



# Sonoma County Employees' Retirement Association

## ACTUARIAL EXPERIENCE STUDY

Analysis of Actuarial Experience  
During the Period  
January 1, 2015 through December 31, 2017



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

September 25, 2018

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

**Re: Review of Actuarial Assumptions for the December 31, 2018 Actuarial Valuation**

Dear Members of the Board:

We are pleased to submit this report of our review of the actuarial experience for the Sonoma County Employees' Retirement Association. This study utilizes the census data for the period January 1, 2015 to December 31, 2017 and provides the proposed actuarial assumptions, both economic and demographic, to be used in the December 31, 2018 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".

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

A handwritten signature in black ink, appearing to read "Andy Yeung".

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

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# I. Introduction, Summary, and Recommendations

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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 January 1, 2015 through December 31, 2017. 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 inflation, investment return, promotional and merit salary increases, retirement from active employment, retirement age for deferred vested members, percent of members assumed to go on to work for a reciprocal system, reciprocal salary increases, pre-retirement mortality, healthy life post-retirement mortality, disabled life post-retirement mortality, termination (refund and deferred vested retirement), disability (service and non-service connected), and cashouts.

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

Pg #	Actuarial Assumption Categories	Recommendation
7	<p><b>Inflation:</b> Future increases in the Consumer Price Index (CPI) which drives investment returns and active member salary increases.</p>	<p>Reduce the inflation assumption from 3.00% to 2.75% per annum as discussed in Section (III)(A).</p>
8	<p><b>Investment Return:</b> The estimated average net rate of return on current and future assets of the Association as of the valuation date. This rate is used to discount liabilities.</p>	<p>Reduce the investment return assumption from 7.25% to 7.00% per annum as discussed in Section (III)(B).</p>
14	<p><b>Individual Salary Increases:</b> 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"> <li>• Inflationary salary increases</li> <li>• Real “across the board” salary increases</li> <li>• Promotional and merit increases</li> </ul>	<p>Reduce the current inflationary salary increase assumption from 3.00% to 2.75% and maintain the current real “across the board” salary increase assumption at 0.50%. This means that the combined inflationary and real “across the board” salary increases will decrease from 3.50% to 3.25%.</p> <p>Change the promotional and merit increases to those developed in Section (III)(C). Future promotional and merit salary increases are slightly higher for General and Safety members at most years of service under the proposed assumption.</p>
20	<p><b>Retirement Rates:</b> The probability of retirement at each age at which participants are eligible to retire.</p> <p><b>Other Retirement Related Assumptions including:</b></p> <ul style="list-style-type: none"> <li>• Retirement age for inactive vested members</li> <li>• Future reciprocal members and reciprocal salary increases</li> <li>• Percent married and spousal age differences for members not yet retired</li> </ul>	<p>For active members, adjust the current retirement rates to those developed in Section (IV)(A). For both non-PEPRA General and Safety members, at most ages, reduce retirement assumptions for those with less than 30 years of service and for those with 30 or more years of service. For PEPRA General and Safety members, reduce retirement assumptions at most ages.</p> <p>For inactive vested members, maintain the assumed retirement age at 58 for General members and increase the assumed retirement age from 52 to 53 for Safety members.</p> <p>Reduce the current proportion of future terminated members expected to be covered by a reciprocal system to 25% for General members and 40% for Safety members. In addition, reduce the current reciprocal salary increase assumption to 3.75% for General members and maintain the current reciprocal salary increase assumption of 4.00% for Safety members.</p> <p>For active and inactive vested members, maintain the percent married at retirement assumption at 70% for males and 55% for females. Maintain the spouse age difference assumption of male retirees are four years older than their spouses and female retirees are two years younger than their spouses.</p>



Pg #	Actuarial Assumption Categories	Recommendation
50	<b>Cashouts:</b> Additional pay elements that are expected to be received during the member's final average earnings period.	Maintain the current cashout assumptions for General Plan A Court members, and decrease the current cashout assumptions for General and Safety Plan A Valley of the Moon members to those developed in Section (IV)(F).

We have estimated the impact of proposed assumption changes as if they were applied to the December 31, 2017 actuarial valuation. In particular, if all of the proposed economic assumption changes (as recommended in Section III of this report) were implemented, the average employer rate would have increased by 1.94% of payroll and the average member rate would have increased by 0.48% of payroll. Of the various economic assumption changes, the most significant cost impact is from the investment return assumption change.

Furthermore, if all of the proposed demographic assumption changes (as recommended in Section IV of this report) were implemented, the average employer rate would have decreased by 0.58% of payroll. The average member rate would have decreased by 0.01% of payroll.

Finally, the estimated cost impact of all proposed assumption changes (both economic and demographic) is 1.36% of payroll for the average employer rate, where the Normal Cost rate increased by 0.79% and the UAAL amortization rate increased by 0.57%. The average member rate would have increased by 0.47% of 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

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

### Economic Assumptions

Economic assumptions consist of:

- **Inflation:** Increases in the price of goods and services. The inflation assumption reflects the basic return that investors expect from securities markets. It also reflects the expected basic salary increase for active employees.
- **Investment Return:** Expected long-term rate of return on the Association’s investments after administrative and investment expenses. This assumption has a significant impact on contribution rates.
- **Salary Increases:** In addition to inflationary increases, it is assumed that salaries will also grow by “across the board” real 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 promotional and merit increases. Payments to amortize any Unfunded Actuarial Accrued Liability (UAAL) are assumed to increase each year by the price inflation rate plus any “across the board” real 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 terminate during the year, we would say the probability of termination in that age group is  $50 \div 500$  or 10%.

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



probability of termination developed for that age category, especially if it is out of line with the pattern shown for the other age groups. Similarly, if we are considering the death decrement, there may be a large number of exposures in, say, the age 20-24 category, but very few decrements (actual deaths); therefore, we would not be able to rely heavily on the probability 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 2017<sup>1</sup> (U.S. City Average - All Urban Consumers)

	25 <sup>th</sup> Percentile	Median	75 <sup>th</sup> Percentile
15-year moving averages	2.4%	3.4%	4.5%
30-year moving averages	3.0%	3.8%	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 178 large public retirement funds<sup>2</sup> in their 2017 fiscal year valuations was 2.75%. In California, CalSTRS and six other 1937 Act CERL systems use an inflation assumption of 2.75%, one other 1937 Act CERL system uses an inflation assumption of 2.90% and two 1937 Act CERL systems use an inflation assumption of 2.50%. CalPERS’ recent experience study recommends 2.50%, and eleven other 1937 Act CERL systems use an inflation assumption of 3.00%.

SCERA’s investment consultant, Aon Hewitt (Aon), anticipates an annual inflation rate of 2.30%, while the average inflation assumption provided by Aon and six other investment advisory firms retained by Segal’s California public sector clients was 2.39%. Note that, in general, investment consultants use a time horizon<sup>3</sup> for this assumption that is shorter than the time horizon of the actuarial valuation.

<sup>1</sup> Source: Bureau of Labor Statistics – Based on CPI for All items in U.S. city average, all urban consumers, not seasonally adjusted (Series Id: CUUR0000SA0)

<sup>2</sup> Among 178 large public retirement funds, the inflation assumption was not available for 19 of the public retirement funds in the survey data.

<sup>3</sup> The time horizon used by the seven investment consultants included in our review generally ranges from 10 years to 30 years and Aon uses 10 years or 30 years depending on the asset class.

To find a forecast of inflation based on a longer time horizon, we referred to the 2018 report on the financial status of the Social Security program.<sup>4</sup> 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%. Besides projecting the results under the intermediate cost assumptions using an inflation assumption of 2.60%, alternative projections were also made using a lower and a higher inflation assumption of 2.00% and 3.20%, respectively.

We also compared the yields on the thirty-year inflation indexed U.S. Treasury bonds to comparable traditional U.S. Treasury bonds.<sup>5</sup> As of August 2018, the difference in yields is about 2.12%, which provides a measure of market expectations of inflation.

**Based on all of the above information, we recommend that the current 3.00% annual inflation assumption be reduced to 2.75% for the December 31, 2018 actuarial valuation.**

The setting of the inflation assumption using the information outlined above is a somewhat subjective process, and Segal does not apply a specific weight to each of the metrics in determining our recommended inflation assumption. Based on a consideration of all these metrics, we have recently been recommending the same 2.75% inflation assumption in our experience studies for our California based public retirement system clients. As discussed on the previous page of this report, several large California public retirement systems have recently adopted a 2.75% inflation assumption in their valuations, including six county retirement systems.

## **B. Investment Return**

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

### **Real Rate of Investment Return**

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

The following is SCERA's current target asset allocation and the assumed real rate of return assumptions by asset class. The first column of real rate of return assumptions are determined by reducing Aon's total or "nominal" 2018 return assumptions by their assumed 2.30% inflation rate. The second column of returns (except for Farmland, Unconstrained Bonds, and Infrastructure) represents the average of a sample of real rate of return assumptions. The sample includes the expected annual real rate of return provided to us by Aon and six other investment

<sup>4</sup> Source: Social Security Administration – The 2018 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds

<sup>5</sup> Source: Board of Governors of the Federal Reserve System

advisory firms retained by Segal’s public sector clients. We believe these averages are a reasonable consensus forecast of long-term future market returns in excess of inflation.

**SCERA’S TARGET ASSET ALLOCATION AND ASSUMED ARITHMETIC REAL RATE OF RETURN ASSUMPTIONS BY ASSET CLASS AND FOR THE PORTFOLIO**

Asset Class	Percentage of Portfolio	Aon’s Assumed Real Rate of Return <sup>6</sup>	Average Assumed Real Rate of Return from a Sample of Consultants to Segal’s California Public Sector Clients <sup>7</sup>
Large Cap Equity	17.97%	5.99%	5.34%
Small Cap Equity	5.45%	7.72%	6.08%
Developed International Equity	16.71%	7.60%	6.80%
Global Equity	15.55%	7.39%	6.44%
Emerging Market Equity	5.57%	9.68%	8.75%
Core Bonds	14.75%	1.61%	1.12%
Bank Loan	3.00%	4.38%	3.55%
Real Estate	10.00%	4.80%	4.58%
Farmland	5.00%	6.81%	6.81% <sup>8</sup>
Unconstrained Bonds	3.00%	3.22%	3.22% <sup>9</sup>
Infrastructure	3.00%	6.70%	6.70% <sup>9</sup>
<b>Total</b>	<b>100.00%</b>	<b>5.94%</b>	<b>5.28%</b>

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

<sup>6</sup> The rates shown below have been estimated by Segal by taking Aon’s net-of-fee geometric return assumptions for each asset class and increasing by the estimated investment fees for that asset class, as provided by SCERA and Aon. These gross-of-fee geometric returns were then translated to an estimated arithmetic return using Aon’s volatility for the respective asset classes. Lastly, the returns were reduced by Aon’s assumed 2.30% inflation rate to develop the assumed real rate of return.

<sup>7</sup> These are based on the projected arithmetic returns provided by Aon and six other investment advisory firms serving the county retirement system of Sonoma and 16 other city and county retirement systems in California. These return assumptions are gross of any applicable investment expenses.

<sup>8</sup> For these asset classes, Aon’s assumptions are applied in lieu of the average because there is a larger disparity in returns for these asset classes among the firms surveyed and using Aon’s assumptions should more closely reflect the underlying investments made specifically for SCERA.

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 SCERA's investment return assumption to reflect a broader range of capital market information and should help reduce year to year volatility in the investment return assumption.
3. Therefore, we recommend that the 5.28% portfolio real rate of return be used to determine SCERA's investment return assumption. This is 0.16% higher than the return that was used three years ago in the review of the recommended investment return assumption for the December 31, 2015 valuation. The difference is due to changes in SCERA's target asset allocation (+0.19%), changes in the real rate of return assumptions provided to us by the investment advisory firms (+0.11%) and the interaction effect between these changes (-0.14%).

### Association Expenses

For funding purposes, the real rate of return assumption for the portfolio needs to be adjusted for investment and administrative expenses expected to be paid from investment income. The following table provides these expenses in relation to the actuarial value of assets for the five years ending December 31, 2017.

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

Year Ending December 31	Actuarial Value of Assets <sup>9</sup>	Administrative and Other Expenses	Investment Expenses <sup>10</sup>	Administrative %	Investment %	Total %
2013	\$2,016,781	\$3,850	\$11,710	0.19	0.58	0.77
2014	2,167,210	3,590	12,667	0.17	0.58	0.75
2015	2,289,057	3,526	13,304	0.15	0.58	0.73
2016	2,399,171	4,219	13,622	0.18	0.57	0.75
2017	2,557,299	3,732	15,872	0.15	0.62	0.77
<b>Five-Year Average</b>				<b>0.17</b>	<b>0.58</b>	<b>0.75</b>
<b>Recommendation</b>						<b>0.75</b>

**The average expense percentage over this five-year period is 0.75% Based on this experience, we have maintained the future expense assumption component of 0.75% 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

<sup>9</sup> As of end of plan year.

<sup>10</sup> 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.

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.”

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.

We do not believe that such a review would have a very significant impact on the recommended investment return assumption developed using the above expense assumption. For now, we will continue to use the current approach that any “alpha” that may be identified would be treated as an increase in the risk adjustment and corresponding confidence level. For example, 0.25% of alpha would increase the confidence level by 3% (see discussions that follow on definitions of risk adjustment and confidence level).

## Risk Adjustment

The real rate of return assumption for the portfolio is adjusted to reflect the potential risk of shortfalls in the return assumptions. SCERA’s asset allocation determines this portfolio risk, since risk levels are driven by the variability of returns for the various asset classes and the correlation of returns among those asset classes. This portfolio risk is incorporated into the real rate of return assumption through a risk adjustment.

The purpose of the risk adjustment (as measured by the corresponding confidence level) is to increase the likelihood of achieving the actuarial investment return assumption in the long term.<sup>11</sup> This is consistent with our experience that retirement plan fiduciaries would generally prefer that returns exceed the assumed rate more often than not.

The 5.28% expected real rate of return developed earlier in this report was based on expected mean or average arithmetic returns. In our model, the confidence level associated with a particular risk adjustment represents the likelihood that future investment earnings would equal or exceed the assumed earnings over a 15-year period on an expected value basis.<sup>12</sup> 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 actual earnings over 15 years will be equal to or greater than the expected earnings. The 15-year time horizon represents an approximation of the “duration” of the fund’s liabilities, where the duration of a liability represents the sensitivity of that liability to interest rate variations. Note that, based on the investment return assumptions recently adopted by systems that have been analyzed under this model, we observe a confidence level generally in the range of 50% to 60%.

Three years ago, the Board adopted an investment return assumption of 7.25%. That return implied a risk adjustment of 0.12%, reflecting a confidence level of 51% that the actual average

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<sup>11</sup> This type of risk adjustment is sometimes referred to as a “margin for adverse deviation.”

<sup>12</sup> If a retirement system uses the expected arithmetic average return as the discount rate in the funding valuation, that retirement system is expected to have no surplus or asset shortfall relative to its expected obligations assuming all actuarial assumptions are met in the future.

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.<sup>13</sup>

If we use the same 51% confidence level from our last study to set this year’s risk adjustment, based on the current long-term portfolio standard deviation of 12.35% provided by Aon, the corresponding risk adjustment would be 0.12%. Together with the other investment return components, this would result in an investment return assumption of 7.16%, which is lower than the current assumption of 7.25%.

Based on the general practice of using one-quarter percentage point increments for economic assumptions, we evaluated the effect on the confidence level of other alternative investment return assumptions. In particular, a net investment return assumption of 7.00%, together with the other investment return components, would produce a risk adjustment of 0.28% which corresponds to a confidence level of 53%. The current net investment return assumption of 7.25% would have a risk adjustment of 0.03% which corresponds to a confidence level of slightly above 50%.

The table below shows SCERA’s recommended investment return assumption, the risk adjustment and confidence level compared to the historical values for prior studies. Note that the recommended confidence level of 53% is somewhat higher than the confidence level adopted by the Board for the 2012-2014 and 2015-2017 valuations.

**HISTORICAL INVESTMENT RETURN ASSUMPTIONS, RISK ADJUSTMENTS AND CONFIDENCE LEVELS BASED ON ASSUMPTIONS ADOPTED BY THE BOARD**

<b>Years Ending December 31</b>	<b>Investment Return</b>	<b>Risk Adjustment</b>	<b>Corresponding Confidence Level</b>
2010 - 2011	7.75%	0.41%	54%
2012 - 2014	7.50%	0.13%	51%
2015 - 2017	7.25%	0.12%	51%
2018 (Recommended)	7.00%	0.28%	53%

As we have discussed in prior experience studies, the risk adjustment model and associated confidence level is most useful as a means for comparing how SCERA has positioned itself relative to risk over periods of time.<sup>14</sup> The use of a 53% 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 Aon. The standard deviation is a statistical measure of the future

<sup>13</sup> Based on an annual portfolio return standard deviation of 12.38% provided by Aon in 2015. 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.

<sup>14</sup> 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.”

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 53% 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.
- As with any model, the results of the risk adjustment model should be evaluated for reasonableness and consistency. This is discussed in the later section on “Comparison with Other Public Retirement Systems”.

Taking into account the factors above, our recommendation is to reduce the net investment return assumption from 7.25% to 7.00%. As noted above, this return implies a 0.28% risk adjustment, reflecting a confidence level of 53% that the actual average return over 15 years would not fall below the assumed return.

### 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.

	Recommended Value	Adopted Value
Assumption Component	December 31, 2018	December 31, 2015
Inflation	2.75%	3.00%
Plus Average Real Rate of Return	5.28%	5.12%
Minus Expense Adjustment	(0.75%)	(0.75%)
Minus Risk Adjustment	(0.28%)	(0.12%)
<b>Total</b>	<b>7.00%</b>	<b>7.25%</b>
<b>Confidence Level</b>	<b>53%</b>	<b>51%</b>

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

### 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, seven County employees’ retirement systems (Contra Costa, Fresno, Marin, Mendocino, Orange, Sacramento, and Santa Barbara) use a 7.00% earnings assumption. Furthermore, the CalPERS Board has approved a reduction in the earnings assumption to 7.00%. In addition, CalSTRS recently adopted a 7.00% earnings assumption for the 2017 valuation. With the exception of the retirement systems stated above, most of the public sector retirement systems in California are using a 7.25% earnings assumption.



The following table compares SCERA’s recommended net investment return assumption against those of the 178 large public retirement funds<sup>15</sup> in their 2017 fiscal year valuations based on information found in the Public Plans Data website, which is produced in partnership with the NASRA:

Assumption	SCERA	Public Plans Data <sup>16</sup>		
		Low	Median	High
Net Investment Return	7.00%	5.25%	7.50%	8.50%

The detailed data shows that more than two-thirds of the systems have an investment return assumption in the range of 6.75% to 7.50%, and a little less than one-half of those systems (or about one-third overall) have used an assumption of 7.50%. Also, about one-third of the systems 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. The recommended assumption of 7.00% provides for a risk margin within the risk adjustment model and is consistent with SCERA’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 below.

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

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

**As discussed earlier in this report, we are recommending that the assumed rate of inflation be reduced from 3.00% to 2.75% per annum. This inflation component is used as part of the salary increase assumption.**

2. **Real “Across the Board” Pay Increases:** These increases are typically termed productivity increases since they are considered to be derived from the ability of an organization or an economy to produce goods and services in a more efficient manner. As

<sup>15</sup> Among 178 large public retirement funds, the investment return assumption was not available for 13 of the public retirement funds in the survey data.

<sup>16</sup> Public Plans Data website – Produced in partnership with the National Association of State Retirement Administrators (NASRA)

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% - 0.8% annually during the last ten to twenty years.

We also referred to the annual report on the financial status of the Social Security program published in June 2018. 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, which is not necessarily based on individual plan experience. However, recent salary experience with public systems in California as well as anecdotal discussions with plans and plan sponsors indicate lower future real wage growth expectations for public sector employees. We note that for SCERA’s active members, the actual average inflation plus “across the board” increase (i.e., wage inflation) over the three-year period ending December 31, 2017 was 3.01% for General and Safety members combined, which is slightly higher than the change in CPI of 2.95% during that same period:

Valuation Date	Actual Average Increase <sup>17</sup>	Actual Change in CPI <sup>18</sup>
December 31, 2015	1.30%	2.61%
December 31, 2016	3.85%	3.01%
December 31, 2017	3.88%	3.22%
<b>Five-Year Average</b>	<b>3.01%</b>	<b>2.95%</b>

**Considering these factors, we recommend maintaining the real “across the board” salary increase assumption at 0.50%. This means that the combined inflation and “across the board” salary increase assumption will decrease from 3.50% to 3.25%.**

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

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

- a. Measuring each continuing member’s actual salary increase over each year of the experience period on a salary-weighted basis, with higher weights assigned to experience from members with larger salaries;
- b. Categorizing these increases according to member demographics;

<sup>17</sup> 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.

<sup>18</sup> Based on the change in Annual CPI for the San Francisco-Oakland-Hayward Area compared to the prior year.

- c. Removing the wage inflation component from these increases (assumed to be equal to the increase in the members’ average salary during the year);
- d. Averaging these annual increases over the three-year experience period; and
- e. Modifying current assumptions to reflect some portion of these measured increases reflective of their “credibility.”

To be consistent with the other economic assumptions, these promotional and merit assumptions should be used in combination with the recommended 3.25% assumed inflation and real “across the board” increases.

The following table shows the General members’ actual average promotional and merit increases by years of service over the three-year period from January 1, 2015 through December 31, 2017 along with the actual average increases based on combining the current three-year period with the three-year period from the prior experience study (recalculated on a salary-weighted basis). The current and proposed assumptions are also shown. The actual increases for the most recent three-year period were reduced by the actual average inflation plus “across the board” increase (i.e., wage inflation, estimated as the increase in average salaries) for each year over the current three-year experience period (3.16% on average).

### GENERAL MEMBERS PROMOTIONAL AND MERIT INCREASES

Years of Service	Rate (%)			
	Current Assumptions	Actual Average Increase (Last 3 Years)	Actual Average Increase from Current and Prior Study	Proposed Assumption
Less than 1	6.00	3.18	4.22	5.50
1	5.00	7.17	7.49	5.00
2	3.75	5.63	5.31	4.50
3	2.50	4.73	4.78	3.50
4	1.50	3.23	3.30	2.50
5	0.50	2.45	2.68	1.50
6	0.50	2.07	2.15	1.25
7	0.50	1.86	1.77	1.00
8	0.50	0.96	1.51	0.95
9	0.50	1.40	1.63	0.90
10	0.50	0.83	1.37	0.85
11	0.50	0.91	1.35	0.80
12	0.50	0.67	1.11	0.75
13	0.50	1.34	1.43	0.75
14	0.50	0.95	1.43	0.75
15 & Over	0.50	0.61	1.41	0.50

The following table provides the same information for Safety members. The actual average promotional and merit increases were determined by reducing the actual average total salary increases by the actual average inflation plus real “across the board” increase (i.e., wage inflation, estimated as the increase in average salaries) for each year over the three-year period (2.57% on average).

### SAFETY MEMBERS PROMOTIONAL AND MERIT INCREASES

Years of Service	Rate (%)			
	Current Assumptions <sup>19</sup>	Actual Average Increase (Last 3 Years)	Actual Average Increase from Current and Prior Study	Proposed Assumption
Less than 1	8.50	6.21	5.15	7.50
1	4.75	10.21	8.50	7.00
2	3.75	6.35	4.80	5.00
3	2.75	4.97	3.82	4.00
4	1.75	7.57	5.18	3.50
5	0.50	2.52	1.78	1.50
6	0.50	2.01	1.43	1.25
7	0.50	1.91	1.45	1.25
8	0.50	1.33	1.56	1.25
9	0.50	2.08	1.78	1.25
10	0.50	1.67	1.29	1.25
11	0.50	2.36	1.49	1.25
12	0.50	2.39	1.61	1.25
13	0.50	1.48	1.69	1.00
14	0.50	1.56	0.89	1.00
15 & Over	0.50	1.35	1.37	0.75

Charts 1 and 2 provide a graphical comparison of the actual promotional and merit increases, compared to the proposed and current assumptions. The charts also show the actual promotional and merit increases based on an average of both the current and previous three-year experience periods. This is discussed below. Chart 1 shows this information for General members and Chart 2 for Safety members.

In addition to the most recent three-year experience period, we also examined the promotional and merit salary experience from the prior experience study. We believe that when the experience from the last two studies are combined into an average result, it provides a more reasonable representation of potential future promotional and merit salary increases over the long term.

<sup>19</sup> It should be noted that on page 55 of our prior experience study dated October 2, 2015, we had inadvertently referenced an assumption of 0.75% for members with “5 & Over” years of service even though 0.50% was used in that study and on subsequent valuations.

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

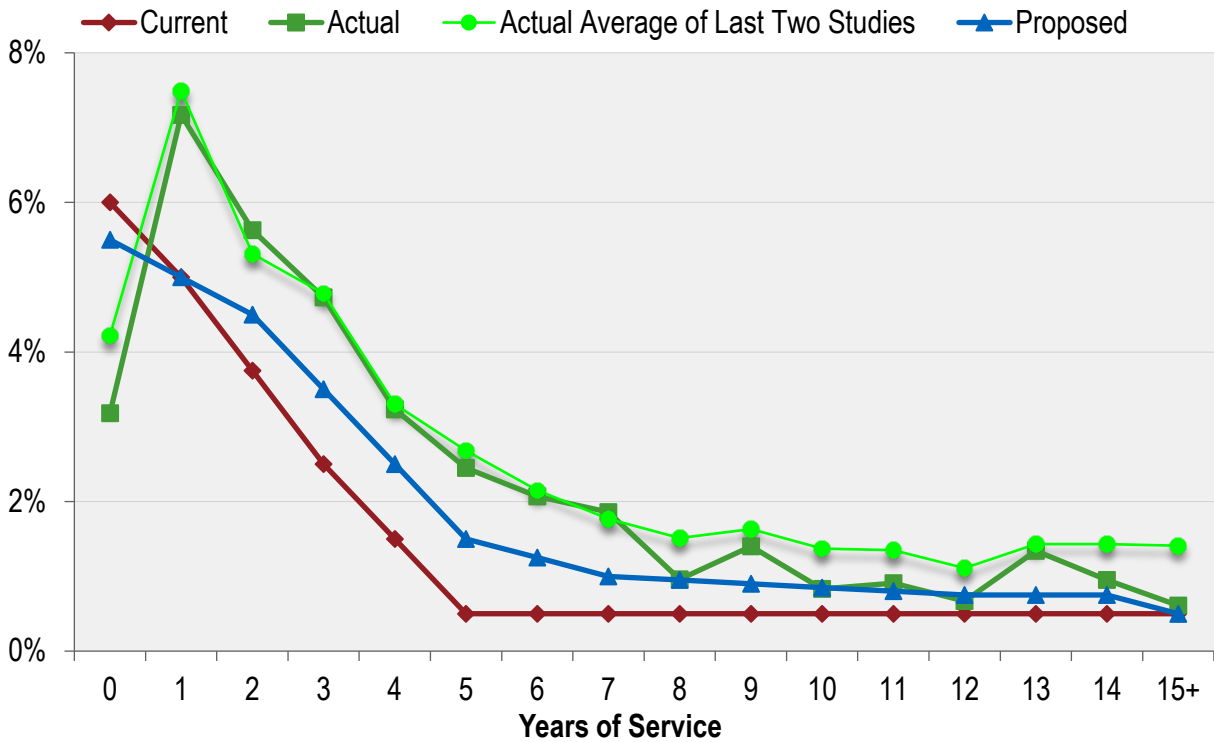
### **Active Member Payroll**

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 promotional and merit increases are not an influence, because this average pay is not specific to an individual.

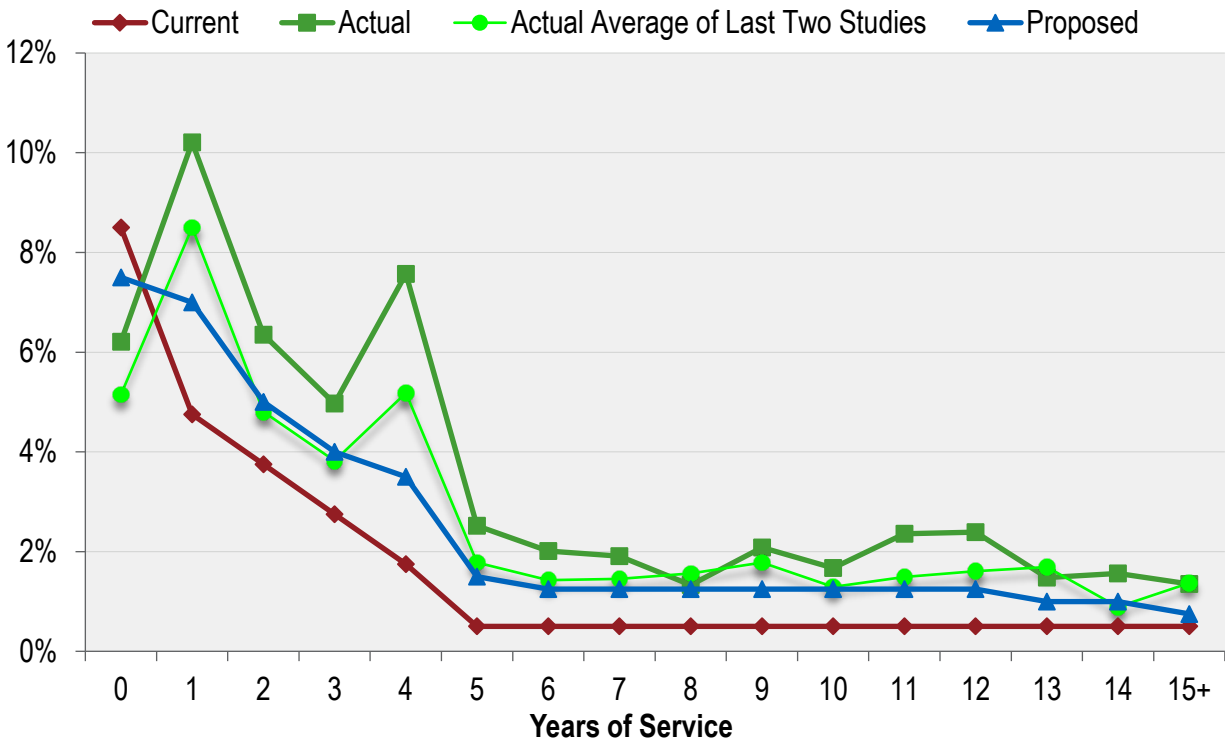
Under the Board’s current practice, the UAAL contribution rate is developed by assuming that the total payroll for all active members will increase annually over the amortization periods at the same assumed rates of inflation plus real “across the board” salary increase assumptions as are used to project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

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

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



**CHART 2: PROMOTIONAL AND MERIT 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 following table shows the observed service retirement rates for General Plan A members based on the actual experience over the past three years. The observed service retirement rates were determined by comparing those members who actually retired from service to those eligible to retire from service. This same methodology is followed throughout this report and was described in Section II. Also shown are the current rates assumed and the rates we propose:

#### General Plan A

Age	Rate of Retirement (%)					
	Less than 30 Years of Service			30 or More Years of Service		
	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
50	7.00	6.88	6.00	10.00	100.00	10.00
51	7.00	2.06	6.00	10.00	0.00	10.00
52	7.00	6.00	6.00	12.00	0.00	10.00
53	8.00	5.75	6.00	16.00	14.29	15.00
54	9.00	5.19	7.00	20.00	22.22	20.00
55	10.00	11.68	10.00	25.00	42.86	25.00
56	10.00	7.65	8.00	30.00	15.38	25.00
57	10.00	7.19	8.00	30.00	27.27	30.00
58	15.00	6.54	12.00	30.00	17.65	30.00
59	20.00	18.79	20.00	40.00	40.00	40.00
60	25.00	24.19	25.00	40.00	54.55	40.00
61	25.00	20.69	25.00	45.00	50.00	45.00
62	30.00	21.65	30.00	45.00	100.00	45.00
63	30.00	23.60	30.00	45.00	N/A	45.00
64	30.00	34.85	30.00	45.00	0.00	45.00
65	30.00	34.48	30.00	45.00	0.00	45.00
66	40.00	51.22	40.00	45.00	0.00	45.00
67	40.00	48.39	40.00	50.00	0.00	50.00
68	50.00	18.75	40.00	50.00	0.00	50.00
69	80.00	43.75	50.00	80.00	100.00	80.00
70 & Over	100.00	25.58	100.00	100.00	100.00	100.00

**As shown above, we are recommending decreases in some of the retirement rates for General Plan A members with less than 30 years of service and General Plan A members with 30 or more years of service.**

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

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

The following table shows the observed retirement rates for Safety Plan A members over the past three years. Also shown are the current rates assumed and the rates we propose:

### Safety Plan A

Age	Rate of Retirement (%)					
	Less than 30 Years of Service			30 or More Years of Service		
	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
48	0.00	11.63	5.00	0.00	N/A	5.00
49	0.00	10.81	5.00	0.00	N/A	5.00
50	14.00	25.00	18.00	10.00	100.00	18.00
51	16.00	13.04	16.00	12.00	66.67	16.00
52	16.00	5.26	12.00	18.00	50.00	18.00
53	18.00	0.00	14.00	25.00	0.00	25.00
54	24.00	16.67	22.00	50.00	33.33	50.00
55	30.00	8.33	25.00	100.00	20.00	75.00
56	30.00	21.05	30.00	100.00	0.00	75.00
57	25.00	18.18	20.00	100.00	100.00	75.00
58	25.00	20.00	20.00	100.00	0.00	75.00
59	25.00	0.00	20.00	100.00	0.00	75.00
60	100.00	25.00	75.00	100.00	0.00	100.00
61	100.00	0.00	75.00	100.00	0.00	100.00
62	100.00	14.29	75.00	100.00	N/A	100.00
63	100.00	20.00	75.00	100.00	N/A	100.00
64	100.00	100.00	75.00	100.00	N/A	100.00
65	100.00	100.00	100.00	100.00	N/A	100.00

**As shown above, we are recommending decreases in most of the retirement rates for Safety Plan A members with less than 30 years of service and decreases in some of the retirement rates for Safety Plan A members with 30 or more years of service.**

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



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

Note that effective January 1, 2013, new PEPRA formulas were implemented for new General and Safety Plan B. For these new tiers we do not have adequate experience from the past three years to propose new rates based on actual retirements from members of those tiers. However, we have recommended changes to the retirement assumptions at some ages for Plan B members somewhat in proportion to our recommended assumption changes for Plan A members with less than 30 years of service. This assumption will continue to be monitored in future experience studies, including whether service based retirement rates should also be implemented for Plan B.

The following are the current and proposed rates of retirement for General Plan B and Safety Plan B members:

### General Plan B and Safety Plan B

Age	Rate of Retirement (%)			
	Current General Plan B	Proposed General Plan B	Current Safety Plan B	Proposed Safety Plan B
50	0.0	0.0	4.0	5.0
51	0.0	0.0	5.0	5.0
52	4.0	3.5	6.0	4.5
53	1.5	1.0	6.0	4.5
54	2.5	2.0	8.0	7.5
55	2.5	2.5	20.0	16.5
56	4.5	3.5	15.0	15.0
57	5.5	4.5	15.0	12.0
58	6.5	5.0	20.0	16.0
59	7.5	7.5	20.0	16.0
60	8.5	8.5	100.0	75.0
61	9.5	9.5	100.0	75.0
62	14.5	14.5	100.0	75.0
63	16.5	16.5	100.0	75.0
64	19.0	19.0	100.0	75.0
65	24.0	24.0	100.0	100.0
66	20.0	20.0	100.0	100.0
67	20.0	20.0	100.0	100.0
68	20.0	20.0	100.0	100.0
69	20.0	20.0	100.0	100.0
70 & Over	100.0	100.0	100.0	100.0

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

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

### Deferred Vested Members

In prior valuations, deferred vested General and Safety members were assumed to retire at age 58 and 52, respectively. The average age at retirement over the prior three years was 58 for General and 57 for Safety.

**We recommend maintaining the General deferred vested retirement assumption at age 58 and increasing the Safety deferred vested retirement assumption from age 52 to age 53.**

### Reciprocity

It was also assumed that 30% of General and 45% of Safety deferred vested participants would be covered under a reciprocal retirement system and receive 4.00% annual salary increases from termination until their date of retirement. As of December 31, 2017, about 23% of the total General deferred vested members and 36% of the total Safety deferred vested members have gone on to be covered by a reciprocal retirement system.

**We recommend decreasing the reciprocity assumption from 30% to 25% for General members and from 45% to 40% for Safety members.**

The annual reciprocal salary increase assumption is based on the ultimate promotional and merit salary increase assumptions for General and Safety members together with the 2.75% inflation and 0.50% real “across the board” salary increase assumptions that are recommended earlier in Section III of this report. This assumption is utilized to anticipate salary increases (under the reciprocal system) from termination from SCERA to the expected date of retirement.

**We recommend decreasing the annual reciprocal salary increase assumption from 4.00% to 3.75% (i.e., 2.75% inflation plus 0.50% “across the board” plus 0.50% promotional and merit) for General deferred vested participants, and maintaining the reciprocal salary increase of 4.00% (i.e., 2.75% inflation plus 0.50% “across the board” plus 0.75% promotional and merit) for Safety deferred vested participants.**

### Survivor Continuance under Unmodified Option

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

Year Ending December 31	New Retirees – Actual Percent with Eligible Spouse or Domestic Partner	
	Male	Female
2015	69%	52%
2016	71%	63%
2017	65%	52%
<b>Total</b>	<b>68%</b>	<b>56%</b>

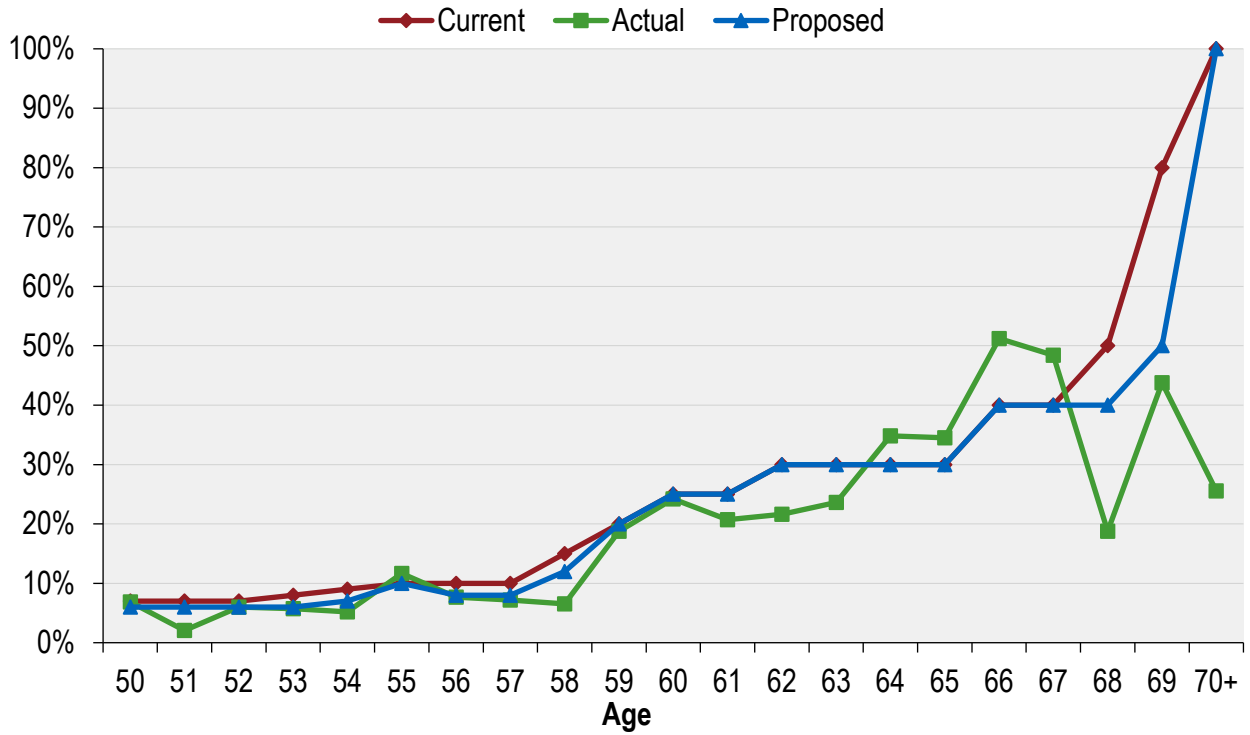
**We recommend maintaining the percent married assumption for both males and females members at 70% and 55%, respectively.**

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

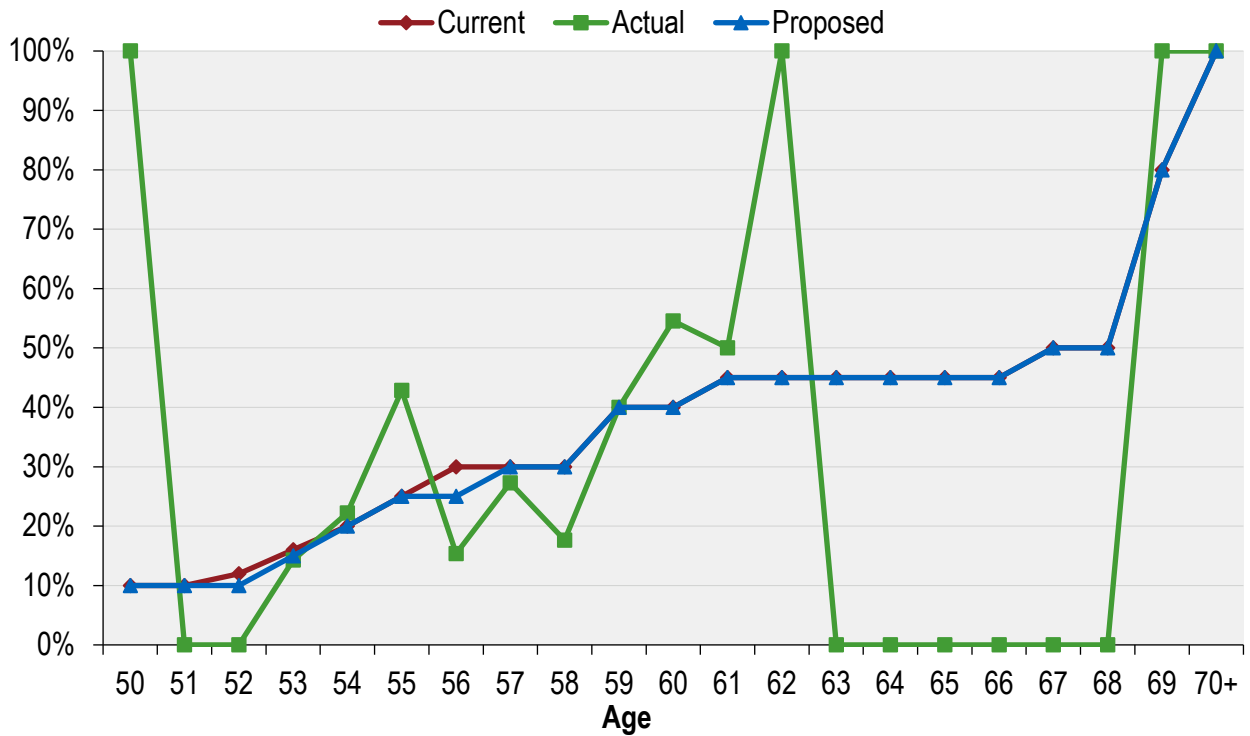
1. Since most of the survivors are actually the opposite sex, even with the inclusion of domestic partners, we will continue to assume that for all active and inactive members, the survivor’s sex is the opposite of the member.
2. The current and proposed assumption for the age of the survivor for all active and inactive members are shown below. These assumptions will continue to be monitored in future experience studies.

Beneficiary Sex	Survivor’s Age as Compared to Member’s Age		
	Current Assumption	Actual SCERA Experience	Proposed Assumption
Male	2 years older	1.3 years older	2 years older
Female	4 years younger	2.7 years younger	4 years younger

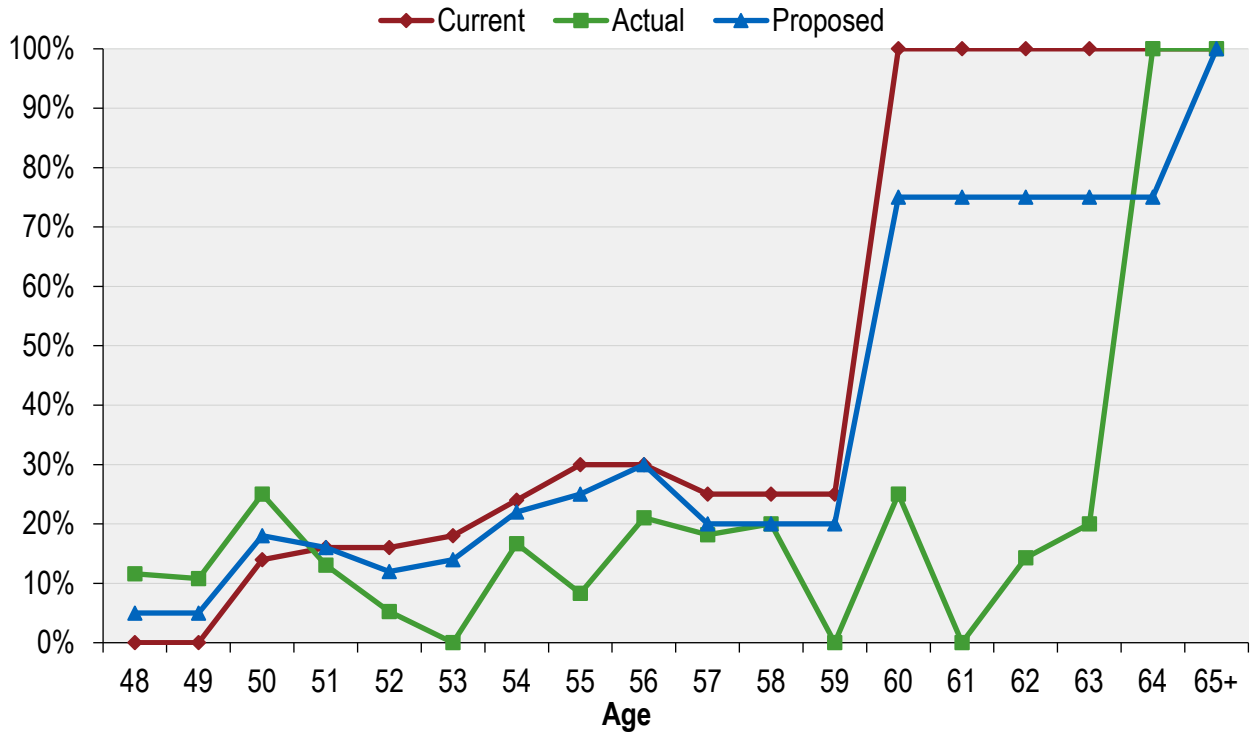
**CHART 3: RETIREMENT RATES – GENERAL PLAN A MEMBERS LESS THAN 30 YEARS OF SERVICE**



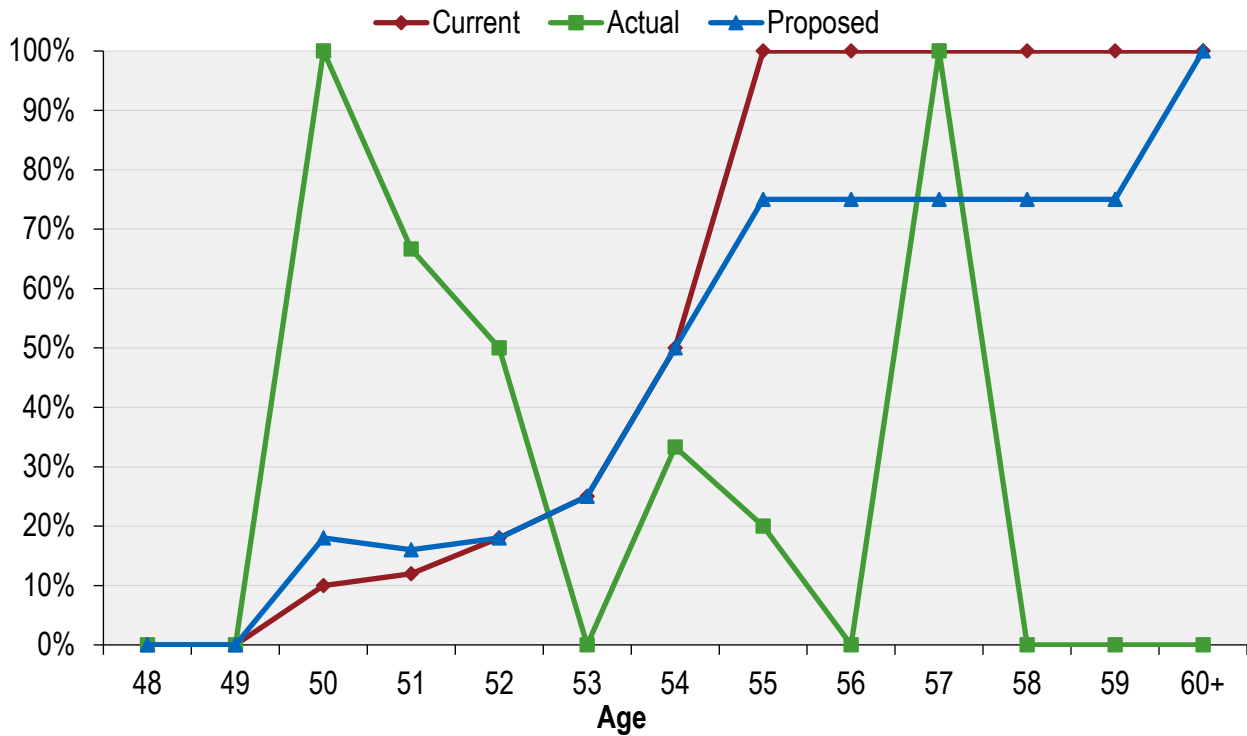
**CHART 4: RETIREMENT RATES – GENERAL PLAN A MEMBERS 30 OR MORE YEARS OF SERVICE**



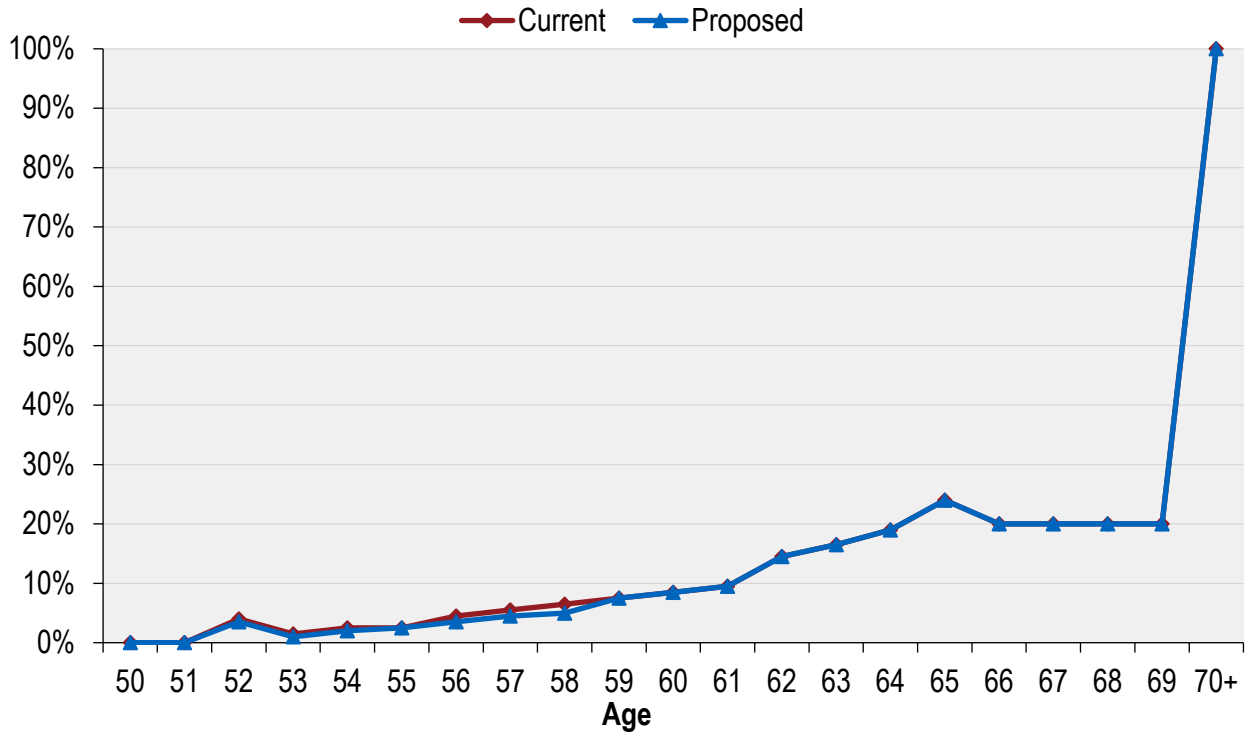
**CHART 5: RETIREMENT RATES – SAFETY PLAN A MEMBERS LESS THAN 30 YEARS OF SERVICE**



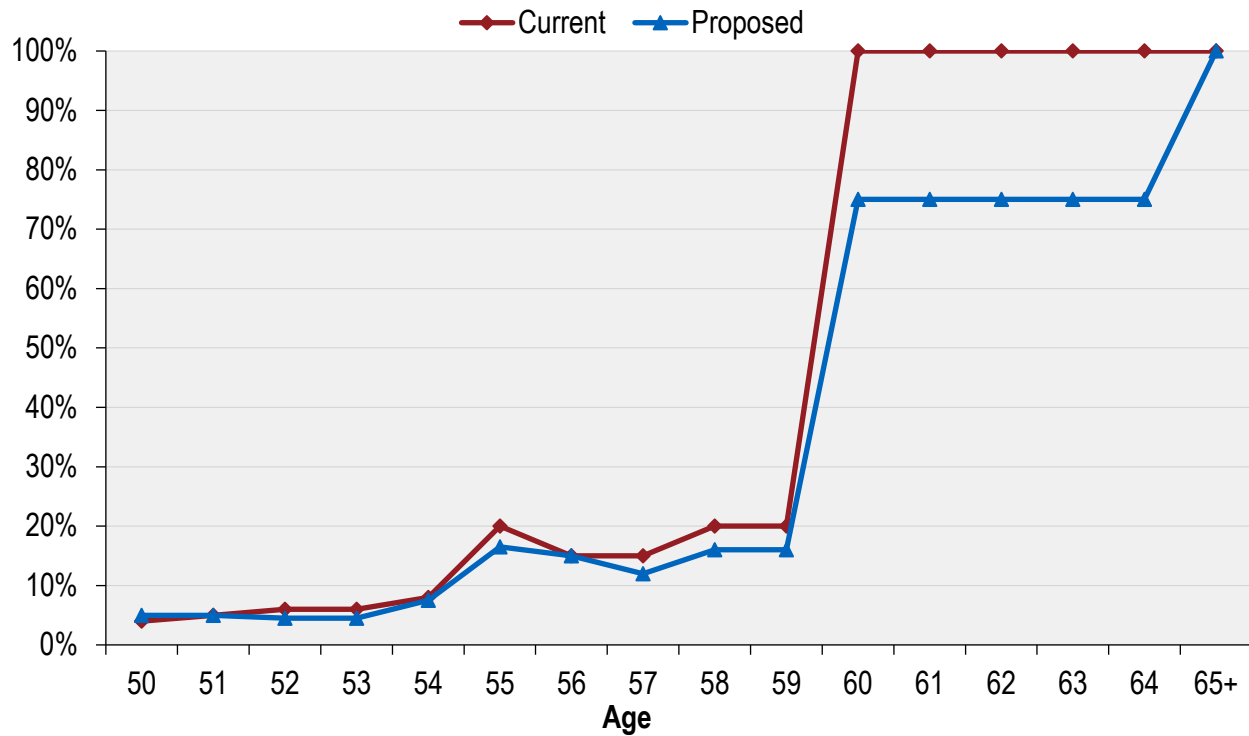
**CHART 6: RETIREMENT RATES – SAFETY PLAN A MEMBERS 30 OR MORE YEARS OF SERVICE**



**CHART 7: RETIREMENT RATES  
GENERAL PLAN B MEMBERS**



**CHART 8: RETIREMENT RATES  
SAFETY PLAN B MEMBERS**



## **B. Mortality Rates - Healthy**

The “healthy” mortality rates project the life expectancy of a member who retires from service (i.e., who did not retire on a disability pension). Also, the “healthy” pre-retirement mortality rates project what proportion of members will die before retirement. For General members, the table currently being used for post-service retirement mortality rates is the Headcount-Weighted RP-2014 Healthy Annuitant Table projected 20 years with the two-dimensional scale MP-2014 set back one year for males and set forward one year for females. For Safety members, the table currently being used for post-service retirement mortality rates is the Headcount-Weighted RP-2014 Healthy Annuitant Table projected 20 years with the two-dimensional scale MP-2014 set back one year. Beneficiaries are assumed to have the same mortality as a General member who has taken a service (non-disability) retirement.

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. However, we note that the RP-2014 benefit-weighted mortality table was prepared without any data from public and multi-employer pension plans. For this reason, the headcount-weighted basis is the approach currently used by Segal in the past for its California public system clients (including SCERA).

The Retirement Plans Experience Committee (RPEC) of the SOA has released an exposure draft of the “Pub-2010” Public Retirement Plans Mortality Tables. It is our understanding that the final mortality tables will be available in late 2018 or early 2019. We will include a discussion with the Board on whether to consider the benefit-weighted mortality rates in the next experience study after the final public sector experience mortality tables become finalized.

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

We understand that RPEC intends to publish annual updates to their mortality improvement scales. Improvement scale MP-2017 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 SCERA experience), and project the mortality improvement generationally using the MP-2017 mortality improvement scale.

As an illustration of the relative impact of these approaches, we have provided in the table below the approximate change 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 – Generational Approach	-0.7% of payroll
Benefit Weighted RP-2014 Family of Tables – Generational Approach	0.3% of payroll

In order to use more actual SCERA experience in our analysis, we have used experience for a nine-year period by using data from the current (from January 1, 2015 to December 31, 2017) and the last two (from January 1, 2012 to December 31, 2014 and from January 1, 2009 to December 31, 2011) experience study periods to analyze this assumption.

Even with the use of nine years of experience, the data is only partially credible, based on standard statistical theory. In 2008 the SOA published an article recommending that mortality assumptions include an adjustment for credibility. Under this approach, the number of deaths needed for full credibility is 1,082, where full credibility means a 90% confidence that the actual experience will be within 5% of the expected value. Therefore, in our recommended assumptions, we did not fully adjust the RP-2014 mortality tables to fit SCERA’s experience. In future experience studies, more data will be available which may increase the credibility further.

### Pre-Retirement Mortality

For General and Safety members, the table currently being used for pre-retirement mortality rates is the Headcount-Weighted RP-2014 Employee Table projected 20 years with the two-dimensional scale MP-2014 times ½.

**We recommend changing the pre-retirement mortality to follow the Headcount-Weighted RP-2014 Employee Mortality Table (separate tables for males and females) times 93% for males and 95% for females, projected generationally with the two-dimensional scale MP-2017.**

The 93% and 95% scaling factors are to account for the lower incidences of observed pre-retirement death on the combined General and Safety workforce relative to the standard table.

**Based on recent experience, we recommend that all pre-retirement deaths continue to be assumed non-service connected.**

### Post-Retirement Mortality (Service Retirements)

Among all retired members, the actual deaths compared to the expected deaths under the current assumptions for the last nine years is shown in the table below. We also show the deaths under the proposed assumptions. In the prior study we set the mortality assumption using a static mortality projection so that actual deaths would be about 20% greater than those assumed. As



noted above, we are recommending the use of a generational mortality table rather than 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 General and Safety combined (plus all beneficiaries) is 98%. In future years the ratio should remain around 100%, as long as actual mortality improves at the same rates as anticipated in the generational mortality tables. The number of actual deaths compared to the number expected under the current and proposed assumptions for the last nine years are as follows:

Gender	General Members – Healthy, Plus All Beneficiaries			Safety Members - Healthy		
	Current Expected Deaths	Actual Deaths	Proposed Expected Deaths	Current Expected Deaths	Actual Deaths	Proposed Expected Deaths
Male	208	263	272	30	29	38
Female	372	446	439	5	6	7
<b>Total</b>	<b>580</b>	<b>709</b>	<b>711</b>	<b>35</b>	<b>35</b>	<b>45</b>
Actual / Expected	122%		100%	100%		78% <sup>20</sup>

Gender	General and Safety Members Combined, Plus All Beneficiaries		
	Current Expected Deaths	Actual Deaths	Proposed Expected Deaths
Male	238	292	310
Female	377	452	446
<b>Total</b>	<b>615</b>	<b>744</b>	<b>756</b>
Actual / Expected	121%		98%

**For both General and Safety members, we recommend updating the current tables to the Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table (separate tables for males and females) times 94% for males and 102% for females, projected generationally with the two-dimensional mortality improvement scale MP-2017.**

Our recommendations are consistent with ASOP 35 as we anticipate future improvement in life expectancy using the generational approach.

<sup>20</sup> The actual to expected ratio for Safety members is lower than 100% because we have used the combined General and Safety (plus all beneficiaries) experience to set the mortality assumption for Safety in order to increase the credibility. Since there are so few Safety deaths, even if we did not combine General and Safety (plus all beneficiaries), the low credibility for the Safety members would result in our recommending substantially the same mortality table as the low credibility would result in only a partial adjustment from the Headcount-Weighted RP-2014 Healthy Annuitant base table to reflect SCERA’s experience.

Chart 9 compares actual to expected deaths for General and Safety members and all beneficiaries combined under the current and proposed assumptions over the past nine years. Experience shows that there were more deaths than predicted by the current table.

Chart 10 shows the life expectancies (i.e., expected future lifetime) under the current and the proposed tables for General members and all beneficiaries.

Chart 11 shows the life expectancies under the current and the proposed tables for Safety members.

The expected deaths (Chart 9) and life expectancies (Charts 10 and 11) under the proposed generational mortality table are based on mortality rates from 2014 which is the base year of the table. In practice, life expectancies will be assumed to increase based on applying the mortality improvement scale.

### **Mortality Table for Member Contributions and Optional Forms of Payment**

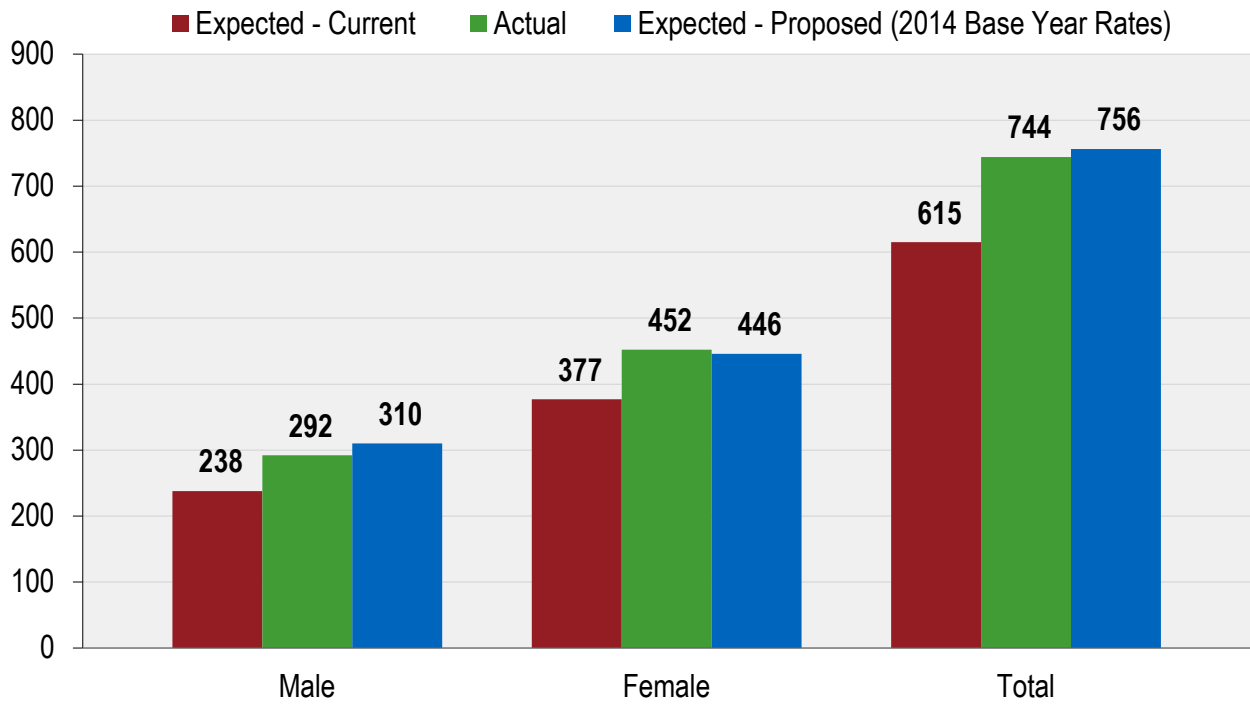
There are administrative reasons why a generational mortality table is more difficult to implement for determining member contributions for legacy tiers (i.e., Plan A) and optional forms of payment. For determining member contributions, one emerging practice is to approximate the use of a generational mortality table by the use of a static table with projection of the mortality improvement over a period that is close to the duration of the benefit payments for active members. We would recommend the use of this approximation for determining member contributions for Plan A. In particular, we recommend tables based on the proposed valuation mortality tables for both General and Safety members, including a blend for the actual gender distribution of each group.

**For General members, we recommend updating the current mortality table for determining member contributions to the Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table (separate tables for males and females) times 94% for males and 102% for females, projected 20 years with the two-dimensional mortality improvement scale MP-2017, weighted one-third male and two-thirds female.**

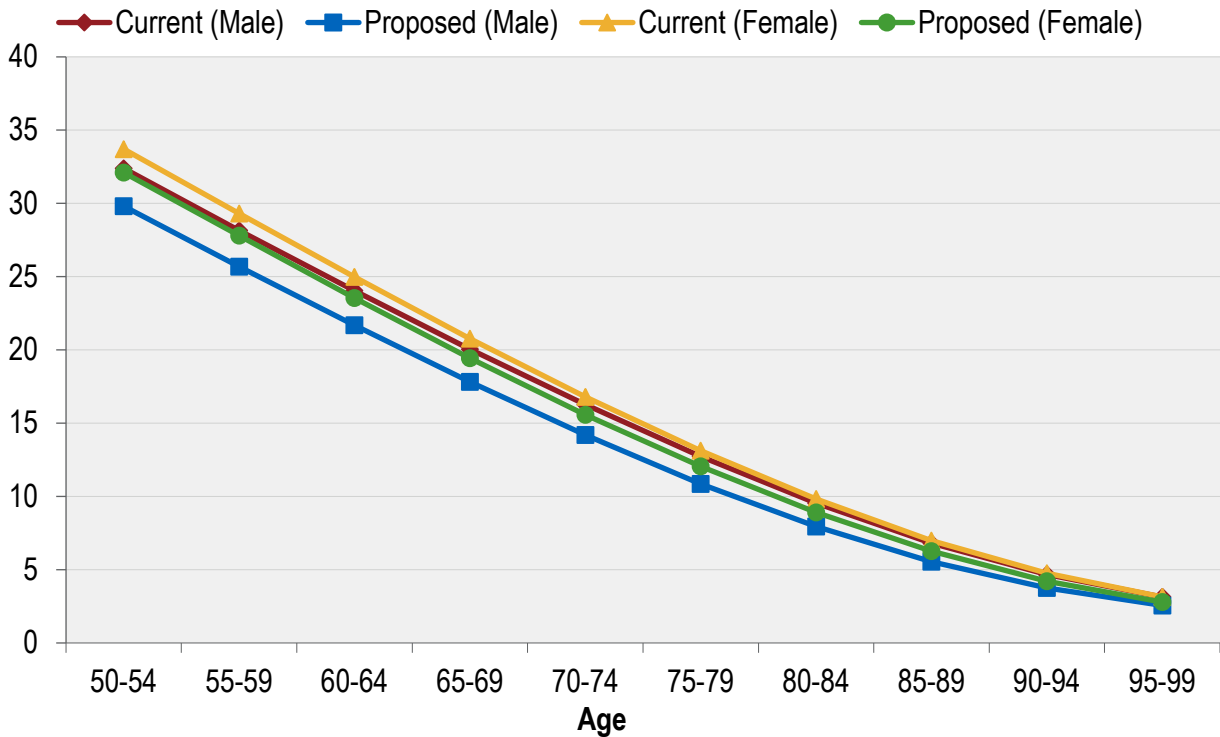
**For Safety members, we recommend updating the current mortality table for determining member contributions to the Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table (separate tables for males and females) times 94% for males and 102% for females, projected 20 years with the two-dimensional mortality improvement scale MP-2017, weighted 75% male and 25% female.**

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

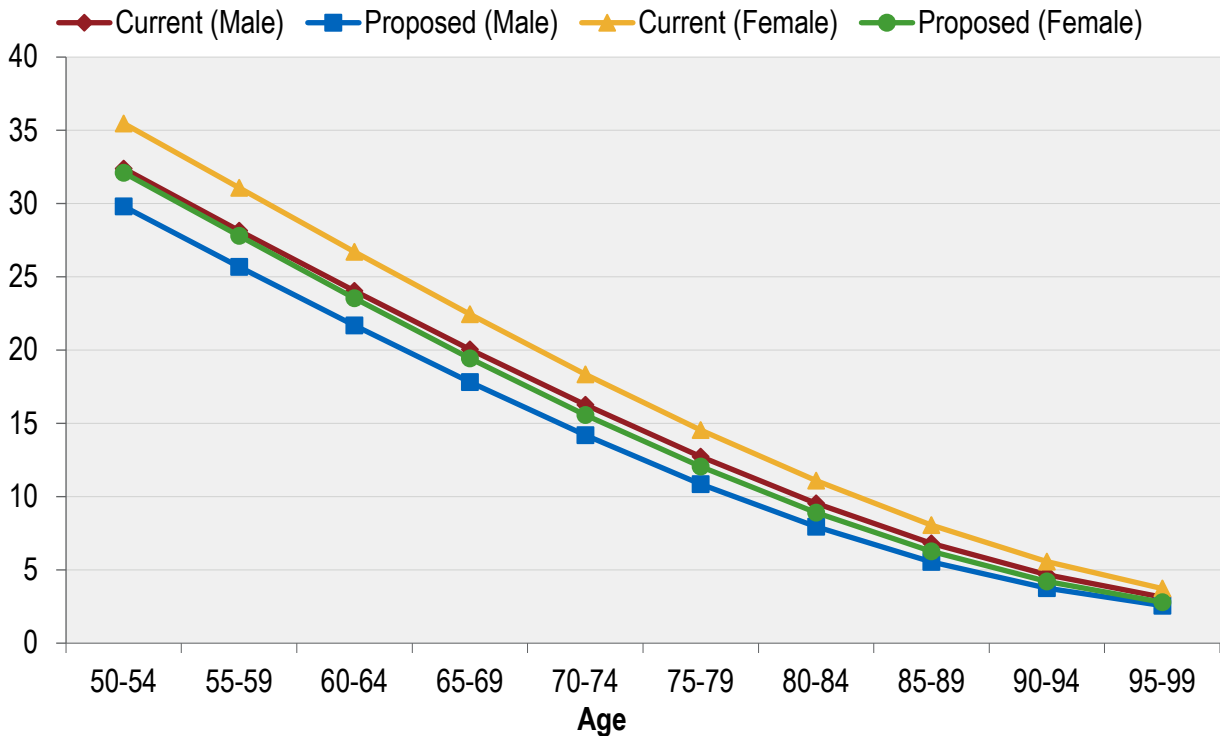
**CHART 9: POST-RETIREMENT DEATHS  
NON-DISABLED GENERAL AND SAFETY MEMBERS AND ALL BENEFICIARIES  
(JANUARY 1, 2009 THROUGH DECEMBER 31, 2017)**



**CHART 10: LIFE EXPECTANCIES  
NON-DISABLED GENERAL MEMBERS AND ALL BENEFICIARIES**



**CHART 11: LIFE EXPECTANCIES  
NON-DISABLED SAFETY MEMBERS**



## C. Mortality Rates - Disabled

Since mortality rates for disabled members can vary from those of healthy members, a different mortality assumption is often used. For General members, the table currently being used is the Headcount-Weighted RP-2014 Healthy Annuitant Table projected 20 years with the two-dimensional scale MP-2014 set forward five years. For Safety members, the table currently being used is the Headcount-Weighted RP-2014 Healthy Annuitant Table projected 20 years with the two-dimensional scale MP-2014 set forward four years.

The number of actual deaths compared to the number expected under the current and proposed assumptions for the last nine years are as follows:

Gender	General - Disabled			Safety - Disabled		
	Current Expected Deaths	Actual Deaths	Proposed Expected Deaths	Current Expected Deaths	Actual Deaths	Proposed Expected Deaths
Male	28	37	45	24	29	48
Female	37	37	51	4	2	9
<b>Total</b>	<b>65</b>	<b>74</b>	<b>96</b>	<b>28</b>	<b>31</b>	<b>57</b>
Actual / Expected	114%		77% <sup>21</sup>	111%		54% <sup>21</sup>

Gender	General and Safety Members Combined		
	Current Expected Deaths	Actual Deaths	Proposed Expected Deaths
Male	52	66	93
Female	41	39	60
<b>Total</b>	<b>93</b>	<b>105</b>	<b>153</b>
Actual / Expected	113%		69% <sup>21</sup>

**For both General and Safety members, we recommend updating the current tables to the Headcount-Weighted RP-2014 Disabled Retiree Mortality Table (separate tables for males and females) times 91% for males and 93% for females, projected generationally with the two-dimensional mortality improvement scale MP-2017.**

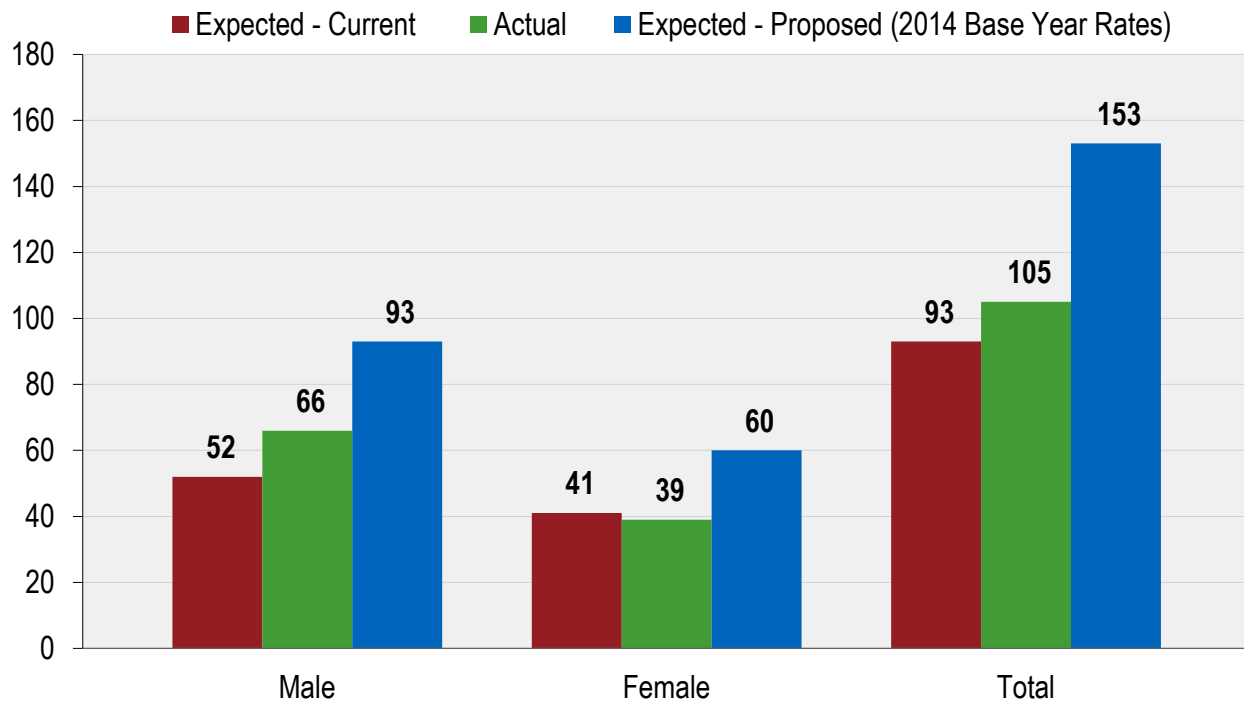
<sup>21</sup> The actual to expected ratios are lower than 100% because there are so few deaths. The low credibility has resulted in only a partial adjustment from the Headcount-Weighted RP-2014 Disabled Retiree base table to reflect SCERA's experience.

Chart 12 compares actual to expected deaths for disabled General and Safety members combined under the current and proposed assumptions over the past nine years. Experience shows that there were more deaths than predicted by the current table.

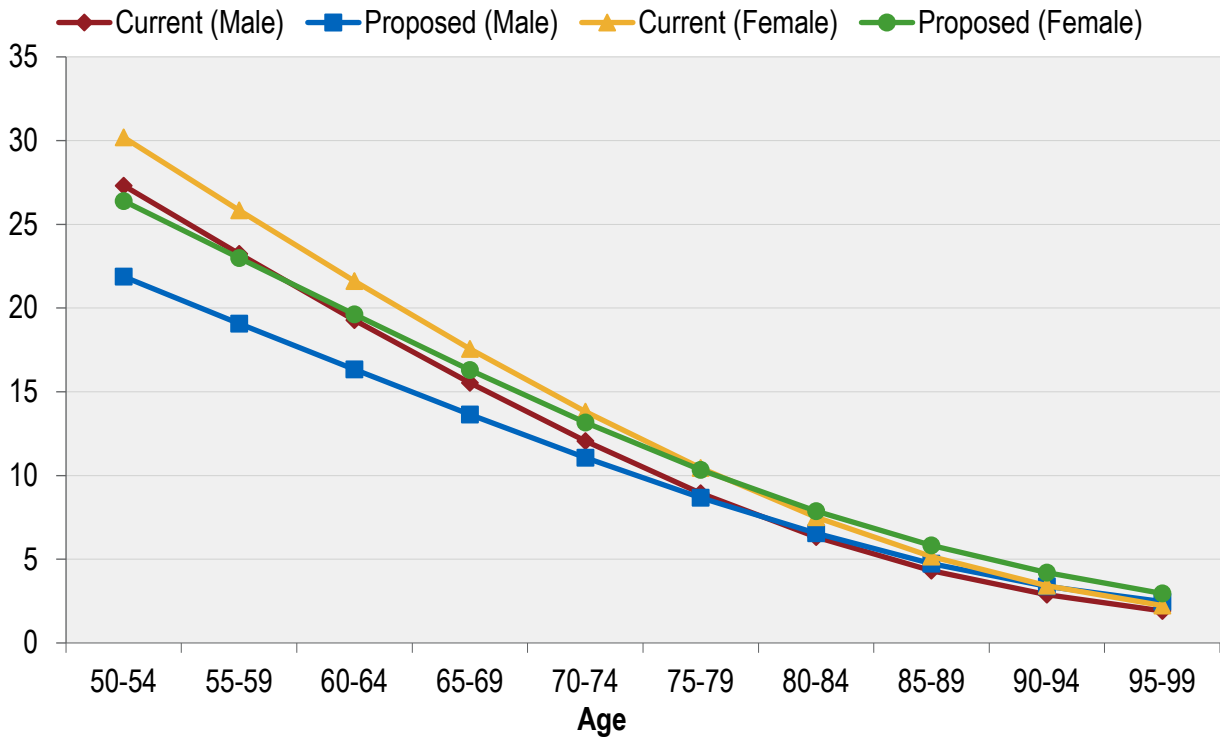
Chart 13 shows the life expectancies under the current and the proposed tables for General members.

Chart 14 shows the life expectancies under the current and the proposed tables for Safety members.

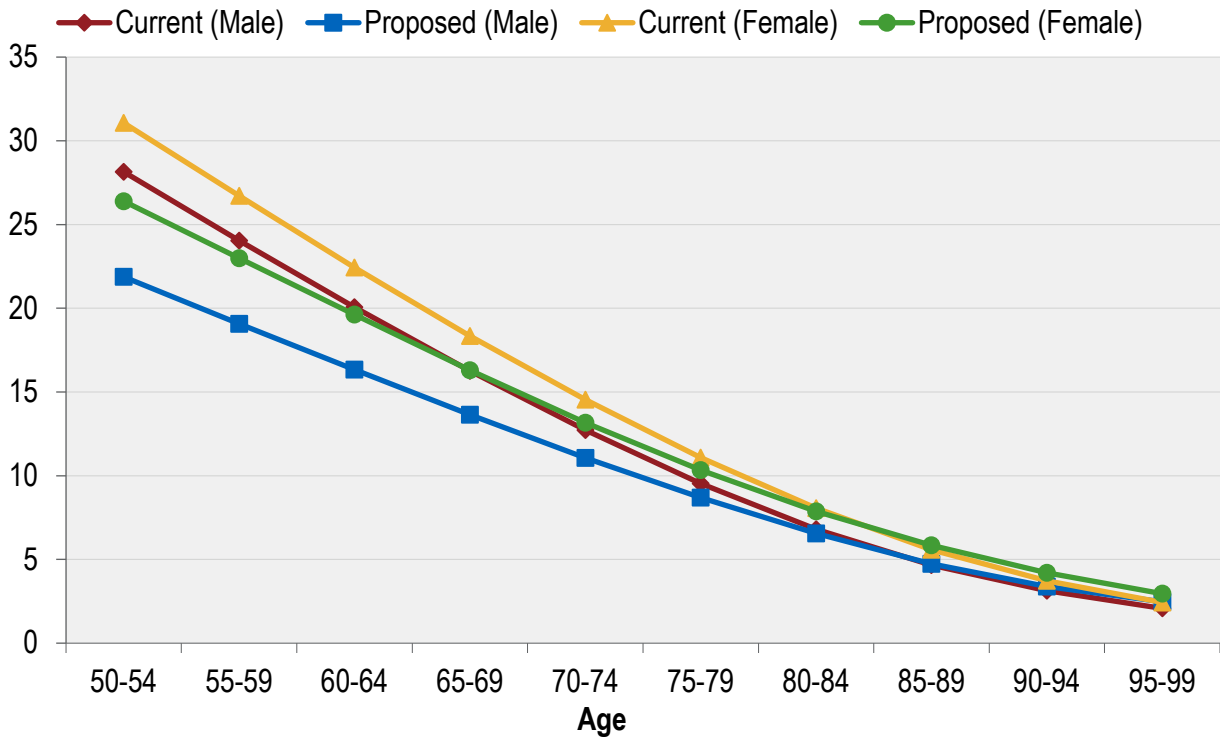
**CHART 12: POST-RETIREMENT DEATHS  
DISABLED GENERAL AND SAFETY MEMBERS  
(JANUARY 1, 2009 THROUGH DECEMBER 31, 2017)**



**CHART 13: LIFE EXPECTANCIES  
DISABLED GENERAL MEMBERS**



**CHART 14: LIFE EXPECTANCIES  
DISABLED SAFETY MEMBERS**



## D. Termination Rates

Termination rates include all terminations for reasons other than death, disability, or retirement. Under the current assumptions there are separate rates of termination for withdrawal (for members expected to receive a refund) and vested termination (for members expected to receive a deferred vested retirement benefit). With this study, we continue to recommend that this same assumption structure be used.

The withdrawal experience over the last three years for General and Safety members, separated between those employees with under five years of service and those with five or more years of service, is as follows:

### Rates of Withdrawal – Less than Five Years of Service

Years of Service	Rates of Withdrawal (%)					
	General			Safety		
	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
Less than 1	6.00	5.76	6.00	4.00	3.03	3.50
1	4.00	1.87	3.00	2.40	2.25	2.40
2	3.00	1.96	2.50	1.60	1.39	1.60
3	2.50	2.35	2.50	1.60	1.79	1.60
4	2.00	1.55	2.00	1.60	2.27	1.60

### Rates of Withdrawal – Five or More Years of Service

Age	Rates of Withdrawal (%)					
	General			Safety		
	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
20 – 24	1.50	N/A	1.50	1.60	N/A	1.60
25 – 29	1.50	0.00	1.50	1.60	0.00	1.60
30 – 34	1.50	0.63	1.30	1.04	0.50	1.00
35 – 39	0.75	0.76	0.75	0.48	0.00	0.40
40 – 44	0.50	0.13	0.40	0.24	0.00	0.15
45 – 49	0.40	0.18	0.35	0.08	0.45	0.05
50 – 54	0.30	0.00	0.30	0.00	0.00	0.00
55 – 59	0.20	1.06	0.20	0.00	0.00	0.00
60 – 64	0.10	0.00	0.10	0.00	0.00	0.00
65 – 69	0.00	0.00	0.00	0.00	0.00	0.00



It is important to note that not every service/age category has enough exposures and/or decrements such that the results in that category are statistically credible even if we look at six years' worth of experience. This is mainly the case at the highest age categories since most members in those categories are eligible to retire and so have been excluded from our review of this experience.

With the proposed assumptions, we expect lower incidences of future withdrawals overall.

Chart 15 compares actual to expected withdrawals over the past three years for the current and proposed assumptions for General members.

Chart 16 compares actual to expected withdrawals over the past three years for the current and proposed assumptions for Safety members.

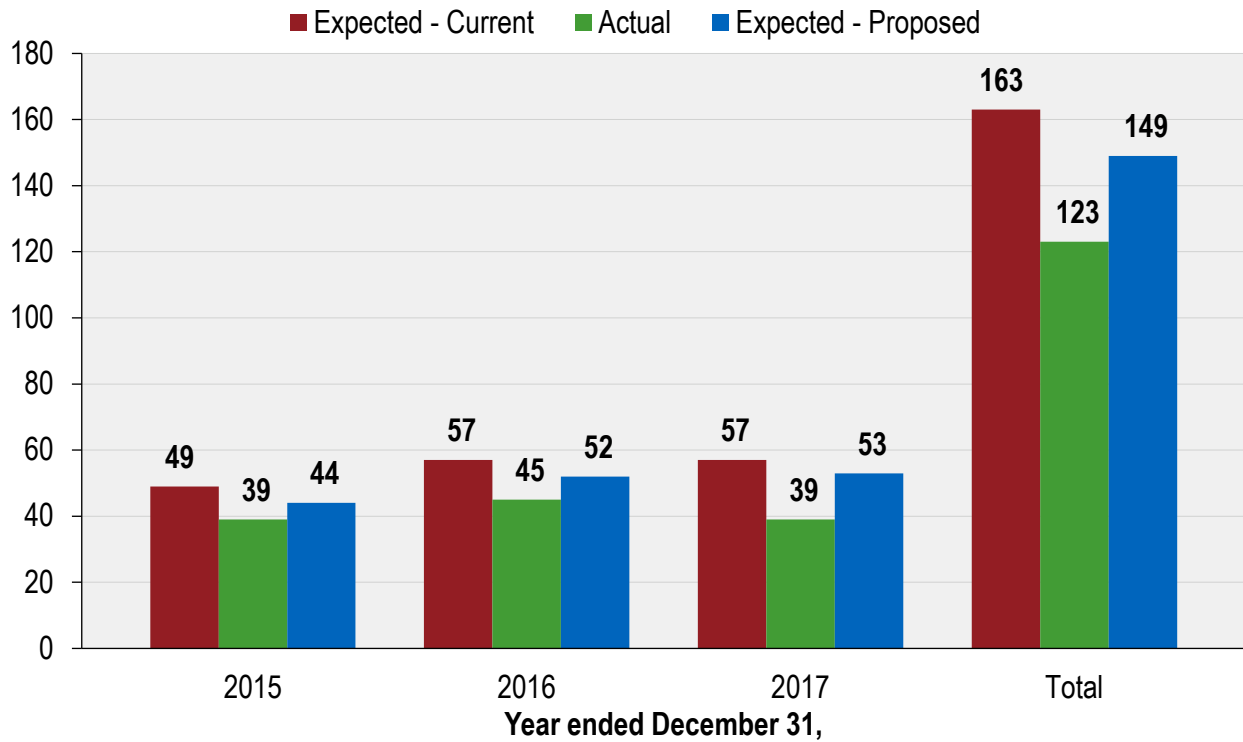
Chart 17 shows the actual withdrawal rates over the past three years compared to the current and proposed assumptions for General members with less than five years of service.

Chart 18 shows the actual withdrawal rates over the past three years compared to the current and proposed assumptions for Safety members with less than five years of service.

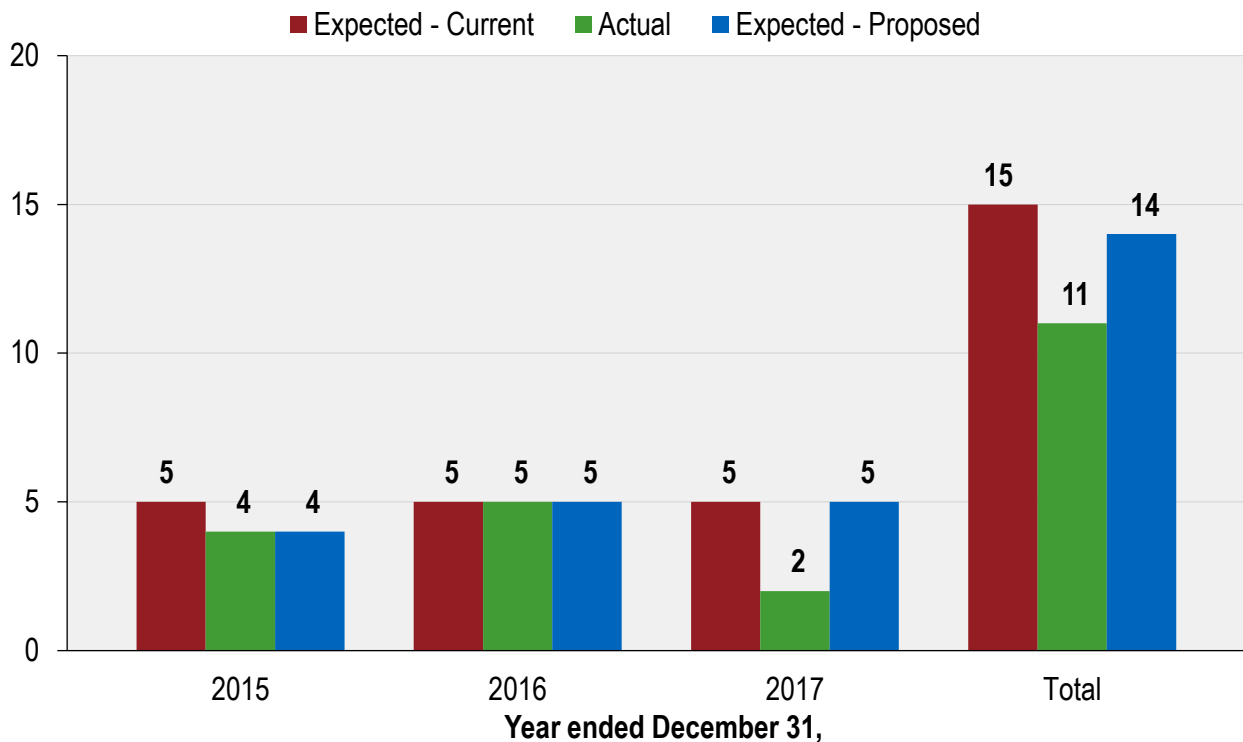
Chart 19 shows the actual withdrawal rates over the past three years compared to the current and proposed assumptions for General members with five or more years of service.

Chart 20 shows the actual withdrawal rates over the past three years compared to the current and proposed assumptions for Safety members with five or more years of service.

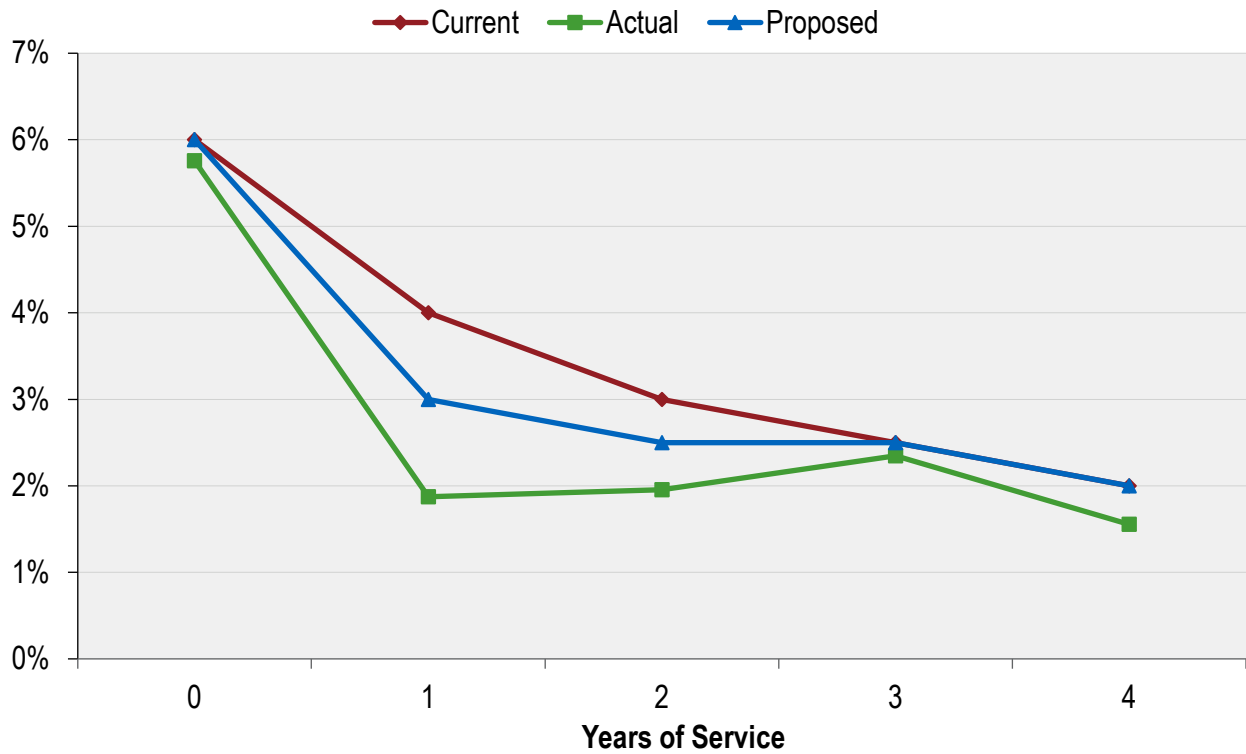
**CHART 15: ACTUAL NUMBER OF WITHDRAWALS COMPARED TO EXPECTED – GENERAL MEMBERS**



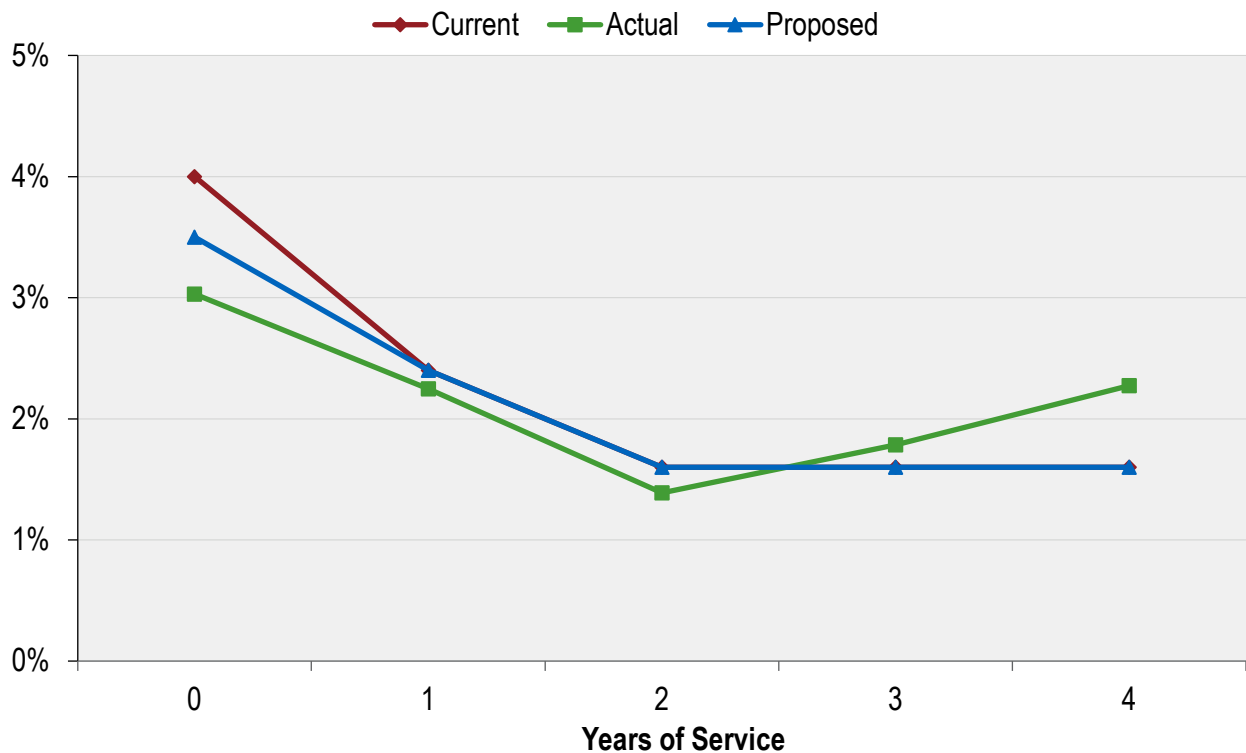
**CHART 16: ACTUAL NUMBER OF WITHDRAWALS COMPARED TO EXPECTED – SAFETY MEMBERS**



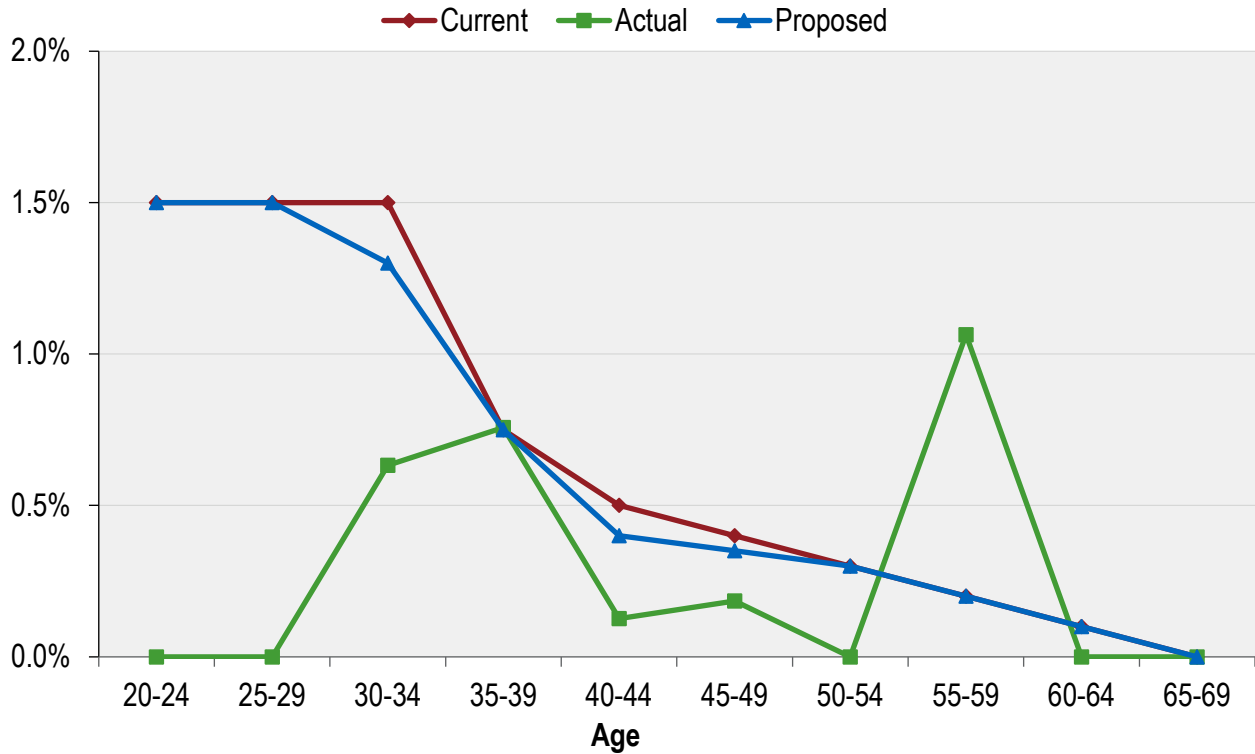
**CHART 17: WITHDRAWAL RATES – GENERAL MEMBERS  
LESS THAN FIVE YEARS OF SERVICE**



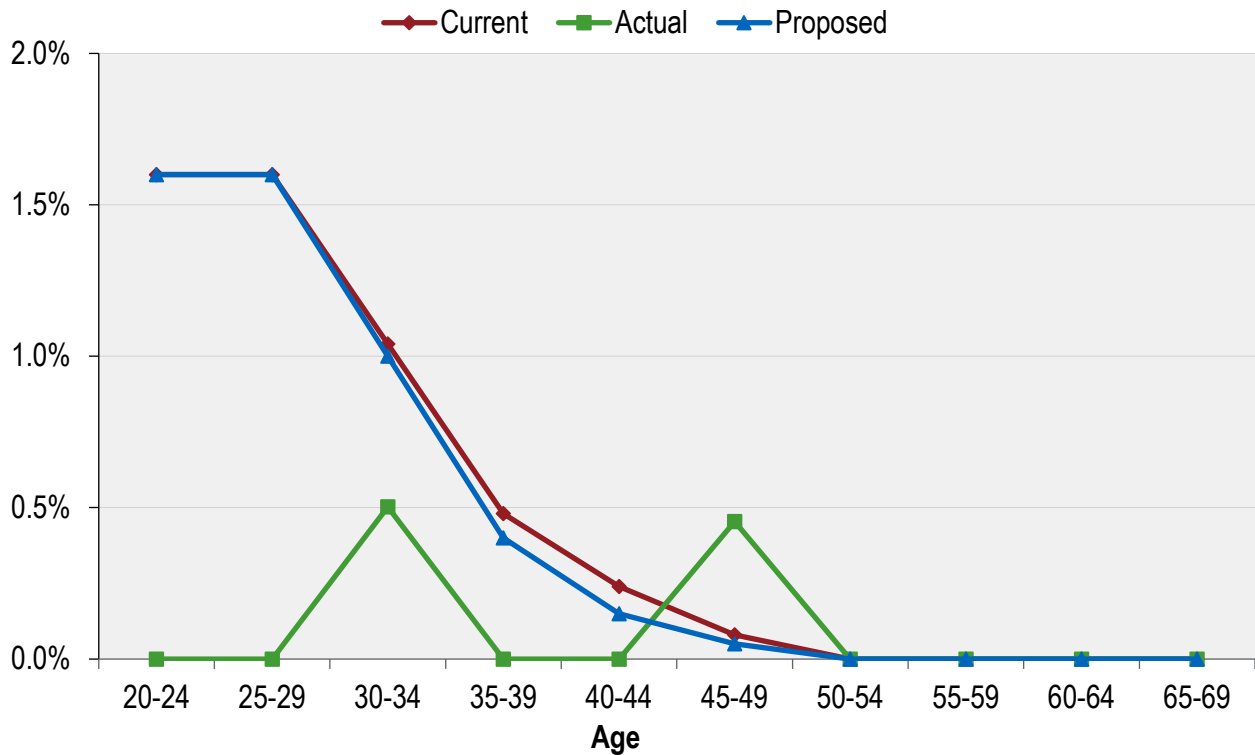
**CHART 18: WITHDRAWAL RATES – SAFETY MEMBERS  
LESS THAN FIVE YEARS OF SERVICE**



**CHART 19: WITHDRAWAL RATES – GENERAL MEMBERS  
FIVE OR MORE YEARS OF SERVICE**



**CHART 20: WITHDRAWAL RATES – SAFETY MEMBERS  
FIVE OR MORE YEARS OF SERVICE**



The vested termination experience over the last three years for General and Safety members, separated between those employees with under five years of service and those with five or more years of service, is as follows:

### Rates of Vested Termination – Less than Five Years of Service

Years of Service	Rates of Vested Termination (%)					
	General			Safety		
	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
Less than 1	6.25	10.15	7.00	6.00	8.33	6.50
1	5.50	6.17	6.00	4.00	6.74	5.00
2	4.00	5.22	4.50	4.00	2.78	4.00
3	3.00	3.52	3.50	4.00	5.36	4.00
4	3.00	5.22	3.50	4.00	4.65	4.00

### Rates of Vested Termination – Five or More Years of Service

Age	Rates of Vested Termination (%)					
	General			Safety		
	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
20 – 24	3.00	N/A	3.50	4.00	N/A	4.00
25 – 29	3.00	8.57	3.50	4.00	0.00	4.00
30 – 34	3.00	3.16	3.50	3.00	2.51	3.00
35 – 39	3.00	2.58	3.00	1.50	4.56	2.00
40 – 44	2.00	3.16	2.50	0.75	1.81	1.00
45 – 49	2.00	1.75	2.00	0.50	0.91	0.75
50 – 54	2.00	2.59	2.00	0.00	5.26	0.00
55 – 59	1.50	3.74	2.00	0.00	5.71	0.00
60 – 64	1.50	2.96	2.00	0.00	0.00	0.00
65 – 69	1.00	13.89	1.00	0.00	0.00	0.00

With the proposed assumptions, we expect higher incidences of future vested terminations overall.

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

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

Chart 22 compares actual to expected vested terminations over the past three years for the current and proposed assumptions for Safety members.

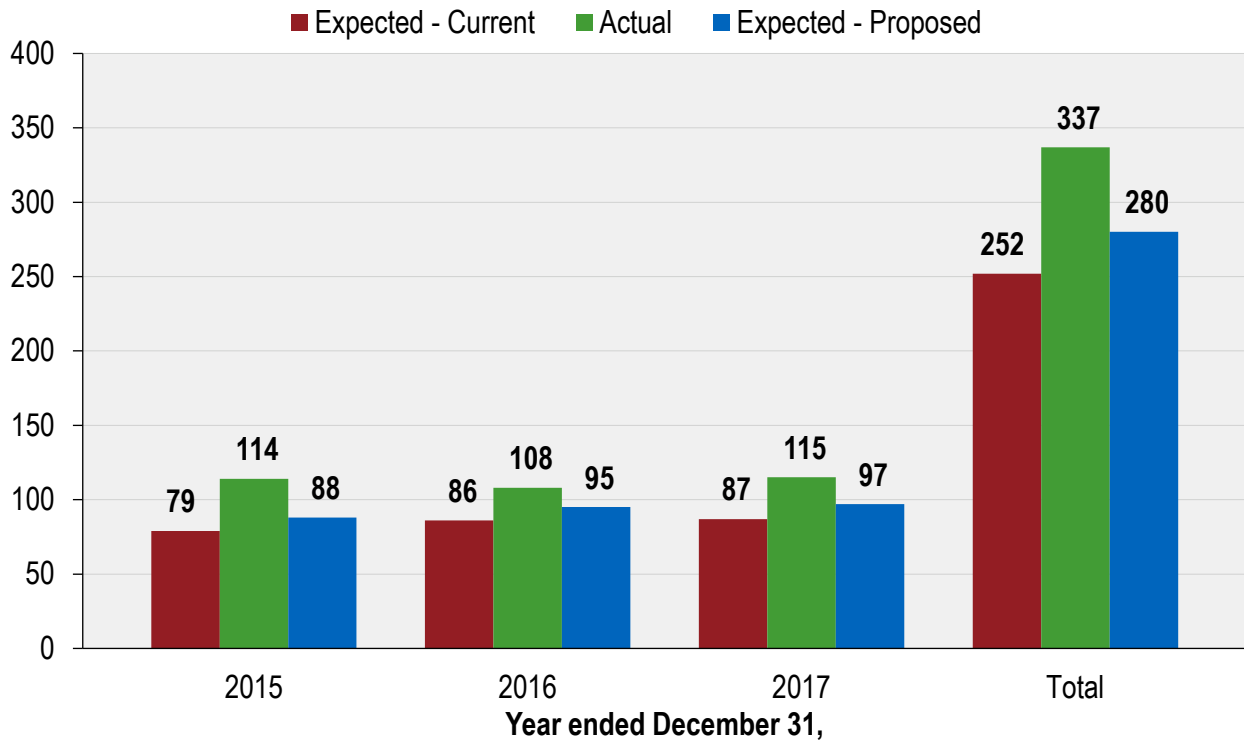
Chart 23 shows the actual vested termination rates over the past three years compared to the current and proposed assumptions for General members with less than five years of service.

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

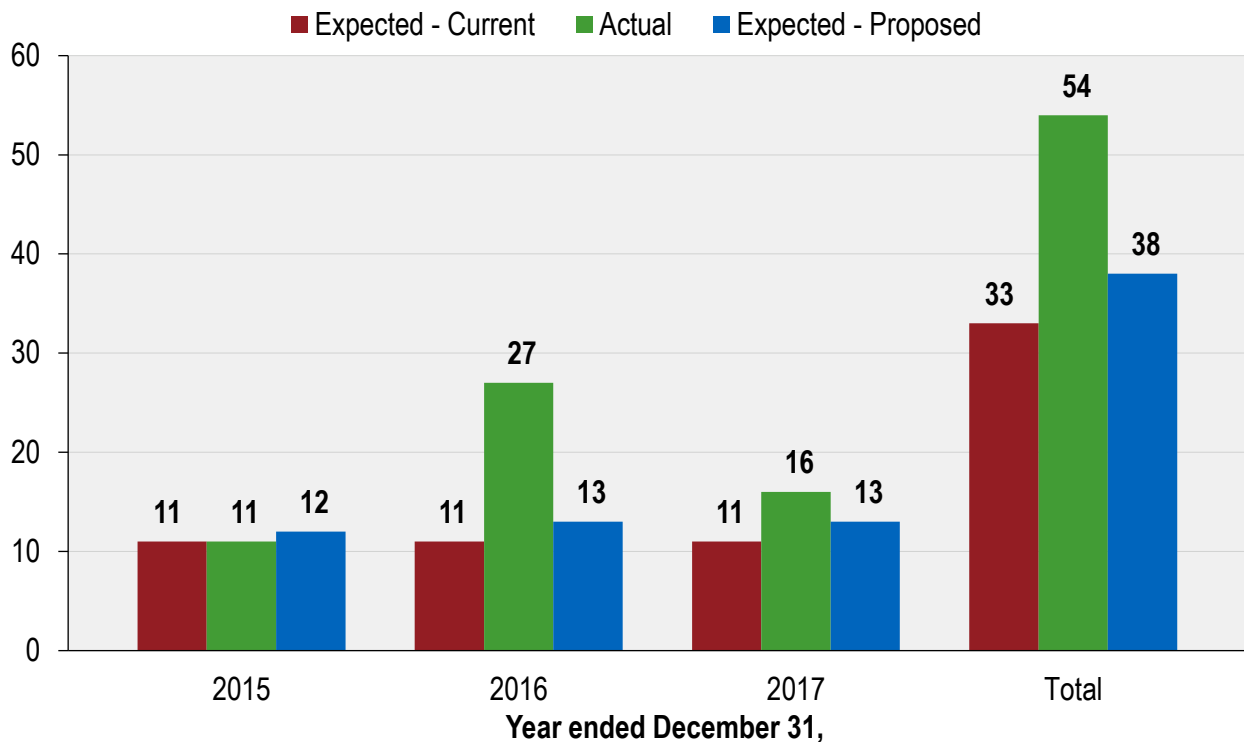
Chart 25 shows the actual vested termination rates over the past three years compared to the current and proposed assumptions for General members with five or more years of service.

Chart 26 shows the actual vested termination rates over the past three years compared to the current and proposed assumptions for Safety members with five or more years of service.

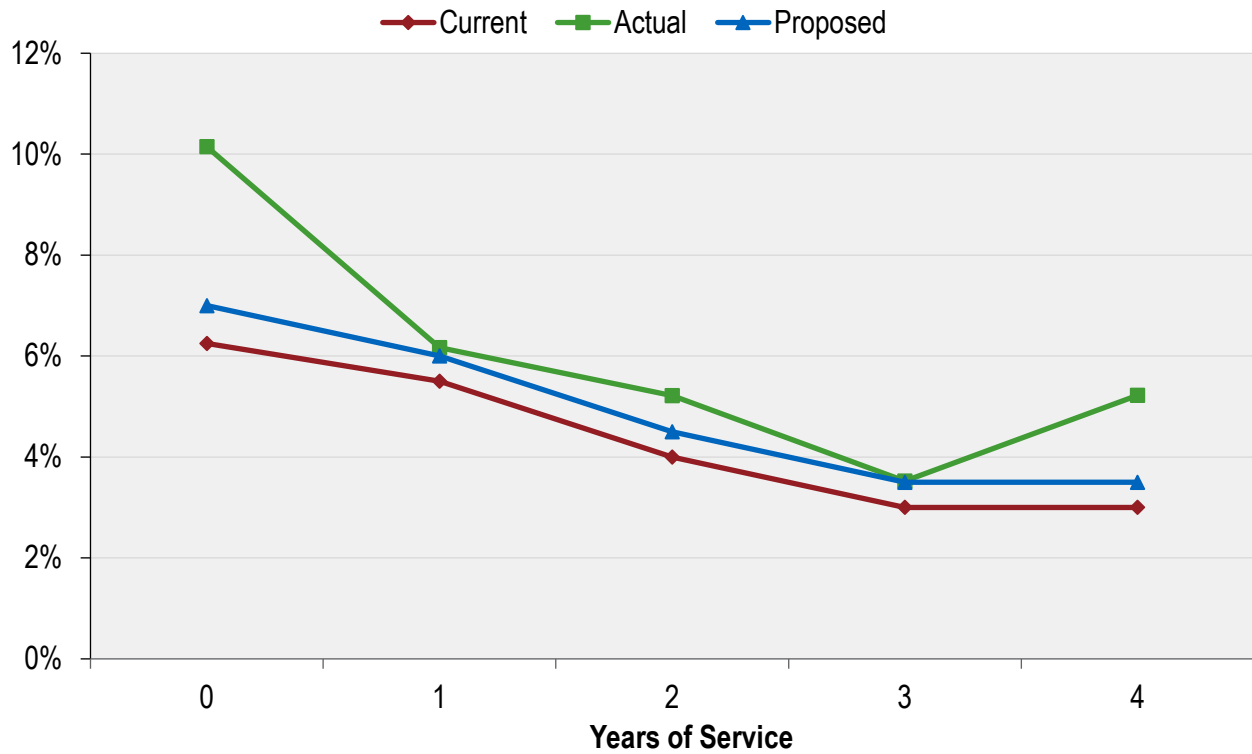
**CHART 21: ACTUAL NUMBER OF VESTED TERMINATIONS COMPARED TO EXPECTED – GENERAL MEMBERS**



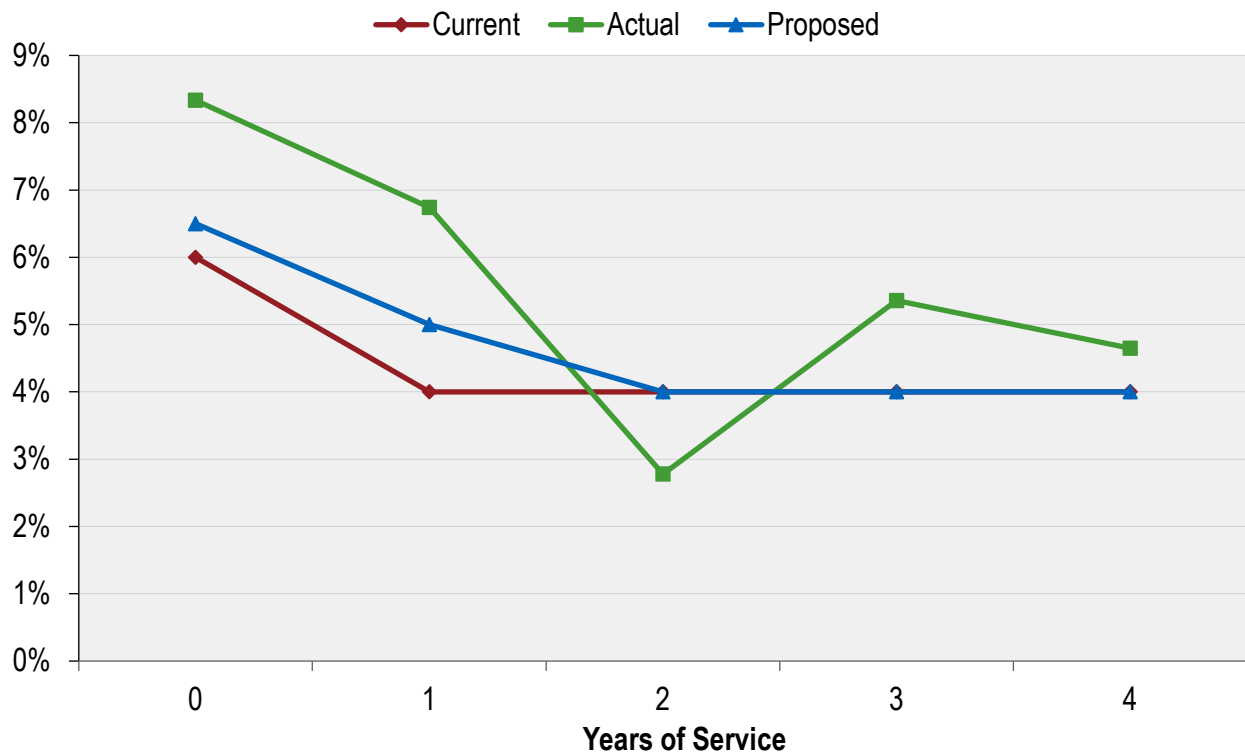
**CHART 22: ACTUAL NUMBER OF VESTED TERMINATIONS COMPARED TO EXPECTED – SAFETY MEMBERS**



**CHART 23: VESTED TERMINATIONS RATES – GENERAL MEMBERS  
LESS THAN FIVE YEARS OF SERVICE**

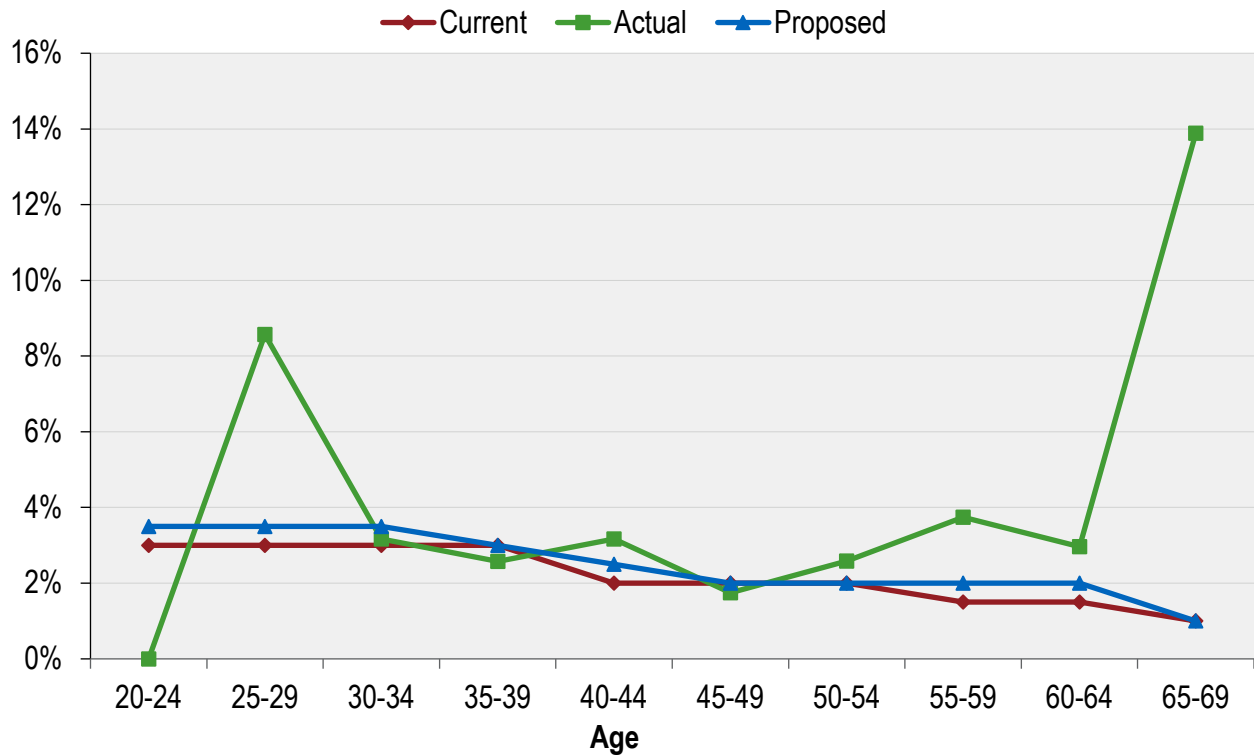


**CHART 24: VESTED TERMINATIONS RATES – SAFETY MEMBERS  
LESS THAN FIVE YEARS OF SERVICE**

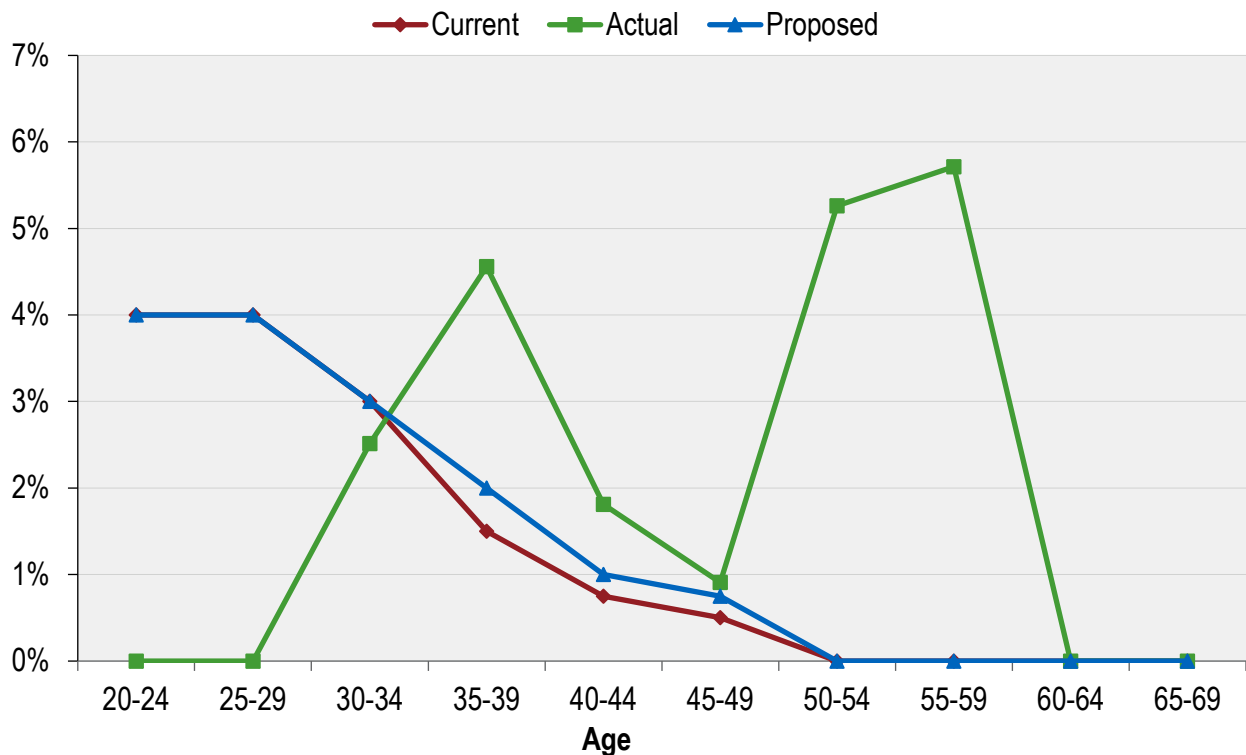




**CHART 25: VESTED TERMINATIONS RATES – GENERAL MEMBERS  
FIVE OR MORE YEARS OF SERVICE**



**CHART 26: VESTED TERMINATIONS RATES – SAFETY MEMBERS  
FIVE OR MORE YEARS OF SERVICE**



## E. Disability Incidence Rates

When a member becomes disabled, he or she may be entitled to at least a 50% of pay pension (service connected disability), or a pension that depends upon the member's years of service (non-service connected disability). The following summarizes the actual incidence of combined service and non-service connected disabilities over the past three years compared to the current and proposed assumptions for both service connected and non-service connected disability incidence:

### Rates of Disability Incidence

Age	Disability Incidence Rate (%)					
	General			Safety		
	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
20 – 24	0.05	0.00	0.05	0.10	0.00	0.10
25 – 29	0.05	0.00	0.05	0.20	0.00	0.20
30 – 34	0.10	0.00	0.05	0.50	1.63	1.00
35 – 39	0.15	0.00	0.05	0.75	2.40	1.50
40 – 44	0.20	0.17	0.20	1.00	0.77	1.50
45 – 49	0.35	0.20	0.25	2.00	3.67	2.50
50 – 54	0.40	0.29	0.35	2.50	2.26	2.50
55 – 59	0.45	0.33	0.40	3.00	3.03	3.00
60 – 64	0.55	0.36	0.45	0.00	3.23	3.00
65 – 69	0.75	0.00	0.70	0.00	0.00	0.00
70 – 74	0.00	0.00	0.00	0.00	0.00	0.00

The proposed disability rates were adjusted to reflect the past three years' experience. Overall, there are decreases in the rates proposed for General members and increases in the rates proposed for Safety members.

**For disabled General members, 61% received a service connected disability. We recommend increasing the percentage of disabled General members who are assumed to receive a service connected disability retirement from 50% to 55%.**

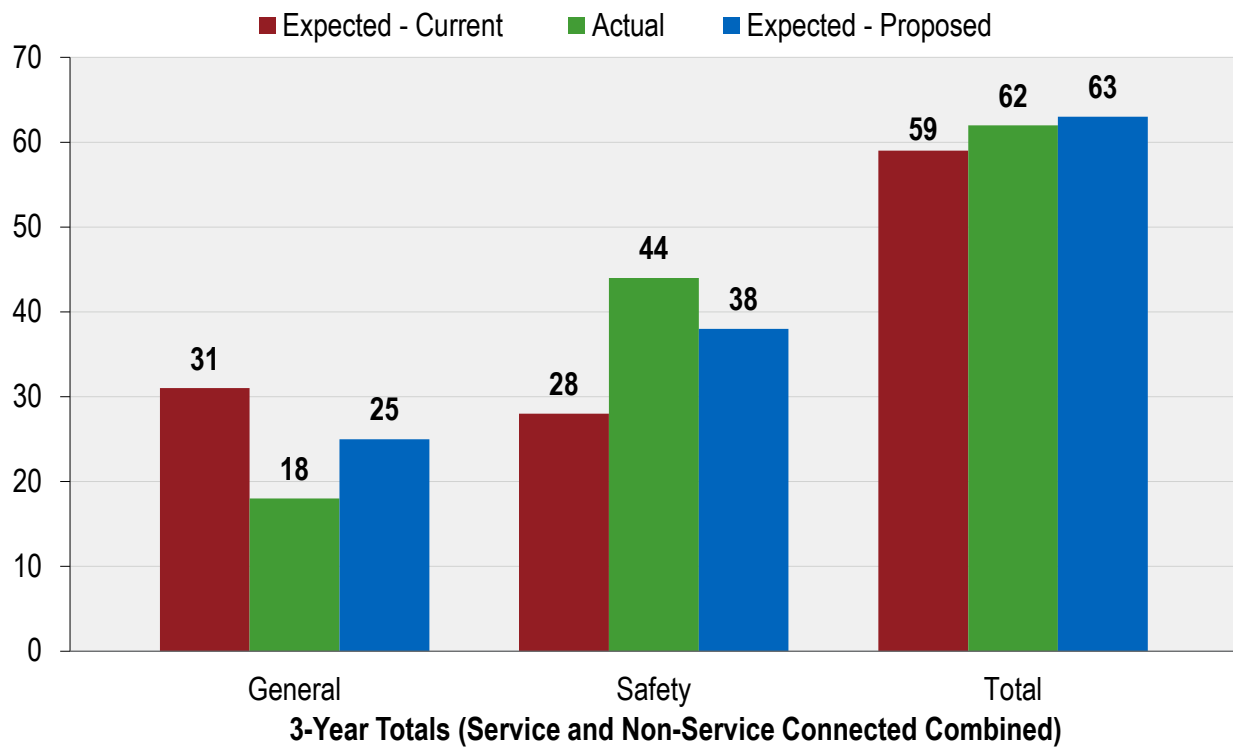
**For disabled Safety members, 98% received a service connected disability. We recommend maintaining the current assumption that 95% of disabilities will receive a service connected disability retirement.**

Chart 27 compares actual to expected service connected and non-service connected disabilities over the past three years for the current and proposed assumptions.

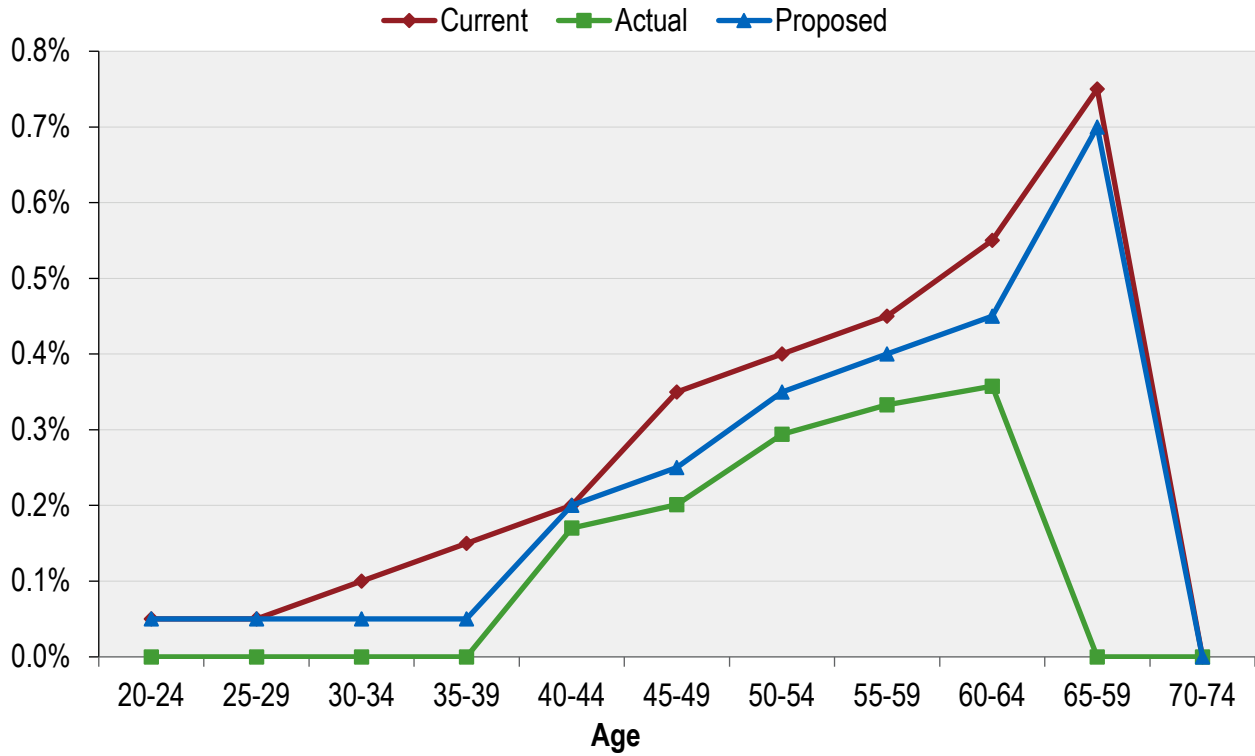
Chart 28 shows the actual disability incidence rates over the past three years compared to the current and proposed assumptions for General members.

Chart 29 shows the actual disability incidence rates over the past three years compared to the current and proposed assumptions for Safety members.

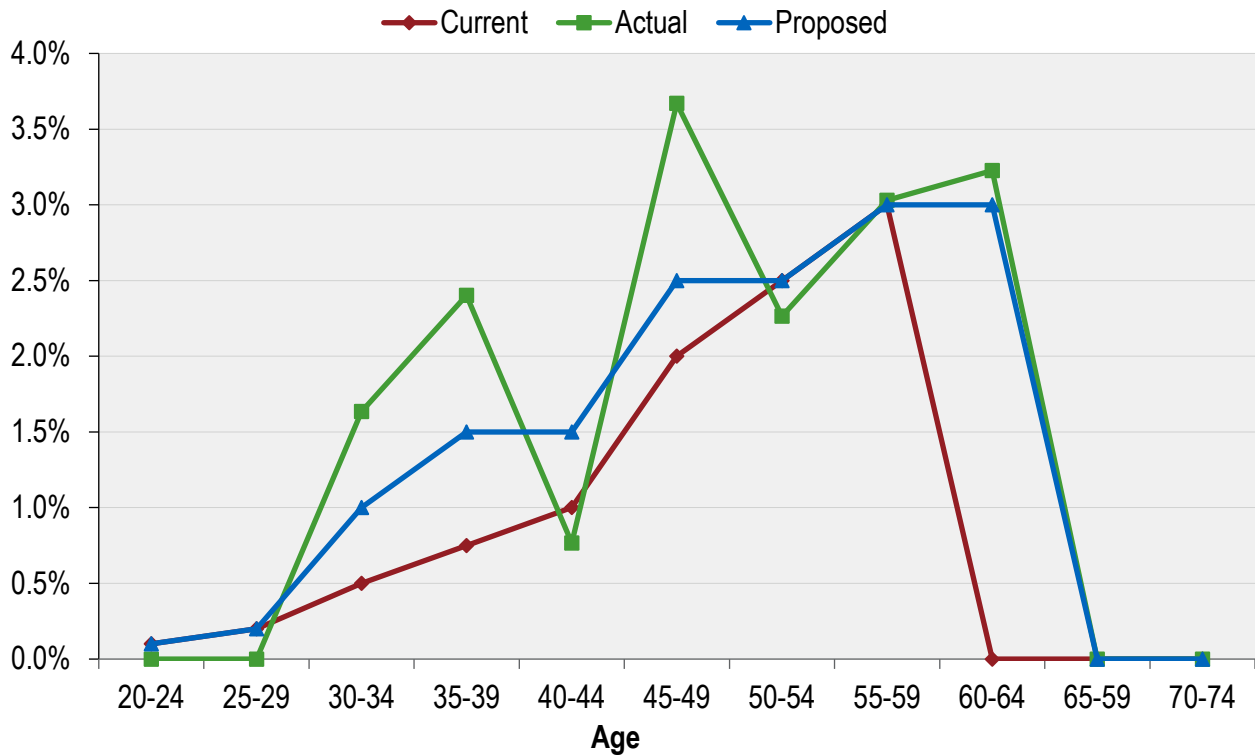
**CHART 27: ACTUAL NUMBER OF DISABILITIES  
COMPARED TO EXPECTED**



**CHART 28: DISABILITY INCIDENCE RATES – GENERAL MEMBERS**



**CHART 29: DISABILITY INCIDENCE RATES – SAFETY MEMBERS**



## F. Cashouts

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

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

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

### Court

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

	General Plan A
Year Ending December 31,	Actual Average Cashout
2015	2.05%
2016	3.77%
2017	4.47%
<b>Weighted Average</b>	<b>3.64%</b>
<b>Current Assumption</b>	4.00%
<b>Proposed Assumption</b>	3.75%

It is our understanding that General Plan A Court members may no longer cash out sick leave starting in fiscal year 2016/2017. SCERA previously determined that about 9% of total cashouts were from sick leave. Instead, General Plan A Court members must convert any unused sick leave at retirement to service credit. (It should be noted that similar to the employees at the County and the Valley of the Moon, when a Court employee applies for retirement and has unused sick leave to convert, SCERA bills the employer for the cost of the conversion at the time of retirement. Therefore, no assumption for the conversion of sick leave is needed for the actuarial valuation.)

**We recommend reducing the current cashout assumption for General Plan A Court members from 4% to 3.75% based on the weighted average of the actual cashouts in the current and prior experience studies being less than 4% and the fact that General Plan A Court members can no longer cash out sick leave.**

## Valley of the Moon

We have also collected data for the Valley of the Moon to estimate cashouts for active General Plan A and Safety Plan A Valley of the Moon members as a percentage of final average pay. Note that in the prior experience study, we used the policy maximum to anticipate cashouts among all bargaining units in our calculations. For this study, we have been provided with additional detail on each member's bargaining unit and corresponding policy maximum. Therefore, we have calculated a weighted average policy maximum based on actual membership data. The results are summarized in the following tables:

General Plan A Valley of the Moon			
	Average Actual Amount Cashed Out Ongoing (1)	Policy Maximum (2)	Difference Between (1) & (2)
Vacation	64	96	
Administrative Leave	27	27	
<b>Total</b>	<b>91</b>	<b>123</b>	<b>32</b>
<b>Current Assumption Used to Predict Cashout During Year of Retirement<sup>22</sup></b>			83
<b>Proposed Assumption Used to Predict Cashout During Year of Retirement<sup>23</sup></b>			42

On an ongoing basis, General Plan A Valley of the Moon members are only cashing out about 91 hours per year which is about 32 hours less than the maximum allowable cashout of 123 hours per year. If we assume that the members will cash out an additional 32 hours in the year of retirement (thereby bringing the total cashed out to the maximum of 123 hours), that additional cashout will be less than the 83 hours we used in our current valuation to predict cashouts during the year of retirement.

Safety Plan A Valley of the Moon			
	Average Actual Amount Cashed Out Ongoing (1)	Policy Maximum (2)	Difference Between (1) & (2)
Vacation	48	96	
Administrative Leave	10	15	
<b>Total</b>	<b>58</b>	<b>111</b>	<b>53</b>
<b>Current Assumption Used to Predict Cashout During Year of Retirement<sup>24</sup></b>			125
<b>Proposed Assumption Used to Predict Cashout During Year of Retirement<sup>25</sup></b>			63

<sup>22</sup> Calculated by multiplying the FTE hours (i.e.,  $80 \times 26.089$ , or 2,087.12) by the 4% current assumption used in our valuation.

<sup>23</sup> Calculated by multiplying the FTE hours (i.e.,  $80 \times 26.089$ , or 2,087.12) by a 2% assumption.

<sup>24</sup> Calculated by multiplying the FTE hours (i.e.,  $80 \times 26.089$ , or 2,087.12) by the 6% current assumption used in our valuation.

<sup>25</sup> Calculated by multiplying the FTE hours (i.e.,  $80 \times 26.089$ , or 2,087.12) by a 3% assumption.

On an ongoing basis, Safety Plan A Valley of the Moon members are only cashing out about 58 hours per year which is about 53 hours less than the maximum allowable cashout of 111 hours per year. If we assume that the members will cash out an additional 53 hours in the year of retirement (thereby bringing the total cashed out to the maximum of 111 hours), that additional cashout will be less than the 125 hours we used in our current valuation to predict cashouts during the year of retirement.

For purposes of calculating member contribution rates for General Plan A and Safety Plan A Valley of the Moon members, no adjustment is needed as none of the full costs included above have been determined by SCERA to be from the cashout of sick leave, which is excluded from the cashout cost paid by the active members.

**We recommend reducing the current cashout assumption for General Plan A Valley of the Moon members from 4% to 2%, and reducing the current cashout assumption for Safety Plan A Valley of the Moon members from 6% to 3%.**

## County

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

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

## 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 in the December 31, 2017 actuarial valuation. If all of the proposed assumption changes (both economic and demographic) were implemented, the Plan's average employer rate would have increased by 1.36% of payroll. The average member rate would have increased by 0.47% of payroll. The Plan's UAAL would have increased by \$31 million.

Employer Contribution Rate Impact (% of Payroll)				
Plan	Normal Cost	UAAL	Total	Estimated Dollar Amounts (in Thousands) <sup>26</sup>
General Plan A – County	0.45%	0.57%	1.02%	\$1,926
General Plan A – Court	0.41%	0.59%	1.00%	\$97
General Plan A – Valley of the Moon	0.57%	0.51%	1.08%	\$3
General Plan B – County	0.28%	0.57%	0.85%	\$792
General Plan B – Court	0.28%	0.59%	0.87%	\$28
General Plan B – Valley of the Moon	0.28%	0.51%	0.79%	\$2
Safety Plan A – County	2.64%	0.55%	3.19%	\$1,810
Safety Plan A – Valley of the Moon	2.37%	0.56%	2.93%	\$118
Safety Plan B – County	1.26%	0.55%	1.81%	\$276
Safety Plan B – Valley of the Moon	1.50%	0.56%	2.06%	\$14
<b>Total Increase in Employer Contribution Rates</b>	<b>0.79%</b>	<b>0.57%</b>	<b>1.36%</b>	<b>\$5,066</b>

<sup>26</sup> Based on December 31, 2017 projected annual payrolls as determined under each set of assumptions.



General Member Contribution Rate Impact (% of Payroll)			
Plan	Current	Proposed	Change
General Plan A – County (Average Entry Age: 36)	11.93%	12.37%	0.44%
General Plan A – Court (Average Entry Age: 35)	12.08%	12.53%	0.45%
General Plan A – Valley of the Moon (Average Entry Age: 52)	12.13%	12.19%	0.06%
General Plan B – County	10.37%	10.65%	0.28%
General Plan B – Court	10.37%	10.65%	0.28%
General Plan B – Valley of the Moon	7.34%	7.62%	0.28%

Safety Member Contribution Rate Impact (% of Payroll)			
Plan	Current	Proposed	Change
Safety Plan A – County (Average Entry Age: 30)	12.07%	12.77%	0.70%
Safety Plan A – Valley of the Moon (Average Entry Age: 36)	10.67%	11.17%	0.50%
Safety Plan B – County	13.98%	15.24%	1.26%
Safety Plan B – Valley of the Moon	9.97%	11.47%	1.50%

If all of the proposed economic assumption changes were implemented, the average employer rate would have increased by 1.94% of payroll and the average member rate would have increased by 0.48% of payroll. Of the various economic assumption changes, the most significant cost impact is from the investment return assumption change.

If all of the proposed demographic assumption changes were implemented, the average employer rate would have decreased by 0.58% of payroll. The average member rate would have decreased by 0.01% of payroll.

Finally, the estimated cost impact of all proposed assumption changes (both economic and demographic) is 1.36% of payroll for the average employer rate, where the Normal Cost rate increased by 0.79% and the UAAL amortization rate increased by 0.57%. The average member rate would have increased by 0.47% of payroll.

# Appendix A: Current Actuarial Assumptions

## Economic Assumptions

<b>Net Investment Return:</b>	7.25%, net of administrative and investment expenses.
<b>Employee Contribution Crediting Rate:</b>	½ of the net investment return credited semi-annually.
<b>Cost-of-Living Adjustments for Retirees:</b>	Not applicable.
<b>Payroll Growth:</b>	Inflation of 3.00% per year plus “across the board” real salary increases of 0.50% per year.
<b>Increase in Section 7522.10 Compensation Limit:</b>	Increase of 3.00% per year from the valuation date.

## Individual Salary Increases

Annual Rate of Compensation Increase (%)		
Inflation: 3.00% per year; plus “across the board” real salary increases of 0.50% per year; plus the following promotional and merit increases:		
Years of Service	General	Safety
Less than 1	6.00	8.50
1	5.00	4.75
2	3.75	3.75
3	2.50	2.75
4	1.50	1.75
5 and Over	0.50	0.50

## Demographic Assumptions

### Post-Retirement Mortality Rates – Healthy

- **General Members:** Headcount-Weighted RP-2014 Healthy Annuitant Table projected 20 years with the two-dimensional scale MP-2014 set back one year for males and set forward one year for females
- **Safety Members:** Headcount-Weighted RP-2014 Healthy Annuitant Table projected 20 years with the two-dimensional scale MP-2014 set back one year

## Post-Retirement Mortality Rates – Disabled

- **General Members:** Headcount-Weighted RP-2014 Healthy Annuitant Table projected 20 years with the two-dimensional scale MP-2014 set forward five years
- **Safety Members:** Headcount-Weighted RP-2014 Healthy Annuitant Table projected 20 years with the two-dimensional scale MP-2014 set forward four years

## Mortality Rates – Beneficiaries

- **Beneficiaries:** Assumed to have the same mortality as a General Member who has taken a service (non-disability) retirement

## Member Contribution Rates

- **General Members:** Headcount-Weighted RP-2014 Healthy Table projected 20 years with the two-dimensional scale MP-2014 set back one year for males and set forward one year for females weighted 33.33% male and 66.67% female
- **Safety Members:** Headcount-Weighted RP-2014 Healthy Table projected 20 years with the two-dimensional scale MP-2014 set back one year weighted 75% male and 25% female

## Pre-Retirement Mortality Rates

- **General Members:** Headcount-Weighted RP-2014 Employee Table projected 20 years with the two-dimensional scale MP-2014 times 1/2
- **Safety Members:** Headcount-Weighted RP-2014 Employee Table projected 20 years with the two-dimensional scale MP-2014 times 1/2

Age	Rate (%)			
	General		Safety	
	Male	Female	Male	Female
30	0.02	0.01	0.02	0.01
35	0.03	0.01	0.03	0.01
40	0.03	0.02	0.03	0.02
45	0.05	0.03	0.05	0.03
50	0.08	0.06	0.08	0.06
55	0.14	0.09	0.14	0.09
60	0.23	0.12	0.23	0.12

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

## Disability Incidence Rates

Age	Rate (%)	
	General <sup>1</sup>	Safety <sup>2</sup>
20	0.05	0.06
25	0.05	0.16
30	0.08	0.38
35	0.13	0.65
40	0.18	0.90
45	0.29	1.60
50	0.38	2.30
55	0.43	2.80
60	0.51	0.00

<sup>1</sup> 50% of General disabilities are assumed to be service connected disabilities. The other 50% are assumed to be non-service connected disabilities.

<sup>2</sup> 95% of Safety disabilities are assumed to be service connected disabilities. The other 5% are assumed to be non-service connected disabilities.

## Withdrawal Rates

Years of Service	Less than Five Years of Service (%)	
	General	Safety
Less than 1	6.00	4.00
1	4.00	2.40
2	3.00	1.60
3	2.50	1.60
4	2.00	1.60

Age	Five or More Years of Service (%)	
	General	Safety
20	1.50	1.60
25	1.50	1.60
30	1.50	1.26
35	1.05	0.70
40	0.60	0.34
45	0.44	0.14
50	0.34	0.00
55	0.24	0.00
60	0.14	0.00

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

## Vested Termination Rates

Less than Five Years of Service (%)		
Years of Service	General	Safety
Less than 1	6.25	6.00
1	5.50	4.00
2	4.00	4.00
3	3.00	4.00
4	3.00	4.00

Five or More Years of Service (%)		
Age	General	Safety
20	3.00	4.00
25	3.00	4.00
30	3.00	3.40
35	3.00	2.10
40	2.40	1.05
45	2.00	0.60
50	2.00	0.00
55	1.70	0.00
60	1.50	0.00
65	1.20	0.00
70	0.00	0.00

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

## Retirement Rates

Age	Rate (%)					
	General			Safety		
	Plan A Less than 30 Years	Plan A 30 or More Years	Plan B	Plan A Less than 30 Years	Plan A 30 or More Years	Plan B
50	7.0	10.0	0.0	14.0	10.0	4.0
51	7.0	10.0	0.0	16.0	12.0	5.0
52	7.0	12.0	4.0	16.0	18.0	6.0
53	8.0	16.0	1.5	18.0	25.0	6.0
54	9.0	20.0	2.5	24.0	50.0	8.0
55	10.0	25.0	2.5	30.0	100.0	20.0
56	10.0	30.0	4.5	30.0	100.0	15.0
57	10.0	30.0	5.5	25.0	100.0	15.0
58	15.0	30.0	6.5	25.0	100.0	20.0
59	20.0	40.0	7.5	25.0	100.0	20.0
60	25.0	40.0	8.5	100.0	100.0	100.0
61	25.0	45.0	9.5	100.0	100.0	100.0
62	30.0	45.0	14.5	100.0	100.0	100.0
63	30.0	45.0	16.5	100.0	100.0	100.0
64	30.0	45.0	19.0	100.0	100.0	100.0
65	30.0	45.0	24.0	100.0	100.0	100.0
66	40.0	45.0	20.0	100.0	100.0	100.0
67	40.0	50.0	20.0	100.0	100.0	100.0
68	50.0	50.0	20.0	100.0	100.0	100.0
69	80.0	80.0	20.0	100.0	100.0	100.0
70	100.0	100.0	100.0	100.0	100.0	100.0

<b>Retirement Age and Benefit for Deferred Vested Members:</b>	<p>For deferred vested members, retirement age assumptions are as follows:</p> <p>General Age: 58 Safety Age: 52</p> <p>We assume that 30% and 45% of future General and Safety deferred vested members, respectively, will continue to work for a reciprocal employer. For reciprocals, we assume 4.00% compensation increases per annum.</p>
<b>Future Benefit Accruals:</b>	1.0 year of service per year.
<b>Unknown Data for Members:</b>	Same as those exhibited by members with similar known characteristics. If not specified, members are assumed to be male.
<b>Definition of Active Members:</b>	First day of eligible employment.

<b>Percent Married:</b>	70% of male members and 55% of female members are assumed to be married at pre-retirement death or retirement.										
<b>Age of Spouse:</b>	Male retirees are 4 years older than their spouses and female retirees are 2 years younger than their spouses.										
<b>Cashouts:</b>	<p><i>Plan A County Members terminated prior to June 1, 2014:</i></p> <p>The following assumptions for a one-time compensation increase at retirement from vacation, sick leave and holiday cashouts is used:</p> <table data-bbox="682 441 1055 514"> <tr> <td>General Members</td> <td>4.00%</td> </tr> <tr> <td>Safety Members</td> <td>6.00%</td> </tr> </table> <p><i>General Plan A Court Members:</i></p> <p>The following assumptions for a one-time compensation increase at retirement from vacation, sick leave and holiday cashouts is used:</p> <table data-bbox="682 661 1023 693"> <tr> <td>General Members</td> <td>4.00%</td> </tr> </table> <p>Note: For the purposes of calculating member contribution rates, these assumptions are adjusted by a factor of 91% since about 9% of the full costs included above have been determined by SCERA to be from the cashout of sick leave which is excluded from the cashout cost paid by the active members.</p> <p><i>Plan A VOM Members:</i></p> <p>The following assumptions for a one-time compensation increase at retirement from vacation, sick leave and holiday cashouts is used:</p> <table data-bbox="682 997 1023 1071"> <tr> <td>General Members</td> <td>4.00%</td> </tr> <tr> <td>Safety Members</td> <td>6.00%</td> </tr> </table>	General Members	4.00%	Safety Members	6.00%	General Members	4.00%	General Members	4.00%	Safety Members	6.00%
General Members	4.00%										
Safety Members	6.00%										
General Members	4.00%										
General Members	4.00%										
Safety Members	6.00%										

# Appendix B: Proposed Actuarial Assumptions

## Economic Assumptions

<b>Net Investment Return:</b>	7.00%, net of administrative and investment expenses.
<b>Employee Contribution Crediting Rate:</b>	½ of the net investment return credited semi-annually.
<b>Cost-of-Living Adjustments for Retirees:</b>	Not applicable.
<b>Payroll Growth:</b>	Inflation of 2.75% per year plus “across the board” real salary increases of 0.50% per year.
<b>Increase in Section 7522.10 Compensation Limit:</b>	Increase of 2.75% per year from the valuation date.

## Individual Salary Increases

Annual Rate of Compensation Increase (%)		
Inflation: 2.75% per year; plus “across the board” real salary increases of 0.50% per year; plus the following promotional and merit increases:		
Years of Service	General	Safety
Less than 1	5.50	7.50
1	5.00	7.00
2	4.50	5.00
3	3.50	4.00
4	2.50	3.50
5	1.50	1.50
6	1.25	1.25
7	1.00	1.25
8	0.95	1.25
9	0.90	1.25
10	0.85	1.25
11	0.80	1.25
12	0.75	1.25
13	0.75	1.00
14	0.75	1.00
15 and Over	0.50	0.75



## Demographic Assumptions

### Post-Retirement Mortality Rates – Healthy

- **General and Safety Members:** Headcount-Weighted RP-2014 Healthy Annuitant Table times 94% for males and 102% for females, projected generationally with the two-dimensional mortality improvement scale MP-2017

### Post-Retirement Mortality Rates – Disabled

- **General and Safety Members:** Headcount-Weighted RP-2014 Disabled Retiree Table times 91% for males and 93% for females, projected generationally with the two-dimensional mortality improvement scale MP-2017

### Mortality Rates – Beneficiaries

- **Beneficiaries:** Assumed to have the same mortality as a General Member who has taken a service (non-disability) retirement

### Member Contribution Rates

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

### Pre-Retirement Mortality Rates

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

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

*Note that generational projections beyond the base year (2014) are not reflected in the above mortality rates. All pre-retirement deaths are assumed to be non-service connected deaths.*

## Disability Incidence Rates

Age	Rate (%)	
	General <sup>1</sup>	Safety <sup>2</sup>
20	0.05	0.10
25	0.05	0.16
30	0.05	0.68
35	0.05	1.30
40	0.14	1.50
45	0.23	2.10
50	0.31	2.50
55	0.38	2.80
60	0.43	3.00
65	0.60	0.00
70	0.00	0.00

<sup>1</sup> 55% of General disabilities are assumed to be service connected disabilities. The other 45% are assumed to be non-service connected disabilities.

<sup>2</sup> 95% of Safety disabilities are assumed to be service connected disabilities. The other 5% are assumed to be non-service connected disabilities.

## Withdrawal Rates

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

Five or More Years of Service (%)		
Age	General	Safety
20	1.50	1.60
25	1.50	1.60
30	1.38	1.24
35	0.97	0.64
40	0.54	0.25
45	0.37	0.09
50	0.32	0.02
55	0.24	0.00
60	0.14	0.00

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

## Vested Termination Rates

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

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

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

## Retirement Rates

Age	Rate (%)					
	General			Safety		
	Plan A Less than 30 Years	Plan A 30 or More Years	Plan B	Plan A Less than 30 Years	Plan A 30 or More Years	Plan B
48	0.0	0.0	0.0	5.0	5.0	0.0
49	0.0	0.0	0.0	5.0	5.0	0.0
50	6.0	10.0	0.0	18.0	18.0	5.0
51	6.0	10.0	0.0	16.0	16.0	5.0
52	6.0	10.0	3.5	12.0	18.0	4.5
53	6.0	15.0	1.0	14.0	25.0	4.5
54	7.0	20.0	2.0	22.0	50.0	7.5
55	10.0	25.0	2.5	25.0	75.0	16.5
56	8.0	25.0	3.5	30.0	75.0	15.0
57	8.0	30.0	4.5	20.0	75.0	12.0
58	12.0	30.0	5.0	20.0	75.0	16.0
59	20.0	40.0	7.5	20.0	75.0	16.0
60	25.0	40.0	8.5	75.0	100.0	75.0
61	25.0	45.0	9.5	75.0	100.0	75.0
62	30.0	45.0	14.5	75.0	100.0	75.0
63	30.0	45.0	16.5	75.0	100.0	75.0
64	30.0	45.0	19.0	75.0	100.0	75.0
65	30.0	45.0	24.0	100.0	100.0	100.0
66	40.0	45.0	20.0	100.0	100.0	100.0
67	40.0	50.0	20.0	100.0	100.0	100.0
68	40.0	50.0	20.0	100.0	100.0	100.0
69	50.0	80.0	20.0	100.0	100.0	100.0
70	100.0	100.0	100.0	100.0	100.0	100.0

<b>Retirement Age and Benefit for Deferred Vested Members:</b>	<p>For deferred vested members, retirement age assumptions are as follows:</p> <p style="padding-left: 40px;">General Age:           58</p> <p style="padding-left: 40px;">Safety Age:             53</p> <p>We assume that 25% and 40% of future General and Safety deferred vested members, respectively, will continue to work for a reciprocal employer. For reciprocals, we assume 3.75% compensation increases per annum for General members and 4.00% compensation increases per annum for Safety members.</p>
<b>Future Benefit Accruals:</b>	1.0 year of service per year.
<b>Unknown Data for Members:</b>	Same as those exhibited by members with similar known characteristics. If not specified, members are assumed to be male.
<b>Definition of Active Members:</b>	First day of eligible employment.

<b>Percent Married:</b>	70% of male members and 55% of female members are assumed to be married at pre-retirement death or retirement.										
<b>Age of Spouse:</b>	Male retirees are 4 years older than their spouses and female retirees are 2 years younger than their spouses.										
<b>Cashouts:</b>	<p><i>Plan A County Members terminated prior to June 1, 2014:</i></p> <p>The following assumptions for a one-time compensation increase at retirement from vacation, sick leave and holiday cashouts is used:</p> <table> <tr> <td>General Members</td> <td>4.00%</td> </tr> <tr> <td>Safety Members</td> <td>6.00%</td> </tr> </table> <p><i>General Plan A Court Members:</i></p> <p>The following assumptions for a one-time compensation increase at retirement from vacation and holiday cashouts is used:</p> <table> <tr> <td>General Members</td> <td>3.75%</td> </tr> </table> <p><i>Plan A VOM Members:</i></p> <p>The following assumptions for a one-time compensation increase at retirement from vacation and holiday cashouts is used:</p> <table> <tr> <td>General Members</td> <td>2.00%</td> </tr> <tr> <td>Safety Members</td> <td>3.00%</td> </tr> </table>	General Members	4.00%	Safety Members	6.00%	General Members	3.75%	General Members	2.00%	Safety Members	3.00%
General Members	4.00%										
Safety Members	6.00%										
General Members	3.75%										
General Members	2.00%										
Safety Members	3.00%										

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