Los Angeles County Employees Retirement Association

2022 Investigation of Experience
for Retirement Benefit Assumptions

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Issued January 6, 2023

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January 6, 2023

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 Trustees 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, 2022. 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, 2022.

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, 2021 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, 2021 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. The experience study results are dependent on the integrity of this information. If any of this information is inaccurate or incomplete, our determinations may 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.

The results for the estimated financial impact were developed using models employing standard actuarial techniques. We have reviewed the models, including their inputs, calculations, and outputs for consistency, reasonableness, and appropriateness to the intended purpose and in compliance with generally accepted actuarial practice and relevant actuarial standards of practice. Reliance on other experts is reflected in Milliman's capital market assumptions, and in Milliman's expected return model maintained by Milliman investment consultants.

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, investment, 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 which are consistent with the principles prescribed by the Actuarial Standards Board and the *Code of Professional Conduct and Qualification Standards for Actuaries Issuing Statements of Actuarial Opinion in the United States*, published by the American Academy of Actuaries. We are members of the American Academy of Actuaries and meet the Qualification Standards to render the actuarial opinion contained herein.

Milliman

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.

Sincerely,

Nick Collier, ASA, EA, MAAA
Consulting Actuary
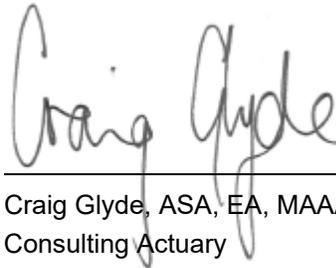
Craig Glyde, ASA, EA, MAAA
Consulting Actuary

laca1838 (Experience Study)

Table of Contents

1. Executive Summary and Recommendations

Milliman has performed the triennial investigation of experience for the period July 1, 2019 through June 30, 2022. Although new information is added to our investigation based on the study period, the analysis and accompanying recommendations encompass a longer period by reflecting results from prior investigations. This report contains the findings of this investigation and includes several recommended changes in assumptions.

Calculating appropriate 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 assumptions and actuarial methods. If adopted, these changes would have an effect on the member and employer contribution rates effective July 1, 2023. 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.

The triennial study period of July 1, 2019 to June 30, 2022 overlapped with the COVID pandemic which impacted the results for that three-year period. In particular, we observed more retiree deaths than predicted by the assumptions, and there were more terminations and service retirements than predicted by the assumptions. We believe both of these were related to the pandemic and are not indicative of long-term trends. Results for the triennial period were reviewed, but changes were only made if they were also supported by experience from prior studies or reflective of emerging best practice in assumption setting.

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 three changes in the actuarial methods used in the valuation.

1. Under LACERA's current amortization policy, annual changes in the Unfunded Actuarial Accrued Liability (UAAL) are funded over separate 20-year periods as a level percentage of payroll. These annual payments are referred to as "layers." This approach of amortizing the changes in the UAAL due to assumption changes and actuarial gains and losses over 20 years is consistent with actuarial guidance and is similar to other California retirement systems. We are recommending one modification to better comply with actuarial guidance. If there is an increase in the UAAL due to changes in the benefit provisions, we recommend the impact of that increase be amortized over a 10-year period.

2. 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. We recommend the funding policy be changed to exclude the STAR reserve from the Valuation Assets for consistency with the treatment of STAR benefits.

3. We believe that the current asset valuation method where actuarial asset 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 are recommending one modification which should result in slightly smoother employer contribution rates in the future. The modified method would still smooth asset gains and losses over 5 years; however, before smoothing is applied, the current year gain (or loss) is offset against prior losses (or gains), if any. In addition to smoother employer contribution rates, the offsetting method is expected to reduce the likelihood and magnitude of spikes or dips in employer contribution rates in most cases.

An update to the operating tables LACERA uses in the calculation of optional forms of payment will be needed to reflect any changes in the COLA, mortality, and investment return assumptions. Based on the recommended changes, the only change would be due to the update to the mortality projection scale.

New member contribution rates will be calculated based on the 2022 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 is expected to be increases in member rates in most cases under the proposed assumptions. Note that the actual member contribution rates cannot be determined until completion of the June 30, 2022 valuation.

Sample member contribution rates are shown in the following table. Note that all estimated member contribution rates also include the proposed demographic assumption changes and are the total member contribution rate (i.e., Normal + COLA).

| Entry Age | Member Contribution Rates[1] | | Estimated Monthly Increase | |
	Current	Estimated New	% of Pay	Average $[2]
General D				
25	6.95%	7.18%	0.23%	$ 19
35	8.56%	8.77%	0.21%	17
45	10.49%	10.63%	0.14%	11
General G				
All Ages	9.08%	9.18%	0.10%	6
Safety B				
25	12.61%	13.00%	0.39%	45
35	14.99%	15.13%	0.14%	16
45	17.83%	17.83%	0.00%	0
Safety C				
All Ages	14.33%	14.33%	0.00%	0

1. Final member contribution rates will not be determined until the June 30, 2022 actuarial valuation is completed.

2. Average increases are based on the estimated percent of pay increase and the average monthly compensation for active members of the specified plan.

Economic Assumptions

Section 4 discusses the economic assumptions: price inflation, general wage growth (which includes price inflation and productivity), payroll growth, investment return, and future retiree COLA increases. There have been significant changes in the economic environment since the last experience study; however, we believe the current assumptions remain appropriate and we are recommending no change.

Balancing both the current high price inflation and forecasts that are somewhat lower than the current assumption, we recommend the price inflation assumption remain at 2.75%. Related to the price inflation assumption, we also recommend the following.

- We recommend the 2.75% price inflation we applied both on a local basis (indirectly affecting general wage growth, payroll and COLA assumptions) and a national basis (indirectly affecting the investment return assumption).

- We recommend the wage inflation assumption remain equal to the local price inflation plus 0.5%, for a total of 3.25%, as there is a high correlation between price and wage inflation.

- We recommend no change in the assumed cost-of-living adjustment (COLA) for retiree benefits, which is equal to the price inflation assumption subject to plan maximum increases and COLA accumulation bank levels. Due to current COLA accumulation bank levels, the assumed COLA for Plan A retirees retired before April 1, 2022 is 3.0%. For other Plan A retirees the assumed COLA is equal to local price inflation. For all other plans the assumed COLA is 2.0% (with pro-rata adjustment based on pre-2002 service for General Plan E).

Based on the January 2022 capital market assumptions, there was less than a 50% probability that the current investment return of 7.0% would be met over the next 10 to 20 years; however, recent changes in the economic environment have increased the expected return as of July 2022 to at or above the 7.0% return. Considering both the January and July 2022 expected returns, we are recommending retaining the investment return assumption of 7.0%.

The following table shows our recommended economic assumptions which are equal to the current assumption.

Assumption	Current = Proposed
Investment Return[1]	7.00%
National Price Inflation	2.75%
Local Price Inflation	2.75%
Wage Growth	3.25%
Payroll Growth	3.25%
COLAs for Retirees (Plan A / Other Plans)[2]	2.75% / 2.00%

1. Net of both investment and administration expenses. For GASB financial reporting, the recommended investment return assumption is 0.15% 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 accumulation balances, retirees and beneficiaries with a retirement date prior to April 1, 2022 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 reflect 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. This approach is consistent with the previous experience study.

Merit Salary Increases

Section 5 discusses the individual salary increases due to promotion and longevity – the merit component of salaries. Merit salary increases were generally higher than the assumed increases. We are recommending increases in the assumption for both General and Safety members at most service levels to reflect actual experience.

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. This experience is likely at least partially related to the pandemic, and as a consequence we are recommending no update to the base mortality tables, nor the plan and gender-specific adjustment factors applied to those base rates. However, we are recommending an update to the mortality improvement scale from the ultimate rate of MP-2014 to the ultimate rate of MP-2021. MP-2021 is the most recent mortality improvement scale published by the Society of Actuaries (SOA) and we believe it is appropriate to use in the valuation of LACERA. This change will result in lower mortality rates for most active members.

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 and service level. The results of our study showed actual retirement rates, weighted by compensation, that were approximately 25% higher than those expected by the assumptions. As noted above, we believe a portion of these extra retirements is related to the pandemic and not necessarily indicative of a long-term trend. As such, our recommendation will not reflect this experience to the extent it is not supported by the experience from earlier study periods.

Historically, rates of retirement have been analyzed based on a members's age and membership class. We have observed that rates of retirement also vary based on a member's years of service. That is, a member age 60 with 30 years of service is more likely to retire than a member age 60 with 10 years of service.

Based on the above, we are recommending modest adjustments to the age-based service retirement rates, and the addition of service-based adjustment factors to reflect different rates of retirement for similarly aged members with a different number of years of service. These revisions are projected to provide a better estimate of liabilities and cashflows.

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).

Service Retirement Rates – All Plans
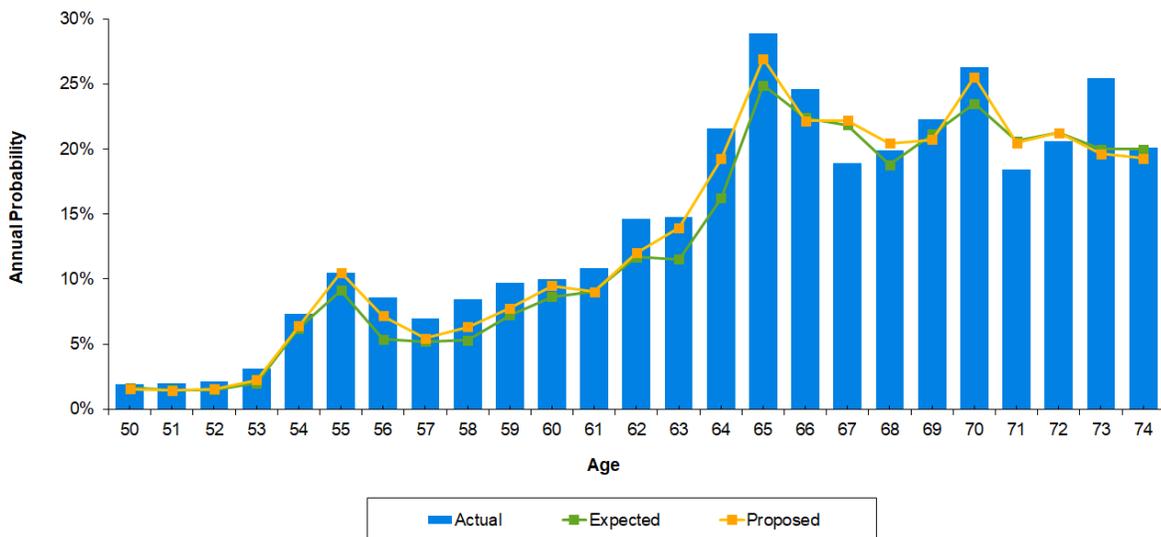
Disability Retirement

Section 8 discusses the probability of an active member becoming disabled. We studied both service-connected disability and nonservice-connected disability.

We have found that in many systems, including LACERA, there is generally at least a six-month lag between the actual occurrence of a disability retirement and the subsequent approval and reporting of that same retirement, which can lead to underreporting of disability retirements. After accounting for this reporting lag, the actual number of disability retirements, specifically service-connected disability retirements, is higher than expected by

the assumptions. As a portion of these disability retirements could be due to the pandemic, we are recommending no change to the disability retirement assumptions. However, if this experience continues over the next study period we will likely recommend changes to these assumptions.

Termination

Section 9 summarizes the results of our study of terminations of employment for reasons other than death, service retirement, or disability. As used in the actuarial valuation, termination rates refer to both voluntary and involuntary terminations of employment.

The results of our study showed actual termination rates, weighted by compensation, that were approximately 50% higher than those expected by the assumptions. As noted above, we believe a portion of these extra terminations is related to the pandemic and not necessarily indicative of a long-term trend. As such, our recommendation will not reflect this experience to the extent it is not supported by the experience from earlier study periods.

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

Termination from Employment Rates – All Plans
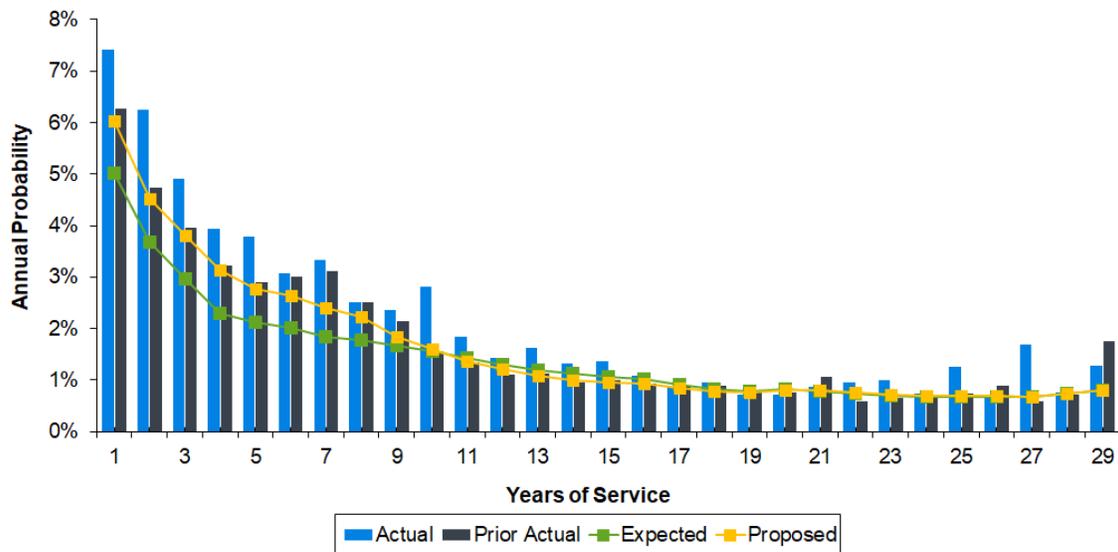
For General Plan D and G members we are recommending increases to the termination rates at service less than 10 years, and small decreases between 10 and 20 years of service. We are also recommending minor changes for Safety and General Plan E members.

Probability of Refund

In Section 10, we report the actual number of vested members electing a refund upon termination was 92% of the expected number. We are recommending small reductions in this assumption for General members 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 approximately 7% more deaths than the assumptions predicted. Since retirees with larger-than-average benefits tend to have lower mortality than those with smaller-than-average benefits we reflect the impact of benefit amounts by weighting the results based on the benefit amount. This approach is consistent with the prior experience study.

Although we observed more deaths than expected, it can be assumed that a portion of these "excess deaths" were related to the pandemic, and may not be expected to be part of a long-term trend. As a consequence we are recommending no update to the base mortality tables, nor the plan and gender-specific adjustment factors applied to those base rates. However, we are recommending an update to the mortality improvement scale from the ultimate rate of MP-2014 to the ultimate rate of MP-2021. MP-2021 is the most recent mortality improvement published by the Society of Actuaries (SOA) and we believe it is appropriate to use in the valuation of LACERA. This change will result in higher mortality rates (and shorter life expectancy) for most retired members.

Additional details are provided in Section 11.

Miscellaneous Assumptions

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

- Modifying the assumption that a female member will have an eligible survivor at retirement who is eligible for the unreduced continuance benefit from a 50% probability to a 48% probability.

- Changing the assumption that an active male's beneficiary is 4 years younger to 3 years younger.

- Updating the current assumption for the probability of a deferred vested member establishing reciprocity and retiring with another system – from 16% to 17% for General members and from 35% to 36% for Safety members.

Summary of Recommendations

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

Assumption	Recommendation
Actuarial Methods	Exclude STAR Reserve from Valuation Assets.
	Amortize benefit changes / improvements that increase UAAL over 10 years.
	Modify the asset valuation method to include an offsetting of gains and losses prior to applying asset smoothing.
Other Actuarial Methods	Update operating tables used in the calculation of optional forms of payment to include recommended changes.
Economic	

Assumption	Current = Proposed
Investment Return	7.00%
National Price Inflation	2.75%
Local Price Inflation	2.75%
Wage Growth	3.25%
Payroll Growth	3.25%
COLAs for Retirees (Plan A / Other Plans)	2.75% / 2.00%

Assumption	Recommendation
Merit Salary Increase	Increases, particularly at longer service durations.
Death While Active	Update mortality improvement scale to ultimate rates of MP-2021.
Service Retirement	Change to reflect the impact of a member's service on retirement probabilities.
Disability Retirement	No change.
Termination	Increases in rates at lower levels of service, primarily for General members.
Probability of Refund	Small reductions.
Retiree Mortality	Update mortality improvement scale to ultimate rates of MP-2021.
Miscellaneous	Minor changes.

Estimated Financial Impact

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 cost of any retirement system is based on the benefits provided by employers, and the actual experience of the system.

The financial impact was evaluated by performing additional valuations with the June 30, 2021 valuation data and benefits, and reflecting the proposed assumption changes. This allows us to evaluate the relative financial impact of the various proposed changes; however, it should be noted that these are just estimates and the actual impact may vary when the June 30, 2022 valuation is completed. We have projected these results forward to June 30, 2022. Note that the impact of the various assumption changes by component is somewhat dependent on the order in which they are evaluated.

Projected Results of June 30, 2022 Valuation
With Proposed Assumptions

	Funded Ratio	Total Employer Contribution	
		% of Payroll	$ millions
June 30, 2021 Valuation	**79.3%**	**24.5%**	**$ 2,205**
Estimated June 30, 2022 Valuation (before changes)	**81.0%**	**24.2%**	**$ 2,178**
Recommended Actuarial Method Changes			
Alternate Asset Smoothing	0.0%	0.2%	$ 18
Exclude STAR Reserve from Funding Assets	-0.5%	0.5%	44
Total Method Changes	**-0.5%**	**0.7%**	**$ 62**
Recommended Economic Assumption Changes			
Economic Assumptions	**0.0%**	**0.0%**	**$ -**
Recommended Demographic Assumption Changes			
Merit Salary Increases	-0.5%	0.7%	$ 62
Service Retirement	-0.9%	1.1%	98
Mortality	0.5%	-0.6%	(52)
Other	0.1%	-0.2%	(15)
Demographic Assumption Changes	**-0.8%**	**1.0%**	**$ 93**
Recommended Changes			
Total Recommended Changes	**-1.3%**	**1.7%**	**$ 155**
Estimated June 30, 2022 Valuation (with all changes)	**79.7%**	**25.9%**	**$ 2,333**

1. Impact estimated based on June 30, 2021 actuarial valuation. New assumptions will be implemented with the June 30, 2022 actuarial valuation and affect contribution rates effective July 1, 2023, so actual results will vary.

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.

Conclusion

We recommend that the Board adopt the proposed actuarial assumptions and methods shown in Appendix A. We believe these assumptions reasonably reflect future expectations.

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 evaluations 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.

A higher investment return assumption will tend to result in 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 consider 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 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, 2021. They may also be referred to as the "current" assumptions. The current assumptions and methods were adopted by the Board based on Milliman's 2019 experience study. The "proposed" or "recommended" assumptions are those we recommend for use in the valuation as of June 30, 2022 and for subsequent valuations until further changes are made.

The choice of economic assumptions (price inflation, investment return, general wage growth, payroll growth, and retiree 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.

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. 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 on an age-by-age basis. The current assumptions – the "expected" rates – used in the June 30, 2021 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 proposed rate line is shown. On most graphs, we have also shown the actual results from the prior study period for comparison.

Actuarial Standard of Practice No. 27: Selection of Economic Assumptions for Measuring Pension Obligations

Actuarial Standard of Practice No. 27 (ASOP 27) 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 27.

Actuarial Standard of Practice No. 35: Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations

Actuarial Standard of Practice No. 35 (ASOP 35) governs the selection of demographic and other non-economic assumptions for measuring pension obligations. ASOP 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 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 35.

Actuarial Standard of Practice No. 44: Selection and Use of Asset Valuation Methods for Pension Valuations

Actuarial Standard of Practice No. 44 (ASOP 44) governs the selection of asset valuation methods. For plans using an asset smoothing method, considerations include: 1) whether actuarial investment gains and losses are recognized over a reasonable period of time; 2) whether there is any significant bias toward the smoothed value overstating or understating compared to the market value; and 3) whether realized and unrealized actuarial investment gains and losses are treated similarly. In our opinion, the asset valuation method recommended in this report has been developed in accordance with ASOP 44.

3. Actuarial Methods

As part of the triennial investigation, we have reviewed the valuation methods and other issues related to the actuarial assumptions. Actuarial Standard of Practice No. 4 (ASOP 4), *Measuring Pension Obligations and Determining Pension Plan Costs or Contributions*, provides guidance to actuaries giving advice on selecting actuarial methods for defined benefit plans. Actuarial Standard of Practice No. 44 (ASOP 44), *Selection and Use of Asset Valuation Methods for Pension Valuations,* provides guidance on methods for recognizing investment gains and losses through the asset valuation method. As part of the current experience study, we reviewed the valuation methods and other issues related to the actuarial assumptions in the context of these ASOPs. This section contains a discussion of actuarial cost methods, the valuation of assets, and other miscellaneous assumptions used in the valuation.

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 (used by about 90% of large public retirement systems), as it results in more stability in normal costs and provides a level allocation of costs as a percentage of pay over each individual's working lifetime. The entry age actuarial cost method satisfies the requirements of ASOP 4 for cost methods.

Valuation Assets

We believe that the current asset valuation method where actuarial asset 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 are recommending one modification which should result in slightly smoother employer contribution rates in the future:

> To the extent that there is a loss for the year and there are unrecognized gains from previous years, or to the extent that there is a gain for the year and there are unrecognized losses from previous years, the gain or loss for the year shall be used to offset unrecognized gains or losses from previous years in the order of oldest to most recent. Any remaining gain or loss for the year is recognized over a five-year period.

Based on our analysis, the addition of the offsetting should result in slightly smoother employer contribution rates. As an example, if LACERA's returns for the last 25 years were to repeat over the next 25 years and all other assumptions are met, we see a slightly smoother employer contribution rate pattern under the offsetting method (green lines) than under the current method without offsetting (blue lines).
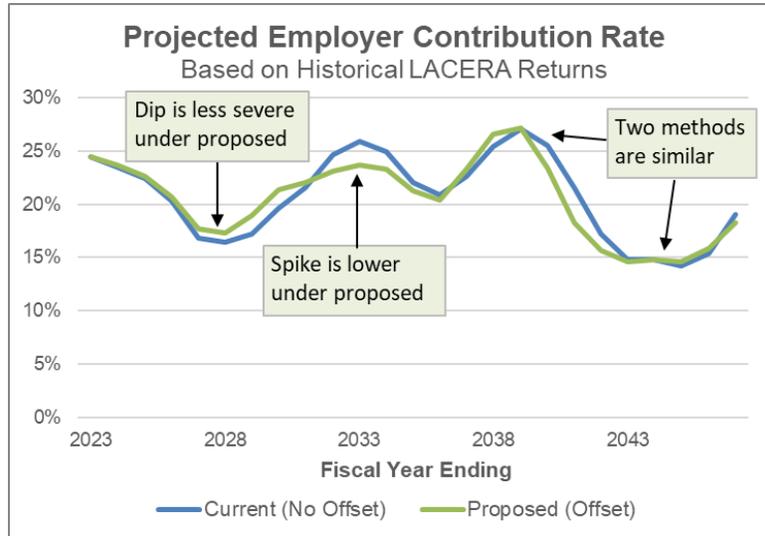
The proposed asset valuation method satisfies the requirements of ASOP 44 that discusses the selection of asset valuation methods.

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). We do not believe the addition of the offsetting of asset gains and losses would change this.The main difference between LACERA's method and the method described in the "Model Practices" is that the model practice 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 Actuarial 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.

Amortization of UAAL

Under LACERA's current amortization policy, annual changes in the Unfunded Actuarial Accrued Liability (UAAL) are funded over separate 20-year periods as a level percentage of payroll. These annual payments are referred to as "layers." This approach of amortizing the changes in the UAAL due to assumption changes and actuarial gains and losses over 20 years is consistent with actuarial guidance and similar to other California retirement systems.

We are recommending one modification to better comply with actuarial guidance. If there is an increase in the UAAL due to changes in the benefit provisions, we recommend the impact of the increase be amortized over a 10-year period.

Treatment of STAR Reserve

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. We recommend the valuation be changed to exclude the STAR reserve from the Valuation Assets for consistency with the treatment of STAR benefits.

Administrative Expense Treatment

Expenses are reflected in the valuation either implicitly or explicitly. Under the implicit method, an adjustment is made to the investment return assumption to reflect that administrative expenses are paid from investment earnings. Under the explicit method, the member and/or employer contribution rates are loaded by a percentage or amount to estimate the administrative expenses for the coming year. LACERA uses the implicit method. We believe this method is appropriate for LACERA and recommend continued usage.

Operating Tables

We are recommending a change in mortality projection assumption. If this change is adopted, the operating tables should be updated to reflect the change.

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 37% of the total present value of benefits for current General members and 85% for current Safety members, compared to 33% and 86% respectively in the prior study.

    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 (no change).

- **Assumed Retirement Year:** Since a generational mortality assumption is complex administratively to apply for operating tables, we recommend a static projection of mortality rates be used instead. To generate the static mortality table we recommend using the average retirement age of General (age 64) and Safety members (age 56) and project the base mortality table rate to 2026 for that age. Mortality rates at all other ages would then be projected to the corresponding year based on the average retirement age in 2026. For example, age 64 is the average retirement age for General members, so the mortality base table rate for age 64 is projected to 2026. The mortality rate at age 74 (10 years from age 64) would then be the base table rate for age 74 projected an additional 10 years to 2036. Note that we recommend that the projected mortality rates be limited such that the rates not be greater than the corresponding base mortality rate.

- ▪ **Retirement Type:** LACERA uses healthy mortality (i.e., the mortality table used for service retirees) in cases where a member retires 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. 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	Estimated Member Contribution Rates[1]		Estimated Monthly Increase	
	Current	Estimated New	% of Pay	Average $[2]
General D				
25	6.95%	7.18%	0.23%	$ 19
35	8.56%	8.77%	0.21%	17
45	10.49%	10.63%	0.14%	11
General G				
All Ages	9.08%	9.18%	0.10%	6
Safety B				
25	12.61%	13.00%	0.39%	45
35	14.99%	15.13%	0.14%	16
45	17.83%	17.83%	0.00%	0
Safety C				
All Ages	14.33%	14.33%	0.00%	0

1. Final member contribution rates will not be determined until the COLA portion is calculated in the June 30, 2022 actuarial valuation.

2. Average increases are based on the estimated percent of pay increase and the average monthly compensation for active members of the specified plan.

4. Economic Assumptions

Actuarial Standard of Practice (ASOP) 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 no changes in these assumptions. We believe this set of assumptions satisfies ASOP 27.

The following table shows the current economic assumptions which is also our recommendation.

Assumption	Current = Proposed
Investment Return[1]	7.00%
National Price Inflation	2.75%
Local Price Inflation	2.75%
Wage Growth	3.25%
Payroll Growth	3.25%
COLAs for Retirees (Plan A / Other Plans)[2]	2.75% / 2.00%

1. Net of both investment and administration expenses. For GASB financial reporting, the recommended investment return assumption is 0.15% 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, 2022 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, both on a local and national basis. The national inflation assumption has an indirect impact on the results of the actuarial valuation through the development of the investment return assumption. The local price inflation affects the general wage increases and the payroll increase assumption. The price inflation assumptions do not have a direct impact on the valuation results, except where it affects the assumed COLA to be paid (local inflation) and the assumed increase in the PEPRA wage limit (national inflation).

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 national 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 both local and national inflation is 2.75% per year. Our recommendation is to retain the assumption.

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 2021. 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% on both a local and national basis.

	CPI Increase	
Decade	**National**	**Local**
2012-2021	2.1%	2.6%
2002-2011	2.5%	2.7%
1992-2001	2.5%	2.2%
1982-1991	3.9%	4.1%
1972-1981	8.6%	8.9%
Prior 50 Years		
1972-2021	3.9%	4.1%

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. There have been differences between U.S. and Los Angeles-area CPI changes over time. For the 50-year period from 1972 to 2021 the CPI increase for the Los Angeles area has been on average 0.17% higher than national inflation.

The following graph shows historical CPI increases. The national CPI increase has generally been less than 2.75% over the last 10 years of the period, with 2021 being a notable exception. Also shown for comparison are CPI increases specific to the Los Angeles area, which has exceeded national CPI by about 0.10% on average over the 30-year period shown.

Historical Inflation

Legend: US CPI-U — L.A. CPI — Flat 2.75%
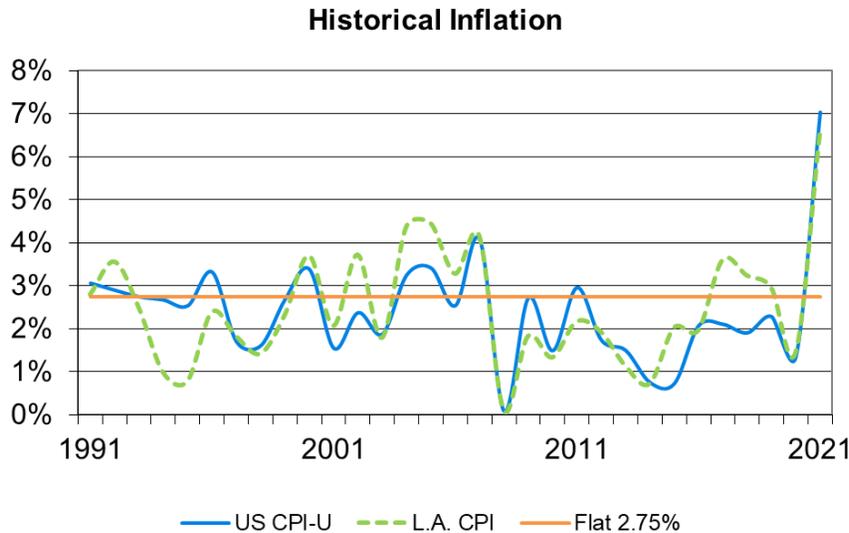
Forecasts of Inflation

Since 2020, national and local CPI have exceeded the assumed 2.75%, and most forecasts are for this to continue in the near term. Over the longer term, CPI is expected to decline as the Federal Reserve has a stated goal of inflation closer to 2.0%. However, it is uncertain over what time period that will occur and what inflation level will be reached. Most long-term forecasts of national inflation are lower than 2.75% although they have increased in response to economic conditions, and many investment consultants' 10-year estimate of average annual inflation is higher than their 20-year estimate.

Since the U.S. Treasury started issuing inflation indexed bonds (TIPS), 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 2022 suggest investors expect inflation to be 2.74% over the next 20 years and 2.46% over the next 30 years. Most long-term forecasts of future price inflation by economists and investment professionals are lower than 2.75%, although they are generally greater than 2.0%.

Additionally, we reviewed the expected increase in the CPI by the Office of the Chief Actuary for the Social Security Administration. In the 2022 Trustees Report, the projected average annual increase in the CPI over the next 75 years under the intermediate cost assumptions was 2.40%.

This work product was prepared solely for LACERA for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

19

Recommendation

We considered both the current high inflationary environment and long-term forecasts that are generally lower than the current 2.75% assumption. We recommend leaving the local and national inflation assumptions at 2.75%, which is consistent with the implied inflation from TIPS over the next 20 years.

Consumer Price Inflation (Local and National)	
Current Assumption	2.75%
Recommended Assumption	2.75%

2.   Wage and Payroll 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 1972.

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 2021. 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
2012-2021	3.2%	2.1%	1.1%
2002-2011	2.7%	2.5%	0.2%
1992-2001	4.2%	2.5%	1.7%
1982-1991	4.7%	3.9%	0.8%
1972-1981	7.8%	8.6%	-0.8%
Prior 50 Years			
1972-2021	4.5%	3.9%	0.6%

LACERA-Specific Experience

We reviewed the increase in the average compensation for LACERA members since 1989. Over that period, the average compensation increased by 3.19% annually, compared to a 2.61% average annual increase in inflation. Therefore, for LACERA members only, we estimate real wage inflation has averaged 0.58% (3.19% less 2.61%) 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 2022 Trustees Report, the ultimate long-term annual increase in the National Average Wage is estimated to be 1.15% higher than the Social Security intermediate inflation assumption of 2.4% 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, with the last 10 year's real wage inflation exceeding the assumption. 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 local price inflation assumption and the real wage inflation rate. If the real wage inflation assumption remains at 0.50% and the local price inflation assumption is set at 2.75%, this would result in a total wage growth assumption 3.25%.

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 (or decrease) 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 the active population is projected to decline or there is projected to be a material change in the make-up of the population. Over the past 20 years LACERA has experienced an overall increase in its active population, and we believe it is reasonable to assume the active population will remain at approximately the current level. We are not aware of any expected changes in the make-up of the population (such as an increased proportion of lower paid employees) that would materially affect the payroll. Therefore, 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 7.00% per year, net of all administrative and investment-related expenses.

January 2022 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, 2022 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	32%
Private Equity	17%
Non-Core Private Real Estate	4%
Liquid Credit	4%
Illiquid Credit	7%
Core / Value-Add Real Estate	6%
Natural Resources / Commodities	3%
Custom Infrastructure	5%
TIPs	3%
Investment Grade Bonds	7%
Custom Hedge Funds	6%
Long-Term Government Bonds	5%
Cash Equivalents	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.

2022 Beginning of Year	Meketa	Milliman	Horizon
Based on 10-Year Assumptions			
Median Annualized Return	**5.6%**	**5.8%**	**6.4%**
Assumed Inflation	2.2%	2.4%	2.5%
Based on 20-Year Assumptions			
Median Annualized Return	**6.6%**	**6.6%**	**7.0%**
Assumed Inflation	2.2%	2.3%	2.4%

Notes:

1. Returns are net of assumed expenses of 0.20% 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, Milliman'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.

July 2022 Expected Long-Term Investment Return

The capital market assumptions used in the previous calculation of the expected return were as of January 2022 (or the end of 2021). Subsequent to those capital market assumptions being determined, there has been a significant increase in yields on fixed income and a decrease in the price-to-earnings ratio. Both Milliman and Meketa issued mid-year updates to their capital market assumptions that reflected this changing environment.

Mid-Year Update 2022	Meketa	Milliman	Horizon
Based on 10-Year Assumptions			
Median Annualized Return	**7.3%**	**6.9%**	Not
Assumed Inflation	2.1%	2.5%	Available
Based on 20-Year Assumptions			
Median Annualized Return	**7.8%**	**7.3%**	Not
Assumed Inflation	2.1%	2.4%	Available

Notes:

1. Returns are net of assumed expenses of 0.20% of assets.
2. The Horizon Survey is annual, so no mid-year update is available.

The mid-year update reflects a significant increase in the expected return as compared to the beginning-of-year forecasts.

Relationship Between Inflation and Investment Return Assumptions

The real return is the investment return that can be achieved above national price inflation. For example, Milliman's 10-year expected return reflecting the mid-year update of capital market assumptions is 6.9% with a underlying price inflation assumed to be 2.5%. Therefore, using a building block approach, the real return is 4.4% (6.9% less 2.5%). In theory, if actual inflation is consistent with the proposed assumption of 2.75%, the expected return would by 0.25% higher at 7.15% (4.4% real return plus 2.75% inflation). However, if inflation is higher than the underlying assumption there is generally an offsetting impact in the short-term as higher inflation generally results in lower fixed income values. Therefore, we have considered the difference in the inflation assumptions in our analysis, but our primary consideration is on the nominal investment return when making our recommendations.

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 net return could at least match the index return. Additionally, we adjust for other investment-related expenses, such as custodian bank fees 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 beginning asset balance at fair market value.

($million) Year Beginning	Beginning Market Assets	Admin. Expense Amount	Ratio
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	78	0.15
2018	56,300	83	0.15
2019	58,295	85	0.15
2020	58,510	91	0.16
2021	73,012	100	0.14

For the administrative expenses, we have assumed a small increase in the assumption to 0.15% of market assets (from 0.13%), as the actual ratio has averaged 0.15% 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 0.20% in our calculation of the expected return. For example, Meketa calculated a 7.5% 10-year expected return based on the mid-year update; we have used 7.3% in our analysis, reflecting this 0.20% 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 7.0%, so LACERA would need to earn a gross return on its assets of 7.2% in order to net the 7.0% for funding purposes.

We recommend the 0.15% 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 net of 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 2022 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 2025 as part of the 2025 experience 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 7.0%. The following chart shows a progression of the distribution of the investment return assumptions. In 2001, very few systems had an assumption of 7.0% or lower and over 80% had an assumption of 8.0% or greater. As of fiscal year 2022, over 70% have an assumption of 7.0% or lower.

Distribution of Investment Return Assumptions, FY 01 to present
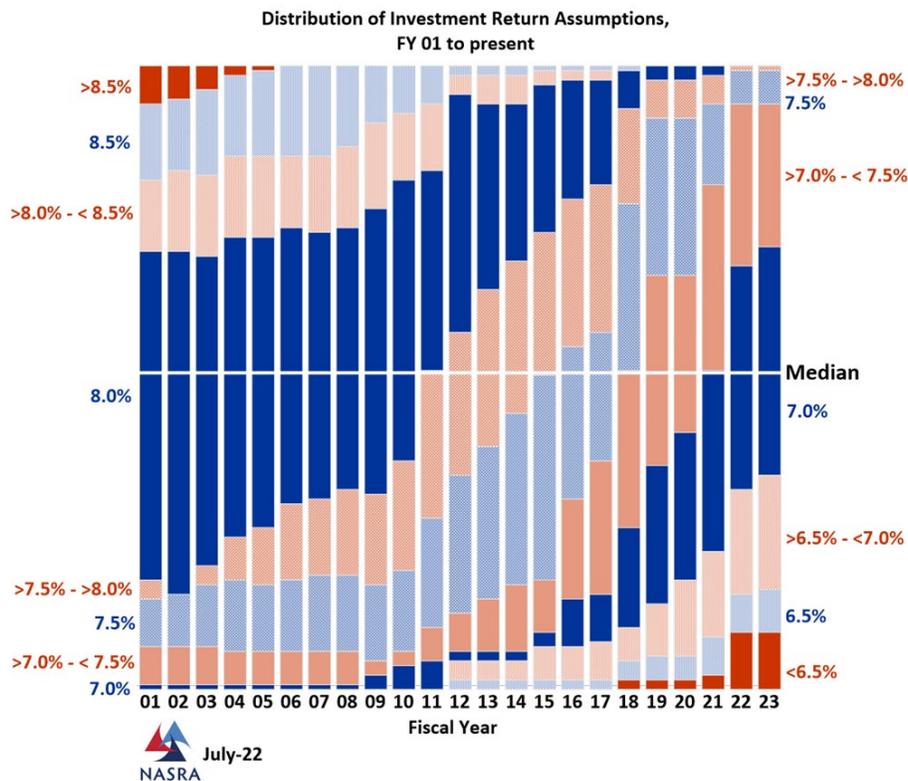
Conclusion

Based on the January 2022 capital market assumptions, there was less than a 50% probability that the current investment return of 7.0% would be met over the next 10 to 20 years; however, recent changes in the economic environment have increased the expected return as of July 2022 to at or above the 7.0% return. Considering both the January and July 2022 expected returns, we are recommending retaining the investment return assumption of 7.0%.

Investment Return (net of all expenses)	
Current assumption	7.0%
Recommended Assumption	7.0%

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

The current assumption is that retiree COLAs will be equal to price inflation subject to plan maximum increases and COLA accumulation bank levels. Due to current COLA accumulation bank levels, the assumed COLA for Plan A retirees retired before April 1, 2022 is 3.0%. For other Plan A retirees the assumed COLA is equal to local price inflation. For all other plans the assumed COLA is 2.0% (with pro-rata adjustment based on pre-2002 service for General Plan E). We recommend this assumption be continued.

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 larger salary increases than General members, particularly later in their career. Similar to prior experience studies, we observed that Safety members received significantly larger merit increases at certain service levels (19, 24 and 29 years of service), consistent with the 2018 contract for deputy sheriffs which includes longevity pay increases at those service levels. Other than those service levels, we observed higher than assumed increases in most service levels. We observed a similar trend for General members with the observed increases exceeding the assumption, primarily at 9 or more years of service.

Methodology

In studying merit increases, we first calculated the increase in member salaries that was due to general wage growth. We then remove this from the total salary increase actually observed for each individual in successive years. The remaining portion of salary increase is the merit increase.

There can be significant year-to-year variations in the calculated general wage growth, and this can lead to disparities in the observed merit salary increases. To reduce these variations, we use a 15-year period in our studies of merit salary increases. We also reviewed the results for the prior two study periods (2016 to 2022) to identify any trends. In general, the merit increases over the last six years have been higher than the 15-year average; however, given the variations that can occur over shorter timeframes, we relied on the 15-year analysis in making our recommendations.

Recommendation

For General members, merit salary increases were higher than assumed for members at all service intervals. We recommend increases in the merit salary increase assumption for General members at service levels of 9 years and higher to better reflect this experience. At shorter service levels we believe the current assumption remains reasonable.

For Safety members, the main observation was that merit salary increases were higher than assumed for members with longer service. At some shorter service levels we observed smaller merit salary increases than assumed. We recommend decreases in the merit salary increase assumption at service years 2 to 5 and increases at most service levels starting at 7 years of service. The recommended rates are shown numerically in Appendix A.

Exhibit 5-1
Salary Increases by Service – General Members
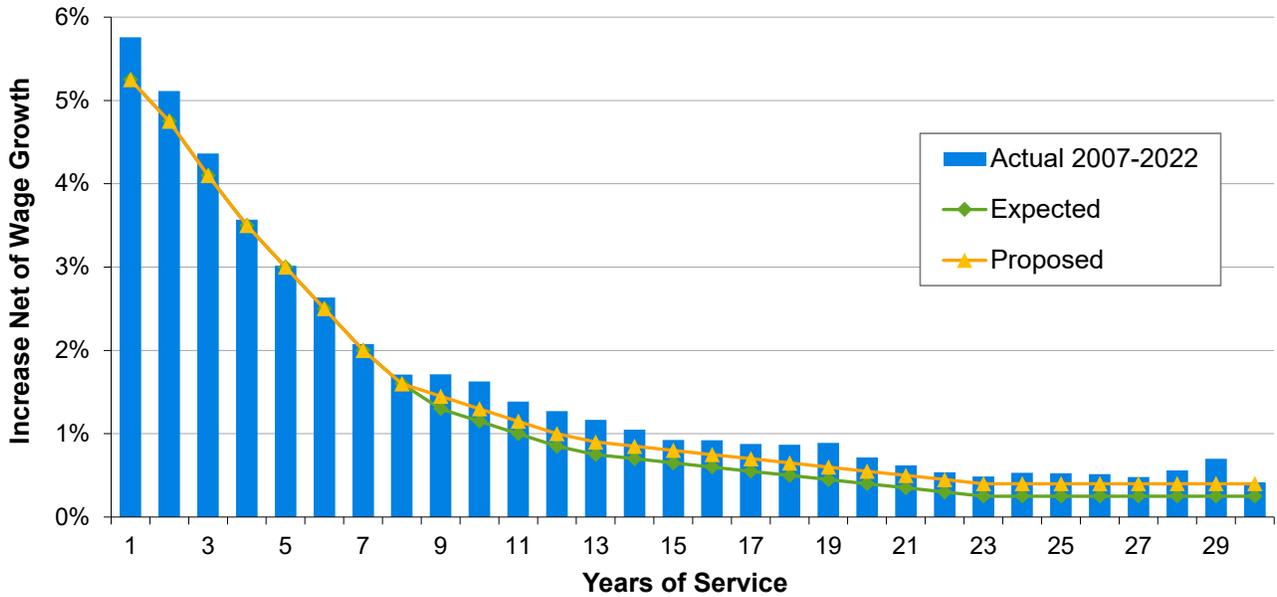
Exhibit 5-2
Salary Increases by Service – Safety Members
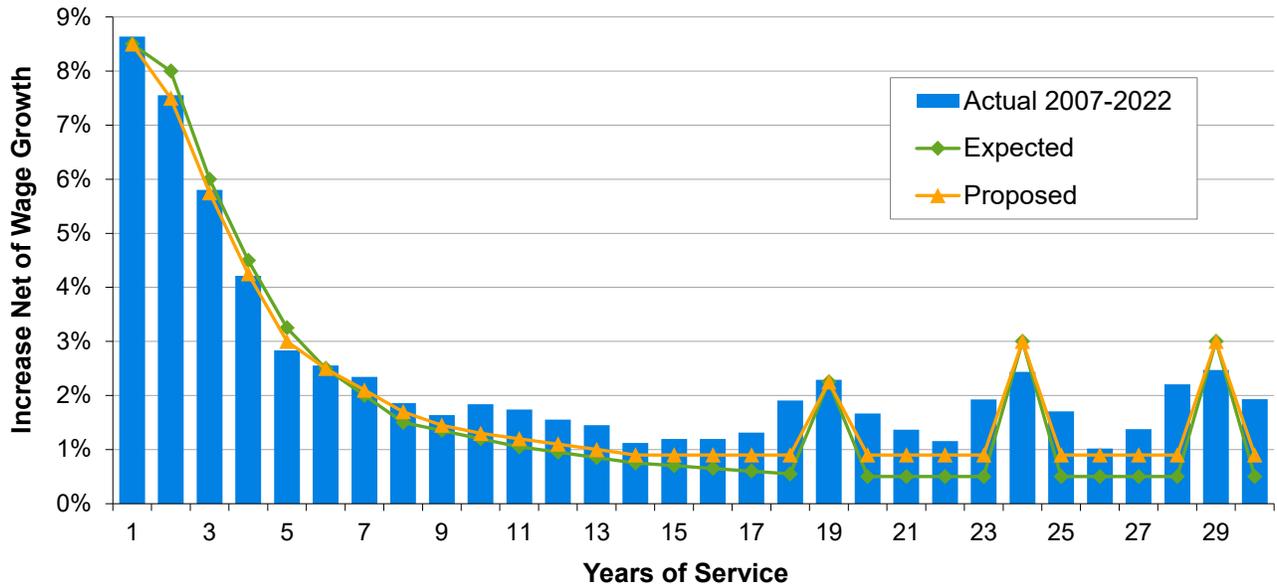
6. Death from Active Status

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 table below shows a comparison of the actual-to-expected deaths of active members by plan and gender for this study period, weighted by compensation. The study period of July 1, 2019 to June 30, 2022 significantly overlaps with the COVID-19 pandemic and this likely at least partially explains the higher number of deaths compared to expected, and the elevated levels of active mortality over this period may not reasonably be expected to continue.

We are recommending no changes to the mortality base tables underlying the ordinary death assumption. However, we recommend reflecting a more recent mortality improvement projection scale. A mortality improvement scale projects the expected changes in mortality over time to reflect that a member aged 35, for example, is expected to experience different rates of mortality, and have a different life expectancy, than a member aged 35 in a future year. The recommended assumptions are discussed on the following page.

Active mortality (weighted by compensation)						
Plan	**Gender**	**Actual**	**Expected**	**Actual / Expected**	**Proposed**	**Actual / Proposed**
General A-D & G[1]	Male	18,591,084	15,063,572	123%	15,126,926	123%
General A-D & G[1]	Female	19,611,792	16,730,379	117%	16,573,807	118%
Safety	Male	4,980,936	3,619,542	138%	3,531,029	141%
Safety	Female	507,456	384,892	132%	371,072	137%
	Total	**43,691,268**	**35,798,385**	**122%**	**35,602,834**	**123%**

1. Note that Plan E has been excluded from this study, as we believe that these deaths may be 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 while in active status than General members. 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.

Projection Scale for Mortality Improvement

The Society of Actuaries (SOA) publishes mortality improvement scales on a regular basis, typically annually. These improvement scales are a complex matrix of rates that vary based on a member's age and birth year. The scales include projections for past and future years until reaching an "ultimate" rate of improvement for individual ages at a future year.

In 2016 LACERA adopted the ultimate rates of the MP-2014 mortality improvement scale for the 2016 and future valuations. In subsequent iterations of the mortality improvement scales the ultimate rate of improvement remained unchanged, until the release of MP-2020 in the fall of 2020. An updated projection scale (MP-2021) was issued last year with similar ultimate rates. MP-2021, like MP-2020, relies heavily on Social Security experience for years 1958 through 2018. Compared to the ultimate rates of MP-2014, the ultimate rates of MP-2021 assume larger mortality improvements at ages less than 83 (i.e fewer deaths at each year of age) and smaller mortality improvements at ages 83 and higher (i.e. more deaths at each year of age).

Recommendation

Based on results of the study, we are recommending no change to the mortality base tables. To reflect future increases in life expectancies and the most recently available published data, we are also recommending updating the mortality improvement projection scale from MP-2014 ultimate to MP-2021 ultimate. A summary of the active mortality assumption (current and proposed) is shown below:

Class	Gender	Current Table[1]	Proposed Table[1]
General	Male	PubG-2010 (120%) Male with MP-2014 Ultimate projection scale	PubG-2010 (120%) Male with MP-2021 Ultimate projection scale
General	Female	PubG-2010 (130%) Female with MP-2014 Ultimate projection scale	PubG-2010 (130%) Female with MP-2021 Ultimate projection scale
Safety	Male	PubS-2010 (100%) Male with MP-2014 Ultimate projection scale	PubS-2010 (100%) Male with MP-2021 Ultimate projection scale
Safety	Female	PubS-2010 (100%) Female with MP-2014 Ultimate projection scale	PubS-2010 (100%) Female with MP-2021 Ultimate projection scale

> 1. All tables are the Pub-2010 Employee mortality tables for General and Safety members.

See Section 11 (Retiree Mortality) for additional discussion about mortality improvement.

Exhibit 6-1
Nonservice-Connected Death – General A-D & G Male Members
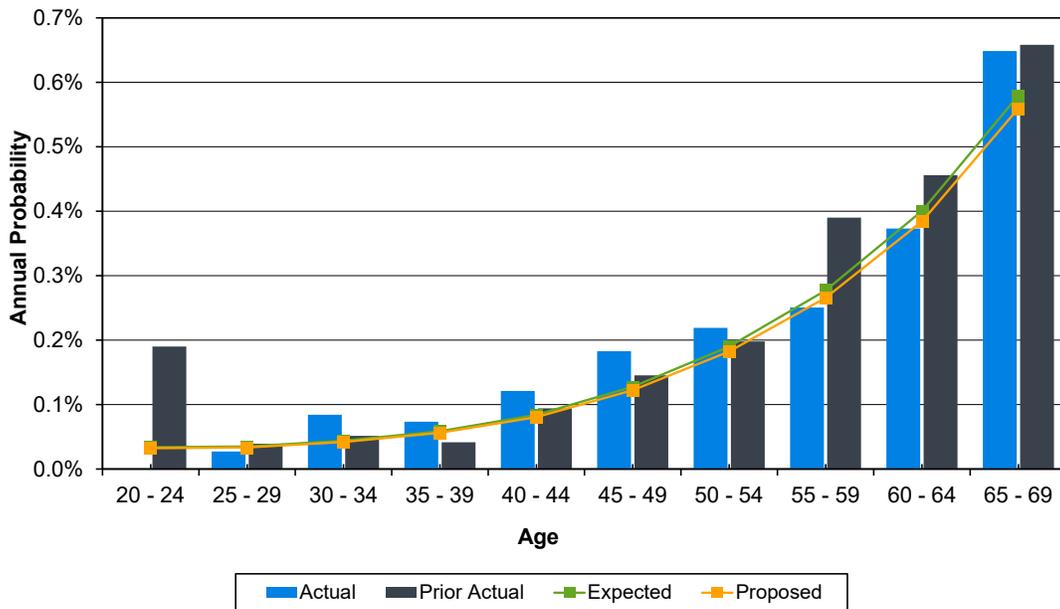
Exhibit 6-2
Nonservice-Connected Death – General A-D & G Female Members
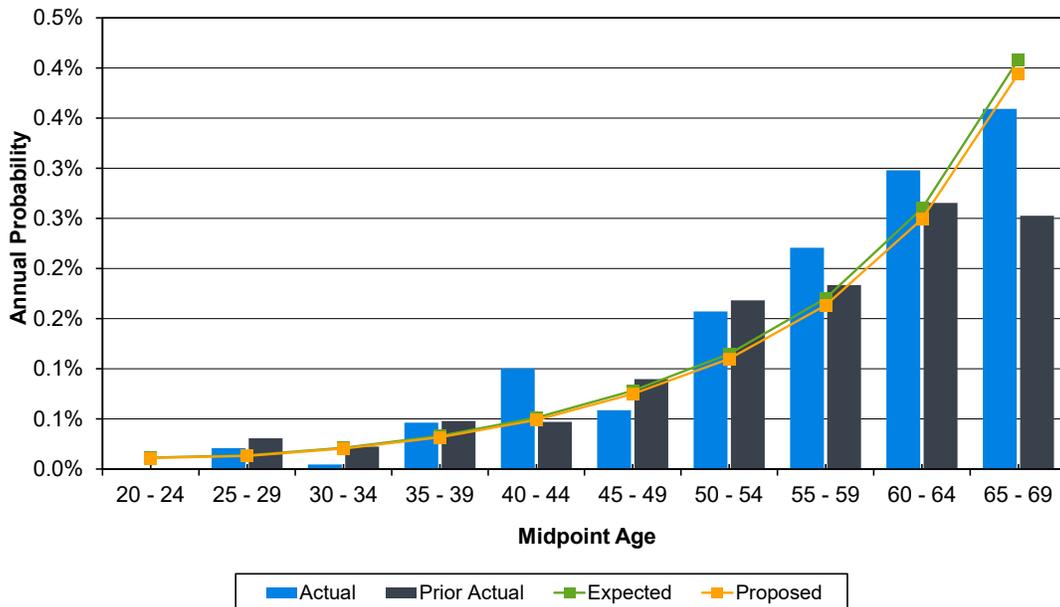
Exhibit 6-3
Nonservice-Connected Death – Safety Male Members
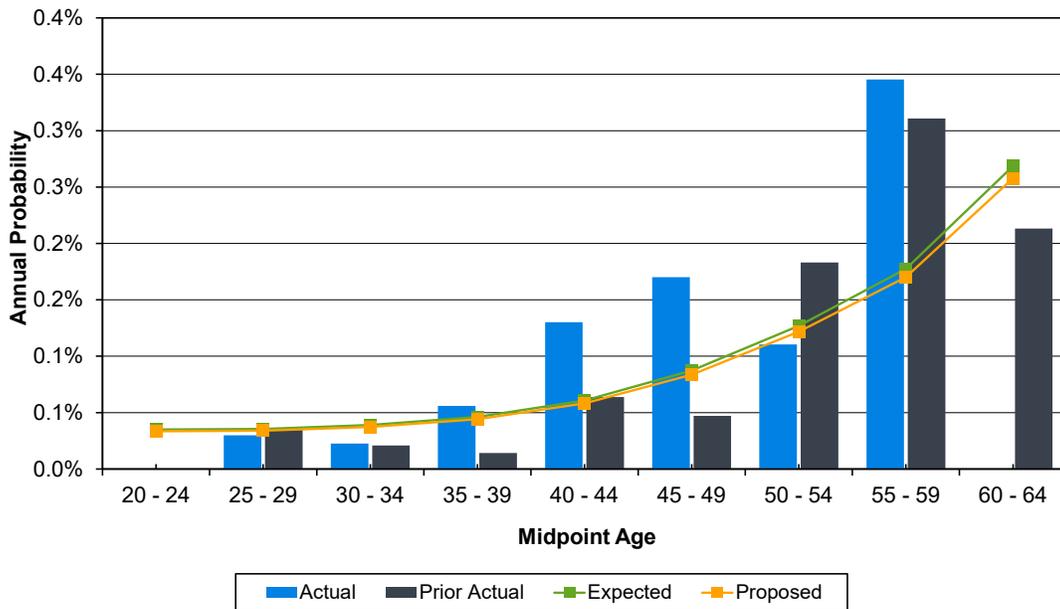
Exhibit 6-4
Nonservice-Connected Death – Safety Female Members
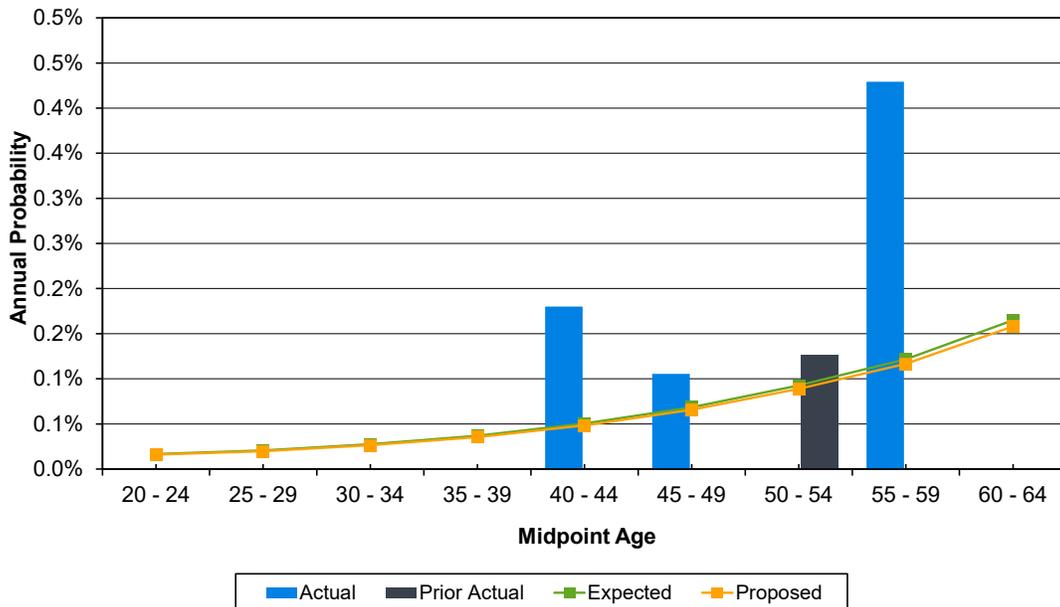
7. Service Retirements

Exhibits 7-1 through 7-3 show the actual and expected rates of service retirements during the study period. These rates are weighted by compensation level. Overall, the actual rates of service retirements exceeded the expected rates, although there were some differences by plan.

General Plan G and Safety Plan C have very few actual retirements since most members in those plans entered LACERA within the last 10 years. General Plans A through C and Safety Plan A have less than 100 combined active members as of June 30, 2022. There were not enough service retirements in any of these plans to perform a meaningful statistical analysis of their experience. As such, our analysis relies primarily on the experience of General Plans D and E, and Safety Plan B.

In prior studies retirement rates have been based primarily on two factors – age and class of membership. We have also observed differences in decrements based upon compensation levels, and therefore we apply a weighting based on compensation level. In addition, we have observed that rates of retirement differ based on number of years of service as well as age;therefore, in this study we reviewed the rates of retirement based on age, service and class of membership. We found that in general, members with more years of service have a higher probability of retiring at a given age than those with less years of service.

For the three-year period, there was a significant increase in employees leaving their jobs, particularly in 2021, in both the public and private sector. This was true of both employees who were eligible for retirement and those who were not. Therefore, we believe that the high level of service retirements may be temporary. Accordingly, our recommendations focus more on fitting retirement patterns better, and the adjustments in the expected number of retirements was only made if it was also consistent with experience from the prior experience study.

Results

For General Plans D and E, and Safety Plan B, the actual number of retirements from active service, weighted by compensation, exceeded the expected number. However, as can be seen in Exhibits 7-1 through 7-3, the pattern of retirements by age varied somewhat compared to expected.

Service Retirements (weighted by compensation)			
Class	Actual	Expected	Actual / Expected
General A-C	6,802,500	8,727,670	78%
General D	467,628,204	354,545,879	132%
General E	224,347,476	204,557,147	110%
Safety B	183,907,920	139,826,097	132%
Total	882,686,100	707,656,793	125%

Note that the numbers shown above are for ages 50 to 74 for General members and ages less than 65 for Safety members. The values in the table are weighted by compensation, so the first line of the table indicates that individuals with total annual compensation of $6,802,500 retired from active status compared to the expected value of $8,727,670 based on the valuation assumption.

As noted above, we also studied the incidence of retirement by years of service for General Plans D and E, and Safety Plan B members, as these plans have sufficiently large populations. To do this, we first determined an age-based assumption for each class of member, and then compared how that proposed age-based assumption compared to actual experience for members with different lengths of service. The tables below show the actual

probability of retirement by years of service compared to what would have been predicted to occur with the proposed age-based assumption.

Service	General Members (Plan D)			General Members (Plan E)		
	Actual Probability of Retirement	Proposed Probability of Retirement	Actual / Proposed	Actual Probability of Retirement	Proposed Probability of Retirement	Actual / Proposed
< 5	n/a	n/a	n/a	n/a	n/a	n/a
5 - 9	45%	23%	199%	n/a	n/a	n/a
10 - 14	4%	7%	66%	7%	9%	70%
15 - 19	5%	7%	76%	6%	10%	64%
20 - 24	6%	6%	88%	7%	10%	64%
25 - 29	8%	6%	136%	9%	8%	108%
30+	14%	7%	197%	14%	10%	142%

Note that the experience for General Plan D members with 5 to 9 years of service includes only a small number of members who are eligible to retire on account of attaining age 70 and is not statistically significant.)

Service	Safety Members (Plan B)		
	Actual Probability of Retirement	Proposed Probability of Retirement	Actual / Proposed
< 5	n/a	n/a	n/a
5 - 9	n/a	n/a	n/a
10 - 14	2%	7%	30%
15 - 19	3%	8%	39%
20 - 24	2%	3%	57%
25 - 29	7%	6%	125%
30+	20%	11%	188%

These results show that at lower years of service actual retirements are less than under the proposed age-only assumptions, and at higher years of service actual retirements are higher than under the proposed age-only assumptions, for both plans.

Recommendation

We are recommending the following changes in the rates of service retirement:

1. Revisions to the age-based service retirement rates; and

2. The addition of a service-based adjustment component.

The service-based adjustment component will be a percentage that will be applied to the age-based service retirement rate to determine the applicable assumed rate of service retirement for an individual of a given age and length of service. We recommend that the proposed retirement probabilities be adjusted based on years of completed service by the percentages shown in the table below.

Proposed Adjustments to Age-Based Retirement Rates			
Service	**General Members (all Plans except Plan E)**	**General Members (Plan E)**	**Safety Members**
< 5	80%	70%	30%
5 - 9	80%	70%	30%
10 - 14	80%	70%	30%
15 - 19	80%	70%	40%
20 - 24	90%	70%	70%
25 - 29	110%	100%	110%
30+	160%	130%	170%

As an illustration of how this service-based adjustment works, assume that the age-based age 65 service retirement rate for a General Plan D member is 23%. Then, for a member with between 20 and 24 years of service, the assumed rate of service retirement will be 20.7% (23% x 90%) and for a member with more than 30 years of service, the assumed rate of service retirement will be 36.8% (23% x 160%).

Exhibits 7-4 and 7-5 shows actual, expected and proposed retirement rates separately for members of General Plan D and Safety Plan B with different lengths of service.

These revisions result in higher expected retirements overall for General and Safety members, and the proposed service retirement rates more closely follow the pattern of anticipated retirements. A comparison of the actual and expected retirements under the proposed assumptions is shown in the table below.

Service Retirements (weighted by compensation)			
Class	**Actual**	**Proposed**	**Actual / Proposed**
General A-C	6,802,500	8,054,244	84%
General D	467,628,204	390,966,684	120%
General E	224,347,476	205,700,607	109%
Safety B	183,907,920	170,664,392	108%
Total	882,686,100	775,385,927	114%

Additionally, we recommend continuing the 100% probability of retirement at certain age and service combinations (shown in Appendix A) where the benefit is approximately 100% (or greater) of final average compensation.

Exhibit 7-1
Service Retirement – General D Members
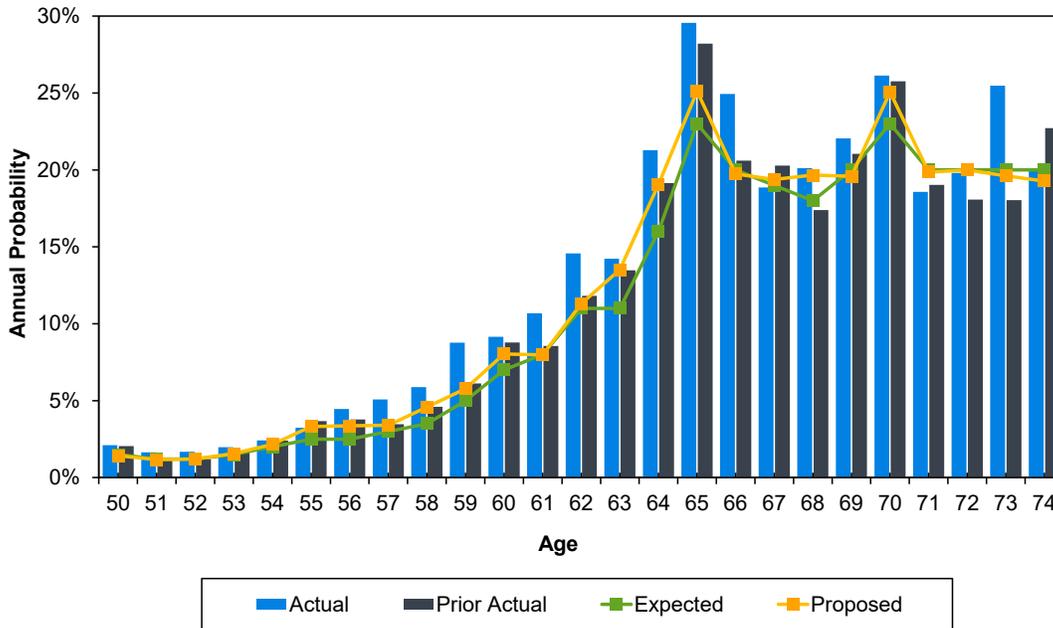
Exhibit 7-2
Service Retirement – General E Members
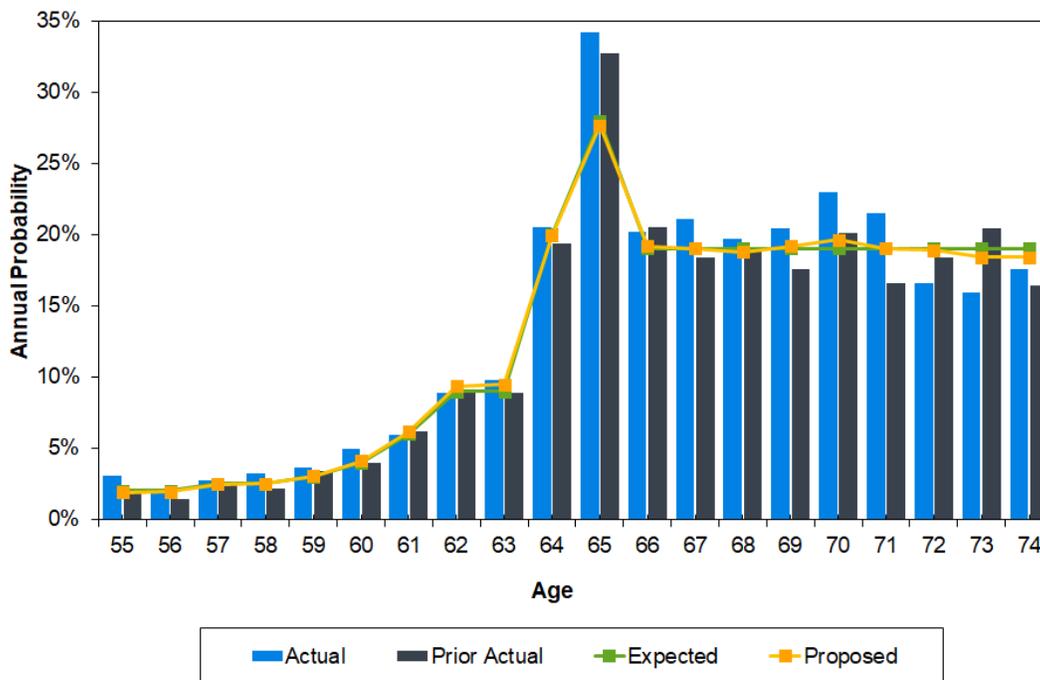
Exhibit 7-3
Service Retirement – Safety Members
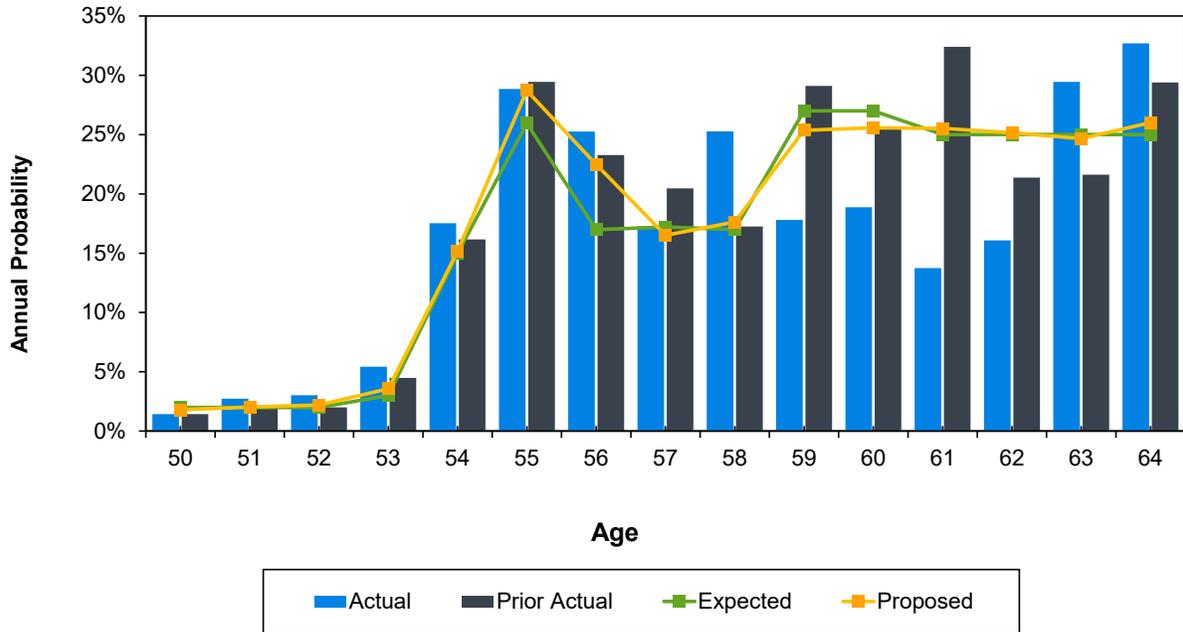
Exhibit 7-4
Service Retirement – General Plan D Members (by Service)
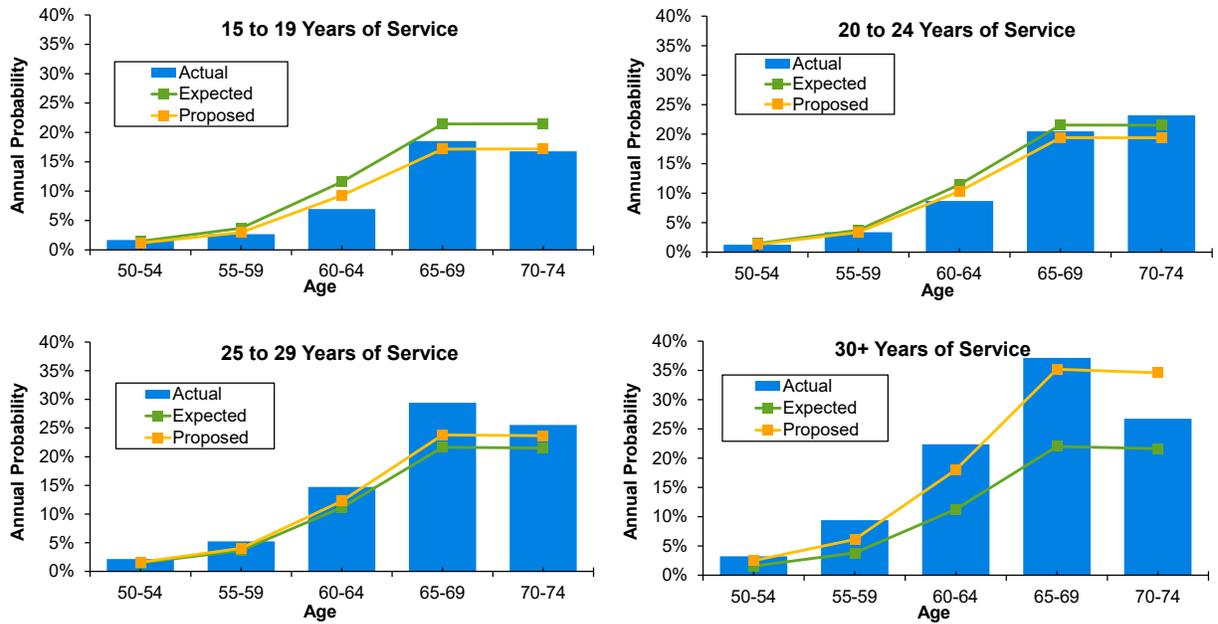
Exhibit 7-5
Service Retirement – Safety Plan B Members (by Service)
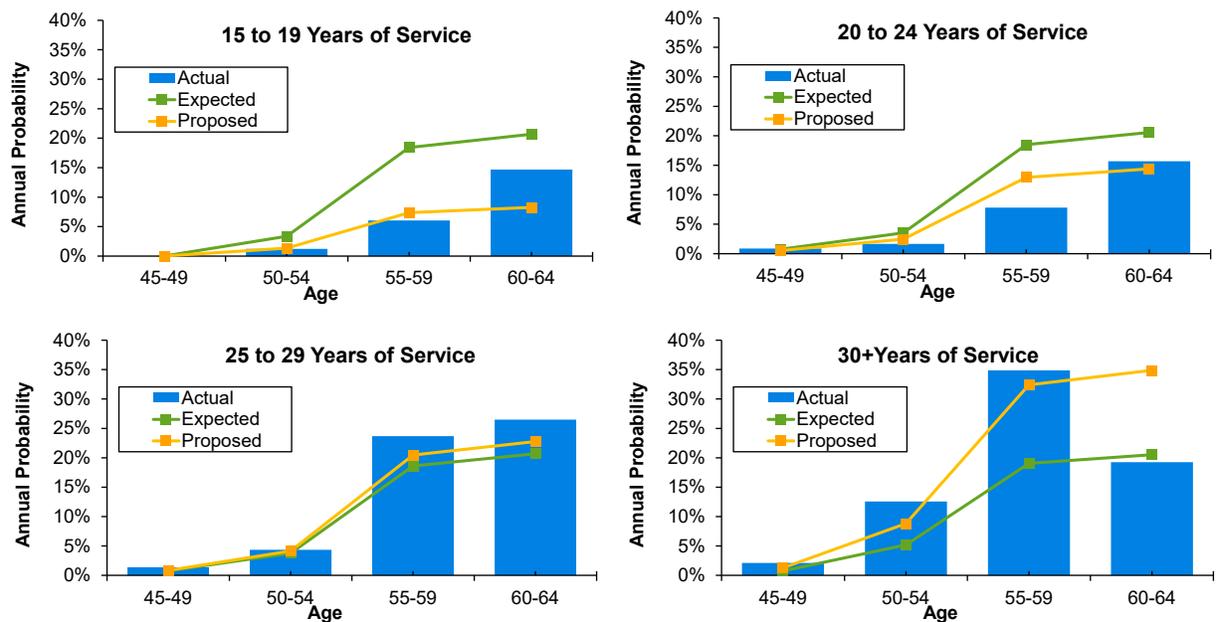
8. Disability Retirements

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.

We have found that in many systems, including LACERA, there is generally at least a six-month lag between the actual occurrence of a disability retirement and the subsequent approval and reporting of that same retirement. In many cases the actual decrement from active service shows in the data as a service retirement, and that service retirement is subsequently reclassified. Since our analysis shown here is based on those active members who have a direct decrement to disability retirement (that is, the change from active status to disability occurs within the same fiscal year) it may underreport the actual number of disability retirements. We discuss this below, and have accounted for it in our recommendation.

Results: Service-Connected Disability

Overall, the actual number of service-connected disabilities, weighted by compensation level, were close to that expected by the current assumptions, although there were some variations between different groups. The following is a comparison of the actual to expected service-connected disabilities for active members by gender and member class for this study period, weighted by compensation level.

Service-Connected Disability Retirements (weighted by compensation)				
Plan	**Gender**	**Actual**	**Expected**	**Actual / Expected**
General A-D & G	Male	6,949,908	9,463,188	73%
General A-D & G	Female	11,596,092	12,027,390	96%
Safety	Male	62,339,544	57,549,026	108%
Safety	Female	9,243,672	10,314,828	90%
Total	**Total**	**90,129,216**	**89,354,432**	101%

Overall, there are 230 General member service-connected disabilities and 460 Safety member service-connected disabilities included in the above analysis. In addition, over the study period 154 retired General members and 571 retired Safety members were reclassified from a service retirement to a service-connected disability retirement.

Exhibits 8-1 to 8-4, at the end of this section, show the results of the analysis graphically.

Results: Nonservice-Connected Disability

Actual experience for nonservice-connected disabilities, weighted by compensation level, was lower than the assumptions for General members predicted, which is consistent with the prior study. Overall we do not view this difference as material given the small number of nonservice-connected disability retirements, and the underreporting noted above. The following is a comparison of the actual-to-expected nonservice-connected disabilities for active General members for this study period, weighted by compensation level. For Safety members there were only four nonservice-connected disabilities, so we have not included them in the table.

Nonservice-Connected Disability Retirements (weighted by compensation)				
Plan	Gender	Actual	Expected	Actual / Expected
General A-D & G	Male	836,040	2,567,535	33%
General A-D & G	Female	2,449,176	3,897,822	63%
Total	**Total**	**3,285,216**	**6,465,357**	51%

Overall there are 44 nonservice-connected disabilities included in the above analysis. In addition, over the study period 26 retired members were reclassified from a service retirement to a nonservice-connected disability retirement.

Exhibits 8-5 to 8-6, at the end of this section, show the results of the analysis graphically.

Recommendation: Service-Connected Disability

After accounting for retired members whose retirement type was reclassified to service-connected disability over the study period, there were significantly more service-connected disability retirements than expected by the assumptions, particularly for Safety members. Consistent with our approach to all decrement analysis in this study, we are attempting to not assign too much credibility to experience during the COVID pandemic period, in case any changes are temporary. As a result, we are recommending no change to the service-connected disability retirement assumptions at this time. However, if this experience continues over the next study period we will likely recommend increases in these assumptions.

Note that for many members who retire due to service-connected disability, their benefit calculated under the service retirement provisions will be larger than that calculated under the disability retirement provisions. As a result, their monthly retirement allowance will be the same regardless of whether they retire for disability. Consequently, the impact on plan liabilities is somewhat muted, except for differences between mortality assumptions and the unmodified continuance allowance provisions.

Recommendation: Nonservice-Connected Disability

Actual experience for nonservice-connected disabilities was lower than the assumptions for General members predicted, even after accounting for retired members whose retirement type was reclassified to nonservice-connected disability over the study period. Given the relatively small number of nonservice-connected disability retirements we do not consider these differences material. For this reason, and our approach of not assigning too much credibility to experience during the COVID pandemic period, we are recommending no change to the nonservice-connected disability retirement assumptions at this time.

For Safety members there were only four nonservice-connected disabilities, so we recommend continuing the current practice of assuming all Safety disability retirements are service-connected.

Exhibit 8-1
Service-Connected Disability Retirement – General A-D & G Male Members
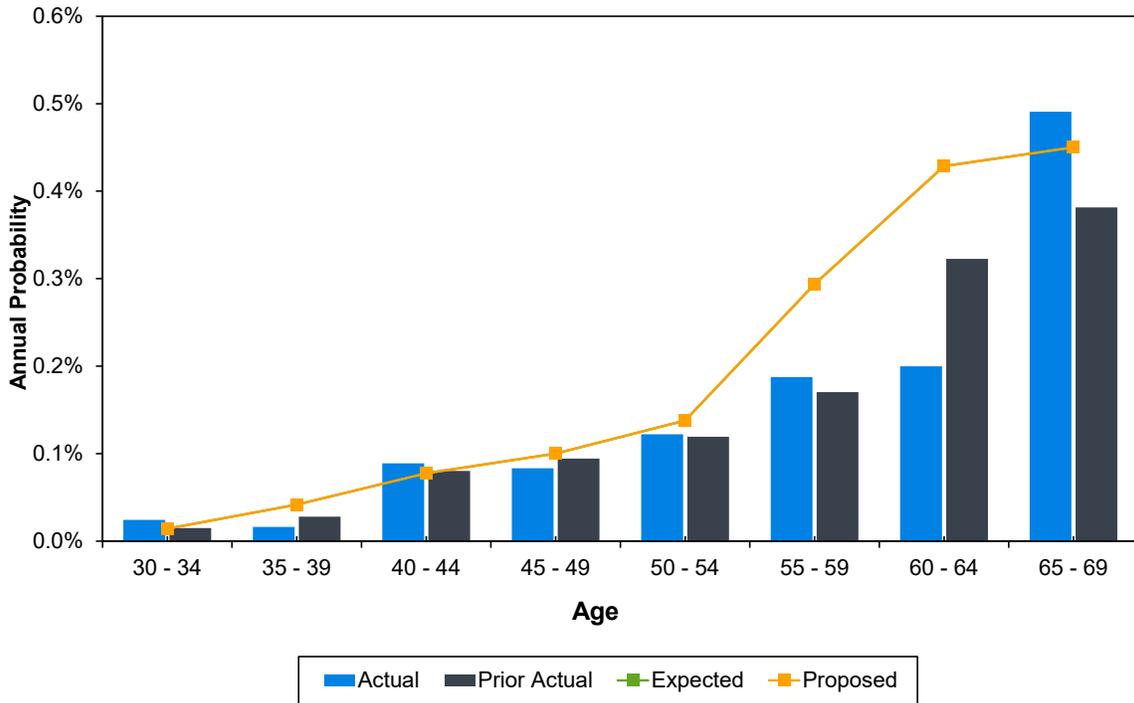
Exhibit 8-2
Service-Connected Disability Retirement – General A-D & G Female Members
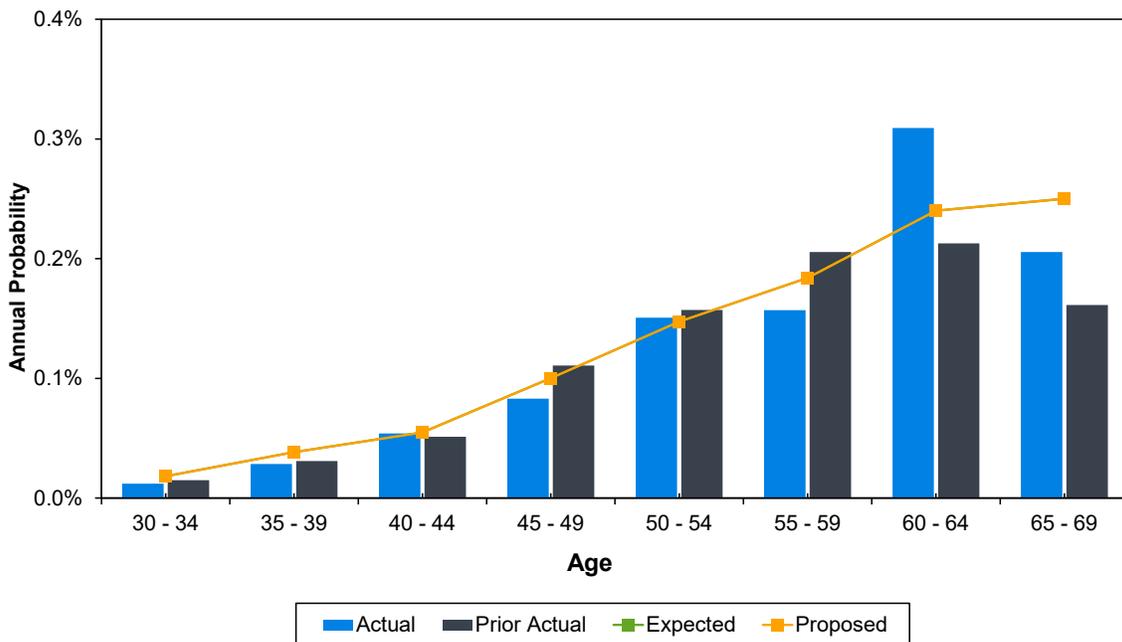
Exhibit 8-3
Service-Connected Disability Retirement – Safety Male Members
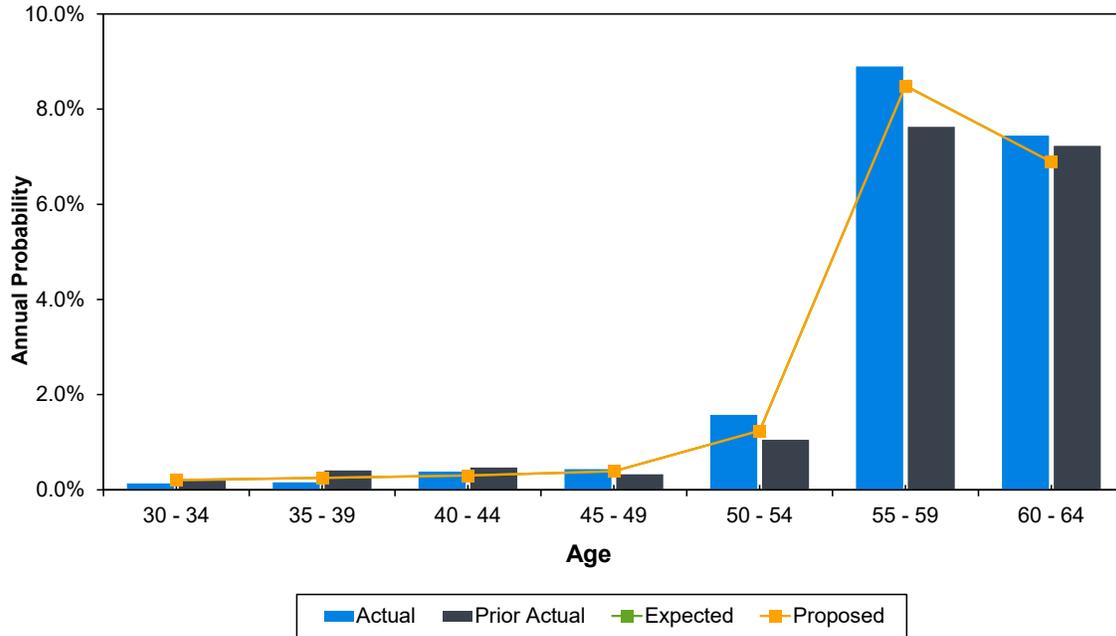
Exhibit 8-4
Service-Connected Disability Retirement – Safety Female Members
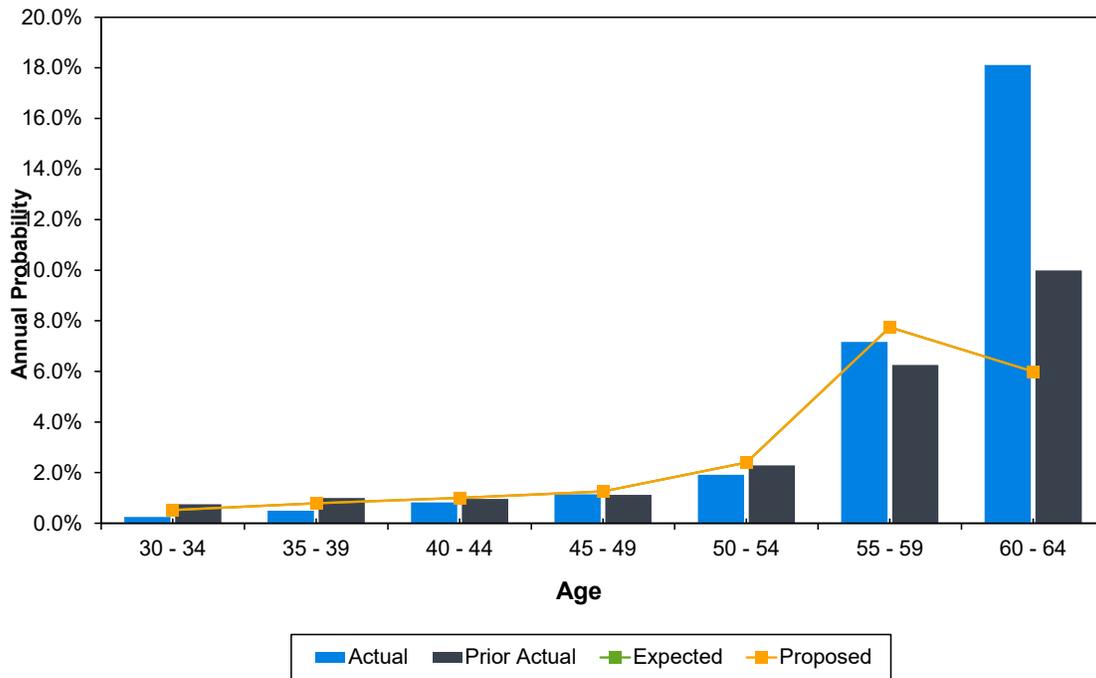
Exhibit 8-5
Nonservice-Connected Disability Retirement – General A-D & G Male Members
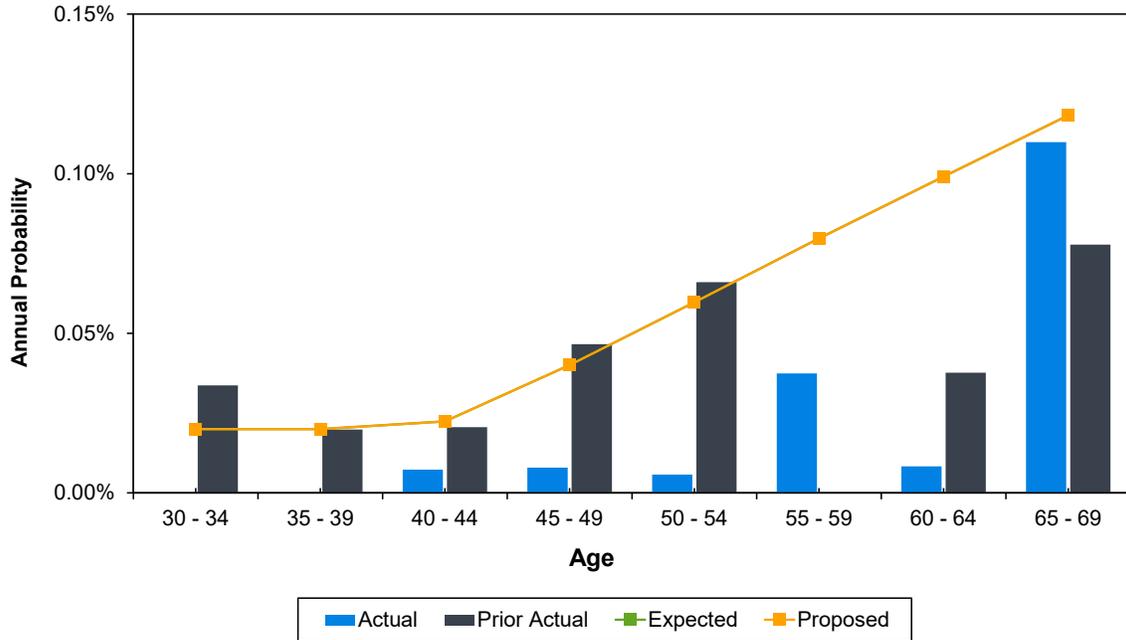
Exhibit 8-6
Nonservice-Connected Disability Retirement – General A-D & G Female Members
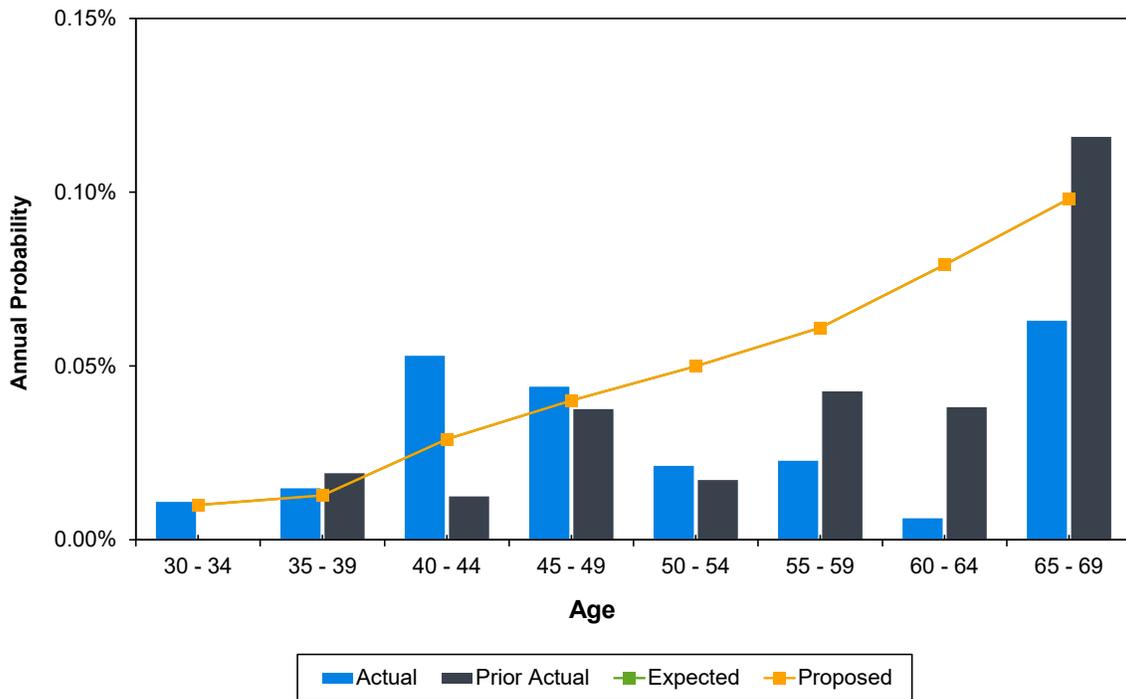
9. Terminations (Includes both Refunds and Vested Terminations)

This section of the report summarizes the results of our study of terminations of employment for reasons other than death, service retirement, or disability. As used in the actuarial valuation, termination rates refer to both voluntary and involuntary terminations of employment. A member who terminates, but does not retire, is assumed to either take a refund (a withdrawal) or to terminate employment but leave their member contributions with the System (a vested termination). We will refer to the combination of the two rates as the aggregate termination rate. This approach sets a probability that the member will terminate, and then assumes a certain portion of the members terminating will elect a refund. The probability of refund is discussed in more detail in Section 10.

We have found in our analysis of LACERA experience that termination rates vary by member class and the stage of a member's career. That is, members in the early stages of their career generally have a higher probability of terminating. This is consistent with our findings from other studies. As such, we analyze termination rates separately for General and Safety members, and based on a member's length of service with LACERA.

Results: Aggregate Terminations (Refunds and Vested Terminations)

As shown in the table below, the overall number of terminations, weighted by compensation level, was higher than expected for all plans. Although the actual terminations were greater, this pattern is consistent with the experience from the prior study. The following is a comparison of the actual to expected terminations by plan for this study period, weighted by compensation level.

Termination of Employment (weighted by compensation)			
Plan	**Actual**	**Expected**	**Actual / Expected**
General D & G	402,079,080	264,955,911	152%
General E	27,038,472	23,084,273	117%
Safety	44,791,668	28,015,182	160%
Total	**473,909,220**	**316,055,365**	**150%**

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 and at different service intervals. This total experience is consistent with the experience of other retirement systems during this study period, which is likely at least partially due to the COVID pandemic.

We studied General Plans D and G together, and Safety Plans B and C together. General Plans A through C and Safety Plan A no longer have many members impacted by the termination assumption so are not considered in this analysis. General Plan D and Safety Plan B provide experience for members with longer service while General Plan G and Safety Plan C provide experience for members with shorter service.

Recommendation

For General Plans D and G we recommend increasing termination rates for members with less than 10 years of service, and slightly lowering termination rates for members who have between 10 and 20 years of service. We also recommend slight increases for members with more than 20 years of service.

For General Plan E we recommend increasing termination rates for members with 8 to 10 years of service, and no change at all other service durations.

Although we reviewed the results of the most recent three-year period, we only made recommendations where the proposed changes were consistent with prior experience.

General Plans A to C are closed and no new employees are covered by these plans since May of 1979. The total membership is aging and has 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 recommend no change to this assumption.

For Safety members we recommend higher termination rates for members with less than two years of service, and no change for members with two or more years of service.

A comparison of the actual and expected terminations under the proposed assumptions, weighted by compensation level, is shown in the table below.

Termination of Employment (weighted by compensation)			
Plan	**Actual**	**Proposed**	**Actual / Proposed**
General D & G	402,079,080	317,831,977	127%
General E	27,038,472	23,411,879	115%
Safety	44,791,668	30,906,182	145%
Total	**473,909,220**	**372,150,038**	**127%**

Exhibit 9-1
Termination Rates – General Plan D & G Members
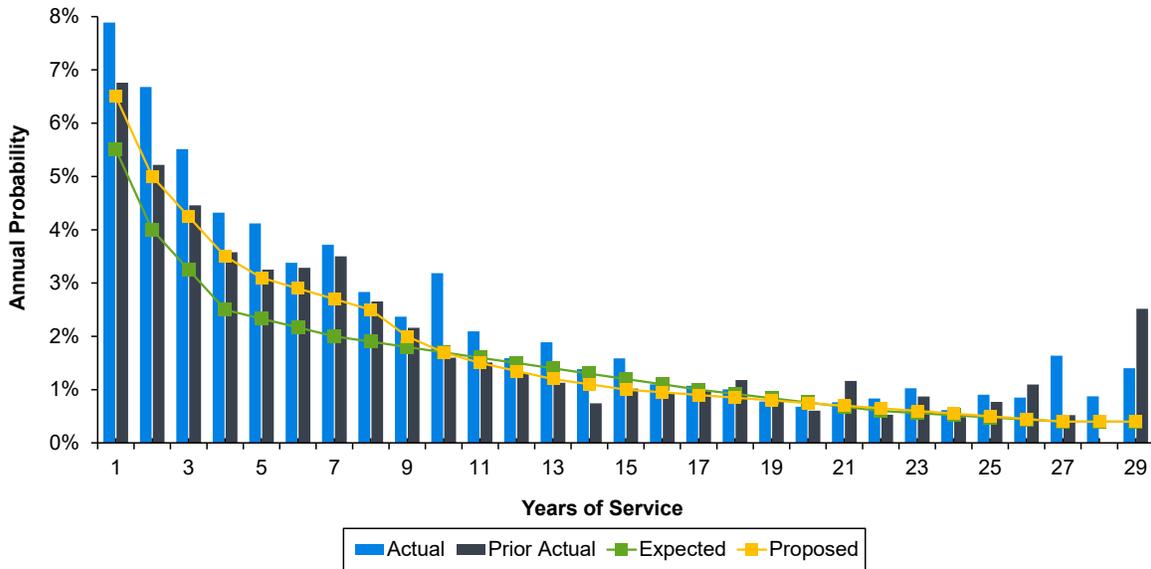
Exhibit 9-2
Termination Rates – General Plan E Members
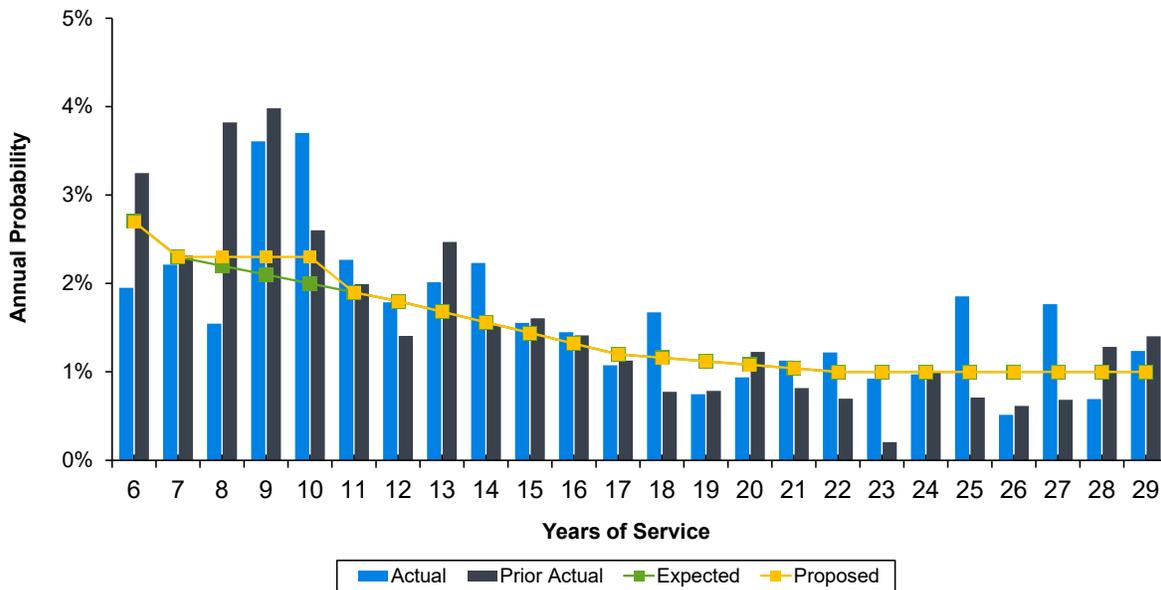
Exhibit 9-3
Termination Rates – Safety Members
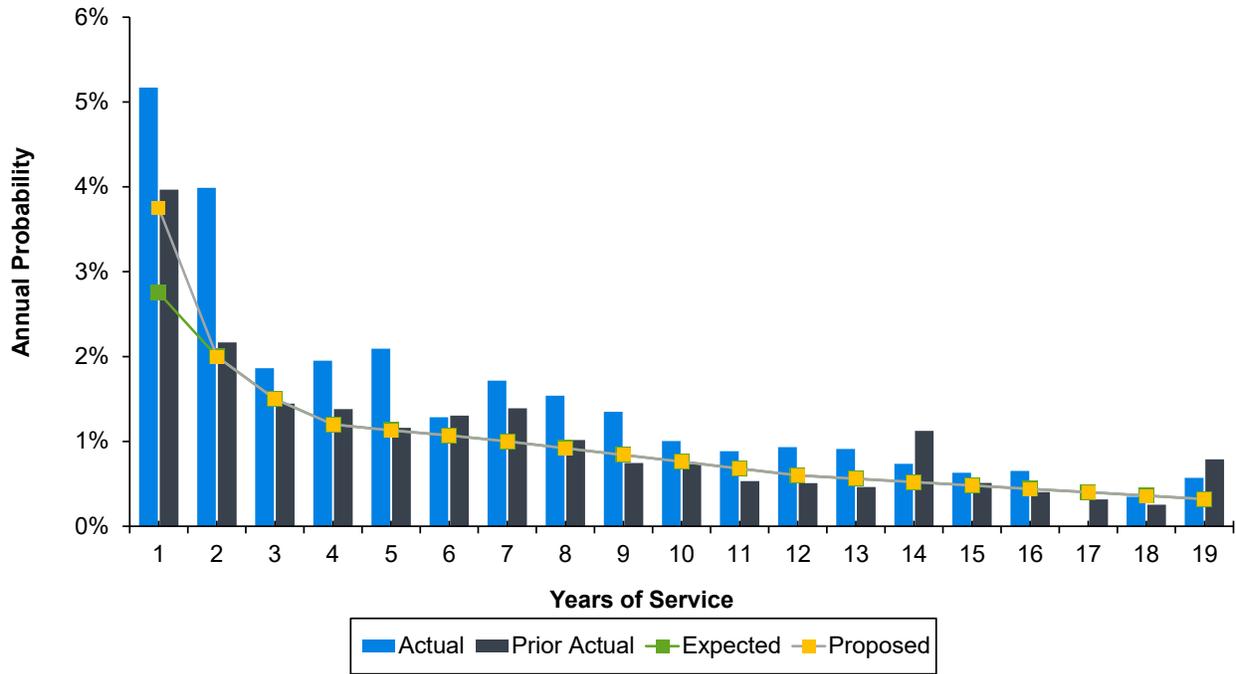
10. Probability of Refund

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 and is discussed in this section.

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 members and more than projected for Safety members, as shown in the following table.

Probability of Refund (at least 5 years of service, headcount weighted)					
Class	Actual	Expected	Actual / Expected	Proposed	Actual / Proposed
General	469	535	88%	501	94%
Safety	58	39	148%	39	148%
Total	**527**	**574**	**92%**	**540**	**98%**

Exhibits 10-1 to 10-2 on the following page show the results of the study graphically. Note that the probability of refund for Safety members with 20 or more years of service only applies to Safety Plan C members, since members of Safety Plans A and B are eligible for service retirement after 20 years of service.

Recommendation

We recommend lowering the probability of refund for General members who have between 5 and 15 years of service. The experience for Safety members is the opposite of what was observed in the prior study, and we recommend no changes in the probability of refund for Safety members at the current time.

Exhibit 10-1
Probability of Refund – General Members
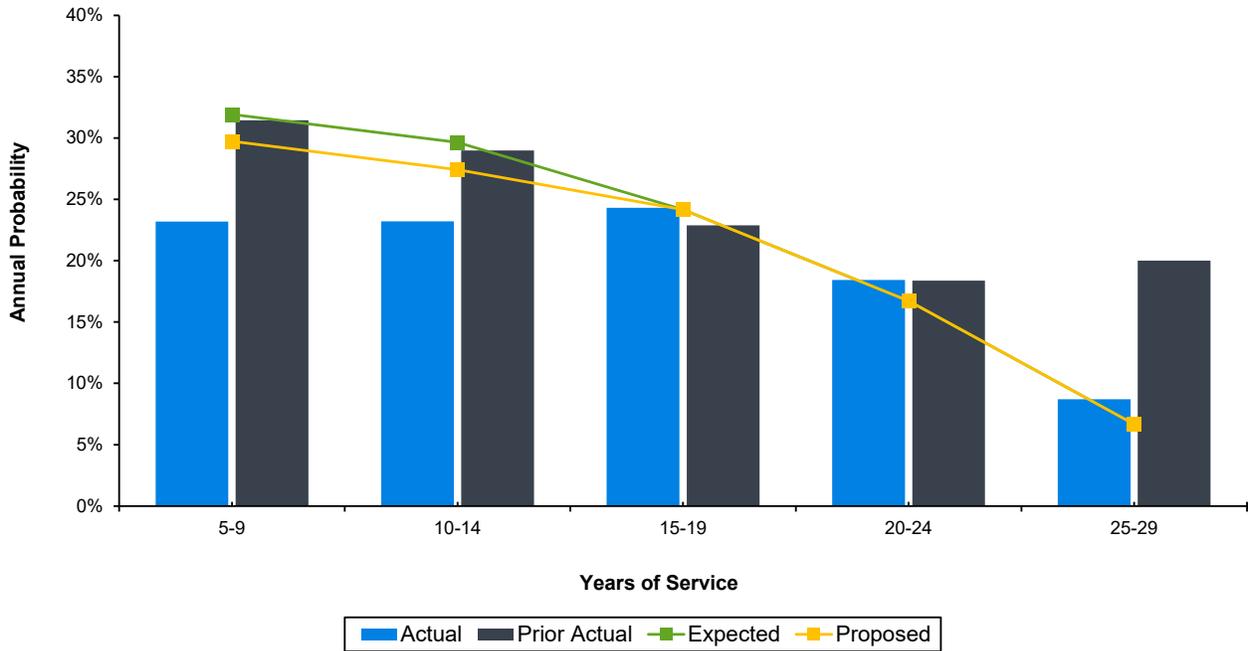
Exhibit 10-2
Probability of Refund – Safety Members
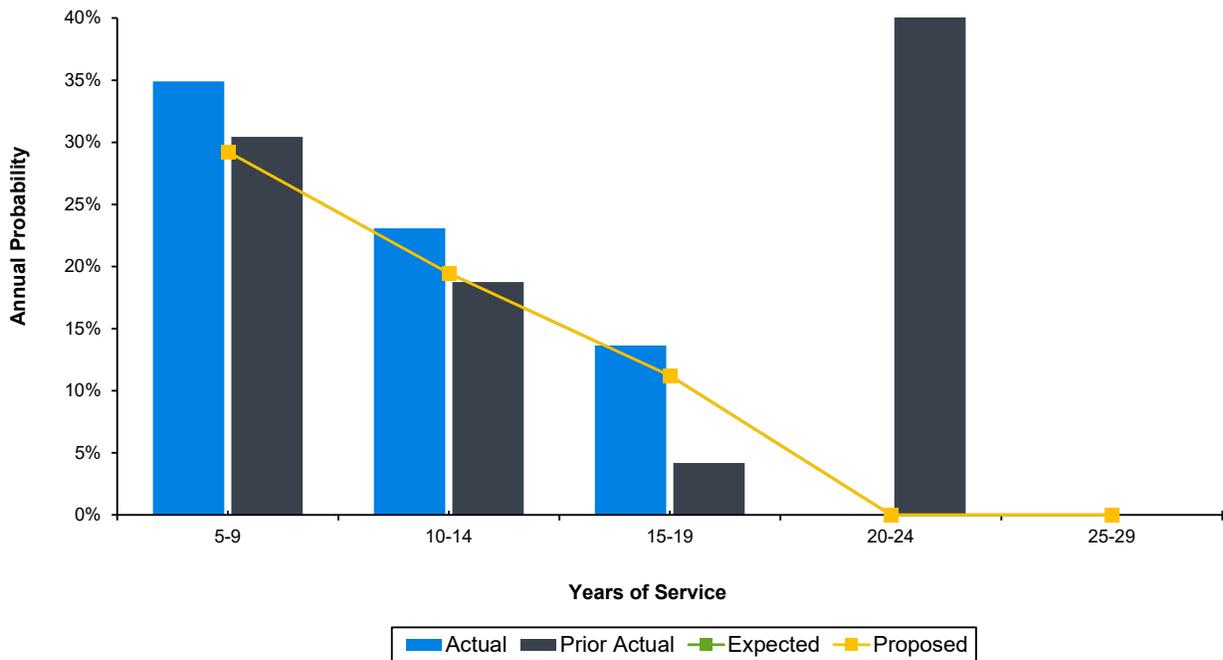
11. Retiree Mortality for Valuation Purposes

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.

Although there has been a recent deviation due to the pandemic, 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 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.

Results

Overall, we found there were more deaths than the current rates predicted for healthy and disabled retired members. This is perhaps unsurprising given the COVID pandemic overlaps significantly with this study period. The ratio of active-to-expected deaths is also higher in this study than in the prior study period. The following table shows a comparison of the actual-to-expected deaths of retired members by gender, class, and type of retirement for the current study period, weighted by benefit amounts.

Retiree Mortality (weighted by benefit amounts)					
Service Retirement					
		Deaths		Actual to	Actual to
Group	Actual	Expected	Proposed	Expected	Proposed
General Male	9,422,483	8,704,306	8,719,998	108%	108%
General Female	7,735,952	7,416,652	7,407,782	104%	104%
Safety Male	2,515,046	2,293,922	2,283,950	110%	110%
Safety Female	140,336	137,850	135,280	102%	104%
Total Svc Ret	**19,813,817**	**18,552,730**	**18,547,010**	**107%**	**107%**
Disability Retirement					
		Deaths		Actual to	Actual to
Group	Actual	Expected	Proposed	Expected	Proposed
General Male	723,259	678,264	676,270	107%	107%
General Female	731,231	634,900	631,663	115%	116%
Safety Male	3,276,596	3,004,383	2,979,974	109%	110%
Safety Female	183,066	160,019	157,498	114%	116%
Total Dis Ret	**4,914,152**	**4,477,566**	**4,445,405**	**110%**	**111%**

The values in the table are weighted by monthly benefit amount, so the first line of the table indicates that General male retirees with total monthly benefits of $9,422,483 died compared to the expected value of monthly benefits associated with General male retiree deaths of $8,704,306 based on the valuation assumptions.

Results are shown graphically on the following pages.

Mortality for Beneficiaries/Survivors

The previous analysis was focused on members who are currently receiving either service retirement or disability retirement benefits. An additional assumption must be made for beneficiaries of members who are currently receiving survivor benefits or may receive survivor benefits in the future. Analysis of this assumption is more difficult as the information on deaths of beneficiaries who are not in payment is generally not as well reported in most systems as members who are in payment. The information on beneficiaries currently receiving survivor benefits is more reliable; however, we do not believe it is appropriate to apply this experience to beneficiaries who are not in payment.

Studies have shown that: 1) beneficiaries have materially higher mortality rates after their spouse has died ("grieving widow effect"); and 2) married people live longer than single people .Since most beneficiaries who are not in payment are spouses of the members, we would expect on average they would live longer than the general retired population as they are married and retirees are a mix of married and single. After the member has died, the expectation is the survivor will have higher mortality (and a shorter life expectancy), which is consistent with LACERA experience. To approximate this lower-than-average beneficiary mortality prior to the retiree's death and higher-than-average beneficiary mortality following the retiree's death, we recommend continuing the assumption of the beneficiary mortality being equal to the assumption for a healthy General retiree of the same gender.

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 2016 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. Beginning in 2014, the Society of Actuaries (SOA) began publishing a mortality improvement scale (MP-2014) that varies by age and birth year. This results in a complex matrix of rates that is projected forwards and backwards. Ultimately, in any mortality improvement table, the mortality improvement scale stops at a future year, and that year's rate is used for all later years. It is referred to as the "ultimate rate".

Our general recommendation is to use a mortality projection scale based on the ultimate portion of the mortality improvement scale. We believe this approach reasonably reflects the long-term expectation of mortality improvement with less complexity than using a complete matrix of improvement rates.

LACERA currently uses a mortality projection scale equal to 100% of the MP-2014 ultimate projection scale.

Although the SOA publishes an updated mortality improvement scale each year, the ultimate rate did not change until the release of MP-2020 in the fall of 2020. An updated projection scale (MP-2021) was issued last year with similar ultimate rates. This new scale relies heavily on Social Security experience for years 1958 through 2018, and assumes flat 1.35% annual improvements in mortality for individuals 62 and younger. Note that since this scale includes experience through 2018 there are no effects of pandemic mortality included, nor any adjustments to account for its impact. The improvement decreases gradually between the ages of 62 and 80, then more steeply for individuals aged 80 and older. Compared to MP-2014, the new scale projects bigger improvements in mortality for individuals younger than 83, and smaller improvements for individuals 83 and older. For example, the improvement under MP-2021 drops to 0.30% at age 100, compared to 0.64% when using MP-2014.

Recommendation

LACERA uses standard mortality tables adjusted to best fit the patterns of mortality among its retirees. The current 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.

We recommend no change to the standard mortality tables, nor scaling factors, currently in place.

We recommend an update to the ultimate projection scale included in the recently published MP-2021 mortality improvement scale.

The recommended mortality rates are therefore all 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-2021 Ultimate projection scale, as follows:

			Mortality Tables	
Class	Type[1]	Sex	Current Table[2]	Proposed Table[3]
General	Healthy	Male	PubG-2010 (100%) Healthy Retiree Male	PubG-2010 (100%) Healthy Retiree Male
General	Healthy	Female	PubG-2010 (110%) Healthy Retiree Female	PubG-2010 (110%) Healthy Retiree Female
Safety	Healthy	Male	PubS-2010 (85%) Healthy Retiree Male	PubS-2010 (85%) Healthy Retiree Male
Safety	Healthy	Female	PubS-2010 (100%) Healthy Retiree Female	PubS-2010 (100%) Healthy Retiree Female
General	Disabled	Male	Avg of: PubG-2010 (100%) Healthy Retiree Male PubG-2010 (100%) Disabled Retiree Male	Avg of: PubG-2010 (100%) Healthy Retiree Male PubG-2010 (100%) Disabled Retiree Male
General	Disabled	Female	Avg of: PubG-2010 (100%) Healthy Retiree Female PubG-2010 (100%) Disabled Retiree Female	Avg of: PubG-2010 (100%) Healthy Retiree Female PubG-2010 (100%) Disabled Retiree Female
Safety	Disabled	Male	PubS-2010 (100%) Disabled Retiree Male	PubS-2010 (100%) Disabled Retiree Male
Safety	Disabled	Female	PubS-2010 (100%) Disabled Retiree 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.
3. Generational Projections using 100% of the MP-2021 Ultimate projection scale.

Exhibit 11-1
Healthy Mortality – Male General Members
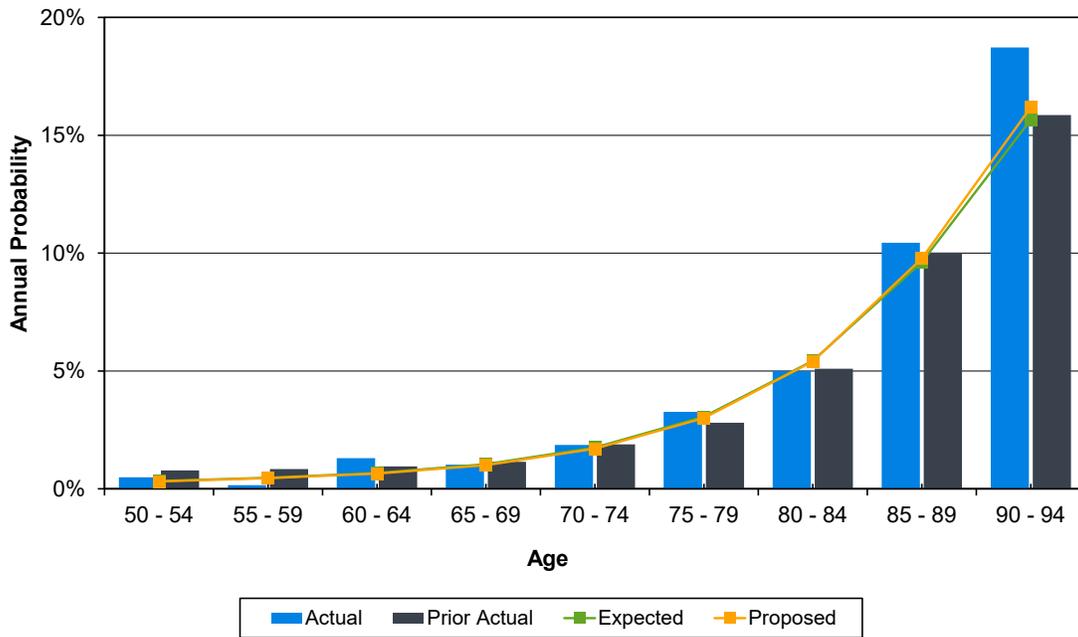
Exhibit 11-2
Healthy Mortality – Female General Members
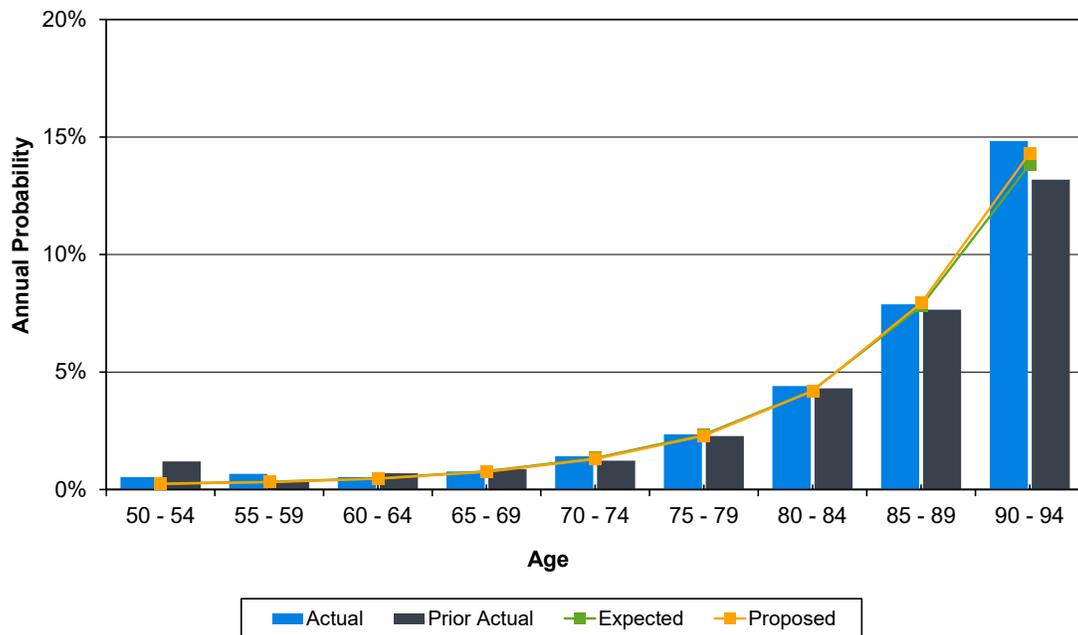
Exhibit 11-3
Healthy Mortality – Male Safety Members
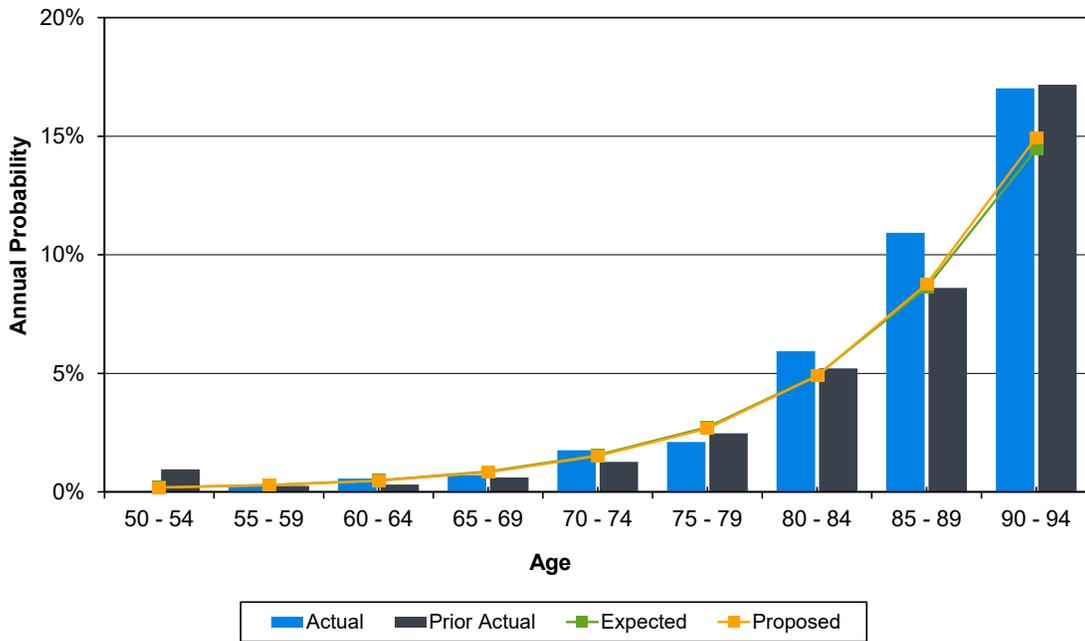
Exhibit 11-4
Healthy Mortality – Female Safety Members
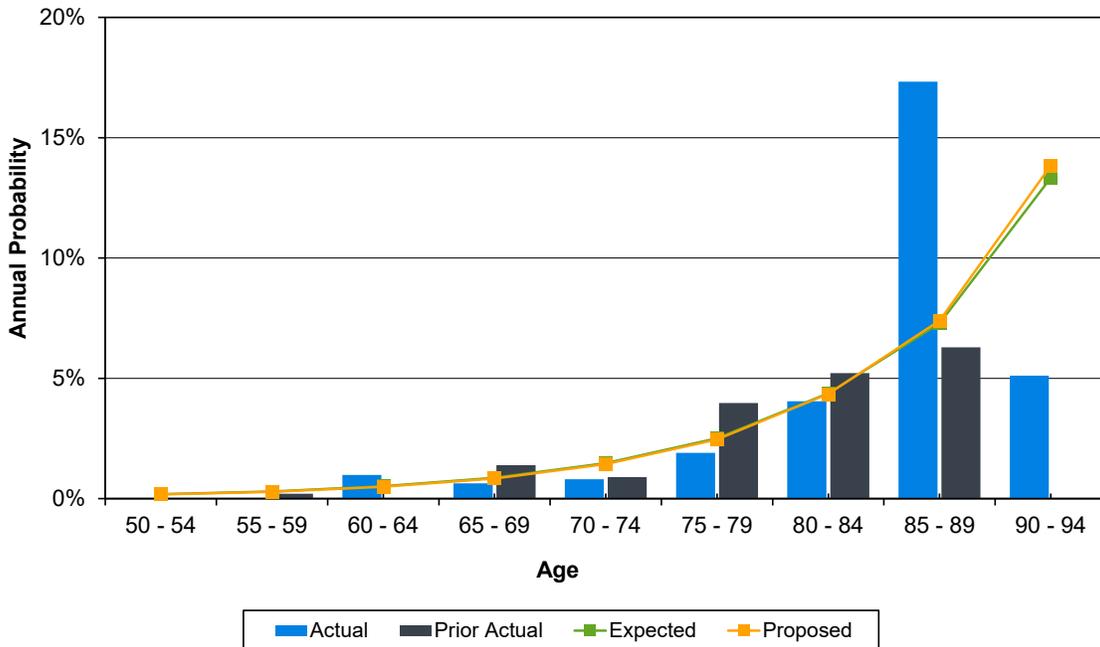
Exhibit 11-5
Disabled Mortality – Male General Members
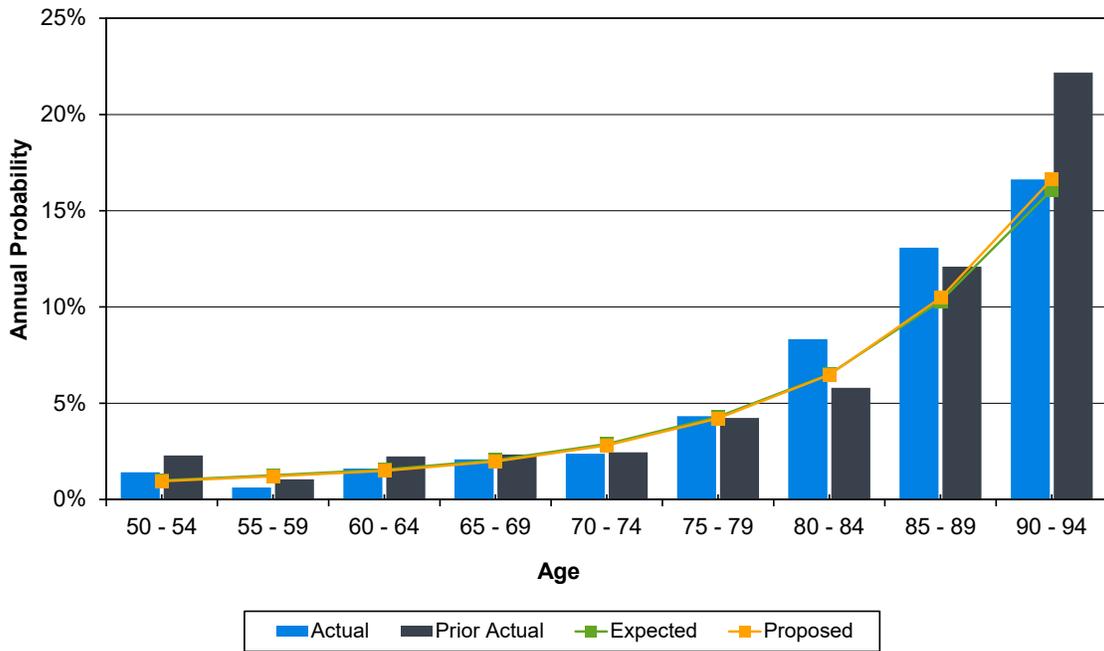
Exhibit 11-6
Disabled Mortality – Female General Members
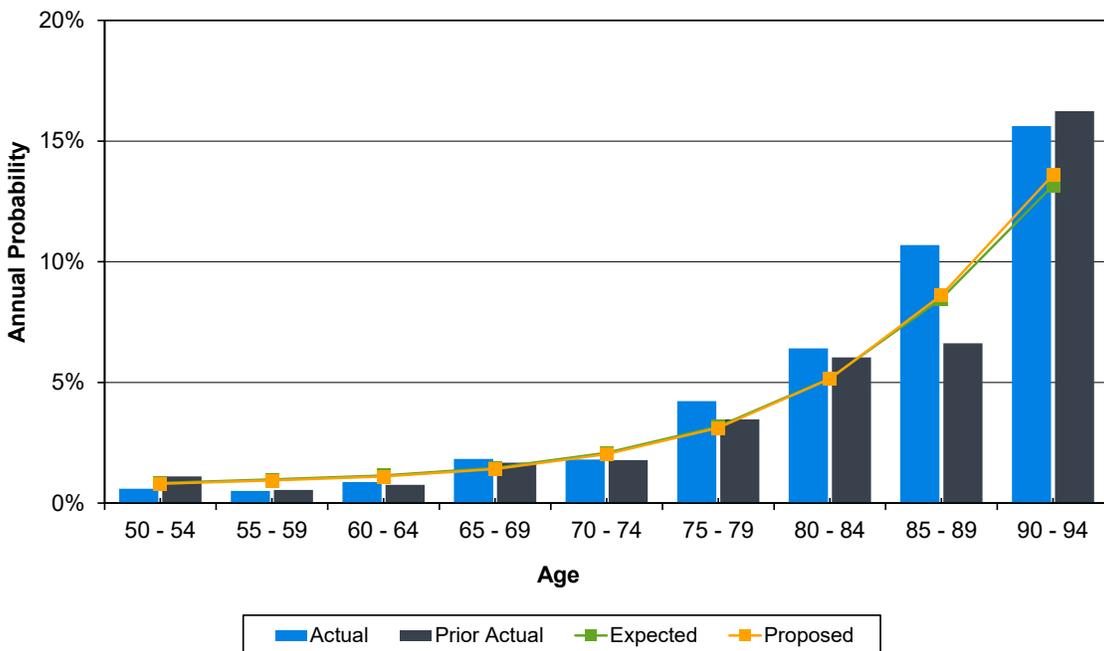
Exhibit 11-7
Disabled Mortality – Male Safety Members
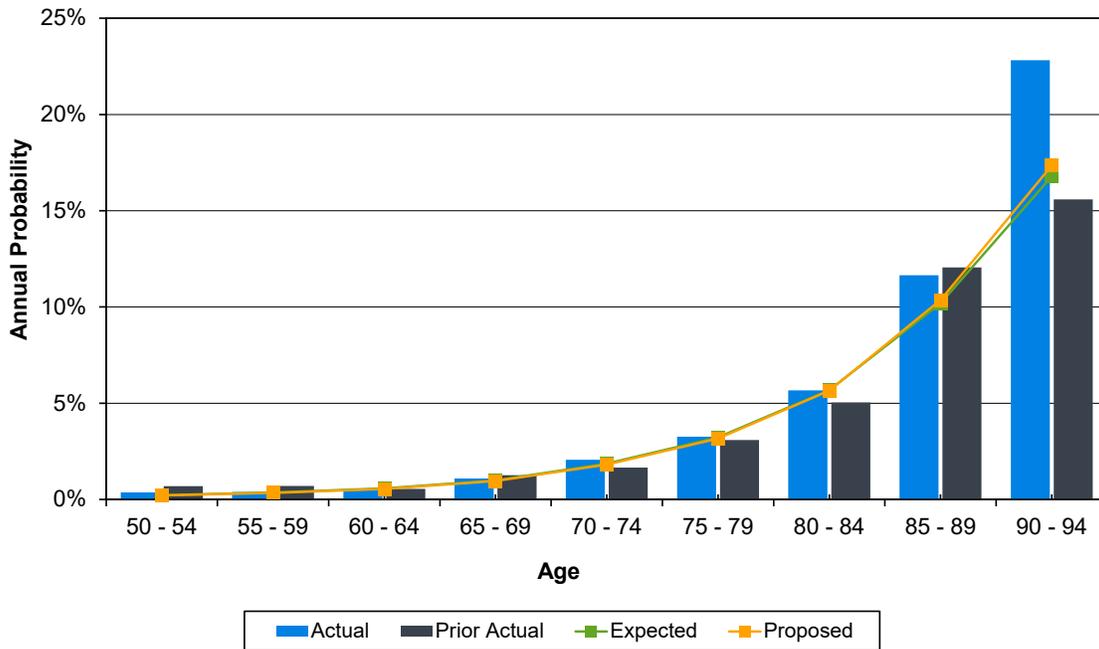
Exhibit 11-8
Disabled Mortality – Female Safety Members
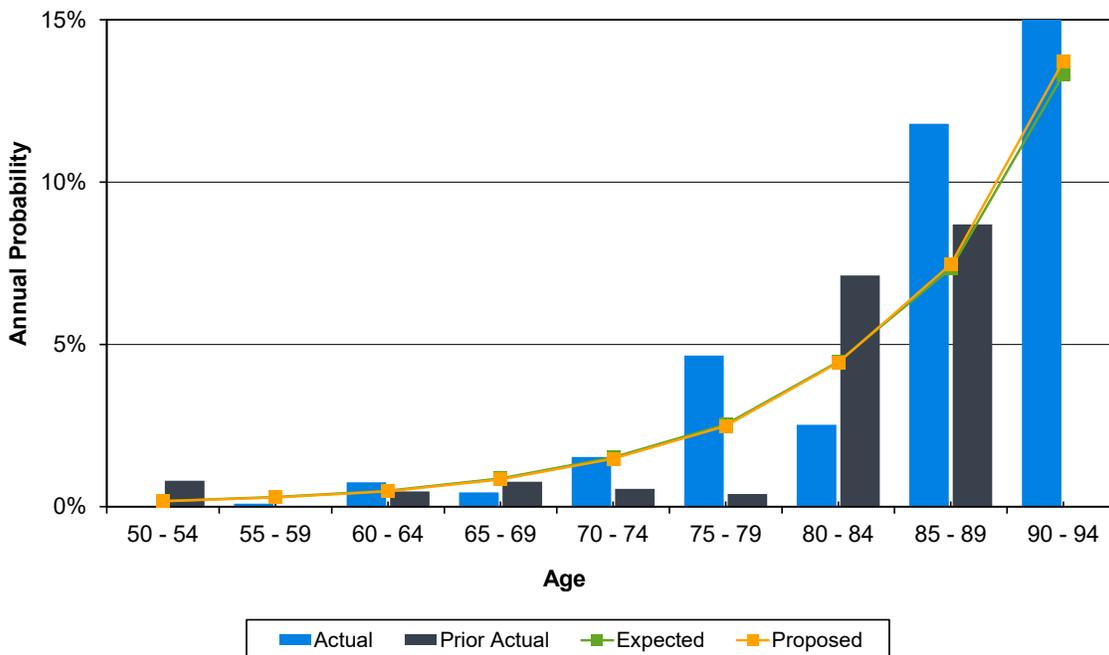
12. Miscellaneous Assumptions

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 76% of males and 45% of females received an unmodified (or unmodified plus) benefit with an eligible survivor. We are recommending lowerering the assumption for probability of retiring with an Eligible Survivor to 48% for female members, while keeping the assumption for male members unchanged at 77%.

	Probability of Retiring with an Eligible Survivor		
Retiree Gender	Current Assumption	Actual Experience	Recommended Assumption
Male	77%	76%	No change
Female	50%	45%	48%

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 their age, we must estimate the age. We studied the beneficiary age difference compared to the member based on retirements during the study period. Based on this analysis, we are recommending changing the assumption for beneficiary age of male retirees to be 3 years younger than the member, while keeping the assumption unchanged at 2 years older for female retirees.

	Beneficiary's Age Relative to Member		
Retiree Gender	Current Assumption	Actual Experience	Recommended Assumption
Male	4 years younger	3.1 years younger	3 years younger
Female	2 years older	1.8 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) employment 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 no changes to current assumptions.

	Assumption for Deferred Commencement		
	Age at Commencement		
Plan	Current Assump.	Actual Results	Proposed Assump.
GA	62	N/A[1]	No Change
GB	62	N/A[1]	No Change
GC	62	N/A[1]	No Change
GD	59	59.2	No Change
GE	62	62.9	No Change
GG	57	N/A[1]	No Change
SA	55	N/A[1]	No Change
SB	50	50.7	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. Based on recent experience, we are recommending increasing the reciprocity percentage by 1% for each group.

	Retirements from Deferred Status (2019-2022)				
Plan	Total	Reciprocal Status	% with Reciprocity	Current Assump.	Proposed Assump.
General	1,207	241	20%	16%	17%
Safety	88	32	36%	35%	36%
Total	1,295	273	21%		

Appendix A: Proposed Actuarial Procedures and Assumptions

This section of the experience study report reflects how the Appendix A of the June 30, 2022 actuarial valuation would appear if the Board of Investments adopts all of the recommended assumptions.

Appendix A   Actuarial Procedures and Assumptions

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 probabilities 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 2022 Investigation of Experience Study. These are the probability that a member will leave the System for various reasons.

Note: Recommended changes from the prior methods and 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).

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).

For members who transferred between plans, entry age is based on original entry into the System.

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

Amortization Method

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. As of the June 30, 2019 valuation, all amortization layers with periods greater than 22 years as of July 1, 2020 were amortized over a 22-year period. Future changes in the UAAL due to actuarial gains and losses and assumption changes are amortized over new closed 20-year periods, beginning with the date the contribution is first expected to be made. This is referred to as "layered" amortization. For increases in the UAAL due to changes in benefit provisions, the increase is amortized over a 10-year period.

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. The normal cost rates for active members within an individual plan 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.

Payroll Growth

Total payroll is expected to grow at 3.25% per year.

Internal Revenue Code Section 415 Limit

The Internal Revenue Code (IRC) Section 415 maximum benefit limitation is not explicitly reflected in the valuation for funding purposes. Any limitation is reflected in a member's benefit calculation at 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.

Government Code Section 7522.10

The maximum compensation limit under Government Code Section 7522.10 is 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 of contributory legacy plans (all plans except General Plans E and G and Safety Plan C) vary by entry age 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 market value excludes the STAR Reserve. 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. To the extent that there is a loss for the year and there are unrecognized gains from previous years, or to the extent that there is a gain for the year and there are unrecognized losses from previous years, the gain or loss for the year shall be used to offset unrecognized gains or losses from previous years in the order of oldest to most recent. Any remaining gain or loss for the year is recognized over a five-year period. The five-year smoothing valuation basis for all assets was adopted effective June 30, 2009, and the offsetting methodology and STAR Reserve treatment were adopted effective June 30, 2022.

Price Inflation (Local and National)

The price inflation assumption is used in the determination of assumptions for individual salary increases, overall wage growth, postretirement benefit increases, and PEPRA compensation limit increases. Both the local and national price inflation assumptions are 2.75% per year.

Investment Earnings and Expenses

The future investment earnings of the assets of LACERA are assumed to accrue at an annual rate of 7.00% compounded annually, net of both investment and administrative expenses. This rate was adopted June 30, 2019.

Postretirement Benefit Increases

Postretirement increases are assumed for the valuation in accordance with the benefits provided as described in Appendix B. These adjustments vary by plan and are assumed payable each year in the future but are limited to not exceed the expected local inflation of 2.75% per year, with the exception that any COLA accumulation banks for Plan A members are reflected in the valuation. The local inflation rate used for the postretirement benefit assumptions was adopted June 30, 2016.

Interest on Member Contributions

The annual credited interest rate on member contributions is assumed to be 7.00% compounded semi-annually for an annualized rate of 7.12%. This rate was adopted effective 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 3.25% 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 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 3.25% 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, 2016.

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 2022 is $161,969 (after applying the 120% factor) and is projected to increase at the CPI rate of 2.75%. This rate of future increase was adopted effective June 30, 2016.

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. Retirement probabilities vary by age and are shown by plan in Tables A-6 through A-13.

All General members who attain or have attained age 75 in active service and all Safety members who attain or 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).

Vested former 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 regard to a particular member. For example, a General Plan D 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 can 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, 2022.

Disability

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

Postretirement Mortality – Other Than Disabled Members

The same postretirement mortality probabilities are used in the valuation for members retired for service and beneficiaries. These probabilities are illustrated in Table A-2. Current beneficiary mortality is assumed to be the same as for healthy members of the same sex. Future beneficiaries are assumed to be of the opposite sex and have the same mortality as General members. The amount-weighted Pub-2010 mortality tables are used. These probabilities were adopted June 30, 2019.

Note that these assumptions include a projection for expected future mortality improvement. The new projection scale was adopted June 30, 2022.

Males: General members: PubG-2010 Healthy Retiree Mortality Table for Males, with MP-2021 Ultimate Projection Scale.

Safety members: PubS-2010 Healthy Retiree Mortality Table for Males multiplied by 85%, with MP-2021 Ultimate Projection Scale.

Females: General members: PubG-2010 Healthy Retiree Mortality Table for Females multiplied by 110%, with MP-2021 Ultimate Projection Scale.

Safety members: PubS-2010 Healthy Retiree Mortality Table for Females, with MP-2021 Ultimate Projection Scale.

Postretirement Mortality – Disabled Members

For members retired for disability, the mortality probabilities used in the valuation are illustrated in Table A-3. The amount-weighted Pub-2010 mortality tables are used. These probabilities were adopted June 30, 2019.

Note that these assumptions include a projection for expected future mortality improvement. The new projection scale was adopted June 30, 2022.

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-2021 Ultimate Projection Scale.

Safety members: PubS-2010 Healthy Retiree Mortality Table for Males, with MP-2021 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-2021 Ultimate Projection Scale.

Safety members: PubS-2010 Healthy Retiree Mortality Table for Females, with MP-2021 Ultimate Projection Scale.

Mortality while in Active Status

For active members, the mortality probabilities used in the valuation are illustrated in Tables A-6 through A-13. The amount-weighted Pub-2010 mortality tables are used. These probabilities 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. *Projected using the MP-2021 Ultimate projection scale.*

These assumptions include a projection for expected future mortality improvement, which was adopted June 30, 2022.

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

Other Employment Terminations

Tables A-6 to A-13 show, for all ages, the probabilities assumed in this valuation for future termination from active service other than for death, disability, or retirement. These probabilities do not apply to members eligible for service retirement. These probabilities were adopted June 30, 2022.

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 probabilities were adopted June 30, 2022.

Probability of Eligible Survivors

For members not currently in pay status, 77% of all males and 48% of all females are assumed to have eligible survivors (spouses or qualified domestic partners). Survivors are assumed to be three years younger than male members and two years older than female members. Survivors are assumed to be of the opposite 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

17% of General and 36% of Safety current and future vested former members are assumed to work for a reciprocal employer.

Current vested reciprocal members are assumed to receive annual salary increases of 4.25%. 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 2044. For Safety members, it is based on an 85% / 15% blend of the male and female annuity factors determined using the same mortality tables as used for service-retired members.

B. The annuity factor used in determining the present value of future benefits (PVFB) at entry age is equal to the life only annuity factor at 7.00%.

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

D. Example: For a General 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.

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

This work product was prepared solely for LACERA for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

68

Table A-1
Summary of Valuation Assumptions as of June 30, 2022

I.   Economic assumptions

    A. Payroll / General wage increases   3.25%

    B. Investment earnings   7.00%

    C. Growth in membership   0.00%

    D. Postretirement benefit increases (varies by plan)   Plan COLA not greater than local price inflation assumption[1]

    E. National price inflation assumption   2.75%

    F. Local price inflation assumption   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[2]   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[2]   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]   Table A-2
        Basis – Beneficiaries are assumed to have the same mortality as a General member of the opposite gender who has taken a service retirement.

    H. Other terminations of employment   Tables A-6 to A-13

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

1. To account for existing Plan A COLA accumulation balances, retirees and beneficiaries with a retirement date prior to April 1, 2022 are assumed to receive 3.00% annual COLAs.

2. All mortality probabilities are projected using the MP-2021 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%

Age	All Groups
60 & Less	1.350%
61	1.350%
62	1.350%
63	1.340%
64	1.320%
65	1.310%
70	1.240%
75	1.170%
80	1.100%
85	0.870%
90	0.630%
95	0.400%
100	0.300%
105	0.200%
110	0.100%
115	0.000%

1. Mortality probabilities 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 probability for an 85-year old Safety male in fiscal year beginning in 2022 is 6.9918% calculated as follows:

Age 85 probability in 2022 = Age 85 probability in 2010 with 12 years improvement

$$= 7.7648\% \times (100.0\% - 0.87\%)^{12} = 6.9918\%$$

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 probabilities 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	30%	30%
6	30%	30%
7	30%	30%
8	29%	28%
9	28%	26%
10	28%	24%
11	28%	22%
12	28%	20%
13	27%	18%
14	26%	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%	7.50%
3	4.10%	5.75%
4	3.50%	4.25%
5	3.00%	3.00%
6	2.50%	2.50%
7	2.00%	2.10%
8	1.60%	1.70%
9	1.45%	1.45%
10	1.30%	1.30%
11	1.15%	1.20%
12	1.00%	1.10%
13	0.90%	1.00%
14	0.85%	0.90%
15	0.80%	0.90%
16	0.75%	0.90%
17	0.70%	0.90%
18	0.65%	0.90%
19	0.60%	2.25%
20	0.55%	0.90%
21	0.50%	0.90%
22	0.45%	0.90%
23	0.40%	0.90%
24	0.40%	3.00%
25	0.40%	0.90%
26	0.40%	0.90%
27	0.40%	0.90%
28	0.40%	0.90%
29	0.40%	3.00%
30 or More	0.40%	0.90%

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

Appendix A   Probabilities 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 of these represents the probability that a member will separate from service at each age due to the particular cause. For example, a probability 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 probabilities 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
Probability 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	0.30000	0.00500	0.00390	0.00092	N/A	0.00383
61	0.30000	0.00500	0.00420	0.00096	N/A	0.00413
62	0.30000	0.00500	0.00450	0.00100	N/A	0.00445
63	0.30000	0.00500	0.00450	0.00104	N/A	0.00481
64	0.30000	0.00500	0.00450	0.00108	N/A	0.00520
65	0.30000	0.00500	0.00450	0.00112	N/A	0.00562
66	0.22000	0.00500	0.00450	0.00116	N/A	0.00607
67	0.22000	0.00500	0.00450	0.00120	N/A	0.00658
68	0.22000	0.00500	0.00450	0.00124	N/A	0.00713
69	0.22000	0.00500	0.00450	0.00128	N/A	0.00775
70	0.22000	0.00500	0.00450	0.00132	N/A	0.00844
71	0.22000	0.00500	0.00450	0.00136	N/A	0.00920
72	0.22000	0.00500	0.00450	0.00140	N/A	0.01004
73	0.22000	0.00500	0.00450	0.00144	N/A	0.01098
74	0.22000	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
Probability 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	0.30000	0.00500	0.00222	0.00072	N/A	0.00242
61	0.30000	0.00500	0.00236	0.00076	N/A	0.00264
62	0.30000	0.00500	0.00250	0.00080	N/A	0.00289
63	0.30000	0.00500	0.00250	0.00084	N/A	0.00317
64	0.30000	0.00500	0.00250	0.00088	N/A	0.00350
65	0.30000	0.00500	0.00250	0.00092	N/A	0.00385
66	0.22000	0.00500	0.00250	0.00096	N/A	0.00425
67	0.22000	0.00500	0.00250	0.00100	N/A	0.00471
68	0.22000	0.00500	0.00250	0.00104	N/A	0.00520
69	0.22000	0.00500	0.00250	0.00108	N/A	0.00575
70	0.22000	0.00500	0.00250	0.00112	N/A	0.00636
71	0.22000	0.00500	0.00250	0.00116	N/A	0.00703
72	0.22000	0.00500	0.00250	0.00120	N/A	0.00777
73	0.22000	0.00500	0.00250	0.00124	N/A	0.00859
74	0.22000	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
Probability of Separation from Active Service for General Members
Plans D & G – Male

Age	Service Retirement[1] Plan D	Service Retirement[1] Plan G	Service Disability	Ordinary Disability	Service Death	Ordinary Death	Years of Service	Other Terminations	Retirement Rate Loading[2]
18	0.00000	0.00000	0.00010	0.00010	N/A	0.00043	0	0.08000	80%
19	0.00000	0.00000	0.00010	0.00010	N/A	0.00046	1	0.06500	80%
20	0.00000	0.00000	0.00010	0.00010	N/A	0.00044	2	0.05000	80%
21	0.00000	0.00000	0.00010	0.00010	N/A	0.00043	3	0.04250	80%
22	0.00000	0.00000	0.00010	0.00010	N/A	0.00040	4	0.03500	80%
23	0.00000	0.00000	0.00010	0.00010	N/A	0.00037	5	0.03100	80%
24	0.00000	0.00000	0.00010	0.00010	N/A	0.00035	6	0.02900	80%
25	0.00000	0.00000	0.00010	0.00010	N/A	0.00034	7	0.02700	80%
26	0.00000	0.00000	0.00010	0.00010	N/A	0.00036	8	0.02500	80%
27	0.00000	0.00000	0.00010	0.00010	N/A	0.00037	9	0.02000	80%
28	0.00000	0.00000	0.00010	0.00010	N/A	0.00040	10	0.01700	80%
29	0.00000	0.00000	0.00010	0.00010	N/A	0.00041	11	0.01500	80%
30	0.00000	0.00000	0.00010	0.00020	N/A	0.00043	12	0.01350	80%
31	0.00000	0.00000	0.00010	0.00020	N/A	0.00046	13	0.01200	80%
32	0.00000	0.00000	0.00010	0.00020	N/A	0.00048	14	0.01100	80%
33	0.00000	0.00000	0.00016	0.00020	N/A	0.00050	15	0.01000	80%
34	0.00000	0.00000	0.00022	0.00020	N/A	0.00053	16	0.00950	80%
35	0.00000	0.00000	0.00028	0.00020	N/A	0.00056	17	0.00900	80%
36	0.00000	0.00000	0.00034	0.00020	N/A	0.00060	18	0.00850	80%
37	0.00000	0.00000	0.00040	0.00020	N/A	0.00064	19	0.00800	80%
38	0.00000	0.00000	0.00048	0.00020	N/A	0.00068	20	0.00750	90%
39	0.00000	0.00000	0.00056	0.00020	N/A	0.00073	21	0.00700	90%
40	0.01500	0.00000	0.00064	0.00020	N/A	0.00079	22	0.00650	90%
41	0.01500	0.00000	0.00072	0.00020	N/A	0.00085	23	0.00600	90%
42	0.01500	0.00000	0.00080	0.00020	N/A	0.00092	24	0.00550	90%
43	0.01500	0.00000	0.00084	0.00024	N/A	0.00100	25	0.00500	110%
44	0.01500	0.00000	0.00088	0.00028	N/A	0.00108	26	0.00450	110%
45	0.01500	0.00000	0.00092	0.00032	N/A	0.00118	27	0.00400	110%
46	0.01500	0.00000	0.00096	0.00036	N/A	0.00128	28	0.00400	110%
47	0.01500	0.00000	0.00100	0.00040	N/A	0.00139	29	0.00400	110%
48	0.01500	0.00000	0.00104	0.00044	N/A	0.00152	30 & Above	0.00000	160%
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	0.03000	0.02400	0.00228	0.00072	N/A	0.00263			
56	0.03000	0.02400	0.00264	0.00076	N/A	0.00283			
57	0.03000	0.02400	0.00300	0.00080	N/A	0.00306			
58	0.04000	0.03200	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	0.07000	0.05600	0.00420	0.00096	N/A	0.00413			
62	0.10000	0.10000	0.00450	0.00100	N/A	0.00445			
63	0.12000	0.12000	0.00450	0.00104	N/A	0.00481			
64	0.17000	0.17000	0.00450	0.00108	N/A	0.00520			
65	0.23000	0.18400	0.00450	0.00112	N/A	0.00562			
66	0.19000	0.15200	0.00450	0.00116	N/A	0.00607			
67	0.19000	0.30000	0.00450	0.00120	N/A	0.00658			
68	0.19000	0.19000	0.00450	0.00124	N/A	0.00713			
69	0.19000	0.19000	0.00450	0.00128	N/A	0.00775			
70	0.24000	0.24000	0.00450	0.00132	N/A	0.00844			
71	0.19000	0.19000	0.00450	0.00136	N/A	0.00920			
72	0.19000	0.19000	0.00450	0.00140	N/A	0.01004			
73	0.19000	0.19000	0.00450	0.00144	N/A	0.01098			
74	0.19000	0.19000	0.00450	0.00148	N/A	0.01201			
75	1.00000	1.00000	0.00000	0.00000	N/A	0.01315			

1. *Service retirement rates vary by years of service. The applicable retirement rate loading that varies by years of service is shown on this page in a separate column.*
2. *The retirement rate loading is applied to the service retirement rate at each member's applicable age and years of service.*

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

Age	Service Retirement[1] Plan D	Plan G	Service Disability	Ordinary Disability	Service Death	Ordinary Death	Years of Service	Other Terminations	Retirement Rate Loading[2]
18	0.00000	0.00000	0.00015	0.00010	N/A	0.00017	0	0.08000	80%
19	0.00000	0.00000	0.00015	0.00010	N/A	0.00017	1	0.06500	80%
20	0.00000	0.00000	0.00015	0.00010	N/A	0.00017	2	0.05000	80%
21	0.00000	0.00000	0.00015	0.00010	N/A	0.00016	3	0.04250	80%
22	0.00000	0.00000	0.00015	0.00010	N/A	0.00014	4	0.03500	80%
23	0.00000	0.00000	0.00015	0.00010	N/A	0.00013	5	0.03100	80%
24	0.00000	0.00000	0.00015	0.00010	N/A	0.00012	6	0.02900	80%
25	0.00000	0.00000	0.00015	0.00010	N/A	0.00012	7	0.02700	80%
26	0.00000	0.00000	0.00015	0.00010	N/A	0.00013	8	0.02500	80%
27	0.00000	0.00000	0.00015	0.00010	N/A	0.00014	9	0.02000	80%
28	0.00000	0.00000	0.00015	0.00010	N/A	0.00016	10	0.01700	80%
29	0.00000	0.00000	0.00015	0.00010	N/A	0.00017	11	0.01500	80%
30	0.00000	0.00000	0.00015	0.00010	N/A	0.00020	12	0.01350	80%
31	0.00000	0.00000	0.00015	0.00010	N/A	0.00021	13	0.01200	80%
32	0.00000	0.00000	0.00015	0.00010	N/A	0.00023	14	0.01100	80%
33	0.00000	0.00000	0.00020	0.00010	N/A	0.00025	15	0.01000	80%
34	0.00000	0.00000	0.00025	0.00010	N/A	0.00027	16	0.00950	80%
35	0.00000	0.00000	0.00030	0.00010	N/A	0.00030	17	0.00900	80%
36	0.00000	0.00000	0.00035	0.00010	N/A	0.00033	18	0.00850	80%
37	0.00000	0.00000	0.00040	0.00010	N/A	0.00036	19	0.00800	80%
38	0.00000	0.00000	0.00042	0.00014	N/A	0.00039	20	0.00750	90%
39	0.00000	0.00000	0.00044	0.00018	N/A	0.00043	21	0.00700	90%
40	0.01500	0.00000	0.00046	0.00022	N/A	0.00047	22	0.00650	90%
41	0.01500	0.00000	0.00048	0.00026	N/A	0.00052	23	0.00600	90%
42	0.01500	0.00000	0.00050	0.00030	N/A	0.00056	24	0.00550	90%
43	0.01500	0.00000	0.00060	0.00032	N/A	0.00061	25	0.00500	110%
44	0.01500	0.00000	0.00070	0.00034	N/A	0.00066	26	0.00450	110%
45	0.01500	0.00000	0.00080	0.00036	N/A	0.00073	27	0.00400	110%
46	0.01500	0.00000	0.00090	0.00038	N/A	0.00079	28	0.00400	110%
47	0.01500	0.00000	0.00100	0.00040	N/A	0.00086	29	0.00400	110%
48	0.01500	0.00000	0.00110	0.00042	N/A	0.00092	30 & Above	0.00000	160%
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	0.03000	0.02400	0.00168	0.00056	N/A	0.00160			
56	0.03000	0.02400	0.00174	0.00058	N/A	0.00173			
57	0.03000	0.02400	0.00180	0.00060	N/A	0.00187			
58	0.04000	0.03200	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	0.07000	0.05600	0.00236	0.00076	N/A	0.00264			
62	0.10000	0.10000	0.00250	0.00080	N/A	0.00289			
63	0.12000	0.12000	0.00250	0.00084	N/A	0.00317			
64	0.17000	0.17000	0.00250	0.00088	N/A	0.00350			
65	0.23000	0.18400	0.00250	0.00092	N/A	0.00385			
66	0.19000	0.15200	0.00250	0.00096	N/A	0.00425			
67	0.19000	0.30000	0.00250	0.00100	N/A	0.00471			
68	0.19000	0.19000	0.00250	0.00104	N/A	0.00520			
69	0.19000	0.19000	0.00250	0.00108	N/A	0.00575			
70	0.24000	0.24000	0.00250	0.00112	N/A	0.00636			
71	0.19000	0.19000	0.00250	0.00116	N/A	0.00703			
72	0.19000	0.19000	0.00250	0.00120	N/A	0.00777			
73	0.19000	0.19000	0.00250	0.00124	N/A	0.00859			
74	0.19000	0.19000	0.00250	0.00128	N/A	0.00950			
75	1.00000	1.00000	0.00000	0.00000	N/A	0.01050			

1. Service retirement rates vary by years of service. The applicable retirement rate loading that varies by years of service is shown on this page in a separate column.
2. The retirement rate loading is applied to the service retirement rate at each member's applicable age and years of service.

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

Age	Service Retirement[1]	Service Disability	Ordinary Disability	Service Death	Ordinary Death	Years of Service	Other Terminations	Retirement Rate Loading[2]
18	0.00000	N/A	N/A	N/A	0.00043	0	0.08000	70%
19	0.00000	N/A	N/A	N/A	0.00046	1	0.06500	70%
20	0.00000	N/A	N/A	N/A	0.00044	2	0.05000	70%
21	0.00000	N/A	N/A	N/A	0.00043	3	0.04250	70%
22	0.00000	N/A	N/A	N/A	0.00040	4	0.03500	70%
23	0.00000	N/A	N/A	N/A	0.00037	5	0.03100	70%
24	0.00000	N/A	N/A	N/A	0.00035	6	0.02700	70%
25	0.00000	N/A	N/A	N/A	0.00034	7	0.02300	70%
26	0.00000	N/A	N/A	N/A	0.00036	8	0.02300	70%
27	0.00000	N/A	N/A	N/A	0.00037	9	0.02300	70%
28	0.00000	N/A	N/A	N/A	0.00040	10	0.02300	70%
29	0.00000	N/A	N/A	N/A	0.00041	11	0.01900	70%
30	0.00000	N/A	N/A	N/A	0.00043	12	0.01800	70%
31	0.00000	N/A	N/A	N/A	0.00046	13	0.01680	70%
32	0.00000	N/A	N/A	N/A	0.00048	14	0.01560	70%
33	0.00000	N/A	N/A	N/A	0.00050	15	0.01440	70%
34	0.00000	N/A	N/A	N/A	0.00053	16	0.01320	70%
35	0.00000	N/A	N/A	N/A	0.00056	17	0.01200	70%
36	0.00000	N/A	N/A	N/A	0.00060	18	0.01160	70%
37	0.00000	N/A	N/A	N/A	0.00064	19	0.01120	70%
38	0.00000	N/A	N/A	N/A	0.00068	20	0.01080	70%
39	0.00000	N/A	N/A	N/A	0.00073	21	0.01040	70%
40	0.00000	N/A	N/A	N/A	0.00079	22	0.01000	70%
41	0.00000	N/A	N/A	N/A	0.00085	23	0.01000	70%
42	0.00000	N/A	N/A	N/A	0.00092	24	0.01000	70%
43	0.00000	N/A	N/A	N/A	0.00100	25	0.01000	100%
44	0.00000	N/A	N/A	N/A	0.00108	26	0.01000	100%
45	0.00000	N/A	N/A	N/A	0.00118	27	0.01000	100%
46	0.00000	N/A	N/A	N/A	0.00128	28	0.01000	100%
47	0.00000	N/A	N/A	N/A	0.00139	29	0.01000	100%
48	0.00000	N/A	N/A	N/A	0.00152	30 & Above	0.01000	130%
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	0.19000	N/A	N/A	N/A	0.00520			
65	0.27000	N/A	N/A	N/A	0.00562			
66	0.20000	N/A	N/A	N/A	0.00607			
67	0.20000	N/A	N/A	N/A	0.00658			
68	0.20000	N/A	N/A	N/A	0.00713			
69	0.20000	N/A	N/A	N/A	0.00775			
70	0.20000	N/A	N/A	N/A	0.00844			
71	0.20000	N/A	N/A	N/A	0.00920			
72	0.20000	N/A	N/A	N/A	0.01004			
73	0.20000	N/A	N/A	N/A	0.01098			
74	0.20000	N/A	N/A	N/A	0.01201			
75	1.00000	N/A	N/A	N/A	0.01315			

1. Service retirement rates vary by years of service. The applicable retirement rate loading that varies by years of service is shown on this page in a separate column.
2. The retirement rate loading is applied to the service retirement rate at each member's applicable age and years of service.

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

Age	Service Retirement[1]	Service Disability	Ordinary Disability	Service Death	Ordinary Death	Years of Service	Other Terminations	Retirement Rate Loading[2]
18	0.00000	N/A	N/A	N/A	0.00017	0	0.08000	70%
19	0.00000	N/A	N/A	N/A	0.00017	1	0.06500	70%
20	0.00000	N/A	N/A	N/A	0.00017	2	0.05000	70%
21	0.00000	N/A	N/A	N/A	0.00016	3	0.04250	70%
22	0.00000	N/A	N/A	N/A	0.00014	4	0.03500	70%
23	0.00000	N/A	N/A	N/A	0.00013	5	0.03100	70%
24	0.00000	N/A	N/A	N/A	0.00012	6	0.02700	70%
25	0.00000	N/A	N/A	N/A	0.00012	7	0.02300	70%
26	0.00000	N/A	N/A	N/A	0.00013	8	0.02300	70%
27	0.00000	N/A	N/A	N/A	0.00014	9	0.02300	70%
28	0.00000	N/A	N/A	N/A	0.00016	10	0.02300	70%
29	0.00000	N/A	N/A	N/A	0.00017	11	0.01900	70%
30	0.00000	N/A	N/A	N/A	0.00020	12	0.01800	70%
31	0.00000	N/A	N/A	N/A	0.00021	13	0.01680	70%
32	0.00000	N/A	N/A	N/A	0.00023	14	0.01560	70%
33	0.00000	N/A	N/A	N/A	0.00025	15	0.01440	70%
34	0.00000	N/A	N/A	N/A	0.00027	16	0.01320	70%
35	0.00000	N/A	N/A	N/A	0.00030	17	0.01200	70%
36	0.00000	N/A	N/A	N/A	0.00033	18	0.01160	70%
37	0.00000	N/A	N/A	N/A	0.00036	19	0.01120	70%
38	0.00000	N/A	N/A	N/A	0.00039	20	0.01080	70%
39	0.00000	N/A	N/A	N/A	0.00043	21	0.01040	70%
40	0.00000	N/A	N/A	N/A	0.00047	22	0.01000	70%
41	0.00000	N/A	N/A	N/A	0.00052	23	0.01000	70%
42	0.00000	N/A	N/A	N/A	0.00056	24	0.01000	70%
43	0.00000	N/A	N/A	N/A	0.00061	25	0.01000	100%
44	0.00000	N/A	N/A	N/A	0.00066	26	0.01000	100%
45	0.00000	N/A	N/A	N/A	0.00073	27	0.01000	100%
46	0.00000	N/A	N/A	N/A	0.00079	28	0.01000	100%
47	0.00000	N/A	N/A	N/A	0.00086	29	0.01000	100%
48	0.00000	N/A	N/A	N/A	0.00092	30 & Above	0.01000	130%
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	0.19000	N/A	N/A	N/A	0.00350			
65	0.27000	N/A	N/A	N/A	0.00385			
66	0.20000	N/A	N/A	N/A	0.00425			
67	0.20000	N/A	N/A	N/A	0.00471			
68	0.20000	N/A	N/A	N/A	0.00520			
69	0.20000	N/A	N/A	N/A	0.00575			
70	0.20000	N/A	N/A	N/A	0.00636			
71	0.20000	N/A	N/A	N/A	0.00703			
72	0.20000	N/A	N/A	N/A	0.00777			
73	0.20000	N/A	N/A	N/A	0.00859			
74	0.20000	N/A	N/A	N/A	0.00950			
75	1.00000	N/A	N/A	N/A	0.01050			

1. Service retirement rates vary by years of service. The applicable retirement rate loading that varies by years of service is shown on this page in a separate column.
2. The retirement rate loading is applied to the service retirement rate at each member's applicable age and years of service.

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

Age	Service Retirement[1] Plans A & B	Plan C	Service Disability	Ordinary Disability	Service Death	Ordinary Death	Years of Service	Other Terminations	Retirement Rate Loading[2]
18	0.00000	0.00000	0.00200	0.00000	0.00010	0.00037	0	0.05000	30%
19	0.00000	0.00000	0.00200	0.00000	0.00010	0.00040	1	0.03750	30%
20	0.00000	0.00000	0.00200	0.00000	0.00010	0.00041	2	0.02000	30%
21	0.00000	0.00000	0.00200	0.00000	0.00010	0.00041	3	0.01500	30%
22	0.00000	0.00000	0.00200	0.00000	0.00010	0.00040	4	0.01200	30%
23	0.00000	0.00000	0.00200	0.00000	0.00010	0.00039	5	0.01130	30%
24	0.00000	0.00000	0.00200	0.00000	0.00010	0.00038	6	0.01070	30%
25	0.00000	0.00000	0.00200	0.00000	0.00010	0.00037	7	0.01000	30%
26	0.00000	0.00000	0.00200	0.00000	0.00010	0.00038	8	0.00920	30%
27	0.00000	0.00000	0.00200	0.00000	0.00010	0.00039	9	0.00840	30%
28	0.00000	0.00000	0.00200	0.00000	0.00010	0.00040	10	0.00760	30%
29	0.00000	0.00000	0.00200	0.00000	0.00010	0.00041	11	0.00680	30%
30	0.00000	0.00000	0.00200	0.00000	0.00010	0.00041	12	0.00600	30%
31	0.00000	0.00000	0.00200	0.00000	0.00010	0.00042	13	0.00560	30%
32	0.00000	0.00000	0.00200	0.00000	0.00010	0.00043	14	0.00520	30%
33	0.00000	0.00000	0.00210	0.00000	0.00010	0.00044	15	0.00480	40%
34	0.00000	0.00000	0.00220	0.00000	0.00010	0.00045	16	0.00440	40%
35	0.00000	0.00000	0.00230	0.00000	0.00010	0.00047	17	0.00400	40%
36	0.00000	0.00000	0.00240	0.00000	0.00010	0.00049	18	0.00360	40%
37	0.00000	0.00000	0.00250	0.00000	0.00010	0.00050	19	0.00320	40%
38	0.00000	0.00000	0.00260	0.00000	0.00010	0.00053	20	0.00280	70%
39	0.00000	0.00000	0.00270	0.00000	0.00010	0.00056	21	0.00240	70%
40	0.00750	0.00000	0.00280	0.00000	0.00010	0.00059	22	0.00200	70%
41	0.00750	0.00000	0.00290	0.00000	0.00010	0.00062	23	0.00200	70%
42	0.00750	0.00000	0.00300	0.00000	0.00010	0.00067	24	0.00200	70%
43	0.00750	0.00000	0.00310	0.00000	0.00010	0.00071	25	0.00200	110%
44	0.00750	0.00000	0.00320	0.00000	0.00010	0.00076	26	0.00200	110%
45	0.00750	0.00000	0.00330	0.00000	0.00010	0.00082	27	0.00200	110%
46	0.00750	0.00000	0.00340	0.00000	0.00010	0.00088	28	0.00200	110%
47	0.00750	0.00000	0.00350	0.00000	0.00010	0.00095	29	0.00200	110%
48	0.00750	0.00000	0.00400	0.00000	0.00010	0.00102	30 & Above	0.00000	170%
49	0.00750	0.00000	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	0.12000	0.08000	0.02000	0.00000	0.00010	0.00162			
55	0.22000	0.15000	0.07500	0.00000	0.00010	0.00175			
56	0.18000	0.15000	0.07500	0.00000	0.00010	0.00190			
57	0.14000	0.23000	0.10000	0.00000	0.00010	0.00205			
58	0.15000	0.15000	0.10000	0.00000	0.00010	0.00223			
59	0.22000	0.22000	0.10000	0.00000	0.00010	0.00243			
60	0.21000	0.21000	0.10000	0.00000	0.00010	0.00264			
61	0.20000	0.20000	0.05000	0.00000	0.00010	0.00288			
62	0.20000	0.20000	0.05000	0.00000	0.00010	0.00315			
63	0.20000	0.20000	0.05000	0.00000	0.00010	0.00344			
64	0.23000	0.23000	0.05000	0.00000	0.00010	0.00375			
65	1.00000	1.00000	0.00000	0.00000	0.00000	0.00410			

1. Service retirement rates vary by years of service. The applicable retirement rate loading that varies by years of service is shown on this page in a separate column.
2. The retirement rate loading is applied to the service retirement rate at each member's applicable age and years of service.

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

Age	Service Retirement[1]		Service Disability	Ordinary Disability	Service Death	Ordinary Death	Years of Service	Other Terminations	Retirement Rate Loading[2]
	Plans A & B	Plan C							
18	0.00000	0.00000	0.00300	0.00000	0.00010	0.00014	0	0.05000	30%
19	0.00000	0.00000	0.00300	0.00000	0.00010	0.00015	1	0.03750	30%
20	0.00000	0.00000	0.00300	0.00000	0.00010	0.00016	2	0.02000	30%
21	0.00000	0.00000	0.00300	0.00000	0.00010	0.00017	3	0.01500	30%
22	0.00000	0.00000	0.00300	0.00000	0.00010	0.00017	4	0.01200	30%
23	0.00000	0.00000	0.00300	0.00000	0.00010	0.00018	5	0.01130	30%
24	0.00000	0.00000	0.00300	0.00000	0.00010	0.00019	6	0.01070	30%
25	0.00000	0.00000	0.00300	0.00000	0.00010	0.00020	7	0.01000	30%
26	0.00000	0.00000	0.00300	0.00000	0.00010	0.00021	8	0.00920	30%
27	0.00000	0.00000	0.00300	0.00000	0.00010	0.00022	9	0.00840	30%
28	0.00000	0.00000	0.00340	0.00000	0.00010	0.00024	10	0.00760	30%
29	0.00000	0.00000	0.00380	0.00000	0.00010	0.00025	11	0.00680	30%
30	0.00000	0.00000	0.00420	0.00000	0.00010	0.00027	12	0.00600	30%
31	0.00000	0.00000	0.00460	0.00000	0.00010	0.00028	13	0.00560	30%
32	0.00000	0.00000	0.00500	0.00000	0.00010	0.00030	14	0.00520	30%
33	0.00000	0.00000	0.00560	0.00000	0.00010	0.00032	15	0.00480	40%
34	0.00000	0.00000	0.00620	0.00000	0.00010	0.00034	16	0.00440	40%
35	0.00000	0.00000	0.00680	0.00000	0.00010	0.00036	17	0.00400	40%
36	0.00000	0.00000	0.00740	0.00000	0.00010	0.00038	18	0.00360	40%
37	0.00000	0.00000	0.00800	0.00000	0.00010	0.00041	19	0.00320	40%
38	0.00000	0.00000	0.00840	0.00000	0.00010	0.00043	20	0.00280	70%
39	0.00000	0.00000	0.00880	0.00000	0.00010	0.00046	21	0.00240	70%
40	0.00750	0.00000	0.00920	0.00000	0.00010	0.00049	22	0.00200	70%
41	0.00750	0.00000	0.00960	0.00000	0.00010	0.00052	23	0.00200	70%
42	0.00750	0.00000	0.01000	0.00000	0.00010	0.00056	24	0.00200	70%
43	0.00750	0.00000	0.01040	0.00000	0.00010	0.00059	25	0.00200	110%
44	0.00750	0.00000	0.01080	0.00000	0.00010	0.00063	26	0.00200	110%
45	0.00750	0.00000	0.01120	0.00000	0.00010	0.00067	27	0.00200	110%
46	0.00750	0.00000	0.01160	0.00000	0.00010	0.00071	28	0.00200	110%
47	0.00750	0.00000	0.01200	0.00000	0.00010	0.00076	29	0.00200	110%
48	0.00750	0.00000	0.01300	0.00000	0.00010	0.00080	30 & Above	0.00000	170%
49	0.00750	0.00000	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	0.12000	0.08000	0.03200	0.00000	0.00010	0.00116			
55	0.22000	0.15000	0.11000	0.00000	0.00010	0.00123			
56	0.18000	0.15000	0.06000	0.00000	0.00010	0.00131			
57	0.14000	0.23000	0.06000	0.00000	0.00010	0.00140			
58	0.15000	0.15000	0.06000	0.00000	0.00010	0.00148			
59	0.22000	0.22000	0.06000	0.00000	0.00010	0.00158			
60	0.21000	0.21000	0.06000	0.00000	0.00010	0.00168			
61	0.20000	0.20000	0.06000	0.00000	0.00010	0.00178			
62	0.20000	0.20000	0.06000	0.00000	0.00010	0.00190			
63	0.20000	0.20000	0.06000	0.00000	0.00010	0.00202			
64	0.23000	0.23000	0.06000	0.00000	0.00010	0.00215			
65	1.00000	1.00000	0.00000	0.00000	0.00000	0.00228			

1. Service retirement rates vary by years of service. The applicable retirement rate loading that varies by years of service is shown on this page in a separate column.
2. The retirement rate loading is applied to the service retirement rate at each member's applicable age and years of service.