Mendocino County Employees' Retirement Association

Actuarial Experience Study

Analysis of Actuarial Experience During the Period July 1, 2019 through June 30, 2022

✦ Segal

May 11, 2023

Board of Retirement
Mendocino County Employees' Retirement Association
625-B Kings Court
Ukiah, CA 95482-5027

Re: Review of Actuarial Assumptions for the June 30, 2023 Actuarial Valuation

Dear Members of the Board:

We are pleased to submit this report of our review of the actuarial experience for the Mendocino County Employees' Retirement Association (MCERA). This study utilizes the census data for the period July 1, 2019 to June 30, 2022 and provides the proposed actuarial assumptions, both economic and demographic, to be used in the June 30, 2023 valuation.
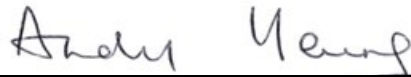
We are members of the American Academy of Actuaries and we meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion herein.

We look forward to reviewing this report with you and answering any questions you may have.

Sincerely,

Paul Angelo, FSA, MAAA, FCA, EA
Senior Vice President and Actuary

Andy Yeung, ASA, MAAA, FCA, EA
Vice President and Actuary

DNA/jl

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1. Introduction, Summary, and Recommendations

To project the cost and liabilities of the pension plan, assumptions are made about all future events that could affect the amount and timing of the benefits to be paid and the assets to be accumulated. Each year actual experience is compared against the projected experience, and to the extent there are differences, the future contribution requirement is adjusted.

If assumptions are modified, contribution requirements are adjusted to take into account a change in the projected experience in all future years. There is a great difference in both philosophy and cost impact between recognizing the actuarial deviations as they occur annually and changing the actuarial assumptions. Taking into account one year's gains or losses without making a change in the assumptions means that year's experience is treated as temporary and that, over the long run, experience will return to what was originally assumed. For example, the actuarial assumptions used in the most recent valuation did not include any possible short-term or long-term impacts on mortality of the covered population that emerged due to COVID-19.[1] Changing assumptions reflects a basic change in thinking about the future, and has a much greater effect on the current contribution requirements than recognizing gains or losses as they occur.

The use of realistic actuarial assumptions is important in maintaining adequate funding, while paying the promised benefit amounts to participants already retired and to those near retirement. The actuarial assumptions used do not determine the "actual cost" of the plan. The actual cost is determined solely by the benefits and administrative expenses paid out, offset by investment income received. However, it is desirable to estimate as closely as possible what the actual cost will be so as to permit an orderly method for setting aside contributions today to provide benefits in the future, and to maintain equity among generations of participants and taxpayers.

This study was undertaken in order to review the economic and demographic actuarial assumptions and to compare the actual experience with that expected under the current assumptions during the three-year experience period from July 1, 2019 through June 30, 2022. The study was performed in accordance with Actuarial Standard of Practice (ASOP) No. 27 "Selection of Economic Assumptions for Measuring Pension Obligations"[2] and ASOP No. 35 "Selection of Demographic and Other Non-Economic Assumptions for Measuring Pension Obligations." These Standards of Practice provide guidance for the selection of the various actuarial assumptions utilized in a pension plan actuarial valuation. Based on the study's results and expected future experience, we are recommending various changes in the current actuarial assumptions.

We are recommending changes in the assumptions for inflation, investment return, merit and promotion salary increases, retirement from active employment, retirement age for deferred vested members, reciprocal salary increases, pre-retirement mortality, post-retirement healthy

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[1] An analysis of the ongoing impact of COVID-19 is beyond the scope of the current experience study.
[2] References made later in this report are with respect to the revised ASOP 27 adopted in June 2020.

and disabled life mortality, termination, and disability incidence (non-service connected and service connected).

Our recommendations for the major actuarial assumption categories are as follows:

Pg #	Actuarial Assumption Categories	Recommendation
11	**Inflation:** Future increases in the Consumer Price Index (CPI), which drives investment returns and active member salary increases.	Reduce the inflation assumption from 2.75% to 2.50% per annum as discussed in Section (3)(A).
14	**Retiree Cost of Living Increases:** Future increases in the cost of living adjustment for retirees.	For those tiers with a 3% maximum cost of living adjustment (COLA), maintain the retiree cost of living assumption at 2.75% per annum (based on our recommended inflation assumption of 2.50% plus a margin for adverse deviation of 0.25%) as discussed in Section (3)(A).
16	**Investment Return:** The estimated average future net rate of return on current and future assets of the Association as of the valuation date. This rate is used to discount liabilities.	Reduce the investment return assumption from 6.75% to 6.50% per annum as discussed in Section (3)(B).
24	**Individual Salary Increases:** Increases in the salary of a member between the date of the valuation to the date of separation from active service. This assumption has three components: • Inflationary salary increases • Real "across the board" salary increases • Merit and promotion increases	Reduce the current inflationary salary increase assumption from 2.75% to 2.50% and maintain the current real "across the board" salary increase assumption at 0.50%. This means that the combined inflationary and real "across the board" salary increases will decrease from 3.25% to 3.00%. We recommend adjusting the merit and promotion rates of salary increase as developed in Section (3)(C) to reflect past experience. Overall future merit and promotion salary increases are higher for General, Safety and Probation members under the proposed assumptions. The recommended <u>total</u> rates of salary increase anticipate slightly lower increases overall than the current assumptions for General, Safety and Probation.
30	**Retirement Rates:** The probability of retirement at each age at which participants are eligible to retire. **Other Retirement Related Assumptions including:** • Retirement age for deferred vested members • Future reciprocal members and reciprocal salary increases • Percent married and spousal age differences for members not yet retired	For active members, adjust the current retirement rates to those developed in Section (4)(A). The retirement rate assumptions anticipate later retirements for General members and slightly earlier retirements for Safety and Probation members overall. For deferred vested members, increase the assumed retirement age for General members from age 60 to age 61, and maintain the assumed retirement age for Safety and Probation members at age 54. Maintain the current assumption for percent of future terminated members expected to be covered by a reciprocal system at 65%. Decrease the reciprocal pay increase assumption from 4.25% to 4.00%. For active and deferred vested members, maintain the percent married at retirement assumption at 70% for males and 50% for females. Maintain the spouse age difference assumption that male retirees are two years older than their spouses and maintain the assumption that female retirees are two years younger than their spouses.

Pg #	Actuarial Assumption Categories	Recommendation
45	**Mortality Rates:** The probability of dying at each age. Mortality rates are used to project life expectancies.	**Healthy Retirees:** Current & recommended base table for General Members: Pub-2010 General Healthy Retiree Amount-Weighted Mortality Table with rates decreased by 5% for males and increased by 5% for females. Current & recommended base table for Safety and Probation Members: Pub-2010 Safety Healthy Retiree Amount-Weighted Mortality Table. **All Beneficiaries:** Current base table - both not in pay status at the valuation and in pay status at the valuation: Pub-2010 Contingent Survivor Amount-Weighted Above-Median Mortality Table with rates increased by 5% for males and females. Recommended base table - not in pay status at the valuation: Pub-2010 General Healthy Retiree Amount-Weighted Mortality Table with rates decreased by 5% for males and increased by 5% for females. Recommended base table - in pay status at the valuation: Pub-2010 Contingent Survivor Amount-Weighted Above-Median Mortality Table with rates increased by 5% for males and females. For the purposes of the actuarial valuations (for funding and financial reporting), when calculating the liability for the continuance to a beneficiary of a surviving member we recommend that the General Healthy Retiree mortality tables be used for beneficiary mortality both before and after the expected death of the General, Safety or Probation member. Upon the actual death of the member (i.e., for all beneficiaries in pay status as of the valuation date), we recommend for the purposes of the actuarial valuations that we use the Contingent Survivor mortality tables as stated above. **Pre-Retirement Mortality:** Current & recommended base table for General Members: Pub-2010 General Employee Amount-Weighted Mortality Table. Current & recommended base table for Safety and Probation Members: Pub-2010 Safety Employee Amount-Weighted Mortality Table. **Disabled Retirees:** Current & recommended base table for General Members: Pub-2010 Non-Safety Disabled Retiree Amount-Weighted Mortality Table with rates decreased by 5% for males and females. Current & recommended base table for Safety and Probation Members: Pub-2010 Safety Disabled Retiree Amount-Weighted Mortality Table. **All current tables** are projected generationally with the two-dimensional mortality improvement scale MP-2019. **All recommended tables** are projected generationally with the two-dimensional mortality improvement scale MP-2021. This is the most recent projection scale, as an updated projection scale was not published in 2022. **For member contribution rates, optional forms, and reserves:** change the mortality rates to those developed in Section (4)(B).

Pg #	Actuarial Assumption Categories	Recommendation
57	**Termination Rates:** The probability of leaving employment at each age and receiving either a refund of member contributions or a deferred vested retirement benefit.	We recommend adjusting the termination rates to those developed in Section (4)(D) to reflect a slightly higher incidence of termination for General, Safety, and Probation members.
62	**Disability Incidence Rates:** The probability of becoming disabled at each age.	We recommend adjusting the disability rates to those developed in Section (4)(E) to reflect a slightly lower incidence of disability overall for General and a slightly higher incidence of disability overall for Safety and Probation members.
65	**Unused Sick Leave:** Unused sick leave hours can be converted into service credit at retirement.	Maintain the assumption to anticipate years of sick leave conversion at service retirement for each year of employment at 0.017.

In this study, we are not recommending any assumption for vacation cash outs at retirement. We understand that in response to the California Supreme Court Alameda Decision, MCERA had the County implement changes to the vacation cash out program that significantly limit the amount of vacation cash out pay that is includible in pension compensation. The County also implemented an Annual Irrevocable Election Form for the vacation cash out program. Employees who do not make an election by the end of an open enrollment period in the preceding calendar year are deemed to have irrevocably elected not to redeem vacation leave hours for pay in the subsequent year. According to MCERA, these changes have significantly reduced the amount of vacation cash outs each fiscal year. In light of these changes, and at MCERA's request, we have not included an assumption to anticipate conversion of relatively higher amounts of vacation cash out immediately prior to retirement unless additional data becomes available for studying the assumption in the future.

We have estimated the impact of all the recommended economic and demographic assumptions (including refinements in the method used to allocate the present value of future benefits for actives between normal cost and actuarial accrued liability) as if they were applied to the June 30, 2022 actuarial valuation. The table below shows the changes in the employer and member contribution rates due to the proposed assumption changes separately for the recommended economic assumption changes (as recommended in Section 3 of this report which include the recommended merit and promotion salary increases) and the recommended demographic assumption changes (as recommended in Section 4 of this report).

<div align="center">

Cost Impact of the Recommended Assumptions
Based on June 30, 2022 Actuarial Valuation

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Assumption	Impact on Average Employer Contribution Rates
Increase due to changes in economic assumptions	2.58%
Increase due to changes in demographic assumptions	0.98%
Total increase in average employer rate	**3.56%**
Total estimated increase in annual dollar amount ($000s)[1]	**$3,012**

[1] Based on June 30, 2022 projected annual payroll as determined under each set of assumptions.

Assumption	Impact on Weighted Average Member Contribution Rates
Increase due to changes in economic assumptions	0.40%
Increase due to changes in demographic assumptions	0.39%
Total increase in average member rate	**0.79%**
Total estimated increase in annual dollar amount ($000s)[1]	**$666**

	Impact on UAAL and Funded Percentage
Increase in UAAL ($000s)	Increase of $18.3 million
Change in Funded Percentage	From 73.2% to 71.7%

Of the various economic assumption changes, the most significant is from the change in the investment return assumption from 6.75% to 6.50%. However, that increase in cost from the investment return assumption is offset somewhat by the decrease in cost from the change in the inflation assumption from 2.75% to 2.50%.

Section 2 provides some background on the basic principles and methodology used for the experience study and for the review of the economic and demographic actuarial assumptions. A detailed discussion of each assumption and reasons for the proposed changes are found in Section 3 for the economic assumptions and Section 4 for the demographic assumptions. The cost impact of the proposed changes is detailed in Section 5.

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[1] Based on June 30, 2022 projected annual payroll as determined under each set of assumptions.

2. Background and Methodology

In this report, we analyzed both economic and demographic ("non-economic") assumptions. The primary economic assumptions reviewed are inflation, investment return, and salary increases. Demographic assumptions include the probabilities of certain events occurring in the population of members, referred to as "decrements," e.g., termination from service, disability retirement, service retirement, and death before and after retirement. In addition to decrements, other demographic assumptions reviewed in this study include the percentage of members with an eligible spouse or domestic partner, spousal age difference, unused sick leave conversions, percent of members assumed to go on to work for a reciprocal system, and reciprocal salary increases. We have also included refinements in the method used to allocate the present value of future benefits for actives between normal cost and actuarial accrued liability.

Economic Assumptions

Economic assumptions consist of:

- **Inflation:** Increases in the price of goods and services. The inflation assumption reflects the basic return that investors expect from securities markets. It also reflects the expected basic salary increase for active employees and drives increases in the allowances of retired members (if any).

- **Investment Return:** Expected long-term rate of return on the Association's investments after accounting for certain investment expenses and all administrative expenses. This assumption has a significant impact on contribution rates.

- **Salary Increases:** In addition to inflationary increases, it is assumed that salaries will also grow by real "across the board" pay increases in excess of price inflation. It is also assumed that employees will receive raises above these average increases as they advance in their careers. These are commonly referred to as merit and promotion increases. Payments to amortize any Unfunded Actuarial Accrued Liability (UAAL) are assumed to increase each year by the price inflation rate plus any real "across the board" pay increases that are assumed.

The setting of these economic assumptions is described in Section 3.

Demographic Assumptions

In order to determine the probability of an event occurring, we examine the "decrements" and "exposures" of that event. For example, taking termination from service, we compare the number of employees who actually terminate in a certain age and/or service category (i.e., the number of "decrements") with those who could have terminated (i.e., the number of "exposures"). For example, if there were 500 active employees in the 20-24 age group at the beginning of the year and 50 of them left during the year, we would say the probability of termination in that age group is 50 ÷ 500 or 10%.

The reliability of the resulting probability is highly dependent on both the number of decrements and the number of exposures. For example, if there are only a few people in a high age category at the beginning of the year (number of exposures), we would not lend as much

credibility to the probability of termination developed for that age category, especially if it is out of line with the pattern shown for the other age groups. Similarly, if we are considering the death decrement, there may be a large number of exposures in the age 20-24 category, but very few decrements (actual deaths); therefore, we would not be able to rely heavily on the probability developed for that category.

One reason we use several years of experience for such a study is to have more exposures and decrements, and therefore more statistical reliability. Another reason for using several years of data is to smooth out fluctuations that may occur from one year to the next. However, we also calculate the rates on a year-to-year basis to check for any trend that may be developing in the later years.

As MCERA is a relatively small Retirement Association, Segal has routinely reviewed the experience over the most recent three-year period and the prior three-year period when setting assumptions, for a total of six years. (We note that for setting the mortality assumptions, we have actually used the data for an eleven-year period.) As noted above, using more years of data tends to smooth out year-to-year fluctuations in the actual experience. In this June 30, 2022 experience study report, we have expanded our tables and charts to show the actual experience over a six-year period.

3. Economic Assumptions

A. Inflation

Unless an investment grows at least as fast as prices increase, investors will experience a reduction in the inflation-adjusted value of their investment. There may be times when "riskless" investments return more or less than inflation, but over the long term, investment market forces will generally require an issuer of fixed income securities to maintain a minimum return which protects investors from inflation.

The inflation assumption is long term in nature, so our analysis begins with a review of historical information. Following is a graph showing historical inflation rates and a comparison with the inflation assumption of 2.50% that we recommend in this report:

Historical Consumer Price Index – 1930 to 2022[1]
(U.S. City Average - All Urban Consumers)
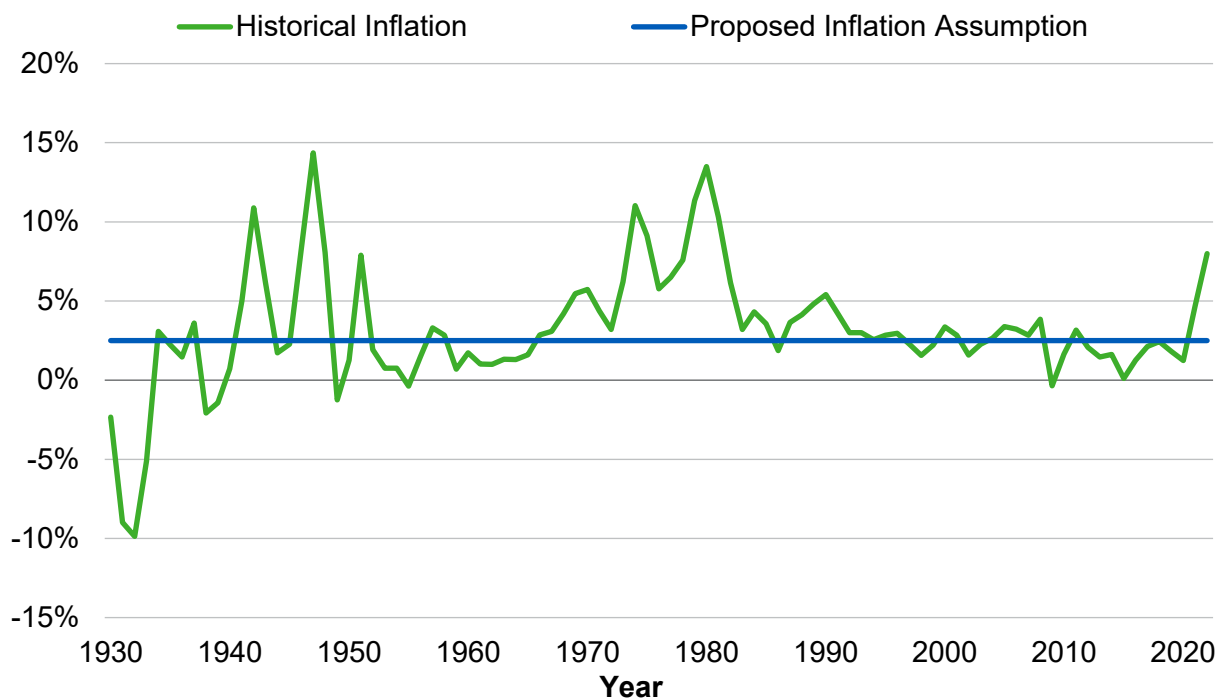
There has been a spike in inflation that started in the second quarter of 2021 and continued into 2022. However, the rate of inflation, while still elevated, has been relatively steady since the Federal Reserve began to increase interest rates starting around the second quarter of 2022.

Based on information found in the Public Plans Database, which is produced in partnership with the National System of State Retirement Administrators (NASRA), the median inflation assumption used by 194 large public retirement funds in their 2021 fiscal year valuations was

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[1] Source: Bureau of Labor Statistics – Based on annual-to-annual CPI for All Items in U.S. city average, all urban consumers, not seasonally adjusted (Series ID: CUUR0000SA0).

2.50%.[1] In California, CalSTRS and ten[2] 1937 Act CERL systems (including MCERA) currently use an inflation assumption of 2.75%, ten 1937 Act CERL systems use an inflation assumption of 2.50%[3] and CalPERS uses an inflation assumption of 2.30%.

MCERA's investment consultant, Callan, anticipates an annual inflation rate of 2.50%, while the average inflation assumption provided by Callan and five other investment advisory firms retained by Segal's California public sector clients, as well as Segal's investment advisory division (Segal Marco Advisors)[4], was 2.43%. Note that, in general, investment consultants use a time horizon for this assumption that is shorter than the time horizon we use for the actuarial valuation.[5]

To find a forecast of inflation based on a longer time horizon, we referred to the Social Security Administration's (SSA) 2023 report on the financial status of the Social Security program.[6] The projected average increase in the Consumer Price Index (CPI) over the next 75 years under the intermediate cost assumptions used in that report was 2.40%. The SSA report also includes alternative projections using lower and higher inflation assumptions of 1.80% and 3.00%, respectively.

We also compared the yields on the thirty-year inflation indexed U.S. Treasury bonds to comparable traditional U.S. Treasury bonds.[7] This "break-even rate" is commonly regarded as a market-based gauge of future inflation expectations. As of April 2023, the difference in yields is about 2.23% which provides a measure of market expectations of inflation. This market expectation for long term inflation can be quite volatile and has dropped from the high of 2.55% over the last 12 months, which is illustrated in the table below. It is worth noting that even during the peak of the recent inflation spike this break-even rate exceeded 2.50% in only a single month, April 2022.

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[1] Among 219 large public retirement funds, the 2021 fiscal year inflation assumption was not available for 25 of the public retirement funds in the survey data as of March 2023.

[2] We note that out of these ten 1937 Act CERL Systems, five of those are served by Segal and we would generally expect to recommend 2.50% as the inflation assumption in their next experience study. MCERA is included in this count.

[3] Four of these 1937 Act CERL systems use a 2.50% inflation assumption with a 2.75% COLA assumption.

[4] We note that this is the first time we have included inflation and real rate of return assumptions used by Segal Marco Advisors in our review of economic assumptions for MCERA.

[5] The time horizon used by the six investment consultants included in our review generally ranges from 20 years to 30 years, with the exception of Callan that uses a 1-year horizon.

[6] Source: Social Security Administration: The 2023 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds

[7] Source: Board of Governors of the Federal Reserve System.

Observation Month	Difference in Yields	Observation Month	Difference in Yields
November 2021	2.38%	August 2022	2.29%
December 2021	2.27%	September 2022	2.27%
January 2022	2.24%	October 2022	2.33%
February 2022	2.18%	November 2022	2.40%
March 2022	2.49%	December 2022	2.26%
April 2022	2.55%	January 2023	2.24%
May 2022	2.47%	February 2023	2.29%
June 2022	2.47%	March 2023	2.26%
July 2022	2.21%	April 2023	2.23%

The following graph shows Segal's historical and proposed inflation assumptions compared to the two other metrics just discussed, going back to 2010. In effect, this compares Segal's assumption to two separate independent forecasts, one based on market observations and one developed by economists at the SSA. The graph shows that over the observed period, Segal's assumption has been higher but consistently moving towards these other forecasts.

Historical Inflation Forecasts
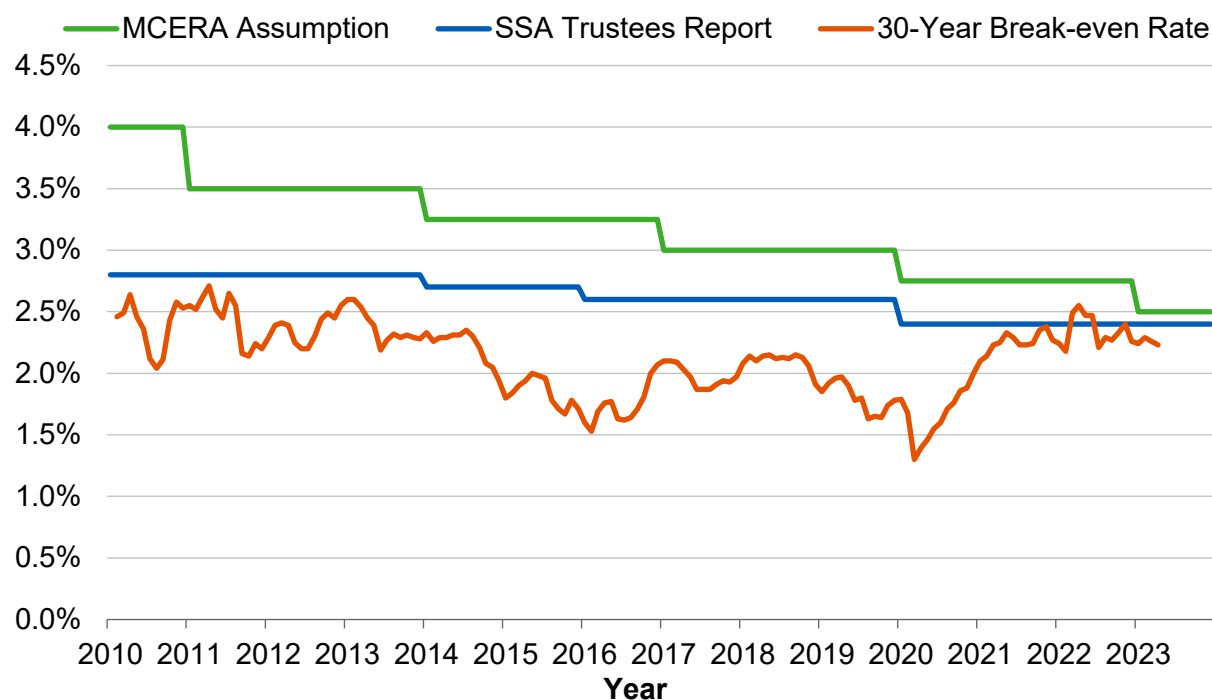
The setting of the inflation assumption using the information outlined above is a somewhat subjective process, and Segal does not apply a specific weight to each of the metrics in determining our recommended inflation assumption. Based on a consideration of all of the above metrics, beginning in 2021 we are generally recommending the same 2.50% inflation assumption in our experience studies for our California public retirement system clients.

Based on all of the above information, we recommend reducing the annual inflation assumption from 2.75% to 2.50%.

Retiree Cost of Living Increases

In our last experience study as of June 30, 2019, consistent with the 2.75% annual inflation assumption adopted by the Board, the Board adopted a 2.75% retiree cost-of-living adjustment (COLA) for the non-CalPEPRA tiers.[1] Note that no COLAs are provided for CalPEPRA members in General Tier 4, Safety Tier 3, and Probation Tier 3.

In the last experience study, we set the recommended post-retirement cost-of-living adjustment (COLA) assumption to be equal to our recommended inflation assumption. However, we observed in the table below that during the most recent 5-year, 10-year and 20-year periods ending before December 31, 2022, the changes in the December CPI based on the Western Region used by the Board to set COLAs have exceeded those of the December CPI for the U.S. City Average.

	Change in December CPI for Western Region	Change in December CPI for U.S. City Average
5-Year Period	4.10%	3.78%
10-Year Period	3.09%	2.60%
20-Year Period	2.68%	2.51%

In order to reflect this experience and to mitigate actuarial losses which may arise from future COLA increases greater than the inflation assumption, we believe it is reasonable for the Board to consider adopting an extra margin above the general price inflation in anticipating future COLAs. **Accordingly, for non-CalPEPRA retirees with a maximum 3% COLA our recommended COLA assumption of 2.75% includes a 0.25% margin above our recommended inflation assumption, which leaves the COLA assumption unchanged as shown below.**

Tiers	Maximum COLA	Current Assumption	Proposed Assumption
Non-CalPEPRA	3.00%	2.75%[2]	2.75%[2]
CalPEPRA	N/A	N/A	N/A

In developing the COLA assumption, we also considered the results of a stochastic approach that would attempt to account for the possible impact of low inflation that could occur before COLA banks are able to be established for the member. Although the results of this type of

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[1] The non-CalPEPRA tiers are General Tiers 1, 2, and 3, Safety Tiers 1 and 2, and Probation Tiers 1 and 2.
[2] We will continue to assume in the valuation that retired members and beneficiaries with a COLA bank on the date of the valuation will continue to receive the maximum COLA until the balances in their COLA banks are used up.

analysis might justify the use of a lower COLA assumption, we are not recommending that at this time. The reasons for this conclusion include the following:

- The results of the stochastic modeling are significantly dependent on assuming that lower levels of inflation will persist in the early years of the projections. If this is not assumed, then the stochastic modeling will produce results similar to our proposed COLA assumptions.

- Using lower long-term COLA assumptions based on a stochastic analysis would mean that an actuarial loss would occur even when the inflation assumption of 2.50% is met in a year. We question the reasonableness of this result.

We do not see the stochastic possibility of COLAs averaging less than those predicted by the assumed rate of inflation as a reliable source of cost savings that should be anticipated in our COLA assumptions. Therefore, we continue to recommend setting the COLA assumptions consistent with the COLA assumption we have used in prior years.

B. Investment Return

The investment return assumption is comprised of two primary components, inflation and real rate of investment return, with adjustments for certain expenses and risk.

Real Rate of Investment Return

This component represents the portfolio's incremental investment market returns over inflation. Generally, when an investor takes on greater investment risk, the return on the investment is expected to also be greater, at least in the long run. This additional risk and return is expected to vary by asset class and empirical data supports that expectation. For that reason, the real rate of return assumptions are developed by asset class. Therefore, the real rate of return assumption for a retirement plan's portfolio will vary with the Board's asset allocation among asset classes.

The Association's current target asset allocation and the assumed real rate of return assumptions by asset class are shown in the following table. The first column of real rate of return assumptions are determined by reducing Callan's total or "nominal" 2023 return assumptions by their assumed 2.50% inflation rate. The second column of returns (except for Private Infrastructure) represents the average of a sample of real rate of return assumptions. The sample includes the expected annual real rate of return provided to us by Callan and five other investment advisory firms retained by Segal's public sector clients, as well as Segal's investment advisory division. We believe these averages are a reasonable consensus forecast of long-term future market returns in excess of inflation.[1]

MCERA's Target Asset Allocation and Assumed Arithmetic Real Rate of Return Assumptions by Asset Class and for the Portfolio

Asset Class	Percentage of Portfolio	Callan's Assumed Net Real Rate of Return[2]	Average Assumed Net Real Rate of Return from a Sample of Consultants to Segal's California Public Sector Clients[3]
Large Cap US Equity	25.90%	6.10%	6.00%
Small Cap US Equity	11.10%	7.10%	6.65%
Global ex-US Equity	25.00%	6.95%	7.05%
US Fixed Income	21.00%	1.75%	1.97%
Real Estate	11.00%	4.10%	3.86%
Private Infrastructure	6.00%	4.65%	4.65%[4]
Total	**100.00%**	**5.20%**	**5.17%**

[1] Note that, just as for the inflation assumption, in general the time horizon used by the investment consultants in determining the real rate of return assumption is shorter than the time horizon encompassed by the actuarial valuation.

[2] The rates shown have been estimated by Segal by taking Callan's nominal arithmetic returns and reducing by Callan's assumed 2.50% inflation rate to develop the assumed real rate of return shown.

[3] These are based on the projected arithmetic returns provided by Callan and five other investment advisory firms serving MCERA and 16 other city and county retirement systems in California, as well as Segal's investment advisory division. These return assumptions are net of any applicable investment expenses.

[4] For this asset class, Callan's assumption is applied in lieu of the average because there is a larger disparity in returns for this asset class among the firms surveyed and using Callan's assumption should more closely reflect the underlying investments made specifically for MCERA.

The above are representative of "indexed" returns and do not include any additional returns ("alpha") from active management. This is consistent with the Actuarial Standard of Practice No. 27, Section 3.8.3.d, which states:

> "Investment Manager Performance - Anticipating superior (or inferior) investment manager performance may be unduly optimistic (or pessimistic). The actuary should not assume that superior or inferior returns will be achieved, net of investment expenses, from an active investment management strategy compared to a passive investment management strategy unless the actuary believes, based on relevant supporting data, that such superior or inferior returns represent a reasonable expectation over the measurement period."

The following are some observations about the returns provided above:

1. The investment consultants to our California public sector clients, as well as Segal's investment advisory division, have each provided us with their expected real rates of return for each asset class, over various future periods of time. However, in general, the returns available from investment consultants are projected over time periods that are shorter than the durations of a retirement plan's liabilities.

2. As discussed in the next section, the real rates of return provided this year by the investment consultants reflect a change in how investment expenses are reported.

3. Using a sample average of expected net real rates of return allows the Association's investment return assumption to reflect a broader range of capital market information and should help reduce year to year volatility in the investment return assumption.

4. Therefore, we recommend that the 5.17% portfolio net real rate of return be used to determine MCERA's investment return assumption, but with some caution. This return is 0.30% higher than the 4.87% gross return that was used three years ago in the review of the recommended investment return assumption for the June 30, 2020 valuation even before we consider the approximately 0.10% in investment management expense that, as discussed in the next section, will no longer be subtracted from the 5.17% gross return.

5. The difference in the portfolio net real rate of return is due to changes in the real rate of return assumptions provided to us by the investment advisory firms (+0.31% under the 2020 asset allocation) and the slight change in MCERA's target asset allocation due to a reallocation of US equity into large cap and small cap portions (-0.01%). We believe the increase in the real rates of return may be due to the very low returns earned in the 2021-2022 plan year, as well as the increase in the federal funds rate during 2022, and so should be used with caution in selecting a long-term investment return assumption.

Association Expenses

For funding purposes, the real rate of return assumption for the portfolio needs to be adjusted for investment expenses expected to be paid from investment income. Current practice for MCERA also adjusts for expected administrative expenses. In the prior experience studies, we had adjusted the gross real rate of return developed using the target asset allocation by the investment expenses expected to be paid by MCERA.

However, as prevailing practice by investment advisory firms is to provide us with the real rates of return net of expected investment expenses, especially for active portfolio management, we now need to make adjustments only for investment consulting fees, custodian fees and other

miscellaneous investment expenses. The following table provides the administrative and investment expenses in relation to the actuarial value of assets as of the beginning of the year, for the six-year period ending June 30, 2022.

Investment Expenses as a Percentage of Actuarial Value of Assets
(Dollars in 000's)

Year Ending June 30	Actuarial Value of Assets[1]	Investment Expenses[2]	Administrative Expenses	Investment %	Administrative %	Total %
2017	$451,045	$409	$1,086	0.09	0.24	0.33
2018	480,080	427	1,142	0.09	0.24	0.33
2019	510,023	373	1,233	0.07	0.24	0.31
Three-Year Average (2017-2019)				**0.08**	**0.24**	**0.32**
2020	532,692	434	1,226	0.08	0.23	0.31
2021	556,717	359	1,372	0.06	0.25	0.31
2022	605,390	382	1,463	0.06	0.24	0.30
Three-Year Average (2020-2022)				**0.07**	**0.24**	**0.31**
Six-Year Average				**0.08**	**0.24**	**0.32**
Current Assumption (including investment management fees)						**0.40**
Proposed Assumption (excluding investment management fees)						**0.30**

Based on the above experience, we recommend reducing the expense component of the investment return assumption from 0.40% to 0.30%.

Note related to investment expenses paid to active managers – As cited above, under Section 3.8.3.d of ASOP No. 27, the effect of an active investment management strategy should be considered "net of investment expenses…unless the actuary believes, based on relevant supporting data, that such superior or inferior returns represent a reasonable expectation over the measurement period."

We have not performed a detailed analysis to measure how much of the investment expenses paid to active managers might have been offset by additional returns ("alpha") earned by that active management. For this study, we will continue to use the current approach that any "alpha" that may be identified would be treated as an increase in the risk adjustment and corresponding confidence level that are discussed in the next section. However, as discussed above, the real return assumptions provided by the investment advisory firms assume that active management will generate additional returns to cover the expense of such management, an assumption that is consistent with ASOP No. 27.

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[1] In this study, we use Actuarial Value of Assets as of the beginning of the plan year. In prior studies, we used the Market Value of Assets as of the beginning of the plan year.
[2] Equals the sum of investment consulting fees, custodian fees, actuarial expense, and miscellaneous investment expenses. Excludes investment manager fees.

Risk Adjustment

The real rate of return assumption for the portfolio is adjusted to reflect the potential risk of shortfalls in the return assumptions. MCERA's asset allocation determines this portfolio risk, since risk levels are driven by the variability of returns for the various asset classes and the correlation of returns among those asset classes. This portfolio risk is incorporated into the real rate of return assumption through a risk adjustment.

The purpose of the risk adjustment (as measured by the corresponding confidence level) is to increase the likelihood of achieving the actuarial investment return assumption in the long term.[1] This is consistent with our experience that retirement plan fiduciaries would generally prefer that returns exceed the assumed rate more often than not.

The 5.17% expected real rate of return developed earlier in this report was based on expected arithmetic average returns. A retirement system using an expected arithmetic average return as the discount rate in a funding valuation is expected on average to have no surplus or asset shortfall relative to its expected obligations assuming all actuarial assumptions are met in the future.[2] That is the basis used in Segal's previous experience studies for MCERA.

Beginning with this study, in addition to no longer including an explicit adjustment for investment management fees, we are converting the portfolio's expected arithmetic average return to an expected geometric average return. A retirement system using an expected geometric average return as the discount rate in a funding valuation will, over long periods of time, have an equal likelihood of having a surplus or asset shortfall relative to its expected obligations assuming all actuarial assumptions are met in the future.[3]

Under either the arithmetic or geometric model, the confidence level associated with a particular risk adjustment represents a relative likelihood that future investment earnings would equal or exceed the assumed earnings over a 15-year period. The 15-year time horizon represents an approximation of the "duration" of the fund's liabilities, where the duration of a liability represents the sensitivity of that liability to interest rate variations.

For comparison purposes we first consider how the earlier model would look if used in this year's study. Three years ago, the Board adopted an investment return assumption of 6.75%. Under the model used in that experience study, that return implied a risk adjustment of 0.47%, corresponding to a 15-year confidence level of 55%, based on an annual portfolio return standard deviation of 13.0% provided by Callan in 2020.

If we use the same 55% 15-year confidence level from our last study to set this year's risk adjustment and the current annual portfolio return standard deviation of 12.8% provided by Callan, the corresponding risk adjustment would be 0.46%. Together with the other investment return components (including for this comparison updated expected arithmetic average returns and the same expense adjustment as used in the prior study), this would result in an investment return assumption of 6.81%, which is higher than the current assumption of 6.75%.

Based on the general practice of using one-quarter percentage point increments for economic assumptions, we evaluated the effect on the confidence level of other alternative investment

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[1] This type of risk adjustment is referred to in the Actuarial Standards of Practice as a "margin for adverse deviation."
[2] The mathematical terminology for this is that the mean (or average) surplus or asset shortfall is expected to be zero.
[3] The mathematical terminology for this is that over time the median surplus or asset shortfall is expected to be zero.

return assumptions. We also considered that, as discussed above, the increase in the real rates of return provided by the investment consultants may reflect the very low returns earned in the 2021-2022 plan year, as well as the increase in the federal funds rate during 2022, and so could be overly optimistic for use in selecting a long-term investment return assumption. For that reason, for this comparison value we considered a net investment return assumption of 6.50% which, together with the other investment return components, would produce a risk adjustment of 0.77% which corresponds to a confidence level of 59% under the model and expense adjustment used in prior studies. We believe this increase in confidence level would be appropriate given the concerns stated. For comparison, the current net investment return assumption of 6.75% would now have a confidence level of 56% under the model and expense adjustment used in prior studies.

As noted above, beginning with this study, in addition to no longer including an explicit adjustment for investment management fees, we are converting the portfolio's expected arithmetic average return to an expected geometric average return. For any given asset portfolio, the expected geometric average return will be less than the expected arithmetic average return.[1] The difference depends on the variability of the portfolio as measured by its standard deviation. Based on the annual portfolio return standard deviation of 12.8% provided by Callan, the adjustment to an expected geometric average return reduces the expected return by 0.77%.

Together with the other investment return components (now excluding investment management expenses) and prior to any risk adjustment, this would result in a median expected assumption of 6.60%, which is lower than the current assumption of 6.75%. In applying this model to MCERA for the first time we again considered a net investment return assumption of 6.50% which, together with the other investment return components, would produce a risk adjustment of 0.10% which under the expected geometric average return model corresponds to a confidence level of 51%. For comparison, the current net investment return assumption of 6.75% would have a confidence level of 48% under this model.

Recommended Investment Return Assumption

The following table summarizes the components of the recommended investment return assumption developed in the previous discussion. For comparison purposes, we have also included similar values from the last study as well as the comparison values discussed above that apply the prior year's model to this year's information.

[1]   This is because the expected geometric average return reflects expected median outcomes, while the expected arithmetic average return reflects expected average or mean outcomes. Expected median outcomes are lower than expected average outcomes because they are less affected by the possibility of extraordinary ("outlier") favorable outcomes.

Assumption Component	June 30, 2023 Recommended Value	June 30, 2023 Comparison Values	June 30, 2020 Adopted Value
Inflation	2.50%	2.50%	2.75%
Portfolio Expected Arithmetic Real Rate of Return	5.17%	5.17%	4.87%
Expense Adjustment	(0.30)%	(0.40)%[1]	(0.40)%
Adjustment to Expected Geometric Real Rate of Return	(0.77)%	N/A	N/A
Risk Adjustment	(0.10)%	(0.77)%	(0.47)%
Total	**6.50%**	**6.50%**	**6.75%**
Confidence Level	**51%**	**59%**	**55%**

Based on this analysis, we recommend reducing the investment return assumption from 6.75% to 6.50% per annum.

The table below shows MCERA's recommended investment return assumption and the corresponding risk adjustment and confidence level compared to the similar values for prior studies.

Historical Investment Return Assumptions, Risk Adjustments and Confidence Levels based on Assumptions Adopted by the Board

Years Ending June 30	Investment Return	Risk Adjustment	Corresponding Confidence Level
2011 - 2013	7.75%	0.32%	54%
2014 - 2016	7.25%	0.30%	53%
2017 - 2019	7.00%	0.48%	55%
2020 - 2022	6.75%	0.47%	55%
2023 (Comparison)	6.50%	0.77%	59%
2023 (Recommended)	6.50%	0.10%	51%

As we have discussed in prior experience studies, the risk adjustment model and associated confidence level is most useful as a means for comparing how MCERA has positioned itself relative to risk over periods of time.[2] The use of either a 51% or 59% confidence level should be considered in context with other factors, including:

- As noted above, the confidence level is more of a relative measure than an absolute measure, and so can be reevaluated and reset for future comparisons. This is particularly true when comparing confidence levels developed using different models, as we are doing in this transitional year from one model to another.

- The confidence level is based on the standard deviation of the portfolio that is determined and provided to us by Callan. The standard deviation is a statistical measure of the future volatility

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[1] For purposes of these comparison values we have assumed the same investment expenses as in the previous study, which included investment management fees.

[2] In particular, it would not be appropriate to use this type of risk adjustment as a measure of determining an investment return rate that is "risk-free."

of the portfolio and so is itself based on assumptions about future portfolio volatility and can be considered somewhat of a "soft" number.

- We have not taken into account any additional returns ("alpha") that might be earned on active management. This means that if active management generates enough alpha to cover its related expenses, this would increase returns. This aspect of Segal's model is further evaluated below.

- As with any model, the results of the risk adjustment model should be evaluated for reasonableness and consistency. This is discussed in the later section on "Comparison with Other Public Retirement Systems."

Comparison with Alternative Model used to Review Investment Return Assumption

In previous studies, we have consistently reviewed investment return assumptions based on our model that incorporates expected arithmetic real returns for the different asset classes and for the entire portfolio as one component of that model.[1] The use of "forward looking expected arithmetic returns" is one of the approaches discussed for use in the Selection of Economic Assumptions for measuring Pension Obligations under Actuarial Standards of Practice (ASOP) No. 27.

Besides using forward looking expected arithmetic returns, ASOP No. 27 also discusses setting investment return assumptions using an alternative "forward looking expected geometric returns" approach, which is the model we have used in this study.[2] Even though as noted earlier expected geometric returns are lower than expected arithmetic returns, and aside from the fact MCERA was one of the first 1937 Act retirement systems to adopt the current 6.75% assumption, public retirement systems that have set investment return assumptions using this geometric approach have in practice adopted investment return assumptions that are comparable to those adopted by the Board for MCERA under the arithmetic approach. This is because under the model used by those retirement systems (especially among those with relatively higher investment management expenses) and by Segal in this report, the investment return assumption is <u>not</u> reduced to anticipate future investment management expenses.

In the interest of still having an alternative model for comparison, we evaluated the recommended 6.50% assumption based on the expected geometric return for the entire portfolio gross of management investment expenses, but using a fully stochastic approach and a different source for capital market assumptions. Under this alternative model, over a 15-year period, there is a 51% likelihood that future average geometric returns will meet or exceed 6.50%[3] developed using the capital market assumptions complied by Horizon Actuarial Services based their most recent survey published in August 2022. While the above likelihood of 51% is substantially lower than the likelihood of 56% that we observed during the review of 2020, some

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[1] Again, as discussed earlier in this section, if a retirement system uses the expected arithmetic average return as the discount rate in the funding valuation, that retirement system is expected to have no surplus or asset shortfall relative to its expected obligations assuming all actuarial assumptions are met in the future.

[2] As also noted earlier in slightly different terms, if a retirement system uses the expected geometric average return as the discount rate in the funding valuation, that retirement system is expected to have an asset value that generally converges to the median accumulated value as the time horizon lengthens assuming all actuarial assumptions are met in the future.

[3] We performed this stochastic simulation using the capital market assumptions included in the 2022 survey prepared by Horizon Actuarial Services. That simulation was performed using 10,000 trial outcomes of future market returns, using assumptions from 20-year arithmetic returns, standard deviations and correlation matrix that were found in the 2022 survey that included responses from 24 investment advisors.

of the investment advisory firms that participated in the 2022 Horizon survey have since raised their capital market assumptions. We believe it is reasonable to expect the above likelihood to increase if we were to revise these results using the updated capital market assumptions when the 2023 Horizon survey becomes available.

Comparison with Other Public Retirement Systems

One final test of the recommended investment return assumption is to compare it against those used by other public retirement systems, both in California and nationwide.

We note that an investment return of 6.75% or lower is becoming more common among California public sector retirement systems. In particular, of the twenty 1937 Act CERL systems, seven use a 7.00% investment return assumption, eight use 6.75%, two use 6.50% and one uses 6.25%. The remaining two 1937 Act CERL systems currently use a 7.25% earnings assumption. Furthermore, CalSTRS currently uses a 7.00% earnings assumption and CalPERS uses a 6.80% earnings assumptions, while the San Jose and San Diego City retirement systems use investment return assumptions of 6.625% and 6.50%, respectively.

The following table compares MCERA's recommended net investment return assumption against those of the 210 large public retirement funds in their 2021 fiscal year valuations based on information found in the Public Plans Database, which is produced in partnership with NASRA:[1]

Assumption	MCERA	Public Plans Data[2]		
		Low	Median	High
Net Investment Return	6.50%	4.25%	7.00%	8.25%

The detailed survey results show that over 80% of the systems have an investment return assumption in the range of 6.75% to 7.50%. Also, over half of the systems have reduced their investment return assumption from 2017 to 2021. State systems outside of California tend to change their economic assumptions less frequently and so may lag behind emerging practices in this area.

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[1]   Among 219 large public retirement funds, the 2021 fiscal year investment return assumption was not available for 9 of the public retirement funds in the Public Plans Database as of March 2023.

[2]   Public Plans Data website – Produced in partnership with the National System of State Retirement Administrators (NASRA).

C. Salary Increase

Salary increases impact plan costs in two ways: (1) by increasing members' benefits (since benefits are a function of the members' highest average pay) and future normal cost collections; and (2) by increasing total active member payroll which in turn generates lower UAAL contribution rates as a percent of payroll. These two impacts are discussed separately as follows:

As an employee progresses through his or her career, increases in pay are expected to come from three sources:

1. **Inflation:** Unless pay grows at least as fast as consumer prices grow, employees will experience a reduction in their standard of living. There may be times when pay increases lag or exceed inflation, but over the long term, labor market forces may require an employer to maintain its employees' standards of living.

   As discussed earlier in this report, we recommend reducing the annual inflation assumption from 2.75% to 2.50%. This inflation component is used as part of the salary increase assumption.

2. **Real "Across the Board" Pay Increases:** These increases are typically termed productivity increases since they are considered to be derived from the ability of an organization or an economy to produce goods and services in a more efficient manner. As that occurs, at least some portion of the value of these improvements can provide a source for pay increases. These increases are typically assumed to extend to all employees "across the board". The State and Local Government Workers Employment Cost Index produced by the Department of Labor provides evidence that real "across the board" pay increases have averaged about 0.5% – 0.8% annually during the last ten to twenty years.

   We also referred to the annual report on the financial status of the Social Security program published in March 2023. In that report, real "across the board" pay increases are forecast to be 1.14% per year under the intermediate assumptions.

   The real pay increase assumption is generally considered a more "macroeconomic" assumption that is not necessarily based on individual plan experience. However, recent salary experience with public systems in California as well as anecdotal discussions with plans and plan sponsors indicate lower future real wage growth expectations for public sector employees. We note that for MCERA's active members, the actual average inflation plus "across the board" increase (i.e., wage inflation) over the three-year period ending June 30, 2022 was 6.87%, which is higher than the change in CPI of 3.77% during that same period, largely as a result of the compensation increases following the 2019 compensation study:

Valuation Date	Actual Average Increase[1]	Actual Change in CPI[2]
June 30, 2020	6.71%	2.78%
June 30, 2021	7.75%	1.47%
June 30, 2022	6.15%	7.05%
Three-Year Average	**6.87%**	**3.77%**

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[1] Reflects the increase in average salary for members at the beginning of the year versus those at the end of the year. It does not reflect the average salary increases received by members who worked the full year.

[2] Based on the change in the December CPI for the Western Region compared to the prior year. For instance, the result of 2.78% shown for the June 30, 2020 valuation date represents the change in the December 1999 vs. December 1998 indices.

Based on all of the above information, we recommend maintaining the real "across the board" salary increase assumption at 0.50%. This means that the combined inflation and "across the board" salary increase assumption will decrease from 3.25% to 3.00%.

3. **Merit and Promotion Increases:** As the name implies, these increases come from an employee's career advances. This form of pay increase differs from the previous two, since it is specific to the individual. For MCERA, there are service-specific merit and promotion increase assumptions.

    The annual merit and promotion increases are determined by measuring the actual increases received by members over the experience period, net of the inflationary and real "across the board" pay increases. Increases are measured separately for General and Safety members. This is accomplished by:

    a. Measuring each continuing member's actual salary increase over each year of the experience period on a salary-weighted basis, with higher weights assigned to experience from members with larger salaries;

    b. Excluding any members with increases of more than 75% or a decrease of more than 20% during any particular year;

    c. Categorizing these increases according to member demographics;

    d. Removing the wage inflation component from these increases (assumed to be equal to the increase in the members' average salary during the year);

    e. Averaging these annual increases over the experience period; and

    f. Modifying current assumptions to reflect some portion of these measured increases reflective of their "credibility."

    To be consistent with the other economic assumptions, these merit and promotion assumptions should be used in combination with the total 3.00% assumed inflation and real "across the board" increases recommended in this study.

    Due to the high variability of the actual salary increases, we have analyzed this assumption using data for the past six years. We believe that when the experience from the current and prior studies is combined, it provides a more reasonable representation of potential future merit and promotion salary increases over the long term.

    In the past, assumed salary increases have been applied based on the member's service at the beginning of the year. We recommend a refinement to this assumption where salary increases are applied based on the member's current service at the end of a fiscal year, which is more consistent with the timing of the actual pensionable compensation we receive to perform the annual valuations.

    The following table shows the General members' actual average merit and promotion increases by years of service over the six-year period from July 1, 2016 through June 30, 2022 (combining the current three-year period with the three-year period from the prior experience study), along with the average increases over the current three-year period from July 1, 2019 through June 30, 2022. The current and proposed assumptions are also shown. The actual increases were reduced by the actual average inflation plus "across the board" increase (i.e. wage inflation, estimated as the increase in average salaries) for each year during the experience period (6.80% weighted average for the current three-year period, 4.30% weighted average for the prior three-year period).

General
Rate (%)

Years of Service	Current Assumption	Actual Average Increase from Current and Prior Studies (Last 6 Years)	Actual Average Increase from Current Study (Last 3 Years)	Proposed Assumption
Less than 1	5.00	4.59	3.62	5.00
1 – 2	4.50	6.31	6.42	4.75
2 – 3	4.00	4.97	5.08	4.50
3 – 4	3.25	4.79	5.36	4.25
4 – 5	2.75	4.00	4.26	3.50
5 – 6	2.25	3.08	3.26	2.75
6 – 7	2.00	2.68	2.48	2.25
7 – 8	1.75	2.02	1.84	1.75
8 – 9	1.25	2.37	2.99	1.50
9 – 10	1.00	2.77	0.93	1.00
10 – 11	1.00	1.55	-0.44	1.00
11 – 12	1.00	1.36	-0.56	1.00
12 – 13	1.00	1.31	-0.01	1.00
13 – 14	1.00	1.24	0.75	1.00
14 – 15	1.00	1.61	1.53	1.00
15 & Over	1.00	1.09	0.02	1.00

Based on this experience, overall we recommend increasing the merit and promotion salary increase assumptions for General members. The overall salary increase assumptions will decrease for General members after taking into account the lower inflation component of the salary increase assumption.

Chart 1 that follows later in the section compares the actual merit and promotion increase experience with the current and proposed assumptions for General members.

The following table shows the Safety and Probation members' actual average merit and promotion increases by years of service over the six-year period from July 1, 2016 through June 30, 2022 (combining the current three-year period with the three-year period from the prior experience study), along with the average increases over the current three-year period from July 1, 2019 through June 30, 2022. The current and proposed assumptions are also shown. The actual increases were reduced by the actual average inflation plus "across the board" increase (i.e. wage inflation, estimated as the increase in average salaries) for each year during the experience period (7.77% weighted average for the current three-year period, 4.65% weighted average for the prior three-year period).

Safety and Probation
Rate (%)

Years of Service	Current Assumption	Actual Average Increase from Current and Prior Studies (Last 6 Years)	Actual Average Increase from Current Study (Last 3 Years)	Proposed Assumption
Less than 1	5.00	5.51	5.36	5.25
1 – 2	4.25	5.71	6.70	5.00
2 – 3	3.75	4.93	5.27	4.50
3 – 4	3.25	3.38	2.52	3.25
4 – 5	2.50	3.84	5.14	3.00
5 – 6	2.00	3.84	2.53	2.25
6 – 7	1.75	2.74	2.50	2.00
7 – 8	1.25	1.80	2.11	1.50
8 – 9	1.00	-0.12	-0.73	1.25
9 – 10	1.00	3.50	3.91	1.25
10 – 11	1.00	3.10	2.46	1.25
11 – 12	1.00	3.55	5.38	1.25
12 – 13	1.00	1.95	0.99	1.00
13 – 14	1.00	-0.69	-2.31	1.00
14 – 15	1.00	3.10	2.25	1.00
15 & Over	1.00	1.86	0.82	1.00

Based on this experience, we recommend increasing the merit and promotion salary increase assumptions for Safety and Probation members. The overall salary increase assumptions will decrease slightly for Safety and Probation members after taking into account the lower inflation component of the salary increase assumption.

Chart 2 compares the actual merit and promotion increase experience with the current and proposed assumptions for Safety and Probation members.

Active Member Payroll

Projected active member payrolls are used to develop the UAAL contribution rate. Future values are determined as a product of the number of employees in the workforce and the average pay for all employees. The average pay for all employees increases only by inflation and real "across the board" pay increases. The merit and promotion increases are not an influence, because this average pay is not specific to an individual.

Under the Board's current practice, the UAAL contribution rate is developed by assuming that the total payroll for all active members will increase annually over the amortization periods at the same assumed rates of inflation plus real "across the board" salary increase assumptions as are used to project the members' future benefits.

Consistent with the combined recommended inflation and real "across the board" salary increase assumptions, we recommend reducing the payroll growth assumption from 3.25% to 3.00% annually.

Chart 1: Merit and Promotion Salary Increase Rates
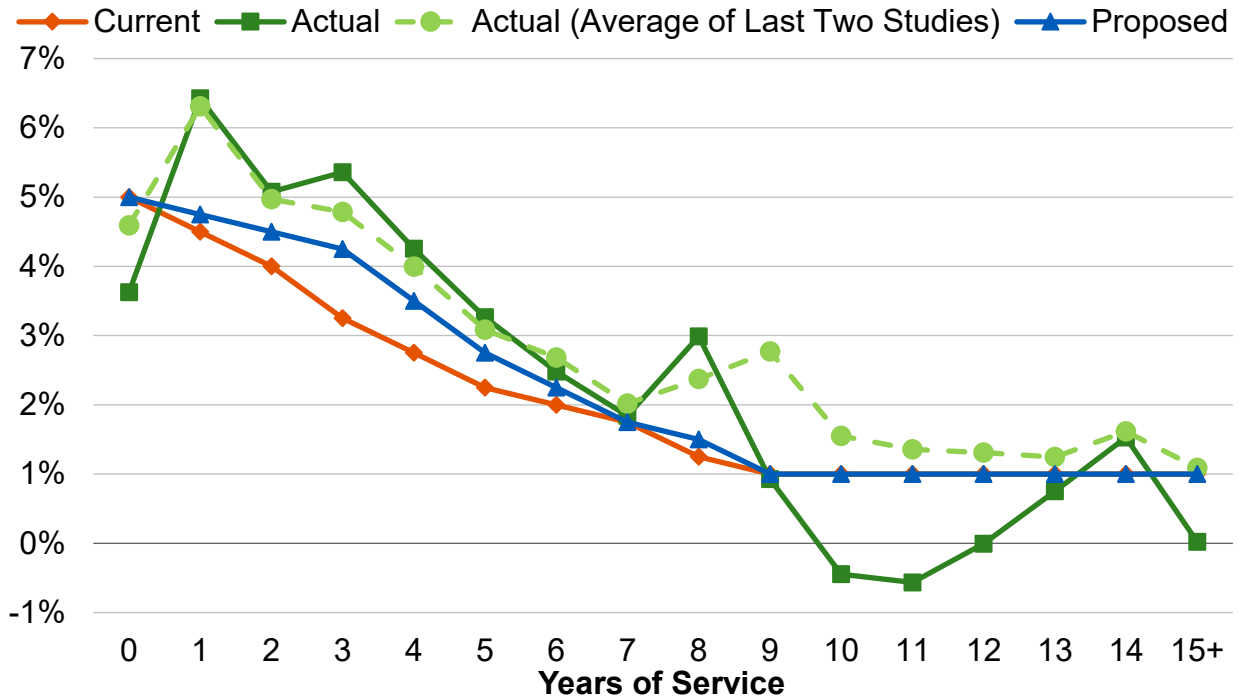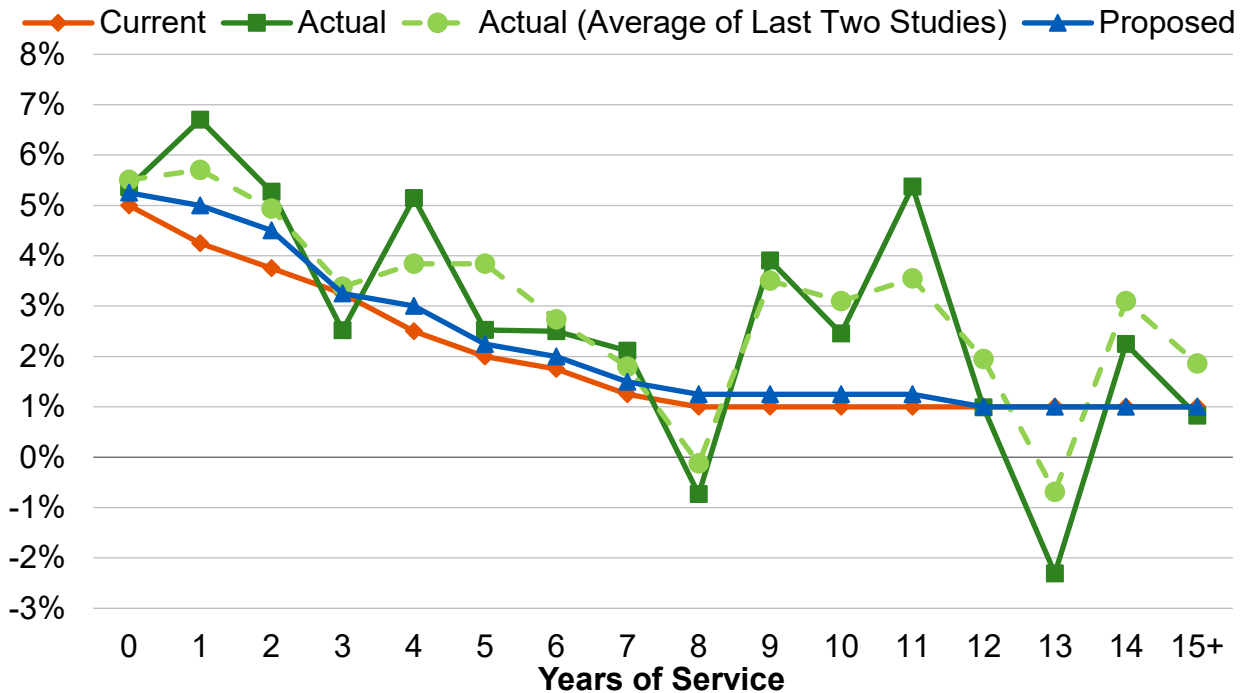### General Members

Chart 2: Merit and Promotion Salary Increase Rates
Safety and Probation Members

4. Demographic Assumptions

A. Retirement Rates

The age at which a member retires from service (i.e., who did not retire on a disability pension) will affect both the amount of the benefits that will be paid to that member as well as the period over which funding must take place.

Currently, the assumed retirement rates are a function of only member's age. With this experience study, we have also analyzed recent years' retirement experience both as a function of age and years of service in relation to the probability of retirement. For General Tiers 1, 2 and 3, we are proposing separate retirement rates for members with less than 30 years of service and for those with 30 or more years of service. For Safety Tiers 1 and 2, we are proposing separate retirement rates for members with less than 25 years of service and for those with 25 or more years of service. For Probation Tiers 1 and 2, we are continuing to propose retirement rates for members be set as a function only of members' ages, due to the limited experience during the current three-year period (i.e., there were only 2 retirements for this group).

The following table shows the observed service retirement rates for General Tier 1, 2 and 3 members based on the actual experience over the past six years, separately for those with less than 30 years of service and 30 or more years of service. The actual service retirement rates were determined by comparing those members who actually retired from service to those eligible to retire from service. This same methodology is followed throughout this report and was described in Section 2. Also shown are the current assumed rates and the rates we propose.

General Tiers 1, 2 and 3

Rate of Retirement (%)

Age	Less than 30 Years of Service				30 or More Years of Service			
	Current Rate	Actual Rate (6 Years)	Actual Rate (3 Years)	Proposed Rate	Current Rate	Actual Rate (6 Years)	Actual Rate (3 Years)	Proposed Rate
50	5.00	7.25	5.26	5.00	5.00	0.00	0.00	5.00
51	5.00	5.00	7.14	5.00	5.00	0.00	0.00	5.00
52	5.00	2.86	5.71	5.00	5.00	0.00	0.00	5.00
53	5.00	2.67	3.45	5.00	5.00	0.00	0.00	5.00
54	5.00	1.28	2.86	5.00	5.00	20.00	0.00	5.00
55	10.00	3.85	0.00	5.00	10.00	0.00	0.00	5.00
56	10.00	5.88	4.55	5.00	10.00	0.00	0.00	5.00
57	10.00	8.54	11.63	10.00	10.00	28.57	33.33	15.00
58	10.00	10.39	10.53	10.00	10.00	14.29	33.33	15.00
59	10.00	10.39	8.57	10.00	10.00	0.00	0.00	15.00
60	12.00	9.46	9.38	12.00	12.00	25.00	25.00	25.00
61	15.00	14.71	14.29	14.00	15.00	0.00	0.00	25.00
62	25.00	14.47	17.24	22.00	25.00	44.44	50.00	35.00
63	20.00	23.53	19.44	20.00	20.00	25.00	0.00	25.00
64	20.00	16.42	19.35	20.00	20.00	33.33	50.00	25.00
65	45.00	33.90	33.33	40.00	45.00	60.00	0.00	45.00
66	45.00	57.45	44.44	40.00	45.00	50.00	50.00	45.00
67	45.00	40.00	27.27	40.00	45.00	50.00	50.00	45.00
68	45.00	31.25	25.00	40.00	45.00	0.00	0.00	45.00
69	45.00	15.38	11.11	40.00	45.00	0.00[1]	0.00[1]	45.00
70	100.00	35.00	30.77	50.00	100.00	0.00[1]	0.00[1]	50.00
71	100.00	50.00	60.00	50.00	100.00	0.00[1]	0.00[1]	50.00
72	100.00	14.29	0.00	50.00	100.00	0.00[1]	0.00[1]	50.00
73	100.00	16.67	33.33	50.00	100.00	0.00[1]	0.00[1]	50.00
74	100.00	20.00	0.00	50.00	100.00	0.00[1]	0.00[1]	50.00
75 & Over	100.00	33.33	40.00	100.00	100.00	0.00[1]	0.00[1]	100.00

Based on this experience, we recommend decreasing the retirement rate assumption at certain ages for General Tier 1, 2 and 3 members with less than 30 years of service, while increasing the retirement rate assumption for General Tier 1, 2 and 3 members with 30 or more years of service. In addition, we recommend extending rates to age 75. Overall, the proposed rates represent a decrease from the current rates for General Tier 1, 2 and 3 members.

[1]   There were no exposures in this age category.

Chart 3 that follows later in this section compares actual to expected retirements over the past six years for both the current and proposed assumptions for General and Safety members in the non-CalPEPRA tiers. Chart 4 provides the same information over the past three years only.

Chart 5 compares the actual retirement experience with the current and proposed assumptions for General Tier 1, 2 and 3 members with less than 30 years of service.

Chart 6 compares the actual retirement experience with the current and proposed assumptions for General Tier 1, 2 and 3 members with 30 or more years of service.

General Tier 4

The following table shows the observed service retirement rates for General Tier 4 members based on the actual experience over the past six years. Also shown are the current assumed rates and the rates we propose.

Due to the limited actual experience of only 20 retirements during the past six years for General Tier 4, we have continued to structure this assumption as a function of age only, and our recommended changes to the retirement rates are consistent with our changes to the retirement rates for General Tier 1, 2, and 3 members with less than 30 years of service.

General Tier 4 (continued)

Rate of Retirement (%)

Age	Current Rate	Actual Rate (6 Years)	Actual Rate (3 Years)	Proposed Rate
52	6.00	0.00	0.00	6.00
53	3.00	0.00	0.00	3.00
54	3.00	0.00	0.00	3.00
55	5.00	10.00	10.00	5.00
56	5.00	11.11	11.11	5.00
57	5.00	0.00	0.00	6.00
58	5.00	0.00	0.00	6.00
59	5.00	15.38	8.33	6.00
60	6.00	8.33	0.00	6.00
61	9.00	0.00	0.00	10.00
62	12.00	0.00	0.00	12.00
63	14.00	10.00	0.00	14.00
64	12.00	26.67	16.67	12.00
65	32.00	37.50	28.57	30.00
66	32.00	33.33	33.33	30.00
67	32.00	0.00	0.00	30.00
68	32.00	20.00	20.00	30.00
69	32.00	66.67	66.67	30.00
70	100.00	25.00	33.33	50.00
71	100.00	0.00	0.00	50.00
72	100.00	25.00	25.00	50.00
73	100.00	0.00	0.00	50.00
74	100.00	0.00[1]	0.00[1]	50.00
75 & Over	100.00	50.00	0.00[1]	100.00

Based on this experience and the experience of General Tier 1, 2, and 3 members, we recommend changing the retirement rate assumption consistent with the changes made for General Tier 1, 2, and 3 members with less than 30 years of service. Overall, the proposed rates represent a decrease from the current rates for General Tier 4 members.

Chart 7 shows the current and proposed assumptions for General Tier 4 members.

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[1] There were no exposures in this age category.

Safety Tiers 1 and 2

The following table shows the observed service retirement rates for Safety Tier 1 and 2 members based on the actual experience over the past six years, separately for those with less than 25 years of service and 25 or more years of service. Also shown are the current assumed rates and the rates we propose.

Rate of Retirement (%)

Age	Less than 25 Years of Service				25 or More Years of Service			
	Current Rate	Actual Rate (6 Years)	Actual Rate (3 Years)	Proposed Rate	Current Rate	Actual Rate (6 Years)	Actual Rate (3 Years)	Proposed Rate
50	8.00	5.00	0.00	6.00	8.00	0.00	0.00	15.00
51	8.00	0.00	0.00	6.00	8.00	14.29	0.00	15.00
52	8.00	0.00	0.00	6.00	8.00	0.00	0.00	15.00
53	8.00	6.67	0.00	8.00	8.00	10.00	16.67	20.00
54	8.00	14.29	16.67	12.00	8.00	42.86	75.00	30.00
55	10.00	30.77	28.57	15.00	10.00	25.00	0.00	35.00
56	15.00	0.00	0.00	20.00	15.00	0.00	0.00	45.00
57	20.00	25.00	33.33	25.00	20.00	40.00	66.67	45.00
58	25.00	0.00	0.00	30.00	25.00	66.67	50.00	45.00
59	30.00	100.00	100.00	40.00	30.00	33.33	100.00	45.00
60	100.00	0.00[1]	0.00[1]	50.00	100.00	50.00	0.00[1]	50.00
61	100.00	0.00	0.00[1]	50.00	100.00	0.00	0.00[1]	50.00
62	100.00	50.00	0.00[1]	50.00	100.00	0.00	0.00	50.00
63	100.00	0.00	0.00	50.00	100.00	0.00	0.00	50.00
64	100.00	25.00	100.00	50.00	100.00	0.00	0.00	50.00
65 & Over	100.00	50.00	100.00	100.00	100.00	16.67	0.00	100.00

Based on this experience, we recommend increasing the retirement rate assumption at certain ages and decreasing the retirement rate assumption for ages 50 to 52 for Safety Tier 1 and 2 members with less than 25 years of service, while increasing the retirement rate assumption for Safety Tier 1 and 2 members with 25 or more years of service. In addition, we recommend extending rates to age 65. Overall, the proposed rates represent an increase from the current rates for Safety Tier 1 and 2 members due to increasing retirement rates for members with 25 or more years of service.

Chart 8 compares the actual retirement experience with the current and proposed assumptions for Safety Tier 1 and 2 members with less than 25 years of service.

Chart 9 compares the actual retirement experience with the current and proposed assumptions for Safety Tier 1 and 2 members with 25 or more years of service.

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[1] There were no exposures in this age category.

Probation Tiers 1 and 2

The following table shows the observed service retirement rates for Probation Tier 1 and 2 members based on the actual experience over the past six years. Also shown are the current assumed rates and the rates we propose.

Rate of Retirement (%)

Age	Current Rate	Actual Rate (6 Years)	Actual Rate (3 Years)	Proposed Rate
50	5.00	0.00	0.00	5.00
51	5.00	25.00	0.00	5.00
52	5.00	50.00	100.00	5.00
53	5.00	0.00	0.00[1]	5.00
54	5.00	0.00	0.00	5.00
55	23.00	66.67	0.00	20.00
56	23.00	0.00	0.00	20.00
57	23.00	0.00	0.00[1]	20.00
58	23.00	25.00	0.00[1]	20.00
59	23.00	20.00	0.00	20.00
60	100.00	0.00	0.00	50.00
61	100.00	20.00	0.00	50.00
62	100.00	100.00	100.00	50.00
63	100.00	0.00[1]	0.00[1]	50.00
64	100.00	0.00[1]	0.00[1]	50.00
65 & Over	100.00	100.00	0.00[1]	100.00

Based on this experience, we recommend decreasing the retirement rate assumption at certain ages, including extending rates to age 65. Overall, the proposed rates represent a decrease from the current rates for Probation Tier 1 and 2 members.

Chart 10 compares the actual retirement experience with the current and proposed assumptions for Probation Tier 1 and 2 members

Safety and Probation Tier 3

For Safety and Probation Tier 3, we do not have credible experience from the past six years to propose new retirement rates. However, we are recommending changing some of the rates at the higher retirement ages currently used for those tiers, consistent with the changes of the retirement assumptions for later ages that we are recommending for Safety and Probation Tiers 1 and 2. This is because the retirement rates for Safety and Probation Tier 3 were partially developed based on then current Safety and Probation Tier 2 retirement rates (after adjusting

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[1] There were no exposures in this age category.

the retirement rates to reflect the lower benefits provided by Tier 3) when the new tiers were first established.

The following table shows the current assumed service retirement rates and the rates we propose for Safety and Probation Tier 3 members.

Rate of Retirement (%)

Age	Safety Tier 3		Probation Tier 3	
	Current Rate	Proposed Rate	Current Rate	Proposed Rate
50	3.00	3.00	4.00	4.00
51	3.00	3.00	4.00	4.00
52	3.00	3.00	4.00	4.00
53	3.00	3.00	4.00	4.00
54	3.00	4.00	4.00	4.00
55	4.00	6.00	13.00	12.00
56	10.00	12.00	24.00	21.00
57	12.00	15.00	24.00	21.00
58	15.00	18.00	24.00	21.00
59	30.00	40.00	24.00	21.00
60	100.00	50.00	100.00	50.00
61	100.00	50.00	100.00	50.00
62	100.00	50.00	100.00	50.00
63	100.00	50.00	100.00	50.00
64	100.00	50.00	100.00	50.00
65 & Over	100.00	100.00	100.00	100.00

Chart 11 compares the current and proposed rates of retirement for Safety Tier 3 members.

Chart 12 compares the current and proposed rates of retirement for Probation Tier 3 members.

Deferred Vested Members

Under the current assumptions, deferred vested General members are assumed to retire at age 60 and Safety and Probation members are assumed to retire at age 54.

The following table shows the observed deferred vested retirement age for General, Safety and Probation members based on the actual experience over the past six years. Also shown are the current assumed retirement ages and the retirement ages we propose. (Note that we have not developed separate retirement age assumptions based on members retiring either with or without reciprocity, due to the data issue mentioned in the next subsection.)

Deferred Vested Retirement Age

	General Members	Safety and Probation Members
Current Assumption	60.0	54.0
Actual Average Age (6 years)	60.8	52.7
Actual Average Age (3 years)	60.9	55.7
Proposed Assumption	**61.0**	**54.0**

Based on this experience, we recommend increasing the deferred vested retirement age assumption for General members from age 60 to 61, and maintaining the deferred vested retirement age for Safety and Probation members at age 54.

Reciprocity

Under current assumptions, it is assumed that 65% of future deferred vested members will be covered under a reciprocal retirement system and receive compensation increases based on the salary increase assumption from termination until their date of retirement.

As of June 30, 2022, the proportion of deferred vested members entitled to future benefits who are covered under a reciprocal retirement system is about 69%.

Note, however, that we have recently been informed by MCERA that they will be reviewing how outbound reciprocities are identified in the annual valuations beginning with the upcoming June 30, 2023 valuation, as they may have been mis-identified by their pension administration system in the past.

For this reason and based on the experience noted above, we recommend maintaining the reciprocity assumption at 65%. Consistent with our recommended salary increase assumption, we recommend decreasing the reciprocal pay increase assumption from 4.25% to 4.00%.

For the annual valuations, we have been requesting from the Association the monthly rate of pay as of the date the most recent salary survey was performed by MCERA for reciprocal members, and it is our understanding that it has been several years since the last survey. At the time of the June 30, 2022 valuation, after considering available resources MCERA indicated it is unknown when they will perform their next salary survey. We would suggest that the Association may want to include such a survey in the next few years before the next experience study. The results of that survey will provide actual data on whether reciprocal members have earned salaries higher/lower than our assumption once they have worked outside of the County.

Survivor Continuance

Under current assumptions, it is assumed that 70% of all active and inactive male members and 50% of all active and inactive female members would be married or have an eligible domestic partner at the time of their retirement or pre-retirement death. We reviewed experience for new retirees during the six-year period and determined the actual percentage of these new retirees that had an eligible spouse or eligible domestic partner at the time of retirement. The results of that analysis are shown below.

New Retirees – Actual Percent with Eligible Spouse or Domestic Partner

Year Ending June 30	Male	Female
2017	70%	49%
2018	59%	59%
2019	71%	38%
Total (2017-2019)	**67%**	**47%**
2020	68%	62%
2021	77%	53%
2022	65%	47%
Total (2020-2022)	**70%**	**53%**
Six-Year Total	**68%**	**50%**

Based on this experience, we recommend maintaining the percent married assumption for male and female members at 70% and 50%, respectively.

Since the present value of the survivor's automatic continuance benefit is dependent on the survivor's age and sex, we must also have assumptions for the age and sex of the survivor. Based on the experience for members who retired during the most recent six-year period (results shown in the table below) and studies done for other retirement systems, **we recommend the following:**

1. Since most of the actual survivors are of the opposite sex, even with the inclusion of domestic partners, **we will continue to assume that all active and inactive members have a survivor of the opposite sex.**

2. **Based on the experience over six years, we recommend maintaining the spouse age difference assumption that male retirees are two years older than their spouses and maintaining the spouse age difference assumption that female retirees are two years younger than their spouses.** These assumptions will continue to be monitored in future experience studies.

Member's Age as Compared to Spouse's Age

	Male Retiree	Female Retiree
Current Assumption	2 years older	2 years younger
Actual Experience	2.2 years older	2.1 years younger
Proposed Assumption	**2 years older**	**2 years younger**

Refinements in the Method used to Allocate Total Present Value of Future Benefits (PVFB) for Actives

With this experience study, we are recommending a refinement of the method used to allocate PVFB between the current and future Normal Costs and the Actuarial Accrued Liability (AAL) to achieve more consistency on how decrements are assumed in the cost calculations. Even though this refinement does not increase the PVFB, by (a) rounding a member's service down, (b) subtracting that service from the year of the valuation, and (c) setting the year of entry into MCERA using that result, there is a higher allocation of the PVFB to the Normal Costs and a lower allocation to the AAL.

Chart 3: Actual Number of Retirements
Compared to Expected for General Tiers 1, 2 and 3 and Safety Tiers 1 and 2
(July 1, 2016 through June 30, 2022)

Legend: ■ Expected - Current ■ Actual ■ Expected - Proposed

	Expected - Current	Actual	Expected - Proposed
General	269	203	229
Safety	43	28	45
Total	312	231	274
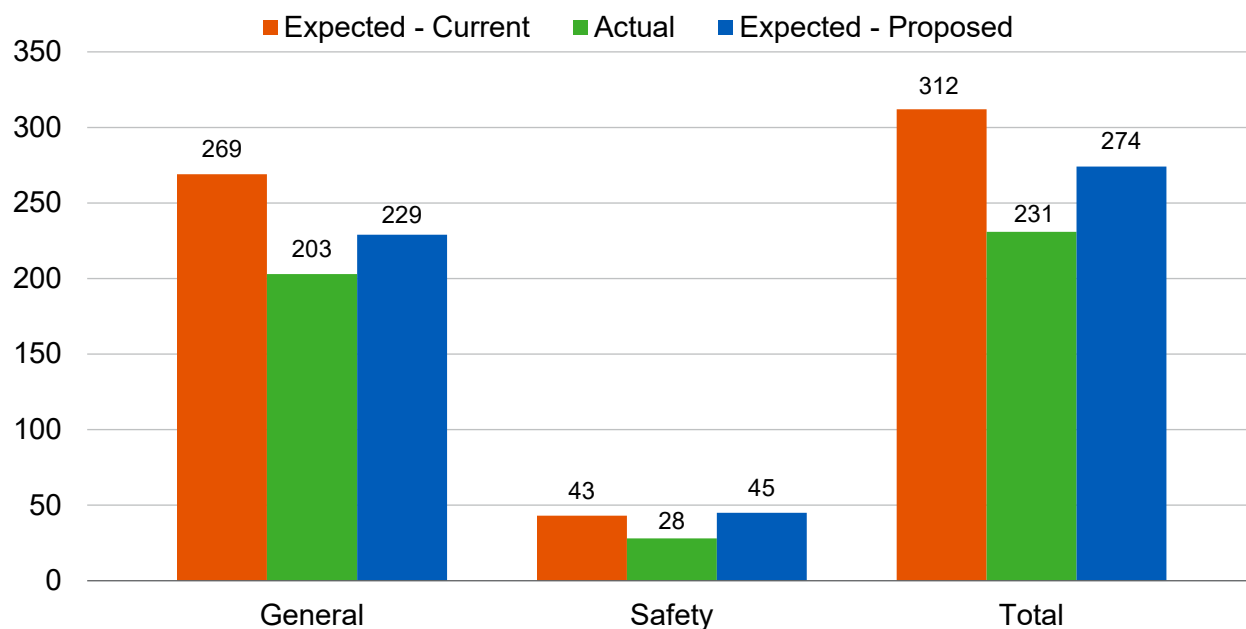
Chart 4: Actual Number of Retirements
Compared to Expected for General Tiers 1, 2 and 3 and Safety Tiers 1 and 2
(July 1, 2019 through June 30, 2022)

Legend: ■ Expected - Current ■ Actual ■ Expected - Proposed

	Expected - Current	Actual	Expected - Proposed
General	137	93	113
Safety	19	16	22
Total	156	109	135
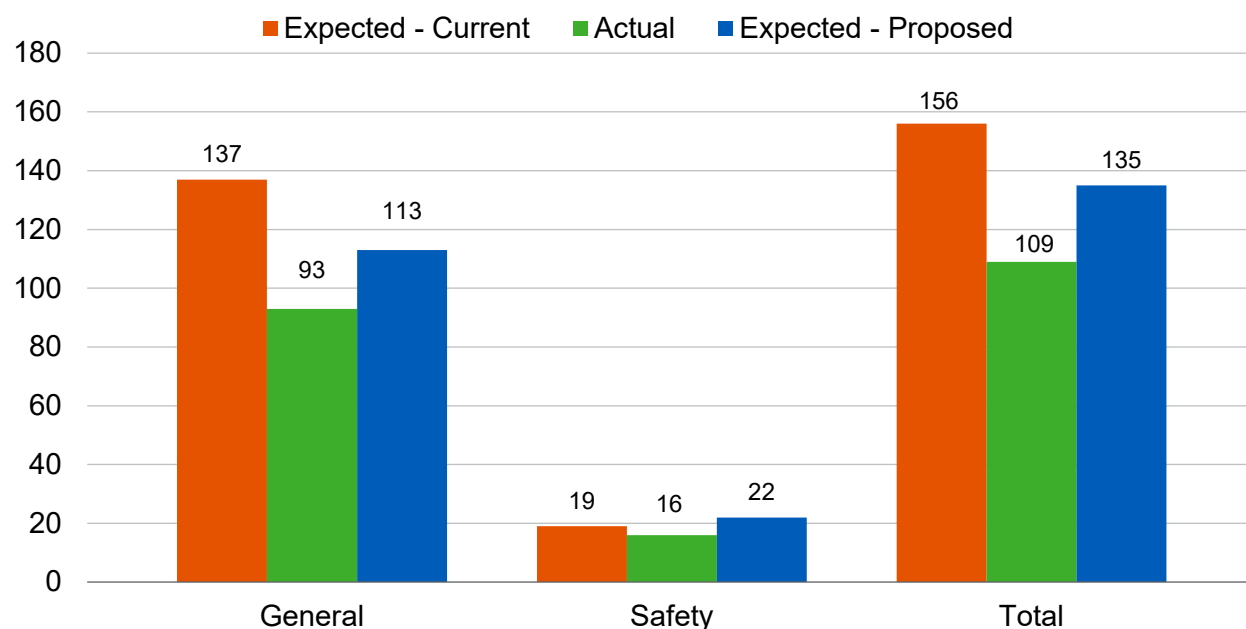
Note: The results in Charts 3 and 4 above exclude Probation Tier 1 and 2 members since there were only 2 retirements for this group during the current 3-year period.

Chart 5: Retirement Rates
General Tier 1, 2 and 3 Members with Less than 30 Years of Service
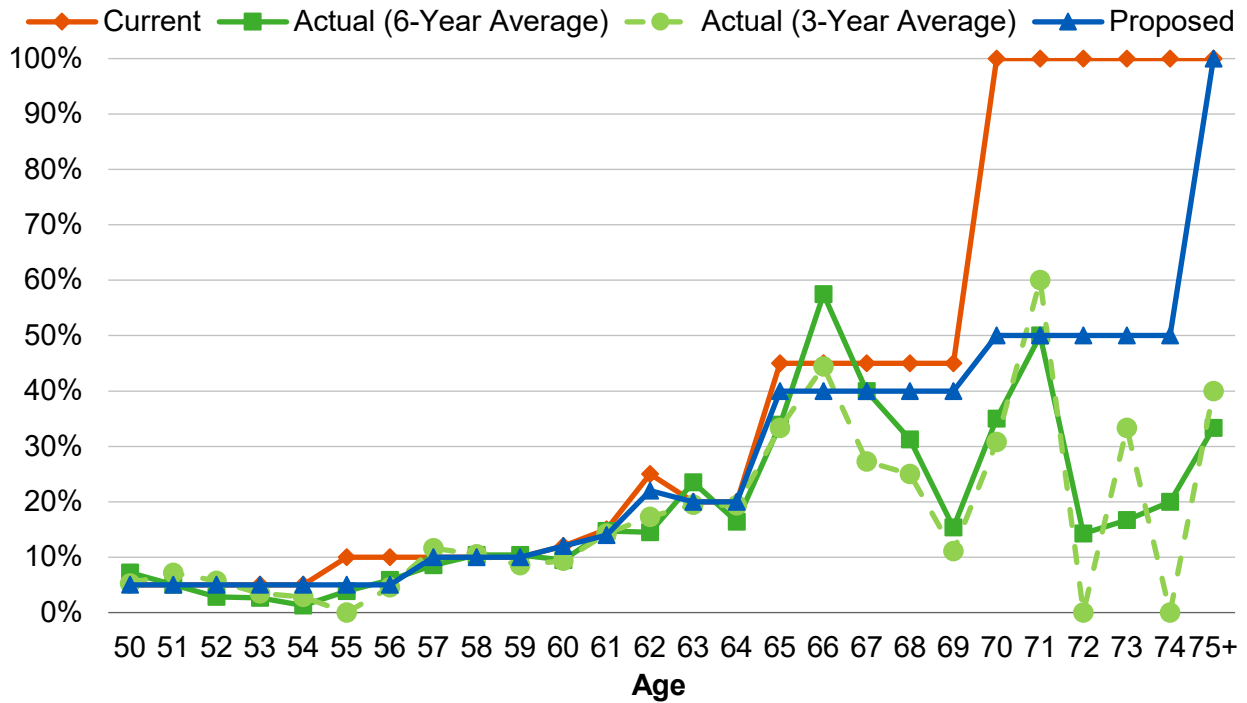
Chart 6: Retirement Rates
General Tier 1, 2 and 3 Members with 30 or More Years of Service
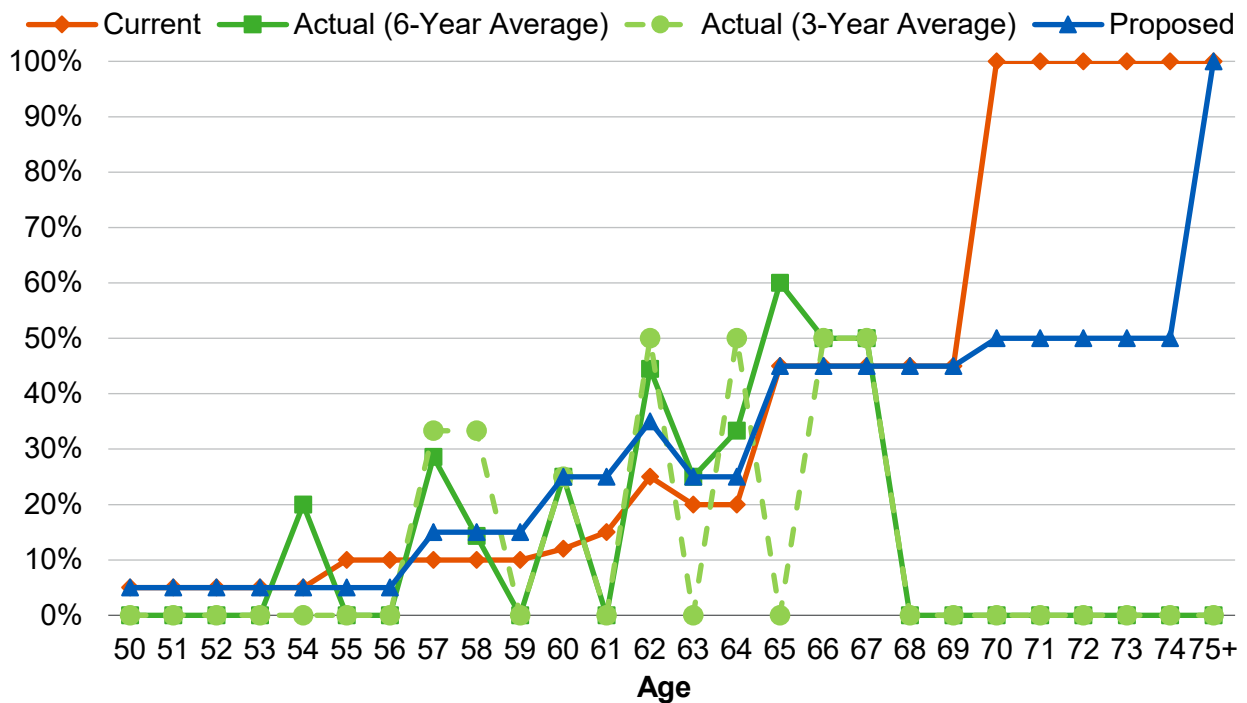
Chart 7: Retirement Rates
General Tier 4 Members
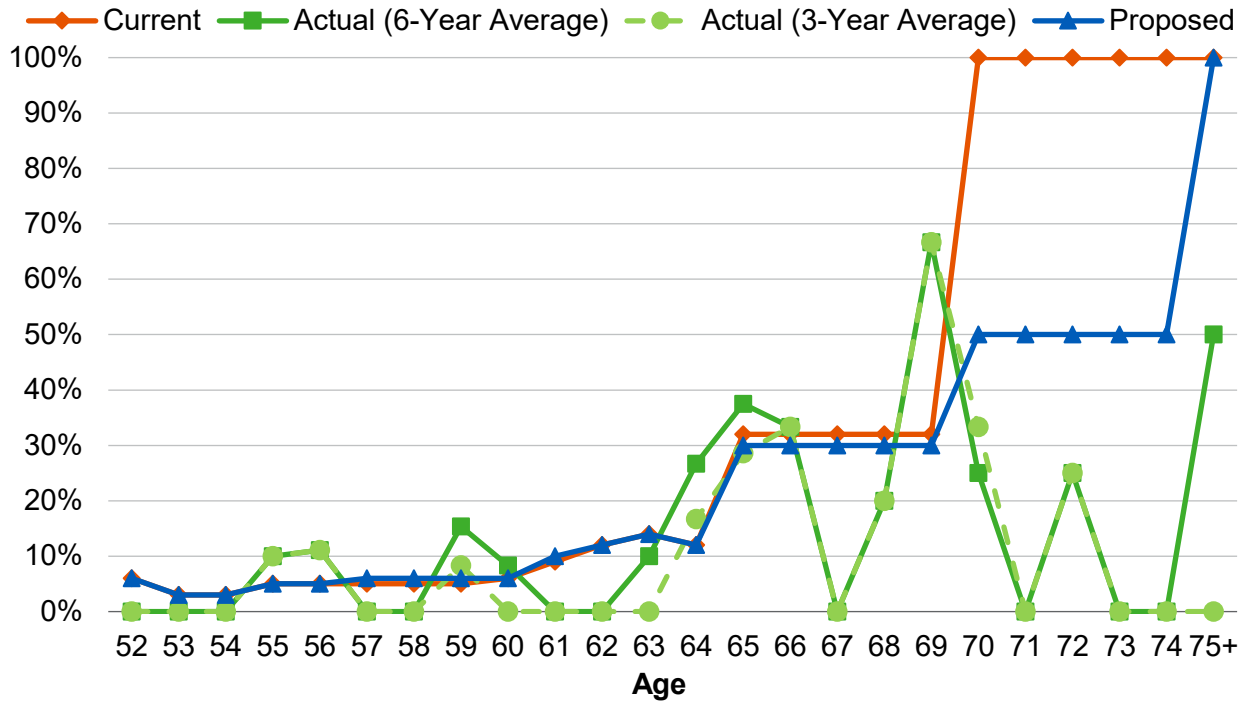
Chart 8: Retirement Rates
Safety Tier 1 and 2 Members with Less than 25 Years of Service
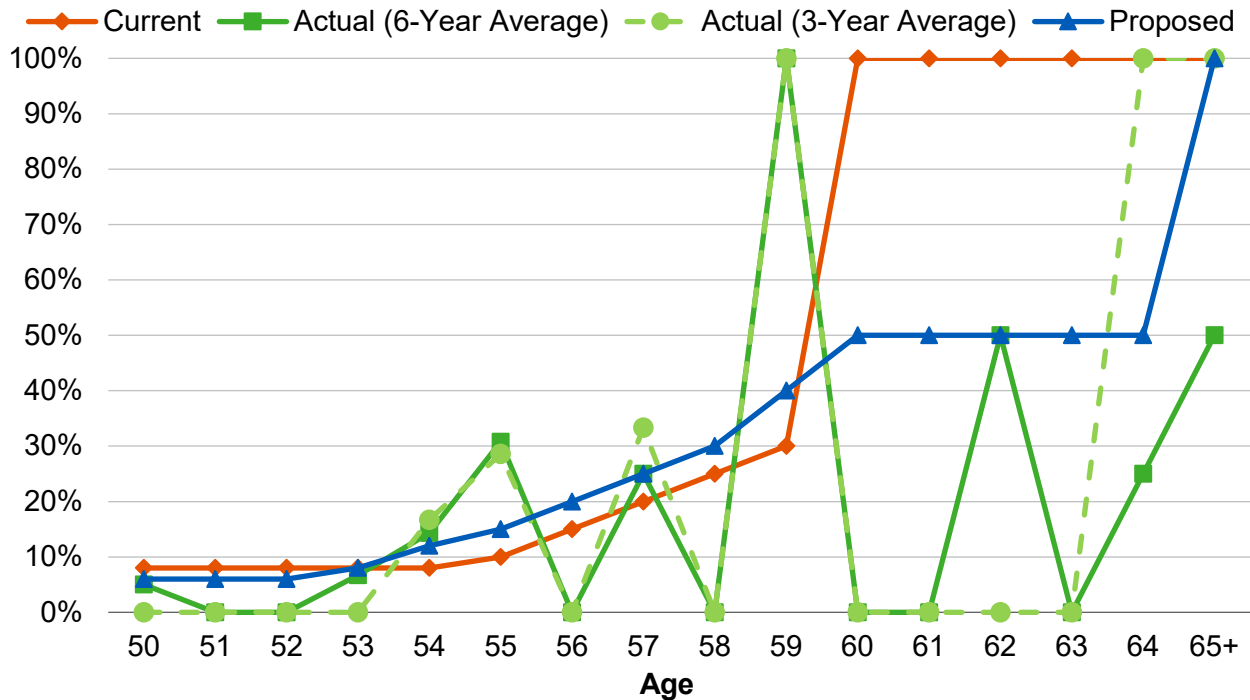
Chart 9: Retirement Rates
Safety Tier 1 and 2 Members with 25 or More Years of Service
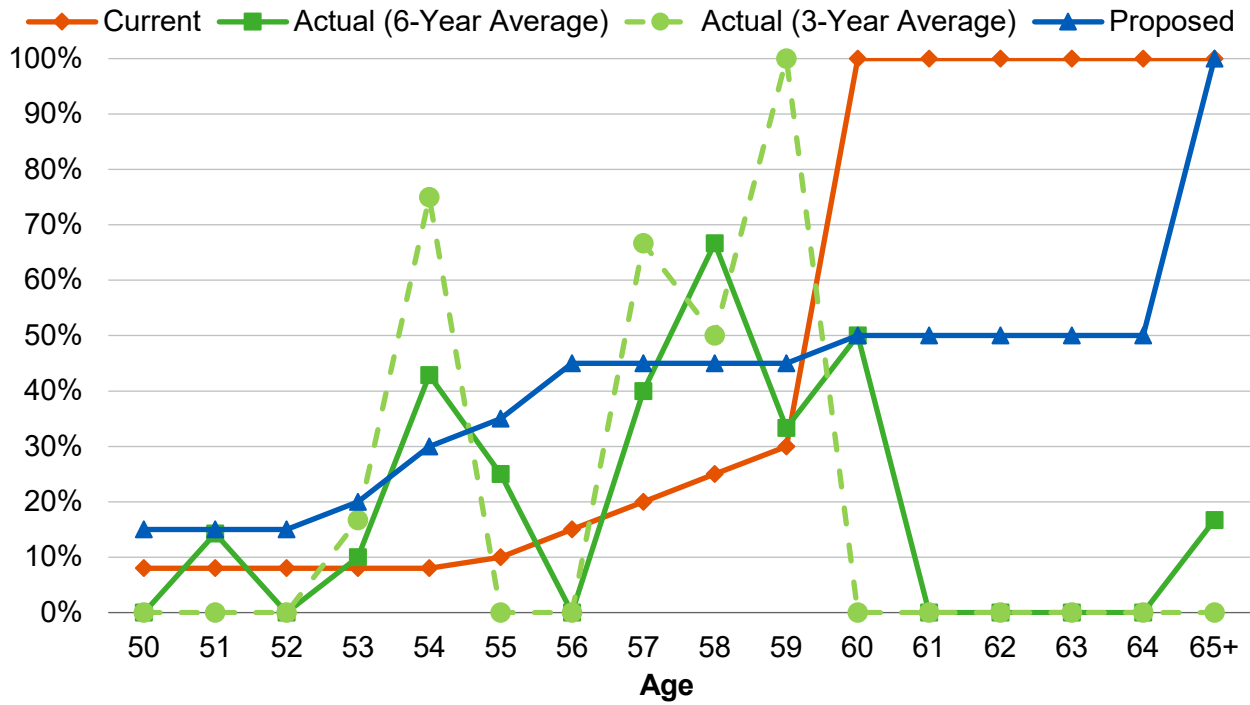
Chart 10: Retirement Rates
Probation Tier 1 and 2 Members
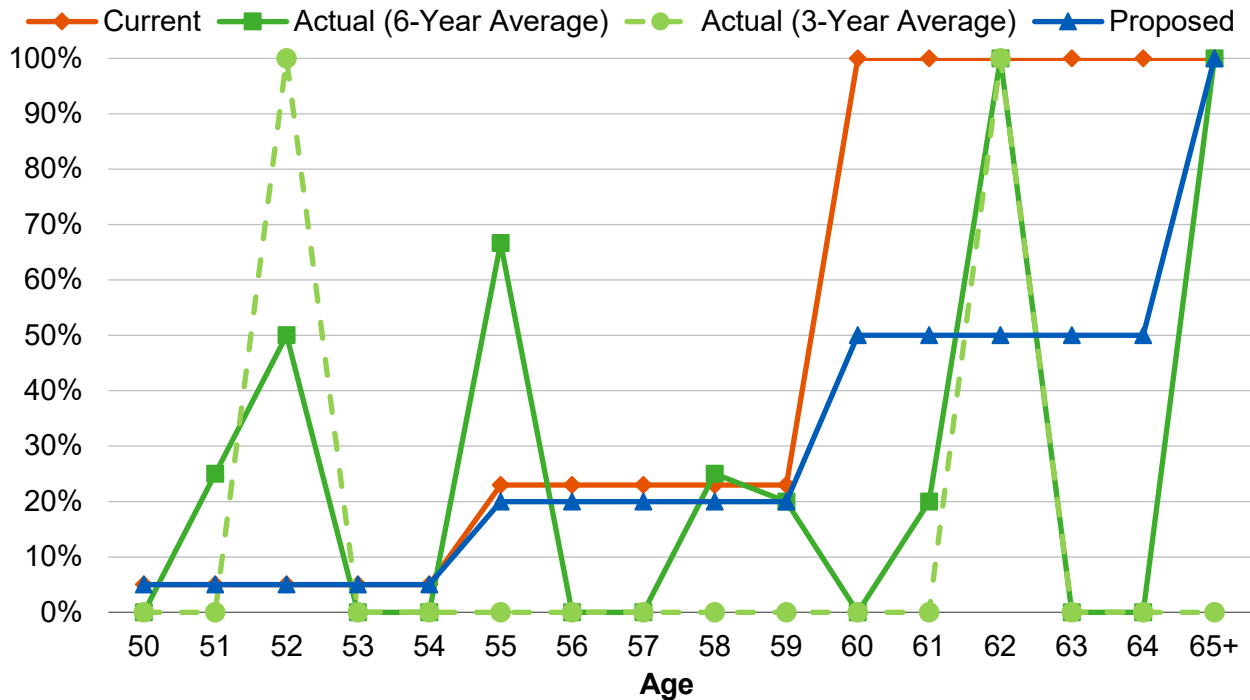
Chart 11: Retirement Rates
Safety Tier 3 Members
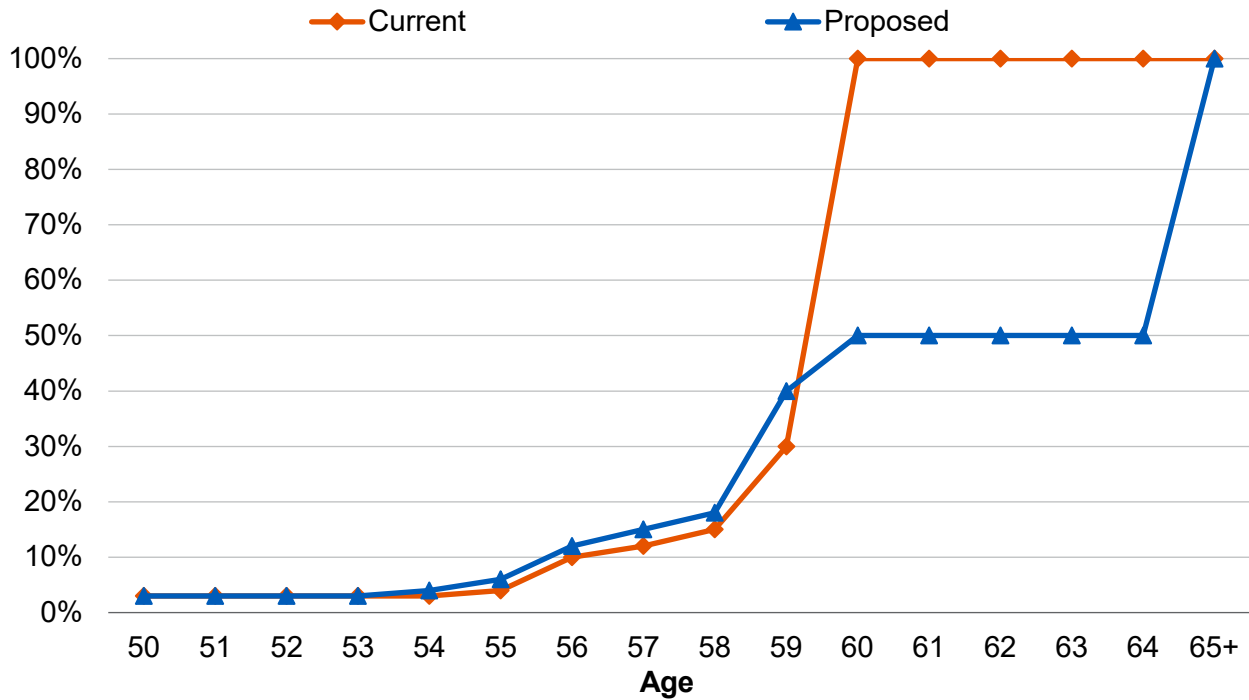
Chart 12: Retirement Rates
Probation Tier 3 Members
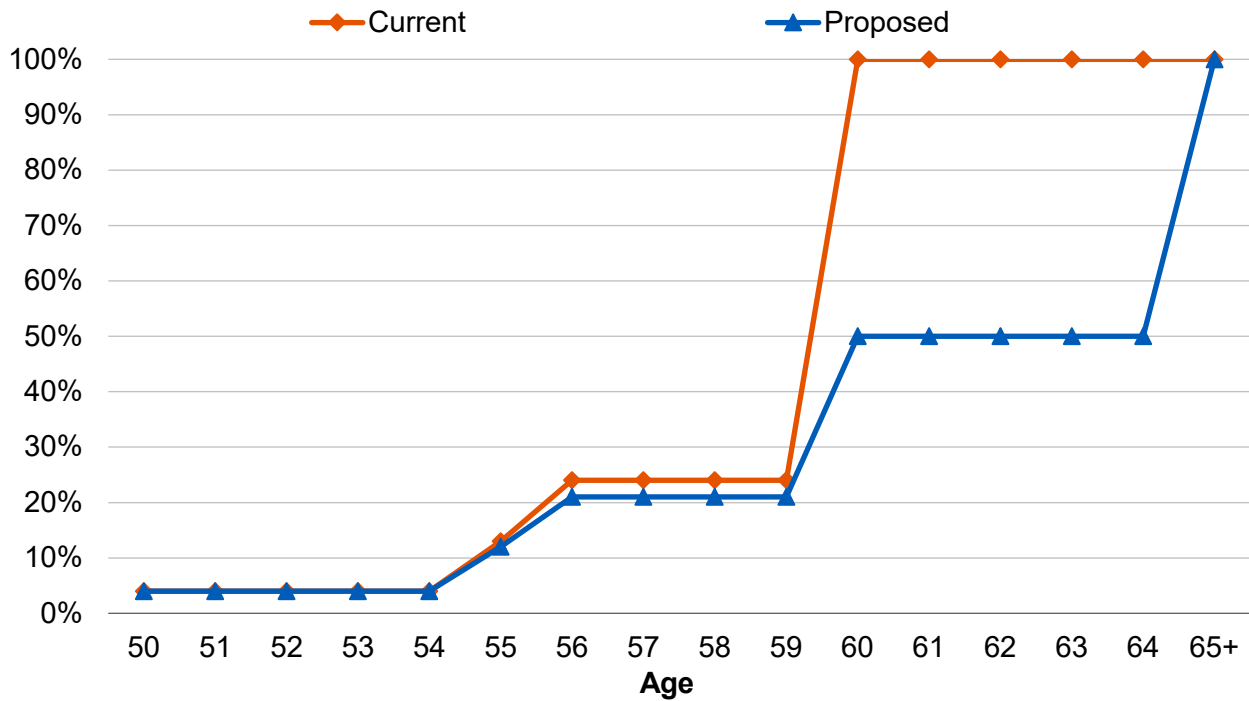
B. Mortality Rates - Healthy

The "healthy" mortality rates project the life expectancy of a member who retires from service (i.e., who did not retire on a disability pension). Also, the "healthy" pre-retirement mortality rates project what proportion of members will die before retirement. For General members, the table currently being used for post-service retirement mortality rates is the Pub-2010 General Healthy Retiree Amount-Weighted Mortality Table (separate tables for males and females), with rates decreased by 5% for males and increased by 5% for females, projected generationally with the two-dimensional mortality improvement scale MP-2019. For Safety and Probation members, the table currently being used for post-service retirement mortality rates is the Pub-2010 Safety Healthy Retiree Amount-Weighted Mortality Table (separate tables for males and females), projected generationally with the two-dimensional mortality improvement scale MP-2019. For all beneficiaries, both not in pay status at the valuation and in pay status at the valuation, the table currently being used is the Pub-2010 Contingent Survivor Amount-Weighted Mortality Table (separate tables for males and females), with rates increased by 5% for males and females, projected generationally with the two-dimensional mortality improvement scale MP-2019.

The Public Retirement Plans Mortality tables (Pub-2010) was published by the Retirement Plans Experience Committee (RPEC) of the SOA in 2019. For the first time, the published mortality tables are based exclusively on public sector pension plan experience in the United States. Within the Pub-2010 family of mortality tables, there are separate tables by job categories of General, Safety and Teachers. Included with the mortality tables is the analysis prepared by RPEC that continues to observe that benefit amount for healthy retirees and salary for employees are the most significant predictors of mortality differences within the job categories. Therefore, Pub-2010 includes mortality rates developed for annuitants on a "benefit" weighted basis, with higher credibility assigned to experience from annuitants receiving larger benefits. We continue to recommend using the "amount weighted" base version of the Pub-2010 mortality tables (adjusted for MCERA experience as discussed herein).

We also continue to recommend that the mortality improvement scale be applied generationally where each future year has its own mortality table that reflects the forecasted improvements, using the published improvement scales. The "generational" approach is now the established practice within the actuarial profession.

A generational mortality table provides dynamic projections of mortality experience for each cohort of retirees. For example, the mortality rate for someone who is 65 next year will be slightly less than for someone who is 65 this year. In general, using generational mortality anticipates increases in the cost of the Plan over time as participants' life expectancies are projected to increase.

We understand that RPEC intends to publish annual updates to their mortality improvement scales. Improvement scale MP-2021 is the latest improvement scale available as RPEC decided not to release an updated projection scale in 2022. According to RPEC, they have been relying on the most recent population mortality experience in their model to project future mortality trends. In 2022, if they were to follow their past practice, they would have relied on the newest mortality data available from 2020 to prepare their "MP-2022" mortality improvement scale. However, population data from 2020 was severely affected by the COVID-19 pandemic. They believed it would not be appropriate to incorporate, without adjustment, the substantially higher rates of population mortality experience from 2020 into their graduation and projection

models used to forecast future mortality. As a result, they elected not to release a new mortality improvement scale for 2022. We recommend that the Board adopt the Amount-Weighted Pub-2010 mortality tables (adjusted for MCERA experience as discussed herein), and project the mortality improvement generationally using the MP-2021 mortality improvement scale.

In order to reflect more MCERA experience in our analysis, we have used experience for an eleven-year period by using data from the current (from July 1, 2019 through June 30, 2022) and the last three (from July 1, 2016 through June 30, 2019; from July 1, 2013 through June 30, 2016; and from July 1, 2011 to June 30, 2014) experience study periods in order to analyze this assumption. While we did not have information on the number of COVID-19 related deaths in 2020-2022 and the long-term impact of COVID-19 is still unknown, we do not believe the increased incidences of death in 2020-2022 were too material compared to other causes of death to warrant any special adjustments to the data used in this study for MCERA.

Even with the use of eleven years of experience, based on standard statistical theory the data is only partially credible especially under the recommended amount-weighted basis when dispersion of retirees' benefit amounts is taken into account, particularly for the Safety and Probation cost groups. In 2008 the SOA published an article recommending that mortality assumptions include an adjustment for credibility. Under this approach, the number of deaths needed for full credibility for a headcount-weighted mortality table is just over 1,000, where full credibility means a 90% confidence that the actual experience will be within 5% of the expected value. Therefore, in our recommended assumptions, we have only partially adjusted the Pub-2010 mortality tables to fit MCERA's experience particularly for the Safety and Probation cost groups. In future experience studies, more data will be available which may further increase the credibility of the MCERA experience.

Post-Retirement Mortality (Service Retirements)

Among all retired members, the actual deaths weighted by benefit amounts under the current assumptions for the last eleven years are shown in the table below. We also show the deaths weighted by benefit amount under the proposed assumptions. We continue to recommend the use of a generational mortality table, which incorporates a more explicit assumption for future mortality improvement. Accordingly, the goal is to start with a mortality table that closely matches the current experience (without a margin for future mortality improvement), and then reflect mortality improvement by projecting lower mortality rates in future years.

The proposed mortality table also reflects current experience to the extent that the experience is credible based on standard statistical theory. For MCERA, the volume of General member data makes it relatively credible. In contrast, there is much less Safety and Probation data, so it is given substantially less credibility. As shown in the table below, the proposed mortality tables have actual to expected ratios of 101% for both General and Safety/Probation, after adjustments for partial credibility. In future years the ratios should remain around 101% for both General and Safety/Probation, as long as actual mortality improves at the same rates as anticipated by the generational mortality tables. The number of actual deaths compared to the number expected under the current and proposed assumptions weighted by benefit amounts for the last eleven years are as follows:

Healthy Retiree Mortality Experience – Benefit Weighted
($ in millions)

Gender	General Members			Safety and Probation Members		
	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths
Male	$2.65	$2.71	$2.64	$0.47	$0.48	$0.47
Female	$1.96	$2.08	$1.95	$0.06	$0.10	$0.06
Total	**$4.61**	**$4.78**	**$4.60**	**$0.54**	**$0.57**	**$0.53**
Actual / Expected	**101%**		**101%**	**101%**		**101%**

Notes:

1. Experience shown above is weighted by annual benefit amounts for deceased members.
2. Expected amounts under the proposed generational mortality table are based on mortality rates from the base year projected with mortality improvements to the experience study period.
3. Results may not add due to rounding.

For General members, we recommend maintaining the post-retirement mortality to follow the Pub-2010 General Healthy Retiree Amount-Weighted Mortality Table (separate tables for males and females), with rates decreased by 5% for males and increased 5% for females, projected generationally, but updated with the two-dimensional mortality improvement scale MP-2021.

For Safety and Probation members, we recommend maintaining the post-retirement mortality to follow the Pub-2010 Safety Healthy Retiree Amount-Weighted Mortality Table (separate tables for males and females), projected generationally, but updated with the two-dimensional mortality improvement scale MP-2021.

Chart 13 that follows later in this section compares the number of actual to expected deaths on a benefit-weighted basis over the past eleven years for the current and proposed assumptions for service retirement General members.

Chart 14 compares the number of actual to expected deaths on a benefit-weighted basis over the past eleven years for the current and proposed assumptions for service retirement Safety and Probation members.

Chart 15 shows the life expectancies (i.e., expected future lifetime) under the current and the proposed tables for General members on a benefit-weighted basis. Life expectancies under the proposed generational mortality rates are based on age as of 2023. In practice, assumed life expectancies will increase as a result of the mortality improvement scale.

Chart 16 shows the life expectancies (i.e., expected future lifetime) under the current and the proposed tables for Safety and Probation members on a benefit-weighted basis. Life expectancies under the proposed generational mortality rates are based on age as of 2023. In practice, assumed life expectancies will increase as a result of the mortality improvement scale.

Beneficiary Mortality

The Pub-2010 Contingent Survivors Table is developed based only on contingent survivor data after the death of the retirees. This is consistent with the mortality experience that we have available for beneficiaries. The Pub-2010 contingent survivor mortality rates are comparable to MCERA's actual mortality experience for beneficiaries. However, in contrast to service retirees, there is much less beneficiary data, so it is given little credibility when adjusting the base table. As shown in the table below, the proposed mortality tables have an actual to expected ratio of 106%, after adjustments for partial credibility. In future years the ratio should remain around 106% as long as actual mortality improves at the same rates as anticipated by the generational mortality tables. The number of actual deaths compared to the number expected under the current and proposed assumptions weighted by benefit amounts for the last eleven years are as follows:

Beneficiary Mortality Experience – Benefit Weighted
($ in millions)

Gender	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths
Male	$0.25	$0.29	$0.25
Female	$0.76	$0.98	$0.75
Total	**$1.01**	**$1.27**	**$1.00**
Actual / Expected	**106%**		**106%**

Notes:
1. Experience shown above is weighted by annual benefit amounts for deceased beneficiaries.
2. Expected amounts under the proposed generational mortality table are based on mortality rates from the base year projected with mortality improvements to the experience study period.
3. Results may not add due to rounding.

For all beneficiaries, we recommend maintaining the beneficiary mortality to follow the Pub-2010 Contingent Survivor Amount-Weighted Mortality Table (separate tables for males and females) with rates increased by 5% for males and females, projected generationally, but updated with the two-dimensional mortality improvement scale MP-2021.

As stated above, the Contingent Survivor mortality tables are developed based on contingent survivor data only after the death of the retirees (i.e., it does not reflect any contingent survivor data before the death of the retirees). In the last experience study, we recommended that the Board applied the Contingent Survivor mortality tables to predict the mortality rates for the beneficiaries both before and after the death of the retirees. According to analysis provided by RPEC, the mortality rates for the beneficiaries could be somewhat overstated before the death of the retirees as the Contingent Survivor mortality tended to be higher than retiree mortality and the difference was statistically significant. Based on this analysis, for the purposes of the actuarial valuations (for funding and financial reporting), when calculating the liability for the

continuance to a beneficiary of a surviving member, we recommend that the <u>General</u> Healthy Retiree mortality tables be used for beneficiary mortality both before and after the expected death of the General or Safety/Probation member. Upon the actual death of the member (i.e., for all beneficiaries in pay status as of the valuation date), we recommend for the purposes of the actuarial valuations that we use the Contingent Survivor mortality tables as stated above. We note that the use of different mortality tables (before and after the death of the member) has been found by the RPEC to be reasonable.

Pre-Retirement Mortality

For General members, the table currently being used for pre-retirement mortality rates is the Pub-2010 General Employee Amount-Weighted Mortality Table (separate tables for males and females), projected generationally with the two-dimensional scale MP-2019. For Safety and Probation members, the table currently being used for pre-retirement mortality rates is the Pub-2010 Safety Employee Amount-Weighted Mortality Table (separate tables for males and females), projected generationally with the two-dimensional scale MP-2019. When analyzing pre-retirement mortality, there is much less data available, so it is given little credibility when adjusting the base table.

For General members, we recommend maintaining the pre-retirement mortality to follow the Pub-2010 General Employee Amount-Weighted Mortality Table (separate tables for males and females), projected generationally, but updated with the two-dimensional mortality improvement scale MP-2021.

For Safety members, we recommend maintaining the pre-retirement mortality to follow the Pub-2010 Safety Employee Amount-Weighted Mortality Table (separate tables for males and females), projected generationally, but updated with the two-dimensional mortality improvement scale MP-2021.

Currently, our assumption is that all General pre-retirement deaths are non-service connected, and Safety/Probation member pre-retirement deaths are service connected. Observed experience over the past eleven years for active member deaths is limited; however, each of the active General deaths reported by MCERA over this period have been classified as non-service connected. There was one service-connected death and one non-service connected death for Safety/Probation members. **We recommend maintaining the current assumption for both General and Safety/Probation members.**

Mortality Table for Member Contributions, Optional Forms of Payments and Reserves

There are administrative reasons why a generational mortality table is more difficult to implement for determining member contributions for legacy tiers (i.e., non-CalPEPRA), optional forms of payment, and reserves. One emerging practice is to approximate the use of a generational mortality table by the use of a static table with projection of the mortality improvement from the measurement year over a period that is close to the duration of the benefit payments for active members. We would recommend the use of this approximation for determining member contributions for employees in the legacy tiers.

For General non-CalPEPRA members, we recommend that the mortality table used for determining contributions be maintained with a blended table based on the Pub-2010 General Healthy Retiree Amount-Weighted Mortality Table (separate tables for males and females), with rates decreased by 5% for males and increased by 5% for females, projected 30 years (from 2010), but updated with the two-dimensional mortality improvement scale MP-2021, weighted 30% male and 70% female.

For Safety non-CalPEPRA members, we recommend that the mortality table used for determining contributions be maintained with a blended table based on the Pub-2010 Safety Healthy Retiree Amount-Weighted Mortality Table (separate tables for males and females), projected 30 years (from 2010), but updated with the two-dimensional mortality improvement scale MP-2021, weighted 80% male and 20% female.

For optional forms of payment and reserves, we would apply a similar methodology for the members mortality tables. Furthermore, as there are complications associated with using different mortality tables for the beneficiaries before and after the death of the retiree, **we recommend that the General Health Retiree mortality tables be used for the beneficiaries in determining optional forms of payment and reserves for General or Safety/Probation retirees.** The recommended tables along with the mortality rates will be provided in a separate letter at a later date, similar to prior years.

Chart 13: Post-Retirement Benefit-Weighted Deaths ($ In Millions)
Service Retirement General Members
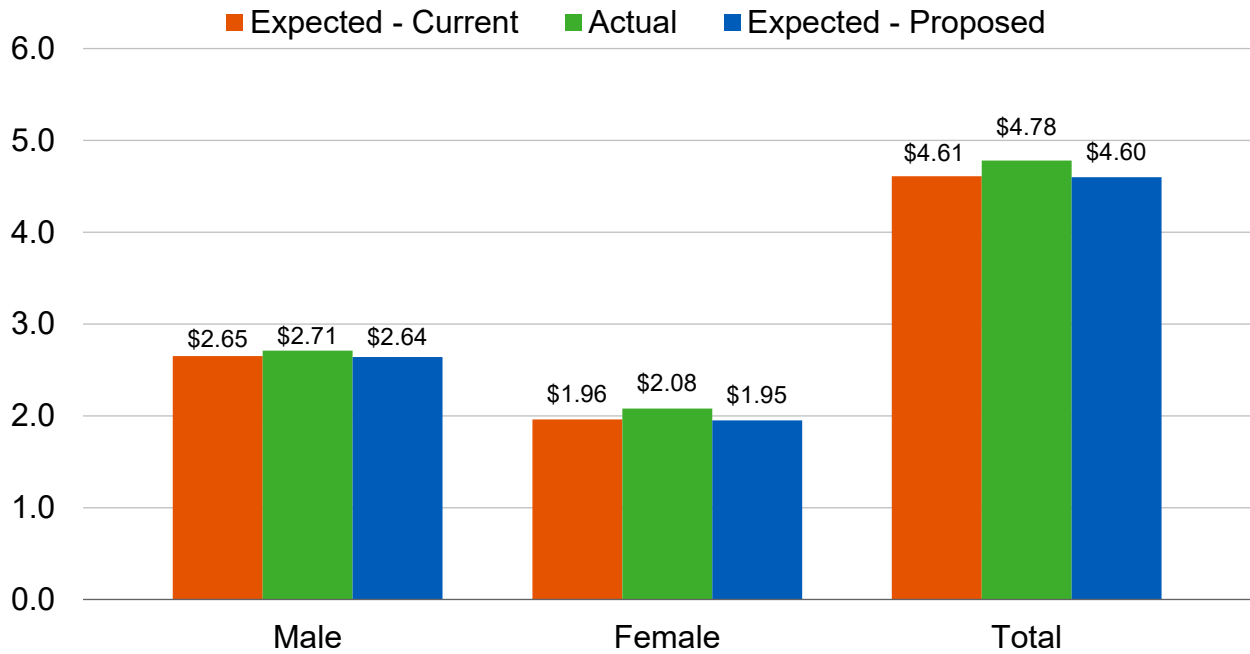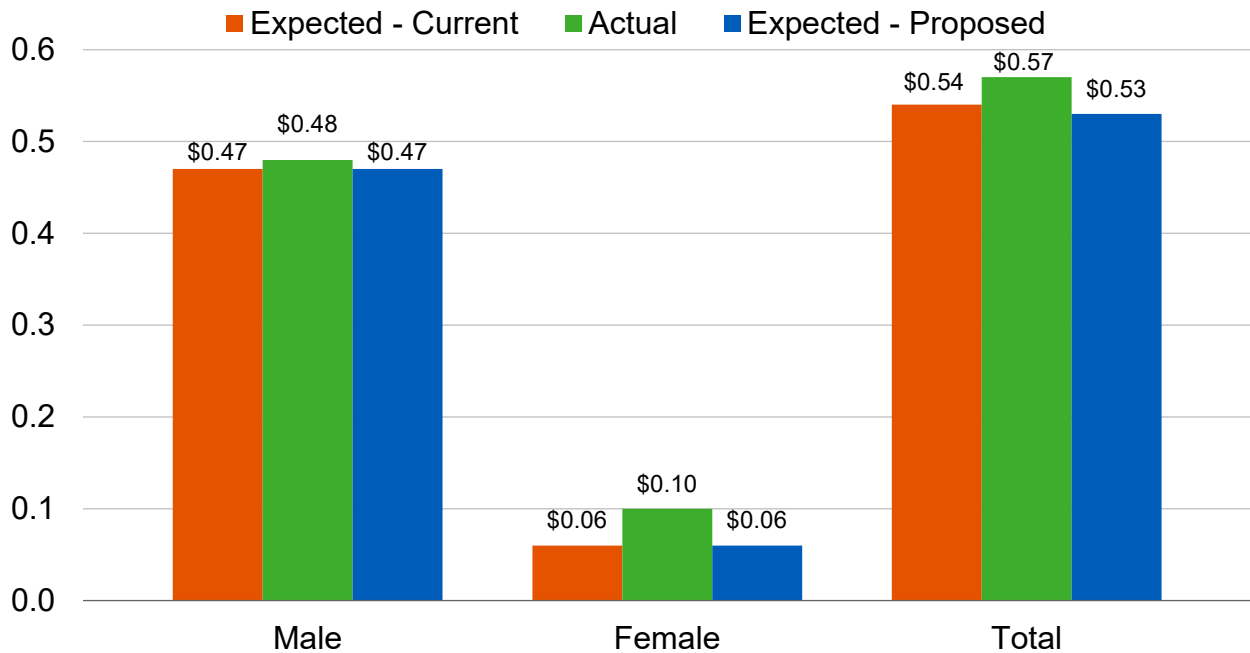### (July 1, 2011 through June 30, 2022)

Legend: ■ Expected - Current ■ Actual ■ Expected - Proposed

	Male	Female	Total
Expected - Current	$2.65	$1.96	$4.61
Actual	$2.71	$2.08	$4.78
Expected - Proposed	$2.64	$1.95	$4.60

Chart 14: Post-Retirement Benefit-Weighted Deaths ($ In Millions)
Service Retirement Safety and Probation Members
(July 1, 2011 through June 30, 2022)

Legend: ■ Expected - Current ■ Actual ■ Expected - Proposed

	Male	Female	Total
Expected - Current	$0.47	$0.06	$0.54
Actual	$0.48	$0.10	$0.57
Expected - Proposed	$0.47	$0.06	$0.53

Chart 15: Benefit-Weighted Life Expectancies
Service Retirement General Members
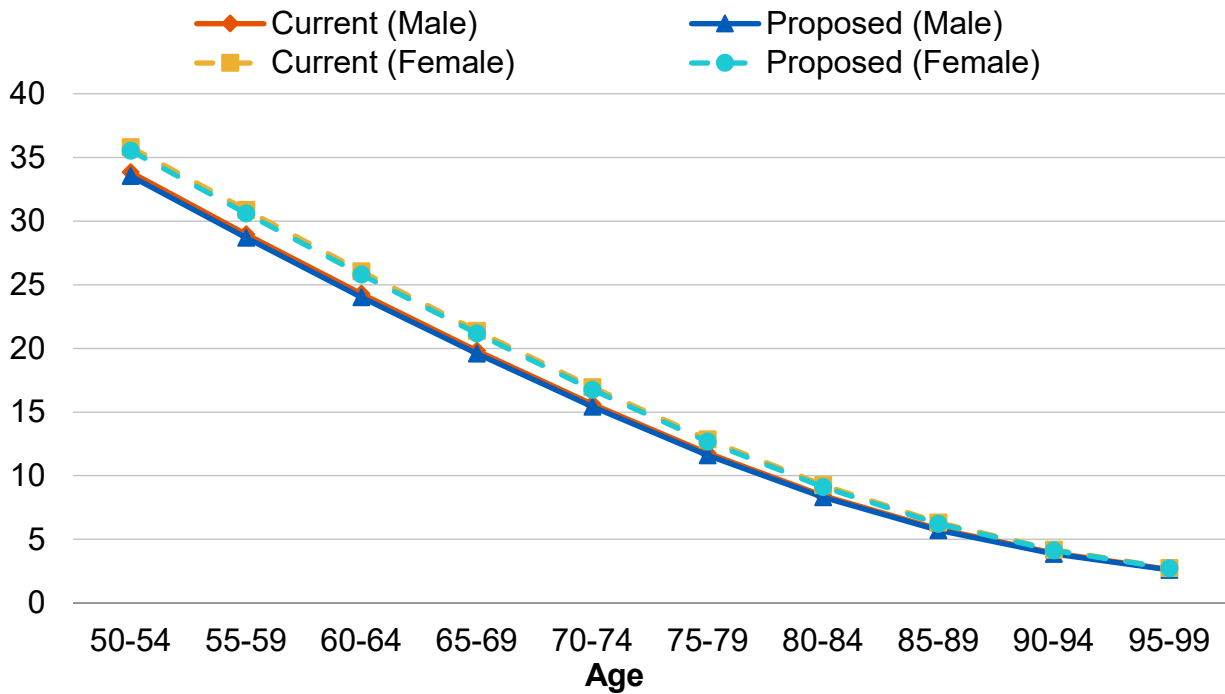
Chart 16: Benefit-Weighted Life Expectancies
Service Retirement Safety and Probation Members
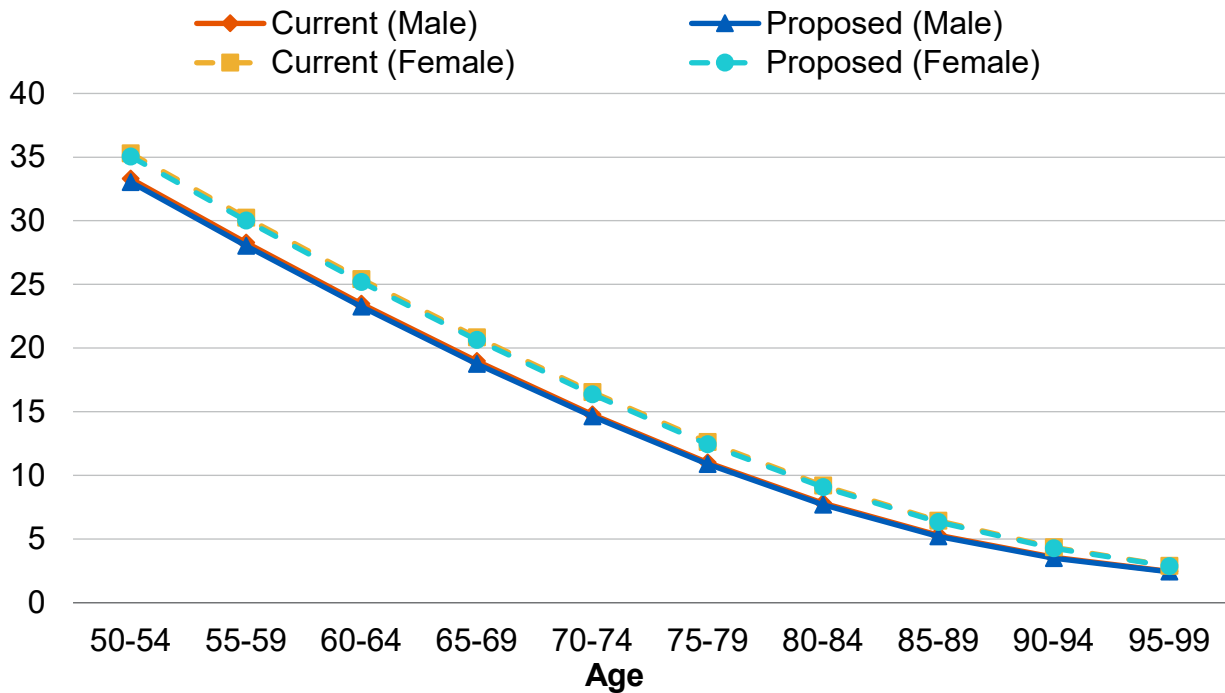
C. Mortality Rates - Disabled

Since mortality rates for disabled members can vary from those of healthy members, a different mortality assumption is often used. For General members the table currently being used is the Pub-2010 Non-Safety Disabled Retiree Amount-Weighted Mortality Table (separate tables for males and females) with rates decreased by 5% for males and females, projected generationally with the two-dimensional mortality improvement scale MP-2019. For Safety and Probation members, the table currently being used is the Pub-2010 Safety Disabled Retiree Amount-Weighted Mortality Table (separate tables for males and females), projected generationally with the two-dimensional mortality improvement scale MP-2019.

Similar to mortality rates for service retirees, the proposed mortality table reflects current experience to the extent that the experience is credible based on standard statistical theory. For MCERA, there is far less data for disabled retirees, so it is given little credibility. As shown in the table below, the proposed mortality tables have actual to expected ratios of 97% and 98% for General and Safety/Probation respectively, after adjustments for partial credibility. In future years the ratio should remain around 97% and 98% for General and Safety/Probation, respectively, as long as actual mortality improves at the same rates as anticipated by the generational mortality tables. The number of actual deaths compared to the number expected under the current and proposed assumptions weighted by benefit amounts for the last eleven years are as follows:

Disabled Retiree Mortality Experience – Benefit Weighted
($ in millions)

	General Members			Safety and Probation Members		
Gender	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths
Male	$0.49	$0.43	$0.49	$0.54	$0.44	$0.54
Female	$0.31	$0.24	$0.31	$0.01	$0.01	$0.01
Total	**$0.80**	**$0.67**	**$0.80**	**$0.55**	**$0.45**	**$0.55**
Actual / Expected	**97%**		**97%**	**98%**		**98%**

Notes:

1. Experience shown above is weighted by annual benefit amounts for deceased members.
2. Expected amounts under the proposed generational mortality table are based on mortality rates from the base year projected with mortality improvements to the experience study period.
3. Results may not add due to rounding.

For General disabled members, we recommend maintaining the disabled mortality to follow the Pub-2010 Non-Safety Disabled Retiree Amount-Weighted Mortality Table (separate tables for males and females), with rates decreased by 5%, projected generationally, but updated with the two-dimensional mortality improvement scale MP-2021.

For Safety disabled members, we recommend maintaining the disabled mortality to follow the Pub-2010 Safety Disabled Retiree Amount-Weighted Mortality Table (separate tables for males and females), projected generationally, but updated with the two-dimensional mortality improvement scale MP-2021.

Chart 17 compares the number of actual to expected deaths on a benefit-weighted basis over the past eleven years for the current and proposed assumptions for disabled General members.

Chart 18 compares the number of actual to expected deaths on a benefit-weighted basis over the past eleven years for the current and proposed assumptions for disabled Safety and Probation members.

Chart 19 shows the life expectancies (i.e., expected future lifetime) under the current and the proposed tables for disabled General members on a benefit-weighted basis. Life expectancies under the current and proposed generational mortality rates are based on age as of 2023. In practice, life expectancies will be assumed to increase based on applying the mortality improvement scale.

Chart 20 shows the life expectancies (i.e., expected future lifetime) under the current and the proposed tables for disabled Safety and Probation members on a benefit-weighted basis. Life expectancies under the proposed generational mortality rates are based on age as of 2023. In practice, assumed life expectancies will increase as a result of the mortality improvement scale.

Chart 17: Post-Retirement Benefit-Weighted Deaths ($ In Millions) Disabled General Members (July 1, 2011 through June 30, 2022)
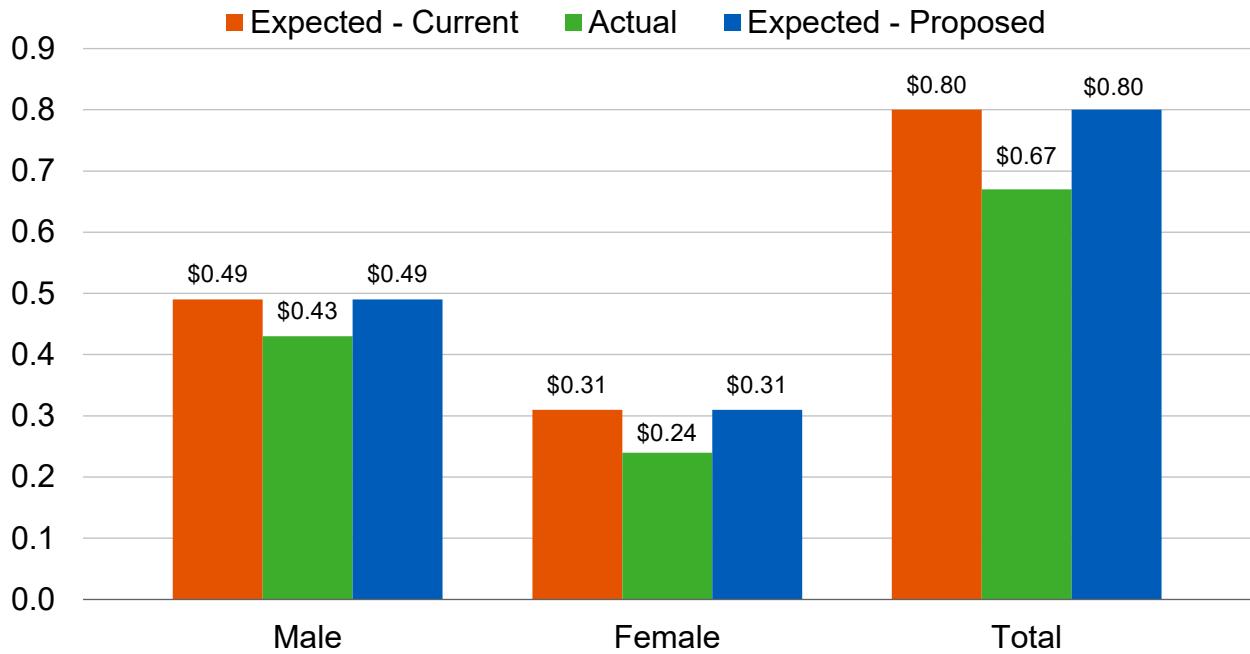

Chart 18: Post-Retirement Benefit-Weighted Deaths ($ In Millions) Disabled Safety and Probation Members (July 1, 2011 through June 30, 2022)
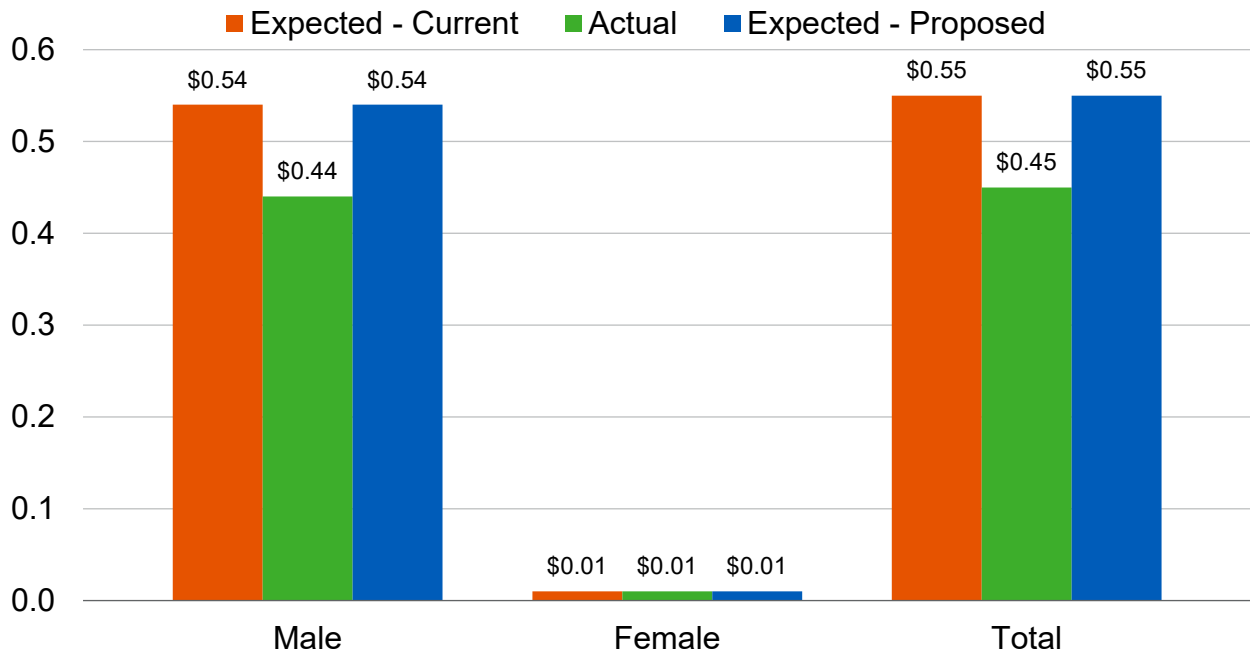
Chart 19: Benefit-Weighted Life Expectancies
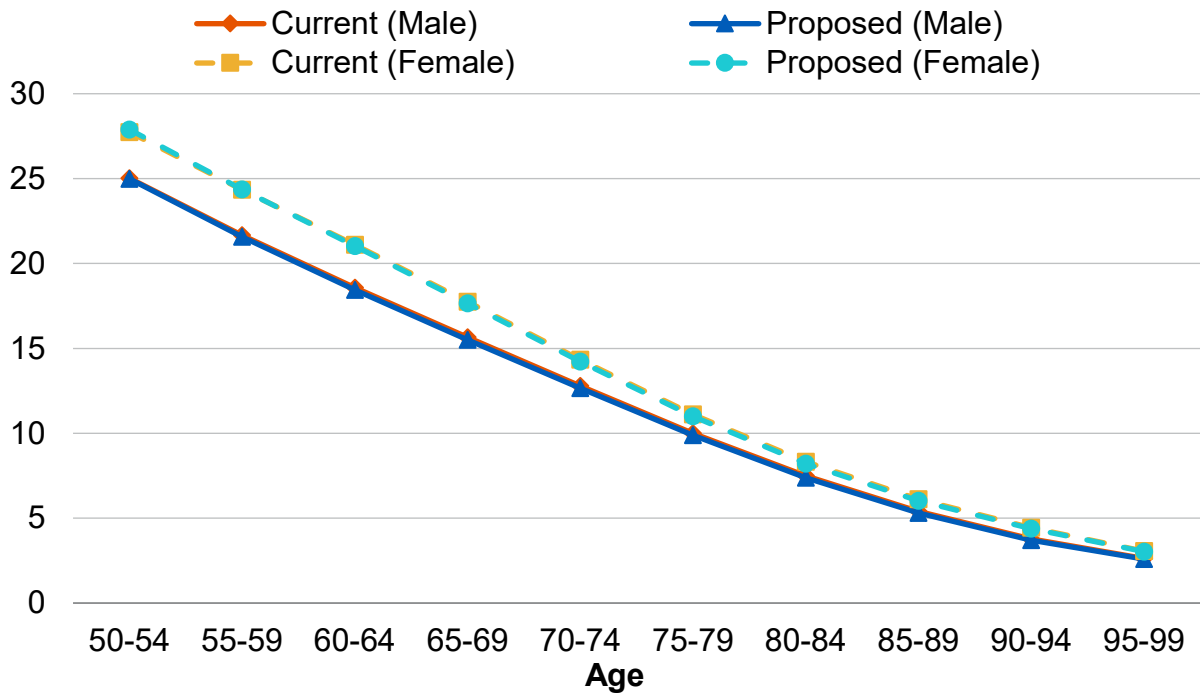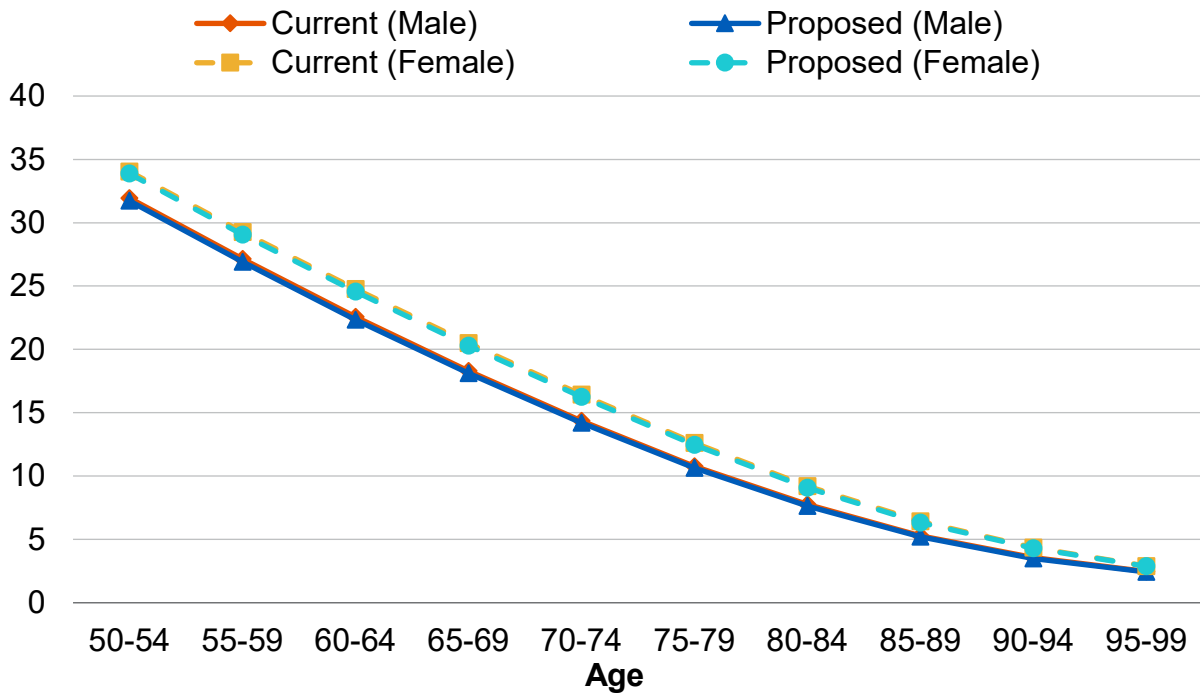## Disabled General Members

Chart 20: Benefit-Weighted Life Expectancies
Disabled Safety and Probation Members

D. Termination Rates

Termination rates include all terminations for reasons other than death, disability, or retirement. Under the current assumptions there is an overall incidence of termination assumed, combined with a separate assumption for the percentage of members who would be expected to elect a refund of member contributions versus a deferred retirement benefit. Under the current assumptions, termination rates are service based for the first five years of service and age based after the first five years of service. With this experience study, we are recommending termination rates based only on a function of the member's years of service.

The following tables show the observed termination rates for General, Safety, and Probation members based on the actual experience over the past six years. Also shown are the current assumed rates and the rates we propose. Please note that we have excluded any members that were eligible for retirement.

Termination
Rates (%)

Service	General				Safety and Probation			
	Current Rate[1]	Actual Rate (6 Years)	Actual Rate (3 Years)	Proposed Rate	Current Rate[1]	Actual Rate (6 Years)	Actual Rate (3 Years)	Proposed Rate
Less than 1	24.00	24.14	23.02	23.00	14.00	12.62	14.29	16.00
1 – 2	16.00	18.72	21.07	19.00	13.00	19.61	24.07	15.00
2 – 3	14.00	14.60	14.18	14.00	12.00	13.41	11.11	14.00
3 – 4	12.00	10.63	11.91	12.00	10.00	12.12	13.89	13.00
4 – 5	11.00	8.70	7.77	9.00	8.00	16.07	22.58	12.00
5 – 6	7.18	8.82	7.35	8.00	5.93	2.86	4.76	7.00
6 – 7	7.10	8.44	7.76	7.00	5.85	10.34	8.70	6.00
7 – 8	7.24	8.13	9.64	7.00	5.13	0.00	0.00	5.00
8 – 9	6.72	4.31	4.17	7.00	4.82	4.76	0.00	5.00
9 – 10	6.36	1.46	3.70	6.50	3.49	3.45	0.00	4.00
10 – 11	6.88	6.15	10.00	6.50	3.90	14.29	0.00	2.50
11 – 12	7.36	5.56	0.00	6.50	4.60	0.00	0.00	2.50
12 – 13	7.42	7.81	8.33	6.50	4.71	14.29	6.67	2.50
13 – 14	6.90	5.88	5.13	6.50	5.16	5.88	7.14	2.50
14 – 15	7.33	9.38	6.45	6.50	5.15	5.56	0.00	2.00
15 – 16	7.04	9.26	5.56	6.50	4.73	6.25	0.00	2.00
16 – 17	7.00	4.17	0.00	6.50	3.60	5.88	0.00	1.50
17 – 18	6.80	2.44	0.00	6.50	3.23	0.00	0.00	1.50
18 – 19	6.44	9.52	15.00	6.50	3.14	0.00	0.00	1.50
19 – 20	6.43	8.57	6.25	6.50	3.43	0.00	0.00	1.50
20 & Over	6.24	6.67	11.11	6.50	0.00	0.00	0.00	1.50

It is important to note that not every category has enough exposures and/or decrements such that the results in that category are statistically credible even if we look at six years' worth of experience. This is mainly the case for those members in the highest service categories because most members in those categories are eligible to retire and have been excluded from our review of this termination experience as mentioned above.

Based on this experience, we recommend increasing the termination rate assumption for certain service groups while decreasing the termination rate assumption for other service groups. Overall, the proposed rates represent an increase from the current rates for General, Safety and Probation members.

We also continue to recommend that no termination is assumed after a member is first assumed to retire.

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[1] The current rates shown for 5 or more years of service are based on our current age-based rates applied to the last three years of exposures.

Chart 21 compares the number of actual to expected terminations over the past six years for the current and proposed assumptions.

Chart 22 compares the actual termination experience with the current and proposed assumptions for General members. The current rates shown for 5 or more years of service are based on our current age-based rates applied to the last three years of exposures.

Chart 23 compares the actual termination experience with the current and proposed assumptions for Safety and Probation members. The current rates shown for 5 or more years of service are based on our current age-based rates applied to the last three years of exposures.

In addition, among the terminations, we recommend the following assumptions for the percentage of members who would elect a refund of contributions versus those who would elect to leave their contributions on deposit and receive a deferred vested benefit.

Proportion of Total Termination Assumed to Receive Refunds and Deferred Vested Benefits
Rates (%)

	Refunds				Deferred Vested Benefits			
Service	Current Rate	Actual Rate (6 Years)	Actual Rate (3 Years)	Proposed Rate	Current Rate	Actual Rate (6 Years)	Actual Rate (3 Years)	Proposed Rate
Less than 5	85.0	89.2	89.3	90.0	15.0	10.8	10.7	10.0
5 & Over	25.0	21.6	18.2	20.0	75.0	78.4	81.8	80.0

Based on this experience, we recommend increasing the refund assumption for the less than 5 years of service group while decreasing the deferred vested assumption for this service group. We also recommend decreasing the refund assumption for the 5 or more years of service group while increasing the deferred vested assumption for this service group.

Chart 21: Actual Number of Terminations Compared to Expected (July 1, 2016 through June 30, 2022)
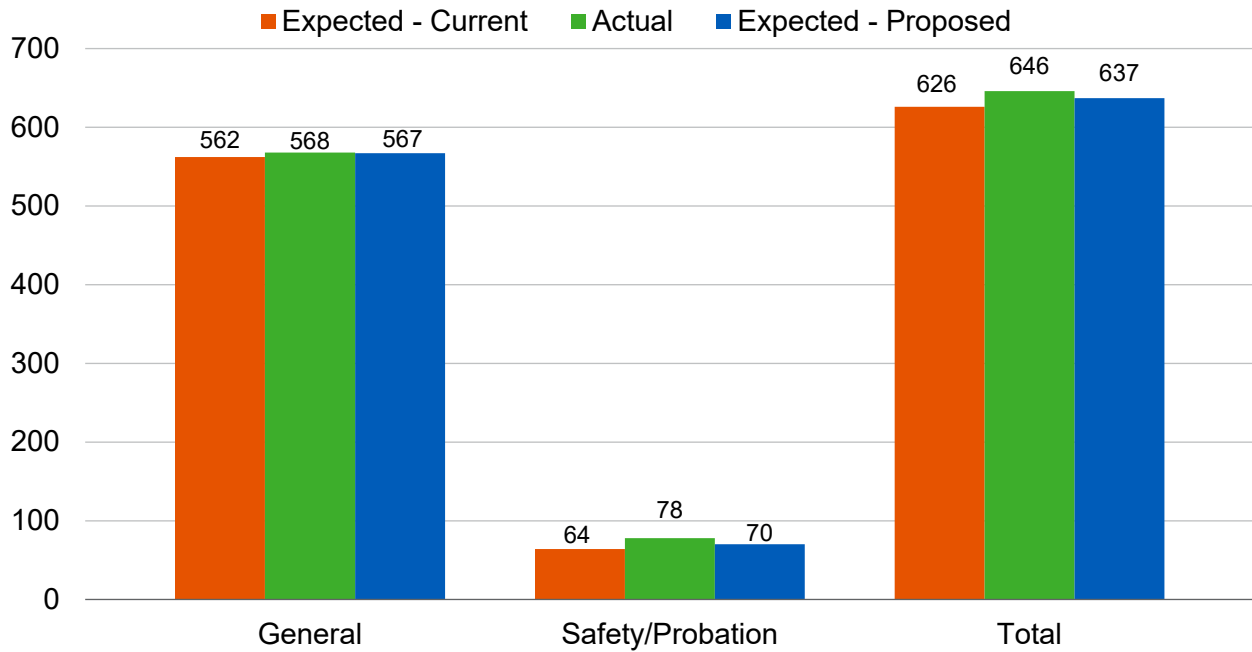
Legend: ■ Expected - Current ■ Actual ■ Expected - Proposed

Category	Expected - Current	Actual	Expected - Proposed
General	562	568	567
Safety/Probation	64	78	70
Total	626	646	637

Chart 22: Termination Rates for General Members

Legend: Current Actual (6-Year Average) Actual (3-Year Average) Proposed

X-axis: Years of Service (0 through 20+)
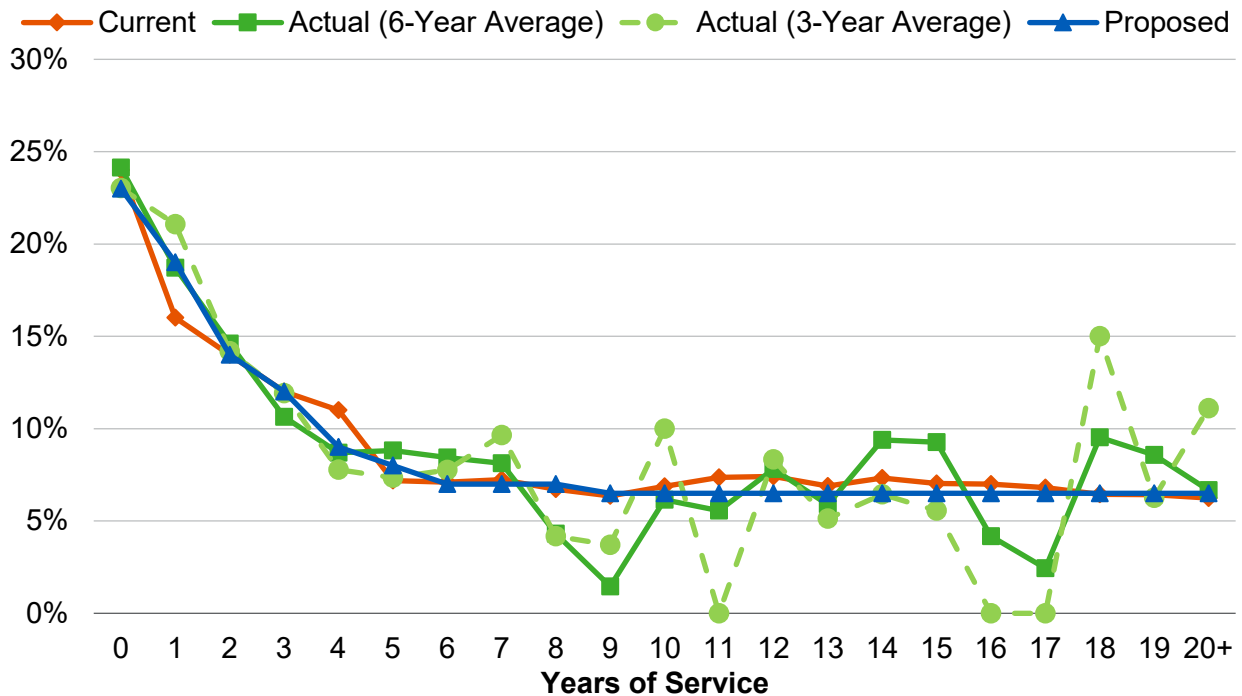
Chart 23: Termination Rates for Safety and Probation Members

Legend: Current — Actual (6-Year Average) — Actual (3-Year Average) — Proposed

Y-axis: 25%, 20%, 15%, 10%, 5%, 0%

X-axis (Years of Service): 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20+
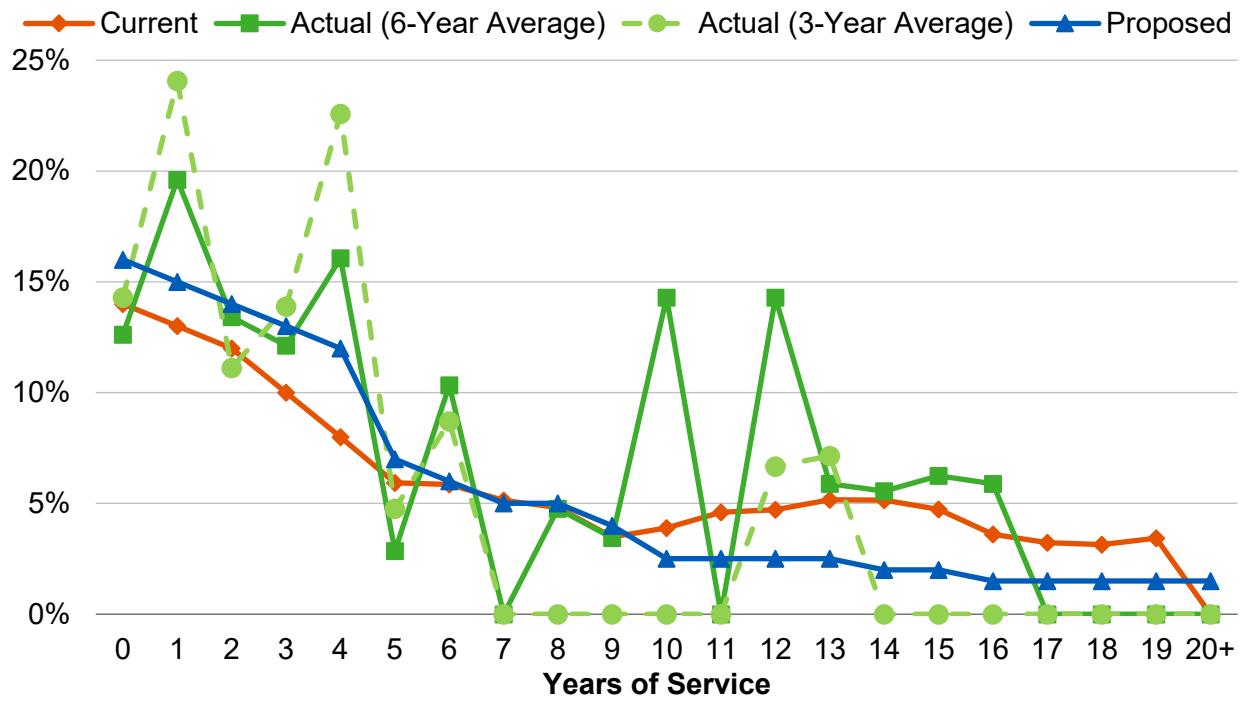
E. Disability Incidence Rates

When a member becomes disabled, he or she may be entitled to at least a 50% of pay pension (service connected disability), or a pension that depends upon the member's years of service (non-service connected disability).

The following table shows the observed disability incidence rates based on the actual experience over the past six years. Also shown are the current assumed rates and the rates we propose. Please note that we have combined service and non-service connected disability incidence in the table below.

Disability Incidence[1]
Rates (%)

Age	General				Safety and Probation			
	Current Rate[2]	Actual Rate (6 Years)	Actual Rate (3 Years)	Proposed Rate[2]	Current Rate[2]	Actual Rate (6 Years)	Actual Rate (3 Years)	Proposed Rate[2]
20 – 24	0.01	0.00	0.00	0.01	0.10	0.00	0.00	0.10
25 – 29	0.01	0.00	0.00	0.01	0.15	0.00	0.00	0.15
30 – 34	0.01	0.00	0.00	0.01	0.20	0.00	0.00	0.20
35 – 39	0.02	0.00	0.00	0.02	1.50	1.46	2.44	1.50
40 – 44	0.20	0.30	0.00	0.20	1.80	1.67	0.00	1.80
45 – 49	0.35	0.26	0.27	0.30	1.80	0.71	0.00	1.80
50 – 54	0.50	0.49	0.48	0.50	2.75	2.63	1.37	2.75
55 – 59	0.50	0.24	0.48	0.50	2.75	2.41	2.38	2.75
60 – 64	0.60	0.57	0.62	0.60	0.00	5.41	7.14	3.50
65 – 69	0.65	0.34	0.00	0.60	0.00	4.76	9.09	0.00

Based on this experience, we recommend slightly decreasing the disability incidence rate assumption for General members in the 45 – 49 and 65 – 69 age ranges and including disability rates through age 64 for Safety and Probation members (100% assumed retirement has been extended to age 65 for Safety and Probation members).

Chart 24 that follows later in this section compares the number of actual to expected service and non-service connected disabilities over the past six years for the current and proposed assumptions.

Chart 25 compares the actual disability incidence experience with the current and proposed assumptions for General members.

Chart 26 compares the actual disability incidence experience with the current and proposed assumptions for Safety and Probation members.

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[1] Total rate for service connected and non-service connected disabilities. Note that the actual rates of disability include new disabled retirees from prior inactive and service retired statuses, since we understand that, in some circumstances, MCERA classifies members in these statuses prior to the disability being granted.

[2] At central age in age range shown.

The following table shows the observed percentage of members that received a service versus non-service connected disability based on the actual experience over the past six years. Also shown are the current assumed percentages and the percentages we propose.

Service vs. Non-Service Connected Disability

Service Connected %	General	Safety
Current Assumption	50%	90%
Actual Experience (last 6 years)	75%	92%
Actual Experience (last 3 years)	71%	100%
Proposed Assumption	**60%**	**95%**

Based on this experience, we recommend increasing the current assumption from 50% to 60% to anticipate service connected disabilities for General members, with the remaining 40% assumed to be non-service connected disabilities. We also recommend increasing the current assumption from 90% to 95% to anticipate service connected disabilities for Safety and Probation members, with the remaining 5% assumed to be non-service connected disabilities.

Chart 24: Actual Number of Disabilities Compared to Expected
(July 1, 2016 through June 30, 2022)
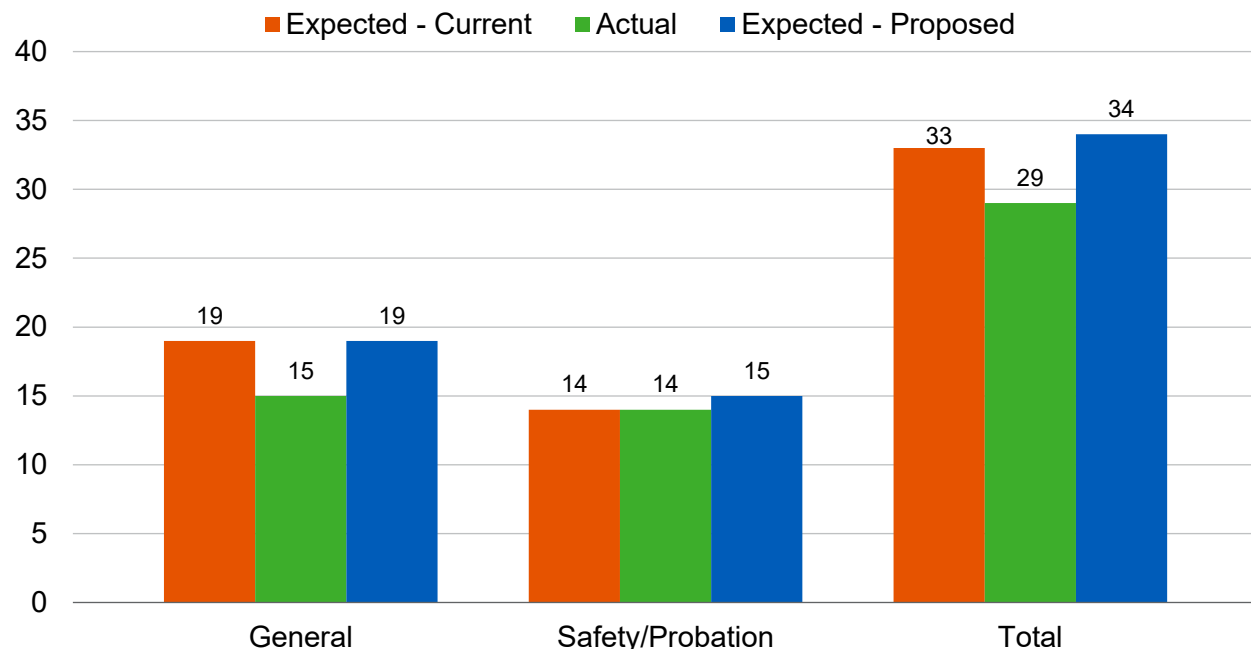
Chart 25: Disability Incidence Rates
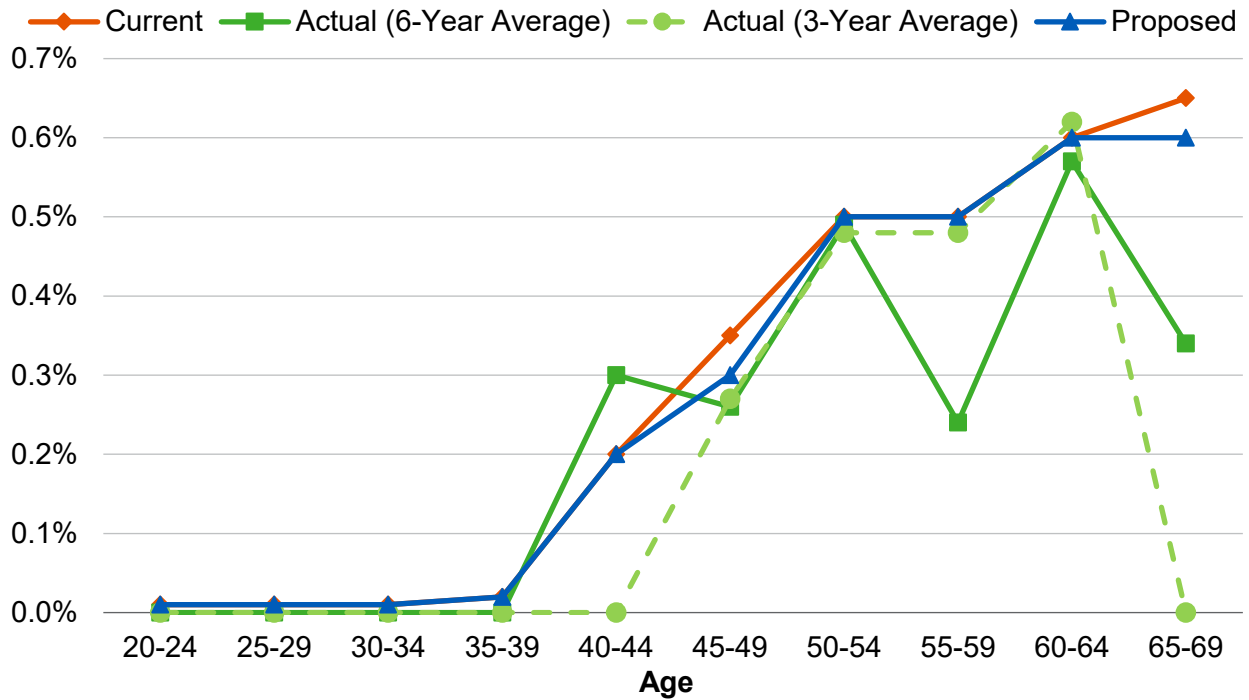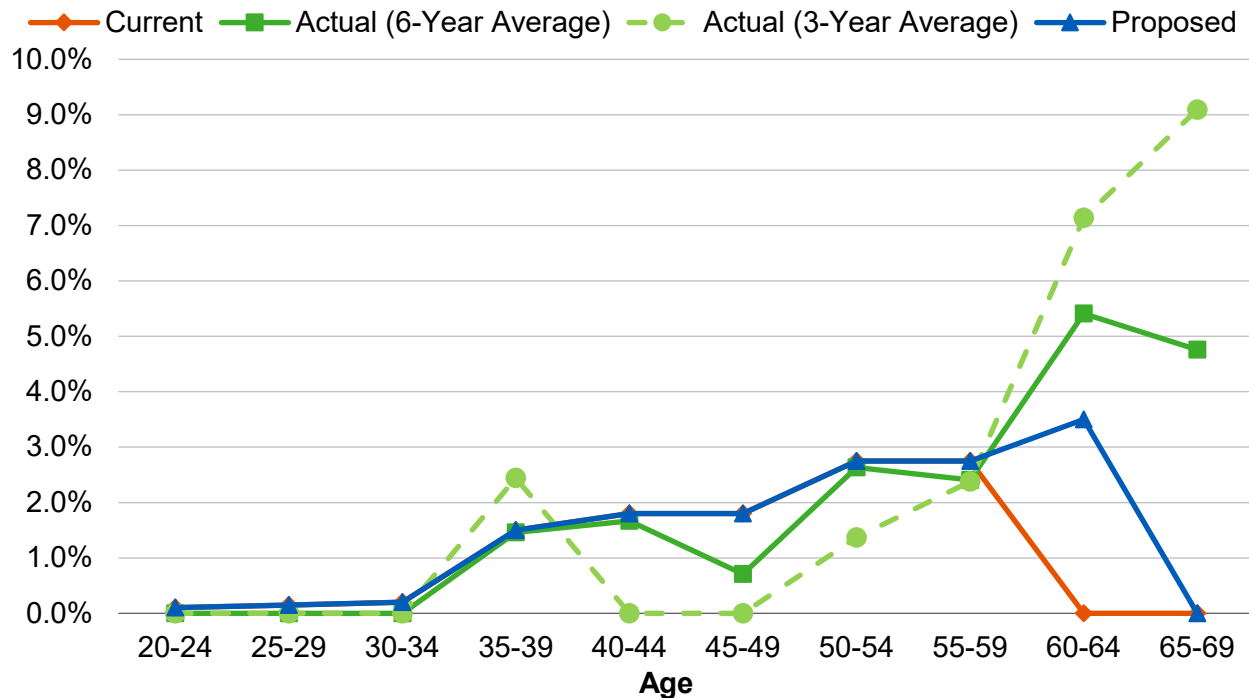## for General Members

Chart 26: Disability Incidence Rates
for Safety and Probation Members

Note: There was 1 actual Safety disability in the 65-69 age category during the most recent 3-year period.

F. Unused Sick Leave

The current assumption for converting unused sick leave into additional service credit at retirement is that for each year of employment, an employee will convert approximately 0.017 years of sick leave into additional service credit at retirement. We have observed that the conversion of sick leave for new service retirees over each of the last six years has averaged about 0.016 years for each year of employment. (The experience over the last three years has averaged about 0.017 years for each year of employment.) Based on this observed experience, we recommend that the sick leave conversion assumption be maintained at 0.017 years of additional service credit at retirement, for each year of employment.

5. Cost Impact

We have estimated the impact of all the recommended economic and demographic assumptions (including refinements in the method used to allocate total present value of future benefits for actives between normal cost and actuarial accrued liability) as if they were applied to the June 30, 2022 actuarial valuation. The table below shows the changes in the employer and member contribution rates due to the proposed changes separately for the recommended economic assumption changes (as recommended in Section 3 of this report) and the recommended demographic assumption changes (as recommended in Section 4 of this report).

Cost Impact of the Recommended Assumptions
Based on June 30, 2022 Actuarial Valuation

Assumption	Impact on Average Employer Contribution Rates
Increase due to changes in economic assumptions	2.58%
Increase due to changes in demographic assumptions	0.98%
Total increase in average employer rate	**3.56%**
Total estimated increase in annual dollar amount ($000s)[1]	**$3,012**

Assumption	Impact on Weighted Average Member Contribution Rates
Increase due to changes in economic assumptions	0.40%
Increase due to changes in demographic assumptions	0.39%
Total increase in weighted average member rate	**0.79%**
Total estimated increase in annual dollar amount ($000s)[1]	**$666**

	Impact on UAAL and Funded Percentage
Increase in UAAL ($000s)	Increase of $18.3 million
Change in funded percentage	From 73.2% to 71.7%

Of the various economic assumption changes, the most significant cost impact is from the change in the investment return assumption from 6.75% to 6.50%. However, that increase in cost from the investment return assumption is offset somewhat by the decrease in cost from the change in the inflation assumption from 2.75% to 2.50%.

We have also analyzed in the tables below the average employer and member contribution rate impacts by each cost group due to the recommended assumptions changes as if they were applied to the June 30, 2022 actuarial valuation.

[1] Based on June 30, 2022 projected annual payroll as determined under each set of assumptions.

Employer Contribution Rate Increases/(Decreases) (% of Payroll)

	Normal Cost	UAAL	Total	Annual Amount[1] ($000s)
General Tier 1	3.14%	1.34%	4.48%	$5
General Tier 2 / Tier 3	2.20%	1.34%	3.54%	$880
General Tier 4	0.87%	1.34%	2.21%	$978
Safety Tier 1	Not Calculated[2]			
Safety Tier 2	4.93%	4.88%	9.81%	$641
Safety Tier 3	1.62%	4.88%	6.50%	$350
Probation Tier 1	Not Calculated[2]			
Probation Tier 2	3.76%	1.63%	5.39%	$100
Probation Tier 3	1.65%	1.63%	3.28%	$58
Combined	**1.71%**	**1.85%**	**3.56%**	**$3,012**

Average Member Contribution Rate Increases/(Decreases) (% of Payroll)

	Rate	Annual Amount[1] ($000s)
General Tier 1	0.00%	$0
General Tier 2 / Tier 3	0.25%	$57
General Tier 4	0.87%	$383
Safety Tier 1	Not Calculated[2]	
Safety Tier 2	1.42%	$93
Safety Tier 3	1.62%	$87
Probation Tier 1	Not Calculated[2]	
Probation Tier 2	0.88%	$16
Probation Tier 3	1.65%	$30
Combined	**0.79%**	**$666**

[1] Based on June 30, 2022 projected annual payroll as determined under each set of assumptions.
[2] There were no Safety Tier 1 or Probation Tier 1 active members reported for the June 30, 2022 valuation.

Appendix A: Current Actuarial Assumptions

Economic Assumptions

Net Investment Return:	6.75%; net of administrative and investment expenses. Expected administrative and investment expenses represent about 0.40% of the Market Value of Assets.
Employee Contribution Crediting Rate:	6.75%, compounded semi-annually.
Cost of Living Adjustment:	Retiree COLA increases are subject to a 2.75% maximum change per year for General Tiers 1, 2, and 3, Safety Tiers 1 and 2, and Probation Tiers 1 and 2 (for non-CalPEPRA members with a sufficient COLA bank, withdrawals from the bank can be made to increase the retiree COLA up to 3% per year). No COLA increases for General Tier 4, Safety Tier 3, and Probation Tier 3.
Payroll Growth:	Inflation of 2.75% per year plus real "across the board" salary increases of 0.50% per year, used to amortize the Unfunded Actuarial Accrued Liability as a level percentage of payroll.
Increase in Internal Revenue Code Section 401(a)(17) Compensation Limit:	Increase of 2.75% per year from the valuation date.
Increase in Section 7522.10 Compensation Limit:	Increase of 2.75% per year from the valuation date.
Salary Increases:	The annual rate of compensation increase includes: • Inflation at 2.75%, plus • "Across the board" salary increases of 0.50% per year, plus • The following merit and promotion increases:

	Rate (%)	
Years of Service	**General**	**Safety and Probation**
Less than 1	5.00	5.00
1 – 2	4.50	4.25
2 – 3	4.00	3.75
3 – 4	3.25	3.25
4 – 5	2.75	2.50
5 – 6	2.25	2.00
6 – 7	2.00	1.75
7 – 8	1.75	1.25
8 – 9	1.25	1.00
9 – 10	1.00	1.00
10 & Over	1.00	1.00

Demographic Assumptions

Post-Retirement Mortality Rates:	*Healthy* • **General Members:** Pub-2010 General Healthy Retiree Amount-Weighted Mortality Tables (separate tables for males and females) with rates decreased by 5% for males and increased by 5% for females, projected generationally with the two-dimensional mortality improvement scale MP-2019. • **Safety and Probation Members:** Pub-2010 Safety Healthy Retiree Amount-Weighted Mortality Tables (separate tables for males and females), projected generationally with the two-dimensional mortality improvement scale MP-2019. *Disabled* • **General Members:** Pub-2010 Non-Safety Disabled Retiree Amount-Weighted Mortality Tables (separate tables for males and females) with rates decreased by 5%, projected generationally with the two-dimensional mortality improvement scale MP-2019. • **Safety and Probation Members:** Pub-2010 Safety Disabled Retiree Amount-Weighted Mortality Tables (separate tables for males and females), projected generationally with the two-dimensional mortality improvement scale MP-2019. *Beneficiaries* • **All Beneficiaries:** Pub-2010 Contingent Survivor Amount-Weighted Mortality Tables (separate tables for males and females) with rates increased by 5%, projected generationally with the two-dimensional mortality improvement scale MP-2019. The Pub-2010 mortality tables and adjustments as shown above reasonably reflect the mortality experience as of the measurement date. These mortality tables were adjusted to future years using the generational projection to reflect future mortality improvement between the measurement date and those years.

Pre-Retirement Mortality Rates:	• **General Members:** Pub-2010 General Employee Amount-Weighted Mortality Tables (separate tables for males and females), projected generationally with the two-dimensional mortality improvement scale MP-2019.				
	• **Safety and Probation Members:** Pub-2010 Safety Employee Amount-Weighted Mortality Tables (separate tables for males and females), projected generationally with the two-dimensional mortality improvement scale MP-2019.				

	Rate (%)			
	General		**Safety and Probation**	
Age	**Male**	**Female**	**Male**	**Female**
25	0.03	0.01	0.04	0.02
30	0.04	0.02	0.04	0.03
35	0.05	0.02	0.05	0.04
40	0.07	0.04	0.06	0.05
45	0.10	0.06	0.08	0.07
50	0.15	0.08	0.12	0.09
55	0.22	0.12	0.18	0.12
60	0.32	0.19	0.26	0.17
65	0.47	0.30	0.41	0.23
70	0.70	0.49	0.77	0.45

Note that generational projections beyond the base year (2010) are not reflected in the above mortality rates.

All General pre-retirement deaths are assumed to be non-service connected deaths. All Safety and Probation pre-retirement deaths are assumed to be service connected deaths.

Mortality Rates for Member Contributions:	• **General Members:** Pub-2010 General Healthy Retiree Amount-Weighted Mortality Tables (separate tables for males and females) with rates decreased by 5% for males and increased by 5% for females, projected 30 years (from 2010) with the two-dimensional mortality improvement scale MP-2019, weighted 30% male and 70% female.
	• **Safety and Probation Members:** Pub-2010 Safety Healthy Retiree Amount-Weighted Mortality Tables (separate tables for males and females), projected 30 years (from 2010) with the two-dimensional mortality improvement scale MP-2019, weighted 80% male and 20% female.

Disability Incidence:

	Rate (%)		
Age	**General**	**Safety**	**Probation**
20	0.01	0.10	0.10
25	0.01	0.13	0.13
30	0.01	0.18	0.18
35	0.02	0.98	0.98
40	0.13	1.68	1.68
45	0.29	1.80	1.80
50	0.44	2.37	2.37
55	0.50	2.75	2.75
60	0.56	0.00	0.00
65	0.63	0.00	0.00

50% of General disabilities are assumed to be service connected disabilities. The other 50% are assumed to be non-service connected disabilities.

90% of Safety and Probation disabilities are assumed to be service connected disabilities. The other 10% are assumed to be non-service connected disabilities.

Termination:

Less than Five Years of Service:

Years of Service	Rate (%)		
	General	Safety	Probation
Less than 1	24.00	14.00	14.00
1 – 2	16.00	13.00	13.00
2 – 3	14.00	12.00	12.00
3 – 4	12.00	10.00	10.00
4 – 5	11.00	8.00	8.00

85% of all terminated members with less than 5 years of service are assumed to choose a refund of contributions. The other 15% are assumed to choose a deferred vested benefit. No termination is assumed after a member is eligible for retirement (as long as a retirement rate is present).

Five or More Years of Service:

Age	Rate (%)		
	General	Safety	Probation
20	8.00	7.00	7.00
25	8.00	7.00	7.00
30	8.00	6.40	6.40
35	8.00	6.00	6.00
40	8.00	4.80	4.80
45	6.80	3.40	3.40
50	6.00	1.80	1.80
55	6.00	0.40	0.40
60	5.40	0.00	0.00
65	4.40	0.00	0.00

25% of all terminated members with 5 or more years of service are assumed to choose a refund of contributions. The other 75% are assumed to choose a deferred vested benefit. No termination is assumed after a member is eligible for retirement (as long as a retirement rate is present).

		Rate (%)					
	Age	**General Tiers 1, 2, & 3**	**General Tier 4**	**Safety Tiers 1 & 2**	**Safety Tier 3**	**Probation Tiers 1 & 2**	**Probation Tier 3**
Retirement Rates:	50	5.00	0.00	8.00	3.00	5.00	4.00
	51	5.00	0.00	8.00	3.00	5.00	4.00
	52	5.00	6.00	8.00	3.00	5.00	4.00
	53	5.00	3.00	8.00	3.00	5.00	4.00
	54	5.00	3.00	8.00	3.00	5.00	4.00
	55	10.00	5.00	10.00	4.00	23.00	13.00
	56	10.00	5.00	15.00	10.00	23.00	24.00
	57	10.00	5.00	20.00	12.00	23.00	24.00
	58	10.00	5.00	25.00	15.00	23.00	24.00
	59	10.00	5.00	30.00	30.00	23.00	24.00
	60	12.00	6.00	100.00	100.00	100.00	100.00
	61	15.00	9.00	100.00	100.00	100.00	100.00
	62	25.00	12.00	100.00	100.00	100.00	100.00
	63	20.00	14.00	100.00	100.00	100.00	100.00
	64	20.00	12.00	100.00	100.00	100.00	100.00
	65	45.00	32.00	100.00	100.00	100.00	100.00
	66	45.00	32.00	100.00	100.00	100.00	100.00
	67	45.00	32.00	100.00	100.00	100.00	100.00
	68	45.00	32.00	100.00	100.00	100.00	100.00
	69	45.00	32.00	100.00	100.00	100.00	100.00
	70	100.00	100.00	100.00	100.00	100.00	100.00

The retirement rates only apply to members who are eligible to retire at the age shown.

Retirement Age and Benefit for Deferred Vested Members:	For current and future deferred vested members, retirement age assumptions are as follows: • General Retirement Age: 60 • Safety and Probation Retirement Age: 54 Deferred vested members who terminate with less than five years of service and are not vested are assumed to retire at age 70 if they decide to leave their contributions on deposit. 65% of future deferred vested members are assumed to continue to work for a reciprocal employer. For reciprocals, 4.25% compensation increases are assumed per annum.
Future Benefit Accruals:	1.0 year of service per year of employment, plus 0.017 years of additional service to anticipate conversion of unused sick leave for each year of employment, for members expected to retire directly from active employment and to receive a service retirement benefit.
Unknown Data for Members:	Same as those exhibited by members with similar known characteristics. If not specified, members are assumed to be male.
Inclusion of Deferred Vested Members:	All deferred vested members are included in the valuation.
Form of Payment:	All active and inactive members are assumed to elect the unmodified option at retirement.
Percent Married:	For all active and inactive members, 70% of male members and 50% of female members are assumed to be married at pre-retirement death or retirement.
Age and Gender of Spouse:	For all active and inactive members, male members are assumed to have a female spouse who is 2 years younger than the member and female members are assumed to have a male spouse who is 2 years older than the member.

Appendix B: Proposed Actuarial Assumptions

Economic Assumptions

Net Investment Return:	6.50%; net of administrative and investment expenses. Expected administrative and investment expenses represent about 0.30% of the Actuarial Value of Assets.
Employee Contribution Crediting Rate:	6.50%, compounded semi-annually.
Cost of Living Adjustment:	Retiree COLA increases are subject to a 2.75% maximum change per year for General Tiers 1, 2, and 3, Safety Tiers 1 and 2, and Probation Tiers 1 and 2 (for non-CalPEPRA members with a sufficient COLA bank, withdrawals from the bank can be made to increase the retiree COLA up to 3% per year). No COLA increases for General Tier 4, Safety Tier 3, and Probation Tier 3.
Payroll Growth:	Inflation of 2.50% per year plus real "across the board" salary increases of 0.50% per year, used to amortize the Unfunded Actuarial Accrued Liability as a level percentage of payroll.
Increase in Internal Revenue Code Section 401(a)(17) Compensation Limit:	Increase of 2.50% per year from the valuation date.
Increase in Section 7522.10 Compensation Limit:	Increase of 2.50% per year from the valuation date.
Salary Increases:	The annual rate of compensation increase includes: • Inflation at 2.50%, plus • "Across the board" salary increases of 0.50% per year, plus • The following merit and promotion increases:

	Rate (%)	
Years of Service	**General**	**Safety and Probation**
Less than 1	5.00	5.25
1 – 2	4.75	5.00
2 – 3	4.50	4.50
3 – 4	4.25	3.25
4 – 5	3.50	3.00
5 – 6	2.75	2.25
6 – 7	2.25	2.00
7 – 8	1.75	1.50
8 – 9	1.50	1.25
9 – 10	1.00	1.25
10 – 11	1.00	1.25
11 – 12	1.00	1.25
12 & Over	1.00	1.00

Demographic Assumptions

Post-Retirement Mortality Rates:	*Healthy* • **General Members:** Pub-2010 General Healthy Retiree Amount-Weighted Mortality Tables (separate tables for males and females) with rates decreased by 5% for males and increased by 5% for females, projected generationally with the two-dimensional mortality improvement scale MP-2021. • **Safety and Probation Members:** Pub-2010 Safety Healthy Retiree Amount-Weighted Mortality Tables (separate tables for males and females), projected generationally with the two-dimensional mortality improvement scale MP-2021. *Disabled* • **General Members:** Pub-2010 Non-Safety Disabled Retiree Amount-Weighted Mortality Tables (separate tables for males and females) with rates decreased by 5%, projected generationally with the two-dimensional mortality improvement scale MP-2021. • **Safety and Probation Members:** Pub-2010 Safety Disabled Retiree Amount-Weighted Mortality Tables (separate tables for males and females), projected generationally with the two-dimensional mortality improvement scale MP-2021. *Beneficiaries* • **Beneficiaries not currently in Pay Status:** Pub-2010 General Healthy Retiree Amount-Weighted Mortality Tables (separate tables for males and females) with rates decreased by 5% for males and increased by 5% for females, projected generationally with the two-dimensional mortality improvement scale MP-2021. • **Beneficiaries currently in Pay Status:** Pub-2010 Contingent Survivor Amount-Weighted Mortality Tables (separate tables for males and females) with rates increased by 5%, projected generationally with the two-dimensional mortality improvement scale MP-2021. The Pub-2010 mortality tables and adjustments as shown above reasonably reflect the mortality experience as of the measurement date. These mortality tables were adjusted to future years using the generational projection to reflect future mortality improvement between the measurement date and those years.

Pre-Retirement Mortality Rates:	• **General Members:** Pub-2010 General Employee Amount-Weighted Mortality Tables (separate tables for males and females), projected generationally with the two-dimensional mortality improvement scale MP-2021.

• **Safety and Probation Members:** Pub-2010 Safety Employee Amount-Weighted Mortality Tables (separate tables for males and females), projected generationally with the two-dimensional mortality improvement scale MP-2021.

	Rate (%)			
	General		Safety and Probation	
Age	Male	Female	Male	Female
25	0.03	0.01	0.04	0.02
30	0.04	0.02	0.04	0.03
35	0.05	0.02	0.05	0.04
40	0.07	0.04	0.06	0.05
45	0.10	0.06	0.08	0.07
50	0.15	0.08	0.12	0.09
55	0.22	0.12	0.18	0.12
60	0.32	0.19	0.26	0.17
65	0.47	0.30	0.41	0.23
70	0.70	0.49	0.77	0.45

Note that generational projections beyond the base year (2010) are not reflected in the above mortality rates.

All General pre-retirement deaths are assumed to be non-service connected deaths. All Safety and Probation pre-retirement deaths are assumed to be service connected deaths.

Mortality Rates for Member Contributions:	• **General Members:** Pub-2010 General Healthy Retiree Amount-Weighted Mortality Tables (separate tables for males and females) with rates decreased by 5% for males and increased by 5% for females, projected 30 years (from 2010) with the two-dimensional mortality improvement scale MP-2021, weighted 30% male and 70% female.

• **Safety and Probation Members:** Pub-2010 Safety Healthy Retiree Amount-Weighted Mortality Tables (separate tables for males and females), projected 30 years (from 2010) with the two-dimensional mortality improvement scale MP-2021, weighted 80% male and 20% female.

Disability Incidence:

	Rate (%)		
Age	General	Safety	Probation
20	0.01	0.10	0.10
25	0.01	0.13	0.13
30	0.01	0.18	0.18
35	0.02	0.98	0.98
40	0.13	1.68	1.68
45	0.26	1.80	1.80
50	0.42	2.37	2.37
55	0.50	2.75	2.75
60	0.56	3.20	3.20
65	0.60	0.00	0.00

60% of General disabilities are assumed to be service connected disabilities. The other 40% are assumed to be non-service connected disabilities.

95% of Safety and Probation disabilities are assumed to be service connected disabilities. The other 5% are assumed to be non-service connected disabilities.

Termination:

	Rate (%)		
Years of Service	**General**	**Safety**	**Probation**
Less than 1	23.00	16.00	16.00
1 – 2	19.00	15.00	15.00
2 – 3	14.00	14.00	14.00
3 – 4	12.00	13.00	13.00
4 – 5	9.00	12.00	12.00
5 – 6	8.00	7.00	7.00
6 – 7	7.00	6.00	6.00
7 – 8	7.00	5.00	5.00
8 – 9	7.00	5.00	5.00
9 – 10	6.50	4.00	4.00
10 – 11	6.50	2.50	2.50
11 – 12	6.50	2.50	2.50
12 – 13	6.50	2.50	2.50
13 – 14	6.50	2.50	2.50
14 – 15	6.50	2.00	2.00
15 – 16	6.50	2.00	2.00
16 – 17	6.50	1.50	1.50
17 – 18	6.50	1.50	1.50
18 – 19	6.50	1.50	1.50
19 – 20	6.50	1.50	1.50
20 & Over	6.50	1.50	1.50

90% of all terminated members with less than 5 years of service are assumed to choose a refund of contributions. The other 10% are assumed to choose a deferred vested benefit.

20% of all terminated members with 5 or more years of service are assumed to choose a refund of contributions. The other 80% are assumed to choose a deferred vested benefit.

No termination is assumed after a member is eligible for retirement (as long as a retirement rate is present).

Retirement Rates:

	Rate (%)		
	General Tiers 1, 2, & 3		
Age	**Less than 30 Years of Service**	**30 or More Years of Service**	**General Tier 4**
50	5.00	5.00	0.00
51	5.00	5.00	0.00
52	5.00	5.00	6.00
53	5.00	5.00	3.00
54	5.00	5.00	3.00
55	5.00	5.00	5.00
56	5.00	5.00	5.00
57	10.00	15.00	6.00
58	10.00	15.00	6.00
59	10.00	15.00	6.00
60	12.00	25.00	6.00
61	14.00	25.00	10.00
62	22.00	35.00	12.00
63	20.00	25.00	14.00
64	20.00	25.00	12.00
65	40.00	45.00	30.00
66	40.00	45.00	30.00
67	40.00	45.00	30.00
68	40.00	45.00	30.00
69	40.00	45.00	30.00
70	50.00	50.00	50.00
71	50.00	50.00	50.00
72	50.00	50.00	50.00
73	50.00	50.00	50.00
74	50.00	50.00	50.00
75	100.00	100.00	100.00

The retirement rates only apply to members who are eligible to retire at the age shown.

	Rate (%)				
	Safety Tiers 1 & 2				
Age	**Less than 25 Years of Service**	**25 or More Years of Service**	**Safety Tier 3**	**Probation Tiers 1 & 2**	**Probation Tier 3**
50	6.00	15.00	3.00	5.00	4.00
51	6.00	15.00	3.00	5.00	4.00
52	6.00	15.00	3.00	5.00	4.00
53	8.00	20.00	3.00	5.00	4.00
54	12.00	30.00	4.00	5.00	4.00
55	15.00	35.00	6.00	20.00	12.00
56	20.00	45.00	12.00	20.00	21.00
57	25.00	45.00	15.00	20.00	21.00
58	30.00	45.00	18.00	20.00	21.00
59	40.00	45.00	40.00	20.00	21.00
60	50.00	50.00	50.00	50.00	50.00
61	50.00	50.00	50.00	50.00	50.00
62	50.00	50.00	50.00	50.00	50.00
63	50.00	50.00	50.00	50.00	50.00
64	50.00	50.00	50.00	50.00	50.00
65	100.00	100.00	100.00	100.00	100.00

The retirement rates only apply to members who are eligible to retire at the age shown.

Retirement Age and Benefit for Deferred Vested Members:

For current and future deferred vested members, retirement age assumptions are as follows:

- General Retirement Age: 61
- Safety and Probation Retirement Age: 54

Deferred vested members who terminate with less than five years of service and are not vested are assumed to retire at age 70 if they decide to leave their contributions on deposit.

65% of future deferred vested members are assumed to continue to work for a reciprocal employer. For reciprocals, 4.00% compensation increases are assumed per annum.

Future Benefit Accruals:

1.0 year of service per year of employment, plus 0.017 years of additional service to anticipate conversion of unused sick leave for each year of employment, for members expected to retire directly from active employment and to receive a service retirement benefit.

Unknown Data for Members:

Same as those exhibited by members with similar known characteristics. If not specified, members are assumed to be male.

Inclusion of Deferred Vested Members:

All deferred vested members are included in the valuation.

Form of Payment:

All active and inactive members are assumed to elect the unmodified option at retirement.

Percent Married:

For all active and inactive members, 70% of male members and 50% of female members are assumed to be married at pre-retirement death or retirement.

Age and Gender of Spouse:

For all active and inactive members, male members are assumed to have a female spouse who is 2 years younger than the member and female members are assumed to have a male spouse who is 2 years older than the member.