



Sacramento County Employees' Retirement System

ACTUARIAL EXPERIENCE STUDY

Analysis of Actuarial Experience
During the Period
July 1, 2013 through June 30, 2016



100 Montgomery Street Suite 500 San Francisco, CA 94104-4308
T 415.263.8200 www.segalco.com

May 8, 2017

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, 2017 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, 2013 to June 30, 2016 and provides the proposed actuarial assumptions, both economic and demographic, to be used in the June 30, 2017 valuation.

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

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

Sincerely,

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

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

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

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

MYM/hy

5468317v8/05750.001

Table of Contents

Actuarial Experience Study

Analysis of Actuarial Experience

During the Period July 1, 2013 through June 30, 2016

I. Introduction, Summary, and Recommendations	1
II. Background and Methodology	5
Economic Assumptions	5
Demographic Assumptions.....	5
III. Economic Assumptions.....	7
A. Inflation.....	7
B. Investment Return.....	8
C. Salary Increase	14
IV. Demographic Assumptions.....	20
A. Retirement Rates	20
B. Mortality Rates - Healthy.....	30
C. Mortality Rates - Disabled.....	37
D. Termination Rates.....	40
E. Disability Incidence Rates	45
F. Service from Unused Sick Leave Conversion.....	47
G. Average Entry Ages.....	48
V. Cost Impact.....	49
Appendix A: Current Actuarial Assumptions	52
Appendix B: Proposed Actuarial Assumptions	59

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. 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, 2013 through June 30, 2016. 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 put forth guidelines 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 investment return, inflation, salary increases, retirement from active employment, reciprocity, pre-retirement mortality, post-retirement healthy and disabled life mortality, termination (refunds and deferred vested retirements), disability (non-duty and duty) and sick leave conversion.

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

Pg #	Actuarial Assumption Categories	Recommendation
7	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 assumed rate of price inflation from 3.25% per annum to 3.00% per annum as discussed in Section (III)(A).

Pg #	Actuarial Assumption Categories	Recommendation
8	<p>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.</p>	<p>Reduce the current investment return assumption from 7.50% per annum to 7.00% per annum as discussed in Section (III)(B). A 7.00% assumption would provide a margin that is consistent with the practice followed in prior studies under the risk-adjusted model used by Segal to evaluate this assumption.</p> <p>As a decrease from 7.50% to 7.00% is a significant reduction in the long-term investment return assumption, we have also developed an alternative assumption of 7.25% that would provide a smaller margin than prior studies under the risk-adjusted model.</p>
14	<p>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:</p> <ul style="list-style-type: none"> • Inflationary salary increases • Real “across the board” salary increases • Merit and promotional increases 	<p>Reduce the current inflationary salary increase assumption from 3.25% to 3.00% 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 3.50% to 3.25%.</p> <p>We recommend adjusting the merit and promotional rates of salary increase as developed in Section III (C) to reflect past experience. The recommended assumptions anticipate slightly higher salary increases overall.</p>
20	<p>Retirement Rates: The probability of retirement at each age at which participants are eligible to retire.</p> <p>Other Retirement Related Assumptions including:</p> <ul style="list-style-type: none"> • Percent married and spousal age differences for members not yet retired • Retirement age for inactive vested members • Future reciprocal members and reciprocal salary increases 	<p>We recommend adjusting the retirement rates to those developed in Section IV (A) for Miscellaneous Tiers 1, 2 and 3 and Safety Tiers 1 and 2 members. We recommend no change in the retirement rates for Miscellaneous Tiers 4 and 5 and Safety Tiers 3 and 4 until actual experience becomes available. We also recommend decreasing the reciprocity assumption for both Miscellaneous and Safety members.</p>
30 37	<p>Mortality Rates: The probability of dying at each age. Mortality rates are used to project life expectancies.</p>	<p>For members who retire from service, we recommend adjusting the rates as developed in Section IV (B) for Miscellaneous and Safety members and all beneficiaries to reflect a slight mortality improvement and a generational approach to anticipating future mortality improvement.</p> <p>The disabled member mortality rates for Miscellaneous and Safety members have also been adjusted as developed in Section IV (C).</p> <p>The recommended pre-retirement mortality assumptions for Miscellaneous and Safety members have been adjusted as developed in Section IV (B). In addition, we recommend maintaining the assumption that all Miscellaneous pre-retirement deaths and 50% of Safety pre-retirement deaths are assumed to be non-duty deaths.</p>

Pg #	Actuarial Assumption Categories	Recommendation
40	Termination Rates: The probability of leaving employment at each age and receiving either a refund of member contributions or a deferred vested retirement benefit.	We recommend adjusting the termination rates to those developed in Section IV (D) to reflect a slightly lower incidence of termination overall. In addition, a lower proportion of members is expected to elect a refund of member contributions with a higher proportion electing instead to receive a deferred vested benefit under the recommended assumptions.
45	Disability Incidence Rates: The probability of becoming disabled at each age.	We recommend adjusting the disability rates to those developed in Section IV (E) to reflect slightly lower incidence of disability for Miscellaneous and Safety members.
47	Service from Unused Sick Leave Conversion: Additional service that is expected to be received when the member retires due to conversion of unused sick leave.	We recommend introducing an assumption for new Miscellaneous disabled retirees to anticipate conversions of unused sick leave at retirement and maintaining the current assumptions to anticipate conversions of unused sick leave at retirement for all other groups of retirees.
48	Average Entry Ages: The entry age used to determine employee rates for members hired after January 1, 1975 and prior to January 1, 2013.	We recommend maintaining the current assumed average entry age of 35 for Miscellaneous and 29 for Safety.

We have estimated the impact of the proposed assumption changes as if they were applied to the June 30, 2016 actuarial valuation. 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.¹

Cost Impact (including a 7.00% investment return assumption)		
<u>Change in Costs</u>	Contribution Rate	Estimated Annual Dollar Amount in Thousands
Total Normal Cost	3.75%	\$34,593
Member Normal Cost	1.79%	\$16,532
Employer Normal Cost	1.96%	\$18,061
Employer UAAL Payments	5.67%	\$52,841
Total for Employer	7.63%	\$70,902

* Based on June 30, 2016 projected annual payroll.

If only the proposed economic assumptions changes were implemented (as recommended in Section III of this report), including a 7.00% investment return assumption, the total (employer and member) normal cost rate would have increased by 2.64% of payroll and the UAAL amortization rate would have increased by 3.39% of payroll. Of the various economic assumption changes, the most significant cost impact is from the investment return assumption change.

¹ Starting in 2017/2018, most Miscellaneous County members and all Safety County members in the legacy tiers would be paying 50% of the total normal cost rates in their tiers. In addition, Miscellaneous members in one District would also be paying 50% of the total normal cost rates in their tiers. All remaining members would pay the full rate.

Furthermore, if only the proposed demographic assumption changes were implemented (as recommended in Section IV of this report), the total (employer and member) normal cost rate would have increased by 1.11% of payroll and the UAAL amortization rate would have increased by 2.28% of payroll. Of the various demographic assumption changes, the most significant cost impact is from the mortality assumption change.

If a 7.25% investment return assumption were implemented instead of a 7.00% investment return assumption together with all the other recommended assumption changes in this report, the total (employer and member) normal cost rate would have increased by 2.25% of payroll and the UAAL amortization rate would have increased by 3.51% of payroll. The breakdown of the cost impact 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 is as follows:

Cost Impact (including a 7.25% investment return assumption)		
<u>Change in Costs</u>	Contribution Rate	Estimated Annual Dollar Amount in Thousands
Total Normal Cost	2.25%	\$20,531
Member Normal Cost	1.07%	\$9,791
Employer Normal Cost	1.18%	\$10,740
Employer UAAL Payments	3.51%	\$32,592
Total for Employer	4.69%	\$43,332

* Based on June 30, 2016 projected annual payroll.

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

II. Background and Methodology

In this report, we analyzed both economic and demographic (“non-economic”) assumptions. The primary economic assumptions reviewed are inflation, investment return, and salary increases. Demographic assumptions include the probabilities of certain events occurring in the population of members, referred to as “decrements,” e.g., termination from service, disability retirement, service retirement, and death after retirement. In addition to decrements, other demographic assumptions reviewed in this study include the percentage of members with an eligible spouse or domestic partner, spousal age difference, percent of members assumed to go on to work for a reciprocal system, reciprocal salary increases, service from 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 employees 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 promotional increases. Payments to amortize any Unfunded Actuarial Accrued Liability (UAAL) are assumed to increase each year by the price inflation rate plus any real “across the board” pay increases that are assumed.

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

Demographic Assumptions

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

The reliability of the resulting probability is highly dependent on both the number of decrements and the number of exposures. For example, if there are only a few people in a high age category

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

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

III. Economic Assumptions

A. Inflation

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

The inflation assumption is long term in nature, so it is set using primarily historical information. Following is an analysis of 15 and 30 year moving averages of historical inflation rates:

HISTORICAL CONSUMER PRICE INDEX – 1930 TO 2016 (U.S. City Average - All Urban Consumers)

	25 th Percentile	Median	75 th Percentile
15-year moving averages	2.5%	3.4%	4.5%
30-year moving averages	3.1%	3.9%	4.8%

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

Based on information found in the Public Plans Data website, which is produced in partnership with the National Association of State Retirement Administrators (NASRA), the median inflation assumption used by 142 large public retirement funds in their 2015 fiscal year valuations was 3.00%. In California, CalPERS, CalSTRS, Contra Costa County, Los Angeles County, and two other 1937 Act CERL systems use an inflation assumption of 2.75% while OCERS and nine other 1937 Act CERL systems use an inflation assumption of 3.00%.

SCERS’ investment consultant, Verus, anticipates an annual inflation rate of 2.10%, while the average inflation assumption provided by Verus and seven other investment advisory firms retained by Segal’s California public sector clients was 2.30%. 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.

To find a forecast of inflation based on a longer time horizon, we referred to the 2016 report on the financial status of the Social Security program. 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 2.60%. We also compared the yields on the thirty-year inflation indexed U.S. Treasury bonds to comparable traditional U.S. Treasury bonds. As of February 2017, the difference in yields is about 2.10%, which provides a measure of market expectations of inflation.

Based on all of the above information, we recommend that the current 3.25% annual inflation assumption be reduced to 3.00% for the June 30, 2017 actuarial valuation.

Retiree Cost of Living Increases

In the last valuation, as of June 30, 2016, consistent with the 3.25% annual inflation assumption used by the Board for that valuation, the Board used a 3.25% cost-of-living adjustment (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 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 3.25% assumption used to value the post-retirement cost-of-living adjustment for Tier 1 be reduced to 3.00%. We are recommending no change in the 2.00% assumption used to value the post-retirement cost-of-living adjustment 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 3.00% is met in a year. We question the reasonableness of this result.

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

B. Investment Return

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

Real Rate of Investment Return

This component represents the portfolio's incremental investment market returns over inflation. Theory has it that as an investor takes a greater investment risk, the return on the investment is expected to also be greater, at least in the long run. This additional return is expected to vary by asset class and empirical data supports that expectation. For that reason, the real rate of return

assumptions are developed by asset class. Therefore, the real rate of return assumption for a retirement association’s portfolio will vary with the Board’s asset allocation among asset classes.

The following is the System’s current target asset allocation and the assumed real rate of return assumptions by asset class. The first column of real rate of return assumptions are determined by netting Verus’ total or “nominal” 2017 return assumptions by their assumed 2.10% inflation rate. The second column of returns (except for Growth Oriented Absolute Return, Private Equity, Private Credit/Private Debt, Diversifying Absolute Return and Private Real Assets) 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 seven 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.²

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 ³	Average Assumed Real Rate of Return from a Sample of Consultants to Segal’s California Public Sector Clients ⁴
U.S. Large Cap Equity	17%	3.80%	5.61%
U.S. Small Cap Equity	4%	4.90%	6.37%
International Developed Equity	16%	9.20%	6.96%
Emerging Markets Equity	4%	9.70%	9.28%
High Yield Bonds	1%	3.10%	3.65%
Bank Loans	1%	3.00%	2.96%
Growth Oriented Abs. Return	3%	4.97%	4.97% ⁵
Private Equity	9%	8.70%	8.70% ⁵
Private Credit/Private Debt	4%	5.10%	5.10% ⁵
Core/Core Plus Bonds	10%	1.40%	1.06%
Global Bonds	3%	0.20%	0.07%
U.S. Treasury	5%	0.60%	0.16%
Diversifying Abs. Return	7%	3.04%	3.04% ⁵
Private Real Estate	7%	3.00%	4.37%
Private Real Assets	7%	7.74%	7.74% ⁵
Commodities	2%	3.40%	3.76%
Total	100%	5.11%	5.15%

² Note that, just as for the inflation assumption, in general the time horizon used by the investment consultants in determining the real rate of return assumption is shorter than the time horizon encompassed by the actuarial valuation.

³ Derived by reducing Verus’ nominal rate of return assumptions by their assumed 2.10% inflation rate.

⁴ These are based on the projected arithmetic returns provided by Verus and seven 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.

⁵ For these asset classes, 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.

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 believes, based on relevant supporting data, that such superior or inferior returns represent a reasonable expectation over the measurement period.”

The following are some observations about the returns provided above:

1. The investment consultants to our California public sector clients have each provided us with their expected real rates of return for each asset class, over various future periods of time. However, in general, the returns available from investment consultants are projected over time periods shorter than the durations of a retirement plan’s liabilities.
2. Using a sample average of expected real rate of returns 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 5.15% portfolio real rate of return be used to determine the System’s investment return assumption. This is 0.52% lower than the return that was used three years ago in the review to prepare the recommended investment return assumption for the June 30, 2014 valuation. The difference is due to changes in the System’s target asset allocation (-0.50%), changes in the real rate of return assumptions provided to us by the investment advisory firms (+0.06%) and the interaction effect between these changes (-0.08%).

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 following table provides the investment expenses in relation to the actuarial value of assets for the five years ending June 30, 2016.

**ADMINISTRATIVE AND INVESTMENT EXPENSES
AS A PERCENTAGE OF ACTUARIAL VALUE OF ASSETS
(Dollars in 000's)**

Year Ending June 30	Actuarial Value of Assets ⁶	Administrative Expenses	Investment Expenses ⁷	Administrative %	Investment %	Total %
2012	\$6,529,895	\$6,288	\$27,478 ⁸	0.10	0.42	0.52
2013	6,797,757	5,719	35,343 ⁸	0.08	0.52	0.60
2014	7,312,993	5,665	43,870 ⁸	0.08	0.60	0.68
2015	7,838,825	5,854	49,868 ⁸	0.07	0.64	0.71
2016	8,236,402	6,362	53,398 ⁸	0.08	0.65	0.73
			Average	0.08%	0.57%	0.65%

Based on this experience, we have increased the future expense component from 0.50% used in the last review in 2014 to 0.65%. This assumption will be re-examined in subsequent assumption reviews as new data becomes available.

Note related to investment expenses paid to active managers – As cited above, under Section 3.6.3.d of ASOP No. 27, the effect of an active investment management strategy should be considered “net of investment expenses...unless the actuary believes, based on relevant data, that such superior or inferior returns represent a reasonable expectation over the measurement period.” For SCERS, nearly all of the investment expenses were paid for expenses associated with active managers.

We have not performed a detailed analysis to measure how much of the investment expenses paid to active managers might have been offset by additional returns (“alpha”) earned by that active management. However, we observed based on information provided in the CAFR that the total fund return on a net of investment expense basis was lower than the policy benchmark by about 0.7% over the last five years. We will work with the System’s staff to determine whether future studies might potentially exclude the level of investment expenses for active managers that are expected to be offset by investment returns. For now, we will continue to use the current approach that any “alpha” that may be identified would be treated as an increase in the risk adjustment and corresponding confidence level. For example, 0.25% of alpha would increase the confidence level by 3% (see discussions that follow on definitions of risk adjustment and confidence level).

Risk Adjustment

The real rate of return assumption for the portfolio is adjusted to reflect the potential risk of shortfalls in the return assumptions. 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

⁶ As of end of plan year.

⁷ 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.

⁸ Excludes approximately \$2 million, \$2 million, \$5 million, \$12 million and \$6 million in incentive based fees for 2012, 2013, 2014, 2015 and 2016, respectively.

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.⁹ The 5.15% expected real rate of return developed earlier in this report was based on expected mean or average arithmetic returns. This means there is a 50% chance of the actual return in each year being at least as great as the average (assuming a symmetrical distribution of future returns). The risk adjustment is intended to increase that probability somewhat above the 50% level. This is consistent with our experience that retirement plan fiduciaries would generally prefer that returns exceed the assumed rate more often than not. 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 60%.

Three years ago, the Board adopted an investment return assumption of 7.50%. That return implied a risk adjustment of 0.92%, reflecting a confidence level of 60% 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.¹⁰

In our model, the confidence level associated with a particular risk adjustment represents the likelihood that the actual average return would equal or exceed the assumed value over a 15-year period. For example, if we set our real rate of return assumption using a risk adjustment that produces a confidence level of 60%, then there would be a 60% chance (6 out of 10) that the average return over 15 years will be equal to or greater than the assumed value. 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.

If we use the same 60% confidence level from our last study to set this year’s risk adjustment, based on the current long-term portfolio standard deviation of 10.50% provided by Verus, the corresponding risk adjustment would be 0.68%. Together with the other investment return components, this would result in an investment return assumption of 6.82%, which is substantially lower than the current assumption of 7.50%.

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 7.00%, together with the other investment return components, would produce a risk adjustment of 0.50%, which corresponds to a confidence level of 57%. As the Board has historically adopted investment return assumptions with confidence levels above 60% in the past several experience studies, we believe this analysis supports reducing the current assumption from 7.50% to 7.00%.

Because this would be a substantial change in this long-term assumption, we also examined the confidence level associated with an alternative assumption of 7.25%. A net investment return

⁹ This type of risk adjustment is sometimes referred to as a “margin for adverse deviation.”

¹⁰ Based on an annual portfolio return standard deviation of 14.10% provided by SIS (before they became part of Verus) in 2014. 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.

assumption of 7.25%, together with the other investment return components, would produce a risk adjustment of 0.25%, which corresponds to a confidence level of 54%.

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.¹¹ The use of either a 57% or 54% confidence level should be considered in context with other factors, including:

- As noted above, the confidence level is more of a relative measure than an absolute measure, and so can be reevaluated and reset for future comparisons.
- 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 either 57% (associated with a 7.00% investment return assumption) or 54% (associated with a 7.25% investment return assumption) is within the range of about 50% to 60% that corresponds to the risk adjustments used by most of Segal’s other California public retirement system clients. Most public retirement systems that have recently reviewed their investment return assumptions have seen decreases in their confidence level even though they adopted more conservative investment return assumptions for their valuations.
- 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”.

Recommended Investment Return Assumption

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

CALCULATION OF INVESTMENT RETURN ASSUMPTION

Assumption Component	June 30,2017 Recommended Value	June 30,2017 Alternative Assumption	June 30, 2014 Adopted Value	June 30, 2012 Adopted Value
Inflation	3.00%	3.00%	3.25%	3.25%
Plus Portfolio Real Rate of Return	5.15%	5.15%	5.67%	5.97%
Minus Expense Adjustment	(0.65%)	(0.65%)	(0.50%)	(0.45%)
Minus Risk Adjustment	(0.50%)	(0.25%)	(0.92%)	(1.27%)
Total	7.00%	7.25%	7.50%	7.50%
Confidence Level	57%	54%	60%	64%

¹¹ 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.”

Based on this analysis, we recommend that the investment return assumption be decreased from 7.50% to 7.00% per annum to maintain a confidence level associated with this assumption to a level more consistent with the practice followed in prior reviews of this assumption. However, an alternative assumption of 7.25% recommendation could be considered if the Board decides to decrease the confidence level associated with this assumption.

Comparing with Other Public Retirement Systems

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

We note that a 7.00% investment return assumption is becoming more common among California public sector retirement systems. In particular, four County employees retirement systems (Contra Costa, Fresno, Mendocino and Santa Barbara) use a 7.00% earnings assumption. Furthermore, the CalPERS Board has approved a reduction in the earnings assumption from 7.50% to 7.00% over the next three years. In addition, CalSTRS recently adopted a 7.25% earnings assumption for the 2016 valuation (down from 7.50%) and a 7.00% earnings assumption for the 2017 valuation.

The following table compares SCERS’ recommended net investment return assumption against those of the nationwide public retirement systems that participated in the National Association of State Retirement Administrators (NASRA) 2016 Public Fund Survey for 142 large public retirement funds in their 2015 fiscal year valuations:

		NASRA 2016 Public Fund Survey		
Assumption	SCERS	Low	Median	High
Net Investment Return	7.00%	4.29%	7.50%	8.50%

The detailed survey results show that more than one-half of the systems have an investment return assumption in the range of 6.75% to 7.75%, and over half of those systems have used an assumption of 7.50%. The survey also notes that several plans have reduced their investment return assumption during the last year. State systems outside of California tend to change their economic assumptions less frequently and so may lag behind emerging practices in this area.

In summary, we believe that both the risk adjustment model and other considerations indicate a lower earnings assumption. While both the recommended assumption of 7.00% or the alternative assumption of 7.25% provides for a smaller margin for adverse deviation within the risk adjustment model as compared to three years ago, they are generally consistent with the System’s current practice relative to other public systems.

C. Salary Increase

Salary increases impact plan costs in two ways: (i) by increasing members’ benefits (since benefits are a function of the members’ highest average pay) and future normal cost collections; and (ii) by increasing total active member payroll which in turn generates lower UAAL contribution rates. 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 3.25% to 3.00% 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 0.6% - 0.9% 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 June 2016. 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 three year period ending June 30, 2016 was 1.3%.

Valuation Date	Actual Average Increase ¹²	Actual Change in CPI ¹³
June 30, 2014	0.1%	2.2%
June 30, 2015	1.8%	2.8%
June 30, 2016	1.9%	2.6%
Three Year Average	1.3%	2.5%

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 3.50% to 3.25%.

3. **Merit and Promotional 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

¹² 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.

¹³ Based on the change in the Annual CPI for the San Francisco-Oakland-San Jose area compared to the prior year.

it is specific to the individual. For SCERS, there are service-specific merit and promotional increases.

The annual merit and promotional 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 member’s actual salary increase over each year of the experience period;
- 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 three-year 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 promotional assumptions should be used in combination with the 3.25% assumed inflation and real “across the board” increases.

The following table shows the average increases over the three-year experience period before removing the inflationary component:

Years of Service	Average Increase (%)	
	Miscellaneous Members	Safety Members
0 – 1	6.10	8.35
1 – 2	9.03	8.26
2 – 3	8.36	8.60
3 – 4	6.59	7.08
4 – 5	5.29	6.76
5 – 6	4.09	6.94
6 – 7	3.83	6.09
7 – 8	4.16	5.51
8 – 9	4.20	5.10
9 – 10	4.22	4.98
10 or more	3.35	4.69

The annual increase in average salary for this three-year period was about 1.17% for Miscellaneous members and 1.16% for Safety members. The following table shows the average merit and promotional increases for the current three-year period, after removing the increases in average salary in each service category:

Years of Service	Average Merit and Promotional Salary Increase (%)	
	Miscellaneous Members	Safety Members
0 – 1	4.74	6.84
1 – 2	7.59	6.84
2 – 3	6.88	7.09
3 – 4	5.27	5.37
4 – 5	4.42	5.89
5 – 6	3.35	6.13
6 – 7	2.76	4.86
7 – 8	2.93	4.40
8 – 9	2.82	4.14
9 – 10	2.77	3.84
10 or more	2.06	3.49

The following table shows the actual and the current and recommended merit and promotional assumptions based on this recent experience:

Years of Service	Current vs. Proposed Merit and Promotional Salary Increase (%)					
	Miscellaneous Members			Safety Members		
	Current	Actual	Proposed	Current	Actual	Proposed
0 – 1	5.00	4.74	5.00	8.00	6.84	7.50
1 – 2	4.50	7.59	4.75	7.00	6.84	7.25
2 – 3	3.75	6.88	4.50	6.00	7.09	6.50
3 – 4	3.50	5.27	4.00	5.00	5.37	5.50
4 – 5	3.00	4.42	3.50	4.00	5.89	5.00
5 – 6	2.50	3.35	2.75	3.50	6.13	4.25
6 – 7	2.25	2.76	2.25	3.25	4.86	3.75
7 – 8	2.00	2.93	2.00	3.00	4.40	3.25
8 – 9	1.75	2.82	1.75	2.75	4.14	3.00
9 – 10	1.00	2.77	1.50	2.00	3.84	2.50
10 or more	1.00	2.06	1.25	1.75	3.49	2.00

Charts 1 and 2 provide a graphical comparison of the current, actual experience and proposed merit and promotional increases.

All three of these forces are incorporated into a salary increase assumption that is applied in the actuarial valuation to project future benefits and future normal cost contribution collections.

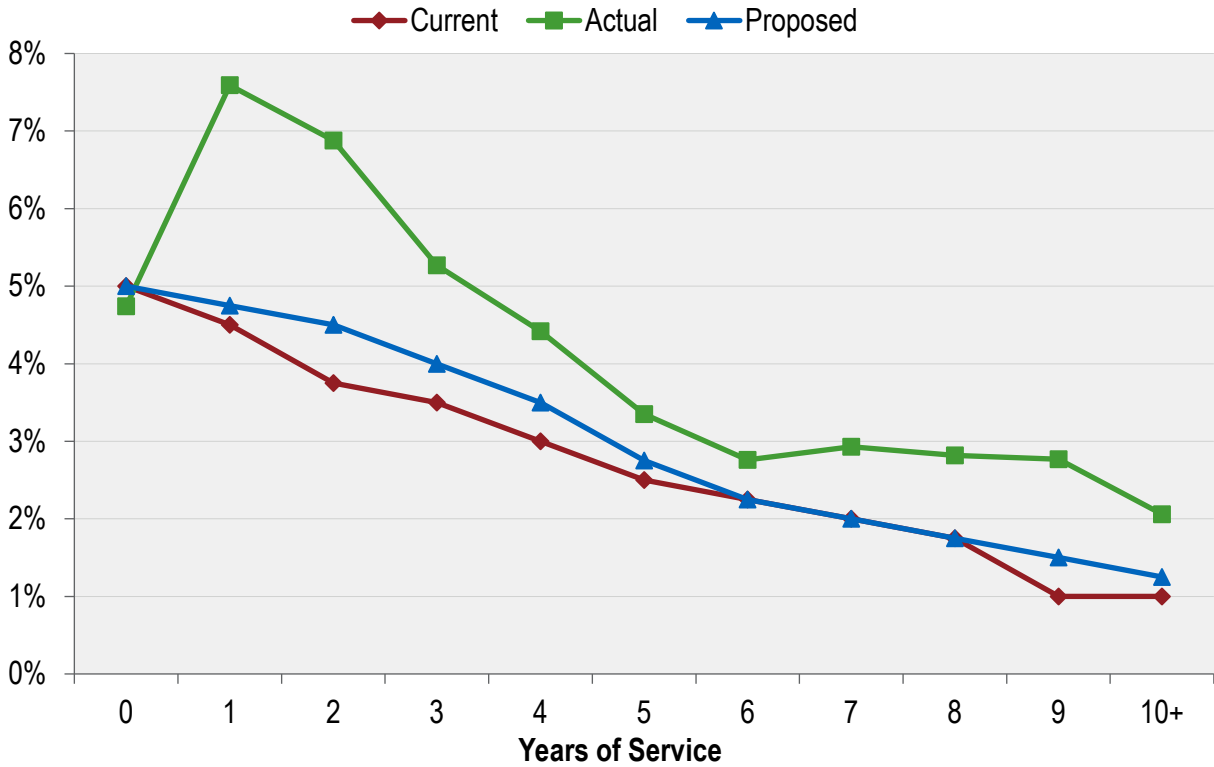
Based on this experience, we are proposing overall increases in the merit and promotional salary increases for both Miscellaneous and Safety members. Overall, salary increases are assumed to be slightly lower for Miscellaneous members and slightly higher for Safety members due to the lower price inflation assumption.

Active Member Payroll

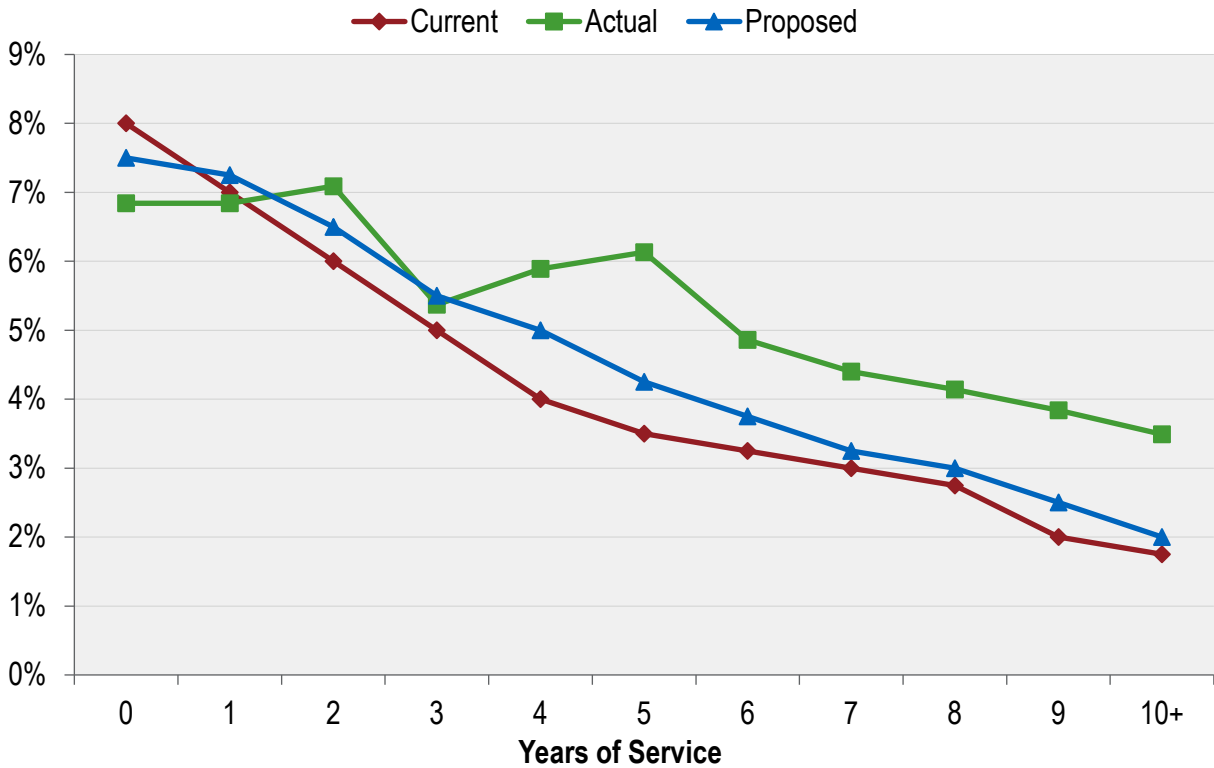
Projected active member payrolls are used to develop the UAAL contribution rate. Future values are determined as a product of the number of employees in the workforce and the average pay for all employees. The average pay for all employees increases only by inflation and real “across the board” pay increases.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

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

**CHART 1: MERIT AND PROMOTIONAL SALARY INCREASE RATES
MISCELLANEOUS MEMBERS**



**CHART 2: MERIT AND PROMOTIONAL 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 1, 2 and 3 and Safety Tiers 1 and 2 member categories. For Miscellaneous Tiers 4 and 5, we are not recommending a change in the retirement assumptions because there is no data available to support a change (and these rates were developed specifically for those tiers).

During the three-year period, a retirement window was offered to DSA members who were eligible to retire. Salary increases were granted that would otherwise have been deferred if a member agreed to retire during the window. The System provided us with a listing of 172¹⁴ members who signed up for the retirement window. For Safety, we studied the retirement experience both including and excluding these members. Excluding these members would have led to further reductions in the retirement rates. Since we are already proposing reductions in the retirement rates, we did not want to reduce them further by excluding these members and risk understating the proposed retirement rates. Therefore, the DSA members who retired during the retirement window are included in the analysis.

In this study, we have adjusted the retirement probabilities to reflect the most recent three-year experience. We have continued to balance this recent experience with the current assumptions so as to reflect the possibility that the most recent three-year experience was a statistical fluctuation related to recent economic conditions.

¹⁴ Of the 172 DSA members, 120 were enrolled in the Safety Tiers and 52 were enrolled in the Miscellaneous Tiers.

Miscellaneous Tier 1

Age	Rate of Retirement (%)		
	Current Rate	Observed Rate	Proposed Rate
45 - 49	0.00	0.00	0.00
50	6.00	0.00	6.00
51	4.00	0.00	4.50
52	4.00	11.11	4.50
53	4.00	5.88	4.50
54	7.00	4.00	5.50
55	10.00	15.15	12.00
56	15.00	31.43	18.00
57	16.00	21.88	18.00
58	18.00	12.50	18.00
59	22.00	17.78	20.00
60	28.00	27.91	28.00
61	30.00	37.21	35.00
62	35.00	36.36	35.00
63	35.00	30.43	35.00
64	40.00	27.78	35.00
65	50.00	15.38	35.00
66	45.00	15.38	40.00
67	45.00	25.00	40.00
68	50.00	66.67	50.00
69	60.00	0.00	60.00
70	100.00	50.00	100.00

Miscellaneous Tiers 2 and 3

Age	Rate of Retirement (%)		
	Current Rate	Observed Rate	Proposed Rate
45 - 49	0.00	100.00*	0.00
50	2.00	0.97	2.00
51	2.00	1.65	2.00
52	2.00	2.68	2.00
53	3.00	3.17	3.00
54	4.00	2.85	4.00
55	6.00	6.49	6.00
56	6.00	5.77	6.00
57	8.00	7.42	8.00
58	12.00	6.30	10.00
59	14.00	10.58	12.00
60	14.00	10.33	12.00
61	14.00	15.34	14.00
62	25.00	26.98	25.00
63	30.00	17.49	25.00
64	35.00	16.00	30.00
65	40.00	31.70	35.00
66	45.00	32.20	40.00
67	45.00	25.23	40.00
68	50.00	21.33	50.00
69	60.00	32.14	60.00
70	100.00	24.38	100.00

* Based on three members who retired between 45 - 49.

Miscellaneous Tier 4

Age	Rate of Retirement (%)		
	Current Rate	Observed Rate	Proposed Rate
45 - 49	0.00	N/A	0.00
50	2.00	N/A	2.00
51	2.00	N/A	2.00
52	2.00	0.00*	2.00
53	2.00	50.00*	2.00
54	3.00	N/A	3.00
55	4.00	N/A	4.00
56	5.00	0.00*	5.00
57	6.00	0.00*	6.00
58	7.00	N/A	7.00
59	8.00	N/A	8.00
60	9.00	100.00*	9.00
61	10.00	N/A	10.00
62	18.00	N/A	18.00
63	16.00	N/A	16.00
64	20.00	N/A	20.00
65	25.00	N/A	25.00
66	20.00	N/A	20.00
67	20.00	N/A	20.00
68	30.00	N/A	30.00
69	40.00	N/A	40.00
70	100.00	0.00*	100.00

* There were members eligible to retire at these ages (although they did not elect to retire). These members are generally eligible to retire due to reciprocal service or attaining age 70.

Miscellaneous Tier 5

Age	Rate of Retirement (%)		
	Current Rate	Observed Rate	Proposed Rate
52	4.00	N/A	4.00
53	1.50	N/A	1.50
54	2.50	N/A	2.50
55	3.50	N/A	3.50
56	4.50	N/A	4.50
57	5.50	N/A	5.50
58	6.50	N/A	6.50
59	7.50	0.00*	7.50
60	8.50	N/A	8.50
61	9.50	0.00*	9.50
62	17.00	N/A	17.00
63	15.00	N/A	15.00
64	19.00	N/A	19.00
65	24.00	N/A	24.00
66	20.00	N/A	20.00
67	20.00	N/A	20.00
68	30.00	N/A	30.00
69	40.00	N/A	40.00
70	100.00	0.00*	100.00

* *There were members eligible to retire at these ages (although they did not elect to retire). These members are generally eligible to retire due to reciprocal service or attaining age 70.*

Safety Tiers 1 and 2

Age	Rate of Retirement (%)		
	Current Rate	Observed Rate	Proposed Rate
45	2.00	1.52	2.00
46	2.00	3.33	2.00
47	2.00	2.25	2.00
48	2.00	3.05	2.00
49	5.00	25.21	5.00
50	25.00	20.97	22.00
51	18.00	16.91	16.00
52	18.00	15.57	16.00
53	22.00	15.05	20.00
54	22.00	12.16	20.00
55	22.00	21.31	20.00
56	25.00	23.21	25.00
57	25.00	20.41	25.00
58	25.00	42.11	25.00
59	30.00	23.08	30.00
60	45.00	31.82	45.00
61	55.00	25.00	55.00
62	70.00	28.57	70.00
63	70.00	0.00	70.00
64	70.00	0.00	70.00
65	100.00	57.14	100.00
66	100.00	50.00	100.00
67	100.00	0.00	100.00
68	100.00	100.00	100.00
69	100.00	0.00	100.00
70	100.00	0.00	100.00

Safety Tier 3

Age	Rate of Retirement (%)		
	Current Rate	Observed Rate	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	0.00*	4.00
50	10.00	N/A	10.00
51	12.00	N/A	12.00
52	14.00	N/A	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

* *There were members eligible to retire at these ages (although they did not elect to retire). These members are generally eligible to retire due to reciprocal service.*

Safety Tier 4

Age	Rate of Retirement (%)		
	Current Rate	Observed Rate	Proposed Rate
50	15.00	N/A	15.00
51	10.50	N/A	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	N/A	25.00
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

Chart 3 compares actual experience with the current and proposed rates of retirement for Miscellaneous Tier 1 members. Chart 4 has the same data for Miscellaneous Tier 2 & 3 members and Chart 5 has the same data for Safety Tiers 1 & 2 members.

Deferred Vested Members

In prior valuations, deferred vested Miscellaneous and Safety members were assumed to retire at age 59 and 53, respectively. The average age at retirement over the prior three years was 59.7 for Miscellaneous and 53.5 for Safety. We recommend maintaining the assumed retirement age for deferred vested members for Miscellaneous and Safety members.

Reciprocity

It was also assumed that 40% of future inactive Miscellaneous and 50% of future inactive Safety deferred vested participants would be covered under a reciprocal retirement system and receive 4.50% and 5.25% salary increases from termination until their date of retirement for

Miscellaneous and Safety, respectively. Based on the actual experience that 33% of Miscellaneous and 42% Safety members went on to be covered by a reciprocal retirement system during the last three years, we recommend decreasing the current 40% reciprocal assumption for Miscellaneous to 35% and decreasing the current 50% reciprocal assumption for Safety to 45%. Based on our ultimate 1.25% and 2.00% recommended merit and promotional salary increase assumptions for members with ten or more years of service, we propose that a 4.50% and 5.25% salary increase assumption for Miscellaneous and Safety members, respectively, be used to anticipate salary increases from the date of termination from SCERS to the expected date of retirement for participants in a reciprocal retirement system.

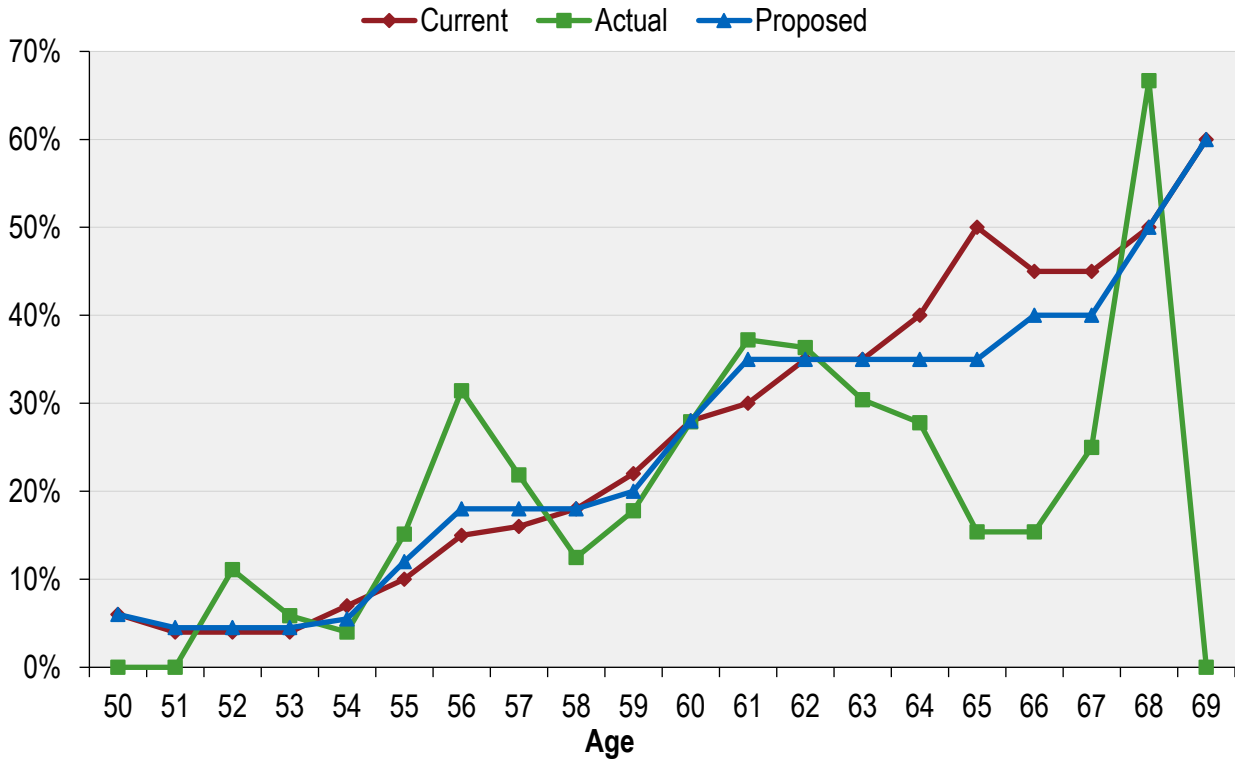
Form of Payment and Survivor Continuance under the Unmodified Option

In prior valuations, it was assumed that all members would select the unmodified option at retirement. Actual experience for recent new retirees shows that around 85% select the unmodified option. Therefore, we recommend maintaining the assumption that all members will elect the unmodified option at retirement.

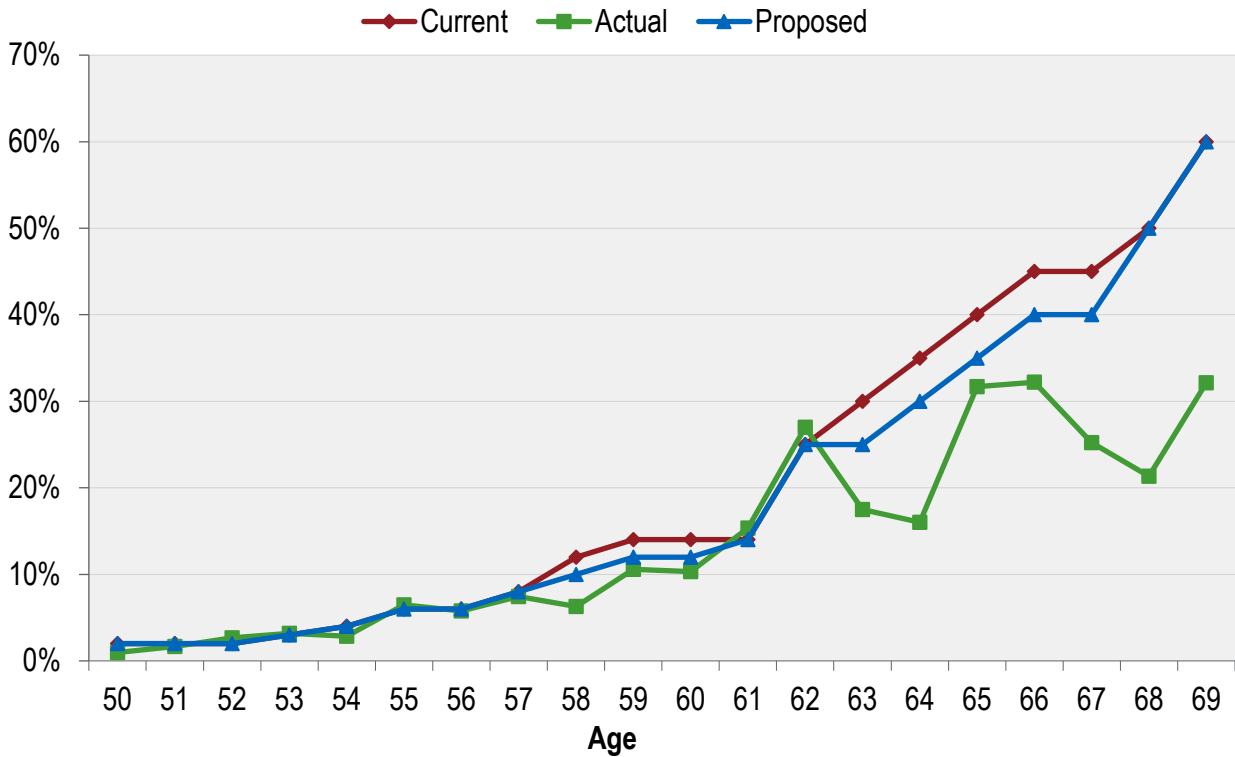
It was also assumed that 80% of all active male members and 55% of all active female members who selected the unmodified option would be married or have an eligible domestic partner when they retired. According to the experience of members who retired during the last three years, about 78% of all male members and 56% of all female members were married or had a domestic partner at retirement. We recommend no change to the current 80% married or domestic partner assumption for male members and 55% married or domestic partner assumption for female members.

Based on observed experience from members who retired during the last three years that when male active members retire, female spouses are about 2.4 years younger than their male spouses, we also recommend that we maintain the assumption that when male active members retire, female spouses are assumed to be three years younger than their male spouses. For when female active members retire, based on observed experience that when female active members retire, male spouses are about 1.6 years older than their female spouses, we recommend changing the assumption that male spouses are three years older to the assumption that male spouses are two year older than their female spouses. Spouses will be assumed to be of the opposite sex to the member as only 1.8% of members who retired during the last three years were reported with a spouse or domestic partner of the same sex.

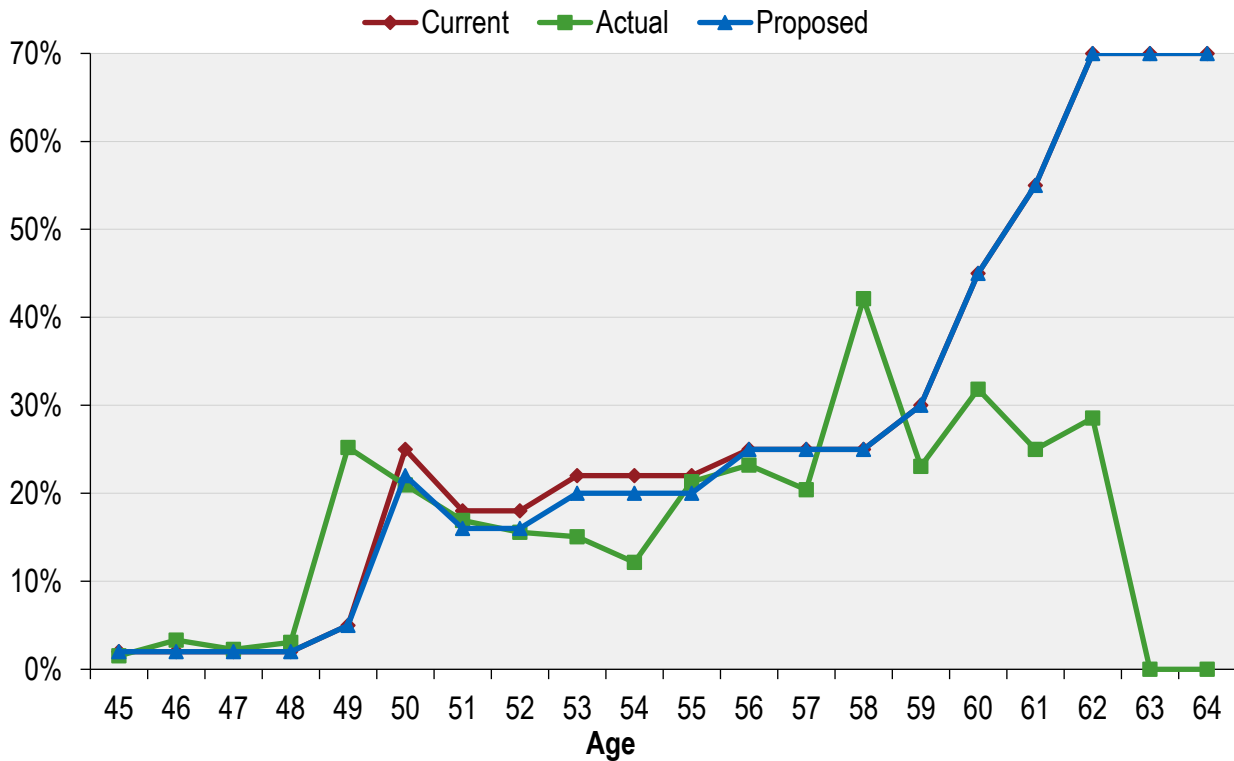
**CHART 3: RETIREMENT RATES
MISCELLANEOUS TIER 1 MEMBERS**



**CHART 4: RETIREMENT RATES
MISCELLANEOUS TIER 2 & 3 MEMBERS**



**CHART 5: RETIREMENT RATES
SAFETY TIER 1 & 2 MEMBERS**



B. Mortality Rates - Healthy

The “healthy” mortality rates project the life expectancy of a member who retires from service (i.e., who did not retire on a disability pension). For Miscellaneous members, the table currently being used for post-service retirement mortality rates is the RP-2000 Combined Healthy Mortality Table (separate tables for males and females) projected with scale BB to 2022 with no age adjustments. For Safety members, the table currently being used is the RP-2000 Combined Healthy Mortality Table (separate tables for males and females) projected with scale BB to 2022 set back one year for males and set forward two years for females. All beneficiaries are assumed to have the same mortality of a Miscellaneous member of the opposite sex who has taken a service (non-disabled) retirement.

Note that when we use a mortality table with a set forward in a valuation for a group of retirees, we anticipate that the group has a shorter life expectancy when compared to the unadjusted table. The opposite is true when we use a mortality table with a setback. For example, a 50-year old member under the age adjusted table, assuming a one year set forward, is anticipated to have the same life expectancy as a 51-year old under the unadjusted table.

The Society of Actuaries (SOA) has published the RP-2014 family of mortality tables and associated mortality improvement scales. Within that family of mortality tables, there are mortality rates developed for annuitants on a “headcount” weighted basis that weight all retirees at the same age the same way without regard to the level of benefits those annuitants are receiving from a retirement plan. Mortality rates are also developed for annuitants on a “benefit”

weighted basis, with higher credibility assigned to experience from annuitants receiving larger benefits. The headcount-weighted basis is the more common practice currently and is the approach used by Segal in the past for its California public system clients (including SCERS) and by other public sector actuaries in California.

As for the mortality improvement scales, they can be applied in one of two ways. Historically, the more common application is to use a “static” approach to anticipate a fixed level of mortality improvement for all annuitants receiving benefits from a retirement plan. This is in contrast to a “generational” approach where each future year has its own mortality table that reflects the forecasted improvements, using the published improvement scales. While the static approach is still used by some of Segal’s California public system clients, including CalPERS, the “generational” approach is the emerging practice within the actuarial profession.

A generational mortality table provides dynamic projections of mortality experience for each cohort of retirees. For example, the mortality rate for someone who is 65 next year will be slightly less than for someone who is 65 this year. In general, using generational mortality anticipates increases in the cost of the Plan over time as participants’ life expectancies are projected to increase. This is in contrast to updating a static mortality assumption with each experience study as we have proposed in prior experience studies.

The SOA is in the process of collecting data from public sector plans so that they can develop mortality tables based on public sector experience comparable to the RP-2014 mortality tables developed using data collected from private and multi-employer plans. Furthermore, after publishing the two-dimensional MP-2014 life expectancy improvement scale, the SOA replaced it with the two-dimensional MP-2015 life expectancy improvement scales to remove some of the conservatism built into the MP-2014 scale and to better reflect the most recent data of mortality improvement from the Social Security Administration. We understand that the Retirement Plans Experience Committee of the Society of Actuaries (RPEC) intends to publish annual updates to their mortality improvement scales. Improvement scale MP-2016 is the latest improvement scale available.

We recommend that given the trend in the retirement industry to move towards generational mortality, it would be reasonable for the Board to adopt the Headcount-Weighted RP-2014 mortality table (adjusted for SCERS experience), and project the mortality improvement generationally using the two-dimensional MP-2016 mortality improvement scale. Once the SOA has included data from public sector plans in developing the new tables, we will also include a discussion with the Board on whether to consider the benefit weighted mortality rates in a future experience study.

In the table below, we have provided the approximate increase in the total employer and member contribution rates based on the different approaches to build in margin for future mortality improvements.

	Employer and Member Contribution Rate Impact Combined
Headcount Weighted RP-2014 Family of Tables – Static Approach with Increased Margin*	2.8% of payroll
Benefit Weighted RP-2014 Family of Tables – Static Approach without Increased Margin	2.2% of payroll
Headcount Weighted RP-2014 Family of Tables – Generational Approach	3.0% of payroll

* Includes an increased margin of 20% to anticipate the move towards a “generational” approach.

Pre-Retirement Mortality

In prior experience studies, the pre-retirement mortality rates for active members were set equal to the post-retirement mortality rates for retirees since the actual number of deaths among active members was not large enough to provide a statistically creditable analysis. However, this approach is not compatible with our current proposal because the post-retirement RP-2014 Healthy Annuitant table does not include rates for ages below 50.

From the RP-2014 family of tables, we recommend that pre-retirement mortality follow the Headcount-Weighted RP-2014 Employee Mortality Table (separate tables for males and females) times 50%, projected generationally with the two-dimensional scale MP-2016, all to account for the lower incidences of observed pre-retirement death on the combined Miscellaneous and Safety workforce. All Miscellaneous pre-retirement deaths are assumed to be non-duty while 50% of Safety pre-retirement deaths are assumed to be non-duty and the rest are assumed to be duty.

Post-Retirement Mortality (Service Retirements)

Our analysis starts with a table that shows, among all retired members, the actual deaths compared to the expected deaths under the current assumptions for the last six years.¹⁵ We also show the deaths under proposed assumptions. In prior years we have generally set the mortality assumption using a static mortality projection so that actual deaths will be at least 10% greater than those assumed. As noted above, we are recommending the use of a generational mortality table rather than static mortality. A generational mortality table incorporates a more explicit assumption for future mortality improvement. Accordingly, the goal is to start with a mortality table that closely matches the current experience (without a margin for future mortality improvement), and then reflect mortality improvement by projecting lower mortality rates in future years. That is why the current actual to expected ratio shown in the table below for Miscellaneous and Safety is 102% and 95%, respectively. In future years these ratios would remain around 100%, as long as actual mortality improved at the same rates as anticipated in the

¹⁵ Note that in order to use more actual SCERS experience in our analysis, we have used experience for a six-year period from both the current and the last experience study periods to study this assumption.

generational mortality tables. The actual deaths compared to the expected deaths under the current and proposed assumptions for the last six years are as follows:

Year Ending June 30	Miscellaneous – Healthy*			Safety - Healthy		
	Current Expected Deaths	Actual Deaths	Proposed Expected Deaths	Current Expected Deaths	Actual Deaths**	Proposed Expected Deaths
2011	161	171	183	13	7	13
2012	169	199	192	15	14	14
2013	178	195	202	16	16	15
2014	189	223	214	17	17	16
2015	198	234	224	18	16	18
2016	210	254	235	22	20	19
Total	1,105	1,276	1,250	101	90	95
Actual / Expected	115%		102%	89%		95%

* Includes beneficiaries of Miscellaneous and Safety members.

** There were 37 and 53 deaths during 2010-2013 and 2013-2016, respectively. For informational purposes, there were 51 deaths during 2007-2010.

For Miscellaneous members, the ratio of actual to expected deaths was 115%. We recommend updating the current table to the RP-2014 Headcount-Weighted Healthy Annuitant Mortality Table (separate tables for males and females) set forward one year for males and no age adjustment for females. This table is then projected generationally with the two-dimensional mortality improvement scale MP-2016. This will bring the current actual to expected ratio to 102%.

For Safety members, the ratio of actual to expected deaths was 89%. We recommend updating the current table to the RP-2014 Headcount-Weighted Healthy Annuitant Mortality Table (separate tables for males and females) set back four years for males and females. This table is then projected generationally with the two-dimensional mortality improvement scale MP-2016. This will bring the current actual to expected ratio to 95%.

Of note is that the ratio of actual to expected deaths for Safety members under the proposed assumptions is lower than the 100% ratio we would normally propose to allow for some margin in future mortality improvements. This is the case because the number of actual deaths during the three-year period from 2011 to 2013 is much lower than during the three-year period from either 2007 to 2010 or 2014 to 2016.

All of this is consistent with ASOP 35 as we anticipate expected future improvement in life expectancy using the generational approach.

Chart 6 compares actual to expected deaths for Miscellaneous members and all beneficiaries under the current and proposed assumptions over the last six years. Experience shows that there were more deaths than predicted by the current table over the last six years.

Chart 7 has the same comparison for Safety members. Experience shows that there were fewer deaths than predicted by the current table over the last six years.

Chart 8 shows the life expectancies under the current and the proposed tables for Miscellaneous members and all beneficiaries.

Chart 9 has the same information for Safety members.

The expected deaths (Charts 6 and 7) and life expectancies (Charts 8 and 9) under the proposed generational mortality table are based on mortality rates from 2014, which is the base year of the table, with any applicable age adjustments. In practice, life expectancies will be increased after applying the mortality improvement scale.

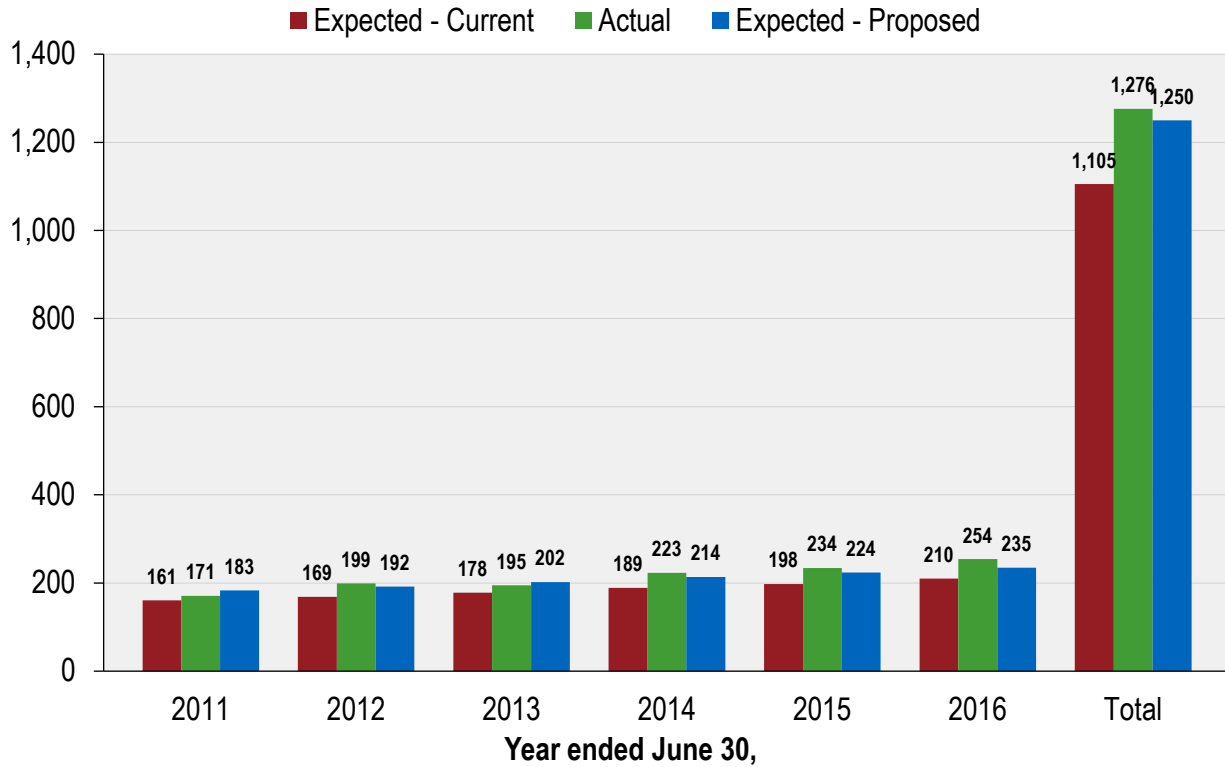
Mortality Table for Member Contributions, Optional Forms of Payment and Reserves

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. 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 over a period that is close to the duration of the benefit payments for active members. We would recommend the use of this approximation.

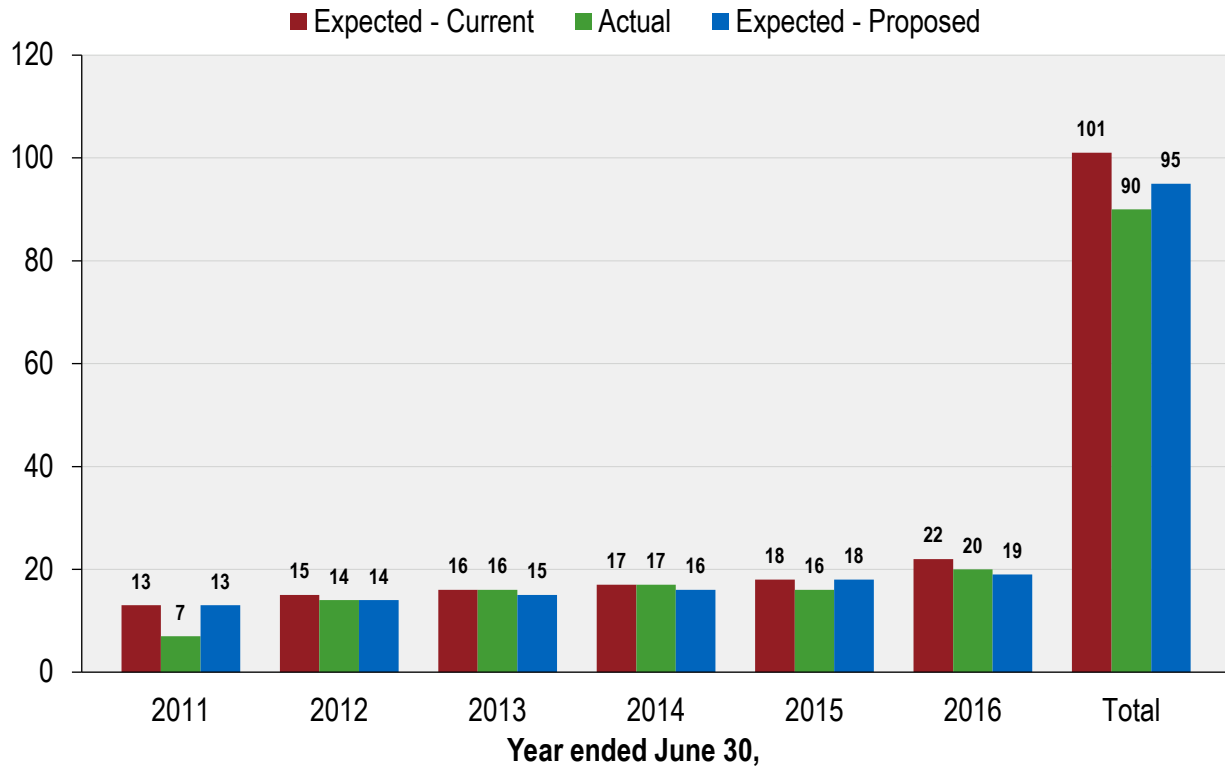
We recommend that the mortality table used for determining contributions for Miscellaneous members be updated from the RP-2000 Combined Healthy Mortality Table projected with Scale BB to 2022 with no age adjustments weighted 40% male and 60% female to the RP-2014 Headcount-Weighted Healthy Annuitant Mortality Table projected 20 years with the two-dimensional mortality improvement scale MP-2016 set forward one year for males and no age adjustment for females weighted 40% male and 60% female. This is based on the proposed valuation mortality table for Miscellaneous members and the actual sex distribution of Miscellaneous members.

For Safety members, we recommend the mortality table be changed from the RP-2000 Combined Healthy Mortality Table projected with Scale BB to 2022 set back one year for males and set forward two years for females weighted 70% male and 30% female to the RP-2014 Headcount-Weighted Healthy Annuitant Mortality Table projected 20 years with the two-dimensional mortality improvement scale MP-2016 set back four years for males and females weighted 75% male and 25% female. This is based on the proposed valuation mortality table for Safety members and the actual sex distribution of Safety members.

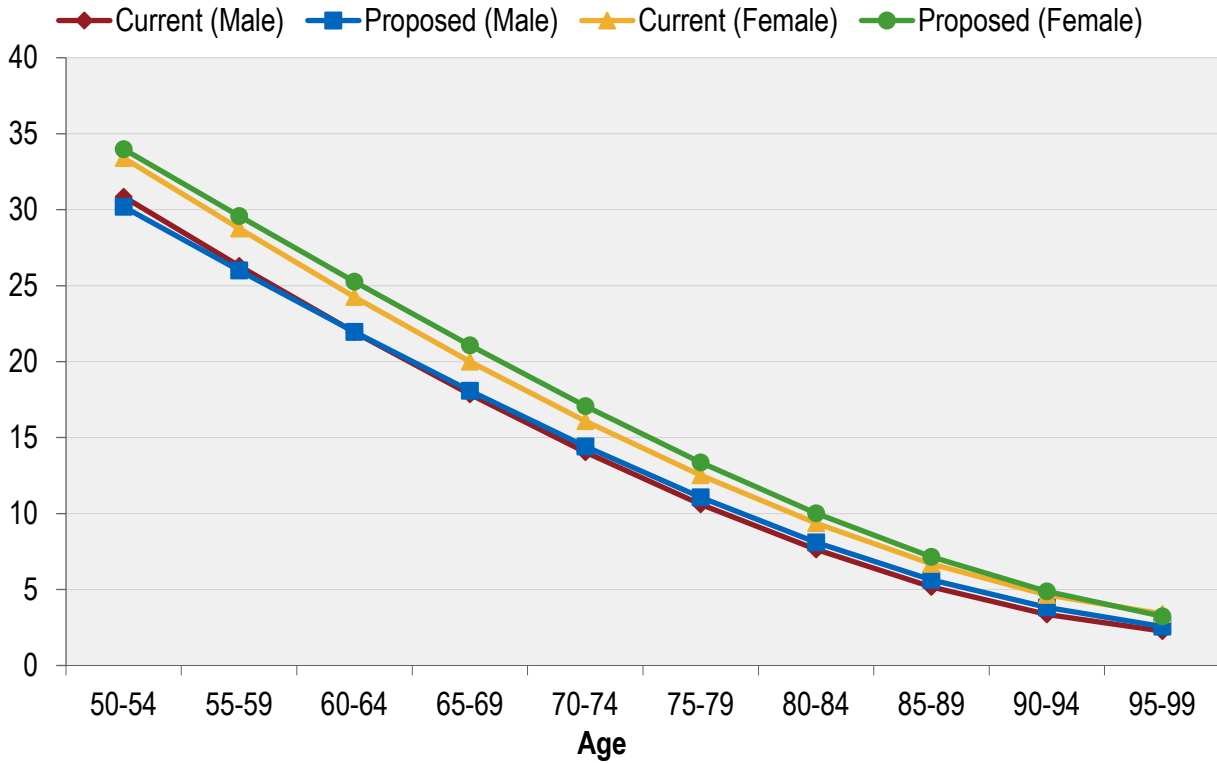
**CHART 6: POST-RETIREMENT DEATHS
MISCELLANEOUS – NON-DISABLED MEMBERS**



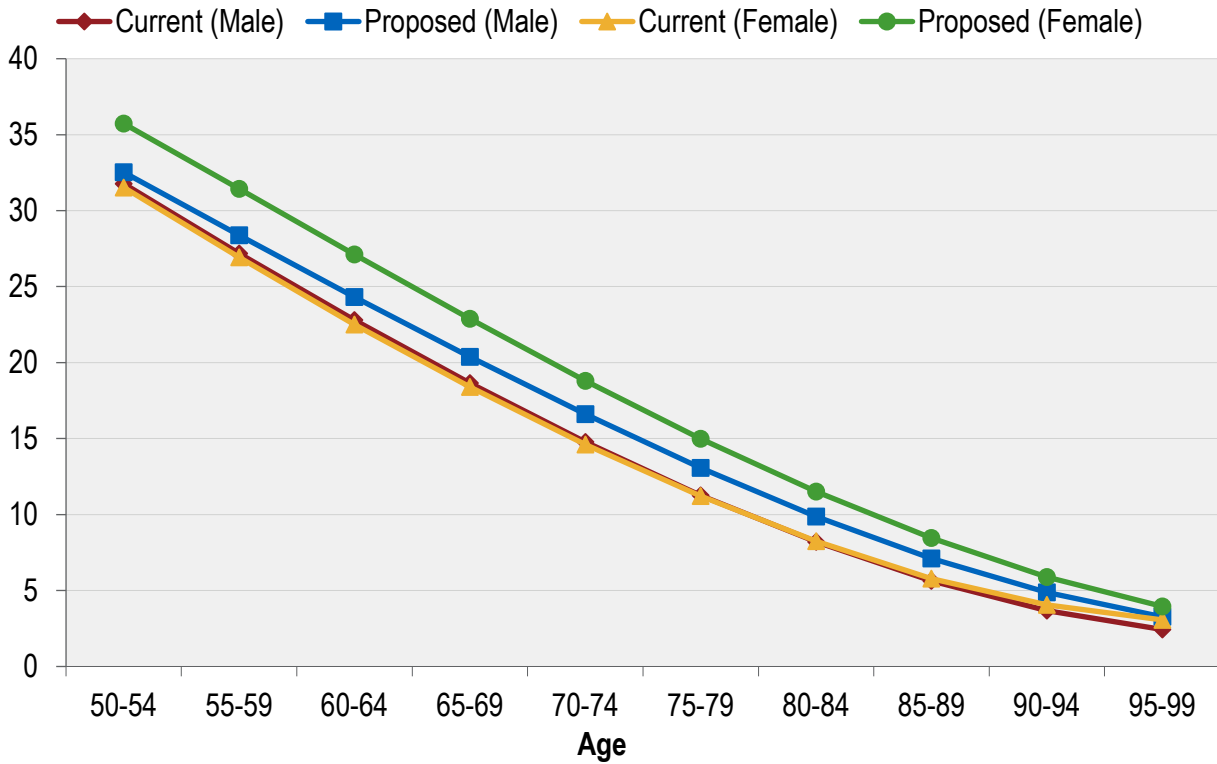
**CHART 7: POST-RETIREMENT DEATHS
SAFETY – NON-DISABLED MEMBERS**



**CHART 8: LIFE EXPECTANCIES
MISCELLANEOUS – NON-DISABLED MEMBERS**



**CHART 9: LIFE EXPECTANCIES
SAFETY – NON-DISABLED 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 RP-2000 Disabled Retiree Mortality Table (separate tables for males and females) projected with Scale BB to 2022 with no age adjustment for males and set forward three years for females. For Safety members, the table currently being used is the RP-2000 Combined Healthy Mortality Table (separate tables for males and females) projected with Scale BB to 2022 set forward two years for males and females.

The number of actual deaths compared to the number expected under the current and proposed assumption for the last six years are as provided in the table below.

Year Ending June 30	Miscellaneous - Disabled			Safety - Disabled		
	Current Expected Deaths	Actual Deaths	Proposed Expected Deaths	Current Expected Deaths	Actual Deaths	Proposed Expected Deaths
2011	20	24	21	3	4	5
2012	21	23	21	3	3	5
2013	20	20	21	5	9	5
2014	20	11	21	4	6	6
2015	22	27	23	4	7	6
2016	22	29	22	5	5	6
Total	125	134	129	24	34	33
Actual / Expected	107%		104%	142%		103%

Based on the actual experience, we recommend changing the mortality table for Miscellaneous disabled members to the RP-2014 Headcount-Weighted Healthy Annuitant Mortality Table (separate tables for males and females) set forward seven years for males and set forward eight years for females. This table is then projected generationally with the two-dimensional mortality improvement scale MP-2016. This will bring the current actual to expected ratio to 104%.

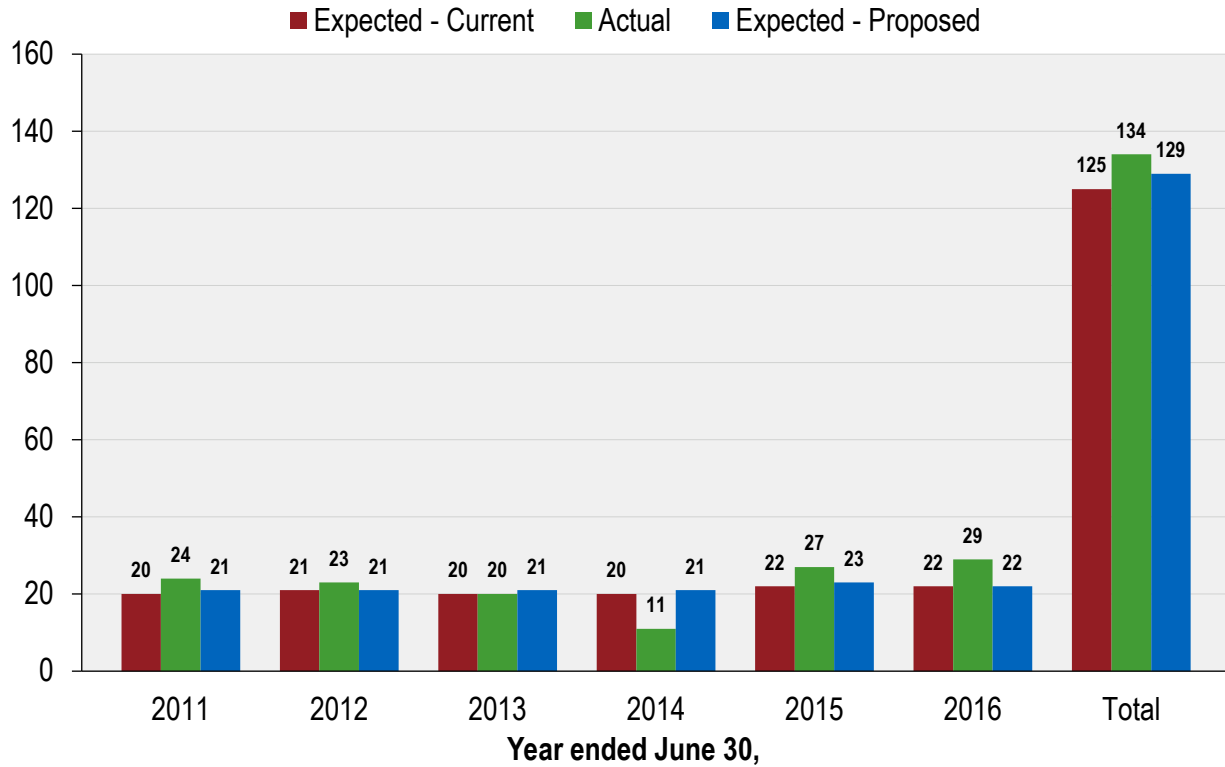
Likewise, based on the actual experience, we recommend changing the mortality table for Safety disabled members to the RP-2014 Headcount-Weighted Healthy Annuitant Mortality Table (separate tables for males and females) set forward four years for males and females. This table is then projected generationally with the two-dimensional mortality improvement scale MP-2016. This will bring the current actual to expected ratio to 103%.

Chart 10 compares actual to expected deaths under both the current and proposed assumptions for disabled Miscellaneous members over the last six years. Experience shows that there were more deaths than predicted by the current table.

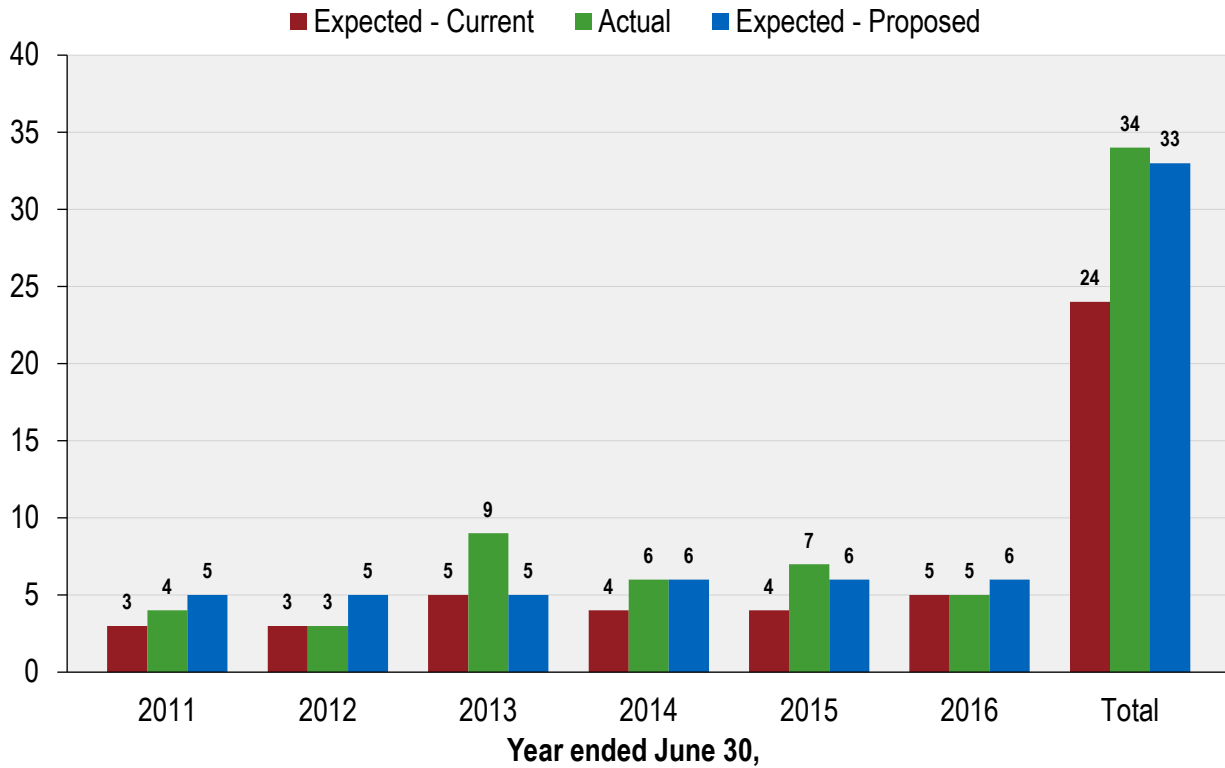
Chart 11 has the same comparison for Safety members. Experience shows that there were more deaths than predicted by the current table.

Chart 12 and 13 show the life expectancies under both the current and proposed tables for Miscellaneous and Safety, respectively.

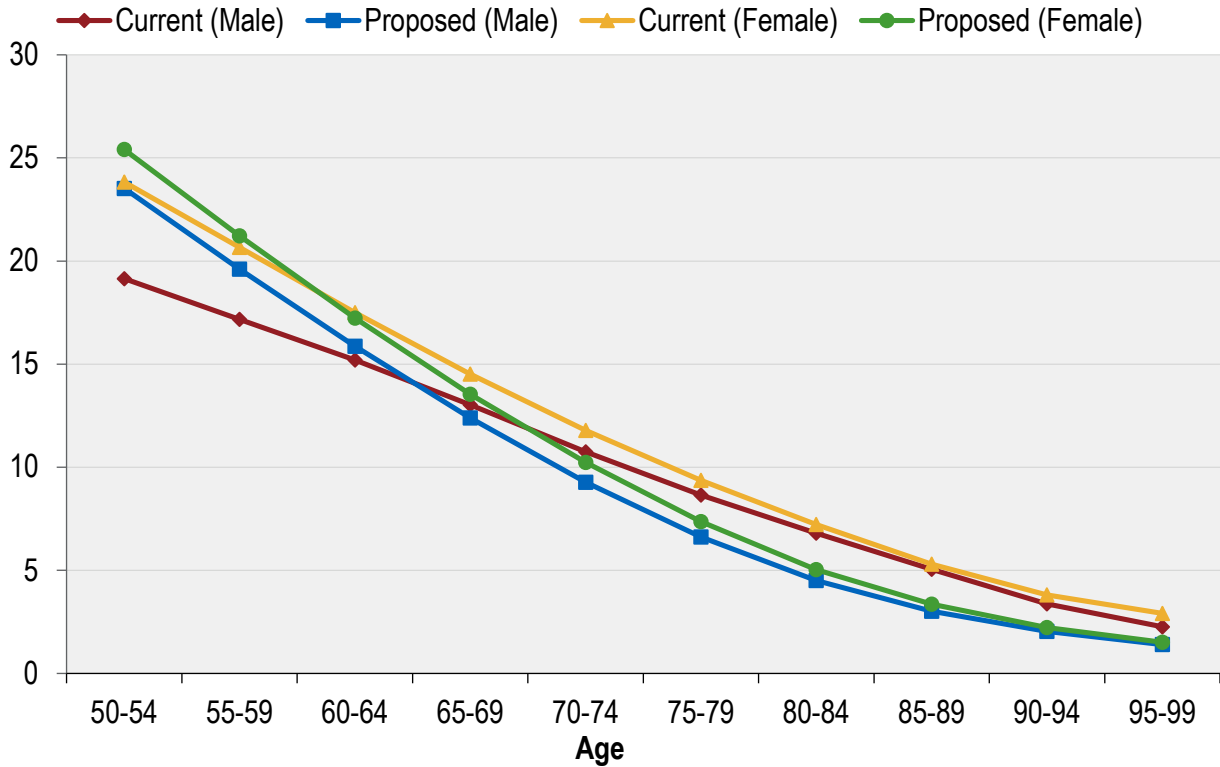
**CHART 10: POST-RETIREMENT DEATHS
MISCELLANEOUS - DISABLED MEMBERS**



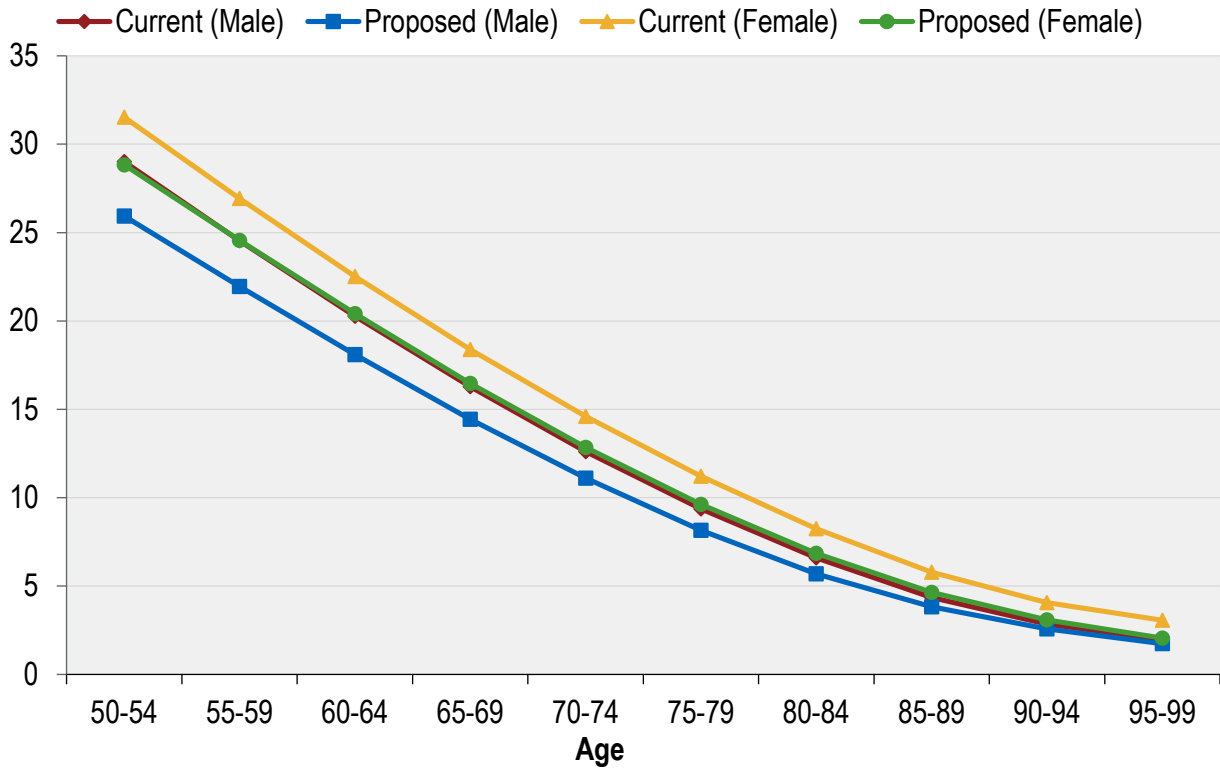
**CHART 11: POST-RETIREMENT DEATHS
SAFETY - DISABLED MEMBERS**



**CHART 12: LIFE EXPECTANCIES
MISCELLANEOUS - DISABLED MEMBERS**



**CHART 13: LIFE EXPECTANCIES
SAFETY - DISABLED MEMBERS**



D. Termination Rates

Termination rates include all terminations for reasons other than death, disability, or retirement. Under the current assumptions there is an overall incidence of termination assumed, combined with assumptions, based on the plan membership, refund election and years of service, that an terminated vested member will choose a deferred vested benefit or will choose a refund of contributions. 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 75% of Miscellaneous members and 50% of Safety members would elect a refund while the remaining 25% and 50% of Miscellaneous and Safety members, respectively, would elect a deferred retirement benefit. For members with over five years of service, it is anticipated under the current assumptions that 50% of Miscellaneous members and 20% of Safety members would elect a refund of contributions while the remaining 50% and 80% 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 separated between those members with under five years of service and those with five or more years of service is as follows:

Rates of Termination – Fewer than Five Years of Service

Years of Service	Termination Rate (%)					
	Miscellaneous			Safety		
	Current Rate	Observed Rate	Proposed Rate	Current Rate	Observed Rate	Proposed Rate
0 – 1	13.00	13.91	13.00	8.00	4.55	6.00
1 – 2	8.00	7.40	8.00	6.00	3.43	5.00
2 – 3	7.00	5.91	7.00	5.00	2.99	4.00
3 – 4	6.00	6.72	6.00	4.00	2.17	3.00
4 – 5	5.50	5.93	5.50	3.00	3.53	3.00

Rates of Termination – Five or More Years of Service

Age	Termination Rate (%)					
	Miscellaneous			Safety		
	Current Rate	Observed Rate	Proposed Rate	Current Rate	Observed Rate	Proposed Rate
20 – 24	5.00	0.00	5.50	2.50	0.00	2.50
25 – 29	5.00	5.26	5.50	2.50	2.50	2.50
30 – 34	4.50	5.38	5.00	2.50	1.91	2.00
35 – 39	4.00	4.05	4.00	2.00	0.87	1.50
40 – 44	3.00	2.68	3.00	1.75	0.59	1.25
45 – 49	2.50	2.00	2.50	1.50	0.76	1.00
50 – 54	2.00	3.69	2.40	1.50	0.00	1.00
55 – 59	1.75	3.28	2.30	1.50	3.33	1.00
60 – 64	1.00	3.94	2.20	1.50	0.00	1.00
65 – 69	1.00	11.28	1.00	0.00	0.00	0.00

Chart 14 compares actual to expected terminations of the past three years for both the current and proposed assumptions for Miscellaneous members and Safety members.

Chart 15 shows the current, along with the proposed withdrawal rates for Miscellaneous members with less than five years of service.

Chart 16 shows the same information as Chart 15, but for Safety members.

Chart 17 shows the current, along with the proposed termination rates for Miscellaneous members with five or more years of service.

Chart 18 shows the same information as Chart 17, but for Safety members.

Based upon the recent experience, we recommend slight adjustments to the withdrawal rates for Miscellaneous and Safety members.

Under the current withdrawal assumptions, for members with less than five years of service, it is anticipated under the current assumptions that 75% of Miscellaneous members and 50% of Safety members would elect a refund while the remaining 25% and 50% of Miscellaneous and Safety members, respectively, would elect a deferred retirement benefit. For members with over five years of service, it is anticipated under the current assumptions that 50% of Miscellaneous members and 20% of Safety members would elect a refund of contributions while the remaining 50% and 80% of Miscellaneous and Safety members, respectively, would elect a deferred retirement benefit.

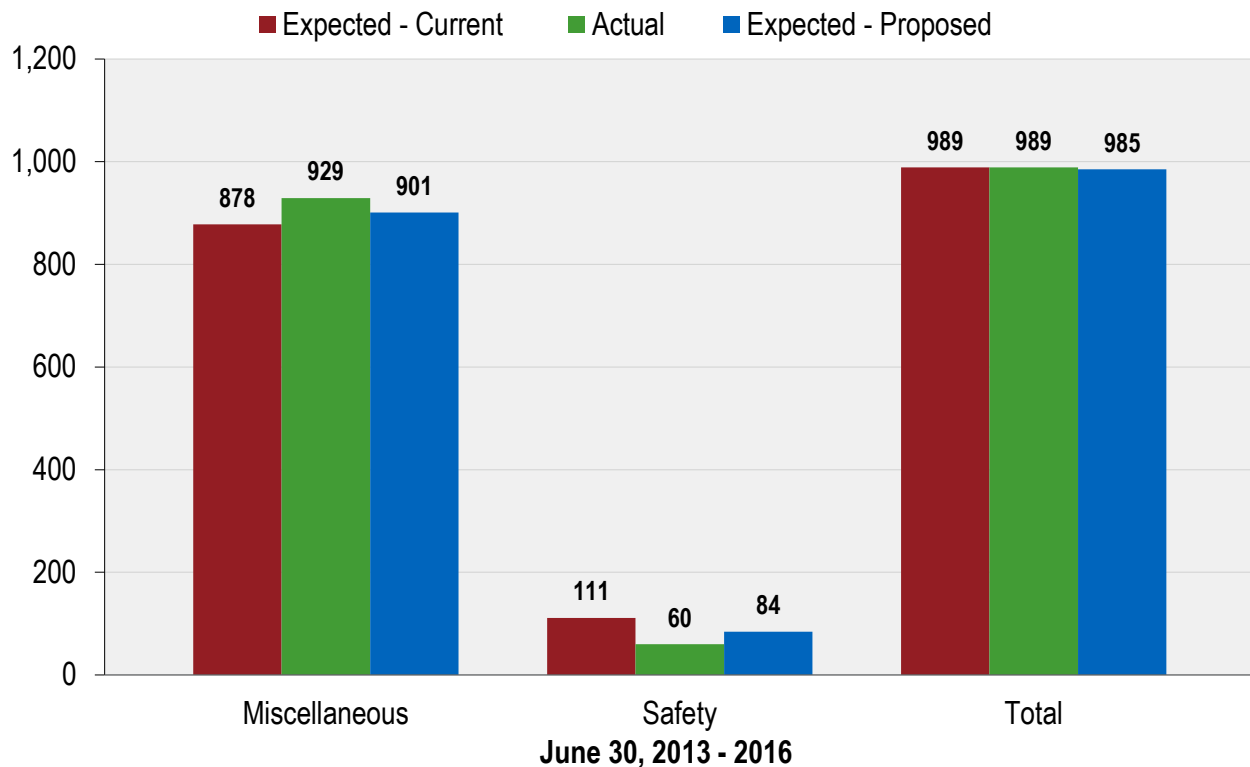
Because there is often a lag between when a member terminates employment and when that member makes an election to receive either a refund of contributions or a deferred retirement benefit, we tracked the election made by all members who terminated during 2013/2014 from the date of termination through the end of the experience study period (June 30, 2016) 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.

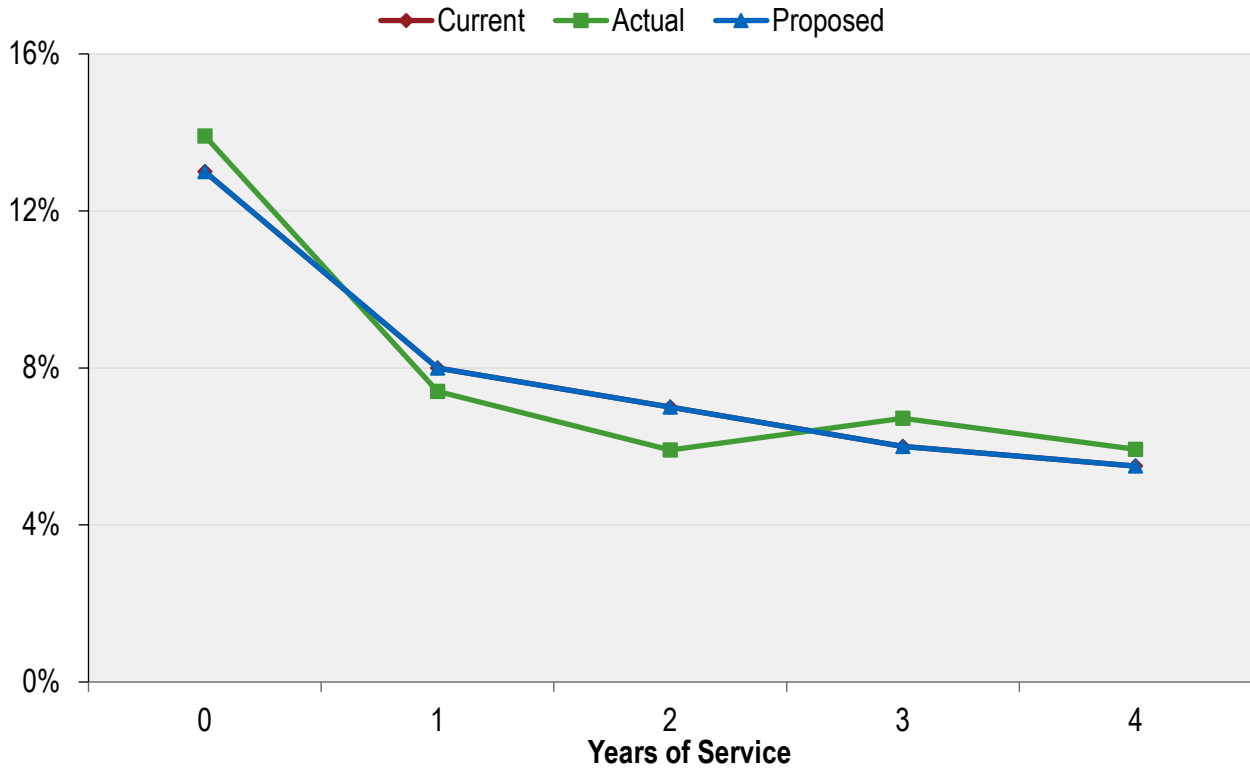
Election for Refund of Contributions						
	Members with Fewer than Five Years of Service			Members with Five or More Years of Service		
	Current Assumption	Observed Rate	Proposed Assumption	Current Assumption	Observed Rate	Proposed Assumption
Miscellaneous	75%	58%	65%	50%	25%	40%
Safety	50%	47%	50%	20%	9%	15%

We will also continue to assume that all termination rates are zero at any age where members are assumed to retire. That means that, at these ages, the members will either retire (and commence receiving a benefit) or continue working.

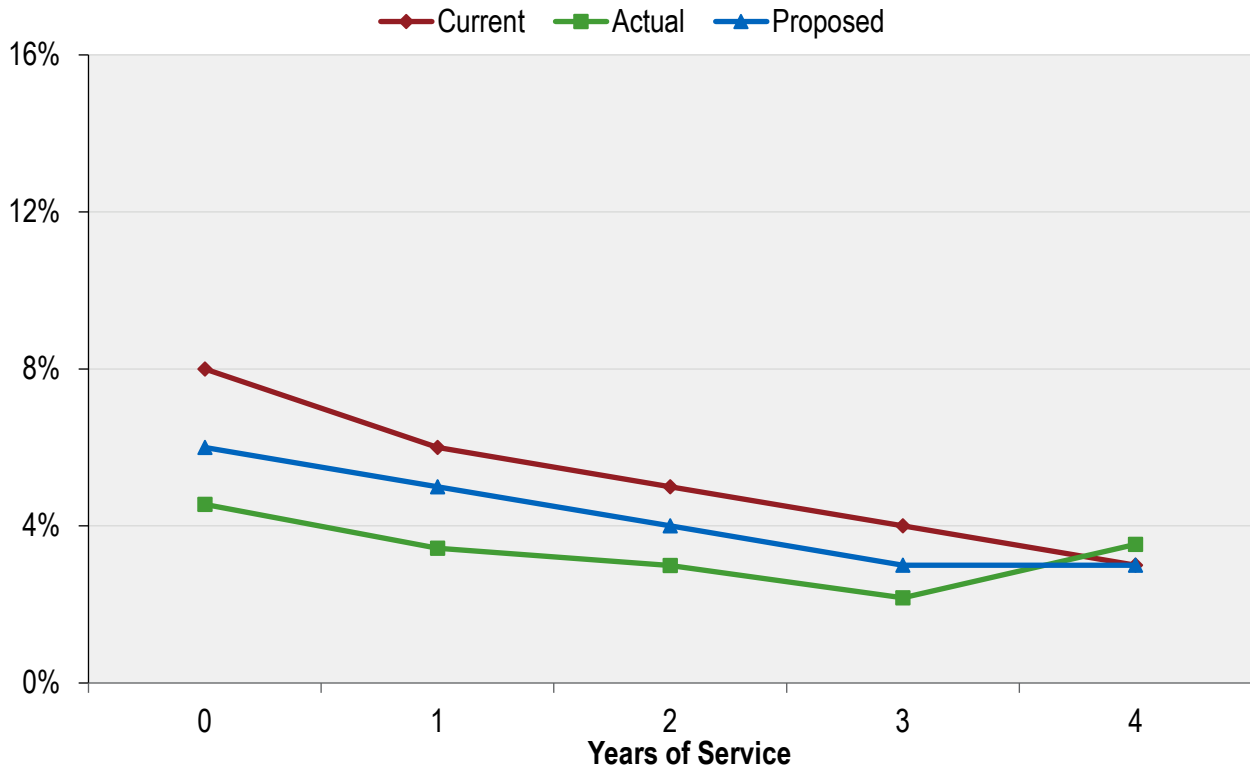
CHART 14: ACTUAL NUMBER OF TERMINATIONS COMPARED TO EXPECTED



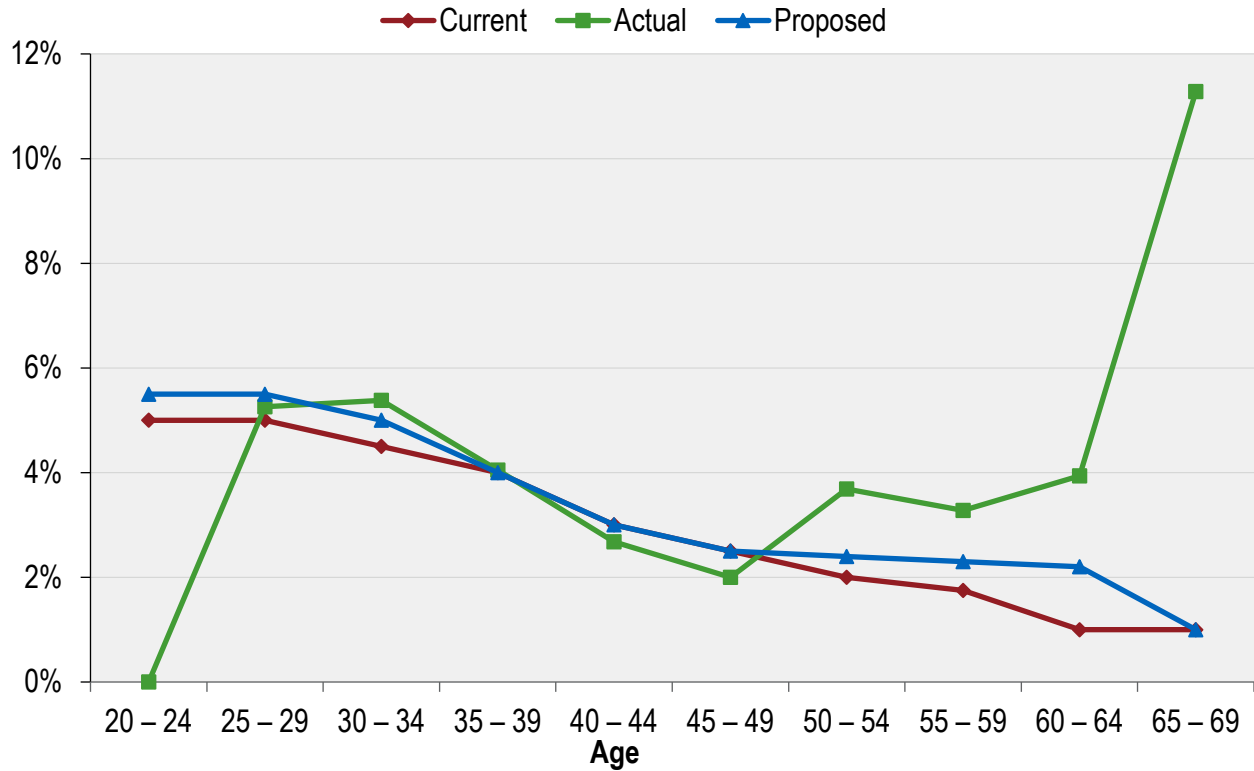
**CHART 15: TERMINATION RATES – MISCELLANEOUS
LESS THAN FIVE YEARS OF SERVICE**



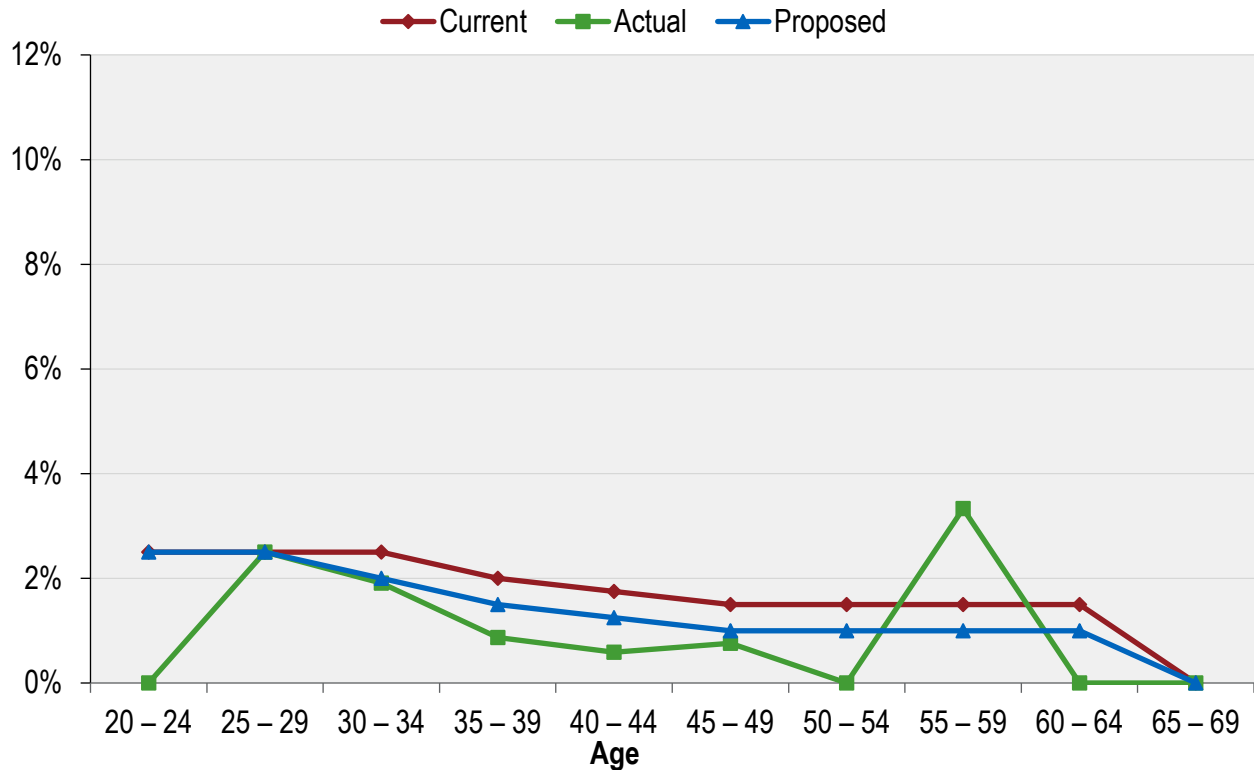
**CHART 16: TERMINATION RATES – SAFETY
LESS THAN FIVE YEARS OF SERVICE**



**CHART 17: TERMINATION RATES – MISCELLANEOUS
MORE THAN FIVE YEARS OF SERVICE**



**CHART 18: TERMINATION RATES – SAFETY
MORE THAN FIVE 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 both duty and non-duty disability incidence:

Rates of Disability Incidence

Age	Disability Incidence Rate (%)					
	Miscellaneous			Safety		
	Current Rate	Observed Rate	Proposed Rate	Current Rate	Observed Rate	Proposed Rate
20 – 24	0.00	0.00	0.00	0.10	0.00	0.10
25 – 29	0.02	0.00	0.02	0.10	0.00	0.10
30 – 34	0.04	0.00	0.04	0.20	0.14	0.20
35 – 39	0.06	0.00	0.06	0.30	0.53	0.40
40 – 44	0.10	0.10	0.10	0.55	0.22	0.45
45 – 49	0.20	0.13	0.15	0.65	0.49	0.55
50 – 54	0.30	0.24	0.25	0.90	0.88	0.90
55 – 59	0.40	0.41	0.40	1.50	0.35	1.00
60 – 64	0.60	0.41	0.50	2.50	1.10	1.50
65 – 69	1.10	0.41	1.00	0.00	0.00	0.00

Chart 19 compares the actual number of non-duty and duty disabilities over the past three years to that expected under both the current and proposed assumptions. The proposed disability rates were adjusted to reflect the past three years’ experience.

Chart 20 shows actual disablement rates, compared to the assumed and proposed rates for Miscellaneous members.

Since 35% of disabled Miscellaneous members received a duty disability, we recommend that the current 25% assumption used to anticipate duty disability retirement be increased to 30%. The remaining 70% of Miscellaneous disabled members will be assumed to receive a non-duty disability.

Chart 21 graphs the same information as Chart 20, but for Safety members.

Since 92% of disabled Safety members received a duty disability, we are continuing to recommend that the current 90% assumption be used to anticipate duty disability retirement. The remaining 10% of Safety disabled members are assumed to receive a non-duty disability.

CHART 19: ACTUAL NUMBER OF DISABILITIES COMPARED TO EXPECTED

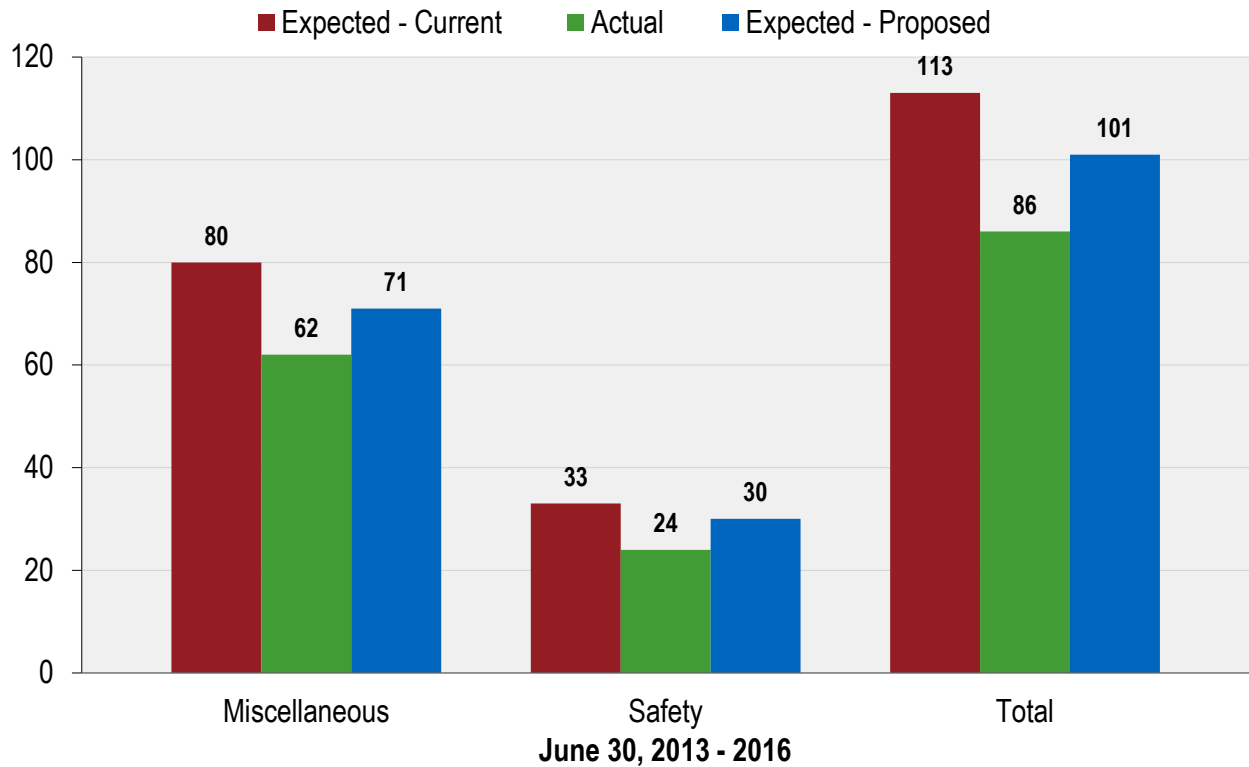
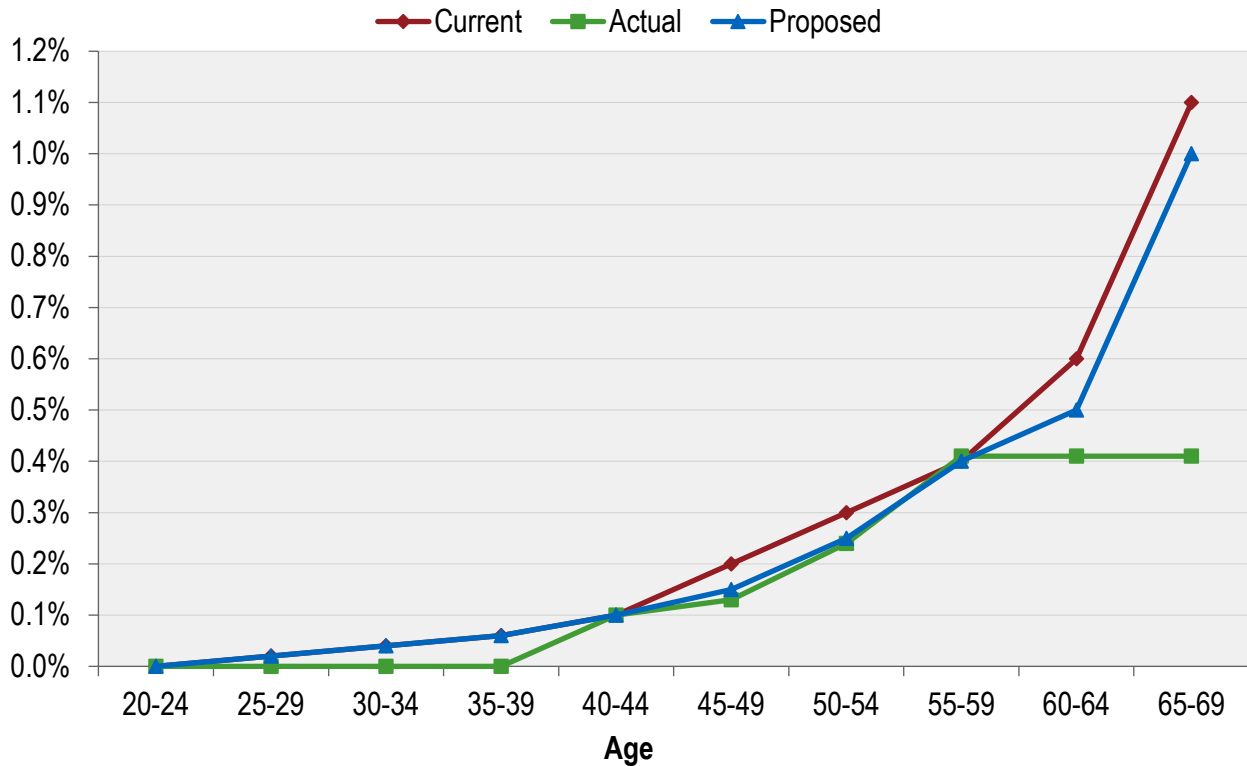
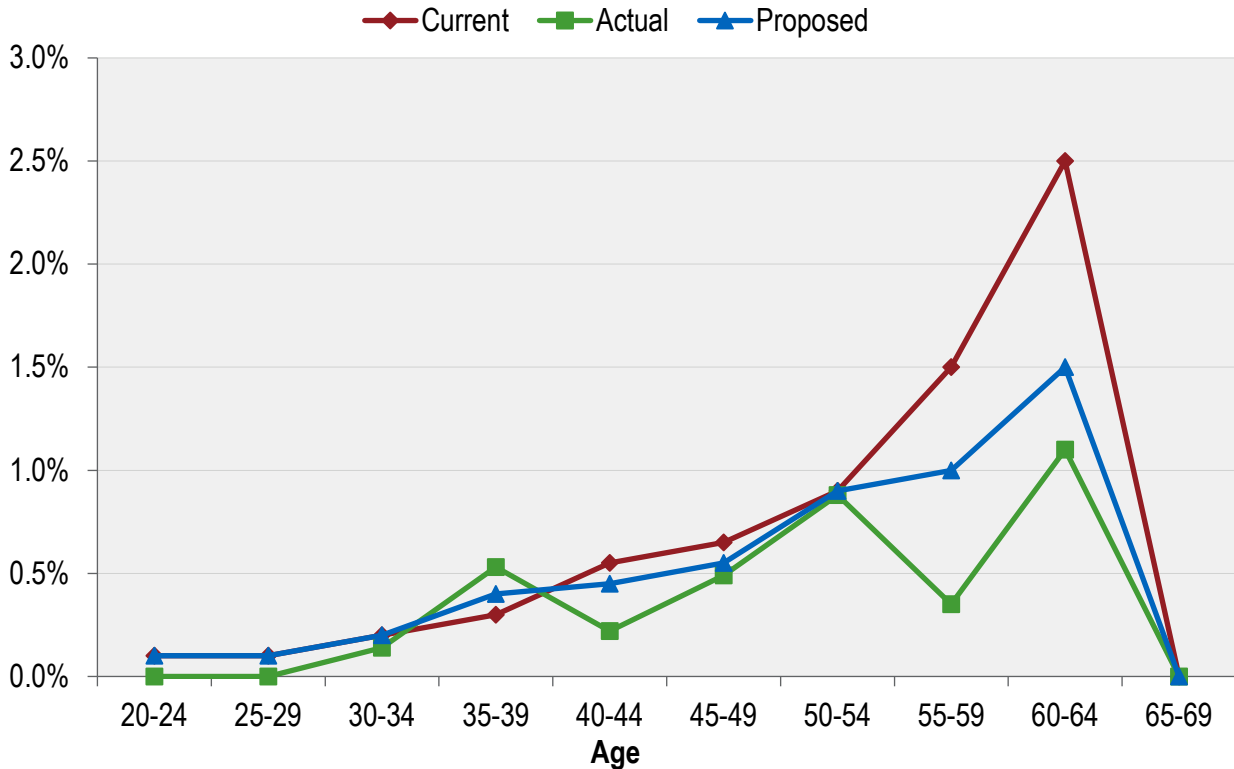


CHART 20: DISABILITY INCIDENCE RATES MISCELLANEOUS MEMBERS



**CHART 21: DISABILITY INCIDENCE RATES
SAFETY MEMBERS**



F. Service from Unused Sick Leave Conversion

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 including 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.

Miscellaneous New Retirees (Non-Disabled)			
Year of Retirement	Current Assumption	Actual Rate	Proposed Assumptions
2013 - 2016	1.50%	1.35%	1.50%

Safety New Retirees (Non-Disabled)			
Year of Retirement	Current Assumption	Actual Rate	Proposed Assumptions
2013 - 2016	2.25%	2.25%	2.25%

Miscellaneous New Retirees (Disabled)			
Year of Retirement	Current Assumption	Actual Rate*	Proposed Assumptions
2013 - 2016	0.00%	0.40%	0.25%

Safety New Retirees (Disabled)			
Year of Retirement	Current Assumption	Actual Rate	Proposed Assumptions
2013 - 2016	0.25%	0.14%	0.25%

* Actual rate of conversion was 0.16% during 2010-2013 and 0.02% during 2007-2010.

Based on this experience we recommend increasing the assumption for Miscellaneous new retirees (disabled) from 0.00% to 0.25% and maintaining the assumptions for all other groups of retirees.

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 an average entry age of all members in the Miscellaneous or the Safety plan.

Based on average age at entry of 34.8 and 28.7 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

The tables below show the changes in the employer and member contribution rates due to the proposed assumption changes as if they were applied to the June 30, 2016 actuarial valuation. 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.¹⁶

If all of the proposed assumption changes (both economic, including a 7.00% investment return assumption, and demographic) were implemented, the average employer rate would have increased by 7.63% of payroll. The average member rate would have increased by 1.79% of payroll. The UAAL would have increased by \$767 million while the funded percentage would have decreased from 87.3% to 80.7%.

Impact on Aggregate Employer Rates taking into account Proportion of Members in Legacy Tiers Paying 50:50 and Full Rates

Employer Contribution Rate Impact (% of Payroll)					
Contributions	Miscellaneous County	Miscellaneous Court	Miscellaneous District	Safety County	Combined
Normal Cost	1.57%	2.27%	2.20%	3.01%	1.96%
UAAL	4.23%	4.23%	4.10%	10.50%	5.67%
Total	5.80%	6.50%	6.30%	13.51%	7.63%

Employer Contribution Rate Impact* (Estimated Annual Dollar Amounts in Thousands)					
Contributions	Miscellaneous County	Miscellaneous Court	Miscellaneous District	Safety County	Combined
Total	\$37,185	\$3,077	\$1,842	\$28,798	\$70,902

* Based on June 30, 2016 projected annual payroll.

¹⁶ Starting in 2017/2018, most Miscellaneous County members and all Safety County members in the legacy tiers would be paying 50% of the total normal cost rates in their tiers. In addition, Miscellaneous members in one District would also be paying 50% of the total normal cost rates in their tiers. All remaining members would pay the full rate.

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

Member Contribution Rate Impact at Sample Entry Ages (Annual Amounts in Dollars)								
	Miscellaneous Tier 1 Full Rates				Safety Tier 1 Full Rates			
Entry Age	Current*	Proposed*	Difference	Annual Amount**	Current*	Proposed*	Difference	Annual Amount**
25	4.19%	4.88%	0.69%	\$526	15.26%	18.11%	2.85%	\$3,646
30	4.55%	5.22%	0.67%	\$514	16.30%	19.09%	2.79%	\$3,571
35	4.95%	5.61%	0.66%	\$503	17.48%	20.26%	2.78%	\$3,548
40	5.40%	6.04%	0.64%	\$492	18.96%	21.74%	2.78%	\$3,541
45	5.95%	6.54%	0.59%	\$153	19.80%	22.30%	2.50%	\$3,169

Member Contribution Rate Impact (Annual Amounts in Dollars)				
	Full Rates			
	Current	Proposed	Difference	Annual Amount**
Miscellaneous Tier 1	4.95%*	5.72%*	0.77%	\$587
Miscellaneous Tier 2	3.54%*	3.87%*	0.33%	\$222
Miscellaneous Tier 3	4.78%*	5.52%*	0.74%	\$539
Miscellaneous Tier 4	7.24%*	8.34%*	1.10%	\$778
Safety Tier 1	16.09%*	19.06%*	2.97%	\$3,803
Safety Tier 2	12.42%*	14.68%*	2.26%	\$2,447
Safety Tier 3	12.10%*	14.22%*	2.12%	\$1,967

* Member rates shown are for annual salary in excess of \$4,200 (or monthly salary of \$350). For annual salary less than \$4,200 (or monthly salary of \$350), the rates are equal to 2/3 of the rates shown.

** Based on average June 30, 2016 projected annual compensation for members in each respective tier.

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

Member Contribution Rate Impact (Annual Amounts in Dollars)				
	50:50 Rates			
	Current	Proposed	Difference	Annual Amount**
Miscellaneous Tier 1	8.03%*	9.44%*	1.41%	\$1,082
Miscellaneous Tier 2	7.27%*	8.43%*	1.16%	\$788
Miscellaneous Tier 3	9.30%*	10.90%*	1.60%	\$1,153
Miscellaneous Tier 4	8.67%*	10.24%*	1.57%	\$1,107
Miscellaneous Tier 5	7.93%	9.38%	1.45%	\$732
Safety Tier 1	18.42%*	21.84%*	3.42%	\$4,375
Safety Tier 2	16.30%*	19.53%*	3.23%	\$3,505
Safety Tier 3	15.45%*	18.35%*	2.90%	\$2,694
Safety Tier 4	13.14%	15.04%	1.90%	\$1,379

* Member rates shown are for annual salary in excess of \$4,200 (or monthly salary of \$350). For annual salary less than \$4,200 (or monthly salary of \$350), the rates are equal to 2/3 of the rates shown.

** Based on average June 30, 2016 projected annual compensation for members in each respective tier.

The total estimated annual dollar increase in member contributions is about \$17 million (or 1.79% of payroll).

Considered separately, the changes in economic assumptions accounted for about two-thirds of the overall cost impact to the plan. Of the various economic assumption changes, the most significant cost impact is from the investment return assumption change. Of the various demographic assumption changes, the most significant cost impact is from the mortality assumption change.

In particular, if only the proposed economic assumptions changes were implemented (as recommended in Section III of this report), including a 7.00% investment return assumption, the total (employer and member) normal cost rate would have increased by 2.64% of payroll and the UAAL amortization rate would have increased by 3.39% of payroll. Of the various economic assumption changes, the most significant cost impact is from the investment return assumption change.

Furthermore, if only the proposed demographic assumption changes were implemented (as recommended in Section IV of this report), the total (employer and member) normal cost rate would have increased by 1.11% of payroll and the UAAL amortization rate would have increased by 2.28% of payroll. Of the various demographic assumption changes, the most significant cost impact is from the mortality assumption change.

If a 7.25% investment return assumption were implemented instead of a 7.00% investment return assumption together with all the other recommended assumption changes in this report, the total (employer and member) normal cost rate would have increased by 2.25% of payroll and the UAAL amortization rate would have increased by 3.51% of payroll.

Appendix A: Current Actuarial Assumptions

Economic Assumptions

Net Investment Return:	7.50%, net of administration and investment expenses
Employee Contribution Crediting Rate:	3.25% (assumed rate of inflation); compounded semi-annually.
Cost-of-Living Adjustment for Retirees:	Miscellaneous and Safety Tier 1 benefits are assumed to increase at 3.25% 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 2.0% per year. Miscellaneous Tier 2 receive no COLA increases.
Payroll Growth:	Inflation of 3.25% per year plus real “across the board” salary increases of 0.25% per year.
Increase in Section 7522.10 Compensation Limit:	Increase of 3.25% per year from valuation date.

Salary Increases

Annual Rate of Compensation Increase (%)		
Inflation: 3.25%, plus “across the board” salary increases of 0.25% per year; plus the following merit and promotional increases.		
Years of Service	Miscellaneous	Safety
0 – 1	5.00	8.00
1 – 2	4.50	7.00
2 – 3	3.75	6.00
3 – 4	3.50	5.00
4 – 5	3.00	4.00
5 – 6	2.50	3.50
6 – 7	2.25	3.25
7 – 8	2.00	3.00
8 – 9	1.75	2.75
9 – 10	1.00	2.00
10 or More	1.00	1.75

Demographic Assumptions

Mortality Rates – Healthy

- **Miscellaneous Members and Beneficiaries:** RP-2000 Combined Healthy Mortality Table projected with scale BB to 2022

- **Safety Members:** RP-2000 Combined Healthy Mortality Table projected with scale BB to 2022 set back one year for males and set forward two years for females

Mortality Rates – Disabled

- **Miscellaneous Members:** RP-2000 Disabled Retiree Mortality Table projected with scale BB to 2022 with no age adjustment for males and set forward three years for females
- **Safety Members:** RP-2000 Combined Healthy Mortality Table projected with scale BB to 2022 set forward two years

Member Contribution Rates

- **Miscellaneous Members:** RP-2000 Combined Healthy Mortality Table projected with scale BB to 2022 weighted 40% male and 60% female
- **Safety Members:** RP-2000 Combined Healthy Mortality Table projected with scale BB to 2022 set back one year for males and set forward two years for females weighted 70% male and 30% female

The above mortality tables contain about a 10% margin, based on actual to expected deaths, as a provision appropriate to reasonably anticipate future mortality improvement, based on a review of mortality experience as of the measurement date.

Mortality Rates Before Retirement

Age	Rate (%)			
	Miscellaneous		Safety	
	Male	Female	Male	Female
25	0.04	0.02	0.04	0.02
30	0.04	0.02	0.04	0.03
35	0.07	0.04	0.07	0.05
40	0.10	0.07	0.10	0.08
45	0.14	0.11	0.13	0.12
50	0.20	0.16	0.19	0.19
55	0.34	0.24	0.30	0.30
60	0.58	0.41	0.52	0.51
65	0.98	0.74	0.88	0.93

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

Disability Incidence Rates

Age	Rate (%)	
	Miscellaneous ¹	Safety ²
20	0.00	0.10
25	0.01	0.10
30	0.03	0.16
35	0.05	0.26
40	0.08	0.45
45	0.16	0.61
50	0.26	0.80
55	0.36	1.26
60	0.52	2.10

¹ 25% of Miscellaneous disabilities are assumed to be duty disabilities. The other 75% are assumed to be non-duty disabilities.

² 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 Service¹

Years of Service	Rate (%)	
	Miscellaneous	Safety
0 - 1	13.00	8.00
1 - 2	8.00	6.00
2 – 3	7.00	5.00
3 – 4	6.00	4.00
4 – 5	5.50	3.00

¹ 75% of the Miscellaneous members and 50% of the Safety members are assumed to elect a refund of contribution balance while the remaining 25% and 50% of Miscellaneous and Safety members, respectively, are assumed to elect a deferred retirement benefit. No withdrawal is assumed after a member is assumed to retire.

Termination Rates –Five or More Years of Service¹

Age	Rate (%)	
	Miscellaneous	Safety
20	5.00	2.50
25	5.00	2.50
30	4.70	2.50
35	4.20	2.20
40	3.40	1.85
45	2.70	1.60
50	2.20	1.50
55	1.85	1.50
60	1.30	1.50
65	1.00	0.00

¹ 50% of the Miscellaneous members and 20% of the Safety members are assumed to elect a refund of contribution balance while the remaining 50% and 80% of Miscellaneous and Safety members, respectively, are assumed to elect a deferred retirement benefit. No withdrawal is assumed after a member is assumed to retire.

Retirement Rates

Age	Rate (%)			
	Miscellaneous			
	Tier 1	Tiers 2 and 3	Tier 4	Tier 5
45	0.00	0.00	0.00	0.00
46	0.00	0.00	0.00	0.00
47	0.00	0.00	0.00	0.00
48	0.00	0.00	0.00	0.00
49	0.00	0.00	0.00	0.00
50	6.00	2.00	2.00	0.00
51	4.00	2.00	2.00	0.00
52	4.00	2.00	2.00	4.00
53	4.00	3.00	2.00	1.50
54	7.00	4.00	3.00	2.50
55	10.00	6.00	4.00	3.50
56	15.00	6.00	5.00	4.50
57	16.00	8.00	6.00	5.50
58	18.00	12.00	7.00	6.50
59	22.00	14.00	8.00	7.50
60	28.00	14.00	9.00	8.50
61	30.00	14.00	10.00	9.50
62	35.00	25.00	18.00	17.00
63	35.00	30.00	16.00	15.00
64	40.00	35.00	20.00	19.00
65	50.00	40.00	25.00	24.00
66	45.00	45.00	20.00	20.00
67	45.00	45.00	20.00	20.00
68	50.00	50.00	30.00	30.00
69	60.00	60.00	40.00	40.00
70	100.00	100.00	100.00	100.00

Retirement Rates (continued)

Age	Rate (%)		
	Safety		
	Tiers 1 and 2	Tier 3	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	25.00	10.00	15.00
51	18.00	12.00	10.50
52	18.00	14.00	12.00
53	22.00	16.00	14.00
54	22.00	18.00	15.50
55	22.00	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	100.00	100.00	100.00
66	100.00	100.00	100.00
67	100.00	100.00	100.00
68	100.00	100.00	100.00
69	100.00	100.00	100.00
70	100.00	100.00	100.00

Retirement Age and Benefit for Deferred Vested Members:	<p>For deferred vested members, we make the following retirement assumption:</p> <p style="padding-left: 40px;">Miscellaneous Age: 59 Safety Age: 53</p> <p>We assume that 40% of future Miscellaneous and 50% of future Safety deferred vested members will continue to work for a reciprocal employer. For reciprocals, we assume 4.50% and 5.25% compensation increases per annum, respectively.</p>
Future Benefit Accruals:	1.0 year of service per year for the full-time employees. Continuation of current partial service accrual for part-time employees.
Unknown Data for Members:	Same as those exhibited by members with similar known characteristics. If not specified, members are assumed to be male.
Definition of Active Members:	All active members of SCERS as of the valuation date.
Form of Payment:	All members are assumed to elect the unmodified option at retirement.
Percent Married:	80% of male members and 55% of female members are assumed to be married at pre-retirement death or retirement.
Age of Spouse:	Female (or male) spouses are 3 years younger (or older) than their spouses.
Service From Unused Sick Leave Conversion:	<p>The following assumptions for service converted from unused sick leave as a percentage of service at retirement are used:</p> <p style="padding-left: 40px;">Service Retirements:</p> <p style="padding-left: 80px;">Miscellaneous: 1.50% Safety: 2.25%</p> <p style="padding-left: 40px;">Disability Retirements:</p> <p style="padding-left: 80px;">Miscellaneous: 0.00% Safety: 0.25%</p>

Appendix B: Proposed Actuarial Assumptions

Economic Assumptions

Net Investment Return:	7.00%, net of administration and investment expenses
Employee Contribution Crediting Rate:	3.00% (assumed rate of inflation); compounded semi-annually.
Cost-of-Living Adjustment for Retirees:	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 2.0% per year. Miscellaneous Tier 2 receive no COLA increases.
Payroll Growth:	Inflation 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 valuation date.

Salary Increases

Annual Rate of Compensation Increase (%)		
Inflation: 3.00%, plus “across the board” salary increases of 0.25% per year; plus the following merit and promotional increases.		
Years of Service	Miscellaneous	Safety
0 – 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 or More	1.25	2.00

Demographic Assumptions

Mortality Rates – Post-Retirement Healthy

- **Miscellaneous Members and 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 – Post-Retirement 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 times 50% projected generationally with the two-dimensional scale MP-2016

Member Contribution Rates

- **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

The RP-2014 mortality tables and adjustments as shown above reflect the mortality experience as of the measurement date. The generational projection is a provision for future mortality improvement.

Mortality Rates Before Retirement

Age	Rate (%)			
	Miscellaneous		Safety	
	Male	Female	Male	Female
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 are not reflected in the above mortality rates.
 All Miscellaneous pre-retirement deaths are assumed to be non-duty. For Safety, 50% pre-retirement deaths are assumed to be non-duty and the rest are assumed to be duty.*

Disability Incidence Rates

Age	Rate (%)	
	Miscellaneous ¹	Safety ²
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

¹ 30% of Miscellaneous disabilities are assumed to be duty disabilities. The other 70% are assumed to be non-duty disabilities.

² 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 Service¹

Years of Service	Rate (%)	
	Miscellaneous	Safety
0 - 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

¹ 65% of the Miscellaneous members and 50% of the Safety members are assumed to elect a refund of contribution balance while the remaining 35% and 50% of Miscellaneous and Safety members, respectively, are assumed to elect a deferred retirement benefit. No withdrawal is assumed after a member is assumed to retire.

Termination Rates –Five or More Years of Service¹

Age	Rate (%)	
	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

¹ 40% of the Miscellaneous members and 15% of the Safety members are assumed to elect a refund of contribution balance while the remaining 60% and 85% of Miscellaneous and Safety members, respectively, are assumed to elect a deferred retirement benefit. No withdrawal is assumed after a member is assumed to retire.

Retirement Rates

Rate (%)				
Miscellaneous				
Age	Tier 1	Tiers 2 and 3	Tier 4	Tier 5
45	0.00	0.00	0.00	0.00
46	0.00	0.00	0.00	0.00
47	0.00	0.00	0.00	0.00
48	0.00	0.00	0.00	0.00
49	0.00	0.00	0.00	0.00
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	100.00	100.00	100.00	100.00

Retirement Rates (continued)

Age	Rate (%)		
	Safety		
	Tiers 1 and 2	Tier 3	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	100.00	100.00	100.00
66	100.00	100.00	100.00
67	100.00	100.00	100.00
68	100.00	100.00	100.00
69	100.00	100.00	100.00
70	100.00	100.00	100.00

Retirement Age and Benefit for Deferred Vested Members:	<p>For deferred vested members, we make the following retirement assumption:</p> <p style="padding-left: 40px;">Miscellaneous Age: 59 Safety Age: 53</p> <p>We assume that 35% of future Miscellaneous and 45% of future Safety deferred vested members will continue to work for a reciprocal employer. For reciprocals, we assume 4.50% and 5.25% compensation increases per annum, respectively.</p>
Future Benefit Accruals:	1.0 year of service per year for the full-time employees. Continuation of current partial service accrual for part-time employees.
Unknown Data for Members:	Same as those exhibited by members with similar known characteristics. If not specified, members are assumed to be male.
Definition of Active Members:	All active members of SCERS as of the valuation date.
Form of Payment:	All members are assumed to elect the unmodified option at retirement.
Percent Married:	80% of male members and 55% of female members are assumed to be married at pre-retirement death or retirement.
Age of Spouse:	Female spouses are 3 years younger than their spouses. Male spouses are 2 years older than their spouses.
Service From Unused Sick Leave Conversion:	<p>The following assumptions for service converted from unused sick leave as a percentage of service at retirement are used:</p> <p style="padding-left: 40px;">Service Retirements:</p> <p style="padding-left: 80px;">Miscellaneous: 1.50% Safety: 2.25%</p> <p style="padding-left: 40px;">Disability Retirements:</p> <p style="padding-left: 80px;">Miscellaneous: 0.25% Safety: 0.25%</p>