Kern County Employees'
Retirement Association

Actuarial Experience Study

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

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August 3, 2020

Board of Retirement
Kern County Employees' Retirement Association
11125 River Run Blvd.
Bakersfield, CA 93311

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

Dear Members of the Board:

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

This study was prepared under the supervision of Tammy F. Dixon, FSA, MAAA, FCA, EA, who is a member of the American Academy of Actuaries and who meets the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion herein.

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

Sincerely,

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

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I. Introduction, Summary, and Recommendations

To project the cost and liabilities of a pension plan, assumptions are made about all future events that could affect the amount and timing of the benefits to be paid and the assets to be accumulated. Each year actual experience is compared against the projected experience, and to the extent there are differences, the future contribution requirement is adjusted.

If assumptions are modified, contribution requirements are adjusted to take into account a change in the projected experience in all future years. There is a great difference in both philosophy and cost impact between recognizing the actuarial deviations as they occur annually and changing the actuarial assumptions. Taking into account one year's gains or losses without making a change in the assumptions means that year's experience is treated as temporary and that, over the long run, experience will return to what was originally assumed. For example, it is impossible to determine when and to what extent the economy will rebound after the current crisis caused by the COVID-19 pandemic.[1] Changing assumptions reflects a basic change in thinking about the future, and has a much greater effect on the current contribution requirements than recognizing gains or losses as they occur.

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

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

Please note that the investment return assumption recommended in this report has been developed without taking into consideration the impact of the 50/50 allocation of future "excess earnings" between the retirement and Supplemental Retiree Benefit Reserve (SRBR) asset pools.

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

We are recommending changes in the assumptions for: inflation, merit and promotion salary increases, retirement from active employment, percent of members married at retirement, percent of members assumed to go on to work for a reciprocal system, reciprocal salary increases, pre-retirement mortality, healthy life post-retirement healthy, disabled life post-retirement mortality, beneficiary mortality, termination (refunds and deferred vested retirements), disability incidence (service and non-service).

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

Pg #	Actuarial Assumption Categories	Recommendation
12	**Inflation:** Future increases in the Consumer Price Index (CPI), which drives investment returns and active member salary.	Reduce the inflation assumption from 3.00% to 2.75% per annum as discussed in Section (III)(A).
14	**Investment Return:** The estimated average future net rate of return on current and future assets of the Association as of the valuation date. This rate is used to discount liabilities.	Maintain the current investment return assumption at 7.25% as discussed in Section (III)(B).
21	**Individual Salary Increases:** Increases in the salary of a member between the date of the valuation to the date of separation from active service. This assumption has three components: • Inflationary salary increases • Real "across the board" salary increases • Merit and promotion increases	Reduce the current inflationary salary increase assumption from 3.00% to 2.75% and maintain the current real "across the board" salary increase assumption at 0.50%. This means that the combined inflationary and real "across the board" salary increases will decrease from 3.50% to 3.25%. We recommend adjusting the merit and promotion rates of salary increase as developed in Section III(C) to reflect past experience. Future merit and promotion salary increases are higher in some service categories and lower in other service categories under the proposed assumptions. The recommended salary increases (after taking into account a 0.25% reduction in the inflation assumption) anticipate slightly higher salary increases overall for General members and slightly lower salary increases overall for Safety members.
27	**Administrative Expenses:** Fees for administration, legal, accounting, and actuarial services, and other functions carried out by the Association.	Maintain the explicit administrative expense load at 0.90% of projected payroll as discussed in Section (III)(D).

Pg #	Actuarial Assumption Categories	Recommendation
28	**Retirement Rates:** The probability of retirement at each age at which participants are eligible to retire. **Other Retirement Related Assumptions including:** • Percent married and spousal age differences for members not yet retired • Retirement age for deferred vested members • Future reciprocal members and reciprocal salary increases	For active members, adjust the current retirement rates to those developed in Section (IV)(A). For Tier I members, we are recommending separate sets of age-based retirement assumptions for those with less than 25 years of service and for those with 25 or more years of service. For active and deferred vested members, reduce the current percent married at retirement assumption from 75% to 70% for males and maintain the assumption at 60% for females. Maintain the spouse age difference assumption that male retirees are three years older than their spouses and female retirees are two years younger than their spouses. For deferred vested members, maintain the General and Safety deferred vested retirement assumption at age 57 and 53, respectively. Reduce the current proportion of future deferred vested members expected to be covered by a reciprocal system from 50% to 45% for General members and increase the assumption from 55% to 60% for Safety members. In addition, maintain the reciprocal salary increase assumption at 4.00% for General members and decrease the assumption from 4.00% to 3.75% for Safety members.

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Pg #	Actuarial Assumption Categories	Recommendation
37	**Mortality Rates:** The probability of dying at each age. Mortality rates are used to project life expectancies.	<u>For pre-retirement mortality:</u> Current base table: Headcount-Weighted RP-2014 Employee Mortality Table times 80%. Recommended base table for General Members: Pub-2010 General Employee Amount-Weighted Mortality Table. Recommended base table for Safety Members: Pub-2010 Safety Employee Amount-Weighted Above-Median Mortality Table. <u>For healthy General retirees:</u> Current base table: Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table set forward one year for males and set forward two years for females. Recommended base table: Pub-2010 General Healthy Retiree Amount-Weighted Mortality Table with rates increased by 15% for females. <u>For healthy Safety retirees:</u> Current base table: Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table set back one year. Recommended base table: Pub-2010 Safety Healthy Retiree Amount-Weighted Above-Median Mortality Table. <u>For all beneficiaries:</u> Current base table: Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table, set forward one year for males and set forward two years for females. Recommended base table: Pub-2010 Contingent Survivor Amount-Weighted Mortality Table with rates increased by 10%. <u>For disabled General retirees:</u> Current base table: Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table set forward seven years for males and set forward eight years for females. Recommended base table: Pub-2010 Non-Safety Disabled Retiree Amount-Weighted Mortality Table with rates decreased by 5%. <u>For disabled Safety retirees:</u> Current: Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table set forward three years. Recommended base table: Pub-2010 Safety Disabled Retiree Amount-Weighted Mortality Table with rates increased by 5%. <u>All current tables</u> are projected generationally with the two-dimensional mortality improvement scale MP-2016. <u>All recommended tables</u> are projected generationally with the two-dimensional mortality improvement scale MP-2019. <u>For member contribution rates, optional forms and reserves:</u> change the mortality rates to those developed in Section (IV)(B).
51	**Termination Rates:** The probability of leaving employment at each age and receiving either a refund of member contributions or a deferred vested retirement benefit.	Adjust the termination rates to those developed in Section IV(D) to reflect a higher incidence of termination overall. In addition, a slightly lower proportion of members is expected to elect a refund of member contributions with a higher proportion electing instead to receive a deferred vested benefit under the recommended assumptions.
59	**Disability Incidence Rates:** The probability of becoming disabled at each age.	Adjust the disability rates to those developed in Section IV(E) to reflect slightly lower incidence of disability for General and Safety members.

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

The cost associated with the administrative expense load has continued to be allocated to both the employer and the member based on the components of the total contribution rate (before administrative expenses) for the employer and the member.[2]

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

Impact on Employer Contribution Rates	
Increase due to changes in economic assumptions	0.27%
Increase due to changes in demographic assumptions	<u>1.94%</u>
Total increase in average employer rate	2.21%
Total estimated increase in annual dollar amount ($000s)[3]	$12,815
Impact on Member Contribution Rates	
Decrease due to changes in economic assumptions	-0.05%
Increase due to changes in demographic assumptions	<u>0.07%</u>
Total increase in average member rate	0.02%
Total estimated increase in annual dollar amount ($000s)[3]	$44
Impact on UAAL and Funded Percentage	
Increase in UAAL	$137 million
Change in Funded Percentage	From 64.80% to 63.49%

Of the various demographic assumption changes, the cost increase is from the change in the mortality assumptions, offset somewhat by the other demographic assumption changes.

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.

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[2] The actual allocation of contribution rates for administrative expenses will be determined in each actuarial valuation to reflect the relative proportion of employer and member contributions.

[3] Based on June 30, 2019 projected annual payroll as determined under each set of assumptions.

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II. Background and Methodology

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

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 Association'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 real "across the board" pay increases in excess of price inflation. It is also assumed that employees will receive raises above these average increases as they advance in their careers. These are commonly referred to as merit and promotion increases. Payments to amortize any Unfunded Actuarial Accrued Liability (UAAL) are assumed to increase each year by the price inflation rate plus any real "across the board" pay increases that are assumed.

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

Demographic Assumptions

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

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

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

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

III. Economic Assumptions

A. Inflation

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

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

Historical Consumer Price Index – 1930 to 2019[4]
(U.S. City Average - All Urban Consumers)

	25th Percentile	Median	75th Percentile
15-year moving averages	2.4%	3.3%	4.4%
30-year moving averages	2.9%	3.7%	4.8%

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

Based on information found in the Public Plans Data website, which is produced in partnership with the National Association of State Retirement Administrators (NASRA), the median inflation assumption used by 174 large public retirement funds in their 2018 fiscal year valuations was 2.65%.[5] In California, CalSTRS and thirteen other 1937 Act CERL systems use an inflation assumption of 2.75%, one 1937 Act CERL system uses an inflation assumption of 2.90%, and two 1937 Act CERL systems use an inflation assumption of 2.50%. CalPERS has lowered their inflation assumption from 2.75% to 2.50% over a three-year period. KCERA and three other 1937 Act CERL systems use an inflation assumption of 3.00%.

KCERA's investment consultant, Verus, anticipates an annual inflation rate of 1.90%, while the average inflation assumption provided by Verus and six other investment advisory firms retained by Segal's California public sector clients was 2.33%. Note that, in general, investment consultants use a time horizon for this assumption that is shorter than the time horizon we use for the actuarial valuation.[6]

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[4] Source: Bureau of Labor Statistics – Based on CPI for All Items in U.S. city average, all urban consumers, not seasonally adjusted (Series ID: CUUR0000SA0).

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

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

To find a forecast of inflation based on a longer time horizon, we referred to the Social Security Administration's (SSA) 2020 report on the financial status of the Social Security program.[7] The projected average increase in the Consumer Price Index (CPI) over the next 75 years under the intermediate cost assumptions used in that report was 2.40%. The SSA report also includes alternative projections using lower and higher inflation assumptions of 1.80% and 3.00%, respectively.

We also compared the yields on the thirty-year inflation indexed U.S. Treasury bonds to comparable traditional U.S. Treasury bonds.[8] As of April 2020, the difference in yields is about 1.39% which provides a measure of market expectations of inflation.

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

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

Retiree Cost-of-Living Increases

In our last experience study as of June 30, 2017, consistent with the 3.00% annual inflation assumption adopted by the Board, the Board maintained the 2.50% retiree cost-of-living adjustment for all General and Safety tiers.

We recommend that the current retiree cost-of-living assumption of 2.50% per year be continued in the June 30, 2020 valuation for all tiers.

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

- The results of the stochastic modeling are significantly dependent on assuming that lower levels of inflation will persist in the early years of the projections. If this is not assumed, then the stochastic modeling will produce results similar to our proposed COLA assumptions.

- Using a lower long-term COLA assumption based on a stochastic analysis would mean that an actuarial loss would occur even when the inflation assumption of 2.75% is met in a year. We question the reasonableness of this result.

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

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[7] Source: Social Security Administration: The 2020 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds
[8] Source: Board of Governors of the Federal Reserve System.

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B. Investment Return

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

Real Rate of Investment Return

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

The Association's current target asset allocation and the assumed real rate of return assumptions by asset class is shown in the following table. The first column of real rate of return assumptions are determined by reducing Verus' total or "nominal" 2020 return assumptions by their assumed 1.90% inflation rate. The second column of returns (except for Private Real Estate, Midstream, Capital Efficiency Alpha Pool, Hedge Fund, Private Equity and Private Credit) represents the average of a sample of real rate of return assumptions, where each firm's nominal returns have been reduced by that firm's assumed inflation rate. The sample includes the expected annual real rate of return provided to us by Verus and six other investment advisory firms retained by Segal's public sector clients. We believe these averages are a reasonable forecast of long-term future market returns in excess of inflation.

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

Asset Class	Percentage of Portfolio	Verus' Assumed Real Rate of Return[9]	Average Assumed Real Rate of Return from a Sample of Consultants to Segal's California Public Sector Clients[10]
Global Equity	37.0%	5.80%	6.51%
Core Fixed Income	14.0%	1.10%	1.09%
High Yield Corporate Credit	6.0%	2.10%	3.38%
Emerging Market Debt Blend	4.0%	3.80%	3.41%
Commodities	4.0%	3.00%	3.08%
Core Real Estate	5.0%	5.40%	4.59%
Private Real Estate	5.0%	9.50%	9.50%[11]
Midstream	5.0%	8.20%	8.20%[11]
Capital Efficiency Alpha Pool	5.0%	2.40%	2.40%[11]
Hedge Fund	10.0%	2.40%	2.40%[11]
Private Equity	5.0%	9.40%	9.40%[11]
Private Credit	5.0%	5.60%	5.60%[11]
Cash	-5.0%	0.00%	0.00%
Total	**100.0%**	**4.96%**	**5.25%**

The above are representative of "indexed" returns and do not include any additional returns ("alpha") from active management. This is consistent with the ASOP No. 27, Section 3.6.3.d, which states:

> "Investment Manager Performance - Anticipating superior (or inferior) investment manager performance may be unduly optimistic (or pessimistic). The actuary should not assume that superior or inferior returns will be achieved, net of investment expenses, from an active investment management strategy compared to a passive investment management strategy unless the actuary has reason to believe, based on relevant supporting data, that such superior or inferior returns represent a reasonable expectation over the long term."

The following are some observations about the returns provided above:

1. The investment consultants to our California public sector clients have each provided us with their expected real rates of return for each asset class, over various future periods of time. However, in general, the returns available from investment consultants are projected over time periods that are much shorter than the durations of a retirement plan's liabilities.

2. Using a sample average of expected real rate of returns allows the Association'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.

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

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

[11] For these asset classes, Verus' assumption is applied in lieu of the average because there is a larger disparity in returns for these asset classes among the firms surveyed and using Verus' assumption should more closely reflect the underlying investments made specifically for KCERA.

3. Therefore, we recommend that the 5.25% portfolio real rate of return be used to determine the Association's investment return assumption. This is 0.43% higher than the return that was used three years ago in the review to prepare the recommended investment return assumption for the June 30, 2017 valuation. The difference is due to changes in the Association's target asset allocation (+0.58%), changes in the real rate of return assumptions provided to us by the investment advisory firms (-0.13%) and the interaction effect between these changes (-0.02%).

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.

The current assumption for investment expenses is 0.35% of the market value of assets. The following table provides the investment expenses in relation to the market value of assets for the three years ending June 30, 2019.

Investment Expenses[12] as a Percentage of Market Value of Assets (Dollars in 000's)

Year Ending June 30	Market Value of Assets[13]	Investment Expenses	Investment %
2014	$3,576,112	$11,634	0.33%
2015	3,625,093	13,608	0.38
2016	3,571,587	13,175	0.37
Prior Three-Year Average			**0.36**
2017	3,962,895	13,356	0.34
2018	4,198,862	18,839	0.45
2019	4,345,780	13,765	0.32
Current Three-Year Average			**0.37**
Six-Year Average			**0.36**
Current Assumption			**0.35**
Proposed Assumption			**0.40**

Based on this experience, we have increased the future expense assumption component from 0.35% to 0.40%.

Note related to investment expenses paid to active managers – As cited above, under Section 3.6.3.d of ASOP No. 27, the effect of an active investment management strategy should be considered "net of investment expenses" when determining whether "the actuary has reason to believe, based on relevant supporting data, that such superior or inferior returns represent a reasonable expectation over the long term."

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[12] Net of securities lending expenses and incentive fees. Because we do not assume any additional net return for this program, we effectively assume that any securities lending expenses will be offset by related income.

[13] As of end of plan year.

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. If necessary, we will work with the KCERA's staff to determine whether future studies might potentially exclude the level of investment expenses for active managers that are expected to be offset by investment returns. For now, we will continue to use the current methodology that any "alpha" that may be identified would be treated as an increase in the risk adjustment and corresponding confidence level. For example, 0.25% of alpha would increase the confidence level by 3% (see discussions that follow on definitions of risk adjustment and confidence level).

Risk Adjustment

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

The purpose of the risk adjustment (as measured by the corresponding confidence level) is to increase the likelihood of achieving the actuarial investment return assumption in the long term.[14] This is consistent with our experience that retirement plan fiduciaries would generally prefer that returns exceed the assumed rate more often than not.

The 5.25% expected real rate of return developed earlier in this report was based on expected mean or average arithmetic returns. In our model, the confidence level associated with a particular risk adjustment represents the relative likelihood that future investment earnings would equal or exceed the assumed earnings over a 15-year period on an expected value basis.[15] The 15-year time horizon represents an approximation of the "duration" of the fund's liabilities, where the duration of a liability represents the sensitivity of that liability to interest rate variations. Note that, based on the investment return assumptions recently adopted by systems that have been analyzed under this model, we observe a confidence level generally in the range of 50% to 55%.

Three years ago, the Board adopted an investment return assumption of 7.25%. That return implied a risk adjustment of 0.22%, reflecting a confidence level of 53% that the actual average return over 15 years would not fall below the assumed return, assuming that the distribution of returns over that period follows the normal statistical distribution.[16]

If we use the same 53% confidence level from our last study to set this year's risk adjustment and the current long-term portfolio standard deviation of 11.0% provided by Verus, the corresponding risk adjustment would be 0.21%. Together with the other investment return components, this would result in an investment return assumption of 7.39%, which is higher than the current assumption of 7.25%. However, as detailed below, our analysis also

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

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

[16] Based on an annual portfolio return standard deviation of 11.70% provided by Verus in 2017. Strictly speaking, future compounded long-term investment returns will tend to follow a log-normal distribution. However, we believe the normal distribution assumption is reasonable for purposes of setting this type of risk adjustment.

considered the general downward trend in the investment return assumption for public retirement systems, as well as the opportunity to use the increase in the portfolio real rate of return to increase the confidence level. For those reasons, we evaluated the effect on the confidence level of alternative investment return assumptions. In particular, a net investment return assumption of 7.25%, together with the other investment return components, would produce a risk adjustment of 0.35%, which corresponds to a confidence level of 55%. We believe this analysis supports maintaining the current assumption at 7.25%.

The table below shows KCERA's investment return assumptions and, for the years when this analysis was performed, the risk adjustments and corresponding confidence levels compared to the values for prior studies.

Historical Investment Return Assumptions, Risk Adjustments and Confidence Levels based on Assumptions Adopted by the Board

Year Ending June 30	Investment Return[17]	Risk Adjustment	Corresponding Confidence Level
2011 - 2013	7.75%	(0.04%)	49%
2014 - 2016	7.50%	0.23%	53%
2017 - 2019	7.25%	0.22%	53%
2020 (Recommended)	7.25%	0.35%	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 Association has positioned itself relative to risk over periods of time.[18] The use of a 55% confidence level under Segal's model should be considered in context with other factors, including:

- As noted above, the confidence level is more of a relative measure than an absolute measure, and so can be reevaluated and reset for future comparisons.

- The confidence level is based on the standard deviation of the portfolio that is determined and provided to us by Verus. The standard deviation is a statistical measure of the future volatility of the portfolio and so is itself based on assumptions about future portfolio volatility and can be considered somewhat of a "soft" number.

- A confidence level of 55% is within the range of about 50% to 55% that corresponds to the risk adjustments used by most of Segal's other California public retirement system clients.

- We have not taken into account any additional returns ("alpha") that might be earned on active management. This means that if active management generates enough alpha to cover its related expenses, this would increase returns. This aspect of Segal's model is further evaluated below.

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

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[17] The investment returns starting in 2014 are gross of administrative expenses.

[18] 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."

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Taking into account the factors above, our recommendation is to maintain the net investment return assumption at 7.25%. As noted above, this return implies a 0.35% risk adjustment and reflects a confidence level of 55%.

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, 2020 Recommended Value	June 30, 2017 Adopted Value
Inflation	2.75%	3.00%
Plus Portfolio Real Rate of Return	5.25%	4.82%
Minus Expense Adjustment	(0.40%)	(0.35%)
Minus Risk Adjustment	(0.35%)	(0.22%)
Total	**7.25%**	**7.25%**
Confidence Level	**55%**	**53%**

Based on this analysis, we recommend that the investment return assumption be maintained at 7.25% per annum.

Effect of Gain Sharing Provisions

The recommended investment return assumption has been developed without taking into consideration any impact of the 50/50 excess earnings allocation between the retirement and Supplemental Retiree Benefit Reserve (SRBR) asset pools. This is based on our understanding that Article 5.5 of the Statute, which authorizes the allocation of 50% allocation of excess earnings to the SRBR, does not allow for the use of a different investment return for funding than is used for interest crediting. This would appear in effect to preclude the prefunding of the SRBR through the use of an assumption lower than the market earnings assumption.

ASOP No. 4 "Measuring Pension Obligations and Determining Pension Plan Costs or Contributions" was revised and adopted in December 2013. The revised ASOP states that some plan provisions, including gain sharing provisions, "may create pension obligations that are difficult to appropriately measure using traditional valuation procedures." ASOP No. 4 now mentions that "for such plan provisions, the actuary should consider using alternative valuation procedures, such as stochastic modeling…to reflect the impact of variations in experience from year to year."

Accordingly, we performed stochastic modeling in December 2015 to estimate the impact of the 50% allocation of future excess earnings to the SRBR. The results of our model indicated that the 50/50 allocation of future excess earnings would have about the same impact as an "outflow" (i.e., assets not available to fund the benefits included in this valuation) that would average approximately 0.3% of assets over time. This was done by comparing the future impact

on the employer's contribution rate over a 15-year period with and without the 50% allocation of excess earnings to the SRBR.

We recommend that we continue to develop our recommended investment return assumption and the resultant member and employer contribution rates without considering the 50% allocation of excess earnings to the SRBR. In addition, we will continue to disclose in the annual actuarial valuation reports the potential increase in actuarial liabilities and employer contributions by re-measuring the liabilities and contributions under an investment return assumption that is reduced by 0.3% to anticipate the 50% allocation of future excess earnings to the SRBR.

Comparison with Alternative Model used to Review Investment Return Assumption

Since our appointment as actuary for KCERA in 2008, we have consistently reviewed investment return assumptions based on our model that incorporates expected arithmetic real returns for the different asset classes and for the entire portfolio as one component of that model.[19] The use of "forward looking expected arithmetic returns" is one of the approaches discussed for use in the Selection of Economic Assumptions for measuring Pension Obligations under ASOP No. 27.

Besides using forward looking expected arithmetic returns, ASOP No. 27 also discussed setting investment return assumptions using an alternative "forward looking expected geometric returns" approach.[20] Even though expected geometric returns are lower than expected arithmetic returns, those California public retirement systems that have set investment return assumptions using this alternative approach have in practice adopted investment return assumptions that are comparable to those adopted by the Board for KCERA. This is because under the model used by those retirement systems, their investment return assumptions are not reduced to anticipate future investment expenses.[21]

For comparison, we evaluated the recommended 7.25% assumption based on the expected geometric return for the entire portfolio, and gross of the investment expenses. Under that model, over a 15-year period, there is a 56% likelihood that future average geometric returns will meet or exceed 7.25%.[22]

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.

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[19] Again, as discussed in the footnote to "Risk Adjustment", if a retirement system uses the expected arithmetic average return as the discount rate in the funding valuation, that retirement system is expected to have no surplus or asset shortfall relative to its expected obligations assuming all actuarial assumptions are met in the future.

[20] If a retirement system uses the expected geometric average return as the discount rate in the funding valuation, that retirement system is expected to have an asset value that generally converges to the median accumulated value as the time horizon lengthens assuming all actuarial assumptions are met in the future.

[21] This means that if the model were to be applied to KCERA, the expected geometric return would not be adjusted for the approximately 0.40% investment expenses paid by KCERA.

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

We note that an investment return of 7.00% or lower is becoming more common among California public sector retirement systems. In particular, of the twenty 1937 Act CERL systems, twelve use a 7.00% investment return assumption, one uses 6.75% and one uses 6.50%. The remaining six 1937 Act CERL systems (including KCERA) currently use a 7.25% earnings assumption. Furthermore, both CalPERS and CalSTRS currently use a 7.00% earnings assumption, while the San Jose and San Diego City retirement systems use investment return assumptions of 6.75% and 6.50%, respectively.

The following table compares KCERA's recommended net investment return assumption against those of the 188 large public retirement funds in their 2018 fiscal year valuations based on information found in the Public Plans Data website, which is produced in partnership with NASRA:[23]

Assumption	KCERA	Public Plans Data[24]		
		Low	Median	High
Net Investment Return	7.25%	4.50%	7.25%	8.00%

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

In summary, we believe that both the risk adjustment model and other considerations support maintaining the current earnings assumption. The recommended assumption of 7.25% provides for a risk margin within the risk adjustment model and is consistent with KCERA's current practice relative to other public systems.

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[23] Among 188 large public retirement funds, the investment return assumption was not available for 6 of the public retirement funds in the survey data.
[24] Public Plans Data website – Produced in partnership with the National Association of State Retirement Administrators (NASRA)

C. Salary Increase

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

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

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

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

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

   We also referred to the annual report on the financial status of the Social Security program published in April 2020. In that report, real "across the board" pay increases are forecast to be 1.1% 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 KCERA's active members, the actual average inflation plus "across the board" increase (i.e., wage inflation) over the three year period ending June 30, 2019 was 0.62% for General and Safety members combined, which is lower than the change in CPI of 3.22% during that same period:

Valuation Date	Actual Average Increase[25]	Actual Change in CPI[26]
June 30, 2017	0.29%	2.79%
June 30, 2018	0.51%	3.81%
June 30, 2019	1.04%	3.07%
Three Year Average	**0.62%**	**3.22%**

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[25] 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.

[26] Based on the change in the annual average CPI for the Los Angeles-Long Beach-Anaheim Area compared to the prior year. Prior to June 30, 2018, this was based on the change in the annual average CPI for Los Angeles- Riverside-Orange County Area.

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

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

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

   a. Measuring each continuing member's actual salary increase over each year of the experience period on a salary-weighted basis, with higher weights assigned to experience from members with larger salaries;

   b. Excluding any members with increases of more than 50% or a decrease of more than 25% during any particular year;

   c. Categorizing these increases according to member demographics;

   d. Removing the wage inflation component from these increases (assumed to be equal to the increase in the members' average salary during the year);

   e. Averaging these annual increases over the experience period; and

   f. Modifying current assumptions to reflect some portion of these measured increases reflective of their "credibility."

   To be consistent with the other economic assumptions, these merit and promotion assumptions should be used in combination with the 3.25% assumed inflation and real "across the board" increases recommended in this study.

   Due to the high variability of the actual salary increases, we have analyzed this assumption using data for the past six years. We believe that when the experience from the current and prior studies is combined, it provides a more reasonable representation of potential future merit and promotion salary increases over the long term.

The following table shows the General members' actual average merit and promotion increases by years of service over the three-year period from July 1, 2016 through June 30, 2019 along with the actual average increases based on combining the current three-year period with the three-year period from the prior experience study. The current and proposed assumptions are also shown. The actual increases were reduced by the actual average inflation plus "across the board" increase (i.e. wage inflation, estimated as the increase in average salaries) for each year during the experience period (0.90% on average for the most recent three-year period).

General

Years of Service	Rate (%)			
	Current Assumptions	Actual Average Increase (Last 3 Years)	Actual Average Increase (Last 6 Years)	Proposed Assumption
Less than 1	5.50	5.06	4.73	5.50
1 – 2	4.00	6.62	6.86	4.50
2 – 3	3.50	6.43	6.46	4.00
3 – 4	3.00	5.47	5.49	3.50
4 – 5	2.50	4.36	4.52	3.00
5 – 6	2.25	3.87	3.88	2.50
6 – 7	2.00	2.96	3.01	2.25
7 – 8	1.50	2.80	2.77	1.75
8 – 9	1.25	2.22	2.28	1.50
9 – 10	1.00	2.72	2.66	1.25
10 – 11	0.90	2.49	2.63	1.15
11 – 12	0.80	1.98	2.08	1.05
12 – 13	0.70	1.84	1.85	0.95
13 – 14	0.60	1.41	1.58	0.85
14 – 15	0.50	2.30	2.21	0.75
15 – 16	0.50	2.28	2.16	0.75
16 – 17	0.50	1.10	1.65	0.75
17 – 18	0.50	1.31	1.30	0.75
18 – 19	0.50	1.26	1.40	0.75
19 – 20	0.50	1.30	1.67	0.75
20 & Over	0.50	1.14	1.44	0.75

The following table shows the Safety members' actual average merit and promotion increases by years of service over the three-year period from July 1, 2016 through June 30, 2019 along with the actual average increases based on combining the current three-year period with the three-year period from the prior experience study. The current and proposed assumptions are also shown. The actual increases were reduced by the actual average inflation plus "across the board" increase (i.e. wage inflation, estimated as the increase in average salaries) for each year during the experience period (0.48% on average for the most recent three-year period).

Safety

Years of Service	Rate (%)			
	Current Assumptions	Actual Average Increase (Last 3 Years)	Actual Average Increase (Last 6 Years)	Proposed Assumption
Less than 1	9.00	6.98	8.40	8.75
1 – 2	6.50	7.32	7.39	7.00
2 – 3	5.50	5.38	5.73	5.50
3 – 4	4.25	5.38	5.50	5.00
4 – 5	3.75	4.86	5.25	4.50
5 – 6	3.25	4.66	4.61	4.00
6 – 7	3.00	3.99	3.78	3.50
7 – 8	2.50	2.87	2.35	2.50
8 – 9	1.75	1.29	1.05	1.50
9 – 10	1.50	1.56	1.29	1.25
10 – 11	1.25	0.92	0.73	1.00
11 – 12	1.00	0.72	0.44	0.80
12 – 13	0.90	0.87	0.39	0.75
13 – 14	0.85	0.42	0.32	0.70
14 – 15	0.80	0.55	0.52	0.65
15 – 16	0.75	0.91	0.63	0.60
16 – 17	0.70	0.72	0.40	0.55
17 – 18	0.65	0.92	0.63	0.50
18 – 19	0.60	0.44	-0.17	0.50
19 – 20	0.55	0.96	0.40	0.50
20 & Over	0.50	0.70	0.30	0.50

Chart 1 that follows later in the section compares actual experience with the current and proposed rates of actual merit and promotion increases for General members. Also shown is the actual merit and promotion increases based on an average of both the current and previous three-year experience periods.

Chart 2 compares actual experience with the current and proposed rates of actual merit and promotion increases for Safety members. Also shown is the actual merit and promotion increases based on an average of both the current and previous three-year experience periods.

Based on this experience, we are proposing changes in the merit and promotion salary increases for both General and Safety members, with increases for almost all service categories for General members and with increases for some service categories and decreases for other service categories for Safety members. Overall, *merit and promotion* **salary increases are assumed to be higher for General members and slightly lower for Safety members. The overall salary increase assumptions will increase slightly for General members and decrease for Safety members after taking into account the lower** *inflation* **component of the salary increase assumption.**

Active Member Payroll

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

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

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

Chart 1: Merit and Promotion Salary Increase Rates
General Members

Legend: Current, Actual, Actual (Average of Last Two Studies), Proposed

X-axis: Years of Service (0 to 20+)
Y-axis: 0% to 8%
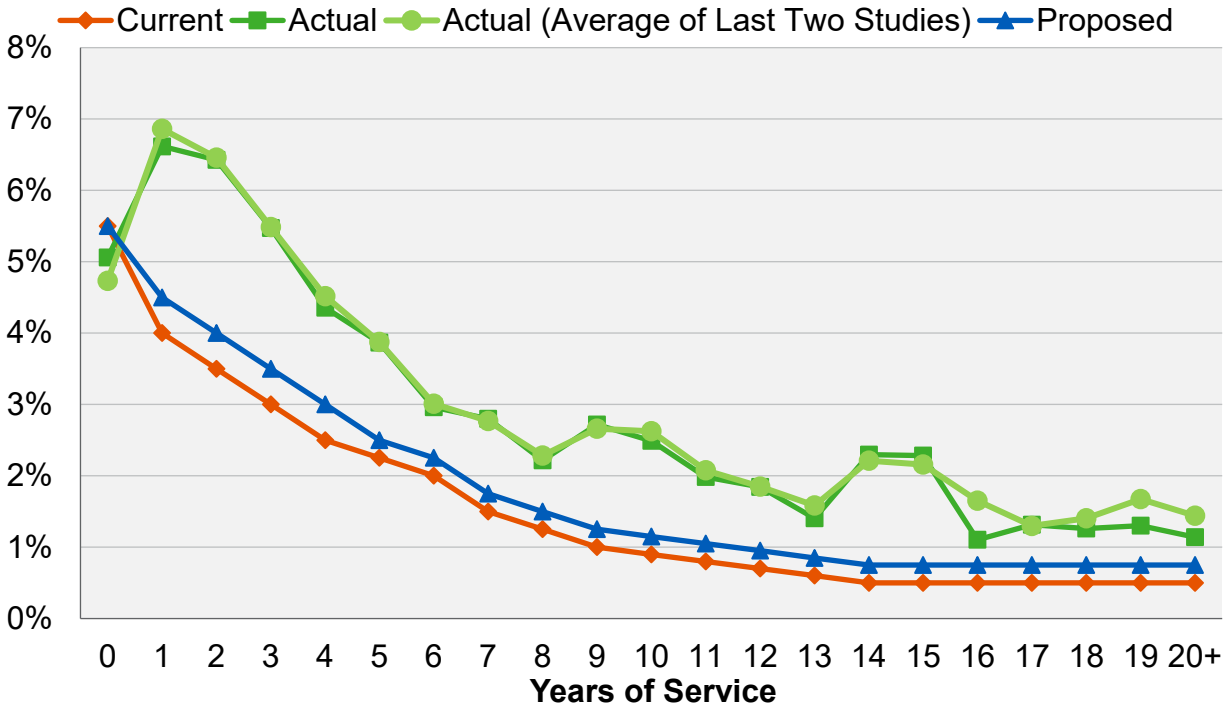
Chart 2: Merit and Promotion Salary Increase Rates
Safety Members

Legend: Current, Actual, Actual (Average of Last Two Studies), Proposed

X-axis: Years of Service (0 to 20+)
Y-axis: -2% to 10%
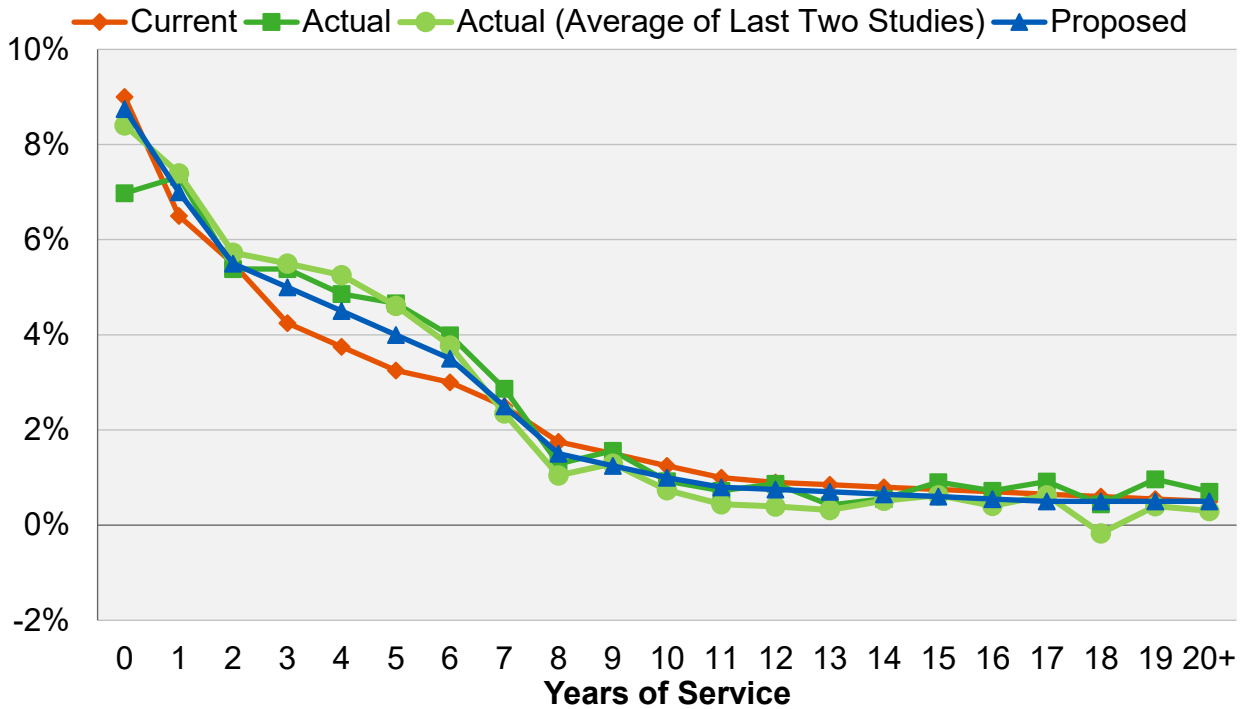
D. Administrative Expenses

Like benefit payments made to members, expenses incurred in connection with the plan's operation are paid from KCERA's assets. These expenses include fees for administrative, legal, accounting, and actuarial services, as well as routine costs for printings, mailings, computer-related activities, and other functions carried out by the plan. They do not include investment-related expenses.

The current administrative expense assumption is 0.90% of projected payroll. The following table provides the administrative expenses in relation to the projected payroll for each of the six years ending June 30, 2019.

Administrative Expenses as a Percentage of Projected Payroll (Dollars in 000's)

Year Ending June 30	Projected Payroll	Administrative Expenses	Administrative %
2014	$533,851	$4,860	0.91%
2015	531,598	4,887	0.92
2016	537,540	5,224	0.97
Prior Three-Year Average			**0.93**
2017	546,671	5,243	0.96
2018	576,729	5,116	0.89
2019	579,072	4,804	0.83
Current Three-Year Average			**0.89**
Six-Year Average			**0.91**
Current Assumption			**0.90**
Proposed Assumption			**0.90**

Based on this experience, we recommend maintaining the current administrative expense assumption of 0.90%. This expense will be allocated to the employer and member based on the total average contribution rates in the upcoming June 30, 2020 actuarial valuation, as determined before including the administrative expenses.

IV. Demographic Assumptions

A. Retirement Rates

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

Currently, the assumed retirement rates are a function of only member's age. With this year's experience study, we have also analyzed recent years' retirement experience both as a function of age and years of service in relation to the probability of retirement. Our review concludes that the retirement rates correlate both with age and with years of service for General Tier I and Safety Tier I members.

As a result of this observation, we recommend that retirement rates be structured as a function of both age and years of service for General Tier I and Safety Tier I. The new structure of retirement assumptions will apply different sets of age-based retirement assumptions for those with less than 25 years of service and for those with more than 25 years of service. For General Tier II, General Tier III, and Safety Tier II, we continue to recommend that retirement rates be structured as a function of only age until more data on actual retirement experience is available to review the retirement rates based on both age and service.

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

General Tier I

	Rate of Retirement (%)				
	All Service	Less than 25 Years of Service		25 or More Years of Service	
Age	Current Rate	Actual Rate	Proposed Rate	Actual Rate	Proposed Rate
50	6.00	10.33	10.00	7.14	10.00
51	6.00	6.33	6.00	5.45	6.00
52	6.00	10.00	6.00	8.57	12.00
53	6.00	5.08	6.00	13.64	12.00
54	8.00	4.78	6.00	10.00	12.00
55	10.00	5.35	6.00	11.81	12.00
56	12.00	5.78	6.00	15.00	14.00
57	14.00	6.36	6.00	14.84	16.00
58	15.00	8.53	9.00	21.62	18.00
59	19.00	14.21	16.00	26.19	24.00
60	23.00	20.00	20.00	45.45	35.00
61	23.00	12.41	16.00	29.73	28.00
62	25.00	17.02	20.00	45.16	35.00
63	25.00	21.54	20.00	22.22	30.00
64	25.00	18.18	20.00	40.00	30.00
65	32.00	34.82	35.00	31.82	35.00
66	35.00	39.47	35.00	42.86	35.00
67	35.00	28.57	35.00	10.00	35.00
68	40.00	30.00	35.00	40.00	35.00
69	40.00	40.00	40.00	40.00	40.00
70 & Over	100.00	33.85	100.00	20.00	100.00

As shown above, we are recommending decreases in most of the retirement rates for General Tier I members with less than 25 years of service and recommending increases in most of the retirement rates for General Tier I members with 25 or more years of service.

Chart 3 that follows later in this section compares actual experience with the current and proposed rates of retirement for General Tier I members with less than 25 years of service.

Chart 4 compares actual experience with the current and proposed rates of retirement for General Tier I members with 25 or more years of service.

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

Safety Tier I

	Rate of Retirement (%)				
	All Service	Less than 25 Years of Service		25 or More Years of Service	
Age	Current Rate	Actual Rate	Proposed Rate	Actual Rate	Proposed Rate
45	2.00	11.63	5.00	N/A	5.00
46	2.00	0.00	5.00	0.00	5.00
47	2.00	12.20	5.00	9.09	5.00
48	3.00	9.76	5.00	0.00	5.00
49	9.00	27.27	25.00	21.05	25.00
50	20.00	9.23	10.00	26.32	30.00
51	15.00	8.00	8.00	25.00	24.00
52	18.00	7.69	8.00	34.78	24.00
53	18.00	9.09	8.00	30.43	24.00
54	20.00	11.11	12.00	22.73	24.00
55	24.00	16.00	14.00	14.29	28.00
56	24.00	12.50	14.00	14.29	28.00
57	24.00	8.33	8.00	23.53	28.00
58	30.00	8.33	8.00	37.50	28.00
59	20.00	12.50	14.00	40.00	28.00
60	20.00	25.00	25.00	20.00	28.00
61	20.00	30.00	25.00	50.00	50.00
62	40.00	0.00	25.00	20.00	50.00
63	40.00	25.00	25.00	50.00	50.00
64	40.00	0.00	25.00	N/A	50.00
65 & Over	100.00	11.11	100.00	60.00	100.00

As shown above, we are recommending decreases in most of the retirement rates for Safety Tier I members with less than 25 years of service and recommending increases in most of the retirement rates for Safety Tier I members with 25 or more years of service.

Chart 5 compares actual experience with the current and proposed rates of retirement for Safety Tier I members with less than 25 years of service.

Chart 6 compares actual experience with the current and proposed rates of retirement for Safety Tier I members with 25 or more years of service.

For General Tier II, General Tier III, and Safety Tier II, we do not have credible experience from the past three years to propose new retirement rates based either only on age, or on age and service. As a result, we have not changed the current age-based assumption structure for Tier II members.

However, we have based our recommended rates for General Tier II, General Tier III, and Safety Tier II on a combination of the current Tier II assumptions and the actual retirement experience that occurred for General and Safety Tier I members.

The following are the current and proposed rates of retirement for General Tier II, General Tier III, and Safety Tier II members:

General Tier II, General Tier III, and Safety Tier II

Age	Rate of Retirement (%)					
	Current General Tier IIA and IIB	Proposed General Tier IIA and IIB	Current General Tier III	Proposed General Tier III	Current Safety Tier IIA and IIB	Proposed Safety Tier IIA and IIB
50	3.00	5.00	0.00	0.00	6.00	3.00
51	3.00	3.00	0.00	0.00	6.00	3.00
52	3.00	3.00	3.00	3.00	6.00	3.00
53	3.00	3.00	3.00	3.00	8.00	5.00
54	3.50	3.50	3.50	3.50	18.00	11.00
55	5.50	4.00	5.50	4.00	22.00	13.00
56	6.50	4.50	6.50	4.50	20.00	12.00
57	7.50	5.00	7.50	5.00	20.00	12.00
58	9.50	6.50	9.50	6.50	20.00	12.00
59	11.50	11.00	11.50	11.00	20.00	12.00
60	13.50	12.00	13.50	12.00	20.00	12.00
61	15.50	13.00	15.50	13.00	20.00	12.00
62	25.00	20.00	25.00	20.00	40.00	25.00
63	25.00	20.00	25.00	20.00	40.00	25.00
64	25.00	20.00	25.00	20.00	40.00	25.00
65	32.00	35.00	32.00	35.00	100.00	100.00
66	35.00	35.00	35.00	35.00	100.00	100.00
67	35.00	35.00	35.00	35.00	100.00	100.00
68	40.00	35.00	40.00	35.00	100.00	100.00
69	40.00	40.00	40.00	40.00	100.00	100.00
70 & Over	100.00	100.00	100.00	100.00	100.00	100.00

Chart 7 compares the current rates with the proposed rates of retirement for General Tier II members.

Chart 8 compares the current rates with the proposed rates of retirement for General Tier III members.

Chart 9 compares the current rates with the proposed rates of retirement for Safety Tier II members.

Deferred Vested Members

In prior valuations, deferred vested General and Safety members were assumed to retire at age 57 and 53, respectively. The average age at retirement over the prior three years was 56.7 for General and 52.0 for Safety.

We recommend maintaining the General and Safety deferred vested retirement assumption at age 57 and 53, respectively.

Reciprocity

Under the current assumptions, it is was assumed that 50% of General and 55% of Safety future deferred vested members would be covered under a reciprocal retirement system. For those covered under a reciprocal retirement system, both General and Safety members are assumed to receive 4.00% annual salary increases from termination until their date of retirement. As of June 30, 2019, about 45% of the total General deferred vested and 57% of the total Safety deferred vested members went on to be covered by a reciprocal retirement system.

We recommend decreasing the reciprocal assumption to 45% for General members and increasing the assumption to 60% for Safety members. This recommendation takes into account the experience of all deferred vested members as of June 30, 2019 instead of just new deferred vested members during the three-year period. This is because there is a lag between a member's date of termination and the time that it is known if they have reciprocity with a reciprocal retirement system.

In addition, we recommend 4.00% and 3.75% annual salary increase assumptions for General and Safety members, respectively, be utilized to anticipate salary increases from the date of termination from KCERA to the expected date of retirement for deferred vested members covered by a reciprocal retirement system. These assumptions are based on the ultimate 0.75% and 0.50% merit and promotion salary increase assumptions for General and Safety members, respectively, together with the 2.75% inflation and 0.50% real "across the board" salary increase assumptions that are recommended earlier in Section III of this report.

Survivor Continuance under the Unmodified Option

In prior valuations, it was assumed that all members would select the unmodified option at retirement. Actual experience for recent new retirees shows that around 90% select the unmodified option. **Therefore, we recommend maintaining the assumption that all members will elect the unmodified option at retirement.**

It was also assumed that 75% of all active and inactive male members and 60% of all active and inactive female members would be married or have an eligible domestic partner entitled to the automatic continuance benefit when they select the unmodified option upon retirement. We reviewed experience for new retirees during the three-year period and determined the actual percentage of these new retirees that had an eligible spouse or eligible domestic partner and selected the unmodified option at the time of retirement. The results of that analysis are shown below.

New Retirees – Actual Percent with Eligible Spouse or Domestic Partner and Selected Unmodified Option		
Year Ending June 30	**Male**	**Female**
2017	68%	52%
2018	62%	56%
2019	72%	57%
Total	**67%**	**55%**

According to experience of members who retired during the last three years, about 67% of all male members and 55% of all female members who selected the unmodified option were married or had a domestic partner at retirement. **We recommend decreasing the assumption from 75% to 70% for male members and maintaining the assumption at 60% for female members.**

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

1. Since most the survivors are actually the opposite sex, even with the inclusion of domestic partners, **we will continue to assume that the survivor's sex is the opposite of the member.**

2. **We recommend the current assumptions for the age of the survivors for all active and inactive members (shown below) be maintained.** These assumptions will continue to be monitored in future experience studies.

	Spouse's Age as Compared to Member's Age	
	Male	**Female**
Current Assumption	3 years older	2 years younger
Actual KCERA Experience	3.3 years older	1.3 years younger
Proposed Assumption	3 years older	2 years younger

Chart 3: Retirement Rates
General Tier I Members with Less than 25 Years of Service

Chart 4: Retirement Rates
General Tier I Members with More than 25 Years of Service
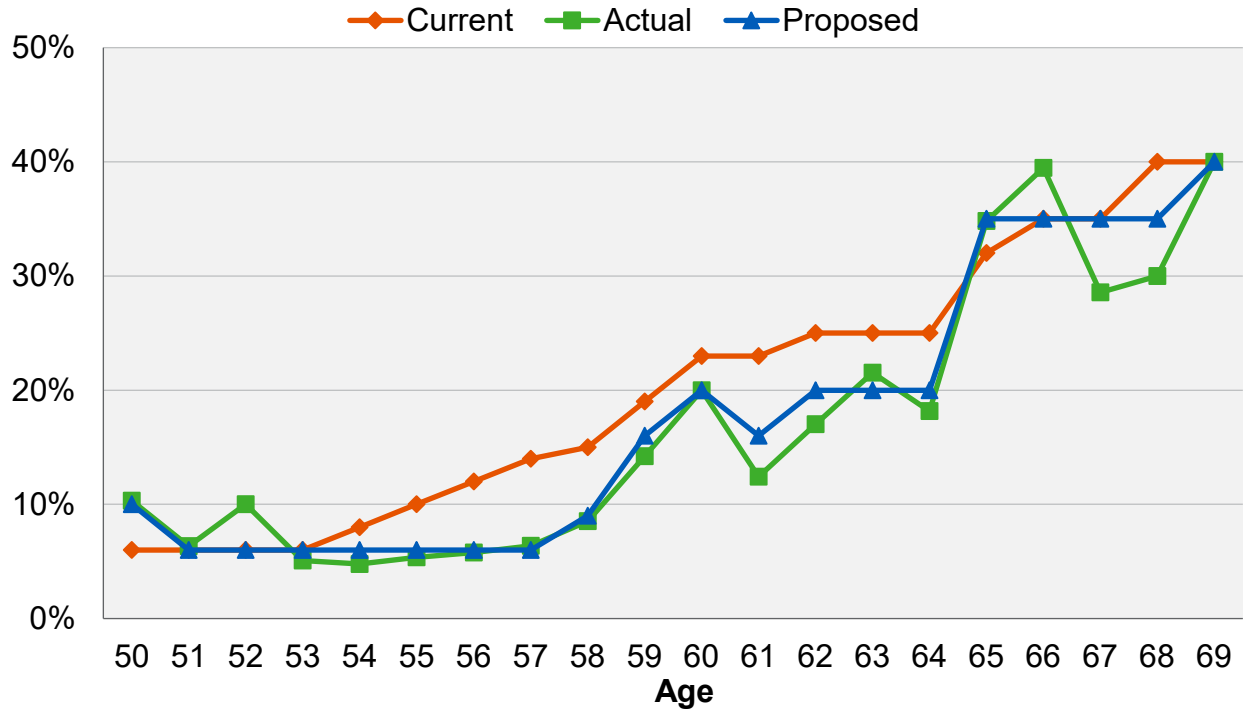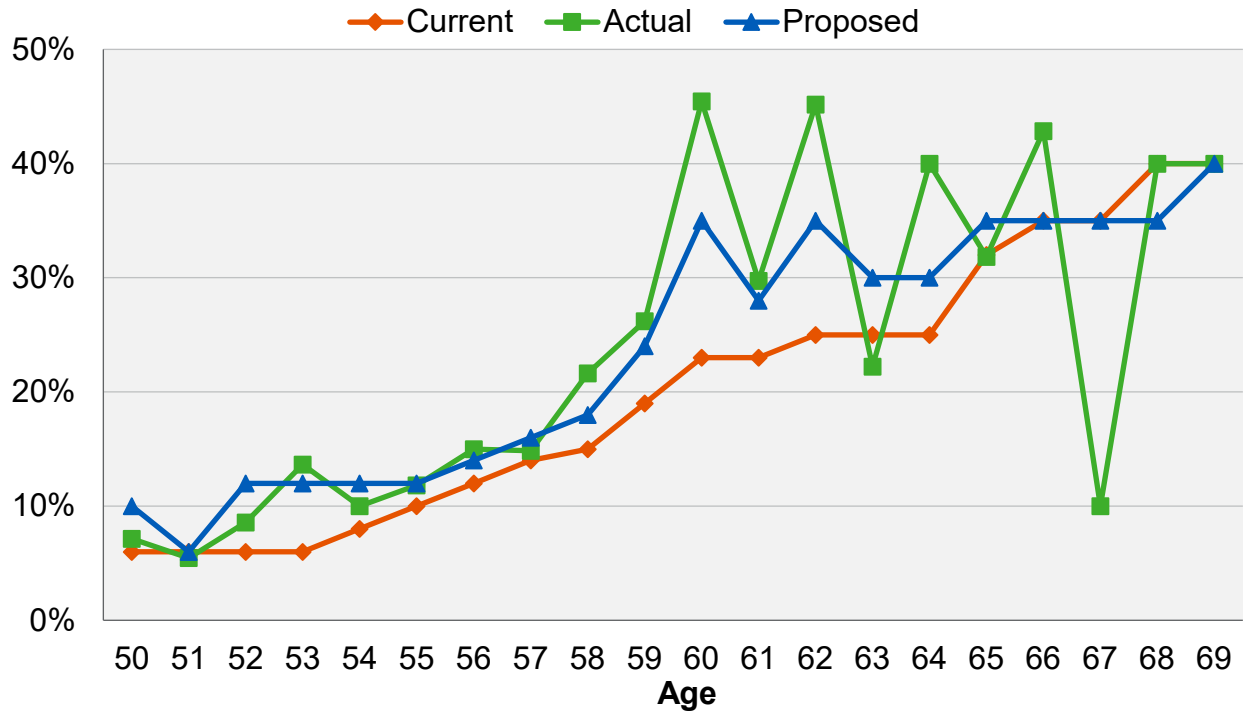
Chart 5: Retirement Rates
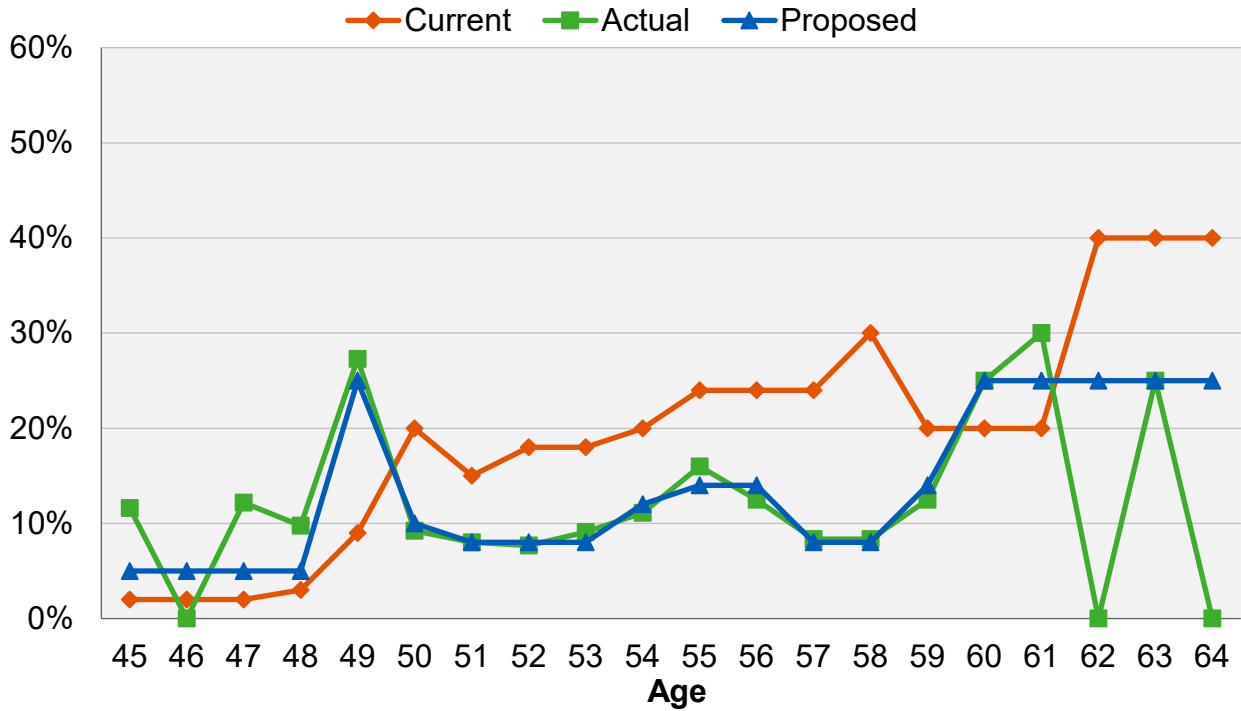## Safety Tier I Members with Less than 25 Years of Service

Chart 6: Retirement Rates
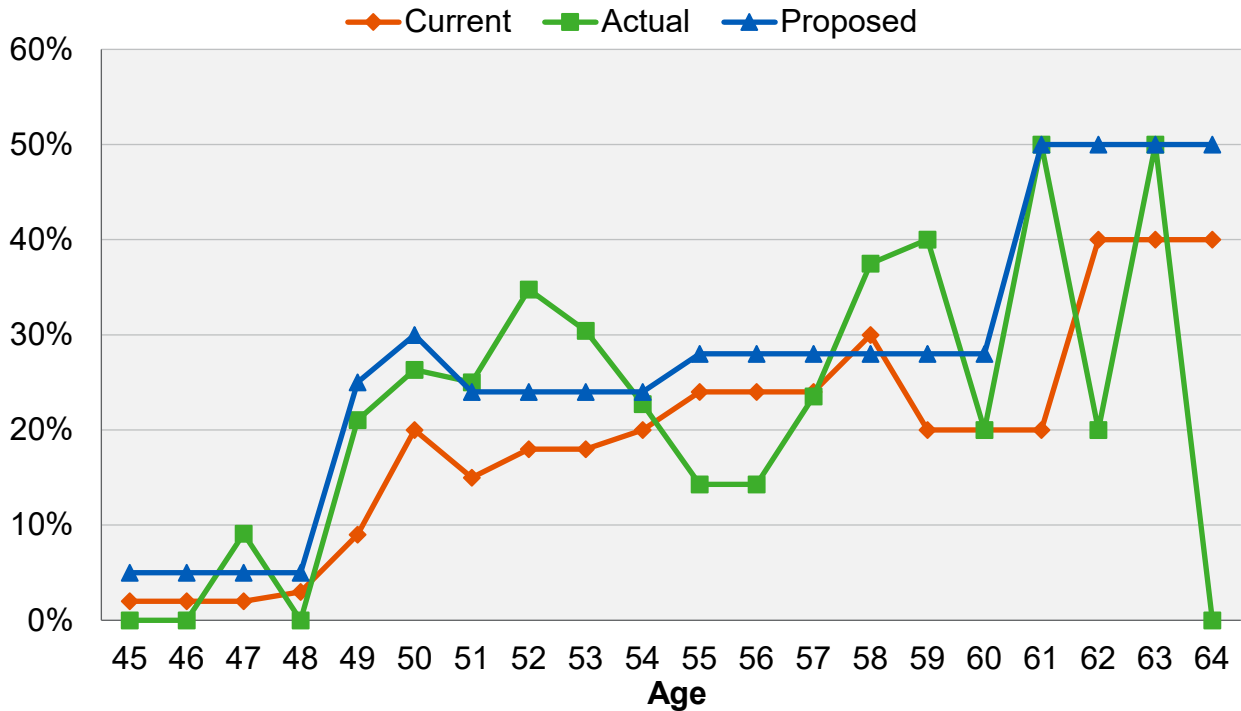## Safety Tier I Members with More than 25 Years of Service

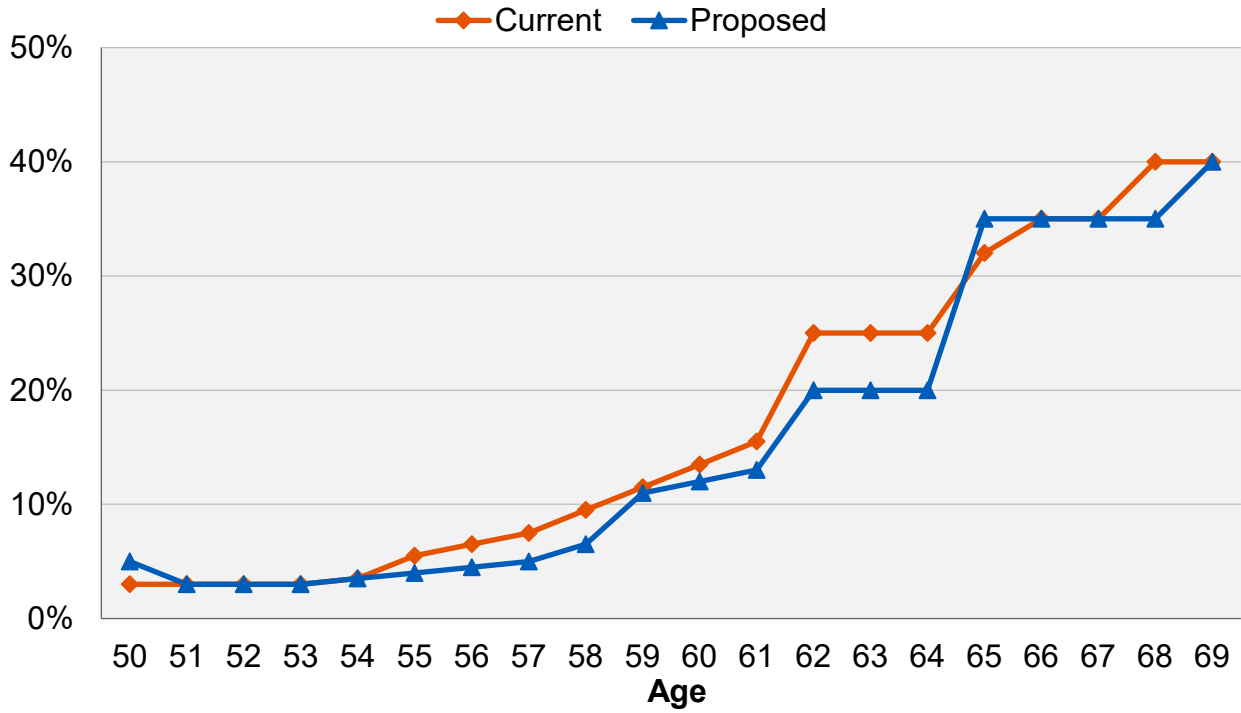# Chart 7: Retirement Rates
General Tier II Members

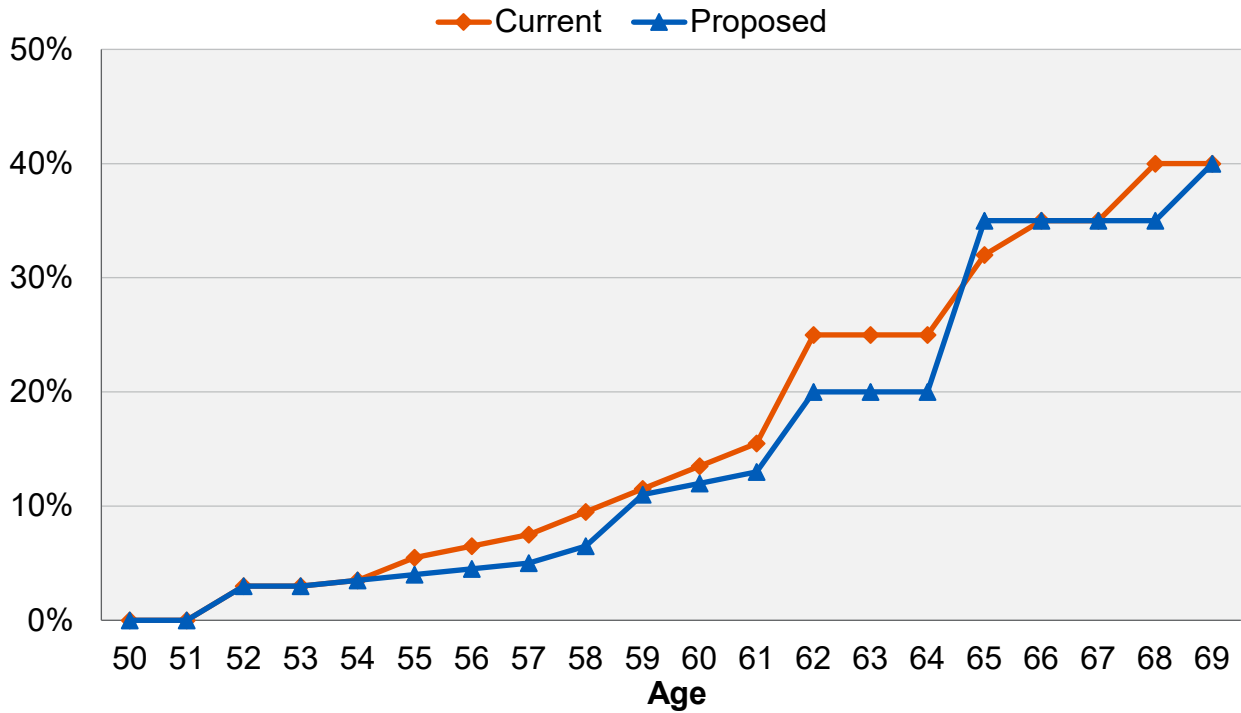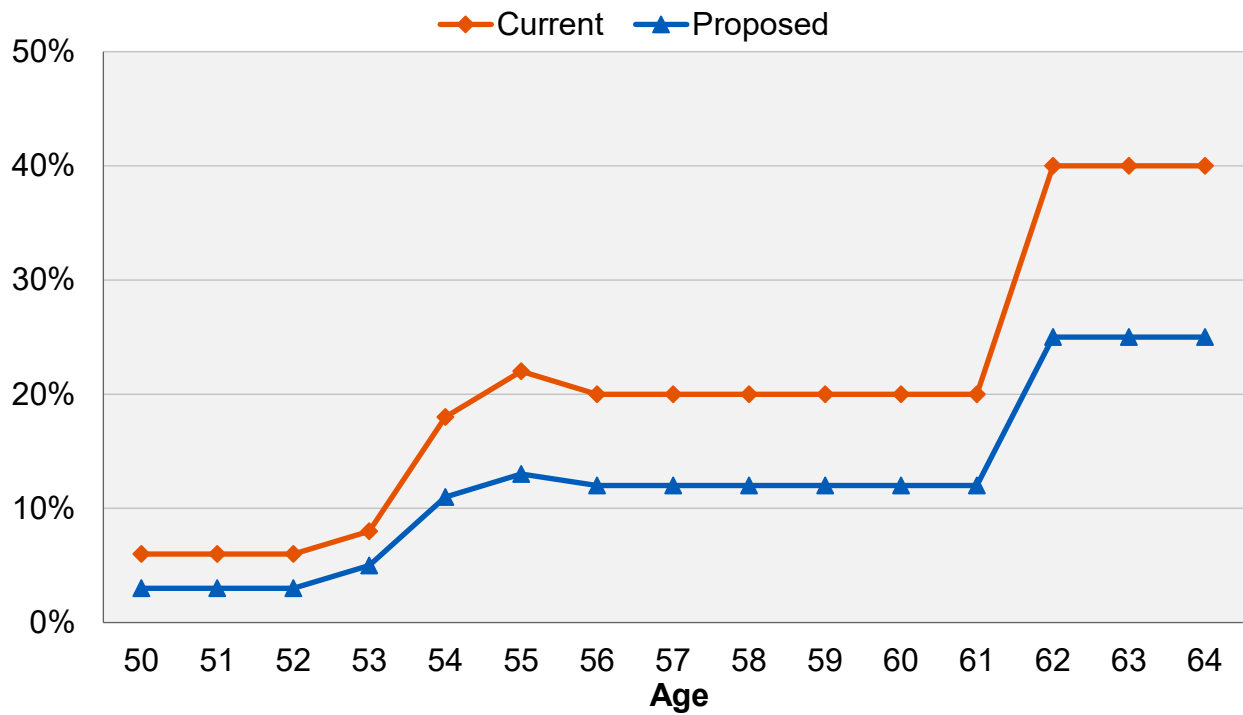# Chart 8: Retirement Rates
General Tier III Members

Chart 9: Retirement Rates
Safety Tier II Members

B. Mortality Rates - Healthy

The "healthy" mortality rates project the life expectancy of a member who retires from service (i.e., who did not retire on a disability pension). Also, the "healthy" pre-retirement mortality rates project what proportion of members will die before retirement. For General members, the table currently being used for post-service retirement mortality rates is the Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table (separate tables for males and females) set forward one year for males and set forward two years for females, projected generationally with the two-dimensional mortality improvement scale MP-2016. For Safety members, the table currently being used for post-service retirement mortality rates is the Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table (separate tables for males and females) with ages set back one year for males and females, projected generationally with the two-dimensional mortality improvement scale MP-2016. Beneficiaries are assumed to have the same mortality as a General Member of the opposite sex who is receiving a service (non-disability) retirement.

When we conducted the last experience study, we alerted the Board that we may recommend a switch from a Headcount-Weighted to a Benefit-Weighted table once the Society of Actuaries (SOA) provided mortality tables based on public sector experience comparable to the RP-2014 mortality tables developed using data collected from private and multi-employer pension plans.

The Retirement Plans Experience Committee (RPEC) of the SOA recently published the Pub-2010 Public Retirement Plans Mortality tables (Pub-2010). For the first time, the published mortality tables are based exclusively on public sector pension plan experience in the United States. Within the Pub-2010 family of mortality tables, there are separate tables by job categories of General, Safety and Teachers. Included with the mortality tables is the analysis prepared by RPEC that continues to observe that benefit amounts for healthy retirees and salary for employees are the most significant predictors of mortality differences within the job categories. Therefore, Pub-2010 includes mortality rates developed for annuitants on a "benefit" weighted basis, with higher credibility assigned to experience from annuitants receiving larger benefits.

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

	Median Benefit Amounts ($) by Gender, Job Category, and Status			
	Males		**Females**	
Job Category	**Employees**	**Retirees**	**Employees**	**Retirees**
General	45,800	21,200	34,700	11,900
Safety	72,200	36,900	61,800	29,200

Note: Values shown as of 2010.

When we adjust the above amounts by a reasonable measure of U.S. price inflation from 2010 to 2019 for a total increase of around 30%, the benefit amounts (or salaries) paid to KCERA's Safety members were generally greater than the adjusted median amounts shown above.

Therefore, we recommend that the median version of the mortality tables for General and the above-median version of the mortality tables for Safety.

We continue to recommend that the mortality improvement scale be applied generationally where each future year has its own mortality table that reflects the forecasted improvements, using the published improvement scales. The "generational" approach is 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.

We understand that RPEC intends to publish annual updates to their mortality improvement scales. Improvement scale MP-2019 is the latest improvement scale available. We recommend that the Board adopt the Benefit-Weighted Pub-2010 mortality table (adjusted for KCERA experience) for General members and the Benefit-Weighted Above-Median Pub-2010 mortality table (adjusted for KCERA experience) for Safety members, and project the mortality improvement generationally using the MP-2019 mortality improvement scale.

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

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

Pre-Retirement Mortality

For General and Safety members, the table currently being used for pre-retirement mortality rates is the Headcount-Weighted RP-2014 Employee Mortality Table (separate tables for males and females) times 80%, projected generationally with the two-dimensional scale MP-2016.

For General members, we recommend changing the pre-retirement mortality to follow the Pub-2010 General Employee Amount-Weighted Mortality Table (separate tables for males and females), projected generationally with the two-dimensional mortality improvement scale MP-2019.

For Safety members, we recommend changing the pre-retirement mortality to follow the Pub-2010 Safety Employee Amount-Weighted Above-Median Mortality Table (separate tables for males and females), projected generationally with the two-dimensional mortality improvement scale MP-2019.

Based on actual experience during the three-year experience study period, we also recommend maintaining the current assumption for pre-retirement mortality of 100% non-service connected for both General and Safety members.[27]

Post-Retirement Mortality (Service Retirements)

Among all retired members, the actual deaths weighted by benefit amounts under the current assumptions for the last nine years are shown in the table below. We also show the deaths weighted by benefit amount under the proposed assumptions. We continue to recommend the use of a generational mortality table, which incorporates 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.

The proposed mortality table also reflects current experience to the extent that the experience is credible based on standard statistical theory. For KCERA, the volume of General member data makes it relatively credible. In contrast, there is much less Safety data, so it is given substantially less credibility. The proposed mortality tables (as shown in the table below) after adjustments for partial credibility have actual to expected ratios of 107% for both General and Safety members. In future years the ratio should remain around 107%for both General and Safety members as long as actual mortality improves at the same rates as anticipated by the generational mortality tables. The number of actual deaths compared to the number expected under the current and proposed assumptions weighted by benefit amounts for the last nine years are as follows:

Gender	General Members – Healthy ($ in millions)			Safety Members – Healthy ($ in millions)		
	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths
Male	14.47	11.72	11.40	8.39	6.90	6.31
Female	12.70	11.37	10.11	0.48	0.31	0.40
Total	**27.17**	**23.09**	**21.51**	**8.87**	**7.21**	**6.71**
Actual / Expected	85%		107%	81%		107%

Notes: (1) Experience shown above is weighted by annual benefit amounts for deceased members instead of by headcounts.

(2) Expected amounts under the proposed generational mortality table are based on mortality rates from the base year projected with mortality improvements to the experience study period.

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[27] While it is possible that COVID-19 deaths for members in certain industries may be considered service connected, we do not recommend a change in our assumption to reflect this possible short-term increase in service connected deaths.

For General members, we recommend updating the current table to the Pub-2010 General Healthy Retiree Amount-Weighted Mortality Table (separate tables for males and females) with rates increased by 15% for females, projected generationally with the two-dimensional mortality improvement scale MP-2019. The recommended mortality table has an actual to expected ratio of 107%.[28]

For Safety members, we recommend updating the current table to the Pub-2010 Safety Healthy Retiree Amount-Weighted Above-Median Mortality Table (separate tables for males and females), projected generationally with the two-dimensional mortality improvement scale MP-2019. The recommended mortality table has an actual to expected ratio to 107%.

For informational purposes only, we have also provided in the table below the actual and expected deaths computed without weighting these by benefit amounts. This is similar to how actual and expected death ratios were developed based on the prior headcount approach.

Gender	General Members – Healthy			Safety Members – Healthy		
	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths
Male	412	381	334	143	150	114
Female	620	625	519	10	7	9
Total	**1,032**	**1,006**	**853**	**153**	**157**	**123**
Actual / Expected	97%		118%	102%		128%

Notes: (1) Experience shown above is weighted by headcounts for deceased members instead of by annual benefit amounts.
(2) The proposed expected deaths are based on the Pub-2010 Amount-Weighted Above-Median Mortality Tables.

Chart 10 that follows later in this section compares actual to expected deaths on a benefit-weighted basis for General members under the current and proposed assumptions over the past nine years.

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

Chart 12 compares actual to expected deaths on a headcount-weighted basis for General members under the current and proposed assumptions over the past nine years provided for informational purposes only.

Chart 13 compares actual to expected deaths on a headcount-weighted basis for Safety members under the current and proposed assumptions over the past nine years provided for informational purposes only.

Chart 14 shows the life expectancies (i.e., expected future lifetime) under the current and the proposed tables for General members on a benefit-weighted basis. Life expectancies under the

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[28] If we use the benchmark Pub-2010 General table without any adjustment, the proposed actual to expected ratio would be 114%.

proposed generational mortality rates are based on age as of 2020. In practice, assumed life expectancies will increase as a result of the mortality improvement scale.

Chart 15 shows the life expectancies (i.e., expected future lifetime) under the current and the proposed tables for Safety members on a benefit-weighted basis.

Beneficiaries Mortality

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

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

For all beneficiaries, we recommend changing the mortality assumption to follow the Pub-2010 Contingent Survivor Amount-Weighted Mortality Table (separate tables for males and females) with rates increased by 10%, projected generationally with the two-dimensional mortality improvement scale MP-2019.

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

There are administrative reasons why a generational mortality table is more difficult to implement for determining member contributions for legacy tiers (i.e., General Tier I, General Tier IIA, Safety Tier I and Safety Tier IIA), optional forms of payment and reserves. For determining member contributions, one emerging practice is to approximate the use of a generational mortality table by the use of a static table with projection of the mortality improvement from the measurement year over a period that is close to the duration of the benefit payments for active members. We would recommend the use of this approximation for determining member contributions for employees in the Tier I.

For General members, we recommend that the mortality table used for determining contributions for General members be updated to a blended table based on the Pub-2010 General Healthy Retiree Amount-Weighted Mortality Table (separate tables for males and females) with rates increased by 15% for females, projected 30 years (from 2010) with the two-dimensional mortality improvement scale MP-2019, weighted 30% male and 70% female.

For Safety members, we recommend that the mortality table used for determining contributions for Safety members be updated to a blended table based on the Pub-2010 Safety Healthy Retiree Amount-Weighted Above-Median Mortality Table (separate tables for males and females), projected 30 years (from 2010) with the two-dimensional mortality improvement scale MP-2019, weighted 80% male and 20% female.

For optional forms of payment and reserves, we would apply a similar methodology. However, the projection of the mortality improvement would be from the measurement year over a period that is close to the duration of the benefit payments for active members retiring in the next three

years. The recommended tables along with the mortality rates will be provided in a separate letter at a later date, similar to prior years.

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

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

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

Chart 10: Post-Retirement Benefit-Weighted Deaths (In Millions)
Non-Disabled General Members (July 1, 2010 through June 30, 2019)

Legend: ■ Expected - Current ■ Actual ■ Expected - Proposed

	Male	Female	Total
Expected - Current	$14.47	$12.70	$27.17
Actual	$11.72	$11.37	$23.09
Expected - Proposed	$11.40	$10.11	$21.51
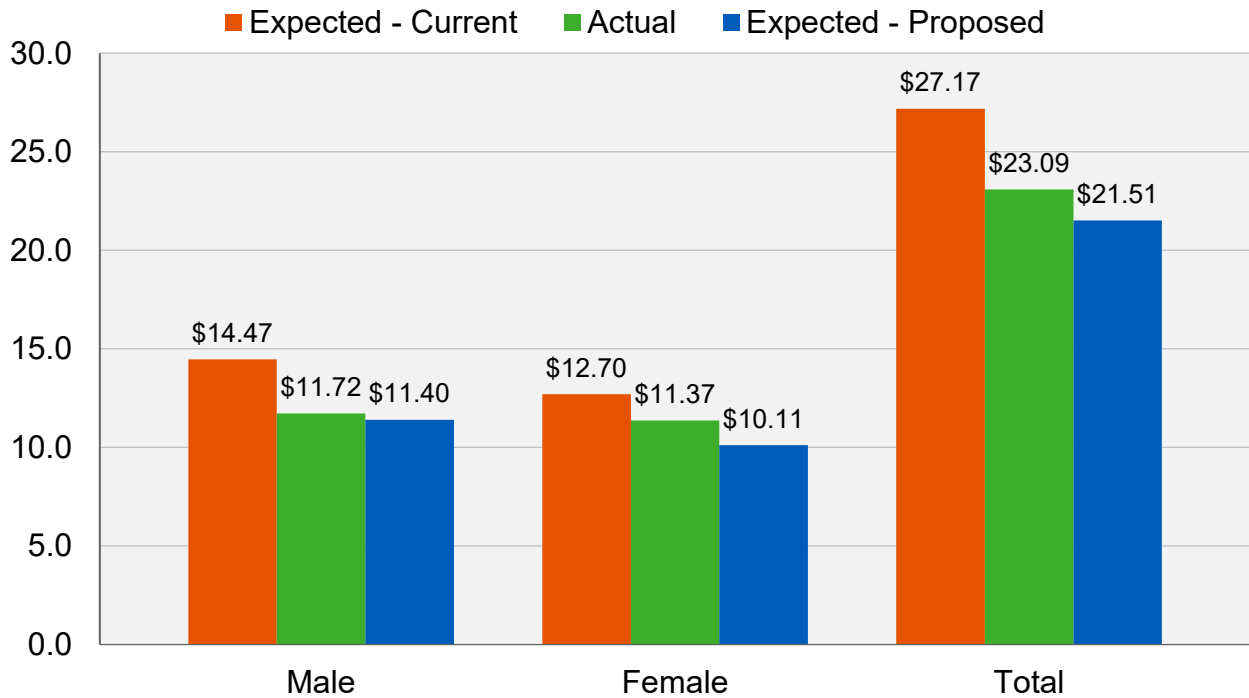
Chart 11: Post-Retirement Benefit-Weighted Deaths (In Millions)
Non-Disabled Safety Members (July 1, 2010 through June 30, 2019)

Legend: ■ Expected - Current ■ Actual ■ Expected - Proposed

	Male	Female	Total
Expected - Current	$8.39	$0.48	$8.87
Actual	$6.90	$0.31	$7.21
Expected - Proposed	$6.31	$0.40	$6.71
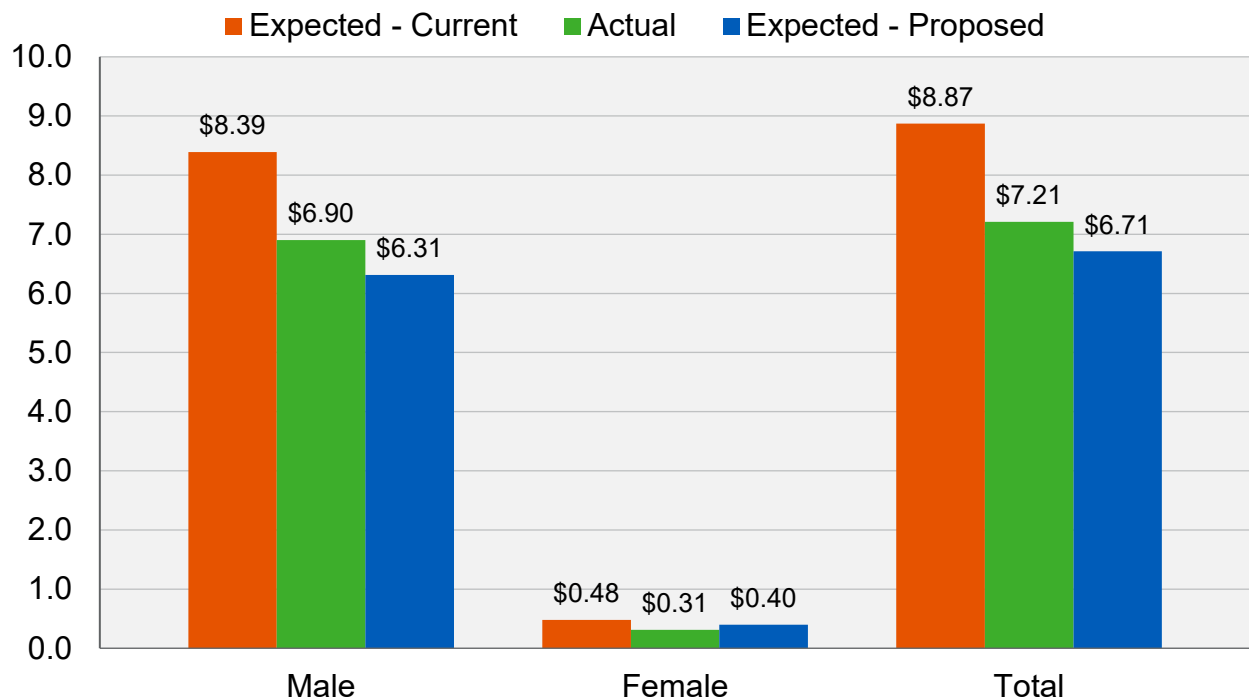
Chart 12: Post-Retirement Headcount-Weighted Deaths
Non-Disabled General Members (July 1, 2010 through June 30, 2019)
Provided for Informational Purposes Only

Legend: ■ Expected - Current ■ Actual ■ Expected - Proposed

	Expected - Current	Actual	Expected - Proposed
Male	412	381	334
Female	620	625	519
Total	1,032	1,006	853
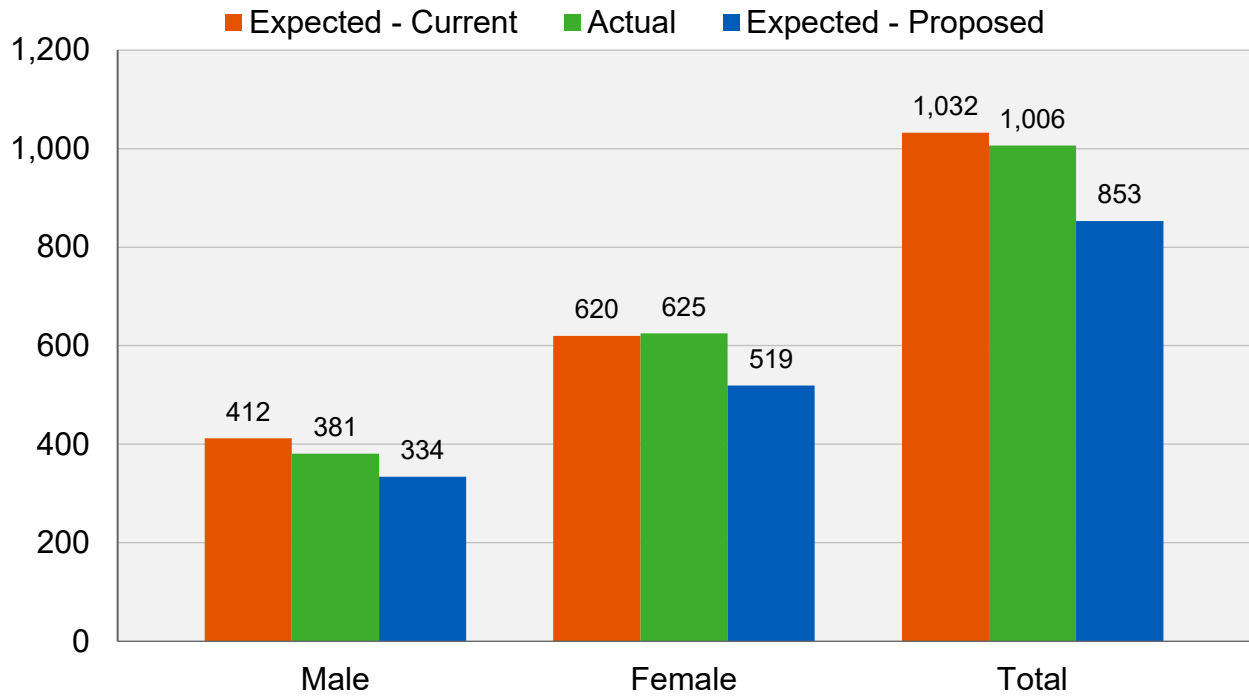
Chart 13: Post-Retirement Headcount-Weighted Deaths
Non-Disabled Safety Members (July 1, 2010 through June 30, 2019)
Provided for Informational Purposes Only

Legend: ■ Expected - Current ■ Actual ■ Expected - Proposed

	Expected - Current	Actual	Expected - Proposed
Male	143	150	114
Female	10	7	9
Total	153	157	123
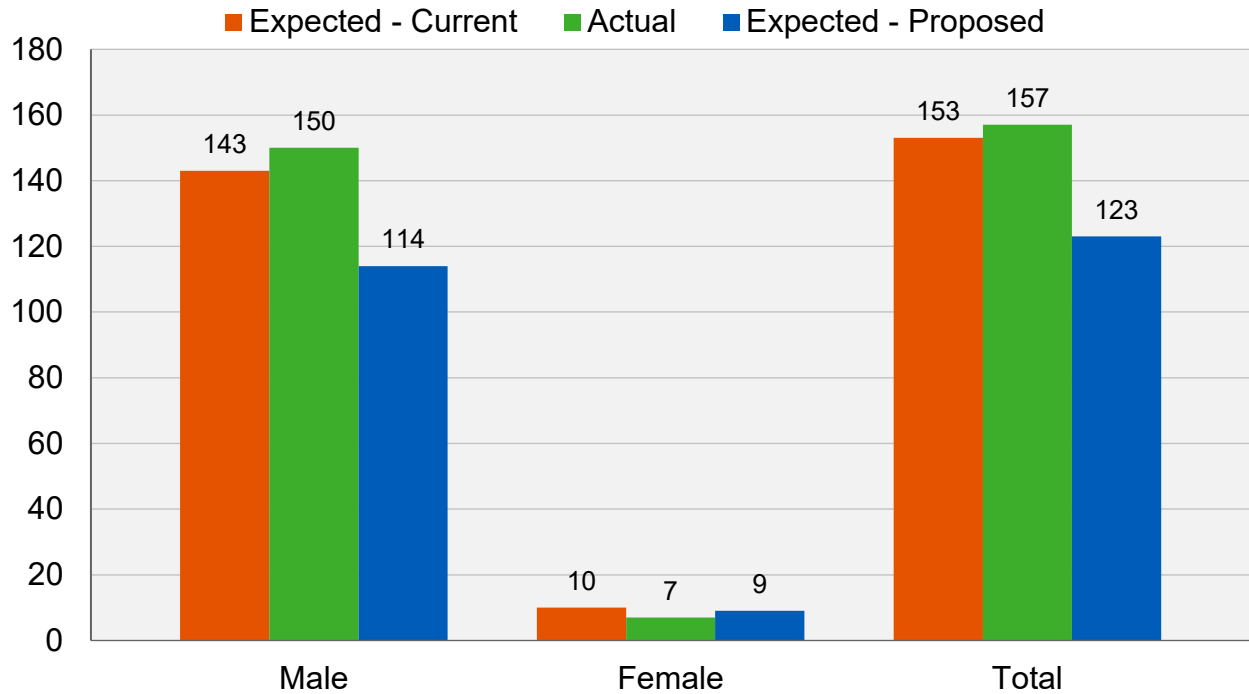
Chart 14: Benefit-Weighted Life Expectancies
Non-Disabled General Members

Legend: Current (Male), Proposed (Male), Current (Female), Proposed (Female)
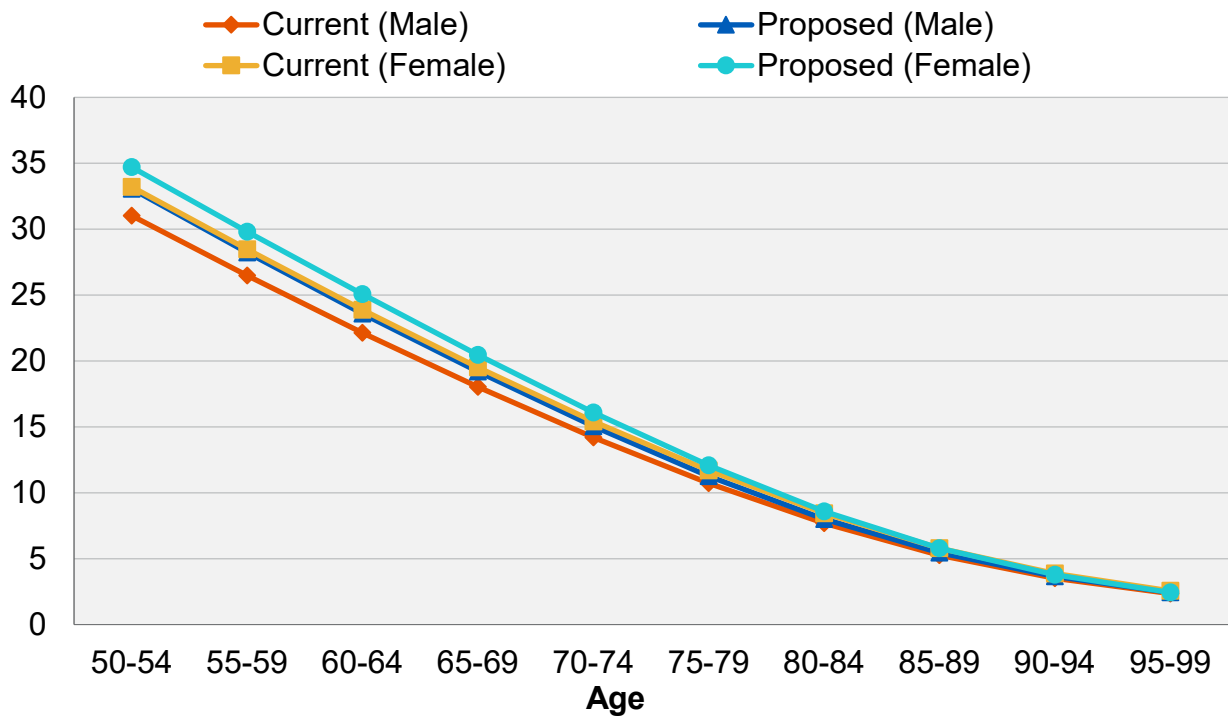
Chart 15: Benefit-Weighted Life Expectancies
Non-Disabled Safety Members

Legend: Current (Male), Proposed (Male), Current (Female), Proposed (Female)
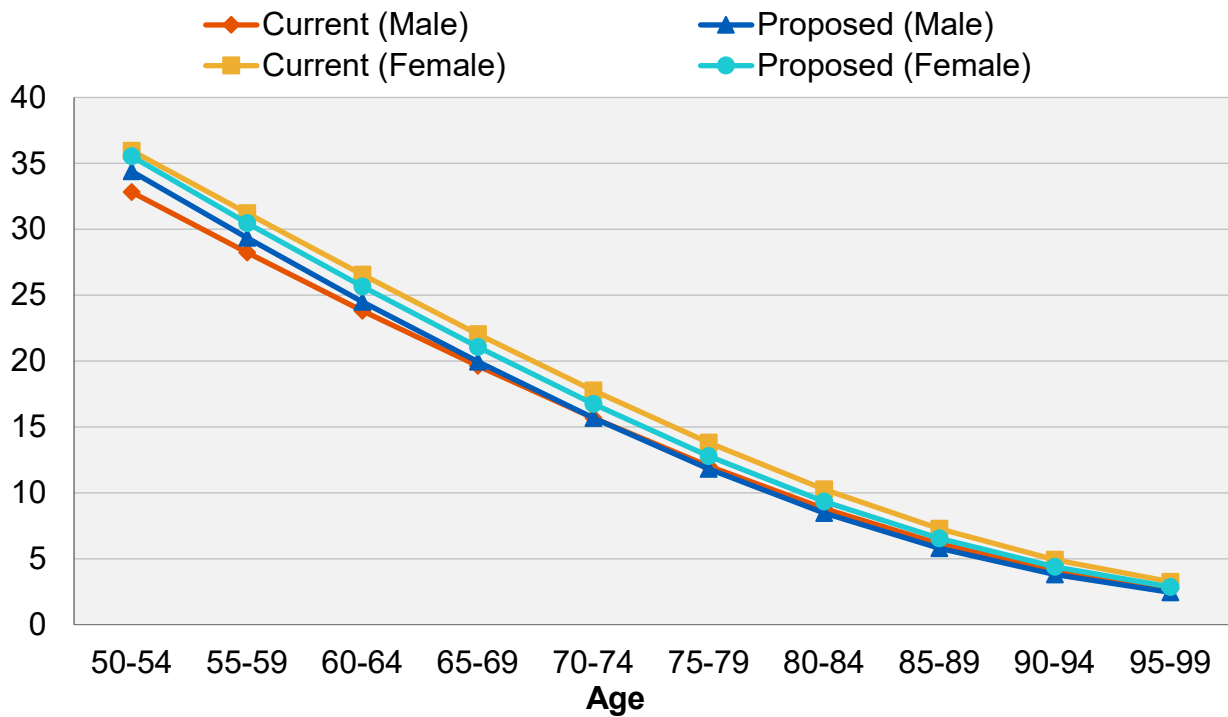
C. Mortality Rates - Disabled

Since mortality rates for disabled members can vary from those of healthy members, a different mortality assumption is often used. For General members, the table currently being used is the Headcount-Weighted RP-2014 Healthy Annuitant Table (separate tables for males and females) projected generationally with the two-dimensional mortality improvement scale MP-2016, set forward seven years for males and set forward eight years for females. For Safety members, the table currently being used is the Headcount-Weighted RP-2014 Healthy Annuitant Table (separate tables for males and females) projected generationally with the two-dimensional mortality improvement scale MP-2016, set forward three years for males and females.

Similar to mortality rates for service retirees, the proposed mortality table reflects current experience to the extent that the experience is credible based on standard statistical theory. For KCERA, there is far less data for disabled retirees, so it is given little credibility. The proposed mortality tables (as shown in the table below) after adjustments for partial credibility have actual to expected ratios of 87% and 112% for General and Safety, respectively. In future years the ratio should remain around 87% and 112% for General and Safety, respectively, as long as actual mortality improves at the same rates as anticipated by the generational mortality tables. The number of actual deaths compared to the number expected under the current and proposed assumptions weighted by benefit amounts for the last nine years are as follows:

Gender	General Members – Disabled ($ in millions)			Safety Members – Disabled ($ in millions)		
	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths
Male	1.45	1.19	1.32	3.37	2.90	2.63
Female	1.55	1.27	1.50	0.21	0.25	0.18
Total	3.00	2.46	2.82	3.58	3.15	2.81
Actual / Expected	82%		87%	88%		112%

Notes: (1) Experience shown above is weighted by annual benefit amounts for deceased members instead of by headcounts.
(2) Expected amounts under the proposed generational mortality table are based on mortality rates from the base year projected with mortality improvements to the experience study period.

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

For General disabled members, we recommend updating the current table to the Pub-2010 Non-Safety Disabled Retiree Amount-Weighted Mortality Table (separate tables for males and females) with rates decreased by 5%, projected generationally with the two-dimensional mortality improvement scale MP-2019. The recommended mortality table has an actual to expected ratio of 87%.

For Safety disabled members, we recommend updating the current table to the Pub-2010 Safety Disabled Retiree Amount-Weighted Mortality Table (separate tables for males and females) with rates increased by 5%, projected generationally with the two-dimensional

mortality improvement scale MP-2019. The recommended mortality table has an actual to expected ratio of 112%.

For informational purposes only, we have also provided in the table below the actual and expected deaths computed without weighting these by benefit amounts. This is similar to how actual and expected death ratios were developed based on the prior headcount approach.

Gender	General Members – Disabled			Safety Members – Disabled		
	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths
Male	63	56	56	78	77	62
Female	80	74	77	7	8	6
Total	143	130	133	84	85	68
Actual / Expected	91%		98%	101%		126%

Notes: (1) Experience shown above is weighted by headcounts for deceased members instead of by annual benefit amounts.
(2) The proposed expected deaths are based on the Pub-2010 Amount-Weighted Above-Median Mortality Tables.

Chart 16 compares actual to expected deaths on a benefit-weighted basis for disabled General members under the current and proposed assumptions over the past nine years.

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

Chart 18 compares actual to expected deaths on a headcount-weighted basis for disabled General members under the current and proposed assumptions over the past nine years provided for informational purposes only.

Chart 19 compares actual to expected deaths on a headcount-weighted basis for disabled Safety members under the current and proposed assumptions over the past nine years provided for informational purposes only.

Chart 20 shows the life expectancies (i.e., expected future lifetime) under the current and the proposed tables for disabled General members on a benefit-weighted basis. Life expectancies under the proposed generational mortality rates are based on age as of 2020. In practice, life expectancies will be assumed to increase based on applying the mortality improvement scale.

Chart 21 shows the life expectancies (i.e., expected future lifetime) under the current and the proposed tables for disabled Safety members on a benefit-weighted basis.

Chart 16: Post-Retirement Benefit-Weighted Deaths (In Millions)
Disabled General Members (July 1, 2010 through June 30, 2019)

Legend: ■ Expected - Current   ■ Actual   ■ Expected - Proposed

	Expected - Current	Actual	Expected - Proposed
Male	$1.45	$1.19	$1.32
Female	$1.55	$1.27	$1.50
Total	$3.00	$2.46	$2.82
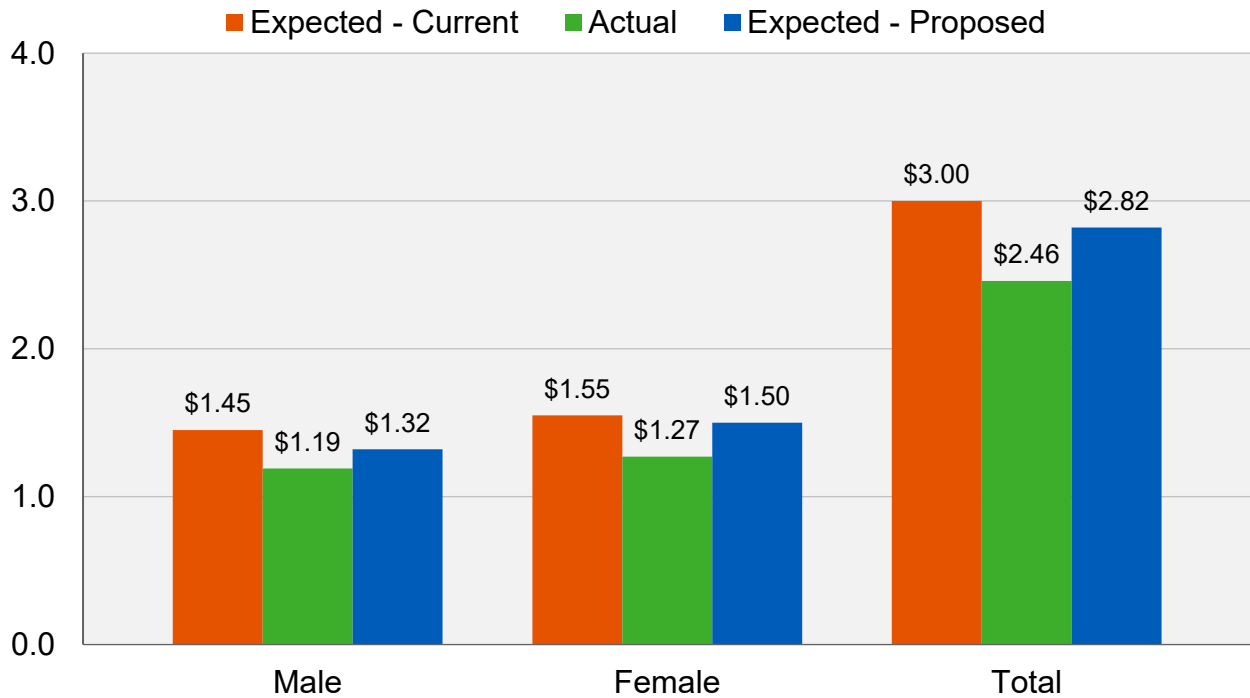
Chart 17: Post-Retirement Benefit-Weighted Deaths (In Millions)
Disabled Safety Members (July 1, 2010 through June 30, 2019)

Legend: ■ Expected - Current   ■ Actual   ■ Expected - Proposed

	Expected - Current	Actual	Expected - Proposed
Male	$3.37	$2.90	$2.63
Female	$0.21	$0.25	$0.18
Total	$3.58	$3.15	$2.81
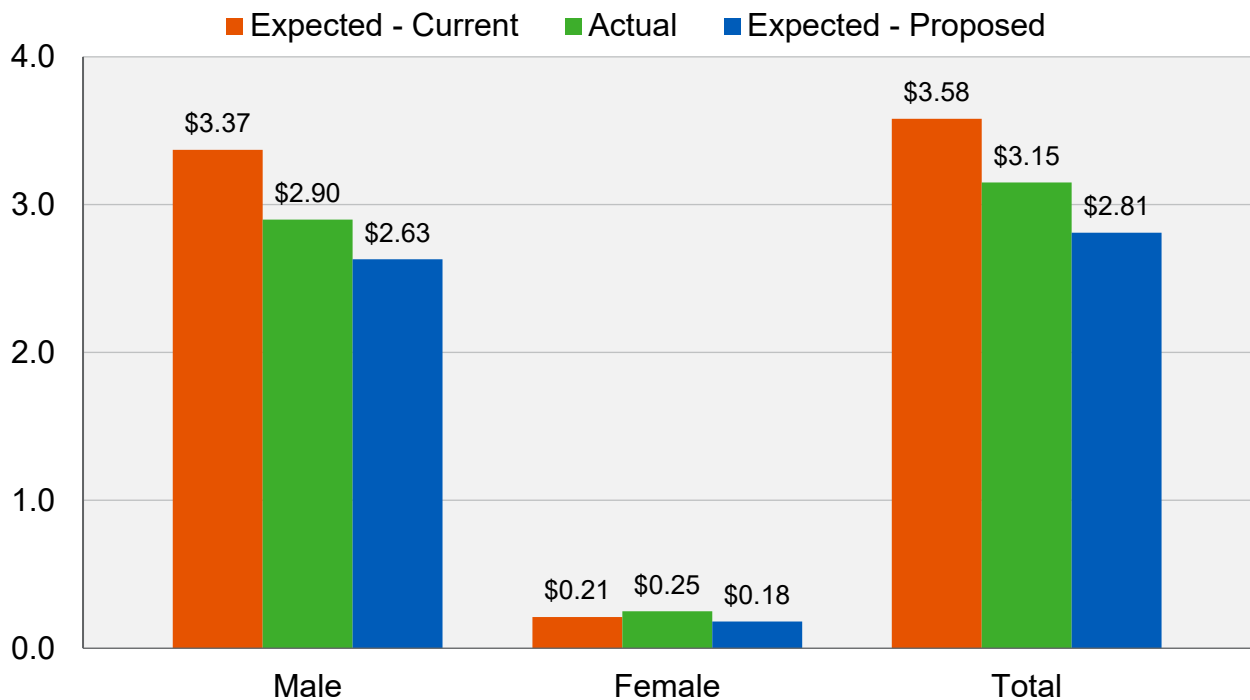
Chart 18: Post-Retirement Headcount-Weighted Deaths
Disabled General Members (July 1, 2010 through June 30, 2019)
Provided for Informational Purposes Only

Legend: Expected - Current | Actual | Expected - Proposed

	Male	Female	Total
Expected - Current	63	80	143
Actual	56	74	130
Expected - Proposed	56	77	133
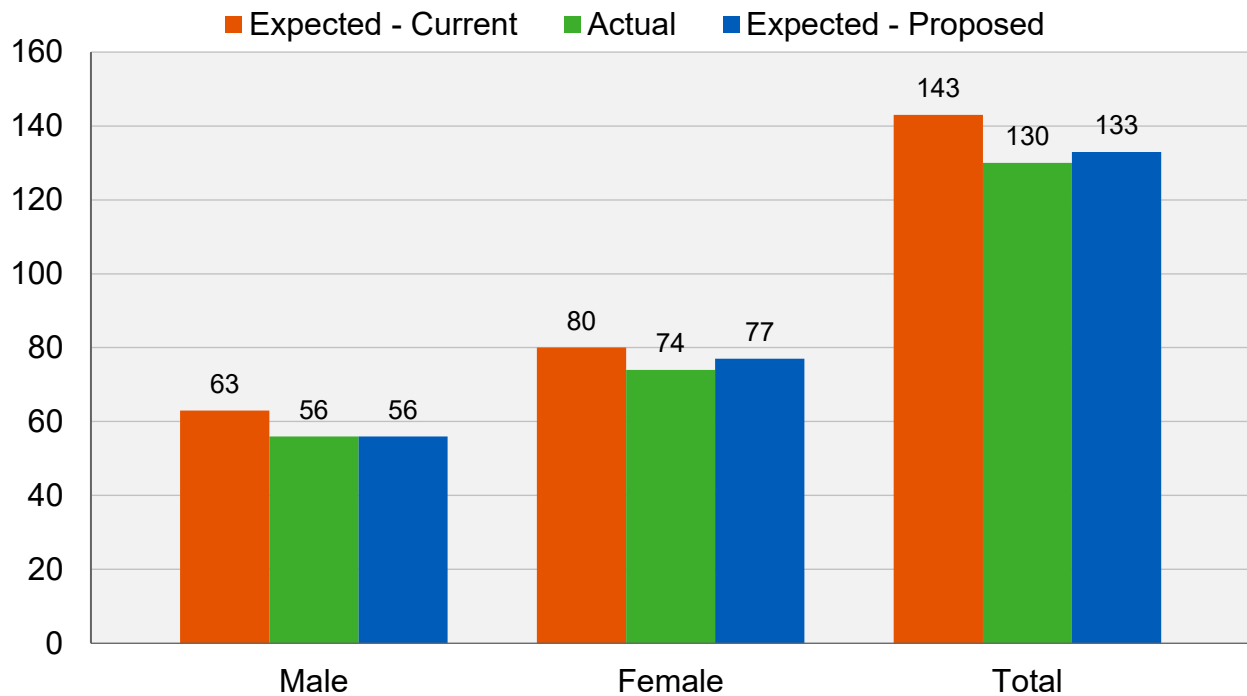
Chart 19: Post-Retirement Headcount-Weighted Deaths
Disabled Safety Members (July 1, 2010 through June 30, 2019)
Provided for Informational Purposes Only

Legend: Expected - Current | Actual | Expected - Proposed

	Male	Female	Total
Expected - Current	78	7	84
Actual	77	8	85
Expected - Proposed	62	6	68
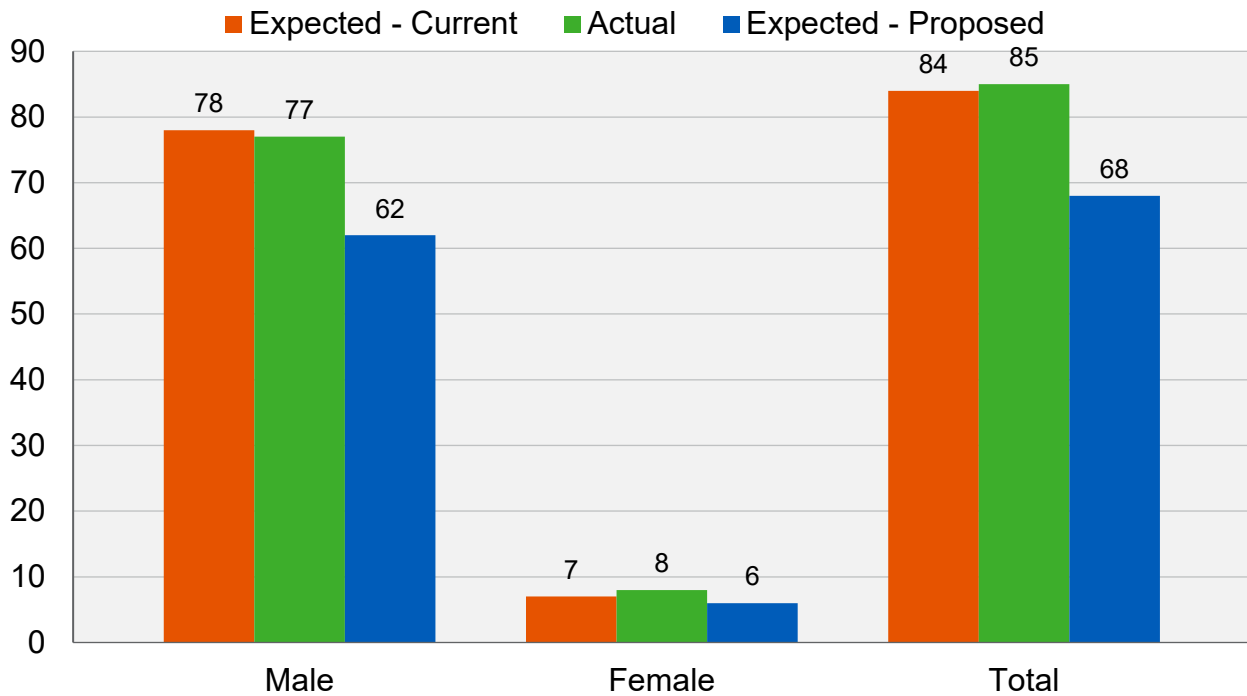
Chart 20: Benefit-Weighted Life Expectancies
Disabled General Members

Legend: Current (Male), Proposed (Male), Current (Female), Proposed (Female)

X-axis: Age (50-54, 55-59, 60-64, 65-69, 70-74, 75-79, 80-84, 85-89, 90-94, 95-99)
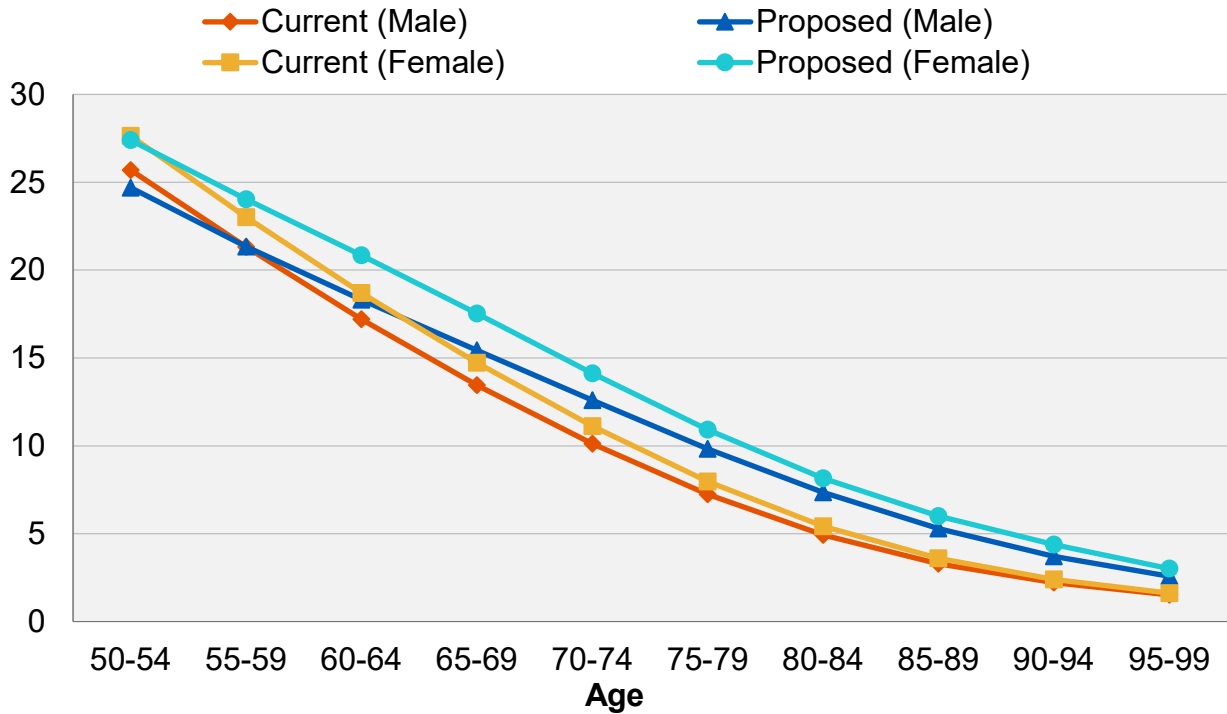
Chart 21: Benefit-Weighted Life Expectancies
Disabled Safety Members

Legend: Current (Male), Proposed (Male), Current (Female), Proposed (Female)

X-axis: Age (50-54, 55-59, 60-64, 65-69, 70-74, 75-79, 80-84, 85-89, 90-94, 95-99)
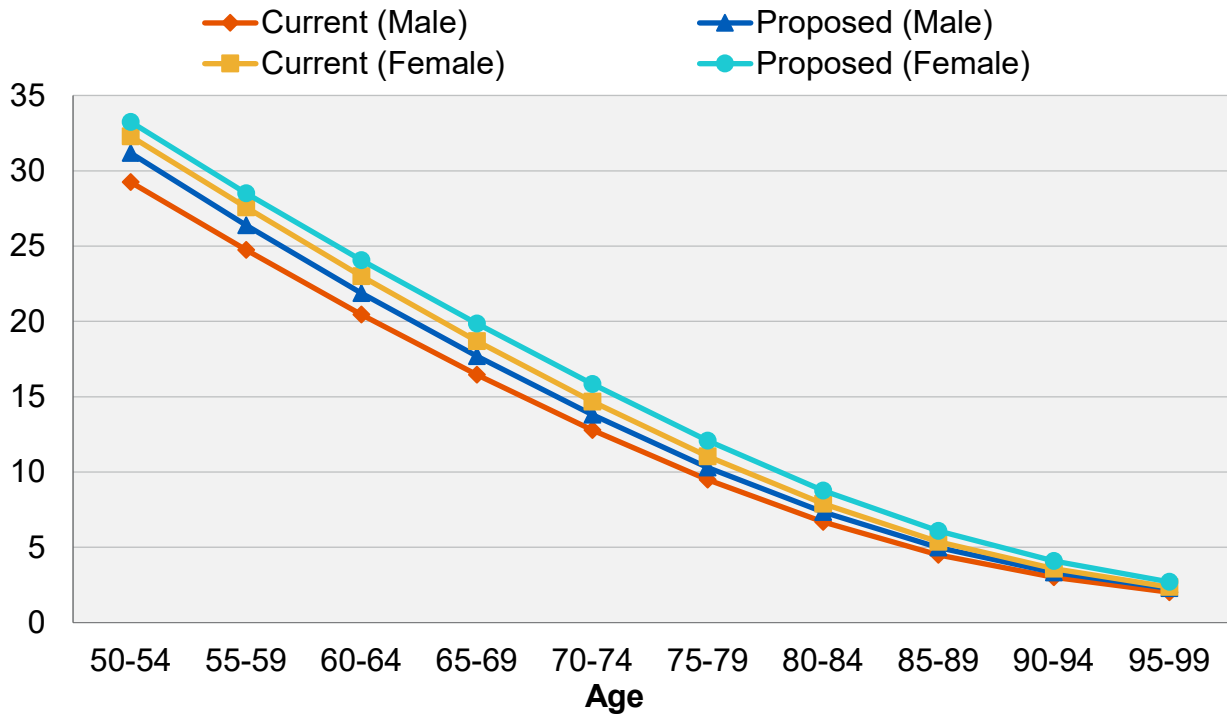
D. Termination Rates

Termination rates include all terminations for reasons other than death, disability, or retirement. Under the current assumptions there is an overall assumed incidence of total termination based on the plan membership, and years of service, combined with an assumption as to whether the terminated vested member will choose a deferred vested benefit or a refund of contributions. The latter assumption is also based on plan membership and years of service. With this study, we continue to recommend that this same assumption structure be used.

The termination experience over the last six years for General and Safety members is shown by years of service in the following tables. We have included six years of experience, rather than only the three years of the current experience period, in order to improve the credibility of KCERA's termination experience. Please note that we have excluded any members that were eligible for retirement. We also show the current and proposed assumptions.

Rates of Termination – General

Years of Service	Termination Rate (%)		
	Current Rate	Observed Rate	Proposed Rate
Less than 1	17.00	16.74	17.00
1 – 2	13.00	12.56	13.00
2 – 3	10.00	10.85	10.00
3 – 4	9.00	8.94	9.00
4 – 5	7.50	9.03	8.50
5 – 6	6.50	7.94	8.00
6 – 7	5.50	7.05	7.00
7 – 8	5.00	5.87	6.00
8 – 9	4.50	5.77	5.00
9 – 10	4.00	4.00	4.00
10 – 11	3.25	4.16	3.75
11 – 12	3.00	4.00	3.50
12 – 13	2.80	5.18	3.25
13 – 14	2.60	2.30	3.00
14 – 15	2.40	2.38	2.75
15 – 16	2.30	3.13	2.50
16 – 17	2.20	2.95	2.30
17 – 18	2.10	2.11	2.10
18 – 19	1.90	0.98	1.90
19 – 20	1.70	2.76	1.70
20 – 21	1.50	2.75	1.50
21 – 22	1.30	2.48	1.30
22 – 23	1.10	2.86	1.10
23 – 24	1.00	0.83	1.00
24 – 25	1.00	1.35	1.00
25 – 26	1.00	3.39	1.00
26 – 27	1.00	4.65	1.00
27 – 28	1.00	4.35	1.00
28 – 29	1.00	0.00	1.00
29 – 30	1.00	0.00	1.00
30 & Over	0.00	N/A	0.00

Rates of Termination – Safety

Years of Service	Termination Rate (%)		
	Current Rate	Observed Rate	Proposed Rate
Less than 1	8.00	9.03	9.00
1 – 2	6.00	8.49	8.00
2 – 3	4.50	7.63	7.00
3 – 4	4.00	6.44	6.00
4 – 5	3.50	6.24	5.00
5 – 6	3.00	3.77	4.00
6 – 7	2.50	3.01	3.50
7 – 8	2.20	4.07	3.25
8 – 9	2.10	3.43	3.00
9 – 10	2.00	3.54	2.60
10 – 11	1.90	2.37	2.20
11 – 12	1.80	1.71	1.80
12 – 13	1.60	0.46	1.60
13 – 14	1.40	1.63	1.40
14 – 15	1.20	1.67	1.20
15 – 16	1.00	1.58	1.00
16 – 17	0.90	0.49	0.90
17 – 18	0.75	0.88	0.75
18 – 19	0.75	0.37	0.75
19 – 20	0.75	0.58	0.75
20 & Over	0.00	N/A	0.00

Based upon the recent experience, we recommend the termination rates for most service categories for both General and Safety members be increased as shown above. It is important to note that not every service category has enough exposures and/or decrements such that the results in that category are statistically credible. This is mainly the case at the highest service 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 in the tables that follow due to the even more limited experience regarding actual terminations.

The next two tables show the refund election experience over the last six years for General and Safety members.

Rates of Electing a Refund of Contributions upon Termination – General

Years of Service*	Rates of Electing a Refund of Contributions upon Termination (%)		
	Current Rate	Observed Rate	Proposed Rate
5 – 6	45.00	31.91	36.00
6 – 7	42.00	34.38	34.00
7 – 8	40.00	20.37	32.00
8 – 9	36.00	23.64	30.00
9 – 10	32.00	20.90	28.00
10 – 11	30.00	21.28	26.00
11 – 12	28.00	17.07	25.00
12 – 13	26.00	20.93	24.00
13 – 14	24.00	18.75	23.00
14 – 15	22.00	25.00	22.00
15 – 16	20.00	21.05	21.00
16 – 17	18.00	0.00	18.00
17 – 18	16.00	11.11	16.00
18 – 19	14.00	33.33	14.00
19 – 20	13.00	14.29	13.00
20 – 21	12.00	0.00	12.00
21 – 22	11.00	0.00	11.00
22 – 23	10.00	0.00	10.00
23 – 24	8.00	0.00	8.00
24 – 25	6.00	0.00	6.00
25 – 26	4.00	0.00	4.00
26 – 27	2.00	0.00	2.00
27 & Over	0.00	0.00	0.00

*   All members with less than 5 years of service are assumed to elect a refund of contributions

Rates of Electing a Refund of Contributions upon Termination – Safety

Years of Service*	Rates of Electing a Refund of Contributions upon Termination (%)		
	Current Rate	Observed Rate	Proposed Rate
5 – 6	50.00	35.00	44.00
6 – 7	46.00	25.00	40.00
7 – 8	44.00	36.36	38.00
8 – 9	36.00	26.32	32.00
9 – 10	32.00	21.05	30.00
10 – 11	28.00	16.67	26.00
11 – 12	25.00	0.00	25.00
12 – 13	21.00	0.00	21.00
13 – 14	18.00	0.00	18.00
14 – 15	15.00	14.29	15.00
15 – 16	12.00	28.57	12.00
16 – 17	10.00	0.00	10.00
17 – 18	8.00	0.00	8.00
18 – 19	6.00	0.00	6.00
19 – 20	4.00	0.00	4.00
20 & Over	0.00	N/A	0.00

*   All members with less than 5 years of service are assumed to elect a refund of contributions

Chart 22 compares actual to expected terminations over the past six years for both the current and proposed assumptions.

Chart 23 shows the actual termination rates over the past six years compared to the current and proposed assumptions for General members.

Chart 24 shows the same information as Chart 22, but for Safety members.

Chart 25 shows the actual rates of electing a refund of contributions compared to the current and proposed assumptions for General members.

Chart 26 shows the same information as Chart 24, but for Safety members.

For both General and Safety members, the overall actual rates for electing a refund of contributions are comparable to the current assumptions for the past six years but there are differences in certain service bands. **For General members, we recommend decreasing the rates of electing a refund of contributions between 5 and 13 years of service and increasing the rate of electing a refund of contributions at 15 years of service, as shown**

above. For Safety members, we recommend decreasing the rates of electing a refund of contributions between 5 and 10 years of service, as shown above.

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

Chart 22: Actual Number of Terminations Compared to Expected
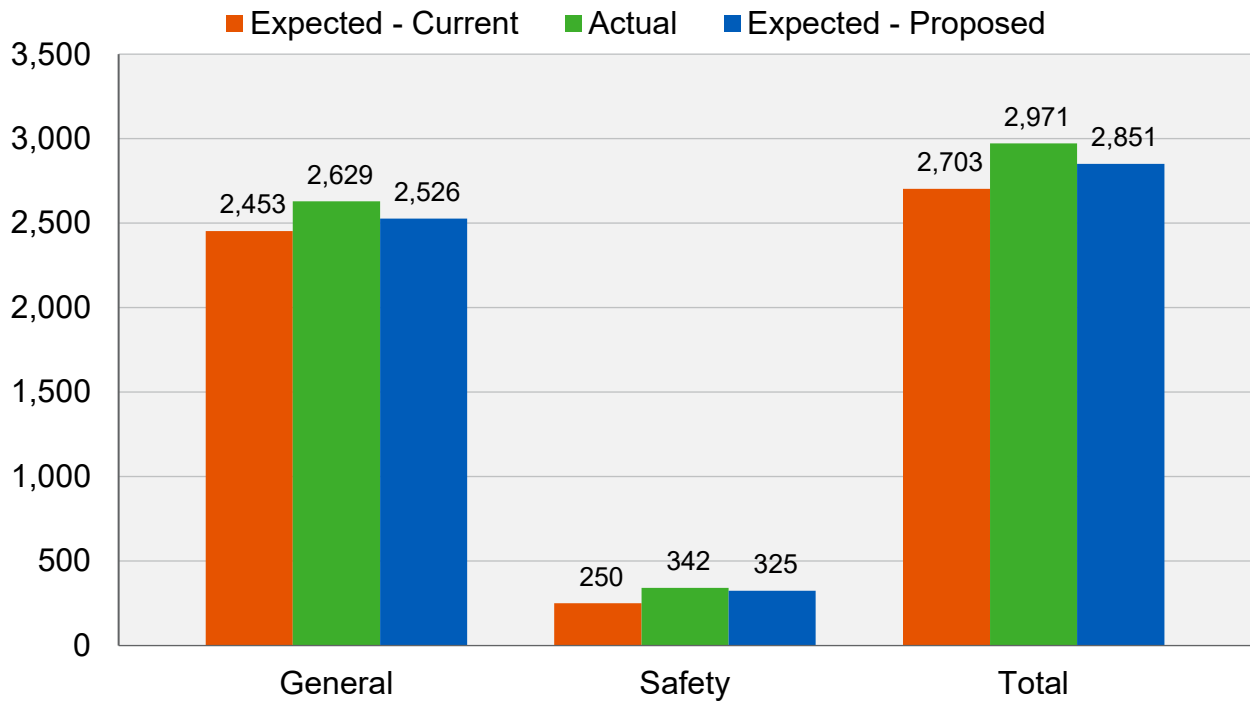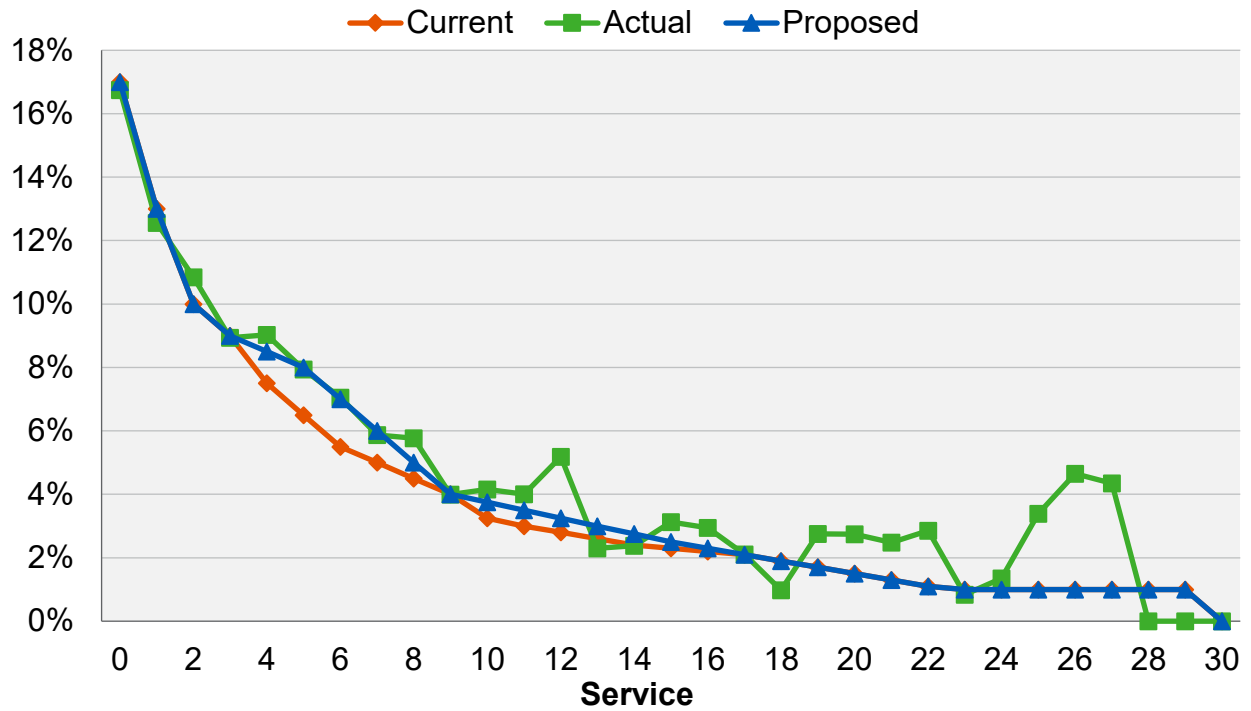
Chart 23: Termination Rates – General Members

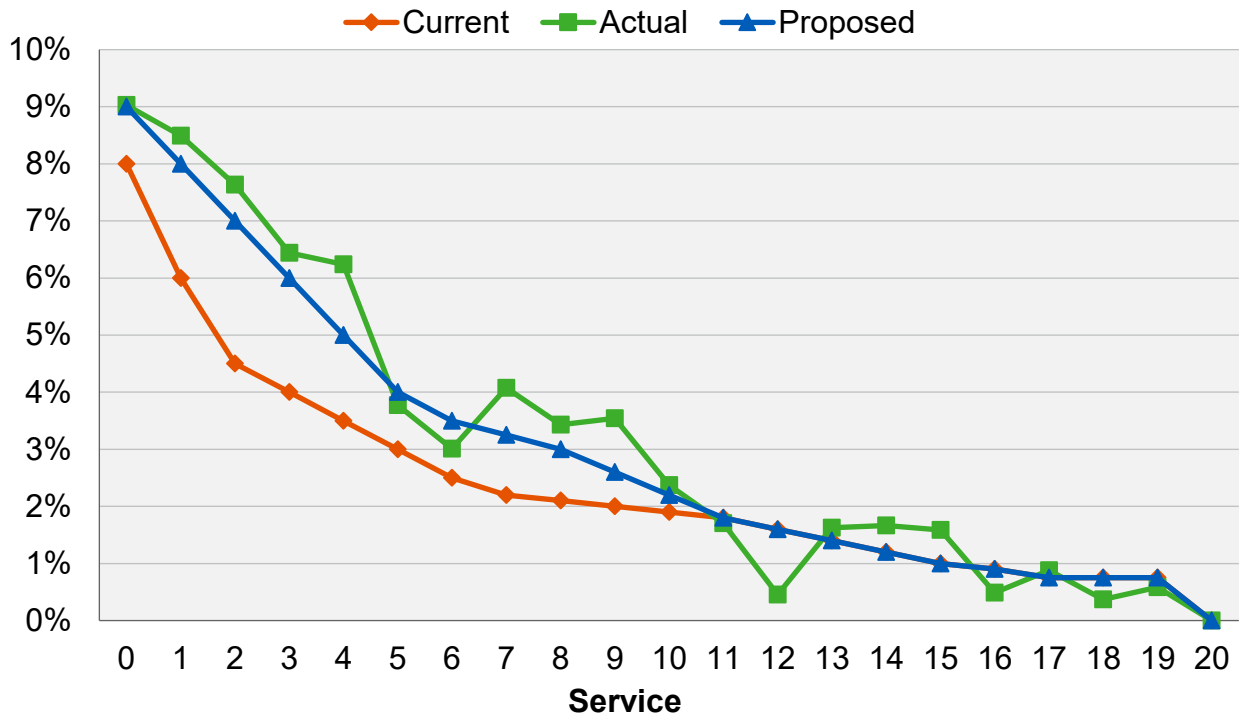# Chart 24: Termination Rates – Safety Members

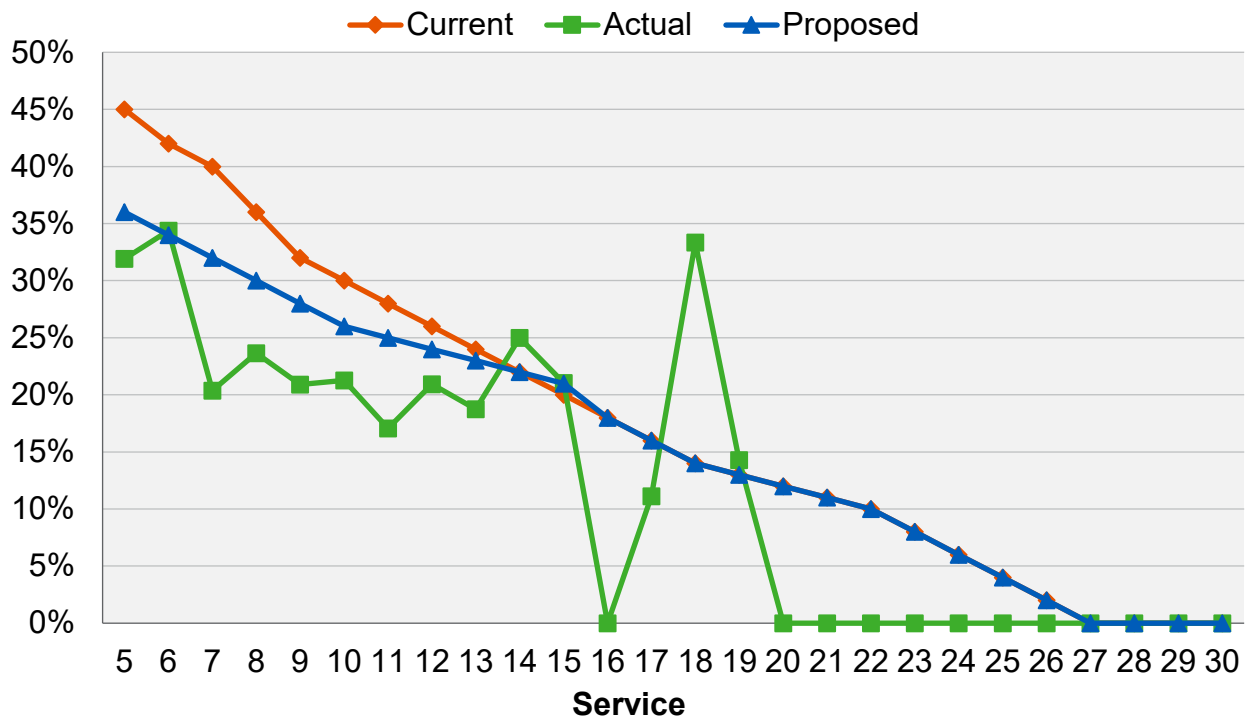# Chart 25: Rates of Electing a Refund – General Members

Chart 26: Rates of Electing a Refund – Safety Members
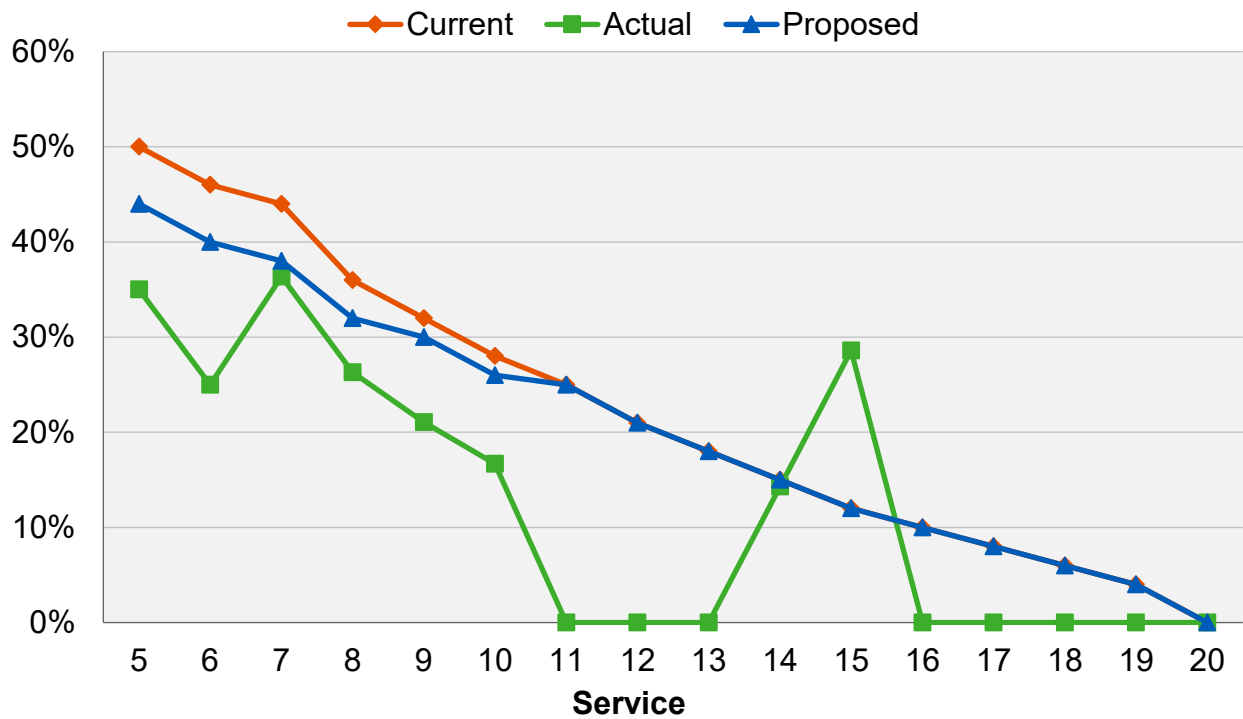
E. Disability Incidence Rates

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

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

Rates of Disability Incidence

	Disability Incidence Rate (%)					
	General			Safety		
Age	Current Rate	Observed Rate	Proposed Rate	Current Rate	Observed Rate	Proposed Rate
20 – 24	0.02	0.00	0.02	0.05	0.00	0.05
25 – 29	0.03	0.00	0.03	0.08	0.00	0.08
30 – 34	0.05	0.00	0.05	0.15	0.09	0.12
35 – 39	0.10	0.00	0.08	0.30	0.18	0.24
40 – 44	0.12	0.04	0.10	0.40	0.10	0.30
45 – 49	0.20	0.00	0.15	0.50	0.40	0.45
50 – 54	0.25	0.17	0.20	1.50	0.00	1.50
55 – 59	0.30	0.17	0.30	3.25	3.65	3.25
60 – 64	0.40	0.44	0.40	4.00	1.35	4.00
65 – 69	0.40	0.22	0.40	0.00	0.00	0.00
70 – 74	0.00	0.00	0.00	0.00	0.00	0.00

Chart 27 compares the actual number of non-service connected and service connected disabilities over the past three years to that expected under both the current and proposed assumptions.

Chart 28 shows actual disability incidence rates, compared to the assumed and proposed rates for General members. Since 56% of disabled General members received a service connected disability, **we recommend maintaining the current assumption that 50% of disabilities will receive a service connected disability retirement. The remaining 50% of disabled General members are assumed to receive a non-service connected disability.**

Chart 29 graphs the same information as Chart 28, but for Safety members. Since 87% of disabled Safety members received a service connected disability, **we recommend maintaining the current assumption that 90% of disabilities will receive a service connected disability retirement. The remaining 10% of disabled Safety members are assumed to receive a non-service connected disability.**

Chart 27: Actual Number of Service and Non-service Disability Retirements Compared to Expected

Legend: Expected - Current (orange), Actual (green), Expected - Proposed (blue)

Category	Expected - Current	Actual	Expected - Proposed
General	35	16	31
Safety	29	15	26
Total	64	31	57
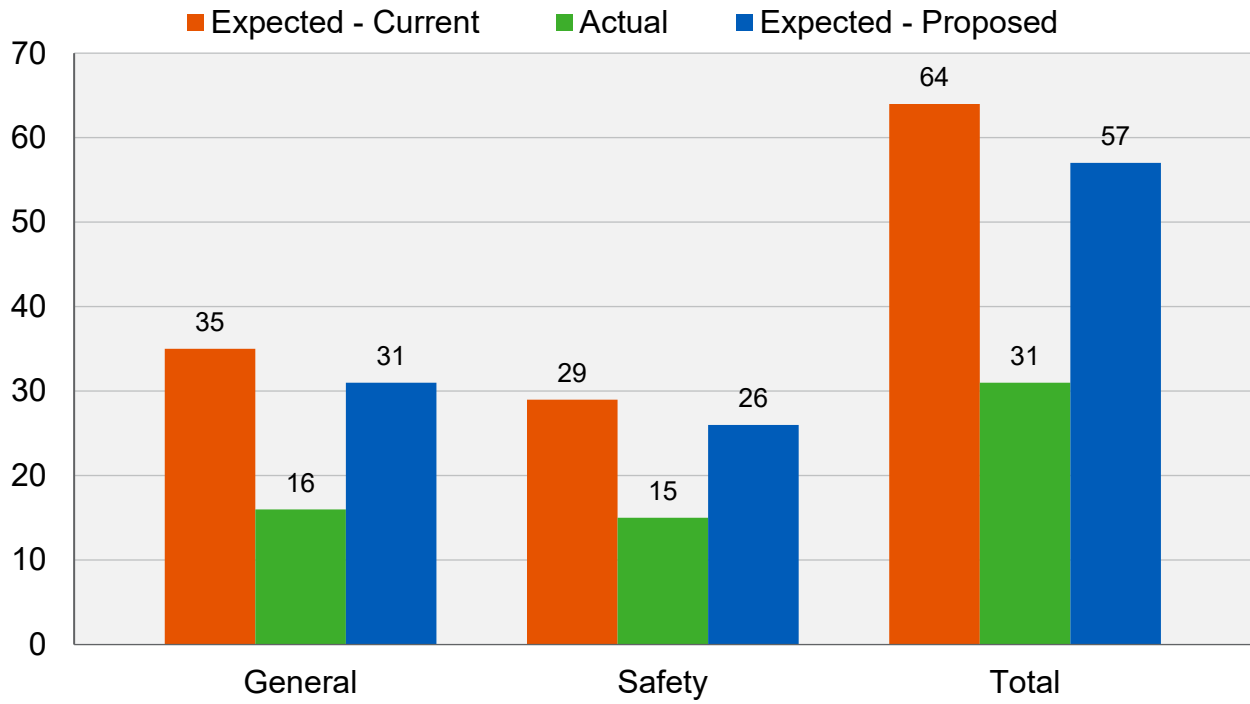
Chart 28: Disability Incidence Rates
General Members
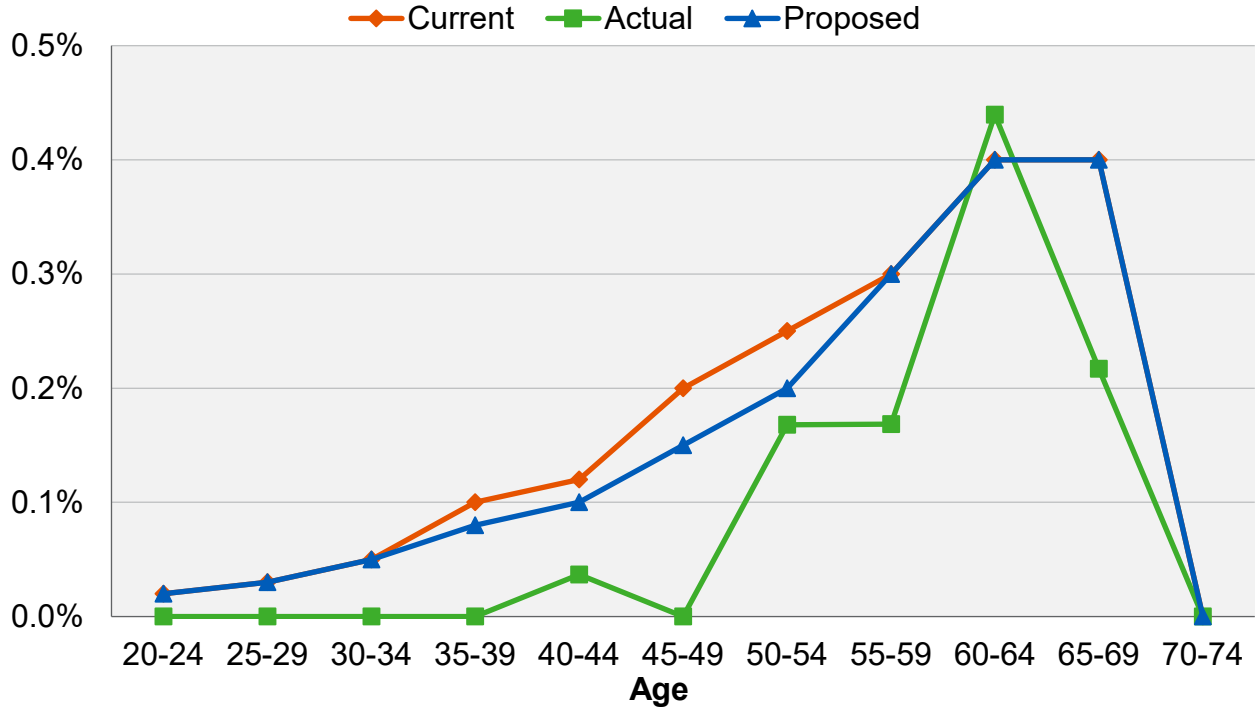
Chart 29: Disability Incidence Rates
Safety Members
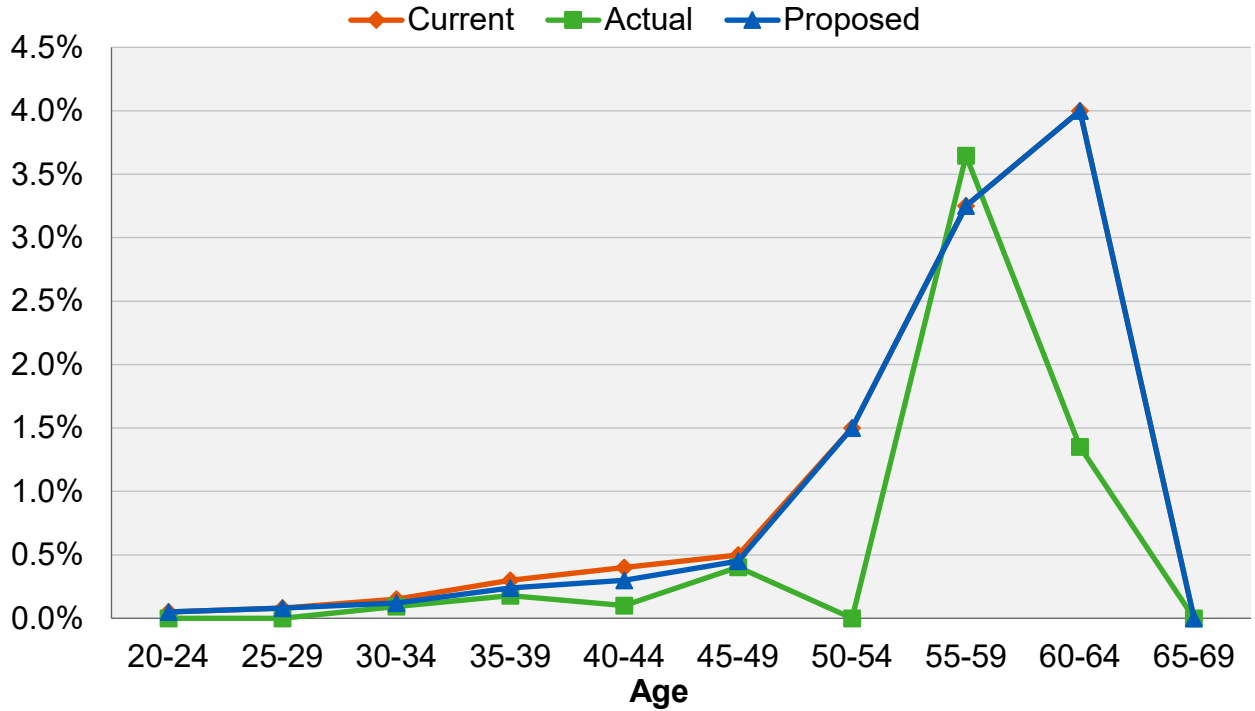
V. Cost Impact

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

The cost associated with the administrative expense load has continued to be allocated to both the employer and the member based on the components of the total contribution rate (before administrative expenses) for the employer and the member.[29]

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

Impact on Employer Contribution Rates	
Increase due to changes in economic assumptions	0.27%
Increase due to changes in demographic assumptions	<u>1.94%</u>
Total increase in average employer rate	2.21%
Total estimated increase in annual dollar amount ($000s)[30]	$12,815
Impact on Member Contribution Rates	
Decrease due to changes in economic assumptions	-0.05%
Increase due to changes in demographic assumptions	<u>0.07%</u>
Total increase in average member rate	0.02%
Total estimated increase in annual dollar amount ($000s)[30]	$44
Impact on UAAL and Funded Percentage	
Increase in UAAL	$137 million
Change in Funded Percentage	From 64.80% to 63.49%

Of the various demographic assumption changes, the cost increase is from the change in the mortality assumptions, offset somewhat by the other demographic assumption changes.

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[29] The actual allocation of contribution rates for administrative expenses will be determined in each actuarial valuation to reflect the relative proportion of employer and member contributions.

[30] Based on June 30, 2019 projected annual payroll as determined under each set of assumptions.

We have also analyzed in the tables below the average employer and member contribution rate impacts for each cost group due to the recommended assumption changes as if they were applied to the June 30, 2019 actuarial valuation.

Employer Contribution Rate Increases/(Decreases) (% of Payroll) (Estimated Annual Dollar amounts in Thousands)				
	Normal Cost	UAAL	Total	Annual Amount[31]
General County without Courts	-0.07%	2.50%	2.43%	$9,356
Courts	0.02%	2.50%	2.52%	785
County Safety	-1.11%	2.47%	1.36%	1,670
District Category I	0.00%	2.72%	2.72%	162
District Category II	-0.12%	2.72%	2.60%	58
District Category III	0.02%	2.72%	2.74%	712
District Category V	-0.06%	2.72%	2.66%	32
District Category VI	0.11%	2.72%	2.83%	12
Declining Employers	0.00%	17.39%	17.39%	28
Combined	**-0.30%**	**2.51%**	**2.21%**	**$12,815**

[31] Based on June 30, 2019 projected annual payroll as determined under each set of assumptions.

	Total	Annual Amount[31]
Average Member Contribution Rate Increases/(Decreases) (% of Payroll) (Estimated Annual Dollar Amounts in Thousands)		
County General Tier I without Courts	0.16%	$232
County General Tier IIA without Courts	0.25%	163
County General Tier IIB without Courts	-0.02%	-61
Courts Tier I	0.00%	-3
Courts Tier IIA	0.23%	6
Courts Tier IIB	-0.02%	-4
County Safety Tier I	0.00%	-18
County Safety Tier IIA	0.02%	0
County Safety Tier IIB	-1.00%	-284
District Category I Tier I	0.09%	4
District Category I Tier IIA	0.28%	2
District Category I Tier IIB	-0.02%	0
District Category II Tier I	0.18%	3
District Category II Tier IIB	-0.02%	-1
District Category II Tier III	0.01%	0
District Category III Tier I (Buttonwillow)	0.28%	-4
District Category III Tier I (SJVAPCD)	0.05%	10
District Category III Tier IIA (Buttonwillow)	-0.02%	0
District Category III Tier IIA (SJVAPCD)	0.00%	0
District Category III Tier IIB	-0.02%	-2
District Category V Tier I	0.04%	0
District Category V Tier IIA	0.27%	1
District Category V Tier IIB	-0.02%	0
District Category VI Tier I	0.00%	0
District Category VI Tier IIB	-0.02%	0
Declining Employers Tier I	0.00%	0
Declining Employers Tier IIB	-0.02%	0
Combined	**0.02%**	**$44**

Appendix A: Current Actuarial Assumptions

Economic Assumptions

Net Investment Return:	7.25%, net of investment expenses.
Administrative Expenses:	0.90% of payroll allocated to both the employer and member based on the components of the total contribution rate (before expenses) for the employer and member.
Employee Contribution Crediting Rate:	7.25%, compounded semi-annually.
Consumer Price Index:	Increase of 3.00% per year; retiree COLA increases due to CPI are limited to maximum of 2.50% per year.
Payroll Growth:	Inflation of 3.00% per year plus "across the board" real salary increases of 0.50% per year.
Increases in Internal Revenue Code Section 401(a)(17) Compensation Limit:	Increase of 3.00% per year from the valuation date.
Increase in Section 7522.10 Compensation Limit:	Increase of 3.00% per year from the valuation date.

Salary Increases

Inflation: 3.00% per year; plus "across the board" real salary increases of 0.50% per year; plus the following merit and promotion increases.

Annual Rate of Compensation Increase

Years of Service	Rate (%)	
	General	Safety
Less than 1	5.50	9.00
1 – 2	4.00	6.50
2 – 3	3.50	5.50
3 – 4	3.00	4.25
4 – 5	2.50	3.75
5 – 6	2.25	3.25
6 – 7	2.00	3.00
7 – 8	1.50	2.50
8 – 9	1.25	1.75
9 – 10	1.00	1.50
10 – 11	0.90	1.25
11 – 12	0.80	1.00
12 – 13	0.70	0.90
13 – 14	0.60	0.85
14 – 15	0.50	0.80
15 – 16	0.50	0.75
16 – 17	0.50	0.70
17 – 18	0.50	0.65
18 – 19	0.50	0.60
19 – 20	0.50	0.55
20 & Over	0.50	0.50

Demographic Assumptions

Mortality Rates – Healthy

- **General Members:** Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table set forward one year for males and set forward two years for females, projected generationally with the two-dimensional MP-2016 projection scale.

- **Safety Members:** Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table set back one year for males and females, projected generationally with the two-dimensional MP-2016 projection scale.

Mortality Rates – Disabled

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

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

Mortality Rates – Beneficiaries

- **Beneficiaries:** Beneficiaries are assumed to have the same mortality as a General Member of the opposite sex who is receiving a service (non-disability) retirement.

Mortality Rates - Member Contribution Rates

- **General Members:** Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table set forward one year for males and set forward two years for females, projected to 2034 with the two-dimensional MP-2016 projection scale, weighted 30% male and 70% female.

- **Safety Members:** Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table set back one year for males and females, projected to 2034 with the two-dimensional MP-2016 projection scale, weighted 80% male and 20% female.

Mortality Rates – Pre-Retirement

- **General and Safety Members:** Headcount-Weighted RP-2014 Employee Mortality Table times 80%, projected generationally with the two-dimensional MP-2016 projection scale.

	Rate (%)			
	General		Safety	
Age	Male	Female	Male	Female
25	0.05	0.02	0.05	0.02
30	0.05	0.02	0.05	0.02
35	0.05	0.03	0.05	0.03
40	0.06	0.04	0.06	0.04
45	0.10	0.07	0.10	0.07
50	0.17	0.11	0.17	0.11
55	0.27	0.17	0.27	0.17
60	0.45	0.24	0.45	0.24
65	0.78	0.36	0.78	0.36

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

Disability Incidence Rates

Age	Rate (%)	
	General*	Safety**
20	0.02	0.05
25	0.03	0.07
30	0.04	0.12
35	0.08	0.24
40	0.11	0.36
45	0.17	0.46
50	0.23	1.10
55	0.28	2.55
60	0.36	3.70
65	0.40	4.00
70	0.00	0.00

* 50% of General disabilities are assumed to be service connected (duty) disabilities and the other 50% are assumed to be non-service connected (ordinary) disabilities.

** 90% of Safety disabilities are assumed to be service connected (duty) disabilities and the other 10% are assumed to be non-service connected (ordinary) disabilities.

Termination Rates*

Years of Service	Rate (%)	
	General	Safety
Less than 1	17.00	8.00
1 – 2	13.00	6.00
2 – 3	10.00	4.50
3 – 4	9.00	4.00
4 – 5	7.50	3.50
5 – 6	6.50	3.00
6 – 7	5.50	2.50
7 – 8	5.00	2.20
8 – 9	4.50	2.10
9 – 10	4.00	2.00
10 – 11	3.25	1.90
11 – 12	3.00	1.80
12 – 13	2.80	1.60
13 – 14	2.60	1.40
14 – 15	2.40	1.20
15 – 16	2.30	1.00
16 – 17	2.20	0.90
17 – 18	2.10	0.75
18 – 19	1.90	0.75
19 – 20	1.70	0.75
20 – 21	1.50	0.00
21 – 22	1.30	0.00
22 – 23	1.10	0.00
23 – 24	1.00	0.00
24 – 25	1.00	0.00
25 – 26	1.00	0.00
26 – 27	1.00	0.00
27 – 28	1.00	0.00
28 – 29	1.00	0.00
29 – 30	1.00	0.00
30 & Over	0.00	0.00

* Refer to the next table that contains rates for electing a refund of contributions upon termination. No termination is assumed after a member is first assumed to retire.

Electing a Refund of Contributions upon Termination

Years of Service	Rate (%)	
	General	Safety
Less than 5	100.00	100.00
5 – 6	45.00	50.00
6 – 7	42.00	46.00
7 – 8	40.00	44.00
8 – 9	36.00	36.00
9 – 10	32.00	32.00
10 – 11	30.00	28.00
11 – 12	28.00	25.00
12 – 13	26.00	21.00
13 – 14	24.00	18.00
14 – 15	22.00	15.00
15 – 16	20.00	12.00
16 – 17	18.00	10.00
17 – 18	16.00	8.00
18 – 19	14.00	6.00
19 – 20	13.00	4.00
20 – 21	12.00	0.00
21 – 22	11.00	0.00
22 – 23	10.00	0.00
23 – 24	8.00	0.00
24 – 25	6.00	0.00
25 – 26	4.00	0.00
26 – 27	2.00	0.00
27 & Over	0.00	0.00

Retirement Rates

Age	Rate (%)				
	General Tier I	General Tier IIA and IIB	General Tier III	Safety Tier I	Safety Tier IIA and IIB
45	0.00	0.00	0.00	2.00	0.00
46	0.00	0.00	0.00	2.00	0.00
47	0.00	0.00	0.00	2.00	0.00
48	0.00	0.00	0.00	3.00	0.00
49	0.00	0.00	0.00	9.00	0.00
50	6.00	3.00	0.00	20.00	6.00
51	6.00	3.00	0.00	15.00	6.00
52	6.00	3.00	3.00	18.00	6.00
53	6.00	3.00	3.00	18.00	8.00
54	8.00	3.50	3.50	20.00	18.00
55	10.00	5.50	5.50	24.00	22.00
56	12.00	6.50	6.50	24.00	20.00
57	14.00	7.50	7.50	24.00	20.00
58	15.00	9.50	9.50	30.00	20.00
59	19.00	11.50	11.50	20.00	20.00
60	23.00	13.50	13.50	20.00	20.00
61	23.00	15.50	15.50	20.00	20.00
62	25.00	25.00	25.00	40.00	40.00
63	25.00	25.00	25.00	40.00	40.00
64	25.00	25.00	25.00	40.00	40.00
65	32.00	32.00	32.00	100.00	100.00
66	35.00	35.00	35.00	100.00	100.00
67	35.00	35.00	35.00	100.00	100.00
68	40.00	40.00	40.00	100.00	100.00
69	40.00	40.00	40.00	100.00	100.00
70	100.00	100.00	100.00	100.00	100.00

Retirement Age and Benefit for Deferred Vested Members	For current and future deferred vested members, retirement age assumptions are as follows: General Age: 57 Safety Age: 53 We assume that 50% of future General and 55% of future Safety deferred vested members will continue to work for a reciprocal employer. For reciprocal members, we assume 4.00% compensation increases per annum for General and Safety members.
Future Benefit Accruals	1.0 year of service per year of employment.
Unknown Data for Members	Same as those exhibited by members with similar known characteristics. If not specified, members are assumed to be male.
Definition of Active Members	All active members of KCERA as of the valuation date.
Form of Payment	All active and inactive members are assumed to elect the unmodified option at retirement.
Percent Married	For all active and inactive members, 75% of male members and 60% of female members are assumed to be married at pre-retirement death or retirement.
Age and Gender of Spouse	For all active and inactive members, male members are assumed to have a female spouse who is 3 years younger than the member and female members are assumed to have a male spouse who is 2 years older than the member.

Appendix B: Proposed Actuarial Assumptions

Economic Assumptions

Net Investment Return:	7.25%, net of investment expenses.
Administrative Expenses:	0.90% of payroll allocated to both the employer and member based on the components of the total contribution rate (before expenses) for the employer and member.
Employee Contribution Crediting Rate:	7.25%, compounded semi-annually.
Consumer Price Index:	Increase of 2.75% per year; retiree COLA increases due to CPI are limited to maximum of 2.50% per year.
Payroll Growth:	Inflation of 2.75% per year plus "across the board" real salary increases of 0.50% per year.
Increases in Internal Revenue Code Section 401(a)(17) Compensation Limit:	Increase of 2.75% per year from the valuation date.
Increase in Section 7522.10 Compensation Limit:	Increase of 2.75% per year from the valuation date.

Salary Increases

Inflation: 2.75% per year; plus "across the board" real salary increases of 0.50% per year; plus the following merit and promotion increases.

Annual Rate of Compensation Increase

Years of Service	Rate (%)	
	General	Safety
Less than 1	5.50	8.75
1 – 2	4.50	7.00
2 – 3	4.00	5.50
3 – 4	3.50	5.00
4 – 5	3.00	4.50
5 – 6	2.50	4.00
6 – 7	2.25	3.50
7 – 8	1.75	2.50
8 – 9	1.50	1.50
9 – 10	1.25	1.25
10 – 11	1.15	1.00
11 – 12	1.05	0.80
12 – 13	0.95	0.75
13 – 14	0.85	0.70
14 – 15	0.75	0.65
15 – 16	0.75	0.60
16 – 17	0.75	0.55
17 – 18	0.75	0.50
18 – 19	0.75	0.50
19 – 20	0.75	0.50
20 & Over	0.75	0.50

Demographic Assumptions

Mortality Rates – Healthy

- **General Members:** Pub-2010 General Healthy Retiree Amount-Weighted Mortality Table (separate tables for males and females) with rates increased by 15% for females, projected generationally with the two-dimensional mortality improvement scale MP-2019.

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

Mortality Rates – Disabled

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

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

Mortality Rates – Beneficiaries

- **Beneficiaries:** Pub-2010 General Contingent Survivor Amount-Weighted Mortality Table (separate tables for males and females) with rates increased by 10% for males and females, projected generationally with the two-dimensional mortality improvement scale MP-2019.

Mortality Rates - Member Contribution Rates

General Members: Pub-2010 General Healthy Retiree Amount-Weighted Mortality Table (separate tables for males and females) with rates increased by 15% for females, projected 30 years (from 2010) with the two-dimensional mortality improvement scale MP-2019, weighted 30% male and 70% female.

- **Safety Members:** Pub-2010 Safety Healthy Retiree Amount-Weighted Above-Median Mortality Table (separate tables for males and females), projected 30 years (from 2010) with the two-dimensional mortality improvement scale MP-2019, weighted 80% male and 20% female.

Mortality Rates – Pre-Retirement

- **General Members:** Pub-2010 General Employee Amount-Weighted Mortality Table (separate tables for males and females), projected generationally with the two-dimensional mortality improvement scale MP-2019.

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

	Rate (%)			
	General		Safety	
Age	Male	Female	Male	Female
25	0.03	0.01	0.03	0.02
30	0.04	0.01	0.04	0.02
35	0.05	0.02	0.04	0.03
40	0.07	0.04	0.05	0.04
45	0.10	0.06	0.07	0.06
50	0.15	0.08	0.10	0.08
55	0.22	0.12	0.15	0.11
60	0.32	0.19	0.23	0.14
65	0.47	0.30	0.35	0.20

All pre-retirement deaths are assumed to be non-service connected. Note that generational projections beyond the base year (2010) are not reflected in the above mortality rates.

Disability Incidence Rates

	Rate (%)	
Age	General*	Safety**
20	0.02	0.05
25	0.03	0.07
30	0.04	0.10
35	0.07	0.19
40	0.09	0.28
45	0.13	0.39
50	0.18	1.08
55	0.26	2.55
60	0.36	3.70
65	0.40	4.00
70	0.00	0.00

* 50% of General disabilities are assumed to be service connected (duty) disabilities and the other 50% are assumed to be non-service connected (ordinary) disabilities.

** 90% of Safety disabilities are assumed to be service connected (duty) disabilities and the other 10% are assumed to be non-service connected (ordinary) disabilities.

Termination Rates*

Years of Service	Rate (%)	
	General	Safety
Less than 1	17.00	9.00
1 – 2	13.00	8.00
2 – 3	10.00	7.00
3 – 4	9.00	6.00
4 – 5	8.50	5.00
5 – 6	8.00	4.00
6 – 7	7.00	3.50
7 – 8	6.00	3.25
8 – 9	5.00	3.00
9 – 10	4.00	2.60
10 – 11	3.75	2.20
11 – 12	3.50	1.80
12 – 13	3.25	1.60
13 – 14	3.00	1.40
14 – 15	2.75	1.20
15 – 16	2.50	1.00
16 – 17	2.30	0.90
17 – 18	2.10	0.75
18 – 19	1.90	0.75
19 – 20	1.70	0.75
20 – 21	1.50	0.00
21 – 22	1.30	0.00
22 – 23	1.10	0.00
23 – 24	1.00	0.00
24 – 25	1.00	0.00
25 – 26	1.00	0.00
26 – 27	1.00	0.00
27 – 28	1.00	0.00
28 – 29	1.00	0.00
29 – 30	1.00	0.00
30 & Over	0.00	0.00

* Refer to the next table that contains rates for electing a refund of contributions upon termination. No termination is assumed after a member is first assumed to retire.

Electing a Refund of Contributions upon Termination

Years of Service	Rate (%)	
	General	Safety
Less than 5	100.00	100.00
5 – 6	36.00	44.00
6 – 7	34.00	40.00
7 – 8	32.00	38.00
8 – 9	30.00	32.00
9 – 10	28.00	30.00
10 – 11	26.00	26.00
11 – 12	25.00	25.00
12 – 13	24.00	21.00
13 – 14	23.00	18.00
14 – 15	22.00	15.00
15 – 16	21.00	12.00
16 – 17	18.00	10.00
17 – 18	16.00	8.00
18 – 19	14.00	6.00
19 – 20	13.00	4.00
20 – 21	12.00	0.00
21 – 22	11.00	0.00
22 – 23	10.00	0.00
23 – 24	8.00	0.00
24 – 25	6.00	0.00
25 – 26	4.00	0.00
26 – 27	2.00	0.00
27 & Over	0.00	0.00

Retirement Rates

Age	Rate (%)						
	General Tier I		General Tiers IIA and IIB	General Tier III	Safety Tier I		Safety Tier IIA and IIB
	<25 Years of Service	>25 Years of Service			<25 Years of Service	>25 Years of Service	
45	0.00	0.00	0.00	0.00	5.00	5.00	0.00
46	0.00	0.00	0.00	0.00	5.00	5.00	0.00
47	0.00	0.00	0.00	0.00	5.00	5.00	0.00
48	0.00	0.00	0.00	0.00	5.00	5.00	0.00
49	0.00	0.00	0.00	0.00	25.00	25.00	0.00
50	10.00	10.00	5.00	0.00	10.00	30.00	3.00
51	6.00	6.00	3.00	0.00	8.00	24.00	3.00
52	6.00	12.00	3.00	3.00	8.00	24.00	3.00
53	6.00	12.00	3.00	3.00	8.00	24.00	5.00
54	6.00	12.00	3.50	3.50	12.00	24.00	11.00
55	6.00	12.00	4.00	4.00	14.00	28.00	13.00
56	6.00	14.00	4.50	4.50	14.00	28.00	12.00
57	6.00	16.00	5.00	5.00	8.00	28.00	12.00
58	9.00	18.00	6.50	6.50	8.00	28.00	12.00
59	16.00	24.00	11.00	11.00	14.00	28.00	12.00
60	20.00	35.00	12.00	12.00	25.00	28.00	12.00
61	16.00	28.00	13.00	13.00	25.00	50.00	12.00
62	20.00	35.00	20.00	20.00	25.00	50.00	25.00
63	20.00	30.00	20.00	20.00	25.00	50.00	25.00
64	20.00	30.00	20.00	20.00	25.00	50.00	25.00
65	35.00	35.00	35.00	35.00	100.00	100.00	100.00
66	35.00	35.00	35.00	35.00	100.00	100.00	100.00
67	35.00	35.00	35.00	35.00	100.00	100.00	100.00
68	35.00	35.00	35.00	35.00	100.00	100.00	100.00
69	40.00	40.00	40.00	40.00	100.00	100.00	100.00
70	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Retirement Age and Benefit for Deferred Vested Members	For current and future deferred vested members, retirement age assumptions are as follows: General Age: 57 Safety Age: 53 We assume that 45% of future General and 60% of future Safety deferred vested members will continue to work for a reciprocal employer. For reciprocal members, we assume 4.00% and 3.75% compensation increases per annum for General and Safety members, respectively.
Future Benefit Accruals	1.0 year of service per year of employment.
Unknown Data for Members	Same as those exhibited by members with similar known characteristics. If not specified, members are assumed to be male.
Definition of Active Members	All active members of KCERA as of the valuation date.
Form of Payment	All active and inactive members are assumed to elect the unmodified option at retirement.
Percent Married	For all active and inactive members, 70% of male members and 60% of female members are assumed to be married at pre-retirement death or retirement.
Age and Gender of Spouse	For all active and inactive members, male members are assumed to have a female spouse who is 3 years younger than the member and female members are assumed to have a male spouse who is 2 years older than the member.