Alameda County Employees' Retirement Association
BOARD OF RETIREMENT

ACTUARIAL COMMITTEE/BOARD MEETING NOTICE and AGENDA

[THIS MEETING WILL BE CONDUCTED VIA TELECONFERENCE [SEE EXECUTIVE ORDER N-29-20 ATTACHED AT THE END OF THIS AGENDA.]

ACERA MISSION:

To provide ACERA members and employers with flexible, cost-effective, participant-oriented benefits through prudent investment management and superior member services.

Thursday, September 17, 2020
11:00 am

ZOOM INSTRUCTIONS	COMMITTEE MEMBERS	
The public can view the Teleconference and comment via audio during the meeting. To join this Teleconference, please click on the link below. https://zoom.us/join Webinar ID: 821 6600 7758 Passcode: 906714 For help joining a Zoom meeting, see:https://support.zoom.us/hc/en-us/articles/201362193	DALE AMARAL, CHAIR	ELECTED SAFETY
	ELIZABETH ROGERS, VICE CHAIR	ELECTED GENERAL
	OPHELIA BASGAL	APPOINTED
	HENRY LEVY	EX-OFFICIO
	LIZ KOPPENHAVER	ELECTED RETIRED

This is a meeting of the Actuarial Committee if a quorum of the Actuarial Committee attends and it is a meeting of the Board if a quorum of the Board attends. This is a joint meeting of the Actuarial Committee and the Board if a quorum of each attends..

The order of agenda items is subject to change without notice. Board and Committee agendas and minutes are available online at www.acera.org.

Note regarding public comments: Public comments are limited to four (4) minutes per person in total.

Note regarding accommodations: The Board of Retirement will provide reasonable accommodations for persons with special needs of accessibility who plan to attend Board meetings. Please contact ACERA at (510) 628-3000 to arrange for accommodation.

Any materials required by law to be made available to the public prior to a meeting of the Board of Retirement will be provided upon request.

Call to Order: 11:00 am

Roll Call:

Public Input

Action Items: Matters for Discussion and Possible Motion by the Committee
 None

Information Items: These items are not presented for Committee action but consist of status updates and cyclical reports

1. **Presentation of the ACERA 2017-2019 Triennial Experience.**
    Staff and Segal Consulting will report on the review of ACERA's actuarial experience for the last three actuarial valuations (2017-2019) and discuss the proposed actuarial assumptions to be used in future acturarial valuation years.

    - Margo Allen
    - Andy Yeung, Segal Consulting

Trustee Input

Future Discussion Items

Recommendation to adopt proposed actuarial assumptions for 2020 – 2022 acturarial valuation years, as proposed using the 2017 – 2019 Triennial Experience.

Establishment of Next Meeting Date

October 15, 2020 at 11:00 am

Adjournment

EXECUTIVE DEPARTMENT
STATE OF CALIFORNIA

EXECUTIVE ORDER N-29-20

WHEREAS on March 4, 2020, I proclaimed a State of Emergency to exist in California as a result of the threat of COVID-19; and

WHEREAS despite sustained efforts, the virus continues to spread and is impacting nearly all sectors of California; and

WHEREAS the threat of COVID-19 has resulted in serious and ongoing economic harms, in particular to some of the most vulnerable Californians; and

WHEREAS time bound eligibility redeterminations are required for Medi-Cal, CalFresh, CalWORKs, Cash Assistance Program for Immigrants, California Food Assistance Program, and In Home Supportive Services beneficiaries to continue their benefits, in accordance with processes established by the Department of Social Services, the Department of Health Care Services, and the Federal Government; and

WHEREAS social distancing recommendations or Orders as well as a statewide imperative for critical employees to focus on health needs may prevent Medi-Cal, CalFresh, CalWORKs, Cash Assistance Program for Immigrants, California Food Assistance Program, and In Home Supportive Services beneficiaries from obtaining in-person eligibility redeterminations; and

WHEREAS under the provisions of Government Code section 8571, I find that strict compliance with various statutes and regulations specified in this order would prevent, hinder, or delay appropriate actions to prevent and mitigate the effects of the COVID-19 pandemic.

NOW, THEREFORE, I, GAVIN NEWSOM, Governor of the State of California, in accordance with the authority vested in me by the State Constitution and statutes of the State of California, and in particular, Government Code sections 8567 and 8571, do hereby issue the following order to become effective immediately:

IT IS HEREBY ORDERED THAT:

1. As to individuals currently eligible for benefits under Medi-Cal, CalFresh, CalWORKs, the Cash Assistance Program for Immigrants, the California Food Assistance Program, or In Home Supportive Services benefits, and to the extent necessary to allow such individuals to maintain eligibility for such benefits, any state law, including but not limited to California Code of Regulations, Title 22, section 50189(a) and Welfare and Institutions Code sections 18940 and 11265, that would require redetermination of such benefits is suspended for a period of 90 days from the date of this Order. This Order shall be construed to be consistent with applicable federal laws, including but not limited to Code of Federal Regulations, Title 42, section 435.912, subdivision (e), as interpreted by the Centers for Medicare and Medicaid Services (in guidance issued on January 30, 2018) to permit the extension of

otherwise-applicable Medicaid time limits in emergency situations.

2. Through June 17, 2020, any month or partial month in which California Work Opportunity and Responsibility to Kids (CalWORKs) aid or services are received pursuant to Welfare and Institutions Code Section 11200 et seq. shall not be counted for purposes of the 48-month time limit set forth in Welfare an Institutions Code Section 11454. Any waiver of this time limit shall not be applied if it will exceed the federal time limits set forth in Code of Federal Regulations, Title 45, section 264.1.

3. Paragraph 11 of Executive Order N-25-20 (March 12, 2020) is withdrawn and superseded by the following text:

Notwithstanding any other provision of state or local law (including, but not limited to, the Bagley-Keene Act or the Brown Act), and subject to the notice and accessibility requirements set forth below, a local legislative body or state body is authorized to hold public meetings via teleconferencing and to make public meetings accessible telephonically or otherwise electronically to all members of the public seeking to observe and to address the local legislative body or state body. All requirements in both the Bagley-Keene Act and the Brown Act expressly or impliedly requiring the physical presence of members, the clerk or other personnel of the body, or of the public as a condition of participation in or quorum for a public meeting are hereby waived.

In particular, any otherwise-applicable requirements that

(i)   state and local bodies notice each teleconference location from which a member will be participating in a public meeting;

(ii)   each teleconference location be accessible to the public;

(iii)   members of the public may address the body at each teleconference conference location;

(iv)   state and local bodies post agendas at all teleconference locations;

(v)   at least one member of the state body be physically present at the location specified in the notice of the meeting; and

(vi)   during teleconference meetings, a least a quorum of the members of the local body participate from locations within the boundaries of the territory over which the local body exercises jurisdiction

are hereby suspended.

A local legislative body or state body that holds a meeting via teleconferencing and allows members of the public to observe and address the meeting telephonically or otherwise electronically, consistent with the notice and accessibility requirements set forth below, shall have satisfied any requirement that the body allow

members of the public to attend the meeting and offer public comment. Such a body need not make available any physical location from which members of the public may observe the meeting and offer public comment.

Accessibility Requirements: If a local legislative body or state body holds a meeting via teleconferencing and allows members of the public to observe and address the meeting telephonically or otherwise electronically, the body shall also:

(i)   Implement a procedure for receiving and swiftly resolving requests for reasonable modification or accommodation from individuals with disabilities, consistent with the Americans with Disabilities Act and resolving any doubt whatsoever in favor of accessibility; and

(ii)   Advertise that procedure each time notice is given of the means by which members of the public may observe the meeting and offer public comment, pursuant to subparagraph (ii) of the Notice Requirements below.

Notice Requirements: Except to the extent this Order expressly provides otherwise, each local legislative body and state body shall:

(i)   Give advance notice of the time of, and post the agenda for, each public meeting according to the timeframes otherwise prescribed by the Bagley-Keene Act or the Brown Act, and using the means otherwise prescribed by the Bagley-Keene Act or the Brown Act, as applicable; and

(ii)   In each instance in which notice of the time of the meeting is otherwise given or the agenda for the meeting is otherwise posted, also give notice of the means by which members of the public may observe the meeting and offer public comment. As to any instance in which there is a change in such means of public observation and comment, or any instance prior to the issuance of this Order in which the time of the meeting has been noticed or the agenda for the meeting has been posted without also including notice of such means, a body may satisfy this requirement by advertising such means using "the most rapid means of communication available at the time" within the meaning of Government Code, section 54954, subdivision (e); this shall include, but need not be limited to, posting such means on the body's Internet website.

All of the foregoing provisions concerning the conduct of public meetings shall apply only during the period in which state or local public health officials have imposed or recommended social distancing measures.

All state and local bodies are urged to use sound discretion and to make reasonable efforts to adhere as closely as reasonably possible to the provisions of the Bagley-Keene Act and the Brown Act, and other applicable local laws regulating the conduct of public meetings, in order to maximize transparency and provide the public access to their meetings.

IT IS FURTHER ORDERED that as soon as hereafter possible, this Order be filed in the Office of the Secretary of State and that widespread publicity and notice be given of this Order.

This Order is not intended to, and does not, create any rights or benefits, substantive or procedural, enforceable at law or in equity, against the State of California, its agencies, departments, entities, officers, employees, or any other person.

IN WITNESS WHEREOF I have hereunto set my hand and caused the Great Seal of the State of California to be affixed this 17th day of March 2020.
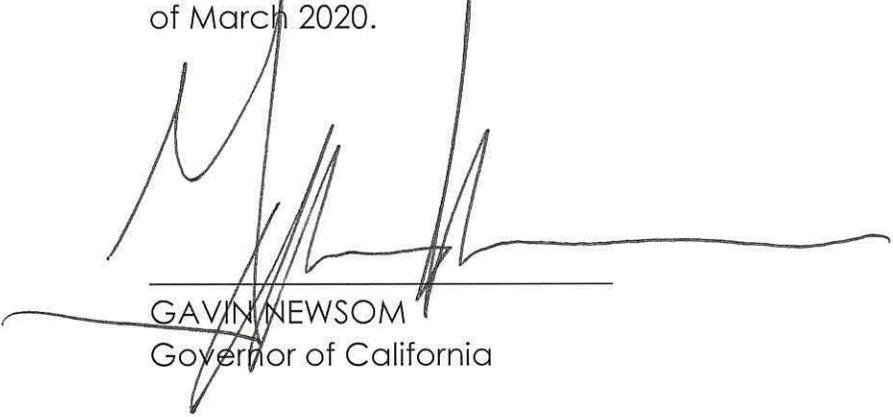
GAVIN NEWSOM
Governor of California

ATTEST:

ALEX PADILLA
Secretary of State

ACERA

MEMORANDUM TO THE ACTUARIAL COMMITTEE

DATE: September 17, 2020

TO: Members of the Actuarial Committee

FROM: Margo Allen, Fiscal Services Officer

SUBJECT: **Actuarial Experience Study (2017 -2019)**

Executive Summary

The Segal Group (Segal) has prepared ACERA's actuarial experience study for the period covering December 1, 2016[1] to November 30, 2019. The report contains proposed economic and non-economic assumptions for use in conducting the December 31, 2020 through December 31, 2022, annual actuarial valuations. Recommendations for the major actuarial assumption categories are outlined below in a chart for your quick review and on pages 6-9 in the report. Segal recommends changes to the following major actuarial assumption categories:

Economic Assumption Compendium	(See p. 6 of experience study for more detail)
Category	**Abridged Recommendation**
a) Inflation Assumption	a) Reduce from 3.00% to 2.75% per annum
b) Investment Return Assumption	b) Reduce from 7.25% to 7.00% per annum
c) Salary Increase Assumption	c) Reduce in aggregate from 3.50% to 3.25%

Demographic Assumption Compendium	(See pp. 7- 9 of experience study for more detail)
Category	**Abridged Recommendation**
Retirement Rates	Separate set of age-based retirement assumptions
Other Retirement Related Assumptions: a) Percent married and spousal age differences for members not yet retired; b) Retirement age for deferred vested members; and c) Future reciprocal members and reciprocal salary increases.	a) Maintain the married at retirement and the spouse age difference assumptions; b) Maintain the General deferred vested retirement age assumption and lower the Safety member vested retirement age assumption; and c) Reduce the current proportion of future deferred vested members expected to be covered by a reciprocal system.
Mortality Rates	Recommendations vary depending on category of membership, Refer to pp. 8-9

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[1] For clarity, the December 1, 2016, date reflects the start of the 2017 actuarial year. The experience study covers calendar years 2017 to 2019.

Termination Rates	Change assumption using service and age to using service only.
Disability Incidence Rates	Increase the percentage of anticipated General member disabilities to be *service connected* from 60% to 65%, and maintain the *service connected* disability assumption at 100% for Safety members.
Sick Leave Conversion	Maintain the sick leave conversion assumption at 0.003 years of addition service credit at retirement of each year of employment for General members, and increase the assumption from 0.006 to 0.007 years for Safety members.

Summary

The final results of the study are provided in the accompanying actuarial report and will be further discussed by the actuaries. The information provided in the chart below is the estimated financial impact of the proposed assumption changes as if they were applied to the December 31, 2019, actuarial valuation.

Cost Impact of Recommended Assumptions		
Change in Costs	**Contribution Rate**	**Estimated Annual Dollars Amount in 000s**
Employer	2.46%	$27,447
Member	0.55%	6,128
Total	**3.01%**	**$33,575**
Of the 3.01% of cost impact, approximately 1.86% is due to the recommended changes in inflation and investment return. The remaining 1.15% is due to all the other recommended changes in assumptions.		
Impact on UAAL and Funded Percentage		
Increase in UAAL	$318 million	
Change in Funded Status	From 77.6% to 75.2%	

Alameda County Employees' Retirement Association

2020 Actuarial Experience Study
September 17, 2020

Andy Yeung, ASA / Eva Yum, FSA/ Paul Angelo, FSA

5659105v6

Selection of Actuarial Assumptions

- New assumptions will be used in December 31, 2020 valuation
  - Sets contributions for 2021 – 2022 fiscal year

- Actuarial assumptions – two kinds
  - Demographic — When benefits will be payable
  - Economic — How assets, and salaries and benefits increase

- Objective, long term

- Recent experience or future expectations
  - Demographic: recent experience
  - Economic: not necessarily!
  - Note: ongoing effect of COVID-19 is <u>beyond scope of this study</u>

- System specific or not
  - All assumptions are system specific except price inflation

- Consistency among assumptions

- Desired pattern of cost incidence
  - Good assumptions produce level costs
  - Beware "results based" assumptions!

Always Remember

C + I = B + E

Contributions + Investment Income

equals

Benefit Payments + Expenses

- Actuarial valuation determines the current or "measured" cost, not the ultimate cost

- Assumptions and funding methods affect only the timing of costs (unless benefits are affected!)

Demographic Assumptions

- Rates of "decrement"
  - Termination, mortality, disability, retirement
  - Termination
    - Withdrawal
    - Deferred vested
  - Mortality
    - Before and after retirement
    - Service retiree, disabled retiree, beneficiary

- Percent married

- Member/spouse age difference

- Reciprocity

- Unused sick leave

- Assumptions can be distinct for General and Safety
  - Also for different tiers

Recommendations – Demographic

- Retirement rates
  - Change in structure to use both age and service for Tier 2
  - For members with under 30 years of service
    - Later retirements for General and Safety members
  - For members with over 30 years of service
    - Earlier retirements for General and Safety members
  - Adjust retirement rates for CalPEPRA formulas consistent with adjustments for the legacy formulas

Retirement Rates – General Tier 2

Chart 4A: Retirement Rates
General Tier 2 Members with Less than 30 Years of Service
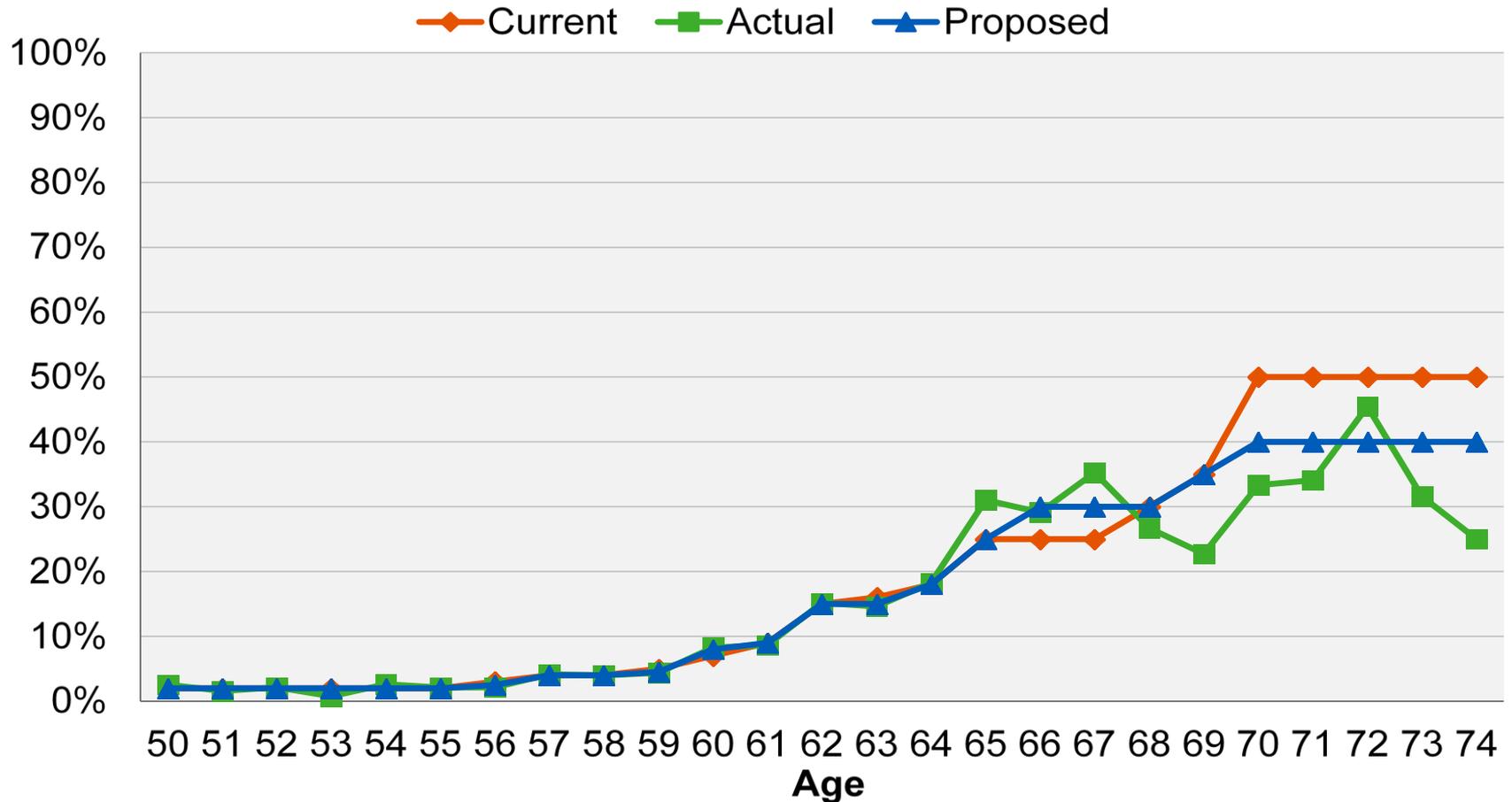
Retirement Rates – General Tier 2

Chart 4B: Retirement Rates
General Tier 2 Members with 30 or More Years of Service
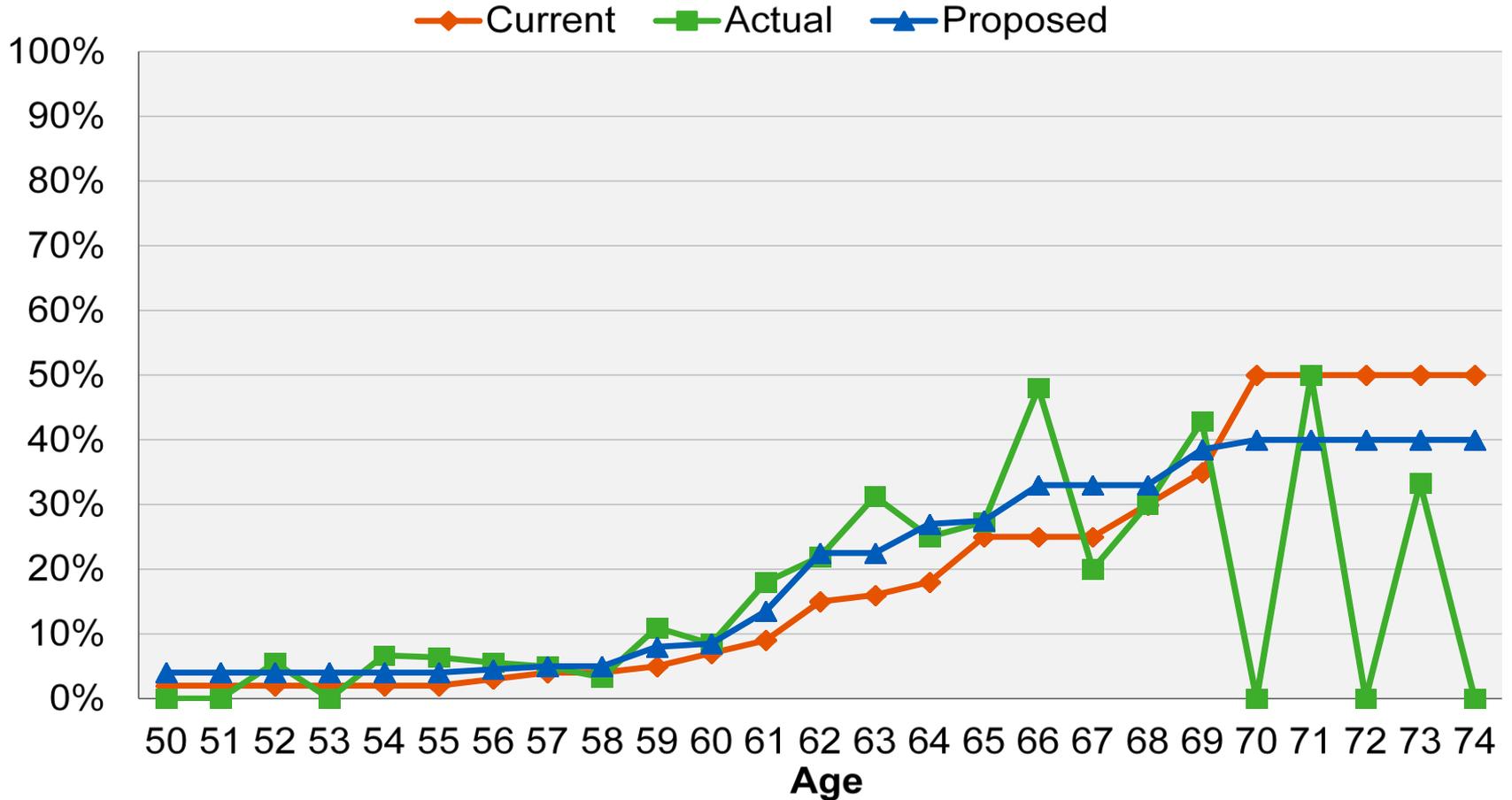
Recommendations – Demographic

- Termination rates:
  - Change in structure to use service only
  - Decrease assumption for proportion of members electing a refund

- Disability incidence:
  - Decrease assumption overall for General and increase assumption overall for Safety

Setting Actuarial Assumptions – Mortality Assumptions for ACERA

- Current mortality assumptions for ACERA members
  - Assumptions adopted with last experience study and used for 12/31/2017, 12/31/2018 and 12/31/2019 valuations
  - Generational projection of future mortality improvement
  - Separate <u>headcount</u> weighted mortality tables for General and Safety members
    - Both using <u>RP-2014</u> as base table
      - RP-2014 table developed using private sector mortality experience
    - Adjusted based on 6 years of ACERA mortality experience
      - General retirees expected to live about as long as base table
      - Safety retirees expected to live about as long as base table

- ACERA adopted generational improvement in 2017 study
  - Recommend continued use of generational improvement
  - ACERA current mortality improvement scale is MP-2016
  - Recommended mortality improvement scale is MP-2019
    - MP-2019 anticipates less future mortality improvement as compared to MP-2016

Setting ACERA Mortality Assumptions – Headcount weighted basis vs benefit weighted

- 2017 study noted upcoming change from headcount weighted basis to benefit weighted basis for pension (or non-OPEB) benefits
  - Headcount weighted looks at number of members who die or survive
    - Still appropriate for OPEB benefits paid by SRBR
  - Benefit weighted basis reflects how income affects mortality
    - Important because pension liability is greater for members with higher benefits
    - Consistent with recommendation made by ACERA's actuarial auditor in 2017
  - Switch to benefit weighted basis was deferred, pending new mortality tables based on public sector experience

- Pub-2010 tables published by the Retirement Plans Experience Committee (RPEC) of the Society of Actuaries (SOA) in 2019
  - Separate tables for
    - Job category (i.e., General, Safety and Teacher)
    - Pre and post retirement
    - Healthy annuitant, disabled annuitant and survivor
    - Three benefit weighted tables
      - Above-median benefit, total population, below-median benefit
      - ACERA benefits are above median

Segal

Setting ACERA Mortality Assumptions – Credibility of ACERA mortality experience

- Greater focus on "credibility" of ACERA specific data
  - About 1,000 deaths needed for <u>full</u> credibility for headcount-weighted mortality
    - Where full credibility means 90% confidence that the actual experience will be within 5% of the expected value
    - More than 1,000 deaths required under benefit weighted basis
      - Because dispersion of retirees' benefit amounts is taken into account
    - With full credibility, can adjust standard tables to match observed experience
      - Otherwise must weight observed experience and standard table
    - Can mean more stable assumptions (especially for smaller groups like Safety)

- Credibility of ACERA specific data
  - ACERA's mortality experience over a 9-year period is slightly more credible for General members and less credible for Safety members
    - <u>Partially</u> adjust the Pub-2010 mortality tables to fit ACERA's experience
    - Pub-2010 rates with no adjustment for General and Safety

Setting ACERA Mortality Assumptions – Mortality Assumptions Example

Chart 10: Post-Retirement Benefit-Weighted Deaths (In Millions)
Non-Disabled General Members (December 1, 2010 through November 30, 2019)
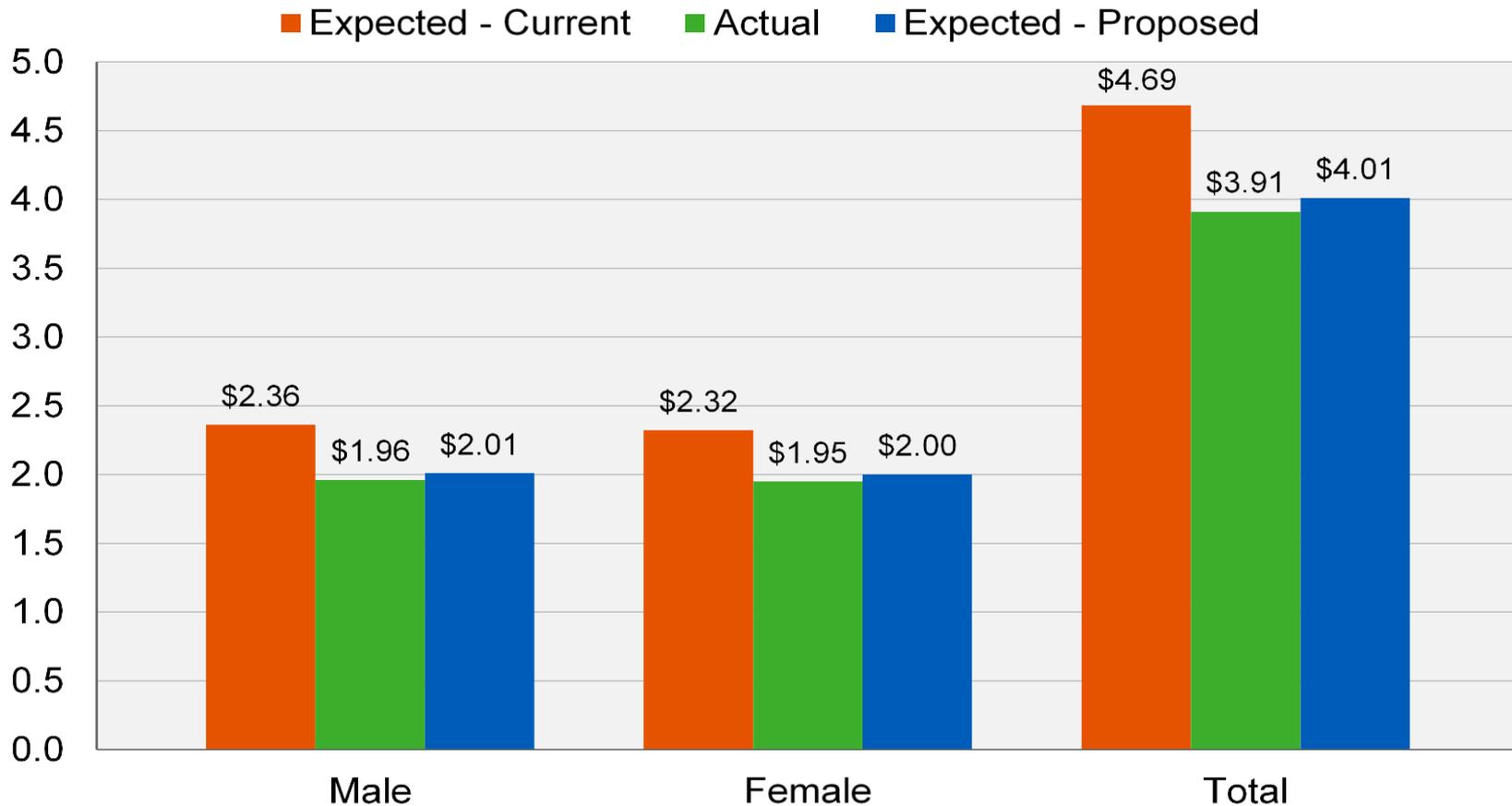
Setting ACERA Mortality Assumptions – Mortality Assumptions Example

Chart 12: Post-Retirement Headcount-Weighted Deaths
Non-Disabled General Members (December 1, 2010 through November 30, 2019)
For OPEB SRBR Valuation
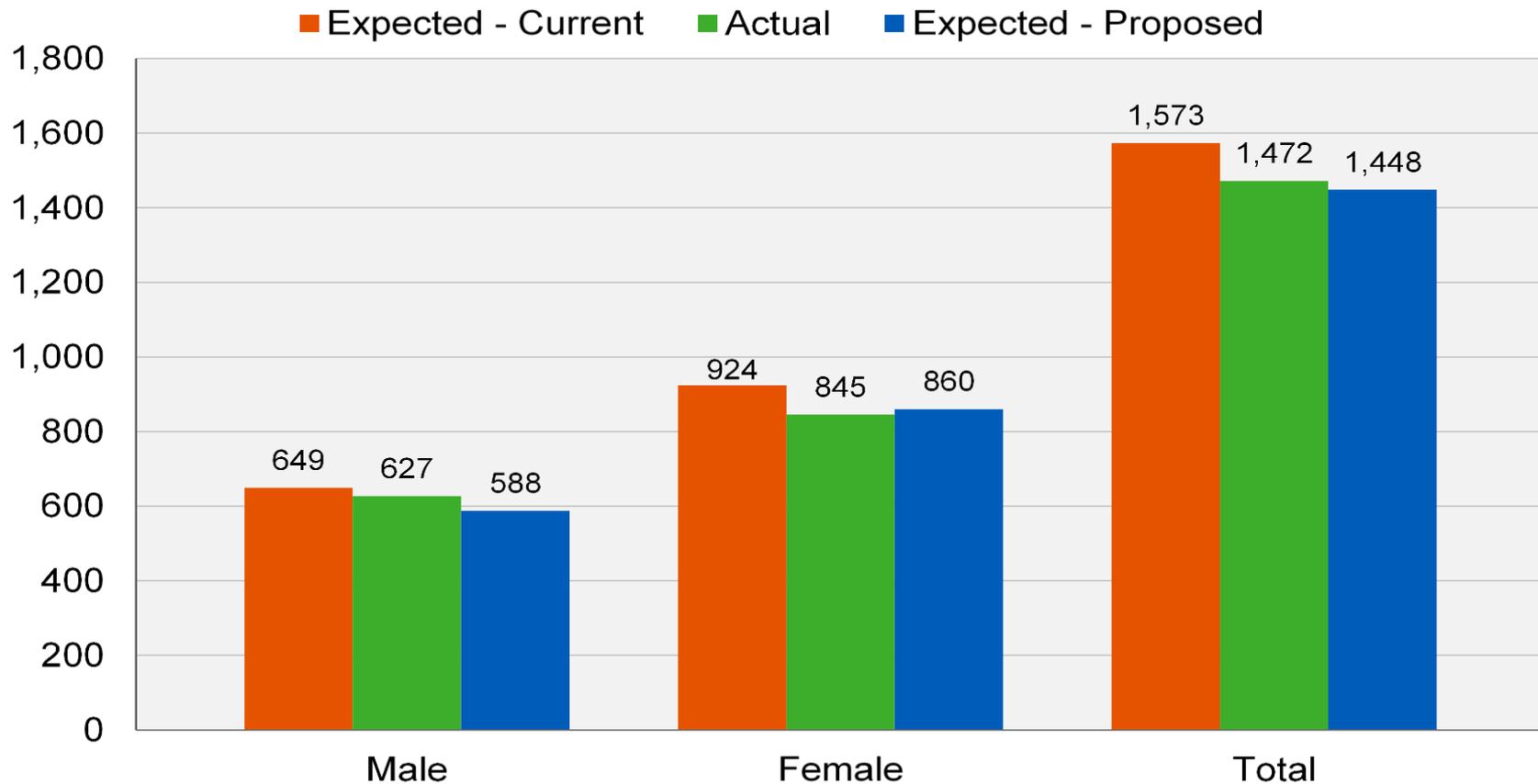
Recommended ACERA Mortality Assumptions

- General retirees base table:
  - Pub-2010 General Healthy Retiree Amount-Weighted Above-Median Mortality Table (separate males and females tables)
  - Base table actual to expected ratio is 97%

- Safety retirees base table:
  - Pub-2010 Safety Healthy Retiree Amount-Weighted Above-Median Mortality Table (separate males and females tables)
  - Base table actual to expected ratio is 107%

- Both tables projected generationally with the two-dimensional mortality improvement scale MP-2019

- Impact of new mortality assumptions on valuation results
  - Increase in liabilities and contribution rates for General members due to effect of new benefit weighted mortality assumptions
  - Increase in liabilities and contribution rates for Safety members also due to effect of new benefit weighted mortality assumptions

Discussion

Economic Assumptions

- Price Inflation (CPI)
  - Investment Return, Salary Increases, COLA

- Salary Increases
  - "Across the board" increases
    - Includes price inflation plus real wage growth
  - Merit & Promotion: based on experience
    - More like a "demographic" assumption
  - Terminal pay

- Investment Return
  - Components include CPI, real return, investment and administrative expenses
  - Generally based on passive returns

- Impact of 50/50 Excess Earnings Allocation on Investment Return
  - Disclosure provided for informational purposes only

Recommended Economic Assumptions – Summary

	2017 Study Adopted		2020 Study Recommended	
	Return	Pay*	Return	Pay*
Price Inflation	3.00%	3.00%	2.75%	2.75%
Real Wages	n/a	0.50%	n/a	0.50%
Net Real Return	4.25%**	n/a	4.25%**	n/a
Total	**7.25%**	**3.50%**	**7.00%**	**3.25%**

* Excludes merit and promotion component of assumed individual salary increases

** Recommended return is net of investment and administrative expenses

Recommended Economic Assumptions – Summary

- Price Inflation (CPI)
  - Decrease from 3.00% to 2.75%

- Retiree Cost of Living Increases
  - Decrease from 3.00% to 2.75%

- Salary Increases
  - Decrease price inflation from 3.00% to 2.75%
  - Maintain "across the board" real wage growth at 0.50%
  - Total wage inflation is decreased from 3.50% to 3.25%
  - Merit and promotion – changes based on experience

Recommended Economic Assumptions – Summary

- Investment Return
  - Decrease from 7.25% to 7.00%
    - Includes 2.75% price inflation and net real return of 4.25%
    - Net real return maintained at 4.25%

- Impact of 50/50 Excess Earnings Allocation on Investment Return
  - For informational purposes only
  - Estimated impact increases from 0.60% to 0.65%

Recommended Economic Assumptions – Price Inflation

- **Historical Consumer Price Index**
  - Averages declining due to low inflation over past 20 years, but still substantially higher than current inflation rates

- **NASRA Survey**
  - Median inflation assumption is 2.65%

- **Social Security Intermediate Forecast = 2.40%**

- **Verus anticipates long-term inflation of 1.90%**
  - Average inflation from survey of 7 consultants = 2.33%

- **Market based inflation expectations = 1.60% (July 2020)**

- **Recommend decreasing price inflation from 3.00% to 2.75%**
  - Segal generally recommending 0.25% decrease in inflation assumption

Recommended Economic Actuarial Assumptions – Salary Increases

- Three components:
  - Price inflation: decrease from 3.00% to 2.75%
  - "Across the board" real wage growth: maintain at 0.50%
    - Department or Labor: Historically: 0.4%-0.7% for state and local governments
    - Social Security projects 1.1% (median assumptions)
  - Merit and Promotion: from experience study
    - Assumption based on years of service
    - General: Currently 4.80% (0-1 years) to 0.40% (11+ years)
      - Increases for most service categories before 11 years of service
    - Safety: Currently 7.80% (0-1 years) to 0.80% (11+ years)
      - Increase for most service categories before 9 years of service

Merit and Promotion Salary Increases – General

Chart 1: Merit and Promotion Salary Increase Rates
General Members
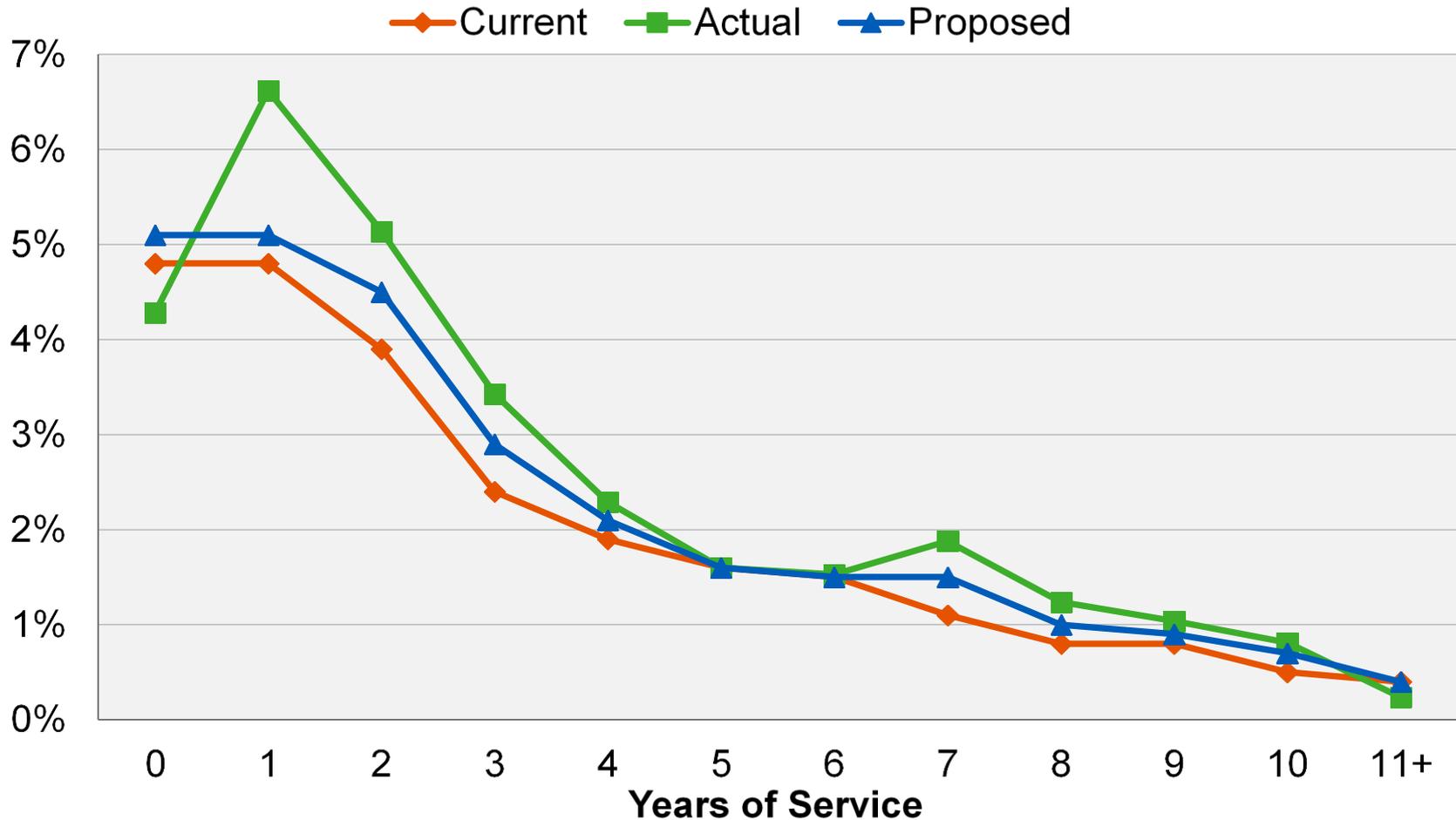
Merit and Promotion Salary Increases – Safety

Chart 2: Merit and Promotion Salary Increase Rates
Safety Members
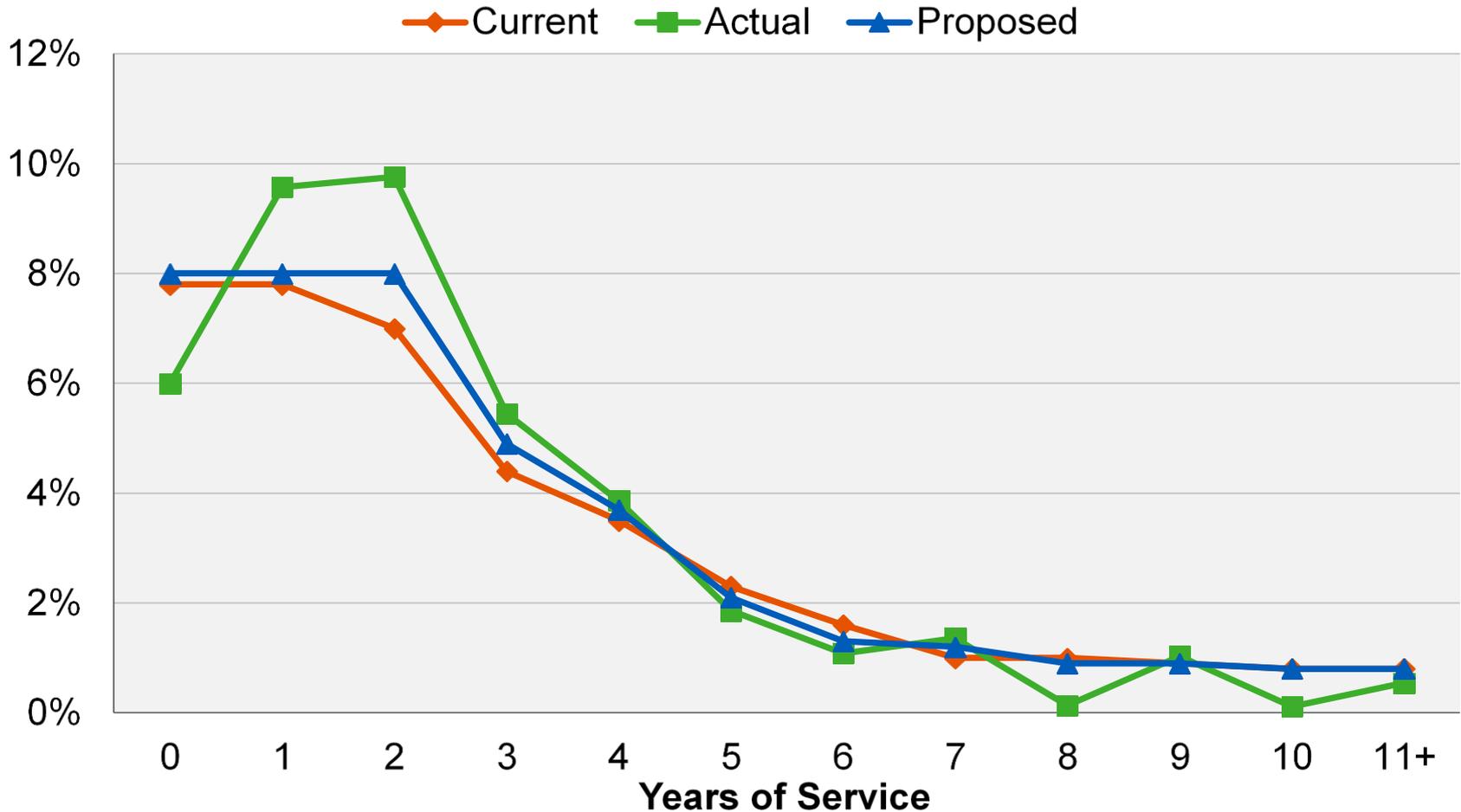
Recommended Economic Assumptions – Payroll Growth and Terminal Pay Assumptions

- Active member payroll based on wage inflation
  - Assume constant future active headcount
  - Used to project total payroll for UAAL amortization

- Includes price inflation and "across the board" real wage growth
  - Price inflation: decrease from 3.00% to 2.75%
  - Real increases: maintain at 0.50%
  - Total is decreased from 3.50% to 3.25%

- Terminal Pay
  - According to ACERA, recent Supreme Court decision on compensation earnable does not affect the terminal pay elements for legacy members
  - Decrease assumption for most General members and Safety members

Question?

Segal

25

Setting Economic Actuarial Assumptions – Investment Return Assumption

- Used to set the discount rate for measuring costs
  - Sometimes called the assumed interest rate
- Used for contribution requirements
  - Also for financial reporting (GASB 67 and 68)
- Affects timing of Plan cost
  - Lower assumed rate means higher <u>current</u> cost
  - Ultimately, actual earnings determine cost
    C + I = B + E
  - "Can't pay benefits with assumed earnings!"

Setting the Investment Return Assumption

- **Building-Block Method**
  - Four components:
    - Expected inflation: consistent with salary increases
    - Real return for each asset class
      - Weighted by asset allocation
    - Less assumed expenses (investment and administrative)
    - Less risk adjustment ("margin for adverse deviation")
      - Expressed as confidence level above 50%

- **Note: generally no add-on for superior managers**
  - "Indexed" returns, no "alpha"

- **Sources of real return data:**
  - Investment consultants (your Fund and industry)

Setting the Investment Return Assumption – Building Block Components – Preview

	2014 Study	**2017 Study**	**2020 Study**
Assumed Inflation	3.25%	3.00%	2.75%
Portfolio Real Rate of Return	5.54%	5.35%	5.56%
Assumed Expenses	(0.90%)	(0.90%)	(0.95%)
Risk Adjustment	(0.29%)	(0.20%)	(0.36%)
Total	**7.60%**	**7.25%**	**7.00%**
Confidence Level	53%*	53%	54%

* Confidence level had been at 56% for many years prior to the 2014 study

Setting the Investment Return Assumption – Real Return Component

- Real returns by asset class
  - Use an average of 7 investment advisory firms retained by Segal's California public clients
    - Use results from Verus for asset categories unique to ACERA
  - Expected real return for ACERA asset allocation is 5.56%
    - Increased from 5.35% in 2017 study
    - Change in the real rate of return (-0.06% under the 2017 asset allocation)
    - Change in the Association's target asset allocation (+0.16%)
    - Interaction effect between these changes (+0.11%)

ACERA Real Rate of Return

Asset Class	Target Allocation	Real Return	Weighted Return
US Large Cap Equity	22.40%	5.43%	1.22%
US Small Cap Equity	2.50%	6.21%	0.16%
International Developed Equity	17.00%	6.67%	1.13%
International Small Cap Equity	3.00%	7.36%	0.22%
Emerging Markets Equity	5.00%	8.58%	0.43%
Core Plus Fixed Income	11.50%	1.10%	0.13%
High Yield Bonds	1.60%	2.91%	0.05%
Global Fixed Income	3.00%	-0.63%	-0.02%
Private Equity	10.50%	10.00%	1.05%
Core Real Estate	8.00%	4.58%	0.37%
Commodities	0.75%	3.46%	0.03%
Infrastructure	1.75%	7.80%	0.14%
Private Credit	4.00%	8.50%	0.34%
Absolute Return	9.00%	3.70%	0.33%
Total	100.00%		5.56%

Administrative and Investment Expenses ($000s)

Year Ending December 31	Average Market Value of Assets	Investment Expenses	Non-Investment Expenses[1]	Investment %	Non-Investment %	Total %
2015	$6,714,319	$55,734	$15,403	0.83	0.23	1.06
2016	6,803,102	49,978	15,808	0.73	0.23	0.96
2017	7,538,840	60,124	15,775	0.80	0.21	1.01
2018	7,852,343	59,934	16,470	0.76	0.21	0.97
2019	8,190,933	52,101	16,629	0.64	0.20	0.84
Average				0.75	0.22	0.97
Current Assumption				0.65	0.25	0.90
Recommended Assumption				**0.75**	**0.20**	**0.95**

[1] Includes administrative, legal, technology, actuarial, and business continuity expenses.

- Based on this experience, we have increased the future total expense component from 0.90% to 0.95%.

Setting the Investment Return Assumption – Risk Adjustment Component

- Risk adjustment model and confidence level
  - Compares the Association's risk position over time
  - Confidence level is a relative, not absolute, measure
    - Can be reevaluated and reset for future comparisons
  - Confidence level is based on standard deviation
    - Measure of volatility based on portfolio assumptions
  - Results should be evaluated for reasonableness

Setting the Investment Return Assumption

- Risk adjustment model and confidence level (continued)
  - Most useful for comparing risk position over time
  - Confidence level is based on standard deviation
    - Relative likelihood that actual average 15-year return will exceed investment return assumption on expected value basis

Year Ending December 31	Investment Return Assumption	Risk Adjustment	Confidence Level
2005	7.90%	0.46%	56%
2006	8.00%	0.41%	56%
2007	8.00%	0.38%	56%
2009	7.90%	0.49%	56%
2011	7.80%	0.53%	56%
2014*	7.60%	0.29%	53%
2017	7.25%	0.20%	53%
2020 (Recommended)	7.00%	0.36%	54%

* Based on the 7.60% investment return assumption adopted by the Board. In our December 31, 2014 triennial experience study report, we calculated a 54% confidence level based on an recommended investment return assumption of 7.50%.

Setting the Investment Return Assumption -- Building Block Components

	Current	Recommended
Assumed Inflation	3.00%	2.75%
Portfolio Real Rate of Return	5.35%	5.56%
Assumed Expenses	(0.90%)	(0.95%)
Risk Adjustment	(0.20%)	(0.36%)
Total	**7.25%**	**7.00%**
Confidence Level	53%	54%

Setting the Investment Return Assumption – Comparison with Other Models

- Segal's model for review of earnings assumption
  - Uses forward looking expected arithmetic average returns
    - No surplus or asset shortfall on expected value basis

- Comparison with an alternate model in common use
  - Uses forward looking expected geometric average returns
    - No surplus or asset shortfall on a median value basis
    - Expected geometric returns are lower than expected arithmetic returns
  - However, under this model, earning assumptions are <u>not</u> reduced for future <u>investment</u> expenses
    - Hence in practice, comparable results between earnings assumptions set using this model versus using Segal's model

- Segal ran ACERA's asset allocation through this model
  - Using a national survey of capital market assumptions (Horizon)
    - Stochastic simulation using 10,000 trial outcomes
  - 55% likelihood of achieving 7.00% using 15-year returns

Setting the Investment Return Assumption – Comparison with Other Systems

- Comparison with other systems
  - National median is 7.50% but continues to trend down nationwide
    - National practice lags California!
  - 7.00% is the most common for California CERL systems
    - Twelve California systems at 7.00%
  - 7.25% currently used by ACERA and four other systems
    - Three systems, including ACERA, currently use 3.00% inflation
    - Two systems currently use 2.75% inflation but have separate contribution charges for administrative expenses
  - CalPERS and CalSTRS both approved reduction to 7.00%

Investment Return Assumption – Expected Return Assumptions for California Systems

System(s)	Assumption	Count
CalPERS	7.00%	
CalSTRS	7.00%	
University of California	6.75%	
1937 CERL Systems	7.25%	5
	7.00%	12
	6.75%	2
	6.50%	1
City Systems		
San Francisco	7.40%	
LACERS, LAFPP	7.00%	
LADWP	7.00%	
Fresno	7.00%	
San Jose	6.75%	
San Diego	6.50%	

Investment Return Assumption –
Change in Distribution of Public Pension
Investment Return Assumptions, FY 01 to FY 20
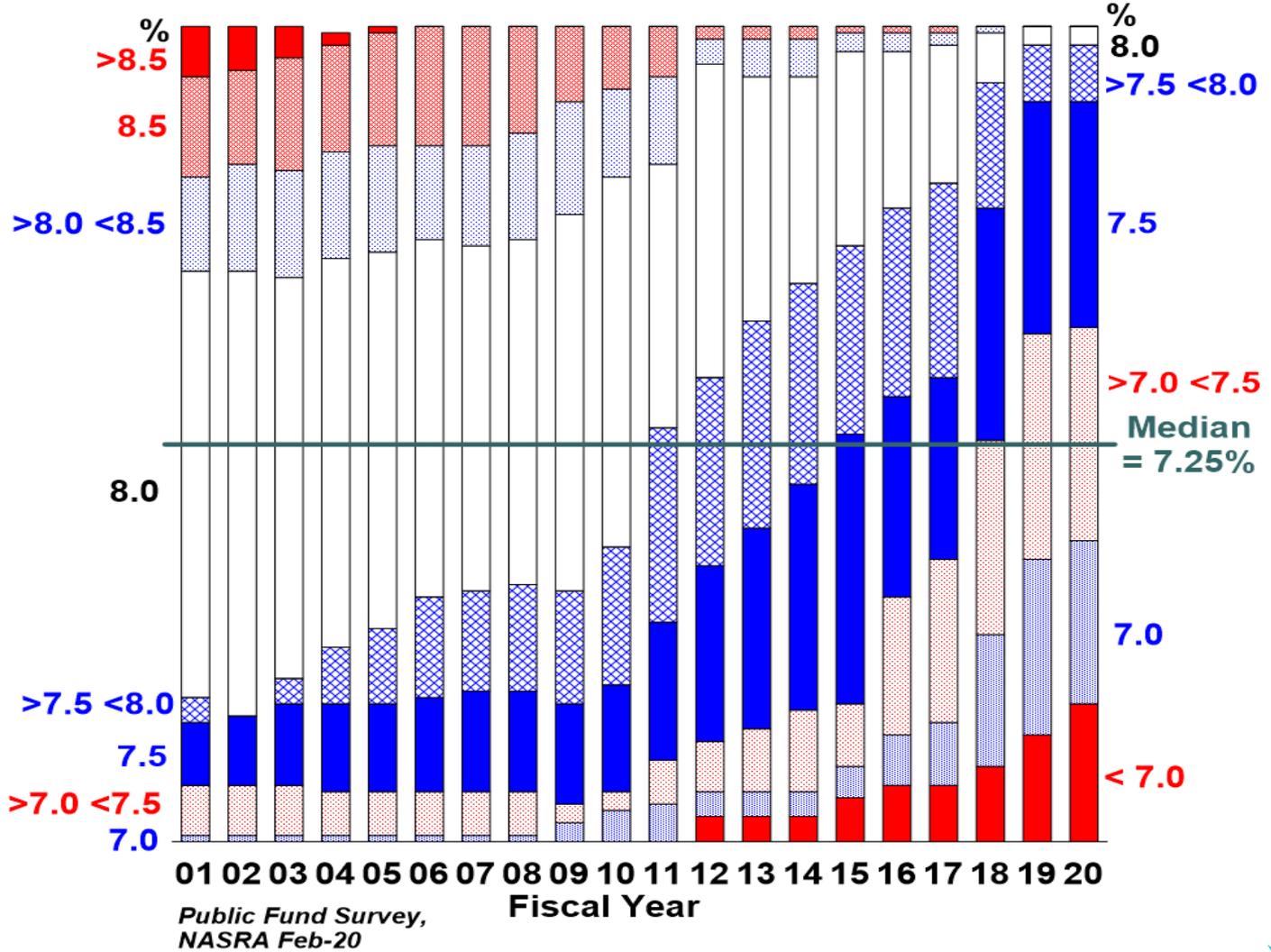
Public Fund Survey, NASRA Feb-20

Impact of 50/50 Excess Earnings Allocation on Investment Return

- Disclosure provided for informational purposes only
  - Article 5.5 of the Statue appears to preclude the prefunding of the SRBR by using an assumption lower than the market earnings assumption

- Impact of 50/50 excess earnings allocation studied using a stochastic model
  - Recommend an increase in assumption to anticipate impact from 0.60% to 0.65%
  - Primarily as a result of increase in the portfolio's standard deviation since last review

Question?

Anticipated Impact on Valuation Results Modeled as of December 31, 2019 for Illustration

Summary of Cost Impact of Recommended Assumptions	
Impact on Employer	
Change due to inflation and investment return assumptions	1.58%
Change due to other assumption changes	<u>0.88%</u>
Total change in average employer rate	2.46%
Total estimated change in annual dollar amount (000s)	$27,447
Impact on Member	
Change due to inflation and investment return assumptions	0.28%
Change due to other assumption changes	<u>0.27%</u>
Total change in average member rate	0.55%
Total estimated change in annual dollar amount (000s)	$6,128
Impact on UAAL and Funded Percentage	
Change in UAAL	$318 million
Change in funded percentage	From 77.6% to 75.2%

Anticipated Impact on Valuation Results Modeled as of December 31, 2019 for Illustration

Assumption Change	Impact on Employer Contribution Rates	Impact on Member Contribution Rates	Impact on UAAL ($ millions)
Decrease due to changes in inflation and investment return assumptions	**1.58%**	**0.28%**	**$195**
Increase/(decrease) due to change in mortality	0.98%	0.20%	$139
Increase due to changes in all other demographic	(0.10%)	0.07%	($16)
Increase due to changes in other assumptions	**0.88%**	**0.27%**	**$123**
Total increase/(decrease) due to all assumption changes	**2.46%**	**0.55%**	**$318**

- Of the various assumption changes, the most significant cost impact (rate increase) for both General and Safety members is from inflation and investment return, followed by the change in the mortality assumptions

Anticipated Impact on Valuation Results
Modeled as of December 31, 2019 for Illustration

Employer Contribution Rate Increases/(Decreases) (% of Payroll) (Estimated Annual Dollar Amounts in $000s)				
	Normal Cost	UAAL	Total	Annual Amount*
General (non-LARPD)	0.24%	1.70%	1.94%	$18,117
LARPD	0.29%	2.54%	2.83%	121
All Safety	1.63%	3.71%	5.34%	9,209
Combined	**0.45%**	**2.01%**	**2.46%**	**$27,447**

* Based on projected annual payroll as determined under each set of assumptions.

Anticipated Impact on Valuation Results Modeled as of December 31, 2019 for Illustration

Average Member Contribution Rate Increases/(Decreases) (% of Payroll) (Estimated Annual Dollar Amounts in $000s)		
	Total	Annual Amount*
General Tier 1	0.27%	$32
General Tier 2	0.52%	2,957
General Tier 3	0.68%	12
General Tier 4	0.33%	1,174
Safety Tier 1	0.28%	2
Safety Tier 2	0.93%	1,023
Safety Tier 2C	1.09%	33
Safety Tier 2D	1.02%	155
Safety Tier 4	1.76%	740
Combined	**0.55%**	**6,128**

* Based on projected annual payroll as determined under each set of assumptions.

Question?

Alameda County Employees'
Retirement Association

Actuarial Experience Study

**Analysis of Actuarial Experience
During the Period
December 1, 2016 through November 30, 2019**

✶ Segal

September 9, 2020

Board of Retirement
Alameda County Employees' Retirement Association
475 14th Street, Suite 1000.
Oakland, CA 94612-1900

RE: Review of Actuarial Assumptions for the December 31, 2020 Actuarial Valuation

Dear Members of the Board:

We are pleased to submit this report of our review of the actuarial experience for the Alameda County Employees' Retirement Association (ACERA). This study utilizes the census data for the period December 1, 2016 to November 30, 2019 and provides the proposed actuarial assumptions, both economic and demographic, to be used in the December 31, 2020 valuation.

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

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

Sincerely,

Andy Yeung, ASA, MAAA, FCA, EA
Vice President and Actuary

Eva Yum, FSA, MAAA, EA
Senior Actuary

DNA/jl

Table of Contents

Segal

✦ Segal

I. Introduction, Summary, and Recommendations

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

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

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

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

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

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

We are recommending changes in the assumptions for: inflation, investment return, merit and promotion salary increases, terminal pay, retirement from active employment, retirement age for deferred vested members, percent of members assumed to go on to work for a reciprocal system, reciprocal salary increases, pre-retirement mortality, healthy life post-retirement mortality, disabled life post-retirement mortality, beneficiary mortality, termination (refunds and deferred vested retirements), percentage expected to receive a refund or deferred vested benefit, disability incidence, percent of disabilities anticipated to be service connected or non-service connected, and sick leave conversion.

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

Pg #	Actuarial Assumption Categories	Recommendation
13	**Inflation:** Future increases in the Consumer Price Index (CPI), which drives investment returns and active member salary increase, as well as cost-of-living adjustments (COLAs) for retirees.	Reduce the inflation assumption from 3.00% to 2.75% per annum as discussed in Section (III)(A).
15	**Investment Return:** The estimated average future net rate of return on current and future assets of the Association as of the valuation date. This rate is used to discount liabilities.	Reduce the current investment return assumption from 7.25% per annum to 7.00% per annum as discussed in Section (III)(B).
24	**Individual Salary Increases:** Increases in the salary of a member between the date of the valuation to the date of separation from active service. This assumption has three components: • Inflationary salary increases • Real "across the board" salary increases • Merit and promotion increases **Terminal Pay:** Additional earnings that are expected to be received during the member's final average earnings period.	Reduce the current inflationary salary increase assumption from 3.00% to 2.75% and maintain the current real "across the board" salary increase assumption at 0.50%. This means that the combined inflationary and real "across the board" salary increases will decrease from 3.50% to 3.25%. We recommend adjusting the merit and promotion rates of salary increase as developed in Section III(C) to reflect past experience. Future merit and promotion salary increases are higher in some service categories and lower in other service categories under the proposed assumptions. The recommended salary increases (after taking into account a 0.25% reduction in the inflation assumption) anticipate slightly lower salary increases overall for General and Safety members. We recommend reduction in the terminal pay assumptions based on recent experience. Separately, in determining the terminal pay assumptions, we asked ACERA for directions on whether the recent California Supreme Court decision on compensation earnable is expected to have an impact on the pay elements that we have used in our analysis of the above assumptions. We were informed that the decision will not affect those pay elements for Legacy members.

Pg #	Actuarial Assumption Categories	Recommendation
32	**Retirement Rates:** The probability of retirement at each age at which participants are eligible to retire. **Other Retirement Related Assumptions including:** • Percent married and spousal age differences for members not yet retired • Retirement age for deferred vested members • Future reciprocal members and reciprocal salary increases	For active members, adjust the current retirement rates to those developed in Section (IV)(A). For General Tier 2 and Safety Tier 2/2D members, we are recommending separate sets of age-based retirement assumptions for those with less than 30 years of service and for those with 30 or more years of service. For active and deferred vested members, maintain the current percent married at retirement assumption at 70% for males and 50% for females. Maintain the spouse age difference assumption that male retirees are three years older than their spouses and female retirees are two years younger than their spouses. For deferred vested members, maintain the General deferred vested retirement assumption at age 61, and lower the assumption for Safety members from age 56 to age 55. Reduce the current proportion of future deferred vested members expected to be covered by a reciprocal system from 30% to 25% for General members and from 60% to 55% for Safety members. In addition, reduce the reciprocal salary increase assumption from 3.90% to 3.65% for General members and from 4.30% to 4.05% for Safety members.

48	**Mortality Rates:** The probability of dying at each age. Mortality rates are used to project life expectancies.	For pre-retirement mortality:
		Current base table: Headcount-Weighted RP-2014 Employee Mortality Tables times 80%.
		For Statutory Retirement Plan Benefits and Discretionary SRBR non-OPEB Benefits
		Recommended base table for General Members: Pub-2010 General Employee Amount-Weighted Above-Median Mortality Table.
		Recommended base table for Safety Members: Pub-2010 Safety Employee Amount-Weighted Above-Median Mortality Table.
		For Discretionary SRBR OPEB Benefits
		Recommended base table for General Members: Pub-2010 General Employee Headcount-Weighted Above-Median Mortality Table.
		Recommended base table for Safety Members: Pub-2010 Safety Employee Headcount-Weighted Above-Median Mortality Table.
		For healthy General retirees:
		Current base table: Headcount-Weighted RP-2014 Healthy Annuitant Mortality Tables with no setback for males and females.
		For Statutory Retirement Plan Benefits and Discretionary SRBR non-OPEB Benefits
		Recommended base table: Pub-2010 General Healthy Retiree Amount-Weighted Above-Median Mortality Tables.
		For Discretionary SRBR OPEB Benefits
		Recommended base table: Pub-2010 General Healthy Retiree Headcount-Weighted Above-Median Mortality Tables.
		For healthy Safety retirees:
		Current base table: Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table with no setback for males and females.
		For Statutory Retirement Plan Benefits and Discretionary SRBR non-OPEB Benefits
		Recommended base table: Pub-2010 Safety Healthy Retiree Amount-Weighted Above-Median Mortality Tables.
		For Discretionary SRBR OPEB Benefits
		Recommended base table: Pub-2010 Safety Healthy Retiree Headcount-Weighted Above-Median Mortality Tables.
		For all beneficiaries:
		Current base table: Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table, with no setback for males and females.
		For Statutory Retirement Plan Benefits and Discretionary SRBR non-OPEB Benefits
		Recommended base table: Pub-2010 General Contingent Survivor Amount-Weighted Above-Median Mortality Table with rates increased by 5% for males.
		For Discretionary SRBR OPEB Benefits
		Recommended base table: Pub-2010 General Contingent Survivor Headcount-Weighted Above-Median Mortality Table with rates increased by 5% for males.

Pg #	Actuarial Assumption Categories	Recommendation
		For disabled General retirees: Current base table: Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table set forward seven years for males and set forward four years for females. *For Statutory Retirement Plan Benefits and Discretionary SRBR non-OPEB Benefits* Recommended base table: Pub-2010 Non-Safety Disabled Retiree Amount-Weighted Mortality Table with rates decreased by 10% for females. *For Discretionary SRBR OPEB Benefits* Recommended base table: Pub-2010 Non-Safety Disabled Retiree Headcount-Weighted Mortality Table with rates decreased by 10% for females. For disabled Safety retirees: Current: Headcount-Weighted RP-2014 Healthy Annuitant Mortality Table set forward two years for males and with no set forward for females. *For Statutory Retirement Plan Benefits and Discretionary SRBR non-OPEB Benefits* Recommended base table: Pub-2010 Safety Disabled Retiree Amount-Weighted Mortality Table with rates increased by 5% for males. *For Discretionary SRBR OPEB Benefits* Recommended base table: Pub-2010 Safety Disabled Retiree Headcount-Weighted Mortality Table with rates increased by 5% for males. All current tables are projected generationally with the two-dimensional mortality improvement scale MP-2016. All recommended tables above are projected generationally with the two-dimensional mortality improvement scale MP-2019. For member contribution rates, optional forms and reserves: change the mortality rates to those developed in Section (IV)(B).
64	**Termination Rates:** The probability of leaving employment at each age or after a certain years of service and receiving either a refund of member contributions or a deferred vested retirement benefit.	Current assumptions use service during the first five years of service and age after the first five years of service to predict termination. New assumptions use service only to predict termination. Adjust the termination rates to those developed in Section IV(D) to reflect a higher incidence of termination overall. In addition, a slightly lower proportion of members is expected to elect a refund of member contributions with a higher proportion electing instead to receive a deferred vested benefit under the recommended assumptions.
68	**Disability Incidence Rates:** The probability of becoming disabled at each age.	Adjust the disability rates to those developed in Section IV(E) to reflect lower incidence of disability for General members and higher incidence for Safety members. Increase the percentage of anticipated General member disabilities to be service connected from 60% to 65%, and maintain the service connected disability assumption at 100% for Safety members.
42	**Sick Leave Conversion:** The assumption for converting unused sick leave into service credit at retirement.	We recommend maintaining the sick leave conversion assumption at 0.003 years of additional service credit at retirement for each year of employment for General members, and increasing the assumption from 0.006 to 0.007 years for Safety members.

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

<div align="center">

Cost Impact of the Recommended Assumptions
Based on December 31, 2019 Actuarial Valuation

</div>

Impact on Employer Contribution Rates	
Increase due to changes in inflation and investment return assumption	1.58%
Increase due to all other assumption changes	0.88%
Total increase in average employer rate	2.46%
Total estimated increase in annual dollar amount ($000s)[2]	$27,447
Impact on Member Contribution Rates	
Increase due to changes in inflation and investment return assumption	0.28%
Increase due to all other assumption changes	0.27%
Total increase in average member rate	0.55%
Total estimated increase in annual dollar amount ($000s)[2]	$6,128
Impact on UAAL and Funded Percentage	
Increase in UAAL	$318 million
Change in Funded Percentage	From 77.6% to 75.2%

Of the various changes to assumptions other than inflation and investment return, the cost increase is primarily from the change in the mortality assumptions.

Section II provides some background on the basic principles and methodology used for the experience study and for the review of the economic and demographic actuarial assumptions. A detailed discussion of each assumption and reasons for the proposed changes are found in Section III for the economic assumptions and Section IV for the demographic assumptions. The cost impact of the proposed changes is detailed in Section V.

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

II. Background and Methodology

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

Economic Assumptions

Economic assumptions consist of:

- **Inflation:** Increases in the price of goods and services. The inflation assumption reflects the basic return that investors expect from securities markets. It also reflects the expected basic salary increase for active employees and drives increases in the allowances of retired members.

- **Investment Return:** Expected long-term rate of return on the Association's investments after investment and administrative expenses. This assumption has a significant impact on contribution rates.

- **Salary Increases:** In addition to inflationary increases, it is assumed that salaries will also grow by real "across the board" pay increases in excess of price inflation. It is also assumed that employees will receive raises above these average increases as they advance in their careers. These are commonly referred to as merit and promotion increases. Payments to amortize any Unfunded Actuarial Accrued Liability (UAAL) are assumed to increase each year by the price inflation rate plus any real "across the board" pay increases that are assumed.

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

Demographic Assumptions

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

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

of line with the pattern shown for the other age groups. Similarly, if we are considering the death decrement, there may be a large number of exposures in, say, the age 20-24 category, but very few decrements (actual deaths); therefore, we would not be able to rely heavily on the probability developed for that category.

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

III. Economic Assumptions

A. Inflation

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

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

Historical Consumer Price Index – 1930 to 2019[3]
(U.S. City Average - All Urban Consumers)

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

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

Based on information found in the Public Plans Data website, which is produced in partnership with the National Association of State Retirement Administrators (NASRA), the median inflation assumption used by 174 large public retirement funds in their 2018 fiscal year valuations was 2.65%.[4] In California, CalSTRS and fifteen other 1937 Act CERL systems use an inflation assumption of 2.75%, three 1937 Act CERL system uses an inflation assumption of 2.50%, while ACERA and one other 1937 Act CERL system use an inflation assumption of 3.00%. CalPERS has lowered their inflation assumption from 2.75% to 2.50% over a three-year period.

ACERA's investment consultant, Verus, anticipates an annual inflation rate of 1.90%, while the average inflation assumption provided by Verus and six other investment advisory firms retained by Segal's California public sector clients was 2.33%. Note that, in general, investment consultants use a time horizon for this assumption that is shorter than the time horizon we use for the actuarial valuation.[5]

To find a forecast of inflation based on a longer time horizon, we referred to the Social Security Administration's (SSA) 2020 report on the financial status of the Social Security program.[6] The

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

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

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

[6] Source: Social Security Administration: The 2020 Annual Report of the Board of Trustees of the Federal Old-Age and Survivors Insurance and Federal Disability Insurance Trust Funds

projected average increase in the Consumer Price Index (CPI) over the next 75 years under the intermediate cost assumptions used in that report was 2.40%. The SSA report also includes alternative projections using lower and higher inflation assumptions of 1.80% and 3.00%, respectively.

We also compared the yields on the thirty-year inflation indexed U.S. Treasury bonds to comparable traditional U.S. Treasury bonds.[7] As of July 2020, the difference in yields is about 1.60% which provides a measure of market expectations of inflation.

Based on all of the above information, we recommend that the current 3.00% annual inflation assumption be reduced to 2.75% for the December 31, 2020 actuarial valuation.

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

Retiree Cost-of-Living Increases

In our last experience study as of November 30, 2016, consistent with the 3.00% annual inflation assumption adopted by the Board, the Board maintained the 3.00% retiree cost-of-living adjustment for Tiers 1 and 3, and the 2.00% cost-of-living adjustment for Tiers 2[8] and 4.

We recommend that the current retiree cost-of-living assumption of 3.00% per year for Tiers 1 and 3 be reduced to 2.75%, and the current assumption of 2.00% per year for Tiers 2[9] and 4 be maintained, in the December 31, 2020 valuation.[9]

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

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

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

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

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[7] Source: Board of Governors of the Federal Reserve System.
[8] Including Safety Tier 2C and Tier 2D.
[9] For current retirees and beneficiaries in Tiers 1 and 3, we would utilize the accumulated COLA banks to value annual 3.00% COLA increases as long as the COLA banks are available.

✦ Segal 14

B. Investment Return

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

Real Rate of Investment Return

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

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

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

Asset Class	Percentage of Portfolio	Verus' Assumed Real Rate of Return[10]	Average Assumed Real Rate of Return from a Sample of Consultants to Segal's California Public Sector Clients[11]
US Large Cap Equity	22.40%	4.70%	5.43%
US Small Cap Equity	2.50%	5.80%	6.21%
International Developed Equity	17.00%	6.50%	6.67%
International Small Cap Equity	3.00%	7.40%	7.36%
Emerging Markets Equity	5.00%	8.50%	8.58%
Core Plus Fixed Income	11.50%	1.10%	1.10%
High Yield Bonds	1.60%	2.10%	2.91%
Global Fixed Income	3.00%	-0.30%	-0.63%
Private Equity	10.50%	13.50%[12]	10.00%
Core Real Estate	8.00%	6.50%[12]	4.58%
Commodities	0.75%	4.10%[12]	3.46%
Infrastructure	1.75%	7.80%[12]	7.80%[13]
Private Credit	4.00%	8.50%[12]	8.50%[13]
Absolute Return	9.00%	3.70%[12]	3.70%[13]
Total	**100.00%**	**5.88%**	**5.56%**

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

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

The following are some observations about the returns provided above:

1. The investment consultants to our California public sector clients have each provided us with their expected real rates of return for each asset class, over various future periods of

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

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

[12] Note that the return assumptions originally provided by Verus for these asset classes only are <u>net</u> of any applicable investment expenses, whereas the return assumptions provided by Verus for the other asset classes are gross of expenses. In order for all of the Verus return assumptions to be on the same (i.e., gross of expenses) basis, we have applied adjustments to each of these net return assumptions. The adjustments were determined as the investment expenses for a particular asset class expressed as a percentage of average market value of assets for that asset class, based on financial information provided by ACERA. Note that in the 2017 experience study, we were informed that the return assumption for Private Equity and Absolute Return were net of any applicable investment expenses and we reflected those expenses using a different approach by excluding the investment expenses for those asset classes in setting the investment expense assumption.

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

time. However, in general, the returns available from investment consultants are projected over time periods that are much shorter than the durations of a retirement plan's liabilities.

2. Using a sample average of expected real rate of returns allows the Association's investment return assumption to reflect a broader range of capital market information and should help reduce year to year volatility in the investment return assumption.

3. Therefore, we recommend that the 5.56% portfolio real rate of return be used to determine the Association's investment return assumption. This is 0.21% higher than the return that was used three years ago in the review to prepare the recommended investment return assumption for the December 31, 2017 valuation. The difference is due to changes in the Association's target asset allocation (+0.16%), changes in the real rate of return assumptions provided to us by the investment advisory firms (-0.06%) and the interaction effect between these changes (+0.11%).

Association Expenses

For funding purposes, the real rate of return assumption for the portfolio needs to be adjusted for investment and administrative (or non-investment) expenses expected to be paid from investment income. Based on information provided by the Association, we have shown in the following table the expenses in relation to the average market value of assets for the five years ending December 31, 2019.

Investment and Non-Investment Expenses as a Percentage of Average Market Value of Assets (Dollars in 000's)

Year Ending December 31	Average Market Value of Assets	Investment Expenses	Non-Investment Expenses[14]	Investment %	Non-Investment %	Total %
2015	$6,714,319	$55,734	$15,403	0.83	0.23	1.06
2016	6,803,102	49,978	15,808	0.73	0.23	0.96
2017	7,538,840	60,124	15,775	0.80	0.21	1.01
2018	7,852,343	59,934	16,470	0.76	0.21	0.97
2019	8,190,933	52,101	16,629	0.64	0.20	0.84
Average				0.75	0.22	0.97
Current Assumption				0.65	0.25	0.90
Recommended Assumption				0.75	0.20	0.95

Based on this experience, we recommend that the Association's future expense assumption be increased from 0.90% to 0.95%.

Note related to investment expenses paid to active managers – As cited above, under Section 3.6.3.d of ASOP No. 27, the effect of an active investment management strategy should be considered "net of investment expenses" when determining whether "the actuary has reason to

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[14] Includes administrative, legal, technology, actuarial, and business continuity expenses. It is our understanding that these amounts have been included by the Association in establishing its budget for administrative expenses.

believe, based on relevant supporting data, that such superior or inferior returns represent a reasonable expectation over the long term."

For ACERA, of the $52.1 million in net fees and investment expenses paid in 2019, about $49.8 million was associated with investment expenses, with the remaining $2.3 million associated with real estate related fees and expenses. Of the $49.8 million of investment expenses, nearly all of them were paid for expenses associated with active managers.

We have not performed a detailed analysis to measure how much of the investment expenses paid to active managers might have been offset by additional returns ("alpha") earned by that active management. However, we observed based on information provided in the Comprehensive Annual Financial Report (CAFR) that the total fund return on a net of investment expense basis was lower than the policy benchmark by about 0.3% over the last fifteen years.[15] We will work with the Association's staff to determine whether future studies might potentially exclude the level of investment expenses for active managers that are expected to be offset by investment returns and the effect the recent decision to increase the exposure to passive investing might have on investment expenses. For now, we will continue to use the current approach that any "alpha" that may be identified would be treated as an increase in the risk adjustment and corresponding confidence level. For example, 0.25% of alpha would increase the confidence level by 3% (see discussions that follow on definitions of risk adjustment and confidence level).

Risk Adjustment

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

The purpose of the risk adjustment (as measured by the corresponding confidence level) is to increase the likelihood of achieving the actuarial investment return assumption in the long term.[16] This is consistent with our experience that retirement plan fiduciaries would generally prefer that returns exceed the assumed rate more often than not.

The 5.56% expected real rate of return developed earlier in this report was based on expected mean or average arithmetic returns. In our model, the confidence level associated with a particular risk adjustment represents the relative likelihood that future investment earnings would equal or exceed the assumed earnings over a 15-year period on an expected value basis.[17] The 15-year time horizon represents an approximation of the "duration" of the fund's liabilities, where the duration of a liability represents the sensitivity of that liability to interest rate variations. Note that, based on the investment return assumptions recently adopted by systems that have been analyzed under this model, we observe a confidence level generally in the range of 50% to 55%.

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[15] Reference: Page 70 of the CAFR for the year ended December 31, 2019.

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

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

Three years ago, the Board adopted an investment return assumption of 7.25%. That return implied a risk adjustment of 0.20%, reflecting a confidence level of 53% that the actual average return over 15 years would not fall below the assumed return, assuming that the distribution of returns over that period follows the normal statistical distribution.[18]

If we use the same 53% confidence level from our last study to set this year's risk adjustment and the current long-term portfolio standard deviation of 12.2% provided by Verus, the corresponding risk adjustment would be 0.21%. Together with the other investment return components, this would result in an investment return assumption of 7.15%, which is lower than the current assumption of 7.25%[19]. Based on our general practice of using one-quarter percentage point increments for economic actuarial assumptions, we evaluated the effect on the confidence level of lowering this preliminary investment return assumption to the next lowest one-quarter percentage point, or 7.00%. A net investment return assumption of 7.00%, together with the other investment return components, would produce a risk adjustment of 0.36%, which corresponds to a confidence level of 54%.

The table below shows ACERA's historical investment return assumptions, risk adjustments and corresponding confidence levels for the current and prior studies, for the years when this analysis was performed.

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

Year Ending December 31	Investment Return	Risk Adjustment	Corresponding Confidence Level
2005	7.90%	0.46%	56%
2006	8.00%	0.41%	56%
2007	8.00%	0.38%	56%
2009	7.90%	0.49%	56%
2011	7.80%	0.53%	56%
2014[20]	7.60%	0.29%	53%
2017	7.25%	0.20%	53%
2020 (Recommended)	7.00%	0.36%	54%

As we have discussed in prior experience studies, the risk adjustment model and associated confidence level is most useful as a means for comparing how the Association has positioned itself relative to risk over periods of time.[21] The use of a 54% confidence level under Segal's model should be considered in context with other factors, including:

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[18] Based on an annual portfolio return standard deviation of 11.52% provided by Verus in 2017. Strictly speaking, future compounded long-term investment returns will tend to follow a log-normal distribution. However, we believe the normal distribution assumption is reasonable for purposes of setting this type of risk adjustment.

[19] It should be noted that an assumption of 7.25% when remeasured using the parameters updated in this study would have resulted in a risk adjustment of 0.11% and a corresponding confidence level of 51%.

[20] Based on the 7.60% investment return assumption adopted by the Board. Note that as part of the 2014 analysis, we had initially recommended a 7.50% investment return assumption that contained a risk adjustment of 0.39% and a confidence level of 54%.

[21] In particular, it would not be appropriate to use this type of risk adjustment as a measure of determining an investment return rate that is "risk-free."

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

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

- A confidence level of 54% (associated with a 7.00% investment return assumption) is within the range of about 50% to 55% that corresponds to the risk adjustments used by most of Segal's other California public retirement system clients.

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

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

Taking into account the factors above, our recommendation is to lower the net investment return assumption from 7.25% to 7.00%. As noted above, this return implies a 0.36% risk adjustment and reflects a confidence level of 54%.

Recommended Investment Return Assumption

The following table summarizes the components of the investment return assumption developed in the previous discussion. For comparison purposes, we have also included similar values from the last study.

Calculation of Investment Return Assumption

Assumption Component	December 31, 2020 Recommended Value	December 31, 2017 Adopted Value	December 31, 2014 Adopted Value
Inflation	2.75%	3.00%	3.25%
Plus Portfolio Real Rate of Return	5.56%	5.35%	5.54%
Minus Expense Adjustment	(0.95%)	(0.90%)	(0.90%)
Minus Risk Adjustment	(0.36%)	(0.20%)	(0.29%)
Total	**7.00%**	**7.25%**	**7.60%**
Confidence Level	**54%**	**53%**	**53%[22]**

Based on this analysis, we recommend that the investment return assumption be decreased from 7.25% to 7.00% per annum.

[22] Confidence level had been at 56% for many years prior to 2014.

Impact of 50/50 Excess Earnings Allocation on Investment Return Assumption

Note that in developing the recommended investment return assumption in the past, we disclosed in our economic assumptions/experience study reports (and in our annual actuarial valuation reports) that the impact of the 50/50 allocation between the retirement and SRBR asset pools of the Article 5.5 "excess earnings" benefits had not been considered. This was based on our understanding that Article 5.5 of the Statute, which authorizes the allocation of 50% of excess earnings to the SRBR, does not allow for the use of a different investment return for funding than is used for interest crediting. This would appear in effect to preclude the prefunding of the SRBR through the use of an assumption lower than the market earnings assumption (which is currently 7.25%).

As required by the Actuarial Standard of Practice (ASOP) No. 4 ("Measuring Pension Obligations and Determining Pension Plan Costs or Contributions"), we performed a simplified stochastic model in 2017 to estimate the impact of the 50% allocation of future excess earnings to the SRBR. The results of our model indicated that the 50/50 allocation of future excess earnings would have about the same impact as an "outflow" (i.e., assets not available to fund the benefits included in the valuation) that would average approximately 0.60% of assets over time. For informational purposes only, when we applied the results of our stochastic model to the most recent December 31, 2019 funding valuation, we included the estimated impact that such an annual outflow would have on the employer's contribution rate and on the actuarial accrued liability measured in that valuation, using the current 7.25% investment return assumption.

Using the same model, we have estimated the impact of the 50% allocation of future excess earnings to the SRBR using the data and recommended results included in this study. Based on that analysis, we recommend that the 0.60% assumption be increased to 0.65% in the December 31, 2020 valuation in preparing the informational purposes only disclosures. Similar to our prior review, we have excluded the amount of deferred and unrecognized investment gains/losses as of the date of the most recent December 31, 2019 valuation in this review because those amounts have fluctuated over time.

We observed that this assumption has increased mainly in response to the change in the portfolio's standard deviation. Other factors, including the risk adjustment (or margin for adverse deviation), also impact this assumption. The portfolio's standard deviation and our recommended assumption for the 50/50 excess earnings allocation in the past experience studies are as follows:

Experience Study ending December 31	Portfolio Standard Deviation	50/50 Excess Earnings Allocation Impact
2014	14.40%	0.75%
2017	11.52%	0.60%
2020	12.20%	0.65%

Comparison with Alternative Model used to Review Investment Return Assumption

Since our appointment as actuary for ACERA in 2003, we have consistently reviewed investment return assumptions based on our model that incorporates expected arithmetic real returns for the different asset classes and for the entire portfolio as one component of that model.[23] The use of "forward looking expected arithmetic returns" is one of the approaches discussed for use in the Selection of Economic Assumptions for measuring Pension Obligations under ASOP No. 27.

Besides using forward looking expected arithmetic returns, ASOP No. 27 also discussed setting investment return assumptions using an alternative "forward looking expected geometric returns" approach.[24] Even though expected geometric returns are lower than expected arithmetic returns, those California public retirement systems that have set investment return assumptions using this alternative approach have in practice adopted investment return assumptions that are comparable to those adopted by the Board for ACERA. This is because under the model used by those retirement systems, their investment return assumptions are not reduced to anticipate future investment expenses.[25]

For comparison, we evaluated the recommended 7.00% assumption based on the expected geometric return for the entire portfolio, and gross of the investment expenses. Under that model, over a 15-year period, there is a 55% likelihood that future average geometric returns will meet or exceed 7.00%.[26]

Comparing with Other Public Retirement Systems

One final test of the recommended investment return assumption is to compare it against those used by other public retirement systems, both in California and nationwide.

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

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

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

[25] This means that if the model were to be applied to ACERA, the expected geometric return would not be adjusted for the approximately 0.75% investment expenses paid by ACERA.

[26] We performed this stochastic simulation using the capital market assumptions included in the 2020 survey prepared by Horizon Actuarial Services. That simulation was performed using 10,000 trial outcomes of future market returns, using assumptions from 20-year arithmetic returns, standard deviations and correlation matrix that were found in the 2020 survey that included responses from 34 investment advisors.

The following table compares ACERA's recommended net investment return assumption against those of the 188 large public retirement funds in their 2018 fiscal year valuations based on information found in the Public Plans Data website, which is produced in partnership with NASRA:[27]

Assumption	ACERA	Public Plans Data[28]		
		Low	Median	High
Net Investment Return	7.00%	4.50%	7.25%	8.00%

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

In summary, we believe that both the risk adjustment model and other considerations indicate a lower earnings assumption. The recommended assumption of 7.00% provides for a risk margin within the risk adjustment model and is consistent with ACERA's current practice relative to other public systems.

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

C. Salary Increase

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

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

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

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

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

   We also referred to the annual report on the financial status of the Social Security program published in April 2020. In that report, real "across the board" pay increases are forecast to be 1.1% per year under the intermediate assumptions.

   The real pay increase assumption is generally considered a more "macroeconomic" assumption that is not necessarily based on individual plan experience. However, recent salary experience with public systems in California as well as anecdotal discussions with plans and plan sponsors indicate lower future real wage growth expectations for public sector employees. We note that for ACERA's active members, the actual average inflation plus "across the board" increase (i.e., wage inflation) over the five year period ending December 31, 2019 was 2.97% for General and Safety members combined, which is lower than the change in CPI of 3.32% during that same period:

Valuation Date	Actual Average Increase[29]	Actual Change in CPI[30]
December 31, 2015	1.76%	3.18%
December 31, 2016	3.15%	3.53%
December 31, 2017	3.21%	2.94%
December 31, 2018	3.37%	4.50%
December 31, 2019	3.36%	2.45%
Five Year Average[31]	**2.97%**	**3.32%**

Even though the actual average salary increase was lower than the average change in the CPI over the last five-year period from 2015 to 2019 (by 0.35%), that difference has decreased in the last three years since the last experience study was performed for ACERA in 2017 (when the difference was 1.18%). Considering these factors, we recommend maintaining the real "across the board" salary increase assumption at 0.50%. This means that the combined inflation and "across the board" salary increase assumption will decrease from 3.50% to 3.25%.

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

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

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

   b. Excluding any members with increases of more than 100% or a decrease of more than 50% during any particular year;

   c. Categorizing these increases according to member demographics;

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

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

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

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

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[29] Reflects the increase in average salary for members at the beginning of the year versus those at the end of the year. It does not reflect the average salary increases received by members who worked the full year.

[30] Based on the change in the December CPI for the San Francisco-Oakland-Hayward Area (formerly the San Francisco-Oakland-San Jose Area, for December 2017 and earlier) compared to the prior year.

[31] The five-year average covering the years 2012 through 2016 was 1.66% for the actual average increase in ACERA salaries and 2.84% for the actual change in CPI, for a difference of 1.18%

The following table shows the General members' actual average merit and promotion increases by years of service over the three-year period from December 1, 2016 through November 30, 2019. The current and proposed assumptions are also shown. The actual increases were reduced by the actual average inflation plus "across the board" increase (i.e., wage inflation, estimated as the increase in average salaries) for each year during the experience period (3.91% on average for the three-year period).

General

Years of Service	Rate (%)		
	Current Assumptions	Actual Average Increase	Proposed Assumption
Less than 1	4.80	4.28	5.10
1 – 2	4.80	6.62	5.10
2 – 3	3.90	5.14	4.50
3 – 4	2.40	3.43	2.90
4 – 5	1.90	2.29	2.10
5 – 6	1.60	1.60	1.60
6 – 7	1.50	1.53	1.50
7 – 8	1.10	1.88	1.50
8 – 9	0.80	1.24	1.00
9 – 10	0.80	1.04	0.90
10 – 11	0.50	0.81	0.70
11 & Over	0.40	0.24	0.40

The following table shows the Safety members' actual average merit and promotion increases by years of service over the three-year period from December 1, 2016 through November 30, 2019. The current and proposed assumptions are also shown. The actual increases were reduced by the actual average inflation plus "across the board" increase (i.e., wage inflation, estimated as the increase in average salaries) for each year during the experience period (4.06% on average for the three-year period).

Safety

Years of Service	Rate (%)		
	Current Assumptions	Actual Average Increase	Proposed Assumption
Less than 1	7.80	5.99	8.00
1 – 2	7.80	9.57	8.00
2 – 3	7.00	9.76	8.00
3 – 4	4.40	5.45	4.90
4 – 5	3.50	3.86	3.70
5 – 6	2.30	1.86	2.10
6 – 7	1.60	1.08	1.30
7 – 8	1.00	1.36	1.20
8 – 9	1.00	0.13	0.90
9 – 10	0.90	1.03	0.90
10 – 11	0.80	0.11	0.80
11 & Over	0.80	0.54	0.80

Chart 1 that follows later in the section compares actual experience with the current and proposed rates of actual merit and promotion increases for General members.

Chart 2 compares actual experience with the current and proposed rates of actual merit and promotion increases for Safety members.

Based on this experience, we are proposing changes in the merit and promotion salary increases for both General and Safety members, with increases for most service categories for General members, and with increases mostly at the lower service categories and decreases a few of the middle service categories for Safety members. Overall, *merit and promotion* salary increases are assumed to be higher for General and Safety members. However, the overall salary increase assumptions will decrease slightly for General and Safety members after taking into account the lower *inflation* component of the salary increase assumption.

Chart 1: Merit and Promotion Salary Increase Rates
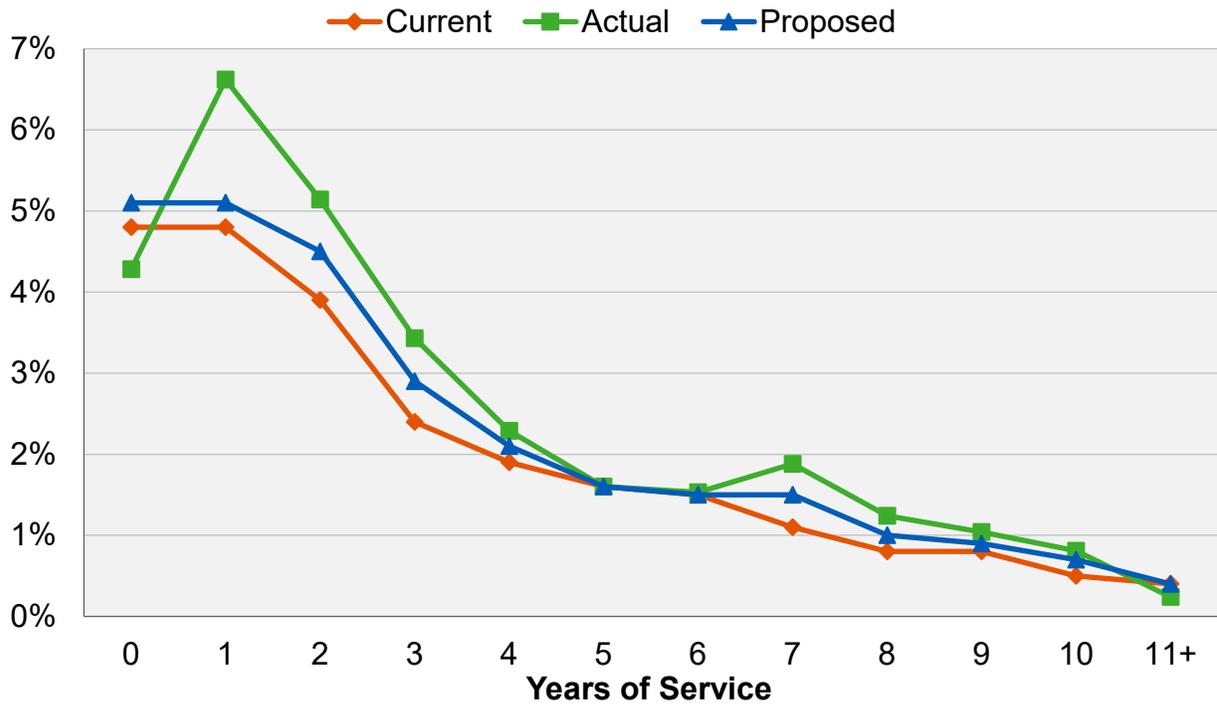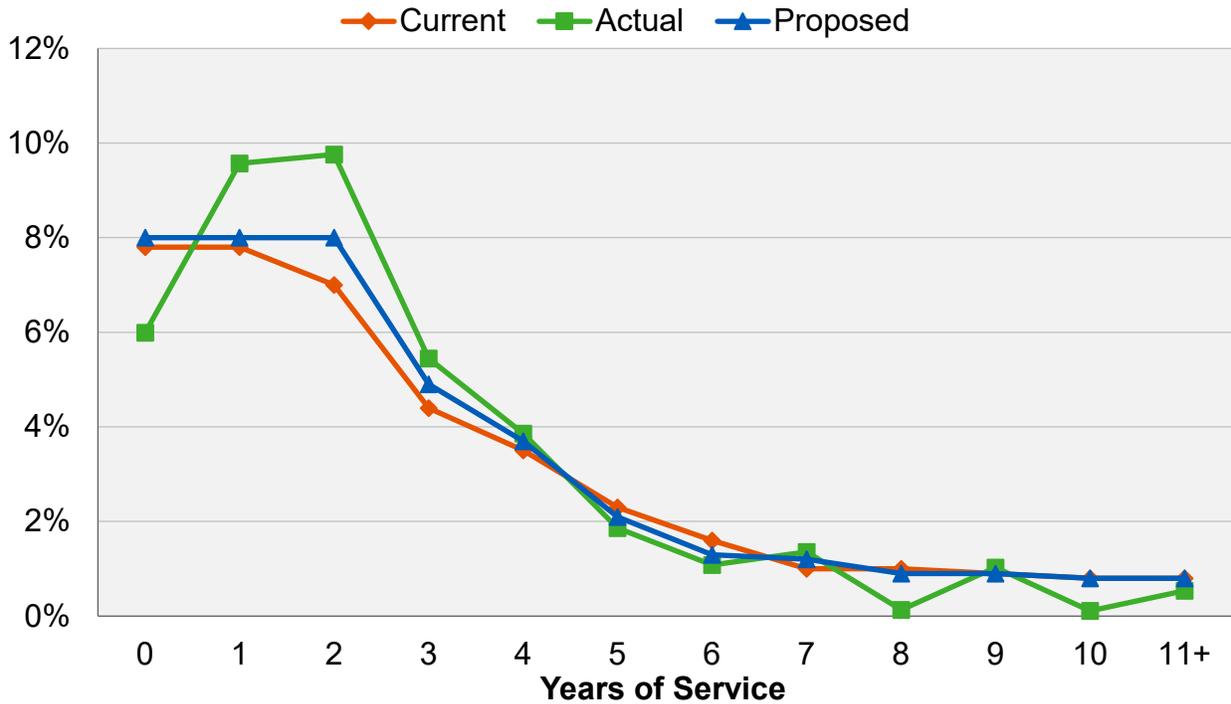## General Members

Chart 2: Merit and Promotion Salary Increase Rates
Safety Members

Active Member Payroll

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

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

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

Terminal Pay

Under the Ventura Settlement, employers agreed to include several additional pay elements as Earnable Compensation for non-CalPEPRA members. There are two categories within which these additional pay elements fall:

➢ Ongoing Pay Elements – Those that are expected to be received relatively uniformly over a member's employment years; and

➢ Terminal Pay Elements – Those that are expected to be received only during the member's final average earnings pay period.

The first category is recognized in the actuarial calculations by virtue of being included in the current pay of active members. The second category requires an actuarial assumption to anticipate its impact on a member's retirement benefit.

Data has been collected since 1997 to estimate terminal pay for active members as a percentage of current pay. Because of the uncertainty associated with terminal pay (e.g., vacation accrual and sell off policies, maximum vacation carryover, vacation usage, etc.) a range of estimates was determined. An assumption was then recommended for terminal pay.

Service Retirements

In the following table, we have summarized the observed vacation and sick leave cash out from members who retired from service during December 2016 – November 2017, December 2017 – November 2018, and December 2018 – November 2019.[32] Note that there was no experience observed for General Tier 3, Safety Tier 2C, or Safety Tier 2D members (and this assumption does not apply to the CalPEPRA tiers, as noted above). In the current valuation, General Tier 3 shares the same terminal pay assumption as General Tier 1 because both of these Tiers use final 1-year average compensation. Similarly, Safety Tier 2C and Safety Tier 2D share the same terminal pay assumption as Safety Tier 2.

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[32] It is our understanding that sick leave cash out is no longer included in final average compensation effective July 12, 2014.

	Observed Terminal Pay Percentages			
	December 2016 – November 2017		December 2017 – November 2018	
Membership Category	Number of Retirees	Terminal Pay*	Number of Retirees	Terminal Pay*
General Tier 1	46	7.4%	32	7.1%
General Tier 2	263	2.7%	286	2.8%
Safety Tier 1	1	0.0%	1	7.5%
Safety Tier 2	33	1.3%	37	2.1%
	Observed Terminal Pay Percentages			
	December 2018 – November 2019		Three-Year Period Combined	
Membership Category	Number of Retirees	Terminal Pay*	Number of Retirees	Terminal Pay*
General Tier 1	24	5.9%	102	6.9%
General Tier 2	304	2.9%	853	2.8%
Safety Tier 1	1	9.6%	3	5.7%
Safety Tier 2	43	2.0%	113	1.8%

* *The total of vacation and sick leave cash out expressed as a percent of final average compensation before such cash out.*

On September 12, 2012, the Governor of California approved Assembly Bill (AB) 197 that, in part, excludes "various payments from the definition of compensation earnable" including "payments made at the termination of employment." We understand that action was taken by the Board to implement AB 197, which was subsequently challenged in a lawsuit. In the latest update we received on July 31, 2020 following the recent California Supreme Court decision on compensation earnable, we asked ACERA for directions on whether the Supreme Court decision on compensation earnable is expected to have an impact on the pay elements that we have used in our analysis of the Terminal Pay assumption. We were informed that the decision will not affect those terminal pay elements for Legacy members. Also, ACERA further indicated that they "will await the Trial Court ruling to determine any future changes which should be minor and only impact a few pay items."

Based on this information, we have not made any adjustments to the pay elements included in our analysis above, and we have recommended a reduction in the terminal pay assumptions for service retirement for General Tier 1 members (and consequently for General Tier 3 members), for Safety Tier 1 members, and for Safety Tier 2 members (and, consequently, for Safety Tier 2C and Tier 2D members). The assumption for General Tier 2 remains unchanged. Note that we will continue to monitor the terminal pay assumptions for all non-CalPEPRA tiers as the impact of the Trial Court ruling becomes available.

The current and recommended terminal pay assumptions for members who are expected to retire from service are as follows:

	Terminal Pay Assumptions for Service Retirement	
Membership Category	Current Assumptions	Proposed Assumptions
General Tier 1	8.0%	7.5%
General Tier 2	3.0%	3.0%
General Tier 3	8.0%	7.5%
Safety Tier 1	8.5%	7.5%
Safety Tier 2	3.5%	2.5%
Safety Tier 2C	3.5%	2.5%
Safety Tier 2D	3.5%	2.5%

Disability Retirements

We have also received data to analyze the terminal pay assumptions for disabled retirees. The results are as follows:

	Observed Terminal Pay Percentages – Three-Year Period Combined	
Membership Category	Number of Retirees	Terminal Pay*
General Tier 1	0	0.0%
General Tier 2	1	1.2%
Safety Tier 1	0	0.0%
Safety Tier 2	19	1.7%

The total of vacation and sick leave cash out expressed as a percent of final average compensation before such cash out.

We are recommending a slight reduction in the terminal pay assumption for disability retirement for Safety Tier 2 members (and, consequently, for Safety Tier 2C and Tier 2D members). The assumptions for the other tiers remain unchanged.

The current and recommended terminal pay assumptions for members who are expected to retire from disability are as follows:

	Terminal Pay Assumptions for Disability Retirement	
Membership Category	Current Assumptions	Proposed Assumptions
General Tier 1	6.5%	6.5%
General Tier 2	1.4%	1.4%
General Tier 3	6.5%	6.5%
Safety Tier 1	6.4%	6.4%
Safety Tier 2	2.1%	1.9%
Safety Tier 2C	2.1%	1.9%
Safety Tier 2D	2.1%	1.9%

IV. Demographic Assumptions

A. Retirement Rates

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

The Association's current retirement rates for the non-CalPEPRA plans are separated into:

(1) General Tier 1

(2) General Tier 2

(3) General Tier 3

(4) Safety Tier 1

(5) Safety Tier 2 (and Safety Tier 2D)

(6) Safety Tier 2C

For members who are covered under the CalPEPRA plans, the retirement rates are separated into:

(1) General Tier 4

(2) Safety Tier 4

Use of Age-Based Versus Service-Based Retirement Assumptions

Currently, the assumed retirement rates are a function of only the member's age. In this year's experience study, we have analyzed recent years' retirement experience for the largest General and Safety tiers, namely General Tier 2 and Safety Tier 2 (with Safety Tier 2D) as a function of age and years of service, but only using two service categories in relation to the probability of retirement. Our review concludes that the General Tier 2 and Safety Tier 2 retirement rates generally correlate both with age and with years of service when we look at the experience of those members before and after attaining 30 years of service.

The tables on the following pages show the observed service retirement rates for the plans listed above based on the actual experience over the past three years. The observed service retirement rates were determined by comparing those members who actually retired from service to those eligible to retire from service. This same methodology is followed throughout this report and was described in Section II. Also shown are the current rates assumed and the rates we propose. For General Tier 2 and Safety Tier 2, experience is separated for members with less than 30 years of service and members with 30 or more years of service.

General Tier 1

Age	Rate of Retirement (%)		
	Current Rate	Actual Rate	Proposed Rate
50	4.00	0.00	2.00
51	4.00	33.33	4.00
52	4.00	0.00	4.00
53	4.00	9.09	5.00
54	4.00	0.00	5.00
55	6.00	0.00	6.00
56	8.00	18.18	10.00
57	10.00	16.00	12.00
58	12.00	5.88	12.00
59	14.00	17.65	14.00
60	20.00	25.00	20.00
61	20.00	20.37	20.00
62	35.00	35.00	35.00
63	30.00	30.95	30.00
64	30.00	17.14	30.00
65	35.00	30.00	30.00
66	35.00	30.00	30.00
67	30.00	16.67	30.00
68	30.00	30.00	30.00
69	35.00	33.33	35.00
70	65.00	66.67	40.00
71	65.00	0.00	40.00
72	65.00	0.00	40.00
73	65.00	0.00	40.00
74	65.00	0.00	40.00
75 & Over	100.00	0.00	100.00

For General Tier 1 members, we are recommending increases in some of the retirement rates at the younger ages and decreases in some of the retirement rates at the older ages. Overall, the proposed rates will anticipate fewer retirements.

Chart 3 that follows later in this section compares actual experience with the current and proposed rates of retirement for General Tier 1 members.

General Tier 2

		Rate of Retirement (%)			
		Actual Rate		**Proposed Rate**	
Age	**Current Rate**	**< 30**	**30+**	**<30**	**30+**
50	2.00	2.56	0.00	2.00	4.00
51	2.00	1.58	0.00	2.00	4.00
52	2.00	2.12	5.56	2.00	4.00
53	2.00	0.77	0.00	2.00	4.00
54	2.00	2.62	6.67	2.00	4.00
55	2.00	2.11	6.35	2.00	4.00
56	3.00	2.13	5.56	2.50	4.50
57	4.00	4.14	4.92	4.00	5.00
58	4.00	3.98	3.28	4.00	5.00
59	5.00	4.36	10.96	4.50	8.00
60	7.00	8.28	8.47	8.00	8.50
61	9.00	8.67	18.00	9.00	13.50
62	15.00	15.17	21.95	15.00	22.50
63	16.00	14.61	31.25	15.00	22.50
64	18.00	18.26	25.00	18.00	27.00
65	25.00	31.02	27.27	25.00	27.50
66	25.00	29.11	48.00	30.00	33.00
67	25.00	35.26	20.00	30.00	33.00
68	30.00	26.67	30.00	30.00	33.00
69	35.00	22.73	42.86	35.00	38.50
70	50.00	33.33	0.00	40.00	40.00
71	50.00	34.09	50.00	40.00	40.00
72	50.00	45.45	0.00	40.00	40.00
73	50.00	31.58	33.33	40.00	40.00
74	50.00	25.00	0.00	40.00	40.00
75 & Over	100.00	16.87	100.00	100.00	100.00

For General Tier 2 members with less than 30 years of service, we are recommending decreases in several of the retirement rates. For General Tier 2 members with 30 or more years of service, we are recommending increases in the retirement rates for ages 50 – 69 and decreases in the rates for ages 70 - 74. Overall, the proposed rates will anticipate more retirements.

Chart 4A that follows later in this section compares actual experience with the current and proposed rates of retirement for General Tier 2 members with less than 30 years of service.

Chart 4B compares actual experience with the current and proposed rates of retirement for General Tier 2 members with 30 or more years of service

General Tier 3

Age	Rate of Retirement (%)		
	Current Rate	Actual Rate	Proposed Rate
50	6.00	33.33	10.00
51	3.00	0.00	10.00
52	5.00	33.33	10.00
53	6.00	25.00	10.00
54	6.00	0.00	10.00
55	12.00	33.33	12.00
56	13.00	33.33	14.00
57	13.00	0.00	16.00
58	14.00	33.33	18.00
59	16.00	0.00	20.00
60	21.00	0.00	20.00
61	20.00	66.67	20.00
62	30.00	50.00	30.00
63	25.00	0.00	25.00
64	25.00	0.00	25.00
65	30.00	75.00	50.00
66	25.00	100.00	50.00
67	25.00	0.00	50.00
68	25.00	0.00	50.00
69	50.00	0.00	50.00
70	65.00	0.00	65.00
71	65.00	0.00	65.00
72	65.00	0.00	65.00
73	65.00	0.00	65.00
74	65.00	0.00	65.00
75 & Over	100.00	0.00	100.00

For General Tier 3 members, we are recommending increases in many of the retirement rates prior to age 69. Overall, the proposed rates will anticipate more retirements.

Chart 5 that follows later in this section compares actual experience with the current and proposed rates of retirement for General Tier 3 members.

General Tier 4

Age	Rate of Retirement (%)		
	Current Rate	Actual Rate	Proposed Rate
50	0.00	0.00	0.00
51	0.00	0.00	0.00
52	4.00	0.00	4.00
53	1.50	7.14	2.00
54	1.50	0.00	2.00
55	2.00	14.29	5.00
56	2.50	0.00	2.50
57	3.50	0.00	3.50
58	3.50	0.00	3.50
59	4.50	11.11	4.50
60	6.00	0.00	5.00
61	8.00	0.00	5.00
62	18.00	23.08	18.00
63	15.00	0.00	15.00
64	17.00	22.22	17.00
65	22.00	33.33	25.00
66	25.00	60.00	30.00
67	25.00	33.33	30.00
68	30.00	50.00	30.00
69	35.00	25.00	35.00
70	50.00	0.00	25.00
71	50.00	0.00	25.00
72	50.00	0.00	25.00
73	50.00	0.00	25.00
74	50.00	0.00	25.00
75 & Over	100.00	22.22	100.00

For General Tier 4 members, we are recommending decreases in some of the retirement rates and increases in some of the other rates. Overall, the proposed rates will anticipate fewer retirements.

Chart 6 that follows later in this section compares actual experience with the current and proposed rates of retirement for General Tier 4 members.

Safety Tier 1

Age	Rate of Retirement (%)		
	Current Rate[1]	Actual Rate[2]	Proposed Rate[1]
49	0.00	0.00	0.00
50	35.00	0.00	35.00
51	30.00	0.00	30.00
52	25.00	0.00	25.00
53	35.00	0.00	35.00
54	45.00	0.00	45.00
55	45.00	0.00	45.00
56	45.00	0.00	45.00
57	45.00	50.00	45.00
58	45.00	100.00	45.00
59	45.00	0.00	45.00
60	45.00	0.00	45.00
61	45.00	0.00	45.00
62	45.00	0.00	45.00
63	45.00	50.00	45.00
64	45.00	0.00	45.00
65 & Over	100.00	0.00	100.00

[1]   Retirement rate is 100% after a member accrues a benefit of 100% of final average earnings.

[2]   Excluding members who have accrued a benefit of 100% of final average earnings.

Due to very limited experience, we are not recommending any changes in the retirement rates for Safety Tier 1 members.

Chart 7 that follows later in this section compares actual experience with the current and proposed rates of retirement for Safety Tier 1 members.

Safety Tier 2 (and Safety Tier 2D)

Currently the retirement rates for Safety Tier 2 members are also used for members in Safety Tier 2D. Note that we only have one Tier 2D member who retired during the current experience study period (at age 58), so we recommend utilizing the proposed Safety Tier 2 rates for Safety Tier 2D. We will monitor this assumption as further experience develops for Tier 2D.

Age	Current Rate[1]	Rate of Retirement (%)			
		Actual Rate		Proposed Rate	
		< 30	30+	< 30	30+
49	10.00	17.07	0.00	12.00	18.00
50	15.00	11.72	0.00	12.00	18.00
51	15.00	9.82	0.00	10.00	24.00
52	15.00	10.11	100.00	10.00	24.00
53	15.00	2.94	16.67	10.00	25.00
54	15.00	9.84	50.00	12.00	27.00
55	15.00	9.09	80.00	12.00	29.00
56	15.00	8.89	0.00	14.00	32.00
57	15.00	17.65	33.33	16.00	32.00
58	20.00	20.00	25.00	18.00	30.00
59	20.00	16.00	0.00	18.00	30.00
60	30.00	30.43	0.00	25.00	30.00
61	30.00	20.00	0.00	25.00	30.00
62	30.00	18.18	0.00	25.00	30.00
63	30.00	11.11	0.00	25.00	30.00
64	50.00	0.00	50.00	30.00	30.00
65 & Over	100.00	35.14	0.00	100.00	100.00

[1]   Retirement rate is currently assumed at 100% after a member accrues a benefit of 100% of final average earnings.

For Safety Tier 2 (and Safety Tier 2D) members with less than 30 years of service, we are recommending decreases in most of the retirement rates. For Safety Tier 2 (and Safety Tier 2D) members with 30 or more years of service, we are recommending increases in most of the retirement rates. Overall, the proposed rates will anticipate fewer retirements.

Retirement rate is currently assumed at 100% after a Safety Tier 2 (and Safety Tier 2D) member accrues a benefit of 100%of final average earnings. However, we are recommending removing this assumption under the new retirement assumption structure as a function of both age and years of service.

Chart 8A that follows later in this section compares actual experience with the current and proposed rates of retirement for Safety Tier 2 members with less than 30 years of service.

Chart 8B compares actual experience with the current and proposed rates of retirement for Safety Tier 2 members with 30 or more years of service

Safety Tier 2C

Age	Rate of Retirement (%)	
	Current Rate[1]	Proposed Rate[1]
49	0.00	0.00
50	4.00	4.00
51	2.00	2.00
52	2.00	2.00
53	3.00	3.00
54	6.00	6.00
55	10.00	10.00
56	12.00	12.00
57	20.00	20.00
58	10.00	10.00
59	15.00	15.00
60	60.00	60.00
61	60.00	60.00
62	60.00	60.00
63	60.00	60.00
64	60.00	60.00
65 & Over	100.00	100.00

[1]   *Retirement rate is 100% after a member accrues a benefit of 100% of final average earnings.*

There was only one Safety Tier 2C member eligible for retirement and that member actually retired (at age 49). Due to this very limited experience, we are not recommending any changes in the retirement rates for Safety Tier 2C members.

Safety Tier 4

	Rate of Retirement (%)		
Age	**Current Rate**	**Actual Rate**	**Proposed Rate**
49	0.00	0.00	0.00
50	4.00	0.00	4.00
51	2.00	0.00	2.00
52	2.00	0.00	2.00
53	3.00	0.00	3.00
54	6.00	0.00	6.00
55	10.00	0.00	10.00
56	12.00	66.67	12.00
57	20.00	100.00	20.00
58	10.00	33.33	10.00
59	15.00	0.00	15.00
60	60.00	0.00	60.00
61	60.00	0.00	60.00
62	60.00	0.00	60.00
63	60.00	0.00	60.00
64	60.00	0.00	60.00
65 & Over	100.00	100.00	100.00

Due to very limited experience, we are not recommending any changes in the retirement rates for Safety Tier 4 members.

Chart 9 that follows later in this section compares actual experience with the current and proposed rates of retirement for Safety Tier 4 members.

Deferred Vested Members

In prior valuations, deferred vested General and Safety members were assumed to retire at age 61 and 56, respectively. The average age at retirement over the prior three years was 61.6 for General and 54.0 for Safety.

We recommend maintaining the General deferred vested retirement assumption at age 61 and lowering the Safety deferred vested retirement assumption to age 55.

Please note that for members who terminate with less than five years of service and are not vested, we assume that they will retire at age 70 for both General and Safety if they decide to leave their contributions on deposit as permitted by §31629.5.

Reciprocity

Under the current assumptions, it is assumed that 30% of General and 60% of Safety future deferred vested members would be covered under a reciprocal retirement system. For those covered under a reciprocal retirement system, General and Safety members are assumed to

receive 3.90% and 4.30% annual salary increases from termination until their date of retirement. During the last three valuations, on average about 23% of the General deferred vested and 45% of the Safety deferred vested members went on to be covered by a reciprocal retirement system.

We recommend decreasing the reciprocal assumption to 25% for General members and to 50% for Safety members. This recommendation takes into account the experience of all deferred vested members during the last three valuations instead of just new deferred vested members during the three-year period. This is because there is a lag between a member's date of termination and the time that it is known if they have reciprocity with a reciprocal retirement system.

In addition, we recommend 3.65% and 4.05% annual salary increase assumptions for General and Safety members, respectively, be utilized to anticipate salary increases from the date of termination from ACERA to the expected date of retirement for deferred vested members covered by a reciprocal retirement system. These assumptions are based on the ultimate 0.40% and 0.80% merit and promotion salary increase assumptions for General and Safety members, respectively, together with the 2.75% inflation and 0.50% real "across the board" salary increase assumptions that are recommended earlier in Section III of this report.

Survivor Continuance

In prior valuations, it was assumed that 70% of all active male members and 50% of all active female members would have an eligible survivor when they retired. According to the experience of members who retired during the three-year period, about 69% of all male members and 51% of all female members were married at retirement. We recommend maintaining this assumption at 70% for male members and 50% for female members.

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

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

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

	Spouse's Age as Compared to Member's Age	
	Male	**Female**
Current Assumption	3 years older	2 years younger
Actual ACERA Experience	3.4 years older	2.1 years younger
Proposed Assumption	3 years older	2 years younger

Conversion of Unused Sick Leave

The current assumption for converting sick leave into additional service credit at retirement is that for each year of employment, an employee will convert approximately 0.003 years of sick leave into additional service credit at retirement for General and 0.006 years of sick leave into additional service credit at retirement for Safety members. We have observed that the conversion of sick leave for new retirees over each of the last three years has averaged about 0.0034 years for each year of employment for General members and about 0.0073 years for Safety members. Based on this observed experience, we recommend that the sick leave conversion assumption be maintained at 0.003 years of additional service credit at retirement for each year of employment for General members, and that the assumption be increased from 0.006 to 0.007 years for Safety members.

Chart 3: Retirement Rates
General Tier 1 Members
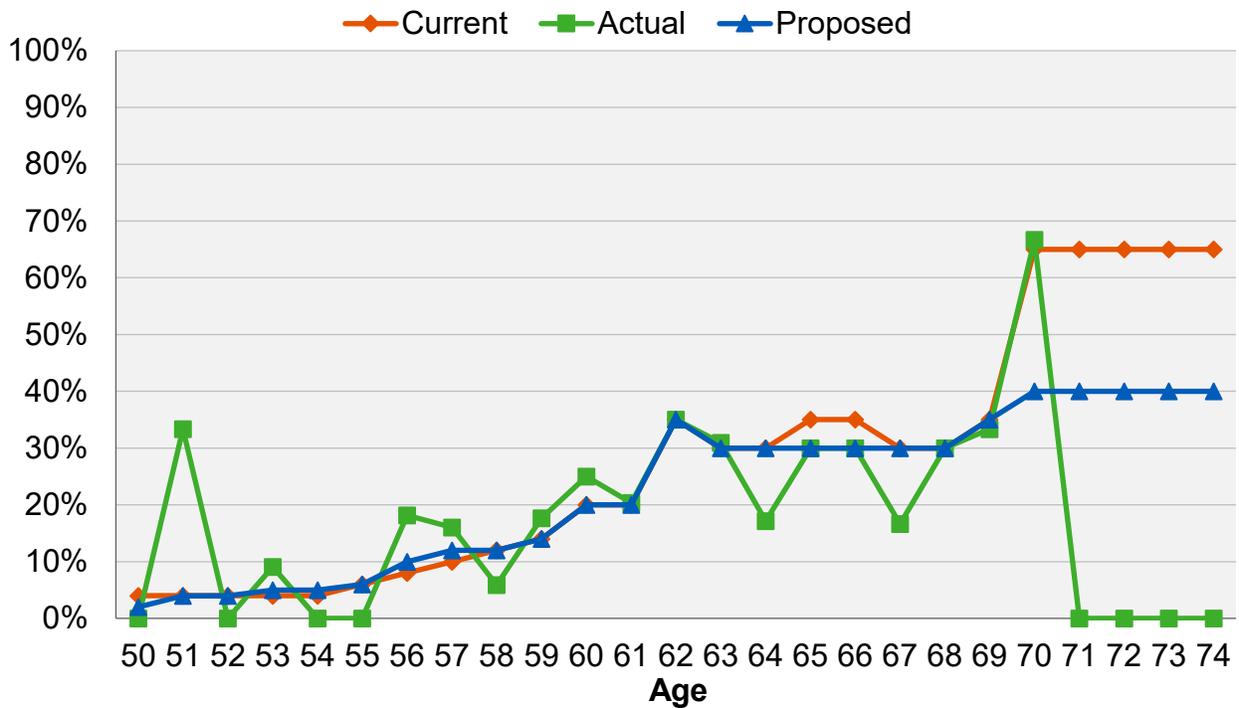
Chart 4A: Retirement Rates
General Tier 2 Members with Less than 30 Years of Service
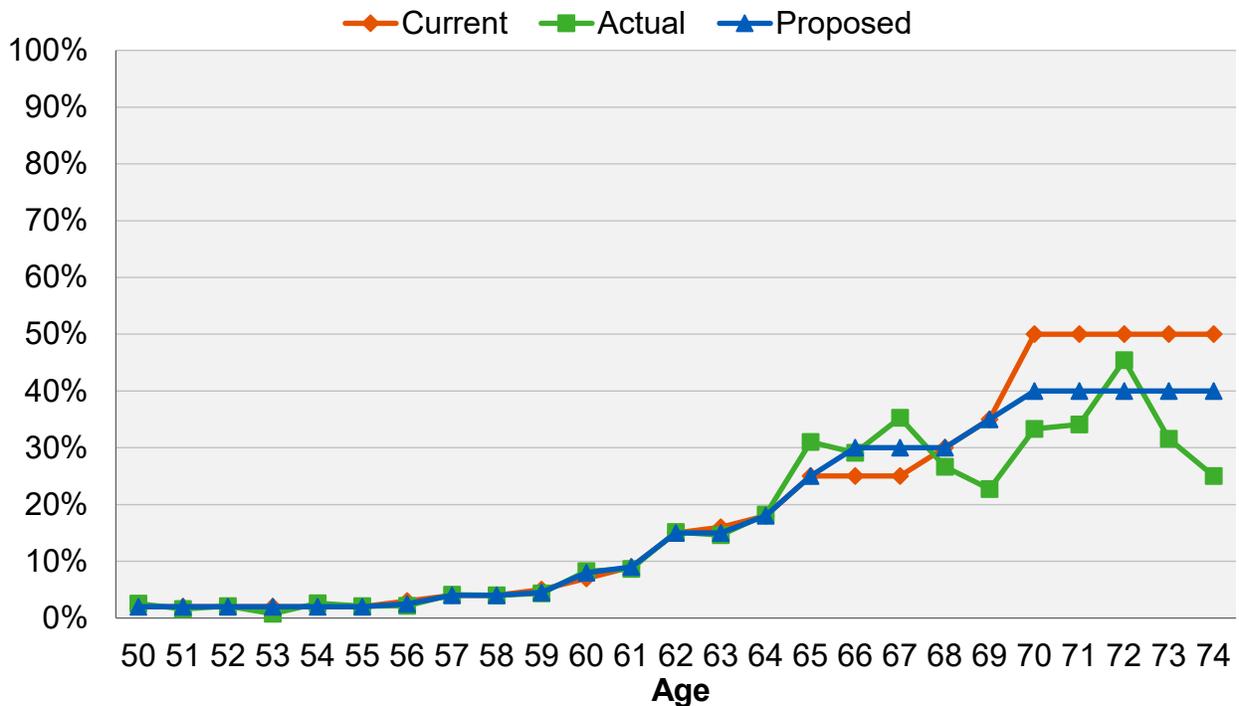
Chart 4B: Retirement Rates
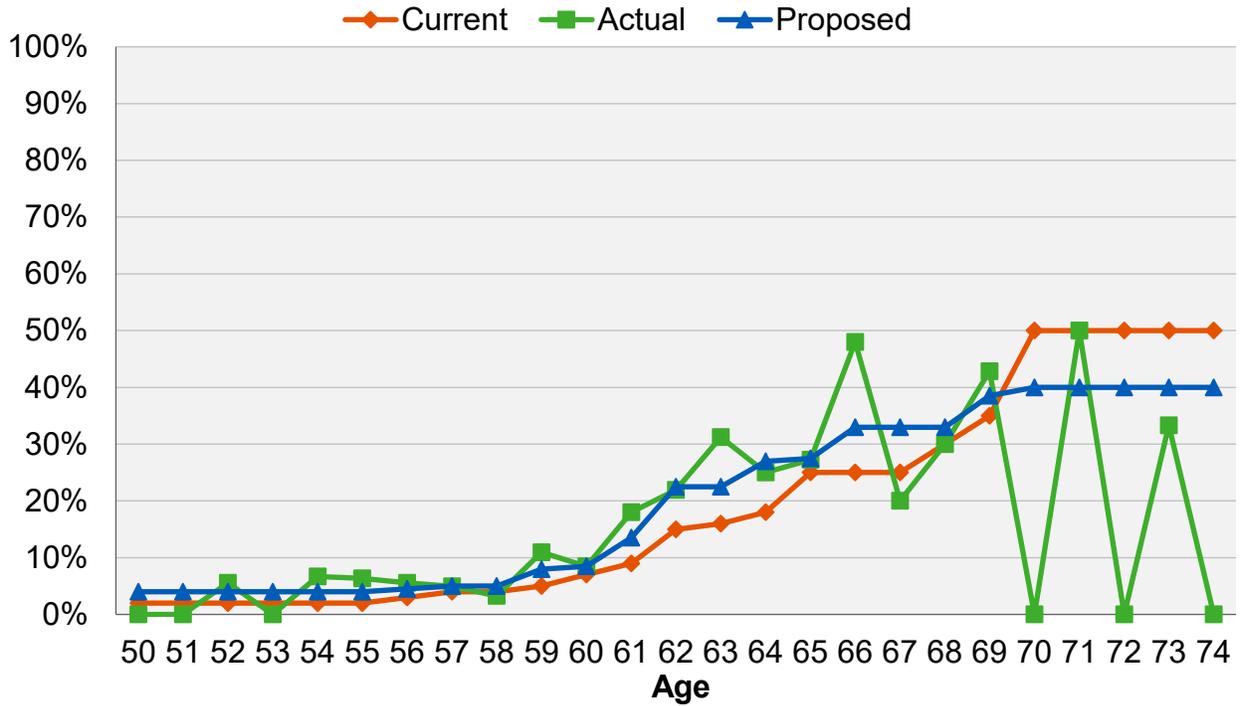## General Tier 2 Members with 30 or More Years of Service
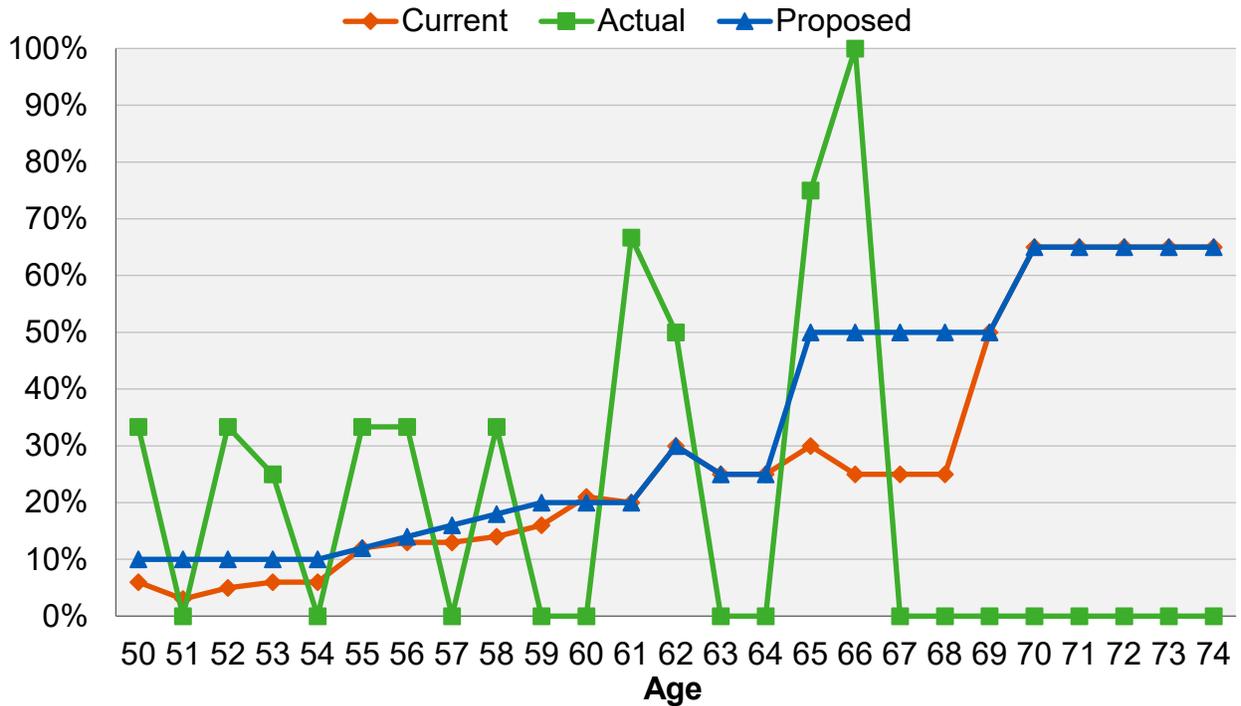

Chart 5: Retirement Rates
General Tier 3 Members
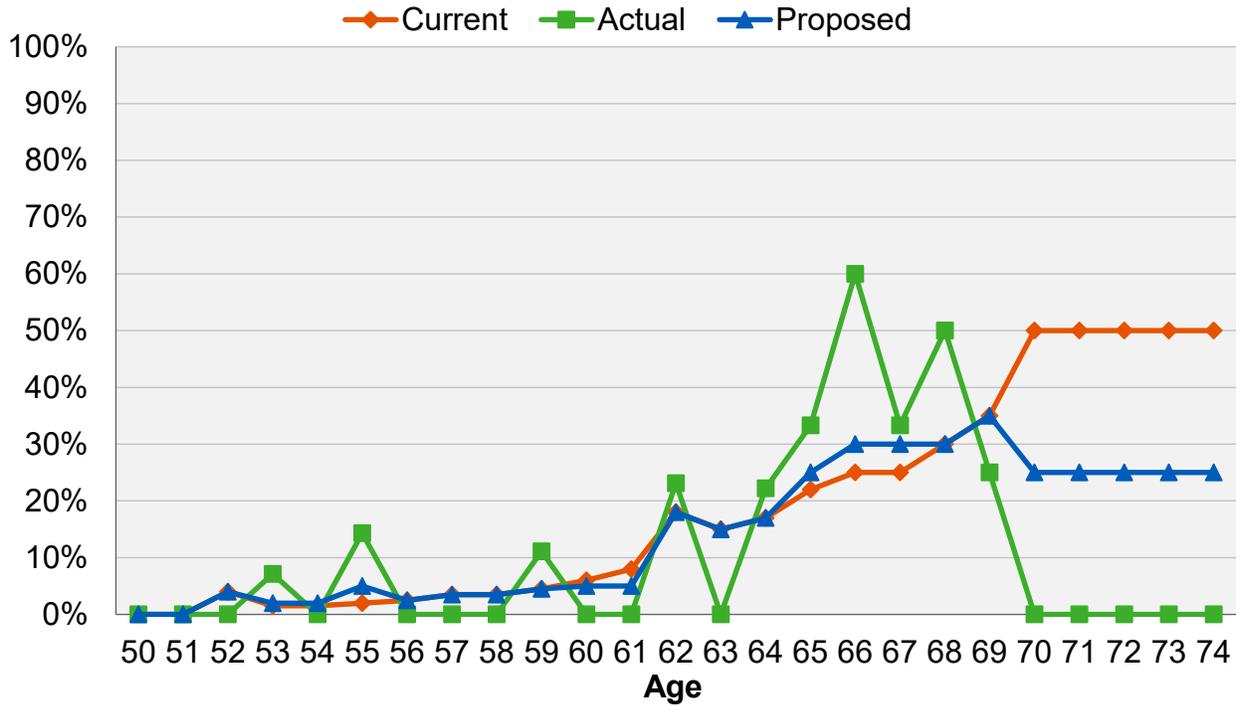
Chart 6: Retirement Rates
General Tier 4 Members
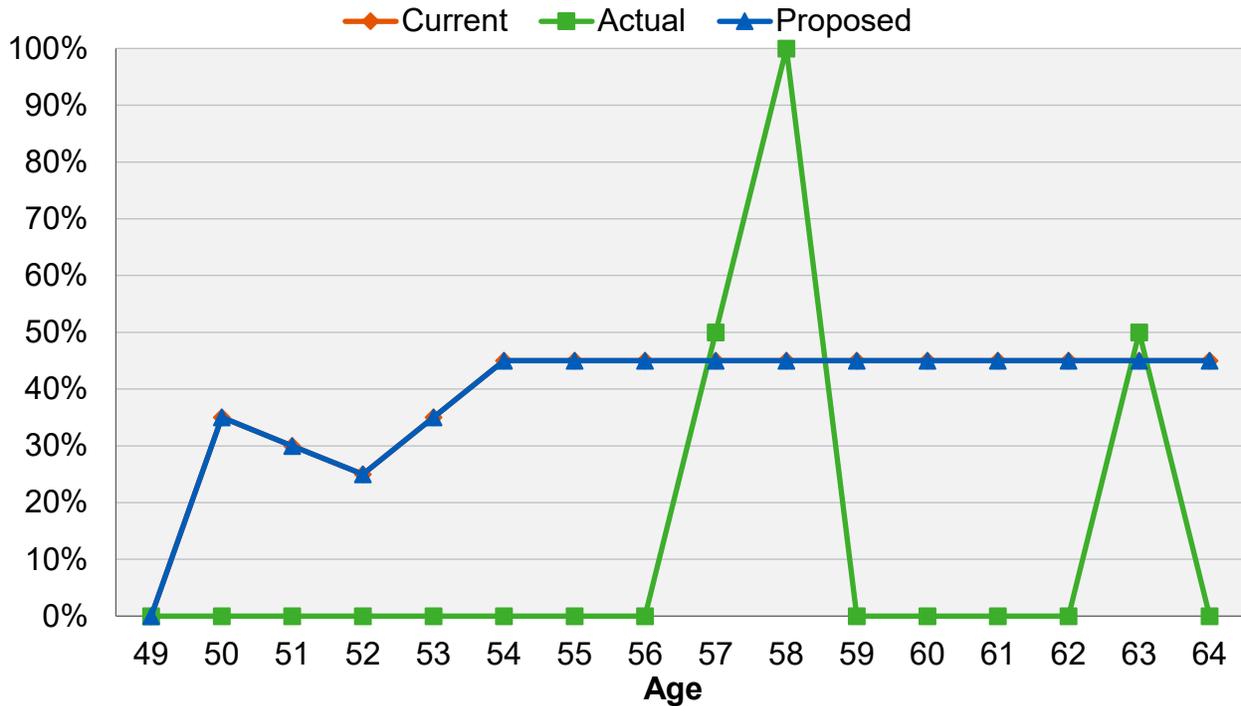

Chart 7: Retirement Rates
Safety Tier 1 Members

Chart 8A: Retirement Rates
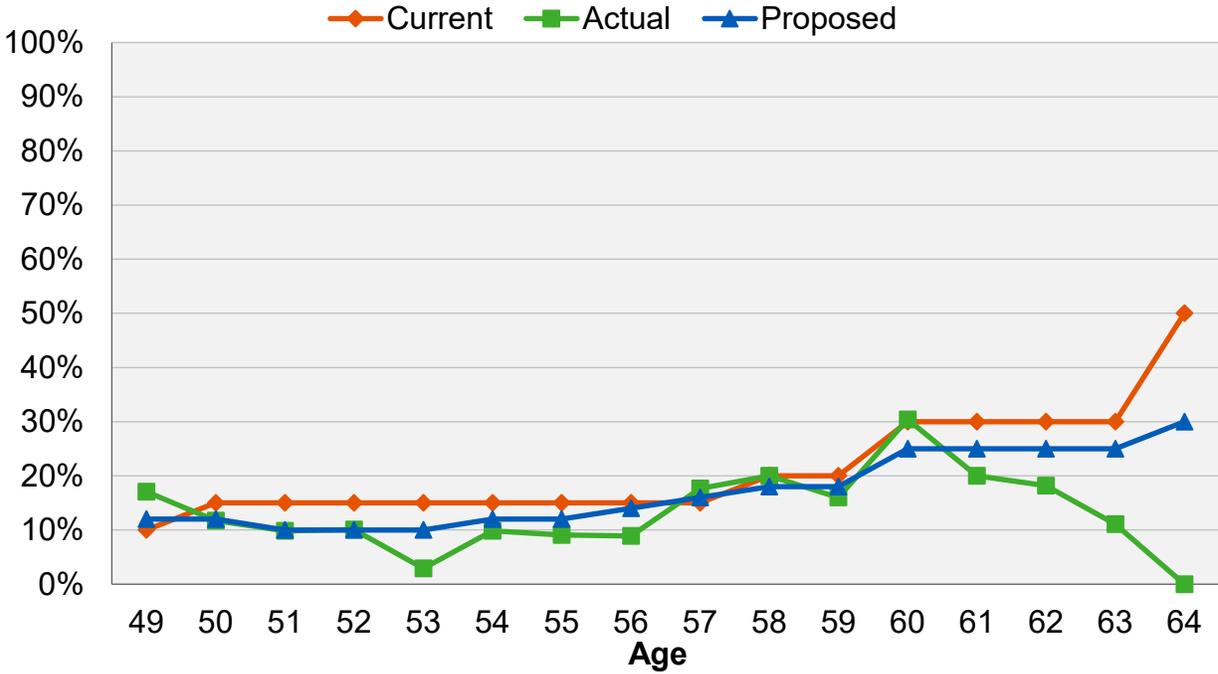## Safety Tier 2 (and Safety Tier 2D) Members with Less than 30 Years of Service

Chart 8B: Retirement Rates
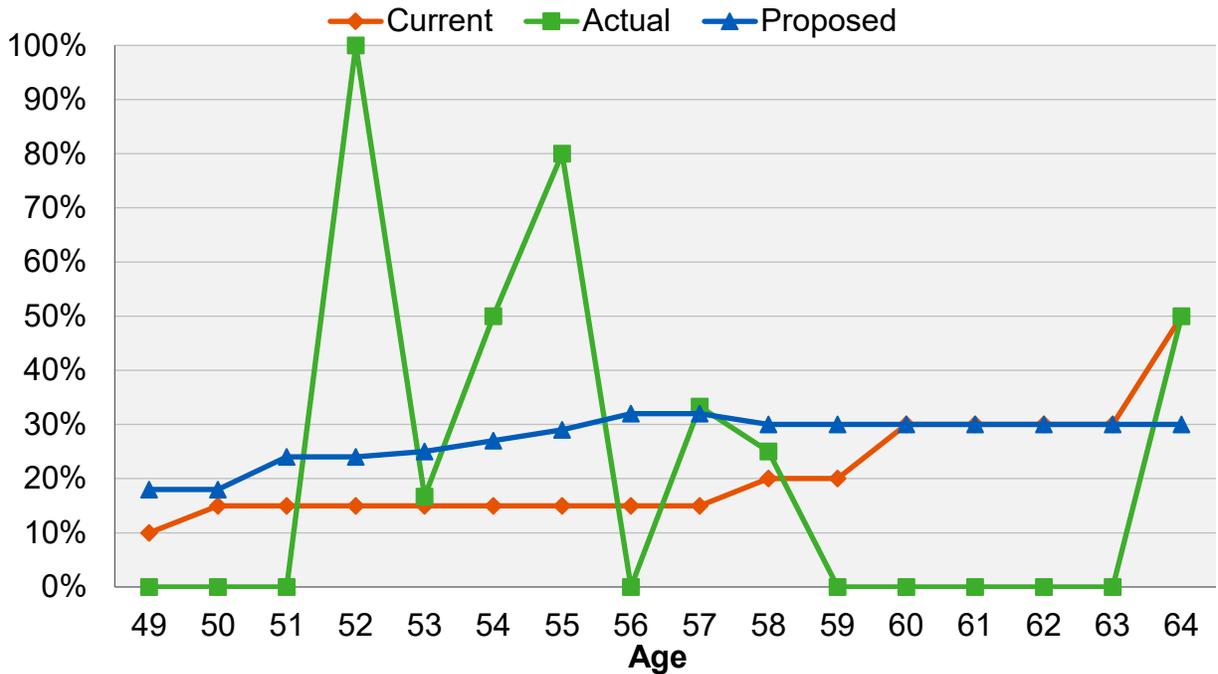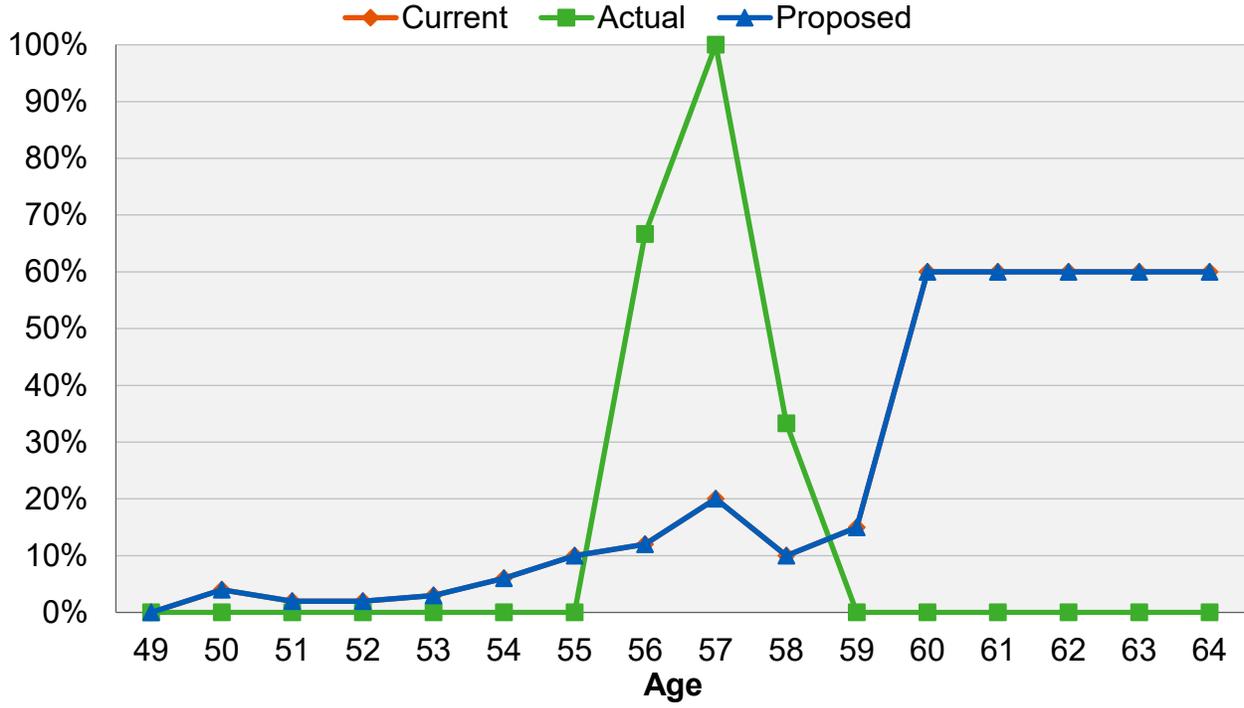## Safety Tier 2 (and Safety Tier 2D) Members with 30 or More Years of Service

Chart 9: Retirement Rates
Safety Tier 4 Members

B. Mortality Rates - Healthy

The "healthy" mortality rates project the life expectancy of a member who retires from service (i.e., who did not retire on a disability pension). Also, the "healthy" pre-retirement mortality rates project what proportion of members will die before retirement. For General and Safety members, the tables currently being used for post-service retirement mortality rates are the Headcount-Weighted RP-2014 Healthy Annuitant Mortality Tables (separate tables for males and females) with no setback for males and females, projected generationally with the two-dimensional mortality improvement scale MP-2016. Beneficiaries are assumed to have the same mortality as a General Member of the opposite sex who is receiving a service (non-disability) retirement.

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

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

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

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

Note: Values shown as of 2010.

When we adjust the above amounts by a reasonable measure of U.S. price inflation from 2010 to 2019 for a total increase of around 30%, the benefit amounts (or salaries) paid to ACERA's members were generally greater than the adjusted median amounts shown above. Therefore, we recommend that the above-median version of the mortality tables be used for General and Safety members.

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

A generational mortality table provides dynamic projections of mortality experience for each cohort of retirees. For example, the mortality rate for someone who is 65 next year will be slightly less than for someone who is 65 this year. In general, using generational mortality anticipates increases in the cost of the Plan over time as participants' life expectancies are projected to increase.

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

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

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

Pre-Retirement Mortality

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

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

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

Based on actual experience during the three-year experience study period, we also recommend maintaining the current assumption for pre-retirement mortality of 100% non-service connected for both General and Safety members.[33]

For General members in the OPEB SRBR valuation, we recommend changing the pre-retirement mortality to follow the Pub-2010 General Employee Headcount-Weighted Above-Median Mortality Tables (separate tables for males and females), projected generationally with the two-dimensional mortality improvement scale MP-2019.

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

Post-Retirement Mortality (Service Retirements)

Among all retired members, the actual deaths compared to the expected deaths weighted by benefit amounts under the current assumptions for the last nine years are shown in the table below. We also show the deaths weighted by benefit amount under the proposed assumptions. We continue to recommend the use of a generational mortality table, which incorporates a more explicit assumption for future mortality improvement. Accordingly, the goal is to adjust the base table so that actual deaths would be about 100% of those assumed (i.e., without a margin for future mortality improvement), because future mortality improvement is already reflected in the generational projection.

The proposed mortality tables also reflect current experience to the extent that the experience is credible based on standard statistical theory. For ACERA, the volume of General member data makes it relatively credible. In contrast, there is much less Safety data, so it is given substantially less credibility. However, in both cases, the volume of member data makes it only partially credible. That is why, as shown in the table below, the proposed mortality tables (which include adjustments to the base table to reflect current experience) have actual to expected ratios of 97% for General members and 107% for Safety members. In future years the ratio should remain around 97% and 107% for General and Safety, respectively, as long as actual mortality improves at the same rates as anticipated by the generational mortality tables.

The number of actual deaths compared to the number expected under the current and proposed assumptions weighted by benefit amounts for the last nine years are as follows:

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

Gender	General Members – Healthy ($ in millions)			Safety Members – Healthy ($ in millions)		
	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths
Male	$2.36	$1.96	$2.01	$0.92	$0.69	$0.65
Female	2.32	1.95	2.00	0.14	0.13	0.12
Total	**$4.69**	**$3.91**	**$4.01**	**$1.05**	**$0.82**	**$0.77**
Actual / Expected	83%		97%	78%		107%

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

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

(3) Results may not add due to rounding.

For General members, we recommend updating the current tables to the Pub-2010 General Healthy Retiree Amount-Weighted Above-Median Mortality Tables (separate tables for males and females), projected generationally with the two-dimensional mortality improvement scale MP-2019. The recommended mortality tables have an actual to expected ratio of 97%.

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

For the purpose of setting the assumptions for the OPEB SRBR valuation, we have also provided in the table below the actual and expected deaths computed without weighting these by benefit amounts using the headcount –weighted version of the Pub-2010 tables. This is similar to how actual and expected death ratios were developed based on the prior headcount approach.

Gender	General Members – Healthy			Safety Members – Healthy		
	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths
Male	649	627	588	148	124	112
Female	924	845	860	27	26	25
Total	1,573	1,472	1,448	175	150	137
Actual / Expected	94%		102%	86%		110%

Notes: (1) Experience shown above is weighted by headcounts for deceased members instead of by monthly benefit amounts.
(2) The proposed expected deaths are based on the Pub-2010 Amount-Weighted Above-Median Mortality Tables.
(3) Results may not add due to rounding.

For General members in the OPEB SRBR valuation, we recommend updating the current tables to the Pub-2010 General Healthy Retiree Headcount-Weighted Above-Median Mortality Tables (separate tables for males and females), projected generationally with the two-dimensional mortality improvement scale MP-2019. The recommended mortality tables will have an actual to expected ratio of 102%.

For Safety members in the OPEB SRBR valuation, we recommend updating the current tables to the Pub-2010 Safety Healthy Retiree Headcount-Weighted Above-Median Mortality Tables (separate tables for males and females), projected generationally with the two-dimensional mortality improvement scale MP-2019. The recommended mortality tables will have an actual to expected ratio of 110%.

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

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

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

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

Chart 14 shows the life expectancies (i.e., expected future lifetime) under the current and the proposed tables for General members on a benefit-weighted basis. Life expectancies under the proposed generational mortality rates are based on age as of 2020. In practice, assumed life expectancies will increase as a result of the mortality improvement scale.

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

Beneficiaries Mortality

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

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

For all beneficiaries under the retirement plan, we recommend changing the mortality assumption to follow the Pub-2010 Contingent Survivor Amount-Weighted Above-Median Mortality Tables (separate tables for males and females) with rates increased by 5% for males, projected generationally with the two-dimensional mortality improvement scale MP-2019.

For all beneficiaries under the SRBR OPEB plan, we recommend changing the mortality assumption to follow the Pub-2010 Contingent Survivor Headcount-Weighted Above-Median Mortality Tables (separate tables for males and females) with rates increased by 5% for males, projected generationally with the two-dimensional mortality improvement scale MP-2019.

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

There are administrative reasons why a generational mortality table is more difficult to implement for determining member contributions for legacy tiers (i.e., General Tiers 1, 2, and 3, and Safety Tiers 1, 2, 2C, and 2D), and optional forms of payment and reserves. For determining member contributions, one emerging practice is to approximate the use of a generational mortality table by the use of a static table with projection of the mortality improvement from the measurement year over a period that is close to the duration of the benefit payments for active members. We would recommend the use of this approximation for determining member contributions for employees in the legacy tiers.

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

For Safety members, we recommend that the mortality table used for determining contributions for Safety members be updated to a blended table based on the Pub-2010 Safety Healthy Retiree Amount-Weighted Above-Median Mortality Table (separate tables for males and females), projected 30 years (from 2010) with the two-dimensional mortality improvement scale MP-2019, weighted 75% male and 25% female.

For optional forms of payment and reserves, there are some administrative issues that we may need to resolve with ACERA and its vendor maintaining the pension administration software before we would recommend a comparable generational scale to anticipate future mortality

improvement. For that reason, we would apply a similar methodology as discussed above for determining member contribution rates for determining optional forms of payment and reserve. However, the projection of the mortality improvement would be from the measurement year over a period that is close to the duration of the benefit payments for active members <u>retiring</u> in the next three years.

For General and Safety service retirements, we recommend using the corresponding base tables and adjustments described within this section, projected 25 years with the two-dimensional mortality improvement scale MP-2019 along with weighting based on actual gender distributions for each group. The weighting is 30% male and 70% female for General service retirement; and 75% male and 25% female for Safety service retirement.

For all beneficiaries, we recommend using the corresponding base tables and adjustments described within this section, projected 25 years with the two-dimensional mortality improvement scale MP-2019 along with weighting based on the inverse of the actual gender distributions for each group.

For General and Safety disability retirements, we recommend using the corresponding base tables and adjustments described within the following section, projected 25 years with the two-dimensional mortality improvement scale MP-2019 along with weighting based on actual gender distributions for each group. The weighting is 30% male and 70% female for General disability retirement; and 75% male and 25% female for Safety disability retirement.

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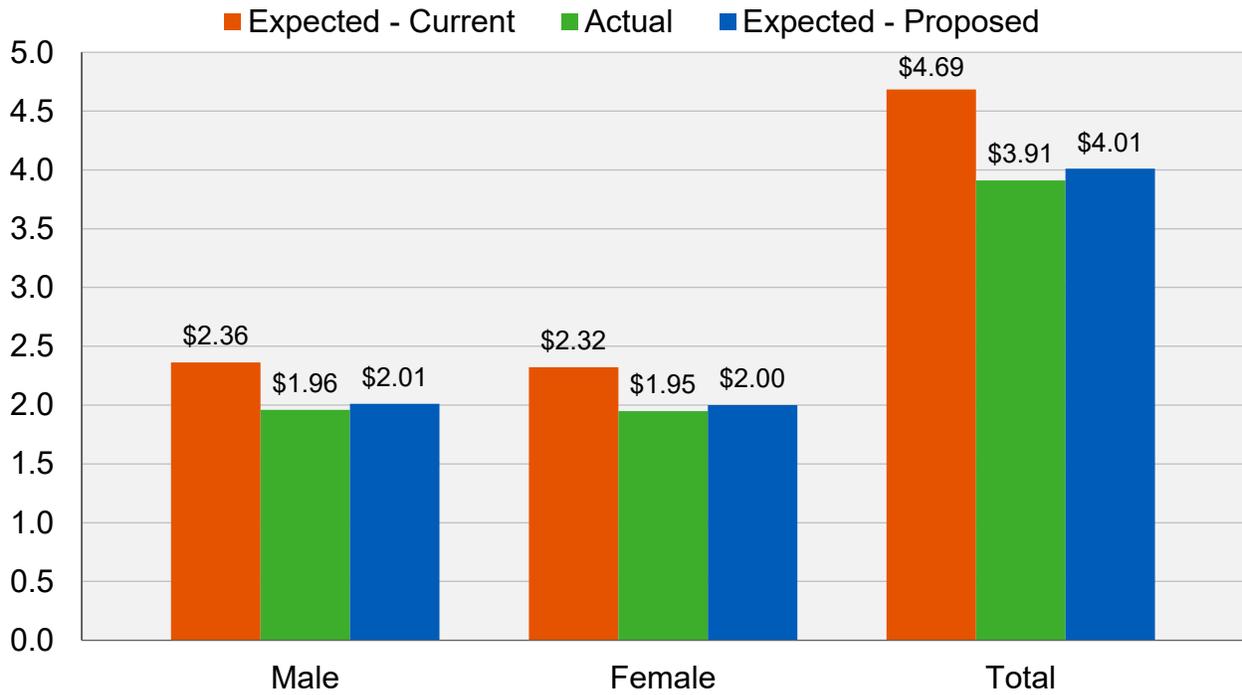## Non-Disabled General Members (December 1, 2010 through November 30, 2019)

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

	Male	Female	Total
Expected - Current	$2.36	$2.32	$4.69
Actual	$1.96	$1.95	$3.91
Expected - Proposed	$2.01	$2.00	$4.01

Chart 11: Post-Retirement Benefit-Weighted Deaths (In Millions)
Non-Disabled Safety Members (December 1, 2010 through November 30, 2019)

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

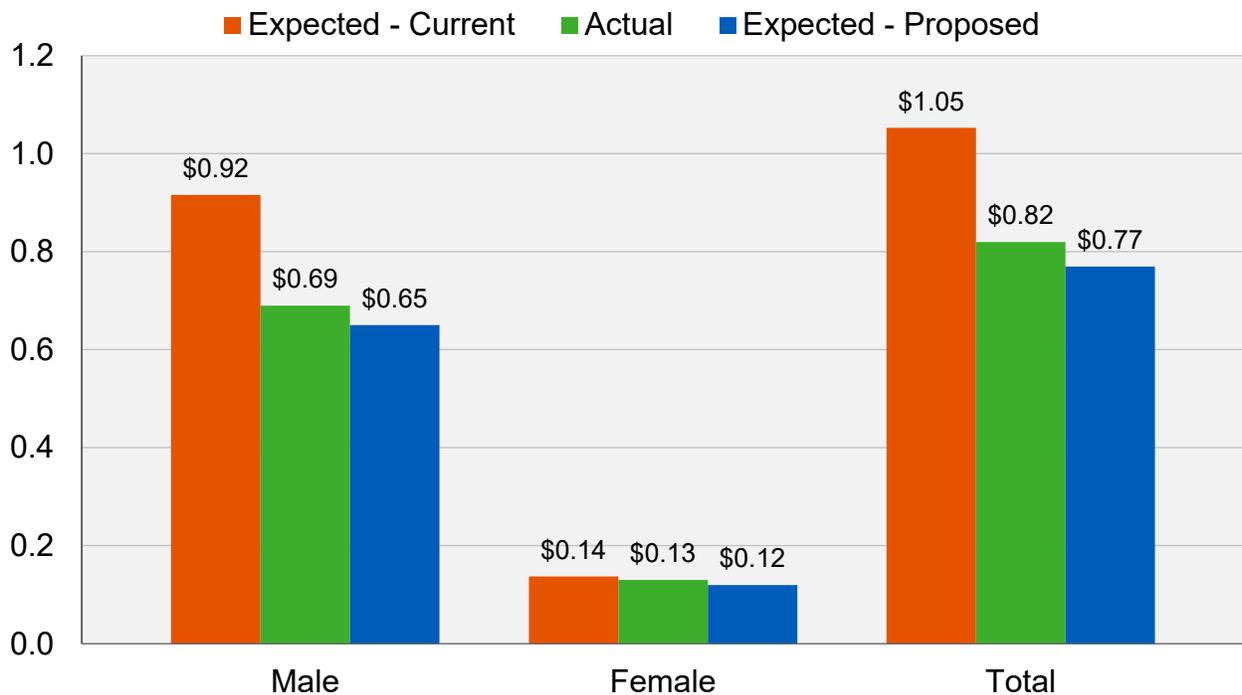|	Male	Female	Total
Expected - Current	$0.92	$0.14	$1.05
Actual	$0.69	$0.13	$0.82
Expected - Proposed	$0.65	$0.12	$0.77

Chart 12: Post-Retirement Headcount-Weighted Deaths
Non-Disabled General Members (December 1, 2010 through November 30, 2019)
For OPEB SRBR Valuation

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

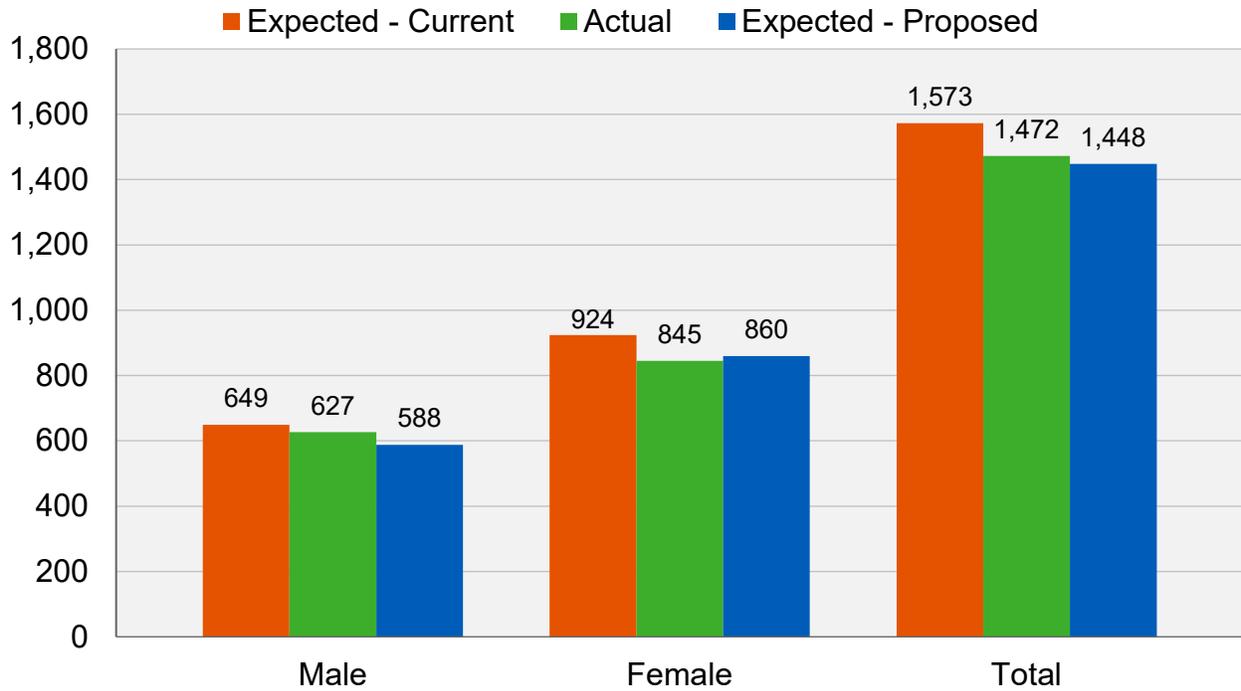|	Expected - Current	Actual	Expected - Proposed
Male	649	627	588
Female	924	845	860
Total	1,573	1,472	1,448

Chart 13: Post-Retirement Headcount-Weighted Deaths
Non-Disabled Safety Members (December 1, 2010 through November 30, 2019)
For OPEB SRBR Valuation

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

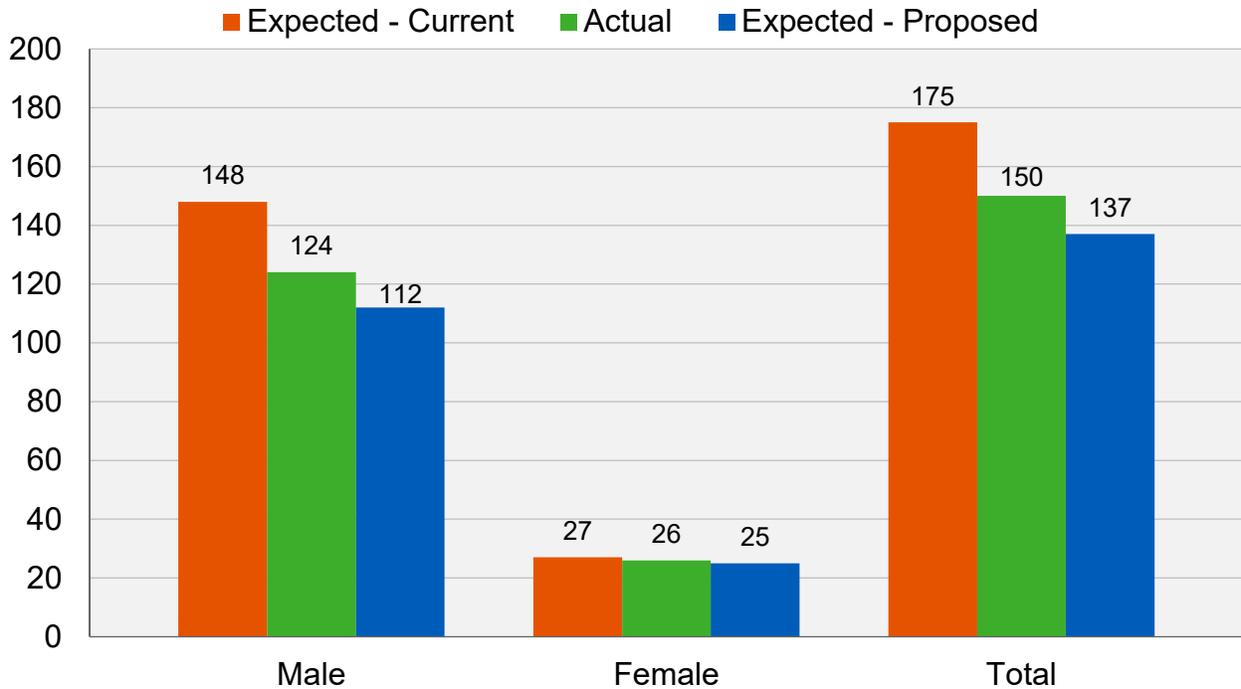|	Expected - Current	Actual	Expected - Proposed
Male	148	124	112
Female	27	26	25
Total	175	150	137

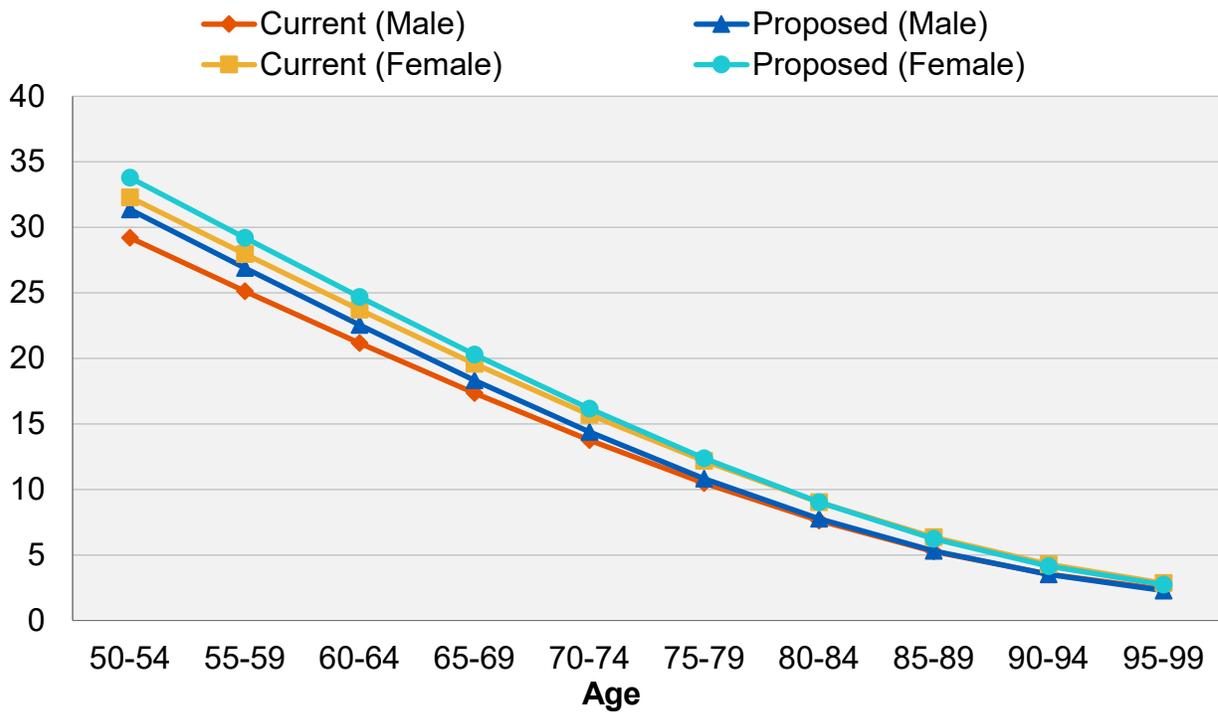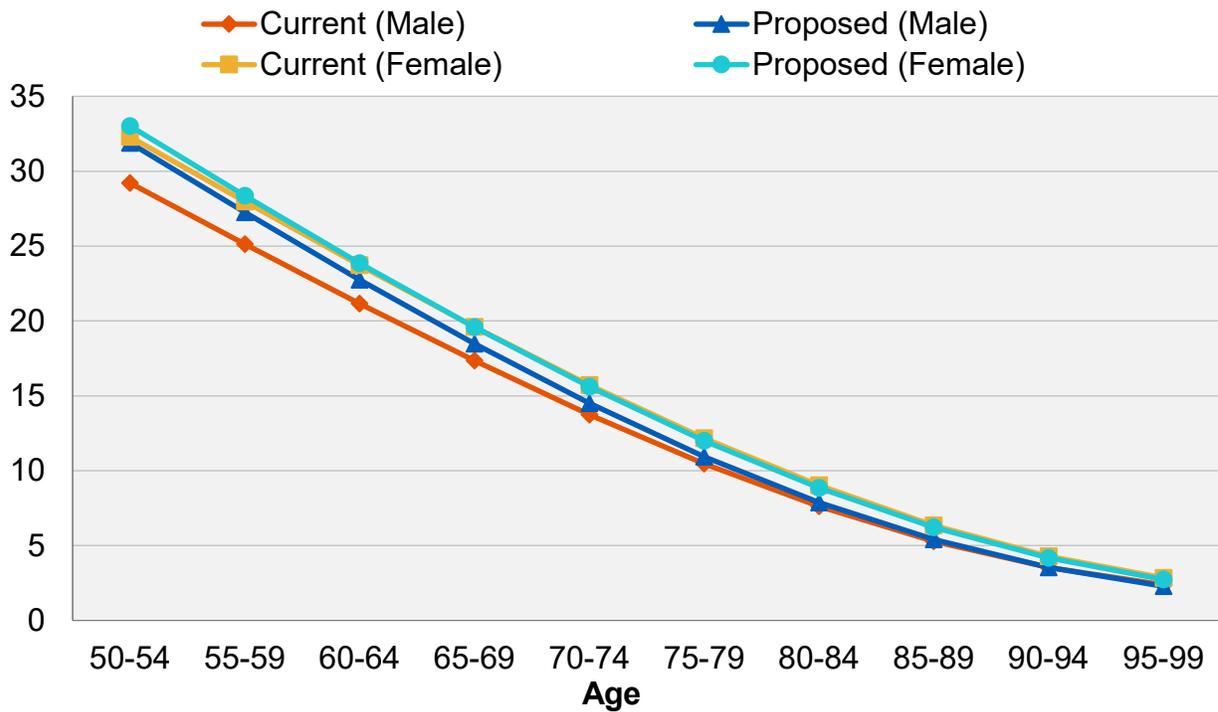Chart 14: Benefit-Weighted Life Expectancies
Non-Disabled General Members

Chart 15: Benefit-Weighted Life Expectancies
Non-Disabled Safety Members

C. Mortality Rates - Disabled

Since mortality rates for disabled members can vary from those of healthy members, a different mortality assumption is often used. For General members, the tables currently being used are the Headcount-Weighted RP-2014 Healthy Annuitant Mortality Tables (separate tables for males and females), set forward seven years for males and set forward four years for females projected generationally with the two-dimensional mortality improvement scale MP-2016. For Safety members, the tables currently being used are the Headcount-Weighted RP-2014 Healthy Annuitant Tables (separate tables for males and females), set forward two years for males and with no set forward for females, projected generationally with the two-dimensional mortality improvement scale MP-2016.

Similar to mortality rates for service retirees, the proposed mortality tables reflect current experience to the extent that the experience is credible based on standard statistical theory. For ACERA, there is far less data for disabled retirees, so it is given little credibility. The proposed mortality tables (as shown in the table below) after adjustments for partial credibility have actual to expected ratios of 80% and 117% for General and Safety, respectively. In future years the ratio should remain around 80% and 117% for General and Safety, respectively, as long as actual mortality improves at the same rates as anticipated by the generational mortality tables.

The number of actual deaths compared to the number expected under the current and proposed assumptions weighted by benefit amounts for the last nine years are as follows:

Gender	General Members – Disabled ($ in millions)			Safety Members – Disabled ($ in millions)		
	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths
Male	$0.15	$0.12	$0.14	$0.13	$0.13	$0.11
Female	0.18	0.18	0.24	0.02	0.01	0.02
Total	**$0.33**	**$0.30**	**$0.38**	**$0.15**	**$0.15**	**$0.13**
Actual / Expected	91%		80%	102%		117%

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

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

(3) Results may not add due to rounding.

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

For General disabled members, we recommend updating the current tables to the Pub-2010 Non-Safety Disabled Retiree Amount-Weighted Mortality Tables (separate tables for males and females) with rates decreased by 10% for females, projected generationally with the two-dimensional mortality improvement scale MP-2019. The recommended mortality tables will have an actual to expected ratio of 80%.

For Safety disabled members, we recommend updating the current tables to the Pub-2010 Safety Disabled Retiree Amount-Weighted Mortality Tables (separate tables for males and females) with rates increased by 5% for males, projected generationally with the two-dimensional mortality improvement scale MP-2019. The recommended mortality tables will have an actual to expected ratio of 117%.

For the purpose of setting the assumptions for the OPEB SRBR valuation, we have also provided in the table below the actual and expected deaths computed without weighting these by benefit amounts and using the headcount-weighted version of the Pub-2010 tables. This is similar to how actual and expected death ratios were developed based on the prior headcount approach.

Gender	General Members – Disabled			Safety Members – Disabled		
	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths	Current Expected Weighted Deaths	Actual Weighted Deaths	Proposed Expected Weighted Deaths
Male	51	49	54	29	31	28
Female	87	90	114	5	5	7
Total	137	139	168	33	36	35
Actual / Expected	101%		83%	108%		104%

Notes: (1) Experience shown above is weighted by headcounts for deceased members instead of by monthly benefit amounts.
(2) The proposed expected deaths are based on the Pub-2010 Amount-Weighted Above-Median Mortality Tables.
(3) Results may not add due to rounding.

For General disabled members in the OPEB SRBR valuation, we recommend updating the current tables to the Pub-2010 Non-Safety Disabled Retiree Headcount-Weighted Mortality Tables (separate tables for males and females) with rates decreased by 10% for females, projected generationally with the two-dimensional mortality improvement scale MP-2019. The recommended mortality tables will have an actual to expected ratio of 83%.

For Safety disabled members in the OPEB SRBR valuation, we recommend updating the current tables to the Pub-2010 Safety Disabled Retiree Headcount-Weighted Mortality Tables (separate tables for males and females) with rates increased by 5% for males, projected generationally with the two-dimensional mortality improvement scale MP-2019. The recommended mortality tables will have an actual to expected ratio of 104%.

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

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

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

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

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

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

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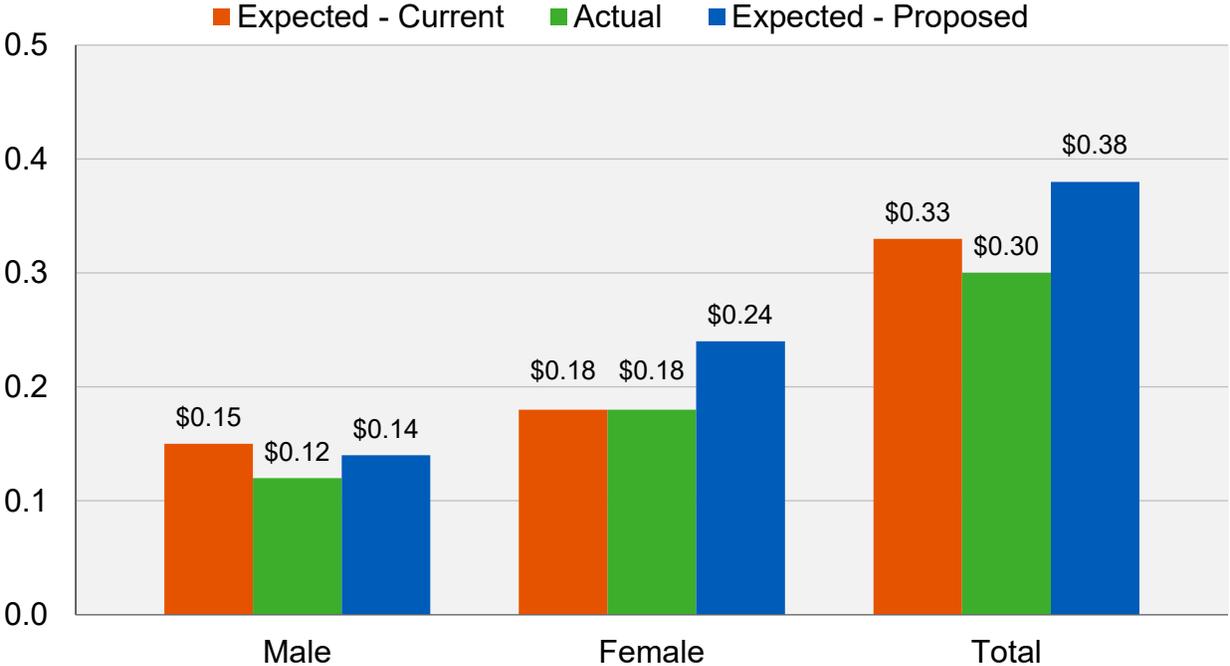

Chart 17: Post-Retirement Benefit-Weighted Deaths (In Millions) Disabled Safety Members (December 1, 2010 through November 30, 2019)
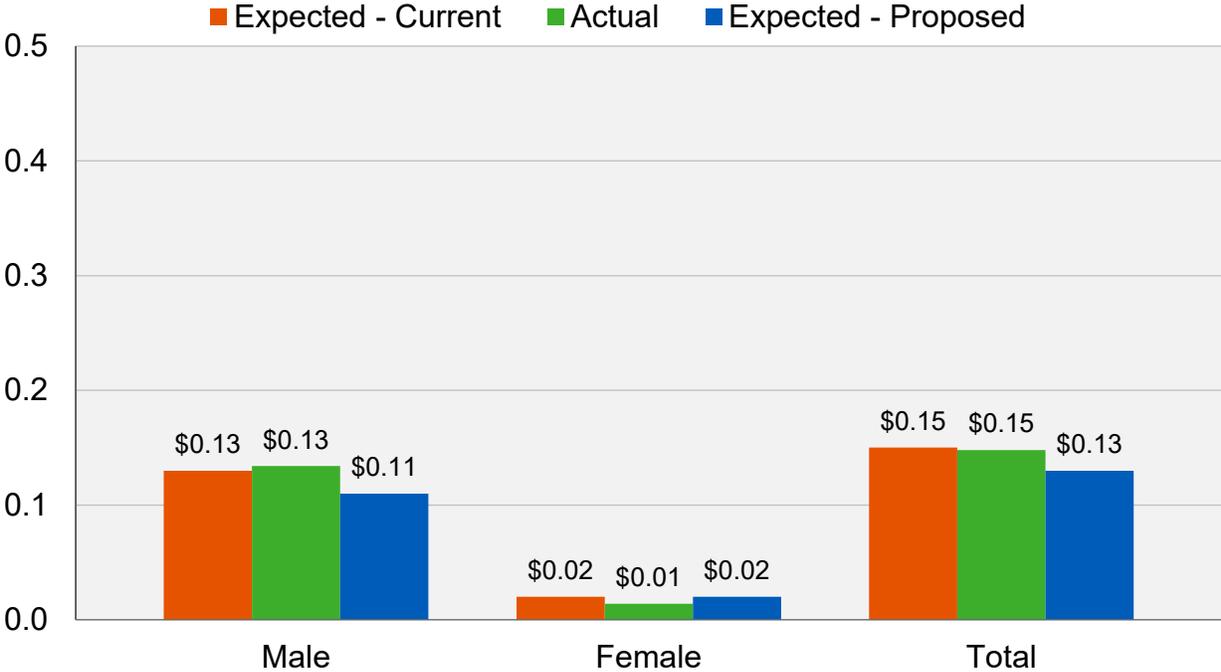
Chart 18: Post-Retirement Headcount-Weighted Deaths
Disabled General Members December 1, 2010 through November 30, 2019)
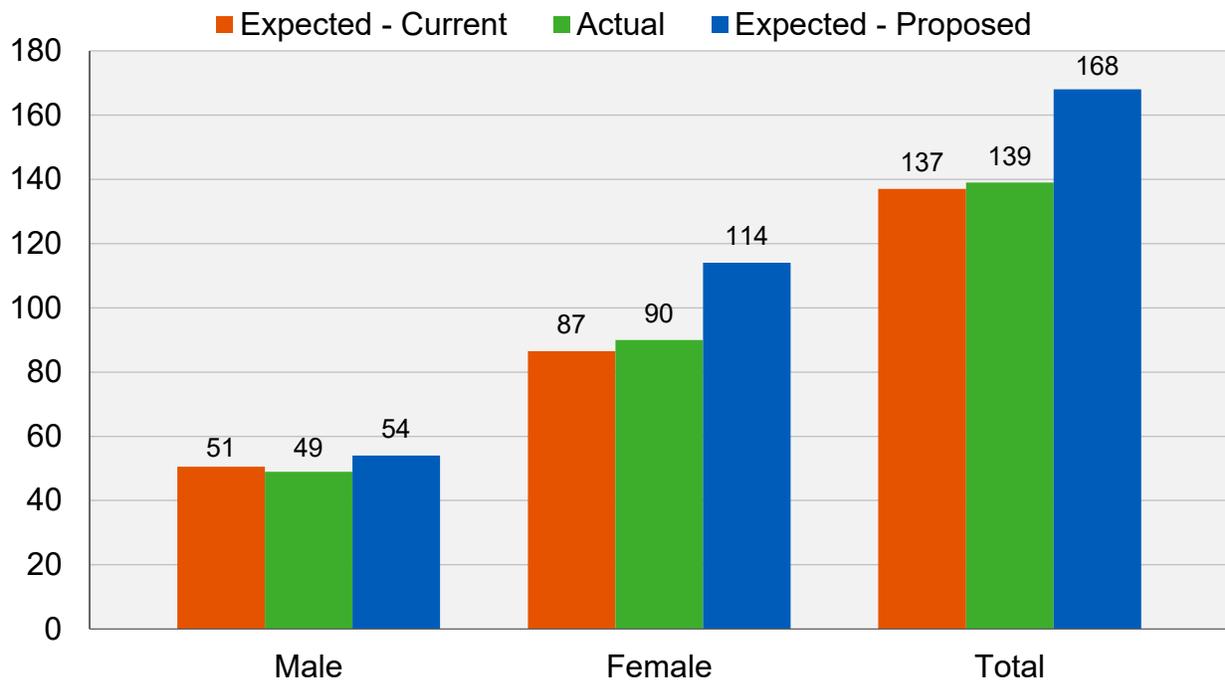## For SRBR OPEB Valuation

Chart 19: Post-Retirement Headcount-Weighted Deaths
Disabled Safety Members (December 1, 2010 through November 30, 2019)
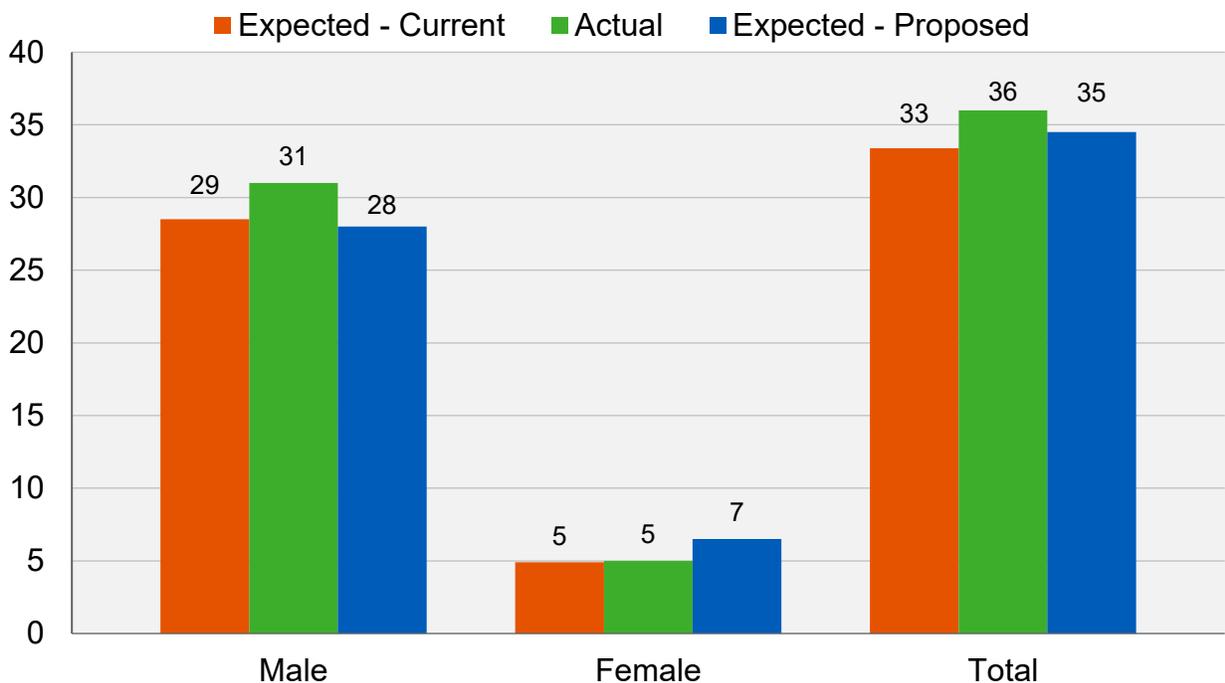## For SRBR OPEB Valuation

Chart 20: Benefit-Weighted Life Expectancies
Disabled General Members

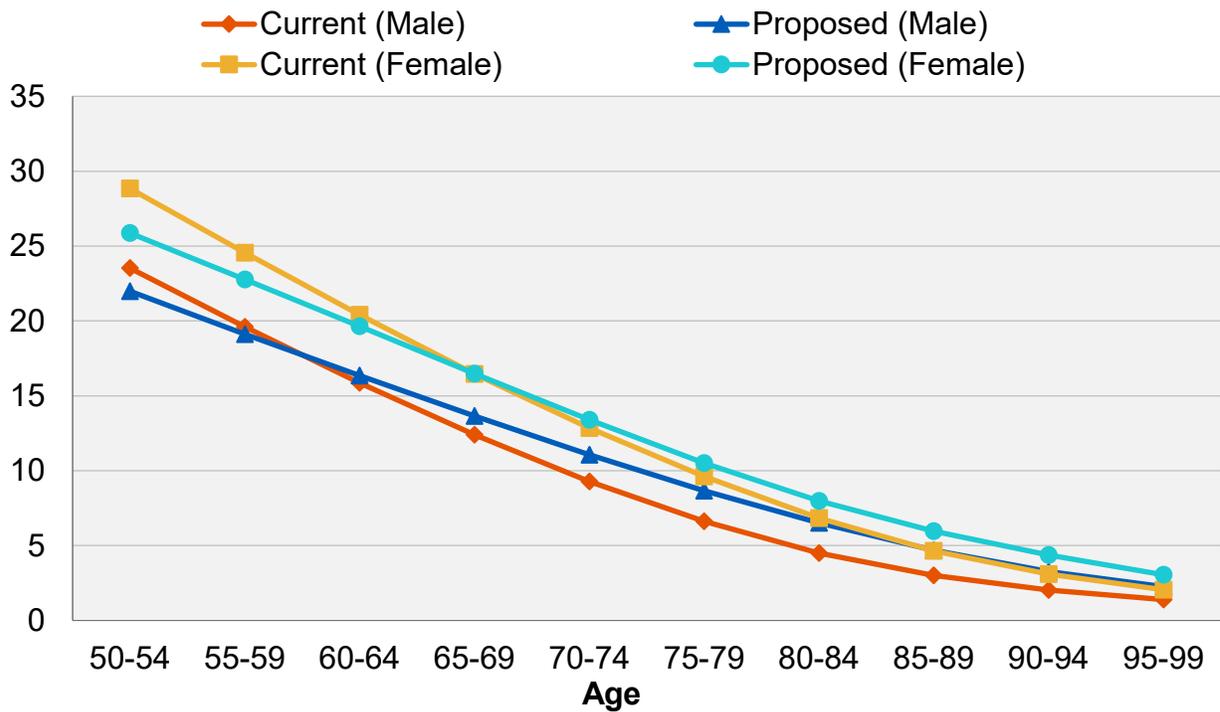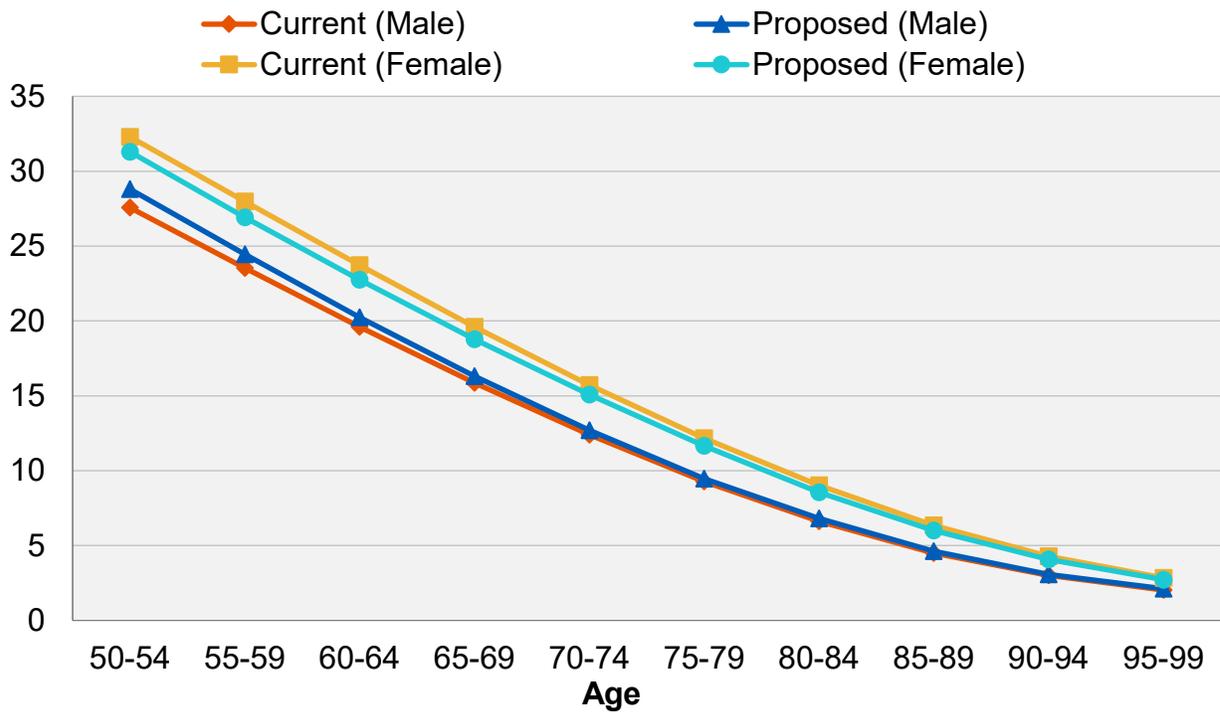Chart 21: Benefit-Weighted Life Expectancies
Disabled Safety Members

D. Termination Rates

Termination rates include all terminations for reasons other than death, disability, or retirement. Under the current assumption structure, there is a separate set of assumptions for members with less than five years of service (i.e., a service-based assumption) and members with five or more years of service (i.e., an age-based assumption). There is also another set of assumptions to anticipate the percentage of members who will withdraw their contributions and members who will leave their contributions on deposit and receive a deferred vested benefit.

Starting with this experience review, we analyzed terminations based on the current bifurcated method mentioned above and on years of service only. Our review concluded that termination rates correlate better with years of service. As a result of this review, we recommend that the termination assumption be structured solely as a function of years of service. The termination experience over the last three years for General and Safety members is shown by years of service in the following table. Please note that we have excluded any members that were eligible for retirement.

Rates of Termination

| Years of Service | Termination Rate (%) | | | | | |
| | General | | | Safety | | |
	Current Rate	Observed Rate	Proposed Rate	Current Rate	Observed Rate	Proposed Rate
Less than 1	11.00	12.73	12.00	4.00	0.00	4.00
1 – 2	9.00	9.48	9.00	3.50	6.06	4.00
2 – 3	8.00	8.10	8.00	3.50	5.88	4.00
3 – 4	6.00	5.76	6.00	2.50	4.31	3.50
4 – 5	6.00	6.60	6.00	2.00	3.91	3.00
5 – 6	3.72	7.35	6.00	1.61	1.46	2.00
6 – 7	3.53	5.59	5.25	1.44	1.98	1.80
7 – 8	3.47	4.44	4.25	1.25	2.35	1.70
8 – 9	3.41	3.59	3.75	1.26	0.75	1.60
9 – 10	3.38	3.56	3.50	1.31	1.72	1.50
10 - 11	3.44	5.52	3.50	1.37	1.95	1.50
11 – 12	3.39	3.96	3.50	1.33	1.48	1.50
12 – 13	3.27	4.08	3.50	1.28	0.61	1.50
13 – 14	3.18	4.24	3.50	1.21	3.57	1.50
14 – 15	3.11	4.24	3.50	1.11	1.00	1.50
15 – 16	3.08	4.14	3.50	1.08	3.73	1.50
16 – 17	3.05	4.65	3.40	1.06	1.83	1.40
17 – 18	3.03	3.23	3.30	1.04	0.64	1.30
18 – 19	2.99	3.04	3.20	1.03	0.00	1.20
19 - 20	2.98	3.09	3.10	1.02	0.00	1.10
20 or more	2.86	6.75	3.00	1.01	0.00	1.00

Note: The current rate shown for five or more years of service is an average rate developed from the current age based assumption for members in that service category.

It is important to note that, in the table above, not every age category has enough exposures and/or decrements such that the results in that category are statistically credible. This is mainly the case at the highest service categories since more members in those categories are eligible to retire and, therefore, they have been excluded from our review of this experience.

Chart 22 compares actual to expected terminations of the past three years for both the current and proposed assumptions for General members and Safety members.

Chart 23 shows the current along with the proposed termination rates for General members. Chart 24 shows the same information as Chart 17, but for Safety members.

Based upon the recent experience, we propose increases to most of the termination rates for General and Safety members. We also continue to assume that all termination rates are zero for all members eligible to retire as long as a retirement rate is present; that is, it is assumed that members eligible to retire at termination will retire rather than defer their benefit.

The following table shows the currently assumed, actual and proposed assumed percentages for members who will elect a refund of contributions upon termination and members who will elect to leave their contributions on deposit and receive a deferred vested benefit. The current assumption is that 60% of all members who terminate with less than five years of service will withdraw their contributions and 40% will choose a deferred vested benefit. For members with five or more years of service, the current assumption is that 35% of all members will withdraw their contributions and 65% will receive a deferred vested benefit.

	Rates of Electing a Refund of Contributions upon Termination (%)					
	Members with Fewer than Five Years of Service			Members with Five or More Years of Service		
	Current Rate	Observed Rate	Proposed Rate	Current Rate	Observed Rate	Proposed Rate
General	60%	34%	55%	35%	22%	30%
Safety	60%	36%	55%	35%	23%	30%
	Rates of Electing a Deferred Vested Benefit (%)					
	Members with Fewer than Five Years of Service			Members with Five or More Years of Service		
	Current Rate	Observed Rate	Proposed Rate	Current Rate	Observed Rate	Proposed Rate
General	40%	66%	45%	65%	78%	70%
Safety	40%	64%	45%	65%	77%	70%

As shown above, we have recommended a reduction in the assumption for the percentage of members electing a refund of contributions for members with fewer than five years of service (i.e., from 60% to 55%) for both General and Safety members. We have also recommended a reduction in the assumption for the percentage of members electing a refund of contributions for members with five or more years of service (i.e., from 35% to 30%) for both General and Safety members. We have recommended a

modest change in the refund assumption for members with less than five years of service even though observed experience differs more significantly from the current assumption. This is because there often appears to be a lag between a member terminating employment and ultimately electing a refund of contributions. Accordingly, we have also looked at the experience over the three-year study period of members who have been initially classified as inactive vested members and then ultimately elected a refund of contributions in making the above recommendations.

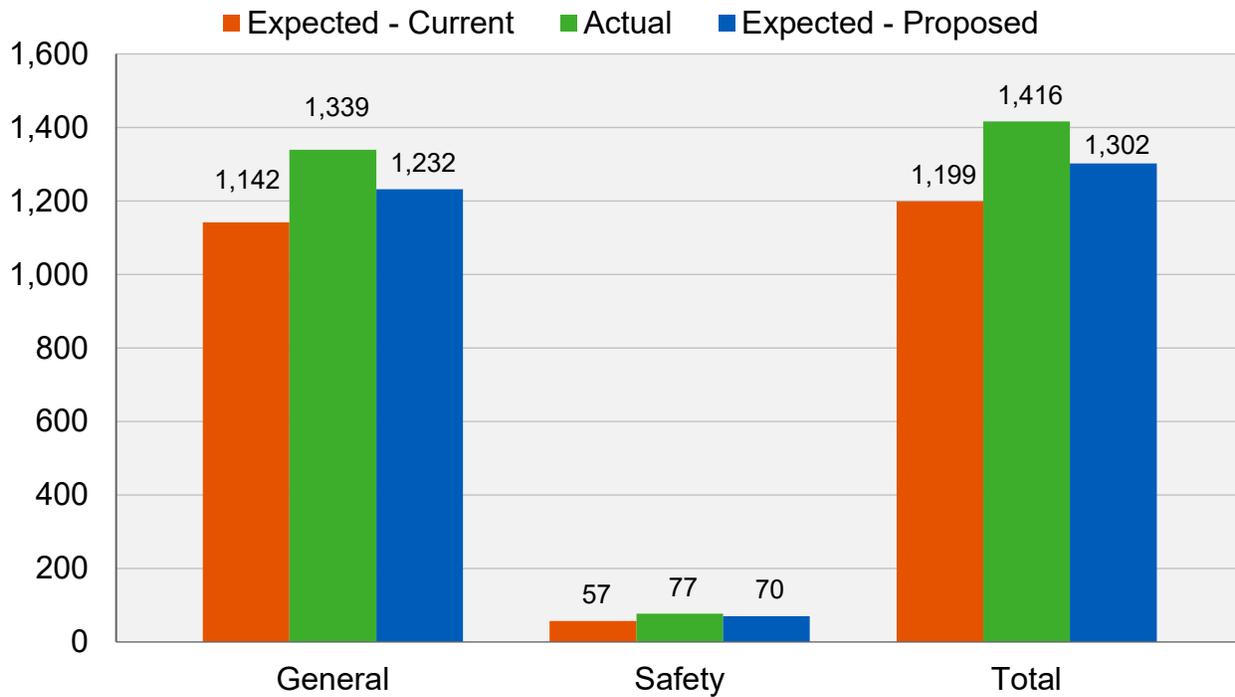## Chart 22: Actual Number of Terminations Compared to Expected
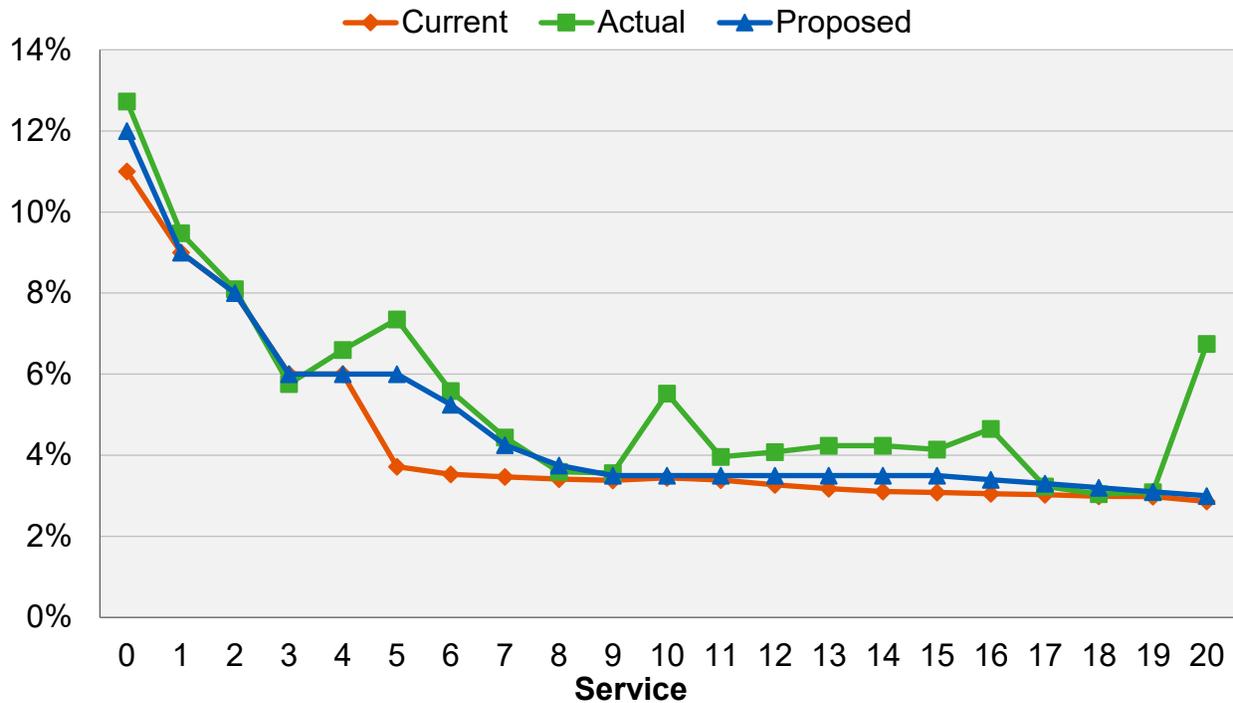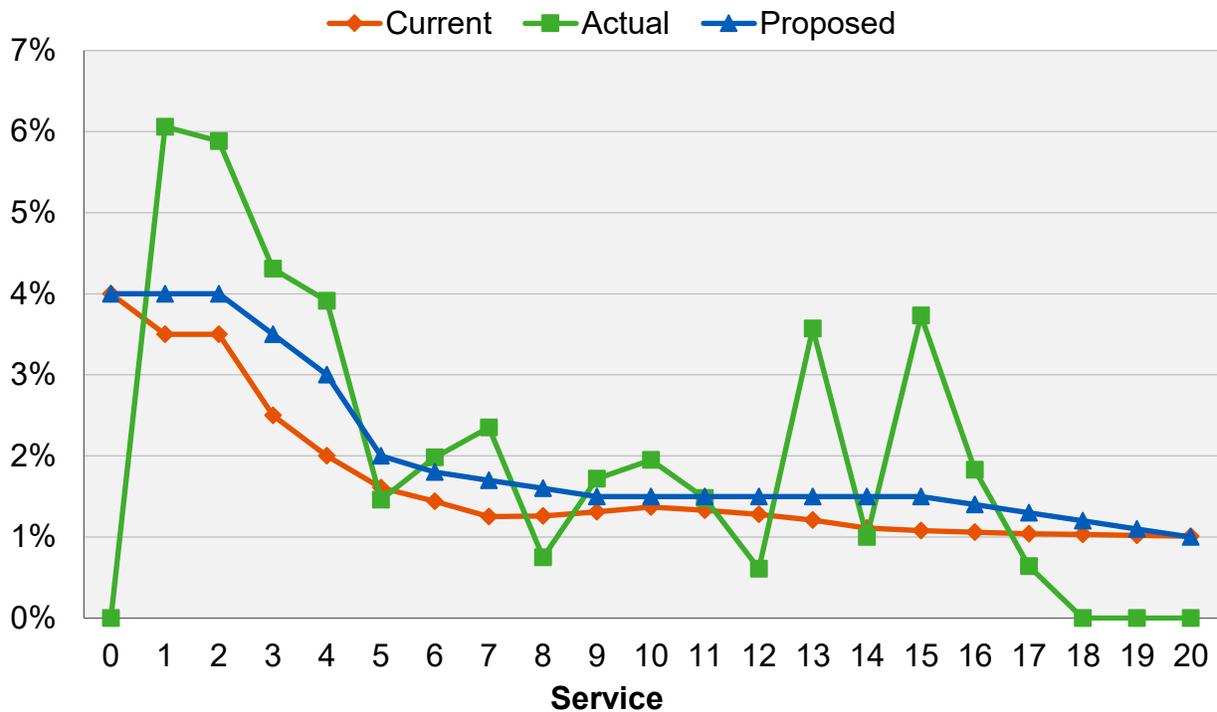
Chart 23: Termination Rates – General

Chart 24: Termination Rates – Safety

E. Disability Incidence Rates

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

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

Rates of Disability Incidence

	Disability Incidence Rate (%)					
	General			Safety		
Age	Current Rate*	Observed Rate	Proposed Rate*	Current Rate*	Observed Rate	Proposed Rate*
20 – 24	0.00	0.00	0.00	0.00	0.00	0.00
25 – 29	0.01	0.00	0.01	0.05	0.00	0.05
30 – 34	0.05	0.00	0.05	0.40	0.19	0.40
35 – 39	0.05	0.11	0.08	0.70	0.96	0.80
40 – 44	0.10	0.08	0.10	0.75	2.73	1.50
45 – 49	0.25	0.12	0.20	0.80	1.63	1.50
50 – 54	0.35	0.32	0.30	2.00	3.30	2.50
55 – 59	0.40	0.21	0.35	2.00	3.40	2.75
60 – 64	0.45	0.27	0.40	3.00	6.36	4.50
65 – 69	0.45	0.70	0.50	0.00	2.78	0.00

At central age in the age range shown.

Based upon the recent experience, we have decreased the disability rates overall for General members and increased the disability rates for Safety members.

Chart 25 compares the actual number of non-service connected and service connected disabilities over the past three years to that expected under both the current and proposed assumptions. The proposed disability rates were adjusted to reflect the past three years' experience. Note that we have reflected in the observed disability incidences those members whose applications for a disability retirement are pending as of the end date of the experience study. Consistent with the last experience study, we have applied a 75% probability to anticipate the number that will be granted a disability benefit.

Chart 26 shows actual disablement rates, compared to the assumed and proposed rates for General members.

Currently, 60% of all new disabled General members are assumed to receive a service connected disability and the remaining 40% are assumed to receive a non-service connected disability. Over the current experience study period, we have observed that 74% of all new

disabled General members received a service connected disability. Accordingly, we are recommending that 65% of the proposed disability rates be used to anticipate service connected disability retirement. The remaining 35% of the proposed disability rates will be used to anticipate non-service connected disability.

Chart 27 graphs the same information as Chart 26, but for Safety members.

Since 99% of all new disabled Safety members received a service connected disability, we are recommending that 100% of the proposed disability rates continue to be used to anticipate service connected disability retirement (i.e., this 100% assumption remains unchanged).

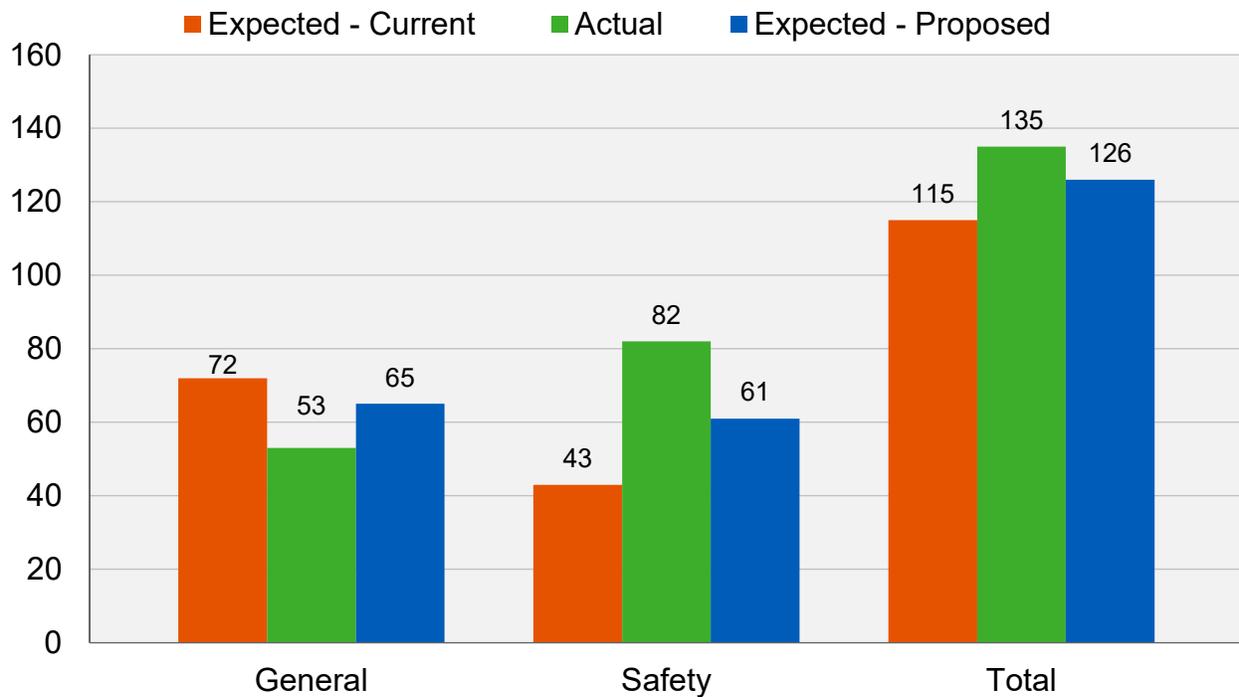## Chart 25: Actual Number of Service and Non-service Connected Disability Retirements Compared to Expected

Chart 26: Disability Incidence Rates
General Members
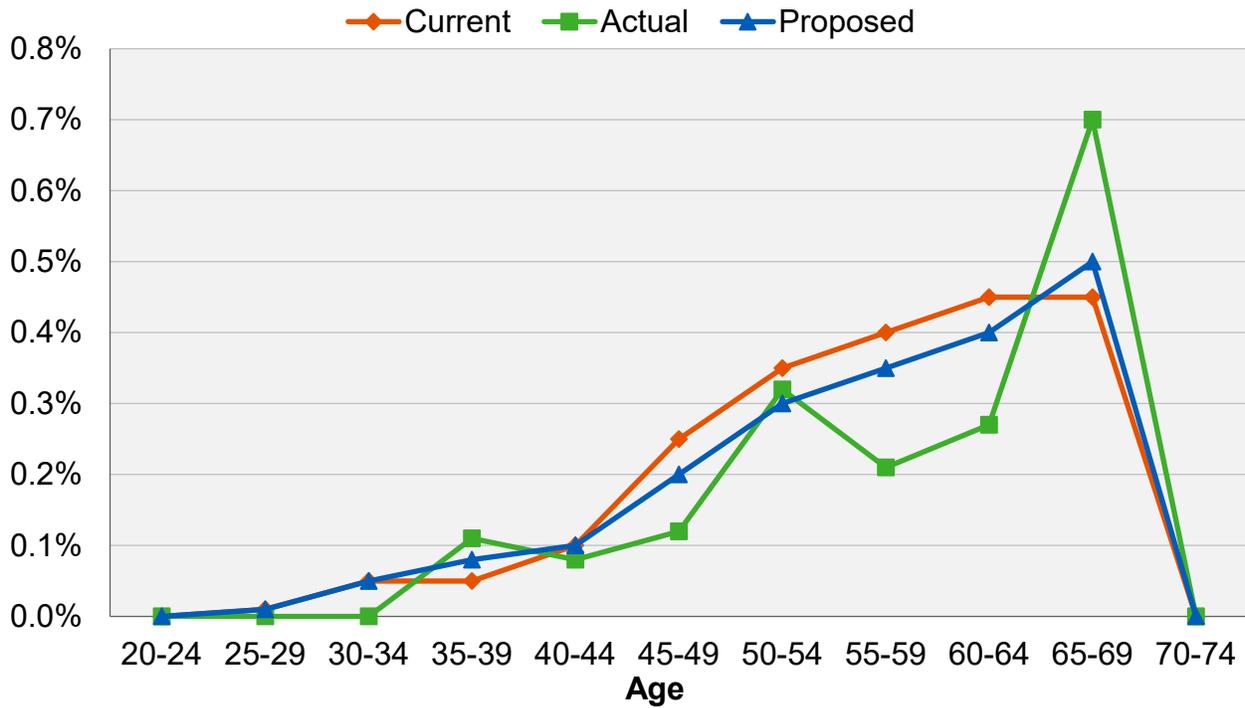
Chart 27: Disability Incidence Rates
Safety Members

Segal 70
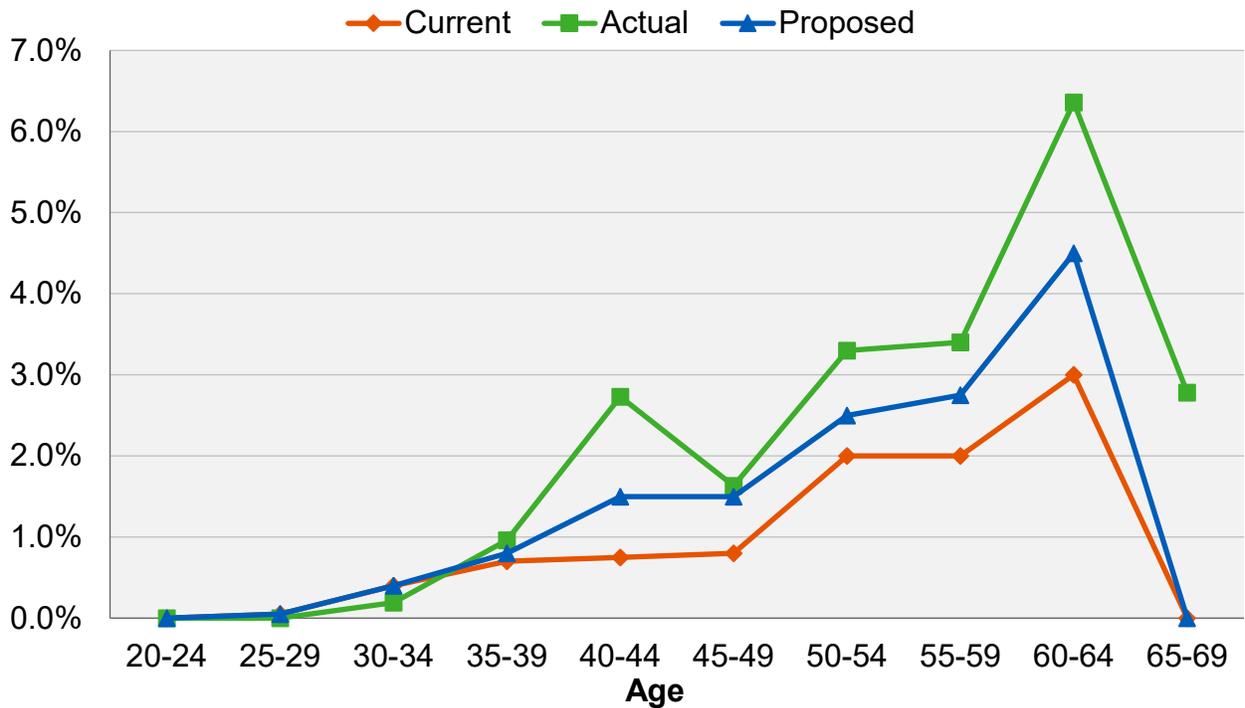
V. Cost Impact

The table on the following page shows the changes in key valuation results due to the recommended assumption changes, as if they were applied in the December 31, 2019 actuarial valuation. If all of the proposed assumption changes were implemented, the Plan's average employer rate would have increased by 2.46% of compensation, and the average member rate would have increased by 0.55% of compensation, for a total contribution rate increase of 3.01% of payroll. The Plan's Unfunded Actuarial Accrued Liability would have increased by $317.8 million, causing the funded ratio to decrease from 77.6% to 75.2% on a valuation value of assets basis.

Of the various assumption changes, the most significant cost impacts are from the reduction in the investment return assumption from 7.25% to 7.00% per year and the change in the post-retirement mortality assumptions to reflect longer life expectancies for future retirees, offset somewhat by the reduction in the inflation assumption. Of the 3.01% of payroll rate impact, about 1.86% of payroll is due to the recommended investment return assumption and inflation assumption, the rest is due to the other recommended non-economic assumptions, primarily due to the updated mortality tables.

Summary of Key Valuation Results as of December 31, 2019 (Dollar amounts in thousands)						
	Current Assumptions		New Assumptions		Change	
Employer Contribution Rates:	Total Rate (%)	Estimated Annual Amount	Total Rate (%)	Estimated Annual Amount	Total Rate (%)	Estimated Annual Amount
County Only						
General Tier 1	22.90	$1,738	24.84	$1,879	1.94	$141
General Tier 2	21.92	85,631	23.80	92,802	1.88	7,171
General Tier 4	21.43	46,119	23.46	50,508	2.03	4,389
Safety Tier 1	83.07	632	90.52	687	7.45	55
Safety Tier 2	63.66	73,163	68.84	78,927	5.18	5,764
Safety Tier 2C	64.94	2,023	71.39	2,219	6.45	196
Safety Tier 2D	63.31	9,918	69.16	10,817	5.85	899
Safety Tier 4	60.49	25,729	65.96	28,024	5.47	2,295
County Combined	30.98	244,953	33.68	265,863	2.70	20,910
AHS, Court & First 5 Only						
General Tier 1	23.77	373	25.71	402	1.94	29
General Tier 2	22.79	44,301	24.67	47,874	1.88	3,573
General Tier 4	22.30	29,861	24.33	32,589	2.03	2,728
Other Districts						
General Tier 1 (non-LARPD)	28.97	834	30.91	888	1.94	54
General Tier 2	27.99	63	29.87	67	1.88	4
General Tier 4 (non-LARPD)	27.50	394	29.53	422	2.03	28
General Tier 1 (LARPD)	38.07	237	40.85	254	2.78	17
General Tier 3	43.82	794	46.60	843	2.78	49
General Tier 4 (LARPD)	36.60	694	39.47	749	2.87	55
All Categories Combined	28.56	322,504	31.02	349,951	2.46	27,447
General (non-LARPD)	22.08	209,314	24.02	227,431	1.94	18,117
LARPD	39.83	1,725	42.65	1,846	2.82	121
All Safety	62.97	111,465	68.31	120,674	5.34	9,209
General (Non-LARPD) Salary		947,839		946,876		-963
LARPD Salary		4,331		4,328		-3
Safety Salary		177,005		176,649		-356

Average Member Contribution Rates:	Total Rate (%)	Estimated Annual Amount	Total Rate (%)	Estimated Annual Amount	Total Rate (%)	Estimated Annual Amount
General Tier 1	9.43	$1,193	9.70	$1,225	0.27	$32
General Tier 2	7.70	45,065	8.22	48,022	0.52	2,957
General Tier 3	14.41	261	15.09	273	0.68	12
General Tier 4	8.85	31191	9.18	32365	0.33	1174
Safety Tier 1	9.96	76	10.24	78	0.28	2
Safety Tier 2	15.81	18,170	16.74	19,193	0.93	1,023
Safety Tier 2C	13.48	420	14.57	453	1.09	33
Safety Tier 2D	16.09	2,521	17.11	2,676	1.02	155
Safety Tier 4	15.42	6,559	17.18	7,299	1.76	740
All Categories Combined	**9.34**	**105,456**	**9.89**	**111,584**	**0.55**	**6,128**

Funded Status:						
Actuarial Accrued Liability		$9,795,019		$10,112,774		$317,755
Valuation Value of Assets (VVA)		$7,599,977		$7,599,977		$0
Funded Percentage		77.6%		75.2%		-2.4%
Unfunded Actuarial Accrued Liability (UAAL) based on VVA		$2,195,042		$2,512,797		$317,755

Chart 28: Member Contribution Rates
General Tier 1 Members
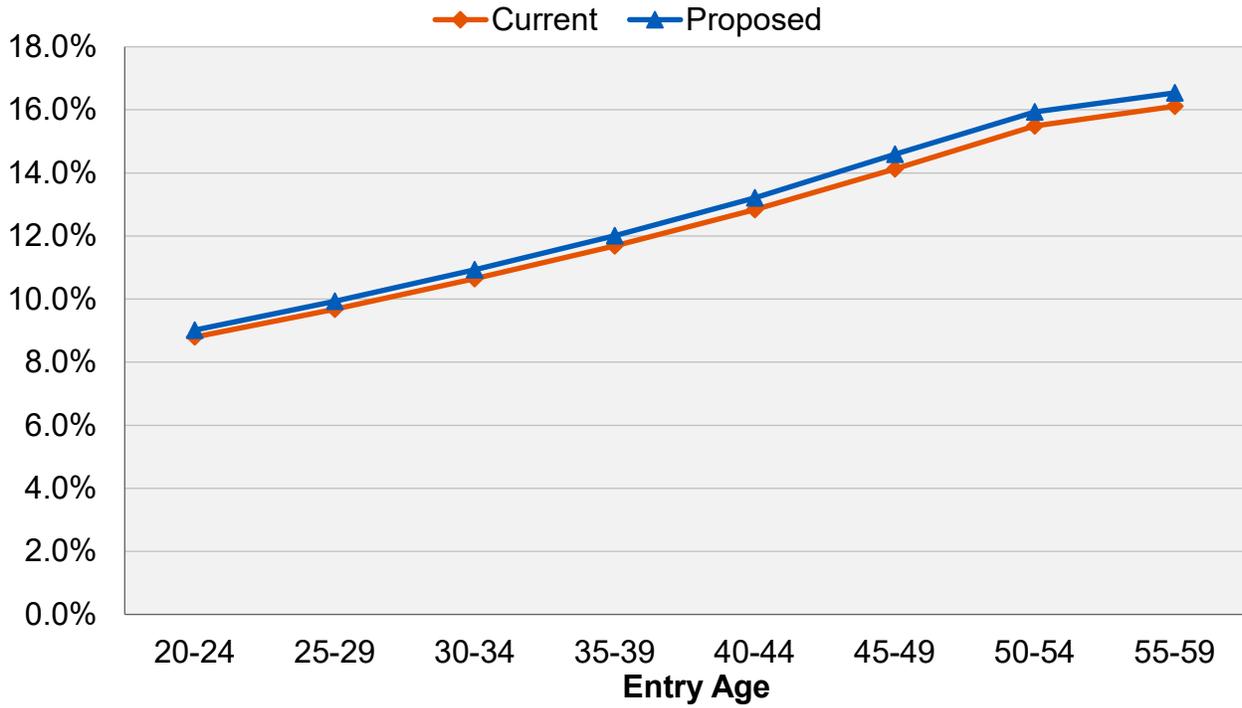
Chart 29: Member Contribution Rates
General Tier 2 Members

Chart 30: Member Contribution Rates
General Tier 3 Members

Chart 31: Member Contribution Rates
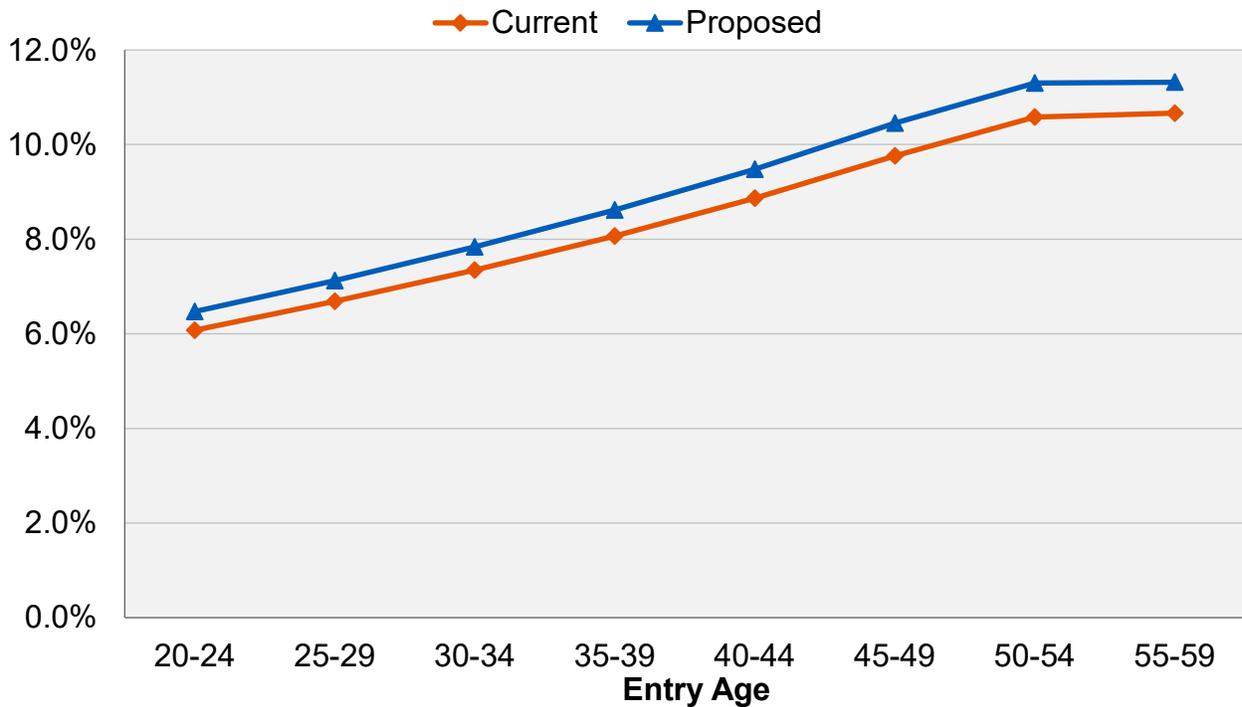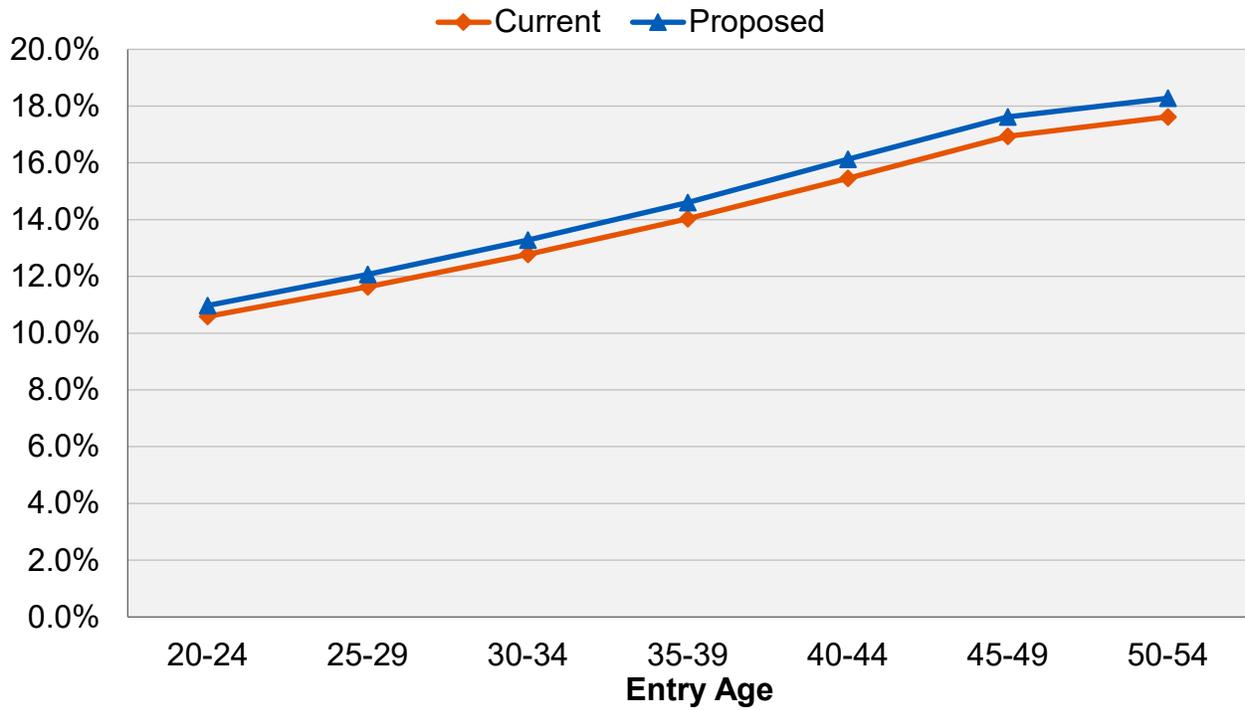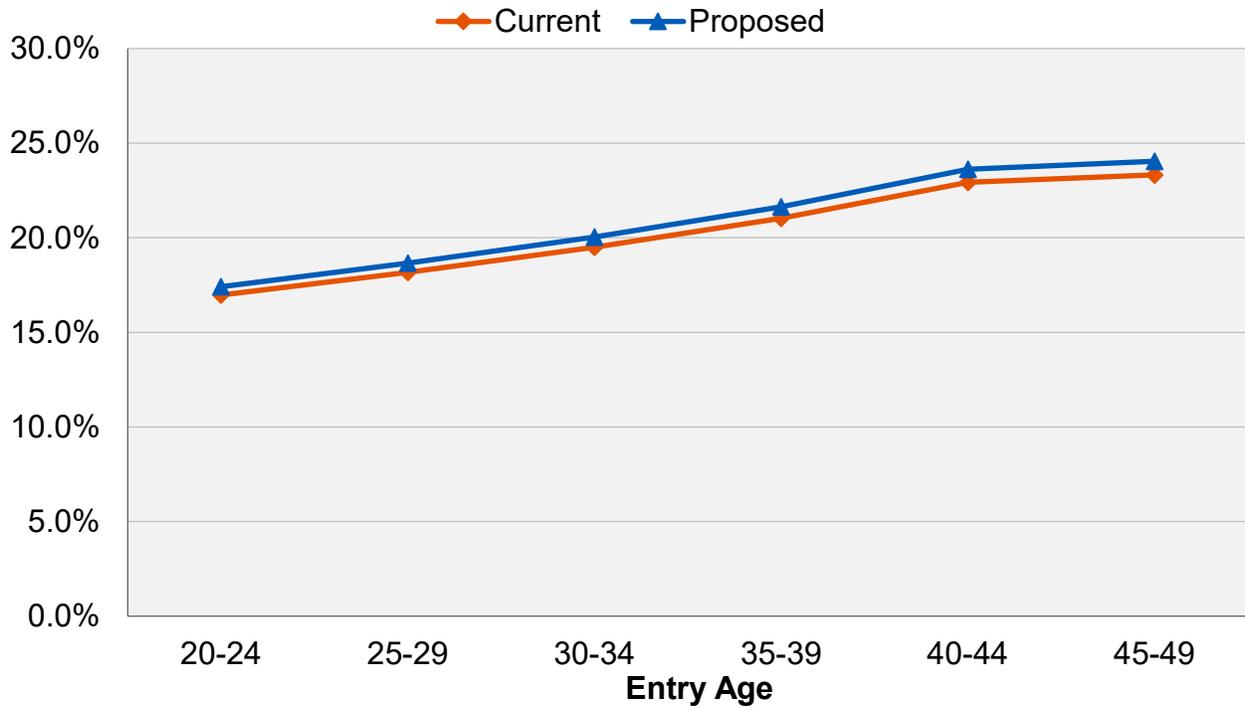## Safety Tier 1 Members

Chart 32: Member Contribution Rates
Safety Tier 2 Members
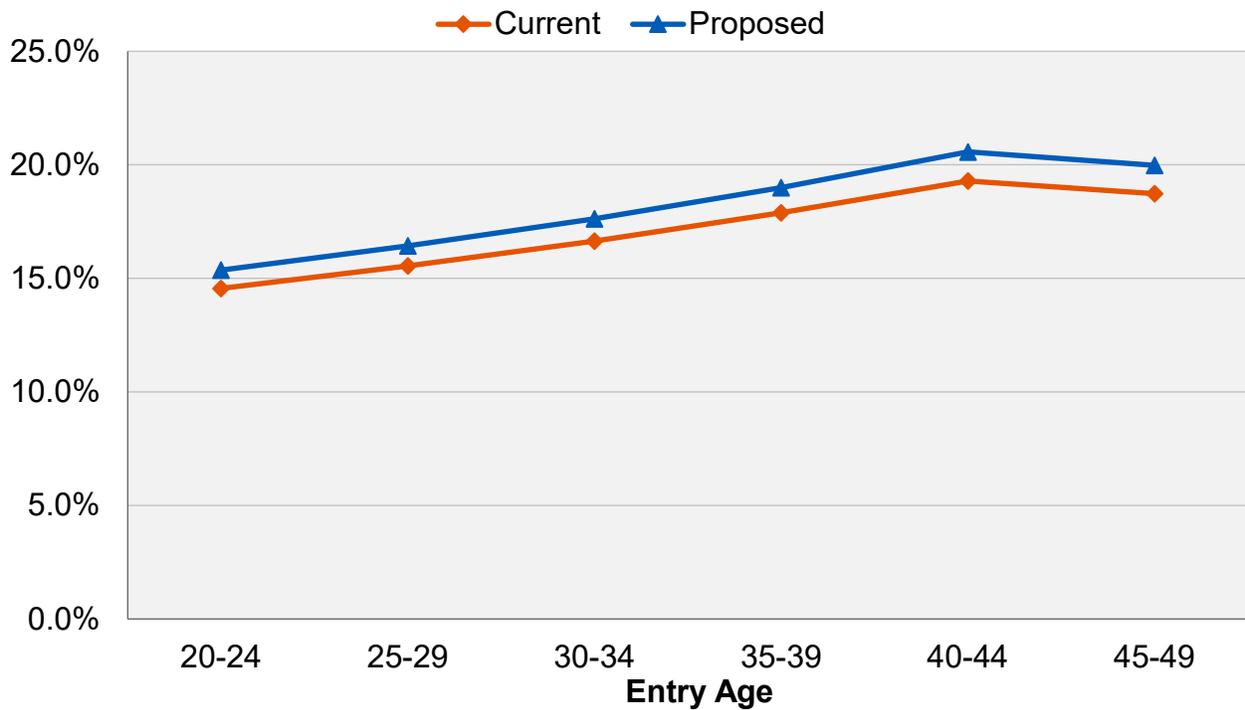
Chart 33: Member Contribution Rates
Safety Tier 2C Members
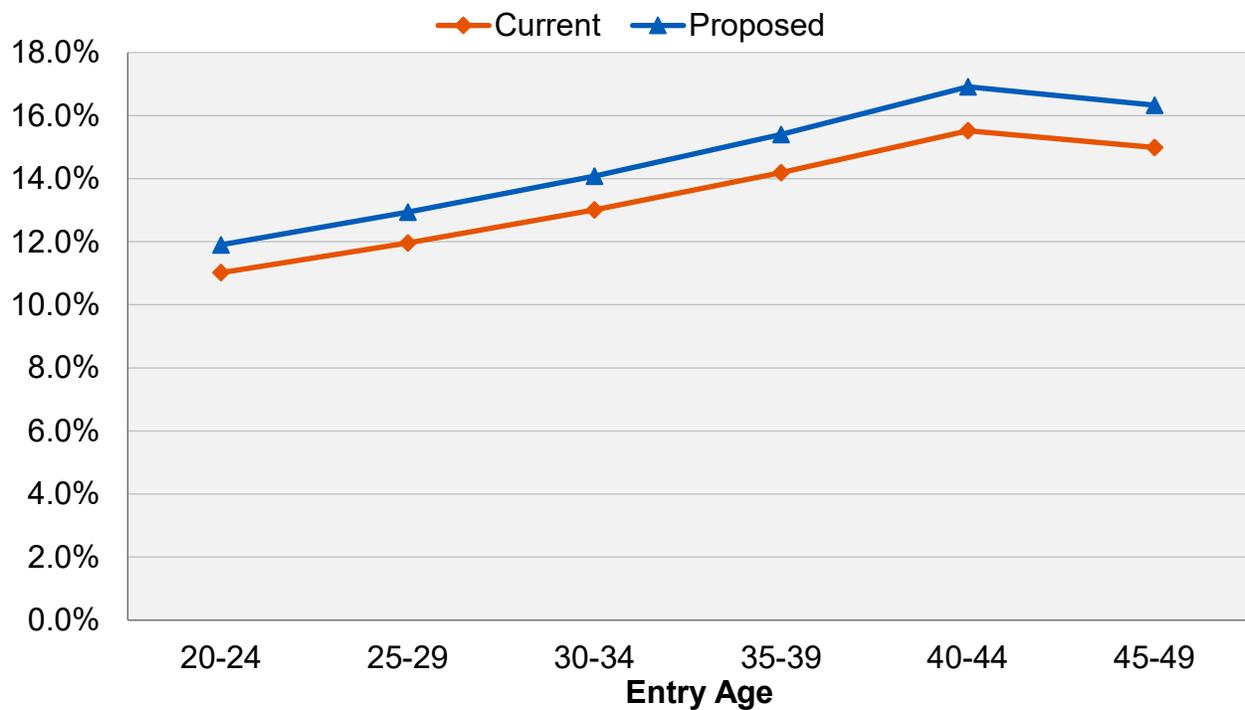
Chart 34: Member Contribution Rates
Safety Tier 2D Members with Less than 5 Years of Vesting Service
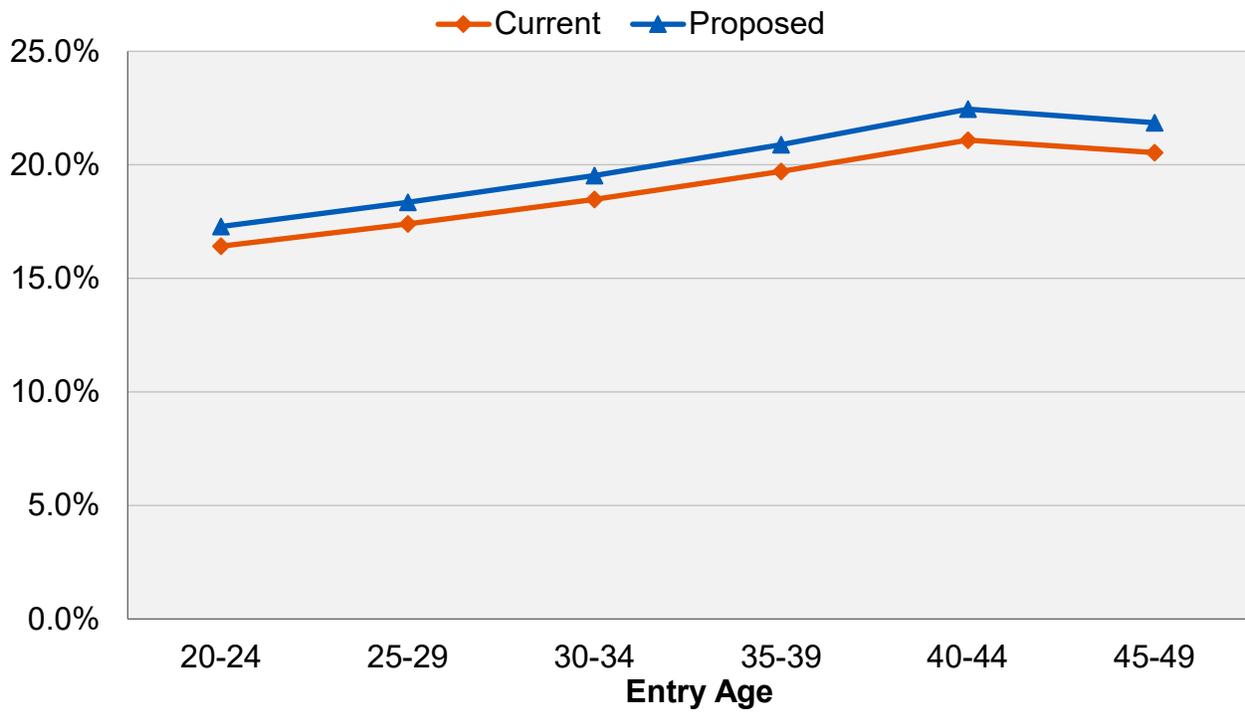
Chart 35: Member Contribution Rates
Safety Tier 2D Members with 5 or More Years of Vesting Service
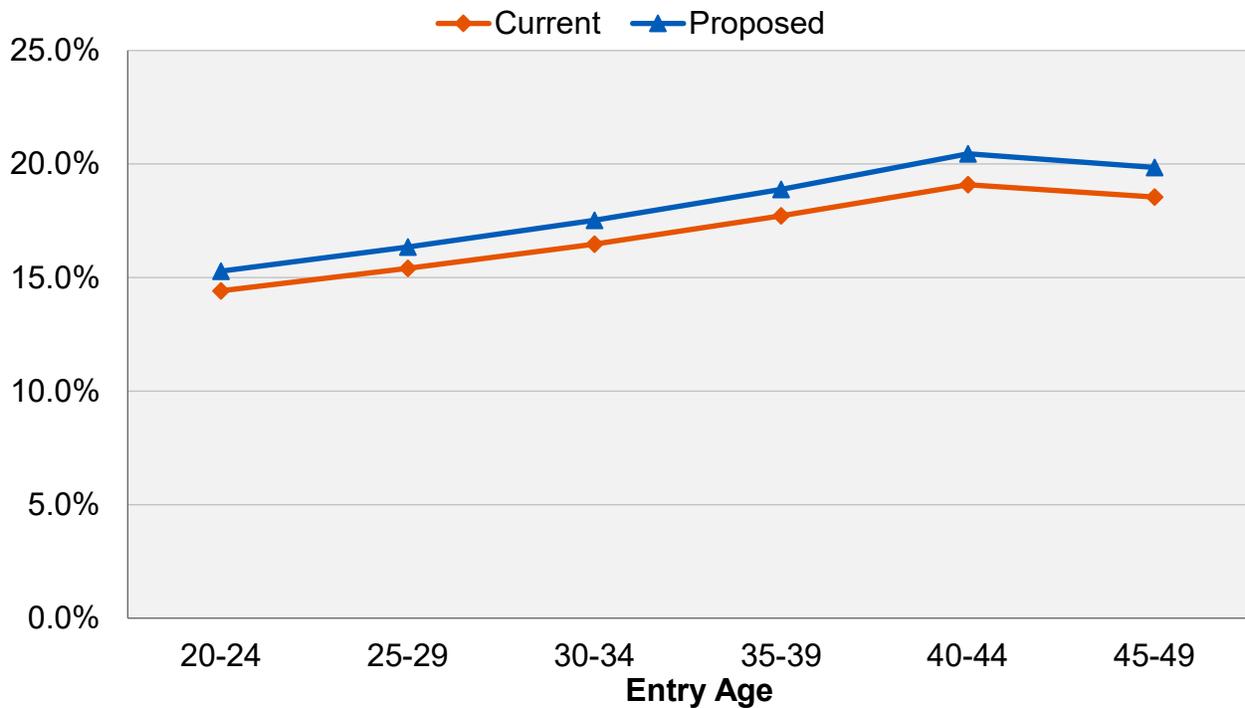
Appendix A: Current Actuarial Assumptions

Economic Assumptions

Net Investment Return:	7.25%, net of administrative and investment expenses. Expected administrative and investment expenses represent about 0.90% of the Market Value of Assets.
Employee Contribution Crediting Rate:	7.25%, compounded semi-annually.
Consumer Price Index:	Increase of 3.00% per year. Retiree COLA increases due to CPI are subject to a 3% maximum change per year for General Tier 1, General Tier 3, and Safety Tier 1, and 2% maximum change per year for General Tier 2, General Tier 4, Safety Tier 2, Safety Tier 2C, Safety Tier 2D, and Safety Tier 4.
Payroll Growth:	Inflation of 3.00% per year plus real "across the board" salary increases of 0.50% per year, used to amortize the Unfunded Actuarial Accrued Liability as a level percentage of payroll.
Increases in Internal Revenue Code Section 401(a)(17) Compensation Limit:	Increase of 3.00% per year from the valuation date.
Increase in Section 7522.10 Compensation Limit:	Increase of 3.00% per year from the valuation date.

Salary Increases

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

Annual Rate of Compensation Increase

Years of Service	Rate (%)	
	General	Safety
Less than 1	4.80	7.80
1 – 2	4.80	7.80
2 – 3	3.90	7.00
3 – 4	2.40	4.40
4 – 5	1.90	3.50
5 – 6	1.60	2.30
6 – 7	1.50	1.60
7 – 8	1.10	1.00
8 – 9	0.80	1.00
9 – 10	0.80	0.90
10 – 11	0.50	0.80
11 & Over	0.40	0.80

Terminal Pay Assumptions

Additional pay elements are expected to be received during a member's final average earnings period. The percentages, added to the final average salary, are:

	Service Retirement	Disability Retirement
General Tier 1	8.0%	6.5%
General Tier 2	3.0%	1.4%
General Tier 3	8.0%	6.5%
General Tier 4	N/A	N/A
Safety Tier 1	8.5%	6.4%
Safety Tier 2	3.5%	2.1%
Safety Tier 2C	3.5%	2.1%
Safety Tier 2D	3.5%	2.1%
Safety Tier 4	N/A	N/A

Demographic Assumptions

Post-Retirement Mortality Rates – Healthy

- **General Members:** Headcount-Weighted RP-2014 (RPH-2014) Healthy Annuitant Mortality Tables, with no setback for males and females, projected generationally with the two-dimensional MP-2016 projection scale.

- **Safety Members:** Headcount-Weighted RP-2014 (RPH-2014) Healthy Annuitant Mortality Tables, with no setback for males and females, projected generationally with the two-dimensional MP-2016 projection scale.

Post-Retirement Mortality Rates – Disabled

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

- **Safety Members:** Headcount-Weighted RP-2014 (RPH-2014) Healthy Annuitant Mortality Tables, set forward two years for males and with no set forward for females, projected generationally with the two-dimensional MP-2016 projection scale.

Mortality Rates – Beneficiaries

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

Mortality Rates – Pre-Retirement

- **General and Safety Members:** Headcount-Weighted RP-2014 (RPH-2014) Employee Mortality Tables multiplied by 80%, projected generationally with the two-dimensional MP-2016 projection scale.

	Rate (%)			
	General		**Safety**	
Age	**Male**	**Female**	**Male**	**Female**
20	0.05	0.02	0.05	0.02
25	0.05	0.02	0.05	0.02
30	0.05	0.02	0.05	0.02
35	0.05	0.03	0.05	0.03
40	0.06	0.04	0.06	0.04
45	0.10	0.07	0.10	0.07
50	0.17	0.11	0.17	0.11
55	0.27	0.17	0.27	0.17
60	0.45	0.24	0.45	0.24
65	0.78	0.36	0.78	0.36

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

Mortality Rates - Member Contribution Rates

- **General Members:** Headcount-Weighted RP-2014 (RPH-2014) Healthy Annuitant Mortality Tables, with no setback for males and females, projected 20 years with the two-dimensional mortality improvement Scale MP-2016, weighted 30% male and 70% female.

- **Safety Members:** Headcount-Weighted RP-2014 (RPH-2014) Healthy Annuitant Mortality Tables, with no setback for males and females, projected 20 years with the two-dimensional mortality improvement Scale MP-2016, weighted 75% male and 25% female.

Optional Forms of Benefit

Service Retirement and All Beneficiaries

- **General Members:** Headcount-Weighted RP-2014 (RPH-2014) Healthy Annuitant Mortality Tables, with no setback for males and females, projected 20 years with the two-dimensional mortality improvement Scale MP-2016, weighted 30% male and 70% female.

- **General Beneficiaries:** Headcount-Weighted RP-2014 (RPH-2014) Healthy Annuitant Mortality Tables, with no setback for males and females, projected 20 years with the two-dimensional mortality improvement Scale MP-2016, weighted 70% male and 30% female.

- **Safety Members:** Headcount-Weighted RP-2014 (RPH-2014) Healthy Annuitant Mortality Tables, with no setback for males and females, projected 20 years with the two-dimensional mortality improvement Scale MP-2016, weighted 75% male and 25% female.

- **Safety Beneficiaries:** Headcount-Weighted RP-2014 (RPH-2014) Healthy Annuitant Mortality Tables, with no setback for males and females, projected 20 years with the two-dimensional mortality improvement Scale MP-2016, weighted 25% male and 75% female.

Disability Retirement

- **General Members:** Headcount-Weighted RP-2014 (RPH-2014) Healthy Annuitant Mortality Tables, set forward seven years for males and set forward four years for females, projected 20 years with the two-dimensional mortality improvement Scale MP-2016, weighted 30% male and 70% female.

- **Safety Members:** Headcount-Weighted RP-2014 (RPH-2014) Healthy Annuitant Mortality Tables, set forward two years for males and with no set forward for females, projected 20 years with the two-dimensional mortality improvement Scale MP-2016, weighted 75% male and 25% female.

Disability Incidence Rates

Age	Rate (%)	
	General	Safety
20	0.00	0.00
25	0.01	0.03
30	0.03	0.26
35	0.05	0.58
40	0.08	0.73
45	0.19	0.78
50	0.31	1.52
55	0.38	2.00
60	0.43	2.60

60% of General disabilities are assumed to be service connected disabilities and the other 40% are assumed to be non-service connected disabilities.

100% of Safety disabilities are assumed to be service connected disabilities.

Termination Rates

Less Than Five Years of Service

Years of Service	Rate (%)	
	General	**Safety**
0-1	11.00	4.00
1-2	9.00	3.50
2-3	8.00	3.50
3-4	6.00	2.50
4-5	6.00	2.00

60% of all terminated members with less than 5 years of service are assumed to choose a refund of contributions. The other 40% are assumed to choose a deferred vested benefit.

Five or More Years of Service

Age	Rate (%)	
	General	**Safety**
20	6.00	2.00
25	6.00	2.00
30	5.40	2.00
35	4.40	1.70
40	3.40	1.20
45	3.00	1.00
50	3.00	1.00
55	3.00	1.00
60	3.00	0.40

35% of all terminated members with 5 or more years of service are assumed to choose a refund of contributions. The other 65% are assumed to choose a deferred vested benefit.

No termination is assumed after a member is eligible for retirement (as long as a retirement rate is present).

Retirement Rates - General[1]

Age	Rate (%)			
	Tier 1	Tier 2	Tier 3	Tier 4
49	0.00	0.00	0.00	0.00
50	4.00	2.00	6.00	0.00
51	4.00	2.00	3.00	0.00
52	4.00	2.00	5.00	4.00
53	4.00	2.00	6.00	1.50
54	4.00	2.00	6.00	1.50
55	6.00	2.00	12.00	2.00
56	8.00	3.00	13.00	2.50
57	10.00	4.00	13.00	3.50
58	12.00	4.00	14.00	3.50
59	14.00	5.00	16.00	4.50
60	20.00	7.00	21.00	6.00
61	20.00	9.00	20.00	8.00
62	35.00	15.00	30.00	18.00
63	30.00	16.00	25.00	15.00
64	30.00	18.00	25.00	17.00
65	35.00	25.00	30.00	22.00
66	35.00	25.00	25.00	25.00
67	30.00	25.00	25.00	25.00
68	30.00	30.00	25.00	30.00
69	35.00	35.00	50.00	35.00
70	65.00	50.00	65.00	50.00
71	65.00	50.00	65.00	50.00
72	65.00	50.00	65.00	50.00
73	65.00	50.00	65.00	50.00
74	65.00	50.00	65.00	50.00
75 & Over	100.00	100.00	100.00	100.00

[1] The retirement rates only apply to members that are eligible to retire at the age shown.

Retirement Rates – Safety[1]

Age	Rate (%)			
	Tier 1[2]	Tier 2, 2D[2]	Tier 2C[2]	Tier 4
49	0.00	10.00	0.00	0.00
50	35.00	15.00	4.00	4.00
51	30.00	15.00	2.00	2.00
52	25.00	15.00	2.00	2.00
53	35.00	15.00	3.00	3.00
54	45.00	15.00	6.00	6.00
55	45.00	15.00	10.00	10.00
56	45.00	15.00	12.00	12.00
57	45.00	15.00	20.00	20.00
58	45.00	20.00	10.00	10.00
59	45.00	20.00	15.00	15.00
60	45.00	30.00	60.00	60.00
61	45.00	30.00	60.00	60.00
62	45.00	30.00	60.00	60.00
63	45.00	30.00	60.00	60.00
64	45.00	50.00	60.00	60.00
65 & Over	100.00	100.00	100.00	100.00

[1] The retirement rates only apply to members that are eligible to retire at the age shown.

[2] Retirement rate is 100% after a member accrues a benefit of 100% of final average earnings.

Retirement Age and Benefit for Deferred Vested Members	For current and future deferred vested members, retirement age assumptions are as follows:
	
	    General Age: 61
	    Safety Age: 56
	
	Future deferred vested members who terminate with less than five years of service and are not vested are assumed to retire at age 70 for both General and Safety if they decide to leave their contributions on deposit.
	
	30% of future General and 60% of future Safety deferred vested members are assumed to continue to work for a reciprocal employer. For reciprocals, 3.90% and 4.30% compensation increases are assumed per annum for General and Safety, respectively.

Future Benefit Accruals	1.0 year of service per year of employment, plus 0.003 years of additional service for General members and 0.006 years of additional service for Safety members, to anticipate conversion of unused sick leave for each year of employment.
Unknown Data for Members	Same as those exhibited by members with similar known characteristics. If not specified, members are assumed to be male.
Inclusion of Deferred Vested Members	All deferred vested members are included in the valuation.
Data Adjustment	Data as of November 30 has been adjusted to December 31 by adding one month of age and, for active members, one month of service.
Form of Payment	All active and inactive vested members are assumed to elect the unmodified option at retirement.
Percent Married	70% of male members; 50% of female members.
Age and Gender of Spouse	For all active and inactive members, male members are assumed to have a female spouse who is 3 years younger than the member and female members are assumed to have a male spouse who is 2 years older than the member.

Appendix B: Proposed Actuarial Assumptions

Economic Assumptions

Net Investment Return:	7.00%, net of administrative and investment expenses. Expected administrative and investment expenses represent about 0.95% of the Market Value of Assets.
Employee Contribution Crediting Rate:	7.00%, compounded semi-annually.
Consumer Price Index:	Increase of 2.75% per year. Retiree COLA increases due to CPI are subject to a 2.75% maximum change per year for General Tier 1, General Tier 3, and Safety Tier 1, and 2% maximum change per year for General Tier 2, General Tier 4, Safety Tier 2, Safety Tier 2C, Safety Tier 2D, and Safety Tier 4. (For General Tier 1, General Tier 3, and Safety Tier 1 members with a sufficient COLA bank, withdrawals from the bank can be made to increase the retiree COLA up to 3% per year.)
Payroll Growth:	Inflation of 2.75% per year plus real "across the board" salary increases of 0.50% per year, used to amortize the Unfunded Actuarial Accrued Liability as a level percentage of payroll.
Increases in Internal Revenue Code Section 401(a)(17) Compensation Limit:	Increase of 2.75% per year from the valuation date.
Increase in Section 7522.10 Compensation Limit:	Increase of 2.75% per year from the valuation date.

Salary Increases

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

Annual Rate of Compensation Increase

Years of Service	Rate (%)	
	General	Safety
Less than 1	5.10	8.00
1 – 2	5.10	8.00
2 – 3	4.50	8.00
3 – 4	2.90	4.90
4 – 5	2.10	3.70
5 – 6	1.60	2.10
6 – 7	1.50	1.30
7 – 8	1.50	1.20
8 – 9	1.00	0.90
9 – 10	0.90	0.90
10 – 11	0.70	0.80
11 & Over	0.40	0.80

Terminal Pay Assumptions

Additional pay elements are expected to be received during a member's final average earnings period. The percentages, added to the final average salary, are:

	Service Retirement	Disability Retirement
General Tier 1	7.5%	6.5%
General Tier 2	3.0%	1.4%
General Tier 3	7.5%	6.5%
General Tier 4	N/A	N/A
Safety Tier 1	7.5%	6.4%
Safety Tier 2	2.5%	1.9%
Safety Tier 2C	2.5%	1.9%
Safety Tier 2D	2.5%	1.9%
Safety Tier 4	N/A	N/A

Demographic Assumptions

Post-Retirement Mortality Rates – Healthy

For the Statutory Retirement Plan Benefits

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

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

For the Discretionary SRBR OPEB Benefits

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

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

Post-Retirement Mortality Rates – Disabled

For the Statutory Retirement Plan Benefits

- **General Members:** Pub-2010 Non-Safety Disabled Retiree Amount-Weighted Mortality Tables (separate tables for males and females) with rates decreased 10% for females, projected generationally with the two-dimensional mortality improvement scale MP-2019.

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

For the Discretionary SRBR OPEB Benefits

- **General Members:** Pub-2010 Non-Safety Disabled Retiree Headcount-Weighted Mortality Tables (separate tables for males and females) with rates decreased by 10% for females, projected generationally with the two-dimensional mortality improvement scale MP-2019.

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

Mortality Rates – Beneficiaries

For the Statutory Retirement Plan Benefits

- **All Beneficiaries:** Pub-2010 General Contingent Survivor Amount-Weighted Above-Median Mortality Tables (separate tables for males and females) with rates increased by 5% for males, projected generationally with the two-dimensional mortality improvement scale MP-2019.

For the Discretionary SRBR OPEB Benefits

- **All Beneficiaries:** Pub-2010 General Contingent Survivor Headcount-Weighted Above-Median Mortality Tables (separate tables for males and females) with rates increased by 5% for males, projected generationally with the two-dimensional mortality improvement scale MP-2019.

Mortality Rates – Pre-Retirement

For the Statutory Retirement Plan Benefits

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

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

	Rate (%)			
	General		Safety	
Age	Male	Female	Male	Female
20	0.04	0.01	0.04	0.02
25	0.02	0.01	0.03	0.02
30	0.04	0.01	0.04	0.02
35	0.04	0.02	0.04	0.03
40	0.06	0.03	0.05	0.04
45	0.09	0.05	0.07	0.06
50	0.13	0.08	0.10	0.08
55	0.19	0.11	0.15	0.11
60	0.28	0.17	0.23	0.15
65	0.41	0.27	0.35	0.20

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

For the Discretionary SRBR OPEB Benefits

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

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

Rate (%)				
	General		Safety	
Age	Male	Female	Male	Female
20	0.04	0.01	0.04	0.02
25	0.03	0.01	0.03	0.02
30	0.04	0.02	0.04	0.02
35	0.05	0.02	0.04	0.03
40	0.06	0.04	0.05	0.04
45	0.09	0.05	0.07	0.06
50	0.14	0.08	0.11	0.08
55	0.20	0.12	0.15	0.11
60	0.29	0.18	0.24	0.16
65	0.42	0.28	0.38	0.22

Mortality Rates - Member Contribution Rates

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

- **Safety Members:** Pub-2010 Safety Healthy Retiree Amount-Weighted Above-Median Mortality Tables (separate tables for males and females), projected 30 years (from 2010) with the two-dimensional mortality improvement scale MP-2019, weighted 75% male and 25% female.

Optional Forms of Benefit

Service Retirement and All Beneficiaries

- **General Members:** Pub-2010 General Healthy Retiree Amount-Weighted Above-Median Mortality Tables (separate tables for males and females), projected 25 years (from 2010) with the two-dimensional mortality improvement scale MP-2019, weighted 30% male and 70% female.

- **General Beneficiaries:** Pub-2010 General Contingent Survivor Amount-Weighted Above-Median Mortality Tables (separate tables for males and females) with rates increased by 5% for males, projected 25 years (from 2010) with the two-dimensional mortality improvement scale MP-2019, weighted 70% male and 30% female.

- **Safety Members:** Pub-2010 Safety Healthy Retiree Amount-Weighted Above-Median Mortality Tables (separate tables for males and females), projected 25 years (from 2010) with the two-dimensional mortality improvement scale MP-2019, weighted 75% male and 25% female.

- **Safety Beneficiaries:** Pub-2010 General Contingent Survivor Amount-Weighted Above-Median Mortality Tables (separate tables for males and females) with rates increased by 5% for males, projected 25 years (from 2010) with the two-dimensional mortality improvement scale MP-2019, weighted 25% male and 75% female.

Disability Retirement

- **General Members:** Pub-2010 Non-Safety Disabled Retiree Amount-Weighted Mortality Tables (separate tables for males and females) with rates decreased 10% for females, projected 25 years (from 2010) with the two-dimensional mortality improvement scale MP-2019, weighted 30% male and 70% female.

- **Safety Members:** Pub-2010 Safety Disabled Retiree Amount-Weighted Mortality Tables (separate tables for males and females) with rates increased by 5% for males, projected 25 years (from 2010) with the two-dimensional mortality improvement scale MP-2019, weighted 75% male and 25% female.

Disability Incidence Rates

Age	Rate (%)	
	General	Safety
20	0.00	0.00
25	0.01	0.03
30	0.03	0.26
35	0.07	0.64
40	0.09	1.22
45	0.16	1.50
50	0.26	2.10
55	0.33	2.65
60	0.38	3.80

65% of General disabilities are assumed to be service connected disabilities and the other 35% are assumed to be non-service connected disabilities.

100% of Safety disabilities are assumed to be service connected disabilities.

Termination Rates

Years of Service	Rate (%)	
	General	Safety
0-1	12.00	4.00
1-2	9.00	4.00
2-3	8.00	4.00
3-4	6.00	3.50
4-5	6.00	3.00
5-6	6.00	2.00
6-7	5.25	1.80
7-8	4.25	1.70
8-9	3.75	1.60
9-16	3.50	1.50
16-17	3.40	1.40
17-18	3.30	1.30
18-19	3.20	1.20
19-20	3.10	1.10
20 or more	3.00	1.00

For members with less than five years of service, 55% of all terminated members are assumed to choose a refund of contributions and the other 45% are assumed to choose a deferred vested benefit. For members with five or more years of service, 30% of all terminated members are assumed to choose a refund of contributions and the other 70% are assumed to choose a deferred vested benefit.

No termination is assumed after a member is eligible for retirement.

Retirement Rates - General[1]

Age	Tier 1	Tier 2		Tier 3	Tier 4
		< 30	30+		
49	0.00	0.00	0.00	0.00	0.00
50	2.00	2.00	4.00	10.00	0.00
51	4.00	2.00	4.00	10.00	0.00
52	4.00	2.00	4.00	10.00	4.00
53	5.00	2.00	4.00	10.00	2.00
54	5.00	2.00	4.00	10.00	2.00
55	6.00	2.00	4.00	12.00	5.00
56	10.00	2.50	4.50	14.00	2.50
57	12.00	4.00	5.00	16.00	3.50
58	12.00	4.00	5.00	18.00	3.50
59	14.00	4.50	8.00	20.00	4.50
60	20.00	8.00	8.50	20.00	5.00
61	20.00	9.00	13.50	20.00	5.00
62	35.00	15.00	22.50	30.00	18.00
63	30.00	15.00	22.50	25.00	15.00
64	30.00	18.00	27.00	25.00	17.00
65	30.00	25.00	27.50	50.00	25.00
66	30.00	30.00	33.00	50.00	30.00
67	30.00	30.00	33.00	50.00	30.00
68	30.00	30.00	33.00	50.00	30.00
69	35.00	35.00	38.50	50.00	35.00
70	40.00	40.00	40.00	65.00	25.00
71	40.00	40.00	40.00	65.00	25.00
72	40.00	40.00	40.00	65.00	25.00
73	40.00	40.00	40.00	65.00	25.00
74	40.00	40.00	40.00	65.00	25.00
75 & Over	100.00	100.00	100.00	100.00	100.00

[1] The retirement rates only apply to members that are eligible to retire at the age shown.

Retirement Rates – Safety[1]

Age	Tier 1[2]	Tier 2, 2D		Tier 2C[2]	Tier 4
		< 30	30+		
49	0.00	12.00	18.00	0.00	0.00
50	35.00	12.00	18.00	4.00	4.00
51	30.00	10.00	24.00	2.00	2.00
52	25.00	10.00	24.00	2.00	2.00
53	35.00	10.00	25.00	3.00	3.00
54	45.00	12.00	27.00	6.00	6.00
55	45.00	12.00	29.00	10.00	10.00
56	45.00	14.00	32.00	12.00	12.00
57	45.00	16.00	32.00	20.00	20.00
58	45.00	18.00	30.00	10.00	10.00
59	45.00	18.00	30.00	15.00	15.00
60	45.00	25.00	30.00	60.00	60.00
61	45.00	25.00	30.00	60.00	60.00
62	45.00	25.00	30.00	60.00	60.00
63	45.00	25.00	30.00	60.00	60.00
64	45.00	30.00	30.00	60.00	60.00
65 & Over	100.00	100.00	100.00	100.00	100.00

[1] The retirement rates only apply to members that are eligible to retire at the age shown.

[2] Retirement rate is 100% after a member accrues a benefit of 100% of final average earnings.

Retirement Age and Benefit for Deferred Vested Members	For current and future deferred vested members, retirement age assumptions are as follows: General Age: 61 Safety Age: 55 Future deferred vested members who terminate with less than five years of service and are not vested are assumed to retire at age 70 for both General and Safety if they decide to leave their contributions on deposit. 25% of future General and 50% of future Safety deferred vested members are assumed to continue to work for a reciprocal employer. For reciprocals, 3.65% and 4.05% compensation increases are assumed per annum for General and Safety, respectively.
Future Benefit Accruals	1.0 year of service per year of employment, plus 0.003 years of additional service for General members and 0.007 years of additional service for Safety members, to anticipate conversion of unused sick leave for each year of employment.
Unknown Data for Members	Same as those exhibited by members with similar known characteristics. If not specified, members are assumed to be male.
Inclusion of Deferred Vested Members	All deferred vested members are included in the valuation.
Data Adjustment	Data as of November 30 has been adjusted to December 31 by adding one month of age and, for active members, one month of service.
Form of Payment	All active and inactive vested members are assumed to elect the unmodified option at retirement.
Percent Married	70% of male members; 50% of female members.
Age and Gender of Spouse	For all active and inactive members, male members are assumed to have a female spouse who is 3 years younger than the member and female members are assumed to have a male spouse who is 2 years older than the member.