Employees' Retirement System of the State of Hawaii

Actuarial Experience Study
for the period ending June 30, 2024

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August 5, 2025

Board of Trustees
Employees' Retirement System of
The State of Hawaii
City Financial Tower
201 Merchant St., Ste. 1400
Honolulu, HI 96813-2980

Subject: Results of 2025 Experience Study

We are pleased to present our report on the results of the 2025 Experience Study for the Employees' Retirement System of the State of Hawaii (ERS). It includes our recommendations for new actuarial assumptions to be effective for the June 30, 2025 actuarial valuation, and it describes the actuarial impact produced by these recommendations as though they had been effective for the June 30, 2024 actuarial valuation.

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

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

Sincerely,
Gabriel, Roeder, Smith & Company

Joseph P. Newton, FSA
Pension Market Leader

Lewis Ward
Consultant

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SECTION I

EXECUTIVE SUMMARY

Executive Summary

In general, the current assumption set portrayed a reasonable estimate of the future liabilities of ERS, and we are recommending only minor changes. The most significant recommendation is the increase in the salary scale assumption for Police and Fire Employees. Our recommended changes to the current actuarial assumptions may be summarized as follows:

Economic Assumptions

- No change to the current nominal investment return assumption of 7.00%. Based on the current capital market assumptions from ERS' investment consultant and the System's target asset allocation, a 7.00% investment return is very close to the median expected geometric return. We have verified this result against a blending of the current capital market assumptions from twelve shorter term and eight longer term independent sources.

- No change to the assumption that administrative expenses will be 0.40% of covered payroll.

- No change to the inflation assumption of 2.50%.

- No change to the general productivity component of the general wage inflation assumption for General Employees and Teachers or 0.50% or the 1.00% for Police and Fire. This yields a nominal wage inflation assumption of 3.00% and 3.50%, respectively. This assumption represents the average increase in wages in the general economy and is used to index salaries for each cohort of new entrants in projections.

- The assumed salary increase schedules include an ultimate component for general wage inflation that may add on additional increases for individual merit (which would include promotions) and then an additional component for step rates based on service. For all three groups, the salary increases over the past decade have been higher than the current assumptions, but that was during a period when actual inflation was higher than the current 2.50% assumption. If inflation is closer to the 2.50% prospectively, it is reasonable to assume that the actual salary increases will be closer to current assumptions. Also, using a longer period of 20 years yields experience much closer to the current assumptions. Thus, we have the following recommendations to the salary increase schedule.

    - No change to the assumption for General Employees.

    - For Teachers, recommend an 0.1% increase for all years.

    - For Police and Fire Employees, the current assumption approximates the average annual salary increase received by the member over their career, from all sources, to be 5.78%. The proposed assumption set would increase that to 5.84%, a small increase. However, the current assumption set includes much higher increases early in the member's career with more modest increases later in the member's career. Based on the last 20 years of experience, the increases appear to be consistent across the entire career. We have recommended a flat 5.85% for the first 30 years and then 5.00% thereafter.

Mortality Assumptions

- For post-retirement mortality, no changes to the base mortality tables or the improvement scale used to project future improvement.
- For pre-retirement mortality, move to the most recent published table for public sector employees (Pub-2016).

Other Demographic Assumptions

- We recommend updating the termination patterns to reflect recent experience. In general, the new tables have slightly higher rates of turnover.
- We recommend small changes to the retirement patterns for all groups based on experience. The most significant change is adding 2% to the annual probability of retirement for Police and Fire members before age 55.
- We recommend minor changes to the disability patterns for members consistent with experience and future expectations.
- For members that become disabled in the future, we will continue to assume 50% of them will choose the 100% joint and survivor annuity option.
- We recommend slight increases to the assumed amount of sick leave converted to service at retirement for Teachers and Police and Fire.

Actuarial Methods and Policies

- We recommend no change to the current process of estimating the valuation payroll for the upcoming fiscal year.
- We recommend no change to the use of a 4-year smoothing technique to determine the actuarial value of assets, used for determining the funding period.
- We recommend no change to the current funding method. The Entry Age Normal cost method (EAN) is the current funding method being used to allocate the actuarial costs of the System. The Entry Age Normal method will generally produce relatively level contribution amounts as a percentage of payroll from year to year, and allocates costs among various generations of taxpayers in a reasonable manner. It is by far the most commonly used actuarial cost method for large public retirement systems.

- ***Impact of all recommended changes:***
  All values are illustrated based on the valuation as of June 30, 2024.

Item	Current Assumptions	Proposed Assumptions
(1)	(2)	(3)
Total System		
Unfunded Actuarial Accrued Liability ($ in Millions)	$14,008	$14,130
Funded Ratio	63.0%	62.8%
Funding Period	22	22
Police and Fire Only		
Unfunded Actuarial Accrued Liability ($ in Millions)	$2,233	$2,361
Total Normal Cost %	27.12%	27.91%
Funding Period based on current 41% employer contribution rate (years)	22	25
All Other Employees		
Unfunded Actuarial Accrued Liability ($ in Millions)	$11,776	$11,770
Total Normal Cost %	12.93%	12.94%
Funding Period based on current 24% employer contribution rate (years)	22	22

SECTION II

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 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 of the retirement system changes, the assumptions should be reviewed and adjusted accordingly.

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

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, contribution rates, and funding periods for retirement plans, actuaries must make assumptions about the future. Among the assumptions that must be made are:

- 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, recent past experience provides important evidence about the future. For other assumptions, such as the investment return rate, the link between past and future results is much weaker. In either case, though, actuaries should review their assumptions periodically and determine whether these assumptions are consistent with actual past experience and with anticipated future experience.

For this purpose we have reviewed and analyzed ERS's data for the period ending June 30, 2024. We used multiple lengths of time for various assumptions. Sometimes using a 3-6 year period gives too much weight to such short-term effects. Alternatively, sometimes using a longer period would water down real changes that may be occurring, such as mortality improvement or a change in the ages at which members retire.

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. 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. Of course we not only look at the assumptions as a whole, but we also review how well they fit the actual results by sex, by age, and by service.

Finally, if the data leads the actuary to conclude that new tables are needed, the actuary "graduates" or smoothes the results, since the raw results can be quite uneven from age to age or from service to service.

Please bear in mind that, while the recommended assumption set represents our best estimate, there are other reasonable assumption sets that could be supported. Some reasonable assumption sets would show higher or lower liabilities or costs.

Organization of Report

Section I of this report summarizes our recommended changes. Section III contains our findings and a more detailed analysis of our recommendation for each actuarial assumption. The impact of adopting our recommendations on liabilities and contribution rates is shown in Section IV. Section V shows a summary of the recommended assumptions for the System.

Experience Analysis Exhibits

Throughout Section IV you will see exhibits showing the analysis of the System's experience. For the most part, the exhibits should generally be self-explanatory. For example, on page 43, we show the exhibit analyzing the police service-based termination rates (liability weighted). The second column shows the total liability of members who terminated during the study period. This excludes members who died, became disabled or retired. Column (3) shows the total liability of those employees "exposed" to the termination assumption. This is the liability of members who could have terminated during any of the years. In this exhibit, the exposures exclude anyone eligible for retirement. A member is counted in each year they could have terminated, so the total shown is the total exposures for the study period. Column (4) shows the probability of termination based on the raw data. That is, it is the result of dividing the actual liability of terminations (col. 2) by the total liability exposed (col. 3). Column (5) shows the current termination rates and column (6) shows the new recommended termination rates. Columns (7) and (8) show the expected liability of terminations based on the current and proposed termination assumptions. Columns (9) and (10) show the Actual-to-Expected ratios under the current and proposed termination assumptions.

SECTION III

ANALYSIS OF EXPERIENCE AND RECOMMENDATIONS

Analysis of Experience and Recommendations

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

ECONOMIC 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. 27, Selection of Economic Assumptions for Measuring Pension Obligations. This standard provides guidance to actuaries giving advice on selecting economic assumptions for measuring obligations under 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:

1. Is 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, and
5. has no significant bias except when provisions for adverse deviation or plan provisions that are difficult to measure are included.

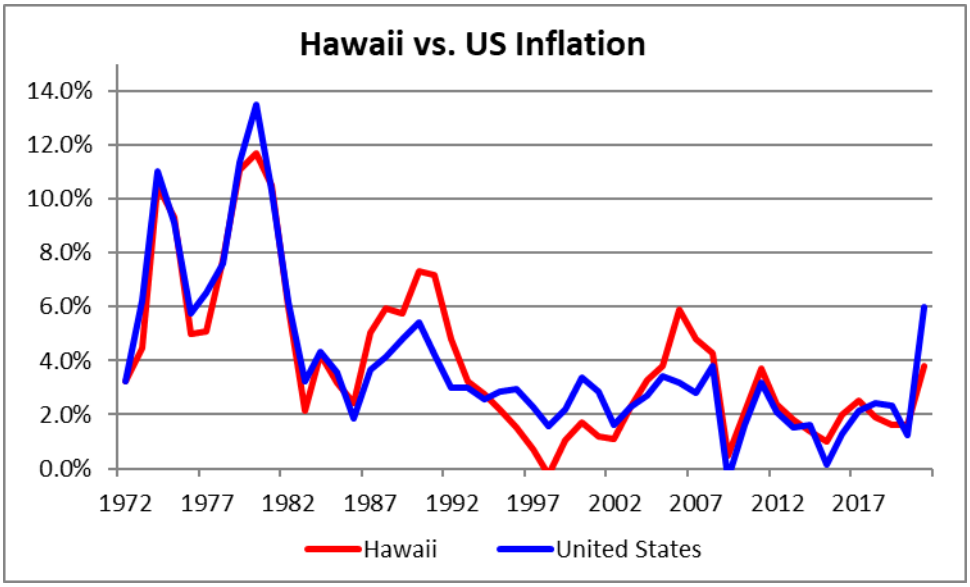
However, the standard explicitly advises an actuary not to give undue weight to recent experience.

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. Nevertheless, the economic assumptions are much more subjective in nature than the demographic assumptions, which in itself can still create a difference in opinion among individuals in the actuarial profession and possibly stakeholders of the Retirement Systems.

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 the rate of payroll growth for amortizing the unfunded actuarial accrued liability. The current annual inflation assumption is 2.50%.

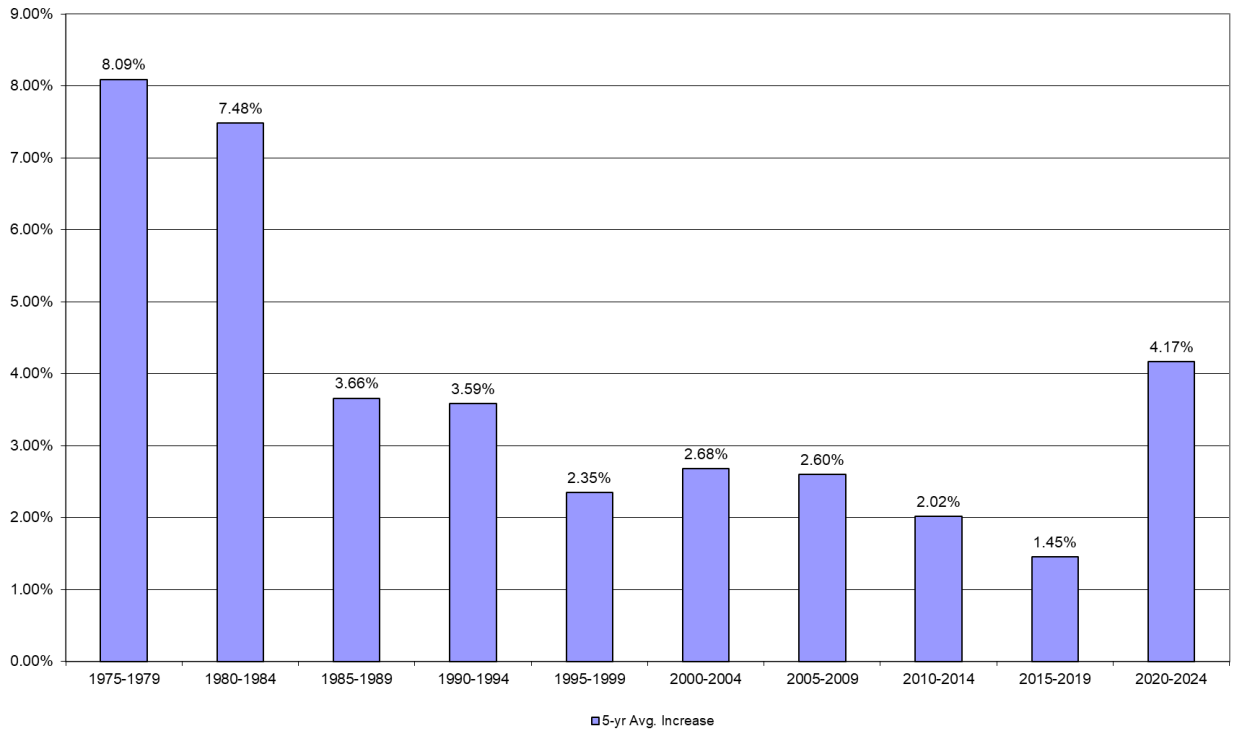
However, because Hawaii's economy is separated from the Mainland and may not trend at the same rate, there could be a need for separate inflation assumptions: one underlying the investment return and one underlying the wage increases. We compared the CPI-U over the last fifty years for Honolulu to All-US. The data showed that while for given periods of time of the economic cycle the two rates may differ, over the long term, the two rates trend very closely. The following graph shows the annual rates of inflation for both sets of data.



Over the long term, when the state economy booms relative to the Mainland, Hawaii's inflation is usually higher and when it is depressed relative to the Mainland, the inflation is usually lower. However, the average Hawaii inflation over the past fifty years has been 3.93%, and the average all-US inflation has been 3.91%. We believe the two inflation measurements will track closely over time and we have developed and recommend one inflation assumption. In addition, if there are differences, the only real place it would impact the valuation results would be in the wage assumptions, in which the difference would naturally be incorporated in the net increases above general inflation.

Actual Change in CPI-U

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



The following table shows the average inflation over various periods, ending June 30, 2024:

Periods Ending June 30, 2024	Average Annual Increase in CPI-U
Last five (5) years	4.17%
Last ten (10) years	2.80%
Last fifteen (15) years	2.54%
Last twenty (20) years	2.55%
Last twenty-five (25) years	2.58%
Last thirty (30) years	2.54%
Since 1913 (first available year)	3.17%

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

As you can see, inflation has higher than the current 2.50% assumption over the past five years, but has been reasonably close to the current assumption over longer time frames.

Expectations Implied in the Bond Market

Another source of information about future inflation is the market for US Treasury bonds. As of March 31, 2025, the 20-Year Breakeven Inflation was 2.47% based on the difference between inflation indexed and non-indexed bonds. The difference in yield for 30-year bonds implies 2.30%

inflation over the next 30 years. This analysis is known to be imperfect as it ignores the inflation risk premium that buyers of US Treasury bonds often demand as well as possible differences in liquidity between US Treasury bonds and TIPS, but has historically been a reasonable estimator of future inflation.

Forecasts from Social Security Administration

In the Social Security Administration's 2024 Trustees Report, the Office of the Chief Actuary is projecting a long-term average annual inflation rate of 2.4% under the intermediate cost assumption and the low cost and high cost scenarios are 1.8% and 3.0%, respectively.

Survey of Professional Forecasters and Fed Policy

The Philadelphia Federal Reserve conducts a quarterly survey of the Society of Professional Forecasters. Their forecast for the first quarter of 2025 was for inflation over the next ten years (2025 to 2034) to average 2.30%. Additionally, the Fed has openly stated that they have a target 2.00% inflation rate.

Comparison of Inflation Expectations from 2021 to 2024

Finally, the table below provides a comparison of the inflation expectations documented in the 2021 experience study report and the current inflation expectations.

	Inflation Expectations		
Source	**2021**	**2024**	**Change**
(1)	(2)	(3)	(4)
ERS' Investment Consultant	2.20%	2.25%	+0.05%
Implied Inflation 20-Year Treasuries	2.42%	2.47%	+0.05%
SSA Trustees Report	2.40%	2.40%	0.00%
Survey of Professional Forecasters	2.55%	2.30%	-0.25%

Recommendation

The inflation assumption is not explicitly used in the valuation but instead is used as a building block into other economic assumptions. As shown, the current 2.50% is slightly higher than a majority of the reported sources, but much closer to the long term averages. As such, we are not recommending a change at this time as 2.50% is still in the reasonable range.

Investment and Administrative Expenses

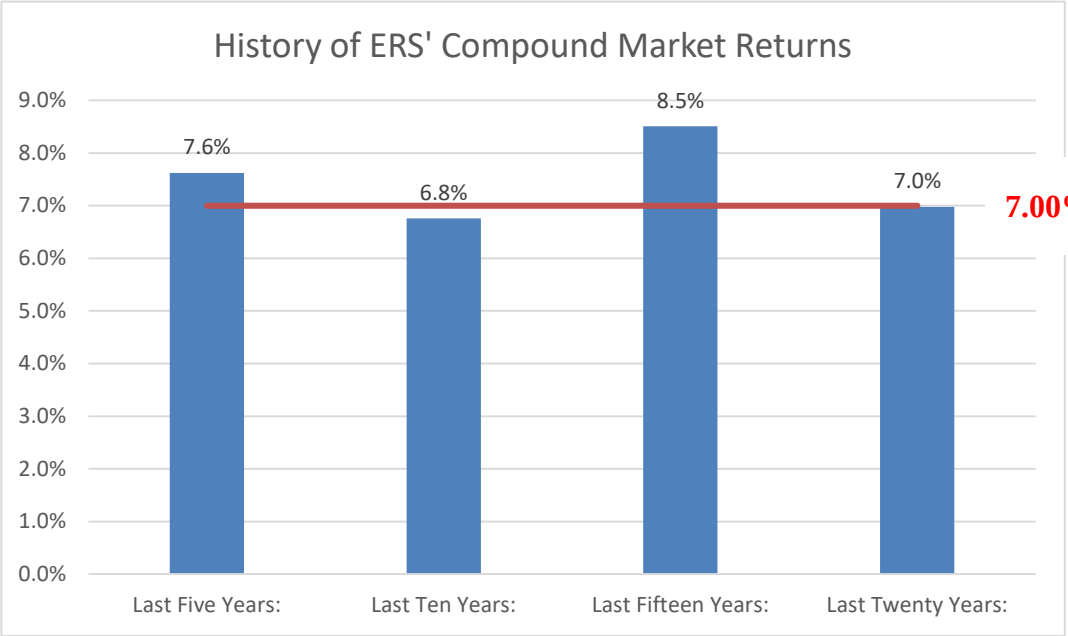
The trust fund pays expenses in addition to member benefits and refunds so we must make some assumption about these. For ERS, current practice has been to have an explicit administrative expense assumption that is a percentage of payroll and include it in the normal cost rate. The current

assumption is 0.40% of payroll. Over the last six years the average was 0.38%. We are recommending no change to the assumption.

Investment Return

ERS assumes an investment return rate of 7.00%, net of investment expenses. This is the rate used in discounting future payments in calculating the actuarial present value of those payments. Even a small change to this assumption can produce significant changes to the liabilities and contribution rates.

The following chart shows a history of ERS' market returns through FY 2024.

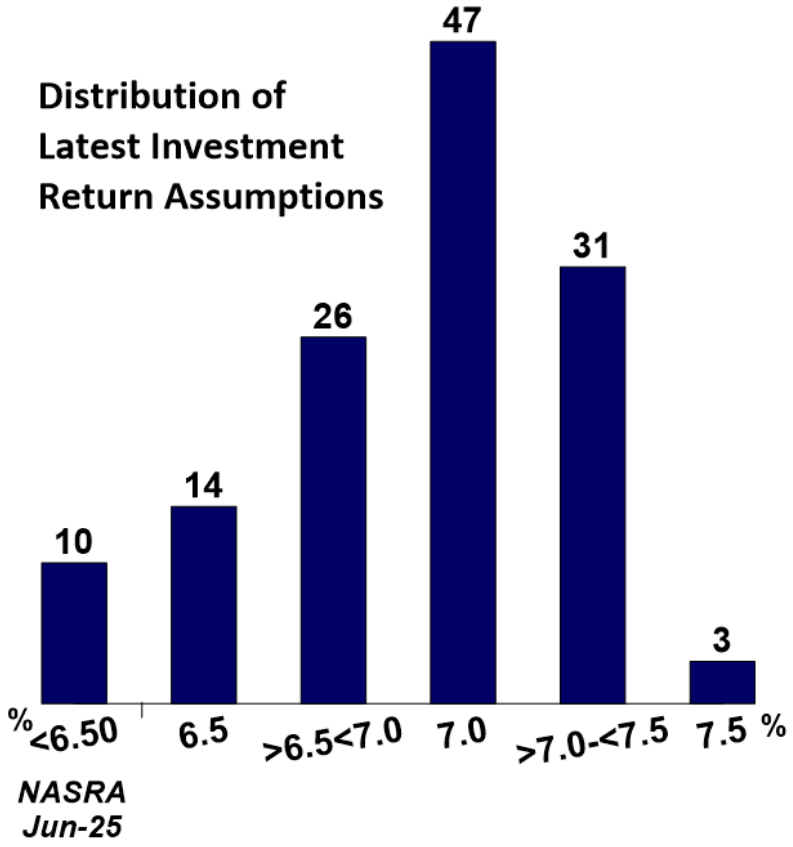


The returns in the chart above are market returns as reporting in the performance report as of June 30, 2024. As shown, ERS has exceeded or generally met the currently expected 7.00% return assumption over all timeframes.

However, past performance, even averaged over a twenty-year period, is not a reliable indicator of future performance for this assumption. The actual asset allocation of the trust fund will significantly impact the overall performance, so returns achieved under a different allocation are not meaningful. More importantly, the real rates of return for many asset classes, especially equities, vary so dramatically from year to year that even a twenty-year period is not long enough to provide reasonable guidance.

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 on the following page shows the distribution of the investment return assumptions in the Public Plans Data as of June 2025.



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

As shown, the median assumption is 7.00%.

Forecasts Developed by ERS' Investment Consultant

We believe a more appropriate approach to selecting an investment return assumption is to identify expected returns developed by mapping the investment policy to forward-looking capital market assumptions that are developed by investment consulting firms.

Because GRS is a benefits consulting firm and does not provide investment consulting advice, we do not develop or maintain our own forecasts of capital market expectations. Instead, we utilized the forward-looking return expectations developed by Meketa (ERS' investment consultant). Meketa regularly updates their capital market expectations (i.e. estimates of expected returns, volatility, and correlations) as the economy and financial markets evolve.

We requested from Meketa the current return expectations and target portfolio of ERS. The following is a summary of the information they provided.

Strategic Class	Long-Term Target Asset Allocation	Expected 20-year Compound Return
(1)	(2)	(3)
Public Equity	20.0%	6.7%
Private Equity	19.0%	9.8%
Liquid Credit	4.0%	6.3%
Private Credit	8.0%	8.7%
Real Estate	9.0%	7.2%
Infrastructure	7.0%	7.3%
Timberland and Agriculture	3.0%	4.6%
Systematic Trend Following	8.0%	3.4%
Long US Treasuries	4.0%	5.0%
Intermediate Government Bonds	14.0%	4.4%
Reinsurance	4.0%	4.8%
Expected Portfolio Geometric Return		7.3%
Expected Portfolio Volatility		11.1%

As you can see, the 2025 capital market assumptions developed by Meketa would result in a twenty-year expected compound return of approximately 7.0%.

Comparison of Meketa's Return Expectations to Other Investment Consultants

As we previously mentioned, most investment consulting firms develop forecasts regarding future investment returns. Meketa's return expectations are one opinion among many different opinions in the professional investment community. In addition to Meketa's return expectations, we utilized 2025 forward-looking capital market return expectations developed by several investment consulting firms. The primary purpose of performing this analysis using multiple investment consulting firms is to quantify possible differences in forward looking return expectations within the professional investment community.

The survey included 12 investment consultants and each provided forward-looking return expectations for next 7 to 10 years. Additionally, seven of these firms develop return expectations over a longer, 20- to 30-year period, although for some of the firms the expectations aren't necessarily for the next 20-30 years, but more of a generic 20-30 year period. There was also one firm that only provided expectations for the longer period.

The short-term expectations range from 6.19% to 7.70%, with an average of 7.11%. This compares to Maketa's 7.3%. It is typical in this process for the expectations from the System's investment consultant to be slightly higher than our survey as the consultant will have a much more specific allocation and understanding of the strategies, while we have to make subjective mapping between

asset classes in many cases and we try to be conservative in any subjective decisions between the classes.

The longer term expectations range from 6.11% to 8.34%, with an average of 7.41% and a 54% probability of achieving 7.00% over the next 20 years.

When developing the expected return for each assumption set we normalized the expected portfolio return for any difference between the investment consultant's price inflation assumption and the 2.50% price inflation assumption used in the actuarial valuation.

Recommendation

We believe the compilation of these sources of data support the current 7.00% long term investment return assumption.

We believe this recommendation satisfies the reasonable assumption requirement under ASOP No. 27. Also, this recommendation is consistent with the recommendations, regarding the use of an investment return assumption that is estimated to be realizable at least 50% of the time, from a report released by the Society of Actuaries Blue Ribbon Panel on public pension plan funding in February 2014.

General Wage Inflation

The valuation currently assumes that General Wage Inflation (GWI) will be 0.50% above price inflation for General Employees and Teachers and 1.00% above price inflation for Police and Fire. The 1.00% 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. This assumption is used primarily to index each cohort of new entrants used in the projections to determine the funding period.

The following table provides various averages of annual change for the three groups of employees over the last decade.

ERS Specific General Wage Statistics					
	Actual Inflation	Change in Average Base Salary	Net of Inflation	Current Assumption Net of Inflation	Proposed Assumption Net of Inflation
General Employees	2.80%	3.04%	0.24%	0.50%	0.50%
Teachers	2.80%	3.31%	0.51%	0.50%	0.50%
Police and Fire	2.80%	3.42%	0.62%	1.00%	1.00%

As shown, the Police and Fire group, in total and for new hires, has been lower than the assumption on net of inflation terms for the past decade. However, this was when inflation was very high, so it is likely

the 3.50% nominal assumption continues to be reasonable and we are recommending no change. For Teachers, the assumption appears to be right on ad the General Employees, there is a similar situation as Police and Fire. Due to current salary pressure for new employees in the economy as a whole, it is likely that new entrant salaries will see increases, especially over the short term, so an assumption above inflation is reasonable.

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 member who is active in two consecutive fiscal years. We focused on the base pay rate provided in the raw data as it appeared to be the most consistent from year to year and would not be impacted by furloughs.

Salary increases for employees of state government tend to vary significantly from year to year. In particular, when the state's tax revenues stall or increase slowly, salary increases often are small or nonexistent. Also, increases may be granted through biennial legislative sessions or through labor negotiations that do not occur every year. In this instance, salary increases were very low for several years following the great recession, and then have been very high these last few years during the period of high inflation. Therefore, a longer period for measuring salary increase rates usually provides a more accurate picture, by allowing us to smooth out short-term effects.

For this assumption, we looked at the salaries provided for all members who were active in the start and the end of an experience year, for the twenty-year study period, beginning July 1, 2004 and ending June 30, 2024.

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

Historically, the data also shows differences in salary increases for Teachers, Police & Fire, and General Employees. Therefore, the salary scales have been derived separately for these three groups.

The current salary increase assumption varies based on years of service, with an ultimate salary increase assumption used for all employees who have attained 25 years of service. For Police and Fire, this ultimate rate does not appear to be met until 30 years of service, so we have extended that definition out. The table below shows the actual average long-service increases for each year of the study. Note that these actual average rates of increase include average actual inflation, not our inflation assumption.

Average "Long-Service" Increase				
Actual Experience 2005-2024				
Year Ending	Inflation	Police & Fire	Teachers	General Employees
2005-2009	2.63%	4.99%	5.55%	5.15%
2010-2014	2.02%	2.87%	1.08%	1.06%
2015-2019	1.45%	7.57%	4.02%	4.19%
2020-2024	4.21%	4.52%	5.17%	4.11%
Average	2.55%	4.94%	3.92%	3.60%
Current Assumption	2.50%	5.00%	3.75%	3.75%
Proposed Assumption	2.50%	5.00%	3.85%	3.75%

As shown, the experience (using 30 years as a definition for 'long-service) for Police and Fire has been very close to the current assumption over the past 20 years. Teachers have been 0.17% higher and General Employees have been slightly lower. We have made recommended adjustments to Teachers, but recommend not decreasing the General Employee group because more recent experience has outpaced the current assumptions.

The ultimate salary increase assumption above incorporates general price inflation, a component for general productivity, and individual merit and promotion. There is also a service-based step-rate

component. The following table shows the average increase over the ten-year period parsed out in five-year service bands for each group:

Average Pay Increase			
Service	Police & Fire	Teachers	General Employees
1 to 5 Years	6.17%	5.84%	5.69%
6 to 10 Years	5.16%	4.94%	4.42%
11 to 15 Years	6.04%	4.60%	4.13%
16 to 20 Years	5.94%	4.26%	3.93%
21 to 24 Years	5.93%	4.22%	3.75%
25 Years or More	5.56%	3.92%	3.60%

Interestingly, the Police and Fire steps are quite flat, with members between 6 and 10 years of service actually receiving smaller increases than those with more than 25 years of service. We have modified the step portion of the schedule to be 0.85% each year through year 30. The schedules for General Employees and Teachers are very close to the current assumption and we have recommended no change.

The full schedule for each group is shown in Section VI of this report.

Career Average Salary Increase Assumptions				
	Actual Inflation	Actual Increase FY 2005 - FY2024	Current Assumption	Proposed Assumption
General Employees	2.55%	4.38%	4.66%	4.66%
Teachers	2.55%	4.77%	4.76%	4.76%
Police and Fire	2.55%	5.84%	5.74%	5.85%

These changes will increase the normal cost and the liabilities for Police and Fire specifically, but will also increase the amount of expected contributions to be received over the funding period.

DEMOGRAPHIC ASSUMPTIONS

Analysis of Post-Retirement Mortality

The most critical demographic assumption used in pension valuations is post-retirement mortality. Rates of mortality affect our estimate of how long each individual is expected to live and consequently

how long each individual is expected to receive a pension. Life expectancy in turn has a direct impact on pension plan liabilities.

Mortality rates have generally decreased over time in the U.S., meaning that life expectancies have generally increased over time. The assumption for future decreases in mortality is referred to as the mortality improvement assumption. In general, the current rates of mortality and mortality improvement are two separate assumptions. Thus, we will discuss this in two parts, the recommended base mortality assumption, and the recommended mortality improvement assumption.

The relevant ASOP, ASOP 35, and published practice notes require pension actuaries to make and disclose an assumption as to expected mortality improvement after the valuation date. To meet this standard, the best practice actuarial model is to use mortality tables that explicitly incorporate projected mortality improvements over time. This type of table (or series of tables) is called "generational mortality." Specifically, mortality rates are assumed to decline each year in the future so that life expectancies for each annual cohort of retirees will be slightly higher than the previous year's. Therefore, the life expectancy at age 60 for someone reaching 60 now will not be as long as the life expectancy for someone reaching 60 in 2030, and their life expectancy will not be as long as someone reaching 60 in 2040, etc.

Because of this assumption of continuous improvement, life expectancies for today's younger active members are expected to be longer than those of today's retirees. By utilizing generational mortality, the improvement over time is built into the contributions for individual members while they are employed. Below is a table with the projected life expectancy (including future improvement) for a retired member who attains age 65 based on the current assumptions.

Current Mortality Assumption – Projected Life Expectancy for an Age 65 Retiree in Years					
Group	**Year of Retirement**				
	2025	**2030**	**2035**	**2040**	**2045**
General Employee – Male	22.8	23.2	23.5	23.9	24.2
General Employee – Female	26.4	26.7	27.0	27.3	27.6
Teachers – Male	24.1	24.4	24.8	25.1	25.4
Teachers – Female	27.9	28.2	28.5	28.8	29.1
Public Safety – Male	21.9	22.2	22.6	23.9	23.3
Public Safety – Female	27.1	27.4	27.7	28.0	28.3

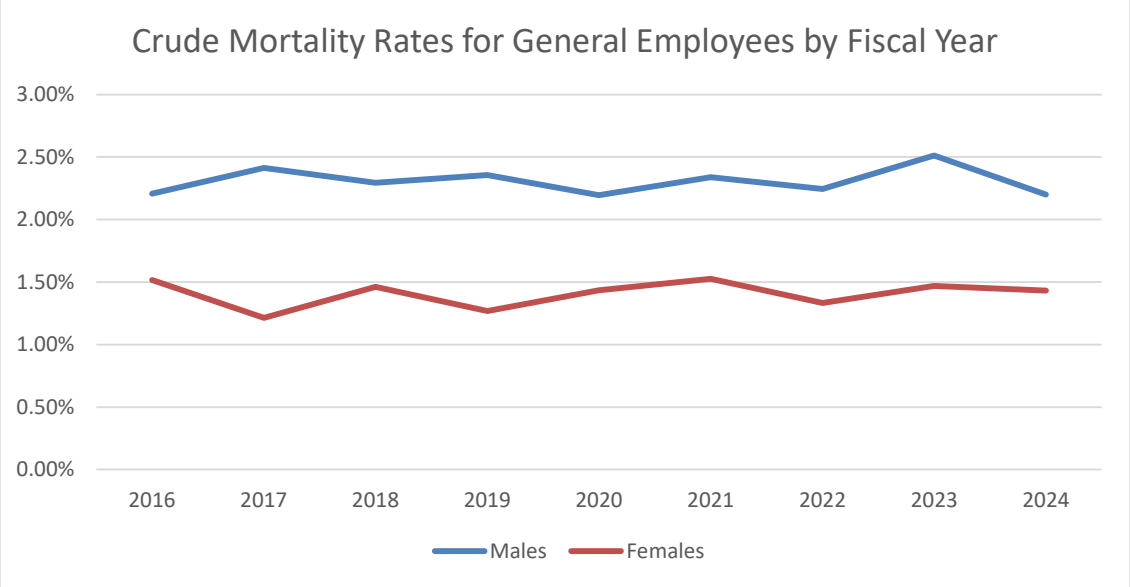
The mortality table currently being used for non-disabled retirees and for beneficiaries receiving benefits is the Hawaiian Retired Public Employees mortality table as of 2022, which is an ERS specific table created in the 2022 Experience Study. The table has separate rates for males and females. Our strategy is to update this table with each experience study to ensure that our Base tables are as current as possible, while leaving the projected improvement unchanged to the extent possible. This strategy allows for making minor, frequent adjustments instead of large adjustment every decade or so and minimizes the volatility that can come from changing mortality assumptions.

Approach and Data

Based on experience observed in prior experience studies, we currently adjust the tables to reflect differences for the three groups of members (Teachers, Public Safety, and General Employees). This is a fairly common practice and is appropriate because individual employee groups may have measurably different rates of mortality. The individual groups are variations of the core Base table, created by combing data from all of the groups, so the first step is the create the core Base table.

We have utilized nine years of experience to increase the credibility of the analysis and minimize any variance created by timing of data collection from year to year. During this time, mortality improvement may have occurred and thus a general procedure is to adjust the actual experience for mortality improvements during the study period to the central year, in this case 2019.

This study does include all years, including data during the pandemic. That is one of the reasons we utilize several years of data, to dampen the potential impact from one year, and it is at least potentially likely mortality will be higher going forward because of either direct impact from post-COVID mobility or indirect impacts from the lockdowns, etc. Also, Hawaii was not impacted by the pandemic to the same extent as other states. In fact, the increase in the crude rates in fiscal year 2020 and 2021 could just as easily be explained by the increase in the average age of the retiree. The following is the crude rate of mortality by year for General Employees during the study period.



The analysis uses only the retirees, not the beneficiaries, joint annuitants, or survivors as the vast majority of the liability is based on this group of members and data from the beneficiaries can often have a survivorship bias which would skew the results. We will use a liability-weighted analysis by weighting members by the amount of their annuity. There are two reasons for using a liability-weighted approach. First, mortality experience across the U.S. has been shown to vary depending on income level. Liability-weighting takes into account differing benefit levels. Second, selecting an assumption based on headcount-weighting is consistent with estimating expected deaths, but selecting an assumption based on liability-weighting is consistent with minimizing the actuarial 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).

Credibility

When choosing an appropriate mortality assumption, actuaries typically use standard mortality tables, unlike when choosing other demographic assumptions. They may choose to adjust these standard mortality tables, however, to reflect various characteristics of the covered group, and to provide for expectations of future mortality improvement (both up to and after the measurement date). 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 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 statistical analysis of ERS specific data was warranted. The method for this approach can be found in the article *"Selecting Mortality Tables: A Credibility Approach" October 2008*. Statistical analysis suggests 1,082 deaths per gender is sufficient to be considered fully credible, as at that amount of experience we are 90% confident that the observed experience is within +/- 5% of the actual pattern. However, when weighting on benefit amounts, it should be even higher. The following table gives the number of deaths needed by gender to have a given level of confidence that the data is +/- X% of the actual pattern.

Standard Score	Confidence	99% – 101%	97% – 103%	95% – 105%	90% – 110%	80% – 120%
0.674	75%	4,543	505	182	45	11
1.282	80%	16,435	1,826	657	164	41
1.645	90%	27,060	3,007	1,082	271	68
1.96	95%	38,416	4,268	1,537	384	96
2.576	99%	66,358	7,373	2,654	664	166

ERS had 5,640 male and 5,373 female observed deaths during the period analyzed. As shown by the statistical credibility table, we are 97% confident that we are within 3% of the true mortality experience. The following provides the full details with p=95% and r=5%.

Group	All Retirees	
	Male	Female
Actual Deaths	5,690	5,391
Deaths needed for full credibility		
Based on Count	1,537	1,537
Based on Annuity Amount	2,982	3,069
Z Factor		
Based on Count	100.0%	100.0%

Based on Annuity Amount	100.0%	100.0%

In addition, to consider a national table, there would need to be one with expectations reasonably close to ERS experience to use as a baseline. The following table shows the life expectancy in years for female retirees ages 60, 65, & 70 based on occupation compared to the life expectancies created by three versions of the recently published PUB (10) mortality tables.

	Females - Life Expectancy in Years (2016 Central Age)				
Current Age	HI Teachers	HI General Employees	PUB(10) Teachers - Median	PUB(10) Teachers – Above Median	PUB(10) General – Above Median
60	30.5	29.5	28.6	28.8	27.2
65	26.0	25.0	24.0	24.2	22.9
70	21.5	20.7	19.6	19.7	18.7

As shown, even compared to the above median versions of the PUB (10) tables, the life expectancy of ERS female retirees far exceeds the expectation from the industry table. It would take material adjustments to the industry tables to mimic ERS experience. Based on this information and the level of credibility discussed above, we conclude it is appropriate for ERS to use non-standard, System specific mortality tables.

Recommended Base Mortality Assumption

As discussed earlier, our preferred approach would be to create new base tables using the latest data possible. However, given the pandemic and the fact that mortality experience was higher than the current table would expect, we would rather not make any significant changes to the base mortality assumptions as this time. The A/E ratios for the current analysis is shown in the tables below:

Actual to Expected Ratios: Current Assumptions			
	General Employee	Teacher	Public Safety
Male	102%	101%	95%
Female	103%	103%	121%

Summary of Experience and Adjustments for Occupation

There are then age adjustments and multipliers applied to this base table based on the occupation. Higher multipliers mean higher rates of mortality and thus shorter life expectancies. The following table provides the multipliers for each gender and occupation combination. Please note that for Public Safety females, we have used the Base table unadjusted. This is because (1) there is not enough data to analyze the female Public Safety members on their own and (2) most of the female mortality liability in the valuation of Public Safety group is in the beneficiary liability, which will look more like the general population. The only recommended change is for Public Safety males, which increases the multiplier but lowers the setback. The net impact is not significant, but does appear to have a better fit across the ages and does produce an A/E ratio closer to 100%.

Mortality Adjustments – Setbacks/Multipliers			
	General Employee	Teacher	Public Safety
Male	0/102%	1/97%	-1/100%
Female	-1/98%	1/101%	0/100%

The setbacks were selected to produce the multiplier closest to 100% possible in each case. In addition, adjustments continued until the total of the individual groups approximately equaled the results based on the Base table alone. Thus, the process of creating more precise life expectancies by occupation should have no impact on the overall conservatism or aggressiveness of the 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 Scale MP-2021 with immediate convergence, which was published in 2021.

This scale was based on 100 years of trends in national data. 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).

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. We recommend no change to this assumption.

The following is a table with the life expectancy for a retired member who attains age 65 based on the proposed assumption set, by calendar year. As shown, the life expectancy is expected to increase into the future. The subsequent exhibits show the healthy mortality experience analysis for the different employee groups.

Proposed Mortality Assumption - Life Expectancy for an Age 65 Retiree in Years					
Group	**Year of Retirement**				
	2025	**2030**	**2035**	**2040**	**2045**
General Employee – Male	22.8	23.2	23.5	23.9	24.2
General Employee - Female	26.3	26.6	26.9	27.2	27.5
Teachers - Male	24.1	24.5	24.9	25.2	25.5
Teachers - Female	28.0	28.3	28.6	28.9	29.2
Public Safety - Male	22.1	22.4	22.8	23.1	23.5
Public Safety - Female	27.1	27.4	27.7	28.0	28.3

GENERAL EMPLOYEES
POST-RETIREMENT MORTALITY - HEALTHY MALE
***Weighted by Annual Benefits in $000s**

				Assumed Rate		Expected Deaths*		Actual/Expected	
Age	Actual Deaths*	Total Exposed*	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55-59	$ 65	$ 13,113	0.0050	0.0040	0.0040	$ 52	$ 52	125%	125%
60-64	379	46,988	0.0081	0.0071	0.0071	332	332	114%	114%
65-69	844	87,408	0.0097	0.0096	0.0096	840	840	101%	101%
70-74	1,353	83,503	0.0162	0.0161	0.0161	1,346	1,346	101%	101%
75-79	1,406	52,674	0.0267	0.0264	0.0264	1,389	1,389	101%	101%
80-84	1,364	27,781	0.0491	0.0473	0.0473	1,314	1,314	104%	104%
85-89	1,222	13,948	0.0876	0.0859	0.0859	1,198	1,198	102%	102%
90-94	744	4,849	0.1535	0.1524	0.1524	739	739	101%	101%
95-99	248	941	0.2638	0.2522	0.2522	237	237	105%	105%
Totals	$ 7,626	$ 331,204	0.0230	0.0225	0.0225	$ 7,446	$ 7,446	102%	102%

GENERAL EMPLOYEES
POST-RETIREMENT MORTALITY - HEALTHY FEMALE
***Weighted by Annual Benefits in $000s**

				Assumed Rate		Expected Deaths*		Actual/Expected	
Age	Actual Deaths*	Total Exposed*	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55-59	$ 55	$ 10,870	0.0051	0.0022	0.0022	$ 27	$ 27	205%	205%
60-64	167	51,175	0.0033	0.0038	0.0038	203	203	82%	82%
65-69	625	104,946	0.0060	0.0055	0.0055	591	591	106%	106%
70-74	949	93,489	0.0102	0.0087	0.0087	807	807	118%	118%
75-79	770	54,657	0.0141	0.0145	0.0145	785	785	98%	98%
80-84	838	27,547	0.0304	0.0287	0.0287	774	774	108%	108%
85-89	782	14,610	0.0535	0.0563	0.0563	808	808	97%	97%
90-94	653	6,397	0.1021	0.1146	0.1146	697	697	94%	94%
95-99	262	1,455	0.1799	0.1927	0.1927	266	266	98%	98%
Totals	$ 5,102	$ 365,145	0.0140	0.0136	0.0136	$ 4,959	$ 4,959	103%	103%

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

				Assumed Rate		Expected Deaths*		Actual/Expected	
Age	Actual Deaths*	Total Exposed*	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55-59	$ -	$ 2,473	0.0000	0.0034	0.0034	$ 8	$ 8	0%	0%
60-64	38	9,938	0.0038	0.0062	0.0062	61	61	62%	62%
65-69	190	23,159	0.0082	0.0085	0.0085	196	196	97%	97%
70-74	390	33,138	0.0118	0.0139	0.0139	459	459	85%	85%
75-79	601	26,864	0.0224	0.0225	0.0225	605	605	99%	99%
80-84	645	16,120	0.0400	0.0398	0.0398	642	642	100%	100%
85-89	701	8,423	0.0832	0.0724	0.0724	610	610	115%	115%
90-94	374	2,649	0.1410	0.1293	0.1293	343	343	109%	109%
95-99	105	362	0.2889	0.2194	0.2194	79	79	132%	132%
Totals	$ 3,042	$ 123,125	0.0247	0.0244	0.0244	$ 3,004	$ 3,004	101%	101%

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

				Assumed Rate		Expected Deaths*		Actual/Expected	
Age	Actual Deaths*	Total Exposed*	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55-59	$ 5	$ 5,952	0.0008	0.0018	0.0018	$ 12	$ 12	39%	39%
60-64	89	24,596	0.0036	0.0033	0.0033	86	86	104%	104%
65-69	277	66,266	0.0042	0.0048	0.0048	330	330	84%	84%
70-74	541	91,067	0.0059	0.0076	0.0076	689	689	78%	78%
75-79	897	68,282	0.0131	0.0117	0.0117	798	798	112%	112%
80-84	815	34,306	0.0238	0.0226	0.0226	755	755	108%	108%
85-89	743	15,630	0.0475	0.0438	0.0438	664	664	112%	112%
90-94	462	4,756	0.0970	0.0876	0.0876	391	391	118%	118%
95-99	147	808	0.1825	0.1729	0.1729	128	128	115%	115%
Totals	$ 3,976	$ 311,664	0.0128	0.0124	0.0124	$ 3,854	$ 3,854	103%	103%

POLICE & FIRE EMPLOYEES
POST-RETIREMENT MORTALITY - HEALTHY MALE
***Weighted by Annual Benefits in $000s**

				Assumed Rate		Expected Deaths*		Actual/Expected	
Age	Actual Deaths*	Total Exposed*	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55-59	$ 245	$ 54,399	0.0045	0.0047	0.0044	$ 254	$ 239	97%	103%
60-64	325	58,504	0.0056	0.0072	0.0074	424	432	77%	75%
65-69	437	51,650	0.0085	0.0107	0.0104	554	535	79%	82%
70-74	617	38,887	0.0159	0.0178	0.0174	691	676	89%	91%
75-79	686	20,913	0.0328	0.0302	0.0289	631	604	109%	114%
80-84	491	8,112	0.0606	0.0549	0.0523	445	424	110%	116%
85-89	238	2,091	0.1137	0.0992	0.0948	207	198	115%	120%
90-94	67	401	0.1681	0.1732	0.1670	69	67	97%	101%
95-99	16	48	0.3347	0.2693	0.2683	13	13	124%	125%
Totals	$ 3,122	$ 235,005	0.0133	0.0140	0.0136	$ 3,290	$ 3,189	95%	98%

POLICE & FIRE EMPLOYEES
POST-RETIREMENT MORTALITY - HEALTHY FEMALE
***Weighted by Annual Benefits in $000s**

				Assumed Rate		Expected Deaths*		Actual/Expected	
Age	Actual Deaths*	Total Exposed*	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55-59	$ -	$ 3,908	0.0000	0.0020	0.0020	$ 8	$ 8	0%	0%
60-64	31	3,658	0.0086	0.0036	0.0036	13	13	242%	242%
65-69	17	2,009	0.0086	0.0051	0.0051	10	10	169%	169%
70-74	2	853	0.0028	0.0082	0.0082	7	7	35%	35%
75-79	0	274	0.0000	0.0130	0.0130	3	3	0%	0%
80-84	6	60	0.0926	0.0256	0.0256	2	2	356%	356%
85-89	0	35	0.0000	0.0500	0.0500	2	2	0%	0%
90-94	0	17	0.0000	0.1005	0.1005	2	2	0%	0%
95-99	0	3	0.0000	0.1860	0.1860	0	0	0%	0%
Totals	$ 57	$ 10,817	0.0052	0.0043	0.0043	$ 47	$ 47	121%	121%

ALL EMPLOYEES
POST-RETIREMENT MORTALITY - HEALTHY MALE
***Weighted by Annual Benefits in $000s**

				Assumed Rate		Expected Deaths*		Actual/Expected	
Age	Actual Deaths*	Total Exposed*	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55-59	$ 310	$ 69,985	0.0044	0.0039	0.0039	$ 272	$ 272	114%	114%
60-64	742	115,430	0.0064	0.0069	0.0069	799	799	93%	93%
65-69	1,471	162,217	0.0091	0.0094	0.0094	1,528	1,528	96%	96%
70-74	2,360	155,528	0.0152	0.0158	0.0158	2,458	2,458	96%	96%
75-79	2,693	100,450	0.0268	0.0258	0.0258	2,597	2,597	104%	104%
80-84	2,500	52,012	0.0481	0.0464	0.0464	2,411	2,411	104%	104%
85-89	2,161	24,461	0.0883	0.0842	0.0842	2,060	2,060	105%	105%
90-94	1,185	7,899	0.1501	0.1494	0.1494	1,180	1,180	100%	100%
95-99	369	1,351	0.2730	0.2473	0.2473	334	334	110%	110%
Totals	$ 13,791	$ 689,334	0.0200	0.0198	0.0198	$ 13,639	$ 13,639	101%	101%

ALL EMPLOYEES
POST-RETIREMENT MORTALITY - HEALTHY FEMALE
***Weighted by Annual Benefits in $000s**

				Assumed Rate		Expected Deaths*		Actual/Expected	
Age	Actual Deaths*	Total Exposed*	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55-59	$ 60	$ 20,730	0.0029	0.0020	0.0020	$ 46	$ 46	132%	132%
60-64	287	79,429	0.0036	0.0036	0.0036	298	298	96%	96%
65-69	919	173,221	0.0053	0.0051	0.0051	918	918	100%	100%
70-74	1,493	185,409	0.0081	0.0082	0.0082	1,507	1,507	99%	99%
75-79	1,667	123,213	0.0135	0.0130	0.0130	1,596	1,596	104%	104%
80-84	1,659	61,913	0.0268	0.0256	0.0256	1,549	1,549	107%	107%
85-89	1,525	30,276	0.0504	0.0500	0.0500	1,474	1,474	103%	103%
90-94	1,115	11,170	0.0998	0.1005	0.1005	1,064	1,064	105%	105%
95-99	409	2,265	0.1806	0.1860	0.1860	391	391	105%	105%
Totals	$ 9,135	$ 687,626	0.0133	0.0129	0.0129	$ 8,844	$ 8,844	103%	103%

Disabled mortality rates

This is a minor assumption, and it has little impact on the liabilities of ERS. We are recommending keeping the prior procedure to assume members that live past normal retirement age will use the same

table as healthy retirees, but with a set-forward of 3 years, meaning a disabled member age 70 will use the same mortality rate as a healthy member age 73. For ages prior to normal retirement age, we will assume the same 3-year set-forward, but we are applying a minimum mortality rate of 3.5% for males and 2.5% for females to reflect impaired mortality during those ages.

Active mortality rates

A separate mortality table is used for active members. It is typical for active mortality to be much lower than the retiree mortality. We are recommending updating to the new Pub2016 mortality tables for active employees, grouped by occupation. This assumption has basically no impact.

Disability rates

Disability is also a minor assumption, with little effect on the liabilities. However, the experience appears to be higher than expected from the current assumptions, especially for duty related disabilities. To determine the actual experience, we counted the actual number of new disability records in the retiree data over the six-year period 2018-2023. This allows the experience to account for the normal delay in processing disability claims. Based on this information, we are recommending changing the percentages of the client table to match the experience of the groups.

	Ordinary Disability			Duty Related Disability		
	Expected	Actual	Proposed	Expected	Actual	Proposed
General Employees	266	245	252	140	149	152
Teachers	57	46	51	7	11	12
Police and Fire	6	5	6	16	16	16

For future members who become disabled, we currently assume 50% will choose a 100% Joint and Survivor option to reflect any subsidy that exists in the option factors. We recommend no change to this assumption.

Retirement rates

For this assumption, an A/E ratio between 90% and 100% is desirable for slight conservatism. We currently use retirement rates that vary by group, age, and sex. The retirement tables also vary by contributory vs. noncontributory. The analysis was completed weighting by liability instead of counts as individuals with higher benefits are more likely to retire earlier. The analysis studied all of the groups separately. Data from the prior experience study was taken into consideration when changes were recommended to the assumptions.

The following sections give a brief description of the findings for unreduced retirement for each group for the "core ages" of 55-69. We are recommending slight changes to some of the retirement patterns, most notably adding 2% below age 55 for Police and Fire. This is followed by the full details of the experience analysis.

Hybrid ($ in 000s of liability)					
		Old Assumptions		Proposed Assumptions	
Group	Actual Retirements	Expected Retirements	Actual/ Expected	Expected Retirements	Actual/ Expected
General Male	$781,747	$782,494	100%	$811,370	96%
General Female	1,074,874	1,037,347	104%	1,062,608	101%
Teacher Male	214,439	$227,315	94%	225,534	95%
Teacher Female	619,240	623,052	99%	627,030	99%

Non-Contributory ($ in 000s of liability)					
		Old Assumptions		Proposed Assumptions	
Group	Actual Retirements	Expected Retirements	Actual/ Expected	Expected Retirements	Actual/ Expected
General Male	$423,972	$426,541	99%	$426,541	99%
General Female	354,139	391,823	90%	396,596	89%
Teacher Male	92,064	86,729	106%	91,204	101%
Teacher Female	207,028	220,175	94%	232,202	89%

Police & Fire Employees – Males and Females ($ in 000s of liability)					
		Old Assumptions		Proposed Assumptions	
Age Range	Actual Retirements	Expected Retirements	Actual/ Expected	Expected Retirements	Actual/ Expected
45-49	$133,391	$113,312	118%	$127,476	105%
50-54	639,272	520,274	123%	578,082	111%
55-59	585,389	597,071	98%	597,071	98%
60-61	94,649	118,284	80%	118,284	80%
Sub-Total	$1,452,701	$1,348,941	108%	$1,420,914	102%
62-64	81,013	99,193	82%	99,193	82%
Total (including ages 62-64)	$1,533,715	$1,448,134	106%	$1,520,106	101%

GENERAL EMPLOYEES - CONTRIBUTORY
MALE NORMAL RETIREMENT EXPERIENCE - AGE BASED (LIABILITY WEIGHTED*)

				Assumed Rate		Expected Retirements*		Actual/Expected	
Age	Actual Retirements*	Total Exposed*	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55	155,712	533,268	0.292	0.250	0.250	133,317	133,317	117%	117%
56	160,662	471,007	0.341	0.250	0.250	117,752	117,752	136%	136%
57	77,341	403,797	0.192	0.160	0.160	64,607	64,607	120%	120%
58	37,000	440,676	0.084	0.160	0.160	70,508	70,508	52%	52%
59	72,920	484,503	0.151	0.130	0.130	62,985	62,985	116%	116%
60	78,702	511,422	0.154	0.130	0.130	66,485	66,485	118%	118%
61	88,587	529,706	0.167	0.130	0.130	68,862	68,862	129%	129%
62	109,926	617,756	0.178	0.280	0.280	172,972	172,972	64%	64%
63	80,044	596,352	0.134	0.200	0.200	119,270	119,270	67%	67%
64	136,622	606,142	0.225	0.200	0.200	121,228	121,228	113%	113%
65	66,472	527,030	0.126	0.200	0.200	105,406	105,406	63%	63%
66	148,461	493,509	0.301	0.180	0.180	88,832	88,832	167%	167%
67	64,337	345,597	0.186	0.180	0.180	62,207	62,207	103%	103%
68	67,845	302,710	0.224	0.180	0.180	54,488	54,488	125%	125%
69	62,450	253,940	0.246	0.180	0.180	45,709	45,709	137%	137%
Subtotal	1,407,081	7,117,413	0.198			1,354,629	1,354,629	104%	104%
70-74	186,747	698,579	0.267	0.200	0.200	139,716	139,716	134%	134%
Subtotal	1,593,828	7,815,992	0.204			1,494,344	1,494,344	107%	107%
75 & Over	62,893	371,557	0.169	1.000	1.000	371,557	371,557	17%	17%
Total	1,656,721	8,187,548	0.202			1,865,901	1,865,901	89%	89%

GENERAL EMPLOYEES - CONTRIBUTORY
FEMALE NORMAL RETIREMENT EXPERIENCE - AGE BASED (LIABILITY WEIGHTED*)

				Assumed Rate		Expected Retirements*		Actual/Expected	
Age	Actual Retirements*	Total Exposed*	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55	38,239	192,464	0.199	0.200	0.200	38,493	38,493	99%	99%
56	34,897	277,473	0.126	0.200	0.200	55,495	55,495	63%	63%
57	57,140	408,755	0.140	0.130	0.130	53,138	53,138	108%	108%
58	38,161	530,356	0.072	0.130	0.130	68,946	68,946	55%	55%
59	85,453	663,399	0.129	0.130	0.130	86,242	86,242	99%	99%
60	84,058	706,229	0.119	0.150	0.150	105,934	105,934	79%	79%
61	104,301	831,236	0.125	0.150	0.150	124,685	124,685	84%	84%
62	166,588	828,204	0.201	0.250	0.250	207,051	207,051	80%	80%
63	101,106	761,357	0.133	0.200	0.200	152,271	152,271	66%	66%
64	119,139	740,270	0.161	0.200	0.200	148,054	148,054	80%	80%
65	143,589	652,765	0.220	0.200	0.200	130,553	130,553	110%	110%
66	181,579	617,224	0.294	0.200	0.200	123,445	123,445	147%	147%
67	105,148	437,207	0.240	0.200	0.200	87,441	87,441	120%	120%
68	84,837	374,293	0.227	0.200	0.200	74,859	74,859	113%	113%
69	42,555	299,006	0.142	0.200	0.200	59,801	59,801	71%	71%
Subtotal	1,386,791	8,320,237	0.167			1,516,409	1,516,409	91%	91%
70-74	120,818	956,633	0.126	0.200	0.200	191,327	191,327	63%	63%
Subtotal	1,507,609	9,276,870	0.163			1,707,735	1,707,735	88%	88%
75 & Over	93,051	425,573	0.219	1.000	1.000	425,573	425,573	22%	22%
Total	1,600,660	9,702,443	0.165			2,133,308	2,133,308	75%	75%

GENERAL EMPLOYEES - CONTRIBUTORY
MALE EARLY RETIREMENT EXPERIENCE - AGE BASED (LIABILITY WEIGHTED*)

				Assumed Rate		Expected Retirements*		Actual/Expected	
Age	Actual Retirements*	Total Exposed*	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Under 45	-	-	N/A	0.000	0.000	-	-	N/A	N/A
45	-	-	N/A	0.000	0.000	-	-	N/A	N/A
46	-	3,876	0.000	0.000	0.000	-	-	N/A	N/A
47	-	4,223	0.000	0.000	0.000	-	-	N/A	N/A
48	-	8,376	0.000	0.000	0.000	-	-	N/A	N/A
49	-	9,713	0.000	0.000	0.000	-	-	N/A	N/A
50	-	4,970	0.000	0.020	0.020	99	99	0%	0%
51	-	57,689	0.000	0.020	0.020	1,154	1,154	0%	0%
52	-	113,343	0.000	0.020	0.020	2,267	2,267	0%	0%
53	4,915	170,941	0.029	0.030	0.030	5,128	5,128	96%	96%
54	4,071	317,480	0.013	0.030	0.030	9,524	9,524	43%	43%
Total	8,985	690,611	0.013			18,173	18,173	49%	49%

GENERAL EMPLOYEES - CONTRIBUTORY
FEMALE EARLY RETIREMENT EXPERIENCE - AGE BASED (LIABILITY WEIGHTED*)

				Assumed Rate		Expected Retirements*		Actual/Expected	
Age	Actual Retirements*	Total Exposed*	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Under 45	-	-	N/A	0.000	0.000	-	-	N/A	N/A
45	-	-	N/A	0.000	0.000	-	-	N/A	N/A
46	-	-	N/A	0.000	0.000	-	-	N/A	N/A
47	-	-	N/A	0.000	0.000	-	-	N/A	N/A
48	-	-	N/A	0.000	0.000	-	-	N/A	N/A
49	-	-	N/A	0.000	0.000	-	-	N/A	N/A
50	-	7,245	0.000	0.000	0.000	-	-	N/A	N/A
51	-	30,118	0.000	0.010	0.010	301	301	0%	0%
52	10,935	48,057	0.228	0.010	0.010	481	481	2275%	2275%
53	-	37,370	0.000	0.010	0.010	374	374	0%	0%
54	15,756	88,997	0.177	0.020	0.020	1,780	1,780	885%	885%
Total	26,691	211,786	0.126			2,935	2,935	909%	909%

GENERAL EMPLOYEES - NONCONTRIBUTORY
MALE NORMAL RETIREMENT EXPERIENCE - AGE BASED (LIABILITY WEIGHTED*)

				Assumed Rate		Expected Retirements*		Actual/Expected	
Age	Actual Retirements*	Total Exposed*	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Under 55	4,654	59,242	0.079	0.150	0.150	8,886	8,886	52%	52%
55	14,865	116,974	0.127	0.200	0.200	23,395	23,395	64%	64%
56	20,488	134,387	0.152	0.180	0.180	24,190	24,190	85%	85%
57	19,226	145,449	0.132	0.130	0.130	18,908	18,908	102%	102%
58	14,216	165,958	0.086	0.100	0.100	16,596	16,596	86%	86%
59	26,182	178,788	0.146	0.100	0.100	17,879	17,879	146%	146%
60	18,407	172,939	0.106	0.100	0.100	17,294	17,294	106%	106%
61	24,526	180,722	0.136	0.110	0.110	19,879	19,879	123%	123%
62	66,023	327,639	0.202	0.200	0.200	65,528	65,528	101%	101%
63	51,254	261,469	0.196	0.200	0.200	52,294	52,294	98%	98%
64	25,332	216,934	0.117	0.120	0.120	26,032	26,032	97%	97%
65	27,983	197,892	0.141	0.140	0.140	27,705	27,705	101%	101%
66	33,044	178,466	0.185	0.200	0.200	35,693	35,693	93%	93%
67	27,978	143,782	0.195	0.200	0.200	28,756	28,756	97%	97%
68	28,920	123,030	0.235	0.200	0.200	24,606	24,606	118%	118%
69	20,875	94,498	0.221	0.200	0.200	18,900	18,900	110%	110%
Subtotal	423,972	2,698,169	0.157			426,541	426,541	99%	99%
70-74	45,491	251,588	0.181	0.200	0.200	50,318	50,318	90%	90%
Subtotal	469,462	2,949,756	0.159			476,858	476,858	98%	98%
75 & Over	18,946	108,680	0.174	1.000	1.000	108,680	108,680	17%	17%
Total	488,409	3,058,437	0.160			585,539	585,539	83%	83%

GENERAL EMPLOYEES - NONCONTRIBUTORY
FEMALE NORMAL RETIREMENT EXPERIENCE - AGE BASED (LIABILITY WEIGHTED*)

				Assumed Rate		Expected Retirements*		Actual/Expected	
Age	Actual Retirements*	Total Exposed*	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Under 55	-	11,189	0.000	0.110	0.110	1,231	1,231	0%	0%
55	10,990	84,563	0.130	0.110	0.120	9,302	10,148	118%	108%
56	14,198	93,500	0.152	0.110	0.120	10,285	11,220	138%	127%
57	8,522	91,001	0.094	0.110	0.120	10,010	10,920	85%	78%
58	12,054	98,241	0.123	0.110	0.120	10,807	11,789	112%	102%
59	12,629	109,973	0.115	0.110	0.120	12,097	13,197	104%	96%
60	15,284	121,006	0.126	0.140	0.140	16,941	16,941	90%	90%
61	15,731	115,621	0.136	0.180	0.180	20,812	20,812	76%	76%
62	48,350	298,733	0.162	0.200	0.200	59,747	59,747	81%	81%
63	52,135	276,007	0.189	0.200	0.200	55,201	55,201	94%	94%
64	31,753	235,662	0.135	0.200	0.200	47,132	47,132	67%	67%
65	35,964	199,449	0.180	0.200	0.200	39,890	39,890	90%	90%
66	29,513	167,015	0.177	0.200	0.200	33,403	33,403	88%	88%
67	30,936	135,713	0.228	0.200	0.200	27,143	27,143	114%	114%
68	20,959	102,828	0.204	0.200	0.200	20,566	20,566	102%	102%
69	15,122	86,289	0.175	0.200	0.200	17,258	17,258	88%	88%
Subtotal	354,139	2,226,790	0.159			391,823	396,596	90%	89%
70-74	55,465	246,430	0.225	0.250	0.200	49,286	49,286	113%	113%
Subtotal	409,604	2,473,220	0.166			441,109	445,882	93%	92%
75 & Over	20,963	106,317	0.197	1.000	1.000	106,317	106,317	20%	20%
Total	430,567	2,579,537	0.167			547,426	552,199	79%	78%

GENERAL EMPLOYEES - NONCONTRIBUTORY
MALE EARLY RETIREMENT EXPERIENCE - AGE BASED (LIABILITY WEIGHTED*)

				Assumed Rate		Expected Retirements*		Actual/Expected	
Age	Actual Retirements*	Total Exposed*	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Under 55	-	-	N\A	0.000	0.000	-	-	N\A	N\A
55	3,165	165,076	0	0.010	0.020	1,651	3,302	192%	96%
56	3,012	158,842	0.019	0.010	0.020	1,588	3,177	190%	95%
57	2,030	158,958	0.013	0.010	0.020	1,590	3,179	128%	64%
58	3,647	149,662	0.024	0.020	0.020	2,993	2,993	122%	122%
59	3,959	142,032	0.028	0.020	0.020	2,841	2,841	139%	139%
60	4,077	135,480	0.030	0.040	0.040	5,419	5,419	75%	75%
61	3,143	122,172	0.026	0.040	0.040	4,887	4,887	64%	64%
Total	23,033	1,032,222	0.022			20,969	25,797	110%	89%

GENERAL EMPLOYEES - NONCONTRIBUTORY
FEMALE EARLY RETIREMENT EXPERIENCE - AGE BASED (LIABILITY WEIGHTED*)

				Assumed Rate		Expected Retirements*		Actual/Expected	
Age	Actual Retirements*	Total Exposed*	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Under 55	-	-	N\A	N\A	0.000	-	-	N\A	N\A
55	1,506	144,623	0	0.010	0.020	1,446	2,892	104%	52%
56	2,698	142,682	0.019	0.010	0.020	1,427	2,854	189%	95%
57	2,800	144,471	0.019	0.010	0.020	1,445	2,889	194%	97%
58	4,579	146,139	0.031	0.020	0.020	2,923	2,923	157%	157%
59	4,897	146,999	0.033	0.020	0.020	2,940	2,940	167%	167%
60	5,755	141,319	0.041	0.040	0.040	5,653	5,653	102%	102%
61	4,959	145,438	0.034	0.040	0.040	5,818	5,818	85%	85%
Total	27,194	1,011,670	0.027			21,651	25,969	126%	105%

GENERAL EMPLOYEES - HYBRID
FEMALE NORMAL RETIREMENT EXPERIENCE - AGE BASED (LIABILITY WEIGHTED*)

				Assumed Rate		Expected Retirements*		Actual/Expected	
Age	Actual Retirements*	Total Exposed*	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Under 45	-	3,154	0.000	0.060	0.100	189	315	0%	0%
55	33,940	245,304	0.138	0.180	0.180	44,155	44,155	77%	77%
56	40,558	272,792	0.149	0.130	0.130	35,463	35,463	114%	114%
57	34,000	304,932	0.112	0.130	0.130	39,641	39,641	86%	86%
58	46,054	328,683	0.140	0.130	0.130	42,729	42,729	108%	108%
59	49,171	335,860	0.146	0.130	0.130	43,662	43,662	113%	113%
60	55,368	318,907	0.174	0.130	0.130	41,458	41,458	134%	134%
61	45,947	321,534	0.143	0.150	0.150	48,230	48,230	95%	95%
62	136,055	798,504	0.170	0.200	0.200	159,701	159,701	85%	85%
63	148,371	708,345	0.209	0.200	0.200	141,669	141,669	105%	105%
64	100,731	572,904	0.176	0.200	0.200	114,581	114,581	88%	88%
65	99,597	498,276	0.200	0.200	0.200	99,655	99,655	100%	100%
66	91,694	428,674	0.214	0.180	0.200	77,161	85,735	119%	107%
67	83,259	351,992	0.237	0.180	0.200	63,359	70,398	131%	118%
68	63,843	267,411	0.239	0.180	0.200	48,134	53,482	133%	119%
69	46,286	208,670	0.222	0.180	0.200	37,561	41,734	123%	111%
Subtotal	1,074,874	5,965,944	0.180			1,037,347	1,062,608	104%	101%
70-74	111,521	526,124	0.212	0.200	0.200	105,741	105,225	105%	106%
Subtotal	1,186,395	6,492,068	0.183			1,143,088	1,167,833	104%	102%
75 & Over	23,277	124,043	0.188	1.000	1.000	124,043	124,043	19%	19%
Total	1,209,672	6,616,112	0.183			1,267,132	1,291,877	95%	94%

GENERAL EMPLOYEES - HYBRID
MALE EARLY RETIREMENT EXPERIENCE - AGE BASED (LIABILITY WEIGHTED*)

				Assumed Rate		Expected Retirements*		Actual/Expected	
Age	Actual Retirements*	Total Exposed*	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55	6,513	234,078	0.028	0.010	0.030	2,341	7,022	278%	93%
56	8,779	227,106	0.039	0.010	0.030	2,271	6,813	387%	129%
57	5,515	221,538	0.025	0.010	0.030	2,215	6,646	249%	83%
58	6,997	222,156	0.031	0.020	0.030	4,443	6,665	157%	105%
59	6,227	212,940	0.029	0.020	0.030	4,259	6,388	146%	97%
60	8,260	201,094	0.041	0.040	0.050	8,044	10,055	103%	82%
61	10,690	190,376	0.056	0.040	0.050	7,615	9,519	140%	112%
62	-	-	N/A	0.000	0.000	-	-	0%	0%
63	-	-	N/A	0.000	0.000	-	-	0%	0%
64	-	-	N/A	0.000	0.000	-	-	0%	0%
Total	52,981	1,509,289	0.035			31,188	53,108	170%	100%

GENERAL EMPLOYEES - HYBRID
FEMALE EARLY RETIREMENT EXPERIENCE - AGE BASED (LIABILITY WEIGHTED*)

				Assumed Rate		Expected Retirements*		Actual/Expected	
Age	Actual Retirements*	Total Exposed*	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55	5,390	325,610	0.017	0.010	0.030	3,256	9,768	166%	55%
56	11,360	307,876	0.037	0.010	0.030	3,079	9,236	369%	123%
57	4,418	288,198	0.015	0.010	0.030	2,882	8,646	153%	51%
58	10,057	274,931	0.037	0.020	0.030	5,499	8,248	183%	122%
59	11,393	268,674	0.042	0.020	0.030	5,373	8,060	212%	141%
60	15,668	266,493	0.059	0.040	0.050	10,660	13,325	147%	118%
61	11,354	245,909	0.046	0.040	0.050	9,836	12,295	115%	92%
62	-	-	N/A	0.000	0.000	-	-	0%	0%
63	-	-	N/A	0.000	0.000	-	-	0%	0%
64	-	-	N/A	0.000	0.000	-	-	0%	0%
Total	69,640	1,977,691	0.035			40,585	69,579	172%	100%

TEACHERS - CONTRIBUTORY
MALE NORMAL RETIREMENT EXPERIENCE - AGE BASED (LIABILITY WEIGHTED*)

				Assumed Rate		Expected Retirements*		Actual/Expected	
Age	Actual Retirements*	Total Exposed*	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55	-	42,311	0.000	0.200	0.200	8,462	8,462	0%	0%
56	6,708	80,237	0.084	0.150	0.150	12,035	12,035	56%	56%
57	14,724	99,307	0.148	0.150	0.150	14,896	14,896	99%	99%
58	19,127	125,779	0.152	0.150	0.150	18,867	18,867	101%	101%
59	-	161,214	0.000	0.150	0.150	24,182	24,182	0%	0%
60	15,158	168,604	0.090	0.140	0.140	23,605	23,605	64%	64%
61	15,689	168,939	0.093	0.140	0.140	23,651	23,651	66%	66%
62	41,207	181,824	0.227	0.140	0.140	25,455	25,455	162%	162%
63	35,982	176,799	0.204	0.140	0.140	24,752	24,752	145%	145%
64	28,180	137,220	0.205	0.140	0.140	19,211	19,211	147%	147%
65	30,846	108,573	0.284	0.200	0.200	21,715	21,715	142%	142%
66	26,263	131,596	0.200	0.150	0.150	19,739	19,739	133%	133%
67	63,268	137,958	0.459	0.150	0.150	20,694	20,694	306%	306%
68	47,887	94,900	0.505	0.150	0.150	14,235	14,235	336%	336%
69	6,570	68,382	0.096	0.150	0.150	10,257	10,257	64%	64%
Subtotal	351,607	1,883,644	0.187			281,757	281,757	125%	125%
70-74	117,925	433,645	0.272	0.150	0.150	65,047	65,047	181%	181%
Subtotal	469,533	2,317,289	0.203			346,804	346,804	135%	135%
75 & Over	9,788	277,487	0.035	1.000	1.000	277,487	277,487	4%	4%
Total	479,320	2,594,776	0.185			624,291	624,291	77%	77%

TEACHERS - CONTRIBUTORY

FEMALE NORMAL RETIREMENT EXPERIENCE - AGE BASED (LIABILITY WEIGHTED*)

				Assumed Rate		Expected Retirements*		Actual/Expected	
Age	Actual Retirements*	Total Exposed*	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55	18,220	82,053	0.222	0.180	0.180	14,770	14,770	123%	123%
56	17,595	148,388	0.119	0.160	0.160	23,742	23,742	74%	74%
57	58,990	209,675	0.281	0.160	0.160	33,548	33,548	176%	176%
58	16,989	230,163	0.074	0.160	0.160	36,826	36,826	46%	46%
59	41,199	335,112	0.123	0.160	0.160	53,618	53,618	77%	77%
60	90,122	416,242	0.217	0.180	0.180	74,924	74,924	120%	120%
61	70,332	433,101	0.162	0.180	0.180	77,958	77,958	90%	90%
62	120,030	505,529	0.237	0.250	0.250	126,382	126,382	95%	95%
63	149,391	544,409	0.274	0.200	0.200	108,882	108,882	137%	137%
64	67,234	479,909	0.140	0.150	0.150	71,986	71,986	93%	93%
65	140,709	460,364	0.306	0.250	0.250	115,091	115,091	122%	122%
66	116,444	353,316	0.330	0.250	0.250	88,329	88,329	132%	132%
67	96,559	255,264	0.378	0.200	0.200	51,053	51,053	189%	189%
68	35,915	188,196	0.191	0.200	0.200	37,639	37,639	95%	95%
69	31,281	146,291	0.214	0.200	0.200	29,258	29,258	107%	107%
Subtotal	1,071,009	4,788,011	0.224			944,006	944,006	113%	113%
70-74	146,854	600,403	0.245	0.200	0.200	120,081	120,081	122%	122%
Subtotal	1,217,862	5,388,414	0.226			1,064,086	1,064,086	114%	114%
75 & Over	42,628	140,883	0.303	1.000	1.000	140,883	140,883	30%	30%
Total	1,260,491	5,529,297	0.228			1,204,969	1,204,969	105%	105%

TEACHERS - NONCONTRIBUTORY

MALE NORMAL RETIREMENT EXPERIENCE - AGE BASED (LIABILITY WEIGHTED*)

				Assumed Rate		Expected Retirements*		Actual/Expected	
Age	Actual Retirements*	Total Exposed*	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55	3,490	20,632	0.169	0.100	0.120	2,063	2,476	169%	141%
56	3,894	28,133	0.138	0.100	0.120	2,813	3,376	138%	115%
57	5,488	31,534	0.174	0.100	0.120	3,153	3,784	174%	145%
58	4,045	34,324	0.118	0.100	0.120	3,432	4,119	118%	98%
59	3,994	35,510	0.112	0.100	0.120	3,551	4,261	112%	94%
60	5,448	35,807	0.152	0.100	0.120	3,581	4,297	152%	127%
61	2,250	37,778	0.060	0.100	0.120	3,778	4,533	60%	50%
62	12,385	75,435	0.164	0.160	0.160	12,070	12,070	103%	103%
63	7,115	60,398	0.118	0.120	0.120	7,248	7,248	98%	98%
64	6,268	57,962	0.108	0.100	0.100	5,796	5,796	108%	108%
65	8,144	58,288	0.140	0.200	0.200	11,658	11,658	70%	70%
66	7,029	54,547	0.129	0.150	0.150	8,182	8,182	86%	86%
67	6,112	46,163	0.132	0.150	0.150	6,924	6,924	88%	88%
68	7,250	41,954	0.173	0.150	0.150	6,293	6,293	115%	115%
69	9,151	41,246	0.222	0.150	0.150	6,187	6,187	148%	148%
Subtotal	92,064	659,711	0.140			86,729	91,204	106%	101%
70-74	21,937	137,299	0.160	0.150	0.150	20,595	20,595	107%	107%
Subtotal	114,001	797,010	0.143			107,324	111,799	106%	102%
75 & Over	10,530	87,675	0.120	1.000	1.000	87,675	87,675	12%	12%
Total	124,530	884,684	0.141			194,999	199,473	64%	62%

TEACHERS - NONCONTRIBUTORY
FEMALE NORMAL RETIREMENT EXPERIENCE - AGE BASED (LIABILITY WEIGHTED*)

				Assumed Rate		Expected Retirements*		Actual/Expected	
Age	Actual Retirements*	Total Exposed*	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55	9,494	87,120	0.109	0.130	0.150	11,326	13,068	84%	73%
56	14,311	100,747	0.142	0.070	0.090	7,052	9,067	203%	158%
57	9,012	99,525	0.091	0.080	0.100	7,962	9,952	113%	91%
58	14,230	94,752	0.150	0.100	0.120	9,475	11,370	150%	125%
59	14,390	83,943	0.171	0.200	0.220	16,789	18,467	86%	78%
60	14,456	73,789	0.196	0.110	0.130	8,117	9,593	178%	151%
61	9,744	61,486	0.158	0.160	0.180	9,838	11,067	99%	88%
62	25,593	131,228	0.195	0.250	0.250	32,807	32,807	78%	78%
63	16,404	107,652	0.152	0.200	0.200	21,530	21,530	76%	76%
64	13,701	94,605	0.145	0.150	0.150	14,191	14,191	97%	97%
65	15,911	89,291	0.178	0.250	0.250	22,323	22,323	71%	71%
66	19,332	72,834	0.265	0.250	0.250	18,209	18,209	106%	106%
67	10,401	61,307	0.170	0.250	0.250	15,327	15,327	68%	68%
68	13,883	57,338	0.242	0.250	0.250	14,335	14,335	97%	97%
69	6,167	43,582	0.142	0.250	0.250	10,896	10,896	57%	57%
Subtotal	207,028	1,259,200	0.164			220,175	232,202	94%	89%
70-74	26,310	138,545	0.190	0.250	0.250	34,636	34,636	76%	76%
Subtotal	233,337	1,397,746	0.167			254,811	266,838	92%	87%
75 & Over	10,892	47,762	0.228	1.000	1.000	47,762	47,762	23%	23%
Total	244,229	1,445,508	0.169			302,573	314,600	81%	78%

TEACHERS - HYBRID
MALE NORMAL RETIREMENT EXPERIENCE - AGE BASED (LIABILITY WEIGHTED*)

				Assumed Rate		Expected Retirements*		Actual/Expected	
Age	Actual Retirements*	Total Exposed*	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55	10,411	56,198	0.185	0.200	0.200	11,240	11,240	93%	93%
56	7,704	56,225	0.137	0.130	0.150	7,309	8,434	105%	91%
57	9,174	77,571	0.118	0.130	0.150	10,084	11,636	91%	79%
58	11,535	82,359	0.140	0.130	0.150	10,707	12,354	108%	93%
59	15,399	82,126	0.188	0.130	0.150	10,676	12,319	144%	125%
60	11,407	70,577	0.162	0.140	0.150	9,881	10,587	115%	108%
61	10,797	76,692	0.141	0.140	0.150	10,737	11,504	101%	94%
62	27,785	171,698	0.162	0.220	0.150	37,773	25,755	74%	108%
63	19,224	150,165	0.128	0.140	0.150	21,023	22,525	91%	85%
64	11,989	129,822	0.092	0.140	0.150	18,175	19,473	66%	62%
65	19,461	124,914	0.156	0.200	0.200	24,983	24,983	78%	78%
66	24,785	115,041	0.215	0.150	0.150	17,256	17,256	144%	144%
67	11,142	93,458	0.119	0.150	0.150	14,019	14,019	79%	79%
68	12,768	83,740	0.152	0.150	0.150	12,561	12,561	102%	102%
69	10,860	72,605	0.150	0.150	0.150	10,891	10,891	100%	100%
Subtotal	214,439	1,443,192	0.149			227,315	225,534	94%	95%
70-74	36,523	193,147	0.189	0.150	0.200	28,972	38,629	126%	95%
Subtotal	250,962	1,636,339	0.153			256,287	264,164	98%	95%
75 & Over	23,305	118,280	0.197	1.000	1.000	118,280	118,280	20%	20%
Total	274,266	1,754,619	0.156			374,567	382,444	73%	72%

TEACHERS - HYBRID

FEMALE NORMAL RETIREMENT EXPERIENCE - AGE BASED (LIABILITY WEIGHTED*)

				Assumed Rate		Expected Retirements*		Actual/Expected	
Age	Actual Retirements*	Total Exposed*	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55	36,083	198,405	0.182	0.160	0.180	31,745	35,713	114%	101%
56	35,286	226,332	0.156	0.100	0.120	22,633	27,160	156%	130%
57	26,793	237,733	0.113	0.100	0.120	23,773	28,528	113%	94%
58	37,615	241,568	0.156	0.120	0.140	28,988	33,820	130%	111%
59	33,347	228,529	0.146	0.120	0.140	27,423	31,994	122%	104%
60	35,972	202,991	0.177	0.140	0.140	28,419	28,419	127%	127%
61	31,904	180,858	0.176	0.180	0.180	32,554	32,554	98%	98%
62	87,541	373,457	0.234	0.300	0.250	112,037	93,364	78%	94%
63	61,568	302,317	0.204	0.200	0.200	60,463	60,463	102%	102%
64	44,765	269,739	0.166	0.200	0.200	53,948	53,948	83%	83%
65	44,489	241,788	0.184	0.250	0.250	60,447	60,447	74%	74%
66	58,218	206,058	0.283	0.250	0.250	51,515	51,515	113%	113%
67	41,113	147,898	0.278	0.250	0.250	36,974	36,974	111%	111%
68	26,056	114,624	0.227	0.250	0.250	28,656	28,656	91%	91%
69	18,492	93,902	0.197	0.250	0.250	23,475	23,475	79%	79%
Subtotal	619,240	3,266,199	0.190			623,052	627,030	99%	99%
70-74	53,380	256,229	0.208	0.250	0.250	64,057	64,057	83%	83%
Subtotal	672,620	3,522,429	0.191			687,109	691,088	98%	97%
75 & Over	11,174	63,764	0.175	1.000	1.000	63,764	63,764	18%	18%
Total	683,795	3,586,193	0.191			750,874	754,852	91%	91%

TEACHERS - HYBRID

MALE EARLY RETIREMENT EXPERIENCE - AGE BASED (LIABILITY WEIGHTED*)

				Assumed Rate		Expected Retirements*		Actual/Expected	
Age	Actual Retirements*	Total Exposed*	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55	1,016	97,609	0.010	0.020	0.020	1,952	1,952	52%	52%
56	1,636	96,693	0.017	0.020	0.020	1,934	1,934	85%	85%
57	2,473	76,329	0.032	0.020	0.020	1,527	1,527	162%	162%
58	481	66,386	0.007	0.020	0.020	1,328	1,328	36%	36%
59	1,215	60,156	0.020	0.030	0.030	1,805	1,805	67%	67%
60	700	61,145	0.011	0.030	0.030	1,834	1,834	38%	38%
61	2,544	56,708	0.045	0.030	0.030	1,701	1,701	150%	150%
62	-	-	N/A	0.000	0.000	-	-	0%	0%
63	-	-	N/A	0.000	0.000	-	-	0%	0%
64	-	-	N/A	0.000	0.000	-	-	0%	0%
Total	10,064	515,026	0.020			12,081	12,081	83%	83%

TEACHERS - HYBRID
FEMALE EARLY RETIREMENT EXPERIENCE - AGE BASED (LIABILITY WEIGHTED*)

				Assumed Rate		Expected Retirements*		Actual/Expected	
Age	Actual Retirements*	Total Exposed*	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
55	4,508	242,882	0.019	0.020	0.020	4,858	4,858	93%	93%
56	2,781	191,848	0.014	0.020	0.020	3,837	3,837	72%	72%
57	1,154	158,895	0.007	0.020	0.020	3,178	3,178	36%	36%
58	6,473	146,567	0.044	0.020	0.020	2,931	2,931	221%	221%
59	4,635	137,018	0.034	0.030	0.030	4,111	4,111	113%	113%
60	6,035	135,171	0.045	0.050	0.050	6,759	6,759	89%	89%
61	8,856	130,330	0.068	0.100	0.100	13,033	13,033	68%	68%
62	-	-	N/A	0.000	0.000	-	-	0%	0%
63	-	-	N/A	0.000	0.000	-	-	0%	0%
64	-	-	N/A	0.000	0.000	-	-	0%	0%
Total	34,442	1,142,711	0.030			38,706	38,706	89%	89%

POLICE & FIRE EMPLOYEES
RETIREMENT EXPERIENCE - AGE BASED (LIABILITY WEIGHTED*)

				Assumed Rate		Expected Retirements*		Actual/Expected	
Age	Actual Retirements*	Total Exposed*	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
45	2,881	8,413	0.342	0.160	0.180	1,346	1,514	214%	43%
46	2,436	31,575	0.077	0.160	0.180	5,052	5,684	48%	80%
47	12,517	87,083	0.144	0.160	0.180	13,933	15,675	90%	123%
48	51,631	232,614	0.222	0.160	0.180	37,218	41,870	139%	102%
49	63,926	348,516	0.183	0.160	0.180	55,763	62,733	115%	85%
50	78,943	465,126	0.170	0.180	0.200	83,723	93,025	94%	84%
51	94,076	562,388	0.167	0.180	0.200	101,230	112,478	93%	124%
52	159,276	641,066	0.248	0.180	0.200	115,392	128,213	138%	110%
53	137,314	625,424	0.220	0.180	0.200	112,576	125,085	122%	142%
54	169,664	596,408	0.284	0.180	0.200	107,353	119,282	158%	91%
55	159,818	801,278	0.199	0.220	0.220	176,281	176,281	91%	101%
56	143,550	645,147	0.223	0.220	0.220	141,932	141,932	101%	101%
57	107,783	485,622	0.222	0.220	0.220	106,837	106,837	101%	101%
58	94,054	386,339	0.243	0.240	0.240	92,721	92,721	101%	101%
59	80,185	293,701	0.273	0.270	0.270	79,299	79,299	101%	75%
60	49,882	221,729	0.225	0.300	0.300	66,519	66,519	75%	86%
61	44,768	172,551	0.259	0.300	0.300	51,765	51,765	86%	43%
Subtotal	1,452,701	6,604,980	0.220			1,348,941	1,420,914	108%	102%
62-64	81,013	330,642	0.245	0.300	0.300	99,193	99,193	82%	82%
Subtotal	1,533,715	6,935,622	0.221			1,448,134	1,520,106	106%	101%
65 & Over	38,948	123,885	0.314	1.000	1.000	123,885	123,885	31%	31%
Total	1,572,663	7,059,507	0.223			1,572,019	1,643,991	100%	96%

Termination rates

Termination rates reflect members who leave for any reason other than death, disability or service retirement. They apply whether the termination is voluntary or involuntary, whether the member is vested or non-vested, and whether the member takes a refund or keeps his/her account balance on deposit and takes a deferred benefit. For this analysis, we utilized 10 years of data to capture a longer economic cycle and have based the analysis weighted by salary instead of count.

We found that while in general the current assumptions may do a reasonable job of estimating the total number of terminations, they tend to underestimate the turnover experience early in the career. However, some of this experience could have been influenced by the COVID pandemic, thus we have made only partial adjustments. For this assumption, the targeted A/E ratio is 100-105% to allow for rehiring at a later date after an initial termination. The following tables show selected information.

Termination Experience, in $000's of Liabilty					
		Old Assumptions		Proposed Assumptions	
	Actual Terminations	Expected Terminations	A/E	Expected Terminations	A/E
10 years of service or less					
Teachers	$8,898	$8,347	107%	$8,433	106%
General Employees	18,000	16,859	107%	17,196	105%
Police & Fire	2,626	2,228	118%	2,450	107%
11 years of service or more					
Teachers	$4,296	$4,339	99%	$4,373	98%
General Employees	7,935	7,865	101%	7,986	99%
Police & Fire	5,752	5,205	110%	5,560	103%

GENERAL EMPLOYEES
***SERVICE BASED WITHDRAWAL EXPERIENCE - LIABILITY WEIGHTED in $000s**

				Assumed Rate		Expected Terminations*		Actual/Expected	
Service	Actual Terminations*	Total Exposed*	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	2,595	13,754	0.1887	0.1772	0.1807	2,437	2,486	106%	104%
2	2,807	18,820	0.1492	0.1422	0.1450	2,676	2,730	105%	103%
3	2,365	19,778	0.1196	0.1142	0.1165	2,259	2,304	105%	103%
4	2,091	21,427	0.0976	0.0920	0.0938	1,971	2,011	106%	104%
5	1,760	21,926	0.0803	0.0748	0.0763	1,640	1,673	107%	105%
6	1,679	22,614	0.0742	0.0617	0.0629	1,395	1,423	120%	118%
7	1,279	24,025	0.0532	0.0519	0.0529	1,247	1,272	103%	101%
8	1,358	25,729	0.0528	0.0447	0.0456	1,150	1,173	118%	116%
9	1,059	27,331	0.0388	0.0396	0.0404	1,082	1,104	98%	96%
10	1,007	27,966	0.0360	0.0358	0.0365	1,001	1,021	101%	99%
11	1,158	28,346	0.0409	0.0328	0.0335	930	948	125%	122%
12	1,003	28,526	0.0352	0.0303	0.0309	864	882	116%	114%
13	871	28,768	0.0303	0.0279	0.0285	803	819	109%	106%
14	760	29,786	0.0255	0.0226	0.0231	673	687	113%	111%
15	647	31,211	0.0207	0.0198	0.0202	618	630	105%	103%
16	689	30,911	0.0223	0.0177	0.0181	547	558	126%	124%
17	589	29,110	0.0202	0.0161	0.0164	469	478	126%	123%
18	358	27,061	0.0132	0.0148	0.0151	401	409	89%	88%
19	378	25,962	0.0146	0.0137	0.0140	356	363	106%	104%
20	235	24,841	0.0094	0.0128	0.0131	318	324	74%	72%
21	268	24,655	0.0109	0.0119	0.0119	293	295	91%	91%
22	170	24,284	0.0070	0.0111	0.0111	270	270	63%	63%
23	184	24,202	0.0076	0.0102	0.0102	247	248	74%	74%
24	161	24,523	0.0066	0.0093	0.0093	228	228	71%	71%
25	126	25,247	0.0050	0.0083	0.0083	210	209	60%	61%
26	104	26,019	0.0040	0.0071	0.0071	185	186	56%	56%
27	96	26,486	0.0036	0.0060	0.0060	159	158	60%	60%
28	79	27,373	0.0029	0.0047	0.0047	129	130	62%	61%
29	58	28,379	0.0020	0.0035	0.0035	99	100	58%	58%
30	0	28,389	0.0013	0.0024	0.0024	68	67	56%	57%
Totals	25,974	767,450				24,724	25,183	105%	103%

TEACHERS

***SERVICE BASED WITHDRAWAL EXPERIENCE - LIABILITY WEIGHTED in $000s**

				Assumed Rate		Expected Terminations*		Actual/Expected	
Service	Actual Terminations*	Total Exposed*	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	1,292	6,343	0.2037	0.1979	0.1999	1,255	1,268	103%	102%
2	1,231	6,970	0.1766	0.1652	0.1669	1,151	1,163	107%	106%
3	1,159	7,962	0.1455	0.1348	0.1362	1,073	1,084	108%	107%
4	946	8,759	0.1080	0.1082	0.1094	948	958	100%	99%
5	900	9,415	0.0956	0.0863	0.0872	813	821	111%	110%
6	848	10,219	0.0830	0.0694	0.0701	709	716	120%	118%
7	673	11,083	0.0607	0.0573	0.0579	635	641	106%	105%
8	607	12,200	0.0498	0.0494	0.0499	603	609	101%	100%
9	642	13,150	0.0489	0.0445	0.0450	585	592	110%	109%
10	599	14,022	0.0427	0.0410	0.0414	575	581	104%	103%
11	571	14,657	0.0390	0.0358	0.0361	525	529	109%	108%
12	482	15,167	0.0318	0.0324	0.0327	491	496	98%	97%
13	530	15,543	0.0341	0.0291	0.0294	452	457	117%	116%
14	449	16,061	0.0279	0.0261	0.0264	419	423	107%	106%
15	422	16,811	0.0251	0.0232	0.0235	390	395	108%	107%
16	329	16,398	0.0201	0.0206	0.0208	338	341	97%	97%
17	272	15,860	0.0171	0.0181	0.0183	287	290	95%	94%
18	265	15,616	0.0170	0.0158	0.0159	247	249	107%	107%
19	185	15,789	0.0117	0.0136	0.0138	215	218	86%	85%
20	195	15,565	0.0125	0.0117	0.0118	182	184	107%	106%
21	132	15,479	0.0086	0.0100	0.0100	155	154	85%	86%
22	67	15,582	0.0043	0.0084	0.0084	131	131	51%	51%
23	74	15,269	0.0048	0.0070	0.0070	107	107	69%	69%
24	62	15,451	0.0040	0.0058	0.0058	90	90	69%	69%
25	71	15,610	0.0046	0.0048	0.0048	75	75	95%	95%
26	58	15,865	0.0037	0.0040	0.0040	63	63	92%	92%
27	69	15,979	0.0043	0.0033	0.0033	53	53	131%	131%
28	24	15,629	0.0015	0.0028	0.0028	44	45	55%	54%
29	25	14,693	0.0017	0.0026	0.0026	38	38	66%	66%
30	12	14,102	0.0009	0.0026	0.0025	37	35	34%	36%
Totals	13,194	411,250				12,686	12,806	104%	103%

POLICE & FIRE EMPLOYEES
***SERVICE BASED WITHDRAWAL EXPERIENCE - LIABILITY WEIGHTED in $000s**

				Assumed Rate		Expected Terminations*		Actual/Expected	
Service	Actual Terminations*	Total Exposed*	Actual Rate	Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	548	3,268	0.1678	0.1400	0.1540	458	503	120%	109%
2	278	5,105	0.0544	0.0524	0.0576	267	294	104%	94%
3	249	5,570	0.0448	0.0413	0.0454	230	253	108%	99%
4	214	6,064	0.0353	0.0348	0.0383	211	232	101%	92%
5	284	6,264	0.0453	0.0302	0.0332	189	208	150%	137%
6	214	6,763	0.0316	0.0266	0.0293	180	198	119%	108%
7	233	7,323	0.0318	0.0237	0.0261	174	191	134%	122%
8	202	8,144	0.0249	0.0213	0.0234	173	191	117%	106%
9	228	9,195	0.0248	0.0191	0.0210	176	193	130%	118%
10	176	9,874	0.0178	0.0172	0.0189	170	187	104%	94%
11	209	10,597	0.0197	0.0156	0.0172	165	182	126%	115%
12	152	11,152	0.0136	0.0106	0.0117	118	130	129%	117%
13	134	11,845	0.0113	0.0100	0.0110	118	130	113%	103%
14	145	12,340	0.0117	0.0094	0.0103	116	128	125%	113%
15	246	14,030	0.0175	0.0088	0.0097	123	136	199%	181%
16	120	14,756	0.0081	0.0082	0.0082	121	121	99%	99%
17	109	15,469	0.0070	0.0076	0.0076	118	118	93%	92%
18	65	15,846	0.0041	0.0070	0.0070	111	111	59%	59%
19	98	16,123	0.0061	0.0064	0.0064	103	103	95%	96%
20	62	16,251	0.0038	0.0058	0.0058	94	94	66%	66%
21	70	16,842	0.0041	0.0052	0.0052	88	88	80%	79%
22	61	17,285	0.0035	0.0046	0.0046	80	80	77%	76%
23	14	17,898	0.0008	0.0040	0.0040	72	72	20%	20%
24	78	18,164	0.0043	0.0034	0.0034	62	62	126%	125%
Totals	4,189	276,166				3,716	4,005	113%	105%

Sick Leave

We currently assume that each member has their service increased at retirement for unused sick leave. The current assumption varies the percentage increase by employee group. Data shows the amount of sick leave is proportional to the amount of service at retirement. Data also shows the amount differs by General Employees, Teachers, and Police and Fire. We are recommending small increases to the assumption. The following is the experience from 2019-2024 based on actual retirements showing the average months of service.

	Credited Service at Retirement	Credited Sick Leave	% Increase	Current Assumption	Proposed Assumption
Teachers	313.7	12.2	3.89%	3.75%	3.85%
General Employees	288.0	9.3	3.21%	3.25%	3.25%
Police & Fire	328.6	16.9	5.14%	5.00%	5.10%

Other assumptions

There are other assumptions made in the course of a valuation, such as the age difference between husbands and wives, the likelihood that a terminating employee will take a refund, timing of decrements, etc. We reviewed these, and decided to recommend no changes to these other assumptions.

Actuarial methods

We have reviewed the actuarial cost method being used—the Entry Age Normal cost method (EAN)—and we continue to believe that this is the method of choice for this plan, since this method usually does the best job of keeping costs level as a percentage of payroll.

Actuarial Value of Assets

Actuaries generally recommend using a smoothed actuarial value of assets (AVA), rather than market value (MVA), in order to dampen the fluctuations in measurements such as the required contribution amount and the funded status of the Plan. Currently, the actuarial value of assets is based on the market value of assets with four-year smoothing applied. We recommend no change to this method.

SECTION IV

ACTUARIAL IMPACT OF RECOMMENDATIONS

Actuarial Impact of Recommendations

All values are based on the illustrated valuation as of June 30, 2024.

Item	Current Assumptions	Proposed Assumptions
(1)	(2)	(3)
Total System		
Unfunded Actuarial Accrued Liability ($ in Millions)	$14,008	$14,130
Funded Ratio	63.0%	62.8%
Funding Period	22	22
Police and Fire Only		
Unfunded Actuarial Accrued Liability ($ in Millions)	$2,233	$2,361
Total Normal Cost %	27.12%	27.91%
Funding Period based on current 41% employer contribution rate (years)	22	25
All Other Employees		
Unfunded Actuarial Accrued Liability ($ in Millions)	$11,776	$11,770
Total Normal Cost %	12.93%	12.94%
Funding Period based on current 24% employer contribution rate (years)	22	22

Shown above is a table that compares key statistics from the June 30, 2024 actuarial valuation before and after taking into account the recommended new assumptions. The net result of making all the recommended changes makes a very small change in the picture of ERS's actuarial status.

The Board's decisions should be based on the appropriateness of each recommendation not on their effect on the funding period or the unfunded liability.

SECTION V

SUMMARY OF ASSUMPTIONS AND METHODS INCORPORATING THE RECOMMENDED ASSUMPTIONS

Summary of Assumptions and Methods
Incorporating the Recommended Assumptions

The following assumptions were developed and recommended based on an experience study performed in 2025. All of the assumptions are based on a combination of anticipated future experience and market observations. We believe all of the assumptions are reasonable and appropriate for this measurement.

I. *Valuation Date*

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

II. *Actuarial Cost Method*

The normal cost and actuarial accrued liability are determined using the Entry Age Actuarial Cost Method. The actuarial accrued liability is assigned to years prior to the valuation, and the normal cost is assigned to the year following the valuation. The remaining costs are assigned to future years. The normal cost and accrued liability are determined on an individual basis.

The normal cost is the level percentage of payroll contribution required to accumulate the needed funds to pay all expected benefits. This percentage of payroll is then applied to the total compensation for the prior year for all active members, and is then adjusted for the payroll growth assumption.

The actuarial accrued liability is the difference between the total present value of future benefits and the actuarial present value of future normal costs. The unfunded actuarial accrued liability (UAAL) is the excess of the actuarial accrued liability over the actuarial value of assets.

III. *Funding of Unfunded Actuarial Accrued Liability*

Since the State statutes governing the System establish the employee and employer contribution rates, the actuarial valuation determines the number of years required to amortize (or fund) the UAAL. Because of the legislated increases in future employer contribution rates and the new tier of benefits for employees hired after June 30, 2012, an open group projection of liabilities and assets was used to determine the length of time until the UAAL is eliminated. The open group projection assumed that the number of active members would remain static (i.e. each active employee who leaves employment due to termination, retirement, death or disability, would be replaced by exactly one new employee).

Because of this methodology for determining the funding period, any change in the unfunded actuarial accrued liability due to (i) actuarial gains and losses, (ii) changes in actuarial assumptions, or (iii) amendments, affects the funding period.

Please see Section V of this table for a description of the new entrant profile used in the open group projection.

IV. *Actuarial Value of Assets*

The actuarial value of assets is based on the market value of assets with a four-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. The expected actuarial value of assets is calculated net of investment expenses, and the expected investment return is equal to the assumed investment return rate multiplied by the prior year's actuarial value of assets, adjusted for contributions, benefits paid, and refunds.

V. New Entrant Profile

For the purposes of determining the funding period, an open group projection is used which replaces on a one-to-one basis each active member who leaves employment with an average new hire. 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 seven or less years of service as of the valuation date. Each group of new hires' salaries is assumed to grow at the General Wage Inflation of 3.50% over the salaries of the previous year's group.

The new entrant profile for members assumed to be hired during the year following the valuation date for the Police and Fire Employees and the All Other Employees are shown in the table below.

New Entrant Profile for Police & Fire Employees		
Entry Age	# of Employees	Average Salary
15-19	3	$61,386
20-24	269	69,440
25-29	400	68,335
30-34	299	67,853
35-39	130	67,634
40-44	46	69,375
45-49	18	71,047
50-54	8	104,673
55-59	8	84,947
Total	1,182	68,806

It is assumed that 90% of new hires will be male.

New Entrant Profile for All Other Employees		
Entry Age	# of Employees	Average Salary
15-19	22	$43,491
20-24	1,729	53,040
25-29	3,438	56,007
30-34	2,979	57,958
35-39	2,581	59,577
40-44	2,244	59,256
45-49	1,900	58,151
50-54	1,530	58,615
55-59	1,236	58,496
60-64	624	59,653
65-69	98	59,848
Total	18,381	57,678

It is assumed that 40.0% of new hires will be male and Teachers replace Teachers and Non-Teachers replace Non-Teachers.

VI. Actuarial Assumptions

A. Economic Assumptions

1. Investment return: 7.00% per year, compounded annually, composed of an assumed 2.50% inflation rate and a 4.50% net real rate of return.

2. General Wage Inflation: 3.50% per annum for Police & Fire, 3.00% per annum for the other groups.

3. Salary increase rates: As shown below

Years of Service	General Employees		Teachers	
	Service-related Component	Total Rate Including 2.50% Inflation Component and 1.25% Productivity Component	Service-related Component	Total Rate Including 2.50% Inflation Component and 1.35% Productivity Component
1	3.00%	6.75%	3.00%	6.85%
2	3.00%	6.75%	3.00%	6.85%
3	2.00%	5.75%	2.00%	5.85%
4	1.50%	5.25%	1.50%	5.35%
5	1.50%	5.25%	1.50%	5.35%
6	1.25%	5.00%	1.25%	5.10%
7	1.25%	5.00%	1.25%	5.10%
8	1.00%	4.75%	1.00%	4.85%
9	1.00%	4.75%	1.00%	4.85%
10	1.00%	4.75%	1.00%	4.85%
11	0.75%	4.50%	0.75%	4.60%
12	0.75%	4.50%	0.75%	4.60%
13	0.50%	4.25%	0.50%	4.35%
14	0.50%	4.25%	0.50%	4.35%
15	0.50%	4.25%	0.50%	4.35%
16	0.50%	4.25%	0.50%	4.35%
17	0.50%	4.25%	0.50%	4.35%
18	0.50%	4.25%	0.50%	4.35%
19	0.50%	4.25%	0.50%	4.35%
20	0.25%	4.00%	0.25%	4.10%
21	0.25%	4.00%	0.25%	4.10%
22	0.25%	4.00%	0.25%	4.10%
23	0.25%	4.00%	0.25%	4.10%
24	0.25%	4.00%	0.25%	4.10%
25 or more	0.00%	3.75%	0.00%	3.85%

3. Salary increase rates (continued):

	Police & Firefighters	
Years of Service	Service-related Component	Total Annual Rate of Increase Including 2.50% Inflation Component and 2.50% General Increase Rate
1	0.85%	5.85%
2	0.85%	5.85%
3	0.85%	5.85%
4	0.85%	5.85%
5	0.85%	5.85%
6	0.85%	5.85%
7	0.85%	5.85%
8	0.85%	5.85%
9	0.85%	5.85%
10	0.85%	5.85%
11	0.85%	5.85%
12	0.85%	5.85%
13	0.85%	5.85%
14	0.85%	5.85%
15	0.85%	5.85%
16	0.85%	5.85%
17	0.85%	5.85%
18	0.85%	5.85%
19	0.85%	5.85%
20	0.85%	5.85%
21	0.85%	5.85%
22	0.85%	5.85%
23	0.85%	5.85%
24	0.85%	5.85%
25	0.85%	5.85%
26	0.85%	5.85%
27	0.85%	5.85%
28	0.85%	5.85%
29	0.85%	5.85%
30	0.85%	5.85%
31 or more	0.00%	5.00%

Salary increases are assumed to occur once a year, on July 1. Therefore the pay used for the period between the valuation date and the first anniversary of the valuation date is equal to the reported pay for the prior year, annualized if necessary, and then increased by the salary increase assumption. To adjust the pays received as of March 31st to the June 30th valaution date, the reported pay for each member is increased by 1%.

B. Demographic Assumptions

1. Mortality rates:

Active Members: Multiples of the Pub-2016, Employee Tables for active employees based on the occupation of the member as follows:

	General Employees	Teachers	Police and Fire
Type	Male & Female	Male & Female	Male & Female
Ordinary	95%	95%	80%
% of Ordinary Choosing Annuity	41%	52%	24%
Duty Related	5%	5%	20%

Healthy Retirees: The 2022 Public Retirees of Hawaii mortality tables. The rates are projected on a fully generational basis by the long-term rates of scale UMP from the year 2022 and with multipliers and setbacks based on plan and group experience. The following are sample rates of the base table with the corresponding multipliers:

Healthy Annuitant Mortality Rates Before Projection (Multiplier Applied)

	General Employees		Teachers		Police and Fire	
Age	Male	Female	Male	Female	Male	Female
50	0.2094%	0.1276%	0.1698%	0.0951%	0.2344%	0.1130%
55	0.3215%	0.1687%	0.2883%	0.1596%	0.3391%	0.1633%
60	0.5570%	0.3095%	0.4672%	0.2467%	0.6090%	0.2799%
65	0.8041%	0.4488%	0.7256%	0.4063%	0.8386%	0.4283%
70	1.2621%	0.7066%	1.0762%	0.6015%	1.3768%	0.6565%
75	2.0700%	1.0964%	1.7879%	0.9358%	2.2442%	1.0121%
80	3.5996%	2.1275%	3.0429%	1.6565%	3.9844%	1.8863%
85	6.5891%	4.1569%	5.5564%	3.2698%	7.2903%	3.6977%
90	11.9340%	8.3647%	10.1056%	6.5007%	13.1174%	7.3991%
Multiplier	102%	98%	97%	101%	100%	100%
Setback	0	-1	1	1	-1	0

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

Life Expectancy for an Age 65 Retiree in Years

Gender	Year of Retirement 2025	2030	2035	2040	2045
			General Retirees		
Male	22.8	23.2	23.5	23.9	24.2
Female	26.3	26.6	26.9	27.2	27.5
			Teachers		
Male	24.1	24.5	24.9	25.2	25.5
Female	28.0	28.3	28.6	28.9	29.2
			Police and Fire		
Male	22.1	22.4	22.8	23.1	23.5
Female	27.1	27.4	27.7	28	28.3

Disabled retirees: Base Table for healthy retirees' occupation, set forward 3 years, generational projection using the UMP projection table from the year 2022. Minimum mortality rate of 3.5% for males and 2.5% for females.

2. Disability rates – The assumed total disability rates at select ages are multiples of the client specific table that follows:

Age	Male & Female
25	0.000%
30	0.001%
35	0.008%
40	0.026%
45	0.064%
50	0.146%
55	0.198%
60	0.212%

Note: The disability rates project the percentage of employees at each age that is assumed to become disabled before retiring. Multiples of the rates above are assumed to be ordinary disability or accidental disability, and varies by employee group as follows:

	General Employees	Teachers	Police and Fire
Type	Male & Female	Male & Female	Male & Female
Ordinary	190%	90%	50%
Accidental	65%	15%	120%

3. Termination Rates - Same male and female rates, based solely on the member's service. Rates reflect terminations for causes other than death, disability or retirement. Employees eligible for retirement are assumed to have no probability of termination. Sample rates are shown below:

	Expected Terminations per 1000 Lives (Male & Female)		
Years of Service	General Employees	Teachers	Police & Fire
0	180.7	0.0	154.0
1	145.0	199.9	57.6
2	116.5	166.9	45.4
3	93.8	136.1	38.3
4	76.3	109.3	33.2
5	62.9	87.2	29.3
6	52.9	70.1	26.1
7	45.6	57.9	23.4
8	40.4	49.9	21.0
9	36.5	44.9	18.9
10	33.5	41.4	17.2
11	30.9	36.2	11.7
12	28.5	32.7	11.0
13	23.1	29.4	10.3
14	20.2	26.4	9.7
15	18.1	23.4	9.0
16	16.4	20.8	7.6
17	15.1	18.3	7.0
18	14.0	16.0	6.4
19	13.1	13.7	5.8
20	12.1	11.8	5.2
21	11.1	10.0	4.6
22	10.2	8.4	4.0
23	9.3	7.0	3.4
24	8.3	5.8	2.8
25	7.1	4.8	0.0
26	6.0	4.0	0.0
27	4.7	3.3	0.0
28	3.5	2.8	0.0
29	2.4	2.6	0.0
30 and more	0.0	0.0	0.0

4. Retirement rates - Separate male and female rates, based on age. Sample rates are shown below:

Contributory Members

Expected Retirements per 100 Lives

	General Employees				Teachers				Police/Fire
	Unreduced Retirement		Reduced Retirement		Unreduced Retirement		Reduced Retirement		Unreduced Retirement
Age	Male	Female	Male	Female	Male	Female	Male	Female	Male & Female
45	0	0	0	0	0	0	0	0	17.5
46	0	0	0	0	0	0	0	0	17.5
47	0	0	0	0	0	0	0	0	17.5
48	0	0	0	0	0	0	0	0	17.5
49	0	0	0	0	0	0	0	0	17.5
50	0	0	0	0	0	0	1	0	20.0
51	0	0	2	1	0	0	1	1	20.0
52	0	0	2	1	0	0	1	1	20.0
53	0	0	2	1	0	0	2	2	20.0
54	0	0	3	2	0	0	3	3	20.0
55	25	20			20	18			22.0
56	25	20			15	16			22.0
57	16	13			15	16			22.0
58	16	13			15	16			24.0
59	13	13			15	16			27.0
60	13	15			14	18			30.0
61	13	15			14	18			30.0
62	28	25			14	25			30.0
63	20	20			14	20			30.0
64	20	20			14	15			30.0
65	20	20			20	25			100.0
66	18	20			15	25			
67	18	20			15	20			
68	18	20			15	20			
69	18	20			15	20			
70	20	20			15	20			
71	20	20			15	20			
72	20	20			15	20			
73	20	20			15	20			
74	20	20			15	20			
75	100	100			100	100			

Noncontributory Members

	Expected Retirements per 100 Lives									
	General Employees						Teacher			
	Unreduced		25 & Out		Reduced		Unreduced		Reduced Retirement	
Age	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
55	20	12	15	11	2	2	12	13	1	2
56	18	12	23	11	2	2	12	7	1	2
57	13	12	18	11	2	2	12	8	1	2
58	10	12	15	11	2	2	12	10	2	2
59	10	12	15	11	2	2	12	20	3	3
60	10	14	15	14	4	4	12	11	5	5
61	11	18	16	18	4	4	12	16	7	5
62	20	20	25	20			16	25		
63	20	20	25	20			12	20		
64	12	20	17	20			10	15		
65	14	20	19	20			20	25		
66	20	20	25	20			15	25		
67	20	20	25	20			15	25		
68	20	20	25	20			15	25		
69	20	20	25	20			15	25		
70	20	20	25	20			15	25		
71	20	20	25	20			15	25		
72	20	20	25	20			15	25		
73	20	20	25	20			15	25		
74	20	20	25	20			15	25		
75	100	100	100	100			100	100		

Note: Retirement rates for the 25&out group prior to age 55 are 15% for male and 11% for female.

Hybrid Members

	Expected Retirements per 100 Lives							
	General Employees				Teachers			
	Unreduced		Reduced		Unreduced		Reduced	
Age	Male	Female	Male	Female	Male	Female	Male	Female
55	20	18	3	3	20	18	2	2
56	15	13	3	3	15	12	2	2
57	15	13	3	3	15	12	2	2
58	15	13	3	3	15	14	2	2
59	18	13	3	3	15	14	3	3
60	20	13	5	5	15	14	3	5
61	16	15	5	5	15	18	3	10
62	20	20			15	25		
63	16	20			15	20		
64	16	20			15	20		
65	20	20			20	25		
66	20	20			15	25		
67	20	20			15	25		
68	20	20			15	25		
69	20	20			15	25		
70	20	20			15	25		
71	20	20			15	25		
72	20	20			15	25		
73	20	20			15	25		
74	20	20			15	25		
75	100	100			100	100		

Note: For the 25&out group with membership dates before July 1, 2012, the retirement rates prior to age 55 are 10% for both male and female.

For members hired after June 30, 2012 the retirement rates for members once they reach unreduced retirement eligibility are increased 10% (multiplicative) for each year the member is beyond the age the member would have been eligible under the Hybrid provisions for members hired prior to June 30, 2012.

C. Other Assumptions

1. Projected payroll for contributions: The aggregate projected payroll for the fiscal year following the valuation date is calculated taking the lessor of the actual payroll paid during the previous fiscal year and the current annualized pay on the valuation date and increasing this number by the payroll growth rate.

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

3. Marriage Assumption: While not implicitly used in the valuation, 100% of active members are assumed to be married when setting other benefit election and eligibility assumptions.

4. Percent electing annuity on death for contributory participants (when eligible): All of the spouses of married participants who die after becoming eligible for a retirement benefit are assumed to elect an annuity or a refund, whichever is more valuable at time of participant's death.

5. Payment Option: Future healthy retirees are assumed to choose the life only payment option. 50% of future disabled retirees are assumed to choose the 100% Joint and Survivor option.

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

7. Assumed age for commencement of deferred benefits: Members electing to receive a deferred benefit are assumed to commence receipt when eligible for early retirement.

8. Administrative expenses: Administrative expenses are assumed to be 0.40% of active member payroll.

9. Reemployment, purchase of service, transfers: No recognition is made of (i) future member reimbursements upon reemployment, (ii) future purchase of additional service, or (iii) special transfer provisions.

10. Sick Leave: It is assumed that all members will have their benefit service increased by sick leave and the following loads will be applied by group:

General Employees	3.25%
Teachers	3.85%
Police and Fire	5.10%

11. COLA delay: It is assumed that the first COLA will be received 9 months after retirement. Teachers are assumed to receive COLA 12 months after retirement,

12. There will be no recoveries once disabled.

13. No surviving spouse will remarry and there will be no children's benefit.

14. Pay increase timing: Beginning of (fiscal) year. This is equivalent to assuming that reported pays represent amounts paid to members during the year ended on the valuation date.

15. Decrement timing: Retirements and terminations of Teachers are assumed to occur at the beginning of the year. All other decrements are assumed to occur mid-year.

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

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

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

19. Benefit Service: All members are assumed to accrue 1 year of service each year. Exact fractional service is used to determine the amount of benefit payable.

20. Police officers, firefighters, investigators of the Department of the Prosecuting Attorney and the Attorney General, narcotic enforcement investigators, and public safety investigators hired prior to June 30, 2012 are not assumed to retire at age 55 unless they have 10 years of service.

VI. Participant Data

Participant data was supplied in electronic files for (i) active members, (ii) inactive vested members, who are entitled to a future deferred benefit, (iii) members and beneficiaries receiving benefits.

Salary supplied for the current year was based on the actual pensionable earnings for the 12-month period ending the March preceding the valuation date. This pay was increased by 1% to reflect the three month difference from March to June. For members with less than one year of service, the base pay rate provided in the data was used.