



Mendocino County Employees'
Retirement Association

Actuarial Experience Study

**Analysis of Actuarial Experience
During the Period**

July 1, 2016 through June 30, 2019

June 11, 2020

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, 2020 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. This study utilizes the census data for the period July 1, 2016 to June 30, 2019 and provides the proposed actuarial assumptions, both economic and demographic, to be used in the June 30, 2020 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,

A handwritten signature in black ink, appearing to read "Paul Angelo", written over a horizontal line.

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

A handwritten signature in black ink, appearing to read "Andy Yeung", written over a horizontal line.

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

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I. 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, it is impossible to determine when and to what extent the economy will rebound after the current crisis caused by the COVID-19 pandemic.¹ Changing assumptions reflects a basic change in thinking about the future, and it 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, 2016 through June 30, 2019. The study was performed in accordance with Actuarial Standard of Practice (ASOP) No. 27 "Selection of Economic Assumptions for Measuring Pension Obligations" 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, percentage of deferred vested members expected to be covered by a reciprocal employer, percentage of members with an eligible spouse or domestic partner, pre-retirement mortality, healthy life post-retirement mortality, disabled life post-retirement mortality,

¹ An analysis of the ongoing impact of the COVID-19 pandemic is beyond the scope of the current experience study.

beneficiary mortality, termination, disability incidence (service and non-service connected), and unused sick leave.

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 3.00% to 2.75% per annum as discussed in Section (III)(A).
14	Investment Return: The estimated average 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 current investment return assumption from 7.00% to 6.75% per annum as discussed in Section (III)(B).
21	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: <ul style="list-style-type: none"> • Inflationary salary increases • Real “across the board” salary increases • Merit and promotion increases 	<p>Reduce the current inflationary salary increase assumption from 3.00% to 2.75% 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 3.50% to 3.25%.</p> <p>We recommend adjusting the merit and promotion rates of salary increase as developed in Section (III)(C) to reflect past experience. Future merit and promotional salary increases are higher in most service categories under the proposed assumptions.</p> <p>The recommended salary increases anticipate higher salary increases overall for General, Safety, and Probation members.</p>
26	Retirement Rates: The probability of retirement at each age at which participants are eligible to retire. Other Retirement Related Assumptions including: <ul style="list-style-type: none"> • Retirement age for deferred vested members • Future reciprocal members and reciprocal salary increases • Percent married and spousal age differences for members not yet retired 	<p>For active members, adjust the current retirement rates to those developed in Section (IV)(A). Overall, the recommended assumptions will anticipate (1) slightly later retirements overall for active members in General Tiers 1, 2, and 3, and (2) slightly earlier retirements overall for active Safety and Probation members. No adjustments have been made to the General Tier 4 rates.</p> <p>For deferred vested members, maintain the assumed retirement age at 60 for General members, and decrease the assumed retirement age for Safety and Probation members from age 55 to age 54.</p> <p>Increase the current assumption for percent of future deferred vested members expected to be covered by a reciprocal employer from 60% to 65%. Increase the reciprocal pay increase assumption from 4.00% to 4.25%.</p> <p>For active and deferred vested members, reduce the percent married at retirement assumption from 75% to 70% for males and maintain the assumption at 50% for females. Maintain the assumed spousal age difference at 2 years (females are assumed to be younger than their male spouses).</p>

Pg #	Actuarial Assumption Categories	Recommendation
34	Mortality Rates: The probability of dying at each age. Mortality rates are used to project life expectancies.	<p><u>For pre-retirement mortality:</u></p> <p>Current base tables: Headcount-Weighted RP-2014 Employee Mortality Tables, set back one year for males and set forward one year for females.</p> <p>Recommended base tables for General members: Pub-2010 General Employee Amount-Weighted Mortality Tables.</p> <p>Recommended base tables for Safety and Probation members: Pub-2010 Safety Employee Amount-Weighted Mortality Tables.</p> <p><u>For healthy retirees:</u></p> <p>Current base tables: Headcount-Weighted RP-2014 Healthy Annuitant Mortality Tables, set back one year for males and set forward one year for females.</p> <p>Recommended base tables for General members: Pub-2010 General Healthy Retiree Amount-Weighted Mortality Tables with rates decreased by 5% for males and increased by 5% for females.</p> <p>Recommended base tables for Safety and Probation members: Pub-2010 Safety Healthy Retiree Amount-Weighted Mortality Tables.</p> <p><u>For all beneficiaries:</u></p> <p>Current base tables: Headcount-Weighted RP-2014 Healthy Annuitant Mortality Tables, set back one year for males and set forward one year for females.</p> <p>Recommended base tables: Pub-2010 Contingent Survivor Amount-Weighted Mortality Tables with rates increased by 5%.</p> <p><u>For disabled retirees:</u></p> <p>Current base tables: Headcount-Weighted RP-2014 Healthy Annuitant Mortality Tables, set forward four years for males and set forward six years for females.</p> <p>Recommended base tables for General members: Pub-2010 Non-Safety Disabled Retiree Amount-Weighted Mortality Tables with rates decreased by 5%.</p> <p>Recommended base tables for Safety and Probation members: Pub-2010 Safety Disabled Retiree Amount-Weighted Mortality Tables.</p> <p><u>All</u> current tables are projected 20 years with the two-dimensional mortality improvement scale MP-2016.</p> <p><u>All</u> recommended tables are projected generationally with the two-dimensional projection scale MP-2019.</p> <p>For member contribution rates, optional forms and reserves, change the mortality rates to those developed in Section (IV)(B).</p>
43		
48	Termination Rates: The probability of leaving employment at each age or service category and receiving either a refund of member contributions or a deferred vested retirement benefit.	<p>Adjust the current termination rates to those developed in Section (IV)(D). The recommended assumptions will anticipate slightly more terminations at some service/age categories and will anticipate slightly fewer terminations at other service/age categories. Maintain the percentage of terminated members assumed to choose a refund of contributions or a deferred vested benefit.</p>

Pg #	Actuarial Assumption Categories	Recommendation
53	Disability Incidence Rates: The probability of becoming disabled at each age.	Adjust the current disability rates to those developed in Section (IV)(E). The recommended assumptions will anticipate slightly fewer disability retirements for General members and more disability retirements for Safety and Probation members. Increase the percentage of disabilities assumed to be service-connected (vs. nonservice-connected) from 35% to 50% for General members, and decrease the percentage from 95% to 90% for Safety and Probation members.
56	Unused Sick Leave: Unused sick leave hours can be converted into service credit at retirement.	Reduce the assumption to anticipate years of sick leave conversion at service retirement for each year of employment from 0.018 to 0.017.
56	Vacation Cash Outs: Vacation cash outs during employment and final salary averaging period.	Continue to work with the employer to collect such data to determine whether an assumption should be included in the actuarial valuation to anticipate conversion of relatively higher amounts of vacation cash outs immediately before retirement.

We have estimated the impact of all the recommended economic and demographic assumptions as if they were applied to the June 30, 2019 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 inflation and investment return assumption changes (as recommended in Section III of this report) and all other recommended demographic assumption changes (the remaining economic assumptions recommended in Section III as well as the demographic changes recommended in Section IV of this report).

Cost Impact of the Recommended Assumptions Based on June 30, 2019 Actuarial Valuation

Impact on Employer Contribution Rates	
Increase due to inflation & investment return assumptions	0.15%
Increase due to all other assumptions	<u>2.33%</u>
Total increase in average employer rate	2.48%
Total estimated increase in annual dollar amount (\$000s)	\$1,827*
Impact on Member Contribution Rates	
Increase due to inflation & investment return assumptions	0.11%
Increase due to all other assumptions	<u>0.84%</u>
Total increase in average member rate	0.95%
Total estimated increase in annual dollar amount (\$000s)	\$692*
Impact on UAAL and Funded Percentage	
Change in UAAL	Increase of \$13 million
Change in Funded Percentage	From 70.6% to 69.4%

* Based on June 30, 2019 projected annual compensation.

Of the various economic assumption changes, the most significant cost impact is from the change in the investment return assumption from 7.00% to 6.75%. However, that increase in cost from the investment return assumption is almost entirely offset by the decrease in cost from the change in the inflation assumption from 3.00% to 2.75%. Of the various demographic assumption changes, about half of the cost impact is from the change in the merit and promotional salary increase assumption and the other half is from the change in the mortality assumption.

Section II 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 III for the economic assumptions and Section IV for the demographic assumptions. The cost impact of the proposed changes is detailed in Section V.

II. 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.

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 members and drives increases in the allowances of retired members.
- **Investment Return:** Expected long-term rate of return on the Association’s investments after investment 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 III.

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 terminated during the year, we would say the probability of termination in that age group is $50 \div 500$ 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, say, the age 20-24 category, but very few decrements (actual deaths); therefore, we would not be able to rely heavily on the probability of death 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.

III. 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 an analysis of 15 and 30 year moving averages of historical inflation rates:

Historical Consumer Price Index – 1930 to 2019²
(U.S. City Average - All Urban Consumers)

	25 th Percentile	Median	75 th Percentile
15-year moving averages	2.4%	3.3%	4.4%
30-year moving averages	2.9%	3.7%	4.8%

The average inflation rates have continued to decline gradually over the last several years due to the relatively low inflationary period over the past two decades. Also, the later 15-year averages during the period are lower as they do not include the high inflation years of the mid-1970s and early 1980s.

Based on information found in the Public Plans Data website, which is produced in partnership with the National Association of State Retirement Administrators (NASRA), the median inflation assumption used by 174 large public retirement funds in their 2018 fiscal year valuations was 2.65%.³ In California, CalSTRS and fourteen other 1937 Act CERL systems use an inflation assumption of 2.75%, two 1937 Act CERL systems use an inflation assumption of 2.50%, while MCERA and three other 1937 Act CERL systems currently use an inflation assumption of 3.00%. CalPERS has lowered their inflation assumption from 2.75% to 2.50% over a three-year period.

MCERA's investment consultant, Callan, anticipates an annual inflation rate of 2.25%, while the average inflation assumption provided by Callan and six other investment advisory firms retained by Segal's California public sector clients was 2.33%. 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.⁴

² Source: Bureau of Labor Statistics – Based on CPI for All Items in U.S. city average, all urban consumers, not seasonally adjusted (Series ID: CUUR0000SA0).

³ Among 188 large public retirement funds, the inflation assumption was not available for 14 of the public retirement funds in the survey data.

⁴ The time horizon used by the seven investment consultants in our review generally ranges from 10 years to 30 years, and Callan uses a 10-year horizon.

To find a forecast of inflation based on a longer time horizon, we referred to the Social Security Administration's (SSA) 2020 report on the financial status of the Social Security program.⁵ 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%. This 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.⁶ As of April 2020, the difference in yields is about 1.39% which provides a measure of market expectations of inflation.

Based on all of the above information, we recommend that the current 3.00% annual inflation assumption be reduced to 2.75% for the June 30, 2020 actuarial valuation.

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 these metrics, since 2018 we have been recommending the same 2.75% inflation assumption in our experience for our California based public retirement system clients. We will continue to review this assumption in future experience studies.

Retiree Cost-of-Living Increases

In our last experience study as of June 30, 2016, consistent with the 3.00% annual inflation assumption adopted by the Board, the Board adopted a 3.00% retiree cost-of-living adjustment (COLA) for the non-CalPEPRA tiers.⁷ Note that no COLAs are provided for members in General Tier 4, Safety Tier 3, and Probation Tier 3.

We recommend that the current retiree cost-of-living assumption of 3.00% per year be reduced to 2.75% in the June 30, 2020 valuation for General Tiers 1, 2, and 3, Safety Tiers 1 and 2, and Probation Tiers 1 and 2.⁸

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 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 a lower long-term COLA assumption based on a stochastic analysis would mean that an actuarial loss would occur even when the inflation assumption of 2.75% is met in a year. We question the reasonableness of this result.

⁵ Source: Social Security Administration: The 2020 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds

⁶ Source: Board of Governors of the Federal Reserve Association.

⁷ The non-CalPEPRA tiers are General Tiers 1, 2, and 3, Safety Tiers 1 and 2, and Probation Tiers 1 and 2

⁸ For current retirees and beneficiaries in the non-CalPEPRA tiers, we would utilize the accumulated COLA banks to value annual 3.00% COLA increases as long as the COLA banks are available.

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 long-term annual inflation assumption, as we have 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 investment expenses and risk.

Real Rate of Investment Return

This component represents the portfolio's incremental investment market returns over inflation. Theory has it that as an investor takes a greater investment risk, the return on the investment is expected to also be greater, at least in the long run. This additional 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 Association's portfolio will vary with the Board's asset allocation among asset classes.

The following is the Association's current target asset allocation and the assumed real rate of return assumptions by asset class. The first column of real rate of return assumptions are determined by reducing Callan's total or "nominal" 2020 return assumptions by their assumed 2.25% inflation rate. The second column of returns (except for Global ex-US Equity and 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 six other investment advisory firms retained by Segal's public sector clients. We believe these averages are a reasonable forecast of long-term future market returns in excess of inflation.

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 Real Rate of Return ⁹	Average Assumed Real Rate of Return from a Sample of Consultants to Segal's California Public Sector Clients ¹⁰
Large Cap U.S. Equity	24.7% ¹¹	6.28% ¹²	5.49%
Small Cap U.S. Equity	12.3% ¹¹	6.28% ¹²	6.10%
Global ex-US Equity	25.0%	6.84%	6.84% ¹³
Domestic Fixed Income	21.0%	0.55%	1.09%
Real Estate	11.0%	4.80%	4.59%
Infrastructure	6.0%	5.30%	5.30% ¹⁴
Total	100.0%	5.00%	4.87%

⁹ Derived by reducing Callan's nominal rate of return assumptions by their assumed 2.25% inflation rate.

¹⁰ These are based on the projected arithmetic returns provided by Callan and six other investment advisory firms serving Mendocino and 16 other city and county retirement systems in California. These return assumptions are gross of any applicable investment expenses.

¹¹ "Broad US equity" represents 37% of the target allocation. We understand that the domestic equity target breakdown is about 2/3 for US large cap equities and 1/3 for US small/mid cap equities.

¹² Note that MCERA's target allocation for domestic equity is based on the "Broad US Equity" asset class, and, accordingly, we have displayed Callan's real rate of return assumption for that asset class here. The averages shown in the next column represent the averages of the US large cap equity and US small cap equity, respectively, for the six other investment advisory firms, and the broad US equity for MCERA.

¹³ For this asset class, Callan's assumption is applied in lieu of the average because the global equity asset class for the other investment advisory firms includes investments from the United States, whereas the Global ex-US Equity asset class for MCERA specifically excludes US investments.

¹⁴ 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 3.6.3.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 has reason to believe, based on relevant supporting data, that such superior or inferior returns represent a reasonable expectation over the long term.”

The following are some observations about the returns provided above:

1. The investment consultants to our California public sector clients 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 much shorter than the durations of a retirement plan’s liabilities.
2. Using a sample average of expected 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.
3. Therefore, we recommend that the 4.87% portfolio real rate of return be used to determine the Association’s investment return assumption. This is 0.01% lower than the return that was used three years ago in the review of the recommended investment return assumption for the June 30, 2017 valuation. The difference is due to changes in asset allocation (a 0.02% decrease) and the real rate of return assumptions provided to us by the investment advisory firms (a 0.01% increase).

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.

The following table provides the administrative and investment expenses in relation to the Market Value of Assets for each of the six years ending June 30, 2019.

Administrative and Investment Expenses as a Percentage of Market Value of Assets (Dollars in 000's)

Year Ending June 30	Market Value of Assets ¹⁵	Investment Expenses	Administrative Expenses	Investment %	Administrative %	Total %
2014	\$383,197	\$503	\$ 930	0.13%	0.24%	0.37%
2015	442,308	565	1,059	0.13	0.24	0.37
2016	444,217	490	1,142	0.11	0.26	0.37
Three-Year Average (2014-2016)				0.12	0.25	0.37
2017	426,338	618	1,086	0.14	0.25	0.39
2018	484,027	925	1,142	0.19	0.24	0.43
2019	520,430	906	1,233	0.17	0.24	0.41
Three-Year Average (2017-2019)				0.17	0.24	0.41
Six-Year Average (2014-2019)				0.15	0.25	0.40
Current Assumption				0.15	0.25	0.40
Proposed Assumption				0.15	0.25	0.40

Based on this experience, we have maintained the future expense assumption component at 0.40%.

Note related to investment expenses paid to active managers – As cited above, under Section 3.6.3.d of ASOP No. 27, the effect of an active investment management strategy should be considered “net of investment expenses” when determining whether “the actuary has reason to believe, based on relevant supporting data, that such superior or inferior returns represent a reasonable expectation over the long term.”

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 now, we will continue to use the current methodology that any “alpha” that may be identified would be treated as an increase in the risk adjustment and corresponding confidence level. For example, 0.25% of alpha would increase the confidence level by 3% (see discussions that follow on definitions of risk adjustment and confidence level).

Risk Adjustment

The real rate of return assumption for the portfolio is adjusted to reflect the potential risk of shortfalls in the return assumptions. The Association’s asset allocation determines this portfolio

¹⁵ As of beginning of plan year.

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.¹⁶ This is consistent with our experience that retirement plan fiduciaries would generally prefer that returns exceed the assumed rate more often than not.

The 4.87% expected real rate of return developed earlier in this report was based on expected mean or average arithmetic returns. In our model, the confidence level associated with a particular risk adjustment represents the relative likelihood that future investment earnings would equal or exceed the assumed earnings over a 15-year period on an expected value basis.¹⁷ 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. Note that, based on the investment return assumptions recently adopted by systems that have been analyzed under this model, we observe a confidence level generally in the range of 50% to 55%.

Three years ago, the Board adopted an investment return assumption of 7.00%. That return implied a risk adjustment of 0.48%, reflecting a confidence level of 55% that the actual average return over 15 years would not fall below the assumed return, assuming that the distribution of returns over that period follows the normal statistical distribution.¹⁸

If we use the same 55% confidence level from our last study to set this year’s risk adjustment, based on the current long-term portfolio standard deviation of 13.0% provided by Callan, the corresponding risk adjustment would be 0.45%. Together with the other investment return components, this would result in an investment return assumption of 6.77%, which is lower than the current assumption of 7.00%.

Based on the general practice of using one-quarter percentage point increments for economic assumptions, we evaluated the effect on the confidence level of alternative investment return assumptions. In particular, a net investment return assumption of 6.75%, together with the other investment return components, would produce a risk adjustment of 0.47%, which corresponds to a confidence level of 55%. We believe this analysis supports reducing the current assumption from 7.00% to 6.75%.

¹⁶ This type of risk adjustment is referred to in the Actuarial Standards of Practice as a “margin for adverse deviation.”

¹⁷ 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.

¹⁸ Based on an annual portfolio return standard deviation of 14.10% provided by Callan in 2017. Strictly speaking, future compounded long-term investment returns will tend to follow a log-normal distribution. However, we believe the normal distribution assumption is reasonable for purposes of setting this type of risk adjustment.

The table below shows MCERA's investment return assumptions and, for the years when this analysis was performed, the risk adjustments and corresponding confidence levels compared to the values for prior studies.

Year Ending June 30	Investment Return	Risk Adjustment	Corresponding Confidence Level
2011	7.75%	0.32%	54%
2014	7.25%	0.30%	53%
2017	7.00%	0.48%	55%
2020 (Recommended)	6.75%	0.47%	55%

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 the Association has positioned itself relative to risk over periods of time.¹⁹ The use of a 55% confidence level associated with the recommended 6.75% assumption under Segal's model 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.
- 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 of the portfolio and so is itself based on assumptions about future portfolio volatility and can be considered somewhat of a "soft" number.
- A confidence level of 55% is within (and at the top end of) the range of about 50% to 55% that corresponds to the risk adjustments used by most of Segal's other California public retirement Association clients.
- 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".

Taking into account the factors above, our recommendation is to reduce the net investment return assumption from 7.00% to 6.75%. As noted above, this return implies a 0.47% risk adjustment and reflects a confidence level of 55%.

¹⁹ 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."

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.

Calculation of Investment Return Assumption

Assumption Component	June 30, 2020 Recommended Value	June 30, 2017 Adopted Value
Inflation	2.75%	3.00%
Plus Portfolio Real Rate of Return	4.87%	4.88%
Minus Expense Adjustment	(0.40)%	(0.40)%
Minus Risk Adjustment	(0.47)%	(0.48)%
Total	6.75%	7.00%
Confidence Level	55%	55%

Based on this analysis, we recommend that the investment return assumption be decreased from 7.00% to 6.75% per annum.

Comparison with Alternative Model used to Review Investment Return Assumption

Since our appointment as actuary for MCERA in 2011, 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.²⁰ 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 discussed setting investment return assumptions using an alternative “forward looking expected geometric returns” approach.²¹ Even though expected geometric returns are lower than expected arithmetic returns, those California public retirement systems that have set investment return assumptions using this alternative approach have in practice adopted investment return assumptions that are comparable to those adopted by the Board for MCERA. This is because under the model used by those retirement systems, their investment return assumptions are not reduced to anticipate future investment expenses.²²

For comparison, we evaluated the recommended 6.75% assumption based on the expected geometric return for the entire portfolio, and gross of the investment expenses. Under that

²⁰ Again, as discussed in the footnote to “Risk Adjustment”, 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.

²¹ 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.

²² This means that if the model were to be applied to MCERA, the expected geometric return would not be adjusted for the approximately 0.40% administrative and investment expenses paid by MCERA.

model, over a 15-year period, there is a 56% likelihood that future average geometric returns will meet or exceed 6.75%.²³

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 7.00% or lower is becoming more common among California public sector retirement systems. In particular, of the twenty 1937 Act CERL systems (including MCERA), twelve use a 7.00% investment return assumption, one uses 6.75%, and one uses 6.50%. The remaining six 1937 Act CERL systems currently use a 7.25% earnings assumption. Furthermore, both CalPERS and CalSTRS currently use a 7.00% earnings assumption, while the San Jose and San Diego City retirement systems use investment return assumptions of 6.75% and 6.50%, respectively.

The following table compares MCERA's recommended net investment return assumption against those of the 188 large public retirement funds in their 2018 fiscal year valuations based on information found in the Public Plans Data website, which is produced in partnership with NASRA:²⁴

		Public Plans Data ²⁵		
Assumption	MCERA	Low	Median	High
Net Investment Return	6.75%	4.50%	7.25%	8.00%

The detailed survey results show that more than 80% of the systems have an investment return assumption in the range of 6.75% to 7.50%. Also, about one-third of the systems have reduced their investment return assumption during the year. State systems outside of California tend to change their economic assumptions less frequently and so may lag behind emerging practices in this area.

In summary, we believe that both the risk adjustment model and other considerations indicate a lower earnings assumption. The recommended assumption of 6.75% provides for a risk margin within the risk adjustment model and is consistent with MCERA's current practice relative to other public systems.

²³ We performed this stochastic simulation using the capital market assumptions included in the 2019 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 2019 survey that included responses from 34 investment advisors.

²⁴ Among 188 large public retirement funds, the investment return assumption was not available for 6 of the public retirement funds in the survey data.

²⁵ Public Plans Data website – Produced in partnership with the National Association of State Retirement Administrators (NASRA)

C. Salary Increase

Salary increases impact plan costs in two ways: (i) by increasing members' benefits (since benefits are a function of the members' highest average pay) and future normal cost collections; and (ii) by increasing total active member payroll which in turn generates lower UAAL contribution rates. 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 are recommending that the assumed rate of inflation be reduced from 3.00% to 2.75% per annum. 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 0.4% – 0.7% 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 April 2020. In that report, real "across the board" pay increases are forecast to be 1.1% 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, 2019 was 4.31% for General, Safety, and Probation members combined, which is higher than the change in CPI of 2.90% during that same period:

Valuation Date	Actual Average Increase ²⁶	Actual Change in CPI ²⁷
June 30, 2017	1.84%	2.50%
June 30, 2018	5.35%	3.14%
June 30, 2019	5.73%	3.06%
Three Year Average	4.31%	2.90%

²⁶ 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.

²⁷ Based on the change in the December CPI for the Western Region compared to the prior year.

Considering these factors, 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 3.50% to 3.25%.

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 increases.

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 3.25% 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 into an average result, it provides a more reasonable representation of potential future merit and promotion salary increases over the long term.

The following table shows the General members’ actual average merit and promotion increases by years of service over the current three-year period from July 1, 2016 through June 30, 2019 and the prior three-year period from July 1, 2013 through June 30, 2016. The current and proposed assumptions are also shown. The actual increases over the current and the prior three-year periods 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 of 4.27% and 0.89%, respectively, on average.

It should be noted when reviewing the proposed assumptions that even though we have effectively doubled the ultimate assumption for the “10 & Over” service category, the actual increases from the current and prior experience study periods were still higher than the proposed assumption. We would continue to monitor the actual experience and report back to the Board at the next experience study on whether a larger increase may be warranted.

General Members Merit and Promotion Increase Rates (%)				
Years of Service	Current Assumptions	Actual Average Increase From Current 3-Year Period	Actual Average Increase From Prior 3-Year Period	Proposed Assumption
0 – 1	5.00	5.46	8.89	5.00
1 – 2	3.75	6.21	6.94	4.50
2 – 3	3.50	4.87	6.19	4.00
3 – 4	2.75	4.16	7.75	3.25
4 – 5	2.25	3.61	6.40	2.75
5 – 6	1.75	2.62	4.57	2.25
6 – 7	1.50	3.50	3.96	2.00
7 – 8	1.25	2.43	2.63	1.75
8 – 9	1.00	1.83	3.67	1.25
9 – 10	0.75	3.22	3.04	1.00
10 & Over	0.50	2.13	2.35	1.00

The following table shows the Safety and Probation members' actual average merit and promotion increases by years of service over the current three-year period from July 1, 2016 through June 30, 2019 and the prior three-year period from July 1, 2013 through June 30, 2016. The current and proposed assumptions are also shown. The actual increases over the current and the prior three-year periods 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 of 4.68% and 2.55%, respectively, on average).

Safety and Probation Members Merit and Promotion Increase Rates (%)				
Years of Service	Current Assumptions	Actual Average Increase From Current 3-Year Period	Actual Average Increase From Prior 3-Year Period	Proposed Assumption
0 – 1	5.00	5.64	6.87	5.00
1 – 2	3.75	4.73	5.11	4.25
2 – 3	3.00	4.49	5.78	3.75
3 – 4	2.25	4.38	5.88	3.25
4 – 5	1.00	2.48	3.33	2.50
5 – 6	0.75	5.48	2.89	2.00
6 – 7	0.75	3.56	0.15	1.75
7 – 8	0.75	0.24	2.03	1.25
8 – 9	0.75	0.67	1.62	1.00
9 – 10	0.75	3.39	3.08	1.00
10 & Over	0.50	2.95	0.96	1.00

Similar to the comment made for General members, we would continue to monitor the actual experience for the Safety and Probation members and report back to the Board at the next experience study on whether a larger increase may be warranted. Chart 1 compares actual

experience with the current and proposed rates of actual merit and promotion increases for General members. Chart 2 compares actual experience with the current and proposed rates of actual merit and promotion increases for Safety and Probation members.

Based on this experience, we are proposing changes in the merit and promotion salary increases for both General and Safety and Probation members, with increases in most service categories. Overall, merit and promotion salary increases are assumed to be higher even after taking into account a 0.25% offset due to the lower combined inflation plus “across the board” increase assumptions.

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 member’s future benefits.

We recommend that the active member payroll increase assumption be decreased from 3.50% to 3.25% annually, consistent with the combined inflation plus real “across the board” salary increase assumptions.

Chart 1: Merit and Promotion Salary Increase Rates
General Members

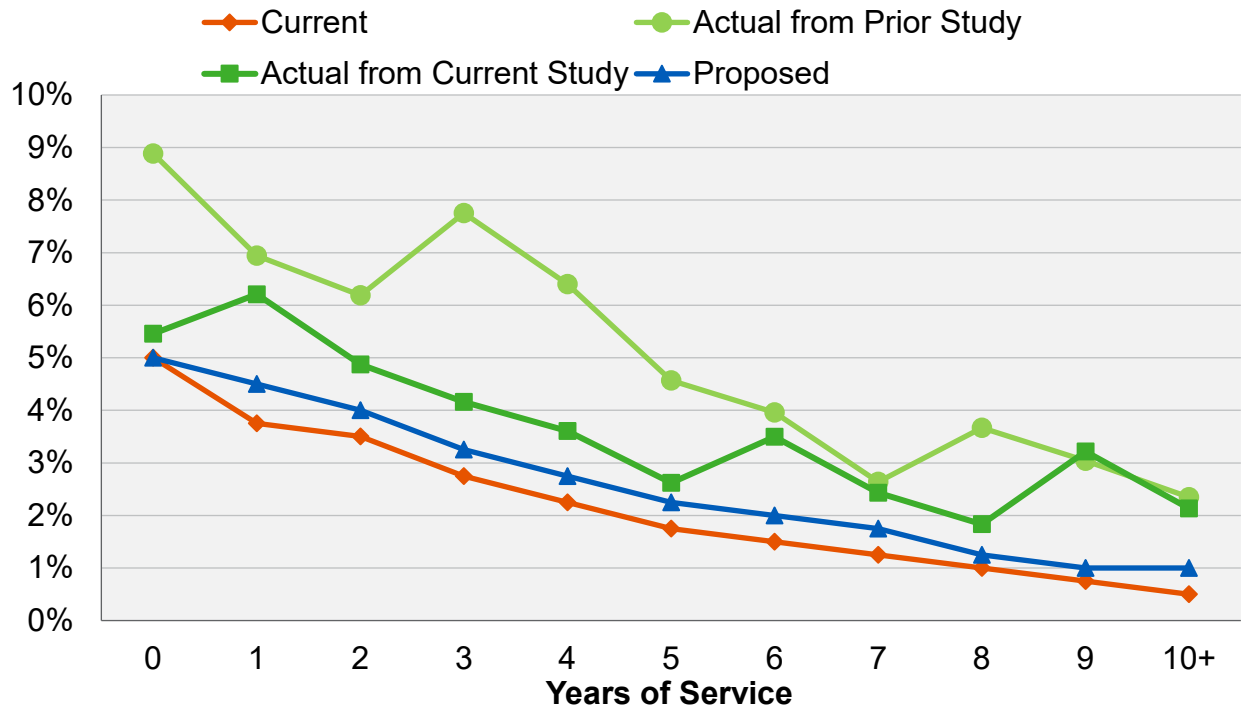
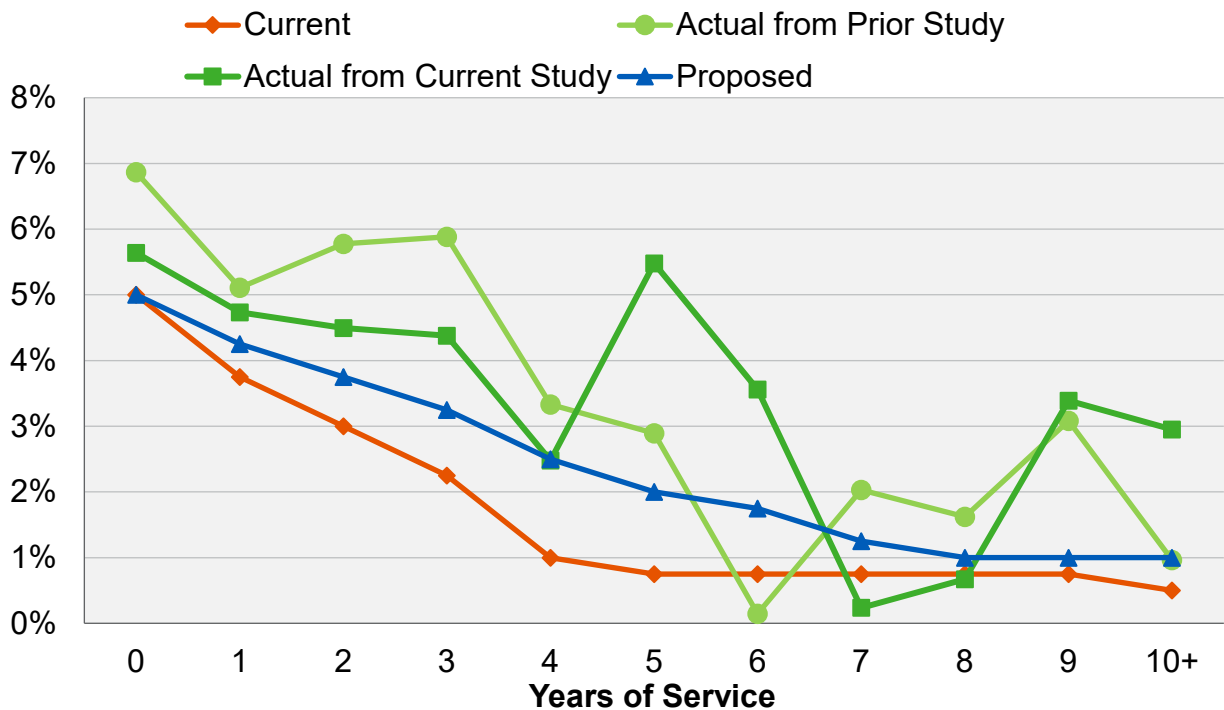


Chart 2: Merit and Promotion Salary Increase Rates
Safety and Probation Members



IV. 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. Our review concludes that the retirement rates correlate better with age than with years of service. We will continue to monitor retirement rates as a function of years of service in future experience studies.

The tables on the following pages show the observed service retirement rates for General, Safety, and Probation members, respectively, based on the actual experience over the past three years. The observed 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 II. Also shown are the current rates assumed and the rates we propose.

General Tiers 1, 2, and 3

Age	Rate of Retirement (%)		
	Current Rate	Actual Rate	Proposed Rate
50	6.00	9.68	5.00
51	6.00	2.63	5.00
52	6.00	0.00	5.00
53	6.00	2.08	5.00
54	6.00	2.17	5.00
55	11.00	6.98	10.00
56	11.00	6.82	10.00
57	11.00	6.98	10.00
58	11.00	9.30	10.00
59	11.00	11.11	10.00
60	12.00	10.87	12.00
61	16.00	13.95	15.00
62	30.00	15.38	25.00
63	20.00	28.95	20.00
64	20.00	15.00	20.00
65	45.00	40.63	45.00
66	45.00	65.52	45.00
67	45.00	47.37	45.00
68	45.00	37.50	45.00
69	45.00	25.00	45.00
70 & Over	100.00	26.32	100.00

As shown above, we are recommending slight decreases in the retirement rates from ages 50 to 62 for General Tier 1, 2, and 3 members.

General Tier 4

For General Tier 4, we do not have credible experience from the past three years to propose new retirement rates. No adjustments have been made to the rates for General Tier 4. We will continue to monitor the retirement experience for General Tier 4 members in future experience studies.

Safety Tiers 1 and 2

Age	Rate of Retirement (%)		
	Current Rate	Actual Rate	Proposed Rate
50	8.00	7.14	8.00
51	8.00	8.33	8.00
52	8.00	0.00	8.00
53	8.00	7.69	8.00
54	8.00	9.09	8.00
55	9.00	37.50	10.00
56	9.00	0.00	15.00
57	10.00	0.00	20.00
58	20.00	100.00	25.00
59	30.00	33.33	30.00
60 & Over	100.00	18.75	100.00

As shown above, we are recommending increases in retirement rates for Safety Tier 1 and 2 members at ages 55 to 58.

Probation Tiers 1 and 2

Age	Rate of Retirement (%)		
	Current Rate	Actual Rate	Proposed Rate
50	5.00	0.00	5.00
51	5.00	50.00	5.00
52	5.00	0.00	5.00
53	5.00	0.00	5.00
54	5.00	0.00	5.00
55	20.00	100.00	23.00
56	20.00	0.00	23.00
57	20.00	0.00	23.00
58	20.00	25.00	23.00
59	20.00	50.00	23.00
60 & Over	100.00	57.14	100.00

As shown above, we are recommending increases in retirement rates for Probation Tier 1 and 2 members at ages 55 to 59.

Chart 3 compares actual experience with the current and proposed rates of retirement for General Tier 1, 2, and 3 members. Chart 4 shows the same information for Safety Tier 1 and 2 members. Chart 5 shows the same information for Probation Tier 1 and 2 members.

Safety and Probation Tier 3

Age	Rate of Retirement (%)			
	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	3.00	4.00	4.00
55	4.00	4.00	11.00	13.00
56	6.00	10.00	21.00	24.00
57	7.00	12.00	21.00	24.00
58	9.00	15.00	21.00	24.00
59	30.00	30.00	21.00	24.00
60 & Over	100.00	100.00	100.00	100.00

For Safety and Probation Tier 3, we do not have credible experience from the past three years to propose new retirement rates. However, we are recommending increasing some of the rates at the higher retirement ages currently used for those tiers, consistent with the increasing 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 the retirement rates to reflect the lower benefits provided by Tier 3) when the new tiers were first established.

Chart 6 shows the current and proposed rates of retirement for Safety Tier 3 members. Chart 7 shows the same information for Probation Tier 3 members.

Deferred Vested Members

In prior valuations, deferred vested General members were assumed to retire at age 60 and Safety and Probation members were assumed to retire at age 55. The average ages at retirement over the prior three years were 60.8 for General and 51.9 for Safety and Probation.

We recommend maintaining the General deferred vested retirement age assumption at age 60, and decreasing the Safety deferred vested retirement age assumption from age 55 to age 54.

Reciprocity

Under the current assumptions, it was assumed that 60% of future deferred vested members would 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, 2019, the proportion of deferred vested members entitled to future benefits who are covered under a reciprocal retirement system is about 72%.

We recommend increasing the reciprocity assumption from 60% to 65%. Consistent with our recommended salary increase assumption, we recommend increasing the reciprocal pay increase assumption from 4.00% to 4.25%.

It should be noted that as part of this experience study, we discussed with the Association the feasibility of conducting a survey of the actual salaries earned by the reciprocal members at their new employers after they left employment with an employer at MCERA. Even though it was concluded that such a survey could not be completed in time for this study, the Association may want to include such a survey in the next few years before the next study. The results of that survey will provide actual data on whether reciprocal members have earned salaries higher/lower than our assumptions once they worked outside the County.

Survivor Continuance under Unmodified Option

In prior valuations, it was assumed that 75% 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 entitled to the automatic continuance benefit when they select the unmodified option upon retirement. We reviewed experience for new retirees during the three-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 and Selected Unmodified Option		
Year Ending June 30	Male	Female
2017	70%	49%
2018	59%	59%
2019	71%	38%
Total	67%	47%

Based on the above, we recommend decreasing the percent married assumption from 75% to 70% for male members and maintaining the percent married assumption at 50% for female members.

Since the 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 current three-year period and studies done for other retirement systems, we recommend the following:

1. Since almost all of the spouses are actually the opposite sex, we will continue to assume that for all active and inactive members, the survivor's sex is the opposite of the member.
2. The current and proposed assumptions for the age of the survivor for all active and inactive members are shown below. These assumptions will continue to be monitored in future experience studies.

	Member's Age as Compared to Spouse's Age	
	Male	Female
Current Assumption	2 years older	2 years younger
Actual MCERA Experience	2.7 years older	2.2 years younger
Proposed Assumption	2 years older	2 years younger

As shown above, we recommend maintaining the age difference for male members of 2 years older, and maintaining the age difference for female members of 2 years younger.

Chart 3: Retirement Rates
General Tiers 1, 2, and 3

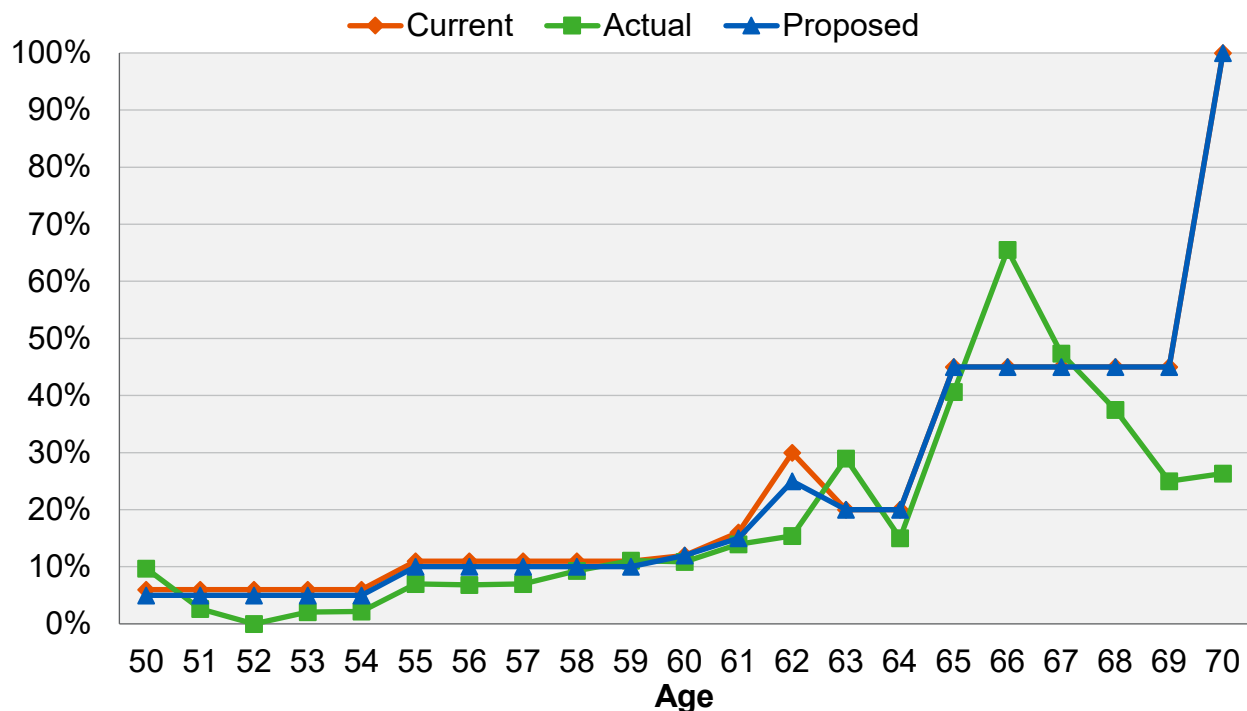


Chart 4: Retirement Rates
Safety Tiers 1 and 2

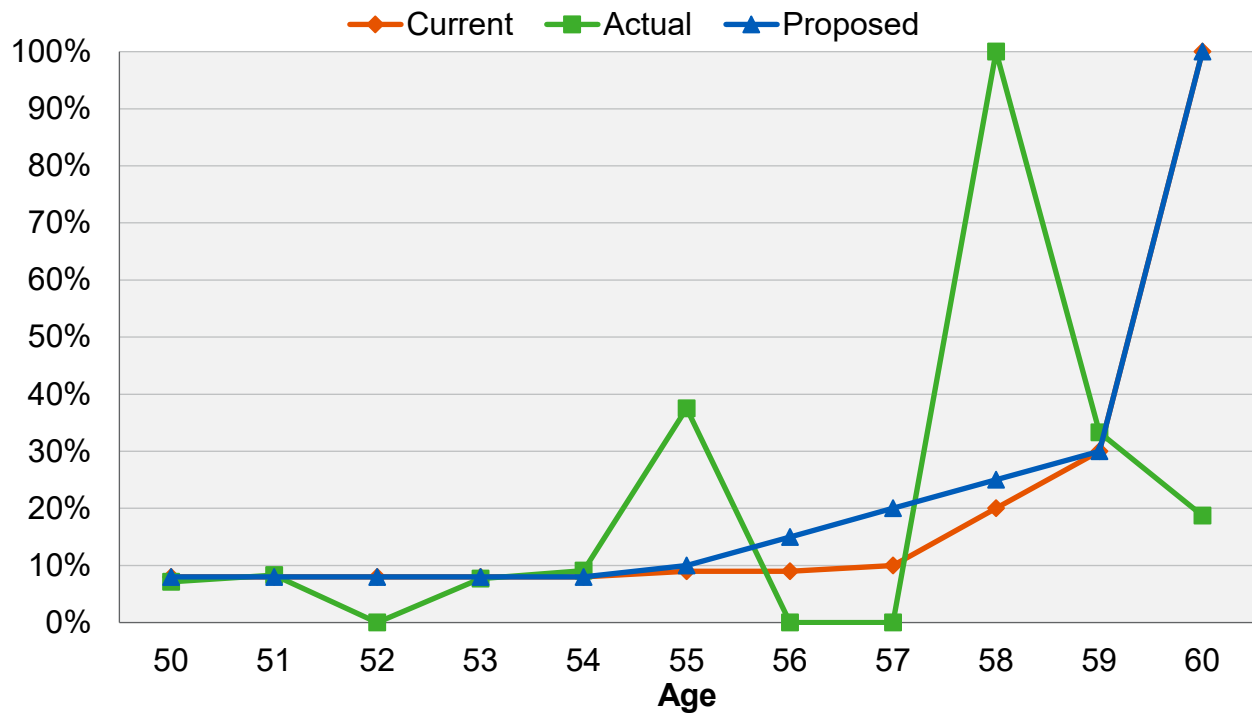


Chart 5: Retirement Rates
Probation Tiers 1 and 2

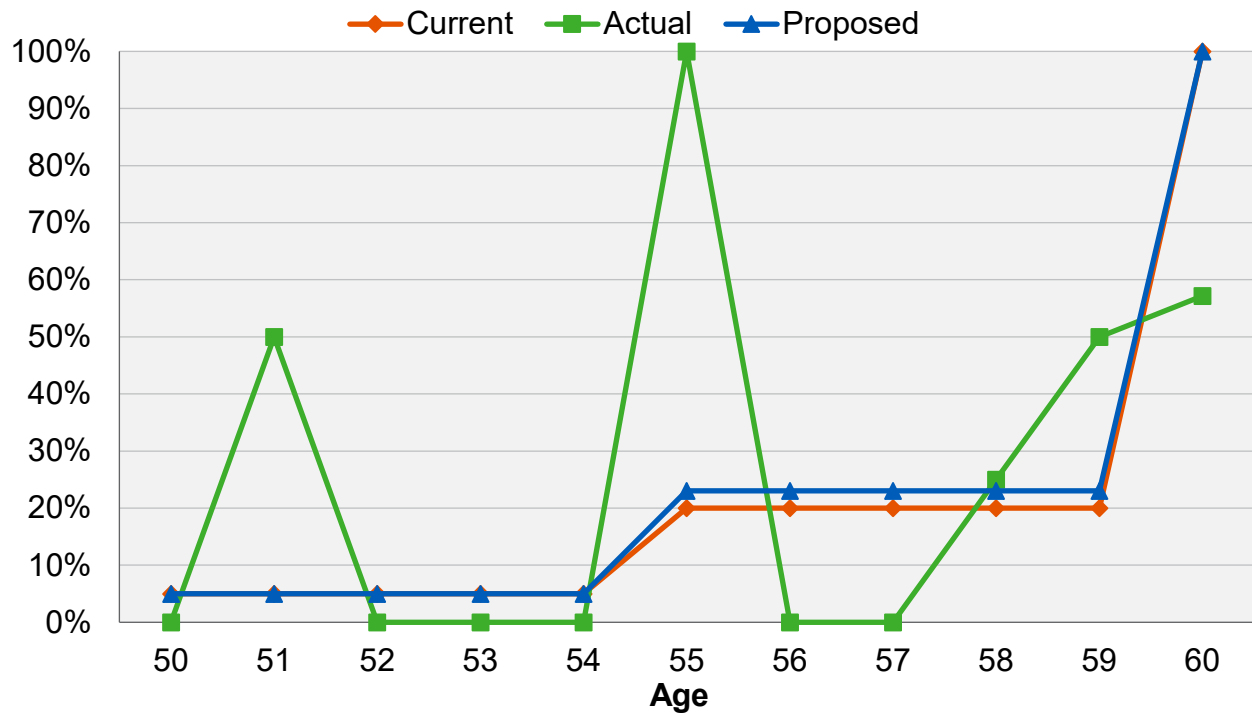


Chart 6: Retirement Rates
Safety Tier 3

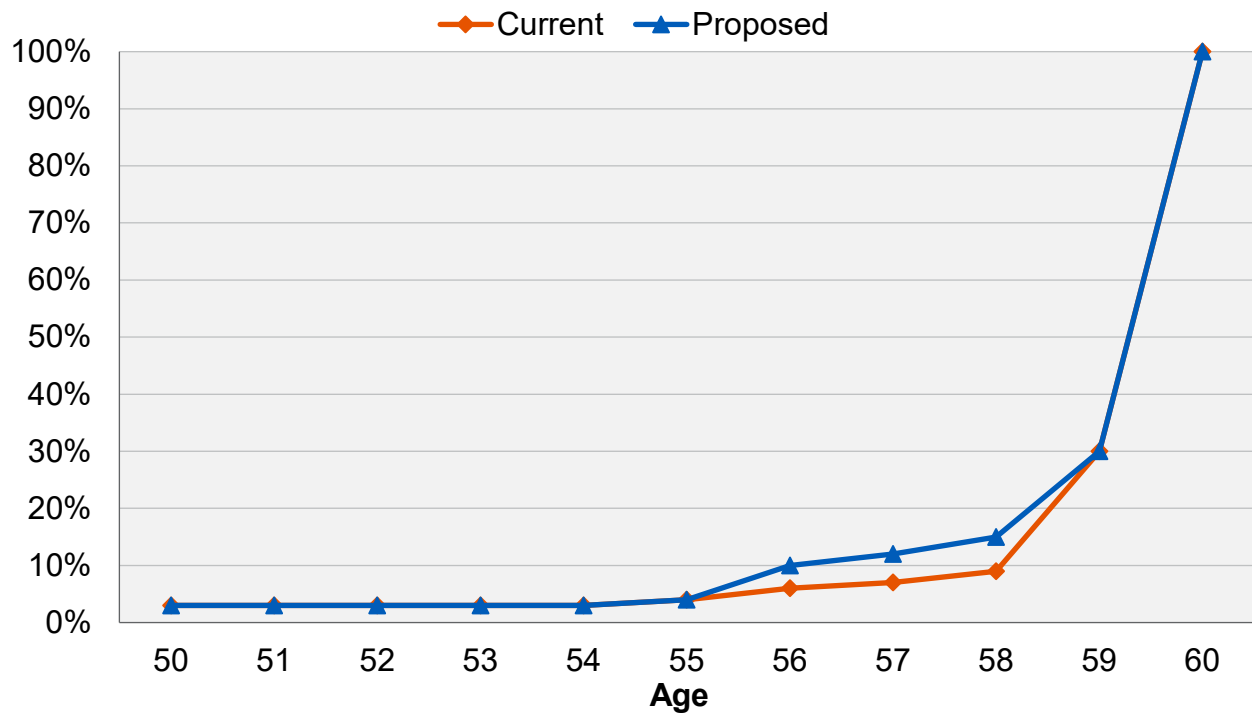
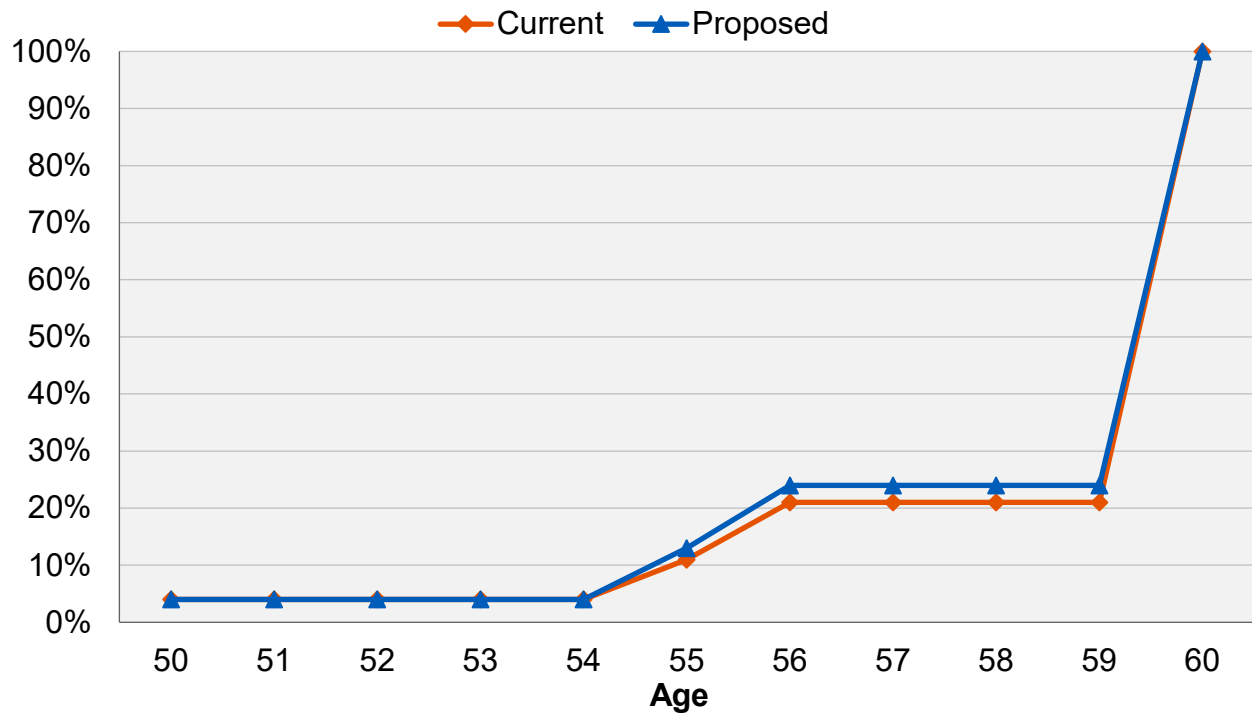


Chart 7: Retirement Rates
Probation Tier 3



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, Safety, and Probation members and beneficiaries, the tables currently being used for post-service retirement mortality rates are the Headcount-Weighted RP-2014 Healthy Annuitant Table (separate tables for males and females) projected 20 years using a “static” approach with the two-dimensional projection scale MP-2016, set back one year for males and set forward one year for females.

When we conducted the last experience study, we alerted the Board that we may recommend a switch from a Headcount-Weighted to a Benefit-Weighted table and from a “static” to a “generational” approach to anticipate mortality improvement, but only after the Society of Actuaries (SOA) provides mortality tables based on public sector experience comparable to the RP-2014 mortality tables developed using data collected from private and multi-employer pension plans.

The Retirement Plans Experience Committee (RPEC) of the SOA has recently published the Pub-2010 Public Retirement Plans Mortality Tables (Pub-2010). For the first time, the Pub-2010 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 amounts 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.

As the Pub-2010 study shows that benefit (or salary for employees) is a significant predictor of mortality difference, the Pub-2010 family of mortality tables also includes mortality rates based on population with above-median benefit amount (or salary for employees), below-median benefit amount (or salary for employees) and total population within each job category. The median benefit amounts used to determine the above-median and below-median mortality rates as shown in the Pub-2010 report for General and Safety are as follows:

	Median Amounts (\$) by Gender, Job Category, and Status			
	Males		Females	
	Employees	Retirees	Employees	Retirees
General	45,800	21,200	34,700	11,900
Safety	72,200	36,900	61,800	29,200

Note: Values shown as of 2010.

After we adjust the above amounts by a reasonable measure of U.S. price inflation from 2010 to 2019 for a total increase of around 30%, the benefit amounts (or salaries) paid to MCERA’s members were generally in a range around the adjusted median amounts shown above.

Therefore, we recommend that the base version of the mortality tables for each job category be used.

As for the mortality improvement scales, they can be applied in one of two ways. Historically, the more common application is to use a “static” approach to anticipate a fixed level of mortality improvement for all annuitants receiving benefits from a retirement plan. This is in contrast to a “generational” approach where each future year has its own mortality table that reflects the forecasted improvements, using the published improvement scales. While the static approach is still used by some of Segal’s California public system clients, as well as CalPERS, 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. This is in contrast to updating a static mortality assumption with each experience study as we have proposed in prior experience studies.

We understand that RPEC intends to publish annual updates to their mortality improvement scales. Improvement scale MP-2019 is the latest improvement scale available. We recommend that given the trend in the retirement industry to move towards generational mortality, it would be reasonable for the Board to adopt the Benefit-Weighted Pub-2010 mortality table (adjusted for MCERA experience), and project the mortality improvement generationally using the MP-2019 mortality improvement scale.

In the prior experience study, we recommended a single mortality table for all General, Safety, and Probation members and beneficiaries. However, the Pub-2010 tables have separate tables for General, Safety, and Contingent (survivor) groups, so we are therefore recommending separate tables for each group.

In order to use more MCERA experience in our analysis, we have used experience for an eight-year period by using data from the current (from July 1, 2016 through June 30, 2019) and the last two (from July 1, 2013 to June 30, 2016 and from July 1, 2011 to June 30, 2014) experience study periods in order to analyze this assumption.

Even with the use of eight years of experience, based on standard statistical theory the data is only partially credible especially under the recommended benefit-weighted basis when dispersion of retirees’ benefit amounts is taken into account. 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. In future experience studies, more data will be available which may further increase the credibility of the MCERA experience.

Pre-Retirement Mortality

For General, Safety and Probation members, the tables currently being used for pre-retirement mortality rates are the Headcount-Weighted RP-2014 Employee Mortality Tables (separate tables for males and females) projected 20 years with the two-dimensional mortality improvement scale MP-2016, set back one year for males and set forward one year for females.

For General members, we recommend changing the pre-retirement mortality to follow the 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.

For Safety and Probation members, we recommend changing the pre-retirement mortality to follow the 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.

Currently, our assumption is that 100% of General member pre-retirement deaths are non-service connected. For Safety and Probation members, 100% of pre-retirement deaths are assumed to be service connected deaths. Observed experience over the past eight 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, and each of the active Safety and Probation deaths reported by MCERA over this period have been classified as service connected.

For General members, we recommend maintaining the current assumption for pre-retirement mortality of 100% non-service connected.

For Safety and Probation members, we recommend maintaining the current assumption for pre-retirement mortality of 100% service connected.

Post-Retirement Mortality (Service Retirements)

Among all retired members, the actual deaths weighted by benefit amounts under the current assumptions for the last eight years are shown in the table below. We also show the deaths weighted by benefit amount under the proposed assumptions. In the prior study we set the mortality assumption using a static mortality projection so that actual deaths would be about 20% greater than those assumed. As noted above, we are recommending the use of a generational mortality table rather than a static mortality table. A generational mortality table 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.

Also, the proposed mortality table reflects current experience to the extent that the experience is credible based on standard statistical theory. For MCERA, the volume of Safety and Probation member data is much less than the General member data, which makes the Safety and Probation group substantially less credible. That is why the proposed mortality tables (as shown in the table below) after adjustments for partial credibility have actual to expected ratios of 102%

for General and 92% for Safety and Probation. In future years the ratio should remain around 102% for General and 92% for Safety and 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 eight years are as follows:

	General Members – Healthy (\$ in millions)			Safety and Probation Members – Healthy (\$ in millions)		
Gender	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths
Male	\$1.59	\$1.64	\$1.76	\$0.28	\$0.28	\$0.27
Female	\$1.29	\$1.45	\$1.26	\$0.04	\$0.00	\$0.04
Total	\$2.88	\$3.09	\$3.02	\$0.32	\$0.28	\$0.31
Actual / Expected	107%		102%	89%		92%

Notes: (1) Experience shown above is weighted by annual benefit amounts for deceased members instead of by headcounts.
(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 total due to rounding.

For General members, we recommend updating the current tables to the 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. The recommended mortality tables will have an actual to expected ratio of 102%.

For Safety and Probation members, we recommend updating the current tables to the 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. The recommended mortality tables will have an actual to expected ratio of 92%.

For this transitional year for informational purposes only, we have also provided in the table below the actual and expected deaths computed without weighting these by benefit amounts. This is similar to how actual and expected death ratios were developed based on the prior headcount approach.

	General Members – Healthy			Safety and Probation Members – Healthy		
Gender	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths
Male	66.2	72	73.2	8.7	12	9.0
Female	81.1	97	80.7	1.3	0	1.3
Total	147.3	169	153.9	10.1	12	10.2
Actual / Expected	115%		110%	119%		117%

Notes: (1) Experience shown above is weighted by headcounts for deceased members instead of by annual benefit amounts.
(2) The proposed expected deaths are based on the Pub-2010 Amount-Weighted Mortality Tables.
(3) Results may not total due to rounding.

Chart 8 compares actual to expected deaths on a benefit-weighted basis for General members under the current and proposed assumptions over the past eight years.

Chart 9 compares actual to expected deaths on a benefit-weighted basis for Safety and Probation members under the current and proposed assumptions over the past eight years.

Chart 10 compares actual to expected deaths on a headcount-weighted basis for General members under the current and proposed assumptions over the past eight years provided for informational purposes only.

Chart 11 compares actual to expected deaths on a headcount-weighted basis for Safety and Probation members under the current and proposed assumptions over the past eight years provided for informational purposes only.

Chart 12 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 2020. In practice, life expectancies will be assumed to increase based on applying the mortality improvement scale.

Chart 13 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.

Beneficiaries Mortality

In studying the mortality for all beneficiaries in our prior experience study, we reviewed the actual deaths compared to the expected deaths and recommended the same mortality tables for General and Safety healthy retirees and all beneficiaries. However, Pub-2010 has separate mortality tables for healthy retirees and contingent annuitants.

The Pub-2010 Contingent Survivors Table is developed only based 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.

For all beneficiaries, we recommend changing the mortality assumption to follow the Pub-2010 Contingent Survivor Amount-Weighted Mortality Table (separate tables for males and females) with rates increased by 5%, projected generationally with the two-dimensional mortality improvement scale MP-2019.

Mortality Table for Member Contributions, Optional Forms of Payment 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. For determining member contributions, 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 members, we recommend that the mortality table used for determining contributions for General members be updated to 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) with the two-dimensional mortality improvement scale MP-2019, weighted 30% male and 70% female. This is based on the proposed valuation mortality table for General members and the actual gender distribution of General members.

For Safety and Probation members, we recommend that the mortality table used for determining contributions for Safety and Probation members be updated to 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) with the two-dimensional mortality improvement scale MP-2019, weighted 80% male and 20% female. This is based on the proposed valuation mortality table for Safety and Probation members and the actual gender distribution of Safety and Probation members.

In prior experience studies, for determining optional forms of payment, our recommendation for mortality tables was based on the post-retirement mortality we recommended for service retirement and disability retirement projected with a static scale to anticipate future mortality improvement. However, given that our current recommendation for post-retirement mortality now includes a generational mortality improvement scale, there are some administrative issues that we may need to resolve with MCERA and its vendor maintaining the pension administration mortality improvement. We will provide a recommendation to MCERA for use in reflecting mortality improvement for determining optional forms of payment after we have those discussions with MCERA and its vendor.

Chart 8: Post-Retirement Benefit-Weighted Deaths (In Millions)
Healthy General Members (July 1, 2011 through June 30, 2019)

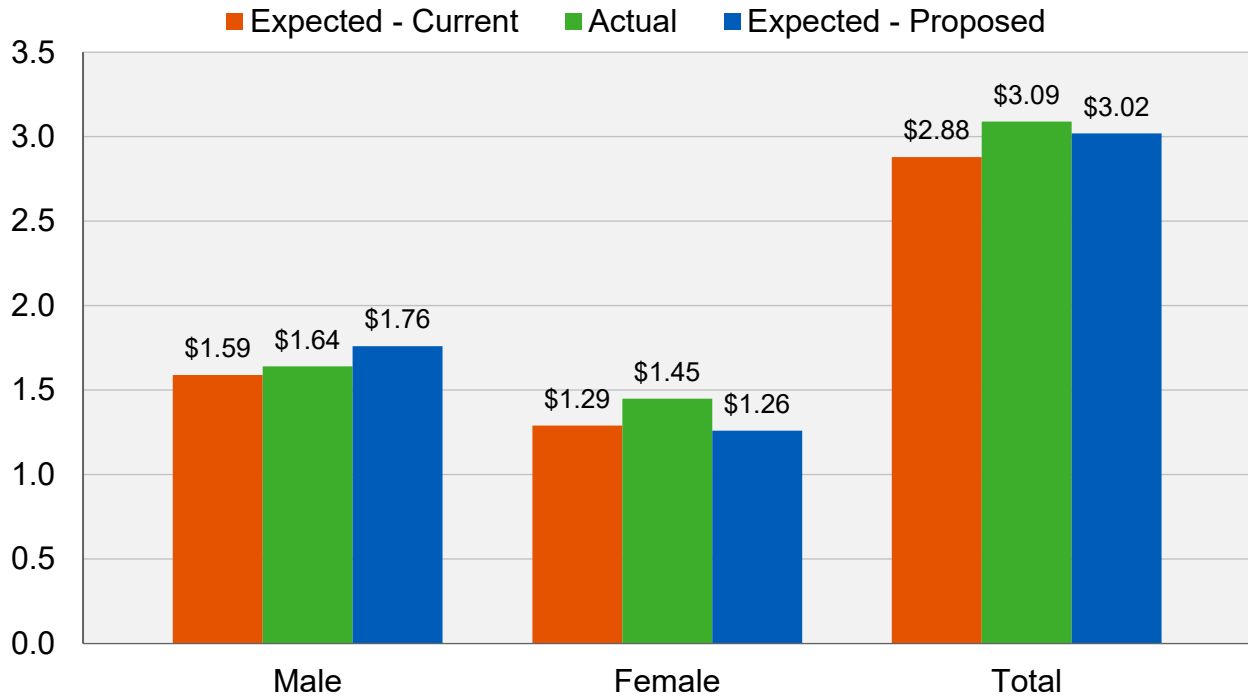


Chart 9: Post-Retirement Benefit-Weighted Deaths (In Millions)
Healthy Safety and Probation Members (July 1, 2011 through June 30, 2019)

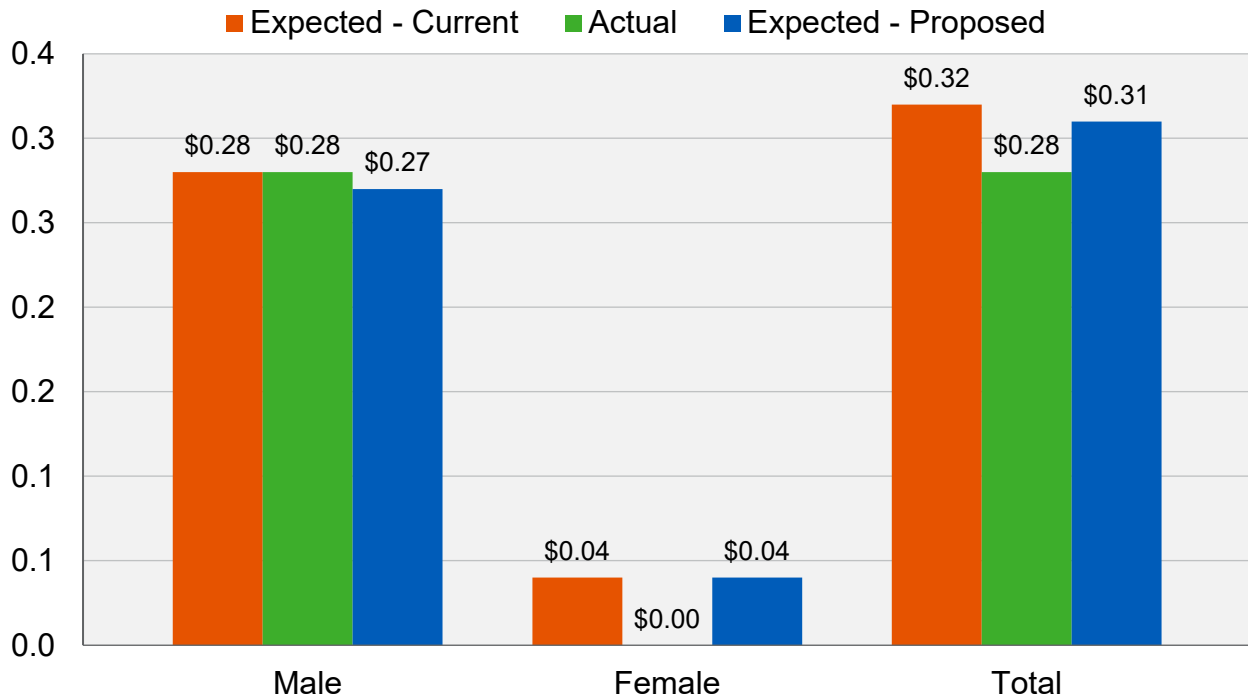


Chart 10: Post-Retirement Headcount-Weighted Deaths
 Healthy General Members (July 1, 2011 through June 30, 2019)
 Provided for Informational Purposes Only

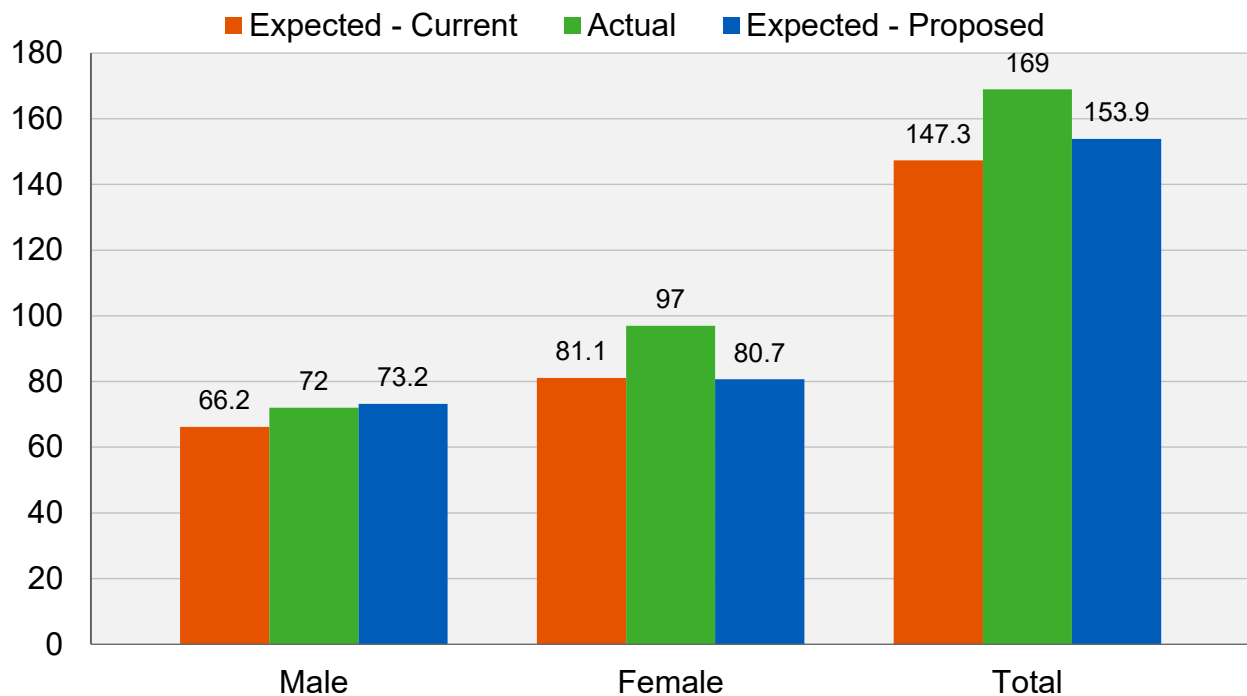


Chart 11: Post-Retirement Headcount-Weighted Deaths
 Healthy Safety and Probation Members (July 1, 2011 through June 30, 2019)
 Provided for Informational Purposes Only

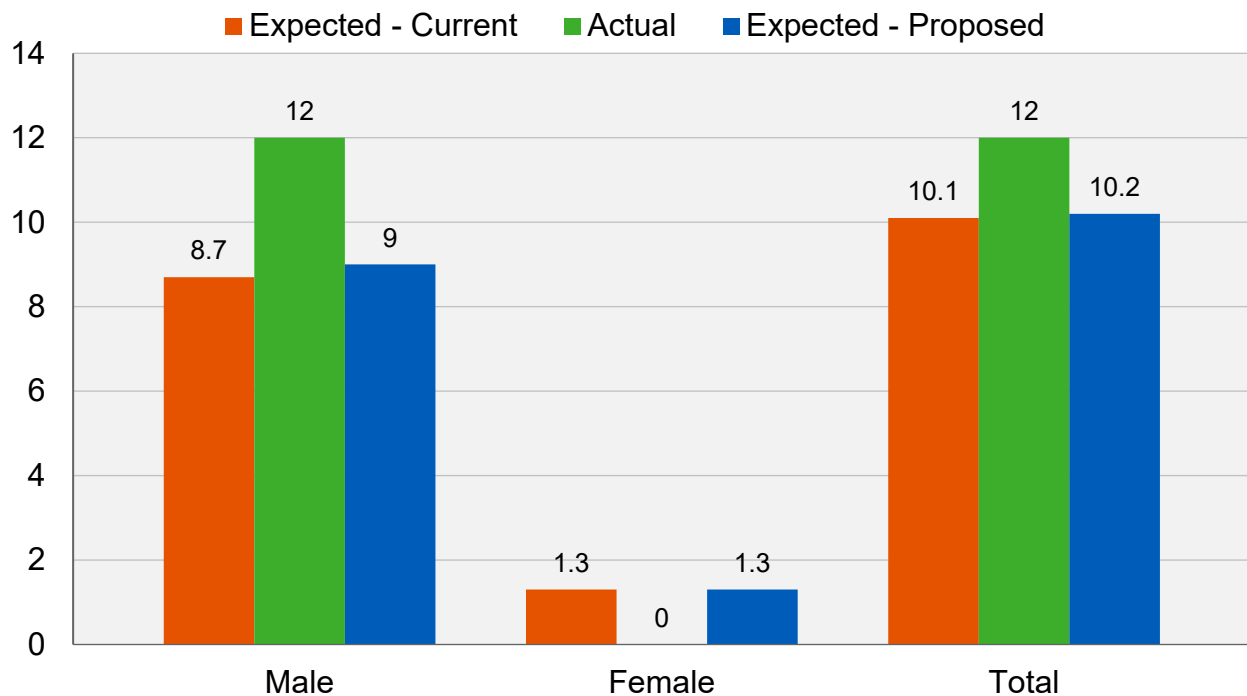


Chart 12: Benefit-Weighted Life Expectancies
Healthy General Members

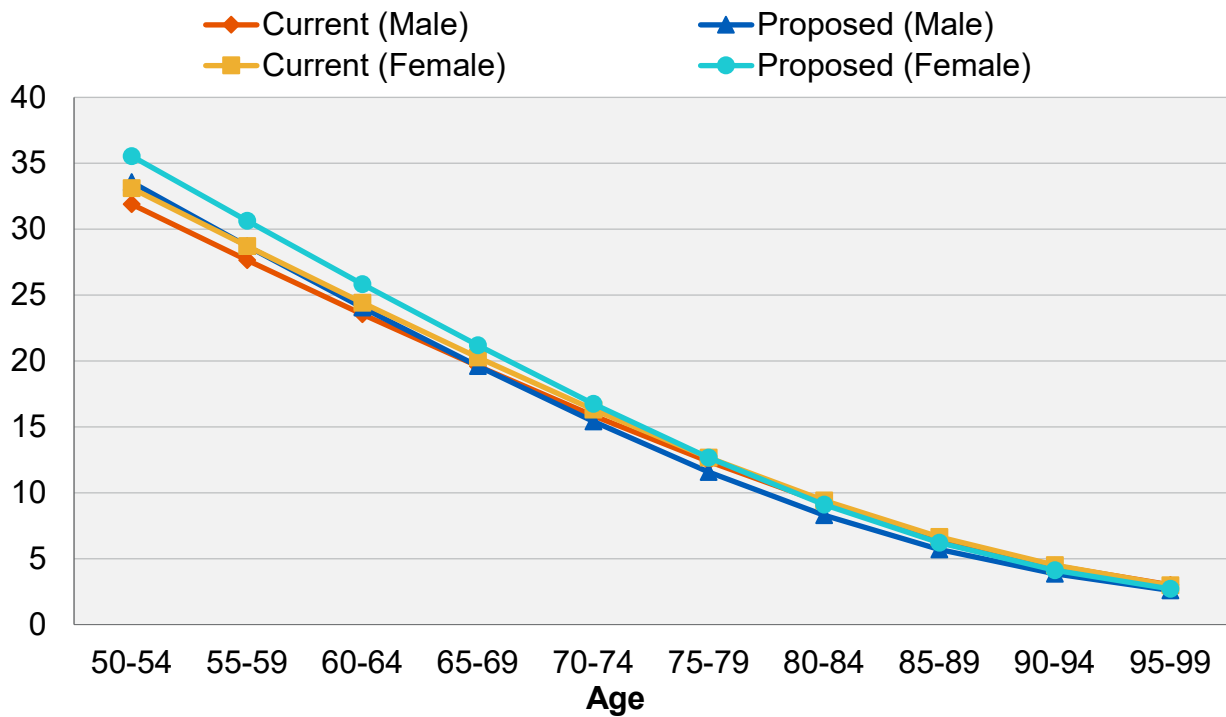
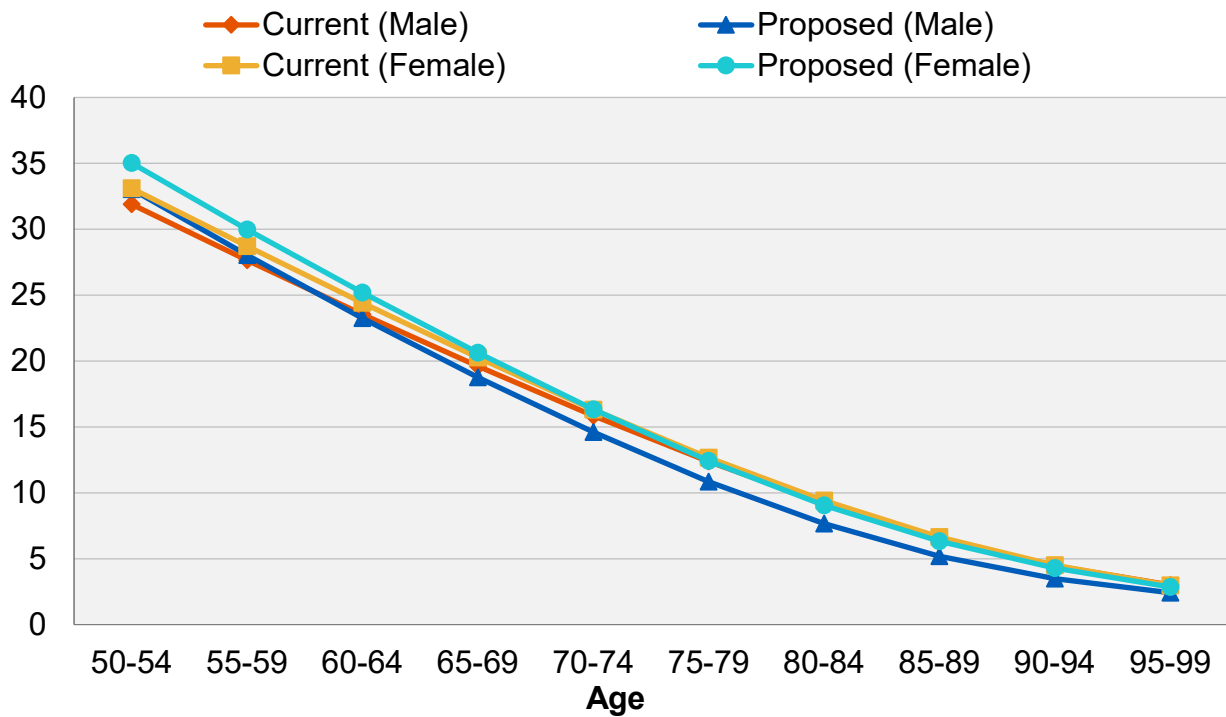


Chart 13: Life Expectancies
Healthy Safety and Probation Members



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, Safety, and Probation members, the table currently being used are the Headcount-Weighted RP-2014 Healthy Annuitant Tables (separate tables for males and females) projected 20 years using a “static” approach with the two-dimensional mortality improvement scale MP-2016, set forward four years for males and set forward six years for females.

The number of actual deaths compared to the number expected under the current and proposed assumptions weighted by benefit amounts for the last eight years are as follows:

	General Members – Disabled (\$ in millions)			Safety and Probation Members – Disabled (\$ in millions)		
Gender	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths
Male	\$0.26	\$0.25	\$0.34	\$0.41	\$0.25	\$0.34
Female	\$0.13	\$0.16	\$0.21	\$0.01	\$0.00	\$0.01
Total	\$0.39	\$0.41	\$0.55	\$0.42	\$0.25	\$0.35
Actual / Expected	106%		75%	60%		73%

Notes: (1) Experience shown above is weighted by annual benefit amounts for deceased members instead of by headcounts.
 (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 total due to rounding.

The Pub-2010 family of mortality tables provides separate disabled retiree mortality tables for Non-Safety disabled retirees and Safety disabled retirees.

For General disabled members, we recommend updating the current tables to the 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. The recommended mortality tables will have an actual to expected ratio of 75%.

For Safety and Probation disabled members, we recommend updating the current tables to the 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. The recommended mortality tables will have an actual to expected ratio of 73%.

For this transitional year for informational purposes only, we have also provided in the table below the actual and expected deaths computed without weighting these by benefit amounts. This is similar to how actual and expected death ratios were developed based on the prior headcount approach.

	General Members – Disabled			Safety and Probation Members – Disabled		
Gender	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths
Male	12.6	13	16.3	11.1	9	9.2
Female	7.0	11	11.3	0.9	1	0.7
Total	19.6	24	27.6	12.0	10	9.9
Actual / Expected	122%		87%	83%		101%

Notes: (1) Experience shown above is weighted by headcounts for deceased members instead of by annual benefit amounts.

(2) The proposed expected deaths are based on the Pub-2010 Amount-Weighted Mortality Tables.

(3) Results may not total due to rounding.

Chart 14 compares actual to expected deaths on a benefit-weighted basis for disabled General members under the current and proposed assumptions over the past eight years.

Chart 15 compares actual to expected deaths on a benefit-weighted basis for disabled Safety and Probation members under the current and proposed assumptions over the past eight years.

Chart 16 compares actual to expected deaths on a headcount-weighted basis for disabled General members under the current and proposed assumptions over the past eight years provided for informational purposes only.

Chart 17 compares actual to expected deaths on a headcount-weighted basis for disabled Safety and Probation members under the current and proposed assumptions over the past eight years provided for informational purposes only.

Chart 18 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 proposed generational mortality rates are based on age as of 2020. In practice, life expectancies will be assumed to increase based on applying the mortality improvement scale.

Chart 19 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.

Chart 14: Post-Retirement Benefit-Weighted Deaths (In Millions)
Disabled General Members (July 1, 2011 through June 30, 2019)

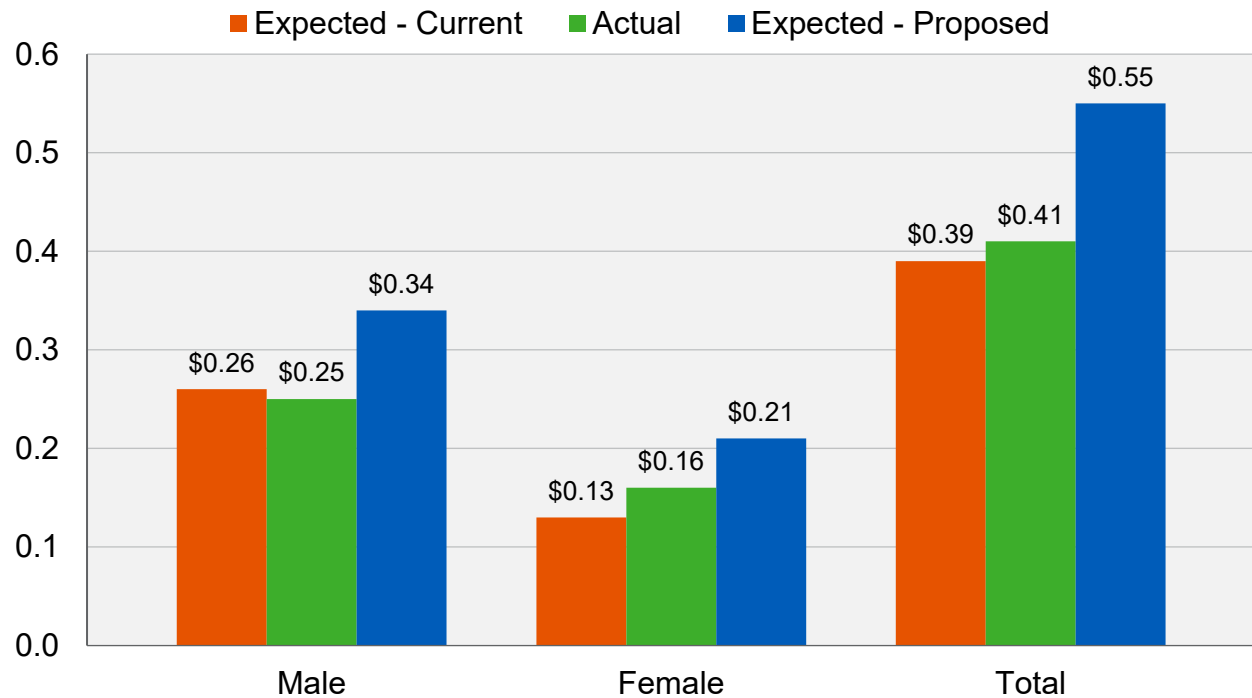


Chart 15: Post-Retirement Benefit-Weighted Deaths (In Millions)
Disabled Safety and Probation Members
(July 1, 2011 through June 30, 2019)

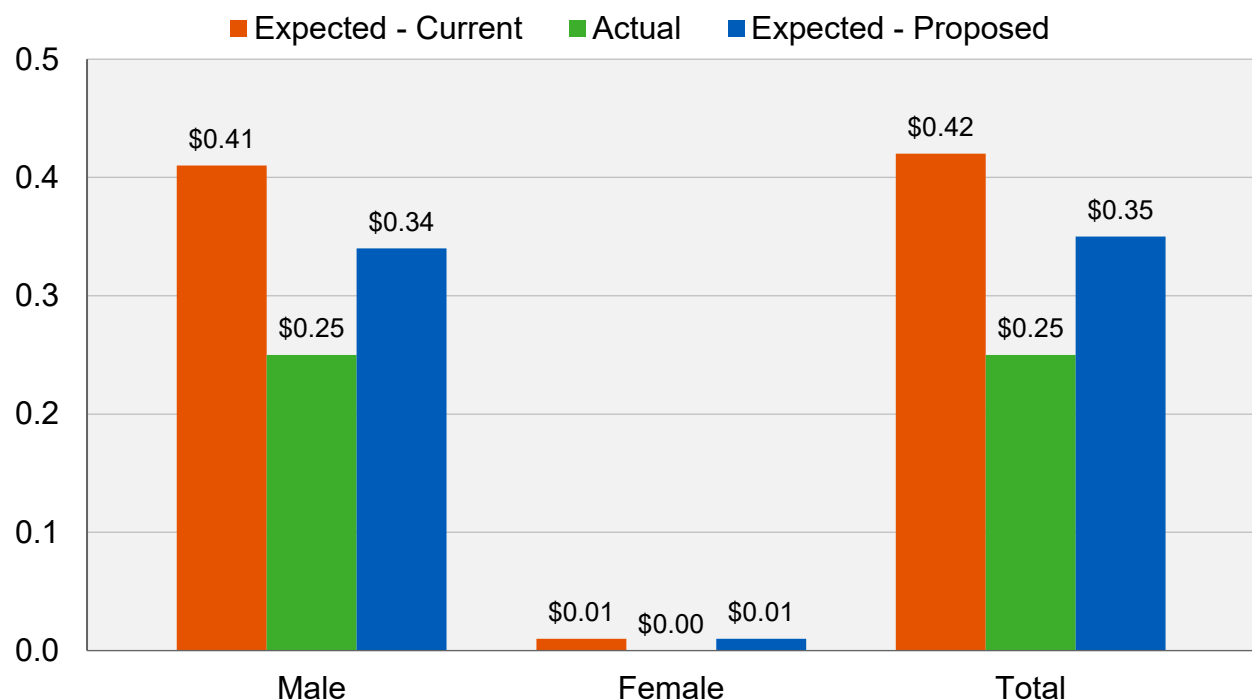


Chart 16: Post-Retirement Headcount-Weighted Deaths
Disabled General Members (July 1, 2011 through June 30, 2019)
Provided for Informational Purposes Only

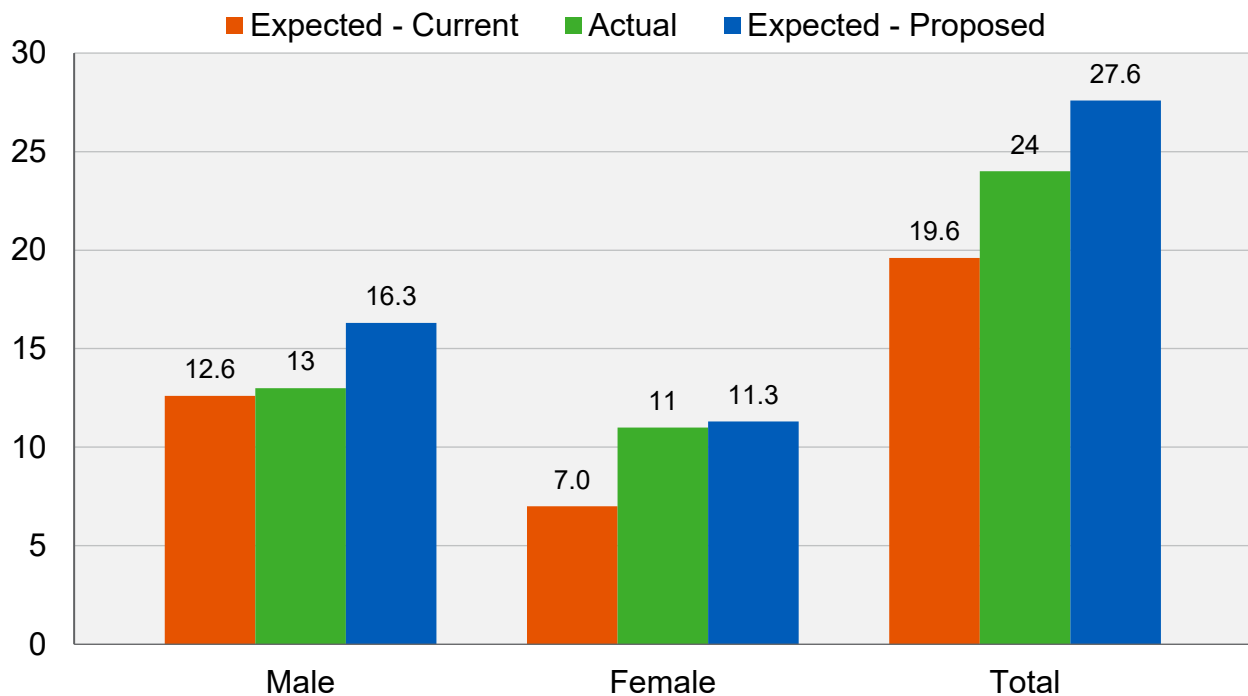


Chart 17: Post-Retirement Headcount-Weighted Deaths
Disabled Safety Members (July 1, 2011 through June 30, 2019)
Provided for Informational Purposes Only

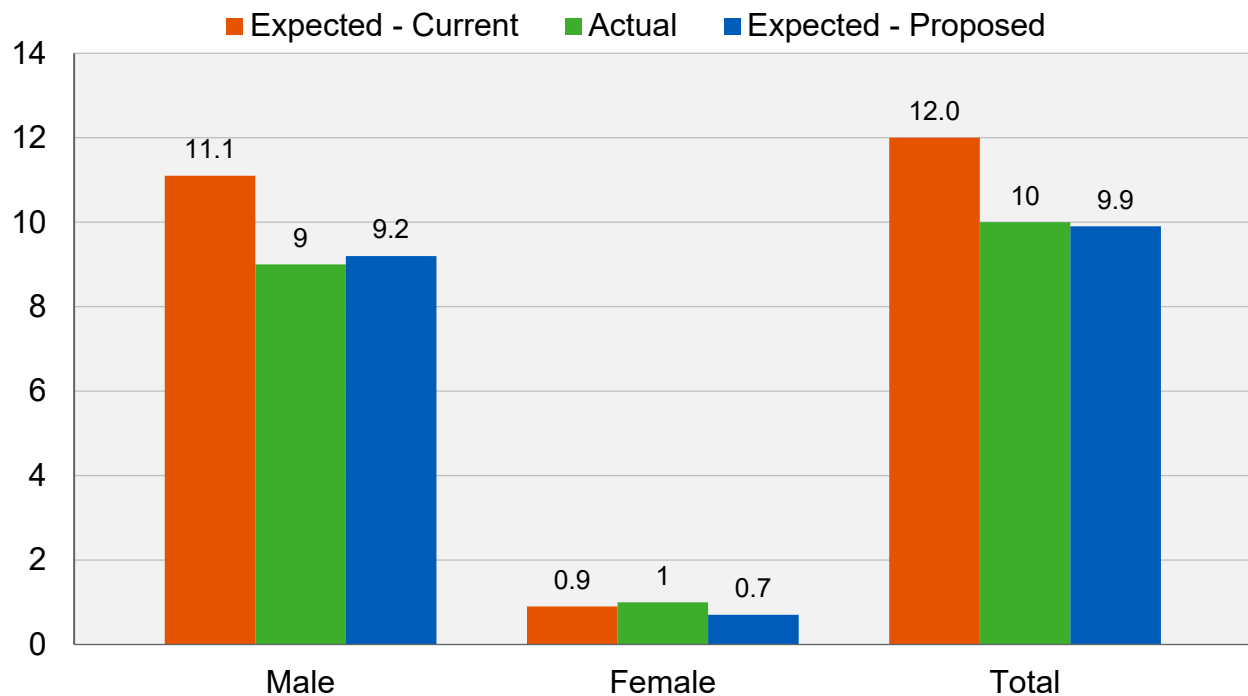


Chart 18: Benefit-Weighted Life Expectancies
Disabled General Members

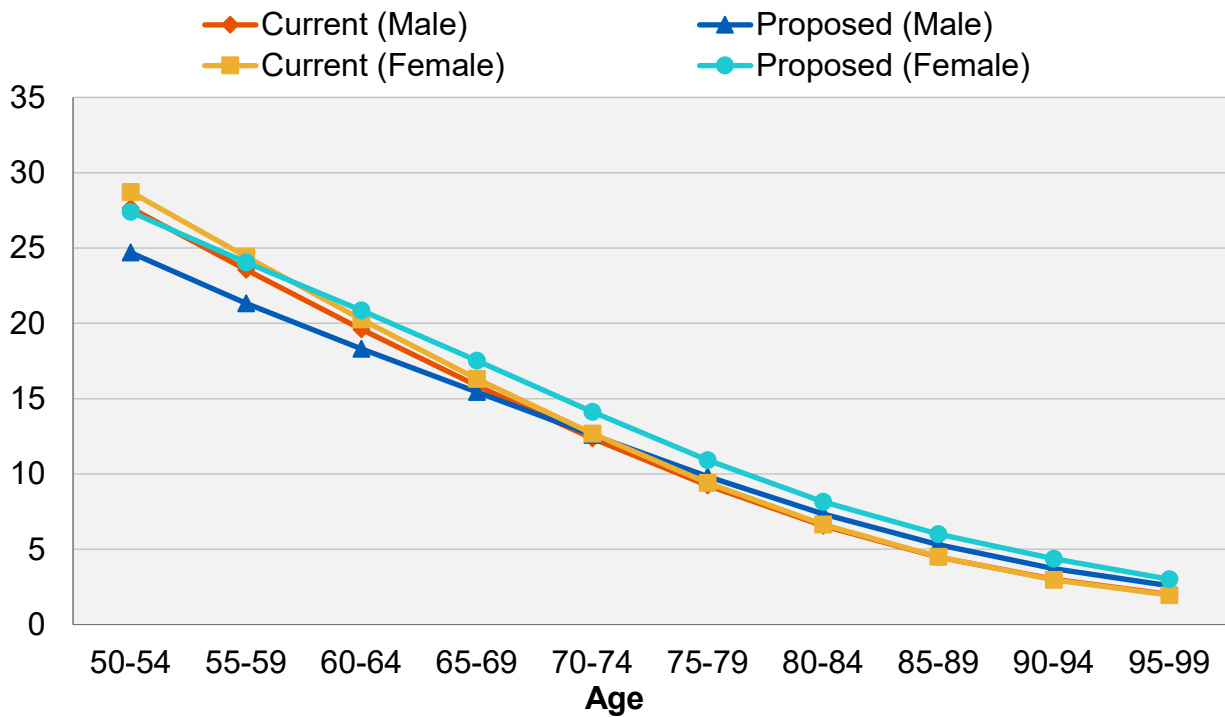
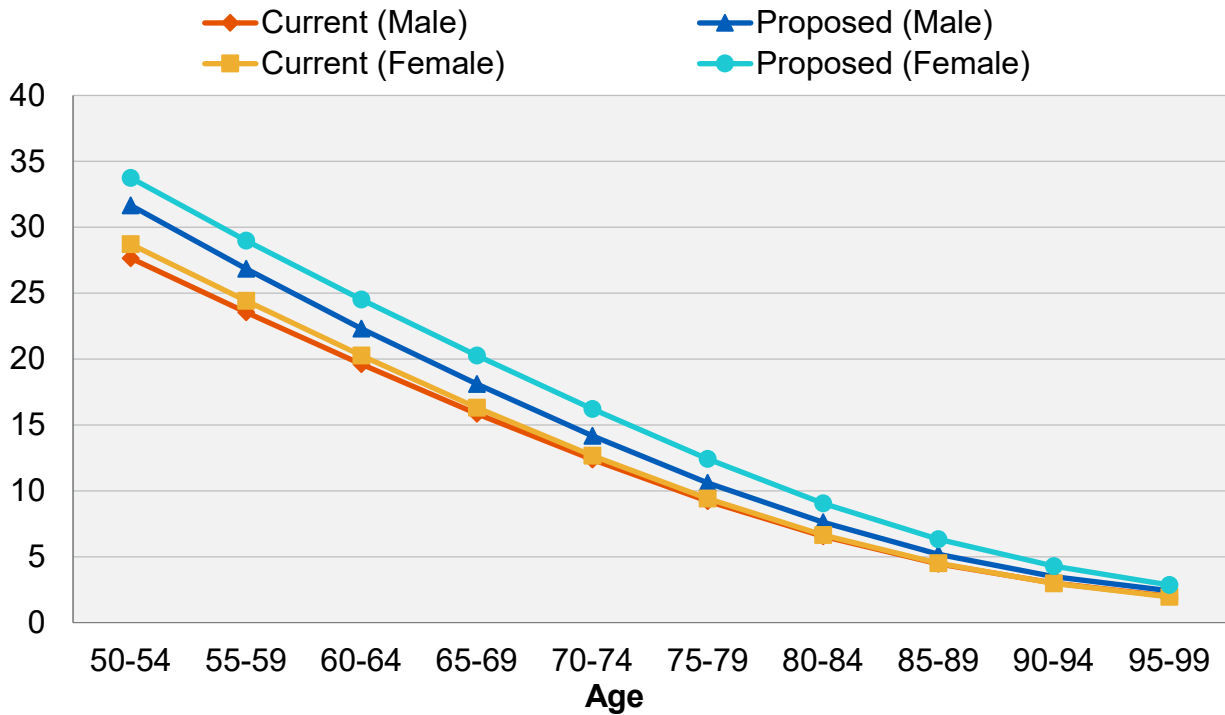


Chart 19: Life Expectancies
Disabled Safety Members



D. Termination Rates

Termination rates include all terminations for reasons other than death, disability, or retirement. Under the current assumptions there is an overall assumed incidence of total termination combined with a separate assumption for the percentage of members who would be expected to elect a refund of 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.

The termination experience over the last three years for General, Safety, and Probation members split between those members with under five years of service and those with five or more years of service is shown in the following tables. Please note that we have excluded any members who were eligible for retirement.

Termination Rates – Less Than Five Years of Service

Years of Service	Rates of Termination (%)					
	General			Safety and Probation		
	Current Rate	Observed Rate	Proposed Rate	Current Rate	Observed Rate	Proposed Rate
Less than 1	22.00	25.12	24.00	16.00	11.11	14.00
1 – 2	16.00	16.52	16.00	13.00	14.58	13.00
2 – 3	14.00	15.00	14.00	10.00	16.22	12.00
3 – 4	13.00	9.18	12.00	9.00	10.00	10.00
4 – 5	12.00	10.07	11.00	8.00	8.00	8.00

Termination Rates – Five or More Years of Service

Age	Rates of Termination (%)*					
	General			Safety and Probation		
	Current Rate	Observed Rate	Proposed Rate	Current Rate	Observed Rate	Proposed Rate
20 – 24	7.50	0.00**	8.00	7.00	0.00**	7.00
25 – 29	7.50	25.00	8.00	6.00	33.33	7.00
30 – 34	7.50	8.16	8.00	5.00	3.13	6.00
35 – 39	7.50	7.69	8.00	4.00	13.16	6.00
40 – 44	7.50	8.72	8.00	3.00	5.45	4.00
45 – 49	7.50	3.64	6.00	2.50	4.00	3.00
50 – 54	7.50	8.00	6.00	2.00	0.00	1.00
55 – 59	6.50	6.67	6.00	0.00	0.00	0.00
60 – 64	5.50	6.25	5.00	0.00	0.00	0.00
65 – 69	4.50	0.00	4.00	0.00	0.00	0.00

* At central age in age range shown.

**There were no eligible members in this age category.

Based upon the recent experience, the proposed termination rates assume slightly more terminations overall. We will also continue to assume that termination rates are zero at any age where members are assumed to retire. In other words, at those ages, members will either retire in accordance with the retirement rate assumptions or continue working, rather than terminate and defer their benefit.

Chart 20 compares actual to expected terminations over the past three years for both the current and proposed assumptions for General, Safety, and Probation members.

Chart 21 shows the actual termination rates over the past three years compared to the current and proposed assumptions for General members with less than five years of service. Chart 22 shows the same information for Safety and Probation members combined.

Chart 23 shows the actual termination rates over the past three years compared to the current and proposed assumptions for General members with five or more years of service. Chart 24 shows the same information for Safety and Probation members combined.

The following table shows the recommended percentages for members who are anticipated to withdraw their contributions and members who will leave their contributions on deposit and receive a deferred vested benefit. The current assumption is that 85% of all members who terminate with less than five years of service would withdraw and receive a refund and the other 15% would choose a deferred vested benefit. For the members with five or more years of service, the current assumption is that 25% of all members who terminate would withdraw and receive a refund and the other 75% would choose a deferred vested benefit. We recommend that these assumptions be maintained for the June 30, 2020 valuation.

Years of Service	Proportion of Total Terminations Assumed to Receive Refunds and Deferred Vested Benefits (%)					
	Refunds			Deferred Vested Benefits		
	Current Assumption	Observed Rate	Proposed Assumption	Current Assumption	Observed Rate	Proposed Assumption
Less than 5	85	89	85	15	11	15
5 or More	25	25	25	75	75	75

Chart 20: Actual Number of Terminations
Compared to Expected

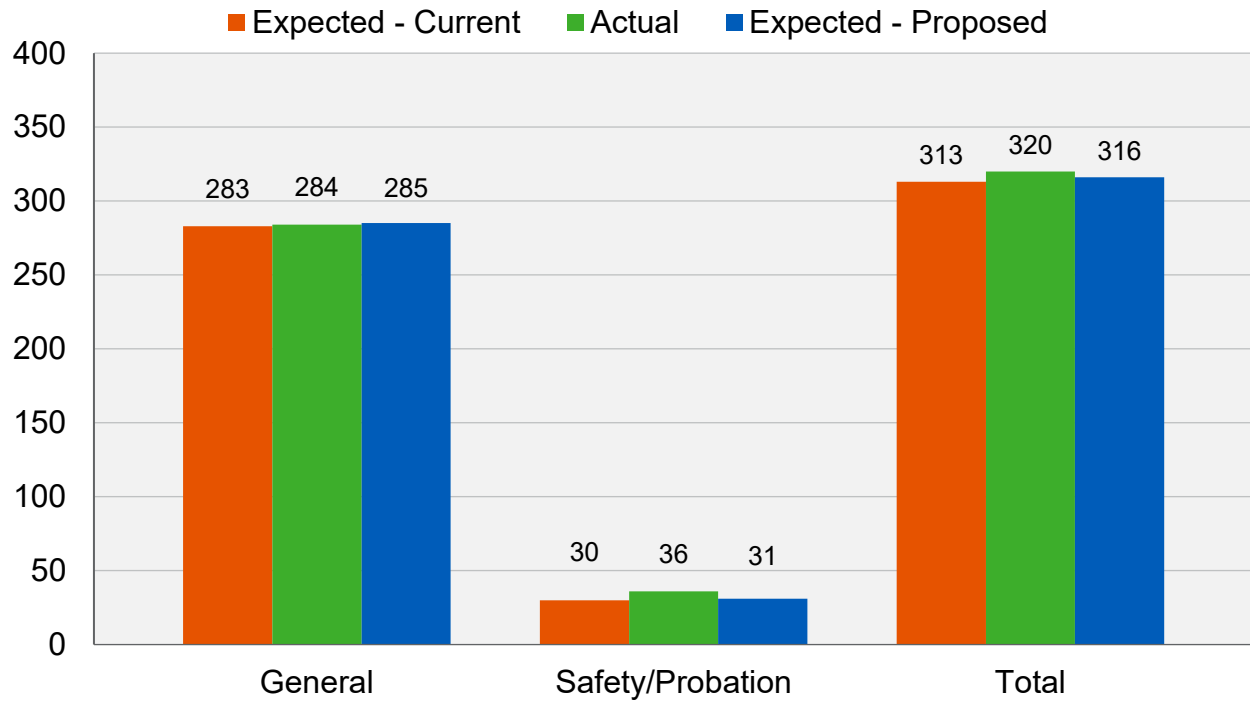


Chart 21: Termination Rates – Less than Five Years of Service
General Members

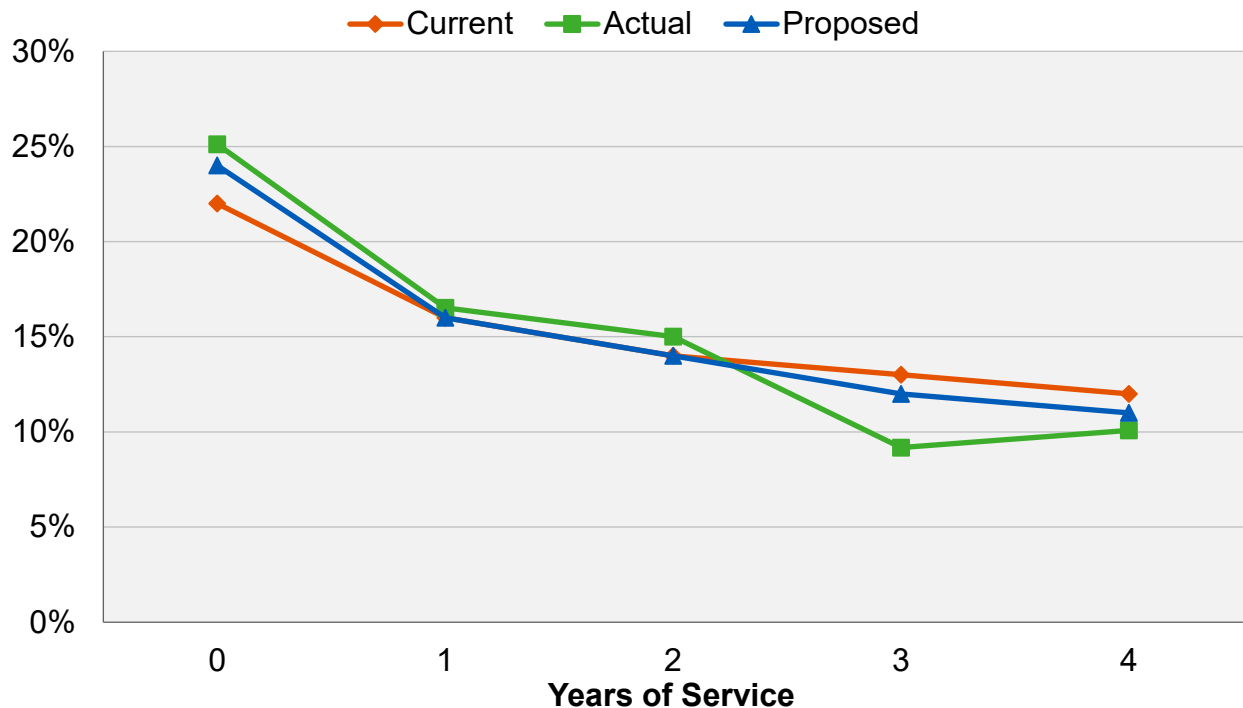


Chart 22: Termination Rates – Less than Five Years of Service
Safety and Probation Members

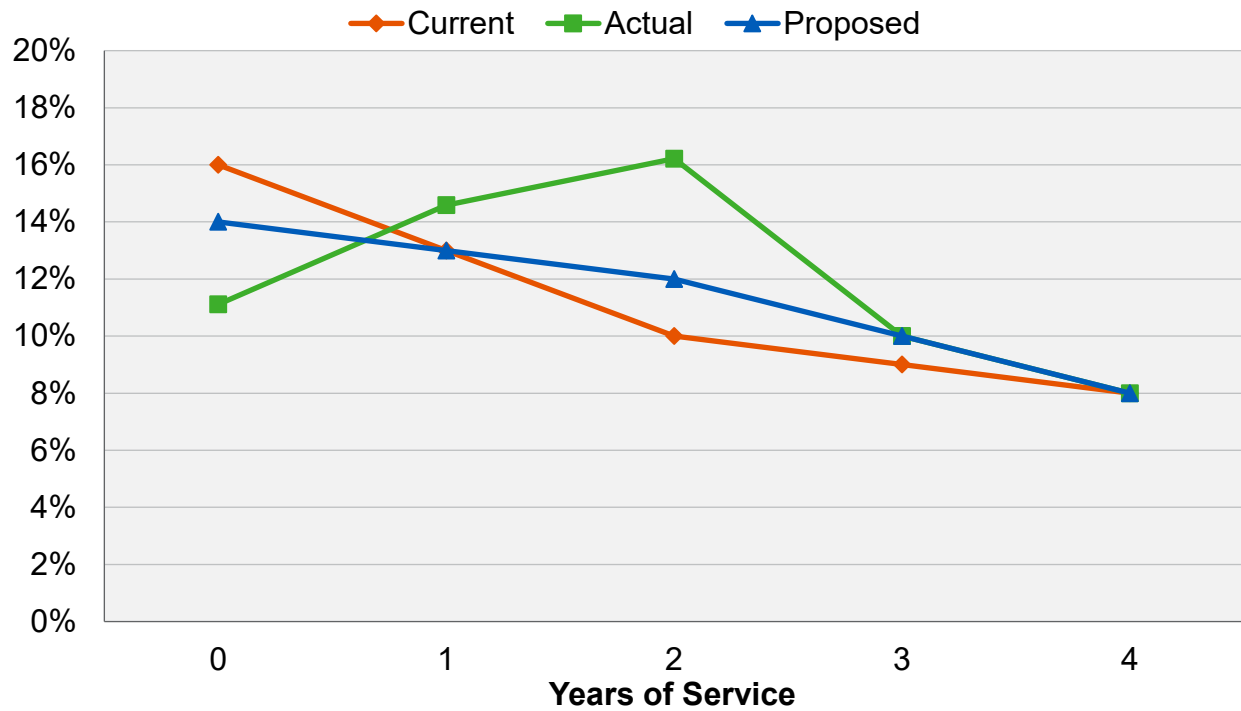


Chart 23: Termination Rates – Five or More Years of Service
General Members

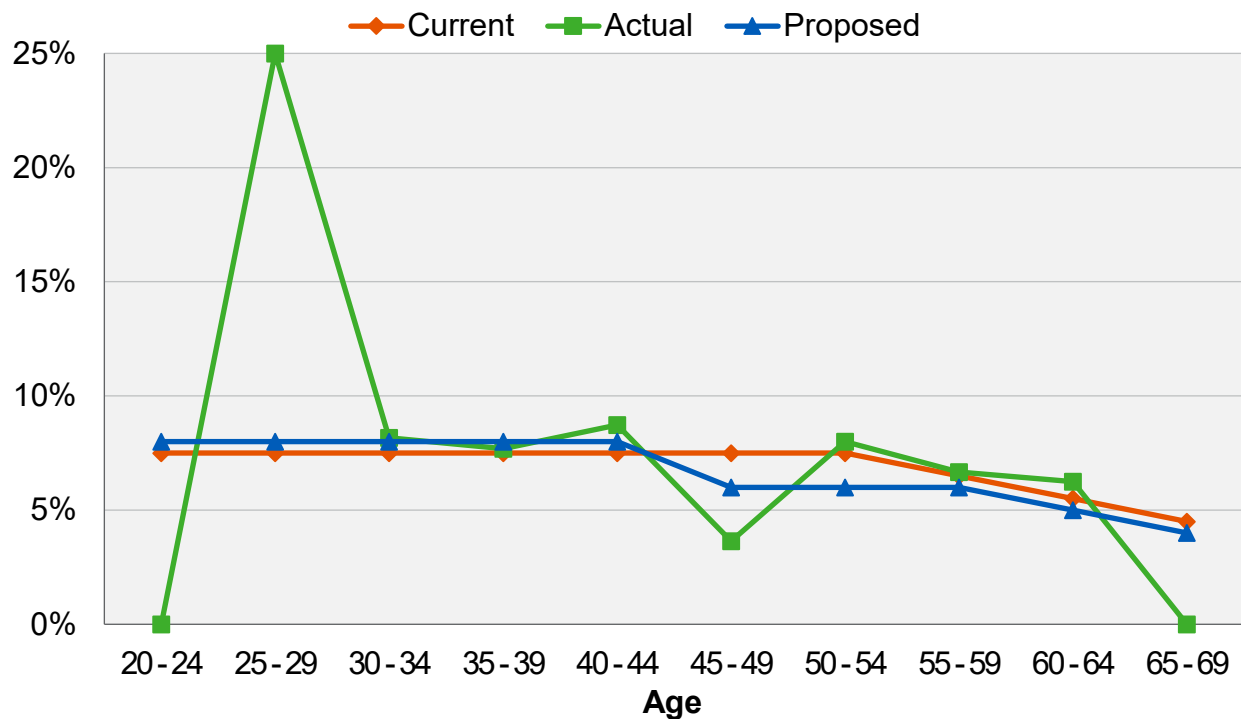
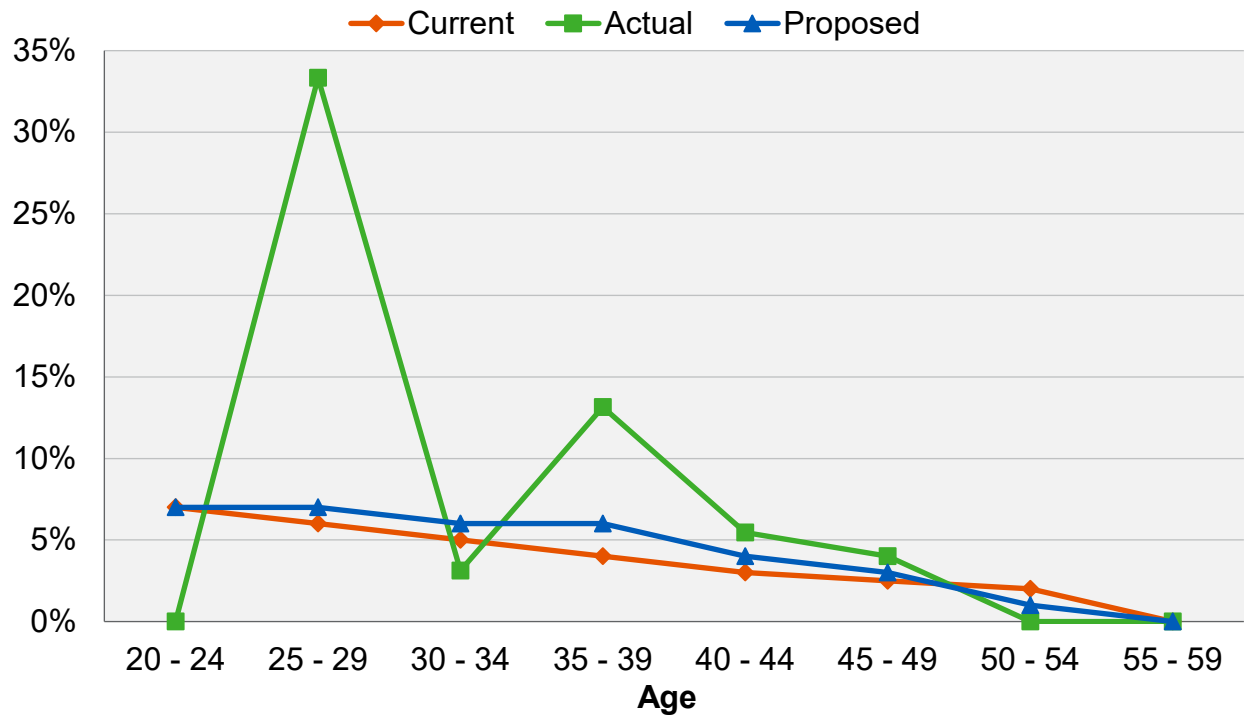


Chart 24: Termination Rates –Five or More Years of Service
Safety and Probation Members



E. Disability Incidence Rates

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

The following tables summarize the actual incidence of combined service and non-service connected disabilities over the past three years compared to the current and proposed assumptions for combined service connected and non-service connected disability:

Disability Incidence Rate (%)*			
General			
Age	Current Rate	Observed Rate	Proposed Rate
20 – 24	0.01	0.00	0.01
25 – 29	0.01	0.00	0.01
30 – 34	0.01	0.00	0.01
35 – 39	0.02	0.00	0.02
40 – 44	0.20	0.63	0.20
45 – 49	0.45	0.25	0.35
50 – 54	0.55	0.51	0.50
55 – 59	0.60	0.00	0.50
60 – 64	0.60	0.53	0.60
65 – 69	0.65	0.65	0.65

Disability Incidence Rate (%)*			
Safety and Probation			
Age	Current Rate	Observed Rate	Proposed Rate
20 – 24	0.10	0.00	0.10
25 – 29	0.15	0.00	0.15
30 – 34	0.20	0.00	0.20
35 – 39	1.50	0.00	1.50
40 – 44	1.75	2.50	1.80
45 – 49	1.75	1.33	1.80
50 – 54	2.75	3.80	2.75
55 – 59	2.75	2.44	2.75

* At central age in age range shown. 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.

The proposed disability rates were adjusted to reflect the past three years' experience. We are recommending decreases in the disability incidence rates for General members from ages 45 to 59 and increases in the rates for Safety and Probation members from ages 40 to 49.

Currently, the assumption is that 35% of disabled General members would receive a service connected disability. Over the past three-year period, 80% of disabled General members received a service connected disability. We recommend increasing the assumption from 35% to 50% to anticipate service connected disability retirement. The remaining 50% will be assumed to receive a non-service connected disability.

Currently, the assumption is that 95% of disabled Safety and Probation members would receive a service connected disability. Over the past three year-period, 83% of disabled Safety members received a service connected disability. We recommend decreasing the assumption from 95% to 90% to anticipate service connected disability retirement. The remaining 10% will be assumed to receive a non-service connected disability.

Chart 25 compares the actual number of non-service and service connected disabilities over the past three years to that expected under both the current and proposed assumptions.

Chart 26 shows the actual disablement rates over the past three years compared to the current and proposed assumptions for General members. Chart 27 shows the same information for Safety and Probation members combined.

**Chart 25: Actual Number of Disabilities
Compared to Expected**

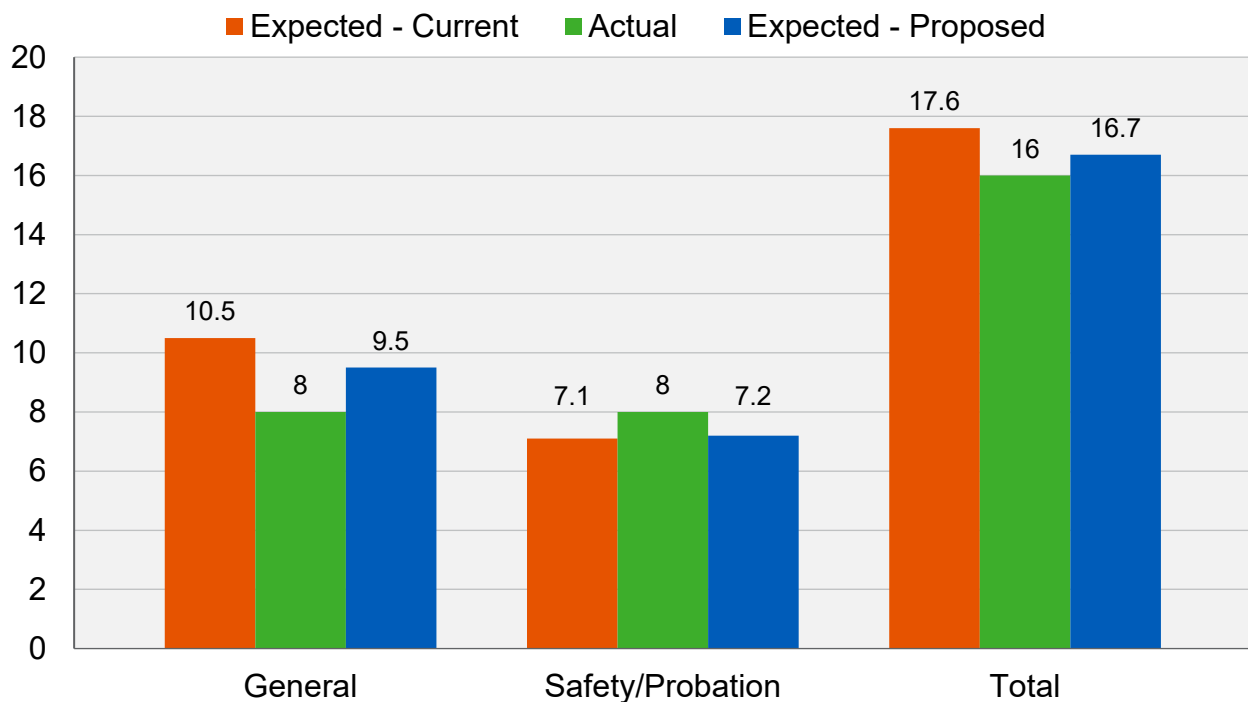


Chart 26: Disability Incidence Rates
General Members

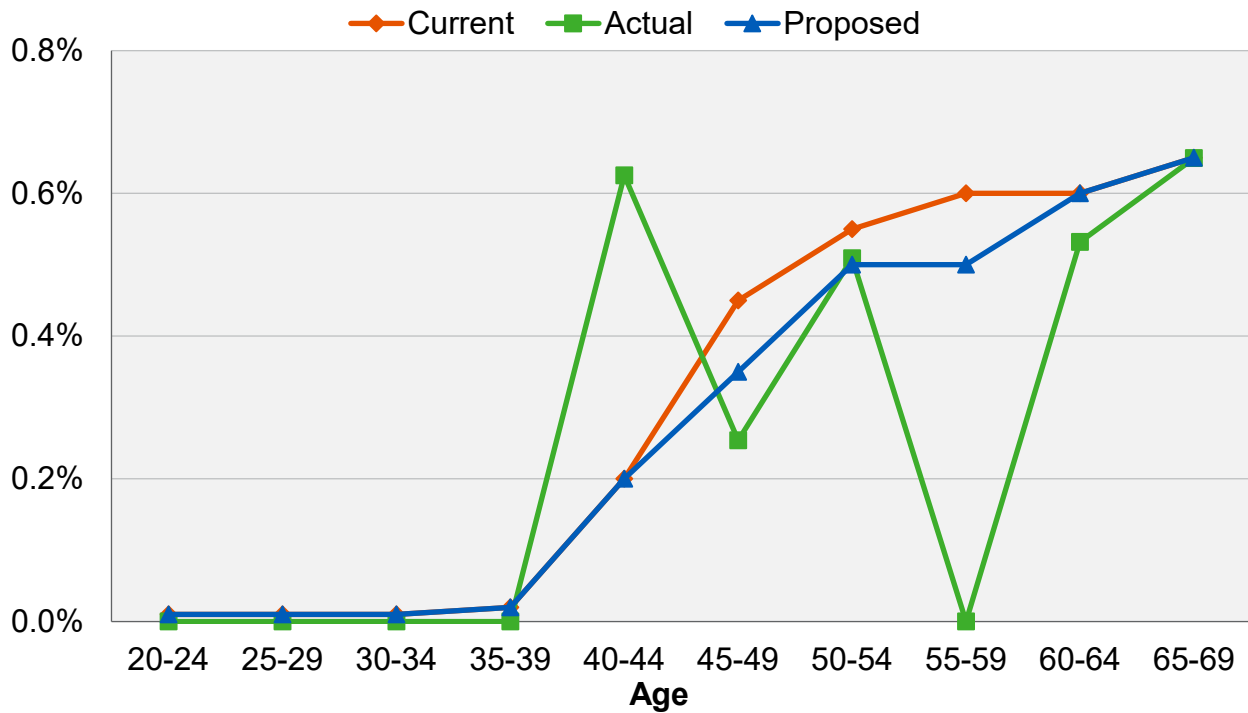
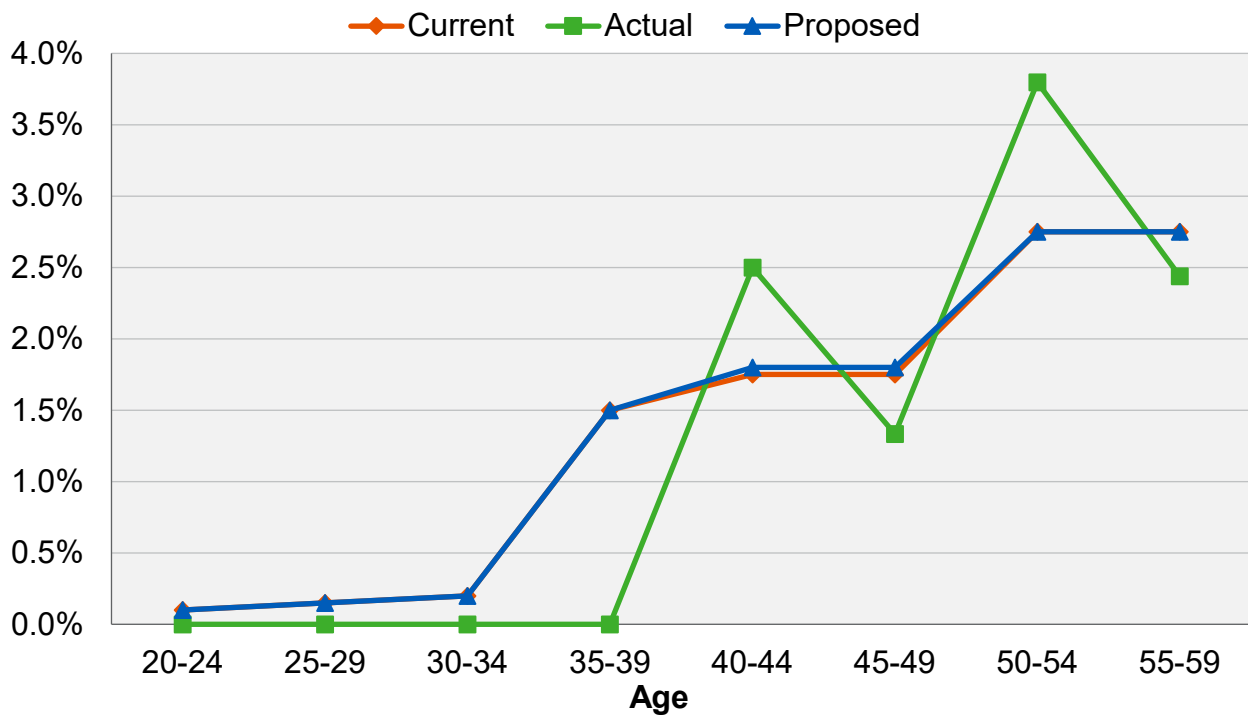


Chart 27: Disability Incidence Rates
Safety and Probation Members



F. 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 0.018 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 three years has averaged about 0.015 years for each year of employment. Based on this observed experience, we recommend that the sick leave conversion assumption be lowered to 0.017 years of additional service credit at retirement, for each year of employment.

G. Vacation Cash Outs

As previously discussed with the Board in our letter dated November 28, 2012, we understand that non-CalPEPRA members' payments received from vacation cash outs are generally considered compensation earnable. Prior to the June 30, 2016 valuation, these amounts were reported in the aggregate to the actuary, together with other elements of compensation earnable outside of base pay. However, if an active member were to have relatively lower vacation cash outs during employment compared to the final salary averaging period, the Association would experience an increase in the UAAL when such higher cash outs are ultimately used in determining the retirement benefit.

We have been exploring with the employer the feasibility of collecting historical vacation cash out data in order to determine whether an assumption to anticipate conversion of relatively higher amounts of vacation cash outs immediately before retirement is warranted for inclusion in future actuarial valuations. The type of data we have been requesting for new retirees over the experience study period is a year-by-year breakdown of their annual pensionable earnings into base pay, payments received from vacation cash outs, and all other categories of pensionable earnings for a minimum of the last ten years of the employees' careers. For the June 30, 2019 valuation, we were able to collect data for the most recent year of retirees, although it appeared the valid pay data received was limited to approximately the last three years of employment. We reviewed that data to see if we could observe any patterns of higher vacation cash outs in the last year of employment, and it did appear that there was a somewhat small increase in the last year compared to the previous two years of employment. However, due to the lack of sufficient credible data and to the relatively small size of the higher vacation cash outs in the last year compared to what have been observed at other systems, we are not recommending a vacation cash out assumption at this time.

With that said, based on recent communications with the Association's staff, we understand they are working with their pension software vendor to refine the vacation cash out information we receive for future valuations so that we can reconcile any discrepancies we have observed in the vacation cash out data for new retirees compared to the past information we have received for these members as active employees. We anticipate that we would have more than one year of experience and more than three years of pay information available at the time of the next experience study in order to study the feasibility of developing a vacation cash out assumption.

V. Cost Impact

We have estimated the impact of all the recommended demographic and economic assumptions as if they were applied to the June 30, 2019 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 III of this report) and the recommended demographic assumption changes (as recommended in Section IV of this report).

Cost Impact of the Recommended Assumptions Based on June 30, 2019 Actuarial Valuation

Impact on Employer Contribution Rates	
Increase due to economic assumptions	0.15%
Increase due to demographic assumptions	<u>2.33%</u>
Total increase in average employer rate	2.48%
Total estimated increase in annual dollar amount (\$000s)	\$1,827*
Impact on Member Contribution Rates	
Increase due to economic assumptions	0.11%
Increase due to demographic assumptions	<u>0.84%</u>
Total increase in average member rate	0.95%
Total estimated increase in annual dollar amount (\$000s)	\$692*
Impact on UAAL and Funded Percentage	
Change in UAAL	Increase of \$13 million
Change in Funded Percentage	From 70.6% to 69.4%

* Based on June 30, 2019 projected annual compensation.

Of the various economic assumption changes, the most significant cost impact is from the change in the investment return assumption from 7.00% to 6.75%. However, that increase in cost from the investment return assumption is almost entirely offset by the decrease in cost from the change in the inflation assumption from 3.00% to 2.75%. Of the various demographic assumption changes, about half of the cost impact is from the change in the merit and promotional salary increase assumption and the other half is from the change in the mortality assumption.

We have also analyzed in the tables below the average employer and member contribution rate impacts by each cost group due to the recommended assumption changes as if they were applied to the June 30, 2019 actuarial valuation.

Employer Contribution Rate Increases (% of Payroll) (Estimated Annual Dollar amounts in Thousands)				
	Normal Cost	UAAL	Total	Annual Amount ²⁸
General Tier 1	1.99%	1.19%	3.18%	\$14
General Tier 2 / Tier 3	1.26%	1.19%	2.45%	\$716
General Tier 4	0.86%	1.19%	2.05%	\$604
Safety Tier 1	Not Calculated ²⁹			
Safety Tier 2	0.96%	2.77%	3.73%	\$274
Safety Tier 3	0.93%	2.77%	3.70%	\$158
Probation Tier 1	Not Calculated ²⁹			
Probation Tier 2	0.74%	1.36%	2.10%	\$36
Probation Tier 3	0.93%	1.36%	2.29%	\$25
Combined	1.04%	1.44%	2.48%	\$1,827

Member Contribution Rate Increases (% of Payroll) (Estimated Annual Dollar Amounts in Thousands)		
	Total	Annual Amount
General Tier 1	0.13%	\$1
General Tier 2 / Tier 3	1.06%	\$308
General Tier 4	0.86%	\$251
Safety Tier 1	Not Calculated ²⁹	
Safety Tier 2	0.88%	\$64
Safety Tier 3	0.93%	\$40
Probation Tier 1	Not Calculated ²⁹	
Probation Tier 2	1.04%	\$18
Probation Tier 3	0.93%	\$10
Combined	0.95%	\$692

²⁸ Based on June 30, 2019 projected annual payroll as determined under each set of assumptions.

²⁹ There were no Safety Tier 1 or Probation Tier 1 active members reported for the June 30, 2019 valuation.

Appendix A: Current Actuarial Assumptions

Economic Assumptions

Net Investment Return	7.00%; 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	7.00%, compounded semi-annually.
Consumer Price Index	Increase of 3.00% per year. Retiree COLA increases due to CPI are subject to a 3% maximum change per year for General Tiers 1, 2, and 3, Safety Tiers 1 and 2, and Probation Tiers 1 and 2 (no COLA increases for General Tier 4, Safety Tier 3, and Probation Tier 3).
Payroll Growth	Inflation of 3.00% 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 3.00% per year from the valuation date.
Increase in Section 7522.10 Compensation Limit	Increase of 3.00% per year from the valuation date.

Salary Increases

The annual rate of compensation increase includes: inflation at 3.00%, plus real “across the board” salary increases of 0.50% per year, plus the following merit and promotion increases:

Merit and Promotion Increases (%)		
Years of Service	General	Safety and Probation
Less than 1	5.00	5.00
1 – 2	3.75	3.75
2 – 3	3.50	3.00
3 – 4	2.75	2.25
4 – 5	2.25	1.00
5 – 6	1.75	0.75
6 – 7	1.50	0.75
7 – 8	1.25	0.75
8 – 9	1.00	0.75
9 – 10	0.75	0.75
10 & Over	0.50	0.50

Demographic Assumptions

Mortality Rates – Healthy

- **All Members and all Beneficiaries:** Headcount-Weighted RP-2014 (RPH-2014) Healthy Annuitant Mortality Tables, set back one year for males and set forward one year females, projected 20 years with the two-dimensional mortality improvement Scale MP-2016.

Mortality Rates – Disabled

- **All Members:** Headcount-Weighted RP-2014 (RPH-2014) Healthy Annuitant Mortality Tables, set forward four years for males and set forward six years for females, projected 20 years with the two-dimensional mortality improvement Scale MP-2016.

The above mortality tables contain a margin of about 20%, based on actual to expected deaths, as a provision to reflect future mortality improvement, based on a review of mortality experience as of the measurement date.

Mortality Rates – Pre-Retirement

- **All Members:** Headcount-Weighted RP-2014 (RPH-2014) Employee Mortality Tables, set back one year for males and set forward one year for females, projected 20 years with the two-dimensional mortality improvement Scale MP-2016.

	Rate (%)			
	General		Safety and Probation	
Age	Male	Female	Male	Female
25	0.05	0.02	0.05	0.02
30	0.05	0.02	0.05	0.02
35	0.05	0.03	0.05	0.03
40	0.07	0.05	0.07	0.05
45	0.09	0.08	0.09	0.08
50	0.15	0.13	0.15	0.13
55	0.25	0.19	0.25	0.19
60	0.42	0.28	0.42	0.28
65	0.75	0.42	0.75	0.42

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:** Headcount-Weighted RP-2014 (RPH-2014) Healthy Annuitant Mortality Tables, set back one year for males and set forward one year for females, projected 20 years with the two-dimensional mortality improvement Scale MP-2016, weighted 30% male and 70% female.
- **Safety and Probation Members:** Headcount-Weighted RP-2014 (RPH-2014) Healthy Annuitant Mortality Tables, set back one year for males and set forward one year for females, projected 20 years with the two-dimensional mortality improvement Scale MP-2016, weighted 80% male and 20% female.

Disability Incidence Rates

Age	Rate (%)		
	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	1.65	1.65
45	0.35	1.75	1.75
50	0.51	2.35	2.35
55	0.58	2.75	2.75
60	0.60	0.00	0.00
65	0.63	0.00	0.00

35% of General disabilities are assumed to be service connected disabilities. The other 65% 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 Rates – Less than Five Years of Service

	Rate (%)		
Years of Service	General	Safety	Probation
Less than 1	22.00	16.00	16.00
1 – 2	16.00	13.00	13.00
2 – 3	14.00	10.00	10.00
3 – 4	13.00	9.00	9.00
4 – 5	12.00	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).

Termination Rates – Five or More Years of Service

	Rate (%)		
Age	General	Safety	Probation
20	7.50	7.40	7.40
25	7.50	6.40	6.40
30	7.50	5.40	5.40
35	7.50	4.40	4.40
40	7.50	3.40	3.40
45	7.50	2.70	2.70
50	7.50	2.20	2.20
55	6.90	0.80	0.80
60	5.90	0.00	0.00
65	4.90	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).

Retirement Rates

	Rate (%)					
Age	General Tiers 1, 2, & 3	General Tier 4	Safety Tiers1 & 2	Safety Tier 3	Probation Tiers 1 & 2	Probation Tier 3
50	6.00	0.00	8.00	3.00	5.00	4.00
51	6.00	0.00	8.00	3.00	5.00	4.00
52	6.00	6.00	8.00	3.00	5.00	4.00
53	6.00	3.00	8.00	3.00	5.00	4.00
54	6.00	3.00	8.00	3.00	5.00	4.00
55	11.00	5.00	9.00	4.00	20.00	11.00
56	11.00	5.00	9.00	6.00	20.00	21.00
57	11.00	5.00	10.00	7.00	20.00	21.00
58	11.00	5.00	20.00	9.00	20.00	21.00
59	11.00	5.00	30.00	30.00	20.00	21.00
60	12.00	6.00	100.00	100.00	100.00	100.00
61	16.00	9.00	100.00	100.00	100.00	100.00
62	30.00	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	<p>For current and future deferred vested members, retirement age assumptions are as follows:</p> <ul style="list-style-type: none"> • General Retirement Age: 60 • Safety and Probation Retirement Age: 55 <p>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.</p> <p>60% 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.</p>
Future Benefit Accruals	1.0 year of service per year of employment, plus 0.018 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, 75% 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	6.75%; 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.
Consumer Price Index	Increase of 2.75% per year. Retiree COLA increases due to CPI 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 real “across the board” salary increases of 0.50% per year, plus the following merit and promotion increases:

Merit and Promotion Increases (%)		
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

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

Mortality Rates – 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

Mortality Rates – 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

Mortality Rates – Pre-Retirement

- **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

Age	Rate (%)			
	General		Safety and Probation	
	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 Rates

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 Rates – Less than Five Years of Service

	Rate (%)		
Years of Service	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).

Termination Rates – Five or More Years of Service

	Rate (%)		
Age	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).

Retirement Rates

	Rate (%)					
Age	General Tiers 1, 2, & 3	General Tier 4	Safety Tiers1 & 2	Safety Tier 3	Probation Tiers 1 & 2	Probation Tier 3
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	<p>For current and future deferred vested members, retirement age assumptions are as follows:</p> <ul style="list-style-type: none"> • General Retirement Age: 60 • Safety and Probation Retirement Age: 54 <p>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.</p> <p>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.</p>
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.