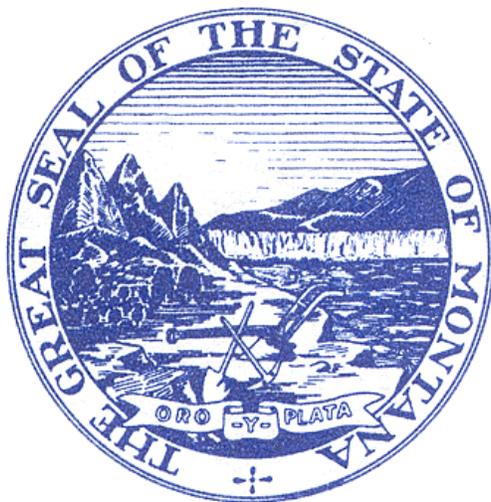




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Experience Study

For the Five-Year Period

July 1, 2016 to June 30, 2021





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May 3, 2022

Teachers' Retirement Board
State of Montana
1500 Sixth Avenue
Helena, MT 59620-0139

Dear Members of the Board:

We are pleased to submit the results of a study of the economic and demographic experience for the Montana Teachers' Retirement System. The purpose of this investigation is to assess the reasonability of the actuarial assumptions for the System. This investigation covers the five-year period from July 1, 2016 to June 30, 2021. As a result of the investigation, it is recommended that revised assumptions be adopted by the Board for future use.

The experience study includes all active members, retired members and beneficiaries of deceased members. The mortality experience was studied separately for males and females. Incidences of withdrawal, disability, retirement and compensation increases were investigated without regard to gender. Retirement experience and compensation increases were investigated separately for university and non-university members.

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

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

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



We hereby certify that, to the best of our knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices which are consistent with the principles prescribed by the Actuarial Standards Board (ASB) and the Code of Professional Conduct and Qualification Standards for Statements of Actuarial Opinion of the American Academy of Actuaries.

We further certify that, in our opinion, the assumptions developed in this report satisfy Actuarial Standards of Practice, in particular, No. 27 (Selection of Economic Assumptions for Measuring Pension Obligations) and No. 35 (Selection of Demographic and Other Non-economic Assumptions for Measuring Pension Obligations).

In order to prepare the results in this study, we have utilized appropriate actuarial models and related software that in our professional judgment has the capability to provide results that are consistent with the purpose of this study and have no material limitations or known weaknesses. We performed analysis to ensure the model reasonably represents that which is intended to be modeled. These models use assumptions about future contingent events, along with recognized actuarial approaches, to develop the necessary results.

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

Respectfully submitted,

A handwritten signature in blue ink that reads 'Todd B. Green' followed by a horizontal line.

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

A handwritten signature in blue ink that reads 'Bryan Hoge'.

Bryan Hoge, FSA, EA, FCA, MAAA
Consulting Actuary

TBG:BH\bvb



Summary of Results

Introduction

This investigation covers the five-year period ending June 30, 2021. The purpose of an actuarial valuation is to provide a timely best estimate of the ultimate costs of a retirement system. An actuarial valuation for the Montana Teachers' Retirement System is prepared annually to determine the actuarial recommended contribution, funded status, and amortization period necessary to achieve a 100% funded status. The valuation requires the use of certain assumptions with respect to the occurrence of future events, such as rates of death, termination of employment, retirement age, and salary changes to estimate the obligations of the system.

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

At the request of the Board, Cavanaugh Macdonald Consulting, LLC (CMC), performed a study of the experience for the five-year period ending in 2021. This report presents the results, analysis, and resulting recommendations of our study. It is anticipated that the changes will first be reflected in the June 30, 2022 actuarial valuations.

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

Our Philosophy

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



Section I: Summary of Results

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

The following summarizes the findings and recommendations with regard to the assumptions utilized by the Montana Teachers' Retirement System. Explanations for the recommendations are found in the sections that follow.

Recommended Economic Assumption Changes

The table below lists the three economic assumptions used in the actuarial valuation and their current and proposed rates. We recommend increasing the price inflation assumption and reducing the assumed rate of return on assets.

Item	Current	Proposed
Price Inflation	2.50%	2.75%
Investment Return	7.50%	7.30%
Real Wage Growth	0.75%	0.75%



Recommended Demographic Assumption Changes

The table below lists the demographic assumptions that we recommend be changed based on the experience of the last five years.

Assumption Change
Update pre and post retirement mortality rates
Update termination rates
Update retirement rates
Update rates of salary increase

Recommended Method Changes

Payroll Growth Assumption

We are recommending wage inflation increase by 0.25%, from 3.25% to 3.50% to correspond with the price inflation recommended increase. To better reflect recent experience and the short-term expectations, we recommend that the payroll growth assumption for amortization as a level percent of pay be set at 0.25% below wage inflation, which is 3.25%, or no change from the current assumption..

Financial Impact

The following table highlights the impact of the recommended changes noted on the previous page on the unfunded actuarial accrued liability (UAAL) and funded status for the System as of July 1, 2021.

	Before Change	After Change	Difference
UAAL	\$1,846,872,523	\$1,921,011,883	\$74,139,360
Funded Status	71.43%	70.61%	(0.82%)



Economic Assumptions

There are three economic assumptions used in performing the actuarial valuation for the Montana Teachers’ Retirement System. The assumptions are:

- Price Inflation
- Investment Return
- Wage Inflation

The Actuarial Standards Board has issued Actuarial Standard of Practice (ASOP) No. 27, “*Selection of Economic Assumptions for Measuring Pension Obligations*”, which provides guidance to actuaries in selecting economic assumptions for measuring obligations under defined benefit plans. As noted in ASOP No. 27, because no one knows what the future holds, the best an actuary can do is to use professional judgment to estimate possible future economic outcomes based on future expectations. These estimates reflect the actuary’s estimate of future experience and have no significant bias. The actuary should consider several 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 experience.

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.

In our opinion, the economic assumptions recommended in this report have been developed in accordance with ASOP No. 27. The following table shows our recommendations followed by explanations of each assumption.

Item	Current	Proposed
Price Inflation	2.50%	2.75%
Real Rate of Return	<u>5.00</u>	<u>4.55</u>
Investment Return	7.50%	7.30%
Price Inflation	2.50%	2.75%
Real Wage Growth	<u>0.75</u>	<u>0.75</u>
Wage Inflation	3.25%	3.50%



Price Inflation

Background: As seen in the table on the previous page, assumed price inflation is used as a component for both the investment return assumption and the wage inflation assumption. The latter two assumptions will be discussed in detail in the following sections.

It is important that the price inflation assumption be consistently applied throughout the economic assumptions utilized in an actuarial valuation. This is called for in ASOP No. 27.

The current price inflation assumption is 2.50% per year.

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

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

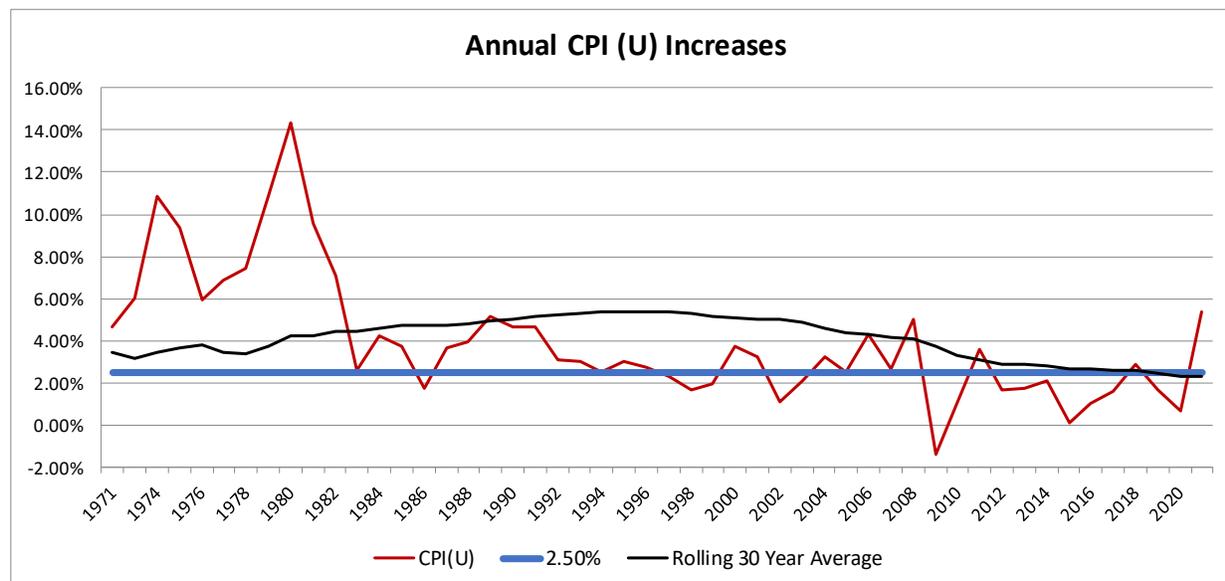
Period	Number of Years	Annualized Rate of Inflation	Annual Standard Deviation
1926 – 2021	95	2.90%	4.03%
1961 – 2021	60	3.75%	2.86%
1971 – 2021	50	3.88%	3.03%
1981 – 2021	40	2.78%	1.61%
1991 – 2021	30	2.33%	1.40%
2001 – 2021	20	2.14%	1.65%
2011 - 2021	10	1.87%	1.45%
2016 - 2021	5	2.43%	1.83%

Over recent historic periods, the average annual rate of increase in the CPI-U has been below 3.00%. The years of high inflation occurring from 1973 to 1982 has a significant impact on the averages over periods which include these rates. We should add that since 1926, the average annual rate of inflation was 2.90%.



Section II: Economic Assumptions

The graph below shows the annual increases in the CPI (U) over a 50-year period.



Additional information to consider is obtained from measuring the spread on inflation protected treasury bills (TIPS) and from the prevailing economic forecasts. The spread between the nominal yield on treasury securities and the inflation indexed nominal yield on TIPS of the same maturity is referred to as the “breakeven rate of inflation” and represents the bond market’s expectation of inflation over the period to maturity. The table below provides the calculation of the breakeven rate of inflation as of March 31, 2022 over various periods.

Years to Maturity	Bond Nominal Yield	TIPS Nominal Yield	Breakeven Rate of Inflation
10	2.32%	-0.52%	2.84%
20	2.59%	-0.20%	2.79%
30	2.44%	-0.03%	2.47%

For shorter time periods, the bond market’s expectation for the rate of inflation is consistent with historical average annual rates and slightly lower for longer periods. Additionally, based upon information provided from the “Survey of Professional Forecasters” published by the Philadelphia Federal Reserve Bank, the median annual rate of inflation for the ten years beginning January 1, 2022 estimated 2.50%.



Section II: Economic Assumptions

Recommendation: It is difficult to accurately predict inflation. We realize recent inflation has been higher than assumed (8.5% for the year ending March 31, 2022). We do not want to give too much credibility to recent experience, but we also cannot ignore the recent inflation that is the highest in the past 40 years. Based on current break-even inflation and other research provided, **we recommend increasing the price inflation assumption from 2.50% to 2.75%.**

Price Inflation Assumption	
Current	2.50%
Recommended	2.75%



Investment Return

Background: The assumed investment return is one of the most significant assumptions in the annual actuarial valuation process as it is used to discount the expected benefit payments for all active, inactive and retired members of the System. Minor changes in this assumption can have a major impact on valuation results. The investment return assumption should reflect the asset allocation target for the funds set by the Board of Investments.

The current assumption is 7.50%, consisting of a price inflation assumption of 2.50% and a real rate of return assumption of 5.00%. The return is net of investment expenses.



Section II: Economic Assumptions

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

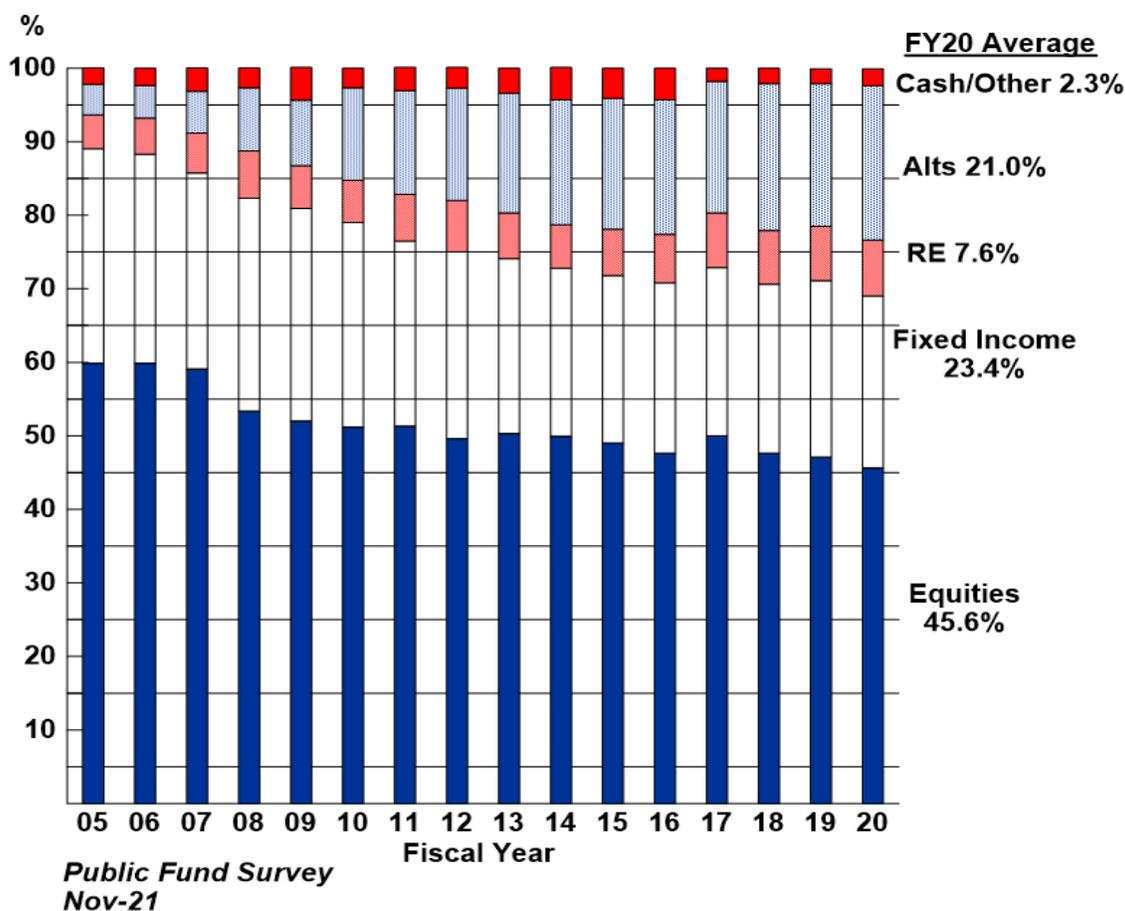
Nominal Total Rate of Return		
Year Ending 6/30	Market Value	Actuarial Value
2002	-7.3%	3.8%
2003	6.2%	1.6%
2004	13.3%	2.1%
2005	8.0%	2.7%
2006	8.9%	8.5%
2007	17.6%	10.2%
2008	-4.9%	7.2%
2009	-20.8%	-10.3%
2010	12.9%	9.8%
2011	21.7%	-0.1%
2012	2.2%	3.2%
2013	12.9%	12.0%
2014	17.1%	13.2%
2015	4.6%	9.6%
2016	2.1%	8.8%
2017	11.9%	8.2%
2018	8.8%	6.9%
2019	5.7%	7.0%
2020	2.7%	7.0%
2021	27.7%	10.7%
20 Year Avg.	7.0%	6.0%
15 Year Avg.	7.5%	6.7%
10 Year Avg.	9.3%	8.6%
5 Year Avg.	11.0%	8.0%



Peer System Comparison

While we do not recommend that the selection of an investment return assumption based on the assumptions used by other systems, it does provide another set of relevant information to consider. The following graph shows the change in the distribution of the investment return assumption from fiscal year 2005 through 2020 for the 130 large public retirement systems included in the National Association of State Retirement Administrators (NASRA) Public Fund Survey. The assumed rate of return is heavily influenced by each Systems' asset allocation. The average asset allocation for the systems in the Public Fund Survey is 2.3% cash, 45.6% equities, 23.4% fixed income, 7.6% real estate, and 21.0% alternative investments which has an impact on the expected return of the systems. Note the increased allocation to alternative investment classes since 2005. The target asset allocation for TRS is 49% equities, 18% alternatives, 9% real estate and 23% fixed income, which is in line with the portfolio of an average system. As a result, it is reasonable to anticipate that the expected return could equal that of the median system.

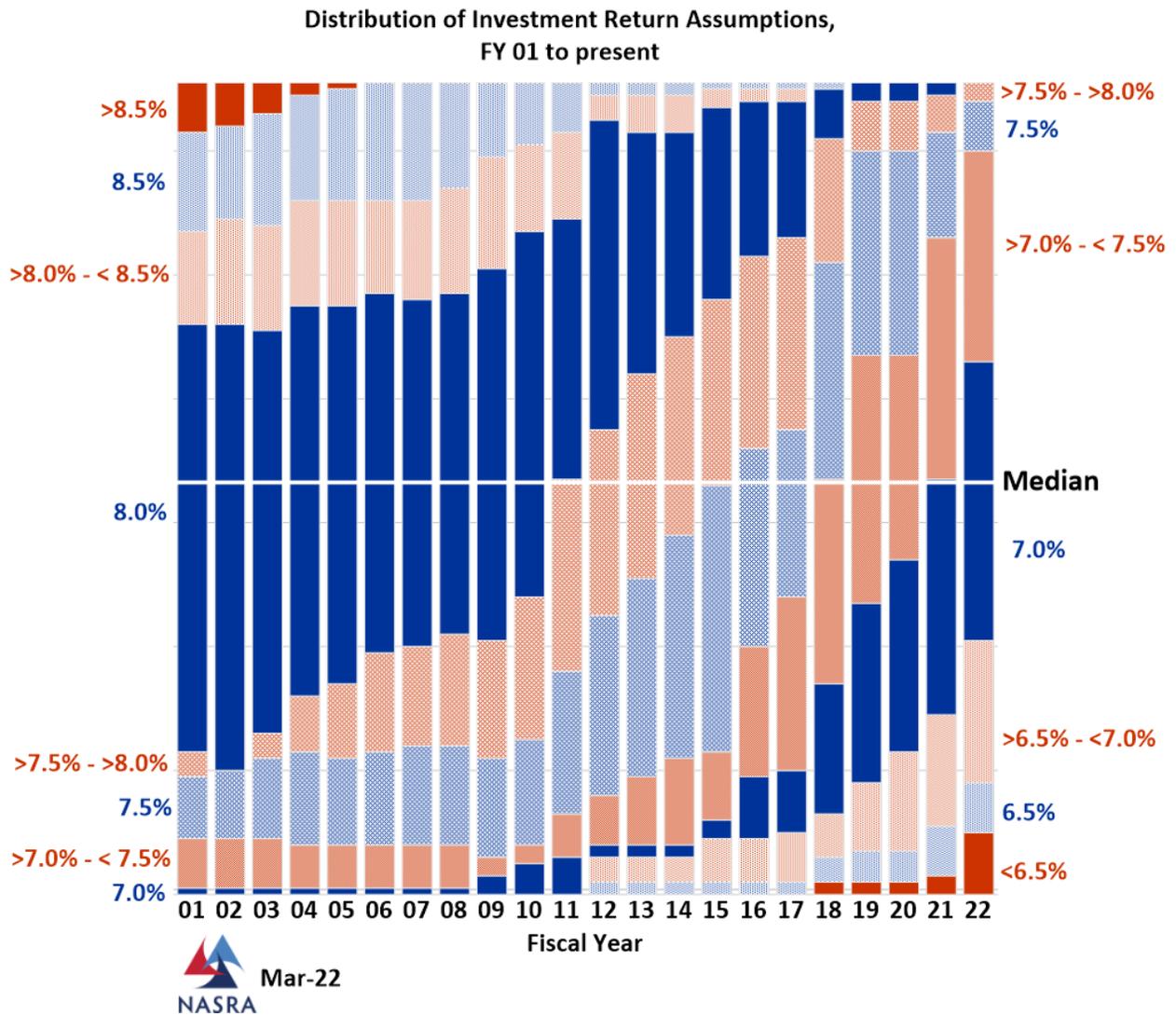
The chart below shows the asset allocation for funds surveyed in the *Public Fund Survey* since 2005.





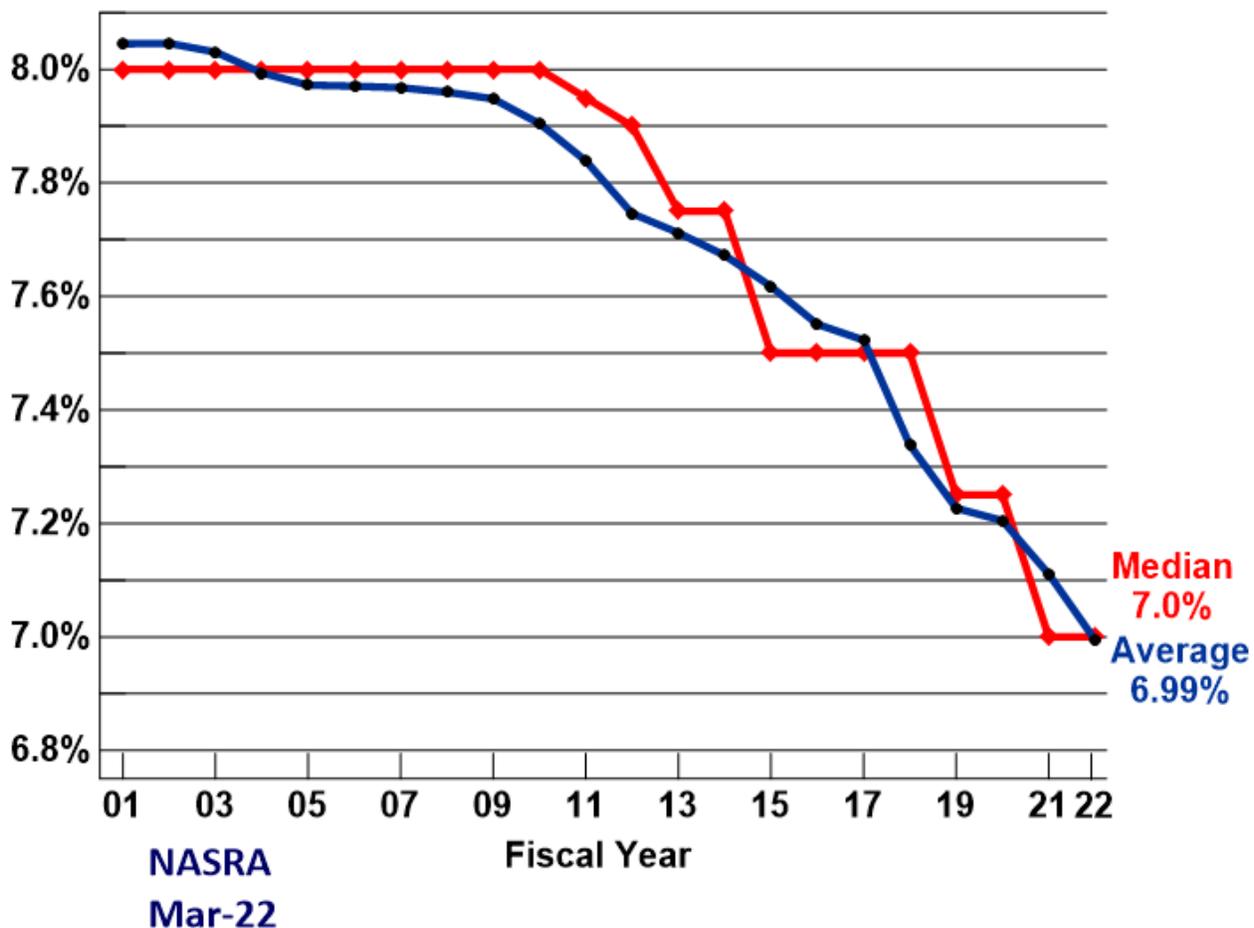
Section II: Economic Assumptions

Below are graphs published by NASRA that show the decreases in the investment return assumptions used by public plans over the last several years.





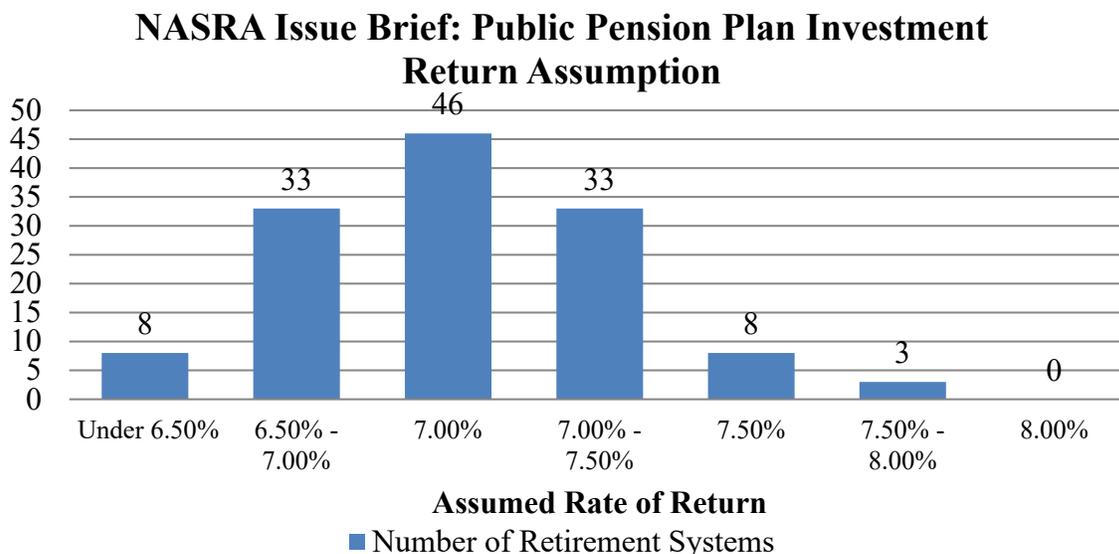
Change to Average and Median Investment Return Assumption, FY 01 to present





Section II: Economic Assumptions

The following table details the number of expected return assumption as stated in the NASRA Issue Brief: Public Pension Plan Investment Return Assumptions. The average return assumption is 6.99% and the median return assumptions is 7.00%.



Capital Market Assumption Analysis: The capital market assumptions and asset allocations used in this analysis are shown in Appendix B. The basis for the analysis is the *Survey of Capital Market Assumptions: 2021 Edition* published by Horizon Actuarial Services, LLC. The System's asset allocation, provides an expected range of real rates of return over various time horizons.

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

Time Span In Years	Mean Real Return	Standard Deviation	Real Returns by Percentile				
			5 th	25 th	50 th	75 th	95 th
1	5.40%	12.58%	-13.94%	-3.41%	4.66%	13.40%	27.27%
5	4.81%	5.58%	-4.11%	0.97%	4.66%	8.48%	14.23%
10	4.73%	3.94%	-1.62%	2.04%	4.66%	7.35%	11.34%
20	4.69%	2.79%	0.18%	2.80%	4.66%	6.55%	9.34%
30	4.68%	2.27%	0.99%	3.14%	4.66%	6.20%	8.46%
50	4.67%	1.76%	1.80%	3.48%	4.66%	5.85%	7.59%

The percentile ranks are the outcomes based on the log normal random variable distribution that produce returns of less than the return at that particular percentile level over the time span. Thus, for the 20-year time span, 5% of the resulting real rates of return were below 0.18% and 95% were above that. As the time span increases, the results begin to merge. Over a 50-year



Section II: Economic Assumptions

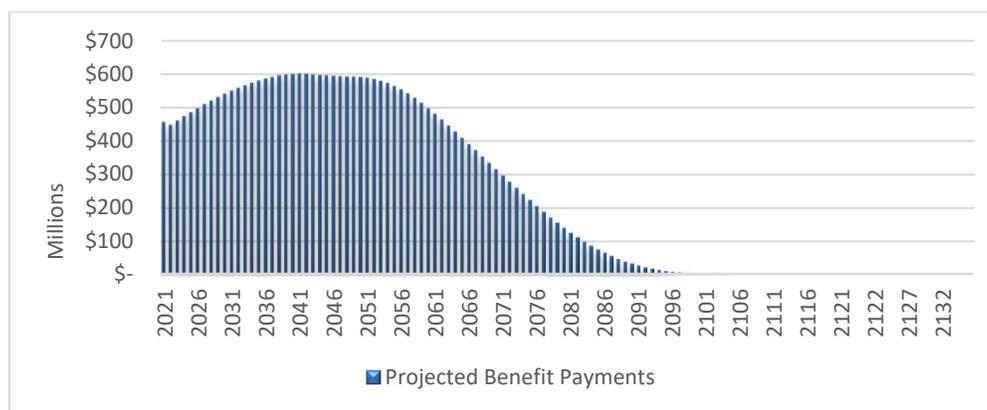
time span, the result indicate there is a 25% chance that real return will be above 5.85% and a 25% chance they will be below 3.48%. In other words, there is a 50% chance the real returns will be between 3.48% and 5.85%.

Over a 50-year time span, the result indicate the median long-term real rate of return is 4.66%.

Long Term Perspective

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

The following graph illustrates the long duration of the expected benefit payments for current members on July 1, 2021.



Investment Expenses

The investment return is assumed to be net of all investment-related expenses. The following table shows the ratio of expenses to Plan assets over the last eight years. The expense ratio is calculated as the total expense divided by the ending asset balance at fair market value. The table below compares, for the last ten years, the expense levels during the fiscal year to the market value of assets for the systems at the end of the fiscal years.



Section II: Economic Assumptions

FY Ending June 30	Investment Expenses	Market Value of Assets	Expense Ratio
2012	16,154,418	2,932,202,476	0.55%
2013	15,148,782	3,185,064,406	0.48
2014	20,130,499	3,652,100,237	0.55
2015	20,479,079	3,708,385,838	0.55
2016	22,349,286	3,656,830,798	0.61
2017	20,425,220	3,950,704,563	0.52
2018	25,576,179	4,148,324,206	0.62
2019	26,178,868	4,220,285,752	0.62
2020	22,535,472	4,167,839,558	0.54
2021	28,997,659	5,116,849,108	0.57

Over the five-year period ended June 30, 2021 the expense ratio averaged approximately 0.57%. For the ten-year period ended June 30, 2021 the expense ratio averaged approximately 0.56%. The capital market assumptions are net of investment expenses; therefore, a separate investment expense assumption is not necessary.

Administrative Expenses: Currently, the investment return is assumed to be net of investment expenses only with the administrative expense assumption added to the total actuarial contribution rate. We recommend an investment return assumption that is net of both investment and administrative expenses. The investment return information we have been provided is net of investment-related expenses. The table below compares, for the last five years, the administrative expense levels during the fiscal year to the market value of assets for the system at the end of the fiscal years.

FY Ending June 30	Administrative Expenses	Market Value of Assets	Expense Ratio
2017	\$2,459,458	\$3,950,704,563	0.06%
2018	2,849,527	4,148,324,206	0.07
2019	2,947,109	4,220,285,752	0.07
2020	3,767,693	4,167,839,558	0.09
2021	3,936,633	5,116,849,108	0.08



Section II: Economic Assumptions

Since June 30, 2017, the expense ratio averaged approximately 0.07%, but has clearly trended upward. We recommend a long-term administrative expense ratio of 0.09% be included in the net investment return assumption.

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

Item	25 th Percentile	50 th Percentile	75 th Percentile
Real Rate of Return	3.48%	4.66%	5.85%
Inflation	2.75	2.75	2.75
Investment Expenses*	(0.00)	(0.00)	(0.00)
Administrative Expenses	<u>(0.09)</u>	<u>(0.09)</u>	<u>(0.09)</u>
Net Investment Return	6.14%	7.32%	8.51%

* *The capital market assumptions used to develop the reasonable range for the real rate of return are net of investment expenses. Therefore, a separate assumption for investment expenses is not necessary.*

The current assumed rate of return of 7.50% is higher than the average assumed rate of return compared with its peer group of other public retirement systems. The 50th percentile net return based on the analysis is 7.32% utilizing the capital market assumption analysis.

The June 30, 2021 Quarterly Investment Performance Analysis prepared for the Montana Board of Investments indicated an annual market value asset return since the inception date of July 1, 1994, was 8.17%. The return on the market value of assets for the 20-year period ended June 30, 2021 is 7.12% which could indicate downward trend of annualized historical returns in the future.

ASOP 27 explicitly advises the actuary not to give undue weight to recent experience, therefore taking into account the capital market assumption analysis, **we recommend an assumed rate of return net of both investment and administrative expenses of 7.30%. This is a reduction from the current assumption of 7.50%.**

Our recommendation would be to assess the actuarial investment gain/loss each annual valuation. If there were to be sufficient actuarial investment gains to be recognized for the current year that would allow the System to reduce the investment return assumption in 5 basis point (0.05%) increments without increasing the amortization funding period, then the assumed rate of return would come down. The investment return assumption would not be increased in



Section II: Economic Assumptions

future valuations if investment losses occurred. However, the in-depth analysis during the next experience study would revisit the long-term assumption.



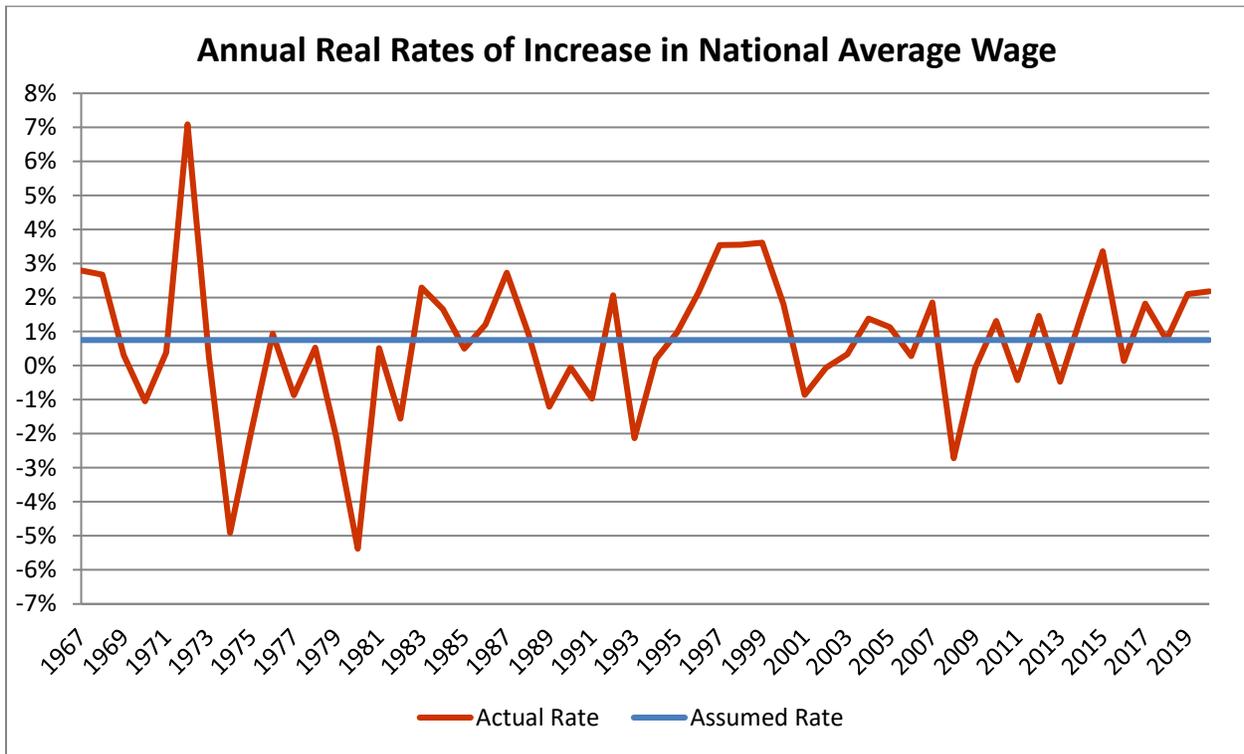
Wage Inflation

Background: The assumed future increases in salaries consist of an inflation component and a component for promotion and longevity, often called merit increases. Merit increases are generally age and/or service related and will be studied in the demographic assumption section of the report. Wage inflation normally is above price inflation, which reflects the overall return on labor in the economy. The current wage inflation assumption is 3.25%, or 0.75% above price inflation.

Past Experience: The Social Security Administration publishes data on wage growth in the United States. Appendix C shows the last 50 calendar years’ data. As we did in our analysis of inflation, on the following page, we show the wage inflation and a comparison with the price inflation over various time periods. Since wage data is only available through 2020 we use that year as the end point.

Period	Wage Inflation	Price Inflation	Real Wage Growth
2011-2020	2.9%	1.5%	1.4%
2001-2020	2.8%	2.0%	0.8%
1991-2020	3.3%	2.2%	1.1%
1981-2020	3.6%	2.7%	0.9%
1971-2020	4.5%	3.8%	0.7%
1961-2020	4.5%	3.7%	0.8%

Thus, over the last 60 years, annual real wage growth has averaged 0.8%, but has been higher over the more recent periods, with 1.1% over the last 30 years and 1.4% over the last 10 years. We would note that this includes wages across all sectors, not just public employees. In general, we have seen public employees receive compensation increase more in the form of benefits than wages, so the averages shown here may be higher than if only public sector employees were considered. The graph on the following page shows the annual increases in real wage growth over the entire 50-year period.



Recommendation: Based on the data reviewed and our future outlook, we recommend retaining the 0.75% real wage growth. If the recommended 2.75% price inflation assumption is adopted, this would translate to an increase in the wage inflation assumption from 3.25% to 3.50%.

Wage Inflation Assumption	
Current	3.25%
Recommended	
Real Wage Growth	0.75%
Inflation	<u>2.75%</u>
Total	3.50%



Demographic Assumptions

There are several demographic assumptions used in the actuarial valuations performed for the Montana Teachers' Retirement System. They are:

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

The Actuarial Standards Board has issued Actuarial Standard of Practice (ASOP) No. 35, "*Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations*", which provides guidance to actuaries in selecting demographic assumptions for measuring obligations under defined benefit plans. In our opinion, the demographic assumptions recommended in this report have been developed in accordance with ASOP No. 35.

The purpose of a study of demographic experience is to compare what actually happened to the membership during the study period (July 1, 2016 through June 30, 2021) with what was expected to happen based on the assumptions used in the most recent actuarial valuations.

Studies of demographic experience generally involve three steps:

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

If the actual experience differs significantly from the overall expected results, or if the pattern of actual decrements, or rates of decrement, by age, gender, or service does not follow the expected



Section III: Demographic Assumptions

pattern, new assumptions are recommended. Recommended changes usually do not follow the exact actual experience during the observation period. Judgment is required to extrapolate future experience from past trends and current member behavior. In addition, non-recurring events, such as early retirement windows, need to be taken into account in determining the weight to give to recent experience.

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

Rates of Withdrawal

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

The current assumption utilizes a service-based approach that sets the withdrawal rates based on years of service. Withdrawal experience was investigated separately for full time members and part time members without regard to gender for both Non-University and University members combined. The System is currently closed to university members. As of July 1, 2021 university members comprise less than 1% of the total population with 175 active members with average age and service of 55 and 20 respectively. As a result, we do not think investigating withdrawal experience separately for Non-University and University members is warranted.

Higher paid members typically have a greater liability compared to members who are lower paid. As a result, termination rates for members with higher compensation levels and higher service will have a greater influence on the liabilities of the System. As a result, we liability weighted the experience to better reflect the impact of the current assumption on liability measures. The liability is approximated by using the member's compensation and years of service to estimate the member's benefit level. The exposure and actual occurrences are then multiplied by the benefit level to provide the liability-weighted experience. We find the liability-weighted experience to better correlate to the impact of actual and expected rates of withdrawal on the valuation results.

The analysis of the liability weighted actual withdrawal experience over the five-year period indicates an overall actual/expected ratio of 85% and 78% for full time members and part time



Section III: Demographic Assumptions

members, respectively. A ratio that is greater than 100% indicates that there were more withdrawals during the experience period than were anticipated by the assumption. A ratio of less than 100% indicates that there were less withdrawals during the experience period than were anticipated by the assumption.

EXPERIENCE UNDER CURRENT ASSUMPTIONS

Years of Service	Full Time Withdrawal Experience			Part Time Withdrawal Experience		
	Actual	Expected	Ratio	Actual	Expected	Ratio
			Actual/Expected			Actual/Expected
Less than 1	3,300,640	3,692,666	0.89	3,057,943	3,717,140	0.82
1	24,496,566	29,491,766	0.83	16,618,710	17,727,136	0.94
2	20,113,508	20,252,218	0.99	9,220,690	11,768,602	0.78
3	15,010,606	17,454,627	0.86	5,779,611	8,117,661	0.71
4	10,569,801	13,133,758	0.80	3,819,846	5,581,872	0.68
5	8,038,959	8,884,287	0.90	1,684,016	2,769,282	0.61
6	4,699,679	6,628,392	0.71	1,029,321	1,989,612	0.52
7	4,032,446	4,794,545	0.84	767,179	1,277,663	0.60
8	2,912,963	3,953,130	0.74	655,391	964,106	0.68
9	3,112,871	3,502,206	0.89	453,098	806,563	0.56
10	2,502,884	3,080,553	0.81	472,930	699,486	0.68
11	1,863,881	2,857,792	0.65	255,607	513,816	0.50
12	2,089,510	2,472,125	0.85	411,275	501,965	0.82
13	1,660,802	2,116,956	0.78	312,417	402,864	0.78
14	1,804,534	1,785,321	1.01	277,511	290,846	0.95
15	844,783	1,541,199	0.55	158,341	237,550	0.67
16	705,715	1,369,990	0.52	81,267	173,242	0.47
17	815,328	1,229,891	0.66	171,894	182,184	0.94
18	1,013,945	1,104,018	0.92	79,071	143,844	0.55
19	588,557	965,472	0.61	21,728	125,832	0.17
20	235,321	863,046	0.27	74,319	104,975	0.71
21	178,520	709,357	0.25	122,998	90,301	1.36
22	432,194	585,486	0.74	38,237	82,906	0.46
23	700,604	464,765	1.51	29,163	55,317	0.53
24	1,334,860	359,012	3.72	36,259	24,465	1.48
TOTAL	113,059,479	133,292,578	0.85	45,628,823	58,349,231	0.78

Findings and Recommendations

The current assumption overestimated the number of withdrawals for both full time members and part time members. As a result, we recommend revising the rates of withdrawal for both full time and part time members to partially reflect the observed experience. The actual/expected ratio under the proposed assumption for full time members and part time members is 96% and 95% respectively. A detailed listing of the recommended assumption is in Appendix D.



EXPERIENCE UNDER PROPOSED ASSUMPTIONS

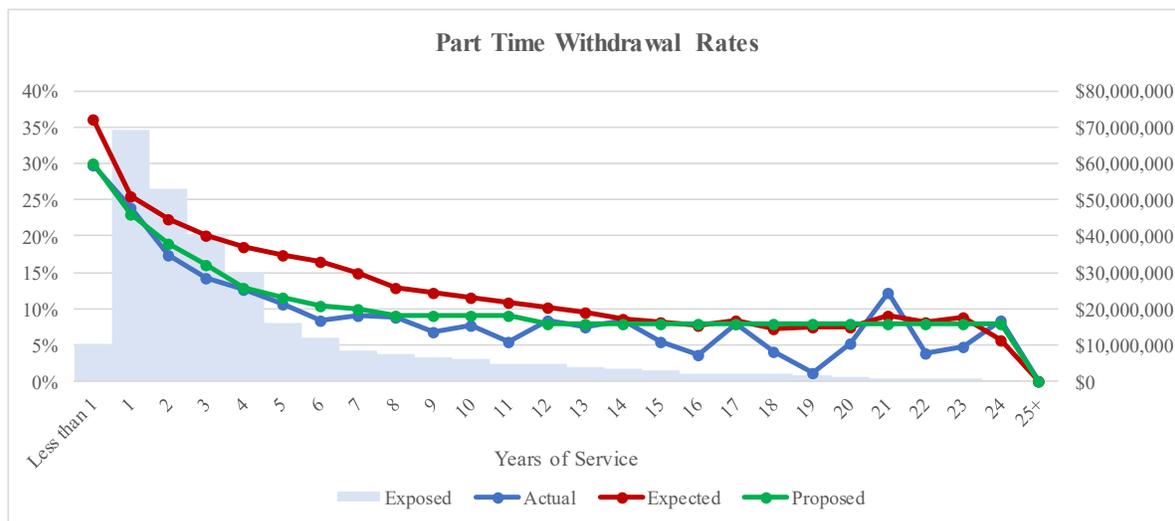
Years of Service	Full Time Withdrawal Experience			Part Time Withdrawal Experience		
	Actual	Proposed	Ratio	Actual	Proposed	Ratio
			Actual/Proposed			Actual/Proposed
Less than 1	3,300,640	3,171,942	1.04	3,057,943	3,091,054	0.99
1	24,496,566	26,184,620	0.94	16,618,710	15,951,050	1.04
2	20,113,508	20,207,134	1.00	9,220,690	10,041,728	0.92
3	15,010,606	14,967,957	1.00	5,779,611	6,462,683	0.89
4	10,569,801	11,368,029	0.93	3,819,846	3,923,882	0.97
5	8,038,959	7,907,404	1.02	1,684,016	1,827,866	0.92
6	4,699,679	5,884,004	0.80	1,029,321	1,271,795	0.81
7	4,032,446	4,367,999	0.92	767,179	856,005	0.90
8	2,912,963	2,973,727	0.98	655,391	673,713	0.97
9	3,112,871	2,874,781	1.08	453,098	594,458	0.76
10	2,502,884	2,881,552	0.87	472,930	545,460	0.87
11	1,863,881	1,953,082	0.95	255,607	427,607	0.60
12	2,089,510	1,864,401	1.12	411,275	390,552	1.05
13	1,660,802	1,729,816	0.96	312,417	334,922	0.93
14	1,804,534	1,565,172	1.15	277,511	267,733	1.04
15	844,783	1,454,867	0.58	158,341	231,927	0.68
16	705,715	1,388,675	0.51	81,267	178,608	0.46
17	815,328	1,349,391	0.60	171,894	175,414	0.98
18	1,013,945	1,285,397	0.79	79,071	156,243	0.51
19	588,557	592,692	0.99	21,728	135,591	0.16
20	235,321	558,046	0.42	74,319	113,254	0.66
21	178,520	483,673	0.37	122,998	80,417	1.53
22	432,194	417,120	1.04	38,237	80,213	0.48
23	700,604	343,346	2.04	29,163	49,524	0.59
24	1,334,860	275,769	4.84	36,259	34,291	1.06
TOTAL	113,059,479	118,050,595	0.96	45,628,823	47,895,990	0.95



Section III: Demographic Assumptions

The right axis of the charts below represents the liability weighted exposures. The exposed liabilities are the total number of salaries subject to withdrawal rates based upon the benefit recipient's age during the experience period. When recommending assumptions changes, it is important to recognize actual experience in areas of higher exposures versus areas of lower exposures when recommending changes to the assumed withdrawal rates.

The left axis of the charts below show (i) the actual withdrawal rates of employment by years of service during the past five years, (ii) the current assumed withdrawal rates and (iii) the proposed assumed withdrawal rates.





Rates of Disability Retirement

The System provides disability benefits for those members who have completed five years of service. A disabled member is entitled to an annuity that is equal to 1/60th of final compensation for each year of service accrued at the date of disability. The minimum disability benefit is equal to 1/4th of final compensation. A Tier Two member is not eligible for a disability retirement if the member is or will be eligible for a service retirement benefit on or before the member's date of determination. The rates of disability used in the actuarial valuation project the percentage of employees who are expected to become disabled each year.

Disability experience was investigated without regard to gender for both Non-University and University members combined.

The analysis of the actual disability experience for both Non-University and University members over the five-year experience period yields an actual/expected ratio of 73%. A ratio that is less than 100% indicates that there were fewer disability retirements during the experience period than were anticipated by the assumption.

The table below details the actual/expected ratio by age group and in total.

EXPERIENCE UNDER CURRENT ASSUMPTIONS

Age Group	Disability Experience		
	Actual	Expected	Ratio
			Actual/Expected
Under 20	0	0	0.00
20 - 24	0	0	0.00
25 - 29	0	0	0.00
30 - 34	0	0	0.00
35 - 39	0	2	0.00
40 - 44	1	4	0.24
45 - 49	8	6	1.31
50 - 54	4	8	0.53
55 - 59	11	9	1.18
60 - 64	5	8	0.65
65 & Over	1	4	0.28
TOTAL	30	41	0.73

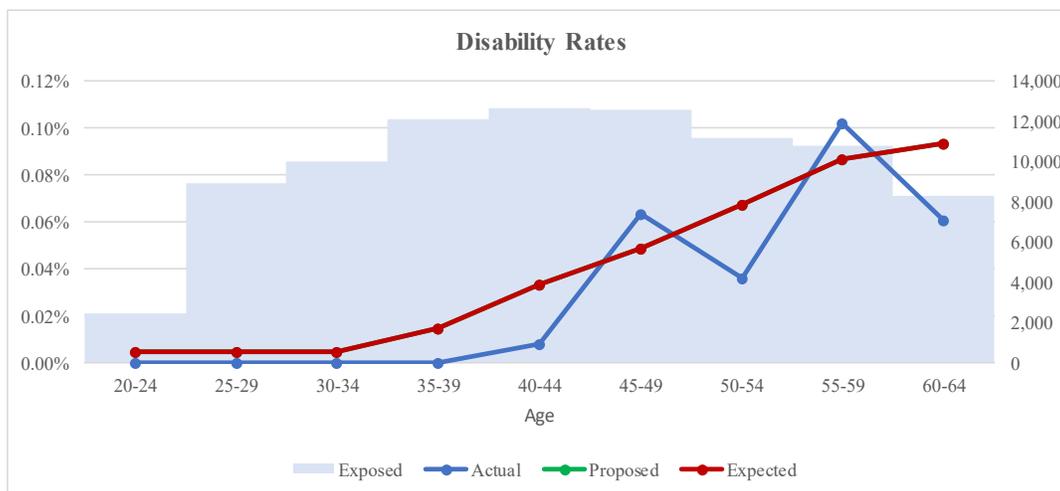


Findings and Recommendations

Experience indicates that the current assumption overestimated the number of disability retirements during the experience period. If we combine this experience with the experience from the prior experience study complete for the periods ended July 1, 2013, July 1, 2017 and July 1, 2021, the total number of disability retirements was 103 compared to the expected number of disability retirements which was 117. The actual/expected ratio on this basis is 88%, which indicates a closer match to the current assumption. As a result, we recommend making no change to the assumed rates of disability.

The right axis of the chart below represents the number of exposed lives. The exposed lives are the total number of individuals who were subject to disability rates based upon the benefit recipient's age during the experience period. When recommending assumptions changes, it is important to recognize actual experience in areas of higher exposures versus areas of lower exposures when recommending changes to the assumed disability rates.

The left axis of the charts below show (i) the actual disability rates of employment by age during the past five years, (ii) the current assumed disability rates and (iii) the proposed assumed disability rates.





Rates of Retirement

Below is a summary of the retirement criteria for Tier One and Tier Two members:

Retirement Type	Tier	Criteria
Early	One	Five years of service and age 50
Normal	One	25 years of service or age 60 with five years of service
Early	Two	Five years of service and age 55
Normal	Two	Age 55 with 30 years of service or age 60 with five years of service

The retirement rates used in the actuarial valuation project the percentage of employees who are expected to retire during the upcoming year. Separate rates are assumed for University and Non-University members. The System is currently closed to university members. As of July 1, 2021 university members comprise less than 1% of the total population with 175 active members with average age and service of 55 and 20 respectively. As a result, we don't think it is statistically relevant to continue to recommend separate retirement rates for university members.

Higher paid members typically have a greater liability compared to members who are lower paid. As a result, retirement rates for members with higher compensation levels and higher service will have a greater influence on the liabilities of the System. As a result, we liability weighted the experience to better reflect the impact of the current assumption on liability measures. The liability is approximated by using the member's compensation to estimate the member's benefit level. The exposure and actual occurrences are then multiplied by the benefit level to provide the liability-weighted experience. We find the liability-weighted experience to better correlate to the impact of actual and expected rates of withdrawal on the valuation results.

In addition to membership type, retirement rates are set based on type of retirement. The rates of retirement were studied separately for those eligible for a reduced benefit, first eligible for an unreduced benefit and beyond first eligibility for an unreduced benefit. An actual/expected ratio that is less than 100% indicates that in general fewer people retired with a retirement benefit than were anticipated by the current assumption while an actual/expected ratio that is greater than 100% indicates more people have retired than expected during the observation period.



Eligible for a Reduced Benefit

The analysis of the actual retirement experience over the five-year period yields actual/expected ratio of 80% for all members.

EXPERIENCE UNDER CURRENT ASSUMPTIONS

Number of Service Retirements Eligible for a Reduced Benefit			
Age	Current Rates		
	Actual	Expected	Ratio
			Actual/Expected
50	2,260,802	3,810,555	0.59
51	2,515,023	3,322,738	0.76
52	1,719,301	2,975,506	0.58
53	2,348,702	2,789,367	0.84
54	2,045,018	3,126,495	0.65
55	1,439,802	3,104,043	0.46
56	2,576,418	3,043,211	0.85
57	2,151,224	2,876,592	0.75
58	2,868,849	2,770,344	1.04
59	4,370,058	2,710,888	1.61
TOTAL	24,295,196	30,529,739	0.80



Findings and Recommendations

In general, actual retirements for members who were eligible for a reduced benefit were less than expected. We recommend revising the assumed rates of retirement to reflect recent experience. The actual/expected ratio under the proposed assumption is 104%.

EXPERIENCE UNDER PROPOSED ASSUMPTIONS

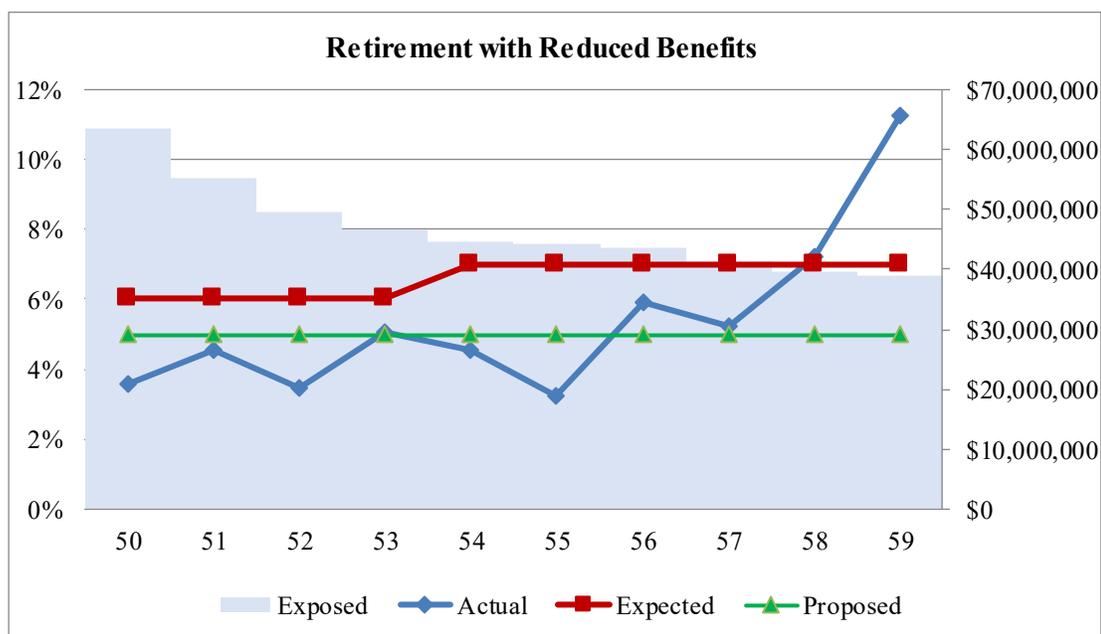
Number of Service Retirements Eligible for a Reduced Benefit			
Age	Proposed Rates		
	Actual	Expected	Ratio
			Actual/Expected
50	2,260,802	3,172,745	0.71
51	2,515,023	2,765,559	0.91
52	1,719,301	2,474,320	0.69
53	2,348,702	2,322,962	1.01
54	2,045,018	2,236,272	0.91
55	1,439,802	2,220,405	0.65
56	2,576,418	2,177,173	1.18
57	2,151,224	2,058,258	1.05
58	2,868,849	1,982,504	1.45
59	4,370,058	1,940,267	2.25
TOTAL	24,295,196	23,350,466	1.04



Section III: Demographic Assumptions

The right axis of the charts below represents the liability weighted exposures. The exposed compensation is a proxy for the liability subject to retirement rates based upon the benefit recipient's age during the experience period. When recommending assumptions changes, it is important to recognize actual experience in areas of higher exposures versus areas of lower exposures when recommending changes to the assumed retirement rates.

The left axis of the charts below show (i) the actual rates of retirement by years of age during the past five years, (ii) the current assumed rates of retirement and (iii) the proposed rates of retirement.





First Eligible for an Unreduced Benefit

The analysis of the actual retirement experience over the five-year period yields an actual/expected ratio of 85%. We recommend revising the assumed rates of retirement for all members.

EXPERIENCE UNDER CURRENT ASSUMPTIONS

Number of Service Retirements First Eligible for an Unreduced Benefit			
Age	Current Rates		
	Actual	Expected	Ratio
			Actual/Expected
45	0	0	0.00
46	0	0	0.00
47	0	390,415	0.00
48	274,001	949,503	0.29
49	426,481	987,218	0.43
50	526,431	599,974	0.88
51	486,784	344,010	1.42
52	330,847	306,408	1.08
53	277,947	238,538	1.17
54	311,782	204,048	1.53
55	220,303	143,884	1.53
56	194,027	268,427	0.72
57	589,332	452,197	1.30
58	363,845	531,208	0.68
59	455,315	542,118	0.84
60	4,685,612	5,157,471	0.91
61	169,171	243,953	0.69
62	256,422	310,867	0.82
63	219,576	210,371	1.04
64	395,363	323,284	1.22
65	271,418	239,052	1.14
66	146,299	183,643	0.80
67	176,552	160,675	1.10
68	206,424	159,470	1.29
69	30,500	43,940	0.69
TOTAL	11,014,432	12,990,676	0.85



Findings and Recommendations

In general, actual retirements for members who were first eligible for an unreduced benefit were less than expected for all members. We recommend revising the assumed rates of retirement to reflect recent experience. The actual/expected ratio based on the proposed assumption is 95%. The table below shows the experience under proposed assumptions.

EXPERIENCE UNDER PROPOSED ASSUMPTIONS

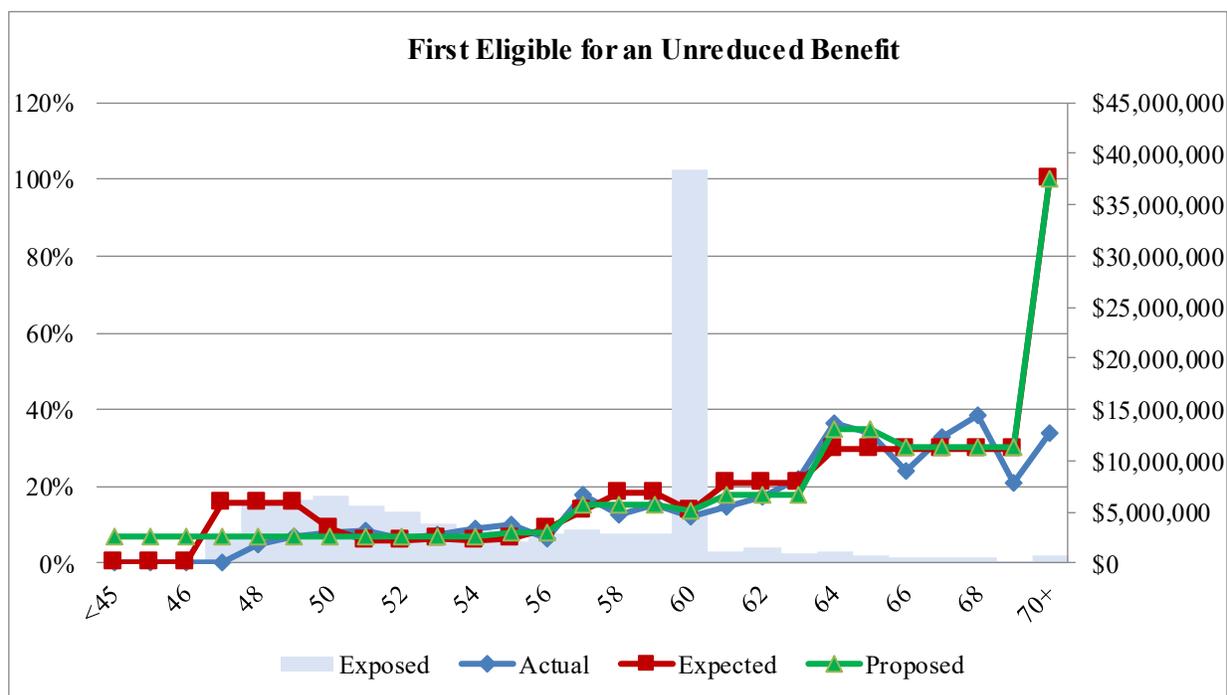
Number of Service Retirements First Eligible for an Unreduced Benefit			
Age	Proposed Rates		
	Actual	Expected	Ratio
			Actual/Expected
45	0	0	0.00
46	0	0	0.00
47	0	170,940	0.00
48	274,001	415,772	0.66
49	426,481	432,155	0.99
50	526,431	464,719	1.13
51	486,784	393,003	1.24
52	330,847	357,900	0.92
53	277,947	267,779	1.04
54	311,782	238,387	1.31
55	220,303	175,260	1.26
56	194,027	238,998	0.81
57	589,332	500,734	1.18
58	363,845	433,776	0.84
59	455,315	443,883	1.03
60	4,685,612	5,181,034	0.90
61	169,171	209,613	0.81
62	256,422	267,180	0.96
63	219,576	180,839	1.21
64	395,363	378,362	1.04
65	271,418	279,898	0.97
66	146,299	184,377	0.79
67	176,552	161,450	1.09
68	206,424	160,288	1.29
69	30,500	44,180	0.69
TOTAL	11,014,432	11,580,526	0.95



Section III: Demographic Assumptions

The right axis of the charts below represents the liability weighted exposures. The exposed lives are the total number of salaries subject to retirement rates based upon the benefit recipient's age during the experience period. When recommending assumptions changes, it is important to recognize actual experience in areas of higher exposures versus areas of lower exposures when recommending changes to the assumed retirement rates.

The left axis of the charts below show (i) the actual rates of retirement by age during the past five years, (ii) the current assumed rates of retirement and (iii) the proposed rates of retirement.





Beyond First Year of Eligibility for an Unreduced Benefit

The analysis of the actual retirement experience over the five-year period yields an actual/expected ratio of 104% for all members. We recommend revising the assumed rates of retirement to reflect recent experience.

EXPERIENCE UNDER CURRENT ASSUMPTIONS

Number of Service Retirements Beyond First Year of Eligibility for an Unreduced Benefit			
Age	Current Rates		Ratio
	Actual	Expected	Actual/Expected
45	0	0	0.00
46	0	539	0.00
47	5,294	1,016	5.21
48	193,304	190,313	1.02
49	371,091	537,134	0.69
50	548,664	822,225	0.67
51	1,317,974	1,210,909	1.09
52	2,030,787	1,849,583	1.10
53	2,425,303	1,844,330	1.32
54	2,625,717	2,230,596	1.18
55	3,068,942	2,808,475	1.09
56	3,186,599	3,198,464	1.00
57	3,949,080	3,669,562	1.08
58	4,017,043	3,927,809	1.02
59	4,723,689	4,446,602	1.06
60	6,299,275	6,098,520	1.03
61	11,428,313	13,928,434	0.82
62	10,906,648	11,425,002	0.95
63	9,115,177	9,885,803	0.92
64	12,233,728	9,909,014	1.23
65	11,267,859	10,472,625	1.08
66	5,632,948	4,059,072	1.39
67	3,658,450	3,165,791	1.16
68	2,206,150	2,274,628	0.97
69	2,815,907	1,988,488	1.42
TOTAL	104,027,941	99,944,934	1.04



Findings and Recommendations

The actual retirement liability was greater than expected. We recommend revising the assumed rates of retirements to reflect recent experience. The table below shows the experience under proposed assumptions. The actual/expected ratio under the proposed assumption is 98%.

EXPERIENCE UNDER PROPOSED ASSUMPTIONS

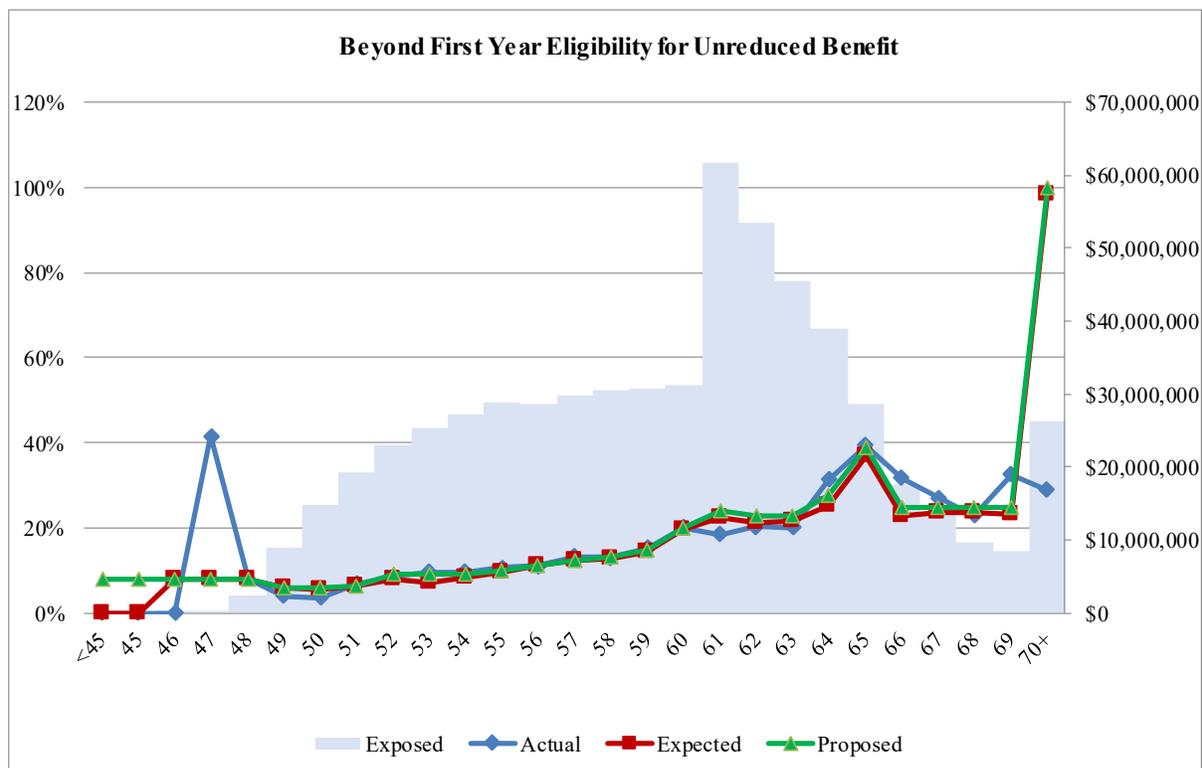
Number of Service Retirements Beyond First Year of Eligibility for an Unreduced Benefit			
Age	Proposed Rates		Ratio
	Actual	Expected	Actual/Expected
45	0	0	0.00
46	0	539	0.00
47	5,294	1,017	5.21
48	193,304	190,476	1.01
49	371,091	534,123	0.69
50	548,664	895,576	0.61
51	1,317,974	1,207,897	1.09
52	2,030,787	2,083,227	0.97
53	2,425,303	2,274,461	1.07
54	2,625,717	2,452,915	1.07
55	3,068,942	2,880,460	1.07
56	3,186,599	3,227,559	0.99
57	3,949,080	3,717,348	1.06
58	4,017,043	3,991,305	1.01
59	4,723,689	4,547,195	1.04
60	6,299,275	6,249,230	1.01
61	11,428,313	14,788,943	0.77
62	10,906,648	12,311,131	0.89
63	9,115,177	10,464,303	0.87
64	12,233,728	10,711,456	1.14
65	11,267,859	11,130,070	1.01
66	5,632,948	4,435,535	1.27
67	3,658,450	3,360,284	1.09
68	2,206,150	2,403,213	0.92
69	2,815,907	2,156,821	1.31
TOTAL	104,027,941	106,015,085	0.98



Section III: Demographic Assumptions

The right axis of the charts below represents the liability weighted exposures. The exposed compensation is a proxy for the liability subject to retirement rates based upon the benefit recipient's age during the experience period. When recommending assumptions changes, it is important to recognize actual experience in areas of higher exposures versus areas of lower exposures when recommending changes to the assumed retirement rates.

The left axis of the charts below show (i) the actual rates of retirement by age during the past five years, (ii) the current assumed rates of retirement and (iii) the proposed rates of retirement.





Rates of Mortality

The Society of Actuaries periodically publishes mortality tables derived from large, national studies. In recent years, they have tended to publish families of tables, allowing actuaries to select a table that is based on a subset of data most similar to that of the data the actuary is trying to value.

In early 2019, the Society released a set of tables based solely on public plan data. This family of tables, called the Pub-2010 tables, includes tables based not only on the gender and status factors already noted, but also on the type of membership (teachers, public safety, and general government), as well as further breakdowns based on those members who were above or below the median benefit amounts. Because most other recent families of tables had excluded public sector data, the Pub-2010 tables are expected to be quite useful for valuing the benefits for public retirement systems.

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

The recommended mortality tables in the analysis on the following pages include adjustments. The adjustments to the standard mortality tables were determined following the procedures outlined in the Credibility Educational Resource for Pension Actuaries, Application of Credibility Theory to Mortality Assumption published by the Society of Actuaries. For the credibility analysis, we utilized a 90% confidence interval on the benefit weighted basis.

Based upon the long-term trend of mortality improvement, actuaries seek to account for future improvements in longevity, either by generationally projecting future improvements or by maintaining a sufficient margin in expected rates of mortality to allow for future improvement. We recommend the generationally projected mortality improvement approach.

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



Retiree Mortality

The analysis of the actual post-retirement mortality experience over the five-year experience study period yields actual/expected ratios of 100% and 100% respectively for males and females. The table below details the actual/expected ratios by individual age group and total.

EXPERIENCE UNDER CURRENT ASSUMPTIONS

Age Group	Post-Retirement Mortality Experience					
	Males			Females		
	Actual	Expected	Ratio	Actual	Expected	Ratio
			Actual/Expected			Actual/Expected
Under 50	0	78	0.00	0	83	0.00
50 - 54	0	1,406	0.00	3,073	1,507	2.04
55 - 59	6,160	6,826	0.90	5,452	10,379	0.53
60 - 64	22,866	35,013	0.65	31,474	49,923	0.63
65 - 69	85,860	123,506	0.70	128,158	167,621	0.76
70 - 74	190,346	250,185	0.76	155,033	218,891	0.71
75 - 79	291,144	306,992	0.95	175,714	196,630	0.89
80 - 84	322,203	305,711	1.05	155,078	161,802	0.96
85 - 89	304,430	251,310	1.21	197,902	138,964	1.42
90 - 94	155,550	129,784	1.20	149,202	93,775	1.59
95 - 99	58,905	31,439	1.87	64,225	39,968	1.61
100 & Over	5,753	6,922	0.83	27,536	14,728	1.87
TOTAL	1,443,217	1,449,175	1.00	1,092,847	1,094,272	1.00

Findings and Recommendations

Experience indicates that the current assumption predicted roughly the same amount of liability to be released as actually occurred, in aggregate, for both male and female mortality experience during the study period. The table currently in use is the RP 2000 Combined Healthy Mortality Table projected to 2022 adjusted for partial credibility setback for two years for both males and females.

Despite the fact that the current assumption anticipated similar deaths to what were expected, we recommend updating the mortality assumption to a more modern base table utilizing a projection scale that directly projects future mortality improvement. We recommend updating the mortality assumption to the PUB-2010 Teacher Amount Weighted Healthy Retiree mortality table projected to 2021 adjusted 102% for males and 103% for females. Future improvement in mortality rates is reflected by applying the MP-2021 projection scale generationally.



EXPERIENCE UNDER PROPOSED ASSUMPTIONS

The actual/expected ratios under the proposed assumptions are 100% and 102% for males and females respectively. The proposed tables also provide a better fit than the prior table when comparing actual/expected ratios at individual age groups. The table below details the actual/expected ratios by individual age group and total.

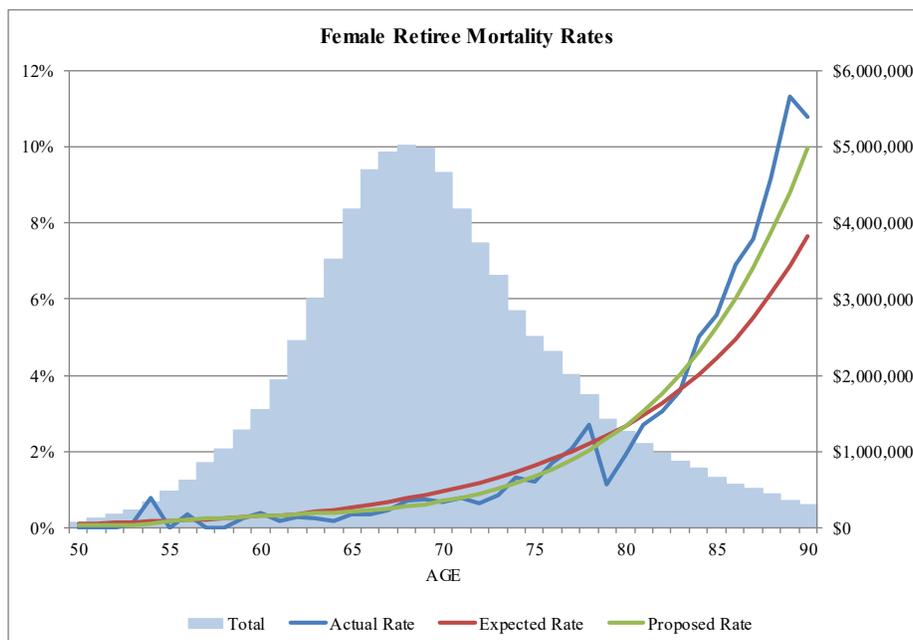
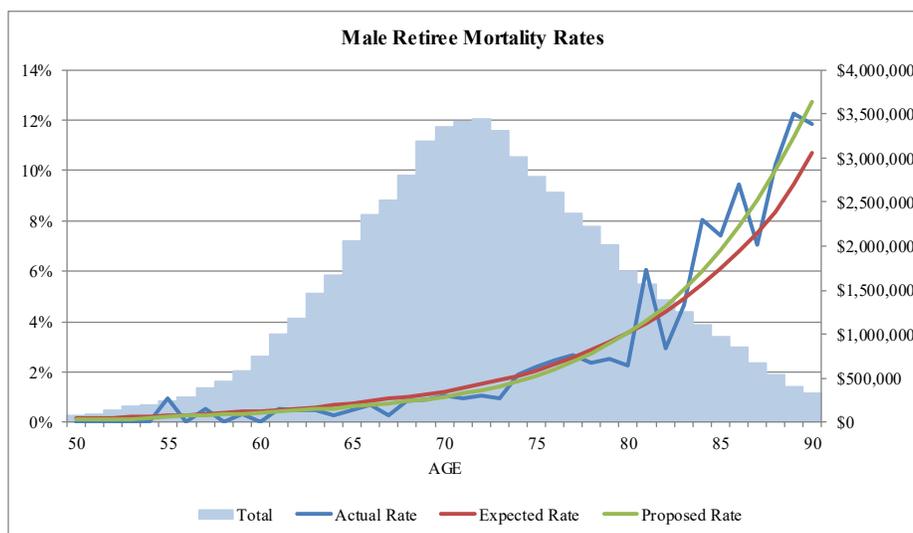
Age Group	Post-Retirement Mortality Experience					
	Males			Females		
	Actual	Proposed	Ratio	Actual	Proposed	Ratio
			Actual/Expected			Actual/Expected
Under 50	0	49	0.00	0	45	0.00
50 - 54	0	917	0.00	3,073	852	3.61
55 - 59	6,160	5,718	1.08	5,452	10,820	0.50
60 - 64	22,866	29,074	0.79	31,474	45,856	0.69
65 - 69	85,860	99,226	0.87	128,158	125,630	1.02
70 - 74	190,346	213,978	0.89	155,033	166,182	0.93
75 - 79	291,144	287,710	1.01	175,714	174,137	1.01
80 - 84	322,203	320,870	1.00	155,078	174,065	0.89
85 - 89	304,430	291,737	1.04	197,902	171,481	1.15
90 - 94	155,550	152,723	1.02	149,202	123,879	1.20
95 - 99	58,905	36,173	1.63	64,225	54,423	1.18
100 & Over	5,753	8,212	0.70	27,536	22,537	1.22
TOTAL	1,443,217	1,446,387	1.00	1,092,847	1,069,907	1.02



Section III: Demographic Assumptions

The right axis of the charts below represents the number of exposed benefit amounts. The exposed benefit amounts are a proxy for the liability subject to mortality rates based upon the benefit recipient's age during the experience period. When recommending assumptions changes, it is important to recognize actual experience in areas of higher exposures versus areas of lower exposures when recommending changes to the assumed retirement rates.

The left axis of the charts below show (i) the actual rates of mortality for retirees by age during the past five years, (ii) the current assumed rates of mortality and (iii) the recommended rates of mortality.





Contingent Survivor Mortality

The analysis of the actual post-retirement mortality experience over the five-year experience study period yields actual/expected ratios of 173% and 140% respectively for males and females. The table below details the actual/expected ratios by individual age group and total.

EXPERIENCE UNDER CURRENT ASSUMPTIONS

Age Group	Post-Retirement Mortality Experience					
	Males			Females		
	Actual	Expected	Ratio	Actual	Expected	Ratio
			Actual/Expected			Actual/Expected
Under 50	2,956	251	11.78	3,369	146	23.08
50 - 54	422	108	3.90	0	189	0.00
55 - 59	3,721	475	7.84	3,204	499	6.42
60 - 64	1,695	1,220	1.39	10,024	1,696	5.91
65 - 69	4,684	4,062	1.15	12,372	6,298	1.96
70 - 74	11,054	7,408	1.49	13,394	17,194	0.78
75 - 79	9,915	9,601	1.03	32,786	35,691	0.92
80 - 84	16,022	8,075	1.98	80,507	51,763	1.56
85 - 89	15,764	7,605	2.07	92,181	65,378	1.41
90 - 94	12,909	7,362	1.75	99,216	69,179	1.43
95 - 99	6,373	3,436	1.85	28,217	25,014	1.13
100 & Over	872	239	3.65	13,728	5,307	2.59
TOTAL	86,386	49,841	1.73	388,998	278,354	1.40

Findings and Recommendations

Experience indicates that overall, more male and female contingent survivors liability has been released than was anticipated during the study period. The table currently in use is the RP 2000 Combined Healthy Mortality Table projected to 2022 adjusted for partial credibility setback for two years for both males and females.

We recommend updating the mortality assumption to a more modern base table for both males and females without adjustment. We recommend updating the mortality assumption to the PUB-2010 Teacher Amount Weighted Contingent Survivor mortality table. Future improvement in mortality rates is reflected by applying the MP-2021 projection scale generationally.



EXPERIENCE UNDER PROPOSED ASSUMPTIONS

The actual/expected ratios under the proposed assumptions are 122% and 105% for males and females respectively. The table below details the actual/expected ratios by individual age group and total.

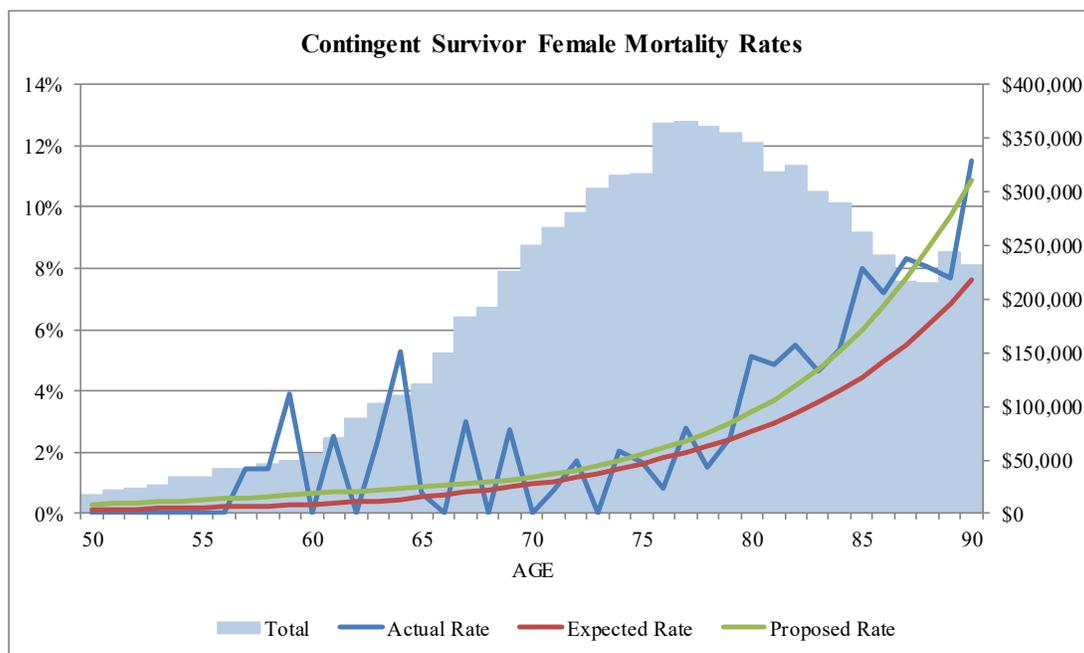
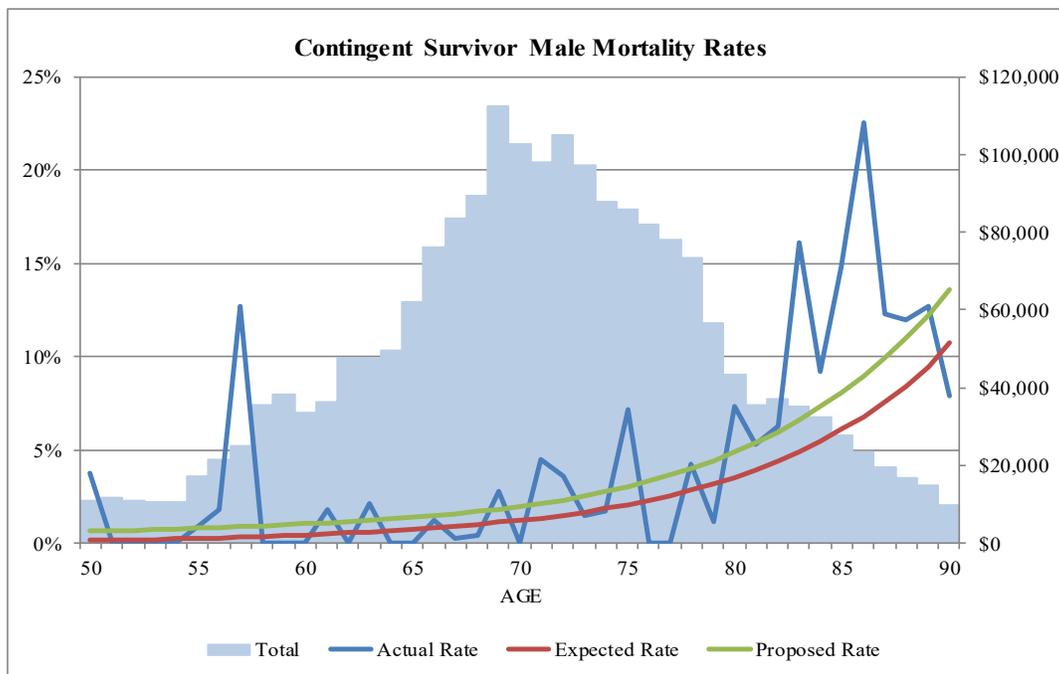
Age Group	Post-Retirement Mortality Experience					
	Males			Females		
	Actual	Proposed	Ratio	Actual	Proposed	Ratio
			Actual/Expected			Actual/Expected
Under 40	2,956	593	4.98	3,369	248	13.58
50 - 54	422	386	1.09	0	445	0.00
55 - 59	3,721	1,249	2.98	3,204	1,132	2.83
60 - 64	1,695	2,563	0.66	10,024	3,186	3.15
65 - 69	4,684	6,917	0.68	12,372	8,659	1.43
70 - 74	11,054	11,469	0.96	13,394	20,664	0.65
75 - 79	9,915	13,615	0.73	32,786	42,499	0.77
80 - 84	16,022	10,904	1.47	80,507	66,237	1.22
85 - 89	15,764	10,005	1.58	92,181	90,813	1.02
90 - 94	12,909	8,924	1.45	99,216	96,712	1.03
95 - 99	6,373	3,910	1.63	28,217	33,607	0.84
100 & Over	872	271	3.21	13,728	7,724	1.78
TOTAL	86,386	70,807	1.22	388,998	371,927	1.05

The right axis of the charts on the following page represents the number of exposed benefit payments. The exposed benefit payments are a proxy for the liability subject to mortality rates based upon the benefit recipient's age during the experience period. When recommending assumptions changes, it is important to recognize actual experience in areas of higher exposures versus areas of lower exposures when recommending changes to the assumed retirement rates.



Section III: Demographic Assumptions

The left axis of the charts below show (i) the actual rates of mortality for beneficiaries by age during the past five years, (ii) the current assumed rates of mortality and (iii) the recommended rates of mortality.





Rates of Disabled Post-Retirement Mortality

The disability mortality rates used in the actuarial valuations project the percentage of disabled retirees who are expected to die in the upcoming year for male and female disabled retirees. Mortality for disabled retirees is expected to be higher than mortality for non-disabled retirees.

The analysis of the actual disabled mortality over the five-year experience study period yields actual/expected ratio of 159% and 168% respectively for disabled male and female retirees respectively. The table below shows the actual/expected ratios by age groups and in total.

EXPERIENCE UNDER CURRENT ASSUMPTIONS

Age Group	Post-Retirement Mortality Experience					
	Males			Females		
	Actual	Expected	Ratio	Actual	Expected	Ratio
			Actual/Expected			Actual/Expected
Under 40	0	0	0.00	0	12	0.00
40 - 44	0	76	0.00	0	53	0.00
45 - 49	0	122	0.00	0	263	0.00
50 - 54	0	622	0.00	0	924	0.00
55 - 59	4,106	1,421	2.89	5,459	2,010	2.72
60 - 64	1,247	972	1.28	12,362	2,236	5.53
65 - 69	0	1,666	0.00	5,668	4,202	1.35
70 - 74	5,679	1,873	3.03	5,271	4,869	1.08
75 - 79	1,624	881	1.84	5,125	3,579	1.43
80 - 84	1,055	1,351	0.78	2,433	3,017	0.81
85 - 89	3,674	2,092	1.76	2,825	1,248	2.26
90 - 94	790	421	1.88	1,556	1,388	1.12
95 - 99	2,379	1,408	1.69	476	645	0.74
100 & Over	0	0	0.00	392	304	1.29
TOTAL	20,554	12,906	1.59	41,568	24,751	1.68



Findings and Recommendations

Experience indicates that overall, more disabled retired liabilities have been released than expected during the study period. The table currently in use is the RP-2000 Disabled Mortality projected by Scale BB to 2022 setback three years and set forward two years for males and females respectively.

Due to the very limited data to analyze and in order to maintain consistency with the healthy mortality assumption we recommend updating the post retirement disabled mortality table to the PUB-2010 Teacher Amount Weighted Disabled Retiree mortality table. No future improvements are reflected for the disabled retirees.

EXPERIENCE UNDER PROPOSED ASSUMPTIONS

Age Group	Post-Retirement Mortality Experience					
	Males			Females		
	Actual	Proposed	Ratio	Actual	Proposed	Ratio
			Actual/Expected			Actual/Expected
Under 40	0	0	0.00	0	12	0.00
40 - 44	0	35	0.00	0	61	0.00
45 - 49	0	70	0.00	0	288	0.00
50 - 54	0	416	0.00	0	994	0.00
55 - 59	4,106	1,010	4.07	5,459	2,258	2.42
60 - 64	1,247	776	1.61	12,362	2,310	5.35
65 - 69	0	1,454	0.00	5,668	3,512	1.61
70 - 74	5,679	1,754	3.24	5,271	3,772	1.40
75 - 79	1,624	853	1.91	5,125	2,957	1.73
80 - 84	1,055	1,457	0.72	2,433	2,809	0.87
85 - 89	3,674	2,598	1.41	2,825	1,298	2.18
90 - 94	790	567	1.39	1,556	1,357	1.15
95 - 99	2,379	1,687	1.41	476	635	0.75
100 & Over	0	0	0.00	392	344	1.14
TOTAL	20,554	12,676	1.62	41,568	22,606	1.84



Rates of Salary Increase

The analysis of salary increases yielded an actual/expected ratio of 101% and 99% for non-university members and university members respectively. A ratio less than 100% indicates that salary increases in general were less than anticipated by the current assumption. We recommend a minor adjustment to non-university members to reflect recent experience.

EXPERIENCE UNDER CURRENT ASSUMPTIONS

Years of Service	Salaries End of Year (in thousands)					
	Non-University Members			University Members		
	Actual	Expected	Ratio	Actual	Expected	Ratio
			Actual/Expected			Actual/Expected
1	204,905	205,033	0.999	805	753	1.069
2	197,402	197,381	1.000	899	940	0.956
3	187,927	188,338	0.998	1,006	850	1.184
4	170,840	169,908	1.005	935	917	1.020
5	158,028	155,652	1.015	799	792	1.009
6	145,059	143,801	1.009	825	846	0.975
7	134,173	133,934	1.002	745	712	1.046
8	132,015	130,939	1.008	1,013	1,025	0.988
9	133,364	132,568	1.006	1,645	1,595	1.031
10	136,147	134,983	1.009	1,240	1,234	1.005
11	134,621	133,925	1.005	1,245	1,327	0.938
12	127,800	126,990	1.006	1,069	1,062	1.007
13	117,567	117,185	1.003	1,138	1,115	1.021
14	115,931	115,410	1.005	1,279	1,276	1.002
15	114,406	114,014	1.003	1,453	1,507	0.964
16	114,021	113,753	1.002	1,059	1,086	0.975
17	111,616	111,432	1.002	706	744	0.949
18	108,033	107,977	1.001	1,095	1,114	0.983
19	103,562	103,110	1.004	882	929	0.949
20	97,561	97,837	0.997	1,068	1,089	0.981
21	92,312	92,116	1.002	1,231	1,205	1.022
22 & Up	681,906	685,583	0.995	49,960	50,998	0.980
TOTAL	3,519,196	3,511,869	1.002	72,097	73,116	0.986



Section III: Demographic Assumptions

The following graphs show a comparison of current, actual and proposed rates of salary increase for Non-University members and for University members.

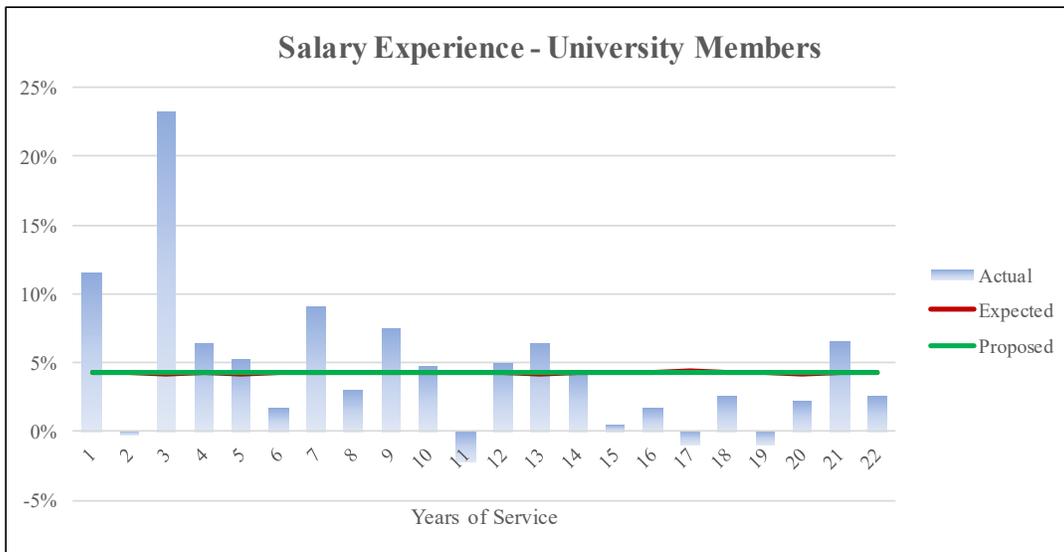
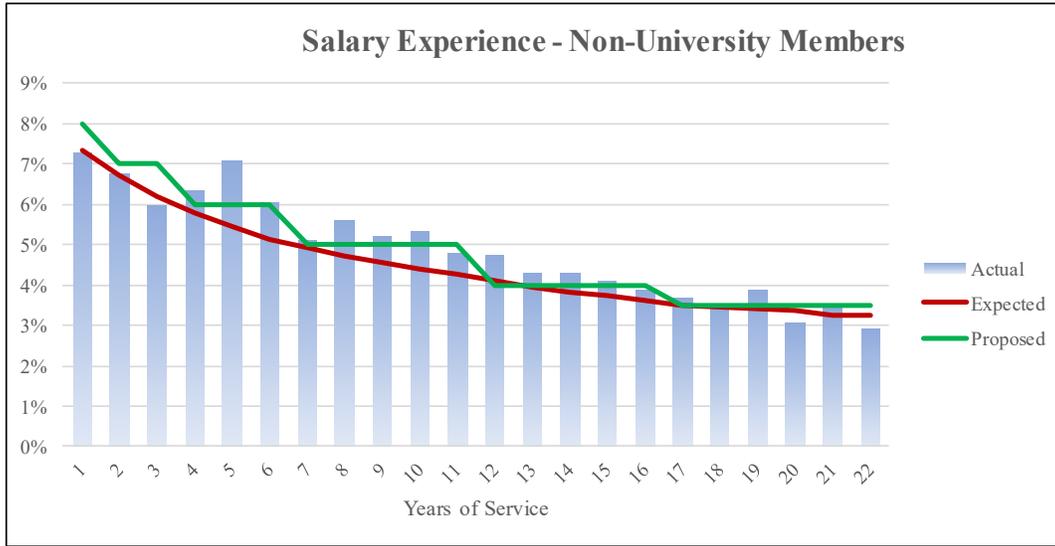
EXPERIENCE UNDER PROPOSED ASSUMPTIONS

Years of Service	Salaries End of Year (in thousands)					
	Non-University Members			University Members		
	Actual	Expected	Ratio	Actual	Expected	Ratio
			Actual/Expected			Actual/Expected
1	204,905	206,294	0.993	805	753	1.070
2	197,402	197,917	0.997	899	939	0.957
3	187,927	189,774	0.990	1,006	851	1.183
4	170,840	170,277	1.003	935	916	1.020
5	158,028	156,449	1.010	799	792	1.008
6	145,059	144,977	1.001	825	845	0.976
7	134,173	134,023	1.001	745	712	1.046
8	132,015	131,289	1.006	1,013	1,025	0.989
9	133,364	133,125	1.002	1,645	1,595	1.031
10	136,147	135,745	1.003	1,240	1,234	1.005
11	134,621	134,888	0.998	1,245	1,327	0.938
12	127,800	126,880	1.007	1,069	1,062	1.006
13	117,567	117,264	1.003	1,138	1,115	1.020
14	115,931	115,599	1.003	1,279	1,276	1.002
15	114,406	114,322	1.001	1,453	1,507	0.964
16	114,021	114,170	0.999	1,059	1,086	0.975
17	111,616	111,421	1.002	706	743	0.950
18	108,033	108,019	1.000	1,095	1,113	0.983
19	103,562	103,200	1.004	882	929	0.950
20	97,561	97,969	0.996	1,068	1,089	0.980
21	92,312	92,339	1.000	1,231	1,205	1.021
22 & Up	681,906	687,243	0.992	49,960	50,998	0.980
TOTAL	3,519,196	3,523,184	0.999	72,097	73,116	0.986



Section III: Demographic Assumptions

The charts below show (i) actual salary increases by years of service (ii) the currently assumed salary increases, and (iii) the proposed salary increase rates.





Percent Married: Currently 100% of members are assumed to be married. The spouse is assumed to be the same age as the eligible member. This is a common and reasonable assumption, and we recommend maintaining this assumption.

Missing Data: In preparing the valuation data, certain data items are missing, unavailable, or unreasonable. In such cases, we have developed assumptions for what the data element should be. We recommend keeping these assumptions.

Part-time employees: The valuation data for active members identify part-time members. Part-time members earning less than \$1000 during any given year are valued at current member contribution balance. We recommend keeping this assumption.

Benefits for Terminating Members: Members terminating with less than 5 years of service are assumed to request an immediate withdrawal of their contributions with interest. A probability is assumed for members terminating with 5 or more years of service for the likelihood of retaining membership in the System. Participants who retain membership are due a vested benefit upon reaching normal retirement while members who do not retain membership are entitled to an immediate refund of the member's contributions with interest. We recommend no change in this assumption at this time.

Interest on Member Contributions: Member contribution balances grow with interest each year. The current assumption is that the balances will grow at 5%. Each year the Board adopts a rate at which to credit interest on member account balances. We recommend changing this assumption to reflect the adopted rate by the Board each year.



Section IV: Actuarial Methods

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

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

Actuarial Value of Assets: The purpose of the asset smoothing is to dampen the impact that market volatility has on valuation results by spreading the unexpected market gains and losses over several years. Currently the System uses smoothing method that recognizes 25% of the difference between the actual and expected market value of assets, based on the assumed rate of return. The actuarial value of assets cannot be less than 80% or more than 120% of market value. We recommend no change in the use of this method.

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

The payroll growth assumption is used to determine the percentage of payroll required over the remaining amortization period to fully amortize the unfunded liability. We recommend retaining the payroll growth assumption of 3.25%.

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



Assumption Changes

As a result of the experience investigation, we are recommending the following:

- Revised rates of termination
- Revise rates of retirement
- Revised rates of pre and post retirement mortality

The change in results represents the financial impact of adopting the proposed assumptions.

	Valuation July 1, 2021	Demographic Assumption Changes	Economic & Demographic Assumption Changes
Employer Contribution Rate:			
Normal Rate	1.52%	1.92%	2.75%
Admin. Expense Load	0.46%	0.46%	0.00%
UAAL	<u>9.78%</u>	<u>9.38%</u>	<u>9.01%</u>
Total Statutory Employer Rate	11.76%	11.76%	11.76%
Actuarial Accrued Liability*	\$6,463,247	\$6,384,101	\$6,537,386
Actuarial Value of Assets*	<u>4,616,374</u>	<u>4,616,374</u>	<u>4,616,374</u>
UAAL*	\$1,846,873	\$1,767,726	\$1,921,012
Amortization Period	24	23	27

* In thousands

**Historical June CPI (U) Index**

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



Survey of Capital Market Assumptions: 2021 Edition

Rates of Return by Asset Class

Asset Class	Target Allocation	Long-Term Expected Real Rate of Return
Domestic Equity	30.0%	5.90%
International Equity	17.0%	7.14%
Private Investments	15.0%	9.13%
Real Assets	5.0%	4.03%
Real Estate	9.0%	5.41%
Core Fixed Income	15.0%	1.14%
Non-Core Fixed Income	6.0%	3.02%
Cash	3.0%	-0.33%
Total	100.0%	



Social Security Administration Wage Index

Year	Wage Index	Annual Increase	Year	Wage Index	Annual Increase
1961	\$4,086.76		1991	\$21,811.60	3.73%
1962	4,291.40	5.01%	1992	22,935.42	5.15
1963	4,396.64	2.45	1993	23,132.67	0.86
1964	4,576.32	4.09	1994	23,753.53	2.68
1965	4,658.72	1.80	1995	24,705.66	4.01
1966	4,938.36	6.00	1996	25,913.90	4.89
1967	5,213.44	5.57	1997	27,426.00	5.84
1968	5,571.76	6.87	1998	28,861.44	5.23
1969	5,893.76	5.78	1999	30,469.84	5.57
1970	6,186.24	4.96	2000	32,154.82	5.53
1971	6,497.08	5.02	2001	32,921.92	2.39
1972	7,133.80	9.80	2002	33,252.09	1.00
1973	7,580.16	6.26	2003	34,064.95	2.44
1974	8,030.76	5.94	2004	35,648.55	4.65
1975	8,630.92	7.47	2005	36,952.94	3.66
1976	9,226.48	6.90	2006	38,651.41	4.60
1977	9,779.44	5.99	2007	40,405.48	4.54
1978	10,556.03	7.94	2008	41,334.97	2.30
1979	11,479.46	8.75	2009	40,711.61	-1.51
1980	12,513.46	9.01	2010	41,673.83	2.36
1981	13,773.10	10.07	2011	42,979.61	3.13
1982	14,531.34	5.51	2012	44,321.67	3.12
1983	15,239.24	4.87	2013	44,888.16	1.28
1984	16,135.07	5.88	2014	46,481.52	3.55
1985	16,822.51	4.26	2015	48,098.63	3.48
1986	17,321.82	2.97	2016	48,642.15	1.13
1987	18,426.51	6.38	2017	50,321.89	3.45
1988	19,334.04	4.93	2018	52,145.80	3.62
1989	20,099.55	3.96	2019	54,099.99	3.75
1990	21,027.98	4.62	2020	55,628.60	2.83



Recommended Mortality Tables

SERVICE RETIREMENT: PUBT-2010 Retiree mortality table projected to 2021 adjusted 102% for males adjusted 103% for females. Future improvement in mortality rates is reflected by applying the MP-2021 projection scale generationally.

DISABLED RETIREMENT: PUBT-2010 Disabled Retiree mortality table.

CONTINGENT SURVIVOR: PUBT-2010 Contingent Survivor table projected to 2021. Future improvement in mortality rates is reflected by applying the MP-2021 projection scale generationally.

PRE-RETIREMENT: PUBT-2010 General Employee mortality table projected to 2021. Future improvement in mortality rates is reflected by applying the MP-2021 projection scale generationally.



Recommended Rates of Retirement

Number of Service Retirements Eligible for a Reduced Benefit				
Age	Current Vs. Proposed Rates			
	Non-University Members		University Members	
	Current	Proposed	Current	Proposed
50	0.0600	0.0500	0.0700	0.0500
51	0.0600	0.0500	0.0700	0.0500
52	0.0600	0.0500	0.0700	0.0500
53	0.0600	0.0500	0.0700	0.0500
54	0.0700	0.0500	0.0700	0.0500
55	0.0700	0.0500	0.0700	0.0500
56	0.0700	0.0500	0.0700	0.0500
57	0.0700	0.0500	0.0700	0.0500
58	0.0700	0.0500	0.0700	0.0500
59	0.0700	0.0500	0.0700	0.0500



Recommended Rates of Retirement, cont.

Number of Service Retirements First Eligible for an Unreduced Benefit				
Age	Current Vs. Proposed Rates			
	Non-University Members		University Members	
	Current	Proposed	Current	Proposed
45	0.1600	0.0700	0.1700	0.0700
46	0.1600	0.0700	0.1700	0.0700
47	0.1600	0.0700	0.1700	0.0700
48	0.1600	0.0700	0.1700	0.0700
49	0.1600	0.0700	0.1700	0.0700
50	0.0900	0.0700	0.1700	0.0700
51	0.0600	0.0700	0.1700	0.0700
52	0.0600	0.0700	0.1700	0.0700
53	0.0600	0.0700	0.1700	0.0700
54	0.0600	0.0700	0.1700	0.0700
55	0.0600	0.0800	0.1500	0.0800
56	0.0900	0.0800	0.1500	0.0800
57	0.1350	0.1500	0.1500	0.1500
58	0.1850	0.1500	0.1500	0.1500
59	0.1850	0.1500	0.1500	0.1500
60	0.1350	0.1350	0.1500	0.1350
61	0.2100	0.1800	0.1400	0.1800
62	0.2100	0.1800	0.2000	0.1800
63	0.2100	0.1800	0.1400	0.1800
64	0.3000	0.3500	0.2000	0.3500
65	0.3000	0.3500	0.2800	0.3500
66	0.3000	0.3000	0.2100	0.3000
67	0.3000	0.3000	0.2100	0.3000
68	0.3000	0.3000	0.2100	0.3000
69	0.3000	0.3000	0.2100	0.3000



Recommended Rates of Retirement, cont.

Number of Service Retirements Beyond First Eligibility for an Unreduced Benefit				
Age	Current Vs. Proposed Rates			
	Non-University Members		University Members	
	Current	Proposed	Current	Proposed
45	0.0800	0.0800	0.0800	0.0800
46	0.0800	0.0800	0.0800	0.0800
47	0.0800	0.0800	0.0800	0.0800
48	0.0800	0.0800	0.0800	0.0800
49	0.0600	0.0600	0.0800	0.0600
50	0.0550	0.0600	0.0800	0.0600
51	0.0630	0.0630	0.0800	0.0630
52	0.0800	0.0900	0.0800	0.0900
53	0.0730	0.0900	0.0800	0.0900
54	0.0820	0.0900	0.0800	0.0900
55	0.0980	0.1000	0.0800	0.1000
56	0.1130	0.1130	0.0800	0.1130
57	0.1250	0.1250	0.0800	0.1250
58	0.1310	0.1310	0.0800	0.1310
59	0.1480	0.1480	0.0800	0.1480
60	0.2000	0.2000	0.0850	0.2000
61	0.2400	0.2400	0.1500	0.2400
62	0.2300	0.2300	0.1500	0.2300
63	0.2300	0.2300	0.1500	0.2300
64	0.2750	0.2750	0.1950	0.2750
65	0.3900	0.3900	0.2600	0.3900
66	0.2500	0.2500	0.1950	0.2500
67	0.2500	0.2500	0.2150	0.2500
68	0.2500	0.2500	0.1950	0.2500
69	0.2500	0.2500	0.1950	0.2500

**Recommended Rates of Withdrawal**

Years of Service	Full Time Withdrawal Rates	
	Current	Proposed
Less than 1	0.3168	0.2800
1	0.1739	0.1600
2	0.1141	0.1200
3	0.1050	0.0900
4	0.0800	0.0700
5	0.0670	0.0600
6	0.0550	0.0500
7	0.0412	0.0400
8	0.0365	0.0300
9	0.0327	0.0300
10	0.0296	0.0300
11	0.0271	0.0200
12	0.0249	0.0200
13	0.0231	0.0200
14	0.0215	0.0200
15	0.0201	0.0200
16	0.0189	0.0200
17	0.0178	0.0200
18	0.0168	0.0200
19	0.0159	0.0100
20	0.0151	0.0100
21	0.0144	0.0100
22	0.0138	0.0100
23	0.0132	0.0100
24	0.0126	0.0100



Recommended Rates of Withdrawal, cont.

Years of Service	Part Time Withdrawal Rates	
	Current	Proposed
Less than 1	0.3600	0.3000
1	0.2673	0.2300
2	0.2397	0.1900
3	0.2201	0.1600
4	0.2050	0.1300
5	0.1926	0.1150
6	0.1821	0.1050
7	0.1690	0.1000
8	0.1513	0.0900
9	0.1422	0.0900
10	0.1350	0.0900
11	0.1250	0.0900
12	0.1200	0.0800
13	0.1100	0.0800
14	0.1014	0.0800
15	0.1013	0.0800
16	0.0986	0.0800
17	0.0912	0.0800
18	0.0900	0.0800
19	0.0900	0.0800
20	0.0900	0.0800
21	0.0900	0.0800
22	0.0900	0.0800
23	0.0900	0.0800
24	0.0900	0.0800



Recommended Rates of Salary Increase

Years of Service	General Members			University Members		
	Individual Merit & Longevity	General Wage Increase	Total Salary Increase	Individual Merit & Longevity	General Wage Increase	Total Salary Increase
1	5.31%	3.50%	9.00%	0.72%	3.50%	4.25%
2	4.35%	3.50%	8.00%	0.72%	3.50%	4.25%
3	3.38%	3.50%	7.00%	0.72%	3.50%	4.25%
4	3.38%	3.50%	7.00%	0.72%	3.50%	4.25%
5	2.42%	3.50%	6.00%	0.72%	3.50%	4.25%
6	2.42%	3.50%	6.00%	0.72%	3.50%	4.25%
7	2.42%	3.50%	6.00%	0.72%	3.50%	4.25%
8	1.45%	3.50%	5.00%	0.72%	3.50%	4.25%
9	1.45%	3.50%	5.00%	0.72%	3.50%	4.25%
10	1.45%	3.50%	5.00%	0.72%	3.50%	4.25%
11	1.45%	3.50%	5.00%	0.72%	3.50%	4.25%
12	1.45%	3.50%	5.00%	0.72%	3.50%	4.25%
13	0.48%	3.50%	4.00%	0.72%	3.50%	4.25%
14	0.48%	3.50%	4.00%	0.72%	3.50%	4.25%
15	0.48%	3.50%	4.00%	0.72%	3.50%	4.25%
16	0.48%	3.50%	4.00%	0.72%	3.50%	4.25%
17	0.48%	3.50%	4.00%	0.72%	3.50%	4.25%
18	0.00%	3.50%	3.50%	0.72%	3.50%	4.25%
19	0.00%	3.50%	3.50%	0.72%	3.50%	4.25%
20	0.00%	3.50%	3.50%	0.72%	3.50%	4.25%
21	0.00%	3.50%	3.50%	0.72%	3.50%	4.25%
22 & Up	0.00%	3.50%	3.50%	0.72%	3.50%	4.25%