



Los Angeles County Employees Retirement Association

2016 Investigation of Experience for Retirement Benefit Assumptions

December 2016 Board Meeting

Prepared by:

Mark C. Olleman, FSA, EA, MAAA
Principal and Consulting Actuary

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

Julie D. Smith, FSA, EA, MAAA
Actuary

Milliman, Inc.
1301 Fifth Avenue, Suite 3800
Seattle, WA 98101-2605
Tel +1 1 206 624 7940
milliman.com



1301 Fifth Avenue
Suite 3800
Seattle, WA 98101-2605
USA

Tel +1 206 624 7940
Fax +1 206 623 3485

milliman.com

December 5, 2016

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

Dear Members of the Board:

It is a pleasure to submit this report of our investigation of the experience of the Los Angeles County Employees Retirement Association (LACERA) for the three-year period ending June 30, 2016. The results of this investigation are the basis for recommended changes in actuarial assumptions for the actuarial valuation to be performed as of June 30, 2016.

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, 2015 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, 2015 Actuarial Valuation report. In our examination, after discussion with LACERA and making certain adjustments, we have found the data to be reasonably consistent and comparable with data used for other purposes. Since the experience study results are dependent on the integrity of the data supplied, the results can be expected to differ if the underlying data is

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

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

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

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

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

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

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

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

Respectfully submitted,

A handwritten signature in black ink that reads "Mark C. Olleman".

Mark C. Olleman, FSA, EA, MAAA
Consulting Actuary

A handwritten signature in black ink that reads "Nick J. Collier".

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

A handwritten signature in black ink that reads "Julie D. Smith".

Julie D. Smith, FSA, EA, MAAA
Actuary

MCO/NJC/JDS/lwl

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Section 1 Executive Summary and Recommendations



Milliman has performed the triennial investigation of experience for the period July 1, 2013 through June 30, 2016. This report contains the findings of this investigation and includes several recommended changes in assumptions.

Determining the adequacy of the current contribution rates is dependent on the assumptions we use 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 pre-funding for the benefits prior to retirement.

Overview

Summary

This section describes the key findings of this investigation of experience. We have recommended several changes to the demographic and economic assumptions. If adopted, changes to the mortality assumptions and the economic assumptions would have a material effect on the member and employer contribution rates effective July 1, 2017. 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 have provided a summary of all changes later in this section. Note that we have shown two recommended sets of economic assumptions that we believe are reasonable, as discussed in Section 4. We will refer to our recommended assumptions as the “proposed” assumptions throughout this report.

Introduction

Section 2 discusses the following:

- The actuarial risk associated with setting actuarial assumptions.
- 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

Section 3 describes the actuarial methods used in performing our valuation and in assisting LACERA to administer the plan. We are not recommending any changes in the actuarial methods used in the valuation; however, we are recommending an update to the operating tables LACERA uses in the calculation of optional forms of payment to reflect the potential changes in the mortality and investment return assumptions.

Also note that new member rates will be computed based on the 2016 valuation using the assumptions adopted. We have estimated the new member rates based on the proposed assumptions, as shown in Section 3. These estimates show that there will be material increases in member rates under the proposed assumptions. Note that the actual rates cannot be determined until completion of the June 30, 2016 valuation.

**Actuarial Methods
(continued)**

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

Entry Age	Currently in Effect ⁽²⁾	Estimated Member Contribution Rates Effective July 1, 2017 ⁽¹⁾	
		Inv = 7.25% Wage = 3.25%	Inv = 7.00% Wage = 3.00%
General A			
25	5.30%	5.32%	5.24%
35	6.63%	6.65%	6.56%
45	8.14%	8.18%	8.07%
General B			
25	7.08%	7.38%	7.60%
35	8.84%	9.22%	9.50%
45	10.88%	11.35%	11.71%
General C			
25	6.03%	6.35%	6.52%
35	7.52%	7.92%	8.15%
45	9.39%	9.91%	10.19%
General D			
25	5.90%	6.31%	6.47%
35	7.36%	7.87%	8.09%
45	9.19%	9.85%	10.11%
General G			
All Ages	7.62%	8.33%	8.57%
Safety A			
25	8.00%	7.82%	7.69%
35	9.86%	9.64%	9.48%
45	11.76%	11.50%	11.33%
Safety B			
25	10.71%	11.07%	11.42%
35	13.19%	13.64%	14.09%
45	15.74%	16.29%	16.83%
Safety C			
All Ages	13.42%	14.39%	14.90%

1. Final member contribution rates will not be determined until the COLA portion is calculated in the June 30, 2016 actuarial valuation.

2. The rates currently in effect are based on the June 30, 2013 actuarial valuation and include an investment return assumption of 7.50% and a wage growth assumption of 3.50%.

Economic Assumptions

Section 4 discusses the economic assumptions: price inflation, general wage growth (includes price inflation and productivity), investment return, and future COLA increases. As with virtually all actuarial assumptions, there is not one right answer; however, we do believe there is evidence that a lower investment return assumption is appropriate for LACERA. We have recommended two alternative sets of economic assumptions. The recommended sets include a reduction in the investment return assumption to either 7.00% or 7.25%.

The most compelling reason to lower the investment return assumption is the lower expectation for future investment returns. The capital market assumptions reported by LACERA's general investment consultant, Meketa Investment Group (Meketa), predict an expected return based on LACERA's asset allocation of less than 7.4% over the next 20 years. Milliman, and many other investment consultants, are predicting less, particularly over the next 10 years. Therefore, we recommend that the investment return assumption be lowered to either 7.00% or 7.25%. Note that we primarily relied upon Meketa's capital market assumptions in making this recommendation.

As detailed in Section 4, the expectation is for lower price inflation in both the short and long term. In particular, there has been a sustained period of low inflation, with a 2.2% average increase over the 20-years ending in 2015. Looking forward, there is a continued expectation of low price inflation, as evidenced by the current (November, 2016) implied inflation expectation of approximately 2.1% based on the difference in yield between 30-year TIPS and a regular 30-year treasury bond.

We are recommending lowering the price inflation assumption to either 2.50% or 2.75%. Also, we recommend a corresponding reduction in the wage inflation assumption to either 3.00% or 3.25%, respectively, as there is a high correlation between price and wage inflation.

We are recommending a reduction in the assumed cost-of-living adjustment (COLA) for retiree benefits for most Plan A retirees if the price inflation assumption is reduced below 3.00%.

The following table shows our recommended assumption sets. We recommend that both the general wage growth assumption and the price inflation assumption be reduced by the same amount as the investment return assumption.

Economic Assumptions	Current Assumptions	Recommended Assumptions	
		Alternative #1	Alternative #2
Investment Return ⁽¹⁾	7.50%	7.25%	7.00%
General Wage Growth	3.50%	3.25%	3.00%
Payroll Growth	3.50%	3.25%	3.00%
Price Inflation	3.00%	2.75%	2.50%
COLAs for Retirees ⁽²⁾	3.00% / 2.00%	2.75% / 2.00%	2.50% / 2.00%

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

2. The first of the two numbers applies to Plan A; the second number applies to the remainder of the plans (although the Plan E COLA is pro-rated based on pre-2002 service). To account for existing Plan A COLA balances, retirees and beneficiaries with a retirement date prior to April 1, 1982 are assumed to receive 3.00% annual COLAs.

Merit Salary Increases

Section 5 discusses the individual salary increases due to promotion and longevity – the merit component of salaries. Overall, the results of our salary study were fairly consistent with the current rates. We are not recommending any changes in the merit salary increase assumption.

Death from Active Status

Section 6 discusses the probability of a member dying while in active employment. The actual rates were close to what the current assumptions predicted:

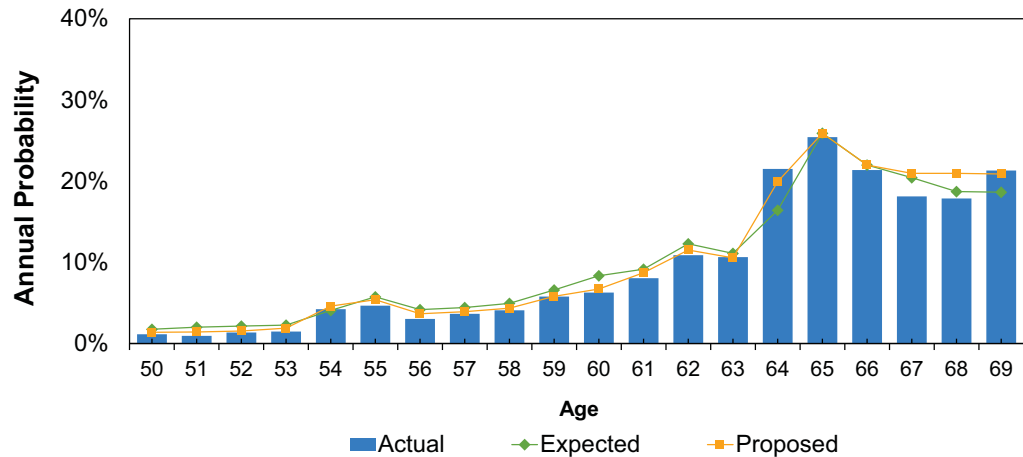
- **Nonservice-Connected Deaths:** The current assumptions expected 247 deaths and 247 actually occurred (excluding Plan E which has no active death benefit), resulting in a total Actual-to-Expected (A/E) ratio of 100% (i.e., the actual number of deaths were 100% of those expected). We have recommended reflecting a more updated mortality table which results in a new A/E of 103%.
- **Service-Connected Deaths:** Given the limited data for this assumption, we are not recommending a change.

Service Retirement

Section 7 discusses the probability of an eligible active member taking a service retirement at a specific age. The results of our study were generally consistent with the current rates, with the exception of the Safety plans which had lower-than-expected rates. The current assumptions expected 6,174 retirements among all active members; 5,626 actually occurred, resulting in a total Actual-to-Expected ratio of 91%. We have recommended decreases to service retirement rates for Safety members and some minor changes to General Plans D and E.

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

Service Retirement Rates – All Plans



Disability Retirement

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

Type	Actual	Expected	Actual / Expected	Proposed	Actual / Proposed
Service-Connected	455	454	100%	463	98%
Nonservice-Connected	54	44	123%	44	123%
Total	509	498	102%	507	100%

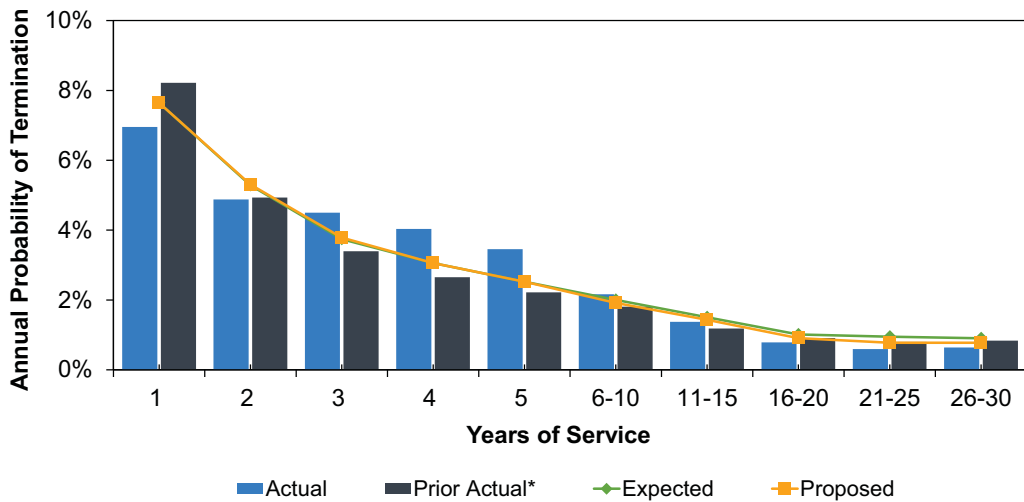
For disability retirements, actual experience was close to expected. We are recommending some minor adjustments to the service-connected disability rates to better fit actual experience at certain ages.

Termination

Section 9 summarizes the results of our study of terminations of employment for reasons other than death, service retirement, or disability. The current assumptions expected 4,615 terminations and 4,582 actually occurred, resulting in a total Actual-to-Expected ratio of 99%. We have recommended small changes to the termination rates for Plan E General members.

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

Termination Rates – All Plans



**Prior Actual numbers reflect average experience from last two studies (2013 and 2010).*

Probability of Refund

In Section 10, we report the actual number of vested members electing a refund upon termination was 88% of the expected number. We are recommending no change in this assumption.

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 show there were 4,792 retiree deaths during the period as compared to 4,441 expected, based on the current assumptions, resulting in a total Actual-to-Expected ratio of 108%.

Retirement Type	Actual	Expected	Actual / Expected
Service (Healthy)	4,025	3,714	108%
Disability	767	727	106%
Total	4,792	4,441	108%

We are recommending changes in the mortality assumptions that predict how long members are currently living. We are also recommending the addition of a projection scale that reflects the gradual year-to-year improvement in mortality that is expected to occur in the future. This approach is sometimes referred to as “generational mortality” because it results in the succeeding generation of members living longer than the preceding one. Overall, the new mortality assumption will result in an increase in life expectancy compared to the prior assumption. If LACERA were to elect to retain the current approach (referred to as a “static” projection), we have included a recommendation for an appropriate static projection period. Additional details are provided in Section 11.

The recommended change in mortality tables results in longer life expectancies, particularly for those members who are not expected to retire until a long time in the future. The following table compares the projected life expectancy for two sample members expected to retire in 2016. There is some increase in life expectancy for those close to retirement, particularly for the General female.

	Expected Lifetime for Future Retirees (Retiring in 2016)			
	General Female		Safety Male	
	Current	Proposed	Current	Proposed
Age at Retirement	60.0	60.0	55.0	55.0
Expected Future Lifetime	26.4	28.1	30.4	31.1
Expected Age at Death	86.4	88.1	85.4	86.1

For members early in their career who will not be retiring for a number of years, the expectation is that the increase in life expectancy will be even greater, with younger members in our example being expected to live about three years longer than someone retiring at a similar age today. Note that this generation of members (those retiring in 30 years) is expected to live significantly longer than the prior generation (those retiring in the current year) due to the projection of mortality improvement for an additional 30 years under the generational mortality approach.

	Expected Lifetime for Future Retirees (Retiring in 2046)			
	General Female		Safety Male	
	Current	Proposed	Current	Proposed
Age at Retirement	60.0	60.0	55.0	55.0
Expected Future Lifetime	26.4	31.1	30.4	34.2
Expected Age at Death	86.4	91.1	85.4	89.2

Miscellaneous Assumptions

Section 12 discusses some other assumptions that are made. There are three changes we are recommending:

- Reduce the probability of an eligible survivor from 80% for males and 55% for females to 77% and 50% respectively.
- Increase the assumed retirement age for deferred vested members for Plans A, B, C and E.
- Decrease the probability of a deferred vested General member establishing reciprocity and retiring with another system from 18% to 16%.

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	Update operating tables used in the calculation of optional forms of payment to include recommended changes.																											
Economic	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2" style="background-color: #1a3d54; color: white;">Assumption</th> <th colspan="3" style="background-color: #1a3d54; color: white;">Economic Assumptions</th> </tr> <tr> <th style="background-color: #1a3d54; color: white;">Current</th> <th style="background-color: #1a3d54; color: white;">Alternative #1</th> <th style="background-color: #1a3d54; color: white;">Alternative #2</th> </tr> </thead> <tbody> <tr> <td>Investment Return</td> <td>7.50%</td> <td>7.25%</td> <td>7.00%</td> </tr> <tr> <td>General Wage Growth</td> <td>3.50%</td> <td>3.25%</td> <td>3.00%</td> </tr> <tr> <td>Payroll Growth</td> <td>3.50%</td> <td>3.25%</td> <td>3.00%</td> </tr> <tr> <td>Price Inflation</td> <td>3.00%</td> <td>2.75%</td> <td>2.50%</td> </tr> <tr> <td>Future Retiree COLAs (Plan A / Other Plans)</td> <td>3.00% / 2.00%</td> <td>2.75% / 2.00%</td> <td>2.50% / 2.00%</td> </tr> </tbody> </table>	Assumption	Economic Assumptions			Current	Alternative #1	Alternative #2	Investment Return	7.50%	7.25%	7.00%	General Wage Growth	3.50%	3.25%	3.00%	Payroll Growth	3.50%	3.25%	3.00%	Price Inflation	3.00%	2.75%	2.50%	Future Retiree COLAs (Plan A / Other Plans)	3.00% / 2.00%	2.75% / 2.00%	2.50% / 2.00%
Assumption	Economic Assumptions																											
	Current	Alternative #1	Alternative #2																									
Investment Return	7.50%	7.25%	7.00%																									
General Wage Growth	3.50%	3.25%	3.00%																									
Payroll Growth	3.50%	3.25%	3.00%																									
Price Inflation	3.00%	2.75%	2.50%																									
Future Retiree COLAs (Plan A / Other Plans)	3.00% / 2.00%	2.75% / 2.00%	2.50% / 2.00%																									
Merit Salary Increase	No changes.																											
Death While Active	Update table to RP-2014 active employee with age adjustments and 110% of MP-2014 Ultimate projection scale.																											
Service Retirement	Small changes to General Plans D and E and reduced rates for Safety plans.																											
Disability Retirement	<ol style="list-style-type: none"> 1) Small changes to service-connected disability rates. 2) No changes to nonservice-connected disability rates. 																											
Termination	Small changes to General Plan E.																											
Probability of Refund	No changes.																											
Retiree Mortality	Small changes to base mortality rates for all retirees. Add mortality improvement projection scale equal to 110% of MP-2014 Ultimate Scale.																											
Miscellaneous	<ol style="list-style-type: none"> 1) Reduce probability of eligible survivor. 2) Increase the assumed retirement age for deferred vested members for General Plans A, B, C and E. 3) Decrease reciprocity assumption for General members 																											

Financial Impact

The estimated financial impact of the proposed changes to the mortality tables is expected to be material. For the other demographic assumptions, the financial impact is expected to be small, as compared to the total liabilities. The proposed economic changes are also expected to have a material 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 costs should approximately balance out, so, for example, the proposed assumptions with the lower investment return component will require more contributions now but will ultimately require less contributions in the future than the current set of assumptions.

The financial impact was evaluated by performing additional valuations with the June 30, 2015 valuation data and benefits, and reflecting the proposed assumption changes. This allows us to evaluate the relative financial impact of the various proposed changes. Note that the impact of the various assumption changes by component is somewhat dependent on the order in which they are evaluated.

The focus of these estimates should be on the relative change due to the assumptions, as the total contribution rate shown is based on the June 30, 2015 valuation and does not include the expected employer rate increase due to the recognition of a net actuarial asset loss that is expected to occur in the June 30, 2016 valuation, as well as a number of other factors that will ultimately affect the 2016 valuation.

Note that if LACERA elects to continue to use a static mortality projection (with the projection consistent with our recommended projection period under static mortality), the impact on the Actuarial Accrued Liability and UAAL rate would be very similar to that shown for the recommended Post-Retirement Mortality using generational mortality, which is shown in the table on the following page. The projected Employer Normal Cost Rate and Total Employer Contribution Rate impact due to mortality would both be about 0.3% of pay less.

**Financial Impact
(continued)**

The estimated financial impact illustrated in the table below was based on the June 30, 2015 valuation using the proposed assumptions, as discussed in this report.

**Hypothetical Results of June 30, 2015 Valuation
With Proposed Assumptions**

	Actuarial Accrued Liability	Employer Normal Cost Rate	UAAL Rate	Total Emp. Contribution Rate
June 30, 2015 Valuation	\$ 56,819	9.28%	8.49%	17.77%
Demographic Assumptions				
Termination Rates, Reciprocity & Refund %	\$ 82	-0.03%	0.06%	0.03%
Rates of Retirement	\$ 71	0.05%	0.07%	0.12%
Rates of Active Disability and Death	\$ 92	-0.02%	0.07%	0.05%
Probability of Eligible Survivor	\$ (86)	-0.05%	-0.07%	-0.12%
Post-Retirement Mortality	\$ 1,770	0.48%	1.33%	1.81%
Subtotal Demographic Change	\$ 1,929	0.43%	1.46%	1.89%
June 30, 2015 Valuation with Changes⁽¹⁾⁽²⁾	\$ 58,748	9.71%	9.95%	19.66%
Recommended Economic Changes (Alternative #1)				
7.25% Interest, 3.00% CPI	\$ 963	0.29%	0.85%	1.14%
Combined Change (Demographic + Econ.)	\$ 2,892	0.72%	2.31%	3.03%
June 30, 2015 Valuation with Changes⁽¹⁾⁽²⁾	\$ 59,711	10.00%	10.80%	20.80%
Recommended Economic Changes (Alternative #2)				
7.00% Interest, 2.75% CPI	\$ 1,972	0.58%	1.70%	2.28%
Combined Change (Demographic + Econ.)	\$ 3,901	1.01%	3.16%	4.17%
June 30, 2015 Valuation with Changes⁽¹⁾⁽²⁾	\$ 60,720	10.29%	11.65%	21.94%

1. Impact estimated based on June 30, 2015 actuarial valuation. New assumptions will be implemented with the June 30, 2016 actuarial valuation and affect contribution rates effective July 1, 2017, so actual results will vary. In particular, it is expected that employer contribution rates will increase due to the recognition of actuarial asset losses, estimated to be an additional 0.36% of pay as of July 1, 2017.

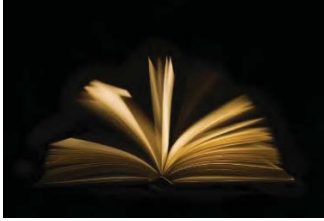
2. Impact of proposed changes will vary by plan; however, this difference between General and Safety is not expected to be large. For example, under Alternative #2, the blended General contribution rate is expected to increase by 4.17% of pay and the blended Safety contribution rate is expected to increase by 4.15% of pay.

Conclusion

We recommend that the Board adopt the proposed actuarial assumptions shown in Appendix A (either Alternative #1 or Alternative #2). We believe these assumptions reasonably reflect future expectations.

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Section 2 Introduction



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

Funding and Valuation Principles

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 average long-term rate that is used to actuarially project and finance the retirement benefits.

Recognition should be made that a higher investment return assumption will tend to lower required contributions in the short term, while a lower investment return assumption will tend to require higher contributions in the short term. However, the actual contributions will be determined by actual the actual experiences, not the assumptions, so ultimately this should balance out.

Using a more conservative (i.e., lower) investment return assumption gives a greater assurance of having actuarial experience gains in the future, whereas using a more aggressive (i.e., higher) investment return assumption implies a willingness to assume a greater actuarial risk of future experience losses.

The actuarial assumptions are usually divided into two groups: economic and demographic. The economic assumptions must not only reflect LACERA's actual experience but also give even greater consideration to the long-term expectation of future economic growth for the nation, as well as the global economy. By long term, we are looking at time periods of 20 to 40 years in the future – a much longer time frame than investment managers or economists will likely be discussing.

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

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, 2015. They may also be referred to as the "current" assumptions. These assumptions and methods were adopted by the Board based on Milliman's 2013 experience study. The "proposed" or "recommended" assumptions are those we recommend for use in the valuation as of June 30, 2016 and for subsequent valuations until further changes are made.

**Overview
(continued)**

The choice of economic assumptions (investment return, general wage growth, payroll increase, and COLA increase) is discussed in Section 4 of this report. These assumptions are generally chosen on the basis of expectations as to the effect of future economic conditions on the operation of LACERA. However, the setting of these assumptions is much more subjective than the setting and recommending of demographic assumptions. Note that we have recommended two alternative sets of economic assumptions for the Board's consideration.

Sections 5 through 12 of this report show the results of our study of demographic assumptions. The Board will most likely rely on our analysis of these assumptions, as they are much more objective than the economic assumptions. The exhibits are detailed comparisons between actual and expected terminations on both the current and proposed bases. Each exhibit is identified by two numbers corresponding to the section of the report. For example, Exhibit 7-1 is referred to in Section 7, retirement rates.

For each type of assumption, graphs show the actual, the expected and proposed rates, usually by some combination of gender, plan, years of service and age. The exhibits also show the total numbers of actual and expected terminations. Ratios larger than 100% on the current basis generally indicate that the rates may need to be raised; ratios smaller than 100% generally indicate that rates may need to be lowered. However, some assumptions (mortality for example) have established trends that may differ from this criterion.

For each exhibit, the actual decrement rates for the current and prior period are shown as bar graphs on either a quinquennial-age basis, a years-of-service basis, or, in the case of retirement rates, on an age-by-age basis. The current assumptions – the "expected" rates – used in the June 30, 2015 actuarial valuation, are shown, as well as the new proposed assumptions, as line graphs. Therefore, the assumption changes we are proposing are illustrated by the difference between the two lines in each exhibit. Note that in cases where no change is being proposed, only the expected rate line is shown.

**Actuarial Standard of
Practice No. 27**

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

Because no one knows what the future holds, the best an actuary can do is to use professional judgment to estimate possible future economic outcomes. These estimates are based on a mixture of past experience, future expectations, and professional judgment. The actuary should consider a number of factors, including the purpose and nature of the measurement, and appropriate recent and long-term historical economic data. However, the standard explicitly advises the actuary not to give undue weight to recent experience.

Actuarial Standard of Practice No. 27 (continued)

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 specific bias (i.e. it is not significantly optimistic or pessimistic), but may specifically make provision for adverse deviation.

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

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

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

Actuarial Standard of Practice No. 35 (ASOP No. 35) governs the selection of demographic and other non-economic assumptions for measuring pension obligations. ASOP No. 35 states that the actuary should use professional judgment to estimate possible future outcomes based on past experience and future expectations, and select assumptions based upon application of that professional judgment. The actuary should select reasonable demographic assumptions in light of the particular characteristics of the defined benefit plan that is the subject of the measurement. A reasonable assumption is one that is expected to appropriately model the contingency being measured and is not anticipated to produce significant cumulative actuarial gains or losses over the measurement period.

ASOP 35 Steps

The actuary should follow the following 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, and general trends.

**ASOP 35 Steps
(continued)**

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. Evaluate the Reasonableness of the Selected Assumption. The assumption should be expected to appropriately model the contingency being measured. The assumption should not be anticipated to produce significant actuarial gains or losses.

**ASOP 35 General
Considerations and
Application**

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

Section 3 Actuarial Methods



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

- **Actuarial Cost Method:** The actuarial valuation is prepared using the entry age actuarial cost method. We believe that this cost method is appropriate for LACERA’s valuation. It is also the cost method that will be required for financial reporting under GASB Statements 67 and 68. We recommend no change. Note that this is by far the most popular method used for public sector retirement systems, as it results in more stability in normal costs and provides a level allocation of costs over each individual’s working lifetime.
- **Valuation of Assets:** We believe that the current asset valuation method where gains and losses are smoothed over five years is appropriate for LACERA’s valuation. A five-year period is used by a majority of large public retirement systems. We recommend no change.

Actuarial 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). The only difference between LACERA’s method and the method described in the “Model Practices” is that it includes a corridor of no greater than 50% to 150%, and LACERA has no corridor for five-year smoothing. We believe a five-year period is short enough that a corridor is not needed.

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

Operating Tables

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

Blended Mortality Table

We are recommending changes in the mortality assumptions. If adopted, the mortality tables used in the calculation of optional forms of payment should be updated to reflect this change.

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 36% of the total present value of benefits for current General members and 88% for current Safety members.

We are recommending the General Unisex mortality table use a blending of 35% male and 65% female (previously 40%/60%). We are recommending the Safety Unisex mortality table use a blending of 90% male and 10% female (no change).

- **Assumed Retirement Year:** Since generational mortality rates vary by age and year, theoretically new operating tables would be needed every year. For administrative simplicity, we recommend using the mortality tables based on the member's age in the year 2020. This is three years in the future from the implementation date. This is expected to allow for use of the new mortality table for the next six years.
- **Retirement Type:** We found that for members who received a benefit based on the service retirement formula, disabled retirees were less than 1% of the General member group and 24% of the Safety member group for those who retired during the period.

Note that members who retire under a disability retirement may receive their monthly benefit based on the service retirement formula if that amount is greater. Since LACERA calculates the optional form of payment for these members (i.e., disability retirees receiving a benefit based on the service retirement formula), the valuation mortality assumption is not exactly aligned with the basis used in the optional factor calculation. However, for General members, the affected group is less than 1%, and for Safety members the difference between healthy and disabled mortality is small. Therefore, we recommend no adjustment be made to the healthy mortality assumption to account, even though in some cases it applies to disabled retirees.

**Operating Tables
 (continued)**

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. The following shows the benefit amounts for two sample employees with a \$1,000 unmodified benefit and an eligible spouse or domestic partner, both with and without the new assumptions. In each case the member is assumed to elect the Unmodified Plus option with a 100% continuance.

Note that the “Current” column reflects the calculated modified benefit under the current assumptions (mortality, investment return, and COLA). The “New” column reflects the calculated modified benefit under the recommended assumptions.

If 7.25% investment return is adopted

Class	Age at Retirement		Monthly Benefit		Percent Change
	Member	Beneficiary	Current (7.5%)	New (7.25%)	
General D	62	60	\$ 954.92	\$ 954.40	-0.1%
Safety B	55	50	\$ 960.56	\$ 954.07	-0.7%

If 7.00% investment return is adopted

Class	Age at Retirement		Monthly Benefit		Percent Change
	Member	Beneficiary	Current (7.5%)	New (7.00%)	
General D	62	60	\$ 954.92	\$ 953.42	-0.2%
Safety B	55	50	\$ 960.56	\$ 952.61	-0.8%

Consistent with the examples shown, we expect the proposed assumptions will generally result in more reduction from the unmodified form, resulting in slightly lower expected benefits for those electing optional forms.

Operating Tables
(continued)

- Member Contribution Rates:** The proposed changes to mortality and the economic assumptions will impact the basic member contribution rates. New member rates will be calculated during the June 30, 2016 actuarial valuation. Additionally, the Cost-of-Living portion of the member rates will be updated at this time. The estimated impact of these proposed changes is shown below.

Entry Age	Currently in Effect ⁽²⁾	Estimated Member Contribution Rates Effective July 1, 2017 ⁽¹⁾	
		Inv = 7.25% Wage = 3.25%	Inv = 7.00% Wage = 3.00%
General A			
25	5.30%	5.32%	5.24%
35	6.63%	6.65%	6.56%
45	8.14%	8.18%	8.07%
General B			
25	7.08%	7.38%	7.60%
35	8.84%	9.22%	9.50%
45	10.88%	11.35%	11.71%
General C			
25	6.03%	6.35%	6.52%
35	7.52%	7.92%	8.15%
45	9.39%	9.91%	10.19%
General D			
25	5.90%	6.31%	6.47%
35	7.36%	7.87%	8.09%
45	9.19%	9.85%	10.11%
General G			
All Ages	7.62%	8.33%	8.57%
Safety A			
25	8.00%	7.82%	7.69%
35	9.86%	9.64%	9.48%
45	11.76%	11.50%	11.33%
Safety B			
25	10.71%	11.07%	11.42%
35	13.19%	13.64%	14.09%
45	15.74%	16.29%	16.83%
Safety C			
All Ages	13.42%	14.39%	14.90%

1. Final member contribution rates will not be determined until the June 30, 2016 actuarial valuation.

2. The rates currently in effect are based on the June 30, 2015 actuarial valuation and include an investment return assumption of 7.50% and a wage growth assumption of 3.50%.

Section 4 Economic Assumptions



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

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

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

After completing the selection process, the actuary should review the set of economic assumptions for consistency. This may lead the actuary to recommend the same inflation component in each of the economic assumptions proposed. This section will discuss the economic assumptions. We have recommended two potential reductions in the price inflation assumption with corresponding reductions in the investment return, wage inflation, and COLA increase (for Plan A) assumptions. We believe either of these sets of assumptions satisfy ASOP No. 27.

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

Economic Assumptions	Current Assumptions	Recommended Assumptions	
		Alternative #1	Alternative #2
Investment Return ⁽¹⁾	7.50%	7.25%	7.00%
General Wage Growth	3.50%	3.25%	3.00%
Payroll Growth	3.50%	3.25%	3.00%
Price Inflation	3.00%	2.75%	2.50%
COLAs for Retirees ⁽²⁾	3.00% / 2.00%	2.75% / 2.00%	2.50% / 2.00%

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

2. The first of the two numbers applies to Plan A; the second number applies to the remainder of the plans (although the Plan E COLA is pro-rated based on pre-2002 service). To account for existing Plan A COLA balances, retirees and beneficiaries with a retirement date prior to April 1, 1982 are assumed to receive 3.00% annual COLAs.

1. Price Inflation

Use in the Valuation

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

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

The current valuation assumption for inflation is 3.00% per year. Our recommendation is to lower the assumption to either 2.50% or 2.75%.

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.

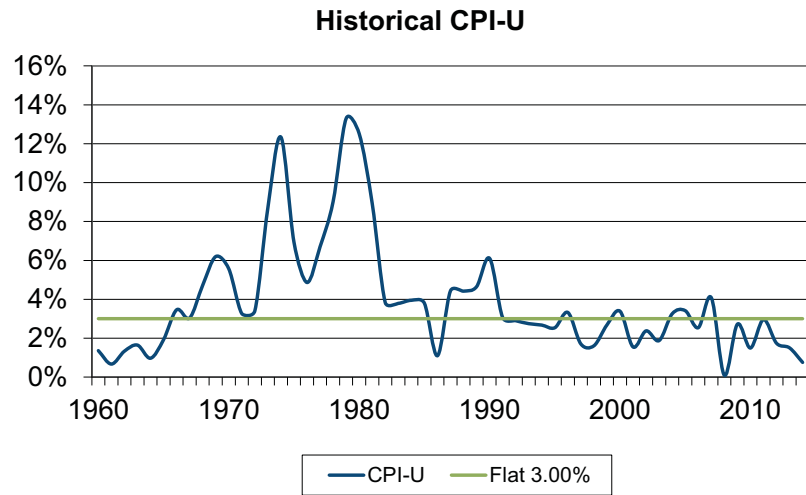
There are numerous ways to review historical data, with significantly differing results. The tables below show the compounded annual inflation rate for various 10-year periods, and for the 50-year period ended in December 2015. Note that the 50-year average is heavily influenced by the inflation of the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

Decade	CPI Increase
2006-2015	1.9%
1996-2005	2.5%
1986-1995	3.5%
1976-1985	7.0%
1966-1975	5.7%
Prior 50 Years	
1966-2015	4.1%

**Historical Perspective
 (continued)**

These are national statistics. The inflation assumption as it relates to the investment return assumption should be based more on national and even global inflation; whereas, the inflation assumption used in the wage growth, payroll growth, and COLA increase assumptions is tied to inflation in California. We believe that although there have been historical differences between U.S. and California CPI changes, in the long term there should be a high correlation. For comparison, the average CPI increase for California has been 4.2% for the 50-year period 1966-2015, compared to the national average of 4.1%.

The following graph shows historical national CPI increases. Note that the actual CPI increase has been close to or less than 3.00% for almost every year since 1991.



Forecasts of Inflation

Since the U.S. Treasury started issuing inflation indexed bonds, it is possible to determine the approximate rate of inflation anticipated by the financial markets by comparing the yields on inflation indexed bonds with traditional fixed government bonds. Current market prices as of November 2016 suggest investors expect inflation to be about 2.1% over the next 30 years.

Additionally, we reviewed the expected increase in the CPI by the Office of the Chief Actuary for the Social Security Administration. In the 2016 Trustees Report, the projected average annual increase in the CPI over the next 75 years under the intermediate cost assumptions was 2.60%.

Recommendation

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

We recommend the long-term assumed inflation rate be decreased to reflect lower forecasts.

Consumer Price Inflation	
Current Assumption	3.00%
Recommended Alternative #1	2.75%
Recommended Alternative #2	2.50%

2. Wage Growth

Use in the Valuation

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

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

Historical Perspective

We have used statistics from the Social Security Administration on the National Average Wage back to 1966.

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 2015. 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
2006-2015	2.4%	1.9%	0.5%
1996-2005	4.1%	2.5%	1.6%
1986-1995	3.9%	3.5%	0.4%
1976-1985	6.9%	7.0%	-0.1%
1966-1975	6.4%	5.7%	0.7%
Prior 50 Years			
1966-2015	4.7%	4.1%	0.6%

Forecasts of Future Wages

Wage inflation has been projected by the Office of the Chief Actuary of the Social Security Administration. In the 2016 Trustees Report, the ultimate long-term annual increase in the National Average Wage is estimated to be 1.2% higher than the Social Security intermediate inflation assumption of 2.7% per year.

Recommendation

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

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

The wage growth assumption is the total of the consumer price inflation assumption and the real wage inflation rate. If the real wage inflation assumption remains at 0.50% and the price inflation assumption is set at 2.50% or 2.75%, this would result in a total wage growth assumption of 3.00% or 3.25% respectively.

Payroll Increase Assumption

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

The current payroll increase assumption is equal to the general wage growth assumption of 3.50%. It is our general recommendation to set these two assumptions to be equal, unless there is a specific circumstance that would call for an alternative assumption. We are recommending that the payroll increase assumption be decreased to 3.00% or 3.25% if the total wage growth assumption is decreased to 3.00% or 3.25% respectively.

Growth in Membership

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

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 7.50% per year, net of all administrative and investment-related expenses.

Expected Long-Term Investment Return

To determine the best-estimate range for the investment return assumption, we have used Meketa's 2016 assumptions for capital markets and LACERA's current target asset allocation. The target asset allocation is summarized in the following table:

Class	Target Allocation
Global Equity	41.4%
Private Equity	10.0%
Fixed Income	27.8%
Real Estate	11.0%
Hedge Funds	5.0%
Comodities	2.8%
Cash	2.0%

Combining the capital market assumptions with the target asset allocation policy, Meketa has calculated the 20-year expected rate of return to be 7.5% (7.37% after adjusting for administrative expenses which are discussed later). This expected return is the median return on a geometric basis for LACERA's assets. We independently made this calculation and came close to Meketa's 7.5%.

Administrative and Investment-Related Expenses

The investment return used for the valuation is assumed to be net of all administrative and investment-related expenses. The following table shows the ratio of administrative expenses to the LACERA Plan assets over the last 10 fiscal years ending June 30. The expense ratio is calculated as the expense amount divided by the ending asset balance at fair market value.

Year Ended	Market Assets	Admin. Expense	
		Amount	Ratio
2007	\$40,873	\$44	0.11%
2008	30,499	48	0.16
2009	38,725	50	0.13
2010	33,434	49	0.15
2011	39,452	51	0.13
2012	38,307	50	0.13
2013	41,774	54	0.13
2014	47,722	59	0.12
2015	48,818	63	0.13
2016	47,847	68	0.14

For purposes of our analysis of the investment return assumption, we have assumed that investment expenses are assumed to be 0.0%, as our understanding is that Meketa has effectively accounted for most of the investment fees in their capital market assumptions. For the administrative expenses, we have assumed no change in current assumption of 0.13% of market assets, as the actual ratio has been close to this over the last five years.

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, the current investment return assumption is 7.50%, so LACERA needs to earn a gross return (after adjustment for investment expenses) on its assets of 7.63% in order to net the 7.50% for funding purposes. Additionally, we recommend the 0.13% adjustment 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.

Variability of Future Returns

Our focus in this analysis has been on the median expected future return. The median return indicates there is a 50% probability, based on the capital market assumptions, that the actual return will meet or exceed this amount. For comparison, the following are the probabilities based on Meketa's capital market assumptions that the actual return will exceed the following thresholds:

20-Year Average Return	Probability of Achieving
9.00%	26%
8.00%	40%
7.50%	48%
7.00%	56%
6.00%	71%
5.00%	84%

Excess Earnings

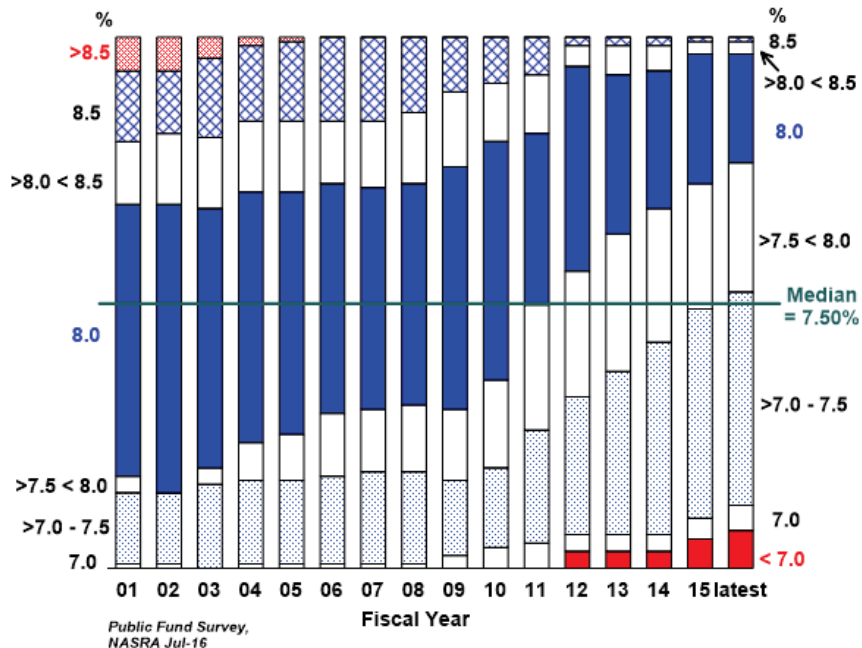
Section 31592.2 of the 1937 Act provides the Retirement Board with the authority to set aside earnings of the retirement fund during any year in excess of the total interest credited to contributions when such surplus exceeds 1.00% of the total assets of the retirement system.

Under LACERA's 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. Therefore, for purposes of the 2016 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 2019 as part of the 2019 assumption study.

If the Board of Investments determines that the fund should share excess earnings with members when times are good, but the fund is not able to collect additional revenue when investment returns lag expectations, there is a cost to LACERA over time. Thus, if the Board changes its policy toward excess earnings, it must find some way to recognize an obligation for benefits attributable to excess earnings. An excess earnings policy would result in increased payments made by LACERA to members over the long-term. If these potential future benefits are not recognized in setting the investment return assumption or in determining LACERA's future benefit payments, the total liabilities will be understated.

Peer System Comparison

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

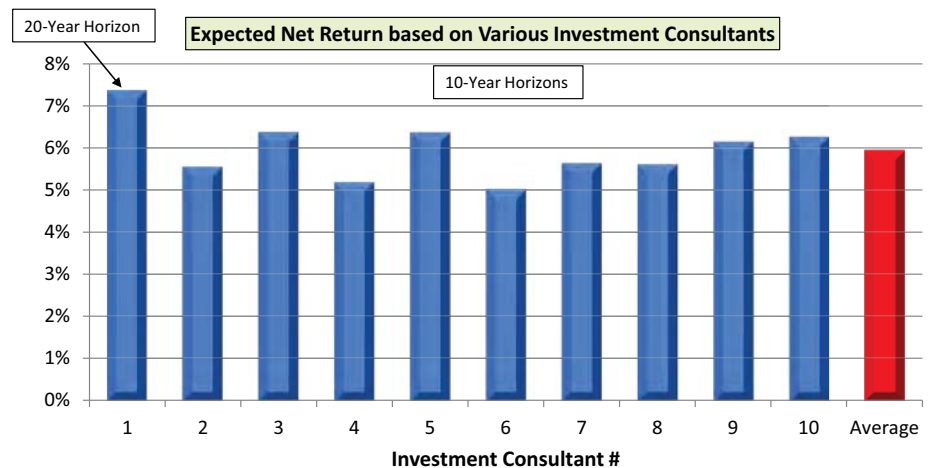


Additional Factors for Consideration in Setting the Investment Return Assumption

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

- **Long-Term Perspective:** The 20-year time horizon used in Meketa’s capital market assumptions is slightly shorter than the 30 years we usually recommend for setting the investment return assumption for valuing pension liabilities. In the shorter term (less than 10 years), there is an expectation of lower returns, primarily due to the current low interest rate environment. The expectation is that when interest rates will increase from their historical lows this will ultimately result in higher expected returns. Including higher returns for the period from 20 to 30 years would result in a higher expected return for the 30-year period than Meketa’s 20-year estimated return. However, the argument can also be made that a greater emphasis should be place on the shorter term returns, since there is more certainty that they will occur than the higher long term returns.
- **Variance in Capital Market Assumptions:** We calculated the expected return for the LACERA portfolio based on the capital market assumptions of a number of other investment consultants we work with in addition to Meketa. The expected return of the other investment consultants was significantly less than Meketa’s. This was at least in part to a shorter time horizon used by the other investment consultants (10 years compared to Meketa’s 20 years). However, it should be noted that the net expected 30-year return is 6.25% based on the capital market assumptions used by Milliman’s investment consultants.

A comparison of the expected returns based on LACERA’s target asset allocation and the capital market assumptions of other investment consultants is shown below. Meketa is represented as Investment Consultant #1 in the graph. Note that we have used Meketa’s capital market assumptions in our analysis, as we believe Meketa is the most familiar with LACERA’s specific investments.



Cost Implications of Changes in Investment Return Assumption

In most retirement systems with variable contribution rates, such as LACERA, the greatest factor contributing to the volatility of contribution rates is the return on investments. If, in the future, the full actuarial assumption of 7.50% is not able to be credited to the valuation reserves, there may be an increase in the employer contribution rate. The base member contribution rates are determined based on the '37 Act statutes, the actuarial assumptions and the benefit provisions. The COLA portion of the member rates also does not reflect asset values. Therefore, any experience gain or loss in investments is not expected to directly impact the member contribution rates but will impact the employer contribution rates.

To assist the Board in understanding the sensitivity to changes in the investment return rate assumption, we revalued the 2015 valuation results using the recommended investment return assumption of 7.00% or 7.25%. This is discussed in the Financial Impact section of the Executive Summary.

Conclusion

Based on Meketa's capital market assumptions, we find there is slightly less than a 50% probability that the current investment return of 7.50% will be met over the next 20 years. Many other investment consultants, including Milliman's, are predicting lower returns than Meketa. Therefore, we are recommending a reduction in the investment return assumption to either 7.00% or 7.25%.

Investment Return (net of all expenses)	
Current assumption	7.50%
Recommended Alternative #1	7.25%
Recommended Alternative #2	7.00%

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

The current assumption is that retiree COLAs will be equal to the maximum COLA level provided by the plan (3% for Plan A, up to 2% for Plan E based on the individual, and 2% for the other plans), but not greater than the price inflation assumption. We recommend this assumption be continued. This means that if the price inflation is reduced, the assumed COLA for Plan A should be reduced to that level. The only exception is that to account for existing Plan A COLA balances, retirees and beneficiaries with a retirement date prior to April 1, 1982 are assumed to receive 3.00% annual COLAs.

Section 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 this section we will study the first of these rates, increases due to promotion or longevity. We generally refer to these increases as merit increases.

Results

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

- **Service:** Members in the early stages of their careers tend to get larger merit increases. In other studies, we have found years of service to have the most significant impact on merit increases. We found this to be true with LACERA.
- **Membership:** The current rates assume that Safety members receive slightly larger salary increases than General members later in their career. We observed that again this year.

Recommendation

Merit rates were generally higher than the assumption this year; however, when viewed in combination with the prior two studies, we believe the experience is consistent with the assumption. Therefore, we are recommending no change to the merit salary increase assumptions. The assumed rates are shown numerically in Appendix A.

Methodology

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

Financial Impact

No financial impact, since no change recommended.

Exhibit 5-1
Salary Increases by Service – General Members

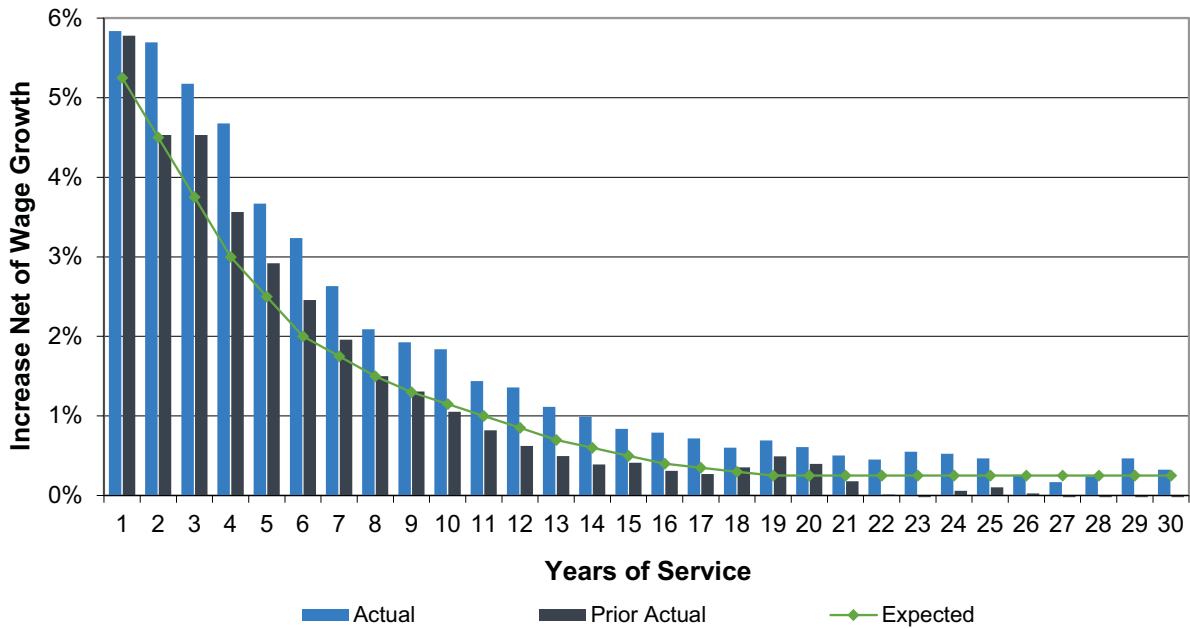
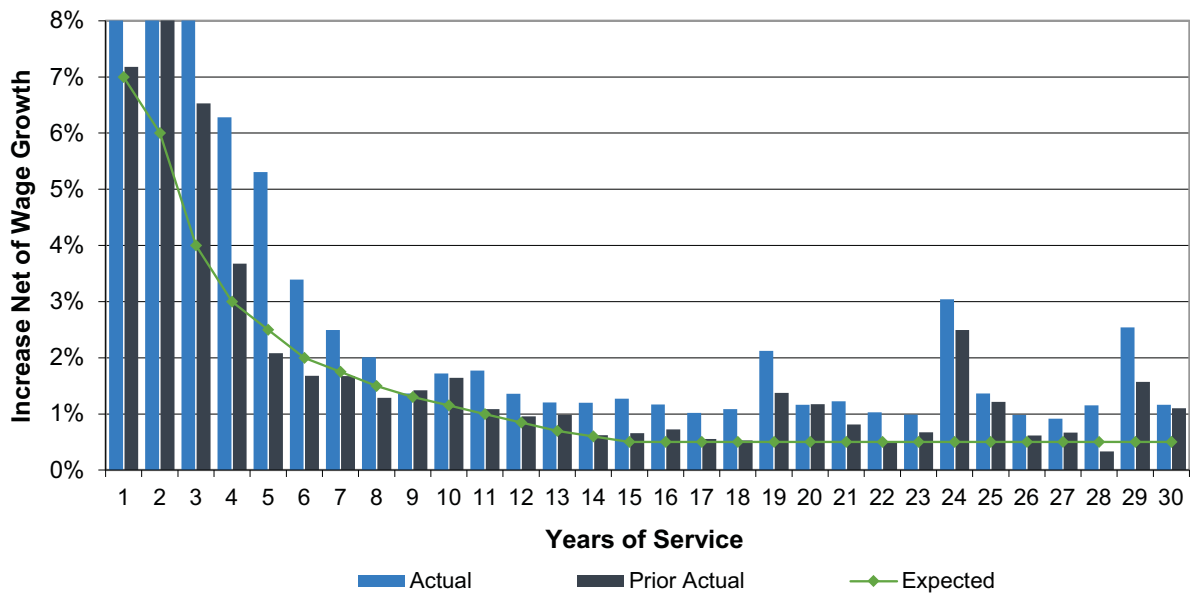
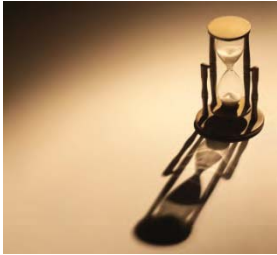


Exhibit 5-2
Salary Increases by Service – Safety Members



Section 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)

Overall, the current rates accurately estimated the actual number of nonservice-connected deaths. The following is a comparison of the actual-to-expected deaths of active members by plan and gender for this study period. We have recommended minor changes to the ordinary death rates to reflect a more recent mortality table and provide for future mortality improvements by using a projection scale. The recommended tables are discussed on the following page.

Plan	Gender	Actual	Expected	Actual / Expected	Proposed	Actual / Proposed
General A-D & G*	Male	93	95	98%	93	100%
General A-D & G*	Female	135	124	109%	120	113%
Safety A & B	Male	14	25	56%	23	61%
Safety A & B	Female	5	3	167%	3	167%
Total		247	247	100%	239	103%

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

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

- **Age:** Members at older ages tend to have a greater probability of dying than younger members. This is almost universally true in mortality studies.
- **Gender:** Male members tend to have a greater probability of dying than females. This trend is generally true for all mortality studies, and we found this to be true with LACERA.
- **Membership:** Safety members have comparatively lower rates of mortality. 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, only the healthiest group remains in active Safety employment.

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

Class	Gender	Current Table		Proposed Table	
General	Male	RP 2000E Male, Proj. 2025 ⁽¹⁾	+1	RP 2014E Male, Generational ⁽²⁾	-2
General	Female	RP 2000E Female, Proj. 2025 ⁽¹⁾	-2	RP 2014E Female, Generational ⁽²⁾	-0
Safety	Male	RP 2000E Male, Proj. 2025 ⁽¹⁾	-5	RP 2014E Male, Generational ⁽²⁾	-6
Safety	Female	RP 2000E Female, Proj. 2025 ⁽¹⁾	-2	RP 2014E Female, Generational ⁽²⁾	-0

1. All tables are the RP-2000 Employee mortality table with a static projection using Projection Scale AA to 2025.
2. All tables are the RP-2014 Employee mortality table with mortality improvement based on 110% of the MP-2014 Ultimate projection scale.

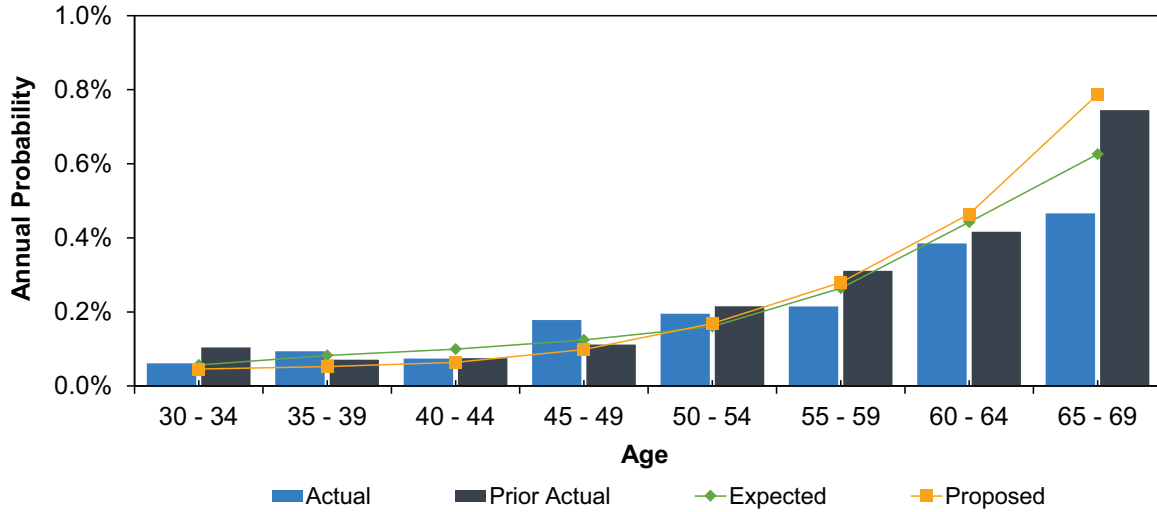
It is our opinion, and that of most pension actuaries, that mortality is expected to improve in the future (i.e., lower probabilities of death). We are recommending that future improvement be built in to the current assumption by including a mortality improvement projection scale. See Section 11 (Retiree Mortality) for additional discussion on this topic.

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

Financial Impact

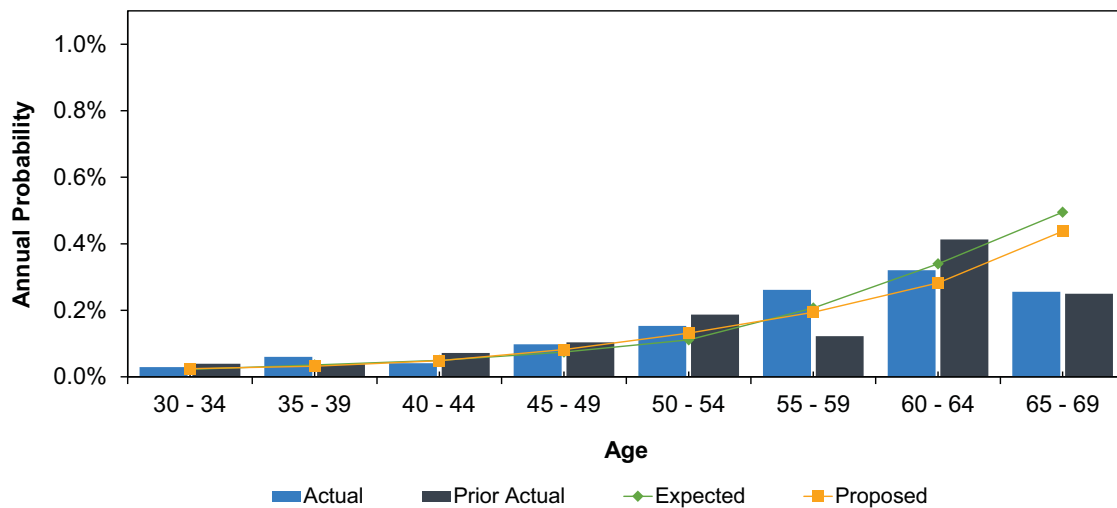
We estimated the financial impact of the recommended change in the ordinary death rate for active members in combination with the change in the disability retirement rates. The total financial impact of this change is discussed in Section 8 of this report. The impact attributable only to the changes in active mortality is relatively small.

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



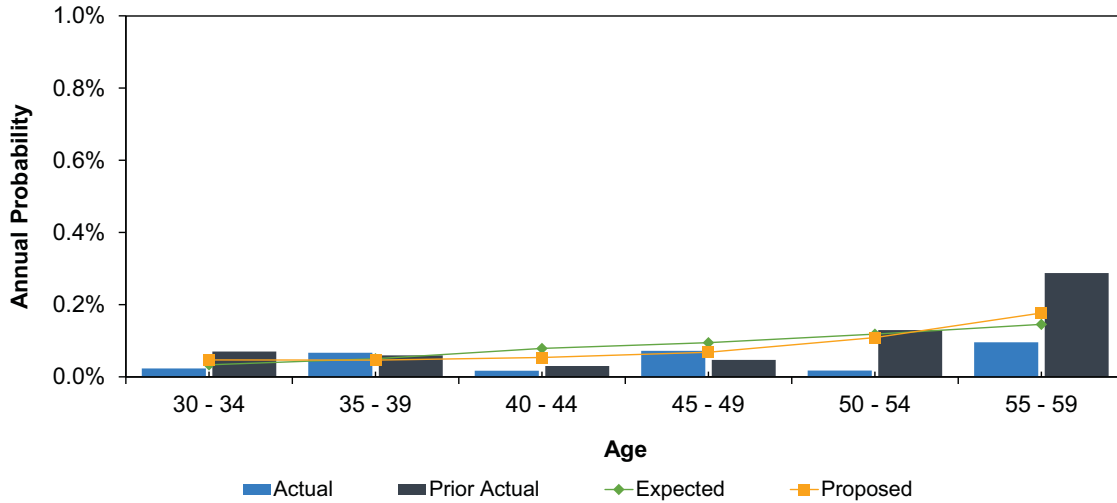
	2013 - 2016 Data		
	Expected	Actual	Proposed
Total Count	95	93	93
Actual / Expected	98%		100%

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



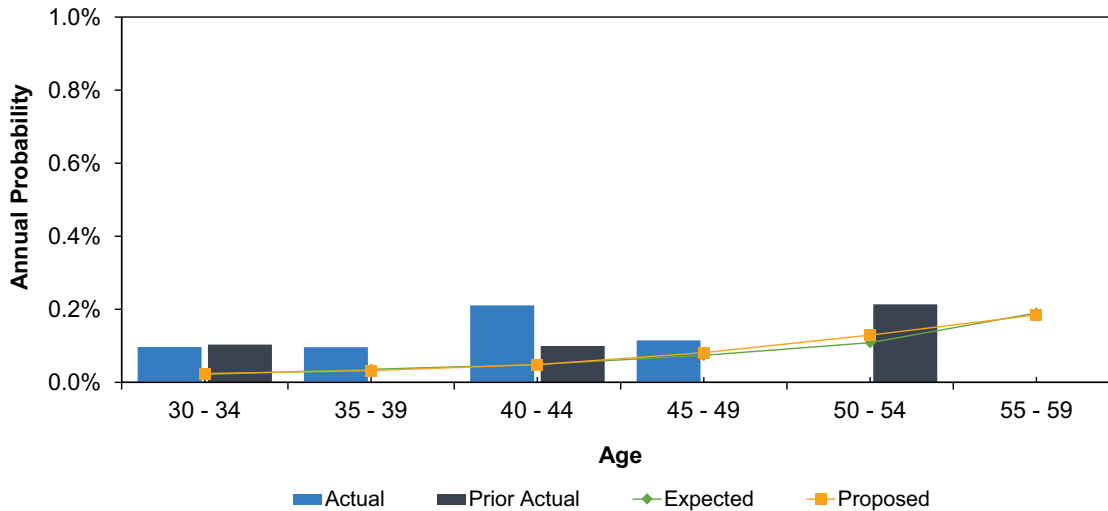
	2013 - 2016 Data		
	Expected	Actual	Proposed
Total Count	124	135	120
Actual / Expected	109%		113%

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



	2013 - 2016 Data		
	Expected	Actual	Proposed
Total Count	25	14	23
Actual / Expected	56%		61%

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



	2013 - 2016 Data		
	Expected	Actual	Proposed
Total Count	3	5	3
Actual / Expected	167%		167%

Section 7 Service Retirements



Exhibits in this section present comparisons of actual service retirements during the study period with those expected according to the actuarial assumptions used in our June 30, 2015 valuation. We found these rates to be fairly consistent with the actual experience during the study period in total, although there were some differences by plan. In particular, for the Safety plans, many members are retiring later than the assumptions are current predicting.

Results

Overall, the current service retirement rates fit reasonably well with the experience for the study period. The only material difference was that Safety Plans A and B had fewer retirements than expected.

Plan	Actual	Expected	Actual / Expected
General A-C	489	518	94%
General D	2,564	2,569	100%
General E	1,865	1,938	96%
Safety A & B	708	1,149	62%
Total	5,626	6,174	91%

Counts reported for General members are for ages 50-69; counts reported for Safety members are for ages less than 65.

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

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

Recommendation

We are recommending some changes in the rates of retirement, as shown in Exhibits 7-1 to 7-4. The new proposed rates are also shown numerically in Appendix A. The recommended changes will decrease the number of expected retirements, primarily for Safety members.

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

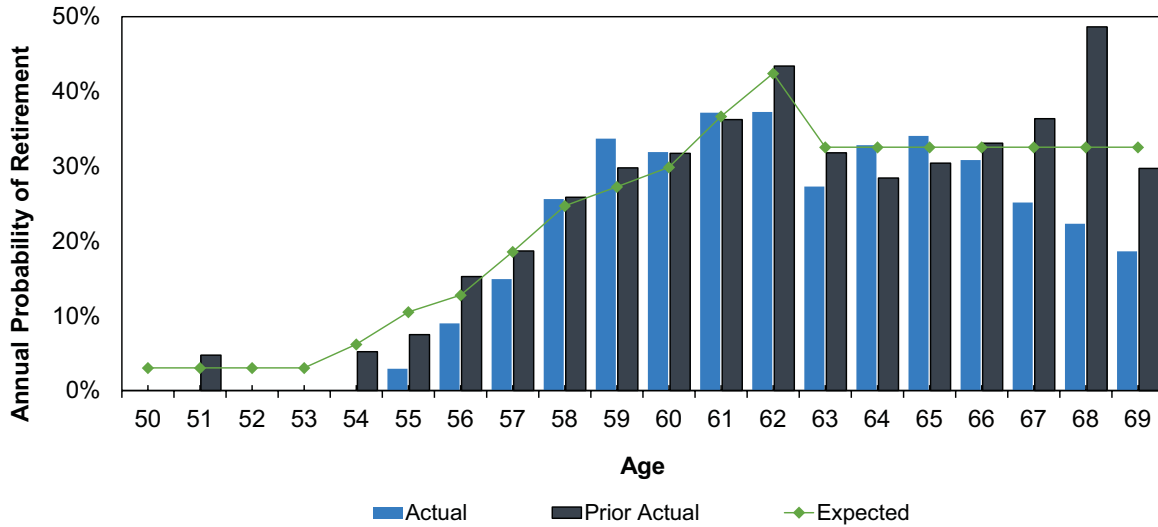
Plan	Actual	Expected	Actual / Expected	Proposed	Actual / Proposed
General A-C	489	518	94%	518	94%
General D	2,564	2,569	100%	2,572	100%
General E	1,865	1,938	96%	1,979	94%
Safety A & B	708	1,149	62%	886	80%
Total	5,626	6,174	91%	5,955	94%

Counts reported for General members for ages 50-69; counts reported for Safety members are for ages less than 65.

Financial Impact

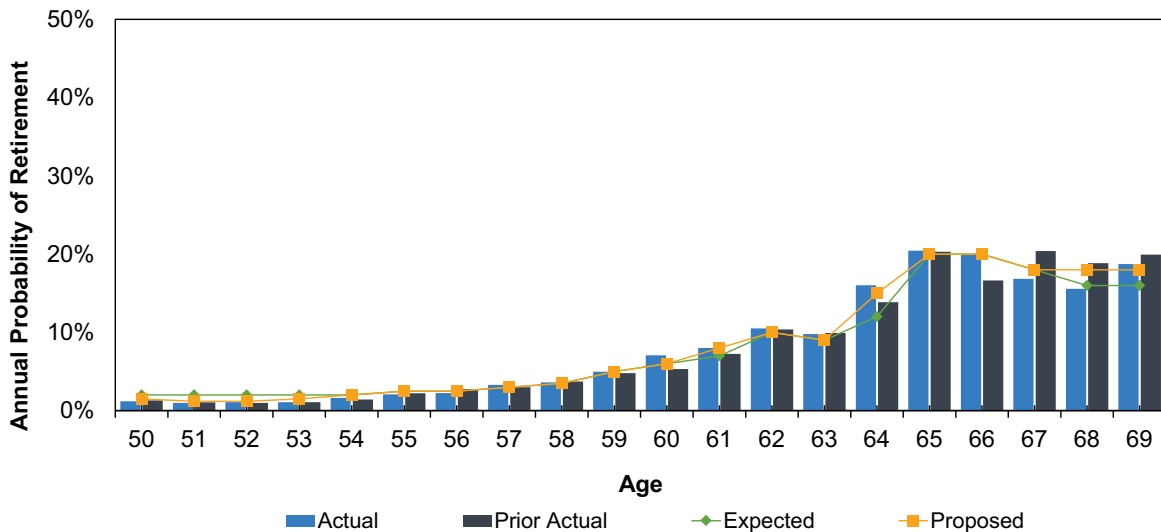
We estimated the financial impact of the recommended change in the service retirement rates. The impact of this change was a 0.12% increase in the projected Total Employer Contribution Rate as a percentage of payroll and an increase in the Actuarial Accrued Liability of \$71 million.

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



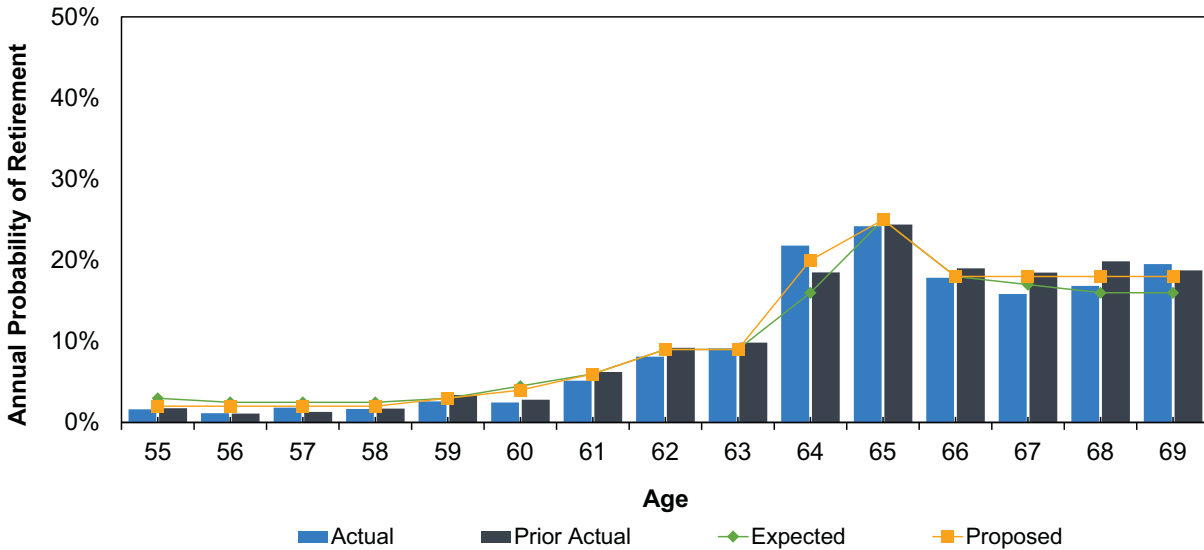
	2013-16 Data		
	Expected	Actual	Proposed
Total Count	518	489	No Change
Actual / Expected	94%		

Exhibit 7-2
Service Retirement – General D Members



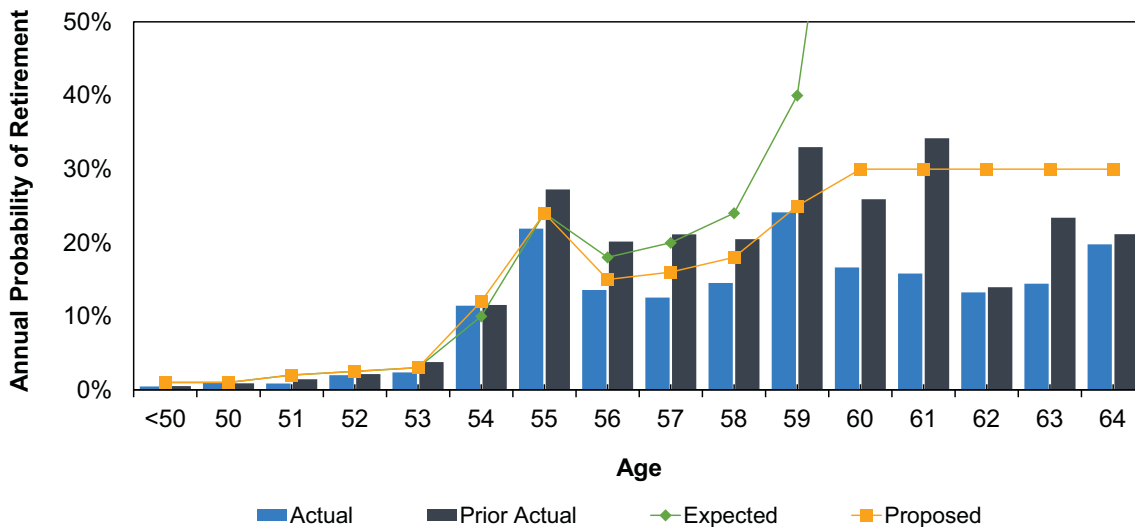
	2013-16 Data		
	Expected	Actual	Proposed
Total Count	2,569	2,564	2,572
Actual / Expected	100%		100%

Exhibit 7-3
Service Retirement – General E Members



	2013-16 Data		
	Expected	Actual	Proposed
Total Count	1,938	1,865	1,979
Actual / Expected	96%		94%

Exhibit 7-4
Service Retirement – Safety Members



	2013-16 Data		
	Expected	Actual	Proposed
Total Count	1,149	708	886
Actual / Expected	62%		80%

Section 8 Disability Retirement



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

- **Nonservice-Connected Disability:** This is available to a disabled member upon satisfying the vesting requirement.
- **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.

Results: Service-Connected Disability

Overall, we found there were almost exactly the same number of service-connected disabilities that the current rates predicted for both General and Safety members. The following is a comparison of the actual to expected service-connected disabilities for active members by gender and plan for this study period.

Plan	Gender	Actual	Expected	Actual / Expected
General A-D & G	Male	58	52	112%
General A-D & G	Female	72	78	92%
Safety A & B	Male	283	281	101%
Safety A & B	Female	42	43	98%
Total		455	454	100%

Counts reported are for the first two years of the study only. The last year is excluded due to a lag in when disabilities occur and when they are approved (and show up in the data).

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

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

**Recommendation:
 Service-Connected
 Disability**

Actual experience for service-connected disabilities was close to the assumptions for both General and Safety members in total. We are recommending minor adjustments to better fit the actual pattern of disability retirements.

The revised results are shown in the following table:

Plan	Gender	Actual	Expected	Actual / Expected	Proposed	Actual / Proposed
General A-D & G	Male	58	52	112%	56	104%
General A-D & G	Female	72	78	92%	80	90%
Safety A & B	Male	283	281	101%	285	99%
Safety A & B	Female	42	43	98%	42	99%
Total		455	454	100%	463	98%

**Results: Nonservice-
 Connected Disability**

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

Plan	Gender	Actual	Expected	Actual / Expected
General A-D & G	Male	18	15	120%
General A-D & G	Female	32	29	110%
Safety A & B	Male	3	0	N/A
Safety A & B	Female	1	0	N/A
Total		54	44	123%

Counts reported are for the first two years of the study only. The last year is excluded due to a lag in when disabilities occur and when they are approved (and show up in the data).

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

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

**Recommendation:
 Nonservice-Connected
 Disability**

Actual experience for nonservice-connected disabilities was slightly higher than the assumptions for General members predicted, we are recommending no change for this group, as we did not view this difference as material given the small size of the group. For Safety members, over 99% of disabilities were service-connected, so we recommend continuing the current practice of assuming all Safety disability retirements are service-connected.

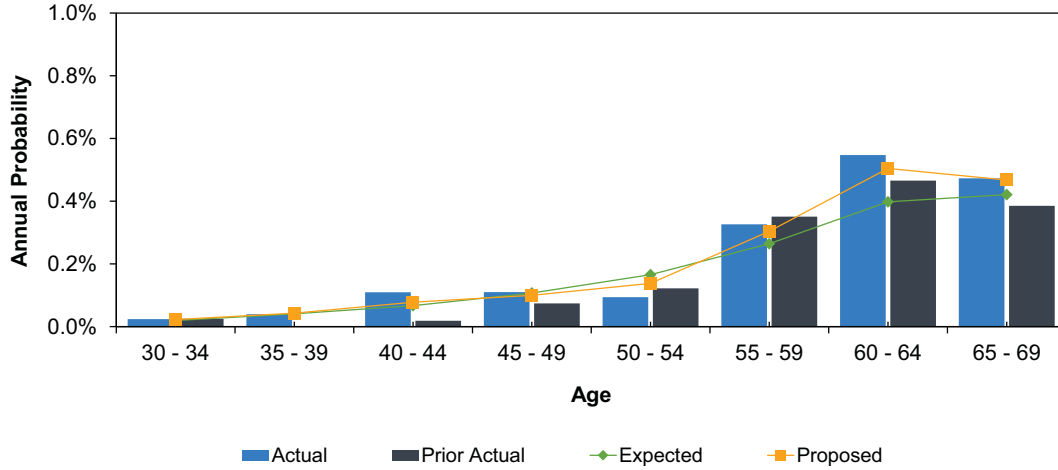
The results reflecting no change are shown in the following table:

Plan	Gender	Actual	Expected	Actual /		
				Expected	Proposed	
General A-D & G	Male	18	15	120%	15	120%
General A-D & G	Female	32	29	110%	29	110%
Safety A & B	Male	3	0	N/A	0	N/A
Safety A & B	Female	1	0	N/A	0	N/A
Total		54	44	123%	44	123%

Financial Impact

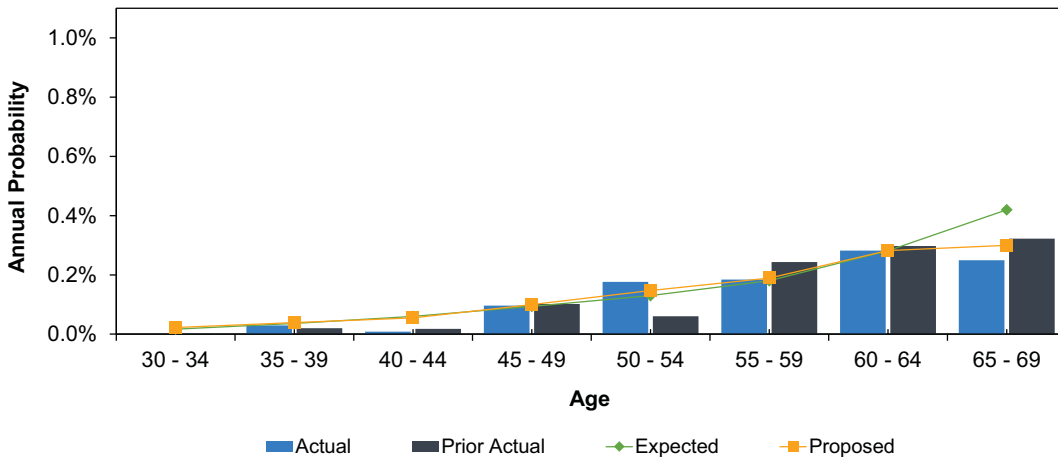
We estimated the financial impact of the recommended change in the disability retirement rates in combination with the change in the active death rates. The total expected impact of these changes is a 0.05% increase in the projected Total Employer Contribution Rate as a percentage of payroll and an increase in the Actuarial Accrued Liability of \$92 million.

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



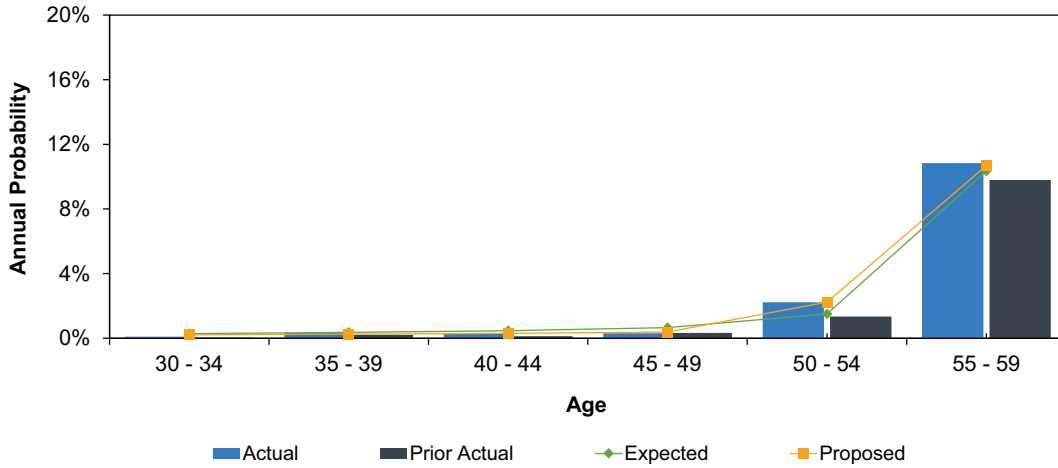
	2013-16 Data		
	Expected	Actual	Proposed
Total Count	52	58	56
Actual / Expected	112%		104%

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



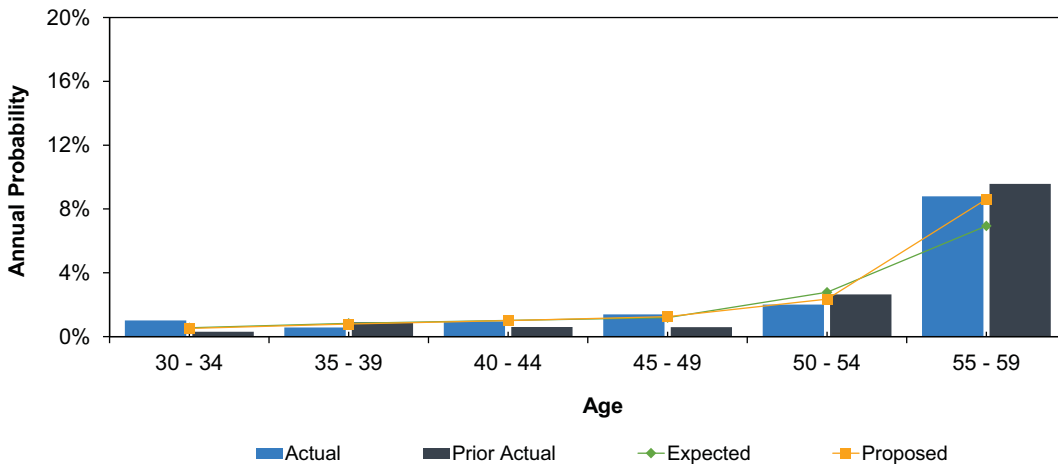
	2013-16 Data		
	Expected	Actual	Proposed
Total Count	78	72	80
Actual / Expected	92%		90%

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



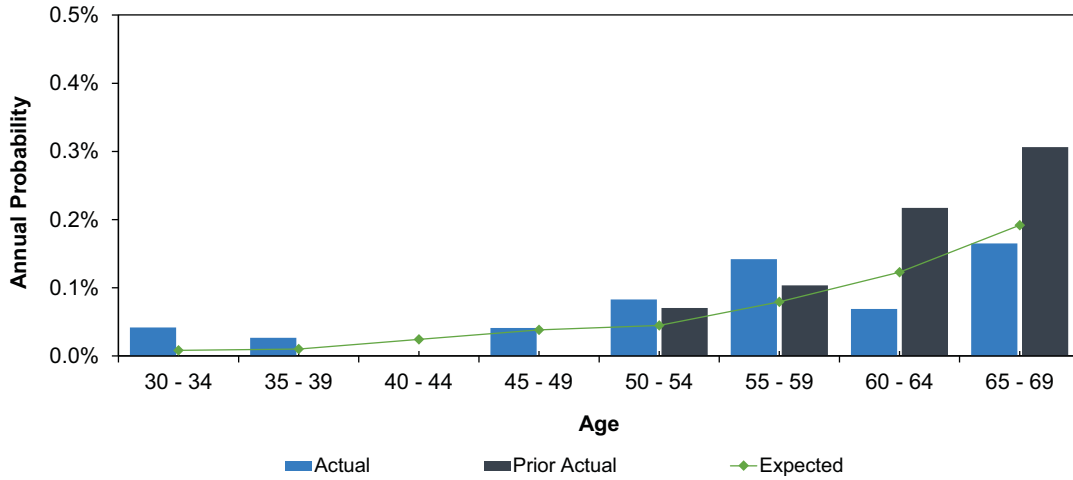
	2013-16 Data		
	Expected	Actual	Proposed
Total Count	281	283	285
Actual / Expected	101%		99%

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



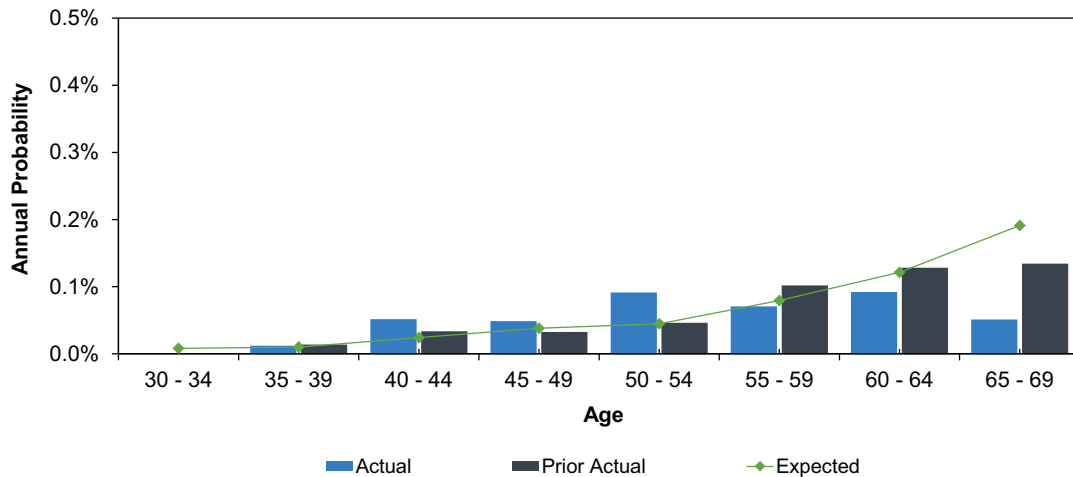
	2013-16 Data		
	Expected	Actual	Proposed
Total Count	43	42	42
Actual / Expected	98%		99%

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



	2013- 2016 Data		
	Expected	Actual	Proposed
Total Count	15	18	No Change
Actual / Expected	120%		

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



	2013 - 2016 Data		
	Expected	Actual	Proposed
Total Count	29	32	No Change
Actual / Expected	110%		

Section 9 Terminations (Includes both Refunds and Vested Terminations)



This section of the report summarizes the results of our study of terminations of employment for reasons other than death, service retirement, or disability. A member who terminates, but does not retire, is assumed to either take a refund (a withdrawal) or to terminate employment but leave 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.

Results – Aggregate Terminations (Refunds and Vested Terminations)

Exhibits 9-1 to 9-5 at the end of this section show the results of the study graphically. Total terminations were approximately to equal to what the assumptions predicted, with some variance by plan. We studied the two new plans separately this year. The current assumption is that General G /Safety C members have the same termination rates as General D / Safety B. For General G, the experience was close to the assumption. There was a greater difference for Safety C, but there is limited amount of experience at this time.

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

Plan	Actual	Expected	Actual / Expected	Proposed	Actual / Proposed
General D	2,039	1,825	112%	1,825	112%
General E	775	909	85%	777	100%
General G	1,484	1,647	90%	1,647	90%
Safety A & B	217	184	118%	184	118%
Safety C	67	50	135%	50	134%
Total	4,582	4,615	99%	4,483	102%

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

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

Recommendation

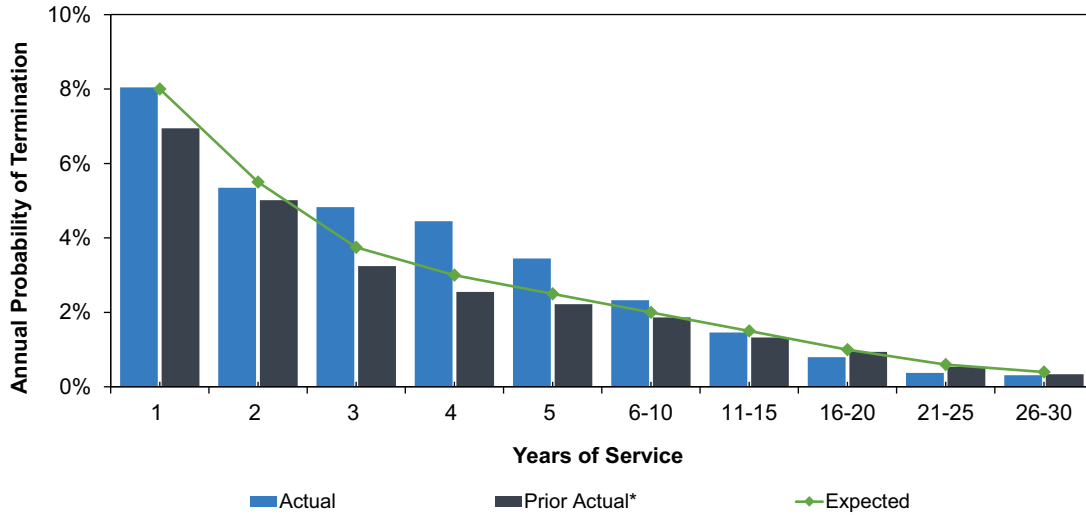
We are recommending new rates of termination for all plans as follows:

- **General Plan D:** We have recommended no changes.
- **General Plan E:** We have recommended slightly higher termination rates with less than five years of service and lower termination rates later in the member's career.
- **General Plan G:** We have recommended no changes.
- **General Plans A-C:** These plans are closed and no new employees are covered by these plans since May of 1979. The total membership is aging and has almost 30 years of service in most cases. Under the current approach to applying termination rates, once a member is eligible for retirement, no termination is assumed. Thus, these rates represent the very low probabilities there are still members not yet eligible for retirement that could terminate. The current rate of termination is assumed at a flat 0.5%, regardless of age or years of service. We are recommending no change to this assumption.
- **Safety Members – A and B:** We have recommended no changes.
- **Safety Members – C:** We have recommended no changes.

Financial Impact – Recommended Rates

We evaluated the net impact for all changes in termination assumptions and found that the calculated Total Employer Contribution Rate increased by 0.03% as a percentage of payroll. The Actuarial Accrued Liability increased by \$82 million. Note that these numbers include the impact of the recommended changes in the probability of reciprocity, as discussed in Section 12.

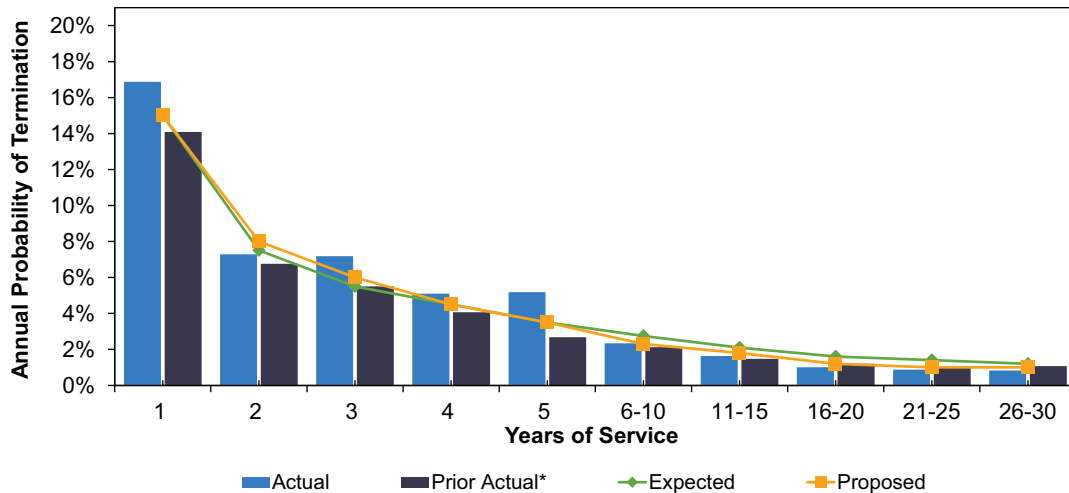
Exhibit 9-1
Termination Rates – General Plan D Members



*Prior Actual numbers reflect average experience from last two studies (2010 and 2013).

	2013 - 2016 Data		
	Expected	Actual	Proposed
Total Count	1,825	2,039	1,825
Actual / Expected	112%		112%

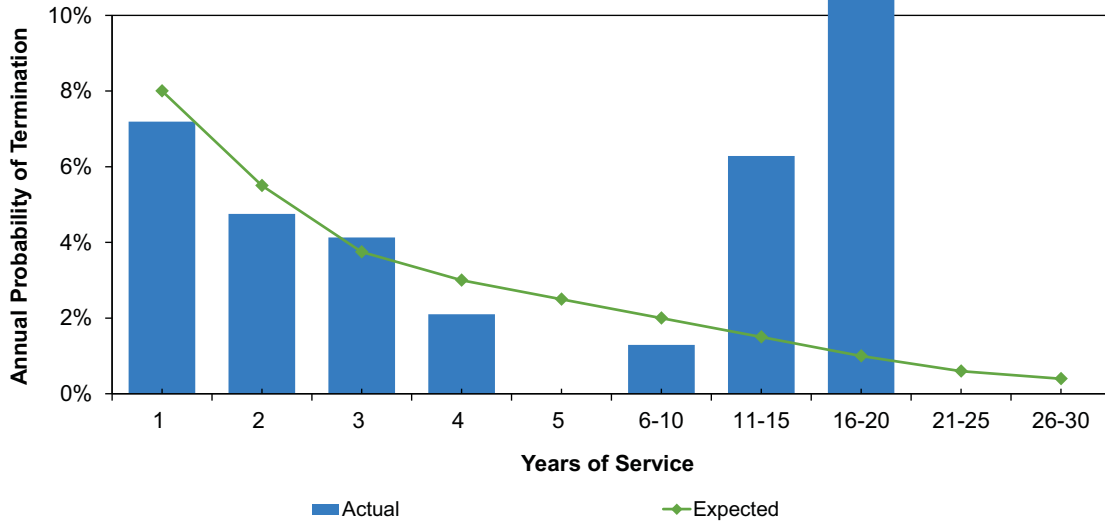
Exhibit 9-2
Termination Rates – General Plan E Members



*Prior Actual numbers reflect average experience from last two studies (2010 and 2013).

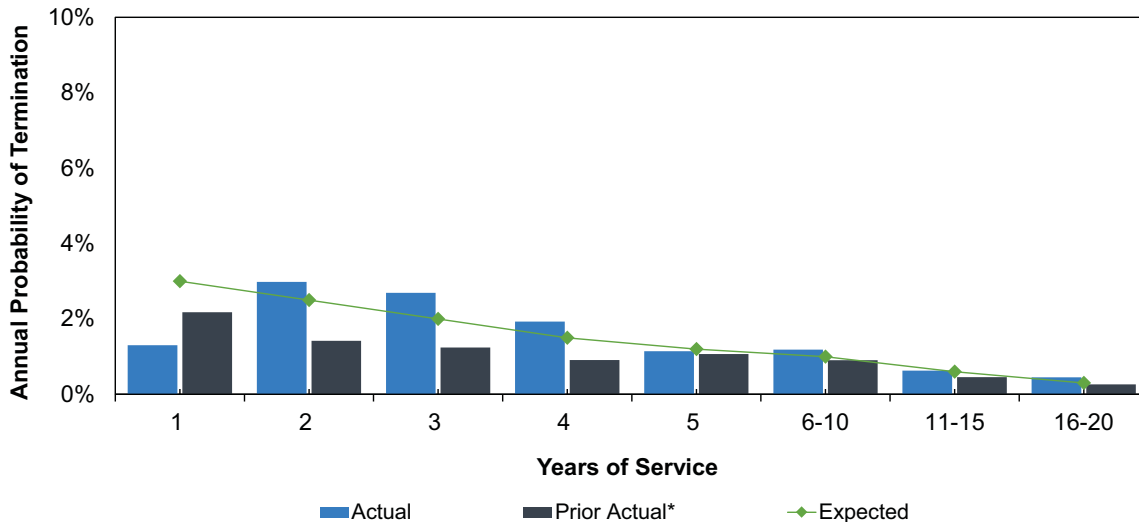
	2013 - 2016 Data		
	Expected	Actual	Proposed
Total Count	909	775	777
Actual / Expected	85%		100%

Exhibit 9-3
Termination Rates – General Plan G Members



	2013 - 2016 Data		
	Expected	Actual	Proposed
Total Count	1,647	1,484	1,647
Actual / Expected	90%		90%

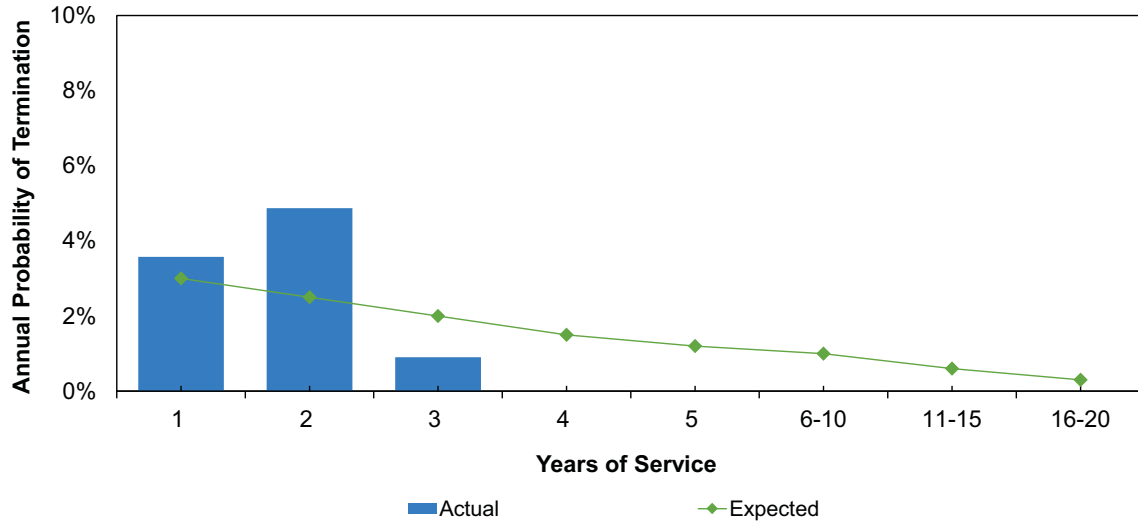
Exhibit 9-4
Termination Rates – Safety Plan A & B Members



*Prior Actual numbers reflect average experience from last two studies (2013 and 2010).

	2013 - 2016 Data		
	Expected	Actual	Proposed
Total Count	184	217	184
Actual / Expected	118%		118%

Exhibit 9-5
Termination Rates – Safety Plans C Members



	2013 - 2016 Data		
	Expected	Actual	Proposed
Total Count	50	67	50
Actual / Expected	135%		134%

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Section 10 Probability of Refund



As discussed in Section 9, the aggregate termination rates include both members who terminate and take a refund of their contributions and those who elect to keep their contributions with LACERA and receive a deferred vested benefit. The percentage of members who are expected take a refund of their contributions is the probability of refund assumption.

Results

The current assumptions assume that a vested member will take a refund of their contributions based on the member's years of service and classification.

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

Plan	Actual	Expected	Actual / Expected
General	401	455	88%
Safety	40	46	88%
Total	441	501	88%

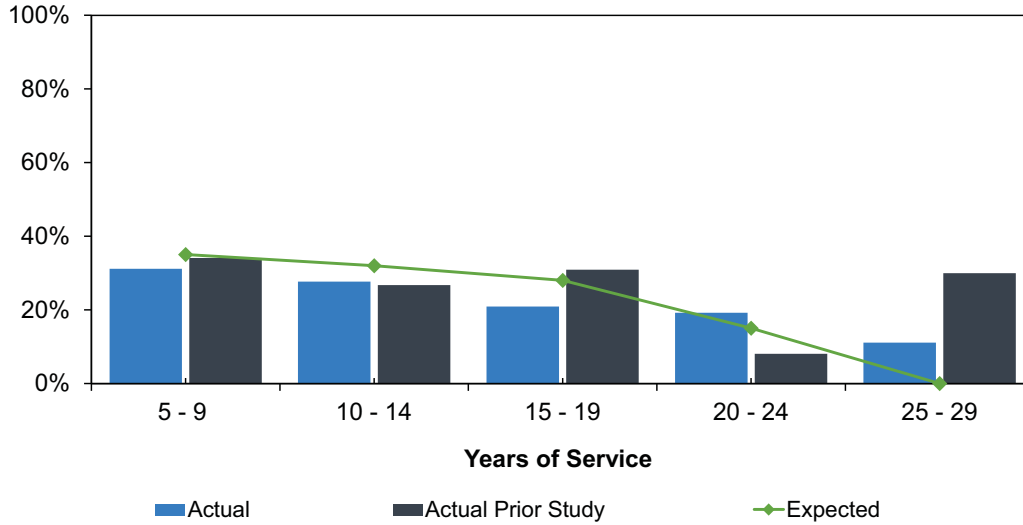
Recommendation

We are recommending no changes in the probability of refund for either General or Safety members. No refunds are assumed to occur after a General member has 26 years of service or after 19 years of service for a Safety member. The rates start higher for members with fewer years of service and decline, as indicated, to 0% or no refund.

Financial Impact

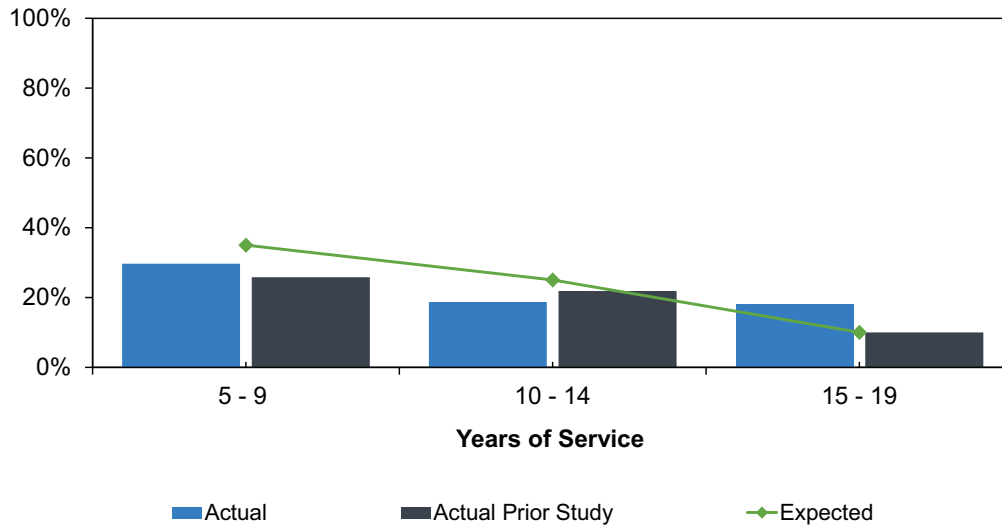
No financial impact, since no change recommended.

Exhibit 10-1
Probability of Refund – General Members



	2010 - 2013 Data		
	Expected	Actual	Proposed
Total Count	455	401	455
Actual / Expected	88%		88%

Exhibit 10-2
Probability of Refund – Safety Members



	2010 - 2013 Data		
	Expected	Actual	Proposed
Total Count	46	40	46
Actual / Expected	88%		88%

Section 11 Retiree Mortality for Valuation Purposes



In this section we look at the results of the study of actual and expected death rates of retired members. We studied rates of mortality among healthy and disabled retired members.

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

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

Results

Overall, we found there were more deaths than the current rates predicted for healthy retired members: 4,025 actual to 3,714 expected for a total ratio of 108%. This ratio was 113% in the prior study indicating a 5% improvement in mortality over the three-year study period. The following is a comparison of the actual-to-expected deaths of service retired members by gender and type for the study period 2013-2016, including updated ratios based on our proposed assumptions.

Healthy (Service Retirement) Mortality

Plan	Type	Gender	Actual	Expected	Actual / Expected	Proposed	Actual / Proposed
General	Healthy	Male	1,767	1,590	111%	1,712	103%
General	Healthy	Female	1,975	1,884	105%	1,906	104%
Safety	Healthy	Male	272	227	120%	263	103%
Safety	Healthy	Female	11	13	85%	14	79%
Total			4,025	3,714	108%	3,895	103%

For disabled retirees, there were more deaths than the current rates predicted: 767 actual to 727 expected for a total ratio of 106%. This ratio was 117% in the prior study indicating an 11% improvement in mortality over the three-year study period. Note that given the smaller size of the disabled retiree group, it is not surprising to see greater variation. The following is a comparison of the actual-to-expected deaths of disabled retired members by gender and type for the study period 2013-2016, including updated ratios based on our proposed assumptions.

Disabled Mortality

Plan	Type	Gender	Actual	Expected	Actual / Expected	Proposed	Actual / Proposed
General	Disabled	Male	194	187	104%	194	100%
General	Disabled	Female	240	220	109%	228	105%
Safety	Disabled	Male	319	300	106%	301	106%
Safety	Disabled	Female	14	20	70%	20	70%
Total			767	727	106%	743	103%

**Results
(continued)**

Exhibits 11-1 through 11-8 show the results of the study graphically for the period studied, 2013-2016. The rates are currently based on several factors. We studied each of these factors to see if they were significant, and, if so, what the impact was. Our findings were as follows:

- **Age:** Members at older ages tend to have a greater probability of dying than younger members. This is almost universally true in mortality studies.
- **Gender:** Male members tend to have a greater probability of dying than females. This trend is generally true for all mortality studies, and we found this to be true with LACERA.
- **Retirement Type:** Healthy retirees live longer than disabled retirees. This trend is generally true for all mortality studies, and we found this to be true with LACERA. Note that the difference between healthy and disabled retirees is significant for General members, but for Safety members the difference in rates of mortality is much less. We also analyzed the mortality of beneficiaries currently in payment and found the mortality rates were somewhat higher (actual-to-expected ratio of 120%). It should be noted that beneficiary deaths are not provided by LACERA, so we attempted to identify deaths based on year-to-year changes in the data. We have not included beneficiaries in the total counts.
- **Membership:** The current assumptions predict that male Safety members live longer than male General members. This study confirms the same relationship between the memberships, although the difference for healthy retirees is fairly small.

We also studied how the value of an individual's benefits affected their mortality. We found that as the value of benefits increased the mortality rates decreased. This is important because this means that even if the assumptions are accurately predicting the number of deaths, the plan will still be incurring actuarial losses. We found this to be particularly true for healthy male retirees. We have tried to keep some margin in our recommended rates to account for this.

**Generational Mortality
Tables**

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

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

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

Projection Scale for Mortality Improvement

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

Our recommendation is to use 110% of the ultimate portion of the MP-2014 projection scale. In other words, our recommendation is to assume 1.1% annual improvements in mortality (for ages less than 85). We believe this reasonably reflects the long-term expectation of mortality improvement. We have compared our recommended projection scale with actual mortality improvement from the most recent 60 years of experience of the US Social Security system and found them to be reasonably consistent.

As noted, the recommended projection scale is a flat 1.1% improvement through age 85. For subsequent ages, the projected improvement is fractionally less, grading down to 0.0% at age 115. For example, the projected improvement is 0.64% per year at age 100.

Static Mortality Projection

Up until about 10 years ago, almost every actuarial valuation for public retirement systems used static mortality tables. That is, mortality rates were assumed to remain constant in the future. This is in contrast to generational mortality tables which project small incremental reductions in mortality rates each year in the future. There are still a number of systems using static mortality tables.

For those systems using static mortality tables, some margin will usually be included in the tables as a way to reflect expected future mortality improvement in the valuation. Many actuaries do this by applying a static projection of mortality improvement for some period in the future. If LACERA were to use static mortality tables, we would recommend using the same base tables and projection scale as recommended in this report; however, instead of generational mortality, mortality improvement should be projected until 2032 using the recommended base tables and projection scale.

2032 was selected because 16 years in the future represents the weighted average of when all future payments are projected to be made based on the June 30, 2015 actuarial valuation. Since the new mortality tables would be first used in the June 30, 2016 valuation, 2032 (2016 + 16) was selected.

Note that if a static projection is used, it is likely that frequent updates will need to be made due to future mortality improvement.

Recommendation

We recommend strengthening the mortality assumption (i.e., increasing life expectancies), by slightly increasing most mortality rates, but adding a projection scale to reflect expected future improvements in mortality. Note that this reduces the total healthy retiree actual/proposed ratio to 103% based on the base rates, but will ultimately result in increased life expectancies due to the projection scale. We believe the combination of the recommended mortality tables with the projection scale allows for a reasonable expectation of future life expectancy increases.

LACERA uses standard mortality tables adjusted to best fit the patterns of mortality among its retirees. The table on the next page describes the new tables being recommended for healthy and disabled retirees. Note these are based on a recent study of retiree pensioners published by the Society of Actuaries in 2014 (hence, the table name RP-2014).

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

Note that the revised assumptions provide a small margin for the effects of benefit-weighting of mortality.

The recommended mortality rates are based on the RP-2014 Healthy Annuitant Mortality table (and the RP-2014 Disabled Retiree table in some cases) and all assume generational mortality improvement based on 110% of the MP-2014 Ultimate projection scale, as follows:

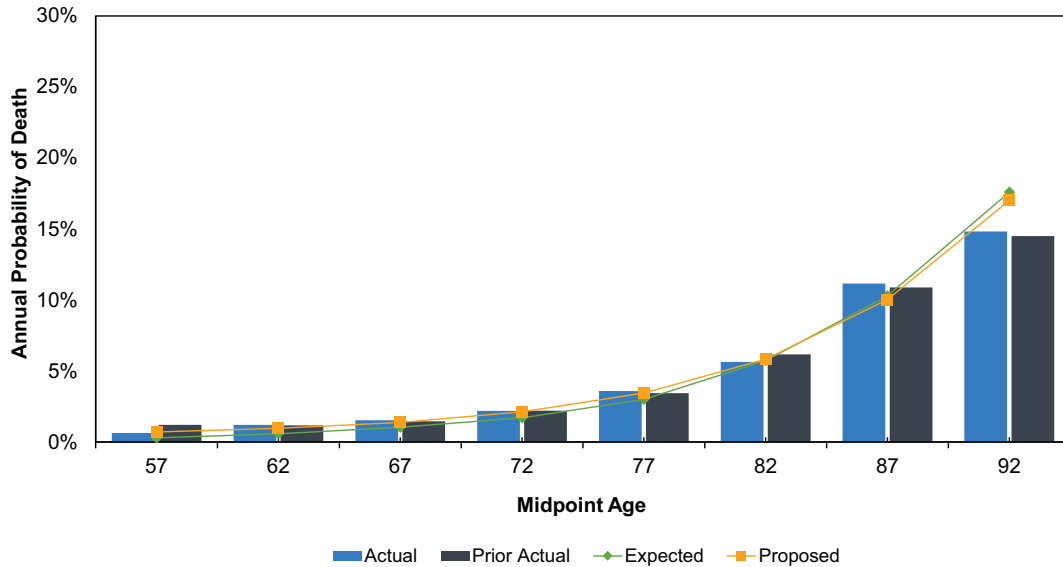
Class	Type ⁽¹⁾	Sex	Mortality Tables	
			Current Table ⁽²⁾	Proposed Table ⁽³⁾
General	Healthy	Male	RP 2000 Combined Male, Proj. 2025 -1	105% of RP-2014 Healthy Annuitant Male
General	Healthy	Female	RP 2000 Combined Female, Proj. 2025 -1	RP-2014 Healthy Annuitant Female
Safety	Healthy	Male	RP 2000 Combined Male, Proj. 2025 -2	95% of RP-2014 Healthy Annuitant Male
Safety	Healthy	Female	RP 2000 Combined Female, Proj. 2025 -1	RP-2014 Healthy Annuitant Female
General	Disabled	Male	Avg of: RP 2000 Combined Male Proj. 2025 -1 RP 2000 Disabled Male Proj. 2025 -1	Avg of: 105% of RP-2014 Healthy Annuitant Male RP-2014 Disabled Retiree Male
General	Disabled	Female	Avg of: RP 2000 Combined Female Proj. 2025 -1 RP 2000 Disabled Female Proj. 2025 -1	Avg of: RP-2014 Healthy Annuitant Female RP-2014 Disabled Retiree Female
Safety	Disabled	Male	RP 2000 Combined Male, Proj. 2025	RP-2014 Healthy Annuitant Male
Safety	Disabled	Female	RP 2000 Combined Female, Proj. 2025	RP-2014 Healthy Annuitant Female

1. Beneficiaries are assumed to have the same mortality as a healthy General member of the same sex.
2. Static projection of the current tables using Projection Scale AA to specified year.
3. Generational Projection of the current tables using 110% of the MP-2014 Ultimate projection scale.

Financial Impact

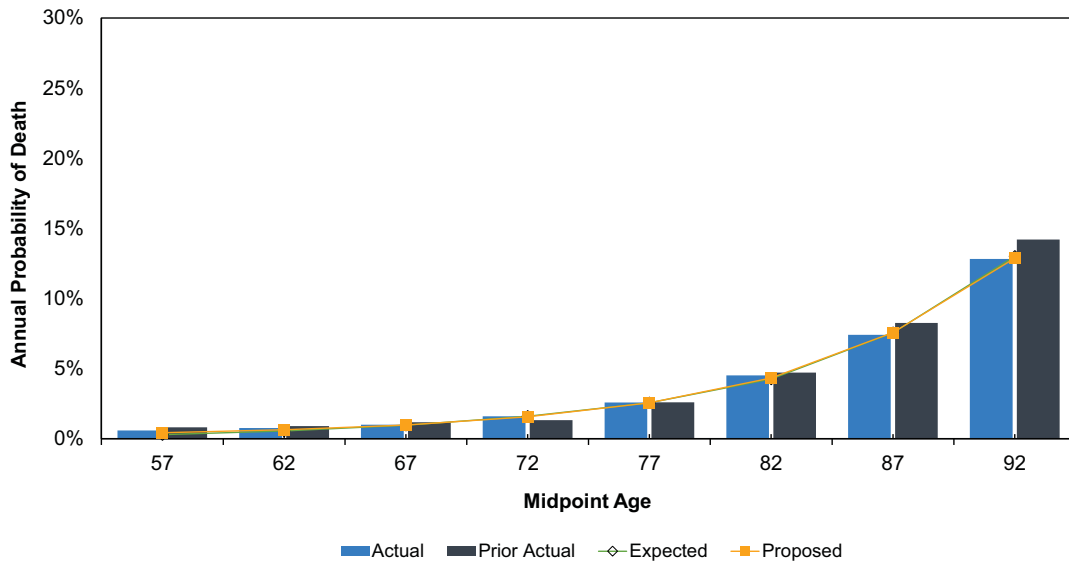
We evaluated the net impact of the recommended changes in the post-retirement mortality assumptions and found that the projected Total Employer Contribution Rate increased by 1.81% of payroll. The Actuarial Accrued Liability increased by \$1,770 million.

**Exhibit 11-1
 Healthy Mortality – Male General Members**



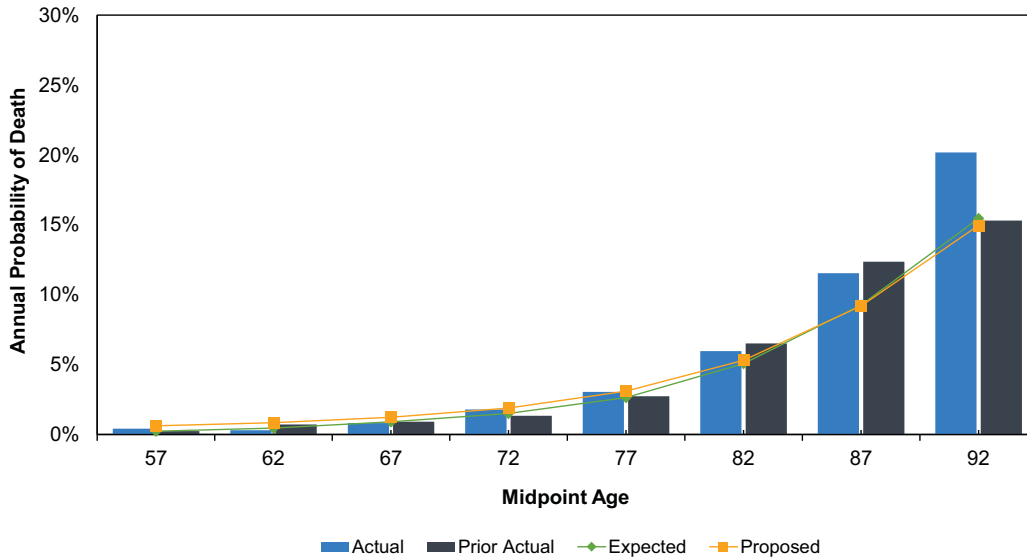
	2013 - 2016 Data		
	Expected	Actual	Proposed
Total Count	1,590	1,767	1,712
Actual / Expected	111%		103%

**Exhibit 11-2
 Healthy Mortality – Female General Members**



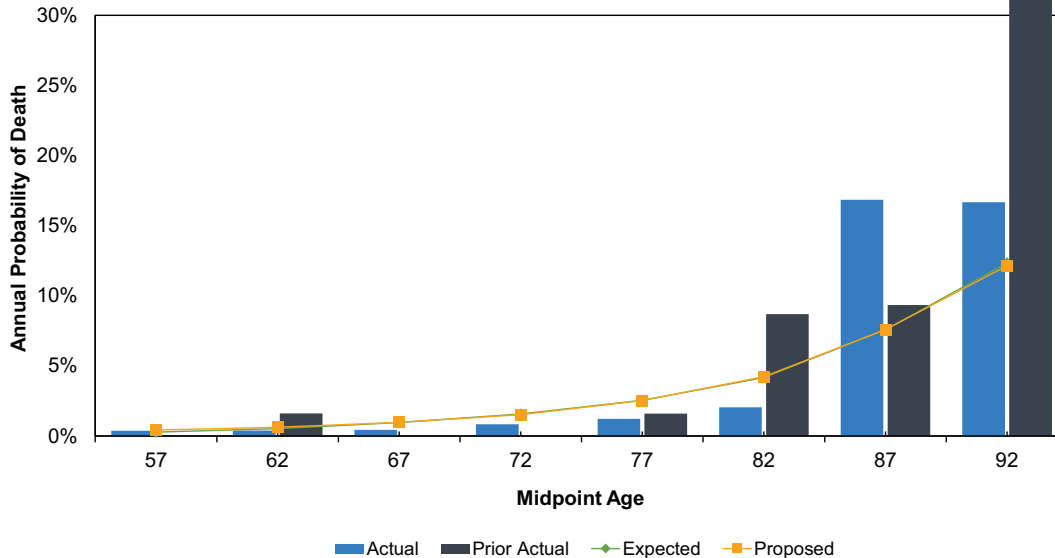
	2013 - 2016 Data		
	Expected	Actual	Proposed
Total Count	1,884	1,975	1,906
Actual / Expected	105%		104%

Exhibit 11-3
Healthy Mortality – Male Safety Members



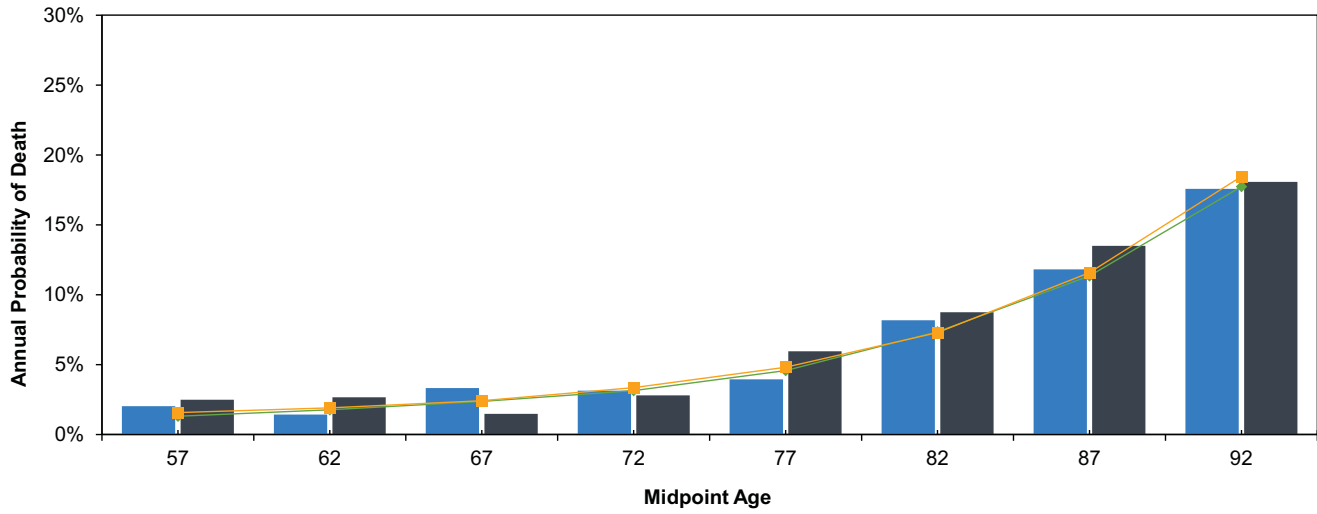
	2013 - 2016 Data		
	Expected	Actual	Proposed
Total Count	227	272	263
Actual / Expected	120%		103%

Exhibit 11-4
Healthy Mortality – Female Safety Members



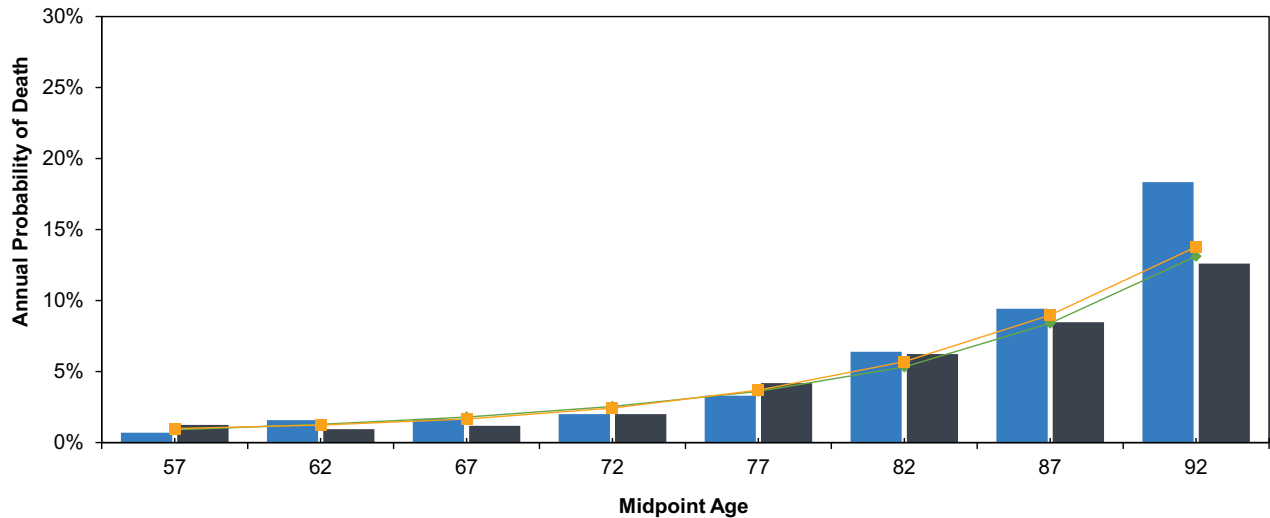
	2013 - 2016 Data		
	Expected	Actual	Proposed
Total Count	13	11	14
Actual / Expected	85%		79%

**Exhibit 11-5
 Disabled Mortality – Male General Members**



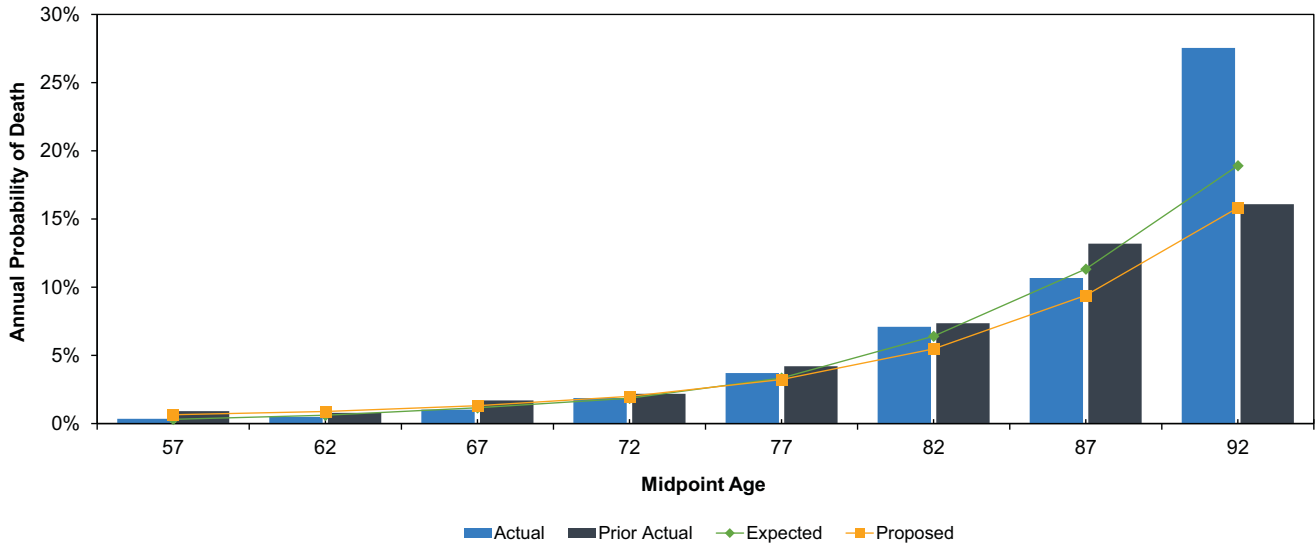
2013 - 2016 Data			
	Expected	Actual	Proposed
Total Count	187	194	194
Actual / Expected	104%		100%

**Exhibit 11-6
 Disabled Mortality – Female General Members**



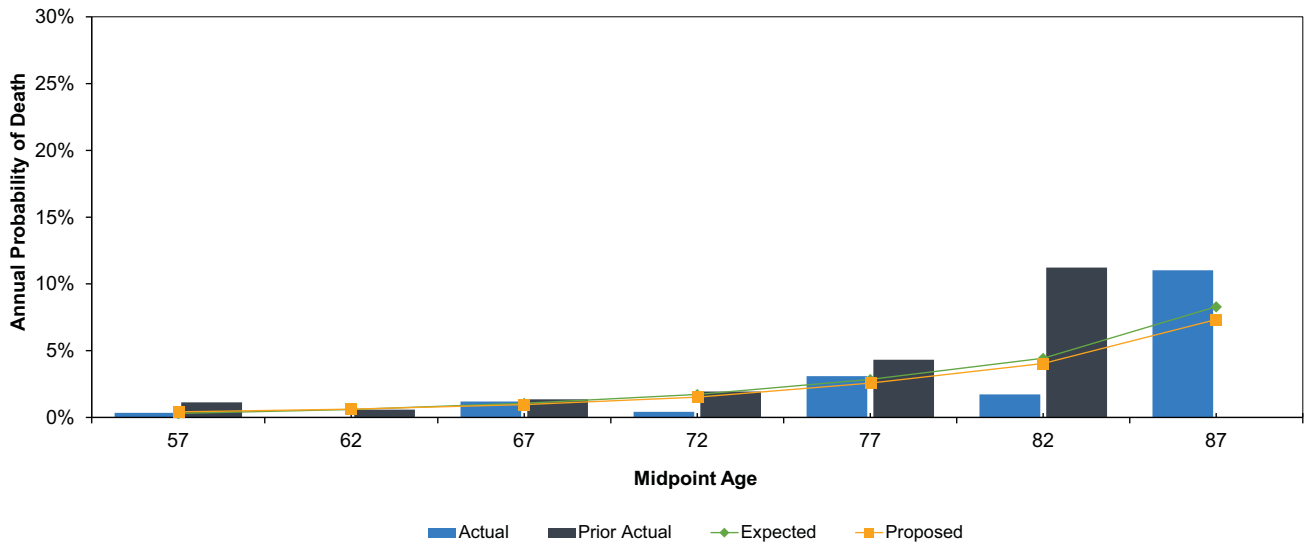
2013 - 2016 Data			
	Expected	Actual	Proposed
Total Count	220	240	228
Actual / Expected	109%		105%

**Exhibit 11-7
 Disabled Mortality – Male Safety Members**



	2013 - 2016 Data		
	Expected	Actual	Proposed
Total Count	300	319	301
Actual / Expected	106%		106%

**Exhibit 11-8
 Disabled Mortality – Female Safety Members**



	2013 - 2016 Data		
	Expected	Actual	Proposed
Total Count	20	14	20
Actual / Expected	70%		70%

Section 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 77% of males and 46% of females received an unmodified (or unmodified plus) benefit, and therefore must have had an eligible survivor. We are recommending reducing the current assumption to reflect this experience.

Males: 77% with an Eligible Survivor (was 80%).

Females: 50% with an Eligible Survivor (was 55%).

Beneficiary Age

To determine the value of a member's retirement or death benefit, we must estimate the value of the portion payable to the surviving eligible beneficiary. Since the value of the survivor's benefit is dependent on his/her age, we must estimate it. We studied the beneficiary age difference compared to the member based on retirements during the study period. Based on this analysis we are recommending reducing the assumed age difference for female retirees.

Retiree Gender	Beneficiary's Age Relative to Member		
	Current Assumption	Actual Experience	Recommended Assumption
Male	4 years younger	3.6 years younger	No change
Female	2 years older	1.9 years older	No change

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

Retirement for Deferred Vested Members

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

Plan	Assumption for Deferred Commencement		
	Age at Commencement		
	Current Assump.	Actual Results	Proposed Assump.
GA	60	64.1	62
GB	60	63.7	62
GC	60	63.8	62
GD	57	57.5	No Change
GE	60	61.9	62
GG	57	N/A*	No Change
SA	55	46.7	No Change
SB	50	49.6	No Change
SC	50	N/A*	No Change

**Insufficient data for analysis.*

Salary Increases in Final Year Before Retirement

In some retirement systems, members can artificially inflate the compensation used in the calculation of their benefit (sometimes referred to as “salary spiking”). This is generally done in two ways:

- Cashouts – Additional pay, such as vacation or sick leave payouts, is included in final compensation along with regular pay. This can cause significant increases in the one-year final compensation if the cashouts are included on top of the full year’s regular compensation.
- Pay Increases – Members may receive higher-than-expected compensation increases in their final year.

LACERA’s calculation of final compensation is such that cashouts should not be a significant issue.

In either case, if the compensation is greater than anticipated by the assumptions, the valuation will be understating the value of future benefits. We analyzed LACERA’s data to see if large increases in compensation were occurring in the member’s final year before retirement from any cause by comparing actual compensation increases for those members who retired with similar members who did not retire. Note that for this analysis we only looked at plans with a one-year final compensation period.

Based on our analysis, we found that General members received compensation increases in their year of retirement that were consistent with comparable members who did not retire. Safety members received slightly higher increases, but the difference was about 1%. Given the relatively small difference, we are not recommending any explicit recognition of this be included in the valuation.

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, 18% reciprocity is assumed for General members, and 35% is assumed for Safety members. We are recommending a small decrease in the assumption for General members based on actual experience.

Retirements from Deferred Status (2013-16)					
Plan	Total	Reciprocal Status	% with Reciprocity	Current Assump.	Proposed Assump.
General	960	140	15%	18%	16%
Safety	47	17	36%	35%	No Change
Total	1,007	157	16%		

Financial Impact

We evaluated the net impact of the recommended changes in the probability of eligible survivor assumptions and found that the projected Total Employer Contribution Rate decreased by 0.12% of payroll. The Actuarial Accrued Liability decreased by \$86 million. The estimated net impact of the other recommended changes to the miscellaneous assumptions were evaluated with the changes previously discussed: a) reciprocity with termination assumption, and b) assumed retirement age for deferred vested members with service retirement assumption.

Appendix A: Proposed Actuarial Procedures and Assumptions

This section of the experience study report reflects how the Appendix A of the June 30, 2016 actuarial valuation would appear if the Board of Investments adopts all of the recommended assumptions.

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Appendix A: Actuarial Procedures and Assumptions



The actuarial procedures and assumptions used in this valuation are described in this section. The assumptions were reviewed and changed June 30, 2016 as a result of the 2016 triennial Investigation of Experience Study.

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

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

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

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

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

Tables A-6 to A-13 was developed from the experience as measured by the 2016 Investigation of Experience Study. The rates are the probabilities a member will leave the system for various reasons.

Note: The assumptions shown in this appendix are Milliman's proposed assumptions and have not yet been adopted by the Board. Recommended changes from the prior assumptions have been shaded in green. All numbers in the tables and certain items within the text may be modified after the Board makes its decision regarding the actuarial assumptions.

Actuarial Cost Method

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

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

The portion of this actuarial present value allocated to a valuation year is called the normal cost. The portion of this actuarial present value not provided for at a valuation date by the sum of (a) the actuarial value of the assets, and (b) the actuarial present value of future normal costs is called the Unfunded Actuarial Accrued Liability (UAAL). The original UAAL as of June 30, 2009 is amortized as a level percentage of the projected salaries of present and future members of LACERA over a closed 30-year period. Future gains and losses are amortized over new closed 30-year periods. This is referred to as "layered" amortization.

For plans that have been in existence for less than five years, the normal cost rate is calculated based on a hypothetical population which includes all current active members with less than five years of service, as if each of these members had entered their respective new plan (split by General and Safety). This normal cost rate is then multiplied by the present value of future compensation of current active members in the respective plans to calculate the present value of future normal costs in aggregate. For all plans, the present value of future benefits minus the present value of future normal costs will be equal to the Actuarial Accrued Liability (AAL).

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

Records and Data

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

Replacement of Terminated Members

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

Growth in Membership

For benefit determination purposes, no growth in the membership of 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 in the total number of active members is assumed.

Internal Revenue Code Section 415 Limit	The Internal Revenue Code Section 415 maximum benefit limitations are not reflected in the valuation for funding purposes. Any limitation is reflected in a member's benefit after retirement.
Internal Revenue Code Section 401(a)(17)	The Internal Revenue Code Section 401(a)(17) maximum compensation limitation is not reflected in the valuation for funding purposes. Any limitation is reflected in a member's benefit after retirement.
Employer Contributions	The employer contribution rate is set by the Board of Investments based on actuarial valuations.
Member Contributions	<p>The member contribution rates vary by entry age (except for PEPRA plans) and are described in the law. Code references are shown in Appendix B of the valuation report. The methods and assumptions used are detailed later in this section.</p> <p>The individual member rates by entry age, plan, and class are illustrated in Appendix D of the valuation report.</p>
Valuation of Assets	The assets are valued using a five-year smoothed method based on the difference between the expected market value and the actual market value of the assets as of the valuation date. The expected market value is the prior year's market value increased with the net increase in the cash flow of funds, all increased with interest during the past fiscal year at the expected investment return rate assumption. The five-year smoothing valuation basis for all assets was adopted effective June 30, 2009.
Investment Earnings and Expenses	The future investment earnings of the assets of LACERA are assumed to accrue at an annual rate of 7.00% or 7.25% compounded annually, net of both investment and administrative expenses. This rate was adopted June 30, 2016.
Post-retirement Benefit Increases	Post-retirement increases are assumed for the valuation in accordance with the benefits provided as described in Appendix B. These adjustments are assumed payable each year in the future as they are not greater than the expected increase in the Consumer Price Index of 2.50% or 2.75% per year. This rate was adopted June 30, 2016.
Interest on Member Contributions	The annual credited interest rate on member contributions is assumed to be 7.00% or 7.25% compounded semi-annually for an annualized rate of 7.12% or 7.38%. This rate was adopted June 30, 2016.
Future Salaries	<p>The rates of annual salary increase assumed for the purpose of the valuation are illustrated in Table A-5. In addition to increases in salary due to promotions and longevity, this scale includes an assumed 3.00% or 3.25% per annum rate of increase in the general wage level of the membership. These rates were adopted June 30, 2016.</p> <p>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.</p>

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

Social Security Wage Base

Plan E members have their benefits offset by an assumed Social Security Benefit. For valuation funding purposes, we need to project the Social Security Benefit. We assume the current Social Security provisions will continue and the annual Wage Base will increase at the rate of 3.00% or 3.25% per year. Note, 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 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 2015 is \$140,424 (after applying the 120% factor) and is projected to increase at the CPI rate of 2.75% or 3.25%. 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. The retirement rates vary by age and are shown by plan in Tables A-6 through A-13.

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

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

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

**Retirement
(continued)**

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

The retirement probabilities were adopted June 30, 2016.

Disability

The rates of disability used in the valuation are also illustrated in Tables A-6 through A-13. These rates were adopted June 30, 2016.

**Post-Retirement
Mortality – Other Than
Disabled Members**

The same post-retirement mortality rates are used in the valuation for active members, members retired for service, and beneficiaries. These rates are illustrated in Table A-2. Current beneficiary mortality is assumed to be the same assumption as healthy members of the same sex. Future beneficiaries are assumed to be of the opposite sex, and have the same mortality as General members. Note that these assumptions directly reflect expected future mortality improvement. These rates were adopted June 30, 2016.

Males General members: RP-2014 Healthy Annuitant Mortality Table for Males multiplied by 105%, with 110% of MP-2014 Ultimate Projection Scale.

Safety members: RP-2014 Healthy Annuitant Mortality Table for Males multiplied by 95%, with 110% of MP-2014 Ultimate Projection Scale.

Females General members: RP-2014 Healthy Annuitant Mortality Table for Females, with 110% of MP-2014 Ultimate Projection Scale.

Safety members: Same as General Females.

**Post-Retirement
Mortality – Disabled
Members**

For disabled members, the mortality rates used in the valuation rates are illustrated in Table A-3. Note that these assumptions directly reflect expected future mortality improvement. These rates were adopted June 30, 2016.

Males General members: Average of RP-2014 Healthy Annuitant Mortality Table for Males multiplied by 105% and RP-2014 Healthy Annuitant Mortality Table for Males, both projected with 110% of MP-2014 Ultimate Projection Scale.

Safety members: RP-2014 Healthy Annuitant Mortality Table for Males, with 110% of MP-2014 Ultimate Projection Scale.

Females General members: Average of RP-2014 Healthy Annuitant Mortality Table for Males multiplied by 105% and RP-2014 Healthy Annuitant Mortality Table for Males, both projected with 110% of MP-2014 Ultimate Projection Scale.

Safety members: RP-2014 Healthy Annuitant Mortality Table for Females, with 110% of MP-2014 Ultimate Projection Scale.

Mortality while in Active Status

For active members, the mortality rates used in the valuation rates are illustrated in Tables A-6 through A-13. These rates were adopted June 30, 2016.

Class	Gender	Proposed Table	
General	Male	RP 2014E Male, Generational ⁽¹⁾	-2
General	Female	RP 2014E Female, Generational ⁽¹⁾	-0
Safety	Male	RP 2014E Male, Generational ⁽¹⁾	-6
Safety	Female	RP 2014E Female, Generational ⁽¹⁾	-0

1. Projection using 110% of MP-2014 Ultimate projection scale.

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

Other Employment Terminations

Tables A-6 to A-13 show, for all ages, the rates assumed in this valuation for future termination from active service other than for death, disability or retirement. These rates do not apply to members eligible for service retirement. These rates were adopted June 30, 2016.

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. All terminating members are assumed to not be rehired.

Table A-4 gives the assumed probabilities that vested members will withdraw their contributions and elect a refund immediately upon termination and the probability that remaining members will elect a deferred vested benefit. All non-vested members are assumed to elect a refund and withdraw their contributions. These rates were adopted June 30, 2016.

Probability of Eligible Survivors

For members not currently in pay status, 77% of all males and 50% of all females are assumed to have eligible survivors (spouses or qualified domestic partners). Survivors are assumed to be four years younger than male members and two years older than female members. Survivors are assumed to be of the opposite gender as the member. There is no explicit assumption for children's benefits. We believe the survivor benefits based on this assumption are sufficient to cover children's benefits as they occur.

Valuation of Vested Former Members

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

Reciprocal Employment

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

Current vested reciprocal members are assumed to receive annual salary increases of 4.00% or 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 2040. For Safety members, it is based on a 90% / 10% blend of the male and female annuity factors.
- 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% or 7.25%.
- C. The Final Compensation is based on the salary paid in the year prior to attaining the retirement age.

Example: For a Plan C Member who enters at age 59 or earlier, the Final Compensation at retirement (age 60) will be the monthly average of the annual salaries during age 59.

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

Table A-1
Summary of Valuation Assumptions as of June 30, 2016

I.	Economic assumptions	
A.	General wage increases	3.00% or 3.25%
B.	Investment earnings	7.00% or 7.25%
C.	Growth in membership	0.00%
D.	Post-retirement benefit increases (varies by plan)	Plan COLA not greater than CPI assumption.
E.	CPI inflation assumption	2.50% or 2.75%
II.	Demographic assumptions	
A.	Salary increases due to service	Table A-5
B.	Retirement	Tables A-6 to A-13
C.	Disability	Tables A-6 to A-13
D.	Mortality during active employment	Tables A-6 to A-13
E.	Mortality for active members after termination and service retired members.	Table A-2
	Basis – RP-2014 Healthy Annuitant Mortality Table for respective genders with 110% of MP-2014 Ultimate Projection Scale	
	<u>Class of Members</u>	<u>Adjustment</u>
	General – males	105% of rates
	General – females	100% of rates
	Safety – males	95% of rates
	Safety – females	100% of rates
F.	Mortality among disabled members	Table A-3
	Basis – Average of RP-2014 Healthy Annuitant and Disabled Mortality Tables for respective genders, with 110% of MP-2014 Ultimate Projection Scale:	
	General – males	105% of Healthy Rates
	General – females	100% of rates
	Basis – RP-2014 Healthy Mortality Table, for respective genders with 110% of MP-2014 Ultimate Projection Scale:	
	Safety – males	100% of rates
	Safety – females	100% of rates
G.	Mortality for beneficiaries.	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

Table A-2
Mortality for Members Retired for Service⁽¹⁾

Age	Safety Male	Safety Female	General Male	General Female
20	0.090%	0.041%	0.103%	0.041%
25	0.108%	0.044%	0.122%	0.044%
30	0.101%	0.055%	0.114%	0.055%
35	0.116%	0.072%	0.132%	0.072%
40	0.140%	0.100%	0.159%	0.100%
45	0.217%	0.165%	0.246%	0.165%
50	0.386%	0.277%	0.427%	0.277%
55	0.545%	0.362%	0.602%	0.362%
60	0.738%	0.519%	0.816%	0.519%
65	1.046%	0.805%	1.156%	0.805%
70	1.593%	1.287%	1.761%	1.287%
75	2.548%	2.094%	2.817%	2.094%
80	4.249%	3.484%	4.696%	3.484%
85	7.362%	6.050%	8.137%	6.050%
90	12.911%	10.713%	14.270%	10.713%

Annual Projected Mortality Improvement

Age	All Groups
65 & Less	1.100%
70	1.100%
75	1.100%
80	1.100%
85	1.100%
90	1.023%
95	0.935%
100	0.704%
105	0.473%
110	0.231%
115	0.000%

1. Mortality rates are those applicable for the fiscal year beginning in 2014. Annual projected improvements are assumed in the following years under the schedule shown. For example, the annual mortality rate for an 85-year old General male in fiscal year beginning in 2017 is 7.122% calculated as follows:

$$\begin{aligned}
 \text{Age 85 rate in 2017} &= \text{Age 85 rate in 2014 with 3 years improvement} \\
 &= 7.362\% \times (100.0\% - 1.1\%) \times (100.0\% - 1.1\%) \times (100.0\% - 1.1\%) \\
 &= 7.122\%
 \end{aligned}$$

Table A-3
Mortality for Members Retired for Disability⁽¹⁾

Age	Safety Male	Safety Female	General Male	General Female
20	0.098%	0.041%	0.407%	0.132%
25	0.117%	0.045%	0.485%	0.141%
30	0.109%	0.058%	0.453%	0.178%
35	0.126%	0.075%	0.524%	0.233%
40	0.151%	0.109%	0.629%	0.322%
45	0.234%	0.184%	0.975%	0.535%
50	0.406%	0.277%	1.233%	0.734%
55	0.573%	0.362%	1.470%	0.905%
60	0.777%	0.519%	1.738%	1.109%
65	1.101%	0.805%	2.162%	1.445%
70	1.677%	1.287%	2.898%	2.054%
75	2.683%	2.094%	4.123%	3.099%
80	4.472%	3.484%	6.179%	4.794%
85	7.750%	6.050%	9.734%	7.546%
90	13.591%	10.713%	15.785%	11.989%

1. Mortality rates are those applicable the year fiscal year beginning in 2014. 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	Safety	General
0	100%	100%
1	100%	100%
2	100%	100%
3	100%	100%
4	100%	100%
5	35%	35%
6	35%	35%
7	35%	35%
8	33%	34%
9	31%	34%
10	29%	33%
11	27%	33%
12	25%	32%
13	22%	31%
14	19%	30%
15	16%	30%
16	13%	29%
17	10%	28%
18	6%	25%
19	2%	23%
20	0%	20%
21	0%	18%
22	0%	15%
23	0%	12%
24	0%	9%
25	0%	6%
26	0%	3%
27	0%	0%
28	0%	0%
29	0%	0%
30 & Up	0%	0%

Table A-5
Annual Increase in Salary⁽¹⁾

Years of Service	General	Safety
<1	6.00%	8.00%
1	5.25%	7.00%
2	4.50%	6.00%
3	3.75%	4.00%
4	3.00%	3.00%
5	2.50%	2.50%
6	2.00%	2.00%
7	1.75%	1.75%
8	1.50%	1.50%
9	1.30%	1.30%
10	1.15%	1.15%
11	1.00%	1.00%
12	0.85%	0.85%
13	0.70%	0.70%
14	0.60%	0.60%
15	0.50%	0.50%
16	0.40%	0.50%
17	0.35%	0.50%
18	0.30%	0.50%
19	0.25%	0.50%
20 or More	0.25%	0.50%

1. *The total expected increase in salary includes both merit (shown above) and the general wage increase assumption of 3.00% or 3.25% per annum 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 9.18% if the general wage increase is 3.00%.*

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

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

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

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

Each table represents the detailed rates needed for each LACERA plan by gender:

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

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

Age	Service Retirement	Other Terminations	Service Disability	Ordinary Disability	Service Death	Ordinary Death
18	0.0000	0.0050	0.0002	0.0001	N/A	0.0003
19	0.0000	0.0050	0.0002	0.0001	N/A	0.0003
20	0.0000	0.0050	0.0002	0.0001	N/A	0.0003
21	0.0000	0.0050	0.0002	0.0001	N/A	0.0004
22	0.0000	0.0050	0.0002	0.0001	N/A	0.0004
23	0.0000	0.0050	0.0002	0.0001	N/A	0.0004
24	0.0000	0.0050	0.0002	0.0001	N/A	0.0005
25	0.0000	0.0050	0.0002	0.0001	N/A	0.0005
26	0.0000	0.0050	0.0002	0.0001	N/A	0.0005
27	0.0000	0.0050	0.0002	0.0001	N/A	0.0005
28	0.0000	0.0050	0.0002	0.0001	N/A	0.0005
29	0.0000	0.0050	0.0002	0.0001	N/A	0.0004
30	0.0000	0.0050	0.0002	0.0001	N/A	0.0004
31	0.0000	0.0050	0.0002	0.0001	N/A	0.0004
32	0.0000	0.0050	0.0002	0.0001	N/A	0.0005
33	0.0000	0.0050	0.0002	0.0001	N/A	0.0005
34	0.0000	0.0050	0.0003	0.0001	N/A	0.0005
35	0.0000	0.0050	0.0003	0.0001	N/A	0.0005
36	0.0000	0.0050	0.0004	0.0001	N/A	0.0005
37	0.0000	0.0050	0.0004	0.0001	N/A	0.0005
38	0.0000	0.0050	0.0005	0.0001	N/A	0.0005
39	0.0000	0.0050	0.0006	0.0001	N/A	0.0006
40	0.0300	0.0050	0.0006	0.0002	N/A	0.0006
41	0.0300	0.0050	0.0007	0.0002	N/A	0.0006
42	0.0300	0.0050	0.0008	0.0002	N/A	0.0006
43	0.0300	0.0050	0.0008	0.0003	N/A	0.0007
44	0.0300	0.0050	0.0009	0.0003	N/A	0.0007
45	0.0300	0.0050	0.0009	0.0003	N/A	0.0008
46	0.0300	0.0050	0.0010	0.0004	N/A	0.0009
47	0.0300	0.0050	0.0010	0.0004	N/A	0.0010
48	0.0300	0.0050	0.0010	0.0004	N/A	0.0011
49	0.0300	0.0050	0.0011	0.0004	N/A	0.0012
50	0.0300	0.0050	0.0011	0.0004	N/A	0.0014
51	0.0300	0.0050	0.0012	0.0004	N/A	0.0015
52	0.0300	0.0050	0.0012	0.0004	N/A	0.0017
53	0.0300	0.0050	0.0016	0.0005	N/A	0.0019
54	0.0600	0.0050	0.0019	0.0006	N/A	0.0021
55	0.1000	0.0050	0.0023	0.0006	N/A	0.0023
56	0.1200	0.0050	0.0026	0.0007	N/A	0.0025
57	0.1700	0.0050	0.0030	0.0008	N/A	0.0028
58	0.2200	0.0050	0.0035	0.0009	N/A	0.0031
59	0.2400	0.0050	0.0040	0.0010	N/A	0.0034
60	0.2600	0.0050	0.0045	0.0010	N/A	0.0038
61	0.3100	0.0050	0.0050	0.0011	N/A	0.0042
62	0.3500	0.0050	0.0055	0.0012	N/A	0.0047
63	0.2800	0.0050	0.0053	0.0014	N/A	0.0052
64	0.2800	0.0050	0.0051	0.0015	N/A	0.0059
65	0.2800	0.0050	0.0049	0.0017	N/A	0.0066
66	0.2800	0.0050	0.0047	0.0018	N/A	0.0074
67	0.2800	0.0050	0.0045	0.0020	N/A	0.0083
68	0.2800	0.0050	0.0045	0.0022	N/A	0.0092
69	0.2800	0.0050	0.0045	0.0023	N/A	0.0102
70	0.2800	0.0050	0.0045	0.0025	N/A	0.0113
71	0.2800	0.0050	0.0045	0.0026	N/A	0.0125
72	0.2800	0.0050	0.0045	0.0028	N/A	0.0139
73	0.2800	0.0050	0.0045	0.0030	N/A	0.0154
74	0.2800	0.0050	0.0045	0.0031	N/A	0.0170
75	1.0000	0.0000	0.0000	0.0000	N/A	0.0189

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.

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

Age	Service Retirement	Other Terminations	Service Disability	Ordinary Disability	Service Death	Ordinary Death
18	0.0000	0.0050	0.0002	0.0001	N/A	0.0002
19	0.0000	0.0050	0.0002	0.0001	N/A	0.0002
20	0.0000	0.0050	0.0002	0.0001	N/A	0.0002
21	0.0000	0.0050	0.0002	0.0001	N/A	0.0002
22	0.0000	0.0050	0.0002	0.0001	N/A	0.0002
23	0.0000	0.0050	0.0002	0.0001	N/A	0.0002
24	0.0000	0.0050	0.0002	0.0001	N/A	0.0002
25	0.0000	0.0050	0.0002	0.0001	N/A	0.0002
26	0.0000	0.0050	0.0002	0.0001	N/A	0.0002
27	0.0000	0.0050	0.0002	0.0001	N/A	0.0002
28	0.0000	0.0050	0.0002	0.0001	N/A	0.0002
29	0.0000	0.0050	0.0002	0.0001	N/A	0.0002
30	0.0000	0.0050	0.0002	0.0001	N/A	0.0002
31	0.0000	0.0050	0.0002	0.0001	N/A	0.0002
32	0.0000	0.0050	0.0002	0.0001	N/A	0.0002
33	0.0000	0.0050	0.0002	0.0001	N/A	0.0003
34	0.0000	0.0050	0.0003	0.0001	N/A	0.0003
35	0.0000	0.0050	0.0003	0.0001	N/A	0.0003
36	0.0000	0.0050	0.0004	0.0001	N/A	0.0003
37	0.0000	0.0050	0.0004	0.0001	N/A	0.0003
38	0.0000	0.0050	0.0004	0.0001	N/A	0.0003
39	0.0000	0.0050	0.0004	0.0001	N/A	0.0004
40	0.0300	0.0050	0.0005	0.0002	N/A	0.0004
41	0.0300	0.0050	0.0005	0.0002	N/A	0.0004
42	0.0300	0.0050	0.0005	0.0002	N/A	0.0005
43	0.0300	0.0050	0.0006	0.0003	N/A	0.0005
44	0.0300	0.0050	0.0007	0.0003	N/A	0.0006
45	0.0300	0.0050	0.0008	0.0003	N/A	0.0007
46	0.0300	0.0050	0.0009	0.0004	N/A	0.0007
47	0.0300	0.0050	0.0010	0.0004	N/A	0.0008
48	0.0300	0.0050	0.0011	0.0004	N/A	0.0009
49	0.0300	0.0050	0.0012	0.0004	N/A	0.0010
50	0.0300	0.0050	0.0013	0.0004	N/A	0.0011
51	0.0300	0.0050	0.0014	0.0004	N/A	0.0012
52	0.0300	0.0050	0.0015	0.0004	N/A	0.0013
53	0.0300	0.0050	0.0016	0.0005	N/A	0.0014
54	0.0600	0.0050	0.0016	0.0006	N/A	0.0015
55	0.1000	0.0050	0.0017	0.0006	N/A	0.0017
56	0.1200	0.0050	0.0017	0.0007	N/A	0.0018
57	0.1700	0.0050	0.0018	0.0008	N/A	0.0019
58	0.2200	0.0050	0.0020	0.0009	N/A	0.0021
59	0.2400	0.0050	0.0023	0.0010	N/A	0.0023
60	0.2600	0.0050	0.0025	0.0010	N/A	0.0024
61	0.3100	0.0050	0.0028	0.0011	N/A	0.0026
62	0.3500	0.0050	0.0030	0.0012	N/A	0.0029
63	0.2800	0.0050	0.0030	0.0014	N/A	0.0031
64	0.2800	0.0050	0.0030	0.0015	N/A	0.0034
65	0.2800	0.0050	0.0030	0.0017	N/A	0.0037
66	0.2800	0.0050	0.0030	0.0018	N/A	0.0041
67	0.2800	0.0050	0.0030	0.0020	N/A	0.0046
68	0.2800	0.0050	0.0030	0.0022	N/A	0.0051
69	0.2800	0.0050	0.0030	0.0023	N/A	0.0057
70	0.2800	0.0050	0.0030	0.0025	N/A	0.0063
71	0.2800	0.0050	0.0030	0.0026	N/A	0.0070
72	0.2800	0.0050	0.0030	0.0028	N/A	0.0078
73	0.2800	0.0050	0.0030	0.0030	N/A	0.0087
74	0.2800	0.0050	0.0030	0.0031	N/A	0.0097
75	1.0000	0.0000	0.0000	0.0000	N/A	0.0108

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

Age	Service Retirement	Service Disability	Ordinary Disability	Service Death	Ordinary Death	Years of Service	Other Terminations
18	0.0000	0.0002	0.0001	N/A	0.0003	0	0.0800
19	0.0000	0.0002	0.0001	N/A	0.0003	1	0.0550
20	0.0000	0.0002	0.0001	N/A	0.0003	2	0.0375
21	0.0000	0.0002	0.0001	N/A	0.0004	3	0.0300
22	0.0000	0.0002	0.0001	N/A	0.0004	4	0.0250
23	0.0000	0.0002	0.0001	N/A	0.0004	5	0.0233
24	0.0000	0.0002	0.0001	N/A	0.0005	6	0.0217
25	0.0000	0.0002	0.0001	N/A	0.0005	7	0.0200
26	0.0000	0.0002	0.0001	N/A	0.0005	8	0.0190
27	0.0000	0.0002	0.0001	N/A	0.0005	9	0.0180
28	0.0000	0.0002	0.0001	N/A	0.0005	10	0.0170
29	0.0000	0.0002	0.0001	N/A	0.0004	11	0.0160
30	0.0000	0.0002	0.0001	N/A	0.0004	12	0.0150
31	0.0000	0.0002	0.0001	N/A	0.0004	13	0.0140
32	0.0000	0.0002	0.0001	N/A	0.0005	14	0.0130
33	0.0000	0.0002	0.0001	N/A	0.0005	15	0.0120
34	0.0000	0.0003	0.0001	N/A	0.0005	16	0.0110
35	0.0000	0.0003	0.0001	N/A	0.0005	17	0.0100
36	0.0000	0.0004	0.0001	N/A	0.0005	18	0.0092
37	0.0000	0.0004	0.0001	N/A	0.0005	19	0.0084
38	0.0000	0.0005	0.0001	N/A	0.0005	20	0.0076
39	0.0000	0.0006	0.0001	N/A	0.0006	21	0.0068
40	0.0150	0.0006	0.0002	N/A	0.0006	22	0.0060
41	0.0150	0.0007	0.0002	N/A	0.0006	23	0.0056
42	0.0150	0.0008	0.0002	N/A	0.0006	24	0.0052
43	0.0150	0.0008	0.0003	N/A	0.0007	25	0.0048
44	0.0150	0.0009	0.0003	N/A	0.0007	26	0.0044
45	0.0150	0.0009	0.0003	N/A	0.0008	27	0.0040
46	0.0150	0.0010	0.0004	N/A	0.0009	28	0.0040
47	0.0150	0.0010	0.0004	N/A	0.0010	29	0.0040
48	0.0150	0.0010	0.0004	N/A	0.0011	30 & Above	0.0000
49	0.0150	0.0011	0.0004	N/A	0.0012		
50	0.0150	0.0011	0.0004	N/A	0.0014		
51	0.0120	0.0012	0.0004	N/A	0.0015		
52	0.0120	0.0012	0.0004	N/A	0.0017		
53	0.0150	0.0016	0.0005	N/A	0.0019		
54	0.0200	0.0019	0.0006	N/A	0.0021		
55	0.0250	0.0023	0.0006	N/A	0.0023		
56	0.0250	0.0026	0.0007	N/A	0.0025		
57	0.0300	0.0030	0.0008	N/A	0.0028		
58	0.0350	0.0035	0.0009	N/A	0.0031		
59	0.0500	0.0040	0.0010	N/A	0.0034		
60	0.0600	0.0045	0.0010	N/A	0.0038		
61	0.0800	0.0050	0.0011	N/A	0.0042		
62	0.1000	0.0055	0.0012	N/A	0.0047		
63	0.0900	0.0053	0.0014	N/A	0.0052		
64	0.1500	0.0051	0.0015	N/A	0.0059		
65	0.2000	0.0049	0.0017	N/A	0.0066		
66	0.2000	0.0047	0.0018	N/A	0.0074		
67	0.1800	0.0045	0.0020	N/A	0.0083		
68	0.1800	0.0045	0.0022	N/A	0.0092		
69	0.1800	0.0045	0.0023	N/A	0.0102		
70	0.2000	0.0045	0.0025	N/A	0.0113		
71	0.2000	0.0045	0.0026	N/A	0.0125		
72	0.2000	0.0045	0.0028	N/A	0.0139		
73	0.2000	0.0045	0.0030	N/A	0.0154		
74	0.2000	0.0045	0.0031	N/A	0.0170		
75	1.0000	0.0000	0.0000	N/A	0.0189		

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

Age	Service Retirement	Service Disability	Ordinary Disability	Service Death	Ordinary Death	Years of Service	Other Terminations
18	0.0000	0.0002	0.0001	N/A	0.0002	0	0.0800
19	0.0000	0.0002	0.0001	N/A	0.0002	1	0.0550
20	0.0000	0.0002	0.0001	N/A	0.0002	2	0.0375
21	0.0000	0.0002	0.0001	N/A	0.0002	3	0.0300
22	0.0000	0.0002	0.0001	N/A	0.0002	4	0.0250
23	0.0000	0.0002	0.0001	N/A	0.0002	5	0.0233
24	0.0000	0.0002	0.0001	N/A	0.0002	6	0.0217
25	0.0000	0.0002	0.0001	N/A	0.0002	7	0.0200
26	0.0000	0.0002	0.0001	N/A	0.0002	8	0.0190
27	0.0000	0.0002	0.0001	N/A	0.0002	9	0.0180
28	0.0000	0.0002	0.0001	N/A	0.0002	10	0.0170
29	0.0000	0.0002	0.0001	N/A	0.0002	11	0.0160
30	0.0000	0.0002	0.0001	N/A	0.0002	12	0.0150
31	0.0000	0.0002	0.0001	N/A	0.0002	13	0.0140
32	0.0000	0.0002	0.0001	N/A	0.0002	14	0.0130
33	0.0000	0.0002	0.0001	N/A	0.0003	15	0.0120
34	0.0000	0.0003	0.0001	N/A	0.0003	16	0.0110
35	0.0000	0.0003	0.0001	N/A	0.0003	17	0.0100
36	0.0000	0.0004	0.0001	N/A	0.0003	18	0.0092
37	0.0000	0.0004	0.0001	N/A	0.0003	19	0.0084
38	0.0000	0.0004	0.0001	N/A	0.0003	20	0.0076
39	0.0000	0.0004	0.0001	N/A	0.0004	21	0.0068
40	0.0150	0.0005	0.0002	N/A	0.0004	22	0.0060
41	0.0150	0.0005	0.0002	N/A	0.0004	23	0.0056
42	0.0150	0.0005	0.0002	N/A	0.0005	24	0.0052
43	0.0150	0.0006	0.0003	N/A	0.0005	25	0.0048
44	0.0150	0.0007	0.0003	N/A	0.0006	26	0.0044
45	0.0150	0.0008	0.0003	N/A	0.0007	27	0.0040
46	0.0150	0.0009	0.0004	N/A	0.0007	28	0.0040
47	0.0150	0.0010	0.0004	N/A	0.0008	29	0.0040
48	0.0150	0.0011	0.0004	N/A	0.0009	30 & Above	0.0000
49	0.0150	0.0012	0.0004	N/A	0.0010		
50	0.0150	0.0013	0.0004	N/A	0.0011		
51	0.0120	0.0014	0.0004	N/A	0.0012		
52	0.0120	0.0015	0.0004	N/A	0.0013		
53	0.0150	0.0016	0.0005	N/A	0.0014		
54	0.0200	0.0016	0.0006	N/A	0.0015		
55	0.0250	0.0017	0.0006	N/A	0.0017		
56	0.0250	0.0017	0.0007	N/A	0.0018		
57	0.0300	0.0018	0.0008	N/A	0.0019		
58	0.0350	0.0020	0.0009	N/A	0.0021		
59	0.0500	0.0023	0.0010	N/A	0.0023		
60	0.0600	0.0025	0.0010	N/A	0.0024		
61	0.0800	0.0028	0.0011	N/A	0.0026		
62	0.1000	0.0030	0.0012	N/A	0.0029		
63	0.0900	0.0030	0.0014	N/A	0.0031		
64	0.1500	0.0030	0.0015	N/A	0.0034		
65	0.2000	0.0030	0.0017	N/A	0.0037		
66	0.2000	0.0030	0.0018	N/A	0.0041		
67	0.1800	0.0030	0.0020	N/A	0.0046		
68	0.1800	0.0030	0.0022	N/A	0.0051		
69	0.1800	0.0030	0.0023	N/A	0.0057		
70	0.2000	0.0030	0.0025	N/A	0.0063		
71	0.2000	0.0030	0.0026	N/A	0.0070		
72	0.2000	0.0030	0.0028	N/A	0.0078		
73	0.2000	0.0030	0.0030	N/A	0.0087		
74	0.2000	0.0030	0.0031	N/A	0.0097		
75	1.0000	0.0000	0.0000	N/A	0.0108		

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

Age	Service Retirement	Service Disability	Ordinary Disability	Service Death	Ordinary Death	Years of Service	Other Terminations
18	0.0000	N/A	N/A	N/A	0.0003	0	0.1500
19	0.0000	N/A	N/A	N/A	0.0003	1	0.0800
20	0.0000	N/A	N/A	N/A	0.0003	2	0.0600
21	0.0000	N/A	N/A	N/A	0.0004	3	0.0450
22	0.0000	N/A	N/A	N/A	0.0004	4	0.0350
23	0.0000	N/A	N/A	N/A	0.0004	5	0.0310
24	0.0000	N/A	N/A	N/A	0.0005	6	0.0270
25	0.0000	N/A	N/A	N/A	0.0005	7	0.0230
26	0.0000	N/A	N/A	N/A	0.0005	8	0.0220
27	0.0000	N/A	N/A	N/A	0.0005	9	0.0210
28	0.0000	N/A	N/A	N/A	0.0005	10	0.0200
29	0.0000	N/A	N/A	N/A	0.0004	11	0.0190
30	0.0000	N/A	N/A	N/A	0.0004	12	0.0180
31	0.0000	N/A	N/A	N/A	0.0004	13	0.0168
32	0.0000	N/A	N/A	N/A	0.0005	14	0.0156
33	0.0000	N/A	N/A	N/A	0.0005	15	0.0144
34	0.0000	N/A	N/A	N/A	0.0005	16	0.0132
35	0.0000	N/A	N/A	N/A	0.0005	17	0.0120
36	0.0000	N/A	N/A	N/A	0.0005	18	0.0116
37	0.0000	N/A	N/A	N/A	0.0005	19	0.0112
38	0.0000	N/A	N/A	N/A	0.0005	20	0.0108
39	0.0000	N/A	N/A	N/A	0.0006	21	0.0104
40	0.0000	N/A	N/A	N/A	0.0006	22	0.0100
41	0.0000	N/A	N/A	N/A	0.0006	23	0.0100
42	0.0000	N/A	N/A	N/A	0.0006	24	0.0100
43	0.0000	N/A	N/A	N/A	0.0007	25	0.0100
44	0.0000	N/A	N/A	N/A	0.0007	26	0.0100
45	0.0000	N/A	N/A	N/A	0.0008	27	0.0100
46	0.0000	N/A	N/A	N/A	0.0009	28	0.0100
47	0.0000	N/A	N/A	N/A	0.0010	29	0.0100
48	0.0000	N/A	N/A	N/A	0.0011	30 & Above	0.0100
49	0.0000	N/A	N/A	N/A	0.0012		
50	0.0000	N/A	N/A	N/A	0.0014		
51	0.0000	N/A	N/A	N/A	0.0015		
52	0.0000	N/A	N/A	N/A	0.0017		
53	0.0000	N/A	N/A	N/A	0.0019		
54	0.0000	N/A	N/A	N/A	0.0021		
55	0.0200	N/A	N/A	N/A	0.0023		
56	0.0200	N/A	N/A	N/A	0.0025		
57	0.0200	N/A	N/A	N/A	0.0028		
58	0.0200	N/A	N/A	N/A	0.0031		
59	0.0300	N/A	N/A	N/A	0.0034		
60	0.0400	N/A	N/A	N/A	0.0038		
61	0.0600	N/A	N/A	N/A	0.0042		
62	0.0900	N/A	N/A	N/A	0.0047		
63	0.0900	N/A	N/A	N/A	0.0052		
64	0.2000	N/A	N/A	N/A	0.0059		
65	0.2500	N/A	N/A	N/A	0.0066		
66	0.1800	N/A	N/A	N/A	0.0074		
67	0.1800	N/A	N/A	N/A	0.0083		
68	0.1800	N/A	N/A	N/A	0.0092		
69	0.1800	N/A	N/A	N/A	0.0102		
70	0.2000	N/A	N/A	N/A	0.0113		
71	0.2000	N/A	N/A	N/A	0.0125		
72	0.2000	N/A	N/A	N/A	0.0139		
73	0.2000	N/A	N/A	N/A	0.0154		
74	0.2000	N/A	N/A	N/A	0.0170		
75	1.0000	N/A	N/A	N/A	0.0189		

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

Age	Service Retirement	Service Disability	Ordinary Disability	Service Death	Ordinary Death	Years of Service	Other Terminations
18	0.0000	N/A	N/A	N/A	0.0002	0	0.1500
19	0.0000	N/A	N/A	N/A	0.0002	1	0.0800
20	0.0000	N/A	N/A	N/A	0.0002	2	0.0600
21	0.0000	N/A	N/A	N/A	0.0002	3	0.0450
22	0.0000	N/A	N/A	N/A	0.0002	4	0.0350
23	0.0000	N/A	N/A	N/A	0.0002	5	0.0310
24	0.0000	N/A	N/A	N/A	0.0002	6	0.0270
25	0.0000	N/A	N/A	N/A	0.0002	7	0.0230
26	0.0000	N/A	N/A	N/A	0.0002	8	0.0220
27	0.0000	N/A	N/A	N/A	0.0002	9	0.0210
28	0.0000	N/A	N/A	N/A	0.0002	10	0.0200
29	0.0000	N/A	N/A	N/A	0.0002	11	0.0190
30	0.0000	N/A	N/A	N/A	0.0002	12	0.0180
31	0.0000	N/A	N/A	N/A	0.0002	13	0.0168
32	0.0000	N/A	N/A	N/A	0.0002	14	0.0156
33	0.0000	N/A	N/A	N/A	0.0003	15	0.0144
34	0.0000	N/A	N/A	N/A	0.0003	16	0.0132
35	0.0000	N/A	N/A	N/A	0.0003	17	0.0120
36	0.0000	N/A	N/A	N/A	0.0003	18	0.0116
37	0.0000	N/A	N/A	N/A	0.0003	19	0.0112
38	0.0000	N/A	N/A	N/A	0.0003	20	0.0108
39	0.0000	N/A	N/A	N/A	0.0004	21	0.0104
40	0.0000	N/A	N/A	N/A	0.0004	22	0.0100
41	0.0000	N/A	N/A	N/A	0.0004	23	0.0100
42	0.0000	N/A	N/A	N/A	0.0005	24	0.0100
43	0.0000	N/A	N/A	N/A	0.0005	25	0.0100
44	0.0000	N/A	N/A	N/A	0.0006	26	0.0100
45	0.0000	N/A	N/A	N/A	0.0007	27	0.0100
46	0.0000	N/A	N/A	N/A	0.0007	28	0.0100
47	0.0000	N/A	N/A	N/A	0.0008	29	0.0100
48	0.0000	N/A	N/A	N/A	0.0009	30 & Above	0.0100
49	0.0000	N/A	N/A	N/A	0.0010		
50	0.0000	N/A	N/A	N/A	0.0011		
51	0.0000	N/A	N/A	N/A	0.0012		
52	0.0000	N/A	N/A	N/A	0.0013		
53	0.0000	N/A	N/A	N/A	0.0014		
54	0.0000	N/A	N/A	N/A	0.0015		
55	0.0200	N/A	N/A	N/A	0.0017		
56	0.0200	N/A	N/A	N/A	0.0018		
57	0.0200	N/A	N/A	N/A	0.0019		
58	0.0200	N/A	N/A	N/A	0.0021		
59	0.0300	N/A	N/A	N/A	0.0023		
60	0.0400	N/A	N/A	N/A	0.0024		
61	0.0600	N/A	N/A	N/A	0.0026		
62	0.0900	N/A	N/A	N/A	0.0029		
63	0.0900	N/A	N/A	N/A	0.0031		
64	0.2000	N/A	N/A	N/A	0.0034		
65	0.2500	N/A	N/A	N/A	0.0037		
66	0.1800	N/A	N/A	N/A	0.0041		
67	0.1800	N/A	N/A	N/A	0.0046		
68	0.1800	N/A	N/A	N/A	0.0051		
69	0.1800	N/A	N/A	N/A	0.0057		
70	0.2000	N/A	N/A	N/A	0.0063		
71	0.2000	N/A	N/A	N/A	0.0070		
72	0.2000	N/A	N/A	N/A	0.0078		
73	0.2000	N/A	N/A	N/A	0.0087		
74	0.2000	N/A	N/A	N/A	0.0097		
75	1.0000	N/A	N/A	N/A	0.0108		

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

Age	Service Retirement	Service Disability	Ordinary Disability	Service Death	Ordinary Death	Years of Service	Other Terminations
18	0.0000	0.0020	0.0000	0.0001	0.0002	0	0.0300
19	0.0000	0.0020	0.0000	0.0001	0.0002	1	0.0250
20	0.0000	0.0020	0.0000	0.0001	0.0002	2	0.0200
21	0.0000	0.0020	0.0000	0.0001	0.0002	3	0.0150
22	0.0000	0.0020	0.0000	0.0001	0.0003	4	0.0120
23	0.0000	0.0020	0.0000	0.0001	0.0003	5	0.0113
24	0.0000	0.0020	0.0000	0.0001	0.0003	6	0.0107
25	0.0000	0.0020	0.0000	0.0001	0.0004	7	0.0100
26	0.0000	0.0020	0.0000	0.0001	0.0004	8	0.0092
27	0.0000	0.0020	0.0000	0.0001	0.0004	9	0.0084
28	0.0000	0.0020	0.0000	0.0001	0.0005	10	0.0076
29	0.0000	0.0020	0.0000	0.0001	0.0005	11	0.0068
30	0.0000	0.0020	0.0000	0.0001	0.0005	12	0.0060
31	0.0000	0.0020	0.0000	0.0001	0.0005	13	0.0054
32	0.0000	0.0020	0.0000	0.0001	0.0005	14	0.0048
33	0.0000	0.0021	0.0000	0.0001	0.0004	15	0.0042
34	0.0000	0.0022	0.0000	0.0001	0.0004	16	0.0036
35	0.0000	0.0023	0.0000	0.0001	0.0004	17	0.0030
36	0.0000	0.0024	0.0000	0.0001	0.0005	18	0.0024
37	0.0000	0.0025	0.0000	0.0001	0.0005	19	0.0018
38	0.0000	0.0026	0.0000	0.0001	0.0005	20 & Above	0.0000
39	0.0000	0.0027	0.0000	0.0001	0.0005		
40	0.0100	0.0028	0.0000	0.0001	0.0005		
41	0.0100	0.0029	0.0000	0.0001	0.0005		
42	0.0100	0.0030	0.0000	0.0001	0.0005		
43	0.0100	0.0031	0.0000	0.0001	0.0006		
44	0.0100	0.0032	0.0000	0.0001	0.0006		
45	0.0100	0.0033	0.0000	0.0001	0.0006		
46	0.0100	0.0034	0.0000	0.0001	0.0006		
47	0.0100	0.0035	0.0000	0.0001	0.0007		
48	0.0100	0.0040	0.0000	0.0001	0.0007		
49	0.0100	0.0050	0.0000	0.0001	0.0008		
50	0.0100	0.0100	0.0000	0.0001	0.0009		
51	0.0200	0.0120	0.0000	0.0001	0.0010		
52	0.0250	0.0140	0.0000	0.0001	0.0011		
53	0.0300	0.0300	0.0000	0.0001	0.0012		
54	0.1200	0.0500	0.0000	0.0001	0.0014		
55	0.2400	0.1200	0.0000	0.0001	0.0015		
56	0.1500	0.0900	0.0000	0.0001	0.0017		
57	0.1600	0.1000	0.0000	0.0001	0.0019		
58	0.1800	0.1000	0.0000	0.0001	0.0021		
59	0.2500	0.1000	0.0000	0.0001	0.0023		
60	0.3000	0.1000	0.0000	0.0001	0.0025		
61	0.3000	0.1000	0.0000	0.0001	0.0028		
62	0.3000	0.1000	0.0000	0.0001	0.0031		
63	0.3000	0.1000	0.0000	0.0001	0.0034		
64	0.3000	0.1000	0.0000	0.0001	0.0038		
65	1.0000	0.0000	0.0000	0.0000	0.0042		

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

Age	Service Retirement	Service Disability	Ordinary Disability	Service Death	Ordinary Death	Years of Service	Other Terminations
18	0.0000	0.0030	0.0000	0.0001	0.0002	0	0.0300
19	0.0000	0.0030	0.0000	0.0001	0.0002	1	0.0250
20	0.0000	0.0030	0.0000	0.0001	0.0002	2	0.0200
21	0.0000	0.0030	0.0000	0.0001	0.0002	3	0.0150
22	0.0000	0.0030	0.0000	0.0001	0.0002	4	0.0120
23	0.0000	0.0030	0.0000	0.0001	0.0002	5	0.0113
24	0.0000	0.0030	0.0000	0.0001	0.0002	6	0.0107
25	0.0000	0.0030	0.0000	0.0001	0.0002	7	0.0100
26	0.0000	0.0030	0.0000	0.0001	0.0002	8	0.0092
27	0.0000	0.0030	0.0000	0.0001	0.0002	9	0.0084
28	0.0000	0.0034	0.0000	0.0001	0.0002	10	0.0076
29	0.0000	0.0038	0.0000	0.0001	0.0002	11	0.0068
30	0.0000	0.0042	0.0000	0.0001	0.0002	12	0.0060
31	0.0000	0.0046	0.0000	0.0001	0.0002	13	0.0054
32	0.0000	0.0050	0.0000	0.0001	0.0002	14	0.0048
33	0.0000	0.0056	0.0000	0.0001	0.0003	15	0.0042
34	0.0000	0.0062	0.0000	0.0001	0.0003	16	0.0036
35	0.0000	0.0068	0.0000	0.0001	0.0003	17	0.0030
36	0.0000	0.0074	0.0000	0.0001	0.0003	18	0.0024
37	0.0000	0.0080	0.0000	0.0001	0.0003	19	0.0018
38	0.0000	0.0084	0.0000	0.0001	0.0003	20 & Above	0.0000
39	0.0000	0.0088	0.0000	0.0001	0.0004		
40	0.0100	0.0092	0.0000	0.0001	0.0004		
41	0.0100	0.0096	0.0000	0.0001	0.0004		
42	0.0100	0.0100	0.0000	0.0001	0.0005		
43	0.0100	0.0104	0.0000	0.0001	0.0005		
44	0.0100	0.0108	0.0000	0.0001	0.0006		
45	0.0100	0.0112	0.0000	0.0001	0.0007		
46	0.0100	0.0116	0.0000	0.0001	0.0007		
47	0.0100	0.0120	0.0000	0.0001	0.0008		
48	0.0100	0.0130	0.0000	0.0001	0.0009		
49	0.0100	0.0150	0.0000	0.0001	0.0010		
50	0.0100	0.0180	0.0000	0.0001	0.0011		
51	0.0200	0.0200	0.0000	0.0001	0.0012		
52	0.0250	0.0240	0.0000	0.0001	0.0013		
53	0.0300	0.0280	0.0000	0.0001	0.0014		
54	0.1200	0.0320	0.0000	0.0001	0.0015		
55	0.2400	0.1100	0.0000	0.0001	0.0017		
56	0.1500	0.0700	0.0000	0.0001	0.0018		
57	0.1600	0.0700	0.0000	0.0001	0.0019		
58	0.1800	0.0800	0.0000	0.0001	0.0021		
59	0.2500	0.0800	0.0000	0.0001	0.0023		
60	0.3000	0.0800	0.0000	0.0000	0.0024		
61	0.3000	0.0800	0.0000	0.0000	0.0026		
62	0.3000	0.0800	0.0000	0.0000	0.0029		
63	0.3000	0.0800	0.0000	0.0000	0.0031		
64	0.3000	0.0800	0.0000	0.0000	0.0034		
65	1.0000	0.0000	0.0000	0.0000	0.0037		