Sacramento County Employees' Retirement System

Actuarial Experience Study

Analysis of Actuarial Experience During the Period July 1, 2016 through June 30, 2019

Segal

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May 11, 2020

Board of Retirement
Sacramento County Employees' Retirement System
980 9th Street, Suite 1900
Sacramento, CA 95814

RE: Review of Actuarial Assumptions for the June 30, 2020 Actuarial Valuation

Dear Members of the Board:

We are pleased to submit this report of our review of the actuarial experience for the Sacramento County Employees' Retirement System. This study utilizes the census data for the period July 1, 2016 to June 30, 2019 and provides the proposed actuarial assumptions, both economic and demographic, to be used in the June 30, 2020 valuation.

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

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

Sincerely,

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

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

MAM/mv

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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 not possible to determine when and to what extent the economy will rebound after the current crisis caused by the COVID-19 pandemic.[1] Changing assumptions reflects a basic change in thinking about the future, and it has a much greater effect on the current contribution requirements than recognizing gains or losses as they occur.

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

This study was undertaken in order to review the economic and demographic actuarial assumptions and to compare the actual experience with that expected under the current assumptions during the three-year experience period from July 1, 2016 through June 30, 2019. The study was performed in accordance with Actuarial Standard of Practice (ASOP) No. 27 "Selection of Economic Assumptions for Measuring Pension Obligations" and ASOP No. 35 "Selection of Demographic and Other Non-Economic Assumptions for Measuring Pension Obligations." These Standards of Practice provide guidance for the selection of the various actuarial assumptions utilized in a pension plan actuarial valuation. Based on the study's results and expected future experience, we are recommending various changes in the current actuarial assumptions.

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

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

disabled life post-retirement mortality, beneficiary mortality, termination, and disability incidence (duty and non-duty).

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

Pg #	Actuarial Assumption Categories	Recommendation
12	**Inflation:** Future increases in the Consumer Price Index (CPI), which drives investment returns and active member salary increases, as well as cost-of-living adjustments (COLAs) for retirees.	Reduce the inflation assumption from 3.00% to 2.75% per annum as discussed in Section (III)(A).
15	**Investment Return:** The estimated average future net rate of return on current and future assets of the System as of the valuation date. This rate is used to discount liabilities.	Reduce the current investment return assumption from 7.00% to 6.75% per annum as discussed in Section (III)(B).
23	**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 3.00% to 2.75% and maintain the current real "across the board" salary increase assumption at 0.25%. 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 salary increases (after taking into account a 0.25% reduction in the inflation assumption) anticipate slightly lower salary increases overall for Miscellaneous members and slightly higher salary increases overall for Safety members.
29	**Retirement Rates:** The probability of retirement at each age at which participants are eligible to retire. **Other Retirement Related Assumptions including:** • Retirement age for deferred vested members • Future reciprocal members and reciprocal salary increases • Percent married and spousal age differences for members not yet retired	For active members, adjust the current retirement rates to those developed in Section (IV)(A). For Miscellaneous Tiers 2 and 3 we are recommending separate sets of age-based retirement assumptions for those with less than 30 years of service and for those with 30 or more years of service. Similarly, for Safety Tiers 1 and 2 we are recommending separate sets of age-based retirement assumptions for those with less than 25 years of service and for those with 25 or more years of service. For deferred vested members, maintain the Miscellaneous deferred vested retirement assumption at age 59, and decrease the Safety deferred vested retirement assumption from age 53 to age 52. Decrease the current proportion of future deferred vested members expected to be covered by a reciprocal system from 35% to 30% for Miscellaneous members, and from 45% to 40% for Safety members. In addition, decrease the reciprocal salary increase assumption from 4.50% to 4.25% for Miscellaneous members and increase the reciprocal salary increase assumption from 5.25% to 5.50% for Safety members. For active and deferred vested members, maintain the current percent married at retirement assumption at 80% for males and at 55% for females. Maintain the spouse age difference assumption that male retirees are 3 years older than their spouses and that female retirees are 2 years younger than their spouses.

Pg #	Actuarial Assumption Categories	Recommendation
42 51	**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, multiplied by 50%. Recommended base table for Miscellaneous 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 Miscellaneous retirees: Current base table: Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table, set forward one year for males. Recommended base table: Pub-2010 General Healthy Retiree Amount-Weighted Above-Median Mortality Table with rates increased by 10%. For healthy Safety retirees: Current base table: Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table, set back four years for males and females. Recommended base table: Pub-2010 Safety Healthy Retiree Amount-Weighted Above-Median Mortality Table with rates decreased by 5% for males. For all beneficiaries: Current base table: Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table, set forward one year for males. Recommended base table: Pub-2010 Contingent Survivor Amount-Weighted Above-Median Mortality Table. For disabled Miscellaneous retirees: Current base table: Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table, set forward seven years for males and set forward eight years for females. Recommended base table: Pub-2010 Non-Safety Disabled Retiree Amount-Weighted Mortality Table. For disabled Safety retirees: Current base table: Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table, set forward four years for males and females. Recommended base table: Pub-2010 Safety Disabled Retiree Amount-Weighted Mortality Table. All current tables are projected generationally with the two-dimensional projection scale MP-2016. All recommended tables are projected generationally with the two-dimensional projection scale MP-2019. For member contribution rates, optional forms and reserves, change the mortality rates to those developed in Section (IV)(B).
56	**Termination Rates:** The probability of leaving employment at each age and receiving either a refund of member contributions or a deferred vested retirement benefit.	Adjust the current termination rates to those developed in Section (IV)(D) to reflect a lower incidence of termination for Miscellaneous and Safety members.
62	**Disability Incidence Rates:** The probability of becoming disabled at each age.	Adjust the current disability rates to those developed in Section (IV)(E) to reflect slightly lower incidence of disability for Miscellaneous and Safety members.

Pg #	Actuarial Assumption Categories	Recommendation
65	**Service From Unused Sick Leave Conversions:** Additional service that is expected to be received when a member retires due to conversion of unused sick leave.	Maintain the current assumptions shown in Section (IV)(F).
65	**Average Entry Ages:** The entry age used to determine employee rates for legacy members hired after January 1, 1975 and prior to January 1, 2013.	Maintain the current assumed average entry ages of 35 for Miscellaneous and 29 for Safety.

We have estimated the impact of all the recommended economic and demographic assumptions as if they were applied to the June 30, 2019 actuarial valuation. The table below shows the changes in the employer and member contribution rates due to the proposed assumption changes separately for the recommended economic assumption changes (as recommended in Section III of this report) and the recommended demographic assumption changes (as recommended in Section IV of this report).

Note that the cost impact shown is after reflecting the impact of some active members in the legacy tiers who have already agreed to pay a higher normal cost on a 50:50 cost-sharing basis, while the remaining active members continue to have agreed only to pay the full rate as defined by statute.

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

Impact on Average Employer Contribution Rates (% of Payroll) (Estimated Annual Dollar amounts in Thousands)		
	Total	**Annual Amount[2]**
Increase due to changes in economic assumptions	2.20%	$22,093
Increase due to changes in demographic assumptions	0.19%	2,006
Total increase	2.39%	$24,099
Impact on Average Member Contribution Rates (% of Payroll) (Estimated Annual Dollar amounts in Thousands)		
	Total	**Annual Amount[2]**
Increase due to changes in economic assumptions	0.67%	$6,651
Increase due to changes in demographic assumptions	0.11%	1,142
Total increase	0.78%	$7,793
Impact on UAAL and Funded Percentage		
Increase in UAAL	$227 million	
Change in Funded Percentage	From 81.6% to 80.0%	

The most significant cost impact is from the change in the investment return assumption.

[2] Based on June 30, 2019 projected annual payroll as determined under each set of assumptions. These annual amounts are expected to change in the future in proportion to future payroll.

Section III of this report discusses 6.50% and 7.00% as two possible alternatives to the recommended 6.75% investment return assumption together with the rationales for considering those assumptions. The following table shows the estimated cost impact of adopting 6.50% and 7.00% investment return assumptions, respectively, together with all the other recommended assumption changes in this report.

Impact of Alternative 1 (6.50% investment return assumption)	
Total increase in average employer rate	5.52%
Total increase in average member rate	1.59%
Impact of Alternative 2 (7.00% investment return assumption)	
Total decrease in average employer rate	(0.64%)
Total increase in average member rate	0.02%

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

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 increase, unused sick leave conversion, and average entry ages for members hired after January 1, 1975 and prior to January 1, 2013.

Economic Assumptions

Economic assumptions consist of:

- **Inflation:** Increases in the price of goods and services. The inflation assumption reflects the basic return that investors expect from securities markets. It also reflects the expected basic salary increase for active members and drives increases in the allowances of retired members.
- **Investment Return:** Expected long-term rate of return on the System's investments after expenses. This assumption has a significant impact on contribution rates.
- **Salary Increases:** In addition to inflationary increases, it is assumed that salaries will also grow by real "across the board" pay increases in excess of price inflation. It is also assumed that employees will receive raises above these average increases as they advance in their careers. These are commonly referred to as merit and promotion increases. Payments to amortize any Unfunded Actuarial Accrued Liability (UAAL) are assumed to increase each year by the price inflation rate plus any real "across the board" pay increases that are assumed.

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

Demographic Assumptions

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

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

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

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

III. Economic Assumptions

A. Inflation

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

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

Historical Consumer Price Index – 1930 to 2019[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 Association of State Retirement Administrators (NASRA), the median inflation assumption used by 174 large public retirement funds in their 2018 fiscal year valuations was 2.65%.[4] In California, CalSTRS and ten other 1937 Act CERL systems use an inflation assumption of 2.75%, one other 1937 Act CERL system uses an inflation assumption of 2.90%, and two 1937 Act CERL systems use an inflation assumption of 2.50%. CalPERS has lowered their inflation assumption from 2.75% to 2.50% over a three-year period. Seven other 1937 Act CERL systems (including SCERS) use an inflation assumption of 3.00%.

SCERS' investment consultant, Verus, anticipates an annual inflation rate of 1.90%, while the average inflation assumption provided by Verus and six other investment advisory firms retained by Segal's California public sector clients was 2.33%. Note that, in general, investment consultants use a time horizon for this assumption that is shorter than the time horizon we use for the actuarial valuation.[5]

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

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

To find a forecast of inflation based on a longer time horizon, we referred to the Social Security Administration's (SSA) 2020 report on the financial status of the Social Security program.[6] The projected average increase in the Consumer Price Index (CPI) over the next 75 years under the intermediate cost assumptions used in that report was 2.40%. The SSA report also includes alternative projections using lower and higher inflation assumptions of 1.80% and 3.00%, respectively.

We also compared the yields on the thirty-year inflation indexed U.S. Treasury bonds to comparable traditional U.S. Treasury bonds.[7] As of March 2020, the difference in yields is about 1.29% which provides a measure of market expectations of inflation.

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

The setting of the inflation assumption using the information outlined above is a somewhat subjective process, and Segal does not apply a specific weight to each of the metrics in determining our recommended inflation assumption. Based on a consideration of all these metrics, since 2018 we have been recommending the same 2.75% inflation assumption in our experience for our California based public retirement system clients.

Retiree Cost-of-Living Increases

In our last experience study as of June 30, 2016, consistent with the 3.00% annual inflation assumption adopted by the Board, the Board adopted a 3.00% cost-of-living adjustment assumption (which is lower than the maximum COLA of 4.00% provided by the System) for all retirees in Tier 1 and a 2.00% cost-of-living adjustment assumption for retirees in Miscellaneous Tiers 3, 4 and 5 and Safety Tiers 2, 3 and 4.

Consistent with our recommended inflation assumption, we also recommend that the current 3.00% assumption used to value the post-retirement cost-of-living adjustment for Tier 1 be reduced to 2.75%. We recommend no change in the 2.00% assumption used to value the post-retirement for Miscellaneous Tiers 3, 4 and 5 and Safety Tiers 2, 3 and 4.

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

- The results of the stochastic modeling are significantly dependent on assuming that lower levels of inflation will persist in the early years of the projections. If this is not assumed, then the stochastic modeling will produce results similar to our proposed COLA assumptions.
- Using a lower long-term COLA assumption based on a stochastic analysis would mean that an actuarial loss would occur even when the inflation assumption of 2.75% is met in a year. We question the reasonableness of this result.

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

[6] 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

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

COLA assumptions. Therefore, we continue to recommend setting the COLA assumptions consistent with the long-term annual inflation assumption, as we have in prior years.

B. Investment Return

The investment return assumption is comprised of two primary components, inflation and real rate of investment return, with adjustments for 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 system's portfolio will vary with the Board's asset allocation among asset classes.

The System'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 Verus' total or "nominal" 2020 return assumptions by their assumed 1.90% inflation rate. The second column of returns (except for Liquid Real Return, Hedge Fund Growth, Hedge Fund Diversifying, Value Added Real Estate, Private Equity, Private Real Assets, and Private Credit) represents the average of a sample of real rate of return assumptions, where each firm's nominal returns have been reduced by that firm's assumed inflation rate. The sample includes the expected annual real rate of return provided to us by Verus and six other investment advisory firms retained by Segal's public sector clients. We believe these averages are a reasonable forecast of long-term future market returns in excess of inflation.

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

Asset Class	Percentage of Portfolio	Verus' Assumed Real Rate of Return[8]	Average Assumed Real Rate of Return from a Sample of Consultants to Segal's California Public Sector Clients[9]
U.S. Large Cap Equity	18%	4.70%	5.42%
U.S. Small Cap Equity	2%	5.80%	6.21%
International Developed Equity	16%	6.50%	6.50%
Emerging Markets Equity	4%	8.50%	8.80%
Core Plus Bonds	10%	1.10%	1.13%
High Yield Bonds	1%	2.10%	3.40%
Global Bonds	3%	(0.30%)	(0.04%)
Bank Loans	1%	3.90%	3.89%
U.S. Treasury	5%	0.00%	0.30%
Real Estate	5%	5.40%	4.57%
Cash	1%	0.00%	(0.03%)
Liquid Real Return	2%	4.47%	4.47%[10]
Hedge Fund Growth	3%	2.40%	2.40%[10]
Hedge Fund Diversifying	7%	2.40%	2.40%[10]
Value Added Real Estate	2%	8.10%	8.10%[10]
Private Equity	9%	9.40%	9.40%[10]
Private Real Assets	7%	8.05%	8.05%[10]
Private Credit	4%	5.60%	5.60%[10]
Total	**100%**	**4.90%**	**5.04%**

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

[8] Derived by reducing Verus' nominal rate of return assumptions by their assumed 1.90% inflation rate.

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

[10] For these assumptions, Verus' 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 Verus' assumption should more closely reflect the underlying investments made specifically for SCERS.

time. However, in general, the returns available from investment consultants are projected over time periods that are much shorter than the durations of a retirement plan's liabilities.

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

3. Therefore, we recommend that the 5.04% portfolio real rate of return be used to determine the System's investment return assumption. This is 0.11% lower than the return that was used three years ago in the review of the recommended investment return assumption for the June 30, 2017 valuation. The difference is due to changes in the System's target allocation (-0.14%), changes in the real rate of return assumptions provided to us by the investment advisory firms (+0.01%) and the interaction effect between these changes (+0.02%).

System 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 current assumption for system expenses is 0.65% of the Actuarial Value of Assets. The following table provides the investment expenses in relation to the Actuarial Value of Assets for each of the five years ending June 30, 2019.

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

Year Ending June 30	Actuarial Value of Assets[11]	Administrative Expenses	Investment Expenses[12]	Administrative %	Investment %	Total %
2015	$7,838,825	$5,854	$49,868	0.07%	0.64%	0.71%
2016	8,236,402	6,362	53,398	0.08%	0.65%	0.73%
2017	8,665,226	6,906	69,747	0.08%	0.80%	0.88%
2018	9,123,004	6,888	62,272	0.08%	0.68%	0.76%
2019	9,703,313	7,601	66,921	0.08%	0.69%	0.77%
Average						**0.77%**
Current Assumption						**0.65%**
Proposed Assumption						**0.75%**

Based on this experience, we have increased the future expense assumption component from 0.65% to 0.75%.

Note related to investment expenses paid to active managers – As cited above, under Section 3.6.3.d of ASOP No. 27, the effect of an active investment management strategy should be considered "net of investment expenses" when determining whether "the actuary has reason to

[11] As of end of plan year.

[12] 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. Excludes approximately $12 million, $6 million, $14 million, $63 million, and $64 million in incentive based fees for 2015, 2016, 2017, 2018, and 2019, respectively.

believe, based on relevant supporting data, that such superior or inferior returns represent a reasonable expectation over the long term."

We have not performed a detailed analysis to measure how much of the investment expenses paid to active managers might have been offset by additional returns ("alpha") earned by that active management. For now, we will continue to use the current methodology that any "alpha" that may be identified would be treated as an increase in the risk adjustment and corresponding confidence level. For example, 0.25% of alpha would increase the confidence level by 3% (see discussions that follow on definitions of risk adjustment and confidence level).

Risk Adjustment

The real rate of return assumption for the portfolio is adjusted to reflect the potential risk of shortfalls in the return assumptions. The System'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.[13] This is consistent with our experience that retirement plan fiduciaries would generally prefer that returns exceed the assumed rate more often than not.

The 5.04% 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.[14] The 15-year time horizon represents an approximation of the "duration" of the fund's liabilities, where the duration of a liability represents the sensitivity of that liability to interest rate variations. Note that, based on the investment return assumptions recently adopted by systems that have been analyzed under this model, we observe a confidence level generally in the range of 50% to 55%.

Three years ago, the Board adopted an investment return assumption of 7.00%. That return implied a risk adjustment of 0.50%, 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.[15]

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 10.93% provided by Verus, the corresponding risk adjustment would be 0.52%. Together with the other investment return components, this would result in an investment return assumption of 6.52%, which is substantially lower than the current assumption of 7.00%.

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

[14] 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.

[15] Based on an annual portfolio return standard deviation of 10.50% provided by Verus in 2017. Strictly speaking, future compounded long-term investment returns will tend to follow a log-normal distribution. However, we believe the normal distribution assumption is reasonable for purposes of setting this type of risk adjustment.

Based on the general practice of using one-quarter percentage point increments for economic assumptions, we evaluated the effect on the confidence level of alternative investment return assumptions. In particular, a net investment return assumption of 6.50%, together with the other investment return components, would produce a risk adjustment of 0.54%, which corresponds to a confidence level of 57%. The Board may want to consider an assumption of 6.50% in order to carry over the same confidence level used three years ago in setting this assumption.

Because this would be a substantial change in this long-term assumption, we also examined the confidence level associated with an assumption of 6.75%. A net investment return assumption of 6.75%, together with the other investment return components, would produce a risk adjustment of 0.29%, which corresponds to a confidence level of 54%. We believe the discussion provided below could support this reduction in the confidence level compared to that used three years ago and on that basis our analysis supports a recommendation to reduce the current assumption from 7.00% to 6.75%.

Finally we observe that the capital market assumptions provided by the investment advisory firms and used in this analysis do not yet reflect the recent market volatility due to the COVID-19 pandemic. As we stated in the introduction to this report we believe it is not yet possible to determine when and to what extent the economy will rebound after the current crisis caused by the COVID-19 pandemic. Nevertheless, given the current uncertain market conditions, the Board could consider maintaining the current net investment return of 7.00%. Given the recommended reduction in the inflation component of this assumption, this would mean an increase in the assumed net real rate of return from 4.00% to 4.25%. As a result, a 7.00% assumption together with the other investment return components, would produce a risk adjustment of 0.04%, which corresponds to a confidence level of only 51%. Due to this low confidence level, we believe the Board should consider an assumption of 7.00% only as an interim assumption, and if adopted it would be our recommendation for the Board to authorize an out-of-cycle review of the economic assumptions within the next year after the capital markets stabilize.

As we have discussed in prior experience studies, the risk adjustment model and associated confidence level is most useful as a means for comparing how the System has positioned itself relative to risk over periods of time.[16] The use of a 54% confidence level associated with a 6.75% assumption under Segal's model should be considered in context with other factors, including:

- As noted above, the confidence level is more of a relative measure than an absolute measure, and so can be reevaluated and reset for future comparisons.
- The confidence level is based on the standard deviation of the portfolio that is determined and provided to us by Verus. 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 54% is lower than the confidence levels historically adopted by the Board, but it is within the range of about 50% to 55% that corresponds to the risk adjustments used by most of Segal's other California public retirement system clients.

[16] 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."

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

Taking into account the factors above, our recommendation is to reduce the net investment return assumption from 7.00% to 6.75%. As noted above, this return implies a 0.29% risk adjustment and reflects a confidence level of 54%.

Recommended Investment Return Assumption

The following tables summarize the components of the investment return assumption developed in the previous discussion. For comparison purposes, we have also included similar values from the last three studies.

Calculation of Investment Return Assumption

Assumption Component	June 30, 2020 Recommended Value	June 30, 2020 Alternative 1	June 30, 2020 Alternative 2
Inflation	2.75%	2.75%	2.75%
Plus Portfolio Real Rate of Return	5.04%	5.04%	5.04%
Minus Expense Adjustment	(0.75)%	(0.75)%	(0.75%)
Minus Risk Adjustment	(0.29)%	(0.54)%	(0.04%)
Total	**6.75%**	**6.50%**	**7.00%**
Confidence Level	**54%**	**57%**	**51%**

Historical Investment Return Assumptions

Assumption Component	June 30, 2017 Adopted Value	June 30, 2014 Adopted Value	June 30, 2012 Adopted Value
Inflation	3.00%	3.25%	3.25%
Plus Portfolio Real Rate of Return	5.15%	5.67%	5.97%
Minus Expense Adjustment	(0.65)%	(0.50)%	(0.45%)
Minus Risk Adjustment	(0.50)%	(0.92)%	(1.27%)
Total	**7.00%**	**7.50%**	**7.50%**
Confidence Level	**57%**	**60%**	**64%**

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

Comparison with Alternative Model used to Review Investment Return Assumption

Since our appointment as actuary for SCERS in 2004, 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.[17] The use of "forward looking expected arithmetic returns" is one of the approaches discussed for use in the Selection of Economic Assumptions for measuring Pension Obligations under Actuarial Standards of Practice (ASOP) No. 27.

Besides using forward looking expected arithmetic returns, ASOP No. 27 also discussed setting investment return assumptions using an alternative "forward looking expected geometric returns" approach.[18] 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 SCERS. This is because under the model used by those retirement systems, their investment return assumptions are not reduced to anticipate future investment expenses.[19]

For comparison, we evaluated the recommended 6.75% assumption based on the expected geometric return for the entire portfolio, and gross of the investment expenses. Under that model, over a 15-year period, there is a 58% likelihood that future average geometric returns will meet or exceed 6.75%.[20] Under this same model the likelihoods associated with the alternative assumptions of 6.50% and 7.00% are 61% and 54% respectively.

Comparison with Other Public Retirement Systems

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

We note that an investment return of 7.00% or lower is becoming more common among California public sector retirement systems. In particular, eleven of the 1937 Act CERL systems (including SCERS) use a 7.00% investment return assumption and one 1937 Act CERL system uses 6.50% The San Jose and San Diego City retirement systems use investment return assumptions of 6.75% and 6.50%, respectively. Furthermore, both CalPERS and CalSTRS currently use a 7.00% earnings assumption. With the exception of the retirement systems stated above, all other County employees' retirement systems in California are using a 7.25% earnings assumption.

[17] 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.

[18] 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.

[19] This means that if the model were to be applied to SCERS, the expected geometric return would not be adjusted for the approximately 0.67% investment expenses paid by SCERS.

[20] We performed this stochastic simulation using the capital market assumptions included in the 2019 survey prepared by Horizon Actuarial Services. That simulation was performed using 10,000 trial outcomes of future market returns, using assumptions from 20-year arithmetic returns, standard deviations and correlation matrix that were found in the 2019 survey that included responses from 34 investment advisors.

The following table compares SCERS' recommended net investment return assumption against those of the 188 large public retirement funds in their 2018 fiscal year valuations based on information found in the Public Plans Data website, which is produced in partnership with NASRA:[21]

		Public Plans Data[22]		
Assumption	**SCERS**	**Low**	**Median**	**High**
Net Investment Return	6.75%	4.50%	7.25%	8.00%

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

In summary, we believe that both the risk adjustment model and other considerations support a lower earnings assumption. While the recommended assumption of 6.75% provides for a lower risk margin within the risk adjustment model, it is a reasonable assumption taking into consideration both of SCERS' current practice as well as those of other public systems.

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

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

C. Salary Increase

Salary increases impact plan costs in two ways: (i) by increasing members' benefits (since benefits are a function of the members' highest average pay) and future normal cost collections; and (ii) by increasing total active member payroll which in turn generates lower UAAL contribution rates 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 reduced from 3.00% to 2.75% per annum. This inflation component is used as part of the salary increase assumption.

2. **Real "Across the Board" Pay Increases:** These increases are typically termed productivity increases since they are considered to be derived from the ability of an organization or an economy to produce goods and services in a more efficient manner. As that occurs, at least some portion of the value of these improvements can provide a source for pay increases. These increases are typically assumed to extend to all employees "across the board". The State and Local Government Workers Employment Cost Index produced by the Department of Labor provides evidence that real "across the board" pay increases have averaged about 0.4% – 0.7% annually during the last ten to twenty years.

   We also referred to the annual report on the financial status of the Social Security program published in April 2019. In that report, real "across the board" pay increases are forecast to be 1.2% per year under the intermediate assumptions.

   The real pay increase assumption is generally considered a more "macroeconomic" assumption that is not necessarily based on individual plan experience. However, recent salary experience with public systems in California as well as anecdotal discussions with plans and plan sponsors indicate lower future real wage growth expectations for public sector employees. We note that for SCERS' active members, the actual average inflation plus "across the board" increase (i.e., wage inflation) over the three year period ending June 30, 2019 was 2.73% for Miscellaneous and Safety members combined, which is lower than the change in CPI of 3.37% during that same period:

Valuation Date	Actual Average Increase[23]	Actual Change in CPI[24]
June 30, 2017	3.09%	3.01%
June 30, 2018	2.07%	3.22%
June 30, 2019	3.02%	3.87%
Three Year Average	**2.73%**	**3.37%**

[23] 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.

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

Considering these factors, we recommend maintaining the real "across the board" salary increase assumption at 0.25%. 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 SCERS, 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 Miscellaneous 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 any decreases during any particular year;
   c. Categorizing these increases according to member demographics;
   d. Removing the wage inflation component from these increases (assumed to be equal to the increase in the members' average salary during the year);
   e. Averaging these annual increases over the experience period; and
   f. Modifying current assumptions to reflect some portion of these measured increases reflective of their "credibility."

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

The following table shows the Miscellaneous members' actual average merit and promotion increases by years of service over the three-year period from July 1, 2016 through June 30, 2019. 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 (2.87% on average for the most recent three-year period).

	Rate (%)		
Years of Service	Current Assumptions	Actual Average Increase	Proposed Assumptions
0 – 1	5.00	4.59	5.00
1 – 2	4.75	7.24	5.00
2 – 3	4.50	6.28	5.00
3 – 4	4.00	5.45	5.00
4 – 5	3.50	4.12	4.00
5 – 6	2.75	3.25	3.00
6 – 7	2.25	2.82	2.50
7 – 8	2.00	2.65	2.25
8 – 9	1.75	2.68	2.00
9 – 10	1.50	2.30	1.80
10 – 11	1.25	1.97	1.70
11 – 12	1.25	2.01	1.60
12 – 13	1.25	1.87	1.50
13 – 14	1.25	1.93	1.45
14 – 15	1.25	1.68	1.35
15 & Over	1.25	1.22	1.25

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, 2016 through June 30, 2019. 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 (2.17% on average for the most recent three-year period).

	Rate (%)		
Years of Service	Current Assumptions	Actual Average Increase	Proposed Assumptions
0 – 1	7.50	7.21	7.50
1 – 2	7.25	5.75	6.50
2 – 3	6.50	5.78	6.25
3 – 4	5.50	5.17	5.50
4 – 5	5.00	3.64	5.00
5 – 6	4.25	4.13	4.25
6 – 7	3.75	4.36	4.00
7 – 8	3.25	3.39	3.50
8 – 9	3.00	4.72	3.25
9 – 10	2.50	3.23	3.00
10 – 11	2.00	2.70	2.50
11 – 12	2.00	3.62	2.50
12 – 13	2.00	2.73	2.50
13 – 14	2.00	3.31	2.50
14 – 15	2.00	3.51	2.50
15 & Over	2.00	3.09	2.50

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

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

Based on this experience, we are proposing changes in the *merit and promotion* salary increases for both Miscellaneous and Safety members, with increases in most service categories. However, the overall salary increases (after taking into account a 0.25% reduction in the inflation assumption) will decrease slightly for Miscellaneous members and increase slightly for Safety members due to 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 member's 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
Miscellaneous Members

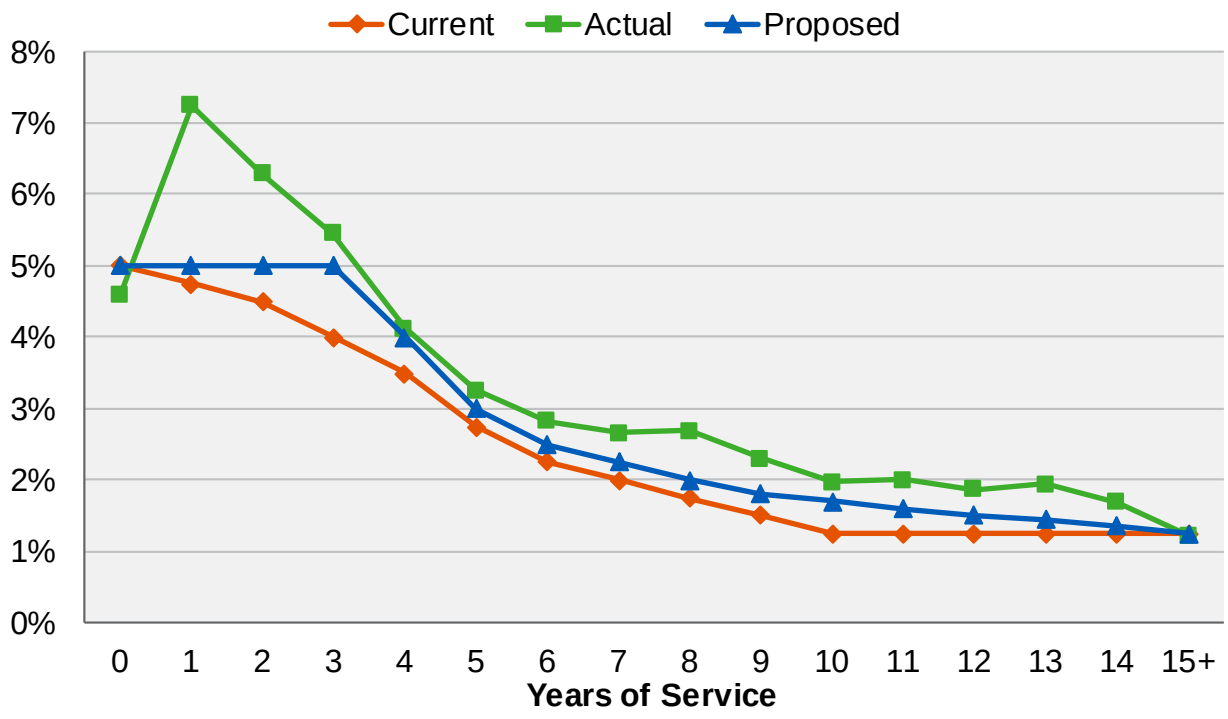
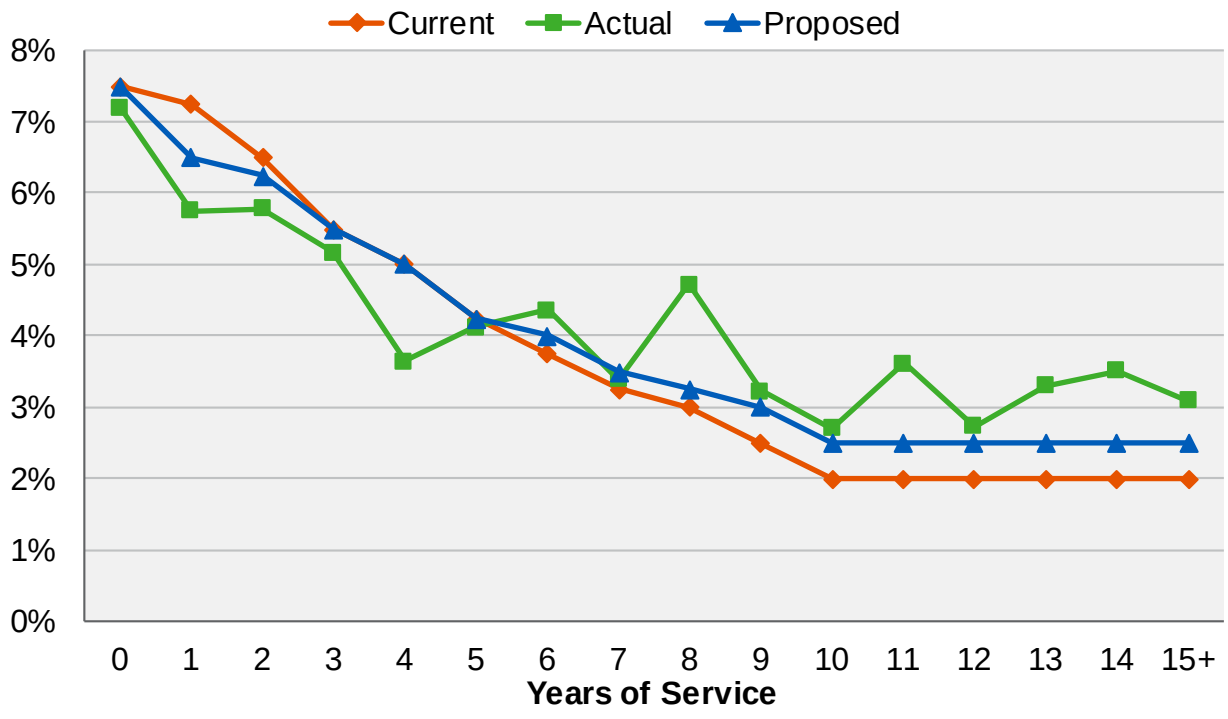


Chart 2: Merit and Promotion Salary Increase Rates
Safety Members



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.

The retirement experience during the current three-year period indicated that there were fewer actual retirements than expected from the Miscellaneous Tiers 2 and 3 member categories and more actual retirements than expected from the Safety Tiers 1 and 2 member categories. For Miscellaneous Tiers 4 and 5, we are recommending lowering the retirement rates consistent with the adjustments made for Miscellaneous Tiers 2 and 3. For Miscellaneous Tier 1 and Safety Tiers 3 and 4, we are not recommending a change in the retirement assumptions because there is insufficient data to support a change.

Currently, the assumed retirement rates are a function of only member's age. With this year's experience study, we have also analyzed recent years' retirement experience both as a function of age and years of service in relation to the probability of retirement. Our review concludes that the retirement rates correlate both with age and with years of service for members in Miscellaneous Tiers 2 and 3 and Safety Tiers 1 and 2. As a result of this observation, we recommend that retirement rates be structured as a function of both age and years of service for these tiers.

For Miscellaneous Tiers 2 and 3, the new structure of retirement assumptions will apply different sets of age-based retirement assumptions for those with less than 30 years of service and those with 30 or more years of service. For Safety Tiers 1 and 2, different sets of age-based retirement assumptions will apply for those with less than 25 years of service and those with 25 or more years of service.

For Miscellaneous Tiers 1, 4 and 5 and Safety Tiers 3 and 4, we will continue to recommend that retirement rates be structured as a function of only age. For Miscellaneous Tier 5 and Safety Tier 4 that are still open to new entrants, we will wait until more data on actual retirement experience is available to allow a review of the retirement rates based on both age and service.

The tables on the following pages show the actual service retirement rates for members of each of the membership categories based on the actual experience over the past three years. The observed service retirement rates were determined by comparing those members who actually retired from service to those eligible to retire from service. This same methodology is followed throughout this report and was described in Section II. Also shown are the current assumed rates and the rates we propose.

Miscellaneous Tier 1

	Rate of Retirement (%)		
Age	Current Rate	Actual Rate[25]	Proposed Rate
50	6.00	N/A	6.00
51	4.50	N/A	4.50
52	4.50	N/A	4.50
53	4.50	N/A	4.50
54	5.50	0.00	5.50
55	12.00	28.57	12.00
56	18.00	20.00	18.00
57	18.00	0.00	18.00
58	18.00	17.65	18.00
59	20.00	22.22	20.00
60	28.00	15.79	28.00
61	35.00	38.89	35.00
62	35.00	23.53	35.00
63	35.00	42.86	35.00
64	35.00	33.33	35.00
65	35.00	10.00	35.00
66	40.00	22.22	40.00
67	40.00	10.00	40.00
68	50.00	33.33	50.00
69	60.00	16.67	60.00
70	100.00	100.00	100.00

As shown above, we are recommending maintaining the current retirement rates for Miscellaneous Tier 1 members.

[25] An Actual Rate of N/A indicates that there were no members eligible to retire at a given age.

Miscellaneous Tiers 2 and 3

	Rate of Retirement (%)					
	Less Than 30 Years of Service			30 or More Years of Service		
Age	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
50	2.00	3.65	2.50	2.00	0.00	2.50
51	2.00	1.59	1.75	2.00	0.00	1.75
52	2.00	1.80	2.00	2.00	0.00	2.00
53	3.00	2.30	2.50	3.00	0.00	2.50
54	4.00	2.76	3.00	4.00	8.16	3.00
55	6.00	4.02	4.00	6.00	21.67	8.00
56	6.00	4.49	5.00	6.00	11.67	10.00
57	8.00	7.38	8.00	8.00	22.78	16.00
58	10.00	9.08	9.00	10.00	17.95	18.00
59	12.00	8.63	9.00	12.00	27.50	18.00
60	12.00	7.52	9.00	12.00	28.77	18.00
61	14.00	15.31	15.00	14.00	37.50	30.00
62	25.00	19.04	18.00	25.00	27.27	18.00
63	25.00	16.53	18.00	25.00	17.39	18.00
64	30.00	18.66	20.00	30.00	31.58	20.00
65	35.00	33.48	35.00	35.00	25.00	35.00
66	40.00	34.88	35.00	40.00	41.67	35.00
67	40.00	29.92	35.00	40.00	37.50	35.00
68	50.00	28.00	35.00	50.00	25.00	35.00
69	60.00	32.14	35.00	60.00	40.00	35.00
70	100.00	27.96	100.00	100.00	27.27	100.00

As shown above, we are recommending decreases in most of the retirement rates for Miscellaneous Tiers 2 and 3 members with less than 30 years of service and recommending increases at some ages and decreases at other ages for Miscellaneous Tiers 2 and 3 members with 30 or more years of service.

Miscellaneous Tier 4

	Rate of Retirement (%)		
Age	Current Rate	Actual Rate[26]	Proposed Rate
50	2.00	N/A	2.50
51	2.00	N/A	1.75
52	2.00	N/A	2.00
53	2.00	100.00	1.75
54	3.00	0.00	2.25
55	4.00	50.00	3.00
56	5.00	N/A	4.50
57	6.00	N/A	6.50
58	7.00	N/A	7.00
59	8.00	N/A	7.00
60	9.00	N/A	7.50
61	10.00	N/A	12.00
62	18.00	N/A	13.00
63	16.00	100.00	12.00
64	20.00	N/A	13.00
65	25.00	N/A	25.00
66	20.00	N/A	18.00
67	20.00	N/A	18.00
68	30.00	N/A	21.00
69	40.00	N/A	23.00
70	100.00	33.33	100.00

As shown above, we are recommending decreases in most of the retirement rates for Miscellaneous Tier 4 members.

For Miscellaneous Tier 4, we do not have credible experience from the past three years to propose new retirement rates based only on age or age and service. As a result, we have not changed the current age-based assumption structure for these members. However, we are recommending lowering many of the rates currently used for this tier, consistent with the changes to the retirement rates that we are recommending for the Miscellaneous Tier 2 and 3 members.

[26] An Actual Rate of N/A indicates that there were no members eligible to retire at a given age.

Miscellaneous Tier 5

	Rate of Retirement (%)		
Age	Current Rate	Actual Rate[27]	Proposed Rate
50	0.00	N/A	0.00
51	0.00	N/A	0.00
52	4.00	0.00	4.00
53	1.50	0.00	1.25
54	2.50	0.00	1.75
55	3.50	0.00	2.50
56	4.50	0.00	4.00
57	5.50	0.00	6.00
58	6.50	0.00	6.50
59	7.50	0.00	6.50
60	8.50	0.00	7.00
61	9.50	20.00	11.00
62	17.00	20.00	12.00
63	15.00	0.00	11.00
64	19.00	33.33	13.00
65	24.00	33.33	24.00
66	20.00	0.00	18.00
67	20.00	0.00	18.00
68	30.00	50.00	21.00
69	40.00	0.00	23.00
70	100.00	0.00	100.00

As shown above, we are recommending decreases in most of the retirement rates for Miscellaneous Tier 5 members.

For Miscellaneous Tier 5, we do not have credible experience from the past three years to propose new retirement rates based only on age or age and service. As a result, we have not changed the current age-based assumption structure for these members. However, we are recommending lowering many of the rates currently used for this tier, consistent with the changes to the retirement rates that we are recommending for the Miscellaneous Tier 2 and 3 members.

[27] An Actual Rate of N/A indicates that there were no members eligible to retire at a given age.

Safety Tiers 1 and 2

	Rate of Retirement (%)					
	Less Than 25 Years of Service			25 or More Years of Service		
Age	Current Rate	Actual Rate[28]	Proposed Rate	Current Rate	Actual Rate[28]	Proposed Rate
45	2.00	2.41	2.50	2.00	0.00	2.50
46	2.00	2.83	2.50	2.00	14.29	2.50
47	2.00	3.81	2.50	2.00	0.00	2.50
48	2.00	3.16	2.50	2.00	6.90	2.50
49	5.00	23.71	10.00	5.00	38.10	10.00
50	22.00	16.45	18.00	22.00	61.76	36.00
51	16.00	14.29	15.00	16.00	44.83	30.00
52	16.00	20.48	18.00	16.00	41.67	36.00
53	20.00	11.59	16.00	20.00	46.15	32.00
54	20.00	16.98	18.00	20.00	32.00	27.00
55	20.00	14.04	18.00	20.00	30.43	27.00
56	25.00	20.00	20.00	25.00	27.27	30.00
57	25.00	15.38	20.00	25.00	20.00	30.00
58	25.00	17.65	20.00	25.00	37.50	30.00
59	30.00	41.18	30.00	30.00	16.67	30.00
60	45.00	12.50	45.00	45.00	0.00	45.00
61	55.00	22.22	55.00	55.00	57.14	55.00
62	70.00	63.64	70.00	70.00	0.00	70.00
63	70.00	25.00	70.00	70.00	50.00	70.00
64	70.00	33.33	70.00	70.00	0.00	70.00
65	100.00	80.00	100.00	100.00	100.00	100.00
66	100.00	N/A	100.00	100.00	0.00	100.00
67	100.00	0.00	100.00	100.00	0.00	100.00
68	100.00	0.00	100.00	100.00	N/A	100.00
69	100.00	N/A	100.00	100.00	N/A	100.00
70	100.00	N/A	100.00	100.00	N/A	100.00

As shown above, we are recommending decreases in many of the retirement rates for Safety Tiers 1 and 2 members with less than 25 years of service and recommending increases at many ages for Safety Tiers 1 and 2 members with 25 or more years of service.

[28] An Actual Rate of N/A indicates that there were no members eligible to retire at a given age.

Safety Tier 3

	Rate of Retirement (%)		
Age	Current Rate	Actual Rate[29]	Proposed Rate
45	1.50	N/A	1.50
46	1.50	N/A	1.50
47	1.50	N/A	1.50
48	1.50	N/A	1.50
49	4.00	N/A	4.00
50	10.00	0.00	10.00
51	12.00	0.00	12.00
52	14.00	0.00	14.00
53	16.00	N/A	16.00
54	18.00	N/A	18.00
55	50.00	N/A	50.00
56	25.00	N/A	25.00
57	25.00	N/A	25.00
58	25.00	N/A	25.00
59	30.00	N/A	30.00
60	45.00	N/A	45.00
61	55.00	N/A	55.00
62	70.00	N/A	70.00
63	70.00	N/A	70.00
64	70.00	N/A	70.00
65	100.00	N/A	100.00
66	100.00	N/A	100.00
67	100.00	N/A	100.00
68	100.00	N/A	100.00
69	100.00	N/A	100.00
70	100.00	N/A	100.00

As shown above, we are recommending maintaining the current retirement rates for Safety Tier 3 members.

For Safety Tier 3, we do not have credible experience from the past three years to propose new retirement rates based only on age or age and service. As a result, we have not changed the current age-based assumption structure for these members. Furthermore, we are not recommending a change in the retirement rates for Safety Tier 3 members.

[29] An Actual Rate of N/A indicates that there were no members eligible to retire at a given age.

Safety Tier 4

	Rate of Retirement (%)		
Age	Current Rate	Actual Rate[30]	Proposed Rate
45	0.00	N/A	0.00
46	0.00	N/A	0.00
47	0.00	N/A	0.00
48	0.00	N/A	0.00
49	0.00	N/A	0.00
50	15.00	0.00	15.00
51	10.50	0.00	10.50
52	12.00	N/A	12.00
53	14.00	N/A	14.00
54	15.50	N/A	15.50
55	40.00	N/A	40.00
56	25.00	N/A	25.00
57	25.00	N/A	25.00
58	25.00	N/A	25.00
59	25.00	0.00	25.00
60	45.00	0.00	45.00
61	55.00	0.00	55.00
62	70.00	0.00	70.00
63	70.00	0.00	70.00
64	70.00	100.00	70.00
65	100.00	N/A	100.00
66	100.00	N/A	100.00
67	100.00	N/A	100.00
68	100.00	N/A	100.00
69	100.00	N/A	100.00
70	100.00	N/A	100.00

As shown above, we are recommending maintaining the current retirement rates for Safety Tier 4 members.

For Safety Tier 4, we do not have credible experience from the past three years to propose new retirement rates based only on age or age and service. As a result, we have not changed the current age-based assumption structure for these members. Furthermore, we are not recommending a change in the retirement rates for Safety Tier 4 members.

[30] An Actual Rate of N/A indicates that there were no members eligible to retire at a given age.

Chart 3 compares actual experience with the current and proposed rates of retirement for Miscellaneous Tier 1 members.

Charts 4 and 5 have the same data for Miscellaneous Tier 2 and 3 members with less than 30 years of service and 30 or more years of service, respectively.

Charts 6 and 7 have the same data for Safety Tier 1 and 2 members with less than 25 years of service and 25 or more years of service, respectively.

Deferred Vested Members

In prior valuations, deferred vested Miscellaneous and Safety members were assumed to retire at ages 59 and 53, respectively. The average age at retirement over the prior three years was 59.8 for Miscellaneous and 51.7 for Safety.

We recommend maintaining the Miscellaneous deferred vested retirement assumption at age 59, and decreasing the Safety deferred vested retirement assumption from age 53 to age 52.

Reciprocity

Under the current assumptions, it was assumed that 35% of Miscellaneous and 45% of Safety future deferred vested members would be covered under a reciprocal retirement system and receive salary increases of 4.50% and 5.25% from termination until retirement for Miscellaneous and Safety, respectively.

The actual experience over the prior three years was that 29.7% of Miscellaneous and 38.5% of Safety deferred vested members went on to be covered by a reciprocal retirement system.

We recommend decreasing the Miscellaneous reciprocal assumption from 35% to 30%, and decreasing the Safety reciprocal assumption from 45% to 40%. In addition, we recommend 4.25% and 5.50% annual salary increase assumptions for Miscellaneous and Safety members, respectively, be utilized to anticipate salary increases from the date of termination from SCERS to the expected date of retirement for deferred vested members covered by a reciprocal employer. These assumptions are based on the ultimate 1.25% and 2.50% merit and promotion salary increase assumptions for Miscellaneous and Safety members, respectively, together with the 2.75% inflation and 0.25% real "across the board" salary increase assumptions that are recommended earlier in Section III of this report.

Survivor Continuance under 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 around 83% 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 80% of all active and inactive male members and 55% of all active and inactive female members would be married or have an eligible domestic partner entitled to the automatic continuance benefit when they select the unmodified option upon retirement. According to the experience of members who retired during the last three years, 79% of male

and 55% of female members who selected the unmodified option were married or had an eligible domestic partner at the time of retirement.

We recommend maintaining the percent married assumption at 80%for male members and 55% for female members.

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

1. Since almost all of the spouses are actually the opposite sex 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 the current assumptions for the age of the survivor for all active and inactive members be maintained, as shown below.** These assumptions will continue to be monitored in future experience studies.

	Spouse's Age as Compared to Member's Age	
	Male	**Female**
Current Assumption	3 years older	2 years younger
Actual SCERS Experience	2.7 years older	2.0 years younger
Proposed Assumption	3 years older	2 years younger

Chart 3: Retirement Rates
Miscellaneous Tier 1

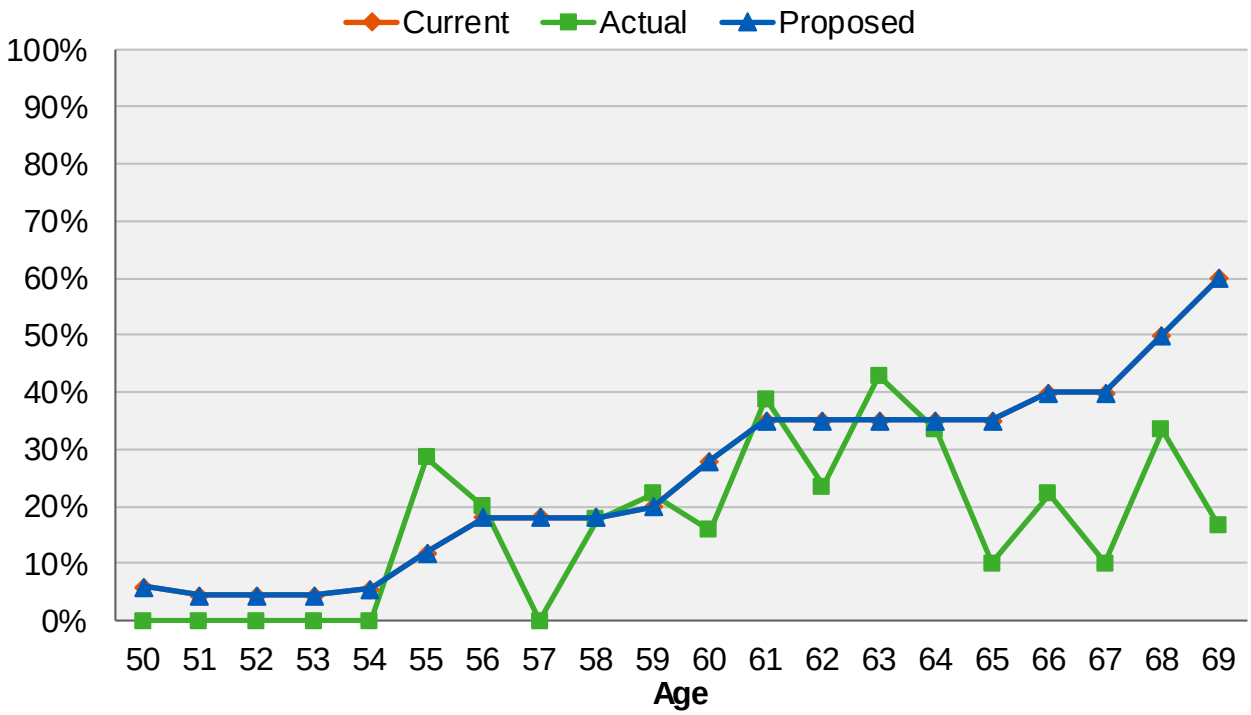


Chart 4: Retirement Rates
Miscellaneous Tiers 2 and 3 – Less Than 30 Years of Service

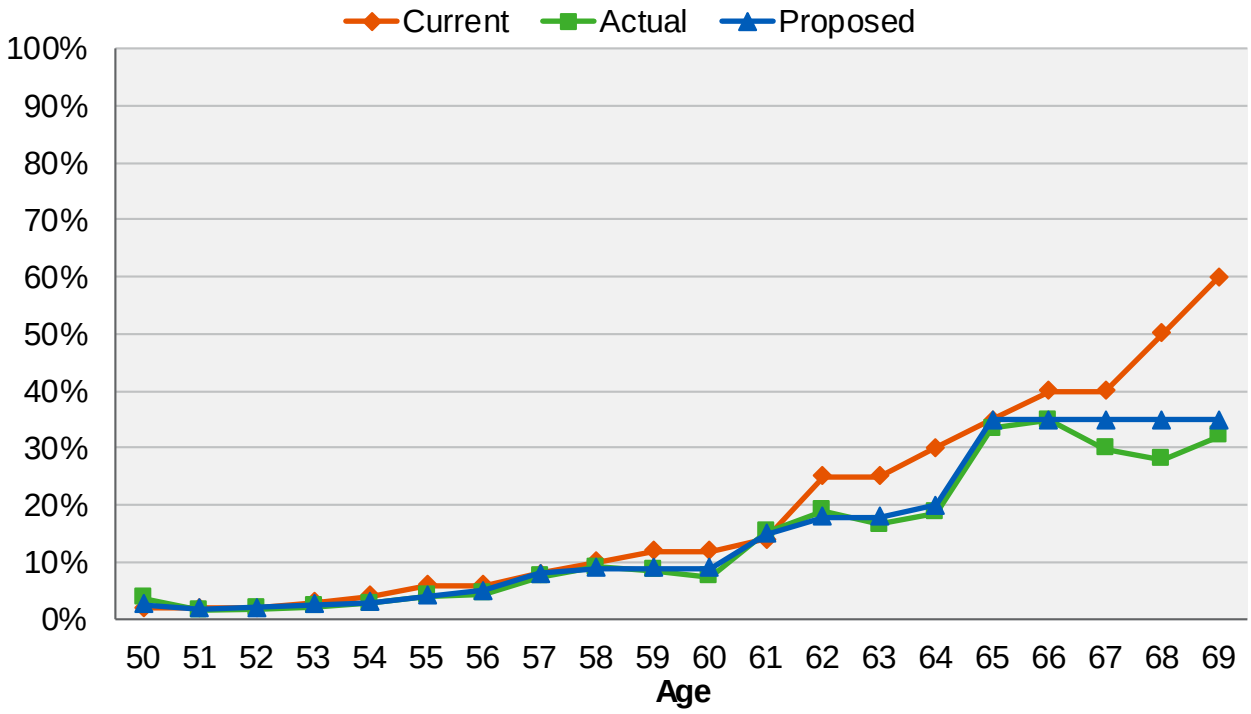


Chart 5: Retirement Rates
Miscellaneous Tiers 2 and 3 – 30 or More Years of Service

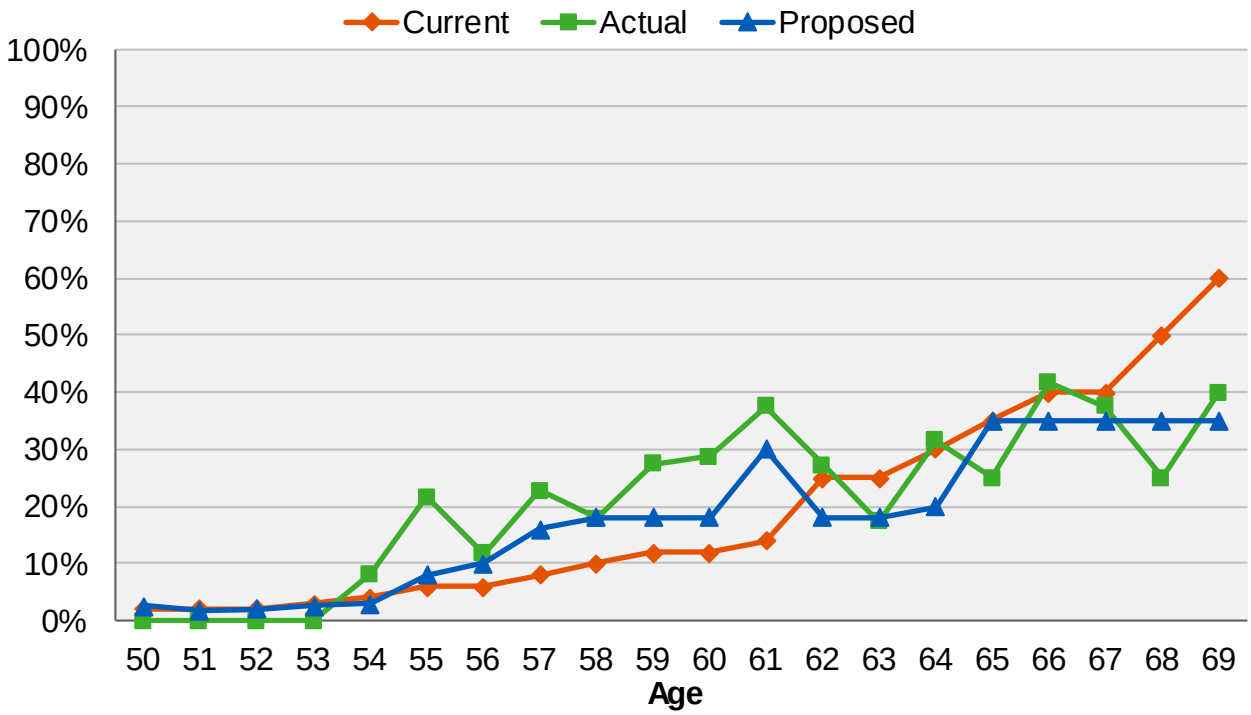


Chart 6: Retirement Rates
Safety Tiers 1 and 2 – Less Than 25 Years of Service

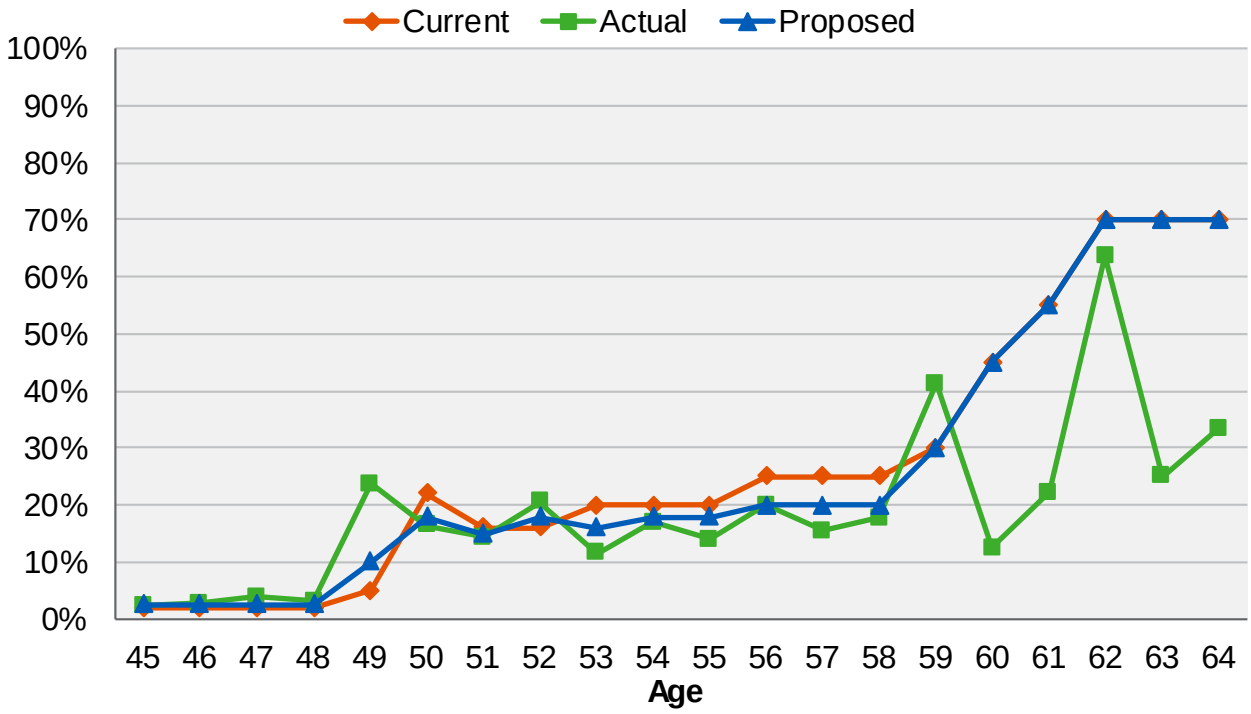
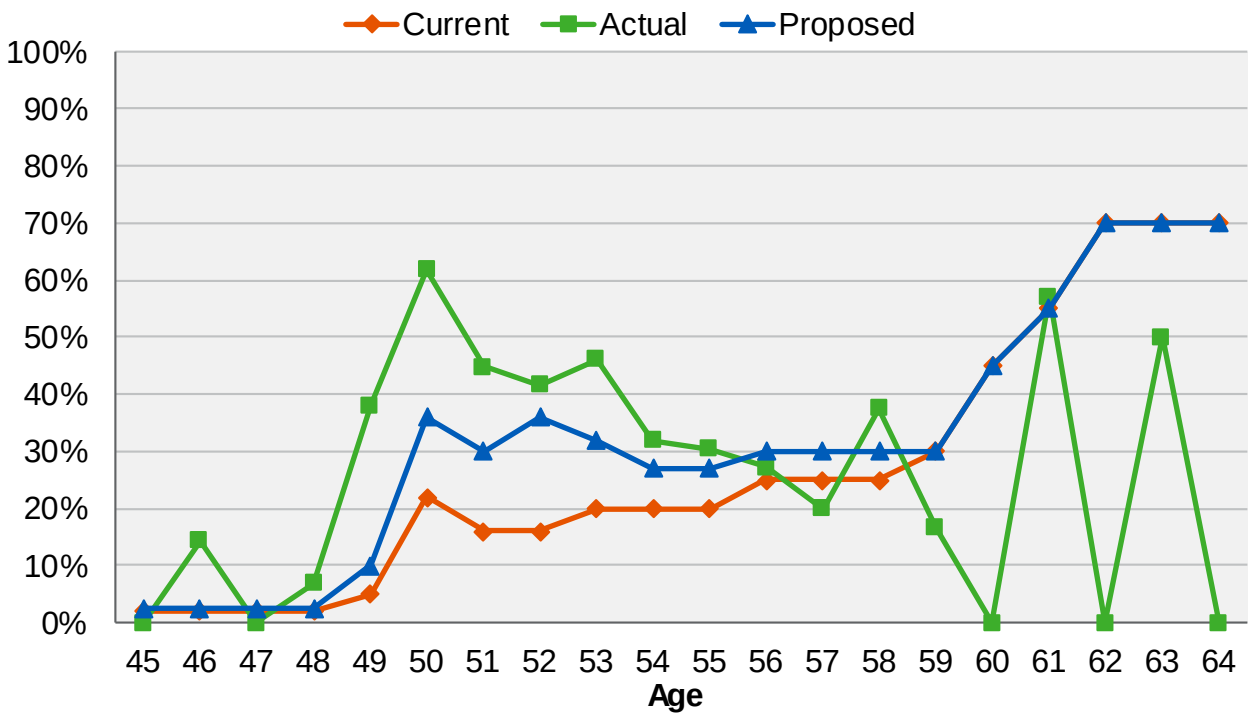


Chart 7: Retirement Rates
Safety Tiers 1 and 2 – 25 or More Years of Service



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 Miscellaneous members, the table currently being used for post-service retirement mortality rates is the Headcount-Weighted RP-2014 Healthy Annuitant Table (separate tables for males and females) projected generationally with the two-dimensional mortality improvement scale MP-2016, set forward one year for males. For Safety members, the table currently being used for post-service retirement mortality rates is the Headcount-Weighted RP-2014 Healthy Annuitant Table (separate tables for males and females) projected generationally with the two-dimensional mortality improvement scale MP-2016, set back four years for males and females. Beneficiaries are assumed to have the same mortality as a Miscellaneous 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 switch from a Headcount-Weighted to a Benefit-Weighted table once the Society of Actuaries (SOA) provided 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 recently published the Pub-2010 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 amounts for healthy retirees and salary for employees are the most significant predictors of mortality differences within the job categories. Therefore, Pub-2010 includes mortality rates developed for annuitants on a "benefit" weighted basis, with higher credibility assigned to experience from annuitants receiving larger benefits.

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

	Median Amounts ($) by Gender, Job Category, and Status			
	Males		Females	
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 2019 for a total increase of around 30%, the benefit amounts (or salaries) paid to

SCERS' 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-2019 is the latest improvement scale available. We recommend that the Board adopt the Benefit-Weighted Above-Median Pub-2010 mortality table (adjusted for SCERS experience), and project the mortality improvement generationally using the MP-2019 mortality improvement scale.

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

In order to use more SCERS experience in our analysis, we have used experience for a nine-year period by using data from the current (from July 1, 2016 through June 30, 2019) and the last two (from July 1, 2013 to June 30, 2016 and from July 1, 2010 to June 30, 2013) experience study periods in order to analyze this assumption.

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

Pre-Retirement Mortality

For Miscellaneous 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) multiplied by 50%, projected generationally with the two-dimensional mortality improvement scale MP-2016.

For Miscellaneous 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-2019.

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-2019.

Currently, our assumption is that 100% of Miscellaneous member pre-retirement deaths are non-duty. For Safety members, 50% are assumed to be non-duty and 50% are assumed to be duty.

We recommend maintaining the current assumption that 100%of Miscellaneous member pre-retirement deaths are non-duty, and maintaining the current assumption that 50%of Safety member pre-retirement deaths are non-duty and the other 50%are duty.

Post-Retirement Mortality (Service Retirements)

Among all retired members, the actual deaths weighted by benefit amounts under the current assumptions for the last nine 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 an 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 SCERS, the volume of Safety member data is much less than the Miscellaneous member data, which makes the Safety group substantially less credible. The proposed mortality tables (as shown in the table below) after adjustments for partial credibility have actual to expected ratios of 101% and 95% for Miscellaneous and Safety, respectively. In future years the ratio should remain around 101% and 95% for Miscellaneous 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 nine years are as follows:

	Miscellaneous 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	28.65	23.48	23.25	9.84	8.34	8.86
Female	16.47	15.38	15.15	0.93	0.97	0.97
Total	**45.12**	**38.86**	**38.40**	**10.77**	**9.31**	**9.83**
Actual / Expected	86%		101%	86%		95%

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.

For Miscellaneous 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 10%, projected generationally with the two-dimensional mortality improvement scale MP-2019. The recommended mortality tables will have an actual to expected ratio of 101%.[31]

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) with rates decreased by 5% for males, projected generationally with the two-dimensional mortality improvement scale MP-2019. The recommended mortality tables will have an actual to expected ratio of 95%.[32]

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.

	Miscellaneous Members – Healthy			Safety Members – Healthy		
Gender	Current Expected Deaths	Actual Deaths	Proposed Expected Deaths	Current Expected Deaths	Actual Deaths	Proposed Expected Deaths
Male	814	714	670	143	140	134
Female	740	745	705	15	21	17
Total	**1,554**	**1,459**	**1,375**	**158**	**161**	**151**
Actual / Expected	94%		106%	102%		107%

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.

[31] If we use the baseline Pub-2010 General table without any adjustment, the proposed actual to expected ratio would be 111%.
[32] If we use the baseline Pub-2010 Safety table without any adjustment, the proposed actual to expected ratio would be 90%.

Chart 8 that follows later in this section compares actual to expected deaths on a benefit-weighted basis for Miscellaneous members under the current and proposed assumptions over the past nine years.

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

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

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

Chart 12 shows the life expectancies (i.e., expected future lifetime) under the current and the proposed tables for Miscellaneous members on a benefit-weighted basis. Life expectancies under the current and 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 13 shows the life expectancies (i.e., expected future lifetime) under the current and the proposed tables for Safety members on a benefit-weighted basis.

Beneficiaries Mortality

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

The Pub-2010 Contingent Survivors Table is developed only based on contingent survivor data after the death of the retirees. This is consistent with the mortality experience that we have available for beneficiaries. The Pub-2010 contingent survivor mortality rates are comparable to SCERS' actual mortality experience for beneficiaries.

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), projected generationally with the two-dimensional mortality improvement scale MP-2019.

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

There are administrative reasons why a generational mortality table is more difficult to implement for determining member contributions for legacy tiers (i.e., Miscellaneous Tiers 1, 2, 3 and 4 and Safety Tiers 1, 2 and 3), 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 Miscellaneous members, we recommend that the mortality table used for determining contributions 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 10%, projected 30 years (from 2010) with the two-dimensional mortality improvement scale MP-2019, weighted 40% male and 60% female. This is based on the proposed valuation mortality table for Miscellaneous members and the actual gender distribution of Miscellaneous members.

For Safety members, we recommend that the mortality table used for determining contributions 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) with rates decreased by 5% for males, projected 30 years (from 2010) with the two-dimensional mortality improvement scale MP-2019, weighted 75% male and 25% female. This is based on the proposed valuation mortality table for Safety members and the actual gender distribution of Safety members.

For optional forms of payment and reserves, we would apply a similar methodology. However, the projection of the mortality improvement would be from the measurement year over a period that is close to the duration of the benefit payments for active members retiring in the next three years. The recommended tables along with the mortality rates will be provided in a separate letter at a later date, similar to prior years.

For Miscellaneous and Safety service retirements, we recommend using the corresponding base tables and adjustments described within this section, projected 20 years with the two-dimensional mortality improvement scale MP-2019 along with weighting based on actual gender distributions for each group.

For all beneficiaries, we recommend using the corresponding base tables and adjustments described within this section, projected 20 years with the two-dimensional mortality improvement scale MP 2019 along with weighting based on the inverse of the actual gender distributions for each group.

For Miscellaneous and Safety disability retirements, we recommend using the corresponding base tables and adjustments described within the following section, projected 20 years with the two-dimensional mortality improvement scale MP-2019 along with weighting based on actual gender distributions for each group.

Chart 8: Post-Retirement Benefit-Weighted Deaths (In Millions)
Non-Disabled Miscellaneous Members (July 1, 2010 through June 30, 2019)

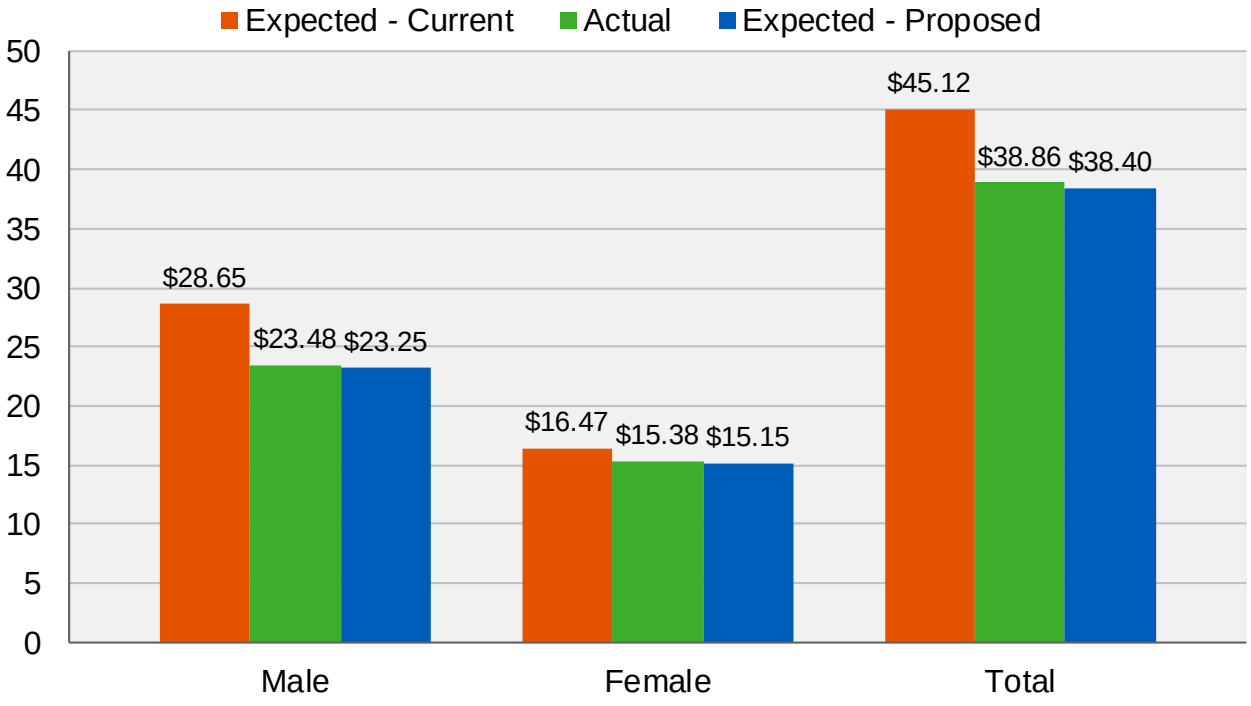


Chart 9: Post-Retirement Benefit-Weighted Deaths (In Millions)
Non-Disabled Safety Members (July 1, 2010 through June 30, 2019)

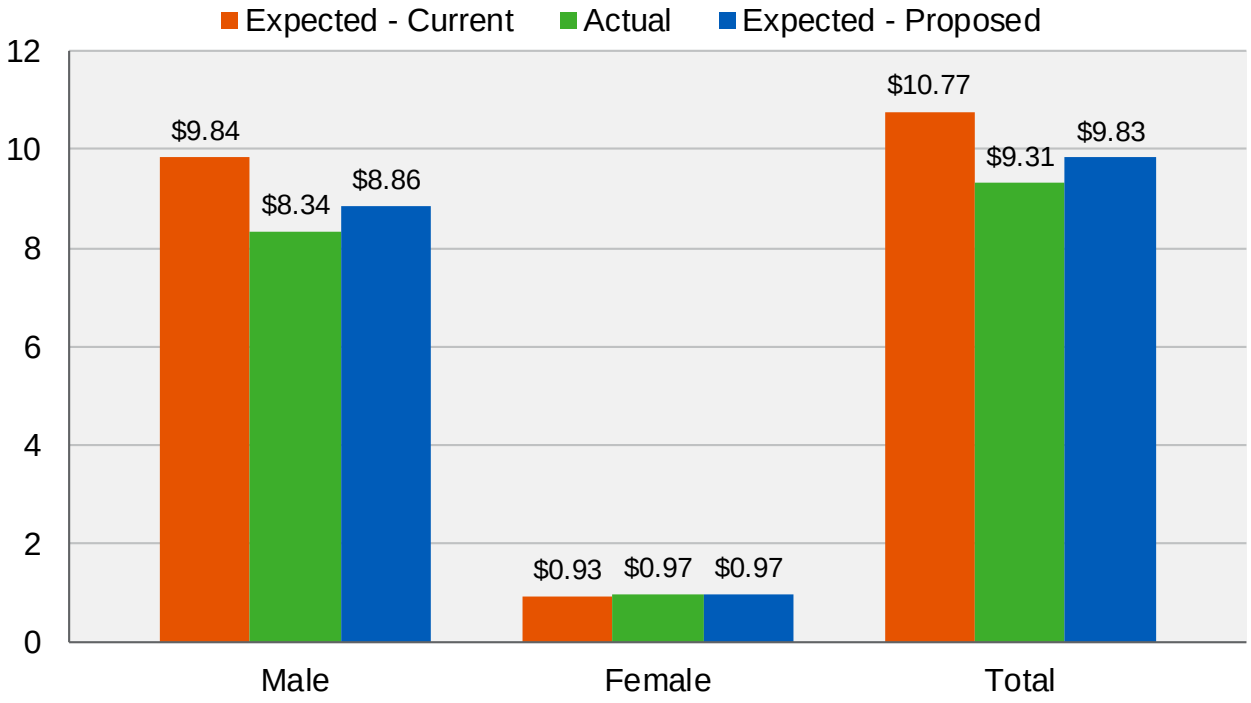


Chart 10: Post-Retirement Headcount-Weighted Deaths
Non-Disabled Miscellaneous Members (July 1, 2010 through June 30, 2019)
Provided for Informational Purposes Only

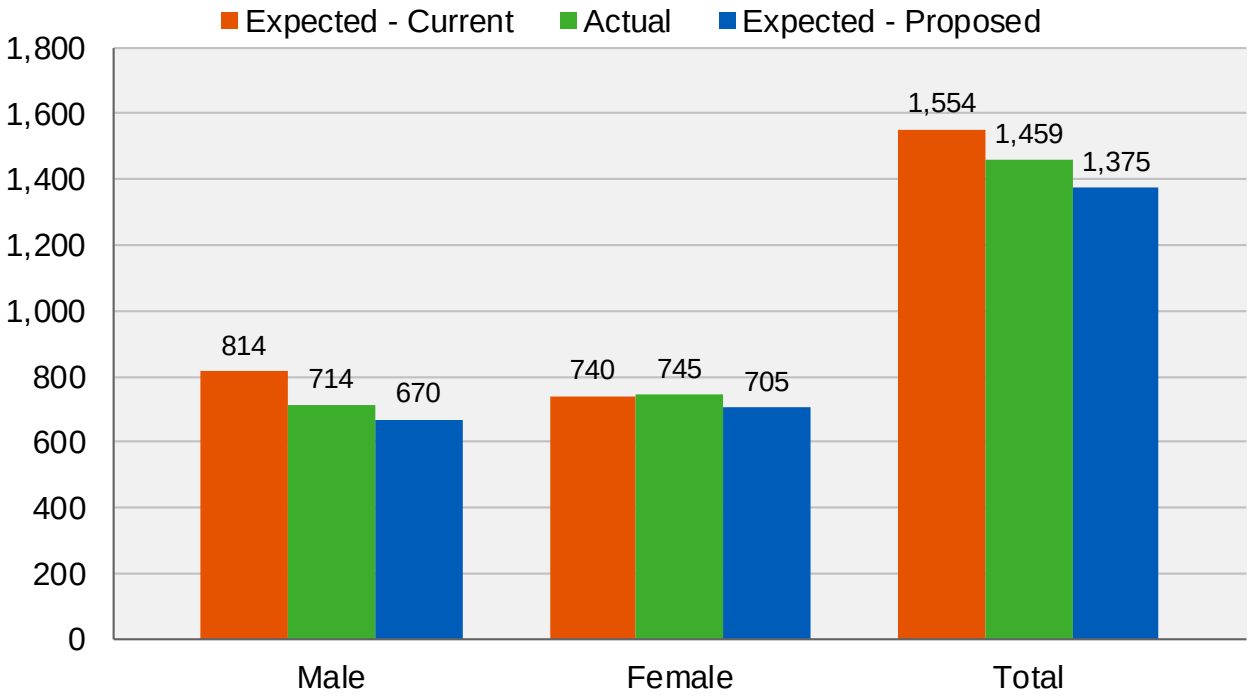


Chart 11: Post-Retirement Headcount-Weighted Deaths
Non-Disabled Safety Members (July 1, 2010 through June 30, 2019)
Provided for Informational Purposes Only

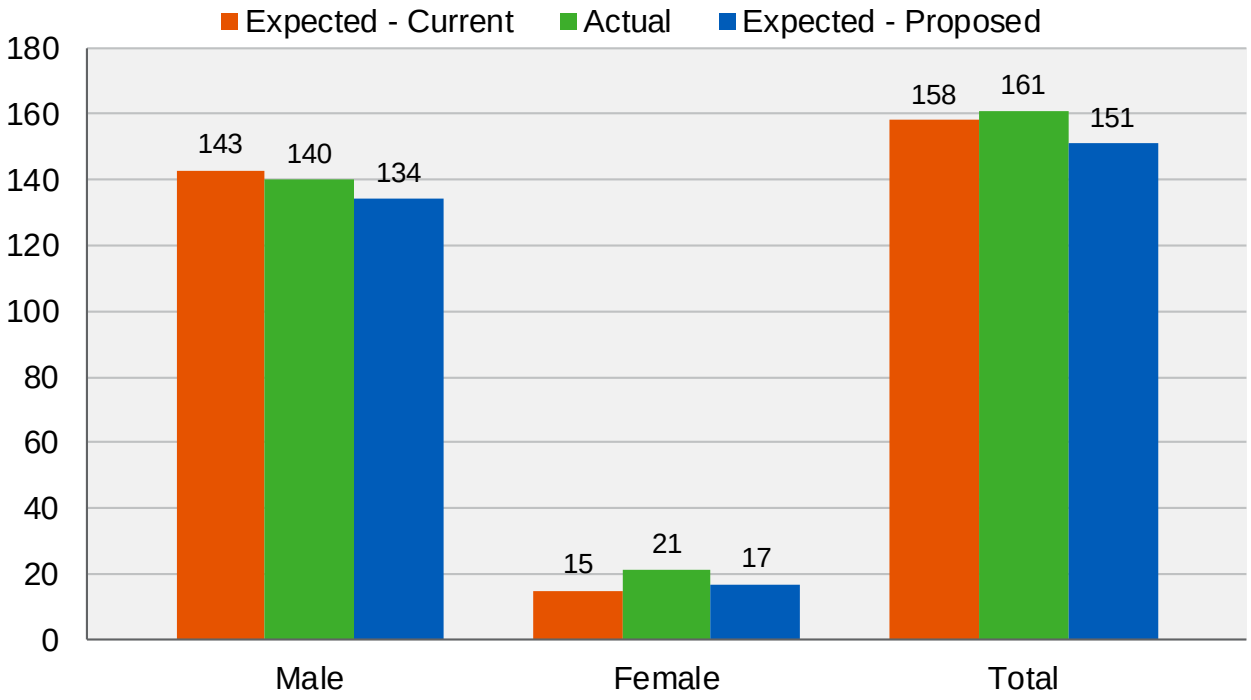


Chart 12: Benefit-Weighted Life Expectancies
Non-Disabled Miscellaneous Members

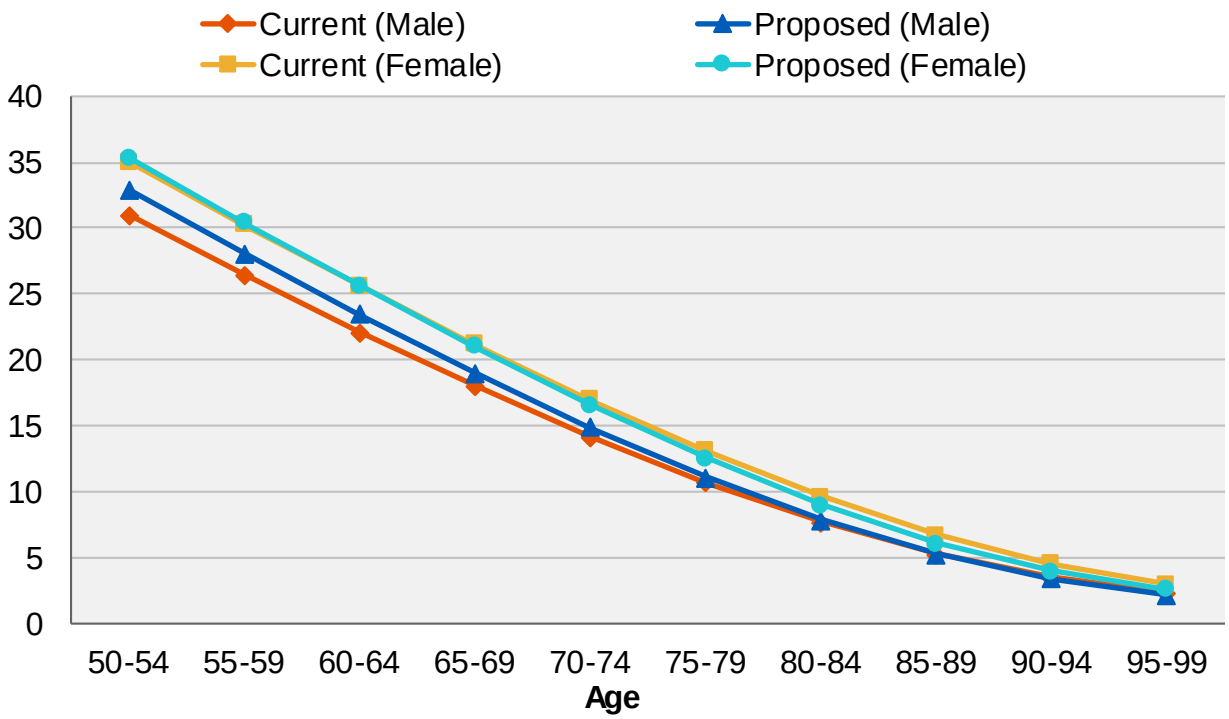
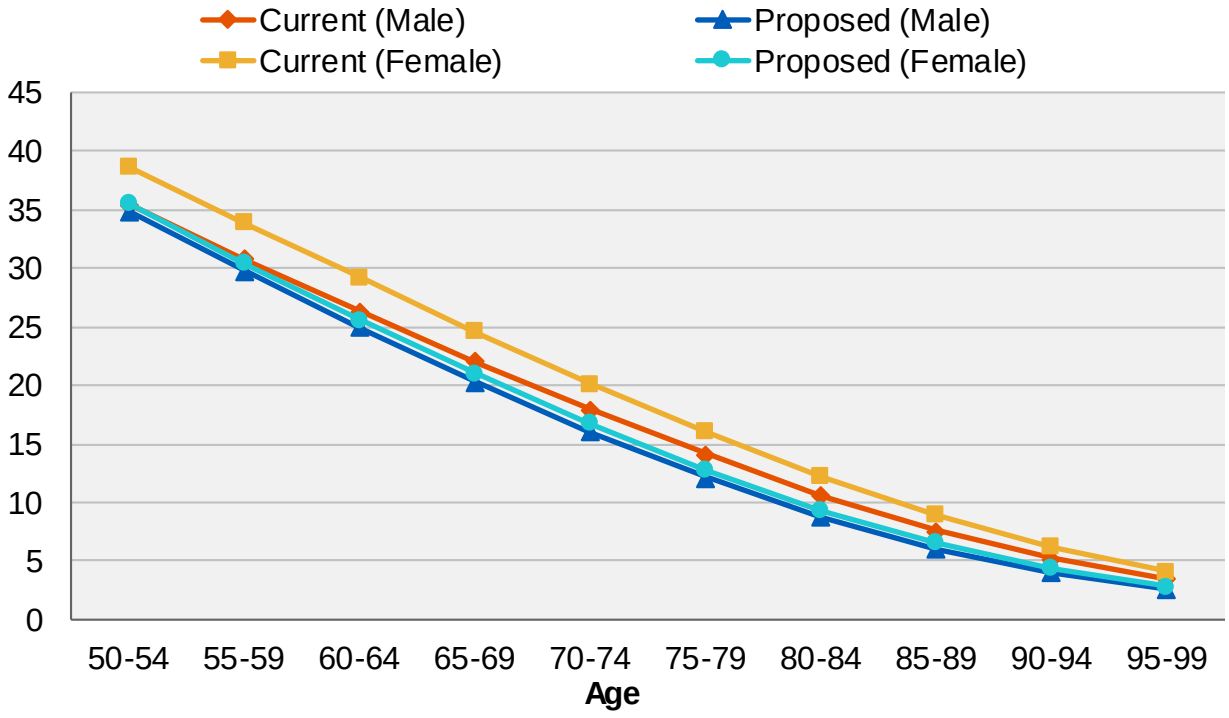


Chart 13: Benefit-Weighted Life Expectancies
Non-Disabled Safety Members



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 Miscellaneous members, the table currently being used is the Headcount-Weighted RP-2014 Healthy Annuitant Table (separate tables for males and females) projected generationally with the two-dimensional mortality improvement scale MP-2016, set forward seven years for males and set forward eight years for females. For Safety members, the table currently being used is the Headcount-Weighted RP-2014 Healthy Annuitant Table (separate tables for males and females) projected generationally with the two-dimensional mortality improvement scale MP-2016, set forward four years for males and females.

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 SCERS, there is far less data for disabled retirees, so it is substantially less credible. The proposed mortality tables (as shown in the table below) after adjustments for partial credibility have actual to expected ratios of 106% and 127% for Miscellaneous and Safety, respectively. In future years the ratio should remain around 106% and 127% for Miscellaneous 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 nine years are as follows:

	Miscellaneous 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	2.37	1.95	1.98	2.35	2.06	1.62
Female	2.09	1.95	1.71	0.23	0.22	0.18
Total	**4.46**	**3.90**	**3.69**	**2.58**	**2.28**	**1.80**
Actual / Expected	87%		106%	88%		127%

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.

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

For Miscellaneous 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-2019. The recommended mortality tables will have an actual to expected ratio of 106%

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-2019. The recommended mortality tables will have an actual to expected ratio of 127%.

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.

	Miscellaneous Members – Disabled			Safety Members – Disabled		
Gender	**Current Expected Deaths**	**Actual Deaths**	**Proposed Expected Deaths**	**Current Expected Deaths**	**Actual Deaths**	**Proposed Expected Deaths**
Male	94	89	80	45	44	32
Female	99	107	83	6	4	4
Total	**193**	**196**	**163**	**51**	**48**	**36**
Actual / Expected	102%		120%	94%		135%

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.

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

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

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

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

Chart 18 shows the life expectancies (i.e., expected future lifetime) under the current and the proposed tables for disabled Miscellaneous members on a benefit-weighted basis. Life expectancies under the current and proposed generational mortality rates are based on age as of 2020. In practice, life expectancies will be assumed to increase based on applying the mortality improvement scale.

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

Chart 14: Post-Retirement Benefit-Weighted Deaths (In Millions)
Disabled Miscellaneous Members (July 1, 2010 through June 30, 2019)

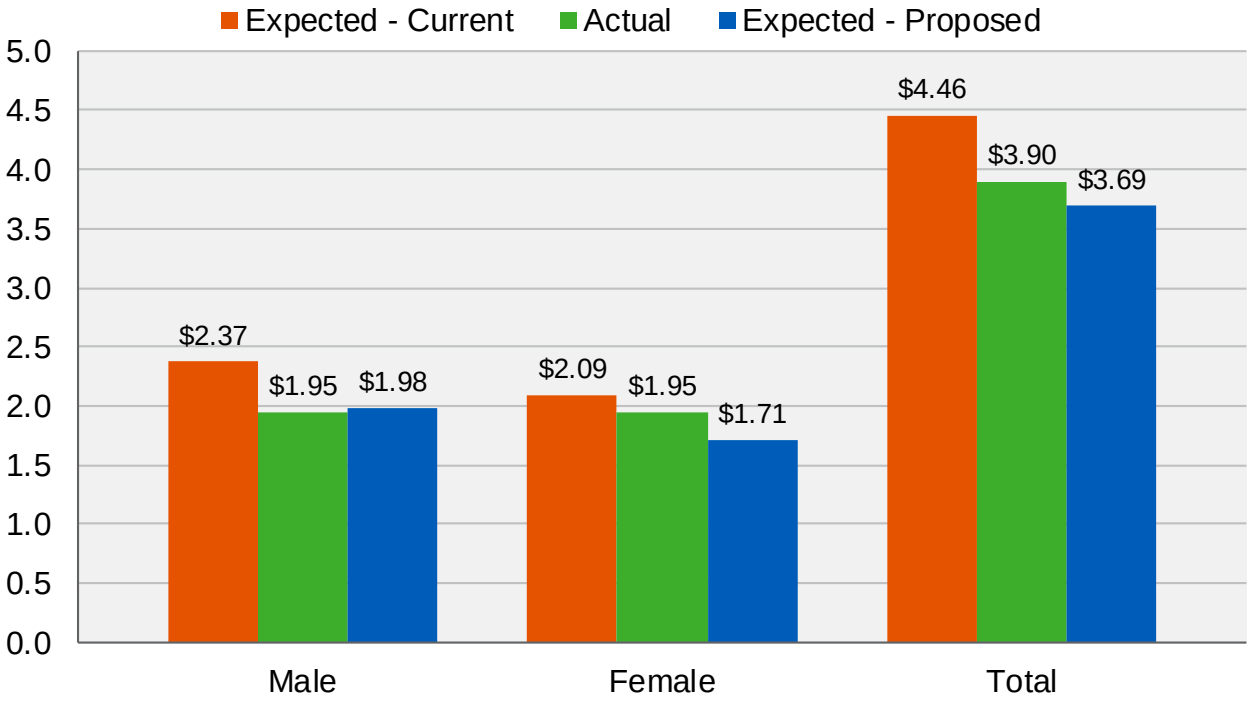


Chart 15: Post-Retirement Benefit-Weighted Deaths (In Millions)
Disabled Safety Members (July 1, 2010 through June 30, 2019)

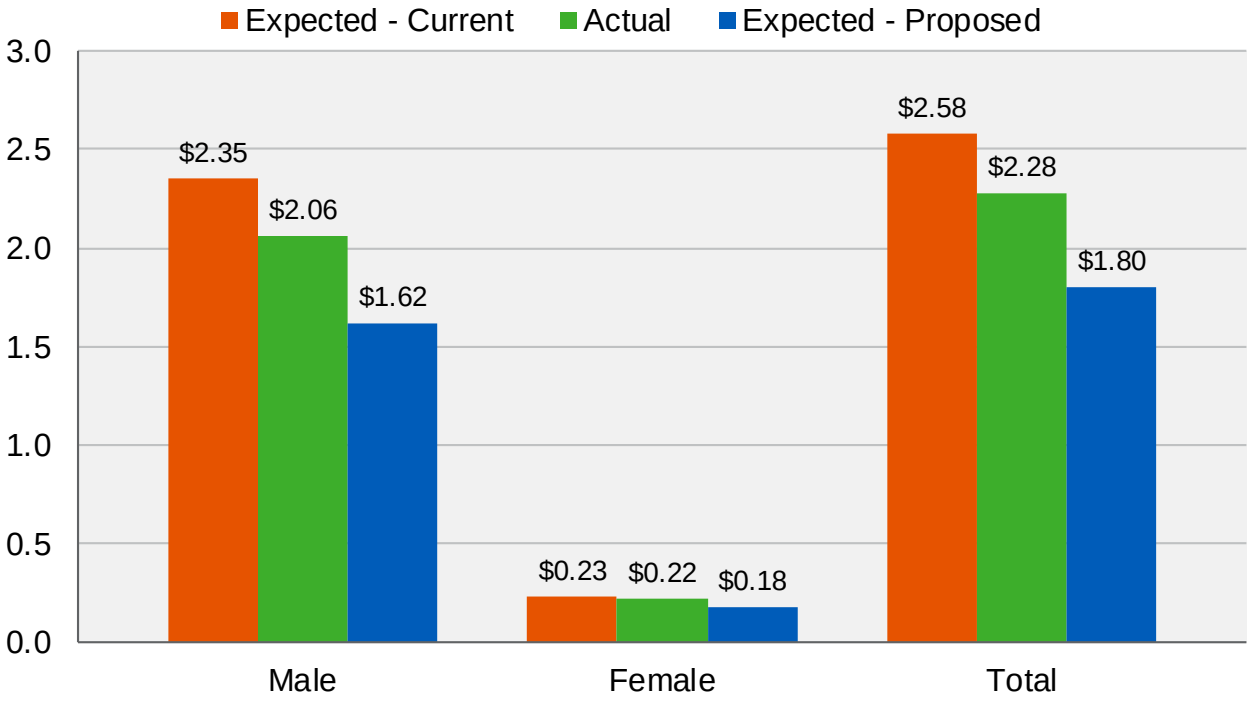


Chart 16: Post-Retirement Headcount-Weighted Deaths
Disabled Miscellaneous Members (July 1, 2010 through June 30, 2019)
Provided for Informational Purposes Only

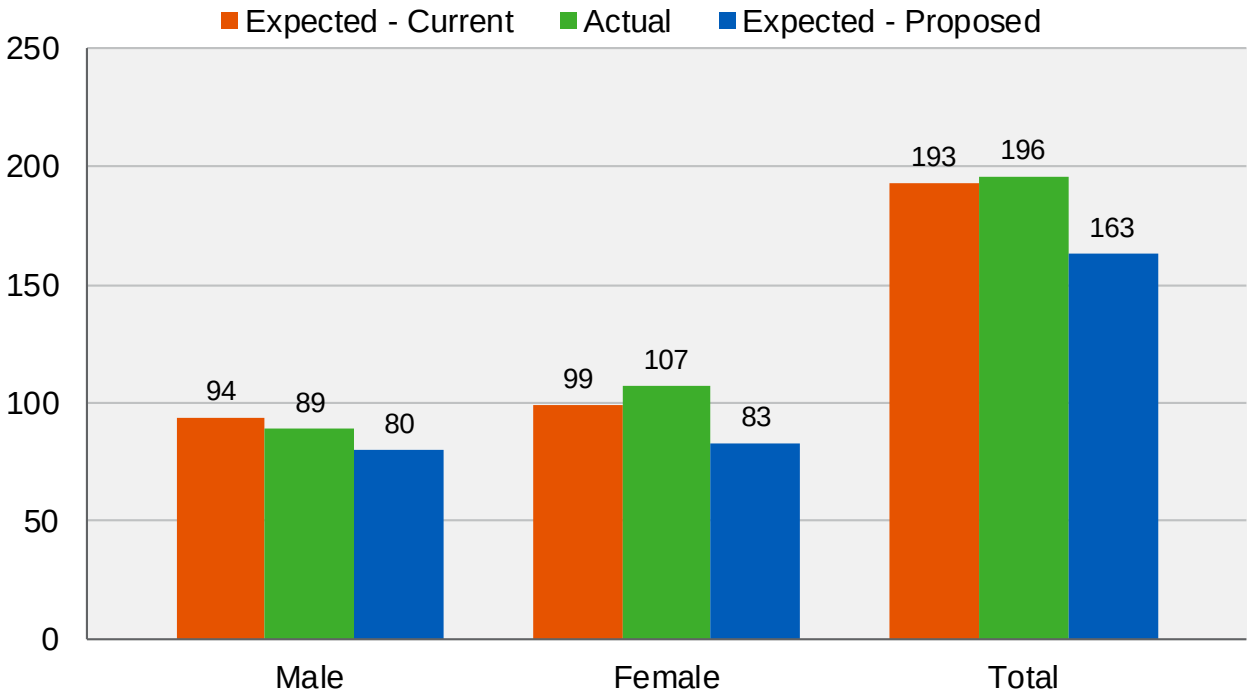


Chart 17: Post-Retirement Headcount-Weighted Deaths
Disabled Safety Members (July 1, 2010 through June 30, 2019)
Provided for Informational Purposes Only

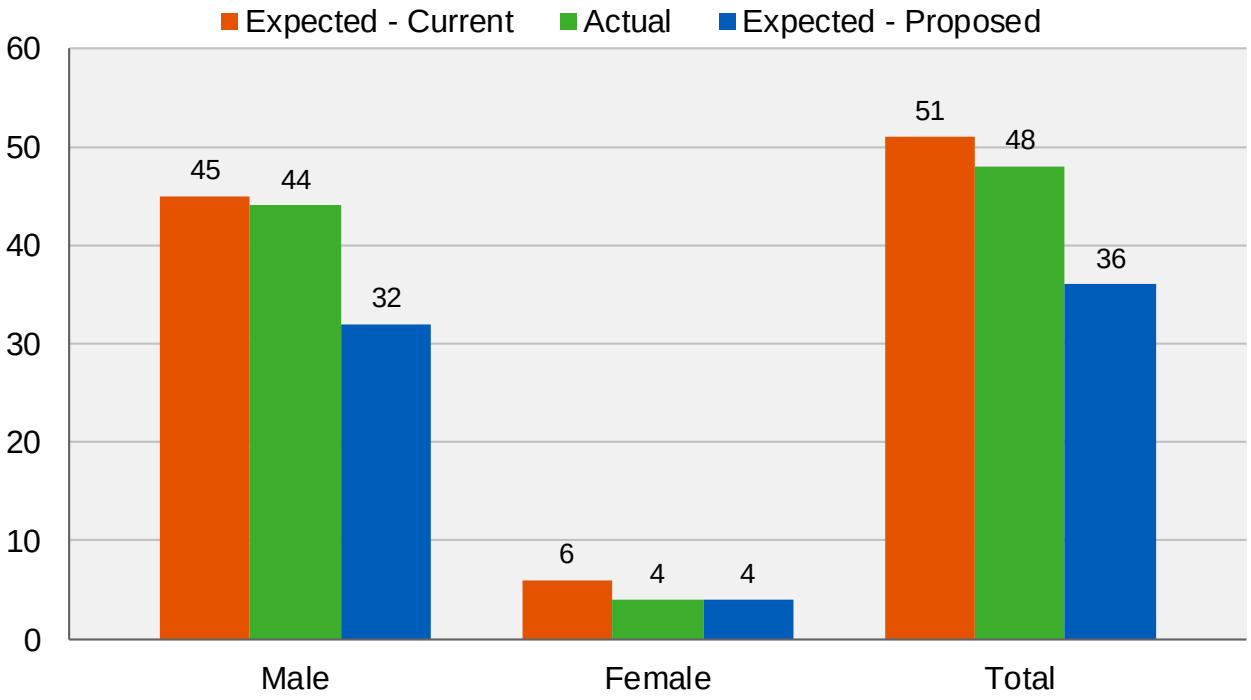


Chart 18: Benefit-Weighted Life Expectancies
Disabled Miscellaneous Members

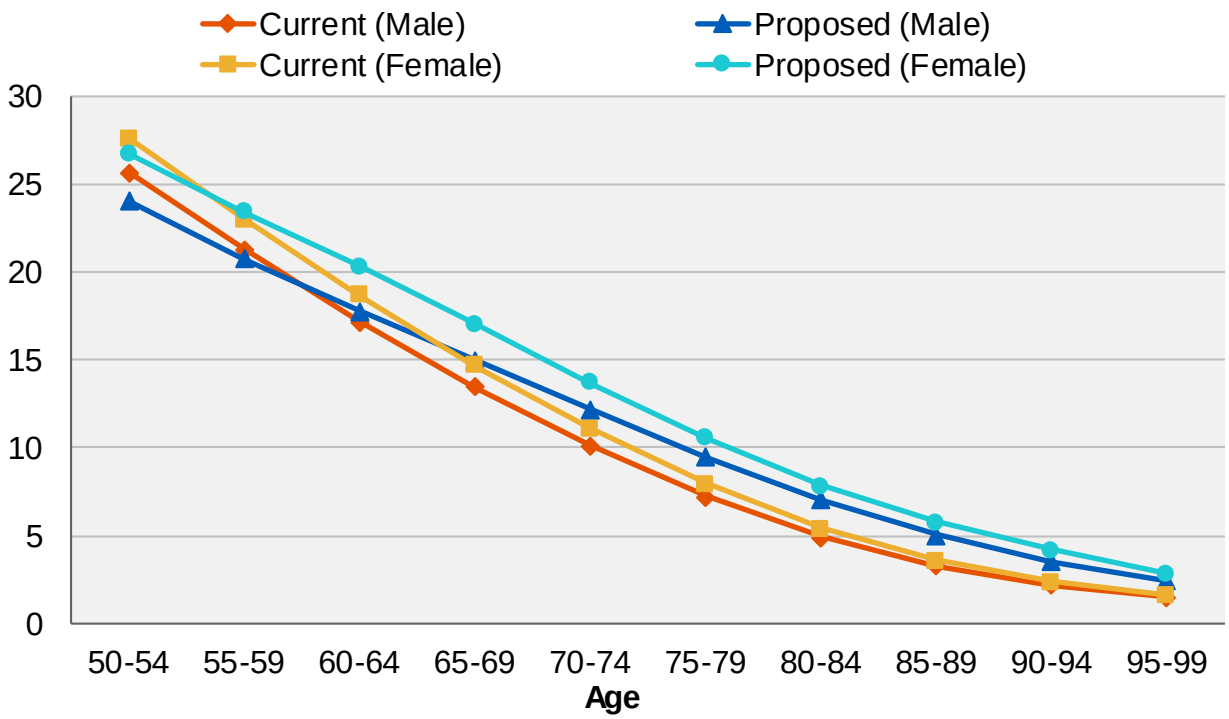
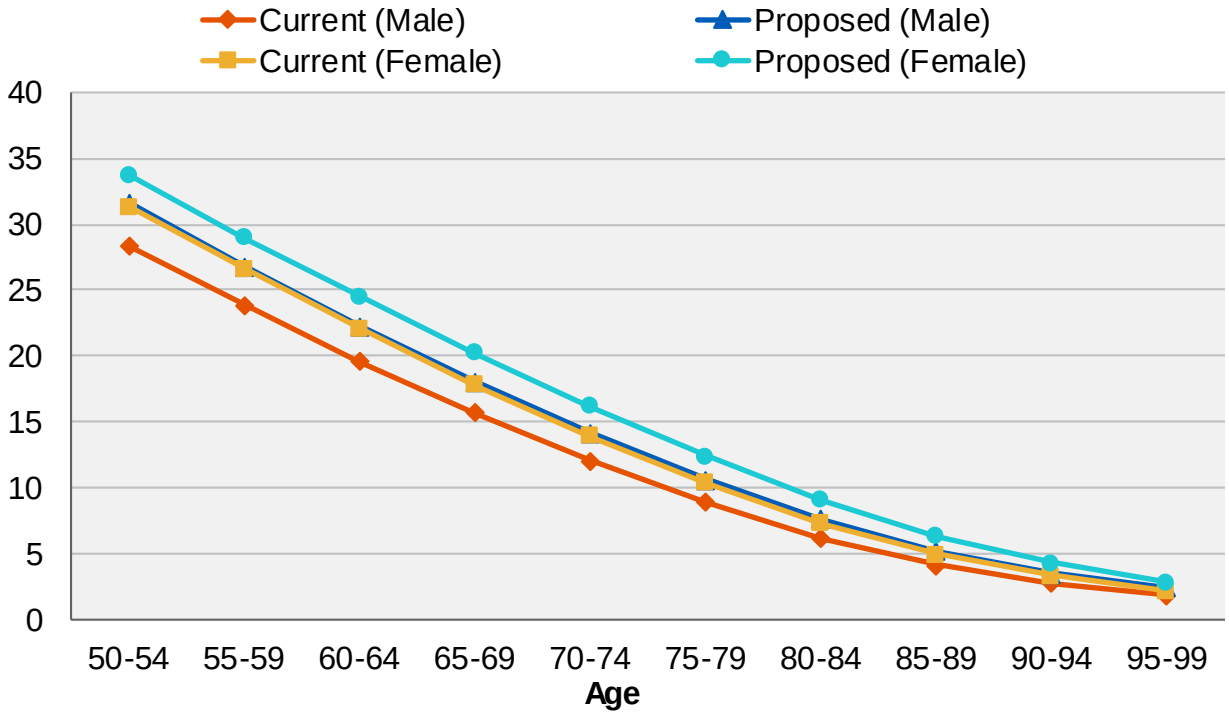


Chart 19: Benefit-Weighted Life Expectancies
Disabled Safety Members



D. Termination Rates

Termination rates include all terminations for reasons other than death, disability, or retirement. Under the current assumptions there is an overall assumed incidence of total termination combined with a separate assumption for the percentage of members who would be expected to elect a refund of contributions versus a deferred retirement benefit. Under the current assumptions, termination rates are service based for the first five years of service and age based after the first five years of service. With this study, we continue to recommend that this same assumption structure be used.

For members who terminate employment with less than five years of service, it is anticipated under the current assumptions that 65% of Miscellaneous members and 50% of Safety members would elect a refund while the remaining 35% and 50% of Miscellaneous and Safety members, respectively, would elect a deferred retirement benefit.

For members with five or more years of service, it is anticipated under the current assumptions that 40% of Miscellaneous members and 15% of Safety members would elect a refund of contributions while the remaining 60% and 85% of Miscellaneous and Safety members, respectively, would elect a deferred retirement benefit.

The termination experience over the last three years for Miscellaneous and Safety members is shown by years of service in the following tables. Please note that we have excluded any members who were eligible for retirement.

Rates of Termination – Less Than Five Years of Service

	Rates of Termination (%)					
	Miscellaneous			Safety		
Years of Service	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
Less than 1	13.00	12.46	13.00	6.00	3.82	5.00
1 – 2	8.00	8.44	8.00	5.00	1.78	4.50
2 – 3	7.00	6.09	6.50	4.00	3.31	4.00
3 – 4	6.00	4.76	5.50	3.00	0.75	2.50
4 – 5	5.50	5.00	5.25	3.00	1.04	2.50

Rates of Termination – Five or More Years of Service

	Rates of Termination (%)					
	Miscellaneous			Safety		
Age	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
20 – 24	5.50	0.00	5.25	2.50	0.00	2.00
25 – 29	5.50	4.92	5.25	2.50	0.00	2.00
30 – 34	5.00	3.72	5.00	2.00	1.73	2.00
35 – 39	4.00	3.89	4.00	1.50	0.97	1.25
40 – 44	3.00	2.71	3.00	1.25	0.68	1.00
45 – 49	2.50	2.69	2.50	1.00	1.66	1.00
50 – 54	2.40	3.92	2.40	1.00	0.00	1.00
55 – 59	2.30	2.51	2.30	1.00	0.00	1.00
60 – 64	2.20	5.68	2.20	1.00	5.00	1.00
65 – 69	1.00	10.17	1.00	0.00	0.00	0.00

Based upon recent experience, we recommend termination rates overall for both Miscellaneous and Safety members be decreased as shown above. We will also continue to assume that termination rates are zero at any age where members are assumed to retire. In other words, at those ages, members will either retire in accordance with the retirement rate assumptions or continue working, rather than terminate and defer their benefit.

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

Chart 21 shows the actual termination rates over the past three years compared to the current and proposed assumptions for Miscellaneous members with less than five years of service.

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

Chart 23 shows the actual termination rates over the past three years compared to the current and proposed assumptions for Miscellaneous members with five or more years of service.

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

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

Because there is often a lag between when a member terminates employment and when that member makes an election to receive either a refund of contributions or a deferred retirement benefit, we tracked the election made by all members who terminated during 2016/2017 from the date of termination through the end of the experience study period (June 30, 2019) to determine the proportion of members that elect to leave their contributions on deposit.

The table below shows the proportion of members assumed to elect a refund of contributions separately for members with less than five years of service and members with five or more years of service as well as Miscellaneous and Safety members.

	Election for Refund of Contributions					
	Less Than Five Years of Service			Five or More Years of Service		
	Current Assumption	Actual Rate	Proposed Assumption	Current Assumption	Actual Rate	Proposed Assumption
Miscellaneous	65%	46%	55%	40%	20%	30%
Safety	50%	44%	50%	15%	14%	15%

For Miscellaneous members, we recommend decreasing the rates of electing a refund of contributions. For Safety members, we recommend maintaining the rates of electing a refund of contributions.

Chart 20: Actual Number of Terminations Compared to Expected

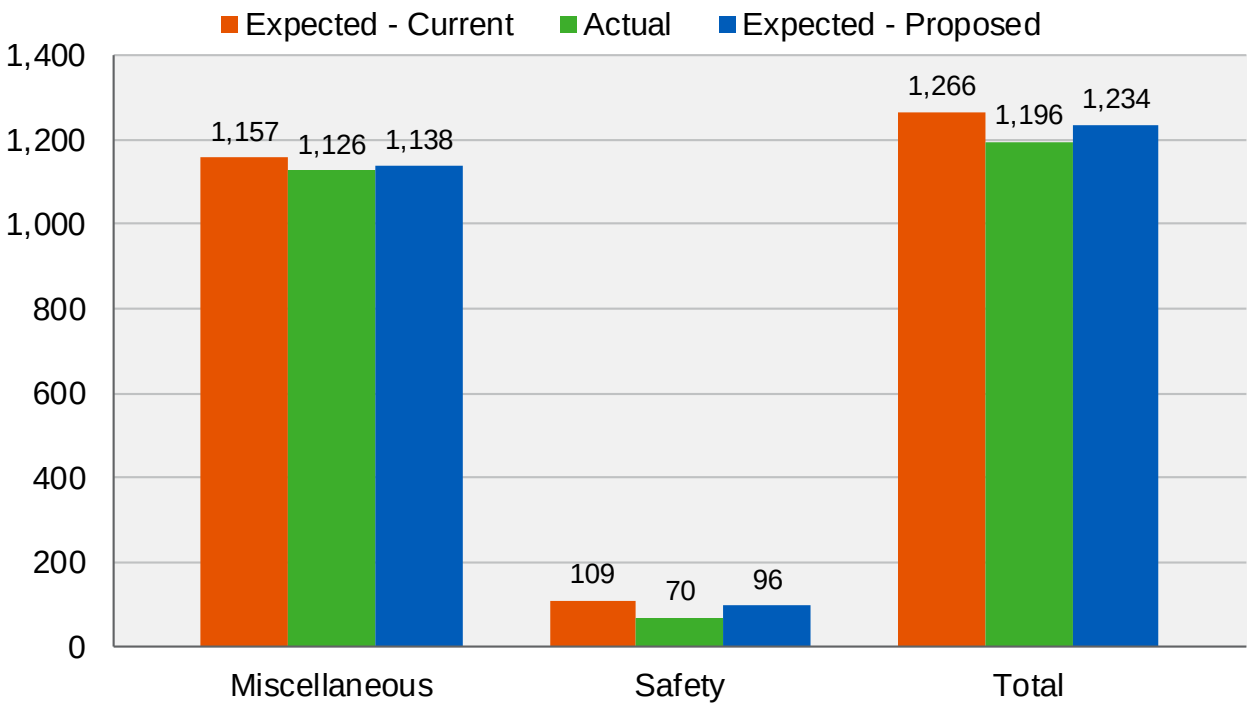


Chart 21: Termination Rates Miscellaneous Members – Less Than Five Years of Service

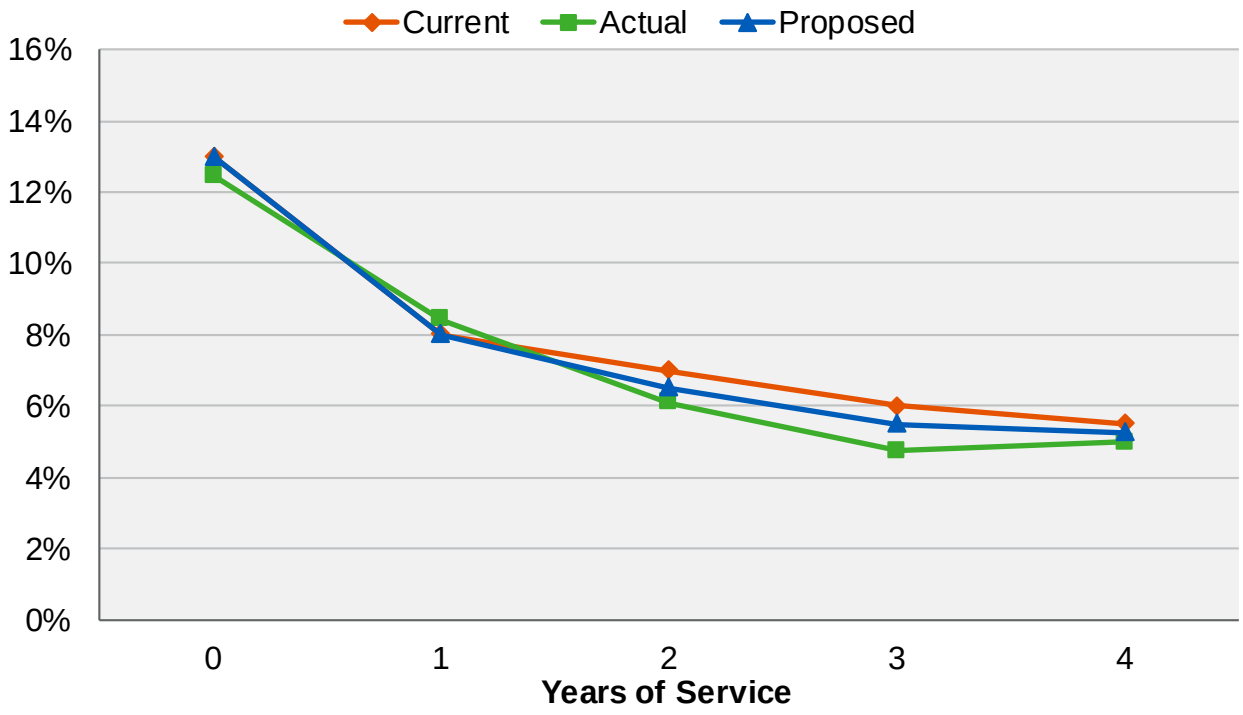


Chart 22: Termination Rates
Safety Members – Less Than Five Years of Service

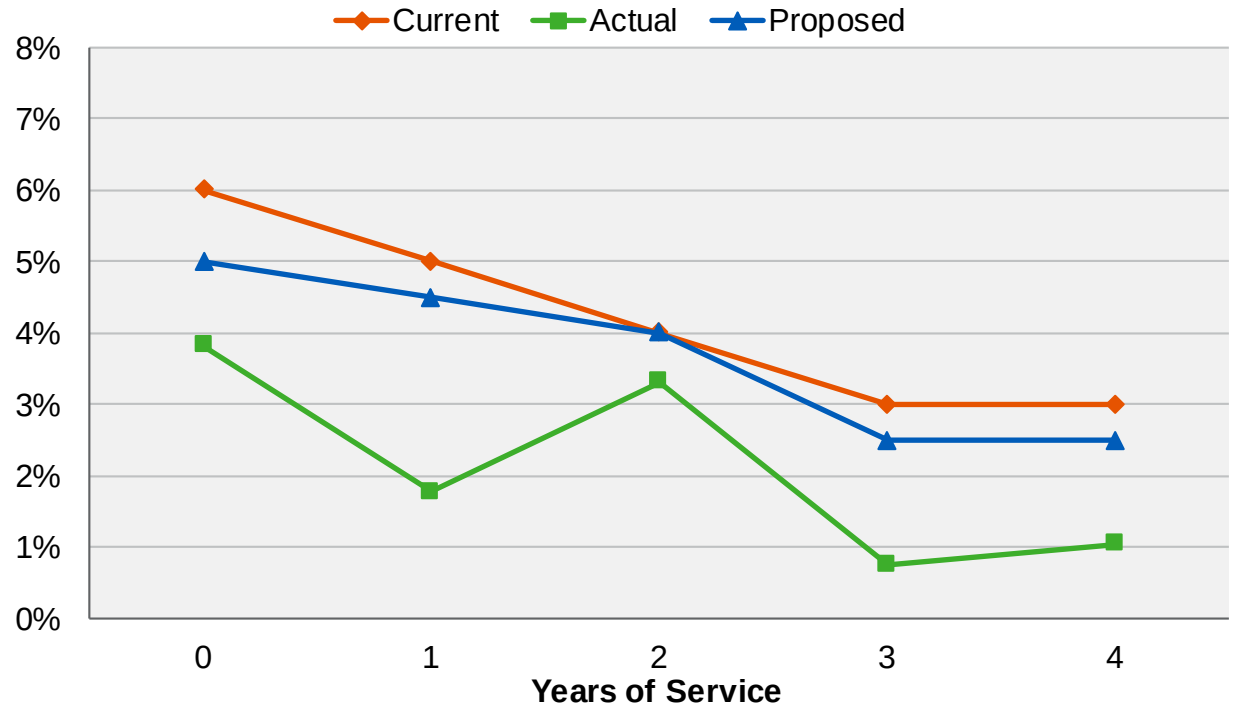


Chart 23: Termination Rates
Miscellaneous Members – Five or More Years of Service

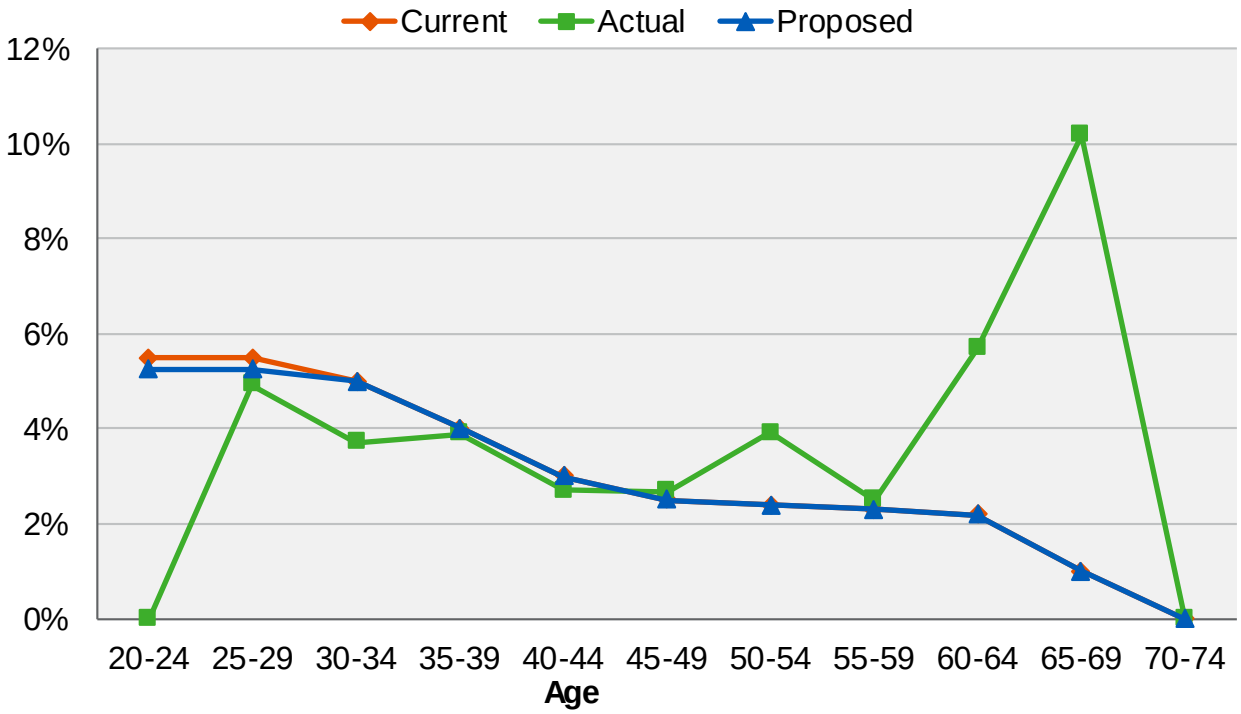
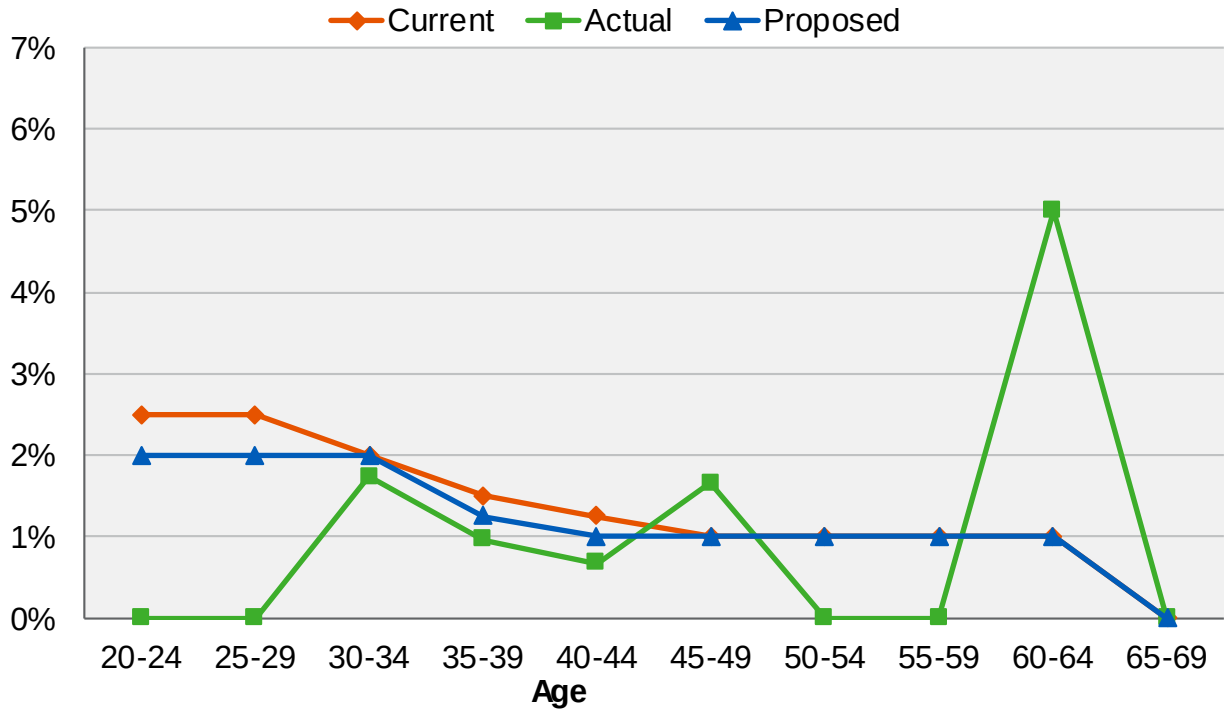


Chart 24: Termination Rates
Safety Members – Five or More Years of Service



E. Disability Incidence Rates

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

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

	Disability Incidence Rate (%)					
	Miscellaneous			Safety		
Age	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
20 – 24	0.01	0.00	0.00	0.10	0.00	0.05
25 – 29	0.02	0.00	0.01	0.10	0.00	0.05
30 – 34	0.04	0.00	0.02	0.20	0.00	0.10
35 – 39	0.06	0.05	0.06	0.40	0.20	0.30
40 – 44	0.10	0.00	0.10	0.45	0.31	0.40
45 – 49	0.15	0.30	0.20	0.55	0.37	0.50
50 – 54	0.25	0.18	0.25	0.90	0.71	0.80
55 – 59	0.40	0.30	0.35	1.00	1.06	1.00
60 – 64	0.50	0.43	0.45	1.50	0.00	1.20
65 – 69	1.00	0.40	0.75	0.00	0.00	0.00

The proposed disability rates were adjusted to reflect the past three years' experience. **We recommend decreases in many of the disability incidence rates for Miscellaneous members and Safety members.**

Currently, the assumption is that 30% of disabled Miscellaneous members would receive a duty disability. Over the past three-year period, 46% of disabled Miscellaneous members received a duty disability. **We recommend increasing the assumption from 30% to 40% to anticipate duty disability retirement. The remaining 60% will be assumed to receive a non-duty disability.**

Currently, the assumption is that 90% of disabled Safety members would receive a duty disability. Over the past three year-period, 84% of disabled Safety members received a duty disability. **We recommend maintaining the current 90% assumption. The remaining 10% will be assumed to receive a non-duty disability.**

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

Chart 26 shows the actual disablement rates over the past three years compared to the current and proposed assumptions for Miscellaneous members.

Chart 27 shows the actual disablement rates over the past three years compared to the current and proposed assumptions for all Safety members.

Chart 25: Actual Number of Disabilities Compared to Expected

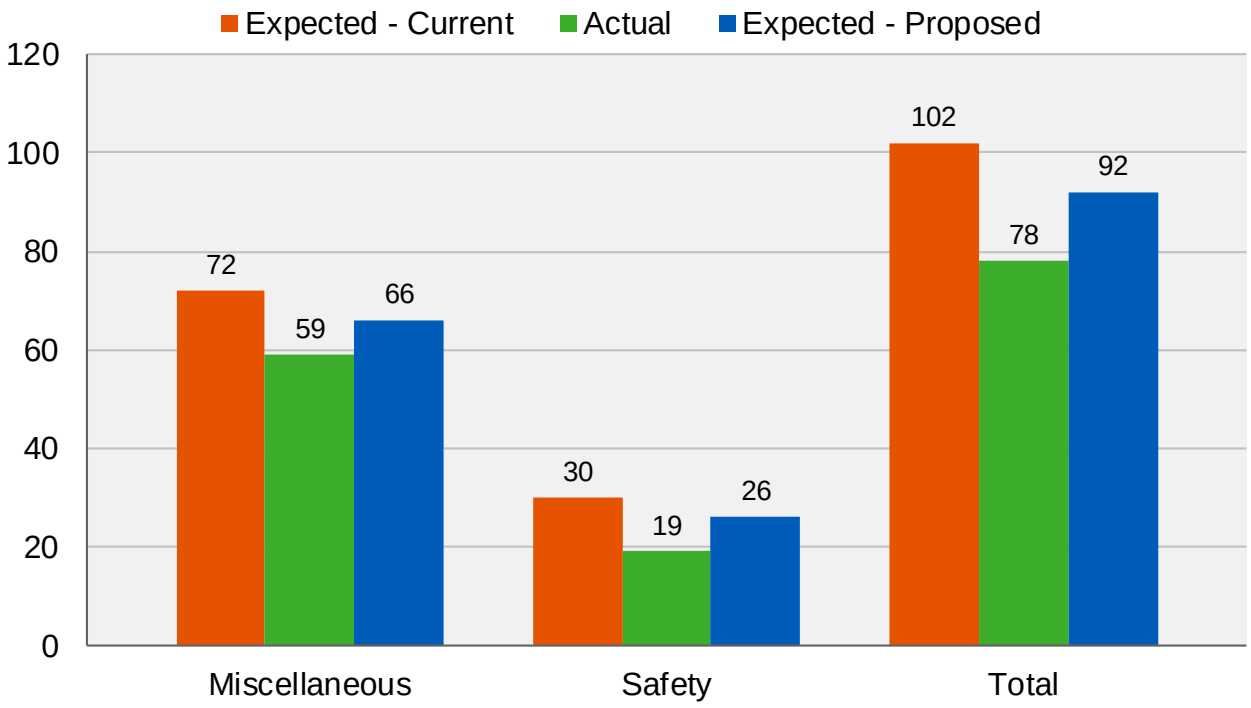


Chart 26: Disability Incidence Rates
Miscellaneous Members

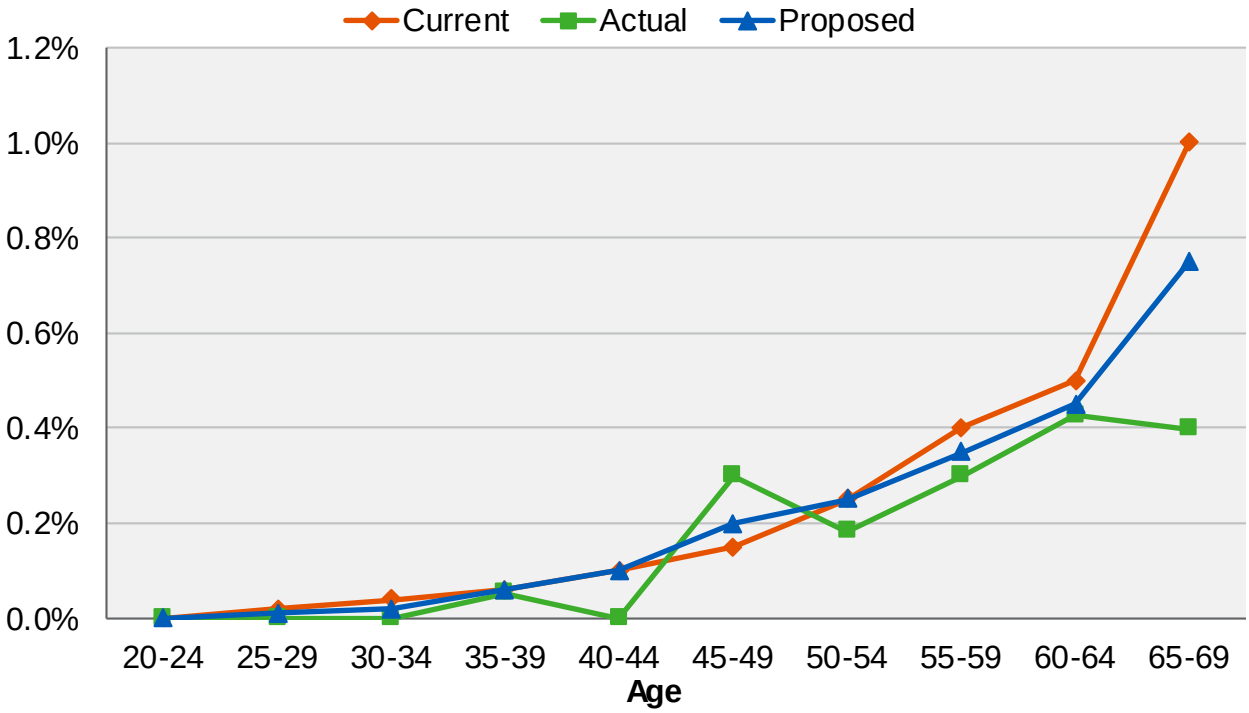
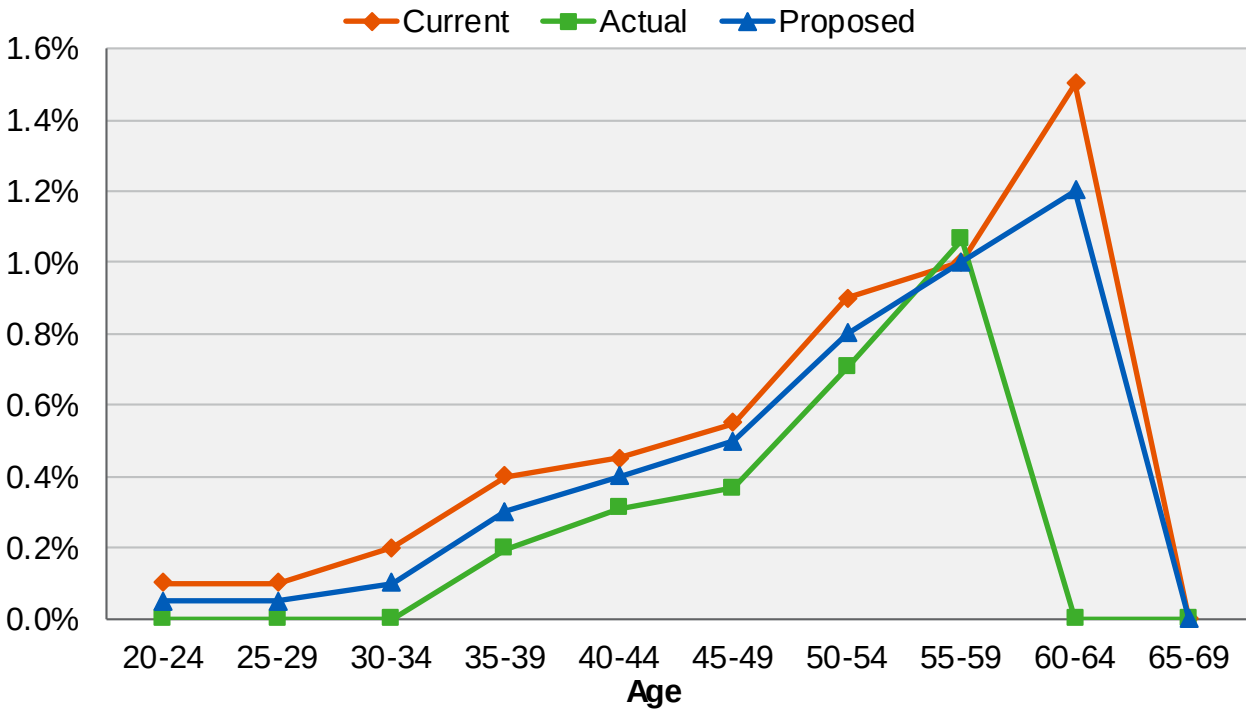


Chart 27: Disability Incidence Rates
Safety Members



F. Service from Unused Sick Leave Conversions

At retirement, members can convert their unused sick leave to increase the service credit used in the calculation of their retirement benefit. The actuarial valuation anticipates this additional benefit using an assumption to estimate the proportional increase in service that will occur due to unused sick leave conversions.

We collected information on the actual amount of sick leave converted to service credit for retirees during the three-year period studied. Consistent with the format of the current assumption, the actual converted sick leave was expressed as a percentage of members' total service credit (before using the unused sick leave credit).

The tables below show the actual sick leave converted to service credit as a percentage of total service credit (before including the sick leave converted to service credit) at retirement separately for Miscellaneous and Safety members as well as for non-disabled and disabled members.

	New Retirees (Non-Disabled)		
	Current	**Actual**	**Proposed**
Miscellaneous	1.50%	1.34%	1.50%
Safety	2.25%	2.01%	2.25%

	New Retirees (Disabled)		
	Current	**Actual**	**Proposed**
Miscellaneous	0.25%	0.02%	0.25%
Safety	0.25%	0.18%	0.25%

Based on the data in the above table, we are recommending no change in the sick leave conversion assumption for Miscellaneous or Safety members.

G. Average Entry Ages

SCERS members who entered Miscellaneous Tiers 1, 2, 3 and 4 and Safety Tiers 1, 2 and 3 after January 1, 1975 and prior to January 1, 2013 pay member contribution rates based on average entry age of all members in the Miscellaneous or Safety plan.

Based on average entry age of 34.6 and 29.0 for Miscellaneous and Safety, respectively, we recommend no change in the assumed average entry age of 35 for Miscellaneous and we recommend no change in the assumed average entry age of 29 for Safety.

V. Cost Impact

We have estimated the impact of all the recommended economic and demographic assumptions as if they were applied to the June 30, 2019 actuarial valuation. The table below shows the changes in the employer and member contribution rates due to the proposed assumption changes separately for the recommended economic assumption changes (as recommended in Section III of this report) and the recommended demographic assumption changes (as recommended in Section IV of this report).

Note that the cost impact shown is after reflecting the impact of some active members in the legacy tiers who have already agreed to pay a higher normal cost on a 50:50 cost-sharing basis, while the remaining active members continue to have agreed only to pay the full rate as defined by statute.

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

Impact on Average Employer Contribution Rates (% of Payroll) (Estimated Annual Dollar amounts in Thousands)		
	Total	**Annual Amount[33]**
Increase due to changes in economic assumptions	2.20%	$22,093
Increase due to changes in demographic assumptions	0.19%	2,006
Total increase	2.39%	$24,099
Impact on Average Member Contribution Rates (% of Payroll) (Estimated Annual Dollar amounts in Thousands)		
	Total	**Annual Amount[33]**
Increase due to changes in economic assumptions	0.67%	$6,651
Increase due to changes in demographic assumptions	0.11%	1,142
Total increase	0.78%	$7,793
Impact on UAAL and Funded Percentage		
Increase in UAAL	$227 million	
Change in Funded Percentage	From 81.6% to 80.0%	

The most significant cost impact is from the change in the investment return assumption.

[33] Based on June 30, 2019 projected annual payroll as determined under each set of assumptions. These annual amounts are expected to change in the future in proportion to future payroll.

Section III of this report discusses 6.50% and 7.00% as two possible alternatives to the recommended 6.75% net investment return assumption. The following table shows the estimated cost impact of adopting 6.50% and 7.00% investment return assumptions, respectively, together with all the other recommended changes in this report.

Impact of Alternative 1 (6.50% investment return assumption)	
Total increase in average employer rate	5.52%
Total increase in average member rate	1.59%
Impact of Alternative 2 (7.00% investment return assumption)	
Total decrease in average employer rate	(0.64%)
Total increase in average member rate	0.02%

We have also analyzed in the tables below the average employer and member contribution rate impacts by each cost group due to the recommended assumption changes (including a 6.75% investment return assumption) as if they were applied to the June 30, 2019 actuarial valuation.

Impact on Aggregate Employer Rates Taking Into Account Proportion of Members in Legacy Tiers Paying 50:50 and Full Rates

Employer Contribution Rate Increases (% of Payroll) (Estimated Annual Dollar amounts in Thousands)				
	Normal Cost	UAAL	Total	Annual Amount[34]
Miscellaneous County	0.63%	1.73%	2.36%	$16,591
Miscellaneous Court	0.85%	1.74%	2.59%	$1,268
Miscellaneous District	0.77%	1.75%	2.52%	$782
Safety County	1.37%	1.08%	2.45%	$5,458
Combined	**0.81%**	**1.58%**	**2.39%**	**$24,099**

[34] Based on June 30, 2019 projected annual payroll as determined under each set of assumptions. These annual amounts are expected to change in the future in proportion to future payroll.

Impact on Member Rates for Members in Legacy Tiers Paying Full Rates

Per Member Contribution Rate Increases or (Decreases) (% of Payroll)		
	Total	**Annual Amount[35]**
Miscellaneous Tier 1	0.29%	$226
Miscellaneous Tier 2	0.29%	$210
Miscellaneous Tier 3	0.48%	$383
Miscellaneous Tier 4	0.59%	$502
Safety Tier 1	(0.92%)	($1,421)
Safety Tier 2	1.19%	$1,442
Safety Tier 3	1.14%	$1,249

Impact on Member Rates for Members in Legacy Tiers Paying 50:50 Rates and in CalPEPRA Tiers

Per Member Contribution Rate Increases or (Decreases) (% of Payroll)		
	Total	**Annual Amount[35]**
Miscellaneous Tier 1	0.47%	$370
Miscellaneous Tier 2	0.53%	$382
Miscellaneous Tier 3	0.71%	$565
Miscellaneous Tier 4	0.50%	$413
Miscellaneous Tier 5	0.51%	$298
Safety Tier 1	0.84%	$1,150
Safety Tier 2	1.81%	$2,210
Safety Tier 3	1.10%	$1,196
Safety Tier 4	0.33%	$249

[35] Based on the average June 30, 2019 projected annual compensation for members in each respective tier. These annual amounts are expected to change in the future in proportion to future payroll.

Appendix A: Current Actuarial Assumptions

Economic Assumptions

Net Investment Return	7.00%; net of administrative and investment expenses.
Employee Contribution Crediting Rate	3.00% (assumed rate of inflation), compounded semi-annually.
Consumer Price Index	Increase of 3.00% per year. Miscellaneous and Safety Tier 1 benefits are assumed to increase at 3.00% per year. Miscellaneous Tier 3, Tier 4 and Tier 5 and Safety Tier 2, Tier 3 and Tier 4 benefits are assumed to increase at 2.00% per year. Miscellaneous Tier 2 receive no COLA increases.
Payroll Growth	Increase of 3.00% per year plus real "across the board" salary increases of 0.25% per year.
Increase in Section 7522.10 Compensation Limit	Increase of 3.00% per year from the valuation date.

Salary Increases

The annual rate of compensation increase includes: inflation at 3.00%, plus "across the board" salary increases of 0.25% per year, plus the following merit and promotion increases:

Merit and Promotion Increases (%)		
Years of Service	**General**	**Safety**
Less than 1	5.00	7.50
1 – 2	4.75	7.25
2 – 3	4.50	6.50
3 – 4	4.00	5.50
4 – 5	3.50	5.00
5 – 6	2.75	4.25
6 – 7	2.25	3.75
7 – 8	2.00	3.25
8 – 9	1.75	3.00
9 – 10	1.50	2.50
10 & Over	1.25	2.00

Demographic Assumptions

Mortality Rates – Healthy

- **Miscellaneous Members and all Beneficiaries:** Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table projected generationally with the two-dimensional scale MP-2016 set forward one year for males and no age adjustment for females.
- **Safety Members:** Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table projected generationally with the two-dimensional scale MP-2016 set back four years for males and females.

Mortality Rates – Disabled

- **Miscellaneous Members:** Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table projected generationally with the two-dimensional scale MP-2016 set forward seven years for males and set forward eight years for females.
- **Safety Members:** Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table projected generationally with the two-dimensional scale MP-2016 set forward four years for males and females.

Mortality Rates – Pre-Retirement

- **Miscellaneous and Safety Members:** Headcount-Weighted RP-2014 Employee Mortality Table multiplied by 50%, projected generationally with the two-dimensional MP-2016 projection scale.

	Miscellaneous		Safety	
Age	**Male**	**Female**	**Male**	**Female**
20	0.03	0.01	0.03	0.01
25	0.03	0.01	0.03	0.01
30	0.03	0.01	0.03	0.01
35	0.03	0.02	0.03	0.02
40	0.04	0.02	0.04	0.02
45	0.06	0.04	0.06	0.04
50	0.10	0.06	0.10	0.06
55	0.17	0.10	0.17	0.10
60	0.28	0.15	0.28	0.15
65	0.49	0.22	0.49	0.22

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

All Miscellaneous pre-retirement deaths are assumed to be non-duty.

For Safety, 50% of pre-retirement deaths are assumed to be non-duty and the rest are assumed to be duty.

Mortality Rates for Member Contributions

- **Miscellaneous Members:** Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table projected 20 years with the two-dimensional scale MP-2016 set forward one year for males and no age adjustment for females weighted 40% male and 60% female.
- **Safety Members:** Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table projected 20 years with the two-dimensional scale MP-2016 set back four years for males and females weighted 75% male and 25% female.

Disability Incidence Rates

Rate (%)		
Age	Miscellaneous	Safety
20	0.00	0.10
25	0.01	0.10
30	0.03	0.16
35	0.05	0.32
40	0.08	0.43
45	0.13	0.51
50	0.21	0.76
55	0.34	0.96
60	0.46	1.30
65	0.80	0.00

30% of Miscellaneous disabilities are assumed to be duty disabilities. The other 70% are assumed to be non-duty disabilities.

90% of Safety disabilities are assumed to be duty disabilities. The other 10% are assumed to be non-duty disabilities.

Termination Rates – Less Than Five Years of Service

Rate (%)		
Years of Service	Miscellaneous	Safety
Less than 1	13.00	6.00
1 – 2	8.00	5.00
2 – 3	7.00	4.00
3 – 4	6.00	3.00
4 – 5	5.50	3.00

65% of the Miscellaneous terminated members and 50% of the Safety terminated members with less than five years of service are assumed to choose a refund of contributions. The other 35% and 50% of Miscellaneous and Safety terminated members, respectively, are assumed to choose a deferred vested benefit.

Termination Rates – Five or More Years of Service

Rate (%)		
Age	**Miscellaneous**	**Safety**
20	5.50	2.50
25	5.50	2.50
30	5.20	2.20
35	4.40	1.70
40	3.40	1.35
45	2.70	1.10
50	2.44	1.00
55	2.34	1.00
60	2.24	1.00
65	1.48	0.00

40% of the Miscellaneous terminated members and 15% of the Safety terminated members with five or more years of service are assumed to choose a refund of contributions. The other 60% and 85% of Miscellaneous and Safety terminated members, respectively, are assumed to choose a deferred vested benefit.

No termination is assumed after a member is eligible to retire.

Retirement Rates – Miscellaneous

	Rate (%)			
Age	Miscellaneous Tier 1	Miscellaneous Tiers 2 and 3	Miscellaneous Tier 4	Miscellaneous Tier 5
50	6.00	2.00	2.00	0.00
51	4.50	2.00	2.00	0.00
52	4.50	2.00	2.00	4.00
53	4.50	3.00	2.00	1.50
54	5.50	4.00	3.00	2.50
55	12.00	6.00	4.00	3.50
56	18.00	6.00	5.00	4.50
57	18.00	8.00	6.00	5.50
58	18.00	10.00	7.00	6.50
59	20.00	12.00	8.00	7.50
60	28.00	12.00	9.00	8.50
61	35.00	14.00	10.00	9.50
62	35.00	25.00	18.00	17.00
63	35.00	25.00	16.00	15.00
64	35.00	30.00	20.00	19.00
65	35.00	35.00	25.00	24.00
66	40.00	40.00	20.00	20.00
67	40.00	40.00	20.00	20.00
68	50.00	50.00	30.00	30.00
69	60.00	60.00	40.00	40.00
70 & Over	100.00	100.00	100.00	100.00

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

Retirement Rates – Safety

	Rate (%)		
Age	Safety Tiers 1 and 2	Safety Tier 3	Safety Tier 4
45	2.00	1.50	0.00
46	2.00	1.50	0.00
47	2.00	1.50	0.00
48	2.00	1.50	0.00
49	5.00	4.00	0.00
50	22.00	10.00	15.00
51	16.00	12.00	10.50
52	16.00	14.00	12.00
53	20.00	16.00	14.00
54	20.00	18.00	15.50
55	20.00	50.00	40.00
56	25.00	25.00	25.00
57	25.00	25.00	25.00
58	25.00	25.00	25.00
59	30.00	30.00	25.00
60	45.00	45.00	45.00
61	55.00	55.00	55.00
62	70.00	70.00	70.00
63	70.00	70.00	70.00
64	70.00	70.00	70.00
65 & Over	100.00	100.00	100.00

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

<table>
<tr><td>Retirement Age and Benefit for Deferred Vested Members</td><td>For current and future deferred vested members, retirement assumptions are as follows:
Miscellaneous Retirement Age: 59
Safety Retirement Age: 53
Current and future deferred vested non-reciprocal members who terminate with less than five years of service and are not vested are assumed to retire at age 70 for both Miscellaneous and Safety if they decide to leave their contributions on deposit.

35% of future Miscellaneous and 45% of future Safety deferred vested members are assumed to continue to work for a reciprocal employer. For reciprocals, 4.50% and 5.25% compensation increases are assumed per annum for Miscellaneous and Safety, respectively.</td></tr>
<tr><td>Future Benefit Accruals</td><td>1.0 year of service per year for the full-time employees. Continuation of current partial service accrual for part-time employees.</td></tr>
<tr><td>Unknown Data for Members</td><td>Same as those exhibited by members with similar known characteristics. If not specified, members are assumed to be male.</td></tr>
<tr><td>Definition of Active Members</td><td>All active members of SCERS as of the valuation date.</td></tr>
<tr><td>Form of Payment</td><td>All active and inactive members are assumed to elect the unmodified option at retirement.</td></tr>
<tr><td>Percent Married</td><td>For all active and inactive members, 80% of male members and 55% of female members are assumed to be married at pre-retirement death or retirement.</td></tr>
<tr><td>Age and Gender of Spouse</td><td>For all active and inactive members, male members are assumed to have a female spouse who is 3 years younger than the member and female members are assumed to have a male spouse who is 2 years older than the member.</td></tr>
<tr><td>Service from Unused Sick Leave Conversion</td><td>The following assumptions for service converted from unused sick leave as a percentage of service at retirement are used:

<table><tr><th></th><th>Service Retirement</th><th>Disability Retirement</th></tr><tr><td>Miscellaneous</td><td>1.50%</td><td>0.25%</td></tr><tr><td>Safety</td><td>2.25%</td><td>0.25%</td></tr></table></td></tr>
</table>

Appendix B: Proposed Actuarial Assumptions

Economic Assumptions

Net Investment Return	6.75%; net of administrative and investment expenses.
Employee Contribution Crediting Rate	2.75% (assumed rate of inflation), compounded semi-annually.
Consumer Price Index	Increase of 2.75% per year. Miscellaneous and Safety Tier 1 benefits are assumed to increase at 2.75% per year. Miscellaneous Tier 3, Tier 4 and Tier 5 and Safety Tier 2, Tier 3 and Tier 4 benefits are assumed to increase at 2.00% per year. Miscellaneous Tier 2 receive no COLA increases.
Payroll Growth	Increase of 2.75% per year plus real "across the board" salary increases of 0.25% per year.
Increase in Section 7522.10 Compensation Limit	Increase of 2.75% per year from the valuation date.

Salary Increases

The annual rate of compensation increase includes: inflation at 2.75%, plus "across the board" salary increases of 0.25% per year, plus the following merit and promotion increases:

Merit and Promotion Increases (%)		
Years of Service	**General**	**Safety**
Less than 1	5.00	7.50
1 – 2	5.00	6.50
2 – 3	5.00	6.25
3 – 4	5.00	5.50
4 – 5	4.00	5.00
5 – 6	3.00	4.25
6 – 7	2.50	4.00
7 – 8	2.25	3.50
8 – 9	2.00	3.25
9 – 10	1.80	3.00
10 – 11	1.70	2.50
11 – 12	1.60	2.50
12 – 13	1.50	2.50
13 – 14	1.45	2.50
14 – 15	1.35	2.50
15 & Over	1.25	2.50

Demographic Assumptions

Mortality Rates – Healthy

- **Miscellaneous Members:** Pub-2010 General Healthy Retiree Amount-Weighted Above-Median Mortality Table (separate tables for males and females) with rates increased by 10%, projected generationally with the two-dimensional mortality improvement scale MP-2019.
- **Safety Members:** Pub-2010 Safety Healthy Retiree Amount-Weighted Above-Median Mortality Table (separate tables for males and females) with rates decreased by 5% for males, projected generationally with the two-dimensional mortality improvement scale MP-2019.

Mortality Rates – Disabled

- **Miscellaneous 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-2019.

- **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-2019.

Mortality Rates – Beneficiaries

- Pub-2010 Contingent Survivor Amount-Weighted Above-Median Mortality Table (separate tables for males and females), projected generationally with the two-dimensional mortality improvement scale MP-2019.

Mortality Rates – Pre-Retirement

- **Miscellaneous 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-2019.
- **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-2019

	Miscellaneous		Safety	
Age	Male	Female	Male	Female
20	0.04	0.01	0.04	0.01
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

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

All Miscellaneous pre-retirement deaths are assumed to be non-duty.

For Safety, 50% of pre-retirement deaths are assumed to be non-duty and the rest are assumed to be duty.

Mortality Rates for Member Contributions

- **Miscellaneous Members:** Pub-2010 General Healthy Retiree Amount-Weighted Above-Median Mortality Table (separate tables for males and females) with rates increased by 10%, projected 30 years (from 2010) with the two-dimensional mortality improvement scale MP-2019, weighted 40% male and 60% female.
- **Safety Members:** Pub-2010 Safety Healthy Retiree Amount-Weighted Above-Median Mortality Table (separate tables for males and females) with rates decreased by 5% for males, projected 30 years (from 2010) with the two-dimensional mortality improvement scale MP-2019, weighted 75% male and 25% female.

Disability Incidence Rates

Rate (%)		
Age	**Miscellaneous**	**Safety**
20	0.000	0.050
25	0.006	0.050
30	0.016	0.080
35	0.044	0.220
40	0.084	0.360
45	0.160	0.460
50	0.230	0.680
55	0.310	0.920
60	0.410	1.120
65	0.630	0.000

40% of Miscellaneous disabilities are assumed to be duty disabilities. The other 60% are assumed to be non-duty disabilities.

90% of Safety disabilities are assumed to be duty disabilities. The other 10% are assumed to be non-duty disabilities.

Termination Rates – Less Than Five Years of Service

Rate (%)		
Years of Service	Miscellaneous	Safety
Less than 1	13.00	5.00
1 – 2	8.00	4.50
2 – 3	6.50	4.00
3 – 4	5.50	2.50
4 – 5	5.25	2.50

55% of the Miscellaneous terminated members and 50% of the Safety terminated members with less than five years of service are assumed to choose a refund of contributions. The other 45% and 50% of Miscellaneous and Safety terminated members, respectively, are assumed to choose a deferred vested benefit.

Termination Rates – Five or More Years of Service

Rate (%)		
Age	Miscellaneous	Safety
20	5.25	2.00
25	5.25	2.00
30	5.10	2.00
35	4.40	1.55
40	3.40	1.10
45	2.70	1.00
50	2.44	1.00
55	2.34	1.00
60	2.24	1.00
65	1.48	0.00

30% of the Miscellaneous terminated members and 15% of the Safety terminated members with five or more years of service are assumed to choose a refund of contributions. The other 70% and 85% of Miscellaneous and Safety terminated members, respectively, are assumed to choose a deferred vested benefit.

No termination is assumed after a member is eligible to retire.

Retirement Rates – Miscellaneous

	Rate (%)				
		Miscellaneous Tiers 2 and 3			
Age	Miscellaneous Tier 1	Less Than 30 Years of Service	30 or More Years of Service	Miscellaneous Tier 4	Miscellaneous Tier 5
50	6.00	2.50	2.50	2.50	0.00
51	4.50	1.75	1.75	1.75	0.00
52	4.50	2.00	2.00	2.00	4.00
53	4.50	2.50	2.50	1.75	1.25
54	5.50	3.00	3.00	2.25	1.75
55	12.00	4.00	8.00	3.00	2.50
56	18.00	5.00	10.00	4.50	4.00
57	18.00	8.00	16.00	6.50	6.00
58	18.00	9.00	18.00	7.00	6.50
59	20.00	9.00	18.00	7.00	6.50
60	28.00	9.00	18.00	7.50	7.00
61	35.00	15.00	30.00	12.00	11.00
62	35.00	18.00	18.00	13.00	12.00
63	35.00	18.00	18.00	12.00	11.00
64	35.00	20.00	20.00	13.00	13.00
65	35.00	35.00	35.00	25.00	24.00
66	40.00	35.00	35.00	18.00	18.00
67	40.00	35.00	35.00	18.00	18.00
68	50.00	35.00	35.00	21.00	21.00
69	60.00	35.00	35.00	23.00	23.00
70 & Over	100.00	100.00	100.00	100.00	100.00

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

Retirement Rates – Safety

Age	Rate (%)			
	Safety Tiers 1 and 2		Safety Tier 3	Safety Tier 4
	Less Than 25 Years of Service	25 or More Years of Service		
45	2.50	2.50	1.50	0.00
46	2.50	2.50	1.50	0.00
47	2.50	2.50	1.50	0.00
48	2.50	2.50	1.50	0.00
49	10.00	10.00	4.00	0.00
50	18.00	36.00	10.00	15.00
51	15.00	30.00	12.00	10.50
52	18.00	36.00	14.00	12.00
53	16.00	32.00	16.00	14.00
54	18.00	27.00	18.00	15.50
55	18.00	27.00	50.00	40.00
56	20.00	30.00	25.00	25.00
57	20.00	30.00	25.00	25.00
58	20.00	30.00	25.00	25.00
59	30.00	30.00	30.00	25.00
60	45.00	45.00	45.00	45.00
61	55.00	55.00	55.00	55.00
62	70.00	70.00	70.00	70.00
63	70.00	70.00	70.00	70.00
64	70.00	70.00	70.00	70.00
65 & Over	100.00	100.00	100.00	100.00

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