Employees' Retirement System of Rhode Island

Actuarial Experience Investigation for the Period Ending June 30, 2022

P: 469.524.0000 | www.grsconsulting.com

May 25, 2023

Retirement Board
50 Service Avenue, 2nd Floor
Warwick, RI 02886-1021

Subject: Results of 2023 Actuarial Experience Study for ERSRI

Dear Members of the Board:

We are pleased to present our report on the results of the 2023 Actuarial Experience Investigation Study for the Employees' Retirement System of Rhode Island (ERSRI). It includes a discussion of recent experience, it presents our recommendations for new actuarial assumptions and methods, and it provides information about the actuarial impact of these recommendations on the liabilities and other key actuarial measures. This report contains the results of the experience study for all groups covered under ERSRI, including State Employees, Teachers, MERS, State Police, State Judges, and the Teacher Survivor Benefit Plan.

Using the recommended set of actuarial assumptions should present a more accurate portrayal of ERSRI's financial condition and should reduce the magnitude of future experience gains and losses.

This study was conducted in accordance with generally accepted actuarial principles and practices, and with the Actuarial Standards of Practice issued by the Actuarial Standards Board. The undersigned meet all of the Qualification Standards of the American Academy of Actuaries. In addition, the undersigned have extensive experience as retained public sector actuaries for several large, statewide public retirement systems.

We wish to thank the ERSRI staff for their assistance in providing data for this study.

Respectfully submitted,

Joseph P. Newton, FSA, MAAA, EA
Pension Market Leader and Actuary

Paul T. Wood, ASA, MAAA, FCA
Senior Consultant and Actuary

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EXECUTIVE SUMMARY

Section I
Summary of Recommendations

Our recommended changes to the current actuarial assumptions may be summarized as follows:

I. Decrease individual salary increases and projected payroll growth for most groups. These two items mainly offset each other in calculating the contribution requirements, especially as dollar amounts. But create a much lower projected annual growth rate in the dollar amounts of contributions.
II. Update the mortality projection scales to the ultimate rates of the most recently published projection scales. This had no material impact to the liabilities or contributions.
III. Increase probabilities of turnover before retirement for most groups.
IV. Slight increase probabilities of retirement for MERS units and State Employees.
V. Slight increase to the probabilities of disability for most groups.
VI. Reduce the credit given to overfunded units to sustain their current surplus.

The net impact to the valuation process is a slight decrease in liabilities and costs for most groups. The contribution as a rate of pay for the State does increase, but the change in dollar amount is modest, and when combined with the 40% responsibility for Teachers, the budget impact to the State in FY2026 is a slight decrease. More importantly, the projected rates of growth in the dollar amounts will be significantly lower. For example, the projected annual rate of growth in dollar contributions for State will decrease from the currently projected 2.57% to 2.12% per year and lower the likelihood of contribution rate increases in the future. The following is a brief summary of our findings.

Economic Assumptions

1. We find the current 2.50% general inflation assumption reasonable. We do find that several of the expectations from forward looking sources are lower than the 2.50%, but recent experience has exceeded the 2.50% and most of the sources have increased since the previous study. Also, the formula for post-retirement benefit adjustments is partially based on actual inflation results, thus the risk to liability growth is tilted towards higher inflation versus lower. For this reason, we would recommend having an assumption higher in the range of reasonable assumptions.

2. We find the current 7.00% investment return assumption reasonable and recommend no change. Based on the current target portfolio and capital market expectations used by the SIC in their asset allocation study, based on a blend of three investment consultants for the Rhode Island SIC, the median expected return net of all expenses is 7.4% over a ten-year period. GRS' own survey of capital market expectations produces an expected return of 7.36%, right in line with the SIC's information. This produces a 53% probability of achieving a 7.0% return over the 10-years. These forward-looking expectations have been quite volatile, ranging from 6.1% to 7.4% at various points over the last three years. This type of precision and volatility is appropriate for the use by the SIC in its investment decisions because they are always interacting with current market prices and expectations over a given investment cycle. However, for use in setting the contribution requirements and funding patterns over a number of years, consistency around a single number that is in the middle of the range is more

appropriate. Please note this assumption is net of administrative expenses, which are assumed to be 0.10% of plan assets per annum.

3. The assumed salary increase schedules for individuals include an ultimate component that begins with the general wage inflation assumption of 3.0% and may add (or subtract) on additional increases for individual merit (which would include promotions) and then an additional component for step rates based on service. Generally, we are recommending a decrease of about 0.25% per year to most groups. The actual salary increases over the past decade have been 0.50%-0.75% lower than current assumptions, but much of that is the inclusion of fiscal years 2013 and 2014 which had very low increases coming out of the Great Recession. Increases over the last 8 years have been closer to current expectations, but still consistently lower. That said, salaries in the data gathering processes are slow to react to new inflation and labor market conditions, so it is possible there are higher wage increases coming over the short term.

4. In conjunction with the lower salary increase assumptions and higher turnover patterns discussed below, we are recommending a 0.50% decrease in the payroll growth rate assumptions for all groups. This produces a 2.50% annual expected payroll growth for all groups (equal to the inflation assumption) except for Teachers, which will lower to 2.0%. Changing the payroll growth assumption has no impact on the liabilities, but does assume there is lower growth in the future payroll to amortize the UAAL, which results in an increase in the current contribution requirements.

5. We recommend no change in the assumption for the contingent post-retirement benefit adjustments of 2.10% per year.

Mortality Assumptions

6. Experience was slightly higher than the current assumptions, mainly due to the last three years of experience during the pandemic. We have chosen to leave the base tables unchanged to wait for more data. In addition, the current assumptions include provisions for further improvement into the future. In 2020 new projection scales used to project this future mortality improvement were issued by the Society of Actuaries with several pages of rationale and disclosure of the process used to generate new long-term rates. The ultimate mortality improvement rates were modified to be higher at some ages and more precise across different age groups based on historical trends. In general, the net change in overall liabilities if a retirement system was using the ultimate rates of the MP-2019 table to the ultimate rates of the MP-2020 version is minimal. Basically, the rates at individual ages were changed but the overall pattern over a lifetime is not much different. We recommend updating to the most recent projection scales.

7. We recommend no change to the post-retirement mortality tables for disabled retirees, except for updating the projection scales as discussed above.

8. We recommend no change to mortality tables for active members, except for updating the projection scales as discussed above.

Other Demographic Assumptions

9. We recommend increasing the probabilities of retirement by 2% across points of service for MERS Police and Fire units and by 5% for all ages past age 62 for State Employees. We recommend slightly simplifying the patterns for Teachers and General MERS.

10. We recommend increasing the probability of turnover for most groups. The experience was quite higher than the current assumptions, and has been trending higher. This change will decrease liabilities and contribution rates.

11. We recommend slightly increasing the probability of disability for most groups based on the experience of the individual group.

12. We recommend no change to the current marriage assumption and spousal age difference.

13. For the Teacher Survivor Benefit Plan, we recommend no modifications to the current marriage, refund, and number of children assumptions. The current assumptions were developed in the 2017 study based on recent elections for members of the Plan and data from the national census and find them to still be reasonable.

Actuarial Methods and Policies

14. We recommend no change to the current asset smoothing method.

15. We recommend no change to the current funding method. The individual Entry Age Normal cost method (EAN) is the current funding method being used to allocate the actuarial costs of the System. The Entry Age Normal method will generally produce relatively level contribution amounts as a percentage of payroll from year to year, and allocates costs among various generations of taxpayers in a reasonable manner. It is by far the most commonly used actuarial cost method for large public retirement systems. We continue to believe this is the most appropriate funding method.

16. We are recommending a slight adjustment to still give a credit to units that are overfunded, but only enough so that the proportionate amount of surplus would remain the same from year to year. For example, if a unit is currently 110% funded, the credit would be enough so that the unit would be expected to remain at 110% funded the next year. The current policy would give a credit large enough to actually be expected to decrease their surplus position over time.

Impact on Liabilities and Contributions

Item	Current Assumptions and Methods	Recommended Assumptions and Methods	Change
State Employees			
Unfunded actuarial accrued liability	$2,032 million	$2,041 million	$9 million
Funded ratio	58.8%	58.7%	-0.1%
Illustrated FY 2026 ARC	28.46%	29.26%	0.80%
Teachers			
Unfunded actuarial accrued liability	$2,735 million	$2,662 million	-$73 million
Funded ratio	61.5%	62.1%	0.6%
Illustrated FY 2026 ARC	24.99%	25.02%	0.04%
SPRBT			
Unfunded actuarial accrued liability	$21 million	$21 million	$0 million
Funded ratio	90.0%	90.0%	0.0%
Illustrated FY 2026 ARC	19.65%	20.25%	0.60%
JRBT			
Unfunded actuarial accrued liability	-$4 million	-$4 million	$0 million
Funded ratio	104.0%	104.4%	0.4%
Illustrated FY 2026 ARC	18.20%	17.80%	-0.40%
MERS General			
Unfunded actuarial accrued liability	$174 million	$171 million	-$3 million
Funded ratio	87.2%	87.4%	0.2%
Illustrated FY 2026 ARC	11.24%	11.38%	0.15%
MERS Police and Fire			
Unfunded actuarial accrued liability	$149 million	$147 million	-$2 million
Funded ratio	84.0%	84.2%	0.2%
Illustrated FY 2026 ARC	18.64%	18.77%	0.13%
Teacher Survivor Benefit Plan			
Unfunded actuarial accrued liability	-$176 million	-$183 million	-$6 million
Funded ratio	178.1%	183.3%	5.2%

SECTION II

INTRODUCTION

Section II
Introduction

Summary of Process

A periodic review and selection of the actuarial assumptions is one of many important components of understanding and managing the financial aspects of the Employees' Retirement System of Rhode Island (ERSRI). Use of outdated or inappropriate assumptions can result in understated costs which will lead to higher future contribution requirements or perhaps an inability to pay benefits when due; or, on the other hand, produce overstated costs which place an unnecessarily large burden on the current generation of members, employers, and taxpayers.

A single set of assumptions is typically not expected to be suitable forever. As the actual experience unfolds or the future expectations change, the assumptions should be reviewed and adjusted accordingly.

It is important to recognize that the impact from various outcomes and the ability to adjust from experience deviating from the assumption are not symmetric. Due to compounding economic forces, legal limitations, and moral obligations, outcomes from underestimating future liabilities are much more difficult to manage than outcomes of overestimates, and that un-symmetric risk should be considered when the assumption set, investment policy and funding policy are created. As such, the assumption set used in the valuation process needs to represent the best estimate of the future experience of the System and be at least as likely, if not more than likely, to overestimate the future liabilities versus underestimate them.

Using this strategic mindset, each assumption was analyzed compared to the actual experience of ERSRI and general experience of other large public employee retirement systems. Changes in certain assumptions and methods are suggested upon this comparison to remove any bias that may exist and to perhaps add in a slight margin for future adverse experience where appropriate. Next, the assumption set as a whole was analyzed for consistency and to ensure that the projection of liabilities was reasonable and consistent with historical trends.

The following report provides our recommended changes to the current actuarial assumptions.

In determining liabilities and contribution rates for retirement plans, actuaries must make assumptions about the future. Among the assumptions that must be made include:

- Retirement rates
- Mortality rates
- Turnover rates
- Disability rates
- Investment return rate
- Salary increase rates
- Inflation rate

For some of these assumptions, such as the mortality rates, past experience provides important evidence about the future. For others, such as the investment return assumption, the link between past and future results is much weaker. In either case, actuaries should review the plan's assumptions periodically and determine whether these assumptions are consistent with actual past experience and with anticipated future experience.

The last such actuarial experience investigation was performed in conjunction with the June 30, 2019 actuarial valuation. For this experience study, we have analyzed ERSRI's experience for all years through June 30, 2022 as applicable.

For most of the assumptions, the data was weighted by some way to reflect how the liability is changing or expected to change versus how individuals are behaving. The weighted analysis gives a better reflection of how actuarial gains or losses are being generated instead of just demographic reconciliation.

In conducting experience studies, actuaries generally use data over a period of several years. This is necessary in order to gather enough data so that the results are statistically significant. In addition, if the study period is too short, the impact of the current economic conditions may lead to misleading results. It is known, for example, that the health of the general economy can impact salary increase rates and withdrawal rates. Using results gathered during a short-term boom or bust will not be representative of the long-term trends in these assumptions. Also, the adoption of legislation, such as plan improvements or changes in salary schedules, will sometimes cause a short-term distortion in the experience. For example, if an early retirement window was opened during the study period, we would usually see a short-term spike in the number of retirements followed by a dearth of retirements for the following two-to-four years. Using a longer period prevents giving too much weight to such short-term effects. On the other hand, using a much longer period would water down real changes that may be occurring, such as mortality improvement or a change in the ages at which members retire. For this reason, we use different time periods for different assumptions.

The following is a list of the time periods utilized throughout the analysis.

Assumption	Data Used	Comment
Wage Inflation and Payroll Growth	20 Years	Long-term trends are needed, also prospective changes must be considered
Individual Salary Increases	10 Years	Longer period will capture a longer economic cycle
Termination	10 Years	Longer period will capture a longer economic cycle
Post-Retirement Mortality	9 Years	Longer period allows for low volatility in the assumption and more credibility.
All Other	6 Years	The assumptions react quicker to changing trends and are less correlated with the economic cycle

In an experience study, we first determine the number of deaths, retirements, etc. that occurred during the period. Then we determine the number expected to occur, based on the current actuarial assumptions. The number of "expected" decrements is determined by multiplying the probability of the occurrence at the given age, by the "exposures" at that same age. For example, let's look at a rate of retirement of 15% at age 55. The number of exposures can only be those members who are age 55 and eligible for retirement at that time. Thus they are considered "exposed" to that assumption. Finally, we calculate the A/E ratio, where "A" is the actual number (of retirements, for example) and "E" is the expected number. If the current assumptions were "perfect", the A/E ratio would be 100%. When it varies much from this figure, it is a sign that new assumptions may be needed. (However, in some cases we prefer to set our assumptions to produce an A/E ratio a little above or below 100%, in order to introduce some conservatism.) Of course we not only look at the assumptions as a whole, but we also review how well they fit the actual results by gender, by age, and by service.

If the data leads the actuary to conclude that new tables are needed, the actuary may "graduate" or smooth the results, since the raw results can be quite uneven from age to age or from service to service.

Please bear in mind that, while the recommended assumption set represents our best estimate, there are other reasonable assumptions sets that could be supported.

Organization of Report

Section III contains our findings and recommendations for each actuarial assumption. The impact of adopting our recommendations on liabilities and contribution rates is shown in Section IV. Section V summarizes the recommended changes. Section VI presents a summary of all the actuarial assumptions and methods, including the recommended changes. Finally, tables summarizing the analysis of the assumptions are in Section VII.

Section VII Exhibits

The exhibits in Section VII should generally be self-explanatory. For example, on page 52, we show the exhibit analyzing the termination rates for Teachers. The second column shows the total payroll for the Teachers who terminated during the study period. This excludes members who died, became disabled or retired. Column (3), labeled "Total Payroll Exposed" shows the total exposures. This is the amount of payroll that could have terminated during any of the years. On this exhibit, the exposures exclude anyone eligible for retirement. A member is counted in each year he could have terminated, so the total shown is the total exposures for the ten-year period used in the analysis. Column (4) shows the probability of termination based on the raw data. That is, it is the result of dividing the actual number of terminations (col. 2) by the number exposed (col. 3). Column (5) shows the current termination rate and column (6) shows the new recommended termination rate. Columns (7) and (8) show the expected numbers of terminations based on the current and proposed termination assumptions. Columns (9) and (10) show the Actual-to-Expected ratios under the current and proposed termination assumptions.

SECTION III

ANALYSIS OF EXPERIENCE AND RECOMMENDATIONS

Section III
Analysis of Experience and Recommendations

We will begin by discussing the economic assumptions: inflation, the investment return rate, the salary increase assumptions, the payroll growth rate, etc. Then we will discuss the demographic assumptions: mortality, disability, termination, retirement, etc. Finally, we will discuss the actuarial methods used.

Inflation and Investment Return Assumptions

Actuarial Standards of Practice (ASOP) No. 27, Selection of Economic Assumptions for Measuring Pension Obligations, provides guidance to actuaries on giving advice on selecting economic assumptions for measuring obligations for defined benefit plans.

Generally, the economic assumptions are much more subjective in nature than the demographic assumptions. As no one knows what the future holds, it is necessary for the actuary to estimate possible future economic outcomes. These estimates are based on a mixture of past experience, future expectations, and professional judgment. The actuary should consider a number of factors, including the purpose and nature of the measurement, and appropriate recent and long-term historical economic data. However, the standard explicitly advises the actuary not to give undue weight to recent and/or historical experience.

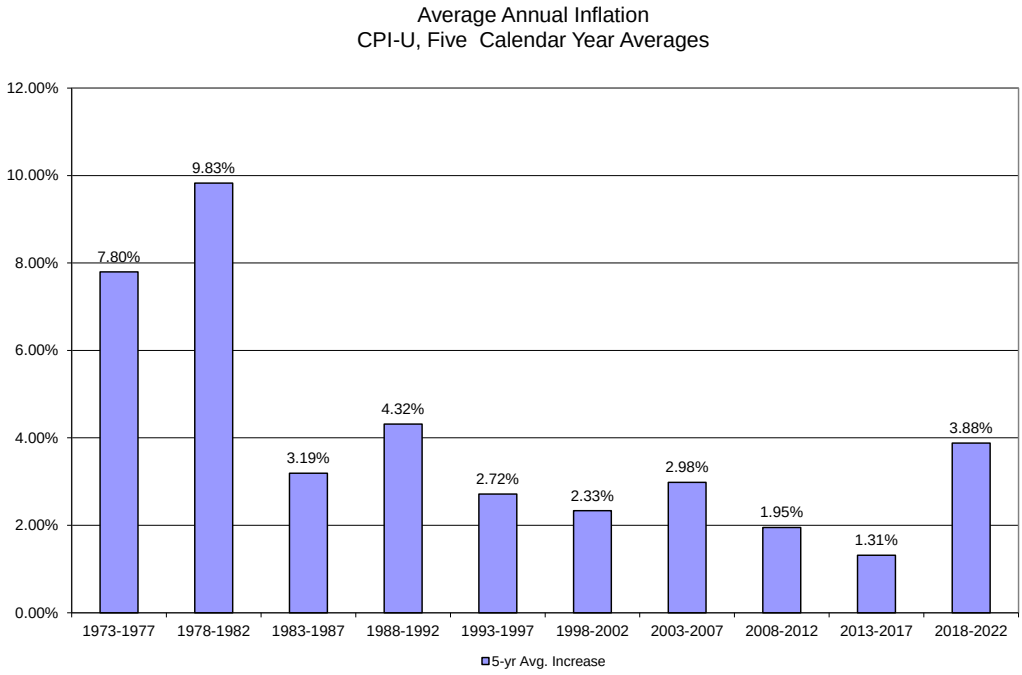
Although recognizing that there is not one right answer, the current standard calls for the actuary to develop a best-estimate for each economic assumption. Each economic assumption should individually satisfy this standard. Furthermore, with respect to any particular valuation, each economic assumption should be consistent with every other economic assumption over the measurement period.

Inflation Assumption

By "inflation," we mean price inflation, as measured by annual increases in the Consumer Price Index (CPI). This inflation assumption underlies most of the other economic assumptions. It impacts investment return, salary increases, payroll growth, and cost-of-living increases. The current annual inflation assumption is 2.50%.

Actual Change in CPI-U

The chart below shows the average annual inflation in each of the ten consecutive five-year periods over the last fifty years:



The following table shows the average inflation over various periods, ending June 30, 2022:

Periods Ending June 30, 2022	Average Annual Increase in CPI-U
Last five (5) years	3.88%
Last ten (10) years	2.59%
Last fifteen (15) years	2.38%
Last twenty (20) years	2.53%
Last twenty-five (25) years	2.49%
Last thirty (30) years	2.53%

Source: Bureau of Labor Statistics, CPI-U, all items, not seasonally adjusted

Sources of Forward-Looking Forecasts

As the valuation is a forward-looking exercise, the forward-looking expectations are more relevant than the historical data. The following is a list of several external sources for forward-looking inflation expectations.

Forward-Looking Price Inflation Forecasts[a]	
Congressional Budget Office[b]	
5-Year Annual Average	3.23%
10-Year Annual Average	2.81%
Federal Reserve Bank of Philadelphia[c]	
5-Year Annual Average	3.75%
10-Year Annual Average	2.95%
Federal Reserve Bank of Cleveland[d]	
10-Year Expectation	2.22%
20-Year Expectation	2.29%
30-Year Expectation	2.37%
Federal Reserve Bank of St. Louis[e]	
10-Year Breakeven Inflation	2.26%
20-Year Breakeven Inflation	2.50%
30-Year Breakeven Inflation	2.26%
U.S. Department of the Treasury[f]	
10-Year Breakeven Inflation	2.07%
20-Year Breakeven Inflation	2.40%
30-Year Breakeven Inflation	2.21%
50-Year Breakeven Inflation	2.34%
100-Year Breakeven Inflation	2.44%
Social Security Trustees[g]	
Ultimate Intermediate Assumption	2.40%

[a] **End of the Fourth Quarter, 2022**. Version 2023-02-09 by Gabriel, Roeder, Smith & Company

[b] *The Budget and Economic Outlook: 2022 to 2032* , Release Date: May 2022, Consumer Price Index (CPI-U), Percentage Change from Year to Year, 5-Year Annual Average (2022 - 2026), 10-Year Annual Average (2022 - 2031).

[c] *Fourth Quarter 2022 Survey of Professional Forecasters* , Release Date: November 14, 2022, Headline CPI, Annualized Percentage Points, 5-Year Annual Average (2022 - 2026), 10-Year Annual Average (2022 - 2031).

[d] Inflation Expectations, Model output date: December 1, 2022.

[e] The breakeven inflation rate represents a measure of expected inflation derived from X-Year Treasury Constant Maturity Securities and X-Year Treasury Inflation-Indexed Constant Maturity Securities. Observation date: December, 2022.

[f] The Treasury Breakeven Inflation (TBI) Curve, Monthly Average Rates, December, 2022.

[g] *The 2022 Annual Report of The Board of Trustees of The Federal Old-Age And Survivors Insurance and Federal Disability Insurance Trust Funds* , June 2, 2022, Long-range (75-year) assumptions, Intermediate, Consumer Price Index (CPI-W), for 2026 and later.

As shown, even though recent inflation has exceeded the current 2.50% assumption, all of the sources with a 10+ year time horizon are projecting inflation to be at or less than the currently assumed 2.50%.

Comparison of Inflation Expectations from December 2019 to December 2022

Finally, the table below provides a comparison of the inflation expectations documented in the last experience study report and the current inflation expectations.

Source	Inflation Expectations December, 2019	2022	Change
(1)	(2)	(3)	(4)
ERSRI' Investment Consultant	2.30%	2.50%	+0.20%
Implied Inflation 20-Year Treasuries	1.85%	2.40%	+0.55%
SSA Trustees Report	2.60%	2.40%	-0.20%
Survey of Professional Forecasters	2.20%	2.95%	+0.75%

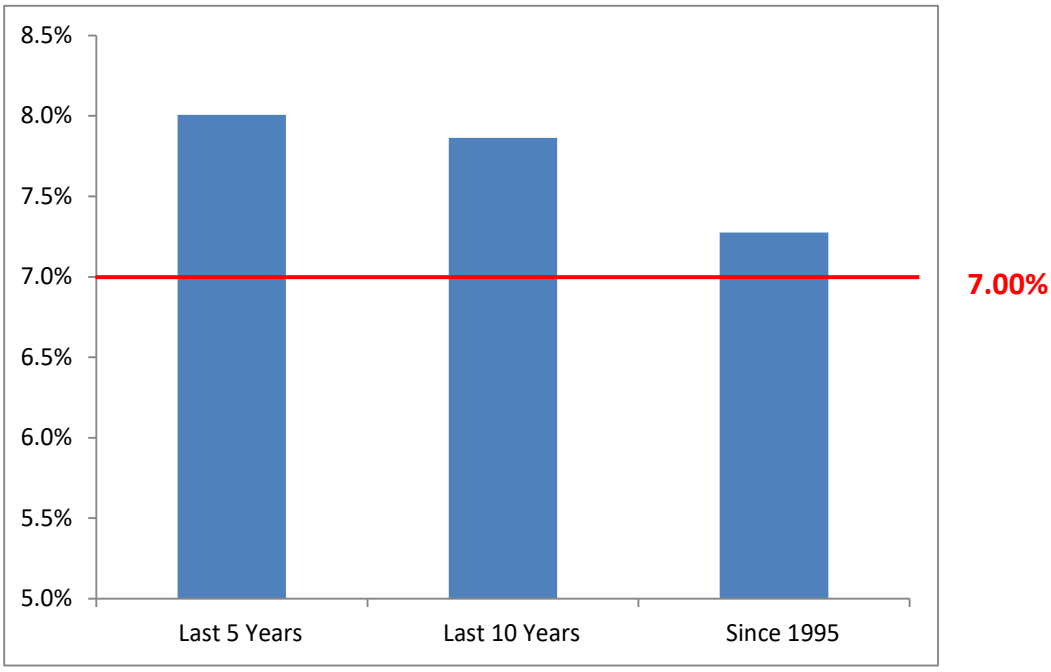
Recommendation

We find the current 2.50% general inflation assumption reasonable. We do find that several of the expectations from forward looking sources are lower than the 2.50%, but recent experience has exceeded the 2.50% and most of the sources have increased since the previous study. Also, the formula for post-retirement benefit adjustments is partially based on actual inflation results, thus the risk to liability growth is tilted towards higher inflation versus lower. For this reason, we would recommend having an assumption higher in the range of reasonable assumptions.

Investment Return Assumption

The investment return assumption is the principal assumption used in any actuarial valuation of a retirement plan. It is used to discount future expected benefit payments to the valuation date in order to determine the liabilities of the plans. Even a small change to this assumption can produce significant changes to the liabilities and contribution rates. Currently, it is assumed that future investment returns will average 7.00% per year, net of investment and administrative expenses. The current assumption assumes inflation of 2.50% per annum and an annual real rate of return of 4.50%, net of expenses.

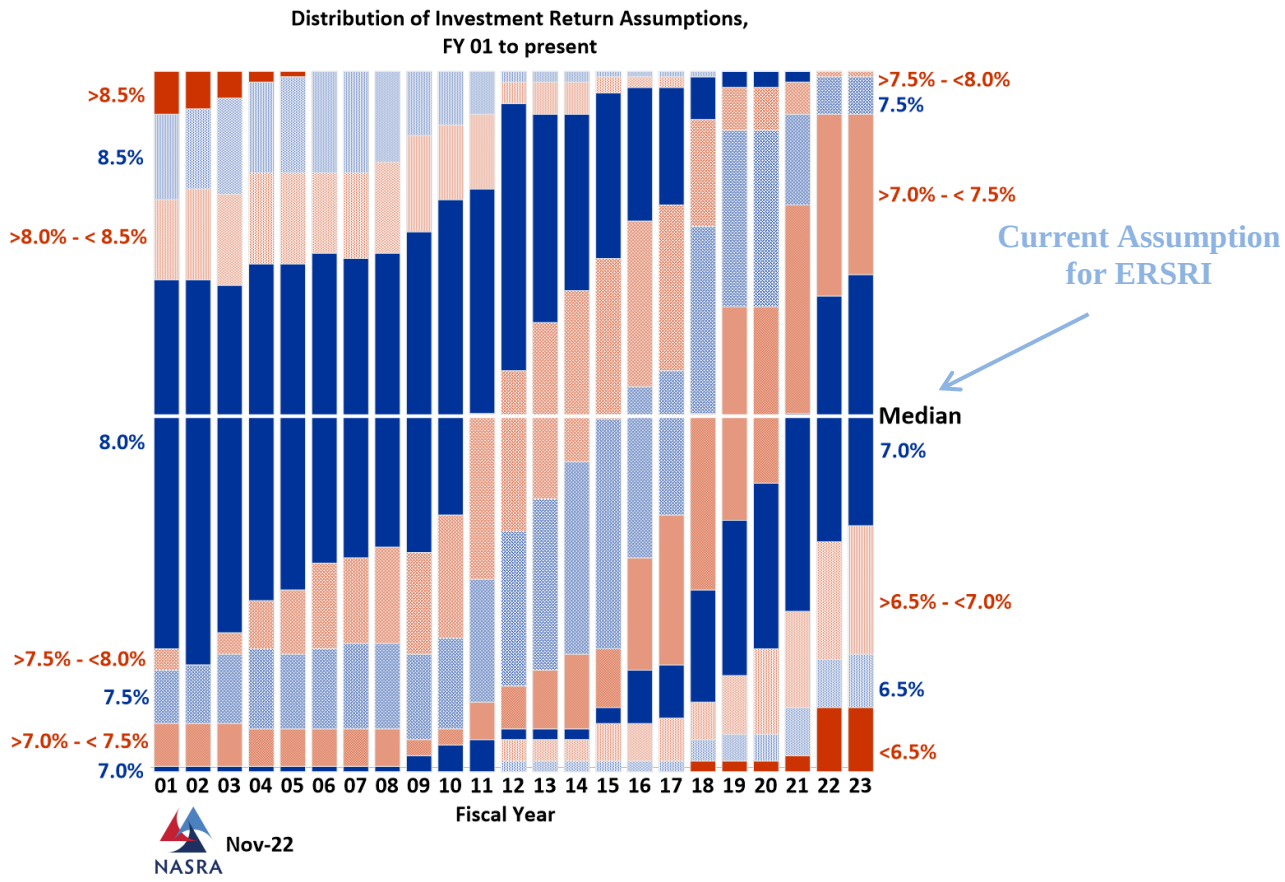
The chart below shows a history of ERSRI' market returns through FY 2022.



Thus, since 1995, the compound return of the System has achieved the current assumption of 7.0%. Even so, past performance, even averaged over a twenty-five year period, is not a reliable indicator of future performance for this assumption. The actual asset allocation of the trust fund will significantly impact the overall performance, so returns achieved under a different allocation are not meaningful. More importantly, the real rates of return for many asset classes, especially equities, vary so dramatically from year to year that even a twenty-year period is not long enough to provide reasonable guidance. And of course, bond yields are materially different than they were in 1995.

Comparison to Peers

We do not recommend the selection of an investment return assumption based on prevalence information. However, it is still informative to identify where the investment return assumption for ERSRI is compared to its peers. The chart on the following page shows the distribution of the investment return assumptions in the Public Plans Data as of April of 2023.



Source: 2023 Public Plans Database. Median investment return assumption: 7.00% nominal return.

The graphic includes the overall national trends in this assumption. The median rate of return is 7.00%, down from 7.25% when reviewed in the 2020 experience study.

Expenses

Since the trust fund pays expenses in addition to member benefits and refunds, we must make some assumption about these. Almost all actuaries treat investment expenses as an offset to the investment return assumption. That is, the investment return assumption represents expected return after payment of investment expenses.

For investment expenses, investment consulting firms periodically issue reports that describe their capital market assumptions. The estimates for core investments (i.e., fixed income, equities, and real estate) are generally based on anticipated returns produced by passive index funds that are net of investment related fees. The investment return expectations for the alternative asset class such as private equity and hedge funds are also net of investment expenses. Therefore, we did not make any adjustments to account for investment related expenses. Some of the Retirement Systems may also employ active management investment strategies that result in higher investment expenses compared to strategies that invest in passive index funds. We have assumed that active management strategies would result in the same returns, net of investment expenses, as passive management strategies.

On the other hand, there is a divergence of practice on the handling of administrative expenses. Some actuaries make an assumption that administrative expenses will be some fixed or increasing dollar amount. Others assume that the administrative expenses will be some percentage of the plan's actuarial liabilities or normal cost. And others treat administrative expenses like investment expenses, as an offset to the investment return assumption. The historical practice for ERSRI has been to set the investment return assumption as the net return after payment of both investment and administrative expenses. Since this is how the investment related cost of living increase is calculated, it makes sense to keep the same process. The following chart shows the administrative expenses for the last six years expressed as a percentage of the assets, adjusted for cash flow, each year:

Fiscal Year	Administrative
2022	0.098%
2021	0.108%
2020	0.106%
2019	0.104%
2018	0.107%
2017	0.099%
Average	0.105%

Based on this information, we have assumed that 0.11% (11 basis points) of each year's investment return will be used to pay administrative expenses. This assumption is then used in setting the investment return assumption.

Asset Allocation

We believe the most appropriate approach to selecting an investment return assumption is to identify expected returns given the funds' asset allocation mapped to forward-looking capital market assumptions. Because GRS is a benefits consulting firm and does not provide investment consulting advice, we do not develop or maintain our own forecasts of capital market expectations. Instead, we utilized the forward-looking return expectations developed by nationally recognized investment consulting firms, including the SIC's investment consultant.

The following is an excerpt from ASOP 27 on the topic of using experts:

> **Section 3.5.6 Views of Experts** – *Economic data and analyses are available from a variety of sources, including representatives of the plan sponsor and administrator, investment advisors, economists, and other professionals. When the actuary is responsible for selecting or giving advice on selecting economic assumptions within the scope of this standard, the actuary may incorporate the views of experts but the selection or advice should reflect the actuary's professional judgement.*

In our professional judgement, it is appropriate to rely on the SIC's investment consultants' input as part of our consideration in making a recommendation as they are the experts and have specialized knowledge in

this subject matter. This is the same data being used for investment decision making, and thus is a reasonable set of data for use in decisions on funding as well.

As part of an asset allocation study, the SIC provided materials to its Board in April of 2023 that used the average capital market expectations of their three consultants (NEPC, Meketa, and Cliffwater) to estimate the expected forward looking 10-year return of its portfolio to be 7.4%.

Using our own survey of capital market expectations called the CMAM, from 11 investment consultants (that does include the three in the SIC survey), we have estimated the forward looking 10-year return to be 7.36%, right in line with the SIC's information. Here is a distribution of all 11 sources in our survey.

GRS 2023 CMAM				
Capital Market Assumption Set (CMA)	Distribution of 10-Year Average Geometric Net Nominal Return			Probability of exceeding
	40th	50th	60th	7.00%
(1)	(2)	(3)	(4)	(5)
1	5.20%	6.22%	7.25%	42.41%
2	5.43%	6.57%	7.72%	46.22%
3	6.05%	7.15%	8.27%	51.38%
4	5.97%	7.18%	8.40%	51.50%
5	5.99%	7.21%	8.44%	51.71%
6	6.43%	7.62%	8.83%	55.24%
7	6.55%	7.65%	8.77%	55.93%
8	6.58%	7.68%	8.78%	56.20%
9	6.70%	7.78%	8.88%	57.24%
10	6.92%	7.93%	8.95%	59.24%
11	6.82%	7.97%	9.14%	58.43%
Average	**6.24%**	**7.36%**	**8.49%**	**53.23%**
Average from last 3 CMAMs		**6.61%**		

Notice the range of the 50th percentile outcome is from 6.22% to 7.97%, which the 7.0% assumption falls in the middle of. Also, while the expected outcome is 7.36%, there is only a 53.23% probability of achieving the 7.0% assumption. Finally, at the bottom, we have provided the average expected return from the last three surveys (2021, 2022, and 2023). To show more detail in the volatility in these expectations, the following exhibit shows the median 10-year outcome from the GRS survey for the past five years for the current ERSRI portfolio.

10-year Expected Return of Current ERSRI Portfolio					
Determined by last 5 GRS Surveys					
2019	2020	2021	2022	2023	Average
(1)	(2)	(3)	(4)	(5)	(6)
7.1%	6.8%	6.3%	6.1%	7.4%	6.7%

Thus the forward looking expectations for the same portfolio have varied from 6.1% to 7.4%. This type of precision and volatility is appropriate for the use by the SIC in its investment decisions because they are always interacting with current market prices and expectations over a given investment cycle. However, for use in setting the contribution requirements and funding patterns over a number of years, consistency around a single number that is in the middle of the range is more appropriate.

Thus, we find the current 7.00% investment return assumption reasonable and recommend no change.

Post-Retirement Benefit Increases

Most members of ERSRI are eligible for post-retirement increases if the individual plan they participate in is over 80% funded (State, Teachers, JRBT, and STPL are all commingled to determine if they meet this requirement).

The increase is calculated as the sum of (1) half of the average compounded investment return during the prior five fiscal years, net of expenses, in excess of a subtrahend equal to the investment return assumption less 2.0%, with the result not less than 0% nor greater than 4% and (2) half of the increase in the September CPI-U for the year prior to the COLA, but not more than 3.0%. The five year average return is represented as the annual rate of return on the actuarial value of assets. We perform one system-wide calculation so all retirees who receive an adjustment will receive the same adjustment.

We will continue to assume the investment related portion is 2.0%. For the CPI related component, we currently assume this will average 2.20% over time.

Thus, the assumption for future post-retirement benefit increases will continue to be 2.10% (the average of 2.00% and 2.20%).

Regarding the 80% funded contingency, during the 2011 pension reform COLAs through 2026 were presumed to be suspended. We have retained that same timeframe since that period, so the valuation currently presumes the COLAs though 2026 will be suspended. We recommend the continued use of this assumption, meaning the 2023 valuations will presume 3 more COLAs will be suspended.

For MERS, most of the MERS units are either already 80% funded or are very close to being so and thus will be 80% funded over a short period of time. As such, we have not reflected any suspension in the increases except for one that may be known to occur the year following the valuation. We recommend continuing this methodology.

General Wage Inflation

The valuation currently assumes that General Wage Inflation (GWI) will be 0.50% above price inflation. The 0.50% represents the real wage growth over time in the general economy, or, is the assumption on how much the pay scales themselves will change year to year, not necessarily how much the pay increases received by individuals are. Another way to look at this assumption is the projected growth rate of the budget of the plan sponsor. This assumption is used primarily to index each cohort of new entrants used in projections, as a building block for the individual salary increase assumption and as a starting point in determining the payroll growth assumption.

Historically, General Wage Inflation almost always exceeds price inflation. This is because wage inflation is in theory the result of (a) price inflation, and (b) productivity gains being passed through to wages. For the national economy as a whole, general wage inflation has exceed inflation by approximately 1.0% annually over most extended timeframes.

However, for the groups covered by ERSRI specifically, the median average salary had hardly kept up with inflation for the last decade. The following chart provides the change in average salary for each of the covered group. This would be the same as the rate of growth in overall payroll with a stable population. The average annual change in average payroll for most of the groups hovered around 2.5% per year, while inflation was 2.6% during the period. However, that could be State Employees has changed by 2.4% per year over that last decade, while the same value for Teachers has been 1.6%. Netting against the actual inflation of 2.6% produces an actual change about equal to inflation for State Employees and much less than inflation for Teachers. However, there is typically a lag between when inflation occurs and when public sector salaries react to that inflation. It is quite possible as the next round of salary negotiations occur the rate of growth in average salary exceeds inflation.

Change in Average Salary Over Last Decade (Headcount Adjusted Overall Rate of Payroll Growth)					
	State	Corrections	Teachers	MERS General	MERS P&F
All Members	2.39%	2.18%	1.58%	2.57%	2.66%
Members with 2-4 years of service	3.07%	2.94%	2.84%	2.56%	3.08%

Also, there is a spread between the average salaries for new hires and inflation, which have been increasing by 3.1% per year for State Employees and 2.8% for Teachers. As this cohort represents more and more future members, it is possible that the change in average salary overall is closer to the current assumption.

The current assumption is already lower than national trends and we recommend no change to the 0.5% spread above inflation. The lower average increase for Teachers above is due to the demographics of that group as discussed below and very low increases, if not decreases, in salaries coming out of the Great Recession. If only looking at the change in median average salary for the past six years, the growth in average salary has been more consistent with the current assumptions.

Salary increase rates

In order to project future benefits, the actuary must project future salary increases. Salaries may increase for a variety of reasons:

- Across-the-board increases for all employees;
- Across-the-board increases for a given group of employees;
- Increases to a minimum salary schedule;
- Additional pay for additional duties;
- Step or service-related increases;

- Increases for acquisition of advanced degrees or specialized training;
- Promotions; or
- Merit increases, if available.

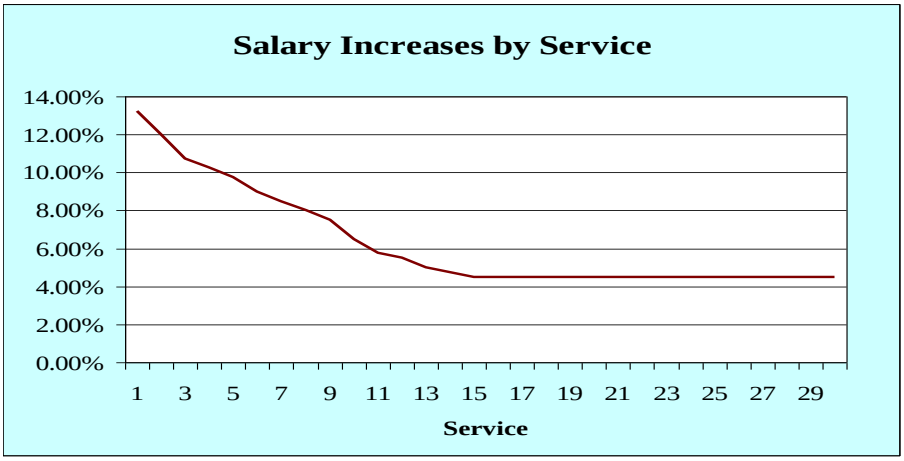
Our salary increase assumption is meant to reflect all of these types of increases.

The actuary should not look at the overall increases in payroll in setting this assumption because payroll can grow at a rate different from the average pay increase for individual members. There are two reasons for this. First, when older, longer-service employees terminate, retire or die, they are generally replaced with new employees who have a lower salary. Because of this, in most populations that are not growing in size, the growth in total payroll is smaller than the average pay increase for members. Second, payroll can change due to an increase or decrease in the size of the group. Therefore, to analyze salary increases, we examine the actual increase in salary for each member who is active in two consecutive fiscal years.

Salary increases for governmental employees can vary significantly from year to year. When the employer's tax revenues stall or increase slowly, salary increases often are small or nonexistent. During good times, salary increases can be larger. Our experience across many governmental plans also shows several occasions in which salary increases will be low for a period of several years followed by a significant increase in one year. Therefore, for this assumption in particular, we prefer to use data over a longer period in establishing our assumptions. We used a ten-year period for this analysis.

Most actuaries recommend salary increase assumptions that include an element that depends on the member's age or service, especially for large, public retirement systems. It is typical to assume larger pay increases for younger or shorter-service employees. This is done in order to reflect pay increases that accompany step increases, changes in job responsibility, promotions, demonstrated merit, etc. The experience shows salaries have been more closely correlated to service (rather than age), as promotions and productivity increases tend to be greater in the first few years of a career, even if the new employee is older than the average new hire.

Thus, if we graph the increases by service, we usually get a graph where the increases are larger for shorter service employees and then level out at a lower level after a period that may be ten to twenty-five years. It might look like this, although in practice not this smooth:



Therefore, we divide the task of setting the salary increase into two pieces:

1. Determining the assumption for long-service employees
2. Determining the additional increases to be applied to shorter-service employees

The next two subsections will discuss these components of the salary assumption.

Salary increase assumptions for long-service employees (ultimate salary scale)

Many of the factors that result in pay increases are largely inapplicable or have diminished importance for longer-service employees. Step or service-related increases have stopped or are minimal. Promotions occur with less frequency. Additional training or acquisition of advanced degrees usually occurs early in the career. In theory, then, salary increases for longer-service employees are heavily driven by wage inflation, with only a small factor for individual merit. We will define the last value in our salary increase assumption as the ultimate component. This will be made up of price inflation plus general productivity plus individual merit. We may also sometimes refer to the sum of the general productivity and the individual merit as the individual productivity component.

For State Employees, our study shows that for members with at least twenty-five years of service, the average annual salary increase during the ten-year period was 2.78%. Inflation during this 10-year period averaged 2.60%. Therefore, long-service employees received an average salary increase of 0.18% above inflation (individual productivity component). So, the average salary increase for long-service members was lower than the current assumption on a nominal basis (2.78% vs 3.25%) and on a real basis (0.18% vs 0.75%). For Teachers, the first three years following the Great Recession were very low and are likely not representative of forward expectations, thus the data is only based on the last seven fiscal years. The following table summarizes this for all of the groups:

Ultimate Salary Scale (10-Year Experience)							
	State	Corrections	Teachers*	MERS General	MERS P&F	State Police	Judges
Long Service Definition (Years)	25	25	25	25	25	10	1
Current Assumption	3.25%	3.25%	3.00%	3.25%	4.00%	3.75%	2.75%
Actual Increase	2.78%	2.34%	2.47%	2.66%	3.57%	6.75%	2.68%
Recommended Ultimate Salary Increase Assumption	3.00%	3.00%	2.75%	3.00%	3.50%	4.00%	2.75%
Change	-0.25%	-0.25%	-0.25%	-0.25%	-0.50%	0.25%	-

- 7 Years

We have lowered the assumption for long service employees across all the groups. Teachers have a pattern of higher increases early in the career and lower late it the career, so the ultimate salary scale is lower than the 3.00% GWI assumption.

While several individual productivity components appear low compared to the assumption, much of that is from fiscal years 2012 and 2013 coming out of the Great Recession. The averages since then have been more in line with the recommended spreads. Also, salaries in the data gathering processes are slow to react to new inflation and labor market conditions, so it is likely there are higher wage increases coming over the short term.

Salary increase assumptions for shorter-service employees

To analyze the service-related salary assumption, we looked at the excess in the average increases for shorter-service employees over the average for longer-service employees. For example, Teachers with three years of service received an average annual increase of 8.33%, which was 5.86% more than the average increase of 2.47% for Teachers with 25 or more years of service. The patterns were graduated for a reasonable, stable pattern and compared to the current assumptions. We then if necessary determined new service-related assumptions reflecting this data. The following is a similar exhibit as above that shows the average increase a member is expected to receive over a 25 year career by category.

Average Career Salary Increase (Last 10-Years Experience)							
	State	Corrections	Teachers*	MERS General	MERS P&F	State Police	Judges
Current Assumption	4.40%	5.08%	5.26%	4.07%	5.42%	6.09%	2.75%
Actual Increase last 10 Years	3.85%	4.51%	4.37%	3.84%	4.70%	6.11%	2.68%
Recommended Average Salary Increase Assumption	4.15%	4.83%	4.95%	4.03%	5.21%	6.34%	2.75%
Change	-0.25%	-0.25%	-0.31%	-0.04%	-0.21%	0.25%	-

- 7 years

The largest change was to State Police and that was all on the productivity component discussed above. Teachers had the largest decrease of 0.31%, but appears to still have a quite a bit of margin when compared to the last decade. Any of the actuals that are lower than the assumption are easily explained by the same issues as before: very low increases in fiscal years 2012 and 2013 as well as the recent spike in inflation not having time to incorporate into the wages yet.

Details of our analysis are shown in Section VII.

Payroll growth rate

The salary increase rates discussed above are assumptions applied to individuals and are used in projecting future benefits. We use a separate payroll growth assumption in determining the annual payment needed to amortize the unfunded actuarial accrued liability. The amortization payments are calculated to be a level percentage of payroll. Therefore, as payroll increases over time, these amortization payments will also increase.

In theory, payroll growth in the absence of membership growth should approximate the wage inflation assumption (proposed to be 3.00%). However, we may make adjustments based on the demographics of the individual population. For example, the current Teacher population is disproportioned to older ages based on hiring and staffing patterns over the last decade. Because of this, we anticipate slower growth over the next ten to fifteen years and use an assumption lower than the GWI assumption.

To analyze this, we need to take into account historical trends, future projections, and risk management around demographic patterns and headcount growth (or lack thereof). We projected the payroll for current members based on the assumed salary increases for the individuals and their assumed termination or retirement rates. We then added in enough new employees each year to replace them. Pay for the first group of new members was initialized based on actual average pay for current new members, and thereafter pay was projected based on the salary assumption and expected retirements and terminations for this cohort of new members. For each subsequent cohort of new members needed to replace the retired and terminated members we increased the starting average pay by the general wage inflation assumption of 3.00%.

The time period that is most important is the remaining large original amortization base from the 2011 pension reforms. Those are the largest amortization payments for the current plans and the ones that will drive the amortization schedule over that timeframe, which is about 10-15 more years. Based on this analysis we found that payroll over the next fifteen years was projected reasonably close to the 2.50% price inflation assumption for State Employees and even lower than inflation for Teachers.

For the last decade, total payroll growth has been much lower than the current assumption for both State and Teachers. Many of the factors that led to this may not be as extreme going forward, but there is still very likely to be a headwind for the remaining amortization period of the 2011 RIRSA base.

Therefore, we are recommending lowering this assumption at 2.00% for Teachers and 2.50% for all other groups.

This assumption has no impact on the liabilities of the System, but does impact the contribution rates because it is used to project out future payrolls that will be the basis of future contributions. By assuming there will be less payroll in the future to make contributions on, the contribution rate must increase short term to reproduce the appropriate amount of dollars into the fund, but the annual dollars in future years will be much less.

Post-retirement mortality rates (service retirees)

Perhaps the most critical demographic assumption used in pension valuations is post-retirement mortality. Rates of mortality affect our estimate of how long each individual is expected to live and consequently how long each individual is expected to receive a pension. Life expectancy in turn has a direct impact on pension plan liabilities.

Mortality rates have generally decreased over time in the U.S., meaning that life expectancies have generally increased over time. The assumption for future decreases in mortality is referred to as the mortality improvement assumption. In general, the mortality and mortality improvement assumptions are treated separately.

The current tables are based on adjusted versions of the Pub-2010 Public Retirement Plans Mortality Tables published by the Society of Actuaries (SOA), projected with the 2019 MP projection scales with immediate convergence. Of course, we also use separate tables for males and females. Separate tables discussed in the following section are used for disabled retirees.

We use separate mortality tables for Teachers and All Other Employees. Life expectancy for Teachers is on average longer than for other state and local government employees. We currently include Public Safety employees in the All Other Employee category. While historically, retirees from Public Safety occupations had a lower life expectancy than the general population, most recent data sources do not show a significant statistical difference between Public Safety retirees and the general population. In fact, if recent trends continue, it is likely today's 40-year old Public Safety employee will have a longer life expectancy once they retire than today's general employee. The largest data set to confirm this trend is the recently published Pub-2010 Public Retirement Plans Mortality Tables, which do show a difference, but only marginally so. We would rather have one larger, more credible dataset than two less credible ones, so we will continue to combine the groups.

To analyze the data, we began by determining the expected number of deaths in each year at each age for males and females. The analysis uses only the retirees, not the beneficiaries, joint annuitants, or survivors. We will use a liability-weighted (or benefit weighted) analysis. There are two reasons for using a liability-weighted approach. First, mortality experience across the U.S. has been shown to vary depending on income level. Liability-weighting takes into account differing benefit levels. Second, selecting an assumption based on headcount-weighting is consistent with estimating expected deaths, but selecting an assumption based on liability-weighting is consistent with minimizing gains and losses associated with expected deaths. By weighting the data by annuity amounts, we are giving more weight to members who have larger annuities (and thus have larger liabilities).

We have utilized nine years of experience to increase the credibility of the analysis and minimize any variance created by timing of data collection from year to year. During this time, mortality improvement may have occurred. A general procedure is to adjust the actual experience for mortality improvements during the study period to the central year, in this case 2016. For purposes of this study, proposed mortality rates shown in the tables have been adjusted to the central year 2016 using the proposed projection scales.

Impact from Pandemic

The data from the last three fiscal years was clearly impacted by the pandemic, with much higher rates of mortality than the first 6 years. No one knows for sure how future mortality patterns will be impacted. As such, we have been careful to not add any more risk into the current assumption than currently exists, meaning if the data suggests life expectancies could be shortened based on the data, we will instead hold the same multipliers on the mortality assumptions and wait for more data before making adjustments.

Pub-2010 Public Retirement Plans Mortality Tables

In January 2019, the Society of Actuaries (SOA) issued the final version of Pub-2010 Public Retirement Plans Mortality Tables. This is the first set of mortality rates published based on U.S. public sector experience. In this study, the SOA examined mortality for Teachers, Public Safety, and General employment categories. The SOA also studied mortality rates by gender, income (in total and separated into above and below median), and status (active employees, retirees, disabled retirees, and contingent survivors). As a consequence, there are over 90 Pub-2010 tables to select from.

In August 2018, the Society of Actuaries (SOA) reviewed the comprehensive annual financial reports of the majority of large public sector employees' retirement systems for a review of their mortality assumptions. The SOA report included analysis of certain annuity values under current assumptions and the new Pub-2010 tables. As can be seen in the charts, the majority of public sector plans would have higher annuity values (i.e., plan costs) under Pub-2010.

Public Plan Mortality Assumption Comparison

Figure 1

2018 AGE 55 ANNUITY FACTORS WITH PUB-2010 AND RP-2006

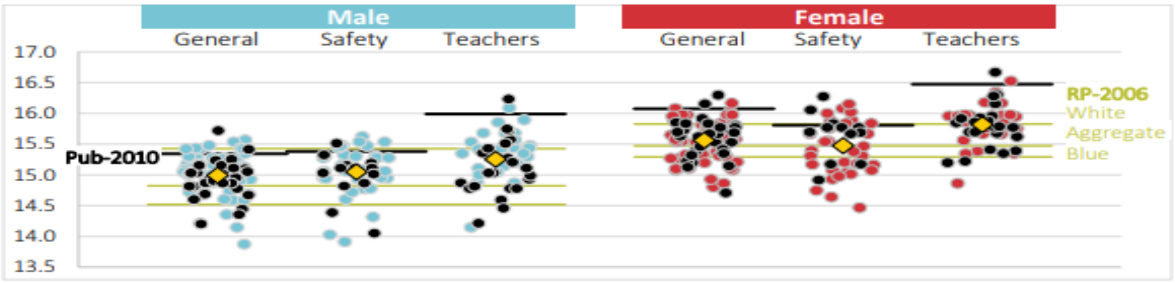


Figure 2

2018 AGE 65 ANNUITY FACTORS WITH PUB-2010 AND RP-2006

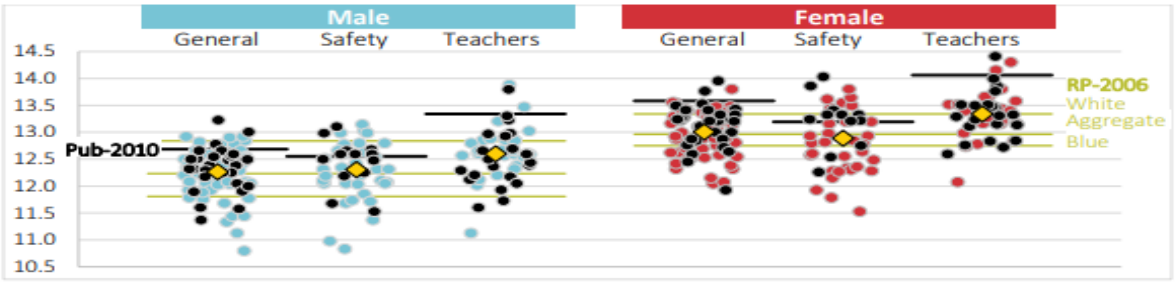
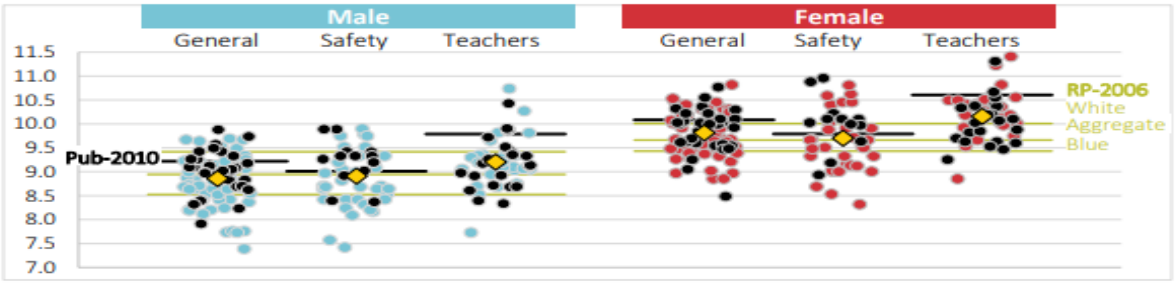


Figure 3

2018 AGE 75 ANNUITY FACTORS WITH PUB-2010 AND RP-2006



Legend

Black dots	Plans that use RP-2006 or RP-2014 mortality rates (possibly adjusted) in the base table
Blue/red dots	Plans that use neither RP-2006 nor RP-2014 mortality rates (adjusted or otherwise) in the base table
Yellow diamonds	Average of all plans in the job category, weighted one per plan
Black lines	Pub-2010 Mortality Tables (amount-weighted) generationally projected with Scale MP-2017
Green lines	RP-2006 Mortality Tables (amount-weighted) generationally projected with Scale MP-2017: white collar (top), aggregate (middle) and blue collar (bottom)
Assumptions	Monthly single life annuities beginning in 2018, computed at 7% interest with 2% annual benefit increases

However, another observation is the wide range of outcomes across the datasets included in the analysis. Thus, occupation is not the only factor for variance in life expectancy. The report published alongside the Pub-2010 tables states that income was generally the most significant explanatory variable, even excluding

job category. For this reason Above Median and Below Median versions of the tables were also published. However, even the range between these versions of the tables is quite wide, especially for general employee males. Other factors could be duration of retirement, geographic region, access to health insurance, and definitions of disability. Some of these factors can be analyzed by trying to match these characteristics of the group to the baseline table, but if the dataset is large enough, this process can be analyzed through statistical techniques to scale the table to the experience.

In this analysis, we look at a subset of the tables illustrated in that study: PubG-2010 for healthy general retirees, PubG-2010 for healthy retired teachers, and PubNS-2010 for disabled retirees. In certain cases, the Pub-2010 tables do not have rates below or above certain ages. In cases where rates are absent, we have extended the published tables with cubic splines or exponentials in a manner similar to the way the tables were created.

Credibility

When choosing an appropriate mortality assumption, actuaries typically use standard mortality tables. If the plan population has sufficient credibility to justify its own mortality table, then the use of such a table also could be appropriate. Factors that may be considered in selecting and/or adjusting a mortality table include the demographics of the covered group, the size of the group, the definition of disability in the plan, the statistical credibility of its experience, and the anticipated rate of future mortality improvement.

We first measured the credibility of the dataset to determine whether standard, unadjusted tables should be used or if client specific data was warranted. We apply a credibility procedure in accordance with ASOP No. 25, Credibility Procedures to determine partial credibility based on the limited fluctuation method to determine appropriate adjustments to the base table to be applied to each gender within each member classification. We utilized approaches described in this paper https://www.soa.org/globalassets/assets/files/static-pages/sections/retirement/credibility-resource-pension.pdf for this analysis. The paper shows that to be +/-5% with 90% confidence requires 1,082 deaths per gender. However, when using a benefit weighted approach to the analysis, even more deaths are required as the variance in the benefit amounts decreases the overall credibility.

During the period, there were 2,093 male deaths and 2,346 female deaths for the Non-Teacher group, indicating they are a highly credible group. For the Teacher group, there were 834 male deaths and 1,217 female deaths, giving them good credibility as well. The following provides the full details with p=90% and r=5%.

Group	Other Employees		Teachers	
	Male	Female	Male	Female
Actual Deaths	2,180	2,512	834	1,217
Deaths needed for full credibility				
Based on Count	1,082	1,082	1,082	1,082
Based on Annuity Amount	1,709	1,781	1,206	1,238
Z Factor				

Based on Count	100.0%	100.0%	87.8%	100.0%
Based on Annuity Amount	100.0%	100.0%	83.2%	99.1%

Base Tables

We have compared the data from the study period to variants of the newer PUB(10) mortality tables. We compared the ratio of the actual deaths to the expected deaths—the A/E ratio—tells us whether the assumptions are reasonable.

We use the limited fluctuation credibility procedure to determine the appropriate scaling factor of the base mortality tables for each gender and each member classification on a benefits weighted basis. In each case, the Z-factor (shown above) is computed based on the experience of the group being studied. This Z-factor is a measure of the credibility of the pertinent group.

The Best Fit is the ratio of actual to expected deaths using the base table. The final scale is then determined as the weighted average of the Best Fit and 100% based on the Z-factor. For example, for male Teachers, the Z-factor of 83.2% suggests the data for that group is 83.2% credible. The Best Fit for that group (without credibility) would be to scale the base tables by 113.1%. The final scaler of 110.9% is the credibility-weighted average (110.9% = 83.2% x 113.1% + 16.8% x 100%). Factors for other groups are determined similarly.

Group	Other Employees		Teachers	
	Male	Female	Male	Female
Actual Deaths ($000 Annuities)	$55,656	$41,706	$37,597	$47,435
Expected Deaths based on Current Assumptions	$54,162	$40,107	$35,879	$46,777
A/E Ratio	102.8%	104.0%	104.8%	101.4%
Expected Deaths based on PUB(10) Median Tables by Occupation	$47,144	$36,306	$33,255	$40,744
A/E Ratio based on Best Fit	118.1%	114.9%	113.1%	116.4%
Multiplier based on LFCT	118.1%	114.9%	110.9%	116.3%
Recommended Multiplier	**115.0%**	**111.0%**	**108.0%**	**115.0%**
Expected Deaths based on PUB(10) Median Tables by Occupation adjusted by Multiplier	$54,216	$40,299	$35,915	$46,856
A/E Ratio	102.7%	103.5%	104.7%	101.2%

Our standard approach would be to use the Multiplier based on LFCT, rounded down to the nearest percent. However, as discussed above, because of the pandemic we have not allowed any multipliers to increase from the current assumptions, and this did impact all four groups.

We also examined the results in five-year age groups, checking how well the pattern in the table matched actual experience. Most importantly, we look at life expectancies in the actual data and the tables, looking for a good fit. A summary of the comparison of life expectancies is shown below:

Group	Other Employees		Teachers	
	Male	Female	Male	Female
Life Expectancy of 65 year old retiree in years (current assumption)	19.35	22.04	21.43	23.10
Life Expectancy of 65 year old retiree in years (actual, smoothed)	19.20	21.74	21.18	22.94
Life Expectancy of 65 year old retiree in years (proposed)	19.36	22.02	21.41	23.07
A/E ratio	99.2%	98.7%	98.9%	99.4%

Without Projection, Central Year 2016

As shown, this produces a reasonable match, with the actual being slightly less because of the pandemic. More detail is shown on the tables in Section VII.

Recommended Mortality Improvement Assumption

We use a fully generational approach to this assumption. Because of this strategy of building in continuous improvement, life expectancies for today's younger active members are expected to be materially longer than those of today's retirees, and this provides substantial stability and dependability on costs and liabilities. We currently use a 1% improvement assumption per year across most ages.

There is an annual report published by the Retirement Plans Experience Committee of the Society of Actuaries to provide commentary on national trends in mortality experience and provide updated projection scales. The initial report was in 2014, with annual updates every year since. In every update, rates of projection were materially decreased, meaning the original MP-2014 table was found to be too conservative. In addition, the amount of change from year to year has been significant. The amount of volatility produced by changing annually to each "most recent" table has been on the same order as the actual investment performance. Thus, we find that the use of the full version of these tables to produce an overly complex, volatile pattern of results that has actually had minimal, if any, predictive power.

After approximately 15 years, all of the versions prior to the 2020 version of the MP tables reflected the same improvement rate at each future calendar year (the ultimate mortality improvement rates) at the 1% per year across most ages we currently use. In order to balance the two objectives of reflecting the most recent data available, while maintaining stability of results from year to year, GRS has been recommending the use of the ultimate mortality improvement rates in the MP tables for all years, which is again approximately 1% per year improvement across most ages.

In the 2020 report the ultimate mortality improvement rates were modified to be higher at some ages and more precise across different age groups based on historical trends. Specifically, the pattern is 1.35% rate for ages 62 and younger, decreasing linearly to 1.10% at age 80, further decreasing linearly to 0.40% at age

95, and then decreasing linearly to 0.00% at age 115 (and thereafter). In general, the net change in overall liabilities if a retirement system was using the ultimate rates of the MP-2019 table to the ultimate rates of the MP-2020 version is minimal. Basically, the rates at individual ages were changed but the overall pattern over a lifetime is not much different.

We find it would be reasonable to use either set of improvement scales, but give preference to the more recently published report all else being equal. Given the material increase in healthcare costs it has required over the last few decades to allow for the rates of improvement that have existed, and the general worsening in morbidity factors in the United States, we find it reasonable to assume the future improvement would be approximate to or less than it has been historically across most ages. The 2020 report provides several pages of rationale and disclosure of the process used to generate the new long-term rates, including comparing to historical trends, and we find the analysis thorough and reasonable. Thus, we are recommending use of the latest MP-2021 scales, but with immediate convergence. Meaning the values in the scale for a given age will be applied to all years.

The following is a table with the life expectancy for a retired member who attains age 65 based on the proposed assumption set, by calendar year. As shown, the life expectancy is expected to increase into the future.

Proposed Mortality Assumption - Life Expectancy for an Age 65 Retiree in Years					
Group	**Year of Retirement**				
	2023	2028	2033	2038	2043
Other Employees – Male	20.8	21.1	21.5	21.9	22.2
Other Employees - Female	23.4	23.8	24.1	24.4	24.8
Teachers - Male	22.8	23.1	23.5	23.8	24.1
Teachers - Female	24.4	24.8	25.1	25.4	25.7

With Generational Projection

Post-retirement mortality rates (disabled retirees)

This is a relatively minor assumption, and it has little impact on the liabilities of ERSRI. We are recommending this assumption continue to use the PUB(10) set of tables, using 100% of the disabled tables by occupation.

Active mortality rates

This is a relatively minor assumption, and it has little impact on the liabilities of ERSRI. We are recommending this assumption continue to use the PUB(10) set of tables, using 100% of the median active employee tables by occupation.

Disability rates

We analyzed disability separately for males and females, State Employees, Teachers, MERS General and MERS P&F, and ordinary and accidental disability.

We compared the number of actual and expected disabilities by group, taking into account the fact that members with less than five years of service and members eligible for retirement are not eligible for ordinary disability.

For disability, there is often a lag time between when the member leaves active service to when the member is approved for disability. In many cases, this timeframe can span over a valuation cycle, meaning a member is active in year 1, shows as an inactive in year 2, and then a disabled member in year 3. We have used the actual disabled records in the 2022 valuation data for members with dates of disability in the six-year period January 1, 2016 through December 31, 2021 as an approximation of our actual disabilities as the FY22 experience likely doesn't completely include members who are in processing as of June 30, 2022.

For this assumption, an A/E close to, but less than, 100% is preferable. The analysis shows a reasonably close match across the groups, given the relatively small numbers. However, several of the groups either show more disabilities than expected or have an increasing trend. We have made recommendations on a few of the groups, and for those have provided the A/E ratio based on the proposed assumptions. For most groups, the size is too small to give full credibility so in most cases the recommended assumption only partially reflect the recent experience. Although there are detailed tables on each of the groups in Section VII, here are tables showing some summary information:

Group/Type	Actual Number	Expected Number	A/E Ratio	A/E on Proposed Assumption
State/Corr male ordinary	88	72	122%	102%
State/Corr female ordinary	91	76	120%	97%
State/Corr male accidental	15	29	52%	71%
State/Corr female accidental	24	26	92%	
Teacher male ordinary	16	23	70%	
Teacher female ordinary	96	65	148%	104%
Teacher male accidental	1	0	NA	33%
Teacher female accidental	11	7	157%	110%
MERS General male ordinary	21	29	72%	
MERS General female ordinary	16	18	89%	
MERS General male accidental	16	20	80%	
MERS General female accidental	11	9	122%	92%
MERS P&F ordinary	14	6	233%	140%
MERS P&F accidental	53	54	98%	87%
Total disabilities	473	434	109%	94%

In addition, for groups that have historically had ages ranges that were eligible for unreduced retirement, but now are not, the current assumptions add 2% to the probability of ordinary disability in those age ranges to reflect the reality that some members who retired under old eligibility provisions would have qualified for disability, but did not apply because there was no need to do so. We recommend no change to this part of the assumption set.

These changes will have a minor impact on the liabilities and contribution requirements. Details are shown in Section VII.

Retirement pattern

The current assumptions were estimates of the impact the changes from RIRSA would have on behavior, and had several categories based on cohorts of members becoming eligible to retire. In general, most of the reasons to have the various cohorts has passed as we are now 12 years past the passage of RIRSA. We have made adjustments and simplifications as appropriate. For this analysis, the data was weighted by the potential liability of the member, so that members with more service and higher salaries influenced the results proportionately more. The following is a summary of the data. Details are shown in Section VII.

Group/Type	Actual Number	Expected Number	A/E Ratio	A/E on Proposed Assumption
State Employees	$6,819	$6,146	111%	93%
Corrections	710	648	110%	99%
Teacher, at First Eligibility	353	385	92%	
Teacher, after First Eligibility	1,047	1,158	90%	
MERS General	2,243	2,322	97%	88%
MERS P&F	598	569	105%	95%
State Police	40	65	62%	
Judges	5	5	100%	
Total Retirements	$11,815	$11,298	105%	92%

$ in 000s of potential liability

Termination rates

Termination rates reflect members who leave for any reason other than death, disability or service retirement. They apply whether the termination is voluntary or involuntary, whether the member is vested or non-vested, and whether the member takes a refund or keeps his/her account balance on deposit and takes a deferred benefit.

We use separate termination rates for males and females and for all groups. The current rates are structured as a function of service. No terminations are assumed once a member becomes eligible for retirement. The current tables were based on ERSRI experience and developed in prior experience studies. For this analysis, we have extended the experience period to ten years as termination patterns tend to be very cyclical with the overall economy. We also weight the data based on the liability of the member.

Group/Type	Actual Liability Turnover	Expected Liability Turnover	A/E Ratio	A/E on Proposed Assumption
State Employees	$332	$274	121%	108%
Corrections	47	44	108%	104%
Teachers	477	366	130%	109%
MERS General	151	117	130%	115%
MERS P&F	132	73	181%	148%
Total Termination	$1,139	$874	130%	113%

$ in millions

As shown, similar to trends in peer retirement systems, turnover has increased compared to historical trends. We have moved the turnover assumptions approximately half way to the target range of 105% for the individual groups. Full detail in the tables in Section VII.

Spousal age difference

Currently, we assume that male members are three years older than their spouses and female members are three years younger than their spouses. This is reasonable, based on general census statistics and we are not recommending changing this assumption.

Refund of contributions

We currently assume that members who are vested and terminate in the future will choose the more valuable of a refund or a deferred annuity. This is a bit conservative, since some people do choose a refund when the deferred benefit is worth more, but we are recommending no change in this assumption.

Other assumptions

There are other technical assumptions made in the course of a valuation, such as the timing of terminations and retirements during the year, and the timing of pay increases. We reviewed these and are recommending no changes.

Actuarial cost method

The individual Entry Age Normal cost method (EAN) is the current funding method being used to allocate the actuarial costs of the Fund. Under this method, the normal cost for each member is determined to be the level percentage of payroll which, if contributed from the date of entry to the date of retirement, would accumulate assets sufficient to pay the retirement benefits when due. Use of this method is required by statute. The Entry Age Normal method will generally produce relatively level contribution amounts as a percentage of payroll from year to year, and allocates costs among various generations of taxpayers in a reasonable fashion. It is by far the most commonly used actuarial cost method for large public retirement systems. We continue to believe this is the best funding method for ERSRI and recommend no change.

Actuarial Value of Assets

Actuaries generally recommend using a smoothed actuarial value of assets (AVA), rather than market value (MVA), in order to dampen the fluctuations in measurements such as the required contribution amount and the funded status of the system.

The current method smooths the differences between the expected returns (based on the annual investment return assumption) and actual returns, net of expenses, over a five-year period. For example, if the actual return is 12.00% in one year, then currently 7.00% is reflected immediately in the AVA, and the other 5.00% is recognized in 20% increments over five years, beginning with 20% for the current year.

The actuarial value of assets is based on the market value of assets with a five-year phase-in of actual investment return in excess of (less than) expected investment income. Offsetting unrecognized gains and losses are immediately recognized, with the shortest remaining bases recognized first and the net remaining bases continuing to be recognized on their original timeframe. Expected investment income is determined

using the assumed investment return rate and the market value of assets (adjusted for receipts and disbursements during the year). The returns are computed net of administrative and investment expenses.

Amortization period

The unfunded actuarial accrued liability from the 2011 pension reform is being amortized over a closed 25-year period from June 30, 2010. The remaining amortization period is 13 years. New gains and losses will be "laddered" on individual 20 year bases once the period on the large base decreases below 20. We are not recommending any change to this in connection with the current experience study.

Units that are overfunded have their past layers eliminated under the idea that there is no longer an UAAL and thus no longer a need to systematically amortize it, and instead a credit can be given for a 20-year amortization of any surplus. This process actually pushes overfunded units towards 100% funded and will eventually use up all of their surplus. We are recommending a slight adjustment to still give a credit, but only enough so that the proportionate amount of surplus would remain the same from year to year. For example, if a unit is currently 110% funded, the credit would be enough so that the unit would be expected to remain at 110% funded the next year.

Election Assumptions for the Teacher Survivor Benefit plan

We reviewed the current election and family distribution assumptions for the Teacher Survivor Benefit Plan. The current assumptions were developed in the previous experience study and are tracking well with experience, thus we are not recommending any changes.

	By Attained Age									
	20	25	30	35	40	45	50	55	60	65
Spouse Only	5%	14%	14%	10%	11%	15%	32%	75%	75%	70%
Spouse and 1 Child	5%	12%	20%	17%	22%	23%	18%	0%	0%	0%
Spouse and 2 or More Children	4%	13%	36%	46%	41%	35%	24%	0%	0%	0%
One Child Alone	5%	6%	3%	7%	8%	10%	6%	0%	0%	0%
Two Children Alone	3%	7%	4%	7%	6%	3%	1%	0%	0%	0%
Three or More Children Alone	1%	4%	4%	5%	4%	1%	1%	0%	0%	0%
Dependent Parent Alone	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
No Dependents/Refund	77%	44%	19%	8%	8%	13%	18%	25%	25%	30%

SECTION IV

ACTUARIAL IMPACT OF RECOMMENDATIONS

Section IV
Impact of Proposed Changes to Actuarial Assumptions

Under Rhode Island General Laws, the employer contribution rates are certified annually by the State of Rhode Island Retirement Board. These rates are determined actuarially, based on the plan provisions in effect as of the valuation date, the actuarial assumptions adopted by the Board, and the methodology set forth in the statutes. The Board's current policy is that the contribution rates determined by a given actuarial valuation become effective two years after the valuation date. For example, the rates determined by the June 30, 2023 actuarial valuation will be applicable for the year beginning July 1, 2025 and ending June 30, 2026.

The actuarial cost method and the amortization period are set by statute. Contribution rates and liabilities are computed using the Entry Age Normal actuarial cost method. The employer contribution rate is the sum of two pieces: the employer normal cost rate and the amortization rate. The normal cost rate is determined as a percent of pay. The employer normal cost is the difference between this and the member contribution rate. The amortization rate is determined as a level percent of pay. It is the amount required to amortize the unfunded actuarial accrued liability over a closed period. The amortization rate is adjusted for the two-year deferral in contribution rates. Separate employer contribution rates are determined for State Employees, Teachers, Judges, State Police, and individual MERS units.

Effect of the proposed assumptions

We are not recommending the June 30, 2022 valuation be restated, but instead, these recommended assumptions be used in this upcoming June 30, 2023 valuation. Shown below is a table that compares key results from the June 30, 2022 actuarial valuation with these same results recalculated using the recommended actuarial assumptions and methods. As you can see, the assumption changes generally increase the contribution requirements and liabilities.

State Employees			
Item	Current Assumptions and Methods	Recommended Assumptions and Methods	Change
Normal cost	7.87%	7.71%	-0.16%
Unfunded actuarial accrued liability	$2,032 million	$2,041 million	$9 million
Funded ratio	58.8%	58.7%	-0.1%
Projected FY 2026 Annual Required Contribution			
a. Percent of payroll	28.46%	29.26%	0.80%
b. Estimated dollar amount	$244.5 million	$246.5 million	$2.0 million

Teachers			
Item	Current Assumptions and Methods	Recommended Assumptions and Methods	Change
Normal cost	7.31%	7.17%	-0.14%
Unfunded actuarial accrued liability	$2,735 million	$2,662 million	-$73 million
Funded ratio	61.5%	62.1%	0.6%
Projected FY 2026 Annual Required Contribution			
a. Percent of payroll	24.99%	25.02%	0.04%
b. Estimated dollar amount	$308.5 million	$303.0 million	-$5.5 million

SPRBT			
Item	Current Assumptions and Methods	Recommended Assumptions and Methods	Change
Normal cost	21.53%	22.00%	0.47%
Unfunded actuarial accrued liability	$21 million	$21 million	$0 million
Funded ratio	90.0%	90.0%	0.0%
Projected FY 2026 Annual Required Contribution			
a. Percent of payroll	19.65%	20.25%	0.60%
b. Estimated dollar amount	$5.9 million	$6.0 million	$0.1 million

JRBT			
Item	Current Assumptions and Methods	Recommended Assumptions and Methods	Change
Normal cost	31.80%	31.62%	-0.18%
Unfunded actuarial accrued liability	-$4 million	-$4 million	$0 million
Funded ratio	104.0%	104.4%	0.4%
Projected FY 2026 Annual Required Contribution			
a. Percent of payroll	18.20%	17.80%	-0.40%
b. Estimated dollar amount	$2.4 million	$2.4 million	$0.0 million

MERS General			
Item	Current Assumptions and Methods	Recommended Assumptions and Methods	Change
Normal cost	9.55%	9.51%	-0.04%
Unfunded actuarial accrued liability	$174 million	$171 million	-$3 million
Funded ratio	87.20%	87.40%	0.2%
Projected FY 2026 Annual Required Contribution			
a. Percent of payroll	11.24%	11.38%	0.15%
b. Estimated dollar amount	$34.5 million	$34.4 million	-$0.1 million

MERS Police and Fire			
Item	Current Assumptions and Methods	Recommended Assumptions and Methods	Change
Normal cost	29.04%	28.75%	-0.29%
Unfunded actuarial accrued liability	$149 million	$147 million	-$2 million
Funded ratio	84.0%	84.2%	0.2%
Projected FY 2026 Annual Required Contribution			
a. Percent of payroll	18.64%	18.77%	0.13%
b. Estimated dollar amount	$28.2 million	$28.0 million	-$0.2 million

Teacher Survivor Benefit Plan			
Item	Current Assumptions and	Recommended Assumptions and	Change
Unfunded actuarial accrued liability	-$176 million	-$183 million	-$6 million
Funded ratio	178.1%	183.3%	5.2%

SECTION V

SUMMARY OF ASSUMPTIONS AND METHODS INCORPORATING THE RECOMMENDED ASSUMPTIONS

Section V
Summary of Assumptions and Methods Incorporating the Recommended Assumptions

I. Valuation Date

The valuation date is June 30th of each plan year. This is the date as of which the actuarial present value of future benefits and the actuarial value of assets are determined.

II. Actuarial Cost Method

The actuarial valuation uses the Entry Age actuarial cost method. Under this method, the employer contribution rate is the sum of (i) the employer normal cost rate, and (ii) a rate that will amortize the unfunded actuarial accrued liability (UAAL).

1. First, the actuarial present value of future benefits is determined by discounting the projected benefits for each member back to the valuation date using the assumed investment return rate as the discount rate. For active members, the projected benefits are based on the member's age, service, gender and compensation, and based on the actuarial assumptions. The calculations take into account the probability of the member's death, disability, or termination of employment prior to becoming eligible for a retirement benefit, as well as the possibility of the member will remain in service and receive a service retirement benefit. Future salary increases are anticipated. The present value of the expected benefits payable to all active members is added to the present value of the expected future payments to retired participants and beneficiaries to obtain the present value of all expected benefits. Liabilities for future members are not included.

2. The employer contributions required to support the benefits are determined as a level percentage of salary, and consist of a normal contribution and an amortization contribution.

3. The normal contribution is determined using the Entry Age Normal method. Under this method, a calculation is made to determine the rate of contribution which, if applied to the compensation of each individual member during the entire period of anticipated covered service, would be required to meet the cost of all benefits payable on his behalf. The salary-weighted average of these rates is the normal cost rate. This calculation reflects the plan provisions that apply to each individual member.

4. The employer normal cost rate is equal to (i) the normal cost rate, minus (ii) the member contribution rate.

5. The actuarial accrued liability is equal to the present value of all benefits less the present value of future normal costs. The unfunded actuarial accrued liability (UAAL) is then determined as (i) the actuarial accrued liability, minus (ii) the actuarial value of assets.

6. The amortization contribution rate is the level percentage of payroll required to reduce the UAAL to zero over the remaining amortization period. The UAAL was initially being amortized over the remainder of a closed 30-year period from June 30, 1999. In conjunction with The Rhode Island Retirement Security Act of 2011, the amortization period was reset to 25 years as of June 30, 2010. The employer contribution rate determined by this valuation will not be effective until two years after the valuation date. The determination of the contribution rate reflects this deferral. The unfunded actuarial accrued liability (UAAL) and covered payroll are projected forward for two years, and we then determine the amortization charge required to amortize the UAAL over the remaining amortization period from that point. In projecting the UAAL, we increase the UAAL for interest at the assumed rate and we decrease it for the amortization payments. The amortization payments for these two years are determined by subtracting the current employer normal cost from the known contribution rates for these years, based on the two prior actuarial valuations. Contributions are assumed to be made monthly throughout the year.

III. Actuarial Value of Assets

The actuarial value of assets is based on the market value of assets with a five-year phase-in of actual investment return in excess of (less than) expected investment income. Offsetting unrecognized gains and losses are immediately recognized, with the shortest remaining bases recognized first and the net remaining bases continue to be recognized on their original timeframe. Expected investment income is determined using the assumed investment return rate and the market value of assets (adjusted for receipts and disbursements during the year). The returns are computed net of administrative and investment expenses.

IV. Actuarial Assumptions

A. Economic Assumptions

1. Investment return: 7.00% per year, compounded annually, composed of an assumed 2.50% inflation rate and a 4.50% net real rate of return. This rate represents the assumed return, net of all investment and administrative expenses.

2. Salary increase rate:

   For State Employees: The sum of (i) a 3.00% wage inflation assumption (composed of a 2.50% price inflation assumption and a 0.50% additional general increase), and (ii) a service-related component as shown on next page.

   For Teachers: The sum of (i) a 2.75% wage inflation assumption (composed of a 2.50% price inflation assumption and a 0.25% additional general increase), and (ii) a service-related component as shown on next page.

Salary Increase Rates						
	State Employees		Correctional Officers		Teachers	
Service	Service-Related Component	Total Increase	Service-Related Component	Total Increase	Service-Related Component	Total Increase
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	1.00%	4.00%	2.00%	5.00%	5.50%	8.25%
2	2.00%	5.00%	3.00%	6.00%	5.50%	8.25%
3	3.00%	6.00%	4.00%	7.00%	5.50%	8.25%
4	2.75%	5.75%	3.75%	6.75%	5.50%	8.25%
5	2.75%	5.75%	3.75%	6.75%	5.50%	8.25%
6	2.50%	5.50%	3.50%	6.50%	5.25%	8.00%
7	1.25%	4.25%	2.25%	5.25%	5.00%	7.75%
8	1.00%	4.00%	2.00%	5.00%	5.00%	7.75%
9	1.00%	4.00%	2.00%	5.00%	5.00%	7.75%
10	1.00%	4.00%	2.00%	5.00%	2.50%	5.25%
11	1.00%	4.00%	1.50%	4.50%	1.25%	4.00%
12	2.00%	5.00%	2.50%	5.50%	0.75%	3.50%
13	1.25%	4.25%	1.75%	4.75%	0.50%	3.25%
14	1.00%	4.00%	1.50%	4.50%	0.50%	3.25%
15	1.00%	4.00%	1.50%	4.50%	0.50%	3.25%
16	1.00%	4.00%	1.00%	4.00%	0.25%	3.00%
17	0.50%	3.50%	1.00%	4.00%	0.25%	3.00%
18	0.50%	3.50%	1.00%	4.00%	0.25%	3.00%
19	0.50%	3.50%	1.00%	4.00%	0.25%	3.00%
20	0.50%	3.50%	1.00%	4.00%	0.50%	3.25%
21	0.50%	3.50%	1.00%	4.00%	0.10%	2.85%
22	0.25%	3.25%	1.00%	4.00%	0.10%	2.85%
23	0.25%	3.25%	1.00%	4.00%	0.10%	2.85%
24	0.25%	3.25%	1.00%	4.00%	0.10%	2.85%
25 or more	0.00%	3.00%	0.00%	3.00%	0.00%	2.75%

For MERS General: The sum of (i) a 3.00% wage inflation assumption (composed of a 2.50% price inflation assumption and a 0.50% additional general increase), and (ii) a service-related component as shown below.

General Employees		
Years of Service	Service-Related Component	Total Increase
1	4.25%	7.25%
2	3.25	6.25
3	3.00	6.00
4	2.75	5.75
5	2.50	5.50
6	2.25	5.25
7	1.50	4.50
8	1.00	4.00
9-10	0.75	3.75
11-15	0.50	3.50
16-20	0.20	3.20
20-24	0.10	3.10
16 or more	0.00	3.00

For police/fire employees, the sum of (i) a 3.50% wage inflation assumption (composed of a 2.50% price inflation assumption and a 1.00% additional general increase), and (ii) a service-related component as shown below.

Police/Fire Employees		
Years of Service	Service-Related Component	Total Increase
1	10.00%	13.50%
2	9.00	12.50
3	7.00	10.50
4	4.00	7.50
5	2.50	6.00
6	3.00	6.50
7-20	0.50	4.00
21-24	0.25	3.75
25 or more	0.00	3.50

Salary increases are assumed to occur once a year, on July 1. Therefore the pay used for the period year following the valuation date is equal to the reported pay for the prior year, increased by the salary increase assumption. For employees with less than one year of service, the reported rate of pay is used rather than the fiscal year salary paid.

3. Payroll growth rate: In the amortization of the unfunded actuarial accrued liability, payroll is assumed to increase 2.50% for State Employees, MERS P&F and MERS General and 2.00% for Teachers per year. This increase rate is solely due to the effect of wage inflation on salaries, with no allowance for future membership growth.

4. Post-retirement Benefit Increase: Post-retirement benefit increases are assumed to be 2.10%, per annum, while the plan has a funding level that exceeds 80%; however, an interim COLA will be granted in four-year intervals while the COLA is suspended. The second such COLA will be applicable in Calendar Year 2021. As of June 30, 2022, it is assumed that the COLAs will be suspended for 5 years due to the current funding level of the plans. The actual COLA will be determined based on the plan's five-year average investment rate of return (return on actuarial assets) minus 5.0% and will range from zero to 4.0%.

B. Demographic Assumptions

1. Post-termination mortality rates (non-disabled)

   a. Male State Employees, MERS General and MERS P&F: PUB-10 Median Table for Healthy General Employee Males, loaded by 115%, projected with Scale MP2021 with immediate convergence.

   b. Female State Employees, MERS General and MERS P&F: : PUB(10) Median Table for Healthy General Employee Females, loaded by 111%, projected with Scale MP2021 with immediate convergence.

   c. Male teachers: PUB-10 Median Table for Healthy Teacher Males, loaded by 108%, projected with Scale MP2021 with immediate convergence.

   d. Female teachers: PUB-10 Median Table for Healthy Teacher Females, loaded by 115%, projected with Scale MP2021 with immediate convergence.

The following table provides the life expectancy for individuals retiring in future years based on the assumption with full generational projection:

Life Expectancy for an Age 65 Retiree in Years					
Group	Year of Retirement				
	2022	2025	2030	2035	2040
State Employee - Male	20.7	20.9	21.3	21.7	22.0
State Employee - Female	23.4	23.6	23.9	24.2	24.6
Teacher - Male	22.7	22.9	23.3	23.6	23.9
Teacher - Female	24.4	24.6	24.9	25.2	25.5

2. Post-retirement mortality (disabled lives):

   a. State Employees: Sex distinct PUB-10 Tables for General Employees by Occupation, projected with Scale MP2021 with immediate convergence.

   b. Teachers: Sex distinct PUB-10 Tables for Teachers Employees by Occupation for females, projected with Scale MP2021 with immediate convergence.

3. Pre-retirement mortality:

   a. State Employees: Sex distinct PUB-10 Tables for General Employees by Occupation, projected with Scale MP2021 with immediate convergence.

   b. Teachers: Sex distinct PUB-10 Tables for Teachers Employees by Occupation for females, projected with Scale MP2021 with immediate convergence.

   c. Male MERS employees: PUB(10) Tables for Employees by Occupation for males, projected with Scale MP2021 with immediate convergence.

   d. Female MERS employees: PUB(10) Tables for Employees by Occupation for females, projected with Scale MP2021 with immediate convergence.

4. Disability rates: Sample rates are shown below. Ordinary disability rates are not applied to members eligible for retirement. One half the accidental disabilities are assumed to be totally and permanently disabled from any occupation.

Age	Number of Disabilities per 1,000							
	State Ordinary Males	State Accidental Males	State Ordinary Females	State Accidental Females	Teachers Ordinary Males	Teachers Accidental Males	Teachers Ordinary Females	Teachers Accidental Females
25	0.54	0.07	0.45	0.07	0.27	0.03	0.32	0.03
30	0.66	0.09	0.55	0.09	0.33	0.03	0.39	0.03
35	0.90	0.12	0.75	0.12	0.45	0.05	0.53	0.05
40	1.32	0.18	1.10	0.18	0.66	0.07	0.77	0.07
45	2.16	0.29	1.80	0.29	1.08	0.11	1.26	0.11
50	3.66	0.49	3.05	0.49	1.83	0.18	2.14	0.18
55	6.06	0.81	5.05	0.81	3.03	0.30	3.54	0.30
60	8.46	1.13	7.05	1.13	4.23	0.42	4.94	0.42
65	13.86	1.85	11.55	1.85	6.93	0.69	8.09	0.69

Age	MERS General, Ordinary, Males	MERS General, Accidental, Males	MERS General, Ordinary, Females	MERS General, Accidental, Females	MERS P&F, Ordinary, Males and Females	MERS P&F, Accidental, Males and Females
25	0.45	0.14	0.45	0.05	0.34	1.53
30	0.55	0.17	0.55	0.06	0.44	1.98
35	0.75	0.23	0.75	0.08	0.58	2.61
40	1.1	0.33	1.1	0.11	0.88	3.96
45	1.8	0.54	1.8	0.18	1.44	6.48
50	3.05	0.92	3.05	0.31	2.42	10.89
55	5.05	1.52	5.05	0.51	2.42	10.89
60	7.05	2.12	7.05	0.71	2.42	10.89
65	11.55	3.47	11.55	1.16	2.42	10.89

In addition, for General Employees and Teachers that are age 55 with 20 Years of service and not eligible to retire, another 1% is added to the rates above. In adition, if the member is above age 60, another 1% is added to the rates above.

5. Termination rates (for causes other than death, disability, or retirement) are a function of the member's service. Termination rates are not applied to members eligible for retirement. Rates are shown below:

Service	State Employees	Correctional Officers	Teachers	MERS General	MERS P&F
1	0.188800	0.104000	0.150000	0.175000	0.100000
2	0.119369	0.072800	0.100000	0.118774	0.069562
3	0.095306	0.059689	0.007500	0.101396	0.0548625
4	0.081230	0.051579	0.056841	0.086148	0.046265
5	0.071243	0.046835	0.047326	0.086007	0.040164
6	0.063496	0.043469	0.040747	0.072536	0.035433
7	0.057166	0.040858	0.035903	0.061073	0.031566
8	0.051815	0.038725	0.032175	0.051453	0.028296
9	0.047180	0.036922	0.029209	0.043504	0.025465
10	0.043091	0.035359	0.026789	0.037061	0.022968
11	0.039433	0.033981	0.024773	0.031957	0.020733
12	0.036125	0.032749	0.023065	0.028021	0.018711
13	0.033104	0.031634	0.021598	0.025086	0.016866
14	0.030325	0.030616	0.020323	0.022985	0.015169
15	0.027752	0.029678	0.019204	0.021550	0.013598
16	0.025357	0.028812	0.018213	0.020615	0.012135
17	0.023117	0.028004	0.017328	0.020008	0.010766
18	0.021012	0.027249	0.016534	0.019563	0.009480
19	0.019027	0.026540	0.015816	0.001911	0.008269
20	0.017152	0.025871	0.015164	0.018489	0.000000
21	0.015370	0.025239	0.014568	0.017524	0.000000
22	0.013677	0.024639	0.014022	0.016050	0.000000
23	0.012062	0.024068	0.013520	0.013898	0.000000
24	0.010519	0.023524	0.013056	0.010902	0.000000
25	0.009041	0.023004	0.000000	0.006892	0.000000

6. Retirement rates (unreduced):

For State Employees (except Correctional Officers): A 20% per year retirement probability for members who is eligible for unreduced retirement before age 62, a 25% retirement probability for those retired between ages 62 to 64, then 30% for members aged 65 and up. 100% of members aged 75 and above are assumed to retire immediately.

For Teachers: a flat 30% per year retirement probability for members between ages 65 to 69, and a flat 35% per year retirement probability for members at age 70 or older eligible for unreduced retirement. A 30% retirement probability at first eligibility will be applied for employees under age 65. 20% per year retirement probability for members at all other ages. 100% of members aged 75 and above are assumed to retire immediately.

For MERS General Employees: a flat 20% per year retirement probability for members eligible for unreduced retirement. A 25% retirement probability will be applied if they have reached age 65.

For MERS P&F: Unisex, service based rates are used for police and fire.

Service	Retirement Probabilities
25	15.0%
26	18.0%
27	21.0%
28	22.0%
29	22.0%
30-34	27.0%
35-39	37.0%
40+	100.0%

100% of members eligible to retire as of June 30, 2012 are assumed to retire once they reach 35 years of service. All members not eligible to retire as of June 30, 2012 are assumed retire at SSNRA, if eligible.

Members are eligible to receive an enhanced benefit if they are at least age 57 with 30 or more years of service. In the year prior to becoming eligible for this provision, no members are assumed to retire

For Correctional Officers: A set of unisex rates, indexed by service, as shown below. 100% of officers who have attained Social Security normal retirement age and have at least 5 years of service are assumed to retire.

Corrections	
Service	Ret. Rate
25	10.00%
26	5.00%
27	6.00%
28	7.00%
29	8.00%
30	9.00%
31	10.00%
32	11.00%
33	12.00%
34	13.00%
35	14.00%
36	15.00%
37	16.00%
38	17.00%
39	18.00%
40	100.00%

7. Reduced retirement rates: No early retirements are assumed for police and fire. Members are eligible to retire with reduced benefit five years prior to their normal retirement age. Rates are on the years from normal retirement age, as shown below:

Year from Normal Retirement Age	Ret. Rate
5	1%
4	1%
3	1%
2	2%
1	3%

C. Other Assumptions

1. Valuation payroll (used for determining the amortization contribution rate): Prior aggregate fiscal year payroll projected forward one year using the overall payroll growth rate.

2. Percent married: For State Employees and Teachers, 85% of employees are assumed to be married. For MERS employees (both MERS General and MERS P&F), 80% of employees are assumed to be married.

3. Age difference: Male members are assumed to be three years older than their spouses, and female members are assumed to be three years younger than their spouses.

4. Percent electing annuity on death (when eligible): All of the spouses of vested, married participants are assumed to elect an annuity. The spousal annuity death benefit for vested married participants is valued using a static optional form conversion factor of 0.84 and 0.78 for males and females respectively.

5. For active death benefits, the liability is initially calculated based on the ordinary death benefit provisions, and then a 7.5% load is applied to account for duty related benefits.

6. Percent electing deferred termination benefit: Vested terminating members are assumed to elect a refund or a deferred benefit, whichever is more valuable at the time of termination.

7. Recovery from disability: None assumed.

8. Remarriage: It is assumed that no surviving spouse will remarry and there will be no children's benefit.

9. Assumed age for commencement of deferred benefits: Members electing to receive a deferred benefit are assumed to commence receipt at the first age at which unreduced benefits are available.

10. Investment and administrative expenses: The assumed investment return rate represents the anticipated net return after payment of all investment and administrative expenses.

11. Inactive members: Liabilities for inactive members are approximated as a multiple of their member contribution account balances. For non-vested inactive members, the multiple is 1.0. For vested inactive members, the multiple is 8.0 for members with 25 or more years of service, 3.0 for vested inactive members age 45 or older with less than 25 years of service, and 1.0 for other vested inactive members younger than age 45.

12. Decrement timing: For all non-teachers employees (State Employees, MERS General, and MERS P&F), decrements are assumed to occur at the middle of the year. For Teachers the retirement and termination decrements are assumed to occur at the beginning of the year, while death and disability are assumed to occur at the middle of the year. For members who terminated service after June 30, 2017, the expected liability at termination has been carried forward with interest from the last valuation the member was active.

13. Eligibility testing: Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur.

14. Decrement relativity: Decrement rates are used directly from the experience study, without adjustment for multiple decrement table effects.

15. Incidence of Contributions: Contributions are assumed to be received continuously throughout the year based upon the computed percent of payroll shown in this report, and the actual payroll payable at the time contributions are made.

16. Benefit Service: All members are assumed to accrue one year of eligibility service each year.

17. All calculations were performed without regard to the compensation limit in IRC Section 401(a)(17) and the benefit limit under IRC Section 415.

D. Participant Data

Participant data was supplied on electronic files. There are separate files for (i) active and inactive members, and (ii) members and beneficiaries receiving benefits.

The data for active members included name, an identification number, gender, a code indicating whether the member was active or inactive, a code indicating employee type (State Employee, Teacher, MERS General or MERS P&F), date of birth, service, salary, date of last contribution, accumulated member contributions without interest, accrued benefit multiplier as of June 30, 2014, Final Average Compensation as of June 30, 2012, Article 7 Retirement Date, and the Rhode Island Retirement Security Act Retirement Date. For retired members and beneficiaries, the data included name, an identification number, gender, date of birth, date of retirement, amount of benefit, the amount of adjustment after age 62 for anyone electing the Social Security option, a code indicating the option elected and the type of retiree (service retiree, disabled retiree, beneficiary), and if applicable, the joint pensioner's date of birth and gender.

Salary supplied for the current year was based on the earnings for the fiscal year preceding the valuation date. However, for members with less than one year of service, the current rate of salary was used. This salary was adjusted by the salary increase rate for one year.

In defining who was an active member, members with a date of last contribution in the final quarter of the fiscal year were considered active. Otherwise, the member was defined as inactive.

To correct for incomplete and inconsistent data, we first attempted to pulled data from prior valuation files and then made general assumptions to fill in the rest. These modifications had no material impact on the results presented.

SECTION VI

SUMMARY OF DATA AND EXPERIENCE

List of Tables

General Employees
POST-RETIREMENT MORTALITY - HEALTHY MALE
Weighted by Annual Benefits in $000s

				Assumed Rate		Expected		Actual/Exp	
Age	Actual Deaths	Total Benefits	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55-59	$ 324	$ 97,264	0.0033	0.0053	0.0052	$ 518	$ 505	62%	64%
60-64	2,244	242,983	0.0092	0.0076	0.0075	1,857	1,811	121%	124%
65-69	5,511	410,678	0.0134	0.0119	0.0116	4,877	4,782	113%	115%
70-74	7,293	383,564	0.0190	0.0204	0.0201	7,828	7,713	93%	95%
75-79	8,682	232,189	0.0374	0.0360	0.0357	8,365	8,282	104%	105%
80-84	9,578	150,583	0.0636	0.0649	0.0648	9,768	9,761	98%	98%
85-89	11,568	94,200	0.1228	0.1153	0.1169	10,860	11,015	107%	105%
90-94	7,978	41,296	0.1932	0.1916	0.1965	7,910	8,114	101%	98%
95-99	2,378	8,934	0.2661	0.2902	0.2987	2,592	2,668	92%	89%
Totals	$ 55,555	$ 1,661,692	0.0334	0.0328	0.0329	$ 54,577	$ 54,652	102%	102%
65-74	$ 12,804	$ 794,242	0.0161	0.0160	0.0157	$ 12,705	$ 12,495	101%	102%
75-84	$ 18,260	$ 382,772	0.0477	0.0474	0.0471	$ 18,133	$ 18,044	101%	101%
85-94	$ 19,546	$ 135,496	0.1443	0.1385	0.1412	$ 18,771	$ 19,128	104%	102%

General Employees
POST-RETIREMENT MORTALITY - HEALTHY FEMALE
Weighted by Annual Benefits in $000s

				Assumed Rate		Expected		Actual/Exp	
Age	Actual Benefits	Total Benefits	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55-59	$ 132	$ 55,350	0.0024	0.0033	0.0032	$ 190	$ 186	69%	71%
60-64	923	229,389	0.0040	0.0047	0.0046	1,127	1,101	82%	84%
65-69	3,449	362,526	0.0095	0.0079	0.0077	2,907	2,851	119%	121%
70-74	4,227	323,024	0.0131	0.0138	0.0136	4,468	4,402	95%	96%
75-79	5,325	228,412	0.0233	0.0245	0.0243	5,581	5,525	95%	96%
80-84	7,654	152,458	0.0502	0.0442	0.0442	6,699	6,698	114%	114%
85-89	8,203	102,070	0.0804	0.0828	0.0840	8,406	8,526	98%	96%
90-94	8,810	55,462	0.1588	0.1484	0.1522	7,961	8,161	111%	108%
95-99	2,984	12,504	0.2386	0.2343	0.2411	2,750	2,833	108%	105%
Totals	$ 41,706	$ 1,521,196	0.0274	0.0264	0.0265	$ 40,089	$ 40,282	104%	104%
65-74	$ 7,676	$ 685,550	0.0112	0.0108	0.0106	$ 7,375	$ 7,252	104%	106%
75-84	$ 12,979	$ 380,870	0.0341	0.0322	0.0321	$ 12,280	$ 12,223	106%	106%
85-94	$ 17,013	$ 157,532	0.1080	0.1039	0.1059	$ 16,366	$ 16,687	104%	102%

TEACHERS
POST-RETIREMENT MORTALITY - HEALTHY MALE
Weighted by Annual Benefits in $000s

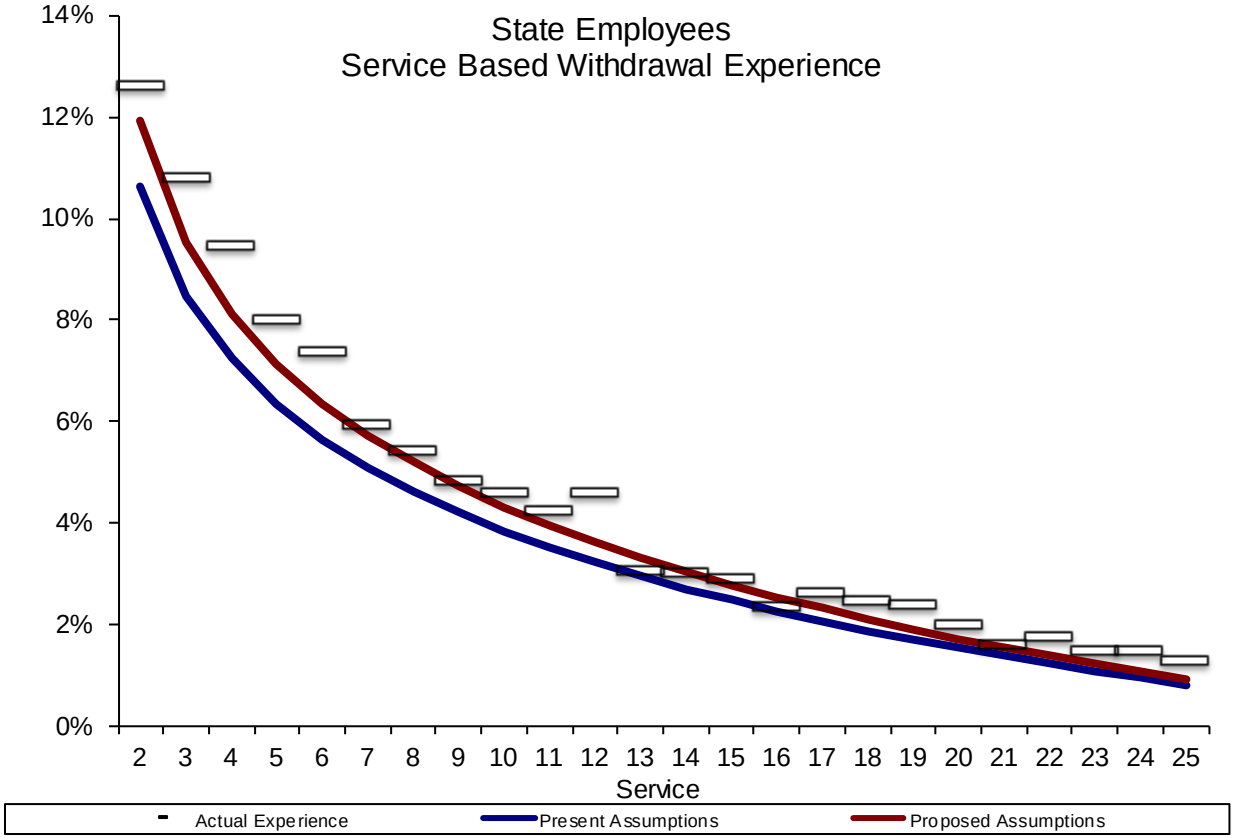
Age	Actual Deaths	Total Benefits	Actual Rate	Assumed Rate		Expected Benefits		Actual/Expected	
				Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55-59	$ 75	$ 14,699	0.0051	0.0027	0.0026	$ 40	$ 39	189%	194%
60-64	370	112,819	0.0033	0.0044	0.0043	493	481	75%	77%
65-69	2,514	325,722	0.0077	0.0075	0.0073	2,436	2,388	103%	105%
70-74	5,405	396,981	0.0136	0.0139	0.0137	5,510	5,430	98%	100%
75-79	7,257	267,926	0.0271	0.0265	0.0262	7,090	7,020	102%	103%
80-84	8,141	147,411	0.0552	0.0498	0.0498	7,347	7,342	111%	111%
85-89	7,147	77,071	0.0927	0.0935	0.0949	7,209	7,312	99%	98%
90-94	5,092	28,784	0.1769	0.1681	0.1724	4,838	4,962	105%	103%
95-99	1,596	5,008	0.3187	0.2702	0.2782	1,353	1,393	118%	115%
Totals	$ 37,597	$ 1,376,422	0.0273	0.0264	0.0264	$ 36,317	$ 36,367	104%	103%
65-74	$ 7,919	$ 722,703	0.0110	0.0110	0.0108	$ 7,947	$ 7,818	100%	101%
75-84	$ 15,398	$ 415,337	0.0371	0.0348	0.0346	$ 14,437	$ 14,362	107%	107%
85-94	$ 12,239	$ 105,855	0.1156	0.1138	0.1160	$ 12,048	$ 12,275	102%	100%

TEACHERS
POST-RETIREMENT MORTALITY - HEALTHY FEMALE
Weighted by Annual Benefits in $000s

				Assumed Rate		Expected Benefits		Actual/Expected	
Age	Actual Benefits	Total Benefits	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55-59	$ 157	$ 50,958	0.0031	0.0024	0.0024	$ 133	$ 130	118%	121%
60-64	1,180	360,144	0.0033	0.0036	0.0035	1,391	1,358	85%	87%
65-69	4,178	840,401	0.0050	0.0059	0.0057	5,058	4,960	83%	84%
70-74	6,960	719,401	0.0097	0.0106	0.0104	7,537	7,425	92%	94%
75-79	6,395	343,799	0.0186	0.0204	0.0202	6,889	6,820	93%	94%
80-84	7,728	182,685	0.0423	0.0392	0.0391	7,082	7,081	109%	109%
85-89	9,656	110,999	0.0870	0.0746	0.0757	8,174	8,289	118%	116%
90-94	7,795	53,996	0.1444	0.1389	0.1424	7,227	7,409	108%	105%
95-99	3,386	14,566	0.2324	0.2391	0.2461	3,283	3,381	103%	100%
Totals	$ 47,435	$ 2,676,949	0.0177	0.0175	0.0175	$ 46,773	$ 46,852	101%	101%
65-74	$ 11,139	$ 1,559,802	0.0071	0.0081	0.0079	$ 12,595	$ 12,385	88%	90%
75-84	$ 14,123	$ 526,484	0.0268	0.0265	0.0264	$ 13,972	$ 13,901	101%	102%
85-94	$ 17,451	$ 164,995	0.1058	0.0933	0.0951	$ 15,400	$ 15,698	113%	111%

STATE EMPLOYEES
SERVICE BASED WITHDRAWAL EXPERIENCE
Weighted by Liability in $millions

				Assumed Rate		Expected Withdrawal		Actual/Expected	
Service	Actual Withdrawal	Total Count	Actual Rate	Current	Proposed	Current	Proposed	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	$ 13,297	$ 106,589	0.124749	0.168000	0.188800	$ 17,907	$ 20,124	74%	66%
2	31,153	247,075	0.126089	0.106218	0.119369	26,244	29,493	119%	106%
3	27,989	258,578	0.108240	0.084806	0.095306	21,929	24,644	128%	114%
4	24,495	259,115	0.094535	0.072281	0.081230	18,729	21,048	131%	116%
5	20,186	251,307	0.080326	0.063394	0.071243	15,931	17,904	127%	113%
6	17,945	243,619	0.073660	0.056501	0.063496	13,765	15,469	130%	116%
7	14,805	250,489	0.059103	0.050869	0.057166	12,742	14,320	116%	103%
8	14,587	269,963	0.054032	0.046107	0.051815	12,447	13,988	117%	104%
9	13,499	280,333	0.048152	0.041982	0.047180	11,769	13,226	115%	102%
10	12,938	282,946	0.045725	0.038344	0.043091	10,849	12,192	119%	106%
11	12,579	295,865	0.042515	0.035089	0.039433	10,382	11,667	121%	108%
12	14,437	314,600	0.045889	0.032145	0.036125	10,113	11,365	143%	127%
13	10,037	329,966	0.030419	0.029457	0.033104	9,720	10,923	103%	92%
14	10,531	347,635	0.030294	0.026984	0.030325	9,381	10,542	112%	100%
15	11,054	380,851	0.029025	0.024695	0.027752	9,405	10,570	118%	105%
16	9,252	396,119	0.023357	0.022564	0.025357	8,938	10,044	104%	92%
17	10,484	398,573	0.026304	0.020570	0.023116	8,199	9,213	128%	114%
18	9,434	385,174	0.024493	0.018697	0.021012	7,202	8,093	131%	117%
19	9,207	388,658	0.023688	0.016932	0.019028	6,581	7,395	140%	124%
20	8,264	410,937	0.020109	0.015261	0.017151	6,271	7,048	132%	117%
21	6,913	433,648	0.015941	0.013677	0.015371	5,931	6,665	117%	104%
22	7,658	440,091	0.017401	0.012170	0.013676	5,356	6,019	143%	127%
23	6,886	461,360	0.014924	0.010733	0.012062	4,952	5,565	139%	124%
24	7,507	504,282	0.014887	0.009359	0.010519	4,720	5,304	159%	142%
25	6,921	546,187	0.012671	0.008045	0.009041	4,394	4,938	158%	140%
Totals	$ 332,056	$ 8,483,959				$ 273,854	$ 307,760	121%	108%

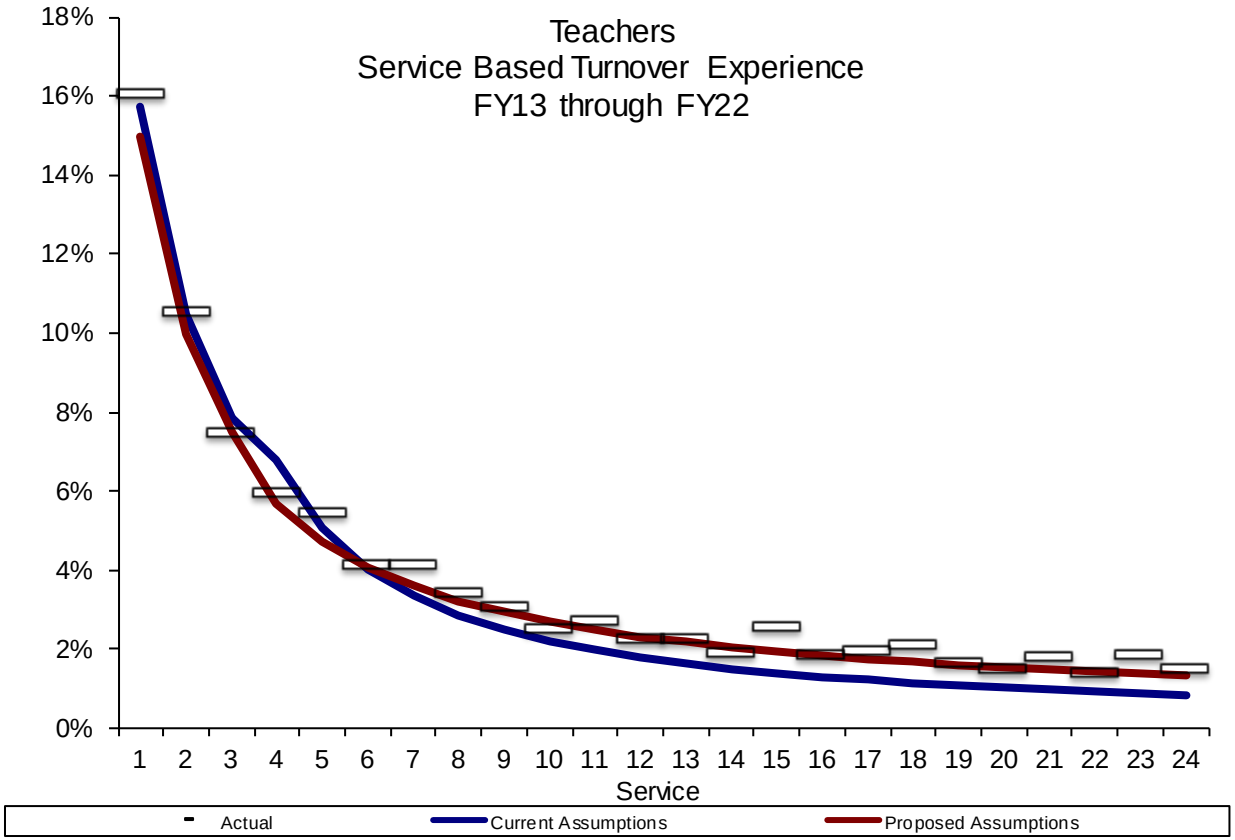

State Employees
Service Based Withdrawal Experience
14%
12%
10%
8%
6%
4%
2%
0%
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Service
Actual Experience
Present Assumptions
Proposed Assumptions

TEACHERS

SERVICE BASED WITHDRAWAL EXPERIENCE

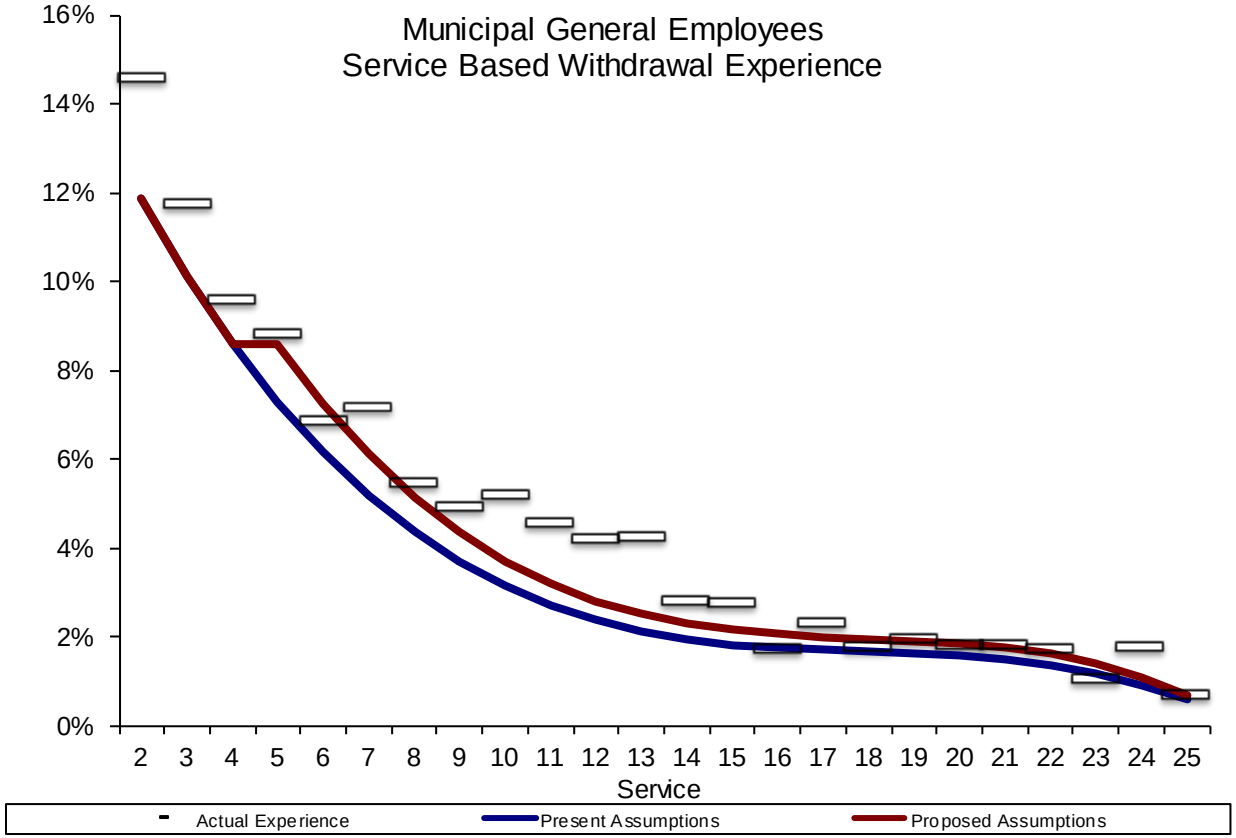
Weighted by Liability in $millions

				Assumed Rate		Expected Withdrawal		Actual/Expected	
Service	Actual Withdrawal	Total Count	Actual Rate	Current	Proposed	Current	Proposed	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	$ 46,059	$ 286,343	0.160851	0.157500	0.150000	$ 45,099	$ 42,951	102%	107%
2	28,607	270,417	0.105788	0.105000	0.100000	28,394	27,042	101%	106%
3	21,044	282,190	0.074573	0.078750	0.075000	22,222	21,164	95%	99%
4	17,749	298,385	0.059483	0.068052	0.056841	20,306	19,339	87%	92%
5	17,367	317,753	0.054657	0.050571	0.047326	16,069	18,365	108%	95%
6	14,014	338,064	0.041452	0.040169	0.040747	13,580	15,519	103%	90%
7	15,128	366,791	0.041243	0.033280	0.035903	12,207	13,951	124%	108%
8	13,867	402,151	0.034481	0.028385	0.032175	11,415	13,046	121%	106%
9	13,947	452,814	0.030802	0.024731	0.029209	11,199	12,798	125%	109%
10	13,115	521,081	0.025169	0.021900	0.026789	11,412	15,650	115%	84%
11	16,189	595,481	0.027187	0.019643	0.024773	11,697	16,042	138%	101%
12	16,096	706,831	0.022772	0.017804	0.023065	12,584	17,259	128%	93%
13	18,293	809,946	0.022585	0.016275	0.021598	13,182	18,078	139%	101%
14	16,829	891,806	0.018871	0.014985	0.020323	13,364	18,327	126%	92%
15	25,041	986,030	0.025396	0.013881	0.019204	13,687	18,771	183%	133%
16	19,717	1,069,365	0.018438	0.012928	0.018213	13,825	18,959	143%	104%
17	22,404	1,148,359	0.019509	0.012094	0.017328	13,888	19,047	161%	118%
18	25,596	1,204,880	0.021244	0.011361	0.016534	13,689	18,773	187%	136%
19	20,203	1,224,195	0.016503	0.010710	0.015816	13,111	17,981	154%	112%
20	18,589	1,223,235	0.015196	0.010128	0.015164	12,389	16,991	150%	109%
21	21,512	1,192,589	0.018038	0.009606	0.014568	11,456	15,712	188%	137%
22	16,755	1,216,893	0.013769	0.009135	0.014022	11,116	15,245	151%	110%
23	21,980	1,172,479	0.018746	0.008707	0.013520	10,209	13,999	215%	157%
24	17,264	1,166,170	0.014804	0.008316	0.013056	9,698	13,300	178%	130%
Totals	$ 477,362	$ 18,144,248				$ 365,797	$ 438,309	130%	109%


Teachers
Service Based Turnover Experience
FY13 through FY22
18%
16%
14%
12%
10%
8%
6%
4%
2%
0%
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
Service
Actual
Current Assumptions
Proposed Assumptions

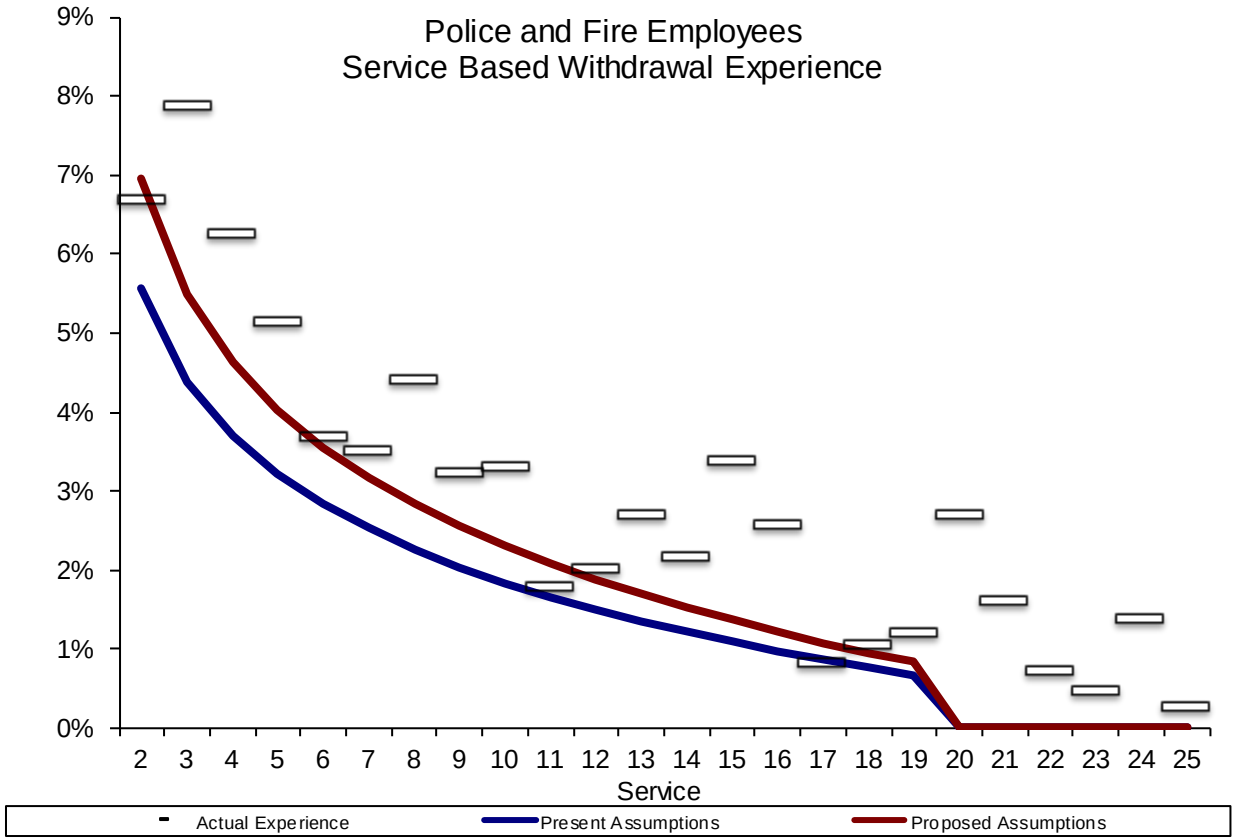
MERS GENERAL EMPLOYEES
SERVICE BASED WITHDRAWAL EXPERIENCE
Weighted by Liability in $millions

				Assumed Rate		Expected Withdrawal		Actual/Expected	
Service	Actual Withdrawal	Total Count	Actual Rate	Current	Proposed	Current	Proposed	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	$ 5,766	$ 33,626	0.171471	0.175000	0.175000	$ 5,884	$ 5,884	98%	98%
2	13,120	89,727	0.146221	0.118774	0.118774	10,657	10,657	123%	123%
3	10,850	92,230	0.117642	0.101396	0.101396	9,352	9,352	116%	116%
4	8,903	92,703	0.096034	0.086148	0.086148	7,986	7,986	111%	111%
5	8,344	94,299	0.088485	0.072887	0.086007	6,873	8,110	121%	103%
6	6,574	95,502	0.068839	0.061471	0.072536	5,871	6,927	112%	95%
7	6,990	97,522	0.071672	0.051757	0.061073	5,047	5,956	138%	117%
8	5,614	102,677	0.054681	0.043604	0.051453	4,477	5,283	125%	106%
9	5,466	110,942	0.049270	0.036868	0.043504	4,090	4,826	134%	113%
10	6,520	125,621	0.051900	0.031408	0.037061	3,945	4,656	165%	140%
11	6,528	142,448	0.045829	0.027082	0.031957	3,858	4,552	169%	143%
12	6,924	164,761	0.042024	0.023746	0.028020	3,912	4,617	177%	150%
13	8,057	189,439	0.042530	0.021259	0.025086	4,027	4,752	200%	170%
14	5,770	204,471	0.028221	0.019479	0.022985	3,983	4,700	145%	123%
15	6,117	220,076	0.027796	0.018263	0.021550	4,019	4,743	152%	129%
16	4,058	231,600	0.017520	0.017470	0.020615	4,046	4,774	100%	85%
17	5,722	245,170	0.023341	0.016956	0.020008	4,157	4,905	138%	117%
18	4,530	252,748	0.017922	0.016579	0.019563	4,190	4,945	108%	92%
19	4,878	249,903	0.019521	0.016198	0.019114	4,048	4,777	121%	102%
20	4,540	251,431	0.018058	0.015669	0.018489	3,940	4,649	115%	98%
21	4,307	236,725	0.018194	0.014851	0.017524	3,516	4,148	123%	104%
22	3,906	224,953	0.017362	0.013602	0.016050	3,060	3,611	128%	108%
23	2,401	222,734	0.010781	0.011778	0.013898	2,623	3,096	92%	78%
24	4,009	223,955	0.017900	0.009239	0.010902	2,069	2,442	194%	164%
25	1,587	221,273	0.007171	0.005841	0.006892	1,292	1,525	123%	104%
Totals	$ 151,481	$ 4,216,534				$ 116,925	$ 131,873	130%	115%


Municipal General Employees
Service Based Withdrawal Experience
16%
14%
12%
10%
8%
6%
4%
2%
0%
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Service
Actual Experience
Present Assumptions
Proposed Assumptions

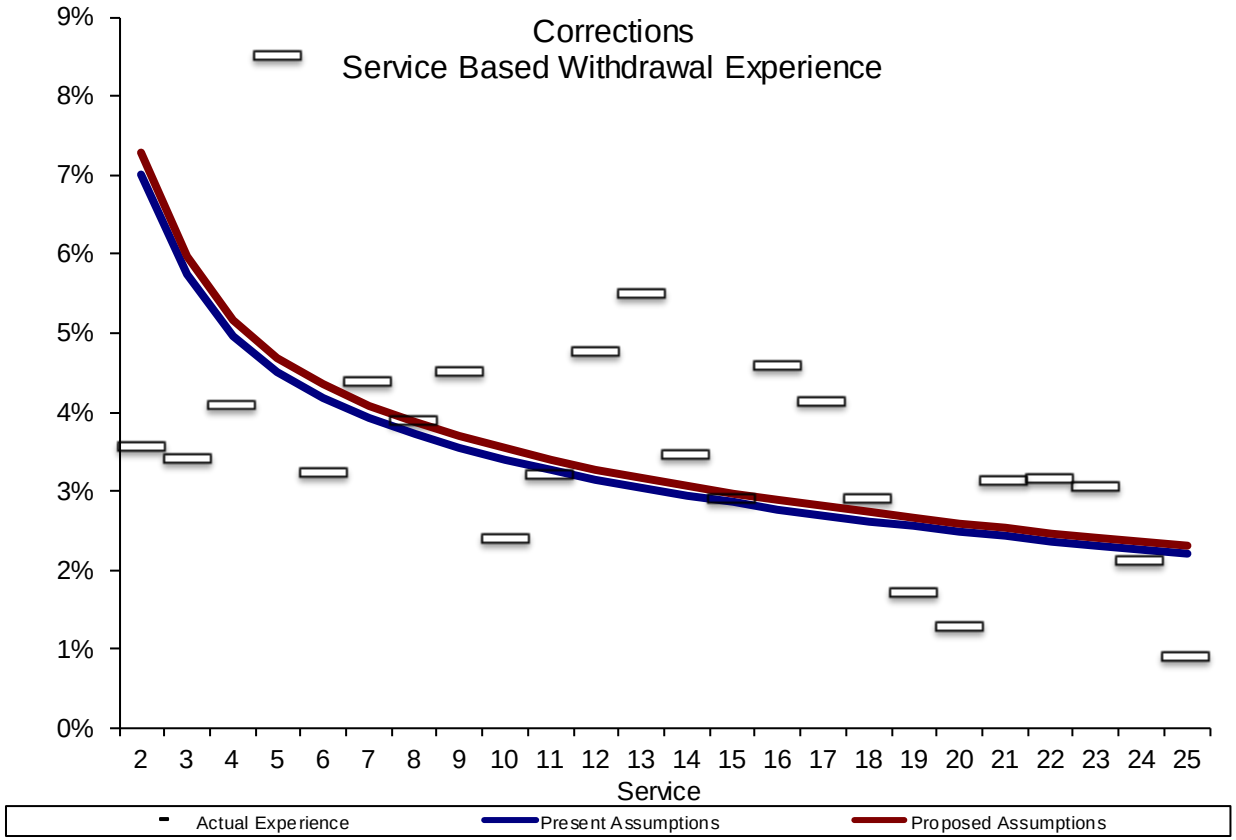
POLICE AND FIRE
SERVICE BASED WITHDRAWAL EXPERIENCE
Weighted by Liability in $millions

				Assumed Rate		Expected Withdrawal		Actual/Expected	
Service	Actual Withdrawal	Total Count	Actual Rate	Current	Proposed	Current	Proposed	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	$ 7,658	$ 74,671	0.102560	0.100000	0.100000	$ 7,467	$ 7,467	103%	103%
2	12,646	162,645	0.066836	0.055650	0.069563	9,051	11,314	140%	112%
3	12,124	158,103	0.078877	0.043890	0.054863	6,939	8,674	175%	140%
4	10,417	157,690	0.062774	0.037012	0.046265	5,836	7,296	178%	143%
5	7,791	158,826	0.051643	0.032131	0.040164	5,103	6,379	153%	122%
6	5,596	147,309	0.036970	0.028346	0.035433	4,176	5,220	134%	107%
7	5,589	153,722	0.035156	0.025253	0.031566	3,882	4,852	144%	115%
8	6,609	156,236	0.044262	0.022637	0.028296	3,537	4,421	187%	149%
9	5,263	164,192	0.032175	0.020372	0.025465	3,345	4,181	157%	126%
10	6,618	169,290	0.032937	0.018374	0.022968	3,111	3,888	213%	170%
11	3,971	185,640	0.017839	0.016586	0.020733	3,079	3,849	129%	103%
12	3,514	182,991	0.020093	0.014969	0.018711	2,739	3,424	128%	103%
13	5,020	193,035	0.027049	0.013493	0.016866	2,605	3,256	193%	154%
14	4,424	200,668	0.021672	0.012135	0.015169	2,435	3,044	182%	145%
15	7,863	223,682	0.033899	0.010878	0.013598	2,433	3,042	323%	258%
16	5,374	218,458	0.025796	0.009708	0.012135	2,121	2,651	253%	203%
17	1,702	214,951	0.008309	0.008613	0.010766	1,851	2,314	92%	74%
18	2,491	220,719	0.010577	0.007584	0.009480	1,674	2,092	149%	119%
19	2,531	219,721	0.012107	0.006615	0.008269	1,453	1,817	174%	139%
20	6,013	220,631	0.027078	0.000000	0.000000	0	0	0%	0%
21	3,240	209,955	0.016021	0.000000	0.000000	0	0	0%	0%
22	1,471	211,264	0.007223	0.000000	0.000000	0	0	0%	0%
23	947	201,642	0.004834	0.000000	0.000000	0	0	0%	0%
24	2,568	189,582	0.013859	0.000000	0.000000	0	0	0%	0%
25	489	188,086	0.002644	0.000000	0.000000	0	0	0%	0%
Totals	$ 131,929	$ 4,583,713				$ 72,837	$ 89,181	181%	148%


Police and Fire Employees
Service Based Withdrawal Experience
9%
8%
7%
6%
5%
4%
3%
2%
1%
0%
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Service
Actual Experience
Present Assumptions
Proposed Assumptions

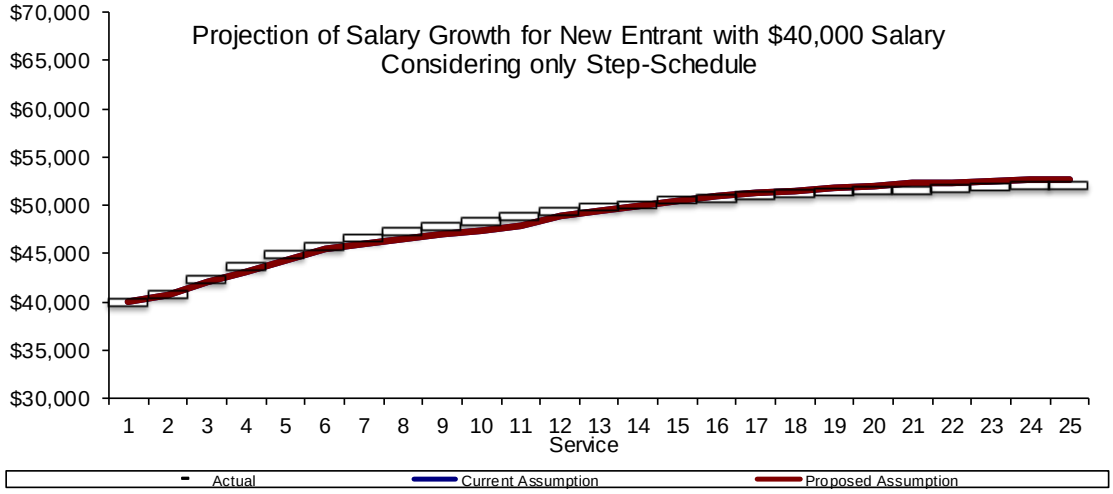
Correctional Officers
SERVICE BASED WITHDRAWAL EXPERIENCE
Weighted by Liability in $millions

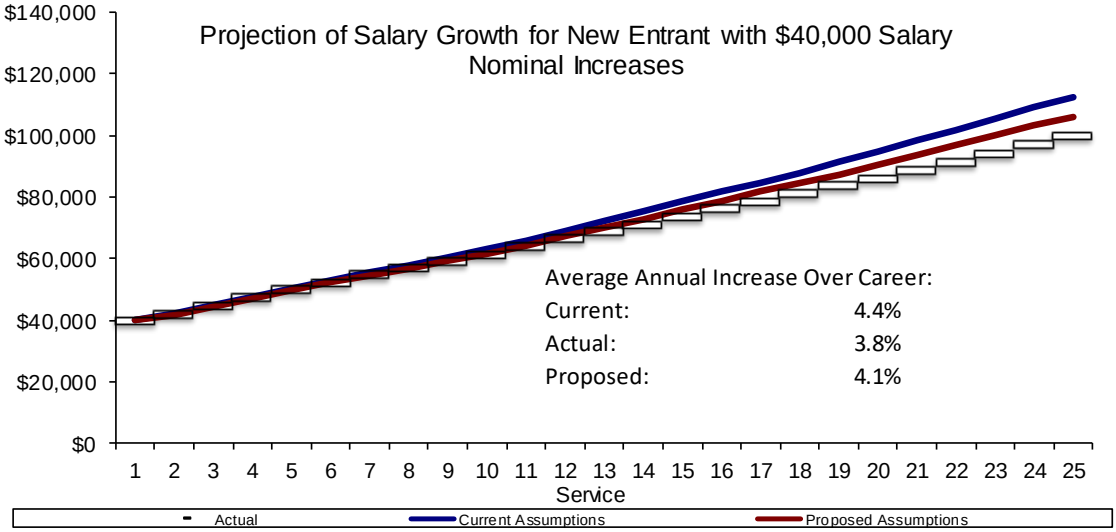
				Assumed Rate		Expected Withdrawal		Actual/Expected	
Service	Actual Withdrawal	Total Count	Actual Rate	Current	Proposed	Current	Proposed	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	$ 1,403	$ 11,384	0.123257	0.100000	0.104000	$ 1,138	$ 1,184	123%	119%
2	953	26,841	0.035496	0.070000	0.072800	1,879	1,954	51%	49%
3	948	27,743	0.034169	0.057393	0.059689	1,592	1,656	60%	57%
4	1,322	32,348	0.040883	0.049595	0.051579	1,604	1,668	82%	79%
5	2,407	28,305	0.085043	0.045034	0.046835	1,275	1,326	189%	182%
6	990	30,713	0.032245	0.041797	0.043469	1,284	1,335	77%	74%
7	1,625	36,934	0.044005	0.039287	0.040858	1,451	1,509	112%	108%
8	1,670	42,990	0.038854	0.037236	0.038725	1,601	1,665	104%	100%
9	2,076	45,820	0.045299	0.035502	0.036922	1,627	1,692	128%	123%
10	1,093	45,562	0.023984	0.033999	0.035359	1,549	1,611	71%	68%
11	1,606	49,937	0.032151	0.032674	0.033981	1,632	1,697	98%	95%
12	2,436	51,135	0.047643	0.031489	0.032749	1,610	1,675	151%	145%
13	3,367	61,195	0.055024	0.030417	0.031634	1,861	1,936	181%	174%
14	2,130	61,774	0.034482	0.029438	0.030616	1,818	1,891	117%	113%
15	1,899	65,376	0.029049	0.028537	0.029678	1,866	1,940	102%	98%
16	3,109	67,772	0.045872	0.027704	0.028812	1,878	1,953	166%	159%
17	2,814	67,880	0.041452	0.026927	0.028004	1,828	1,901	154%	148%
18	1,722	59,485	0.028949	0.026201	0.027249	1,559	1,621	110%	106%
19	1,042	61,073	0.017060	0.025519	0.026540	1,559	1,621	67%	64%
20	850	65,826	0.012916	0.024876	0.025871	1,637	1,703	52%	50%
21	2,236	71,619	0.031218	0.024268	0.025239	1,738	1,808	129%	124%
22	2,869	90,891	0.031564	0.023691	0.024639	2,153	2,239	133%	128%
23	3,339	109,643	0.030457	0.023142	0.024068	2,537	2,639	132%	127%
24	2,437	115,100	0.021176	0.022619	0.023524	2,603	2,708	94%	90%
25	1,071	117,434	0.009116	0.022119	0.023004	2,598	2,701	41%	40%
Totals	$ 47,415	$ 1,444,777				$ 43,877	$ 45,632	108%	104%


Corrections
Service Based Withdrawal Experience
9%
8%
7%
6%
5%
4%
3%
2%
1%
0%
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
Service
Actual Experience
Present Assumptions
Proposed Assumptions

Salary Scale Assumption
State Employees

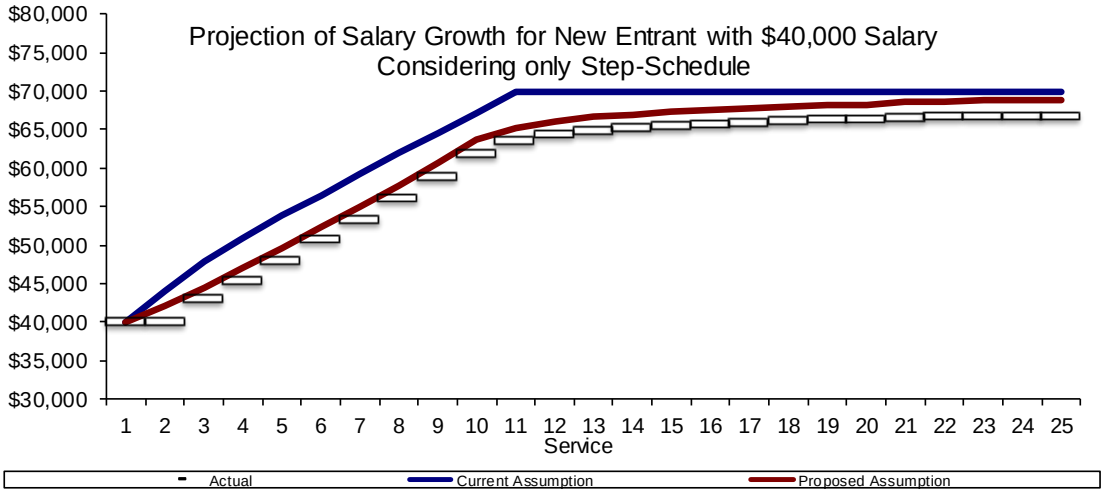
Year	Average Long Service Increase	CPI	Productivity
2013	0.84%	1.96%	-1.12%
2014	0.76%	1.99%	-1.23%
2015	3.75%	0.17%	3.58%
2016	2.19%	0.83%	1.37%
2017	1.67%	1.73%	-0.06%
2018	1.82%	2.95%	-1.13%
2019	4.12%	1.81%	2.31%
2020	4.79%	0.99%	3.81%
2021	1.65%	5.37%	-3.71%
2022	6.38%	8.52%	-2.14%
Average	2.78%	2.60%	0.18%
Proposed	3.00%	2.50%	0.50%

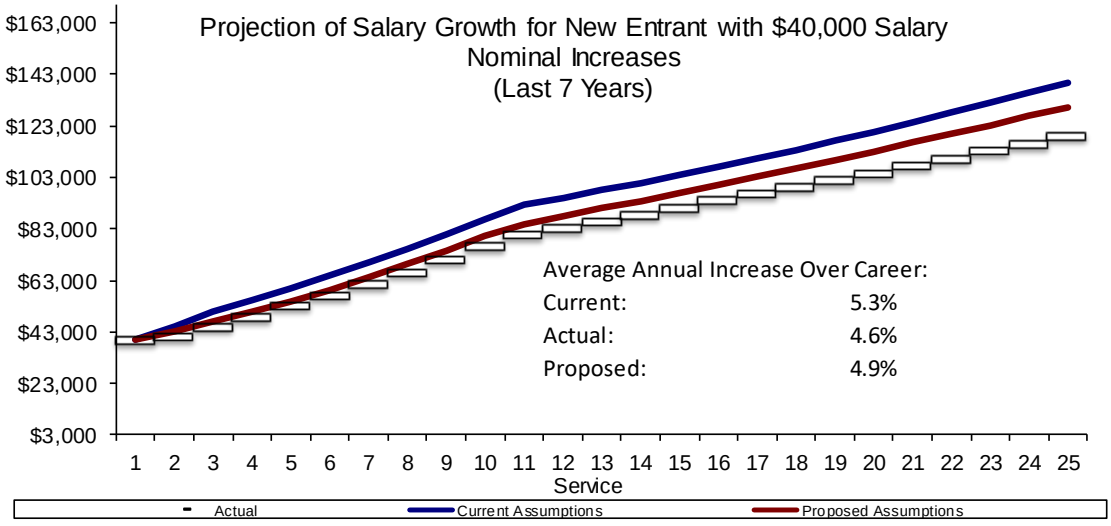




Salary Scale Assumption
Teachers

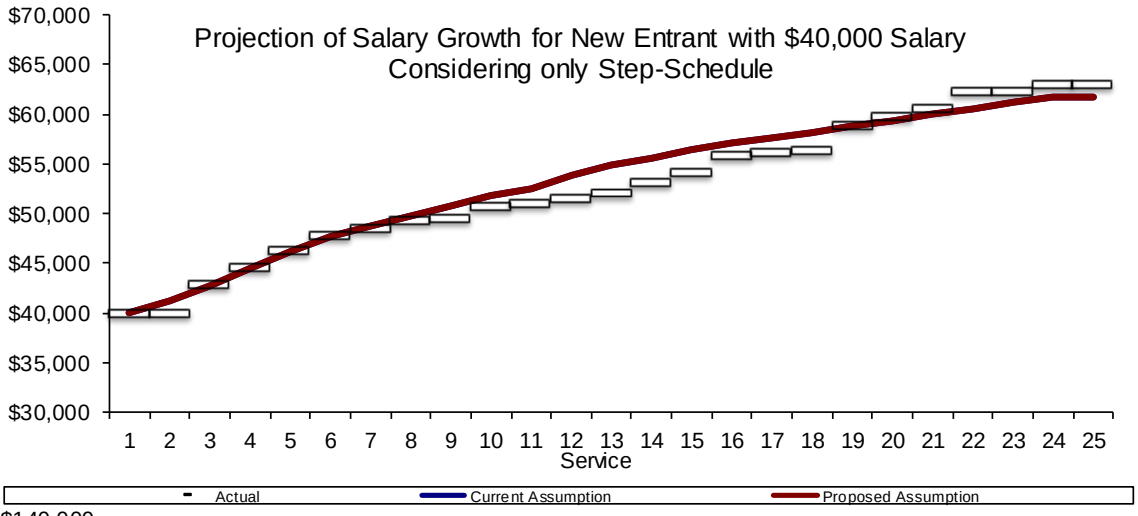
Year	Average Long Service Increase	CPI	Productivity
2013	-2.38%	1.96%	-4.34%
2014	1.36%	1.99%	-0.64%
2015	1.52%	0.17%	1.35%
2016	3.50%	0.83%	2.67%
2017	2.60%	1.73%	0.88%
2018	2.65%	2.95%	-0.30%
2019	2.45%	1.81%	0.64%
2020	2.13%	0.99%	1.15%
2021	1.78%	5.37%	-3.59%
2022	2.20%	8.52%	-6.33%
Average	1.78%	2.60%	-0.82%
Proposed	3.00%	2.50%	0.50%

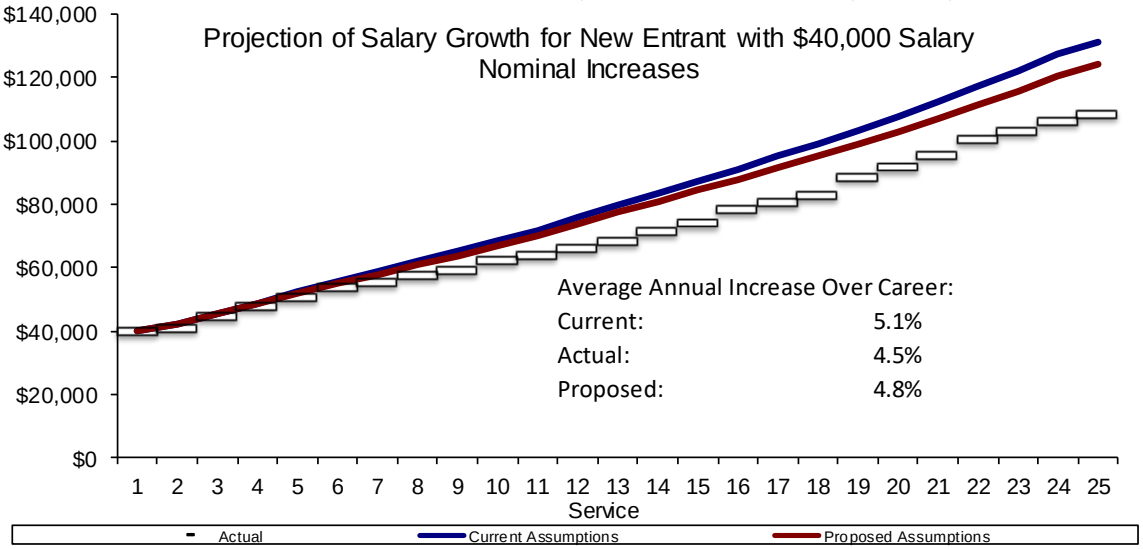




Salary Scale Assumption
Corrections

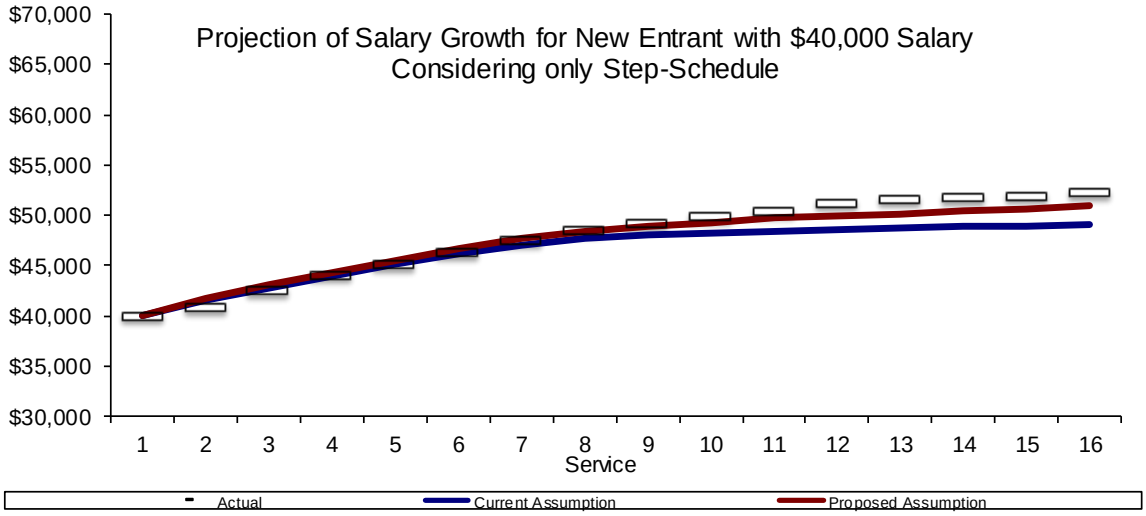
Year	Average Long Service Increase	CPI	Productivity
2013	-0.61%	1.96%	-2.57%
2014	0.76%	1.99%	-1.23%
2015	0.75%	0.17%	0.58%
2016	0.50%	0.83%	-0.33%
2017	9.17%	1.73%	7.44%
2018	2.62%	2.95%	-0.33%
2019	4.03%	1.81%	2.22%
2020	4.35%	0.99%	3.37%
2021	1.06%	5.37%	-4.31%
2022	1.12%	8.52%	-7.40%
Average	2.34%	2.60%	-0.26%
Proposed	3.00%	2.50%	0.50%

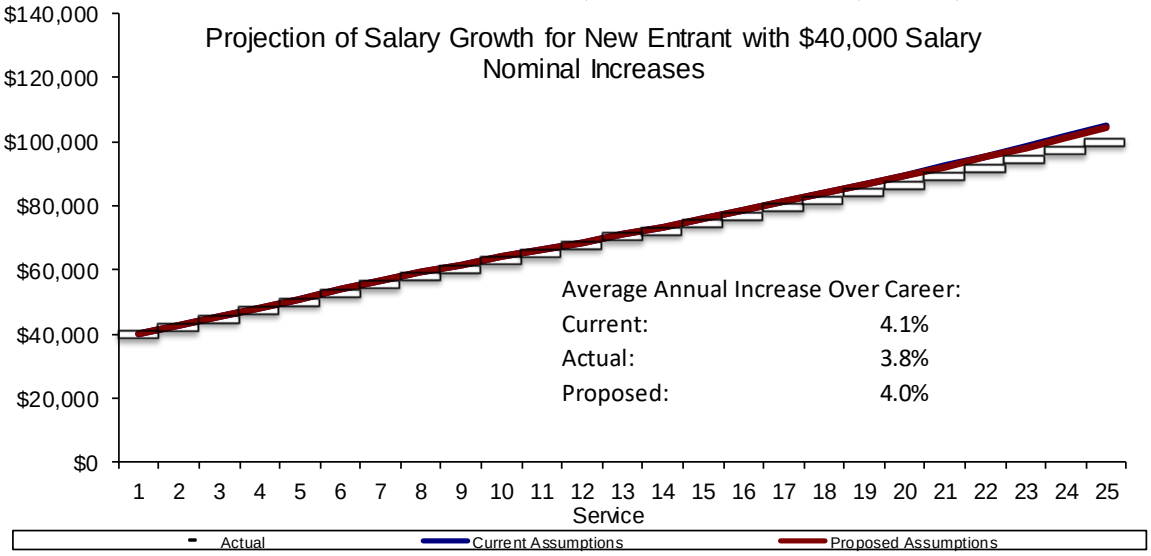




Salary Scale Assumption
MERS General

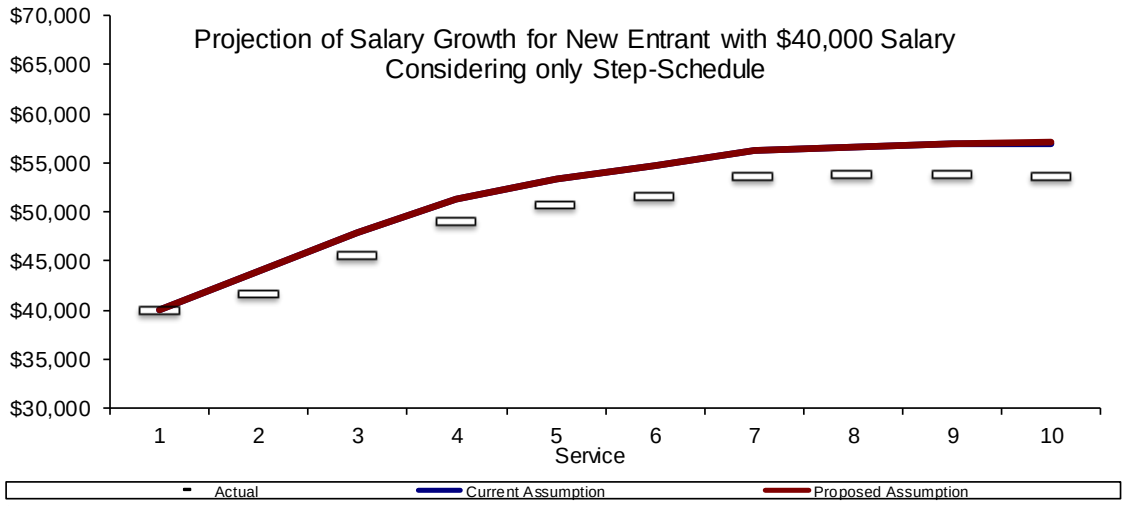
Year	Average Long Service Increase	CPI	Productivity
2013	2.27%	1.96%	0.31%
2014	1.61%	1.99%	-0.38%
2015	2.42%	0.17%	2.25%
2016	2.06%	0.83%	1.23%
2017	3.86%	1.73%	2.14%
2018	3.00%	2.95%	0.05%
2019	2.67%	1.81%	0.85%
2020	2.92%	0.99%	1.93%
2021	2.74%	5.37%	-2.63%
2022	3.06%	8.52%	-5.47%
Average	2.66%	2.60%	0.05%
Proposed	3.00%	2.50%	0.50%

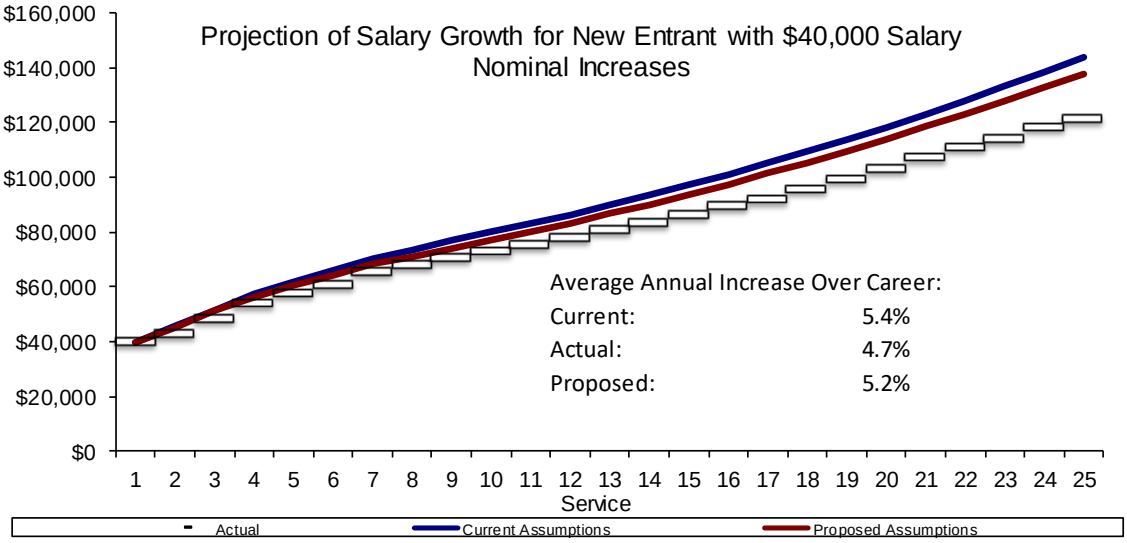




Salary Scale Assumption
MERS Police and Fire

Year	Average Long Service Increase	CPI	Productivity
2013	3.96%	1.96%	2.00%
2014	2.99%	1.99%	0.99%
2015	2.70%	0.17%	2.53%
2016	4.48%	0.83%	3.65%
2017	3.70%	1.73%	1.97%
2018	3.41%	2.95%	0.46%
2019	3.27%	1.81%	1.45%
2020	4.21%	0.99%	3.22%
2021	3.92%	5.37%	-1.45%
2022	3.05%	8.52%	-5.48%
Average	3.57%	2.60%	0.96%
Proposed	3.50%	2.50%	1.00%





GENERAL STATE EMPLOYEES
RETIREMENT EXPERIENCE - AGE BASED
Weighted by Liability in $millions

				Assumed Rate		Expected Retirement		Actual/Expected	
Age	Actual Retirement	Total Count	Actual Rate	Current	Proposed	Current	Proposed	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Under 60	853	5,168	0.165	0.22	0.20	1,145	1,034	74%	83%
60	598	2,796	0.214	0.21	0.20	579	559	103%	107%
61	435	2,739	0.159	0.21	0.20	574	548	76%	79%
62	857	3,432	0.250	0.21	0.25	726	858	118%	100%
63	591	2,771	0.213	0.20	0.25	557	693	106%	85%
64	562	2,219	0.253	0.20	0.25	444	555	127%	101%
65	605	2,441	0.248	0.22	0.30	525	732	115%	83%
66	728	2,189	0.332	0.21	0.30	450	657	162%	111%
67	457	1,556	0.294	0.20	0.30	311	467	147%	98%
68	303	1,124	0.270	0.20	0.30	225	337	135%	90%
69	213	871	0.245	0.20	0.30	174	261	122%	82%
70	231	731	0.316	0.20	0.30	146	219	158%	105%
71	157	527	0.298	0.20	0.30	105	158	149%	99%
72	104	391	0.267	0.20	0.30	78	117	133%	89%
73	69	284	0.244	0.20	0.30	57	85	122%	81%
74	55	234	0.235	0.20	0.30	47	70	117%	78%
Total	6,819	29,472	0.231	0.209	0.249	6,146	7,350	111%	93%

CORRECTIONAL OFFICERS
RETIREMENT EXPERIENCE - SERVICE BASED
Weighted by Liability in $millions

				Assumed Rate		Expected Retirement		Actual/Expected	
Service Year	Actual Retirement	Total Count	Actual Rate	Current	Proposed	Current	Proposed	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
25	4	227	0.016	0.050	0.100	23	23	15%	15%
26	53	477	0.111	0.050	0.050	24	24	221%	221%
27	16	563	0.028	0.050	0.060	28	34	57%	47%
28	35	681	0.051	0.050	0.070	34	48	103%	73%
29	50	809	0.061	0.050	0.080	40	65	124%	76%
30	70	839	0.084	0.130	0.090	50	76	140%	92%
31	60	832	0.072	0.130	0.100	58	83	104%	72%
32	84	628	0.134	0.130	0.110	50	69	168%	122%
33	59	477	0.123	0.200	0.120	43	57	137%	103%
34	62	378	0.165	0.200	0.130	38	49	164%	127%
35	44	307	0.143	0.350	0.140	77	43	57%	102%
36	41	300	0.136	0.250	0.150	60	45	68%	91%
37	34	237	0.142	0.250	0.160	47	38	72%	89%
38	29	209	0.141	0.250	0.170	42	36	70%	82%
39	70	170	0.410	0.250	0.180	34	31	205%	225%
Total	710	7,134				648	721	110%	99%

MERS GENERAL RETIREMENT EXPERIENCE
Weighted by Liability in $millions

				Assumed Rate		Expected Retirement		Actual/Expected	
Age	Actual Retirement	Total Count	Actual Rate	Current	Proposed	Current	Proposed	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Under 60	41	214	0.191	0.200	0.200	43	43	96%	96%
60	87	640	0.136	0.200	0.200	128	128	68%	68%
61	153	1,444	0.106	0.200	0.200	289	289	53%	53%
62	245	1,675	0.146	0.200	0.200	335	335	73%	73%
63	221	1,541	0.143	0.200	0.200	308	308	72%	72%
64	228	1,405	0.162	0.200	0.200	281	281	81%	81%
65	310	1,197	0.259	0.200	0.250	239	299	130%	104%
66	281	924	0.304	0.200	0.250	185	231	152%	122%
67	216	719	0.301	0.200	0.250	144	180	150%	120%
68	137	506	0.270	0.200	0.250	101	126	135%	108%
69	82	401	0.204	0.200	0.250	80	100	102%	82%
70	74	321	0.230	0.200	0.250	64	80	115%	92%
71	67	250	0.266	0.200	0.250	50	63	133%	106%
72	50	167	0.298	0.200	0.250	33	42	149%	119%
73	20	112	0.182	0.200	0.250	22	28	91%	73%
74	31	94	0.332	0.200	0.250	19	24	166%	133%
Total	2,243	11,611	0.193			2,322	2,557	97%	88%

POLICE AND FIRE OFFICERS
RETIREMENT EXPERIENCE - SERVICE BASED
For members who reach 20 years of service
Weighted by Liability in $millions

				Assumed Rate		Expected Retirement		Actual/Expected	
Service Year	Actual Retirement	Total Count	Actual Rate	Current	Proposed	Current	Proposed	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
25	136	843	0.161	0.130	0.150	110	126	124%	108%
26	104	633	0.163	0.160	0.180	101	114	102%	91%
27	97	507	0.191	0.190	0.210	96	106	100%	91%
28	124	365	0.340	0.200	0.220	73	80	170%	155%
29	38	244	0.156	0.200	0.220	49	54	78%	71%
30	27	148	0.183	0.250	0.270	37	40	73%	68%
31	33	91	0.366	0.250	0.270	23	25	146%	135%
32	16	47	0.344	0.250	0.270	12	13	138%	127%
33	-	15	0.000	0.250	0.270	4	4	0%	0%
34	8	19	0.405	0.250	0.270	5	5	162%	150%
35	-	17	0.000	0.350	0.370	6	6	0%	0%
36	-	12	0.000	0.350	0.370	4	4	0%	0%
37	-	12	0.000	0.350	0.370	4	4	0%	0%
38	-	25	0.000	0.350	0.370	9	9	0%	0%
39	6	19	0.322	0.350	0.370	7	7	92%	87%
40 and more	9	30	0.288	1.000	1.000	30	30	29%	29%
Total	598	3,028				569	629	105%	95%