Los Angeles County Employees Retirement Association

2019 Investigation of Experience for Retirement Benefit Assumptions

January 2020 Board Meeting

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January 28, 2020

Board of Investments
Los Angeles County Employees Retirement Association
300 North Lake Avenue, Suite 820
Pasadena, CA 91101-4199

Re: **Los Angeles County Employees Retirement Association**

Dear Members of the Board:

It is a pleasure to submit this report of our investigation of the experience of the Los Angeles County Employees Retirement Association (LACERA) for the three-year period ending June 30, 2019. The results of this investigation are the basis for recommended changes in actuarial assumptions for the actuarial valuation of retirement benefits to be performed as of June 30, 2019.

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 LACERA.

We have provided financial information showing the estimated hypothetical impact of the recommended assumptions if they had been used in the June 30, 2018 actuarial valuation. We believe the recommended assumptions provide a reasonable estimate of anticipated experience affecting LACERA. 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 LACERA's staff. This information includes, but is not limited to, statutory provisions, employee data, and financial information. We used LACERA's benefit provisions as stated in our June 30, 2018 Actuarial Valuation report. In our examination, after discussion with LACERA 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 LACERA. 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 exception(s):

(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 retirement 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.

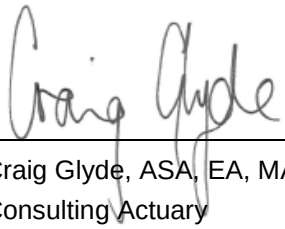
We would like to acknowledge the help in the preparation of the data for this investigation given by the LACERA staff. We look forward to our discussions and the opportunity to respond to your questions and comments at your next meeting.

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.

Sincerely,

Mark Olleman, FSA, EA, MAAA
Consulting Actuary

Nick Collier, ASA, EA, MAAA
Consulting Actuary



Craig Glyde, ASA, EA, MAAA
Consulting Actuary

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1. Executive Summary and Recommendations

Milliman has performed the triennial investigation of experience for the period July 1, 2016 through June 30, 2019. This report contains the findings of this investigation and includes several recommended changes in assumptions.

Determining the adequacy of the current contribution rates is dependent on the assumptions used to project the future benefit payments and then to discount the value of future benefits to determine the present values. Therefore, the assumptions are critical in assisting the System in adequately funding future retirement benefits.

Summary

This section describes the key findings of this investigation of experience. We have recommended several changes to the demographic and economic assumptions. If adopted, these changes would have a material effect on the member and employer contribution rates effective July 1, 2020. The potential impact to the members is discussed on the next page. The potential impact to employers is discussed at the end of this section.

We will refer to our recommended assumptions as the "recommended" or "proposed" assumptions throughout this report. We have provided a summary of the proposed changes to the assumptions later in this section. The Board of Investments has the ultimate decision on the assumptions to be used in the actuarial valuation.

Introduction

Section 2 discusses the following:

- How the investigation of experience study was performed.
- Actuarial Standards of Practice No. 27 and No. 35.
- The presentation of results you will see in this report.

Actuarial Methods (Includes Amortization Periods and Member Contribution Rates)

Section 3 describes the actuarial methods used in performing our valuation and in assisting LACERA to administer the plan. We are recommending one change in the actuarial methods used in the valuation. Under LACERA's current amortization policy, annual changes in the Unfunded Actuarial Accrued Liability (UAAL) are funded over separate 30-year periods as a level percentage of payroll. These annual payments are referred to as "layers." We recommend that the 30-year period for these layers be changed to 20 years for future changes in the UAAL. 30 years is inconsistent with actuarial guidance and is longer than other California retirement systems.

We are not recommending any changes in the amortization periods for the existing amortization layers. However, it should be noted that some existing layers would still have amortization periods much longer than 20 years. One option for LACERA would be to combine all existing layers greater than 22 years and reamortize them over 22 years in the 2019 valuation. Under this approach, LACERA would be fully transitioned to 20-year amortization with the 2021 valuation. Either of these two approaches (no changes to existing layers, or changing to a 22-year maximum period for existing layers) would be appropriate for LACERA.

One additional option that we discussed with the Board of Investments was the reamortization of the full UAAL as of June 30, 2019 over a 25-year period, with future changes in the UAAL being amortized over 20-year periods. This weakens the funding of the existing UAAL by reducing the contribution rate for existing layers. However, Milliman would view this as reasonable if the change was combined with a reduction in the investment return assumption to 6.75%. Overall, Milliman would view this as strengthening funding, and it would result in each component of the assumptions and methods being acceptable.

We are also recommending an update to the operating tables LACERA uses in the calculation of optional forms of payment to reflect any changes in the COLA, mortality, and investment return assumptions.

Also note that new member rates will be computed based on the 2019 triennial valuation using the assumptions adopted. We have estimated the new member rates based on the proposed assumptions, as shown in Section 3. These estimates show that there will be material increases in member rates under the proposed assumptions. Note that the actual member contribution rates cannot be determined until completion of the June 30, 2019 valuation.

Sample member contribution rates are shown in the following table. We have shown the results under two economic scenarios: 1) the recommended investment return assumption of 6.75% and a wage growth assumption of 3.00%; and 2) a reasonable alternative investment return assumption of 7.00% and a wage growth assumption of 3.25%. We have shown these two sets as they were the two alternatives where most of the focus was during discussions between Milliman and the Board of Investments this fall. Note that all estimated member contribution rates also include the proposed demographic assumption changes and are the total member rate (i.e., Normal + COLA).

	Entry Age	Currently in Effect[2]	Estimated Member Contribution Rates Effective July 1, 2020[1] Inv = 6.75% Wage = 3.00%	Estimated Member Contribution Rates Effective July 1, 2020[1] Inv = 7.00% Wage = 3.25%
General Members				
Plan D	25	6.27%	7.02%	6.83%
	35	7.83%	8.66%	8.43%
	45	9.78%	10.62%	10.33%
	55	11.57%	12.35%	12.00%
Plan G	All Ages	8.43%	9.46%	9.21%
Safety Members				
Plan B	25	11.00%	12.81%	12.42%
	35	13.57%	15.24%	14.75%
	45	16.20%	18.14%	17.56%
	55	16.35%	18.14%	17.55%
Plan C	All Ages	13.69%	15.33%	14.83%

1. Final member contribution rates will not be determined until the COLA portion is calculated in the June 30, 2019 actuarial valuation.

2. The rates currently in effect are based on the June 30, 2016 actuarial valuation and include an investment return assumption of 7.25% and a wage growth assumption of 3.25%.

Economic Assumptions

Section 4 discusses the economic assumptions: price inflation, general wage growth (includes price inflation and productivity), investment return, and future COLA increases. As with virtually all actuarial assumptions, there is not one right answer; however, we do believe there is considerable evidence that a lower investment return assumption is appropriate for LACERA. We have recommended a reduction in the investment return assumption to 6.75%. We have also included two alternative investment return assumptions of 6.50% or 7.00% in our discussion, which we believe would be reasonable with certain wage growth assumptions.

The most compelling reason to lower the investment return assumption is the lower expectation for future investment returns. The capital market assumptions reported by LACERA's general investment consultant, Meketa Investment Group (Meketa), forecast an expected net return based on LACERA's asset allocation of between 6.8% and 7.5% depending on the timeframe (10 to 20 years). Milliman's capital market assumptions are projecting a 6.4% net expected return for LACERA's target portfolio over the next 20 years (6.3% net expected return over 10 years).

Further, the capital market assumptions used in the analysis of the expected return were determined at January 2019 (or the end of 2018). Subsequent to those capital market assumptions being determined, there has been a significant decline in yields on fixed income which we believe will cause a drag on future expected returns, and an increase in the price-to-earnings ratio which leaves less room for future growth. Therefore, we recommend that the investment return assumption be lowered to 6.75% (net of both investment and administration expenses). Note that we relied upon both Meketa's and Milliman's capital market assumptions in making this recommendation, as well as a survey of other investment consultants.

As detailed in Section 4, there is an expectation for lower price inflation in both the short and long term. In particular, there has been a sustained period of low inflation, with a 2.2% average increase over the 20-year period ending in 2018. Looking forward, there is a continued expectation of low price inflation, as evidenced by the current (November, 2019) implied inflation expectation of approximately 1.7% based on the difference in yield between 30-year Treasury Inflation-Protected Securities (TIPS) and a regular 30-year treasury bond. However, it should be noted that CPI increases in the Los Angeles area have been 1.0% higher over the last four years than the national average, which most forecasts are focused on.

We recommend a price inflation assumption of either 2.50% (if the investment return assumption is lowered to 6.75% or less) or 2.75%. We recommend the wage inflation assumption be set equal to the price inflation plus 0.5% (either 3.00% or 3.25%), as there is a high correlation between price and wage inflation. We recommend a reduction in the assumed cost-of-living adjustment (COLA) for retiree benefits for most Plan A retirees if the price inflation assumption is reduced.

The following table shows our recommended assumption set, along with two alternatives.

Assumption	Economic Assumptions			
	Current	Recommended	Alternative A	Alternative B
Investment Return[1]	7.25%	6.75%	7.00%	6.50%
General Wage Growth	3.25%	3.00% or 3.25%	3.25%	3.00%
Payroll Growth	3.25%	3.00% or 3.25%	3.25%	3.00%
Price Inflation	2.75%	2.50% or 2.75%	2.75%	2.50%
Future Retiree COLAs[2] (Plan A / Other Plans)	2.75% / 2.00%	2.50% / 2.00% or 2.75% / 2.00%	2.75% / 2.00%	2.50% / 2.00%

1. Net of both investment and administration expenses. For GASB financial reporting, the recommended investment return assumption is 0.13% higher.

2. The first of the two numbers applies to Plan A; the second number applies to the remainder of the plans (although the Plan E COLA is pro-rated based on pre-2002 service). To account for existing Plan A COLA balances, retirees and beneficiaries with a retirement date prior to April 1, 1981 are assumed to receive 3.00% annual COLAs.

Analysis by Compensation Level

In our analysis of the active demographic assumptions (merit salary, active death, service retirement, disability, and termination), we reflected the impact of compensation levels by weighting the results by compensation. That is, a member with annual compensation of $80,000 has twice the impact on the observed rates in comparison to a member with annual compensation of $40,000. We observed some differences in member behavior based on compensation. For example, members with higher levels of compensation tended to have higher probabilities of retiring at a given age. These compensation-weighted probabilities are shown as the “Actual” bars in the graphs in Section 5 through Section 9.

Merit Salary Increases

Section 5 discusses the individual salary increases due to promotion and longevity – the merit component of salaries. Merit salary increases were higher than assumed increases, primarily for Safety members. We are recommending small increases in the assumption for General members to reflect actual experience. For Safety members, we are recommending small increases at most service levels and large increases at certain service levels where longevity increases occur for many members.

Death from Active Status

Section 6 discusses the probability of a member dying while in active employment. For nonservice-connected deaths, the actual rates were greater than what the current assumptions predicted. We are recommending updating the assumptions to new active employee mortality tables specific to public plans. The recommended tables result in a small increase in the assumed mortality. For the service-connected death assumption, we are not recommending a change given the limited data for this assumption.

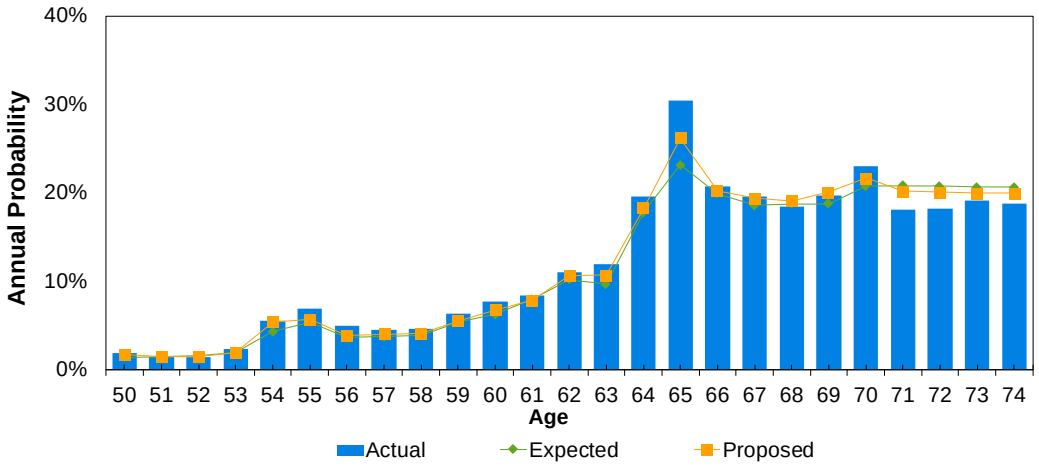
Service Retirement

Section 7 discusses the probability of an eligible active member taking a service retirement at a specific age. The results of our study showed actual retirement rates that were generally equal to or greater than the assumptions. The current assumptions expected 7,050 retirements among all active members; 7,569 actually occurred, resulting in a total Actual-to-Expected ratio of 107%. We have recommended increases to service retirement rates

for Safety B members and some minor changes to General Plans D and E. We have also recommended new separate tables for General G and Safety C to reflect their specific age factors.

The following graph shows the actual experience for all members from the current experience study (light blue bars). The proposed assumptions are shown as an orange line and compared to the current assumptions (green line). As the graph illustrates, the overall changes were relatively small.

Service Retirement Rates – All Plans



Disability Retirement

Section 8 discusses the probability of an active member becoming disabled. We studied both service-connected disability and nonservice-connected disability. The results were as follows:

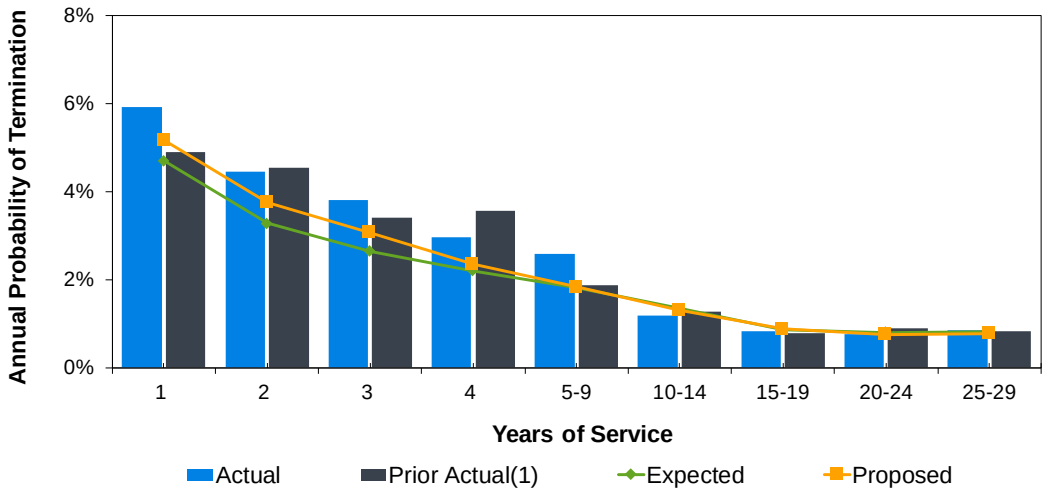
Type	Actual	Expected	Actual / Expected	Proposed	Actual / Proposed
Service-Connected	640	788	81%	661	97%
Nonservice-Connected	55	81	68%	77	71%
Total	**695**	**869**	**80%**	**738**	**94%**

For disability retirements, actual experience was less than expected. We are recommending reductions to the assumed rates to better fit actual experience, primarily to the service-connected disability rates.

Termination

Section 9 summarizes the results of our study of terminations of employment for reasons other than death, service retirement, or disability. The current assumptions expected 3,324 terminations and 3,890 actually occurred, resulting in a total Actual-to-Expected ratio of 117%. We have recommended increases to the termination rates at service less than five years.

The following graph shows the actual experience for all members from the current experience study (light blue bars), as well as the average experience from the prior two experience studies (dark gray bars). The proposed assumptions are shown as an orange line and compared to the current assumptions (green line).



1. Prior Actual numbers reflect average experience from last two studies (2016 and 2013).

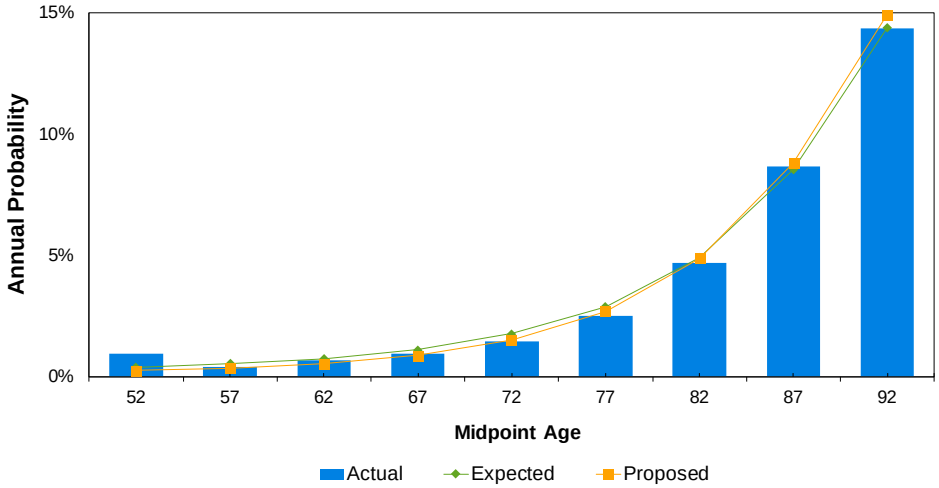
Probability of Refund

In Section 10, we report the actual number of vested members electing a refund upon termination was 91% of the expected number. We are recommending small reductions in this assumption to reflect the recent experience.

Retiree 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 showed there were 3% more deaths than the assumptions predicted. However, retirees with larger-than-average benefits tend to have lower mortality than those with smaller-than-average benefits. Adjusting for the impact of the benefit levels on mortality, there were actually 6% fewer deaths than assumed. That is, the assumptions projected that 6% more benefits would stop being paid during the period than actually occurred.

We are recommending new retiree mortality rates based on recently published tables that are specific to public plan general and safety members, with adjustments to match LACERA experience. Under the recommended tables the assumptions are very close to actual experience, after accounting for the impact of benefit levels. The graph below shows the results of the study for service retirees on a benefit-weighted basis.



We are also recommending the continued use 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. We are not recommending any changes to the projection scale. Additional details are provided in Section 11.

Miscellaneous Assumptions

Section 12 discusses some other assumptions that are made. We are recommending the following:

- Retain the current assumption for the probability a member will have an eligible survivor at retirement who is eligible for the unreduced continuance benefit.
- Increase the assumed retirement age for deferred vested members for General Plan D. Retain the current assumption for all other plans.
- Retain the current assumption for the probability of a deferred vested member establishing reciprocity and retiring with another system.

Summary of Recommendations

The following table summarizes our recommendations. The next section provides an overview of the financial impact of these proposed changes.

<table>
<tr><th>Assumption</th><th>Recommendation</th></tr>
<tr><td>Actuarial Methods (Amortization)</td><td>Amortize future changes in the UAAL over 20 years.

For existing amortization layers, either 1) continue to amortize the existing layers over the current periods; or 2) amortize all existing layers over the shorter of the current period and 22 years. A full reset at 25 years would also be reasonable if a 6.75% investment return assumption is adopted.</td></tr>
<tr><td>Other Actuarial Methods</td><td>Update operating tables used in the calculation of optional forms of payment to include recommended changes.</td></tr>
<tr><td>Economic</td><td>
<table>
<tr><th rowspan="2">Assumption</th><th colspan="2">Economic Assumptions</th></tr>
<tr><th>Current</th><th>Recommended</th></tr>
<tr><td>Investment Return</td><td>7.25%</td><td>6.75%</td></tr>
<tr><td>General Wage Growth</td><td>3.25%</td><td>3.00% or 3.25%</td></tr>
<tr><td>Payroll Growth</td><td>3.25%</td><td>3.00% or 3.25%</td></tr>
<tr><td>Price Inflation</td><td>2.75%</td><td>2.50% or 2.75%</td></tr>
<tr><td>Future Retiree COLAs (Plan A / Other Plans)</td><td>2.75% / 2.00%</td><td>2.50% / 2.00% or 2.75% / 2.00%</td></tr>
</table>
</td></tr>
<tr><td>Merit Salary Increase</td><td>Increases, primarily for Safety plans.</td></tr>
<tr><td>Death While Active</td><td>Move to updated tables specific to public plans with adjustments for consistency with LACERA experience.</td></tr>
<tr><td>Service Retirement</td><td>Small increases to General Plans D and E and Safety plans.</td></tr>
<tr><td>Disability Retirement</td><td>Reductions to both service-connected disability and nonservice-connected disability rates.</td></tr>
<tr><td>Termination</td><td>Small increases in rates at lower levels of service. Extend termination rates beyond 20 years for Safety C members.</td></tr>
<tr><td>Probability of Refund</td><td>Small reductions.</td></tr>
<tr><td>Retiree Mortality</td><td>Move to updated tables specific to public plans with adjustments for consistency with LACERA experience.</td></tr>
<tr><td>Miscellaneous</td><td>Increase the assumed retirement age for deferred vested members for General Plan D.</td></tr>
</table>

Estimated Financial Impact

The estimated financial impact of the proposed changes to the economic assumptions, if adopted, is expected to be significant. For the recommended demographic assumptions, the financial impact will be smaller, but is still projected to result in a material increase in the employer contribution rates. The following exhibit is designed to give the reader an idea of how the proposed changes may affect LACERA as a whole. Note that these estimates

represent the immediate impact. Ultimately, the long-term costs should approximately balance out, so, for example, the proposed assumptions with the lower investment return component will require more contributions in the short term but will ultimately require less contributions in the future than the current set of assumptions.

The financial impact was evaluated by performing additional valuations with the June 30, 2018 valuation data and benefits, and reflecting the proposed assumption changes. This allows us to evaluate the relative financial impact of the various proposed changes. We have projected these results forward to June 30, 2019. Note that the impact of the various assumption changes by component is somewhat dependent on the order in which they are evaluated.

We have shown the estimated financial impact based on the recommended 6.75% investment return assumption and a 3.00% wage growth assumption. We have shown this set of economic assumptions because the Board of Investments has previously indicated a preference for this assumption compared to our alternative recommendation of a 6.75% investment return assumption with a 3.25% wage growth assumption.

Projected Results of June 30, 2019 Valuation
With Proposed Assumptions

	Funded Ratio	Total Employer Contribution	
		% of Payroll	$ millions
June 30, 2018 Valuation	**80.6%**	**20.9%**	**$ 1,771**
Preliminary Estimate of Year-to-Year Change	0.1%	0.4%	93
Est. June 30, 2019 Valuation (no changes)	**80.7%**	**21.3%**	**$ 1,864**
Recommended Economic & 20-Year Amortization of New UAAL Layers			
6.75% Interest / 3.00% Wage / 2.50% CPI	-3.9%	4.0%	$ 350
Recommended Demographic Assumptions			
Merit Salary	-0.2%	0.4%	$ 35
Post-Retirement Mortality	0.1%	0.0%	-
Rates of Retirement	-0.2%	0.3%	26
All Other Changes	-0.1%	0.1%	9
Subtotal Demographic Change	-0.4%	0.8%	$ 70
Summary			
Est. June 30, 2019 Valuation (no changes)	80.7%	21.3%	$ 1,864
Economic Assumptions	-3.9%	4.0%	350
Demographic Assumptions	-0.4%	0.8%	70
Total Assumption Changes	-4.3%	4.8%	$ 420
Est. June 30, 2019 Valuation with Changes[(1)(2)]	**76.4%**	**26.1%**	**$ 2,284**

1. Impact estimated based on June 30, 2018 actuarial valuation. New assumptions will be implemented with the June 30, 2019 actuarial valuation and affect contribution rates effective July 1, 2020, so actual results will vary. A 20-year amortization of changes in the June 30, 2019 UAAL is included in the estimate.

2. Impact of proposed changes will vary by plan; however, relative increase for the combined General plans and the combined Safety plans should be similar.

Reset of Amortization Period

As discussed at the bottom of page 1 of this report, one option that we have discussed with the Board of Investments is the reamortization of the full UAAL as of June 30, 2019 over a 25-year period, with future changes in the UAAL being amortized over 20-year periods. The following table shows the estimated financial impact of a 25-year reamortization of the UAAL.

	Funded Ratio	Total Employer Contribution % of Payroll	Total Employer Contribution $ millions
25-Year Reamortization of UAAL			
Est. June 30, 2019 Valuation (no changes)	80.7%	21.3%	$ 1,864
Combined Assumption Changes	-4.3%	4.8%	420
25-Year Reamortization Impact	0.0%	-1.4%	(123)
Adjusted Financial Impact with Reamoritzation	-4.3%	3.4%	$ 297
Est. June 30, 2019 Valuation	**76.4%**	**24.7%**	**$ 2,161**

Estimated Financial Impact of Alternative Reasonable Assumptions

Milliman has provided the estimated financial impact of a number of reasonable alternative assumptions during our presentations to the Board of Investments. As previously noted, one of the reasonable alternatives that has been extensively discussed during our presentations is a 7.00% investment return assumption with a 3.25% wage growth assumption and a 20-year amortization of future changes in the UAAL. We estimate that this alternative would have a 77.8% Funded Ratio and a total employer contribution rate of 24.7% of pay if the change in assumptions were fully recognized in the June 30, 2019 actuarial valuation.

Phase-in of Employer Contribution Rates

When new assumptions were adopted following the previous investigation of experience, LACERA elected to phase-in the increases in employer contribution rates over a three-year period. That is, in the first year, one-third of the increase was recognized followed by two-thirds in the second year. In the third year, no adjustment was made as the full increase was recognized. Note that this results in a slightly higher employer contribution rate in the third year than if the increase in the employer contribution rates was fully recognized in the first year .

This approach is acceptable under actuarial guidance, and we believe it continues to be a reasonable approach for LACERA. We provided LACERA with estimates of the financial impact of using the three-year phase-in approach at the December Board of Investments meeting.

Conclusion

We recommend that the Board adopt the proposed actuarial assumptions shown in Appendix A. We believe these assumptions reasonably reflect future expectations. Other assumption packages may be reasonable, and we have provided information on other assumptions that we feel are reasonable.

2. Introduction

Funding and Valuation Principles

While our goal is to make the best possible estimate of future experience, it is important for the Board to recognize that the future will almost certainly differ from our current best efforts to forecast it. Routine scheduled reevaluations of the actuarial assumptions, such as through this experience investigation, are a sound methodology to identify where assumptions differ from emerging experience and to fine-tune the actuarial estimates to keep them as close as possible to emerging experience.

It is expected that there will be years in which the actual investment return will exceed the actuarial assumption, and there will be years when the actual experience will not meet the assumed rate. It is the annualized expected median long-term rate that is used to actuarially project and finance the retirement benefits.

Recognition should be made that a higher investment return assumption will tend to lower required contributions in the short term (and higher required contributions in the long term), while a lower investment return assumption will tend to require higher contributions in the short term (and lower required contributions in the long term). However, the actual contributions will ultimately be determined by the actual experience, so in the long term, this should approximately balance out.

The actuarial assumptions are usually divided into two groups: economic and demographic. The economic assumptions must not only reflect LACERA's actual experience but also give even greater consideration to the long-term expectation of future economic growth for the nation as well as the global economy.

The non-economic, or demographic assumptions, are based on LACERA's actual experience, adjusted to reflect trends and historical experience. Thus, the economic assumptions are much more subjective than the demographic assumptions, and the demographic assumptions are much more dependent on recent experience.

Overview

This report presents the results of an investigation of the recent actuarial experience of LACERA. We will refer to this investigation as an experience study.

Throughout this report, we refer to "expected" and "proposed" actuarial assumptions. The "expected" assumptions are those used for our actuarial valuation of LACERA as of June 30, 2018. They may also be referred to as the "current" assumptions. These assumptions and methods were adopted by the Board based on Milliman's 2016 experience study. The "proposed" or "recommended" assumptions are those we recommend for use in the valuation as of June 30, 2019 and for subsequent valuations until further changes are made.

The choice of economic assumptions (investment return, general wage growth, payroll increase, and COLA increase) is discussed in Section 4 of this report. These assumptions are generally chosen on the basis of expectations as to the effect of future economic conditions on the operation of LACERA. However, the setting of these assumptions is much more subjective than the setting and recommending of demographic assumptions.

Sections 5 through 12 of this report show the results of our study of demographic assumptions. These assumptions tend to be more objective than the economic assumptions. The exhibits are detailed comparisons between actual and expected decrements (members leaving active or retired status, for reasons such as retirement or death) on both the current and proposed bases. Each exhibit is identified by two numbers corresponding to the section of the report and the specific exhibit within that section. For example, Exhibit 7-1 is referred to in Section 7, retirement rates.

For each type of assumption, graphs show the actual, the expected and proposed rates, usually by some combination of gender, plan, years of service, and age. The exhibits also show the total numbers of actual and expected terminations. Ratios larger than 100% on the current basis generally indicate that the rates may need to be raised; ratios smaller than 100% generally indicate that rates may need to be lowered.

For each exhibit, the actual decrement rates for the current and prior period are shown as bar graphs on either a quinquennial-age basis, a years-of-service basis, or, in the case of retirement rates, on an age-by-age basis. The current assumptions – the "expected" rates – used in the June 30, 2018 actuarial valuation, are shown, as well as the new proposed assumptions, as line graphs. Therefore, the assumption changes we are proposing are illustrated by the difference between the two lines in each exhibit. Note that in cases where no change is being proposed, only the expected rate line is shown.

Actuarial Standard of Practice No. 27

The Actuarial Standards Board has adopted Actuarial Standard of Practice (ASOP) No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations*. This standard provides guidance to actuaries giving advice on selecting economic assumptions for measuring obligations under defined benefit plans such as LACERA.

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.

ASOP 27 states that each economic assumption selected by the actuary should be reasonable. The assumption is reasonable if it has the following characteristics:

- It is appropriate for the purpose of the measurement.
- It reflects the actuary's professional judgment.
- It takes into account relevant historical and current economic data.
- It reflects the actuary's estimate of future experience and observation of the estimates in market data.
- It has no significant bias (i.e., it is not significantly optimistic or pessimistic), but may specifically make provision for adverse deviation.

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.

In our opinion, the economic assumptions we recommend for Retirement Board consideration in this report have been developed in accordance with ASOP No. 27.

Actuarial Standard of Practice No. 35: Selection of Demographic Assumptions

Actuarial Standard of Practice No. 35 (ASOP No. 35) governs the selection of demographic and other non-economic assumptions for measuring pension obligations. ASOP No. 35 states that the actuary should use professional judgment to estimate possible future outcomes based on past experience and future expectations, and select assumptions based upon application of that professional judgment. The actuary should select reasonable demographic assumptions in light of the particular characteristics of the defined benefit plan that is the subject of the measurement.

ASOP 35 Steps

The actuary should follow these steps in selecting the demographic assumptions:

1. **Identify the types of assumptions.** Types of demographic assumptions include but are not limited to: retirement, mortality, termination of employment, disability, election of optional forms of payment, administrative expenses, family composition, and treatment of missing or incomplete data. The actuary should consider the purpose and nature of the measurement, the materiality of each assumption, and the characteristics of the covered group in determining which types of assumptions should be incorporated into the actuarial model.
2. **Consider the relevant assumption universe.** The relevant assumption universe includes experience studies or published tables based on the experience of other representative populations, the experience of the plan sponsor, the effects of plan design, general trends, and future expectations.
3. **Consider the assumption format.** The assumption format includes whether assumptions are based on parameters such as gender, age, service, or calendar year. The actuary should consider the impact the format may have on the results, the availability of relevant information, the potential to model anticipated plan experience, and the size of the covered population.
4. **Select the Specific Assumptions.** In selecting an assumption the actuary should consider the potential impact of future plan design as well as the factors listed above.
5. **Select a Reasonable Assumption.** The assumption should be expected to appropriately model the contingency being measured. The assumption should not be anticipated to produce significant actuarial gains or losses.

ASOP 35 General Considerations and Application

Each individual demographic assumption should satisfy the criteria of ASOP No. 35. In selecting demographic assumptions, the actuary should also consider: the internal consistency between the assumptions, materiality, cost effectiveness, and the combined effect of all assumptions. At each measurement date, the actuary should consider whether the selected assumptions continue to be reasonable, but the actuary is not required to do a complete assumption study at each measurement date. In our opinion, the demographic assumptions recommended in this report have been developed in accordance with ASOP No. 35.

3. Actuarial Methods

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

- **Actuarial Cost Method:** The actuarial valuation is prepared using the entry age actuarial cost method. We believe that this cost method is appropriate for LACERA's valuation. It is also the cost method that is required for financial reporting under GASB Statements 67 and 68. We recommend no change. Note that this is by far the most common 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.
- **Valuation Assets:** We believe that the current asset valuation method where gains and losses are smoothed over five years is appropriate for LACERA's valuation. A five-year period is used by a majority of large public retirement systems. We recommend no change.

  Under LACERA's funding policy, the reserve value for STAR benefits is included in the Valuation Assets; however, the liability for any STAR benefits that may be granted in the future is not included in the liability portion of valuation. At the time decision this decision was made, our recommendation was to exclude the STAR reserve from the Valuation Assets for consistency with the treatment of STAR benefits. If the funding policy is revisited, we recommend the STAR reserved be excluded from the valuation assets.

It should be noted that the California Actuary Advisory Panel (CAAP) has published a paper on model actuarial funding policies which include guidelines for asset smoothing. LACERA's method of five-year smoothing without a corridor falls in the "Acceptable Practices" category under these guidelines (categories described below for reference). The only difference between LACERA's method and the method described in the "Model Practices" is that it includes a corridor of no greater than 50% to 150%, and LACERA has no corridor for five-year smoothing. We believe a five-year period is short enough that a corridor is not needed.

Categories Under CAAP Guidelines	
Model Practices	Those practices most consistent with the Level Cost Acturial Model (LCAM) developed by CAAP.
Acceptable Practices	Generally those which, while not consistent with the LCAM, are well established in practice and typically do not require additional analysis.
Acceptable Practices with Conditions	May be acceptable in some circumstances either to reflect different policy objectives or on the basis of additional analysis.
Non-Recommended Practices	Systems using these practices should acknowledge the policy concerns identified in the CAAP Guidelines.
Unacceptable Practices	No description provided by CAAP, but implication appears to be clear.

Operating Tables

We are recommending changes in the investment return and mortality assumptions and have included possible changes to the COLA increase assumptions. If any of these changes are adopted, the operating tables should be updated to reflect the changes.

Blended Mortality Table

We have studied the following factors that apply to the blended mortality tables used in the operating factors:

- **Gender Proportion:** We found that males account for 33% of the total present value of benefits for current General members and 86% for current Safety members.

  We are recommending the General Unisex mortality table use a blending of 35% male and 65% female (no change) and the Safety Unisex mortality table use a blending of 85% male and 15% female (was 90%/10%).
- **Assumed Retirement Year:** Since generational mortality rates vary by age and year, theoretically new operating tables would be needed every year. For administrative simplicity, we recommend using the mortality tables based on the member's age in the year 2023. This is three years in the future from the implementation date. This is expected to allow for use of the new mortality table for the next six years.
- **Retirement Type:** LACERA uses healthy mortality (i.e., the mortality table used for service retirees) in cases where a members as a disability, but the benefit is based on the service retirement formula. We believe this continues to be a reasonable approach.

  Reflecting the proposed assumptions in the optional monthly annuities would result in changes in the modified (or Unmodified Plus) benefit amount for future retirees who elect optional forms of payment. It would not affect the unmodified benefit.

Sample member contribution rates are shown in the following table. We have shown the results under two economic scenarios: 1) the recommended investment return assumption of 6.75% and a wage growth assumption of 3.00%; and 2) a reasonable alternative investment return assumption of 7.00% and a wage growth assumption of 3.25%. We have shown these two sets as they were the two alternatives where most of the focus was during discussions between Milliman and the Board of Investments this fall. Note that all estimated member contribution rates include the proposed demographic assumption changes and are the total member rate (i.e., Normal + COLA).

	Entry Age	Currently in Effect[2]	Estimated Member Contribution Rates Effective July 1, 2020[1] Inv = 6.75% Wage = 3.00%	Estimated Member Contribution Rates Effective July 1, 2020[1] Inv = 7.00% Wage = 3.25%
General Members				
Plan D	25	6.27%	7.02%	6.83%
	35	7.83%	8.66%	8.43%
	45	9.78%	10.62%	10.33%
	55	11.57%	12.35%	12.00%
Plan G	All Ages	8.43%	9.46%	9.21%
Safety Members				
Plan B	25	11.00%	12.81%	12.42%
	35	13.57%	15.24%	14.75%
	45	16.20%	18.14%	17.56%
	55	16.35%	18.14%	17.55%
Plan C	All Ages	13.69%	15.33%	14.83%

1. Final member contribution rates will not be determined until the COLA portion is calculated in the June 30, 2019 actuarial valuation.

2. The rates currently in effect are based on the June 30, 2016 actuarial valuation and include an investment return assumption of 7.25% and a wage growth assumption of 3.25%.

4. 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. As future events are unknown, 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. To meet the standard, the assumption should reflect "the actuary's estimate of future experience" and "it has no significant bias (i.e., it is not significantly optimistic or pessimistic)…"

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.

This section will discuss the economic assumptions. We have recommended two potential reductions in the price inflation assumption with corresponding reductions in the investment return, wage inflation, and COLA increase (for Plan A) assumptions. We believe either of these sets of assumptions satisfy ASOP No. 27.

The following table shows our recommendation and the alternative assumption sets.

Economic Assumptions	Current Assumptions	Recommended Assumptions	
		Alternative #1	Alternative #2
Investment Return[(1)]	7.25%	6.75%	6.75%
General Wage Growth	3.25%	3.25%	3.00%
Payroll Growth	3.25%	3.25%	3.00%
Price Inflation	2.75%	2.75%	2.50%
COLAs for Retirees[(2)]	2.75% / 2.00%	2.75% / 2.00%	2.50% / 2.00%

1. Net of both investment and administration expenses. For GASB financial reporting, the recommended investment return assumption is 0.13% higher.

2. The first of the two numbers applies to Plan A; the second number applies to the remainder of the plans (although the Plan E COLA is pro-rated percentage of 2.00% based on pre-2002 service). To account for existing Plan A COLA balances, retirees and beneficiaries with a retirement date prior to April 1, 1981 are assumed to receive 3.00% annual COLAs.

1. Price Inflation

Use in the Valuation

When we refer to inflation in this report, we are generally referring to price inflation. The inflation assumption has an indirect impact on the results of the actuarial valuation through the development of the assumptions for investment return, general wage increases and the payroll increase assumption. It does not have a direct impact on the valuation results, except where it affects the assumed COLA to be paid.

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. Our recommendation is to retain the assumption, or consider lowering it to 2.50% (if the investment return assumption is lowered to 6.75% or less).

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.

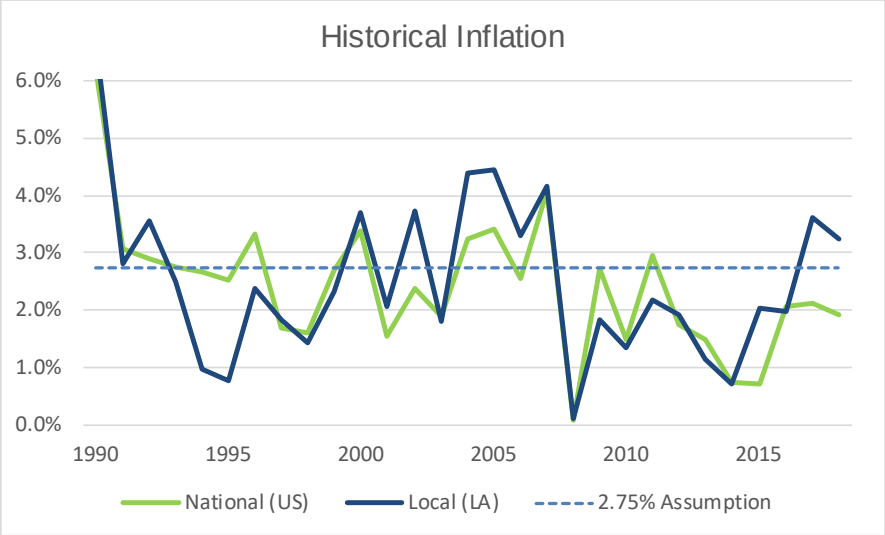
Although economic activities in general and inflation in particular, do not lend themselves to prediction on the basis of historical analysis, historical patterns and long term trends are a factor to be considered in developing the inflation assumption.

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 2018. Note that the 50-year average is heavily influenced by the inflation of the late 1970s and early 1980s. The last 30 years have averaged closer to 2.5%.

Decade	CPI Increase
2009-2018	1.8%
1999-2008	2.5%
1989-1998	3.1%
1979-1988	5.9%
1969-1978	6.7%
Prior 50 Years	
1969-2018	4.0%

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 California. We believe that although there have been historical differences between U.S. and California CPI changes, in the long term there should be a high correlation. For comparison, the average CPI increase for California has been 4.2% for the 50-year period 1966-2018, compared to the national average of 4.0%.

The following graph shows historical CPI increases since 1990. The national CPI increase has generally been less than 2.75% over the last 10 years of the period. Also shown for comparison are CPI increases specific to the Los Angeles area. These have tracked fairly close to the national statistics, although over the last four years, local CPI has exceeded the national CPI by 1.0% on average.



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 November 2019 suggest investors expect inflation to be about 1.7% over the next 30 years. Most forecasts of future price inflation by economists and investment professionals are lower than 2.75%, although they are generally 2.0% or greater.

Additionally, we reviewed the expected increase in the CPI by the Office of the Chief Actuary for the Social Security Administration. In the 2019 Trustees Report, the projected average annual increase in the CPI over the next 75 years under the intermediate cost assumptions was 2.60%.

Recommendation

The price inflation assumption is not used in determining LACERA'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.

Given that LACERA has recently experienced both greater-than-assumed COLAs and wage increases, it would be reasonable to leave the inflation assumption at 2.75%. Forecasts on a national basis are for lower inflation, so it would also be reasonable to lower the inflation assumption to 2.50%.

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

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 1969.

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 2018. 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
2009-2018	2.2%	1.8%	0.4%
1999-2008	3.7%	2.5%	1.2%
1989-1998	4.1%	3.1%	1.0%
1979-1988	6.2%	5.9%	0.3%
1969-1978	6.6%	6.7%	-0.1%
Prior 50 Years			
1969-2018	4.5%	4.0%	0.5%

LACERA-Specific Experience

We reviewed the increase in the average compensation for LACERA members since 1989. Over that period, the average compensation increased by 3.10% annually, compared to a 2.53% average annual increase in inflation. Therefore, for LACERA members only, we estimate real wage inflation has averaged 0.57% (3.10% less 2.53%) over the last three decades.

Forecasts of Future Wages

Wage inflation has been projected by the Office of the Chief Actuary of the Social Security Administration. In the 2019 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, although this has varied considerably by decade. Over the most recent 10-year period, the real wage growth has been 0.4%, after being higher than the assumption for each of the two decades before that. Actual experience for employees participating in LACERA has also been close to the assumption over the last 30 years. 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 at 0.50% and the price inflation assumption is set at 2.50% or 2.75%, this would result in a total wage growth assumption of 3.00% or 3.25% respectively.

Payroll Increase Assumption

In addition to setting salary assumptions for individual members, the aggregate payroll of LACERA 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 assumption continue to be set equal to total wage growth assumption.

Growth in Active Membership

We propose continuing the assumption that no future growth or decline in active 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 only. 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.

3. Investment Return

Use in the Valuation

The investment return assumption is one of the primary determinants in the calculation of the expected cost of LACERA'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 LACERA is 7.25% per year, net of all administrative and investment-related expenses.

Expected Long-Term Investment Return

To estimate the expected long-term return we have looked at capital market assumptions from three sources: Milliman, Meketa (LACERA's external investment consultant, and a survey of other investment consulting firms (Horizon Survey of Capital Market Assumptions, 2019 edition). We have combined these capital market assumptions with LACERA's target asset allocation. The target asset allocation is summarized in the following table:

Class	Target Allocation
Global Equity	35%
Private Equity	10%
Opportunistic Real Estate	2%
High Yield Bonds	3%
Bank Loans	4%
Emerging Market Debt	2%
Illiquid Credit	3%
Core / Value-Add Real Estate	7%
Natural Resources / Commodities	4%
Private Infrastructure	3%
TIPs	3%
Investment Grade Bonds	19%
Diversified Hedge Funds	4%
Cash	1%

Combining the capital market assumptions with the target asset allocation policy, we calculated both the 10- and 20-year expected returns for each of the three sources. These expected returns have been reduced for administrative and investment expenses, as discussed later, and are the median expected return on a geometric basis for LACERA's assets. Note that we have also indicated the associated inflation assumptions for the capital market assumptions. A higher inflation assumption will generally lead to a higher expected return.

	Meketa	Milliman	Horizon
Based on 10-Year Assumptions			
Median Annualized Return	**6.8%**	**6.3%**	**6.6%**
Assumed Inflation	2.1%	2.3%	2.2%
Based on 20-Year Assumptions			
Median Annualized Return	**7.5%**	**6.4%**	**7.3%**
Assumed Inflation	2.6%	2.3%	2.3%

Notes:

1. Returns are net of assumed expenses of 0.18% of assets.
2. The Horizon Survey reports a limited number of asset classes. In cases where there was not a corresponding asset class in the survey, Meketa's assumptions for the corresponding time horizon were used.
3. Horizon 10-year assumptions include some consultants with less than 10 years. Horizon 20-year assumptions include some consultants with more than 20 years and are based on a subgroup of less than half of the full group.

When actuaries recommend the investment return assumption, they generally consider a long-term time horizon. As LACERA is a mature plan (over half the value of accrued liabilities are expected to be paid in the next 15 years), we have considered both the 10-year and 20-year time horizons in making our recommendation. This reflects the time horizon over which the majority of LACERA's acturial accrued liability is to be paid.

Timing of Capital Market Assumptions

The capital market assumptions used in this analysis were determined as of January 2019 (or the end of 2018). Subsequent to those capital market assumptions being determined, there has been a significant decline in yields on fixed income which we believe will cause a drag on future expected returns, and an increase in the price-to-earnings ratio which leaves less room for future growth. At the October Board of Investments meeting, Meketa indicated that they also expect to see a decline in the expected return. We have considered this decrease in expected future returns in making our recommendations, but have not directly reflected it in our analysis.

Administrative and Investment-Related Expenses

The investment return used for the valuation is assumed to be net of all administrative and investment-related expenses. Most asset classes in the Milliman capital market assumptions are effectively net of investment expenses. It is our understanding this is true for Meketa and the investment consultants included in the Horizon survey. Asset classes that are readily marketable, such as global equity and fixed income, do not reflect expenses in the expected return assumption. For those classes, we assume investment fees based on the cost of indexing, as it is unlikely LACERA would pay active managers unless it was expected the return could at least match the index return. Additionally, we adjust for other investment-related expenses, such as internal investment staff and outside consultants. Our assumption is that investment expenses will be 0.05% of assets.

The following table shows the ratio of administrative expenses to the LACERA Plan assets over the last 10 fiscal years ending June 30. The expense ratio is calculated as the expense amount divided by the ending asset balance at fair market value.

($million) Year Beginning	Beginning Market Assets	Admin. Expense Amount	Admin. Expense Ratio
2009	$30,499	$49	0.16%
2010	33,434	51	0.15
2011	39,452	50	0.13
2012	38,307	54	0.14
2013	41,774	59	0.14
2014	47,722	63	0.13
2015	48,818	67	0.14
2016	47,847	67	0.14
2017	52,743	67	0.13
2018	56,300	71	0.13

For the administrative expenses, we have assumed no change in the current assumption of 0.13% of market assets, as the actual ratio has been close to this over the last five years. Accounting for this, combined with the 0.05% we have assumed for investment-related expenses, we have included a reduction of 0.18% in our calculation of the expected return. For example, Meketa calculated a 7.0% 10-year expected return; we have used 6.8% in our analysis, reflecting this 0.18% reduction.

The expense assumption does not have a direct impact on the actuarial valuation results, 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, our recommended investment return assumption is 6.75%, so LACERA would need to earn a gross return on its assets of 6.93% in order to net the 6.75% for funding purposes.

We recommend the 0.13% adjustment for administrative expenses be added to the investment return assumption adopted to determine the discount rate used in LACERA'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, but not investment expenses.

Excess Earnings

Section 31592.2 of the 1937 Act provides the Retirement Board with the authority to set aside earnings of the retirement fund during any year in excess of the total interest credited to contributions when such surplus exceeds 1.00% of the total assets of the retirement system.

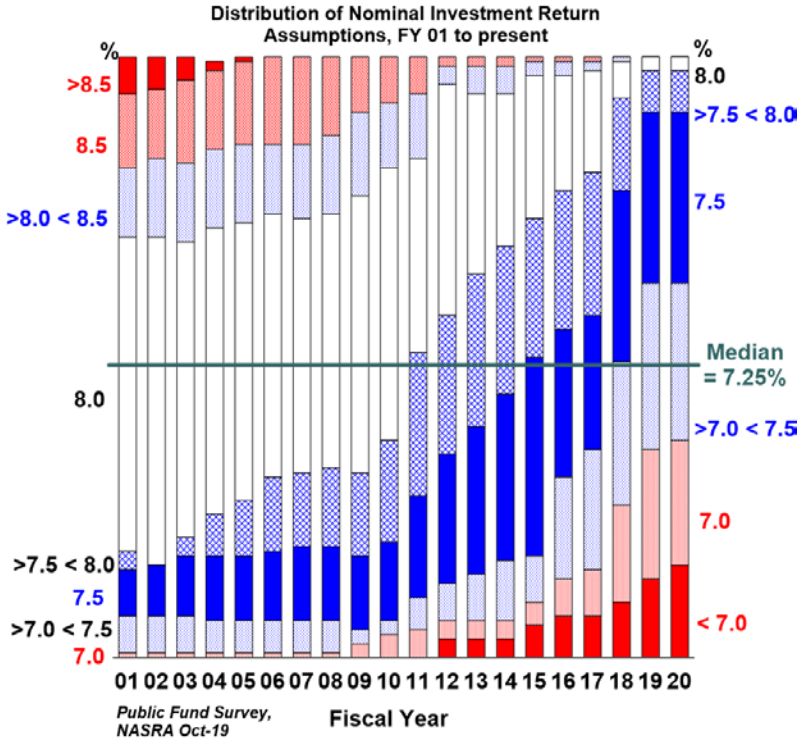
Under LACERA's Retirement Benefit Funding Policy, it is the intention of the Board of Investments to distribute no excess earnings unless the plan is fully funded and then to only provide limited benefits on the basis of excess earnings after the plan is fully funded. Since it is expected to be quite some time before LACERA once again reaches full funding status, the likelihood of any excess earnings being distributed for discretionary benefits is quite low in the foreseeable future. Further Section 7522.44 may further restrict the Board's ability to distribute excess earnings. Therefore, for purposes of the 2019 experience study, we do not propose to recognize any additional excess earnings benefits for future years when setting the investment return assumption. This issue should be addressed again in 2022 as part of the 2022 assumption study.

If the Board of Investments determines that the fund should share excess earnings with members when times are good, but the fund is not able to collect additional revenue when investment returns lag expectations, there is a

cost to LACERA over time. Thus, if the Board changes its policy toward excess earnings, it must find some way to recognize an obligation for benefits attributable to excess earnings. An excess earnings policy would result in increased payments made by LACERA to members over the long term. If these potential future benefits are not recognized in setting the investment return assumption or in determining LACERA's future benefit payments, the total liabilities will be understated.

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 7.25%. The following chart shows a progression of the distribution of the investment return assumptions. In 2001, very few systems had an assumption of 7.25% or lower and over 80% had an assumption of 8.0% or greater. As of fiscal year 2019, over 50% have an assumption of 7.25% or less and this is continuing to trend down.



Cost Implications of Changes in Investment Return Assumption

In most retirement systems with variable contribution rates, such as LACERA, the greatest factor contributing to the volatility of contribution rates is the return on investments. If, in the future, the full actuarial assumption of 7.25% is not able to be credited to the valuation reserves, there may be an increase in the employer contribution rate. The base member contribution rates are determined based on the '37 Act statutes, the actuarial assumptions, and the benefit provisions and are not affected by asset values. The COLA portion of the member rates also does 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 employer contribution rates.

To assist the Board in understanding the sensitivity to changes in the investment return rate assumption, we revalued the 2018 valuation results using the recommended investment return assumption of 6.75%, as well as an alternative of 7.00%. This is discussed in the Financial Impact section of the Executive Summary.

Conclusion

Based on Meketa's January 2019 capital market assumptions, there is slightly more than a 50% probability that the current investment return of 7.25% will be met over the next 20 years; however, there is less than a 50% probability that the current investment return of 7.25% will be met over the next 10 years. Based on Milliman's capital market assumptions, the probability of meeting 7.25% is materially less than 50% over all time horizons. Further, expected returns have declined since January 2019. Therefore, we are recommending a reduction in the investment return assumption to 6.75%.

Investment Return (net of all expenses)	
Current assumption	7.25%
Recommended	6.75%
Reasonable Alternatives	6.50% or 7.00%

Post-Retirement Cost-of-Living Adjustments (COLA)

The current assumption is that retiree COLAs will be equal to the maximum COLA level provided by the plan (3% for Plan A, up to 2% for Plan E based on the individual, and 2% for the other plans), but not greater than the price inflation assumption. We recommend this assumption be continued. This means that if the price inflation is reduced, the assumed COLA for Plan A should be reduced to that level. The only exception is that to account for existing Plan A COLA balances, retirees and beneficiaries with a retirement date prior to April 1, 1981 are assumed to receive 3.00% annual COLAs.

5. Salary Increases Due to Promotion and Longevity (Merit Increases)

As discussed in Section 4, 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; and
2. Increases in the general wage level of the membership, which are closely related to inflation and increases in productivity.

In section 4, we reviewed the general wage growth assumption. In this section, we will study increases due to promotion or longevity. We generally refer to these increases as merit increases.

Results

Merit increases are assumed to be related to two factors. We studied each of these factors to see if they were significant, and, if so, what the impact was. Our findings were as follows:

- **Service:** Members in the early stages of their careers tend to get larger merit increases. In other studies, we have found years of service to have the most significant impact on merit increases. We found this to be true with LACERA.
- **Membership:** The current rates assume that Safety members receive slightly larger salary increases than General members later in their career. As noted in the Methodology section below, we studied a longer period this year. Based on this study, we observed that Safety members received significantly larger merit increases at certain service levels (19, 24 and 29 years of service). We reviewed the most recent contract for deputy sheriffs and confirmed that the contract has included longevity pay increases at those service levels for a number of years. Note that other Safety groups have different provisions in their contracts, but given the size of the deputy sheriff group, it is clearly having a significant impact. Therefore, we believe the results of the study are valid and are recommending changes to reflect the actual experience.

Methodology

In studying merit increases, we first calculated the increase in member salaries that was due to general wage growth for each year of the study. For each individual we then calculated the total salary increase by comparing salaries for successive years. The merit increase was then identified by removing the general wage growth portion from the member's total salary increase.

There can be significant year-to-year variations in the calculated general wage growth, which can in turn cause disparities in the observed merit salary increases. To reduce these variations, we are using longer time frames in our studies of merit salary increases. For LACERA, we have used a 15-year period.

Recommendation

Merit salary increases were higher than assumed increases, primarily for Safety members. We are recommending small increases in the assumption for General members to reflect actual experience. For Safety members, we are recommending small increases at most service levels and large increases at service years 19, 24, and 29. The assumed rates are shown numerically in Appendix A.

Exhibit 5-1
Salary Increases by Service – General Members

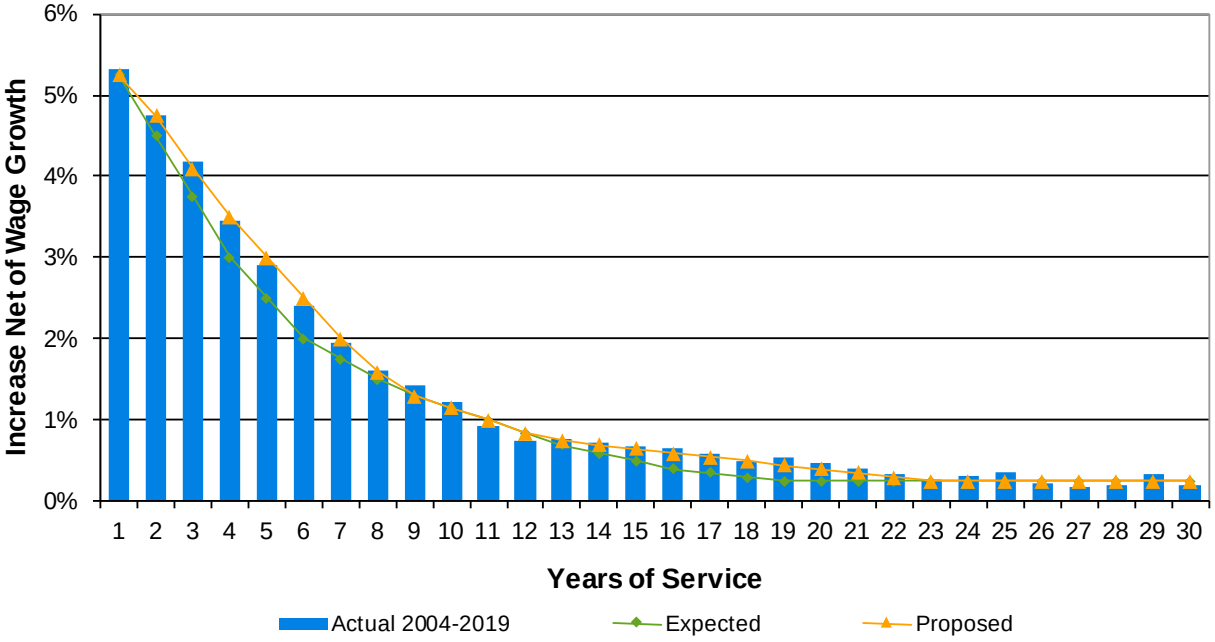
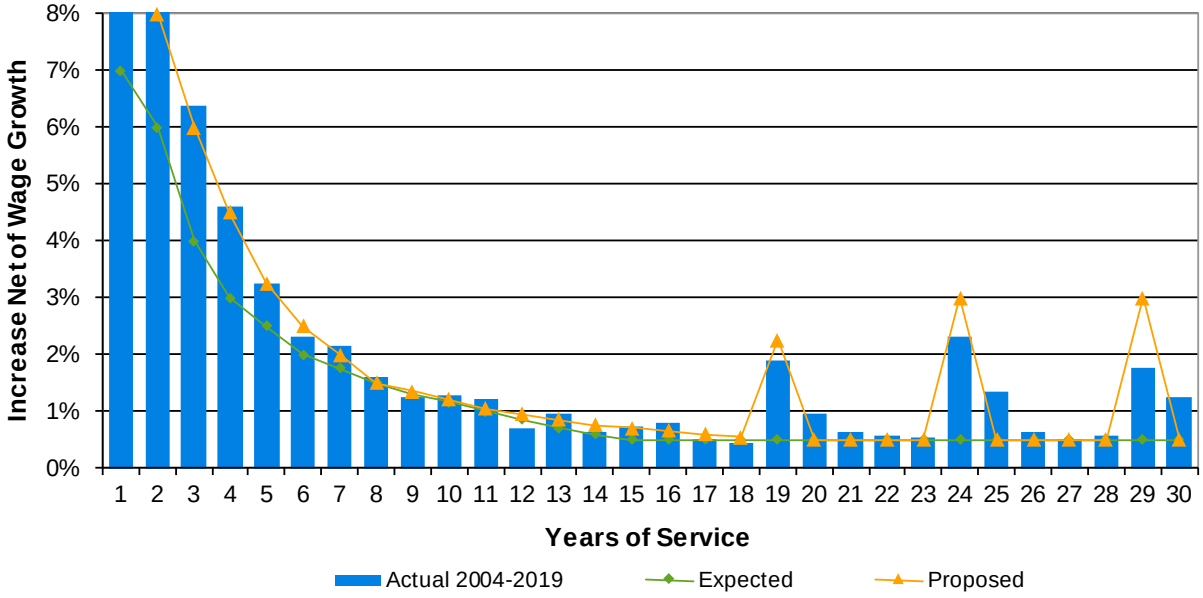


Exhibit 5-2
Salary Increases by Service – Safety Members



6. Death from Active Status

We studied rates of mortality among active members. At any given age, the current assumption is a lower probability of death for an active member than for a retired member. We feel this is reasonable as a person who is actively working tends to be healthier on average, and therefore less likely to die than the general population.

Results: Service-Connected Deaths

The current assumptions for service-connected deaths are zero for General members and 0.01% per year for Safety members. Since the actual experience is extremely limited, we recommend retaining the current service-connected death assumption for active members. The data is not a statistically significant enough size to merit studying separately.

Results: Nonservice-Connected Deaths (Ordinary Deaths)

The following is a comparison of the actual-to-expected deaths of active members by plan and gender for this study period. We have recommended changes to the ordinary death rates to reflect more recent mortality tables based on experience for public sector retirement systems. The recommended tables are discussed on the following page.

Plan	Gender	Actual	Expected	Actual / Expected	Proposed	Actual / Proposed
General A-D & G[(1)]	Male	125	99	126%	104	120%
General A-D & G[(1)]	Female	152	130	117%	127	120%
Safety	Male	30	24	125%	28	107%
Safety	Female	1	3	33%	3	33%
	Total	**308**	**256**	**120%**	**262**	**118%**

1. Note that Plan E has been excluded from this study, as we believe that these deaths are under-reported because Plan E does not provide a death benefit for active members.

The results of the study are shown graphically in Exhibits 6-1 to 6-4. The proposed rates are also shown numerically in Appendix A. The rates are currently based on three factors. We studied each of these factors to see if they were significant, and, if so, what the impact was. Our findings were as follows:

- **Age:** Members at older ages tend to have a greater probability of dying than younger members. This is almost universally true in mortality studies.
- **Gender:** Male members tend to have a greater probability of dying than females. This trend is generally true for all mortality studies, and we found this to be true with LACERA.
- **Membership:** Safety members have comparatively lower rates of mortality than the general population. These lower rates of death while still in active employment are most likely a result of the much earlier retirement ages available to Safety members and their higher rates of disability while active. That is, Safety members who are less healthy than the rest of the population will tend to leave active employment sooner, and only the healthiest group remains in active Safety employment at ages 50 and above when there is a higher probability of active death.

Additionally, we looked at the impact of the compensation level on active mortality rates. We observed that members with lower compensation levels had higher rates of mortality. The graphs at the end of this section reflect the compensation-weighted probabilities of death while active.

New Public Plan-Specific Mortality Tables

In 2019, the Society of Actuaries published new mortality tables based on data from public sector retirement systems. In particular, tables specific to general and safety members were included. We compared how well the current LACERA mortality tables and the new class-specific mortality table matched the actual experience. Based on our analysis, we found that the tables matched well with the retired mortality experience. There was more variation among the active member groups, which is typical of what we see with other systems. We are recommending a change to the new tables.

Recommendation

Based on results of the study, we have recommended lowering the member death rates as follows:

Class	Gender	Current Table		Proposed Table
General	Male	RP 2014E Male, Generational[1]	-2	PubG-2010 (120%) Employee Male[2]
General	Female	RP 2014E Female, Generational[1]	-0	PubG-2010 (130%) Employee Female[2]
Safety	Male	RP 2014E Male, Generational[1]	-6	PubS-2010 (100%) Employee Male[2]
Safety	Female	RP 2014E Female, Generational[1]	-0	PubS-2010 (100%) Employee Female[2]

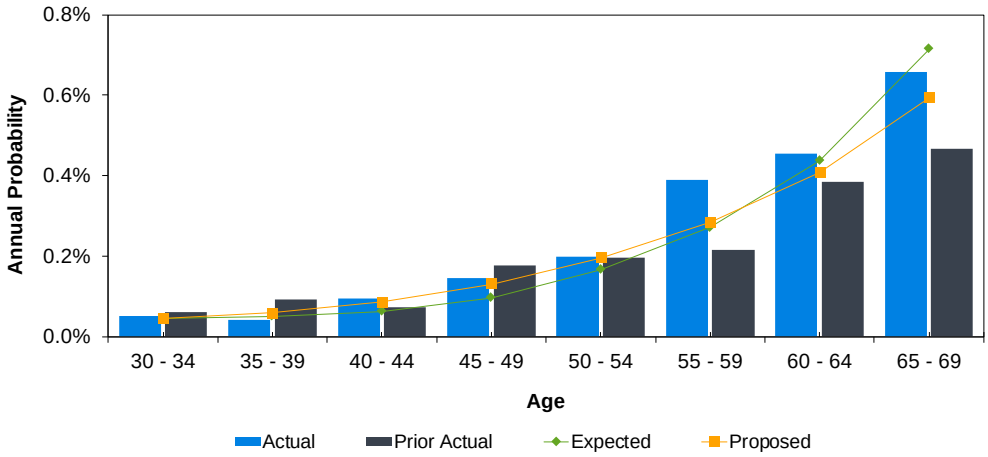
1. All tables are the RP-2014 Employee mortality table with mortality improvement based on 100% of the MP-201 Ultimate projection scale.

2. All tables are the Pub-2010 Employee mortality tables for General and Safety members, with mortality improvement based on 100% of the MP-2019 Ultimate projection scale.

To reflect future increase in life expectancies, we are recommending continued use of the same mortality improvement projection scale. Note that the public-specific mortality tables did not include projections scales. See Section 11 (Retiree Mortality) for additional discussion on this topic.

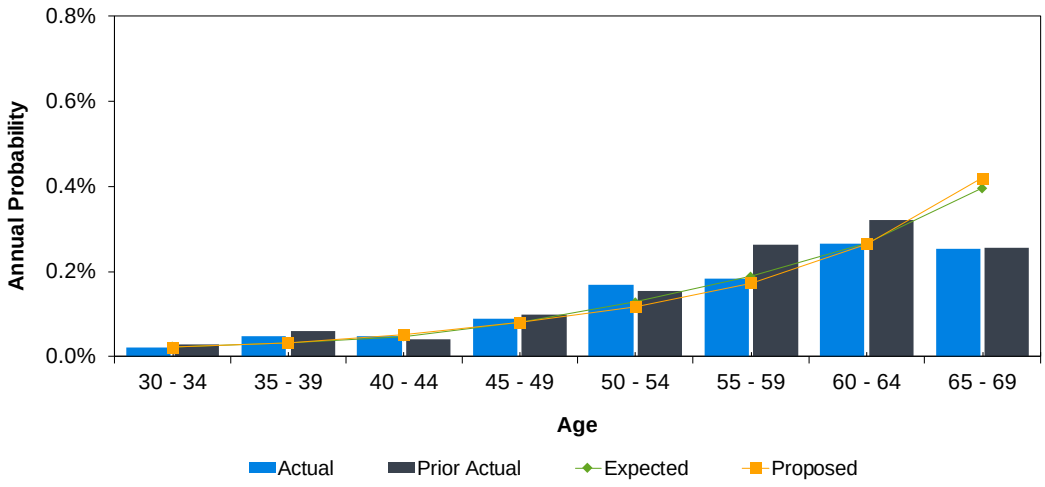
There is insufficient data for female Safety members to perform an analysis that is statistically significant. We have recommended the female Safety member nonservice-connected death rate be set equal to the female General member assumption. This is consistent with the current assumption.

Exhibit 6-1
Nonservice-Connected Death – General A-D & G Male Members



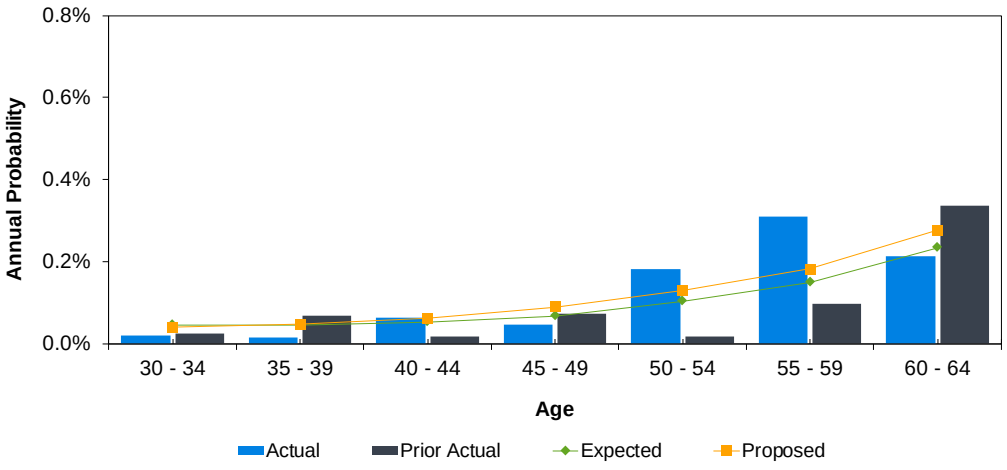
	2016 - 2019 Data		
	Expected	Actual	Proposed
Total Count	99	125	104
Actual / Expected	126%		120%

Exhibit 6-2
Nonservice-Connected Death – General A-D & G Female Members



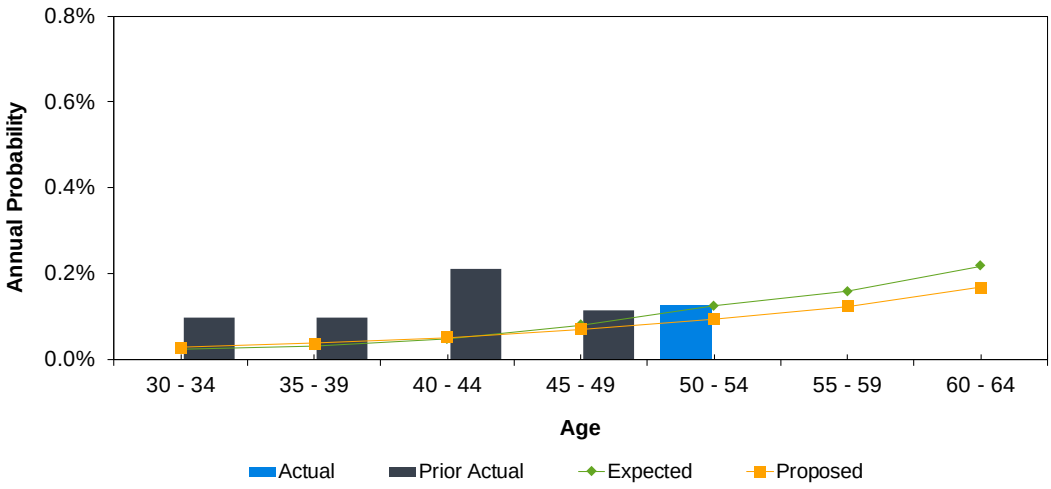
	2016 - 2019 Data		
	Expected	Actual	Proposed
Total Count	130	152	127
Actual / Expected	117%		120%

Exhibit 6-3
Nonservice-Connected Death – Safety Male Members



	2016 - 2019 Data		
	Expected	Actual	Proposed
Total Count	24	30	28
Actual / Expected	125%		107%

Exhibit 6-4
Nonservice-Connected Death – Safety Female Members



	2016 - 2019 Data		
	Expected	Actual	Proposed
Total Count	3	1	3
Actual / Expected	33%		33%

7. Service Retirements

Exhibits in this section present comparisons of actual service retirements during the study period with those expected according to the actuarial assumptions used in our June 30, 2018 valuation. Overall, the actual number of service retirements exceeded the number expected, although there were some differences by plan.

Results

For General D and Safety A & B plan members, the actual number of retirements exceeded the expected number.

Plan	Actual	Expected	Actual / Expected
General A-C	218	244	89%
General D	3,829	3,375	113%
General E	2,387	2,423	99%
Safety A & B	1,135	1,008	113%
Total	**7,569**	**7,050**	**107%**

Counts reported for General members are for ages 50-74;
counts reported for Safety members are for ages less than 65.

Retirement rates are currently based on two factors. We studied each of these factors to see if they were significant, and, if so, what the impact was. Our findings were as follows:

- **Age:** For General members, probabilities of retirement tend to be higher at ages 60 and above than at earlier ages. Additionally, there tend to be even higher rates at ages 62, 65, 66, and 67, likely due to the impact of Medicare and Social Security. The trend is less pronounced for LACERA than we generally see in other systems, since the County has not participated in Social Security since 1982.
- **Membership:** The older, closed General Plans A-C have higher rates of retirement than the younger Plans D and E, likely due to the more valuable benefit formula at the younger ages for these plans. Safety members are currently assumed to have retired from active status by age 65 and have much higher rates of retirement between ages 55 and 60 than the General members. General members are assumed to have retired from active status by age 75. Note that we have excluded the new plans (General G and Safety C) as there were insufficient members eligible for retirement during the period to analyze their experience.

Additionally, we looked at the impact of the compensation level on service retirement rates. We observed that members with higher compensation have higher probabilities of retiring at a given age. The graphs at the end of this section reflect the compensation-weighted probabilities of service retirement.

Recommendation

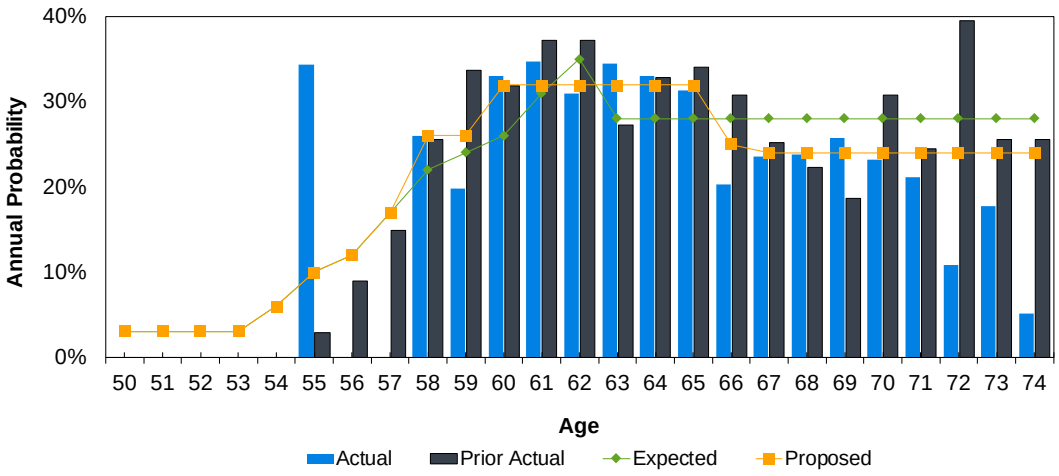
We are recommending some changes in the rates of retirement, as shown in Exhibits 7-1 to 7-4. These are primarily increases in the assumed service retirement rates. We have also recommended new tables for General G and Safety C to reflect their specific age factors. The new proposed rates are shown numerically in Appendix A. The recommended changes will increase the number of expected retirements.

The results reflecting the proposed assumptions are shown in the following table:

Plan	Actual	Expected	Actual / Expected	Proposed	Actual / Proposed
General A-C	218	244	89%	243	90%
General D	3,829	3,375	113%	3,584	107%
General E	2,387	2,423	99%	2,506	95%
Safety A & B	1,135	1,008	113%	1,073	106%
Total	**7,569**	**7,050**	**107%**	**7,406**	**102%**

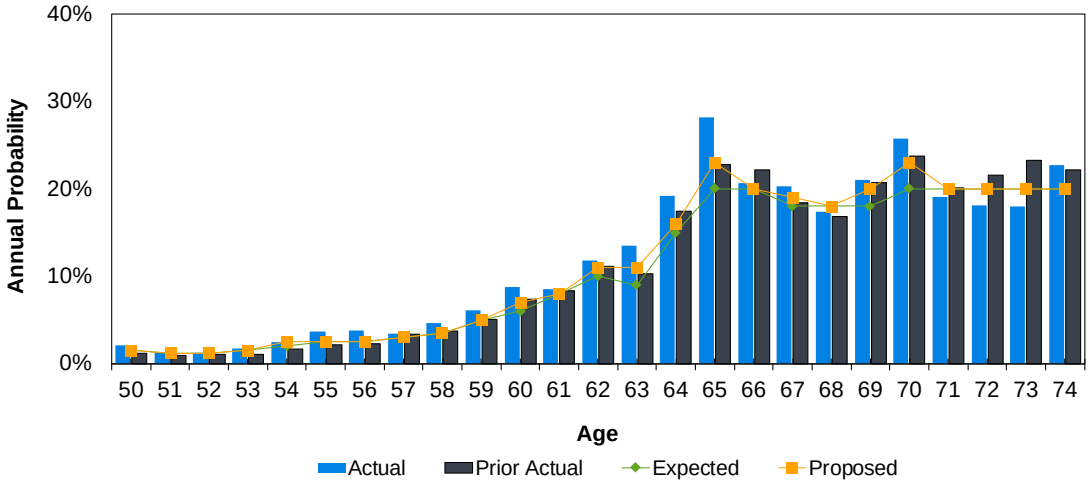
Counts reported for General members for ages 50-74; counts reported for Safety members are for ages less than 65.

Exhibit 7-1
Service Retirement – General A, B & C Members



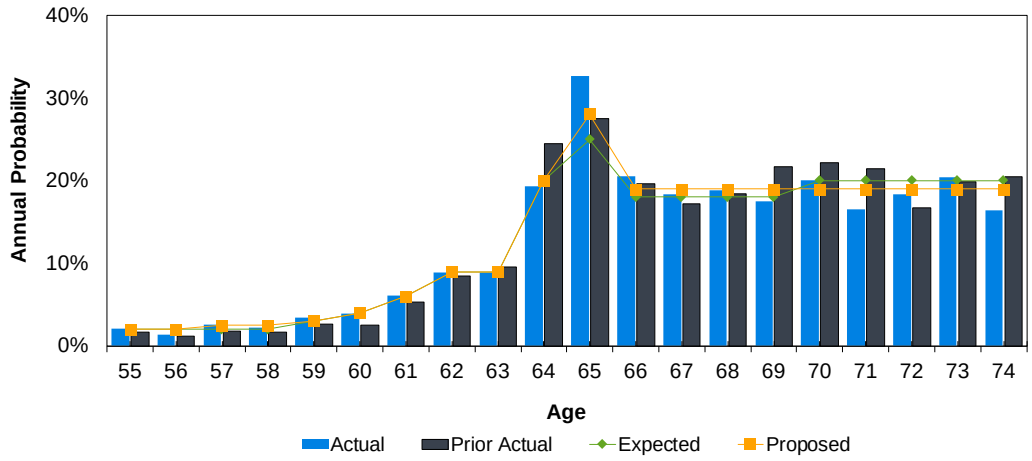
	2016 - 2019 Data		
	Expected	Actual	Proposed
Total Count	244	218	243
Actual / Expected	89%		90%

Exhibit 7-2
Service Retirement – General D Members



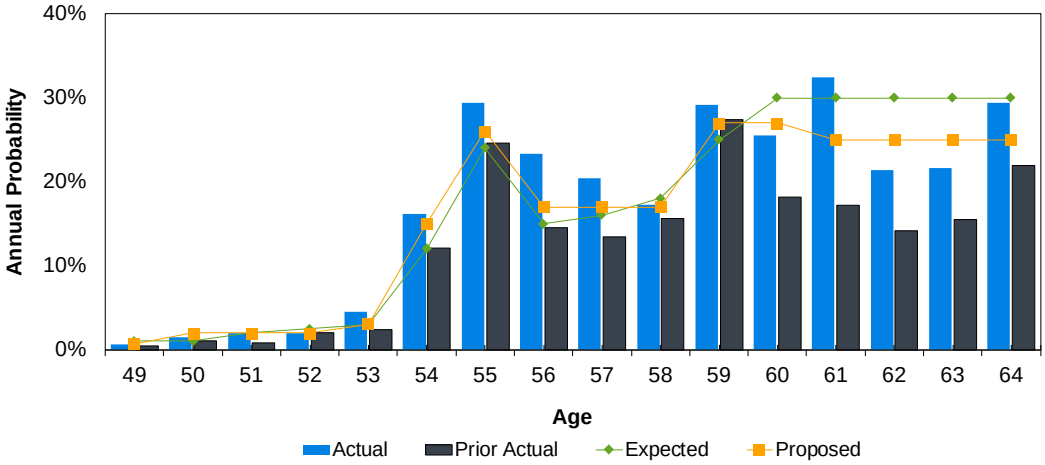
	2016 - 2019 Data		
	Expected	Actual	Proposed
Total Count	3,375	3,829	3,584
Actual / Expected	113%		107%

Exhibit 7-3
Service Retirement – General E Members



	2016 - 2019 Data		
	Expected	Actual	Proposed
Total Count	2,423	2,387	2,506
Actual / Expected	99%		95%

Exhibit 7-4
Service Retirement – Safety Members



	2016 - 2019 Data		
	Expected	Actual	Proposed
Total Count	1,008	1,135	1,073
Actual / Expected	113%		106%

8. Disability Retirements

LACERA allows a member to start receiving benefits prior to eligibility for service retirement if the member becomes disabled. There are two types of disability:

- **Service-Connected Disability:** This is available only to members who are disabled for the performance of duty. There is no service requirement for this benefit, and the service-connected disability benefit generally pays a larger benefit than nonservice-connected disability.
- **Nonservice-Connected Disability:** This is available to a disabled member upon satisfying the vesting requirement.

Results: Service-Connected Disability

Overall, we found there were fewer service-connected disabilities than the current rates predicted. The following is a comparison of the actual to expected service-connected disabilities for active members by gender and plan for this study period.

Plan	Gender	Actual	Expected	Actual / Expected
General A-D & G	Male	76	92	83%
General A-D & G	Female	132	133	99%
Safety	Male	355	490	72%
Safety	Female	77	73	105%
	Total	**640**	**788**	**81%**

Exhibits 8-1 to 8-4, at the end of this section, show the results of the study graphically. The rates are currently based on age, gender, and plan membership. Our findings were as follows:

- **Age:** Members at older ages tend to have a greater probability of becoming disabled than younger members.
- **Gender:** For General members, males have a higher rate of disability than females. For Safety members, females tend to have higher rates (relative to males) at younger ages.
- **Membership:** Safety members have significantly higher rates of disability than General members; therefore, separate rates are recommended for each class. All General contributory members were studied together. Plan E does not provide for disability benefits and is therefore excluded from the study.

Recommendation: Service-Connected Disability

Male General and Safety members experienced fewer service-connected disabilities than were expected by the current assumptions. We are recommending adjustments primarily at older ages to better fit the actual pattern of disability retirements.

Actual experience for female General and Safety members was close to the assumptions for each class. We are recommending minor adjustments to better fit the actual pattern of disability retirements for both General and Safety female members.

The revised results are shown in the following table:

Plan	Gender	Actual	Expected	Actual / Expected	Proposed	Actual / Proposed
General A-D & G	Male	76	92	83%	89	85%
General A-D & G	Female	132	133	99%	129	102%
Safety	Male	355	490	72%	370	96%
Safety	Female	77	73	105%	73	105%
	Total	**640**	**788**	**81%**	**661**	**97%**

Results: Nonservice-Connected Disability

Overall, we found there were fewer nonservice-connected disabilities than the current rates would have predicted, which is the opposite of our findings from the prior study. The following is a comparison of the actual-to-expected nonservice-connected disabilities for active members by plan and gender for this study period.

Plan	Gender	Actual	Expected	Actual / Expected
General A-D & G	Male	20	27	74%
General A-D & G	Female	34	54	63%
Safety	Male	0	0	N/A
Safety	Female	1	0	N/A
	Total	**55**	**81**	**68%**

Exhibits 8-5 to 8-6 show the results of the study graphically. We studied rates by gender, age, and plan. Our findings were as follows:

- Age: Members at older ages tend to have a greater probability of becoming disabled than younger members.
- Gender: Females tend to have slightly higher disability rates at younger ages than males.
- Membership: There were very few nonservice-connected disabilities for Safety members.

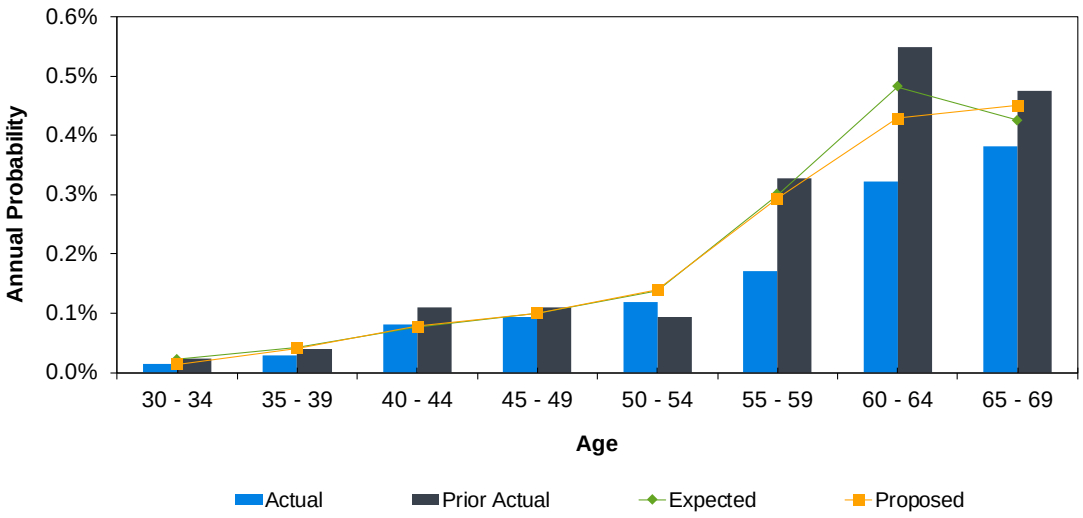
Recommendation: Nonservice-Connected Disability

Actual experience for nonservice-connected disabilities was lower than the assumptions for General members predicted, which is the opposite of experience in the prior study. Overall we do not view this difference as material given the small number of retirements. However, we are recommending adjustments to these assumptions to better fit the actual pattern of disability retirements over the last two study periods.. For Safety members there was only one nonservice-connected disability, so we recommend continuing the current practice of assuming all Safety disability retirements are service-connected.

The results reflecting the proposed assumptions are shown in the following table.

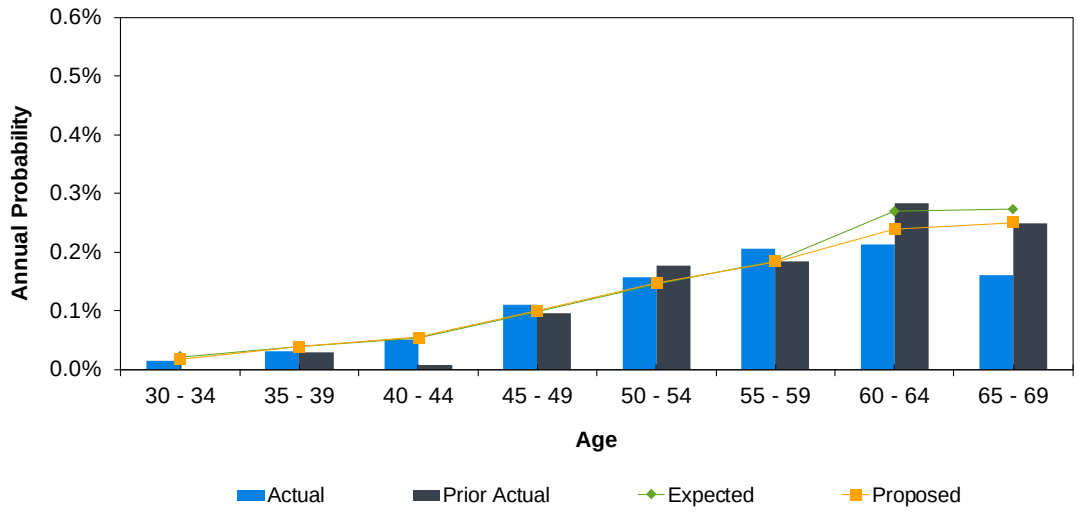
Plan	Gender	Actual	Expected	Actual / Expected	Proposed	Actual / Proposed
General A-D & G	Male	20	27	74%	29	69%
General A-D & G	Female	34	54	63%	48	71%
Safety	Male	0	0	N/A	0	N/A
Safety	Female	1	0	N/A	0	N/A
	Total	**55**	**81**	**68%**	**77**	**71%**

Exhibit 8-1
Service-Connected Disability Retirement – General A-D & G Male Members



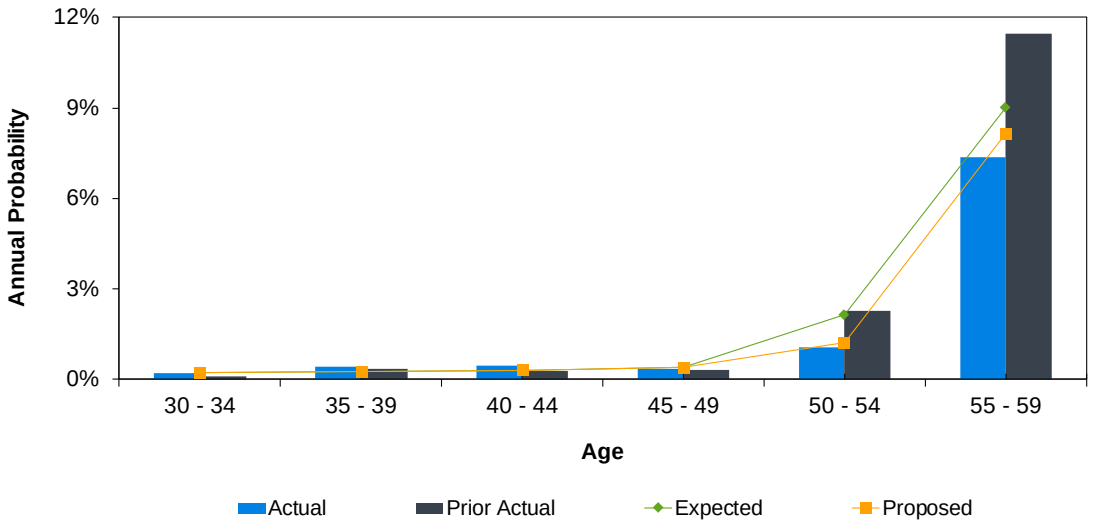
	2016 - 2019 Data		
	Expected	Actual	Proposed
Total Count	92	76	89
Actual / Expected	83%		85%

Exhibit 8-2
Service-Connected Disability Retirement – General A-D & G Female Members



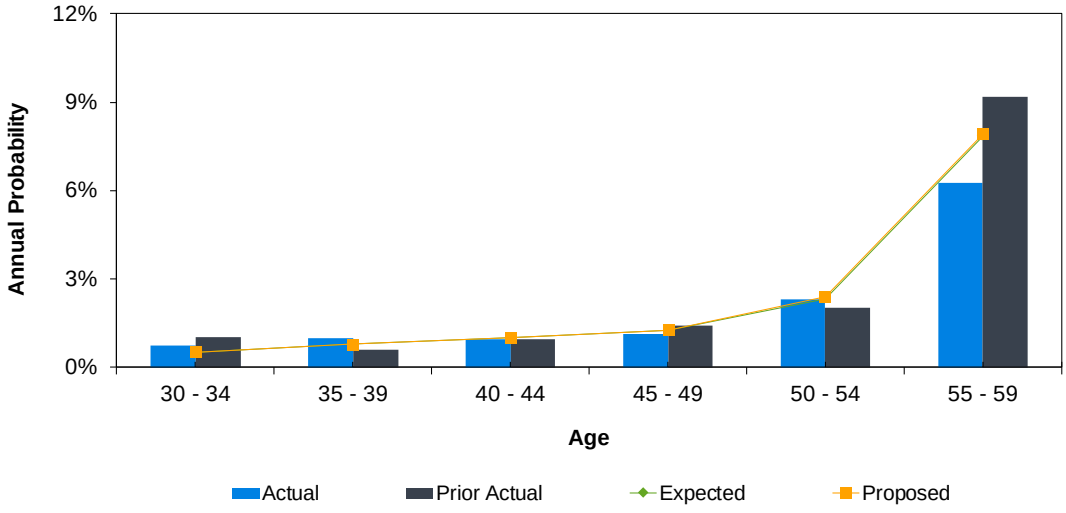
	2016 - 2019 Data		
	Expected	Actual	Proposed
Total Count	133	132	129
Actual / Expected	99%		102%

Exhibit 8-3
Service-Connected Disability Retirement – Safety Male Members



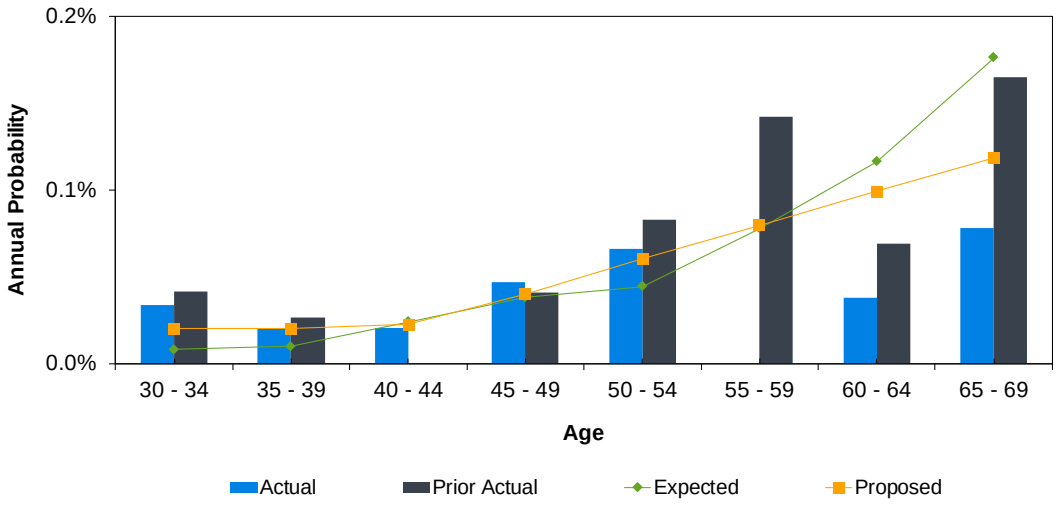
	2016 - 2019 Data		
	Expected	Actual	Proposed
Total Count	490	355	370
Actual / Expected	72%		96%

Exhibit 8-4
Service-Connected Disability Retirement – Safety Female Members



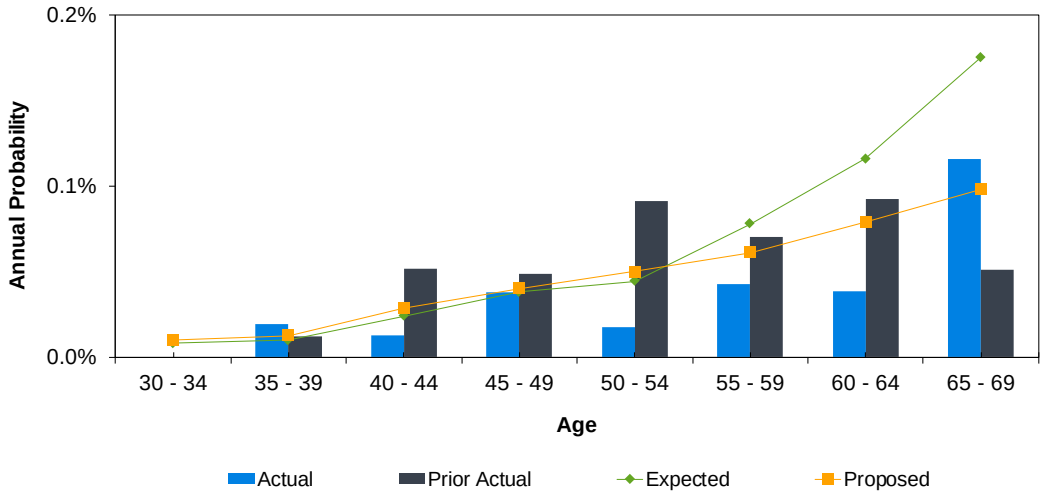
	2016 - 2019 Data		
	Expected	Actual	Proposed
Total Count	73	77	73
Actual / Expected	105%		105%

Exhibit 8-5
Nonservice-Connected Disability Retirement – General A-D & G Male Members



	2016 - 2019 Data		
	Expected	Actual	Proposed
Total Count	27	20	29
Actual / Expected	74%		69%

Exhibit 8-6
Nonservice-Connected Disability Retirement – General A-D & G Female Members



	2016 - 2019 Data		
	Expected	Actual	Proposed
Total Count	54	34	48
Actual / Expected	63%		71%

9. Terminations (Includes both Refunds and Vested Terminations)

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 the 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 10.

Results: Aggregate Terminations (Refunds and Vested Terminations)

Exhibits 9-1 to 9-3 at the end of this section show the results of the study graphically. Total terminations were greater than the assumptions predicted, with some variance by plan. We studied General D and General G together, and all Safety plans together this year. General A – C and Safety A no longer have many members impacted by the termination assumption so are not considered in this analysis. General D and Safety B provide experience for members with longer service while General G and Safety C provide experience for members with shorter service.

The following table summarizes these results along with our proposed changes:

Plan	Actual	Expected	Actual / Expected	Proposed	Actual / Proposed
General D & G	3,139	2,664	118%	2,826	111%
General E	507	454	112%	454	112%
Safety	244	206	118%	214	114%
Total	**3,890**	**3,324**	**117%**	**3,494**	**111%**

Termination rates are currently based on two factors: years of service and membership. We studied each of these factors to see if they were significant, and if so, what the impact was. Our findings were as follows:

- **Service:** Members in the early stages of their careers generally have a higher probability of terminating. In other studies, we have found years of service to have the most significant impact on termination, and have also found this to be true with LACERA.
- **Membership:** Currently, members are assumed to have a different probability of termination depending on which plan they are in. Each plan was analyzed and we determined an appropriate set of rates based on their experience. We found that there were differences with respect to rates of termination by plan, particularly when comparing Safety members to the other General plans.

Recommendation

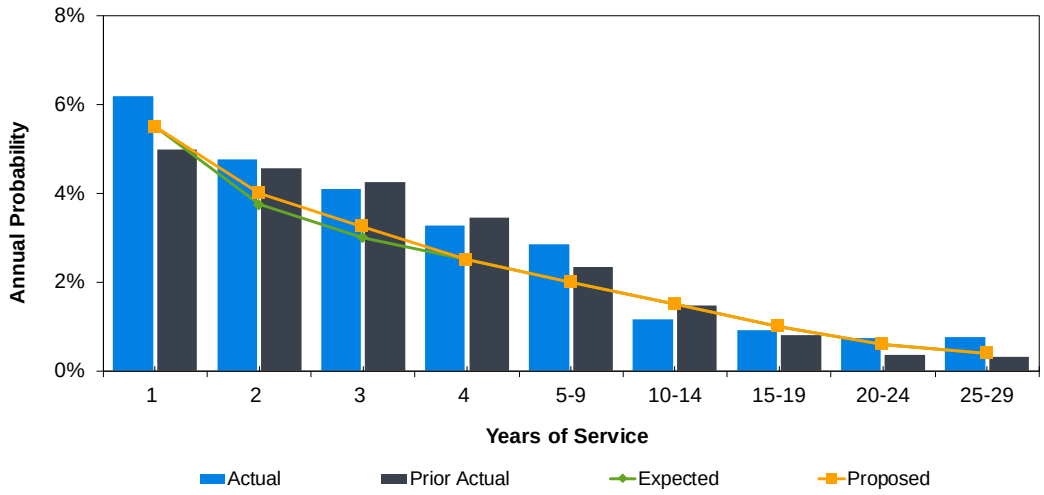
We are recommending rates of termination for all plans as follows:

- **General Plans D & G:** We are recommending slightly higher termination rates for members with less than three years of service and no changes for members with longer service.
- **General Plan E:** We are recommending no change to this assumption.

- **General Plans A-C:** These plans are closed and no new employees are covered by these plans since May of 1979. The total membership is aging and has almost 30 years of service in most cases. Under the current approach to applying termination rates, once a member is eligible for retirement, no termination is assumed. Thus, these rates represent the very low probabilities there are still members not yet eligible for retirement that could terminate. The current rate of termination is assumed at a flat 0.5%, regardless of age or years of service. We are recommending no change to this assumption.
- **Safety Members:** We are recommending slightly higher termination rates for members with one year of service, and adding an annual termination rate of 0.2% for members with between 20 and 29 years of service. Note that the extended termination rates do not apply to Safety A & B members who are eligible for service retirement with 20 years of service or more.

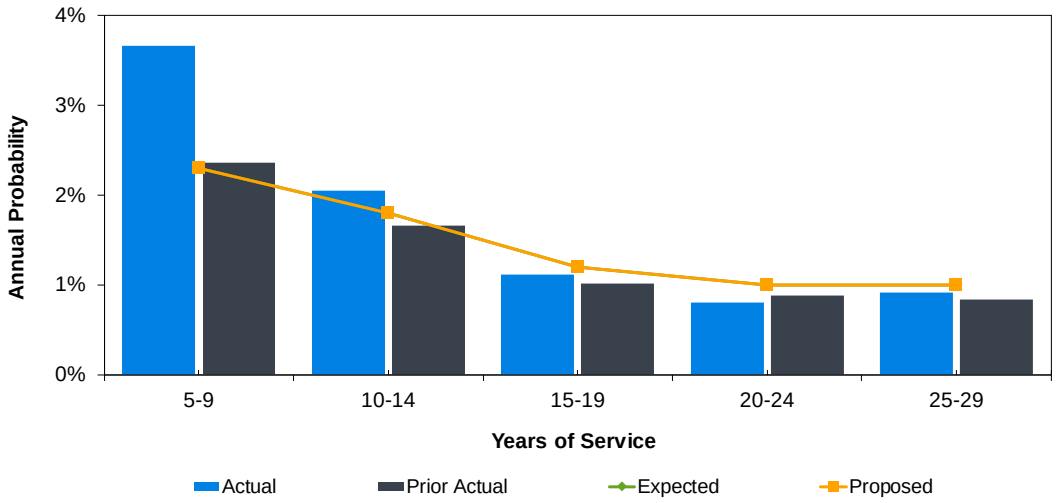
Additionally, we looked at the impact of member compensation level on termination rates. Compensation level appeared to have very little impact on termination rates, although we did observe slightly higher rates in the first years of service for members with higher compensation levels. The graphs at the end of this section reflect the compensation-weighted probabilities of termination from active status.

Exhibit 9-1
Termination Rates – General Plan D & G Members



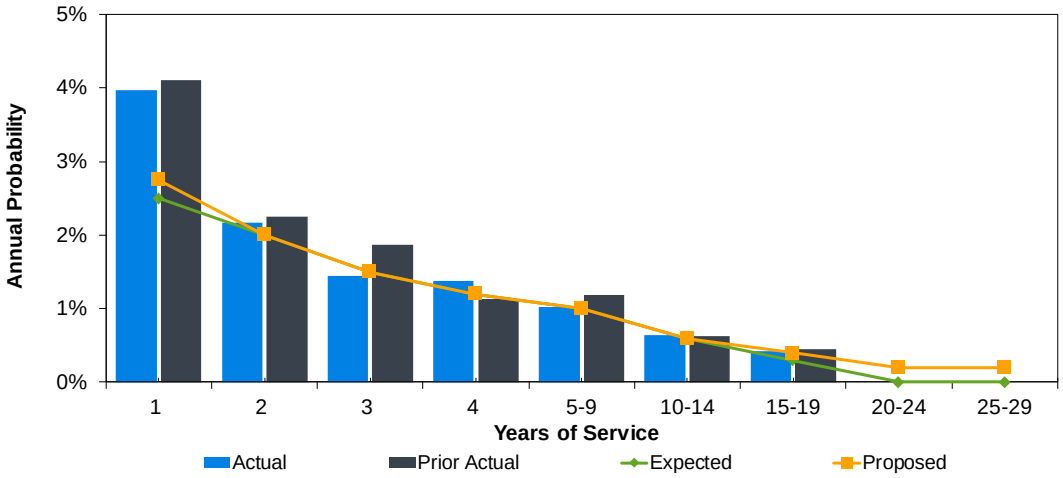
	2016 - 2019 Data (Excludes First Year)		
	Expected	Actual	Proposed
Total Count	2,664	3,139	2,826
Actual / Expected	118%		111%

Exhibit 9-2
Termination Rates – General Plan E Members



	2016 - 2019 Data		
	Expected	Actual	Proposed
Total Count	454	507	No
Actual / Expected	112%		Change

Exhibit 9-3
Termination Rates – Safety Members



	2016 - 2019 Data (Excludes First Year)		
	Expected	Actual	Proposed
Total Count	206	244	214
Actual / Expected	118%		114%

10. Probability of Refund

As discussed in Section 9, 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 LACERA and receive a deferred vested benefit. The percentage of members who are expected take a refund of their contributions is the probability of refund assumption.

Results

The current assumptions project that a portion of vested members will take a refund of their contributions based on their years of service and classification.

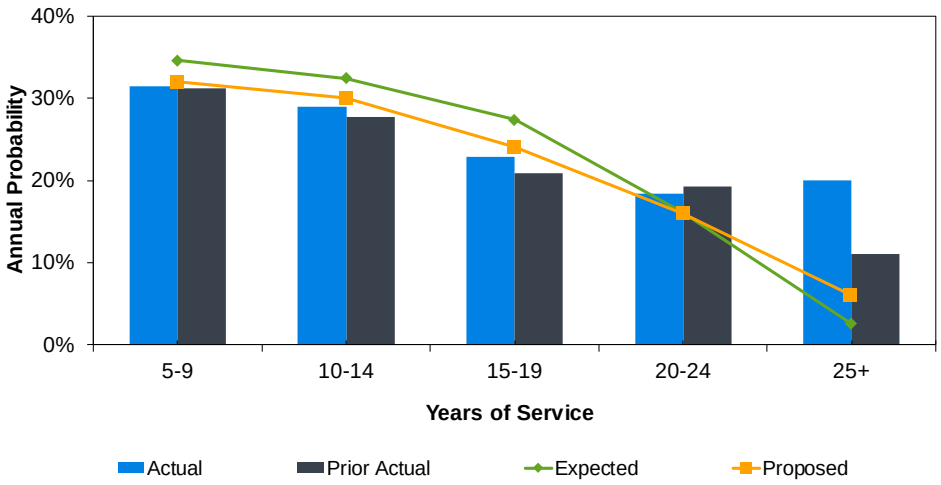
For vested members, there were somewhat fewer refunds than the assumptions projected for General and Safety members. Exhibits 10-1 to 10-2 on the following page show the results of the study graphically.

Plan	Actual	Expected	Actual / Expected	Proposed	Actual / Proposed
General	432	474	91%	436	99%
Safety	32	38	85%	32	100%
Total	**464**	**512**	**91%**	**468**	**99%**

Recommendation

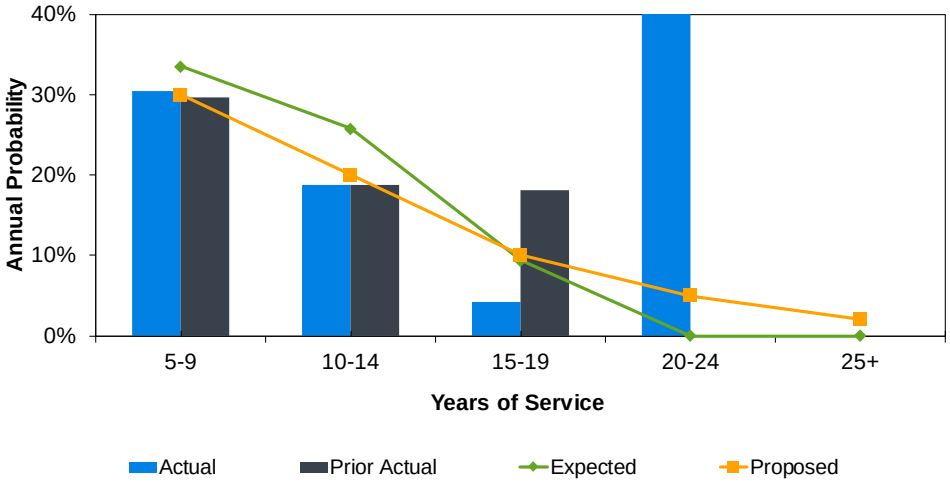
We are recommending changes in the probability of refund for both General or Safety members, generally to lower the probability of refunds for members with between 5 years of service and 20 years of service. We also recommend extending the assumption so that no refunds are assumed after a member has 30 years of service. Currently refunds are assumed to not occur after a General member has 26 years of service and a Safety member has 19 years of service. The rates start higher for members with fewer years of service and decline, as indicated, to 0% or no refund. Note that the probability of refund for Safety members with 20 or more years of service only applies to Safety Plan C members, as members of Safety Plans A & B are eligible for service retirement with 20 years of service.

Exhibit 10-1
Probability of Refund – General Members



	2016 - 2019 Data		
	Expected	Actual	Proposed
Total Count	474	432	436
Actual / Expected	91%		99%

Exhibit 10-2
Probability of Refund – Safety Members



	2016 - 2019 Data		
	Expected	Actual	Proposed
Total Count	38	32	32
Actual / Expected	85%		99%

11. Retiree Mortality for Valuation Purposes

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.

Mortality has been improving in this country and is expected to continue to improve. We recommend continued use of 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 for healthy retired members: 4,101 actual to 3,959 expected for a total ratio of 104%. This ratio was 103% in the prior study indicating the improvement in mortality over the three-year study period was close to the expectation. The following is a comparison of the actual-to-expected deaths of service retired members by gender and type for the study period 2016-2019, including updated ratios based on our proposed assumptions.

Healthy (Service Retirement) Mortality

Plan	Type	Gender	Actual	Expected	Actual / Expected	Proposed	Actual / Proposed
General	Healthy	Male	1,708	1,689	101%	1,561	109%
General	Healthy	Female	2,038	1,897	107%	1,881	108%
Safety	Healthy	Male	259	283	92%	246	105%
Safety	Healthy	Female	15	17	88%	16	94%
		Total	**4,020**	**3,886**	**103%**	**3,704**	**109%**

Note: Results in the table above are based on headcount. The recommended assumptions account for differences due to benefit levels (discussed below).

For disabled retirees, there were more deaths than the current rates predicted: 787 actual to 765 expected for a total ratio of 103%. This ratio was 103% in the prior study indicating the improvement in mortality over the three-year study period was close to the expectation. The following is a comparison of the actual-to-expected deaths of disabled retired members by gender and type for the study period 2016-2019, including updated ratios based on our proposed assumptions.

Disabled Mortality

Plan	Type	Gender	Actual	Expected	Actual / Expected	Proposed	Actual / Proposed
General	Disabled	Male	187	184	102%	166	113%
General	Disabled	Female	212	218	97%	206	103%
Safety	Disabled	Male	368	340	108%	329	112%
Safety	Disabled	Female	20	23	87%	22	91%
		Total	**787**	**765**	**103%**	**723**	**109%**

Note: Results in the table above are based on headcount. The recommended assumptions account for differences due to benefit levels (discussed below).

Exhibits 11-1 through 11-8 show the results of the study graphically for the period studied, 2016-2019. The rates are currently based on several factors. We studied each of these factors to see if they were significant, and, if so, what the impact was. Our findings were as follows:

- **Age:** Members at older ages tend to have a greater probability of dying than younger members. This is almost universally true in mortality studies.
- **Gender:** Male members tend to have a greater probability of dying than females. This trend is generally true for all mortality studies, and we found this to be true with LACERA.
- **Retirement Type:** Healthy retirees live longer than disabled retirees. This trend is generally true for all mortality studies, and we found this to be true with LACERA. Note that the difference between healthy and disabled retirees is significant for General members, but for Safety members the difference in rates of mortality is much less.
- **Membership:** The current assumptions predict that male Safety members live longer than male General members. This study confirms the same relationship between the memberships, although the difference for healthy retirees is fairly small.
- **Benefit Amount**: We also studied how the amount of an individual's benefits affected his/her mortality. We found that members with larger-than-average benefits tended to have lower mortality than those with smaller-than-average benefits. This is important because this means that if the assumptions exactly predict the number of deaths, the plan will incur actuarial losses. We found this to be particularly true for healthy male retirees. We have accounted for the impact of the benefit levels on mortality in our recommended rates. The graphs at the end of this section reflect the benefit-weighted probabilities of death while retired.

Generational Mortality Tables

Most actuarial valuations for public sector retirement systems 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 that the valuation assumptions should effectively update each year to reflect improved mortality, and the mortality tables should need to be changed less frequently. During the previous investigation of experience study, LACERA adopted a generational mortality assumption.

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 general recommendation is to use a mortality projection scale of between 100% and 120% of the ultimate portion of the MP-2014 projection scale. In other words, our recommendation is to assume 1.0% and 1.2% 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.

LACERA currently uses a mortality projection equal to 100% of the MP-2014 ultimate projection scale. That is, the current 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. We believe this continues to be a reasonable assumption and recommend retaining this assumption.

New Public Plan-Specific Mortality Tables

As discussed in Section 6, the Society of Actuaries recently published new mortality tables based on data from public sector retirement systems. In particular, tables specific to general and safety members were included. We compared how well the current LACERA mortality tables and the new class-specific mortality table matched the actual experience. Based on our analysis, we found that the tables matched well with the retired mortality experience. We are recommending a change to the new tables.

Recommendation

We recommend an update to the mortality assumptions to reflect the new public plan specific mortality tables and retaining the mortality projection scale. Note that the total healthy retiree actual/proposed ratio under the recommended assumptions is 109% based on a head-count weighted basis. Accounting for the impact of benefit values, the actual/proposed ratio is 99%. We believe the combination of the recommended mortality tables with the projection scale allows for a reasonable expectation of future life expectancy increases.

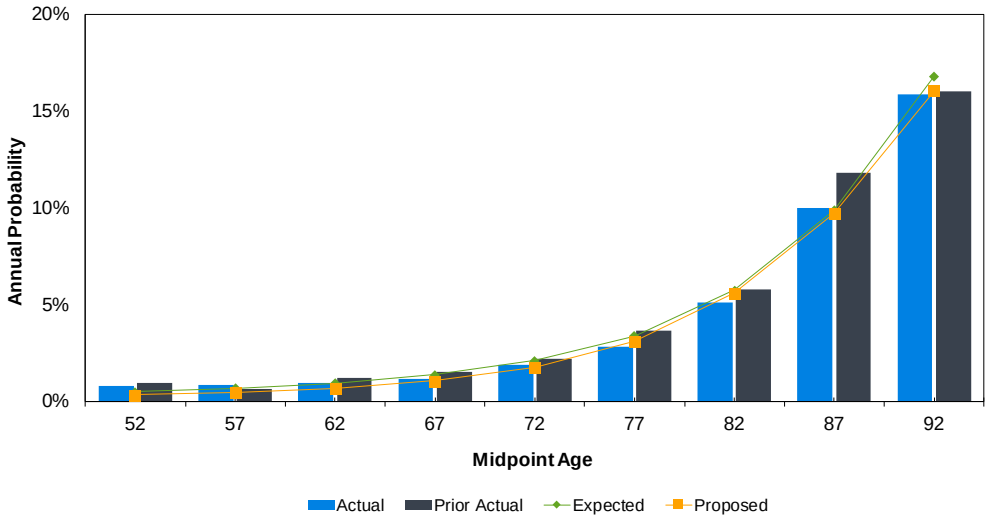
LACERA uses standard mortality tables adjusted to best fit the patterns of mortality among its retirees. The table below describes the new tables being recommended for healthy and disabled retirees. These are based on the recent study of public plan retirees. Note that for beneficiaries of healthy and disabled retirees, we recommend that the mortality for healthy general retirees be used.

The recommended mortality rates are based on the PubG-2010 and PubS-2010 Healthy Retiree and Disabled Retiree mortality tables and all assume generational mortality improvement based on 100% of the MP-2014 Ultimate projection scale, as follows:

			Mortality Tables[2]	
Class	Type[1]	Sex	Current Table	Proposed Table
General	Healthy	Male	RP-2014 (105%) Healty Annuitant Male	PubG-2010 (100%) Healthy Retiree Male
General	Healthy	Female	RP-2014 (100%) Healty Annuitant Female	PubG-2010 (110%) Healthy Retiree Female
Safety	Healthy	Male	RP-2014 (95%) Healty Annuitant Male	PubS-2010 (85%) Healthy Retiree Male
Safety	Healthy	Female	RP-2014 (100%) Healty Annuitant Female	PubS-2010 (100%) Healthy Retiree Female
General	Disabled	Male	Avg of: RP-2014 (105%) Healty Annuitant Male RP-2014 (100%) Disabled Retiree Male	Avg of: PubG-2010 (100%) Healthy Retiree Male PubG-2010 (100%) Disabled Retiree Male
General	Disabled	Female	Avg of: RP-2014 (100%) Healty Annuitant Female RP-2014 (100%) Disabled Retiree Female	Avg of: PubG-2010 (100%) Healthy Retiree Female PubG-2010 (100%) Disabled Retiree Female
Safety	Disabled	Male	RP-2014 (100%) Healty Annuitant Male	PubS-2010 (100%) Disabled Retiree Male
Safety	Disabled	Female	RP-2014 (100%) Healty Annuitant Female	PubS-2010 (100%) Disabled Retiree Female

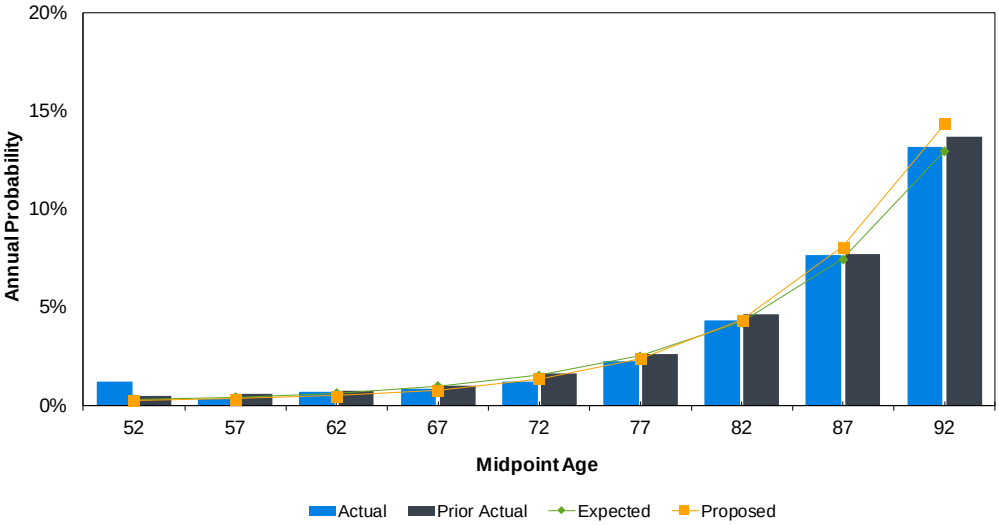
1. Beneficiaries are assumed to have the same mortality as a healthy General member of the same sex.
2. Generational Projections using 100% of the MP-2014 Ultimate projection scale.

Exhibit 11-1
Healthy Mortality – Male General Members



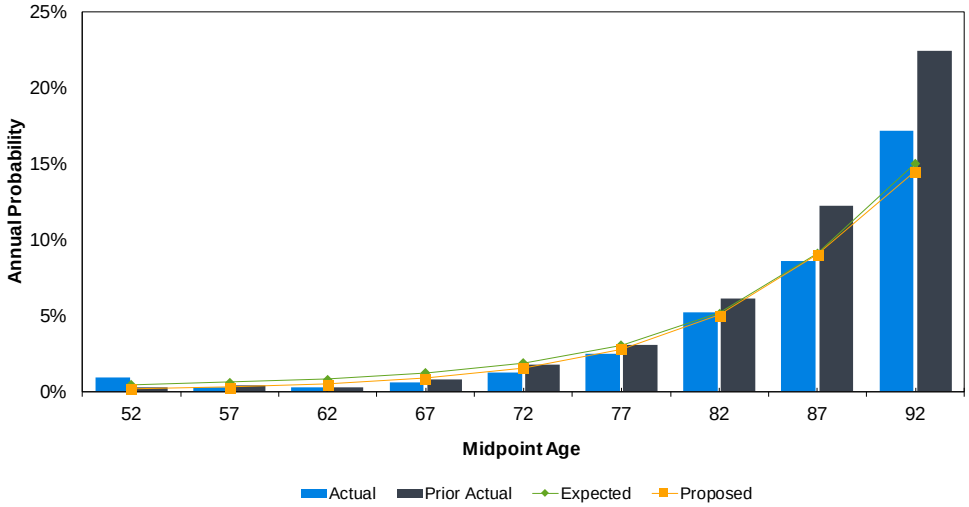
	2016 - 2019 Data		
	Expected	Actual	Proposed
Total Count	1,689	1,708	1,561
Actual / Expected	101%		109%

Exhibit 11-2
Healthy Mortality – Female General Members



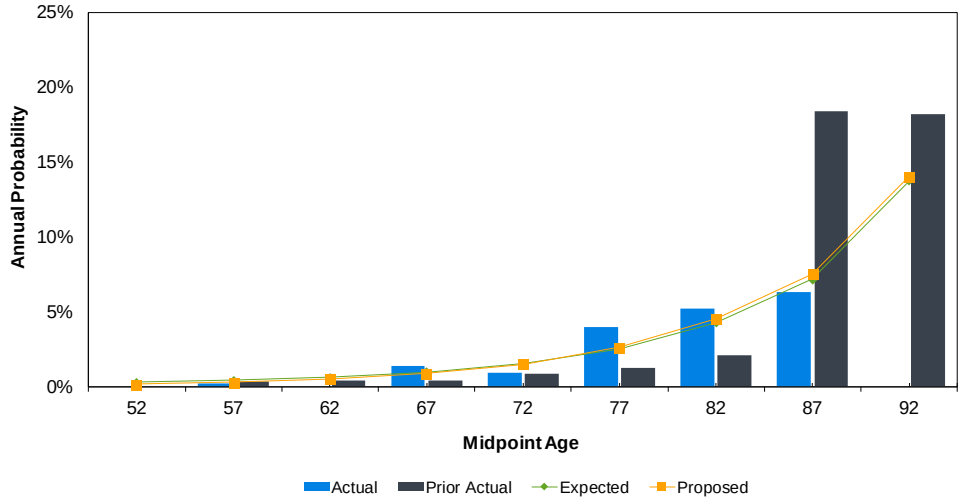
	2016 - 2019 Data		
	Expected	Actual	Proposed
Total Count	1,897	2,038	1,881
Actual / Expected	107%		108%

Exhibit 11-3
Healthy Mortality – Male Safety Members



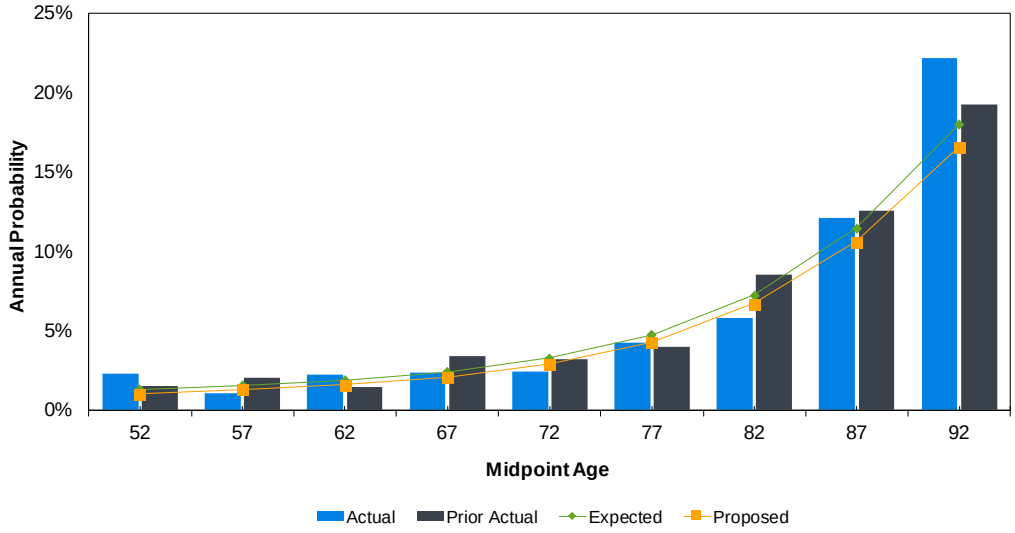
	2016 - 2019 Data		
	Expected	Actual	Proposed
Total Count	283	259	246
Actual / Expected	92%		105%

Exhibit 11-4
Healthy Mortality – Female Safety Members



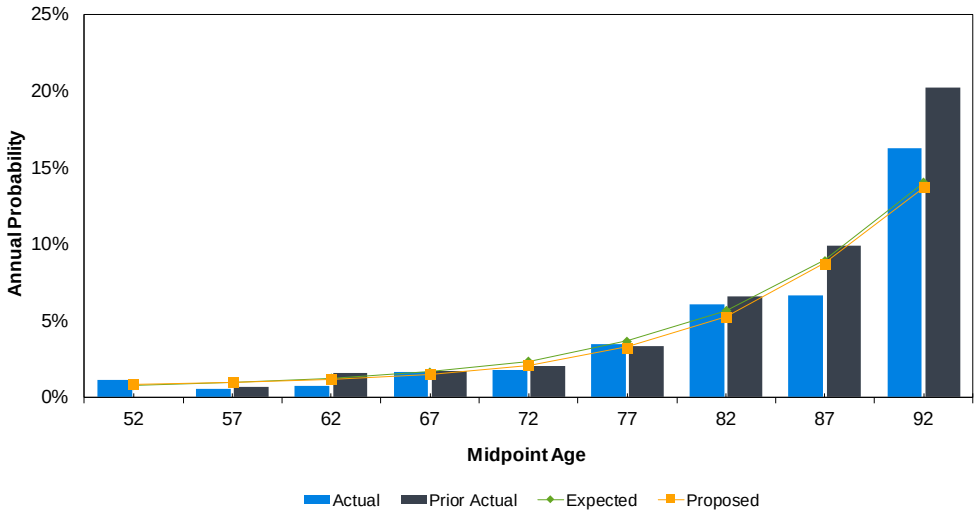
	2016 - 2019 Data		
	Expected	Actual	Proposed
Total Count	17	15	16
Actual / Expected	88%		94%

Exhibit 11-5
Disabled Mortality – Male General Members



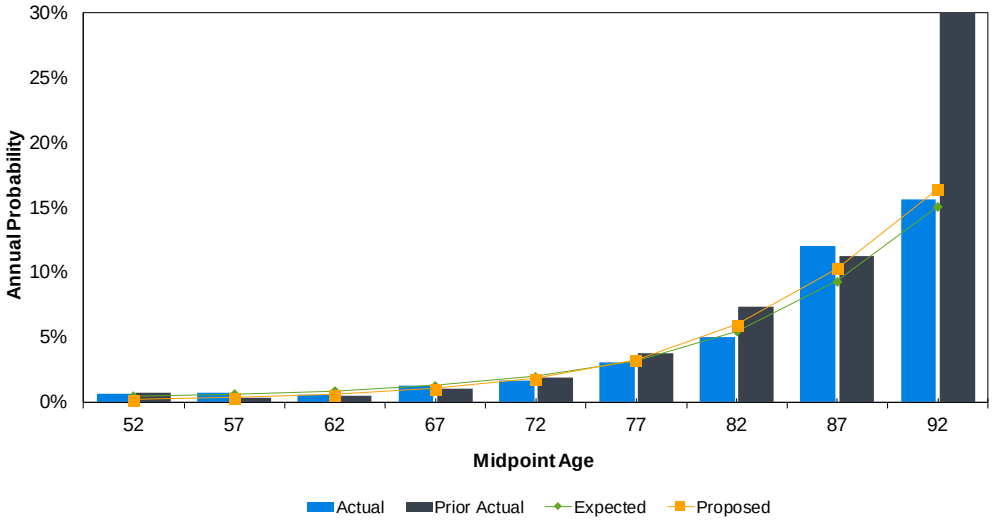
	2016 - 2019 Data		
	Expected	Actual	Proposed
Total Count	184	187	166
Actual / Expected	102%		113%

Exhibit 11-6
Disabled Mortality – Female General Members



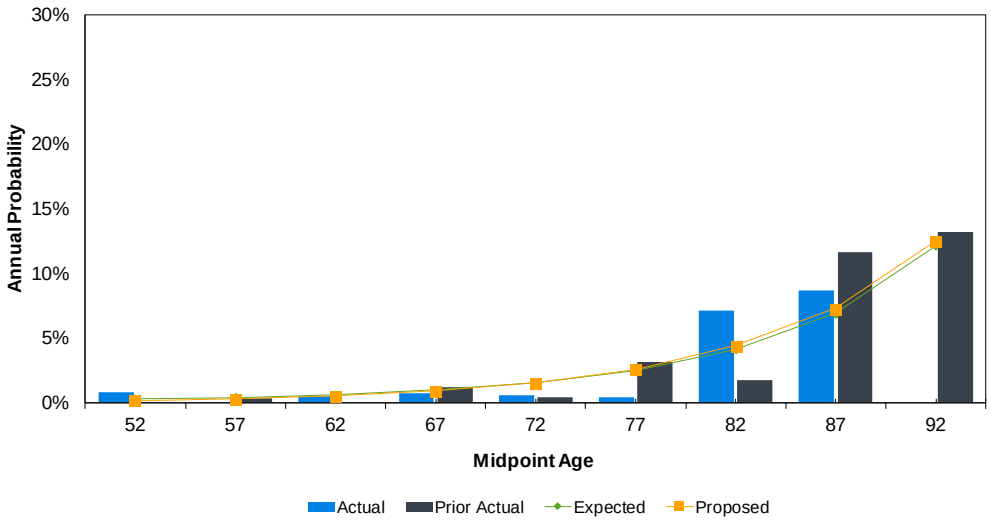
	2016 - 2019 Data		
	Expected	Actual	Proposed
Total Count	218	212	206
Actual / Expected	97%		103%

Exhibit 11-7
Disabled Mortality – Male Safety Members



	2016 - 2019 Data		
	Expected	Actual	Proposed
Total Count	340	368	329
Actual / Expected	108%		112%

Exhibit 11-8
Disabled Mortality – Female Safety Members



	2016 - 2019 Data		
	Expected	Actual	Proposed
Total Count	23	20	22
Actual / Expected	87%		91%

12. Miscellaneous Assumptions

Probability of Eligible Survivor

All members are assumed to elect the unmodified retirement allowance. Surviving beneficiaries (spouses or qualified domestic partners of members) generally receive a 65% continuance of the member's benefit (100% continuance for service-connected disabilities and 55% for Plan E members). Thus, the probability a member has an eligible survivor impacts the value of the benefit.

Based on our analysis of retirements during the study period, we found that 80% of males and 49% of females received an unmodified (or unmodified plus) benefit with an eligible survivor. As the actual experience was close to the assumptions, we are recommending no changes.

	Probability of retiring with an Eligible Survivor		
Retiree Gender	Current Assumption	Actual Experience	Recommended Assumption
Male	77%	80%	No change
Female	50%	49%	No change

Beneficiary Age

To determine the value of a member's retirement or death benefit, we must estimate the value of the portion payable to the surviving eligible beneficiary. Since the value of the survivor's benefit is dependent on his/her age, we must estimate it. We studied the beneficiary age difference compared to the member based on retirements during the study period. Based on this analysis, we are recommending no changes in the assumed age difference between retirees and beneficiaries.

	Beneficiary's Age Relative to Member		
Retiree Gender	Current Assumption	Actual Experience	Recommended Assumption
Male	4 years younger	3.3 years younger	No change
Female	2 years older	2.0 years older	No change

Since the majority of eligible survivors are expected to be of the opposite gender, even with the inclusion of qualified domestic partners, we will continue to assume that the survivor's gender is the opposite of the member.

Retirement for Deferred Vested Members

The age when members who terminate (or have terminated) with a vested benefit are assumed to retire varies by plan. We have studied the actual retirement ages of deferred vested members during the study period, and we recommend a change in the assumption for General members in Plan D.

Assumption for Deferred Commencement

	Age at Commencement		
Plan	Current Assump.	Actual Results	Proposed Assump.
GA	62	66.7	No Change
GB	62	N/A[1]	No Change
GC	62	N/A[1]	No Change
GD	57	59.0	59
GE	62	61.9	No Change
GG	57	N/A[1]	No Change
SA	55	N/A[1]	No Change
SB	50	50.8	No Change
SC	50	N/A[1]	No Change

1. Insufficient data for analysis.

Note that General Plans A, B and C and Safety Plan A have very few deferred vested members. For these plans, we consider this assumption to not be material. For General Plan G and Safety Plan C, there is very little experience for this assumption at this time.

Reciprocity

Members who terminate in the future (or have already terminated) with a deferred vested benefit may go to work for a reciprocal employer. This can result in an increase in the member's final compensation used in the calculation of their LACERA benefit. Currently, 16% reciprocity is assumed for General members, and 35% is assumed for Safety members. We are recommending no change in the reciprocity assumption.

Retirements from Deferred Status (2016-2019)

Plan	Total	Reciprocal Status	% with Reciprocity	Current Assump.	Proposed Assump.
General	1,137	198	17%	16%	No Change
Safety	88	34	39%	35%	No Change
Total	1,225	232	19%		

Appendix A: Proposed Actuarial Procedures and Assumptions

This section of the experience study report reflects how the Appendix A of the June 30, 2019 actuarial valuation would appear if the Board of Investments adopts all of the recommended assumptions.

Appendix A Actuarial Procedures and Assumptions

The actuarial procedures and assumptions used in this valuation are described in this section. The assumptions were reviewed and changed effective with the June 30, 2019 valuation, as a result of the 2019 triennial Investigation of Experience Study.

The actuarial assumptions used in the valuations are intended to estimate the future experience of the members of LACERA and of LACERA 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 LACERA'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-13 were developed from the experience as measured by the 2019 Investigation of Experience Study. The rates are the probabilities a member will leave the System for various reasons.

Note: Recommended changes from the prior assumptions have been shaded in green.

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 between plans, entry age is based on original entry into the System.

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 original UAAL as of June 30, 2009 is amortized as a level percentage of the projected salaries of present and future members of LACERA over a closed 30-year period. Future gains and losses are amortized over new closed 30-year periods. This is referred to as “layered” amortization.

For General Plan G and Safety Plan C, the normal cost rate is rounded up to the nearest 0.02%.

Records and Data

The data used in this valuation consists 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 LACERA and are accepted for valuation purposes without audit.

Replacement of Former 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 LACERA 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 or decline 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.

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 employer contribution rate is set by the Board of Investments based on actuarial valuations.

Member Contributions

The member contribution rates vary by entry age (except for PEPRA plans) 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 smoothing valuation basis for all assets was adopted effective June 30, 2009.

Investment Earnings and Expenses

The future investment earnings of the assets of LACERA are assumed to accrue at an annual rate of 6.75% compounded annually, net of both investment and administrative expenses. This rate was adopted June 30, 2019.

Post-retirement Benefit Increases

Post-retirement increases are assumed for the valuation in accordance with the benefits provided as described in Appendix B. These adjustments are assumed payable each year in the future as they are not greater than the expected increase in the Consumer Price Index of 2.50% or 2.75% per year. This rate was adopted June 30, 2019.

Interest on Member Contributions

The annual credited interest rate on member contributions is assumed to be 6.75% compounded semi-annually for an annualized rate of 6.86%. This rate was adopted June 30, 2019.

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% or 3.25% per annum rate of increase in the general wage level of the membership. These rates were adopted June 30, 2019.

Increases are assumed to occur mid-year (i.e., January 1st) and only apply to base salary, excluding megaflex compensation. The mid-year timing reflects that salary increases occur throughout the year, or on average mid-year.

For plans with a one-year final average compensation period, actual average annual compensation is used. For Plan E, Plan G and Safety Plan C, the monthly rate as of June of the valuation year was annualized. Due to irregular compensation payments now included as pensionable earnings, actual annual pay is preferred over annualizing a single monthly payment amount.

Social Security Wage Base

Plan E 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 3.00% or 3.25% per year. Note that statutory provisions describe exactly how to compute the offset for purposes of determining a member's offset amount at time of termination or retirement. This rate was adopted June 30, 2019.

Note also, that it is assumed all Plan E members born after 1950 have less than 10 years of Social Security-covered service and, therefore, do not have their benefit offset.

General Plan G and Safety Plan C members have their compensation limited to approximately 120% of the Social Security Wage Base. The limit for 2019 is $149,016 (after applying the 120% factor) and is projected to increase at the CPI rate of 2.50% or 2.75%. This rate of future increase was adopted effective June 30, 2019.

Retirement

Members in General Plans A-D may retire at age 50 with 10 years of service, or any age with 30 years of service, or age 70 regardless of the number of years of service. General Plan G members are eligible to retire at age 52 with 5 years of service, or age 70 regardless of the number of years of service. Non-contributory Plan E members may retire at age 55 with 10 years of service. Members of Safety Plans A and B may retire at age 50 with 10 years of service, or any age with 20 years of service. Safety Plan C members are eligible to retire at age 50 with 5 years of County service. The retirement rates vary by age and are shown by plan in Tables A-6 through A-13.

All general members who attain or who have attained age 75 in active service and all safety members who have attained age 65 in active service are assumed to retire immediately (except for Safety Plan C members who have not yet attained 5 years of service).

Deferred vested members are assumed to retire at the later of their current age and the assumed retirement age specified as follows:

Assumption for Deferred Commencement

Plan	Age at Commencement
GA	62
GB	62
GC	62
GD	59
GE	62
GG	57
SA	55
SB	50
SC	50

The assumptions regarding termination of employment, early retirement, and unreduced service retirement are treated as a single set of decrements in regards to a particular member. For example, a general member hired at age 30 has a probability of withdrawing from LACERA due to death, disability or other termination of employment until age 50. After age 50, the member could still withdraw due to death, disability, or retirement. Thus, in no year during the member's projected employment would the member be eligible for both a probability of other termination of employment and a probability of retirement.

The retirement probabilities were adopted June 30, 2019.

Disability

The rates of disability used in the valuation are also illustrated in Tables A-6 through A-13. These rates were adopted June 30, 2019.

Post-Retirement Mortality – Other Than Disabled Members

The same post-retirement mortality rates are used in the valuation for active members, members retired for service, and beneficiaries. These rates are illustrated in Table A-2. Current beneficiary mortality is assumed to be the same assumption as healthy members of the same sex. Future beneficiaries are assumed to be of the opposite sex and have the same mortality as General members.

Note that these assumptions directly reflect expected future mortality improvement. These rates were adopted June 30, 2019.

Males — General members: PubG-2010 Healthy Retiree Mortality Table for Males, with MP-2014 Ultimate Projection Scale.

Safety members: PubS-2010 Healthy Retiree Mortality Table for Males multiplied by 85%, with MP-2014 Ultimate Projection Scale.

Females — General members: PubG-2010 Healthy Retiree Mortality Table for Females multiplied by 110%, with MP-2014 Ultimate Projection Scale.

Safety members: PubS-2010 Healthy Retiree Mortality Table for Females, with MP-2014 Ultimate Projection Scale.

Post-Retirement Mortality – Disabled Members

For disabled members, the mortality rates used in the valuation rates are illustrated in Table A-3. Note that these assumptions directly reflect expected future mortality improvement. These rates were adopted June 30, 2019.

Males — General members: Average of PubG-2010 Healthy Retiree Mortality Table for Males and PubG-2010 Disabled Retiree Mortality Table for Males, both projected with MP-2014 Ultimate Projection Scale.

Safety members: PubS-2010 Healthy Retiree Mortality Table for Males, with MP-2014 Ultimate Projection Scale.

Females — General members: Average of PubG-2010 Healthy Retiree Mortality Table for Females and PubG-2010 Disabled Retiree Mortality Table for Females, both projected with MP-2014 Ultimate Projection Scale.

Safety members: PubS-2010 Healthy Retiree Mortality Table for Females, with MP-2014 Ultimate Projection Scale.

Mortality while in Active Status

For active members, the mortality rates used in the valuation rates are illustrated in Tables A-6 through A-13. These rates were adopted June 30, 2019.

Class	Gender	Proposed Table
General	Male	PubG-2010 (120%) Employee Male[1]
General	Female	PubG-2010 (130%) Employee Female[1]
Safety	Male	PubS-2010 (100%) Employee Male[1]
Safety	Female	PubS-2010 (100%) Employee Female[1]

1. Projection using MP-2014 Ultimate projection scale.

Note: Safety members have an additional service-connected mortality rate of 0.01% per year.

Other Employment Terminations

Tables A-6 to A-13 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. These rates were adopted June 30, 2019.

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 LACERA. 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 LACERA or a reciprocal retirement system. All terminating members who are not eligible for vested benefits are assumed to withdraw their contributions immediately. It is assumed that all terminating members will not be rehired in the future.

Table A-4 gives the assumed probabilities that vested members will withdraw their contributions and elect a refund immediately upon termination and the probability that remaining members will elect a deferred vested benefit. All non-vested members are assumed to elect a refund and withdraw their contributions. These rates were adopted June 30, 2019.

Probability of Eligible Survivors

For members not currently in pay status, 77% of all males and 50% of all females are assumed to have eligible survivors (spouses or qualified domestic partners). Survivors are assumed to be four years younger than male members and two years older than female members. Survivors are assumed to be of the opposite gender 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 Vested Former Members

The deferred retirement benefit is calculated based on the member's final compensation and service at termination. The compensation amount is projected until the assumed retirement age for members who are assumed to be employed by a reciprocal agency. For members who are missing compensation data, Final Compensation is estimated as the average amount for all members who terminated during the same year and had a valid compensation amount. The greater of the present value of the calculated benefit and the employee's current contribution balance is valued for future deferred vested members.

Reciprocal Employment

16% of General and 35% of Safety current and future deferred vested members are assumed to work for a reciprocal employer.

Current vested reciprocal members are assumed to receive annual salary increases of 3.75% or 4.00%. Future reciprocal vested members are assumed to receive the same salary increases they would have received if they had stayed in active employment with LACERA and retired at the assumed retirement age.

Valuation of Annuity Purchases

Over 30 years ago, LACERA purchased single life annuities from two insurance companies for some retired members (currently less than 1% of the retired population). The total liability for these members is calculated and then offset by the expected value of the benefit to be paid by the insurance companies.

For affected members, the insurance companies are responsible for:

1. Straight life annuity payments
2. Statutory COLAs

LACERA is responsible for:

1. Benefit payments payable to any beneficiary
2. STAR COLAs

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 35% / 65% blend of the male and female valuation mortality tables and projection scale, with a static projection to 2041. For Safety members, it is based on a 85% / 15% blend of the male and female annuity factors.

B. The annuity factor used in determining the 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 C Member who enters at age 59 or earlier, the Final Compensation at retirement (age 60) will be the monthly average of the annual salaries during age 59.

D. Member Rates are assumed to increase with entry age (except for PEPRA plans). There are a few exceptions at the higher entry ages where the calculated rate is less than the previous entry age (for example, age 53 for General A). In these cases the member contribution rate is adjusted so that it is no less than the value for the previous entry age.

Table A-1
Summary of Valuation Assumptions as of June 30, 2019

I. Economic assumptions

A.	General wage increases	3.00% or 3.25%
B.	Investment earnings	6.75%
C.	Growth in membership	0.00%
D.	Post-retirement benefit increases (varies by plan)	Plan COLA not greater than CPI assumption.
E.	CPI inflation assumption	2.50% or 2.75%

II. Demographic assumptions

A.	Salary increases due to service	Table A-5
B.	Retirement	Tables A-6 to A-13
C.	Disability	Tables A-6 to A-13
D.	Mortality during active employment	Tables A-6 to A-13
E.	Mortality for active members after termination and service retired members(1)	Table A-2

Class	Gender	
General	Male	PubG-2010 (100%) Healthy Retiree Male
General	Female	PubG-2010 (110%) Healthy Retiree Female
Safety	Male	PubS-2010 (85%) Healthy Retiree Male
Safety	Female	PubS-2010 (100%) Healthy Retiree Female

F. Mortality among disabled members(1) — Table A-3

Class	Gender	
General	Male	Avg of: PubG-2010 (100%) Healthy Retiree Male PubG-2010 (100%) Disabled Retiree Male
General	Female	Avg of: PubG-2010 (100%) Healthy Retiree Female PubG-2010 (100%) Disabled Retiree Female
Safety	Male	PubS-2010 (100%) Healthy Retiree Male
Safety	Female	PubS-2010 (100%) Healthy Retiree Female

G.	Mortality for beneficiaries(1) Basis – Beneficiaries are assumed to have the same mortality as a general member of the opposite gender who has taken a service retirement.	Table A-2
H.	Other terminations of employment	Tables A-6 to A-13
I.	Refund of contributions on vested termination	Table A-4

1. All mortality rates are projected using the MP-2014 Ultimate projection scale.

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

Age	Safety Male	Safety Female	General Male	General Female
20	0.0520%	0.0210%	0.0740%	0.0380%
25	0.0470%	0.0260%	0.0560%	0.0260%
30	0.0520%	0.0350%	0.0720%	0.0440%
35	0.0590%	0.0470%	0.0940%	0.0680%
40	0.0750%	0.0640%	0.1320%	0.1060%
45	0.1037%	0.0870%	0.1960%	0.1650%
50	0.1632%	0.1490%	0.2980%	0.2442%
55	0.2601%	0.2580%	0.4310%	0.3146%
60	0.4318%	0.4460%	0.6150%	0.4224%
65	0.7489%	0.7700%	0.9130%	0.6743%
70	1.3328%	1.3290%	1.5260%	1.1693%
75	2.4021%	2.2950%	2.6710%	2.0713%
80	4.3376%	3.9620%	4.7740%	3.6960%
85	7.7648%	6.8420%	8.5910%	6.8255%
90	13.4810%	11.8150%	14.6720%	12.6357%

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 2010. Annual projected improvements are assumed in the following years under the schedule shown. For example, the annual mortality rate for an 85-year old Safety male in fiscal year beginning in 2019 is 7.0933% calculated as follows:

Age 85 rate in 2019 = Age 85 rate in 2010 with 9 years improvement
= 7.7648% x (100.0% - 1.0%) ^ 9
= 7.0933%

Table A-3
Mortality for Members Retired for Disability[1]

Age	Safety Male	Safety Female	General Male	General Female
20	0.0610%	0.0210%	0.2430%	0.1340%
25	0.0550%	0.0260%	0.1670%	0.0940%
30	0.0610%	0.0350%	0.2130%	0.1485%
35	0.0700%	0.0470%	0.2760%	0.2315%
40	0.0880%	0.0640%	0.3885%	0.3625%
45	0.1220%	0.0870%	0.6015%	0.5675%
50	0.1920%	0.1490%	0.9515%	0.8525%
55	0.3060%	0.2580%	1.2725%	1.0140%
60	0.5080%	0.4460%	1.5590%	1.1700%
65	0.8810%	0.7700%	1.9785%	1.4345%
70	1.5680%	1.3290%	2.7135%	1.9625%
75	2.8260%	2.2950%	3.9315%	2.9430%
80	5.1030%	3.9620%	6.0610%	4.6835%
85	9.1350%	6.8420%	9.7030%	7.7680%
90	15.8600%	11.8150%	15.4625%	12.5760%

1. Mortality rates are those applicable for the fiscal year beginning in 2010. Annual projected improvements are assumed in the following years under the schedule shown on the preceding page.

Table A-4
Immediate Refund of Contributions upon Termination of Employment
(Excludes Plan E)

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

Table A-5
Annual Increase in Salary[1]

Years of Service	General	Safety
<1	6.00%	9.00%
1	5.25%	8.50%
2	4.75%	8.00%
3	4.10%	6.00%
4	3.50%	4.50%
5	3.00%	3.25%
6	2.50%	2.50%
7	2.00%	2.00%
8	1.60%	1.50%
9	1.30%	1.35%
10	1.15%	1.20%
11	1.00%	1.05%
12	0.85%	0.95%
13	0.75%	0.85%
14	0.70%	0.75%
15	0.65%	0.70%
16	0.60%	0.65%
17	0.55%	0.60%
18	0.50%	0.55%
19	0.45%	2.25%
20	0.40%	0.50%
21	0.35%	0.50%
22	0.30%	0.50%
23	0.25%	0.50%
24	0.25%	3.00%
25	0.25%	0.50%
26	0.25%	0.50%
27	0.25%	0.50%
28	0.25%	0.50%
29	0.25%	3.00%
30 or More	0.25%	0.50%

1. The total expected increase in salary includes both merit (shown above) and the general wage increase assumption of 3.00% or 3.25% per annum. The total result is compounded rather than additive. For example, the total increase to service less than one year is 9.18% or 9.45% for General members.

Appendix A: Rates of Separation from Active Service Tables A-6 to A-13

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 LACERA plan by gender:

Table	A-6: General Plan A, B & C – Males	A-10: General Plan E – Males
	A-7: General Plan A, B & C – Females	A-11: General Plan E – Females
	A-8: General Plan D & G – Males	A-12: Safety Plan A, B & C – Males
	A-9: General Plan D & G – Females	A-13: Safety Plan A, B & C – Females

Table A-6
Rate of Separation from Active Service for General Members
Plans A, B & C – Male

Age	Service Retirement	Other Terminations	Service Disability	Ordinary Disability	Service Death	Ordinary Death
18	0.00000	0.00500	0.00010	0.00010	N/A	0.00043
19	0.00000	0.00500	0.00010	0.00010	N/A	0.00046
20	0.00000	0.00500	0.00010	0.00010	N/A	0.00044
21	0.00000	0.00500	0.00010	0.00010	N/A	0.00043
22	0.00000	0.00500	0.00010	0.00010	N/A	0.00040
23	0.00000	0.00500	0.00010	0.00010	N/A	0.00037
24	0.00000	0.00500	0.00010	0.00010	N/A	0.00035
25	0.00000	0.00500	0.00010	0.00010	N/A	0.00034
26	0.00000	0.00500	0.00010	0.00010	N/A	0.00036
27	0.00000	0.00500	0.00010	0.00010	N/A	0.00037
28	0.00000	0.00500	0.00010	0.00010	N/A	0.00040
29	0.00000	0.00500	0.00010	0.00010	N/A	0.00041
30	0.00000	0.00500	0.00010	0.00020	N/A	0.00043
31	0.00000	0.00500	0.00010	0.00020	N/A	0.00046
32	0.00000	0.00500	0.00010	0.00020	N/A	0.00048
33	0.00000	0.00500	0.00016	0.00020	N/A	0.00050
34	0.00000	0.00500	0.00022	0.00020	N/A	0.00053
35	0.00000	0.00500	0.00028	0.00020	N/A	0.00056
36	0.00000	0.00500	0.00034	0.00020	N/A	0.00060
37	0.00000	0.00500	0.00040	0.00020	N/A	0.00064
38	0.00000	0.00500	0.00048	0.00020	N/A	0.00068
39	0.00000	0.00500	0.00056	0.00020	N/A	0.00073
40	0.03000	0.00500	0.00064	0.00020	N/A	0.00079
41	0.03000	0.00500	0.00072	0.00020	N/A	0.00085
42	0.03000	0.00500	0.00080	0.00020	N/A	0.00092
43	0.03000	0.00500	0.00084	0.00024	N/A	0.00100
44	0.03000	0.00500	0.00088	0.00028	N/A	0.00108
45	0.03000	0.00500	0.00092	0.00032	N/A	0.00118
46	0.03000	0.00500	0.00096	0.00036	N/A	0.00128
47	0.03000	0.00500	0.00100	0.00040	N/A	0.00139
48	0.03000	0.00500	0.00104	0.00044	N/A	0.00152
49	0.03000	0.00500	0.00108	0.00048	N/A	0.00166
50	0.03000	0.00500	0.00112	0.00052	N/A	0.00179
51	0.03000	0.00500	0.00116	0.00056	N/A	0.00194
52	0.03000	0.00500	0.00120	0.00060	N/A	0.00210
53	0.03000	0.00500	0.00156	0.00064	N/A	0.00227
54	0.06000	0.00500	0.00192	0.00068	N/A	0.00244
55	0.10000	0.00500	0.00228	0.00072	N/A	0.00263
56	0.12000	0.00500	0.00264	0.00076	N/A	0.00283
57	0.17000	0.00500	0.00300	0.00080	N/A	0.00306
58	0.26000	0.00500	0.00330	0.00084	N/A	0.00330
59	0.26000	0.00500	0.00360	0.00088	N/A	0.00355
60	0.32000	0.00500	0.00390	0.00092	N/A	0.00383
61	0.32000	0.00500	0.00420	0.00096	N/A	0.00413
62	0.32000	0.00500	0.00450	0.00100	N/A	0.00445
63	0.32000	0.00500	0.00450	0.00104	N/A	0.00481
64	0.32000	0.00500	0.00450	0.00108	N/A	0.00520
65	0.32000	0.00500	0.00450	0.00112	N/A	0.00562
66	0.25000	0.00500	0.00450	0.00116	N/A	0.00607
67	0.24000	0.00500	0.00450	0.00120	N/A	0.00658
68	0.24000	0.00500	0.00450	0.00124	N/A	0.00713
69	0.24000	0.00500	0.00450	0.00128	N/A	0.00775
70	0.24000	0.00500	0.00450	0.00132	N/A	0.00844
71	0.24000	0.00500	0.00450	0.00136	N/A	0.00920
72	0.24000	0.00500	0.00450	0.00140	N/A	0.01004
73	0.24000	0.00500	0.00450	0.00144	N/A	0.01098
74	0.24000	0.00500	0.00450	0.00148	N/A	0.01201
75	1.00000	0.00000	0.00000	0.00000	N/A	0.01315

Table A-7
Rate of Separation from Active Service for General Members
Plans A, B & C – Female

Age	Service Retirement	Other Terminations	Service Disability	Ordinary Disability	Service Death	Ordinary Death
18	0.00000	0.00500	0.00015	0.00010	N/A	0.00017
19	0.00000	0.00500	0.00015	0.00010	N/A	0.00017
20	0.00000	0.00500	0.00015	0.00010	N/A	0.00017
21	0.00000	0.00500	0.00015	0.00010	N/A	0.00016
22	0.00000	0.00500	0.00015	0.00010	N/A	0.00014
23	0.00000	0.00500	0.00015	0.00010	N/A	0.00013
24	0.00000	0.00500	0.00015	0.00010	N/A	0.00012
25	0.00000	0.00500	0.00015	0.00010	N/A	0.00012
26	0.00000	0.00500	0.00015	0.00010	N/A	0.00013
27	0.00000	0.00500	0.00015	0.00010	N/A	0.00014
28	0.00000	0.00500	0.00015	0.00010	N/A	0.00016
29	0.00000	0.00500	0.00015	0.00010	N/A	0.00017
30	0.00000	0.00500	0.00015	0.00010	N/A	0.00020
31	0.00000	0.00500	0.00015	0.00010	N/A	0.00021
32	0.00000	0.00500	0.00015	0.00010	N/A	0.00023
33	0.00000	0.00500	0.00020	0.00010	N/A	0.00025
34	0.00000	0.00500	0.00025	0.00010	N/A	0.00027
35	0.00000	0.00500	0.00030	0.00010	N/A	0.00030
36	0.00000	0.00500	0.00035	0.00010	N/A	0.00033
37	0.00000	0.00500	0.00040	0.00010	N/A	0.00036
38	0.00000	0.00500	0.00042	0.00014	N/A	0.00039
39	0.00000	0.00500	0.00044	0.00018	N/A	0.00043
40	0.03000	0.00500	0.00046	0.00022	N/A	0.00047
41	0.03000	0.00500	0.00048	0.00026	N/A	0.00052
42	0.03000	0.00500	0.00050	0.00030	N/A	0.00056
43	0.03000	0.00500	0.00060	0.00032	N/A	0.00061
44	0.03000	0.00500	0.00070	0.00034	N/A	0.00066
45	0.03000	0.00500	0.00080	0.00036	N/A	0.00073
46	0.03000	0.00500	0.00090	0.00038	N/A	0.00079
47	0.03000	0.00500	0.00100	0.00040	N/A	0.00086
48	0.03000	0.00500	0.00110	0.00042	N/A	0.00092
49	0.03000	0.00500	0.00120	0.00044	N/A	0.00100
50	0.03000	0.00500	0.00130	0.00046	N/A	0.00108
51	0.03000	0.00500	0.00140	0.00048	N/A	0.00117
52	0.03000	0.00500	0.00150	0.00050	N/A	0.00126
53	0.03000	0.00500	0.00156	0.00052	N/A	0.00137
54	0.06000	0.00500	0.00162	0.00054	N/A	0.00147
55	0.10000	0.00500	0.00168	0.00056	N/A	0.00160
56	0.12000	0.00500	0.00174	0.00058	N/A	0.00173
57	0.17000	0.00500	0.00180	0.00060	N/A	0.00187
58	0.26000	0.00500	0.00194	0.00064	N/A	0.00203
59	0.26000	0.00500	0.00208	0.00068	N/A	0.00221
60	0.32000	0.00500	0.00222	0.00072	N/A	0.00242
61	0.32000	0.00500	0.00236	0.00076	N/A	0.00264
62	0.32000	0.00500	0.00250	0.00080	N/A	0.00289
63	0.32000	0.00500	0.00250	0.00084	N/A	0.00317
64	0.32000	0.00500	0.00250	0.00088	N/A	0.00350
65	0.32000	0.00500	0.00250	0.00092	N/A	0.00385
66	0.25000	0.00500	0.00250	0.00096	N/A	0.00425
67	0.24000	0.00500	0.00250	0.00100	N/A	0.00471
68	0.24000	0.00500	0.00250	0.00104	N/A	0.00520
69	0.24000	0.00500	0.00250	0.00108	N/A	0.00575
70	0.24000	0.00500	0.00250	0.00112	N/A	0.00636
71	0.24000	0.00500	0.00250	0.00116	N/A	0.00703
72	0.24000	0.00500	0.00250	0.00120	N/A	0.00777
73	0.24000	0.00500	0.00250	0.00124	N/A	0.00859
74	0.24000	0.00500	0.00250	0.00128	N/A	0.00950
75	1.00000	0.00000	0.00000	0.00000	N/A	0.01050

Table A-8
Rate of Separation from Active Service for General Members
Plan D & G – Male

Age	Service Retirement Plan D	Service Retirement Plan G	Service Disability	Ordinary Disability	Service Death	Ordinary Death	Years of Service	Other Terminations
18	0.00000	0.00000	0.00010	0.00010	N/A	0.00043	0	0.07000
19	0.00000	0.00000	0.00010	0.00010	N/A	0.00046	1	0.05500
20	0.00000	0.00000	0.00010	0.00010	N/A	0.00044	2	0.04000
21	0.00000	0.00000	0.00010	0.00010	N/A	0.00043	3	0.03250
22	0.00000	0.00000	0.00010	0.00010	N/A	0.00040	4	0.02500
23	0.00000	0.00000	0.00010	0.00010	N/A	0.00037	5	0.02330
24	0.00000	0.00000	0.00010	0.00010	N/A	0.00035	6	0.02170
25	0.00000	0.00000	0.00010	0.00010	N/A	0.00034	7	0.02000
26	0.00000	0.00000	0.00010	0.00010	N/A	0.00036	8	0.01900
27	0.00000	0.00000	0.00010	0.00010	N/A	0.00037	9	0.01800
28	0.00000	0.00000	0.00010	0.00010	N/A	0.00040	10	0.01700
29	0.00000	0.00000	0.00010	0.00010	N/A	0.00041	11	0.01600
30	0.00000	0.00000	0.00010	0.00020	N/A	0.00043	12	0.01500
31	0.00000	0.00000	0.00010	0.00020	N/A	0.00046	13	0.01400
32	0.00000	0.00000	0.00010	0.00020	N/A	0.00048	14	0.01300
33	0.00000	0.00000	0.00016	0.00020	N/A	0.00050	15	0.01200
34	0.00000	0.00000	0.00022	0.00020	N/A	0.00053	16	0.01100
35	0.00000	0.00000	0.00028	0.00020	N/A	0.00056	17	0.01000
36	0.00000	0.00000	0.00034	0.00020	N/A	0.00060	18	0.00920
37	0.00000	0.00000	0.00040	0.00020	N/A	0.00064	19	0.00840
38	0.00000	0.00000	0.00048	0.00020	N/A	0.00068	20	0.00760
39	0.00000	0.00000	0.00056	0.00020	N/A	0.00073	21	0.00680
40	0.01500	0.00000	0.00064	0.00020	N/A	0.00079	22	0.00600
41	0.01500	0.00000	0.00072	0.00020	N/A	0.00085	23	0.00560
42	0.01500	0.00000	0.00080	0.00020	N/A	0.00092	24	0.00520
43	0.01500	0.00000	0.00084	0.00024	N/A	0.00100	25	0.00480
44	0.01500	0.00000	0.00088	0.00028	N/A	0.00108	26	0.00440
45	0.01500	0.00000	0.00092	0.00032	N/A	0.00118	27	0.00400
46	0.01500	0.00000	0.00096	0.00036	N/A	0.00128	28	0.00400
47	0.01500	0.00000	0.00100	0.00040	N/A	0.00139	29	0.00400
48	0.01500	0.00000	0.00104	0.00044	N/A	0.00152	30 & Above	0.00000
49	0.01500	0.00000	0.00108	0.00048	N/A	0.00166		
50	0.01500	0.01200	0.00112	0.00052	N/A	0.00179		
51	0.01200	0.00960	0.00116	0.00056	N/A	0.00194		
52	0.01200	0.00960	0.00120	0.00060	N/A	0.00210		
53	0.01500	0.01200	0.00156	0.00064	N/A	0.00227		
54	0.02000	0.01600	0.00192	0.00068	N/A	0.00244		
55	0.02500	0.02000	0.00228	0.00072	N/A	0.00263		
56	0.02500	0.02000	0.00264	0.00076	N/A	0.00283		
57	0.03000	0.02400	0.00300	0.00080	N/A	0.00306		
58	0.03500	0.02800	0.00330	0.00084	N/A	0.00330		
59	0.05000	0.04000	0.00360	0.00088	N/A	0.00355		
60	0.07000	0.05600	0.00390	0.00092	N/A	0.00383		
61	0.08000	0.06400	0.00420	0.00096	N/A	0.00413		
62	0.11000	0.11000	0.00450	0.00100	N/A	0.00445		
63	0.11000	0.11000	0.00450	0.00104	N/A	0.00481		
64	0.16000	0.16000	0.00450	0.00108	N/A	0.00520		
65	0.23000	0.18000	0.00450	0.00112	N/A	0.00562		
66	0.20000	0.18000	0.00450	0.00116	N/A	0.00607		
67	0.19000	0.30000	0.00450	0.00120	N/A	0.00658		
68	0.18000	0.18000	0.00450	0.00124	N/A	0.00713		
69	0.20000	0.20000	0.00450	0.00128	N/A	0.00775		
70	0.23000	0.23000	0.00450	0.00132	N/A	0.00844		
71	0.20000	0.20000	0.00450	0.00136	N/A	0.00920		
72	0.20000	0.20000	0.00450	0.00140	N/A	0.01004		
73	0.20000	0.20000	0.00450	0.00144	N/A	0.01098		
74	0.20000	0.20000	0.00450	0.00148	N/A	0.01201		
75	1.00000	1.00000	0.00000	0.00000	N/A	0.01315		

Table A-9
Rate of Separation from Active Service for General Members
Plan D & G – Female

Age	Service Retirement Plan D	Service Retirement Plan G	Service Disability	Ordinary Disability	Service Death	Ordinary Death
18	0.00000	0.00000	0.00015	0.00010	N/A	0.00017
19	0.00000	0.00000	0.00015	0.00010	N/A	0.00017
20	0.00000	0.00000	0.00015	0.00010	N/A	0.00017
21	0.00000	0.00000	0.00015	0.00010	N/A	0.00016
22	0.00000	0.00000	0.00015	0.00010	N/A	0.00014
23	0.00000	0.00000	0.00015	0.00010	N/A	0.00013
24	0.00000	0.00000	0.00015	0.00010	N/A	0.00012
25	0.00000	0.00000	0.00015	0.00010	N/A	0.00012
26	0.00000	0.00000	0.00015	0.00010	N/A	0.00013
27	0.00000	0.00000	0.00015	0.00010	N/A	0.00014
28	0.00000	0.00000	0.00015	0.00010	N/A	0.00016
29	0.00000	0.00000	0.00015	0.00010	N/A	0.00017
30	0.00000	0.00000	0.00015	0.00010	N/A	0.00020
31	0.00000	0.00000	0.00015	0.00010	N/A	0.00021
32	0.00000	0.00000	0.00015	0.00010	N/A	0.00023
33	0.00000	0.00000	0.00020	0.00010	N/A	0.00025
34	0.00000	0.00000	0.00025	0.00010	N/A	0.00027
35	0.00000	0.00000	0.00030	0.00010	N/A	0.00030
36	0.00000	0.00000	0.00035	0.00010	N/A	0.00033
37	0.00000	0.00000	0.00040	0.00010	N/A	0.00036
38	0.00000	0.00000	0.00042	0.00014	N/A	0.00039
39	0.00000	0.00000	0.00044	0.00018	N/A	0.00043
40	0.01500	0.00000	0.00046	0.00022	N/A	0.00047
41	0.01500	0.00000	0.00048	0.00026	N/A	0.00052
42	0.01500	0.00000	0.00050	0.00030	N/A	0.00056
43	0.01500	0.00000	0.00060	0.00032	N/A	0.00061
44	0.01500	0.00000	0.00070	0.00034	N/A	0.00066
45	0.01500	0.00000	0.00080	0.00036	N/A	0.00073
46	0.01500	0.00000	0.00090	0.00038	N/A	0.00079
47	0.01500	0.00000	0.00100	0.00040	N/A	0.00086
48	0.01500	0.00000	0.00110	0.00042	N/A	0.00092
49	0.01500	0.00000	0.00120	0.00044	N/A	0.00100
50	0.01500	0.01200	0.00130	0.00046	N/A	0.00108
51	0.01200	0.00960	0.00140	0.00048	N/A	0.00117
52	0.01200	0.00960	0.00150	0.00050	N/A	0.00126
53	0.01500	0.01200	0.00156	0.00052	N/A	0.00137
54	0.02000	0.01600	0.00162	0.00054	N/A	0.00147
55	0.02500	0.02000	0.00168	0.00056	N/A	0.00160
56	0.02500	0.02000	0.00174	0.00058	N/A	0.00173
57	0.03000	0.02400	0.00180	0.00060	N/A	0.00187
58	0.03500	0.02800	0.00194	0.00064	N/A	0.00203
59	0.05000	0.04000	0.00208	0.00068	N/A	0.00221
60	0.07000	0.05600	0.00222	0.00072	N/A	0.00242
61	0.08000	0.06400	0.00236	0.00076	N/A	0.00264
62	0.11000	0.11000	0.00250	0.00080	N/A	0.00289
63	0.11000	0.11000	0.00250	0.00084	N/A	0.00317
64	0.16000	0.16000	0.00250	0.00088	N/A	0.00350
65	0.23000	0.18000	0.00250	0.00092	N/A	0.00385
66	0.20000	0.18000	0.00250	0.00096	N/A	0.00425
67	0.19000	0.30000	0.00250	0.00100	N/A	0.00471
68	0.18000	0.18000	0.00250	0.00104	N/A	0.00520
69	0.20000	0.20000	0.00250	0.00108	N/A	0.00575
70	0.23000	0.23000	0.00250	0.00112	N/A	0.00636
71	0.20000	0.20000	0.00250	0.00116	N/A	0.00703
72	0.20000	0.20000	0.00250	0.00120	N/A	0.00777
73	0.20000	0.20000	0.00250	0.00124	N/A	0.00859
74	0.20000	0.20000	0.00250	0.00128	N/A	0.00950
75	1.00000	1.00000	0.00000	0.00000	N/A	0.01050

Years of Service	Other Terminations
0	0.07000
1	0.05500
2	0.04000
3	0.03250
4	0.02500
5	0.02330
6	0.02170
7	0.02000
8	0.01900
9	0.01800
10	0.01700
11	0.01600
12	0.01500
13	0.01400
14	0.01300
15	0.01200
16	0.01100
17	0.01000
18	0.00920
19	0.00840
20	0.00760
21	0.00680
22	0.00600
23	0.00560
24	0.00520
25	0.00480
26	0.00440
27	0.00400
28	0.00400
29	0.00400
30 & Above	0.00000

Table A-10
Rate of Separation from Active Service for General Members
Plan E – Male

Age	Service Retirement	Service Disability	Ordinary Disability	Service Death	Ordinary Death	Years of Service	Other Terminations
18	0.00000	N/A	N/A	N/A	0.00043	0	0.15000
19	0.00000	N/A	N/A	N/A	0.00046	1	0.08000
20	0.00000	N/A	N/A	N/A	0.00044	2	0.06000
21	0.00000	N/A	N/A	N/A	0.00043	3	0.04500
22	0.00000	N/A	N/A	N/A	0.00040	4	0.03500
23	0.00000	N/A	N/A	N/A	0.00037	5	0.03100
24	0.00000	N/A	N/A	N/A	0.00035	6	0.02700
25	0.00000	N/A	N/A	N/A	0.00034	7	0.02300
26	0.00000	N/A	N/A	N/A	0.00036	8	0.02200
27	0.00000	N/A	N/A	N/A	0.00037	9	0.02100
28	0.00000	N/A	N/A	N/A	0.00040	10	0.02000
29	0.00000	N/A	N/A	N/A	0.00041	11	0.01900
30	0.00000	N/A	N/A	N/A	0.00043	12	0.01800
31	0.00000	N/A	N/A	N/A	0.00046	13	0.01680
32	0.00000	N/A	N/A	N/A	0.00048	14	0.01560
33	0.00000	N/A	N/A	N/A	0.00050	15	0.01440
34	0.00000	N/A	N/A	N/A	0.00053	16	0.01320
35	0.00000	N/A	N/A	N/A	0.00056	17	0.01200
36	0.00000	N/A	N/A	N/A	0.00060	18	0.01160
37	0.00000	N/A	N/A	N/A	0.00064	19	0.01120
38	0.00000	N/A	N/A	N/A	0.00068	20	0.01080
39	0.00000	N/A	N/A	N/A	0.00073	21	0.01040
40	0.00000	N/A	N/A	N/A	0.00079	22	0.01000
41	0.00000	N/A	N/A	N/A	0.00085	23	0.01000
42	0.00000	N/A	N/A	N/A	0.00092	24	0.01000
43	0.00000	N/A	N/A	N/A	0.00100	25	0.01000
44	0.00000	N/A	N/A	N/A	0.00108	26	0.01000
45	0.00000	N/A	N/A	N/A	0.00118	27	0.01000
46	0.00000	N/A	N/A	N/A	0.00128	28	0.01000
47	0.00000	N/A	N/A	N/A	0.00139	29	0.01000
48	0.00000	N/A	N/A	N/A	0.00152	30 & Above	0.01000
49	0.00000	N/A	N/A	N/A	0.00166		
50	0.00000	N/A	N/A	N/A	0.00179		
51	0.00000	N/A	N/A	N/A	0.00194		
52	0.00000	N/A	N/A	N/A	0.00210		
53	0.00000	N/A	N/A	N/A	0.00227		
54	0.00000	N/A	N/A	N/A	0.00244		
55	0.02000	N/A	N/A	N/A	0.00263		
56	0.02000	N/A	N/A	N/A	0.00283		
57	0.02500	N/A	N/A	N/A	0.00306		
58	0.02500	N/A	N/A	N/A	0.00330		
59	0.03000	N/A	N/A	N/A	0.00355		
60	0.04000	N/A	N/A	N/A	0.00383		
61	0.06000	N/A	N/A	N/A	0.00413		
62	0.09000	N/A	N/A	N/A	0.00445		
63	0.09000	N/A	N/A	N/A	0.00481		
64	0.20000	N/A	N/A	N/A	0.00520		
65	0.28000	N/A	N/A	N/A	0.00562		
66	0.19000	N/A	N/A	N/A	0.00607		
67	0.19000	N/A	N/A	N/A	0.00658		
68	0.19000	N/A	N/A	N/A	0.00713		
69	0.19000	N/A	N/A	N/A	0.00775		
70	0.19000	N/A	N/A	N/A	0.00844		
71	0.19000	N/A	N/A	N/A	0.00920		
72	0.19000	N/A	N/A	N/A	0.01004		
73	0.19000	N/A	N/A	N/A	0.01098		
74	0.19000	N/A	N/A	N/A	0.01201		
75	1.00000	N/A	N/A	N/A	0.01315		

Table A-11
Rate of Separation from Active Service for General Members
Plan E – Female

Age	Service Retirement	Service Disability	Ordinary Disability	Service Death	Ordinary Death	Years of Service	Other Terminations
18	0.00000	N/A	N/A	N/A	0.00017	0	0.15000
19	0.00000	N/A	N/A	N/A	0.00017	1	0.08000
20	0.00000	N/A	N/A	N/A	0.00017	2	0.06000
21	0.00000	N/A	N/A	N/A	0.00016	3	0.04500
22	0.00000	N/A	N/A	N/A	0.00014	4	0.03500
23	0.00000	N/A	N/A	N/A	0.00013	5	0.03100
24	0.00000	N/A	N/A	N/A	0.00012	6	0.02700
25	0.00000	N/A	N/A	N/A	0.00012	7	0.02300
26	0.00000	N/A	N/A	N/A	0.00013	8	0.02200
27	0.00000	N/A	N/A	N/A	0.00014	9	0.02100
28	0.00000	N/A	N/A	N/A	0.00016	10	0.02000
29	0.00000	N/A	N/A	N/A	0.00017	11	0.01900
30	0.00000	N/A	N/A	N/A	0.00020	12	0.01800
31	0.00000	N/A	N/A	N/A	0.00021	13	0.01680
32	0.00000	N/A	N/A	N/A	0.00023	14	0.01560
33	0.00000	N/A	N/A	N/A	0.00025	15	0.01440
34	0.00000	N/A	N/A	N/A	0.00027	16	0.01320
35	0.00000	N/A	N/A	N/A	0.00030	17	0.01200
36	0.00000	N/A	N/A	N/A	0.00033	18	0.01160
37	0.00000	N/A	N/A	N/A	0.00036	19	0.01120
38	0.00000	N/A	N/A	N/A	0.00039	20	0.01080
39	0.00000	N/A	N/A	N/A	0.00043	21	0.01040
40	0.00000	N/A	N/A	N/A	0.00047	22	0.01000
41	0.00000	N/A	N/A	N/A	0.00052	23	0.01000
42	0.00000	N/A	N/A	N/A	0.00056	24	0.01000
43	0.00000	N/A	N/A	N/A	0.00061	25	0.01000
44	0.00000	N/A	N/A	N/A	0.00066	26	0.01000
45	0.00000	N/A	N/A	N/A	0.00073	27	0.01000
46	0.00000	N/A	N/A	N/A	0.00079	28	0.01000
47	0.00000	N/A	N/A	N/A	0.00086	29	0.01000
48	0.00000	N/A	N/A	N/A	0.00092	30 & Above	0.01000
49	0.00000	N/A	N/A	N/A	0.00100		
50	0.00000	N/A	N/A	N/A	0.00108		
51	0.00000	N/A	N/A	N/A	0.00117		
52	0.00000	N/A	N/A	N/A	0.00126		
53	0.00000	N/A	N/A	N/A	0.00137		
54	0.00000	N/A	N/A	N/A	0.00147		
55	0.02000	N/A	N/A	N/A	0.00160		
56	0.02000	N/A	N/A	N/A	0.00173		
57	0.02500	N/A	N/A	N/A	0.00187		
58	0.02500	N/A	N/A	N/A	0.00203		
59	0.03000	N/A	N/A	N/A	0.00221		
60	0.04000	N/A	N/A	N/A	0.00242		
61	0.06000	N/A	N/A	N/A	0.00264		
62	0.09000	N/A	N/A	N/A	0.00289		
63	0.09000	N/A	N/A	N/A	0.00317		
64	0.20000	N/A	N/A	N/A	0.00350		
65	0.28000	N/A	N/A	N/A	0.00385		
66	0.19000	N/A	N/A	N/A	0.00425		
67	0.19000	N/A	N/A	N/A	0.00471		
68	0.19000	N/A	N/A	N/A	0.00520		
69	0.19000	N/A	N/A	N/A	0.00575		
70	0.19000	N/A	N/A	N/A	0.00636		
71	0.19000	N/A	N/A	N/A	0.00703		
72	0.19000	N/A	N/A	N/A	0.00777		
73	0.19000	N/A	N/A	N/A	0.00859		
74	0.19000	N/A	N/A	N/A	0.00950		
75	1.00000	N/A	N/A	N/A	0.01050		

Table A-12
Rate of Separation from Active Service for Safety Members
Plan A, B & C – Male

Age	Service Retirement Plans A-B	Service Retirement Plan C	Service Disability	Ordinary Disability	Service Death	Ordinary Death
18	0.00000	0.00000	0.00200	0.00000	0.00010	0.00037
19	0.00000	0.00000	0.00200	0.00000	0.00010	0.00040
20	0.00000	0.00000	0.00200	0.00000	0.00010	0.00041
21	0.00000	0.00000	0.00200	0.00000	0.00010	0.00041
22	0.00000	0.00000	0.00200	0.00000	0.00010	0.00040
23	0.00000	0.00000	0.00200	0.00000	0.00010	0.00039
24	0.00000	0.00000	0.00200	0.00000	0.00010	0.00038
25	0.00000	0.00000	0.00200	0.00000	0.00010	0.00037
26	0.00000	0.00000	0.00200	0.00000	0.00010	0.00038
27	0.00000	0.00000	0.00200	0.00000	0.00010	0.00039
28	0.00000	0.00000	0.00200	0.00000	0.00010	0.00040
29	0.00000	0.00000	0.00200	0.00000	0.00010	0.00041
30	0.00000	0.00000	0.00200	0.00000	0.00010	0.00041
31	0.00000	0.00000	0.00200	0.00000	0.00010	0.00042
32	0.00000	0.00000	0.00200	0.00000	0.00010	0.00043
33	0.00000	0.00000	0.00210	0.00000	0.00010	0.00044
34	0.00000	0.00000	0.00220	0.00000	0.00010	0.00045
35	0.00000	0.00000	0.00230	0.00000	0.00010	0.00047
36	0.00000	0.00000	0.00240	0.00000	0.00010	0.00049
37	0.00000	0.00000	0.00250	0.00000	0.00010	0.00050
38	0.00000	0.00000	0.00260	0.00000	0.00010	0.00053
39	0.00000	0.00000	0.00270	0.00000	0.00010	0.00056
40	0.00750	0.00750	0.00280	0.00000	0.00010	0.00059
41	0.00750	0.00750	0.00290	0.00000	0.00010	0.00062
42	0.00750	0.00750	0.00300	0.00000	0.00010	0.00067
43	0.00750	0.00750	0.00310	0.00000	0.00010	0.00071
44	0.00750	0.00750	0.00320	0.00000	0.00010	0.00076
45	0.00750	0.00750	0.00330	0.00000	0.00010	0.00082
46	0.00750	0.00750	0.00340	0.00000	0.00010	0.00088
47	0.00750	0.00750	0.00350	0.00000	0.00010	0.00095
48	0.00750	0.00750	0.00400	0.00000	0.00010	0.00102
49	0.00750	0.00750	0.00500	0.00000	0.00010	0.00111
50	0.02000	0.02000	0.00750	0.00000	0.00010	0.00120
51	0.02000	0.02000	0.00750	0.00000	0.00010	0.00129
52	0.02000	0.02000	0.00750	0.00000	0.00010	0.00140
53	0.03000	0.03000	0.02000	0.00000	0.00010	0.00151
54	0.15000	0.10000	0.02000	0.00000	0.00010	0.00162
55	0.26000	0.15000	0.07500	0.00000	0.00010	0.00175
56	0.17000	0.15000	0.07500	0.00000	0.00010	0.00190
57	0.17000	0.28000	0.10000	0.00000	0.00010	0.00205
58	0.17000	0.17000	0.10000	0.00000	0.00010	0.00223
59	0.27000	0.27000	0.10000	0.00000	0.00010	0.00243
60	0.27000	0.27000	0.10000	0.00000	0.00010	0.00264
61	0.25000	0.25000	0.05000	0.00000	0.00010	0.00288
62	0.25000	0.25000	0.05000	0.00000	0.00010	0.00315
63	0.25000	0.25000	0.05000	0.00000	0.00010	0.00344
64	0.25000	0.25000	0.05000	0.00000	0.00010	0.00375
65	1.00000	1.00000	0.00000	0.00000	0.00000	0.00410

Years of Service	Other Terminations
0	0.03500
1	0.02750
2	0.02000
3	0.01500
4	0.01200
5	0.01130
6	0.01070
7	0.01000
8	0.00920
9	0.00840
10	0.00760
11	0.00680
12	0.00600
13	0.00560
14	0.00520
15	0.00480
16	0.00440
17	0.00400
18	0.00360
19	0.00320
20	0.00280
21	0.00240
22	0.00200
23	0.00200
24	0.00200
25	0.00200
26	0.00200
27	0.00200
28	0.00200
29	0.00200
30 & Above	0.00000

Table A-13
Rate of Separation from Active Service for Safety Members
Plan A, B & C – Female

Age	Service Retirement Plans A-B	Service Retirement Plan C	Service Disability	Ordinary Disability	Service Death	Ordinary Death
18	0.00000	0.00000	0.00300	0.00000	0.00010	0.00014
19	0.00000	0.00000	0.00300	0.00000	0.00010	0.00015
20	0.00000	0.00000	0.00300	0.00000	0.00010	0.00016
21	0.00000	0.00000	0.00300	0.00000	0.00010	0.00017
22	0.00000	0.00000	0.00300	0.00000	0.00010	0.00017
23	0.00000	0.00000	0.00300	0.00000	0.00010	0.00018
24	0.00000	0.00000	0.00300	0.00000	0.00010	0.00019
25	0.00000	0.00000	0.00300	0.00000	0.00010	0.00020
26	0.00000	0.00000	0.00300	0.00000	0.00010	0.00021
27	0.00000	0.00000	0.00300	0.00000	0.00010	0.00022
28	0.00000	0.00000	0.00340	0.00000	0.00010	0.00024
29	0.00000	0.00000	0.00380	0.00000	0.00010	0.00025
30	0.00000	0.00000	0.00420	0.00000	0.00010	0.00027
31	0.00000	0.00000	0.00460	0.00000	0.00010	0.00028
32	0.00000	0.00000	0.00500	0.00000	0.00010	0.00030
33	0.00000	0.00000	0.00560	0.00000	0.00010	0.00032
34	0.00000	0.00000	0.00620	0.00000	0.00010	0.00034
35	0.00000	0.00000	0.00680	0.00000	0.00010	0.00036
36	0.00000	0.00000	0.00740	0.00000	0.00010	0.00038
37	0.00000	0.00000	0.00800	0.00000	0.00010	0.00041
38	0.00000	0.00000	0.00840	0.00000	0.00010	0.00043
39	0.00000	0.00000	0.00880	0.00000	0.00010	0.00046
40	0.00750	0.00750	0.00920	0.00000	0.00010	0.00049
41	0.00750	0.00750	0.00960	0.00000	0.00010	0.00052
42	0.00750	0.00750	0.01000	0.00000	0.00010	0.00056
43	0.00750	0.00750	0.01040	0.00000	0.00010	0.00059
44	0.00750	0.00750	0.01080	0.00000	0.00010	0.00063
45	0.00750	0.00750	0.01120	0.00000	0.00010	0.00067
46	0.00750	0.00750	0.01160	0.00000	0.00010	0.00071
47	0.00750	0.00750	0.01200	0.00000	0.00010	0.00076
48	0.00750	0.00750	0.01300	0.00000	0.00010	0.00080
49	0.00750	0.00750	0.01500	0.00000	0.00010	0.00085
50	0.02000	0.02000	0.01800	0.00000	0.00010	0.00091
51	0.02000	0.02000	0.02000	0.00000	0.00010	0.00097
52	0.02000	0.02000	0.02400	0.00000	0.00010	0.00103
53	0.03000	0.03000	0.02800	0.00000	0.00010	0.00109
54	0.15000	0.10000	0.03200	0.00000	0.00010	0.00116
55	0.26000	0.15000	0.11000	0.00000	0.00010	0.00123
56	0.17000	0.15000	0.06000	0.00000	0.00010	0.00131
57	0.17000	0.28000	0.06000	0.00000	0.00010	0.00140
58	0.17000	0.17000	0.06000	0.00000	0.00010	0.00148
59	0.27000	0.27000	0.06000	0.00000	0.00010	0.00158
60	0.27000	0.27000	0.06000	0.00000	0.00010	0.00168
61	0.25000	0.25000	0.06000	0.00000	0.00010	0.00178
62	0.25000	0.25000	0.06000	0.00000	0.00010	0.00190
63	0.25000	0.25000	0.06000	0.00000	0.00010	0.00202
64	0.25000	0.25000	0.06000	0.00000	0.00010	0.00215
65	1.00000	1.00000	0.00000	0.00000	0.00000	0.00228

Years of Service	Other Terminations
0	0.03500
1	0.02750
2	0.02000
3	0.01500
4	0.01200
5	0.01130
6	0.01070
7	0.01000
8	0.00920
9	0.00840
10	0.00760
11	0.00680
12	0.00600
13	0.00560
14	0.00520
15	0.00480
16	0.00440
17	0.00400
18	0.00360
19	0.00320
20	0.00280
21	0.00240
22	0.00200
23	0.00200
24	0.00200
25	0.00200
26	0.00200
27	0.00200
28	0.00200
29	0.00200
30 & Above	0.00000