



City of Los Angeles Fire and Police Pension Plan

ACTUARIAL EXPERIENCE STUDY

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



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May 23, 2017

Board of Fire and Police Pension Commissioners
City of Los Angeles Fire and Police Pension Plan
701 East 3rd Street, Suite 200
Los Angeles, CA 90013

Re: Review of Actuarial Assumptions for the June 30, 2017 Actuarial Valuation

Dear Members of the Board:

We are pleased to submit this report of our review of the actuarial experience for the City of Los Angeles Fire and Police Pension Plan. This study utilizes the census data for the period July 1, 2013 to June 30, 2016 and provides the proposed actuarial assumptions, both economic and demographic, to be used in the June 30, 2017 valuation.

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

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

Sincerely,

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

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

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

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

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Actuarial Experience Study

Analysis of Actuarial Experience

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I. Introduction, Summary, and Recommendations

To project the cost and liabilities of the Pension Fund, 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 assumptions, and to the extent there are differences, the future contribution requirement is adjusted.

If assumptions are changed, 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 that year's experience was 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 promised benefit amounts to participants already retired and to those near retirement. The actuarial assumptions used do not determine the "actual cost" of the plan. The actual cost is determined solely by the benefits and administrative expenses paid out, offset by investment income received. However, it is desirable to estimate as closely as possible what the actual cost will be so as to permit an orderly method for setting aside contributions today to provide benefits in the future, and to maintain equity among generations of participants and taxpayers.

This study was undertaken in order to review the economic and demographic actuarial assumptions and to compare the actual experience with that expected under the current assumptions during the three-year experience period from July 1, 2013 through June 30, 2016. The study was performed in accordance with Actuarial Standard of Practice (ASOP) No. 35, "Selection of Demographic and Other Non-Economic Assumptions for Measuring Pension Obligations" and ASOP No. 27 "Selection of 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, across-the-board salary increases, merit and promotional salary increases, retirement from active employment, percent married and spouse age difference, pre-retirement mortality, post-retirement healthy and disabled life mortality, termination rates, and disability incidence rates.

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

Pg #	Actuarial Assumption Categories	Recommendation
6	<p>Inflation: Future increases in the Consumer Price Index (CPI), which drives investment returns and active member salary increases, as well as cost-of-living adjustments (COLAs) for retirees.</p>	<p>Reduce the current 3.25% inflation assumption to 3.00% per annum as discussed in Section (III)(A).</p> <p>Reduce the current 3.25% COLA assumption to 3.00% for retired employees in Tiers 1 and 2. Maintain the current 3.00% COLA assumption for retired employees in Tiers 3 through 6.</p>
7	<p>Investment Return: The estimated average future net rate of return on current and future assets of the Plan as of the valuation date. This rate is used to discount liabilities.</p>	<p>Reduce the current investment return assumption from 7.50% per annum to 7.25% per annum as discussed in Section (III)(B).</p>
14	<p>Individual Salary Increases: Increases in the salary of a member between the date of the valuation to the date of separation from active service. This assumption has three components:</p> <ul style="list-style-type: none"> • Inflationary salary increases • Real “across the board” salary increases • Merit and promotional increases 	<p>Reduce the current inflationary salary increase assumption from 3.25% to 3.00% per annum consistent with our recommended general inflation assumption and reduce the current real “across the board” salary increase assumption from 0.75% to 0.50%. This means that the combined inflationary and real “across the board” salary increases will decrease from 4.00% to 3.50% per annum.</p> <p>We recommend adjusting the merit and promotional rates of salary increase to those developed in Section (III)(C) to reflect past experience.</p>
13	<p>Administrative Expenses: Fees for administration, legal, accounting, and actuarial services, and other functions carried out by the Plan.</p>	<p>Increase the total administrative expense load from 1.00% to 1.25% of projected payroll as discussed in Section (III)(B). The portion allocated to the Retirement Plan and the Health Plan is 1.16% and 0.09%, of projected payroll, respectively.</p>
20	<p>Retirement Rates: The probability of retirement at each age at which participants are eligible to retire.</p> <p>Other Retirement Related Assumptions including:</p> <ul style="list-style-type: none"> • Percent married and spousal age differences for members not yet retired • Retirement age for inactive vested members 	<p>Adjust the retirement rates to those developed in Section (IV)(A) to anticipate generally later retirements at higher ages.</p> <p>For active and deferred vested members, reduce the percent married at retirement assumption for females to 55% and maintain the assumption at 80% for males. Reduce the spouse age difference assumption from three years to two years for female members (female members are assumed to be two years younger than their male spouse beneficiaries).</p>
27 33	<p>Mortality Rates: The probability of dying at each age. Mortality rates are used to project life expectancies.</p>	<p>For members who retire from service, adjust the rates as developed in Section (IV)(B) to reflect a generational approach to anticipating future healthy mortality improvement.</p> <p>Adjust also the disabled member mortality rates as developed in Section (IV)(C).</p> <p>The recommended pre-retirement mortality assumptions have been adjusted as developed in Section (IV)(B). In addition, maintain the assumption that all pre-retirement deaths are assumed to be service connected.</p> <p>The recommended mortality assumption will anticipate longer life expectancy for both pre- and post-retirement.</p>
35	<p>Termination Rates: The probability of leaving employment at each age and receiving either a refund of member contributions or a deferred vested retirement benefit.</p>	<p>Reduce the current rates to those developed in Section (IV)(D) to reflect recent experience.</p>

Pg #	Actuarial Assumption Categories	Recommendation
40	Disability Incidence Rates: The probability of becoming disabled at each age.	Adjust the current disability rates to those developed in Section (IV)(E) to reflect slightly lower incidence of disability. Maintain the current anticipated level of disability benefit (that reflects severity of disability) payable upon disability retirement and lower the current assumption from 90% to 85% of all disability retirements will be service connected disability retirements.

We have estimated the impact of the proposed assumption changes as if they were applied to the June 30, 2016 actuarial valuations. In particular, if all of the proposed assumption changes (both economic and demographic) recommended in this report were implemented, the aggregate employer contribution rate would have increased by 4.71% of payroll for the Retirement Plan and 1.72% of payroll for the Health Plan.

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

II. Background and Methodology

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

Economic Assumptions

Economic assumptions consist of:

- **Inflation:** Increases in the price of goods and services. The inflation assumption reflects the basic return that investors expect from securities markets. It also reflects the expected basic salary increase for active employees and drives increases in the allowances of retired members.
- **Investment Return:** Expected long term rate of return on the Plan’s investments after 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 merit and promotional increases. With the exception of Tier 1, 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” pay increases that are assumed.

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

Demographic Assumptions

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

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

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

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

III. Economic Assumptions

A. Inflation

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

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

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

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

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

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

LAFPP’s investment consultant, RVKuhns & Associates, anticipates an annual inflation rate of 2.50%, while the average inflation assumption provided by RVKuhns & Associates and seven other investment advisory firms retained by Segal’s California public sector clients was 2.30%. Note that, in general, investment consultants use a time horizon for this assumption that is shorter than the time horizon we use for the actuarial valuation.

To find a forecast of inflation based on a longer time horizon, we referred to the 2016 report on the financial status of the Social Security program. The projected average increase in the Consumer Price Index (CPI) over the next 75 years under the intermediate cost assumptions used in that report was 2.60%. We also compared the yields on the thirty-year inflation indexed U.S. Treasury bonds to comparable traditional U.S. Treasury bonds. As of February 2017, the difference in yields is about 2.10%, which provides a measure of market expectations of inflation.

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

Retiree Cost of Living Increases

In our last review of the economic assumptions as of June 30, 2014, consistent with the 3.25% annual inflation assumption adopted by the Board for that valuation, the Board adopted a 3.25% retiree cost-of-living adjustment for all retirees in Tiers 1 and 2, since these tiers have an uncapped COLA. The retiree cost-of-living adjustment is subject to a 3.00% maximum for Tiers 3 through 6 and a 3.00% assumption was used for retirees in those tiers.

Consistent with our recommended inflation assumption, we also recommend that the current 3.25% retiree cost-of-living assumption for Tiers 1 and 2 be reduced to 3.00%. We are recommending no change to the 3.00% retiree cost-of-living assumption for retirees in Tiers 3 through 6.

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

- The results of the stochastic modeling are significantly dependent on assuming that lower levels of inflation will persist in the early years of the projections. If this is not assumed, then the stochastic modeling will produce results similar to our proposed COLA assumptions.
- Using a lower long-term COLA assumption based on a stochastic analysis would mean that an actuarial loss would occur even when the inflation assumption of 3.00% is met in a year. We question the reasonableness of this result.

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

B. Investment Return

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

Real Rate of Investment Return

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

Following is the Plan’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 RVKuhns’ total or “nominal” 2017 return assumptions by their assumed 2.50% inflation rate. The second column of returns (except for Unconstrained Fixed Income and Private Equity) represents the average of a sample of real rate of return assumptions. The sample includes the expected annual real rates of return provided to us by RVKuhns and by seven other investment advisory firms retained by Segal’s California public sector retirement clients. We believe these averages are a reasonable forecast of long term future market returns¹.

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

Asset Class	Percentage of Portfolio	RVKuhns’ Assumed Real Rate of Return ²	Average Assumed Real Rate of Return from a Sample of Consultants to Segal’s California Public Sector Clients ³
Large Cap U.S. Equity	23%	4.50%	5.61%
Small Cap U.S. Equity	6%	5.00%	6.37%
Developed International Equity	16%	5.75%	6.96%
Emerging Markets Equity	5%	8.25%	9.28%
U.S. Core Fixed Income	12%	1.00%	1.06%
TIPS	5%	1.25%	0.94%
High Yield Bonds	3%	3.50%	3.65%
Real Estate	10%	3.75%	4.37%
Commodities	5%	3.25%	3.76%
Cash	1%	-0.25%	-0.17%
Unconstrained Fixed Income	2%	2.50%	2.50% ⁴
Private Equity	12%	7.50%	7.50% ⁴
Total	100%	4.44%	5.11%

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

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

² Derived by reducing RVKuhns’ nominal rate of return assumptions by their assumed 2.50% inflation rate.

³ These are based on the projected arithmetic returns provided by RVKuhns and seven other investment advisory firms serving the LA Fire and Police Pension Plan and 16 other city and county retirement systems in California. These return assumptions are gross of any applicable investment expenses.

⁴ For these asset classes, RVKuhns’ assumption is applied in lieu of the average because there is a larger disparity in returns for these asset classes among firms surveyed and using RVKuhns’ assumption should more closely reflect the underlying investments made specifically for LAFPP.

The following are some observations about the returns provided above:

1. The investment consultants to our California public sector clients have each provided us with their expected real rates of return for each asset class, over various future periods of time. However, in general, the returns available from investment consultants are projected over time periods shorter than the durations of a retirement plan's liabilities.
2. Using a sample average of expected real rate of returns allows the Plan's investment return assumption to reflect a broader range of capital market information and should help reduce year to year volatility in the investment return assumption.
3. Therefore, we recommend that the 5.11% portfolio real rate of return be used to determine the Plan's investment return assumption. This is 0.01% lower than the return that was used three years ago in the review to prepare the recommended investment return assumption for the June 30, 2014 valuation. The difference is due to changes in LAFPP's target asset allocation (+ 0.13%) and changes in the real rate of return assumptions provided to us by the investment advisory firms (- 0.14%).

Investment Expenses

For funding purposes, the real rate of return assumption for the portfolio needs to be adjusted for investment expenses expected to be paid from investment income. LAFPP previously adopted an explicit administrative expense assumption and used that in the development of employer contributions starting with the June 30, 2014 valuation. The payment of those expenses would not result in a reduction in the net income available from investment return. The following table provides the investment expenses in relation to the actuarial value of assets for the five-year period ending June 30, 2016. (For informational purposes, we have also provided the investment expenses calculated over the ten-year period ending June 30, 2016.)

INVESTMENT EXPENSES AS A PERCENTAGE OF ACTUARIAL VALUE OF ASSETS (DOLLARS IN 000'S)

Year Ending June 30	Actuarial Value of Assets ⁵	Investment Expenses ⁶	Investment
2012	\$15,179,275	\$51,790	0.34%
2013	15,671,112	55,588	0.35%
2014	16,879,354	70,028	0.41%
2015	18,114,393	75,765	0.42%
2016	19,126,148	77,289	0.40%
Five-Year Average			0.38%
Ten-Year Average			0.37%
Recommendation			0.40%

⁵ As of end of plan year.

⁶ From LAFPP audited financial statements.

Based on this experience and in consultation with LAFPP’s staff, we believe that an increase in the future investment expense assumption from 0.35% to 0.40% is reasonable. This assumption will be re-examined in subsequent assumption reviews as new data becomes available.

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

We have not performed a detailed analysis to measure how much of the investment expenses paid to active managers might have been offset by additional returns (“alpha”) earned by that active management. However, we observed based on information provided in the RVKuhns’ Investment Performance Analysis for the period ended June 30, 2016 that over the historical period of 10 years provided in that report, the Fund’s performance gross of the fees for investments was 0.13% above the policy benchmark (and that 0.13% was approximately equal to one-third of the investment expenses averaged over the last ten years). We could work with the Plan’s staff to determine whether future studies might potentially exclude the level of investment expenses for active managers that could be expected to be offset by investment returns. For now, we will continue to use the current approach that any “alpha” that may be identified would be treated as an increase in the risk adjustment and corresponding confidence level. For example, 0.25% of alpha would increase the confidence level by 3% (see discussions that follow on definitions of risk adjustment and confidence level).

Risk Adjustment

The real rate of return assumption for the portfolio is adjusted to reflect the potential risk of shortfalls in the return assumptions. The Plan’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 term⁷. The 5.11% expected real rate of return developed earlier in this report was based on expected mean or average arithmetic returns. This means there is a 50% chance of the actual return in each year being at least as great as the average (assuming a symmetrical distribution of future returns). The risk adjustment is intended to increase that probability somewhat above the 50% level. This is consistent with our experience that retirement plan fiduciaries would generally prefer that returns exceed the assumed rate more often than not. Note that, based on the investment return assumptions recently adopted by systems that have been analyzed under this model, we observe a confidence level generally in the range of 50% to 60%.

Three years ago, the Board adopted an investment return assumption of 7.50%. That return implied a risk adjustment of 0.52%, reflecting a confidence level of 56% that the actual average

⁷ This type of risk adjustment is sometimes referred to as a “margin for adverse deviation”.

return over 15 years would not fall below the assumed return, assuming that the distribution of returns over that period follows the normal statistical distribution⁸.

In our model, the confidence level associated with a particular risk adjustment represents the likelihood that the actual average return would equal or exceed the assumed value over a 15-year period. For example, if we set our real rate of return assumption using a risk adjustment that produces a confidence level of 60%, then there would be a 60% chance (6 out of 10) that the average return over 15 years will be equal to or greater than the assumed value. The 15-year time horizon represents an approximation of the “duration” of the fund’s liabilities, where the duration of a liability represents the sensitivity of that liability to interest rate variations.

If we use the same 56% confidence level from our last study to set this year’s risk adjustment, based on the current long-term portfolio standard deviation of 12.89% provided by RVKuhns, the corresponding risk adjustment would be 0.52%. Together with the other investment return components, this would result in an investment return assumption of 7.19%, which is lower than the current assumption of 7.50%.

Based on the general practice of using one-quarter percentage point increments for economic assumptions, we evaluated the effect on the confidence level of a 7.25% investment return assumption. In particular, a net investment return assumption of 7.25%, together with the other investment return components, would produce a risk adjustment of 0.46%, which when rounded corresponds to a confidence level of 55%. This is slightly lower than the confidence level implicit in the investment return assumption adopted by the Board in the last study.

The table below shows the recommended investment return assumption, the risk adjustment and corresponding confidence level, all compared to the values from prior studies.

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

Year Ending June 30	Investment Return	Risk Adjustment	Corresponding Confidence Level
2007 – 2010	8.00%	1.35%	65%
2011 – 2013	7.75%	1.03%	62%
2014 – 2016	7.50%	0.52%	56%
2017 (Recommended)	7.25%	0.46%	55%

As we have discussed in prior experience studies, the risk adjustment model and associated confidence level is most useful as a means for comparing how the Plan has positioned itself relative to risk over periods of time.⁹ The use of a 55% confidence level should be considered in context with other factors, including:

⁸ Based on an annual portfolio return standard deviation of 13.49% provided by RVKuhns in 2014. Strictly speaking, future compounded long-term investment returns will tend to follow a log-normal distribution. However, we believe the normal distribution assumption is reasonable for purposes of setting this type of risk adjustment.

⁹ 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.”

- 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 RVKuhns. The standard deviation is a statistical measure of the future volatility of the portfolio and so is itself based on assumptions about future portfolio volatility and can be considered somewhat of a “soft” number.
- A confidence level of 55% (associated with a 7.25% investment return assumption) is within the range of about 50% to 60% that corresponds to the risk adjustments used by most of Segal’s other California public retirement system clients. Most public retirement systems that have recently reviewed their investment return assumptions have seen decreases in their confidence level even though they adopted more conservative investment return assumptions for their valuations.
- As with any model, the results of the risk adjustment model should be evaluated for reasonableness and consistency. This is discussed in the later section on “Comparison with Other Public Retirement Systems”.

Taking into account the factors above, our recommendation is to reduce the net investment return assumption from 7.50% to 7.25%. As noted above, this return implies a 0.46% risk adjustment, reflecting a confidence level of 55% 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.

CALCULATION OF INVESTMENT RETURN ASSUMPTION

Assumption Component	June 30,2017 Recommended Value	June 30, 2014 Adopted Value	June 30, 2010 Adopted Value
Inflation	3.00%	3.25%	3.50%
Plus Portfolio Real Rate of Return	5.11%	5.12%	5.73%
Minus Investment Expenses	(0.40%)	(0.35%)	(0.45%)
Minus Risk Adjustment	(0.46%)	(0.52%)	(1.03%)
Total	7.25%	7.50%	7.75%
Confidence Level	55%	56%	62%

Based on this analysis, we recommend that the investment return assumption be reduced from 7.50% to 7.25% 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 7.25% investment return assumption is now the most common assumption, and is used by nine California County employees retirement systems. However, a 7.00% investment return assumption is becoming more common among California public sector retirement systems. In particular, six County employees retirement systems (Contra Costa, Fresno, Mendocino, Sacramento, San Mateo and Santa Barbara) use a 7.00% earnings assumption. Furthermore, the CalPERS Board has approved a reduction in the earnings assumption from 7.50% to 7.00% over the next three years. In addition, CalSTRS recently adopted a 7.25% earnings assumption for the 2016 valuation (down from 7.50%) and a 7.00% earnings assumption for the 2017 valuation.

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

Assumption	LAFPP	NASRA 2016 Public Fund Survey		
		Low	Median	High
Net Investment Return	7.25%	5.50%	7.50%	8.50%

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

In summary, we believe that both the risk adjustment model and other considerations indicate a lower earnings assumption. The recommended assumption of 7.25% is generally consistent with the Plan's current practice relative to other public systems.

Administrative Expenses

The following table provides the administrative expenses in relation to the projected payroll for each of the five-year period ending June 30, 2016. (For informational purposes, we have also provided the administrative expenses calculated over the ten-year period ending June 30, 2016.)

ADMINISTRATIVE EXPENSES AS A PERCENTAGE OF COVERED-EMPLOYEE PAYROLL (DOLLARS IN 000'S)

Year Ending June 30	Covered-Employee Payroll*	Administrative Expenses	Administrative Expenses as a Percent of Payroll
2012	\$1,213,396	\$14,498	1.19%
2013	1,277,031	13,045	1.02%
2014	1,308,199	14,882	1.14%
2015	1,314,360	19,178	1.46%
2016	1,351,788	20,897	1.55%
Five-Year Average			1.27%
Ten-Year Average			1.16%
Recommendation			1.25%

* Based on the budgeted payroll used to determine prepaid contributions.

The average administrative expenses percentage over this five-year period is 1.27% of covered-employee payroll, with the most recent value higher than this average. Based on information provided by LAFPP's staff, we understand that there were some additional expenses related to the development of the new pension administration system that were included in the expenses reported in recent years and those expenses would be expected to drop off in the next few years. However, beginning with FYE 2015, the City now bills LAFPP directly for their respective share of the LACERS pension contributions made on behalf of LAFPP staff. This new expense will continue to be paid by the Plan in the future. We have taken this information into consideration in developing our assumption and recommend increasing the current administrative expense assumption from 1.00% to 1.25% of payroll. This expense will be allocated to the employer contribution rates for the Retirement and Health Plans in the amounts of 1.16% and 0.09%, respectively if paid biweekly. This breakdown is proportional to the expenses allocated to the Retirement and Health Plans in the five-year period ending June 30, 2016.

C. Salary Increase

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

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

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

As discussed earlier in this report, we are recommending that the assumed rate of inflation be reduced from 3.25% to 3.00% per annum. This inflation component will be used as part of the salary increase assumption.

2. **Real “Across the Board” Pay Increases:** These increases are typically termed productivity increases since they are considered to be derived from the ability of an organization or an economy to produce goods and services in a more efficient manner. As that occurs, at least some portion of the value of these improvements can provide a source for pay increases. These increases are typically assumed to extend to all employees “across the board.” The State and Local Government Workers Employment Cost Index produced by the Department of Labor provides evidence that real “across the board” pay increases have averaged about 0.6% - 0.9% annually during the last ten to twenty years.

We also referred to the annual report on the financial status of the Social Security program published in June 2016. In that report, real “across the board” pay increases are forecast to be 1.2% per year under the intermediate assumptions.

The real pay increase assumption is generally considered a more “macroeconomic” assumption that is not necessarily based on individual plan experience. However, recent salary experience with public systems in California as well as anecdotal discussions with plans and plan sponsors indicate lower future real wage growth expectations for public sector employees. We note that for LAFPP’s active members, the actual average inflation plus “across the board” increases (i.e., wage inflation) over three year period ending June 30, 2016 was 1.5%.

Valuation Date	Actual Average Increase ¹⁰	Actual Change in CPI ¹¹
June 30, 2014	4.1%	0.5%
June 30, 2015	0.6%	0.1%
June 30, 2016	-0.2%	2.4%
Three-Year Average	1.5%	1.0%

Considering these factors, we recommend reducing the real “across the board” salary increase assumption from 0.75% to 0.50% for the June 30, 2017 actuarial valuation. This means that the combined inflation and “across the board” salary increase assumption will decrease from 4.00% to 3.50%.

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

The annual merit and promotional increases are determined by measuring the actual increases received by members over the experience period, net of the actual average

¹⁰ 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.

¹¹ Based on the change in the February CPI for the Los Angeles-Riverside-Orange County Area compared to the prior year.

inflationary and real “across the board” pay increases. Increases are measured in combination for Fire and Police members. This is accomplished by:

- a. Measuring each member’s actual salary increase over each year of the experience period;
- b. Excluding any members with increases of more than 50% or any decreases during any particular year;
- c. Categorizing these increases into groups by years of service;
- d. Removing the wage inflation component from these increases (assumed equal to the increase in the members’ average salary during the year);
- e. Averaging these annual increases over the three-year experience period; and
- f. Modifying current assumptions to reflect some portion of these measured increases reflective of their “credibility.”

To be consistent with the other economic assumptions, these merit and promotional assumptions should be used in combination with the 3.50% assumed inflation and real “across the board” increases.

The following table shows the average increases over the three-year experience period (July 1, 2013 through June 30, 2016) before removing the wage inflation components:

Years of Service	Average Increase (%)
0	13.60
1	15.50
2	14.04
3	13.37
4	6.66
5	4.28
6	2.70
7	2.17
8	2.99
9	4.39
10	2.90
11	2.41
12	2.78
13	3.23
14	3.62
15 or more	2.35

The annual increase in average salary over this three -year period was about 1.5% for all members. The following table shows the average merit and promotional increases for the current three-year period, after removing increases in average salary in each service category.

Years of Service	Average Merit and Promotional Salary Increase (%)
0	12.60
1	14.09
2	12.96
3	10.68
4	4.10
5	2.37
6	1.32
7	0.93
8	2.11
9	2.82
10	0.98
11	1.10
12	1.22
13	1.83
14	2.17
15 or more	0.84

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

Current vs. Proposed Merit and Promotional Salary Increase (%)			
Years of Service	Current	Actual	Proposed
0	7.50	12.60	8.50
1	6.50	14.09	7.50
2	5.00	12.96	6.00
3	4.75	10.68	5.50
4	3.75	4.10	4.00
5	3.00	2.37	2.75
6	2.25	1.32	2.50
7	2.00	0.93	2.00
8	1.75	2.11	1.75
9	1.75	2.82	1.75
10	1.25	0.98	1.25
11	0.75	1.10	1.00
12	0.75	1.22	1.00
13	0.75	1.83	1.00
14	0.75	2.17	1.00
15 or more	0.75	0.84	0.80

Based on this experience, we are recommending overall increases in the merit and promotional salary increase assumption.

Chart 1 provides a graphical comparison of the current, actual experience and proposed merit and promotional increases.

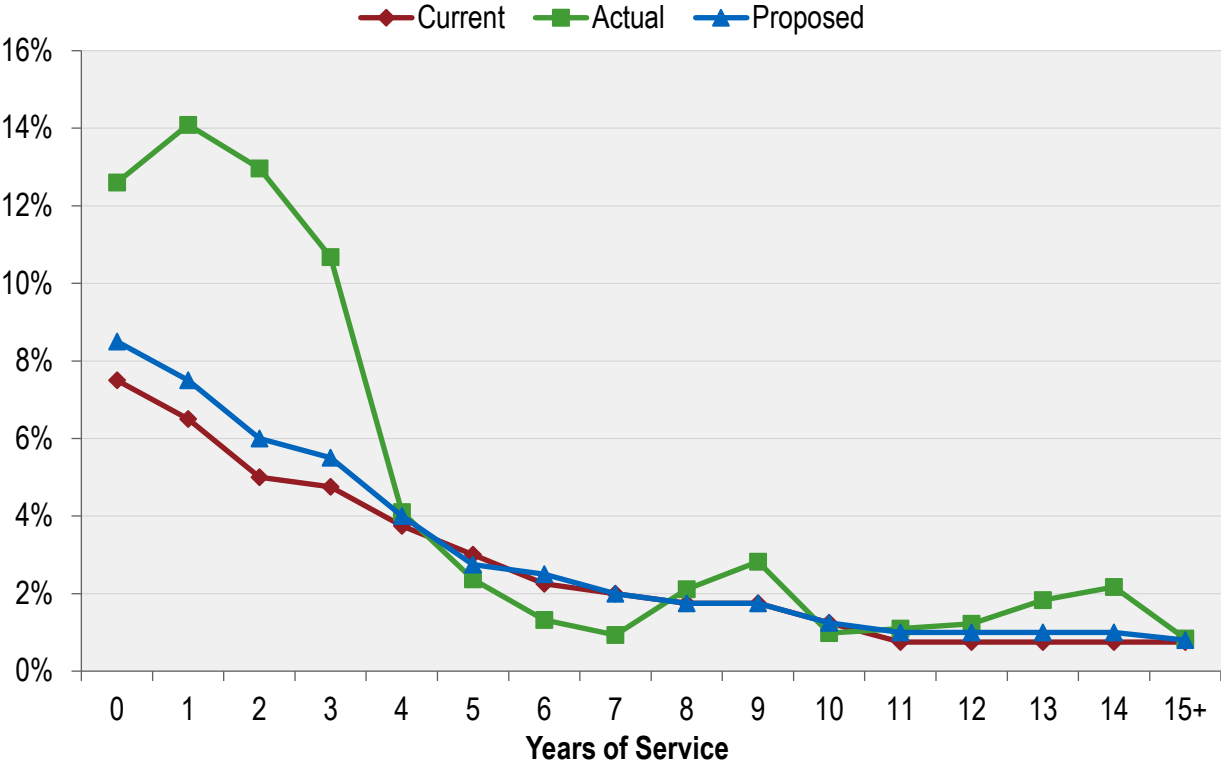
All three of these forces are incorporated into a salary increase assumption that is applied in the actuarial valuation to project future benefits and future normal cost contribution collections. Overall, salary increases are assumed to be slightly lower due to the lower price inflation assumption and real “across-the-board” pay increases.

Active Member Payroll

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

We recommend that the active member payroll increase assumption be reduced from 4.00% to 3.50% annually, consistent with the combined inflation and real “across the board” salary increase assumptions.

CHART 1: MERIT AND PROMOTIONAL SALARY INCREASE RATES



IV. Demographic Assumptions

A. Retirement Rates

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

The retirement experience during the current three-year period indicated that there were slightly more actual retirements than expected but members were retiring slightly later than under the current assumptions.

In this study, we have adjusted the retirement probabilities to reflect the current three-year experience, as well as prior experience as represented by the current retirement assumptions for Fire and Police members in Tiers 3 – 5. For Fire Tier 6, we are not recommending any changes in the retirement rates under age 65 due to lack of actual retirement experience. For ages 65 and older, we recommend extending the last retirement age until age 70 to maintain consistency with the proposed last retirement age for Tiers 2 through 5. Even though there is no actual experience available for Police Tier 6, we are recommending an increase to the rate at age 54 to maintain consistency with the increase in age 54 rates for Tiers 2 and 4. We have also increased the rates at ages 55 and 56 and reduced the rate at age 59, as well as extended the last retirement age to age 70. This is to maintain consistency with those we recommend for Police Tiers 2 through 5 as the rates for Police Tier 6 were originally set equal to the rates for Police Tiers 2 and 4 for ages below 55 and for Police Tiers 3 and 5 for ages above 55.

For this experience study, consistent with prior practice, retirement experience for those members who retire after having participated in the DROP is combined with those members who have never participated in the DROP. This is based on the notion that DROP participants are considered active members until they leave DROP and begin receiving retirement benefits. However, at the date of retirement, there is an assumption that we apply to project the probability that a member has elected DROP before retirement, and if so, how many years the member has been in the DROP.

Fire

Age	Rate of Retirement (%)							
	Fire Tiers 2 and 4			Fire Tiers 3 and 5			Fire Tier 6	
	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate	Current Rate	Proposed Rate
41	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
42	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
43	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
44	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
45	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
46	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
47	1.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00
48	2.00	20.00	2.00	0.00	0.00	0.00	0.00	0.00
49	2.00	0.00	2.00	0.00	0.00	0.00	0.00	0.00
50	3.00	0.00	3.00	3.00	1.12	2.00	3.00	3.00
51	4.00	0.00	5.00	3.00	0.00	2.00	3.00	3.00
52	5.00	12.50	8.00	3.00	0.32	2.00	4.00	4.00
53	10.00	0.00	10.00	3.00	0.56	2.00	5.00	5.00
54	15.00	25.00	20.00	7.00	8.06	7.00	5.00	5.00
55	20.00	25.00	25.00	12.00	16.22	14.00	10.00	10.00
56	20.00	21.43	25.00	14.00	17.51	16.00	12.00	12.00
57	20.00	55.56	25.00	16.00	22.58	18.00	15.00	15.00
58	20.00	66.67	25.00	20.00	27.53	25.00	18.00	18.00
59	20.00	0.00	25.00	25.00	33.33	25.00	20.00	20.00
60	20.00	0.00	25.00	25.00	25.51	30.00	25.00	25.00
61	20.00	100.00	25.00	30.00	31.58	30.00	30.00	30.00
62	25.00	0.00	25.00	35.00	42.00	35.00	30.00	30.00
63	25.00	0.00	25.00	40.00	41.38	40.00	35.00	35.00
64	30.00	0.00	30.00	40.00	35.71	40.00	40.00	40.00
65	100.00	50.00	60.00	100.00	60.00	60.00	100.00	60.00
66	100.00	0.00	60.00	100.00	66.67	60.00	100.00	60.00
67	100.00	0.00	60.00	100.00	0.00	60.00	100.00	60.00
68	100.00	100.00	60.00	100.00	0.00	60.00	100.00	60.00
69	100.00	0.00	60.00	100.00	0.00	60.00	100.00	60.00
70	100.00	0.00	100.00	100.00	0.00	100.00	100.00	100.00

Chart 2 compares actual experience with the current and proposed assumed rates of retirement for Fire Tier 2 and Tier 4 members. Chart 3 has similar data for Fire Tier 3 and Tier 5 members.

Police

Rate of Retirement (%)								
Police Tiers 2 and 4			Police Tiers 3 and 5			Police Tier 6		
Age	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate	Current Rate	Proposed Rate
41	10.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00
42	10.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00
43	10.00	75.00	10.00	0.00	0.00	0.00	0.00	0.00
44	10.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00
45	10.00	0.00	10.00	0.00	0.00	0.00	0.00	0.00
46	7.00	0.00	7.00	0.00	0.00	0.00	0.00	0.00
47	7.00	0.00	7.00	0.00	0.00	0.00	0.00	0.00
48	7.00	5.56	7.00	0.00	0.00	0.00	0.00	0.00
49	7.00	1.96	7.00	0.00	0.00	0.00	0.00	0.00
50	12.00	2.13	12.00	7.00	7.22	7.00	8.00	8.00
51	12.00	10.00	12.00	6.00	3.98	5.00	10.00	10.00
52	12.00	15.38	12.00	6.00	3.42	5.00	10.00	10.00
53	15.00	29.03	20.00	6.00	3.51	5.00	15.00	15.00
54	20.00	40.00	25.00	10.00	13.08	12.00	15.00	20.00
55	20.00	42.86	30.00	18.00	21.52	20.00	18.00	20.00
56	25.00	50.00	30.00	18.00	20.71	20.00	18.00	20.00
57	25.00	17.65	30.00	20.00	20.70	20.00	20.00	20.00
58	25.00	58.33	30.00	22.00	24.52	22.00	22.00	22.00
59	25.00	28.57	30.00	25.00	18.40	22.00	25.00	22.00
60	25.00	33.33	30.00	25.00	28.47	25.00	25.00	25.00
61	25.00	50.00	30.00	25.00	23.86	25.00	25.00	25.00
62	25.00	100.00	30.00	25.00	25.40	25.00	25.00	25.00
63	30.00	0.00	30.00	25.00	41.86	25.00	25.00	25.00
64	40.00	0.00	40.00	30.00	23.08	30.00	30.00	30.00
65	100.00	100.00	60.00	100.00	30.77	60.00	100.00	60.00
66	100.00	0.00	60.00	100.00	33.33	60.00	100.00	60.00
67	100.00	0.00	60.00	100.00	62.50	60.00	100.00	60.00
68	100.00	0.00	60.00	100.00	40.00	60.00	100.00	60.00
69	100.00	0.00	60.00	100.00	33.33	60.00	100.00	60.00
70	100.00	0.00	100.00	100.00	50.00	100.00	100.00	100.00

Chart 4 compares actual experience with the current and proposed assumed rates of retirement for Police Tier 2 and Tier 4 members. Chart 5 has similar data for Police Tier 3 and Tier 5 members.

Chart 6 compares the current and proposed assumed rates of retirement for Fire Tier 6. Chart 7 has similar data for Police Tier 6 members.

Deferred Vested Members

In prior valuations, deferred vested members were assumed to retire at age 50. The average age at retirement over the prior three years was 50.2 for all deferred vested members. (It is our understanding that the Pension Plan would pay retirement benefits retroactively to age 50.) We recommend maintaining the assumed retirement age for deferred vested participants.

Survivor Continuance

In prior valuations, it was assumed that 80% of all male members and 60% of all female members will be married or have a domestic partner when they retire. According to experience of members who retired during the last three years, about 80% of all male members and 50% of all female members were married or had a domestic partner at retirement. We recommend maintaining the assumption that 80% of all male members will be married or have a domestic partner when they retire and lowering the assumption to assume 55% of all female members will be married or have a domestic partner when they retire.

In prior valuations, female spouses were assumed to be 3 years younger than their male spouses. Based on observed experience from members who retired during the last three years, female spouses were 3.3 years younger than the male members and male spouses were 0.9 years older than the female members, we recommend maintaining the assumption that when active male members retire, female spouses are assumed to be three years younger. When active female members retire, we recommend changing the assumption to be male spouses are assumed to be two years older. Spouses will be assumed to be of the opposite sex to the member until we have more actual experience concerning domestic partners.

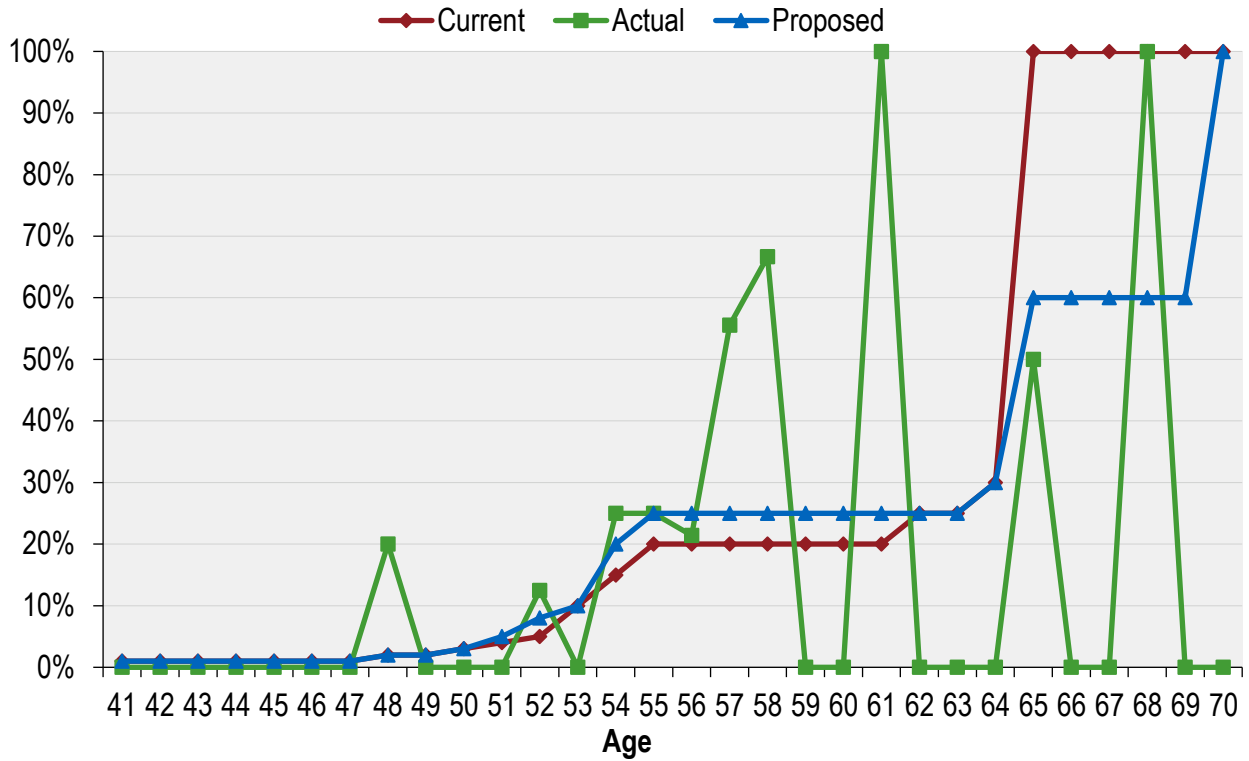
DROP Elections

DROP participants are considered active members until they leave the DROP and begin receiving retirement benefits.

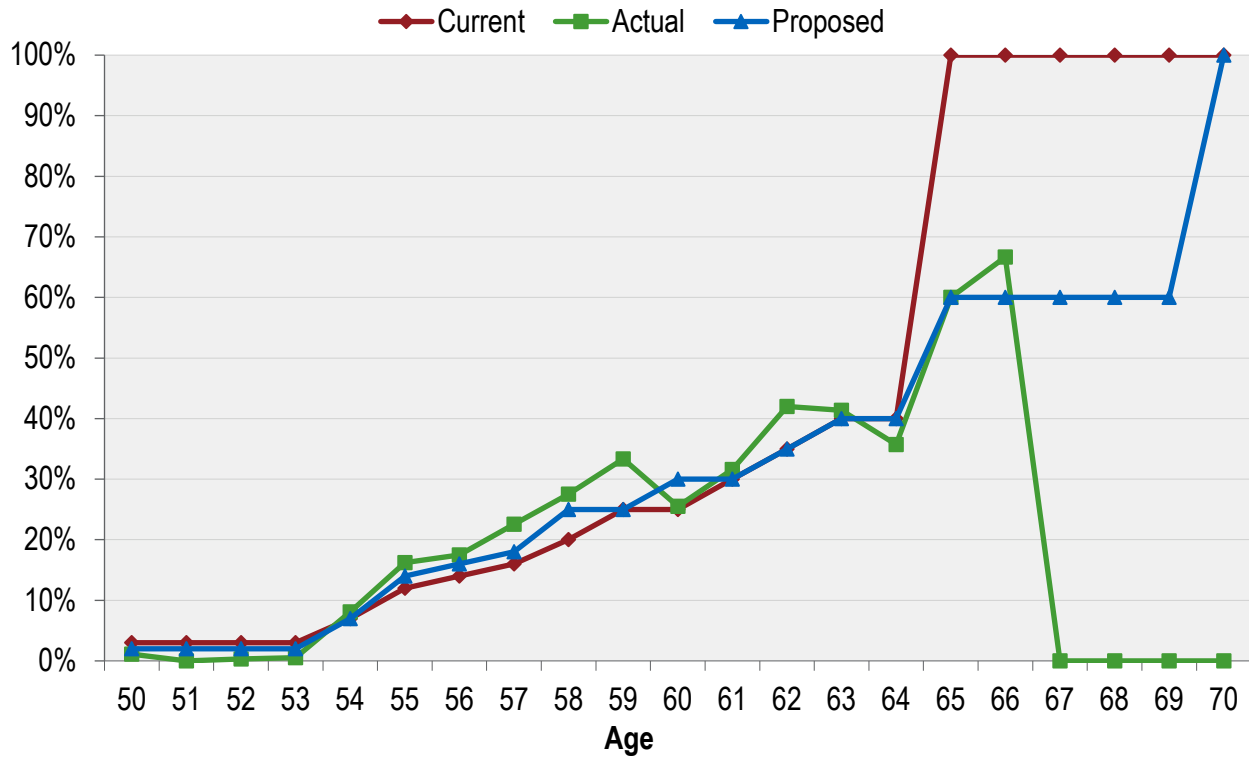
In prior valuations, of all members expected to retire with service retirement benefit, we assumed a 95% probability that members have elected DROP before retirement if they also satisfy the requirements for participating in the DROP for 5 years. The average participation rate over the prior three years was 96%. We recommend maintaining the DROP probability at 95%.

In prior valuations, members were assumed to remain in DROP for 5 years. According to experience for the last three years, the average period of participation in DROP was 4 years and 5 months. Based on this, we recommend maintaining the expected period of participation in DROP at 5 years.

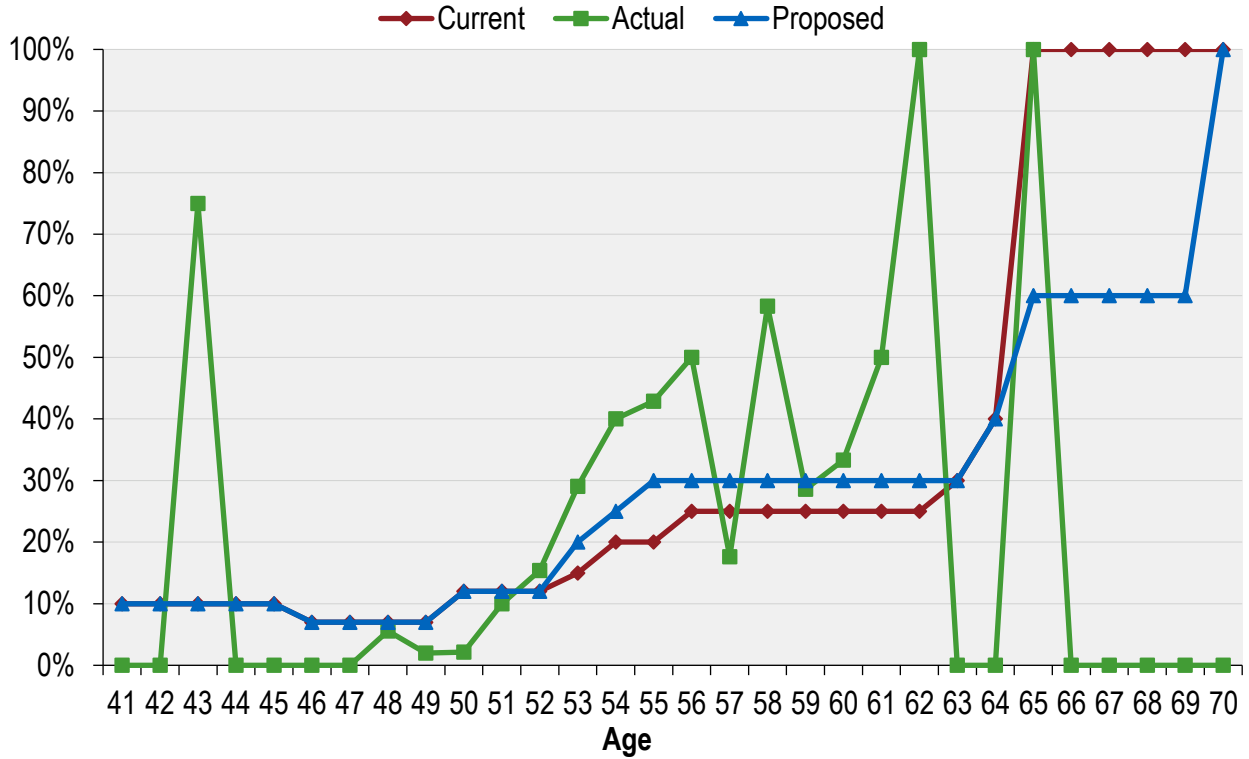
**CHART 2: RETIREMENT RATES
FIRE – TIERS 2 AND 4**



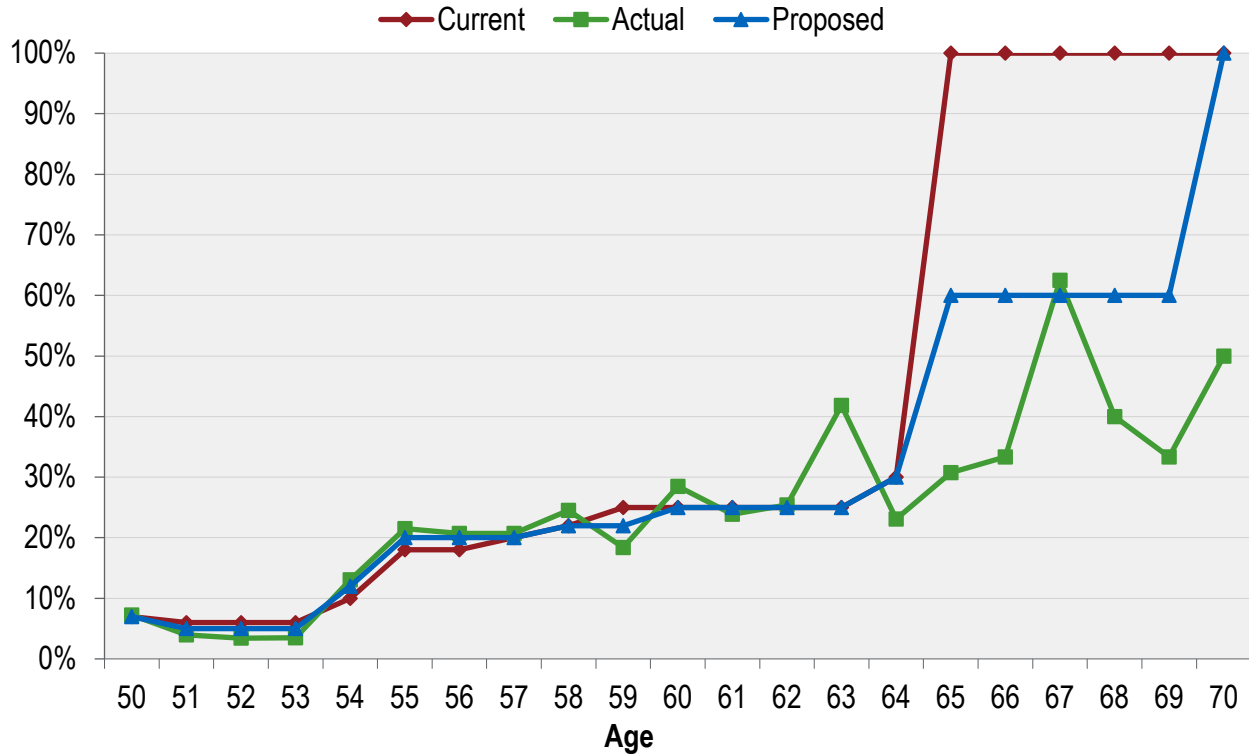
**CHART 3: RETIREMENT RATES
FIRE – TIERS 3 AND 5**



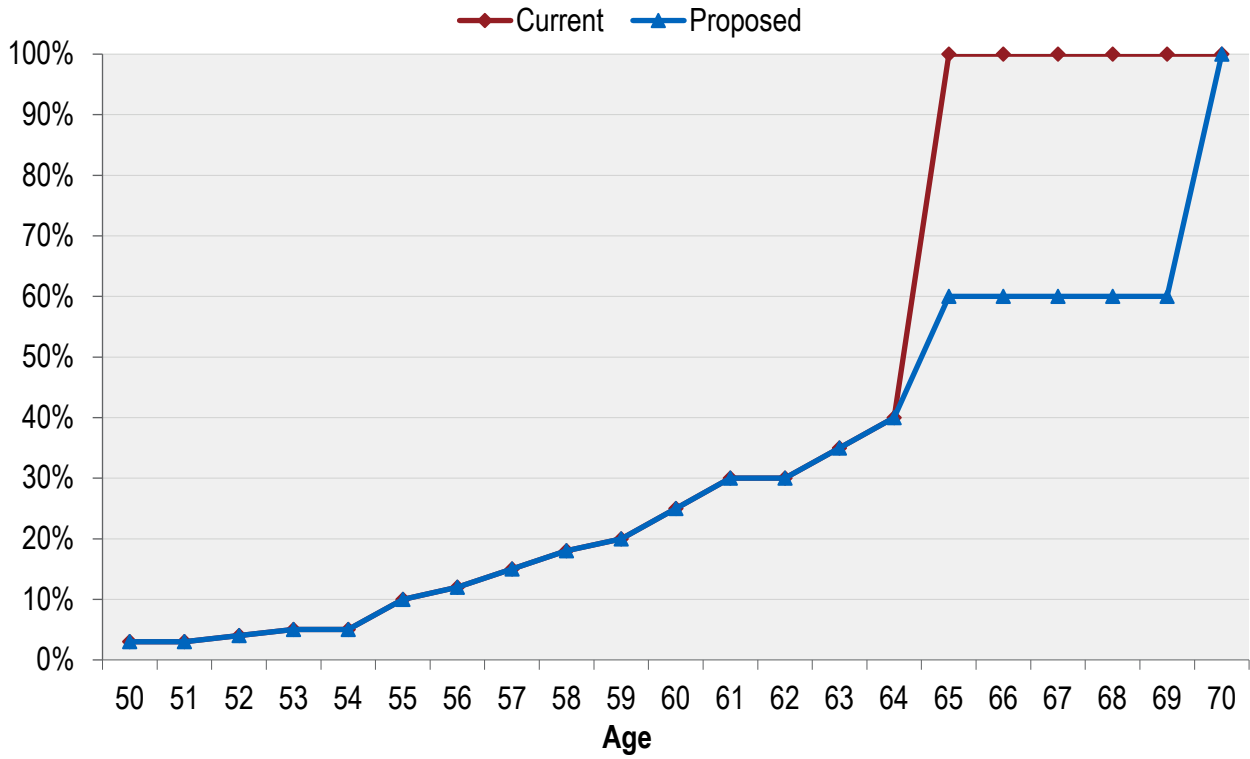
**CHART 4: RETIREMENT RATES
POLICE – TIERS 2 AND 4**



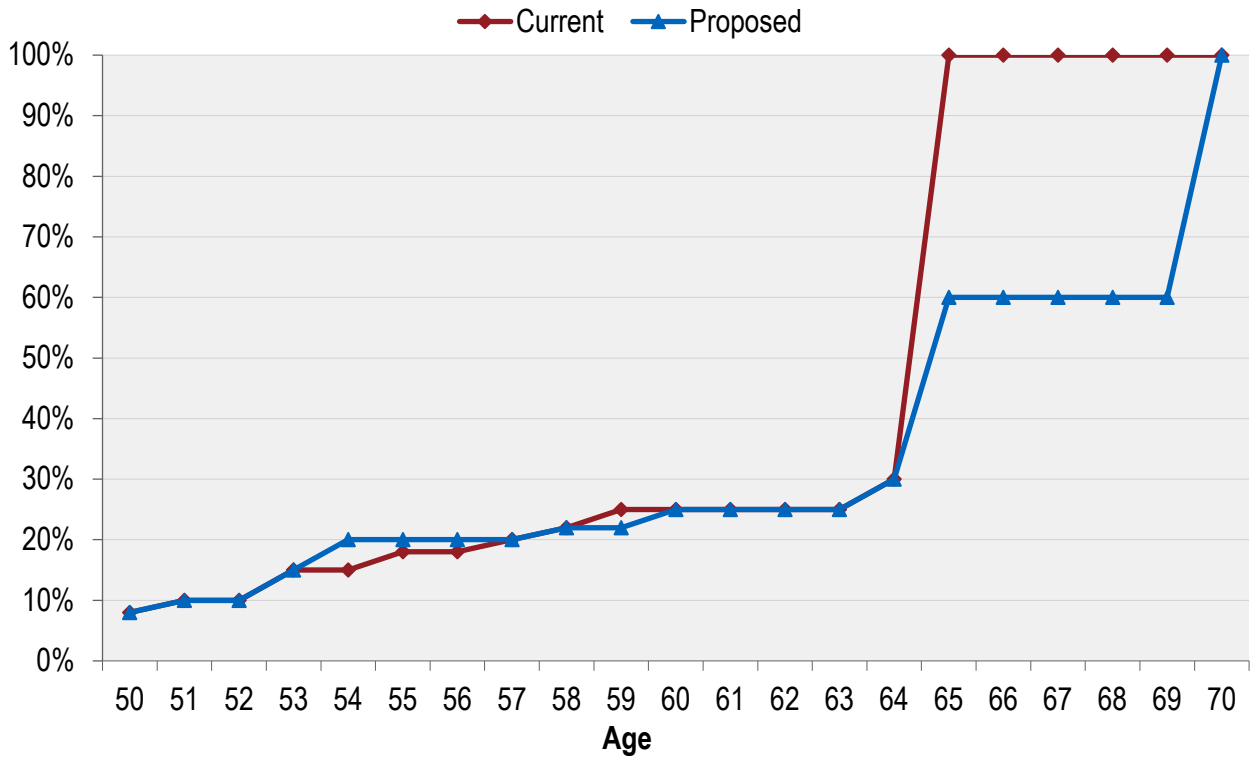
**CHART 5: RETIREMENT RATES
POLICE – TIERS 3 AND 5**



**CHART 6: RETIREMENT RATES
FIRE – TIER 6**



**CHART 7: RETIREMENT RATES
POLICE – TIER 6**



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). The tables currently being used for post-service retirement mortality rates are the RP-2000 Combined Healthy Mortality Table (separate tables for males and females), projected to 2022 with Scale BB, set back one year for members and the RP-2000 Combined Healthy Mortality Table (separate tables for males and females), projected to 2022 with Scale BB, set forward one year for beneficiaries.

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

The Society of Actuaries (SOA) has published the RP-2014 family of mortality tables and associated mortality improvement scales. Within that family of mortality tables, there are mortality rates developed for annuitants on a “headcount” weighted basis that weight all retirees at the same age the same way without regard to the level of benefits those annuitants are receiving from a retirement plan. Mortality rates are also developed for annuitants on a “benefit” weighted basis, with higher credibility assigned to experience from annuitants receiving larger benefits. The headcount-weighted basis is the more common practice currently and is the approach used by Segal in the past for its California public system clients (including LAFPP) and by other public sector actuaries in California.

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

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

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

their mortality improvement scales. Improvement scale MP-2016 is the latest improvement scale available.

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

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

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

	Employer Contribution Rate Impact
Headcount Weighted RP-2014 Family of Tables– Static Approach with Increased Margin*	2.0% of payroll
Benefit Weighted RP-2014 Family of Tables – Static approach with Increased Margin*	3.4% of payroll
Headcount Weighted RP-2014 Family of Tables – Generational Approach	2.5% of payroll

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

Pre-Retirement Mortality

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

From the RP-2014 family of tables, we recommend that pre-retirement mortality follow the Headcount-Weighted RP-2014 Employee Mortality Table (separate tables for males and females) times 90%, projected generationally with the two-dimensional scale MP-2016, all to account for the lower incidences of observed pre-retirement deaths.

We assume that all pre-retirement deaths are service connected deaths.

Post- Retirement Mortality (Service Retirements)

Our analysis starts with a table that shows, among all retired members, the actual deaths compared to the expected deaths under the current assumptions for males and females over the six-year period from both the current and the last experience study periods. We also show the deaths under the proposed assumptions. In prior years we have generally set the mortality

assumption using a static mortality projection so that actual deaths will be at least 10% greater than those assumed. As noted above, we are recommending the use of a generational mortality table rather than static mortality. A generational mortality table incorporates a more explicit assumption for future mortality improvement. Accordingly, the goal is to start with a mortality table that closely matches the current experience (without a margin for future mortality improvement), and then reflect mortality improvement by projecting lower mortality rates in future years. That is why the current actual to expected ratio shown in the table below is 99%. In future years this ratio would remain around 100%, as long as actual mortality improved at the same rates as anticipated in the generational mortality tables. The actual deaths compared to the expected deaths under the current and proposed assumptions for males and females over the last six year period are as follows:

	Healthy Retirees		
	Current Expected Deaths	Actual Deaths	Proposed Expected Deaths
Male	1,137	1,255	1,260
Female	26	26	31
Total	1,163	1,281	1,291
Actual / Expected	110%		99%

The ratio of actual to expected deaths was 110%. We recommend updating the current table to the RP-2014 Headcount-Weighted Healthy Annuitant Mortality Table (separate tables for males and females) set back one year. This table is then projected generationally with the two-dimensional mortality improvement scale MP-2016. This will bring the actual to expected ratio to 99%.

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

Chart 8 compares actual to expected deaths for all members under the current and proposed assumptions over the last six years. Experience shows that there were more deaths than predicted by the current table.

Chart 9 shows the life expectancies under the current and the proposed tables for members.

Post-Retirement Mortality (Beneficiaries)

Among beneficiaries, the actual deaths compared to the expected deaths under the current and proposed assumptions for the last six years are as follows:

	Beneficiaries		
	Current Expected Deaths	Actual Deaths	Proposed Expected Deaths
Male	7	11	8
Female	771	868	821
Total	778	879	829
Actual / Expected	113%		106%

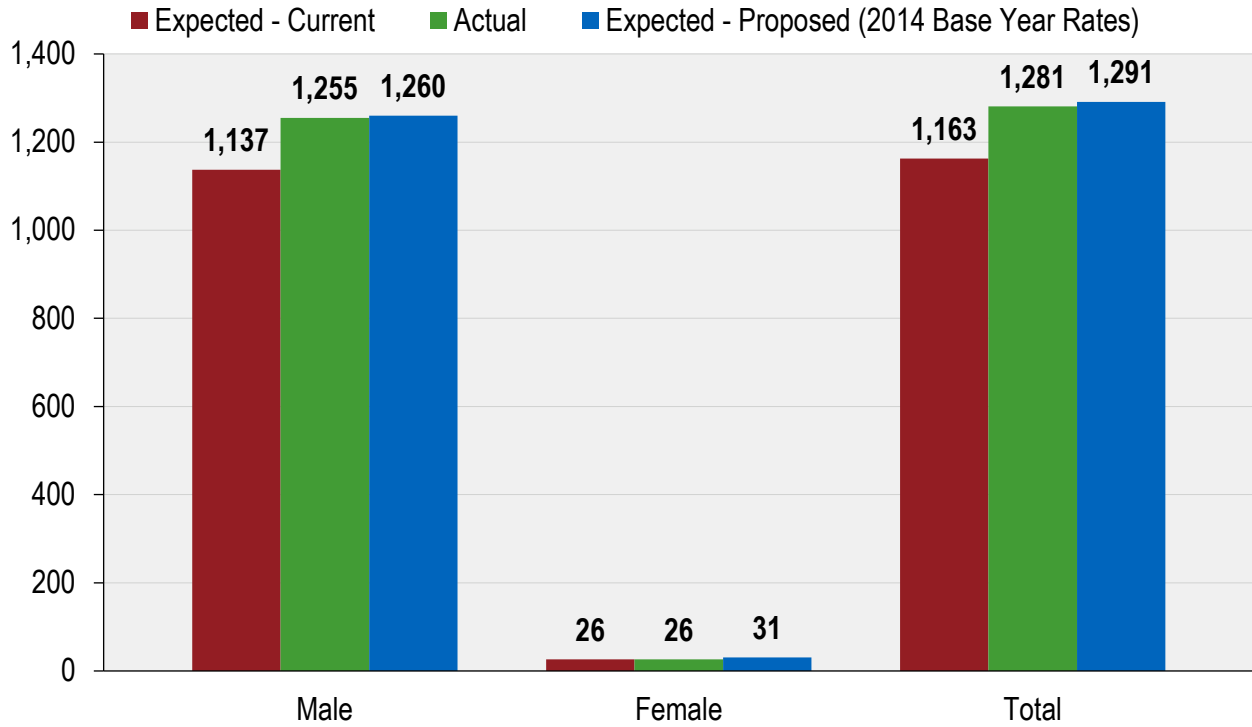
The ratio of actual to expected deaths was 113%. We recommend updating the current table to the RP-2014 Headcount-Weighted Healthy Annuitant Mortality Table (separate tables for males and females) set forward one year. This table is then projected generationally with the two-dimensional mortality improvement scale MP-2016. This will bring the actual to expected ratio to 106%.

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

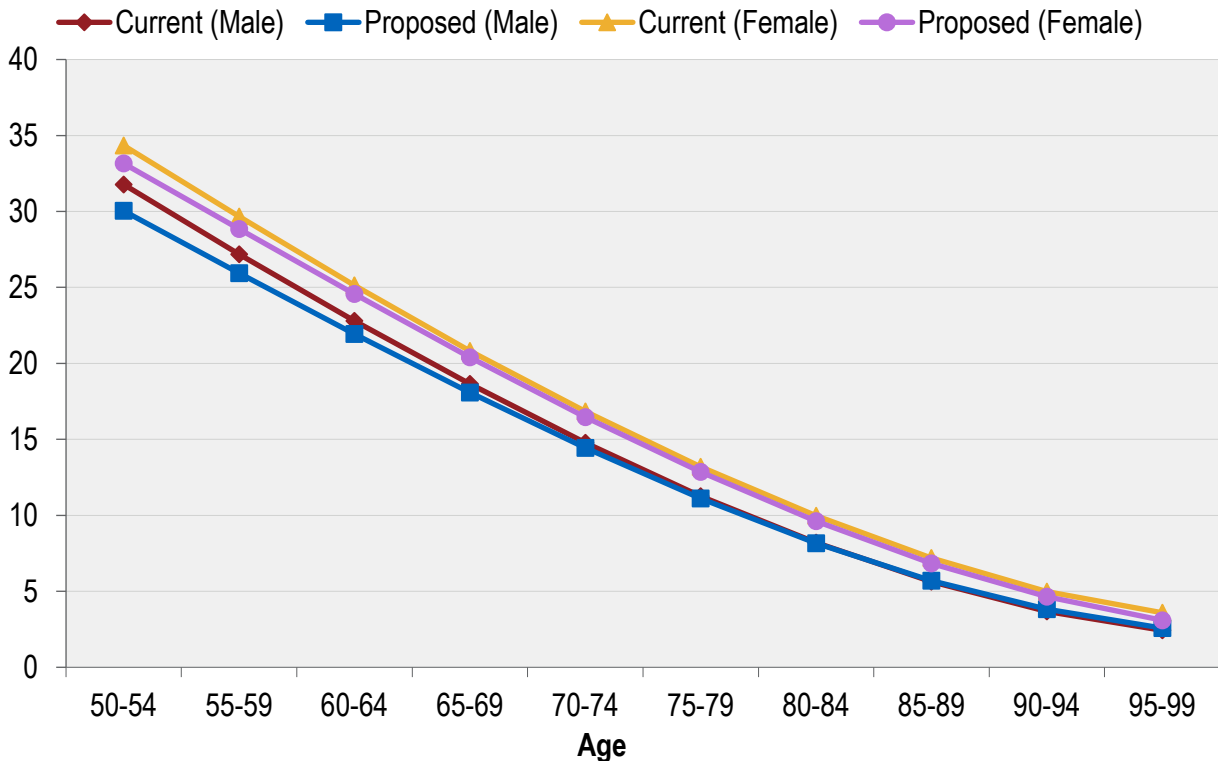
Chart 11 shows the life expectancies under the current and the proposed tables for beneficiaries.

The expected deaths (Charts 8 and 10) and life expectancies (Charts 9 and 11) under the proposed generational mortality table are based on mortality rates from 2014, which is the base year of the table, with any applicable age adjustments. In practice, life expectancies will be increased after applying the mortality improvement scale.

**CHART 8: POST-RETIREMENT DEATHS
SERVICE RETIREMENTS
(JULY 1, 2010 THROUGH JUNE 30, 2016)**



**CHART 9: LIFE EXPECTANCIES
NON – DISABLED MEMBERS**



**CHART 10: POST-RETIREMENT DEATHS BENEFICIARIES
(JULY 1, 2010 THROUGH JUNE 30, 2016)**

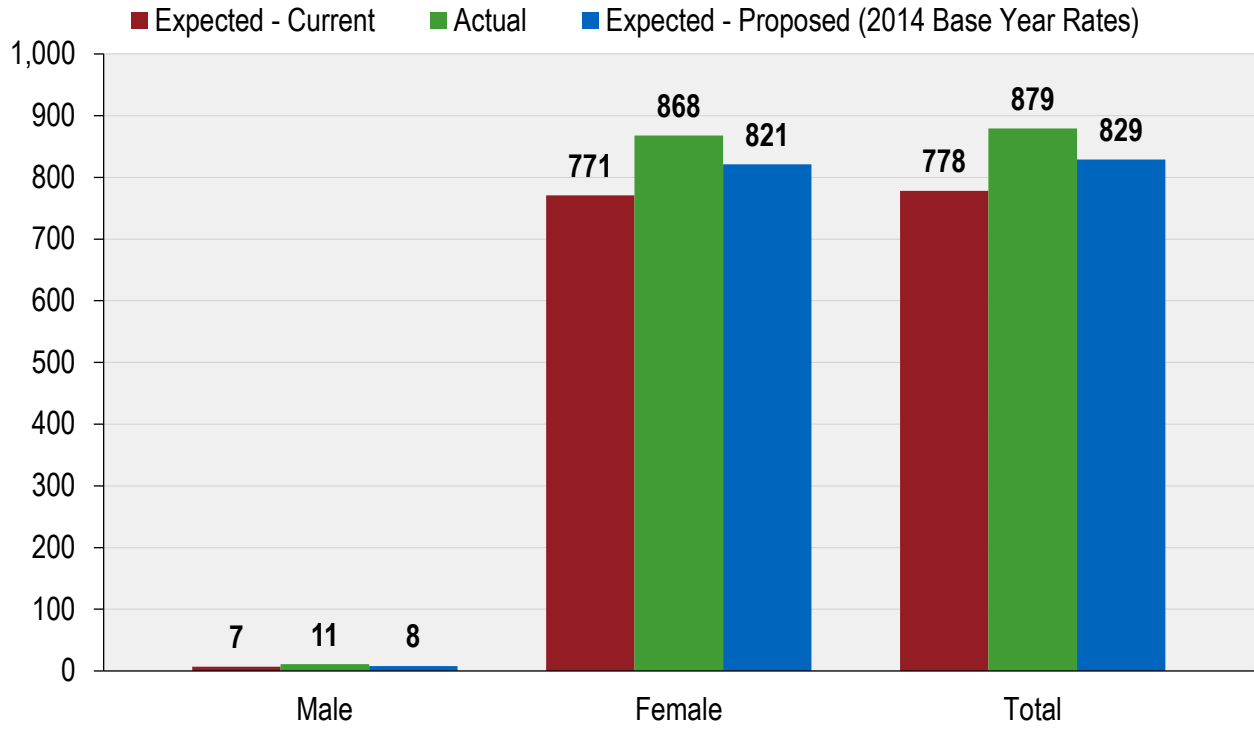
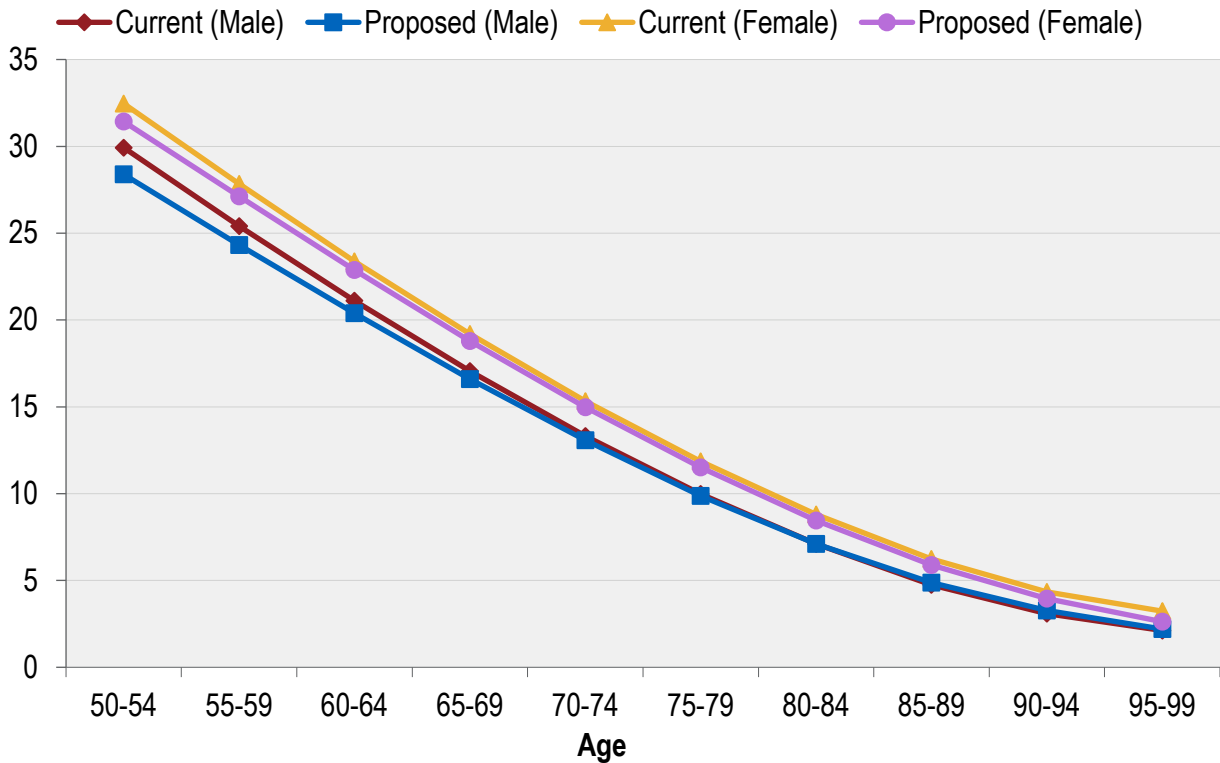


CHART 11: LIFE EXPECTANCIES BENEFICIARIES



C. Mortality Rates - Disabled

Since mortality rates for disabled members can vary from those of healthy members, a different mortality assumption is often used. The table currently being used is the RP-2000 Combined Healthy Mortality Table (separate tables for males and females), projected to 2022 with Scale BB, set forward one year.

The number of actual deaths compared to the number expected under the current and proposed assumptions for males and females over the last six years is as follows:

	Disabled		
	Current Expected Deaths	Actual Deaths	Proposed Expected Deaths
Male	324	355	356
Female	8	12	10
Total	332	367	366
Actual / Expected	110%		100%

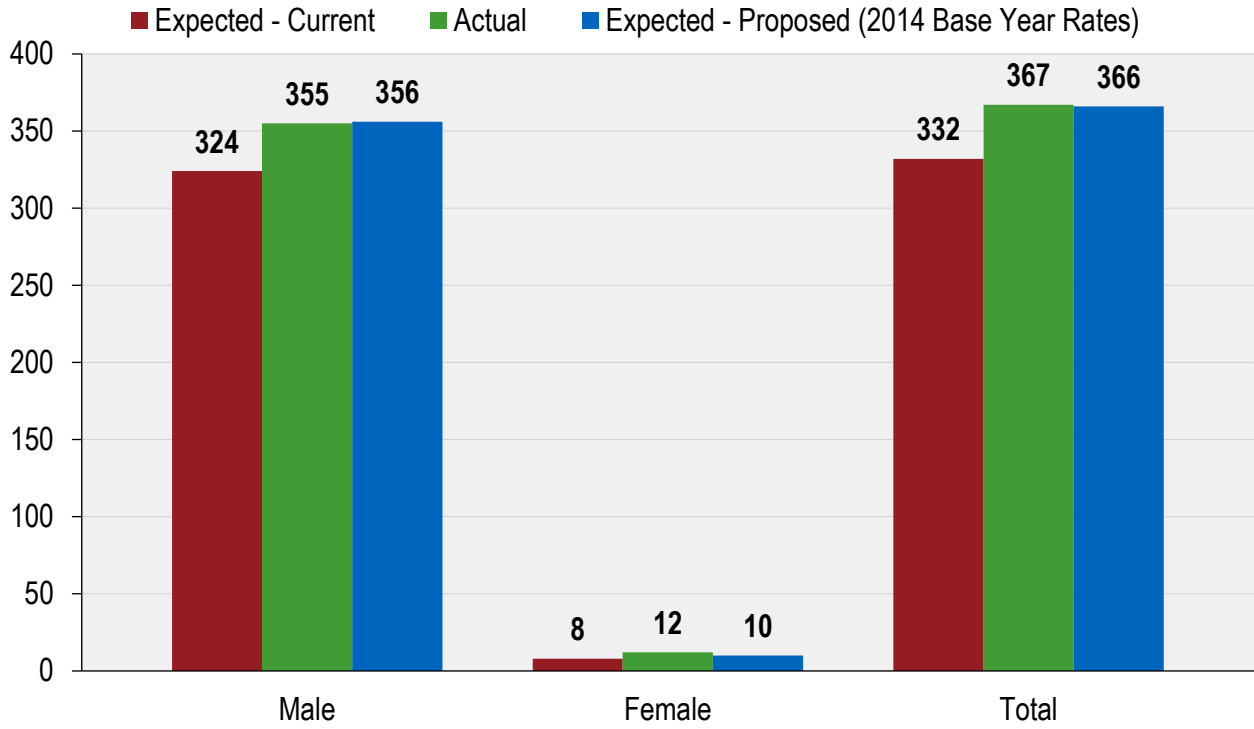
The ratio of actual to expected deaths was 110%. We recommend updating the current table to the RP-2014 Headcount-Weighted Healthy Annuitant Mortality Table (separate tables for males and females) set forward one year. This table is then projected generationally with the two-dimensional mortality improvement scale MP-2016. This will bring the actual to expected ratio to 100%.

Chart 12 compares actual to expected deaths under both the current and proposed assumptions for disabled members over the last six years. Experience shows that there were more deaths than predicted by the current table.

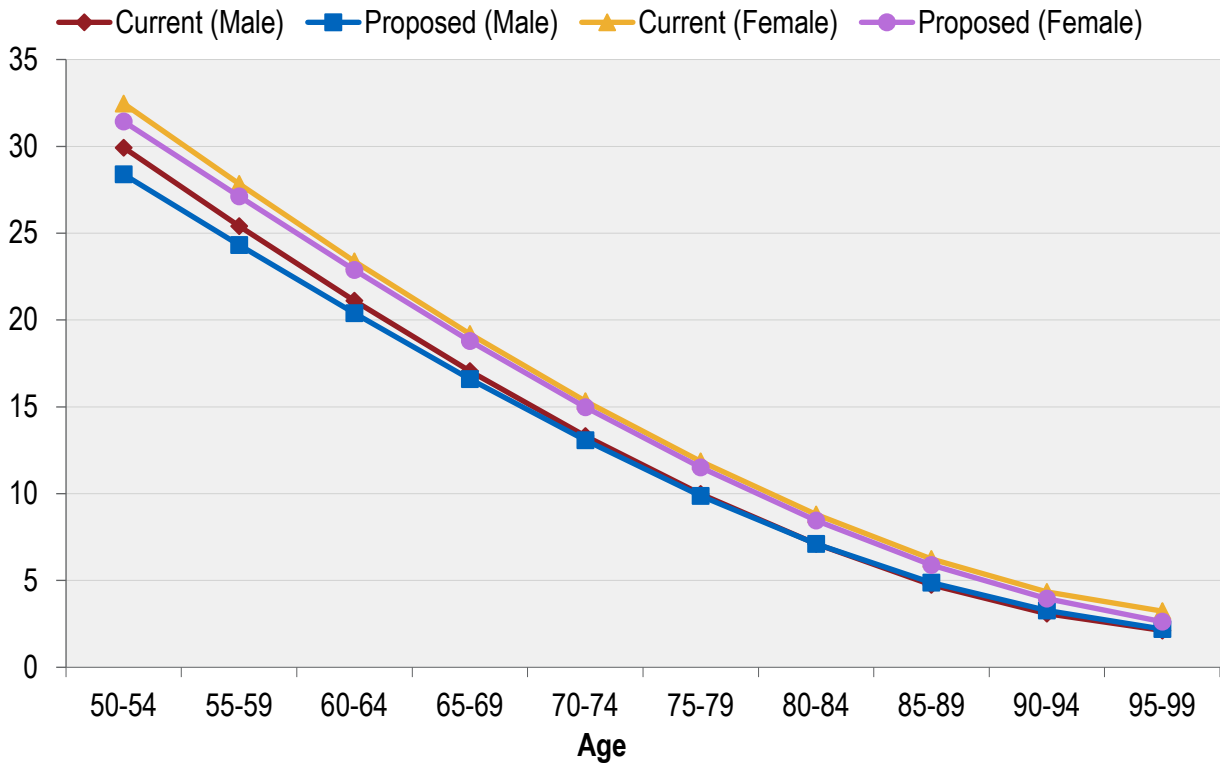
Chart 13 shows the life expectancies under the current and proposed tables for disabled members.

The expected deaths (Chart 12) and life expectancies (Chart 13) under the proposed generational mortality table are based on mortality rates from 2014, which is the base year of the table, with any applicable age adjustments. In practice, life expectancies will be increased after applying the mortality improvement scale.

**CHART 12: POST-RETIREMENT DEATHS
DISABLED MEMBERS
(JULY 1, 2010 THROUGH JUNE 30, 2016)**



**CHART 13: LIFE EXPECTANCIES
DISABLED MEMBERS**



D. Termination Rates

Termination rates include all terminations for reasons other than death, disability, or retirement. Consistent with plan benefit provisions which vary by Tier, in the valuation program members who would not be expected to be eligible to receive a deferred vested benefit¹² are assumed to withdraw their contributions upon termination (except for Tier 4 members who are not eligible for a withdrawal). With this experience study, we are recommending changing the current termination assumptions.

The termination experience over the last three years for Fire and Police members separated between those members with under five years of service and those with five or more years of service is shown below. Please note that we have excluded any members that were eligible for retirement.

Rates of Termination – Fewer than Five Years of Service

Years of Service	Termination Rate (%)					
	Fire			Police		
	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
0 – 1	8.00	8.72	8.00	8.00	11.12	9.00
1 – 2	2.50	0.00	2.50	3.00	3.94	3.50
2 – 3	1.50	100.00*	1.50	2.50	3.99	3.00
3 – 4	0.75	0.00	0.75	2.50	3.13	2.75
4 – 5	0.50	0.47	0.50	1.75	2.53	2.00

* Based on one member. Note that there were very few new entrants into the Fire Department in FYE 2011, 2012 and 2013, and that resulted in only one member being reported during FYE 2014, 2015 and 2016 with 2-3 years of service in this experience study period.

¹² Tiers 5 and 6 is eligible for a deferred retirement benefit after 20 years of service. Tier 3 is eligible for a deferred retirement benefit after 10 years of service.

Rates of Termination – Five or More Years of Service**

	Termination Rate (%)					
	Fire			Police		
Age	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
20 – 24	1.00	0.00	0.80	2.00	0.00	1.80
25 – 29	1.00	0.00	0.80	2.00	1.69	1.80
30 – 34	0.75	0.42	0.55	1.50	1.10	1.30
35 – 39	0.40	0.20	0.30	1.00	0.64	0.85
40 – 44	0.35	0.08	0.25	0.75	0.54	0.65
45 – 49	0.05	0.07	0.05	0.60	0.51	0.55
50 – 54	0.00	0.00	0.00	0.00	0.26	0.00
55 – 59	0.00	0.00	0.00	0.00	0.56	0.00

** No termination is assumed after a member is eligible for retirement. This includes all active members currently in Tier 2. Members in Tiers 3, 5 and 6 who are not eligible to receive a deferred vested retirement benefit are assumed to receive refund of member contributions.

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. This is mainly the case at the older age categories since most members in those categories are eligible to retire and so have been excluded from our review of this experience. It is also the case due to the limited overall experience regarding actual terminations.

Chart 14 compares actual to expected total terminations over the past three years for both the current and proposed assumptions for Fire members.

Chart 15 shows the same information as Chart 14, but for Police members.

Chart 16 shows the current and proposed termination rates for Fire members with less than five years of service.

Chart 17 shows the same information as Chart 16, but for Police members.

Chart 18 shows the current and proposed termination rates for Fire members with five or more years of service.

Chart 19 shows the same information as Chart 18, but for Police members.

Based upon the recent experience as captured in Charts 14 and 15, we recommend slight adjustments to the assumed termination rates for both Fire and Police members.

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

CHART 14: ACTUAL NUMBER OF TERMINATIONS COMPARED TO EXPECTED - FIRE (WITHDRAWALS PLUS VESTED TERMINATIONS)

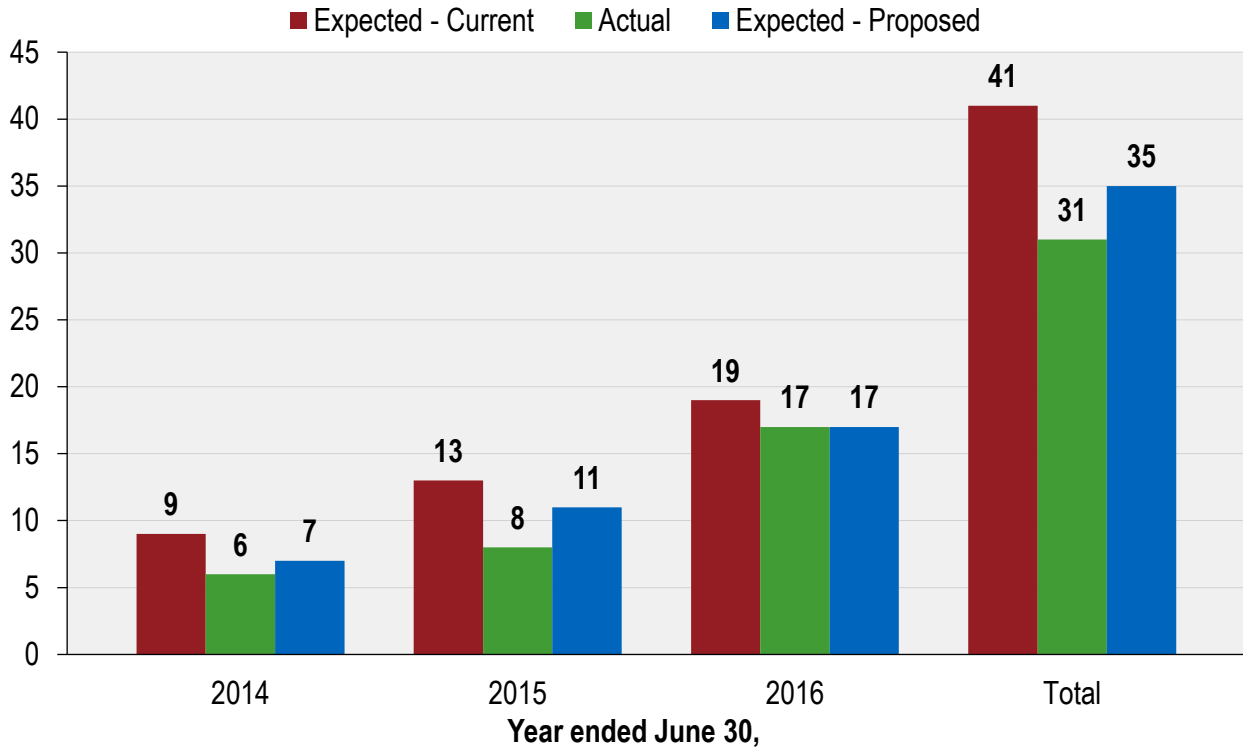
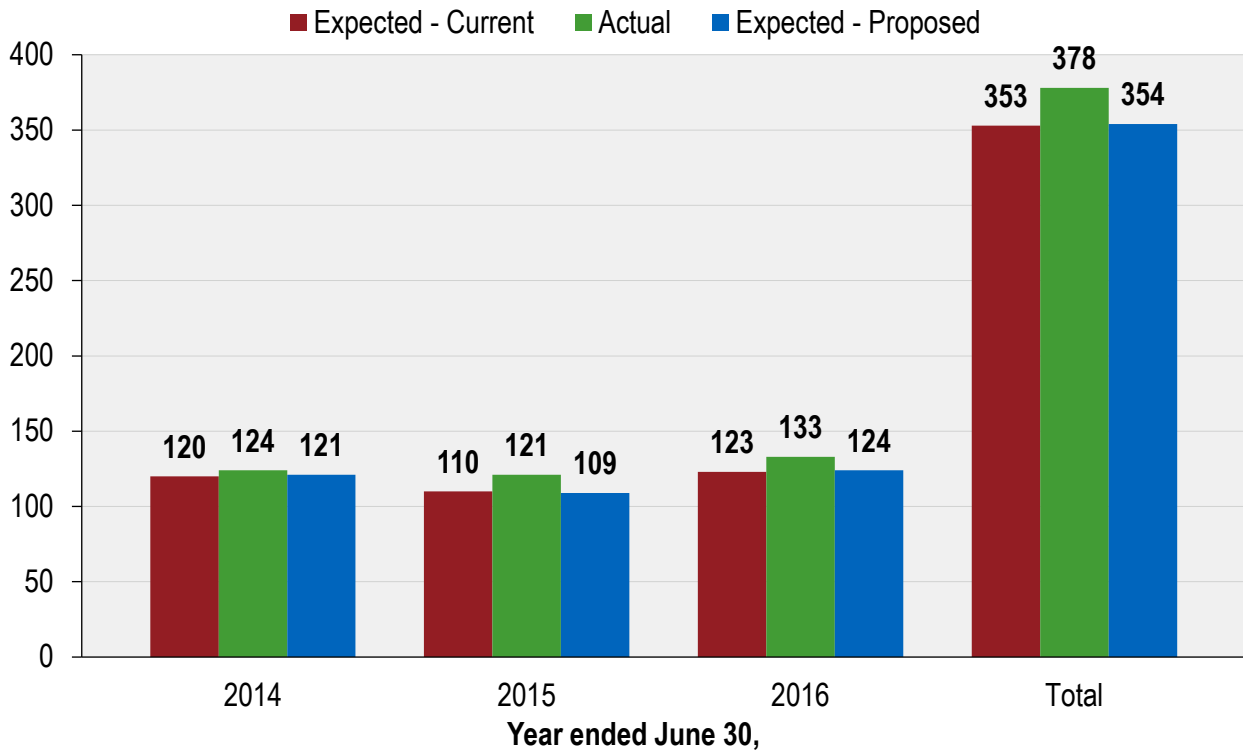
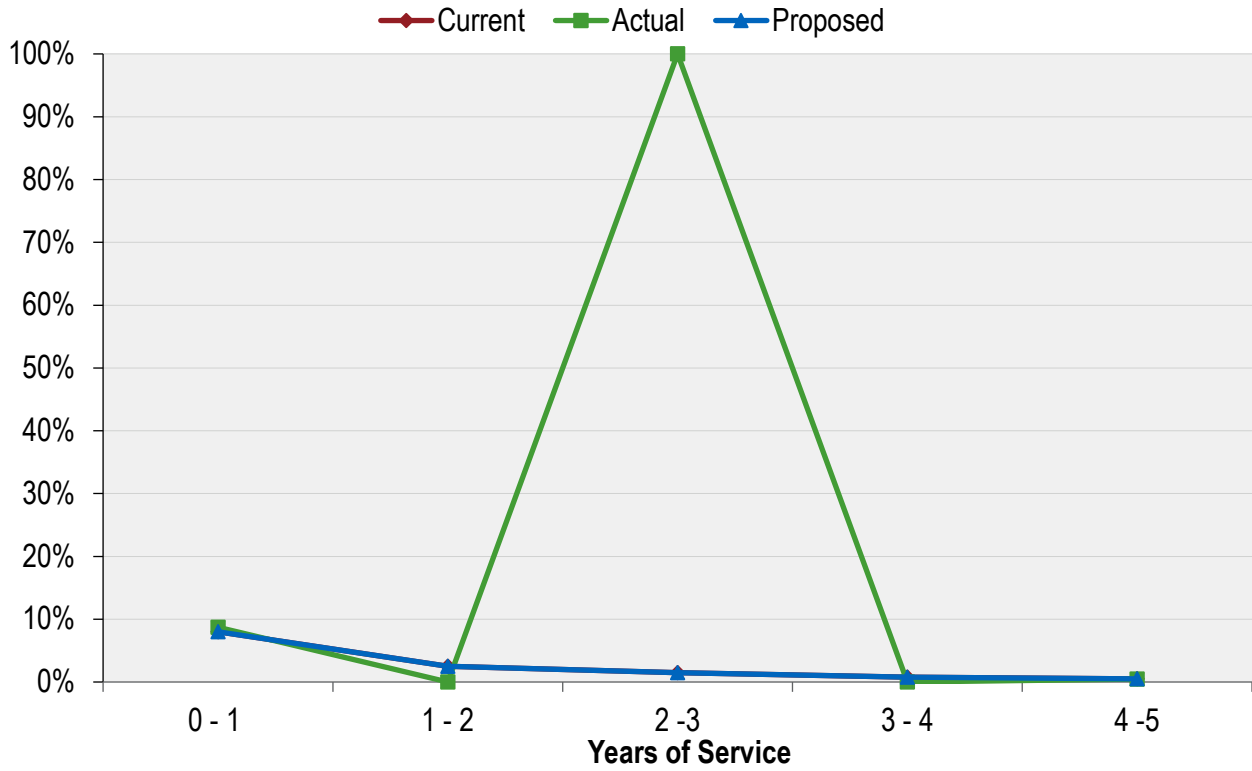


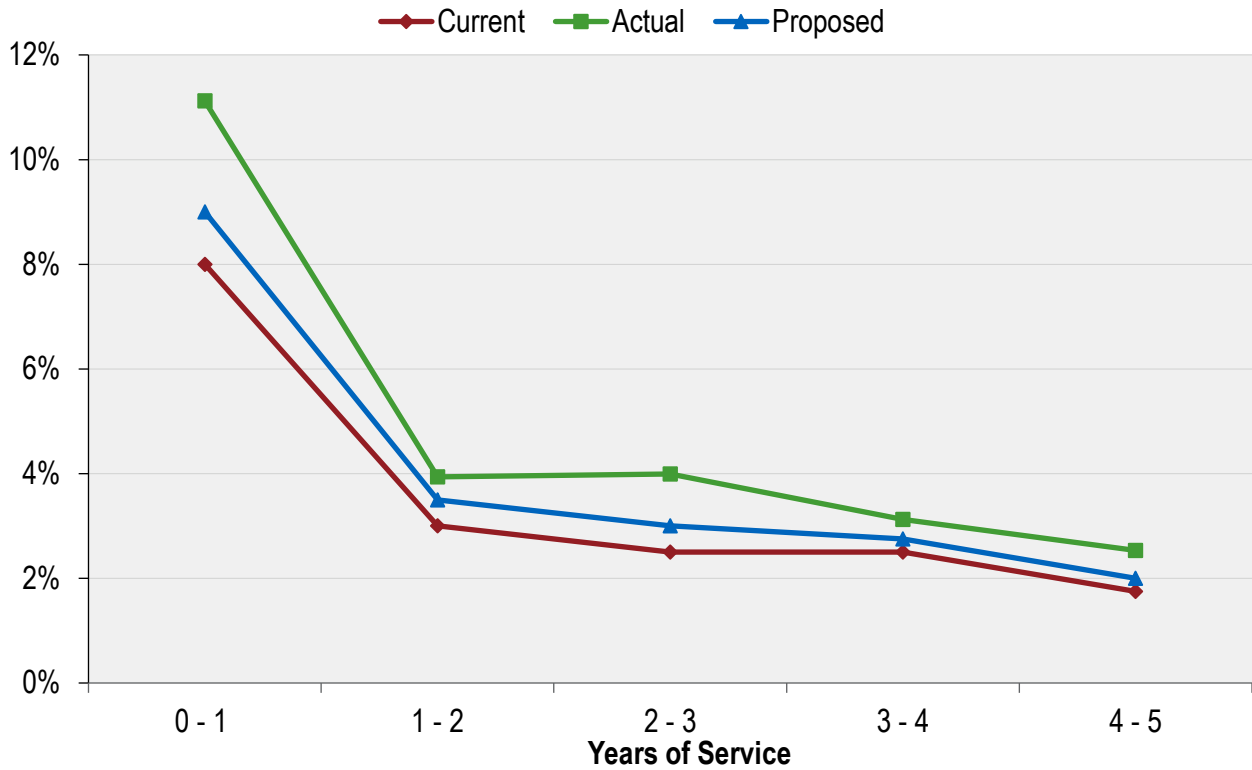
CHART 15: ACTUAL NUMBER OF TERMINATIONS COMPARED TO EXPECTED - POLICE (WITHDRAWALS PLUS VESTED TERMINATIONS)



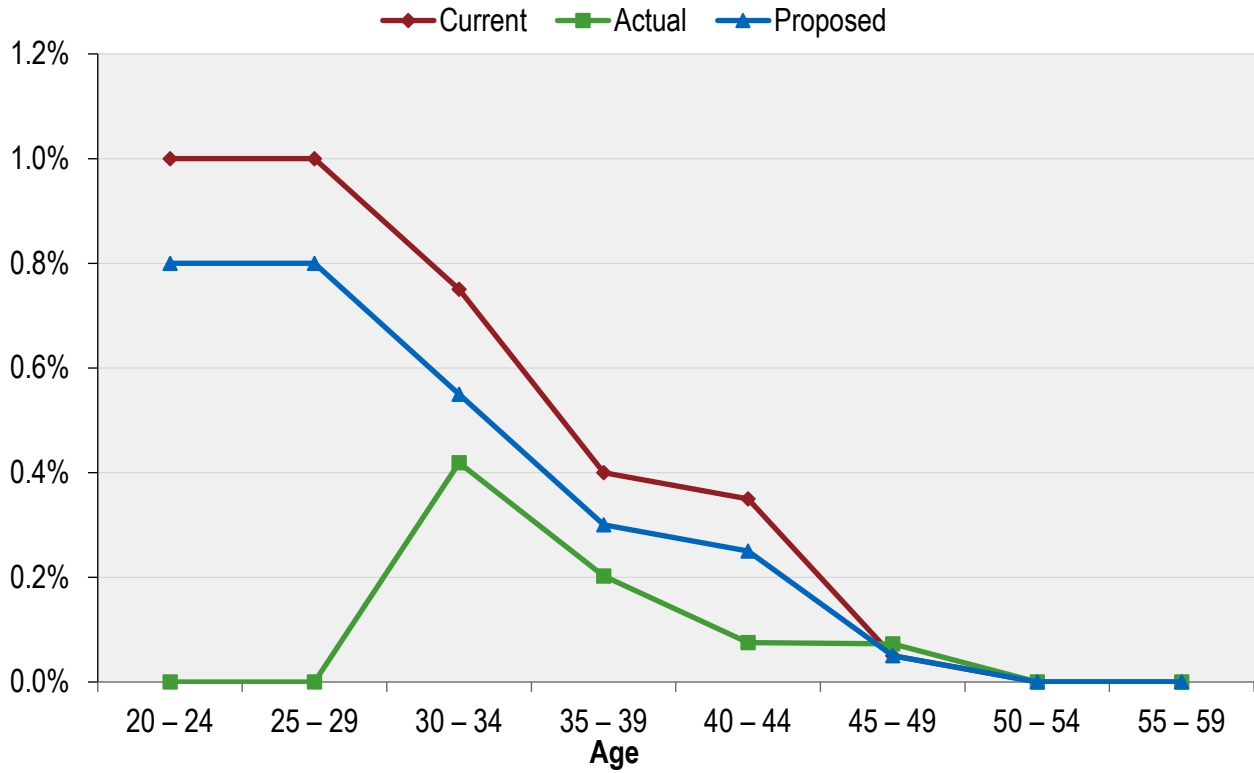
**CHART 16: TERMINATION RATES - FIRE
LESS THAN FIVE YEARS OF SERVICE**



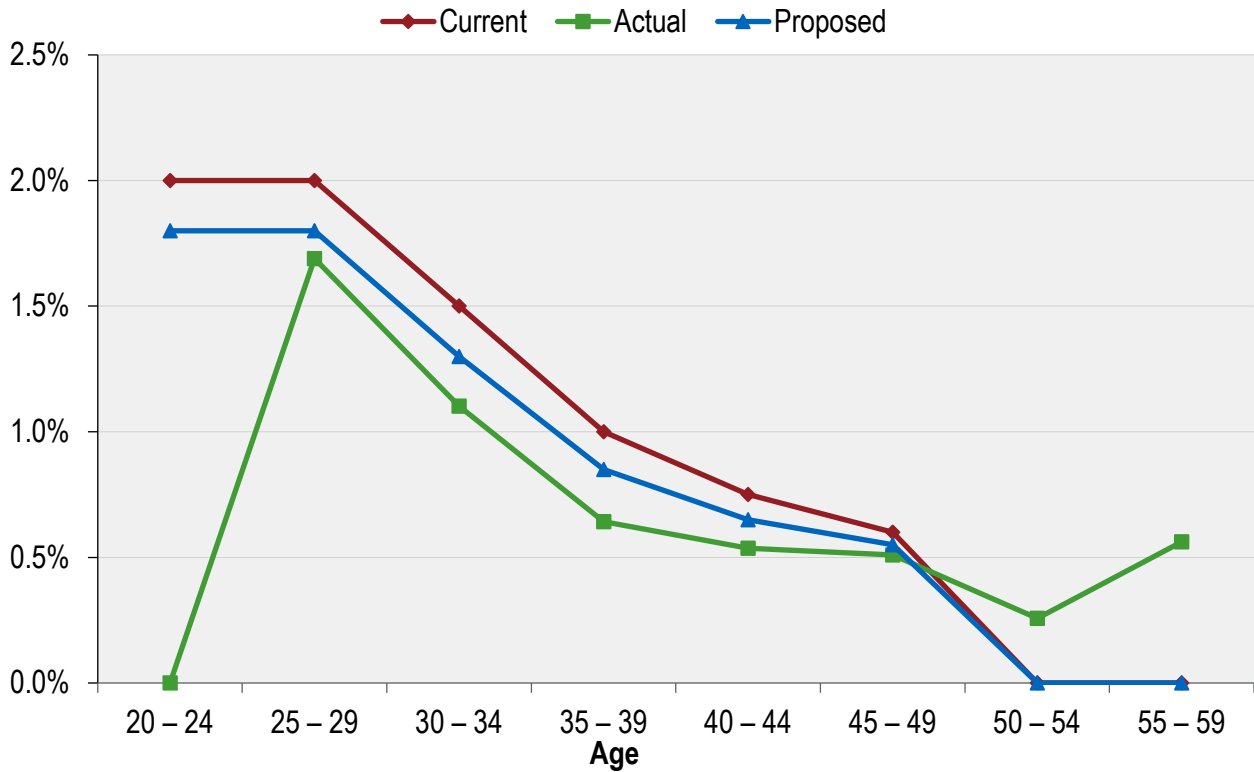
**CHART 17: TERMINATION RATES - POLICE
LESS THAN FIVE YEARS OF SERVICE**



**CHART 18: TERMINATION RATES - FIRE
MORE THAN FIVE YEARS OF SERVICE**



**CHART 19: TERMINATION RATES - POLICE
MORE THAN FIVE YEARS OF SERVICE**



E. Disability Incidence Rates

When a member becomes disabled, he or she may be entitled to a service connected disability benefit or a non-service connected disability benefit. The following summarizes the actual incidence of disabilities over the past three years compared to the current and proposed assumptions for disability incidence:

Rates of Disability Incidence

Age	Disability Incidence Rate (%)*					
	Fire			Police		
	Current Rate	Actual Rate	Proposed Rate	Current Rate	Actual Rate	Proposed Rate
20 – 24	0.02	0.00	0.02	0.02	0.00	0.02
25 – 29	0.02	0.00	0.02	0.03	0.00	0.03
30 – 34	0.03	0.08	0.03	0.06	0.02	0.06
35 – 39	0.08	0.00	0.08	0.09	0.07	0.09
40 – 44	0.19	0.00	0.15	0.30	0.15	0.25
45 – 49	0.25	0.00	0.20	0.40	0.23	0.30
50 – 54	0.30	0.00	0.25	0.50	0.42	0.45
55 – 59	1.50	0.00	1.00	1.00	0.00	0.90
60 – 64	4.00	0.00	3.50	1.30	0.00	1.20

* The current assumptions are only applied to members not eligible for the DROP. There were two members enrolled in the DROP and three members eligible for the DROP who were reclassified as being disabled during the most recent experience study period. We still recommend that the disability rates continue to be applied only to members not eligible for the DROP, and the actual rates shown above are calculated consistent with that recommendation. We will monitor this aspect of the data in future studies.

Chart 20 compares the actual number of disabilities for Fire members over the past three years to that expected under both the current and proposed assumptions. There was 1 actual disability in the current experience study period versus 8 actual disabilities in the last experience study period. (We would have observed 4 actual disabilities instead of one if we were to include the 3 Fire members who became disabled after they were enrolled in DROP.)

Chart 21 graphs the same information as Chart 20, but for Police members. There were 34 actual disabilities in the current experience study period versus 27 actual disabilities in the last experience study period.

Chart 22 shows the actual disability incidence rates, compared to the assumed and proposed rates for Fire members.

Chart 23 graphs the same information as Chart 22, but for Police members.

In prior valuations, it was assumed that 90% of all disabilities would be service connected disabilities. Since about 80% of disabled members received a service connected disability during

the last three years, we recommend lowering the assumption to assume 85% of all disabilities will be service connected disabilities.

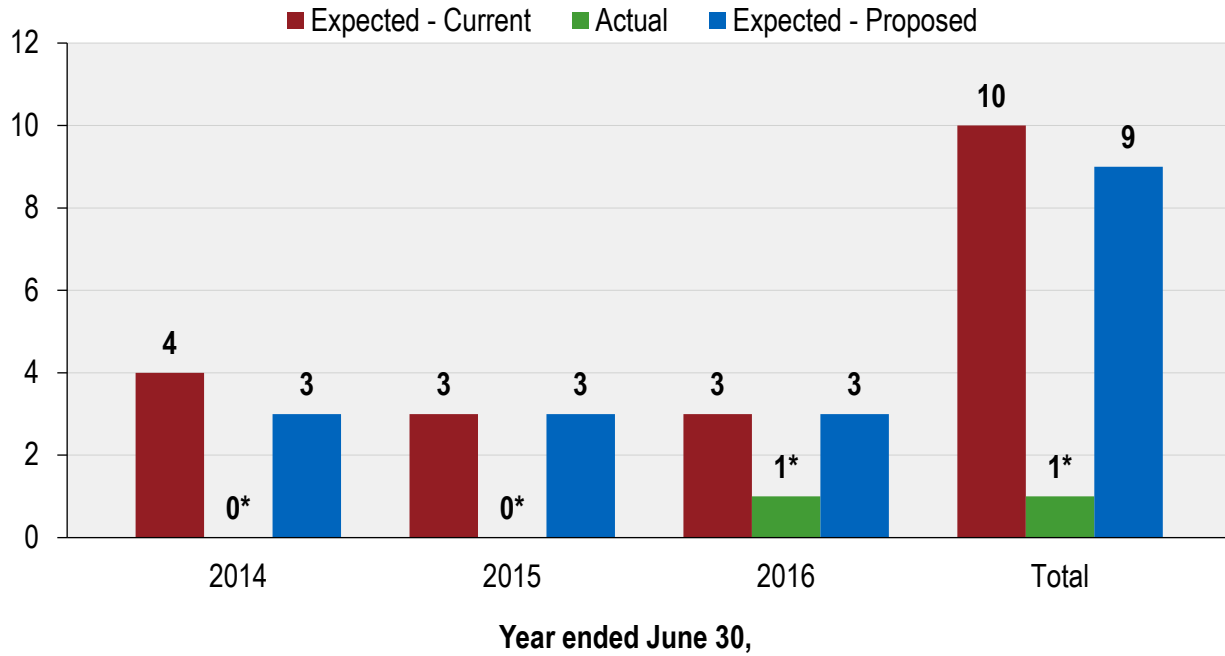
Level of Disability Benefit

The level of disability benefit (expressed as a percentage of Final Average Salary) is dependent on the severity of disability. For those members who started to receive a disability benefit during the last 3 years, we estimated the percentage of final average salary paid by dividing the disability benefit paid upon retirement by the approximate final average salary reported in the valuation data file immediately preceding the date of disability retirement. Based upon the recent experience, we recommend maintaining the current assumptions for percentage of final average salary for service connected disabilities and nonservice connected disabilities.

Service Connected Disabilities			
Years of Service	Current Assumed Percentage	Actual Percentage	Proposed Assumed Percentage
Less than 20	55%	52%	55%
20 – 30	65%	64%	65%
More than 30	75%	74%	75%

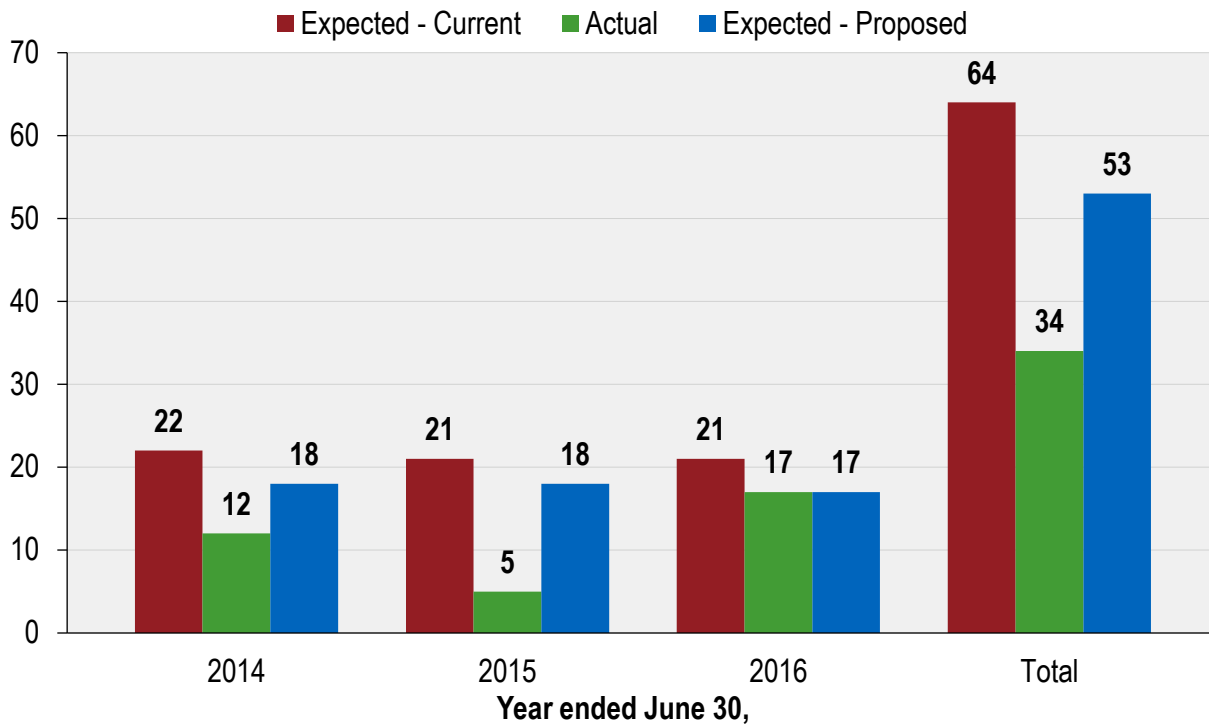
Nonservice Connected Disabilities			
Years of Service	Current Assumed Percentage	Actual Percentage	Proposed Assumed Percentage
All	40%	43%	40%

**CHART 20: ACTUAL NUMBER OF DISABILITIES
COMPARED TO EXPECTED - FIRE**

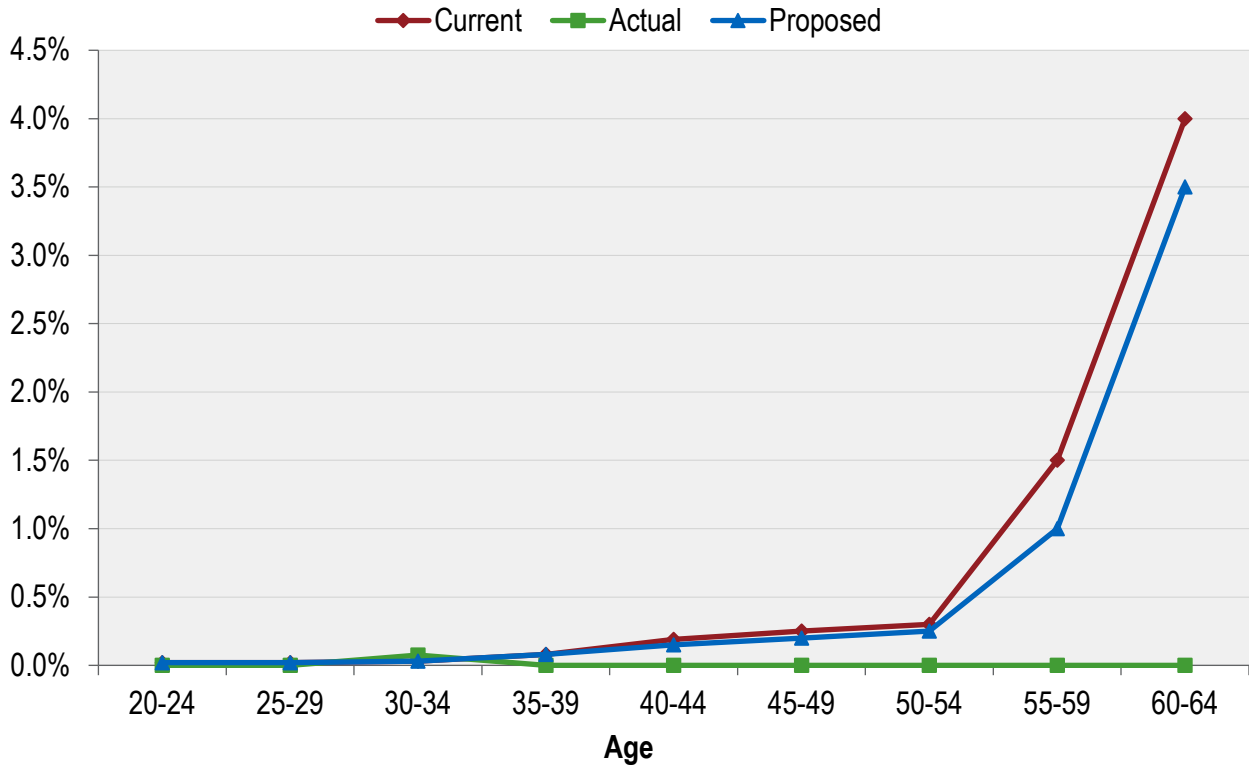


* Reduced from 8 disabilities reported during the prior experience study period.

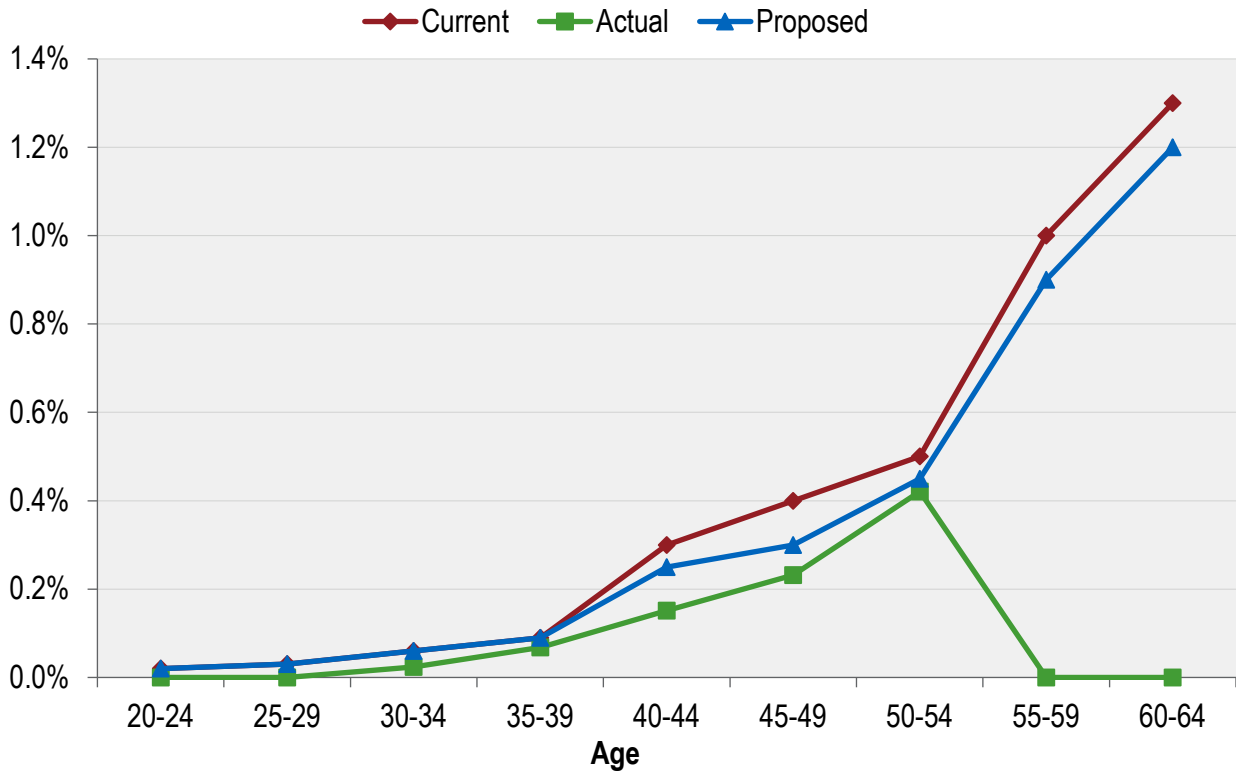
**CHART 21: ACTUAL NUMBER OF DISABILITIES
COMPARED TO EXPECTED - POLICE**



**CHART 22: DISABILITY INCIDENCE RATES
FIRE**



**CHART 23: DISABILITY INCIDENCE RATES
POLICE**



V. Cost Impact

Retirement Plan

The table below shows the changes in the total normal cost and actuarial accrued liability for the Retirement Plan due to the proposed assumption changes, as if they were applied in the June 30, 2016 actuarial valuation. If all of the proposed assumption changes (both economic and demographic) were implemented, the total normal cost for the Retirement Plan would have increased by about \$13.4 million and the actuarial accrued liability would have increased by about \$681.7 million. The funded percentage would have decreased from 93.9% to 90.6%.

	Change in Plan Liabilities as of June 30, 2016		
	Current Assumptions	Proposed Assumptions	Increase / (Decrease)
Total Normal Cost	\$394,881,645	\$408,257,941	\$13,376,296
Actuarial Accrued Liability	\$18,798,510,534	\$19,480,177,161	\$681,666,627

If all of the proposed assumption changes (both economic and demographic) were implemented, the aggregate beginning-of-the-year employer contribution rate would have increased by 4.71% of payroll. The results include an increase in the administrative expense load allocated to the Retirement Plan from 0.94% to 1.16% (i.e., an increase of 0.22%) if paid biweekly. The increase is 0.21% if paid at the beginning of the year.

Employer Contribution Rate Impact (% of Payroll at Beginning of the Year)			
Contributions	City	Harbor Port Police	Total
Normal Cost	1.04%	1.19%	1.04%
UAAL	3.48%	1.31%	3.46%
Administrative Expenses	0.21%	0.21%	0.21%
Total	4.73%	2.71%	4.71%

Health Plan

The table below shows the changes in the total normal cost and actuarial accrued liability for the Health Plan due to the proposed assumption changes, as if they were applied in the June 30, 2016 actuarial valuation. If all of the proposed assumption changes (both economic and demographic) were implemented, the total normal cost for the Health Plan would have increased by about \$8.2 million and the actuarial accrued liability would have increased by about \$216.9 million. The funded percentage would have decreased from 48.1% to 44.9%.

	Change in Plan Liabilities as of June 30, 2016		
	Current Assumptions	Proposed Assumptions	Increase / (Decrease)
Total Normal Cost	\$65,407,443	\$73,573,942	\$8,166,499
Actuarial Accrued Liability	\$3,079,669,517	\$3,296,563,750	\$216,894,233

If all of the proposed assumption changes (both economic and demographic) were implemented, the aggregate beginning-of-the-year employer contribution rate would have increased by 1.72% of payroll. The results include an increase in the administrative expense load allocated to the Health Plan from 0.06% to 0.09% (i.e., an increase of 0.03%) if paid biweekly. The increase is 0.03% if paid at the beginning of the year.

Employer Contribution Rate Impact (% of Payroll at Beginning of the Year)			
Contributions	City	Harbor Port Police	Total
Normal Cost	0.60%	0.94%	0.60%
UAAL	1.10%	0.60%	1.09%
Administrative Expenses	0.03%	0.03%	0.03%
Total	1.73%	1.57%	1.72%

Appendix A: Current Actuarial Assumptions

Economic Assumptions

Net Investment Return:	7.50%, net of investment expenses
Consumer Price Index:	Increase of 3.25% per year; benefit increases due to CPI subject to a 3.0% maximum for Tiers 3 through 6.
Member Contribution and Matching Account Crediting Rate:	5.00%
Administrative Expenses:	Out of the total 1.00% of payroll in administrative expense, 0.94% of payroll payable biweekly is allocated to the Retirement Plan. This is equal to 0.91% of payroll payable at beginning of the year.
Payroll Growth:	Inflation of 3.25% per year plus “across-the-board” real salary increases of 0.75% per year.

Individual Salary Increases

Annual Rate of Compensation Increase (%)	
Inflation: 3.25% per year; plus 0.75% “across the board” salary increases; plus the following Merit and Longevity increases based on service.	
Years of Service	Additional Salary Increase
0	7.50
1	6.50
2	5.00
3	4.75
4	3.75
5	3.00
6	2.25
7	2.00
8	1.75
9	1.75
10	1.25
11 & Over	0.75

Demographic Assumptions

Mortality Rates

- **Healthy Mortality:** RP-2000 Combined Healthy Mortality Table (separate tables for males and females), projected to 2022 with scale BB set back one year

- **Disabled Mortality:** RP-2000 Combined Healthy Mortality Table (separate tables for males and females), projected to 2022 with scale BB set forward one year
- **Beneficiary Mortality:** RP-2000 Combined Healthy Mortality Table (separate tables for males and females), projected to 2022 with scale BB set forward one year

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

Mortality Rates Before Retirement

Age	Rate (%)	
	Male	Female
20	0.03	0.02
25	0.04	0.02
30	0.04	0.02
35	0.07	0.04
40	0.10	0.06
45	0.13	0.10
50	0.19	0.15
55	0.30	0.22
60	0.52	0.36

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

Disability Incidence Rates*

Age	Rate (%)	
	Fire	Police
20	0.02	0.02
25	0.02	0.03
30	0.03	0.05
35	0.06	0.08
40	0.15	0.22
45	0.23	0.36
50	0.28	0.46
55	1.02	0.80
60	3.00	1.18

* 90% of disabilities are assumed to be service connected. Disability rates are not applied to members eligible to DROP.

Termination Rates – Less than Five Years of Service

Years of Service	Rate (%)	
	Fire	Police
0 – 1	8.00	8.00
1 – 2	2.50	3.00
2 – 3	1.50	2.50
3 – 4	0.75	2.50
4 – 5	0.50	1.75

Termination Rates – Five or More Years of Service*

Age	Rate (%)	
	Fire	Police
20	1.00	2.00
25	1.00	2.00
30	0.85	1.70
35	0.54	1.20
40	0.37	0.85
45	0.17	0.66
50	0.02	0.24
55	0.00	0.00
60	0.00	0.00

* No termination is assumed after a member is eligible for retirement. This includes all active members currently in Tier 2. Members in Tiers 3, 5 and 6 who are not eligible to receive a deferred vested retirement benefit are assumed to receive refund of member contributions.

Retirement Rates

Age	Rate (%)					
	Fire			Police		
	Tiers 2 and 4	Tiers 3 and 5	Tier 6	Tiers 2 and 4	Tiers 3 and 5	Tier 6
41	1.00	0.00	0.00	10.00	0.00	0.00
42	1.00	0.00	0.00	10.00	0.00	0.00
43	1.00	0.00	0.00	10.00	0.00	0.00
44	1.00	0.00	0.00	10.00	0.00	0.00
45	1.00	0.00	0.00	10.00	0.00	0.00
46	1.00	0.00	0.00	7.00	0.00	0.00
47	1.00	0.00	0.00	7.00	0.00	0.00
48	2.00	0.00	0.00	7.00	0.00	0.00
49	2.00	0.00	0.00	7.00	0.00	0.00
50	3.00	3.00	3.00	12.00	7.00	8.00
51	4.00	3.00	3.00	12.00	6.00	10.00
52	5.00	3.00	4.00	12.00	6.00	10.00
53	10.00	3.00	5.00	15.00	6.00	15.00
54	15.00	7.00	5.00	20.00	10.00	15.00
55	20.00	12.00	10.00	20.00	18.00	18.00
56	20.00	14.00	12.00	25.00	18.00	18.00
57	20.00	16.00	15.00	25.00	20.00	20.00
58	20.00	20.00	18.00	25.00	22.00	22.00
59	20.00	25.00	20.00	25.00	25.00	25.00
60	20.00	25.00	25.00	25.00	25.00	25.00
61	20.00	30.00	30.00	25.00	25.00	25.00
62	25.00	35.00	30.00	25.00	25.00	25.00
63	25.00	40.00	35.00	30.00	25.00	25.00
64	30.00	40.00	40.00	40.00	30.00	30.00
65	100.00	100.00	100.00	100.00	100.00	100.00

DROP Program:

DROP participants are considered active members until they leave DROP and begin receiving retirement benefits. Members are assumed to remain in the DROP for 5 years. Of all members expected to retire with a service retirement benefit, we project a 95% probability that members have elected DROP before retirement if they will have also satisfied the requirements for participating in the DROP for 5 years.

Retirement Age and Benefit for Deferred Vested Members:	For deferred vested members, retirement assumption is age 50.									
Future Benefit Accruals:	1.0 year of service per year.									
Unknown Data for Members:	Same as those exhibited by members with similar known characteristics. If not specified, members are assumed to be male.									
Percent Married/Domestic Partner:	80% of male members, 60% of female members.									
Age of Spouse:	Wives are 3 years younger than their husbands.									
Service Connected Disability Benefits:	<table border="0"> <thead> <tr> <th><u>Years of Service</u></th> <th><u>Benefit</u></th> </tr> </thead> <tbody> <tr> <td>Less than 20</td> <td>55% of Final Average Salary</td> </tr> <tr> <td>20 – 30</td> <td>65% of Final Average Salary</td> </tr> <tr> <td>More than 30</td> <td>75% of Final Average Salary</td> </tr> </tbody> </table>	<u>Years of Service</u>	<u>Benefit</u>	Less than 20	55% of Final Average Salary	20 – 30	65% of Final Average Salary	More than 30	75% of Final Average Salary	
<u>Years of Service</u>	<u>Benefit</u>									
Less than 20	55% of Final Average Salary									
20 – 30	65% of Final Average Salary									
More than 30	75% of Final Average Salary									
Non-Service Connected Disability Benefits:	40% of Final Average Salary									

Appendix B: Proposed Actuarial Assumptions

Economic Assumptions

Net Investment Return:	7.25%, net of investment expenses
Consumer Price Index:	Increase of 3.00% per year; benefit increases due to CPI subject to a 3.0% maximum for Tiers 3 through 6.
Member Contribution and Matching Account Crediting Rate:	4.00%
Administrative Expenses:	Out of the total 1.25% of payroll in administrative expense, 1.16% of payroll payable biweekly is allocated to the Retirement Plan and 0.09% of payroll payable biweekly is allocated to the Health Plan.
Payroll Growth:	Inflation of 3.00% per year plus “across-the-board” real salary increases of 0.50% per year.

Individual Salary Increases

Annual Rate of Compensation Increase (%)	
Inflation: 3.00% per year; plus 0.50% “across the board” salary increases; plus the following Merit and Promotional increases based on service.	
Years of Service	Additional Salary Increase
0	8.50
1	7.50
2	6.00
3	5.50
4	4.00
5	2.75
6	2.50
7	2.00
8	1.75
9	1.75
10	1.25
11	1.00
12	1.00
13	1.00
14	1.00
15 & Over	0.80

Demographic Assumptions

Mortality Rates – Post-Retirement

- **Healthy Mortality:** Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table set back one year, projected generationally with the two-dimensional scale MP-2016
- **Disabled Mortality:** Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table set forward one year, projected generationally with the two-dimensional scale MP-2016
- **Beneficiary Mortality:** Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table set forward one year, projected generationally with the two-dimensional scale MP-2016

Mortality Rates – Pre-Retirement

- **Employee Mortality:** Headcount-Weighted RP-2014 Employee Mortality Table times 90%, projected generationally with the two-dimensional scale MP-2016

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

Mortality Rates Before Retirement

Age	Rate (%)	
	Male	Female
20	0.05	0.02
25	0.06	0.02
30	0.05	0.02
35	0.06	0.03
40	0.07	0.04
45	0.11	0.07
50	0.19	0.12
55	0.31	0.19
60	0.51	0.27

Note: Generational projections are not reflected in the above mortality rates.

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

Disability Incidence Rates*

Age	Rate (%)	
	Fire	Police
25	0.02	0.03
30	0.03	0.05
35	0.06	0.08
40	0.12	0.19
45	0.18	0.28
50	0.23	0.39
55	0.70	0.72
60	2.50	1.08
65	1.40	0.48

* 85% of disabilities are assumed to be service connected. Disability rates are not applied to members eligible to enter the DROP.

Termination Rates – Less than Five Years of Service

Years of Service	Rate (%)	
	Fire	Police
0 - 1	8.00	9.00
1 - 2	2.50	3.50
2 - 3	1.50	3.00
3 - 4	0.75	2.75
4 - 5	0.50	2.00

Termination Rates – Five or More Years of Service*

Age	Rate (%)	
	Fire	Police
20	0.80	1.80
25	0.80	1.80
30	0.65	1.50
35	0.40	1.03
40	0.27	0.73
45	0.13	0.59
50	0.02	0.22
55	0.00	0.00
60	0.00	0.00

* No termination is assumed after a member is eligible for retirement. This includes all active members currently in Tier 2. Members in Tiers 3, 5 and 6 who are not eligible to receive a deferred vested retirement benefit are assumed to receive refund of member contributions.

Retirement Rates

Age	Rate (%)					
	Fire			Police		
	Tiers 2 and 4	Tiers 3 and 5	Tier 6	Tiers 2 and 4	Tiers 3 and 5	Tier 6
41	1.00	0.00	0.00	10.00	0.00	0.00
42	1.00	0.00	0.00	10.00	0.00	0.00
43	1.00	0.00	0.00	10.00	0.00	0.00
44	1.00	0.00	0.00	10.00	0.00	0.00
45	1.00	0.00	0.00	10.00	0.00	0.00
46	1.00	0.00	0.00	7.00	0.00	0.00
47	1.00	0.00	0.00	7.00	0.00	0.00
48	2.00	0.00	0.00	7.00	0.00	0.00
49	2.00	0.00	0.00	7.00	0.00	0.00
50	3.00	2.00	3.00	12.00	7.00	8.00
51	5.00	2.00	3.00	12.00	5.00	10.00
52	8.00	2.00	4.00	12.00	5.00	10.00
53	10.00	2.00	5.00	20.00	5.00	15.00
54	20.00	7.00	5.00	25.00	12.00	20.00
55	25.00	14.00	10.00	30.00	20.00	20.00
56	25.00	16.00	12.00	30.00	20.00	20.00
57	25.00	18.00	15.00	30.00	20.00	20.00
58	25.00	25.00	18.00	30.00	22.00	22.00
59	25.00	25.00	20.00	30.00	22.00	22.00
60	25.00	30.00	25.00	30.00	25.00	25.00
61	25.00	30.00	30.00	30.00	25.00	25.00
62	25.00	35.00	30.00	30.00	25.00	25.00
63	25.00	40.00	35.00	30.00	25.00	25.00
64	30.00	40.00	40.00	40.00	30.00	30.00
65	60.00	60.00	60.00	60.00	60.00	60.00
66	60.00	60.00	60.00	60.00	60.00	60.00
67	60.00	60.00	60.00	60.00	60.00	60.00
68	60.00	60.00	60.00	60.00	60.00	60.00
69	60.00	60.00	60.00	60.00	60.00	60.00
70	100.00	100.00	100.00	100.00	100.00	100.00

DROP Program:	DROP participants are considered active members until they leave DROP and begin receiving retirement benefits. Members are assumed to remain in the DROP for 5 years. Of all members expected to retire with a service retirement benefit, we project a 95% probability that members have elected DROP before retirement if they will have also satisfied the requirements for participating in the DROP for 5 years.	
Retirement Age and Benefit for Deferred Vested Members:	For deferred vested members, retirement assumption is age 50.	
Future Benefit Accruals:	1.0 year of service per year.	
Unknown Data for Members:	Same as those exhibited by members with similar known characteristics. If not specified, members are assumed to be male.	
Percent Married/Domestic Partner:	80% of male members, 55% of female members.	
Age of Spouse:	Male retirees are 3 years older than their spouses. Female retirees are 2 years younger than their spouses.	
Service Connected Disability Benefits:	<u>Years of Service</u>	<u>Benefit</u>
	Less than 20	55% of Final Average Salary
	20 – 30	65% of Final Average Salary
	More than 30	75% of Final Average Salary
Non-Service Connected Disability Benefits:	40% of Final Average Salary	