CHEIRON *Classic Values, Innovative Advice*

Merced County Employees' Retirement Association

Actuarial Experience Study for July 1, 2016 through June 30, 2019

Produced by Cheiron

February 2020

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February 19, 2020

Retirement Board of Merced
County Employees' Retirement Association
3199 M Street
Merced, CA 95348

Dear Members of the Board:

The purpose of this report is to provide the results of an Actuarial Experience Study of the Merced County Employees' Retirement Association (MCERA) covering actuarial experience from July 1, 2016 through June 30, 2019. This report is for the use of the MCERA Retirement Board in selecting assumptions to be used in actuarial valuations beginning June 30, 2019.

In preparing our report, we relied on information (some oral and some written) supplied by MCERA. This information includes, but is not limited to, the plan provisions, employee data, and financial information. We performed an informal examination of the obvious characteristics of the data for reasonableness and consistency in accordance with Actuarial Standard of Practice No. 23.

This report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices and our understanding of the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board as well as applicable laws and regulations. Furthermore, as credentialed actuaries, we meet the Qualification Standards of the American Academy of Actuaries to render the opinion contained in this report. This report does not address any contractual or legal issues. We are not attorneys and our firm does not provide any legal services or advice.

This report was prepared for the Retirement Board of MCERA for the purposes described herein. This report is not intended to benefit any other party, and Cheiron assumes no duty or liability to any such party.

If you have any questions about the report or would like additional information, please let us know.

Sincerely,
Cheiron

Graham A. Schmidt, ASA, FCA, MAAA, EA
Consulting Actuary

Anne Harper, FSA, MAAA, EA
Principal Consulting Actuary

SECTION I – EXECUTIVE SUMMARY

Actuarial assumptions (economic and demographic) are intended to be long-term in nature, and should be both individually reasonable and consistent in the aggregate. The purpose of this experience study is to evaluate whether or not the current assumptions adequately reflect the long-term expectations for MCERA, and if not, to recommend adjustments. It is important to note that frequent and significant changes in the actuarial assumptions are not typically recommended, unless there are known fundamental changes in expectations of the economy, or with respect to MCERA's membership or assets that would warrant such frequent or significant changes.

SUMMARY OF ECONOMIC ASSUMPTION ANALYSIS

The specific economic assumptions analyzed in this report are price inflation, wage inflation, COLA growth, and the discount rate. These assumptions have a significant impact on the contribution rates in the short-term and the risk of negative outcomes in the long-term.

The Retirement Board recently adopted the following economic assumptions at their December 12, 2019 Board Meeting:

- Long-term rate of return on Plan assets decreased to 7.00% from 7.25%,
- Maintain price inflation measured by the Consumer Price Index (CPI) of 2.50%,
- Maintain annual wage increase of 2.75%, and
- Post-retirement COLA average growth rate of 2.40% for Tier 1 members.

The nominal discount rate assumption is considerably less than the geometric average 20-year return of 8.00% for the current target portfolio based on the 2019 capital market assumptions provided by Meketa, the Plan's investment consultant. Based on these capital market assumptions, the real return adopted by the Board (4.50%) has a 59% chance of being achieved. We note that the capital market assumptions from 2018 provided by Meketa would have projected a significantly lower likelihood of achieving these benchmarks, though still greater than 50%: 53% for the 7.00% nominal return and 52% for the 4.50% real return. We also reviewed the 2018 and 2019 capital market assumptions from other investment consultants, and in aggregate they forecast a slightly higher than 50% chance of achieving the 7.00% nominal return and the 4.50% real return.

Other data presented in this report support the finding that the discount rate and other economic assumptions adopted by the Retirement Board are reasonable.

SECTION I – EXECUTIVE SUMMARY

SUMMARY OF DEMOGRAPHIC ASSUMPTION ANALYSIS

This experience study specifically analyzes and makes the following recommendations for the demographic assumptions:

- **Retirement rates**
  - General – Change from gender specific to unisex tables; and combine of service groupings for less than 20 years and 20-29 years.
  - Safety – Adjustments to rates at all service levels.
  - No change to the approach recommended for PEPRA tiers due to lack of experience.
- **Termination rates**
  - General – Adjustments to the male rates for years of service less than two and female rates for years of service less than 15.
  - Safety – Adjustments to rates for years of service less than 19.
- **Disability rates**
  - General – Change the rates to the CalPERS Public Agency State Miscellaneous Non-Industrial Table, blended 30% male and 70% female.
  - Safety – No change.
- **Mortality base rates**
  - General – No change (i.e. CalPERS base tables, with generational improvement for all members.
  - Safety – Change to 2010 Public Safety Below Median tables, with generational improvement, for healthy annuitants (adjusted by 105%) and active employees (no adjustment). No change to disabled members and line-of-duty active deaths (i.e. continue to use CalPERS base tables).
- **Mortality improvement -** Update improvement scale from SOA MP-2016 to MP-2019 for all groups.
- **Merit salary increases** – Increase ultimate rate and the rates for most service points for both General and Safety.
- **Other assumptions** – Adjustments to other assumptions, including the withdrawal and reciprocal transfer rates, deferred retirement commencement age, family composition and terminal pay load assumptions.

The body of this report provides additional detail and support for our conclusions and recommendations.

COST OF ECONOMIC AND DEMOGRAPHIC ASSUMPTION CHANGES

The change in the discount rate had the largest impact on the total Plan (employer plus employee) cost. Among the demographic assumptions, the recommended changes to termination type and merit salary increases have the largest impact on the overall contribution rates. These tables summarize the estimated total cost impact – for the General, Safety, and combined membership – of the recommended changes to economic and demographic assumptions

contained in this report in the first year and after the impacts are fully phased in, based on the three-year phase-in policy for changes to the UAL amortization rates.

Table I-1

Initial Impact on Employer Contribution Rates from Recommended Assumption Changes	General Contribution Rate	Safety Contribution Rate	Total Contribution Rate
Retirement Rates	-0.24%	-0.29%	-0.25%
Disability Rates	0.28%	-0.01%	0.22%
Termination Rates	-0.02%	-0.68%	-0.12%
Termination Type	0.45%	0.42%	0.44%
Vested / Reciprocal Deferral Age	-0.07%	-0.05%	-0.06%
Percent Married	0.08%	-0.09%	0.04%
Mortality	-0.44%	-0.70%	-0.47%
Merit Scale	1.07%	0.68%	0.99%
FAC Load (percentage)	-0.08%	-0.01%	-0.06%
Total Effect of Demographic Changes	**1.03%**	**-0.73%**	**0.73%**
Impact of Reducing Discount Rate to 7.0%	1.15%	1.55%	1.22%
Employee Contribution Crediting Rate	-0.02%	-0.02%	-0.02%
Updating Employee Contribution Rates	-0.79%	-0.41%	-0.82%
Total Effect of Assumption Changes	**1.37%**	**0.39%**	**1.11%**

Ultimate Impact on Employer Contribution Rates from Recommended Assumption Changes (After Phase-In)	General Contribution Rate	Safety Contribution Rate	Total Contribution Rate
Retirement Rates	-0.45%	-0.57%	-0.47%
Disability Rates	0.25%	0.00%	0.20%
Termination Rates	0.01%	-0.65%	-0.10%
Termination Type	0.55%	0.49%	0.53%
Vested / Reciprocal Deferral Age	-0.12%	-0.08%	-0.11%
Percent Married	0.12%	-0.15%	0.07%
Mortality	-1.10%	-1.73%	-1.18%
Merit Scale	1.39%	0.89%	1.28%
FAC Load (percentage)	-0.12%	0.05%	-0.09%
Total Effect of Demographic Changes	**0.53%**	**-1.75%**	**0.13%**
Impact of Reducing Discount Rate to 7.0%	2.46%	3.29%	2.59%
Employee Contribution Crediting Rate	-0.02%	-0.02%	-0.01%
Updating Employee Contribution Rates	-0.78%	-0.40%	-0.85%
Total Effect of Assumption Changes	**2.19%**	**1.12%**	**1.86%**

SECTION II – ECONOMIC ASSUMPTIONS
PRICE INFLATION

The economic assumptions used in actuarial valuations are intended to be long-term in nature, and should be both individually reasonable and consistent with each other. The specific assumptions analyzed in this report are:

- **Price inflation** – used indirectly as an underlying component of other economic assumptions.
- **Wage inflation** – across the board wage growth used to project benefits and to amortize the unfunded liability as a level percentage of expected payroll.
- **COLA growth** – rate at which inflation-linked post-retirement COLAs are expected to change.
- **Discount rate** – used both to project long-term asset growth and to discount future cash flows in calculating the liabilities and costs of the Plan.

In order to develop recommendations for each of these assumptions, we considered historical data, both nationally and for the Plan, and expectations for the future, as expressed by the Plan's and other external investment consultants and the Board.

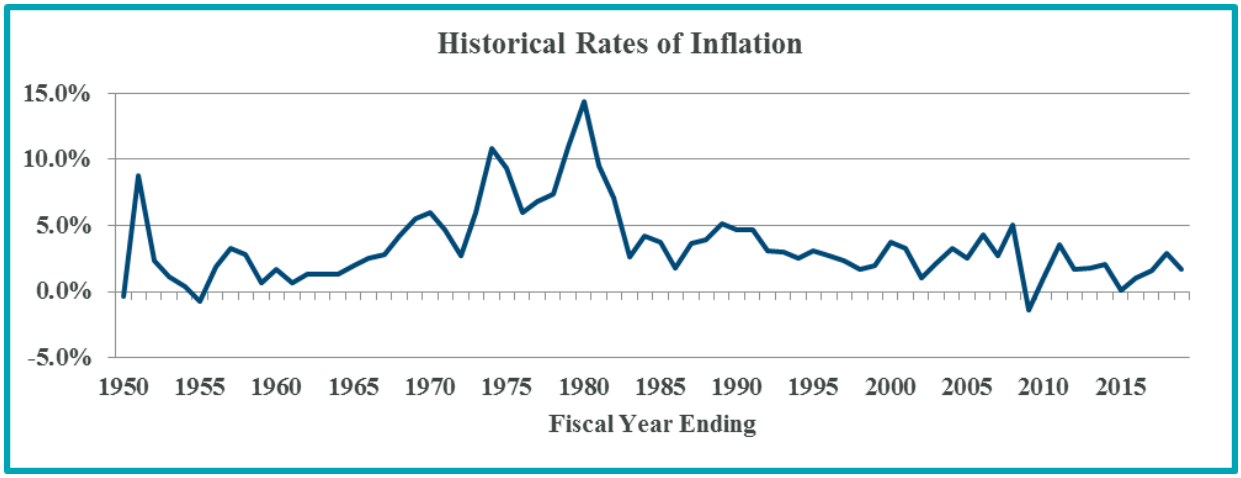
PRICE INFLATION

Long-term price inflation rates are the foundation of other economic assumptions. In a growing economy, wages, and investments are expected to grow at the underlying inflation rate plus some additional real growth rate, whether it reflects productivity in terms of wages or risk premiums in terms of investments.

Historical Data

Chart II-1 below shows inflation for the U.S. by Plan year (ending June 30) since 1950.

Chart II-1



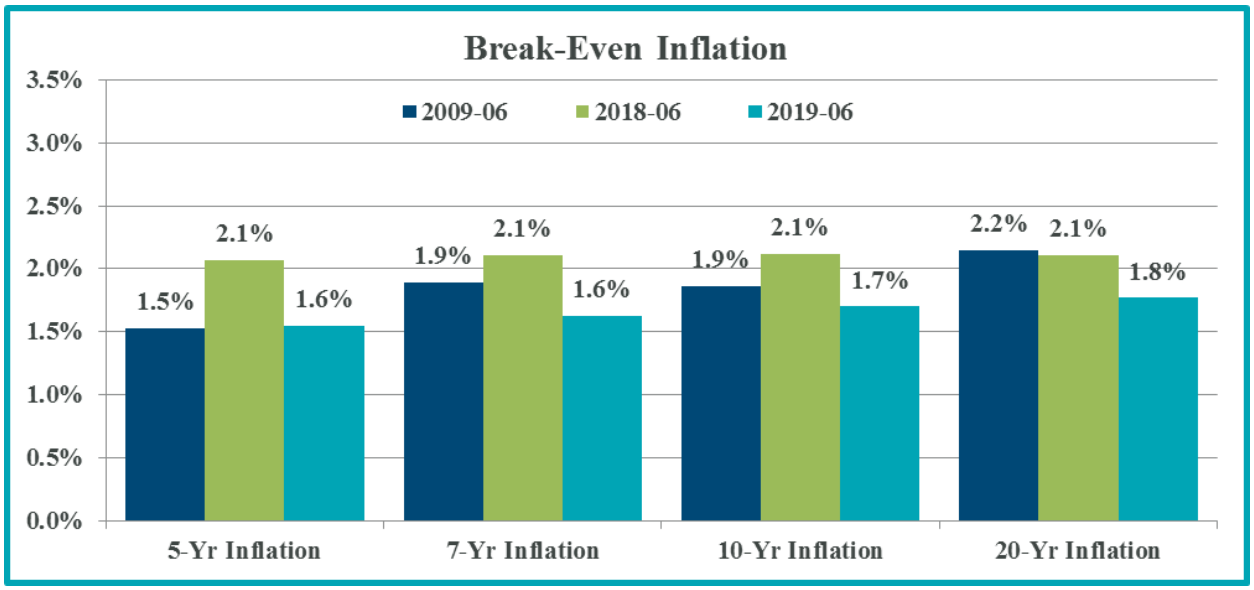
SECTION II – ECONOMIC ASSUMPTIONS
PRICE INFLATION

Over the 50 years ending June 2019, the geometric average inflation rate for the U.S. has been about 4.0%, but this average is heavily influenced by the high inflation rates in the 1970s and early 1980s. Over the last 20 years, the geometric average inflation rate has been 2.2%, and only about 1.7% over the past 10 years.

Future Expectations

A measure of the market consensus of expected future inflation rates is the difference in yields between conventional treasury bonds and Treasury Inflation-Protected Securities (TIPS) at the same maturity. Chart II-2 shows the break-even inflation rate as of June 2009, June 2018, and June 2019. Break-even inflation is the level of inflation needed for an investment in TIPS to "break even" with an investment in conventional treasury bonds of the same maturity.

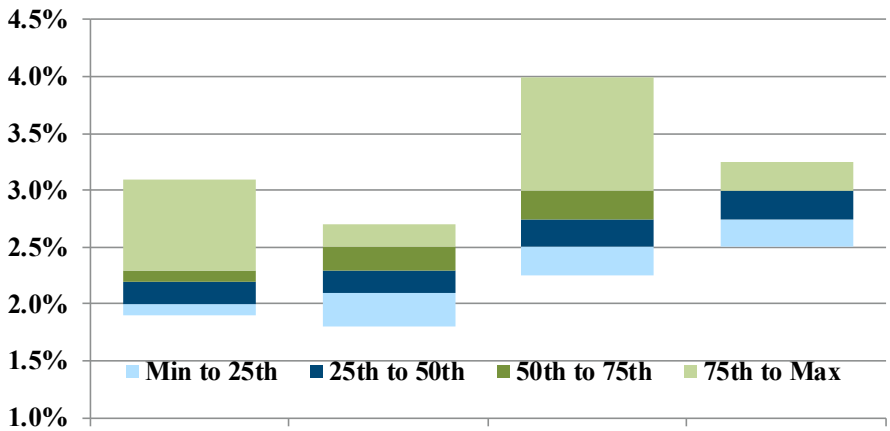
Chart II-2



SECTION II – ECONOMIC ASSUMPTIONS
PRICE INFLATION

The Federal Reserve Bank of Philadelphia publishes a quarterly survey of professional economic forecasters. Chart II-3 shows the distribution of the professionals forecasts for average inflation over the next 10 years compared to the distribution of 20-year inflation assumptions used investment consultants in Horizon Actuarial Service's 2019 survey, 2018 assumptions used by the plans in the Public Plans Database, and 2018 assumptions used by California public pension plans from Cheiron's survey.

Chart II-3



	Economic Forecasters (10-Yr)	Horizon Survey (20-Yr)	Public Plan Database	California Survey
Minimum	1.90%	1.80%	2.25%	2.50%
25th Percentile	2.00%	2.10%	2.50%	2.75%
50th Percentile	2.20%	2.30%	2.75%	3.00%
75th Percentile	2.30%	2.50%	3.00%	3.00%
Maximum	3.10%	2.70%	4.00%	3.25%

Finally, Meketa, the Board's investment consultant, uses an inflation assumption of around 2.60%.

Based on all of these considerations, we believe a reasonable range for long-term price inflation for use in the Plan's actuarial valuations is between 2.00% and 3.00%. Therefore, we support the Board's recent action to maintain the assumption at 2.50%. Although the comparison between the conventional Treasury bond and TIPS yields indicates a breakeven inflation rate below 2.00%, we note that this spread (as well as other market indicators of inflation) can be quite volatile.

WAGE INFLATION

Wage inflation can be thought of as the annual across-the-board increase in wages. Individuals often receive salary increases in excess of the wage inflation rate, and we study these increases as a part of the merit salary scale assumption. Wage inflation generally exceeds price inflation by some margin reflecting the history of increased purchasing power.

Wage inflation is used in the actuarial valuation as the minimum expected salary increase for an individual and, for purposes of amortizing the Unfunded Actuarial Liability, the rate at which payroll is expected to grow over the long term, assuming a stable active member population.

Since 2002, the Social Security Average Wage Index has grown by 2.7%, which is 0.7% higher than inflation. However, over the same time period the increase in the median wage was only 0.3% per year, as much of the growth in wages was clustered at the top end of the wage scale.

It is acceptable to assume some additional level of base payroll increase beyond general inflation. Potential reasons contributing to the increase may include the presence of strong union representation in the collective bargaining process, competition in hiring among other similar employers, and regional factors – such as the local inflation index exceeding the national average, as has sometimes proven the case in parts of California. Also, the Social Security Administration projects real wage growth of 0.6% - 1.8% going forward in their Social Security solvency projections. However, governmental entities remain under financial stress, and other areas of employee compensation – most notably health care costs and pension contributions – have continued to increase faster than the CPI.

Cheiron supports the Board's recent action to maintain a non-inflationary base payroll growth assumption of 0.25% annually. As a result, the annual expected increase in base payroll will remain at 2.75% (0.25% wage inflation + 2.50% price inflation). This rate will be applied to all continuing active members, and to starting pay for new entrants when projections of future populations are required. This rate will also be used in the calculation of the unfunded liability amortization payment as a level percentage of payroll.

COLA GROWTH

Tier 1 members of MCERA are eligible to receive automatic Cost-of-Living Adjustments (COLAs), based on the growth in the Bay Area Consumer Price Index (CPI) with a 3% cap on the annual COLA increase. Any increase in the CPI above the 3% maximum increase can be banked for future years in which the change in the CPI is below 3%.

It is necessary to determine an assumed rate of COLA growth, reflecting both inflation (i.e., the growth in the CPI), and the interaction of the CPI with the COLA cap and banking mechanism. Simulations of inflation show us that the average growth in the COLA is expected to be below the cap, even if the expected increase in the CPI is equal to or higher than the cap itself. This is because if there is not a significant bank already in existence (such as in the early years of retirement) and there are years in which inflation is below the cap, this shortfall will not be made up in future years.

As part of the prior experience study, we previously produced statistical simulations of inflation and then modeled how the COLA maximum and the banking process interact with changes in CPI for Merced. For a given long-term estimate of inflation, we used two sets of inputs and then blended the results: a 50% autocorrelation factor with 1.5% annual inflation volatility, and a 25% autocorrelation factor with 1.0% annual inflation volatility. Based on the results of the prior analysis, and given the decision by the Board to maintain the 2.50% inflation assumption, we recommend maintaining the COLA growth assumption at 2.40%.

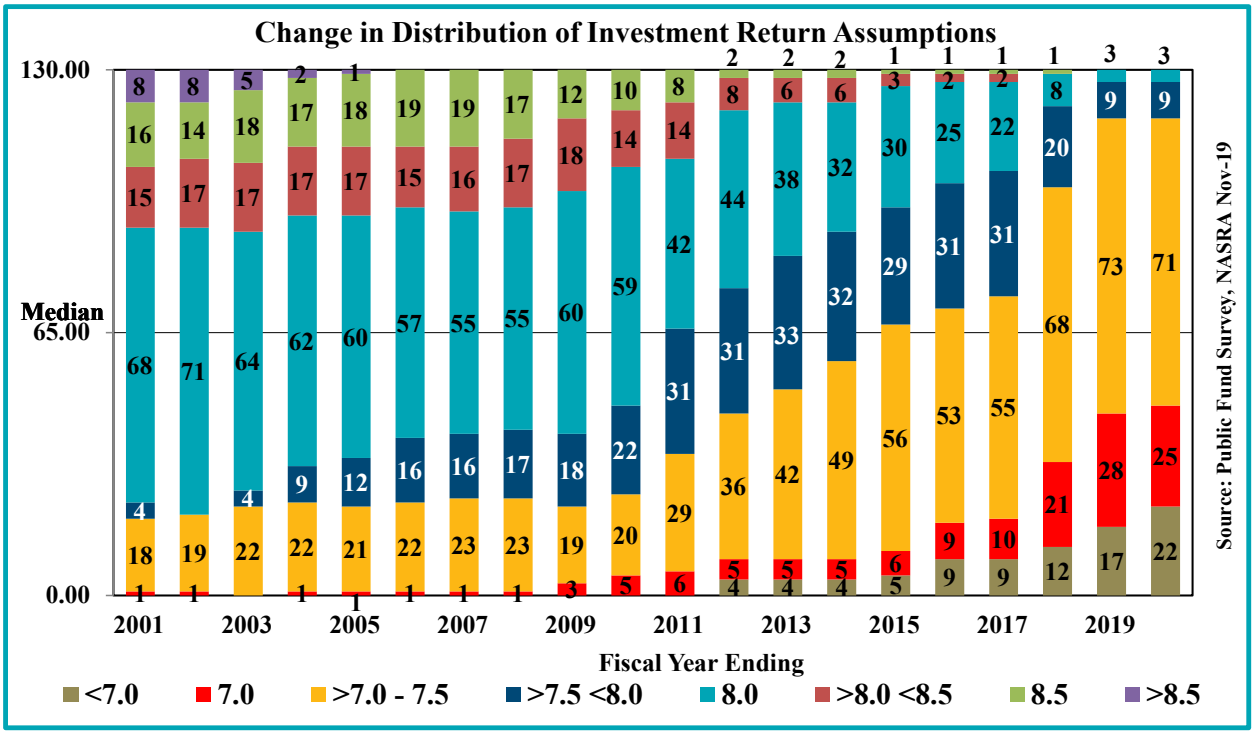
DISCOUNT RATE

The discount rate assumption is generally the most significant of all the assumptions employed in actuarial valuations. The discount rate is based on the long-term expected return on plan investments. In the short-term, a higher discount rate results in lower expected contributions. However, over the long term, actual contributions will depend on actual investment returns and not the discount rate (or expected investment returns). If actual investment returns are lower than expected, contribution rates will increase in the future. It is important to set a realistic discount rate so that projections of future contributions for budgeting purposes will not be significantly biased, particularly to be too low.

Other Large Public Retirement Plans

Based on the Public Fund Survey, developed by the National Association of State Retirement Administrators (NASRA) covering most of the largest public retirement systems in the country, there has been a general movement over at least the last decade to reduce the discount rate used in actuarial valuations. The latest data includes results collected through November 2019, and covers 130 retirement plans. Chart II-4 below shows the change in the distribution of assumptions since 2001. The median assumption is now 7.25% and the number of plans using a discount rate of 7.50% or lower has increased significantly.

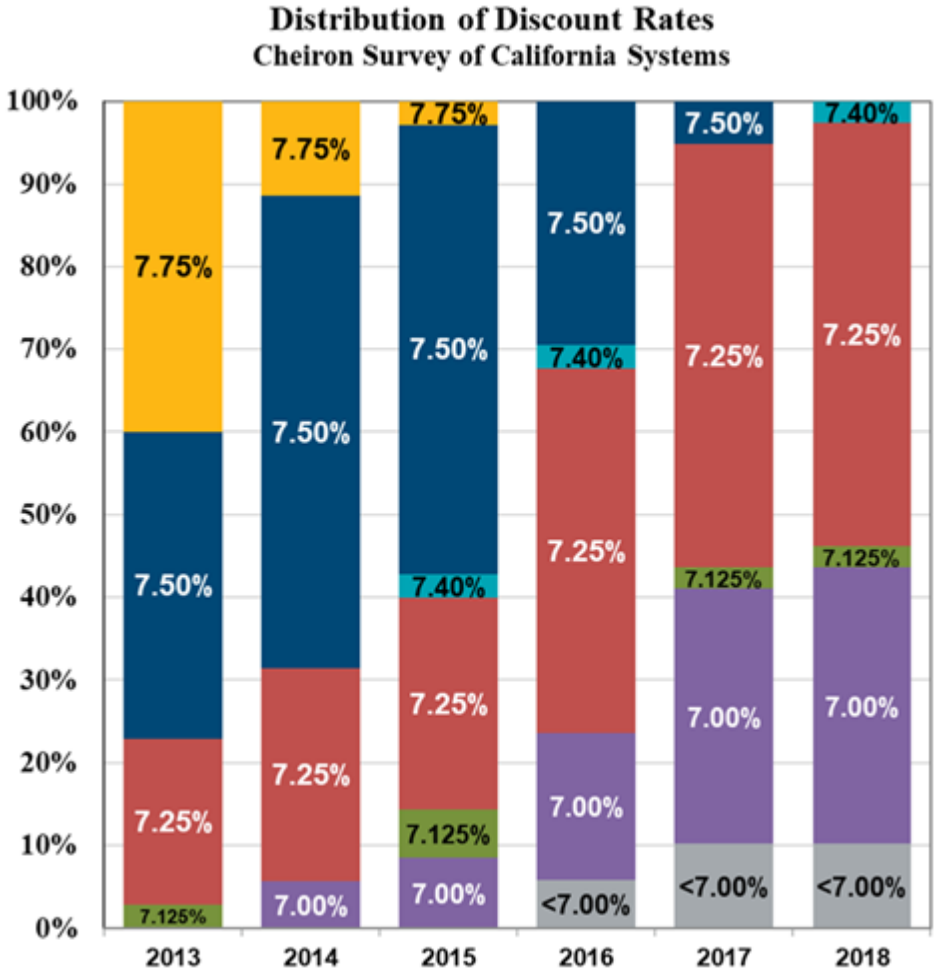
Chart II-4



SECTION II – ECONOMIC ASSUMPTIONS
DISCOUNT RATE

Our survey of California retirement systems has the same median assumption of 7.25%, with 20 of the 39 systems using the median rate and only one system above the median rate. Chart II-5 below shows the change in discount rate assumptions for California systems from 2013 to 2018.

Chart II-5



Target Asset Allocation and Future Expectations

The discount rate assumption depends on the anticipated average level of inflation and the anticipated average *real rate of return.* The real rate of return is the investment return in excess of underlying inflation. The expected average real rate of return is heavily dependent on asset mix: the portion of assets in stocks, bonds, and other asset classes. Table II-1 shows the current asset allocation for MCERA.

SECTION II – ECONOMIC ASSUMPTIONS
DISCOUNT RATE

Table II-1

Summary of Meketa Long-Term Capital Market Projections (for MERCED)	MCERA Portfolio Geometric 2019 Expectations
Annual Standard Deviation	12.36%
Expected Return 20 yrs Nominal	8.04%
Inflation Expectation 20 yrs	2.60%
Expected Return 20 yrs Real	5.30%
Sharpe Ratio	0.42
Asset Classes	**Weights**
Short-term Investment Grade Bonds	4.0%
Investment Grade Bonds	14.0%
High Yield Bonds	2.5%
Bank Loans	2.5%
US Equity	21.0%
Developed Market Equity (non-US)	10.0%
Emerging Market Equity	8.0%
Private Equity/Debt	15.0%
Real Estate	8.0%
Natural Resources (Private)	2.5%
Core Infrastructure	2.5%
Hedge Funds	10.0%

Based on the current target allocation and Meketa's 2019 capital market assumptions, we calculated an expected return of 8.00%, which is very close to the geometric return expectation provided by Meketa for this portfolio (8.04%). This correlates to a 5.40% real expected return based on the Meketa inflation assumption of 2.60%. We note that the 2019 capital market expectations were significantly higher than those provided in 2018, as a result of the market conditions existing in December 2018, when the 2019 expectations were developed. Meketa and other investment consultants have indicated that if current market conditions hold, it is likely that the 2020 expectations may look more like their 2018 expectations than their 2019 expecations, therefore we also calculated the expected returns for the portfolio under the 2018 assumptions. These results are significantly lower than the 2019 expectations, generating a 7.29% expected nominal return and a 4.69% real return.

We also reran the results using Verus' 10 and 30-year expectations (30-year for 2019 only) and using a broader survey of capital market assumptions conducted by Horizon Actuarial Services using 10 and 20-year expectations. The results are shown in Tables II-2 and II-3, for the 2019 and 2018 assumptions, respectively.

SECTION II – ECONOMIC ASSUMPTIONS
DISCOUNT RATE

Table II-2

MercedCERA Target Portfolio Return Expectations (2019 Capital Market Expectations)			
Source	**Nominal**	**Inflation**	**Real**
Meketa (20-year)	8.00%	2.60%	5.40%
Verus (10-year)	6.97%	2.00%	4.97%
Verus (30-year)	7.01%	1.80%	5.21%
Verus (Average)	6.99%	1.90%	5.09%
Horizon (Survey, 10-year)	6.84%	2.22%	4.62%
Horizon (Survey, 20-year)	7.83%	2.29%	5.54%
Horizon (Average)	7.33%	2.26%	5.08%
Average (Mek/Ver/Hor)	7.44%	2.25%	5.19%

Table II-3

MercedCERA Target Portfolio Return Expectations (2018 Capital Market Expectations)			
Source	**Nominal**	**Inflation**	**Real**
Meketa (20-year)	7.29%	2.60%	4.69%
Verus (10-year)	6.19%	2.10%	4.09%
Verus (30-year)	N/A	N/A	N/A
Verus (Average)	6.19%	2.10%	4.09%
Horizon (Survey, 10-year)	6.65%	2.24%	4.41%
Horizon (Survey, 20-year)	7.84%	2.48%	5.36%
Horizon (Average)	7.25%	2.36%	4.89%
Average (Mek/Ver/Hor)	6.91%	2.35%	4.56%

As of the 2013 valuation, the expected rate of return is expressed net of investment, but not administrative expenses. The returns above were modeled based on the expected returns of the portfolio benchmark indices, which are expected to have minimal expenses. The actuarial standards on selecting a return assumption (ASOP 27) state that in general, superior or inferior returns (net of fees) should not be assumed for active versus passive management; therefore, we do not recommend a significant adjustment to the modeled returns for the fees of the asset managers. However, a slight margin is appropriate to reflect the investment-related expenses other than those of the investment managers, which would include the investment advisor and custodian.

SECTION II – ECONOMIC ASSUMPTIONS
DISCOUNT RATE

Based on each set of 2019 and 2018 capital market assumptions, we also calculated the likelihood of achieving various nominal and real returns over various periods, as shown in Tables II-4 and II-5.

Table II-4

Likelihood of Achieving Average Returns (2019)				
	Nominal		Real	
Consultant	7.00%	7.25%	4.50%	4.75%
Meketa (20)	60%	58%	59%	57%
Verus (10)	50%	47%	55%	52%
Verus (30)	50%	47%	58%	55%
Horizon (10)	48%	45%	51%	49%
Horizon (20)	63%	59%	66%	62%
Average	54%	51%	58%	55%

Table II-5

Likelihood of Achieving Average Returns (2018)				
	Nominal		Real	
Consultant	7.00%	7.25%	4.50%	4.75%
Meketa (20)	53%	50%	52%	49%
Verus (10)	42%	39%	46%	43%
Horizon (10)	46%	44%	49%	46%
Horizon (20)	63%	59%	63%	59%
Average	51%	48%	53%	49%

We note that the average likelihood of achieving the nominal (7.00%) and real (4.50%) return assumptions exceeds 50% in both time periods. We therefore find the current discount rate of 7.00% recently adopted by the Board to be a reasonable assumption.

MEMBER CONTRIBUTION BALANCE CREDITING RATE

Interest is credited semi-annually to each Member's accumulated contribution balance. The crediting rate is set by the Board, and Board policy limits the interest crediting rate to between 0% and 2.00% less than the assumed rate of return. The prior assumption was 5.25% (2.00% less than the previous assumed rate of return of 7.25%). Although the rate credited in recent years has been less than assumed, past actuarial practice had been to set it to a rate 2.00% less than the assumed rate of return. We believe the rate assumed to be credited to member contribution balances should be reduced to 5.00% (2.00% less than the updated assumed rate of return of 7.00%).

SECTION III – DEMOGRAPHIC ASSUMPTIONS
MERIT SALARY INCREASES

Demographic assumptions are used to predict membership behavior, including rates of retirement, termination, disability, and mortality. These assumptions are based primarily on the historical experience of MCERA, with some adjustments where future experience is expected to differ from historical experience and with deference to standard tables where MCERA experience is not fully credible and a standard table is available. For purposes of this study, merit salary increases are also considered a demographic assumption because the assumption is based primarily on MCERA's historical experience.

MERIT SALARY INCREASES

Salary increases consist of three components: Increases due to cost-of-living maintenance (inflation), increases related to non-inflationary pressures on base pay (such as productivity increases), and increases in individual pay due to merit, promotion, and longevity. Increases due to cost-of-living and non-inflationary base pay factors were addressed in an earlier section of this report.

The merit salary increase assumption is analyzed by employee group and by service. Generally, newer employees are more likely to earn a longevity increase or receive a promotion, so their salary increases tend to be greater than those for longer service employees.

The merit salary increase assumption is added to the wage inflation assumption to calculate the total salary increase expected for an individual. To analyze the merit component, we subtracted the Plan's real wage growth from the total pay increases experienced by each member during the experience study period. We have computed the real wage growth by calculating the increase in the average salary across all active members (calculated separately for General and Safety) each year, and adjusting for changes in the average service level.

The analysis of the merit salary increase assumption is based on experience from 2013 through 2019. Chart III-1 and III-2 on the following page show the information graphically, with the charts showing the actual experience (blue line) compared to the current assumption (red line) and the proposed assumption (green line).

Merit salary increases have been higher than expected for most years of service. We propose to partially reflect this pattern by increasing the current merit salary increase assumption for most years of service for General members and increasing the rates for less than 9 years of service and more than 19 years of service for Safety members.

SECTION III – DEMOGRAPHIC ASSUMPTIONS
MERIT SALARY INCREASES

Chart III-1: General

General Merit Salary Increase by Service

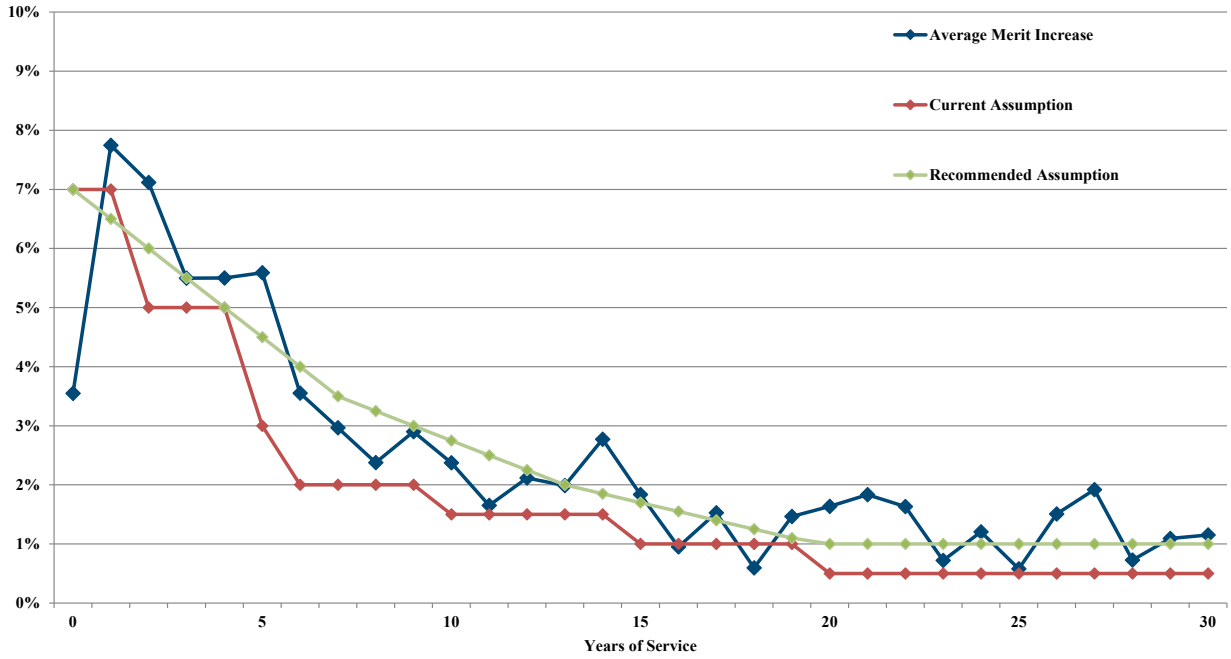
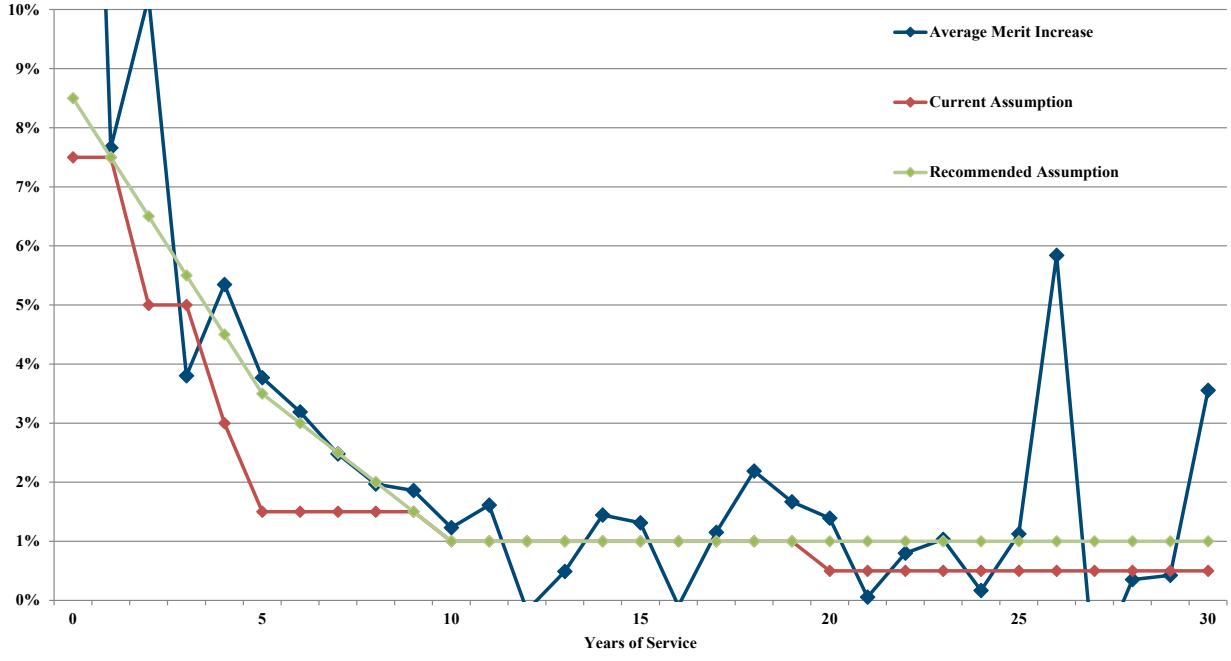


Chart III-2: Safety

Safety Merit Salary Increase by Service



FUTURE RECIPROCAL TRANSFERS' PAY GROWTH

In the past, the pay growth for future reciprocal transfers, while employed by a reciprocal employer, was assumed to be the wage inflation assumption plus the ultimate merit salary scale increase. We recommend no change to this methodology, but since we are recommending an increase in the ultimate merit salary scale rate from 0.50% to 1.00%, we also recommend increasing the assumption for pay growth for future reciprocal transfers from 3.25% to 3.75% (2.75% wage inflation + 1.00% ultimate merit increase).

We are not recommending a change to the assumed pay growth of current reciprocal transfers. Their pay is assumed to increase according to the assumptions applied to the active members until their assumed retirement age.

TERMINAL (VENTURA) PAY LOAD

Under the Ventura Settlement, members have been able to cash out some or all of their leave time (up to 160 hours) in the year prior to retirement; the cashed out pay was then included in the members' final average compensation.

The current actuarial assumptions include a load of 6.92% for Tier 1 members and 2.31% for Tier 2 members to Final Average Compensation to account for this cash out. This is equivalent to assuming that members will cash out 90% of the maximum allowable time in the year of retirement: 90% x 160 hours / 2080 hours worked per year = 6.92% for Tier 1. The load is divided by 3 for Tier 2 (6.92% / 3 = 2.31%) to account for the fact that these members use three year averaging for their final compensation.

We performed an analysis of the retirement calculations that occurred between July 1, 2016 and June 30, 2019. As part of this analysis, we calculated the percentage increase in the final average compensation resulting from the terminal cash outs.

For the 62 General Tier 1 members who retired from active status, the cash outs increased the final average compensation by around 5.11%. For the 100 Tier 2 and 3 members, the figure was 1.49%.

For the 16 Safety Tier 1 members who retired from active status, the cash outs increased the final average compensation by around 9.51%. For the 14 Tier 2 and 3 members, the figure was 0.94%.

We recommend updating the FAC load to 5.50% for General Tier 1 members, 8.00% for Safety Tier 1 members, and 1.50% for all Tier 2 and 3 members. We recommend that no load be applied to the benefits of the Tier 4 (PEPRA) members, as they are not eligible to receive the final compensation cash outs.

SECTION III – DEMOGRAPHIC ASSUMPTIONS
MERIT SALARY INCREASES

We also recommend applying this load to the maximum benefit amount applicable to Tiers 1-3 (i.e. the 100% of pay maximum). Previously, we had not been applying the load to the maximum benefit amount, just the standard service-based benefit.

We will continue to monitor terminal pay experience and adjust this assumption as necessary. Modifications may also be necessary if there are any changes to the terminal payout policies, or if there are any changes to the policies that govern the accumulation of leave.

SECTION III – DEMOGRAPHIC ASSUMPTIONS

ANALYSIS OF OTHER DEMOGRAPHIC ASSUMPTIONS

For all of the remaining demographic assumptions, we determined the ratio of the actual number of decrements for each membership group compared to the expected number of decrements (A/E ratio or actual-to-expected ratio). If the assumption is perfect, this ratio will be 100%. Otherwise, any recommended assumption change should move from the current A/E ratio towards 100% unless future experience is expected to be different than the experience during the period of study.

We also calculate an r-squared statistic for each assumption. R-squared measures how well the assumption fits the actual data and can be thought of as the percentage of the variation in actual data explained by the assumption. Ideally, r-squared would equal 1.00 although this is never the case. Any recommended assumption change should increase the r-squared compared to the current assumption making it closer to 1.00 unless the pattern of future decrements is expected to be different from the pattern experienced during the period of study.

In addition, we calculated the 90% confidence interval, which represents the range within which the true decrement rate during the experience study period fell with 90% confidence. If there is insufficient data to calculate a confidence interval, the confidence interval is shown as the entire range of the graph. We generally propose assumption changes when the current assumption is outside the 90% confidence interval of the observed experience. However, adjustments are made to account for differences between future expectations and historical experience, to account for the past experience represented by the current assumption, and to maintain a neutral to slight conservative bias in the selection of the assumption. For mortality rates, we compare MCERA's experience to that of a standard table and adjust the tables to bring the proposed assumption closer to an A/E ratio of 100%.

Finally, since the amount of data that is available over a three-year period to analyze the decrements is somewhat limited, we have added data from the prior study where noted to add more credibility to these calculations.

RETIREMENT RATES

The current retirement rates vary by group, gender, age, and service, and are applied to all members who are eligible to retire. We have combined the experience of the past three years with that of the prior three-year period in order to have a more robust dataset to review.

Generally, at any given age, members with more service are generally more likely to retire than members with fewer years of service. We reviewed the MCERA actual retirement rates based on service groupings since MCERA is not large enough to justify assumptions for each age and service combination.

We recommend separate assumptions by age for the following two service groups for General members; members with less than 30 years of service and members with 30 or more years of service. We found that recent retirement experience was not materially different between males and females for General members, so we recommend changing to unisex rates.

We recommend maintaining separate assumptions by age for the following two service groups for Safety members; members with less than 20 years of service and members with 20 or more years of service. There is very little female Safety experience, so we recommend keeping unisex rates.

There is some expectation that PEPRA members may retire later than those in other tiers due to their lower benefit levels, particularly for the General members. For example, CalPERS has developed assumed retirement rates for their 2% at 62 members (the same formula as MCERA's General PEPRA members) that anticipate an average retirement age around two years later than for their 3% @ 60 members (the same formula as the bulk of MCERA's non-PEPRA members).

However, when we applied the CalPERS 2% at 62 retirement assumptions to MCERA's General PEPRA population, it showed only a modest impact on the total normal cost for these members (under 5% of the normal cost), even though it had a significant impact on the expected retirement age (nearly four years later). We believe it would be hasty to assume such a drastic change in behavior without any existing evidence for MCERA's population. Therefore if we were to propose a separate set of retirement rates for General PEPRA members, the impact on behavior and the associated average retirement age would likely be less than the impact of the CalPERS 2% at 62 retirement assumptions and thus the impact on the normal cost would be even more moderate.

In addition, although there has been very little retirement data thus far on the PEPRA members, by the time of the next scheduled experience study (in 2022), we anticipate that there could be as many as 70 General PEPRA members eligible to retire. Even though that may not represent a large enough population to produce a distinct set of retirement rates at all age and service levels, we may be able to at least determine whether there appears to be an overall difference in behavior for the PEPRA population, which could act as a guide in helping to develop a reasonable set of retirement rates.

SECTION III – DEMOGRAPHIC ASSUMPTIONS
RETIREMENT RATES

Therefore, we recommend the continued use of the same assumptions for all PEPRA members as the other members, since we do not yet have any plan experience to support a different set of assumptions, and our initial analysis shows very little impact - around 0.15% of pay on both the member and employer General PEPRA rates - if a modest change in behavior were anticipated (something akin to a two year delay in the average retirement age).

Table III-R1 shows the calculation of actual-to-expected ratios and the r-squared statistic for General members with less than 30 years of service. Chart III-R1 shows the information graphically along with the 90% confidence interval.

The data shows generally lower actual retirement rates than expected under the current assumption. The proposed assumption decreases the aggregate assumed rate of retirement and increases the aggregate A/E ratio from 87% to 100%. The r-squared increases from 81% to 91%.

Table III-R1 – General

General Retirement Rates For Less than 30 Years of Service												
		Retirements			Retirement Rates						A/E Ratios	
Age	Exposures	Actual	Current	Proposed	Actual	Current Male 10-19	Current Male 20-29	Current Female 10-19	Current Female 20-29	Proposed	Current	Proposed
50	42	3	3	4	7.1%	5.0%	10.0%	2.5%	7.5%	10.0%	89%	71%
51	46	4	4	5	8.7%	5.0%	10.0%	2.5%	7.5%	10.0%	108%	87%
52	50	7	6	5	14.0%	5.0%	10.0%	5.0%	12.5%	10.0%	126%	140%
53	48	5	5	5	10.4%	5.0%	10.0%	5.0%	12.5%	10.0%	94%	104%
54	53	5	6	5	9.4%	5.0%	10.0%	5.0%	12.5%	10.0%	91%	94%
55	210	26	30	21	12.4%	10.0%	12.5%	12.0%	25.0%	10.0%	85%	124%
56	208	15	27	21	7.2%	10.0%	12.5%	8.5%	25.0%	10.0%	56%	72%
57	200	22	26	20	11.0%	10.0%	12.5%	8.5%	25.0%	10.0%	84%	110%
58	180	28	22	27	15.6%	10.0%	12.5%	8.5%	25.0%	15.0%	125%	104%
59	147	27	20	29	18.4%	10.0%	12.5%	10.0%	30.0%	20.0%	135%	92%
60	121	22	24	24	18.2%	20.0%	25.0%	15.0%	30.0%	20.0%	93%	91%
61	109	25	30	22	22.9%	20.0%	25.0%	27.5%	40.0%	20.0%	84%	115%
62	89	22	23	18	24.7%	20.0%	25.0%	27.5%	40.0%	20.0%	94%	124%
63	64	10	17	13	15.6%	20.0%	25.0%	27.5%	40.0%	20.0%	59%	78%
64	56	7	14	11	12.5%	20.0%	25.0%	27.5%	40.0%	20.0%	48%	63%
65	52	19	21	18	36.5%	35.0%	50.0%	40.0%	50.0%	35.0%	89%	104%
66	33	15	14	12	45.5%	35.0%	50.0%	45.0%	50.0%	35.0%	105%	130%
67	17	5	8	6	29.4%	35.0%	50.0%	50.0%	50.0%	35.0%	65%	84%
68	13	4	7	5	30.8%	35.0%	50.0%	60.0%	60.0%	35.0%	59%	88%
69	9	2	5	3	22.2%	35.0%	50.0%	80.0%	80.0%	35.0%	38%	63%
Total	**1,747**	**273**	**313**	**273**	**15.6%**					**15.6%**	**87%**	**100%**
Confidence Interval %				**95.0%**								
R-squared			**80.7%**	**91.2%**								

SECTION III – DEMOGRAPHIC ASSUMPTIONS
RETIREMENT RATES

Chart III-R1 – General

General Retirement Rates For Less than 30 Years of Service

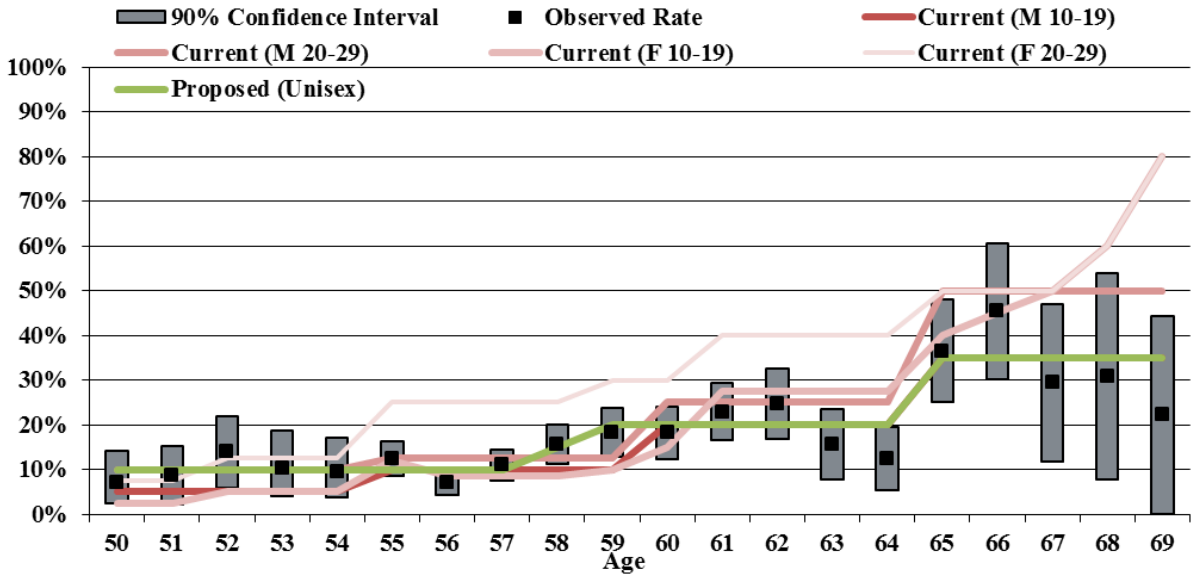


Table III-R2 shows the calculation of actual-to-expected ratios and the r-squared statistic for General members with 30 or more years of service. Chart III-R2 shows the information graphically along with the 90% confidence interval.

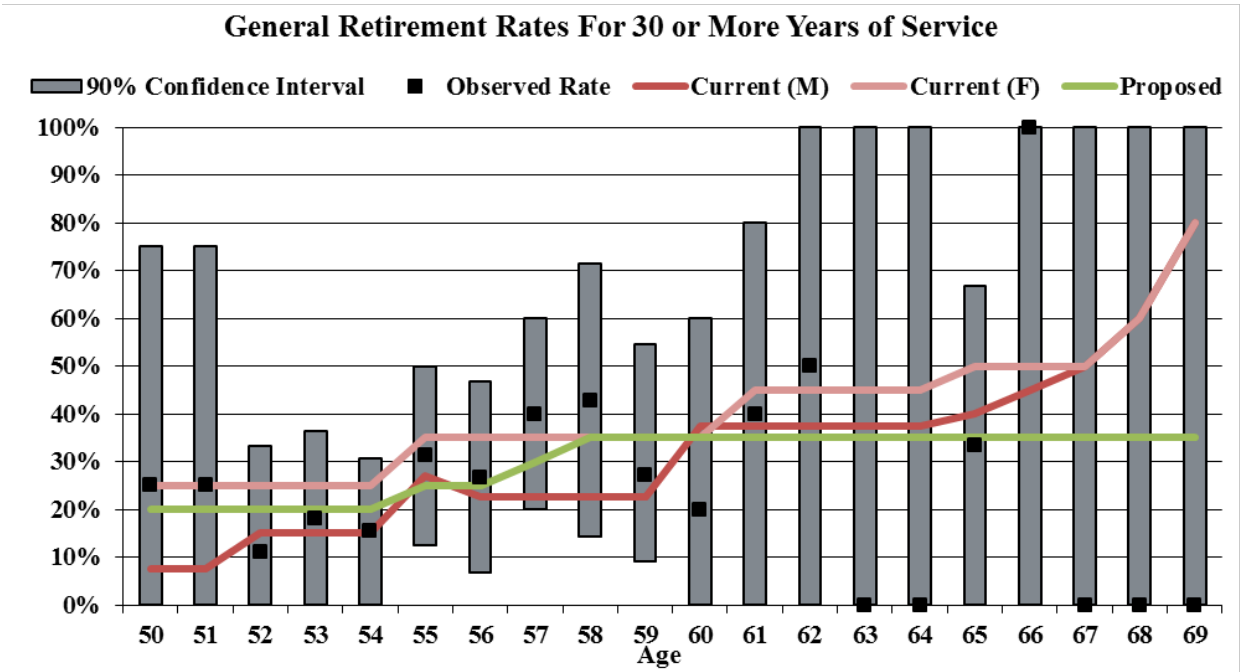
The data shows lower actual retirement rates than expected under the current assumption. The proposed assumption decreases the aggregate assumed rate of retirement and increases the aggregate A/E ratio from 90% to 101%. The r-squared remains level at 82%.

SECTION III – DEMOGRAPHIC ASSUMPTIONS
RETIREMENT RATES

Table III-R2 – General

General Retirement Rates For 30 or More Years of Service										
		Retirements			Retirement Rates				A/E Ratios	
Age	Exposures	Actual	Current	Proposed	Actual	Current Male	Current Female	Proposed	Current	Proposed
50	4	1	1	1	25.0%	7.5%	25.0%	20.0%	100%	125%
51	4	1	1	1	25.0%	7.5%	25.0%	20.0%	121%	125%
52	9	1	2	2	11.1%	15.0%	25.0%	20.0%	47%	56%
53	11	2	3	2	18.2%	15.0%	25.0%	20.0%	75%	91%
54	13	2	3	3	15.4%	15.0%	25.0%	20.0%	68%	77%
55	16	5	5	4	31.3%	27.0%	35.0%	25.0%	96%	125%
56	15	4	5	4	26.7%	22.5%	35.0%	25.0%	84%	107%
57	15	6	5	5	40.0%	22.5%	35.0%	30.0%	130%	133%
58	7	3	2	2	42.9%	22.5%	35.0%	35.0%	129%	122%
59	11	3	3	4	27.3%	22.5%	35.0%	35.0%	93%	78%
60	5	1	2	2	20.0%	37.5%	35.0%	35.0%	55%	57%
61	5	2	2	2	40.0%	37.5%	45.0%	35.0%	95%	114%
62	4	2	2	1	50.0%	37.5%	45.0%	35.0%	116%	143%
63	4	0	2	1	0.0%	37.5%	45.0%	35.0%	0%	0%
64	2	0	1	1	0.0%	37.5%	45.0%	35.0%	0%	0%
65	3	1	1	1	33.3%	40.0%	50.0%	35.0%	77%	95%
66	2	2	1	1	100.0%	45.0%	50.0%	35.0%	211%	286%
67	0	0	0	0	0.0%	50.0%	50.0%	35.0%	0%	0%
68	0	0	0	0	0.0%	60.0%	60.0%	35.0%	0%	0%
69	0	0	0	0	0.0%	80.0%	80.0%	35.0%	0%	0%
Total	**130**	**36**	**40**	**36**	**27.7%**			**27.3%**	**90%**	**101%**
Confidence Interval %				**100.0%**						
R-squared			**81.9%**	**81.7%**						

Chart III-R2 – General



SECTION III – DEMOGRAPHIC ASSUMPTIONS
RETIREMENT RATES

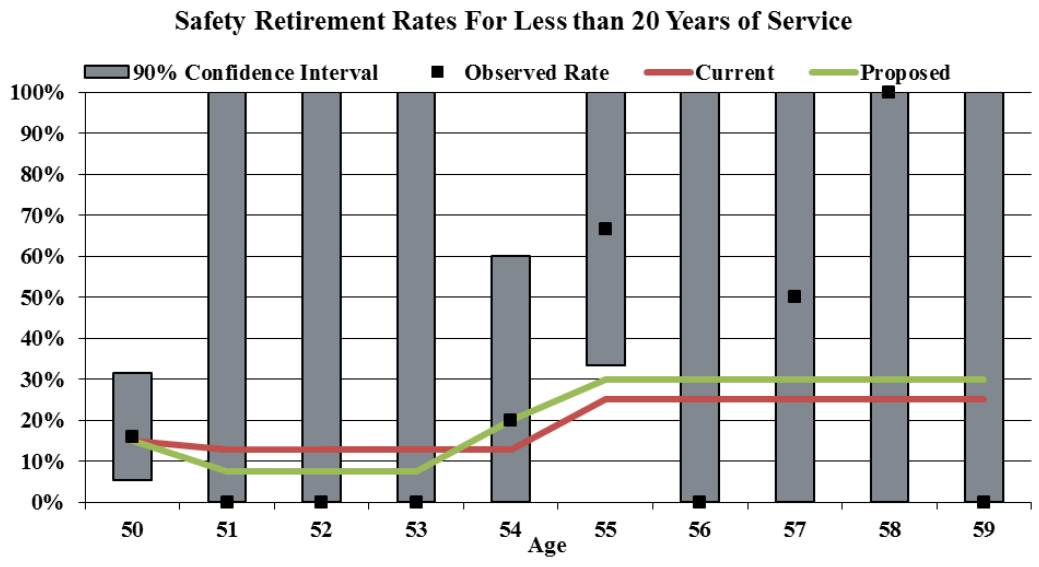
Table III-R3 shows the calculation of actual-to-expected ratios and the r-squared statistic for Safety members with less than 20 years of service. Chart III-R3 shows the information graphically along with the 90% confidence interval.

The data shows lower actual retirement rates than expected under the current assumption. The proposed assumption decreases the aggregate assumed rate of retirement and increases the aggregate A/E ratio from 79% to 85%. The r-squared increases from 29% to 53%.

Table III-R3 – Safety

Safety Retirement Rates For Less than 20 Years of Service									
		Retirements			Retirement Rates			A/E Ratios	
Age	Exposures	Actual	Current	Proposed	Actual	Current	Proposed	Current	Proposed
50	19	3	3	3	15.8%	15.0%	15.0%	105%	105%
51	13	0	2	1	0.0%	12.8%	7.5%	0%	0%
52	10	0	1	1	0.0%	12.8%	7.5%	0%	0%
53	7	0	1	1	0.0%	12.8%	7.5%	0%	0%
54	5	1	1	1	20.0%	12.8%	20.0%	156%	100%
55	3	2	1	1	66.7%	25.0%	30.0%	267%	222%
56	4	0	1	1	0.0%	25.0%	30.0%	0%	0%
57	2	1	1	1	50.0%	25.0%	30.0%	200%	167%
58	1	1	0	0	100.0%	25.0%	30.0%	400%	333%
59	1	0	0	0	0.0%	25.0%	30.0%	0%	0%
Total	**65**	**8**	**10**	**9**	**6.2%**	**7.8%**	**7.2%**	**79%**	**85%**
Confidence Interval %			**90.0%**	**90.0%**					
R-squared			**29.0%**	**53.0%**					

Chart III-R3 – Safety



SECTION III – DEMOGRAPHIC ASSUMPTIONS
RETIREMENT RATES

Table III-R4 shows the calculation of actual-to-expected ratios and the r-squared statistic for Safety members with 20 or more years of service. Chart III-R4 shows the information graphically along with the 90% confidence interval.

The data shows lower actual retirement rates than expected under the current assumption. The proposed assumption decreases the aggregate assumed rate of retirement and increases the aggregate A/E ratio from 77% to 91%. The r-squared increases from 41% to 69%.

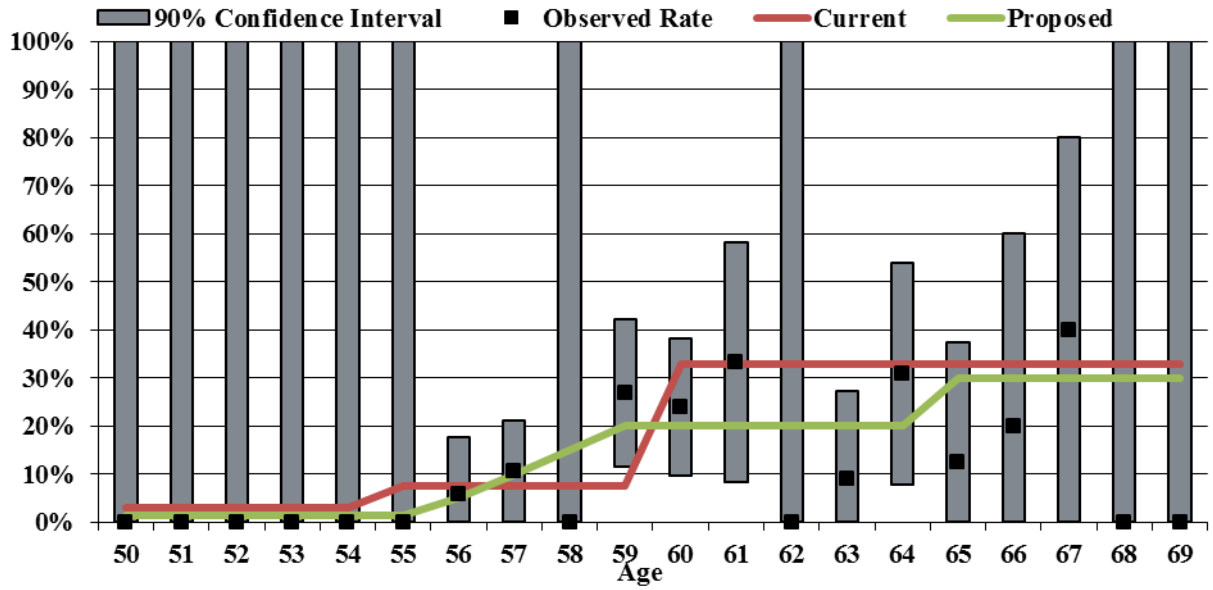
Table III-R4 – Safety

Safety Retirement Rates For 20 or More Years of Service									
		Retirements			Retirement Rates			A/E Ratios	
Age	Exposures	Actual	Current	Proposed	Actual	Current	Proposed	Current	Proposed
40	0	0	0	0	0.0%	3.1%	1.5%	0%	0%
41	0	0	0	0	0.0%	3.1%	1.5%	0%	0%
42	1	0	0	0	0.0%	3.1%	1.5%	0%	0%
43	6	0	0	0	0.0%	3.1%	1.5%	0%	0%
44	9	0	0	0	0.0%	3.1%	1.5%	0%	0%
45	11	0	1	0	0.0%	7.6%	1.5%	0%	0%
46	17	1	1	1	5.9%	7.6%	5.0%	77%	118%
47	19	2	1	2	10.5%	7.6%	10.0%	139%	105%
48	19	0	1	3	0.0%	7.6%	15.0%	0%	0%
49	26	7	2	5	26.9%	7.6%	20.0%	354%	135%
50	21	5	7	4	23.8%	32.9%	20.0%	72%	119%
51	12	4	4	2	33.3%	32.9%	20.0%	101%	167%
52	11	0	4	2	0.0%	32.9%	20.0%	0%	0%
53	11	1	4	2	9.1%	32.9%	20.0%	28%	45%
54	13	4	4	3	30.8%	32.9%	20.0%	94%	154%
55	8	1	3	2	12.5%	32.9%	30.0%	38%	42%
56	5	1	2	2	20.0%	32.9%	30.0%	61%	67%
57	5	2	2	2	40.0%	32.9%	30.0%	122%	133%
58	1	0	0	0	0.0%	32.9%	30.0%	0%	0%
59	1	0	0	0	0.0%	32.9%	30.0%	0%	0%
Total	**196**	**28**	**36**	**31**	**21.5%**	**28.0%**	**23.7%**	**77%**	**91%**
Confidence Interval %			**90.0%**	**100.0%**					
R-squared			**40.9%**	**69.1%**					

SECTION III – DEMOGRAPHIC ASSUMPTIONS
RETIREMENT RATES

Chart III-R4 – Safety

Safety Retirement Rates For 20 or More Years of Service



SECTION III – DEMOGRAPHIC ASSUMPTIONS

TERMINATION RATES

Termination rates reflect the frequency at which active members leave employment for reasons other than retirement, death, or disability. Currently, the termination rates are based on service for both Safety and General members. We have found that the rate of termination is more related to years of service rather than age. This methodology also avoids under-weighting the liabilities that can occur if using age-based rates only. The termination rates do not apply once members are eligible for a service retirement benefit. Again, we have combined the experience of the past three years with that of the prior three-year period in order to have a more robust dataset to review.

To make the best use of the available member data, we study all terminations together – vested terminations, terminating members who withdraw their contributions, and members who transfer to a reciprocal pension plan – to determine an overall termination rate. We then analyze the percentages of terminating members who withdraw their contributions, transfer, or are eligible for a vested benefit.

Table III-T1 shows the calculation of actual-to-expected ratios and the r-squared statistic for General male members, and Chart III-T1 shows the information graphically along with the 90% confidence interval.

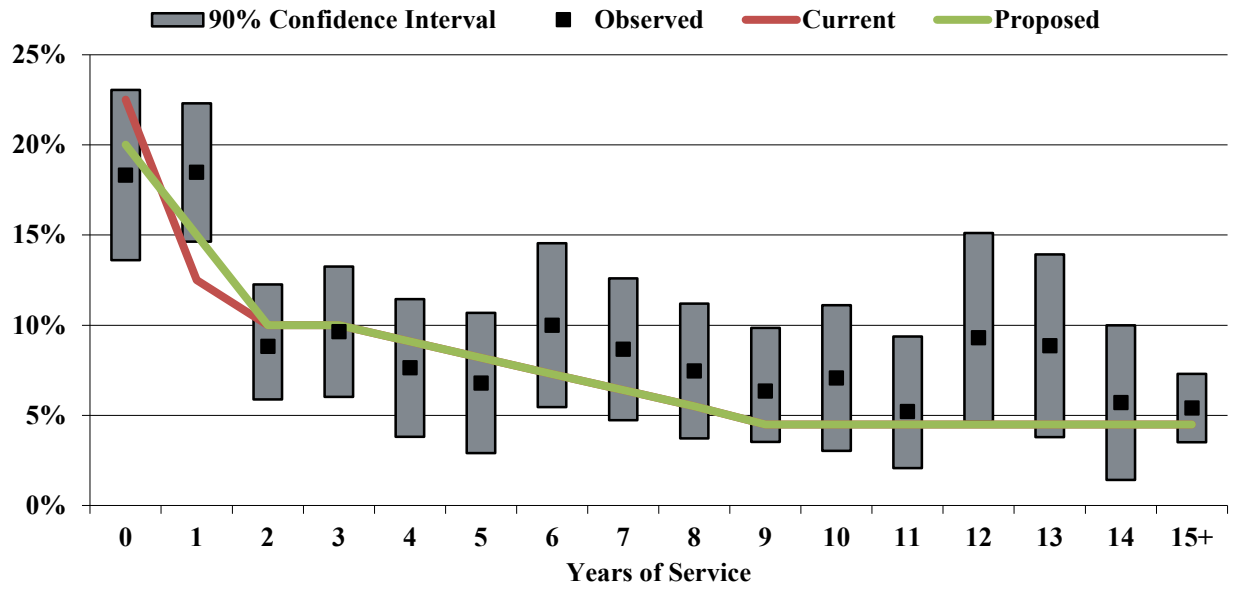
The data shows higher actual termination rates than expected under current assumption. The proposed assumption increases the aggregate assumed rates of termination and decreases the aggregate A/E ratio from 114% to 113%. The r-squared increases from 88% to 95%.

SECTION III – DEMOGRAPHIC ASSUMPTIONS
TERMINATION RATES

Table III-T1 – General Male

General Termination Rates - Male									
		Terminations			Termination Rates			A/E Ratios	
Service	Exposures	Actual	Current	Proposed	Actual	Current	Proposed	Current	Proposed
0	191	35	43	38	18.32%	22.50%	20.00%	81%	92%
1	287	53	36	43	18.47%	12.50%	15.00%	148%	123%
2	204	18	20	20	8.82%	10.00%	10.00%	88%	88%
3	166	16	17	17	9.64%	10.00%	10.00%	96%	96%
4	131	10	12	12	7.63%	9.10%	9.10%	84%	84%
5	103	7	8	8	6.80%	8.20%	8.20%	83%	83%
6	110	11	8	8	10.00%	7.30%	7.30%	137%	137%
7	127	11	8	8	8.66%	6.40%	6.40%	135%	135%
8	134	10	7	7	7.46%	5.50%	5.50%	136%	136%
9	142	9	6	6	6.34%	4.50%	4.50%	141%	141%
10	99	7	4	4	7.07%	4.50%	4.50%	157%	157%
11	96	5	4	4	5.21%	4.50%	4.50%	116%	116%
12	86	8	4	4	9.30%	4.50%	4.50%	207%	207%
13	79	7	4	4	8.86%	4.50%	4.50%	197%	197%
14	70	4	3	3	5.71%	4.50%	4.50%	127%	127%
15+	370	20	17	17	5.41%	4.50%	4.50%	120%	120%
Total	**2,395**	**231**	**202**	**205**	**9.65%**	**8.44%**	**8.54%**	**114%**	**113%**
Confidence Interval %			**87.5%**	**93.8%**					
R-squared			**87.9%**	**95.2%**					

Chart III-T1 – General Male



SECTION III – DEMOGRAPHIC ASSUMPTIONS
TERMINATION RATES

Table III-T2 shows the calculation of actual-to-expected ratios and the r-squared statistic for General female members, and Chart III-T2 shows the information graphically along with the 90% confidence interval.

The data shows higher actual termination rates than expected under the current assumption. The proposed assumption increases the aggregate assumed rate of termination and decreases the aggregate A/E ratio from 120% to 105%. The r-squared increases from 90% to 98%.

Table III-T2 – General Female

General Termination Rates - Female									
		Terminations			Termination Rates			A/E Ratios	
Service	Exposures	Actual	Current	Proposed	Actual	Current	Proposed	Current	Proposed
0	443	102	53	89	23.02%	12.00%	20.00%	192%	115%
1	645	91	77	97	14.11%	12.00%	15.00%	118%	94%
2	474	50	50	47	10.55%	10.50%	10.00%	100%	105%
3	390	35	29	39	8.97%	7.50%	10.00%	120%	90%
4	308	32	23	28	10.39%	7.50%	9.10%	139%	114%
5	231	24	17	19	10.39%	7.50%	8.20%	139%	127%
6	249	18	19	18	7.23%	7.50%	7.30%	96%	99%
7	282	12	21	18	4.26%	7.50%	6.40%	57%	66%
8	304	21	21	17	6.91%	7.00%	5.50%	99%	126%
9	296	16	16	13	5.41%	5.50%	4.50%	98%	120%
10	235	13	8	11	5.53%	3.60%	4.50%	154%	123%
11	245	12	9	10	4.90%	3.60%	4.00%	136%	122%
12	249	9	9	9	3.61%	3.60%	3.50%	100%	103%
13	234	6	8	7	2.56%	3.60%	3.00%	71%	85%
14	212	9	8	6	4.25%	3.60%	3.00%	118%	142%
15+	1,101	35	33	33	3.18%	3.00%	3.00%	106%	106%
Total	**5,898**	**485**	**403**	**460**	**8.22%**	**6.83%**	**7.81%**	**120%**	**105%**
Confidence Interval %			**87.5%**	**93.8%**					
R-squared			**89.6%**	**98.0%**					

Chart III-T2 – General Female

Table III-T3 shows the calculation of actual-to-expected ratios and the r-squared statistic for Safety members, and Chart III-T3 shows the information graphically along with the 90% confidence interval.

The data shows higher actual termination rates than expected under the current assumption. The proposed assumption increases the aggregate assumed rate of termination and decreases the aggregate A/E ratio from 130% to 111%. The r-squared increases from 87% to 88%.

SECTION III – DEMOGRAPHIC ASSUMPTIONS
TERMINATION RATES

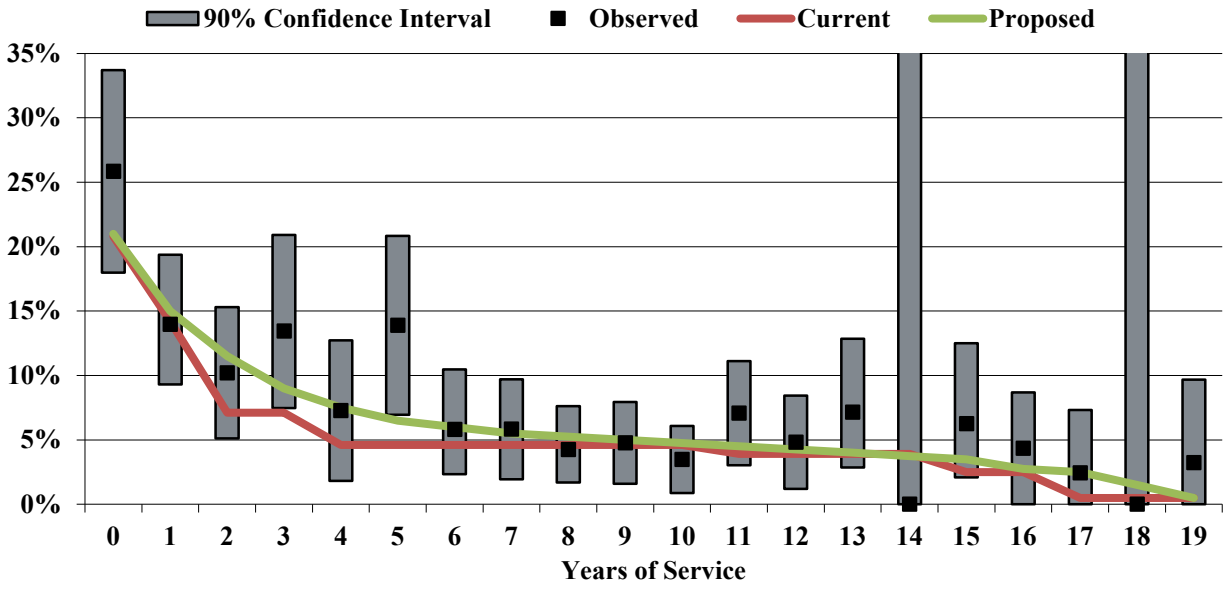
Table III-T3 – Safety

Safety Termination Rates									
		Terminations			Termination Rates			A/E Ratios	
Service	Exposures	Actual	Current	Proposed	Actual	Current	Proposed	Current	Proposed
0	89	23	19	19	25.84%	20.80%	21.00%	124%	123%
1	129	18	18	19	13.95%	14.20%	15.00%	98%	93%
2	98	10	7	11	10.20%	7.10%	11.50%	144%	89%
3	67	9	5	6	13.43%	7.10%	9.00%	189%	149%
4	55	4	3	4	7.27%	4.60%	7.50%	158%	97%
5	72	10	3	5	13.89%	4.60%	6.50%	302%	214%
6	86	5	4	5	5.81%	4.60%	6.00%	126%	97%
7	103	6	5	6	5.83%	4.60%	5.50%	127%	106%
8	118	5	5	6	4.24%	4.60%	5.25%	92%	81%
9	126	6	6	6	4.76%	4.60%	5.00%	104%	95%
10	115	4	5	5	3.48%	4.60%	4.75%	76%	73%
11	99	7	4	4	7.07%	3.90%	4.50%	181%	157%
12	83	4	3	4	4.82%	3.90%	4.25%	124%	113%
13	70	5	3	3	7.14%	3.90%	4.00%	183%	179%
14	60	0	2	2	0.00%	3.90%	3.75%	0%	0%
15	48	3	1	2	6.25%	2.50%	3.50%	250%	179%
16	46	2	1	1	4.35%	2.50%	2.75%	174%	158%
17	41	1	0	1	2.44%	0.50%	2.50%	488%	98%
18	35	0	0	1	0.00%	0.50%	1.50%	0%	0%
19	31	1	0	0	3.23%	0.50%	0.50%	645%	645%
Total	**1,571**	**123**	**95**	**111**	**7.83%**	**6.02%**	**7.04%**	**130%**	**111%**
Confidence Interval %			**90.0%**	**95.0%**					
R-squared			**86.9%**	**88.3%**					

SECTION III – DEMOGRAPHIC ASSUMPTIONS
TERMINATION RATES

Chart III-T3 – Safety

Safety Termination Rates



SECTION III – DEMOGRAPHIC ASSUMPTIONS
TERMINATION RATES

TYPES OF TERMINATION

When a vested member terminates employment, the member has the option of receiving a refund of contributions with interest or a deferred annuity. If an employee terminates employment and works for a reciprocal employer (also referred to as a transfer), the employees' retirement benefit is based on the employee's service with MCERA and Final Compensation based on employment with the reciprocal employer.

Table III-T4 and III-T5 show the results of our analysis of terminations for General and Safety members, as well as our recommendations regarding rates of withdrawal, vested termination, and transfer.

The number of both General and Safety members taking a withdrawal of their employee contributions when they terminate decreased for all service levels above four years for both General and Safety members. Our recommended assumptions for withdrawal is shown in the table below.

Table III-T4

Termination from Active Status							
	Years of Service						
	General				Safety		
Type	0 to 4	5-9	10-14	15+	0 to 4	5-9	10+
Withdrawal							
Current Assumption	90.0%	40.0%	40.0%	10.0%	90.0%	30.0%	30.0%
Actual Experience	95.0%	32.1%	19.1%	5.3%	95.4%	30.0%	0.0%
Proposed Assumption	92.5%	30.0%	20.0%	5.0%	92.5%	25.0%	15.0%
Transfers							
Current Assumption	10.0%	10.0%	10.0%	10.0%	10.0%	25.0%	25.0%
Actual Experience	4.7%	6.9%	5.6%	10.5%	4.6%	8.0%	0.0%
Proposed Assumption	7.5%	35.0%	40.0%	47.5%	7.5%	50.0%	56.7%
Vested Terms							
Current Assumption	0.0%	50.0%	50.0%	80.0%	0.0%	45.0%	45.0%
Actual Experience	0.0%	61.1%	75.3%	84.2%	0.0%	62.0%	0.0%
Proposed Assumption	0.0%	35.0%	40.0%	47.5%	0.0%	25.0%	28.3%

For the analysis of the rates of reciprocity, we have performed the analysis from two different perspectives. The first method, shown in Table III-T4, looks at the number of members who notify MCERA that they have been employed at a reciprocal retirement system when they leave MCERA employment. The second method, shown in Table III-T5, looks at the number of

members who retired from a terminated status at MCERA and were employed at a reciprocal system.

The first analysis results in lower rates of reciprocity, most likely due to members not reporting to MCERA that they were hired at a reciprocal system and the information only becoming available once the member retires from the reciprocal system. Based on the second analysis, we are recommending significant increases in the percentage of reciprocal transfers and corresponding decreases in the percentage of vested terms.

Table III-T5

Retirement from Terminated Status				
	General		Safety	
Type	Retirements	Fraction	Retirements	Fraction
Transfers	70	50.4%	15	78.9%
Vested Terms	69	49.6%	4	21.1%

DEFERRED RETIREMENT COMMENCEMENT AGE

For General participants, the current assumption is that terminated vested members will retire at 59 and future reciprocal transfers will retire at age 61. The data for the three-year period studied showed the average retirement age was 60.0 for terminated vested members and 60.5 for reciprocal transfers. We recommend increasing the assumption for terminated vested members to 60 and maintaining the assumption for future reciprocal transfers at 61.

For Safety participants, the current assumption is that terminated vested members will retire at 53 and future reciprocal transfers will retire at age 55. The data for the three-year period studied showed the average retirement age was 50.3 for terminated vested members and 58.9 for reciprocal transfers, but this only represented two vested terminations and five reciprocal transfers. We recommend decreasing the assumption for terminated vested members to 51 and increasing the assumption for future reciprocal transfers to 57.

Current reciprocal transfers are assumed to begin receiving benefits based on the probabilities of retirement applied to the active members. We do not recommend a change to this assumption.

SECTION III – DEMOGRAPHIC ASSUMPTIONS
DISABILITY RATES

This section analyzes the incidence of disability by the age of the employee. All disabilities for members with less than five years of service are assumed to be service-related. The amount of disability experience is fairly limited; only 24 disabilities have occurred during the last three years for Safety and General members combined. To improve the credibility of the data, we have aggregated the experience of the past three years with that of the prior experience study (2013-2016).

Table III-D1 shows the calculation of actual-to-expected ratios and the r-squared statistic for all disabilities for General members, and Chart III-D1 shows the information graphically along with the 90% confidence interval.

The data shows that actual disability rates are higher than expected disability rates in aggregate. We recommend changing the assumption to the CalPERS Public Agency State Miscellaneous Non Industrial Disability table, based on a blend of 30% of the male rates and 70% of the female rates. We also recommend that 50% of disabilities are assumed to be duty related and 50% are assumed to be non-duty related.

The proposed assumption decreases the aggregate A/E ratio from 162% to 100% and the r-squared decreases from 35.13% to 25.13%.

See Appendix A or B for a sample listing of the rates.

Table III-D1 – General

Disability Rates - General						
Age Band	Exposures	Disabilities			Actual to Expected Ratios	
		Actual	Current	Recommended	Current	Recommended
20 - 24	91	0	0	0	0%	0%
25 - 29	868	0	0	0	0%	0%
30 - 34	1,377	0	0	1	0%	0%
35 - 39	1,650	1	1	2	131%	59%
40 - 44	1,463	3	1	3	299%	97%
45 - 49	1,233	3	1	4	211%	74%
50 - 54	1,394	4	3	5	157%	82%
55 - 59	1,304	5	4	3	142%	149%
60 - 64	636	4	2	2	166%	263%
65 - 69	178	0	-	0	0%	0%
70 +	36	0	-	0	0%	0%
Total	**10,230**	**20**	**12**	**20**	**162%**	**100%**
R-squared			**0.3513**	**0.2513**		

SECTION III – DEMOGRAPHIC ASSUMPTIONS
DISABILITY RATES

Chart III-D1 – General

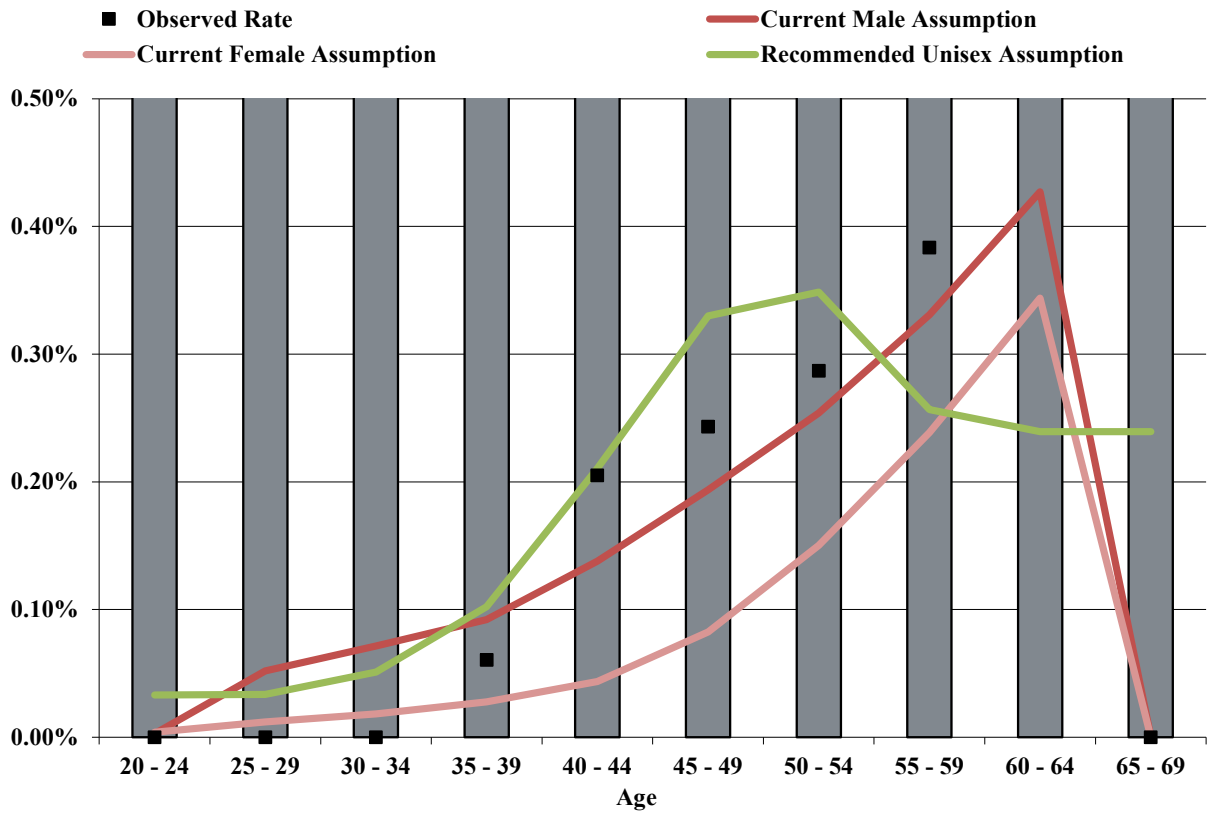


Table III-D2 shows the calculation of actual-to-expected ratios and the r-squared statistic for Safety members, and Chart III-D2 shows the information graphically along with the 90% confidence interval.

The data shows that the number of disabilities is higher than the number expected under the current assumption. As with the General members, the amount of experience upon which to base credible assumptions is limited, so Cheiron recommends maintaining the rates at 50% of the CalPERS industrial disability rates for Public Agency Police for duty-related disabilities and 50% of the CalPERS non-industrial disability rates for Public Agency Police for non-duty related disabilities.

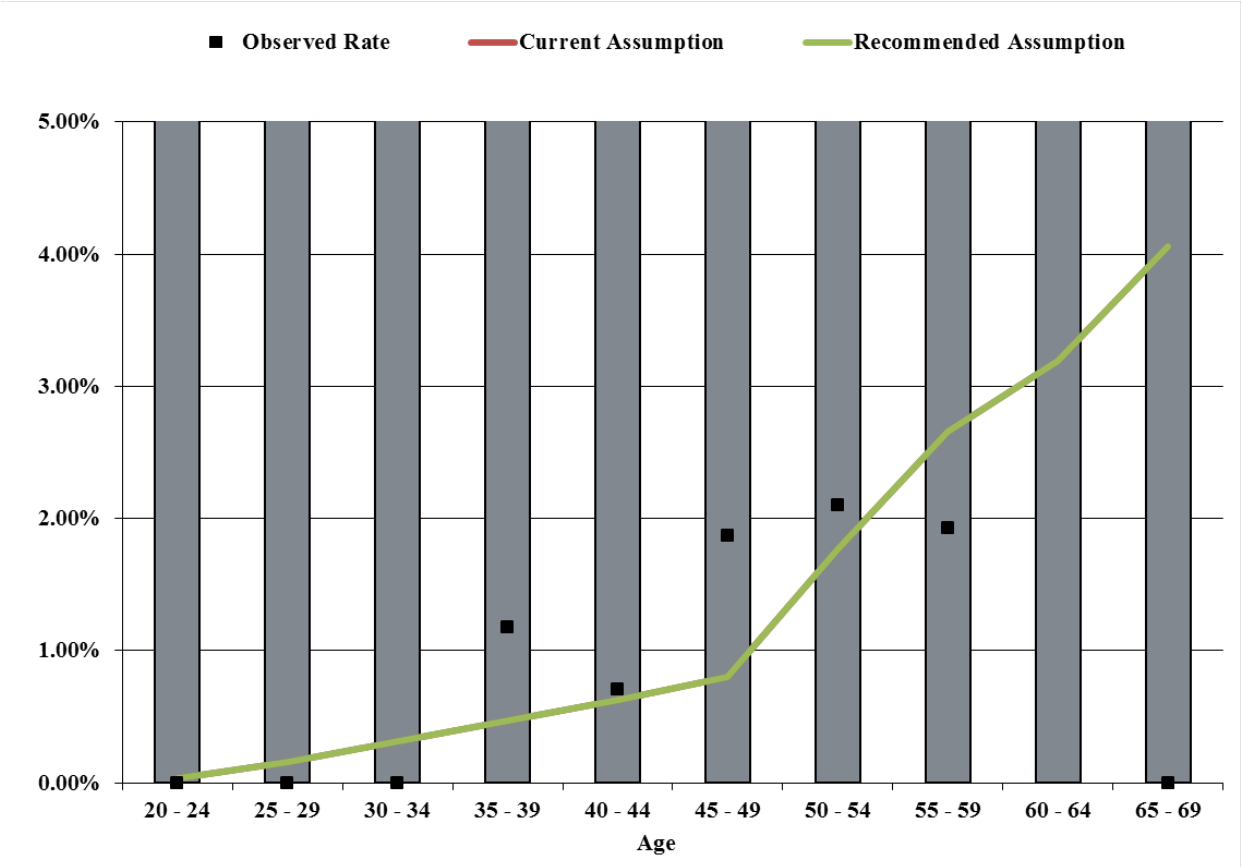
See Appendix A or B for a sample listing of the rates.

SECTION III – DEMOGRAPHIC ASSUMPTIONS
DISABILITY RATES

Table III-D2 – Safety

Disability Rates - Safety						
Age Band	Exposures	Disabilities			Actual to Expected Ratios	
		Actual	Current	Recommended	Current	Recommended
20 - 24	51	0	0	0	0%	0%
25 - 29	232	0	0	0	0%	0%
30 - 34	371	0	1	1	0%	0%
35 - 39	425	5	2	2	251%	251%
40 - 44	284	2	2	2	112%	112%
45 - 49	267	5	2	2	234%	234%
50 - 54	143	3	3	3	119%	119%
55 - 59	52	1	1	1	72%	72%
60 - 64	8	3	0	0	1176%	1176%
65 - 69	4	0	0	0	0%	0%
70 +	1	0	0	0	0%	0%
Total	**1,838**	**19**	**12**	**12**	**161%**	**161%**
R-squared			**0.1677**	**0.1677**		

Chart III-D2 – Safety



SECTION III – DEMOGRAPHIC ASSUMPTIONS
MORTALITY RATES

Post-retirement mortality assumptions are typically developed separately by sex for both healthy annuitants and disabled annuitants. Pre-retirement mortality assumptions are also developed separately by sex. Unlike most of the other demographic assumptions that rely exclusively on the experience of the plan, for mortality, standard mortality tables and projection scales serve as the primary basis for the assumption.

The Retirement Plans Experience Committee (RPEC) of the SOA recently completed an extensive mortality study and published a new set of mortality tables for U.S. public pension plans, the Pub-2010 Mortality Tables, with separate tables for teachers, safety members, and other public employees. The experience covered 35 public systems with 78 plans. Since benefits for retirees and salaries for active members are a significant predictor of mortality differences, separate tables were also developed for Above-Median and Below-Median.

RPEC also published the most recent mortality improvement projection scale, MP-2019, in late 2019. We used these tables as the basis for our analysis.

The steps in our analysis are as follows:

1. Select a standard mortality table that is, based on experience, most closely matching the anticipated experience of MCERA.
2. Compare actual MCERA experience to what would have been predicted by the selected standard table for the period of the experience study.
3. Adjust the standard table either fully or partially depending on the level of credibility for MCERA experience. This adjusted table is called the base table.
4. Select an appropriate standard mortality improvement projection scale and apply it to the base table.

As we have done in prior experience studies, we have combined the experience of the past three years with that of the prior three-year period in order to have a more robust dataset to review.

In the prior study, MCERA elected to use the following assumptions:

Active members

- CalPERS 2009 Non-Industrial Employees Mortality Table, with no adjustment.
- CalPERS 2009 Industrial Employee Mortality, with no adjustment (Line-of-Duty, Safety only).

Healthy retirees and beneficiaries

- CalPERS 2009 Healthy Annuitant Mortality Table, with no adjustment.

Disabled members

- CalPERS 2009 Industrial Disability Mortality Table.

SECTION III – DEMOGRAPHIC ASSUMPTIONS
MORTALITY RATES

Since the prior study, the Society of Actuaries' Retirement Plans Experience Committee (RPEC) has released a new mortality improvement scale, Scale MP-2019, which reflects three more years of data than was used in the development of Scale MP-2016.

MP-2019 represents the Society of Actuaries' most advanced actuarial methodology in incorporating mortality improvement trends with actual recent mortality rates, by using rates that vary not only by age but also by calendar year – known as a two-dimensional approach to projecting mortality improvements. Scale MP-2019 was designed with the intent of being applied to mortality on a generational basis. The effect of this is to build in an automatic expectation of future improvements in mortality. Recent reports issued by RPEC suggest that using generational mortality is a preferable approach, as it allows for an explicit declaration of the amount of future mortality improvement included in the assumptions.

For General members, MCERA's experience over the past six years matches well with the existing assumption of the CalPERS rates, after applying the improvement projections from the base year of the tables (2009) using the new MP-2019 mortality improvement projections through the mid-point of the six-year period (2016).

For Safety members, MCERA's experience is higher than the rates of most of the standard tables, although this is based on an extremely limited dataset. The closest match is with the new Below Median Safety Pub-2010 rates, after applying the improvement projections from the base year of the tables (2010) using the new MP-2019 mortality improvement projections through the mid-point of the six-year period (2016).

Even with the use of six years of data, the MCERA experience is only partially credible, based on standard statistical theory, particularly for Safety members. We therefore recommend partially adjusting the Below Median Safety Pub-2010 base tables to fit MCERA's experience to develop a new base table. The rates for each age in the standard table are adjusted by a factor, where the factor is determined by multiplying the actual-to-expected ratio for the group by a credibility factor, which will bring the A/E results closer – but not all the way – to 100%.

Rather than weighting the experience based on the number of members living and dying, we have weighted the experience based on benefit size. This approach has been recommended by RPEC, since members with larger benefits are expected to live linger, and a benefit-weighted approach helps avoid underestimating the liabilities.

Based on this information, we are recommending the following base mortality table assumptions:

Active members

- General - CalPERS 2009 Non-Industrial Employees Mortality Table
- Safety
    - 2010 Public Safety Below Median Employee Mortality Table
    - CalPERS 2009 Industrial Employee Mortality (Line-of-Duty only)

SECTION III – DEMOGRAPHIC ASSUMPTIONS
MORTALITY RATES

Healthy retirees and beneficiaries

- General - CalPERS 2009 Healthy Annuitant Mortality Table
- Safety - 105% times the 2010 Public Safety Below Median Healthy Retiree Mortality Table

Disabled members

- Duty Related - CalPERS 2009 Industrial Disability Mortality Table
- Non-Duty Related - CalPERS 2009 Non-Industrial Disability Mortality Table

We also recommend projecting these base tables generationally using the MP-2019 mortality improvement scale described above for all types of mortality.

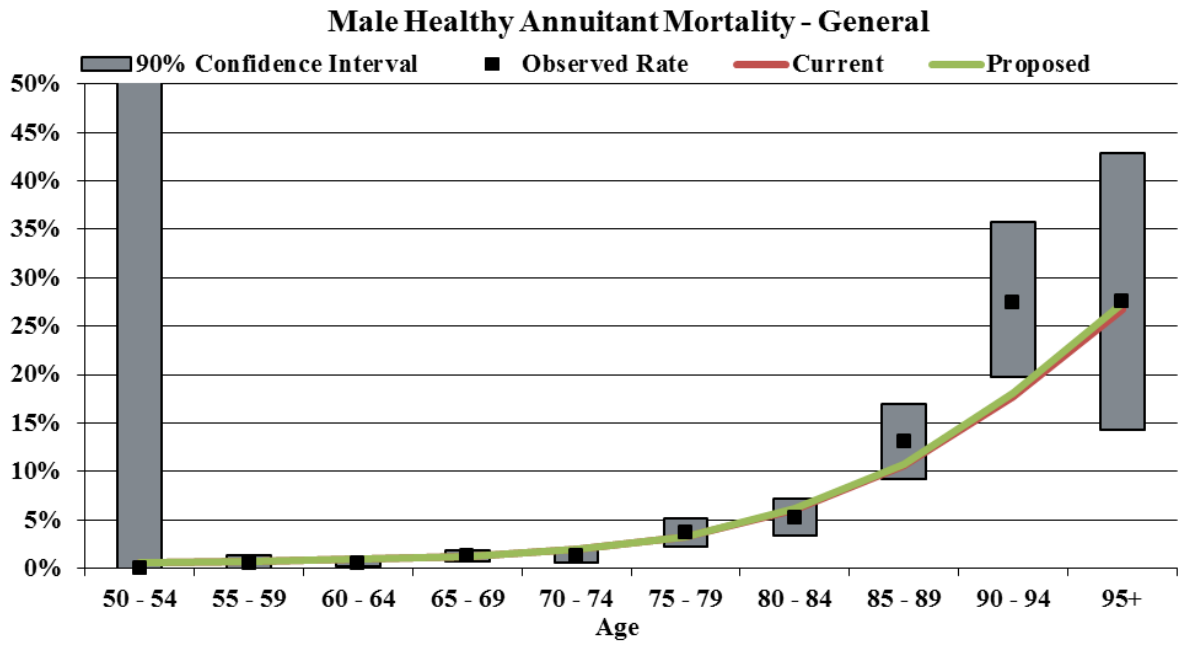
As shown in the following tables and charts, our proposed mortality rates for healthy annuitants (i.e. service-retired members and their beneficiaries) are closer to recent experience than the current mortality rates (reflecting an A/E ratio closer to 100%), although there is still some conservatism in the General female and the Safety rates.

SECTION III – DEMOGRAPHIC ASSUMPTIONS
MORTALITY RATES

Table III-M1

Healthy Annuitant Mortality - Base Table for Males - General								
Age Band	Exposures	Actual Deaths	Weighted Exposures	Weighted Deaths			A/E Ratios	
				Actual	Current	Proposed	Current	Proposed
50 - 54	69	-	149,852	-	822	841	0%	0%
55 - 59	291	3	692,347	3,644	4,874	4,947	75%	74%
60 - 64	619	4	2,216,445	10,853	20,205	20,223	54%	54%
65 - 69	863	8	3,281,858	40,567	40,065	39,749	101%	102%
70 - 74	654	13	2,296,219	28,605	45,727	45,648	63%	63%
75 - 79	489	20	1,317,402	48,558	43,219	43,444	112%	112%
80 - 84	349	22	674,686	35,460	41,115	41,445	86%	86%
85 - 89	218	26	460,803	60,099	48,995	49,519	123%	121%
90 - 94	81	21	179,155	49,094	31,839	32,427	154%	151%
95 +	28	6	41,797	11,503	11,175	11,450	103%	100%
Total	**3,661**	**123**	**11,310,566**	**288,382**	**288,036**	**289,692**	**100%**	**100%**

Chart III-M1

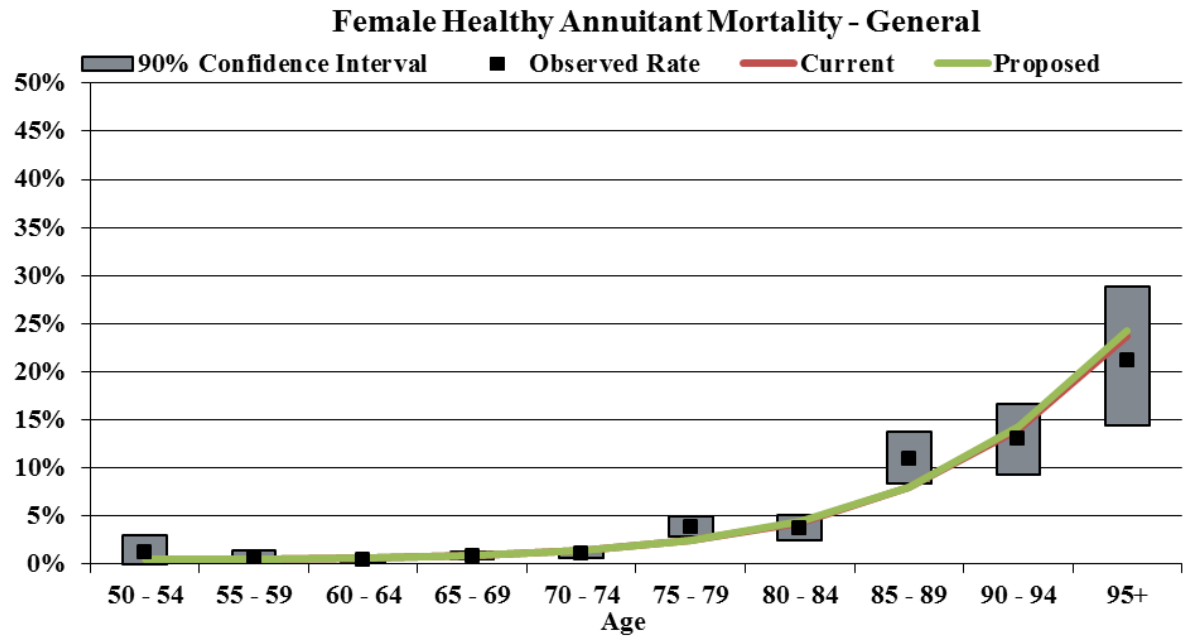


SECTION III – DEMOGRAPHIC ASSUMPTIONS
MORTALITY RATES

Table III-M2

Healthy Annuitant Mortality - Base Table for Females - General								
Age Band	Exposures	Actual Deaths	Weighted Exposures	Weighted Deaths			A/E Ratios	
				Actual	Current	Proposed	Current	Proposed
50 - 54	99	1	187,232	2,250	917	934	245%	241%
55 - 59	579	5	1,440,500	10,120	7,006	7,053	144%	143%
60 - 64	1,209	7	3,114,968	13,666	18,141	18,131	75%	75%
65 - 69	1,440	11	3,460,112	29,978	29,361	29,304	102%	102%
70 - 74	1,279	16	2,372,983	25,319	33,410	33,554	76%	75%
75 - 79	834	24	1,357,378	53,070	33,571	33,848	158%	157%
80 - 84	575	23	951,829	35,711	41,369	41,705	86%	86%
85 - 89	357	33	517,906	56,559	41,133	41,522	138%	136%
90 - 94	235	35	297,246	38,888	41,709	42,422	93%	92%
95 +	83	19	115,531	24,450	27,431	28,017	89%	87%
Total	**6,690**	**174**	**13,815,685**	**290,012**	**274,048**	**276,490**	**106%**	**105%**

Chart III-M2

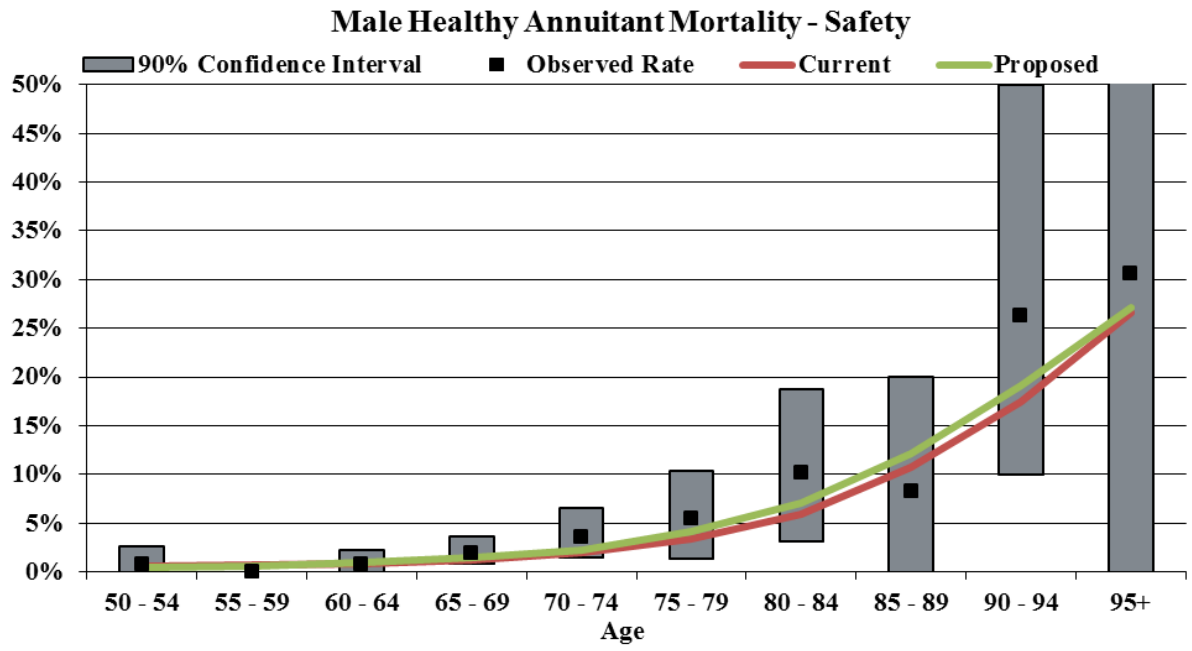


SECTION III – DEMOGRAPHIC ASSUMPTIONS
MORTALITY RATES

Table III-M3

Healthy Annuitant Mortality - Base Table for Males - Safety								
Age Band	Exposures	Actual Deaths	Weighted Exposures	Weighted Deaths			A/E Ratios	
				Actual	Current	Proposed	Current	Proposed
50 - 54	112	2	455,540	3,602	2,432	1,871	148%	193%
55 - 59	165	1	583,458	78	4,016	3,660	2%	2%
60 - 64	176	1	648,776	5,207	5,874	6,161	89%	85%
65 - 69	246	3	910,192	18,027	11,057	12,932	163%	139%
70 - 74	137	5	403,908	14,202	7,817	9,273	182%	153%
75 - 79	77	5	243,787	13,374	8,196	10,037	163%	133%
80 - 84	32	3	125,579	12,812	7,502	8,814	171%	145%
85 - 89	25	3	68,290	5,672	7,327	8,330	77%	68%
90 - 94	10	3	42,129	11,067	7,386	8,057	150%	137%
95 +	7	2	16,103	4,934	4,290	4,362	115%	113%
Total	**987**	**28**	**3,497,761**	**88,975**	**65,899**	**73,496**	**135%**	**121%**

Chart III-M3

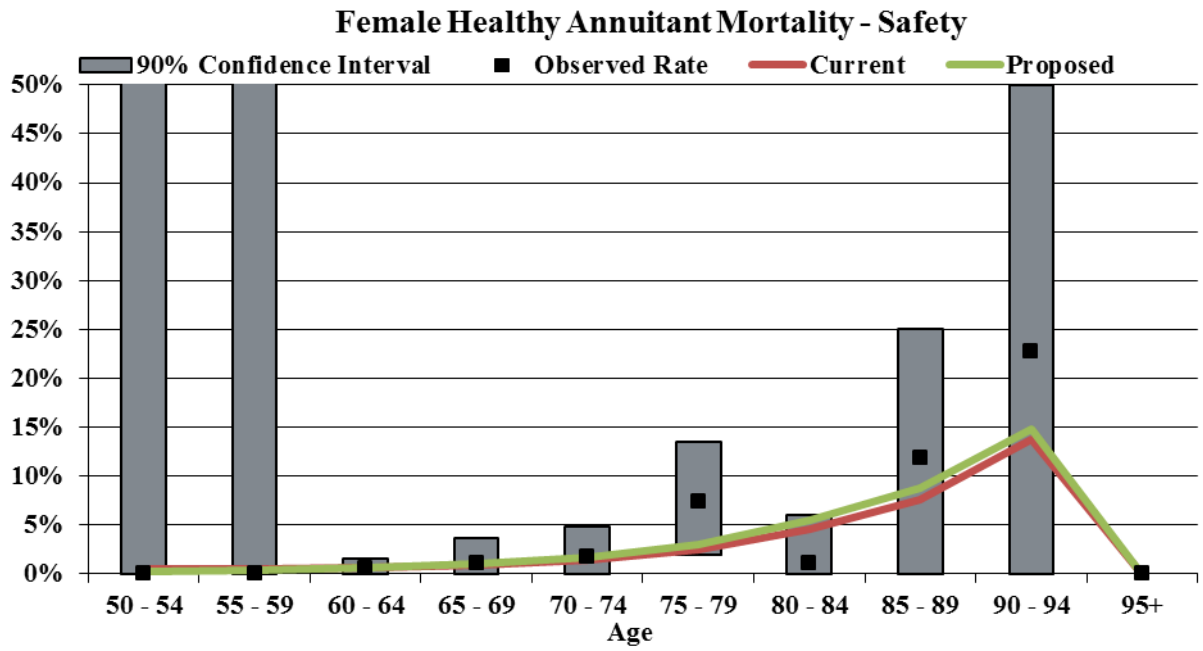


SECTION III – DEMOGRAPHIC ASSUMPTIONS
MORTALITY RATES

Table III-M4

Healthy Annuitant Mortality - Base Table for Females - Safety								
Age Band	Exposures	Actual Deaths	Weighted Exposures	Weighted Deaths			A/E Ratios	
				Actual	Current	Proposed	Current	Proposed
50 - 54	30	0	86,068	0	423	202	0%	0%
55 - 59	60	0	184,871	0	892	707	0%	0%
60 - 64	62	1	201,338	1,029	1,164	1,236	88%	83%
65 - 69	82	2	214,796	2,302	1,879	2,239	123%	103%
70 - 74	83	3	278,527	4,818	3,828	4,632	126%	104%
75 - 79	52	2	120,133	8,854	2,946	3,579	300%	247%
80 - 84	33	1	72,095	812	3,294	3,989	25%	20%
85 - 89	20	3	44,926	5,307	3,431	3,940	155%	135%
90 - 94	8	2	15,630	3,560	2,146	2,316	166%	154%
95 +	0	0	0	0	0	0	0%	0%
Total	**430**	**14**	**1,218,384**	**26,682**	**20,003**	**22,842**	**133%**	**117%**

Chart III-M4



SECTION III – DEMOGRAPHIC ASSUMPTIONS
MORTALITY RATES

We have not shown the data for the disabled and active member mortality experience, as the number of deaths is very low – 36 total disabled deaths and six total active deaths – over the six-year period, which is not enough data to produce sufficiently credible assumptions. We have used our professional judgement to recommend the continued use of the CalPERS base tables based on the CalPERS rates, and applied the same generational improvement scales as recommended for the healthy annuitant members. We note that the CalPERS tables, unlike the Pub-2010 tables, include distinct assumptions for duty versus non-duty related disabilities, which we believe supports the use of the CalPERS tables, since experience has shown that duty-related disabled members experience lower rates of death, at least in the initial years of retirement, and particularly for Safety members.

Mortality Assumptions for Employee Contribution Rates

For purposes of determining employee contribution rates, the use of generational mortality improvements is impractical from an administrative perspective. Therefore, we recommend using the base mortality tables described above projected using Scale MP-2019 to 2041. These static projections are intended to approximate generational mortality improvements.

The projection periods are based upon the duration of active liabilities for the respective impacted groups, and the period during which the associated employee contribution rates will be in use. The employee contribution rates are also blended using a male/female weighting of 30%/70% for General Members and 70%/30% for Safety members.

We anticipate that these mortality assumptions will be used to determine the employee contribution rates in effect for the period of July 1, 2020 through June 30, 2023. We also anticipate that the mortality assumptions for this purpose will be updated again after the next experience study covering the period from July 1, 2019 through June 30, 2022.

SECTION III – DEMOGRAPHIC ASSUMPTIONS
OTHER DEMOGRAPHIC ASSUMPTIONS

FAMILY COMPOSITION

Members who are married at the time of retirement are entitled to an unreduced 60% joint and survivor annuity.

An analysis of newly retiring General members showed that 77% of males are married and 53% of females are married. We recommend increasing the assumption for future male General retires from 70% to 75% and increasing the assumption for future female General retirees from 50% to 55%.

An analysis of newly retiring Safety members showed that 80% are married, with no significant difference between males and females. We recommend decreasing the assumption for future Safety retirees from 90% to 85%.

An analysis of newly retiring General and Safety members showed that male members are 3.0 years older than their spouses and female members are 1.5 years younger than their spouses. We recommend maintaining the current assumption that male members are three years older than their spouses and female members are two years younger than their spouses.

PLAN EXPENSES

An allowance of $2,200,000 for Plan administrative expenses was included in the annual cost calculation for FYE 2017 after the prior study, and was expected to increase with the assumed price inflation annually. An assumed allowance of $2,311,000 was made for FYE 2019. Actual administrative expenses for the FYE 2019 were $2,351,000. Based on experience we propose no change to the plan expense assumption, which is the prior year's assumed expense increased with the price inflation annually. This results in an assumed administrative expense of $2,369,000 for FYE 2020.

These expenses are split between employees and employers based on their share of the overall contributions.

APPENDIX A – SUMMARY OF PROPOSED ASSUMPTIONS

The recommended assumptions were adopted by the Board at their December 12, 2019 meeting. The assumptions are based on an experience study covering the period from July 1, 2016 through June 30, 2019.

1. Rate of Return

Assets are assumed to earn 7.00% net of investment expenses.

2. Administrative Expenses

Administrative expenses are assumed to be $2.369 million for the next year, to be allocated between the employer and employees based on each group's share of the non-expense related contributions. Administrative expenses in future years are expected to increase with the Consumer Price Index (CPI).

3. Cost of Living

The cost of living as measured by the Consumer Price Index (CPI) will increase at the rate of 2.50% per year.

4. Post Retirement COLA

Benefits are assumed to increase after retirement at the rate of 2.40% per year for Tier 1 members.

5. Increases in Pay

Wage inflation component: 2.75%
Additional longevity and promotion component:

Years of Service	General	Safety	Years of Service	General	Safety
0	7.00%	8.50%	11	2.50%	1.00%
1	6.50%	7.50%	12	2.25%	1.00%
2	6.00%	6.50%	13	2.00%	1.00%
3	5.50%	5.50%	14	1.85%	1.00%
4	5.00%	4.50%	15	1.70%	1.00%
5	4.50%	3.50%	16	1.55%	1.00%
6	4.00%	3.00%	17	1.40%	1.00%
7	3.50%	2.50%	18	1.25%	1.00%
8	3.25%	2.00%	19	1.10%	1.00%
9	3.00%	1.50%	20+	1.00%	1.00%
10	2.75%	1.00%			

APPENDIX A – SUMMARY OF PROPOSED ASSUMPTIONS

6. Final Average Compensation Load

The final average compensation (FAC) for members projected to receive a service retirement benefit has been increased based on the assumption that members will have elements of pay included in their FAC which are not included in the annual pay provided to the Actuary (Ventura decision pays). The FAC for General Tier 1 members has been increased by 5.50%, the FAC for Safety Tier 1 members has been increased by 8.00%, and the FAC for all Tier 2 and Tier 3 members by 1.50%.

7. Family Composition

55% of female General members, 75% of male General members and 85% of Safety members are assumed to be married at retirement. Male members are assumed to be three years older than their spouses are and female members are assumed to be two years younger than their spouses are.

8. Rates of Mortality

Mortality rates for actives, retirees, disabled members, beneficiaries, terminated vesteds, and reciprocal transfers are based on the sex-distinct employee and annuitant mortality tables as described below. Future mortality improvements are reflected by applying the SOA MP-2019 projection scale on a generational basis from the base year of 2009 for the CalPERS tables and the base year of 2010 for the Below Median Safety member Pub-2010 tables.

Category	Base Mortality Table	
	General	Safety
Healthy Annuitant	CalPERS 2009 Healthy Annuitant Mortality Table	1.05 times the 2010 Public Safety Below Median Mortality Table for Healthy Retirees
Duty Disabled Annuitants	CalPERS 2009 Industrial Disability Mortality Table	CalPERS 2009 Industrial Disability Mortality Table
Non-Duty Disabled Annuitant	CalPERS 2009 Non-Industrial Disability Mortality Table	CalPERS 2009 Non-Industrial Disability Mortality Table
Active Employees	CalPERS 2009 Non-Industrial Employees Mortality Table	2010 Public Safety Below Median Mortality Table for Healthy Employees
Actives, Line of Duty (Safety only)	N/A	CalPERS 2009 Industrial Employees Mortality Table

For determining mortality rates for future disabled members, 50% of future General disabilities are assumed to be duty related and 50% are assumed to be non-duty related. 100% of future Safety disabilities are assumed to be duty related.

APPENDIX A – SUMMARY OF PROPOSED ASSUMPTIONS

9. Rates of Termination

Sample rates of termination[1] are shown in the following table.

Years of Service	General Male	General Female	Safety
0	20.0%	20.0%	21.0%
5	8.2%	8.2%	6.5%
10	4.5%	4.5%	4.75%
15	4.5%	3.0%	3.5%
20	4.5%	3.0%	0.0%
25	4.5%	3.0%	0.0%
30	0.0%	0.0%	0.0%

[1] *Termination rates do not apply once a member is eligible for retirement.*

There are three types of terminations: withdrawals, reciprocal transfers, and vested terminations. Rates of withdrawal apply to active Members who terminate their employment and withdraw their member contributions, forfeiting entitlement to future Plan benefits. Rates of reciprocal transfer are for members who leave their member contributions on deposit and engage in employment covered by a pension plan with a reciprocal relationship with MCERA. Finally, rates of vested termination apply to active Members who terminate their employment and leave their member contributions on deposit with the Plan.

The table below shows the percentages of total terminations falling into these categories.

	Years of Service						
	General				Safety		
	0 – 4	5 – 9	10-14	15+	0 – 4	5-9	10+
Withdrawals	92.5%	30.0%	20.0%	5.0%	92.5%	25.0%	15.0%
Transfers	7.5%	35.0%	40.0%	47.5%	7.5%	50.0%	56.7%
Vested Terminations	0.0%	35.0%	40.0%	47.5%	0.0%	25.0%	28.3%

Vested terminated General Members are assumed to begin receiving benefits at age 60; Vested terminated Safety Members are assumed to begin receiving benefits at age 51. Future reciprocal transfer General members are assumed to begin receiving benefits at age 61; future reciprocal transfer Safety members are assumed to begin receiving benefits at age 57. Current reciprocal transfer members are assumed to begin receiving benefits based on the probabilities of retirement applied to the active members.

Future reciprocal transfers' pay growth is assumed to be 3.75% while employed by a reciprocal employer. Current reciprocal transfers' pay growth is assumed to increase according to the assumptions applied to the active members until the assumed retirement age.

APPENDIX A – SUMMARY OF PROPOSED ASSUMPTIONS

10. Rates of Retirement

Rates of retirement are based on age according to the following table, and are applied once members are eligible for a service retirement benefit.

General			Safety		
	Years of Service			Years of Service	
Age	<30	30+	Age	<20	20+
50	10.00%	20.00%	40	0.00%	1.50%
51	10.00%	20.00%	41	0.00%	1.50%
52	10.00%	20.00%	42	0.00%	1.50%
53	10.00%	20.00%	43	0.00%	1.50%
54	10.00%	20.00%	44	0.00%	1.50%
55	10.00%	25.00%	45	0.00%	1.50%
56	10.00%	25.00%	46	0.00%	5.00%
57	10.00%	30.00%	47	0.00%	10.00%
58	15.00%	35.00%	48	0.00%	15.00%
59	20.00%	35.00%	49	0.00%	20.00%
60	20.00%	35.00%	50	15.00%	20.00%
61	20.00%	35.00%	51	7.50%	20.00%
62	20.00%	35.00%	52	7.50%	20.00%
63	20.00%	35.00%	53	7.50%	20.00%
64	20.00%	35.00%	54	20.00%	20.00%
65	35.00%	35.00%	55	30.00%	30.00%
66	35.00%	35.00%	56	30.00%	30.00%
67	35.00%	35.00%	57	30.00%	30.00%
68	35.00%	35.00%	58	30.00%	30.00%
69	35.00%	35.00%	59	30.00%	30.00%
70+	100.00%	100.00%	60	100.00%	100.00%

APPENDIX A – SUMMARY OF PROPOSED ASSUMPTIONS

11. Rates of Disability

Sample service-connected disability rates of active participants are provided in the table below.

	General		Safety	
Age	Service-Connected	Non-Service Connected[1]	Service-Connected	Non-Service Connected[1]
20	0.0165%	0.0165%	0.0000%	0.0050%
25	0.0165%	0.0165%	0.0825%	0.0050%
30	0.0190%	0.0190%	0.2380%	0.0100%
35	0.0390%	0.0390%	0.3940%	0.0150%
40	0.0806%	0.0806%	0.5500%	0.0200%
45	0.1447%	0.1447%	0.7060%	0.0250%
50	0.1829%	0.1829%	0.9230%	0.0400%
55	0.1442%	0.1442%	2.3925%	0.0650%
60	0.1196%	0.1196%	3.0120%	0.1000%
65	0.1196%	0.1196%	3.6385%	0.1000%

[1] *Rates are applied once members have at least five years of service.*

12. Member Contribution Balance Crediting Rate

5.00% (2.00% less than the assumed rate of return of 7.00%).

APPENDIX B – SUMMARY OF PRIOR ASSUMPTIONS

The assumptions and methods used in the June 30, 2018 actuarial valuation reflect the results of an Experience Study performed by Cheiron covering the period from July 1, 2013 through June 30, 2016 and adopted by the Board.

1. Rate of Return

Assets are assumed to earn 7.25% net of investment expenses.

2. Administrative Expenses

Administrative expenses are assumed to be $2.31 million for the next year, to be allocated between the employer and employees based on each group's share of the non-expense related contributions. Administrative expenses in future years are expected to increase with the Consumer Price Index (CPI).

3. Cost of Living

The cost of living as measured by the Consumer Price Index (CPI) will increase at the rate of 2.50% per year.

4. Post Retirement COLA

Benefits are assumed to increase after retirement at the rate of 2.40% per year for Tier 1 members.

5. Increases in Pay

Wage inflation component: 2.75%
Additional longevity and promotion component:

Years of Service	General	Safety
0-1	7.00%	7.50%
2-3	5.00%	5.00%
4	5.00%	3.00%
5	3.00%	1.50%
6-9	2.00%	1.50%
10-14	1.50%	1.00%
15-19	1.00%	1.00%
20+	0.50%	0.50%

APPENDIX B – SUMMARY OF PRIOR ASSUMPTIONS

Final Average Compensation Load

The final average compensation (FAC) for members projected to receive a service retirement benefit has increased based on the assumption that members will have elements of pay included in their FAC which are not included in the annual pay provided to the actuary (Ventura decision pays). The FAC for Tier 1 members has been increased by 6.92% and the FAC for Tier 2 and Tier 3 members by 2.31%.

6. Family Composition

50% of female General members, 70% of male General members and 90% of Safety members are assumed to be married at retirement. Male members are assumed to be three years older than their spouses are and female members are assumed to be two years younger than their spouses are.

7. Rates of Mortality

Mortality rates for actives, retirees, disabled members, beneficiaries, terminated vesteds, and reciprocal transfers are based on the sex-distinct employee and annuitant CALPERS mortality tables as described below. Future mortality improvements are reflected by applying the SOA MP-2016 projection scale on a generational basis from the base year of 2009.

Category	Base Mortality Table
Healthy Annuitant	CalPERS 2009 Healthy Annuitant Mortality Table
Disabled Annuitant	CalPERS 2009 Industrial Disability Mortality Table
Healthy Non-Annuitant	CalPERS 2009 Non-Industrial Employees Mortality Table
Actives, Line of Duty (Safety only)	CalPERS 2009 Industrial Employees Mortality Table

APPENDIX B – SUMMARY OF PRIOR ASSUMPTIONS

8. Rates of Termination

Sample rates of termination[1] are shown in the following table.

Years of Service	General Male	General Female	Safety
0	22.5%	12.0%	20.8%
5	8.2%	7.5%	4.6%
10	4.5%	3.6%	4.6%
15	4.5%	3.0%	2.5%
20	4.5%	3.0%	0.0%
25	4.5%	3.0%	0.0%
30	0.0%	0.0%	0.0%

[1] *Termination rates do not apply once a member is eligible for retirement.*

There are three types of terminations: withdrawals, reciprocal transfers, and vested terminations. Rates of withdrawal apply to active Members who terminate their employment and withdraw their member contributions, forfeiting entitlement to future Plan benefits. Rates of reciprocal transfer are for members who leave their member contributions on deposit and engage in employment covered by a pension plan with a reciprocal relationship with MCERA. Finally, rates of vested termination apply to active Members who terminate their employment and leave their member contributions on deposit with the Plan.

The table below shows the percentages of total terminations falling into these categories.

	Years of Service				
	General			Safety	
	0 – 4	5 – 14	15+	0 – 4	5+
Withdrawals	90.0%	40.0%	10.0%	90.0%	30.0%
Transfers	10.0%	10.0%	10.0%	10.0%	25.0%
Vested Terminations	0.0%	50.0%	80.0%	0%	45.0%

Vested terminated General Members are assumed to begin receiving benefits at age 59; vested terminated Safety Members are assumed to begin receiving benefits at age 53. Future reciprocal transfer General members are assumed to begin receiving benefits at age 61; future reciprocal transfer safety members are assumed to begin receiving benefits at age 55. Current reciprocal transfer members are assumed to begin receiving benefits based on the probabilities of retirement applied to the active members.

Future reciprocal transfers' pay growth is assumed to be 3.25% while employed by a reciprocal employer. Current reciprocal transfers' pay growth is assumed to increase according to the assumptions applied to the active members until the assumed retirement age.

APPENDIX B – SUMMARY OF PRIOR ASSUMPTIONS

9. Rates of Service-Connected Disability

Sample service-connected disability rates of active participants are provided in the table.

	Safety	General	
Age	All	Male	Female
20	0.0000%	0.0027%	0.0040%
25	0.0825%	0.0053%	0.0075%
30	0.2380%	0.0133%	0.0115%
35	0.3940%	0.0240%	0.0150%
40	0.5500%	0.0320%	0.0190%
45	0.7060%	0.0480%	0.0340%
50	0.9230%	0.0640%	0.0600%
55	2.3925%	0.0800%	0.1050%
60	3.0120%	0.1120%	0.1575%
65	3.6385%	0.0000%	0.0000%

10. Rates of Non Service-Connected Disability

Sample non service-connected disability rates of active participants are provided in the table. Rates are applied once members have at least five years of service.

	Safety	General	
Age	All	Male	Female
20	0.0050%	0.0000%	0.0000%
25	0.0050%	0.0267%	0.0033%
30	0.0100%	0.0533%	0.0067%
35	0.0150%	0.0533%	0.0100%
40	0.0200%	0.0867%	0.0133%
45	0.0250%	0.1267%	0.0300%
50	0.0400%	0.1600%	0.0600%
55	0.0650%	0.2133%	0.0933%
60	0.1000%	0.2800%	0.1533%
65	0.1000%	0.0000%	0.0000%

APPENDIX B – SUMMARY OF PRIOR ASSUMPTIONS

11. Rates of Retirement

Rates of retirement are based on age according to the following table, and are applied once members are eligible for a service retirement benefit.

	General Male			General Female			Safety		
	Years of Service			Years of Service			Years of Service		
Age	10 – 19	20 – 29	30+	10 – 19	20 – 29	30+	Age	10 – 19	20+
50	5.00%	10.00%	7.50%	2.50%	7.50%	25.00%	40	0.00%	3.10%
51	5.00%	10.00%	7.50%	2.50%	7.50%	25.00%	41	0.00%	3.10%
52	5.00%	10.00%	15.00%	5.00%	12.50%	25.00%	42	0.00%	3.10%
53	5.00%	10.00%	15.00%	5.00%	12.50%	25.00%	43	0.00%	3.10%
54	5.00%	10.00%	15.00%	5.00%	12.50%	25.00%	44	0.00%	3.10%
55	10.00%	12.50%	27.00%	12.00%	25.00%	35.00%	45	0.00%	7.60%
56	10.00%	12.50%	22.50%	8.50%	25.00%	35.00%	46	0.00%	7.60%
57	10.00%	12.50%	22.50%	8.50%	25.00%	35.00%	47	0.00%	7.60%
58	10.00%	12.50%	22.50%	8.50%	25.00%	35.00%	48	0.00%	7.60%
59	10.00%	12.50%	22.50%	10.00%	30.00%	35.00%	49	0.00%	7.60%
60	20.00%	25.00%	37.50%	15.00%	30.00%	35.00%	50	15.00%	32.90%
61	20.00%	25.00%	37.50%	27.50%	40.00%	45.00%	51	12.80%	32.90%
62	20.00%	25.00%	37.50%	27.50%	40.00%	45.00%	52	12.80%	32.90%
63	20.00%	25.00%	37.50%	27.50%	40.00%	45.00%	53	12.80%	32.90%
64	20.00%	25.00%	37.50%	27.50%	40.00%	45.00%	54	12.80%	32.90%
65	35.00%	50.00%	40.00%	40.00%	50.00%	50.00%	55	25.00%	32.90%
66	35.00%	50.00%	45.00%	45.00%	50.00%	50.00%	56	25.00%	32.90%
67	35.00%	50.00%	50.00%	50.00%	50.00%	50.00%	57	25.00%	32.90%
68	35.00%	50.00%	60.00%	60.00%	60.00%	60.00%	58	25.00%	32.90%
69	35.00%	50.00%	80.00%	80.00%	80.00%	80.00%	59	25.00%	32.90%
70+	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	60	100.00%	100.00%

12. Member Contribution Balance Crediting Rate

5.25% (2.00% less than the assumed rate of return of 7.25%).

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