

Georgia Public School Employees Retirement System



**Experience Study for
the Five-Year Period
Ending June 30, 2024**

Submitted: December 4, 2025



December 4, 2025

Board of Trustees
Georgia Public School Employees Retirement System
Two Northside 75, Suite 300
Atlanta, GA 30318

Members of the Board:

We are pleased to submit the results of an investigation of the economic and demographic experience for the Georgia Public School Employees Retirement System. The investigation has been made in accordance with Section 47-3-23(b) of the retirement law which provides that at least once in every five-year period, the actuary shall make an actuarial investigation into the mortality, service and compensation experience of the members and beneficiaries of the Retirement System. The purpose of the investigation is to assess the reasonability of the actuarial assumptions and methods currently used by the Retirement System. This investigation covers the five-year period from July 1, 2019 to June 30, 2024. As a result of this investigation, it is recommended that revised demographic tables be adopted by the Board for future use. We also recommend a change to the COLA assumption. We do not recommend any other changes to the economic assumptions and methods from the 2024 valuation.

The investigation of the demographic experience of members of the System includes all active and retired members as well as beneficiaries of deceased members. The experience was investigated separately for males and females where gender is a basis for material differences in experience.

The number of members expected to separate from active service, the expected rates of salary increase, and the expected number of post-retirement deaths were obtained by use of the rates determined in the last experience investigation and adopted by the Board of Trustees. The results of the investigation indicate that the assumed rates of separation from active service due to withdrawal, disability, death and retirement and rates of post-retirement mortality need revision in order to provide a better fit between the actual and anticipated experience of the Retirement System. As a result of the investigation, new withdrawal, disability, retirement and mortality tables have been developed which reflect more closely the actual experience of the membership.

All new assumptions are shown in the attached tables throughout the report. In the actuary's judgment, the recommended assumptions are suitable for use until further experience indicates that modifications are desirable.

In order to prepare the measurement of the impact on liabilities in this report, we have utilized actuarial models that we developed to measure liabilities and develop actuarial costs. These models include tools that we have produced and tested, along with commercially available valuation software that we have reviewed to confirm the appropriateness and accuracy of the output. In utilizing these models, we develop and use input parameters and assumptions about future contingent events along with recognized actuarial approaches to develop the needed results.



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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 Public Statements of Actuarial Opinion of the American Academy of Actuaries.

We further certify that, in our opinion, the assumptions developed in this report satisfy Actuarial Standards of Practice, in particular, No. 27 (Selection of Assumptions for Measuring Pension Obligations).

We note that as we prepare this report, the world has been in a pandemic during much of the experience study period. We have taken this into consideration as we reviewed the experience, particularly regarding mortality, retirement, termination, disability, and salary increase patterns. While we do not believe that there is yet sufficient data to warrant the significant modification of any of our assumptions specifically due to COVID-19, we will continue to monitor the emerging data and advise the Board in the future of any adjustments that we believe would be appropriate.

The experience investigation 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. Edward Koebel and Ben Mobley meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

Respectfully submitted,

Edward J. Koebel, EA, FCA, MAAA
Chief Executive Officer

Ben Mobley, ASA, FCA, MAAA
Consulting Actuary



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SECTION I – EXECUTIVE SUMMARY

The purpose of an actuarial valuation is to provide the best estimate of the expected future costs of a retirement system. An actuarial valuation for the Georgia Public School Employees Retirement System of Georgia (System) is prepared annually to determine the actuarial contribution rates required to fund the system on an actuarial reserve basis, (i.e., the current assets plus future contributions, along with investment earnings will be sufficient to provide the benefits promised by the system). The valuation requires the use of certain assumptions with respect to the occurrence of future events, such as rates of investment return, 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.

CavMac has performed a study of the experience of the System for the five-year period ending June 30, 2024. This report presents the results, analysis, and resulting recommendations of our study. It is anticipated that the changes, if approved, will first be reflected in the June 30, 2025 actuarial valuation.

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:

- **Do Not Overreact:** When we see significant changes in experience, we generally do not adjust our rates to reflect the entire degree of 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.





SECTION I – EXECUTIVE SUMMARY

- **Anticipate Trends:** If there is an identified trend that is expected to continue, we believe that this should be more fully 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 for the plans. Detailed explanations for the recommendations are found in the sections that follow.

Recommended Economic Assumption

Economic assumptions are some of the most visible and significant assumptions used in the valuation process. The items in the broad economy modeled by these assumptions can be very volatile over short periods of time, as clearly seen in the economic recovery from the pandemic in 2021 followed by the downward trend in global markets in 2022. Our goal is to focus on the emerging long-term trends in the midst of this volatility so that we can then apply reasonable assumptions.

Most of the economic assumptions used by actuaries are developed through a building-block approach. For example, the expected return on assets is based on the expectation for inflation plus the expected real return on assets. As this is usually the most significant source of annual gains and losses to a mature pension plan, it is important that each of these components, inflation and real return, are primarily based on long-term future expectation and not the short-term historical performance.

At the core of the economic assumptions is the inflation assumption. As we discuss later in the report, although the plans have experienced higher than normal inflation recently due to the recovery from the pandemic, we believe that long-term inflation will settle back down in the pre-pandemic 2.50% range. Therefore, **we are recommending that the price inflation assumption be maintained at 2.50%.**

We are recommending that the long-term expected return on assets assumption remain at 7.00%, reflecting the 2.50% inflation assumption and a 4.50% real rate of return assumption. This will be discussed in detail later in this report, but a real rate of return of 4.50% is supported by the forecasting models developed using the Department of Investment Services (DIS) capital market assumptions and the System's target asset allocation. Further analysis of the 41 sets of capital market assumptions included in the Horizon Actuarial Services, LLC. Survey conducted in 2025 and the System's target asset allocation also support this recommendation.

We are also recommending that the annual Cost-of-Living Adjustment (COLA) assumption be decreased from 1.50% semi-annually to 1.20% annually. In recent years, the PSERS Board has based its COLA recommendation for PSERS retirees on the same formula that is utilized and outlined in the ERS Funding Policy. It is our understanding that this methodology shall continue in the future. Therefore, based on stochastic modeling analysis using current PSERS funding projections, we believe this assumption should be decreased.





SECTION I – EXECUTIVE SUMMARY

Actuarial Methods

The basic actuarial methodologies used in the valuation process include the:

- Actuarial Cost Method
- Asset Valuation Method
- Amortization Method

Based on our review, discussed in full detail in Section IV of this report, we recommend no changes in these actuarial methods at this time.

Recommended Demographic Assumption Changes

In the experience study, actual demographic experience for the study period is compared to that expected based on the current actuarial assumption. Comparing the actual incidence of the event to what was expected (called the Actual-to-Expected ratio, or A/E ratio) then provides the basis for our analysis.

Mortality is perhaps the most important demographic assumption when valuing the liabilities of a pension plan. The issue of future mortality improvement is one that the actuarial profession has become increasingly focused on studying in recent years. There have been significant improvements in longevity in the past, although there are different opinions about future expectations. We believe it is prudent to anticipate that this trend will continue to some degree in the future.

Plans currently reflect mortality improvements with the use of a generational mortality approach. This approach directly anticipates future improvements in mortality by using a different set of mortality rates for each year of birth, with the rates for later years of birth assuming lower mortality rates than the rates for earlier years of birth. The varying mortality rates by year of birth create a series of tables that contain “built-in” mortality improvements, e.g., a member who turns age 65 in 2045 has a longer life expectancy than a member who turns age 65 in 2025. When using generational mortality, the A/E ratios for the observed experience are set near 100% since future mortality improvements will be taken into account directly in the actuarial valuation process.

The current mortality assumptions are based on the Pub-2010 family of mortality tables using a generational mortality approach as described above. The Society of Actuaries (SOA) published these mortality tables in 2019 which were developed exclusively from public sector retirement system experience. There was an update to these tables in 2025 called the Pub-2016 family of mortality tables. **We are recommending changes to this new family of mortality tables and we are also recommending a change to the most recent mortality improvement scale, MP-2021. These published mortality tables will be discussed in the demographic section of this report.**





SECTION I – EXECUTIVE SUMMARY

The following is a list of other recommended changes to the demographic assumptions for the System.

Assumption	Recommended Change
Retirement	Recommend slight decreases to the rates of retirement at most ages to fine-tune our expectations of retirement in the future.
Disability	Recommend minor changes in the rates of disability to better match expectations of disability in the future.
Withdrawal	Recommend minor changes in the rates of withdrawal to better match expectations of withdrawal in the future.

Section V of this report provides additional details of these recommended demographic changes.

Recommended Other Assumptions

The table below lists the other assumptions and methods that are considered in our valuations that should be reviewed during the experience study.

Assumption or Method	Recommended Change
Administrative Expenses	Recommend increase in assumed expenses from \$1,400,000 to \$2,000,000 per year.
Option Factors	Recommend change in current option factors to reflect change in mortality table
Vested Termination Benefit	Recommend assuming 80% of active members who terminate with 10 or more years of service will receive a benefit beginning at age 60 and 20% will elect to receive a refund of member contributions.

Section VI of this report provides additional details of these recommended changes.





SECTION II – FINANCIAL IMPACT

Although the assumption changes, if approved, will first be reflected in the June 30, 2025 valuation, we have provided the following table which highlights the impact of the recommended changes on the unfunded accrued liability (UAL), amortization period, actuarially determined employer contribution (ADEC), and funded ratio based on the June 30, 2024 valuation results.

Impact on Principal Valuation Results			
	Valuation Results 2024	All Recommended Assumptions EXCEPT COLA Assumption	All Recommended Assumptions
Unfunded Accrued Liability (UAL)	\$198,199,584	\$177,360,181	\$15,198,602
Funded Ratio	85.6%	86.9%	98.7%
Amortization Period (in years)	16.0	15.4	3.3
<u>Actuarially Determined Employer Contribution</u>			
Normal*	\$14,554,000	\$14,694,000	\$12,885,000
Unfunded Actuarial Accrued Liability	<u>20,978,000</u>	<u>19,190,000</u>	<u>5,275,000</u>
Total	\$35,532,000	\$33,884,000	\$18,160,000

* Includes administrative expenses





SECTION III – ECONOMIC ASSUMPTIONS

There are two economic assumptions used in the actuarial valuations performed for the System. They are:

- Price Inflation
- Investment Return

Actuarial Standard of Practice (ASOP) No. 27, “*Selection of Assumptions for Measuring Pension Obligations*,” provides guidance to actuaries in selecting economic assumptions for measuring obligations under defined benefit plans and was revised in January 2025. The revised standard now requires that each economic assumption selected by the actuary should be reasonable which means it has the following characteristics:

- It is appropriate for the purpose of the measurement;
- It reflects the actuary’s professional judgment;
- It takes into account historical and current economic data that is relevant as of the measurement date;
- It reflects the actuary’s estimate of future experience, the actuary’s observation of the estimates inherent in market data, or a combination thereof; and
- It has no significant bias (i.e., it is not significantly optimistic or pessimistic), except when provisions for adverse deviation or plan provisions that are difficult to measure are included and disclosed, or when alternative assumptions are used for the assessment of risk.

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.

As part of our analysis for the actuarial assumptions used in the Governmental Accounting Standards Board (GASB) No. 67 report as of June 30, 2025, we reviewed the System’s economic assumptions and found them to be reasonable. We have included most of that analysis of the System’s economic assumptions in this report and recommend no further revisions at this time.

In our opinion, the economic assumptions recommended in this report have been developed in accordance with ASOP No. 27, as revised in January 2025. The following table shows our recommendation followed by detailed discussions of each assumption.

Item	Current	Proposed
Price Inflation	2.50%	2.50%
Real Rate of Return	<u>4.50%</u>	<u>4.50%</u>
Investment Return	7.00%	7.00%





SECTION III – ECONOMIC ASSUMPTIONS

Price Inflation

Background: Assumed price inflation is used as the basis for both the investment return assumption and the wage inflation assumption. These 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 and is also required to meet the parameters for determining pension liabilities and expenses under Governmental Accounting Standards Board (GASB) Statements No. 67 and 68.

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, annual 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:

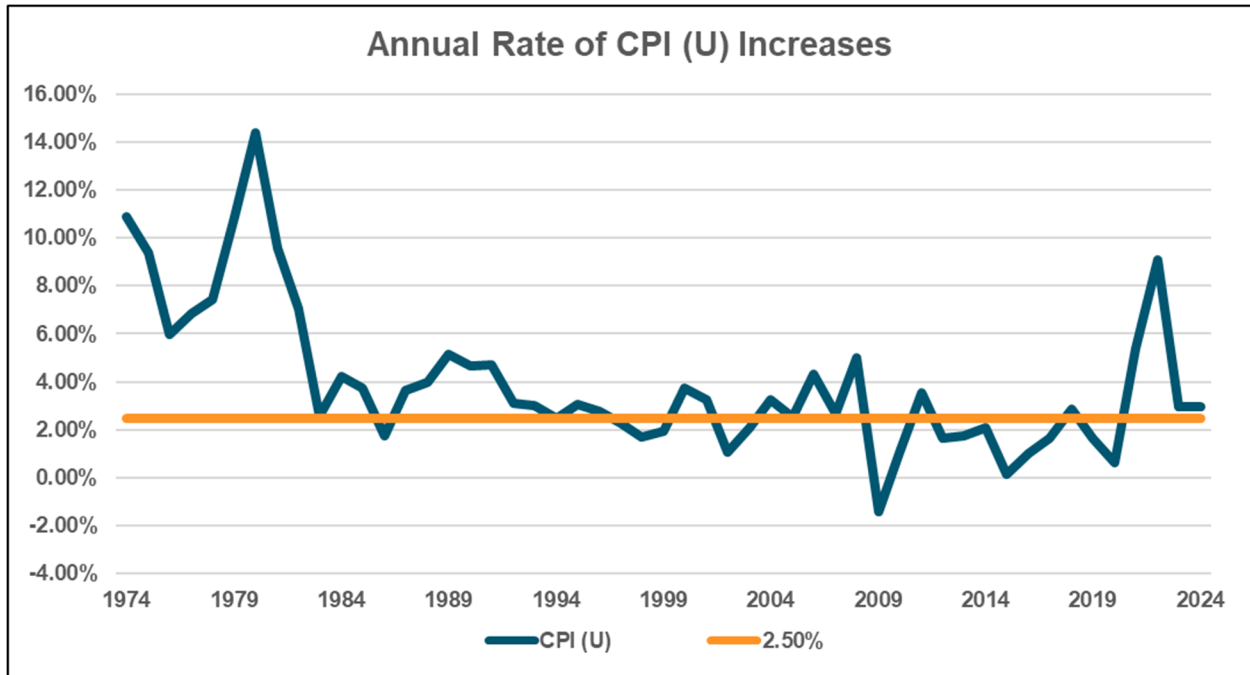
Period	Number of Years	Annualized Rate of Inflation	Annual Standard Deviation
1934 – 2024	90	3.59%	3.39%
1974 – 2024	50	3.79%	2.94%
1984 – 2024	40	2.81%	1.75%
1994 – 2024	30	2.54%	1.86%
2004 – 2024	20	2.55%	2.23%
2014 – 2024	10	2.80%	2.66%

The graph below shows the annual increases in the CPI (U) over the 50-year period (1974-2024) compared to the 2.50% currently assumed.





SECTION III – ECONOMIC ASSUMPTIONS



As can be seen from the table on the previous page, over the last 30 years, the average annual rate of increase in the CPI-U has been just over 2.50%. The higher annual rates from 2021 and 2022 have increased this average.

Forecasts

Based upon information contained in the “Survey of Professional Forecasters” for the third quarter of 2025 as published by the Philadelphia Federal Reserve Bank, the median expected annual rate of inflation for the next ten years is 2.31%. Although 10 years of future expectation is too short of a period for the basis of our inflation assumption, the information does provide some evidence that the consensus expectations of these experts are for rates of inflation very close to our current assumption of 2.50% for the near-term future.

The latest forecast from the National Association for Business Economics (NABE) released in August 2025 shows its members largely agree that the Personal Consumption Expenditures Price Index (PCE) will not hit the 2.00% target before 2027.

The spread between the yield on treasury securities (bonds) and the inflation indexed yield on Treasury Inflation Protected Securities (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.





SECTION III – ECONOMIC ASSUMPTIONS

The table below provides the breakeven rates of inflation as of the beginning of October 2025.

Years to Maturity	Breakeven Rate of Inflation
10	2.35%
20	2.42%
30	2.23%

The bond market's expectation for the rate of inflation over the 30-year period is 2.23% which is lower than 30-year historical annualized rates and the current 2.50% assumed rate of inflation.

Social Security Administration

Although many economists forecast lower inflation than the assumption used by most retirement plans, they are generally looking at a shorter time horizon than is appropriate for a pension valuation. To consider a longer, similar time frame, we looked at the expected increase in the CPI by the Office of the Chief Actuary for the Social Security Administration. In the 2025 annual report, the projected ultimate average annual increase in the CPI over the next 75 years was estimated to be 2.40%, under the intermediate (best estimate) cost assumption. The range of inflation assumptions used in the Social Security 75-year modeling, which includes a low and high-cost scenario, in addition to the intermediate cost projection, was 1.80% to 3.00%. These rates remained unchanged from their 2024 annual report.

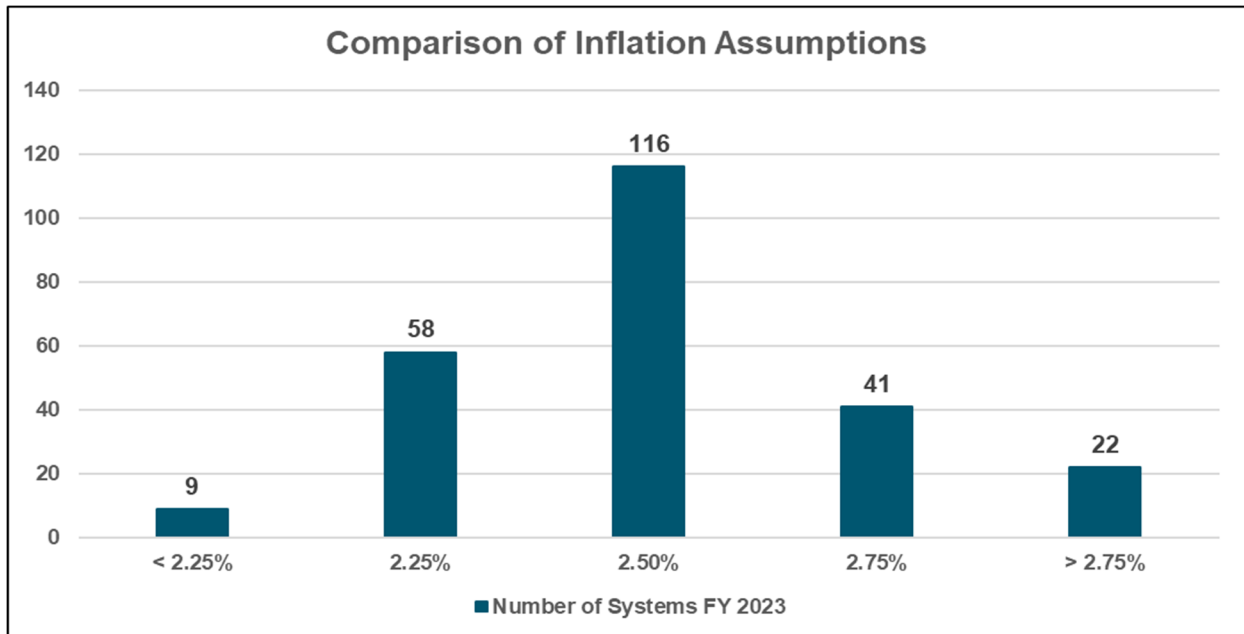
Peer Comparison

While we do not recommend the selection of any assumption based on what other systems use, it does provide another set of relevant information to consider. The following chart shows the inflation rate assumptions of 246 plans in the Public Plan Database of the Center for Retirement Research. Based on the current data, the average inflation assumption is 2.52%. The assumptions are from actuarial valuations reported in FYE 2023. Although inflation has spiked recently, we have not seen a reversal of this trend and expect most systems to take a wait-and-see approach.





SECTION III – ECONOMIC ASSUMPTIONS



Recommendation

It is difficult to predict inflation accurately. Inflation's short-term volatility is illustrated by comparing its average rate over the last 10 and 50 years. Although the 10-year average of 2.80% is closer to the System's assumed rate of 2.50%, the longer 50-year average of 3.79% is much higher and it includes the very high rates of inflation from the late 1970s and early 1980s.

Although we have experienced rather high inflation in 2021 and 2022 due to the recovery from the COVID-19 pandemic, current economic forecasts suggest annual inflation rates closer to 2.50% over the short-term and long-term, respectively. We concur with these forecasts and recommend maintaining the inflation assumption for the System at 2.50%.

Price Inflation Assumption	
Current	2.50%
Recommended	2.50%





SECTION III – ECONOMIC ASSUMPTIONS

Investment Rate of 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 Trustees.

The current assumption is 7.00%, consisting of a price inflation assumption of 2.50% and a real rate of return assumption of 4.50%. The return is net of investment expenses.

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. For actuarial calculations, we typically consider very long periods of time. For example, a newly hired employee who is 25 years old may work for 35 years, to age 60, and live another 30 years, to age 90 (or longer). The retirement system would receive contributions for the first 35 years and then pay out benefits for the next 30 years. During the entire 65-year period, the system is investing assets related to the member. For such a typical career employee, more than one-half of the investment income earned on assets accumulated to pay benefits is received after the employee retires. In addition, in an open, ongoing system like this Plan, 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. This difference in the time horizon used by actuaries and investment consultants is frequently a source of debate and confusion when setting economic assumptions.

Past Experience: The assets for the System are valued using a widely accepted asset-smoothing methodology (5-year smoothing) that fully recognizes the expected investment income and also recognizes 20% of each year’s investment gain or loss (the difference between actual and expected investment income). The recent experience over the last five years is shown in the table below.

Year Ending 6/30	Actuarial Value	Market Value
2020	6.96%	5.40%
2021	12.37%	29.54%
2022	7.89%	-11.69%
2023	6.86%	11.21%
2024	8.45%	13.89%
Average	8.51%	9.67%





SECTION III – ECONOMIC ASSUMPTIONS

The impact of the asset smoothing method can be observed in the table. Although the average returns over the five-year period are very close, the return on actuarial value is, as expected, less variable. We also note, as provided by the guidance of the Actuarial Standards of Practice (ASOP), that historical returns over a short time period are not credible for the purpose of setting the long-term assumed future rate of return.

We next include in our analysis information concerning future expectations for the investment return assumption. We prefer to base our investment return assumption largely on the capital market assumptions utilized by the Board in setting investment policy and the System’s asset allocation. The investment rate of return assumption has two component parts: the rate of price inflation and the real rate of investment return. This component approach is referred to as the building block method in ASOP No. 27. The price inflation component was discussed previously in this report; therefore, this section will focus on the real rate of investment return component.

Analysis: The current capital market assumptions and asset allocation as provided by the System investment staff, the Division of Investment Services (DIS), are shown in Appendix B. We further assumed that investment returns approximately follow a lognormal distribution with no correlation between years. The results below provide an expected range of real rates of return over up to a 50-year time horizon. Looking at one-year results produces an expected real return of 7.5% but also has a high standard deviation or measurement of volatility. By expanding the time horizon, the compound average return approaches the expected median of future real returns, and the volatility declines significantly. The following table provides a summary of results. The geometric real rates of return are net of investment expenses.

Time Span In Years	Mean Real Return	Standard Deviation	Real Returns by Percentile				
			5 th	25 th	50 th	75 th	95 th
1	7.5%	14.1%	-14.0%	-2.4%	6.6%	16.4%	32.1%
5	6.8%	6.2%	-3.2%	2.5%	6.6%	10.8%	17.3%
10	6.7%	4.4%	-0.4%	3.6%	6.6%	9.6%	14.0%
20	6.6%	3.1%	1.6%	4.5%	6.6%	8.7%	11.8%
30	6.6%	2.5%	2.5%	4.9%	6.6%	8.3%	10.8%
50	6.6%	2.0%	3.4%	5.2%	6.6%	7.9%	9.8%

Based on this analysis the median (50th percentile) real rate of return over a 50-year period is 6.6%. It can also be anticipated that for the 10-year time span, 50% of the expected compound average real rates of return were between 3.6% and 9.6%. As the time span increases, this spread begins to narrow. Over a 50-year time span, the analysis indicates there is a 25% likelihood that real returns will average below 5.2% and a 25% likelihood they will be above 7.9%. In other words, 50% of the distribution of expected compound average real returns will be between 5.2% and 7.9%.





SECTION III – ECONOMIC ASSUMPTIONS

Using the building block approach of ASOP No. 27 and the projection results outlined above, we have determined a range for the investment return assumption of the 25th to 75th percentile real returns over the 50-year time span plus the recommended inflation assumption. The following table details the range.

Item	25 th Percentile	50 th Percentile	75 th Percentile
Real Rate of Return*	5.2%	6.6%	7.9%
Inflation	<u>2.5%</u>	<u>2.5%</u>	<u>2.5%</u>
Net Investment Return	7.7%	9.1%	10.4%

* net of investment expenses

Based on the capital market assumptions provided by the System’s investment experts, the median expected compound average return is 9.1% over a 50-year period. The current 7.00% assumed rate of return is approximately the 15th percentile of the distribution of expected average rate of returns over a 50-year period. Although not in the center of the recommended range, in our opinion a return of 7.00% is a reasonable expectation with a sufficient margin to account for adverse experience. It should be noted that the capital market assumptions of investment professionals will vary from year to year and can differ substantially from investment professional to investment professional. Different market expectations could impact the development of a recommended assumption.

For a broader view of expected returns, we also reviewed the 2025 Survey of Capital Market Assumptions produced by Horizon Actuarial Services, LLC to see what other investment professionals are currently using for capital market assumptions. The Horizon survey includes both 10-year horizon and 20-year horizon capital market assumptions of several investment consultants. Using the Board’s current target asset allocation, we applied the same statistical analysis to these survey results as we did the capital market assumption of the investment staff with the following results for the 20-year horizon:

Time Span In Years	Mean Real Return	Standard Deviation	Real Returns by Percentile				
			5 th	25 th	50 th	75 th	95 th
1	5.4%	12.4%	-13.7%	-3.3%	4.7%	13.3%	27.0%
5	4.8%	5.5%	-4.0%	1.0%	4.7%	8.5%	14.1%
10	4.8%	3.9%	-1.5%	2.1%	4.7%	7.4%	11.3%
20	4.7%	2.7%	0.3%	2.8%	4.7%	6.6%	9.3%
30	4.7%	2.2%	1.1%	3.2%	4.7%	6.2%	8.4%
50	4.7%	1.7%	1.9%	3.5%	4.7%	5.9%	7.6%





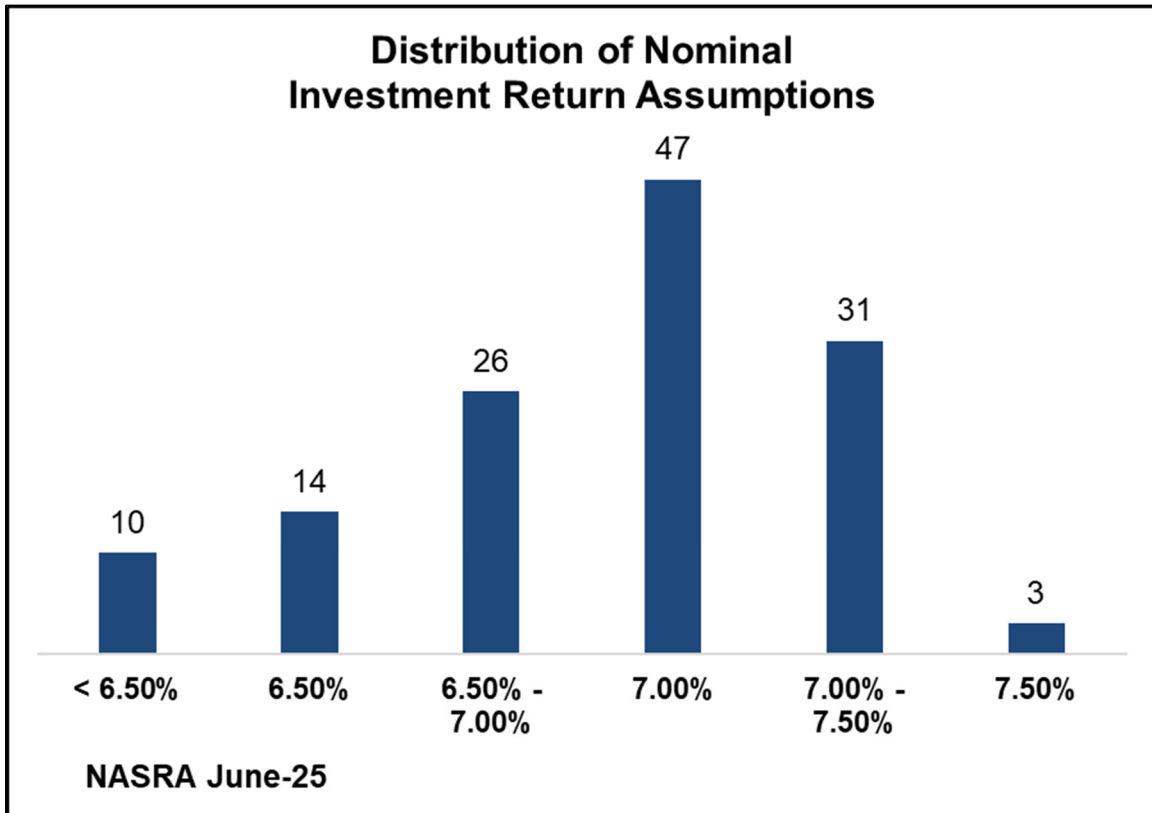
SECTION III – ECONOMIC ASSUMPTIONS

Again, using the building block approach and the Horizon projection results, the following shows the range for the investment return assumptions.

Item	25 th Percentile	50 th Percentile	75 th Percentile
Real Rate of Return	3.5%	4.7%	5.9%
Inflation	<u>2.5%</u>	<u>2.5%</u>	<u>2.5%</u>
Net Investment Return	6.0%	7.2%	8.4%

Using this basis, the 7.00% is slightly below the median expected return over a 50-year period. We prefer the use of the capital market assumptions of the Board’s investment professional, DIS, over the assumptions from a survey of several consultants which do not serve the Board since the survey assumptions were not the basis for the asset allocation decisions of the Board. By the guidance of the actuarial standards, we maintain a long-term perspective in setting all assumptions, especially the investment return assumption.

Peer Comparison: The following chart shows the nominal investment return assumptions of 131 plans in the National Association of State Retirement Administrators (NASRA). The assumptions shown below are as of June 2025 and are updated frequently by the NASRA staff.





SECTION III – ECONOMIC ASSUMPTIONS

Recommendation: By actuarial standards, we are required to maintain a long-term perspective in setting all assumptions, including the investment return assumption. Therefore, we believe actuaries must be careful not to let recent experience or short-term expectations excessively impact our judgment regarding the appropriateness of the current assumption over the long term.

There has been a significant trend in lowering the investment return assumption for pension plans across the country. According to the March 2025 NASRA Issue Brief, the median return assumption has decreased from 8.00% in 2010 to 7.00% in 2024. In addition, the capital market assumptions for investment consultants have bounced around quite a bit lately and have been historically lower than what they are today. We continue to favor an assumption which is less than the median rate of return based on current capital market assumptions for the longer timeframes and recommend no change to the current 7.00% annual rate of investment return assumption.

Below is a breakdown of the building block approach as recommended under ASOP No. 27.

Investment Return Assumption		
	Current	Recommended
Real Rate of Return*	4.50%	4.50%
Inflation	<u>2.50%</u>	<u>2.50%</u>
Net Investment Return	7.00%	7.00%

* net of investment expenses





SECTION III – ECONOMIC ASSUMPTIONS

Cost-of-Living Adjustment (COLA) Assumption

In recent years, the PSERS Board has based its COLA recommendation for PSERS retirees on the same formula that is utilized and outlined in the ERS Funding Policy. It is our understanding that this methodology shall continue in the future. Therefore, beginning July 1, 2026 and each July 1 thereafter, a COLA increase will be determined as described in the Appendix of the new Board Funding Policy. The current COLA assumption is semi-annual 1.50% increases and was adopted many years ago.

For this study, we have updated our analysis based on the funding status of the System as of June 30, 2024 but including actual June 30, 2025 assets and the following parameters:

- For the actual fair value of asset returns, 1,000 30-year scenarios were simulated where annual returns were randomly sampled for each year of the projection period from a lognormal distribution of returns with a geometric mean return of 7.0% and an annual standard deviation of 12.4%.
- For the SSA OASDI COLA rate, 1,000 30-year scenarios were simulated where annual rates of change were randomly generated for each year of the projection period from a lognormal distribution with a geometric mean of 2.5% and an annual standard deviation of 1.0%.
- Simulated actuarial value of asset returns and System funded ratios were determined for each of the 1,000 annual scenarios for each year of the projection
- Simulated COLA rates were then developed following the procedure outlined in the Appendix of the Board Funding Policy and analyzed by calculating the average COLA rate over each 30-year scenario and then calculating the median average COLA rate over the 1,000 scenarios.

Based on the results of our analysis, we recommend that the assumption of 1.50% semi-annual COLAs be decreased to 1.20% annual COLAs.





SECTION IV – ACTUARIAL METHODS

Actuarial Cost Method

There are various actuarial cost methods, each of which has different characteristics, advantages and disadvantages. However, Governmental Accounting Standard Board (GASB) Statement Numbers 67 and 68 require that the Entry Age Normal cost method be used for financial reporting. Most systems do not want to use a different actuarial cost method for funding and financial reporting. In addition, the Entry Age Normal method has been the most common funding method for public systems for many years. This is the cost method currently used by the plans.

The rationale of the Entry Age Normal (EAN) cost method is that the cost of each member's benefit is determined to be a level percentage of their salary from date of hire to the end of their employment with the employer. This level percentage multiplied by the member's annual salary is referred to as the normal cost and is that portion of the total cost of the employee's benefit that is allocated to the current year. The portion of the present value of future benefits allocated to the future is determined by multiplying this percentage times the present value of the member's assumed earnings for all future years including the current year. The Entry Age Normal accrued liability is then developed by subtracting from the present value of future benefits that portion of costs allocated to the future. To determine the unfunded accrued liability, the value of plan assets is subtracted from the Entry Age Normal accrued liability. The current year's cost to amortize the unfunded accrued liability is developed by applying an amortization factor.

It is to be expected that future events will not occur exactly as anticipated by the actuarial assumptions in each year. Actuarial gains/losses from experience under this actuarial cost method can be directly calculated and are reflected as a decrease/increase in the unfunded accrued liability. Consequently, the gain/loss results in a decrease/increase in the amortization payment, and therefore the contribution rate.

Considering that the Entry Age Normal cost method is the most commonly used cost method by public plans, that it develops a normal cost rate that tends to be less volatile and is the required cost method under calculations required by GASB disclosures, **we recommend use of the Entry Age Normal actuarial cost method be continued.**





SECTION IV – ACTUARIAL METHODS

Actuarial Value of Assets

In preparing an actuarial valuation, the actuary must assign a value to the assets of the fund. An adjusted market value is often used to smooth out the volatility that is reflected in the market value of assets. This is because most employers would rather have annual costs remain relatively smooth, as a percentage of payroll or in actual dollars, as opposed to a cost pattern that is extremely volatile.

The actuary does not have complete freedom in assigning this value. The Actuarial Standards Board also has basic principles regarding the calculation of a smoothed asset value, Actuarial Standard of Practice No. 44 (ASOP 44), *Selection and Use of Asset Valuation Methods for Pension Valuations*.

ASOP 44 provides that the asset valuation method should bear a reasonable relationship to the market value. Furthermore, the asset valuation method should be likely to satisfy both of the following:

- Produce values within a reasonable range around market value, AND
- Recognize differences from market value in a reasonable amount of time.

In lieu of both of the above, the standard will be met if either of the following requirements is satisfied:

- There is a sufficiently narrow range around the market value, OR
- The method recognizes differences from market value in a sufficiently short period.

These rules or principles prevent the asset valuation methodology from being used to manipulate annual funding patterns. No matter what asset valuation method is used, it is important to note that, like a cost method or actuarial assumptions, the asset valuation method does not affect the true cost of the plan; it only impacts the incidence of cost.

The 5-year phase-in methodology that PSERS currently uses meets these rules and is, in fact, the most commonly used methodology for plans similar to PSERS.

Currently, the actuarial value of assets recognizes a portion of the difference between the market value of assets and the expected market value of assets, based on the assumed valuation rate of return. The amount recognized each year is 20% of the difference between market value and expected market value. **We recommend no change in this methodology.**





SECTION IV – ACTUARIAL METHODS

Amortization of the Unfunded Accrued Liability

The accrued liability is the portion of the actuarial present value of future benefits that is not included in future normal costs. Thus, it represents the liability that, in theory, should have been funded through normal costs for past service. Unfunded accrued liability (UAL) exists when the accrued liability exceeds the actuarial value of plan assets. These deficiencies can result from:

- (i) plan improvements,
- (ii) experience that is less favorable than expected, or
- (iii) assumption changes that increase liabilities.

There are a variety of different methods that can be used to amortize the UAL. Each method results in a different payment stream and, therefore, has cost implications. For each methodology, there are three characteristics:

- The period over which the UAL is amortized,
- The rate at which the amortization payment increases, and
- The number of components of UAL (separate amortization bases).

Amortization Period: The amortization period can be either closed or open. If it is a closed amortization period, the number of years remaining in the amortization period declines by one in each future year. Alternatively, if the amortization period is an open or rolling period, the amortization period does not decline but is reset to the same number each year. This approach essentially “refinances” the System’s debt (UAL) every year

Amortization Payment: The level dollar amortization method is similar to the method in which a homeowner pays off a mortgage. The liability, once calculated, is financed by a constant fixed dollar amount, based on the amortization period until the liability is extinguished. This results in the liability steadily decreasing while the payments, though remaining level in dollar terms, in all probability decrease as a percentage of payroll. Even if a plan sponsor’s population is not growing, inflationary salary increases will usually be sufficient to increase the aggregate covered payroll.

The rationale behind the level percentage of payroll amortization method is that since normal costs are calculated to be a constant percentage of pay, the unfunded accrued liability should be paid off in the same manner. When this method of amortizing the unfunded accrued liability is adopted, the initial amortization payments are lower than they would be under a level dollar amortization payment method, but the payments increase at a fixed rate each year so that ultimately the annual payment far exceeds the level dollar payment. The expectation is that total payroll will increase at the same rate so that the amortization payments will remain constant, as a percentage of payroll. In the initial years, the level percentage of payroll amortization payment is often less than the interest accruing on the unfunded accrued liability meaning that even if there are no experience losses, the dollar amount of the unfunded accrued liability will grow (called negative amortization). This is particularly true if the plan sponsor is paying off the unfunded accrued liability over a long period, such as 20 or more years.





SECTION IV – ACTUARIAL METHODS

Amortization Bases: The UAL can be amortized either as one single amount or as components or “layers”, each with a separate amortization base, payment and period. If the UAL is amortized as one amount, the UAL is recalculated each year in the valuation and experience gains/losses or other changes in the UAL are folded into the single UAL amortization base. The amortization payment is then the total UAL divided by an amortization factor for the applicable amortization period.

If separate amortization bases are maintained, the UAL is composed of multiple amortization bases, each with its own payment schedule and remaining amortization period. In each valuation, the unexpected change in the UAL is established as a new amortization base over the appropriate amortization period beginning on that valuation date. The UAL is then the sum of all of the outstanding amortization bases on the valuation date and the UAL payment is the sum of all of the amortization payments on the existing amortization bases. This approach provides transparency in that the current UAL is paid off over a fixed period of time and the remaining components of the UAL are clearly identified. Adjustments to the UAL are also separately identified in each future year.

Currently, the amortization methodology is based on the level dollar amortization method for the System. In addition, we are amortizing the UAL as of June 30, 2013 (Transitional UAL) over a closed period equal to an amortization period not to exceed 25 years (it is 16.0 years as of June 30, 2024). In each subsequent valuation all benefit changes, assumption and method changes and experience gains and/or losses that have occurred since the previous valuation will determine a New Incremental UAL. Each New Incremental UAL will be amortized as a level dollar amount over a closed 25-year period from the date it is established.

We recommend continuation of these methodologies and assumptions.





SECTION V – DEMOGRAPHIC ASSUMPTIONS

There are several demographic assumptions used in the actuarial valuations performed for the Georgia Public School Employees Retirement System. They are:

- Rates of Withdrawal
- Rates of Disability Retirement
- Rates of Service Retirement
- Rates of Mortality

The Actuarial Standards Board has issued a revised Actuarial Standard of Practice (ASOP) No. 27, “*Selection of Assumptions for Measuring Pension Obligations*” as of January 2025, 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. 27.

The purpose of a study of demographic experience is to compare what actually happened to the membership during the study period (July 1, 2019 through June 30, 2024) with what was expected to happen based on the assumptions used in the last five actuarial valuations.

Detailed tabulations by age, service and/or gender are performed over the entire study period. These tabulations look at all active and retired members during the period as well as separately annotating those who experience a demographic event, also referred to as a decrement. In addition, the tabulation of all members together with the current assumptions permits the calculation of the number of expected decrements during the study period.

Instead of relying entirely on the counts of actual and expected decrements, we utilized a weighted experience approach which better reflects the impact demographic experience has on liability measures. Although the benefit formula is not based on salary, we still receive salary in the census data from staff. Therefore, we weight decrements from active service with the expected salaries of the individual members and we weight the post-retirement mortality experience with the annual retirement benefits of the individuals. We still review the actual counts of actual and expected decrements, but it is used for informational purposes only.

If the actual experience differs significantly from the overall expected results, or if the pattern of actual decrements, or rates of decrement, by age, gender, or service does not follow the expected pattern, new assumptions are recommended. Recommended changes usually do not follow the exact actual experience during the observation period. Judgment is required to extrapolate future experience from past trends and current member behavior.





SECTION V – DEMOGRAPHIC ASSUMPTIONS

The following table outlines the demographic (gain) or loss that the plan has experienced over the past five years. The impacts below show the increase/loss or decrease/gain in the unfunded accrued liability in each of the valuation years. We use this analysis to assist us when developing our proposed assumptions. If the Plan experiences certain (gains) or losses in every year of the study, that means there is a good indication that the assumptions need to be adjusted.

For example, the System has experienced gains for turnover and retirement in three out of the last five years. Therefore, we need to analyze and adjust these decrements to diminish this trend. Many factors could be contributing to these results including the pandemic, hybrid work availability, and the economic environment.

For pensioners' mortality, as expected, the System experienced higher mortality gains during the two years of high mortality experience during the pandemic but we have actually seen gains in all five years of the study period.

\$ in Thousands	2020	2021	2022	2023	2024
Pensioners' Mortality	(2,626.4)	(5,890.6)	(6,977.5)	(3,084.4)	(3,244.5)
Turnover and Retirements	814.7	337.8	(4,481.5)	(3,081.6)	(3,535.4)

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 (A/E Ratios) under the current assumptions. If a change is being proposed, the revised A/E Ratios are shown as well.



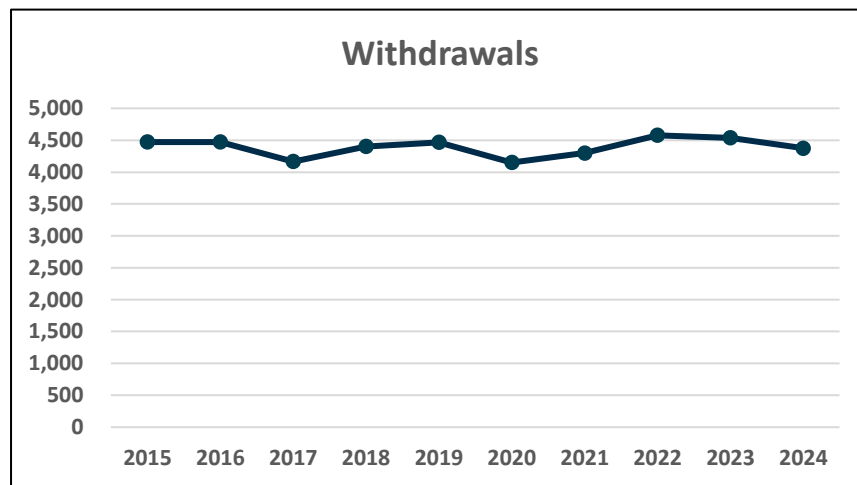


SECTION V – DEMOGRAPHIC ASSUMPTIONS

RATES OF WITHDRAWAL

The rates of withdrawal are used to determine the expected number of separations from active service which will occur prior to eligibility for retirement for reasons other than death and disability (e.g., termination of employment). The current set of assumptions include one set of rates for members with less than 5 years of service, another set of rates for members with 5 to 10 years of service, and a third set of rates for members with 10 or more years of service.

The graph below shows the total number of withdrawals for the System over the last 10 years. During that time, withdrawals have been relatively consistent each. We believe that the COVID-19 pandemic likely had some kind of impact on the incidence of withdrawals over the 5-year study period but it remains unclear how much of an impact the pandemic will continue to display on termination rates in the near or long-term.



The tables that follow on the next several pages present the actual to expected analysis of withdrawal experience. While the graph above looked at 10-year trends, the tables that follow and the remaining analysis focuses on the 5-year study period from July 1, 2019 through June 30, 2024. In this study we have analyzed recent withdrawal experience on a salary-weighted basis where the exposures and withdrawals are weighted by annual member salary amounts.





SECTION V – DEMOGRAPHIC ASSUMPTIONS

COMPARISON OF ACTUAL AND EXPECTED WITHDRAWALS FROM ACTIVE SERVICE

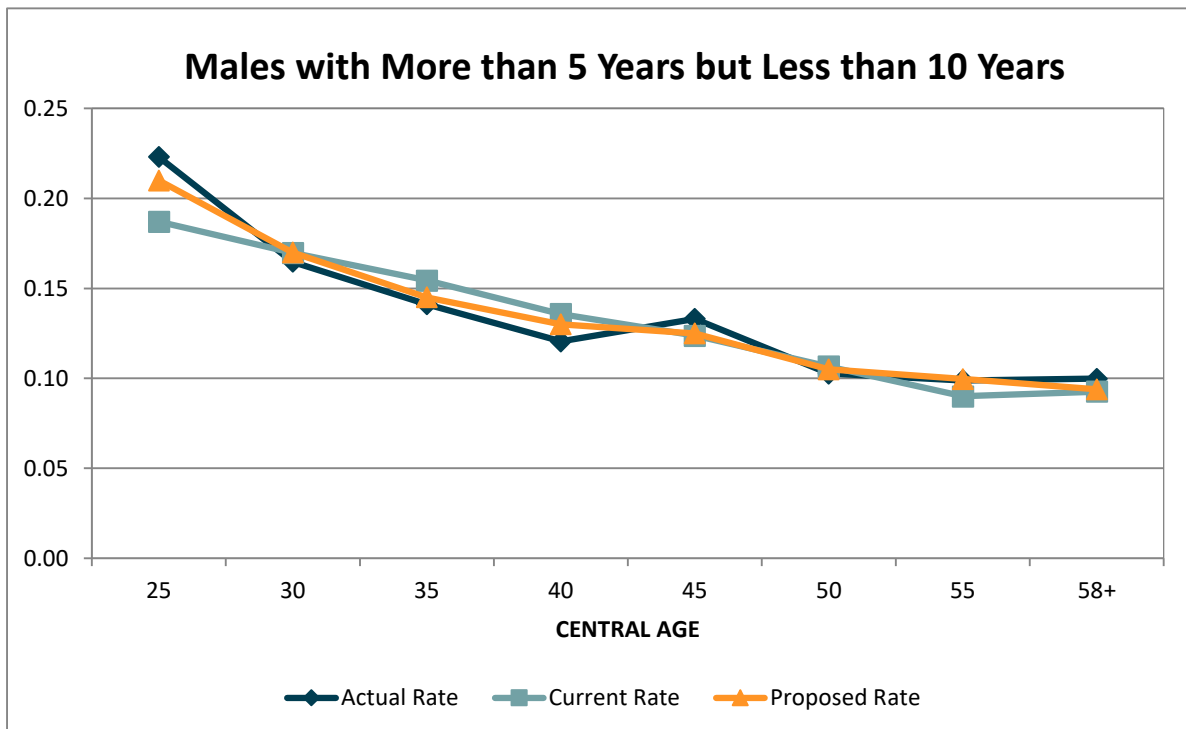
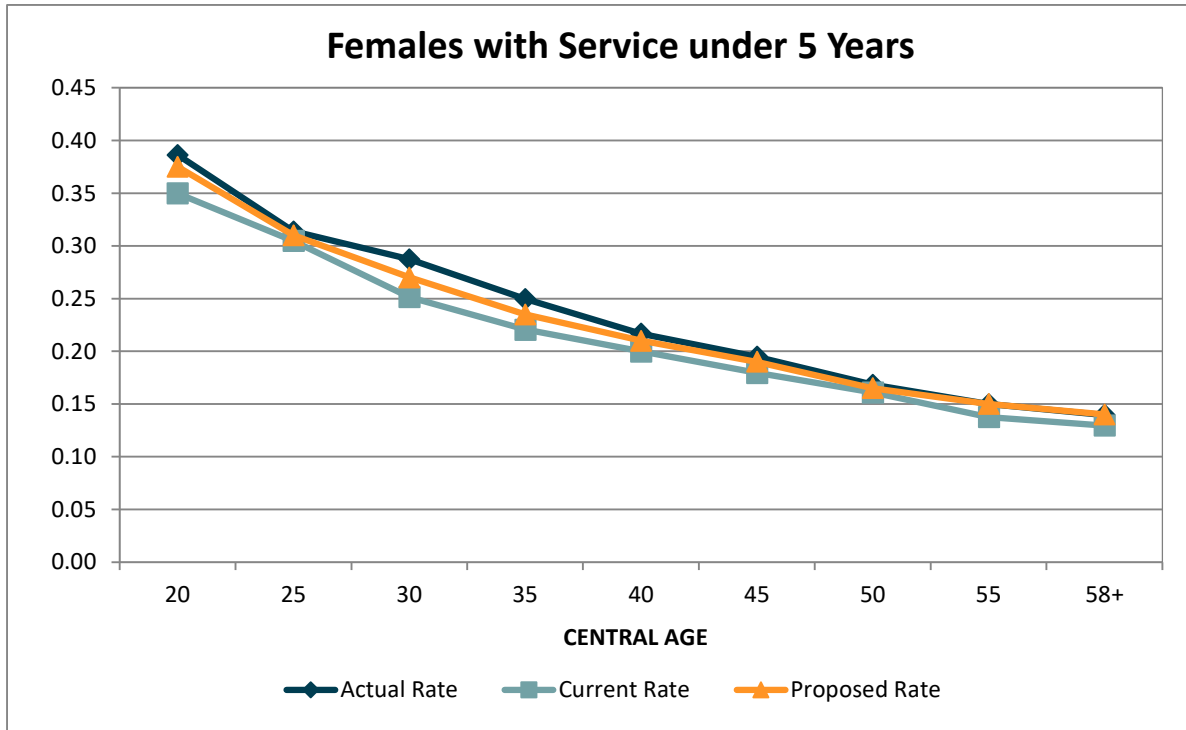
CENTRAL AGE OF GROUP	Salary Weighted Experience					
	Current Rates					
	MALES			FEMALES		
	Actual	Expected	Ratio of Actual to Expected	Actual	Expected	Ratio of Actual to Expected
	Withdrawals with less than 5 years of service					
20	1,971,357	2,003,460.7	98.4%	1,150,784	1,042,106.9	110.4%
25	5,583,385	6,155,988.7	90.7%	4,891,553	4,750,613.6	103.0%
30	5,968,332	5,827,263.2	102.4%	10,626,512	9,305,340.6	114.2%
35	5,114,785	5,518,776.1	92.7%	13,429,070	11,861,281.3	113.2%
40	6,325,847	6,232,463.7	101.5%	13,645,500	12,583,492.5	108.4%
45	5,093,977	5,719,280.9	89.1%	11,815,778	10,885,386.4	108.5%
50	5,144,039	6,767,619.1	76.0%	11,056,933	10,574,732.4	104.6%
53 & OVER	23,762,489	21,974,025.2	108.1%	25,312,695	23,400,814.2	108.2%
TOTAL	58,964,211	60,198,877.6	97.9%	91,928,825	84,403,767.9	108.9%
	Withdrawals with at least 5 but less than 10 years of service					
25	641,952	544,488.0	117.9%	317,081	282,409.6	112.3%
30	1,483,488	1,528,052.1	97.1%	2,028,769	1,619,367.0	125.3%
35	1,779,798	1,945,873.5	91.5%	3,446,001	3,222,275.6	106.9%
40	1,918,713	2,162,121.0	88.7%	5,276,981	4,768,192.9	110.7%
45	2,550,410	2,372,272.3	107.5%	5,750,621	5,299,791.3	108.5%
50	2,545,392	2,643,924.7	96.3%	5,894,474	5,384,569.2	109.5%
53 & OVER	15,321,112	14,159,921.8	108.2%	16,029,315	15,965,443.8	100.4%
TOTAL	26,240,865	25,356,653.4	103.5%	38,743,242	36,542,049.4	106.0%
	Withdrawals with 10 or more years of service					
30	144,536	154,949.8	93.3%	93,606	79,647.0	117.5%
35	881,392	674,716.6	130.6%	671,073	518,257.4	129.5%
40	1,013,682	991,730.5	102.2%	2,207,879	1,544,245.3	143.0%
45	1,674,202	1,348,991.3	124.1%	4,068,871	3,390,613.0	120.0%
50	3,054,796	2,386,521.4	128.0%	6,497,334	6,549,670.6	99.2%
53 & OVER	5,108,391	4,907,380.6	104.1%	13,000,519	12,839,877.5	101.3%
TOTAL	11,876,999	10,464,290.2	113.5%	26,539,282	24,922,310.8	106.5%





SECTION V – DEMOGRAPHIC ASSUMPTIONS

The following sample graphs show a comparison of the current expected, actual, and proposed rates of withdrawal for actives at certain service levels.





SECTION V – DEMOGRAPHIC ASSUMPTIONS

The preceding results indicate that withdrawals were close to expected for males with less than 10 years of service but were slightly more than expected for males with 10 or more years of service. For females, there were consistently more withdrawals than expected at all service levels. Typically, less withdrawals than expected create losses to the System since more members remain in service to accrue additional benefits.

Since the recent withdrawal experience may represent a temporary anomaly rather than a long-term shift in withdrawal patterns, we want to be cautious not to overreact to the observed data. Therefore, we recommend slight adjustments in the rates of withdrawals for all age and service categories and for both males and females. These adjustments bring the A/E ratio closer to 100% but leave room for the possibility that in the next experience study we may see withdrawal rates revert back to pre-COVID patterns. If instead rates continue to follow the recent pattern, then we would likely recommend continuing to move the assumed rates in that direction.

COMPARATIVE RATES OF WITHDRAWAL

AGE	RATES OF WITHDRAWAL					
	CURRENT			PROPOSED		
	Years of Service			Years of Service		
	0 – 4	5 – 9	10+	0 – 4	5 – 9	10+
Males						
20	34.00%			34.00%		
25	31.00	19.00%		30.00	21.00%	
30	27.50	17.00	12.50%	27.50	17.00	11.50%
35	24.50	15.50	9.00	24.00	14.50	10.00
40	22.00	13.50	8.25	22.00	13.00	8.50
45	21.00	12.50	7.00	19.75	12.50	8.00
50	18.50	11.00	7.00	16.50	10.50	8.00
55	15.25	9.00	6.00	15.00	9.00	6.50
Females						
20	35.00%			37.50%		
25	31.00	20.00%		31.00	20.00%	
30	25.00	16.50	10.00%	27.00	18.00	11.00%
35	22.00	15.00	10.00	23.50	16.00	11.00
40	20.00	14.00	9.00	21.00	14.50	11.00
45	18.00	12.00	8.00	19.00	12.50	8.75
50	16.25	10.00	7.00	16.50	10.50	7.00
55	13.50	9.00	6.00	15.00	9.00	6.00





SECTION V – DEMOGRAPHIC ASSUMPTIONS

COMPARISON OF ACTUAL AND EXPECTED WITHDRAWALS BASED ON PROPOSED RATES

CENTRAL AGE OF GROUP	Salary Weighted Experience					
	Proposed Rates					
	MALES			FEMALES		
	Actual	Expected	Ratio of Actual to Expected	Actual	Expected	Ratio of Actual to Expected
Withdrawals with less than 5 years of service						
20	1,971,357	2,007,896.5	98.2%	1,150,784	1,117,105.2	103.0%
25	5,583,385	5,934,247.1	94.1%	4,891,553	4,832,090.9	101.2%
30	5,968,332	5,824,209.9	102.5%	10,626,512	9,987,830.7	106.4%
35	5,114,785	5,393,456.5	94.8%	13,429,070	12,637,617.3	106.3%
40	6,325,847	6,186,213.0	102.3%	13,645,500	13,221,108.9	103.2%
45	5,093,977	5,450,600.6	93.5%	11,815,778	11,523,853.4	102.5%
50	5,144,039	6,048,452.2	85.0%	11,056,933	10,843,676.4	102.0%
53 & OVER	23,762,489	23,171,820.8	102.5%	25,312,695	25,359,492.3	99.8%
TOTAL	58,964,211	60,016,896.6	98.2%	91,928,825	89,522,775.2	102.7%
Withdrawals with at least 5 but less than 10 years of service						
25	641,952	604,483.2	106.2%	317,081	286,862.0	110.5%
30	1,483,488	1,530,749.5	96.9%	2,028,769	1,765,290.6	114.9%
35	1,779,798	1,828,135.2	97.4%	3,446,001	3,434,202.6	100.3%
40	1,918,713	2,070,351.2	92.7%	5,276,981	4,991,171.5	105.7%
45	2,550,410	2,396,491.5	106.4%	5,750,621	5,532,889.5	103.9%
50	2,545,392	2,604,107.8	97.7%	5,894,474	5,707,745.8	103.3%
53 & OVER	15,321,112	14,632,760.5	104.7%	16,029,315	16,136,084.2	99.3%
TOTAL	26,240,865	25,667,078.9	102.2%	38,743,242	37,854,246.2	102.3%
Withdrawals with 10 or more years of service						
30	144,536	143,474.6	100.7%	93,606	87,611.8	106.8%
35	881,392	740,377.0	119.0%	671,073	575,971.3	116.5%
40	1,013,682	1,033,881.1	98.0%	2,207,879	1,895,696.5	116.5%
45	1,674,202	1,514,452.1	110.5%	4,068,871	3,744,804.5	108.7%
50	3,054,796	2,727,453.0	112.0%	6,497,334	6,632,978.2	98.0%
53 & OVER	5,108,391	5,098,309.2	100.2%	13,000,519	12,839,877.5	101.3%
TOTAL	11,876,999	11,257,947.0	105.5%	26,539,282	25,776,939.8	103.0%



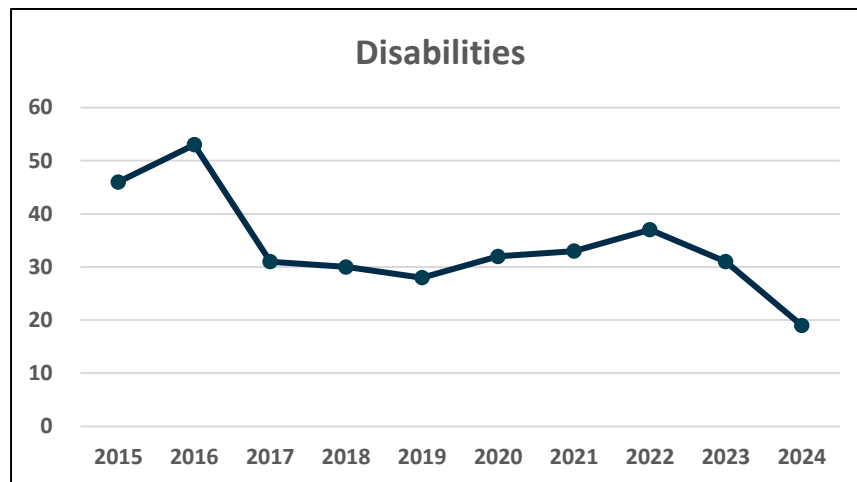


SECTION V – DEMOGRAPHIC ASSUMPTIONS

RATES OF DISABILITY RETIREMENT

The rates of disability are used to anticipate the expected number of separations due to disabilities of eligible active members. As rates of disability are very small, the number of disabilities incurred and expected is small relative to other decrements. When a disability does occur, it will result in an increase in the plan liability to reflect the immediate annuity payable to eligible disabled members at typically earlier ages.

The graph below shows the number of disabilities for the System over the last 10 years. During that time, the number of disabilities seem to have noticeably declined beginning in 2017 but then were relatively consistent each year thereafter but did experience another sharp decline in 2024. In the last experience study, it was observed that rates of disability appeared to have been declining. We generally have been seeing a trend of lower rates of disability for most retirement systems across the country. It is unclear if the drop in disabilities in 2024 represents a long-term trend that will continue for the System.



The tables that follow on the next several pages present the actual to expected analysis of disability experience. While the graph above looked at 10-year trends, the tables that follow and the remaining analysis focuses on the 5-year study period from July 1, 2019 through June 30, 2024. Unlike withdrawal and retirement, we have analyzed recent disability experience on a count basis rather than a salary-weighted basis. This is because there can often be a prevalence of lower salaries and service disruptions ahead of a disability determination which can make using a salary-weighted basis less reliable.



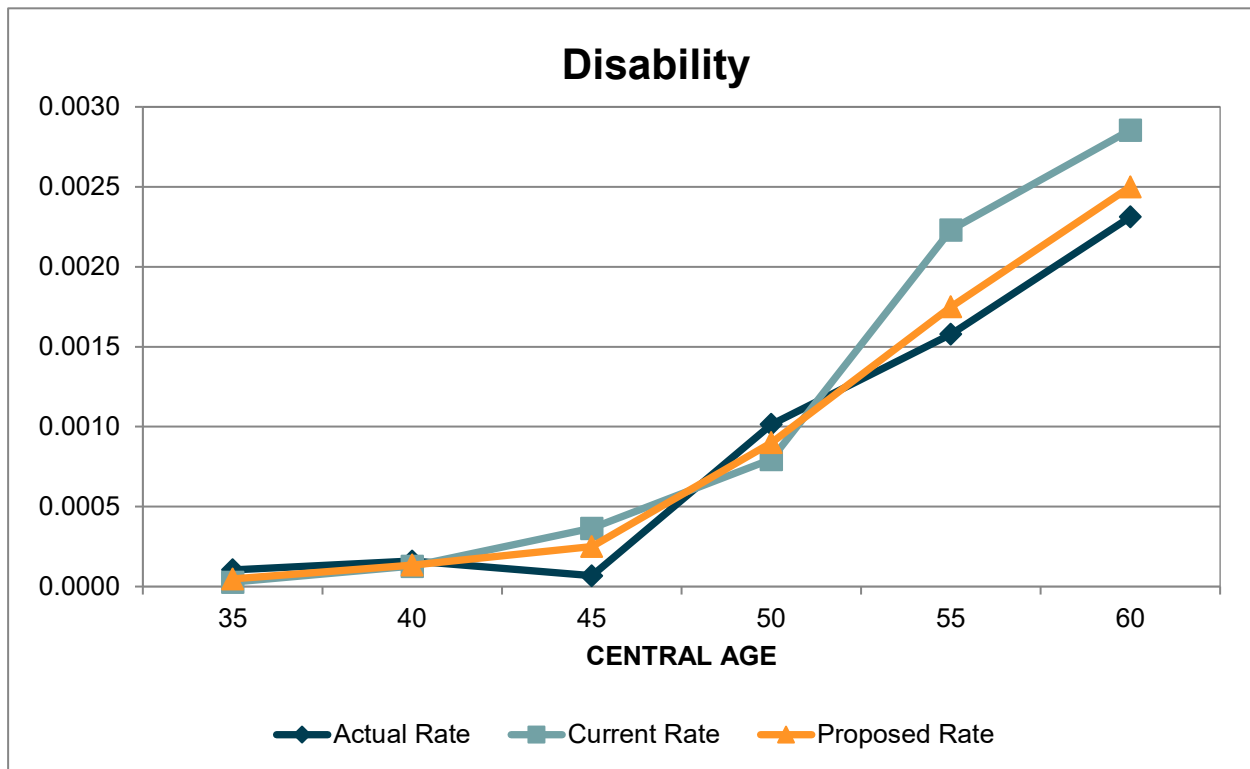


SECTION V – DEMOGRAPHIC ASSUMPTIONS

COMPARISON OF ACTUAL AND EXPECTED DISABILITY RETIREMENTS

CENTRAL AGE OF GROUP	NUMBER OF DISABILITY RETIREMENTS		
	Current Rates		
	Actual	Expected	Ratio of Actual to Expected
35	1	0.3	333.3%
40	2	1.6	125.0%
45	1	5.4	18.5%
50	21	16.5	127.3%
55	42	59.4	70.7%
60	72	88.9	81.0%
63 & OVER	13	26.0	50.0%
TOTAL	152	198.1	76.7%

The following graphs show a comparison of the current expected, actual, and proposed rates of disability retirement.





SECTION V – DEMOGRAPHIC ASSUMPTIONS

During the period under investigation, the actual rates of disability retirement were slightly less than expected in most age groups. We recommend the rates of disability retirement be revised to reflect the experience of the System. The following tables show a comparison between the present disability retirement rates and the proposed rates.

COMPARATIVE RATES OF DISABILITY RETIREMENTS

AGE	RATES OF DISABILITY	
	Current	Proposed
30	0.0000%	0.0000%
35	0.0018	0.0048
40	0.0110	0.0135
45	0.0330	0.0250
50	0.0770	0.0900
55	0.2250	0.1750
60	0.2500	0.2500

COMPARISON OF ACTUAL AND EXPECTED DISABILITY RETIREMENTS BASED ON PROPOSED RATES

CENTRAL AGE OF GROUP	NUMBER OF DISABILITY RETIREMENTS		
	Proposed Rates		
	Actual	Expected	Ratio of Actual to Expected
35	1	0.6	166.7%
40	2	1.8	113.6%
45	1	4.8	21.0%
50	21	19.5	107.5%
55	42	46.7	89.9%
60	72	69.4	103.7%
63 & OVER	13	14.8	87.8%
TOTAL	152	157.6	96.4%



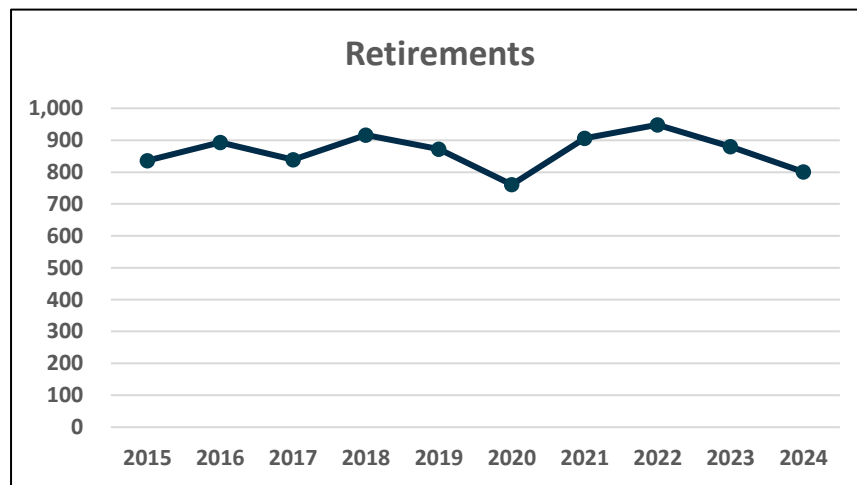


SECTION V – DEMOGRAPHIC ASSUMPTIONS

RATES OF RETIREMENT

The rates of retirement are used to determine the expected number of separations from active service due to election of retirement under the applicable retirement provisions. There are currently one set of rates for both males and females.

The graph below shows the number of retirements for the System over the last 10 years. During this time, the number of retirements have been relatively consistent. Over the most recent five years, there may have been some unusual patterns related to the COVID-19 pandemic with a drop in the number of retirements in 2020 followed by increases in the number of retirements in 2021 and 2022 and then an apparent trend of declining retirements in the most recent two years. It is unclear to what degree this may signal a change in the long-term expectation for retirement patterns.



The tables that follow on the next several pages present the actual to expected analysis of retirement experience. While the graph above looked at 10-year trends, the tables that follow and the remaining analysis focuses on the 5-year study period from July 1, 2019 through June 30, 2024. In this study, we have analyzed recent retirement experience on a salary-weighted basis where the exposures and retirements are weighted by annual member salary amounts.





SECTION V – DEMOGRAPHIC ASSUMPTIONS

COMPARISON OF ACTUAL AND EXPECTED RETIREMENTS

AGE	Salary Weighted Experience		
	Current Rates		
	Actual	Expected	Ratio of Actual to Expected
< 61	4,079,123	6,482,439.2	62.9%
61	4,159,008	6,322,836.8	65.8%
62	6,755,430	10,649,197.5	63.4%
63	4,225,274	7,812,429.3	54.1%
64	5,504,813	6,335,227.8	86.9%
65	8,021,092	9,754,758.0	82.2%
66	5,788,548	8,006,318.0	72.3%
67	4,548,700	5,602,217.5	81.2%
68	3,176,121	4,752,051.0	66.8%
69	3,214,874	4,401,347.7	73.0%
70	2,813,551	4,055,240.4	69.4%
71	2,152,121	3,470,693.2	62.0%
72	2,061,543	3,260,875.3	63.2%
73	1,993,358	2,975,817.5	67.0%
74	1,697,159	2,548,728.3	66.6%
75 & OVER	7,080,892	14,585,719.3	48.5%
TOTAL	67,271,607	101,015,896.8	66.6%

The overall analysis of the experience reflects that the current assumed rates of retirement generally anticipated more retirements at all ages than what actually happened in the last five years. Fewer retirements than expected typically create gains to the System, while more retirements than expected typically create losses, particularly for unreduced retirement at younger ages. Fewer retirements were noted in the last two years of the study, however.

Similar to withdrawals, since the recent retirement experience may represent a temporary anomaly rather than a long-term shift in retirement patterns, we want to be cautious not to overreact to the observed data. We do recommend slight decreases in the rates of retirements at most ages. These adjustments bring the A/E ratio closer to 100% but leave room for the possibility that in the next experience study we may see retirement rates revert back to pre-COVID patterns. If instead rates continue to follow the recent pattern, then we would likely recommend continuing to move the assumed rates in that direction.





SECTION V – DEMOGRAPHIC ASSUMPTIONS

The following graphs show a sample of comparisons of the current, actual, and proposed rates of retirements.





SECTION V – DEMOGRAPHIC ASSUMPTIONS

The following table shows a comparison of the current and proposed rates of service retirement.

COMPARATIVE RATES OF RETIREMENT

AGE	RATES OF RETIREMENT	
	Current	Proposed
60	12.0%	10.0%
61	12.0	10.0
62	21.0	16.0
63	17.0	12.5
64	15.0	15.0
65	26.0	24.0
66	26.0	22.0
67	22.0	20.0
68	22.0	20.0
69	23.5	20.0
70	25.0	20.0
71	25.0	20.0
72	25.0	20.0
73	25.0	20.0
74	25.0	20.0
75	25.0	20.0
76	25.0	20.0
77	25.0	20.0
78	25.0	20.0
79	25.0	20.0
80 & OVER	100.0	100.0





SECTION V – DEMOGRAPHIC ASSUMPTIONS

COMPARISON OF ACTUAL AND EXPECTED EARLY RETIREMENTS BASED ON PROPOSED RATES OF RETIREMENT

AGE	Salary Weighted Experience		
	Proposed Rates		
	Actual	Expected	Ratio of Actual to Expected
< 61	4,079,123	5,492,692.0	74.3%
61	4,159,008	5,278,494.6	78.8%
62	6,755,430	8,131,687.6	83.1%
63	4,225,274	5,748,731.6	73.5%
64	5,504,813	6,363,938.6	86.5%
65	8,021,092	9,059,847.6	88.5%
66	5,788,548	6,806,825.9	85.0%
67	4,548,700	5,103,763.3	89.1%
68	3,176,121	4,329,257.8	73.4%
69	3,214,874	3,750,239.2	85.7%
70	2,813,551	3,267,028.6	86.1%
71	2,152,121	2,791,913.1	77.1%
72	2,061,543	2,635,765.8	78.2%
73	1,993,358	2,393,252.8	83.3%
74	1,697,159	2,052,722.6	82.7%
75 & OVER	7,080,892	7,193,678.7	98.4%
TOTAL	67,271,607	80,399,839.8	83.7%





SECTION V – DEMOGRAPHIC ASSUMPTIONS

RATES OF MORTALITY

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

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

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

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

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





SECTION V – DEMOGRAPHIC ASSUMPTIONS

There are two, widely used ways to reflect future improvements in mortality:

- (1) Static table with “margin”
- (2) Generational mortality

The first approach of reflecting mortality improvements is through the use of a static mortality table with “margin.” Under this approach, the Actual to Expected Ratio is intentionally targeted to be over 100% so that mortality can improve without creating actuarial losses over the period prior to the next experience study. This was the approach used historically by many retirement systems. In this manner, it could be expected that as mortality improves, each successive experience study will require mortality assumption changes which will have an increase to the measured liabilities.

Another approach, referred to as generational mortality, directly anticipates future improvements in mortality by using a different set of mortality rates based on each year of birth, with the rates for later years of birth assuming lower mortality than the rates for earlier years of birth. The varying mortality rates by year of birth create a series of tables that contain “built-in” mortality improvements, e.g., a member who turns age 65 in 2045 has a longer life expectancy than a member who turns age 65 in 2025. When using generational mortality, the Actual to Expected Ratios for the observed experience are set near 100% as future mortality improvements will be considered directly in the actuarial valuation process. The generational approach is the current approach used by the System and is the preferred method for recognizing future mortality improvements in the valuation process because it is more direct and results in longer life expectancy for members who are younger, consistent with established trends in improved longevity. In this manner, with future mortality improvements already considered, the adjustments to the mortality assumptions in each experience study will be expected to be minor and not significantly impact the measured liabilities.

Finally, it is common in demographic studies to weight the exposures and decrements by an approximation of the associated liability. In this study, we have analyzed recent experience on a benefit-weighted basis where the exposures and deaths are multiplied by the monthly retirement benefit amount. Because a valuation is designed to measure the amount and timing of future benefit payments (liability) rather than simply the number of retirees leaving pay status, this benefit-weighted approach is an important factor in valuing plan obligations. Most modern mortality tables used by actuaries are developed on a weighted basis. This also helps to reflect any differences that arise from better mortality experience among those with larger benefits.





SECTION V – DEMOGRAPHIC ASSUMPTIONS

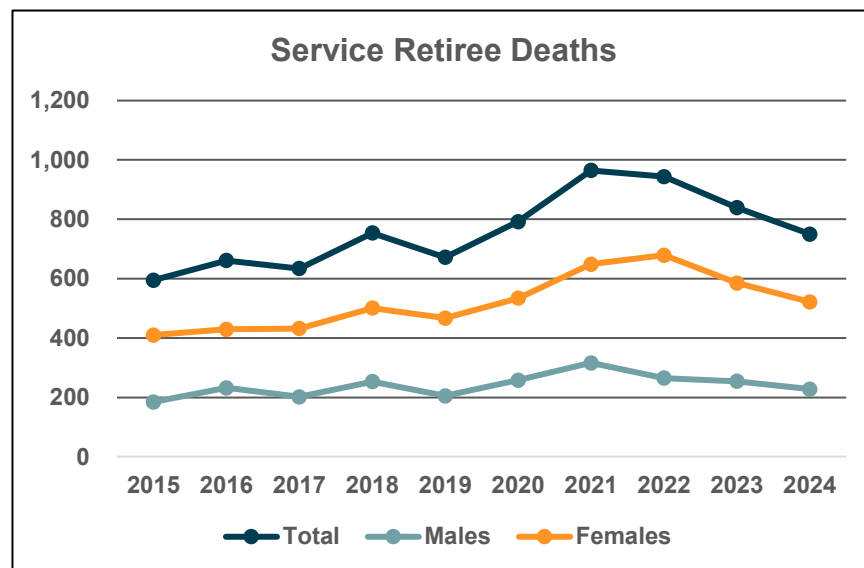
Mortality –Service Retirees

The current basis for rates for service retirees is the Pub-2010 General Below-Median Healthy Annuitant table projected generationally with MP-2019 with further adjustments as follows:

Service Retirees (Current Table)

Participant Type	Membership Table	Set Forward (+)/ Setback (-)	Adjustment to Rates
Service Retirees	General Healthy Below-Median Annuitant	Male: +2; Female: +2	Male: 101%; Female: 103%

The graph below shows the number of service retiree deaths for the System over the last 10 years in total as well as by gender. Over that span, the number of deaths each year has steadily increased from around 600 in 2015 to around 750 in 2024. Much of this increase can be attributed to the increase in the number of retired members in the System over that time and that this population continues to age as a group. There appears to be a clear spike in the number of deaths during the period 2021-2022 which are some of the years generally considered most affected by the COVID-19 pandemic. The number of deaths in 2023 and 2024 seem to have come back down from the highs in 2021 and 2022 but it remains unclear how much the pandemic continues to have an impact on mortality rates.



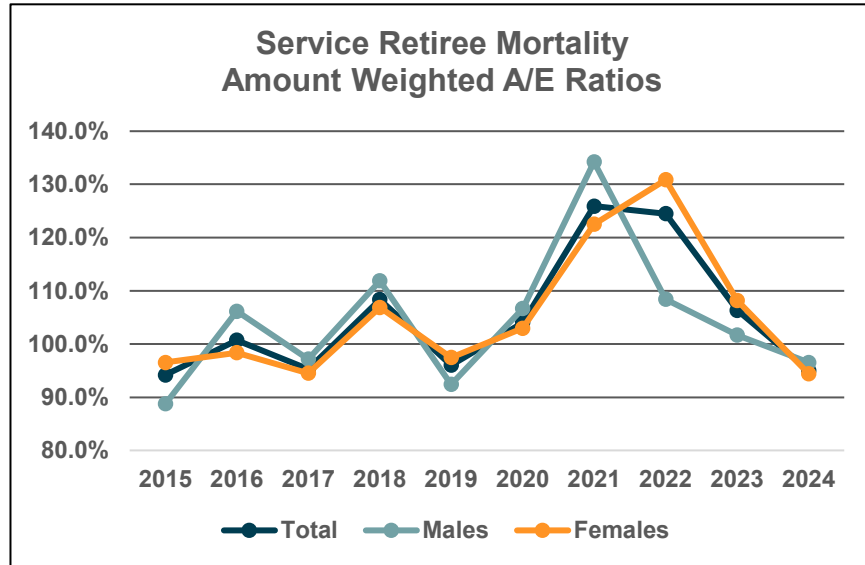
When comparing the weighted Actual to Expected (A/E) ratios over the last 10 years (as shown in the figure on the next page), actual deaths have generally been approximately 100% of expected deaths according to the current mortality assumptions used in the valuation. There was a notable increase in 2021 for both males and females with higher ratios for females in 2022 as well. This provides support for the idea that there were some excess deaths during these years due to the pandemic. The A/E ratios in 2023 and 2024, however, seem to be indicating that mortality rates are trending back down closer to 100%. Normally, we would perform our analysis for mortality based on just the most recent 5 years of data but, since several of





SECTION V – DEMOGRAPHIC ASSUMPTIONS

these years show anomalous patterns, we have instead excluded the experience for years 2020-2022 and included the experience for the previous 5 years (2015-2019) along with 2023 and 2024 to ensure an adequate amount of data.



The tables below and on the next page present the actual to expected analysis of mortality experience for the combined period from July 1, 2015 through June 30, 2019 and the period from July 1, 2022 through June 30, 2024.

Service Retirees Mortality Experience (2015-2019 and 2023-2024)						
Males						
Central Age	Exposures	Actual Deaths	Expected Deaths under Current Assumptions	Count Based A/E Ratio	Weighted A/E Ratio	
62 & Under	534	7	6.7	104.5%	127.7%	
65	3,892	73	62.5	116.8%	123.4%	
70	6,451	161	157.5	102.2%	103.3%	
75	6,833	263	275.5	95.5%	101.9%	
80	5,400	336	374.2	89.8%	92.7%	
85	3,295	379	380.6	99.6%	102.9%	
90	1,361	234	241.3	97.0%	91.5%	
93 & Over	387	106	101.1	104.8%	103.2%	
Total	28,153	1,559	1,599.4	97.5%	99.2%	





SECTION V – DEMOGRAPHIC ASSUMPTIONS

Service Retirees Mortality Experience (2015-2019 and 2023-2024) Females						
Central Age	Exposures	Actual Deaths	Expected Deaths under Current Assumptions	Count Based A/E Ratio	Weighted A/E Ratio	
62 & Under	2,109	14	13.6	102.9%	97.3%	
65	13,572	141	118.1	119.4%	119.9%	
70	20,053	325	286.6	113.4%	114.9%	
75	18,866	532	475.7	111.8%	111.9%	
80	14,381	671	655.4	102.4%	104.9%	
85	8,920	708	741.3	95.5%	94.8%	
90	4,333	568	619.9	91.6%	91.1%	
93 & Over	1,728	387	404.6	95.7%	92.4%	
Total	83,962	3,346	3,315.2	100.9%	99.6%	

Overall, the current assumed mortality rates performed quite well over the study period as the weighted A/E ratios are very close to 100% both in total and for many age sub-groups. This is perhaps not too surprising since the bulk of the data is what was used to select the current assumptions. However, even if we were to look at the period 2023-2024 in isolation, the weighted A/E ratios are still very close to 100% even if there is greater volatility due to the smaller size of the data.

Service Retirees Mortality Experience (2023-2024) Males						
Central Age	Exposures	Actual Deaths	Expected Deaths under Current Assumptions	Count Based A/E Ratio	Weighted A/E Ratio	
62 & Under	124	1	1.6	62.5%	150.4%	
65	1,170	23	18.9	121.7%	138.1%	
70	1,856	45	44.3	101.6%	102.1%	
75	2,259	84	88.6	94.8%	101.5%	
80	1,760	92	118.1	77.9%	84.1%	
85	1,029	121	116.4	104.0%	111.8%	
90	473	76	82.0	92.7%	84.6%	
93 & Over	151	40	38.9	102.8%	107.6%	
Total	8,822	482	508.8	94.7%	99.1%	





SECTION V – DEMOGRAPHIC ASSUMPTIONS

Service Retirees Mortality Experience (2023-2024) Females					
Central Age	Exposures	Actual Deaths	Expected Deaths under Current Assumptions	Count Based A/E Ratio	Weighted A/E Ratio
62 & Under	556	2	3.6	55.6%	47.1%
65	3,867	40	33.4	119.8%	107.6%
70	5,978	99	82.6	119.9%	114.6%
75	6,236	189	152.3	124.1%	120.3%
80	4,719	230	210.8	109.1%	114.6%
85	3,012	234	245.9	95.2%	93.2%
90	1,441	186	202.0	92.1%	89.5%
93 & Over	557	127	129.8	97.8%	93.2%
Total	26,366	1,107	1,060.4	104.4%	101.2%

Given the experience and the uncertainties of how recent trends in mortality may impact longer term trends in the future, it perhaps would be reasonable to continue using the current mortality assumptions until more data is collected. However, in May of 2025, the SOA released updated mortality tables called the Pub-2016 tables. Like the Pub-2010 tables, these mortality rates were developed exclusively from public sector retirement system data and include specific tables for different employee types. We also note that, since the last experience study, there have been additional mortality improvement scales released by the SOA. The most recent of these is MP-2021. After analyzing the study data, we have concluded that the Pub-2016 General table in conjunction with the MP-2021 scale provides as good, if not better, fit to mortality patterns than the current mortality assumption tables.

Therefore, we recommend that the rates of service retiree mortality be revised to the Pub-2016 General Retiree Below-Median Table projected generationally with MP-2021 with further adjustments as follows:

Service Retirees (Proposed Table)

Participant Type	Membership Table	Set Forward (+)/ Setback (-)	Adjustment to Rates
Service Retirees	General Retiree Below-Median	Male: +1; Female: +1	Male: 107%; Female: 108%

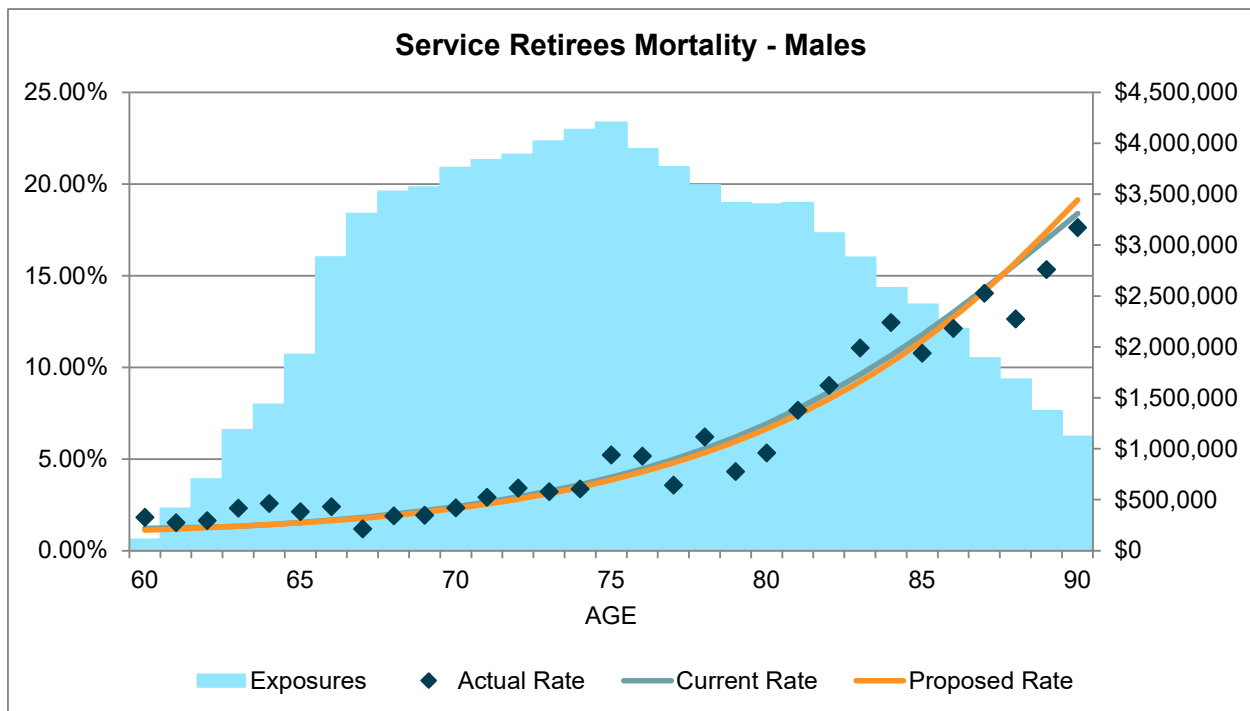




SECTION V – DEMOGRAPHIC ASSUMPTIONS

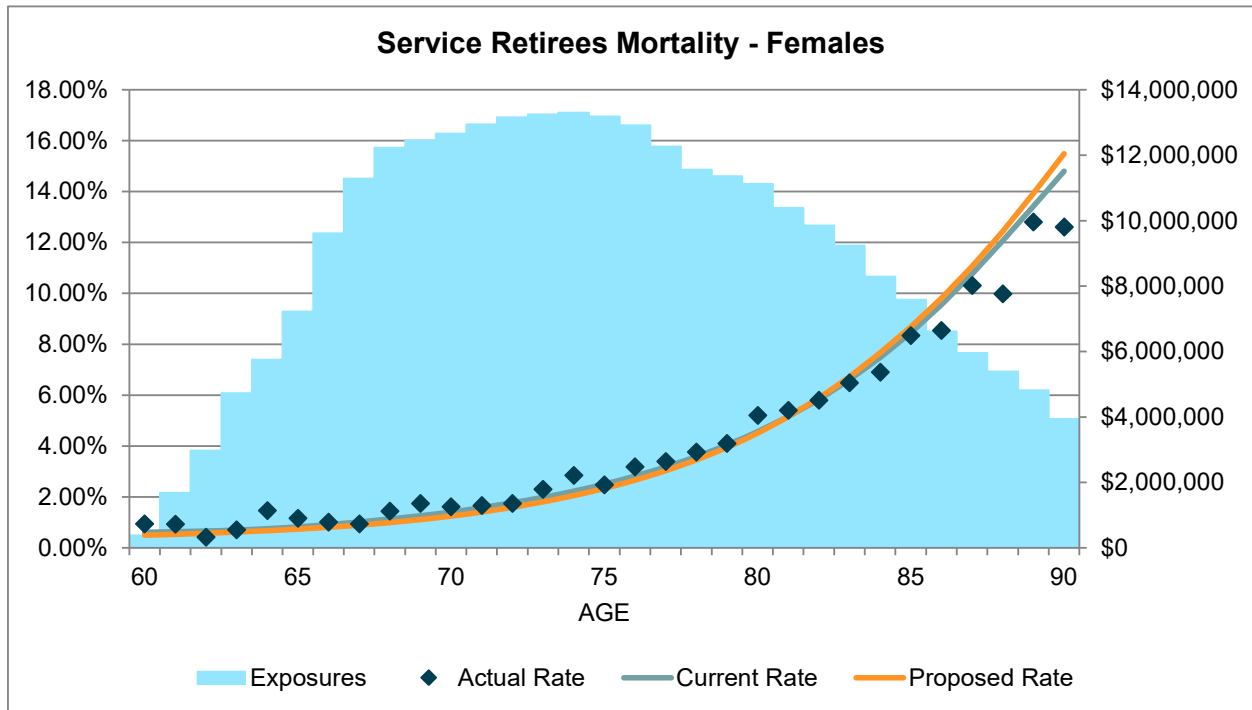
The following graphs show a comparison of the current, actual and proposed rates of service retiree mortality. The right axis of the charts below represents the number of exposed benefit amounts (light blue shaded portion of graph). The exposed benefit amounts are a proxy for the liability subject to mortality rates based upon the benefit recipient's age during the experience period. When recommending assumption 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 shows, for the adjusted study period (2015-2019 and 2023-2024), (i) the actual rates of mortality for service retirees by age, (ii) the current assumed rates of mortality and (iii) the proposed rates of mortality.





SECTION V – DEMOGRAPHIC ASSUMPTIONS



The resulting A/E ratios for the seven studied years are shown in the following tables.

Service Retirees Mortality Experience (2015-2019 and 2023-2024)					
Males					
Central Age	Actual Deaths	Expected Deaths under Proposed Assumptions	Weighted A/E Ratio under Current Assumptions	Weighted A/E Ratio under Proposed Assumptions	
62 & Under	7	6.5	127.7%	133.6%	
65	73	61.4	123.4%	125.8%	
70	161	151.7	103.3%	107.1%	
75	263	267.3	101.9%	105.1%	
80	336	361.5	92.7%	96.0%	
85	379	371.9	102.9%	105.3%	
90	234	250.3	91.5%	88.2%	
93 & Over	106	110.9	103.2%	94.1%	
Total	1,559	1,581.5	99.2%	99.7%	





SECTION V – DEMOGRAPHIC ASSUMPTIONS

Service Retirees Mortality Experience (2015-2019 and 2023-2024) Females				
Central Age	Actual Deaths	Expected Deaths under Proposed Assumptions	Weighted A/E Ratio under Current Assumptions	Weighted A/E Ratio under Proposed Assumptions
62 & Under	14	11.5	97.3%	115.1%
65	141	103.8	119.9%	136.3%
70	325	258.4	114.9%	127.4%
75	532	447.6	111.9%	118.9%
80	671	649.8	104.9%	105.8%
85	708	760.2	94.8%	92.5%
90	568	646.5	91.1%	87.3%
93 & Over	387	418.4	92.4%	89.4%
Total	3,346	3,296.2	99.6%	99.4%





SECTION V – DEMOGRAPHIC ASSUMPTIONS

Mortality – Beneficiaries

The current basis for rates for beneficiaries is the Pub-2010 General Below-Median Contingent Survivors table projected generationally with MP-2019 with further adjustments as follows:

Beneficiaries (Current Table)

Participant Type	Membership Table	Set Forward (+)/ Setback (-)	Adjustment to Rates
Beneficiaries	General Below-Median Contingent Survivors	Male: +2; Female: +2	Male: 104%; Female: 99%

The tables below and on the next page present the actual to expected analysis of mortality experience for the combined period from July 1, 2015 through June 30, 2019 and the period from July 1, 2022 through June 30, 2024.

Beneficiaries Mortality Experience (2015-2019 and 2023-2024)						
Males						
Central Age	Exposures	Actual Deaths	Expected Deaths under Current Assumptions	Count Based A/E Ratio	Weighted A/E Ratio	
57 & Under	763	7	5.2	134.6%	153.7%	
60	215	1	3.2	31.3%	16.6%	
65	264	7	5.2	134.6%	114.1%	
70	282	11	8.2	134.1%	153.0%	
75	307	18	13.3	135.3%	122.0%	
80	218	15	15.1	99.3%	83.9%	
85	126	25	13.8	181.2%	191.6%	
88 & Over	58	15	12.7	118.1%	126.5%	
Total	2,233	99	76.7	129.1%	128.9%	





SECTION V – DEMOGRAPHIC ASSUMPTIONS

Beneficiaries Mortality Experience (2015-2019 and 2023-2024) Females						
Central Age	Exposures	Actual Deaths	Expected Deaths under Current Assumptions	Count Based A/E Ratio	Weighted A/E Ratio	
57 & Under	1,303	9	6.7	134.3%	110.9%	
60	495	6	5.2	115.4%	105.2%	
65	588	9	7.9	113.9%	107.9%	
70	756	18	14.6	123.3%	112.6%	
75	765	24	23.1	103.9%	103.2%	
80	677	38	33.4	113.8%	124.0%	
85	527	47	44.2	106.3%	111.9%	
88 & Over	480	69	86.0	80.2%	88.3%	
Total	5,591	220	221.1	99.5%	102.7%	

We recommend that the rates of beneficiary mortality be revised to the Pub-2016 Contingent Survivor Below-Median Table projected generationally with MP-2021 with further adjustments as follows:

Beneficiaries (Proposed Table)

Participant Type	Membership Table	Set Forward (+)/ Setback (-)	Adjustment to Rates
Beneficiaries	Contingent Survivor Below-Median	Male: +3; Female: +2	Male: 109%; Female: 103%

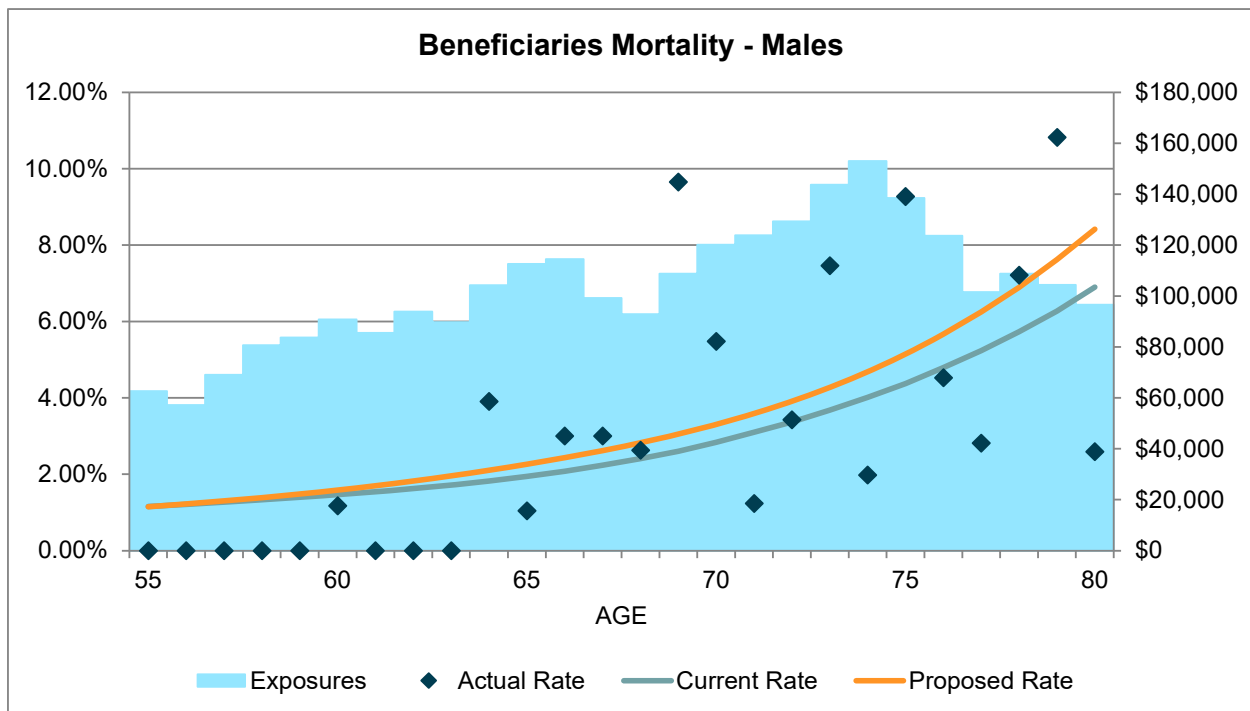




SECTION V – DEMOGRAPHIC ASSUMPTIONS

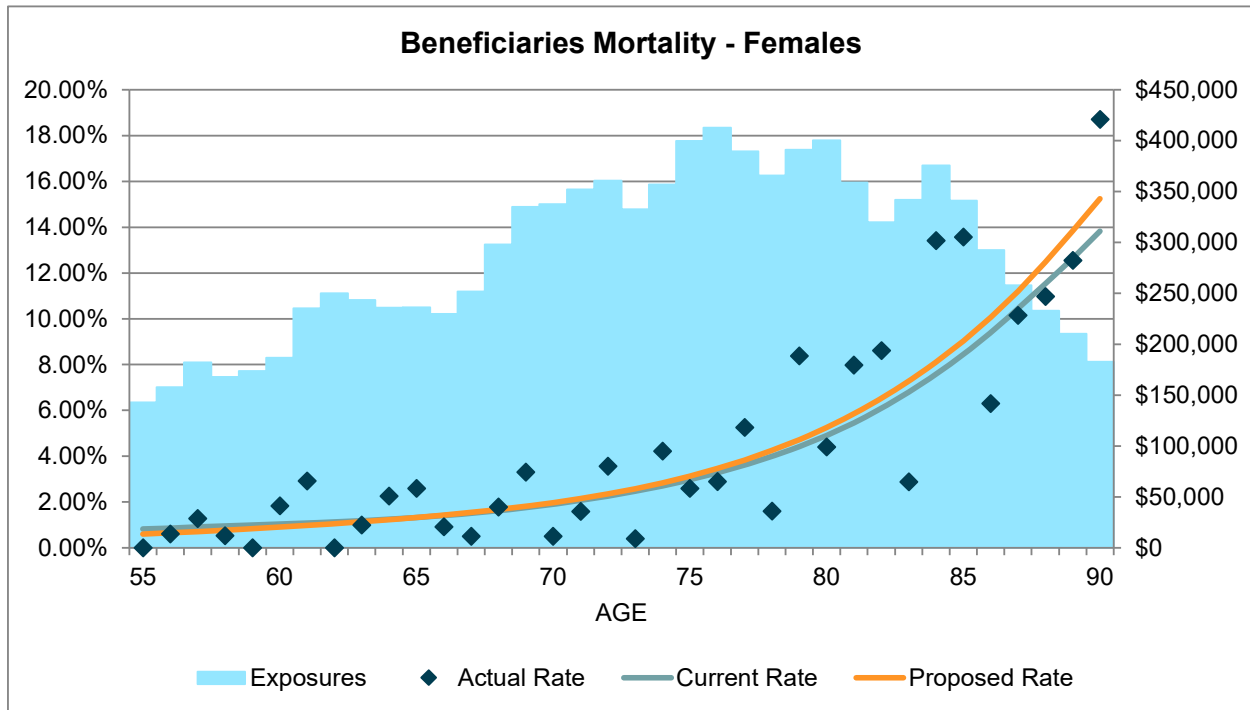
The following graphs show a comparison of the current, actual and proposed rates of beneficiary mortality. The right axis of the charts below represents the number of exposed benefit amounts (light blue shaded portion of graph). The exposed benefit amounts are a proxy for the liability subject to mortality rates based upon the benefit recipient's age during the experience period. When recommending assumption 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 shows, for the adjusted study period (2015-2019 and 2023-2024), (i) the actual rates of mortality for beneficiaries by age, (ii) the current assumed rates of mortality and (iii) the proposed rates of mortality.





SECTION V – DEMOGRAPHIC ASSUMPTIONS



The resulting A/E ratios for the seven studied years are shown in the following tables.

Beneficiaries Mortality Experience (2015-2019 and 2023-2024)					
Males					
Central Age	Actual Deaths	Expected Deaths under Proposed Assumptions	Weighted A/E Ratio under Current Assumptions	Weighted A/E Ratio under Proposed Assumptions	
57 & Under	7	5.2	153.7%	155.4%	
60	1	3.4	16.6%	15.4%	
65	7	6.0	114.1%	98.9%	
70	11	9.5	153.0%	131.1%	
75	18	15.8	122.0%	103.0%	
80	15	18.5	83.9%	68.4%	
85	25	17.8	191.6%	148.8%	
88 & Over	15	16.1	126.5%	99.1%	
Total	99	92.3	128.9%	106.2%	





SECTION V – DEMOGRAPHIC ASSUMPTIONS

Beneficiaries Mortality Experience (2015-2019 and 2023-2024) Females				
Central Age	Actual Deaths	Expected Deaths under Proposed Assumptions	Weighted A/E Ratio under Current Assumptions	Weighted A/E Ratio under Proposed Assumptions
57 & Under	9	5.0	110.9%	150.2%
60	6	4.5	105.2%	121.0%
65	9	7.9	107.9%	108.2%
70	18	15.2	112.6%	107.6%
75	24	24.4	103.2%	97.4%
80	38	35.7	124.0%	115.8%
85	47	47.4	111.9%	104.4%
88 & Over	69	94.0	88.3%	80.6%
Total	220	234.1	102.7%	96.2%





SECTION V – DEMOGRAPHIC ASSUMPTIONS

Mortality – Disabled Retirees

The current basis for rates for disabled retirees is the Pub-2010 General Disabled table projected generationally with MP-2019 with further adjustments as follows:

Disabled Retirees (Current Table)

Participant Type	Membership Table	Set Forward (+)/ Setback (-)	Adjustment to Rates
Disabled Retirees	General Disabled	Male: -3; Female: 0	Male: 103%; Female: 106%

The tables below and on the next page present the actual to expected analysis of mortality experience for the combined period from July 1, 2015 through June 30, 2019 and the period from July 1, 2022 through June 30, 2024.

Disabled Retirees Mortality Experience (2015-2019 and 2023-2024)						
Males						
Central Age	Exposures	Actual Deaths	Expected Deaths under Current Assumptions	Count Based A/E Ratio	Weighted A/E Ratio	
52 & Under	53	1	0.6	166.7%	112.4%	
55	174	12	3.2	375.0%	385.5%	
60	348	16	8.3	192.8%	174.8%	
65	386	21	11.0	190.9%	200.8%	
70	254	11	8.5	129.4%	125.5%	
75	204	24	8.5	282.4%	298.2%	
80	117	14	6.5	215.4%	209.4%	
83 & Over	55	12	5.3	226.4%	236.8%	
Total	1,591	111	51.9	213.9%	218.0%	





SECTION V – DEMOGRAPHIC ASSUMPTIONS

Disabled Retirees Mortality Experience (2015-2019 and 2023-2024) Females						
Central Age	Exposures	Actual Deaths	Expected Deaths under Current Assumptions	Count Based A/E Ratio	Weighted A/E Ratio	
52 & Under	106	5	1.6	312.5%	312.5%	
55	368	9	7.1	126.8%	114.0%	
60	867	23	18.7	123.0%	119.9%	
65	1,191	45	27.6	163.0%	163.2%	
70	1,098	49	31.1	157.6%	151.7%	
75	1,029	60	40.6	147.8%	152.3%	
80	668	49	40.0	122.5%	117.1%	
83 & Over	401	56	43.4	129.0%	127.7%	
Total	5,728	296	210.1	140.9%	137.6%	

We recommend that the rates of disabled retiree mortality be revised to the Pub-2016 Non-Safety Disabled Retiree Table projected generationally with MP-2021 with further adjustments as follows:

Disabled Retirees (Proposed Table)

Participant Type	Membership Table	Set Forward (+)/ Setback (-)	Adjustment to Rates
Disabled Retirees	Non-Safety Disabled Retiree	Male: +4; Female: +4	Male: 100%; Female: 100%

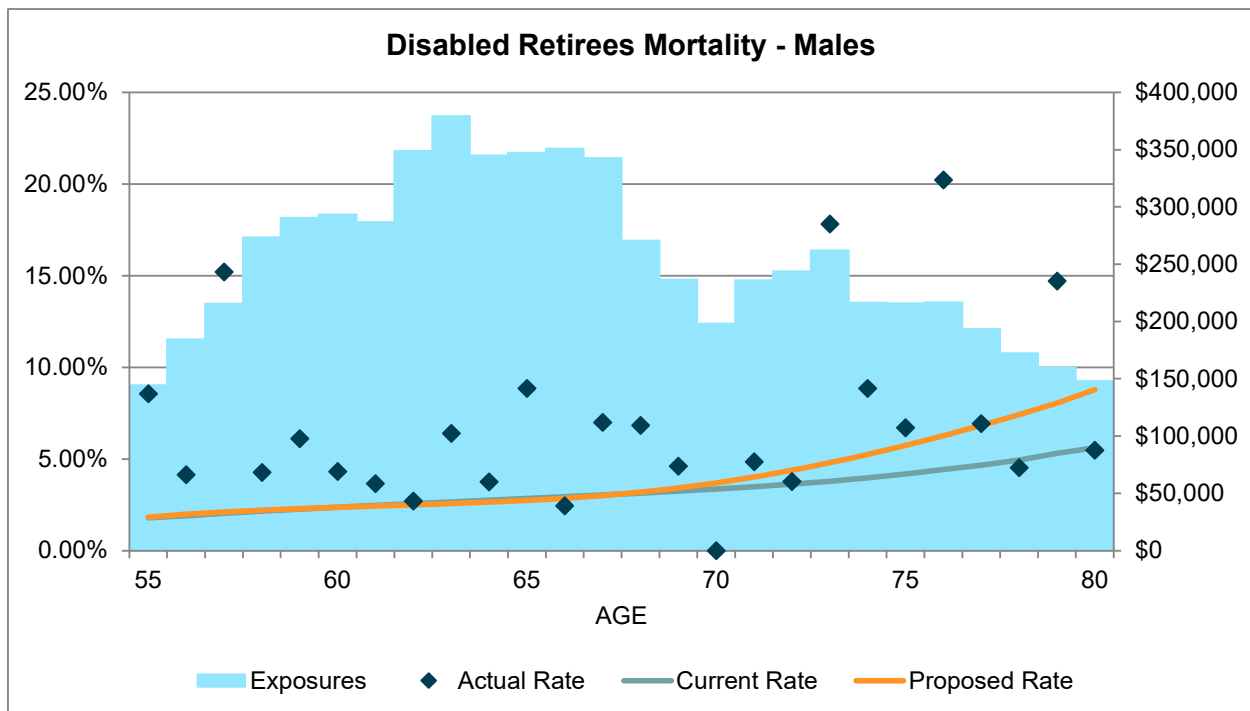




SECTION V – DEMOGRAPHIC ASSUMPTIONS

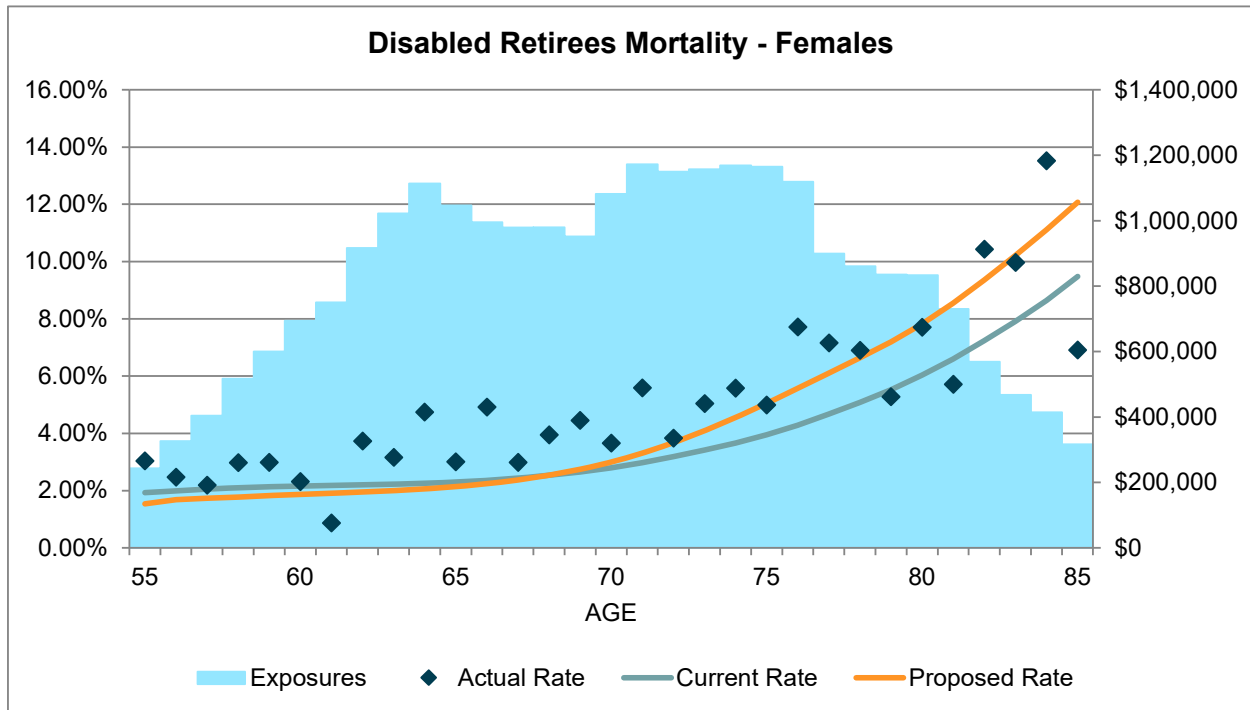
The following graphs show a comparison of the current, actual and proposed rates of disabled retiree mortality. The right axis of the charts below represents the number of exposed benefit amounts (light blue shaded portion of graph). The exposed benefit amounts are a proxy for the liability subject to mortality rates based upon the benefit recipient's age during the experience period. When recommending assumption 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 shows, for the adjusted study period (2015-2019 and 2023-2024), (i) the actual rates of mortality for disabled retirees by age, (ii) the current assumed rates of mortality and (iii) the proposed rates of mortality.





SECTION V – DEMOGRAPHIC ASSUMPTIONS



The resulting A/E ratios for the seven studied years are shown in the following tables.

Disabled Retirees Mortality Experience (2015-2019 and 2023-2024)					
Males					
Central Age	Actual Deaths	Expected Deaths under Proposed Assumptions	Weighted A/E Ratio under Current Assumptions	Weighted A/E Ratio under Proposed Assumptions	
52 & Under	1	0.6	112.4%	111.5%	
55	12	3.3	385.5%	374.5%	
60	16	8.2	174.8%	177.3%	
65	21	10.5	200.8%	208.1%	
70	11	9.5	125.5%	112.5%	
75	24	11.8	298.2%	214.8%	
80	14	10.2	209.4%	134.1%	
83 & Over	12	9.4	236.8%	131.8%	
Total	111	63.5	218.0%	172.2%	





SECTION V – DEMOGRAPHIC ASSUMPTIONS

Disabled Retirees Mortality Experience (2015-2019 and 2023-2024) Females				
Central Age	Actual Deaths	Expected Deaths under Proposed Assumptions	Weighted A/E Ratio under Current Assumptions	Weighted A/E Ratio under Proposed Assumptions
52 & Under	5	1.1	312.5%	454.4%
55	9	5.8	114.0%	140.1%
60	23	16.0	119.9%	139.9%
65	45	25.7	163.2%	175.1%
70	49	34.3	151.7%	137.3%
75	60	52.3	152.3%	118.3%
80	49	52.2	117.1%	89.9%
83 & Over	56	55.7	127.7%	99.5%
Total	296	243.1	137.6%	116.5%





SECTION V – DEMOGRAPHIC ASSUMPTIONS

Mortality – Active Employees

The current basis for rates for active employees is the Pub-2010 General Below-Median Employee table projected generationally with MP-2019 with no adjustments:

Active Employees (Current Table)

Participant Type	Membership Table	Set Forward (+)/ Setback (-)	Adjustment to Rates
Active Employees	General Below-Median Employee	Male: 0; Female: 0	Male: 100%; Female: 100%

The potential COVID impacts seemed to only noticeably affect the experience for 2021 and 2022. Since active mortality already represents a relatively smaller number of deaths compared to the retiree experience, we decided to only exclude the active mortality experience for 2021 and 2022.

The tables below and on the next page present the actual to expected analysis of mortality experience for eight of the last ten years, fiscal years ending 2015 through 2020, and 2023 through 2024.

Active Employees Mortality Experience (2015-2020 and 2023-2024)						
Males						
Central Age	Exposures	Actual Deaths	Expected Deaths under Current Assumptions	Count Based A/E Ratio	Weighted A/E Ratio	
47 & Under	22,366	17	22.5	75.6%	54.2%	
50	9,538	23	20.0	115.0%	96.0%	
55	12,816	32	41.0	78.0%	80.5%	
60	15,056	51	72.6	70.2%	64.0%	
65	12,677	50	86.2	58.0%	55.7%	
70	8,178	43	78.0	55.1%	46.9%	
75	3,615	28	52.1	53.7%	53.4%	
78 & Over	1,348	19	27.7	68.6%	68.2%	
Total	85,594	263	400.1	65.7%	61.1%	





SECTION V – DEMOGRAPHIC ASSUMPTIONS

Active Employees Mortality Experience (2015-2020 and 2023-2024) Females						
Central Age	Exposures	Actual Deaths	Expected Deaths under Current Assumptions	Count Based A/E Ratio	Weighted A/E Ratio	
47 & Under	60,265	29	30.4	95.4%	104.7%	
50	28,976	25	30.6	81.7%	76.2%	
55	34,809	54	57.5	93.9%	80.1%	
60	33,756	66	83.5	79.0%	73.9%	
65	19,539	58	70.4	82.4%	77.4%	
70	8,706	20	49.1	40.7%	34.7%	
75	3,376	16	31.2	51.3%	52.7%	
78 & Over	987	12	13.4	89.6%	109.7%	
Total	190,414	280	366.1	76.5%	72.3%	

We recommend that the rates of active employee mortality be revised to the Pub-2016 General Below-Median Employee Table projected generationally with MP-2021 with further adjustments as follows:

Active Employees (Proposed Table)

Participant Type	Membership Table	Set Forward (+)/ Setback (-)	Adjustment to Rates
Active Employees	General Below-Median Employee	Male: -3; Female: -3	Male: 80%; Female: 90%

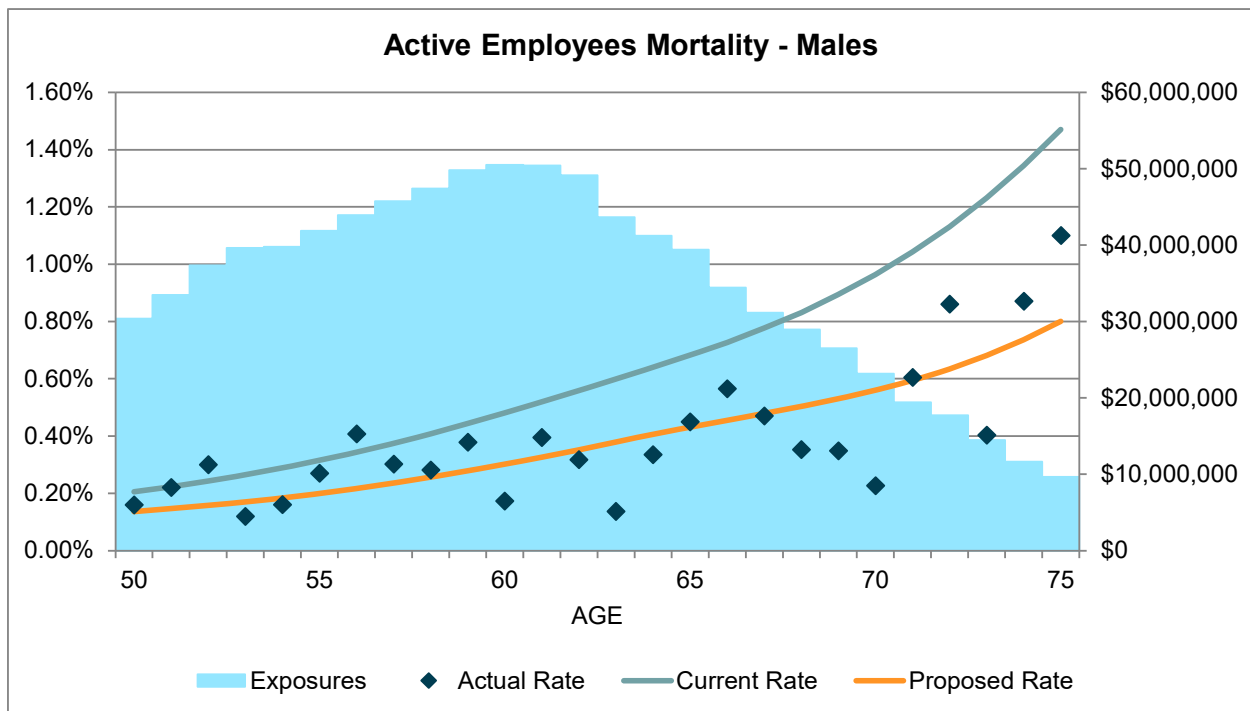




SECTION V – DEMOGRAPHIC ASSUMPTIONS

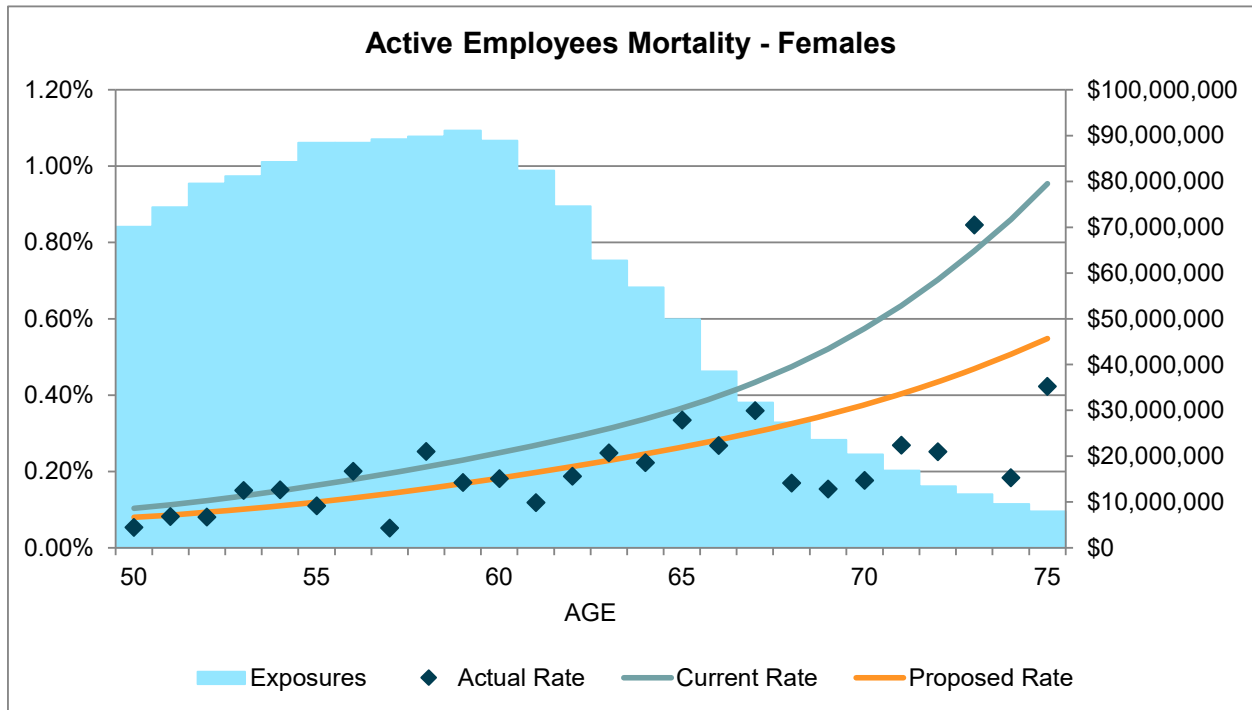
The following graphs show a comparison of the current, actual and proposed rates of active employee mortality. The right axis of the charts below represents the number of exposed benefit amounts (light blue shaded portion of graph). The exposed benefit amounts are a proxy for the liability subject to mortality rates based upon the benefit recipient's age during the experience period. When recommending assumption 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 shows, for the adjusted study period (2015-2020 and 2023-2024), (i) the actual rates of mortality for disabled retirees by age, (ii) the current assumed rates of mortality and (iii) the proposed rates of mortality.





SECTION V – DEMOGRAPHIC ASSUMPTIONS



The resulting A/E ratios for the eight studied years are shown in the following tables.

Active Employees Mortality Experience (2015-2020 and 2023-2024)					
Males					
Central Age	Actual Deaths	Expected Deaths under Proposed Assumptions	Weighted A/E Ratio under Current Assumptions	Weighted A/E Ratio under Proposed Assumptions	
47 & Under	17	14.6	54.2%	83.2%	
50	23	13.4	96.0%	144.0%	
55	32	26.1	80.5%	126.6%	
60	51	45.4	64.0%	102.7%	
65	50	53.8	55.7%	89.2%	
70	43	45.7	46.9%	80.1%	
75	28	28.6	53.4%	97.4%	
78 & Over	19	12.8	68.2%	144.6%	
Total	263	240.4	61.1%	101.0%	





SECTION V – DEMOGRAPHIC ASSUMPTIONS

Active Employees Mortality Experience (2015-2020 and 2023-2024) Females				
Central Age	Actual Deaths	Expected Deaths under Proposed Assumptions	Weighted A/E Ratio under Current Assumptions	Weighted A/E Ratio under Proposed Assumptions
47 & Under	29	24.4	104.7%	131.0%
50	25	23.9	76.2%	97.9%
55	54	42.1	80.1%	109.6%
60	66	60.7	73.9%	101.8%
65	58	50.7	77.4%	107.6%
70	20	32.4	34.7%	52.6%
75	16	18.1	52.7%	91.1%
78 & Over	12	6.4	109.7%	225.2%
Total	280	258.7	72.3%	102.1%

Mortality –Summary

The table below summarizes all of the recommendations for mortality assumptions. All tables are from the Pub-2016 family of mortality tables and are projected generationally with MP-2021 with further adjustments as follows:

Participant Type	Membership Table	Set Forward (+)/ Setback (-)	Adjustment to Rates
Service Retirees	General Retiree Below-Median	Male: +1; Female: +1	Male: 107%; Female: 108%
Disabled Retirees	Non-Safety Disabled Retiree	Male: +4; Female: +4	Male: 100%; Female: 100%
Beneficiaries	Contingent Survivor Below-Median	Male: +3; Female: +2	Male: 109%; Female: 103%
Active Employees	General Below-Median Employee	Male: -3; Female: -3	Male: 80%; Female: 90%





SECTION VI – OTHER ASSUMPTIONS AND METHODS

ADMINISTRATIVE EXPENSES: This assumption is currently \$1,400,000 (included in normal contribution). The actual administrative expenses over the experience study period have increased each year approaching \$2,000,000 in the most recent year. **We recommend changing this assumption \$2,000,000.**

OPTION FACTORS: The option factors currently used by the Retirement System are based on the mortality tables and investment rate of return (discount rate) used in the valuation. **We recommend that the factors be revised to be based on the mortality tables recommended for the valuation.**

VESTED TERMINATION BENEFIT ELECTION: Currently, it is assumed that 75% of active members who terminate with 10 or more years of service before retirement will receive a benefit beginning at age 65 and 25% will receive a refund of member contributions. We continue to see a pattern where more such inactive members are leaving their contributions in the System instead of taking it out as a refund. **Therefore, we recommend a change in this assumption to 80% of active members who terminate with ten or more years of service before retirement will receive a benefit beginning at age 65 and 20% will elect to receive a refund of member contributions.**





APPENDIX A – HISTORICAL JUNE CPI (U) INDEX

Fiscal Year Ending 6/30	CPI (U)	Fiscal Year Ending 6/30	CPI (U)
1964	31.0	1995	152.5
1965	31.6	1996	156.7
1966	32.4	1997	160.3
1967	33.3	1998	163.0
1968	34.7	1999	166.2
1969	36.6	2000	172.4
1970	38.8	2001	178.0
1971	40.6	2002	179.9
1972	41.7	2003	183.7
1973	44.2	2004	189.7
1974	49.0	2005	194.5
1975	53.6	2006	202.9
1976	56.8	2007	208.352
1977	60.7	2008	218.815
1978	65.2	2009	215.693
1979	72.3	2010	217.965
1980	82.7	2011	225.722
1981	90.6	2012	229.478
1982	97.0	2013	233.504
1983	99.5	2014	238.343
1984	103.7	2015	238.638
1985	107.6	2016	241.018
1986	109.5	2017	244.955
1987	113.5	2018	251.989
1988	118.0	2019	256.143
1989	124.1	2020	257.797
1990	129.9	2021	271.696
1991	136.0	2022	296.311
1992	140.2	2023	305.109
1993	144.4	2024	314.175
1994	148.0		





APPENDIX B – CAPITAL MARKET ASSUMPTIONS AND ASSET ALLOCATION

Capital Market Assumptions and Asset Allocation As Provided by the System

Arithmetic Rates of Return and Standard Deviations by Asset Class

Asset Class	Expected Rate of Return*	Standard Deviation
Fixed Income	5.0%	9.0%
US Large Stocks	12.3%	19.7%
US Small Stocks	16.0%	30.9%
Int'l Developed Mkt Stocks	12.3%	21.5%
Int'l Emerging Mkt Stocks	14.3%	29.1%
Alternatives	14.4%	21.9%

*Includes 3.00% assumed inflation

Asset Class Correlation Coefficients

Asset Class	Fixed Income	US Large Stocks	US Small Stocks	Int'l Dev Mkt Stocks	Int'l EM Mkt Stocks	Alts
Fixed Income	1.00					
US Large Stocks	0.21	1.00				
US Small Stocks	0.19	0.84	1.00			
Int'l Developed Mkt Stocks	0.20	0.69	0.61	1.00		
Int'l Emerging Mkt Stocks	0.11	0.66	0.64	0.72	1.00	
Alternatives	(0.01)	0.42	0.29	0.36	0.34	1.00

Asset Allocation Targets

Asset Class	Asset Allocation
Fixed Income	30.0%
US Large Stocks	43.2%
US Small Stocks	4.3%
Int'l Developed Mkt Stocks	12.3%
Int'l Emerging Mkt Stocks	5.2%
Alternatives	5.0%





APPENDIX C – RECOMMENDED DEMOGRAPHIC RATES

TABLE 1

RATES OF SEPARATION FROM ACTIVE SERVICE – MALES

Age	Rates of Withdrawal			Disability	Retirement
	Years of Service				
	0-4	5-9	10+		
19	0.3400	0.2100	0.1150		
20	0.3400	0.2100	0.1150		
21	0.3320	0.2100	0.1150		
22	0.3240	0.2100	0.1150		
23	0.3160	0.2100	0.1150		
24	0.3080	0.2100	0.1150		
25	0.3000	0.2100	0.1150		
26	0.2950	0.2020	0.1150		
27	0.2900	0.1940	0.1150		
28	0.2850	0.1860	0.1150		
29	0.2800	0.1780	0.1150		
30	0.2750	0.1700	0.1150		
31	0.2680	0.1650	0.1120	0.000006	
32	0.2610	0.1600	0.1090	0.000012	
33	0.2540	0.1550	0.1060	0.000024	
34	0.2470	0.1500	0.1030	0.000036	
35	0.2400	0.1450	0.1000	0.000048	
36	0.2360	0.1420	0.0970	0.000065	
37	0.2320	0.1390	0.0940	0.000083	
38	0.2280	0.1360	0.0910	0.000100	
39	0.2240	0.1330	0.0880	0.000118	
40	0.2200	0.1300	0.0850	0.000135	
41	0.2155	0.1290	0.0840	0.000158	
42	0.2110	0.1280	0.0830	0.000181	
43	0.2065	0.1270	0.0820	0.000204	
44	0.2020	0.1260	0.0810	0.000227	
45	0.1975	0.1250	0.0800	0.000250	
46	0.1910	0.1210	0.0800	0.000380	
47	0.1845	0.1170	0.0800	0.000510	
48	0.1780	0.1130	0.0800	0.000640	
49	0.1715	0.1090	0.0800	0.000770	
50	0.1650	0.1050	0.0800	0.000900	
51	0.1608	0.1050	0.0800	0.001070	
52	0.1567	0.1050	0.0800	0.001240	
53	0.1525	0.1050	0.0700	0.001410	
54	0.1525	0.0900	0.0700	0.001580	
55	0.1500	0.0900	0.0650	0.001750	
56	0.1500	0.0900	0.0650	0.001900	
57	0.1450	0.1200	0.0500	0.002050	
58	0.1450	0.0850	0.0500	0.002200	
59	0.1450	0.0750	0.0500	0.002350	
60	0.1450	0.0750		0.002500	0.1000
61	0.1450	0.0750		0.002190	0.1000
62	0.1450	0.1000		0.001880	0.1600
63	0.1450	0.1000		0.001570	0.1250
64	0.1450	0.1000		0.001260	0.1500
65	0.1450	0.1000			0.2400
66	0.1450	0.1000			0.2200
67	0.1450	0.1000			0.2000
68	0.1450	0.1000			0.2000
69	0.1450	0.1000			0.2000
70	0.1450	0.1000			0.2000
71	0.1450	0.1000			0.2000
72	0.1450	0.1000			0.2000
73	0.1450	0.1000			0.2000
74	0.1450	0.1000			0.2000
75	0.1450	0.1000			0.2000
76	0.1450	0.1000			0.2000
77	0.1450	0.1000			0.2000
78	0.1450	0.1000			0.2000
79	0.1450	0.1000			0.2000
80+	0.0000	0.0000			1.0000





APPENDIX C – RECOMMENDED DEMOGRAPHIC RATES

TABLE 2

RATES OF SEPARATION FROM ACTIVE SERVICE – FEMALES

Age	Rates of Withdrawal			Disability	Retirement
	Years of Service				
	0-4	5-9	10+		
19	0.3750	0.2000	0.1100		
20	0.3750	0.2000	0.1100		
21	0.3620	0.2000	0.1100		
22	0.3490	0.2000	0.1100		
23	0.3360	0.2000	0.1100		
24	0.3230	0.2000	0.1100		
25	0.3100	0.2000	0.1100		
26	0.3020	0.1960	0.1100		
27	0.2940	0.1920	0.1100		
28	0.2860	0.1880	0.1100		
29	0.2780	0.1840	0.1100		
30	0.2700	0.1800	0.1100		
31	0.2630	0.1760	0.1100	0.000006	
32	0.2560	0.1720	0.1100	0.000012	
33	0.2490	0.1680	0.1100	0.000024	
34	0.2420	0.1640	0.1100	0.000036	
35	0.2350	0.1600	0.1100	0.000048	
36	0.2300	0.1570	0.1100	0.000065	
37	0.2250	0.1540	0.1100	0.000083	
38	0.2200	0.1510	0.1100	0.000100	
39	0.2150	0.1480	0.1100	0.000118	
40	0.2100	0.1450	0.1100	0.000135	
41	0.2060	0.1410	0.1055	0.000158	
42	0.2020	0.1370	0.1010	0.000181	
43	0.1980	0.1330	0.0965	0.000204	
44	0.1940	0.1290	0.0920	0.000227	
45	0.1900	0.1250	0.0875	0.000250	
46	0.1850	0.1210	0.0840	0.000380	
47	0.1800	0.1170	0.0805	0.000510	
48	0.1750	0.1130	0.0770	0.000640	
49	0.1700	0.1090	0.0735	0.000770	
50	0.1650	0.1050	0.0700	0.000900	
51	0.1600	0.1000	0.0675	0.001070	
52	0.1550	0.0950	0.0650	0.001240	
53	0.1500	0.0900	0.0625	0.001410	
54	0.1500	0.0900	0.0600	0.001580	
55	0.1500	0.0900	0.0600	0.001750	
56	0.1500	0.0900	0.0575	0.001900	
57	0.1500	0.0800	0.0550	0.002050	
58	0.1400	0.0800	0.0500	0.002200	
59	0.1400	0.0800	0.0500	0.002350	
60	0.1400	0.0800		0.002500	0.1000
61	0.1400	0.0800		0.002190	0.1000
62	0.1400	0.1000		0.001880	0.1600
63	0.1400	0.1000		0.001570	0.1250
64	0.1400	0.1000		0.001260	0.1500
65	0.1400	0.1000			0.2400
66	0.1400	0.1000			0.2200
67	0.1400	0.1000			0.2000
68	0.1400	0.1000			0.2000
69	0.1400	0.1000			0.2000
70	0.1400	0.1000			0.2000
71	0.1400	0.1000			0.2000
72	0.1400	0.1000			0.2000
73	0.1400	0.1000			0.2000
74	0.1400	0.1000			0.2000
75	0.1400	0.1000			0.2000
76	0.1400	0.1000			0.2000
77	0.1400	0.1000			0.2000
78	0.1400	0.1000			0.2000
79	0.1400	0.1000			0.2000
80+	0.0000	0.0000			1.0000





APPENDIX C – RECOMMENDED DEMOGRAPHIC RATES

TABLE 3

RATES OF MORTALITY FOR ACTIVE MEMBERS*

Age	Male	Female	Age	Male	Female
20	0.00014	0.00006	46	0.00101	0.00061
21	0.00017	0.00007	47	0.00109	0.00066
22	0.00020	0.00009	48	0.00118	0.00071
23	0.00022	0.00010	49	0.00127	0.00077
24	0.00026	0.00011	50	0.00138	0.00083
25	0.00028	0.00013	51	0.00149	0.00089
26	0.00031	0.00014	52	0.00161	0.00096
27	0.00034	0.00014	53	0.00174	0.00104
28	0.00036	0.00016	54	0.00187	0.00113
29	0.00039	0.00017	55	0.00202	0.00122
30	0.00042	0.00018	56	0.00219	0.00131
31	0.00045	0.00020	57	0.00238	0.00142
32	0.00047	0.00022	58	0.00257	0.00154
33	0.00049	0.00023	59	0.00278	0.00167
34	0.00051	0.00025	60	0.00300	0.00180
35	0.00052	0.00027	61	0.00323	0.00194
36	0.00053	0.00029	62	0.00348	0.00210
37	0.00055	0.00031	63	0.00374	0.00227
38	0.00058	0.00033	64	0.00400	0.00245
39	0.00061	0.00036	65	0.00426	0.00265
40	0.00064	0.00039	66	0.00451	0.00285
41	0.00069	0.00041	67	0.00478	0.00309
42	0.00074	0.00045	68	0.00505	0.00333
43	0.00079	0.00049	69	0.00534	0.00359
44	0.00086	0.00052	70	0.00566	0.00387
45	0.00093	0.00057			

* Base mortality rates as of 2016 before application of improvement scale





APPENDIX C – RECOMMENDED DEMOGRAPHIC RATES

TABLE 4

RATES OF MORTALITY FOR MEMBERS RETIRED ON ACCOUNT OF SERVICE*

Age	Male	Female	Age	Male	Female
50	0.00678	0.00319	86	0.12906	0.09901
51	0.00712	0.00329	87	0.14335	0.11139
52	0.00748	0.00340	88	0.15894	0.12505
53	0.00785	0.00352	89	0.17579	0.14018
54	0.00824	0.00364	90	0.19333	0.15571
55	0.00866	0.00378	91	0.21127	0.17113
56	0.00910	0.00391	92	0.22950	0.18627
57	0.00957	0.00410	93	0.24811	0.20129
58	0.01006	0.00434	94	0.26724	0.21655
59	0.01057	0.00462	95	0.28711	0.23251
60	0.01113	0.00491	96	0.30789	0.24964
61	0.01173	0.00525	97	0.32968	0.26829
62	0.01239	0.00563	98	0.35243	0.28865
63	0.01315	0.00607	99	0.37590	0.31061
64	0.01402	0.00661	100	0.39959	0.33364
65	0.01502	0.00727	101	0.42267	0.35676
66	0.01621	0.00807	102	0.44495	0.37975
67	0.01759	0.00901	103	0.46624	0.40240
68	0.01920	0.01013	104	0.48640	0.42452
69	0.02106	0.01142	105	0.50532	0.44591
70	0.02323	0.01291	106	0.52294	0.46643
71	0.02573	0.01460	107	0.53500	0.48595
72	0.02860	0.01654	108	0.53500	0.50437
73	0.03185	0.01874	109	0.53500	0.52163
74	0.03551	0.02124	110	0.53500	0.53769
75	0.03959	0.02410	111	0.53500	0.54000
76	0.04414	0.02735	112	0.53500	0.54000
77	0.04920	0.03106	113	0.53500	0.54000
78	0.05482	0.03533	114	0.53500	0.54000
79	0.06105	0.04025	115	0.53500	0.54000
80	0.06799	0.04592	116	0.53500	0.54000
81	0.07568	0.05245	117	0.53500	0.54000
82	0.08423	0.05986	118	0.53500	0.54000
83	0.09374	0.06822	119	1.00000	1.00000
84	0.10430	0.07752	120	1.00000	1.00000
85	0.11606	0.08776			

* Base mortality rates as of 2016 before application of improvement scale





APPENDIX C – RECOMMENDED DEMOGRAPHIC RATES

TABLE 5

RATES OF MORTALITY FOR BENEFICIARIES OF DECEASED MEMBERS*

Age	Male	Female	Age	Male	Female
50	0.00904	0.00429	86	0.16243	0.10151
51	0.00936	0.00460	87	0.18118	0.11290
52	0.00989	0.00494	88	0.20056	0.12556
53	0.01044	0.00532	89	0.21988	0.13908
54	0.01103	0.00572	90	0.23886	0.15327
55	0.01167	0.00614	91	0.25759	0.16808
56	0.01236	0.00661	92	0.27635	0.18355
57	0.01310	0.00712	93	0.29553	0.19979
58	0.01391	0.00766	94	0.31557	0.21695
59	0.01479	0.00826	95	0.33679	0.23515
60	0.01576	0.00891	96	0.35930	0.25447
61	0.01682	0.00962	97	0.38293	0.27488
62	0.01800	0.01040	98	0.40706	0.29623
63	0.01929	0.01127	99	0.43057	0.31820
64	0.02073	0.01221	100	0.45327	0.34024
65	0.02233	0.01326	101	0.47496	0.36217
66	0.02410	0.01440	102	0.49549	0.38377
67	0.02607	0.01567	103	0.51476	0.40486
68	0.02826	0.01707	104	0.53272	0.42527
69	0.03072	0.01862	105	0.54500	0.44484
70	0.03344	0.02034	106	0.54500	0.46345
71	0.03649	0.02225	107	0.54500	0.48102
72	0.03992	0.02438	108	0.54500	0.49748
73	0.04375	0.02675	109	0.54500	0.51280
74	0.04804	0.02940	110	0.54500	0.51500
75	0.05283	0.03236	111	0.54500	0.51500
76	0.05817	0.03568	112	0.54500	0.51500
77	0.06411	0.03941	113	0.54500	0.51500
78	0.07069	0.04361	114	0.54500	0.51500
79	0.07799	0.04833	115	0.54500	0.51500
80	0.08611	0.05364	116	0.54500	0.51500
81	0.09512	0.05961	117	1.00000	0.51500
82	0.10515	0.06628	118	1.00000	1.00000
83	0.11684	0.07373	119	1.00000	1.00000
84	0.13043	0.08202	120	1.00000	1.00000
85	0.14558	0.09125			

* Base mortality rates as of 2016 before application of improvement scale





APPENDIX C – RECOMMENDED DEMOGRAPHIC RATES

TABLE 6

RATES OF MORTALITY FOR MEMBERS RETIRED ON ACCOUNT OF DISABILITY*

Age	Male	Female	Age	Male	Female
50	0.01213	0.01025	86	0.16429	0.13197
51	0.01321	0.01115	87	0.18068	0.14265
52	0.01437	0.01213	88	0.19745	0.15414
53	0.01564	0.01319	89	0.21449	0.16659
54	0.01702	0.01435	90	0.23188	0.18013
55	0.01853	0.01561	91	0.24976	0.19488
56	0.02016	0.01698	92	0.26833	0.21094
57	0.02117	0.01733	93	0.28775	0.22833
58	0.02204	0.01766	94	0.30811	0.24701
59	0.02279	0.01800	95	0.32937	0.26684
60	0.02345	0.01835	96	0.35131	0.28760
61	0.02406	0.01874	97	0.37345	0.30893
62	0.02466	0.01920	98	0.39502	0.33033
63	0.02531	0.01976	99	0.41584	0.35162
64	0.02608	0.02047	100	0.43574	0.37259
65	0.02705	0.02138	101	0.45458	0.39307
66	0.02831	0.02256	102	0.47226	0.41288
67	0.02995	0.02408	103	0.48873	0.43188
68	0.03201	0.02598	104	0.50000	0.44995
69	0.03450	0.02828	105	0.50000	0.46701
70	0.03743	0.03104	106	0.50000	0.48299
71	0.04084	0.03429	107	0.50000	0.49786
72	0.04472	0.03807	108	0.50000	0.50000
73	0.04906	0.04236	109	0.50000	0.50000
74	0.05385	0.04709	110	0.50000	0.50000
75	0.05901	0.05217	111	0.50000	0.50000
76	0.06446	0.05742	112	0.50000	0.50000
77	0.07012	0.06267	113	0.50000	0.50000
78	0.07608	0.06800	114	0.50000	0.50000
79	0.08252	0.07364	115	0.50000	0.50000
80	0.08968	0.07986	116	1.00000	1.00000
81	0.09789	0.08708	117	1.00000	1.00000
82	0.10847	0.09502	118	1.00000	1.00000
83	0.12062	0.10351	119	1.00000	1.00000
84	0.13397	0.11248	120	1.00000	1.00000
85	0.14854	0.12195			

* Base mortality rates as of 2016 before application of improvement scale

