Employees Retirement System of Texas

Actuarial Experience Study
As of August 31, 2023

Presented to the ERS Board of Trustees on March 20, 2024

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March 7, 2024

Board of Trustees
Employees Retirement System of Texas
200 East 18th Street
Austin, TX 78701

Subject: Results of 2024 Actuarial Experience Study

Members of the Board:

We are pleased to present our report on the results of the 2024 Actuarial Experience Study for the Employees Retirement System of Texas (ERS). It includes our recommendations for new actuarial assumptions and methods to be effective for the August 31, 2024 actuarial valuation, and it describes the actuarial impact produced by these recommendations as though they had been effective for the August 31, 2023 actuarial valuation.

With the Board's approval of the recommendations in this report, we believe the actuarial condition of ERS will be more accurately portrayed. The Board's decisions should be based on the appropriateness of each recommendation individually, not on their collective effect on the funding period or the unfunded liability.

This study was conducted in accordance with generally accepted actuarial principles and practices, and with the Actuarial Standards of Practice issued by the Actuarial Standards Board. The signing actuaries are independent of the plan sponsor. Mr. Newton and Ms. Woolfrey are Enrolled Actuaries and Fellows of the Society of Actuaries, and all of the undersigned are Members of the American Academy of Actuaries, and meet the Qualification Standards of the American Academy of Actuaries. Finally, each of the undersigned are experienced in performing valuations for large public retirement systems. We wish to thank the ERS staff for their assistance in providing data for this study.

Respectfully submitted,
Gabriel, Roeder, Smith & Company

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

Dana Woolfrey, FSA, EA, MAAA
Senior Consultant & Actuary

Thomas J. Bevins, ASA, MAAA
Consultant & Actuary

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SECTION A

EXECUTIVE SUMMARY

Summary of Recommendations

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

Economic Assumptions

1. No change to the nominal investment return assumption of 7.00%.
2. No change to the inflation assumption of 2.30%.
3. No change to the salary increase patterns for individuals.
4. No change to the general wage inflation assumption 2.70%. This assumption is used primarily to index each cohort of new entrants used in the projections to determine the funding period.
5. No change to the overall payroll growth assumption of 2.70% for ERS and LECOS and 2.30% for JRS2. This assumption is used to project future contributions to be received in order to determine the funding period.
6. No change to the assumption there will be no cost of living increases or supplemental payments provided to retirees for Groups 1, 2, and 3, with the exception of the one-time increase described in Section 814.604.
7. No change to the gain-sharing or annuitization assumptions for Group 4.
8. Recommend updating administrative expense assumptions based on recent experience.

Mortality Assumptions

9. No change to the post-retirement mortality tables for non-disabled (healthy) retirees for ERS and LECOS. Incorporate increased longevity expectation for JRS2.
10. No change to the post-retirement mortality tables for disabled retirees.
11. No change to the pre-retirement mortality tables for active employees.
12. Recommend updating the projection scales for mortality improvement to be based on the most recent MP scale published by the Society of Actuaries, with immediate convergence.

Other Demographic Assumptions

13. Recommend generally lowering disability patterns based on experience.
14. Recommend generally lowering retirement patterns based on experience.
15. Recommend generally increasing turnover patterns based on experience for LECOS and slightly decreasing turnover patterns for Regular employees hired after the age of 35.

Actuarial Methods and Policies

16. We recommend no change to the current process of estimating the valuation payroll for the upcoming fiscal year.

17. We recommend no change to the actuarial cost method nor the asset smoothing method.

Cost Impact – Employees Retirement System of Texas (ERS)

Results as of August 31, 2023	Current Assumptions	Proposed Assumptions
Actuarial Accrued Liability	$48.0 billion	$47.7 billion
Actuarial Value of Assets	$34.0 billion	$34.0 billion
Unfunded Accrued Liability	$14.0 billion	$13.7 billion
Funded Ratio	70.8%	71.2%
Normal Cost with Admin (% of pay)	13.52%	13.52%
Legacy Payment to Eliminate UAAL by 2054	$385 million	$366 million
Recommended Legacy Contributions Projected for Upcoming Biennium Per Section 815.407	$510 million	$510 million

Average normal cost rate for all groups, includes administrative expenses

Cost Impact – Law Enforcement and Custodial Officer Supplemental Retirement Fund (LECOSRF)

Results as of August 31, 2023	Current Assumptions	Proposed Assumptions
Actuarial Accrued Liability	$1.80 billion	$1.79 billion
Actuarial Value of Assets	$1.80 billion	$1.80 billion
Unfunded Accrued Liability	$0.00 billion	($0.01 billion)
Funded Ratio	100.0%	100.60%
Normal Cost with Admin (% of pay)	2.11%	2.08%
Statutory Contributions (% of pay)	3.26%	3.26%
Contributions Sufficient?	Yes	Yes

Average normal cost rate for all groups, includes administrative expenses

Cost Impact – Judicial Retirement System of Texas, Plan 2 (JRS2)

Results as of August 31, 2023	Current Assumptions	Proposed Assumptions
Actuarial Accrued Liability	$672 million	$700 million
Actuarial Value of Assets	$679 million	679 million
Unfunded Accrued Liability	($8) million	$20 million
Funded Ratio	101.2%	97.10%
Normal Cost with Admin (% of pay)	28.24%	29.19%
Statutory Contributions (% of pay)	28.61%	28.61%
Contributions Sufficient?	Yes	Yes*

Average normal cost rate, includes administrative expenses

**New cash balance design for members hired on or after September 1, 2024 is expected to reduce the JRS2 normal cost significantly. The normal cost with administrative expenses is expected to be less than the statutory contributions starting in 2025. The plan is expected to return to full funding in eight years projecting off the smoothed or actuarial value of assets. The plan is expected to return to full funding in six years projecting off the market value of assets.*

SECTION B

INTRODUCTION

Introduction

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

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

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

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

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

Summary of Process

In determining liabilities and contribution rates for retirement plans, actuaries must make assumptions about the future. The following are among the assumptions that must be made:

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

For some of these assumptions, such as the mortality rates, past experience provides important evidence about the future. For others, such as the investment return assumption, past performance cannot predict future returns. In either case, actuaries should review the plan's assumptions periodically and determine whether these assumptions are consistent with actual past experience and with anticipated future experience.

The last such actuarial experience investigation was performed following the August 31, 2020 actuarial valuation and the recommendations were adopted on May 20, 2020. For this experience study, we have reviewed ERS' experience for the four-year period from August 31, 2020 through August 31, 2023. However, for much of the analysis, we used longer experience to increase data credibility.

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

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

In many circumstances, we enhance this process by using an amount-weighted analysis. An amount-weighted analysis will generally use amounts such as benefits, pay, or liabilities to complete the analysis. From the perspective of the mortality assumption, there are two reasons for using an amount-weighted approach. First, mortality experience across the U.S. has been shown to vary depending on income level. Amount-weighting takes into account differing benefit levels. Second, selecting an assumption based on headcount-weighting is consistent with estimating expected deaths, but selecting an assumption based on amount-weighting is consistent with minimizing gains and losses associated with expected deaths. By weighting the data by annuity amounts, we are giving more weight to members who have larger annuities (and thus have larger liabilities). The same concepts apply when the amount-weighted approach is applied to other demographic assumptions such as termination and retirement.

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

Section E Exhibits

The exhibits in Section E should generally be self-explanatory. For example, on page E-17, we show an exhibit analyzing the termination rates for LECO members by years of service. The second column shows the total amount-weighted number of LECO members who terminated during the study period. This excludes members who died, became disabled or retired. Column (3), labeled "Total Count" shows the total amount-weighted exposures of this group. This is the number of members who meet the criteria who could have terminated during any of the years. On this exhibit, the exposures exclude anyone eligible for unreduced retirement. A member is counted in each year they could have terminated, so the total shown is the total exposures for the five-year period. Column (4) shows the probability of termination based on the raw data.

That is, it is the result of dividing the actual number of terminations (col. 2) by the number exposed (col. 3). Column (5) shows the new recommended termination rate. Column (6) shows the expected amount-weighted number of terminations based on the proposed termination assumptions. Column (7) shows the Actual-to-Expected ratios under the proposed termination assumptions.

SECTION C

ANALYSIS OF EXPERIENCE AND RECOMMENDATIONS

Analysis of Experience and Recommendations

We will begin by discussing the economic assumptions: inflation, the investment return rate, the general wage increase assumption, the salary increase assumption for individuals, cost-of-living increases if applicable, and the payroll growth rate used for projecting total contributions. Then we will discuss the demographic assumptions: mortality, disability, termination and retirement. Finally we will discuss the actuarial methods used.

Inflation and Investment Return Assumptions

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

As no one knows what the future holds, it is necessary for an actuary to estimate possible future economic outcomes. Recognizing that there is not one right answer, the current standard calls for an actuary to develop a reasonable economic assumption. A reasonable assumption is one that is:

1. appropriate for the purpose of the measurement,
2. reflects the actuary's professional judgment,
3. takes into account historical and current economic data that is relevant as of the measurement date,
4. is an estimate of future experience; an observation of market data; or a combination thereof,
5. and has no significant bias except when provisions for adverse deviation or plan provisions that are difficult to measure are included.

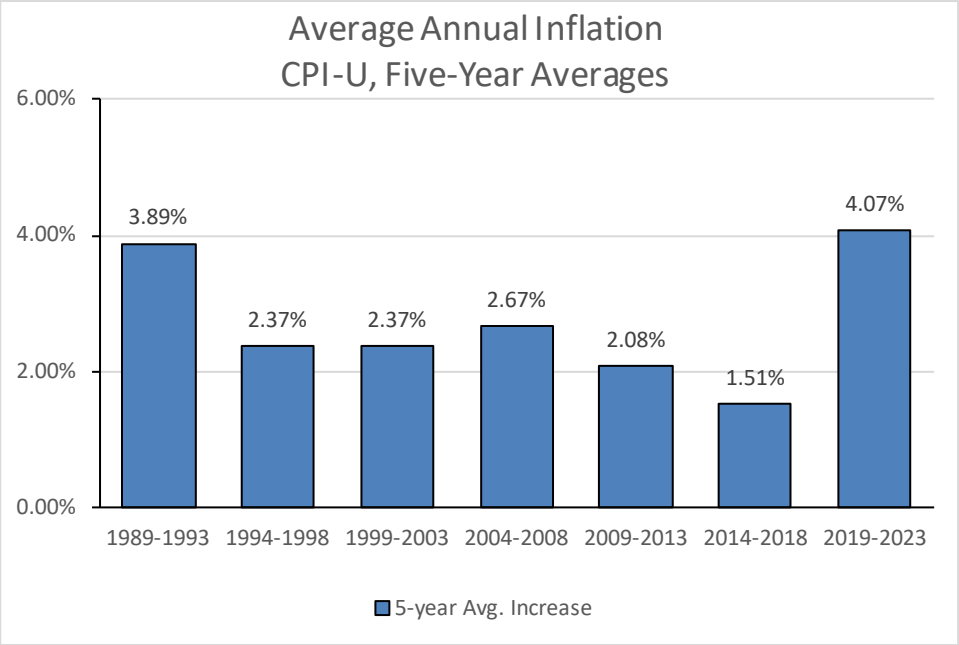
However, the standard explicitly advises an actuary not to give undue weight to recent experience.

Each economic assumption should individually satisfy this standard. Furthermore, with respect to any particular valuation, each economic assumption should be consistent with every other economic assumption over the measurement period. Generally, the economic assumptions are much more subjective in nature than the demographic assumptions.

Inflation Assumption

By "inflation," we mean price inflation, as measured by annual increases in the Consumer Price Index (CPI). This inflation assumption underlies most of the other economic assumptions. It impacts investment return, salary increases, and overall payroll growth. The current annual inflation assumption is 2.30%.

The following chart shows the average annual inflation, as measured by the increase in the U.S. Consumer Price Index for All Urban Consumers (CPI-U), in each of the seven consecutive five-year periods over the last 35 years.



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

The table below shows the average inflation over various periods, ending December 2023.

Periods Ending Dec. 2023	Average Annual Increase in CPI-U
Last five (5) years	4.07%
Last ten (10) years	2.79%
Last fifteen (15) years	2.55%
Last twenty (20) years	2.58%
Last twenty-five (25) years	2.54%
Last thirty (30) years	2.51%
Since 1913 (first available year)	3.16%

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

As you can see, inflation has spiked higher recently, after being relatively low for the twenty-five year period 1994 through 2018.

Forecasts from NEPC (ERS Investment Consultant)

The 2024 Capital Market Assumptions for NEPC, ERS' Investment Consultant, are using 2.60% as the price inflation assumption for the next 10 years.

Forecasts from Other Investment Consulting Firms

We examined the capital market assumption sets for 14 investment consulting firms and the average assumption for inflation was 2.52%, with a range of 2.26% to 2.90%.

Other Forward-Looking Inflation Forecasts

Forward-Looking Price Inflation Forecasts[a]	
Congressional Budget Office[b]	
5-Year Annual Average	2.83%
10-Year Annual Average	2.57%
Federal Reserve Bank of Philadelphia[c]	
5-Year Annual Average	2.60%
10-Year Annual Average	2.40%
Federal Reserve Bank of Cleveland[d]	
10-Year Expectation	2.28%
20-Year Expectation	2.33%
30-Year Expectation	2.39%
Federal Reserve Bank of St. Louis[e]	
10-Year Breakeven Inflation	2.18%
20-Year Breakeven Inflation	2.42%
30-Year Breakeven Inflation	2.19%
U.S. Department of the Treasury[f]	
10-Year Breakeven Inflation	2.09%
20-Year Breakeven Inflation	2.37%
30-Year Breakeven Inflation	2.19%
50-Year Breakeven Inflation	2.29%
100-Year Breakeven Inflation	2.36%
Social Security Trustees[g]	
Ultimate Intermediate Assumption	2.40%

[a] **End of the Fourth Quarter, 2023**. Version 2024-01-25 by Gabriel, Roeder, Smith & Company

[b] *The Budget and Economic Outlook: 2023 to 2033* , Release Date: February 2023, Consumer Price Index (CPI-U), Percentage Change from Year to Year, 5-Year Annual Average (2023 - 2027), 10-Year Annual Average (2023 - 2032).

[c] *Fourth Quarter 2023 Survey of Professional Forecasters* , Release Date: November 13, 2023, Headline CPI, Annualized Percentage Points, 5-Year Annual Average (2023 - 2027), 10-Year Annual Average (2023 - 2032).

[d] Inflation Expectations, Model output date: December 1, 2023.

[e] The breakeven inflation rate represents a measure of expected inflation derived from X-Year Treasury Constant Maturity Securities and X-Year Treasury Inflation-Indexed Constant Maturity Securities. Observation date: December, 2023.

[f] The Treasury Breakeven Inflation (TBI) Curve, Monthly Average Rates, December, 2023.

[g] *The 2023 Annual Report of The Board of Trustees of The Federal Old-Age And Survivors Insurance and Federal Disability Insurance Trust Funds* , March 31, 2023, p. 10, Key Assumptions and Summary Measures for the Last 65 Years of the Long-Range (75-year) Projection Period, Intermediate, Consumer Price Index (CPI-W).

Recommendation

As a result, we find a reasonable range for this assumption to be 2.20% to 2.60%. While recent experience has exceeded the 2.30% assumption, many of the forward-looking forecasts are still below 2.50% and close to the current 2.30%. We find the 2.30% to be reasonable and recommend no change at this time.

Investment and Administrative Expenses

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

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

On the other hand, there is a divergence of practice on the handling of administrative expenses. Some actuaries make an assumption that administrative expenses will be some fixed or increasing dollar amount. Others assume that the administrative expenses will be some percentage of the plan's actuarial liabilities or normal cost. And others treat administrative expenses like investment expenses, as an offset to the investment return assumption. For ERS, the practice has been to explicitly add a load onto the normal cost. This is also our preferred approach and we recommend continuing this practice. Using an explicit load onto the normal cost maximizes transparency, aligns better with the standards of the Governmental Accounting Standards Board, and maintains a parallel between the investment returns used by the investment consultant and the actuary.

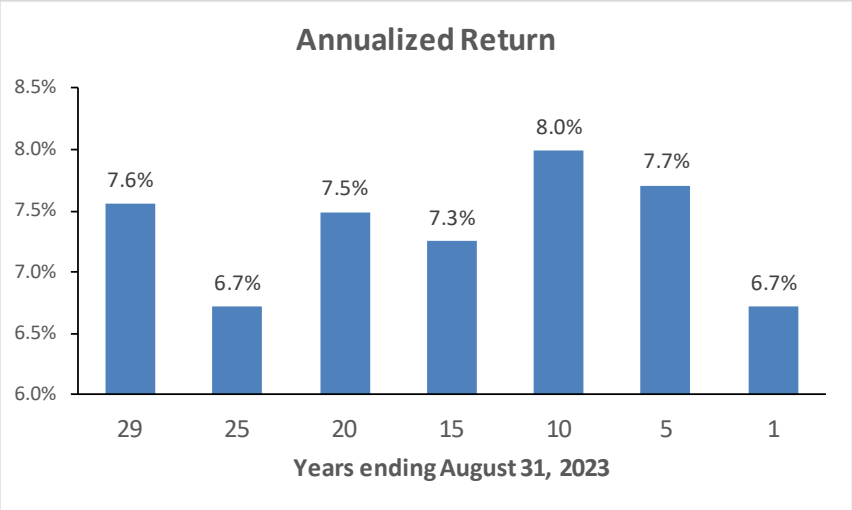
The following table provides the actual administrative expenses as a percentage of covered payroll for the last five years for the three pre-funded plans, along with our recommended assumptions.

Administrative Expense as a Percentage of Covered Payroll								
	FY23	FY22	FY21	FY20	FY19	Average	Current Assumption	Recommended Assumption
ERS	0.54%	0.44%	0.30%	0.34%	0.40%	0.40%	0.33%	0.40%
LECOSRF	0.15%	0.11%	0.11%	0.12%	0.13%	0.12%	0.08%	0.12%
JRS2	0.27%	0.36%	0.26%	0.31%	0.45%	0.33%	0.33%	0.33%

Investment Return Rate

The investment return assumption is one of the principal assumptions used in any actuarial valuation of a retirement plan. It is used to discount future expected benefit payments to the valuation date in order to determine the liabilities of the plans. Even a small change to this assumption can produce significant changes to the liabilities and contribution rates. Currently, it is assumed that ERS' future investment returns will average 7.00% per year, net of investment expenses.

The chart below shows the historical annualized returns of the ERS Trust through FY 2023.



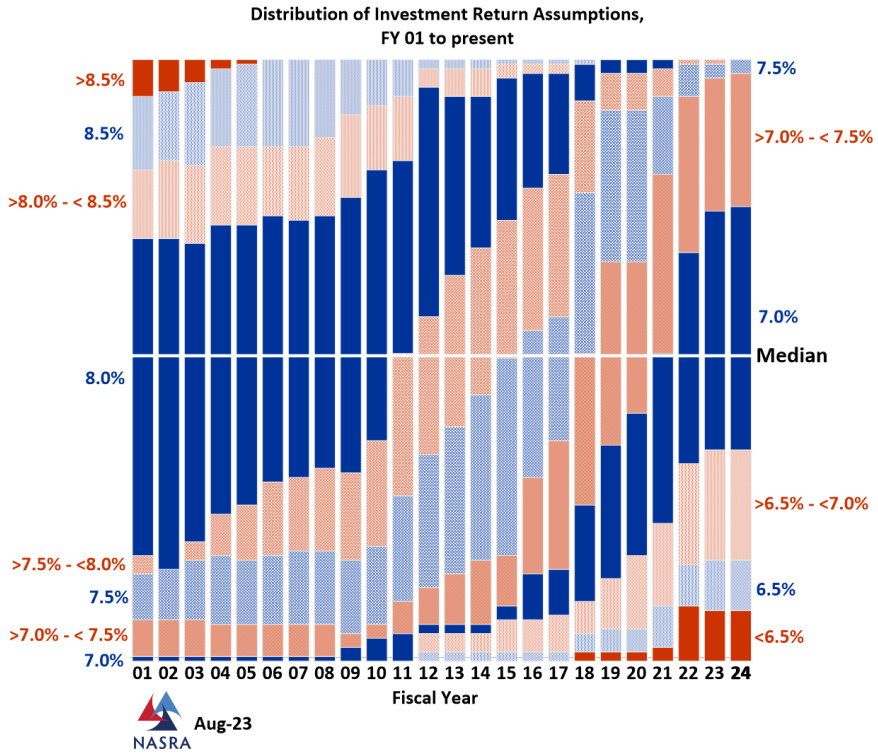
The figures in the chart above represent the annualized returns of the ERS Trust, net of investment expenses, as reported in the actuarial valuations. Such returns have generally compounded at a rate that has exceeded the current 7.0% assumption for most time periods ending FY2023. One exception is that its annualized return over the trailing 25-year period was 6.7%, but this figure is end-point dependent. The last 25 years saw the ERS Trust exceed the expected 7.00% return assumption in 14 of those years, with an average yearly return during this period of 7.01%.

However, for this assumption, past performance, even averaged over a twenty-five year period, is not a reliable indicator of future performance. The actual asset allocation of the trust fund will significantly impact the overall performance, so returns achieved under a different allocation are not meaningful.

More importantly, the real rates of return for many asset classes, especially equities, vary so dramatically from year to year that even a twenty-five year period is not long enough to provide reasonable guidance.

Assumption Comparison to Peers

We do not recommend the selection of an investment return assumption based on prevalence information. However, it is still informative to identify where the investment return assumption for ERS is compared to its peers. The chart below shows the distribution of the investment return assumptions, as reported by NASRA in 2024.



The median rate of return is 7.00% and the distribution remains mostly unchanged from 2023.

Asset Allocation

We believe the most appropriate approach to selecting an investment return assumption is to identify expected returns given the funds' asset allocation mapped to forward-looking capital market assumptions. We view the investment return assumption as having two components: the assumed rate of (price) inflation plus the real return net of inflation. This "building block" approach is one explicitly permitted under ASOP 27. The inflation assumption has already been discussed, so we will proceed with the analysis of the real rate of return assumption.

To do this, we will examine the results of applying a set of capital market assumptions to the plan's target asset allocation. Because GRS is a benefits consulting firm and does not develop or maintain our own capital market assumptions, we typically will utilize the forward-looking return expectations developed by several investment consulting firms. The following is an excerpt from ASOP 27 on the topic of using experts:

> ***Section 3.5.6 Other Sources of Economic Data and Analyses****—When the actuary is responsible for selecting or giving advice on selecting economic assumptions, the actuary may incorporate economic data and analyses from a variety of other sources, including representatives of the plan sponsor and administrator, investment advisors, economists, and other professionals. However, the selection or advice should reflect the actuary's professional judgment.*

In our professional judgement, the consulting firms we included in our survey are experts with specialized knowledge and it is appropriate to incorporate their outlooks in our analysis.

We will give a higher emphasis to the estimates produced by NEPC, ERS' investment consultant as they are more familiar with ERS' specific investments, but we will also verify with other independent sources.

Based on ERS' Investment Policy Statement below is a summary of the target asset for ERS:

CURRENT LONG-TERM ASSET ALLOCATION TARGET	
ASSET CLASS	**Current**
Public Equity	35%
Private Equity	16%
Public Credit	9%
Private Credit	3%
Public Real Estate	3%
Private Real Estate	9%
Private Infrastructure	5%
Rates	12%
Hedge Funds	6%
Cash	2%
Total	100%

NEPC provided their forward-looking expectations for ERS' target portfolio to be 6.47% over the next decade and 7.59% over the longer term.

Within our direct GRS survey of other investment firms, we collected eleven sets of expectations based on a 7-10 year time horizon. Based on the average of these sets of expectations and the ERS asset allocation, the expected compound return over the next 10 years is 7.05%, with a range of 6.40% to 7.54%.

Seven of the firms also provide longer term expectations (20 years or longer), with the average of those sets of expectations having an expected compound return over the next 20-30 years of 7.34%, with a range of outcomes from 6.16% to 8.31%.

In our opinion, the process above is consistent with the assumption setting guidance. The results were appropriate for the purpose of the measurement as the estimates were based on medium to longer-term forecasts of market expectations, they took into account historical and current economic data that is relevant as of the measurement date, they represent an estimate of future experience and an observation of market data, and they had no significant bias (i.e., it is not significantly optimistic or pessimistic).

RECOMMENDATION

In our professional judgement, we believe the current 7.00% assumption meets the requirements under ASOP 27 for being a reasonable assumption and recommend no change at this time.

Cost-of-Living Increase Assumption

The ERS plan is not statutorily designed or funded to provide automatic post-retirement cost of living adjustments (COLAs) to retired members in Groups 1, 2 and 3. It has been past practice for the legislature to periodically grant ad hoc COLAs. However, as we have seen over the last two decades, the COLAs are certainly not automatic. We recommend continuing to assume no future COLAs in the annual valuations, with the exception of the one-time increase described in Section 814.604 and the Group 4 Gain-Sharing provision. If the legislature were to grant an ad hoc COLA, this would create additional liability. We recommend that any consideration given to granting an ad hoc COLA provide additional funding to cover the increased liability. This is consistent with the ERS Pension Funding Policy Priorities and Guidelines which states that new benefit enhancements should be pre-funded by the legislature to avoid creating new unfunded liability.

Retired members of the Elected Class in ERS receive post-retirement increases that are tied to the State base salary of a district court judge. JRS1 retirees who retire on or after September 1, 2019 will be based on 120% of the State base salary, consistent with a judge of a court of the same classification as the court on which the retiree last served before retirement. The annuities of past retirees who may have retired under a different salary schedule will continue to be based on the prescribed state base salary schedule consistent with a judge of a court of the same classification as the court on which the retiree last served before retirement, with future adjustments upon changes in the state base salary. These expected pay increases are discussed in the salary increase section, below.

Group 4 Gain-sharing Assumption

Active and retired Group 4 members are eligible for gain-sharing benefits based on the investment performance of the ERS portfolio. Active members will receive a 4% interest credit annually plus the amount determined by the gain-sharing formula. Retirees will receive an increase in their monthly annuity equal to the amount determined by the same actual gain-sharing formula. The amount each year is equal to half of the five-year annualized investment performance of ERS in excess of 4%, but not more than 3% in a given year (or below 0%). For example, if the five year annualized return were 6%, the gain-sharing amount would be (6%-4%)*50%=1.0% and if the five year annualized return were 8%, the gain-sharing amount would be (8%-4%)*50%=2.0%. Based on modeling of a 7% geometric return with 12% standard deviation, the expected gain-sharing will average 1.5% per year, consistent with the current assumption. We recommend no change to this assumption.

General Wage Inflation

A General Wage Inflation (GWI) assumption represents the real wage growth over time in the general economy, or, is the assumption on how much the pay scales themselves will change year to year, not necessarily how much the pay increases received by individuals are, or even necessarily how the payroll in total may change, which can be impacted by population changes, etc. This assumption should be applicable to a local economy, not necessarily one group inside a retirement system. This assumption is used primarily to index the pay of each group of new entrants used in the open group projections. In an open group projection, projected terminations from the current active population are replaced with projected new entrants.

Historically, General Wage Inflation has almost always exceeded price inflation. This is because wage inflation is in theory the result of (a) price inflation, and (b) productivity gains being passed through to

wages. Since 1951, for the national economy as a whole, wage inflation has been about 1.00% larger than price inflation each year.

For the last 10 years, for the national economy as a whole, wage inflation has been 3.71%, outpacing price inflation by about 1.12%. Over the last 20 years, wage inflation has been 3.31%, outpacing price inflation by about 0.79%.

Over the past 10 years, the average salary for an ERS member with less than 5 years of service has changed by 3.2% for regular class members and 3.1% for LECO members. This is the closest apples-to-apples comparison for this assumption as it shows how the pay scales themselves are changing, not how the population inside is changing. Currently ERS uses a GWI assumption of 2.70%, comprised of a real productivity growth assumption of 0.4% and 2.3% price inflation. Given that inflation was 0.46% higher than assumed during the 10-year period (which accounts for the higher 3.2% and 3.1% results), we find there is strong support for leaving this assumption unchanged.

We recommend leaving the real productivity growth assumption unchanged at 0.40%, or a nominal 2.70% GWI assumption.

Salary increase rates

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

- Across-the-board increases for all employees;
- Across-the-board increases for a given group of employees;
- Increases to a minimum salary schedule;
- Additional pay for additional duties;
- Step or service-related increases;
- Increases for acquisition of advanced degrees or specialized training;
- Promotions;
- Overtime;
- Bonuses, if available; or
- Merit increases, if available.

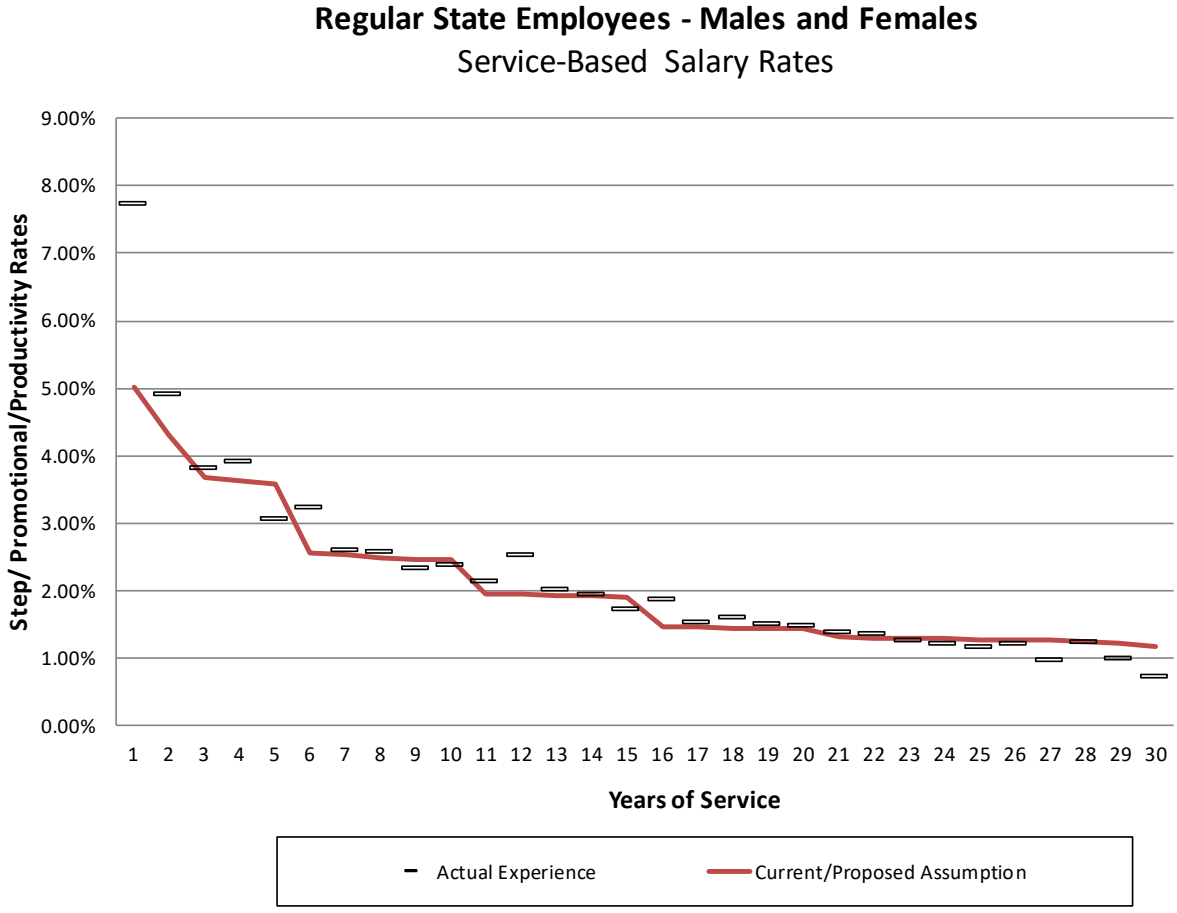
Our salary increase assumption is meant to reflect all of these kinds of increases to the extent that they are included in the pay used to determine contributions or plan benefits.

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

Regular State employees

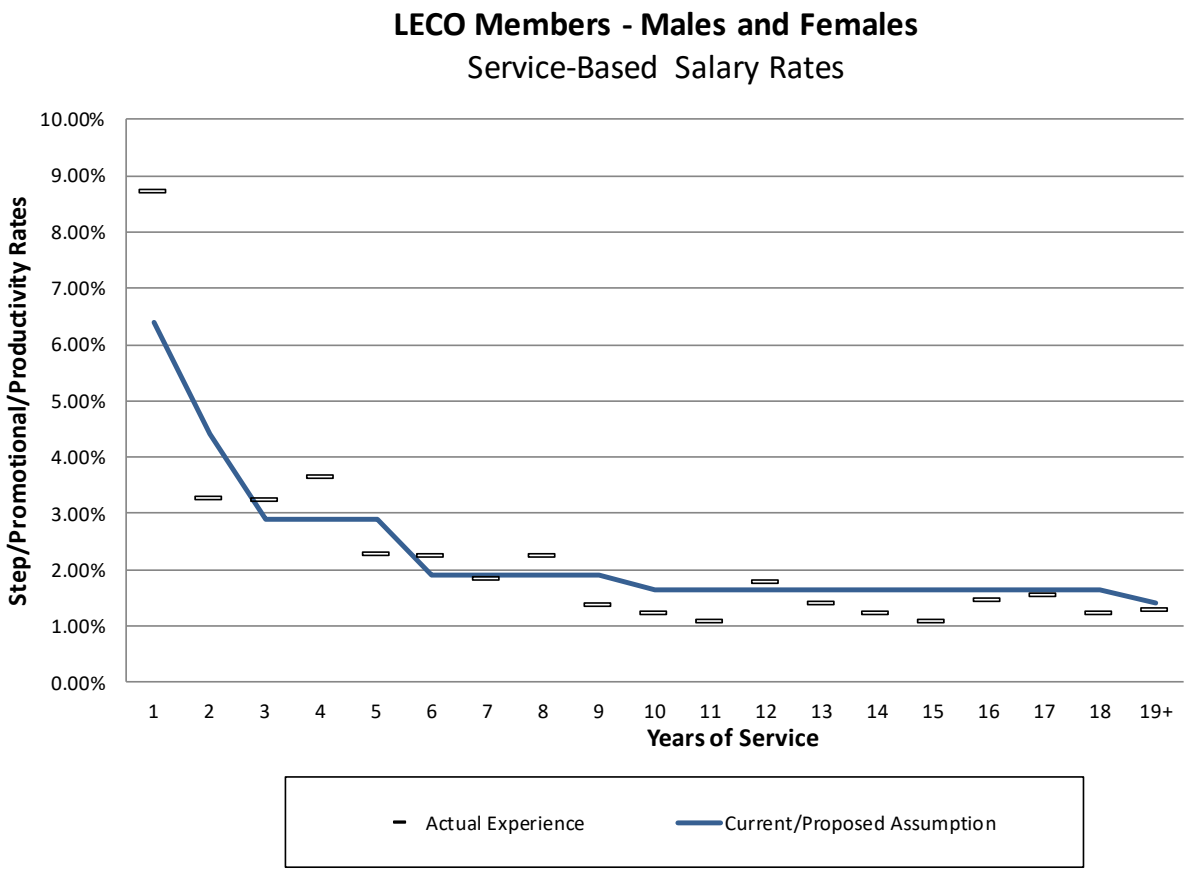
ERS uses an age and service-based rate assumption table for Regular State employees. We looked at the salaries provided for all members who were active in the start and the end of an experience year, for a 10-year study period.

GRS examined the underlying data and found that the data continues to support use of both age and service in the development of these rates, and that entry age *is* a driver in the progression of pays. GRS found that after adjusting for actual price inflation during the experience period, the current rates continue to be a reasonable fit to the observed data. Although we evaluated the data using both age and service, the aggregated service-based results are shown below for ease of use.



LECO Members

ERS uses a service-based rate assumption table for LECO members and GRS found that this continues to be appropriate. As with the Regular State employees, GRS found that after adjusting for actual price inflation during the experience period, the current rates continue to be a reasonable fit to the observed data.



Judicial Salaries

Judicial pay increases impact the retirement plans in multiple ways. First, an individual salary increase assumption (similar to the discussion above) must be developed to project the salaries throughout the careers of the active judges that are participating in the Judicial Retirement System of Texas, Plan 1 (JRS1) and the Judicial Retirement System of Texas, Plan 2 (JRS2). Additionally, the post-retirement benefits for Elected Class and JRS1 members are indexed to the increases in the State base salary of a district court judge.

House Bill 2384, enacted in 2019 by the Texas State Legislature, restructured the compensation and retirement benefits for State judges. This restructuring also impacted the compensation used to determine benefits upon retirement for Elected Class members. HB 2384 sets forth specific service-based salary increases as a percentage of the State base salary for each judicial office type, as shown below:

Annual Salary Increases for Merit, Promotion and Longevity Male and Female District Attorneys in the Elected Class			
Age	Years of Eligibility Service as a District Attorney		
	Less than 4	4 or more, but less than 8	8 or more
All	State base salary of a district judge	110% of base salary	120% of base salary

Currently, we assume that the base salary will increase with price inflation and, in addition, judges will receive the service-based increases. GRS recommends no change to this assumption or approach.

Payroll Growth Rate

The salary increase rates discussed above are assumptions applied to individuals. They are used in projecting future benefits. The GWI assumption above reflects how wages will change in the general economy. The GWI assumption is used in projections and to compare the reasonableness of the assumption set to national trends. There also may be an overall payroll growth assumption, currently 2.70%, in projecting aggregate payroll growth for a specific retirement system, and more specifically, perhaps a separate group inside a retirement system. For example, all plans under ERS should have the same GWI assumption, but it could be reasonable for ERS, LECOSRF, and JRS2 to have different payroll growth assumptions based on their individual demographics.

Typically, the payroll growth rate is used in determining the contributions needed to amortize the unfunded actuarial accrued liability. The amortization payments are calculated to be a level percentage of payroll, so as payroll increases over time, these contributions also increase. Thus, the amortization percentage is dependent on the rate at which payroll is assumed to increase.

The best way to estimate this assumption is to produce an open group projection using all of the census data, the demographic assumptions, and the other wage assumptions, in order to project total payroll over the amortization period.

We have performed open group projections, based on the proposed salary scales, demographic assumptions, and increasing the payroll for each cohort of new entrants by the 2.70% GWI assumption. These projections show that payroll will grow over the next couple of decades reasonably close to the 2.70% GWI assumption. Therefore, we are recommending no change to the payroll growth assumption of 2.70% for ERS and LECOS.

Over the last several decades years, the State base salary has not kept pace with price inflation. Although this trend is not sustainable indefinitely, this pattern indicates that general wage inflation may overestimate this assumption. Therefore, we are recommending no change to the payroll growth assumption of 2.30%, consistent with the price inflation assumption, for JRS2.

Demographic Assumptions

Actuaries are guided by the Actuarial Standards of Practice (ASOP) adopted by the Actuarial Standards Board (ASB). One of these standards is ASOP No. 35, *Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations*. This standard provides guidance to actuaries giving advice on selecting noneconomic assumptions for measuring obligations under defined benefit plans. We believe the recommended assumptions in this report were developed in compliance with this standard.

Post-Retirement Mortality Rates

ERS' actuarial liabilities and contribution rates depend in part on how long retirees live. If members live longer than expected, benefits will be paid for a longer period of time and the liability and ultimate contribution rates will be larger than expected.

The mortality table currently being used for non-disabled retirees and for beneficiaries receiving benefits is the 2020 State Retirees of Texas (SRT) mortality tables for males and females. The 2020 SRT tables were developed based on actual experience of ERS members through August 31, 2019. Generational mortality improvements in accordance with Scale MP with immediate convergence are projected from the year 2020.

In determining whether the current table continues to be appropriate, we have weighted the analysis by the liability of the member's monthly annuity. This is consistent with the previous analysis and the development of all national tables, as data shows a clear correlation between income and longevity. By weighting the data, we are giving more weight to members who have larger annuities (and thus have larger liabilities).

We begin by determining the expected number of deaths in each year at each age for males and females. Then we compare the actual number to the expected number. The ratio of the actual deaths to the expected deaths (the A/E ratio) tells us whether the assumptions are reasonable. When using a generational approach for mortality improvement, an A/E of 100% is targeted. However, we will also focus on the pattern across all ages and life expectancy created at individual ages when determining whether the assumption is appropriate.

We have utilized nine years of experience to increase the credibility of the analysis and minimize any variance created by timing of data collection from year to year. Retiree data was not available by regular State employees and LECOs, separately, but those eligible for a LECOSRF benefit (20 years CPO/CO service) could be identified within the overall data. During this time, mortality improvement may have occurred. A general procedure is to adjust the actual experience for mortality improvements during the study period to the central year, in this case 2018. For purposes of this study, proposed mortality rates shown in the tables have been adjusted to the central year 2018 using the proposed projection scales.

We will discuss this in two parts, the recommended base mortality assumption, and the recommended mortality improvement assumption.

Impact from Pandemic

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

Credibility

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

We first measured the credibility of the dataset to determine whether standard, unadjusted tables should be used or if client specific data was warranted. We apply a credibility procedure in accordance with ASOP No. 25, Credibility Procedures to determine partial credibility based on the limited fluctuation method to determine appropriate adjustments to the base table to be applied to each gender within each member classification. We utilized approaches described in this paper:

https://www.soa.org/globalassets/assets/files/static-pages/sections/retirement/credibility-resource-pension.pdf for this analysis. The paper shows that to be +/-5% with 95% confidence requires 1,537 deaths per gender. However, when using a benefit weighted approach to the analysis, even more deaths are required as the variance in the benefit amounts decreases the overall credibility.

During the period, there were 10,967 male deaths and 9,838 female deaths for Regular Employees, indicating they are a highly credible group. The following provides the full details with p=95% and r=5%.

Group	Regular Employees		LECO	
	Male	Female	Male	Female
Actual Deaths	10,967	9,838	1,461	214
Deaths needed for full credibility				
Based on Count	1,537	1,537	1,537	1,537
Based on Annuity Amount	2,393	2,488	1,852	1,778
Z Factor				
Based on Count	100.0%	100.0%	97.4%	37.3%
Based on Annuity Amount	100.0%	100.0%	88.7%	34.7%

Recommended Base Mortality Assumption

Based on non-LECOSRF mortality experience, overall actual to expected ratios were 114% and 112% for males and females, respectively. When compared to the current assumptions, LECOSRF male mortality experience produced an actual to expected ratio of 109%. There was very minimal LECOSRF female mortality experience.

This experience alone would suggest the assumption may be too conservative, but as we noted in the Pandemic comments, the data from fiscal year 2021 and 2022 were especially high and may not be reflective of future experience. We recommend no change to this assumption.

Recommended Mortality Improvement Assumption

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

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

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

In the 2020 report the ultimate mortality improvement rates were modified to be higher at some ages and more precise across different age groups based on historical trends. Specifically, the pattern is 1.35% rate for ages 62 and younger, decreasing linearly to 1.10% at age 80, further decreasing linearly to 0.40% at age 95, and then decreasing linearly to 0.00% at age 115 (and thereafter). In general, the net change in overall liabilities if a retirement system was using the ultimate rates of the MP-2019 table to the ultimate rates of the MP-2020 version is minimal. Basically, the rates at individual ages were changed but the overall pattern over a lifetime is not much different.

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

Recommended Base Mortality Assumption – State Judges

The available mortality experience for State Judges is limited. However, education level is generally a strong predictor of longevity, and this is generally a highly educated group. GRS recommends incorporating a two-year setback (a member age 65 uses the age 63 rate, etc) on the regular employee table in the valuation mortality assumption to reflect the increased longevity of this group. The two-year setback has a similar impact to moving to an above-median income (a proxy for education) on standard published Society of Actuaries tables and although the data is limited, does create a good fit for the observed data.

Group 4 Annuity Conversion Rates

It is currently assumed that the conversion of the cash balances at retirement for Group 4 members will be based on the valuation assumptions and that no subsidy will be willingly passed from the State to the members or from the members to the State. We recommend no change to this assumption.

Disabled Mortality Rates

Because the rate of disability incidence is low for the ERS plans and the disabled mortality rates apply to a very small subsection of plan participants, this is a minor assumption that has little impact on the liabilities of ERS. We recommend no change to the base tables, which uses the same mortality as healthy retirees, set forward three years for males and females, with a minimum mortality rate of 3.0% and 2.5% for males and females, respectively. Additionally, we recommend updating to the same projection scale as discussed above.

Active Mortality Rates

Active mortality is also a minor assumption. Incidence of active deaths is very low in comparison to terminations and retirements. The tables being used are standard tables published by the Society of Actuaries and represent the most recent, most applicable published tables for these populations. We recommend no changes to the base tables and duty/non-duty multipliers. We do recommend updating to the ultimate rates of the mortality improvement rates in the most recent MP tables which have changed slightly.

Disability Rates

This is a very minor assumption for ERS as its overall utilization of the provision is low. Disability experience during the five-year period ending August 31, 2023 has been trending lower. We recommend lowering the probabilities for all groups.

Retirement Rates

The valuation currently uses retirement rates that vary by age, eligibility type, and benefit group. There are also provisions to allow members to retire earlier than the data would expect to reflect sick/annual leave service conversions, service purchases and portability. For the assumption, an Actual to Expected ratio of slightly less than 100% is preferred.

Regular State Employees

Separate age-based retirement rates are used depending on what type of retirement eligibility is reached first:

- "Rule of"-based (Years of Service + Age greater than or equal to Rule of eligibility requirement)
- Non rule-based (Reach required age)

In addition, there is an additional adjustment at first eligibility under Rule-based retirement. GRS recommends continuing this structure.

<u>Members hired before September 1, 2009</u>

Based on recent liability-weighted experience, GRS found that those regular State employees qualifying for a rule-based retirement, both at first eligibility and thereafter, were retiring at a lower rate than expected under the current assumption. Therefore, **GRS reduced both the age-based assumption for rule-based retirements and reduced the add-on percentage at first eligibility**. The resulting actual to expected ratio for rule-based retirements was 91% at first eligibility and 95% for years after first eligibility.

GRS found that, for this same group, the current age-based rates for non rule-based retirements were still a reasonable fit for the observed experience and recommends no change. The actual to expected ratio for non rule-based retirements was 95%.

Members hired on or after September 1, 2009

The current assumptions for Groups 2, 3 and 4 are estimates as very few members in those groups are yet eligible to retire. Currently the retirement rates are based on the Group 1 retirement rates with modifications to the Group 1 rates to reflect the following:

- Age-based retirement reductions are effective in producing longer tenured employees - the more substantial the reduction in benefit, the more substantial the reduction in expected rates of retirement;
- Increased retirement at first eligibility for unreduced benefits to reflect "pent-up demand" to retire due to later unreduced retirement eligibility than Group 1; and
- An overall tendency for the retirement behavior for all benefit groups to ultimately converge at older ages when all groups are eligible for unreduced benefits and the demand for retirement becomes more related to ability to continue to work.

That being said, we did make some modifications to the adjustments being used to reflect the most recent expectations. These adjustments reflect observations that:

- The retirement rates at first eligibility in the Groups 2, 3 and 4 based on the current adjustments were often well in excess of 50% which, based on our experience, is high for what are still relatively young retirement ages.
- Based on experience with other systems, pent-up demand may not be as substantial as would be suggested by simply comparing the accumulated probability of retirement of a Group 1 and Group 2, 3 or 4 member. It seems reasonable to think that expectations regarding career length are actually altered by the provisions in place for a member during their career.

LECOS Employees

Separate age-based retirement rates are used depending on what type of retirement eligibility is reached first:

- 20 years of CPO service
- Age 55 and 10 years of CPO service

In addition, there is an additional adjustment at first eligibility under 20-year CPO retirement. GRS recommends continuing this structure.

Members hired before September 1, 2009

Based on recent liability-weighted experience, GRS found that there were less retirements than expected based on the current 20-year rates both at first eligibility and beyond. GRS made adjustments to the recommended rates which generally **resulted in less expected retirements** under this provision.

Currently, the rates are doubled at first eligibility under the 20-year provision. GRS recommends continuing to use this approach, except at age 50 as there is already a high rate before the doubling and doubling would provide 100% retirement, an unintended result.

The resulting actual to expected ratio for 20-year retirements was 89% at first eligibility and 93% for years after first eligibility.

Based on recent liability-weighted experience, GRS found that there were more retirements than expected based on the current age 55 and 10 years of service retirement rates. GRS made adjustments to the recommended rates which generally **resulted in more expected retirements** under this provision.

The resulting actual to expected ratio for 55 and 10 retirements was 97%.

Members hired on or after September 1, 2009

As with regular State employees, there is little retirement experience on which to base the rates for members hired on or after September 1, 2009. GRS re-examined the adjustments being made and found them to be reasonable. The adjustments do result in high retirement rates being applied in some instances but we find that this is better justified in the public safety population, and the assumption is conservative until more retirement data from this population can be observed.

Elected Officials

The current age-based retirement rates produce an overall actual to expected ratio of 94% which could be considered a reasonable fit. However, GRS found that this was due to more than expected retirements at early ages and less than expected at older ages. Currently there is a 10% rate at younger ages and 20% at older ages. GRS recommends a flat rate of 15% per year until the maximum assumed retirement age of 75. This results in an overall actual to expected ratio of 90%, and is a much better fit to the underlying observed age-based experience.

State Judges

The current age-based retirement rates produce an overall actual to expected ratio of 99%. The observed experience did not suggest that the rates could be better fitted at individual ages and GRS recommends no change.

Termination Rates

Termination rates reflect members who leave state employment for any reason other than death, disability or service retirement. They apply whether the termination is voluntary or involuntary, and whether the member takes a refund or keeps his/her account balance on deposit in ERS. The current termination rates are separated by regular State employees or LECOs, with regular State employees having different rates depending on whether their entry age is before or after age 35. This results in three distinct tables of termination rates. Each of these three termination rate tables is based on service.

In analyzing this assumption, we have weighted the experience by the present value of benefits (PVB), meaning instead of counting members and the number of members that terminate employment, we have summed the PVB and the portion of the PVB that terminates. Setting this assumption by counts can result in an assumption which will accurately predict the number of terminations, but result in gains or losses on liabilities each year. For example, a higher paid member has more liability than a lower paid member, and thus the termination pattern for the higher paid member will have more impact on the future liabilities of the plan. Also, higher paid members may be hired into positions that have lower turnover versus lower paid

members. For the assumption, an Actual to Expected ratio of slightly higher than 100% is preferred to allow for slight conservatism but also to allow for some members returning to employment in the future.

In general, GRS found that the termination rates were still a reasonable fit to the observed experience and recommends only modest adjustments to the rates. GRS recommends no change to the basic structure of the three tables.

The current assumptions produce an A/E ratio for LECOs of 112%. GRS recommends increasing the rates using a multiplier of 1.05, resulting in an A/E ratio of 106% based on the proposed rates.

The current assumptions produce an A/E ratio of 103% for regular State employees with Entry Age At or Younger Than 35. GRS recommends no change to this assumption.

The current assumptions produce an A/E ratio for regular employees with Entry Age Older Than 35 of 98%. GRS recommends decreasing the rates using a multiplier of 0.95, resulting in an A/E ratio of 103% based on the proposed rates.

The final A/E ratios of 106%, 103% and 104%, respectively, show a good fit to the observed data, with small margins of conservatism and reemployment.

The results are shown below ($ in 100,000s):

Termination Rates – LECOs					
		Current Assumptions		Recommended Assumptions	
Service Years	Actual terms	Expected Terms	A/E ratio	Expected Terms	A/E ratio
0	5,757	4,549	127%	4,777	121%
1-4	11,955	11,024	108%	11,575	103%
5-9	6,620	6,424	103%	6,745	98%
≥ 10	5,033	4,314	117%	4,531	111%
Totals	29,365	26,311	**112%**	27,628	**106%**

Termination Rates – Regular Employees / Entry Age At or Younger Than 35					
		Current Assumptions		Recommended Assumptions	
Service Years	Actual terms	Expected Terms	A/E ratio	Expected Terms	A/E ratio
0	6,141	5,002	123%	5,002	123%
1-4	14,149	14,247	99%	14,247	99%
5-9	9,870	10,168	97%	10,168	97%
≥ 10	14,605	14,045	104%	14,045	104%
Totals	44,764	43,462	**103%**	43,462	**103%**

Termination Rates – Regular Employees / Entry Age Older Than 35					
		Current Assumptions		Recommended Assumptions	
Service Years	Actual terms	Expected Terms	A/E ratio	Expected Terms	A/E ratio
0	5,002	4,289	117%	4,074	123%
1-4	11,376	12,054	94%	11,449	99%
5-9	7,335	7,831	94%	7,439	99%
≥ 10	4,704	4,752	99%	4,514	104%
Totals	28,417	28,926	98%	27,476	**103%**

Elected Officials

Currently termination rates for Elected Officials are four percent per year. GRS did not see sufficient evidence in the age or service-based data to refine this assumption. The current actual to expected is 136%. Although conservative, we find this to be appropriate for what is likely a more volatile group from one experience period to the next.

State Judges

Currently termination rates for State Judges are four percent per year. After examining the experience, we did see some service-based trends and recommend implementing service-based rates. The change resulted in better fitting rates at particular service levels and improved the overall actual to expected from 116% to 111%.

Termination Rates – State Judges					
		Current Assumptions		Recommended Assumptions	
Service Years	Actual terms	Expected Terms	A/E ratio	Expected Terms	A/E ratio
0-3	63	44	142%	56	113%
4-7	32	28	113%	28	113%
8-11	13	15	84%	12	113%
12+	2	7	30%	3	60%
Totals	110	95	116%	99	**111%**

Service Conversions at Retirement

We are not recommending any changes for assumptions regarding service adjustments for service conversion at retirement.

Other Assumptions and Refunds

There are other assumptions made in the course of a valuation, such as the percentage of members who are married, the age difference between husbands and wives, the likelihood that a terminating employee will withdraw their account, etc. We are not recommending any changes to these minor assumptions at this time.

Actuarial Methods

Actuarial Cost Method

We recommend continuing to use the Individual Entry Age Normal (IEAN) actuarial cost method. IEAN will generally produce level contribution amounts for each member as a percentage of salary from year to year, and allocates costs among various generations of taxpayers in a reasonable manner. It is by far the most commonly used actuarial cost method for large public retirement systems and the method used for accounting disclosures under GASB Statement No. 67.

For a plan that receives its contribution as a fixed percent of payroll, the IEAN method does, however, eliminate the ability to perform a simple and algebraic calculation of the funding period and contribution requirements. Thus, the funding period will continue to be determined based on an open group projection. In the open group projection, the demographic assumptions are applied to the current active members (many of which are members hired before September 1, 2022) and any members that are assumed to leave employment are replaced one-for-one with new members. Over time this results in the change of the membership to mostly members hired after September 1, 2022 (with the less expensive benefit structure as compared to some of the earlier benefit levels) and incorporates the fact that the normal cost rate will trend down over time. The projection is built to assume no gains or losses on the actuarial accrued liability or the actuarial value of assets.

Asset Valuation (Smoothing) Method

The purpose of asset smoothing is to reduce short-term volatility in actuarial valuation results which are intended for long-term decision making and funding. Periods of poor returns are often followed by some amount of recovery or vice versa, and a market value (unsmoothed) approach, may result in overreaction to short-term market volatility.

We are recommending no change to the asset valuation method. The current method keeps track of individual gains or losses each year and ensures that they are recognized within the 5-year period. If an offsetting gain or loss occurs in a future valuation, the current method would use the offsetting gain or loss to recognize the individual gains or losses more quickly. This method has the benefit of ensuring that any individual gain or loss is recognized in a reasonable timeframe, while eliminating the artificial volatility that is introduced from the more traditional individual gain loss method.

SECTION D

SUMMARY OF ASSUMPTIONS AND METHODS

Summary of Assumptions and Methods
Incorporating the Recommended Assumptions

The assumptions and methods applied in this actuarial valuation may be adopted by the Board of Trustees on March 20, 2024 based on the experience investigation that covered the experience period ending August 31, 2023.

I. Valuation Date

The valuation date is August 31 of each plan year. This is the date as of which the actuarial present value of future benefits and the actuarial value of assets are determined.

II. Actuarial Cost Method

The actuarial valuation is used to determine the adequacy of the State contribution rate (established by Legislative appropriation) and employer contribution rate (established by statute) and to describe the current financial condition of ERS.

The actuarial valuation uses the Entry Age Normal actuarial cost method. Under this method, the first step is to determine the contribution rate (level as a percentage of pay) required to provide the benefits to each member, or the normal cost rate. The normal cost rate consists of two pieces: (i) the member's contribution rate, and (ii) the remaining portion of the normal cost rate which is the employer's normal cost rate. The total normal cost rate is based on the benefits payable to each individual active member.

The Unfunded Actuarial Accrued Liability (UAAL) is the liability for future benefits which is in excess of (i) the actuarial value of assets, and (ii) the present value of future normal costs. The employer contribution provided in excess of the employer normal cost is applied to amortize the UAAL.

The funding period is calculated as the number of years required to fully amortize the UAAL, and is calculated with the use of an open group projection that takes into account: (a) future market earnings, net of investment-related expenses, will equal 7.00% per year, (b) there will be no changes in assumptions, (c) the number of active members will remain unchanged, (d) active members who leave employment will be replaced by new entrants each year, and (e) State and employer contributions will remain the same percentage of payroll as described in Appendix I of the valuation report.

The Entry Age actuarial cost method is an "immediate gain" method (i.e., experience gains and losses are separately identified as part of the UAAL). However, they are amortized over the same period applied to all other components of the UAAL.

III. Actuarial Value of Assets

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

IV. Actuarial Assumptions

Investment Return: 7.00% per year, net of investment-related expenses (composed of an assumed 2.30% inflation rate and a 4.70% real rate of return)

Administrative Expenses: 0.40% of valuation payroll per year for ERS
0.12% of valuation payroll per year for LECOSRF
0.33% of valuation payroll per year for JRS2

Salary Increases: Inflationary pay increases are assumed to occur at the beginning of the year and the remaining pay increases associated with merit, promotion and longevity are assumed to occur at the middle of the valuation year and vary by employee group. The components of the annual increases are:

Employee Group	Inflation ***	Real Wage Growth (Productivity)	Merit, Promotion and Longevity
Elected Class: Legislators	0%	0%	0%
Elected Class: District Attorneys	2.30%	0%	See salary structure below
Elected Class: Other than Legislators and District Attorneys	2.30%	0%	0%
Employee Class	2.30%	included in Merit, Promotion and Longevity Increases	See sample rates
State Base Salary of a District Judge*	2.30%	0%	0%
Inactive members who transfer to TRS**	2.30%	0%	2.50%

* Retirees from the Elected Class are assumed to receive post-retirement increases in accordance with changes in the State base salary of a district judge.

** Assumed in estimating benefits of former members who transfer to the Teacher Retirement System of Texas (TRS).

*** Total liabilities for this valuation reflect the most significant across-the-board pay increases appropriated by the State legislature for the current biennium compared to the assumed rate of inflation.

Sample Rates:

Annual Salary Increases for Merit, Promotion and Longevity Male and Female Regular State Employees							
	Years of Eligibility Service						
Age	0	1	2 - 4	5 - 9	10 - 14	15 - 19	20+
20	6.50 %	4.95 %	4.45 %	4.00 %			
25	6.10	4.95	4.45	3.20	2.20 %		
30	5.60	4.95	4.45	2.70	2.20	1.70 %	
35	5.10	4.45	3.70	2.70	2.20	1.70	1.60 %
40	4.60	4.45	3.70	2.70	2.20	1.60	1.50
45	4.10	3.95	3.45	2.70	2.10	1.60	1.40
50	3.60	3.40	2.90	2.40	1.90	1.40	1.30
55	3.10	2.90	2.50	2.10	1.60	1.30	1.20
60+	2.60	2.40	2.00	1.70	1.30	1.10	1.00

Annual Salary Increases for Merit, Promotion and Longevity Male and Female LECO Members						
	Years of Eligibility Service					
Age	0	1	2 -4	5 - 8	9 - 17	18+
All	6.45 %	4.45 %	2.95 %	1.95 %	1.70 %	1.45 %

District attorneys in the Elected Class are assumed to follow the judicial salary schedule of a district judge as prescribed in Section 659.012 of the Texas Government Code. The salary structure is illustrated below:

Annual Salary Increases for Merit, Promotion and Longevity Male and Female District Attorneys in the Elected Class			
	Years of Eligibility Service as a District Attorney		
Age	Less than 4	4 or more, but less than 8	8 or more
All	State base salary of a district judge	110% of base salary	120% of base salary

New Entrant Wage Growth: 2.70% per year, compounded annually (for increasing new hire salary in open group projection).

New Entrant Profile: The average new hire is determined based on a new entrant profile, which is created from the valuation data by determining the entry age and entry pay for anyone with greater than or equal to three but less than eight years of service as of the valuation date. Each group of

new hires' salaries is assumed to grow at the New Entrant Wage Growth of 2.70% over the salaries of the previous year's group.

Post-Retirement Increases for Elected Class Members: If benefits are based on the State base salary of a district judge, the benefits are assumed to increase 2.30% per year during retirement (each September 1), compounded annually, consistent with the assumed Salary Increase for a district judge. Increases are assumed to also occur during deferral periods (if any). Otherwise, no increases are assumed.

Post-Retirement Increase in Accordance with Section 814.604: Section 814.604 of the Texas Government Code provides for a one-time limited group of retirees to receive a permanent monthly annuity increase once the funding period will remain under the 31-year requirement after the increase is reflected. This timing of this COLA is assumed to be in January, 2025.

Age and Service Assumptions and Methods:

Eligibility Service:

Eligibility Service is considered to be all service eligible for vesting purposes, which includes service earned as a Regular State Employee, a LECO member, a member of the Elected Class, as State Judge, and service earned in the Teacher Retirement System of Texas ("TRS").

Benefit Service:

Current Benefit Service in years and months as of the valuation date was provided by ERS. This service plus Future Earned Service, Service Credit at Retirement, and Eligibility Service at Retirement were used to project benefit amounts.

Future Earned Service:

Active members were assumed to earn one additional year of service credit in each future year employed based on their current class of membership (but not beyond the amount of credit needed to provide a 100% of average monthly compensation standard service retirement annuity).

Service Credit at Retirement:

For regular state employees, service credit when eligible for service retirement is assumed to be increased by:

- 1.0 years if age plus service, prior to adjustment, is greater than or equal to 80;
- 0.5 years if age plus service, prior to adjustment, is less than 80; and

(but not beyond the amount of credit needed to provide a 100% of average monthly compensation standard service retirement annuity).

For LECO members, service credit when eligible for service retirement is assumed to be increased by:

- 1.0 years if CPO/CO service, prior to adjustment, is at least 20 years; and
- 0.5 years if CPO/CO service, prior to adjustment, is less than 20 years.

(but not beyond the amount of credit needed to provide a 100% of average monthly compensation standard service retirement annuity).

For the Elected Class members, there is no assumed increase in service credit when eligible for service retirement.

Entry Age:

Entry age is calculated as the age at the valuation date minus Eligibility Service (excluding TRS service).

Decrement Timing: All decrements – mortality, service retirement, disability retirement, and termination of employment for reasons other than death or retirement – are assumed to occur at the middle of the valuation year.

Mortality Decrements:

Service Retirees, Beneficiaries, and Inactive Members

2020 State Retirees of Texas (SRT) mortality table. Generational mortality improvements in accordance with the ultimate rates from the scale most recently published by Retirement Plans Experience Committee of the Society of Actuaries ("Scale U-MP") and projected from the year 2020. Rates for male LECO members are set forward one year. Sample rates for the base mortality table included below.

Annual Mortality Rates per 100 Individuals		
Age	Males	Females
40	0.0585	0.0369
45	0.1028	0.0667
50	0.1771	0.1179
55	0.3052	0.2086
60	0.5260	0.3691
65	0.9066	0.6530
70	1.5627	1.1554
75	2.6933	2.0443
80	4.6421	3.6170
85	8.0010	6.3997
90	13.8587	11.3793

Active Members

Pub-2010 General Employees Active Member Mortality table for non-LECO members. Pub-2010 Public Safety Active Member Mortality table for LECO members. Generational mortality improvements in accordance with the Ultimate MP scales are projected from the year 2010.

Disability Retirees

2020 State Retirees of Texas (SRT) mortality table, set forward three years for males and females. Minimum rates at all ages of 3.0% and 2.5% for males and females, respectively. Generational mortality improvements in accordance with the Ultimate MP scales are projected from the year 2020.

Occupational Death

1.0% of male and female active member deaths are assumed to be occupational.

Service Retirement Decrements: Graded tables based on ERS experience.

Active Regular State Employees

Service retirement rates are determined by the first set of eligibility requirements satisfied:

- Eligibility A: Age plus eligibility service is greater than or equal to 80 ("Rule of 80")
- Eligibility B: Retirement eligibility other than Rule of 80

Adjustments to the base rates are made to account for age at first eligibility or reduced retirement benefits, based on date of hire (described below sample table).

Base rates for eligible members:

Annual Service Retirement Rates Regular State Employees (Males & Females)		
	Eligibility A	Eligibility B
Age	Rule of 80	Other Age/Service
<50	0.25	
50	0.25	
51	0.25	
52	0.25	
53	0.25	
54	0.24	
55	0.23	
56	0.22	
57	0.21	
58	0.20	
59	0.20	
60	0.20	0.18
61	0.20	0.12
62	0.30	0.20
63	0.25	0.18
64	0.25	0.18
65 -74	0.30	0.27
75	1.00	1.00

Adjustments for members hired before September 1, 2009:

- Eligibility A: Add 0.10 at age of 1st eligibility if prior to age 60

Adjustments for members hired on or after September 1, 2009, but before September 1, 2013:

- Eligibility A: If age of 1st eligibility is before age 60, then
  - rates prior to age 60 are multiplied by 75% for each year prior to age 60
  - at age 60, base table rate plus 0.10

Adjustments for members hired on or after September 1, 2013, but before September 1, 2022:

- Eligibility A: If age of 1st eligibility is before age 62, then
  - rates prior to age 62 are multiplied by 75% for each year prior to age 62
  - at age 62, base table rate plus 0.20

Adjustments for members hired on or after September 1, 2022:

- Eligibility A: If age of 1st eligibility is before age 62, then
  - rates prior to age 62 are multiplied by 75% for each year prior to age 62

Active LECO Members

Service retirement rates are determined by the first set of eligibility requirements satisfied:

- Eligibility A: 20 years of CPO/CO service
- Eligibility B: Age 55 and 10 years of CPO/CO service
- Eligibility C: Any eligibility pertaining to regular State employees (see rates and adjustments for regular State employees)

Adjustments to the base rates are made to account for age at first eligibility or reduced retirement benefits, based on date of hire (described below sample table).

Base rates for eligible members:

Annual Service Retirement Rates LECO Members (Males & Females)			
Eligibility A		Eligibility B	
Age	20 yrs CPO/CO	Age	Age 55 & 10 yrs CPO/CO
<48	0.03		
48	0.05		
49	0.05		
50	0.50	55 - 61	0.20
51 - 59	0.28	62-64	0.30
60 - 74	0.50	65 - 74	0.40
75	1.00	75	1.00

Adjustments for members hired before September 1, 2013:

- Eligibility A and B: Rate set to zero if member has 18 or 19 years of CPO/CO service. Rate is doubled if member has 20 years of CPO/CO service.

Adjustments for members hired on or after September 1, 2013:

- Eligibility A: If age of 1st eligibility is before age 57, then
  - rates prior to age 57 are multiplied by 75% for each year prior to age 57
  - the rate at age 57 is 100%
- Eligibility B: If member will attain 20 years of CPO/CO service at or before age 62, rates are zero prior to age 62 and 80% when member attains 20 years of CPO/CO service.
- Eligibility B: If member will attain 20 years of CPO/CO service after age 62, then
  - rates prior to age 62 are multiplied by 75% for each year prior to age 62
  - the rate at age 62 is the base table rate plus 0.06 times the number of years the age at 1st eligibility was before age 62

Elected Class Members: 15 per 100 participants for members eligible for service retirement starting at age 50. 100% retirement at age 75.

Disability Retirement Decrements: Graded Tables Based on ERS Experience

Active Regular State Employees

- The rates do not apply before someone is eligible for the benefit.
- 10 years of service is required for non-occupational disability retirement.
- Non-occupational disability rates are assumed to be zero once the sum of the member's age and eligibility service is greater than or equal to 80.

Active Elected Class Members and State Judges

- The rates do not apply before someone is eligible for the benefit.
- No occupational disabilities are assumed for the elected class or judges.
- Eight years of service is required for non-occupational disability retirement for Elected Class members.
- Seven years of service is required for non-occupational disability retirement for judges.
- Non-occupational disability rates are assumed to be zero once the member has attained service retirement eligibility.

Sample rates for eligible regular State employees, elected class members, and judges:

Annual Disability Rates per 100 Participants		
	Regular State Employes and Elected Class	
Age	Males	Females
30	0.0220	0.0108
35	0.0520	0.0353
40	0.0599	0.0717
45	0.0821	0.1164
50	0.1187	0.1657
55	0.1981	0.2791
60	0.2992	0.4466

99% of the disability rates stated above are assumed to be attributable to non-occupational disabilities and 1% are assumed to be attributable to occupational disabilities. No occupational disabilities are assumed for the elected class and judges.

Active LECO Members

- The rates do not apply before a member is eligible for the benefit.
- Service greater than zero is required for occupational disability retirement.
- 10 years of service is required for non-occupational disability retirement.
- Non-occupational disability rates are assumed to be zero once the sum of the member's age and eligibility service is greater than or equal to 80, or the member has attained age 55 with 10 or more years of CPO/CO service.

Sample rates for members:

Annual Disability Rates per 100 Participants LECO Members	
Age	Males and Females
30	0.0062
35	0.0209
40	0.0391
45	0.0654
50	0.1183
55	0.1640
60	0.2100

95% of the disability rates stated above are assumed to be attributable to non-occupational disabilities, 4.5% are assumed to be attributable to non-total occupational disabilities, and 0.5% are assumed to be attributable to total occupational disabilities.

Termination Decrements for Reasons Other Than Death or Retirement: Graded Tables Based on ERS Experience.

Rates of termination are zero for members eligible for service retirement. To account for active regular State employees and LECO members that accumulate additional eligibility service at retirement through converting sick/annual leave or other types of service purchases, termination rates are also set to zero in the year prior to first retirement eligibility.

Rates for members not eligible for service retirement:

Active Regular State Employees

Annual Rates of Termination per 100 Participants Regular State Employees		
	Male and Female	
Eligibility Service	Entry age 35 or younger	Entry age over 35
0	25.25	18.65
1	21.24	16.07
2	17.88	13.26
3	15.07	11.08
4	12.76	9.42
5	10.86	8.16
6	9.33	7.21
7	8.09	6.49
8	7.10	5.94
9	6.31	5.50
10	5.67	5.11
11	5.15	4.75
12	4.71	4.39
13	4.32	4.03
14	3.97	3.66
15	3.64	3.29
16	3.30	2.95
17	2.97	2.69
18	2.62	2.53
19	2.27	1.00
20	1.92	1.00
21	1.59	1.00
22	1.29	1.00
23	1.05	1.00
24	0.89	1.00
25+	0.85	1.00

Active LECO Members

Annual Rates of Termination per 100 Participants LECO Members	
Eligibility Service	Male and Female
0	27.77
1	23.21
2	18.54
3	15.07
4	12.51
5	10.64
6	9.26
7	8.22
8	7.38
9	6.67
10	5.99
11	5.33
12	4.71
13	4.14
14	3.71
15	3.51
16	3.02
17	1.21
18	1.21
19+	0.00

Elected Class Members: 4 per 100 participants for members not eligible for service retirement

Withdrawal of Employee Contributions: Members that terminate with a vested benefit are assumed to choose the most valuable option available to them at the time of termination: withdrawal of contributions or deferred annuity.

Percentage of Members Electing Various Benefit Options:

Sex / Benefit	Standard Life Annuity	Option 1	Option 4
Male Member			
Disability	50%	50%	0%
Service Retirement			
Non-LECO	100%	0%	0%
LECO	60%	40%	0%
Death Benefit Plan	0%	85%	15%
Female Member			
Disability	75%	25%	0%
Service Retirement	100%	0%	0%
Death Benefit Plan	0%	70%	30%

The value of the Standard Service Retirement Life Annuity reflects the return of excess contributions payable as a lump sum death benefit in cases the annuity benefits paid are less than the member account balance at the time of retirement.

Beneficiary Characteristics: Male member is assumed to be two years older than female beneficiary; and female member is assumed to be two years younger than male beneficiary.

Transfers from ERS to TRS:

Contributing ERS members:

It is assumed that 10% of regular State employees and LECO members who cease contributing to ERS and do not withdraw employee contributions will transfer ERS service credit to TRS at retirement.

Noncontributing ERS Members:

Records of ERS and TRS are matched by ERS staff to determine former ERS members who are currently contributing under TRS.

TRS Retirement Age:

Former ERS members who are, or are assumed to become, contributing TRS members are assumed to continue to earn service credit under TRS until first eligible for unreduced service retirement benefits, retire at that time, and transfer ERS service credit to TRS.

Major assumptions specific to the Judicial Retirement System

Mortality Decrements:

Service Retirees, Beneficiaries, and Inactive Members

2020 State Retirees of Texas (SRT) mortality tables set back two years. Generational mortality improvements in accordance with the ultimate rates from the scales published in 2020 by Retirement Plans Experience Committee of the Society of Actuaries ("Ultimate MP") and projected from the year 2020.

Service Retirement Decrements: Graded Tables Based on JRS-1 and JRS-2 Experience

Eligibility Service is used to determine when the rates apply:

- Age 65 with ten years of service, if member currently holding judicial office
- Age 65 with twelve years of service
- Twenty years of service
- Age plus service equal to or greater than 70, if member has at least twelve years of service on an appellate court

Annual Service Retirement Rates State Judges		
	Male and Female	
Age	Unreduced	Reduced
50 - 64	0.20	0.10
65 - 69	0.20	N/A
70 - 74	0.25	N/A
75+	1.00	N/A

Members are assumed to retire when they are projected to have accrued the maximum benefit of 90% of applicable salary, regardless of whether the member elects to continue contributing.

Termination Decrements for Reasons Other Than Death or Retirement:

Annual Termination Rates State Judges	
Service	Rate
0-3	0.05
4-7	0.04
8-11	0.03
12+	0.02

Participants who terminate with at least eight, but less than 12, years of service are assumed to attain the 12 years of eligibility service required for a vested benefit by means of accruing service as a visiting judge.

Census Data and Assets

- The valuation was based on members of ERS as of August 31, 2019 and does not take into account future members.
- All census data was supplied by ERS and was subject to reasonable consistency checks.
- There were data elements that were modified for some members as part of the valuation in order to make the data complete. However, the number of missing data items was immaterial.
- Asset data was supplied by ERS.

Other Actuarial Valuation Procedures

- No provision was made in this actuarial valuation for the limitations of Internal Revenue Code Sections 415 or 401(a)17.
- Valuation payroll (earnings applied to the current valuation year) is the expected payroll for the fiscal year following the valuation date. It is based on reported payroll determined from August member contributions increased to reflect the across-the-board salary increases appropriated by the State legislature, effective on or after September 1, and projected according to the actuarial assumptions for the upcoming fiscal year.
- No liability was included for benefits which are funded by special State appropriations.
- State appropriations for membership fees are currently immaterial in relation to the overall payroll contributions and have been ignored.

SECTION E

SUMMARY OF DATA AND EXPERIENCE

Retirement Experience for the Five-Year Period Ending August 31, 2023

Regular State Employees - Males and Females

First retirement eligibility: Rule of 80, at First Eligibility Age

Weighted by Liability in $100,000's

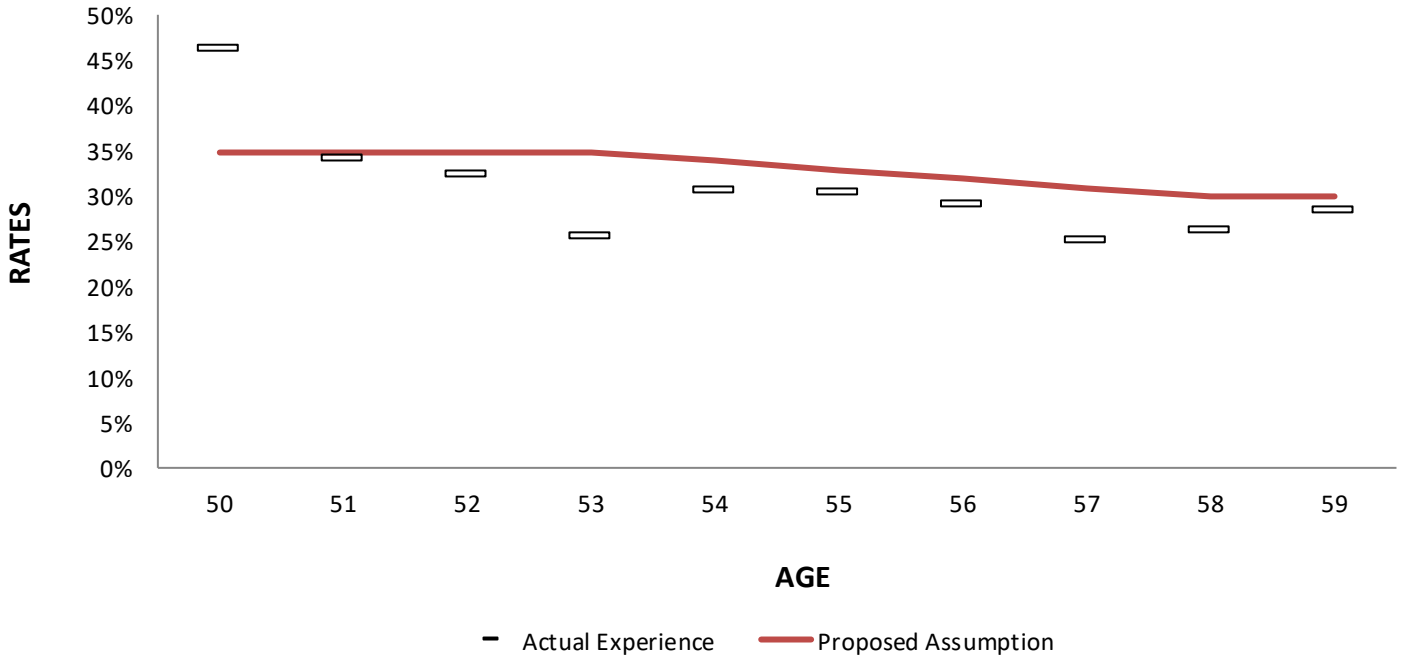
Age	Actual Retirement	Total Count	Actual Rate	Proposed Rate	Expected Retirement (3) * (5)	Actual/ Expected (2) / (6)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
50	$621	$1,339	46%	35%	$469	132%
51	885	2,585	34%	35%	905	98%
52	1,257	3,868	33%	35%	1,354	93%
53	984	3,845	26%	35%	1,346	73%
54	971	3,157	31%	34%	1,074	90%
55	884	2,894	31%	33%	955	93%
56	804	2,748	29%	32%	879	92%
57	598	2,382	25%	31%	738	81%
58	569	2,160	26%	30%	648	88%
59	568	1,999	28%	30%	600	95%
Total	$8,143	$26,977	30%	33%	$8,968	91%

*Includes all Regular State Employees in their first year of eligibility for Rule of 80 prior to other retirement eligibilities. Members may be beyond their initial retirement eligibility at the time of inclusion in the retirement experience. For example, the age 60 experience may include someone who is age 60 with 22 years of service. This person was first eligible for retirement at age 59 with 21 years of service, a "Rule of" retirement.

Retirement Experience for the Five-Year Period Ending August 31, 2023

Regular State Employees - Males and Females

First retirement eligibility: Rule of 80



Retirement Experience for the Five-Year Period Ending August 31, 2023

Regular State Employees - Males and Females

First retirement eligibility: Rule of 80, after First Eligibility Age

Weighted by Liability in $100,000's

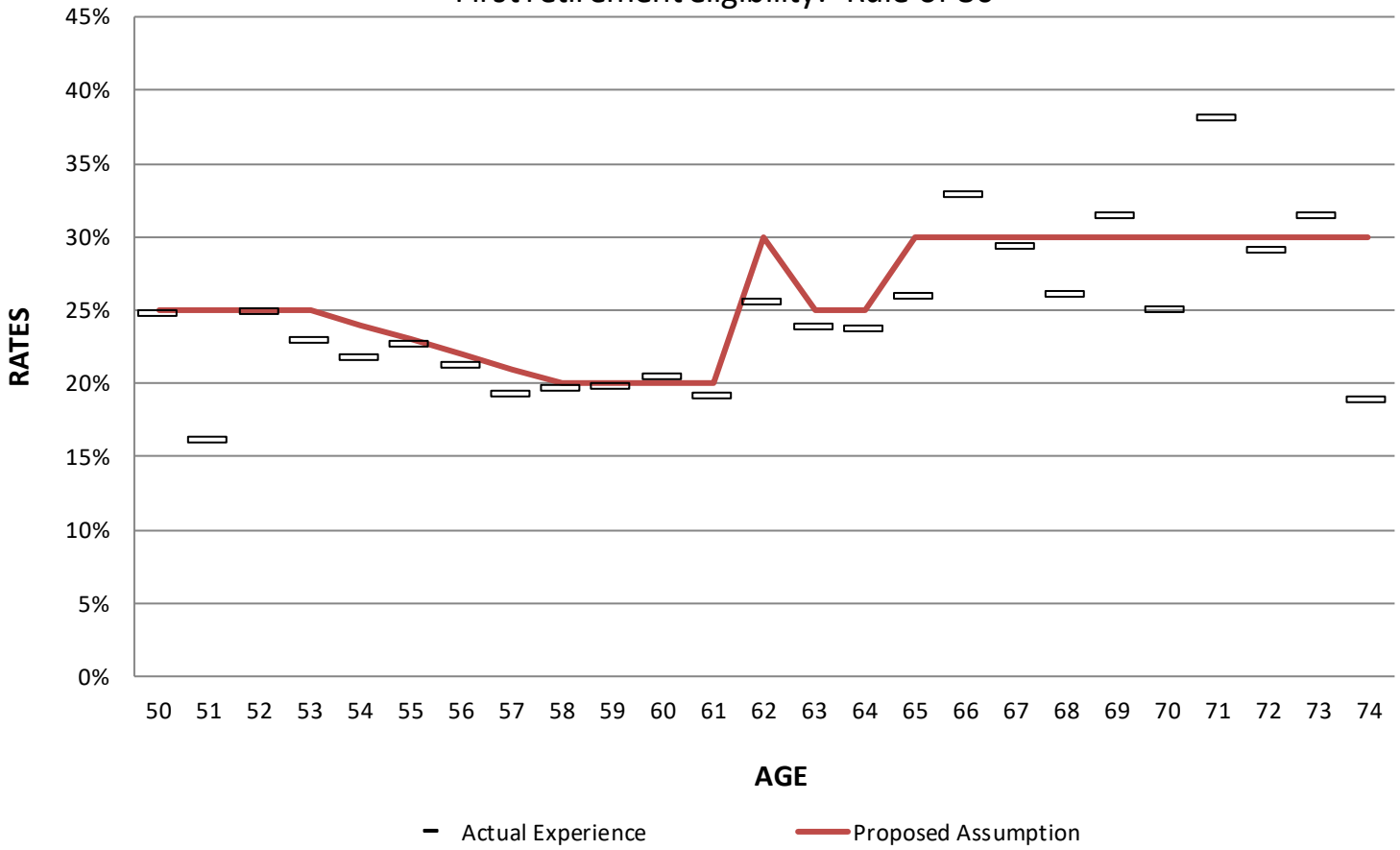
Age	Actual Retirement	Total Count	Actual Rate	Proposed Rate	Expected Retirement (3) * (5)	Actual/ Expected (2) / (6)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
50	$71	$288	25%	25%	$72	99%
51	179	1,111	16%	25%	278	64%
52	713	2,867	25%	25%	717	99%
53	1,172	5,128	23%	25%	1,282	91%
54	1,575	7,247	22%	24%	1,739	91%
55	1,894	8,385	23%	23%	1,929	98%
56	1,856	8,766	21%	22%	1,928	96%
57	1,812	9,413	19%	21%	1,977	92%
58	1,980	10,102	20%	20%	2,020	98%
59	2,004	10,145	20%	20%	2,029	99%
60	2,092	10,252	20%	20%	2,050	102%
61	1,915	10,048	19%	20%	2,010	95%
62	2,181	8,533	26%	30%	2,560	85%
63	1,514	6,373	24%	25%	1,593	95%
64	1,180	4,992	24%	25%	1,248	95%
65	1,002	3,867	26%	30%	1,160	86%
66	976	2,969	33%	30%	891	110%
67	563	1,917	29%	30%	575	98%
68	337	1,292	26%	30%	388	87%
69	292	931	31%	30%	279	105%
70	152	609	25%	30%	183	83%
71	176	461	38%	30%	138	127%
72	83	287	29%	30%	86	97%
73	78	250	31%	30%	75	104%
74	30	158	19%	30%	48	62%
Total	$25,827	$116,393	22%	23%	$27,255	95%

*Includes all Regular State Employees who reached eligibility for Rule of 80 prior to other retirement eligibilities, but are NOT in their first year of eligibility. For example, the age 60 experience may include someone who is age 60 with 22 years of service. This person was first eligible for retirement at age 59 with 21 years of service, a “Rule of” retirement.

Retirement Experience for the Five-Year Period Ending August 31, 2023

Regular State Employees - Males and Females

First retirement eligibility: Rule of 80



Retirement Experience for the Five-Year Period Ending August 31, 2023

Regular State Employees - Males and Females

First retirement eligibility other than Rule of 80*

Weighted by Liability in $100,000's

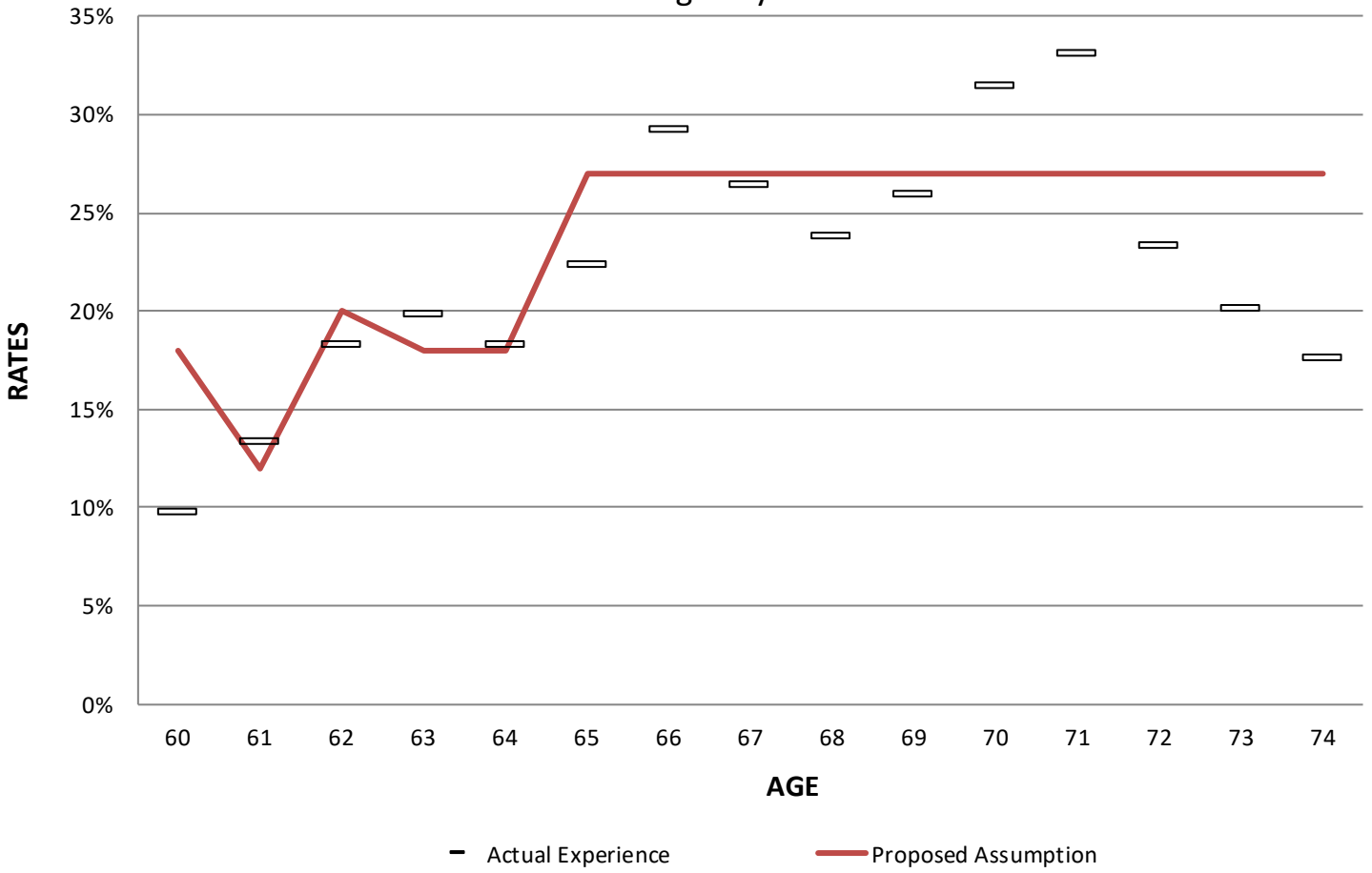
Age	Actual Retirement	Total Count	Actual Rate	Proposed Rate	Expected Retirement (3) * (5)	Actual/ Expected (2) / (6)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
60	$234	$2,404	10%	18%	$433	54%
61	335	2,519	13%	12%	302	111%
62	475	2,596	18%	20%	519	92%
63	485	2,447	20%	18%	440	110%
64	400	2,188	18%	18%	394	101%
65	538	2,411	22%	27%	651	83%
66	647	2,213	29%	27%	597	108%
67	469	1,773	26%	27%	479	98%
68	318	1,337	24%	27%	361	88%
69	280	1,082	26%	27%	292	96%
70	268	853	31%	27%	230	117%
71	188	567	33%	27%	153	123%
72	94	404	23%	27%	109	87%
73	65	323	20%	27%	87	75%
74	46	262	18%	27%	71	65%
Total	$4,842	$23,378	21%	22%	$5,118	95%

*Includes all Regular State Employees who reached eligibility for retirement prior to reaching Rule of 80. Members may be beyond their initial retirement eligibility at the time of inclusion in the retirement experience. For example, the age 61 experience may include someone who is age 61 with 12 years of service. This person was first eligible for retirement at age 60 with 11 years of service, an age and service combination not meeting Rule of 80.

Retirement Experience for the Five-Year Period Ending August 31, 2023

Regular State Employees - Males and Females

First retirement eligibility other than Rule of 80



Retirement Experience for the Five-Year Period Ending August 31, 2023

LECO Members - Males and Females

First retirement eligibility: 20 years of CPO/CO service, At First Eligbility

Weighted by Liability in $100,000's

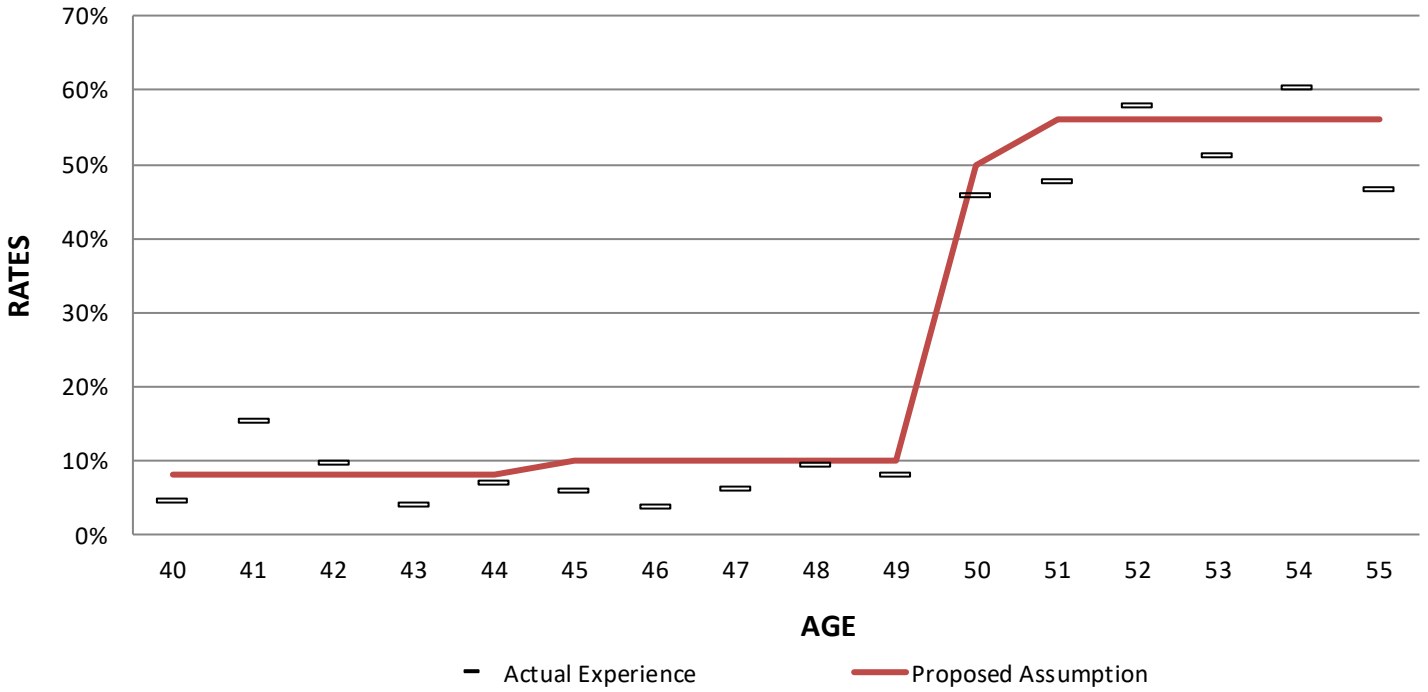
Age	Actual Retirement	Total Count	Actual Rate	Proposed Rate	Expected Retirement (3) * (5)	Actual/ Expected (2) / (6)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
40	$8	$191	4%	8%	$15	54%
41	22	145	15%	8%	12	183%
42	29	309	9%	8%	25	116%
43	9	235	4%	8%	19	47%
44	16	236	7%	8%	19	84%
45	16	286	6%	10%	29	56%
46	11	298	4%	10%	30	36%
47	16	268	6%	10%	27	60%
48	29	317	9%	10%	32	90%
49	24	298	8%	10%	30	79%
50	154	337	46%	50%	169	91%
51	114	240	48%	56%	134	85%
52	99	171	58%	56%	96	103%
53	112	221	51%	56%	124	91%
54	108	179	60%	56%	100	108%
55	65	139	46%	56%	78	83%
Total	$831	$3,870	21%	24%	$939	89%

*Includes all LECOs who reached eligibility for retirement under the 20 years of CPO/CO service provisions prior to other retirement eligibilities and are in their first year of eligibility.

Retirement Experience for the Five-Year Period Ending August 31, 2023

LECO Members- Males and Females

First Eligibility: 20 or more years of CPO/CO service, At First Eligibility



Retirement Experience for the Five-Year Period Ending August 31, 2023

LECO Members - Males and Females

First retirement eligibility: 20 years of CPO/CO service, After First Eligbility

Weighted by Liability in $100,000's

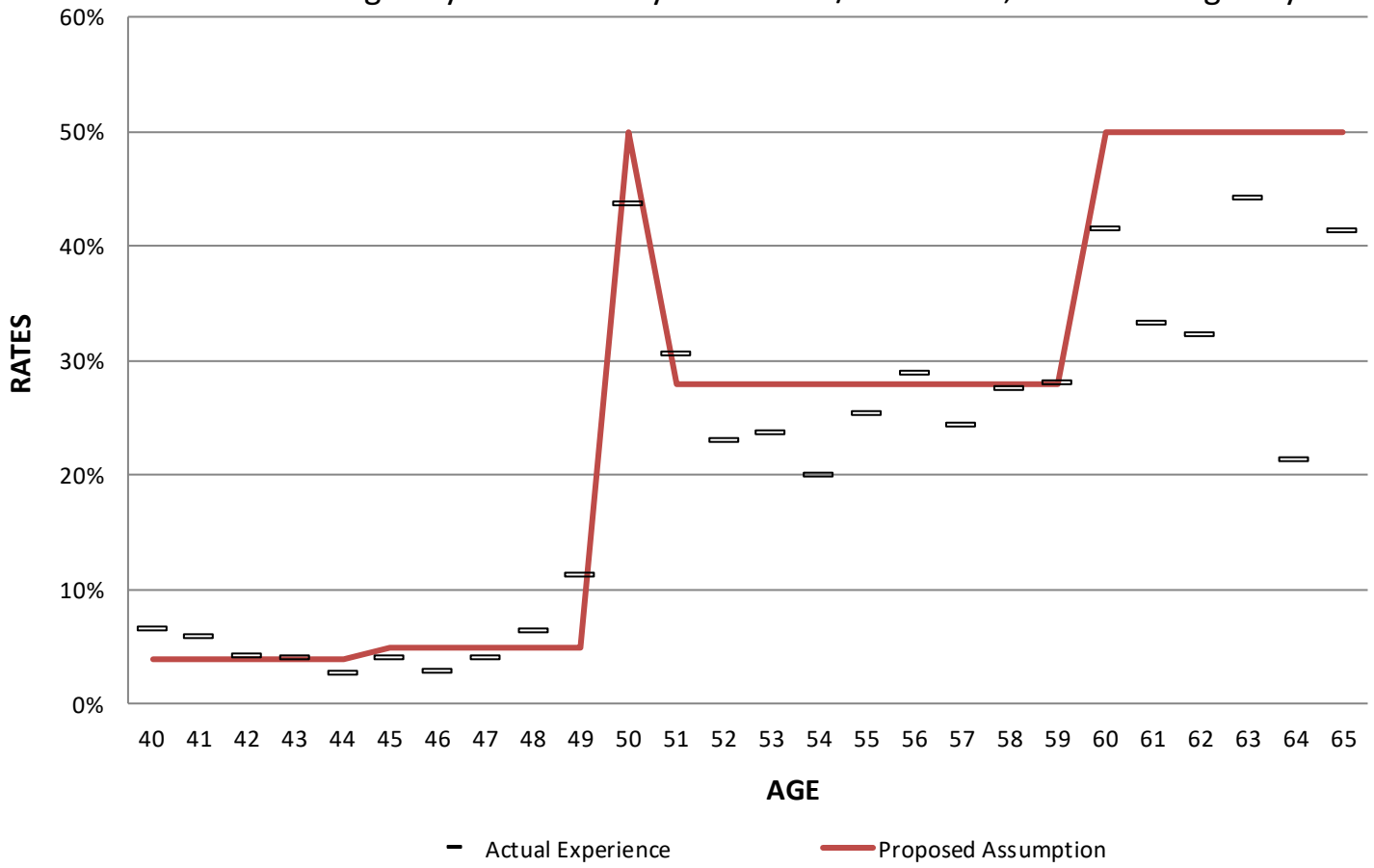
Age	Actual Retirement	Total Count	Actual Rate	Proposed Rate	Expected Retirement (3) * (5)	Actual/ Expected (2) / (6)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
40	$15	$238	6%	4%	$10	154%
41	32	550	6%	4%	22	144%
42	39	953	4%	4%	38	101%
43	62	1,560	4%	4%	62	100%
44	62	2,356	3%	4%	94	66%
45	125	3,171	4%	5%	159	79%
46	115	4,208	3%	5%	210	55%
47	213	5,308	4%	5%	265	80%
48	419	6,718	6%	5%	336	125%
49	846	7,541	11%	5%	377	224%
50	3,582	8,211	44%	50%	4,106	87%
51	1,563	5,124	30%	28%	1,435	109%
52	955	4,163	23%	28%	1,166	82%
53	798	3,373	24%	28%	944	85%
54	605	3,041	20%	28%	852	71%
55	627	2,483	25%	28%	695	90%
56	556	1,937	29%	28%	542	103%
57	348	1,433	24%	28%	401	87%
58	314	1,145	27%	28%	321	98%
59	220	787	28%	28%	220	100%
60	235	568	41%	50%	284	83%
61	115	348	33%	50%	174	66%
62	82	255	32%	50%	127	65%
63	63	143	44%	50%	71	89%
64	15	71	21%	50%	36	42%
65	22	54	41%	50%	27	82%
66	25	34	74%	50%	17	146%
67	0	19	2%	50%	9	5%
68	21	28	74%	50%	14	146%
69	0	8	0%	50%	4	0%
70	6	6	100%	50%	3	208%
71	0	9	0%	50%	4	0%
72	5	27	17%	50%	13	36%
73	6	34	18%	50%	17	35%
74	5	30	18%	50%	15	36%
Total	$12,096	$65,931	18%	20%	$13,070	93%

*Includes all LECOs who reached eligibility for retirement under the 20 years of CPO/CO service provisions prior to other retirement eligibilities and are beyond their first year of eligibility. For example, the age 60 experience may include someone who is age 60 with 28 years of CPO/CO service. This person was first eligible for retirement at age 52 with 20 years of service, a service-based retirement.

Retirement Experience for the Five-Year Period Ending August 31, 2023

LECO Members- Males and Females

First Eligibility: 20 or more years of CPO/CO service, After First Eligibility



Retirement Experience for the Five-Year Period Ending August 31, 2023

LECO Members - Males and Females

First retirement eligibility: Age 55 & 10 years of CPO/CO service*

Weighted by Liability in $100,000's

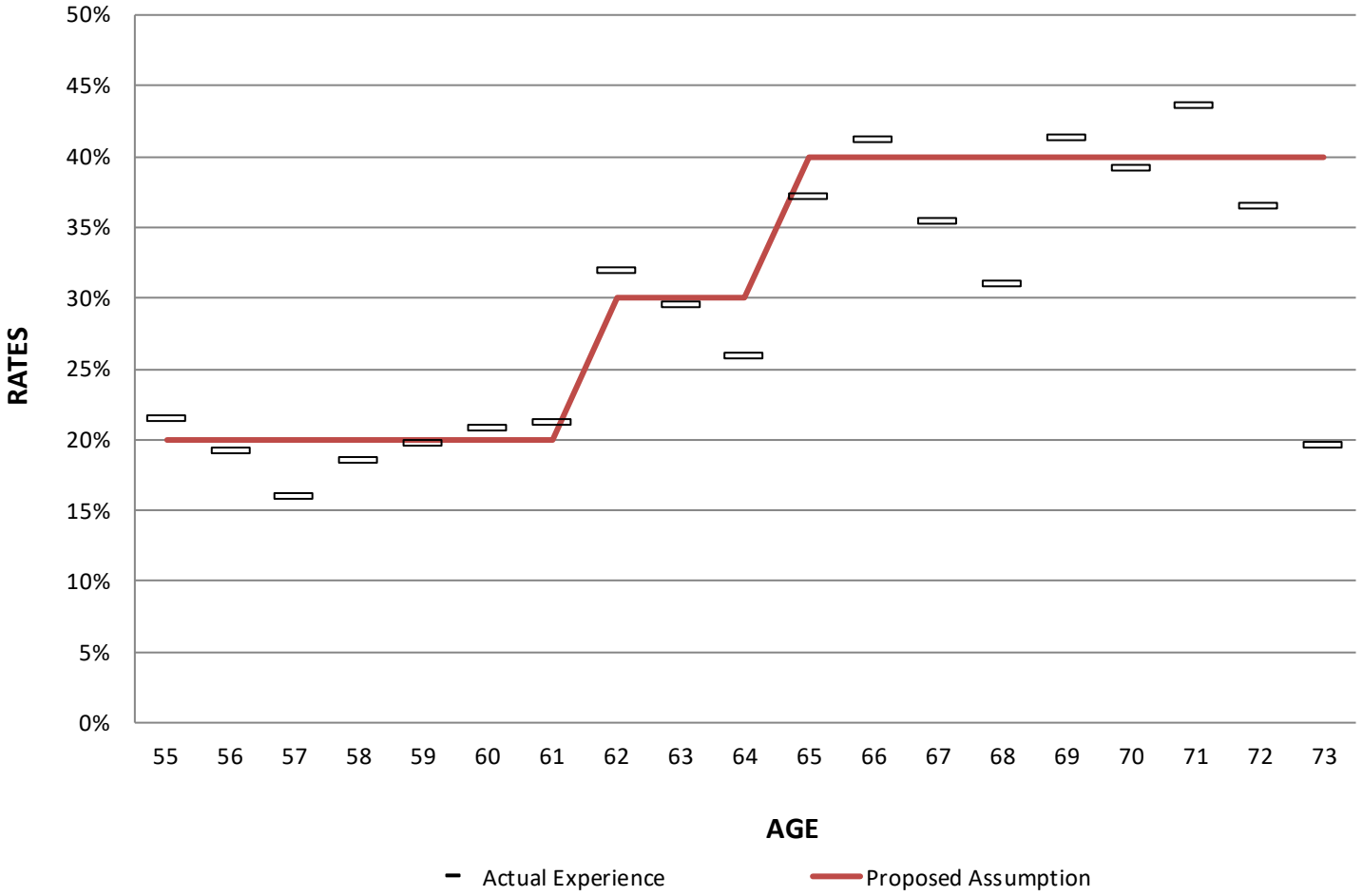
Age	Actual Retirement	Total Count	Actual Rate	Proposed Rate	Expected Retirement (3) * (5)	Actual/ Expected (2) / (6)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
55	$544	$2,540	21%	20%	$508	107%
56	451	2,350	19%	20%	470	96%
57	355	2,226	16%	20%	445	80%
58	412	2,222	19%	20%	444	93%
59	429	2,169	20%	20%	434	99%
60	444	2,141	21%	20%	428	104%
61	406	1,917	21%	20%	383	106%
62	574	1,801	32%	30%	540	106%
63	421	1,428	29%	30%	428	98%
64	293	1,132	26%	30%	340	86%
65	344	928	37%	40%	371	93%
66	279	679	41%	40%	272	103%
67	170	478	35%	40%	191	89%
68	112	362	31%	40%	145	77%
69	115	280	41%	40%	112	103%
70	70	179	39%	40%	72	97%
71	59	135	44%	40%	54	109%
72	31	85	36%	40%	34	91%
73	12	62	20%	40%	25	48%
74	16	56	29%	40%	22	74%
Total	$5,536	$23,169	24%	25%	$5,718	97%

*Includes all LECOs who reached eligibility for retirement under the 55 and 10 years of CPO/CO service provisions prior to other retirement eligibilities. Members may be beyond their initial retirement eligibility at the time of inclusion in the retirement experience. For example, the age 60 experience may include someone who is age 60 with 14 years of CPO/CO service. This person was first eligible for retirement at age 56 with 10 years of service, an age-based retirement.

Retirement Experience for the Five-Year Period Ending August 31, 2023

LECO Members- Males and Females

First eligibility: Age 55 & 10 years of CPO/CO service



Withdrawal Experience for the Five-Year Period Ending August 31, 2023*

Regular State Employees - Males and Females

Entry age of 35 or younger

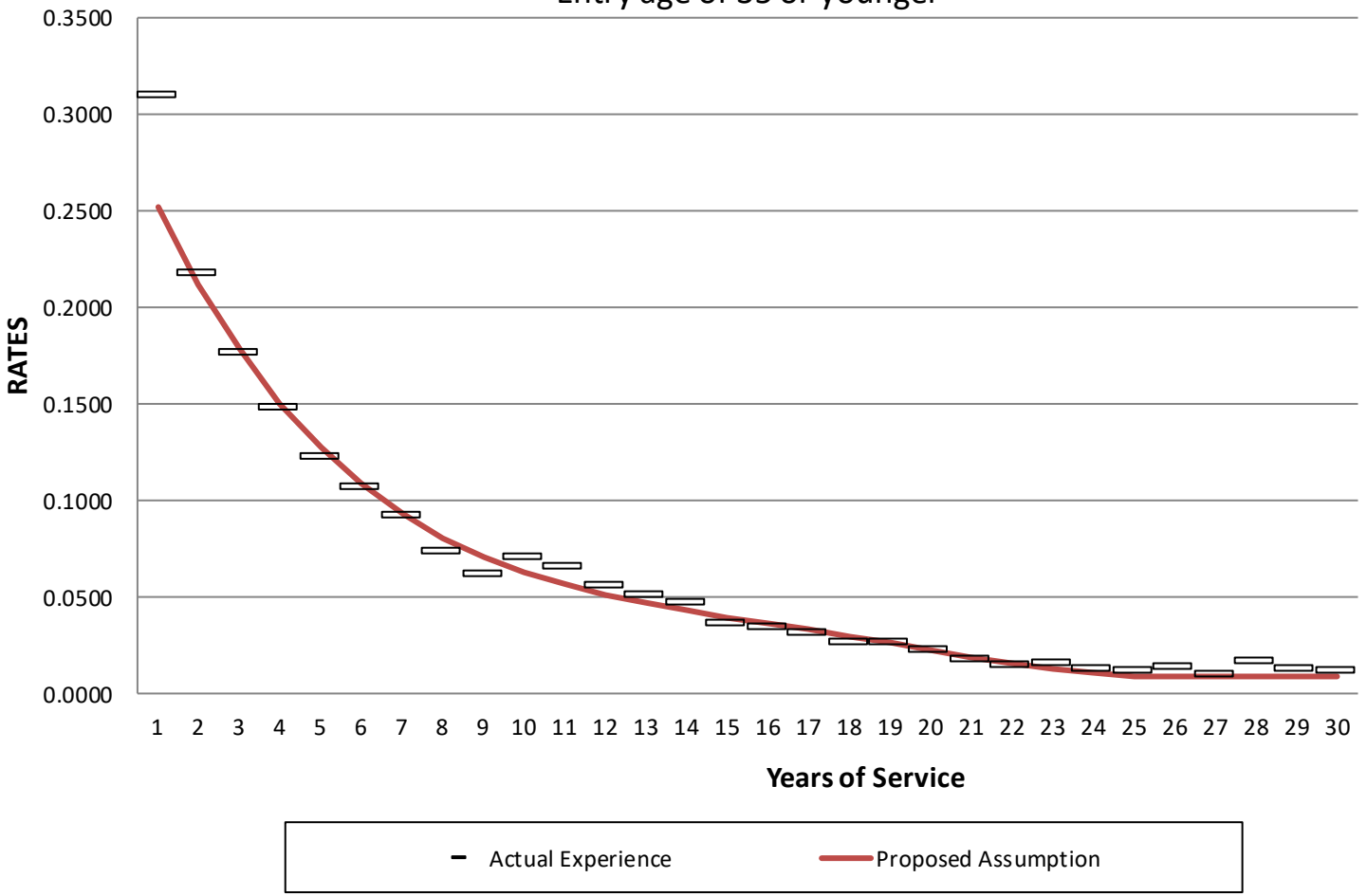
Years of Service	Actual Withdrawal	Total Count	Actual Rate	Proposed Rate	Expected Withdrawal (3) * (5)	Actual/ Expected (2) / (6)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	6,141	19,810	0.3100	0.2525	5002	123%
2	4,496	20,669	0.2175	0.2124	4391	102%
3	3,740	21,164	0.1767	0.1788	3783	99%
4	3,192	21,575	0.1479	0.1507	3252	98%
5	2,721	22,113	0.1230	0.1276	2821	96%
6	2,465	23,102	0.1067	0.1086	2510	98%
7	2,263	24,533	0.0922	0.0933	2289	99%
8	1,860	25,098	0.0741	0.0809	2031	92%
9	1,546	25,088	0.0616	0.0710	1782	87%
10	1,736	24,659	0.0704	0.0631	1556	112%
11	1,585	24,005	0.0660	0.0567	1361	116%
12	1,412	25,074	0.0563	0.0515	1291	109%
13	1,391	27,225	0.0511	0.0471	1282	108%
14	1,386	29,466	0.0471	0.0432	1274	109%
15	1,118	30,434	0.0367	0.0397	1209	92%
16	1,048	30,736	0.0341	0.0364	1118	94%
17	996	31,648	0.0315	0.0330	1046	95%
18	862	32,596	0.0264	0.0297	967	89%
19	896	33,917	0.0264	0.0262	888	101%
20	846	37,538	0.0225	0.0227	852	99%
21	733	41,444	0.0177	0.0192	796	92%
22	579	39,379	0.0147	0.0159	626	92%
23	547	35,340	0.0155	0.0129	456	120%
24	407	30,589	0.0133	0.0105	321	127%
25	290	25,000	0.0116	0.0089	223	130%
26	261	19,254	0.0136	0.0085	165	158%
27	124	11,934	0.0104	0.0085	102	122%
28	95	5,694	0.0167	0.0085	49	194%
29	27	1,997	0.0133	0.0085	17	157%
30	3	245	0.0123	0.0085	2	151%
Total	44,764	741,326	0.0604		43,462	103%

*Withdrawal indicates any termination of active employment for reasons other than death, disability or retirement.

Withdrawal Experience for the Ten-Year Period Ending August 31, 2023

Regular State Employees - Males and Females

Entry age of 35 or younger



Withdrawal Experience for the Ten-Year Period Ending August 31, 2023*

Regular State Employees - Males and Females

Entry age over 35

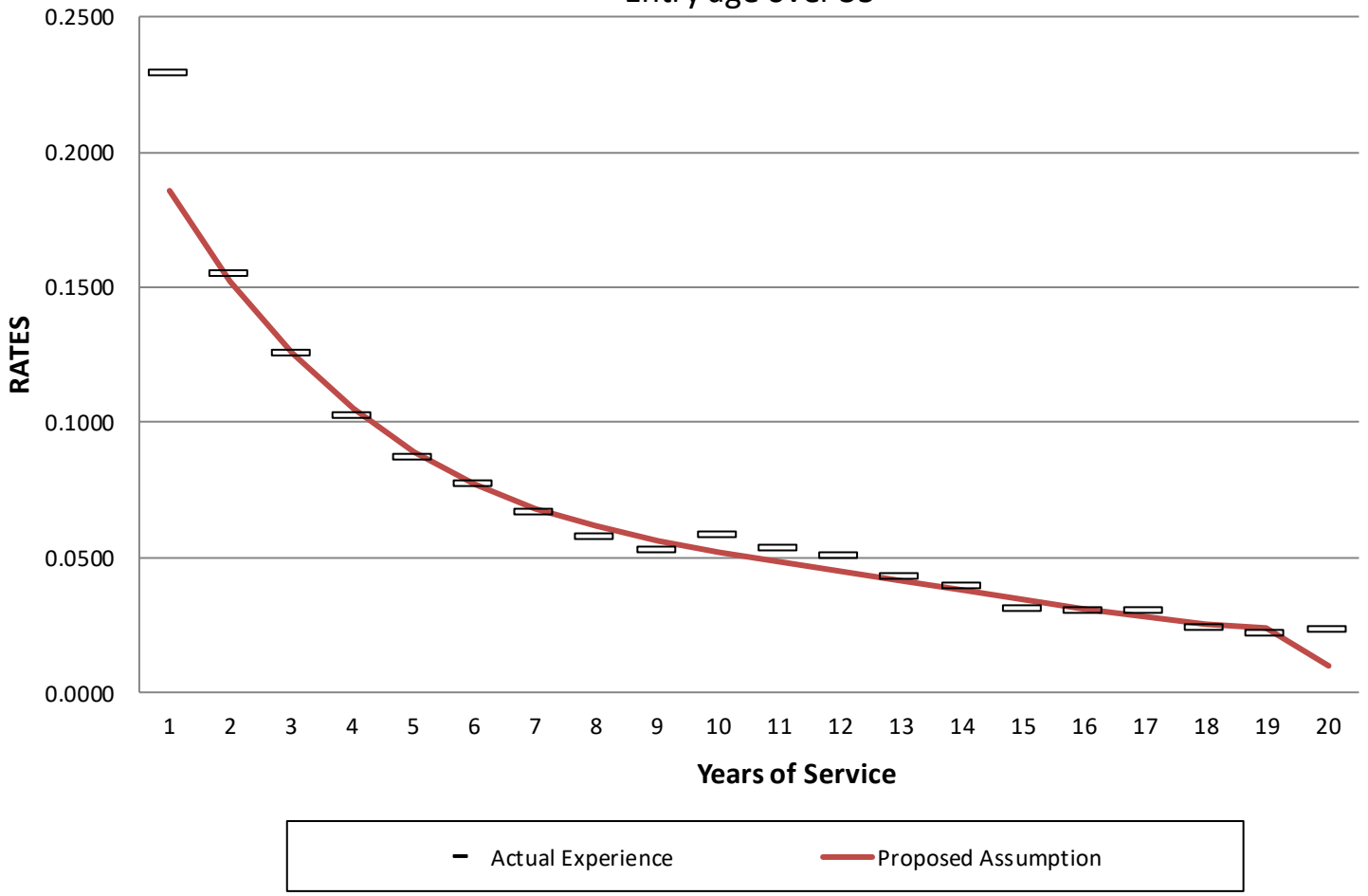
Years of Service	Actual Withdrawal	Total Count	Actual Rate	Proposed Rate	Expected Withdrawal (3) * (5)	Actual/ Expected (2) / (6)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	5,002	21,851	0.2289	0.1864	4074	123%
2	3,668	23,638	0.1552	0.1526	3608	102%
3	3,074	24,457	0.1257	0.1260	3081	100%
4	2,497	24,420	0.1022	0.1053	2571	97%
5	2,137	24,475	0.0873	0.0895	2189	98%
6	1,900	24,542	0.0774	0.0775	1901	100%
7	1,677	25,230	0.0665	0.0685	1728	97%
8	1,430	24,824	0.0576	0.0617	1531	93%
9	1,152	21,792	0.0529	0.0564	1230	94%
10	1,176	20,100	0.0585	0.0522	1049	112%
11	955	17,929	0.0533	0.0485	870	110%
12	854	16,874	0.0506	0.0451	761	112%
13	685	15,995	0.0428	0.0417	667	103%
14	594	15,135	0.0392	0.0383	579	103%
15	429	13,891	0.0309	0.0347	482	89%
16	375	12,524	0.0299	0.0313	391	96%
17	335	11,018	0.0304	0.0281	309	109%
18	225	9,305	0.0241	0.0255	237	95%
19	162	7,459	0.0217	0.0240	179	90%
20	91	3,946	0.0232	0.0100	39	235%
Total	28,417	359,405	0.0791		27,476	103%

*Withdrawal indicates any termination of active employment for reasons other than death, disability or retirement.

Withdrawal Experience for the Ten-Year Period Ending August 31, 2023

Regular State Employees - Males and Females

Entry age over 35



Withdrawal Experience for the Ten-Year Period Ending August 31, 2023*

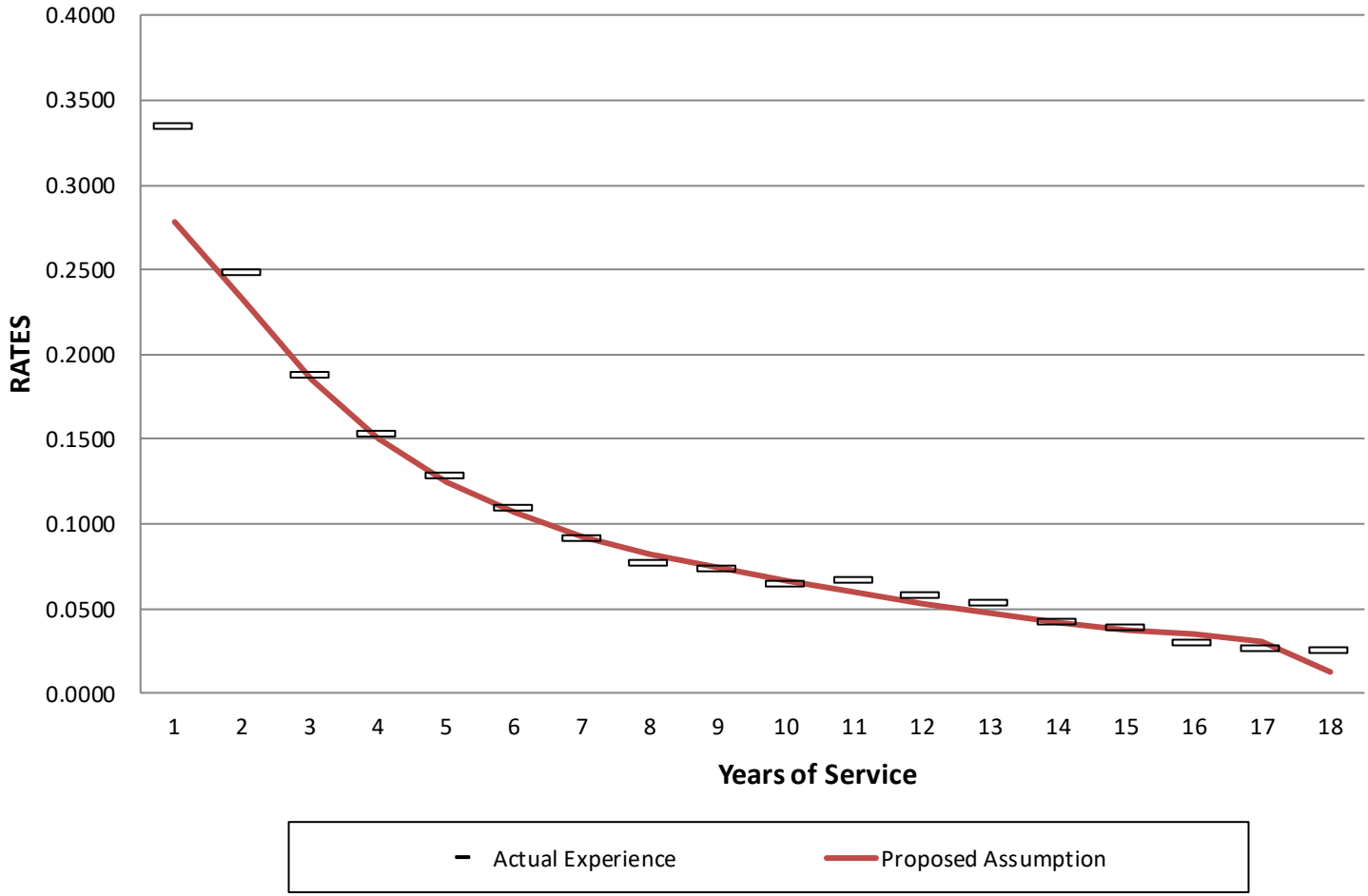
LECO Members- Males and Females

Years of Service	Actual Withdrawal	Total Count	Actual Rate	Proposed Rate	Expected Withdrawal (3) * (5)	Actual/ Expected (2) / (6)
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	5,757	17,199	0.3347	0.2777	4777	121%
2	4,315	17,441	0.2474	0.2321	4047	107%
3	3,058	16,336	0.1872	0.1854	3029	101%
4	2,465	16,129	0.1528	0.1507	2430	101%
5	2,117	16,541	0.1280	0.1251	2069	102%
6	1,834	16,901	0.1085	0.1064	1798	102%
7	1,562	17,156	0.0910	0.0926	1589	98%
8	1,306	16,984	0.0769	0.0822	1396	94%
9	1,026	14,064	0.0730	0.0738	1038	99%
10	892	13,864	0.0643	0.0667	924	97%
11	909	13,609	0.0668	0.0599	814	112%
12	803	13,906	0.0577	0.0533	742	108%
13	755	14,208	0.0531	0.0471	670	113%
14	607	14,704	0.0413	0.0414	608	100%
15	557	14,645	0.0380	0.0371	543	103%
16	429	14,568	0.0294	0.0351	511	84%
17	397	14,966	0.0265	0.0302	453	88%
18	319	12,559	0.0254	0.0121	152	210%
19	257	3,123	0.0823	0.0121	38	676%
Total	29,365	278,903	0.1053		27,628	106%

*Withdrawal indicates any termination of active employment for reasons other than death, disability or retirement.

Withdrawal Experience for the Ten-Year Period Ending August 31, 2023

LECO Members- Males and Females



Service-Based Salary Rates

Regular State Employees - Males and Females

	Current Salary Scale		2014-2023 Actual Experience		Proposed Salary Scale	
Years of Service	Total	Step Rate/ Promotional/ Productivity	Total	Step Rate/ Promotional/ Productivity	Total	Step Rate/ Promotional, Productivity
(1)	(2)	(3)	(4)	(6)	(7)	(8)
1	7.33%	5.03%	10.47%	7.71%	7.33%	5.03%
2	6.61%	4.31%	7.65%	4.89%	6.61%	4.31%
3	5.99%	3.69%	6.56%	3.80%	5.99%	3.69%
4	5.93%	3.63%	6.65%	3.89%	5.93%	3.63%
5	5.87%	3.57%	5.80%	3.04%	5.87%	3.57%
6	4.86%	2.56%	5.97%	3.21%	4.86%	2.56%
7	4.82%	2.52%	5.35%	2.59%	4.82%	2.52%
8	4.79%	2.49%	5.31%	2.55%	4.79%	2.49%
9	4.77%	2.47%	5.07%	2.31%	4.77%	2.47%
10	4.76%	2.46%	5.13%	2.37%	4.76%	2.46%
11	4.25%	1.95%	4.89%	2.13%	4.25%	1.95%
12	4.24%	1.94%	5.26%	2.50%	4.24%	1.94%
13	4.23%	1.93%	4.75%	1.99%	4.23%	1.93%
14	4.22%	1.92%	4.68%	1.92%	4.22%	1.92%
15	4.21%	1.91%	4.45%	1.70%	4.21%	1.91%
16	3.76%	1.46%	4.62%	1.86%	3.76%	1.46%
17	3.75%	1.45%	4.26%	1.50%	3.75%	1.45%
18	3.75%	1.45%	4.34%	1.58%	3.75%	1.45%
19	3.74%	1.44%	4.25%	1.49%	3.74%	1.44%
20	3.74%	1.44%	4.23%	1.47%	3.74%	1.44%
21	3.60%	1.30%	4.11%	1.36%	3.60%	1.30%
22	3.60%	1.30%	4.11%	1.35%	3.60%	1.30%
23	3.59%	1.29%	4.00%	1.24%	3.59%	1.29%
24	3.58%	1.28%	3.95%	1.20%	3.58%	1.28%
25	3.58%	1.28%	3.89%	1.13%	3.58%	1.28%
26	3.57%	1.27%	3.96%	1.20%	3.57%	1.27%
27	3.56%	1.26%	3.72%	0.96%	3.56%	1.26%
28	3.54%	1.24%	3.98%	1.22%	3.54%	1.24%
29	3.53%	1.23%	3.73%	0.97%	3.53%	1.23%
30	3.46%	1.16%	3.47%	0.71%	3.46%	1.16%

Current Inflation Assumption	2.30%
Proposed Inflation Assumption	2.30%
Actual CPI-U Inflation for Period	2.76%

Service-Based Salary Rates

LECO Members - Males and Females

	Current Salary Scale		2014-2023 Actual Experience		Proposed Salary Scale	
Years of Service	Total	Step Rate/ Promotional/ Productivity	Total	Step Rate/ Promotional/ Productivity	Total	Step Rate/ Promotional/ Productivity
(1)	(2)	(3)	(4)	(6)	(7)	(8)
1	8.70%	6.40%	11.46%	8.70%	8.70%	6.40%
2	6.70%	4.40%	6.01%	3.26%	6.70%	4.40%
3	5.20%	2.90%	5.98%	3.22%	5.20%	2.90%
4	5.20%	2.90%	6.38%	3.62%	5.20%	2.90%
5	5.20%	2.90%	5.01%	2.25%	5.20%	2.90%
6	4.20%	1.90%	4.97%	2.21%	4.20%	1.90%
7	4.20%	1.90%	4.57%	1.81%	4.20%	1.90%
8	4.20%	1.90%	4.99%	2.23%	4.20%	1.90%
9	4.20%	1.90%	4.10%	1.34%	4.20%	1.90%
10	3.95%	1.65%	3.98%	1.22%	3.95%	1.65%
11	3.95%	1.65%	3.83%	1.07%	3.95%	1.65%
12	3.95%	1.65%	4.52%	1.76%	3.95%	1.65%
13	3.95%	1.65%	4.13%	1.37%	3.95%	1.65%
14	3.95%	1.65%	3.97%	1.21%	3.95%	1.65%
15	3.95%	1.65%	3.81%	1.05%	3.95%	1.65%
16	3.95%	1.65%	4.19%	1.43%	3.95%	1.65%
17	3.95%	1.65%	4.29%	1.53%	3.95%	1.65%
18	3.95%	1.65%	3.95%	1.19%	3.95%	1.65%
19+	3.70%	1.40%	4.01%	1.25%	3.70%	1.40%

Current Inflation Assumption	2.30%
Proposed Inflation Assumption	2.30%
Actual CPI-U Inflation for Period	2.76%

Post-Retirement Mortality Experience

Non-LECO Healthy Males

Age	Actual Deaths*	Total Exposures*	Actual Rate	Assumed Rate		Expected Deaths*		Actual / Expected	
				Current	Proposed	Current	Proposed	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55-59	$ 45	$ 8,631	0.0052	0.0039	0.0039	$ 35	$ 35	128.8%	127.9%
60-64	105	13,188	0.0079	0.0067	0.0067	90	91	115.9%	115.1%
65-69	215	16,509	0.0130	0.0115	0.0116	193	194	111.4%	110.8%
70-74	308	14,859	0.0207	0.0198	0.0199	294	295	104.7%	104.2%
75-79	338	9,533	0.0354	0.0342	0.0343	322	323	104.9%	104.6%
80-84	405	5,814	0.0697	0.0589	0.0589	339	339	119.7%	119.7%
85-89	373	3,171	0.1176	0.1016	0.1012	315	314	118.4%	118.9%
90-94	255	1,170	0.2180	0.1758	0.1746	197	196	129.3%	130.2%
95-99	80	266	0.3019	0.3050	0.3025	76	75	106.1%	107.0%
100-104	11	26	0.4309	0.4973	0.4944	12	12	94.5%	95.1%
105-109	1	1	0.5560	0.4983	0.4965	1	1	111.6%	112.1%
Total	$ 2,136	$ 73,169	0.0292	0.0256	0.0256	$ 1,874	$ 1,874	114.0%	113.9%

* $ in houndred-thousands of liability

Modest differences between current and proposed reflect the recommended change to the latest mortality projection scale.

Post-Retirement Mortality Experience

Non-LECO Healthy Females

Age	Actual Deaths*	Total Exposures*	Actual Rate	Assumed Rate		Expected Deaths*		Actual / Expected	
				Current	Proposed	Current	Proposed	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55-59	$ 41	$ 11,095	0.0037	0.0027	0.0027	$ 31	$ 31	133.4%	132.5%
60-64	105	18,692	0.0056	0.0047	0.0048	91	92	115.2%	114.4%
65-69	172	20,560	0.0084	0.0084	0.0084	173	174	99.2%	98.7%
70-74	219	14,267	0.0153	0.0148	0.0149	209	210	104.6%	104.2%
75-79	206	7,468	0.0275	0.0262	0.0263	192	192	107.1%	106.8%
80-84	194	3,726	0.0520	0.0464	0.0464	170	170	114.3%	114.2%
85-89	183	1,891	0.0965	0.0822	0.0818	152	152	119.7%	120.2%
90-94	149	809	0.1842	0.1459	0.1448	114	113	131.0%	132.0%
95-99	56	195	0.2853	0.2598	0.2577	47	47	117.5%	118.4%
100-104	11	29	0.3854	0.4648	0.4621	12	12	91.0%	91.6%
105-109	1	2	0.4708	0.4983	0.4965	1	1	94.6%	95.0%
Total	$ 1,336	$ 78,734	0.0170	0.0151	0.0152	$ 1,193	$ 1,194	112.0%	111.8%

* $ in houndred-thousands of liability

Modest differences between current and proposed reflect the recommended change to the latest mortality projection scale.