

California Public Employees' Retirement System

Review of 2025 CalPERS Experience Study and Review of Actuarial
Assumptions



Gallagher

Insurance | Risk Management | Consulting

June 11, 2025

Board of Administration
California Public Employees' Retirement System (CalPERS)
P.O. Box 942701
Sacramento, CA 94229-2701

Members of the Board:

As provided in Contract 2024-0739, we have reviewed a draft of the *2025 CalPERS Experience Study and Review of Actuarial Assumptions* report (Experience Study). In the following pages, our report presents the results of our review of this Experience Study.

The Table of Contents, which immediately follows, outlines the material contained in our report.

This report was prepared for the Board and professional staff of CalPERS for their use in evaluating the preparation of the Experience Study by the CalPERS Actuarial Office (CalPERS ACTO). Use of this report for any other purpose or by other parties may not be appropriate and may result in mistaken conclusions because of failure to understand applicable assumptions, methods, or inapplicability of the report for other purposes. Because of the risk of misinterpretation of actuarial results, Gallagher recommends requesting its advance review of any statement, document, or filing to be based on information contained in this report. Gallagher will accept no liability for any such statement, document or filing made without its prior review.

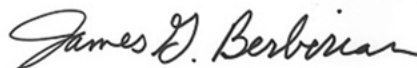
In our professional opinion, the assumptions recommended by CalPERS ACTO are reasonable, appropriate, and in accordance with the generally accepted actuarial principles.

The undersigned are members of the Society of Actuaries, Members of the American Academy of Actuaries and Enrolled Actuaries. We each meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained in this report. We believe this report has been prepared in accordance with all applicable Actuarial Standards of Practice, and we are available to answer questions about it.

Gallagher Benefit Services, Inc.



David L. Driscoll, FSA, MAAA, EA, FCA
Principal, Consulting Actuary
David_Driscoll@ajg.com
617.306.2011



Jim Berberian, ASA, EA, MAAA, FCA
Principal, Manager Central Review
Jim_Berberian@ajg.com
404.484.6103

Contents

1	Executive Summary.....	4
2	Economic Assumptions.....	8
2.1	Price Inflation	8
2.2	Wage Inflation	10
2.3	Payroll Growth	12
3	Demographic Assumptions.....	14
3.1	Service Retirement	14
3.2	Mortality.....	23
3.3	Disability Retirement	40
3.4	Termination	48
3.5	Other Assumptions	56
3.6	Salary/Merit Increase	59
4	Workpapers Received from CalPERS for Review	67

1. Executive Summary

Scope of Engagement

Letter of Engagement No. 2024-0739 lists the following required services associated with the assignment:

Perform a study of the following economic assumptions:

- Future Annual Price Inflation
- Future Wage Growth
- Payroll Growth

In addition, perform a comprehensive peer review of the demographic experience study covering the period from 2003 to 2023. The review report will include a statement as to whether or not the assumptions recommended by CalPERS ACTO are reasonable, appropriate and in accordance with generally accepted actuarial principles. The review will include:

- An examination of the processes used by CalPERS ACTO to analyze the data
- Calculations of exposures and decrements
- Calculations of the raw rates
- Methods used to smooth the raw rates

Recreating the participant data is not part of this review. CalPERS will provide the participant data used in the demographic experience study.

- Some of the assumptions used by CalPERS apply to all members while some vary by category. The review of the new and existing assumptions applies to the following groups:
 - State Miscellaneous
 - State Industrial members
 - State Police Officers and Firefighters (POFF)
 - State Safety members
 - California Highway Patrol members
 - Schools
 - Public Agency (PA) Miscellaneous
 - Public Agency (PA) Safety
 - Fire
 - Police (this group also includes Sheriff)
 - County Peace Officers
- The review will apply to the following:
 - Rate smoothing (graduation of the probabilities of decrement)
 - Calculation of expected decrements using existing and new assumptions and comparison to actual decrements

1. Executive Summary (continued)

Scope of Engagement (continued)

- The review will apply to the following decrements:
 - Service Retirement (varies by plan (State plans, Schools, Public Agency formula) and by member category and benefit formula)
 - Active Members (Age Service matrix)
 - Terminated Members (Age Service matrix)
 - Pre-retirement Mortality (varies by gender, all plans combined)
 - Ordinary
 - Industrial
 - Disability (varies by plan and member category)
 - Ordinary
 - Industrial
 - Termination (varies by plan and member category)
 - With a refund
 - Without a refund
 - Post-retirement Mortality (varies by gender, all plans combined)
 - Service Retirement
 - Disability
 - Industrial Disability
 - Salary Scale (Seniority, Merit and Promotion portion)

In subsequent discussions with CalPERS ACTO, the following points were clarified to be outside of the scope of the engagement:

- Recreation of experience study results for all or any particular group(s)
- Testing of alternative assumption formats/groupings

1. Executive Summary (continued)

Review Methodology

From January 2025 through May 2025, CalPERS ACTO provided Gallagher with various files associated with the Experience Study. The files provided can be categorized as follows:

- Supporting workpapers – workpapers and other studies that were part of the decision-making process behind the development of final assumptions but not used explicitly in the development of final assumptions. For example:
 - Preliminary study results presented to upper management
 - Alternative data groupings not used in final assumption setting processes
- Draft report write-ups – draft, preliminary sections of the Experience Study report which ACTO provided to Gallagher throughout the duration of the project. Gallagher reviewed these files and corresponded with ACTO with questions about these files during the project, however, the findings presented in this report are based solely on the final Experience Study.
- Final workpapers – workpapers and other studies that were used in the development of final assumptions and tie to the Experience Study report. Unless otherwise noted, Gallagher’s review focused on the information contained in these final workpaper files.

A listing of files provided to Gallagher for this project is referenced later in this report in Section 4.

The final workpapers provided to Gallagher did not contain input data (i.e., individual records by person-year). Accordingly, Gallagher cannot comment on the appropriateness of the input data used in the analyses.

Regarding demographic assumptions excluding salary scale, the files provided to Gallagher contained decrement exposures and actual decrements in the aggregate, in the selected assumption formats. Gallagher took this aggregated data and used proprietary tools to replicate the exposure, decrement, and raw rates results presented in the Experience Study report. In certain cases, Gallagher believed it appropriate to exclude some of the exposures and decrements provided by ACTO in the review of certain assumptions. In these situations, Gallagher has noted the reason for the exclusions and commented on the significance of the exclusions in the assumption setting process. To assess the reasonableness of the proposed assumptions, Gallagher independently calculated actual vs. expected ratios, exposure weighted r-squared statistics, and the percentage of assumption values that fall within a 90% confidence interval around the raw rates. For assumptions where graduated raw rates were provided, Gallagher used these same statistics to assess the reasonableness of methods used to smooth the raw rates.

Regarding salary scale, in order to assess the reasonableness of proposed merit increase rates, Gallagher modified the final workpapers provided by ACTO to analyze the experience data against the proposed assumptions in narrower groupings than were used to develop the proposed assumptions.

Gallagher prepared an independent study of future annual price inflation, future wage growth, and payroll growth, with commentary related to those studies contained in Section 2.

1. Executive Summary (continued)

Key Findings and Recommendations

In our professional opinion, the assumptions recommended by CalPERS ACTO are reasonable, appropriate, and in accordance with generally accepted actuarial principles.

We note that the 2025 experience report is unsigned. Precept 4 of the Code of Professional Conduct states:

An Actuary who issues an Actuarial Communication shall take appropriate steps to ensure that the Actuarial Communication is clear and appropriate to the circumstances and its intended audience, and satisfies applicable standards of practice.

Annotation 4-1. An Actuary who issues an Actuarial Communication shall ensure that the Actuarial Communication clearly identifies the Actuary as being responsible for it.

Annotation 4-2. An Actuary who issues an Actuarial Communication should indicate the extent to which the Actuary or other sources are available to provide supplementary information and explanation.

We recommend that the Experience Study report be modified to included content that directly addresses Annotations 4-1 and 4-2. Additionally, we recommend that the statement identifying the actuary or actuaries who are responsible for the report also state that the actuaries meet the qualification standards to issue the report, in accordance with Section 5 of the Qualification Standards for Actuaries Issuing Statements of Actuarial Opinion in the United States.

Each subsequent section in this report contains a Summary of Observations and Recommendations for CalPERS ACTO's future consideration. A few key recommendations are as follows:

- On May 6, 2025, the Society of Actuaries released the Pub-2016 Public Retirement Plans Mortality Tables, which reflects a review of mortality experience specific to public sector plans. CalPERS ACTO has indicated that they will consider these tables for the next study.
- For post-retirement mortality, we would recommend considering distinct rates for contingent survivors. CalPERS ACTO has indicated that they will consider this for the next study.
- Consider liability-weighted experience for active decrements. If the data is being split into significant, relevant subgroups, the weighted experience rates should be similar to rates developed on a headcount basis. Wide divergence would indicate that something is missing in the groups/variables assumed to be predictive; that could lead to either more refined modeling or using the liability-weighted rates for valuations. CalPERS ACTO has indicated that they will take this under consideration for future studies.

2. Economic Assumptions

2.1 Price Inflation

Assumption Purpose

The price inflation assumption is an explicit component of other economic assumptions used in the actuarial valuations of plans that participate in CalPERS:

- Cost-of-living adjustments for CalPERS retirees
- Investment return / discount rate
- Individual salary increases
- Payroll growth

Selecting an Inflation Assumption

ASOP No. 27, Section 3.6 provides the following with respect to selecting an inflation assumption:

*When selecting an **inflation** assumption as an independent assumption or as an explicit component of other economic assumptions, the actuary should evaluate appropriate **inflation** data. These data may include consumer price indices, the implicit price deflator, forecasts of **inflation**, yields on government securities of various maturities, and yields on nominal and **inflation**-indexed debt.*

Analysis

- 2025 OASDI Trustees Report projects long-term (75-year) estimates of inflation ranging from between 1.8% and 3.0%
- The most recent¹ headline consumer price index 10-year forecast (2025-2034) published in the Federal Reserve Bank of Philadelphia Survey of Professional Forecasters is 2.35%
- The most recent² inflation expectations published by the Federal Reserve Bank of Cleveland are as follows:
 - 10-Years: 2.33%
 - 20-Years: 2.39%
 - 30-Years: 2.44%
- The most recent³ Gallagher capital market assumptions provide the following inflation expectations (geometric mean)
 - 10-Years: 2.4%
 - 20-Years: 2.5%
 - 30-Years: 2.4%

¹ Q2 2025

² July 15, 2025 Update

³ Q4 2024

2. Economic Assumptions (continued)

2.1 Price Inflation (continued)

Summary of Observations and Recommendations

Based upon the reviewed data, we believe the CalPERS ACTO recommendation to increase the price inflation from 2.30% per year to 2.50% per year is reasonable. The benchmark data shown above might tend more towards 2.40% but considering both recent actual inflation – especially core inflation that was 2.8% year over year in May 2025 – and the 2025 OASDI report, an increase to 2.5% is within a reasonable range. Note, too, that inflation is a component in the assumptions for wage increases and salary scale discussed below, maintaining relative consistency between economic rates.



2. Economic Assumptions (continued)

2.2 Wage Inflation

Assumption Purpose

The wage inflation assumption, which is the sum of assumed price inflation and productivity increases (also known as real wage increases) is an explicit component of other economic assumptions used in the actuarial valuations of plans that participate in CalPERS:

- Individual salary increases
- Payroll growth

Selecting a Wage Inflation Assumption

ASOP No. 27, Section 3.9 provides that “*Generally, a participant’s compensation will increase over the long term in accordance with **inflation**, productivity growth (i.e., the change in the real value of goods or services per unit of work), and merit adjustments (i.e., changes attributable to personal performance, promotion, seniority, or other individual factors).*” The “wage inflation” assumption as used in CalPERS valuations is the sum of the first two components.

Our comments regarding the selection of the price inflation section are included in Section 2.1 above. Assumed productivity increases are generally based on average wage growth for the economy as a whole, with potentially time-limited adjustments for other factors such as industry, employer, region, etc.

Analysis

- The CalPERS ACTO recommended setting the price inflation assumption to 2.50%, which we consider reasonable
 - The 2024 OASDI Trustees Report notes that “for the period from 1969 to 2019...the annual real (i.e., inflation-adjusted) growth rate in the average covered wage averaged 0.77 percent”
 - 2024 OASDI Trustees Report projects long-term (75-year) estimates of productivity increases ranging between 0.53% and 1.74%
 - 2023 OASDI Trustees Report projected long-term (75-year) estimates of productivity increases ranging between 0.54% and 1.74%
 - The following table provides the annual changes in average CalPERS payroll, inflation using CPI-U, and the difference between the two (i.e., net)
- 

2. Economic Assumptions (continued)

2.2 Wage Inflation (continued)

Change in Average CalPERS Pay versus CPI-U (2007-2023)

Year (June to June)	CalPERS	CPI-U	NET
2007-2008	4.75%	5.02%	-0.27%
2008-2009	0.54%	-1.43%	1.97%
2009-2010	-0.29%	1.05%	-1.34%
2010-2011	2.98%	3.56%	-0.58%
2011-2012 ⁴	1.94%	1.66%	0.27%
2012-2013	0.01%	1.75%	-1.74%
2013-2014	2.57%	2.07%	0.50%
2014-2015	2.13%	0.12%	2.00%
2015-2016	2.57%	1.00%	1.57%
2016-2017	4.11%	1.63%	2.47%
2017-2018	3.12%	2.87%	0.25%
2018-2019	3.16%	1.65%	1.51%
2019-2020	3.80%	0.65%	3.16%
2020-2021	2.12%	5.39%	-3.27%
2021-2022	3.26%	9.06%	-5.80%
2022-2023	4.57%	2.97%	1.60%
Geometric Averages			
2008-2013 (5 Years)	1.03%	1.31%	-0.28%
2013-2018 (5 Years)	2.90%	1.54%	1.36%
2018-2023 (5 Years)	3.38%	3.90%	-0.52%
2007-2023 (Last 16 Years)	2.57%	2.41%	0.16%
2013-2023 (Last 10 Years)	3.14%	2.71%	0.43%
2018-2023 (Last 5 Years)	3.38%	3.90%	-0.52%

- Recent experience indicates that changes in CPI-U have outpaced changes in average compensation for CalPERS members – not unexpected given unusually high inflation in recent periods
- Longer-term recent experience (2007-2023 and 2013-2023) has shown CalPERS average compensation increasing at a higher rate than CPI-U (between 0.16% and 0.43%)

Summary of Observations and Recommendations

CalPERS ACTO has recommended that the productivity component of the annual wage inflation assumption remain at 0.50%. This rate is slightly below the “high-cost” long-term assumptions used in the 2024 OASDI Trustees Report but is not out of line with recent CalPERS experience. Based upon the reviewed data, we believe the CalPERS ACTO recommendation to maintain the wage inflation assumption at 0.50% is reasonable.

⁴ Excludes the experience for the Schools group due to an apparent programming adjustment

2. Economic Assumptions (continued)

2.3 Payroll Growth

Assumption Purpose

The payroll growth assumption is used in the calculation of amortization payments for Unfunded Accrued Liability (UAL) bases that were established prior to June 30, 2019. These UAL bases are amortized as a level percent of payroll, with payroll assumed to increase in accordance with the payroll growth assumption. UAL bases established on or after June 30, 2019, are amortized on a level dollar basis.

Selecting a Payroll Growth Assumption

ASOP No. 27, Section 3.17.3 provides the following with respect to selecting a payroll growth assumption:

As a result of terminations and new participants, total payroll generally grows at a different rate than does a participant's salary or the average of all current participants combined. As such, when a payroll growth assumption is needed, the actuary should use an assumption that is consistent with but typically not identical to the compensation increase assumption. One approach to setting the payroll growth assumption may be to reduce the compensation increase assumption by the effect of any assumed merit adjustments. The actuary should apply professional judgment in determining whether, given the purpose of the measurement, the payroll growth assumption should be based on a closed or open group and, if the latter, whether the size of that group should be expected to increase, decrease, or remain constant.

Analysis

- The “compensation increase assumption” reduced by “the effect of any assumed merit adjustments” would be equal to the wage inflation assumption, which has been set to 3.00% and which we believe is reasonable.
- Based on data provided by CalPERS, the geometric average growth rate in payroll for various periods ending with the valuation date as of June 30, 2023, are provided in the table below. For added context, we’ve also shown the geometric average growth rate in the active participant count:

Period	Geometric Average Growth Rate in Total Payroll	Geometric Average Growth Rate in Active Participant Count
20-Yr Period Ending with June 30, 2023 valuation	3.41%	0.77%
15-Yr Period Ending with June 30, 2023 valuation	2.90%	0.73%
10-Yr Period Ending with June 30, 2023 valuation	5.07%	1.88%
5-Yr Period Ending with June 30, 2023 valuation	4.87%	1.44%

2. Economic Assumptions (continued)

2.3 Payroll Growth (continued)

Summary of Observations and Recommendations

CalPERS ACTO has recommended that the “payroll growth assumption remain at 2.80%, which is equal to the recommended wage inflation assumption of 3.00% minus 0.20% as a margin against adverse experience.”⁵ This is lower than observed by recent experience. CalPERS does not appear to have incorporated an expectation of future member count in their development of this assumption. However, considering the purpose of the assumption, which is solely for the calculation of amortization payments for bases that were established prior to June 30, 2019, we find the assumption to be reasonable. In particular:

- A payroll growth assumption that includes a “margin against adverse experience” provides for relatively higher amortization payments than would be calculated using a best estimate approach.
- We agree with CalPERS ACTO’s conclusion that “using a payroll growth assumption that is lower than the wage inflation assumption guards against contribution rate increases in the event that overall payroll does not increase as quickly as expected.”

⁵ In the context of amortizing unfunded liability lower rates generate higher annual amounts, as discussed below

3. Demographic Assumptions

3.1 Service Retirement

Assumption Purpose

The service retirement assumption projects the timing that participants leave the active population and commence their CalPERS-provided retirement benefit. The service retirement assumption is crucial for reasonably determining the liability associated with a participant's membership in CalPERS and for estimating the percent-of-pay cost associated with funding those benefits over a full career. The service retirement assumption is critical to best approximating a member's future benefit level and for determining the overall duration of their retirement payments. Additionally, the liability associated with service retirement benefits makes up the lion's share of the overall liabilities of CalPERS plans.

Selecting a Service Retirement Assumption

ASOP No. 27, Section 3.10 provides the following with respect to selecting a retirement assumption:

When selecting a retirement assumption, the actuary should take into account factors such as the following:

- a. employer-specific or job-related factors such as occupation, employment practices, work environment, unionization, hazardous conditions, and location of employment;*
- b. the plan design, where specific incentives may influence when participants retire. For example, the introduction of an early retirement subsidy could influence the plan's incidence of retirement. Under these circumstances, in order to measure the incremental cost associated with this change, the assumption for the proposed plan provision may differ from the assumption for the current provision;*
- c. the design of, and date of anticipated payment from, social insurance programs (for example, Social Security or Medicare) or other non-employer-sponsored benefit programs (for example, health insurance exchange plan); and*
- d. the availability of other employer-sponsored postretirement benefit programs (for example, postretirement health coverage or savings plan).*

Summary of Review – Service Retirement

CalPERS applies separate service retirement assumptions to active members and terminated members. The service retirement assumptions that apply to active members are additionally applied to transferred members.

For purposes of Gallagher's review, CalPERS ACTO provided experience study analyses of the service retirement assumption for active and transferred members for the following groups:

- State
 - CHP - Classic
 - Industrial – Classic
 - Industrial – PEPPA
 - Miscellaneous – Classic

3. Demographic Assumptions (continued)

3.1 Service Retirement (continued)

- Miscellaneous – PEPRA
 - POFF – Classic
 - POFF – PEPRA
 - Safety – Classic
 - Safety – PEPRA
- Schools
 - Miscellaneous – Classic
 - Miscellaneous - PEPRA
- PA Miscellaneous
 - 2% at Age 62 PEPRA
 - 2% at Age 55
 - 2% at Age 60
 - 2.5% at Age 55
 - 2.7% at Age 55
 - 3% at Age 60
- PA Fire
 - 2% at Age 50
 - 2% at Age 55
 - 2% at Age 57
 - 2.7% at Age 57
 - 3% at Age 50
 - 3% at Age 55
- PA Police
 - 2% at Age 50
 - 2% at Age 55
 - 2% at Age 57 PEPRA
 - 2.7% at Age 57 PEPRA
 - 3% at Age 50
 - 3% at Age 55

The service retirement assumptions for active and transferred members were developed based on active member experience covering the period June 30, 2011, through June 30, 2023, and additional periods were analyzed. The assumption format varies by age and service.

Gallagher was not provided with information to assess the service retirement assumption for terminated members.

3. Demographic Assumptions (continued)

3.1 Service Retirement (continued)

Analysis – Service Retirement Assumption - Active and Transferred Members

The following table summarizes the total exposures and actual decrements provided by CalPERS ACTO and counts excluded by Gallagher for review of the retirement assumption. For purposes of this analysis, Gallagher excluded records from the exposure and decrement counts who had no expectation of decrementing based on the current and proposed assumption. This approach is an alternative to the one followed by CalPERS ACTO, and does not imply that the inclusion of such records is in any way inappropriate. Gallagher does not believe this adjustment had any material impact on results. Records with no expectation of decrementing based on the current and proposed assumptions generally fell into one of two categories. First were those with age and service combinations that implied an unexpectedly low hire age, which may have been the result of air time purchases. Second were those which had PEPRAs appointments but were classic members.

Assumption Group	Exposures			Actual Decrement		
	CalPERS Studied	Gallagher Studied	Gallagher Excluded	CalPERS Studied	Gallagher Studied	Gallagher Excluded
State CHP-Classic	12,994	12,994	-	2,468	2,468	-
State Industrial - Classic	45,888	45,881	7	4,265	4,258	7
State Industrial - PEPRAs	2,270	1,915	355	87	87	-
State Miscellaneous - Classic	815,874	815,611	263	71,969	71,765	204
State Miscellaneous - PEPRAs	34,381	29,605	4,776	1,528	1,527	1
State POFF - Classic	110,206	110,189	17	16,569	16,561	8
State POFF - PEPRAs	1,449	1,449	-	49	49	-
State Safety - Classic	97,977	97,977	-	7,164	7,164	-
State Safety - Pepra	7,109	7,109	-	164	164	-
Schools Classic	1,356,789	1,356,778	11	103,937	103,935	2
Schools PEPRAs	59,870	50,951	8,919	2,131	2,119	12
2% at 62-Misc	44,927	38,239	6,688	2,057	2,038	19
2% at 55-Misc	284,249	284,236	13	26,792	26,692	100
2% at 60-Misc	48,950	48,949	1	3,411	3,410	1
2.5% at 55-Misc	200,886	200,872	14	19,938	19,936	2
2.7% at 55-Misc	201,650	201,650	-	20,946	20,946	-
3% at 60-Misc	101,088	101,085	3	9,702	9,701	1
2% at 50-Fire	725	725	-	73	73	-
2% at 55-Fire	294	294	-	23	23	-
2% at 57-Fire	28	28	-	4	4	-
2.7% at 57-Fire	217	217	-	19	19	-
3% at 50-Fire	27,976	27,976	-	3,698	3,698	-
3% at 55-Fire	9,320	9,320	-	971	971	-
2% at 50-Police	5,078	5,078	-	537	537	-
2% at 55-Police	532	532	-	37	37	-
2% at 57-Police	72	72	-	3	3	-
2.7% at 57-Police	735	735	-	70	70	-
3% at 50-Police	50,037	50,034	3	9,374	9,372	2
3% at 55-Police	8,750	8,750	-	952	952	-

3. Demographic Assumptions (continued)

3.1 Service Retirement (continued)

Analysis – Service Retirement Assumption - Active and Transferred Members (continued)

The following table provides Gallagher's analysis of the current and proposed assumptions for the below groups.

Assumption Group	Actual / Expected (A/E) Ratio		Exposure Weighted R-Squared (Age Based)		Percent Inside 90% Confidence Intervals (Age Based)	
	Current	Proposed	Current	Proposed	Current	Proposed
CHP-Classic	100.6%	99.3%	0.9905	0.9990	64%	91%
Industrial - Classic	101.3%	99.8%	0.9887	1.0000	96%	100%
Industrial - PEPR	99.2%	100.0%	0.7396	0.5723	84%	68%
Miscellaneous - Classic	100.5%	99.7%	0.9964	1.0000	48%	100%
Miscellaneous - PEPR	102.8%	100.0%	0.8915	0.9751	64%	92%
POFF - Classic	99.9%	100.0%	0.9990	1.0000	60%	100%
POFF - PEPR	75.3%	103.5%	0.3868	0.4056	60%	73%
Safety - Classic	101.6%	100.0%	0.9884	1.0000	79%	96%
Safety - Pepra	74.4%	102.9%	0.7532	0.8437	47%	100%
Schools Classic	97.8%	100.0%	0.9965	1.0000	20%	100%
Schools PEPR	107.2%	100.0%	0.7910	0.9782	36%	84%
2% at 62-Misc	98.3%	106.3%	0.9068	0.9279	48%	60%
2% at 55-Misc	100.6%	98.9%	0.9965	0.9979	80%	72%
2% at 60-Misc	104.7%	93.3%	0.9891	0.8896	76%	44%
2.5% at 55-Misc	99.3%	101.0%	0.9945	0.9987	76%	100%
2.7% at 55-Misc	96.9%	101.3%	0.9975	0.9993	64%	100%
3% at 60-Misc	95.5%	105.9%	0.9910	0.9937	60%	56%
2% at 50-Fire	111.0%	100.8%	-	0.0622	80%	87%
2% at 55-Fire	29.8%	102.5%	0.0378	0.4438	47%	87%
2% at 57-Fire	145.3%	133.9%	0.2218	0.0108	20%	20%
2.7% at 57-Fire	99.0%	101.2%	0.1570	0.2166	73%	73%
3% at 50-Fire	95.6%	99.8%	0.9935	1.0000	80%	100%
3% at 55-Fire	102.2%	101.8%	0.9885	0.9964	100%	100%
2% at 50-Police	109.8%	93.4%	0.8608	0.9286	93%	87%
2% at 55-Police	86.2%	88.5%	0.3948	0.3653	80%	93%
2% at 57-Police	91.2%	126.2%	0.0507	0.3507	20%	20%
2.7% at 57-Police	118.9%	128.6%	0.1636	0.0920	87%	87%
3% at 50-Police	102.5%	99.9%	0.9971	1.0000	93%	100%
3% at 55-Police	106.5%	104.3%	0.9736	0.9812	93%	100%

Source workbooks provided by CalPERS ACTO generally align with the actual, expected, and proposed service retirement headcounts noted in the Experience Study report. Ignoring the proposed exclusion of records for whom no probability of retiring applies, Gallagher can replicate the A/E ratios noted in the the Experience Study report. The current assumption aligns with the assumption specified in recent CalPERS actuarial valuation reports, as expected.

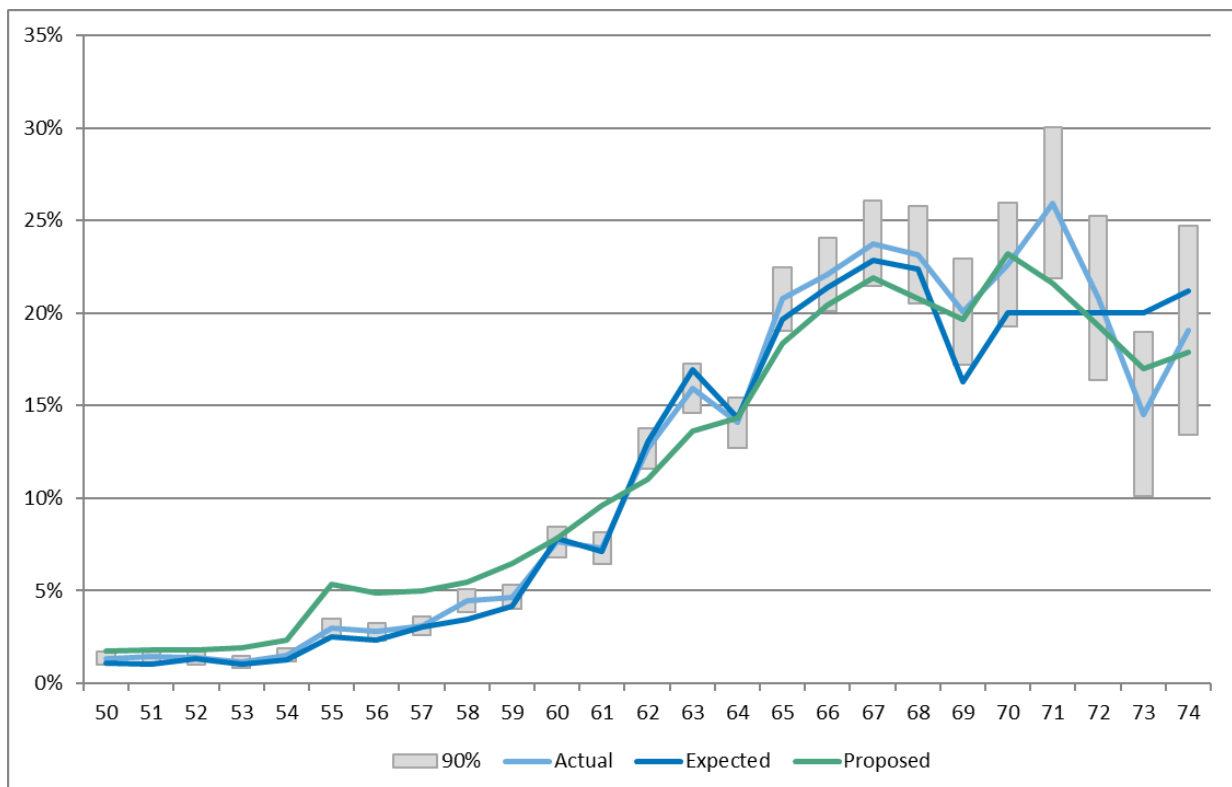
3. Demographic Assumptions (continued)

3.1 Service Retirement (continued)

The factors that CalPERS uses in grouping data, as indicated in the Experience Study report, i.e., age, service, retirement formula, employment classification, status, appears consistent with the guidance provided in ASOP No. 27, Section 3.10.

Generally, the proposed assumptions are a better fit to the actual experience of the plan compared to the current assumptions. Gallagher notes that there are two groups where the proposed assumption results in a poorer fit against the experience based on the A/E ratio, the r-squared coefficient, and the number of assumption inputs that are within a 90% confidence interval – PA Miscellaneous 2% at Age 60 and Police 2.7% at 57. A few items for consideration follow:

- PA Miscellaneous 2% at Age 60* proposed rates are “tilted” compared to the actual rates, i.e., they are consistently higher than the actual rates through age 61 and are consistently lower than actual rates after age 61. This result can be observed in the following graph, which shows actual, expected, and proposed retirement experience by age, as well as the 90% confidence interval around the experience for each age. Consideration should be given to whether this “tilt” is intentional and if so additional rationale could be documented.



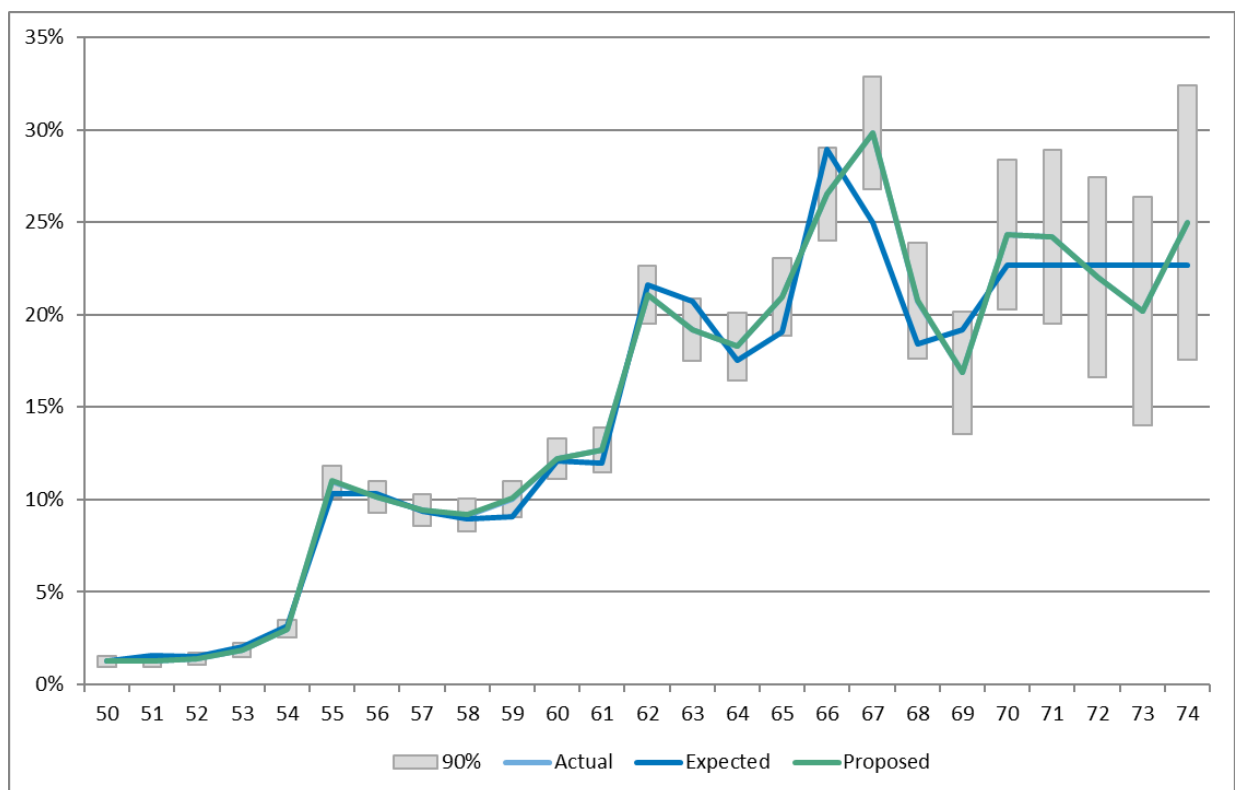
3. Demographic Assumptions (continued)

3.1 Service Retirement (continued)

- Regarding the Police 2.7% at 57 formula, the report indicates that actual numbers of service retirements were lower than assumed, but this does not appear to be the case based on the data summarized elsewhere in the report.

We observe that there are a fairly significant number of retirement rate tables for which 100% of the proposed rates fall within the 90% confidence interval. Considering that each grouping has a number of rates (e.g., a specific rate for each age from 50 to 75), this may suggest that some of the proposed rates are over-fitting the experience data. This can be observed in the following graph, which pertains to the Industrial Classic grouping. Notably, there is no evident distinction between the “Actual” line and the “Proposed” line.

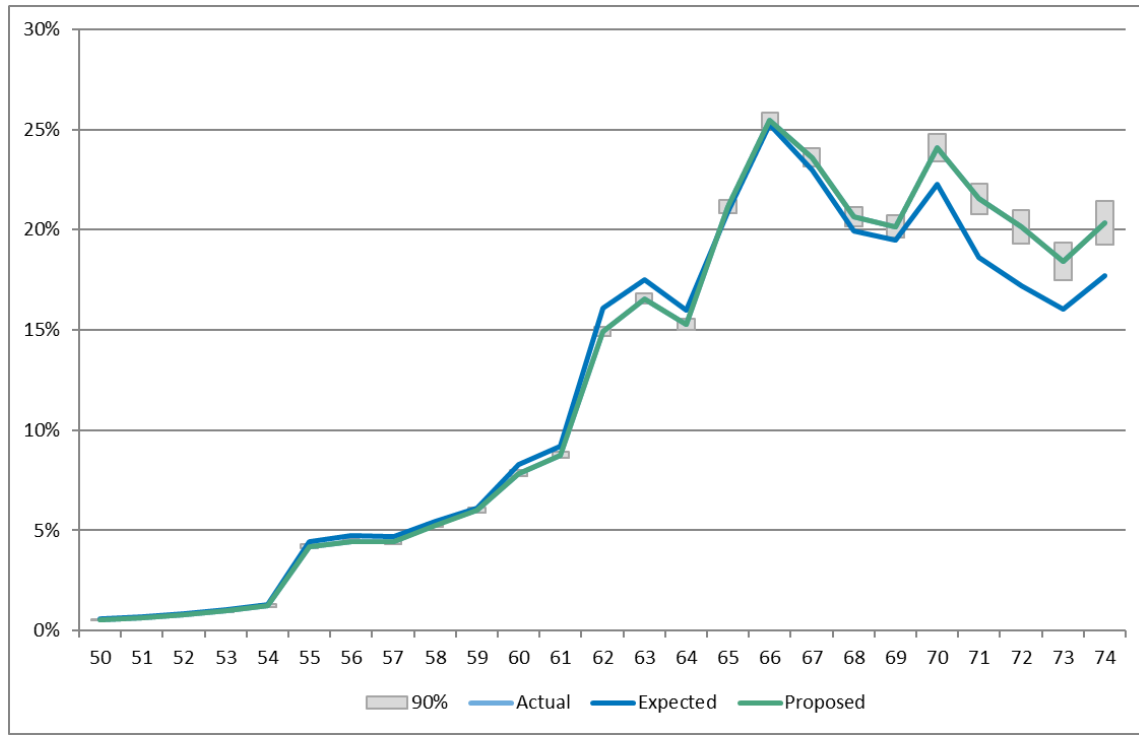
Industrial Classic Retirement Rates



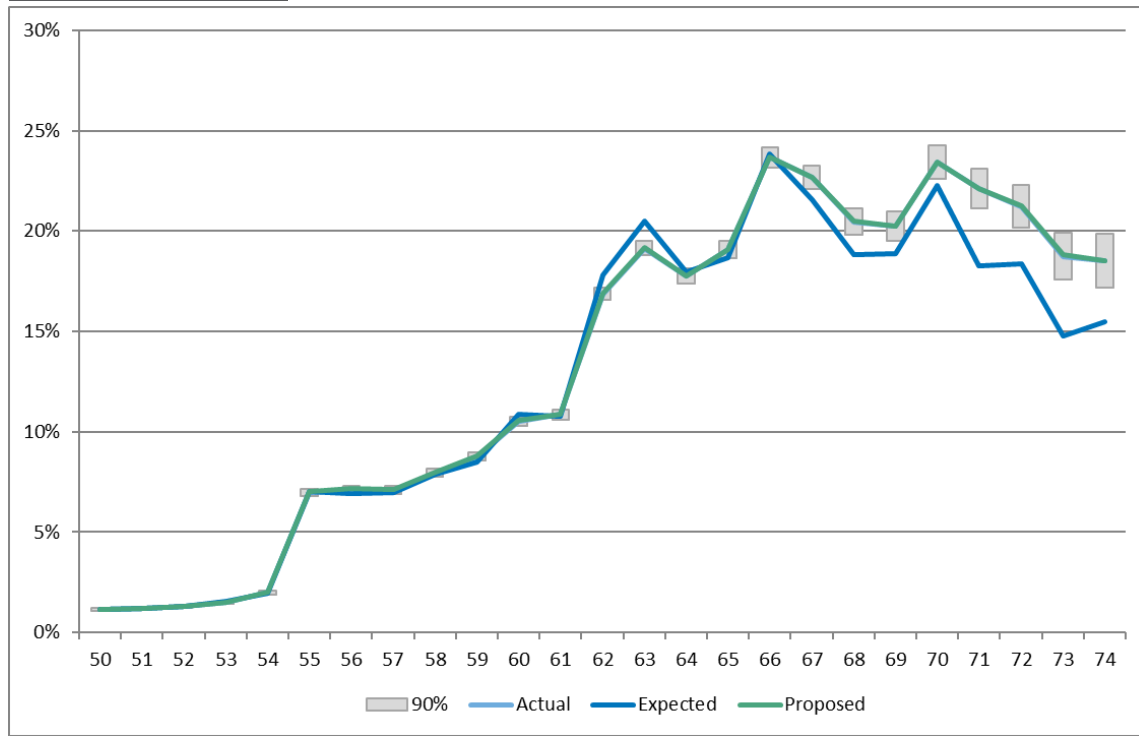
Gallagher was not provided service retirement data to validate the ages at which a 100% probability of retirement is applied.

The graphs on the following pages show actual, expected, and proposed retirement rates by age, as well as the 90% confidence interval around the experience for each age, for a few of the larger assumption groups. A visual inspection indicates that the proposed rates generally align well with the experience rates.

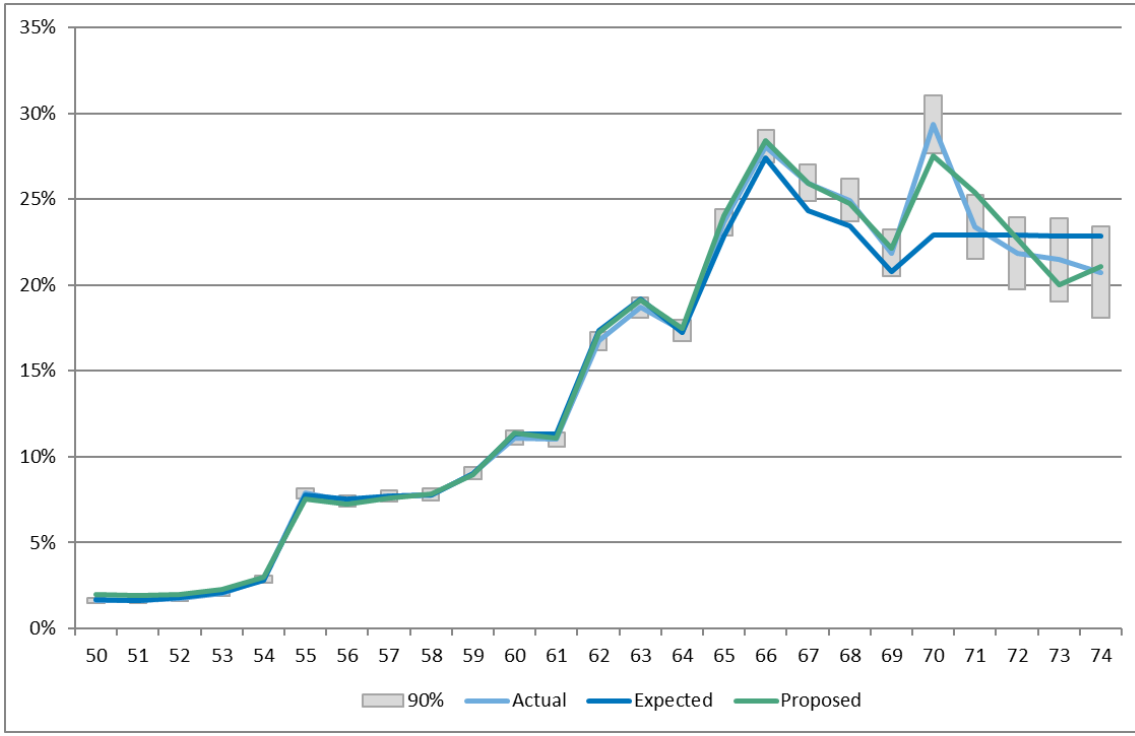
Schools Miscellaneous



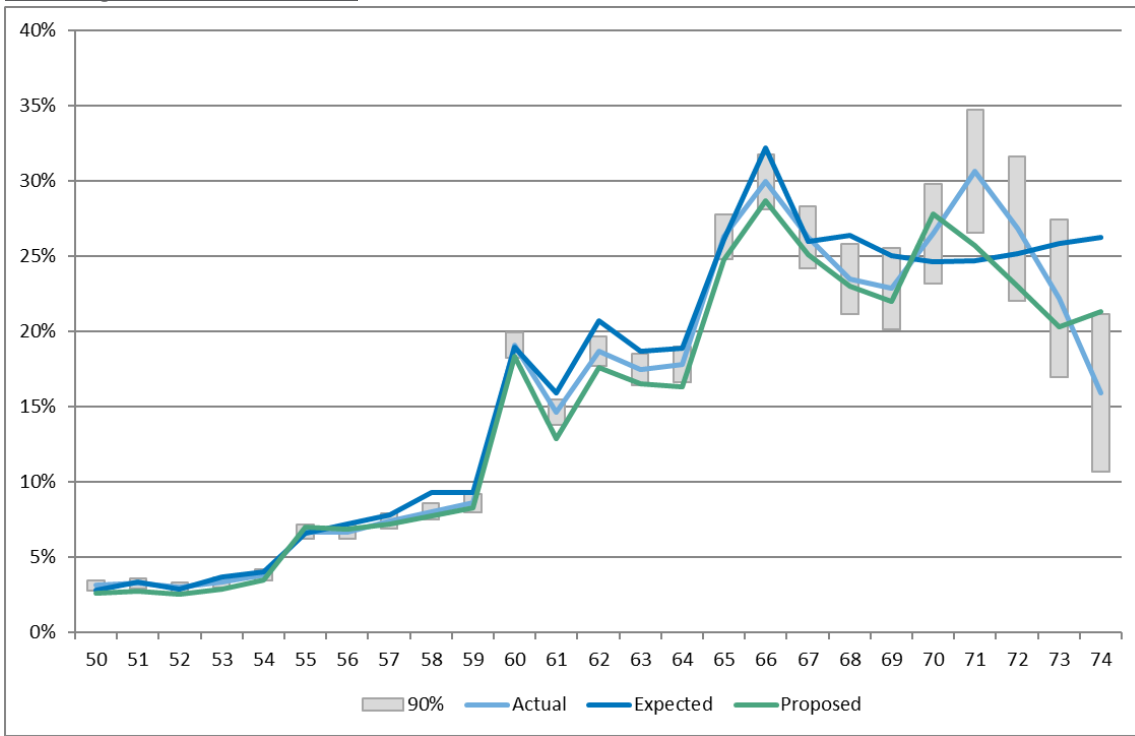
Miscellaneous - Classic



2% at Age 55 - Miscellaneous



3% at Age 60 - Miscellaneous



3. Demographic Assumptions (continued)

3.1 Service Retirement (continued)

Summary of Observations and Recommendations

In general, Gallagher believes the proposed retirement rates, including the methodology used to study retirement experience, are reasonable.

3. Demographic Assumptions (continued)

3.2 Mortality

Assumption Purpose

CalPERS provides benefits to its members and their beneficiaries that are contingent upon their life span. The mortality assumption is used to model the expected lifespan of those members. For active members, the mortality assumption determines the probability of surviving to retirement age and the expected span of their retirement. For retired members, the mortality assumption determines the expected span of their retirement. CalPERS members are also eligible for various death benefits, and the liability of those benefits is sensitive to the mortality assumptions.

Defined benefit pension systems, like CalPERS, can provide adequate retirement income for participants by pooling mortality risk. The sustainability of CalPERS is dependent on the mortality assumption being a reasonable representation of future mortality experience of its members.

Selecting a Mortality Assumption

ASOP No. 27, Section 3.12 provides the following with respect to selecting a mortality assumption:

When selecting a mortality assumption, the actuary should take into account factors such as the following:

- a. the characteristics of employees and retirees (for example, it may be reasonable to select different assumptions for pre and post retirement);*
- b. the size of the covered population (for example, for some small plans, a reasonable model for mortality may be to assume no mortality before retirement);*
- c. the characteristics of disabled lives, which may depend on the plan's definition of disability and how it is administered; and*
- d. the characteristics of different participant subgroups and beneficiaries.*

The actuary should consider using actual participant mortality data, to the extent fully or partially credible, or published and generally available mortality tables.

ASOP No. 27, Section 3.13 provides the following with respect to selecting a mortality improvement assumption:

*When selecting a mortality assumption, the actuary should reflect the effect of mortality improvement (which may be positive, negative, or zero) both before and after the **measurement date**. When reflecting the effect of mortality improvement, the actuary should do the following:*

- a. adjust mortality rates to reflect an assumption as to mortality improvement before the **measurement date**. For example, if the actuary starts with a published mortality table, the mortality rates may need to be adjusted to reflect mortality improvement to the **measurement date**. Such an adjustment is not necessary if, in the actuary's professional judgment, the published mortality table reflects expected mortality rates as of the **measurement date**. This assumption should be disclosed in accordance with section 4.1.1, even if the actuary concludes that such an adjustment is not necessary; and*

3. Demographic Assumptions (continued)

3.2 Mortality (continued)

- b. include an assumption as to expected mortality improvement after the **measurement date**. This assumption should be disclosed in accordance with section 4.1.1, even if the actuary concludes that an assumption of zero future improvement is reasonable as described in section 3.5. The existence of uncertainty about the occurrence or magnitude of future mortality improvement does not by itself mean that an assumption of zero future improvement is a reasonable assumption.*

Summary of Review

CalPERS applies varying mortality assumptions based on member status, health, and gender.

The post-retirement mortality varies based on the following categories:

- Service Retirement (Healthy)
 - Male
 - Female
- Non-Industrial Disability
 - Male
 - Female
- Industrial Disability
 - Male
 - Female

The Service Retirement mortality assumption applies to both service retirees and those beneficiaries in receipt of a survivor benefit. Beneficiary mortality experience is not tracked prior to the death of the primary members. The Service Retirement mortality assumption is based on benefit-weighted experience. The Non-Industrial and Industrial Disability mortality assumption is based on headcount-weighted experience.

The post-retirement mortality assumption was developed based on experience covering the period June 30, 2015, through June 30, 2019. COVID experience, i.e. June 30, 2019 through June 30, 2023 was reviewed by CalPERS ACTO and they determined that it appeared to include significant excess mortality that precluded its usefulness in evaluating future mortality levels.

The pre-retirement mortality assumption varies based on the following categories:

- Non-Industrial Death
 - Male
 - Female
- Industrial Death
 - Male
 - Female

The pre-retirement mortality assumption was developed based on experience covering the period June 30, 2004, through June 30, 2019. COVID experience, i.e. June 30, 2019 through June 30, 2023 was reviewed by CalPERS ACTO and they determined that it appeared to include significant excess mortality that precluded its usefulness in evaluating future mortality levels.

3. Demographic Assumptions (continued)

3.2 Mortality (continued)

Analysis – Post-retirement Mortality – Service Retirement

The following table provides Gallagher’s analysis of the current and proposed assumptions for the post-service retirement mortality.

	Healthy Females	Healthy Males
Actual / Expected (A/E) Ratio		
• Actual / Current	99.2%	95.3%
• Actual / Smoothed	99.9%	99.1%
• Smoothed / Proposed	99.9%	99.1%
Exposure Weighted R-Squared		
• Actual / Current	0.9861	0.9856
• Actual / Proposed	0.9971	0.9946
• Smoothed / Proposed	0.9994	0.9993
Percent Inside 90% Confidence Intervals		
• Current	47%	45%
• Smoothed	96%	92%
• Proposed	86%	90%

Data grouping

Experience data over the years 2015 through 2019 (four years, 7/1/2015 – 6/30/2019) was combined prior to graduation. Male and female data were kept separate consistent with differences in longevity observed in virtually all published mortality tables. Inspection of the individual year exposures, deaths, and aggregate raw rates by gender indicated experience was consistent across years, and hence suitable for being combined.

This healthy annuitant experience was not segregated by Retiree versus Contingent Survivor, or Safety versus General populations. Re-evaluating such grouping decisions by examining the underlying source data was outside the scope of our review. The study does indicate, “there are no material differences in the post-retirement mortality rates between retirees from safety groups as compared to retirees from miscellaneous groups.” The retiree/survivor issue has not been discussed. Both of these splits were found to be significant and led to separate mortality tables in the Pub-2010 and Pub-2016 RPEC studies.

For a valuation of the plan as a whole, these differences, even if material may be averaged under a combined-basis mortality table. Benefits-weighting helps support such an approach. However, plan design impacts related to specific groups of members, e.g. survivor benefits, or provisions for Safety members, could be distorted.

3. Demographic Assumptions (continued)

3.2 Mortality (continued)

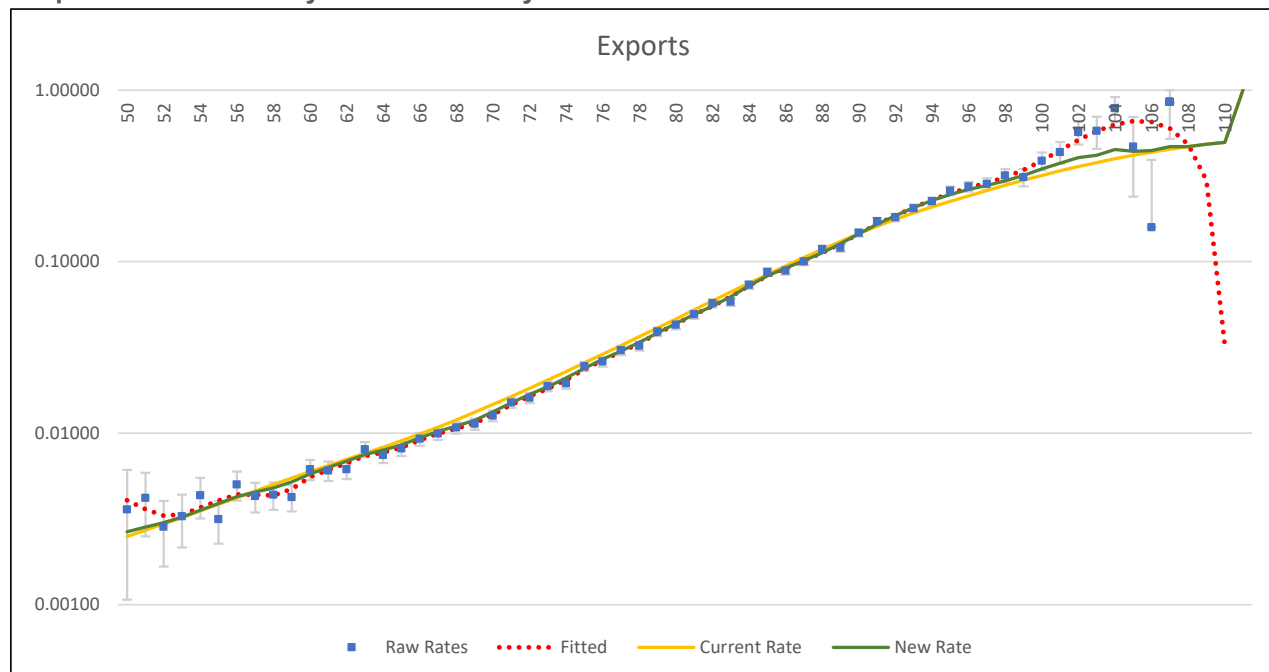
Analysis – Post-retirement Mortality – Service Retirement (continued)

Graduation method

Raw mortality rates on an amounts basis are graduated into relatively smooth curves using a Whittaker-Henderson model. This is a well-established approach. Parameters selected by the user impact the degree of smoothing relative to the raw experience rates that tend to be choppy, especially where data is thin.

In this application, a high smoothness parameter ($h = 10,000,000$) tends to mitigate fluctuations, but the cubic polynomials (order $k=3$) do allow for border anomalies at extreme (low and high) ages. The graph below, as an example, comes from the graduation spreadsheet for male healthy retirees; it has been reformatted to log-scale so low-age results are also visible.

Graph M-1: Male Healthy Retiree Mortality



Note that much of this extraneous curvature is removed in the credibility process, but a certain amount of choppiness passes through to the final rates. Even if these fluctuations reflect some valid information from the experience data, those effects may be cohort-related and not necessarily optimal for long-term valuation rates.

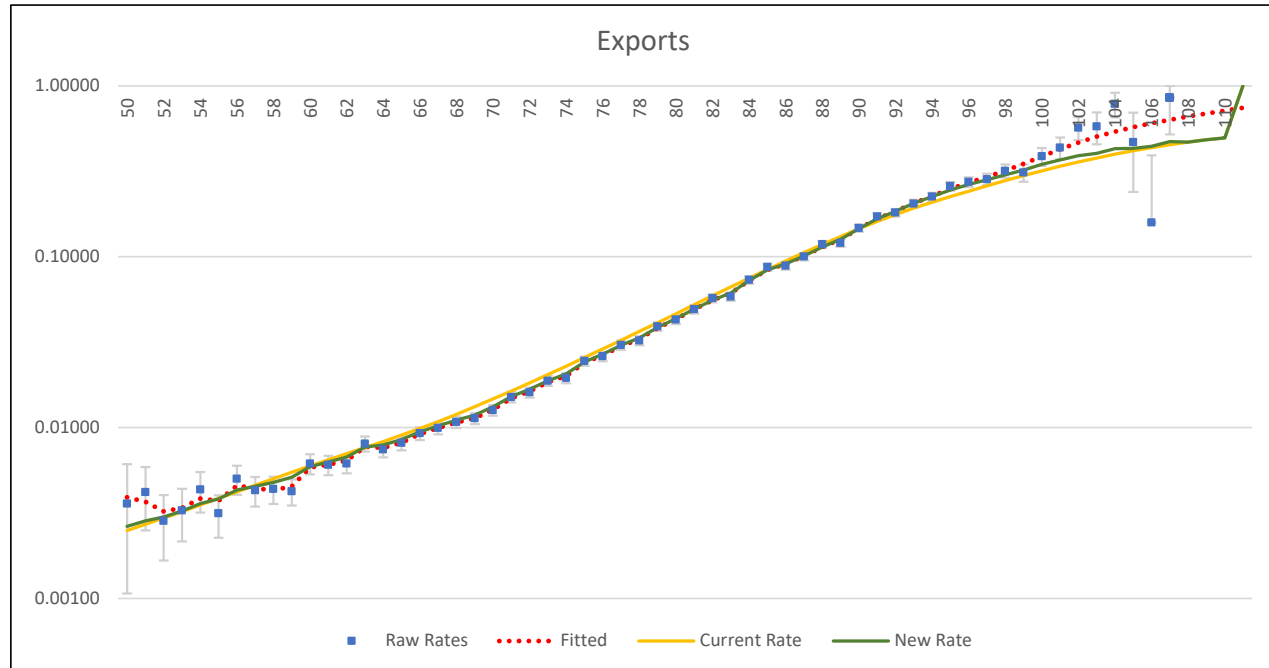
Using an order-2 quadratic model is another way to address smoothness. However, order-2, or even order-1, models do not fully address graduation shape at the endpoints (see order-1 example below calculated by the same spreadsheet).

3. Demographic Assumptions (continued)

3.2 Mortality (continued)

Analysis – Post-retirement Mortality – Service Retirement (continued)

Graph M-2: Male Order-1 Graduation



Credibility weighting

The blending of graduated experience with a Pub-2010 based reference table uses a creative application of Limited Fluctuation Credibility Theory (LFCT). Full (100%) credibility at each age uses the familiar “1,000” deaths approach – based on a 90% chance of being within +/- 5% of the true rate – adjusted for the probability of not dying in/at a given year/age. Partial credibility then comes from the square root of deaths divided by the full-credibility threshold.

This methodology deviates in two ways from a “theoretically pure” LFCT approach. First, the experience credibility at each age is not applied to the actual experience rate upon which the credibility (number of deaths) is based but is instead applied to the graduated mortality rate at that age. Second, no benefit dispersion factor is applied to adjust the full credibility threshold upwards to account for the increased variance generated by amounts-basis experience. These two alterations should tend to work in “opposite directions”.

Not increasing the full-credibility threshold for benefit variability would tend to overstate the partial credibility of each age’s experience data. On the other hand, a rate from a graduated curve is not based solely on the experience data at that age and potentially inherits some higher credibility from neighboring ages. The first item could be quantified by examining source data benefit amounts (as noted above, outside our scope); the second item would be hard to quantify but could be explored empirically. As already discussed above, the credibility-weighted study rates appear reasonable.

3. Demographic Assumptions (continued)

3.2 Mortality (continued)

Analysis – Post-retirement Mortality – Service Retirement (continued)

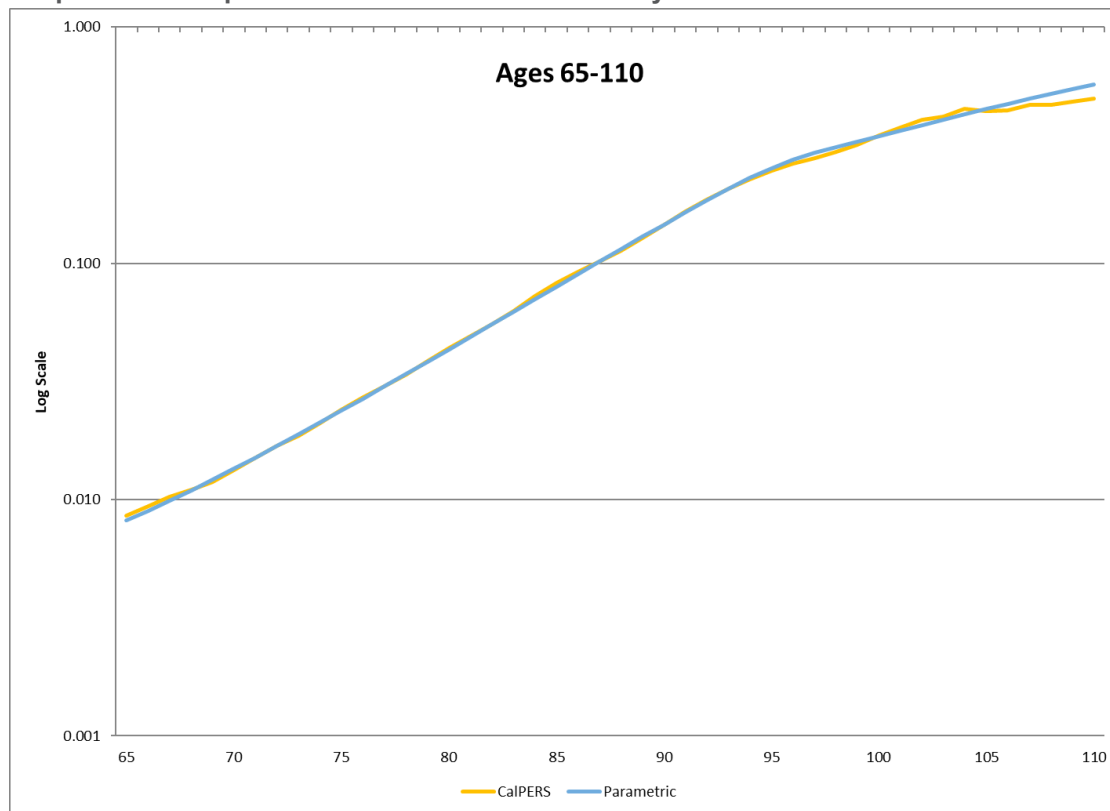
Final base rates

Assumed healthy retiree mortality is central to the valuation of plan liability, and this study presents very credible experience data. To confirm that present values generated by the final rates are appropriate, we applied a totally different independent graduation approach to the experience data to see if the end results would be comparable.

Specifics behind the graduation process are beyond the scope here, but it should be noted that the parametric model generated rates that were in the aggregate unbiased relative to the experience. The curve was in no way dependent upon reference rates (i.e. assumed full credibility for the graduated results) and was exceedingly smooth owing to the parameterized formulation.

The graph below (log scale), for example, compares final rates from the male graduation spreadsheet to results from the parametric approach. A table beneath the graph compares present value factors at 4% interest at various ages.

Graph M-3: Male parametric rates versus final study rates



3. Demographic Assumptions (continued)

3.2 Mortality (continued)

Analysis – Post-retirement Mortality – Service Retirement (continued)

Single Life Annuity Factor	CalPERS	Parametric	Ratio (Parametric/CalPERS)
Age 55	16.6806	16.7354	100.3%
Age 65	13.4487	13.4664	100.1%
Age 75	9.4703	9.4852	100.2%
Age 85	5.4929	5.4980	100.1%

Female graduations show a similar concurrence. This indicates the data was sufficiently credible to produce very similar results using dissimilar graduation methodologies.

3. Demographic Assumptions (continued)

3.2 Mortality (continued)

Analysis – Post-retirement Mortality – Disabled Mortality

The following table provides Gallagher's analysis of the current and proposed assumptions for the post-disability mortality.

Non Industrial Disability Mortality	Healthy Females	Healthy Males
Actual / Expected (A/E) Ratio		
• Actual / Current	88.0%	99.6%
• Actual / Proposed	90.4%	99.8%
• Smoothed / Proposed	90.4%	99.8%
Exposure Weighted R-Squared		
• Actual / Current	0.9270	0.9443
• Actual / Proposed	0.9393	0.9556
• Smoothed / Proposed	0.9720	0.9807
Percent Inside 90% Confidence Intervals		
• Current	59%	66%
• Smoothed	76%	81%
• Proposed	64%	70%

Industrial Disability	Healthy Females	Healthy Males
Actual / Expected (A/E) Ratio		
• Actual / Current	91.7%	101.9%
• Actual / Proposed	92.1%	101.0%
• Smoothed / Proposed	92.2%	101.0%
Exposure Weighted R-Squared		
• Actual / Current	0.7923	0.9804
• Actual / Proposed	0.8051	0.9829
• Smoothed / Proposed	0.9270	0.9965
Percent Inside 90% Confidence Intervals		
• Current	59%	80%
• Smoothed	73%	85%
• Proposed	59%	81%

3. Demographic Assumptions (continued)

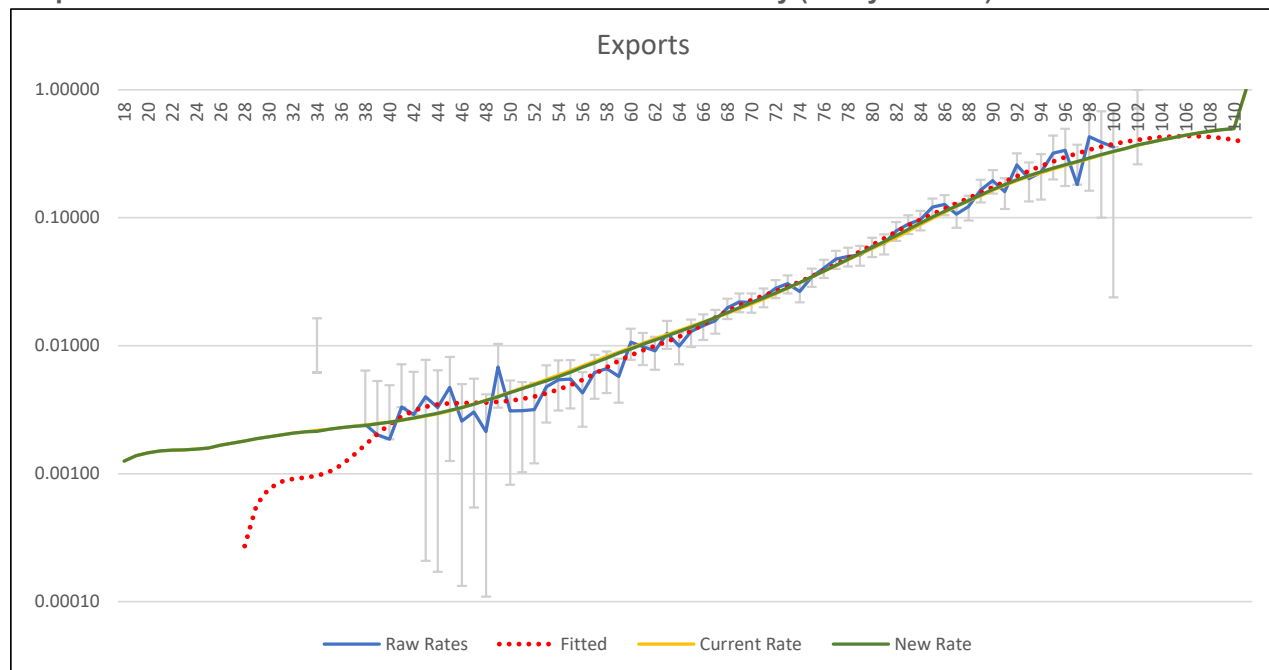
3.2 Mortality (continued)

Analysis – Post-retirement Mortality – Disabled Mortality (continued)

The overall approach used for disabled mortality is the same as discussed under health mortality. The effect of the method when experience data is thin (fewer observations) is quite different. In the end the results are likely reasonable.

For example, the male industrial-related experience data contains a total of 2,553 deaths, which would be fully credible for a scalar factor (A/E) approach (e.g. IRS substitute mortality regulations, based on Gavin Benjamin's paper). However, this study's development uses the same credibility approach as for the healthy mortality experience, leading to minimal credibility at each age (0% - 30% range). Graph (log scale) shows "new" rates virtually identical to "current" assumption.

Graph MI-1: Male Industrial-Related Disabled Retiree Mortality (Study Method)



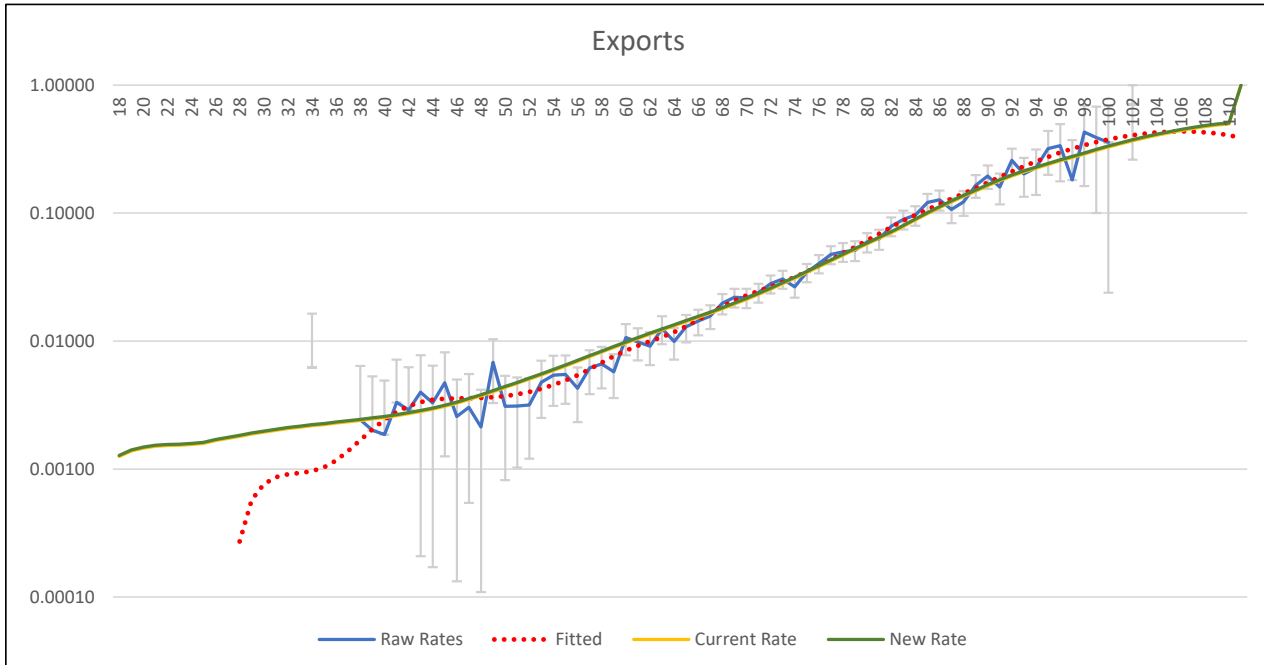
Since the aggregate A/E for the population is $2553/2506 = 1.018755$, the scalar factor approach would merely load the current rates 1.8755%, which is still very little adjustment.

3. Demographic Assumptions (continued)

3.2 Mortality (continued)

Analysis – Post-retirement Mortality – Disabled Mortality (continued)

Graph MI-2: Male Industrial-Related Disabled Retiree Mortality (Scalar Approach)



This indicates the final study rates – essentially the current rates with small adjustments – are reasonable.

3. Demographic Assumptions (continued)

3.2 Mortality (continued)

Analysis – Post-retirement Mortality – Disabled Mortality (continued)

The table below lists the industrial disabled mortality counts and A/E ratios relative to current assumptions. Future studies might consider an aggregate A/E approach when individual-age credibility is trivial but aggregate A/E credibility could be significant.

Table MI-1: Disabled Mortality A/E Ratios and Aggregate LFCT Credibility

	Actual Deaths	Expected	A/E	Aggregate Credibility
Industrial Male	2,553	2,506	1.0187	100%
Industrial Female	287	316	0.9092	52%
Non-Industrial Male	2,227	2,236	0.9961	100%
Non-Industrial Female	2,469	2,836	0.8707	100%

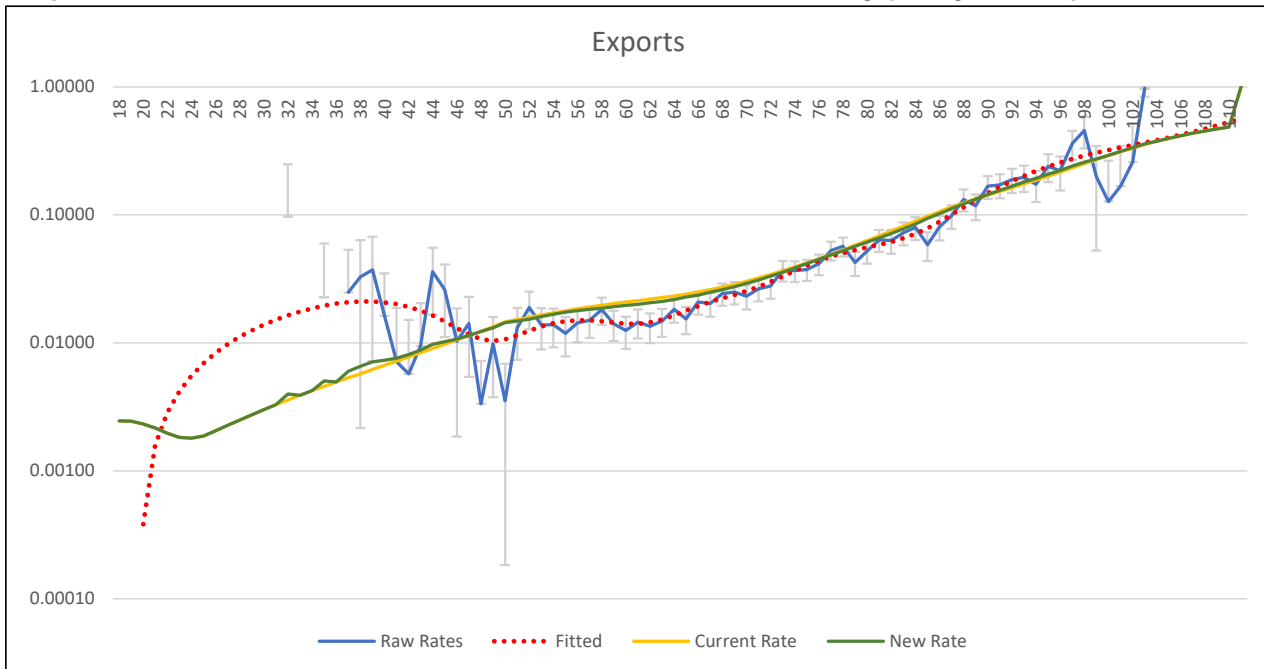
Only in the case of Non-Industrial Female experience would a scalar factor (aggregate A/E) approach generate a noticeably different rate set, as shown graphically below. However, because graduated rates are both above and below current rates for significant ranges of ages it appears a scalar approach is potentially *less* appropriate for this data set.

3. Demographic Assumptions (continued)

3.2 Mortality (continued)

Analysis – Post-retirement Mortality – Disabled Mortality (continued)

Graph MI-3: Female Non-Industrial Related Disabled Retiree Mortality (Study Method)

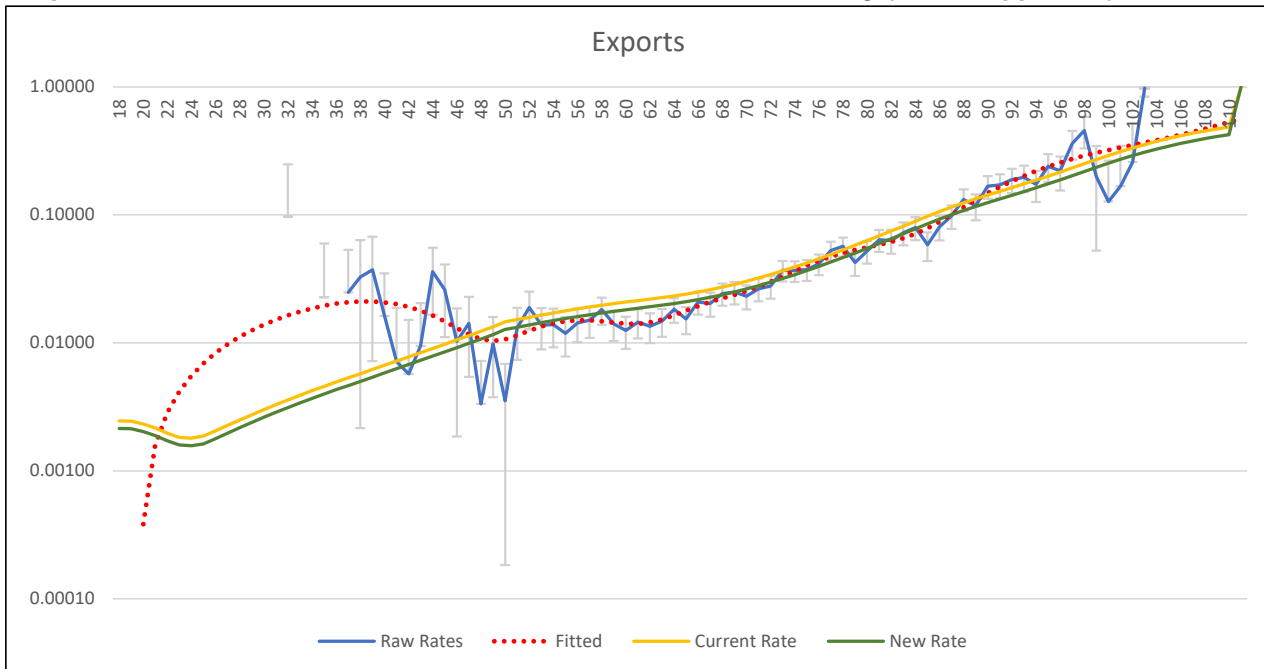


3. Demographic Assumptions (continued)

3.2 Mortality (continued)

Analysis – Post-retirement Mortality – Disabled Mortality (continued)

Graph MI-4: Female Non-Industrial Related Disabled Retiree Mortality (Scalar Approach)



3. Demographic Assumptions (continued)

3.2 Mortality (continued)

Analysis – Pre-Retirement Mortality

CalPERS ACTO provided data for Gallagher that supports the exclusion of experience from June 30, 2019, through June 30, 2023 from the setting of the pre-retirement mortality assumption.

Excluding experience from the COVID years seems appropriate given the mortality ratios to pre-COVID data. Updating the mortality improvement assumption to MP-2021 (from MP-2020) is consistent with annual updates from the Society of Actuaries (SOA) Retirement Plans Experience Committee (RPEC) regarding the onset, peak, and ongoing decline of COVID-related excess mortality in the U.S. Projecting mortality improvement generationally (as opposed to using a fixed static period) is also a positive refinement.

A summary of A/E ratios for the experience data provided, covering the four-year period July 1, 2019 – June 30, 2023, shows significant excess mortality for the credible groups.

Table AM-1: Pre-Retirement Mortality

Pre Retirement Population	Actual Deaths	Expected Deaths	A/E Ratio	Aggregate Credibility (1082)
Non-Duty Death Miscellaneous Male	2,072.00	1,742.85	1.1889	100%
Non-Duty Death Miscellaneous Female	1,784.00	1,672.28	1.0668	100%
Non-Duty Death Safety Male	373.00	333.58	1.1182	59%
Non-Duty Death Safety Female	124.00	103.89	1.1935	34%
Duty Death Miscellaneous Male	5.00	17.65	0.2834	7%
Duty Death Miscellaneous Female	1.00	16.81	0.0595	3%
Duty Death Safety Male	99.00	36.87	2.6854	30%
Duty Death Safety Female	4.00	11.67	0.3427	6%
Total	4,462.00	3,935.60	1.1338	100%

Relying on the prior study's experience data, which considered a 15-year pre-COVID period, feels justified at this point due to the significant impact of COVID on recent experience.

3. Demographic Assumptions (continued)

3.2 Mortality (continued)

Analysis – Mortality Improvement

This mortality study proposes using 80% of the MP-2021 mortality improvement rates. Predicting future mortality trends is speculative, but it is not unreasonable to assume scales other than MP-2021. For example, many Gallagher clients currently utilize a Modified 2021 scale; it was developed using the same underlying data and methodology as RPEC's MP-2021, but assuming lower ultimate rates of long-term mortality improvement. Several potential reasons for projecting lower rates were noted:

- Actual plan experience compared to underlying SSA data used to develop the MP scales.
- The absence of consensus among experts about the magnitude of future mortality improvement, including evolving information related to COVID-19 and its long-term impact.
- RPEC used the most recent Social Security data set available and came to a different conclusion than SSA about the level of future mortality improvement, indicating that experts can arrive at different reasonable assumptions using the same underlying data.
- Rates of mortality improvement have varied greatly across time periods, for example averaging 1.80% per year for males and 1.37% per year for females over 1999-2009 but averaging 0.45% for males and females over 2009-2019.
- Pandemics may be a recurring problem resulting from globalization.
- The trend of U.S. healthcare costs growing faster than the U.S. economy is not sustainable indefinitely. Efforts to slow the growth of healthcare costs may cause lower rates of mortality improvement.

The following graph illustrates various mortality improvement scales' ultimate rates.

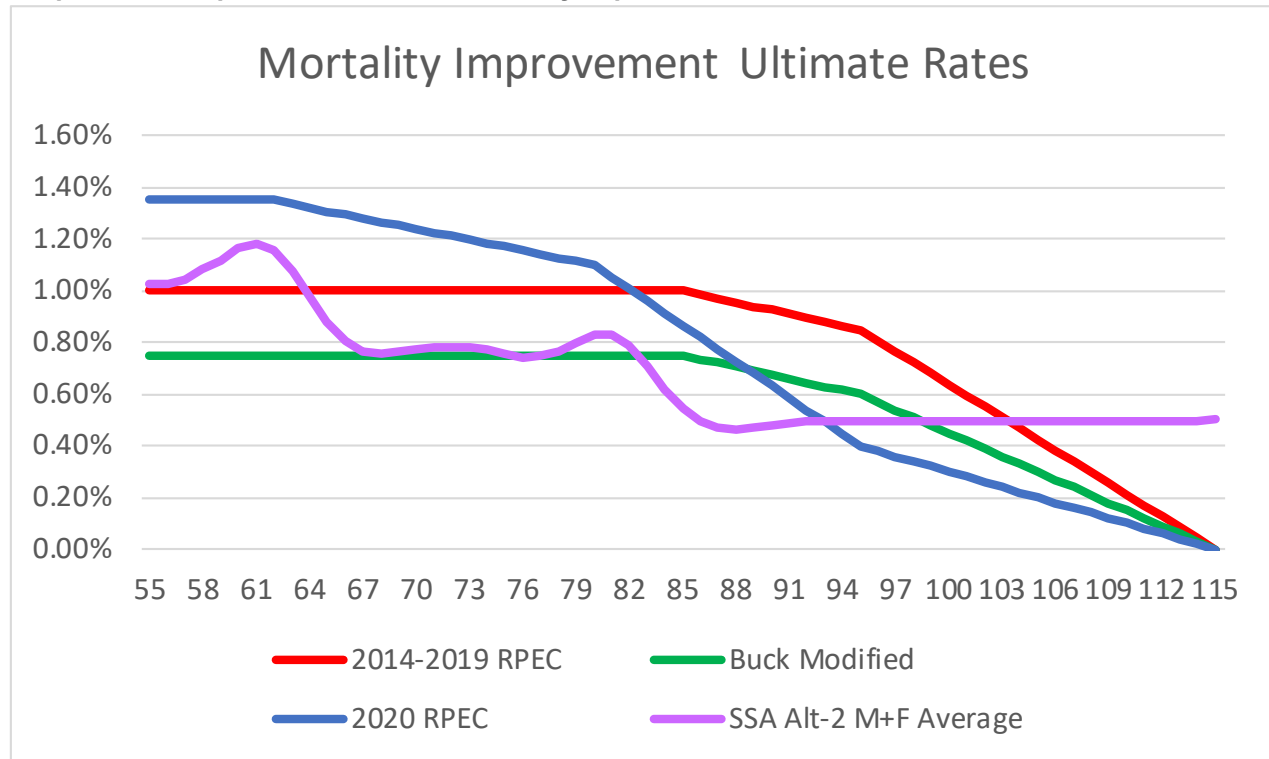


3. Demographic Assumptions (continued)

3.2 Mortality (continued)

Analysis – Mortality Improvement (continued)

Graph M-4: Comparison of ultimate mortality improvement rates



* SSA reflects the intermediate alternative for years 2035-2095, using a 50/50 average of the male/female rates based on the probabilities posted by SSA Trustees in 2020.

In summary, we are comfortable the 80% of MP-2021 assumption represents one reasonable basis (out of many possible approaches) for projecting healthy retiree mortality for measuring pension plan obligations.

3. Demographic Assumptions (continued)

3.2 Mortality (continued)

Summary of Observations and Recommendations

In general, we believe that the mortality assumptions developed by CalPERS ACTO reflect a sound method and a reasonable outcome. Nevertheless, there are some items for consideration listed below, both of which CalPERS ACTO has expressed that they will consider for future studies:

- The Pub-2010 (and now Pub-2016) tables concluded that mortality rates can differ substantially for contingent survivors after the death of the retiree. We recommend that consideration be given to segregating contingent survivor experience from retiree experience.
- Future studies might consider an aggregate A/E approach when individual-age credibility is trivial but aggregate A/E credibility could be significant.

On May 6, 2025, the Society of Actuaries released the Pub-2016 Public Retirement Plans Mortality Tables, which reflects a review of mortality experience specific to public sector plans. These tables reflect mortality experience in calendar years 2013–2019 and the rates in these tables are considered to be one-year mortality probabilities as of July 1, 2016. In general, liabilities calculated using Pub-2016 tables are slightly lower than those calculated using corresponding Pub-2010 tables, although for a handful of specific groups and at some ages the liabilities are higher or differ more than slightly. In particular, liabilities for public safety male members, non-safety disabled members and for plans using above median amount weighted tables, liabilities are expected to increase. CalPERS ACTO plans to consider these tables in the next study.

3.1 Demographic Assumptions (continued)

3.3 Disability Retirement

Assumption Purpose

CalPERS provides benefits to members who have a disabling injury or illness that prevents them from performing their usual job duties. Those whose illness or injury is job-related are eligible for an industrial disability retirement, while others are eligible for a non-industrial disability retirement. The disability retirement assumptions are intended to model the fact that some portion of the active population is expected to become disabled and begin receiving disability retirement benefits.

Selecting a Disability Assumption

ASOP No. 27, Section 3.14 provides the following with respect to selecting a disability assumption:

When selecting disability and disability recovery assumptions, the actuary should take into account factors such as the following:

- a. the plan's definition of disability (for example, whether the person with a disability must be eligible for Social Security disability benefits); and*
- b. the potential for recovery. For example, if the plan requires continued disability monitoring and if the plan's definition of disability is not highly restrictive, an assumption for rates of recovery may be appropriate. Alternatively, the probability of recovery may be reflected by assuming a lower incidence of disability than the actuary might otherwise assume.*

Summary of Review - Non-Industrial Disability Retirement

CalPERS applies two distinct disability retirement assumptions to active members. The non-industrial disability retirement assumption estimates the portion of active members who will become disabled and commence a non-industrial disability retirement benefit. The industrial disability retirement assumption estimates the portion of active members who will become disabled and commence an industrial disability retirement benefit.

CalPERS developed non-industrial disability rates based on the experience of three different groups: Miscellaneous, State Industrial, and Safety. In the previous study, CalPERS ACTO had developed rates for 13 different groups, but citing insufficient sample size for adequate credibility, they consolidated the data into the three aforementioned groups.

The study analyzed non-industrial disability retirement experience over three distinct periods: (a) 2015 to 2019 and 2019 to 2023, (b) 2008 to 2023, and (c) 2009 to 2019. However, noting some inconsistencies and unreliability in the 2019 to 2023 period, the rates were ultimately determined based on the more stable and consistent experience observed during the 10-year period from 2009 to 2019. The rates were based on the combined experience of males and females as gender-distinct rates were deemed to have inadequate data for appropriate analysis. Inspection of the individual year exposures and deaths indicated experience was consistent across years, and hence suitable for being combined.

3. Demographic Assumptions (continued)

3.3 Disability Retirement (continued)

Analysis – Non-Industrial Disability Retirement

Data grouping

In previous studies, CalPERS ACTO had developed rates for 13 different groups, but citing insufficient sample size for adequate credibility, they consolidated the data into three different groups: Miscellaneous, State Industrial, and Safety. The following table shows the mapping of each group in the prior study to the group in the current study.

Prior Study	Current Study
Public Agency Miscellaneous Female	Miscellaneous
Public Agency Miscellaneous Male	Miscellaneous
Schools Miscellaneous Female	Miscellaneous
Schools Miscellaneous Male	Miscellaneous
State Miscellaneous Female	Miscellaneous
State Miscellaneous Male	Miscellaneous
Public Agency CPO	Safety
Public Agency Fire	Safety
Public Agency Police	Safety
State CHP	Safety
State POFF	Safety
State Safety	Safety
State Industrial	State Industrial

The following tables summarize the total exposures and actual decrements provided by CalPERS ACTO, and some resultant analytical measurements. Gallagher did not exclude any records for review of the disability assumptions.

We show the counts according to the three distinct groups, but we understand the actual study combined the State Industrial with the Miscellaneous group, and the State Industrial group's rates were then set equal to three times the resulting Miscellaneous rates. The "Misc. + Ind." shows the results from the actual study that formed the basis of the proposed Miscellaneous study. The expected proposed number under "State Industrial" reflects the Miscellaneous group's rates times three.

3. Demographic Assumptions (continued)

3.3 Disability Retirement (continued)

Analysis – Non-Industrial Disability Retirement (continued)

	Misc. + Ind.	Miscellaneous	State Industrial	Safety
Exposures	4,690,658	4,609,223	81,435	958,128
Actual	7,710	7,317	393	826
Expected under current assumption	8,890	8,741	351	1,404
Expected under proposed assumption	7,828	7,696	396	818
Actual / Expected (A/E) Ratio				
• Actual / Current	86.7%	83.7%	112.1%	58.8%
• Actual / Proposed	98.5%	95.1%	99.3%	101.0%
Exposure Weighted R-Squared				
• Actual / Current	0.9832	0.9818	0.8806	0.7819
• Actual / Proposed	0.9899	0.9893	0.8734	0.9381
Percent Inside 90% Confidence Intervals				
• Current	55%	51%	62%	53%
• Proposed	72%	68%	65%	78%

Generally, these measurements indicate that the proposed assumptions are a better fit to the actual experience of the plan compared to the current assumptions. The graduated rates for both the Miscellaneous and Safety groups are based on the expectation of full credibility, which is not the case for the Safety group. However, given that the actual experience for this group was significantly lower than the current assumption would have predicted, then adjusting for credibility would likely worsen the fit of the new assumption.

The proposed rates were manually leveled out after certain ages: age 56 for Miscellaneous and age 65 for Safety. For Miscellaneous, we surmise this is in recognition that the graduated rates themselves level off and the manual adjustment was for smoothing purposes. For Safety, the rates were leveled off at 65, with CalPERS ACTO citing the volatility of the raw rates after that age.

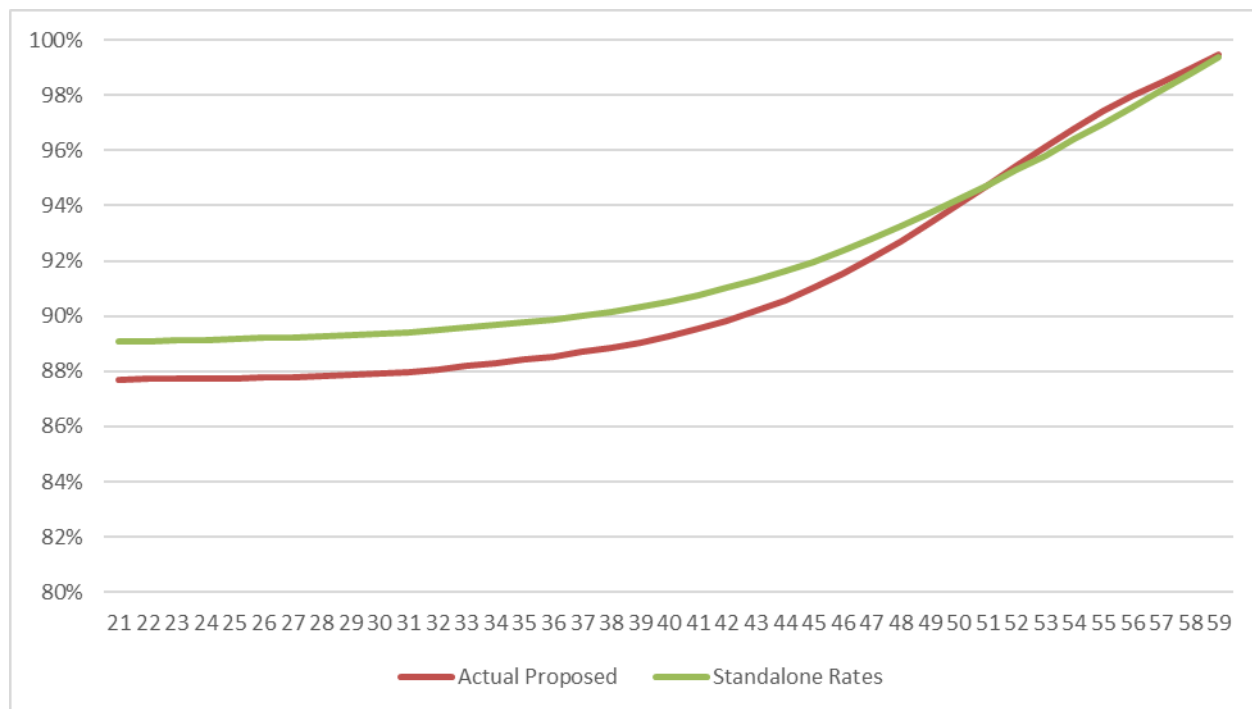
As noted, the CalPERS experience study combined the data for Miscellaneous and State Industrial. We split that combined group into two standalone groups and attempted to develop proposed rates roughly following CalPERS' methodology. This is strictly for comparative purposes and note that the standalone State Industrial group is too small to have fully creditable data.

3. Demographic Assumptions (continued)

3.3 Disability Retirement (continued)

Analysis – Non-Industrial Disability Retirement (continued)

The following chart compares the actual proposed rates for the State Industrial group to the rough estimates we made treating them as a standalone group. This is not a recommendation about methodology, merely an assessment of how well the proposed rates compare to actual experience. The values in the chart are the probability at each age of reaching age 60 *without* incurring a non-industrial disability and assuming no other decrements occur. Note that the y-axis begins at 80% so that the differences are more visible. This shows that the actual proposed rates determined for the study are not an unreasonable representation of the result had the standalone data been used (though again we note that the standalone data is not fully credible).



3. Demographic Assumptions (continued)

3.3 Disability Retirement (continued)

Summary of Review - Industrial Disability Retirement

CalPERS developed industrial disability rates based on the experience of eleven different groups. In the previous study, CalPERS ACTO had developed rates for seven different groups

The study analyzed industrial disability retirement experience over multiple periods. However, noting some inconsistencies and unreliability in the 2019 to 2023 period, the rates were ultimately determined based on the more stable and consistent experience observed during the 4-year period from 2015 to 2019. The rates were based on the combined experience of males and females as separate rates were deemed to have inadequate data for appropriate analysis.

For purposes of Gallagher's review, CalPERS ACTO provided experience study analyses of the industrial disability retirement assumption for the following groups:

- State CHP
- State Industrial
- State POFF
- State Safety
- PA Police
- PA Fire
- PA CPO
- Sheriffs
- Prosecutors
- School Police
- Other Safety

Analysis – Industrial Disability Retirement

Experience data over the years 2015 through 2019 (four years, 7/1/2015 – 6/30/2019) was combined prior to graduation. Male and female data were combined since gender-distinct data was not deemed adequate for analysis. Inspection of the individual year exposures, deaths, and aggregate raw rates by gender indicated experience was consistent across years, and hence suitable for being combined.

Rather than generate industrial disability rates directly on this experience, the proposed assumption appears to consist of manual adjustments to rates under the current assumption at select ages. The adjustments appear to occur at ages where the graduated rate differs substantially from the current assumption. A visual inspection showed that these adjustments appear to be reasonable.

3. Demographic Assumptions (continued)

3.3 Disability Retirement (continued)

The following table summarizes the total exposures and actual decrements provided by CalPERS ACTO. Note that experience data is shown for PA Sheriffs, PA Prosecutors, PA School Police and PA Other Safety, but the proposed rates for those groups were ultimately based on a percentage of PA CPO rates; specifically, 100%, 1%, 80% and 100%, respectively. The rationale for these percentages was not disclosed though the A/E ratios below do provide some support.

Assumption Group	Exposures	Actual	Expected Current	Actual / Expected (A/E) Ratio Current	Expected Proposed	Actual / Expected (A/E) Ratio Proposed
State CHP	29,038	213	201	106.0%	217	98.2%
State POFF	164,347	1,227	1,158	106.0%	1,237	99.2%
State Industrial	45,923	7	7	99.2%	7	99.2%
State Safety	108,802	616	596	103.4%	596	103.4%
PA Police	88,189	1,285	1262	101.8%	1262	101.8%
PA Fire	57,336	481	496	97.0%	495	97.2%
PA CPO	43,313	301	274	110.7%	307	98.8%
PA Sheriffs	5,265	40	110	36.3%	46	87.0%
PA Prosecutors	16	0	0	N/A	0	N/A
PA School Police	2,727	17	26	64.9%	17	97.4%
PA Other Safety	566	4	10	40.4%	4	96.3%

3. Demographic Assumptions (continued)

3.3 Disability Retirement (continued)

Assumption Group	Actual / Expected (A/E) Ratio		Exposure Weighted R Squared		Percent Inside 90% Confidence Intervals	
	Current	Proposed	Current	Proposed	Current	Proposed
State CHP	106.0%	98.2%	0.6640	0.9122	65%	72%
State POFF	106.0%	99.2%	0.8163	0.9551	48%	65%
State Industrial	99.2%	99.2%	0.1196	0.1196	11%	11%
State Safety	103.4%	103.4%	0.9107	0.9107	65%	65%
PA Police	101.8%	101.8%	0.9202	0.9202	53%	53%
PA Fire	97.0%	97.2%	0.9131	0.9468	54%	59%
PA CPO	110.7%	98.8%	0.7865	0.7915	62%	63%
PA Sheriffs	36.3%	87.0%	0.4879	0.5589	39%	50%
PA Prosecutors	N/A	N/A	N/A	N/A	77%	77%
PA School Police	64.9%	97.4%	0.2279	0.2572	45%	44%
PA Other Safety	40.4%	96.3%	0.2500	0.2083	38%	33%

3. Demographic Assumptions (continued)

3.3 Disability Retirement (continued)

Analysis – Industrial Disability Retirement (continued)

Generally, these measurements indicate that the proposed assumptions are a better fit to the actual experience of the plan compared to the current assumptions.

The Experience Study report notes a pattern of substantial increases in the incidence of industrial disability once retirement age has been attained. It is common that job-related disability rates increase with age. It is non-intuitive that the rates would accelerate even further upon the attainment of retirement eligibility. We do note the comment:

“These differences between member categories are believed to be due to:

- differences in how strictly the disability criteria are enforced for the different groups, and
- differences in the service retirement formulas of active members within each group.”

We suggest that, for future experience studies, CalPERS ACTO should assess the availability of information pertaining to recovery from disability or whether any disability retirements later become classified as service retirements.

Summary of Observations and Recommendations

- More detail on why the PA Sheriffs, PA Prosecutors, PA School Police and PA Other Safety groups were segregated is advisable. Perhaps include a statement pertaining to why these groups were selected, whether there were other similarly sized groups that were not selected, whether their experience was included in the PA CPO experience under study and any other information that would make their treatment more transparent.
 - A statement on how the assigned percentages of the PA CPO rates for PA Sheriffs, PA Prosecutors, PA School Police and PA Other Safety is recommended.
 - For future experience studies, CalPERS ACTO should assess the availability of information pertaining to recovery from disability or whether any disability retirements later become classified as service retirements, particularly for industrial disabilities.
- 

3. Demographic Assumptions (continued)

3.4 Termination

Assumption Purpose

Active members maximize their benefits in CalPERS by remaining active members until retirement eligibility. The termination assumption models the fact that some portion of the active population is expected to terminate employment prior to reaching retirement eligibility. If terminating prior to becoming vested, members will be due a refund of employee contributions. If terminating subsequent to becoming vested, members will be due a deferred retirement benefit or, if so elected, a refund of employee contributions.

Selecting a Termination Assumption

ASOP No. 27, Section 3.11 provides the following with respect to selecting a termination assumption:

When selecting a termination assumption, the actuary should take into account factors such as the following:

- a. employer-specific or job-related factors such as occupation, employment practices, work environment, unionization, hazardous conditions, and location of employment; and*
- b. plan provisions, such as early retirement benefits, vesting schedule, or payout options.*

Summary of Review

CalPERS applies two distinct termination assumptions to active members. The first is the termination with refund assumption, which estimates the portion of active members who will terminate and elect to receive a refund of their employee contributions. The second is the termination with vested benefits assumption, which estimates the portion of active members who will terminate and elect to receive a deferred retirement benefit.

For purposes of Gallagher's review, CalPERS ACTO provided experience study analyses of the termination assumption for the following groups:

- CHP
 - Male
 - Female
- PA CPO
 - Male
 - Female
- PA Fire
 - Male
 - Female
- PA Miscellaneous
 - Male
 - Female

3. Demographic Assumptions (continued)

3.4 Termination (continued)

- PA Police
 - Male
 - Female
- POFF
 - Male
 - Female
- Schools Miscellaneous
 - Male
 - Female
- State Industrial (unisex)
- State Miscellaneous Tier 1
 - Male
 - Female
- State Miscellaneous Tier 2
 - Male
 - Female
- State Safety
 - Male
 - Female

The termination assumptions were developed based on experience covering the period June 30, 2007 through June 30, 2021. Experience for the period June 30, 2021 through June 30, 2023 was excluded because it was an extraordinary period and CalPERS ACTO concluded that experience was not “reflective of most likely future experience.” Gallagher does not dispute this conclusion or approach.

The termination assumption format varies by gender, entry age (in some cases), and attained service.

3. Demographic Assumptions (continued)

3.4 Termination (continued)

Analysis – Terminations with Refund

The following table summarizes the total exposures and actual decrements across all gender, age and service groups provided by CalPERS ACTO and counts excluded by Gallagher for review of the termination with refund assumption. For purposes of this analysis, Gallagher excluded records from the exposure and decrement counts who had no expectation of decrementing based on the current and proposed assumption. This approach is an alternative to the one followed by CalPERS ACTO, and does not imply that the inclusion of such records is in any way inappropriate. Gallagher does not believe this adjustment had any material impact on results.

Assumption Group	Exposures			Actual Decrements		
	CalPERS Studied	Gallagher Studied	Gallagher Excluded	CalPERS Studied	Gallagher Studied	Gallagher Excluded
CHP Female	7,317	1,772	5,545	10	7	3
CHP Male	94,039	32,584	61,455	213	185	28
PA CPO Female	38,709	27,884	10,825	803	793	10
PA CPO Male	110,625	89,075	21,550	1,606	1,596	10
PA Fire Female	7,323	2,214	5,109	103	99	4
PA Fire Male	197,638	105,821	91,817	1,686	1,658	28
PA Misc Female	1,499,973	1,034,523	465,450	55,612	54,714	898
PA Misc Male	1,349,998	873,887	476,111	39,297	38,667	630
PA Police Female	35,525	23,734	11,791	510	506	4
PA Police Male	308,623	181,105	127,518	3,358	3,300	58
POFF Female	100,088	89,961	10,127	1,111	1,110	1
POFF Male	493,474	479,158	14,316	6,435	6,435	-
Schools Misc Female	2,991,742	2,983,161	8,581	138,035	138,020	15
Schools Misc Male	1,213,191	1,205,504	7,687	53,973	53,952	21
State Industrial	153,282	153,076	206	2,810	2,810	-
State Misc T1 Female	1,220,340	707,206	513,134	27,143	26,550	593
State Misc T1 Male	998,268	600,900	397,368	22,095	21,720	375
State Misc T2 Female	45,026	11,815	33,211	274	204	70
State Misc T2 Male	36,407	11,243	25,164	230	194	36
State Safety Female	189,197	182,555	6,642	6,258	6,254	4
State Safety Male	172,838	171,696	1,142	4,077	4,077	-

3. Demographic Assumptions (continued)

3.4 Termination (continued)

Analysis – Terminations with Refund (continued)

The following table provides Gallagher's analysis of the current and proposed assumptions for the below groups.

Assumption Group	Actual / Expected (A/E) Ratio			Exposure Weighted R-Squared (Service Based)			Percent Inside 90% Confidence Intervals (Service Based)		
	Current	Proposed	Graduated Rates	Current	Proposed	Graduated Rates	Current	Proposed	Graduated Rates
CHP Female	66.1%	72.9%	70.3%	0.4564	0.4940	0.9294	60%	60%	60%
CHP Male	82.8%	90.7%	90.0%	0.8462	0.8617	0.9971	70%	70%	70%
PA CPO Female	91.9%	100.1%	100.0%	0.9767	0.9807	1.0000	73%	80%	80%
PA CPO Male	93.4%	100.0%	99.9%	0.9875	0.9887	0.9999	65%	65%	70%
PA Fire Female	103.5%	99.1%	100.0%	0.9290	0.9323	1.0000	100%	100%	100%
PA Fire Male	102.7%	100.0%	100.0%	0.9909	0.9942	1.0000	87%	93%	93%
PA Misc Female	94.6%	99.1%	99.1%	0.9964	0.9965	1.0000	27%	33%	47%
PA Misc Male	97.3%	98.6%	98.7%	0.9953	0.9956	1.0000	0%	33%	40%
PA Police Female	89.7%	100.1%	100.0%	0.9802	0.9804	1.0000	73%	80%	80%
PA Police Male	97.0%	100.0%	100.0%	0.9809	0.9803	1.0000	60%	60%	60%
POFF Female	77.0%	100.2%	100.1%	0.9834	0.9839	1.0000	52%	80%	80%
POFF Male	91.8%	100.0%	100.0%	0.9906	0.9937	1.0000	66%	79%	79%
Schools Misc Female	104.0%	103.0%	103.0%	0.9984	0.9986	1.0000	28%	73%	80%
Schools Misc Male	100.4%	102.7%	102.7%	0.9977	0.9982	0.9999	70%	73%	65%
State Industrial	106.6%	100.1%	100.0%	0.9920	0.9920	1.0000	59%	91%	86%
State Misc T1 Female	96.1%	99.1%	99.1%	0.9943	0.9952	0.9999	33%	33%	53%
State Misc T1 Male	97.7%	98.8%	98.9%	0.9946	0.9945	0.9999	33%	40%	60%
State Misc T2 Female	210.3%	167.8%	163.4%	0.6895	0.7762	0.9002	40%	60%	67%
State Misc T2 Male	250.6%	206.3%	197.2%	0.3157	0.4874	0.8195	33%	47%	80%
State Safety Female	99.1%	100.0%	100.0%	0.9942	0.9942	1.0000	70%	77%	77%
State Safety Male	104.7%	100.1%	100.1%	0.9976	0.9977	1.0000	65%	73%	70%

Source workbooks provided by CalPERS ACTO align with the actual, expected, and proposed termination with refund experience noted in the Experience Study report. Prior to excluding records for whom no probability of terminating with a refund benefit applies, Gallagher can replicate the A/E ratios noted in the Experience Study report. The current assumption aligns with the assumption specified in recent CalPERS actuarial valuation reports, as expected.

The factors that CalPERS uses in grouping data, as indicated in the Experience Study report, Entry Age, Service, and Employee Category, provide that the assumption was set within the guidance provided in ASOP No. 27, Section 3.11.

Gallagher's exclusion of records for whom no probability of terminating with a refund benefit applies had a generally minimal impact on actual vs expected ratios. The most notable impact was with the CHP group – both males and females.

For all but three groups, the proposed rates are based entirely on plan experience, to which smoothing techniques were then applied. The State Miscellaneous Tier 2 rates were set equal to the State Miscellaneous Tier 1 rates. The CHP female rates were set to equal 95% of male rates, except 8% was assigned to the service-equals-0 rate. The reason for the CHP treatment was not provided.

3. Demographic Assumptions (continued)

3.4 Termination (continued)

Analysis – Terminations with Refund (continued)

A visual inspection of the termination with refund graphs presented in the Experience Study report indicates that the proposed rates generally align well with the experience rates.

The proposed rates improved actual vs expected ratios for all groups. Exposure weighted R-squared measures were consistent, improved, or more closely approach 1.0000, with the proposed assumption for all groups. The percent of assumption values that were inside the 90% confidence interval around actual experience improved with the proposed assumption for all groups.

Methods that were used to smooth the raw rates did not cause the analysis to deviate significantly from actual experience, as indicated by the relatively high exposure weighted r-squared between the graduated rates and actual experience rates.



3. Demographic Assumptions (continued)

3.4 Termination (continued)

Analysis – Terminations with Vested Benefits

The following table summarizes the total exposures and actual decrements provided by CalPERS ACTO and counts excluded by Gallagher for review of the terminations with refund assumption. For purposes of this analysis, Gallagher excluded records from the exposure and decrement counts who had no expectation of decrementing based on the current and proposed assumption. This approach is an alternative to the one followed by CalPERS ACTO, and does not imply that the inclusion of such records is in any way inappropriate. Gallagher does not believe this adjustment had any material impact on results.

Assumption Group	Exposures			Actual Decrements		
	CalPERS Studied	Gallagher Studied	Gallagher Excluded	CalPERS Studied	Gallagher Studied	Gallagher Excluded
CHP Female	6,356	6,311	45	31	31	-
CHP Male	75,961	75,317	644	364	363	1
PA CPO Female	25,692	25,692	-	433	433	-
PA CPO Male	75,451	75,444	7	805	805	-
PA Fire Female	5,508	5,508	-	79	79	-
PA Fire Male	144,270	144,226	44	707	707	-
PA Misc Female	887,494	887,362	132	20,724	20,724	-
PA Misc Male	825,703	825,517	186	14,908	14,908	-
PA Police Female	25,841	25,841	-	400	400	-
PA Police Male	232,023	231,985	38	2,130	2,130	-
POFF Female	70,517	70,449	68	726	726	-
POFF Male	330,249	330,008	241	2,360	2,360	-
Schools Misc Female	1,478,928	1,478,669	259	33,977	33,976	1
Schools Misc Male	660,479	660,351	128	12,973	12,972	1
State Industrial	97,526	97,441	85	1,482	1,481	1
State Misc T1 Female	774,985	773,355	1,630	11,779	11,776	3
State Misc T1 Male	592,222	591,405	817	8,102	8,100	2
State Misc T2 Female	33,087	33,080	7	600	600	-
State Misc T2 Male	24,964	24,958	6	388	387	1
State Safety Female	79,272	79,209	63	1,691	1,691	-
State Safety Male	66,692	66,652	40	1,069	1,069	-

3. Demographic Assumptions (continued)

3.4 Termination (continued)

Analysis – Terminations with Vested Benefits (continued)

The following table provides Gallagher's analysis of the current and proposed assumptions for the below groups.

Assumption Group	Actual / Expected (A/E) Ratio			Exposure Weighted R-Squared (Service Based)			Percent Inside 90% Confidence Intervals (Service Based)		
	Current	Proposed	Graduated Rates	Current	Proposed	Graduated Rates	Current	Proposed	Graduated Rates
CHP Female	62.5%	101.8%	121.0%	0.4438	0.4279	0.9195	58%	65%	65%
CHP Male	107.6%	102.8%	100.2%	0.7921	0.8035	0.9998	76%	80%	80%
PA CPO Female	104.7%	No change	100.0%	0.9673	No change	1.0000	77%	No change	74%
PA CPO Male	102.9%	No change	100.2%	0.9565	No change	1.0000	80%	No change	83%
PA Fire Female	115.1%	No change	100.0%	0.6157	No change	1.0000	67%	No change	67%
PA Fire Male	98.3%	No change	101.0%	0.9600	No change	0.9996	87%	No change	93%
PA Misc Female	100.8%	99.5%	97.8%	0.9989	0.9991	0.9992	83%	92%	89%
PA Misc Male	105.0%	99.8%	97.9%	0.9979	0.9983	0.9988	67%	81%	72%
PA Police Female	93.5%	101.3%	100.3%	0.9559	0.9543	1.0000	68%	71%	68%
PA Police Male	103.3%	No change	100.5%	0.9788	No change	0.9999	80%	No change	80%
POFF Female	86.6%	99.8%	100.1%	0.9574	0.9588	1.0000	87%	87%	87%
POFF Male	99.1%	No change	100.0%	0.9531	No change	1.0000	77%	No change	83%
Schools Misc Female	108.5%	99.4%	97.8%	0.9987	0.9993	0.9988	22%	89%	92%
Schools Misc Male	109.2%	99.5%	97.5%	0.9985	0.9989	0.9986	47%	94%	89%
State Industrial	111.8%	100.2%	100.2%	0.9799	0.9799	1.0000	83%	78%	78%
State Misc T1 Female	99.1%	99.4%	98.2%	0.9968	0.9987	0.9996	86%	92%	92%
State Misc T1 Male	101.6%	99.5%	98.0%	0.9966	0.9987	0.9994	86%	97%	97%
State Misc T2 Female	88.8%	157.2%	157.6%	0.9481	0.9308	0.9893	75%	47%	72%
State Misc T2 Male	87.1%	144.3%	141.6%	0.7956	0.7814	0.9040	67%	50%	81%
State Safety Female	103.8%	No change	100.0%	0.9882	No change	1.0000	87%	No change	87%
State Safety Male	105.9%	No change	100.0%	0.9879	No change	1.0000	87%	No change	87%

Source workbooks provided by CalPERS ACTO align with the actual, expected, and proposed termination rates with vested benefits experience noted in the Experience Study report. Prior to excluding records for whom no probability of terminating with a vested benefit applies, Gallagher can replicate the A/E ratios noted in the Experience Study report. The current assumption aligns with the assumption specified in recent CalPERS actuarial valuation reports, as expected.

The factors that CalPERS uses in grouping data, as indicated in the Experience Study report, Entry Age, Service, and Employee Category, provide that the assumption was set within the guidance provided in ASOP No. 27, Section 3.11.

Gallagher's exclusion of records for whom no probability of terminating with a vested benefit applies had a generally minimal impact on actual vs expected ratios.

For all but three groups for which rates were changed, the proposed rates are based entirely on plan experience, to which smoothing techniques were then applied. The State Miscellaneous Tier 2 rates were set equal to the State Miscellaneous Tier 1 rates. The CHP female rates were set to equal 115% of male rates.

3. Demographic Assumptions (continued)

3.4 Termination (continued)

Analysis – Terminations with Vested Benefits (continued)

A visual inspection of the termination with vested benefits graphs presented in the Experience Study report indicates that the proposed rates align generally well with the experience rates.

Generally speaking, other than for State Miscellaneous Tier 2, the proposed assumption changes provide an improved fit against the experience.

- The proposed rates improved actual vs expected ratios for all groups who had an assumption change.
- Exposure weighted R-squared measures improved, or more closely approach 1.0000, with the proposed assumption for most groups.
- The percent of assumption values that were inside the 90% confidence interval around actual experience improved with the proposed assumption for all groups.

Methods that were used to smooth the raw rates did not cause the analysis to deviate significantly from actual experience, as indicated by the relatively high exposure weighted r-squared between the graduated rates and actual experience rates

Summary of Observations and Recommendations

In general, Gallagher believes the proposed vested termination rates, including the methodology used to study termination experience, are reasonable.



3. Demographic Assumptions (continued)

3.5 Other Assumptions

The Experience Study report included analysis for four other assumptions not previously discussed and for which Gallagher was provided details for review. These other assumptions are discussed below.

Unused Sick Leave – School Member, School Safety Member, or Local Member

The unused sick leave assumption accounts for the provision that unused sick leave can be converted to service credits in the determination of pension benefits.

Gallagher agrees with the methodology employed to study the experience. Data provided to Gallagher for review of this assumption is consistent with the results disclosed in the Experience Study report and support the recommendation to maintain the one percent loading factor.

Gender Blending for Optional Forms of Benefits

As described in the Experience Study report, the purpose of this assumption is to determine the male/female mortality rate blending ratios used for developing unisex mortality tables for optional forms of benefits.

Gallagher does not have data to confirm the tabulations used in the development of the proposed blending factors but can confirm that the amounts included in the report are consistent with the amounts provided to Gallagher for review.

Assuming the tabulations are correct, Gallagher agrees that the proposed blending factors are reasonable and consistent with observed experience.

Percentage Married and Age Difference

As described in the Experience Study report, the purpose of this assumption is to determine the percentage married and age difference between male and female spouses for purposes of valuing the likelihood of a member having a statutory spouse at retirement.

Gallagher does not have data to confirm the tabulations used in the development of the proposed assumptions but can confirm that the values included in the report are consistent with the amounts provided to Gallagher for review and are consistent with the values published in the previous experience study.

Assuming the tabulations are correct, Gallagher agrees that the proposed assumptions are reasonable and consistent with observed experience.

3. Demographic Assumptions (continued)

3.5 Other Assumptions (continued)

Eligible Survivor Percentage for 1959 Survivor Program

The 1959 Survivor Benefit Program provides pre-retirement death benefits for active members not covered by Social Security. The purpose of this assumption is to determine the probability of those active members having an eligible survivor at the date of death. Eligible survivors include any surviving spouse, domestic partner, children under the age of 22 (unless disabled) or parents of the deceased member.

Analysis

CalPERS ACTO combined the experience of CalPERS plans systemwide with the experience of the 1959 Survivor Benefit Program during the period June 30, 2018 through June 30, 2023. Presumably, care was taken not to double-count individuals who are participants in both plans. However, even if this is not true, the 1959 plan's experience is small enough relative to the system-wide data that excluding it entirely would not significantly alter the results, except arguably in the 25-29 age range. In general, the result was a reduction in the current assumption of 10-15 percentage points at all ages (40 percentage points for those under 25).

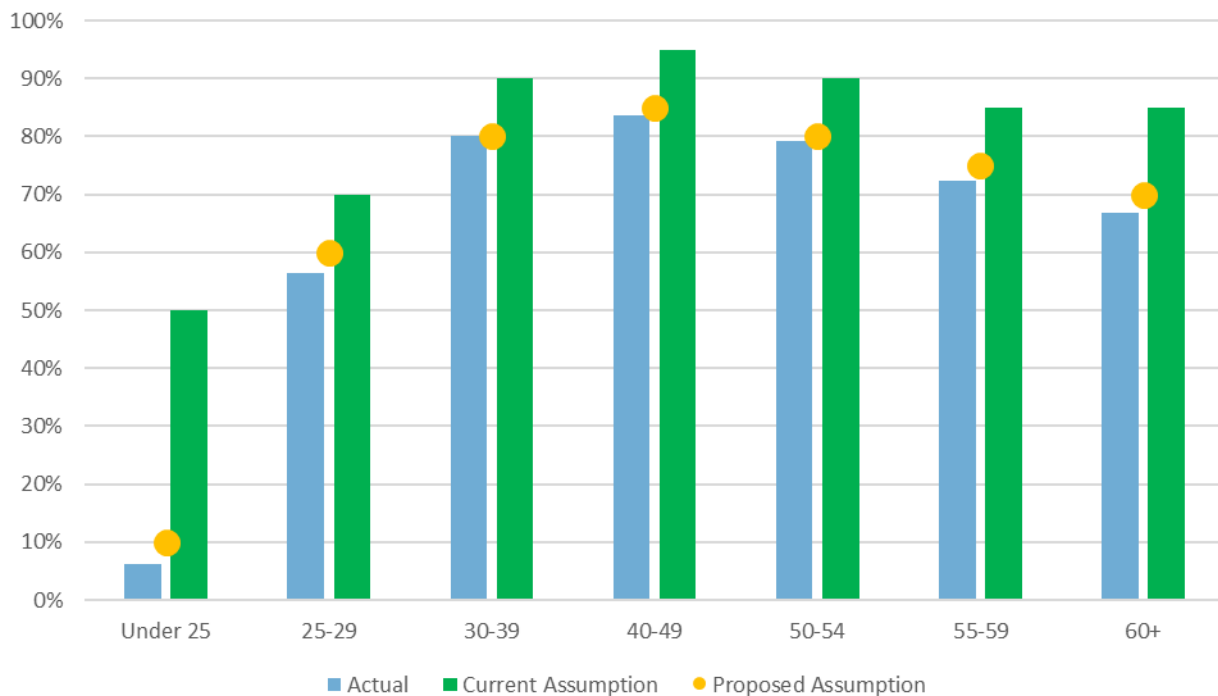
The following details the results of the experience development.

Age Range	1959 Survivor and PRSA Deaths with Eligible Survivor	1959 Survivor and PRSA Death Counts	Percentage of 1959 Survivor and PRSA Deaths with Eligible Survivor
Under 25	1	16	6%
25-29	61	108	56%
30-39	769	960	80%
40-49	2,974	3,560	84%
50-54	17,840	22,537	79%
55-59	32,553	44,942	72%
60+	70,501	105,607	67%

3. Demographic Assumptions (continued)

3.5 Other Assumptions (continued)

The following graph compares the actual probability of active members having an eligible survivor at the date of death, the expected experience based on the current assumption, and the new proposed assumption based on these results. It can be seen that significant weight was given to the actual experience of the plan.



ASOP No. 27, Section 3.17.6 indicates that “Household composition may affect the payment of benefits, the number of benefits, or other assumptions. For example, some plans provide annuity death benefits to surviving children under a stated age. In that case, an assumption as to the number and ages of the potential beneficiaries may be needed.”

It is our understanding that the household composition of those with eligible survivors is incorporated in the present value of average claim at the time of death assumption. This assumption is outside the scope of this assignment.

Summary of Observations and Recommendations

We believe the method used is sound, and the heavy reliance on actual experience is reasonable given the number of members included. We do recommend that consideration be given to whether gender-distinct data might produce a materially different result.

3. Demographic Assumptions (continued)

3.6 Salary/Merit Increase

Assumption Purpose

The benefits that CalPERS members receive are generally related to the compensation they receive as active employees. Accordingly, projected future salary increases are needed in order to accurately estimate future benefits payable to current employees. The total salary increase assumption is also a critical component in determining the allocation of the present value of future benefits to past service and future service periods of active participants.

CalPERS bifurcates the total salary assumption into two components: 1) wage inflation and 2) seniority, merit, and promotion increases. Wage inflation is discussed elsewhere in this report, so this section focuses on the assumption related to seniority, merit and promotion increases.

Selecting a Salary/Merit Increase Assumption

ASOP No. 27, Section 3.9 provides that merit adjustments are described as “*changes attributable to personal performance, seniority, or other individual factors*” This is consistent with how CalPERS has studied the salary/merit increase assumption in the Experience Study report.

In accordance with ASOP No. 27, the Experience Study analyzed historical compensation increases and practices of the plan sponsors and developed separate assumptions for different employee groups. Gallagher agrees with the methodology used to isolate the year-to-year merit increase rates and consider them independently of wage inflation.

Summary of Review

For the purpose of Gallagher’s review, CalPERS ACTO provided experience study analyses of the merit increase assumption for the following groups:

- CHP
- PA CPO
- PA Fire
- PA Miscellaneous
- PA Police
- POFF
- Schools Miscellaneous
- State Industrial
- State Miscellaneous
- State Safety

The files provided to Gallagher indicate that the merit increase assumptions were developed based on experience covering the period June 30, 2007 through June 30, 2023. Schools experience for the 2011-2012 fiscal year was excluded due to “unexpected non-recurring economic events during the fiscal year.”

3. Demographic Assumptions (continued)

3.6 Salary/Merit Increase

The proposed merit increase rates vary by entry age, service, and membership category. Entry age bands in which proposed assumptions are set vary by group as follows:

- All Entry Ages: CHP, POFF, State Safety
- Entry Ages 15-29, 30-39, 40-84: PA CPO, PA Miscellaneous, PA Police, State Miscellaneous, State Industrial, Schools Miscellaneous, PA Fire

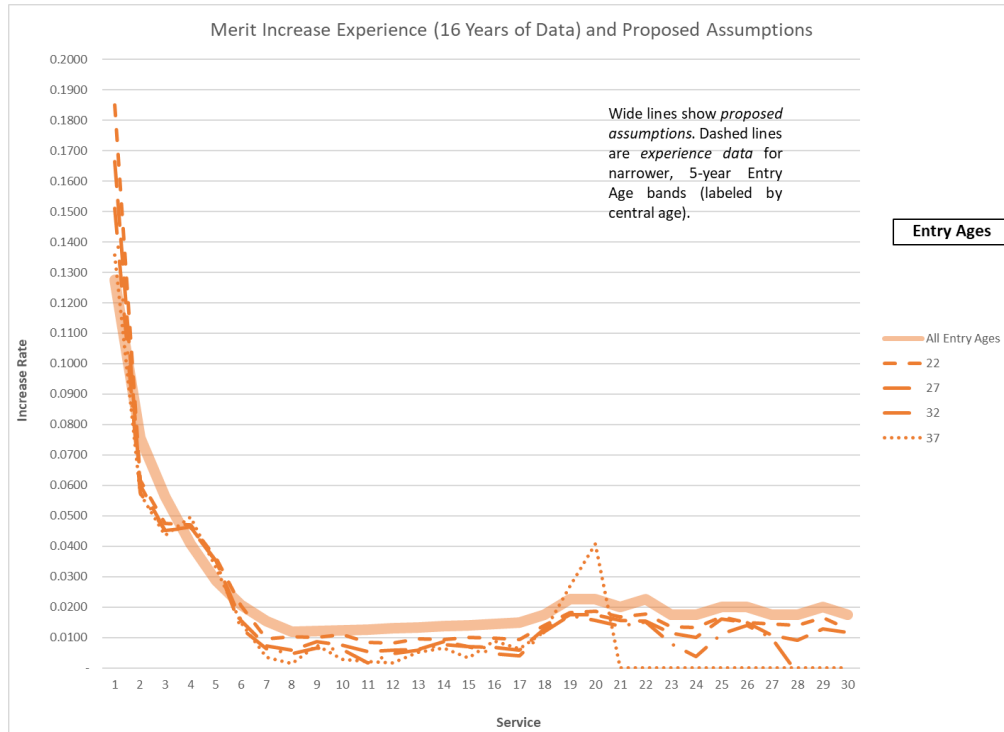
Analysis

For all groups, CalPERS ACTO provided Gallagher with workbooks that included the development of the proposed rates. We validated that the raw merit increase rates calculated in the workbooks were derived appropriately and reflected the appropriate wage inflation for each group.

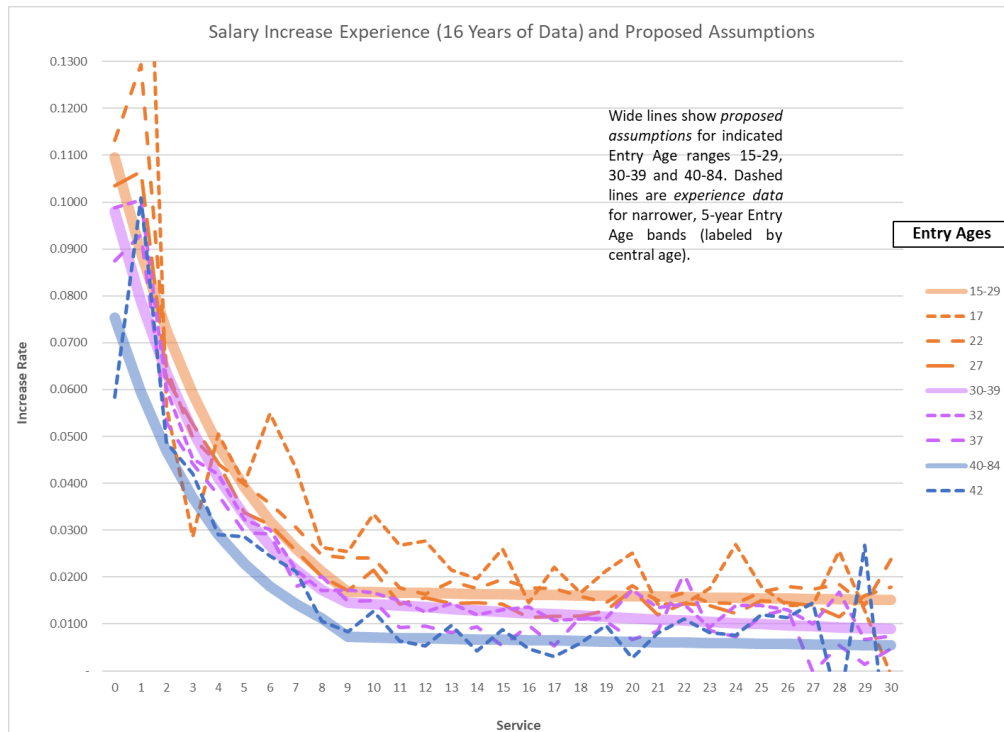
For purposes of our review, for each assumption group, we modified the entry age bands to be narrower than was used to develop the proposed assumptions, and graphed the raw rates against the proposed rates. We excluded results for entry age bands or service levels that contained relatively few observations. From this, we considered whether the proposed rates reasonably align with the experience for the more granular groupings.

The graphs we produced are provided below. It appears the relatively wide entry age bands, and proposed rates for each band, generally parallel the more granular data encompassed by those bands.

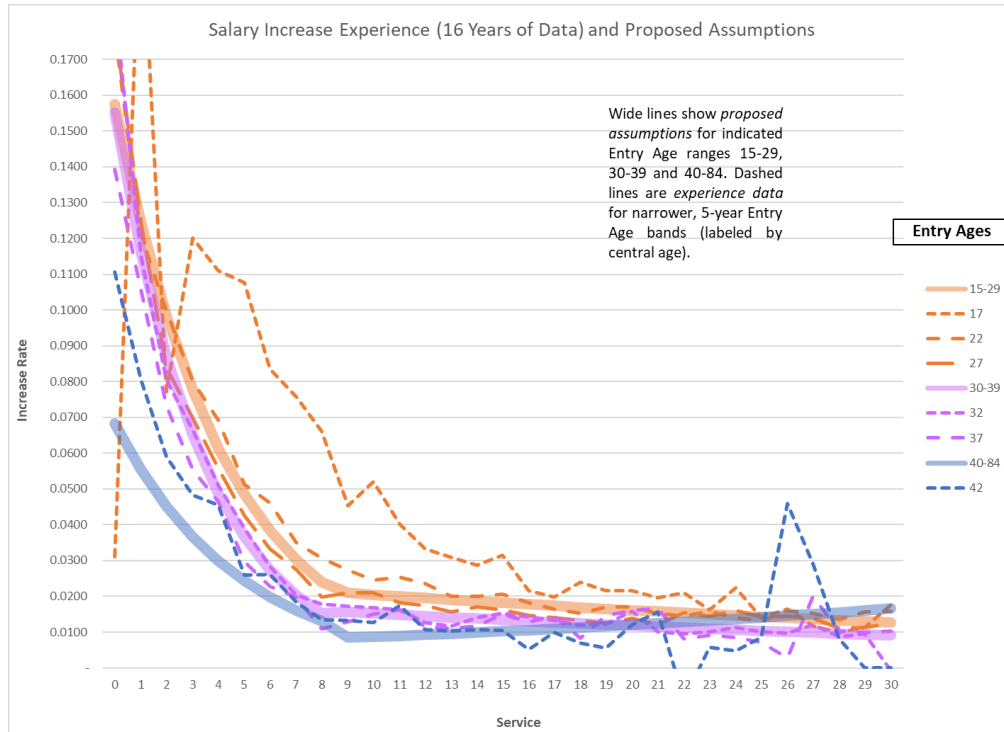
CHP



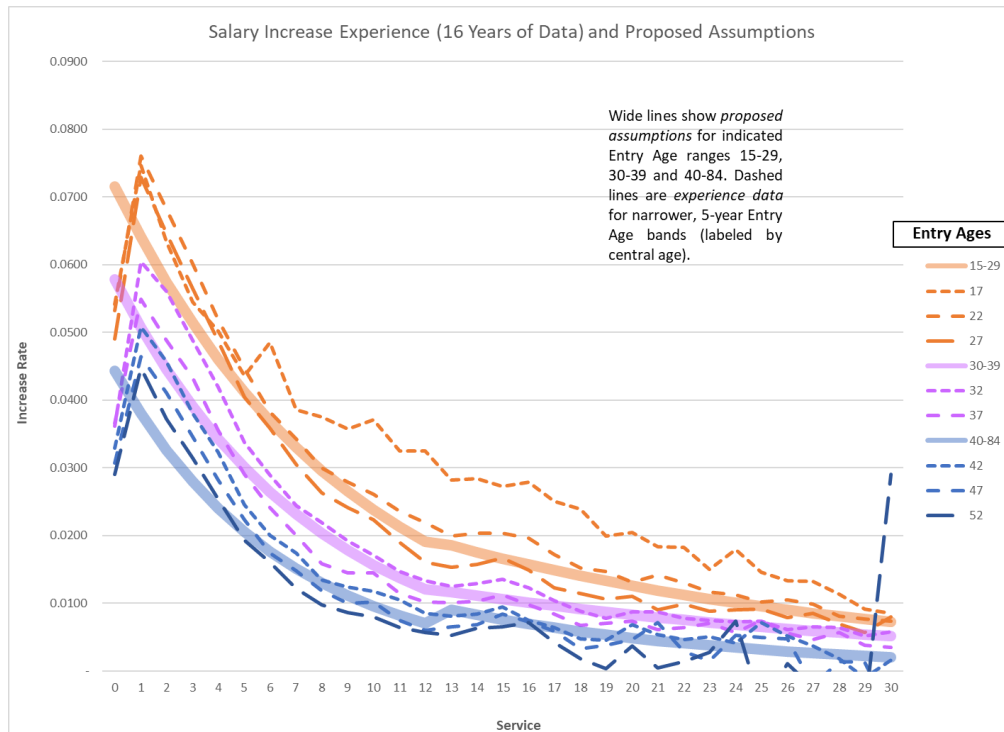
PA CPO



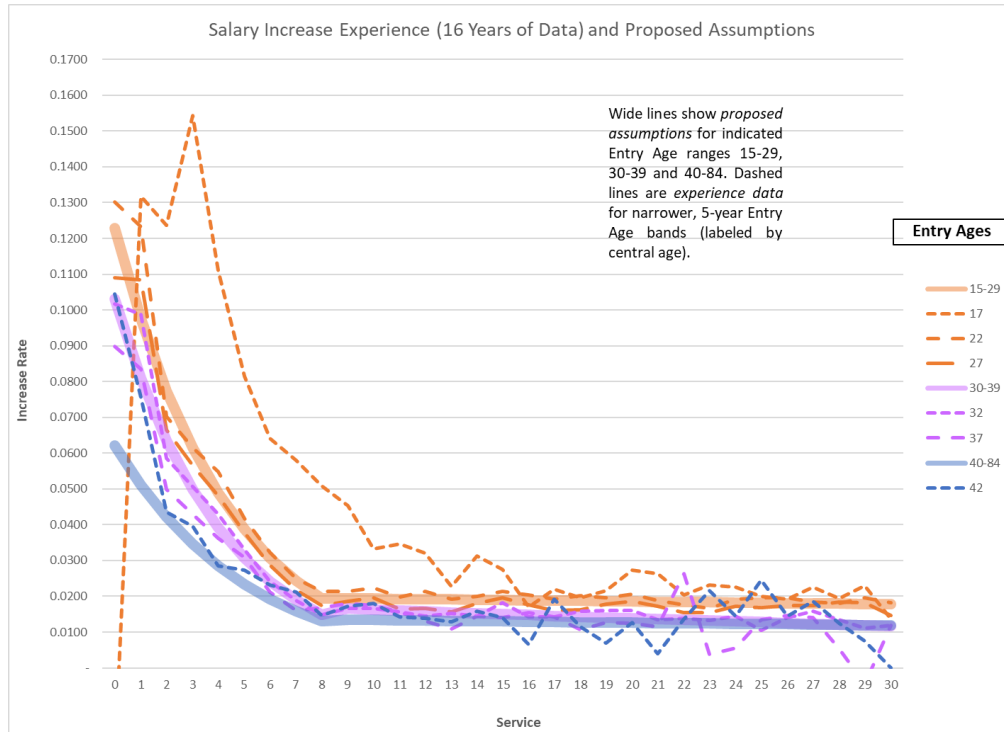
PA Fire



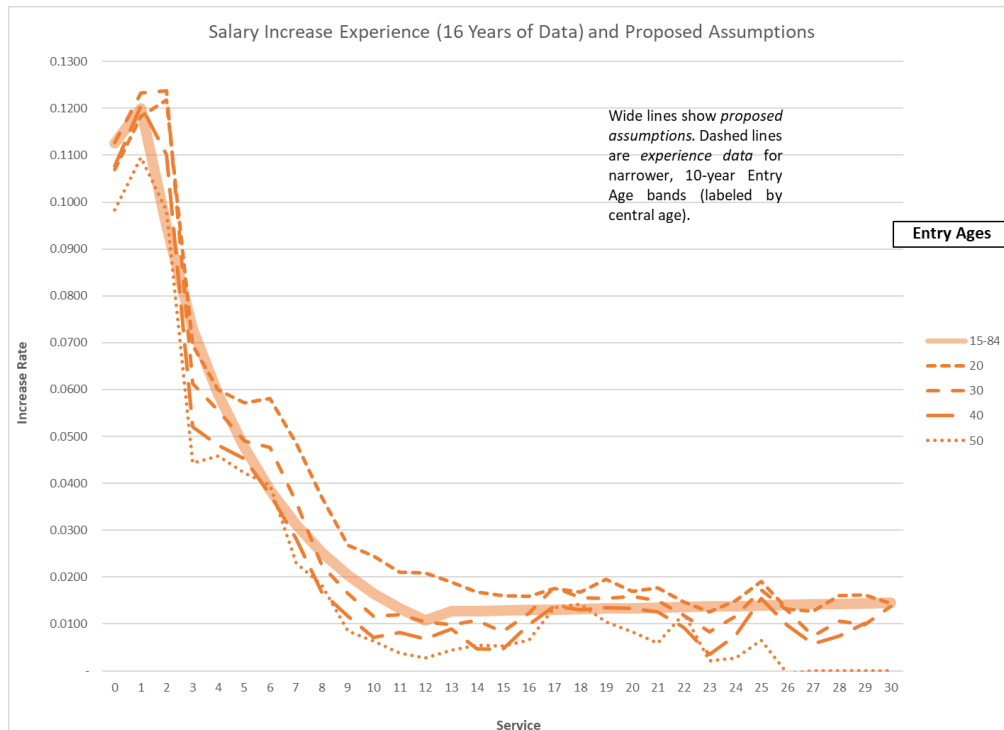
PA Miscellaneous



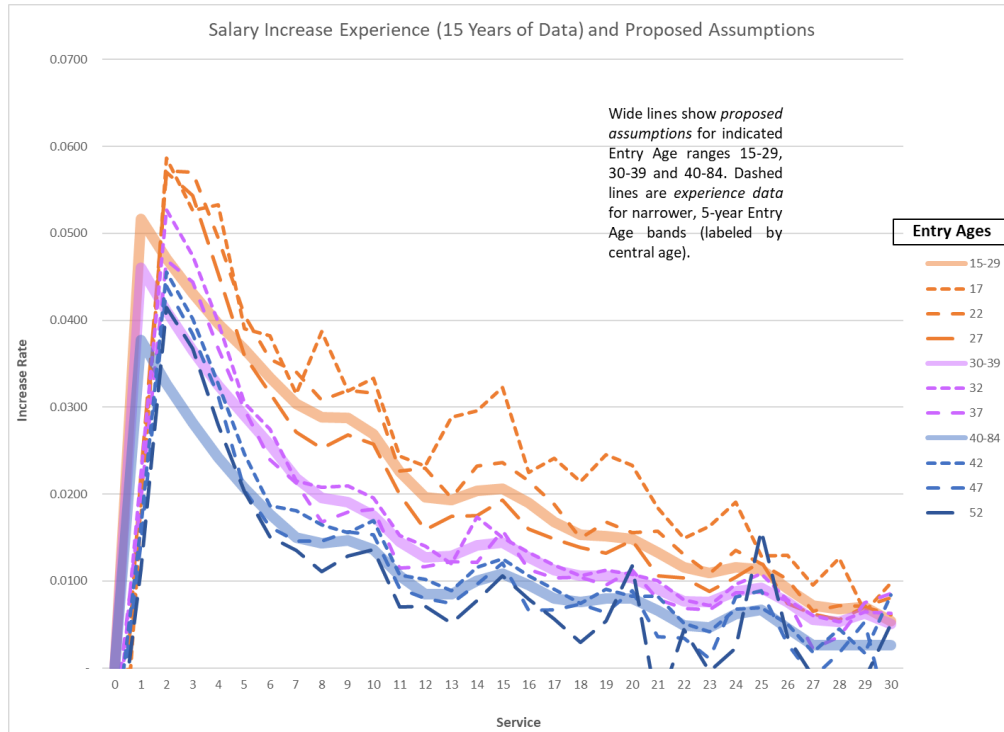
PA Police



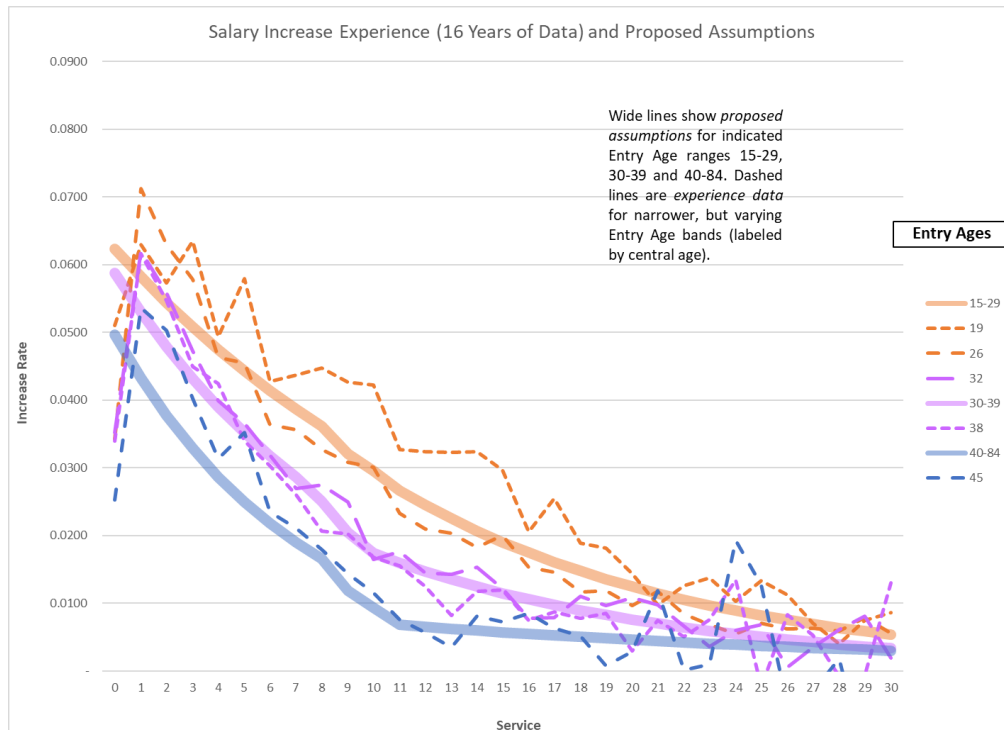
POFF



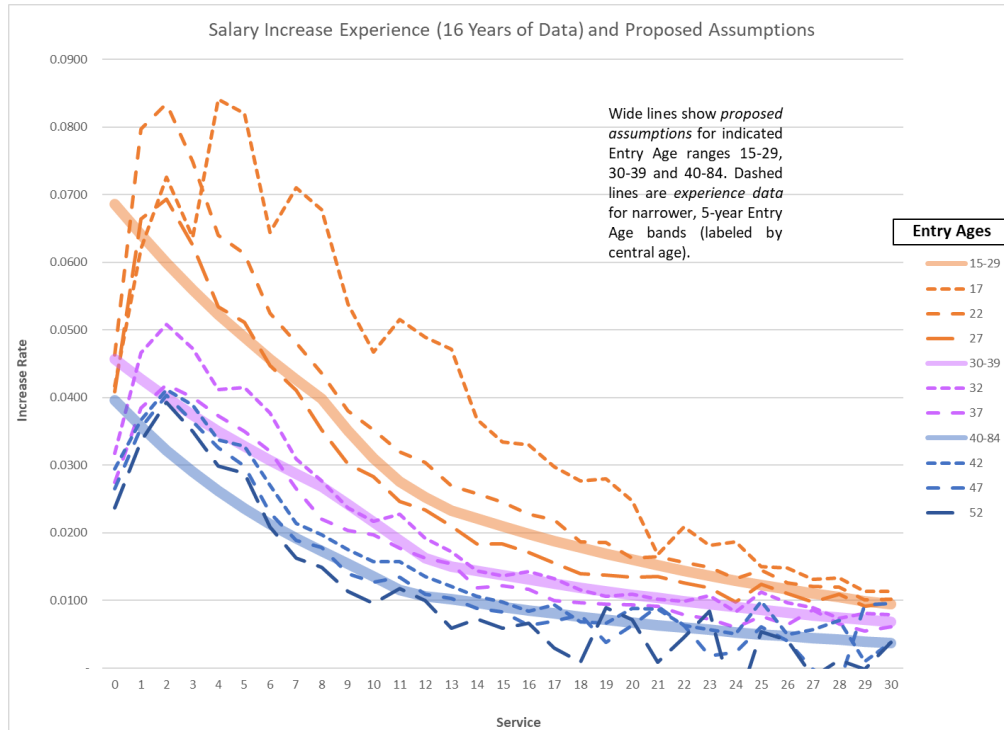
Schools Miscellaneous



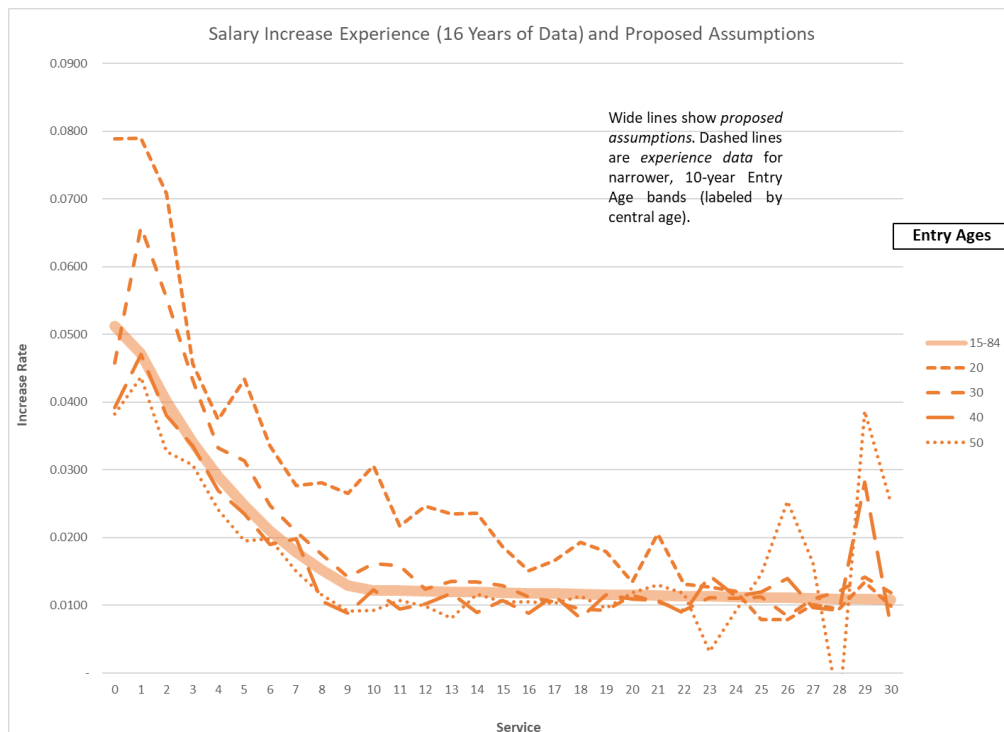
State Industrial



State Miscellaneous



State Safety



3. Demographic Assumptions (continued)

3.6 Salary/Merit Increase

Summary of Observations and Recommendations

In general, we observed that the proposed assumptions aligned well with experience.

While we do not disagree with the proposed assumptions, items that CalPERS ACTO may consider addressing are as follows:

- We observed that the proposed merit increase rates for CHP after 10 years of service consistently exceeded observed experience over the study period.
- For PA Fire and PA Police, there is a point in which the merit increase rates applied to older entry ages exceed the rates for younger entry ages with the same level of attained service. The Experience Study report notes that “employees with lower entry ages tend to get larger pay increases at the same amount of service.” So while this may be true in general, some narrative around the situations where there are exceptions to this rule may be of value.
- Several groups, including Schools Miscellaneous and State Miscellaneous, have proposed assumptions at earlier years of service that are consistently lower than observed experience over the study period.

Other items of consideration regarding the merit increase assumption:

- A reading of the narrative included in the Experience Study report indicates that historical compensation serves as the sole basis for setting the merit increase assumption. Consider expanding the discussion to document how other factors are considered, including:
 - Current compensation practices and any anticipated changes in these practices
 - Competitive factors
 - Collective bargaining
 - Compensation volatility (i.e., prevalence of bonus or overtime compensation that varies significantly from year to year)
- Consider including discussion regarding how the credibility of the compensation data is determined and applied.

4. Workpapers Received from CalPERS for Review

Assumption Category	File Name	Date Received
1959 Survivor	1959 Claims Matrix.2023.1.0_ES 4 59S January New Proposed Rates.xlsm	3/4/2025
1959 Survivor	1959 Eligible Survivor Assumption.pptx	3/4/2025
1959 Survivor	1959 Financing.2023.1.0_ES 4 59S January Proposed New Rates..xlsm	3/4/2025
1959 Survivor	Active Death Counts from Extract FINAL.xlsx	3/4/2025
1959 Survivor	Claims Matrix_5 January New Proposed Rates.csv	3/4/2025
1959 Survivor	ELIGIBLE SURVIVOR PERCENTAGE FOR 1959 SURVIVOR PRORAM.docx	3/4/2025
Genders and Marriage	2024 GENDER BLENDING FOR OPTIONAL FORMS OF BENEFITS version2.docx	2/20/2025
Genders and Marriage	2025 ES Marriage Percent and Age Difference.pptx	2/4/2025
Genders and Marriage	Audit File.xlsx	2/11/2025
Genders and Marriage	PERCENTAGE MARRIED AND AGE DIFFERENCE.docx	2/11/2025
Genders and Marriage	Summary 2020-2023 _v4.xlsm	2/11/2025
Genders and Marriage	Summary to Management.xlsx	2/11/2025
IDR	IDR 2025 Experience Study.docx	4/16/2025
IDR	IDR Rate Proposal Presentation.pptx	4/16/2025
IDR	No Changes - PA Police 2015-2019.xlsm	2/4/2025
IDR	No Changes - State Industrial 2015-2019.xlsm	2/4/2025
IDR	No Changes - State Safety 2015-2019.xlsm	2/4/2025
IDR	PA School Police 2015-2019.xlsm	5/9/2025
IDR	PA Sheriff 2015-2019.xlsm	5/9/2025
IDR	Proposed Rates - PA CPO 2015-2019.xlsm	2/4/2025
IDR	Proposed Rates - PA Fire 2015-2019.xlsm	2/4/2025
IDR	Proposed Rates - PA Safety Prosecutor 2015-2019.xlsm	5/9/2025
IDR	Proposed Rates - PA SOS 2015-2019 _462847.xlsm	5/9/2025
IDR	Proposed Rates - State CHP 2015-2019.xlsm	2/4/2025
IDR	Proposed Rates - State POFF 2015-2019.xlsm	2/4/2025
NIDR	All Misc Final 2009-2019.xlsm	1/23/2025
NIDR	All Safety Final 2009-2019 .xlsm	1/23/2025
NIDR	NIDR 2025 Experience Study .docx	2/4/2025
NIDR	NIDR Final Consolidated Rates Presentation - Copy.pptx	1/23/2025
NIDR	State Industrial Final 2009-2019.xlsm	1/23/2025
NIDR	Summary Spreadsheet 2004-2023 (Combo).xlsm	1/23/2025
Pre-Ret Mortality	DD Misc F 2nd attempt_457085.xlsm	1/24/2025

Assumption Category	File Name	Date Received
Pre-Ret Mortality	DD Misc M 2nd attempt_457083.xlsm	1/24/2025
Pre-Ret Mortality	DD Safety F_457287.xlsm	1/24/2025
Pre-Ret Mortality	DD Safety M_457289.xlsm	1/24/2025
Pre-Ret Mortality	NDD Misc F_457012.xlsm	1/24/2025
Pre-Ret Mortality	NDD Misc M_456989.xlsm	1/24/2025
Pre-Ret Mortality	NDD Safety F_457009.xlsm	1/24/2025
Pre-Ret Mortality	NDD Safety M_457011.xlsm	1/24/2025
Pre-Ret Mortality	Pre-ret Mort - Report Draft - v4 .docm	4/17/2025
Post-Ret Mortality	2021 Experience Study Review - Mortality Auditor.pptx	1/23/2025
Post-Ret Mortality	2025 Experience Study Proposal - Mortality Auditor.pptx	1/23/2025
Post-Ret Mortality	CPE_IDR_F_2015_2019_EPM_379741_80_PCT_MP_2020.xlsm	3/24/2025
Post-Ret Mortality	CPE_IDR_M_2015_2019_EPM_379743_Upd_Pub2010_Proj.xlsm	1/23/2025
Post-Ret Mortality	CPE_NIDR_F_2015_2019_EPM_379745_80_PCT_MP_2020.xlsm	3/24/2025
Post-Ret Mortality	CPE_NIDR_M_2015_2019_EPM_379746_Upd_Pub2010_Proj.xlsm	1/23/2025
Post-Ret Mortality	CPE_SR_F_BW_2015_2019_379704_80_PCT_MP_2020.xlsm	3/24/2025
Post-Ret Mortality	CPE_SR_M_BW_2015_2019_379708_Upd_PubG2010_Proj.xlsm	1/23/2025
Post-Ret Mortality	POST-RETIREMENT MORTALITY FOR HEALTHY RECIPIENTS_2025_StudyA.docx	1/23/2025
Post-Ret Mortality	POST-RETIREMENT MORTALITY FOR INDUSTRIAL RELATED DISABLED RETIREES_2025_Study.docx	1/23/2025
Post-Ret Mortality	POST-RETIREMENT MORTALITY FOR NON-INDUSTRIAL RELATED DISABLED RETIREES_2025_Study.docx	1/23/2025
Salary Scale	2025 Salary Scale Presentation - WORKING February 18 2025.pptx	3/3/2025
Salary Scale	Analysis of Schools year 0 to 1 merits.xlsx	3/3/2025
Salary Scale	CHP 2007-2023_ES_456357 & WAGE INFLATION.xlsm	3/3/2025
Salary Scale	PA CPO 2007-2023_ES_456897 - Updated Graphs.xlsm	3/3/2025
Salary Scale	PA Fire 2007-2023_ES_456899.xlsm	3/3/2025
Salary Scale	PA Misc 2007-2023 ES_456763 - 0-12,13-30 Segments.xlsm	3/3/2025
Salary Scale	PA Police 2007-2023 ES_456766 -Updated Graph.xlsm	3/3/2025
Salary Scale	POFF 2007-2023_ES_456705 - Same Adjustments as Last 2021 ES.xlsm	3/3/2025
Salary Scale	SALARY-MERIT INCREASE 2025.docx	4/25/2025
Salary Scale	Schools Misc 2007-2023 ESS_456717 adjusted year 1-5 merit.xlsm	3/3/2025
Salary Scale	State Industrial 2007-2023 ES_456759 - Updated Graphs - Modded Y0 RAW - TP smooth 8 -11.xlsm	3/3/2025
Salary Scale	State Misc 2007-2023 ES_456715 Smoothed 8-11, 11-30.xlsm	3/3/2025
Salary Scale	State Safety 2007-2023_ES_456901.xlsm	3/3/2025
Service Retirement	aa -- Experience_study_ESR_457830 - all but 3@50.xlsm	4/7/2025

Assumption Category	File Name	Date Received
Service Retirement	aa -- Experience_study_ESR_CHP_rx_2011-2023.xlsm	4/7/2025
Service Retirement	aa -- Experience_study_ESR_Industrial_rx_2011-2023.xlsm	4/7/2025
Service Retirement	aa -- Experience_study_ESR_POFF_rx_2011-2023.xlsm	4/7/2025
Service Retirement	aa -- Experience_study_ESR_Sate Misc_rx_2011-2023.xlsm	4/7/2025
Service Retirement	aa -- Experience_study_ESR_Schools_rx_2011-2023.xlsm	4/7/2025
Service Retirement	aa -- Experience_study_ESR_State Safety_rx_2011-2023.xlsm	4/7/2025
Service Retirement	aa -- PA Miscellaneous Comparison v3.xlsx	4/7/2025
Service Retirement	aa -- PA Police Presentation v2.pptx	4/7/2025
Service Retirement	aa -- Schools.xlsx	4/7/2025
Service Retirement	aa -- State and Schools Presentation v2.pptx	4/7/2025
Service Retirement	aa -- State Miscellaneous Industrial.xlsx	4/7/2025
Service Retirement	aa -- State Safety POFF CHP.xlsx	4/7/2025
Service Retirement	aa -- Experience_study_ESR_457830 - 3@50.xlsm	4/7/2025
Service Retirement	aa -- PA Safety Comparison v5.xlsx	4/7/2025
Service Retirement	Adjusted for PEPPRA Experience_study_ESR_PA Misc_rx_2011-2023.xlsm	4/22/2025
Service Retirement	PA Fire Presentation.pptx	4/22/2025
Service Retirement	PA Miscellaneous Presentation v2.pptx	4/7/2025
Service Retirement	public-agencies-schools-assumption-methods 2021.xlsx	5/7/2025
Service Retirement	SERVICE RETIREMENT FOR TERMINATED MEMBERS.docx	5/2/2025
Service Retirement	state-assumption-methods 2021.xlsx	5/7/2025
Sick Leave	Report Writeup.docx	3/3/2025
Sick Leave	SickLeave - Data - Clean - 02.xlsx	3/3/2025
Term Refund	2025 Term Refund Presentation Feb 13 2025.pptx	3/3/2025
Term Refund	CHP F 2007-2021 ES_457218.xlsm	3/3/2025
Term Refund	CHP M 2007-2021 ES_457220.xlsm	3/3/2025
Term Refund	PA CPO F 2007-2021 ES_457222.xlsm	3/3/2025
Term Refund	PA CPO M 2007-2021 ES_457224.xlsm	3/3/2025
Term Refund	PA Fire F 2007-2021 ES_457226.xlsm	3/3/2025
Term Refund	PA Fire M 2007-2021 ES_457228.xlsm	3/3/2025
Term Refund	PA Misc F 2007-2021 ES_457230 30-49 Combined.xlsm	3/3/2025
Term Refund	PA Misc M 2007-2021 ES_457232 30-49 Combined.xlsm	3/3/2025
Term Refund	PA Police F 2007-2021 ES_457234.xlsm	3/3/2025
Term Refund	PA Police M 2007-2021 ES_457236.xlsm	3/3/2025
Term Refund	POFF F 2007-2021 ES_457238.xlsm	3/3/2025
Term Refund	POFF M 2007-2021 ES_457240.xlsm	3/3/2025
Term Refund	Schools Misc F 2007-2021 ES_457242.xlsm	3/3/2025

Assumption Category	File Name	Date Received
Term Refund	Schools Misc M 2007-2021 ES_457244.xlsm	3/3/2025
Term Refund	State Industrial 2007-2021 ES_457246.xlsm	3/3/2025
Term Refund	State Misc T1 F 2007-2021 ES_457252 30-49 Combined.xlsm	3/3/2025
Term Refund	State Misc T1 M 2007-2021 ES_457254 30-49 Combined.xlsm	3/3/2025
Term Refund	State Misc T2 F 2007-2021 ES_457260 (Override to T1 Rates).xlsm	3/3/2025
Term Refund	State Misc T2 M 2007-2021 ES_457258 (Override to T1 Rates).xlsm	3/3/2025
Term Refund	State Safety F 2007-2021 ES_457248.xlsm	3/3/2025
Term Refund	State Safety M 2007-2021_457250.xlsm	3/3/2025
Term Refund	Summary page feb 13 2025.xlsx	3/3/2025
Term Refund	Term Vest and Term Refund Final.docx	4/25/2025
Term Vest	2025 Term Vest Presentation.pptx	4/23/2025
Term Vest	an_CHP F 2007-2021 ES_457199.xlsm	5/9/2025
Term Vest	an_PA CPO F 2007-2021_ES_457165.xlsm	5/9/2025
Term Vest	an_PA Fire F 2007-2021_ES_457161.xlsm	5/9/2025
Term Vest	an_PA Police F 2007-2021 ES_457205.xlsm	5/9/2025
Term Vest	ao_CHP M 2007-2021 ES_457197.xlsm	5/9/2025
Term Vest	ao_PA CPO M 2007-2021_ES_457163.xlsm	5/9/2025
Term Vest	ao_PA Fire M 2007-2021_ES_457159.xlsm	5/9/2025
Term Vest	ao_PA Police M 2007-2021 ES_457203.xlsm	5/9/2025
Term Vest	ao_POFF F 2007-2021 ES_457213.xlsm	5/9/2025
Term Vest	ao_POFF M 2007-2021 ES_457211.xlsm	5/9/2025
Term Vest	ao_State Safety F 2007-2021 ES_457209.xlsm	5/9/2025
Term Vest	ao_State Safety M 2007-2021 ES_457207.xlsm	5/9/2025
Term Vest	PA Misc & SPR F 2007-2021_ES_457170 ra60.xlsm	5/9/2025
Term Vest	PA Misc & SPR M 2007-2021_ES_457168 ra60.xlsm	5/9/2025
Term Vest	Schools Misc F 2007-2021 F ES_457195 ra60.xlsm	5/9/2025
Term Vest	Schools Misc M 2007-2021 ES_457193 ra60.xlsm	5/9/2025
Term Vest	State Industrial 2007-2021 ES_457201 ra60.xlsm	5/9/2025
Term Vest	State Misc T1 F 2007-2021_ES_457174 ra60.xlsm	5/9/2025
Term Vest	State Misc T1 M 2007-2021_ES_457172 ra60.xlsm	5/9/2025
Term Vest	State Misc T2 F 2007-2021 (excl. 2011-2012)_ES_457178 w T1F rates ra60.xlsm	5/9/2025
Term Vest	State Misc T2 M 2007-2021 (excl. 2011-2012)_ED_457176 w T1M rates ra60.xlsm	5/9/2025
Term Vest	Term Vest and Term Refund Final.docx	4/25/2025
Term Vest	TV_CHP F 2007-2021 ES_457199 (with male rates and multiplier).xlsm	5/9/2025

© 2025 Arthur J. Gallagher & Co.

Consulting and insurance brokerage services to be provided by Gallagher Benefit Services, Inc. and/or its affiliate Gallagher Benefit Services (Canada) Group Inc. Gallagher Benefit Services, Inc. is a licensed insurance agency that does business in California as Gallagher Benefit Services of California Insurance Services and in Massachusetts as Gallagher Benefit Insurance Services. Neither Arthur J. Gallagher & Co., nor its affiliates provide accounting, legal or tax advice.



Gallagher

Insurance | Risk Management | Consulting