Ventura County Employees'
Retirement Association

Actuarial Experience Study

Analysis of Actuarial Experience During the Period July 1, 2017 through June 30, 2020

Segal

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June 3, 2021

Board of Retirement
Ventura County Employees' Retirement Association
1190 South Victoria Avenue, Suite 200
Ventura, CA 93003-6572

Re: Review of Actuarial Assumptions for the June 30, 2021 Actuarial Valuation

Dear Members of the Board:

We are pleased to submit this report of our review of the actuarial experience for the Ventura County Employees' Retirement Association. This study utilizes the census data for the period July 1, 2017 to June 30, 2020 and provides the proposed actuarial assumptions, both economic and demographic, to be used in the June 30, 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,

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Senior Vice President and Actuary

Molly Calcagno, ASA, MAAA, EA
Actuary

JY/jl

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I. Introduction, Summary, and Recommendations

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

If assumptions are modified, contribution requirements are adjusted to take into account a change in the projected experience in all future years. There is a great difference in both philosophy and cost impact between recognizing the actuarial deviations as they occur annually and changing the actuarial assumptions. Taking into account one year's gains or losses without making a change in the assumptions means that year's experience is treated as temporary and that, over the long run, experience will return to what was originally assumed. For example, it is impossible to determine 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 July 1, 2017 through June 30, 2020. The study was performed in accordance with Actuarial Standard of Practice (ASOP) No. 27 "Selection of Economic Assumptions for Measuring Pension Obligations" and ASOP No. 35 "Selection of Demographic and Other Non-Economic Assumptions for Measuring Pension Obligations." These Standards of Practice provide guidance for the selection of the various actuarial assumptions utilized in a pension plan actuarial valuation. Based on the study's results and expected future experience, we are recommending various changes in the current actuarial assumptions.

We are recommending changes in the assumptions for inflation, investment return, merit and promotion salary increases, retirement from active employment, retirement age for deferred vested members, pre-retirement mortality, post-retirement healthy and disabled life mortality, termination (refunds and deferred vested retirements), disability (non-service connected and service connected) and in-service redemptions.

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

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. **Retiree Cost of Living Increases:** Future increases in the Cost of Living adjustment for Retirees.	Reduce the inflation assumption from 2.75% to 2.50% per annum as discussed in Section (III)(A). Maintain the retiree cost-of-living assumption at 2.75% per annum (based on our recommended inflation assumption of 2.50% plus a margin for adverse deviation of 0.25%) as discussed in Section (III)(A).
14	**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 7.25% to 7.00% per annum as discussed in Section (III)(B).
22	**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 (III)(C) to reflect past experience. Future merit and promotion salary increases are higher in most service categories under the proposed assumptions. The recommended total rates of salary increase anticipate about the same salary increases overall as the current assumptions, for both General and Safety members.
28	**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	We recommend adjusting the retirement rates to those developed in Section (IV)(A). For active and deferred vested members, maintain the current percent married at retirement assumption at 70% for males and 55% for females. Maintain the spouse age difference assumption that male retirees are three years older than their spouses and that female retirees are two years younger than their spouses. For deferred vested members, increase the deferred vested retirement age assumption to age 60 for all General members. For Safety members, decrease to age 52 for those who are not covered by a reciprocal system and increase to age 55 for those who are covered by a reciprocal system. Maintain the current proportion of future deferred vested members expected to be covered by a reciprocal system at 45% for General members and 60% for Safety members. In addition, maintain the reciprocal salary increase assumption at 3.75% for General members and increase from 3.95% to 4.00% for Safety members.

Pg #	Actuarial Assumption Categories	Recommendation
38	**Mortality Rates:** The probability of dying at each age. Mortality rates are used to project life expectancies.	For pre-retirement mortality: Current base table: Headcount-Weighted RP-2014 Employee Mortality Table with rates decreased by 20%. Recommended base table for General Members: Pub-2010 General Employee Amount-Weighted Above-Median Mortality Table. Recommended base table for Safety Members: Pub-2010 Safety Employee Amount-Weighted Above-Median Mortality Table. For healthy General retirees: Current base table: Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table with rates decreased by 10% for males. Recommended base table: Pub-2010 General Healthy Retiree Amount-Weighted Above-Median Mortality Table with rates increased by 5% for females. For healthy Safety retirees: Current base table: Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table with rates decreased by 25% for males and 15% for females. Recommended base table: Pub-2010 Safety Healthy Retiree Amount-Weighted Above-Median Mortality Table. For all beneficiaries: Current base table: Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table with rates decreased by 10% for males. Recommended base table: Pub-2010 Contingent Survivor Amount-Weighted Above-Median Mortality Table with rates increased by 10% for females. For disabled General retirees: Current base table: Headcount-Weighted RP-2014 Disabled Retiree Mortality Table with rates reduced by 15% for males. Recommended base table: Pub-2010 Non-Safety Disabled Retiree Amount-Weighted Mortality Table For disabled Safety retirees: Current: Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table with rates increased by 15% for females. Recommended base table: Pub-2010 Safety Disabled Retiree Amount-Weighted Mortality Table. 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, optional forms and reserves: change the mortality rates to those developed in Section (IV)(B).
52	**Termination Rates:** The probability of leaving employment at each age and receiving either a refund of member contributions or a deferred vested retirement benefit.	We recommend adjusting the termination rates to those developed in Section (IV)(D) to reflect a slightly lower incidence of termination overall for both General and Safety members.
57	**Disability Incidence Rates:** The probability of becoming disabled at each age.	We recommend adjusting the disability rates to those developed in Section (IV)(E) to reflect a slightly lower incidence of disability overall for both General and Safety members.

Pg #	Actuarial Assumption Categories	Recommendation
61	**In Service Redemptions:** Additional pay elements that are expected to be received during the member's final average earnings period.	Increase the current in-service redemption assumption for General Tier 1, maintain the current in-service redemption assumption for General Tier 2, and decrease the current in-service redemption assumption for non-PEPRA Safety, as developed in Section (IV)(F).
62	**Average Entry Age (for member contributions):** Used for determining contribution rates for non-PEPRA members hired after November 1974 who are not contributing fifty percent of Normal Cost.	Maintain the current average entry age assumption for General and Safety members as developed in Section (IV)(G).

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

Cost Impact of the Recommended Assumptions Based on June 30, 2020 Actuarial Valuation

Impact on Average Employer Contribution Rates	
Increase due to changes in economic assumptions	2.53%
Decrease due to changes in demographic assumptions[2]	-0.64%
Total increase in average employer rate	1.89%
Total estimated increase in annual dollar amount ($000s)	$14,941
Impact on Average Member Contribution Rates	
Increase due to changes in economic assumptions	0.58%
Increase due to changes in demographic assumptions[2]	0.09%
Total increase in average member rate	0.67%
Total estimated increase in annual dollar amount ($000s)	$5,276
Impact on UAAL and Funded Percentage	
Increase in UAAL	$116 million
Change in Funded Percentage	From 89.57% to 88.06%

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

[2] 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 VCERA service. The refinement spreads the Normal Cost over only the member's service period with VCERA. 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.

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

II. Background and Methodology

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

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.
- **Investment Return:** Expected long-term rate of return on the Association's investments after administration 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 III.

Demographic Assumptions

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

III. Economic Assumptions

A. Inflation

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

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

Historical Consumer Price Index – 1930 to 2020[3]
(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 Data website, which is produced in partnership with the National System of State Retirement Administrators (NASRA), the median inflation assumption used by 178 large public retirement funds in their 2019 fiscal year valuations was 2.50%.[4] In California, CalSTRS, and sixteen 1937 Act CERL systems use an inflation assumption of 2.75% while CalPERS and four 1937 Act CERL systems use an inflation assumption of 2.50%.[5]

VCERA's investment consultant, New England Pension Consultants (NEPC), anticipates an annual inflation rate of 2.20%, while the average inflation assumption provided by NEPC and five other investment advisory firms retained by Segal's California public sector clients was 2.23%. 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.[6]

[3] 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).
[4] Among 199 large public retirement funds, the inflation assumption was not available for 21 of the public retirement funds in the survey data.
[5] One of these 1937 Act CERL systems uses a 2.50% inflation assumption with a 2.75% COLA assumption.
[6] The time horizon used by the six investment consultants included in our review generally ranges from 10 years to 30 years, with NEPC 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) 2020 report on the financial status of the Social Security program.[7] 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.[8] As of April 2021, the difference in yields is about 2.25% which provides a measure of market expectations of inflation.

Based on all of the above information, we recommend that the current 2.75% annual inflation assumption be reduced to 2.50% for the June 30, 2021 actuarial valuation.

The setting of the inflation assumption using the information outlined above is a somewhat subjective process, and Segal does not apply a specific weight to each of the metrics in determining our recommended inflation assumption. Based on a consideration of all 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.

Retiree Cost-of-Living Increases

Retiree cost-of-living adjustments for all General Tier 1 and Safety members are based on actual changes in CPI and are subject to a 3.00% maximum change per year. In our last experience study as of June 30, 2018, consistent with the 2.75% annual inflation assumption adopted by the Board for that valuation, the Board used a 2.75% cost-of-living adjustment for all General Tier 1 and Safety members.

Note that General Tier 2 members with COLA provision are entitled to receive a fixed 2% COLA, not limited to actual changes in the CPI, that applies to future service after March 2003.

In the last experience study, we set the recommended post-retirement cost-of-living adjustment (COLA) assumption to be equal to our recommended inflation assumption. However, we observed in the table below that during the most recent 5-year, 10-year and 20-year periods, the changes in the December CPI based on Los Angeles-Long Beach-Anaheim area used by the Board to set COLAs have exceeded those of the December CPI for the U.S. City Average. In order to reflect this experience and to mitigate actuarial losses which may arise from future COLA increases greater than the inflation assumption, we believe it is reasonable for the Board to consider adopting an extra margin above the general price inflation in anticipating future COLAs. **Our recommended COLA assumption of 2.75% includes a 0.25% margin above our recommended inflation assumption, which leaves the COLA assumption unchanged.**

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

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

	Change in December CPI for Los Angeles-Long Beach-Anaheim Area	Change in December CPI for U.S. City Average
5-year period	2.64%	1.95%
10-year period	2.12%	1.74%
20-year period	2.60%	2.04%

In developing the COLA assumption for this study, we also considered the results of a stochastic approach that would attempt to account for the possible impact of low inflation that could occur before COLA banks are able to be established for the member. Although the results of this type of analysis might justify the use of a lower COLA assumption, we are not recommending that at this time. The reasons for this conclusion include the following:

- The results of the stochastic modeling are significantly dependent on assuming that lower levels of inflation will persist in the early years of the projections. If this is not assumed, then the stochastic modeling will produce results similar to our proposed COLA assumptions.
- Using a lower long-term COLA assumption based on a stochastic analysis would mean that an actuarial loss would occur even when the inflation assumption is met in a year. We question the reasonableness of this result.

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

B. Investment Return

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

Real Rate of Investment Return

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

The 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 NEPC's total or "nominal" 2021 return assumptions by their assumed 2.20% 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 NEPC 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.[9]

[9] 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.

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

Asset Class	Percentage of Portfolio	NEPC's Assumed Real Rate of Return[10]	Average Assumed Real Rate of Return from a Sample of Consultants to Segal's California Public Sector Clients[11]
Large Cap Equity	27.69%	5.42%	5.39%
Small Cap Equity	3.96%	6.37%	6.58%
Developed International Equity	16.04%	6.28%	6.39%
Emerging Market Equity	4.31%	9.70%	8.60%
Core Bonds	5.00%	0.77%	0.83%
Treasuries	2.00%	0.10%	0.00%
Real Estate	8.00%	5.78%	5.01%
Private Equity	16.00%	11.93%	10.00%
Private Debt/Credit Strategies	6.00%	6.70%	5.02%
Infrastructure	4.00%	5.89%	5.89%[12]
Natural Resources	2.00%	11.24%	11.24%[12]
Absolute Return Fixed Income	5.00%	2.17%	2.17%[12]
Total	**100.00%**	**6.56%**	**6.06%**

The above are representative of "indexed" returns and do not include any additional returns ("alpha") from active management. This is consistent with the Actuarial Standard of Practice No. 27, Section 3.6.3.d, which states:

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

The following are some observations about the returns provided above:

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

[10] The rates shown have been estimated by Segal by taking NEPC's net-of-fee return assumptions for each asset class and increasing by the estimated investment fees for that asset class, as provided by VCERA and NEPC. The returns are reduced by NEPC's assumed 2.20% inflation rate to develop the assumed real rate of return.

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

[12] For these asset classes, NEPC'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 NEPC's assumption should more closely reflect the underlying investments made specifically for VCERA.

3. Therefore, we recommend that the 6.06% portfolio real rate of return be used to determine VCERA's investment return assumption. This is 0.65% higher than the return that was used three years ago in the review of the recommended investment return assumption for the June 30, 2018 valuation. The difference is due to changes in the real rate of return assumptions provided to us by the investment advisory firms (+0.11% under the 2018 asset allocation), changes in the VCERA's target asset allocation (+0.46%) and the interaction effect between these changes (+0.08%).

Association Expenses

For funding purposes, the real rate of return assumption for the portfolio needs to be adjusted for investment and administrative expenses expected to be paid from investment income. The following table provides the investment and administrative expenses in relation to the actuarial value of assets for the five years ending June 30, 2020.

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

Year Ending June 30	Actuarial Value of Assets[13]	Administrative Expenses	Investment Expenses[14]	Administrative %	Investment %	Total %
2016	4,592,439	4,474	14,309	0.10	0.31	0.41
2017	4,963,653	5,524	14,829	0.11	0.30	0.41
2018	5,385,146	7,695	15,597	0.14	0.29	0.43
2019	5,664,610	7,739	20,432	0.14	0.36	0.50
2020	6,044,102	7,950	22,961	0.13	0.38	0.51
Five-Year Average				0.12	0.33	0.45
Three-Year Average				0.14	0.34	0.48
Current Assumption						0.30
Proposed Assumption						0.50

In the prior experience study, we excluded the investment expenses associated with private equity and real assets because the capital market assumptions provided by NEPC for those categories were net of active management fees. With this study, we estimated the real return gross of investment expenses in order to be consistent with the returns shown by other investment consultants for our survey. As a result, the average expense percentage over this three-year period is 0.48%, including investment expenses associated with private equity and real assets. **Therefore, we are recommending an increase in the future expense assumption component from 0.30% to 0.50%.**

Note related to investment expenses paid to active managers – As cited above, under Section 3.6.3.d of ASOP No. 27, the effect of an active investment management strategy should be considered "net of investment expenses…unless the actuary believes, based on relevant data, that such superior or inferior returns represent a reasonable expectation over the measurement

[13] As of end of plan year.

[14] 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.

period." For VCERA, a significant portion of the investment expenses were paid for expenses associated with active managers.

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 2% (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. VCERA'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.[15] This is consistent with our experience that retirement plan fiduciaries would generally prefer that returns exceed the assumed rate more often than not.

The 6.06% 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.[16] 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 7.25%. That return implied a risk adjustment of 0.61%, reflecting a confidence level of 57% 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.[17]

If we use the same 57% confidence level from our last study to set this year's risk adjustment and the current long-term portfolio standard deviation of 15.10% provided by NEPC, the corresponding risk adjustment would be 0.68%. Together with the other investment return components, this would result in an investment return assumption of 7.38%, which is higher than the current assumption of 7.25%. However, VCERA's target asset allocation in recent years has shifted towards one that exhibits a significantly higher risk profile compared to

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

[16] 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.

[17] Based on an annual portfolio return standard deviation of 13.61% provided by NEPC 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.

VCERA's prior asset allocation and compared to the other California retirement systems that we evaluate using this risk model. As detailed below, our analysis also considered the general downward trend in the investment return assumption for public retirement systems, as well as the opportunity to use the increase in the portfolio real rate of return to increase the confidence level. For these reasons, we evaluated the effect on the confidence level of alternative investment return assumptions. In particular, a net investment return assumption of 7.00% together with the other investment return components, would produce a risk adjustment of 1.06%, which reflects a confidence level of 60%. We believe this analysis and the discussion below supports reducing the current assumption of 7.25% to 7.00%.

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

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

Year Ending June 30	Investment Return	Risk Adjustment	Corresponding Confidence Level
2003	8.00%	0.48%	57%
2004	8.00%	1.02%	64%
2005	8.00%	0.99%	64%
2006	8.00%	0.85%	61%
2007 - 2008	8.00%	0.82%	61%
2009 - 2011	8.00%	0.57%	57%
2012 - 2014	7.75%	0.41%	54%
2015 - 2017	7.50%	0.36%	54%
2018 - 2020	7.25%	0.61%	57%
2021 (Recommended)	7.00%	1.06%	60%

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 VCERA has positioned itself relative to risk over periods of time.[18] The use of a 60% 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 NEPC. 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 60% is at the high 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. However, taking into account the higher risk profile of the current

[18] 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."

target asset allocation compared to other California retirement systems, we believe that a higher confidence level is reasonable.

- We have not taken into account any additional returns ("alpha") that might be earned on active management. This means that if active management generates enough alpha to cover its related expenses, this would increase returns. This aspect of Segal's model is further evaluated below.
- As with any model, the results of the risk adjustment model should be evaluated for reasonableness and consistency. This is discussed in the later section on "Comparison with Other Public Retirement Systems."

Taking into account the factors above, our recommendation is to reduce the net investment return assumption from 7.25% to 7.00%. As noted above, this return implies a 1.06% risk adjustment, reflecting a confidence level of 60%.

Recommended Investment Return Assumption

The following table summarizes the components of the investment return assumption developed in the previous discussion. For comparison purposes, we have also included similar values from the last study.

Calculation of Investment Return Assumption

Assumption Component	June 30, 2021 Recommended	June 30, 2018 Adopted Value
Inflation	2.50%	2.75%
Plus Portfolio Real Rate of Return	6.06%	5.41%
Minus Expense Adjustment	(0.50%)	(0.30%)
Minus Risk Adjustment	(1.06%)	(0.61%)
Total	**7.00%**	**7.25%**
Confidence Level	**60%**	**57%**

Based on this analysis, we recommend that the investment return assumption be reduced from 7.25% to 7.00% per annum.

Comparison with Alternative Model used to Review Investment Return Assumption

Since our appointment as actuary for VCERA in 2003, 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.[19] 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.

[19] 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.

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.[20] Even though expected geometric returns are lower than expected arithmetic returns, those California public retirement systems that have set investment return assumptions using this alternative approach have in practice adopted investment return assumptions that are comparable to those adopted by the Board for VCERA. This is because under the model used by those retirement systems, their investment return assumptions are not reduced to anticipate future investment expenses.[21]

For comparison, we evaluated the recommended 7.00% assumption based on the expected geometric return for the entire portfolio, net of administrative and investment expenses. Under that model, over a 15-year period, there is a 62% likelihood that future average geometric returns will meet or exceed 7.00%.[22]

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 becoming more common among California public sector retirement systems. In particular, of the twenty 1937 Act CERL systems, thirteen use a 7.00% investment return assumption, three use 6.75%, and one uses 6.50%. The remaining three 1937 Act CERL systems (including VCERA) 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 VCERA's recommended net investment return assumption against those of the 199 large public retirement funds in their 2019 fiscal year valuations based on information found in the Public Plans Data website, which is produced in partnership with NASRA:[23]

		Public Plans Data[24]		
Assumption	**VCERA**	**Low**	**Median**	**High**
Net Investment Return	7.00%	4.50%	7.25%	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 2019. State systems outside of California tend to

[20] 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.

[21] This means that if the model were to be applied to VCERA, the expected geometric return would not be adjusted for the approximately 0.35% investment expenses paid by VCERA.

[22] 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.

[23] Among 199 large public retirement funds, the investment return assumption was not available for 12 of the public retirement funds in the survey data.

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

change their economic assumptions less frequently and so may lag behind emerging practices in this area.

In summary, we believe the recommended assumption of 7.00% provides for an appropriate risk margin within the risk adjustment model and is consistent with VCERA's historical practice relative to other public systems.

C. Salary Increase

Salary increases impact plan costs in two ways: (i) by increasing members' benefits (since benefits are a function of the members' highest average pay) and future normal cost collections; and (ii) by increasing total active member payroll which in turn generates lower UAAL contribution rates 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 are recommending that the assumed rate of inflation be decreased from 2.75% to 2.50% per annum. This inflation component is used as part of the salary increase assumption.

2. **Real "Across the Board" Pay Increases:** These increases are typically termed productivity increases since they are considered to be derived from the ability of an organization or an economy to produce goods and services in a more efficient manner. As that occurs, at least some portion of the value of these improvements can provide a source for pay increases. These increases are typically assumed to extend to all employees "across the board". The State and Local Government Workers Employment Cost Index produced by the Department of Labor provides evidence that real "across the board" pay increases have averaged about 0.5% – 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 April 2020. In that report, real "across the board" pay increases are forecast to be 1.1% per year under the intermediate assumptions.

   The real pay increase assumption is generally considered a more "macroeconomic" assumption that is not necessarily based on individual plan experience. However, recent salary experience with public systems in California as well as anecdotal discussions with plans and plan sponsors indicate lower future real wage growth expectations for public sector employees. We note that for VCERA's active members, the actual average inflation plus "across the board" increase (i.e., wage inflation) over the three year period ending June 30, 2020 was 2.56%, which is less than the change in CPI of 3.27% during that same period:

Valuation Date	Actual Average Increase[25]	Actual Change in CPI[26]
June 30, 2018	2.56%	3.61%
June 30, 2019	2.22%	3.24%
June 30, 2020	2.90%	2.96%
Three Year Average	**2.56%**	**3.27%**

[25] 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.

[26] Based on the change in the December CPI index for the Los Angeles-Long Beach-Anaheim Area compared to the prior year.

Considering these factors, we recommend maintaining the real "across the board" salary increase assumption at 0.50%. This means that the combined inflation and "across the board" salary increase assumption will decrease from 3.25% 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 VCERA, there are service-specific merit and promotion increases.

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

   a. Measuring each continuing member's actual salary increase over each year of the experience period on a salary-weighted basis, with higher weights assigned to experience from members with larger salaries;
   b. Excluding any members with increases of more than 50% or decreases of more than 10% during any particular year;
   c. Categorizing these increases according to member demographics;
   d. Removing the wage inflation component from these increases (assumed to be equal to the increase in the members' average salary during the year);
   e. Averaging these annual increases over the experience period; and
   f. Modifying current assumptions to reflect some portion of these measured increases reflective of their "credibility."

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

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

The following table shows the General members' actual average merit and promotion increases by years of service over the three-year period from July 1, 2017 through June 30, 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 (2.84% on average for the most recent three-year period).

General

	Rate (%)			
Years of Service	**Current Assumptions**	**Actual Average Increase from Current Study (Last 3 Years)**	**Actual Average Increase Current and Prior Two Studies (Last 6 Years)**	**Proposed Assumption**
Less than 1	7.00	5.97	7.57	7.00
1 – 2	5.25	4.73	5.77	5.25
2 – 3	4.00	3.96	4.74	4.00
3 – 4	3.50	3.20	4.14	3.50
4 – 5	2.75	3.15	3.61	3.00
5 – 6	2.25	3.65	3.60	2.75
6 – 7	2.00	3.19	3.37	2.50
7 – 8	1.75	3.29	3.21	2.25
8 – 9	1.50	2.76	2.78	2.00
9 – 10	1.25	2.68	2.78	1.75
10 – 11	1.00	2.55	2.80	1.50
11 – 12	0.95	2.11	2.35	1.40
12 – 13	0.90	2.15	2.39	1.30
13 – 14	0.85	2.10	2.18	1.20
14 – 15	0.80	1.86	2.25	1.10
15 – 16	0.75	1.88	2.11	1.00
16 – 17	0.70	1.71	1.64	0.95
17 – 18	0.65	1.59	1.89	0.90
18 – 19	0.60	1.63	1.60	0.85
19 – 20	0.55	1.28	1.41	0.80
20 & Over	0.50	1.40	1.65	0.75

The following table shows the Safety members' actual average merit and promotion increases by years of service over the three-year period from July 1, 2017 through June 30, 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 (1.38% on average for the most recent three-year period).

Safety

	Rate (%)			
Years of Service	**Current Assumptions**	**Actual Average Increase from Current Study (Last 3 Years)**	**Actual Average Increase Current and Prior Two Studies (Last 6 Years)**	**Proposed Assumption**
Less than 1	8.50	11.44	11.70	9.00
1 – 2	6.50	5.18	6.25	6.25
2 – 3	5.00	4.30	5.03	4.75
3 – 4	4.25	6.04	5.44	4.50
4 – 5	3.75	6.19	6.20	4.25
5 – 6	3.50	4.57	4.45	4.00
6 – 7	2.50	3.11	3.26	2.75
7 – 8	1.50	1.77	1.64	1.75
8 – 9	1.25	2.29	1.30	1.50
9 – 10	1.00	1.79	1.31	1.25
10 – 11	0.95	2.28	2.26	1.20
11 – 12	0.90	2.05	1.72	1.15
12 – 13	0.85	2.22	1.28	1.10
13 – 14	0.80	1.74	1.46	1.05
14 – 15	0.70	1.63	1.19	1.00
15 – 16	0.70	1.89	1.30	1.00
16 – 17	0.70	2.01	1.45	1.00
17 – 18	0.70	2.16	1.81	1.00
18 – 19	0.70	2.55	1.86	1.00
19 – 20	0.70	2.23	1.75	1.00
20 & Over	0.70	2.15	1.66	1.00

Chart 1 that follows later in the section compares actual experience with the current and proposed rates of actual merit and promotion increases 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.

Chart 2 compares actual experience with the current and proposed rates of actual merit and promotion increases 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.

Based on this experience, we are proposing increases overall in the merit and promotion salary increases for both General and Safety members. The overall salary increase assumptions will remain substantially the same for both General and Safety members after taking into account the lower inflation component of the salary increase assumption.

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.

We recommend that the active member payroll increase assumption be decreased from 3.25% to 3.00% annually, consistent with the combined inflation plus real "across the board" salary increase assumptions.

Chart 1: Merit and Promotion Salary Increase Rates
General Members

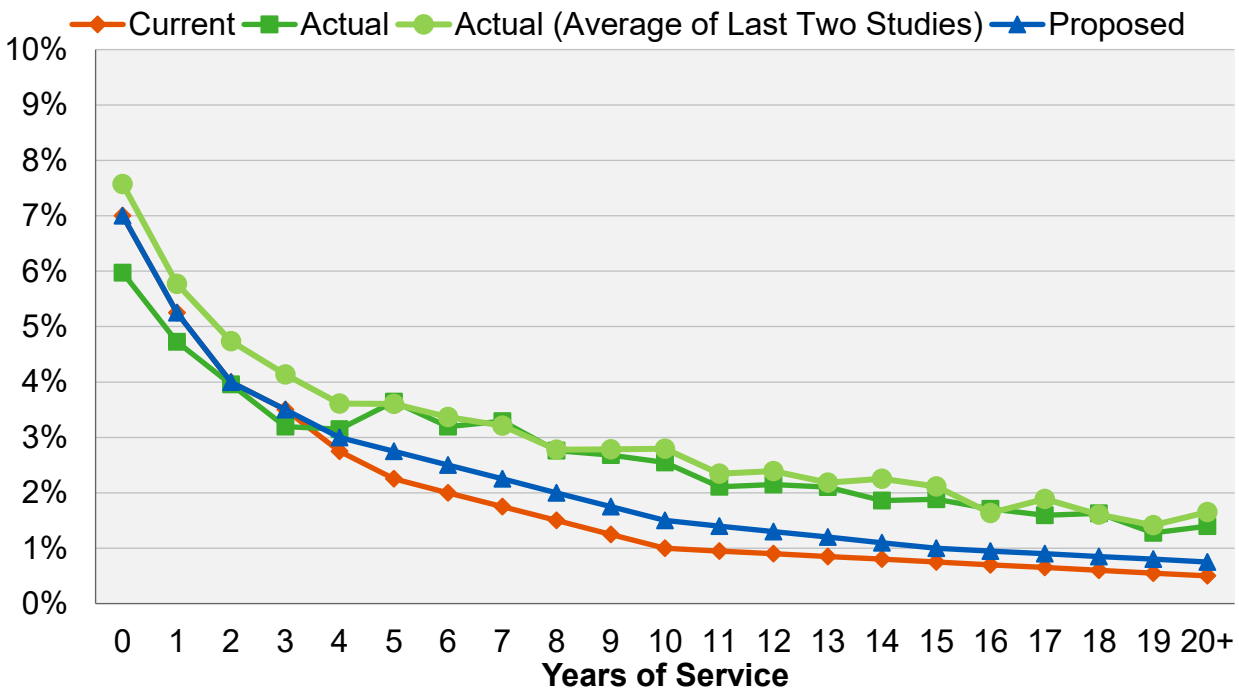
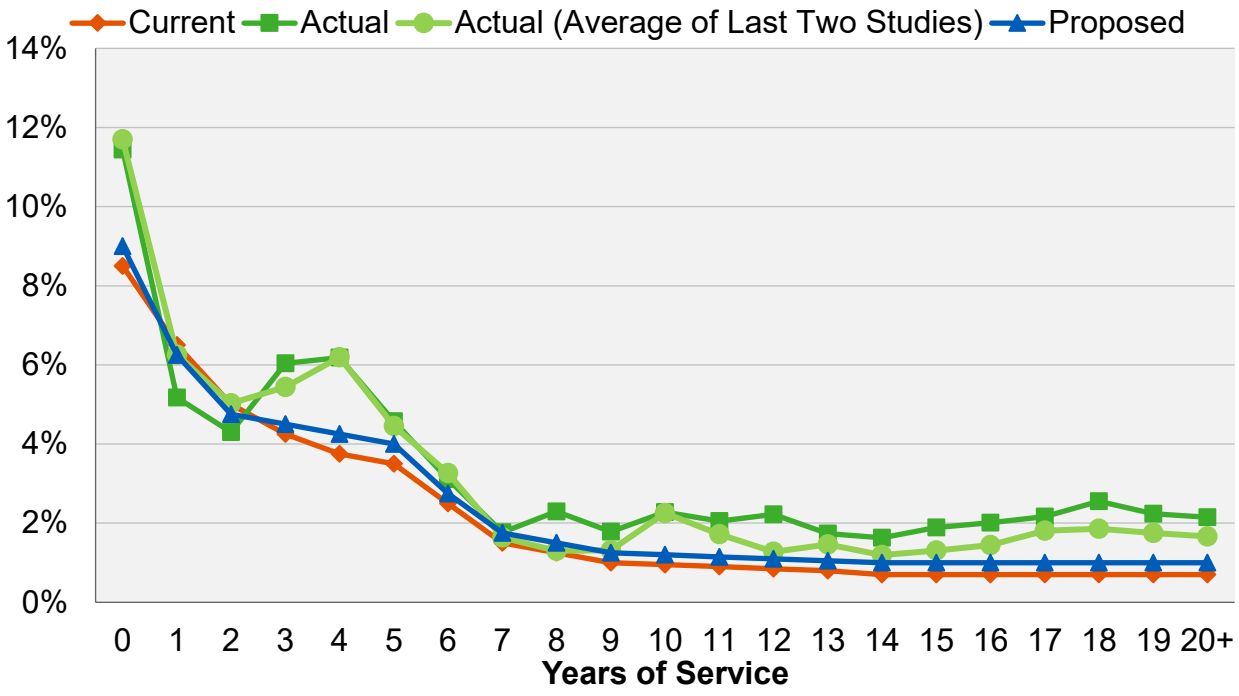


Chart 2: Merit and Promotion Salary Increase Rates
Safety Members



IV. Demographic Assumptions

A. Retirement Rates

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

Continuing the practice adopted in the last experience study, the retirement assumptions apply different sets of age based retirement assumptions for those with less than 30 years of service and to those with more than 30 years of service. The table on the following page show the observed service retirement rates for non-PEPRA General members (i.e., General Tiers 1 and 2) 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 observed service retirement rates were determined by comparing those members who actually retired from service to those eligible to retire from service. This same methodology is followed throughout this report and was described in Section II. Also shown are the current assumed rates and the rates we propose.

Non-PEPRA General Tiers

	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
Under 50	0.00	N/A	0.00	50.00	50.00	50.00
50	2.00	1.87	2.00	2.00	0.00	2.00
51	2.00	3.31	2.25	2.00	0.00	2.25
52	2.50	2.91	2.75	2.50	0.00	2.75
53	3.00	3.69	3.00	3.00	0.00	3.00
54	3.25	3.31	3.25	3.25	8.70	4.00
55	4.75	3.64	4.50	4.75	9.09	5.00
56	5.00	6.48	5.25	5.00	4.08	6.00
57	5.50	4.96	5.50	5.50	8.82	7.00
58	7.00	4.09	6.00	7.00	11.69	9.00
59	7.50	8.92	8.00	7.50	11.11	9.50
60	10.50	10.60	10.50	15.75	12.31	14.00
61	14.00	11.45	13.00	21.00	19.30	20.00
62	25.00	18.01	22.00	37.50	23.64	30.00
63	20.00	15.66	18.00	30.00	23.53	25.00
64	20.00	18.95	18.00	30.00	17.65	25.00
65	28.00	36.69	30.00	42.00	48.28	45.00
66	35.00	42.42	35.00	52.50	47.06	50.00
67	30.00	40.85	35.00	45.00	50.00	47.50
68	30.00	24.44	27.50	45.00	50.00	47.50
69	22.50	29.73	25.00	22.50	40.00	25.00
70	22.50	29.27	25.00	22.50	40.00	25.00
71	20.00	30.30	25.00	20.00	33.33	25.00
72	20.00	22.73	25.00	20.00	25.00	25.00
73	20.00	25.00	25.00	20.00	33.33	25.00
74	20.00	37.50	25.00	20.00	0.00	25.00
75 & Over	100.00	23.68	100.00	100.00	13.33	100.00

As shown above, we are recommending decreases in some of the retirement rates at certain ages while recommending increases in some of the retirement rates at other ages. Overall, the proposed rates represent a slight decrease from current rates for non-PEPRA General members.

The same retirement rates are proposed for both General Tiers 1 and 2 members. This is because retirement experience is largely driven by Tier 2 members as there are very few Tier 1 non-retired members.

In some age categories limited experience is available, such as under age 50 (for those with 30 or more years of service) or over age 65. For the under age 50 category, we continue proposing a 50% retirement rate similar to the last experience study. For ages over 65, there is some smoothing of the proposed rates for those age categories.

Chart 3 that follows later in this section compares actual experience with the current and proposed rates of retirement for non-PEPRA General members with less than 30 years of service.

Chart 4 compares actual experience with the current and proposed rates for non-PEPRA General members with 30 or more years of service.

The following table shows the observed retirement rates for non-PEPRA Safety members (i.e., Safety Tier 1) 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.

Non-PEPRA Safety Tier

	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
40	1.00	0.00	1.50	1.00	N/A	1.50
41	1.00	0.00	1.50	1.00	N/A	1.50
42	1.00	5.88	1.50	1.00	N/A	1.50
43	1.00	0.00	1.50	1.00	N/A	1.50
44	1.00	5.56	1.50	1.00	N/A	1.50
45	1.00	0.00	1.50	1.00	N/A	1.50
46	1.00	0.00	1.50	1.00	N/A	1.50
47	1.00	2.15	1.50	1.00	N/A	1.50
48	1.00	1.92	1.50	1.00	N/A	1.50
49	1.00	0.82	1.50	1.00	0.00	1.50
50	2.00	2.14	2.00	2.00	0.00	2.00
51	2.25	0.89	1.75	2.25	0.00	1.75
52	2.50	1.83	2.25	2.50	0.00	2.25
53	3.50	3.03	3.25	3.50	4.00	3.25
54	13.00	17.07	15.00	13.00	26.47	20.00
55	20.00	21.82	20.00	30.00	51.35	37.00
56	20.00	21.95	20.00	30.00	12.50	25.00
57	18.00	30.77	22.00	27.00	36.00	30.00
58	22.00	6.67	22.00	33.00	31.25	33.00
59	22.00	15.38	22.00	33.00	46.15	35.00
60	25.00	55.56	35.00	37.50	33.33	35.00
61	28.00	50.00	35.00	42.00	60.00	45.00
62	35.00	50.00	35.00	45.00	25.00	45.00
63	35.00	33.33	35.00	45.00	0.00	45.00
64	35.00	0.00	35.00	45.00	33.33	45.00
65 & Over	100.00	57.14	100.00	100.00	20.00	100.00

Overall, we are recommending increases in most of the retirement rates for non-PEPRA Safety members, both with less than 30 years of service and with 30 or more years of service.

Chart 5 compares actual experience with the current and proposed rates for non-PEPRA Safety members with less than 30 years of service.

Chart 6 compares actual experience with the current and proposed rates for non-PEPRA Safety members with 30 or more years of service.

On January 1, 2013, new PEPRA formulas were implemented for new General and Safety tiers. For these new tiers we do not have credible experience from the past three years to propose

new rates based on actual retirements from members of those tiers nor change the current assumption structure based on both age and years of service. However, we have revised some of our recommended rates for PEPRA members based on our recommended rates for non-PEPRA members. This assumption will continue to be monitored in future experience studies, including whether service based retirement rates should also be implemented for PEPRA tiers.

The following are the current assumed rates and the rates we propose for PEPRA General and Safety members.

General and Safety PEPRA Tiers

	Rate of Retirement (%)			
Age	Current General PEPRA Tiers	Proposed General PEPRA Tiers	Current Safety PEPRA Tier	Proposed Safety PEPRA Tier
50	0.00	0.00	4.00	4.00
51	0.00	0.00	2.25	1.75
52	1.50	1.50	3.50	3.25
53	1.50	1.50	5.50	5.50
54	2.00	2.00	13.00	16.00
55	4.00	4.00	20.00	20.00
56	4.50	4.75	20.00	20.00
57	5.00	5.25	18.00	20.00
58	5.50	5.50	18.00	18.00
59	6.00	6.50	25.00	25.00
60	9.00	9.00	25.00	30.00
61	11.00	11.00	25.00	30.00
62	22.50	20.00	40.00	35.00
63	20.00	18.00	40.00	35.00
64	18.00	16.00	40.00	35.00
65	20.00	20.00	100.00	100.00
66	30.00	30.00	100.00	100.00
67	30.00	35.00	100.00	100.00
68	25.00	25.00	100.00	100.00
69	35.00	35.00	100.00	100.00
70	50.00	55.00	100.00	100.00
71	50.00	55.00	100.00	100.00
72	50.00	55.00	100.00	100.00
73	50.00	55.00	100.00	100.00
74	50.00	55.00	100.00	100.00
75 & Over	100.00	100.00	100.00	100.00

Chart 7 compares the current rates with the proposed rates of retirement for PEPRA General members.

Chart 8 compares the current rates with the proposed rates of retirement for PEPRA Safety members.

Deferred Vested Members

In prior valuations, deferred vested General and Safety members were assumed to retire at age 59 and 53, respectively. The average ages at retirement over the most recent six years were 59.9 for reciprocal General members and 60.4 for non-reciprocal General members. The average ages at retirement over the same period were 54.6 for reciprocal Safety members and 51.6 and for non-reciprocal Safety members. **For General members, we recommend increasing the current assumption to age 60 for both reciprocal and non-reciprocal members. For Safety members, we recommend increasing the current assumption for reciprocal members to age 55 and decreasing the current assumption for non-reciprocal members to age 52.**

Reciprocity

Under the current assumptions, it was also assumed that 45% of General and 60% of Safety future deferred vested members would be covered under a reciprocal retirement system. For those covered under a reciprocal retirement system, a General member is assumed to receive 3.75% annual salary increases, while a Safety member is assumed to receive 3.95% annual salary increases from termination until their date of retirement. As of June 30, 2020, about 41% of the total General deferred vested members and 61% of the total Safety deferred vested members went on to be covered by a reciprocal retirement system.

We recommend maintaining the reciprocal assumption at 45% for General members and 60% for Safety members. This recommendation takes into account the experience of all deferred vested members as of June 30, 2020 instead of just new deferred vested members during the three-year period. This is because there is a lag between a member's date of termination and the time that it is known if they have reciprocity with a reciprocal retirement system.

In addition, we recommend 3.75% and 4.00% annual salary increase assumptions for General and Safety members, respectively, be utilized to anticipate salary increases from the date of termination from VCERA to the expected date of retirement for deferred vested members covered by a reciprocal retirement system. These assumptions are based on the ultimate 0.75% and 1.00% merit and promotion salary increase assumptions for General and Safety members, respectively, together with the 2.50% inflation and 0.50% real "across the board" salary increase assumptions that are recommended earlier in Section III of this report.

Form of Payment and Survivor Continuance under the Unmodified Option

In prior valuations, it was assumed that all members would select the unmodified option at retirement. Actual experience for recent new retirees shows that more than 90% select the unmodified option. Therefore, we recommend maintaining the assumption that all members will elect the unmodified option at retirement.

It was also assumed that 70% of all active male members and 55% of all active female members who selected the unmodified option would be married or have an eligible domestic partner when they retired. We reviewed experience for new retirees during the three-year period and determined the actual percentage of these new retirees that had an eligible spouse or eligible domestic partner at the time of retirement. The results of that analysis are shown below.

	New Retirees – Actual Percent with Eligible Spouse or Domestic Partner and Selected Unmodified Option	
Year Ending June 30	**Male**	**Female**
2018	72%	55%
2019	69%	56%
2020	70%	55%
Total	**70%**	**55%**

According to experience of members who retired during the last three years, about 70% of all male members and 55% of all female members who selected the unmodified option were married or had a domestic partner at retirement. We recommend maintaining the assumption for both males and females 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 survivors are actually of the opposite sex, even with the inclusion of domestic partners, **we will continue to assume that the survivor's sex is the opposite of the member.**
2. **We recommend maintaining the spouse age difference assumption that male retirees are three years older than their spouses and 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	3 years older	2 years younger
Actual Experience	2.5 years older	1.3 years younger
Proposed Assumption	3 years older	2 years younger

Chart 3: Retirement Rates
Non-PEPRA General Members with less than 30 Years of Service

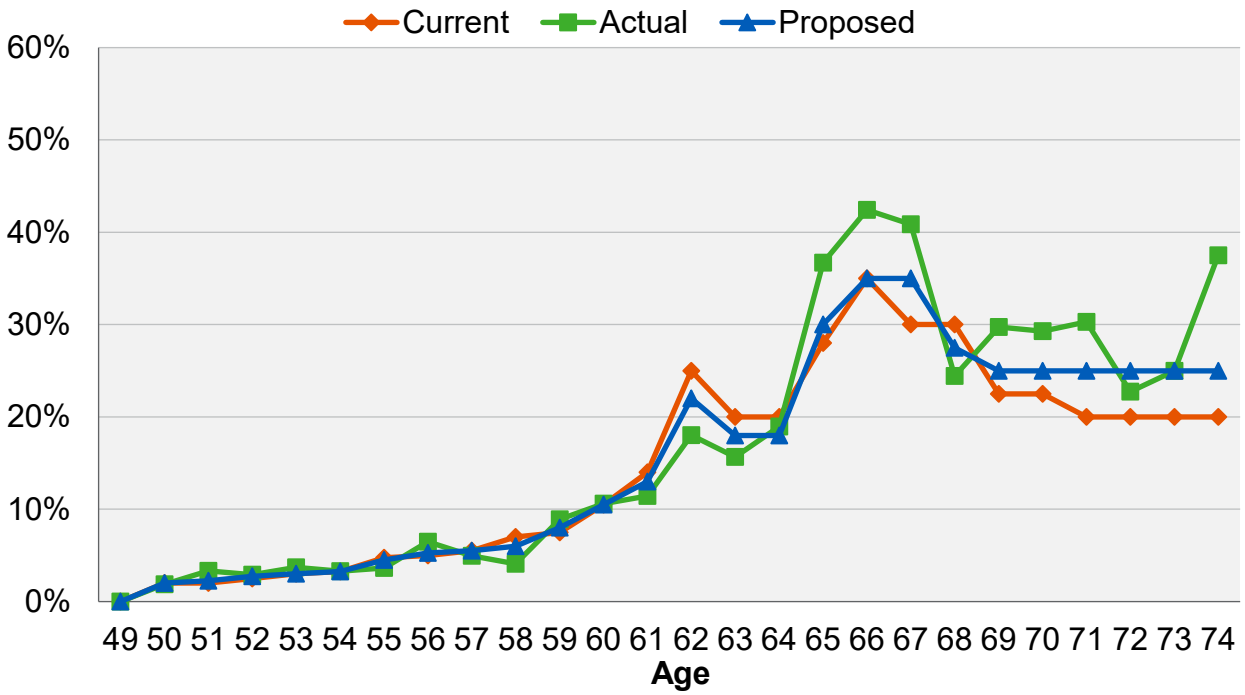


Chart 4: Retirement Rates
Non-PEPRA General Members with 30 or more Years of Service

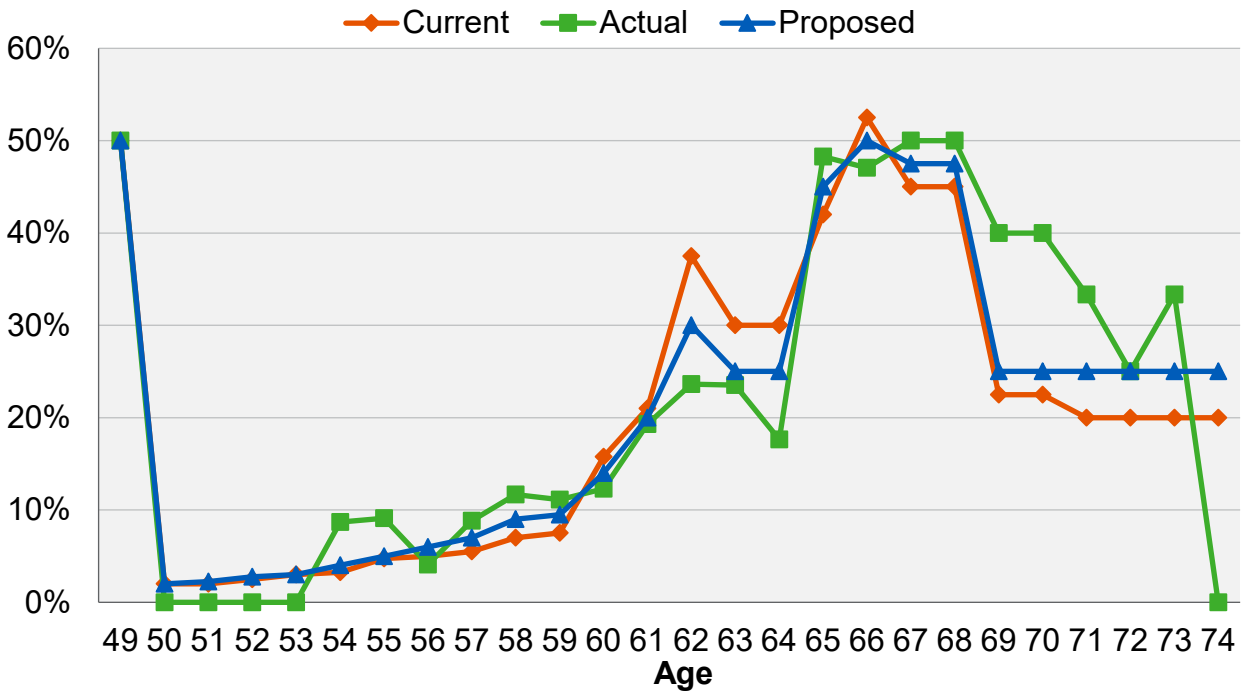


Chart 5: Retirement Rates
Non-PEPRA Safety Members with less than 30 Years of Service

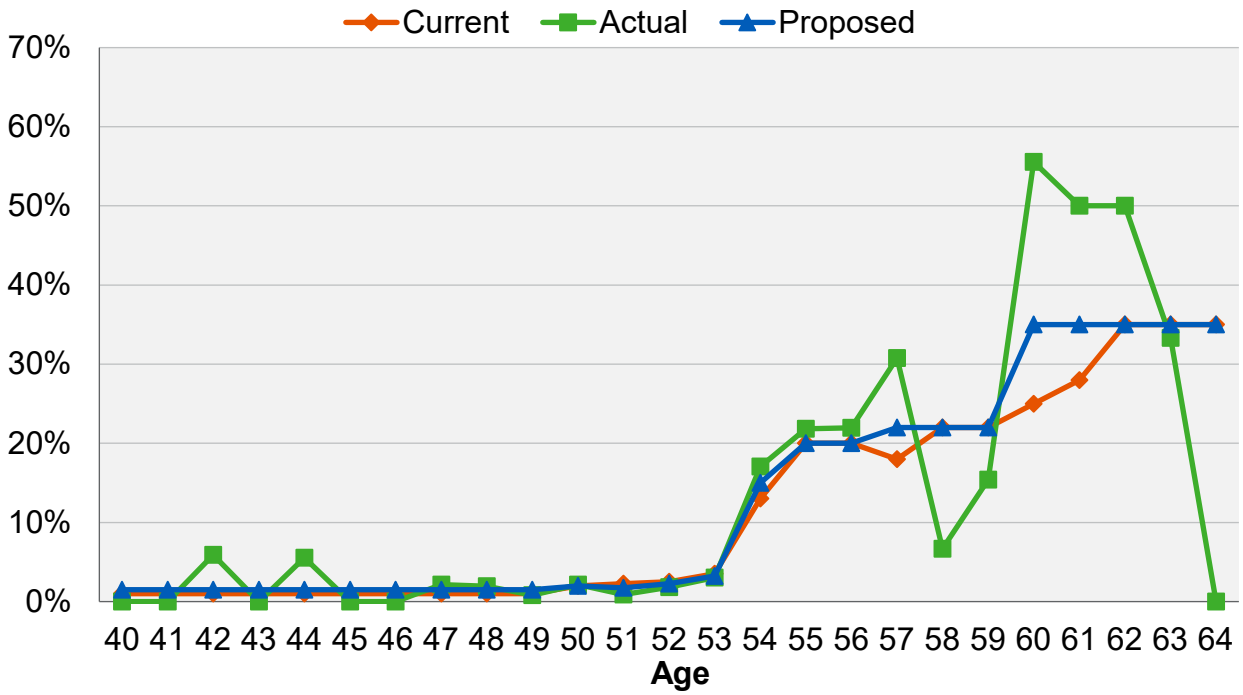


Chart 6: Retirement Rates
Non-PEPRA Safety Members with 30 or more Years of Service

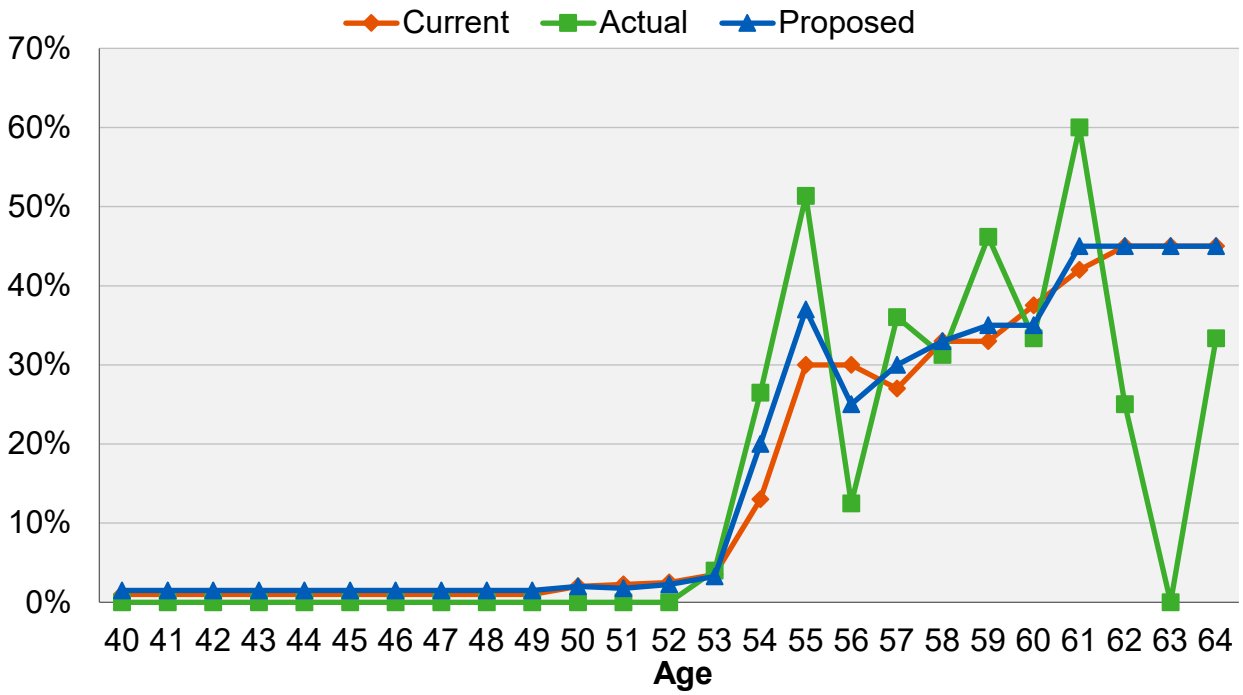


Chart 7: Retirement Rates
PEPRA General Members

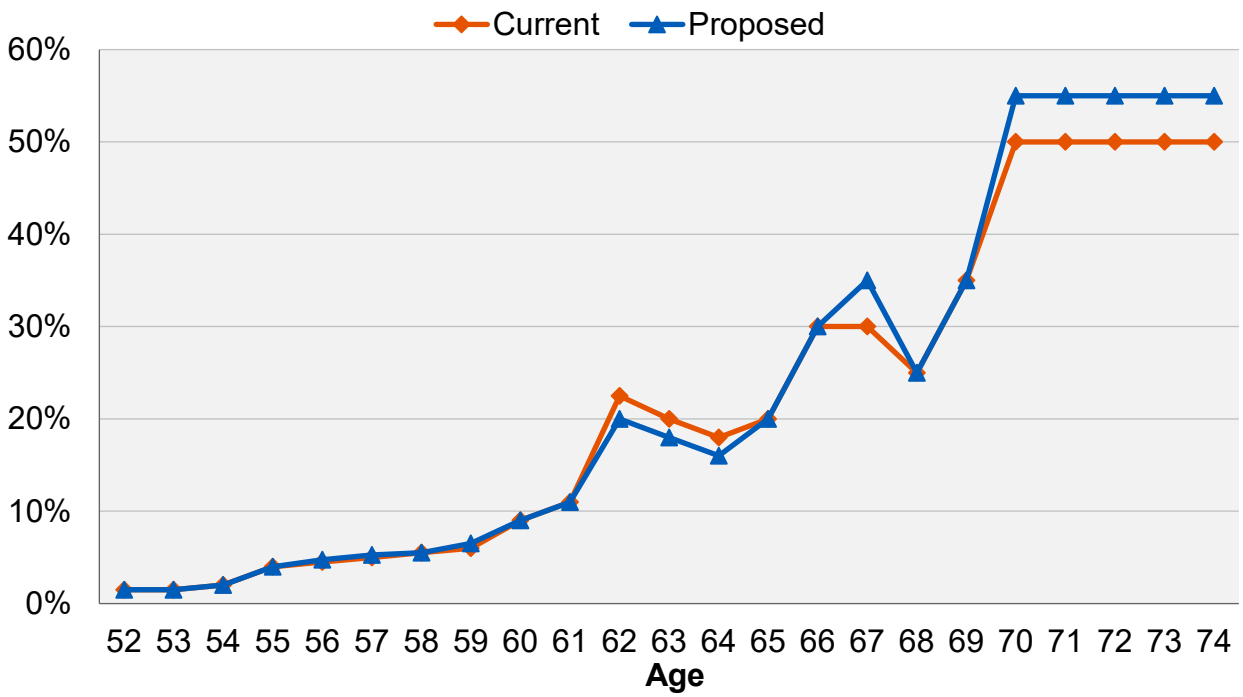
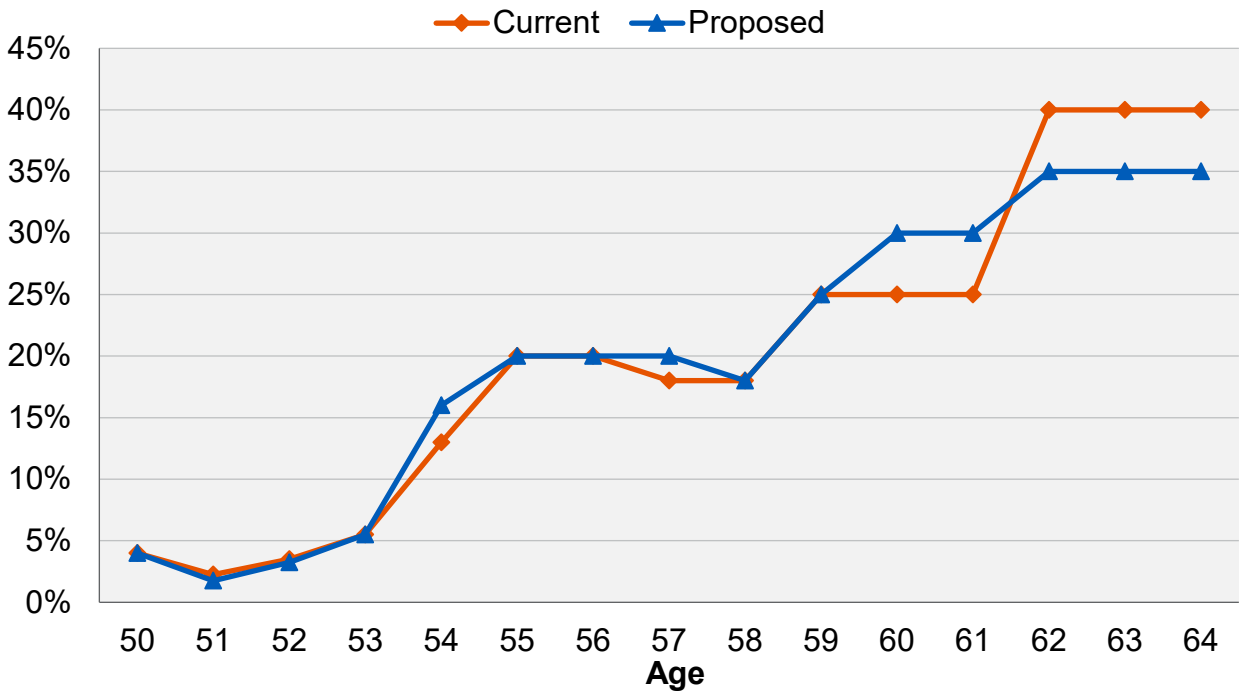


Chart 8: Retirement Rates
PEPRA Safety Members



B. Mortality Rates - Healthy

The “healthy” mortality rates project the life expectancy of a member who retires from service (i.e., who did not retire on a disability pension). Also, the “healthy” pre-retirement mortality rates project what proportion of members will die before retirement. For General members, the table currently being used for post-service retirement mortality rates is the Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table (separate tables for males and females) decreased by 10% for males, projected generationally with the two-dimensional mortality improvement scale MP-2017. For 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 25% for males and decreased by 15% 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 VCERA’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.

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 VCERA experience), and project the mortality improvement generationally using the MP-2020 mortality improvement scale.

In order to reflect more VCERA experience in our analysis, we have used experience for a twelve-year period by using data from the current (from July 1, 2017 through June 30, 2020 and the last three (from July 1, 2014 through June 30, 2017; from July 1, 2011 through June 30, 2014; and from July 1, 2008 through June 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 VCERA'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 VCERA experience.

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 20%, projected generationally with the two-dimensional scale MP-2017.

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), 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), 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 (ordinary). Based on the actual experience during the last three years of 31 total deaths, only one was due to service-connected (duty) causes. Therefore, we recommend maintaining the current assumption for both General and Safety members.[27]

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.

The proposed mortality table also reflects current experience to the extent that the experience is credible based on standard statistical theory. For VCERA, 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 100% and 92% for General and Safety respectively, after an adjustment to the General female rates for partial credibility. In future years the ratios should remain around 100% and 92% 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:

	General Members – Healthy ($ in millions)			Safety Members – Healthy ($ in millions)		
Gender	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths
Male	15.96	13.92	14.55	8.28	7.06	7.65
Female	13.08	11.92	11.40	0.41	0.31	0.38
Total	**29.04**	**25.84**	**25.95**	**8.69**	**7.37**	**8.03**
Actual / Expected	89%		100%[28]	85%		92%

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

(2) Expected amounts under the proposed generational mortality table are based on mortality rates from the base year projected with mortality improvements to the experience study period.

(3) Results may not add due to rounding.

[27] While it is possible that COVID-19 deaths for members in certain industries may be considered service connected, we do not recommend a change in our assumption to reflect this possible short-term increase in service connected deaths.

[28] If we use the benchmark Pub-2010 General table without any adjustment, the proposed actual to expected ratio would be 102%.

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. The recommended mortality table has an actual to expected ratio of 100%.[29]

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. The recommended mortality table has an actual to expected ratio to 92%.

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

	General Members – Healthy			Safety Members – Healthy		
Gender	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths
Male	481	475	445	98	94	93
Female	623	611	560	8	8	7
Total	**1,104**	**1,086**	**1,005**	**106**	**102**	**100**
Actual / Expected	98%		106%	96%		100%

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.

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

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

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

Chart 12 compares actual to expected deaths on a headcount-weighted basis for Safety members under the current and proposed assumptions over the past twelve years 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

[29] If we use the benchmark Pub-2010 General table without any adjustment, the proposed actual to expected ratio would be 102%.

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 VCERA'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 114%, after adjustments for partial credibility. In future years the ratio should remain around 114% 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:

	Beneficiaries ($ in millions)		
Gender	**Current Expected Weighted Deaths**	**Actual Weighted Deaths**	**Proposed Expected Weighted Deaths**
Male	0.98	1.22	1.10
Female	5.13	6.11	5.35
Total	**6.11**	**7.32**	**6.45**
Actual / Expected	120%		114%[30]

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 10% for females, projected generationally with the two-dimensional mortality improvement scale MP-2020.

[30] If we use the benchmark Pub-2010 General table without any adjustment, the proposed actual to expected ratio would be 123%.

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

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

For General members, we recommend that the mortality table used for determining contributions for General members be updated to a blended table based on the Pub-2010 General Healthy Retiree Amount-Weighted 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 one-third male and two-thirds 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 80% male and 20% female.

For optional forms of payment and reserves, there are some administrative issues that we may need to resolve with VCERA 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 VCERA for use in reflecting mortality improvement for determining optional forms of payment after we have those discussions with VCERA and its vendor.

Chart 9: Post-Retirement Benefit-Weighted Deaths ($ In Millions)
Non-Disabled General Members (July 1, 2008 through June 30, 2020)

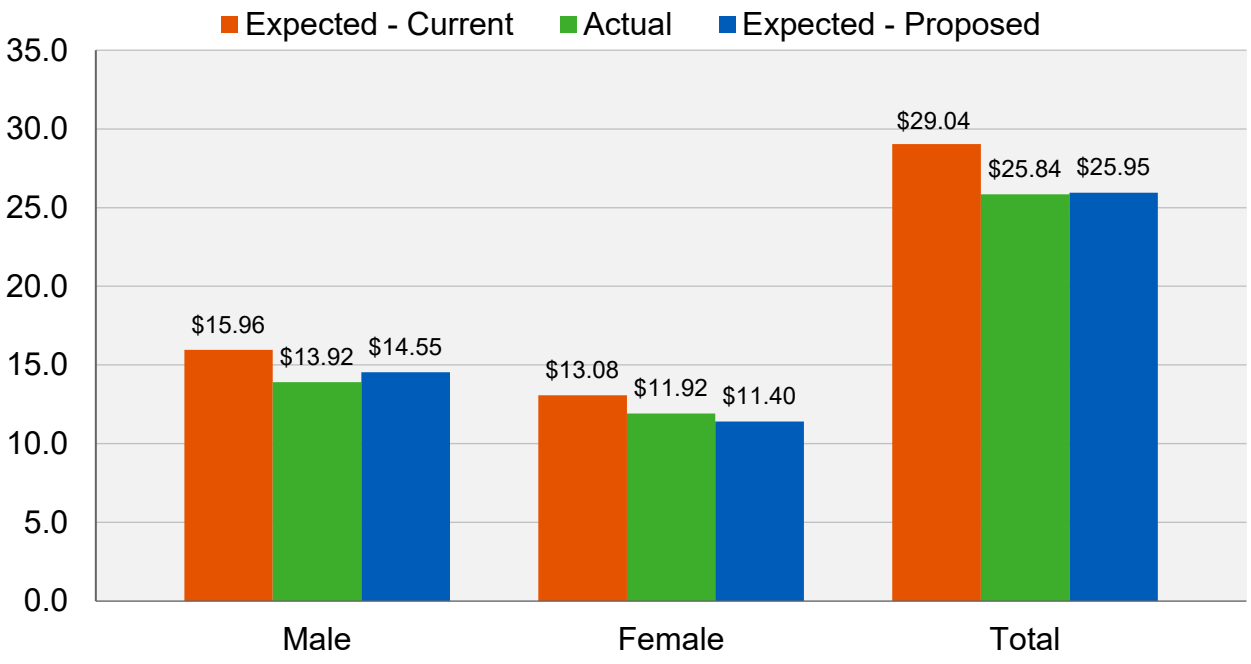


Chart 10: Post-Retirement Benefit-Weighted Deaths ($ In Millions)
Non-Disabled Safety Members (July 1, 2008 through June 30, 2020)

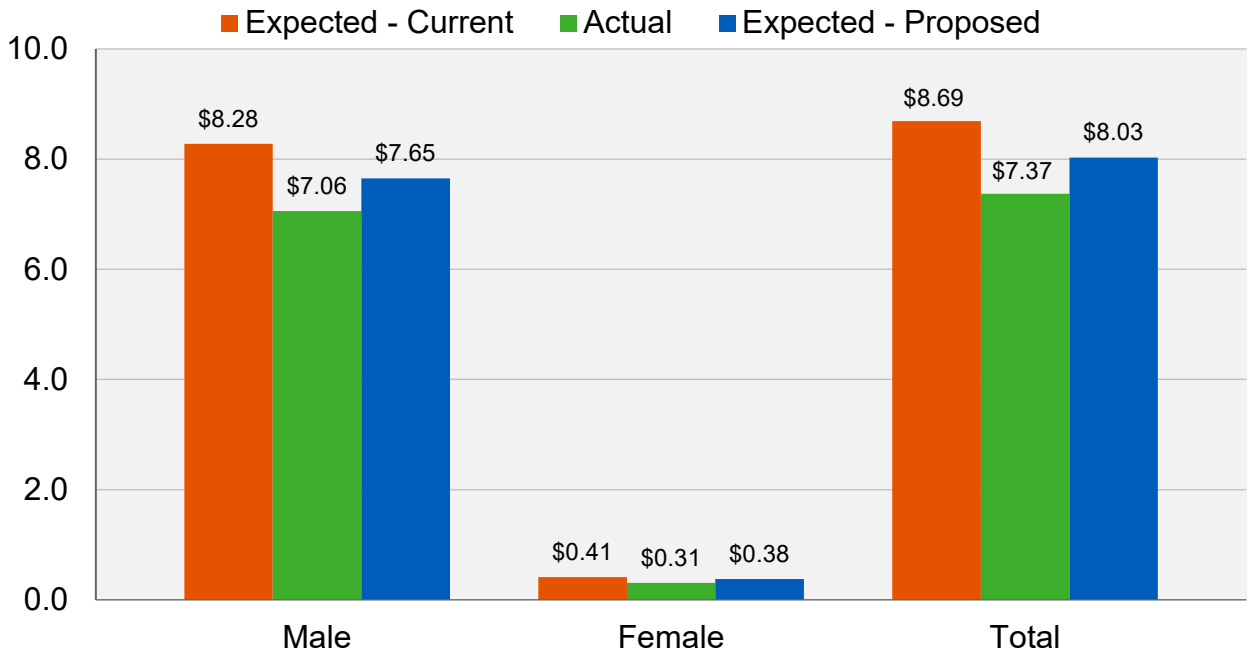


Chart 11: Post-Retirement Headcount-Weighted Deaths Non-Disabled General Members (July 1, 2008 through June 30, 2020) Provided for Informational Purposes Only

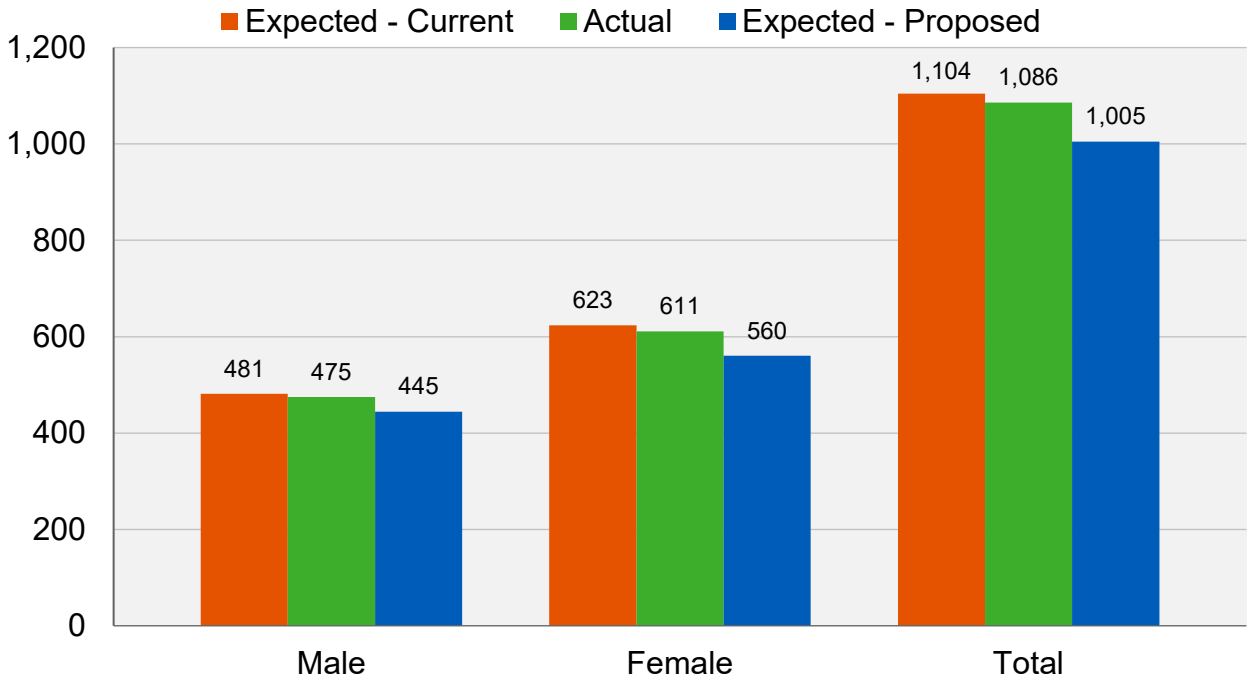


Chart 12: Post-Retirement Headcount-Weighted Deaths Non-Disabled Safety Members (July 1, 2008 through June 30, 2020) Provided for Informational Purposes Only

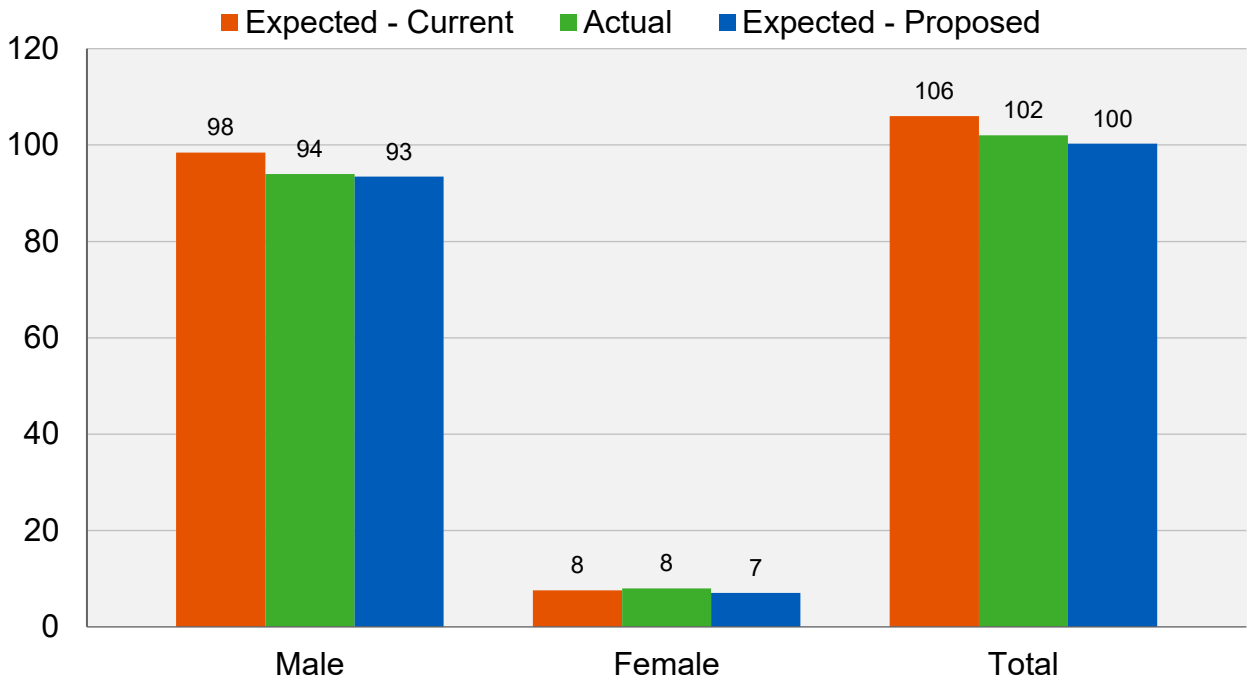


Chart 13: Benefit-Weighted Life Expectancies
Non-Disabled General Members

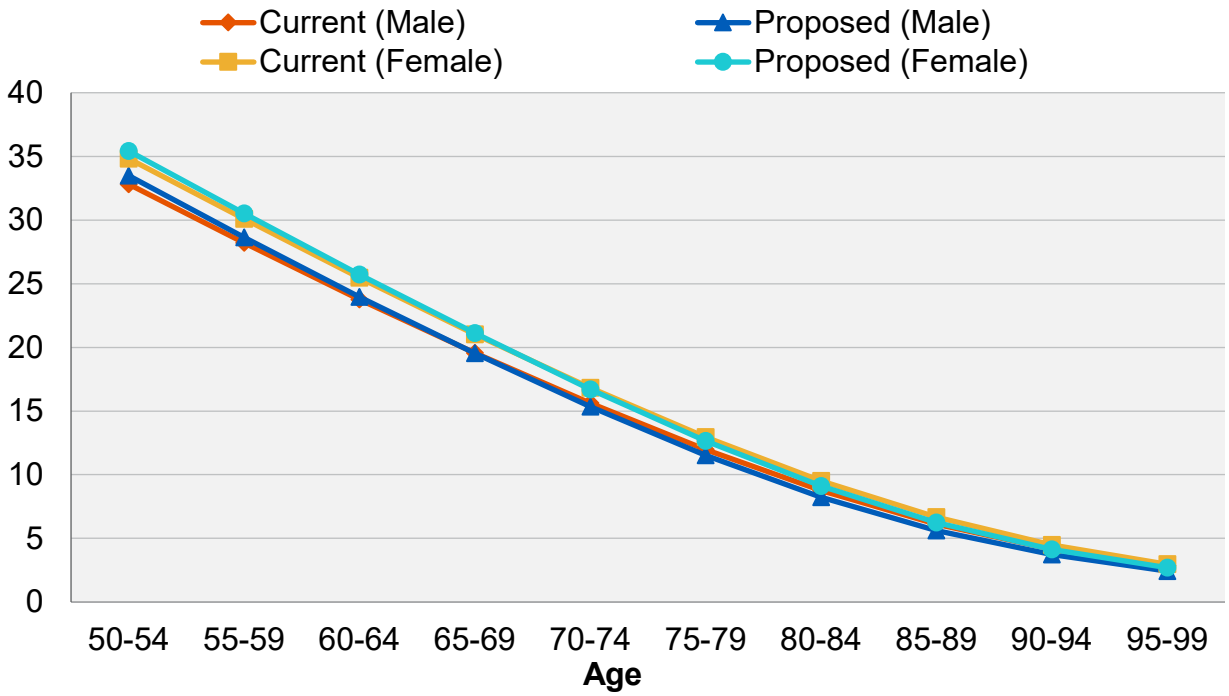
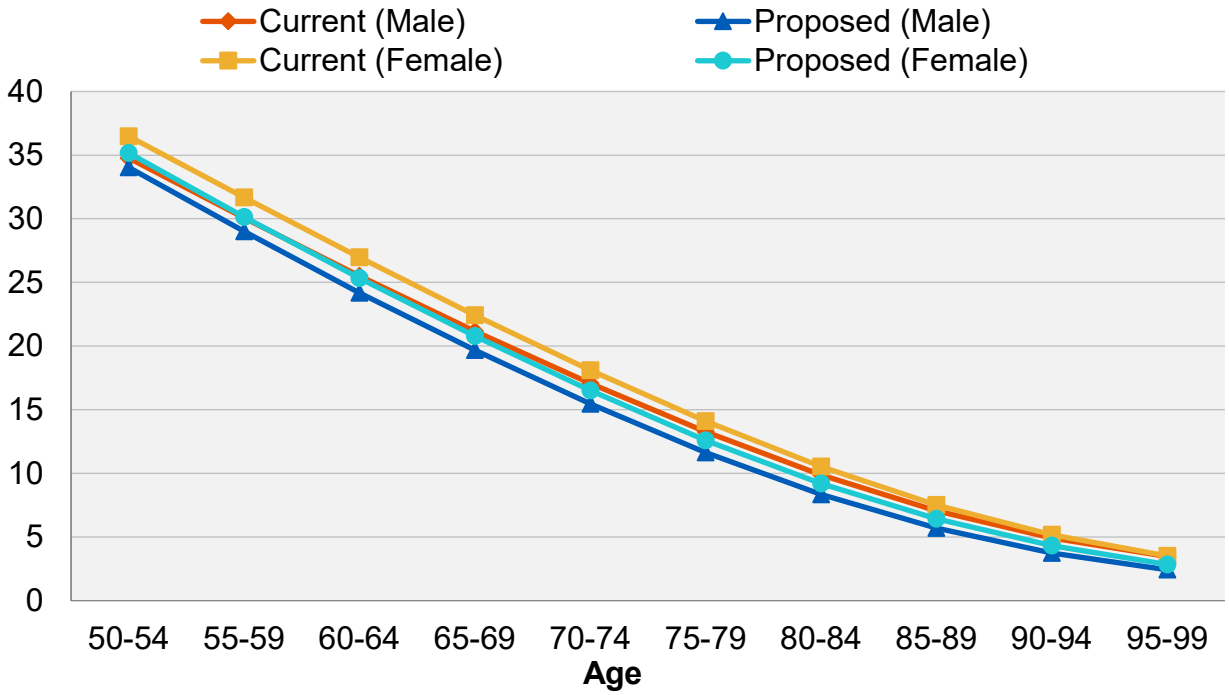


Chart 14: Life Expectancies
Non-Disabled Safety Members



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 members, the table currently being used is the Headcount-Weighted RP-2014 Disabled Retiree Mortality Table (separate tables for males and females) decreased by 15% for males, projected generationally with the two-dimensional mortality improvement scale MP-2017. For Safety members, the table currently being used is the Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table (separate tables for males and females) increased by 15% 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 VCERA, 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 92% and 88% for General and Safety respectively, after adjustments for partial credibility. In future years the ratio should remain around 92% and 88% 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:

	General Members – Disabled ($ in millions)			Safety Members – Disabled ($ in millions)		
Gender	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths
Male	0.76	1.43	1.63	4.63	3.99	4.50
Female	0.85	1.64	1.70	0.20	0.14	0.17
Total	**1.60**	**3.07**	**3.33**	**4.84**	**4.12**	**4.67**
Actual / Expected	191%		92%	85%		88%

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.

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

For General disabled members, we recommend updating the current table to the Pub-2010 Non-Safety Disabled Retiree Amount-Weighted Mortality Table (separate tables for males and females), projected generationally with the two-dimensional mortality improvement scale MP-2020. The recommended mortality table has an actual to expected ratio of 92%.

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), projected generationally with the two-dimensional mortality improvement scale MP-2020. The recommended mortality table has an actual to expected ratio of 88%.

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

	General Members – Disabled			Safety Members – Disabled		
Gender	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths
Male	38	80	78	75	81	73
Female	54	103	102	5	4	4
Total	**92**	**183**	**181**	**80**	**85**	**78**
Actual / Expected	199%		100%	106%		103%

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 add due to rounding.

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

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

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

Chart 18 compares actual to expected deaths on a headcount-weighted basis for disabled Safety members under the current and proposed assumptions over the past twelve years 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 (July 1, 2008 through June 30, 2020)

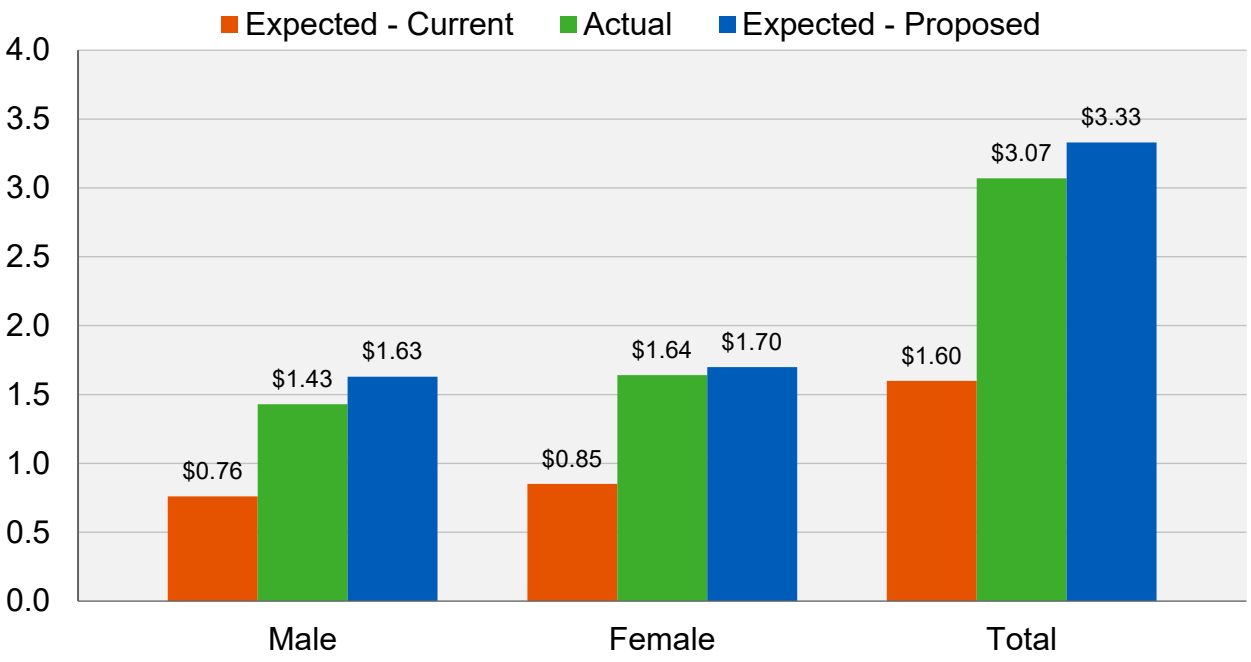


Chart 16: Post-Retirement Benefit-Weighted Deaths ($ In Millions) Disabled Safety Members (July 1, 2008 through June 30, 2020)

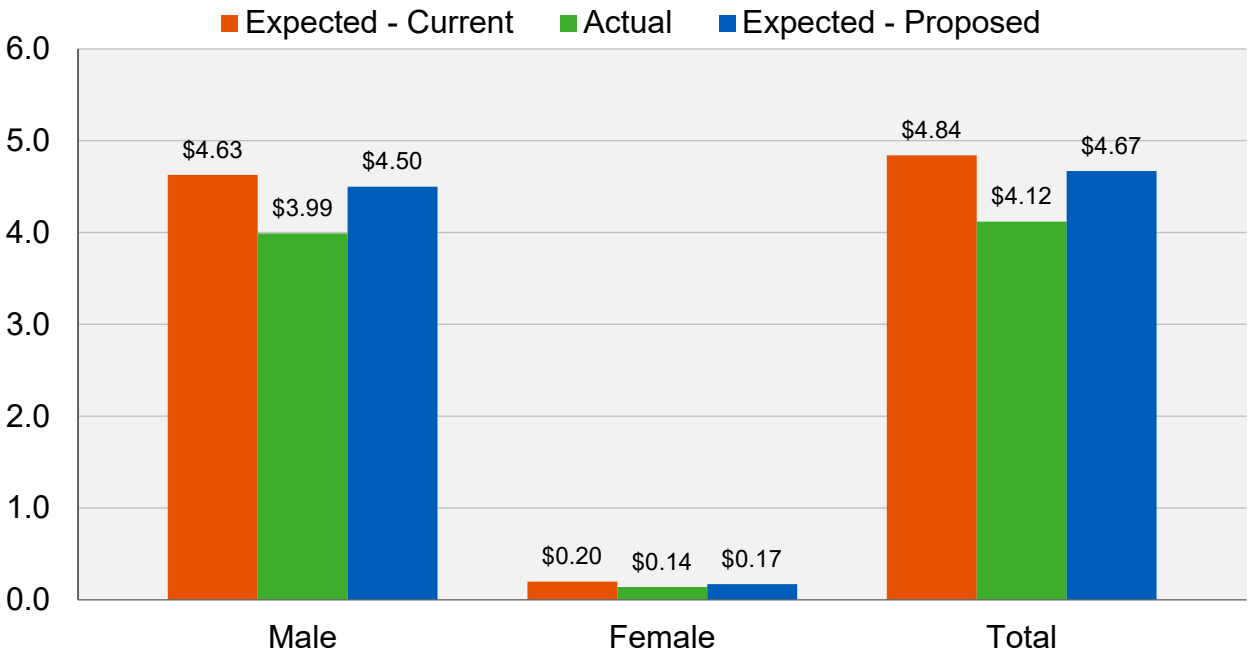


Chart 17: Post-Retirement Headcount-Weighted Deaths
Disabled General Members (July 1, 2008 through June 30, 2020)
Provided for Informational Purposes Only

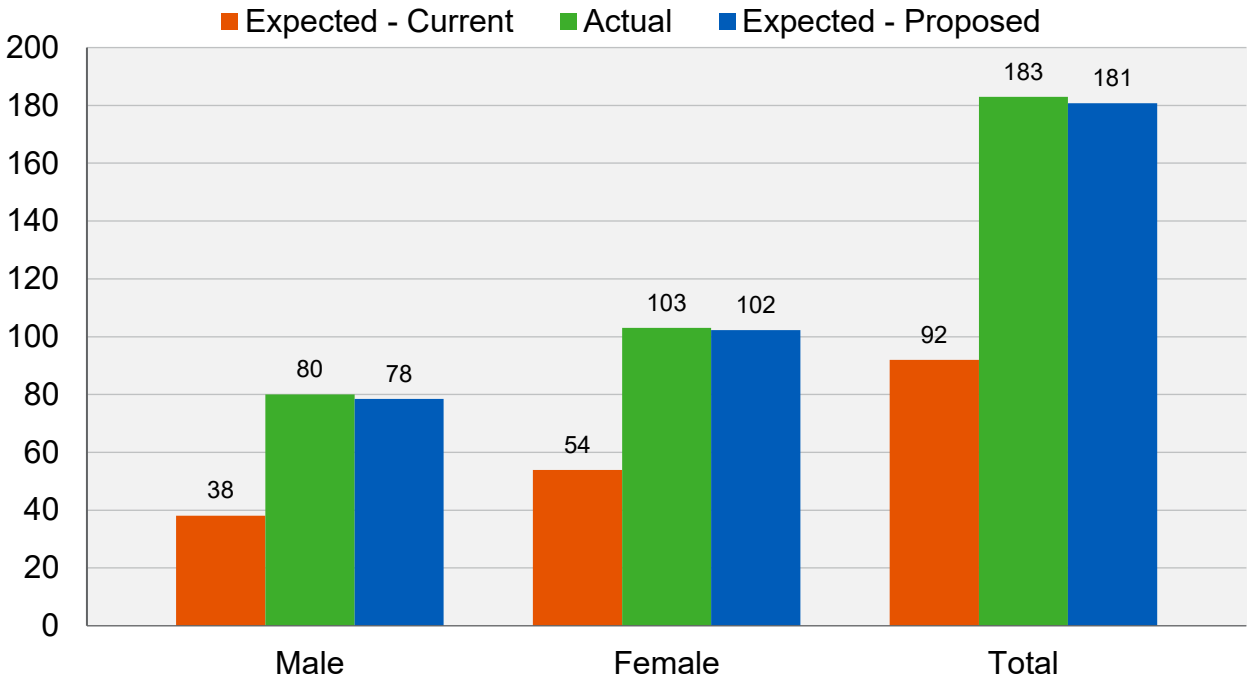


Chart 18: Post-Retirement Headcount-Weighted Deaths
Disabled Safety Members (July 1, 2008 through June 30, 2020)
Provided for Informational Purposes Only

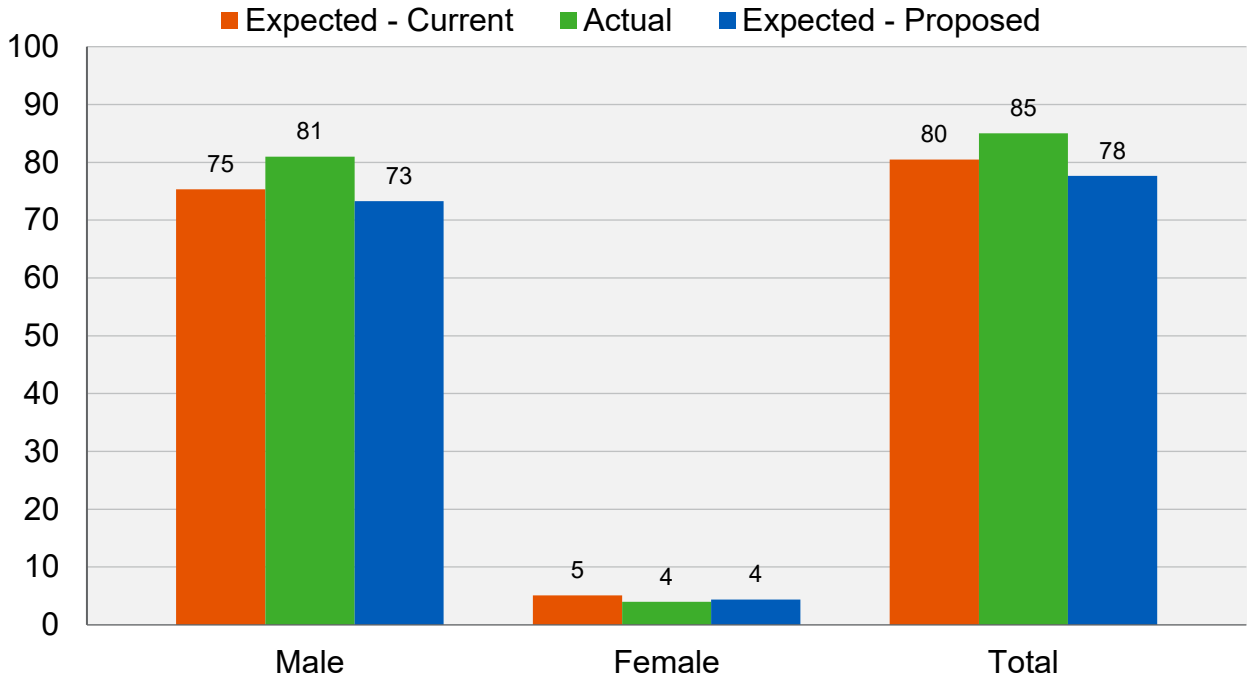


Chart 19: Benefit-Weighted Life Expectancies
Disabled General Members

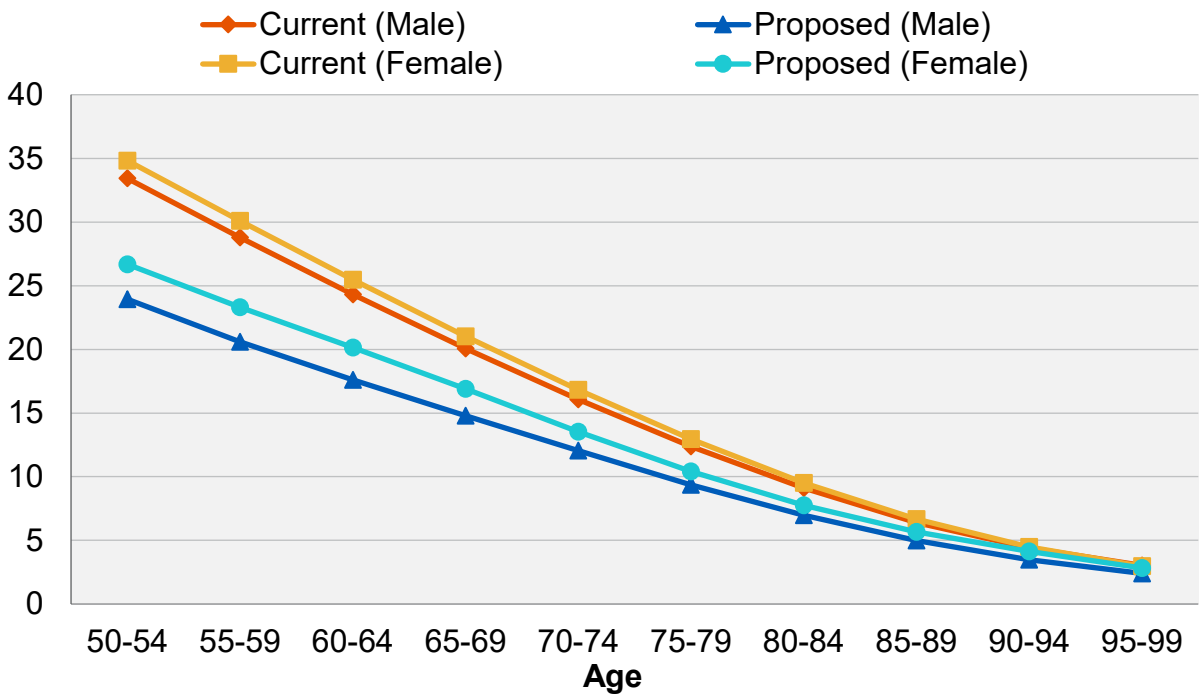
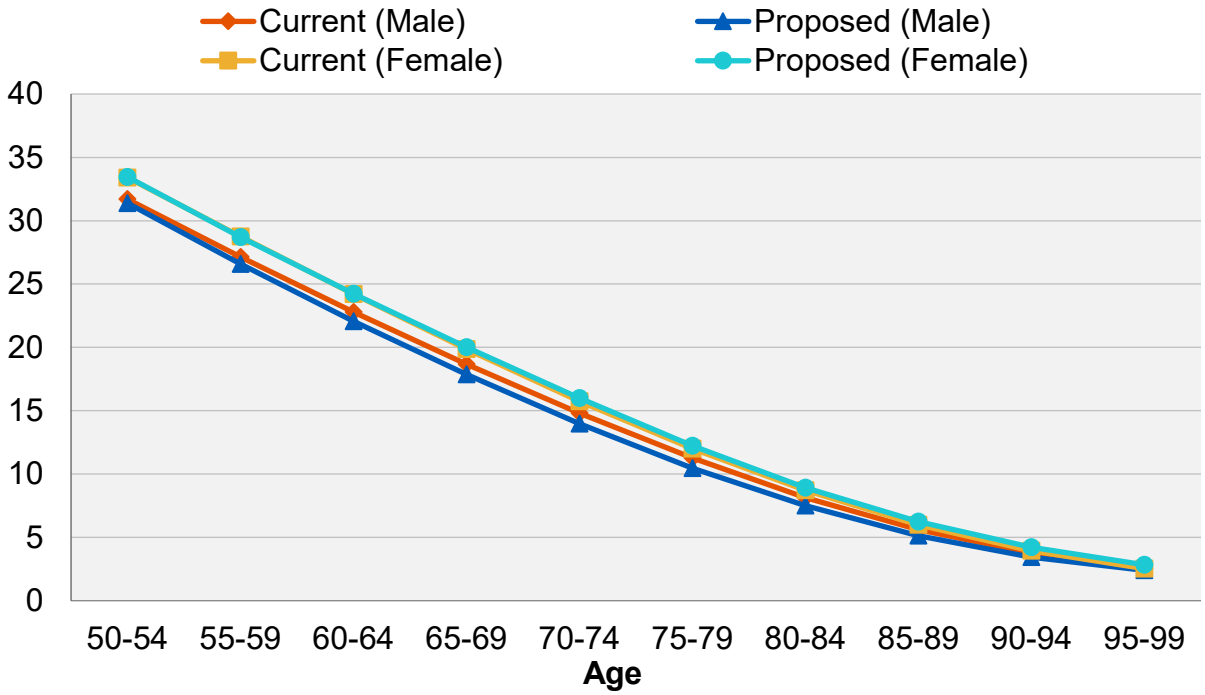


Chart 20: Life Expectancies
Disabled Safety Members



D. Termination Rates

Termination rates include all terminations for reasons other than death, disability, or retirement. Under the current assumptions there is an overall incidence of termination assumed, combined with an assumption that a member will choose between a refund of contributions and a deferred vested benefit based on which option is more valuable. With this study, we continue to recommend that this same assumption structure be used.

Currently, assumed termination rates are a function of years of service. We continue to believe that termination rates are strongly correlated with years of service. Therefore, we have maintained the current termination assumption structure as a function of years of service.

The termination experience over the last three years for General and Safety members is shown by years of service in the following tables. Please note that we have excluded any members that were eligible for retirement. We also show the current and proposed assumptions.

General

	Termination Rate (%)		
Years of Service	**Current Rate**	**Observed Rate**	**Proposed Rate**
Less than 1	14.00	12.82	13.50
1 – 2	10.00	9.48	9.50
2 – 3	8.25	8.64	8.50
3 – 4	7.25	6.17	6.75
4 – 5	6.00	5.15	5.50
5 – 6	5.00	4.74	5.00
6 – 7	4.00	4.11	4.00
7 – 8	3.50	3.55	3.50
8 – 9	3.50	3.56	3.50
9 – 10	3.25	4.64	3.50
10 – 11	3.25	3.79	3.50
11 – 12	3.00	3.75	3.25
12 – 13	3.00	3.68	3.25
13 – 14	2.75	3.41	3.00
14 – 15	2.75	2.76	2.75
15 – 16	2.50	3.39	2.75
16 – 17	2.50	2.07	2.50
17 – 18	2.25	3.00	2.50
18 – 19	2.00	0.88	2.00
19 – 20	2.00	1.14	1.75
20 & Over	2.00	2.12	1.75

Safety

Years of Service	Termination Rate (%)		
	Current Rate	Observed Rate	Proposed Rate
Less than 1	11.00	7.65	10.00
1 – 2	6.00	3.21	5.50
2 – 3	5.75	5.13	5.25
3 – 4	4.50	3.83	4.50
4 – 5	4.25	4.09	4.25
5 – 6	3.00	1.35	2.50
6 – 7	2.50	1.44	2.25
7 – 8	2.25	0.00	2.00
8 – 9	1.80	0.88	1.80
9 – 10	1.60	1.32	1.60
10 – 11	1.40	2.23	1.50
11 – 12	1.20	3.06	1.40
12 – 13	1.00	1.20	1.20
13 – 14	0.95	0.81	1.10
14 – 15	0.90	1.72	1.00
15 – 16	0.85	0.98	0.95
16 – 17	0.80	3.94	0.85
17 – 18	0.75	0.81	0.75
18 – 19	0.70	0.00	0.50
19 – 20	0.65	0.00	0.50
20 & Over	0.60	N/A	0.50

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 termination experience.

Based upon the recent experience, we have decreased the termination rates overall for both General and Safety members.

It is our understanding that General Tier 2 COLA members can elect a refund of all or a portion of their Tier 2 COLA member contributions and forgo the Tier 2 COLA upon retirement. Based on the data for the three-year period ending June 30, 2020, about 33% of total General Tier 2 COLA member contributions were refunded for retiring members. We will continue to monitor the experience and conservatively assume that all members retiring with the Tier 2 COLA will elect to have the COLA applied to their benefit in lieu of a refund.

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

Chart 21 compares actual to expected terminations over the past three years for both the current and proposed assumptions for General members.

Chart 22 shows the same information as Chart 21, but for Safety members.

Chart 23 shows the actual termination rates over the past three years compared to the current and proposed assumptions for General members.

Chart 24 shows the same information as Chart 23, but for Safety members.

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

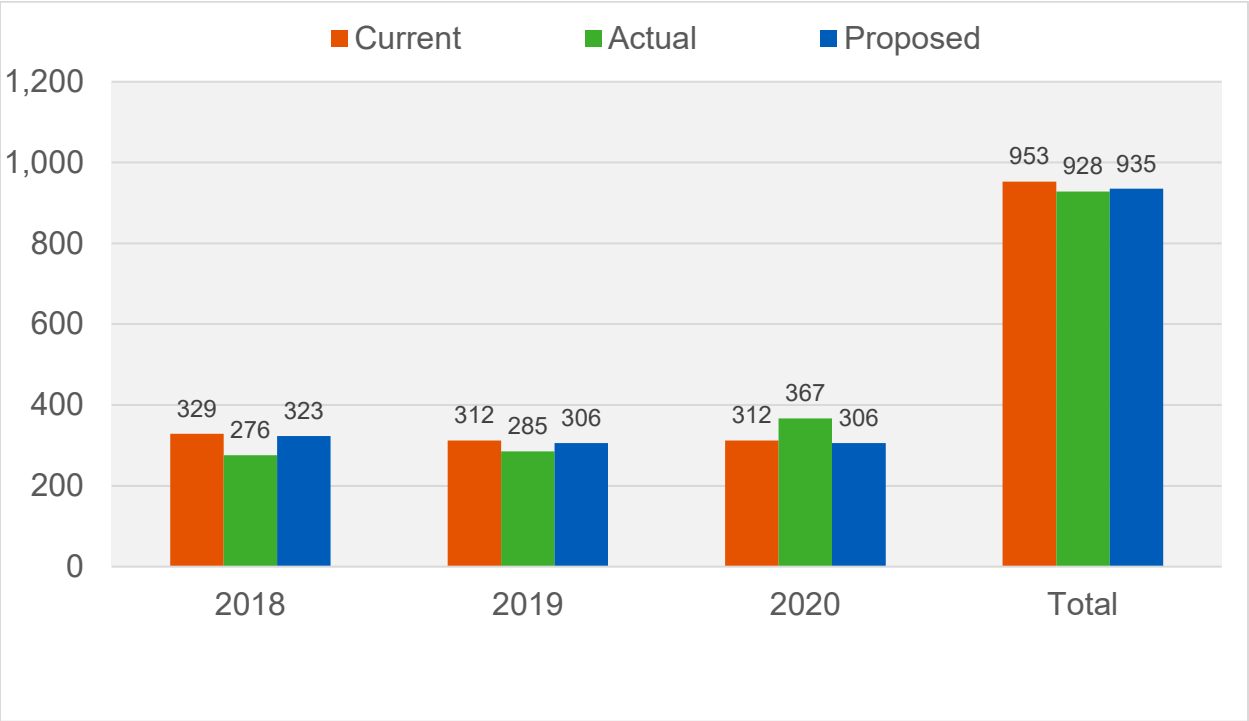


Chart 22: Actual Number of Terminations Compared to Expected – Safety Members

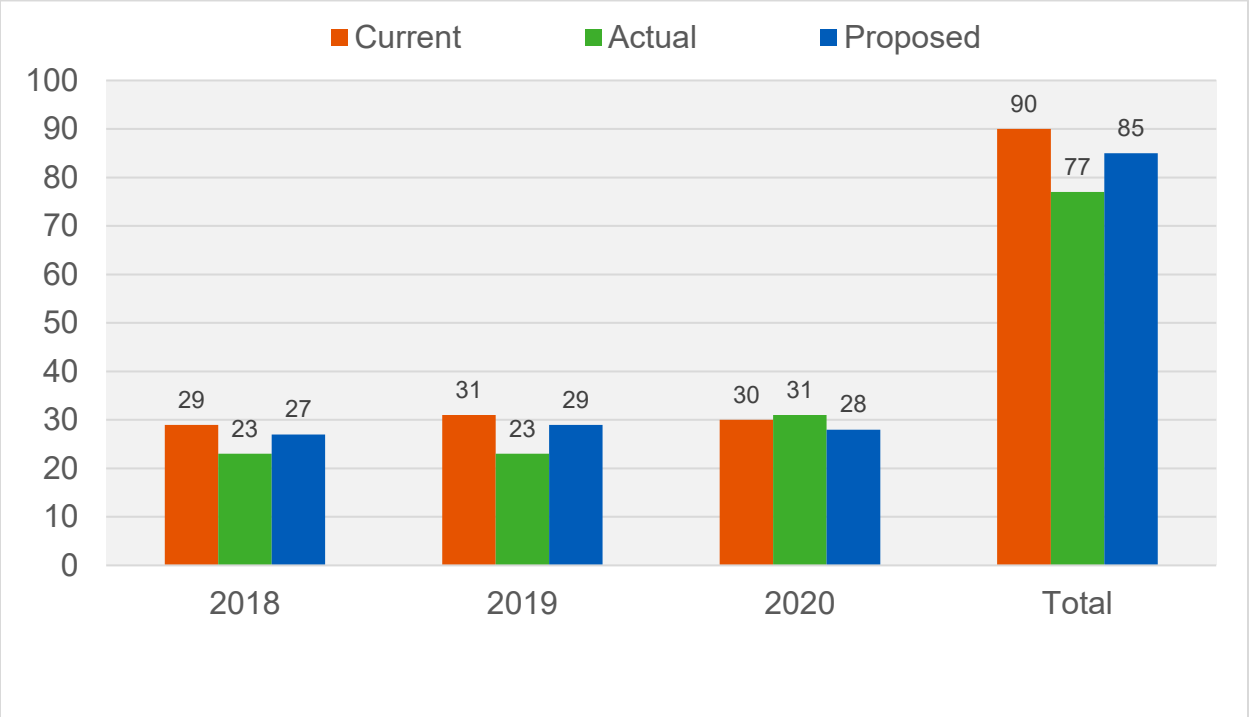


Chart 23: Termination Rates – General Members

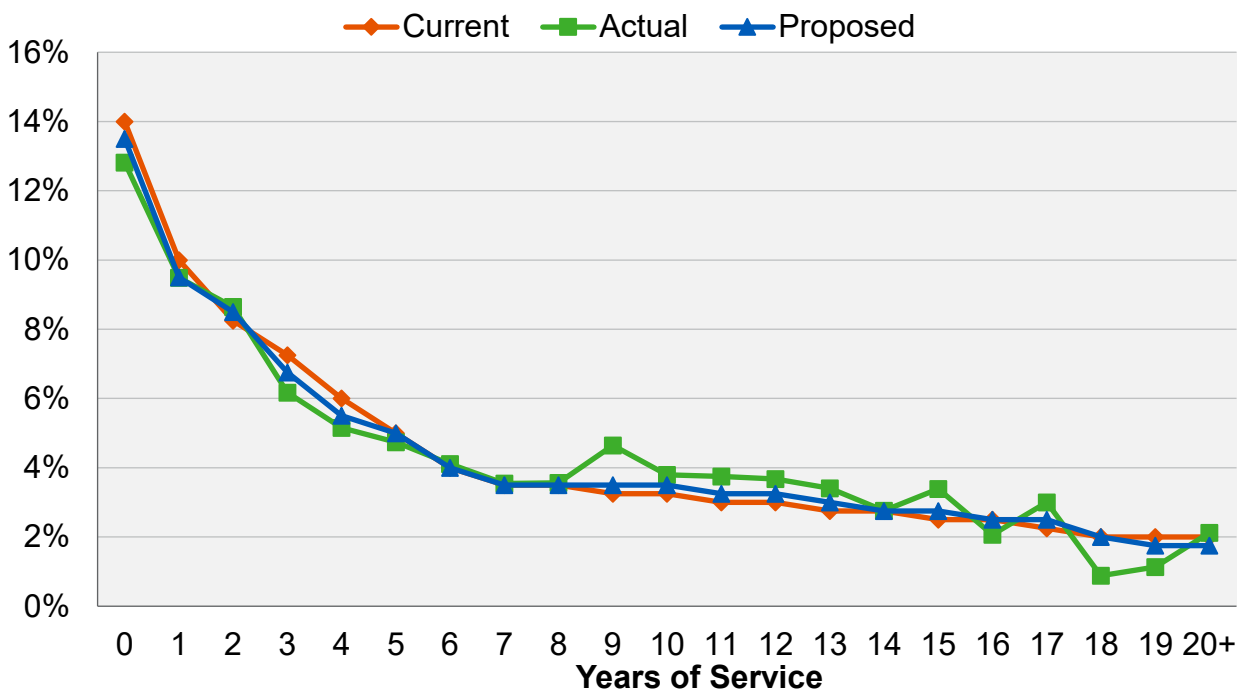
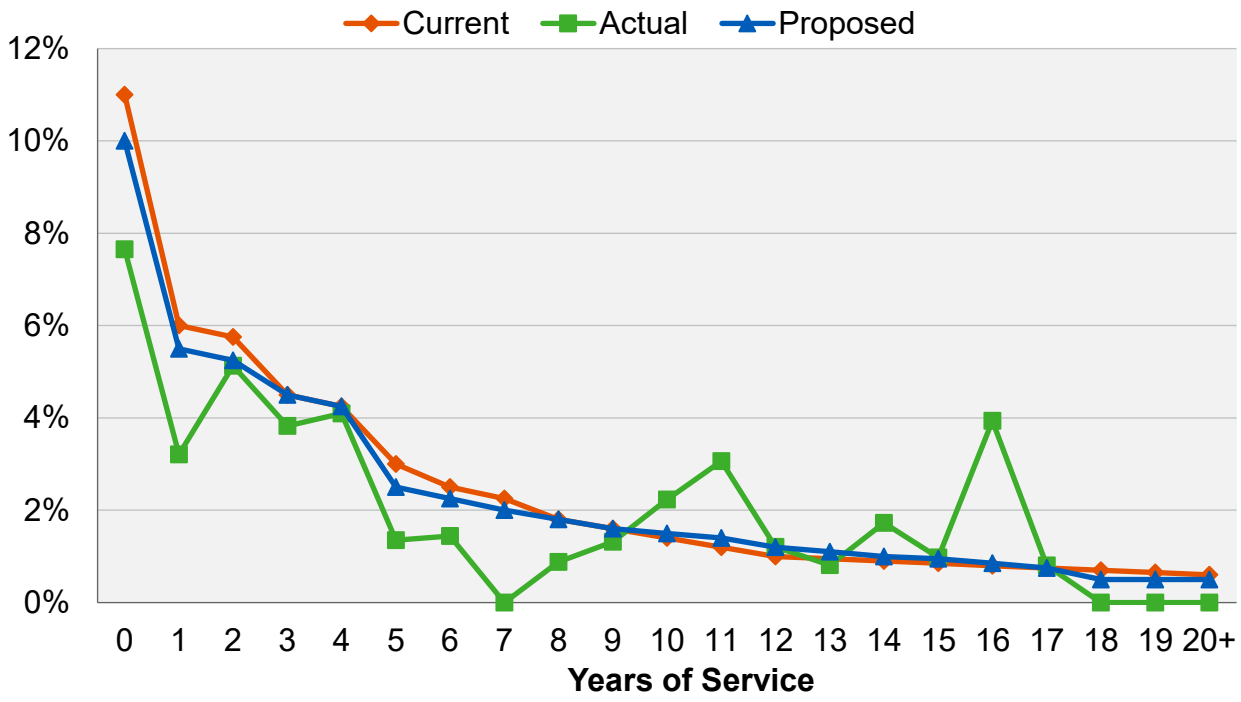


Chart 24: Termination Rates – Safety Members



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 Rate[31] (%)		
Age	**Current Rate**	**Observed Rate**	**Proposed Rate**
20 – 24	0.01	0.00	0.01
25 – 29	0.02	0.00	0.01
30 – 34	0.04	0.00	0.02
35 – 39	0.08	0.03	0.05
40 – 44	0.13	0.08	0.10
45 – 49	0.20	0.00	0.14
50 – 54	0.25	0.21	0.22
55 – 59	0.35	0.07	0.25
60 – 64	0.45	0.24	0.35
65 – 69	0.60	0.31	0.45
70 & Over	0.75	0.00	0.45

Safety

	Disability Incidence Rate[31] (%)		
Age	**Current Rate**	**Observed Rate**	**Proposed Rate**
20 – 24	0.05	0.00	0.03
25 – 29	0.15	0.00	0.08
30 – 34	0.30	0.42	0.35
35 – 39	0.40	0.28	0.40
40 – 44	0.60	0.84	0.60
45 – 49	1.00	0.98	1.00
50 – 54	1.50	0.61	1.20
55 – 59	3.60	2.76	3.40
60 & Over	7.00	9.21	7.50

Based upon the recent experience, we have decreased the disability incidence rates overall for both General and Safety members.

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

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

Chart 26 shows actual disablement rates, compared to the assumed and proposed rates for General members while Chart 27 shows the same information 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[32]	25%	56%	30%	70%
Safety	90%	95%	90%	10%

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

[32] In the prior experience study, 15% of General disablements during the three-year period ending June 30, 2017 were receiving service connected disabilities.

Chart 25: Actual Number of Service and Non-service Disability Retirements Compared to Expected

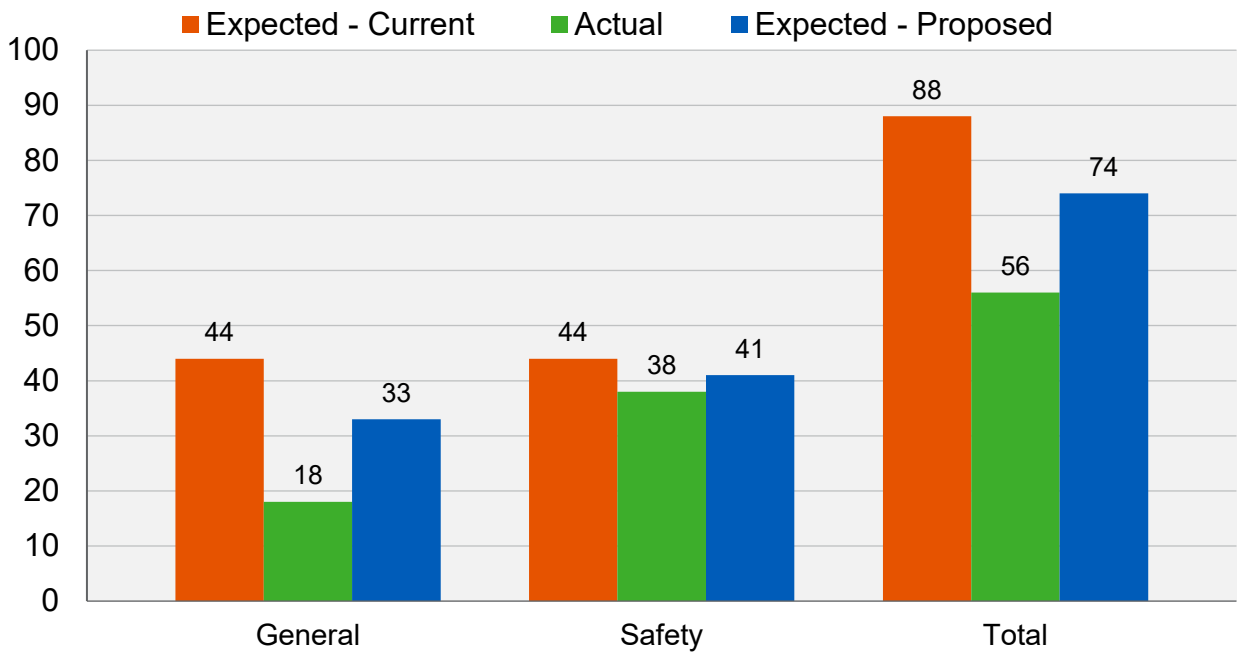


Chart 26: Disability Incidence Rates General Members

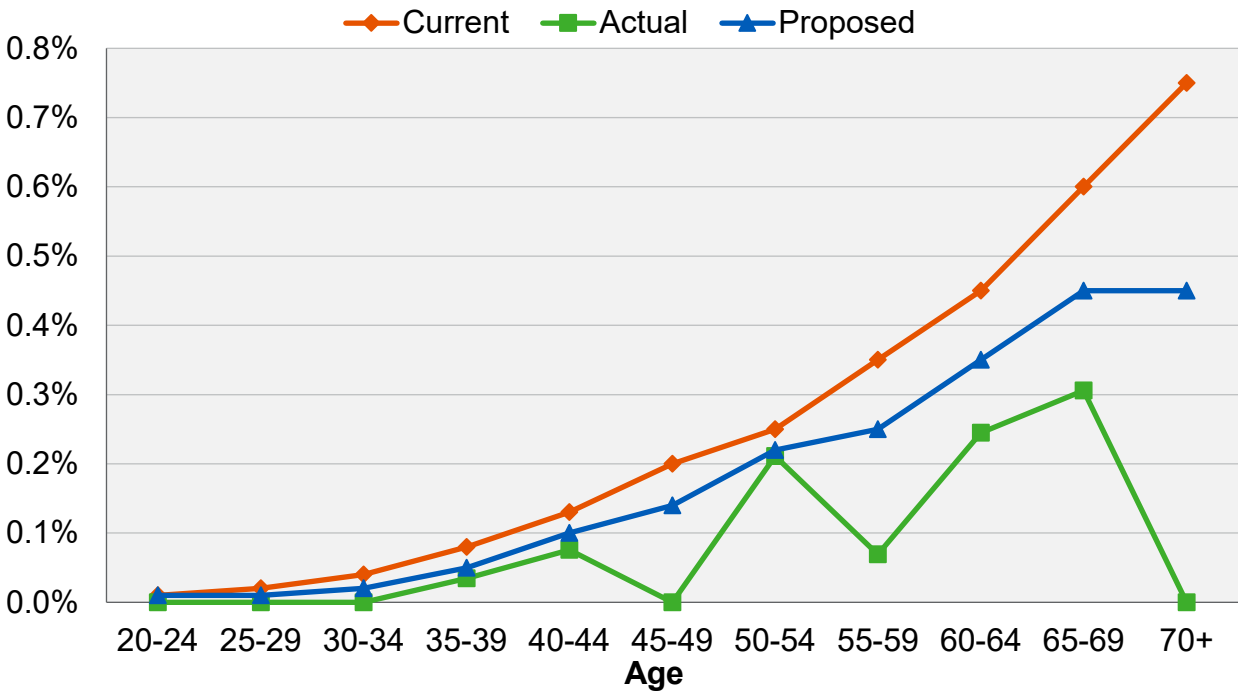
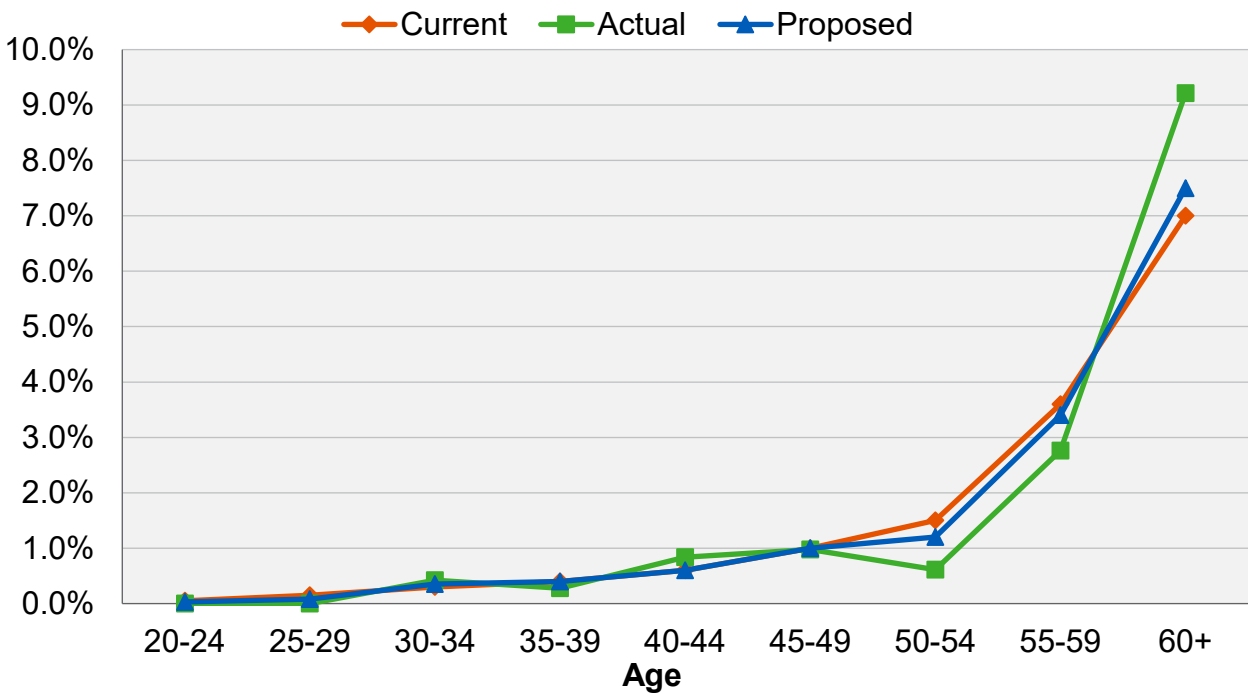


Chart 27: Disability Incidence Rates
Safety Members



F. In-Service Redemptions

In 1998, the Board of Retirement, in the course of actions related to the Ventura Settlement, 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
- Terminal Pay Elements – Those that are expected to increase 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. Any year to year fluctuation in the amount of in-service redemptions would be incorporated in the salary scale assumptions discussed in the prior section of this report. The second category requires a separate actuarial assumption to anticipate its impact on a member's retirement benefit.

In this study, we have collected data for the last three years to estimate in-service redemptions for non-PEPRA active members as a percentage of final average pay. The results are summarized in the following table:

	Actual Average In-Service Redemptions for Non-PEPRA Members		
Year Ending June 30	**General Tier 1**	**General Tier 2**	**Safety**
2018	10.48%	3.71%	6.57%
2019	6.23%	2.80%	6.77%
2020	10.19%	3.29%	5.30%
Average	**9.12%**	**3.28%**	**6.23%**
Current Assumption	7.50%	3.50%	7.00%
Proposed Assumption	8.00%	3.50%	6.50%

For determining the cost of the basic benefit (i.e., non-COLA component), the cost of this pay element is currently recognized in the valuation as an employer only cost and does not affect member contribution rates.

Based on the above experience, we recommend increasing the assumption for General Tier 1 members, maintaining the assumption for General Tier 2 members and decreasing the assumption for Safety members.

In determining the assumptions for the in-service redemptions, we have asked VCERA for guidance on whether or not the recent California Supreme Court decision on compensation earnable is expected to have an impact on the pay elements that we have used in the analysis of the above assumptions. Based on guidance from the Association, it is our understanding that the California Supreme Court decision does not have a material impact on the terminal pay elements that this assumption is meant to capture.

G. Average Entry Age (For Non-PEPRA Member Contributions)

The assumption for average entry age of non-PEPRA active members is used in determining the rate at which members who were hired after November 1974 contribute. In addition, this only applies to non-PEPRA active members that are not contributing fifty percent of the Normal Cost. The current assumption is age 35 for General members and age 27 for Safety members. The actual average entry ages for all active members as of June 30, 2020 is age 34.4 for General members and age 26.4 for Safety members.

Based on this experience we recommend that the average entry age for General members used for determining member contribution rates be maintained at age 35. For Safety members we recommend that the average entry age used for determining member contribution rates be maintained at age 27.

V. Cost Impact

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

Cost Impact of the Recommended Assumptions Based on June 30, 2020 Actuarial Valuation

Impact on Average Employer Contribution Rates	
Increase due to changes in economic assumptions	2.53%
Decrease due to changes in demographic assumptions[33]	-0.64%
Total increase in average employer rate	1.89%
Total estimated increase in annual dollar amount ($000s)	$14,941
Impact on Average Member Contribution Rates	
Increase due to changes in economic assumptions	0.58%
Increase due to changes in demographic assumptions[33]	0.09%
Total increase in average member rate	0.67%
Total estimated increase in annual dollar amount ($000s)	$5,276
Impact on UAAL and Funded Percentage	
Increase in UAAL	$116 million
Change in Funded Percentage	From 89.57% to 88.06%

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

Assumption Change	Impact on Average Employer Contribution Rates	Impact on Average Member Contribution Rates	Impact on UAAL ($ millions)
Increase due to changes in economic assumptions	**2.53%**	**0.58%**	**$199**
Change due to change in mortality	-0.60%	0.03%	(68)
Change due to changes in all other demographic assumptions[33]	-0.04%	0.06%	(16)
Change due to changes in demographic assumptions[33]	**-0.64%**	**0.09%**	**$(83)**
Total increase due to all assumption changes	**1.89%**	**0.67%**	**$116**

[33] 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 VCERA service. The refinement spreads the Normal Cost over only the member's service period with VCERA. 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.

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 June 30, 2020 actuarial valuation.

Employer Contribution Rate Increases/(Decreases) (% of Payroll) (Estimated Annual Dollar amounts in Thousands)				
	Normal Cost	**UAAL**	**Total**	**Annual Amount[34]**
General Tier 1	1.37%	0.92%	2.29%	$93
General Tier 2	0.58%	1.22%	1.80%	3,680
General PEPRA Tier 2	0.36%	1.22%	1.58%	1,286
General Tier 2 w/COLA	0.86%	0.92%	1.78%	3,539
General PEPRA w/COLA	0.53%	0.92%	1.45%	1,704
General Combined	**0.64%**	**1.06%**	**1.70%**	**$10,302**
Safety	1.63%	1.06%	2.69%	3,920
Safety PEPRA	0.77%	1.06%	1.83%	719
Safety Combined	**1.45%**	**1.06%**	**2.51%**	**$4,639**
All Categories combined	**0.83%**	**1.06%**	**1.89%**	**$14,941**

Average Member Contribution Rate Increases/(Decreases) (% of Payroll) (Estimated Annual Dollar Amounts in Thousands)		
	Rate	**Annual Amount[34]**
General Tier 1	1.33%	$54
General Tier 2	0.58%	1,179
General PEPRA Tier 2	0.36%	290
General Tier 2 w/COLA	0.58%	1,145
General PEPRA Tier 2 w/COLA	0.36%	416
Safety	1.29%	1,889
Safety PEPRA	0.77%	303
All Categories combined	**0.67%**	**$5,276**

[34] Based on June 30, 2020 projected annual payroll as determined under each set of assumptions.

Appendix A: Current Actuarial Assumptions

Economic Assumptions

Net Investment Return:	7.25%, net of investment and administrative expenses.
Member Contribution Crediting Rate:	2.75% (actual increase is based on projected long term ten-year Treasury rate).
Consumer Price Index:	Increase of 2.75% per year; retiree COLA increases due to CPI are subject to a 3.00% maximum change per year for both PEPRA and Non-PEPRA General Tier 1 and both PEPRA and Non-PEPRA Safety. For both PEPRA and non-PEPRA General Tier 2, SEIU members receive a fixed 2% cost-of-living adjustment, not subject to changes in the CPI, that applies to future service after March 2003.
Payroll Growth:	Inflation of 2.75% per year plus “across the board” real 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

Inflation: 2.75% per year; plus "across the board" real salary increases of 0.50% per year; plus the following merit and promotion increases.

Annual Rate of Compensation Increase

Rate (%)		
Years of Service	**General**	**Safety**
Less than 1	7.00	8.50
1 – 2	5.25	6.50
2 – 3	4.00	5.00
3 – 4	3.50	4.25
4 – 5	2.75	3.75
5 – 6	2.25	3.50
6 – 7	2.00	2.50
7 – 8	1.75	1.50
8 – 9	1.50	1.25
9 – 10	1.25	1.00
10 – 11	1.00	0.95
11 – 12	0.95	0.90
12 – 13	0.90	0.85
13 – 14	0.85	0.80
14 – 15	0.80	0.70
15 – 16	0.75	0.70
16 – 17	0.70	0.70
17 – 18	0.65	0.70
18 – 19	0.60	0.70
19 – 20	0.55	0.70
20 & Over	0.50	0.70

Demographic Assumptions

Mortality Rates – Healthy

- **General Members:** Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table (separate tables for males and females) decreased by 10% for males, projected generationally with the two-dimensional mortality improvement scale MP-2017
- **Safety Members:** Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table (separate tables for males and females) decreased by 25% for males and decreased by 15% for females, projected generationally with the two-dimensional mortality improvement scale MP-2017

Mortality Rates – Disabled

- **General Members:** Headcount-Weighted RP-2014 Disabled Retiree Mortality Table (separate tables for males and females) decreased by 15% for males, projected generationally with the two-dimensional mortality improvement scale MP-2017
- **Safety Members:** Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table (separate tables for males and females) increased by 15% for females, projected generationally with the two-dimensional mortality improvement scale MP-2017

Mortality Rates – Beneficiaries

- **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. The generational projection is a provision for future mortality improvement.

Member Contribution Rates

- **General Members:** Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table (separate tables for males and females) decreased by 10% for males, projected 20 years with the two-dimensional mortality improvement scale MP-2017, weighted one-third male and two-thirds female
- **Safety Members:** Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table (separate tables for males and females) decreased by 25% for males and decreased by 15% for females, projected 20 years with the two-dimensional mortality improvement scale MP-2017, weighted 80% male and 20% female

Mortality Rates – Pre-Retirement

- **General and Safety Members:** Headcount-Weighted RP-2014 Employee Mortality Table (separate tables for males and females) decreased by 20%, projected generationally with the two-dimensional scale MP-2017

	Rate (%)	
Age	**Male**	**Female**
25	0.05	0.02
30	0.05	0.02
35	0.05	0.03
40	0.06	0.04
45	0.10	0.07
50	0.17	0.11
55	0.27	0.17
60	0.45	0.24
65	0.78	0.36
70	1.27	0.59

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.

Disability Incidence Rates

	Rate (%)	
Age	General[1]	Safety[2]
20	0.01	0.05
25	0.02	0.11
30	0.03	0.24
35	0.06	0.36
40	0.11	0.52
45	0.17	0.84
50	0.23	1.30
55	0.31	2.76
60	0.41	5.64
65	0.54	2.80
70	0.69	0.00

[1] 25% of General disabilities are assumed to be service connected (duty) disabilities and the other 75% are assumed to be non-service connected (ordinary) disabilities.

[2] 90% of Safety disabilities are assumed to be service connected (duty) disabilities and the other 10% are assumed to be non-service connected (ordinary) disabilities.

Termination Rates

Rate (%)		
Years of Service	General	Safety
Less than 1	14.00	11.00
1 – 2	10.00	6.00
2 – 3	8.25	5.75
3 – 4	7.25	4.50
4 – 5	6.00	4.25
5 – 6	5.00	3.00
6 – 7	4.00	2.50
7 – 8	3.50	2.25
8 – 9	3.50	1.80
9 – 10	3.25	1.60
10 – 11	3.25	1.40
11 – 12	3.00	1.20
12 – 13	3.00	1.00
13 – 14	2.75	0.95
14 – 15	2.75	0.90
15 – 16	2.50	0.85
16 – 17	2.50	0.80
17 – 18	2.25	0.75
18 – 19	2.00	0.70
19 – 20	2.00	0.65
20 & Over	2.00	0.60

The greater of a refund of member contributions and a deferred annuity is valued when a member withdraws.

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

Retirement Rates

	Rate (%)			
	General Tier 1 and 2		Safety Non-PEPRA	
Age	Less than 30 Years of Service	30 or More Years of Service	Less than 30 Years of Service	30 or More Years of Service
Under 50	0.00	50.00	1.00	1.00
50	2.00	2.00	2.00	2.00
51	2.00	2.00	2.25	2.25
52	2.50	2.50	2.50	2.50
53	3.00	3.00	3.50	3.50
54	3.25	3.25	13.00	13.00
55	4.75	4.75	20.00	30.00
56	5.00	5.00	20.00	30.00
57	5.50	5.50	18.00	27.00
58	7.00	7.00	22.00	33.00
59	7.50	7.50	22.00	33.00
60	10.50	15.75	25.00	37.50
61	14.00	21.00	28.00	42.00
62	25.00	37.50	35.00	45.00
63	20.00	30.00	35.00	45.00
64	20.00	30.00	35.00	45.00
65	28.00	42.00	100.00	100.00
66	35.00	52.50	100.00	100.00
67	30.00	45.00	100.00	100.00
68	30.00	45.00	100.00	100.00
69	22.50	22.50	100.00	100.00
70	22.50	22.50	100.00	100.00
71	20.00	20.00	100.00	100.00
72	20.00	20.00	100.00	100.00
73	20.00	20.00	100.00	100.00
74	20.00	20.00	100.00	100.00
75	100.00	100.00	100.00	100.00

Retirement Rates (continued)

	Rate (%)	
Age	General PEPRA Tier 1 and 2	Safety PEPRA
50	0.00	4.00
51	0.00	2.25
52	1.50	3.50
53	1.50	5.50
54	2.00	13.00
55	4.00	20.00
56	4.50	20.00
57	5.00	18.00
58	5.50	18.00
59	6.00	25.00
60	9.00	25.00
61	11.00	25.00
62	22.50	40.00
63	20.00	40.00
64	18.00	40.00
65	20.00	100.00
66	30.00	100.00
67	30.00	100.00
68	25.00	100.00
69	35.00	100.00
70	50.00	100.00
71	50.00	100.00
72	50.00	100.00
73	50.00	100.00
74	50.00	100.00
75	100.00	100.00

Retirement Age and Benefit for Deferred Vested Members	For current and future deferred vested members, retirement age assumptions are as follows: General Age: 59 Safety Age: 53 We assume that 45% and 60% of future General and Safety deferred vested members, respectively, will continue to work for a reciprocal employer. For reciprocals, we assume 3.75% and 3.95% compensation increases per annum for General and Safety deferred vested members, respectively.
Future Benefit Accruals	1.0 year of service per year.
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	All active members of VCERA as of the valuation date.
Form of Payment	All members are assumed to elect the unmodified option at retirement.
Percent Married	70% of male members and 55% of female members are assumed to be married at pre-retirement death or retirement. There is no explicit assumption for children's benefits.
Age Spouse	Male retirees are 3 years older than their spouses, and female retirees are 2 years younger than their spouses.
In-Service Redemptions	*Non-PEPRA Formulas:* The following assumptions for in-service redemptions pay as a percentage of final average compensation are used: General Tier 1 7.50% General Tier 2 3.50% Safety 7.00% For determining the cost of the basic benefit (i.e., non-COLA component), the cost of this pay element is currently recognized in the valuation as an employer only cost and does not affect member contribution rates. *PEPRA Formulas:* • None.
Average Entry Age for Member Contribution Rates	For non-PEPRA members hired after November 1974 who are not contributing fifty percent of Normal Cost, they will pay a contribution corresponding to a General and Safety member hired at entry age 35 and 27, respectively.
Methodology for use in Setting Entry Age for use in Actuarial Cost Method	Member's age at valuation date minus years of service.

Appendix B: Proposed Actuarial Assumptions

Economic Assumptions

Net Investment Return:	7.00%, net of investment and administrative expenses.
Member Contribution Crediting Rate:	2.50% (actual increase is based on projected long term ten-year Treasury rate).
Consumer Price Index:	Increase of 2.50% per year; retiree COLA increases of 2.75% are subject to a 3.00% maximum change per year for both PEPRA and Non-PEPRA General Tier 1 and both PEPRA and Non-PEPRA Safety. For both PEPRA and non-PEPRA General Tier 2, SEIU members receive a fixed 2% cost-of-living adjustment, not subject to changes in the CPI, that applies to future service after March 2003.
Payroll Growth:	Inflation of 2.50% per year plus “across the board” real 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

Inflation: 2.50% per year; plus "across the board" real salary increases of 0.50% per year; plus the following merit and promotion increases.

Annual Rate of Compensation Increase

Rate (%)		
Years of Service	**General**	**Safety**
Less than 1	7.00	9.00
1 – 2	5.25	6.25
2 – 3	4.00	4.75
3 – 4	3.50	4.50
4 – 5	3.00	4.25
5 – 6	2.75	4.00
6 – 7	2.50	2.75
7 – 8	2.25	1.75
8 – 9	2.00	1.50
9 – 10	1.75	1.25
10 – 11	1.50	1.20
11 – 12	1.40	1.15
12 – 13	1.30	1.10
13 – 14	1.20	1.05
14 – 15	1.10	1.00
15 – 16	1.00	1.00
16 – 17	0.95	1.00
17 – 18	0.90	1.00
18 – 19	0.85	1.00
19 – 20	0.80	1.00
20 & Over	0.75	1.00

Demographic Assumptions

Mortality Rates – Healthy

- **General Members:** 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
- **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

Mortality Rates – Disabled

- **General Members:** Pub-2010 Non-Safety Disabled Retiree Amount-Weighted Mortality Table (separate tables for males and 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), projected generationally with the two-dimensional mortality improvement scale MP-2020

Mortality Rates – Beneficiaries

- **Beneficiaries:** Pub-2010 General Contingent Survivor Amount-Weighted Above-Median Mortality Table (separate tables for males and females) with rates increased by 10% for females, projected generationally with the two-dimensional mortality improvement scale MP-2020

Member Contribution Rates

- **General Members:** 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 one-third male and two-thirds 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 80% male and 20% female

Mortality Rates – Pre-Retirement

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

	Rate (%)			
	General		Safety	
Age	Male	Female	Male	Female
25	0.02	0.01	0.03	0.02
30	0.03	0.01	0.04	0.02
35	0.04	0.02	0.04	0.03
40	0.06	0.03	0.05	0.04
45	0.09	0.05	0.07	0.06
50	0.13	0.08	0.10	0.08
55	0.19	0.11	0.15	0.11
60	0.28	0.17	0.23	0.14
65	0.41	0.27	0.35	0.20
70	0.61	0.44	0.66	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.

Disability Incidence Rates

	Rate (%)	
Age	General[1]	Safety[2]
20	0.01	0.03
25	0.01	0.06
30	0.02	0.24
35	0.04	0.38
40	0.08	0.52
45	0.12	0.84
50	0.19	1.12
55	0.24	2.52
60	0.31	5.86
65	0.41	0.00
70	0.45	0.00

[1] 30% of General disabilities are assumed to be service connected (duty) disabilities and the other 70% are assumed to be non-service connected (ordinary) disabilities.

[2] 90% of Safety disabilities are assumed to be service connected (duty) disabilities and the other 10% are assumed to be non-service connected (ordinary) disabilities.

Termination Rates

Rate (%)		
Years of Service	General	Safety
Less than 1	13.50	10.00
1 – 2	9.50	5.50
2 – 3	8.50	5.25
3 – 4	6.75	4.50
4 – 5	5.50	4.25
5 – 6	5.00	2.50
6 – 7	4.00	2.25
7 – 8	3.50	2.00
8 – 9	3.50	1.80
9 – 10	3.50	1.60
10 – 11	3.50	1.50
11 – 12	3.25	1.40
12 – 13	3.25	1.20
13 – 14	3.00	1.10
14 – 15	2.75	1.00
15 – 16	2.75	0.95
16 – 17	2.50	0.85
17 – 18	2.50	0.75
18 – 19	2.00	0.50
19 – 20	1.75	0.50
20 & Over	1.75	0.50

The greater of a refund of member contributions and a deferred annuity is valued when a member withdraws.

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

Retirement Rates

	Rate (%)			
	General Tier 1 and 2		Safety Non-PEPRA	
Age	Less than 30 Years of Service	30 or More Years of Service	Less than 30 Years of Service	30 or More Years of Service
Under 50	0.00	50.00	1.50	1.50
50	2.00	2.00	2.00	2.00
51	2.25	2.25	1.75	1.75
52	2.75	2.75	2.25	2.25
53	3.00	3.00	3.25	3.25
54	3.25	4.00	15.00	20.00
55	4.50	5.00	20.00	37.00
56	5.25	6.00	20.00	25.00
57	5.50	7.00	22.00	30.00
58	6.00	9.00	22.00	33.00
59	8.00	9.50	22.00	35.00
60	10.50	14.00	35.00	35.00
61	13.00	20.00	35.00	45.00
62	22.00	30.00	35.00	45.00
63	18.00	25.00	35.00	45.00
64	18.00	25.00	35.00	45.00
65	30.00	45.00	100.00	100.00
66	35.00	50.00	100.00	100.00
67	35.00	47.50	100.00	100.00
68	27.50	47.50	100.00	100.00
69	25.00	25.00	100.00	100.00
70	25.00	25.00	100.00	100.00
71	25.00	25.00	100.00	100.00
72	25.00	25.00	100.00	100.00
73	25.00	25.00	100.00	100.00
74	25.00	25.00	100.00	100.00
75	100.00	100.00	100.00	100.00

Retirement Rates (continued)

	Rate (%)	
Age	General PEPRA Tier 1 and 2	Safety PEPRA
50	0.00	4.00
51	0.00	1.75
52	1.50	3.25
53	1.50	5.50
54	2.00	16.00
55	4.00	20.00
56	4.75	20.00
57	5.25	20.00
58	5.50	18.00
59	6.50	25.00
60	9.00	30.00
61	11.00	30.00
62	20.00	35.00
63	18.00	35.00
64	16.00	35.00
65	20.00	100.00
66	30.00	100.00
67	35.00	100.00
68	25.00	100.00
69	35.00	100.00
70	55.00	100.00
71	55.00	100.00
72	55.00	100.00
73	55.00	100.00
74	55.00	100.00
75	100.00	100.00

Retirement Age and Benefit for Deferred Vested Members	For current and future deferred vested members, retirement age assumptions are as follows: <u>General Retirement Age</u> Reciprocal members: 60 Other members: 60 <u>Safety Retirement Age</u> Reciprocal members: 55 Other members: 52 We assume that 45% and 60% of future General and Safety deferred vested members, respectively, will continue to work for a reciprocal employer. For reciprocals, we assume 3.75% and 4.00% compensation increases per annum for General and Safety deferred vested members, respectively.
Future Benefit Accruals	1.0 year of service per year.
Unknown Data for Members	Same as those exhibited by members with similar known characteristics. If not specified, members are assumed to be male.
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Age Spouse	Male retirees are 3 years older than their spouses, and female retirees are 2 years younger than their spouses.
In-Service Redemptions	*Non-PEPRA Formulas:* The following assumptions for in-service redemptions pay as a percentage of final average compensation are used: General Tier 1 8.00% General Tier 2 3.50% Safety 6.50% For determining the cost of the basic benefit (i.e., non-COLA component), the cost of this pay element is currently recognized in the valuation as an employer only cost and does not affect member contribution rates. *PEPRA Formulas:* • None.
Average Entry Age for Member Contribution Rates	For non-PEPRA members hired after November 1974 who are not contributing fifty percent of Normal Cost, they will pay a contribution corresponding to a General and Safety member hired at entry age 35 and 27, respectively.
Methodology for use in Setting Entry Age for use in Actuarial Cost Method	Member's age at valuation date minus the lesser of years of employment or years of benefit service.