named the Pub-2016 tables which are organized in a similar fashion as the Pub-2010 tables. We anticipate that this new family of tables will be a good starting point in developing a recommendation for mortality assumptions.





SECTION III – DEMOGRAPHIC ASSUMPTIONS

The issue of future mortality improvement is one that the actuarial profession has become increasingly focused on studying and monitoring. This has resulted in changes to the relevant Actuarial Standard of Practice, ASOP 27, *Selection of Assumptions for Measuring Pension Obligations*. This ASOP requires the pension actuary to make and disclose a specific recommendation with respect to future improvements in mortality after the valuation date, although it does not require that an actuary assume there will be future improvements. There have been significant improvements in longevity in the past, although there are different opinions about future expectations, and thus there is a subjective component in the estimation of future mortality improvement. We believe it is prudent to anticipate that the trend will continue to some degree in the future and that it is appropriate to reflect some future mortality improvement as part of the mortality assumption.

The most direct approach of including future mortality improvements, referred to as generational mortality, directly anticipates future improvements in mortality by using a different set of mortality rates for each year of birth, with the rates for later years of birth assuming lower mortality than the rates for earlier years of birth. MPERA's current methodology uses the generational approach, which is the most commonly used method and is our preferred method for recognizing future mortality improvements in the valuation process because it is more direct and results in longer life expectancy for members who are younger, consistent with what we believe is more likely to occur. The varying mortality rates by year of birth create a series of tables that contain "built-in" mortality improvements, e.g., a member who turns age 65 in 2046 has a longer life expectancy than a member who turns age 65 in 2026. When using generational mortality, the target for the A/E ratios for the observed experience is set near 100% as future mortality improvements will be reflected directly in the actuarial valuation process.

The post-retirement mortality rates used in the actuarial valuation project the percentage of retirees who are expected to die in a given future year. This assumption is a very material assumption and has the most significant impact of all demographic assumptions on liability projections. An important note in the examination of mortality is that it is an observed correlation that life expectancy is greater for retirees with higher benefits than retirees with lower benefits. Because the goal of an actuarial valuation is to model the expected benefit payments to be provided by a system and the liability associated with these payments, actuaries increasingly analyze mortality experience on a liability-weighted basis rather than simply considering headcounts (number of members dying), which is how we performed this analysis.

The number of deaths among active members is not large enough to provide enough statistically credible data to develop a unique table. Therefore, the same family of tables are used for pre-retirement mortality that were used for healthy post-retirement mortality.





SECTION III – DEMOGRAPHIC ASSUMPTIONS

RETIREE MORTALITY

Public Safety Plans (FURS, GWPORS, HPORS, MPORS, SRS and VFCA)

The liability weighted analysis of the actual post-retirement mortality experience over the five-year study period for the combined Public Safety Plans (FURS, GWPORS, HPORS, MPORS, SRS, and VFCA) yields actual/expected ratios of 102.5% and 46.7% respectively for males and females.

Public Safety Plans Retiree Mortality Experience – Current Table

POST-RETIREMENT MORTALITY EXPERIENCE (Liability Weighted)						
Central Age	Males			Females		
	Actual	Expected	Ratio of Actual/Expected	Actual	Expected	Ratio of Actual/Expected
57 & Under	7,663,534	5,832,613	1.314	0	255,168	0.000
60	5,354,312	8,161,461	0.656	0	320,052	0.000
65	12,048,320	12,658,682	0.952	385,915	400,826	0.963
70	18,103,116	18,093,816	1.001	307,640	635,672	0.484
75	22,191,259	23,155,053	0.958	201,687	254,852	0.791
80	16,428,299	18,086,644	0.908	38,006	145,347	0.261
85	17,123,220	12,840,579	1.334	14,746	22,012	0.670
90	7,419,852	5,777,686	1.284	3,986	5,873	0.679
95	1,692,153	1,142,165	1.482	0	0	0.000
98 & Over	541,167	196,114	2.759	0	0	0.000
TOTAL	108,565,233	105,944,814	1.025	951,981	2,039,802	0.467

Findings and Recommendations

Experience indicates that overall, the aggregate liability released due to death is greater than expected for males and less than expected for females. during the study period. The table currently in use is the PUB-2010 Safety Amount Weighted Healthy Retiree mortality table projected to 2021 set forward one year and adjusted 105% for males and with no adjustment for females. Future improvement in mortality rates is reflected by applying the MP-2021 projection scale generationally.

We recommend updating the mortality assumption to the most recent public sector tables published by the SOA. **We recommend updating the mortality assumption to the PUB-2016 Public Safety Amount Weighted Healthy Retiree mortality tables set forward 2 years for males, projected generationally using MP-2021.**





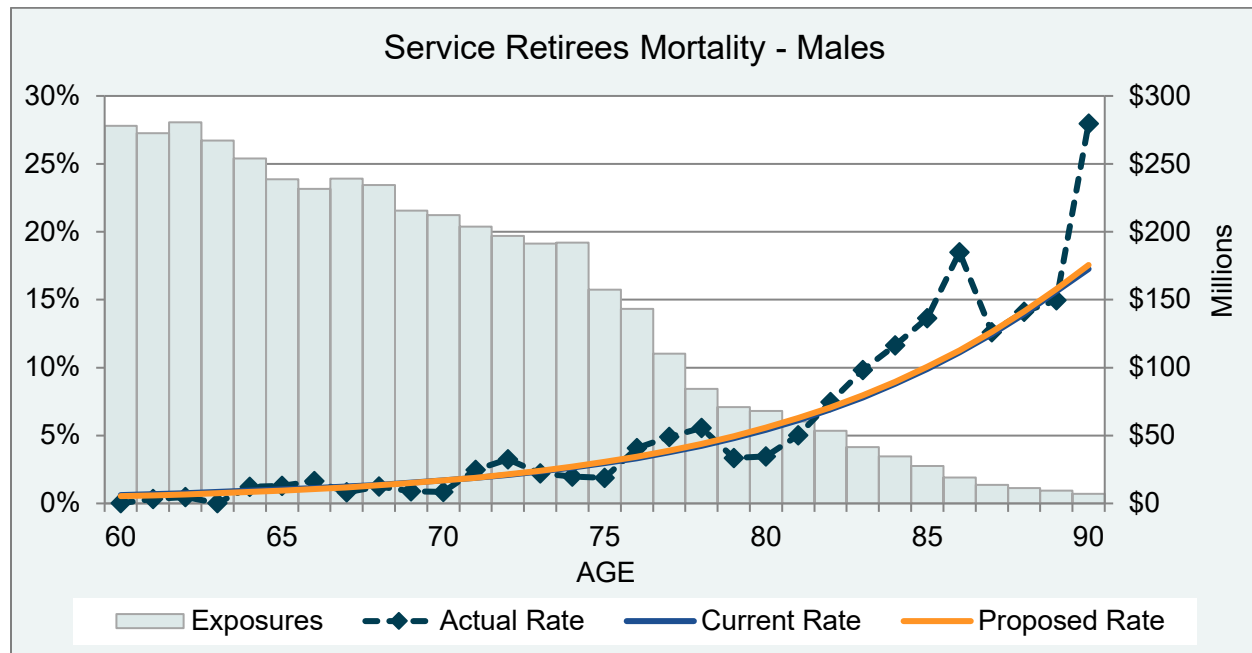
SECTION III – DEMOGRAPHIC ASSUMPTIONS

EXPERIENCE UNDER PROPOSED ASSUMPTIONS

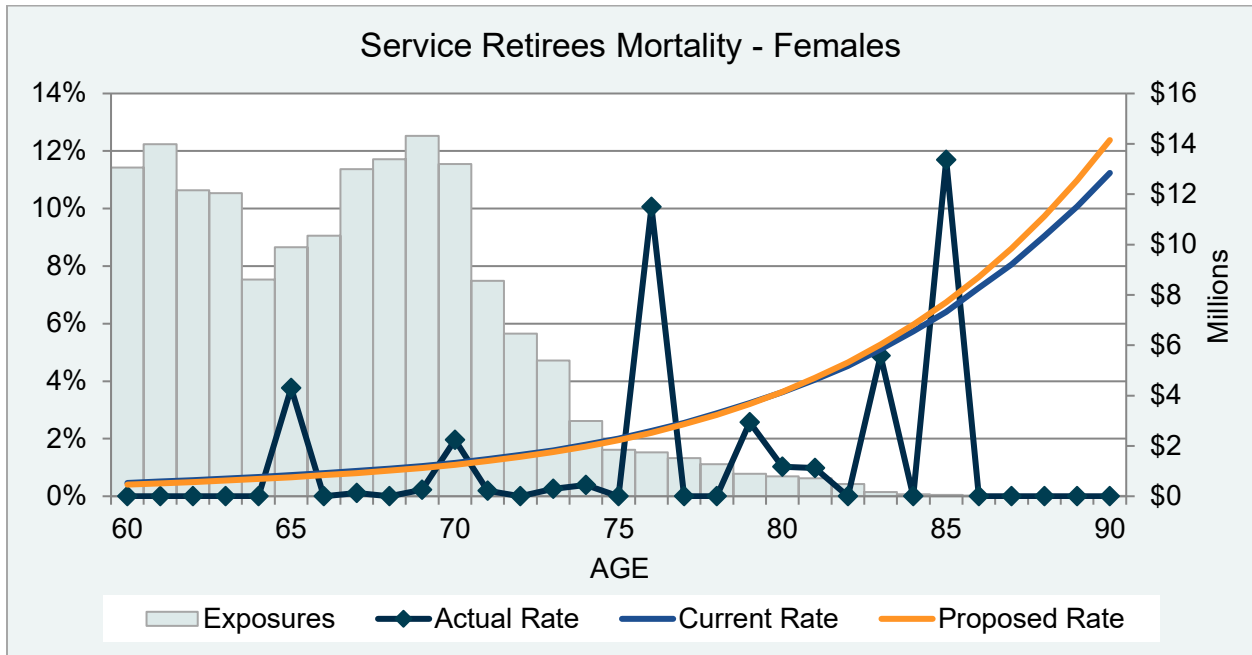
The actual/expected ratios under the proposed assumptions are 102.9% and 49.8% for males and females respectively. The proposed tables also provide a better fit than the prior table when comparing actual/expected ratios at individual age groups. The table below details the actual/expected ratios by individual age group and total.

POST-RETIREMENT MORTALITY EXPERIENCE (Liability Weighted)						
Central Age	Males			Females		
	Actual	Expected	Ratio of Actual/Expected	Actual	Expected	Ratio of Actual/Expected
57 & Under	7,663,534	5,893,041	1.300	0	247,405	0.000
60	5,354,312	7,205,293	0.743	0	282,537	0.000
65	12,048,320	11,623,746	1.037	385,915	363,771	1.061
70	18,103,116	17,990,155	1.006	307,640	597,219	0.515
75	22,191,259	23,791,075	0.933	201,687	247,040	0.816
80	16,428,299	18,559,143	0.885	38,006	145,563	0.261
85	17,123,220	13,052,042	1.312	14,746	22,971	0.642
90	7,419,852	5,887,706	1.260	3,986	6,417	0.621
95	1,692,153	1,240,359	1.364	0	0	0.000
98 & Over	541,167	219,298	2.468	0	0	0.000
TOTAL	108,565,233	105,461,859	1.029	951,981	1,912,925	0.498

The complete tables of recommended mortality rates are shown in Appendix D.



SECTION III – DEMOGRAPHIC ASSUMPTIONS





SECTION III – DEMOGRAPHIC ASSUMPTIONS

General Employee Plans (PERS and JRS)

The liability weighted analysis of the actual post-retirement mortality experience over the five-year study period for the combined General Employee Plans (PERS and JRS) yields actual/expected ratios of 94.4% and 96.1% respectively for males and females.

POST-RETIREMENT MORTALITY EXPERIENCE (Liability Weighted)						
Central Age	Males			Females		
	Actual	Expected	Ratio of Actual/Expected	Actual	Expected	Ratio of Actual/Expected
57 & Under	2,985,924	1,880,031	1.588	237,075	1,245,654	0.190
60	11,452,655	10,442,289	1.097	5,749,641	6,024,065	0.954
65	28,686,923	35,052,821	0.818	18,887,138	22,244,813	0.849
70	61,676,177	71,857,022	0.858	37,855,916	42,714,086	0.886
75	75,953,386	84,961,882	0.894	42,329,333	45,757,271	0.925
80	65,462,785	66,048,121	0.991	38,375,571	37,579,380	1.021
85	45,003,059	45,044,223	0.999	26,811,159	27,084,648	0.990
90	26,925,035	23,794,432	1.132	19,341,527	16,491,817	1.173
95	8,703,497	7,576,353	1.149	7,450,361	6,085,181	1.224
98 & Over	1,413,119	1,004,572	1.407	1,543,412	1,452,186	1.063
TOTAL	328,262,562	347,661,747	0.944	198,581,133	206,679,101	0.961

Findings and Recommendations

Experience indicates that overall, the aggregate liability released due to death is less than expected for both males and females during the study period. The table currently in use is the PUB-2010 General Amount Weighted Healthy Retiree mortality table projected to 2021 set forward one year and adjusted 104% for males and 103% for females. Future improvement in mortality rates is reflected by applying the MP-2021 projection scale generationally.

We recommend updating the mortality assumption to the most recent public sector tables published by the SOA. **We recommend updating the mortality assumption to the PUB-2016 General Amount Weighted Healthy Retiree mortality tables set forward 1 year for males and females, projected generationally using MP-2021.**





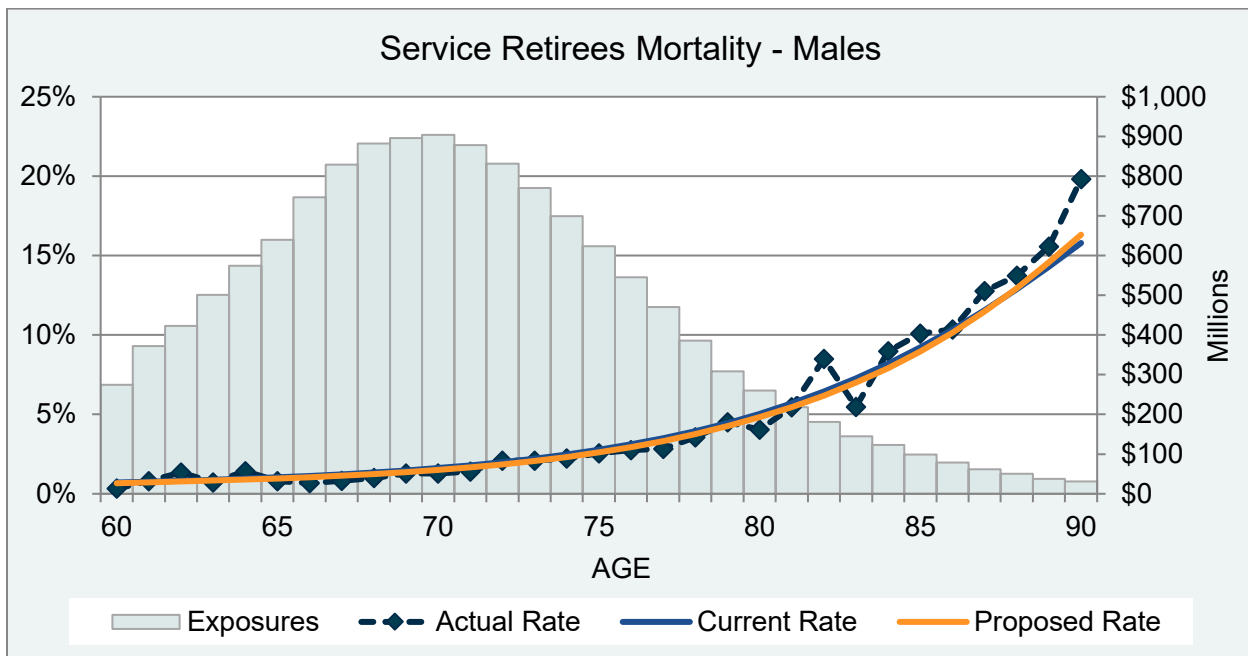
SECTION III – DEMOGRAPHIC ASSUMPTIONS

EXPERIENCE UNDER PROPOSED ASSUMPTIONS

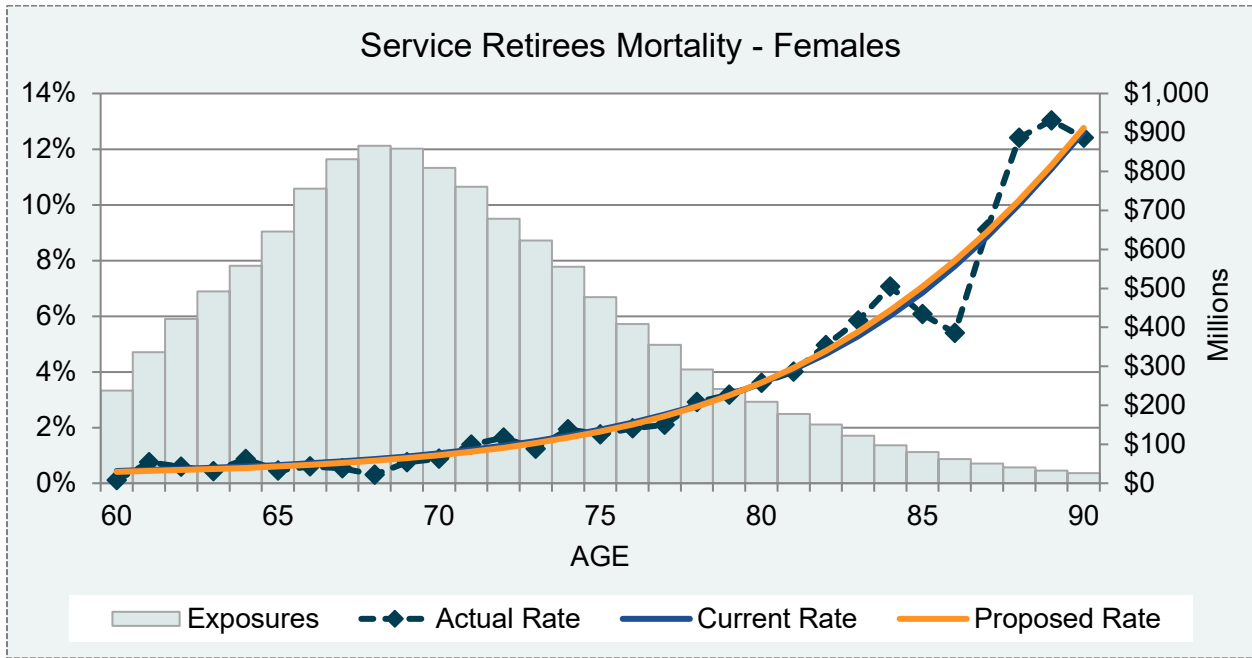
The actual/expected ratios under the proposed assumptions are 99.0% and 98.6% for males and females respectively. The proposed tables also provide a better fit than the prior table when comparing actual/expected ratios at individual age groups. The table below details the actual/expected ratios by individual age group and total.

POST-RETIREMENT MORTALITY EXPERIENCE (Liability Weighted)						
Central Age	Males			Females		
	Actual	Expected	Ratio of Actual/Expected	Actual	Expected	Ratio of Actual/Expected
57 & Under	2,985,924	1,766,347	1.690	237,075	1,188,234	0.200
60	11,452,655	9,759,017	1.174	5,749,641	5,570,795	1.032
65	28,686,923	32,729,762	0.876	18,887,138	20,433,154	0.924
70	61,676,177	66,534,606	0.927	37,855,916	40,092,247	0.944
75	75,953,386	79,983,313	0.950	42,329,333	44,110,601	0.960
80	65,462,785	63,318,746	1.034	38,375,571	37,768,436	1.016
85	45,003,059	43,851,007	1.026	26,811,159	27,843,790	0.963
90	26,925,035	24,435,866	1.102	19,341,527	16,694,252	1.159
95	8,703,497	8,044,060	1.082	7,450,361	6,196,736	1.202
98 & Over	1,413,119	1,054,869	1.340	1,543,412	1,428,764	1.080
TOTAL	328,262,562	331,477,593	0.990	198,581,133	201,327,009	0.986

The complete tables of recommended mortality rates are shown in Appendix D.



SECTION III – DEMOGRAPHIC ASSUMPTIONS





SECTION III – DEMOGRAPHIC ASSUMPTIONS

Contingent Survivor Mortality

Currently, the assumption for this group is based on rates from the PUB-2010 Safety Amount Weighted Contingent Survivor mortality tables set forward one year for males and the PUB-2010 General Amount Weighted Contingent Survivor Retiree mortality table projected to 2021 set forward one year for both male and females. Future improvement in mortality rates is reflected by applying the MP-2021 projection scale generationally. For the survivors in the Public Safety Plans, the study period yielded actual/expected ratios 494.0% and 152.1% respectively for males and females. For survivors in the General Employee Plans, the study period yielded actual/expected ratios of 159.6% and 132.5% respectively for males and females. These ratios indicate survivors are dying at a rate greater than as currently assumed.

Contingent Survivor Mortality Experience under Current Assumptions

	Actual Deaths	Expected Deaths	A/E Ratio
Public Safety Plans			
Males	2,243,813	454,180	4.940
Females	29,985,413	19,712,855	1.521
General Employees			
Males	12,322,064	7,720,581	1.596
Females	60,245,432	45,466,744	1.325

Contingent Survivor Mortality Findings and Recommendations

Experience indicates that overall, more survivors have died than expected during the study period. However, the number of actual and expected survivor deaths are not fully credible due to a low number of exposed lives during the experience period. We recommend updating the mortality assumption to the most recent public sector tables published by the SOA. **We recommend updating the mortality assumption to the PUB-2016 Public Safety Amount Weighted Contingent Survivor mortality tables set forward 2 years for males for the public safety plans, and the PUB-2016 General Amount Weighted Contingent Survivor mortality tables set forward 1 year for males and females for the general employees plans.** Future improvement in mortality rates is reflected by applying the MP-2021 projection scale generationally.





SECTION III – DEMOGRAPHIC ASSUMPTIONS

Disabled Retiree Mortality

Members who retire under the disability retirement provisions are generally expected to be less healthy than the overall population. Currently, for the Public Safety Plans, the PUB-2010 Safety Amount Weighted Disabled Retiree mortality tables set forward one year for males is used. For the General Employees Plans, the PUB-2010 General Amount Weighted Disabled Retiree mortality table set forward 1 year for both male and females is used. No future improvements are reflected for the disabled retirees. For the retirees in the Public Safety Plans, the study period yielded actual/expected ratios 132.8% and 144.2% respectively for males and females. For retirees in the General Employee Plans, the study period yielded actual/expected ratios of 143.1% and 182.6% respectively for males and females. These ratios indicate disabled individuals are dying at a rate that is greater rate than is currently assumed.

Disabled Retiree Mortality Experience under Current Assumptions

	Actual Deaths	Expected Deaths	A/E Ratio
Public Safety Plans			
Males	11,382,073	8,570,845	1.328
Females	710,768	492,861	1.442
General Employees			
Males	13,908,946	9,718,382	1.431
Females	9,794,903	5,363,464	1.826

Disabled Retiree Mortality Findings and Recommendations

Experience indicates that overall, more survivors have died than expected during the study period. However, the number of actual and expected survivor deaths are not fully credible due to a low number of exposed lives during the experience period. We recommend updating the mortality assumption to the most recent public sector tables published by the SOA. **For the public safety plans, we recommend updating the mortality assumption to the PUB-2016 Safety Amount Weighted Disabled Retiree mortality tables set forward 2 years for males. For the General Employees plans, we recommend updating the mortality assumption to the PUB-2016 General Amount Weighted Disabled Retiree mortality tables set forward 1 year for males and females. No future improvements are reflected for the disabled retirees.**





SECTION III – DEMOGRAPHIC ASSUMPTIONS

Rates of Pre-Retirement Mortality

The rates of pre-retirement mortality are used in the actuarial valuation to project the percentage of employees who are expected to terminate due to death.

EXPERIENCE UNDER CURRENT ASSUMPTIONS

	Actual	Expected	A/E Ratio
PERS	18,150,382	33,514,635	54.16%
JRS	0	440,289	0.00%
HPORS	711,718	395,417	179.99%
SRS	683,646	1,843,573	37.08%
GWPORS	372,920	1,270,866	29.34%
MPORS	1,582,774	1,457,588	108.59%
FURS	537,636	2,261,280	23.78%
VFCA	215,113	116,407	184.79%

Findings and Recommendations

As is typical with most large public pension plans, a small number of deaths occur amongst the active member population during the experience period. The observed data is not sufficient to base a recommended change in the actuarial assumption for pre-retirement mortality. As a result, we recommend updating the mortality assumption to the most recent public sector tables published by the SOA. **For the Public Safety Plans, we recommend adopting the PUB-2016 Public Safety Employee mortality tables. For the General Employees Plans, we recommend adopting the PUB-2016 General Employee mortality table. Future improvement in mortality rates is reflected by applying the MP-2021 projection scale generationally.**





SECTION III – DEMOGRAPHIC ASSUMPTIONS

RATES OF SALARY INCREASE

Estimates of future salaries are based on assumptions for two types of increases:

- Increases in each individual's salary due to promotion or longevity (often called a merit scale), and
- Increases in the general wage level of the membership, which are directly related to price and wage inflation.

Earlier in this report, we recommended a general wage increase assumption of 3.75% (2.75% inflation and 1.00% real wage growth). Therefore, the merit scale will be added to the 3.75% general wage increase assumption to develop the total individual salary increase assumption.

Analysis of the merit salary scale is complicated by the fact that the retirement system receives only the total salary paid, which includes both the underlying wage inflation component of salary increases and the merit salary scale. Furthermore, there also is often a delay in the actual price and general wage inflation compared to when it impacts salary increases for active members. As a result, it is difficult to isolate the merit scale for purposes of measuring the actual experience.

Actual inflation was higher than the current assumption of 2.75% over this period so we would expect actual salary increases to also be higher than the current individual salary increase assumption. This was the case over this study period for most plans. This can partially be explained by the higher inflation experienced during the five-year study period. However, as we have seen with other retirement systems throughout the country, salary increases have been much higher in the recent past so there are likely other factors impacting salary increases.

The VFCA is not a salary-based benefit, therefore there is no assumption for salary increases members of VFCA.





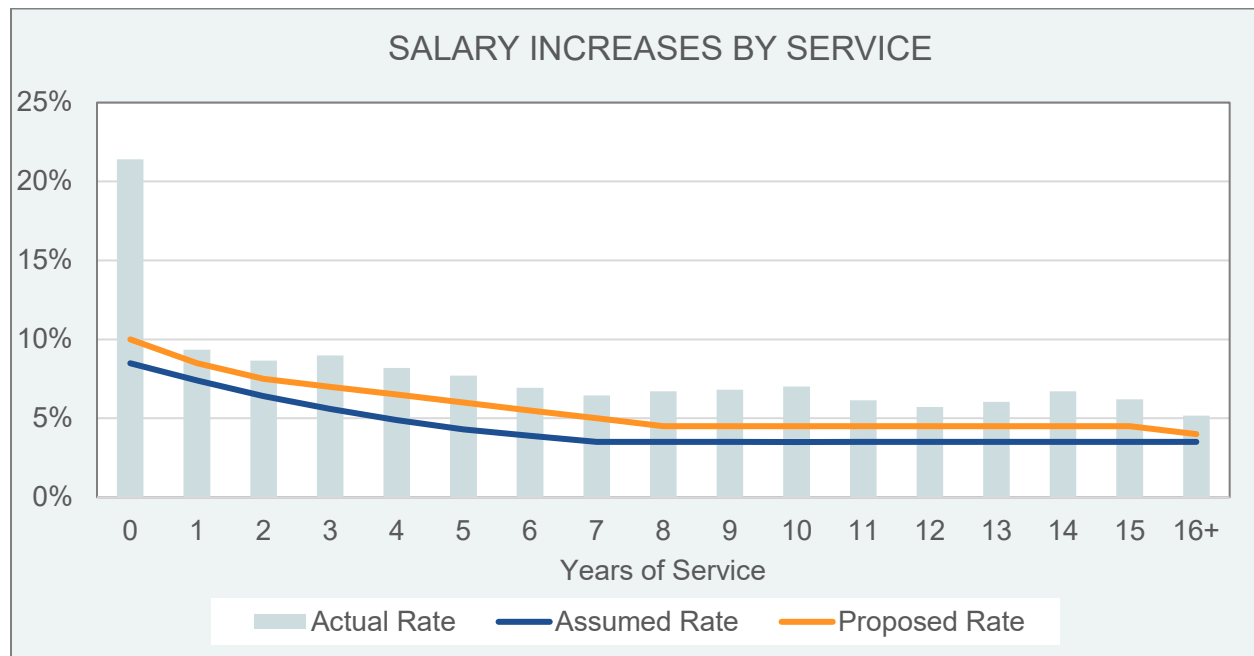
SECTION III – DEMOGRAPHIC ASSUMPTIONS

The table below shows the actual/expected ratios for total salary increases over the five-year period. In general salary increases were slightly less than anticipated over the experience period for PERS and JRS, and more than anticipated for HPORS, SRS, GWPORS, MPORS and FURS.

	Salaries End of Year (in thousands)		
	Actual	Expected	A/E Ratio
PERS	6,317,614	6,101,712	103.54%
JRS	40,220	40,465	99.39%
HPORS	73,168	70,104	104.37%
SRS	432,984	415,227	104.28%
GWPORS	265,308	257,050	103.21%
MPORS	270,325	261,971	103.19%
FURS	310,195	297,624	104.22%

PERS Members

The analysis of salary increases yielded an actual/expected ratio of 103.5%. This ratio indicates that salary increases were more than anticipated by the current assumption. In Section II of this report, we recommended an increase in the wage base component of the total salary increase assumption. In addition, we recommend adjusting the merit component of the salary scale assumption.

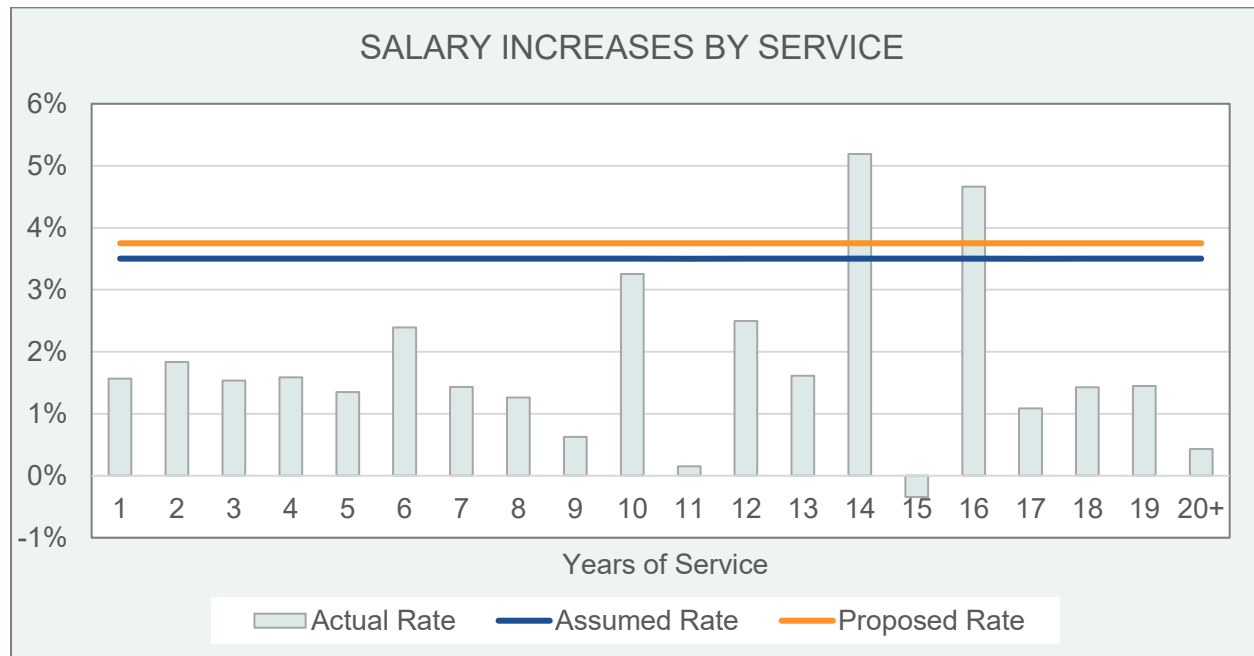




SECTION III – DEMOGRAPHIC ASSUMPTIONS

JRS Members

The JRS assumed salary increase is based on the underlying wage inflation only. The analysis of salary increases yielded an actual/expected ratio of 99.4%. This ratio indicates that salary increases in general were as anticipated by the current assumption. In Section II of this report, we recommended an increase in the wage base component of the total salary increase assumption. We make no further recommended changes to the assumed rates of salary merit increases, just the increase due to the recommended increase in wage growth.

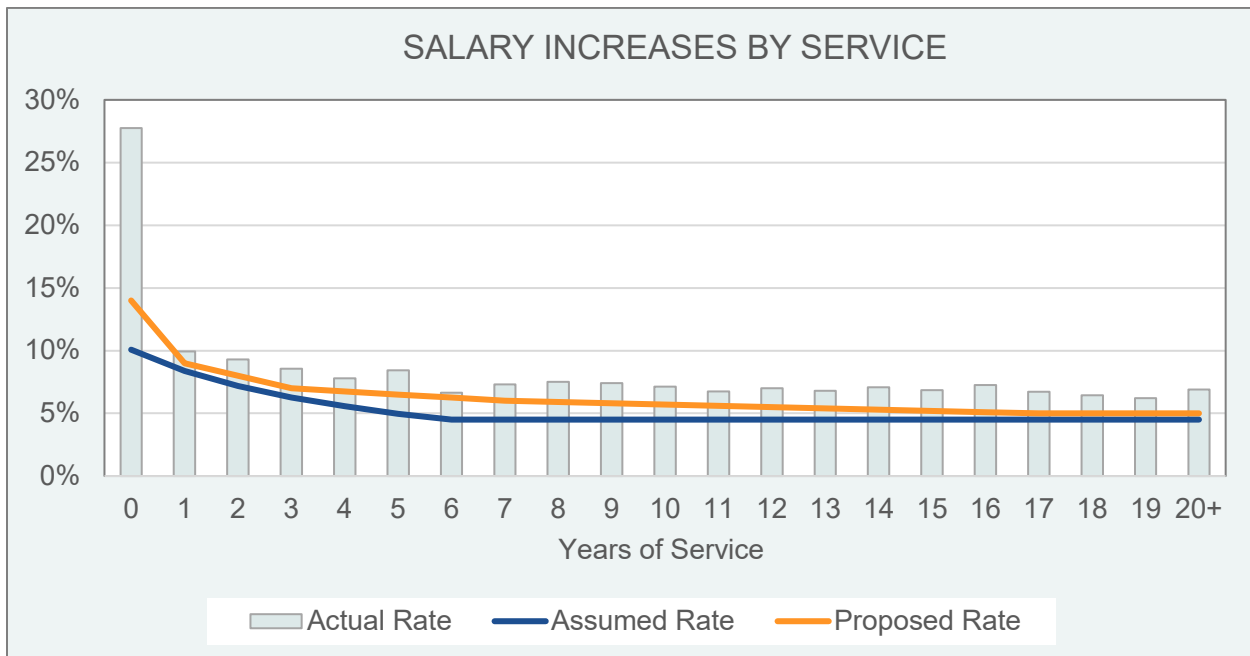




SECTION III – DEMOGRAPHIC ASSUMPTIONS

Public Safety Members (FURS, GWPORS, HPORS, MPORS, and SRS)

In order to increase the credibility of the data, we have combined all the public safety plans together in performing this analysis. The analysis of salary increases of the combined Public Safety members yielded an actual/expected ratio of 103.8%. A ratio more than 100% indicates that salary increases in general were more than anticipated by the current assumption for the public safety plans. In Section II of this report, we recommended an increase in the wage base component of the total salary increase assumption. In addition, we recommend adjusting the merit component of the salary scale assumption to reflect recent experience for lengths of service greater than seven years to match recent experience.



The actual/expected ratio based on the recommended assumption is 102.6% compared to 103.8% based on the current assumption.

It should be noted that each public safety plan was analyzed separately as well as together. All systems had a similar salary pattern during the study period, so we believe it is reasonable to analyze all public safety plans together.





SECTION III – DEMOGRAPHIC ASSUMPTIONS

MISCELLANEOUS ASSUMPTIONS

Percent Married: Currently, 100% of members are assumed to be married with the husband three years older than the wife. This is a common and reasonable assumption, and we recommend maintaining this assumption.

Interest on Member Contributions: Member contribution balances grow with interest each year. The current assumption is that the balances will grow at 2.50%. Each year the Board adopts a rate at which to credit interest on member account balances, but it is limited to 2.50%. We recommend maintaining the 2.50% assumption.

Actuarial Factors: The actuarial factors currently used by MPERA are based on the mortality tables and investment return used in the valuation. We recommend that the factors be revised based on the mortality tables and investment return adopted for the valuation.





SECTION IV – ACTUARIAL METHODS

Actuarial valuations utilize methods to determine the liabilities, assets, and costs of the systems. While these are not like other assumptions that may change over time, an experience study is still a good opportunity to review these methods to see if they are still appropriate for systematically funding the promised benefits. Significant methods are described below.

Actuarial Cost Method: The cost method is used to allocate the present value of benefits between past service (actuarial accrued liability) and future service (normal cost). Currently, the valuation applies the entry age normal cost method. This is the most widely used cost method of large public sector plans and has demonstrated the highest degree of stability as compared to alternative methods. We recommend no change in the use of this method.

Actuarial Value of Assets: The purpose of asset smoothing is to dampen the impact that market volatility has on valuation results by spreading the unexpected market gains and losses over several years. Currently, the System uses a smoothing method that recognizes 25% of the difference between the assumed rate of return on the market value of assets and the actual rate of return on the market value of assets. We recommend no change to the current method at this time.

Amortization Method: The unfunded actuarial accrued liability is amortized using a level percentage of payroll method over the amortization period as a single base. Under the level percentage of payroll method, amortization payments will not be large enough to cover interest on the UAAL in the beginning of the amortization schedule, which means that as a dollar amount the UAAL is expected to grow. After a period of time, amortization payments will be large enough that the amortization payments will cover both interest and principal, and the UAAL as a dollar amount will be projected to decrease in each subsequent year. We recommend no change in the use of this method.

The payroll growth assumption is used to determine the percentage of payroll required over the remaining amortization period to fully amortize the unfunded liability. As previously discussed, we recommend reducing this assumption from 3.25% to 3.00% for HPORS, to 2.25% for JRS and retaining 3.25% for all other plans.

Amortization payments are calculated as increasing each year. If future experience follows the actuarial assumptions, this should result in amortization payments that align with the assumed growth in overall compensation. It is important to note, that the normal cost rate for new hires is less than the current members. As members terminate or retire and are replaced with a new hire with a lower normal cost rate, more of the employer contribution will be available to amortize the unfunded accrued liability. As a result, the effective amortization period is less than the amortization period calculated in the actuarial valuation which does not reflect new hires.





APPENDIX A – HISTORICAL JUNE CPI (U) INDEX

Year	CPI (U)	Year	CPI (U)
1970	38.80	1998	166.20
1971	40.60	1999	172.40
1972	41.70	2000	178.00
1973	44.20	2001	179.90
1974	49.00	2002	183.70
1975	53.60	2003	189.70
1976	56.80	2004	194.50
1977	60.70	2005	202.90
1978	65.20	2006	208.35
1979	72.30	2007	218.82
1980	82.70	2008	215.69
1981	90.60	2009	217.96
1982	97.00	2010	217.97
1983	99.50	2011	225.72
1984	103.70	2012	229.48
1985	107.60	2013	233.50
1986	109.50	2014	238.34
1987	113.50	2015	238.64
1988	118.00	2016	241.02
1989	124.10	2017	244.96
1990	136.00	2018	251.99
1991	140.20	2019	256.14
1992	144.40	2020	257.80
1993	148.00	2021	271.70
1994	152.50	2022	296.31
1995	156.70	2023	305.11
1996	160.30	2024	314.18
1997	163.00	2025	322.56





Survey of Capital Market Assumptions: 2025 Edition

Rates of Return by Asset Class

Asset Class	Target Allocation	Long-Term Expected Real Rate of Return
US Equity - Large Cap	22.3%	5.88%
US Equity - Small/Mid Cap	4.3%	6.94%
Non-US Equity - Developed	11.9%	6.55%
Non-US Equity - Emerging	3.4%	8.22%
US Corporate Bonds - Core	13.4%	2.87%
US Corporate Bonds - Long	0.0%	3.39%
US Corporate Bonds - High Yield	3.3%	4.41%
Non-US Debt - Developed	2.5%	1.88%
Non-US Debt - Emerging	1.2%	4.46%
US Treasuries (Cash	2.6%	1.20%
TIPS (Inflation-Protected)	0.2%	2.20%
Real Estate	11.9%	5.18%
Hedge Funds	0.0%	4.16%
Commodities	2.8%	3.96%
Infrastructure	3.1%	6.24%
Private Equity	12.5%	9.73%
Private Debt	4.7%	6.30%
Total	100.0%	



APPENDIX C – SOCIAL SECURITY ADMINISTRATION WAGE INDEX



SOCIAL SECURITY ADMINISTRATION WAGE INDEX

Year	Wage Index	Annual Increase	Year	Wage Index	Annual Increase
1965	4,658.72		1995	24,705.66	4.01%
1966	4,938.36	6.00%	1996	25,913.90	4.89
1967	5,213.44	5.57	1997	27,426.00	5.84
1968	5,571.76	6.87	1998	28,861.44	5.23
1969	5,893.76	5.78	1999	30,469.84	5.57
1970	6,186.24	4.96	2000	32,154.82	5.53
1971	6,497.08	5.02	2001	32,921.92	2.39
1972	7,133.80	9.80	2002	33,252.09	1.00
1973	7,580.16	6.26	2003	34,064.95	2.44
1974	8,030.76	5.94	2004	35,648.55	4.65
1975	8,630.92	7.47	2005	36,952.94	3.66
1976	9,226.48	6.90	2006	38,651.41	4.60
1977	9,779.44	5.99	2007	40,405.48	4.54
1978	10,556.03	7.94	2008	41,334.97	2.30
1979	11,479.46	8.75	2009	40,711.61	-1.51
1980	12,513.46	9.01	2010	41,673.83	2.36
1981	13,773.10	10.07	2011	42,979.61	3.13
1982	14,531.34	5.51	2012	44,321.67	3.12
1983	15,239.24	4.87	2013	44,888.16	1.28
1984	16,135.07	5.88	2014	46,481.52	3.55
1985	16,822.51	4.26	2015	48,098.63	3.48
1986	17,321.82	2.97	2016	48,642.15	1.13
1987	18,426.51	6.38	2017	50,321.89	3.45
1988	19,334.04	4.93	2018	52,145.80	3.62
1989	20,099.55	3.96	2019	54,099.99	3.75
1990	21,027.98	4.62	2020	55,628.60	2.83
1991	\$21,811.60	3.73	2021	60,575.07	8.89
1992	22,935.42	5.15	2022	63,795.13	5.32
1993	23,132.67	0.86	2023	66,621.80	4.43
1994	23,753.53	2.68	2024	69,846.57	4.84





APPENDIX D – RECOMMENDED ACTUARIAL ASSUMPTIONS

MONTANA PUBLIC EMPLOYEE’S RETIREMENT SYSTEM

SUMMARY OF RECOMMENDED ACTUARIAL ASSUMPTIONS

Economic Assumptions

Investment Return: 7.30% net of expenses, compounded annually

Salary Increases: Sample rates below, plus an annual inflation rate of 2.75% and real wage growth rate of 1.00%:

<u>Service Years</u>	<u>Individual Merit & Longevity</u>	<u>Total Salary Increase</u>
0 – 1	6.25%	10.00%
1 – 2	4.75	8.50
2 – 3	3.75	7.50
3 – 4	3.25	7.00
4 – 5	2.75	6.50
5 – 6	2.25	6.00
6 – 7	1.75	5.50
7 – 8	1.25	5.00
8 – 15	0.75	4.50
16 &	0.25	4.00

Payroll Growth: 3.25% per year



APPENDIX D – RECOMMENDED ACTUARIAL ASSUMPTIONS



MONTANA PUBLIC EMPLOYEE'S RETIREMENT SYSTEM

Demographic Assumptions

Retirement Rates: Sample rates per 1,000 members

<u>Age</u>	<u>Less than 30 years of</u>	<u>30 or more years of service or age 60 25 years of service</u>
<50	0	100
50-54	45	180
55	45	200
56	55	200
57	60	200
58	60	200
59	60	200
60	70	200
61	93	200
62	93	200
63	150	200
64	150	200
65	150	420
66	300	380
67	300	350
68	350	350
69	270	250
70 &	1,000	1,000





MONTANA PUBLIC EMPLOYEE’S RETIREMENT SYSTEM

Demographic Assumptions (continued)

Mortality Rates

Active participants	PUB 2016 General Amount Weighted Employee Mortality. Projected generationally using MP-2021.
Disabled pensioners	PUB 2016 General Amount Weighted Disabled Retiree Mortality with ages set forward 1 year for males and females.
Contingent Survivor pensioners	PUB 2016 General Amount Weighted Contingent Survivor Mortality with ages set forward 1 year for males and females. Projected generationally using MP-2021.
Retired Healthy pensioners	PUB 2016 General Amount Weighted Healthy Retiree Mortality Table with ages set forward 1 year and adjusted 104% for males and 103% for females. Projected generationally using MP-2021.

Disability Rates:

Sample disability rates per 1,000 members

Nearest	
<u>Age</u>	<u>Male</u>
22	0.00
27	0.04
32	0.04
37	0.04
42	0.16
47	0.40
52	0.71
57	1.00
60	1.44
62	0.00



APPENDIX D – RECOMMENDED ACTUARIAL ASSUMPTIONS



MONTANA PUBLIC EMPLOYEE'S RETIREMENT SYSTEM

Demographic Assumptions (continued)

Withdrawal Rates:

Sample withdrawal rates per 1000 members

<u>Service</u>	<u>Members Rates of</u>
0 – 1	350
1 – 2	270
2 – 3	180
3 – 4	140
4 – 5	110
5 – 6	110
6 – 7	100
7 – 8	90
8 – 9	80
9 – 10	70
10 – 11	65
11 – 12	60
12 – 13	55
13 – 14	50
14 – 15	50
15 – 16	45
16 – 17	40
17 – 18	35
18 – 19	30
19 – 20	28
20 & Over	25

Marital Status:

Percentage Married

100%

Age difference

Males are assumed to be three years older than spouses.

Form of Payment:

Participants are assumed to elect a life-only form of payment.





JUDGES' RETIREMENT SYSTEM

SUMMARY OF ACTUARIAL ASSUMPTIONS

Economic Assumptions

Investment Return:	7.30% net of expenses, compounded annually
Salary Increases:	Increase 3.75% yearly (based on an annual inflation rate of 2.75% and 1.00% real wage growth) with no increases assumed for merit and seniority.
Payroll Growth:	2.25% per year

Demographic Assumptions

Retirement Rates: Sample rates per 1,000 members

<u>Age</u>	<u>Rates</u>
60	100
61	100
62	100
63	100
64	100
65	200
66	200
67	200
68	200
69	200
70 & Over	1,000





JUDGES' RETIREMENT SYSTEM

Demographic Assumptions (continued)

Mortality Rates

Active participants	PUB 2016 General Amount Weighted Employee Mortality. Projected generationally using MP-2021.
Disabled pensioners	PUB 2016 General Amount Weighted Disabled Retiree Mortality with ages set forward 1 year for males and females.
Contingent Survivor pensioners	PUB 2016 General Amount Weighted Contingent Survivor Mortality with ages set forward 1 year for males and females. Projected generationally using MP-2021.
Retired Healthy pensioners	PUB 2016 General Amount Weighted Healthy Retiree Mortality Table with ages set forward 1 year for males and females. Projected generationally using MP-2021.

Disability Rates:

Sample disability rates per 1,000 members

Nearest	
<u>Age</u>	<u>Male</u>
22	0.00
27	0.04
32	0.04
37	0.04
42	0.16
47	0.40
52	0.71
57	1.00
60	1.44
62	0.00





JUDGES' RETIREMENT SYSTEM

Demographic Assumptions (continued)

Withdrawal Rates: No terminations are assumed other than for retirement, death or disability.

Marital Status:

Percentage Married 100%

Age difference Males are assumed to be four years older than spouses.

Form of Payment: Participants are assumed to elect a life-only form of payment.





SHERIFFS' RETIREMENT SYSTEM

SUMMARY OF ACTUARIAL ASSUMPTIONS

Economic Assumptions

Investment Return: 7.30% net expenses, compounded annually

Salary Increases: Sample rates below, plus an annual inflation rate of 2.75% and real wage growth rate of 1.00%:

<u>Service Years</u>	<u>Individual Merit & Longevity</u>	<u>Total Salary Increase</u>
0 – 1	10.25%	14.00%
1 – 2	5.25	9.00
2 – 3	4.25	8.00
3 – 4	3.25	7.00
4 – 5	3.00	6.75
5 – 6	2.75	6.50
6 – 7	2.50	6.25
7 – 8	2.25	6.00
8 – 9	2.15	5.90
9 – 10	2.05	5.80
10 – 11	1.95	5.70
11 – 12	1.85	5.60
12 – 13	1.75	5.50
13 – 14	1.65	5.40
14 – 15	1.55	5.30
15 – 16	1.45	5.20
17 – 17	1.35	5.10
17 & Over	1.25	5.00

Payroll Growth: 3.25% per year





APPENDIX D – RECOMMENDED ACTUARIAL ASSUMPTIONS

SHERIFFS’ RETIREMENT SYSTEM

Demographic Assumptions

Retirement Rates: Sample rates per 1,000 members

<u>Service</u>	<u>Less than Age 65</u>	<u>Age 65 & Over</u>
< 20	0	0
20	410	410
21 & Over -	210	210

Mortality Rates

Active participants	PUB 2016 Public Safety Amount Weighted Employee Mortality for males and females. Projected generationally using MP-2021.
Disabled pensioners	PUB 2016 Public Safety Amount Weighted Disabled Retiree Mortality set forward two years for males.
Contingent Survivor pensioners	PUB 2016 Public Safety Amount Weighted Contingent Survivor Mortality, set forward two years for males. Projected generationally using MP-2021.
Retired Healthy pensioners	PUB 2016 Safety Amount Weighted Healthy Retiree Mortality Table, set forward two years for males. Projected generationally using MP-2021.





APPENDIX D – RECOMMENDED ACTUARIAL ASSUMPTIONS

Disability Rates:

Sample disability rates per 1,000 members

Nearest	
<u>Age</u>	<u>Male</u>
22	0.0
27	1.1
32	1.1
37	1.1
42	3.7
47	3.7
52	3.7
57	3.6
62	0.0

Withdrawal Rates:

Sample withdrawal rates per 1000 members

<u>Service</u>	<u>Members Rates of Termination</u>
0 – 1	260
1 – 2	230
2 – 3	200
3 – 4	180
4 – 5	150
5 – 6	130
6 – 7	110
7 – 8	100
8 – 10	90
10 – 13	80
13 – 15	70
15 & Over	45





APPENDIX D – RECOMMENDED ACTUARIAL ASSUMPTIONS

Marital Status:

Percentage Married	100%
Age difference	Males are assumed to be three years older than spouses.

Form of Payment:

Participants are assumed to elect a life-only form of payment.





GAME WARDENS' AND PEACE OFFICERS' RETIREMENT SYSTEM

SUMMARY OF ACTUARIAL ASSUMPTIONS

Economic Assumptions

Investment Return: 7.30% net of expenses, compounded annually

Salary Increases: Sample rates below, plus an annual inflation rate of 2.75% and real wage growth of 1.00%:

<u>Service Years</u>	<u>Individual Merit & Longevity</u>	<u>Total Salary Increase</u>
0 – 1	10.25%	14.00%
1 – 2	5.25	9.00
2 – 3	4.25	8.00
3 – 4	3.25	7.00
4 – 5	3.00	6.75
5 – 6	2.75	6.50
6 – 7	2.50	6.25
7 – 8	2.25	6.00
8 – 9	2.15	5.90
9 – 10	2.05	5.80
10 – 11	1.95	5.70
11 – 12	1.85	5.60
12 – 13	1.75	5.50
13 – 14	1.65	5.40
14 – 15	1.55	5.30
15 – 16	1.45	5.20
17 – 17	1.35	5.10
17 & Over	1.25	5.00

Payroll Growth: 3.25% per year





GAME WARDENS' AND PEACE OFFICERS' RETIREMENT SYSTEM

Demographic Assumptions

Retirement Rates: Sample rates per 1,000 members

<u>Service</u>	<u>Less than Age 65</u>	<u>Age 65 & Over</u>
< 20	0	1,000
20	370	1,000
21	330	1,000
22	270	1,000
23 & Over	250	1,000

Mortality Rates

Active participants	PUB 2016 Public Safety Amount Weighted Employee Mortality for males and females. Projected generationally using MP-2021.
Disabled pensioners	PUB 2016 Public Safety Amount Weighted Disabled Retiree Mortality set forward two years for males.
Contingent Survivor pensioners	PUB 2016 Public Safety Amount Weighted Contingent Survivor Mortality, set forward two years for males. Projected generationally using MP-2021.
Retired Healthy pensioners	PUB 2016 Safety Amount Weighted Healthy Retiree Mortality Table, set forward two years for males. Projected generationally using MP-2021.





APPENDIX D – RECOMMENDED ACTUARIAL ASSUMPTIONS

GAME WARDENS' AND PEACE OFFICERS' RETIREMENT SYSTEM

Demographic Assumptions (continued)

Disability Rates:

Sample disability rates per 1,000 members

Nearest	
<u>Age</u>	<u>Male</u>
22	0.0
27	1.1
32	1.1
37	1.1
42	3.7
47	3.7
52	3.7
57	3.6
62	0.0



APPENDIX D – RECOMMENDED ACTUARIAL ASSUMPTIONS



GAME WARDENS' AND PEACE OFFICERS' RETIREMENT SYSTEM

Demographic Assumptions (continued)

Withdrawal Rates:

Sample withdrawal rates per 1,000 members

<u>Service</u>	<u>Members Rates of Termination</u>
0 – 1	300
1 – 2	250
2 – 3	180
3 – 4	150
4 – 5	130
5 – 8	100
8 – 12	80
12 – 17	50
17 & Over	30

Marital Status:

Percentage Married

100%

Age difference

Males are assumed to be three years older than spouses.

Form of Payment:

Participants are assumed to elect a life-only form of payment.





HIGHWAY PATROL OFFICERS' RETIREMENT SYSTEM

SUMMARY OF ACTUARIAL ASSUMPTIONS

Economic Assumptions

Investment Return: 7.30% net of expenses, compounded annually

Salary Increases: Sample rates below, plus an annual inflation rate of 2.75% and real wage growth of 1.00%:

<u>Service Years</u>	<u>Individual Merit & Longevity</u>	<u>Total Salary Increase</u>
0 – 1	10.25%	14.00%
1 – 2	5.25	9.00
2 – 3	4.25	8.00
3 – 4	3.25	7.00
4 – 5	3.00	6.75
5 – 6	2.75	6.50
6 – 7	2.50	6.25
7 – 8	2.25	6.00
8 – 9	2.15	5.90
9 – 10	2.05	5.80
10 – 11	1.95	5.70
11 – 12	1.85	5.60
12 – 13	1.75	5.50
13 – 14	1.65	5.40
14 – 15	1.55	5.30
15 – 16	1.45	5.20
17 – 17	1.35	5.10
17 & Over	1.25	5.00

Payroll Growth: 3.00% per year





HIGHWAY PATROL OFFICERS' RETIREMENT SYSTEM

Demographic Assumptions

Retirement Rates: Sample rates per 1,000 members

<u>Service</u>	<u>Less than Age 60</u>	<u>Age 60 & Over</u>
< 20	0	1,000
20-22	500	1,000
23 & Over	400	1,000

Mortality Rates

Active participants	PUB 2016 Public Safety Amount Weighted Employee Mortality for males and females. Projected generationally using MP-2021.
Disabled pensioners	PUB 2016 Public Safety Amount Weighted Disabled Retiree Mortality set forward two years for males.
Contingent Survivor pensioners	PUB 2016 Public Safety Amount Weighted Contingent Survivor Mortality, set forward two years for males. Projected generationally using MP-2021.
Retired Healthy pensioners	PUB 2016 Safety Amount Weighted Healthy Retiree Mortality Table, set forward two years for males. Projected generationally using MP-2021.





APPENDIX D – RECOMMENDED ACTUARIAL ASSUMPTIONS

HIGHWAY PATROL OFFICERS’ RETIREMENT SYSTEM

Demographic Assumptions (continued)

Disability Rates: Sample disability rates per 1,000 members

Nearest	
<u>Age</u>	<u>Male</u>
22	0.0
27	1.1
32	1.1
37	1.1
42	3.7
47	3.7
52	3.7
57	3.6
62	0.0

Withdrawal Rates: Sample withdrawal rates per 1,000 members

<u>Service</u>	<u>Members Rates of Termination</u>
0 – 1	120
1 – 4	75
4 – 10	55
10 – 15	30
15 & Over	10

Marital Status:

Percentage Married 100%

Age difference Males are assumed to be three years older than spouses.

Form of Payment: Participants are assumed to elect a life-only form of payment.





MUNICIPAL POLICE OFFICERS' RETIREMENT SYSTEM

SUMMARY OF ACTUARIAL ASSUMPTIONS

Economic Assumptions

Investment Return: 7.30% net of expenses, compounded annually

Salary Increases: Sample rates below, plus an annual inflation rate of 2.75% and real wage growth of 1.00%:

<u>Service Years</u>	<u>Individual Merit & Longevity</u>	<u>Total Salary Increase</u>
0 – 1	10.25%	14.00%
1 – 2	5.25	9.00
2 – 3	4.25	8.00
3 – 4	3.25	7.00
4 – 5	3.00	6.75
5 – 6	2.75	6.50
6 – 7	2.50	6.25
7 – 8	2.25	6.00
8 – 9	2.15	5.90
9 – 10	2.05	5.80
10 – 11	1.95	5.70
11 – 12	1.85	5.60
12 – 13	1.75	5.50
13 – 14	1.65	5.40
14 – 15	1.55	5.30
15 – 16	1.45	5.20
17 – 17	1.35	5.10
17 & Over	1.25	5.00

Payroll Growth: 3.25% per year



APPENDIX D – RECOMMENDED ACTUARIAL ASSUMPTIONS



MUNICIPAL POLICE OFFICERS' RETIREMENT SYSTEM

Demographic Assumptions

Retirement Rates: Sample rates per 1,000 members

<u>Service</u>	<u>Less than Age 65</u>	<u>Age 65 & Over</u>
<20	0	1,000
20	550	1,000
21 - 24	320	1,000
25	450	1,000
26 & Over	190	1,000

Mortality Rates

Active participants	PUB 2016 Public Safety Amount Weighted Employee Mortality for males and females. Projected generationally using MP-2021.
Disabled pensioners	PUB 2016 Public Safety Amount Weighted Disabled Retiree Mortality set forward two years for males.
Contingent Survivor pensioners	PUB 2016 Public Safety Amount Weighted Contingent Survivor Mortality, set forward two years for males. Projected generationally using MP-2021.
Retired Healthy pensioners	PUB 2016 Safety Amount Weighted Healthy Retiree Mortality Table, set forward two years for males. Projected generationally using MP-2021.





APPENDIX D – RECOMMENDED ACTUARIAL ASSUMPTIONS

MUNICIPAL POLICE OFFICERS’ RETIREMENT SYSTEM

Demographic Assumptions (continued)

Disability Rates:

Sample disability rates per 1000 members

Nearest	
<u>Age</u>	<u>Male</u>
22	0.0
27	1.1
32	1.1
37	1.1
42	3.7
47	3.7
52	3.7
57	3.6
62	0.0

Withdrawal Rates:

Sample withdrawal rates per 1000 members

<u>Service</u>	<u>Members Rates of Termination</u>
0 – 1	160
1 – 2	130
2 – 3	100
3 – 4	80
4 – 8	70
8 – 11	50
11 – 15	30
15 & Over	20

Marital Status:

Percentage Married

100%

Age difference

Males are assumed to be three years older than spouses.

Form of Payment:

Participants are assumed to elect a life-only form of payment.





FIREFIGHTERS' UNIFIED RETIREMENT SYSTEM

SUMMARY OF ACTUARIAL ASSUMPTIONS

Economic Assumptions

Investment Return: 7.30% net of expenses, compounded annually

Salary Increases: Sample rates below, plus an annual inflation rate of 2.75% and real wage growth of 1.00%:

<u>Service Years</u>	<u>Individual Merit & Longevity</u>	<u>Total Salary Increase</u>
0 – 1	10.25%	14.00%
1 – 2	5.25	9.00
2 – 3	4.25	8.00
3 – 4	3.25	7.00
4 – 5	3.00	6.75
5 – 6	2.75	6.50
6 – 7	2.50	6.25
7 – 8	2.25	6.00
8 – 9	2.15	5.90
9 – 10	2.05	5.80
10 – 11	1.95	5.70
11 – 12	1.85	5.60
12 – 13	1.75	5.50
13 – 14	1.65	5.40
14 – 15	1.55	5.30
15 – 16	1.45	5.20
17 – 17	1.35	5.10
17 & Over	1.25	5.00

Payroll Growth: 3.25% per year





APPENDIX D – RECOMMENDED ACTUARIAL ASSUMPTIONS

FIREFIGHTERS’ UNIFIED RETIREMENT SYSTEM

Demographic Assumptions

Retirement Rates: Sample rates per 1,000 members

<u>Service</u>	<u>Less than Age 65</u>	<u>Age 65 & Over</u>
<20	0	1,000
20	160	1,000
21 - 25	130	1,000
25 & Over	240	1,000

Mortality Rates

Active participants	PUB 2016 Public Safety Amount Weighted Employee Mortality for males and females. Projected generationally using MP-2021.
Disabled pensioners	PUB 2016 Public Safety Amount Weighted Disabled Retiree Mortality set forward two years for males.
Contingent Survivor pensioners	PUB 2016 Public Safety Amount Weighted Contingent Survivor Mortality, set forward two years for males. Projected generationally using MP-2021.
Retired Healthy pensioners	PUB 2016 Safety Amount Weighted Healthy Retiree Mortality Table, set forward two years for males. Projected generationally using MP-2021.



APPENDIX D – RECOMMENDED ACTUARIAL ASSUMPTIONS



FIREFIIGHTERS' UNIFIED RETIREMENT SYSTEM

Demographic Assumptions (continued)

Disability Rates:

Sample disability rates per 1,000 members

Nearest	
<u>Age</u>	<u>Male</u>
22	0.0
27	1.1
32	1.1
37	1.1
42	3.7
47	3.7
52	3.7
57	3.6
62	0.0

Withdrawal Rates:

Sample withdrawal rates per 1,000 members

<u>Service</u>	<u>Rates of Termination</u>
0 – 1	80
1 – 2	100
2 – 3	60
3 – 4	50
4 – 5	45
5 – 6	40
6 – 7	30
7 – 15	20
15 & Over	15

Marital Status:

Percentage Married

100%

Age difference

Males are assumed to be three years older than spouses.

Form of Payment:

Participants are assumed to elect a life-only form of payment.





VOLUNTEER FIREFIGHTERS' COMPENSATION ACT

SUMMARY OF ACTUARIAL ASSUMPTIONS

Economic Assumptions

Investment Return: 7.30% net of expenses, compounded annually

Demographic Assumptions

Retirement Rates: Sample rates per 1,000 members

Age	10 – 19 years of service	20 or more years of
<55	0	0
55 – 56	0	320
57 – 60	0	250
60 – 69	200	250
70 & Over	1,000	1,000

Mortality Rates

Active participants	PUB 2016 Public Safety Amount Weighted Employee Mortality for males and females. Projected generationally using MP-2021.
Disabled pensioners	PUB 2016 Public Safety Amount Weighted Disabled Retiree Mortality set forward two years for males.
Contingent Survivor pensioners	PUB 2016 Public Safety Amount Weighted Contingent Survivor Mortality, set forward two years for males. Projected generationally using MP-2021.
Retired Healthy pensioners	PUB 2016 Safety Amount Weighted Healthy Retiree Mortality Table, set forward two years for males. Projected generationally using MP-2021.



APPENDIX D – RECOMMENDED ACTUARIAL ASSUMPTIONS



VOLUNTEER FIREFIGHTERS' COMPENSATION ACT

Demographic Assumptions (continued)

Disability Rates: None

Withdrawal Rates: Sample withdrawal rates per 1,000 members

<u>Service</u>	<u>Members Rates of Termination</u>
0 – 8	230
8 – 9	200
9 – 10	170
10 – 14	150
14 – 26	130
26 & Over	100

Marital Status:

Percentage Married 100%

Age difference Males are assumed to be three years older than spouses.

Form of Payment: Participants are assumed to elect a life-only form of payment.

