Sonoma County Employees'
Retirement Association

Actuarial Experience Study

Analysis of Actuarial Experience During the Period January 1, 2018 through December 31, 2020

Segal

Segal

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October 15, 2021

Board of Retirement
Sonoma County Employees' Retirement Association
433 Aviation Boulevard, Suite 100
Santa Rosa, CA 95403

Re: Review of Actuarial Assumptions for the December 31, 2021 Actuarial Valuation

Dear Members of the Board:

We are pleased to submit this report of our review of the actuarial experience for the Sonoma County Employees' Retirement Association. This study utilizes the census data for the period January 1, 2018 to December 31, 2020 and provides the proposed actuarial assumptions, both economic and demographic, to be used in the December 31, 2021 valuation.

We are members of the American Academy of Actuaries and we meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion herein.

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

Sincerely,

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

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

OH/jl

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1. Introduction, Summary, and Recommendations

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

If assumptions are modified, contribution requirements are adjusted to take into account a change in the projected experience in all future years. There is a great difference in both philosophy and cost impact between recognizing the actuarial deviations as they occur annually and changing the actuarial assumptions. Taking into account one year's gains or losses without making a change in the assumptions means that year's experience is treated as temporary and that, over the long run, experience will return to what was originally assumed. For example, it is impossible to determine how and to what extent the economy will be affected by the COVID-19 pandemic.[1] Changing assumptions reflects a basic change in thinking about the future, and has a much greater effect on the current contribution requirements than recognizing gains or losses as they occur.

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

This study was undertaken in order to review the economic and demographic actuarial assumptions and to compare the actual experience with that expected under the current assumptions during the three-year experience period from January 1, 2018 through December 31, 2020. The study was performed in accordance with Actuarial Standard of Practice (ASOP) No. 27 "Selection of Economic Assumptions for Measuring Pension Obligations"[2] and ASOP No. 35 "Selection of Demographic and Other Non-Economic Assumptions for Measuring Pension Obligations." These Standards of Practice provide guidance for the selection of the various actuarial assumptions utilized in a pension plan actuarial valuation. Based on the study's results and expected future experience, we are recommending various changes in the current actuarial assumptions.

We are recommending changes in the assumptions for inflation, investment return, merit and promotion salary increases, retirement from active employment, retirement age for deferred vested members, percent of members assumed to go on to work for a reciprocal system,

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

reciprocal salary increases, pre-retirement mortality, post-retirement healthy and disabled life mortality, termination (refunds and deferred vested retirements), disability (non-service connected and service connected) and cashouts.

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

Pg #	Actuarial Assumption Categories	Recommendation
11	**Inflation:** Future increases in the Consumer Price Index (CPI), which drives investment returns and active member salary increases.	Reduce the inflation assumption from 2.75% to 2.50% per annum as discussed in Section (3)(A).
13	**Investment Return:** The estimated average future net rate of return on current and future assets of the Association as of the valuation date. This rate is used to discount liabilities.	Reduce the investment return assumption from 7.00% to 6.75% per annum as discussed in Section (3)(B).
20	**Individual Salary Increases:** Increases in the salary of a member between the date of the valuation to the date of separation from active service. This assumption has three components: • Inflationary salary increases • Real "across the board" salary increases • Merit and promotion increases	Reduce the current inflationary salary increase assumption from 2.75% to 2.50% and maintain the current real "across the board" salary increase assumption at 0.50%. This means that the combined inflationary and real "across the board" salary increases will decrease from 3.25% to 3.00%. We recommend adjusting the merit and promotion rates of salary increase as developed in Section (3)(C) to reflect past experience. Future merit and promotion salary increases are higher for General and Safety members at most years under the proposed assumptions. The recommended total rates of salary increase anticipate slightly lower increases overall than the current assumptions for both General and Safety.
26	**Retirement Rates:** The probability of retirement at each age at which participants are eligible to retire. **Other Retirement Related Assumptions including:** • Percent married and spousal age differences for members not yet retired • Retirement age for deferred vested members • Future reciprocal members and reciprocal salary increases	For active members, adjust the current retirement rates to those developed in Section (4)(A). For Plan A General and Safety members, at most ages, reduce retirement assumptions for those with less than 30 years of service and for those with 30 or more years of service. For Plan B General members increase retirement assumptions overall and for Plan B Safety members reduce retirement assumptions overall. For inactive vested members that work for a reciprocal employer, increase the assumed retirement age from 58 to 60 for General members and from 53 to 55 for Safety members. For inactive vested members that do not work for a reciprocal employer, maintain the assumed retirement age of 58 for General members and reduce the assumed retirement age from 53 to 52 for Safety members. Maintain the current proportion of future terminated members expected to be covered by a reciprocal system of 25% for General members and reduce the current proportion from 40% to 35% for Safety members. In addition, reduce the current reciprocal salary increase assumption to 3.55% for General members and maintain the current reciprocal salary increase assumption of 4.00% for Safety members. For active and deferred vested members, maintain the percent married at retirement assumption at 70% for males and 55% for females. Decrease the spouse age difference assumption for male retirees from four to three years older than their spouses and maintain the assumption that female retirees are two years younger than their spouses.

Pg #	Actuarial Assumption Categories	Recommendation
36	**Mortality Rates:** The probability of dying at each age. Mortality rates are used to project life expectancies.	**Healthy Retirees:** Current base table for General and Safety Members: Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table with rates decreased by 6% for males and increased by 2% for females. Recommended base table for General Members: Pub-2010 General Healthy Retiree Amount-Weighted Above-Median Mortality Table with rates increased by 5% for females. Recommended base table for Safety Members: Pub-2010 Safety Healthy Retiree Amount-Weighted Above-Median Mortality Table. **All Beneficiaries:** Current base table: Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table with rates decreased by 6% for males and increased by 2% for females. Recommended base table: Pub-2010 Contingent Survivor Amount-Weighted Above-Median Mortality Table with rates increased by 5% for males and females. **Pre-Retirement Mortality:** Current base table for General and Safety Members: Headcount-Weighted RP-2014 Employee Mortality Table with rates decreased by 7% for males and 5% for females. Recommended base table for General Members: Pub-2010 General Employee Amount-Weighted Above-Median Mortality Table with rates decreased by 5% for males. Recommended base table for Safety Members: Pub-2010 Safety Employee Amount-Weighted Above-Median Mortality Table with rates decreased by 5% for males. **Disabled Retirees:** Current base table for General and Safety Members: Headcount-Weighted RP-2014 Disabled Retiree Mortality Table with rates decreased by 9% for males and 7% for females. Recommended base table: Pub-2010 Non-Safety Disabled Retiree Amount-Weighted Mortality Table with rates decreased by 5% for males and 10% for females. Recommended base table: Pub-2010 Safety Disabled Retiree Amount-Weighted Mortality Table with rates decreased by 5% for females. **All current tables** are projected generationally with the two-dimensional mortality improvement scale MP-2017. **All recommended tables** are projected generationally with the two-dimensional mortality improvement scale MP-2020. **For member contribution rates and optional forms:** change the mortality rates to those developed in Section (4)(B).
51	**Termination Rates:** The probability of leaving employment at each age and receiving either a refund of member contributions or a deferred vested retirement benefit.	We recommend adjusting the withdrawal and vested termination rates to those developed in Section (4)(D) to reflect a slightly lower incidence of withdrawal for General and Safety members and a slightly higher incidence of vested termination for General and Safety members.
61	**Disability Incidence Rates:** The probability of becoming disabled at each age.	We recommend adjusting the disability rates to those developed in Section (4)(E) to reflect a slightly lower incidence of disability overall for General and maintain the rates for Safety members.

Pg #	Actuarial Assumption Categories	Recommendation
65	**Cashouts:** Additional pay elements that are expected to be received during the member's final average earnings period.	Maintain the current cashout assumptions for General Plan A Sonoma Valley Fire District members, and decrease the current cashout assumptions for General Plan A Court and Safety Plan A Sonoma Valley Fire District members to those developed in Section (4)(F).
68	**Entry Age Method Refinement**	Adjust the methodology as discussed in Section (4)(G) to spread a member's normal cost over only the member's service period with SCERA.

We have estimated the impact of all the recommended economic and demographic assumptions as if they were applied to the December 31, 2020 actuarial valuation. The table below shows the changes in the employer and member contribution rates due to the proposed assumption changes separately for the recommended economic assumption changes (as recommended in Section 3 of this report which include the recommended merit and promotion salary increases) and the recommended demographic assumption changes (as recommended in Section 4 of this report).

Cost Impact of the Recommended Assumptions Based on December 31, 2020 Actuarial Valuation

Assumption	Impact on Average Employer Contribution Rates
Increase due to changes in economic assumptions	1.84%
Increase due to changes in demographic assumptions[1]	0.57%
Total increase in average employer rate	**2.41%**
Total estimated increase in annual dollar amount ($000s)	**$9,532**

Assumption	Impact on Weighted Average Member Contribution Rates
Increase due to changes in economic assumptions	0.31%
Increase due to changes in demographic assumptions[1]	0.22%
Total increase in average member rate	**0.53%**
Total estimated increase in annual dollar amount ($000s)	**$2,086**

	Impact on UAAL and Funded Percentage
Increase in UAAL ($000s)	$95,517
Change in Funded Percentage	-2.6%

[1] Includes a refinement in calculating some member's entry ages as used in Entry Age actuarial cost method calculations. Previously, the Normal Cost was spread over a period including both the member's service with a reciprocal system (if any) and their SCERA service. The refinement spreads the Normal Cost over only the member's service period with SCERA. This refinement does not change the Present Value of Future Benefits but it increases the Normal Cost and decreases the Actuarial Accrued Liability for members with reciprocal service.

Of the various assumption changes, the most significant rate increase is due to the change in the investment return assumption.

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

2. Background and Methodology

In this report, we analyzed both economic and demographic ("non-economic") assumptions. The primary economic assumptions reviewed are inflation, investment return, and salary increases. Demographic assumptions include the probabilities of certain events occurring in the population of members, referred to as "decrements," e.g., termination from service, disability retirement, service retirement, and death before and after retirement. In addition to decrements, other demographic assumptions reviewed in this study include the percentage of members with an eligible spouse or domestic partner, spousal age difference, percent of members assumed to go on to work for a reciprocal system, reciprocal salary increases, and cashouts.

Economic Assumptions

Economic assumptions consist of:

- **Inflation:** Increases in the price of goods and services. The inflation assumption reflects the basic return that investors expect from securities markets. It also reflects the expected basic salary increase for active employees and drives increases in the allowances of retired members (if any).
- **Investment Return:** Expected long-term rate of return on the Association's investments after administrative and 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 3.

Demographic Assumptions

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

The reliability of the resulting probability is highly dependent on both the number of decrements and the number of exposures. For example, if there are only a few people in a high age category at the beginning of the year (number of exposures), we would not lend as much credibility to the probability of termination developed for that age category, especially if it is out of line with the pattern shown for the other age groups. Similarly, if we are considering the death

decrement, there may be a large number of exposures in the age 20-24 category, but very few decrements (actual deaths); therefore, we would not be able to rely heavily on the probability developed for that category.

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

3. Economic Assumptions

A. Inflation

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

The inflation assumption is long term in nature, so our analysis begins with a review of historical information. Following is an analysis of 15 and 30 year moving averages of historical inflation rates:

Historical Consumer Price Index – 1930 to 2020[1]
(U.S. City Average - All Urban Consumers)

	25th Percentile	Median	75th 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 environment over the past two decades. Also, the later 15-year averages during the period are lower because they do not include the high inflation years of the mid-1970s and early 1980s.

Based on information found in the Public Plans Database, which is produced in partnership with the National System of State Retirement Administrators (NASRA), the median inflation assumption used by 169 large public retirement funds in their 2020 fiscal year valuations was 2.50%.[2] In California, CalSTRS and fourteen 1937 Act CERL systems use an inflation assumption of 2.75% while CalPERS[3] and six 1937 Act CERL systems use an inflation assumption of 2.50%.[4]

SCERA's investment consultant, Aon Hewitt (Aon), anticipates an annual inflation rate of 2.10%, while the average inflation assumption provided by Aon and five other investment advisory firms retained by Segal's California public sector clients was 2.20%. Note that, in general, investment consultants use a time horizon for this assumption that is shorter than the time horizon we use for the actuarial valuation.[5]

[1] 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).
[2] Among 209 large public retirement funds, the 2020 fiscal year inflation assumption was not available for 40 of the public retirement funds in the survey data as of September 2021.
[3] In a draft 2021 experience study report released by CalPERS, their actuaries have included a recommendation to their board to lower the inflation assumption to 2.25%.
[4] Two of these 1937 Act CERL systems use a 2.50% inflation assumption with a 2.75% COLA assumption.
[5] The time horizon used by the six investment consultants included in our review generally ranges from 10 years to 30 years, with Aon using a 30 year-horizon.

To find a forecast of inflation based on a longer time horizon, we referred to the Social Security Administration's (SSA) 2021 report on the financial status of the Social Security program.[1] The projected average increase in the Consumer Price Index (CPI) over the next 75 years under the intermediate cost assumptions used in that report was 2.40%. The SSA report also includes alternative projections using lower and higher inflation assumptions of 1.80% and 3.00%, respectively.

We also compared the yields on the thirty-year inflation indexed U.S. Treasury bonds to comparable traditional U.S. Treasury bonds.[2] As of August 2021, the difference in yields is about 2.23% which provides a measure of market expectations of inflation.

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

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

[1] Source: Social Security Administration: The 2021 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds

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

B. Investment Return

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

Real Rate of Investment Return

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

The Association's current target asset allocation and the assumed real rate of return assumptions by asset class are shown in the following table. The first column of real rate of return assumptions are determined by reducing Aon's total or "nominal" 2021 return assumptions by their assumed 2.10% inflation rate. The second column of returns (except certain asset classes as noted in the table) 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 Aon and five other investment advisory firms retained by Segal's public sector clients. We believe these averages are a reasonable consensus forecast of long-term future market returns in excess of inflation.[1]

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

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

Asset Class	Percentage of Portfolio	Aon's Assumed Real Rate of Return[1]	Average Assumed Real Rate of Return from a Sample of Consultants to Segal's California Public Sector Clients[2]
Large Cap Equity	16.50%	5.75%	5.35%
Small Cap Equity	5.00%	7.56%	6.55%
Developed International Equity	14.88%	7.10%	6.31%
Global Equity	18.00%	6.71%	6.28%
Emerging Market Equity	6.62%	8.95%	8.47%
Core Bonds	16.00%	0.80%	0.70%
Bank Loan	3.00%	3.48%	2.43%
Real Estate	10.00%	4.13%	4.89%
Infrastructure	5.00%	6.05%	6.05%[3]
Farmland	5.00%	5.90%	5.90%[4]
Total	**100.00%**	**5.43%**	**5.11%**

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

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

The following are some observations about the returns provided above:

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

[1] The rates shown have been estimated by Segal by taking Aon's nominal geometric returns, converting to an arithmetic return based on the expected risk for each asset class as provided by Aon, and then reduced by Aon's assumed 2.10% inflation rate to develop the assumed real rate of return shown.

[2] These are based on the projected arithmetic returns provided by Aon and five other investment advisory firms serving the county retirement system of SCERA and 16 other city and county retirement systems in California. These return assumptions are gross of any applicable investment expenses.

[3] For these asset classes, Aon's assumption is applied in lieu of the average because there is a larger disparity in returns for these asset classes among the firms surveyed and using Aon's assumption should more closely reflect the underlying investments made specifically for SCERA.

2. Using a sample average of expected real rate of returns allows SCERA'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 5.11% portfolio real rate of return be used to determine SCERA's investment return assumption. This is 0.17% lower than the return that was used three years ago in the review of the recommended investment return assumption for the December 31, 2018 valuation. The difference is due to changes in the real rate of return assumptions provided to us by the investment advisory firms (-0.22% under the 2018 asset allocation), changes in the SCERA's target asset allocation (+0.07%) and the interaction effect between these changes (-0.02%).

Association Expenses

For funding purposes, the real rate of return assumption for the portfolio needs to be adjusted for administrative and investment expenses expected to be paid from investment income. The following table provides the administrative and investment expenses in relation to the actuarial value of assets for the five years ending December 31, 2020.

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

Year Ending December 31	Actuarial Value of Assets[1]	Administrative Expenses	Investment Expenses[2]	Administrative %	Investment %	Total %
2016	$2,399,171	$4,219	$13,622	0.18	0.57	0.75
2017	2,557,299	3,732	15,872	0.15	0.62	0.77
2018	2,667,345	3,583	15,770	0.13	0.59	0.72
2019	2,811,292	3,546	14,887	0.13	0.53	0.66
2020	2,981,688	3,032	13,707	0.10	0.46	0.56
Five-Year Average				**0.14**	**0.55**	**0.69**
Three-Year Average				**0.12**	**0.53**	**0.65**
Current Assumption						**0.75**
Proposed Assumption						**0.70**

Based on the above experience, we recommend reducing the administrative and investment expense assumption from 0.75% to 0.70%.

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

[1] As of end of plan year.
[2] Net of securities lending expenses. Because we do not assume any additional net return for this program, we effectively assume that any securities lending expenses will be offset by related income.

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 approach 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. SCERA's asset allocation determines this portfolio risk, since risk levels are driven by the variability of returns for the various asset classes and the correlation of returns among those asset classes. This portfolio risk is incorporated into the real rate of return assumption through a risk adjustment.

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

The 5.11% 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.[2] 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 in the range of 50% to 60%.

Three years ago, the Board adopted an investment return assumption of 7.00%. That return implied a risk adjustment of 0.28%, reflecting a confidence level of 53% 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.[3]

If we use the same 53% confidence level from our last study to set this year's risk adjustment and the current long-term portfolio standard deviation of 12.44% provided by Aon, the corresponding risk adjustment would be 0.28%. Together with the other investment return components, this would result in an investment return assumption of 6.63%, 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 other alternative investment return assumptions. In particular, a net investment return assumption of 6.75%, together with

[1] This type of risk adjustment is referred to in the Actuarial Standards of Practice as a "margin for adverse deviation."

[2] 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.

[3] Based on an annual portfolio return standard deviation of 12.35% provided by Aon in 2018. 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 other investment return components, would produce a risk adjustment of 0.16% which corresponds to a confidence level of 52%. The current net investment return assumption of 7.00% would have a confidence level below 50%.

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

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

Years Ending December 31	Investment Return	Risk Adjustment	Corresponding Confidence Level
2010 - 2011	7.75%	0.41%	54%
2012 - 2014	7.50%	0.13%	51%
2015 - 2017	7.25%	0.12%	51%
2018 - 2020	7.00%	0.28%	53%
2021 (Recommended)	6.75%	0.16%	52%

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 SCERA has positioned itself relative to risk over periods of time.[1] The use of a 52% confidence level 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 Aon. 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 52% is at the lower end of the range of about 50% to 60% that corresponds to the risk adjustments used by most of Segal's other California public retirement system 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."

[1] 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	December 31, 2021 Recommended	December 31, 2018 Adopted Value
Inflation	2.50%	2.75%
Portfolio Real Rate of Return	5.11%	5.28%
Expense Adjustment	(0.70%)	(0.75%)
Risk Adjustment	(0.16%)	(0.28%)
Total	**6.75%**	**7.00%**
Confidence Level	**52%**	**53%**

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

Comparison with Alternative Model used to Review Investment Return Assumption

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

Besides using forward looking expected arithmetic returns, ASOP No. 27 also discussed setting investment return assumptions using an alternative "forward looking expected geometric returns" approach.[2] Even though expected geometric returns are lower than expected arithmetic returns, 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 SCERA. This is because under the model used by those retirement systems, their investment return assumptions are not reduced to anticipate future investment expenses.[3]

For comparison, we evaluated the recommended 6.75% assumption based on the expected geometric return for the entire portfolio, net of administrative expenses. Under that model, over

[1] 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.

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

[3] This means that if the model were to be applied to SCERA, the expected geometric return would not be adjusted for the approximately 0.55% investment expenses paid by SCERA.

a 15-year period, there is a 58% likelihood that future average geometric returns will meet or exceed 6.75%.[1]

Comparing 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 the most common among California public sector retirement systems. In particular, of the twenty 1937 Act CERL systems, twelve use a 7.00% investment return assumption, four use 6.75%, and two use 6.50%. The remaining two 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 6.625% and 6.50%, respectively.

The following table compares SCERA's recommended net investment return assumption against those of the 207 large public retirement funds in their 2020 fiscal year valuations based on information found in the Public Plans Database, which is produced in partnership with NASRA:[2]

		Public Plans Data[3]		
Assumption	**SCERA**	**Low**	**Median**	**High**
Net Investment Return	6.75%	4.50%	7.20%	8.25%

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, almost half of the systems have reduced their investment return assumption from 2017 to 2020. 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 the recommended assumption of 6.75% provides for an appropriate risk margin within the risk adjustment model and is consistent with SCERA's historical practice relative to other public systems.

[1] We performed this stochastic simulation using the capital market assumptions included in the 2020 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 2020 survey that included responses from 39 investment advisors.

[2] Among 209 large public retirement funds, the 2020 fiscal year investment return assumption was not available for 2 of the public retirement funds in the Public Plans Database as of September 2021.

[3] Public Plans Data website – Produced in partnership with the National System of State Retirement Administrators (NASRA). NASRA also maintains a survey separate from the Public Plans Database that is updated more frequently. As of September 2021 the NASRA survey shows a median net investment return assumption of 7.00%.

C. Salary Increase

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

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

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

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

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

   We also referred to the annual report on the financial status of the Social Security program published in August 2021. In that report, real "across the board" pay increases are forecast to be 1.2% 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 SCERA's active members, the actual average inflation plus "across the board" increase (i.e., wage inflation) over the five year period ending December 31, 2020 was 3.32%, which is greater than the change in CPI of 3.03% during that same period:

Valuation Date	Actual Average Increase[1]	Actual Change in CPI[2]
December 31, 2016	3.85%	3.01%
December 31, 2017	3.88%	3.22%
December 31, 2018	4.59%	3.87%
December 31, 2019	(0.43%)	3.31%
December 31, 2020	4.74%	1.72%
Five-Year Average	**3.32%**	**3.03%**

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

[2] Based on the change in the Annual CPI index for the San Francisco-Oakland-Hayward Area compared to the prior year.

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

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

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

   a. Measuring each continuing member's actual salary increase over each year of the experience period on a salary-weighted basis, with higher weights assigned to experience from members with larger salaries;
   b. Categorizing these increases according to member demographics;
   c. Removing the wage inflation component from these increases (assumed to be equal to the increase in the members' average salary during the year);
   d. Averaging these annual increases over the experience period; and
   e. Modifying current assumptions to reflect some portion of these measured increases reflective of their "credibility."

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

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

The following table shows the General members' actual average merit and promotion increases by years of service over the three-year period from January 1, 2018 through December 31, 2020 along with the actual average increases based on combining the current three-year period with the three-year period from the prior experience study. The current and proposed assumptions are also shown. The actual increases were reduced by the actual average inflation plus "across the board" increase (i.e. wage inflation, estimated as the increase in average salaries) for each year during the experience period (2.91% on average for the most recent three-year period).

General

Rate (%)

Years of Service	Current Assumption	Actual Average Increase from Current Study (Last 3 Years)	Actual Average Increase from Current and Prior Studies (Last 6 Years)	Proposed Assumption
Less than 1	5.50	3.13	3.16	5.00
1 – 2	5.00	6.25	6.71	5.50
2 – 3	4.50	4.48	5.06	4.50
3 – 4	3.50	3.25	3.99	3.50
4 – 5	2.50	2.41	2.82	2.50
5 – 6	1.50	2.07	2.26	2.00
6 – 7	1.25	1.52	1.80	1.50
7 – 8	1.00	1.42	1.64	1.25
8 – 9	0.95	1.83	1.40	1.25
9 – 10	0.90	1.74	1.57	1.25
10 – 11	0.85	1.73	1.28	1.00
11 – 12	0.80	1.54	1.23	1.00
12 – 13	0.75	0.89	0.78	0.75
13 – 14	0.75	0.81	1.08	0.75
14 – 15	0.75	0.56	0.76	0.75
15 & Over	0.50	0.57	0.59	0.55

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

Chart 1 that follows later in the section compares the actual merit and promotion increase experience with the current and proposed assumptions for General members. Also shown is the actual merit and promotion increases based on an average of both the current and previous three-year experience periods.

The following table shows the Safety members' actual average merit and promotion increases by years of service over the three-year period from January 1, 2018 through December 31, 2020 along with the actual average increases based on combining the current three-year period with the three-year period from the prior experience study. The current and proposed assumptions are also shown. The actual increases were reduced by the actual average inflation plus "across the board" increase (i.e. wage inflation, estimated as the increase in average salaries) for each year during the experience period (3.19% on average for the most recent three-year period).

Safety

Rate (%)

Years of Service	Current Assumption	Actual Average Increase from Current Study (Last 3 Years)	Actual Average Increase from Current and Prior Studies (Last 6 Years)	Proposed Assumption
Less than 1	7.50	6.94	6.58	7.50
1 – 2	7.00	8.96	9.59	7.50
2 – 3	5.00	5.16	5.76	5.00
3 – 4	4.00	4.44	4.71	4.50
4 – 5	3.50	3.24	5.41	3.50
5 – 6	1.50	2.21	2.37	1.75
6 – 7	1.25	2.05	2.03	1.50
7 – 8	1.25	0.51	1.21	1.25
8 – 9	1.25	1.44	1.39	1.25
9 – 10	1.25	1.00	1.54	1.25
10 – 11	1.25	0.39	1.03	1.25
11 – 12	1.25	1.28	1.82	1.25
12 – 13	1.25	1.28	1.84	1.25
13 – 14	1.00	0.88	1.18	1.00
14 – 15	1.00	1.45	1.51	1.00
15 & Over	0.75	1.13	1.24	1.00

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

Chart 2 compares the actual merit and promotion increase experience with the current and proposed assumptions for Safety members. Also shown is the actual merit and promotion increases based on an average of both the current and previous three-year experience periods.

Active Member Payroll

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

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

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

Chart 1: Merit and Promotion Salary Increase Rates
General Members

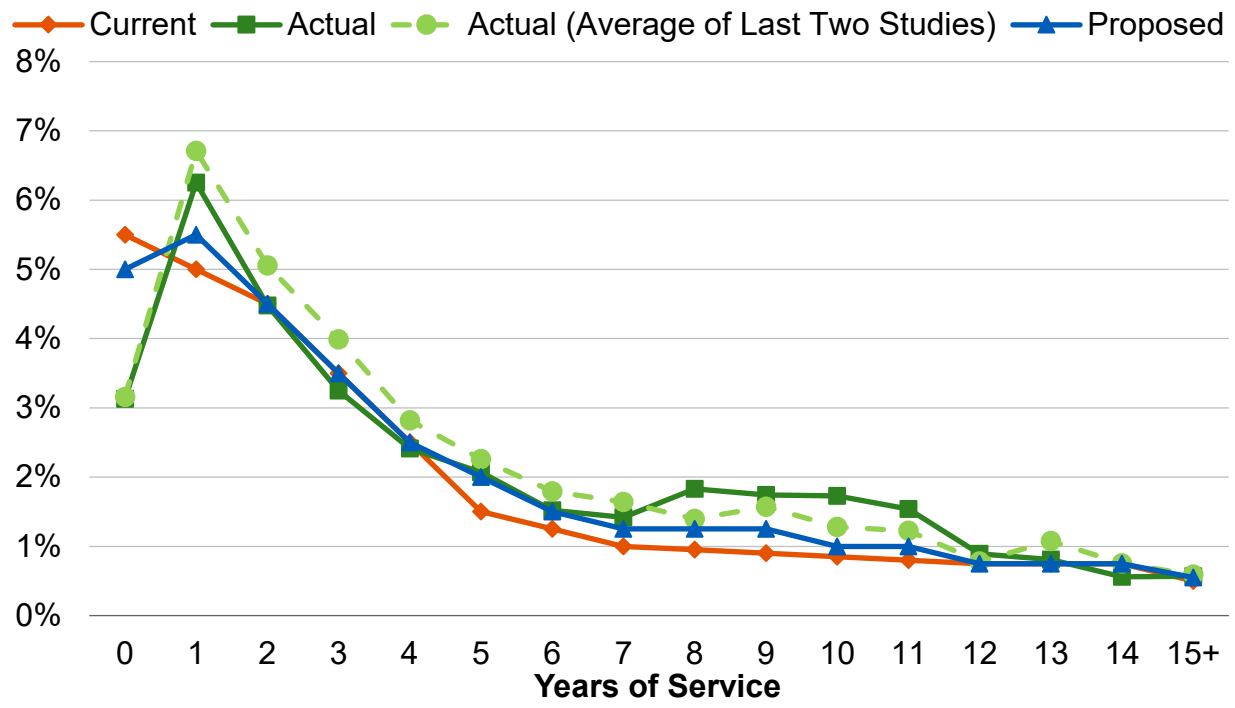
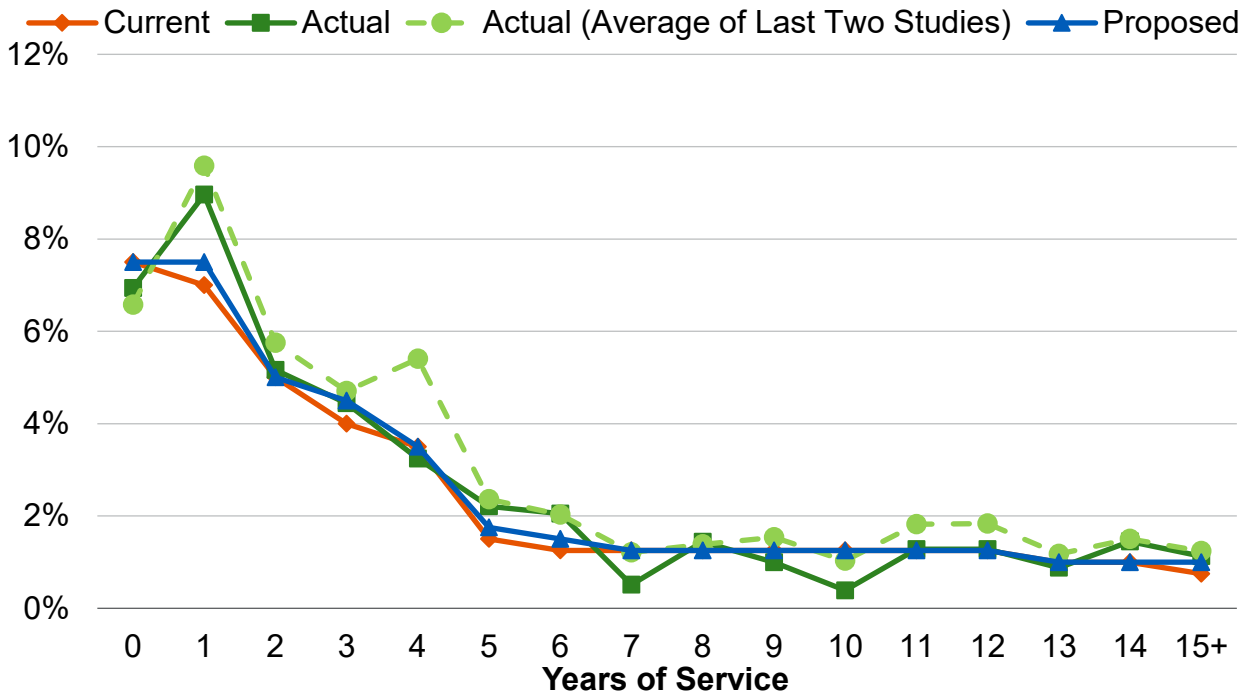


Chart 2: Merit and Promotion Salary Increase Rates
Safety Members



4. Demographic Assumptions

A. Retirement Rates

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

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

General Plan A

Rate of Retirement (%)

	Less than 30 Years of Service			30 or More Years of Service		
Age	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
50	6.00	4.35	5.00	10.00	0.00	10.00
51	6.00	2.63	3.50	10.00	0.00	10.00
52	6.00	2.60	4.50	10.00	0.00	10.00
53	6.00	4.30	5.00	15.00	6.25	15.00
54	7.00	4.43	5.50	20.00	0.00	20.00
55	10.00	8.96	10.00	25.00	11.11	20.00
56	8.00	9.04	8.50	25.00	16.67	20.00
57	8.00	9.84	8.50	30.00	15.38	20.00
58	12.00	10.06	10.00	30.00	23.08	25.00
59	20.00	17.22	18.00	40.00	52.94	40.00
60	25.00	19.85	21.00	40.00	55.56	40.00
61	25.00	14.91	21.00	45.00	22.22	40.00
62	30.00	27.18	27.00	45.00	50.00	45.00
63	30.00	28.17	27.00	45.00	33.33	45.00
64	30.00	22.67	27.00	45.00	0.00	45.00
65	30.00	35.19	32.00	45.00	66.67	45.00
66	40.00	31.71	40.00	45.00	100.00	45.00
67	40.00	50.00	40.00	50.00	33.33	45.00
68	40.00	23.08	40.00	50.00	50.00	50.00
69	50.00	38.46	50.00	80.00	0.00	50.00
70 & Over	100.00	31.82	100.00	100.00	0.00	100.00

Based on this experience, we recommend decreasing the retirement rate assumption at certain ages while increasing the retirement rate assumption at other ages. Overall, the proposed rates represent a decrease from the current rates for General Plan A members.

Chart 3 that follows later in this section compares the actual retirement experience with the current and proposed assumptions for General Plan A members with less than 30 years of service.

Chart 4 compares the actual retirement experience with the current and proposed assumptions for General Plan A members with 30 or more years of service.

The following table shows the observed service retirement rates for Safety Plan A members based on the actual experience over the past three years, separately for those with less than 30 years of service and more than 30 years of service. Also shown are the current assumed rates and the rates we propose.

Safety Plan A

Rate of Retirement (%)

	Less than 30 Years of Service			30 or More Years of Service		
Age	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
46	0.00	2.86	2.00	0.00	N/A	0.00
47	0.00	5.56	2.00	0.00	N/A	0.00
48	5.00	6.67	6.00	5.00	N/A	6.00
49	5.00	25.49	15.00	5.00	100.00	15.00
50	18.00	18.18	18.00	18.00	N/A	18.00
51	16.00	6.52	14.00	16.00	0.00	16.00
52	12.00	13.51	12.00	18.00	0.00	18.00
53	14.00	13.51	14.00	25.00	0.00	25.00
54	22.00	6.67	16.00	50.00	0.00	50.00
55	25.00	16.00	18.00	75.00	0.00	50.00
56	30.00	25.00	25.00	75.00	0.00	50.00
57	20.00	15.38	20.00	75.00	50.00	50.00
58	20.00	0.00	20.00	75.00	0.00	50.00
59	20.00	25.00	20.00	75.00	100.00	75.00
60	75.00	42.86	50.00	100.00	N/A	75.00
61	75.00	42.86	50.00	100.00	0.00	75.00
62	75.00	20.00	50.00	100.00	0.00	75.00
63	75.00	37.50	50.00	100.00	33.33	75.00
64	75.00	40.00	50.00	100.00	0.00	75.00
65 & Over	100.00	0.00	100.00	100.00	0.00	100.00

Based on this experience, we recommend decreasing the retirement rate assumption at certain ages while increasing the retirement rate assumption at other ages. Overall, the proposed rates represent a decrease from the current rates for Safety Plan A members.

Chart 5 compares the actual retirement experience with the current and proposed assumptions for Safety Plan A members with less than 30 years of service.

Chart 6 compares the actual retirement experience with the current and proposed assumptions for Safety Plan A members with 30 or more years of service.

On January 1, 2013, new PEPRA formulas were implemented for new General and Safety Plan B tiers. For these new tiers we do not have enough credible experience from the past three years to propose new rates based solely on actual retirements from members of those tiers nor change the assumption structure to be based on both age and years of service. However, we have revised some of our recommended rates for Plan B members based on our recommended rates for Plan A members as well as some of the Plan B experience that we have observed. This assumption will continue to be monitored in future experience studies, including whether service based retirement rates should also be implemented for Plan B members.

The following table shows the observed service retirement rates for General Plan B members along with the current assumed rates and the rates we propose.

General Plan B

Rate of Retirement (%)

Age	Current Rate	Actual Rate	Proposed Rate
50	0.00	N/A	0.00
51	0.00	N/A	0.00
52	3.50	0.00	3.50
53	1.00	0.00	1.00
54	2.00	0.00	2.00
55	2.50	0.00	2.50
56	3.50	0.00	3.50
57	4.50	0.00	4.50
58	5.00	10.00	5.00
59	7.50	0.00	7.50
60	8.50	0.00	8.00
61	9.50	6.25	12.00
62	14.50	5.26	15.00
63	16.50	33.33	20.00
64	19.00	27.27	25.00
65	24.00	44.44	25.00
66	20.00	66.67	25.00
67	20.00	40.00	25.00
68	20.00	25.00	25.00
69	20.00	0.00	25.00
70 & Over	100.00	23.08	100.00

Chart 7 compares the actual retirement experience with the current and proposed assumptions for General Plan B members.

The following table shows the observed service retirement rates for Safety Plan B members along with the current assumed rates and the rates we propose.

Safety Plan B

Rate of Retirement (%)

Age	Current Rate	Actual Rate	Proposed Rate
50	5.00	N/A	5.00
51	5.00	N/A	5.00
52	4.50	N/A	4.50
53	4.50	0.00	4.50
54	7.50	N/A	7.50
55	16.50	0.00	16.50
56	15.00	0.00	15.00
57	12.00	0.00	12.00
58	16.00	0.00	16.00
59	16.00	N/A	16.00
60	75.00	N/A	50.00
61	75.00	N/A	50.00
62	75.00	0.00	50.00
63	75.00	100.00	50.00
64	75.00	N/A	50.00
65 & Over	100.00	100.00	100.00

Chart 8 compares the actual retirement experience with the current and proposed assumptions for Safety Plan B members.

Deferred Vested Members

Under the current assumptions, deferred vested General and Safety members were assumed to retire at age 58 and 53, respectively, regardless of the member's reciprocity status. For this study, we examined the deferred vested retirement age separately for reciprocal and non-reciprocal members.

The following table shows the observed deferred vested retirement age for General members based on the actual experience over the past three years, separately for those who went on to work at a reciprocal retirement system and those that did not. Also shown are the current assumed retirement ages and the retirement ages we propose.

General Members' Deferred Vested Retirement Age

	Reciprocal Members	Non-Reciprocal Members
Current Assumption	58.0	58.0
Actual Average Age	61.1	57.7
Proposed Assumption	60.0	58.0

Based on this experience, we recommend increasing the deferred vested retirement age assumption for General reciprocal members from age 58 to 60 and maintaining the deferred vested retirement age assumption for General non-reciprocal members at age 58.

The following table shows the observed deferred vested retirement age for Safety members based on the actual experience over the past three years, separately for those who went on to work at a reciprocal retirement system and those that did not. Also shown are the current assumed retirement ages and the retirement ages we propose.

Safety Members' Deferred Vested Retirement Age

	Reciprocal Members	Non-Reciprocal Members
Current Assumption	53.0	53.0
Actual Average Age	56.0	50.8
Proposed Assumption	55.0	52.0

Based on this experience, we recommend increasing the deferred vested retirement age assumption for Safety reciprocal members from age 53 to 55 and reducing the deferred vested retirement age assumption for Safety non-reciprocal members from age 53 to 52.

Reciprocity

Under current assumptions, it is assumed that 25% of General and 40% of Safety future deferred vested members will be covered under a reciprocal retirement system. As of December 31, 2020, about 22% of the total General deferred vested members and 32% of the total Safety deferred vested members went on to be covered by a reciprocal retirement system.

Based on this experience, we recommend maintaining the future reciprocal assumption for General members at 25% and reducing the future reciprocal assumption for Safety members from 40% to 35%.

It is assumed that all current and future members covered under a reciprocal retirement system will receive annual salary increases from termination until their date of retirement. Under current assumptions, these annual salary increases are 3.75% for General members and 4.00% for Safety members. These salary increases are based on the current ultimate merit and promotion salary increase assumptions, together with the current inflation and real "across the board" salary increase assumptions.

Based on the recommended ultimate 0.55% and 1.00% merit and promotion salary increase assumptions, for General and Safety members respectively, together with the recommended 2.50% inflation assumption and 0.50% real "across the board" salary increase assumption, we recommend reducing the reciprocal salary increase assumption for General members from 3.75% to 3.55% and maintaining the reciprocal salary increase assumption for Safety members at 4.00%.

Survivor Continuance Under the Unmodified Option

Under current assumptions, it was assumed that 70% of all active and inactive male members and 55% of all active and inactive female members would be married or have an eligible domestic partner at the time of their retirement or pre-retirement death. We reviewed experience for new retirees during the 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

Year Ending December 31	Male	Female
2018	67%	58%
2019	63%	55%
2020	70%	55%
Total	**66%**	**56%**

Based on this experience, we recommend maintaining the percent married assumption for male and female members at 70% and 55%, respectively.

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

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

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

Member's Age as Compared to Spouse's Age

	Male Retiree	Female Retiree
Current Assumption	4 years older	2 years younger
Actual Experience	2.6 years older	1.7 years younger
Proposed Assumption	3 years older	2 years younger

Chart 3: Retirement Rates
General Plan A Members with less than 30 Years of Service

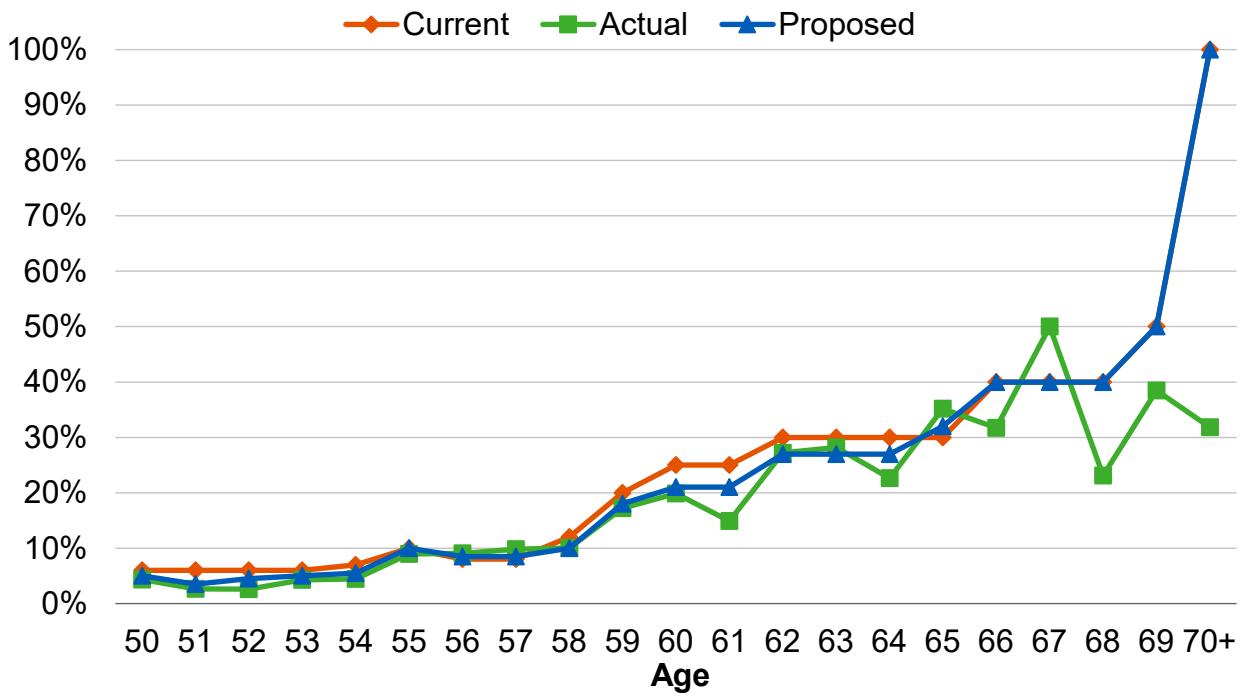


Chart 4: Retirement Rates
General Plan A Members with 30 or more Years of Service

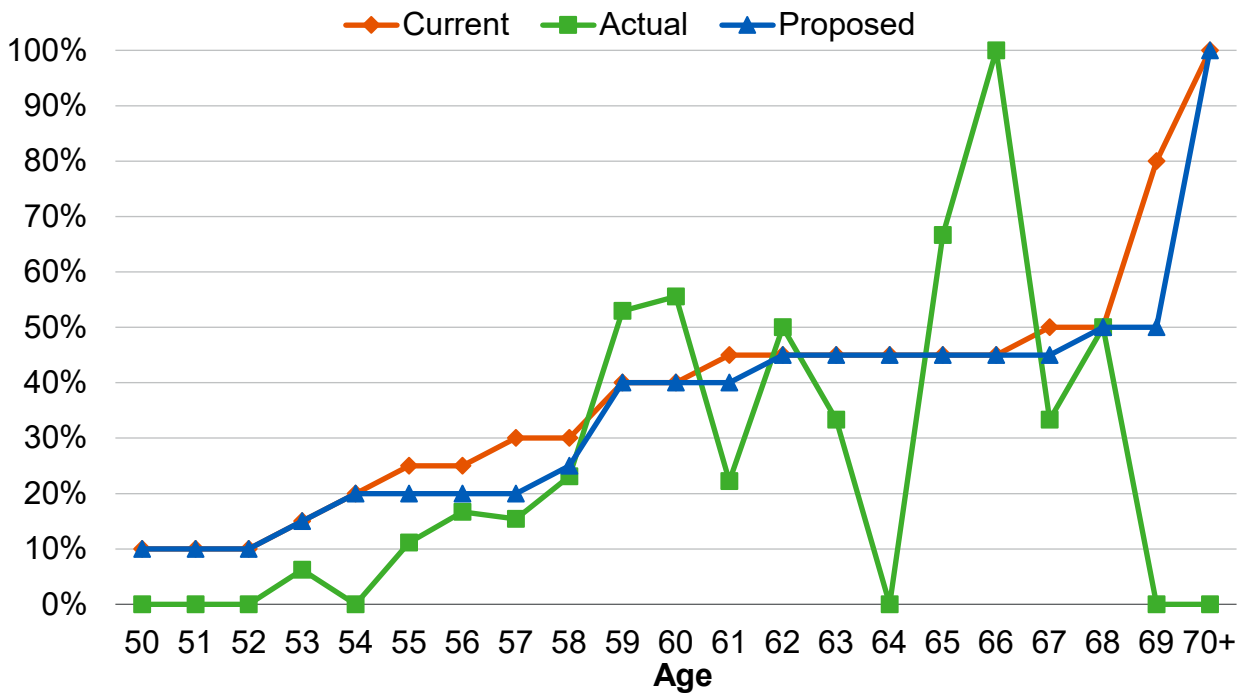


Chart 5: Retirement Rates
Safety Plan A Members with less than 30 Years of Service

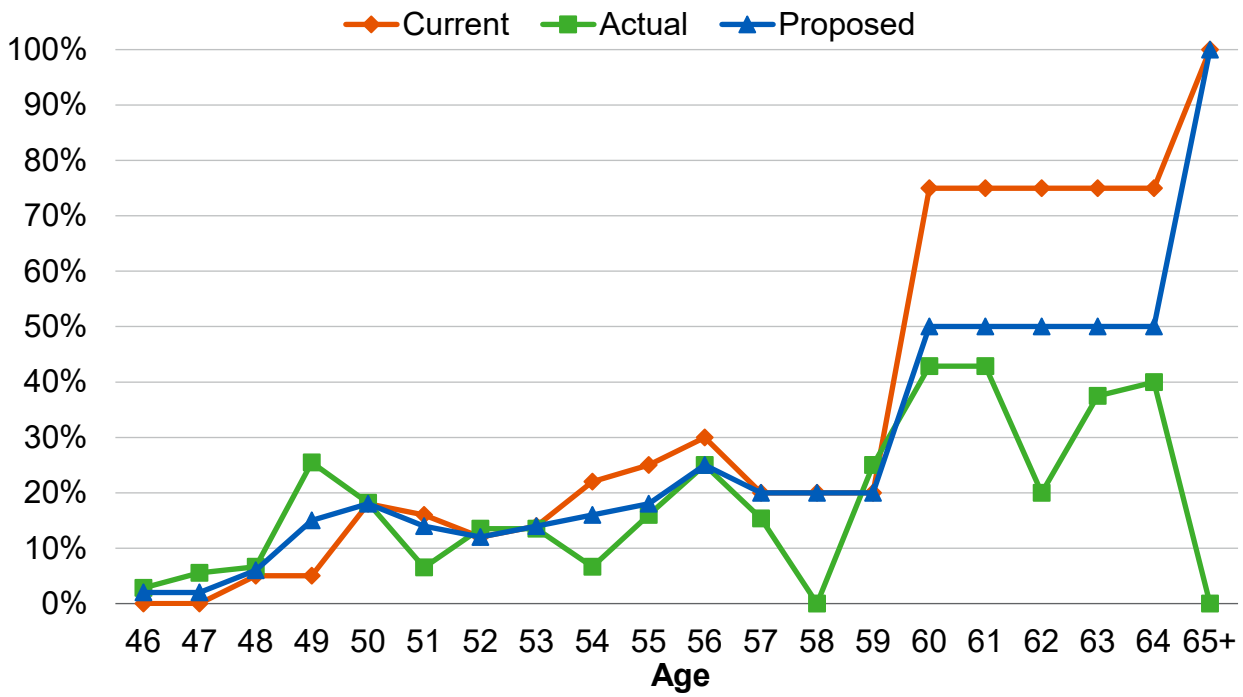


Chart 6: Retirement Rates
Safety Plan A Members with 30 or more Years of Service

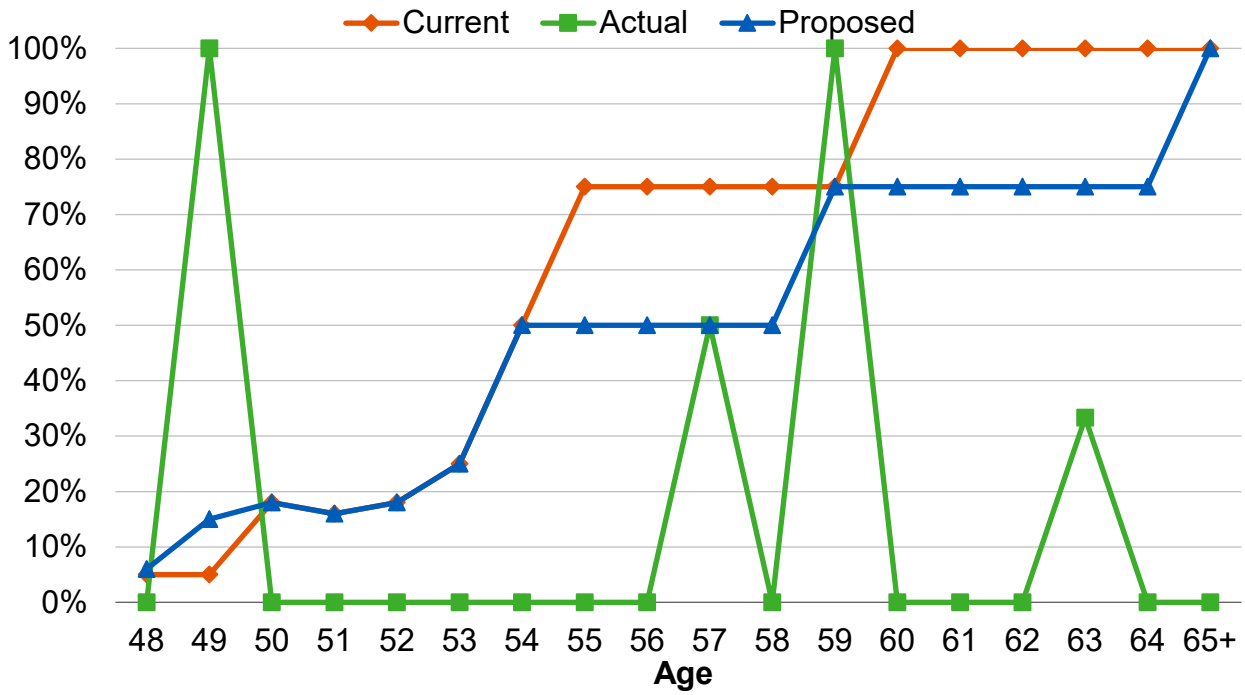


Chart 7: Retirement Rates
General Plan B Members

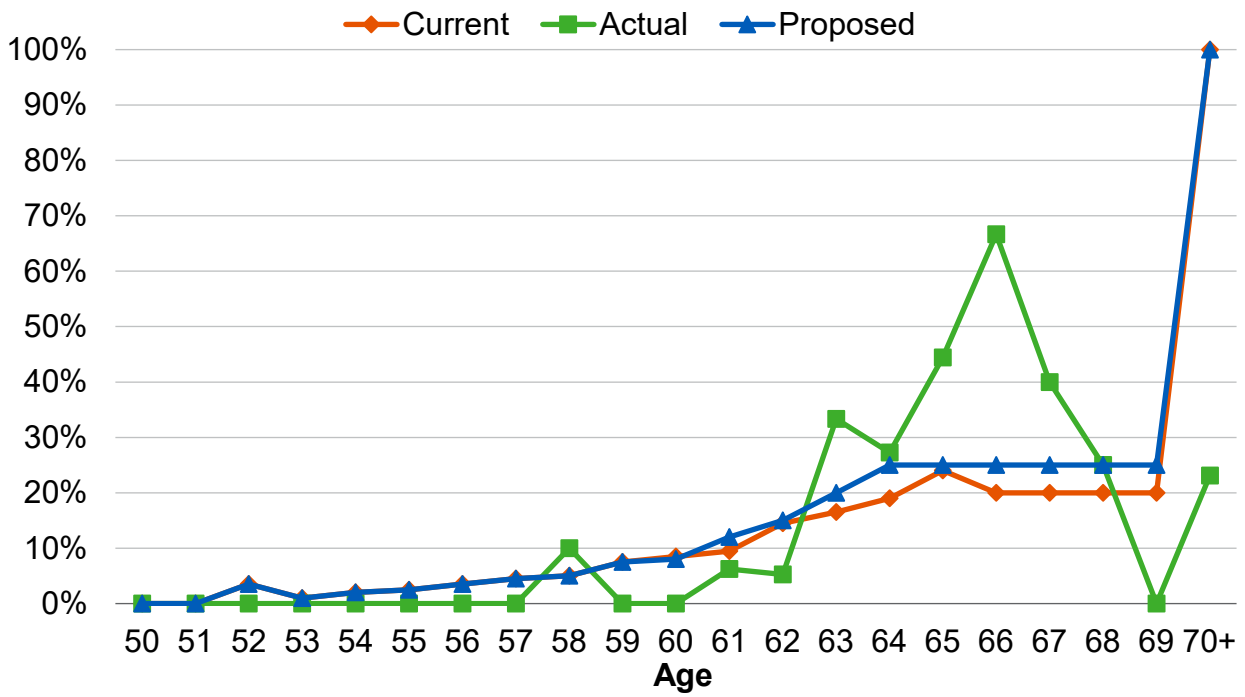
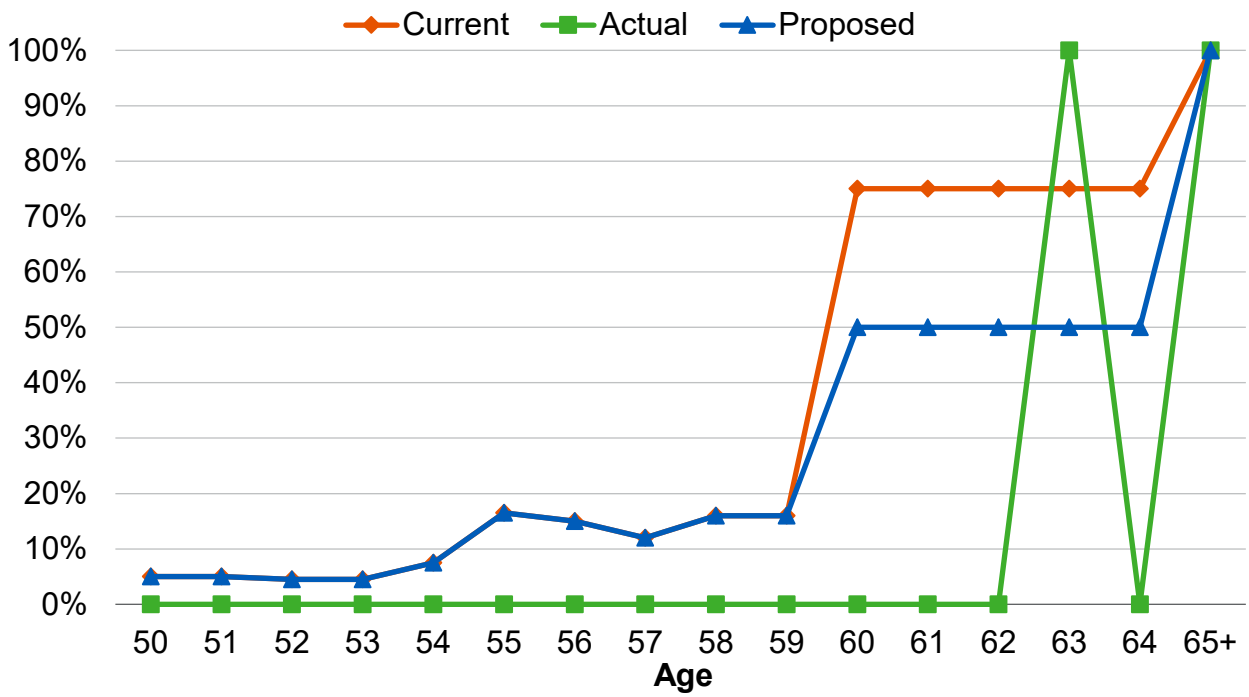


Chart 8: Retirement Rates
Safety Plan B Members



B. Mortality Rates - Healthy

The “healthy” mortality rates project the life expectancy of a member who retires from service (i.e., who did not retire on a disability pension). Also, the “healthy” pre-retirement mortality rates project what proportion of members will die before retirement. For General and Safety members, the table currently being used for post-service retirement mortality rates is the Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table (separate tables for males and females) decreased by 6% for males and increased by 2% for females, projected generationally with the two-dimensional mortality improvement scale MP-2017. Beneficiaries are assumed to have the same mortality as a General Member of the opposite sex who is receiving a service (non-disability) retirement.

When we conducted the last experience study, we alerted the Board that we may recommend a change from a Headcount-Weighted to a Benefit-Weighted table once the Society of Actuaries (SOA) provided such 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 published the Public Retirement Plans Mortality tables (Pub-2010). For the first time, the published mortality tables are based exclusively on public sector pension plan experience in the United States. Within the Pub-2010 family of mortality tables, there are separate tables by job categories of General, Safety and Teachers. Included with the mortality tables is the analysis prepared by RPEC that continues to observe that benefit amount for healthy retirees and salary for employees are the most significant predictors of mortality differences within the job categories. Therefore, Pub-2010 includes mortality rates developed for annuitants on a “benefit” weighted basis, with higher credibility assigned to experience from annuitants receiving larger benefits.

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 Benefit Amounts ($) by Gender, Job Category, and Status

	Males		Females	
Job Category	**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.

Even after we adjust the above amounts by a reasonable measure of U.S. price inflation from 2010 to 2020 for a total increase of around 30%, the benefit amounts (or salaries) paid to SCERA’s members were generally greater than the adjusted median amounts shown above.

Therefore, we recommend that the above-median version of the mortality tables for each job category be used. [1]

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

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

We understand that RPEC intends to publish annual updates to their mortality improvement scales. Improvement scale MP-2020 is the latest improvement scale available. We recommend that the Board adopt the Benefit-Weighted Above-Median Pub-2010 mortality table (adjusted for SCERA experience), and project the mortality improvement generationally using the MP-2020 mortality improvement scale.

In order to reflect more SCERA experience in our analysis, we have used experience for a twelve-year period by using data from the current (from January 1, 2018 through December 31, 2020 and the last three (from January 1, 2015 through December 31, 2017; from January 1, 2012 through December 31, 2014; and from January 1, 2009 through December 30, 2011) experience study periods in order to analyze this assumption.

Even with the use of twelve 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, particularly for the Safety cost groups. In 2008 the SOA published an article recommending that mortality assumptions include an adjustment for credibility. Under this approach, the number of deaths needed for full credibility for a headcount-weighted mortality table is just over 1,000, where full credibility means a 90% confidence that the actual experience will be within 5% of the expected value. Therefore, in our recommended assumptions, we have only partially adjusted the Pub-2010 mortality tables to fit SCERA's experience particularly for the Safety cost groups. In future experience studies, more data will be available which may further increase the credibility of the SCERA experience.

Post-Retirement Mortality (Service Retirements)

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

[1] In a draft 2021 experience study report released by CalPERS, their actuaries have included a recommendation to the board to use benefit-weighted experience in selecting mortality tables.

The proposed mortality table also reflects current experience to the extent that the experience is credible based on standard statistical theory. For SCERA, the volume of General member data makes it relatively credible. In contrast, there is much less Safety data, so it is given substantially less credibility. As shown in the table below, the proposed mortality tables have actual to expected ratios of 101% and 98% for General and Safety respectively, after an adjustment to the General female rates for partial credibility. In future years the ratios should remain around 101% and 98% for General and Safety, respectively, as long as actual mortality improves at the same rates as anticipated by the generational mortality tables. The number of actual deaths compared to the number expected under the current and proposed assumptions weighted by benefit amounts for the last twelve years are as follows:

Healthy Retiree Mortality Experience – Benefit Weighted

($ in millions)

	General Members			Safety Members		
Gender	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths
Male	10.72	8.84	8.84	2.68	1.73	1.80
Female	9.29	7.83	7.74	0.37	0.32	0.28
Total	**20.02**	**16.67**	**16.58**	**3.05**	**2.04**	**2.08**
Actual / Expected	**83%**		**101%[1]**	**67%**		**98%**

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 add due to rounding.

For General members, we recommend updating the current table to the Pub-2010 General Healthy Retiree Amount-Weighted Above-Median Mortality Table (separate tables for males and females) with rates increased by 5% for females, projected generationally with the two-dimensional mortality improvement scale MP-2020.

For Safety members, we recommend updating the current table to the Pub-2010 Safety Healthy Retiree Amount-Weighted Above-Median Mortality Table (separate tables for males and females), projected generationally with the two-dimensional mortality improvement scale MP-2020.

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.

[1] If we use the benchmark Pub-2010 General table without any adjustment, the proposed actual to expected ratio would be 103%.

Healthy Retiree Mortality Experience – Headcount Weighted

	General Members			Safety Members		
Gender	Current Expected Deaths	Actual Deaths	Proposed Expected Deaths	Current Expected Deaths	Actual Deaths	Proposed Expected Deaths
Male	334	312	287	59	46	43
Female	450	438	397	10	12	8
Total	**784**	**750**	**683**	**69**	**58**	**51**
Actual / Expected	**96%**		**110%**	**84%**		**114%**

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 Above-Median Mortality Tables.
3. Results may not total due to rounding.
4. In the last experience study, we reviewed the mortality expected for all General, Safety and all beneficiaries combined. If we were to combine the current expected deaths provided in the table above for General and Safety only, the actual to expected ratio would have been 95%.

Chart 9 that follows later in this section compares the number of actual to expected deaths on a benefit-weighted basis over the past twelve years for the current and proposed assumptions for Service Retirement General members.

Chart 10 compares the number of actual to expected deaths on a benefit-weighted basis over the past twelve years for the current and proposed assumptions for Service Retirement Safety members.

Chart 11 compares the number of actual to expected deaths on a headcount-weighted basis over the past twelve years for the current and proposed assumptions for Service Retirement General members, provided for informational purposes only.

Chart 12 compares the number of actual to expected deaths on a headcount-weighted basis over the past twelve years for the current and proposed assumptions for Service Retirement Safety members, provided for informational purposes only.

Chart 13 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, assumed life expectancies will increase as a result of the mortality improvement scale.

Chart 14 shows the life expectancies (i.e., expected future lifetime) under the current and the proposed tables for Safety members on a benefit-weighted basis.

Beneficiary 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 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 based only on contingent survivor data after the death of the retirees. This is consistent with the mortality experience that we have available for beneficiaries. The Pub-2010 contingent survivor mortality rates are comparable to SCERA's actual mortality experience for beneficiaries. However, in contrast to service retirees, there is much less beneficiary data, so it is given little credibility when adjusting the base table. As shown in the table below, the proposed mortality tables have an actual to expected ratio of 109%, after adjustments for partial credibility. In future years the ratio should remain around 109% 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 twelve years are as follows:

Beneficiary Mortality Experience – Benefit Weighted
($ in millions)

Gender	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths
Male	0.48	0.61	0.55
Female	2.47	2.66	2.43
Total	**2.95**	**3.27**	**2.98**
Actual / Expected	**111%**		**109%[1]**

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 add due to rounding.

For all beneficiaries, we recommend changing the mortality assumption to follow the Pub-2010 Contingent Survivor Amount-Weighted Above-Median Mortality Table (separate tables for males and females) with rates increased by 5% for females and males, projected generationally with the two-dimensional mortality improvement scale MP-2020.

Pre-Retirement Mortality

For General and Safety members, the table currently being used for pre-retirement mortality rates is the Headcount-Weighted RP-2014 Employee Mortality Table (separate tables for males and females) decreased by 7% for males and 5% for females, projected generationally with the two-dimensional scale MP-2017.

[1] If we use the benchmark Pub-2010 Contingent Survivor table without any adjustment, the proposed actual to expected ratio would be 115%.

When analyzing pre-retirement mortality, there is much less data available, so it is given little credibility when adjusting the base table. As shown in the table below, the proposed mortality tables have an actual to expected ratio of 78% and 28% for General and Safety respectively, after adjustments for partial credibility. In future years the ratio should remain around 78% and 28% for General and Safety, respectively, as long as actual mortality improves at the same rates as anticipated by the generational mortality tables. The number of actual deaths compared to the number expected under the current and proposed assumptions weighted by annual salary for the last twelve years are as follows:

Pre-Retirement Mortality Experience – Salary Weighted
($ in millions)

	General Members			Safety Members		
Gender	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths
Male	3.07	0.98	1.64	0.94	0.16	0.48
Female	2.69	1.56	1.62	0.13	0.00	0.09
Total	**5.77**	**2.54**	**3.26**	**1.07**	**0.16**	**0.58**
Actual / Expected	**44%**		**78%[1]**	**15%**		**28%[2]**

Notes:

1. Experience shown above is weighted by annual salary 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 add due to rounding.

For General members, we recommend changing the pre-retirement mortality to follow the Pub-2010 General Employee Amount-Weighted Above-Median Mortality Table (separate tables for males and females) decreased by 5% for males, projected generationally with the two-dimensional mortality improvement scale MP-2020.

For Safety members, we recommend changing the pre-retirement mortality to follow the Pub-2010 Safety Employee Amount-Weighted Above-Median Mortality Table (separate tables for males and females) decreased by 5% for males, projected generationally with the two-dimensional mortality improvement scale MP-2020.

Currently, our assumption is that all General and Safety member pre-retirement deaths are non-service connected. Based on the actual experience during the last three years of 7 total deaths, none were due to service-connected causes. **Based on this experience, we recommend maintaining the current assumption for both General and Safety members.[3]**

[1] If we use the benchmark Pub-2010 General Employee table without any adjustment, the proposed actual to expected ratio would be 76%.

[2] If we use the benchmark Pub-2010 General Employee table without any adjustment, the proposed actual to expected ratio would be 27%.

[3] We understand based on anecdotal information provided by SCERA, there might have been one COVID-19 related death among the beneficiaries preceding a retired member. While it is possible that COVID-19 deaths for members in certain industries may be

Mortality Table for Member Contributions, Optional Forms of Payment

There are administrative reasons why a generational mortality table is more difficult to implement for determining member contributions for legacy tiers (i.e., Plan A) and optional forms of payment. 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 Plan A.

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 Above-Median Mortality Table (separate tables for males and females) with rates increased by 5% for females, projected 30 years (from 2010) with the two-dimensional mortality improvement scale MP-2020, weighted 33.33% male and 66.667% female.

For Safety members, we recommend that the mortality table used for determining contributions for Safety members be updated to a blended table based on the Pub-2010 Safety Healthy Retiree Amount-Weighted Above-Median Mortality Table (separate tables for males and females), projected 30 years (from 2010) with the two-dimensional mortality improvement scale MP-2020, weighted 75% male and 25% female.

For optional forms of payment, there are some administrative issues that we may need to resolve with SCERA and its vendor maintaining the pension administration software before we would recommend a comparable generational scale to anticipate future mortality improvement. We will provide a recommendation to SCERA for use in reflecting mortality improvement for determining optional forms of payment after we have those discussions with SCERA and its vendor.

considered service connected, we do not recommend a change in our assumption to reflect this possible short-term increase in service connected deaths.

Chart 9: Post-Retirement Benefit-Weighted Deaths ($ In Millions)
Service Retirement General Members
(January 1, 2009 through December 31, 2020)

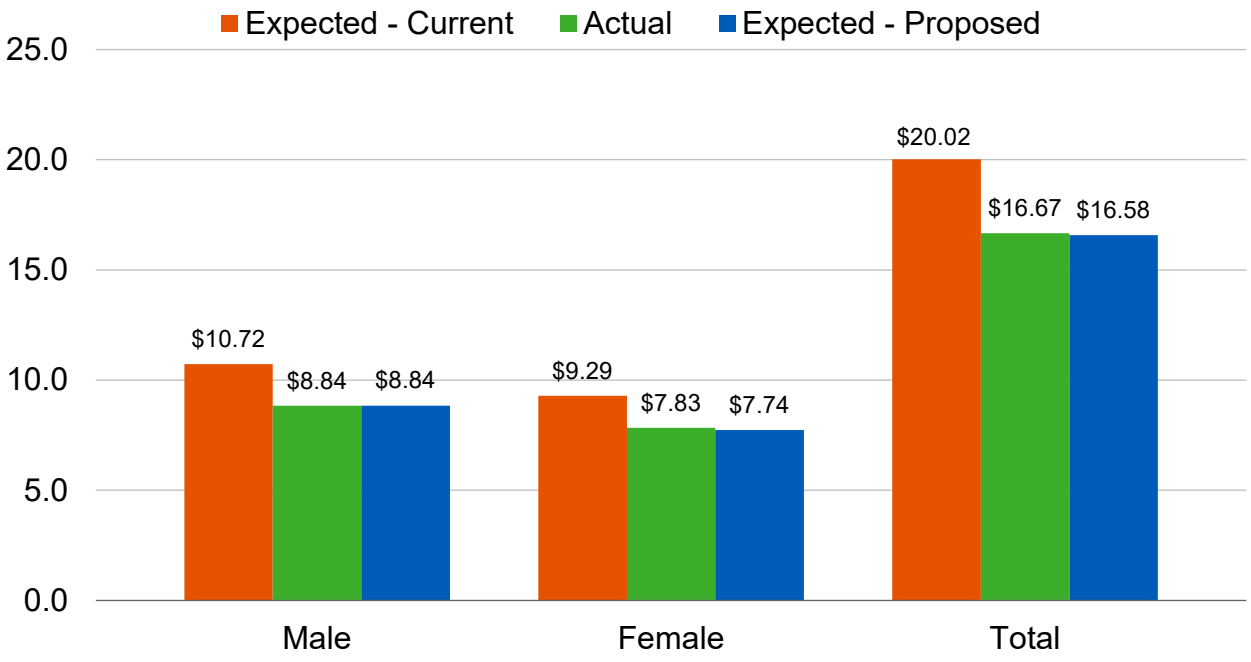


Chart 10: Post-Retirement Benefit-Weighted Deaths ($ In Millions)
Service Retirement Safety Members
(January 1, 2009 through December 31, 2020)

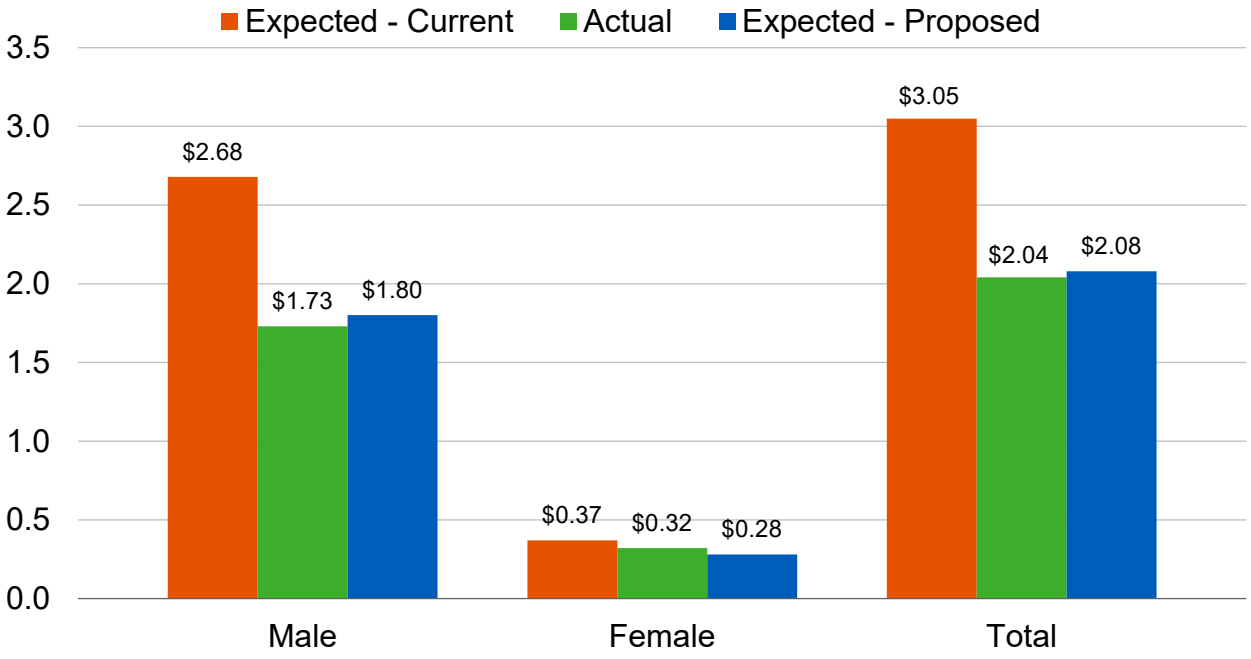


Chart 11: Post-Retirement Headcount-Weighted Deaths
Service Retirement General Members (January 1, 2009 through December 31, 2020)
Provided for Informational Purposes Only

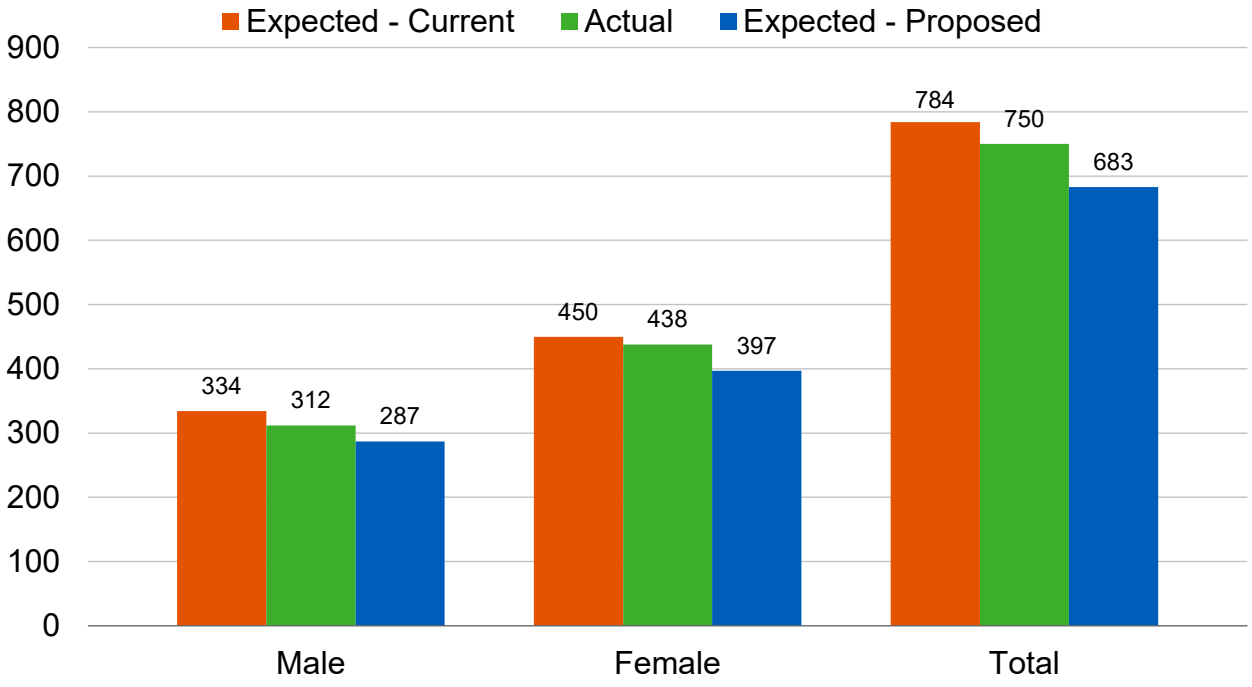


Chart 12: Post-Retirement Headcount-Weighted Deaths
Service Retirement Safety Members (January 1, 2009 through December 31, 2020)
Provided for Informational Purposes Only

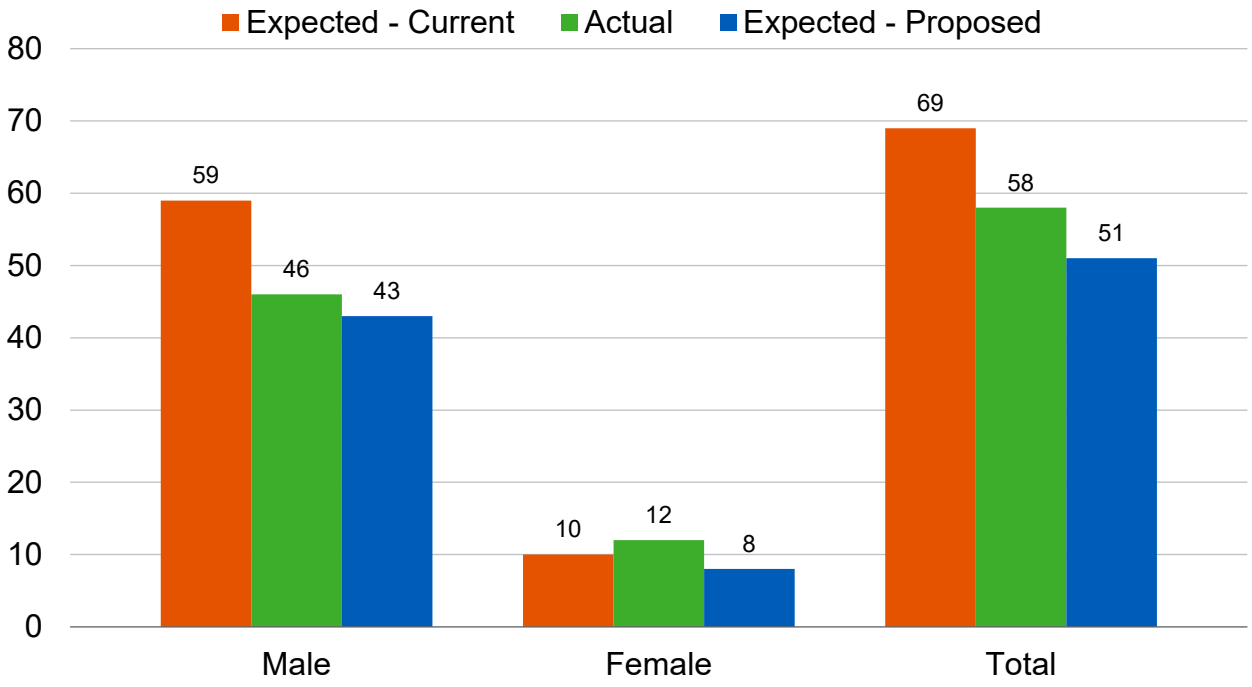


Chart 13: Benefit-Weighted Life Expectancies
Service Retirement General Members

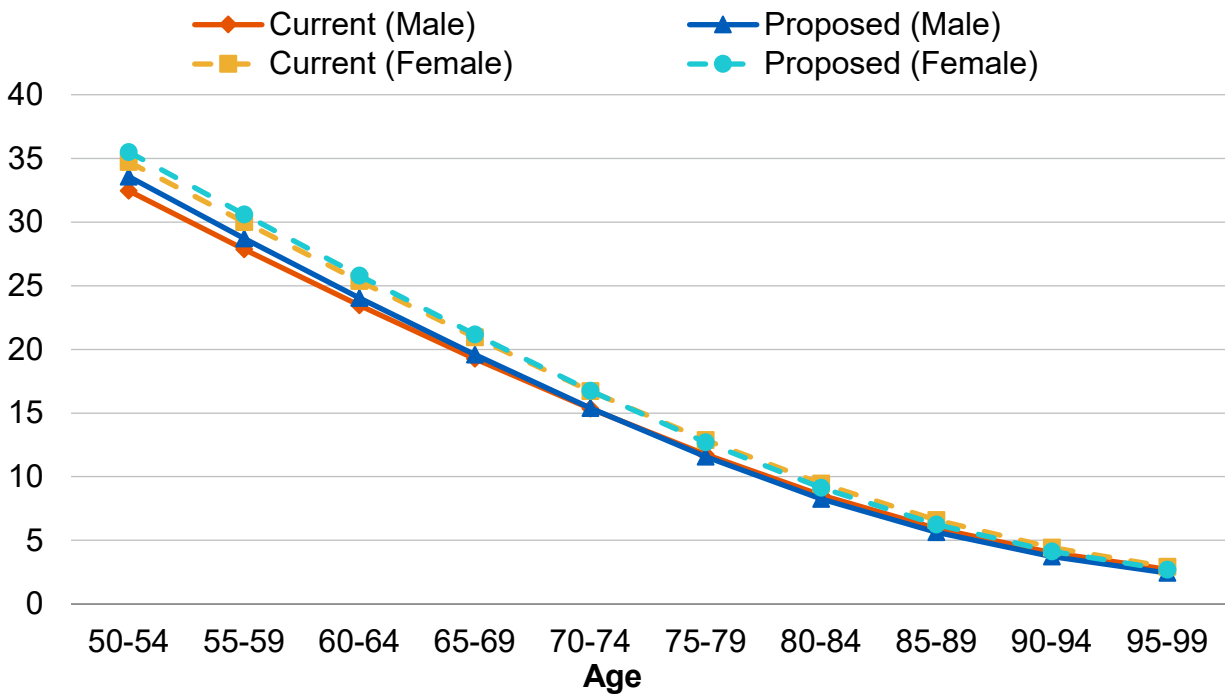
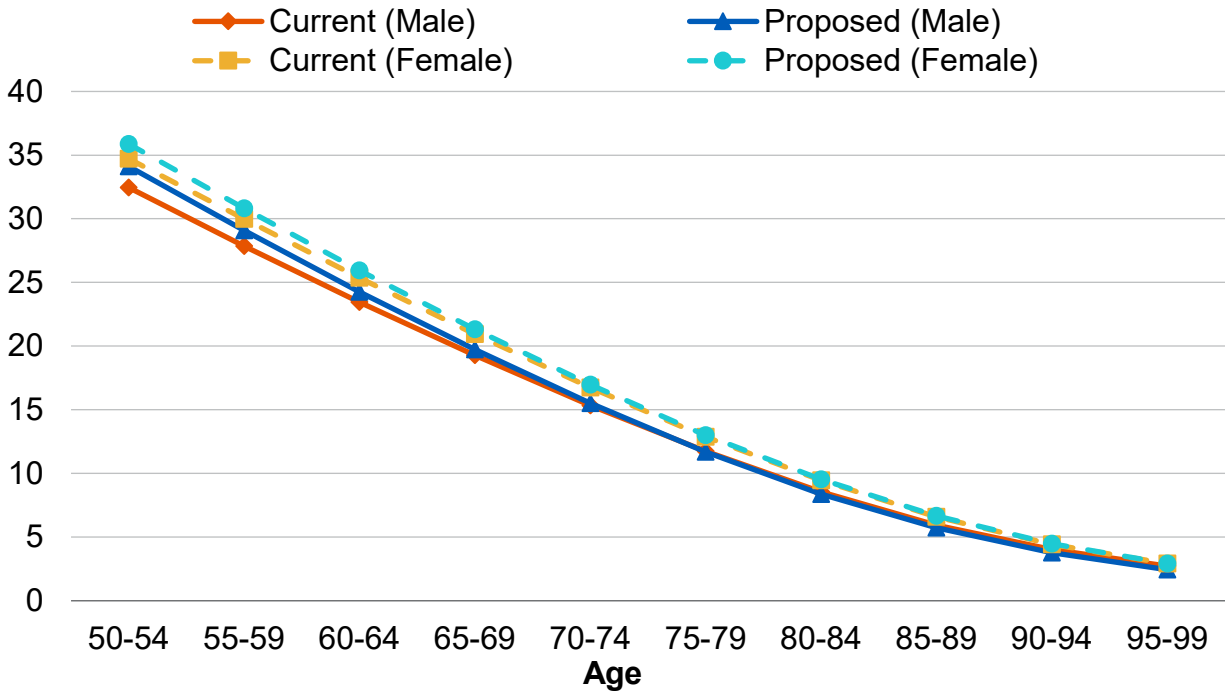


Chart 14: Life Expectancies
Service Retirement Safety Members



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 and Safety members, the table currently being used is the Headcount-Weighted RP-2014 Disabled Retiree Mortality Table (separate tables for males and females) decreased by 9% for males and 7% for females, projected generationally with the two-dimensional mortality improvement scale MP-2017.

Similar to mortality rates for service retirees, the proposed mortality table reflects current experience to the extent that the experience is credible based on standard statistical theory. For SCERA, there is far less data for disabled retirees, so it is given little credibility. As shown in the table below, the proposed mortality tables have actual to expected ratios of 74% and 102% for General and Safety respectively, after adjustments for partial credibility. In future years the ratio should remain around 74% and 102% for General and Safety, respectively, as long as actual mortality improves at the same rates as anticipated by the generational mortality tables. The number of actual deaths compared to the number expected under the current and proposed assumptions weighted by benefit amounts for the last twelve years are as follows:

Disabled Retiree Mortality Experience – Benefit Weighted

($ in millions)

	General Members			Safety Members		
Gender	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths
Male	1.40	1.05	1.28	2.47	1.09	0.98
Female	1.14	0.75	1.17	0.38	0.07	0.16
Total	**2.54**	**1.80**	**2.45**	**2.84**	**1.16**	**1.14**
Actual / Expected	**71%**		**74%[1]**	**41%**		**102%[2]**

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 add due to rounding.

For General disabled members, we recommend updating the current table to the Pub-2010 Non-Safety Disabled Retiree Amount-Weighted Mortality Table (separate tables for males and females) with rates decreased by 5% for males and 10% for females, projected generationally with the two-dimensional mortality improvement scale MP-2020.

[1] If we use the benchmark Pub-2010 Non-Safety Disabled table without any adjustment, the proposed actual to expected ratio would be 68%.

[2] If we use the benchmark Pub-2010 Safety Disabled table without any adjustment, the proposed actual to expected ratio would be 101% (due to an actual to expected ratio of 44% for disabled Safety females vs. an actual to expected ratio of 46% with adjustment).

For Safety disabled members, we recommend updating the current table to the Pub-2010 Safety Disabled Retiree Amount-Weighted Mortality Table (separate tables for males and females) with rates decreased by 5% for females, projected generationally with the two-dimensional mortality improvement scale MP-2020.

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.

Disabled Retiree Mortality Experience – Headcount Weighted

	General Members			Safety Members		
Gender	Current Expected Deaths	Actual Deaths	Proposed Expected Deaths	Current Expected Deaths	Actual Deaths	Proposed Expected Deaths
Male	59	51	55	68	38	29
Female	69	54	70	13	3	6
Total	**129**	**105**	**124**	**80**	**41**	**34**
Actual / Expected	**81%**		**85%**	**51%**		**120%**

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 add due to rounding.

Chart 15 compares the number of actual to expected deaths on a benefit-weighted basis over the past twelve years for the current and proposed assumptions for disabled General members.

Chart 16 compares the number of actual to expected deaths on a benefit-weighted basis over the past twelve years for the current and proposed assumptions for disabled Safety members.

Chart 17 compares the number of actual to expected deaths on a headcount-weighted basis over the past twelve years for the current and proposed assumptions for disabled General members, provided for informational purposes only.

Chart 18 compares the number of actual to expected deaths on a headcount-weighted basis over the past twelve years for the current and proposed assumptions for disabled Safety members, provided for informational purposes only.

Chart 19 shows the life expectancies (i.e., expected future lifetime) under the current and the proposed tables for disabled General members on a benefit-weighted basis. Life expectancies under the 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 20 shows the life expectancies (i.e., expected future lifetime) under the current and the proposed tables for disabled Safety members on a benefit-weighted basis.

Chart 15: Post-Retirement Benefit-Weighted Deaths ($ In Millions)
Disabled General Members
(January 1, 2009 through December 31, 2020)

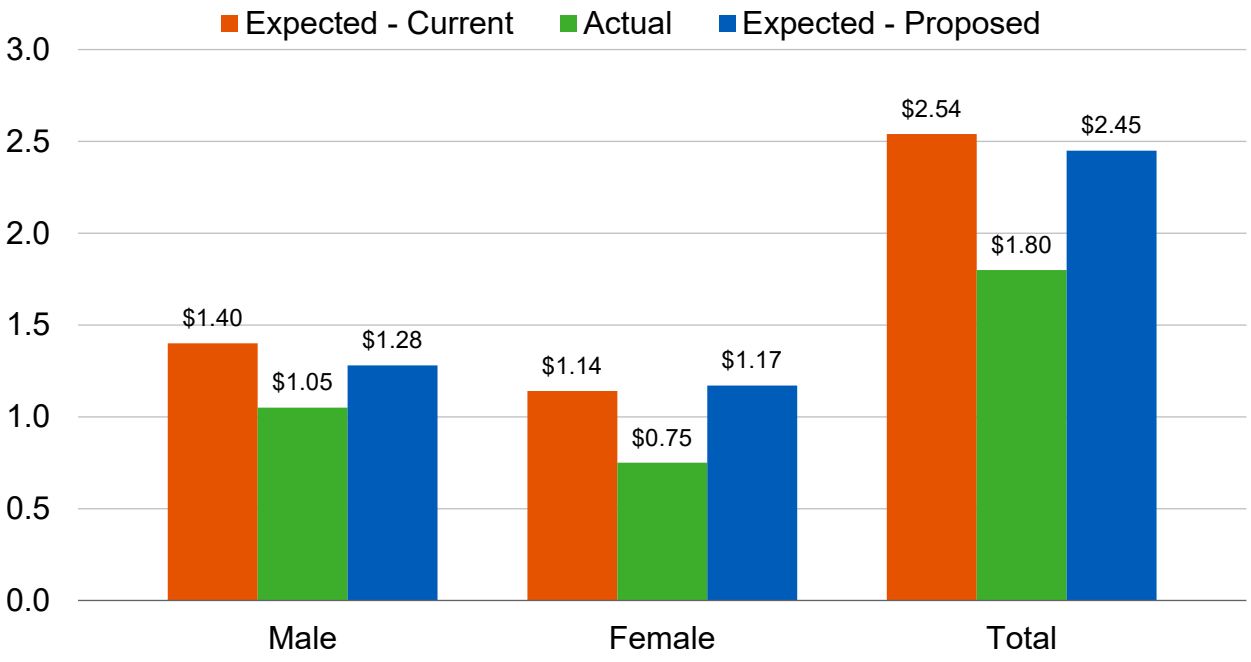


Chart 16: Post-Retirement Benefit-Weighted Deaths ($ In Millions)
Disabled Safety Members
(January 1, 2009 through December 31, 2020)

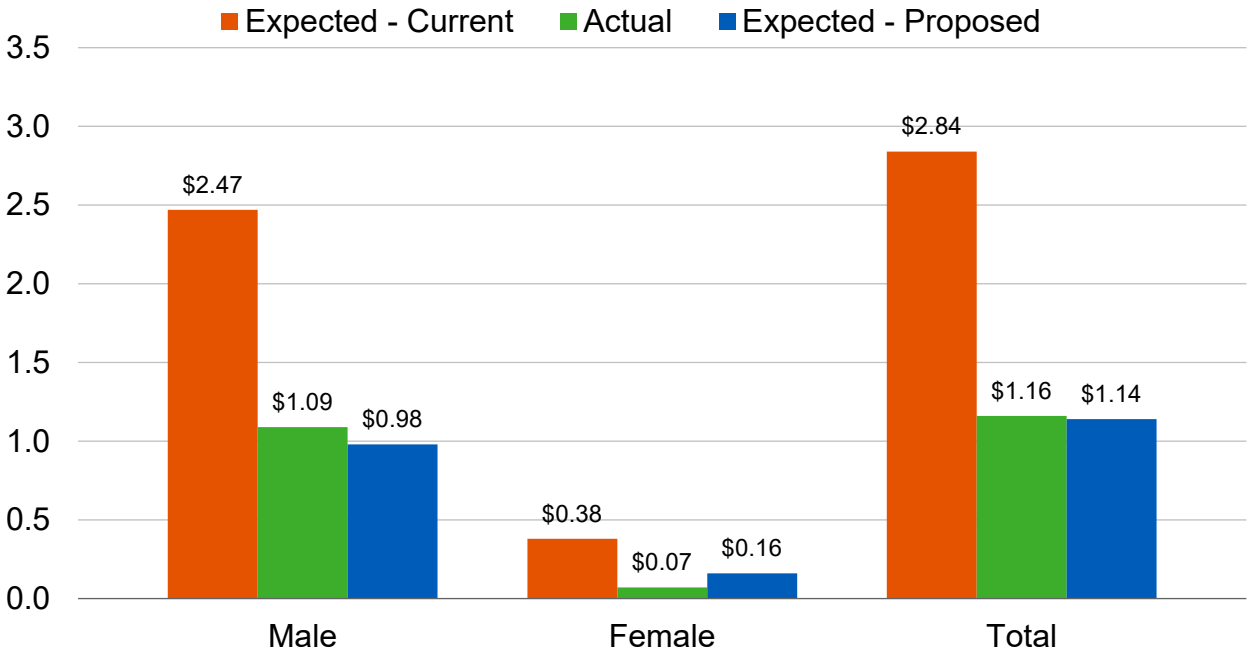


Chart 17: Post-Retirement Headcount-Weighted Deaths
Disabled General Members (January 1, 2009 through December 31, 2020)
Provided for Informational Purposes Only

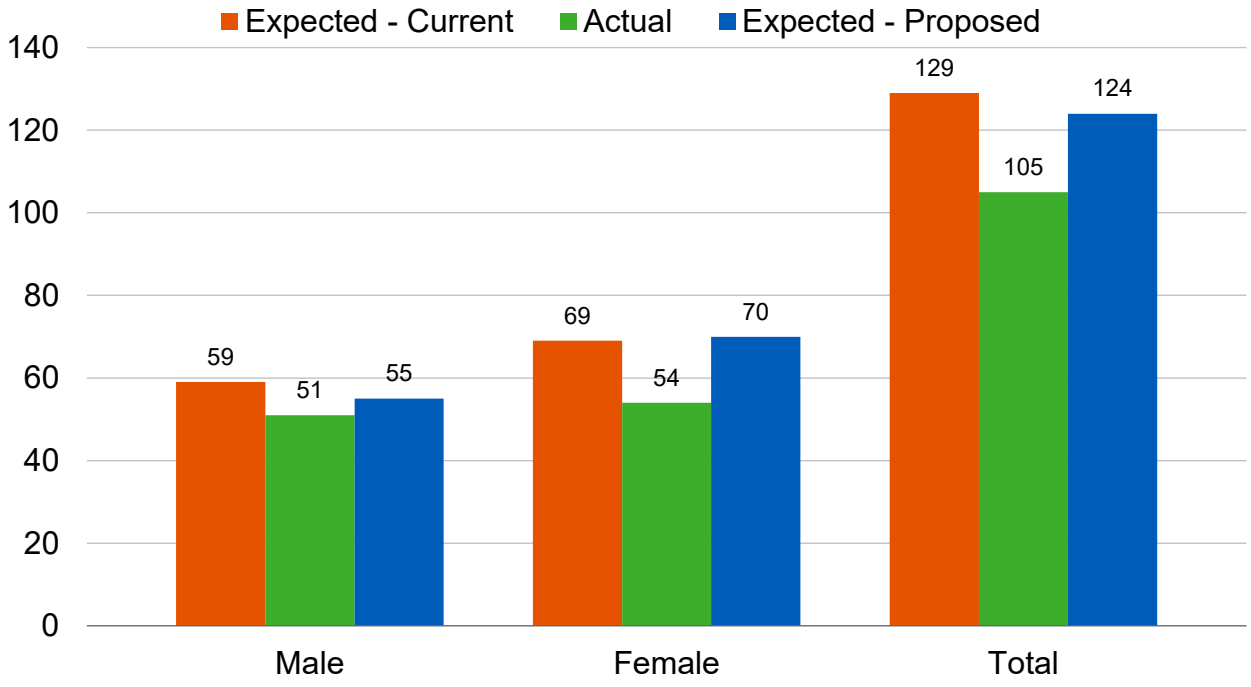


Chart 18: Post-Retirement Headcount-Weighted Deaths
Disabled Safety Members (January 1, 2009 through December 31, 2020)
Provided for Informational Purposes Only

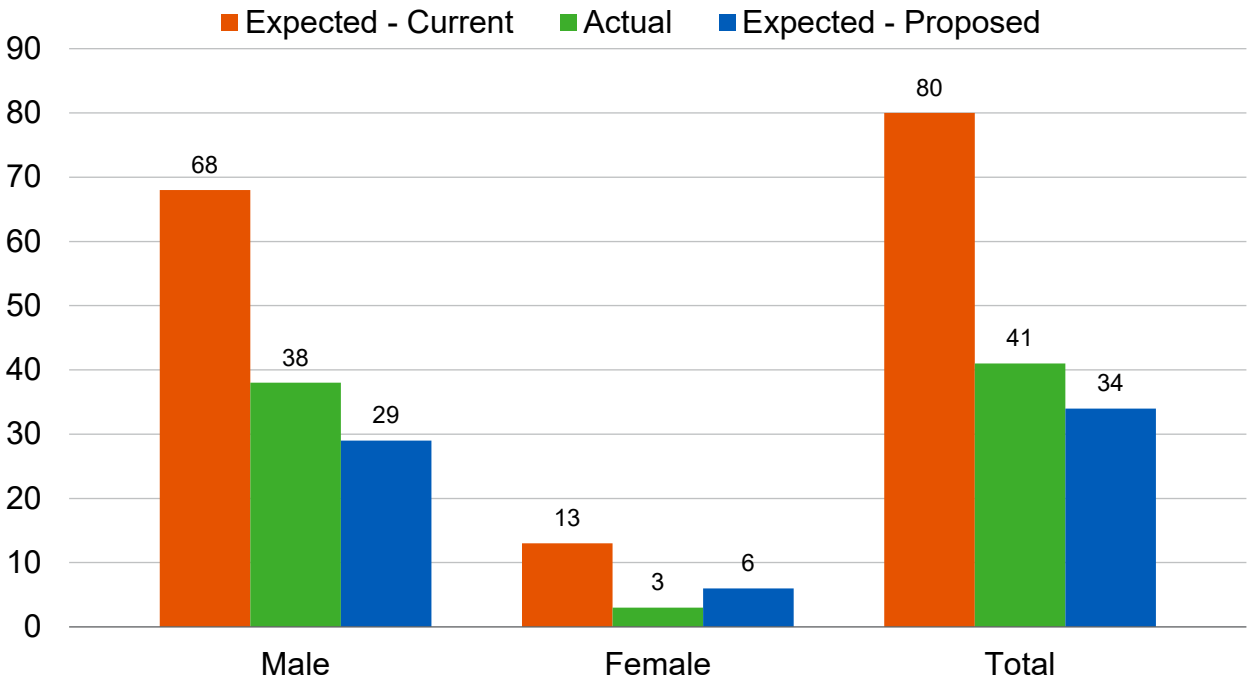


Chart 19: Benefit-Weighted Life Expectancies
Disabled General Members

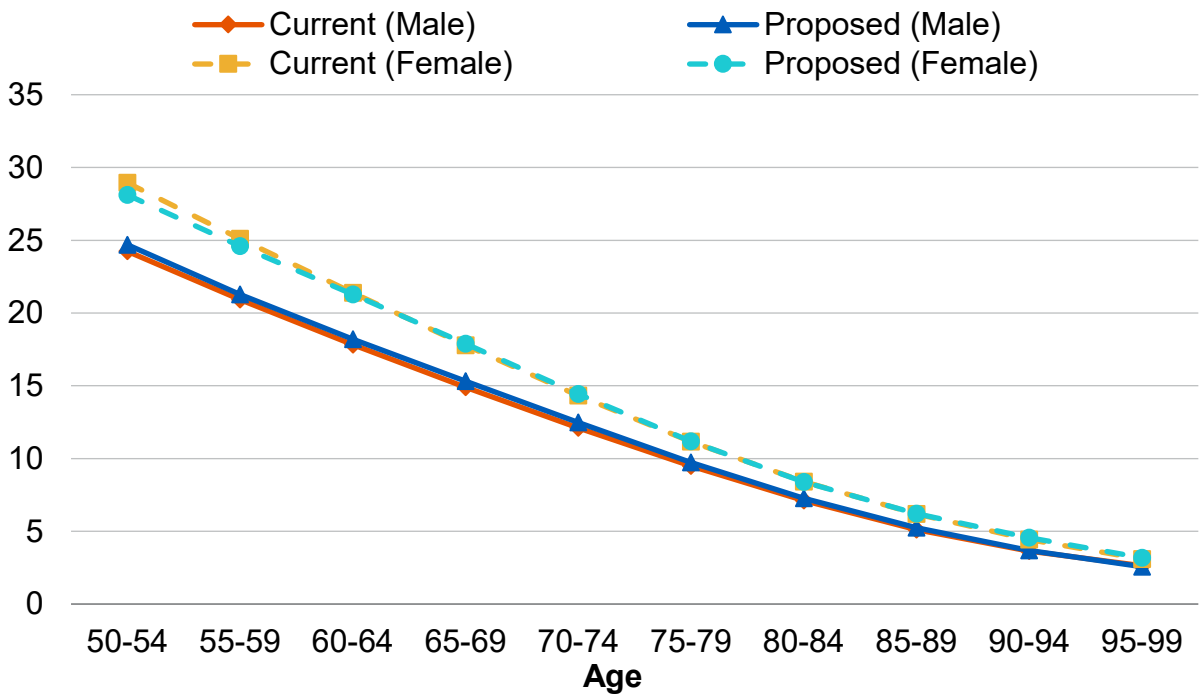
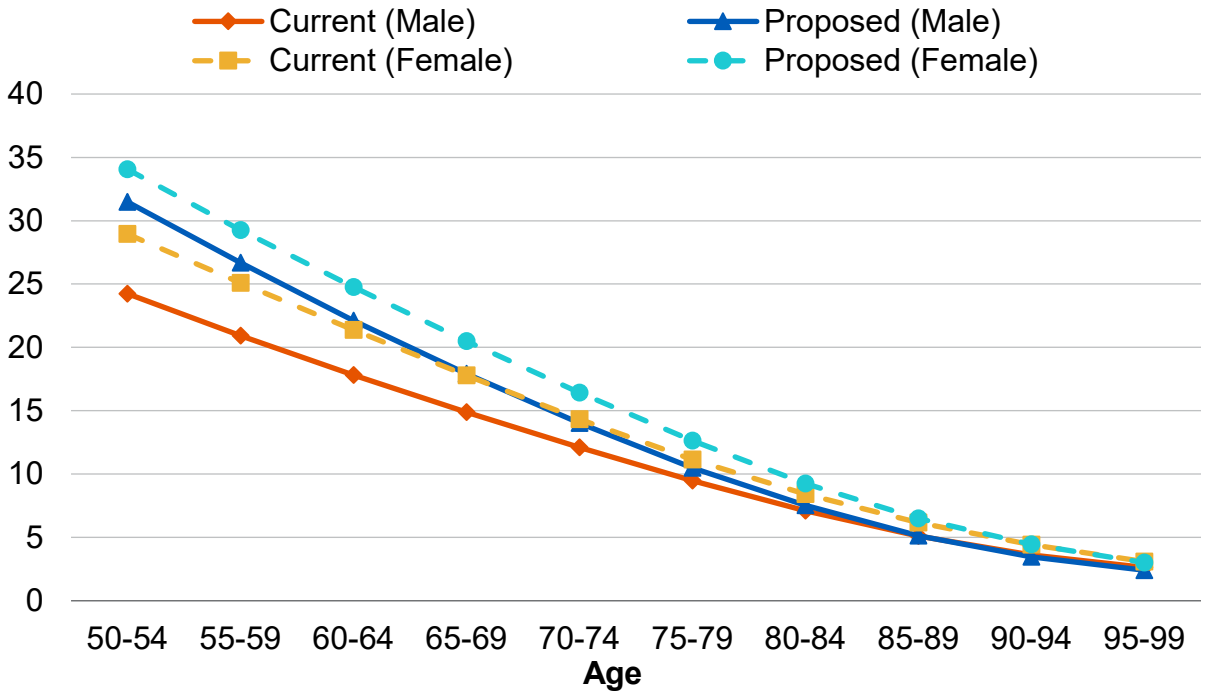


Chart 20: Life Expectancies
Disabled Safety Members



D. Termination Rates

Termination rates include all terminations for reasons other than death, disability, or retirement. Under the current assumptions there are separate rates of termination for withdrawal (for members expected to receive a refund) and vested termination (for members expected to receive a deferred vested retirement benefit). Furthermore, withdrawal and vested termination rates are based on a function of the member's years of service as well as their age. With this study, we continue to recommend that this same assumption structure be used.

The withdrawal experience over the last three years for General and Safety members, separated between those member with less than five years of service and those with five or more years of service, is shown in the following tables. Also shown are the current assumed rates and the rates we propose. Please note that we have excluded any members that were eligible for retirement.

Withdrawal – Less than Five Years of Service

Rates (%)

	General			Safety		
Years of Service	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
Less than 1	6.00	4.93	5.75	3.50	2.55	3.00
1 – 2	3.00	2.78	2.75	2.40	2.42	2.40
2 – 3	2.50	2.76	2.50	1.60	0.85	1.40
3 – 4	2.50	2.16	2.50	1.60	0.95	1.40
4 – 5	2.00	1.11	1.75	1.60	0.00	1.40

Withdrawal – Five or More Years of Service

Rates (%)

	General			Safety		
Age	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
20 - 24	1.50	N/A	1.25	1.60	N/A	1.00
25 - 29	1.50	0.00	1.25	1.60	0.00	1.00
30 - 34	1.30	0.00	1.00	1.00	0.00	0.75
35 – 39	0.75	0.27	0.50	0.40	0.00	0.40
40 - 44	0.40	0.25	0.40	0.15	0.00	0.15
45 – 49	0.35	0.47	0.35	0.05	0.00	0.05
50 – 54	0.30	0.00	0.30	0.00	0.00	0.00
55 – 59	0.20	0.00	0.10	0.00	0.00	0.00
60 – 64	0.10	0.00	0.00	0.00	0.00	0.00
65 - 69	0.00	0.00	0.00	0.00	0.00	0.00

It is important to note that not every service category has enough exposures and/or decrements such that the results in that category are statistically credible even if we look at six years' worth of experience. This is mainly the case at the highest service categories since most members in

those categories are eligible to retire and so have been excluded from our review of this withdrawal experience.

Based on this experience, we recommend decreasing the withdrawal rates overall for both General and Safety members.

Chart 21 compares the number of actual to expected withdrawals over the past three years for the current and proposed assumptions for General members.

Chart 22 compares the number of actual to expected withdrawals over the past three years for the current and proposed assumptions for Safety members.

Chart 23 compares the actual withdrawal experience with the current and proposed assumptions for General members with less than five years of service.

Chart 24 compares the actual withdrawal experience with the current and proposed assumptions for Safety members with less than five years of service.

Chart 25 compares the actual withdrawal experience with the current and proposed assumptions for General members with five or more years of service.

Chart 26 compares the actual withdrawal experience with the current and proposed assumptions for Safety members with five or more years of service.

Chart 21: Actual Number of Withdrawals Compared to Expected – General Members

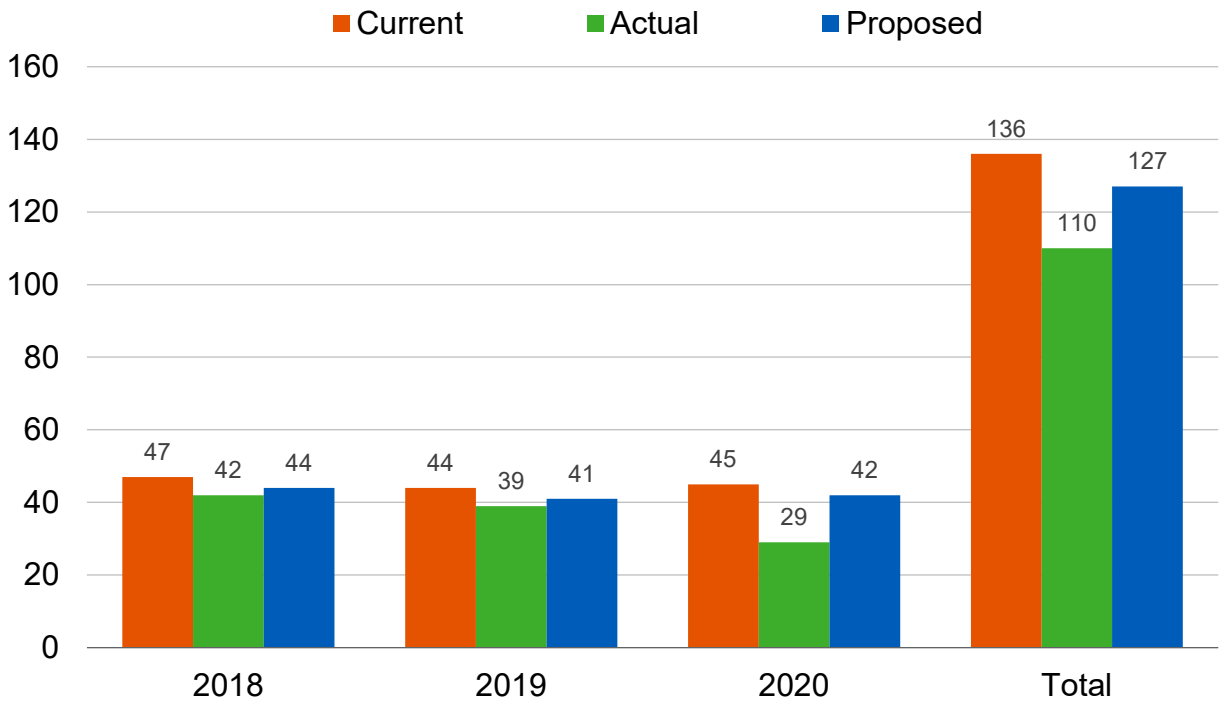


Chart 22: Actual Number of Withdrawals Compared to Expected – Safety Members

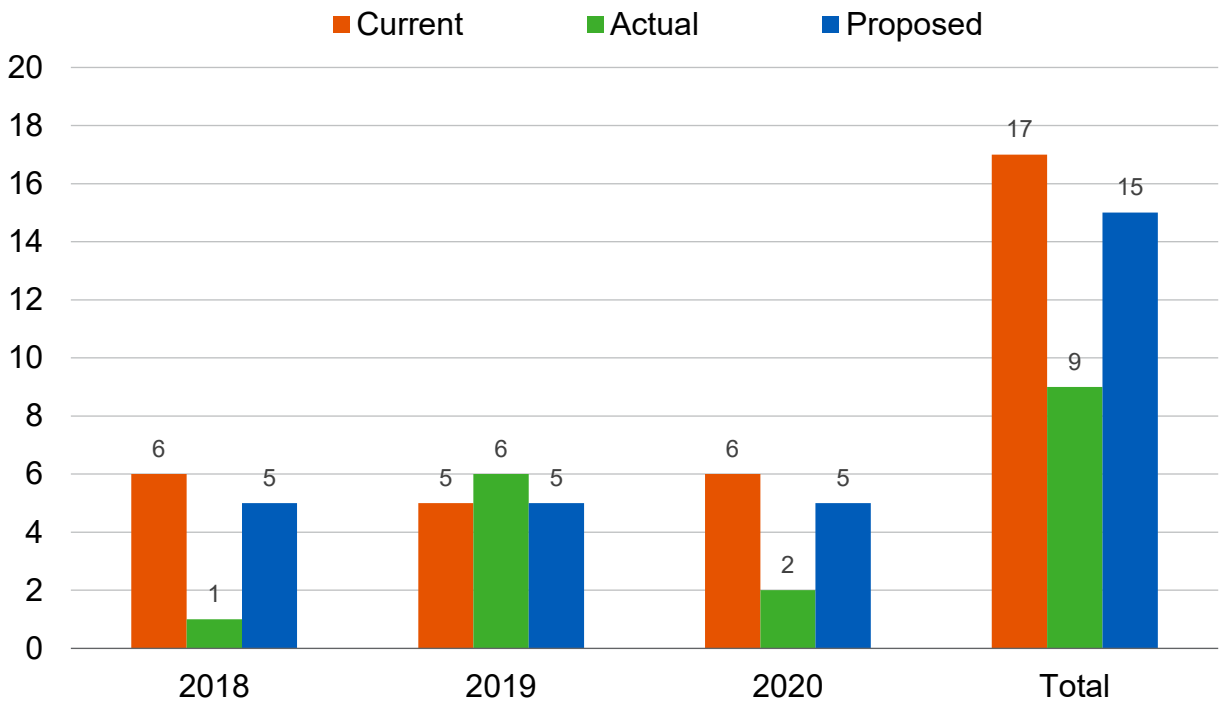


Chart 23: Withdrawals Rates – General Members
Less than Five Years of Service

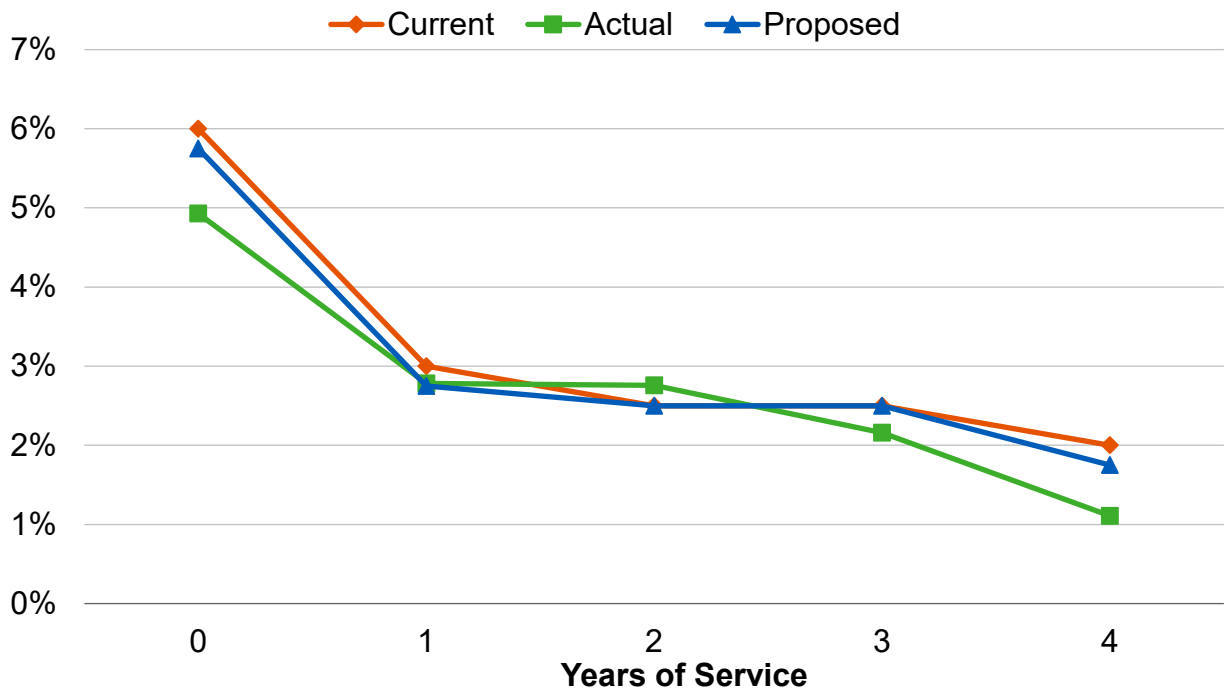


Chart 24: Withdrawals Rates – Safety Members
Less than Five Years of Service

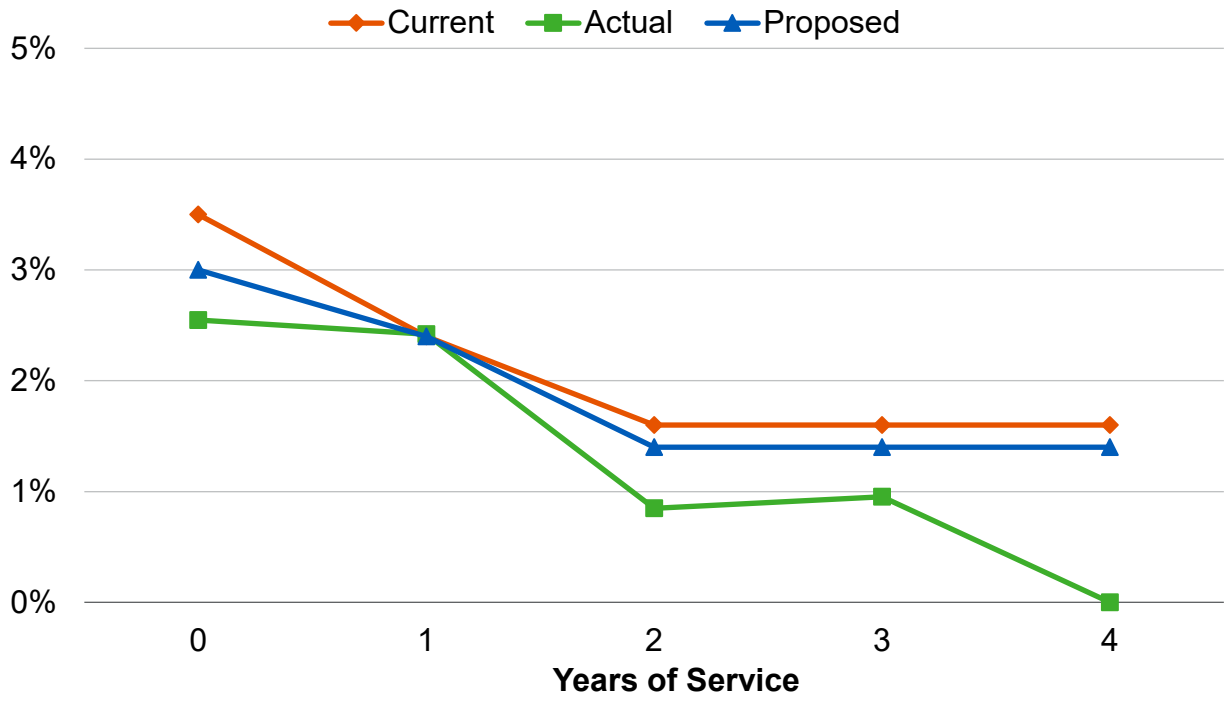


Chart 25: Withdrawals Rates – General Members
Five or More Years of Service

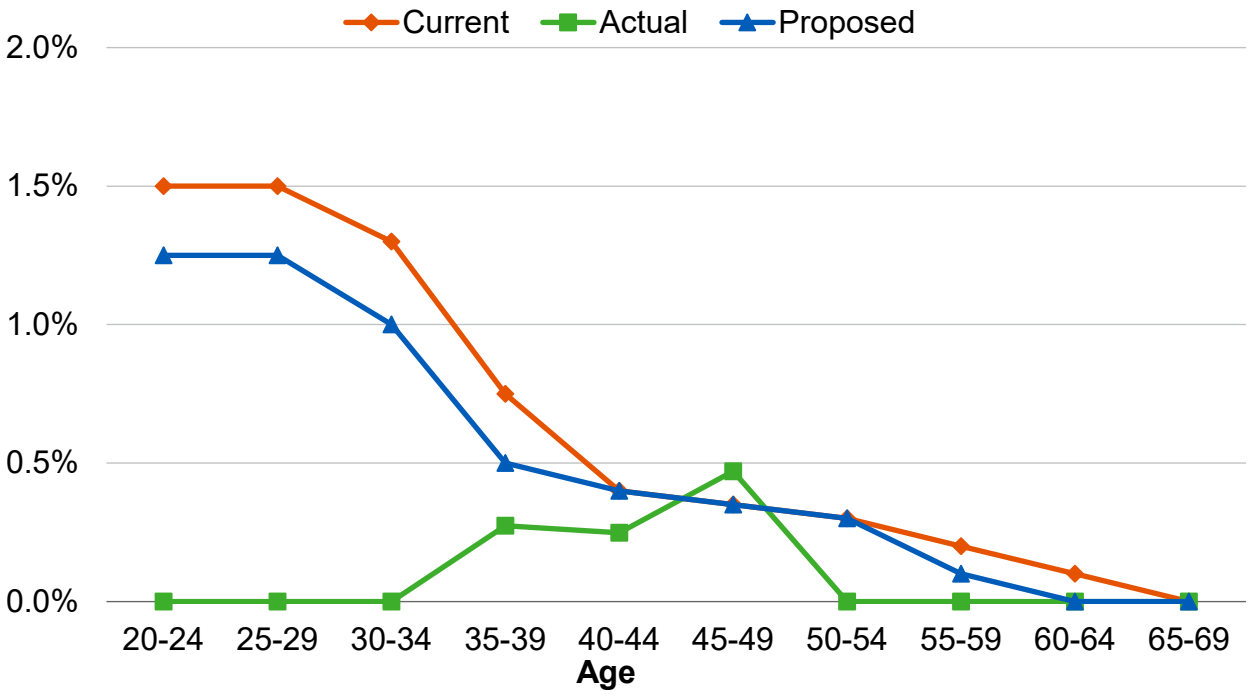
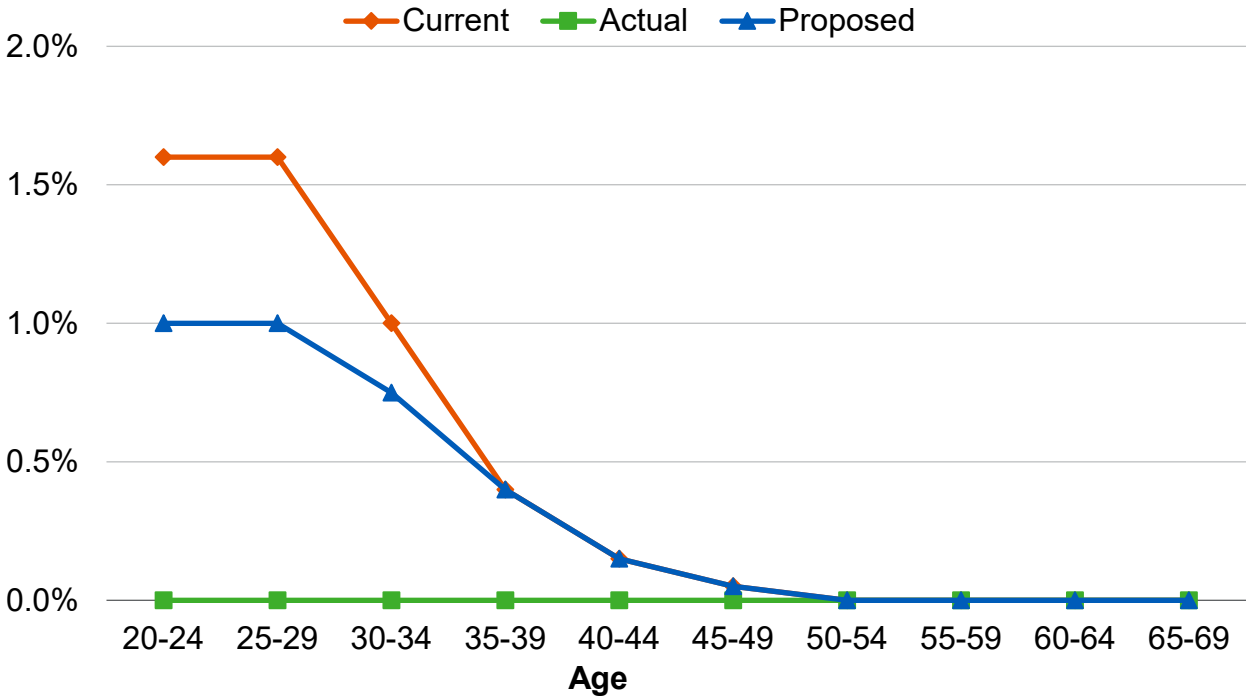


Chart 26: Withdrawals Rates – Safety Members
Five or More Years of Service



The vested termination experience over the last three years for General and Safety members, separated between those employees with under five years of service and those with five or more years of service, is shown in the following tables. Also shown are the current assumed rates and the rates we propose. Please note that we have excluded any members that were eligible for retirement.

Vested Termination – Less than Five Years of Service

Rates (%)

	General			Safety		
Years of Service	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
Less than 1	7.00	8.95	8.00	6.50	10.83	7.50
1 – 2	6.00	5.56	6.00	5.00	6.45	6.00
2 – 3	4.50	5.91	5.50	4.00	5.93	4.00
3 – 4	3.50	6.07	4.50	4.00	1.90	4.00
4 – 5	3.50	4.30	4.00	4.00	4.26	4.00

Vested Termination – Five or More Years of Service

Rates (%)

	General			Safety		
Age	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
20 - 24	3.50	N/A	4.00	4.00	N/A	3.75
25 - 29	3.50	0.00	4.00	4.00	3.57	3.75
30 - 34	3.50	5.25	4.00	3.00	1.33	2.50
35 – 39	3.00	3.14	3.00	2.00	0.00	2.00
40 - 44	2.50	5.21	3.00	1.00	1.15	1.00
45 – 49	2.00	2.35	2.25	0.75	0.56	0.75
50 – 54	2.00	3.14	2.25	0.00	0.00	0.00
55 – 59	2.00	3.25	2.25	0.00	0.00	0.00
60 – 64	2.00	5.15	2.25	0.00	0.00	0.00
65 - 69	1.00	15.38	2.25	0.00	20.00	0.00

Based on this experience, we recommend increasing the vested termination rates overall for both General and Safety members.

For both General and Safety, we continue to recommend termination rates be set at 0% at any age where members are assumed to retire. In other words, at those ages, members will either retire (and commence receiving a benefit) or continue working.

Chart 27 compares the number of actual to expected vested terminations over the past three years for the current and proposed assumptions for General members.

Chart 28 compares the number of actual to expected vested terminations over the past three years for the current and proposed assumptions for Safety members.

Chart 29 compares the actual vested termination experience with the current and proposed assumptions for General members with less than five years of service.

Chart 30 compares the actual vested termination experience with the current and proposed assumptions for Safety members with less than five years of service.

Chart 31 compares the actual vested termination experience with the current and proposed assumptions for General members with five or more years of service.

Chart 32 compares the actual vested termination experience with the current and proposed assumptions for Safety members with five or more years of service.

Chart 27: Actual Number of Vested Termination Compared to Expected – General Members

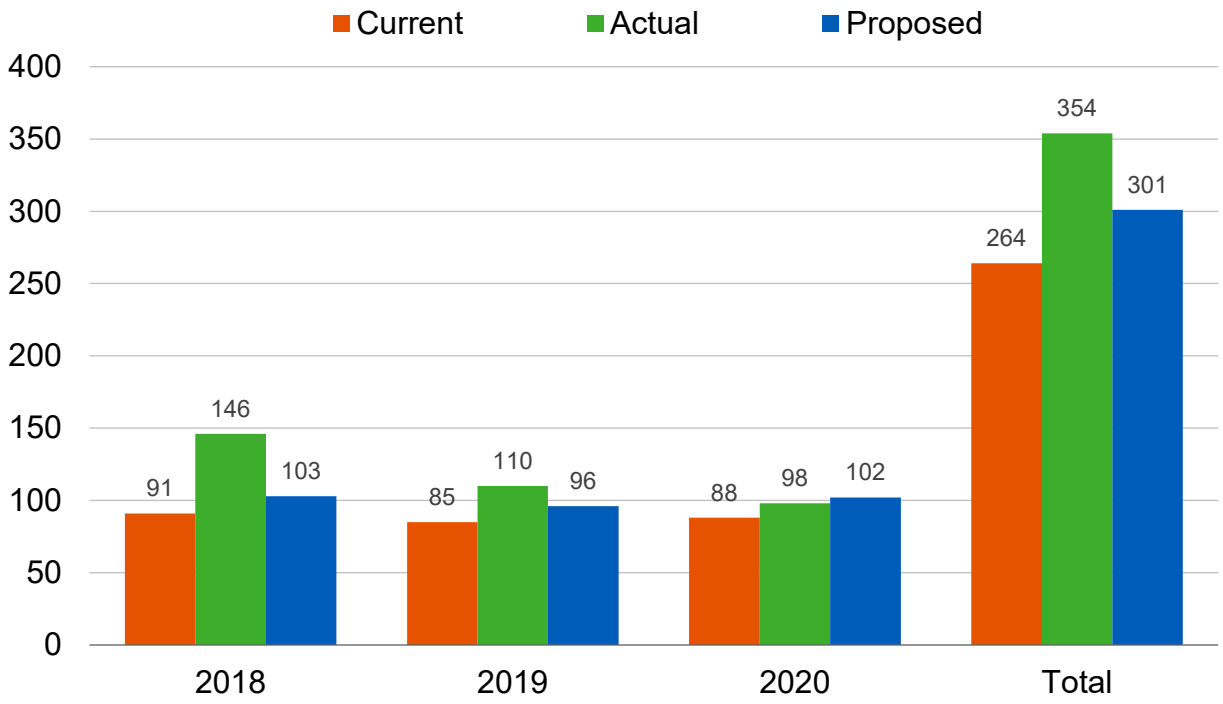


Chart 28: Actual Number of Vested Termination Compared to Expected – Safety Members

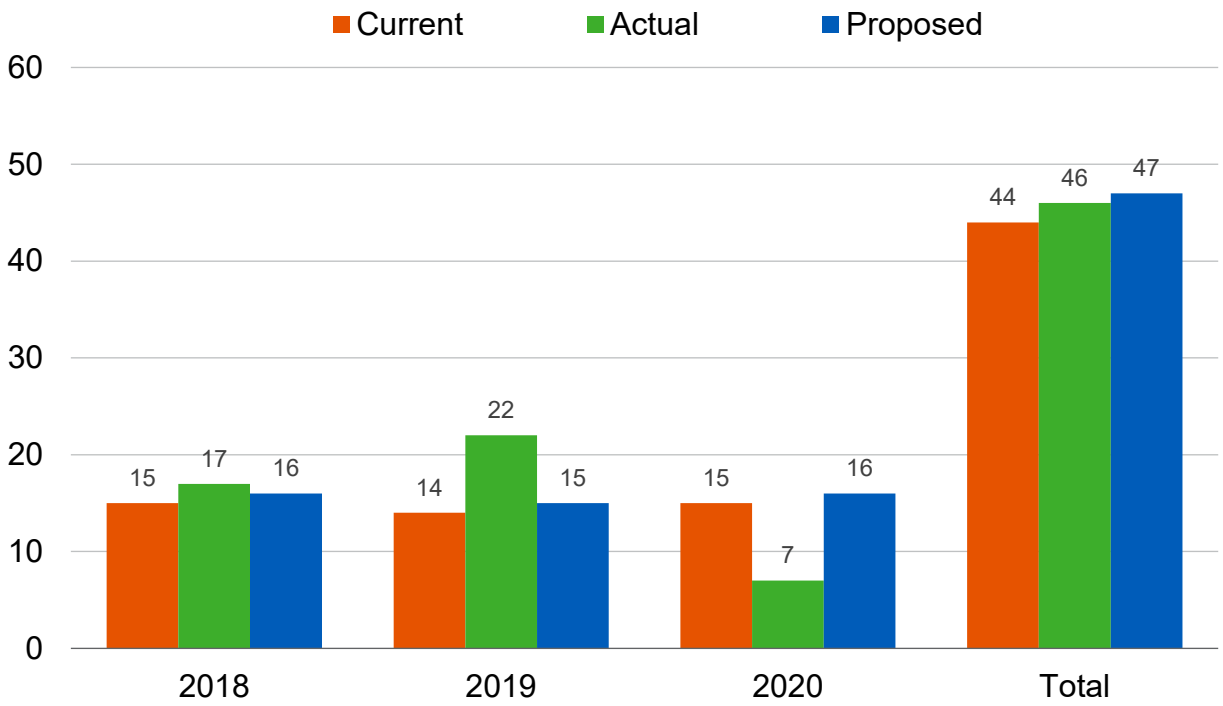


Chart 29: Vested Termination Rates – General Members
Less than Five Years of Service

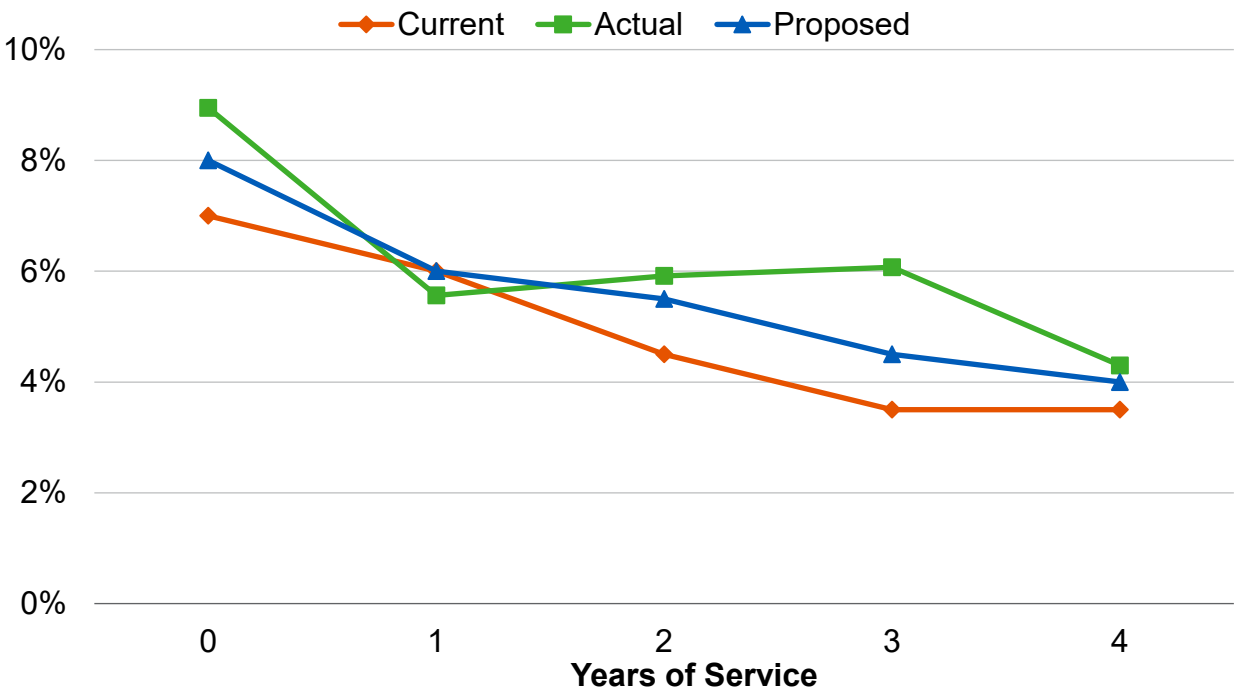


Chart 30: Vested Termination Rates – Safety Members
Less than Five Years of Service

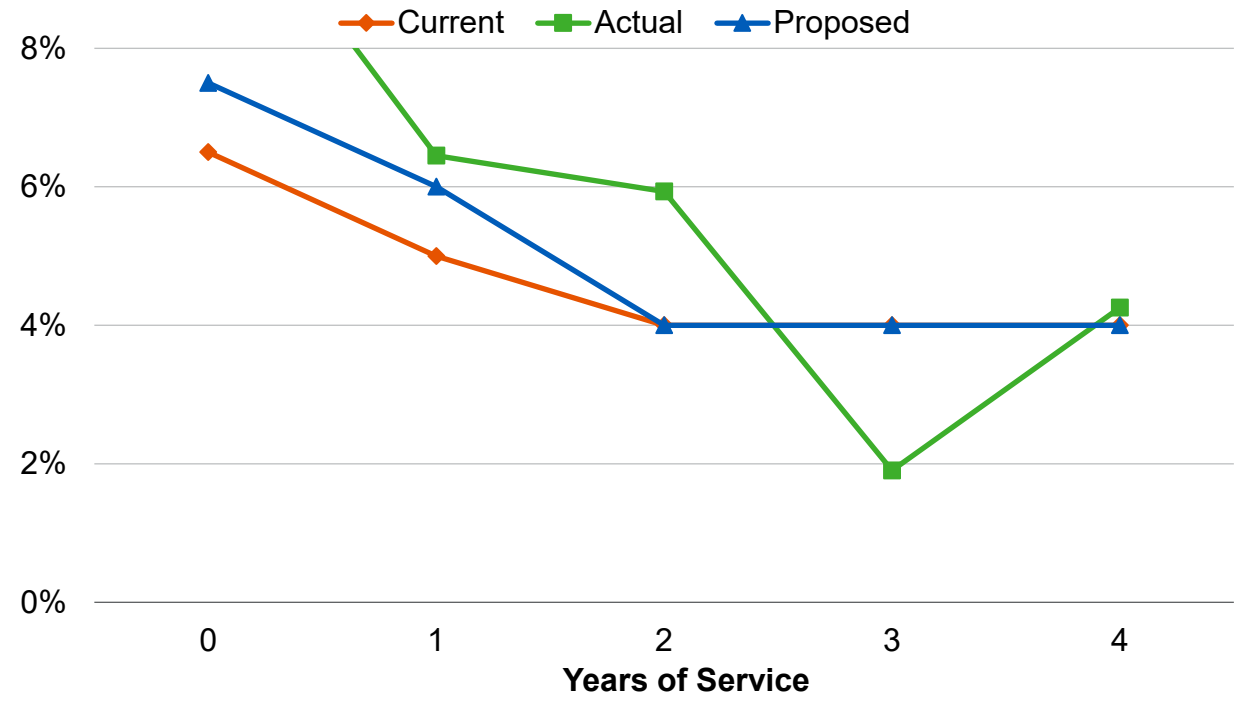


Chart 31: Vested Termination Rates – General Members
Five or More Years of Service

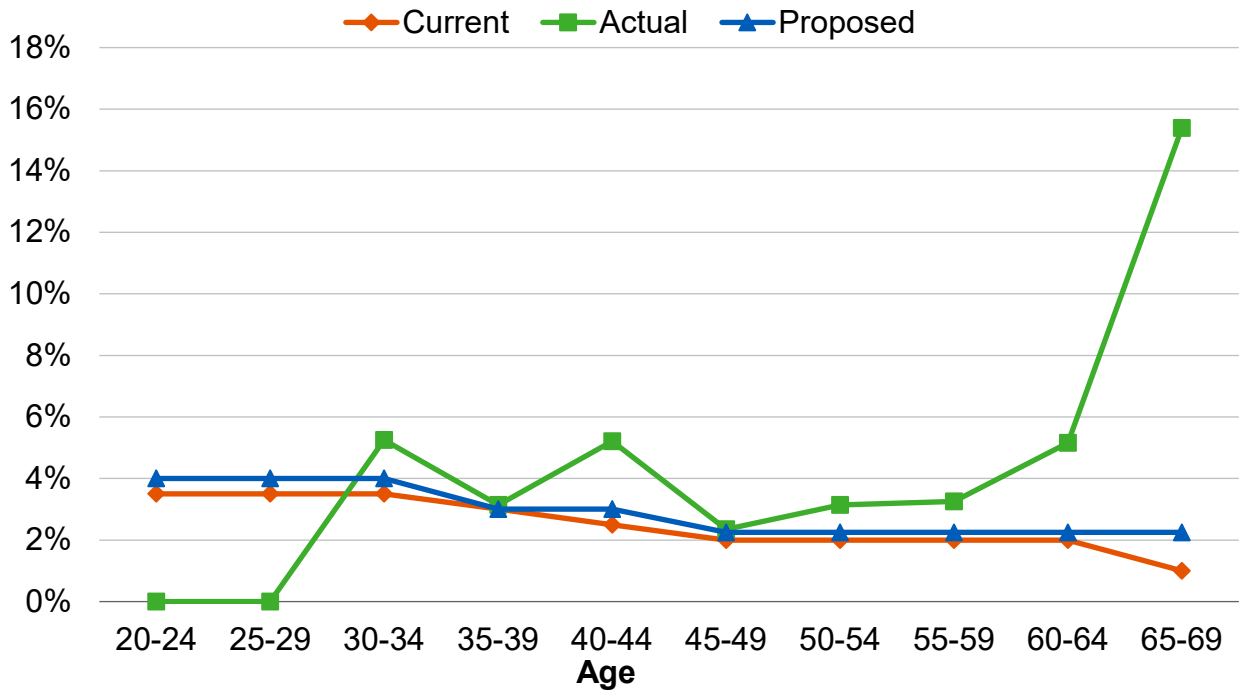
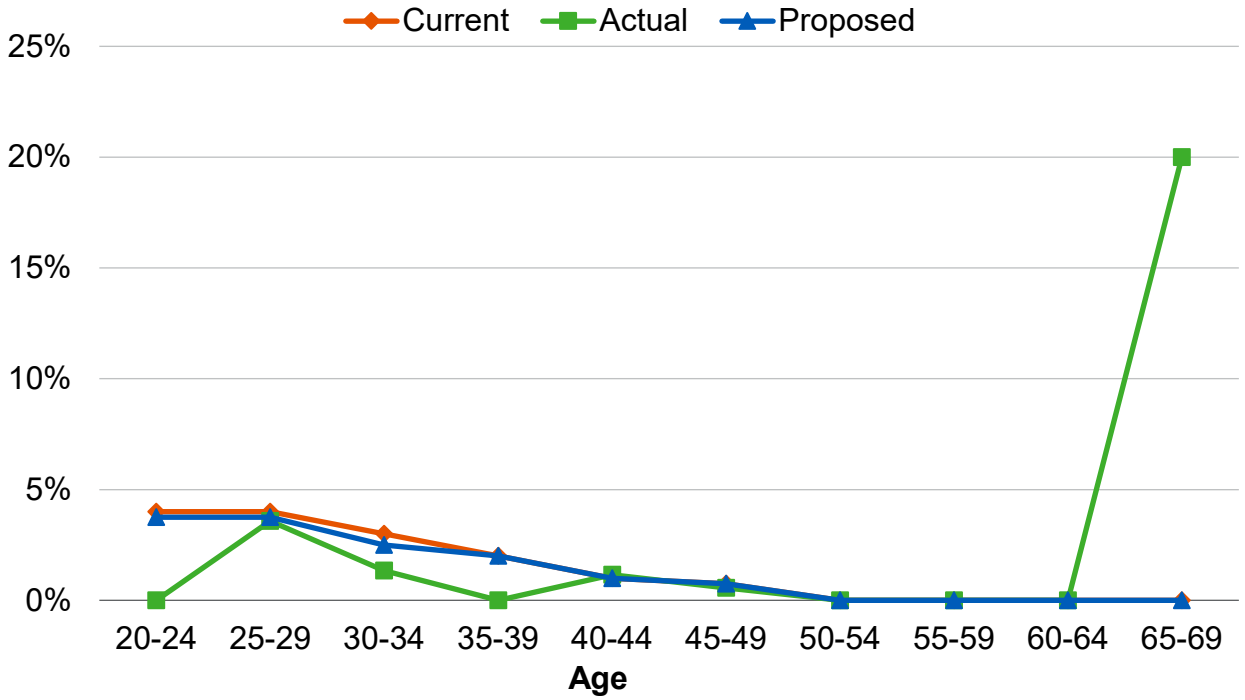


Chart 32: Vested Termination Rates – Safety Members
Five or More Years of Service



E. Disability Incidence Rates

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

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

General

Disability Incidence Rates[1] (%)

Age	Current Rate	Actual Rate	Proposed Rate
20 – 24	0.05	0.00	0.05
25 – 29	0.05	0.00	0.05
30 – 34	0.05	0.00	0.05
35 – 39	0.05	0.00	0.05
40 – 44	0.20	0.24	0.20
45 – 49	0.25	0.15	0.20
50 – 54	0.35	0.13	0.25
55 – 59	0.40	0.14	0.30
60 – 64	0.45	0.11	0.30
65 – 69	0.70	0.00	0.30
70 & Over	0.00	0.00	0.00

Safety

Disability Incidence Rates[1] (%)

Age	Current Rate	Actual Rate	Proposed Rate
20 – 24	0.10	0.00	0.10
25 – 29	0.20	0.00	0.20
30 – 34	1.00	0.32	1.00
35 – 39	1.50	2.32	1.50
40 – 44	1.50	1.24	1.50
45 – 49	2.50	1.74	2.50
50 – 54	2.50	3.64	2.50
55 – 59	3.00	2.46	3.00
60 - 64	3.00	2.99	3.00
65 & Over	0.00	0.00	0.00

[1] Total rate for service connected and non-service connected disabilities.

Based on the above experience, we recommend decreasing the disability incidence rates overall for General members and maintain the disability incidence rates for Safety members.

Chart 33 that follows later in this section compares the number of actual to expected service and non-service connected disabilities over the past three years for the current and proposed assumptions.

Chart 34 compares the actual disability incidence experience with the current and proposed assumptions for General members.

Chart 35 compares the actual disability incidence experience with the current and proposed assumptions for Safety members.

The following table shows the currently assumed, actual and proposed assumed percentages for service versus non-service connected disability for the groups.

Service vs. Non-Service Connected Disability

	Disablements Receiving Service Connected Disability			Disablements Receiving Non-Service Connected Disability
	Current Assumption	Actual Percentage	Proposed Assumption	Proposed Assumption
General	55%	50%	55%	45%
Safety	95%	97%	100%	0%

Based upon the recent experience, we have increased the assumed percentage for service connected disability for Safety members while maintaining the assumed percentage for General members.

Chart 33: Actual Number of Service and Non-service Disability Retirements Compared to Expected

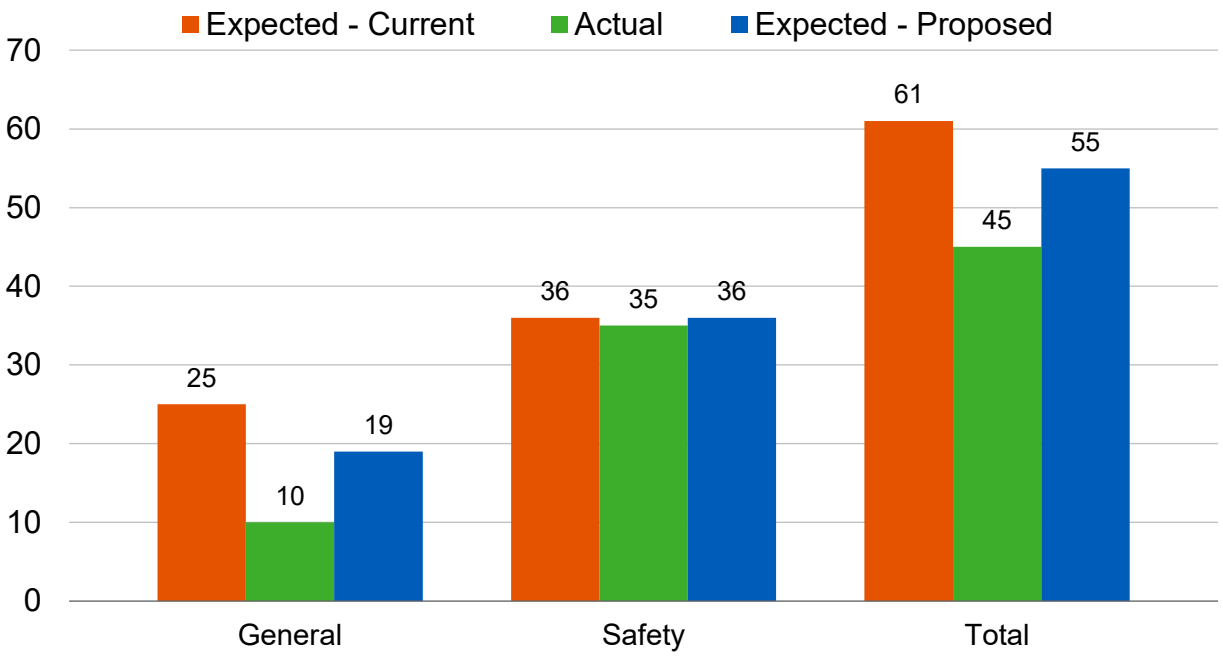


Chart 34: Disability Incidence Rates General Members

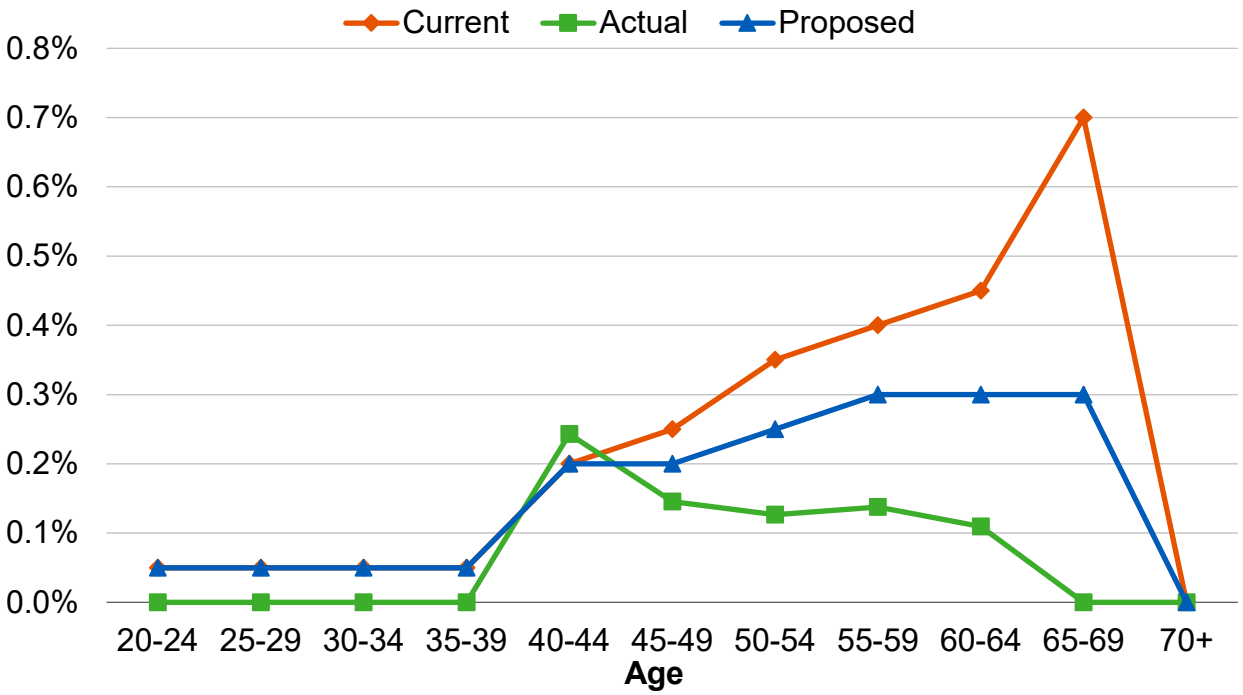
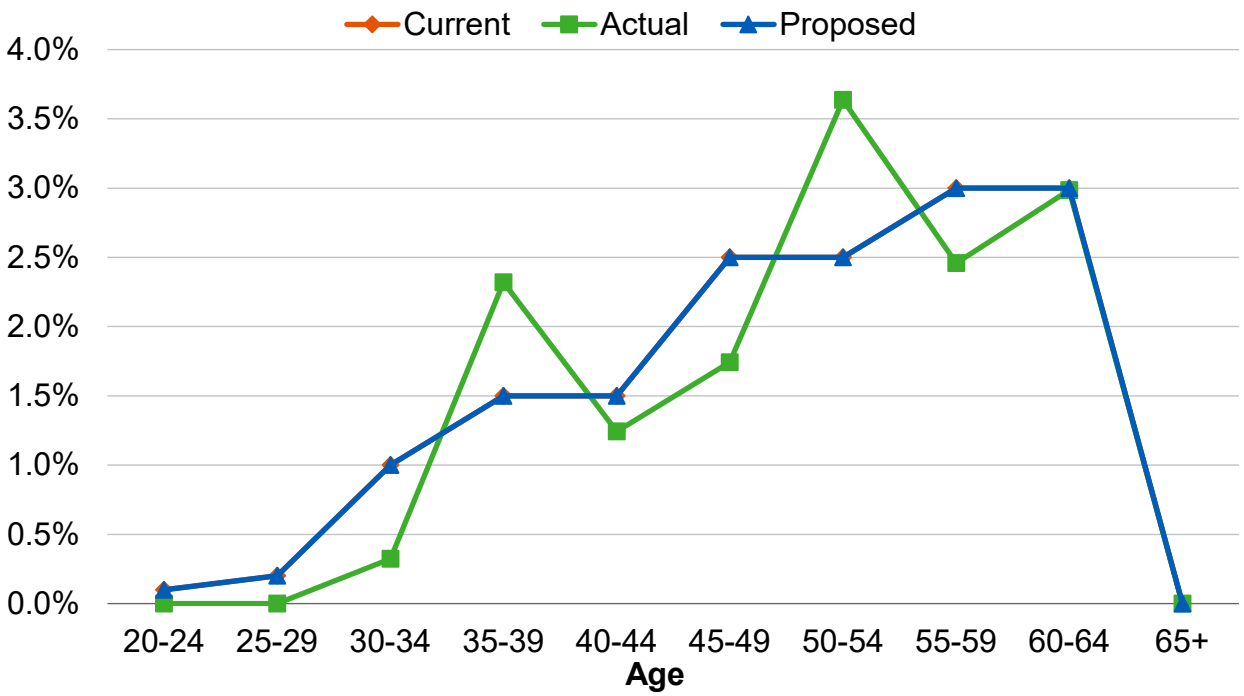


Chart 35: Disability Incidence Rates
Safety Members



F. Cashouts

The Board of Retirement has determined that several additional pay elements should be included as Earnable Compensation. These additional pay elements fall into two categories:

- Ongoing Pay Elements – Those that are expected to be received relatively uniformly over a member's employment years; and
- Cashout Pay Elements – Those that are expected to be received only during the member's final average earnings pay period.

The first category is recognized in the actuarial calculations by virtue of being included in the current pay of active members. The second category requires a separate actuarial assumption to anticipate its impact on a member's retirement benefit for the Court and Sonoma Valley Fire District members in Plan A.

Court

In this study, we have collected data for the last three years to estimate vacation and holiday cashouts for active General Plan A Court members as a percentage of final average pay. The results are summarized in the following table:

General Plan A – Court

Year Ending December 31,	Actual Average Cashout
2018	2.11%
2019	3.26%
2020	1.91%
Weighted Average	**2.44%**
Current Assumption	**3.75%**
Proposed Assumption	**3.25%**

Beginning with the 2016/2017 fiscal year, General Plan A Court members may no longer cash out sick leave. Instead, General Plan A Court members must convert any unused sick leave at retirement to service credit. It should be noted that, similar to the employees at the County and the Sonoma Valley Fire District, when a Court employee applies for retirement and has unused sick leave to convert, SCERA bills the employer for the cost of the conversion at the time of retirement. Therefore, no assumption for the conversion of sick leave is needed for the actuarial valuation.

Based on the above experience, we recommend reducing the cashout assumption for General Plan A Court members from 3.75% to 3.25%.

Sonoma Valley Fire District

We have also collected data for the Sonoma Valley Fire District to estimate cashouts for active General Plan A and Safety Plan A Sonoma Valley Fire District members as a percentage of final average pay. We have calculated a weighted average policy maximum based on actual membership data. The results are summarized in the following tables:

General Plan A – Sonoma Valley Fire District

	Average Actual Amount Cashed Out Ongoing (1)	Policy Maximum (2)	Difference Between (1) & (2)
Vacation	48	96	
Administrative Leave	0	0	
Total	**48**	**96**	**48**
Current Assumption Used to Predict Cashout During Year of Retirement[1]			**42**
Proposed Assumption Used to Predict Cashout During Year of Retirement[2]			**42**

On an ongoing basis, General Plan A Sonoma Valley Fire District members are cashing out about 48 hours per year which is about 48 hours less than the maximum allowable cashout of 96 hours per year. If we assume that the members will cash out an additional 48 hours in the year of retirement (thereby bringing the total cashed out to the maximum of 96 hours), that additional cashout will be slightly more than the 42 hours we used in our current valuation to predict cashouts during the year of retirement.

Safety Plan A – Sonoma Valley Fire District

	Average Actual Amount Cashed Out Ongoing (1)	Policy Maximum (2)	Difference Between (1) & (2)
Vacation	63	96	
Administrative Leave	13	13	
Total	**76**	**109**	**33**
Current Assumption Used to Predict Cashout During Year of Retirement[3]			**63**
Proposed Assumption Used to Predict Cashout During Year of Retirement[4]			**52**

On an ongoing basis, Safety Plan A Sonoma Valley Fire District members are cashing out about 76 hours per year which is about 33 hours less than the maximum allowable cashout of 109 hours per year. If we assume that the members will cash out an additional 33 hours in the year of retirement (thereby bringing the total cashed out to the maximum of 109 hours), that additional cashout will be less than the 63 hours we used in our current valuation to predict cashouts during the year of retirement.

Based on the above experience, we recommend maintaining the cashout assumption for General Plan A Sonoma Valley Fire District at 2.00% and reducing the cashout assumption for Safety Plan A Sonoma Valley Fire District from 3.00% to 2.50%.

[1] Calculated by multiplying the FTE hours (i.e., 80 × 26.089, or 2,087.12) by the 2% current assumption used in our valuation.
[2] Calculated by multiplying the FTE hours (i.e., 80 × 26.089, or 2,087.12) by a 2% assumption.
[3] Calculated by multiplying the FTE hours (i.e., 80 × 26.089, or 2,087.12) by the 3% current assumption used in our valuation.
[4] Calculated by multiplying the FTE hours (i.e., 80 × 26.089, or 2,087.12) by a 2.5% assumption.

County

It should be noted that County active employees are no longer eligible for cashouts.

However, for General Plan A County members who terminated prior to June 1, 2014 we have maintained the current cashout assumption of 4%. Similarly, for Safety Plan A County members who terminated prior to June 1, 2014 we have maintained the current cashout assumption of 6%. This is based on our understanding that salaries reported for the valuation have not been adjusted for cashouts. (These assumptions were based on the cashout assumptions in effect at the time the County ceased allowing cashouts at retirement on a go-forward basis.)

G. Entry Age Method Refinement

In this experience study we are recommending a refinement to the Entry Age actuarial cost method calculation. In previous valuations, normal cost was spread over a longer period of time which included the member's service periods with both a reciprocal system and SCERA. We recommend in this experience study that the normal cost be spread only over the member's service period with SCERA. This refinement did not change the present value of future benefits, but it slightly increased the normal cost rate and decreased the actuarial accrued liability.

This change results in an increase of 0.23% in the average employer normal cost rate and a decrease of 0.11% in the average employer UAAL rate, for a net increase of 0.12%. This change also resulted in an increase of 0.04% in the average member contribution rates.

5. Cost Impact

We have estimated the impact of all the recommended demographic and economic assumptions as if they were applied to the December 31, 2020 actuarial valuation. The table below shows the changes in the employer and member contribution rates due to the proposed assumption changes separately for the recommended economic assumption changes (as recommended in Section 3 of this report which include the recommended merit and promotion salary increases) and the recommended demographic assumption changes (as recommended in Section 4 of this report).

Cost Impact of the Recommended Assumptions Based on December 31, 2020 Actuarial Valuation

Assumption	Impact on Average Employer Contribution Rates
Increase due to changes in economic assumptions	1.84%
Increase due to changes in demographic assumptions[1]	0.57%
Total increase in average employer rate	**2.41%**
Total estimated increase in annual dollar amount ($000s)	**$9,532**

Assumption	Impact on Weighted Average Member Contribution Rates
Increase due to changes in economic assumptions	0.31%
Increase due to changes in demographic assumptions[1]	0.22%
Total increase in weighted average member rate	**0.53%**
Total estimated increase in annual dollar amount ($000s)	**$2,086**

	Impact on UAAL and Funded Percentage
Increase in UAAL ($000s)	$95,517
Change in Funded Percentage	-2.6%

Of the various assumption changes, the most significant rate increase is due to the change in the investment return assumption.

[1] Includes a refinement in calculating some member's entry ages as used in Entry Age actuarial cost method calculations. Previously, the Normal Cost was spread over a period including both the member's service with a reciprocal system (if any) and their SCERA service. The refinement spreads the Normal Cost over only the member's service period with SCERA. This refinement does not change the Present Value of Future Benefits but it increases the Normal Cost and decreases the Actuarial Accrued Liability for members with reciprocal service.

Assumption Change	Impact on Average Employer Contribution Rates	Impact on Weighted Average Member Contribution Rates	Impact on UAAL ($000s)
Increase due to changes in economic assumptions	**1.84%**	**0.31%**	**$77,340**
Increase due to change in mortality	0.70%	0.21%	30,948
Change due to changes in all other demographic assumptions[1]	-0.13%	0.01%	(12,771)
Increase due to changes in demographic assumptions[1]	**0.57%**	**0.22%**	**$18,177**
Total increase due to all assumption changes	**2.41%**	**0.53%**	**$95,517**

We have also analyzed in the tables below the average employer and member contribution rate impacts for each cost group due to the recommended assumption changes as if they were applied to the December 31, 2020 actuarial valuation.

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

	Normal Cost	UAAL	Total	Annual Amount[2] ($000s)
General Plan A – County	0.60%	1.34%	1.94%	$3,113
General Plan A – Court	0.57%	1.34%	1.91%	147
General Plan A – Sonoma Valley Fire District	0.54%	1.43%	1.97%	3
General Plan B – County	0.31%	1.34%	1.65%	2,291
General Plan B – Court	0.31%	1.34%	1.65%	89
General Plan B – Sonoma Valley Fire District	0.31%	1.43%	1.74%	4
General Combined	**0.46%**	**1.34%**	**1.80%**	**$5,647**
Safety Plan A – County	2.05%	3.09%	5.14%	$2,516
Safety Plan A – Sonoma Valley Fire District	2.21%	3.11%	5.32%	228
Safety Plan B – County	0.88%	3.09%	3.97%	1,050
Safety Plan B – Sonoma Valley Fire District	0.93%	3.11%	4.04%	91
Safety Combined	**1.65%**	**3.09%**	**4.74%**	**$3,885**
All Categories combined	**0.71%**	**1.70%**	**2.41%**	**$9,532**

[1] Includes impact of a refinement in calculating some member's entry ages as used in Entry Age actuarial cost method calculations. Previously, the Normal Cost was spread over a period including both the member's service with a reciprocal system (if any) and their SCERA service. The refinement spreads the Normal Cost over only the member's service period with SCERA. This refinement does not change the Present Value of Future Benefits but it increases the Normal Cost and decreases the Actuarial Accrued Liability for members with reciprocal service.

[2] Based on December 31, 2020 projected annual payroll as determined under each set of assumptions.

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

	Rate	Annual Amount[1] ($000s)
General Plan A – County (Average Entry Age: 35)	0.62%	$981
General Plan A – Court (Average Entry Age: 34)	0.58%	45
General Plan A – Sonoma Valley Fire District (Average Entry Age: 49)	0.69%	1
General Plan B – County	0.31%	408
General Plan B – Court	0.31%	16
General Plan B – Sonoma Valley Fire District	0.31%	1
Safety Plan A – County (Average Entry Age: 30)	0.76%	368
Safety Plan A – Sonoma Valley Fire District (Average Entry Age: 35)	0.71%	31
Safety Plan B – County	0.88%	232
Safety Plan B – Sonoma Valley Fire District	0.93%	21
All Categories Combined	**0.54%**	**$2,104**

[1] Based on December 31, 2020 projected annual payroll as determined under each set of assumptions.

Appendix A: Current Actuarial Assumptions

Economic Assumptions

Net Investment Return:	7.00%, net of administrative and investment expenses.
Employee Contribution Crediting Rate:	Assumed inflation rate of 2.75% as an estimate of the 10-Year Treasury rate; credited semi-annually.
Consumer Price Index:	Not Applicable.
Payroll Growth:	Inflation of 2.75% per year plus "across the board" salary increases of 0.50% per year.
Increases in Internal Revenue Code Section 401(a)(17) Compensation Limit:	Increase of 2.75% per year from the valuation date.
Increase in Section 7522.10 Compensation Limit:	Increase of 2.75% per year from the valuation date.
Salary Increases:	The annual rate of compensation increase includes: • Inflation at 2.75%, plus • "Across the board" salary increases of 0.50% per year, plus • The following merit and promotion increases:

Years of Service	Rate (%)	
	General	Safety
Less than 1	5.50	7.50
1 – 2	5.00	7.00
2 – 3	4.50	5.00
3 – 4	3.50	4.00
4 – 5	2.50	3.50
5 – 6	1.50	1.50
6 – 7	1.25	1.25
7 – 8	1.00	1.25
8 – 9	0.95	1.25
9 – 10	0.90	1.25
10 – 11	0.85	1.25
11 – 12	0.80	1.25
12 – 13	0.75	1.25
13 – 14	0.75	1.00
14 – 15	0.75	1.00
15 & Over	0.50	0.75

Demographic Assumptions

Post-Retirement Mortality Rates:	*Healthy* • **General Members:** Headcount-Weighted RP-2014 Healthy Annuitant Table times 94% for males and 102% for females, projected generationally with the two-dimensional mortality improvement scale MP-2017 • **Safety Members:** Headcount-Weighted RP-2014 Healthy Annuitant Table times 94% for males and 102% for females, projected generationally with the two-dimensional mortality improvement scale MP-2017 *Disabled* • **General Members:** Headcount-Weighted RP-2014 Disabled Retiree Table times 91% for males and 93% for females, projected generationally with the two-dimensional mortality improvement scale MP-2017 • **Safety Members:** Headcount-Weighted RP-2014 Disabled Retiree Table times 91% for males and 93% for females, projected generationally with the two-dimensional mortality improvement scale MP-2017 *Beneficiary* • **All Beneficiaries:** Beneficiaries are assumed to have the same mortality as a General Member of the opposite sex who has taken a service (non-disability) retirement The RP-2014 mortality tables and adjustments as shown above reflect the mortality experience as of the measurement date. These mortality tables were adjusted to future years using the generational projection to reflect future mortality improvement between the measurement date and those years.

Pre-Retirement Mortality Rates:

- **General Members:** Headcount-Weighted RP-2014 Employee Table times 93% for males and 95% for females, projected generationally with the two-dimensional mortality improvement scale MP-2017
- **Safety Members:** Headcount-Weighted RP-2014 Employee Table times 93% for males and 95% for females, projected generationally with the two-dimensional mortality improvement scale MP-2017

	Rate (%)			
	General		Safety	
Age	Male	Female	Male	Female
20	0.05	0.02	0.05	0.02
25	0.06	0.02	0.06	0.02
30	0.06	0.03	0.06	0.03
35	0.06	0.03	0.06	0.03
40	0.07	0.05	0.07	0.05
45	0.11	0.08	0.11	0.08
50	0.19	0.13	0.19	0.13
55	0.32	0.20	0.32	0.20
60	0.53	0.29	0.53	0.29
65	0.91	0.42	0.91	0.42

Note that generational projections beyond the base year (2014) are not reflected in the above mortality rates.

All pre-retirement deaths are assumed to be non-service connected related.

Mortality Rates for Member Contributions:

- **General Members:** Headcount-Weighted RP-2014 Healthy Annuitant Table times 94% for males and 102% for females, projected 20 years with the two-dimensional scale MP-2017, weighted 33.33% male and 66.67% female
- **Safety Members:** Headcount-Weighted RP-2014 Healthy Annuitant Table times 94% for males and 102% for females, projected 20 years with the two-dimensional scale MP-2017, weighted 75% male and 25% female

Disability Incidence:

Age	Rate (%) General	Rate (%) Safety
20	0.05	0.10
25	0.05	0.16
30	0.05	0.68
35	0.05	1.30
40	0.14	1.50
45	0.23	2.10
50	0.31	2.50
55	0.38	2.80
60	0.43	3.00
65	0.60	0.00
70	0.00	0.00

55% of General disabilities are assumed to be service connected disabilities. The other 45% are assumed to be non-service connected disabilities.

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

Withdrawal:

Less Than Five Years of Service

Years of Service	Rate (%) General	Rate (%) Safety
Less than 1	6.00	3.50
1 – 2	3.00	2.40
2 – 3	2.50	1.60
3 – 4	2.50	1.60
4 – 5	2.00	1.60

Five or More Years of Service

Age	Rate (%) General	Rate (%) Safety
20	1.50	1.60
25	1.50	1.60
30	1.38	1.24
35	0.97	0.64
40	0.54	0.25
45	0.37	0.09
50	0.32	0.02
55	0.24	0.00
60	0.14	0.00
65	0.04	0.00
70	0.00	0.00

No withdrawal is assumed after a member is first assumed to retire.

Vested Termination:

Less Than Five Years of Service

Years of Service	Rate (%)	
	General	Safety
Less than 1	7.00	6.50
1 – 2	6.00	5.00
2 – 3	4.50	4.00
3 – 4	3.50	4.00
4 – 5	3.50	4.00

Five or More Years of Service

Age	Rate (%)	
	General	Safety
20	3.50	4.00
25	3.50	4.00
30	3.50	3.40
35	3.20	2.40
40	2.70	1.40
45	2.20	0.85
50	2.00	0.30
55	2.00	0.00
60	2.00	0.00
65	1.40	0.00
70	0.00	0.00

No vested termination is assumed after a member is first assumed to retire.

Retirement Rates – General:

Age	Rate (%) General Plan A Less Than 30 Years	Rate (%) General Plan A 30 or More Years	Rate (%) General Plan B
48	0.0	0.0	0.0
49	0.0	0.0	0.0
50	6.0	10.0	0.0
51	6.0	10.0	0.0
52	6.0	10.0	3.5
53	6.0	15.0	1.0
54	7.0	20.0	2.0
55	10.0	25.0	2.5
56	8.0	25.0	3.5
57	8.0	30.0	4.5
58	12.0	30.0	5.0
59	20.0	40.0	7.5
60	25.0	40.0	8.5
61	25.0	45.0	9.5
62	30.0	45.0	14.5
63	30.0	45.0	16.5
64	30.0	45.0	19.0
65	30.0	45.0	24.0
66	40.0	45.0	20.0
67	40.0	50.0	20.0
68	40.0	50.0	20.0
69	50.0	80.0	20.0
70	100.0	100.0	100.0

Retirement Rates – Safety:

Age	Rate (%) Safety: Plan A Less Than 30 Years	Plan A 30 or More Years	Plan B
48	5.0	5.0	0.0
49	5.0	5.0	0.0
50	18.0	18.0	5.0
51	16.0	16.0	5.0
52	12.0	18.0	4.5
53	14.0	25.0	4.5
54	22.0	50.0	7.5
55	25.0	75.0	16.5
56	30.0	75.0	15.0
57	20.0	75.0	12.0
58	20.0	75.0	16.0
59	20.0	75.0	16.0
60	75.0	100.0	75.0
61	75.0	100.0	75.0
62	75.0	100.0	75.0
63	75.0	100.0	75.0
64	75.0	100.0	75.0
65	100.0	100.0	100.0
66	100.0	100.0	100.0
67	100.0	100.0	100.0
68	100.0	100.0	100.0
69	100.0	100.0	100.0
70	100.0	100.0	100.0

Retirement Age and Benefit for Deferred Vested Members

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

General Age: 58

Safety Age: 53

General and Safety 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.

25% of future General and 40% of future Safety deferred vested members are assumed to continue to work for a reciprocal employer. For reciprocals, 3.75% and 4.00% compensation increases per annum are assumed for General and Safety, respectively.

Future Benefit Accruals:

1.0 year of service per year of employment.

Unknown Data for Members:

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

Definition of Active Member:

First day of employment.

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 55% of female members are assumed to be married at pre-retirement death or retirement.
Age Spouse:	For all active and inactive members, male members are assumed to have a female spouse who is 4 years younger than the member and female members are assumed to have a male spouse who is 2 years older than the member.
Cashouts:	The following assumptions for a one-time compensation increase at retirement from vacation, sick leave and holiday cashouts are used: *Plan A County Members terminated prior to June 1, 2014:* General Members 4.00% Safety Members 6.00% The following assumptions for a one-time compensation increase at retirement from vacation and holiday cashouts are used: *General Plan A Court Members:* General Members 3.75% *Plan A SVFD Members:* General Members 2.00% Safety Members 3.00%

Appendix B: Proposed Actuarial Assumptions

Economic Assumptions

Net Investment Return:	6.75%, net of administrative and investment expenses.
Employee Contribution Crediting Rate:	Assumed inflation rate of 2.50% as an estimate of the 10-Year Treasury rate; credited semi-annually.
Consumer Price Index:	Not Applicable.
Payroll Growth:	Inflation of 2.50% per year plus "across the board" salary increases of 0.50% per year.
Increases in Internal Revenue Code Section 401(a)(17) Compensation Limit:	Increase of 2.50% per year from the valuation date.
Increase in Section 7522.10 Compensation Limit:	Increase of 2.50% per year from the valuation date.
Salary Increases:	The annual rate of compensation increase includes: • Inflation at 2.50%, plus • "Across the board" salary increases of 0.50% per year, plus • The following merit and promotion increases:

Years of Service	Rate (%)	
	General	Safety
Less than 1	5.00	7.50
1 – 2	5.50	7.50
2 – 3	4.50	5.00
3 – 4	3.50	4.50
4 – 5	2.50	3.50
5 – 6	2.00	1.75
6 – 7	1.50	1.50
7 – 8	1.25	1.25
8 – 9	1.25	1.25
9 – 10	1.25	1.25
10 – 11	1.00	1.25
11 – 12	1.00	1.25
12 – 13	0.75	1.25
13 – 14	0.75	1.00
14 – 15	0.75	1.00
15 & Over	0.55	1.00

Demographic Assumptions

Post-Retirement Mortality Rates:	*Healthy* • **General Members:** Pub-2010 General Healthy Retiree Amount-Weighted Above-Median Mortality Table (separate tables for males and females) increased by 5% for females, projected generationally with the two-dimensional mortality improvement scale MP-2020 • **Safety Members:** Pub-2010 Safety Healthy Retiree Amount-Weighted Above-Median Mortality Table (separate tables for males and females), projected generationally with the two-dimensional mortality improvement scale MP-2020 *Disabled* • **General Members:** Pub-2010 Non-Safety Disabled Retiree Amount-Weighted Mortality Table (separate tables for males and females) decreased 5% for males and decreased 10% for females, projected generationally with the two-dimensional mortality improvement scale MP-2020 • **Safety Members:** Pub-2010 Safety Disabled Retiree Amount-Weighted Mortality Table (separate tables for males and females) decreased 5% for females, projected generationally with the two-dimensional mortality improvement scale MP-2020 *Beneficiary* • **All Beneficiaries:** Pub-2010 Contingent Survivor Amount-Weighted Above Median Mortality Table (separate tables for males and females) increased 5% for males and females, projected generationally with the two-dimensional mortality improvement scale MP-2020 The Pub-2010 mortality tables and adjustments as shown above reasonably reflect the mortality experience as of the measurement date. These mortality tables were adjusted to future years using the generational projection to reflect future mortality improvement between the measurement date and those years.

Pre-Retirement Mortality Rates:

- **General Members:** Pub-2010 General Employee Amount-Weighted Above-Median Mortality Table (separate tables for males and females), decreased 5% for males, projected generationally with the two-dimensional mortality improvement scale MP-2020
- **Safety Members:** Pub-2010 Safety Employee Amount-Weighted Above-Median Mortality Table (separate tables for males and females), decreased 5% for males, projected generationally with the two-dimensional mortality improvement scale MP-2020

	Rate (%)			
	General		Safety	
Age	Male	Female	Male	Female
20	0.03	0.01	0.04	0.01
25	0.02	0.01	0.03	0.02
30	0.03	0.01	0.03	0.02
35	0.04	0.02	0.04	0.03
40	0.05	0.03	0.05	0.04
45	0.08	0.05	0.07	0.06
50	0.12	0.08	0.10	0.08
55	0.18	0.11	0.14	0.11
60	0.26	0.17	0.22	0.14
65	0.38	0.27	0.34	0.20
70	0.58	0.44	0.63	0.39

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

All pre-retirement deaths are assumed to be non-service connected related.

Mortality Rates for Member Contributions:

- **General Members:** Pub-2010 General Healthy Retiree Amount-Weighted Above-Median Mortality Table (separate tables for males and females) increased 5% for females, projected 30 years (from 2010) with the two-dimensional mortality improvement scale MP 2020, weighted 33.33% male and 66.67% female
- **Safety Members:** Pub-2010 Safety Healthy Retiree Amount-Weighted Above-Median Mortality Table (separate tables for males and females), projected 30 years (from 2010) with the two-dimensional mortality improvement scale MP-2020, weighted 75% male and 25% female

Disability Incidence:

Age	Rate (%) General	Rate (%) Safety
20	0.05	0.10
25	0.05	0.16
30	0.05	0.68
35	0.05	1.30
40	0.14	1.50
45	0.20	2.10
50	0.23	2.50
55	0.29	2.80
60	0.30	3.00
65	0.30	0.00
70	0.00	0.00

55% of General disabilities are assumed to be service connected disabilities. The other 45% are assumed to be non-service connected disabilities.

100% of Safety disabilities are assumed to be service connected disabilities.

Withdrawal:

Less Than Five Years of Service

Years of Service	Rate (%) General	Rate (%) Safety
Less than 1	5.75	3.00
1 – 2	2.75	2.40
2 – 3	2.50	1.40
3 – 4	2.50	1.40
4 – 5	1.75	1.40

Five or More Years of Service

Age	Rate (%) General	Rate (%) Safety
20	1.25	1.00
25	1.25	1.00
30	1.10	0.85
35	0.70	0.54
40	0.44	0.25
45	0.37	0.09
50	0.32	0.02
55	0.18	0.00
60	0.04	0.00
65	0.00	0.00
70	0.00	0.00

No withdrawal is assumed after a member is first assumed to retire.

Vested Termination:

Less Than Five Years of Service

Years of Service	Rate (%)	
	General	Safety
Less than 1	8.00	7.50
1 – 2	6.00	6.00
2 – 3	5.50	4.00
3 – 4	4.50	4.00
4 – 5	4.00	4.00

Five or More Years of Service

Age	Rate (%)	
	General	Safety
20	4.00	3.75
25	4.00	3.75
30	4.00	3.00
35	3.40	2.20
40	3.00	1.40
45	2.55	0.85
50	2.25	0.30
55	2.25	0.00
60	2.25	0.00
65	2.25	0.00
70	0.00	0.00

No vested termination is assumed after a member is first assumed to retire.

Retirement Rates – General:

Age	Rate (%) General Plan A Less Than 30 Years	Rate (%) General Plan A 30 or More Years	Rate (%) General Plan B
46	0.0	0.0	0.0
47	0.0	0.0	0.0
48	0.0	0.0	0.0
49	0.0	0.0	0.0
50	5.0	10.0	0.0
51	3.5	10.0	0.0
52	4.5	10.0	3.5
53	5.0	15.0	1.0
54	5.5	20.0	2.0
55	10.0	20.0	2.5
56	8.5	20.0	3.5
57	8.5	20.0	4.5
58	10.0	25.0	5.0
59	18.0	40.0	7.5
60	21.0	40.0	8.0
61	21.0	40.0	12.0
62	27.0	45.0	15.0
63	27.0	45.0	20.0
64	27.0	45.0	25.0
65	32.0	45.0	25.0
66	40.0	45.0	25.0
67	40.0	45.0	25.0
68	40.0	50.0	25.0
69	50.0	50.0	25.0
70	100.0	100.0	100.0

Retirement Rates – Safety:

Age	Rate (%) Safety Plan A Less Than 30 Years	Safety Plan A 30 or More Years	Safety Plan B
46	2.0	0.0	0.0
47	2.0	0.0	0.0
48	6.0	6.0	0.0
49	15.0	15.0	0.0
50	18.0	18.0	5.0
51	14.0	16.0	5.0
52	12.0	18.0	4.5
53	14.0	25.0	4.5
54	16.0	50.0	7.5
55	18.0	50.0	16.5
56	25.0	50.0	15.0
57	20.0	50.0	12.0
58	20.0	50.0	16.0
59	20.0	75.0	16.0
60	50.0	75.0	50.0
61	50.0	75.0	50.0
62	50.0	75.0	50.0
63	50.0	75.0	50.0
64	50.0	75.0	50.0
65	100.0	100.0	100.0
66	100.0	100.0	100.0
67	100.0	100.0	100.0
68	100.0	100.0	100.0
69	100.0	100.0	100.0
70	100.0	100.0	100.0

Retirement Age and Benefit for Deferred Vested Members:

For current and future deferred vested members without reciprocity, retirement age assumptions are as follows:

General Age: 58

Safety Age: 52

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

General Age: 60

Safety Age: 55

General and Safety 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.

25% of future General and 35% of future Safety deferred vested members are assumed to continue to work for a reciprocal employer. For reciprocals, 3.55% and 4.00% compensation increases per annum are assumed for General and Safety, respectively.

Future Benefit Accruals:

1.0 year of service per year of employment.

Unknown Data for Members:	Same as those exhibited by members with similar known characteristics. If not specified, members are assumed to be male.
Definition of Active Member:	First day of employment.
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 55% of female members are assumed to be married at pre-retirement death or retirement.
Age Spouse:	For all active and inactive members, male members are assumed to have a female spouse who is 3 years younger than the member and female members are assumed to have a male spouse who is 2 years older than the member.
Cashouts:	The following assumptions for a one-time compensation increase at retirement from vacation, sick leave and holiday cashouts are used: *Plan A County Members terminated prior to June 1, 2014:* General Members 4.00% Safety Members 6.00% The following assumptions for a one-time compensation increase at retirement from vacation and holiday cashouts are used: *General Plan A Court Members:* General Members 3.25% *Plan A SVFD Members:* General Members 2.00% Safety Members 2.50%

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