Milliman

San Mateo County Employees' Retirement Association

Investigation of Experience July 1, 2014 – April 30, 2017

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Board of Retirement
San Mateo County Employees' Retirement Association
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Dear Members of the Board:

It is a pleasure to submit this report of our investigation of the experience of the San Mateo County Employees' Retirement Association (SamCERA) for the period July 1, 2014 through April 30, 2017. The results of this investigation are the basis for the actuarial assumptions and methods to be used in the actuarial valuation to be performed as of June 30, 2017.

The purpose of this report is to communicate the results of our review of the actuarial methods and the economic and demographic assumptions to be used in the completion of the upcoming valuation. Several of our recommendations represent changes from the prior methods or assumptions and are designed to better anticipate the emerging experience of SamCERA.

We have provided financial information showing the estimated hypothetical impact of the recommended assumptions, if they had been reflected in the June 30, 2016 actuarial valuation. We believe the recommended assumptions provide a reasonable estimate of anticipated experience affecting SamCERA. Nevertheless, the emerging costs will vary from those presented in this report to the extent that actual experience differs from that projected by the actuarial assumptions. Future actuarial measurements may differ significantly from the current measurements presented in this report due to factors such as the following:

- Plan experience differing from the actuarial assumptions,
- Future changes in the actuarial assumptions,
- Increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as potential additional contribution requirements due to changes in the Plan's funded status), and
- Changes in the plan provisions or accounting standards.

Due to the scope of this assignment, we did not perform an analysis of the potential range of such measurements.

In preparing this report, we relied without audit on information (some oral and some in writing) supplied by SamCERA's staff. This information includes, but is not limited to, statutory provisions, employee data, and financial information. We used SamCERA's benefit provisions as stated in our amended June 30, 2016 Actuarial Valuation report. In our examination, after discussion with SamCERA and making certain adjustments, we have found the data to be reasonably consistent and comparable with data used for other purposes. Since the experience study results are dependent on the integrity of the data supplied, the results can be expected to differ

if the underlying data is incomplete or missing. It should be noted that if any data or other information is inaccurate or incomplete, our determinations might need to be revised.

We certify that the assumptions developed in this report satisfy ASB Standards of Practice, in particular, No. 27 (Selection of Economic Assumptions for Measuring Pension Obligations) and No. 35 (Selection of Demographic and Other Non-Economic Assumptions for Measuring Pension Obligations).

This investigation of experience report recommends assumptions to be used in the valuation to provide an estimate of the System's financial condition as of a single date. The valuation can neither predict the System's future condition nor guarantee future financial soundness. Actuarial valuations do not affect the ultimate cost of System benefits, only the timing of System contributions. While the valuation is based on an array of individually reasonable assumptions, other assumption sets may also be reasonable and valuation results based on those assumptions would be different. No one set of assumptions is uniquely correct. Determining results using alternative assumptions is outside the scope of our engagement.

Milliman's work is prepared solely for the internal business use of SamCERA. To the extent that Milliman's work is not subject to disclosure under applicable public records laws, Milliman's work may not be provided to third parties without Milliman's prior written consent. Milliman does not intend to benefit or create a legal duty to any third party recipient of its work product. Milliman's consent to release its work product to any third party may be conditioned on the third party signing a Release, subject to the following exceptions:

(a) The System may provide a copy of Milliman's work, in its entirety, to the System's professional service advisors who are subject to a duty of confidentiality and who agree to not use Milliman's work for any purpose other than to benefit the System.

(b) The System may provide a copy of Milliman's work, in its entirety, to other governmental entities, as required by law.

No third party recipient of Milliman's work product should rely upon Milliman's work product. Such recipients should engage qualified professionals for advice appropriate to their own specific needs.

The consultants who worked on this assignment are pension actuaries. Milliman's advice is not intended to be a substitute for qualified legal or accounting counsel.

The signing actuaries are independent of the Plan Sponsor. We are not aware of any relationship that would impair the objectivity of our work.

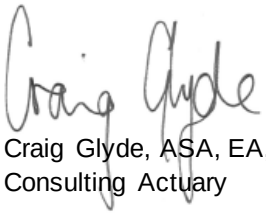
On the basis of the foregoing, we hereby certify that, to the best of our knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices.

We would like to acknowledge the help in the preparation of the data for this investigation given by the SamCERA staff. We look forward to our discussions and the opportunity to respond to your questions and comments at your next meeting.

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

Respectfully submitted,

Nick J. Collier, ASA, EA, MAAA
Consulting Actuary



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Section 1 Executive Summary

Any actuarial valuation is based on certain underlying assumptions. Determining the adequacy of the contribution rate is highly dependent on the assumptions that the actuary uses to project the future benefit payments and then to discount the value of future benefits to determine the present values. Thus, the assumptions are critical in assisting the system in adequately pre-funding for the benefits prior to retirement.

Overview

To assess the reasonableness of the assumptions used in the valuation, they should be studied regularly. This process is called an investigation of experience (or experience study).

Summary of Results

This section describes the key findings of this investigation of experience of the San Mateo County Employees' Retirement Association (SamCERA) for the period July 1, 2014 through April 30, 2017. We are recommending several changes to the demographic assumptions. If adopted, these proposed changes (primarily the mortality assumption) will have a material financial impact, as discussed at the end of this section. We previously recommended economic assumptions that were adopted at the June 2017 Board of Retirement meeting. We will refer to our recommended assumptions, including the recently adopted economic assumptions, as the "proposed" assumptions.

The following table shows a summary of our recommendations for all assumptions and methods studied.

Assumption	Recommendation
Inflation	Decrease by 0.25% (previously adopted)
Investment Return	Decrease by 0.25% (previously adopted)
General Wage Growth	Decrease by 0.25% (previously adopted)
Payroll Increase Assumption	Decrease by 0.25% (previously adopted)
Funding Method	No Change
Merit Salary Scale	Increase Safety rates after 10 years of service
Death while Active	Update rates with projected improvement
Service Retirement	Decrease most rates for Plans 1, 2 and 4; Add separate rates for General Plans 5-7 members
Disability	Increase Safety rates
Termination	Small increases and some decreases
Probability of Refund	Small changes
Mortality after Retirement	Update rates with projected improvement
Probability of Eligible Survivor	No Change
Reciprocity	Decrease probability
Retirement for Deferreds	Increase assumed age for General members

If adopted, the new assumptions would result in an increase in the statutory employer contribution rate and a decrease in the Funded Ratio calculated in the next valuation, as compared to the current assumptions. A further discussion is included in the Financial Impact section at the end of the Executive Summary.

Economic Assumptions

Section 2 discusses the economic assumptions: price inflation, general wage growth (includes price inflation and productivity) and the investment return assumption. As with virtually all actuarial assumptions, there is not one right answer; however, we do believe there is evidence that the lower investment return assumption recently adopted by the Board is appropriate for SamCERA. The set of economic assumptions we recommended, and the Board adopted, to be used for the next valuation includes a reduction in the investment return assumption to 6.75%, as well as a 0.25% reduction in the price and wage inflation.

The most compelling reason for lowering the investment return assumption is the lower expectation for future investment returns. The capital market assumptions reported by SamCERA's general investment consultant (Verus) predict an expected return based on SamCERA's asset allocation of 6.5% over the next 10 years, after reducing the expected return for administrative expenses. Note that Verus's capital market assumptions include a 2.1% annual increase assumption for price inflation. Milliman, and many other investment consultants, are predicting lower investment returns over that period. Therefore, we recommended that the investment return assumption be lowered to 6.75%.

As detailed in Section 2, the expectation is for lower price inflation in both the short and long term. In particular, there has been a sustained period of low inflation, with a 2.1% average increase over the 20-years ending in 2016. Looking forward, there is a continued expectation of low price inflation, as evidenced by the current (May 2017) implied inflation expectation of approximately 2.1% based on the difference in yield between 30-year TIPS and a regular 30-year treasury bond.

We recommended either lower the price inflation assumption to 2.50% or maintain the prior rate of 2.75%. Also, we recommended the real wage growth remain at 0.50% above price inflation which resulted in a wage inflation assumption of either 3.00% or 3.25%, as there is a high correlation between price and wage inflation. The Board adopted the 2.50% price inflation and the 3.00% wage inflation assumptions.

We also recommended a reduction in the assumed cost-of-living adjustment (COLA) for retiree benefits for most Plan 1 and Plan 2 members if the price inflation assumption was reduced to 2.50%.

The following table shows our recommended assumption sets. The Board adopted Alternative #1 at its June 2017 meeting.

Economic Assumptions	Current Assumptions	Recommended Assumptions	
		Alternative #1	Alternative #2
Investment Return	7.00%	6.75%	6.75%
GASB Discount Rate	7.20%	6.92%	6.92%
General Wage Growth	3.25%	3.00%	3.25%
Payroll Growth	3.25%	3.00%	3.25%
Price Inflation	2.75%	2.50%	2.75%
COLAs for Retirees	2.75%/2.65%/1.90%	2.50%/2.40%/1.90%	2.75%/2.65%/1.90%

Actuarial Methods and Miscellaneous Assumptions

Section 3 discusses the actuarial methods and other miscellaneous assumptions used in the valuation and administration of the system.

We are recommending changes in this area as follows:

- The assumptions for reciprocal employment should be decreased slightly.
- A change to the member contribution rates should be made to reflect the recently adopted economic assumptions as well as the new mortality and merit salary assumptions if they are adopted. The impact of this is discussed later in this section.
- A change to the factors used for determining optional benefits and service purchase costs, as well as the Plan 3 early retirement age factors, should be considered to reflect the recently adopted economic assumptions as well as the new mortality assumptions if they are adopted.

Demographic Assumptions

Sections 4-9 discuss the demographic assumptions. Unlike the economic assumptions, which are more global in nature, the demographic assumptions are based heavily on recent SamCERA experience. Demographic assumptions are used to predict future member behavior (e.g., when will a member retire? How long will the member live?).

Based on the results of this study, we are recommending changes to several of the demographic assumptions. In cases where we have recommended changes, the changes have for the most part only partially reflect recent experience due to the long-term nature of actuarial assumptions.

From a cost perspective, the most significant demographic change that we are recommending is the addition of an assumption that projects future improvements in mortality. The financial impact is discussed at the end of this section.

When reviewing the sections on demographic assumptions, please note the following:

- Our analysis uses the Actual-to-Expected (A/E) ratio to measure how well the current assumptions fit actual experience. For example, if the service retirement A/E is 80%, it indicates that there were 20% fewer service retirements than expected, and that we should consider decreasing the assumption. By decreasing the expected rates, this results in a higher ratio, in this case closer to 100%.
- Due to scheduling considerations, the data provided to us by SamCERA was as of April 30, 2017. This was necessary to complete both the experience investigation and the valuation in time for inclusion in the Comprehensive Annual Financial Report (CAFR). Thus, the study period was two years and 10 months instead of the three years implied by the "triennial" description. We do not believe this two-month difference has a material impact on the results.
- When we refer to "Safety" members in this report, we are including both Safety and Probation members.

Demographic Assumptions (continued)

- When we refer to the "proposed" assumptions, these are the assumptions that we are recommending. These include the recently adopted economic assumptions. The current assumptions are referred to as the "expected" assumptions.
- For many of the assumptions, we show detailed graphs of our analysis showing the actual experience for the study (blue bar), the actual experience from the prior study (black bar), the current assumption (green line), and the new proposed assumptions (orange line).

The recommended rates are shown in detail in Appendix A.

Individual Salary Increases due to Promotion and Longevity (Merit)

Section 4 discusses the individual salary increases due to promotion and longevity – the merit component of salaries. Overall, the results show increases close to what the current rates predicted, although there were some differences when General and Safety members were studied separately. We are recommending increasing rates at earlier years for General members and increasing rates at later years for Safety members. See Section 4 for more details on this analysis.

Mortality

The mortality assumption is used to predict the life expectancy of both members currently in pay status and those expected to receive a benefit in the future. The results of the study show there were 300 retiree deaths during the period as compared to 275 expected, based on the current assumptions, resulting in a total Actual-to-Expected ratio of 109%.

Retirement Type	Actual	Expected	Actual / Expected
Service (Healthy)	273	248	110%
Disability	27	27	100%
Total	**300**	**275**	**109%**

We are recommending changes in the mortality assumptions that predict how long members are currently living. We are also recommending the addition of a projection scale that reflects the gradual year-to-year improvement in mortality that is expected to occur in the future. This approach is sometimes referred to as "generational mortality" because it results in the succeeding generation of members living longer than the preceding one. Overall, the new mortality assumption will result in an increase in life expectancy compared to the prior assumption. Additional details are provided in Section 5.

Service Retirement

Overall, the actual number of service retirements was less than what the assumptions predicted for both General members and Safety/Probation members. The following chart shows the results for all members eligible for retirement.

Service Retirements					
Class	Actual	Expected	Act / Exp	Proposed	Act / Prop
General	381	485	79%	428	89%
Safety	72	98	73%	80	90%
Total	453	583	78%	508	89%

We are recommending changes to more closely match the assumption to the incidence of service retirement at specific ages including extending the retirement rates to age 75 for General members and age 65 for Safety/Probation members. Further analysis is shown in Section 6 of this report.

Disability Retirement

Overall, the actual number of disability retirements was close in total to the assumptions; however, the Safety disability retirements were greater than assumed. The following chart shows the results for General and Safety disability retirements.

Disability Retirements					
Class	Actual	Expected	Act / Exp	Proposed	Act / Prop
General	47	47	100%	48	98%
Safety	15	9	167%	11	136%
Total	62	56	111%	59	105%

As indicated by the increased number of expected disabilities for Safety members under the proposed rates (11 proposed versus 9 expected under the current assumptions), we are recommending higher rates of disability retirement for Safety members. Further analysis is shown in Section 7 of this report.

Termination

The actual number of terminations for both General and Safety/Probation members was higher than the assumptions predicted. The following chart shows the results for the two groups.

Termination			
Class	Actual	Expected	Act / Exp
General	885	639	139%
Safety	52	46	113%
Total	937	685	137%

Overall, we are recommending increases to the rates of termination. Further analysis is shown in Section 8 of this report.

Probability of Refund upon Vested Termination

The actual number of refunds for vested members at termination was slightly lower than expected for General members, and as expected for Safety members.

Probability of Refund			
Group	**Actual**	**Expected**	**Act / Exp**
General	115	138	84%
Safety	8	8	100%

We are recommending minor changes to the rates of refund. Further analysis is shown in Section 9 of this report.

Financial Impact of the Recommended Assumptions

The following exhibit shows the expected financial impact the proposed changes would have on SamCERA's funding. Note that the proposed changes would increase the expected statutory employer contribution rate and decrease the reported Funded Ratio of the system, primarily due to the recently adopted economic assumptions and recommended increase in projected life expectancies.

The financial impact was evaluated by performing additional valuations with the June 30, 2016 valuation data and reflecting the proposed assumption changes. The actual financial impact will vary to some extent for the June 30, 2017 valuation due to year-to-year changes in the member population and investment experience.

	Funded Ratio	Statutory Contribution Rate
June 30, 2016 Valuation	**83.1%**	**33.77%**
Economic Assumptions	-0.7%	1.25%
Mortality Rates with Projection Scale	-1.8%	2.19%
Other Demographic Including Merit Salary	0.2%	-0.06%
June 30, 2016 Valuation with Changes	**80.8%**	**37.15%**

Impact of the Recommended Assumptions on Member Contribution Rates

If adopted, the recommended assumptions would result in an increase in the member contribution rates. The following are sample member rates (entry age 35 for General and 25 for Safety and Probation) based on the 2016 valuation, but using the recommended assumptions for 2017. The final member rates will be determined with the 2017 valuation.

Sample Changes in Member Rates due to Proposed Assumption Changes (Based on June 30, 2016 Actuarial Valuation[1])

	Entry Age	Current	Proposed	Increase
General Members - County				
Plan 1	35	13.54%	13.84%	0.30%
Plan 2	35	13.45%	13.71%	0.26%
Plan 4	35	12.26%	12.77%	0.51%
Plan 5	35	7.91%	8.39%	0.48%
Plan 7	All	8.14%	8.71%	0.57%
Probation Members				
Plan 1	25	17.78%	17.71%	-0.07%
Plan 2	25	17.59%	17.51%	-0.08%
Plan 4	25	14.99%	15.81%	0.82%
Plan 5	25	14.67%	15.53%	0.86%
Plan 6	25	10.87%	11.66%	0.79%
Plan 7	All	13.38%	14.70%	1.32%
Safety Members -- Other than Deputy Sheriffs [2]				
Plan 1	25	19.46%	18.71%	-0.75%
Plan 2	25	19.26%	18.92%	-0.34%
Plan 4	25	16.50%	17.30%	0.80%
Plan 5	25	15.19%	16.04%	0.85%
Plan 6	25	10.96%	11.84%	0.88%
Plan 7	All	13.90%	15.08%	1.18%

1 Final FYB 2018 member rates will be determined based on the June 30, 2017 valuation.

2 Cost Sharing varies for Deputy Sheriffs as follows, so total rate is either 2.0%, 1.5%, or 0.5% less than shown depending on the level of service.
3.0% if employee is less than age 45 and has less than 5 years of service.
3.5% if employee is less than age 45 and has between 5 and 15 years of service.
4.5% if employee is older than age 45 or has at least 15 years of service.

Note that the sample member contribution rates are total rates and include the COLA and Cost Share portions where applicable.

Proposed Assumptions and Methods

Appendix A illustrates the Summary of Actuarial Assumptions as it will appear in the June 30, 2017 valuation report if all recommended assumptions and methods are adopted. Proposed changes in assumptions are highlighted in yellow.

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Section 2 Economic Assumptions

Actuarial Standard of Practice (ASOP) No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations*, provides guidance to actuaries giving advice on selecting economic assumptions for measuring obligations under defined benefit plans. Because no one knows what the future holds, the best an actuary can do is to use professional judgment to estimate possible future economic outcomes. These estimates are based on a mixture of past experience, future expectations, and professional judgment. The actuary should consider a number of factors, including the purpose and nature of the measurement, and appropriate recent and long-term historical economic data. However, the standard explicitly advises the actuary not to give undue weight to recent experience.

Recent changes in ASOP No. 27 have restricted what assumptions satisfy the standard. In particular, previously any assumption within the "best-estimate" range (a wide range in our opinion) was likely to satisfy the standard. To meet the new standard, the assumption "reflects the actuary's estimate of future experience" and "it has no significant bias (i.e., it is not significantly optimistic or pessimistic)…" We believe this reduces the range of assumptions that would be considered reasonable.

Each economic assumption should individually satisfy this standard. Furthermore, with respect to any particular valuation, each economic assumption should be consistent with every other economic assumption over the measurement period.

After completing the selection process, the actuary should review the set of economic assumptions for consistency. This may lead the actuary to recommend the same inflation component in each of the economic assumptions proposed.

This section will discuss the economic assumptions. We have recommended a reduction in the investment return assumption. We have also provided two potential inflation assumptions and corresponding wage inflation and COLA assumptions. We believe either of these sets of assumptions satisfy ASOP No. 27.

The following table shows our two recommended alternatives.

Economic Assumptions	Current Assumptions	Recommended Assumptions	
		Alternative #1	Alternative #2
Investment Return	7.00%	6.75%	6.75%
GASB Discount Rate	7.20%	6.92%	6.92%
General Wage Growth	3.25%	3.00%	3.25%
Payroll Growth	3.25%	3.00%	3.25%
Price Inflation	2.75%	2.50%	2.75%
COLAs for Retirees	2.75%/2.65%/1.90%	2.50%/2.40%/1.90%	2.75%/2.65%/1.90%

1. Price Inflation & COLA Assumptions

Use in the Valuation

When we refer to inflation in this report, we are generally referring to price inflation. The inflation assumption is not used in the valuation, so it does not directly impact the results. However, it is used in the development of the assumptions for future investment returns, general wage increases, payroll increases and COLA increases, which do directly impact the valuation results.

The long-term relationship between inflation and investment return has long been recognized by economists. The basic principle is that the investors demand a "real return" – the excess of actual investment returns over inflation. If inflation rates are expected to be high, investors will demand investment returns that are also expected to be high enough to exceed inflation, while lower inflation rates will result in lower expected investment returns, at least in the long run.

The current valuation assumption for inflation is 2.75% per year. We have recommended two alternatives to be considered, one maintaining the current inflation rate, and the other lowering the assumption to 2.50% with corresponding adjustments to the assumed COLA.

Historical Perspective

The data for inflation shown below is based on the national Consumer Price Index, US City Average, All Urban Consumers (CPI-U) as published by the Bureau of Labor Statistics.

Although economic activities in general and inflation in particular, do not lend themselves to prediction on the basis of historical analysis, historical patterns and long-term trends are a factor to be considered in developing the inflation assumption.

There are numerous ways to review historical data, with significantly differing results. The table below shows the compounded annual inflation rate for various 10-year periods, and for the 50-year period ended in December 2015. Note that the 50-year average is heavily influenced by the inflation of the late 1970s and early 1980s.

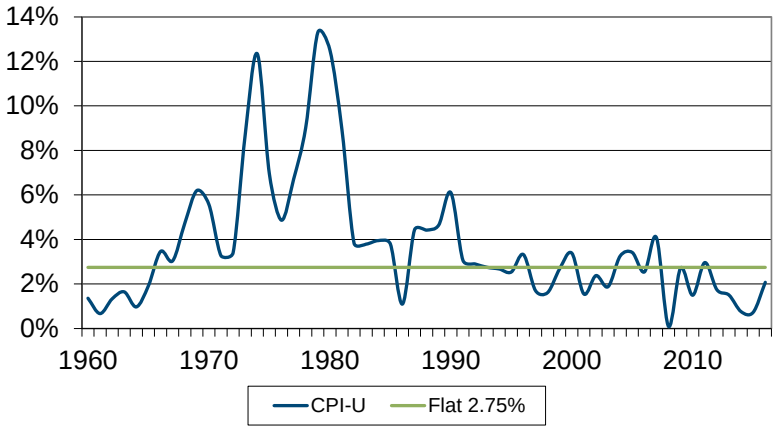
Decade	CPI Increase
2007-2016	1.8%
1997-2006	2.4%
1987-1996	3.7%
1977-1986	6.6%
1967-1976	5.9%
Prior 50 Years	
1967-2016	4.1%

Historical Perspective (Continued)

These are national statistics. The inflation assumption as it relates to the investment return assumption should be based more on national and even global inflation, whereas, the inflation assumption used in the wage growth, payroll growth, and COLA increase assumptions is tied to inflation in the Bay Area. We believe that although there have been historical differences between U.S. and Bay Area CPI changes, in the long term there should be a high correlation. For comparison, the average CPI increase for the Bay Area has been about 0.25% higher than the national average for the 30-year period 1987-2016.

The following graph shows historical national CPI increases. Note that the actual CPI increase has generally been less than 2.75% since 1991.

Historical CPI-U



Forecasts of Inflation

Since the U.S. Treasury started issuing inflation indexed bonds, it is possible to determine the approximate rate of inflation anticipated by the financial markets by comparing the yields on inflation indexed bonds with traditional fixed government bonds. Current market prices as of May 2017 suggest investors expect inflation to be about 2.0% over the next 30 years.

Additionally, we reviewed the expected increase in the CPI by the Office of the Chief Actuary for the Social Security Administration. In the 2016 Trustees Report, the projected average annual increase in the CPI over the next 75 years under the intermediate cost assumptions was 2.6%.

Price Inflation Recommendation

The price inflation assumption is not used in determining SamCERA's funding and thus has no direct impact on the contribution rates; however, it is a factor in our recommendations for the wage growth, COLA, and investment return assumptions.

We recommend either maintaining the long-term assumed inflation rate or decreasing it by 0.25% to reflect lower forecasts.

Consumer Price Inflation	
Current Assumption	2.75%
Recommended	
Alternative #1	2.50%
Alternative #2	2.75%

Postretirement Cost-of-Living Adjustments (COLA)

The current assumption is that retiree COLAs for Plan 1 will be equal to the price inflation assumption. We recommend continuing this practice. If the assumption is lowered, this would result in a reduction in the assumed COLAs for Plan 1 to 2.5% per year. In reality, some years, the CPI will be higher than the assumption and some years it will be lower. Over the long term, if CPI increases average 2.5% (or 2.75%), Plan 1 COLAs should average close to 2.5% (or 2.75%), since the maximum COLA is much higher at 5% (3% for Probation) and there is a COLA bank.

For the other contributory plans, the maximum COLA is lower (3% for Plan 2 and 2% for the other plans) and there is no COLA bank. Since when CPI increases are higher than 2% (or 3% for Plan 2) the COLA will be limited, but when they are lower they will not be limited (except in rare cases), we expect the actual COLAs granted will be less than the average CPI (or the maximum COLA in the case of Plans 4-7). Our current assumption for the Plan 2 COLA is that it will be 0.1% less than the CPI assumption, and the COLAs for Plans 4-7 will be 0.1% less than the maximum COLA amount. We feel this continues to be a reasonable assumption.

General Plan 3 does not have a COLA. Therefore, the assumed COLA is 0.0%.

COLA Recommendation

We recommend the COLA assumption be adjusted if the price inflation assumption is reduced.

	Annual Cost of Living Adjustment		
	Current	Recommended	
		Alternative #1	Alternative #2
Plan 1	2.75%	2.50%	2.75%
Plan 2	2.65%	2.40%	2.65%
Plan 3	0.00%	0.00%	0.00%
Plans 4, 5, 6 & 7	1.90%	1.90%	1.90%

2. Wage Growth

Use in the Valuation

Estimates of future salaries are based on two types of assumptions: 1) general wage increase and 2) merit increase. Rates of increase in the general wage level of the membership are directly related to inflation, while individual salary increases due to promotion and longevity generally occur even in the absence of inflation. The promotion and longevity assumptions, referred to as the merit scale, will be reviewed with the other demographic assumptions (see Section 5).

The current assumption is for wage growth of 0.50% above the inflation assumption.

Historical Perspective

We have used statistics from the Social Security Administration on the National Average Wage back to 1967.

There are numerous ways to review this data. For consistency with our observations of other indices, the table below shows the compounded annual rates of wage growth for various 10-year periods and for the 50-year period ending in 2016. The excess of wage growth over price inflation represents "productivity" (or the increase in the standard of living, also called the real wage inflation rate).

Decade	Wage Growth	CPI Increase	Real Wage Inflation
2007-2016	2.5%	1.8%	0.7%
1997-2006	4.1%	2.4%	1.7%
1987-1996	4.1%	3.7%	0.4%
1977-1986	6.5%	6.6%	-0.1%
1967-1976	6.4%	5.9%	0.5%
Prior 50 Years			
1967-2016	4.7%	4.1%	0.6%

Like price inflation, wage growth can also be influenced by location, particularly in the short term. The average annual salary for SamCERA members has increased by 3.1% over the last ten years compared to 2.5% nationally. After removing the actual price inflation for the Bay Area for the period, this results in 0.6% real wage growth over the period, very comparable to the national real wage inflation of 0.7% for the same ten years.

Forecasts of Future Wages

Wage inflation has been projected by the Office of the Chief Actuary of the Social Security Administration. In the 2016 Trustees Report, the ultimate long-term annual increase in the National Average Wage is estimated to be 1.2% higher than the Social Security intermediate inflation assumption of 2.6% per year.

Recommendation

Over the last 50 years, the actual experience, on a national basis, has been close to the current assumption. We believe that wages will continue to grow at a greater rate than prices over the long term, although not to the extent projected by Social Security. We are recommending that the long-term assumed real wage inflation rate remain at 0.50% per year.

Real Wage Inflation Rate	
Current assumption	0.50%
Recommended Assumption	0.50%

The wage growth assumption is the total of the consumer price inflation assumption and the real wage inflation rate. If the real wage inflation assumption remains 0.50% and the price inflation is set at 2.50%, this would result in a total wage growth assumption of 3.00%. If there is no change in the price inflation assumption, the total wage growth would remain at 3.25%.

Payroll Increase Assumption

In addition to setting salary assumptions for individual members, the aggregate payroll of SamCERA is expected to increase, without accounting for the possibility of an increase in membership. See comments on growth in membership discussed below.

The current payroll increase assumption is equal to the general wage growth assumption of 3.25%. It is our general recommendation to set these two assumptions to be equal, unless there is a specific circumstance that would call for an alternative assumption. We are recommending that the payroll increase continue to be equal to the wage growth assumption, so it would be either 3.00% or 3.25% depending on the wage growth assumption adopted.

Growth in Membership

We propose continuing the assumption that no future growth in membership will occur. This assumption affects the Unfunded Actuarial Accrued Liability (UAAL) amortization payment rate. With no assumed growth in membership, future salaries are assumed to grow due to wage growth increases. If increases should occur because of additional members, there will be a larger pool of salaries over which to spread the UAAL, if any, resulting in an actuarial gain. This current assumption is consistent with GASB parameters.

It should be noted that membership growth could be affected by the County's "Agile" workforce program, which fills some positions with employees who would not participate in SamCERA. To the extent this occurs, membership growth could be negative, although over the past few years, the active membership has been increasing, so there does not appear to have been a significant impact so far.

3. Investment Return

Use in the Valuation

The investment return assumption is one of the primary determinants in the calculation of the projected contributions needed to pay for SamCERA's benefits, providing a discount of the future benefit payments that reflects the time value of money. This assumption has a direct impact on the calculation of liabilities, normal costs, member contribution rates, and the factors for optional forms of benefits. The current investment return assumption for SamCERA is 7.00% per year, net of all administrative and investment-related expenses.

Expected Long-Term Investment Return

To determine the expected long-term investment return, we have used Verus's 2017 assumptions for capital markets and SamCERA's current target asset allocation. The target asset allocation, along with the capital market assumptions, are summarized in the following table:

	Allocation	Expected Return[1]	Standard Deviation
Large Cap Equity	20%	4.7 %	15.8 %
Small Cap Equity	3	4.8	21.8
International Equity	19	9.7	18.9
Fixed Income	21	3.9	6.5
Private Equity	7	7.8	26.2
Risk Parity	8	7.2	10.0
Hedge Fund Composite	6	6.0	13.2
TIPS	2	2.6	5.7
Liquid Real Assets[2]	5	4.3	16.1
Real Estate	7	6.6	17.9
Private Real Assets[2]	2	3.1	18.0
Total	100 %		

[1] *10-year geometric average.*
[2] *Used Verus's assumption for commodities.*

Combining the capital market assumptions with the target asset allocation policy, Verus has calculated the 10-year expected rate of return to be 6.7%. This expected return is the median return on a geometric basis for SamCERA's assets. That is, there is a 50% probability the return will exceed 6.7% and a 50% probability the return will be less than 6.7%. We independently calculated the expected return and came close to Verus's 6.7% using their capital market assumptions which include an implicit 2.1% inflation assumption.

Administrative and Investment-Related Expenses

The investment return used for the valuation is assumed to be net of all administrative and investment-related expenses. The following table shows the ratio of administrative expenses to the SamCERA Plan assets over the last 10 fiscal years beginning July 1. The expense ratio is calculated as the expense amount divided by the ending asset balance at fair market value.

($millions) FYB	Market Assets	Admin. Expense	Expense Ratio
2006	$ 1,790	$ 2.1	0.12%
2007	2,132	2.8	0.13
2008	2,011	3.2	0.16
2009	1,591	3.4	0.21
2010	1,816	3.6	0.20
2011	2,318	5.0	0.22
2012	2,360	4.9	0.21
2013	2,728	4.9	0.18
2014	3,292	5.5	0.17
2015	3,454	6.0	0.17

Note that for purposes of this calculation we have included only the regular administrative expenses. If the information technology expense was included, the expense ratio for the fiscal year beginning July 1, 2015 would be 0.19%, instead of 0.17%.

For the administrative expenses, we have assumed a reduction in the current assumption of 0.20% of market assets to 0.17%, as the actual ratio has been less than 0.20% over the last three years and we project a material growth in the market assets over the next few years due to the current high level of funding.

Investment expenses have been slightly less than 1% of the market value of assets. However, for purposes of our analysis of the investment return assumption, we have only accounted for passive management fees and other fixed investment expenses. The reasoning for this is that for assets classes where passive management is available, SamCERA would not use active management unless there was an expectation that the returns net of fees would be at least as great as the net return using passive management. For asset classes where passive management is not available, our understanding is that Verus's capital market assumptions are net of investment expenses. We have therefore assumed that investment expenses to be 0.06% (0.04% for passive management fees and 0.02% for fixed investment expenses).

The expense assumption does not have a direct impact on the actuarial valuation results under the current methods, but it does provide a measure of gross return on investments that will be needed to meet the actuarial assumption used for the valuation. For example, the current investment return assumption is 7.00%, so SamCERA needs to earn a gross return (after adjustment for investment expenses) on its assets of 7.17% in order to net the 7.00% for funding purposes.

Administrative and Investment-Related Expenses (continued)

Additionally, we recommend the 0.17% adjustment be added to the investment return assumption adopted to determine the discount rate used in SamCERA's GASB 67 and 68 valuations, as GASB requires the discount rate to be the long-term expected rate of return gross of administrative expenses.

Explicit Recognition of Administrative Expenses

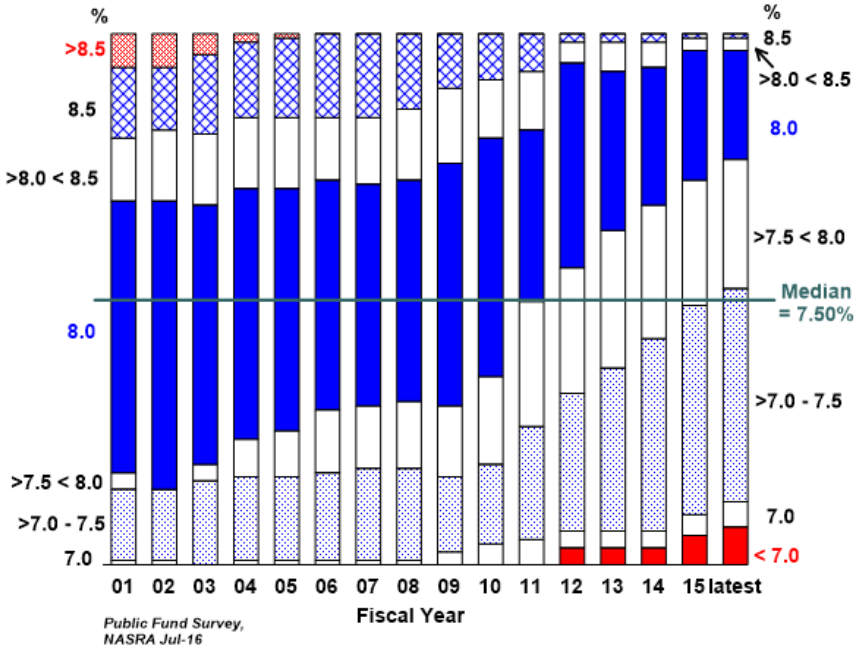
The investment return assumption used for the valuation is assumed to be net of all administrative and investment related expenses. By deducting both of these categories of expenses, the investment return assumption is less than if just the investment related expenses were deducted, resulting in higher employer and member contribution rates. A portion of these higher contribution rates is assumed to pay for administrative expenses. Consequently, the administrative expense is "implicitly" included in the rates.

About half of the '37 Act systems only deduct the investment related expenses from the investment return assumption, which does not decrease the investment return assumption as much and, correspondingly, does not increase the contribution rates as much. For these systems, however, the administrative costs are separately accounted for and then "explicitly" included in the contribution rates, which, in turn, increases the rates. For the systems that explicitly include the administrative expenses in the contribution rates, the costs can be applied to either the member or the employer or shared between the two. A sharing of these cost would be required for the PEPRA Plan 7 members if the administrative expenses are assumed to be part of the normal cost rate.

Switching from the "implicit" to "explicit" method would in essence redistribute the payment of the administrative costs among the different employers and different plan members. Either method is acceptable. Given that SamCERA currently uses the implicit method and there would be some administrative issues in changing, we are recommending continuing with the current method of implicitly recognizing administrative expenses for the 2017 valuation.

Peer System Comparison

According to the *Public Fund Survey*, the average investment return assumption for statewide systems has been steadily declining. As of the most recent study, the median rate is 7.50%. The following chart shows a progression of the distribution of the investment return assumptions. In 2001, very few systems had an assumption of 7.5% or lower and over 80% had an assumption of 8.0% or greater. As of fiscal year 2016, over 50% have an assumption of 7.5% or less and this is continuing to trend down.



Crediting of Reserves

Section 31592.2 of the 1937 Act provides the Retirement Board with the authority to set aside surplus earnings of the retirement fund which are in excess of the total interest credited to reserves, provided this surplus exceeds 1.00% of the total assets of the retirement system. Historically, some '37 Act systems have used these surplus earnings to increase benefits as allowed under the law. This creates a drag on the investment return, if not all earnings are used to pay for the current benefits. If this is the case, the actuary may recommend reducing the investment return assumption to account for this impact.

SamCERA's current interest crediting policy requires that any available earnings first go to crediting the basic reserves. Any remaining available earnings are then used to fill up the contingency reserve up to 3% of assets. All remaining available earnings or losses are then credited to the Undistributed Earnings/Losses Reserve. Since there is no provision for spending investment earnings on anything but the current benefits, no adjustment in the investment return assumption is needed.

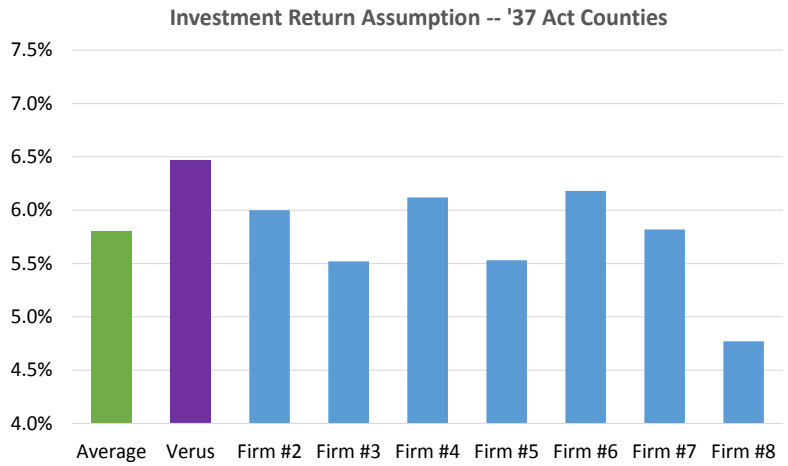
Additional Factors for Consideration in Setting the Investment Return Assumption

The capital market assumptions provide the most tangible measure for estimating future returns; however, there are other factors that we believe should be considered in setting the investment return assumption, with the two key considerations being:

- **Long-Term Perspective:** The 10-year time horizon used in Verus's capital market assumptions is shorter than the 30 years we usually recommend for setting the investment return assumption for valuing pension liabilities. In the shorter term (10 years or less), there is an expectation of lower returns, primarily due to the current low interest rate environment. The expectation is that when interest rates increase from their historical lows this will ultimately result in higher expected returns. Reflecting higher returns for the period from 10 to 30 years would result in a higher expected return for the 30-year period than Verus's 10-year estimated return. For example, Milliman's capital market assumptions, which vary by time horizon, have an expected return that is 0.35% greater over the next 30 years than the next 10 years. However, the argument can also be made that a greater emphasis should be placed on the shorter term returns, since there is more certainty that they will occur than the higher long-term returns.

- **Variance in Capital Market Assumptions:** We calculated the expected return for the SamCERA portfolio based on the capital market assumptions of a number of other investment consultants we work with in addition to Verus. The expected return of the other investment consultants was less than Verus's, sometimes significantly. This variance among investment consultants is typical of what we see with other plans.

  A comparison of the expected returns based on SamCERA's target asset allocation and the capital market assumptions of other investment consultants is shown below. These expected returns are net of assumed investment and administrative expenses, so the expected return we show for Verus is slightly less than the 6.7% they report. Verus is represented by the purple bar in the graph, and the average of just under 6.0% is represented by the green bar. Note that we have used Verus's capital market assumptions in our analysis, as we believe Verus is most familiar with SamCERA's specific investments.



Variability of Future Returns

Our focus in this analysis has been on the median expected future return. The median return indicates there is a 50% probability, based on the capital market assumptions, that the actual return will meet or exceed this amount. For comparison, the following are the probabilities based on Verus's capital market assumptions that the actual return, net of expenses, will exceed the following thresholds over a 30-year time period. Note that we have extrapolated Verus's 10-year capital market assumptions over a 30-year period, so it isn't a perfect comparison, but it does give some idea of the potential variability of the expected return.

30-Year Average Return[1]	Probability of Achieving
8.0%	23%
7.0%	40%
6.5%	50%
6.0%	59%
5.0%	76%

1. Average return is net of assumed administrative and investment expenses.

Note that if we increased SamCERA's expected 30-year returns by 0.35% over the expected 10-year return, there would be a 47% probability of meeting a 7.0% return over the 30-year period. The 0.35% difference is based on the difference in Milliman's capital market expectations over 10-year and 30-year periods.

Cost Implications of Changes in Investment Return Assumption

In most retirement systems with variable contribution rates, such as SamCERA, the greatest factor contributing to the volatility of contribution rates is the return on investments. If, in the future, the full actuarial assumption of 7.00% is not met, there would likely be an increase in the statutory employer contribution rates.

The base member contribution rates are determined based on the '37 Act statutes, the actuarial assumptions, and the benefit provisions. The COLA portion of the member rates and the cost-sharing contributions also do not reflect asset values. Therefore, any experience gain or loss in investments is not expected to directly impact the member contribution rates but will impact the statutory employer contribution rates.

To assist the Board in understanding the sensitivity to changes in the assumptions, we revalued the June 30, 2016 valuation results using the recommended assumptions, including the economic assumptions that were adopted at the June meeting. These results are shown at the end of the Executive Summary.

Recommendation

Based on Verus's capital market assumptions, we find there is less than a 50% probability that the current investment return of 7.0% (net of all expenses) will be met. Based on our limited survey, other investment consultants are generally predicting lower returns than Verus. Although there may be an expectation of higher returns over periods longer than the 10 years Verus is using, 7.00% still appears to be above the expected median return based on our analysis. Therefore, we are recommending a reduction of 0.25% in the investment return assumption to 6.75%.

	Investment Return
Current assumption	7.00%
Recommendation	6.75%

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Section 3 Actuarial Methods and Miscellaneous Assumptions

Actuarial Methods

As part of the triennial investigation, we have reviewed the actuarial methods and other issues related to the actuarial assumptions.

- **Cost Method:** The actuarial valuation is prepared using the entry age actuarial cost method (CERL 31453.5). We believe that this cost method is appropriate for SamCERA's valuation. It is also the cost method that is required for GASB Statements 67 and 68. We recommend no change. Note that this is by far the most popular method used for public sector retirement systems, as it results in more stability in normal costs and provides a level allocation of costs over each individual's working lifetime.

- **Funding Method (amortization of UAAL):** The current method uses a 15-year closed period layered approach. This method is consistent with guidelines published by the California Actuarial Advisory Panel (CAAP). We recommend no change.

- **Valuation of Assets:** We believe that the current asset valuation method which smoothes gains and losses over five years (actually 10 six-month periods) and includes an 80% to 120% corridor is appropriate for SamCERA's valuation. A five-year smoothing period is used by a majority of large public retirement systems. This method is also consistent with guidelines published by CAAP. We recommend no change.

- **Adjustment to Plan 3 Normal Cost Rate:** The current method increases the Plan 3 Normal Cost rate to account for Plan 3 members being eligible to transfer to Plans 2, 4 or 5 (depending on entry date) after five years of service. Under this method, the Plan 3 Normal Cost rate is 50% of the unadjusted Plan 3 Normal Cost rate and 50% of the Plan 4 Normal Cost rate. We believe this method continues to be appropriate and recommend no change.

- **Plan 3 Retirement Age Factors:** Plan 3 retirement age factors are intended to provide an early retirement benefit that is the actuarial equivalent of an age 65 benefit. Specifically, CERL 31497.3(f) states: "The ERA (early retirement age) factors set forth in this subdivision shall be used until adjusted by the board in accordance with the interest and mortality tables adopted by the board." Since the interest rate and mortality assumptions have changed, we recommend the Board consider adopting new ERA factors to reflect the new assumptions. The expected impact would be a small increase in the ERA factors, resulting in slightly larger future benefits than under the current factors for Plan 3 members retiring prior to age 65.

Miscellaneous Assumptions

Miscellaneous Assumptions

- **Reciprocity:** Members who terminate may go to work for a reciprocal employer. This can result in an increase in the member's final average compensation used in the calculation of their SamCERA benefit. We currently assume that 35% of future General terminated vested members and 45% of future Safety terminated vested members retire with a reciprocal employer. We reviewed this assumption and are recommending a small decrease in the assumption for both General and Safety members. The results of the study are as follows. Note that for this study we studied all current deferred vested members.

Probability of Reciprocal Employer					
Class	All Terms >= 5 Years	Recip.	Actual	Expected	Proposed
General	823	257	31%	35%	30%
Safety	55	21	38%	45%	40%

- **Probability of Eligible Survivor:** Eligible surviving beneficiaries (spouses or qualified domestic partners of members) generally receive a 60% continuance of the member's benefit (100% continuance for service-connected disabilities and 50% for Plan 3 members). The valuation assumes a certain percentage of members will have an eligible survivor at retirement. We studied this assumption and are not recommending a change. The results of the study are as follows:

Retirees with Eligible Survivor			
Gender	Actual	Expected	Proposed
Male	70%	75%	75%
Female	51%	55%	55%

- **Survivor age difference:** We are not recommending a change to the assumption of the age difference between members and their eligible survivors. The current assumption is that survivors are three years younger than male members and two years older than female members. We studied the beneficiary age difference compared to the member age based on retirements during the study period where the unmodified 60% continuance was elected and found the results to be consistent with the assumptions. Specifically, male retirees were 2.9 years older than their beneficiaries, and female retirees were 1.7 years younger than their beneficiaries. Based on this analysis, we recommend no change to the assumption.

Miscellaneous Assumptions (continued)

- **Assumed Commencement Age for Deferred Members:** We studied the actual retirement ages of members who previously terminated and chose to defer their retirement. The results of the study and our proposed assumptions are shown in the following table. Our one recommended change is to increase the assumed retirement age for General members (except Plans 3 & 7).

	Deferred Retirements		Assumed Retirement Age	
Plan	Count	Avg Age	Current	Proposed
G1, G2, G4 & G5	112	59.6	55	58
G3	15	60.6	65	65
G7	0	na	62	62
All S/P	23	53.0	50	50

- **Sick Leave Service Credit:** Some county retirement systems allow the conversion of unused sick leave to retirement service credit at retirement. In those cases, an assumption for an increase in service credit at retirement due to sick leave service credit may be appropriate. County employees may convert unused sick leave to contributions for purchasing health benefits but cannot convert to retirement service credit, and therefore there is no impact on the retirement service credit. We analyzed actual retirements for the fiscal year ending June 30, 2016 and found no additional increase in service credit at retirement. Accordingly, we recommend continuing with the current assumption of no sick leave service being converted to retirement service.

Non-Valuation Methods

- **Operating Tables:** We recommend the operating tables be updated to reflect the new economic assumptions as well as the new mortality assumptions.
- **Member Contribution Rates:** The proposed changes to the economic assumptions, mortality and merit salary scale will impact the basic member contribution rates. New member rates will need to be calculated during the June 30, 2017 actuarial valuation. Additionally, the Cost-of-Living portion of the member rates will be updated at that time. A sample of the estimated impact to member rates due of these proposed changes is shown in the chart below.

Sample Changes in Member Rates due to Proposed Assumption Changes (Based on June 30, 2016 Actuarial Valuation[1])

	Entry Age	Current	Proposed	Increase
General Members - County				
Plan 1	35	13.54%	13.84%	0.30%
Plan 2	35	13.45%	13.71%	0.26%
Plan 4	35	12.26%	12.77%	0.51%
Plan 5	35	7.91%	8.39%	0.48%
Plan 7	All	8.14%	8.71%	0.57%
Probation Members				
Plan 1	25	17.78%	17.71%	-0.07%
Plan 2	25	17.59%	17.51%	-0.08%
Plan 4	25	14.99%	15.81%	0.82%
Plan 5	25	14.67%	15.53%	0.86%
Plan 6	25	10.87%	11.66%	0.79%
Plan 7	All	13.38%	14.70%	1.32%
Safety Members -- Other than Deputy Sheriffs [2]				
Plan 1	25	19.46%	18.71%	-0.75%
Plan 2	25	19.26%	18.92%	-0.34%
Plan 4	25	16.50%	17.30%	0.80%
Plan 5	25	15.19%	16.04%	0.85%
Plan 6	25	10.96%	11.84%	0.88%
Plan 7	All	13.90%	15.08%	1.18%

1 Final FYB 2018 member rates will be determined based on the June 30, 2017 valuation.

2 Cost Sharing varies for Deputy Sheriffs as follows, so total rate is either 2.0%, 1.5%, or 0.5% less than shown depending on the level of service.
3.0% if employee is less than age 45 and has less than 5 years of service.
3.5% if employee is less than age 45 and has between 5 and 15 years of service.
4.5% if employee is older than age 45 or has at least 15 years of service.

Note that the sample member contribution rates are total rates and include the COLA and Cost Share portions where applicable.

Non-Valuation Methods (continued)

Note that for purposes of calculating the member contribution rates we recommend the valuation mortality tables use a static projection to 2039 for the calculation of member rates to reflect future mortality improvement. 2039 was selected because it represents the weighted average of when all future payments are projected to be made to the active members whose contribution rates vary by entry age. Additionally, we are recommending using a male/female blend for Safety/Probation of 75%/25% (currently 83%/17%) based on the make-up of the group.

- **Implementation:** For the Plan 3 ERA factors, the operating tables and the member contribution rates, we recommend the implementation date be July 1, 2018.

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Section 4 Salary Increases Due to Promotion and Longevity (Merit)

Estimates of future salaries are based on assumptions for two types of increases:

1) Increases in each individual's salary due to promotion or longevity, which occur even in the absence of inflation (merit increases); and

2) Increases in the general wage level of the membership, which are directly related to inflation and increases in productivity.

In Section 2, we discuss the second of these rates, the general wage inflation, which is 3.00% under the proposed assumptions.

Results

Exhibit 4-1 shows the actual merit increases, plus the general wage growth assumption, over the period July 1, 2005-June 30, 2016. Increases were generally higher earlier in a member's career (lower service) and then decreased over time, consistent with the current assumptions. Overall, the actual increases were close to that predicted by the current assumptions, although the Safety group tended to have higher merit increases later in their careers.

Note that this period is longer than the period over which all other assumptions were studied. We felt that studying salary increases over a longer period of time would smooth out short-term differences and would result in a more representative analysis of salary increase patterns.

We also studied the merit patterns of Safety and General members separately, as we have seen differences between the two groups in other systems. There were some differences for SamCERA; in particular, the merit increases for Safety members generally exceeded the assumption after 10 years of service. We decided to incorporate these differences and use one assumption for General members and a separate assumption for Safety/Probation members. The results by class are shown in Exhibit 4-2 and Exhibit 4-3.

Recommendation

Based on the results of this, we are recommending a change in the merit component of the salary increase assumptions.

Additionally, for SamCERA members currently working for a reciprocal employer (or assumed to in the future), we recommend using a 3.52% annual increase for General members and a 3.77% annual increase for Safety members. These assumptions are equal to the wage growth assumption plus the ultimate assumed merit increase for the respective class.

Exhibit 4-1 **Total Annual Rates of Increase in Salary Due to Merit and Longevity**
(Excluding the General Wage Growth Assumption)

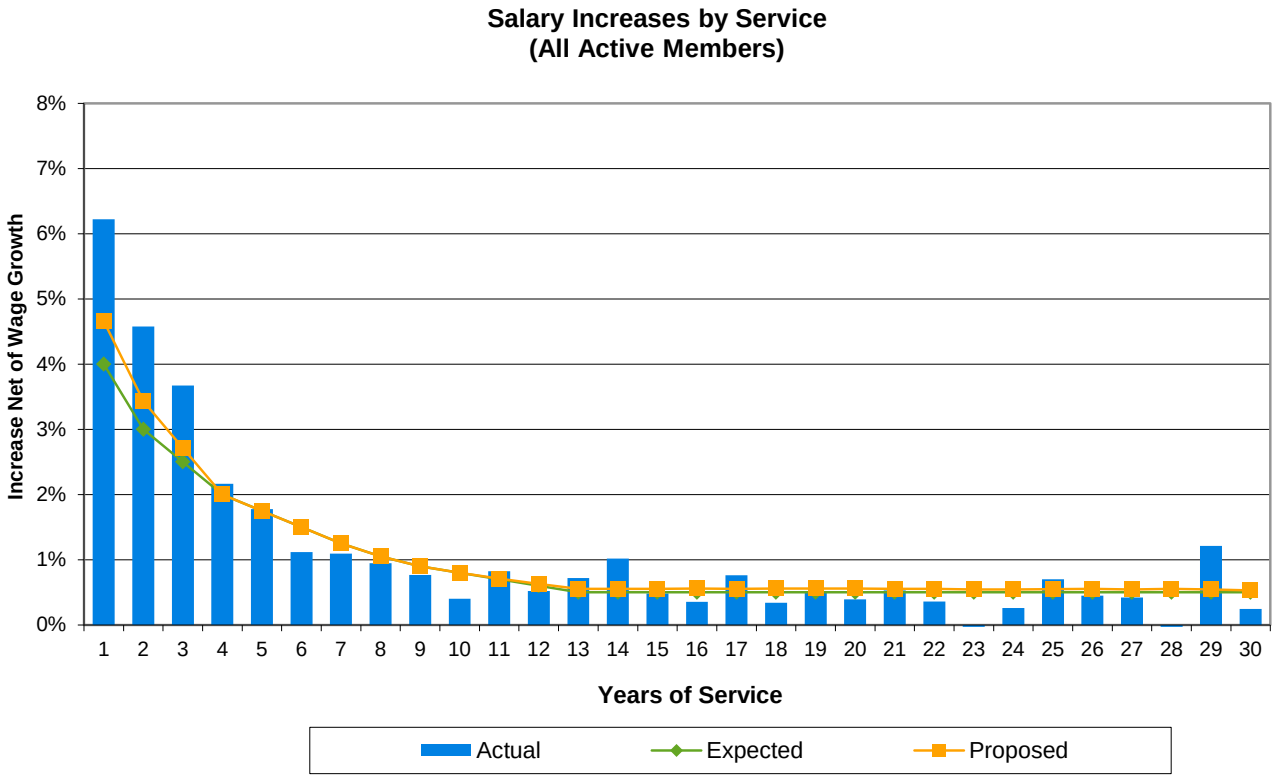


Exhibit 4-2 **Total Annual Rates of Increase in Salary for General Members Due to Merit and Longevity**
(Excluding the General Wage Growth Assumption)

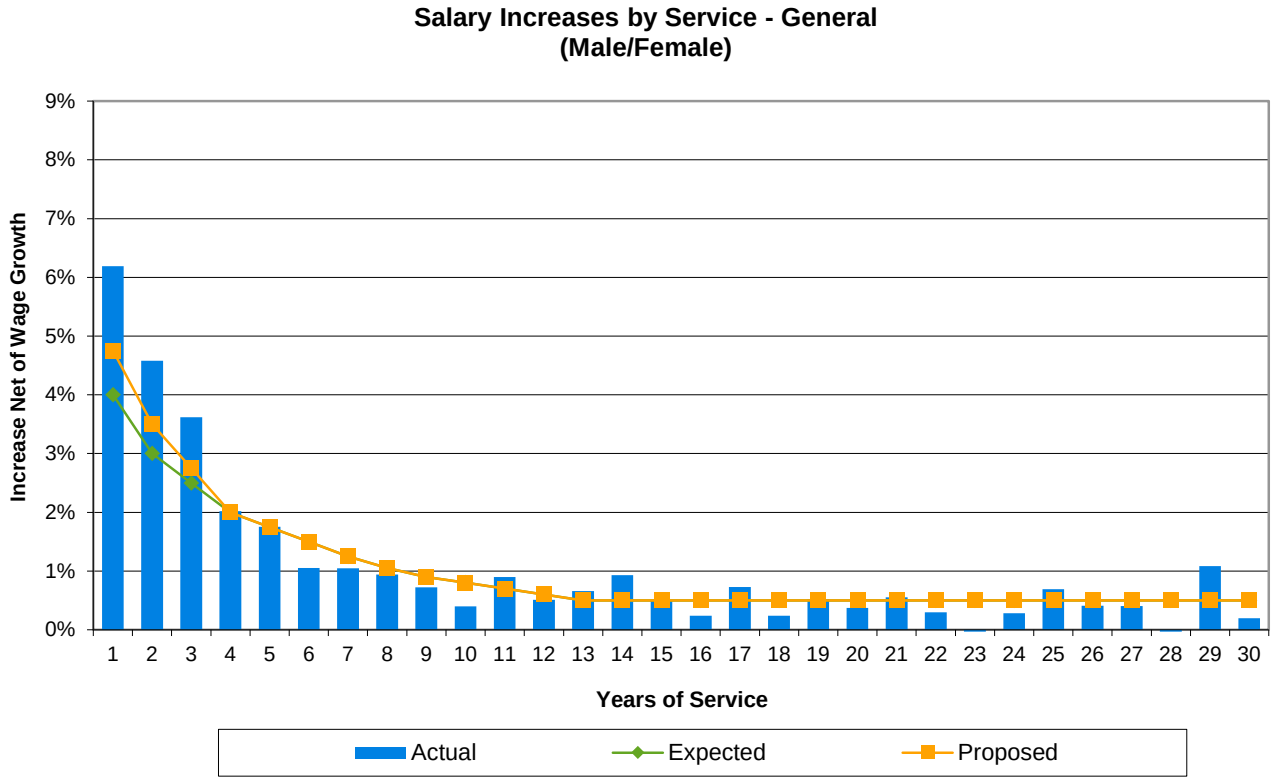
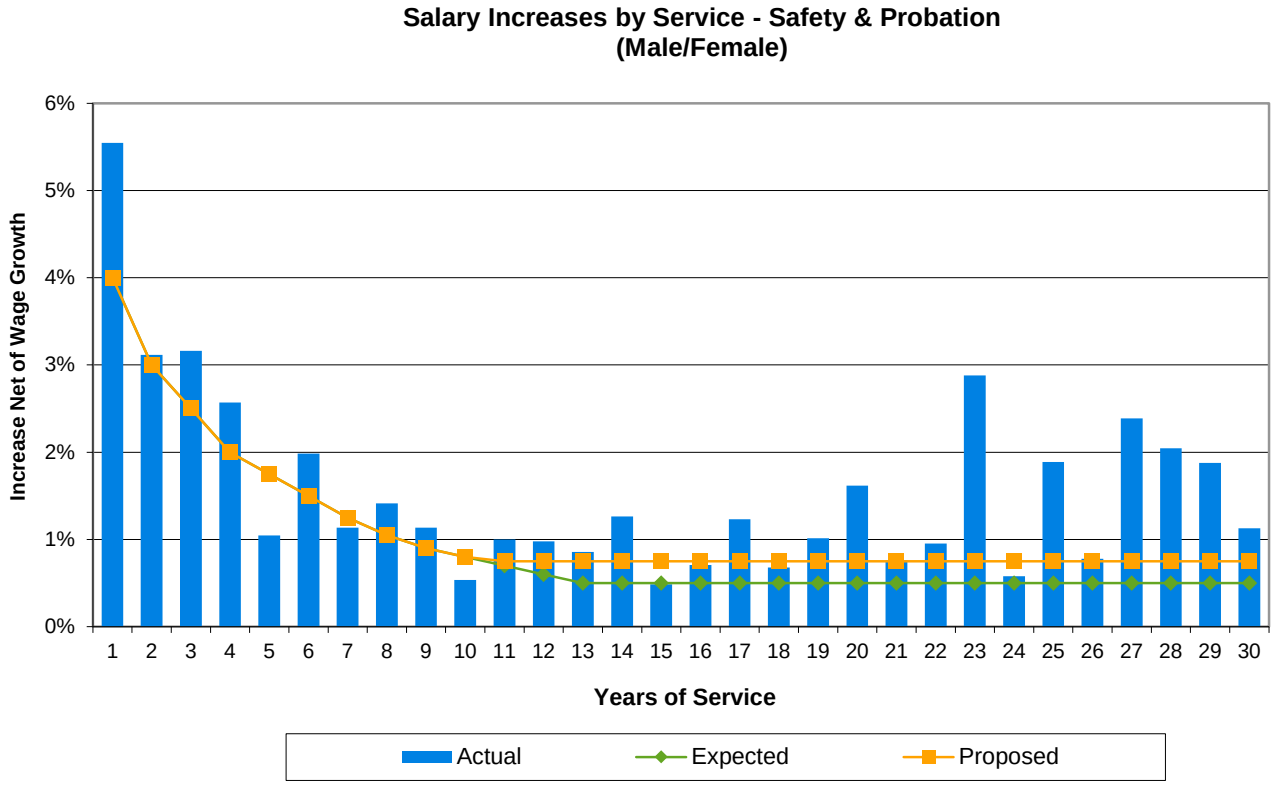
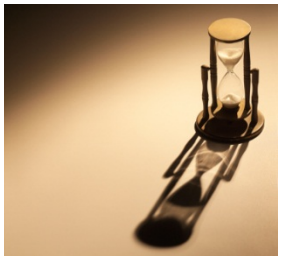


Exhibit 4-3 **Total Annual Rates of Increase in Salary for Safety/Probation Members Due to Merit and Longevity**
(Excluding the General Wage Growth Assumption)



Section 5 Mortality



In this section we look at the results of the study of actual and expected death rates of retired members. We studied rates of mortality among healthy and disabled retired members. Valuation mortality is a critical assumption, since it has a material impact on the estimate of the costs of the future plan obligations.

Mortality has been improving in this country and is expected to continue to improve. A comprehensive study released in 2014 by the Society of Actuaries a few years ago showed marked increases in life expectancies since its previous study in 2000. We recommend using generational mortality tables (see later discussion) to account for projected future improvements in mortality. Generational mortality is reflected by including a mortality improvement scale that projects small annual decreases in mortality rates. Therefore generational mortality explicitly assumes that members born more recently will live longer than the members born before them.

The Actuarial Standards of Practice require expected future mortality improvements to be considered in selecting the assumption. Using generational mortality tables achieves this. If generational mortality tables are not used, a margin in the mortality assumption should be used to account for future improvements in mortality, which is discussed later in this section.

Results

Overall, we found there were more deaths than the current rates predicted: 300 actual to 275 expected for a total ratio of 109%. The following is a comparison of the actual-to-expected deaths of retired members by class and gender for the study period.

Retiree Mortality

Service Retirement

	Deaths			Actual to	Actual to
Group	Actual	Expected	Proposed	Expected	Proposed
General Male	92	86	90	107%	102%
General Female	163	146	161	112%	101%
Safety Male	15	15	17	100%	88%
Safety Female	3	1	2	300%	150%
Total Svc Ret	**273**	**248**	**270**	**110%**	**101%**

Disability Retirement

	Deaths			Actual to	Actual to
Group	Actual	Expected	Proposed	Expected	Proposed
General Male	8	9	8	89%	100%
General Female	16	13	14	123%	114%
Safety Male	3	4	4	75%	75%
Safety Female	-	1	1	0%	0%
Total Dis Ret	**27**	**27**	**27**	**100%**	**100%**
Grand Total	**300**	**275**	**297**	**109%**	**101%**

Results (continued)

Results are shown graphically on the following pages. Note that analysis of Safety females is not shown in graph form due to the small number of actual and expected deaths.

We also studied how the value of an individual's benefits affected their mortality. We found that as the value of benefits increased the mortality rates decreased; however, it was of a smaller magnitude than we have seen in most other systems. We have included a small margin in our recommended rates to account for this.

Generational Mortality Tables

There is a trend in the actuarial profession to use generational mortality tables, which explicitly reflect expected improvements in mortality. Generational mortality tables include a base table and a projection table. The projection table reflects the expected annual reduction in mortality rates at each age. Therefore, each year in the future, the mortality at a specific age is expected to decline slightly (and people born in succeeding years are expected to live slightly longer).

For example, if the mortality rate at age 75 is 2.00% for a member currently aged 75 and the projected improvement is 1.00%, the mortality rate at age 75 for a member currently aged 74 will be 1.98% [2.00% x (100.00% - 1.00%)]. Therefore, the life expectancy for a 75-year old in the next year will be greater than a 75-year old in the current year. This can result in significant differences in life expectancies when projecting improvements 30-plus years into the future.

One of the main benefits of generational mortality tables is the valuation assumptions should effectively update each year to reflect improved mortality, and the mortality tables should need to be changed much less.

Projection Scale for Mortality Improvement

There is a strong consensus in the actuarial community that future improvements in mortality should be reflected in the valuation assumptions. There is less consensus, however, about how much mortality improvement should be reflected. The projection scale (which projects future improvements in mortality) published by the Society of Actuaries (SOA) in 2014 incorporates a complex matrix of rates of improvement that vary by both age and birth year. Ultimately, the projection scale (MP-2014) goes to a flat 1% annual improvement in years 2027 and later for ages 85 or less.

Our recommendation is to use 100% of the ultimate portion of the MP-2014 projection scale. In other words, our recommendation is to assume 1.0% annual improvements in mortality (for ages less than 85). We believe this reasonably reflects the long-term expectation of mortality improvement. We have compared our recommended projection scale with actual mortality improvement from the most recent 60 years of experience of the US Social Security system and found them to be reasonably consistent.

As noted, the recommended projection scale is a flat 1.0% improvement through age 85. For subsequent ages, the projected improvement is fractionally less, grading down to 0.0% at age 115. For example, the projected improvement is 0.64% per year at age 100.

Recommendation

We recommend strengthening the mortality assumption (i.e., increasing life expectancies), by slightly increasing most mortality rates, but adding a projection scale to reflect expected future improvements in mortality. Note that this reduces the total healthy retiree actual/proposed ratio to 101% based on the base rates, but will ultimately result in increased life expectancies due to the projection scale. We believe the combination of the recommended mortality tables with the projection scale allows for a reasonable expectation of future life expectancy increases.

SamCERA uses standard mortality tables adjusted to best fit the patterns of mortality among its retirees. Appendix A-1 describes the new tables being recommended for healthy and disabled retirees. Note these are based on a recent study of retiree pensioners published by the Society of Actuaries in 2014 (hence, the table name RP-2014). The recommended mortality rates are based on the RP-2014 Healthy Annuitant Mortality table (and the RP-2014 Disabled Retiree table in some cases) and all assume generational mortality improvement based on 100% of the MP-2014 Ultimate projection scale

Note that for beneficiaries of healthy and disabled retirees, we recommend that the mortality for healthy general retirees be used.

Exhibit 5-1 **Mortality for Service Retirees**
General Males

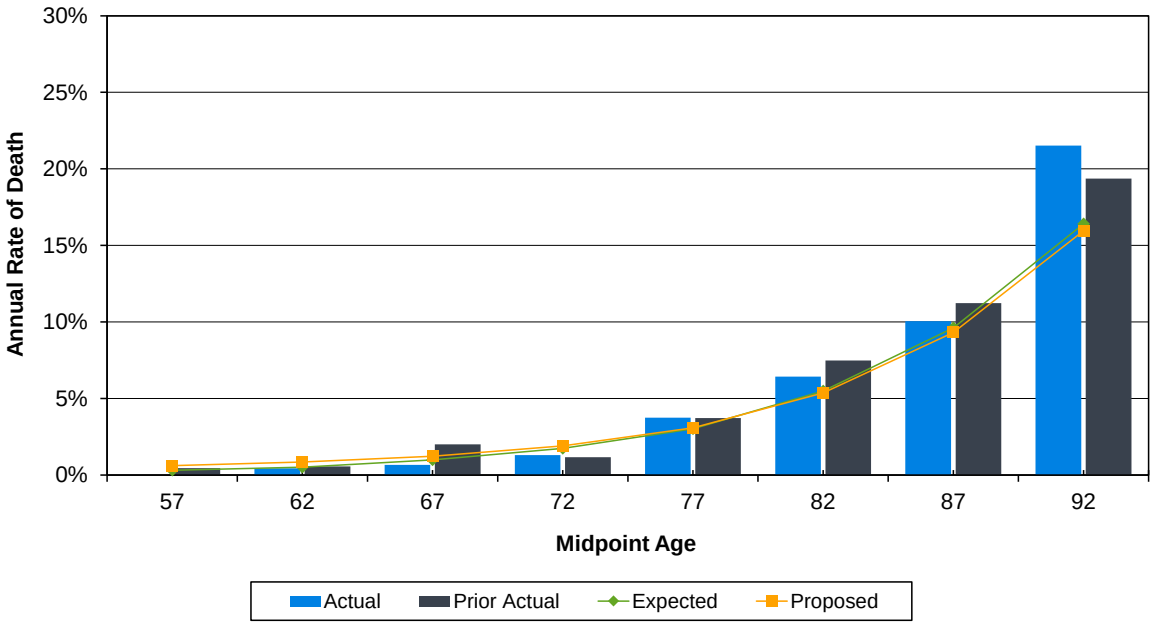
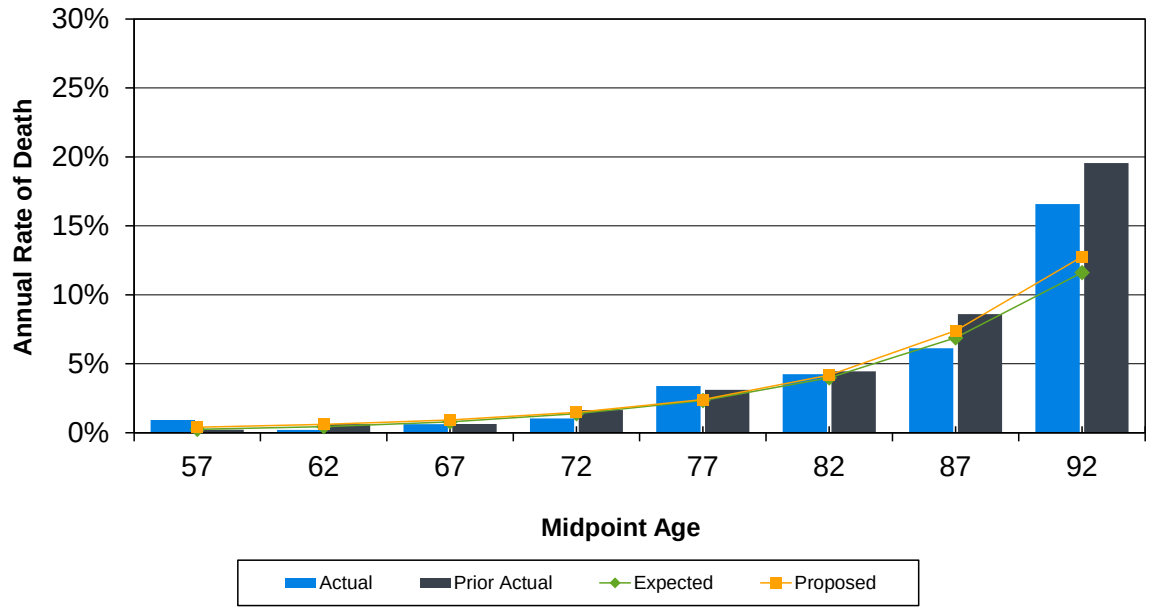
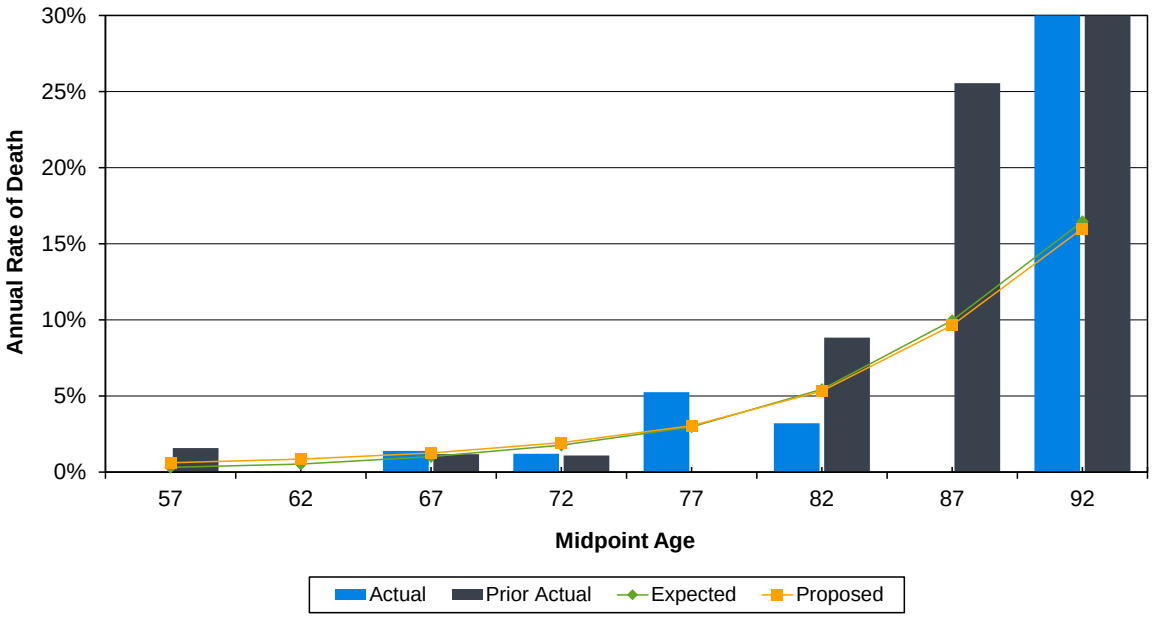


Exhibit 5-2 **Mortality for Service Retirees**
General Females



Mortatlity for Service Retirees -- General Members					
Gender	**Actual**	**Expected**	**Act / Exp**	**Proposed**	**Act / Prop**
Male	92	86	107%	90	102%
Female	163	146	112%	161	101%
Total	255	232	110%	251	102%

Exhibit 5-3 Mortality for Service Retirees
Safety Males



Mortatlity for Service Retirees -- Safety Members					
Gender	**Actual**	**Expected**	**Act / Exp**	**Proposed**	**Act / Prop**
Male	15	15	100%	17	88%
Female	3	1	300%	2	150%
Total	18	16	113%	19	95%

Exhibit 5-4 **Mortality for Disabled Retirees**
General Males

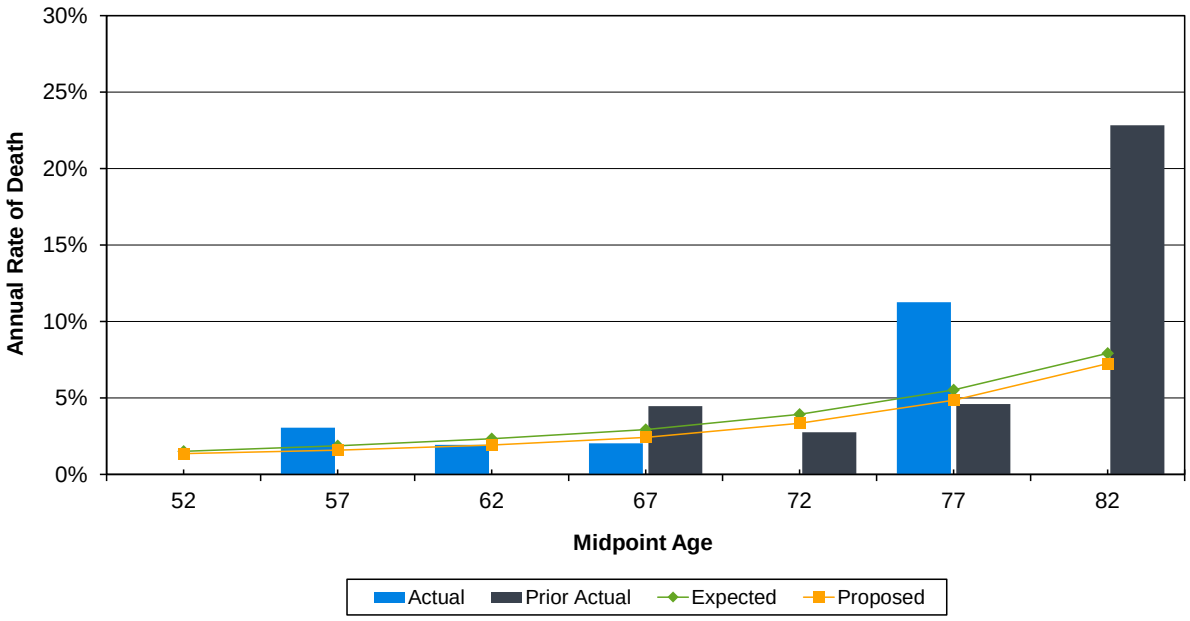
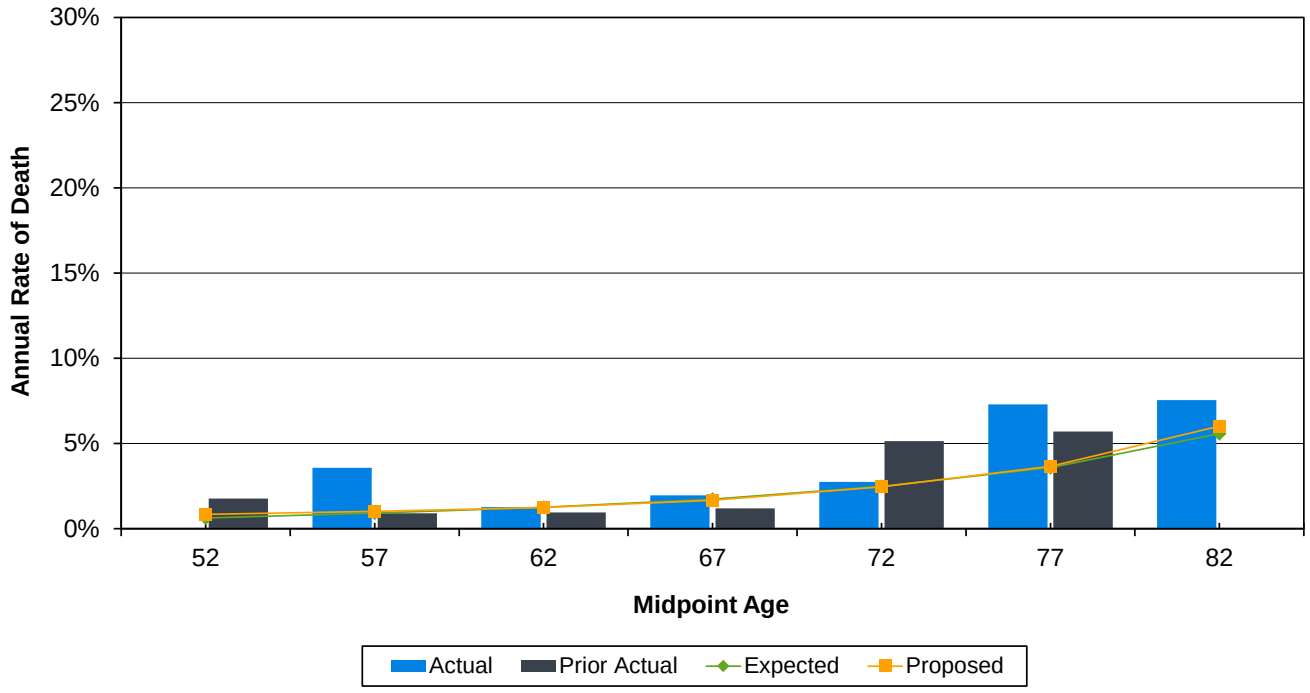
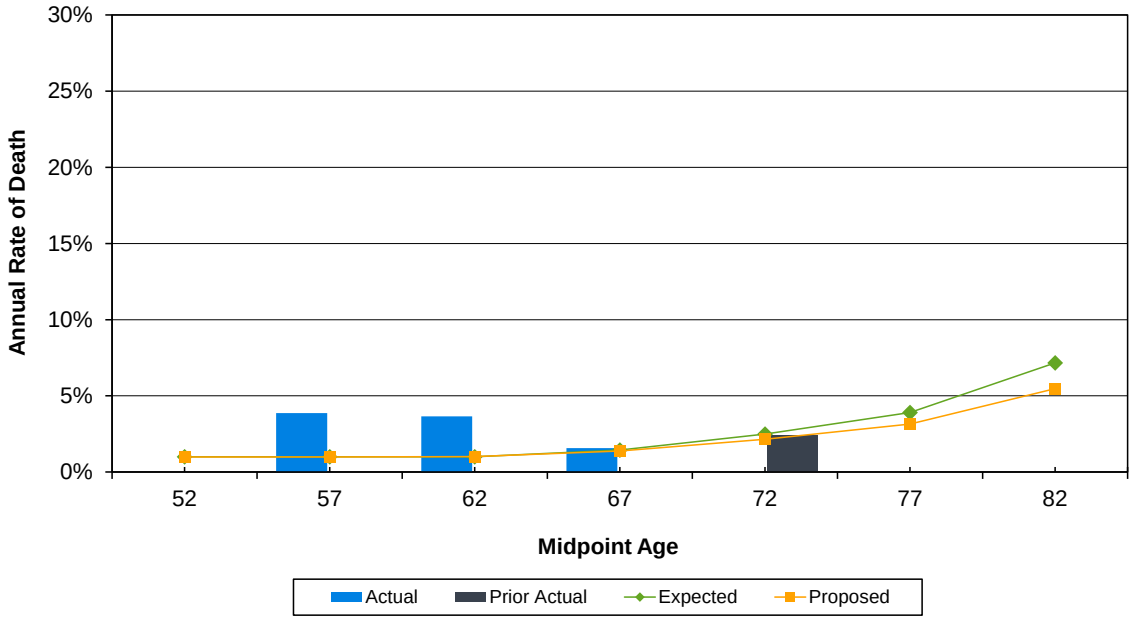


Exhibit 5-5 **Mortality for Disabled Retirees**
General Females



Mortatlity for Disability Retirees -- General Members					
Gender	**Actual**	**Expected**	**Act / Exp**	**Proposed**	**Act / Prop**
Male	8	9	89%	8	100%
Female	16	13	123%	14	114%
Total	24	22	109%	22	109%

Exhibit 5-6 Mortality for Disabled Retirees Safety Males



Mortatlity for Disability Retirees -- Safety Members					
Gender	**Actual**	**Expected**	**Act / Exp**	**Proposed**	**Act / Prop**
Male	3	4	75%	4	75%
Female	0	1	0%	1	0%
Total	3	5	60%	5	60%

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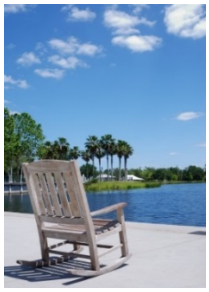
Section 6 Service Retirements



Exhibits 6-1 through 6-3 show the actual and expected rates of service retirement. Our analysis of rates of service retirement was by attained age.

Exhibits 6-1 through 6-3 study retirements for the following groups:

- Exhibit 6-1: General Members – Males
- Exhibit 6-2: General Members – Females
- Exhibit 6-3: Safety/Probation Members – Males and Females

Results

For General and Safety/Probation members, the total actual retirements from active service were less than the assumptions predicted.

As shown below, the total number of retirements (453) was only 78% of the total number expected (583).

Service Retirements			
Class	**Actual**	**Expected**	**Act / Exp**
General	381	485	79%
Safety	72	98	73%
Total	453	583	78%

Recommendation

We recommend revised service retirement rates for General and Safety/Probation members, including extending the retirement rates to age 75 for General members and age 65 for Safety/Probation members. Previously, a 100% probability of retirement was assumed at ages 70 and 60 respectively. These revisions result in lower expected retirements, and the proposed retirement rates more closely follow the age pattern of actual retirements of the last two studies. Additionally, we recommend continuing the 100% probability of retirement at certain age and service combinations (shown in Appendix A) where the benefit is approximately 100% of final average compensation.

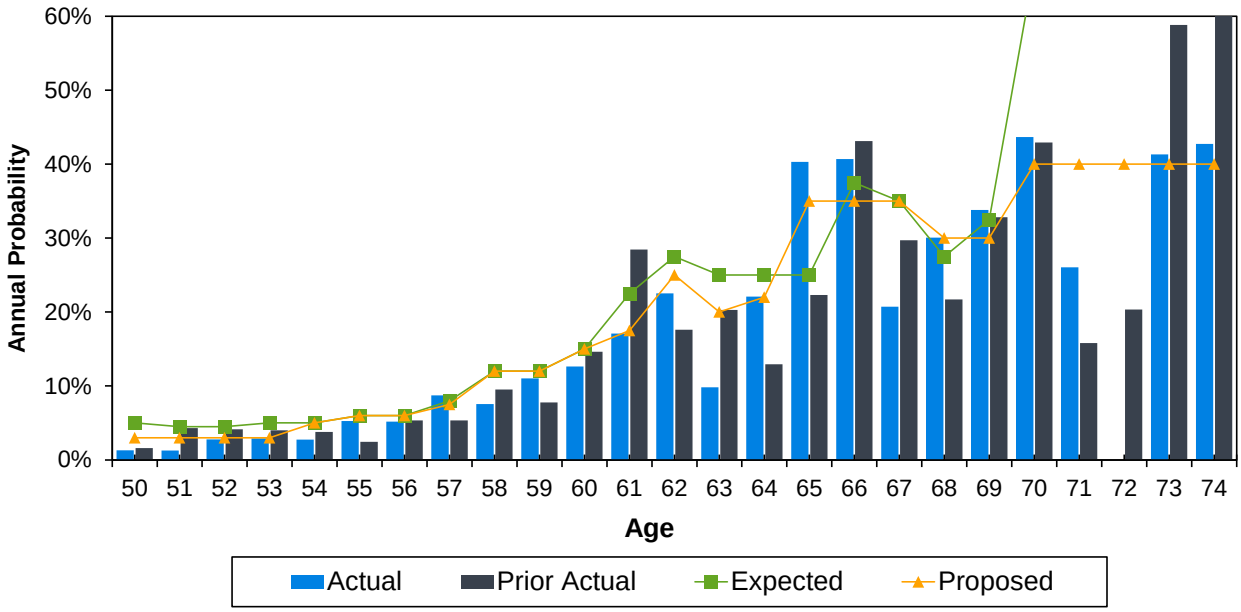
A comparison of the actual and expected retirements under the recommended assumptions is shown in the table below.

Service Retirements			
Class	**Actual**	**Proposed**	**Act / Prop**
General	381	428	89%
Safety	72	80	90%
Total	453	508	89%

For General Plans, 5, 6 and 7 members, we are a recommending lower retirement rates at most ages to reflect the lower benefits (compared to Plans 1, 2 and 4) provided under these plans.

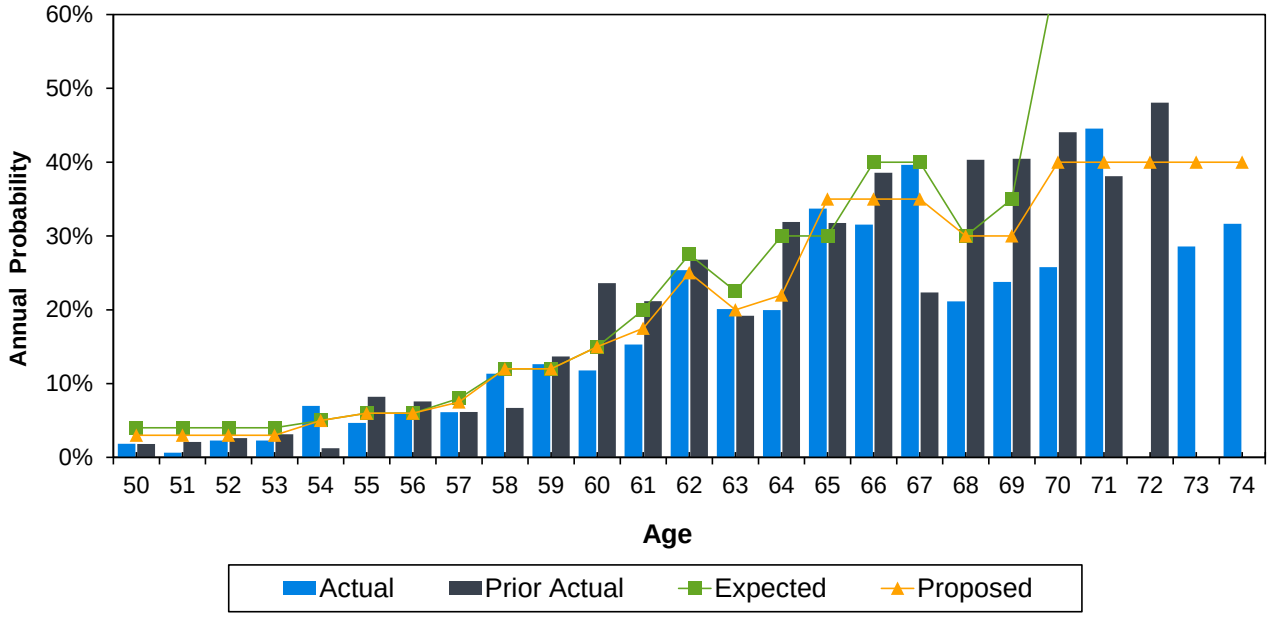
There were not enough Plan 3 service retirements to perform a statistically meaningful study; therefore we are recommending no change to these rates except for extending the rates to age 75. The proposed rates result in 11 expected General Plan 3 retirements compared to eight actual.

Exhibit 6-1 **Retirement Rates**
General Males (excluding Plan 3)



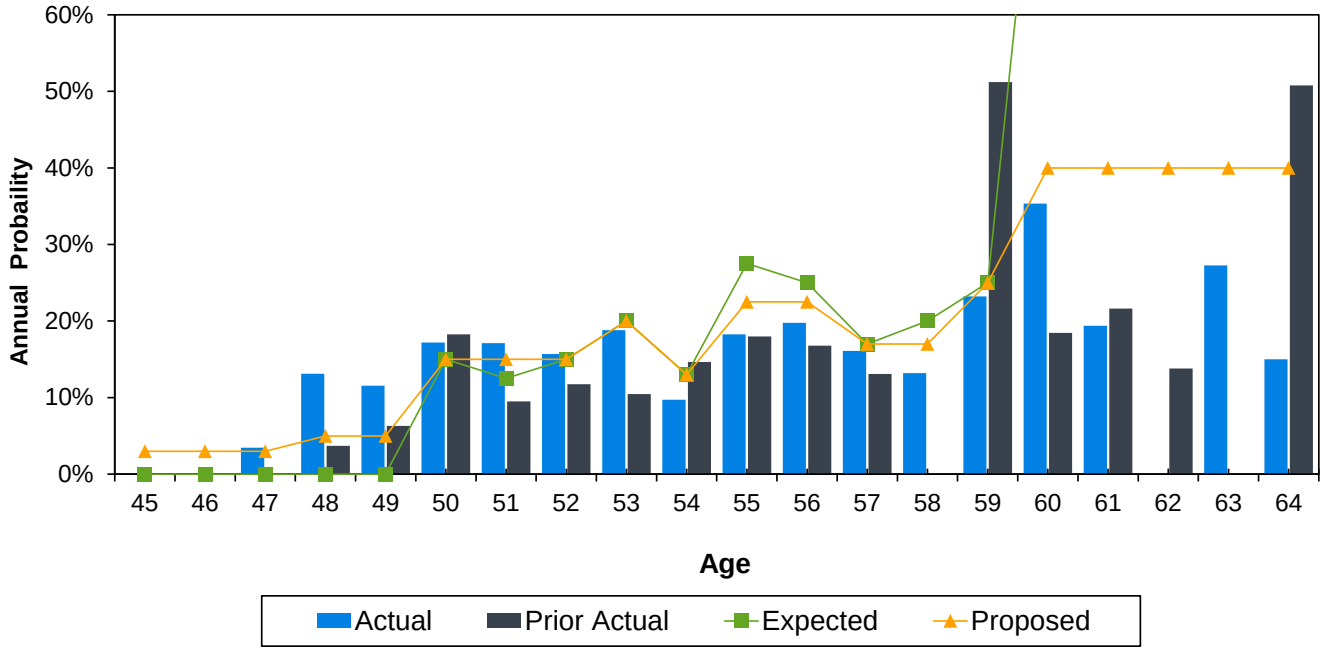
Ages 50-74	Expected	Actual	Proposed
Total Count	164	126	144
Actual / Expected	77%		88%

Exhibit 6-2 **Retirement Rates**
General Females (excluding Plan 3)



Ages 50-74	Expected	Actual	Proposed
Total Count	313	249	276
Actual / Expected	80%		90%

Exhibit 6-3 **Retirement Rates**
Safety Males/Females



Ages 45-64	Expected	Actual	Proposed
Total Count	98	72	80
Actual / Expected	73%		90%

Section 7 Disability Retirement

Results

SamCERA allows a member to start receiving benefits prior to eligibility for service retirement if they become disabled. There are two types of disability:

1) Non-service-Connected Disability: This is available to a disabled member only if he has satisfied the vesting requirement.

2) Service-Connected Disability: This is available only to members who are disabled for the performance of duty. There is no service requirement, and the service-connected disability benefit generally pays a larger benefit than Non-service-connected disability.

We have found that in many systems, including SamCERA, there is generally at least a six-month lag between the actual occurrence of a disability retirement and the subsequent approval and reporting of that same retirement. To account for this, we studied the period July 1, 2013 to June 30, 2016.

The total adjusted number of disability retirements (service-connected and Non-service-connected combined) was as expected for General members (47 actual versus 47 expected). There were 15 actual Safety disabilities, compared to nine expected disabilities.

Disability Retirements			
Class	**Actual**	**Expected**	**Act / Exp**
General	47	47	100%
Safety	15	9	167%
Total	62	56	111%

Results – Comparison of Service and Ordinary Disability

The total disability rates are split between ordinary and service disability in accordance with the approximate relative number of each reported in the experience data for General and Safety members. The proportions of disabilities attributable to each cause in the study period are shown in the following chart.

Split between Service and Non-Service Connected Disability					
Class	**Svc**	**Non-Svc**	**Total**	**Svc/Total**	**Exp Svc %**
General	36	11	47	77%	60%
Safety	14	1	15	93%	100%

Recommendation

We are recommending no change to the rates of disability retirement for General male members and are recommending adjustments to the rates of disability retirement for General female members and all Safety/Probation members to better reflect observed experience.

We recommend changing from a 60%/40% split between service-connected and Non-service-connected disabilities for General members to a 65%/35% split. We recommend continuing to use an assumption of 100% service-connected disability for Safety/Probation members.

Disability Retirements					
Class	**Actual**	**Expected**	**Act / Exp**	**Proposed**	**Act / Prop**
General	47	47	100%	48	98%
Safety	15	9	167%	11	136%
Total	62	56	111%	59	105%

Section 8 Other Terminations of Employment

This section of the report summarizes the results of our study of terminations of employment for reasons other than death, service retirement, or disability. A member who terminates, but does not retire, is assumed to either take a refund (a withdrawal) or to terminate employment but leave their member contributions with the system (a vested termination). We will refer to the combination of the two rates as the aggregate termination rate. This approach sets a probability that the member will terminate, and then assumes a certain portion of the members terminating will elect a refund. The probability of refund is discussed in more detail in Section 9.

Results

Termination rates are currently based on two factors: years of service and membership. Rates of termination vary by years of service – the greater the years of service, the less likely a member is to terminate employment. We found that there were differences with respect to rates of termination by plan, particularly when comparing Safety members to the General members. The current assumptions also vary by gender for General members, with females having a slightly lower probability of terminating than males.

Overall, the actual number of terminations was higher than expected for both General and Safety members.

Termination - General Members			
Gender	**Actual**	**Expected**	**Act / Exp**
Male	276	216	128%
Female	609	423	144%
Total	885	639	139%

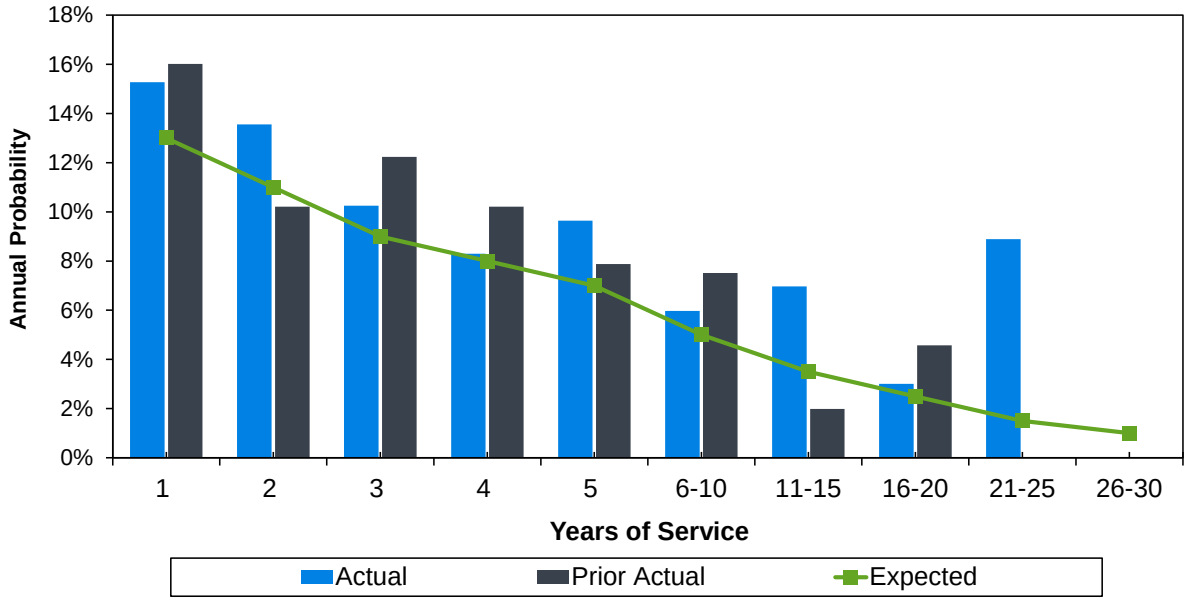
Termination - Safety Members			
Gender	**Actual**	**Expected**	**Act / Exp**
Male/Female	52	46	113%

Recommendation

We are recommending no changes to the rates of termination for male General members. We are recommending some increases to the rates of termination for female General members and minor modifications to the Safety/Probation members to better fit the actual pattern.

With the recommended rates the actual-to-expected ratio decreases from 137% in total to 126%. Note that we did not increase the rates further, because the rates from the prior study were lower. Also, some of the terminations may rehire in the future.

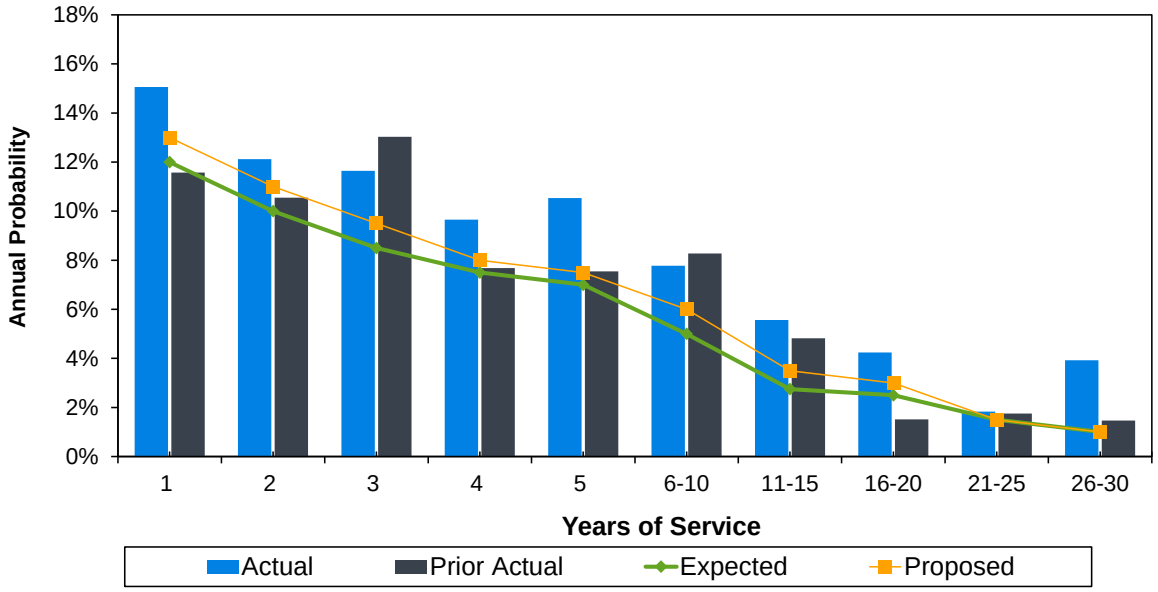
Exhibit 8-1 Termination by Years of Service* – General Males



	2014 - 2017 Data		
	Expected	Actual	Proposed
Total Count	216	276	216
Actual / Expected	128%		128%

**Excludes retirement-eligible members.*

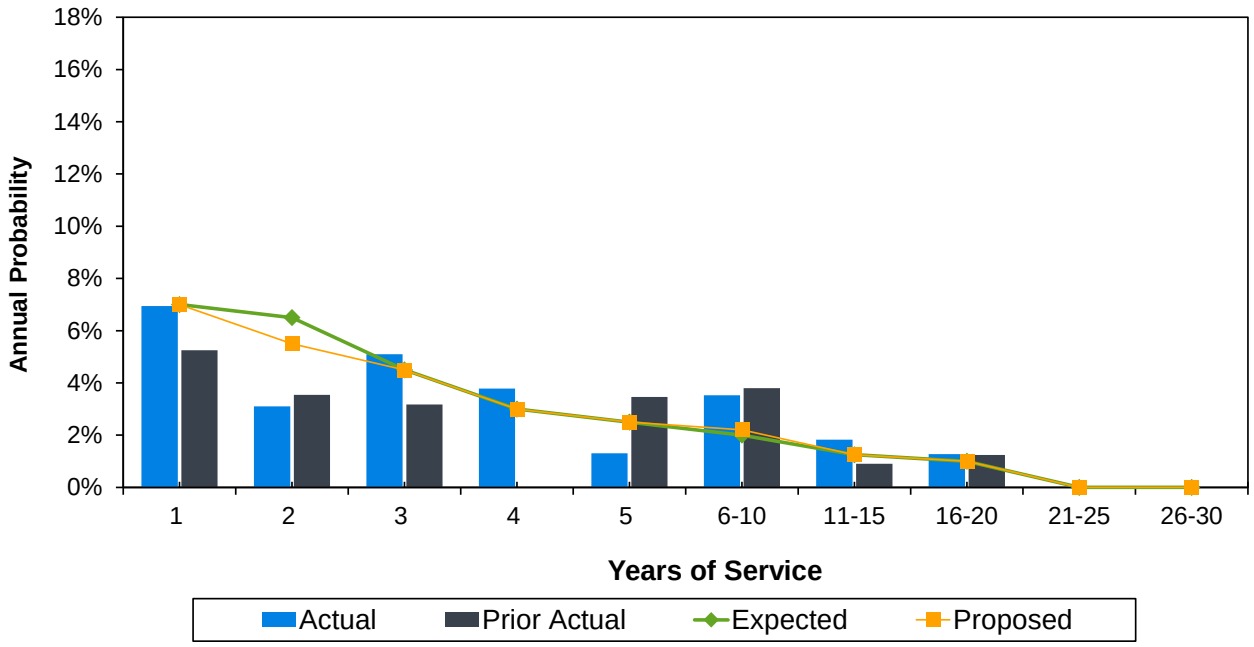
Exhibit 8-2 Termination by Years of Service* – General Females



	2014 - 2017 Data		
	Expected	Actual	Proposed
Total Count	423	609	482
Actual / Expected	144%		126%

**Excludes retirement-eligible members.*

Exhibit 8-3 Termination by Years of Service* – Safety



	2014 - 2017 Data		
	Expected	Actual	Proposed
Total Count	46	52	46
Actual / Expected	113%		113%

**Excludes retirement-eligible members.*

Section 9 Probability of Refund Upon Vested Termination

As discussed in Section 8, the aggregate termination rates include both members who terminate and take a refund of their contributions and those who elect to keep their contributions with SamCERA and receive a deferred vested benefit. This section of the report deals with the rates at which employees elect a refund of their contributions upon termination of service. It only considers vested members who are not yet eligible for service retirement. Under the current assumptions, members who terminate with fewer years of service have a greater probability of electing to withdraw their contributions. All non-vested members are assumed to take a refund at termination.

Results

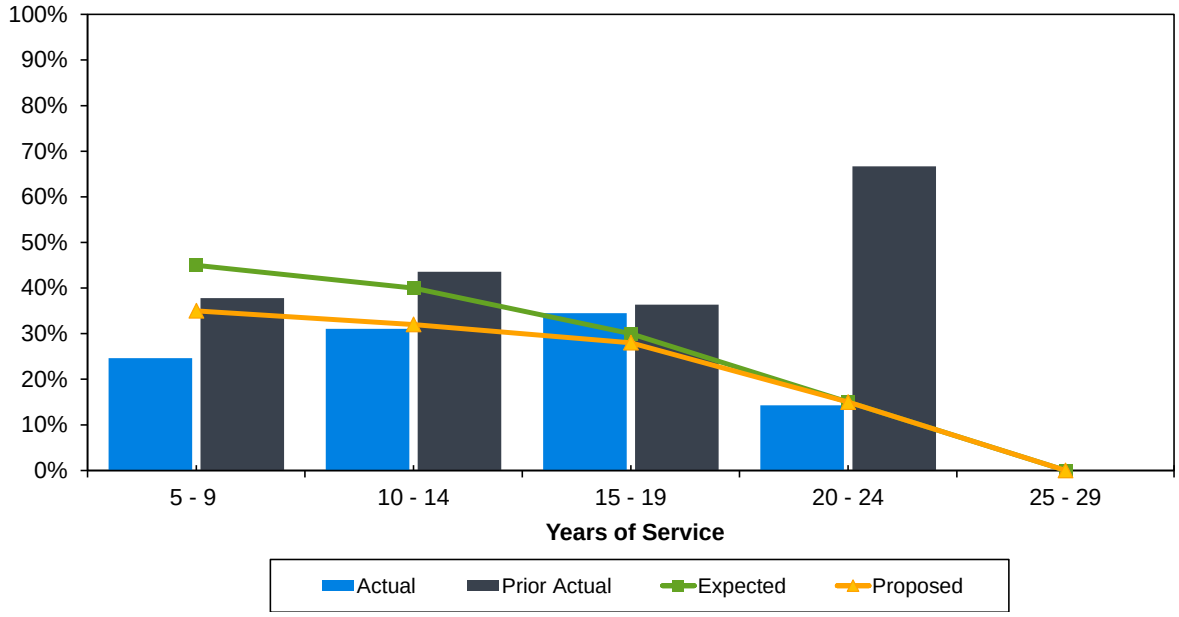
Exhibit 9-1 summarizes the results of our study. The results are generally lower than the assumptions.

Probability of Refund					
Class	**Actual**	**Expected**	**Act / Exp**	**Proposed**	**Act / Prop**
General	86	132	65%	105	82%
Safety	7	8	88%	7	100%
Total	93	140	66%	112	83%

Recommendation

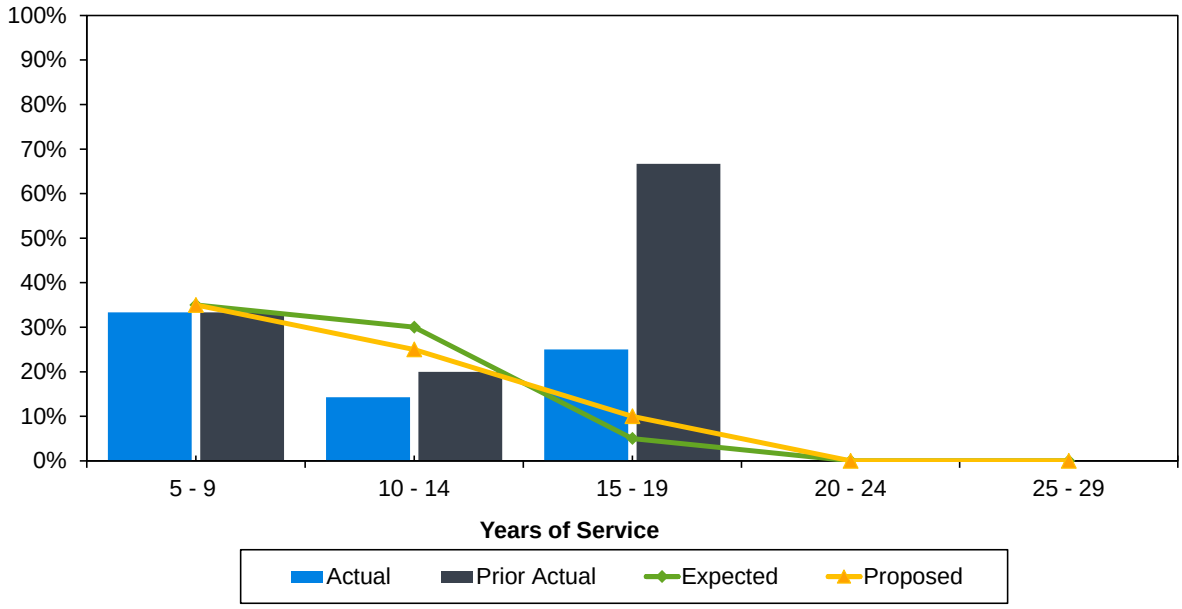
Based on the experience, we are recommending reductions to the rates at which members withdraw their contributions from SamCERA to better fit the actual pattern over the prior two studies.

Exhibit 9-1 Probability of Refund upon Vested Termination – General



	2014 - 2017 Data		
	Expected	Actual	Proposed
Total Count	132	86	105
Actual / Expected	65%		82%

Exhibit 9-2 Probability of Refund upon Vested Termination – Safety



	2014 - 2017 Data		
	Expected	Actual	Proposed
Total Count	8	7	7
Actual / Expected	88%		100%

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Appendix A Actuarial Procedures and Assumptions

The actuarial procedures and assumptions to be used in the June 30, 2017 valuation are described in this section. The assumptions were reviewed and changed as a result of the 2017 Investigation of Experience Study. Assumptions that have been changed, or are recommended to be changed, since the June 30, 2016 valuation are highlighted in yellow in the section that follows.

The actuarial assumptions used in the valuations are intended to estimate the future experience of the members of SamCERA and of SamCERA itself in areas that affect the projected benefit flow and anticipated investment earnings. Any variations in future experience from that expected from these assumptions will result in corresponding changes in the estimated costs of SamCERA's benefits.

Table A-1 summarizes the assumptions. The mortality rates are taken from the sources listed.

Tables A-2 and A-3 show how members are expected to leave retired status due to death.

Table A-4 presents the probability of refund of contributions upon termination of employment while vested.

Table A-5 presents the expected annual percentage increase in salaries.

Tables A-6 to A-11 present the probabilities a member will leave the system for various reasons.

NOTE: Assumptions for Probation members are assumed to be the same as Safety members unless otherwise noted.

Actuarial Cost Method

The actuarial valuation is prepared using the entry age actuarial cost method (CERL 31453.5). Under the principles of this method, the actuarial present value of the projected benefits of each individual included in the valuation is allocated as a level percentage of the individual's projected compensation between entry age and assumed exit (until maximum retirement age).

For members who transferred from Plan 3 to another General plan, entry age is based on the transfer date.

The portion of this actuarial present value allocated to a valuation year is called the normal cost. The portion of this actuarial present value not provided for at a valuation date by the sum of (a) the actuarial value of the assets, and (b) the actuarial present value of future normal costs is called the Unfunded Actuarial Accrued Liability (UAAL). The UAAL as of June 30, 2008 is amortized as a level percentage of the projected salaries of present and future members of SamCERA over the remaining period from the valuation date to June 30, 2023. This is commonly referred to as a "closed amortization method". Actuarial gains and losses after the June 30, 2008 valuation are amortized over new closed 15-year periods from their respective valuation dates.

Beginning with the June 30, 2010 actuarial valuation, the San Mateo County Mosquito and Vector Control District adopted the same "enhanced" benefit formula that applies to Plan 1, 2, and 4 County General members and the same member rates currently being paid by County General members from those plans. However, because the Mosquito and Vector Control District does not participate in cost sharing on the member rates, it will have a separate normal cost rate and expected member contribution rate from the County General group.

The normal cost rate is calculated separately for County General and for the Mosquito and Vector Control District. These normal cost rates will differ from each other for two reasons:

1) The demographics within the two groups will vary (specifically, the groups will have different average entry ages), and
2) The expected refund of contributions, which is a component of the normal cost, will differ between the County and the Mosquito and Vector Control District, since the District does not participate in cost sharing on the member rates.

Records and Data

The data used in this valuation consist of financial information and the age, service, and income records for active and inactive members and their survivors. All of the data were supplied by SamCERA and are accepted for valuation purposes without audit.

Replacement of Terminated Members

The ages and relative salaries at entry of future members are assumed to follow a new entrant distribution based on the pattern of current members. Under this assumption, the normal cost rates for active members will remain fairly stable in future years unless there are changes in the governing law, the actuarial assumptions or the pattern of the new entrants.

Growth in Membership

For benefit determination purposes, no growth in the membership of SamCERA is assumed. For funding purposes, if amortization is required, the total payroll of covered members is assumed to grow due to the combined effects of future wage increases of current active members and the replacement of the current active members by new employees. No growth in the total number of active members is assumed.

Internal Revenue Code Section 415 Limit

The Internal Revenue Code Section 415 maximum benefit limitations are not reflected in the valuation for funding purposes. Any limitation is reflected in a member's benefit after retirement, except for Plan 7 members which cannot receive benefits in excess of the 415 limit. For Plan 7 members, the benefit levels, combined with the limited compensation are low enough that it is unlikely the 415 limit would apply.

Internal Revenue Code Section 401(a)(17)

The Internal Revenue Code Section 401(a)(17) maximum compensation limitation is not reflected in the valuation for funding purposes. Any limitation is reflected in a member's benefit after retirement.

Employer Contributions

The statutory employer contribution rate is set by the Retirement Board based on actuarial valuations.

Member Contributions

The member contribution rates vary by entry age (except for Plan 7) and are described in the law. Code references are shown in Appendix B of the valuation report. The methods and assumptions used are detailed later in this section. The individual member rates by entry age, plan, and class are illustrated in Appendix D of the valuation report.

Valuation of Assets

The assets are valued using a five-year smoothed method based on the difference between the expected market value and the actual market value of the assets as of the valuation date. The expected market value is the prior year's market value increased with the net increase in the cash flow of funds, all increased with interest during the past fiscal year at the expected investment return rate assumption. The five-year period consists of ten 6-month periods.

Investment Earnings and Expenses

The future investment earnings of the assets of SamCERA are assumed to accrue at an annual rate of 6.75% compounded annually, net of both investment and administrative expenses. This rate was adopted effective June 30, 2017.

Postretirement Benefit Increases

Postretirement increases are described in Appendix B. Assumed increases for valuation purposes are:

	General	Safety	Probation
Plan 1	2.50%	2.50%	2.50%
Plan 2	2.40%	2.40%	2.40%
Plan 3	0.00%	N/A	N/A
Plans 4, 5 & 7	1.90%	1.90%	1.90%
Plan 6	N/A	1.90%	1.90%

Assumed Plan 1 General and Safety COLAs are set at the inflation (CPI) assumption of 2.50% per year. Since Plan 2 does not have a COLA bank, it is expected that increases will be limited in some years. This reduces the overall expected rate and is reflected in a lower assumed increase.

Interest on Member Contributions

The annual credited interest rate on member contributions is assumed to be 6.75% compounded semi-annually (3.375% per six-month period) for an annualized rate of 6.86%. This rate was adopted effective June 30, 2017 for valuation purposes, although the change in member crediting will not be effective until July 1, 2018.

Future Salaries

The rates of annual salary increase assumed for the purpose of the valuation are illustrated in Table A-5. In addition to increases in salary due to promotions and longevity, this scale includes an assumed 3.00% per annum rate of increase in the general wage level of the membership.

Increases are assumed to occur mid-year. The mid-year timing reflects that salary increases occur throughout the year, or on average mid-year.

SamCERA supplied two types of compensation data: 1) pensionable pay from the most recent bi-weekly pay period; and 2) pensionable pay from the prior year. We annualized bi-weekly pay (by multiplying by 26) and then used the greater of the two amounts.

Social Security Wage Base

Plan 3 members have their benefits offset by an assumed Social Security Benefit. For valuation funding purposes, we need to project the Social Security Benefit. We assume the current Social Security provisions will continue and the annual Wage Base will increase at the rate of 2.50% per year. Note, statutory provisions describe how to compute a member's offset amount at time of termination or retirement.

Retirement

The retirement rates vary by age and are shown by plan in Tables A-6 through A-11.

All General members who attain or who have attained age 75 and all Safety members who have attained age 65 are assumed to retire immediately. Additionally, if a member's benefit is equal to or greater than the 100% of compensation limit, they are also assumed to retire immediately. For purposes of the valuation, immediate retirement is assumed at:

- Age 62 with 38 years of service (General, Plans 1, 2 & 4)
- Age 65 with 41 years of service (General Plan 5)
- Age 67 with 40 years of service (General Plan 7)
- Age 50 with 33 years of service (Safety & Probation, Plans 1, 2 & 4)
- Age 55 with 33 years of service (Safety & Probation Plan 5)
- Age 55 with 38 years of service (Safety & Probation Plan 6)
- Age 57 with 38 years of service (Safety & Probation Plan 7)

Deferred vested members are assumed to retire at the later of current age and:

- Age 58 (General Members, except Plan 3 and Plan 7)
- Age 65 (General Plan 3 Members)
- Age 62 (General Plan 7 Members)
- Age 50 (Probation and Safety members)

The retirement rates were adopted June 30, 2017.

Disability

The rates of disability used in the valuation are also illustrated in Tables A-6 through A-11. The disability rates were adopted June 30, 2017.

Retiree Mortality – Other Than Disabled Members

The same postretirement mortality rates are used in the valuation for active members, members retired for service, and beneficiaries. These rates are illustrated in Table A-2. Beneficiary mortality is assumed to be the same as for healthy members. Beneficiaries are assumed to be of the opposite sex and have the same mortality as General members.

General Males	RP-2014 Healthy Annuitant Mortality Table for Males multiplied by 95%, with MP-2014 Ultimate Projection Scale.
Safety Males	Same as General.
General Females	RP-2014 Healthy Annuitant Mortality Table for Females multiplied by 95%, with MP-2014 Ultimate Projection Scale.
Safety Females	Same as General.

The rates of retired mortality were adopted June 30, 2017.

Retiree Mortality – Disabled Members

For disabled members, the mortality rates used in the valuation are illustrated in Table A-3.

General Males	Average of RP-2014 Healthy Annuitant (multiplied by 95%) and Disabled Mortality (multiplied by 105%) Tables for Males, with MP-2014 Ultimate Projection Scale (minimum is 1.0%).
Safety Males	RP-2014 Healthy Annuitant Mortality Table for Males multiplied by 105%, with MP-2014 Ultimate Projection Scale (minimum is 1.0%).
General Females	Average of RP-2014 Healthy Annuitant (multiplied by 95%) and Disabled Mortality (multiplied by 105%) Tables for Females, with MP-2014 Ultimate Projection Scale (minimum is 0.5%).
Safety Females	RP-2014 Healthy Annuitant Mortality Table for Females multiplied by 105%, with MP-2014 Ultimate Projection Scale (minimum is 0.5%).

The rates of mortality were adopted June 30, 2017.

Other Employment Terminations

Tables A-6 to A-11 show, for all ages, the rates assumed in this valuation for future termination from active service other than for death, disability or retirement. These rates do not apply to members eligible for service retirement.

Terminating employees may withdraw their contributions immediately upon termination of employment and forfeit the right to further benefits, or they may leave their contributions with SamCERA. Former contributing members whose contributions are on deposit may later elect to receive a refund, may return to work or may remain inactive until becoming eligible to receive a retirement benefit under either SamCERA or a reciprocal retirement system. All terminating members who are not eligible for vested benefits are assumed to withdraw their contributions immediately.

The rates of termination were adopted June 30, 2017.

Probability of Refund

Table A-4 gives the assumed probabilities that vested members will withdraw their contributions and elect a refund immediately upon termination and the probability the remaining members will elect a deferred vested benefit. For Plan 3, 100% of members are assumed to elect a vested benefit. All non-vested members are assumed to elect a refund and withdraw their contributions.

The probability of refund assumptions were adopted June 30, 2017.

Probability of Eligible Survivor

For members not currently in pay status, 75% of all males and 55% of all females are assumed to have eligible survivors (spouses or qualified domestic partners). Survivors are assumed to be three years younger than male members and two years older than female members. Survivors are assumed to be of the opposite sex as the member. There is no explicit assumption for children's benefits. We believe the survivor benefits based on this assumption are sufficient to cover children's benefits as they occur.

Valuation of Current Deferred Members

Current non-vested members who have terminated active employment are assumed to take a refund of their contributions.

Current vested members who have terminated active employment are assumed to keep their accounts with SamCERA and retire as specified in this section. An adjustment is made to the salary data provided for these individuals, as it is our understanding that the salary data may not be complete in many cases. The adjustment is based on the average pay for all members of the active group divided by average pay for the deferred group. The average pay for the active group is based on the average pay over the last five-year period using the information supplied in the CAFR.

Reciprocal Benefits

30% of future deferred vested General members and 40% of future deferred vested Safety members are assumed to immediately join a reciprocal agency. For future reciprocal members, salaries are assumed to increase at the same rate as if they had remained in active employment with SamCERA. For current deferred vested members, eligibility is based on the data supplied by SamCERA and future salaries are assumed to increase at 3.52% annually for General members and 3.77% annually for Safety members.

Part-Time Employees

For valuation purposes, part-time employees are assumed to continue working the same number of hours in the future.

Member Contribution Rate Assumptions

The following assumptions summarize the procedures used to compute member contribution rates based on entry age:

In general, the member rate is determined by the present value of the future benefit (PVFB) payable at retirement age, divided by the present value of all future salaries payable between age at entry and retirement age. For these purposes, per the CERL:

A. The annuity factor used for General members is based on a 33% / 67% blend of the male and female annuity factors using current valuation assumptions and no COLA. For Safety members it is based on a 75% / 25% blend of the male and female annuity factors using current valuation assumptions. The valuation mortality tables use a static projection to 2039.

B. The annuity factor used in determining the present value of future benefits (PVFB) at entry age is equal to the life only annuity factor at 6.75%.

C. The Final Compensation is based on the salary paid in the year prior to attaining the retirement age.

   Example: For a Plan 4 Member who enters at age 54 or earlier, the Final Compensation at retirement (age 55) will be the monthly average of the annual salary for age 54.

D. For purposes of calculating the value of the member's future contribution, interest is assumed to be credited at 6.75% semiannually (3.375% for each six-month period) for a 6.86% annual rate.

E. Member Rates are assumed to increase with entry age, except in Plan 7. There are a few exceptions at the higher entry ages where the calculated rate is less than the previous entry age. In these cases the member contribution rate is adjusted so that it is no less than the value for the previous entry age.

F. Member rates for all members are loaded to account for a 50% COLA share. The only exception is for Plans 1, 2, and 4 members of the Board of Supervisors bargaining unit with a most recent hire date before August 7, 2011. The COLA loads are applied to the otherwise applicable basic member rates prior to the addition of and cost-sharing rates. The loads were determined based on 2016 information and applied as follows (preliminary):

General Plan 1:	35.02%
General Plan 2:	33.38%
General Plan 4:	25.86%
General Plan 5:	25.08%
Safety Plan 1:	47.93%
Safety Plan 2:	50.13%
Safety Plan 4:	37.61%
Safety Plan 5:	34.73%
Safety Plan 6:	32.47%
Probation Plan 1:	53.21%
Probation Plan 2:	51.08%
Probation Plan 4:	37.79%
Probation Plan 5:	34.64%
Probation Plan 6:	30.45%

San Mateo County Employees' Retirement Association

Table A-1 Summary of Valuation Assumptions as of June 30, 2017

I.	Economic assumptions	
	A. General wage increases	3.00%
	B. Investment earnings	6.75%
	C. Growth in active membership	0.00%
	D. CPI inflation assumption	2.50%
II.	Demographic assumptions	
	A. Salary increases due to service	Table A-5
	B. Retirement	Tables A-6 to A-11
	C. Disability	Tables A-6 to A-11
	D. Mortality for active members prior to termination	Tables A-6 to A-11

Basis – RP-2014 Employee Mortality Table for respective genders with MP-2014 Ultimate Projection Scale:

Class of Members	Adjustment Factor
General – Males	100%
General – Females	100%
Safety – Males	100%
Safety – Females	100%

E. Mortality for active members after termination and service retired members — Table A-2

Basis – RP-2014 Healthy Annuitant Mortality Table for respective genders with MP-2014 Ultimate Projection Scale:

Class of Members	Adjustment Factor
General – Males	95%
General – Females	95%
Safety – Males	95%
Safety – Females	95%

Table A-1 Summary of Valuation Assumptions as of June 30, 2017 (continued)

F. Mortality among disabled members — Table A-3

Basis – Average of RP-2014 Healthy Annuitant and Disabled Mortality Tables for respective genders, with MP-2014 Ultimate Projection Scale:

Class of Members	Adjustment Factor	Minimum Blended Rate
General – Males	95% for Healthy and 105% for Disabled	1.00%
General – Females	95% for Healthy and 105% for Disabled	0.50%

Basis – RP-2014 Healthy Annuitant Mortality Table for respective genders with MP-2014 Ultimate Projection Scale:

Class of Members	Adjustment Factor	Minimum Blended Rate
Safety – Males	105%	1.00%
Safety – Females	105%	0.50%

G. Mortality for beneficiaries — Table A-2

Basis – Beneficiaries are assumed to be of the opposite sex and have the same mortality as General members.

H. Other terminations of employment — Tables A-6 to A-11

I. Refund of contributions on vested termination — Table A-4

Table A-2 Mortality for Members Retired for Service[1]

Age	General Male	General Female	Safety Male	Safety Female
20	0.093%	0.039%	0.093%	0.039%
25	0.111%	0.041%	0.111%	0.041%
30	0.103%	0.052%	0.103%	0.052%
35	0.120%	0.068%	0.120%	0.068%
40	0.144%	0.094%	0.144%	0.094%
45	0.223%	0.157%	0.223%	0.157%
50	0.386%	0.263%	0.386%	0.263%
55	0.545%	0.344%	0.545%	0.344%
60	0.738%	0.493%	0.738%	0.493%
65	1.046%	0.765%	1.046%	0.765%
70	1.593%	1.223%	1.593%	1.223%
75	2.548%	1.989%	2.548%	1.989%
80	4.249%	3.310%	4.249%	3.310%
85	7.362%	5.748%	7.362%	5.748%
90	12.911%	10.177%	12.911%	10.177%

Annual Projected Mortality Improvement

Age	All Groups
65 & Less	1.000%
70	1.000%
75	1.000%
80	1.000%
85	1.000%
90	0.930%
95	0.850%
100	0.640%
105	0.430%
110	0.210%
115	0.000%

1. Mortality rates are those applicable for the fiscal year beginning in 2014. Annual projected improvements are assumed in the following years under the schedule shown. For example, the annual mortality rate for an 85-year old General male in fiscal year beginning in 2017 is 7.143% calculated as follows:

Age 85 rate in 2017 = Age 85 rate in 2014 with 3 years improvement
= 7.362% x (100.0% - 1.0%) x (100.0% - 1.0%) x (100.0% - 1.0%)
= 7.143%

Table A-3 Mortality for Members Retired for Disability

Age	General Male	General Female	Safety Male	Safety Female
20	1.000%	0.500%	1.000%	0.500%
25	1.000%	0.500%	1.000%	0.500%
30	1.000%	0.500%	1.000%	0.500%
35	1.000%	0.500%	1.000%	0.500%
40	1.000%	0.500%	1.000%	0.500%
45	1.006%	0.554%	1.000%	0.500%
50	1.264%	0.757%	1.000%	0.500%
55	1.499%	0.932%	1.000%	0.500%
60	1.766%	1.139%	1.000%	0.545%
65	2.187%	1.477%	1.156%	0.845%
70	2.915%	2.092%	1.761%	1.351%
75	4.124%	3.149%	2.817%	2.198%
80	6.147%	4.860%	4.696%	3.659%
85	9.629%	7.621%	8.137%	6.353%
90	15.538%	12.053%	14.270%	11.248%

Table A-4 Immediate Refund of Contributions Upon Termination of Employment (Excludes Plan 3)

Years of Service	General	Safety
0	100%	100%
1	100%	100%
2	100%	100%
3	100%	100%
4	100%	100%
5	35%	35%
6	35%	35%
7	35%	35%
8	34%	33%
9	34%	31%
10	33%	29%
11	33%	27%
12	32%	25%
13	31%	22%
14	30%	19%
15	30%	16%
16	29%	13%
17	28%	10%
18	25%	8%
19	23%	6%
20	20%	0%
21	18%	0%
22	15%	0%
23	12%	0%
24	9%	0%
25	6%	0%
26	3%	0%
27	0%	0%
28	0%	0%
29	0%	0%
30 & Up	0%	0%

Table A-5 Annual Increase in Salary

Years of Service	Due to Promotion and Longevity		Total Annual Increase[1]	
	General	Safety	General	Safety
<1	6.50%	6.00%	9.70%	9.18%
1	4.75%	4.00%	7.89%	7.12%
2	3.50%	3.00%	6.61%	6.09%
3	2.75%	2.50%	5.83%	5.58%
4	2.00%	2.00%	5.06%	5.06%
5	1.75%	1.75%	4.80%	4.80%
6	1.50%	1.50%	4.55%	4.55%
7	1.25%	1.25%	4.29%	4.29%
8	1.05%	1.05%	4.08%	4.08%
9	0.90%	0.90%	3.93%	3.93%
10	0.80%	0.80%	3.82%	3.82%
11	0.70%	0.75%	3.72%	3.77%
12	0.60%	0.75%	3.62%	3.77%
13	0.50%	0.75%	3.52%	3.77%
14	0.50%	0.75%	3.52%	3.77%
15	0.50%	0.75%	3.52%	3.77%
16	0.50%	0.75%	3.52%	3.77%
17	0.50%	0.75%	3.52%	3.77%
18	0.50%	0.75%	3.52%	3.77%
19	0.50%	0.75%	3.52%	3.77%
20 or More	0.50%	0.75%	3.52%	3.77%

1. *The total expected increase in salary is the increase due to promotion and longevity, adjusted for assumed 3.00% per annum increases in the general wage. The total result is compounded rather than additive.*

Appendix A Rates of Separation From Active Service Tables A-6 to A-11

A schedule of the probabilities of termination of employment due to the following causes can be found on the following pages:

Service Retirement:	Member retires after meeting age and service requirements for reasons other than disability.
Withdrawal:	Member terminates and elects a refund of member contributions, or a deferred vested retirement benefit.
Service Disability:	Member receives disability retirement; disability is service related.
Ordinary Disability:	Member receives disability retirement; disability is not service related.
Service Death:	Member dies before retirement; death is service related.
Ordinary Death:	Member dies before retirement; death is not service related.

Each rate represents the probability that a member will separate from service at each age due to the particular cause. For example, a rate of 0.0300 for a member's service retirement at age 50 means we assume that 30 out of 1,000 members who are age 50 will retire at that age.

Each table represents the detailed rates needed for each SamCERA plan by sex:

Table
- A-6: General Plan 1, 2, 4, 5 & 7 Males
- A-7: General Plan 1, 2, 4, 5 & 7 Females
- A-8: General Plan 3 Males
- A-9: General Plan 3 Females
- A-10: Safety and Probation Plans 1, 2, 4, 5, 6 & 7 Males
- A-11: Safety and Probation Plans 1, 2, 4, 5, 6 & 7 Females

Table A-6 Rate of Separation From Active Service
General Plans 1, 2, 4, 5 & 7 – Male

Age	Plans 1, 2, 4 Service Retirement*	Plans 5 & 7 Service Retirement*	Service Disability	Ordinary Disability	Service Death	Ordinary Death	Years of Service	Other Terminations
18	0.0000	0.0000	0.0004	0.0002	N/A	0.0003	0	0.1300
19	0.0000	0.0000	0.0004	0.0002	N/A	0.0004	1	0.1100
20	0.0000	0.0000	0.0004	0.0002	N/A	0.0004	2	0.0900
21	0.0000	0.0000	0.0004	0.0002	N/A	0.0004	3	0.0800
22	0.0000	0.0000	0.0004	0.0002	N/A	0.0005	4	0.0700
23	0.0000	0.0000	0.0004	0.0002	N/A	0.0005	5	0.0633
24	0.0000	0.0000	0.0004	0.0002	N/A	0.0005	6	0.0567
25	0.0000	0.0000	0.0004	0.0002	N/A	0.0005	7	0.0500
26	0.0000	0.0000	0.0004	0.0002	N/A	0.0005	8	0.0470
27	0.0000	0.0000	0.0004	0.0002	N/A	0.0004	9	0.0440
28	0.0000	0.0000	0.0005	0.0002	N/A	0.0004	10	0.0410
29	0.0000	0.0000	0.0005	0.0003	N/A	0.0004	11	0.0380
30	0.0000	0.0000	0.0006	0.0003	N/A	0.0005	12	0.0350
31	0.0000	0.0000	0.0006	0.0003	N/A	0.0005	13	0.0330
32	0.0000	0.0000	0.0006	0.0003	N/A	0.0005	14	0.0310
33	0.0000	0.0000	0.0007	0.0004	N/A	0.0005	15	0.0290
34	0.0000	0.0000	0.0008	0.0004	N/A	0.0005	16	0.0270
35	0.0000	0.0000	0.0008	0.0004	N/A	0.0005	17	0.0250
36	0.0000	0.0000	0.0008	0.0005	N/A	0.0005	18	0.0230
37	0.0000	0.0000	0.0009	0.0005	N/A	0.0006	19	0.0210
38	0.0000	0.0000	0.0010	0.0006	N/A	0.0006	20	0.0190
39	0.0000	0.0000	0.0011	0.0006	N/A	0.0006	21	0.0170
40	0.0000	0.0000	0.0012	0.0007	N/A	0.0006	22	0.0150
41	0.0000	0.0000	0.0013	0.0007	N/A	0.0007	23	0.0140
42	0.0000	0.0000	0.0014	0.0008	N/A	0.0007	24	0.0130
43	0.0000	0.0000	0.0015	0.0008	N/A	0.0008	25	0.0120
44	0.0000	0.0000	0.0016	0.0008	N/A	0.0009	26	0.0110
45	0.0000	0.0000	0.0017	0.0009	N/A	0.0010	27	0.0100
46	0.0000	0.0000	0.0018	0.0009	N/A	0.0011	28	0.0100
47	0.0000	0.0000	0.0019	0.0010	N/A	0.0012	29	0.0100
48	0.0000	0.0000	0.0020	0.0011	N/A	0.0014	30 & Above**	0.0100
49	0.0000	0.0000	0.0020	0.0011	N/A	0.0015		
50	0.0300	0.0270	0.0021	0.0011	N/A	0.0017		
51	0.0300	0.0270	0.0021	0.0012	N/A	0.0019		
52	0.0300	0.0270	0.0022	0.0012	N/A	0.0021		
53	0.0300	0.0270	0.0023	0.0012	N/A	0.0023		
54	0.0500	0.0450	0.0023	0.0013	N/A	0.0025		
55	0.0600	0.0540	0.0023	0.0013	N/A	0.0028		
56	0.0600	0.0540	0.0024	0.0013	N/A	0.0031		
57	0.0750	0.0675	0.0025	0.0013	N/A	0.0034		
58	0.1200	0.1080	0.0027	0.0014	N/A	0.0038		
59	0.1200	0.1080	0.0028	0.0015	N/A	0.0042		
60	0.1500	0.1350	0.0029	0.0016	N/A	0.0047		
61	0.1750	0.1575	0.0031	0.0017	N/A	0.0052		
62	0.2500	0.2250	0.0033	0.0018	N/A	0.0059		
63	0.2000	0.1800	0.0033	0.0018	N/A	0.0066		
64	0.2200	0.1980	0.0033	0.0018	N/A	0.0074		
65	0.3500	0.3150	0.0033	0.0018	N/A	0.0083		
66	0.3500	0.3150	0.0033	0.0018	N/A	0.0092		
67	0.3500	0.4200	0.0033	0.0018	N/A	0.0102		
68	0.3000	0.3000	0.0033	0.0018	N/A	0.0113		
69	0.3000	0.3000	0.0033	0.0018	N/A	0.0125		
70	0.4000	0.4000	0.0033	0.0018	N/A	0.0139		
71	0.4000	0.4000	0.0033	0.0018	N/A	0.0154		
72	0.4000	0.4000	0.0033	0.0018	N/A	0.0170		
73	0.4000	0.4000	0.0033	0.0018	N/A	0.0189		
74	0.4000	0.4000	0.0033	0.0018	N/A	0.0209		
75	1.0000	1.0000	0.0000	0.0000	N/A	0.0232		

** 100% probability of retirement is assumed at ages 62 and above with 38 or more years of service (65/41 for Plan 5; 67/40 for Plan 7). Rates of retirement are 0.00% prior to age 52 for Plan 7.*

*** 0.00% probability of termination with 30 years of serivce and above for Plans 1, 2, 4,& 5.*

Table A-7 Rate of Separation From Active Service
General Plans 1, 2, 4, 5 & 7 – Female

Age	Plans 1, 2, 4 Service Retirement*	Plans 5 & 7 Service Retirement*	Service Disability	Ordinary Disability	Service Death	Ordinary Death	Years of Service	Other Terminations
18	0.0000	0.0000	0.0005	0.0003	N/A	0.0002	0	0.1300
19	0.0000	0.0000	0.0005	0.0003	N/A	0.0002	1	0.1100
20	0.0000	0.0000	0.0005	0.0003	N/A	0.0002	2	0.0950
21	0.0000	0.0000	0.0005	0.0003	N/A	0.0002	3	0.0800
22	0.0000	0.0000	0.0005	0.0003	N/A	0.0002	4	0.0750
23	0.0000	0.0000	0.0005	0.0003	N/A	0.0002	5	0.0700
24	0.0000	0.0000	0.0005	0.0003	N/A	0.0002	6	0.0650
25	0.0000	0.0000	0.0005	0.0003	N/A	0.0002	7	0.0600
26	0.0000	0.0000	0.0005	0.0003	N/A	0.0002	8	0.0550
27	0.0000	0.0000	0.0005	0.0003	N/A	0.0002	9	0.0500
28	0.0000	0.0000	0.0005	0.0003	N/A	0.0002	10	0.0450
29	0.0000	0.0000	0.0006	0.0003	N/A	0.0002	11	0.0400
30	0.0000	0.0000	0.0006	0.0003	N/A	0.0002	12	0.0350
31	0.0000	0.0000	0.0007	0.0004	N/A	0.0002	13	0.0340
32	0.0000	0.0000	0.0007	0.0004	N/A	0.0002	14	0.0330
33	0.0000	0.0000	0.0007	0.0004	N/A	0.0003	15	0.0320
34	0.0000	0.0000	0.0008	0.0004	N/A	0.0003	16	0.0310
35	0.0000	0.0000	0.0008	0.0005	N/A	0.0003	17	0.0300
36	0.0000	0.0000	0.0009	0.0005	N/A	0.0003	18	0.0270
37	0.0000	0.0000	0.0010	0.0005	N/A	0.0003	19	0.0240
38	0.0000	0.0000	0.0011	0.0006	N/A	0.0003	20	0.0210
39	0.0000	0.0000	0.0012	0.0007	N/A	0.0004	21	0.0180
40	0.0000	0.0000	0.0014	0.0007	N/A	0.0004	22	0.0150
41	0.0000	0.0000	0.0015	0.0008	N/A	0.0004	23	0.0140
42	0.0000	0.0000	0.0016	0.0009	N/A	0.0005	24	0.0130
43	0.0000	0.0000	0.0018	0.0010	N/A	0.0005	25	0.0120
44	0.0000	0.0000	0.0020	0.0011	N/A	0.0006	26	0.0110
45	0.0000	0.0000	0.0022	0.0012	N/A	0.0007	27	0.0100
46	0.0000	0.0000	0.0024	0.0013	N/A	0.0007	28	0.0100
47	0.0000	0.0000	0.0026	0.0014	N/A	0.0008	29	0.0100
48	0.0000	0.0000	0.0027	0.0015	N/A	0.0009	30 & Above**	0.0100
49	0.0000	0.0000	0.0029	0.0015	N/A	0.0010		
50	0.0300	0.0270	0.0030	0.0016	N/A	0.0011		
51	0.0300	0.0270	0.0031	0.0017	N/A	0.0012		
52	0.0300	0.0270	0.0033	0.0018	N/A	0.0013		
53	0.0300	0.0270	0.0034	0.0019	N/A	0.0014		
54	0.0500	0.0450	0.0036	0.0020	N/A	0.0015		
55	0.0600	0.0540	0.0038	0.0021	N/A	0.0017		
56	0.0600	0.0540	0.0040	0.0022	N/A	0.0018		
57	0.0750	0.0675	0.0042	0.0023	N/A	0.0019		
58	0.1200	0.1080	0.0044	0.0024	N/A	0.0021		
59	0.1200	0.1080	0.0046	0.0025	N/A	0.0023		
60	0.1500	0.1350	0.0048	0.0026	N/A	0.0024		
61	0.1750	0.1575	0.0050	0.0027	N/A	0.0026		
62	0.2500	0.2250	0.0052	0.0028	N/A	0.0029		
63	0.2000	0.1800	0.0052	0.0028	N/A	0.0031		
64	0.2200	0.1980	0.0052	0.0028	N/A	0.0034		
65	0.3500	0.3150	0.0052	0.0028	N/A	0.0037		
66	0.3500	0.3150	0.0052	0.0028	N/A	0.0041		
67	0.3500	0.4200	0.0052	0.0028	N/A	0.0046		
68	0.3000	0.3000	0.0052	0.0028	N/A	0.0051		
69	0.3000	0.3000	0.0052	0.0028	N/A	0.0057		
70	0.4000	0.4000	0.0052	0.0028	N/A	0.0063		
71	0.4000	0.4000	0.0052	0.0028	N/A	0.0070		
72	0.4000	0.4000	0.0052	0.0028	N/A	0.0078		
73	0.4000	0.4000	0.0052	0.0028	N/A	0.0087		
74	0.4000	0.4000	0.0052	0.0028	N/A	0.0097		
75	1.0000	1.0000	0.0000	0.0000	N/A	0.0108		

** 100% probability of retirement is assumed at ages 62 and above with 38 or more years of service (65/41 for Plan 5; 67/40 for Plan 7). Rates of retirement are 0.00% prior to age 52 for Plan 7.*

*** 0.00% probability of termination with 30 years of serivce and above for Plans 1, 2, 4,& 5.*

Table A-8 Rate of Separation From Active Service General Plan 3 – Male

Age	Service Retirement	Service Disability	Ordinary Disability	Service Death	Ordinary Death	Years of Service	Other Terminations
18	0.0000	N/A	N/A	N/A	0.0003	0	0.1300
19	0.0000	N/A	N/A	N/A	0.0004	1	0.1100
20	0.0000	N/A	N/A	N/A	0.0004	2	0.0900
21	0.0000	N/A	N/A	N/A	0.0004	3	0.0800
22	0.0000	N/A	N/A	N/A	0.0005	4	0.0700
23	0.0000	N/A	N/A	N/A	0.0005	5	0.0633
24	0.0000	N/A	N/A	N/A	0.0005	6	0.0567
25	0.0000	N/A	N/A	N/A	0.0005	7	0.0500
26	0.0000	N/A	N/A	N/A	0.0005	8	0.0470
27	0.0000	N/A	N/A	N/A	0.0004	9	0.0440
28	0.0000	N/A	N/A	N/A	0.0004	10	0.0410
29	0.0000	N/A	N/A	N/A	0.0004	11	0.0380
30	0.0000	N/A	N/A	N/A	0.0005	12	0.0350
31	0.0000	N/A	N/A	N/A	0.0005	13	0.0330
32	0.0000	N/A	N/A	N/A	0.0005	14	0.0310
33	0.0000	N/A	N/A	N/A	0.0005	15	0.0290
34	0.0000	N/A	N/A	N/A	0.0005	16	0.0270
35	0.0000	N/A	N/A	N/A	0.0005	17	0.0250
36	0.0000	N/A	N/A	N/A	0.0005	18	0.0230
37	0.0000	N/A	N/A	N/A	0.0006	19	0.0210
38	0.0000	N/A	N/A	N/A	0.0006	20	0.0190
39	0.0000	N/A	N/A	N/A	0.0006	21	0.0170
40	0.0000	N/A	N/A	N/A	0.0006	22	0.0150
41	0.0000	N/A	N/A	N/A	0.0007	23	0.0140
42	0.0000	N/A	N/A	N/A	0.0007	24	0.0130
43	0.0000	N/A	N/A	N/A	0.0008	25	0.0120
44	0.0000	N/A	N/A	N/A	0.0009	26	0.0110
45	0.0000	N/A	N/A	N/A	0.0010	27	0.0100
46	0.0000	N/A	N/A	N/A	0.0011	28	0.0100
47	0.0000	N/A	N/A	N/A	0.0012	29	0.0100
48	0.0000	N/A	N/A	N/A	0.0014	30 & Above	0.0100
49	0.0000	N/A	N/A	N/A	0.0015		
50	0.0000	N/A	N/A	N/A	0.0017		
51	0.0000	N/A	N/A	N/A	0.0019		
52	0.0000	N/A	N/A	N/A	0.0021		
53	0.0000	N/A	N/A	N/A	0.0023		
54	0.0000	N/A	N/A	N/A	0.0025		
55	0.0300	N/A	N/A	N/A	0.0028		
56	0.0300	N/A	N/A	N/A	0.0031		
57	0.0300	N/A	N/A	N/A	0.0034		
58	0.0300	N/A	N/A	N/A	0.0038		
59	0.0300	N/A	N/A	N/A	0.0042		
60	0.0300	N/A	N/A	N/A	0.0047		
61	0.0600	N/A	N/A	N/A	0.0052		
62	0.1500	N/A	N/A	N/A	0.0059		
63	0.1000	N/A	N/A	N/A	0.0066		
64	0.1500	N/A	N/A	N/A	0.0074		
65	0.3000	N/A	N/A	N/A	0.0083		
66	0.3000	N/A	N/A	N/A	0.0092		
67	0.3000	N/A	N/A	N/A	0.0102		
68	0.3000	N/A	N/A	N/A	0.0113		
69	0.3000	N/A	N/A	N/A	0.0125		
70	0.4000	N/A	N/A	N/A	0.0139		
71	0.4000	N/A	N/A	N/A	0.0154		
72	0.4000	N/A	N/A	N/A	0.0170		
73	0.4000	N/A	N/A	N/A	0.0189		
74	0.4000	N/A	N/A	N/A	0.0209		
75	1.0000	N/A	N/A	N/A	0.0232		

Table A-9 Rate of Separation From Active Service General Plan 3 – Female

Age	Service Retirement	Service Disability	Ordinary Disability	Service Death	Ordinary Death	Years of Service	Other Terminations
18	0.0000	N/A	N/A	N/A	0.0002	0	0.1300
19	0.0000	N/A	N/A	N/A	0.0002	1	0.1100
20	0.0000	N/A	N/A	N/A	0.0002	2	0.0950
21	0.0000	N/A	N/A	N/A	0.0002	3	0.0800
22	0.0000	N/A	N/A	N/A	0.0002	4	0.0750
23	0.0000	N/A	N/A	N/A	0.0002	5	0.0700
24	0.0000	N/A	N/A	N/A	0.0002	6	0.0650
25	0.0000	N/A	N/A	N/A	0.0002	7	0.0600
26	0.0000	N/A	N/A	N/A	0.0002	8	0.0550
27	0.0000	N/A	N/A	N/A	0.0002	9	0.0500
28	0.0000	N/A	N/A	N/A	0.0002	10	0.0450
29	0.0000	N/A	N/A	N/A	0.0002	11	0.0400
30	0.0000	N/A	N/A	N/A	0.0002	12	0.0350
31	0.0000	N/A	N/A	N/A	0.0002	13	0.0340
32	0.0000	N/A	N/A	N/A	0.0002	14	0.0330
33	0.0000	N/A	N/A	N/A	0.0003	15	0.0320
34	0.0000	N/A	N/A	N/A	0.0003	16	0.0310
35	0.0000	N/A	N/A	N/A	0.0003	17	0.0300
36	0.0000	N/A	N/A	N/A	0.0003	18	0.0270
37	0.0000	N/A	N/A	N/A	0.0003	19	0.0240
38	0.0000	N/A	N/A	N/A	0.0003	20	0.0210
39	0.0000	N/A	N/A	N/A	0.0004	21	0.0180
40	0.0000	N/A	N/A	N/A	0.0004	22	0.0150
41	0.0000	N/A	N/A	N/A	0.0004	23	0.0140
42	0.0000	N/A	N/A	N/A	0.0005	24	0.0130
43	0.0000	N/A	N/A	N/A	0.0005	25	0.0120
44	0.0000	N/A	N/A	N/A	0.0006	26	0.0110
45	0.0000	N/A	N/A	N/A	0.0007	27	0.0100
46	0.0000	N/A	N/A	N/A	0.0007	28	0.0100
47	0.0000	N/A	N/A	N/A	0.0008	29	0.0100
48	0.0000	N/A	N/A	N/A	0.0009	30 & Above	0.0100
49	0.0000	N/A	N/A	N/A	0.0010		
50	0.0000	N/A	N/A	N/A	0.0011		
51	0.0000	N/A	N/A	N/A	0.0012		
52	0.0000	N/A	N/A	N/A	0.0013		
53	0.0000	N/A	N/A	N/A	0.0014		
54	0.0000	N/A	N/A	N/A	0.0015		
55	0.0400	N/A	N/A	N/A	0.0017		
56	0.0400	N/A	N/A	N/A	0.0018		
57	0.0400	N/A	N/A	N/A	0.0019		
58	0.0400	N/A	N/A	N/A	0.0021		
59	0.0400	N/A	N/A	N/A	0.0023		
60	0.0400	N/A	N/A	N/A	0.0024		
61	0.0600	N/A	N/A	N/A	0.0026		
62	0.1500	N/A	N/A	N/A	0.0029		
63	0.1000	N/A	N/A	N/A	0.0031		
64	0.1500	N/A	N/A	N/A	0.0034		
65	0.3000	N/A	N/A	N/A	0.0037		
66	0.3000	N/A	N/A	N/A	0.0041		
67	0.3000	N/A	N/A	N/A	0.0046		
68	0.3000	N/A	N/A	N/A	0.0051		
69	0.3000	N/A	N/A	N/A	0.0057		
70	0.4000	N/A	N/A	N/A	0.0063		
71	0.4000	N/A	N/A	N/A	0.0070		
72	0.4000	N/A	N/A	N/A	0.0078		
73	0.4000	N/A	N/A	N/A	0.0087		
74	0.4000	N/A	N/A	N/A	0.0097		
75	1.0000	N/A	N/A	N/A	0.0108		

Table A-10 Rate of Separation From Active Service Safety & Probation Plans – Male

Age	Plans 1, 2, 4 Service Retirement*	Plans 5, 6, 7 Service Retirement**	Service Disability	Ordinary Disability	Service Death	Ordinary Death	Years of Service	Other Terminations
18	0.0000	0.0000	0.0015	0.0000	0.0010	0.0003	0	0.0700
19	0.0000	0.0000	0.0015	0.0000	0.0010	0.0004	1	0.0550
20	0.0000	0.0000	0.0015	0.0000	0.0010	0.0004	2	0.0450
21	0.0000	0.0000	0.0015	0.0000	0.0010	0.0004	3	0.0300
22	0.0000	0.0000	0.0015	0.0000	0.0010	0.0005	4	0.0250
23	0.0000	0.0000	0.0015	0.0000	0.0010	0.0005	5	0.0240
24	0.0000	0.0000	0.0015	0.0000	0.0010	0.0005	6	0.0230
25	0.0000	0.0000	0.0015	0.0000	0.0010	0.0005	7	0.0220
26	0.0000	0.0000	0.0015	0.0000	0.0010	0.0005	8	0.0201
27	0.0000	0.0000	0.0015	0.0000	0.0010	0.0004	9	0.0182
28	0.0000	0.0000	0.0016	0.0000	0.0010	0.0004	10	0.0163
29	0.0000	0.0000	0.0017	0.0000	0.0010	0.0004	11	0.0144
30	0.0000	0.0000	0.0018	0.0000	0.0010	0.0005	12	0.0125
31	0.0000	0.0000	0.0019	0.0000	0.0010	0.0005	13	0.0120
32	0.0000	0.0000	0.0020	0.0000	0.0010	0.0005	14	0.0115
33	0.0000	0.0000	0.0021	0.0000	0.0010	0.0005	15	0.0110
34	0.0000	0.0000	0.0022	0.0000	0.0010	0.0005	16	0.0105
35	0.0000	0.0000	0.0023	0.0000	0.0010	0.0005	17	0.0100
36	0.0000	0.0000	0.0024	0.0000	0.0010	0.0005	18	0.0080
37	0.0000	0.0000	0.0025	0.0000	0.0010	0.0006	19	0.0060
38	0.0000	0.0000	0.0026	0.0000	0.0010	0.0006	20***	0.0040
39	0.0000	0.0000	0.0027	0.0000	0.0010	0.0006	21***	0.0020
40	0.0000	0.0000	0.0028	0.0000	0.0010	0.0006	22 & Above***	0.0000
41	0.0000	0.0000	0.0029	0.0000	0.0010	0.0007		
42	0.0000	0.0000	0.0030	0.0000	0.0010	0.0007		
43	0.0000	0.0000	0.0032	0.0000	0.0010	0.0008		
44	0.0000	0.0000	0.0035	0.0000	0.0010	0.0009		
45	0.0300	0.0000	0.0037	0.0000	0.0010	0.0010		
46	0.0300	0.0000	0.0040	0.0000	0.0010	0.0011		
47	0.0300	0.0000	0.0042	0.0000	0.0010	0.0012		
48	0.0500	0.0000	0.0048	0.0000	0.0010	0.0014		
49	0.0500	0.0000	0.0054	0.0000	0.0010	0.0015		
50	0.1500	0.0500	0.0077	0.0000	0.0010	0.0017		
51	0.1500	0.0500	0.0088	0.0000	0.0010	0.0019		
52	0.1500	0.0500	0.0100	0.0000	0.0010	0.0021		
53	0.2000	0.0500	0.0111	0.0000	0.0010	0.0023		
54	0.1300	0.1000	0.0122	0.0000	0.0010	0.0025		
55	0.2250	0.2750	0.0134	0.0000	0.0010	0.0028		
56	0.2250	0.2750	0.0145	0.0000	0.0010	0.0031		
57	0.1700	0.2750	0.0156	0.0000	0.0010	0.0034		
58	0.1700	0.2750	0.0139	0.0000	0.0010	0.0038		
59	0.2500	0.2750	0.0122	0.0000	0.0010	0.0042		
60	0.4000	0.4000	0.0106	0.0000	0.0010	0.0047		
61	0.4000	0.4000	0.0089	0.0000	0.0010	0.0052		
62	0.4000	0.4000	0.0072	0.0000	0.0010	0.0059		
63	0.4000	0.4000	0.0055	0.0000	0.0010	0.0066		
64	0.4000	0.4000	0.0038	0.0000	0.0010	0.0074		
65	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000		

** 100% probability of retirement is assumed at ages 50 and above with 33 or more years of service for Safety and Probation Plans 1, 2, and 4.*

*** 100% probability of retirement is assumed at ages 55 and above with 33 or more years of service for Safety and Probation Plan 5, ages 55 and above with 38 or more years of service for Safety and Probation Plan 6, and ages 57 and above with 38 or more years of service for Safety and Probation Plan 7.*

**** 0.00% probability of termination with 20 years of serivce and above for all Safety/Probation plans except Plan 7.*

Table A-11 Rate of Separation From Active Service Safety & Probation Plans – Female

Age	Plans 1, 2, 4 Service Retirement*	Plans 5, 6, 7 Service Retirement**	Service Disability	Ordinary Disability	Service Death	Ordinary Death	Years of Service	Other Terminations
18	0.0000	0.0000	0.0015	0.0000	0.0010	0.0002	0	0.0700
19	0.0000	0.0000	0.0015	0.0000	0.0010	0.0002	1	0.0550
20	0.0000	0.0000	0.0015	0.0000	0.0010	0.0002	2	0.0450
21	0.0000	0.0000	0.0015	0.0000	0.0010	0.0002	3	0.0300
22	0.0000	0.0000	0.0015	0.0000	0.0010	0.0002	4	0.0250
23	0.0000	0.0000	0.0015	0.0000	0.0010	0.0002	5	0.0240
24	0.0000	0.0000	0.0015	0.0000	0.0010	0.0002	6	0.0230
25	0.0000	0.0000	0.0015	0.0000	0.0010	0.0002	7	0.0220
26	0.0000	0.0000	0.0015	0.0000	0.0010	0.0002	8	0.0201
27	0.0000	0.0000	0.0015	0.0000	0.0010	0.0002	9	0.0182
28	0.0000	0.0000	0.0016	0.0000	0.0010	0.0002	10	0.0163
29	0.0000	0.0000	0.0017	0.0000	0.0010	0.0002	11	0.0144
30	0.0000	0.0000	0.0018	0.0000	0.0010	0.0002	12	0.0125
31	0.0000	0.0000	0.0019	0.0000	0.0010	0.0002	13	0.0120
32	0.0000	0.0000	0.0020	0.0000	0.0010	0.0002	14	0.0115
33	0.0000	0.0000	0.0021	0.0000	0.0010	0.0003	15	0.0110
34	0.0000	0.0000	0.0022	0.0000	0.0010	0.0003	16	0.0105
35	0.0000	0.0000	0.0023	0.0000	0.0010	0.0003	17	0.0100
36	0.0000	0.0000	0.0024	0.0000	0.0010	0.0003	18	0.0080
37	0.0000	0.0000	0.0025	0.0000	0.0010	0.0003	19	0.0060
38	0.0000	0.0000	0.0026	0.0000	0.0010	0.0003	20***	0.0040
39	0.0000	0.0000	0.0027	0.0000	0.0010	0.0004	21***	0.0020
40	0.0000	0.0000	0.0028	0.0000	0.0010	0.0004	22 & Above***	0.0000
41	0.0000	0.0000	0.0029	0.0000	0.0010	0.0004		
42	0.0000	0.0000	0.0030	0.0000	0.0010	0.0005		
43	0.0000	0.0000	0.0032	0.0000	0.0010	0.0005		
44	0.0000	0.0000	0.0035	0.0000	0.0010	0.0006		
45	0.0300	0.0000	0.0037	0.0000	0.0010	0.0007		
46	0.0300	0.0000	0.0040	0.0000	0.0010	0.0007		
47	0.0300	0.0000	0.0042	0.0000	0.0010	0.0008		
48	0.0500	0.0000	0.0048	0.0000	0.0010	0.0009		
49	0.0500	0.0000	0.0054	0.0000	0.0010	0.0010		
50	0.1500	0.0500	0.0077	0.0000	0.0010	0.0011		
51	0.1500	0.0500	0.0088	0.0000	0.0010	0.0012		
52	0.1500	0.0500	0.0100	0.0000	0.0010	0.0013		
53	0.2000	0.0500	0.0111	0.0000	0.0010	0.0014		
54	0.1300	0.1000	0.0122	0.0000	0.0010	0.0015		
55	0.2250	0.2750	0.0134	0.0000	0.0010	0.0017		
56	0.2250	0.2750	0.0145	0.0000	0.0010	0.0018		
57	0.1700	0.2750	0.0156	0.0000	0.0010	0.0019		
58	0.1700	0.2750	0.0139	0.0000	0.0010	0.0021		
59	0.2500	0.2750	0.0122	0.0000	0.0010	0.0023		
60	0.4000	0.2750	0.0106	0.0000	0.0010	0.0024		
61	0.4000	0.2750	0.0089	0.0000	0.0010	0.0026		
62	0.4000	0.2750	0.0072	0.0000	0.0010	0.0029		
63	0.4000	0.2750	0.0055	0.0000	0.0010	0.0031		
64	0.4000	0.2750	0.0038	0.0000	0.0010	0.0034		
65	1.0000	1.0000	0.0000	0.0000	0.0000	0.0000		

** 100% probability of retirement is assumed at ages 50 and above with 33 or more years of service for Safety and Probation Plans 1, 2, and 4.*

*** 100% probability of retirement is assumed at ages 55 and above with 33 or more years of service for Safety and Probation Plan 5, ages 55 and above with 38 or more years of service for Safety and Probation Plan 6, and ages 57 and above with 38 or more years of service for Safety and Probation Plan 7.*

**** 0.00% probability of termination with 20 years of serivce and above for all Safety/Probation plans except Plan 7.*