**Milliman**

# California State Teachers' Retirement System

2024 Experience Analysis

January 2024 Meeting

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**Milliman**

December 22, 2023

Teachers' Retirement Board
California State Teachers' Retirement System

Re:    **California State Teachers' Retirement System 2024 Experience Analysis**

Dear Members of the Board:

It is a pleasure to submit this 2024 experience analysis of the California State Teachers' Retirement System (CalSTRS). This study covers the period July 1, 2007 through June 30, 2022. The results of this analysis are the basis for the actuarial assumptions and methods to be used in the actuarial valuations to be performed as of June 30, 2023.

**Actuarial Certification**

The purpose of this report is to communicate the results of our review of the actuarial methods and the economic and demographic assumptions to be used in the completion of the upcoming valuations. Several of our recommendations represent changes from the prior methods or assumptions and are designed to better anticipate the emerging experience of CalSTRS.

We have provided financial information showing the estimated impact of the recommended assumptions, as if they had been reflected in the June 30, 2022 actuarial valuation. We believe the recommended assumptions provide a reasonable estimate of anticipated experience affecting CalSTRS and are expected to have no significant bias. Nevertheless, the emerging costs will vary from those presented in this report to the extent that actual experience differs from that projected by the actuarial assumptions.

The valuation results were developed using models employing standard actuarial techniques. We have reviewed the models, including their inputs, calculations, and outputs for consistency, reasonableness, and appropriateness to the intended purpose and in compliance with generally accepted actuarial practice and relevant actuarial standards of practice. We have incorporated other sources of economic data in assessing the reasonableness of the assumptions. Reliance on other experts is reflected in Milliman's capital market assumptions, and in Milliman's expected return model maintained by Milliman investment consultants. We have also considered CalSTRS investment policy, capital market assumptions, and expected return model in our assessment of the investment return assumption.

Future actuarial measurements may differ significantly from the current measurements presented in this report due to factors such as the following: plan experience differing from that anticipated by the economic or demographic assumptions; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the Plan's Funded Ratio); and changes in plan provisions or applicable law.

Due to the limited scope of our assignment, we did not perform an analysis of the potential range of such measurements.

In preparing this report, we relied without audit on information (some oral and some in writing) supplied by CalSTRS staff. This information includes, but is not limited to, statutory provisions, employee data, and financial information. In our examination, after discussion with CalSTRS and certain adjustments, we have found the data to be reasonably consistent and comparable with data used for other purposes. Since the experience study results are dependent on the integrity of the data supplied, the results can be expected to differ if the underlying data is incomplete or missing. It should be noted that if any data or other information is inaccurate or incomplete, our determinations might need to be revised.

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

Milliman's work is prepared solely for the internal business use of CalSTRS. To the extent that Milliman's work is not subject to disclosure under applicable public records laws, Milliman's work may not be provided to third parties without Milliman's prior written consent. Milliman does not intend to benefit or create a legal duty to any third-party recipient of its work product. Milliman's consent to release its work product to any third party may be conditioned on the third party signing a Release, subject to the following exceptions:

(a) CalSTRS may provide a copy of Milliman's work, in its entirety, to CalSTRS professional service advisors who are subject to a duty of confidentiality and who agree to not use Milliman's work for any purpose other than to benefit CalSTRS.

(b) CalSTRS may provide a copy of Milliman's work, in its entirety, to other governmental entities, as required by law.

No third-party recipient of Milliman's work product should rely upon Milliman's work product. Such recipients should engage qualified professionals for advice appropriate to their own specific needs.

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

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

On the basis of the foregoing, we hereby certify that, to the best of our knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices which are consistent with the principles prescribed by the Actuarial Standards Board and the *Code of Professional Conduct* and *Qualification Standards for Actuaries Issuing Statements of Opinion* in the United States, published by the American Academy of Actuaries. We are members of the American Academy of

Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.
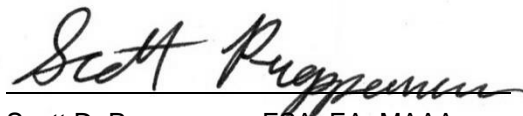
We would like to acknowledge the help in the preparation of the data for this analysis given by the CalSTRS staff.

We respectfully submit the following report and we look forward to discussing it with you.
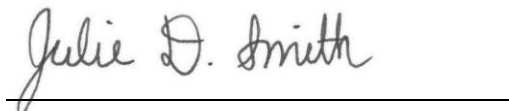
Sincerely,

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## Table of Contents

## 1. Executive Summary

Any actuarial valuation is based on certain underlying assumptions. The results of the actuarial valuation, including the determination of the sufficiency of the contributions being made by members, employers, and the state, are highly dependent on the assumptions that the actuary uses to project the future benefit payments and then to discount the future benefits to determine the present values. Thus, the assumptions are critical in assisting the System in adequately monitoring the funding of the promised benefits and adjusting the contributions as necessary to maintain adequate funding.

To ensure the ongoing reasonableness of the assumptions used in the valuation, they should be studied regularly. This process is called an experience analysis (or experience study). As the board is scheduled to adopt the assumptions at its January 2024 meeting, we will refer to this report as the 2024 Experience Analysis.

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

This experience analysis overlapped with the COVID pandemic which impacted some of the results of the study. In our analysis, we considered both the recent 5-year period (2017-2022) and the 15-year period (2007-2022). Except where noted, we primarily based our recommendations on the results of the 15-year study to smooth out fluctuations due to the pandemic and other factors. Note that because 2023 valuation data was not available when the experience study commenced, the analysis of the demographic assumptions is through June 30, 2022. This is consistent with the approach that has been used in prior studies.

**Summary of Results**

We are recommending several changes to the demographic and economic assumptions. Throughout this report, we will refer to the outcomes based on our recommended assumptions as the "proposed" assumptions and the outcomes based on the current assumptions as the "expected" assumptions.

The following are the two changes that we are recommending that would have the greatest impact on the Funded Ratio or the unconstrained employer and state contribution rates. Note that the unconstrained contribution rates are the actuarially calculated rates before any limits to changes are applied and do not reflect the board's ability to maintain state and employer contribution rates that are greater than the actuarially calculated rates.

- **Payroll growth assumption:** The proposed reduction in the assumed payroll growth will increase the unconstrained employer contribution rate but will not affect the current Funded Ratio. There is no expected impact on the contribution rates to be paid next fiscal year, if the board elects not to reduce the employer and state contribution rates, as has been recent practice.

- **Mortality assumption:** We are recommending changes in the mortality assumptions including the improvement scale which will reduce the normal cost rates as well as the unconstrained state and employer rates while increasing the Funded Ratio. There is no expected impact on the contribution rates to be paid next fiscal year, if the board elects not to reduce the employer and state contribution rates, as has been recent practice.

All of the other base recommendations are expected to have lesser impacts on the projected unconstrained contribution rates needed and the Funded Ratio of the System.

If adopted, the recommended assumptions are projected to result in a 1.1% increase in the Funded Ratio as of June 30, 2023, an increase in the unconstrained employer contribution rate, and a decrease in the unconstrained state contribution rate, as compared to the current assumptions. It is expected there will be no impact on member contribution rates if the recommended assumptions are adopted. This is discussed further in the Financial Impact section at the end of the Executive Summary.

## Summary of Recommended Changes (Economic)

The following table shows a summary of our base recommendations for the economic assumptions. Note that where the recommendations differ from the current assumption, the values are shown in bold. The potential financial impact is discussed later in this section.

| | DB Program | | CBB / DBS Programs | |
|---|---|---|---|---|
| | **Current** | **Recommended** | **Current** | **Recommended** |
| Consumer Price Inflation | 2.75 % | 2.75 % | 2.75 % | 2.75 % |
| Net Real Rate of Return | 4.25 | 4.25 | 3.75 / 4.25 | **4.25** / 4.25 |
| Investment Return [1] | 7.00 % | 7.00 % | 6.50 / 7.00 % | **7.00** / 7.00 % |
| Interest on Member Accounts | 3.00 % | 3.00 % | 6.50 / 7.00 % | **7.00** / 7.00 % |
| Consumer Price Inflation | 2.75 % | 2.75 % | 2.75 % | 2.75 % |
| Real Wage Inflation | 0.75 | 0.75 | 0.75 | 0.75 |
| Wage Growth | 3.50 % | 3.50 % | 3.50 % | 3.50 % |
| Payroll Growth | 3.50 % | **3.25** % | 3.50 % | **3.25** % |
| Portfolio Standard Deviation | N/A % | N/A % | 13.10 / 11.00 % | **11.30 / 11.30** % |

*1. Net of investment and administrative expenses.*

## Summary of Recommended Changes (Demographic)

The following table shows a summary of our recommendations for the demographic assumptions (i.e., those relating to member behavior).

| Demographic Assumption | Recommended Changes |
|---|---|
| **Mortality** | |
| Healthy Retired Members | Decrease rates at younger ages, increase rates at older ages |
| Beneficiaries | Decrease rates at younger ages, increase rates at older ages |
| Disabled Members | Decrease rates at younger ages, increase rates at older ages |
| Active Members | Increase rates |
| **Service Retirement** | |
| Retirement from Active Membership | Increase rates at most ages |
| Retirement from Vested Membership | No change |
| **Disability** | |
| Coverage A | No change |
| Coverage B | Reduce rates |
| **Other Terminations of Membership** | |
| Termination | Reduce rates |
| Probability of Refund | Reduce rates |
| **Salary Increases for Merit** | Make small changes at some age/svc levels |
| **Miscellaneous Assumptions** | |
| Load for Sick Leave Service | Reduce |
| Probability of Marriage | No change |
| Number of Children | Increase assumption for males |
| Offsets for Death & Disability | No change |
| Valuation of Current Inactive Members | No change |
| Valuation of Future Inactive Members | Apply 5% load (reciprocity impact on final compensation) |
| Benefit Amount Split between 1990 and New Benefits for Current Retirees | Update estimates of 1990 benefit portion based on retirement year (used to allocate state/employer portion of unfunded obligation) |

All assumptions recommended for the DB Program are also recommended to be used for the June 30, 2023 actuarial projection of the Supplemental Benefit Maintenance Account (SBMA) and the June 30, 2023 valuation of the Medicare Premium Payment (MPP) Program, where applicable.

**Summary of Recommended Changes (MPP Program)**

The following table shows a summary of our recommendations for the assumptions specific to the MPP Program.

| MPP-Specific Assumption | Recommended Changes |
|---|---|
| Enrollment | No change |
| Part A Premium Increases | Overall increase in trend rates |
| Part B Premium Increases | Overall increase in trend rates |

**Economic Assumptions**

Section 2 discusses the economic assumptions: price inflation, general wage growth (includes price inflation and productivity), payroll growth, interest credit on member accounts, and the investment return assumption. We are recommending one change to the current DB Program economic assumptions: decreasing the payroll growth assumption from 3.50% to 3.25%.

As discussed in Section 2, price inflation over the last 50 years has averaged higher than the current 2.75% assumption, though experience over the last 25 years and forecasts for future inflation are somewhat lower. Inflation for California has tended to track national patterns, though it has historically averaged a bit higher than national inflation. In recent years actual price inflation has been significantly higher than the current assumption, with both US and California CPI averaging over 3.8% annually over the last five years. However, national forecasts of long-term inflation generally remain somewhat lower than the current assumption. Given the current high-inflation environment, the relevance of California inflation, and the purposes for which this assumption is used, we consider the current 2.75% assumption to be reasonable and recommend maintaining the current assumption.

Over the last 50 years, increases for wages for all occupations have exceeded price inflation by 0.5% on average, although the difference has been higher (1.0%) over the last 30 years. Our recommendation is that the difference between wage growth and inflation remain at 0.75%, resulting in a total general wage growth assumption of 3.50%. We recommend a 0.25% decrease in the payroll growth assumption from 3.50% to 3.25% due to a projected near-term decline in student population and other factors discussed in Section 2.

Based on the CalSTRS current capital market assumptions and target asset allocation, the current 7.00% investment return assumption for the DB Program is somewhat lower than the expected median long-term return (net of expenses). The current assumption is comparable to the expected long-term median return that would be developed using a lower inflation assumption. Our recommendation is to retain the current assumption. For the DBS Program, we recommend the return assumption continue to be set equal to the DB Program as the DBS Program assets are invested similarly to the DB Program. For the CBB Program, we recommend the assumption be changed to equal the DB Program assumption due to the board adopting a revised investment policy statement that applies the same asset allocation to the DB, DBS and CBB programs. This results in an increase in the return assumption for the CBB Program from 6.50% to 7.00%.

Note that our conclusion that the recommended investment return assumption is reasonable is based on the advice of outside experts as provided for in the Actuarial Standards of Practice, in this case the capital market assumptions adopted by CalSTRS, based on advice from their investment staff and outside consultants. Based on Milliman's July 2023 capital market assumptions, we project a 20-year expected return about 0.5% less than using the CalSTRS capital market assumption, although still close to the 7.0% assumption. It should be noted that Milliman's capital market assumptions are based on an inflation assumption that is about 0.4% less than used by CalSTRS. Therefore, the assumed real rate of return (investment return less price inflation) between the two sets of capital market assumptions is largely consistent.

We are recommending no change to the interest assumed to be credited to members' accounts in the DB Program (3.00%) which is 0.25% over price inflation. We believe the current assumption of inflation plus a small margin to reflect the yield in excess of inflation on two-year Treasuries remains a reasonable assumption.

For the DBS and CBB Programs, we recommend retaining the current practice of setting the assumed interest credit on member accounts equal to the investment return assumption, as the intention under the board policy is to allocate all investment earnings to the member accounts over the long term.

Under board policy, the calculation of the additional earnings credits for the DBS and CBB Programs is based on the Funded Ratio of the respective program and certain thresholds. These thresholds are based on the standard deviation of the program's portfolio and are reviewed with the experience study. Based on the current asset allocation and CalSTRS capital market assumptions, we recommend the assumed standard deviation be set equal to 11.3% for the DBS Program (previously 13.1%) and 11.3% for the CBB Program (previously 11.0%). Note that the change to the CBB Program reflects the change in its asset allocation to be similar to the DBS Program. The recommended standard deviations reflect the impact of the SBMA interest credit guarantee, as discussed at the end of Section 2.

**Actuarial Methods and Miscellaneous Assumptions**

Section 3 discusses the actuarial methods and other miscellaneous assumptions used in the valuation and administration of the System.

We are recommending changes in this area, as follows:

- **Sick Leave** – We are recommending a small reduction in the additional sick leave that members are assumed to have at service retirement.

- **Option Factors** – We are recommending some small updates to the assumptions used for the option factors.

- **Number of Children** – We are recommending a small increase in the number of children assumed for male members, from 0.65 to 0.70.

- **1990 Benefits for Retirees** – Retiree benefits are split between 1990 Structure Benefits and New Benefits (i.e., those not included in the 1990 Benefit Structure) as part of the process of allocating the unfunded actuarial obligation (UAO) between the state and the employers. To split the retiree benefits, the difference between the one-year and three-year final compensation is estimated for future retirements. For current retirees, historical average differences are used. We are recommending updates to the historical measurements to reflect the last four years' experience.

- **Valuation of Future Inactive Members**: A 5% load will be applied to the projected compensation used for future inactive members assumed to defer their service retirement benefit to account for potential post-termination increases in salary due to factors such as reciprocity. A 5% load is already applied to current inactive members in the valuation. This change is therefore only for projected future inactive members.

**Demographic Assumptions**

Sections 4-10 discuss the demographic assumptions. Unlike the economic assumptions, which are more global in nature, the demographic assumptions are based heavily on recent CalSTRS experience. Demographic assumptions are used to predict future member behavior (e.g., when will the member retire? how long will the member live?).

From a cost perspective, the most significant change to the demographic assumptions that we are recommending are changes to the mortality assumptions.

When reviewing the sections on demographic assumptions, please note the following:

- Our analysis uses the Actual-to-Expected (A/E) ratio to measure how well the current assumptions fit actual experience. For example, if the service retirement A/E is 80%, it indicates that there were 20% fewer actual service retirements than expected, and that we should consider decreasing the assumption. By decreasing the expected rates, the result is a higher ratio, in this case closer to 100%.

- When we refer to the "proposed" assumptions, these are the assumptions that we are recommending. The current assumptions are also referred to as the "expected" assumptions.

- For many of the assumptions, we show graphs of our analysis displaying the actual experience for the 2017-2022 study period (blue bar), the actual experience from the 2007-2022 study period (black bar), the current assumption (green line), and the new proposed assumption (orange line).

The recommended rates are shown in detail in Appendix A.

**Individual Salary Increases due to Promotion and Longevity (Merit)**

Section 4 discusses the individual salary increases due to promotion and longevity – the merit component of salaries. Our analysis of the merit salary primarily looks at the results of the 15-year study period of 2007-2022 due to the variation we typically see in this assumption from one study to the next. Overall, the results show increases have generally been close to the current rates predicted (as shown in the following graph). We are recommending small changes to this assumption. See Section 4 for more details on this analysis.

**Salary Increases Less Wage Inflation -- All Members**
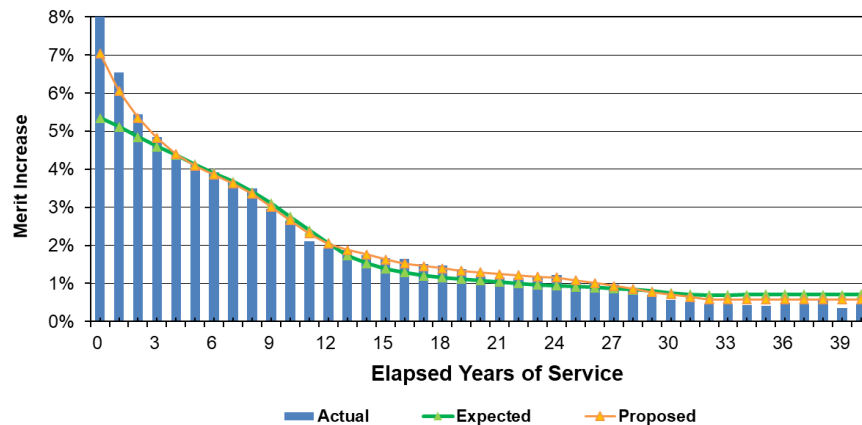
**Mortality after Retirement**

The mortality assumption is used to predict the life expectancy of both members currently in pay status and those expected to receive a benefit in the future. The current assumptions include a projection scale that reflects the gradual year-to-year improvement in mortality that is expected to occur in the future.

Overall, the actual mortality experience over both the 5-year and 15-year study period was somewhat greater than that projected by the assumptions. We are recommending an update to the custom base mortality tables to better reflect CalSTRS-specific experience, but we are recommending these rates be set slightly lower than the actual experience to reflect that mortality rates were somewhat higher during the pandemic years. We are also recommending an update to the latest projection of mortality improvement, the MP-2021 Ultimate Projection Scale. Additional details are provided in Section 5.

Overall, the proposed mortality tables project modestly lower life expectancies than the current table. The base tables, which reflect mortality from the recent past, show very small changes overall. The reduced life expectancies are primarily due to the lower projected improvement in future mortality. This can be seen in the following graph which shows how long an age 63 female member retiring in 2023 is expected to live to under the current and proposed mortality assumptions. We first isolate only changes to the base tables and then show the life expectancy also reflecting future mortality improvements.

### Life Expectancy for Age 63 Female Retiring in 2023



**Without Mortality Improvement**

| | Current | Proposed |
|---|---|---|
| | 89.2 | 89.0 |

**With Mortality Improvement**

| | Current | Proposed |
|---|---|---|
| | 91.0 | 90.3 |
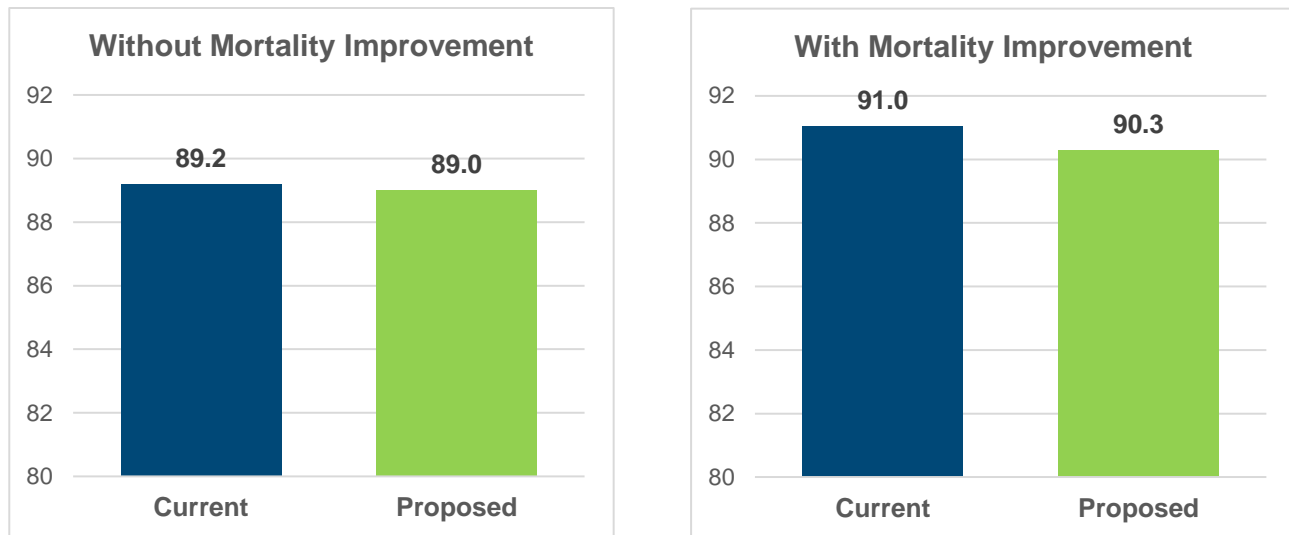
**Death from Active Status**

Overall, the actual number of deaths from active status was greater than what the assumptions predicted for the 2017-2022 study period. We are recommending increased base mortality rates for active members with future improvements projected using the MP-2021 Ultimate Projection Scale. Further analysis is shown in Section 6 of this report.

**Service Retirement**

Overall, the number of service retirements from active status was greater than what the assumptions predicted, as shown in the table below.

| 2007-2022 Study Period | | | |
|---|---|---|---|
| **Number of Service Retirements (2% at 60) — Expected** | | | |
| | **Actual** | **Expected** | **Actual / Expected** |
| Less than 25 Years of Service | 79,275 | 67,591 | 117% |
| 25 to 30 Years of Service | 30,046 | 28,211 | 107% |
| 30 Years or More of Service | 60,341 | 57,188 | 106% |
| Total | 169,662 | 152,989 | 111% |

We are recommending increases in the service retirement rates for 2% at 60 members for most age and service groups to reflect actual experience.

The table below illustrates the actual number of service retirements for the 2% at 60 group, along with the expected number based on the proposed assumptions, for males and females combined.

| 2007-2022 Study Period | | | |
|---|---|---|---|
| **Number of Service Retirements (2% at 60) — Proposed** | | | |
| | **Actual** | **Proposed** | **Actual / Proposed** |
| Less than 25 Years of Service | 79,275 | 77,449 | 102% |
| 25 to 30 Years of Service | 30,046 | 29,242 | 103% |
| 30 Years or More of Service | 60,341 | 59,114 | 102% |
| Total | 169,662 | 165,805 | 102% |

For the 2% at 62 members, there is currently only sufficient data to study members with less than 10 years of service. We are recommending some refinements to the current rates, which are currently based on age and service.

We are recommending similar changes to the 1990 Structure Benefits that adjust the retirement rates based on age and credited service. These rates are used to determine the actuarial obligation that is part of the state's share of the UAO. Note that as the 1990 Structure has not applied for over 20 years, we do not have any recent experience to assess what the actual retirement rates would be under the 1990 Benefit Structure. Historically, the approach has been to maintain the retirement rates from the time the prior structure last applied. We are recommending some additional modifications this year, consistent with the approach currently used for the current benefit structure for 2% at 60 members.

Further analysis is shown in Section 7 of this report.

**Disability Retirement**

Overall, the actual number (6,856) of disability retirements was lower than what the assumptions predicted (8,141) for the 2007-2022 study period. We are recommending reduced rates of disability retirement for Coverage B. Further analysis is shown in Section 8 of this report.

**Other Terminations of Employment**

The termination assumption encompasses members leaving active employment for reasons other than death, disability or service retirement. The current 2017-2022 study shows actual rates of termination that are overall lower than the current assumptions (expected rates) and lower than observed in the 2007-2022 study period (see following graph for females), although this varies by level of service. We are recommending adjustments to the assumed rates to better fit the pattern of actual terminations. In making this recommendation, we also considered that members working full-time for their entire career have lower termination rates than those who have worked part-time or previously had a break in their service. Since a full-time member has greater credited service than a part-time member at the same level of elapsed service, full-time members will have a relatively greater impact on the actuarial obligation. Therefore, we weighted the results by credited service to better reflect the impact on the actuarial obligation. Further analysis is shown in Section 9 of this report.
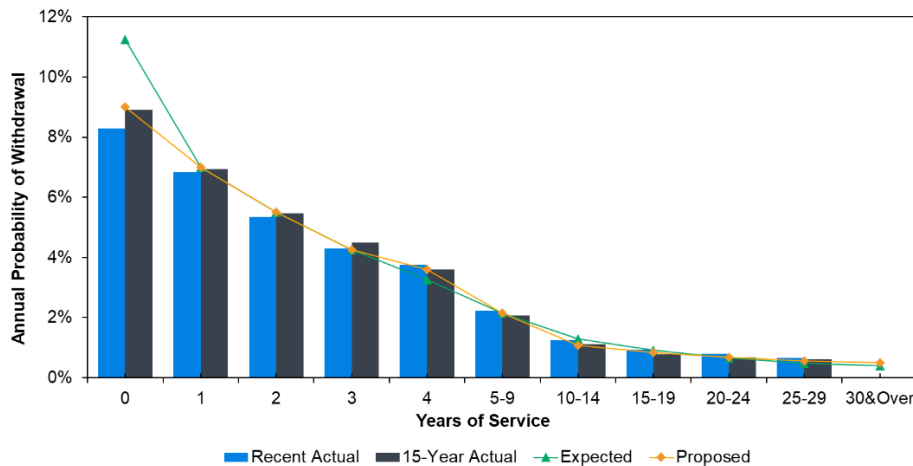


**Probability of Refund upon Vested Termination**

The actual number of refunds (15,254) paid to vested members at termination was less than the assumptions predicted (21,374) for the 2007-2022 study period. We are recommending decreases in this assumption. Further analysis is shown in Section 10 of this report.

**Financial Impact – Recommended Assumptions (DB Program)**

The following chart shows the expected financial impact on some key measurements of the DB Program if the recommended package of assumptions is adopted. If these assumption changes are adopted, the member, state and employer contribution rates are projected to remain the same, and the Funded Ratio of the DB Program is expected to see a small increase. Note that the state and employer rates shown assume the board continues its recent pattern of not lowering contribution rates unless statutorily required.
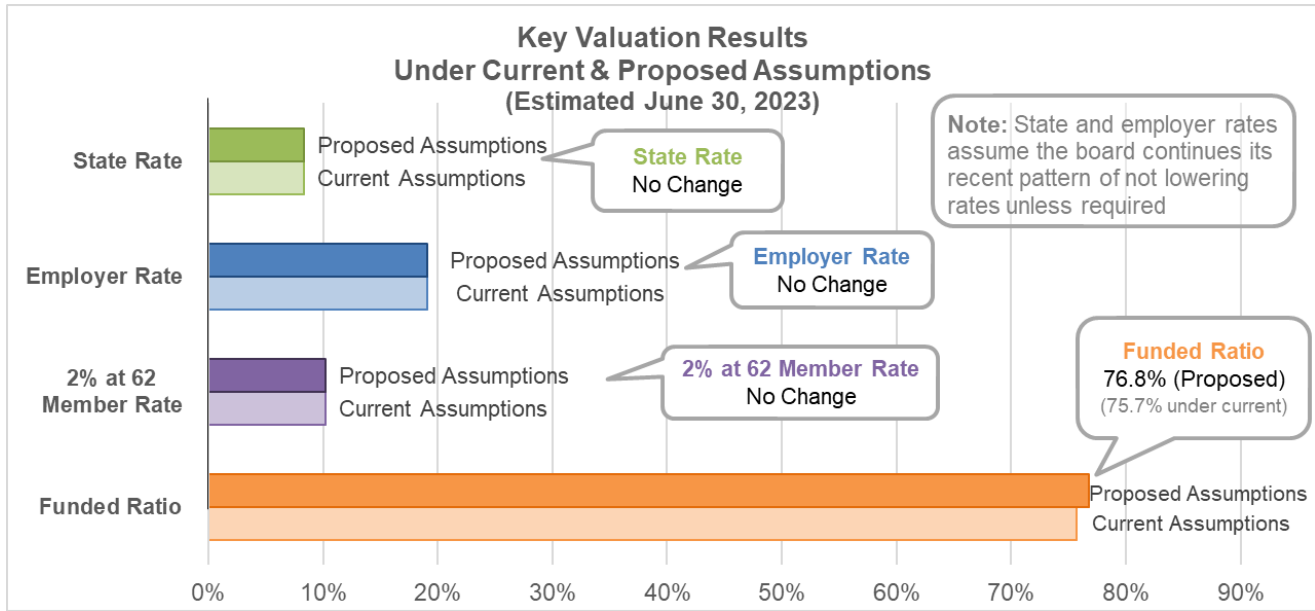


The financial impact was evaluated by performing additional valuations with the June 30, 2022 valuation data and reflecting the proposed assumption changes. We then projected the results to June 30, 2023 with a 6.6% money-weighted investment return for the fiscal year ended June 30, 2023. Note that this return estimate differs from the time-weighted return reported by CalSTRS in July 2023. The actual financial impact will vary somewhat for the June 30, 2023 valuation due to year-to-year changes.

The key valuation results displayed in the prior chart show the estimated aggregate impact of the proposed assumption changes and assume the board will make no changes to the state and employer contribution rates unless required. The following exhibit shows the detailed changes for each assumption if there were no limitations (unconstrained rates) on changes in member, employer and state contribution rates. Key observations are as follows:

- The proposed reduction in the assumed payroll growth is expected to have the most significant impact on the unconstrained employer contribution rate, but the increase is not expected to be large enough to raise the actuarially calculated employer rate above the current 19.10% rate.

- The proposed mortality assumption changes, primarily the update to the improvement scale, are expected to have the biggest impact of the proposed changes, causing reductions in the normal cost rates, as well as the unconstrained state and employer rates, and increasing the Funded Ratio.

- The overall change to the 2% at 62 Normal Cost rate, which the contribution rate for those members is based upon, is expected to be small.

- All other proposed changes are expected to have a relatively small impact.

| | Normal Cost % | | Funded | Projected Unconstrained[1] Contribution Rate in FY2024-25 (FY2023-24 for 2022 Valuation) | |
| --- | --- | --- | --- | --- | --- |
| | 2% at 60 | 2% at 62 | Ratio | State | Employer |
| **June 30, 2022 Actuarial Valuation** | **20.78%** | **18.39%** | **74.4%** | **5.53%** | **18.48%** |
| Projected Impact including Recent Investment Experience | 0.00% | 0.00% | 1.3% | -0.27% | -0.03% |
| **June 30, 2023 Actuarial Valuation (Est.)** | **20.78%** | **18.39%** | **75.7%** | **5.26%** | **18.45%** |
| **Recommended Changes** | | | | | |
| 0.25% Payroll Growth Reduction | 0.00% | 0.00% | 0.0% | -0.01% | 0.41% |
| Mortality Changes | -0.23% | -0.29% | 1.2% | -1.14% | -0.20% |
| Service Retirement Rate Changes | 0.05% | 0.09% | -0.1% | 0.11% | 0.02% |
| Termination Rate & Refund Changes | 0.10% | 0.05% | 0.0% | 0.13% | -0.01% |
| Merit Salary Changes | 0.33% | 0.13% | -0.1% | 0.33% | -0.02% |
| All Other Changes[2] | -0.02% | -0.03% | 0.1% | 0.04% | -0.06% |
| Subtotal for Recommended Changes | 0.23% | -0.05% | 1.1% | -0.54% | 0.14% |
| **June 30, 2023 Actuarial Valuation (Est.) with Recommended Changes** | **21.01%** | **18.34%** | **76.8%** | **4.72%** | **18.59%** |

*1. Actuarially calculated contribution rates prior to any limitations on year-to-year rate changes. The state contribution rate shown excludes the 2.5% SBMA contribution rate.*

*2. Proposed changes in assumptions for rates of disability, one-year final compensation, number of children, and sick leave credit at retirement.*

## Financial Impact – Member Contribution Rates

Contribution rates for 2% at 60 members are fixed and are not impacted by the assumptions.

Contribution rates for 2% at 62 members are based on the group's Normal Cost rate and therefore may ultimately be impacted by the assumptions. In general, the contribution rate for 2% at 62 members is set equal to the base member contribution rate of one-half of the Normal Cost rate plus an additional amount for the annual 2% benefit adjustment. As the Normal Cost rate will change year to year due to assumption changes and changes in demographics of the group, contribution rates for 2% at 62 members can vary from year to year. However, the base member contribution rate does not change if the increase or decrease in the Normal Cost rate for these members is less than 1% of pay since the last adjustment.

Under the recommended assumptions, the Normal Cost rate for 2% at 62 members is 18.34% of pay. This compares to the rate at the last adjustment of 17.89% of pay. As the total change since the last adjustment is materially less than 1% of pay, it is unlikely that when the 2023 valuation is completed, the change in the Normal Cost rate for 2% at 62 members would exceed 1.00% and require an increase or decrease to their contribution rate if the recommended package of assumptions is adopted.

**Financial Impact – Unfunded Actuarial Obligation**

The funding plan includes actuarial funding (within certain constraints) for most of the benefits provided by CalSTRS. The one exception is that there is no provision for the state, employers, or members to fund any UAO arising for New Benefits (i.e., those not included in the 1990 Benefit Structure) attributable to service after June 30, 2014, referred to as the "Unallocated UAO." Under the valuation policy, a portion of each year's total contributions, equal to the Normal Cost of the New Benefits, is allocated to fund these benefits. Since the allocated contribution is equal to that Normal Cost, there are no remaining contributions to pay down the Unallocated UAO (if any). Therefore, the Unallocated UAO will increase or decrease based on future experience and changes in actuarial assumptions.

The following chart shows a comparison of the expected impact of the proposed assumptions on the unfunded actuarial obligation (UAO). Under the valuation policy, the UAO is split into three pieces: 1) the employers' share; 2) the state's share; and 3) the unallocated piece which has no dedicated funding source. As shown in the following chart, the state's portion, employers' portion and Unallocated UAO are projected to decrease (an increase in the surplus for the Unallocated UAO) under the proposed assumptions. The change for each of these pieces is primarily due to the update in the mortality improvement scale used to project future life expectancies.



**Breakdown of Unfunded Actuarial Obligation
Under Current & Proposed Assumptions
(Estimated June 30, 2023)**

State's Share — Proposed Assumptions / Current Assumptions

**State's Share**
$4.9 billion (Proposed)
($8.7 billion under current)

Employers' Share — Proposed Assumptions / Current Assumptions

**Employers' Share**
$78.3 billion (Proposed)
($79.3 billion under current)

Unallocated — Proposed Assumptions / Current Assumptions

**Unallocated UAO**
-$0.8 billion (Proposed)
(-$0.4 billion under current)

UAO / (Surplus) in $Billions

**Financial Impact – Projected 2046 Funding**

The 2022 valuation showed the DB Program was projected to be fully funded by 2046. Applying the recommended package of assumptions, the contributions to the DB Program are still projected to be sufficient to reach full funding by 2046.

The projection assumptions are the same as those stated on page 7 of our 2022 DB Program valuation report, except for the reflection of the assumptions recommended in this report and the inclusion of the estimated FYE2023 investment return of 6.6%.

**Financial Impact – DBS and CBB Programs**

The following tables show the expected financial impact the proposed changes would have on the funded status of the DBS and CBB Programs. There would be no impact on the DBS or CBB Actuarial Obligations for active and inactive members if the recommended assumptions are adopted, as the non-retired group is valued based on the account values and not affected by the assumptions. There would be a small impact on the Actuarial Obligation for retirees due to the proposed changes in mortality and the investment return assumption for the CBB Program. As the retiree obligation is only a small portion of the total obligation, the overall impact is very minor. Note that funded ratios shown are as of June 30, 2022. Values as of June 30, 2023 (prior to any additional earnings credits) are expected to be higher due to the actual return for the year ended June 30, 2023 being greater than the interest credited to the accounts for the period.

| DBS Program -- Financial Impact of Recommended Assumptions | |
| --- | --- |
| | **Funded Ratio** |
| **June 30, 2022 Actuarial Valuation** | **124.14%** |
| Mortality Changes | 0.15% |
| **June 30, 2022 Actuarial Valuation Changes** | **124.29%** |

| CBB Program -- Financial Impact of Recommended Assumptions | |
| --- | --- |
| | **Funded Ratio** |
| **June 30, 2022 Actuarial Valuation** | **111.00%** |
| Investment Return Assumption 7.00% | 0.12% |
| Mortality Changes | 0.05% |
| **June 30, 2022 Actuarial Valuation Changes** | **111.17%** |

**Financial Impact – SBMA**

The funding of the SBMA is currently projected to be sufficient at the 85% purchasing power level. There is some margin for possible adverse experience in the future. The recommended assumptions, namely the proposed mortality assumptions, would increase this margin since the increase in the assumed mortality rates at older ages would result in lower projected payments of purchasing power benefits.

**Financial Impact – MPP Program**

The proposed increases in the Medicare trend rates are projected to increase the actuarial obligation of the MPP Program, but this is not expected to change the conclusion of the 2022 valuation that there is adequate funding.

**Variance of Future Results**

The previous analysis showed the estimated financial impact under various assumption and method changes. It is virtually certain that future experience will not exactly match the assumptions. The emerging costs will vary from those presented in this report to the extent that actual experience differs from that projected by the actuarial assumptions. This potential variance is discussed in more detail in our actuarial valuation reports and the "2023 Review of Funding Level and Risks" completed by CalSTRS internal actuarial staff.

**Complete List of Revised Assumptions and Methods**

Appendix A illustrates the Summary of Actuarial Assumptions as it will appear in the June 30, 2023 valuation report, if all recommended assumptions and methods are adopted. Proposed changes in assumptions are highlighted in green. The recommended assumptions are for use with CalSTRS funding calculations.

**Assumptions and Methods to be used for Financial Reporting**

In general, the assumptions and methods adopted for the June 30, 2023 funding valuations should also be used for June 30, 2024 financial reporting under Governmental Accounting Standards Board (GASB) Statements Nos. 67, 68, 74 and 75. The following are exceptions. None of these represent a change from the current methods.

- Asset method: The Fiduciary Net Position reported in CalSTRS financial statements should be used.

- Actuarial cost method: The Entry Age Cost Method should be used for all programs.

- Discount rate (GASB 67/68): The discount rate used in the GASB 67/68 valuations is equal to the investment return assumption used for funding purposes plus an adjustment of 0.10% to make the value gross of administrative expenses. Thus, if the recommended package of assumptions is adopted, the discount rate should remain at 7.10%.

- Discount rate (GASB 74/75): The discount rate used in the GASB 74/75 is set equal to the municipal bond index and updated annually.

## 2. Economic Assumptions

Actuarial Standard of Practice (ASOP) No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations*, provides guidance to actuaries giving advice on selecting economic assumptions for measuring obligations under defined benefit plans. To project future events that are uncertain, the best an actuary can do is to use professional judgment to estimate possible future economic outcomes. These estimates are based on a combination of past experience, future expectations, and professional judgment. The actuary should consider a number of factors including the purpose and nature of the measurement and appropriate recent and long-term historical economic data.

ASOP No. 27 states that for the assumption to be considered reasonable, it should, among other things, reflect "the actuary's estimate of future experience" and have "no significant bias (i.e., it is not significantly optimistic or pessimistic)."

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

After completing the selection process, the actuary should review the set of economic assumptions for consistency. This may lead the actuary to recommend the same inflation component in each of the economic assumptions proposed.

This section will discuss the economic assumptions. In our opinion, the economic assumptions recommended in this report have been developed in accordance with ASOP No. 27. The following table summarizes the current and recommended assumptions. Although we are recommending a specific set of assumptions, there are other assumption sets that may also be reasonable.

| | DB Program | | CBB / DBS Programs | |
|---|---|---|---|---|
| | **Current** | **Recommended** | **Current** | **Recommended** |
| Consumer Price Inflation | 2.75 % | 2.75 % | 2.75 % | 2.75 % |
| Net Real Rate of Return | 4.25 | 4.25 | 3.75 / 4.25 | **4.25** / 4.25 |
| Investment Return [1] | 7.00 % | 7.00 % | 6.50 / 7.00 % | **7.00** / 7.00 % |
| Interest on Member Accounts | 3.00 % | 3.00 % | 6.50 / 7.00 % | **7.00** / 7.00 % |
| Consumer Price Inflation | 2.75 % | 2.75 % | 2.75 % | 2.75 % |
| Real Wage Inflation | 0.75 | 0.75 | 0.75 | 0.75 |
| Wage Growth | 3.50 % | 3.50 % | 3.50 % | 3.50 % |
| Payroll Growth | 3.50 % | **3.25** % | 3.50 % | **3.25** % |
| Portfolio Standard Deviation | N/A % | N/A % | 13.10 / 11.00 % | **11.30 / 11.30** % |

*1. Net of investment and administrative expenses.*

| 1. Price Inflation |
|:---:|

## Use in the Valuation

When we refer to inflation in this report, we are referring to price inflation. The inflation assumption has an indirect impact on the results of the actuarial valuation through the development of the assumptions for the investment return, the interest rate on member accounts, the general wage increase, and the payroll increase assumption. Inflation directly affects the assumed increase in the PEPRA wage limit. It also has a direct impact on the actuarial projection of the SBMA, as it will be used to project the expected future purchasing power payments.

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

The current valuation assumption for inflation is 2.75% per year. Our recommendation is to retain this assumption.

## Historical Perspective

The data for inflation shown below is based on the national Consumer Price Index, US City Average, All Urban Consumers (CPI-U) as published by the Bureau of Labor Statistics.

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

There are numerous ways to review historical data, with significantly differing results. The table below shows the compounded annual inflation rate for various 10-year periods, and for the 30-year period and 50-year period ended in December 2022. Note that the 50-year average is heavily influenced by the inflation of the late 1970s and early 1980s. The last 30 years have averaged closer to 2.5%.

| Decade | US CPI Increase |
|:---:|:---:|
| 2012-2022 | 2.6% |
| 2002-2012 | 2.4% |
| 1992-2002 | 2.5% |
| 1982-1992 | 3.8% |
| 1972-1982 | 8.7% |
| **Prior 30 Years** | |
| 1992-2022 | 2.5% |
| **Prior 50 Years** | |
| 1972-2022 | 4.0% |

These are national statistics. The inflation assumption as it relates to the investment return assumption should be based more on national and even global inflation, whereas the inflation assumption used in the SBMA projection and the wage growth and payroll growth assumptions for the DB Program are tied to inflation in California. We believe that although there have been historical differences between U.S. and California CPI changes, in the long term there should be a high correlation. For comparison, the average CPI increase for California has been 4.2% for the 50-year period 1972-2022, compared to the national average of 4.0%.

The following graph shows historical national CPI increases over the last 50 years. The actual CPI increase has generally been less than 2.75% during the last 25 years of the period; however, recent inflation has been significantly higher. Also shown for comparison are CPI increases specific to California, which has tracked fairly closely to the national statistics (although California CPI has been slightly higher on average).



**Historical Inflation**

Legend: National — California ----- 2.75% Assumption
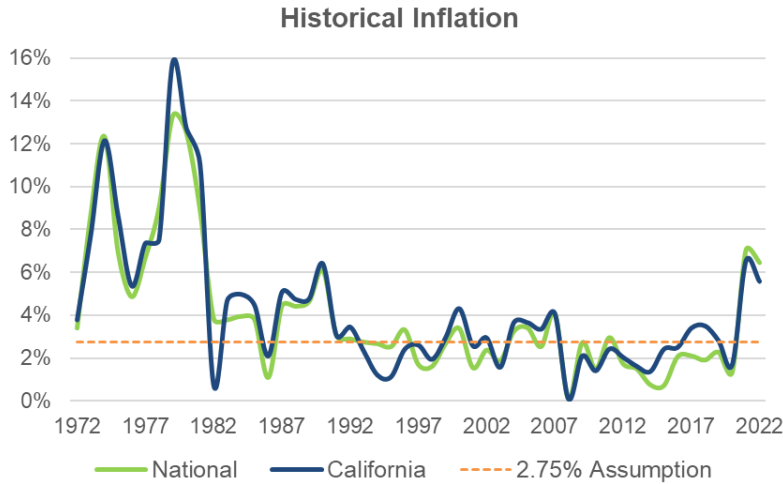
**Peer System Comparison**

According to the Public Plans Database (a survey of over 200 state and local systems maintained by a collaboration between the Center for Retirement Research at Boston College, the MissionSquare Research Institute, and the National Association of State Retirement Administrators), the average inflation assumption for statewide systems declined for a number of years and has recently levelled off. As of the most recent study, the median assumption is 2.50%, so CalSTRS is slightly above average. The following graph shows this distribution.



**Price Inflation Assumption
Public Funds Survey**

Percent of Retirement Systems Using Assumption
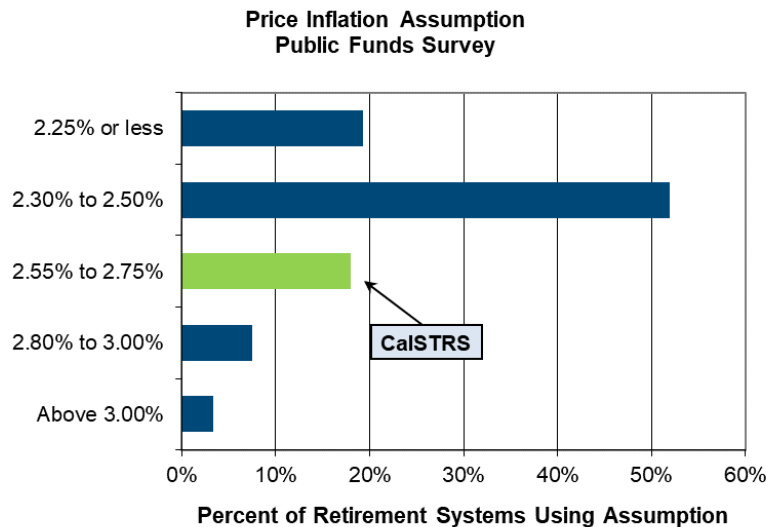
**Forecasts of Inflation**

Since the U.S. Treasury started issuing inflation indexed bonds, it is possible to determine the approximate rate of inflation anticipated by the financial markets by comparing the yields on inflation indexed bonds with traditional fixed government bonds. Market prices as of October 2023 suggest investors expect inflation to be about 2.6% over the next 20 years.

CalSTRS staff and investment consultants used a 2.75% inflation assumption in their 2023 Asset Liability Management study. Milliman's internal investment professionals are forecasting 2.33% over the next 20 years.

We also reviewed the expected increase in future CPI used by the Office of the Chief Actuary for the Social Security Administration. In the 2023 Trustees Report, the projected average annual increase in the CPI over the next 75 years under the intermediate cost assumptions was 2.40%.

**Recommendation**

Nationally, inflation over the last 10 years has been slightly less than the 2.75% assumption at 2.60%, although it has been slightly higher in California at 2.85%. There has been a recent uptick in inflation, with both US and California CPI averaging about 3.8% annually over the last five years. Given the current high-inflation environment, the relevance of California inflation, and the sensitivity of the SBMA projection to the assumption, we are recommending the current 2.75% inflation be retained; however, a slightly lower assumption would also be reasonable. This should be monitored closely going forward. In addition, we recommend ensuring the selection of the investment return assumption (discussed below) results in a choice that would still be reasonable with a slightly lower inflation assumption to account for the possibility that national inflation may continue to trail California inflation in the future.

| Price Inflation | |
|---|---|
| Current Assumption | 2.75% |
| Recommended Assumption | 2.75% |

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## 2. Wage and Payroll Growth

**Use in the Valuation**

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

The current assumption is for wage growth to be 0.75% above the inflation assumption.

**Historical Perspective**

We have used statistics from the Social Security Administration on the National Average Wage dating from 1972 to 2022.

There are numerous ways to review this data. For consistency with our observations of other indices, the table below shows the compounded annual rates of wage growth for various 10-year periods and for the 30-year period and 50-year period ending in 2022. The excess of wage growth over price inflation represents "productivity" (or the increase in the standard of living, also called the real wage inflation rate).

| Decade | Wage Growth | US CPI Increase | Real Wage Inflation |
|---|---|---|---|
| 2012-2022 | 3.9% | 2.6% | 1.3% |
| 2002-2012 | 2.9% | 2.4% | 0.5% |
| 1992-2002 | 3.8% | 2.5% | 1.3% |
| 1982-1992 | 4.7% | 3.8% | 0.9% |
| 1972-1982 | 7.4% | 8.7% | -1.3% |
| **Prior 30 Years** | | | |
| 1992-2022 | 3.5% | 2.5% | 1.0% |
| **Prior 50 Years** | | | |
| 1972-2022 | 4.5% | 4.0% | 0.5% |

These are national statistics for all jobs. For comparison, our analysis (comparing the average compensation earnable for CalSTRS members to California-specific inflation) shows the average increase in the real wage for members of CalSTRS has been slightly negative for the most recent 30-year period. That is, teachers' wages have increased slightly less than price inflation in California. This is significantly less than the national average which increased close to 1.0% more than US inflation over the last 30 years and 0.5% for the last 50 years.

**Forecasts of Future Wages**

Wage inflation has been projected by the Office of the Chief Actuary of the Social Security Administration. In the 2023 Trustees Report, the ultimate long-term annual increase in the National Average Wage is estimated to be 1.1% higher than the Social Security intermediate inflation assumption of 2.4% per year.

**Reasonable Range and Recommendation**

Over the last 50 years, the real wage increases on a national basis have been less than the current 0.75% real wage increase assumption. When looking over a more recent period (30 years), the converse is true with real

wage increase being somewhat greater than the current assumption. Our analysis shows that actual real wage increases for California teachers have significantly lagged the assumption. This difference may reverse itself, so at this point we are not recommending a change, but this should be monitored going forward. Our recommendation is to maintain the real wage growth assumption of 0.75%.

| Real Wage Growth Rate | |
|---|---|
| Current Assumption | 0.75% |
| Recommended Assumption | 0.75% |

The wage growth assumption is the total of the consumer price inflation assumption and the real wage inflation rate. If the real wage inflation assumption is maintained at 0.75% and the price inflation assumption remains at 2.75%, this would result in a total wage growth assumption of 3.50%, consistent with the current assumption.

**Payroll Increase Assumption**

The aggregate payroll of CalSTRS is assumed to increase, without accounting for the possibility of an increase or decrease in membership (the current assumption is that no growth in membership will occur). The current assumption is that the payroll will increase at the same rate as the general wage growth (3.50%).

Over the last 20 years, the number of active DB Program members has fluctuated, but ultimately the number of teachers today is about the same as the number 20 years ago. Combined with the lower-than-assumed increases in compensation for CalSTRS members over the same period, this results in an average payroll increase of about 2.1% over the period, in comparison to the assumed 3.5%.

There are several factors that we believe will apply downward pressure on the total CalSTRS payroll in the future:

- Although we do not have projections of the active teacher population, the California Department of Finance publishes a projection of school age children on their website. The October 2023 study projects a decline in the student population of 11% over the next 10 years (1.2% annual rate of decline) and 15% over the next 20 years (0.8% annual rate of decline).

- As discussed in the CalSTRS 2023 Review of Funding Levels and Risks, when a charter school is created it must decide, as part of the chartering process, whether or not to provide CalSTRS benefits to its employees. The percentage of newly created charter schools not electing CalSTRS had been increasing, but it has somewhat levelled off over the last few years. Although teachers and administrators working for charter schools not covered by CalSTRS currently represents just over one percent of CalSTRS active membership, to the extent the number of charter schools increase, this could result in a decline in future active CalSTRS membership.

- CalSTRS 2% at 62 members are subject to a more restrictive definition of creditable compensation and therefore are expected to have slightly lower pay than comparable CalSTRS 2% at 60 members. Further, this maximum limit on creditable compensation is required by law to only increase based on price inflation, which is less than the assumed increase in wages. As only a very small percentage of active members are currently over this limit, the current impact on payroll is negligible; however, it is projected that there will be an increase in this percentage in the future if wages increase more than inflation.

Each of these factors is projected to have a small downward impact on future payrolls; however, there are factors that could lead to an increasing active teacher population. In particular, the adoption of universal transitional kindergarten was included in the 2021–22 state budget. This essentially creates a new grade that will likely

require more teachers to staff the new classes, which, as it is phased in, could potentially increase the active teacher population, or mitigate any decrease.

Our current assumption is that the payroll increase assumption is equal to the wage growth assumption. Given the factors just discussed, we recommend adopting a payroll increase assumption that is 0.25% less than the general wage growth assumption. Combined with the recommended no change in the general wage growth assumption, this results in a 0.25% total decrease in the payroll growth assumption.

| Payroll Growth Rate | |
| --- | --- |
| Current Assumption | 3.50% |
| Recommended Assumption | 3.25% |

## 3. Investment Return

**Use in the Valuation**

The investment return assumption is one of the primary determinants in the calculation of the expected cost of the System's benefits, providing a discount of the future benefit payments that reflects the time value of money. This assumption has a direct impact on the calculation of liabilities, normal costs, and the factors for optional forms of benefits. The current investment return assumption for the CalSTRS DB and DBS Programs is 7.00% per year, net of administrative and investment-related expenses. For the CBB Program, the assumed return is 6.50%. Based on our analysis, the current assumptions remain reasonable, and we recommend no changes to the investment return assumption for the CalSTRS DB and DBS Programs. We recommend adopting the same 7.00% assumption for the CBB Program as the other programs, based on our understanding that CBB Program assets are now invested similarly to other State Teachers' Retirement Plan (STRP) assets, as discussed below.

**Expected Long-Term Investment Return**

We have determined the expected long-term investment return. As input, we have used the CalSTRS capital market assumptions (from the January 2023 Investment Committee meeting) and the CalSTRS target asset allocation (adopted at the May 2023 Investment Committee meeting). The CalSTRS target asset allocation is summarized in the following table:

| | Target Allocation |
|---|---|
| Global Equity | 38 % |
| Private Equity | 14 |
| Real Estate | 15 |
| Inflation Sensitive | 7 |
| Fixed Income | 14 |
| Risk Mitigation Strategies | 10 |
| Cash | 2 |
| Total | 100 % |

Combining the capital market assumptions, which include an underlying inflation assumption of 2.75%, with the target asset allocation policy, CalSTRS calculates the median long-term (20 years) expected rate of return to be 7.4% (7.3% if adjusted for administrative and passive investment expenses). This expected return is the median return on a geometric basis for all STRP assets, and we believe this is a reasonable estimate for the future DB Program return.

**2023 CalSTRS Capital Market Assumptions**

The 2023 CalSTRS capital market assumptions used in the analysis are from Agenda Item 3 of the January 2023 Investment Committee meeting. These assumptions are based on an underlying inflation assumption of 2.75%, which is the same as is recommended in this report.

|  | Allocation | Expected Return[1] | Standard Deviation[2] |
|---|---|---|---|
| Global Equity | 38 % | 8.0 % | 16.2 % |
| Private Equity | 14 | 9.5 | 21.1 |
| Real Estate | 15 | 6.8 | 11.6 |
| Inflation Sensitive | 7 | 6.4 | 10.5 |
| Fixed Income | 14 | 5.2 | 6.2 |
| Risk Mitigation Strategies | 10 | 5.0 | 7.4 |
| Cash | 2 | 2.8 | 0.5 |
| Total | 100 % | 7.4 % | 10.1 % |

*1. 20-to-30-year geometric average.*

*2. Standard deviation does not reflect impact of guaranteed return to SBMA.*

**Investment and Administrative Expenses**

The investment return used for the valuation is assumed to be net of all investment and administrative expenses. It is our understanding that the CalSTRS capital market assumptions are effectively net of all investment expenses, so no adjustment in the expected return due to investment expenses is needed.

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

| ($million) FYB | Market Assets | Admin. Expense | Expense Ratio |
|---|---|---|---|
| 2013 | $ 166,349 | 154 | 0.09% |
| 2014 | 190,312 | 145 | 0.08 |
| 2015 | 191,822 | 180 | 0.09 |
| 2016 | 189,113 | 182 | 0.10 |
| 2017 | 209,779 | 216 | 0.10 |
| 2018 | 224,869 | 254 | 0.11 |
| 2019 | 238,862 | 219 | 0.09 |
| 2020 | 246,984 | 252 | 0.10 |
| 2021 | 310,293 | 191 | 0.06 |
| 2022 | 316,919 | 222 | 0.07 |

The ratio of administrative expenses to market assets has averaged just under 0.10% over the period shown. This amount does not have a direct impact on the actuarial valuation results, but it does provide a measure of the return on investments that will be needed to meet the actuarial assumption used for the valuation. For example, if

the investment return assumption is set equal to 7.00%, then CalSTRS would need to earn a return on its assets, net of investment expenses, of about 7.10% in order to net the current 7.00% assumed return for funding purposes. The assumed administrative expenses will also impact the discount rate used in the GASB 67/68 Financial Reporting Valuation, since GASB requires the discount rate to be gross of administrative expenses.

**Peer System Comparison**

According to the Public Fund Survey, the average investment return assumption for statewide systems has been steadily declining. As of the most recent study, the median rate is 7.00%. The following chart shows a progression of the distribution of the investment return assumptions. In 2001, very few systems had an assumption of 7.0% or lower and over 80% had an assumption of 8.0% or higher. As of fiscal year 2023, about 75% have an assumption of 7.0% or less.



Distribution of Investment Return Assumptions, FY 01 to present

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23

**Capital Market Assumptions Relative to Others**

As noted, our analysis of the expected return has been based on the 2023 CalSTRS capital market assumptions. It should be noted that there is a fair amount of variation among investment professionals. For example, the expected 20-year return based on 2023 Milliman's capital market assumptions and the CalSTRS asset allocation is approximately 6.8%, net of administrative and investment expenses.

The 2023 Horizon Survey of Capital Market Assumptions provides average 20-year (and longer) capital market assumptions for a number of asset classes based on a survey of 27 investment advisory firms. Combining these capital market assumptions with the CalSTRS asset allocation yields an expected return for the total portfolio of approximately 7.5%, net of administrative and investment expenses.

It should be noted that Milliman's and Horizon's capital market assumptions are based on a lower inflation assumption than the proposed assumption of 2.75%. The lower underlying inflation assumption will tend to lead to a lower expected return, although not necessarily a one-to-one correspondence. This would indicate an expected return under Milliman's capital market assumptions and a 2.75% inflation assumption of closer to the 7.3% (net of expenses) calculated by CalSTRS. Making an adjustment for the inflation assumption would result in the expected return under the Horizon capital market assumption being even higher relative to the CalSTRS expected return.

Note that in our analysis of other capital market assumptions, we used the CalSTRS capital market assumptions for specific asset classes if there was not a directly corresponding asset class in the Horizon or Milliman capital market assumptions.

**Expected Return for the CBB Program**

The assets of the CBB Program are a subset of the STRP assets. In the past, the return credited to the CBB Program assets was based on a different allocation that excluded the private equity and real estate asset classes. The current investment return assumption for this program has been set 0.5% less than the DB Program to account for this. However, at its September 2023 meeting, the CalSTRS board adopted a revised investment policy statement that applies the asset allocation to all programs, so we recommend that the return assumption for the CBB Program be changed to be consistent with the investment return assumption used for the DB and DBS Programs. Based on the recommended investment return assumption, this would result in an increase in the return assumption for the CBB Program from 6.5% to 7.0%.

**Additional Impact of Change in DB Program Investment Return Assumptions**

The DB Program investment return assumption also impacts the following.

- **Optional Forms of Payment:** CalSTRS members may elect to receive their DB Program benefit in several forms. The member's unmodified benefit amount is reduced to reflect the actual form of payment elected based on the investment return assumption and mortality rates used. Lowering the investment return assumption used in this calculation would tend to increase the expected cost of the optional form of payment and would therefore result in a slightly greater reduction in the benefit amount (all other things being equal). Increasing the return assumption would have the opposite impact.

- **Service Purchase Costs:** CalSTRS members may purchase service under certain circumstances. Some of these service purchases base the cost on the investment return assumption. If the actual rate of return earned in the long term is less than the investment return assumption used in the service purchase cost calculation, the System will have charged the member less than the true cost, and the employer will ultimately have to make up this shortfall. Conversely, if the actual rate of return earned in the long term is greater than the investment return assumption, the System will have charged the member more than the

full actuarial cost, and the employer will have to contribute less in the future. In either situation, the risk or benefit of investment underperformance or overperformance lies with the state and the employers and not the members, as the purchase cost is fixed for the member at the time of purchase.

- **Interest Credited to SBMA:** As previously noted, the DB Program investment return assumption will be used to credit interest to the SBMA.

**Conclusion**

Based on portfolio analysis, the current 7.0% investment return assumption for the DB and DBS Programs is somewhat lower than the expected long-term median return (net of administrative and investment expenses), based on the CalSTRS 2023 capital market assumptions. The 7.0% assumption is also comparable to the expected long-term median return that would be developed using a lower inflation assumption. We believe the current assumption is reasonable. For the CBB Program, we are recommending the assumption be set equal to the DB Program assumption.

| Investment Return Assumption | | |
|---|---|---|
| | **DB & DBS** | **CBB** |
| Current Assumption | 7.00% | 6.50% |
| Recommended Assumption | 7.00% | 7.00% |

## 4.   Interest on Member Accounts

**Use in the Valuation**

This assumption is used to predict the level of future member account balances. In the DB Program, the account balance may be refunded upon termination of membership. In the DBS and CBB Programs, all benefits are dependent on the level of the account balance.

The current assumption is 3.00% per year for the DB Program. For the DBS and CBB Programs, the assumed interest credit is set equal to the investment return assumption.

**DB Program**

The board's policy is to credit interest to member accounts in an amount to be calculated annually based on the rate paid on two-year Treasury notes for the previous 12 months. The rate can go no higher than the actuarial assumed investment return, nor lower than a current passbook rate.

In light of this policy, the actuarial assumption in the valuation has been set equal to the assumed increase in the Consumer Price Index plus a margin to reflect the yield in excess of inflation on two-year Treasuries. The following table shows the average excess yield of two-year Treasuries over inflation since 2000.

| Excess Yield over Inflation on 2-Year Treasuries | | | |
|---|---|---|---|
| Year | CPI | 2-Year Treasury Rate | Excess / (Shortfall) |
| 2000 | 3.2% | 5.7% | 2.5% |
| 2001 | 3.5 | 6.0 | 2.5 |
| 2002 | 1.1 | 3.5 | 2.4 |
| 2003 | 3.0 | 2.4 | (0.6) |
| 2004 | 1.7 | 1.7 | 0.0 |
| 2005 | 3.0 | 2.6 | (0.4) |
| 2006 | 3.6 | 4.0 | 0.4 |
| 2007 | 2.4 | 5.0 | 2.6 |
| 2008 | 4.0 | 3.9 | (0.1) |
| 2009 | 0.2 | 1.8 | 1.6 |
| 2010 | 2.1 | 0.9 | (1.2) |
| 2011 | 2.1 | 0.7 | (1.4) |
| 2012 | 2.9 | 0.4 | (2.5) |
| 2013 | 2.0 | 0.3 | (1.7) |
| 2014 | 1.1 | 0.3 | (0.8) |
| 2015 | 0.0 | 0.5 | 0.5 |
| 2016 | 1.0 | 0.7 | (0.3) |
| 2017 | 2.7 | 0.9 | (1.8) |
| 2018 | 2.2 | 1.5 | (0.7) |
| 2019 | 1.5 | 2.6 | 1.1 |
| 2020 | 2.3 | 1.8 | (0.5) |
| 2021 | 1.7 | 0.2 | (1.5) |
| 2022 | 7.9 | 0.4 | (7.5) |
| 2023 | 6.0 | 3.5 | (2.5) |

As shown in the table, over the period the excess has been negative in many years as the average increase in the two-year U.S. Treasury rate has been less than inflation; however, the current two-year treasury rate has increased significantly over the last two years and is about 5.0% as of September 2023. We believe the current assumption of inflation plus a small margin to reflect the yield in excess of inflation on two-year Treasuries remains a reasonable assumption. We recommend retaining the current assumption of 3.00% (inflation assumption plus 0.25%) for future interest crediting to DB Program accounts.

**DBS and CBB Programs**

For the DBS and CBB Programs, the board's policy is to credit interest to member accounts based on the statutory minimum rate for the year, plus a portion of the returns in excess of the statutory minimum. The board has the authority to establish a reserve for short-term fluctuations in the actual returns from year to year so that the minimum credit can be allocated from current invested assets. Nevertheless, the long-term intention is to allocate all of the investment earnings to the member accounts. Therefore, the assumed long-term credit to member accounts should be the same as the investment return assumption for the CBB and DBS Programs (7.0% per year).

The statutory minimum interest rate for the CBB and DBS Programs is based on the average rate for 30-year U.S. Treasury bonds during the 12-month period ending in the February immediately preceding the plan year. Since the expected long-term return on 30-year Treasuries is less than 7.0%, the expected minimum rate is expected to be less than 7.0%. Therefore, the minimum interest rate is not expected to impact the long-term interest credit to CBB & DBS member accounts.

**Recommendation**

Our recommended assumptions are shown below.

| Assumption for Interest on Member Accounts | | |
|---|---|---|
| | **DB** | **CBB / DBS** |
| Current Assumption | 3.00% | 6.5% / 7.0% |
| Recommended Assumption | 3.00% | 7.0% / 7.0% |

## 5.    DBS and CBB Program Standard Deviation

**Use in the Valuation**

The standard deviation assumption is not directly used in the valuation, but it is used in the determination of additional earnings credits.

**DBS and CBB Programs Standard Deviation**

Under board policy, the additional earnings credits for the DBS and CBB Programs are based on the Funded Ratio of the respective program and certain thresholds. These thresholds are based on the standard deviation of the program's portfolio.

The analysis so far has focused on the expected return for the STRP assets. However, the DB, CBB and DBS Program assets are only a portion of the total STRP assets. A growing portion of the STRP assets is attributable to the SBMA. In 2007, the SBMA represented only 2% of the total STRP assets. This percentage has grown to approximately 8% in 2022, and we project it will increase to around 12% over the next 30 years.

By law, the SBMA is guaranteed a return equal to the valuation assumption, so the SBMA portion of the STRP assets will experience no return volatility. Consequently, the rest of the assets will have higher return volatility than the total STRP assets.

We used stochastically generated returns based on the total asset allocation to estimate the impact of the SBMA guarantee on the volatility of the remainder of the assets. In comparing the assets excluding the SBMA to the total STRP assets, we calculated the standard deviation to be 11.3%. This compares to the current assumption of 13.1% for the DBS Program and 11.0% for the CBB Program.

As previously discussed in the investment return section, the CBB Program assets are now allocated similarly to the DBS Program. Therefore, the standard deviation should be the same for both programs. Given the change in the asset allocation previously discussed, the CBB Program return will now be affected by the return credited to the SBMA in the same fashion as the DBS Program.

**Recommendation**

Our recommended assumptions are shown below.

| Portfolio Standard Deviation | | |
|---|---|---|
| | **DBS** | **CBB** |
| Current Assumption | 13.10% | 11.00% |
| Recommended Assumption | 11.30% | 11.30% |

## 3. Actuarial Methods and Miscellaneous Assumptions

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

### Actuarial Cost Method

### DB Program

The cost method used for the DB Program valuation is referred to as the Entry Age Cost Method (except in the special cases noted below). Under this method, the actuarial present value of projected benefits for each individual member included in the valuation is allocated on a level basis over the earnings of the individual between entry age (equal to age at membership date) and assumed exit ages. The portion of this actuarial present value allocated to the valuation year is called the Normal Cost; the portion of the actuarial present value not provided for at a valuation date by the actuarial present value of future Normal Costs is called the Actuarial Obligation.

The Entry Age Cost Method with projected benefits allocated over earnings (often referred to as "Level Percent of Pay") is by far the most common cost method among public sector pension plans. The advantage to using this method is that the cost over time tends to remain fairly level as a percentage of overall payroll, all else being equal. This is well-suited to most public systems, which tend to contribute as a percentage of pay, and which benefit from a stable contribution rate for budgeting and planning purposes.

We believe that the Entry Age Cost Method continues to be the most reasonable choice for the ongoing portion of the DB Program.

### DB Program – Pre-2014 Benefits

For the actuarial obligation allocated to service earned prior to July 1, 2014, the Projected Unit Credit (PUC) Cost Method is used. Under the PUC cost method, the actuarial present value of projected benefits for each individual member included in the valuation is determined based on the current service (in this case credited service as of June 30, 2014) and compensation projected to the age the member leaves active employment. The Normal Cost is $0 since no benefits are being earned. We believe this continues to be the appropriate cost method to determine the actuarial obligation for benefits earned prior to July 1, 2014 for both the current benefit structure and the 1990 Benefit Structure.

### DBS and CBB Programs

The cost method used for the DBS and CBB Program valuations is referred to as the Traditional Unit Credit Cost Method. Under this method, the projected benefits of each individual member are allocated by a consistent formula to valuation years. When the Traditional Unit Credit Method is applied to the DBS and CBB Programs, the result is that the Actuarial Obligation is equal to the accumulated account balances, and the Normal Cost is equal to the total annual contribution.

We believe that the Traditional Unit Credit Cost Method continues to be the most reasonable method for the valuation of the DBS and CBB Programs. In particular, if another cost method were used, then the situation could arise where the assets for either program were exactly equal to the associated accumulated account balances,

and yet the Funded Ratio for the given program would be different from 100%. We believe such a situation would cause unnecessary confusion. We recommend no change to the cost method for the DBS and CBB Programs.

Note that for financial reporting under GASB 67/68, the Entry Age Cost Method is required. However, we still recommend use of the Traditional Unit Credit Method for funding purposes.

**MPP Program**

The cost method used for the MPP Program valuation is the Entry Age Cost Method. Since there are no active members eligible to receive future MPP Program benefits, the Normal Cost is $0, and the actuarial obligation for the MPP Program is equal to the value of all benefits expected to be paid in the future. This obligation, less any assets currently residing in the Teachers' Health Benefit Fund (THBF), is included with the obligation of the DB Program.

**SBMA Program**

No Normal Cost or actuarial obligation is calculated for funding, because only an actuarial projection is done, not a valuation. Therefore, no cost method is needed for funding purposes. For financial reporting under GASB 67/68, the Entry Age Cost Method is required.

**Valuation of Assets (DB Program)**

The valuation of assets for an actuarial valuation of a defined benefit pension plan may be thought of in a different light than the value of assets for a retirement system's financial statement. The purpose in a financial statement disclosure is to make a representation of the current value of the assets on a fair value basis. Because the underlying calculations in the actuarial valuation are long term in nature, and one of the goals of the actuarial valuation process is to measure the funding stability of the DB Program, it can be advantageous to recognize short-term fluctuations in the fair value of assets over a period of time.

Like the majority of large public retirement systems, the DB Program uses an asset smoothing method to determine the Actuarial Value of Assets. Under this method, the assets are valued using a delay of the recognition of annual investment gains or losses. The expected actuarial value is the prior year's actuarial value increased with net cash flow of funds, and all increased with interest during the past year at the expected investment return assumption. One-third of the difference between the expected actuarial value of assets and the Fair Market Value of assets is added to the expected actuarial value of assets to arrive at the Actuarial Value of Assets.

The following chart shows a history of the Actuarial Value of Assets compared to the Fair Market Value of Assets.
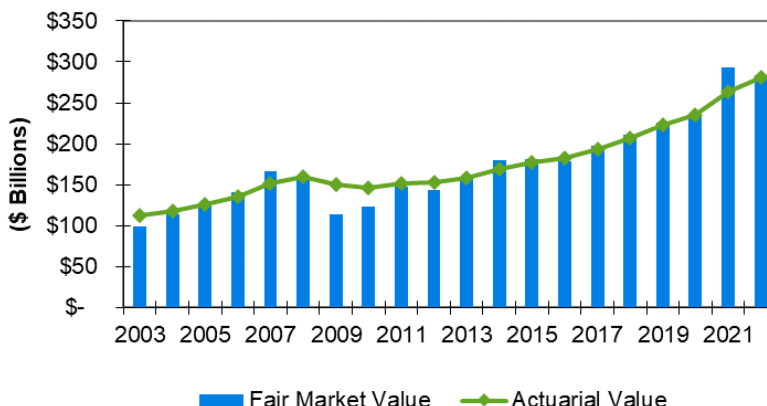


Asset smoothing is a valuable tool for addressing contribution volatility. CalSTRS' current method that smooths gains and losses over roughly three years provides a reasonable compromise between minimizing volatility and not straying too far from the market value. One concern is that a more rapid recognition (1/3rd recognition is quicker than what most public plans use) could lead to significant year-to-year contribution rate volatility. However, the caps on the state and employer contribution rate increases also mitigate the potential year-to-year contribution rate volatility. Given these caps on how much the state and employer contribution rates can change in a given year, we analyzed moving to Fair Market Value (i.e., no smoothing). We found that the smoothing reduces the year-to-year contribution rate volatility (primarily for the state) and it is not expected to negatively impact future Funded Ratios. Therefore, our recommendation is to retain the current method, including the adjustment described in the following paragraph.

The financial statements provided by CalSTRS include a liability to reflect "Net Pension and OPEB Obligation." This liability reflects GASB 68 and 75 obligations for benefits provided to CalSTRS staff through CalPERS. The contributions CalSTRS makes to CalPERS to fund these benefit payments are reflected in the CalSTRS financial statements each year in the administrative expenses. Since there already is an assumption for future administrative expenses that is reflected by a reduction in the investment return assumption, these future obligations are already accounted for in the funding valuation. Therefore, we recommend continuing to exclude the Net Pension and OPEB Obligation, along with associated deferred inflows and outflows of resources, from the assets used in the funding valuation. Note that we are not recommending any changes to the way the assets are reported in the financial statements.

**Valuation of Assets (DBS and CBB Programs)**

The assets are valued at Fair Market Value and the Gain and Loss Reserve acts as a smoothing technique. We recommend this method be continued, along with the same adjustment to the Fair Market Value as the DB Program to exclude the "Net Pension and OPEB Obligation."

**Valuation of Assets (MPP Program)**

The assets in the THBF are valued at Fair Market Value. We recommend this method be continued, along with the same adjustment to the Fair Market Value as the DB Program to exclude the "Net Pension and OPEB Obligation."

**Miscellaneous Assumptions (Proposed assumptions are shown in Table A-1.8)**

**Valuation of Current Inactive Members:** The valuation data provided for inactive members (members who have left active service but have not yet commenced receiving their benefit) does not include salary information. To estimate the projected retirement benefits, the inactive members' earnable salary information is retrieved from the active data in the year they were most recently active. For those we cannot locate on the active data, their compensation is based on the average active compensation in the year the member terminated. Using the compensation information along with the age and service data, an estimated benefit is included in the actuarial valuation. We continue to believe this is a reasonable approach. More details on this calculation are provided in Appendix A-1.

**Valuation of Future Inactive Members:** A 5% load will be applied to the projected compensation used in the calculation of the estimated benefit for future inactive members assumed to defer their service retirement benefit. This adjustment is included to account for potential post-termination increases in salary due to factors such as reciprocity. A 5% load is already applied to current inactive members in the valuation. This change is therefore only for projected future inactive members.

**Inactive Member Retirement Age:** We studied the age at which inactive members commence retirement benefits. Based on the experience analysis, the average age at which such members retired over the period is approximately age 60 for 2% at 60 members and approximately age 62 for 2% at 62 members. Our current assumption is age 60 for 2% at 60 members and age 62 for 2% at 62 members, so we are recommending retaining the current assumptions.

**Number of Children:** We studied the number of children for surviving spouses and disability retirements. Based on this analysis, we are recommending no change in the number of children assumed for female members and a small increase in the number of children assumed for male members. The following table shows the results of our study of married members. Note that the number of children only reflects those expected to be eligible for survivor or disability benefits (generally age 21 or less).

| Member's Gender | Actual # of Children | Current Assumption | Recommendation |
|---|---|---|---|
| Male | 0.72 | 0.65 | 0.70 |
| Female | 0.49 | 0.50 | 0.50 |

**Assumed Offsets:** A portion of disability and survivor benefits may be reduced (offset) if the member or beneficiary is receiving other public benefits related to the member's death or disability. We studied the benefit offset amounts for surviving spouses and disability retirements. Based on the current experience analysis, the actual offsets were very low. This is similar to findings from prior studies. Our recommendation is to continue to assume no offsets for future death and disability benefits but continue to value the offsets as they actually occur.

**Probability of Eligible Survivor for Active Death Benefit:** Surviving beneficiaries may be eligible for a survivor benefit if a member dies during active employment. The valuation assumes a certain percentage of members will have an eligible survivor. The current assumption is that 85% of males and 65% of females will have an eligible survivor. Members who die during active employment with an eligible beneficiary who elects the annuity benefit are not reported separately from those who die without an eligible beneficiary. Therefore, we are unable to perform a statistically valid study of this assumption. To assess the reasonableness of this assumption, we looked at other public retirement systems in California and other teacher retirement systems across the country, and based on this analysis we believe the current assumption is reasonable. We are recommending retaining the assumption.

**Sick Leave Load:** We have studied the unused sick leave for those members who retired during the study period. We found that this service was generally proportional to credited service. On average, new retirees had 0.29 years of unused sick leave service and 24.3 years of credited service (including unused sick leave service). This implies that sick leave service is approximately 1.22% of non-sick leave credited service. This is based on five-year period ending June 30, 2022; however, it is skewed by lower sick leave service in the first two years of that period. Looking at only the most recent three years, the average is 1.5%.

The current assumption is a 1.7% load on credited service to account for future sick leave service; we recommend adjusting this to 1.6% to partially reflect the recent experience. The following graph shows the results of our study.



**Ratio of Eligible Sick Leave Service to Service Credit at Retirement**
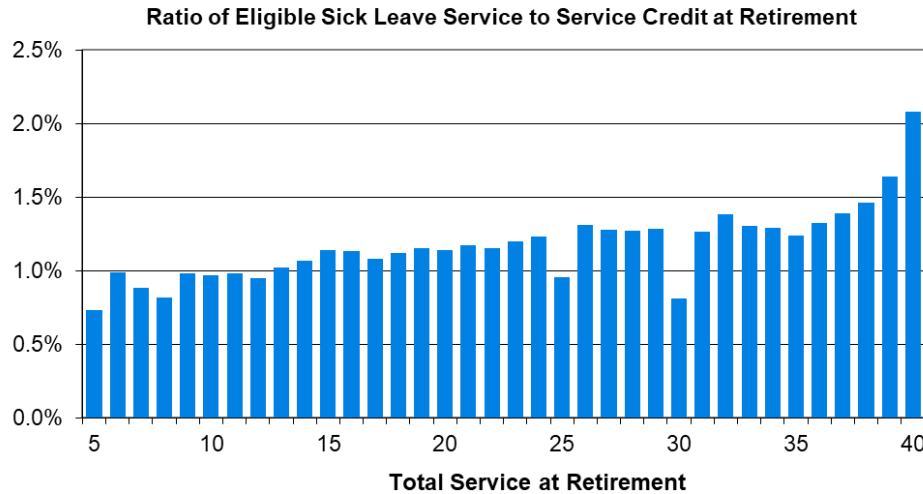
**Option Factors:** In general, option factors are based on the valuation assumptions. If changes in the mortality rates or investment return assumptions are adopted, the options factors should be updated to reflect these changes.

Additionally, CalSTRS makes assumptions specific to the option factor, as discussed below. Members who retire and elect a 100% continuance benefit tend to have higher mortality in the first few years than the general population. We recommend the following adjustments be made to the mortality used in the calculation of the two options with a 100% continuance (Options 2 and 6):

| Retirement | Multiply Standard Mortality Rate by | | |
|---|---|---|---|
| Year | Actual | Expected | Proposed |
| **Male Mortality** | | | |
| 1st | 115% | 140% | 125% |
| 2nd | 125% | 120% | 115% |
| 3rd | 99% | 100% | 100% |
| 4th | 83% | 100% | 100% |
| **Female Mortality** | | | |
| 1st | 188% | 250% | 190% |
| 2nd | 153% | 160% | 150% |
| 3rd | 100% | 130% | 100% |
| 4th | 90% | 100% | 100% |

Members who elect continuance benefits tend to have a higher proportion of male members than the general population. We are recommending reductions in the assumptions used in the calculation of the blended mortality rate for the optional factors. Note that for options 2, 3, 4 & 5 there was not statistically sufficient data to recommend a change.

| | Male Percentage | | |
|---|---|---|---|
| **Option** | **Actual** | **Expected** | **Proposed** |
| 2 | n/a | 80% | No Change |
| 3 | n/a | 55% | No Change |
| 4 | n/a | 75% | No Change |
| 5 | n/a | 70% | No Change |
| 6 | 48.6% | 50% | No Change |
| 7 | 28.0% | 30% | No Change |
| 8 | 37.1% | n/a | No Change |
| 9 | 42.4% | 40% | No Change |

For all other administrative factors, we recommend blended mortality rates assuming 30% male and 70% female, consistent with the current assumption. Based on a study of service retirements during the last five years, we found the benefit amount payable to male retirees was 29.1% of the total benefit amounts.

With generational mortality, mortality rates by age change every year. In theory, this would cause the mortality rates used in the option factors to need to be updated every year. We recommend CalSTRS continue with the current simplification, that is, to change the mortality tables used for the option factors only following each experience study, instead of every year. With this option, full generational mortality tables are used based on the birth year for a member retiring at age 62 at the midpoint of the period the options factors would apply. For example, if the option factors were to apply to 2024-2028, full generational projection would apply to the mortality tables based on a fixed retirement year of 2026 and a 1964 birth year (mid-point of period of 2026, less assumed retirement of age 62). Note that the mortality projection scale is discussed in Section 5.

**Estimated Impact of 1-Year Final Compensation:** To isolate the value of the 1990 benefits for current retirees, CalSTRS provides the value of the increased benefit for various components of the new benefits (career average bonus, longevity bonus, ad hoc COLA, sick leave, etc.) on the retiree valuation data, where "new benefits" are those attributable to benefit changes after 1990. The increase in benefit amount for those members who are eligible to have their final average calculation based on one year (instead of three years) is not provided on the data, so an assumption is required. The current assumption estimates the impact of using one-year compensation on a year-by-year basis. We reviewed this assumption on both a count-weighted and service-weighted basis, and the results were consistent between the two methods. We recommend continuing to use this assumption, with updates for the last four years.

We determined the impact for each year by comparing the actual final compensation for each retiree eligible for the one-year final compensation with their estimated three-year final compensation. The results are as follows:

| Retirement Year | Actual 1-Year Final Comp | Est. 3-Year Final Comp | Increase |
|---|---|---|---|
| 2002 | 6,115 | 5,727 | 6.8% |
| 2003 | 6,202 | 5,964 | 4.0% |
| 2004 | 6,451 | 6,174 | 4.5% |
| 2005 | 6,495 | 6,293 | 3.2% |
| 2006 | 6,685 | 6,458 | 3.5% |
| 2007 | 7,067 | 6,702 | 5.5% |
| 2008 | 7,148 | 6,809 | 5.0% |
| 2009 | 7,140 | 6,966 | 2.5% |
| 2010 | 7,235 | 7,146 | 1.2% |
| 2011 | 7,230 | 7,141 | 1.2% |
| 2012 | 7,389 | 7,249 | 1.9% |
| 2013 | 7,335 | 7,162 | 2.4% |
| 2014 | 7,363 | 7,127 | 3.3% |
| 2015 | 7,637 | 7,323 | 4.3% |
| 2016 | 7,923 | 7,547 | 5.0% |
| 2017 | 8,116 | 7,798 | 4.1% |
| 2018 | 8,349 | 8,146 | 2.5% |
| 2019 | 8,695 | 8,413 | 3.3% |
| 2020 | 8,710 | 8,451 | 3.1% |
| 2021 | 8,979 | 8,740 | 2.7% |
| 2022 | 9,130 | 8,810 | 3.6% |

Note: Compensation amounts are earnable amounts and are monthly figures.

We are recommending the actual increase, as shown in the table above, be applied to the individual's 1990 benefit to determine the new benefit attributable to the one-year final compensation. Note that this is only applied to the benefits of retirees who were eligible for the one-year final compensation. For retirement years prior to 2002, 5.0% is used. For retirement years after 2022, 4.1% is used. The 4.1% represents the assumed 3.5% general wage growth assumption plus 0.6% for merit. If a different general wage growth assumption is adopted, the 4.1% should be adjusted to reflect this. We recommend this table be updated with each following experience analysis study.

## 4. Salary Increases Due to Promotion and Longevity (Merit)

**Results**

Estimates of future salaries are based on assumptions for two types of increases:

1. Increases in each individual's salary due to promotion or longevity, which occur even in the absence of inflation (merit increases); and

2. Increases in the general wage level of the membership, which are directly related to inflation and increases in productivity.

In Section 2, we discuss the second of these rates, the general wage inflation. Our base recommendation is to retain the current assumption of 3.50%. See that section of the report for discussion. This section addresses the first of these rates, the merit salary increase.

The merit increases shown in this section are calculated as the total increase for each individual, less the observed general wage inflation during the study period. Isolating the general wage growth and merit increases accurately over short periods can be difficult, so we use a longer period for the merit increase study. The observed general wage growth over the 15-year study period is 1.94%.

Exhibit 4-1 shows the actual merit increases in salary over the period July 1, 2007 – June 30, 2022. Increases were higher earlier in a member's career (lower service) and then decreased over time, consistent with the current assumptions. The actual increases were close to those predicted by the current assumptions over all service levels. Note that when we calculate the merit salary increase at different service levels, we use elapsed service. For example, if a member hired 10 years ago and worked half-time during that period, our analysis would use 10 years of service, not the five years of credited service they would have accrued.

The current merit salary assumptions are separated by entry age. Exhibit 4-2 shows the average increases by entry age group. This exhibit illustrates the pattern of merit increases based on the age at which a member enters the System. Specifically, at any given service level, members with younger entry ages tend to receive larger merit increases, consistent with the current assumptions.

**Recommendation**

Based on the results of the 15-year study period, we are recommending small increases or decreases to the merit increase assumption depending on the service level. The proposed rates are shown in Table A-1.7.

**Exhibit 4-1**
**Total Rates of Increase in Salary Due to Merit and Longevity**
**All Members**

(Excluding Actual General Wage Growth)

**Salary Increases Less Wage Inflation -- All Members**
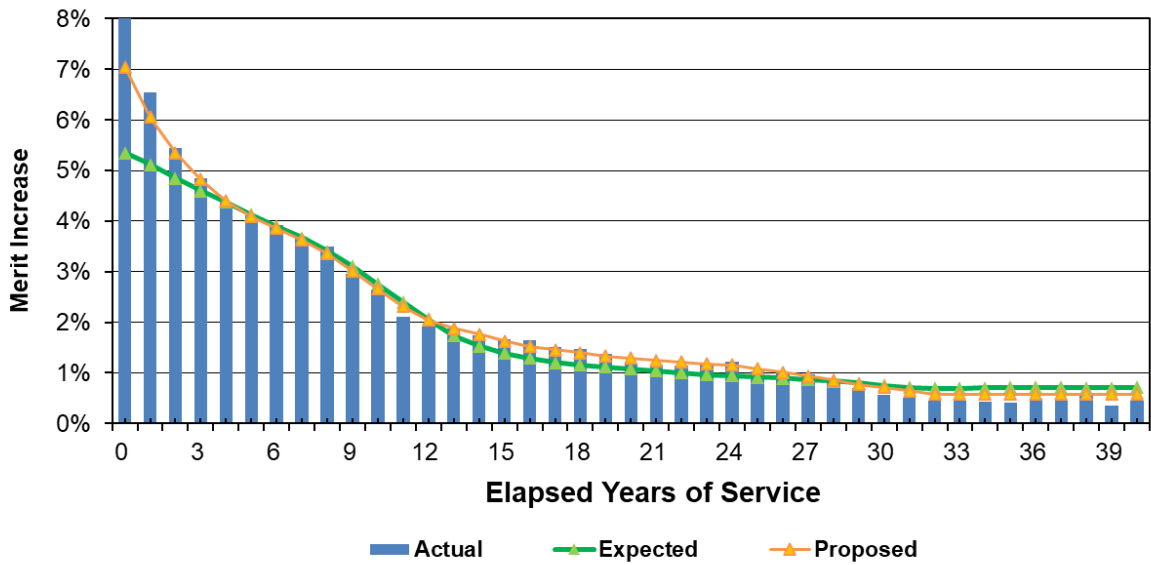
## Exhibit 4-2
## Annual Rates of Increase in Salary by Entry Age
## Due to Merit and Longevity

(Excluding Actual General Wage Growth)

### Average Merit Salary Increases by Entry Age Group
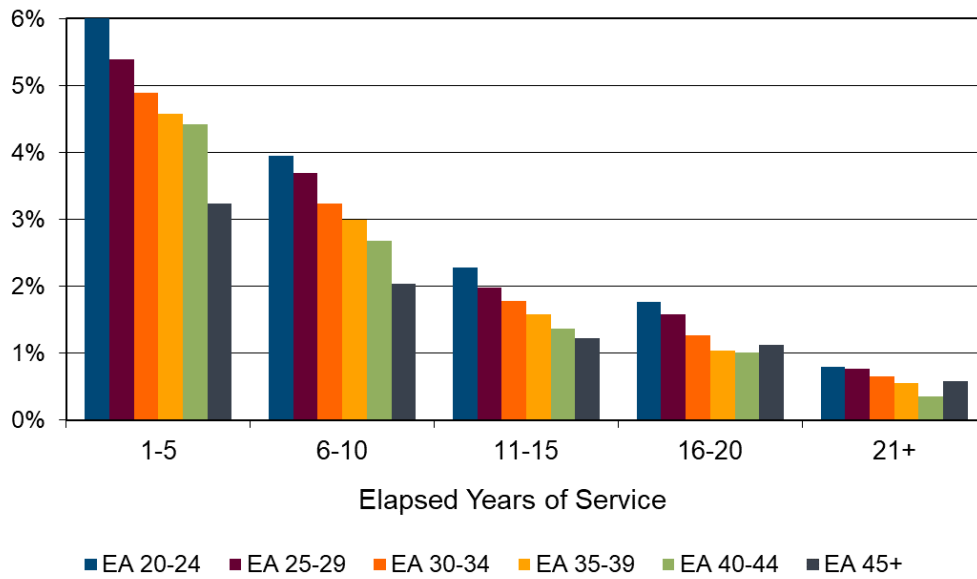
## 5. Retired Mortality

In this section we look at the results of the study of actual and expected death rates of retired members. We studied rates of mortality among healthy and disabled retired members. Our analysis looked at both a 15-year study period as well as the most recent five years.

Although there has been a recent deviation due to the pandemic, mortality has been improving in this country and is expected to continue to improve. We recommend continued use of generational mortality tables (see later discussion) to account for projected future improvements in mortality. Generational mortality is reflected by including a mortality improvement scale that projects annual decreases in mortality rates. Therefore, generational mortality explicitly assumes that members born more recently will live longer than the members born before them.

The Actuarial Standards of Practice require expected future mortality improvements to be considered in selecting the assumption. Using generational mortality tables achieves this.

### Results

Overall, we found the number of deaths over both the 5-year and 15-year study periods for retirees was somewhat greater than the number predicted by the current rates with a total actual/expected ratio of 107%. In total, there were more deaths than the current rates predicted for healthy and disabled retired members over both the 5-year and 15-year study periods. This is perhaps unsurprising given the COVID pandemic overlapped with the study periods, particularly the most recent five-year period. The ratio of active-to-expected deaths is also higher in this study than in the prior study period as discussed in Section 6.

The following shows a summary of the results of the study, with the deaths weighted by monthly allowances. Detailed results are shown graphically later in this Section.

| 2017-2022 Study Period | | | | | | |
|---|---|---|---|---|---|---|
| | Actual to Expected (Benefit-Weighted)[1] | | | Actual to Proposed (Benefit-Weighted)[1] | | |
| **Status** | **Actual** | **Expected** | **A/E Ratio** | **Actual** | **Proposed** | **A/P Ratio** |
| Healthy Male | 62,958 | 59,373 | 106% | 62,958 | 59,901 | 105% |
| Healthy Female | 71,401 | 66,983 | 107% | 71,401 | 67,893 | 105% |
| Healthy Total | 134,359 | 126,356 | 106% | 134,359 | 127,794 | 105% |
| | | | | | | |
| Disabled Male | 1,637 | 1,388 | 118% | 1,637 | 1,520 | 108% |
| Disabled Female | 3,493 | 2,978 | 117% | 3,493 | 3,095 | 113% |
| Disabled Total | 5,130 | 4,366 | 117% | 5,130 | 4,615 | 111% |
| | | | | | | |
| **Grand Total** | **139,489** | **130,722** | **107%** | **139,489** | **132,409** | **105%** |

*1. Amounts shown represent aggregate monthly allowances in $1,000s of retired members who died during the study period.*

The values in the table are weighted by monthly allowance, so, for example, the first line of the table indicates that healthy male retirees (i.e., service retirees) with total monthly allowances of $62,958,000 died compared to the expected value of monthly allowances associated with healthy male retiree deaths of $59,373,000 based on the valuation assumptions.

### Study Period

We performed analysis on mortality rates for both the most recent five years and a longer 15-year period. Both periods have some limitations associated with them. The most recent five years is more heavily impacted by higher mortality rates associated with COVID-19 related deaths. The 15-year period is less impacted by the

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39

pandemic but requires more estimation of what historical mortality improvement has been (technical note: to reflect estimated mortality improvement for prior years, we assumed improvement would be equal to the year-by-year age factors included in the MP-2021 scale). Although we looked at both periods, our focus in setting the proposed mortality rates was the most recent five-year period. We accounted for higher mortality rates associated with COVID-19 by setting the rates about 5% lower than actual experience.

### Benefit-Weighted Analysis

In our experience studying the mortality of public pension plan retirees, we have consistently found that retirees with larger benefits tend to live longer than retirees with smaller benefits. We have studied the mortality for CalSTRS on both a benefit-weighted and a headcount-weighted basis and found this to be true, although the impact is less than we have observed in most other systems, probably because members of CalSTRS are relatively homogenous. Our recommendations are primarily based on the benefit-weighted analysis, as it is a better predictor of future liabilities than a strictly headcount-weighted analysis.

### Mortality for Beneficiaries/Survivors

The previous analysis was focused on members who are currently receiving either service retirement or disability retirement benefits. An additional assumption must be made for beneficiaries of members who are currently receiving survivor benefits or may receive survivor benefits in the future. Analysis of this assumption is more difficult as the information on deaths of beneficiaries who are not in payment is generally not as well reported in most systems as members who are in payment. The information on beneficiaries currently receiving survivor benefits is more reliable; however, applying the results of the experience for in-payment beneficiaries to beneficiaries who are not in payment would likely overstate the mortality rates for the group.

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

### Generational Mortality Tables

Like CalSTRS, most public plan actuarial valuations use generational mortality tables, which explicitly reflect expected future improvements (i.e., decreases) in mortality. Generational mortality tables include a base table and a projection table. The projection table reflects the expected annual reduction in mortality rates at each age. Therefore, each year in the future, the mortality at a specific age is expected to decline slightly (and people born in succeeding years are expected to live slightly longer).

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

One of the primary benefits of generational mortality tables is the valuation assumptions should effectively update each year to reflect anticipated improvements in mortality, so that the base tables should not require significant changes when updates are made based on future experience studies.

**Projection Scale for Mortality Improvement**

The most recent projection scale published by the Society of Actuaries (SOA) incorporates a complex matrix of rates of improvement that vary by both age and birth year. The projection scale (Scale MP-2021) goes to ultimate annual improvement rates in years 2037 and later that vary by age only. Note that the SOA has not issued an update to the mortality improvement scale since 2021 due to the substantially higher mortality rates that occurred during the pandemic.

We have compared the ultimate rates from the MP-2021 scale with actual mortality improvement from the most recent 60 years of experience of the US Social Security system and found them to be similar. We believe the ultimate MP-2021 scale reasonably reflects the long-term expectation of mortality improvement. Note that the current projection scale assumption is 110% of the ultimate portion of the MP-2019 scale. At the time of the prior experience analysis we recommended using 110% of the MP-2019 scale because of some inconsistencies with historical mortality improvements. Given the consistency with the newest scale and actual mortality improvement, we do not believe any adjustment to the new scale is warranted.

**Recommendation**

We are recommending custom base mortality tables to best fit the patterns of mortality among CalSTRS retirees, after accounting for COVID-19 impact. Note that for beneficiaries of healthy and disabled retirees, the mortality for healthy retirees is used.

For the mortality improvement projection scale, we recommend updating the projection scale to the MP-2021 Ultimate Projection Scale.

The following table shows that the recommended mortality tables with no mortality improvement project that members retiring in the next year will live approximately the same number of years as projected by the current assumptions. With mortality improvement, the recommended mortality tables project that members retiring in the next year will live slightly less than projected by the current assumptions.

| Expected Lifetime for Future Retirees (Retiring in 2023) | | | | |
|---|---|---|---|---|
| | No mortality improvements | | | |
| | Males | | Females | |
| | Current | Proposed | Current | Proposed |
| Age at Retirement | 63.0 | 63.0 | 63.0 | 63.0 |
| Expected Future Lifetime | 23.7 | 23.6 | 26.2 | 26.0 |
| Expected Age at Death | 86.7 | 86.6 | 89.2 | 89.0 |
| | With mortality improvements | | | |
| | Males | | Females | |
| | Current | Proposed | Current | Proposed |
| Age at Retirement | 63.0 | 63.0 | 63.0 | 63.0 |
| Expected Future Lifetime | 25.4 | 24.9 | 28.0 | 27.3 |
| Expected Age at Death | 88.4 | 87.9 | 91.0 | 90.3 |

The proposed rates are shown in Table A-1.2. Rates of mortality among active members prior to retirement are discussed separately in Section 6 of this report.

**Exhibit 5-1**
**Mortality for Service (Healthy) Retirees – Males**
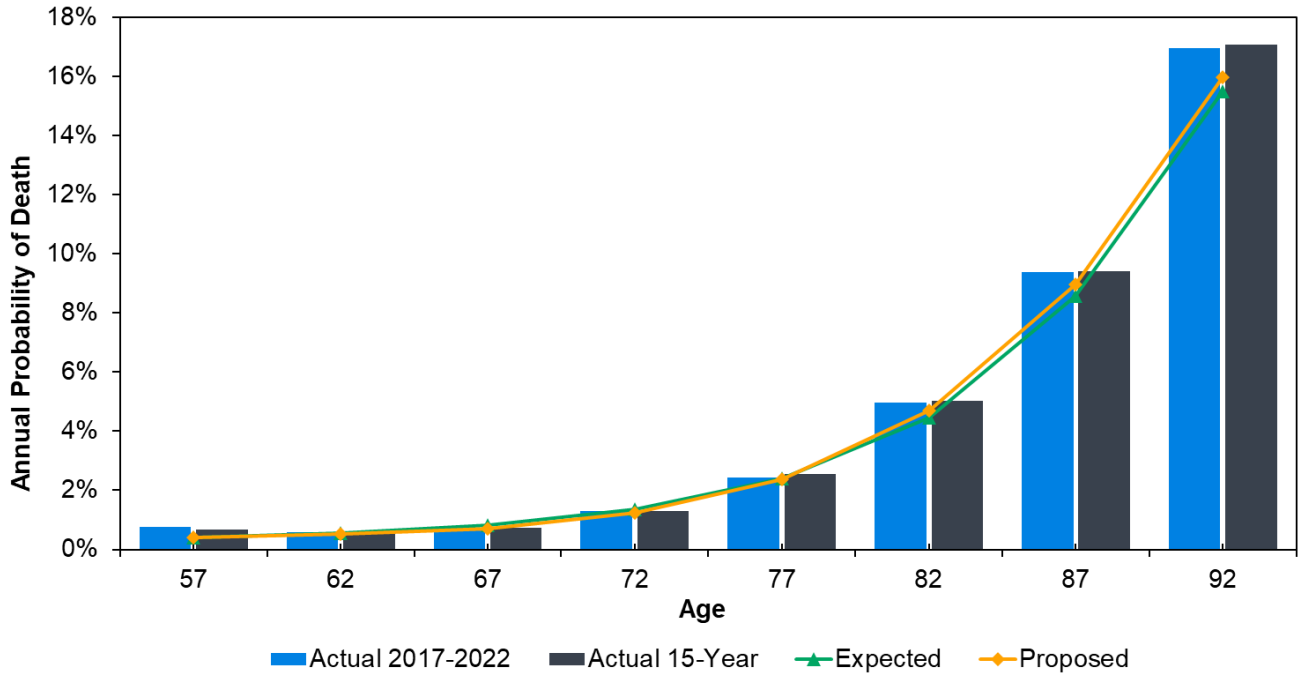


**All Ages**

|  | Expected | Actual | Proposed |
|---|---|---|---|
| Total [1] | 59,373 | 62,958 | 59,901 |
| Actual / Expected | 106% |  | 105% |

*1. Amounts shown represent aggregate monthly allowances in $1,000s of retired members who died during the study period.*

**Exhibit 5-2**
**Mortality for Service (Healthy) Retirees – Females**
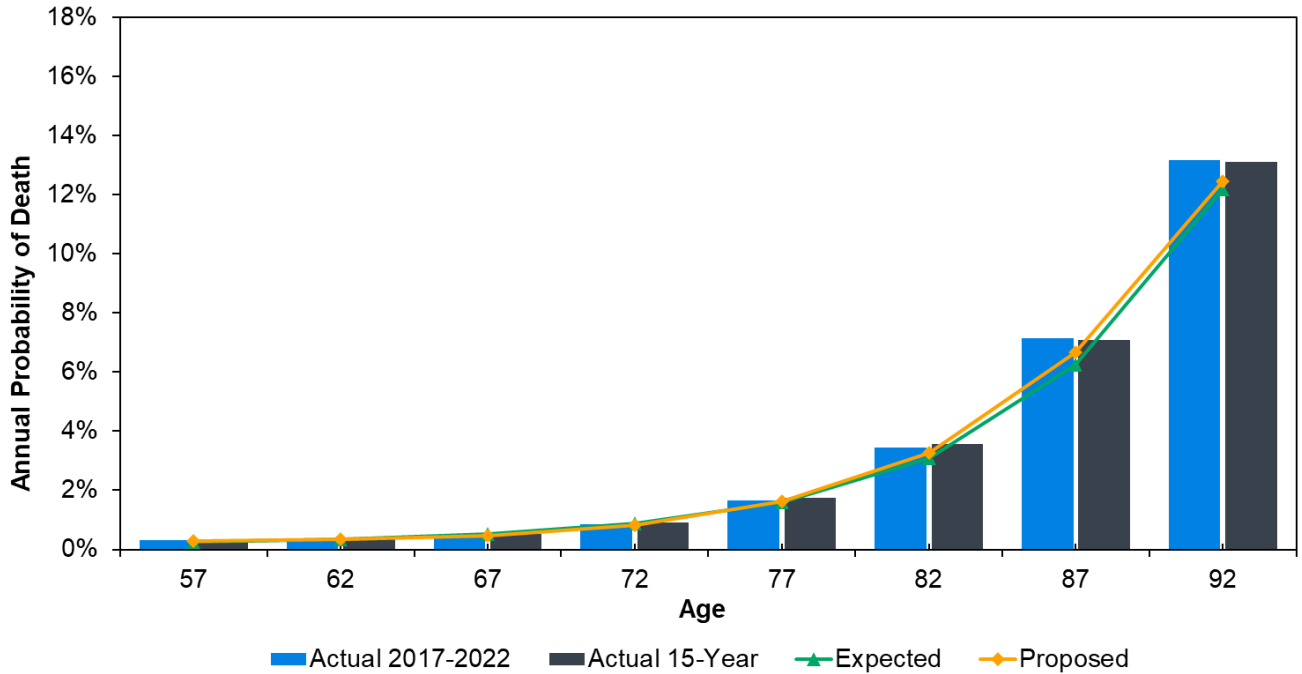


### All Ages

|  | Expected | Actual | Proposed |
|---|---|---|---|
| Total [1] | 66,983 | 71,401 | 67,893 |
| Actual / Expected | 107% |  | 105% |

*1. Amounts shown represent aggregate monthly allowances in $1,000s of retired members who died during the study period.*

**Exhibit 5-3**
**Mortality for Disabled Retirees – Males**
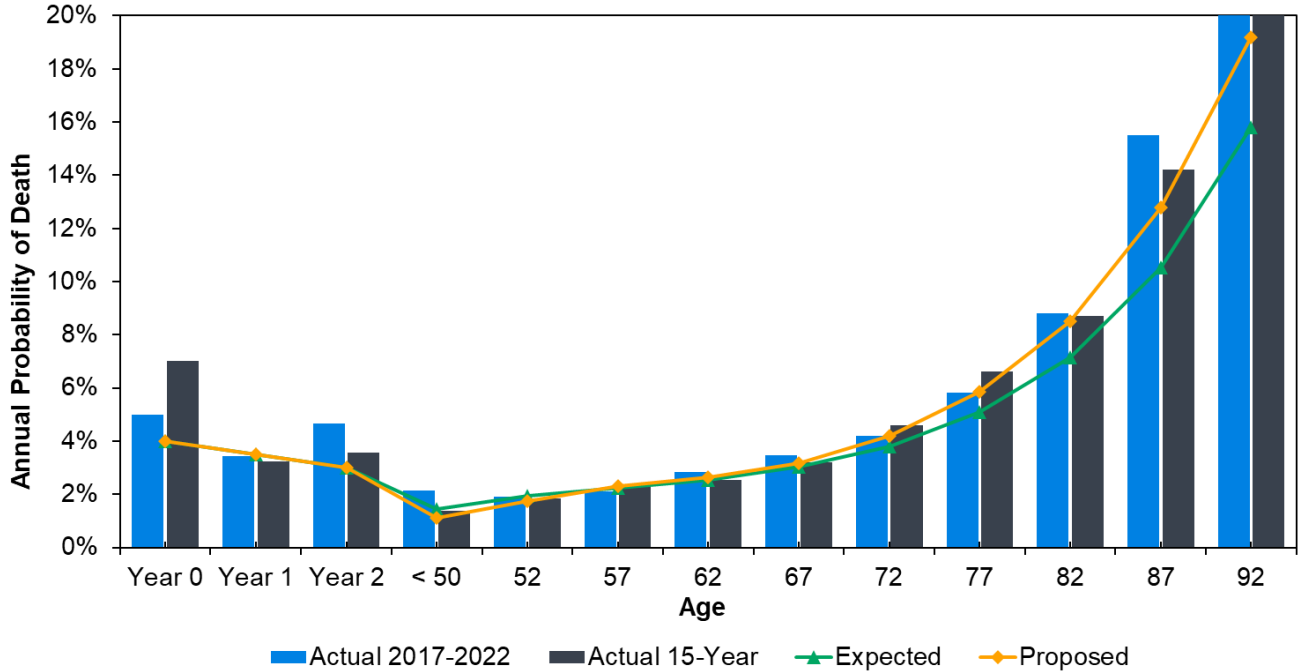


**All Ages**

| | Expected | Actual | Proposed |
|---|---|---|---|
| Total [1] | 1,388 | 1,637 | 1,520 |
| Actual / Expected | 118% | | 108% |

**First Three Years of Retirement**

| | Expected | Actual | Proposed |
|---|---|---|---|
| Total [1] | 120 | 150 | 120 |
| Actual / Expected | 126% | | 126% |

*1. Amounts shown represent aggregate monthly allowances in $1,000s of retired members who died during the study period.*

**Exhibit 5-4**
**Mortality for Disabled Retirees – Females**
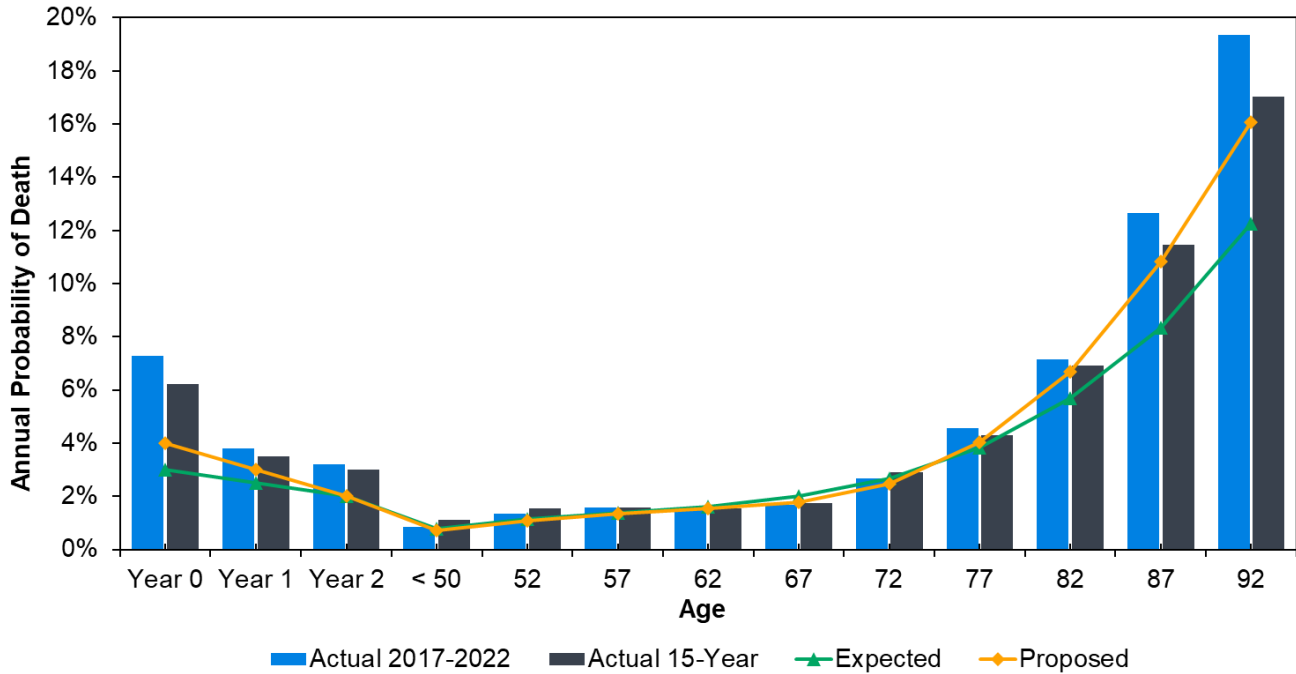


## All Ages

| | Expected | Actual | Proposed |
|---|---|---|---|
| Total [1] | 2,978 | 3,493 | 3,095 |
| Actual / Expected | 117% | | 113% |

## First Three Years of Retirement

| | Expected | Actual | Proposed |
|---|---|---|---|
| Total [1] | 285 | 501 | 330 |
| Actual / Expected | 176% | | 152% |

*1. Amounts shown represent aggregate monthly allowances in $1,000s of retired members who died during the study period.*

## 6. Probability of Death from Active Status

In this section we look at the results of the study of actual and expected death rates for members in active status.

**Results**

The number of active deaths was more than expected, with an actual-to-expected ratio of 136%. The proposed rates reduce the rates to be more in line with the actual experience while still including a margin to reflect the approximate impact of the pandemic on mortality rates.

| | 2017-2022 Study Period | | | | | |
|---|---|---|---|---|---|---|
| | Actual to Expected | | | Actual to Proposed | | |
| **Status** | **Actual** | **Expected** | **A/E Ratio** | **Actual** | **Proposed** | **A/P Ratio** |
| Active Male | 930 | 638 | 146% | 930 | 847 | 110% |
| Active Female | 1,197 | 929 | 129% | 1,197 | 1,103 | 109% |
| Active Total | 2,127 | 1,567 | 136% | 2,127 | 1,950 | 109% |

Note that this analysis is on a head-count weighted basis. We performed additional analysis of the active mortality rates on a compensation-weighted basis. The compensation-weighted results were compared to the headcount-weighted analysis, and we did not observe a significant difference. Therefore, our analysis, including the proposed rates, is on a head-count weighted basis.

We compared the proposed rates with the most recent teacher-specific employee mortality table (PubT.H-2010 employee mortality table) and found that the proposed rates on average were slightly less than the standard tables on a relative basis for females and approximately the same for males.

**Recommendation**

We recommend new custom tables be adopted based on CalSTRS mortality experience for active members. All proposed tables use the MP-2021 Ultimate Projection Scale applied generationally. The proposed rates are shown in Table A-1.2.

## 7.  Service Retirement from Active Status

Exhibits 7-1 through 7-8 show the actual and expected rates of service retirement from active status. Our analysis of rates of service retirement was by attained age and gender, and only includes active members who are eligible for service retirement. Our analysis looked at both a 15-year study period as well as the most recent five years, but our recommendations were primarily based on the results from the 15-year period. Additional analysis was done on a compensation-weighted basis, but the results were not materially different than the headcount-weighted analysis; therefore, we have continued using a headcount-weighted approach in our analysis.

Due to the different benefit provisions, we reviewed rates of retirement separately based on an individual member's years of credited service. Therefore, we performed analysis of service retirement by age for the following three service retirement assumption categories for 2% at 60 members:

1.  Less than 25 years of service: This is the basic group.
2.  Between 25 and 30 years of service: This group is eligible for one-year final compensation.
3.  30 or more years of service: This group is eligible for the career factor (additional 0.2% in percentage formula). Some members of this group will be eligible for the longevity bonus; however, this is a declining group with only a small percentage of active members currently eligible.

Exhibits 7-1 through 7-6 show retirements from active status for 2% at 60 members for the following groups:

- Exhibit 7-1: Members with < 25 Years of Service – Males
- Exhibit 7-2: Members with < 25 Years of Service – Females

- Exhibit 7-3: Members with 25 to <30 Years of Service – Males
- Exhibit 7-4: Members with 25 to <30 Years of Service – Females

- Exhibit 7-5: Members with >=30 Years of Service – Males
- Exhibit 7-6: Members with >=30 Years of Service – Females

Exhibits 7-7 through 7-8 show retirements from active status for 2% at 62 members for the following groups (note that the only service group with any statistically significant data was the short service group):

- Exhibit 7-7: Members with 5 to 9 Years of Service – Males
- Exhibit 7-8: Members with 5 to 9 Years of Service – Females

We also performed additional analysis by years of service within those groups.

**Results: 2% at 60 Members**

For members at each of the three service breakdowns shown, the total actual retirements from active service were greater than what the assumptions predicted. The table below illustrates the actual and expected number of service retirements for males and females combined, split by service level.

| 2007-2022 Study Period | | |
|---|---|---|
| **Number of Service Retirements (2% at 60) — Expected** | | |
| | **Actual** | **Expected** | **Actual / Expected** |
| Less than 25 Years of Service | 79,275 | 67,591 | 117% |
| 25 to <30 Years of Service | 30,046 | 28,211 | 107% |
| 30 Years or More of Service | 60,341 | 57,188 | 106% |
| Total | 169,662 | 152,989 | 111% |

**Results: 2% at 62 Members**

There is currently only sufficient data to study service retirement rates for 2% at 62 members with less than 10 years of service. We expect 2% at 62 members will have different retirement patterns than the 2% at 60 members due to lower benefit percentages and less generous provisions (e.g., no career bonus, longevity, or one-year final compensation), although it is difficult to estimate at this point. There may still be some correlation with service, where members with more years of service have a higher probability of retirement; however, we would not expect the differences at 25 and 30 years of service to be as significant.

The following table shows the results for 2% at 62 members. Note that results are based on the most recent five years, as there was no statistically significant experience for this group prior to 2017.

| **2017-2022 Study Period** | | | |
|---|---|---|---|
| **Number of Service Retirements (2% at 62) -- Expected** | | | |
| | **Actual** | **Expected** | **Actual / Expected** |
| 5 to 9 Years of Service | 223 | 171 | 130% |

**Recommendation: 2% at 60 Members**

We are recommending increases to the retirement rates for members for most age and service groups. We recommend continuing the current approach which sets retirement rates based on five-year bands of service with additional breakpoints for those with over 25 years of service. Specifically, a separate set of rates is assumed for members with 5-9 years of service, 10-14 years of service, 15-19 years of service, 20-24 years of service, 25 years of service, 26-29 years of service, 30 years of service, and 31 or more years of service. We find this breakdown continues to reflect the actual experience. The only exception is that we did not see a meaningful difference in the last two service groups, so we are recommending they be combined as a service group with 30 or more years of service. The proposed rates are shown in Tables A-1.3a to A-1.3b.

As illustrated in the following graphs, we have moved proposed rates close to the actual experience given the long period of study. A comparison of the actual and proposed retirements under the recommended assumptions is shown in the table below.

| **2007-2022 Study Period** | | | |
|---|---|---|---|
| **Number of Service Retirements (2% at 60) — Proposed** | | | |
| | **Actual** | **Proposed** | **Actual / Proposed** |
| Less than 25 Years of Service | 79,275 | 77,449 | 102% |
| 25 to <30 Years of Service | 30,046 | 29,242 | 103% |
| 30 Years or More of Service | 60,341 | 59,114 | 102% |
| Total | 169,662 | 165,805 | 102% |

## Recommendation: 2% at 62 Members

The current assumptions assume the 2% at 62 service retirement rates are a certain percentage of the 2% at 60 rates based on the specific age and service combination. We recommend continuing this approach with no changes to the percentage adjustments. Note that because the proposed rates for the 5-to-9 years-of-service group increased for the 2% at 60 members, this resulted in an increase in the proposed rates for the 2% at 62 group. This proposed change is reflected in the following table. The detailed proposed rates are shown in Tables A-1.3c to A-1.3d.

| 2017-2022 Study Period | | | |
|---|---|---|---|
| **Number of Service Retirements (2% at 62) -- Proposed** | | | |
| | **Actual** | **Proposed** | **Actual / Proposed** |
| 5 to 9 Years of Service | 223 | 212 | 105% |

## Recommendation: 1990 Structure

The current service retirement rates for calculations under the 1990 Structure are based on the experience prior to 2001 when the 1990 Structure benefit provisions applied, but these rates were adjusted with the last experience study to be consistent with methodology changes made to other service retirement assumptions to reflect the impact of credited service. We continue to believe that maintaining separate retirement rates for the 1990 Structure benefits is appropriate. Our intent is for the 1990 Structure service retirement rates to stay constant; however, we are recommending additional modifications this year. Similar to the changes with the last study, the proposed modifications are to ensure consistency with changes in methodology used in this study for analyzing other service retirement assumptions. The proposed rates are shown in Tables A-1.3e to A-1.3f. The proposed retirement rates include the combining of rates for service years 20 through 29 and reflect an overall increase in the retirement rates, primarily at lower levels of service.

**Exhibit 7-1**
**Service Retirement Rates (2% at 60 Members)**
**Males – Less than 25 Years of Service**
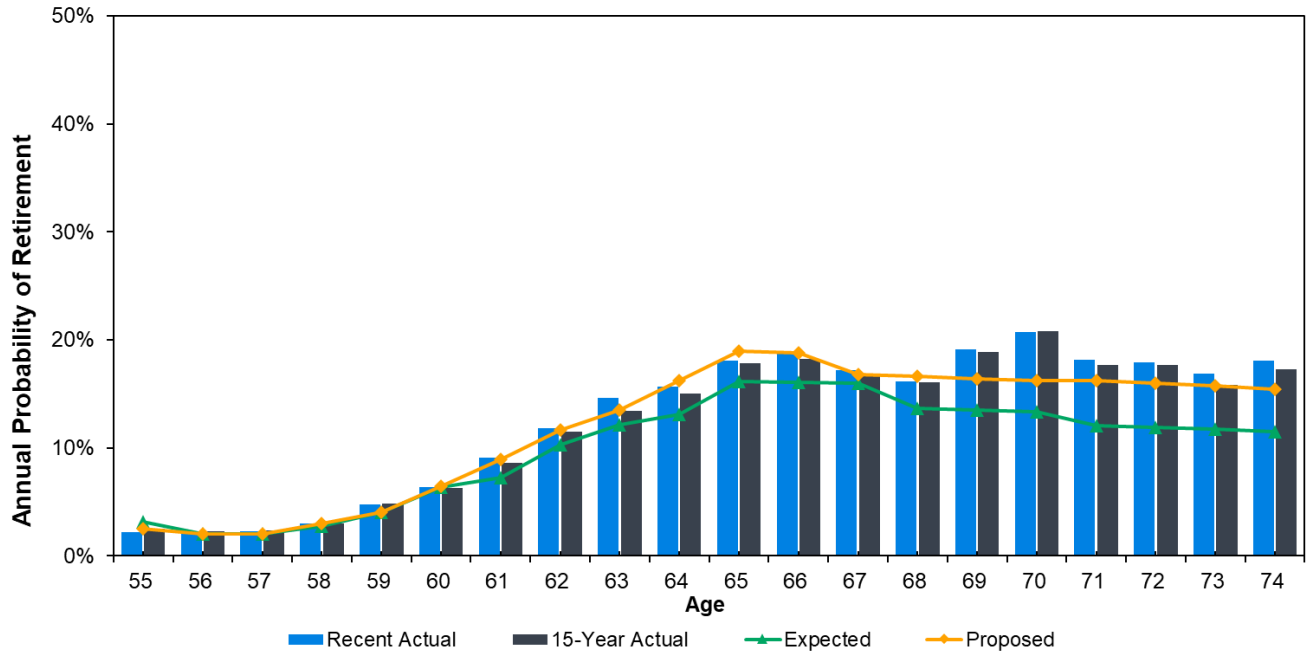


**2007-2022 Study Period**
**Service Retirement Summary (Ages 55-74)**

| <25 Years of Svc | Expected | Actual | Proposed |
|---|---|---|---|
| Total Count | 17,580 | 20,951 | 20,037 |
| Actual / Expected | 119% | | 105% |

**Exhibit 7-2**
**Service Retirement Rates (2% at 60 Members)**
**Females – Less than 25 Years of Service**
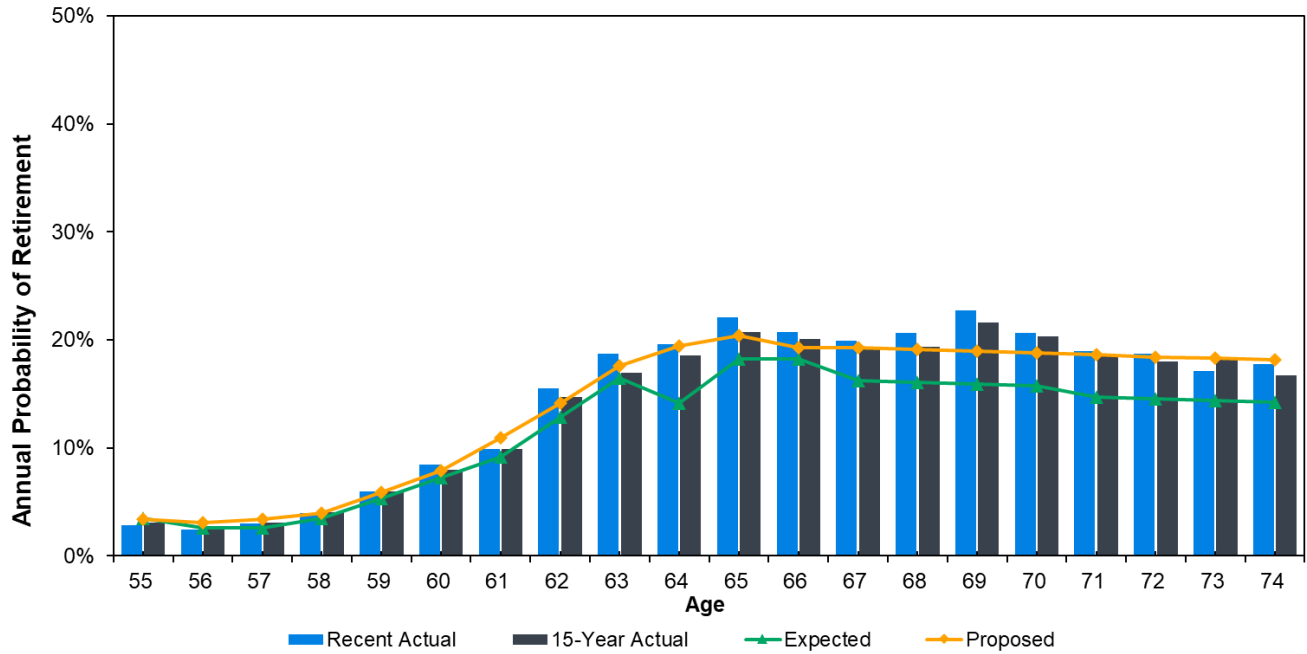


**2007-2022 Study Period**
**Service Retirement Summary (Ages 55-74)**

| <25 Years of Svc | Expected | Actual | Proposed |
|---|---|---|---|
| Total Count | 50,011 | 58,324 | 57,412 |
| Actual / Expected | 117% | | 102% |

**Exhibit 7-3**
**Service Retirement Rates (2% at 60 Members)**
**Males – 25 to 30 Years of Service**
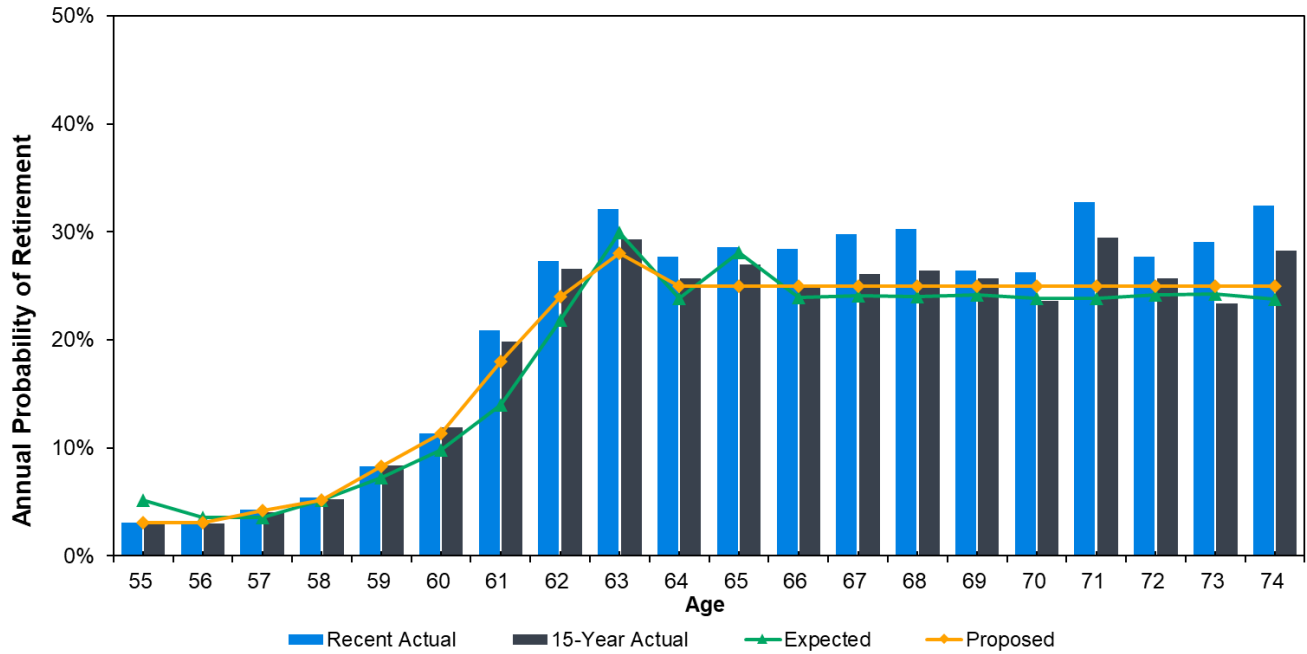


**2007-2022 Study Period**
**Service Retirement Summary (Ages 55-74)**

| 25 to 30 Yrs of Svc | Expected | Actual | Proposed |
|---|---|---|---|
| Total Count | 7,426 | 7,988 | 7,653 |
| Actual / Expected | 108% | | 104% |

**Exhibit 7-4**
**Service Retirement Rates (2% at 60 Members)**
**Females – 25 to 30 Years of Service**
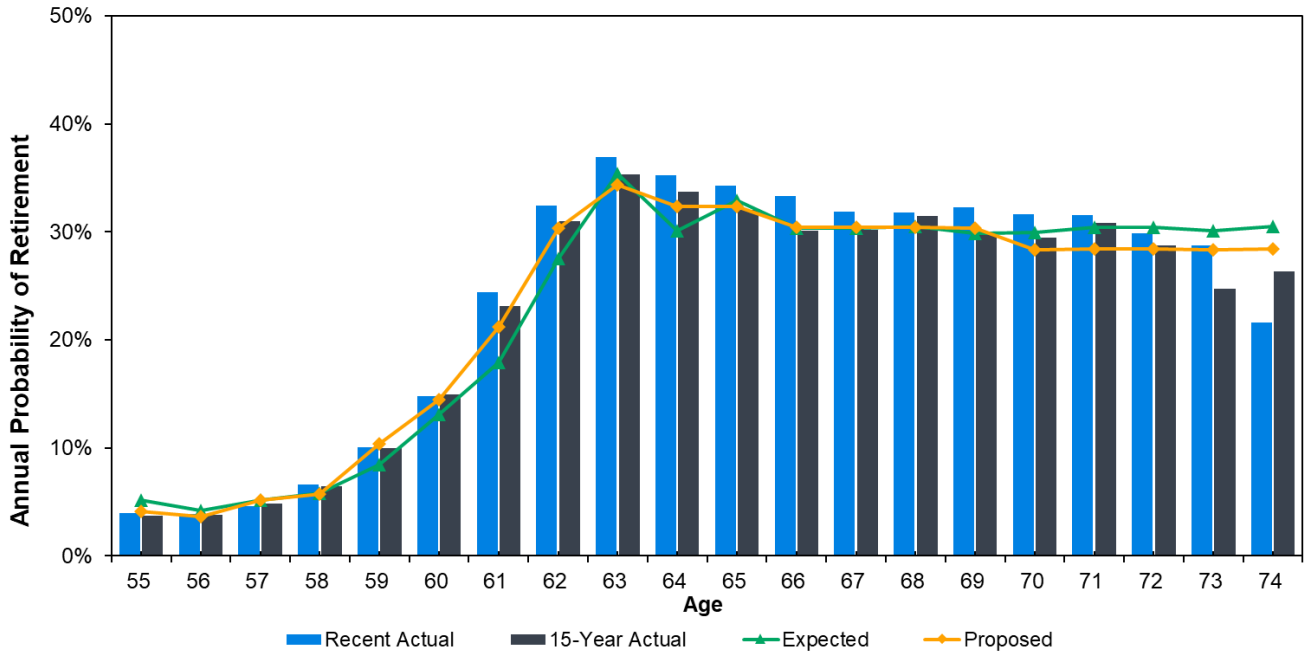


**2007-2022 Study Period**
**Service Retirement Summary (Ages 55-74)**

| 25 to 30 Yrs of Svc | Expected | Actual | Proposed |
|---|---|---|---|
| Total Count | 20,784 | 22,058 | 21,589 |
| Actual / Expected | 106% | | 102% |

**Exhibit 7-5**
**Service Retirement Rates (2% at 60 Members)**
**Males – 30 or more Years of Service**
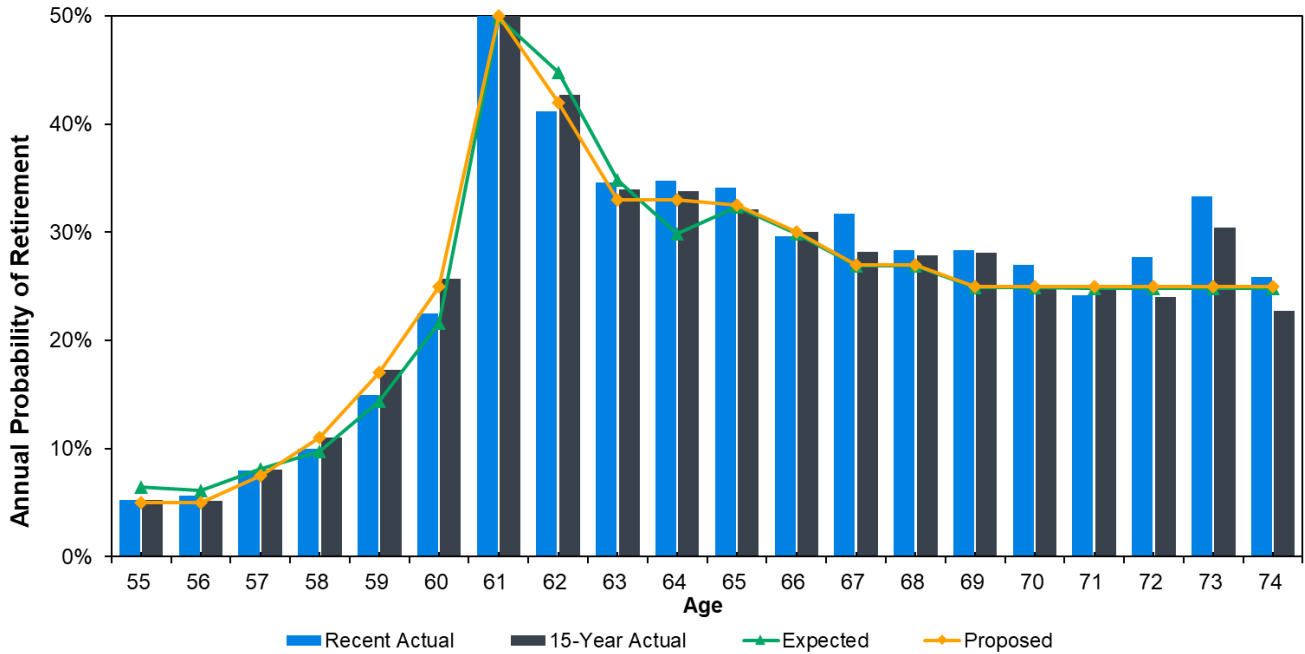


**2007-2022 Study Period**
**Service Retirement Summary (Ages 50-74)**

| 30 Years & Up | Expected | Actual | Proposed |
|---|---|---|---|
| Total Count | 19,400 | 20,764 | 20,040 |
| Actual / Expected | 107% | | 104% |

**Exhibit 7-6**
**Service Retirement Rates (2% at 60 Members)**
**Females – 30 or more Years of Service**
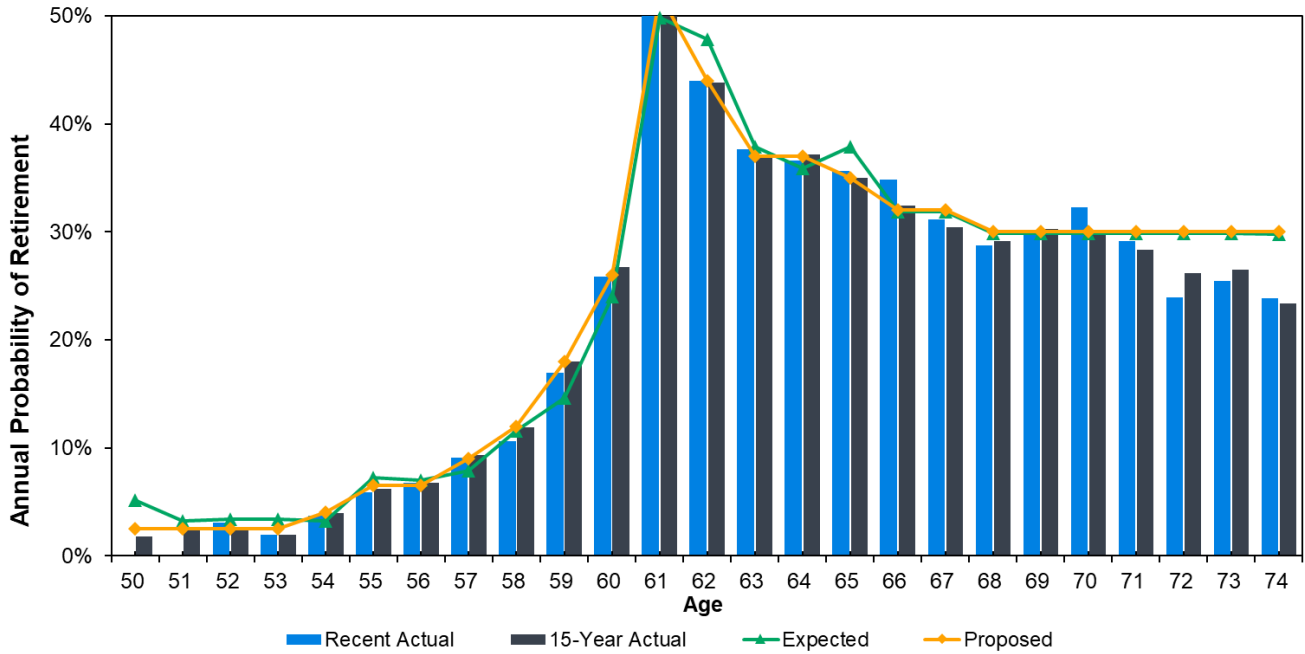


**2007-2022 Study Period**
**Service Retirement Summary (Ages 50-74)**

| 30 Years & Up | Expected | Actual | Proposed |
|---|---|---|---|
| Total Count | 37,788 | 39,577 | 39,074 |
| Actual / Expected | 105% | | 101% |

**Exhibit 7-7**
**Service Retirement Rates (2% at 62 Members)**
**Males – 5 to 9 Years of Service**
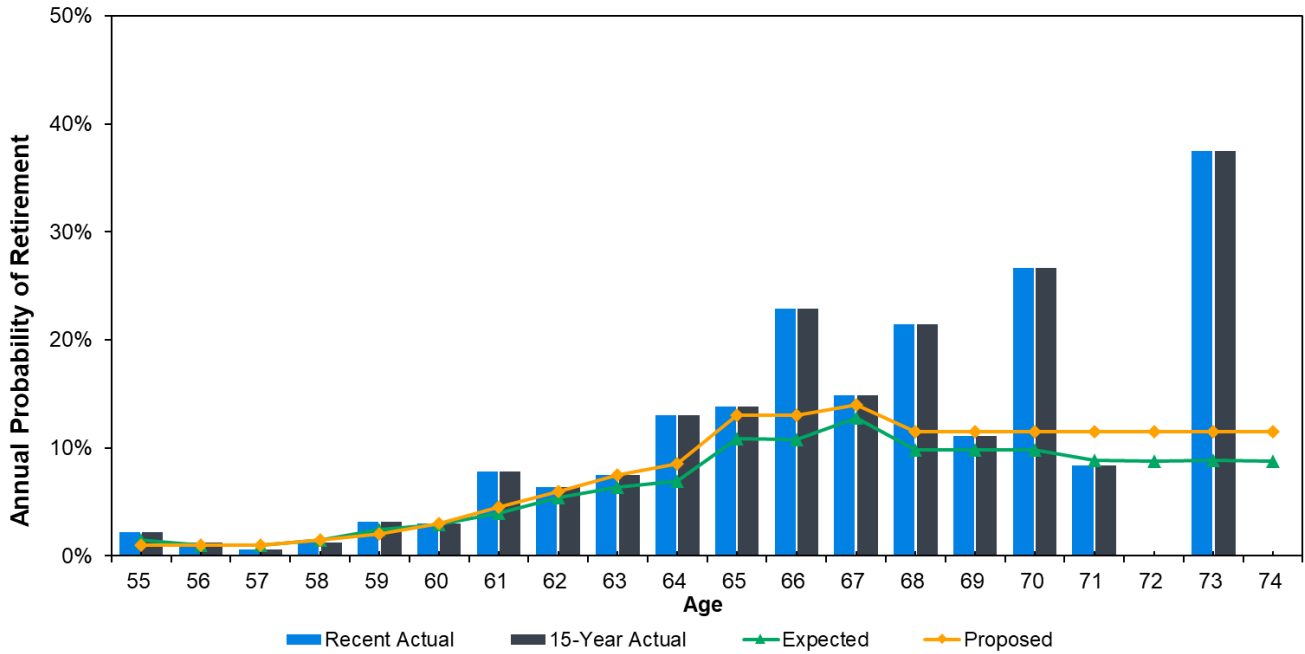


**2017-2022 Study Period**
**Service Retirement Summary (Ages 50-74)**

| 5 to 9 Years of Svc | Expected | Actual | Proposed |
|---|---|---|---|
| Total Count | 62 | 90 | 69 |
| Actual / Expected | 145% | | 131% |

**Exhibit 7-8**
**Service Retirement Rates (2% at 62 Members)**
**Females – 5 to 9 Years of Service**
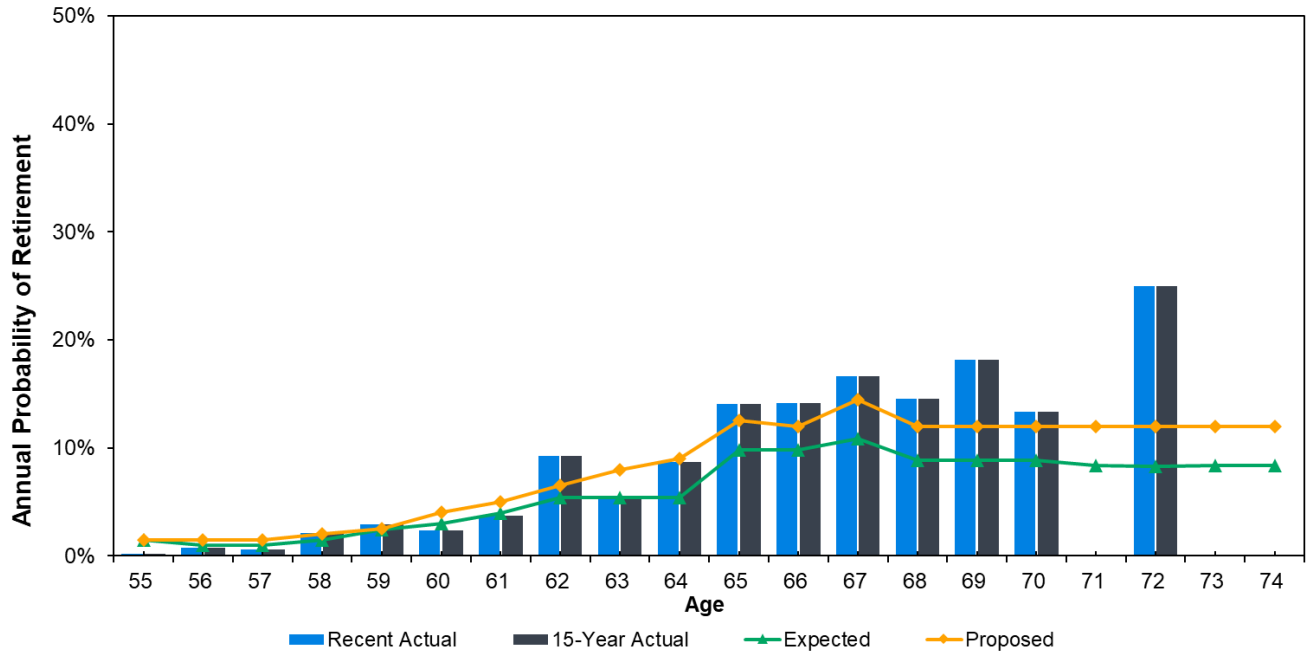


**2017-2022 Study Period**
**Service Retirement Summary (Ages 50-74)**

| 5 to 9 Years of Svc | Expected | Actual | Proposed |
|---|---|---|---|
| Total Count | 109 | 133 | 143 |
| Actual / Expected | 122% | | 93% |

## 8. Disability Retirement

CalSTRS allows a member to start receiving benefits prior to eligibility for service retirement if they become disabled. Rates of disability are studied separately for Coverage A and Coverage B members due to the different benefit provisions.

### Results

The following table shows the actual versus expected number of disabilities for Coverage A and Coverage B males and females for the 2007-2022 study period. In all categories other than female Coverage A, there were fewer disabilities than expected. Actual disability retirements reflect both members who went from active status to disability retirement and those who moved from inactive status to disability retirement.

| Actual vs. Expected Disability Retirements | | |
|---|---|---|
| **Coverage A** | | |
| | Actual | Expected | Actual / Expected |
| Male | 261 | 292 | 90% |
| Female | 842 | 833 | 101% |
| Total | 1,103 | 1,125 | 98% |
| **Coverage B** | | |
| | Actual | Expected | Actual / Expected |
| Male | 1,435 | 1,914 | 75% |
| Female | 4,318 | 5,103 | 85% |
| Total | 5,753 | 7,016 | 82% |

### Recommendation

We are recommending decreasing the rates of disability for Coverage B members. The following table shows the actual versus proposed number of disabilities for the 2007-2022 study period. The proposed rates are shown in Table A-1.4.

| Actual vs. Proposed Disability Retirements | | |
|---|---|---|
| **Coverage A** | | |
| | Actual | Proposed | Actual / Proposed |
| Male | 261 | 292 | 90% |
| Female | 842 | 833 | 101% |
| Total | 1,103 | 1,125 | 98% |
| **Coverage B** | | |
| | Actual | Proposed | Actual / Proposed |
| Male | 1,435 | 1,567 | 92% |
| Female | 4,318 | 4,749 | 91% |
| Total | 5,753 | 6,316 | 91% |

## 9. Other Terminations of Employment (Termination)

This section of the report summarizes the results of our study of terminations of employment for reasons other than death, service retirement, or disability. Rates of termination vary by years of elapsed service (the greater the years of service, the less likely a member is to terminate employment) and gender.

### Factors Affecting Termination Rates

We continue to find that service level is the single greatest factor affecting rates of termination. Reflecting this, the current assumptions are based on elapsed service (years since the member joined CalSTRS). The results of the analysis are weighted by credited service, which differs from elapsed service for members who have worked part-time or had a break in service, as we have found that members working full-time for their entire career have lower termination rates than the part-time group (those members who have significantly less credited service than elapsed service).

Additional analysis was done on a compensation and credited service-weighted basis, but the results were not materially different than the credited service-weighted basis; therefore we used a credited-service weighted approach in our analysis.

### Results

Overall, the actual number of terminations was less than expected for the 2007-2022 study period, as shown in the following table. Note that the results are weighted by credited service.

| Actual vs. Expected Terminations[1] | | | |
|---|---|---|---|
| | Actual | Expected | Actual / Expected |
| Males | 172,689 | 180,132 | 96% |
| Females | 403,112 | 426,819 | 94% |
| Total | 575,801 | 606,952 | 95% |

*1. Weighted by credited service. Excludes retirement-eligible members.*

Note that we exclude retirement-eligible members from the study of non-retirement terminations. Additionally, we reduce the number of terminations by any rehires at the corresponding service level.

**Recommendation**

The results of the study are shown in Exhibits 9-1 and 9-2 with the proposed new termination rates, which are lower than the current rates. We are recommending the reduced rates to reflect recent experience. In making this recommendation, we also considered that members working full-time for their entire career have lower termination rates than those who have worked part-time or previously had a break in their service. Since a full-time member has greater credited service than a part-time member at the same level of elapsed service, full-time members will have a relatively greater impact on the actuarial obligation. Therefore, we gave greater weight to the full-time service group who have lower rates of termination to better reflect their impact on the actuarial obligation. The following table summarizes these results for the 2007-2022 study period. The proposed rates are shown in Table A-1.5.

| Actual vs. Proposed Terminations[1] | | |
|---|---|---|
| | Actual | Proposed | Actual / Proposed |
| Males | 172,689 | 177,096 | 98% |
| Females | 403,112 | 406,708 | 99% |
| Total | 575,801 | 583,804 | 99% |

*1. Weighted by credited service. Excludes retirement-eligible members.*

**Exhibit 9-1**
**Termination by Years of Elapsed Service – Males**
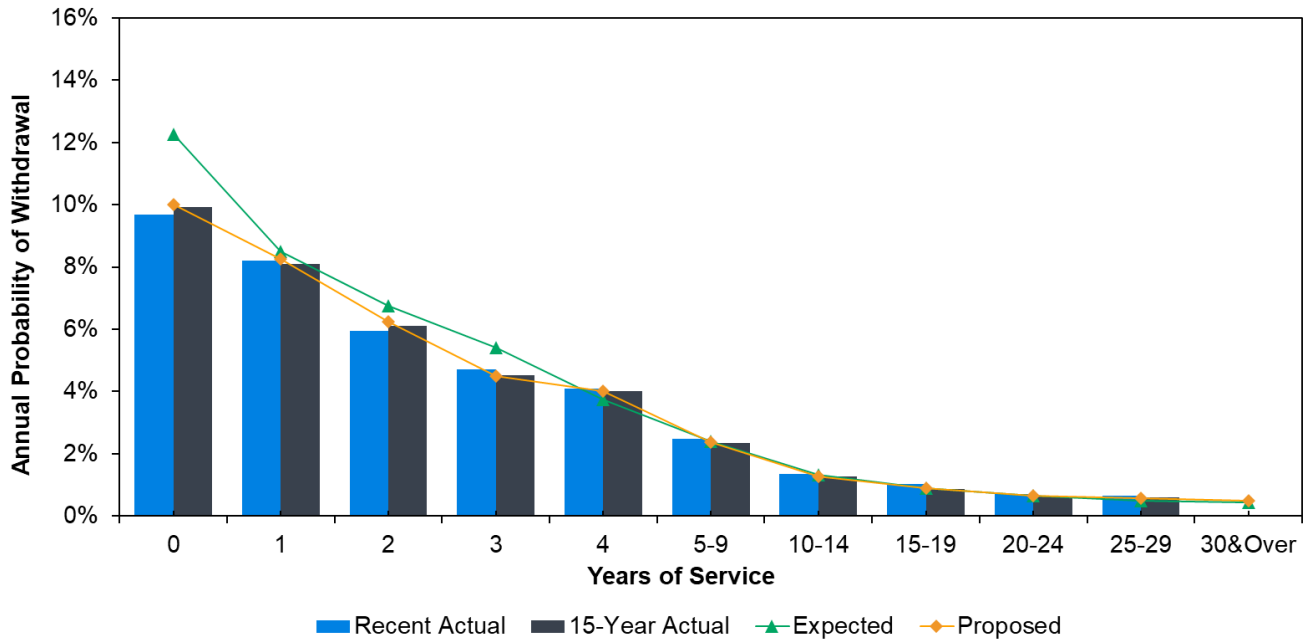


**2007-2022 Study Period**

|  | Expected | Actual | Proposed |
|---|---|---|---|
| Total[1] | 180,132 | 172,689 | 177,096 |
| Actual / Expected | 96% |  | 98% |

*1. Excludes retirement-eligible members. Amounts shown represent aggregate years of credited service of active members who terminated during the study period.*

**Exhibit 9-2**
**Termination by Years of Elapsed Service – Females**
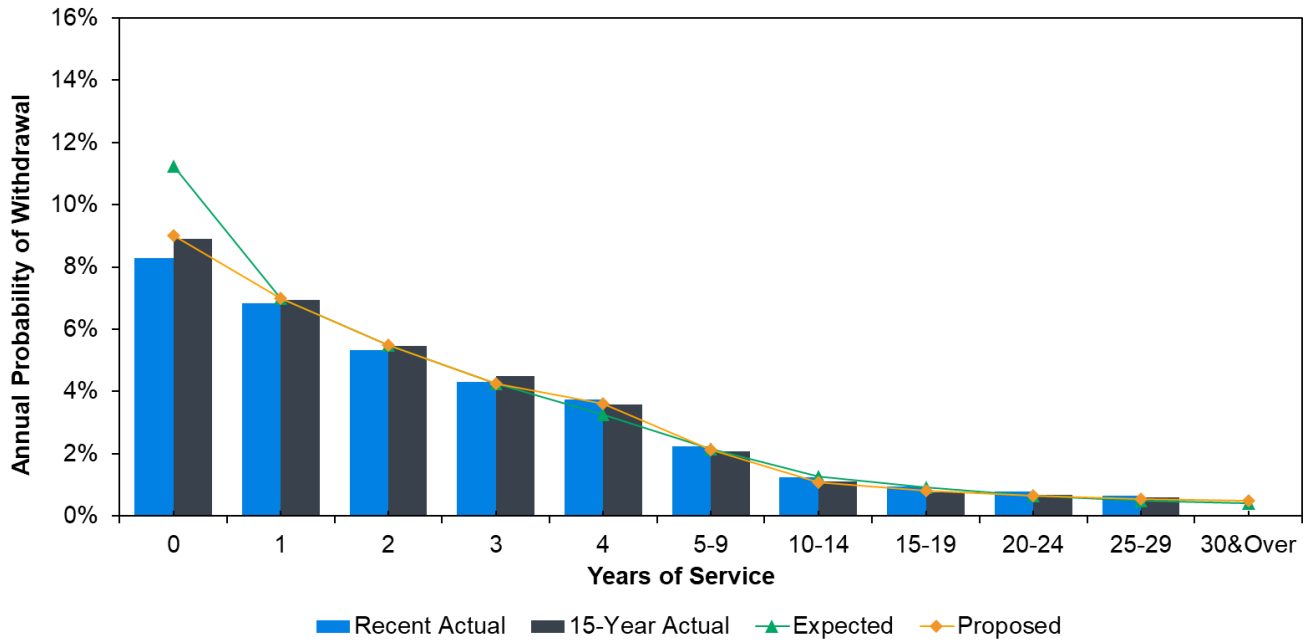


**2007-2022 Study Period**

|  | Expected | Actual | Proposed |
|---|---|---|---|
| Total[1] | 426,819 | 403,112 | 406,708 |
| Actual / Expected | 94% |  | 99% |

*1. Excludes retirement-eligible members. Amounts shown represent aggregate years of credited service of active members who terminated during the study period.*

## 10. Probability of Refund Upon Vested Termination

This section of the report discusses the probabilities at which employees elect a refund of their contributions upon termination of service. It only considers vested members who are not yet eligible for service retirement. Under the current assumptions, members who terminate with fewer years of service have a greater probability of electing to withdraw their contributions. All non-vested members are assumed to take a refund at termination. Note that the assumed probability of refund varies by entry age group.

**Results**

The following table shows the actual and expected number of refunds among vested members who terminated employment during the study period, split by entry age group. Members with higher entry ages (who are closer to retirement at a given level of service) have a lower probability of refund. In aggregate, the actual total number of refunds was 29% less than what the assumptions predicted for the 2007-2022 study period.

| Actual to Expected Number of Refunds | | | |
| --- | --- | --- | --- |
| Entry Age | Actual | Expected | Ratio |
| 20 - 24 | 4,854 | 6,471 | 75% |
| 25 - 29 | 5,801 | 7,760 | 75% |
| 30 - 34 | 2,509 | 3,726 | 67% |
| 35 - 39 | 1,330 | 2,072 | 64% |
| 40 - 44 | 584 | 1,085 | 54% |
| 45 & Up | 176 | 260 | 68% |
| Total | 15,254 | 21,374 | 71% |

**Recommendation**

Based on the experience, we are recommending continuing to use a unisex table for the assumed rates at which members withdraw their contributions from CalSTRS. The proposed rates reflect reductions in the overall probability of refund. The results based on the proposed assumptions are shown below for the 2007-2022 study period. The proposed rates are shown in Table A-1.6.

| Actual to Proposed Number of Refunds | | | |
| --- | --- | --- | --- |
| Entry Age | Actual | Proposed | Ratio |
| 20 - 24 | 4,854 | 4,941 | 98% |
| 25 - 29 | 5,801 | 5,487 | 106% |
| 30 - 34 | 2,509 | 2,458 | 102% |
| 35 - 39 | 1,330 | 1,437 | 93% |
| 40 - 44 | 584 | 653 | 89% |
| 45 & Up | 176 | 172 | 103% |
| Total | 15,254 | 15,148 | 101% |

**Exhibit 10-1**
**Probability of Refund[1]**
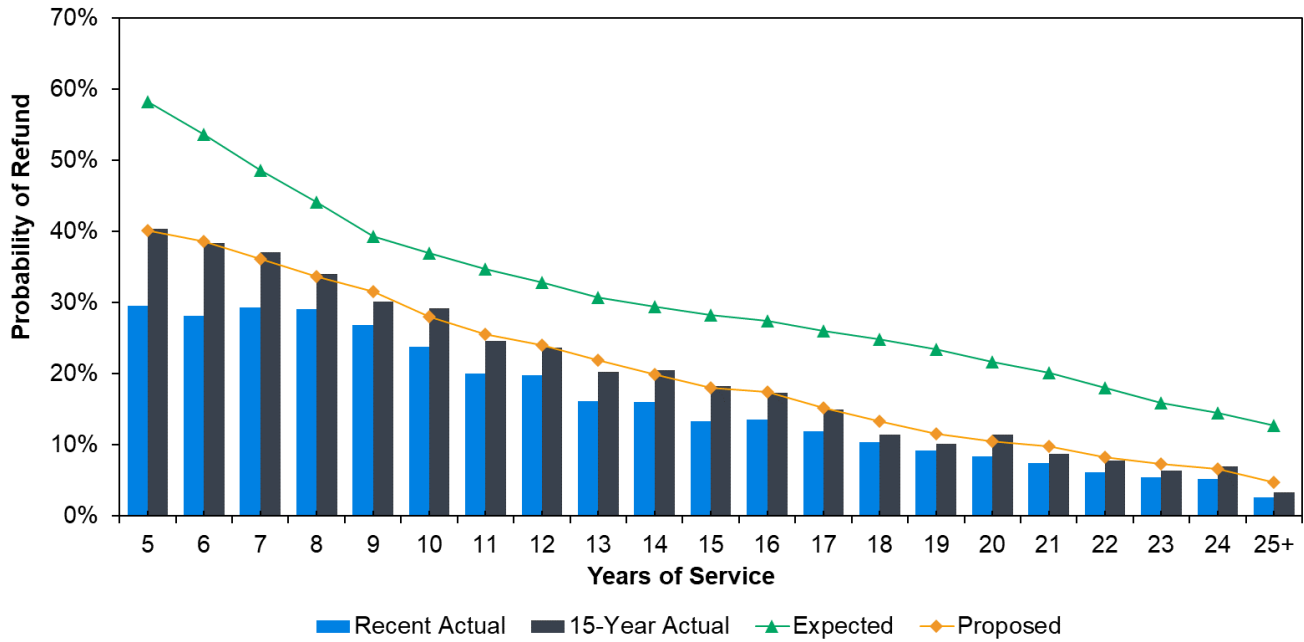


**2007-2022 Study Period**

|                   | Expected | Actual | Proposed |
|-------------------|----------|--------|----------|
| Total             | 21,374   | 15,254 | 15,148   |
| Actual / Expected | 71%      |        | 101%     |

*1. Excludes retirement-eligible members.*

## 11. Assumptions Specific to the MPP Program

This section of the report deals with the MPP Program assumptions. For purposes of this study, experience from the eight-year period June 30, 2014 to June 30, 2022 was included. Table A-4.1 in Appendix A shows a summary of the current and recommended assumptions for the MPP Program.

**Investment Return Assumption / Discount Rate**

For the funding valuation, we recommend that CalSTRS continue to use the same investment return assumption as for the DB Program valuation to estimate the present value of the MPP Program liabilities.

For GASB 74/75 reporting, we recommend CalSTRS continue to use a municipal bond index to discount the projected MPP Program benefit payments. For this purpose, we recommend continued use of the Bond Buyer 20-Bond GO Index which consists of 20 general obligation bonds that mature in 20 years. This index is consistent with GASB parameters.

**MPP Program Participation Rates**

Table A-4.4 in Appendix A presents the recommended participation (enrollment) assumptions to be used in the June 30, 2023 MPP Program valuation. Based on a review of the actual enrollment experience over the last eight years, we are recommending no changes to the rates used in the 2023 valuation. Exhibit 11-1 shows the results of our experience analysis.

Note the participation rates include a small margin for members who were not retired on June 30, 2012 but may elect in the future to backdate their retirement date under Education Code Section 24204 and potentially become eligible for benefits under the MPP Program.

**Medicare Premium Trend Rates**

We have also reviewed historical and predicted increases to the Medicare Part A and Part B premiums. This analysis takes into account projections from the 2023 Annual Report of the Boards of Trustees of the Federal Hospital Insurance Trust Fund and the Federal Supplementary Medical Insurance Trust Fund. Based on these projections, we recommend a trend assumption for Part A premiums that varies by year. It is approximately equivalent to assuming a fixed 5.0% increase each year. For Part B premiums, we recommend a trend assumption that varies by year. It is approximately equivalent to assuming a fixed 6.5% increase each year.

The following table shows the recommended trend rates:

| Trend Assumption | | |
| --- | --- | --- |
| | Assumed Annual Increase | |
| Years[1] | Part A | Part B |
| 2023 - 2032 | 5.40% | 6.62% |
| 2033 - 2042 | 4.93% | 5.59% |
| 2043 - 2052 | 4.32% | 4.54% |
| 2053 & Later | 4.09% | 4.26% |

*1. Trend rates indicate medical inflation in the specific valuation year and therefore affect the premiums for the following valuation year. For example, the projected 2024-2025 premium is the 2023-2024 premium increased by the assumed 2023-2024 trend rate.*

Note that for the valuation year July 1, 2023 to June 30, 2024, we will use six months of the actual Part A premium rates for the calendar year 2023 ($506/month) and six months from 2024 ($505/month). Estimates for future valuation years are based on that average increased by the applicable trend assumption. We have assumed all members who retire after December 31, 2000 and participate in the MPP Program will be required to pay the full premium amount. This retains a small level of conservatism since some members may qualify for a reduced (45% reduction) Part A premium, due to their employment history or their spouse's employment history, which would mean reduced payments from the Program.

Similarly, for the valuation year July 1, 2023 to June 30, 2024, we will use the average of the actual Part B monthly premium rates for the calendar years 2023 ($164.90/month) and 2024 ($174.70/month). Note that we have not adjusted for retirees whose income (or joint income) exceeded the 2023 income threshold, as the Part B penalty amount paid by CalSTRS depends on the base Part B amount. Additionally, we have assumed that the participating retirees are not eligible for the "hold harmless" provision that currently may limit the Part B premium amount.

## Exhibit 11-1
## Study of Actual Part A Enrollment Rates

| | Enrollees | Total Retirees[1] | Enrollment Percent | | |
| --- | --- | --- | --- | --- | --- |
| | | | Actual | Expected | Proposed |
| Under 65 Retirees (All years) | 469 | 25,586 | 1.83% | 2.00% | 2.00% |
| Over 65 Retirees (non Currently Enrolled) at Age: | | | | | |
| 65 | 59 | 35,742 | 0.17% | 0.20% | 0.20% |
| 66 | 12 | 56,907 | 0.02% | 0.02% | 0.02% |
| 67 | 10 | 70,324 | 0.01% | 0.02% | 0.02% |
| 68 | 7 | 76,851 | 0.01% | 0.02% | 0.02% |
| 69 | 5 | 75,137 | 0.01% | 0.02% | 0.02% |
| 70-74 | 16 | 372,445 | 0.00% | 0.02% | 0.02% |
| 75-84[2] | 13 | 606,753 | 0.00% | 0.02% | 0.02% |
| All Ages | 591 | 1,319,745 | 0.04% | 0.06% | 0.06% |

*1. Includes only those retirees hired prior to April of 1986, retired prior to July 1, 2012, and attained age 65 or older during study period.*

*2. Ages 85 and above are assumed to have 0.00% enrollment.*

## Appendix A-1    Defined Benefit Program Actuarial Methods and Assumptions

(Proposed changes shown in <mark>Green</mark>. Note that if all rates in a table are proposed to be changed, the label is highlighted rather than the individual rates.)

This section of the report discloses the actuarial methods and assumptions used in this Actuarial Valuation. These methods and assumptions have been chosen on the basis of recent experience of the DB Program and on current expectations as to future economic conditions.

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

**Actuarial Cost Method**

Entry Age Cost Method:

The accruing costs of all benefits with future accruals are measured by the Entry Age Cost Method. For measurements where no future service is earned (i.e., those with service fixed as of June 30, 2014), the Actuarial Obligation uses the Projected Unit Credit Cost Method. The projected revenue in excess of the Normal Cost rate is tested for sufficiency to amortize the Unfunded Actuarial Obligation calculated under the applicable cost method. Additional details of the amortization of the Unfunded Actuarial Obligation are shown in the Amortization Method subsection following.

The actuarial present value of projected benefits for each individual member included in the valuation is allocated on a level basis over the earnings of the individual between entry age and assumed exit ages. The portion of this actuarial present value allocated to a valuation year is called the Normal Cost. The Normal Cost is based on the respective benefit structures. For projection purposes, the Normal Cost Rate is assumed to increase by a relative 0.12% per year to reflect an assumed gradual increase in life expectancies due to generational mortality. The portion of this actuarial present value not provided for at a valuation date by the actuarial present value of future Normal Costs is called the Actuarial Obligation. The excess of the Actuarial Obligation over the Actuarial Value of Assets is called the Unfunded Actuarial Obligation. If the Actuarial Value of Assets exceeds the Actuarial Obligation, the difference is called the Actuarial Surplus.

Entry Age:

The ages at entry of future active members are assumed to average the same as the entry ages of the present active members they replace. If the number of active members should increase (or decrease), it is further assumed that the average entry age of the larger (or smaller) group will be the same, from an actuarial standpoint, as that of the present active group. Under these assumptions, the Normal Cost Rate will not vary significantly due to the termination of the present active membership, or with an expansion or contraction of the active membership.

Entry age is determined as age at membership date.

Projected Unit Credit (PUC) Cost Method:

This cost method is used for calculations of the Actuarial Obligation where there are no future service accruals after 2014. Under the PUC method, the actuarial present value of projected benefits for each individual member included in the valuation is determined based on the current service and salary projected to the age the member leaves active employment. The Normal Cost is $0 since no benefits are being earned.

## Asset Valuation Method

The assets are valued using a method that delays recognition of investment gains or losses. The expected actuarial value is the prior year's actuarial value increased with net cash flow of funds, and all increased with interest during the past year at the expected investment return assumption. One-third of the difference between the expected Actuarial Value of Assets and the Fair Market Value of Assets is added to the expected Actuarial Value of Assets to arrive at the Actuarial Value of Assets. The smoothing is applied on the total DB Program assets and then the SBMA is deducted to determine the net actuarial value for funding purposes. The Fair Market Value excludes the liability for "Net Pension and OPEB Obligation," which are pre-recognized administrative expenses, from the Fiduciary Net Position reported for accounting purposes.

## Amortization Method

Under the board's valuation policy, the Unfunded Actuarial Obligation (or Surplus Funding) is amortized as a percentage of the projected future payroll using the payroll growth assumption. The Unfunded Actuarial Obligation is divided into three pieces under the policy and funded as follows:

1. For the Unfunded Actuarial Obligation attributable to the 1990 Benefit Structure, the state funds this piece over a closed amortization period ending June 30, 2046. The state makes a supplemental contribution rate. A portion of the supplemental contribution rate is used to fund the 1990 Normal Cost deficit, which is the shortfall between the basic 16% contribution rate (8.00% state and 8.00% employer) under the 1990 Contribution Structure and the Normal Cost Rate associated with the 1990 Benefit Structure. The remaining portion of the state supplemental contribution rate is used to fund the 1990 UAO. Note that for the state, the payroll is the second prior fiscal year payroll, so state contributions made in fiscal year 2022-2023 will be based on the covered member compensation for fiscal year 2020-2021.

2. For the Unfunded Actuarial Obligation attributable to benefit changes after 1990 for service as of June 30, 2014, the employers fund the majority of this piece as an employer supplemental contribution over a closed amortization period ending June 30, 2046. This portion of the UAO is funded through the 0.25% employer sick leave contribution under EC 22951, the 2.017% state contribution rate under EC 22955, and an actuarially calculated employer supplemental contribution rate under EC 22950.5.

3. The Unfunded Actuarial Obligation not included in the other two pieces is referred to as the "Unallocated UAO." Under the valuation policy, a portion of each year's total contributions, equal to the Normal Cost of the New Benefits (those not a part of the 1990 Benefit Structure), is allocated to fund these benefits. Since the contribution is equal to the Normal Cost, there are no remaining contributions to pay down the Unallocated UAO, if any. Therefore, the Unallocated UAO will increase or decrease based on future experience.

## Actuarial Assumptions

The Actuarial Standards Board has adopted Actuarial Standard of Practice No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations*. This Standard provides guidance on selecting economic assumptions under defined benefit retirement programs such as the System. In our opinion, the economic assumptions have been developed in accordance with the Standard.

The Actuarial Standards Board has adopted Actuarial Standard of Practice No. 35, *Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations*. This Standard provides guidance on selecting demographic assumptions under defined benefit retirement programs such as the System. In our opinion, the demographic assumptions have been developed in accordance with the Standard.

The assumptions are intended to estimate the future experience of the members of the DB Program and of the System itself in areas that affect the projected benefit flow and anticipated investment earnings. Any variations in

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69

future experience from that expected from these assumptions will result in corresponding changes in estimated costs of the Program's benefits.

The demographic assumptions are listed in **Table A-1.1** and illustrated at selected ages and duration combinations in **Tables A-1.2 – A-1.7**.

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70

## Table A-1.1
## List of Major Valuation Assumptions

| Economic Assumptions | |
|---|---|
| Investment Return (net of investment and administrative expenses) | 7.00% |
| Interest on Member Accounts | 3.00% |
| Wage Growth | 3.50% |
| Payroll Growth | 3.25% |
| Inflation | 2.75% |

| Demographic Assumptions | | |
|---|---|---|
| Mortality[1] | | |
| Active - Male | 2023 CalSTRS Active Member Male | Table A-1.2 |
| Active - Female | 2023 CalSTRS Active Member Female | Table A-1.2 |
| Retired & Beneficiary - Male | 2023 CalSTRS Service Retired Male | Table A-1.2 |
| Retired & Beneficiary - Female | 2023 CalSTRS Service Retired Female | Table A-1.2 |
| Disabled - Male | 2023 CalSTRS Disabled Retiree Male | Table A-1.2 |
| Disabled - Female | 2023 CalSTRS Disabled Retiree Female (select rates in first three years for both Males and Females) | Table A-1.2 |
| Service Retirement | | Table A-1.3a-f |
| Disability Retirement | | Table A-1.4 |
| Withdrawal | | Table A-1.5 |
| Probability of Refund | | Table A-1.6 |
| Merit Salary Increases | | Table A-1.7 |
| Supplemental Assumptions | | Table A-1.8 |

*1. The mortality assumption uses a generational mortality approach with a base year of 2023. Projected improvement is based on the MP-2021 Ultimate Projection Scale. The combined base tables and projection scale specified contain a margin for expected future mortality improvement.*

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71

**Table A-1.2**
**Mortality as of June 30, 2023**

| Age | Active Members[1] Male | Active Members[1] Female | Projection Scale |
|---|---|---|---|
| 25 | 0.014% | 0.008% | 1.350% |
| 30 | 0.023 | 0.014 | 1.350 |
| 35 | 0.033 | 0.022 | 1.350 |
| 40 | 0.044 | 0.031 | 1.350 |
| 45 | 0.063 | 0.042 | 1.350 |
| 50 | 0.106 | 0.065 | 1.350 |
| 55 | 0.184 | 0.099 | 1.350 |
| 60 | 0.279 | 0.146 | 1.350 |
| 65 | 0.400 | 0.211 | 1.310 |

| Age | Retired Members and Beneficiaries[1] Male | Retired Members and Beneficiaries[1] Female | Disabled Members (After Year 3)[1] Male | Disabled Members (After Year 3)[1] Female | Projection Scale |
|---|---|---|---|---|---|
| 50 | 0.195% | 0.141% | 1.446% | 0.929% | 1.350% |
| 55 | 0.312 | 0.226 | 1.971 | 1.187 | 1.350 |
| 60 | 0.445 | 0.289 | 2.447 | 1.397 | 1.350 |
| 65 | 0.575 | 0.369 | 2.720 | 1.577 | 1.310 |
| 70 | 0.903 | 0.602 | 3.573 | 2.016 | 1.240 |
| 75 | 1.754 | 1.195 | 4.981 | 3.206 | 1.170 |
| 80 | 3.482 | 2.416 | 7.139 | 5.421 | 1.100 |
| 85 | 6.893 | 5.007 | 10.794 | 9.021 | 0.870 |
| 90 | 12.924 | 9.999 | 16.596 | 14.059 | 0.630 |
| 95 | 22.529 | 17.907 | 24.286 | 20.081 | 0.400 |

**Select minimum rates for disability:**

| | | |
|---|---|---|
| First year of disability | 4.0% | 4.0% |
| Second year of disability | 3.5 | 3.0 |
| Third year of disability | 3.0 | 2.0 |

*1. The mortality assumption uses a generational mortality approach with a base year of 2023. Projected improvement is based on the MP-2021 Ultimate Projection Scale. The rates shown reflect mortality improvement through June 30, 2023. The projection scale does not apply to the select minimum rates.*

**Table A-1.3a**
**Service Retirement – 2% at 60 Males**

| | DB Program - 2% at 60 Members - Males | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Years of Credited Service** | | | | | | |
| **Age** | **5-9 years** | **10-14 years** | **15-19 years** | **20-24 years** | **25 years** | **26-29 years** | **30 or More Years** |
| 50 | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 4.5% |
| 51 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.0 |
| 52 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.0 |
| 53 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.0 |
| 54 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.0 |
| 55 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 3.0 | 5.0 |
| 56 | 1.5 | 1.5 | 2.0 | 2.5 | 3.5 | 3.0 | 5.0 |
| 57 | 1.5 | 1.5 | 2.0 | 2.5 | 5.0 | 4.0 | 7.5 |
| 58 | 2.0 | 2.5 | 3.0 | 3.5 | 6.0 | 5.0 | 11.0 |
| 59 | 2.5 | 3.0 | 4.0 | 5.0 | 9.5 | 8.0 | 17.0 |
| 60 | 4.0 | 5.0 | 6.5 | 8.0 | 13.0 | 11.0 | 25.0 |
| 61 | 6.0 | 7.0 | 9.0 | 11.0 | 18.0 | 18.0 | 50.0 |
| 62 | 8.0 | 9.0 | 12.0 | 14.5 | 24.0 | 24.0 | 42.0 |
| 63 | 9.0 | 10.5 | 14.0 | 17.0 | 28.0 | 28.0 | 33.0 |
| 64 | 11.0 | 13.0 | 17.0 | 20.5 | 25.0 | 25.0 | 33.0 |
| 65 | 13.0 | 15.0 | 20.0 | 24.0 | 25.0 | 25.0 | 32.5 |
| 66 | 13.0 | 15.0 | 20.0 | 24.0 | 25.0 | 25.0 | 30.0 |
| 67 | 11.5 | 13.5 | 18.0 | 21.5 | 25.0 | 25.0 | 27.0 |
| 68 | 11.5 | 13.5 | 18.0 | 21.5 | 25.0 | 25.0 | 27.0 |
| 69 | 11.5 | 13.5 | 18.0 | 21.5 | 25.0 | 25.0 | 25.0 |
| 70 | 11.5 | 13.5 | 18.0 | 21.5 | 25.0 | 25.0 | 25.0 |
| 71 | 11.5 | 13.5 | 18.0 | 21.5 | 25.0 | 25.0 | 25.0 |
| 72 | 11.5 | 13.5 | 18.0 | 21.5 | 25.0 | 25.0 | 25.0 |
| 73 | 11.5 | 13.5 | 18.0 | 21.5 | 25.0 | 25.0 | 25.0 |
| 74 | 11.5 | 13.5 | 18.0 | 21.5 | 25.0 | 25.0 | 25.0 |
| 75+ | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

The assumptions shown above are for retirement from active status. It is assumed that all vested terminated 2% at 60 members retire at age 60.

## Table A-1.3b
## Service Retirement – 2% at 60 Females

| | DB Program - 2% at 60 Members - Females | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Years of Credited Service** | | | | | | |
| **Age** | **5-9 years** | **10-14 years** | **15-19 years** | **20-24 years** | **25 years** | **26-29 years** | **30 or More Years** |
| 50 | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 2.5% |
| 51 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.5 |
| 52 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.5 |
| 53 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.5 |
| 54 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 4.0 |
| 55 | 2.0 | 2.5 | 3.5 | 4.5 | 4.5 | 4.0 | 6.5 |
| 56 | 2.0 | 2.5 | 3.0 | 4.0 | 4.0 | 3.5 | 6.5 |
| 57 | 2.0 | 2.5 | 3.5 | 4.5 | 6.0 | 5.0 | 9.0 |
| 58 | 2.5 | 3.0 | 4.0 | 5.0 | 6.5 | 5.5 | 12.0 |
| 59 | 3.5 | 4.5 | 6.0 | 7.5 | 11.5 | 10.0 | 18.0 |
| 60 | 5.0 | 6.0 | 8.0 | 10.0 | 16.0 | 14.0 | 26.0 |
| 61 | 6.5 | 8.5 | 11.0 | 14.0 | 22.0 | 21.0 | 52.0 |
| 62 | 8.5 | 11.0 | 14.5 | 18.0 | 31.5 | 30.0 | 44.0 |
| 63 | 11.0 | 13.5 | 18.0 | 22.5 | 35.5 | 34.0 | 37.0 |
| 64 | 12.0 | 15.0 | 20.0 | 25.0 | 33.5 | 32.0 | 37.0 |
| 65 | 12.5 | 16.0 | 21.0 | 26.5 | 33.5 | 32.0 | 35.0 |
| 66 | 12.0 | 15.0 | 20.0 | 25.0 | 31.5 | 30.0 | 32.0 |
| 67 | 12.0 | 15.0 | 20.0 | 25.0 | 31.5 | 30.0 | 32.0 |
| 68 | 12.0 | 15.0 | 20.0 | 25.0 | 31.5 | 30.0 | 30.0 |
| 69 | 12.0 | 15.0 | 20.0 | 25.0 | 31.5 | 30.0 | 30.0 |
| 70 | 12.0 | 15.0 | 20.0 | 25.0 | 29.5 | 28.0 | 30.0 |
| 71 | 12.0 | 15.0 | 20.0 | 25.0 | 29.5 | 28.0 | 30.0 |
| 72 | 12.0 | 15.0 | 20.0 | 25.0 | 29.5 | 28.0 | 30.0 |
| 73 | 12.0 | 15.0 | 20.0 | 25.0 | 29.5 | 28.0 | 30.0 |
| 74 | 12.0 | 15.0 | 20.0 | 25.0 | 29.5 | 28.0 | 30.0 |
| 75+ | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

The assumptions shown above are for retirement from active status. It is assumed that all vested terminated 2% at 60 members retire at age 60.

**Table A-1.3c**
**Service Retirement – 2% at 62 Males**

| | DB Program - 2% at 62 Members - Males | | | | | |
|---|---|---|---|---|---|---|
| | **Years of Credited Service** | | | | | |
| **Age** | **5-9 years** | **10-14 years** | **15-19 years** | **20-24 years** | **25-29 years** | **30 or More Years** |
| 50 | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| 51 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 52 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 53 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 54 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 55 | 1.0 | 1.5 | 2.0 | 2.5 | 2.5 | 3.0 |
| 56 | 1.0 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 |
| 57 | 1.0 | 1.0 | 1.5 | 2.0 | 3.0 | 3.5 |
| 58 | 1.5 | 2.0 | 2.5 | 2.5 | 4.0 | 5.0 |
| 59 | 2.0 | 2.5 | 3.0 | 4.0 | 6.0 | 7.0 |
| 60 | 3.0 | 4.0 | 5.0 | 6.0 | 8.5 | 10.0 |
| 61 | 4.5 | 5.5 | 7.0 | 8.5 | 13.5 | 16.0 |
| 62 | 6.0 | 7.0 | 9.0 | 11.0 | 18.0 | 21.5 |
| 63 | 7.5 | 8.5 | 11.0 | 13.5 | 18.5 | 22.5 |
| 64 | 8.5 | 10.0 | 13.0 | 15.5 | 19.0 | 23.0 |
| 65 | 13.0 | 15.0 | 20.0 | 24.0 | 25.0 | 25.0 |
| 66 | 13.0 | 15.0 | 20.0 | 24.0 | 25.0 | 25.0 |
| 67 | 14.0 | 16.0 | 21.5 | 26.0 | 30.0 | 30.0 |
| 68 | 11.5 | 13.5 | 18.0 | 21.5 | 25.0 | 25.0 |
| 69 | 11.5 | 13.5 | 18.0 | 21.5 | 25.0 | 25.0 |
| 70 | 11.5 | 13.5 | 18.0 | 21.5 | 25.0 | 25.0 |
| 71 | 11.5 | 13.5 | 18.0 | 21.5 | 25.0 | 25.0 |
| 72 | 11.5 | 13.5 | 18.0 | 21.5 | 25.0 | 25.0 |
| 73 | 11.5 | 13.5 | 18.0 | 21.5 | 25.0 | 25.0 |
| 74 | 11.5 | 13.5 | 18.0 | 21.5 | 25.0 | 25.0 |
| 75 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

The assumptions shown above are for retirement from active status. It is assumed that all vested terminated 2% at 62 members retire at age 62.

**Table A-1.3d**
**Service Retirement – 2% at 62 Females**

| | DB Program - 2% at 62 Members - Females | | | | | |
|---|---|---|---|---|---|---|
| | **Years of Credited Service** | | | | | |
| **Age** | **5-9 years** | **10-14 years** | **15-19 years** | **20-24 years** | **25-29 years** | **30 or More Years** |
| 50 | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| 51 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 52 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 53 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 54 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 55 | 1.5 | 2.0 | 2.5 | 3.5 | 3.0 | 3.5 |
| 56 | 1.5 | 2.0 | 2.5 | 3.0 | 2.5 | 3.0 |
| 57 | 1.5 | 2.0 | 2.5 | 3.5 | 4.0 | 5.0 |
| 58 | 2.0 | 2.5 | 3.0 | 4.0 | 4.5 | 5.5 |
| 59 | 2.5 | 3.5 | 4.5 | 5.5 | 7.5 | 9.0 |
| 60 | 4.0 | 4.5 | 6.0 | 7.5 | 11.0 | 13.0 |
| 61 | 5.0 | 6.5 | 8.5 | 10.5 | 16.0 | 19.0 |
| 62 | 6.5 | 8.5 | 11.0 | 13.5 | 22.5 | 27.0 |
| 63 | 8.0 | 10.0 | 13.0 | 16.5 | 23.5 | 28.0 |
| 64 | 9.0 | 11.5 | 15.0 | 19.0 | 24.0 | 29.0 |
| 65 | 12.5 | 16.0 | 21.0 | 26.5 | 32.5 | 32.5 |
| 66 | 12.0 | 15.0 | 20.0 | 25.0 | 30.5 | 30.5 |
| 67 | 14.5 | 18.0 | 24.0 | 30.0 | 36.5 | 36.5 |
| 68 | 12.0 | 15.0 | 20.0 | 25.0 | 30.5 | 30.5 |
| 69 | 12.0 | 15.0 | 20.0 | 25.0 | 30.5 | 30.5 |
| 70 | 12.0 | 15.0 | 20.0 | 25.0 | 28.5 | 28.5 |
| 71 | 12.0 | 15.0 | 20.0 | 25.0 | 28.5 | 28.5 |
| 72 | 12.0 | 15.0 | 20.0 | 25.0 | 28.5 | 28.5 |
| 73 | 12.0 | 15.0 | 20.0 | 25.0 | 28.5 | 28.5 |
| 74 | 12.0 | 15.0 | 20.0 | 25.0 | 28.5 | 28.5 |
| 75 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

The assumptions shown above are for retirement from active status. It is assumed that all vested terminated 2% at 62 members retire at age 62.

**Table A-1.3e**
**Service Retirement – 1990 Benefit Structure Males**

| | DB Program - 1990 Structure - Males | | | | |
|---|---|---|---|---|---|
| | **Years of Credited Service** | | | | |
| **Age** | **5-9 years** | **10-14 years** | **15-19 years** | **20-29 years** | **30 or More Years** |
| 50 | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| 51 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 52 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 53 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 54 | 1.0 | 1.5 | 1.5 | 1.5 | 2.0 |
| 55 | 5.5 | 6.5 | 7.5 | 7.5 | 8.5 |
| 56 | 3.5 | 4.0 | 4.5 | 5.0 | 5.5 |
| 57 | 3.5 | 4.0 | 4.5 | 5.0 | 5.5 |
| 58 | 5.5 | 6.5 | 7.5 | 7.5 | 8.5 |
| 59 | 10.5 | 12.5 | 14.5 | 15.5 | 17.0 |
| 60 | 16.5 | 20.0 | 23.0 | 24.0 | 26.5 |
| 61 | 11.5 | 13.5 | 16.0 | 16.5 | 18.0 |
| 62 | 11.5 | 13.5 | 16.0 | 16.5 | 18.0 |
| 63 | 11.5 | 13.5 | 16.0 | 16.5 | 18.0 |
| 64 | 13.5 | 16.0 | 19.0 | 20.0 | 21.5 |
| 65 | 13.5 | 16.0 | 19.0 | 20.0 | 21.5 |
| 66 | 13.5 | 16.0 | 19.0 | 20.0 | 21.5 |
| 67 | 13.5 | 16.0 | 19.0 | 20.0 | 21.5 |
| 68 | 12.0 | 14.5 | 17.0 | 17.5 | 19.0 |
| 69 | 12.0 | 14.5 | 17.0 | 17.5 | 19.0 |
| 70+ | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

The assumptions shown above are for retirement from active status. It is assumed that all vested terminated members retire at age 60 under the 1990 Benefit Structure.

**Table A-1.3f**
**Service Retirement – 1990 Benefit Structure Females**

| | DB Program - 1990 Structure - Females | | | | |
|---|---|---|---|---|---|
| | **Years of Credited Service** | | | | |
| **Age** | **5-9 years** | **10-14 years** | **15-19 years** | **20-29 years** | **30 or More Years** |
| 50 | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| 51 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 52 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 53 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 54 | 1.0 | 1.5 | 1.5 | 1.5 | 2.0 |
| 55 | 5.5 | 6.5 | 7.5 | 7.5 | 8.5 |
| 56 | 3.5 | 4.0 | 4.5 | 5.0 | 5.5 |
| 57 | 3.5 | 4.0 | 4.5 | 5.0 | 5.5 |
| 58 | 5.5 | 6.5 | 7.5 | 7.5 | 8.5 |
| 59 | 10.5 | 12.5 | 14.5 | 15.5 | 17.0 |
| 60 | 16.5 | 20.0 | 23.0 | 24.0 | 26.5 |
| 61 | 11.5 | 13.5 | 16.0 | 16.5 | 18.0 |
| 62 | 11.5 | 13.5 | 16.0 | 16.5 | 18.0 |
| 63 | 11.5 | 13.5 | 16.0 | 16.5 | 18.0 |
| 64 | 13.5 | 16.0 | 19.0 | 20.0 | 21.5 |
| 65 | 13.5 | 16.0 | 19.0 | 20.0 | 21.5 |
| 66 | 13.5 | 16.0 | 19.0 | 20.0 | 21.5 |
| 67 | 13.5 | 16.0 | 19.0 | 20.0 | 21.5 |
| 68 | 12.0 | 14.5 | 17.0 | 17.5 | 19.0 |
| 69 | 12.0 | 14.5 | 17.0 | 17.5 | 19.0 |
| 70+ | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

The assumptions shown above are for retirement from active status. It is assumed that all vested terminated members retire at age 60 under the 1990 Benefit Structure.

**Table A-1.4**
**Disability Retirement**

| Coverage A | | |
| --- | --- | --- |
| **Age** | **Male** | **Female** |
| 25 | 0.015% | 0.015% |
| 30 | 0.025 | 0.025 |
| 35 | 0.040 | 0.050 |
| 40 | 0.065 | 0.075 |
| 45 | 0.090 | 0.090 |
| 50 | 0.130 | 0.180 |
| 55 | 0.170 | 0.225 |

| Coverage B | | |
| --- | --- | --- |
| **Age** | **Male** | **Female** |
| 25 | 0.010% | 0.015% |
| 30 | 0.010 | 0.015 |
| 35 | 0.020 | 0.030 |
| 40 | 0.040 | 0.055 |
| 45 | 0.070 | 0.095 |
| 50 | 0.105 | 0.165 |
| 55 | 0.200 | 0.270 |
| 60 | 0.275 | 0.305 |
| 65 | 0.305 | 0.325 |
| 70 | 0.305 | 0.325 |

<div align="center">

**Table A-1.5**
**Other Terminations of Employment (Withdrawal)**

| Year[1] | Male | Female |
|:---:|:---:|:---:|
| 0 | 10.00% | 9.00% |
| 1 | 8.25 | 7.00 |
| 2 | 6.25 | 5.50 |
| 3 | 4.50 | 4.25 |
| 4 | 4.00 | 3.60 |
| 5 | 3.10 | 3.00 |
| 6 | 2.70 | 2.50 |
| 7 | 2.35 | 2.00 |
| 8 | 2.00 | 1.70 |
| 9 | 1.80 | 1.50 |
| 10 | 1.60 | 1.35 |
| 11 | 1.40 | 1.20 |
| 12 | 1.30 | 1.10 |
| 13 | 1.20 | 1.00 |
| 14 | 1.10 | 0.90 |
| 15 | 1.00 | 0.90 |
| 16 | 0.95 | 0.85 |
| 17 | 0.90 | 0.85 |
| 18 | 0.85 | 0.80 |
| 19 | 0.80 | 0.75 |
| 20 | 0.75 | 0.75 |
| 21 | 0.70 | 0.70 |
| 22 | 0.65 | 0.65 |
| 23 | 0.60 | 0.60 |
| 24 | 0.60 | 0.60 |
| 25 | 0.60 | 0.60 |
| 26 | 0.55 | 0.55 |
| 27 | 0.55 | 0.55 |
| 28 | 0.55 | 0.55 |
| 29 | 0.50 | 0.50 |
| 30+ | 0.50 | 0.50 |

</div>

*1. Based on elapsed service since membership date.*

## Table A-1.6
## Probability of Refund

| Year[1] | Entry Ages | | | | | |
| --- | --- | --- | --- | --- | --- | --- |
| | Under 25 | 25-29 | 30-34 | 35-39 | 40-44 | 45 and Up |
| Under 5 | 100% | 100% | 100% | 100% | 100% | 100% |
| 5 | 44 | 42 | 39 | 36 | 30 | 29 |
| 6 | 42 | 40 | 37 | 34 | 28 | 27 |
| 7 | 40 | 38 | 35 | 32 | 25 | 24 |
| 8 | 37 | 35 | 32 | 29 | 21 | 20 |
| 9 | 35 | 33 | 30 | 27 | 18 | 17 |
| 10 | 32 | 29 | 26 | 23 | 13 | 12 |
| 11 | 29 | 26 | 24 | 21 | 11 | 10 |
| 12 | 27 | 24 | 22 | 19 | 9 | 8 |
| 13 | 25 | 22 | 20 | 17 | 7 | 6 |
| 14 | 23 | 20 | 18 | 15 | 5 | 4 |
| 15 | 21 | 18 | 16 | 13 | 3 | 2 |
| 16 | 20 | 17 | 15 | 12 | 2 | 1 |
| 17 | 18 | 15 | 13 | 10 | 0 | 0 |
| 18 | 16 | 13 | 11 | 8 | 0 | 0 |
| 19 | 14 | 11 | 9 | 6 | 0 | 0 |
| 20 | 13 | 10 | 8 | 5 | 0 | 0 |
| 21 | 12 | 9 | 7 | 4 | 0 | 0 |
| 22 | 10 | 8 | 6 | 3 | 0 | 0 |
| 23 | 9 | 7 | 5 | 2 | 0 | 0 |
| 24 | 8 | 6 | 4 | 1 | 0 | 0 |
| 25 | 6 | 4 | 2 | 0 | 0 | 0 |
| 26 | 5 | 3 | 1 | 0 | 0 | 0 |
| 27 | 4 | 2 | 0 | 0 | 0 | 0 |
| 28 | 3 | 1 | 0 | 0 | 0 | 0 |
| 29 | 2 | 0 | 0 | 0 | 0 | 0 |
| 30 | 1 | 0 | 0 | 0 | 0 | 0 |

*1. Assumption applied at time of assumed termination based on credited service. Members who terminate with less than five years of credited service are assumed to have 100% probability of refund.*

## Table A-1.7
## Merit Salary Increases[1]

| Year[2] | Entry Age - Annual Increase in Salaries Due to Merit | | | | | |
|---|---|---|---|---|---|---|
| | **Under 25** | **25-29** | **30-34** | **35-39** | **40-44** | **45 & up** |
| 0 | 8.0% | 7.5% | 7.0% | 6.5% | 6.0% | 5.5% |
| 1 | 7.0 | 6.5 | 6.0 | 5.5 | 5.0 | 4.5 |
| 2 | 6.3 | 5.8 | 5.3 | 5.0 | 4.5 | 3.8 |
| 3 | 5.8 | 5.3 | 4.8 | 4.5 | 4.0 | 3.0 |
| 4 | 5.3 | 4.8 | 4.4 | 4.1 | 3.8 | 2.8 |
| 5 | 4.8 | 4.5 | 4.1 | 3.8 | 3.5 | 2.6 |
| 6 | 4.6 | 4.3 | 3.9 | 3.6 | 3.3 | 2.4 |
| 7 | 4.3 | 4.0 | 3.6 | 3.4 | 3.0 | 2.2 |
| 8 | 4.0 | 3.8 | 3.3 | 3.1 | 2.8 | 2.0 |
| 9 | 3.6 | 3.4 | 3.0 | 2.7 | 2.4 | 1.8 |
| 10 | 3.2 | 3.0 | 2.6 | 2.3 | 2.1 | 1.6 |
| 11 | 2.8 | 2.6 | 2.2 | 2.0 | 1.8 | 1.4 |
| 12 | 2.5 | 2.2 | 2.0 | 1.8 | 1.6 | 1.3 |
| 13 | 2.3 | 2.0 | 1.8 | 1.6 | 1.5 | 1.3 |
| 14 | 2.1 | 1.9 | 1.7 | 1.5 | 1.4 | 1.2 |
| 15 | 1.9 | 1.8 | 1.6 | 1.4 | 1.3 | 1.1 |
| 16 | 1.8 | 1.6 | 1.5 | 1.3 | 1.2 | 1.0 |
| 17 | 1.8 | 1.6 | 1.4 | 1.2 | 1.1 | 0.9 |
| 18 | 1.7 | 1.5 | 1.3 | 1.1 | 1.0 | 0.9 |
| 19 | 1.7 | 1.5 | 1.2 | 1.0 | 0.9 | 0.9 |
| 20 | 1.6 | 1.4 | 1.1 | 1.0 | 0.9 | 0.9 |
| 21 | 1.6 | 1.4 | 1.1 | 0.9 | 0.9 | 0.8 |
| 22 | 1.5 | 1.3 | 1.0 | 0.9 | 0.9 | 0.8 |
| 23 | 1.5 | 1.3 | 1.0 | 0.9 | 0.8 | 0.8 |
| 24 | 1.4 | 1.2 | 1.0 | 0.9 | 0.8 | 0.7 |
| 25 | 1.3 | 1.1 | 0.9 | 0.8 | 0.8 | 0.8 |
| 26 | 1.2 | 1.0 | 0.9 | 0.8 | 0.7 | 0.7 |
| 27 | 1.1 | 0.9 | 0.8 | 0.8 | 0.8 | 0.8 |
| 28 | 1.0 | 0.8 | 0.8 | 0.7 | 0.7 | 0.7 |
| 29 | 0.9 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 |
| 30 | 0.8 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 |
| 31 | 0.7 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 |
| 32 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 |
| 33 | 0.6 | 0.6 | 0.6 | 0.6 | 0.5 | 0.5 |
| 34 | 0.6 | 0.6 | 0.6 | 0.5 | 0.5 | 0.5 |
| 35+ | 0.6 | 0.6 | 0.6 | 0.5 | 0.5 | 0.5 |

*1. The total expected increase in salary includes both merit (shown above) and the general wage increase assumption of 3.50% per annum. The total result is compounded rather than additive. For example, the total assumed increase for service less than one year (Year 0 above) is 11.178% (1.080 x 1.035) for member in the entry age under 25 group.*

*2. Based on elapsed service since membership date.*

## Table A-1.8
## Supplemental Assumptions

**PEPRA Coverage**

All members hired on or after the valuation date are assumed to be subject to the provisions of PEPRA.

**Unused Sick Leave**

Credited Service is increased by 1.6%.

**Optional Forms**

Active and Inactive: Based on single life annuity assumed.

Retirees and Beneficiaries: Based on optional form in data.

**Probability of Eligible Survivor**

Male:          85%

Female:        65%

Male spouses are assumed to be three years older than female spouses.

**Number of Children**

Married members under age 60 are assumed to have the number of children shown in the following table. Children are assumed to receive benefits until the member would have turned age 60.

| Member's Gender | Assumed Number of Children |
|---|---|
| Male | 0.70 |
| Female | 0.50 |

**Assumed Offsets**

No offsets to disability and survivor benefits are assumed.

**Valuation of Inactive Members**

Salary and benefit information is not available on the valuation data provided for inactive members. Therefore, we estimate the projected retirement benefits for inactive members as follows:

1. The inactive member's earnable salary information is retrieved from when they were active by matching with a database of active valuation data back to 2001 and taking the highest earnable salary for the member during the period.

2. For those members who cannot be located on the active database (because they terminated prior to 2001 or another reason), their earnable salary is estimated based on 120% of the average earnable salary for all active members in the year the member terminated.

3.  The earnable salary amount from the prior steps is treated as the member's final compensation with two additional adjustments.

    a.  An additional load of 5% for all current and future inactive members is applied to their salary amount to account for potential post-termination increases in salary due to factors such as reciprocity.

    b.  Final compensation is increased by an additional 4.1% if the member has 25 or more years of credited service.

4.  Based on the salary data described above and the birth date and credited service from the current year's valuation data, the projected benefit amount is calculated and valued as a deferred service retirement.

5.  Non-vested members who have been inactive for less than two years are assumed to take an immediate refund of their member contributions.

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84

## Appendix A-2   Defined Benefit Supplement Program Actuarial Methods and Assumptions

(Proposed changes shown in <mark>Green</mark>. Note that if all rates in a table are proposed to be changed, the label is highlighted rather than the individual rates.)

This section of the report discloses the actuarial methods and assumptions used in the Actuarial Valuation of the DBS Program. These methods and assumptions have been chosen on the basis of recent experience of the DB Program and on current expectations as to future economic conditions.

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

### Actuarial Cost Method

The accruing costs of all benefits are measured by the Traditional Unit Credit Cost Method. Under this method, the projected benefits of each individual member are allocated by a consistent formula to valuation years. The actuarial present value of future projected benefits allocated to the current year is called the Normal Cost. The actuarial present value of future projected benefits allocated to periods prior to the valuation year is called the Actuarial Obligation.

The Actuarial Obligation is equal to the accumulated account balances and the Normal Cost is equal to the total annual contribution.

### Asset Valuation Method

The assets are valued at Fair Market Value. The Fair Market Value excludes the liability for "Net Pension and OPEB Obligation," which are pre-recognized administrative expenses, from the Fiduciary Net Position reported for accounting purposes.

### Actuarial Assumptions

The Actuarial Standards Board has adopted Actuarial Standard of Practice No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations*. This Standard provides guidance on selecting economic assumptions under defined benefit retirement programs such as the System. In our opinion, the economic assumptions have been developed in accordance with the Standard.

The Actuarial Standards Board has adopted Actuarial Standard of Practice No. 35, *Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations*. This Standard provides guidance on selecting demographic assumptions under defined benefit retirement programs such as the System. In our opinion, the demographic assumptions have been developed in accordance with the Standard.

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

The demographic assumptions are listed in **Table A-2.1** and illustrated at selected ages in **Table A-2.2**.

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85

### Table A-2.1
### List of Major Valuation Assumptions for DBS Program

| Economic Assumptions | |
|---|---|
| Investment Return (net of investment and administrative expenses) | 7.00% |
| Interest on Member Accounts | 7.00% |
| Wage Growth | 3.50% |
| Inflation | 2.75% |
| Standard Deviation of Portfolio | 11.30% |

| Demographic Assumptions | | |
|---|---|---|
| Mortality[1] | | |
| Retired & Beneficiary - Male | 2023 CalSTRS Service Retired Male | Table A-2.2 |
| Retired & Beneficiary - Female | 2023 CalSTRS Service Retired Female | Table A-2.2 |
| Disabled - Male | 2023 CalSTRS Disabled Retiree Male | Table A-2.2 |
| Disabled - Female | 2023 CalSTRS Disabled Retiree Female (select rates in first three years for both Males and Females) | Table A-2.2 |

*1. The mortality assumption uses a generational mortality approach with a base year of 2023. Projected improvement is based on the MP-2021 Ultimate Projection Scale. The combined base tables and projection scale specified contain a margin for expected future mortality improvement.*

Note: Assumptions for active and inactive members do not apply to the DBS Program valuation as each active and inactive member's liabilities are equal to the member's account balance.

## Table A-2.2
## Mortality as of June 30, 2023

| Age | Retired Members and Beneficiaries[1] | | Disabled Members (After Year 3)[1] | | Projection Scale |
| --- | --- | --- | --- | --- | --- |
| | Male | Female | Male | Female | |
| 50 | 0.195% | 0.141% | 1.446% | 0.929% | 1.350% |
| 55 | 0.312 | 0.226 | 1.971 | 1.187 | 1.350 |
| 60 | 0.445 | 0.289 | 2.447 | 1.397 | 1.350 |
| 65 | 0.575 | 0.369 | 2.720 | 1.577 | 1.310 |
| 70 | 0.903 | 0.602 | 3.573 | 2.016 | 1.240 |
| 75 | 1.754 | 1.195 | 4.981 | 3.206 | 1.170 |
| 80 | 3.482 | 2.416 | 7.139 | 5.421 | 1.100 |
| 85 | 6.893 | 5.007 | 10.794 | 9.021 | 0.870 |
| 90 | 12.924 | 9.999 | 16.596 | 14.059 | 0.630 |
| 95 | 22.529 | 17.907 | 24.286 | 20.081 | 0.400 |

**Select minimum rates for disability:**

| | | |
| --- | --- | --- |
| First year of disability | 4.0% | 4.0% |
| Second year of disability | 3.5 | 3.0 |
| Third year of disability | 3.0 | 2.0 |

*1. The mortality assumption uses a generational mortality approach with a base year of 2023. Projected improvement is based on the MP-2021 Ultimate Projection Scale. The rates shown reflect mortality improvement through June 30, 2023. The projection scale does not apply to the select minimum rates.*

## Appendix A-3    Cash Balance Benefit Program Actuarial Methods and Assumptions

(Proposed changes shown in <mark>Green</mark>. Note that if all rates in a table are proposed to be changed, the label is highlighted rather than the individual rates.)

This section of the report discloses the actuarial methods and assumptions used in the Actuarial Valuation of the CBB Program. These methods and assumptions have been chosen on the basis of recent experience of the DB Program and on current expectations as to future economic conditions.

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

### Actuarial Cost Method

The accruing costs of all benefits are measured by the Traditional Unit Credit Cost Method. Under this method, the projected benefits of each individual member are allocated by a consistent formula to valuation years. The actuarial present value of future projected benefits allocated to the current year is called the Normal Cost. The actuarial present value of future projected benefits allocated to periods prior to the valuation year is called the Actuarial Obligation.

The Actuarial Obligation is equal to the accumulated account balances and the Normal Cost is equal to the total annual contribution.

### Asset Valuation Method

The assets are valued at Fair Market Value. The Fair Market Value excludes the liability for "Net Pension and OPEB Obligation," which are pre-recognized administrative expenses, from the Fiduciary Net Position reported for accounting purposes.

### Actuarial Assumptions

The Actuarial Standards Board has adopted Actuarial Standard of Practice No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations*. This Standard provides guidance on selecting economic assumptions under defined benefit retirement programs such as the System. In our opinion, the economic assumptions have been developed in accordance with the Standard.

The Actuarial Standards Board has adopted Actuarial Standard of Practice No. 35, *Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations*. This Standard provides guidance on selecting demographic assumptions under defined benefit retirement programs such as the System. In our opinion, the demographic assumptions have been developed in accordance with the Standard.

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

The demographic assumptions are listed in **Table A-3.1** and illustrated at selected ages in **Table A-3.2**.

## Table A-3.1
## List of Major Valuation Assumptions for CBB Program

| Economic Assumptions | |
| --- | --- |
| Investment Return (net of investment and administrative expenses) | 7.00% |
| Interest on Member Accounts | 7.00% |
| Wage Growth | 3.50% |
| Inflation | 2.75% |
| Standard Deviation of Portfolio | 11.30% |

| Demographic Assumptions | | |
| --- | --- | --- |
| Mortality[1] | | |
| Retired & Beneficiary - Male | 2023 CalSTRS Service Retired Male | Table A-3.2 |
| Retired & Beneficiary - Female | 2023 CalSTRS Service Retired Female | Table A-3.2 |
| Disabled - Male | 2023 CalSTRS Disabled Retiree Male | Table A-3.2 |
| Disabled - Female | 2023 CalSTRS Disabled Retiree Female (select rates in first three years for both Males and Females) | Table A-3.2 |

*1. The mortality assumption uses a generational mortality approach with a base year of 2023. Projected improvement is based on the MP-2021 Ultimate Projection Scale. The combined base tables and projection scale specified contain a margin for expected future mortality improvement.*

Note: Assumptions for active and inactive members do not apply to the CBB Program valuation as each active and inactive member's liabilities are equal to the member's account balance.

**Table A-3.2**
**Mortality as of June 30, 2023**

| Age | Retired Members and Beneficiaries[1] | | Disabled Members (After Year 3)[1] | | Projection Scale |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| 50 | 0.195% | 0.141% | 1.446% | 0.929% | 1.350% |
| 55 | 0.312 | 0.226 | 1.971 | 1.187 | 1.350 |
| 60 | 0.445 | 0.289 | 2.447 | 1.397 | 1.350 |
| 65 | 0.575 | 0.369 | 2.720 | 1.577 | 1.310 |
| 70 | 0.903 | 0.602 | 3.573 | 2.016 | 1.240 |
| 75 | 1.754 | 1.195 | 4.981 | 3.206 | 1.170 |
| 80 | 3.482 | 2.416 | 7.139 | 5.421 | 1.100 |
| 85 | 6.893 | 5.007 | 10.794 | 9.021 | 0.870 |
| 90 | 12.924 | 9.999 | 16.596 | 14.059 | 0.630 |
| 95 | 22.529 | 17.907 | 24.286 | 20.081 | 0.400 |

**Select minimum rates for disability:**

| | | |
|---|---|---|
| First year of disability | 4.0% | 4.0% |
| Second year of disability | 3.5 | 3.0 |
| Third year of disability | 3.0 | 2.0 |

*1. The mortality assumption uses a generational mortality approach with a base year of 2023. Projected improvement is based on the MP-2021 Ultimate Projection Scale. The rates shown reflect mortality improvement through June 30, 2023. The projection scale does not apply to the select minimum rates.*

## Appendix A-4: Medicare Premium Payment Program Actuarial Methods and Assumptions

(Proposed changes shown in Green. Note that if all rates in a table are proposed to be changed, the label is highlighted rather than the individual rates.)

This section of the report discloses the actuarial methods and assumptions used in the Actuarial Valuation of the MPP Program. These methods and assumptions have been chosen on the basis of recent experience of the MPP Program and on current expectations as to future economic conditions.

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

### Actuarial Cost Method

The cost method used for the MPP Program valuation is the Entry Age Cost Method. Since there are no active members eligible to receive future MPP Program benefits, the Normal Cost is $0, and the actuarial obligation for the MPP Program is equal to the value of all benefits expected to be paid in the future. This obligation, less any assets currently residing in the Teachers' Health Benefit Fund (THBF), is included with the obligation of the DB Program. The assets in the THBF are valued at Fair Market Value but exclude line items for "Net Pension and OPEB Obligation" for funding purposes.

### Asset Valuation Method

For funding purposes, the assets are valued as the allocated value of DB Program Assets. This figure is equal to the actuarial obligation of the MPP Program benefits.

### Actuarial Assumptions

The Actuarial Standards Board has adopted Actuarial Standard of Practice No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations*. This Standard provides guidance on selecting economic assumptions under defined benefit retirement programs such as the System. In our opinion, the economic assumptions have been developed in accordance with the Standard.

The Actuarial Standards Board has adopted Actuarial Standard of Practice No. 35, *Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations*. This Standard provides guidance on selecting demographic assumptions under defined benefit retirement programs such as the System. In our opinion, the demographic assumptions have been developed in accordance with the Standard.

The demographic assumptions are listed in **Table A-4.2** and illustrated at selected ages in **Table A-4.3.**

### Economic Assumptions

**Table A-4.1** contains a summary of economic and demographic assumptions proposed for the June 30, 2023 MPP Program valuation and a comparison against the June 30, 2022 MPP Program valuation assumptions.

Note that the June 30, 2023 valuation will use the 2024 Medicare Part A and Part B premiums as the basis for future premium calculations. Future premiums are assumed to increase with a medical trend that varies by year, as shown in the Medical Inflation section of **Table A-4.2**.

The Part A trend is approximately equivalent to assuming a fixed 5.0% increase each year. The Part B trend is approximately equivalent to assuming a fixed 6.5% increase each year.

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

91

## Enrollment Assumption

**Table A-4.4** presents the participation (enrollment) assumptions included in this valuation. The enrollment rates are based on actual enrollments divided by all pre-April 1, 1986 hires. For valuation purposes, it is assumed that all pre-April 1, 1986 hires are potentially eligible for the MPP Program.

Note the participation rates include a small margin for members who were not retired on June 30, 2012 but may elect in the future to backdate their retirement date under Education Code Section 24204 and potentially become eligible for benefits under the MPP Program.

## Other Assumptions

Other assumptions include a 7.00% investment return assumption and the 2023 CalSTRS mortality assumptions, which are the same as the assumptions proposed for the June 30, 2023 DB Program funding valuation.

Financial reporting for GASB 74 and 75 apply to the MPP Program. It is our understanding that CalSTRS will use a discount rate based on the Bond Buyer 20-Bond GO Index.

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92

## Table A-4.1
## Recommended June 30, 2023 Valuation Assumptions

| | June 30, 2023 Valuation (Recommended) | June 30, 2022 Valuation |
|---|---|---|
| Retirement/Termination/Disability/Mortality | Same as DB Program valuation | Same as DB Program valuation |
| Enrollment Rates | See Table A-4.4 | See Table A-4.4 |
| Interest Rate | | |
|   - For funding | 7.00%, same as DB Program Valuation | 7.00%, same as DB Program Valuation |
|   - For GASB reporting (for following year) | To be determined (Based on Bond Buyer 20-Bond GO Index) | 3.65% (Based on Bond Buyer 20-Bond GO Index) |
| Part A Premiums | | |
|   - Initial premium[1] | $505 (CY 2024) | $506 (CY 2023) |
|   - Inflation (trend) | Varies by year equivalent to fixed 5.0% | Varies by year equivalent to fixed 4.5% |
| Part B Premiums | | |
|   - Initial premium[2] | $174.70 (CY 2024) | $164.90 (CY 2023) |
|   - Inflation (trend) | Varies by year equivalent to fixed 6.5% | Varies by year equivalent to fixed 5.4% |
| Retirement/Termination/Disability/Mortality | Same as pension valuation | Same as pension valuation |

1. CalSTRS pays the applicable Part A premium. For some pre-2001 retirees, CalSTRS also pays a late enrollment surcharge.

2. CalSTRS pays the Part B penalty, which is a percentage of the Part B premium amount. Part B penalties used in the valuation are those supplied by CalSTRS after adjusting for the applicable trend rate.

### Table A-4.2
### List of Major Valuation Assumptions

Economic Assumptions

A.  Investment Return         7.00%
    (net of investment and administrative expenses)

B.  Medical Inflation

| Trend Assumption | | |
|---|---|---|
| | **Assumed Annual Increase** | |
| **Years[1]** | **Part A** | **Part B** |
| 2023 - 2032 | 5.40% | 6.62% |
| 2033 - 2042 | 4.93% | 5.59% |
| 2043 - 2052 | 4.32% | 4.54% |
| 2053 & Later | 4.09% | 4.26% |

*1. Trend rates indicate medical inflation in the specific valuation year and therefore affect the premiums for the following valuation year. For example, the projected 2024-2025 premium is the 2023-2024 premium increased by the assumed 2023-2024 trend rate.*

C.  Price Inflation         2.75%

**Demographic Assumptions**

A.  Mortality[2]

| | | | |
|---|---|---|---|
| Active | - Male | N/A | |
| | - Female | N/A | |
| Retired & | - Male | 2023 CalSTRS Retired Male | Table A-4.3 |
| Beneficiary | - Female | 2023 CalSTRS Retired Female | Table A-4.3 |
| Disabled | - Male | 2023 CalSTRS Disabled Retiree Male | Table A-4.3 |
| | - Female | 2023 CalSTRS Disabled Retiree Female | Table A-4.3 |

(select rates in first 3 years for both Males and Females)

*2. The mortality assumption uses a generational mortality approach with a base year of 2023. Projected improvement is based on the MP-2021 Ultimate Projection Scale. The combined base tables and projection scale specified contain a margin for expected future mortality improvement.*

| | | | |
|---|---|---|---|
| B. | Service Retirement | N/A | |
| C. | Disability Retirement | N/A | |
| D. | Withdrawal | N/A | |
| E. | Probability of Refund | N/A | |
| F. | MPP Program Enrollment Rates | Experience Tables | Table A-4.4 |

### Table A-4.3
### Mortality as of June 30, 2023

| Age | Retired Members and Beneficiaries[1] | | Disabled Members (After Year 3)[1] | | Projection Scale |
|---|---|---|---|---|---|
| | Male | Female | Male | Female | |
| 50 | 0.195% | 0.141% | 1.446% | 0.929% | 1.350% |
| 55 | 0.312 | 0.226 | 1.971 | 1.187 | 1.350 |
| 60 | 0.445 | 0.289 | 2.447 | 1.397 | 1.350 |
| 65 | 0.575 | 0.369 | 2.720 | 1.577 | 1.310 |
| 70 | 0.903 | 0.602 | 3.573 | 2.016 | 1.240 |
| 75 | 1.754 | 1.195 | 4.981 | 3.206 | 1.170 |
| 80 | 3.482 | 2.416 | 7.139 | 5.421 | 1.100 |
| 85 | 6.893 | 5.007 | 10.794 | 9.021 | 0.870 |
| 90 | 12.924 | 9.999 | 16.596 | 14.059 | 0.630 |
| 95 | 22.529 | 17.907 | 24.286 | 20.081 | 0.400 |

**Select minimum rates for disability:**

| | | |
|---|---|---|
| First year of disability | 4.0% | 4.0% |
| Second year of disability | 3.5 | 3.0 |
| Third year of disability | 3.0 | 2.0 |

*1. The mortality assumption uses a generational mortality approach with a base year of 2023. Projected improvement is based on the MP-2021 Ultimate Projection Scale. The rates shown reflect mortality improvement through June 30, 2023. The projection scale does not apply to the select minimum rates.*

**Table A-4.4**
**Summary of Part A[1] Enrollment Rates**

| Assumption | Rate |
|---|---|
| Percent of under age 65 retirees enrolling (all years) [2] | 2.00% |
| Percent of over age 65 retirees enrolling (for those not currently enrolled) at Age:[3] | |
| 65 | 0.20% |
| 66 | 0.02 |
| 67 | 0.02 |
| 68 | 0.02 |
| 69 | 0.02 |
| 70-84 | 0.02 |
| 85 & Above | 0.00 |
| Percent of over age 65 retirees enrolling (for those already enrolled) | 100.0% |

*1. Only current enrollees are assumed to receive Part B payments.*

*2. For under age 65 retirees, the enrollment percent applies upon reaching age 65. No enrollment is assumed after age 65 for retirees currently under age 65. The only change from the current assumptions is to combine the assumption for under age 65 retirees for all years.*

*3. For over 65 retirees, the enrollment percent applies in each future year.*