California State Teachers' Retirement System (CalSTRS)

Replication and Review of 2024 Experience Analysis

Analysis of Actuarial Experience During the Period July 1, 2007 through June 30, 2022

Segal

Segal

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May 17, 2024

Rick Reed
System Actuary
California State Teachers' Retirement System

Re: Replication and Review of 2024 Actuarial Experience Analysis

Dear Rick:

We are pleased to present the results of this replication and review of the 2024 Actuarial Experience Analysis for the California State Teachers' Retirement System (CalSTRS). The purpose of this replication and review is to verify the calculations completed by Milliman and used in their development of the economic and demographic assumptions, and to offer comments on the related actuarial methods. These assumptions and methods will be applied together in Milliman's upcoming actuarial valuations.

This review was conducted by Todd Tauzer, a Fellow of the Society of Actuaries and Member of the American Academy of Actuaries, Andy Yeung, an Associate of the Society of Actuaries, Member of the American Academy of Actuaries and an Enrolled Actuary under ERISA, and Brad Ramirez, a Fellow of the Society of Actuaries, Member of the American Academy of Actuaries and an Enrolled Actuary under ERISA. This review was conducted in accordance with the standards of practice prescribed by the Actuarial Standards Board.

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

The assistance of CalSTRS and Milliman is gratefully acknowledged. We appreciate the opportunity to be of service to CalSTRS, and we are available to answer any questions you may have on this report.

Sincerely,

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Senior Vice President and Actuary

Andy Yeung, ASA, MAAA, FCA, EA
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Executive Summary

This report has been prepared by Segal to present a replication and review of the 2024 Experience Analysis performed by Milliman for CalSTRS.

This replication and review report includes an independent reproduction of the detailed experience analysis results that appear in the CalSTRS 2024 Experience Analysis for the period July 1, 2007 through June 30, 2022, prepared by Milliman and dated December 22, 2023. This replication and review was based on actuarial reports, employee data and supplemental information provided by both CalSTRS and Milliman.

We have performed this replication and review to provide assurance to CalSTRS that the actuarial calculations are reasonable and that the actuarial process was conducted according to generally accepted actuarial principles and practices. **Our replication and review confirms that the economic and demographic assumptions, actuarial methods, and Medicare Premium Payment (MPP) assumptions recommended by Milliman are reasonable and based on generally accepted actuarial principles and practices.** We were able to follow Milliman's methodologies to match and validate nearly all of their results. However, there are a few areas where we believe a different approach or methodology would result in an improved analysis of historical experience and determination of proposed assumptions in the next experience study, particularly on the economic assumptions. We have also included some observations on actuarial methods employed in the determination of required contributions, even though we acknowledge that they generally are not under Milliman's power to adjust, and are more for the general consideration of CalSTRS.

Economic assumptions

We have performed an analysis of the economic assumptions that Milliman recommended, and they are reasonable to use in the CalSTRS valuations. We have also provided some recommendations for CalSTRS and Milliman to consider in future experience analyses, which are briefly summarized here.

We recommend making a distinction between the process used to select the price inflation assumption and the other economic assumptions, including the cost-of-living adjustment (COLA) and the wage inflation assumption. This is especially pertinent as price inflation is based on national metrics, while the COLA is based on California data only, and wage inflation may also be linked to economic conditions in California.

Milliman has recommended maintaining the current 2.75% price inflation assumption. We understand that the 2.75% price inflation assumption was also recommended by CalSTRS investment staff as part of the CalSTRS Asset Liability Management (ALM) study in 2023. While this is reasonable, we recommend that CalSTRS and Milliman consider a lower price inflation assumption of 2.50%, based on our analysis of historical experience, Social Security's long-term forecast, market expectations, investment experts' consensus sentiment, and a peer group comparison.

We recommend that Milliman consider setting a separate assumption for the COLA used for the valuation of the Supplemental Benefit Maintenance Account (SBMA) program, based on the observation that price inflation in California has been consistently higher than national price inflation. After reflecting a 0.25% regional inflation adjustment, we recommend a 2.75% assumption for this purpose, which is the same as what Milliman has recommended (for both inflation and COLA).

Milliman has recommended maintaining the current 0.75% real wage growth assumption as a component of members' projected salary increases. While this is reasonable, given the consistently low historical wage growth for CalSTRS teachers, we recommend that CalSTRS and Milliman consider reducing the assumption to 0.50%.

Milliman has recommended maintaining the general wage growth component of individual salary increases at 3.50%, and reducing the aggregate payroll increase assumption from 3.50% to 3.25%, which is reasonable. We recommend that CalSTRS and Milliman consider 3.25% for both assumptions, which reflects our recommended 2.50% national price inflation assumption, our 0.25% regional inflation adjustment for California, and our 0.50% real wage growth assumption.

Milliman has worked with CalSTRS staff to recommend maintaining the current 7.00% investment return. This is reasonable, but we would note that it does not include much margin for future adverse deviation, especially if the inflation component were reduced to 2.50% as we recommend. We recommend that CalSTRS and Milliman consider lowering the investment return assumption to 6.75% as part of the next ALM study.

For the Defined Benefit (DB) program, Milliman has recommended maintaining the current 3.00% interest crediting rate assumption for member account balances, which are based on two-year Treasury rates. While this is reasonable, we recommend Milliman consider reducing the assumption to 2.75%. This is based on our recommended 2.50% national price inflation assumption plus a small margin for future adverse deviation. For the Defined Benefit Supplement (DBS) and Cash Balance Benefit (CBB) programs, we support Milliman's recommendation to set the interest crediting rate assumption equal to the investment return assumption.

Milliman has reduced the standard deviation assumption for the DBS and CBB programs from 13.10% to 11.30%, and we support their recommendation.

Actuarial methods

As part of our replication and review of CalSTRS' 2024 experience study, we have reviewed the actuarial methods used in valuing liabilities, setting contribution rates, and generally working toward the full funding of the System. We acknowledge that the Funding Plan made significant strides towards the long-term funding and sustainability of the system. Nevertheless, there are still methodology weaknesses that could grow over time and disrupt this long-term goal of full funding. We outline our three primary concerns here.

The determination of the Unfunded Actuarial Obligation (UAO) allocation is complicated and incomplete. These complexities lead to calculations of assumptions and liabilities that are difficult to determine, justify, and administer, and even leave some UAO unallocated. We

recommend that CalSTRS work with the legislature to set a more straightforward, intuitive, and stable allocation of the UAO.

The Funding Plan increased contributions and funding significantly, but it still left CalSTRS with limited rate-setting authority, and those limits could result in possible scenarios where contributions are insufficient to continue to work toward full funding. We recommend that CalSTRS work with the legislature to give CalSTRS more rate-setting authority, especially considering the employer contribution cap and the 0.5% limit on the state contribution increase per year.

The Funding Plan targets full funding by 2046 by using a closed, declining amortization of the UAO (without getting into the nuances of the different allocations). Any closed, declining amortization is inherently unstable and will lead to a time when a new amortization policy must be implemented. We recommend that CalSTRS work with the legislature to establish funding policies that are evergreen and stable through layered amortization of new sources of unfunded liability with a period between 15-20 years. We also recommend that other relevant provisions of the Funding Plan not be allowed to expire in 2046.

Demographic assumptions

We have performed a replication and review of the demographic assumptions, and they are reasonable to use in the DB, DBS, CBB, and MPP valuations. We appreciate Milliman's timely and detailed responses to all of our questions.

Throughout this report, the results labeled "Segal Replication" are our attempt to match Milliman's decrement counts and results using the methodology they have described in their experience study report and in conversations with us. We also verified the exposure counts that Milliman separately provided to Segal. Unless otherwise noted for a few minor assumptions, Segal closely matches Milliman's analysis of the actual demographic experience.

The following is a summary of our suggestions for the next experience study:

- Consider adding more detail to the experience study report to further allow another actuary to evaluate the reasonableness of the results.
- Consider adjustments to the methodology for calculating the impact of one-year average compensation.
- Consider using 15 years of experience to analyze the miscellaneous assumptions and mortality assumption, consistent with the other demographic assumptions.
- Consider weighting active mortality experience by salary.
- Consider introducing a separate mortality assumption for beneficiaries in pay status.
- Consider explicitly incorporating credibility into the analysis of the mortality assumption, including use of or reference to published mortality tables prepared by the Society of Actuaries.
- Consider including all service retirements in the analysis of the service retirement assumption to reflect those who may age into retirement eligibility during the year; currently the analysis only counts service retirement decrements if members were eligible to retire based on beginning of year age and middle of year service.

- Monitor disability retirement experience to see if the actual number of disability retirements are returning to higher pre-2020 levels or if they remain at current levels.
- In the analysis of the disability retirement assumption, consider including members who have moved from service retirement to disability retirement status subsequent to the initial status assigned at retirement.
- Consider excluding retirement-eligible rehires from the analysis of the net termination assumption, consistent with the exclusion of retirement-eligible terminations.
- In the analysis of the refund assumption, consider excluding members who are eligible for service retirement from the refund counts and the rehire counts, and consider counting terminations using the same methodology as for the termination assumption.

Medicare Premium Payment (MPP) assumptions

We reviewed Milliman's analysis of the assumptions specific to the Medicare Premium Payment (MPP) Program and found the recommendations to be reasonable. The recommended changes to the Part A and Part B premium trend rates are consistent with the 2023 Medicare Trustees report and other models for long-term medical inflation. We replicated Milliman's participation analysis and agree with their recommendation to leave the current rates unchanged.

Content of experience analysis report

The discussion of the economic and demographic assumptions in Milliman's report complies with generally accepted actuarial principles and practices. We recommend that Milliman consider adding additional detail about the calculation of some of the experience analysis.

The executive summary is lengthy, due in part to the complexity of the plan and the assumptions, but the tables summarizing the recommended changes and the cost impact add particularly high value as an overview of the most important results.

We recommend that Milliman consider expanding the discussion of actuarial methods, and modifying the order in which it appears in the report for a potentially more intuitive progression of topics.

Purpose and Scope of the Actuarial Replication and Review

Purpose of the replication and review

Segal has performed an actuarial replication and review of the CalSTRS 2024 Experience Analysis to provide assurance to CalSTRS that the actuarial calculations are reasonable and that the actuarial calculations were conducted according to generally accepted actuarial principles and practices.

Scope of the replication and review

The scope of the replication and review, as described in the CalSTRS Actuarial Replication and Review Services Agreement with Segal, includes the following:

- Replication of the 2024 Experience Analysis Report for use in recommending assumptions for the DB, DBS, CBB, SBMA and MPP programs.
- Evaluation of the reasonableness of the actuarial methods used in determining CalSTRS' liabilities and setting CalSTRS' required contribution rates.
- Review of the experience study report to comply with Actuarial Standards, as well as for completeness and readability.

Economic Assumptions

Currently, the assumption for price inflation is also used by Milliman to project COLA for use in the SBMA program valuation. **We recommend making a distinction between the process used to select the price inflation assumption and the other economic assumptions, including the COLA assumption and the wage inflation assumption, as described below.**

Price inflation

In the 2024 experience analysis, Milliman recommended maintaining the current 2.75% price inflation assumption. While 2.75% is reasonable, we recommend that CalSTRS and Milliman consider a lower inflation assumption of 2.50% next time this assumption is reviewed. Milliman also mentioned in their report that a slightly lower assumption would also be reasonable.

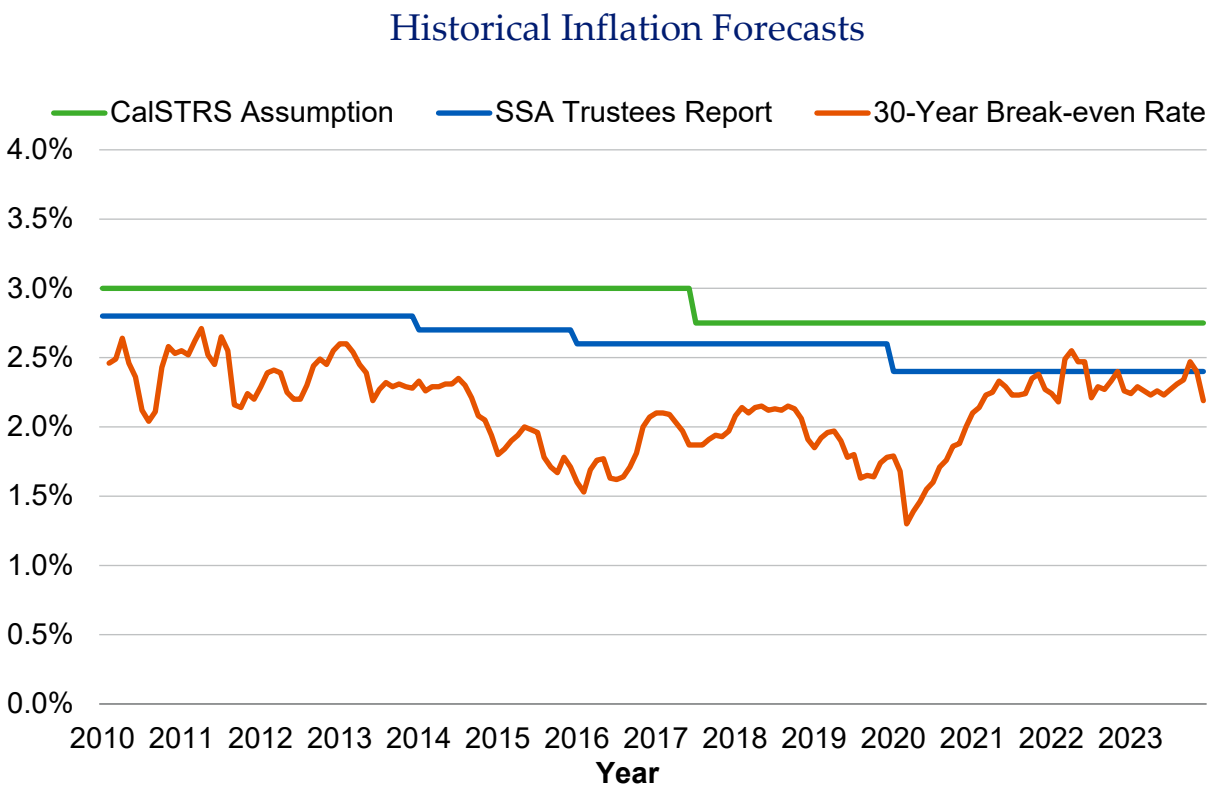
We agree with the information presented by Milliman regarding the historical changes in the U.S. Consumer Price Index (CPI), which shows that the rate of inflation over the last 25 years has generally been lower than 2.75%, even taking into account the recent spike in CPI that started in the second quarter of 2021 and continued into 2022. We note the rate of inflation, while still elevated, has declined since the Federal Reserve began to increase interest rates starting around the second quarter of 2022.

To find a forecast of inflation based on a longer time horizon, Milliman referred to the Social Security Administration's (SSA) 2023 report on the financial status of the Social Security program. The projected average increase in the CPI over the next 75 years under the intermediate cost assumptions used in that report was 2.40%.

Milliman calculated the market expected inflation (or "break-even rate") as of October 2023 as 2.6% by comparing inflation indexed bonds with traditional fixed government bonds over the next 20 years, which provides a market-implied inflation forecast. We also calculate a lower break-even rate when looking at a longer period. The table below provides a market-implied inflation forecast by comparing the yield between 30-year inflation indexed U.S. Treasury bonds and comparable 30-year traditional U.S. Treasury bonds. Although the data from the more recent months has only become available after Milliman completed their experience analysis report, we would note that the forecasted inflation is about 2.27% as of March 2024. It is worth noting that even during the higher inflation environment of 2023 and 2024, there has been no single month in these years where the break-even rate exceeded 2.50%.

Observation Month	Difference in Yields	Observation Month	Difference in Yields
January 2023	2.24%	September 2023	2.34%
February 2023	2.29%	October 2023	2.47%
March 2023	2.26%	November 2023	2.40%
April 2023	2.23%	December 2023	2.19%
May 2023	2.26%	January 2024	2.24%
June 2023	2.23%	February 2024	2.26%
July 2023	2.27%	March 2024	2.27%
August 2023	2.31%		

The following graph shows CalSTRS' historical and current proposed inflation assumptions compared to the two other metrics just discussed, going back to 2010. In effect, this compares CalSTRS' assumption to two separate independent forecasts, one based on market observations, and one developed by economists at the SSA. The graph shows that over this period, CalSTRS' assumption has been higher than these forecasts, even during the recent inflation spike.



Based on information found in the Public Plans Database, which is produced in partnership with the National Association of State Retirement Administrators (NASRA), the median inflation assumption used by 210 large public retirement funds in their 2022 fiscal year valuations was 2.50%. The 25th and 75th percentiles of the inflation assumption were at 2.30% and 2.71%. In California, CalSTRS and four 1937 Act County Employees Retirement Law (CERL) systems currently use an inflation assumption of 2.75%, the other sixteen 1937 Act CERL systems use

an inflation assumption of 2.50% and CalPERS uses an inflation assumption of 2.30%. Finally, Horizon Actuarial Services published their survey of the 2023 Capital Market Assumptions utilized by 42 investment advisors in August 2023. Over a 20-year horizon, the 25th and 75th percentiles of the inflation assumption were at 2.3% and 2.6% with a median assumption at 2.4%. We note that the proposed 2.75% inflation assumption, while reasonable, is on the higher end when compared to the inflation assumptions set by other entities.

The inflation assumption is long-term in nature, and we agree with Milliman's comment that the price inflation component of the investment return assumption should be based on national and even global inflation. However, we recommend putting less weight on near term (i.e., inflation spike) and regional (i.e., California) CPI changes when recommending the inflation assumption for use in developing the investment return assumption.

We agree with Millman that the price inflation assumption is related to the COLA assumption in the SBMA program valuation, which is based on the CPI change in California only. Additionally, we would note that salary increases are linked to economic conditions in California. We also agree with Milliman's observation that inflation in California has historically been higher than national inflation. **As a result, we recommend that CalSTRS and Milliman consider using a separate COLA assumption used for the SBMA program valuation as well as for wage inflation, as described below.** This allows for a more direct application of inflation assumptions in the valuation process that align with historical data and expert forecasts.

In summary, while the 2.75% price inflation assumption is reasonable, it may be high considering the historical experience, Social Security's long-term forecast, market expectations, investment experts' consensus sentiment, and a peer group comparison. **We recommend that CalSTRS and Milliman consider a lower price inflation assumption of 2.50% the next time this assumption is reviewed.**

Cost-of-living adjustment (COLA)

For the SBMA program, the level of the purchasing power protection benefits is dependent on the California CPI change for the month of June in one year to the month of June in another year. In the experience analysis, Milliman used the same rationale to set the price inflation assumption and the COLA assumption, so their report also recommended maintaining the COLA assumption at 2.75%.

As noted above, we recommend that Milliman consider a separate COLA assumption for the SBMA program to recognize the difference between national inflation and regional inflation. This enables us to agree with Milliman's analysis of California consistently seeing higher inflation levels than the national average and apply that directly to analysis for the SBMA program.

The table below compares the average changes in the June CPI for California used by CalSTRS to set COLAs, and the June CPI for the U.S. City Average during the most recent 5-year, 10-year and 20-year periods as of June 2023. This table shows that inflation in California has historically been higher than national inflation.

	Average Change in June CPI for California	Average Change in June CPI for U.S. City Average	Difference
5-Year Period	4.03%	3.90%	0.13%
10-Year Period	3.22%	2.71%	0.51%
20-Year Period	2.83%	2.57%	0.26%

In summary, we support Milliman's recommendation to maintain the current COLA assumption of 2.75%, understanding that we prefer this assumption be set separately from the inflation assumption. From our perspective, the 2.75% COLA assumption consists of a 2.50% national inflation assumption and a 0.25% regional adjustment (a form of additional margin on the inflation assumption).

Real wage growth

There are three assumptions used to project individual salary increases for an active member: (1) an inflation assumption, (2) an "across the board" real wage growth assumption and (3) merit salary increase assumptions. Milliman recommended maintaining the current 0.75% real wage growth assumption.

On a national scale, Milliman reviewed historical U.S. real wage growth over a 50-year period and concluded that it is 0.5% higher than the average U.S. CPI increase for the same period. In addition, Milliman reviewed the forecast real wage growth from the Social Security Administration's Office of the Chief Actuary published in March 2023. In that report, real wage growth pay increases are forecast to be 1.14% per year under the intermediate assumptions. We agree with these observations.

The real pay increase assumption is generally considered a more "macroeconomic" assumption which is not necessarily based on individual plan experience. However, recent salary experience for public systems in California indicate lower future real wage growth expectations for public sector employees. Milliman acknowledges this for CalSTRS, noting that the growth in average earnable salary for teachers in CalSTRS is lower than the California CPI over a 30-year period. Using the most recent 5-year period ending June 30, 2022 as an example, the average wage increase for CalSTRS is 2.80%, and the average change in California's June CPI is 4.19%. This has resulted in an average reduction or loss of purchasing power of 1.39% per year. This shows a significant lag in teachers' real wage growth in California when compared to regional CPI.

Also as mentioned by Milliman, CalSTRS' members in the 2% at 62 tier (i.e., members hired in 2013 or later) are subject to a more restrictive definition of creditable compensation, which includes a dollar cap on compensation for use in determining the members' benefits that is indexed on price inflation. As a result, members in the 2% at 62 tier are expected to have slightly lower creditable compensation than comparable members in the 2% at 60 tier. As more members in the 2% at 62 tier replace existing members in the 2% at 60 tier over time, the real wage increase experience will be indirectly affected by payroll that is subject to the indexed cap.

For large public plans in California, the real wage increase assumptions are currently between 0.25% and 0.75%. Milliman's recommended assumption of 0.75% is on the higher end of the range and is still reasonable. **However, we recommend that CalSTRS and Milliman consider lowering the real wage increase assumption to 0.50% given the low historical increases in CalSTRS teachers' real wage growth.**

General wage growth and payroll increase

Milliman has recommended maintaining the general wage growth component of individual salary increases at 3.50%, which consists of their 2.75% inflation assumption and 0.75% real wage growth assumption. For the long-term increase in aggregate pensionable payroll, Milliman recommended reducing the current 3.50% assumption to 3.25%, which includes a (0.25%) downwards adjustment due to the factors that they believe will result in lower payroll increases.

We agree with various factors referenced by Milliman that point toward a lower total payroll increase assumption. These factors include a projected year-by-year decline in student population in the next twenty years, more charter schools not covered by CalSTRS, and more 2% at 62 members who are subject to a more restrictive definition of creditable compensation over time.

In the table below, we observe that the average change in CalSTRS' total annual payroll was about 3.0% over the past five years. This average reflects some volatility in the most recent two years (from 2020 to 2021 and from 2021 to 2022).

Fiscal Year	CalSTRS Annual Payroll	Change in Total Annual Payroll
2022	$36,017,000,000	6.2%
2021	33,914,000,000	0.3%
2020	33,811,000,000	2.8%
2019	32,897,000,000	3.2%
2018	31,884,000,000	2.4%
2017	31,136,000,000	

We again recommend that Milliman consider separating the national price inflation assumption from the inflation component of the general wage growth and payroll increase assumptions, in order to reflect that salary increases are linked to economic conditions in California.

In summary, we find that Milliman's recommendations of a 3.50% general wage growth assumption and 3.25% payroll increase assumption are reasonable. **However, we recommend that CalSTRS and Milliman consider 3.25% for both assumptions, which reflects our recommended 2.50% national price inflation assumption, our 0.25% regional inflation adjustment for California, and our 0.50% real wage growth assumption.**

Investment return

Milliman recommended maintaining the current 7.00% investment return assumption for the DB program and DBS program and increasing the investment return assumption for the CBB program from 6.50% to 7.00%. The investment return assumptions are net of both administrative and investment expenses.

Administrative and investment expenses

Segal independently calculated the ratio of administrative expenses to the value of the Retirement System's assets, and we agree with Milliman's 0.10% assumption for administrative expenses. Milliman also stated that CalSTRS' capital market assumptions are effectively net of all investment expenses.

Expected investment returns

The following table summarizes the expected investment returns calculated based on CalSTRS' target asset allocation (adopted at the May 2023 Investment Committee meeting) and different sources of capital market assumptions. It includes the Milliman and Horizon results mentioned in Milliman's experience analysis, and Segal's independent calculation.

Source of Capital Market Assumptions	Capital Market Assumption Horizon	Inflation Assumption	Expected Return[1]
CalSTRS[2]	20-year to 30-year	2.75%	7.30%
Milliman[1]	20-year	2.33%	6.80%
Horizon[1]	20-year	2.46%	7.50%
Segal	20-year to 30-year	2.50%	7.21%

The row labeled Segal is our independent calculation of the expected return based on the average of real rate of return assumptions for each asset class provided to us by six investment advisory firms retained by Segal's public sector clients in California, as well as Segal's investment advisory division.[3] These were calculated by reducing the total returns by the investment consultant's inflation assumption. We believe these averages are a reasonable consensus forecast of long-term future market returns in excess of inflation. If a given asset class did not have a directly corresponding asset class in our survey, we followed Millman's approach of using the CalSTRS capital market assumptions for these asset classes, and we believe the impact of any differences in the expectations for these classes should not significantly affect the overall portfolio expectations. Finally, the expected return is calculated by adding the 2.50% price inflation assumption that we recommend.

Risk margin

Although the median investment return assumption of 7.21% calculated by Segal is greater than Milliman's recommended assumption of 7.00%, we would note that this assumption only

[1] Net of administrative and investment expenses.
[2] From Milliman's experience study report.
[3] Using a sample average of expected real rate of returns allows investment return assumption to reflect a broader range of capital market information and should help reduce year to year volatility in the investment return assumption.

includes a small margin for adverse deviation. We recommend a lower investment return assumption to increase the likelihood of achieving the assumption in the long term.

The confidence level associated with a particular assumption represents the relative likelihood that future investment earnings would equal or exceed the assumed earnings over a 15-year period under a geometric model. The 15-year time horizon represents an approximation of the "duration" of the fund's liabilities, where the duration of a liability represents the sensitivity of that liability to interest rate variations.

The confidence level associated with the 7.00% investment return assumption is 53.2%, based on an annual portfolio return standard deviation of 10.10% provided by CalSTRS. A 6.75% investment return, on the other hand, would have a confidence level of 57.1%, which we believe to be an appropriate margin for adverse deviation.

We believe a margin for adverse deviation is particularly relevant given the current macroeconomic conditions. The real rates of return in our survey of investment consultants have increased in recent years to levels unprecedented in recent history. This may reflect the very low returns earned in 2022, as well as the increase in the federal funds rate during 2022, and could be overly optimistic for use in setting a long-term investment return assumption. The margin for adverse deviation built into a 6.75% assumption would provide for a more stable long-term investment return assumption if the capital market assumptions were to return to a level that is closer to earlier expectations. We note that Milliman's expected return provided aligns very closely with a 6.75% assumption.

We also agree with Milliman's comment that the use of different inflation assumption components of the capital market expectations tend to lead to different return expectations. Although not necessarily a one-to-one correspondence, the expected return calculated using CalSTRS' capital market assumptions would be close to 7.00% if CalSTRS were to assume a 2.50% inflation assumption, as we recommend. Under these alternative capital market assumptions, the 7.00% investment return assumption would include an even smaller margin.

Comparison with other public retirement systems

One final test of the recommended investment return assumption is to compare it against those used by other public retirement systems, both in California and nationwide. We note that an investment return of 6.75% or lower is becoming more common among California public retirement systems. Of the twenty 1937 Act CERL systems, seven use a 7.00% investment return assumption, eight use 6.75%, three use 6.50%, and one uses 6.25%. The remaining 1937 Act CERL system currently uses a 7.25% investment return assumption. Furthermore, CalPERS uses a 6.80% investment return assumption, while the Los Angeles City, San Jose, and San Diego City retirement systems use investment return assumptions of 7.00%, 6.625% and 6.50%, respectively.

The following table compares the 7.00% investment return assumption against those of the 220 large public retirement funds in their 2022 fiscal year valuations based on information found in the Public Plans Database, which is produced in partnership with NASRA:

CalSTRS' Investment Return vs. Public Plans Database[1] Investment Return Assumptions

Assumption	CalSTRS	Public Plan Data Low	Public Plan Data Median	Public Plan Data High
Net investment return	7.00%	5.32%	7.00%	8.25%

The detailed survey results show that over 80% of the systems have an investment return assumption in the range of 6.75% to 7.50%. Also, over half of the systems have reduced their investment return assumption from 2017 to 2022. State systems outside of California tend to change their economic assumptions less frequently and so may lag behind emerging practices in this area.

In summary, we believe the 7.00% investment return assumption is reasonable based on CalSTRS' target asset allocation. **However, we recommend that CalSTRS and Milliman consider lowering the investment return assumption to 6.75%.** The lower investment return assumption would provide a larger margin for future adverse deviation and provide stability against the volatility we see in capital market assumptions over time.

In addition, we agree with Milliman's recommendation of setting the same investment return assumption for the CBB program to the investment return assumption for the DB and DBS programs. This is because CalSTRS recently adopted a revised investment policy statement that applies the same asset allocation to all programs.

[1] Public Plans Data website – Produced in partnership with the National Association of State Retirement Administrators (NASRA).

Interest on member accounts

For the DB program, Milliman recommended maintaining the current 3.00% interest crediting assumption for member account balances, equal to their recommended 2.75% inflation assumption plus a margin of 0.25%. For the DBS and CBB programs, Milliman recommended setting the interest crediting rate to be the same as the investment return assumption.

For the DB program, CalSTRS' policy is to credit interest to the member account annually based on the average rate of two-year Treasury note for the previous 12 months. Milliman analyzed the year-to-year average CPI increase and the rates on two-year Treasury notes since 2000. Milliman has observed that the rates on two-year Treasury notes are generally lower when compared to the CPI increase for the same period. In particular, there were only two calendar years since 2010 where the rates on two-year Treasury notes exceeded the CPI increase.

Milliman also stated that the two-year Treasury rate has increased significantly over the last two years to about 5.0% as of September 2023, and they believe the current inflation assumption plus a small margin to reflect the yield in excess of inflation on two-year Treasuries remains a reasonable assumption. We observe that the recent spike in Treasury rates is a result of the recent high inflationary environment, and recently, the Federal Reserve Open Market Committee has suggested that several rate cuts will take place in the next few years.

Based on the comparison between historical CPI and the rates on two-year Treasury notes since 2000, **we recommend that CalSTRS and Milliman consider lowering the interest crediting assumption for the DB plan from 3.00% to 2.75%.** This includes a margin over our recommended 2.50% national price inflation assumption and matches our recommended long term COLA assumption for the SBMA program. However, we believe Milliman's recommended assumption of 3.00% is reasonable, and a more conservative assumption because it will anticipate slightly larger liabilities for members who terminate from the DB plan.

For the DBS and CBB programs, CalSTRS' current policy is to credit interest to member accounts based on the statutory minimum rate using the 30-year Treasury note, plus a portion of the returns in excess of the statutory minimum based on the assumed standard deviation of the investment portfolio and the program's funded ratio.

Milliman has noted that CalSTRS' "long-term intention is to allocate all of the investment earnings to the member accounts." This together with the fact that the rates on 30-year Treasury notes have been lower than the investment return assumptions for the DBS and CBB programs, **we agree with Milliman's recommendation of setting the interest crediting rate to be the same as the investment return assumption.**

DBS and CBB programs standard deviation

For the DBS program, Milliman recommended reducing the current 13.10% standard deviation assumption to 11.30%. For the CBB program, Milliman recommended increasing the current 11.00% standard deviation assumption to 11.30%. Both the DBS and CBB programs have the same recommended standard deviation assumption.

First, we agree with Milliman's approach of recommending the same assumption for both programs because the investment allocation is now the same as the other State Teachers' Retirement Plan (STRP) assets. This is consistent with Milliman's recommendation to use the same investment return assumption for the DB, DBS, and CBB programs.

The STRP contains the assets for the DB, DBS, CBB, and SBMA programs. The SBMA is credited with a 7.00% guaranteed return regardless of actual investment performance. In other words, the STRP assets are leveraged from the SBMA and the remaining STRP assets other than SBMA would theoretically have a higher standard deviation. As noted by Milliman, a growing portion of the STRP assets is attributable to the SBMA.

We independently performed an analysis similar to what Milliman described; i.e., we generated returns stochastically on the total STRP assets based on the CalSTRS capital market assumptions and estimated the impact of the SBMA guarantee return on the volatility of the remainder of the assets. We applied Milliman's assumption that the SBMA assets as a percentage of the STRP portfolio will range from 8% of the total in 2022 to 12% in 2052, and we derived the portfolio standard deviation other than the SBMA assets to be between 11.1% and 11.7% depending on the proportion of SBMA assets to total assets.

In summary, we agree with Milliman's recommendation of using a 11.30% standard deviation assumption for both the DBS and CBB programs.

Actuarial Methods

We commend CalSTRS for their efforts in working together with the legislature and other stakeholders in the landmark passing of the CalSTRS Funding Plan in 2014. The implementation of that Funding Plan over the last ten years has significantly improved the funding outlook of the plan and has put the plan on much stronger footing going forward. Nevertheless, there are still aspects of the funding mechanisms and setting of required contributions that leave weaknesses to long-term plan sustainability. Left untreated, those weaknesses will grow with time. On that basis, we offer the following considerations.

Funding Policy and the Unfunded Actuarial Obligation (UAO)

Complexity of the UAO Allocation

The allocation of the UAO between the state, employers, and the unallocated portion is highly complicated, leading to liabilities that have complex and counterintuitive interactions and the use of theoretical assumptions (as discussed in the service retirement section later in this report) that are not easy to justify. Beyond being difficult to manage administratively and leaving a portion of the UAO completely unaddressed, these allocations lead to current and ongoing funding challenges. For example, the current allocation leaves more than 100% of plan assets with the state, giving employers a negative asset balance. This leads to the unpreferred outcome that when the plan has net investment gains, employers' costs go up, and when the plan has net investment losses, employers' costs go down. This allocation leads to a state contribution rate which has leveraged sensitivity to investment volatility, and this sensitivity may grow as time goes on.

We recommend that CalSTRS work with the legislature to set a more straightforward, intuitive, and stable allocation of the UAO. This could be as simple as assigning a direct proportion of the UAO or total plan liabilities to the state and to the employer, which is common among other plans. Relatedly, CalSTRS and their actuary might also consider simplifying the different cost methods (within reason) used for different valuations within the plan, making the entire plan more consistent and easier to assess.

Limited ability to set contribution rates

While the Funding Plan increased contribution rates for participating employees, employers, and the state, it still left CalSTRS with limited rate-setting authority to adjust those rates over time in order to proactively fund plan liabilities (even though that authority is clearly improved by the Funding Plan). The employer's rate, for example, is subject to a maximum of 20.25% of compensation, and the state's, while it has no cap, can only increase by 0.5% per year. These limitations can lead to plausible scenarios where contributions are insufficient to make progress towards fully funding the plan. Additionally, if the state's portion of the UAO ever disappeared due to a strong investment year (for example), the state's contribution could decrease significantly and then only increase by 0.5% per year in future years if there was a subsequent market correction, leaving the plan vulnerable to insufficient contribution levels.

We recommend that CalSTRS work with the legislature to provide more rate-setting authority to CalSTRS. Ideally, this would be in conjunction with simplifying the allocation of the UAO. In this case, the most straightforward approach would be for CalSTRS to set a reasonable actuarially determined contribution for both the employers and the state based on their allocations of the UAO. But even if CalSTRS did not receive unlimited rate-setting authority, more flexibility in setting the employer contribution rate and in the year-to-year adjustments of the state's contribution rate would be prudent.

Amortization Policy and 2046

The Funding Plan targets full funding by 2046. In practice, this plan acts to pay off the UAO based on a closed, declining amortization schedule. We commend the Funding Plan for improving on previous funding policies and creating a plan to eliminate the UAO. Nevertheless, a closed, declining amortization schedule is inherently unstable. As the amortization period gets closer to zero, gains and losses will be amortized over a shorter window, leading to greater swings in required contribution rates. In turn, these required swings may be nullified by the limited rate setting authority provided for in the Funding Plan, leading to insufficient contributions towards full funding. Additionally, when 2046 is reached, the Funding Plan essentially expires and with no action, CalSTRS may see similar underfunding to what it saw before the Funding Plan was implemented.

We recommend that CalSTRS work with the legislature to establish funding policies that are stable and evergreen. Closed, layered amortization schedules provide the most transparency, accountability, and stability in paying off unfunded liabilities and are widely accepted to be industry best practice. We recommend that as CalSTRS approaches between 15-20 years of 2046, the Funding Plan should be adjusted to allow new plan experience (gains and losses) to be amortized independently through between 15-20 year amortization layers each year going forward. As part of this important consideration, we recommend that other relevant provisions of the Funding Plan be set to not expire as well.

Valuation of Assets

We note that Milliman uses three-year asset smoothing in the valuation of the DB Program. This is on the shorter side of asset smoothing periods and results in more recognition of investment volatility than longer periods would, especially for the state contribution rate. However, since the state contribution rate is capped at a 0.5% increase per year, the result is not that the contribution rate is volatile, but that it risks being significantly below the corresponding actuarially determined rate and needing multiple years to catch up. **In the end, while we might prefer a slightly longer asset smoothing period given the circumstances (like five years), we believe the current methodology is reasonable. We also believe using a Fair Market Value for the DBS, CBB, and MPP programs is reasonable.**

Demographic Assumptions

Miscellaneous assumptions

Valuation of current and future inactive members

For current inactive members, Milliman's practice has been to estimate their salary information based on their salary when last active, increased by 5% to anticipate potential salary increases at a reciprocal employer. Because CalSTRS' census data does not indicate which inactive members are employed by a reciprocal employer, **it is reasonable to include this slightly conservative margin for all inactive salaries upon retirement.**

According to the experience analysis report, Milliman is refining the process to apply the same 5% load in their modeling of benefits for future inactive members. This change will make the valuation process more consistent for current and future inactive members.

As Milliman has noted in the report, CalSTRS' census data does not include compensation information for inactive members. If this has not already been explored, **we recommend that Milliman work with CalSTRS to see if it is possible to obtain this information in the census data, even if it does not include any post-termination salary increases, or if data is available to confirm the 5% assumption.**

Inactive member retirement age

Milliman has proposed maintaining the current assumption for the retirement age of inactive members. The years included in the study period were not mentioned, but using 15 years of data, **Segal closely matches Milliman's analysis of the actual experience. Maintaining the current assumptions is reasonable.**

Tier	Current Assumption	Actual Average Retirement Age (Milliman)	Actual Average Retirement Age (Segal Replication)	Proposed Assumption
2% at 60	60	60	61	60
2% at 62	62	62	62	62

In the experience analysis for the period July 1, 2010 through June 30, 2015, Milliman originally set the inactive member retirement age assumption for the 2% at 62 tier at a later age than the 2% at 60 tier due to the differences in plan design. While this assumption is only supported by very limited data on inactive retirements from this tier, additional data should be available in the future to evaluate this assumption as more members in this tier reach retirement.

Number of children

Milliman has slightly increased the assumption for a male member's number of children and maintained the current assumption for female members. The years included in the study period

were not mentioned, but using five years of data, **Segal closely matches Milliman's analysis of the actual experience. The proposed assumptions are reasonable.**

Member's Gender	Current Assumption	Actual Average # of Children (Milliman)	Actual Average # of Children (Segal Replication)	Proposed Assumption
Male	0.65	0.72	0.72	0.70
Female	0.50	0.49	0.48	0.50

If this assumption was studied using a five-year period, we recommend that Milliman consider studying this assumption over a 15-year period, consistent with the other demographic assumptions in the experience analysis, or providing rationale for use of the shorter period. As the number of children for males has been gradually increasing over the 15-year period, it is reasonable to give more weight to recent experience.

Assumed offsets

A member's disability or survivor benefits may be partially offset due to the receipt of other public disability or survivor benefits. Milliman has continued to assume no offsets for future death and disability benefits. Based on the low incidence of actual offsets, **maintaining this assumption is reasonable.**

Probability of eligible survivor for active death benefit

Milliman has continued to assume that 85% of males and 65% of females will have an eligible survivor if they die as an active member. They have noted that data is not available on the actual percentage of active members with an eligible survivor, but these assumptions are comparable to other public retirement systems that have studied these assumptions using available data. **Maintaining this assumption is reasonable.**

Sick leave load

Milliman has lowered the assumption for unused sick leave service as a percentage of the total service credit at retirement. For this assumption, they studied five years of experience, focusing on the most recent three years because the years ended June 30, 2018 and 2019 were low outliers. Based on this experience, Milliman lowered the assumption.

Segal closely matches Milliman's analysis of the actual three-year experience, and the proposed assumption is reasonable.

Current Assumption	Actual Sick Leave Ratio (Milliman)	Actual Sick Leave Ratio (Segal Replication)	Proposed Assumption
1.7%	1.5%	1.5%	1.6%

We recommend that Milliman consider studying this assumption over a 15-year period, consistent with the other demographic assumptions in the experience analysis, or

providing rationale for use of the shorter period. Using a 15-year period could smooth out some of the variation in experience that Milliman has observed.

Option factors

We agree with Milliman's statement that option factors should be updated to reflect any changes in assumed mortality rates and the investment return assumption.

The years included in the study period were not mentioned for the adjustment to mortality for members electing a 100% continuance option, but Milliman indicated the percent male assumption was studied over a five-year period. **We recommend that Milliman consider studying these assumptions over a 15-year period, consistent with the other demographic assumptions in the experience analysis, or providing rationale for use of the shorter period.**

Adjustment to mortality for 100% continuance

For the purpose of developing the factors used to determine optional forms of benefit, Milliman has recommended increasing the member's assumed mortality rates in the first few years of retirement if they select a benefit option with a 100% continuance. We understand that this is intended to anticipate anti-selection for members with these benefit options.

Segal's analysis of increased mortality for members selecting 100% continuance is close to Milliman's at some years and it differs in others, and we believe the proposed assumptions are reasonable. With respect to any differences, there are multiple possible methodologies to assign experience to a particular year of retirement, so we do not have concerns with Milliman's lowering these assumptions.

Male

Year of Retirement	Current Assumption	Actual Change in Mortality (Milliman)	Actual Change in Mortality (Segal Replication)	Proposed Assumption
1	140%	115%	96%	125%
2	120%	125%	123%	115%
3	100%	99%	90%	100%
4	100%	83%	89%	100%

Female

Year of Retirement	Current Assumption	Actual Change in Mortality (Milliman)	Actual Change in Mortality (Segal Replication)	Proposed Assumption
1	250%	188%	178%	190%
2	160%	153%	141%	150%
3	130%	100%	83%	100%
4	100%	90%	121%	100%

Percent male

The factors used to determine optional forms of benefit are based on mortality tables that are weighted at some percentage between the male and female mortality rates. For the purpose of developing these factors, Milliman has reviewed the percentage of members electing each option who are male versus female. They have focused their analysis on options 6, 7, and 9, as these are the options currently available for members to elect, omitting option 8, which is the compound option for multiple beneficiaries or QDROs. Milliman is maintaining the current assumptions.

Segal closely matches Milliman's analysis of the actual experience, and the proposed assumptions are reasonable.

Option	Current Assumption	Actual Percent Male (Milliman)	Actual Percent Male (Segal Replication)	Proposed Assumption
6	50%	48.6%	47.1%	50%
7	30%	28.0%	27.9%	30%
9	40%	42.4%	41.2%	40%
All Retirees	30%	29.1%	28.6%	30%

Estimated impact of one-year final compensation

Under the 1990 benefit structure, all benefits were based on three-year final compensation. Under the current plan of benefits, members in the 2% at 60 tier with at least 25 years of service are entitled to benefits based on one-year final compensation. In order to value the cost to provide the 1990 benefit structure separately, Milliman is using an assumption to estimate what the benefits for these members would have been using three-year final compensation.

Future retirees

Milliman assumes that the one-year final compensation is 4.1% greater than the three-year final compensation. This is based on the economic assumptions and is made up of 3.5% in general wage growth plus a 0.6% merit increase. **We recommend that Milliman consider providing**

more details about how the 0.6% merit increase was selected, but we believe it to be reasonable.

Current retirees

Milliman assumes that the one-year final compensation is greater than the three-year final compensation by a percentage that varies based on the year of retirement. For new retirees in each year who are eligible for one-year final compensation, Milliman has also estimated their three-year final compensation to determine the actual relationship between one-year and three-year final compensation.

Based on conversations with Milliman about their methodology, **Segal closely matches Milliman's analysis for the year ended June 30, 2022, and the proposed assumption is reasonable.**

Result	Milliman	Segal Replication
Monthly average compensation over one year	$9,130	$9,129
Monthly average compensation over three years	8,810	8,830
Increase	**3.6%**	**3.4%**

The records used in this analysis were those with service of at least 26.5 years instead of the minimum 25 years, to avoid using sick leave in the eligibility for one-year average compensation. **We recommend that Milliman consider explicitly subtracting sick leave from total service and using those with a resulting service of at least 25 years.**

The records used in this analysis were those who retired in May or June 2022, in order to avoid partial years. Because the compensation is annualized in CalSTRS' census data, **we recommend that Milliman consider using all members regardless of retirement month, or providing information in the report regarding the rationale for limiting the analysis to May or June retirees.**

The one-year final compensation is the maximum of the one-year final compensation provided in the June 30, 2022 data and the annual compensation in each of the two most recent years. Segal calculated the three-year final compensation as the average of the June 30, 2020 and June 30, 2021 annual compensations and the June 30, 2022 one-year final compensation provided in the data (or an earlier consecutive three-year period if higher). **We recommend that Milliman consider providing information in the report about how the one-year and three-year final compensation amounts were calculated.**

Alternatively, if this has not already been explored, **we recommend that Milliman work with CalSTRS to see if it is possible to obtain both the one-year and three-year final compensation amounts in the census data,** which would remove the need to have this assumption for current retirees.

Salary increases due to promotion and longevity (merit)

Milliman has increased the assumed merit rates at some service levels and decreased the assumed merit rates at other service levels. **Segal closely matches Milliman's analysis of the actual merit salary experience, and the proposed assumptions are reasonable.**

The entry age groups used to set separate salary increase rates are reasonable, as is the approach to setting the rates by elapsed service (length of time between entry age and current age).

Milliman provided Segal with a summary of the actual salary increases over the 15-year period, starting for members with one year of elapsed service, omitting a summary for members with zero years of elapsed service. Although there is often variation in methodology for how salary increases for new members are calculated, we reviewed the proposed assumptions for members with zero years of elapsed service and found them to be reasonable as well.

Graphs on the subsequent pages show the current and proposed merit salary assumptions and the actual experience over the 15-year period.

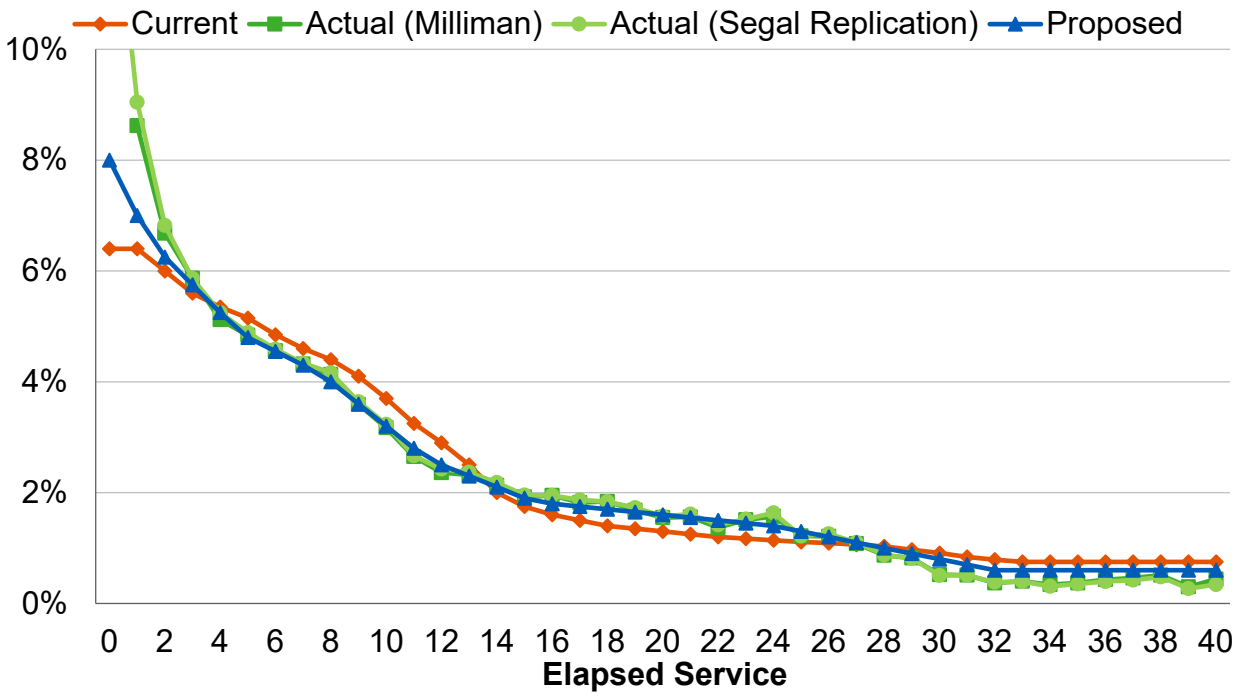
General wage inflation

As described in an earlier section of this report, Milliman's assumption for general wage inflation is 3.50% (i.e., 2.75% inflation assumption plus 0.75% real wage growth assumption). The merit salary increase assumption is used to project members' salary increases in addition to the general wage inflation.

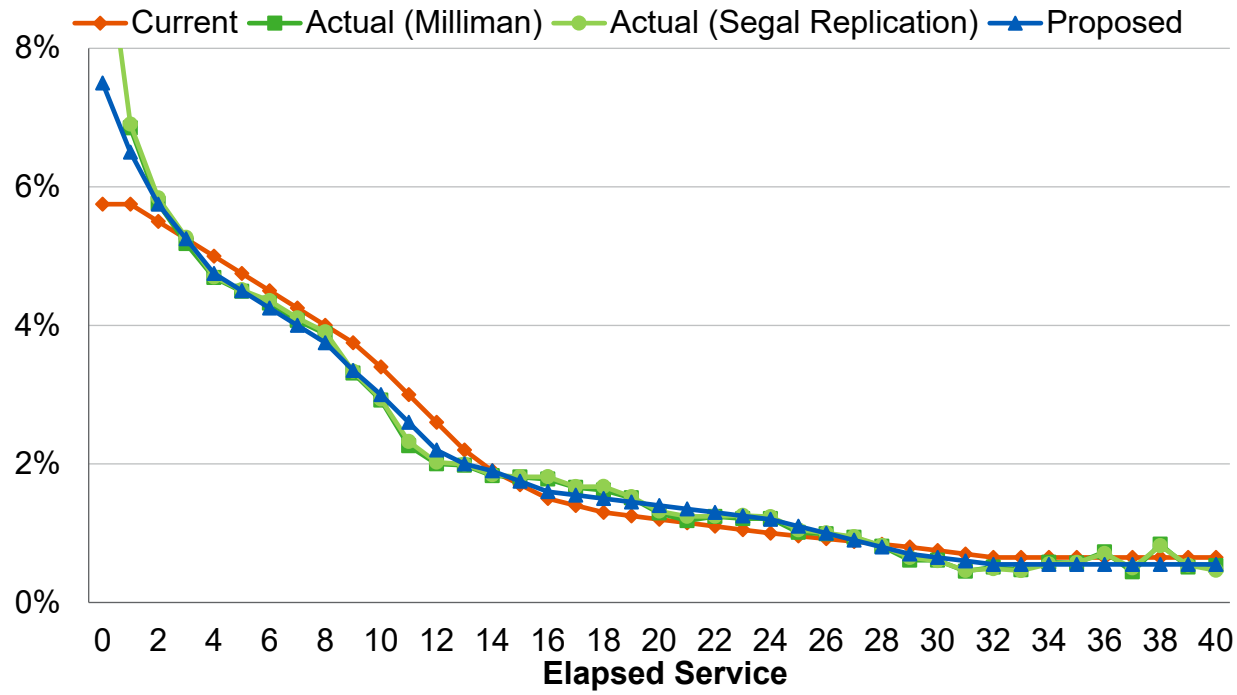
Milliman has observed that the actual general wage inflation over the 15-year study period was 1.94%, and any salary increase for a given member above that level is considered a merit increase. As Milliman communicated to us, the 1.94% general wage inflation is based on the average increase in average salaries over the 15-year period, adjusted to reflect the amount that salaries would have been expected to increase over that time due to the increasing maturity of the population.

We recommend that Milliman consider providing additional information on this calculation in the report, but the result is reasonable.

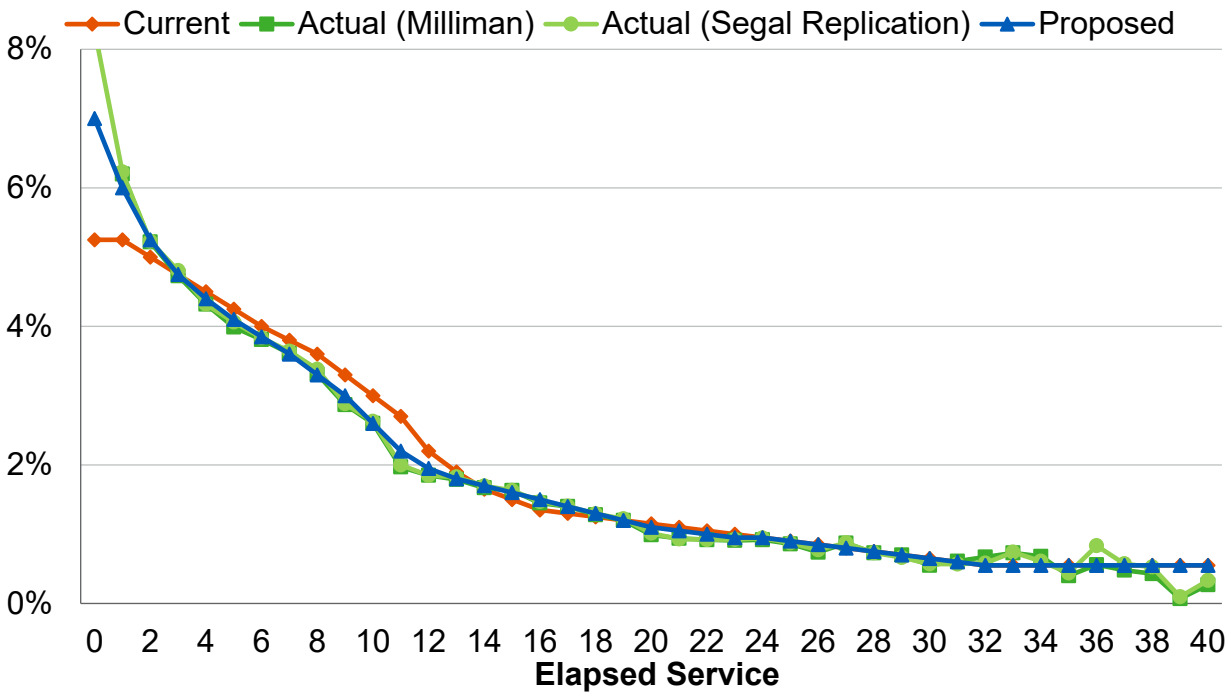
Merit Salary Increase Rates
Entry Age Less Than 25



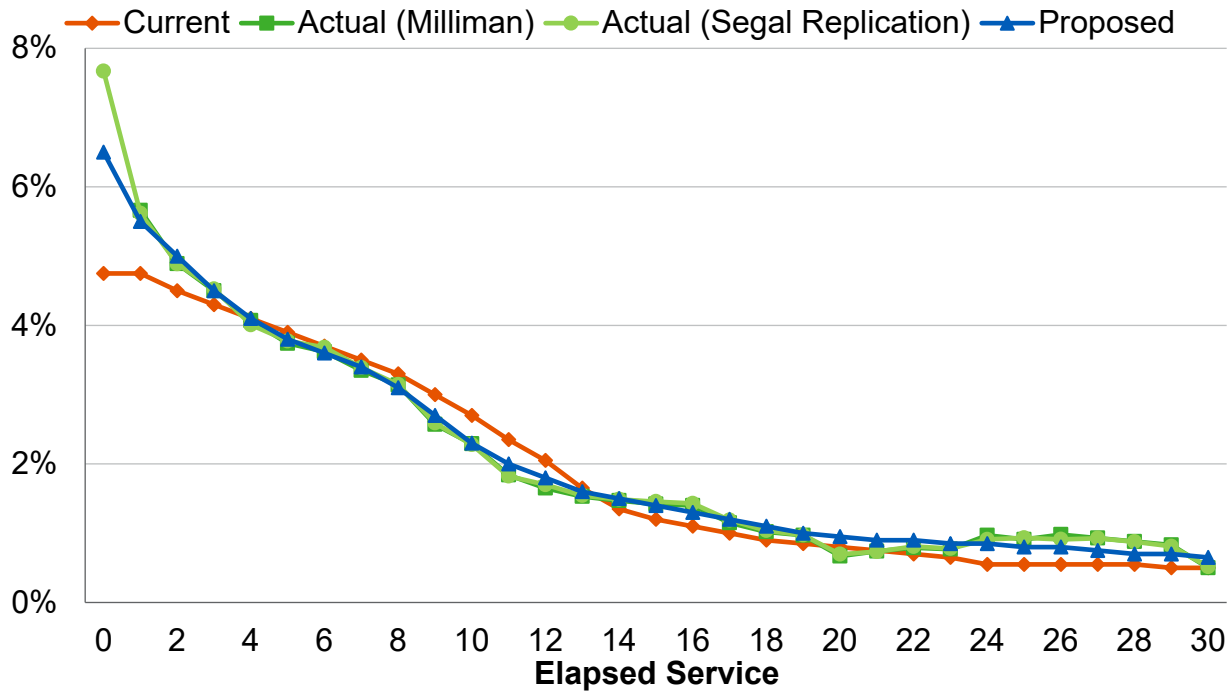
Merit Salary Increase Rates
Entry Age 25 – 29



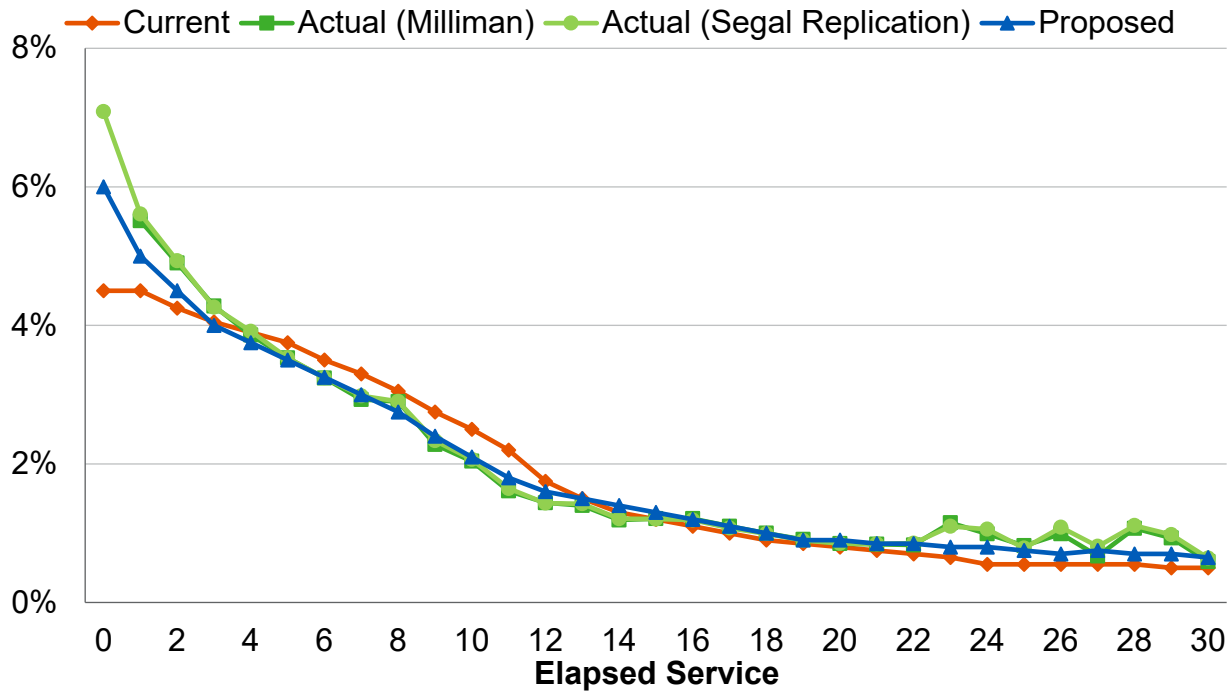
Merit Salary Increase Rates
Entry Age 30 – 34



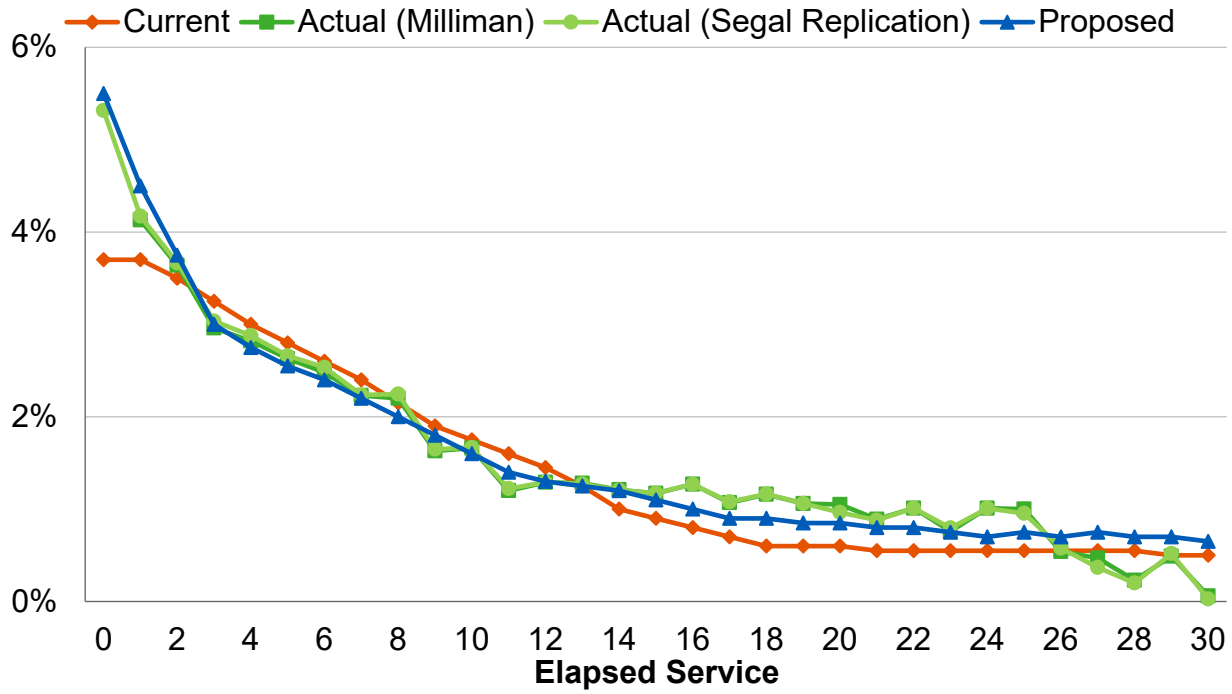
Merit Salary Increase Rates
Entry Age 35 – 39



Merit Salary Increase Rates
Entry Age 40 – 44



Merit Salary Increase Rates
Entry Age 45 And Over



Mortality

Milliman has increased the assumed mortality rates at some ages and decreased the assumed mortality rates at other ages. **Segal closely matches Milliman's analysis of the actual mortality experience over the most recent five years, and the proposed assumptions are reasonable.**

Based on conversations with Milliman, our actual mortality counts also include records in pay status that dropped off from the data file from one year to the next, plus records that moved from retiree to beneficiary status.

The actual, expected, and proposed counts over the most recent five years are shown below.

For members in pay status, the counts shown below are the dollar amounts for the actual, expected, and proposed deaths weighted by monthly benefit, in thousands.

Service Retiree Benefit-Weighted Mortality – Male

Result	Milliman	Segal Replication	% Difference
Actual	$62,958	$62,844	(0.2%)
Expected	59,373	59,322	(0.1%)
Proposed	59,901	60,180	0.5%
Actual ÷ Expected	**106%**	**106%**	
Actual ÷ Proposed	**105%**	**104%**	

Service Retiree Benefit-Weighted Mortality – Female

Result	Milliman	Segal Replication	% Difference
Actual	$71,401	$71,238	(0.2%)
Expected	66,983	66,958	0.0%
Proposed	67,893	68,267	0.6%
Actual ÷ Expected	**107%**	**106%**	
Actual ÷ Proposed	**105%**	**104%**	

Disabled Retiree Benefit-Weighted Mortality – Male

Result	Milliman	Segal Replication	% Difference
Actual	$1,637	$1,609	(1.7%)
Expected	1,388	1,384	(0.3%)
Proposed	1,520	1,522	0.1%
Actual ÷ Expected	**118%**	**116%**	
Actual ÷ Proposed	**108%**	**106%**	

Disabled Retiree Benefit-Weighted Mortality – Female

Result	Milliman	Segal Replication	% Difference
Actual	$3,493	$3,384	(3.1%)
Expected	2,978	2,969	(0.3%)
Proposed	3,095	3,104	0.3%
Actual ÷ Expected	**117%**	**114%**	
Actual ÷ Proposed	**113%**	**109%**	

For active members, the counts shown below are the headcounts for the actual, expected, and proposed deaths.

Active Headcount-Weighted Mortality – Male

Result	Milliman	Segal Replication	% Difference
Actual	930	933	0.3%
Expected	638	639	0.2%
Proposed	847	846	(0.1%)
Actual ÷ Expected	**146%**	**146%**	
Actual ÷ Proposed	**110%**	**110%**	

Active Headcount-Weighted Mortality – Female

Result	Milliman	Segal Replication	% Difference
Actual	1,197	1,194	(0.3%)
Expected	929	929	0.0%
Proposed	1,103	1,103	0.0%
Actual ÷ Expected	**129%**	**128%**	
Actual ÷ Proposed	**109%**	**108%**	

Mortality weights

Starting with the 2024 experience analysis, the retired mortality experience has been studied on a benefit-weighted basis. We agree with this change in methodology. A benefit-weighted approach reflects the observation that benefit amounts are a significant predictor of mortality differences, and under this approach, higher weight is given to retirees receiving larger benefits.

Milliman's report noted that the retiree deaths are weighted by monthly allowances. **We recommend that Milliman consider expanding on this description** to state that they adjust the benefit weights to what they would have been under the unmodified form of payment in order to disregard the impact of a member electing an optional form of payment.

Milliman's report also noted that the active deaths are analyzed on a headcount-weighted basis. Milliman reviewed the salary-weighted results as well and found that the difference was not significant. **However, we recommend that Milliman consider using a salary-weighted analysis to set the active mortality assumptions.** This would improve the consistency between the retiree and active mortality assumptions, since the same rationale for benefit-weighted retiree mortality applies to salary-weighted active mortality. Additionally, the mortality assumptions would then be already set on a salary-weighted basis should a difference between the headcount-weighted and salary-weighted approaches to active mortality ever arise.

Generational projection scale

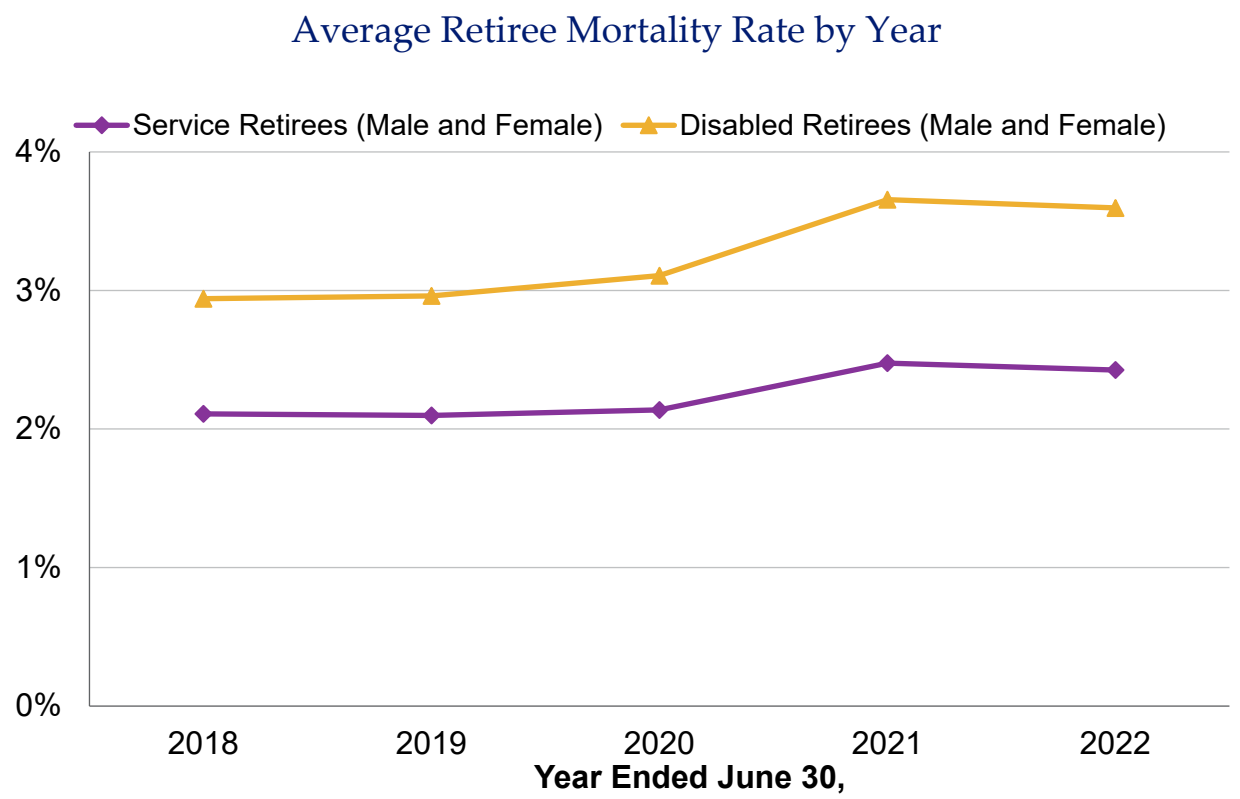
Milliman has continued to propose the use of a generational mortality projection scale, which is an explicit assumption for future mortality improvement. We agree with this approach.

The current generational projection assumption is 110% of the ultimate MP-2019 scale, and the proposed assumption is 100% of the ultimate MP-2021 scale. In the published MP-2019 and MP-2021 scales, the rate of mortality improvement varies by age and birth year for several years, before ultimately varying just by age. By using the ultimate mortality improvement scale, Milliman is anticipating that improvements in mortality will just be based on age, regardless of birth year. **Although we believe that the full MP-2021 scale is an appropriate estimate of future mortality improvement, Milliman's use of the ultimate scale is also reasonable.**

As Milliman noted in the report, their analysis of the mortality experience over the most recent five years used the full MP-2021 projection scale to estimate the rates of recent mortality improvement.

Impact of COVID-19

The mortality assumptions are based on experience from the most recent five years, which includes a significant amount of experience after the start of the COVID-19 pandemic. Milliman observed in the report that COVID-19 has resulted in higher mortality rates for CalSTRS. We agree with this observation; the following graph shows the observed average benefit-weighted mortality rates for all service and disabled retirees over the most recent five years.



Milliman mentioned in the report that they set the proposed mortality rates lower than actual experience to account for the recent increase in deaths due to COVID-19. In other words, they are not assuming that the level of mortality incidence in the most recent five years will continue in the long term. For healthy retirees, the ratio of actual to proposed deaths is 105%, and for disabled retirees, the ratio is 111%. **These are reasonable results given the impact of COVID-19 during the study period.**

Beneficiary mortality

In both the current and proposed assumptions, the mortality tables used for beneficiaries are the same as the mortality tables used for service retirees. To support this, Milliman noted factors that may tend to increase beneficiary life expectancy while the member is alive and decrease beneficiary life expectancy after the member's death. They have also noted that data is not available on the mortality experience for beneficiaries before the death of the member. Overall, this approach is reasonable.

However, we recommend that Milliman consider using a separate mortality table for beneficiaries in pay status, while continuing to use the same assumption as service retirees for contingent beneficiaries not yet in pay status. As Milliman has noted, beneficiaries in pay status have higher mortality due to the widowhood effect, which supports use of a separate mortality table. Furthermore, data on the mortality experience of beneficiaries in pay status is available in CalSTRS' census data, making it possible to set separate mortality assumptions for this group. If this approach is taken, we recommend that Milliman also consider showing counts of actual and expected deaths in the report for beneficiaries in pay status.

Disabled mortality select period

In both the current and proposed assumptions, the disabled retiree mortality tables are set based on age, except that a service-based mortality assumption is used for the first three years of disability. **We recommend that Milliman consider providing some rationale for this assumption structure in the report.**

We did not exactly match Milliman's number of actual deaths in the first three years of disability, but we do not have any concern with Milliman's assumptions. This is a very small group (less than 200 deaths over the five-year period), so small differences in counts can produce larger percent differences. Additionally, there are multiple possible methodologies to assign experience to a particular year of disability.

Again, the counts shown below are the dollar amounts for the actual, expected, and proposed deaths weighted by monthly benefit, in thousands.

Disabled Retiree Benefit-Weighted Mortality – Male
First Three Years of Disability Only

Result	Milliman	Segal Replication	% Difference
Actual	$150	$142	(5.3%)
Expected	120	120	0.0%
Proposed	120	120	0.0%
Actual ÷ Expected	**126%**	**119%**	
Actual ÷ Proposed	**126%**	**119%**	

Disabled Retiree Benefit-Weighted Mortality – Female
First Three Years of Disability Only

Result	Milliman	Segal Replication	% Difference
Actual	$501	$466	(7.0%)
Expected	285	285	0.0%
Proposed	330	330	0.0%
Actual ÷ Expected	**176%**	**163%**	
Actual ÷ Proposed	**152%**	**141%**	

Credibility

The current and proposed mortality assumptions use custom mortality base tables which reflect CalSTRS' historical experience over the most recent five years. We recommend that Milliman consider incorporating published tables such as the Public Retirement Plans Mortality tables (Pub-2010) that were published by the Retirement Plans Experience Committee of the Society of Actuaries in 2019. The Pub-2010 family of tables include sets of mortality tables that apply to populations of teachers.

Setting a fully credible custom mortality table based on observed experience by age requires a very large amount of data. The number of deaths needed for full credibility for a headcount-weighted mortality table is just over 1,000,[1] where full credibility means a 90% confidence that the actual experience will be within 5% of the expected value. To create a fully credible custom mortality table, this number of deaths would be needed at *each age*. Even a very large system like CalSTRS does not have this number of deaths for all ages and groups over either a five-year or 15-year study period.

On the other hand, if an actuary believes that a published mortality table has appropriate probabilities of death for a retirement plan's population, they can scale these probabilities of death in the published mortality table up or down to fit the population's experience to the extent that the underlying data is credible. The standard for full credibility under this approach is 1,000 deaths across all ages, which is easier to meet.

Out of all the groups, CalSTRS has the most data on service retiree deaths. The proposed service retiree mortality rates are lower at earlier ages and higher at later ages than the Pub-2010 Teacher Annuitant table, which may support using a custom table instead of this published table. There are much fewer disability retiree deaths and active deaths, which make it more difficult to evaluate whether or not the published tables are a good fit for these groups (in addition to having lower credibility to justify using a custom table).

Even if no change is made to the approach, **we recommend that Milliman consider expanding on their discussion in the report about the justification for using custom mortality tables,** the comparison with the Pub-2010 tables (currently mentioned in the report just for active mortality), and whether any published tables were considered in the process of setting mortality assumptions for ages or groups with very little mortality data.

Study period

Finally, Milliman mentioned that they reviewed the mortality experience over the most recent five years and the most recent 15 years, but focused on the five-year period when setting the assumptions. **We recommend that Milliman consider using 15 years of mortality experience instead of five years, consistent with the other demographic assumptions.**

If Milliman chooses to more explicitly take credibility into consideration, the additional years would increase the credibility of the data. If Milliman continues with the current approach, the additional years would provide more justification for the proposed assumptions. This would also have the impact of diluting outlier experience like the COVID-19 pandemic, requiring less of an adjustment to remove its effects from the proposed assumptions.

Because mortality has tended to improve over time, gathering data across multiple years needs to take into account an estimate of the rate of mortality improvement during the study period, as Milliman has done for the five-year period using the generational mortality projection assumptions. Milliman has noted that a 15-year period would have required more estimation of the rate of mortality improvement than a five-year period. Even with this in mind, we believe it would still be an advantage to use more data in the analysis.

[1] The number of deaths needed for full credibility for a benefit-weighted mortality table is generally higher and based on the dispersion of the benefit amount for a given retiree group.

Service retirement

Milliman has increased the assumed service retirement rates at most age and service combinations. **Segal closely matches Milliman's analysis of the actual service retirement experience, and the proposed assumptions are reasonable**.

The actual, expected, and proposed counts of retirement for ages 50 through 74 are shown below. For members in the 2% at 60 tier, the counts are over the most recent 15 years, and for members in the newer 2% at 62 tier, the counts are only over the most recent five years. Graphs on subsequent pages show the current and proposed service retirement assumptions and the actual experience over the 15-year or five-year period.

Service Retirement – 2% at 60 Tier

Result	Milliman	Segal Replication	% Difference
Actual	169,662	169,329	(0.2%)
Expected	152,989	153,712	0.5%
Proposed	165,805	165,466	(0.2%)
Actual ÷ Expected	**111%**	**110%**	
Actual ÷ Proposed	**102%**	**102%**	

Service Retirement – 2% at 62 Tier

Result	Milliman	Segal Replication	% Difference
Actual	223	222	(0.4%)
Expected	171	174	1.8%
Proposed	212	212	0.0%
Actual ÷ Expected	**130%**	**128%**	
Actual ÷ Proposed	**105%**	**105%**	

In the 2024 experience analysis, the service groups for 30 years of service and 31 or more years of service were combined into one category. The service groups used to set separate service retirement rates are reasonable.

We would ordinarily expect the proposed assumptions to either fall between the current assumptions and actual experience, or closely follow actual experience. However, at some age and service combinations, Milliman's proposed assumptions are greater than both the current assumption and the observed retirement rate. Conversely, the proposed assumptions at other age and service combinations are lower than both the current assumption and the observed retirement rate. **We recommend that Milliman continue to monitor this experience and consider if it would be reasonable to more closely follow actual experience at these age and service combinations.**

For the 2% at 62 tier, there is virtually no service retirement experience for members with 10 or more years of service. The service retirement rates for such members were adjusted consistent

with the adjustments to the 2% at 60 tier, and the proposed assumptions are reasonable. As time passes, more data will be available to set these service retirement rates based on actual experience.

Service retirement eligibility

Milliman's analysis of the service retirement decrement focuses on members who are eligible to retire. In order to anticipate members aging into retirement eligibility during a given fiscal year, Milliman's analysis of this assumption includes anyone who is eligible for retirement based on rounded age at the beginning of a fiscal year, and service projected to the middle of the fiscal year. This approach incorporates some, but not all, members who age into service retirement eligibility during the year.

We recommend that Milliman consider also reflecting service retirements by members who did not meet the eligibility criteria as defined above, by adding such members to the exposures and actual counts if they retired during the year. We estimate that this would have added approximately 2,500 total service retirements to the 15-year counts, slightly increasing the observed retirement rates.

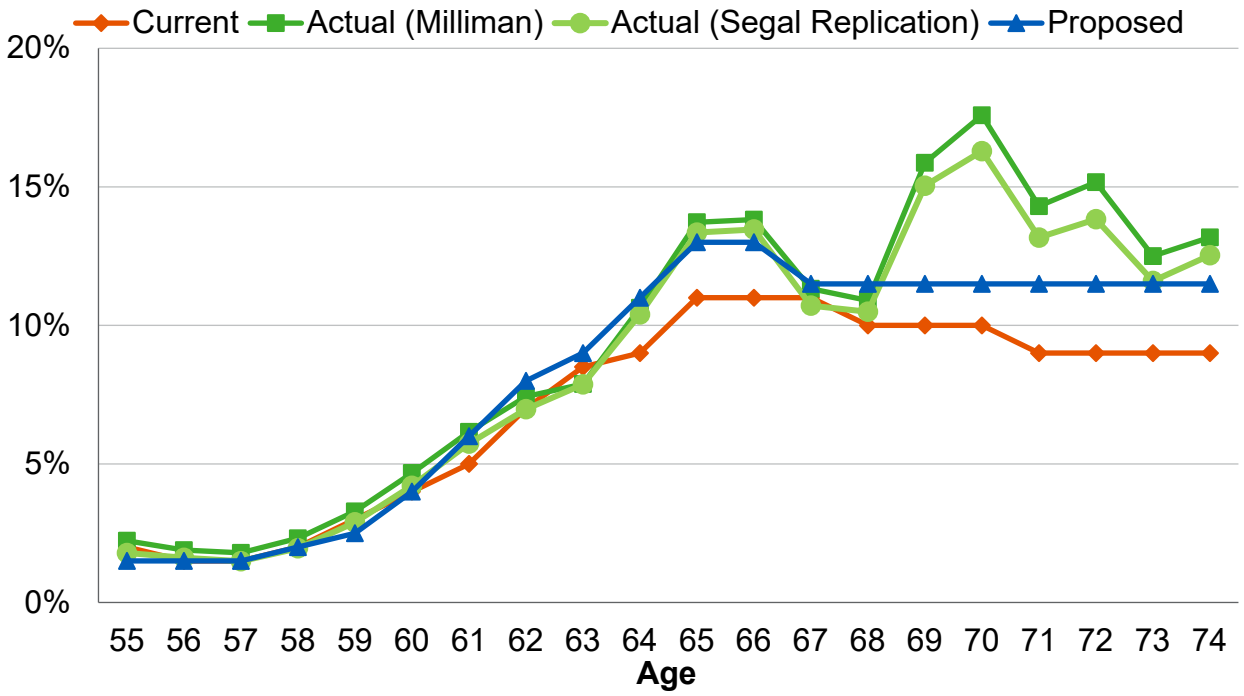
1990 Benefit Structure

Milliman maintains separate service retirement rates that are used to value the liabilities under the 1990 Benefit Structure. We understand that this approach of setting separate retirement rates for that structure is consistent with CalSTRS' Funding Plan as the UAO for the 1990 Benefit Structure is paid by the State. Because the retirement offerings were different in 1990, there is an argument that the valuation of the UAO should recognize different service retirement timing that would have taken place under that earlier plan of benefits.

However, we would note that it is difficult to reliably set service retirement rates for the 1990 Benefit Structure. There is no data on when members in 2024 or later would have retired under a benefit structure from 1990. Service retirement rates from 1990 have been based on very old demographic experience, and any adjustments to these rates over time, including the adjustments in the 2024 experience analysis, are by necessity highly speculative. We also note that other assumptions that could have been affected by the difference in benefit structure do not incorporate the same distinction. **Therefore, we recommend that Milliman consider treating retirement rates consistently with other assumptions and no longer calculate the theoretical rates for the 1990 Benefit Structure.**

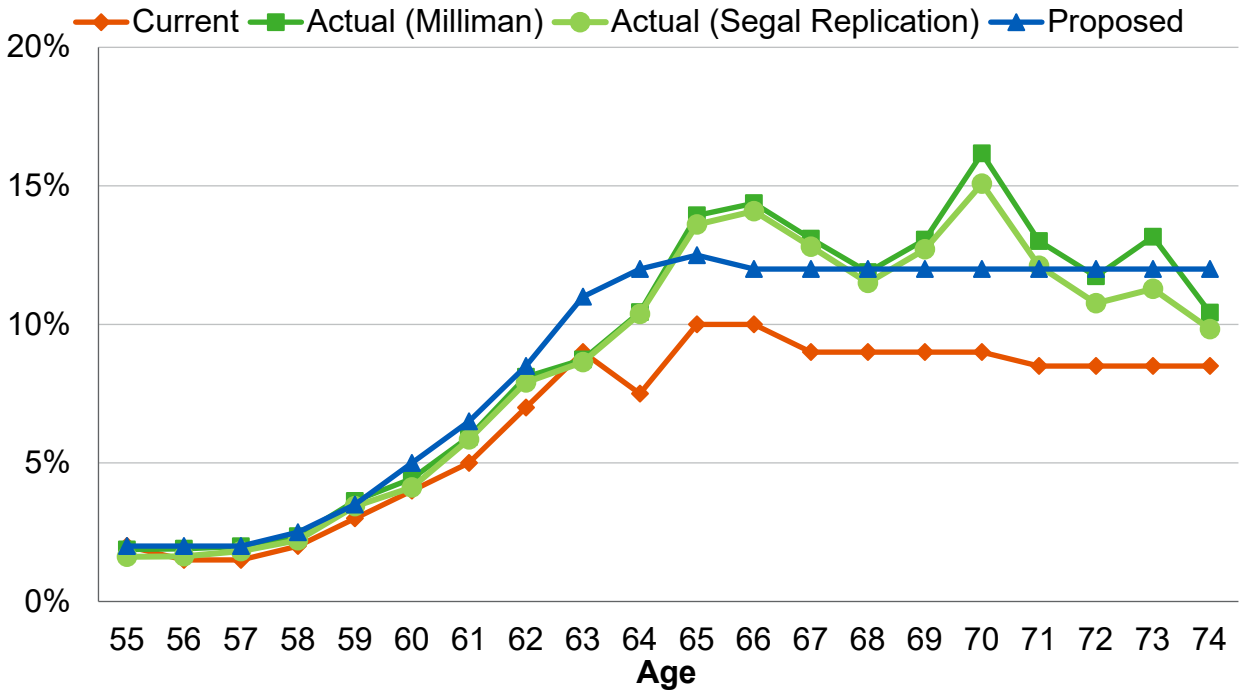
Service Retirement Rates

2% at 60 Tier: Service 5 – 9, Male



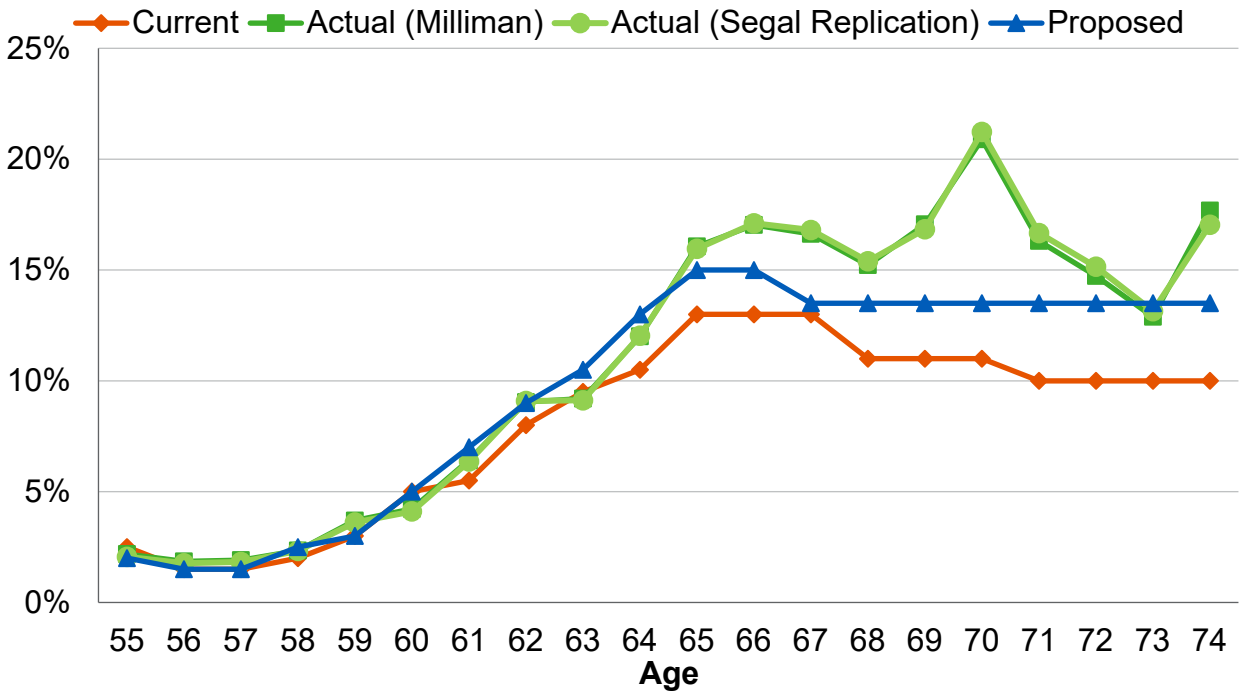
Service Retirement Rates

2% at 60 Tier: Service 5 – 9, Female



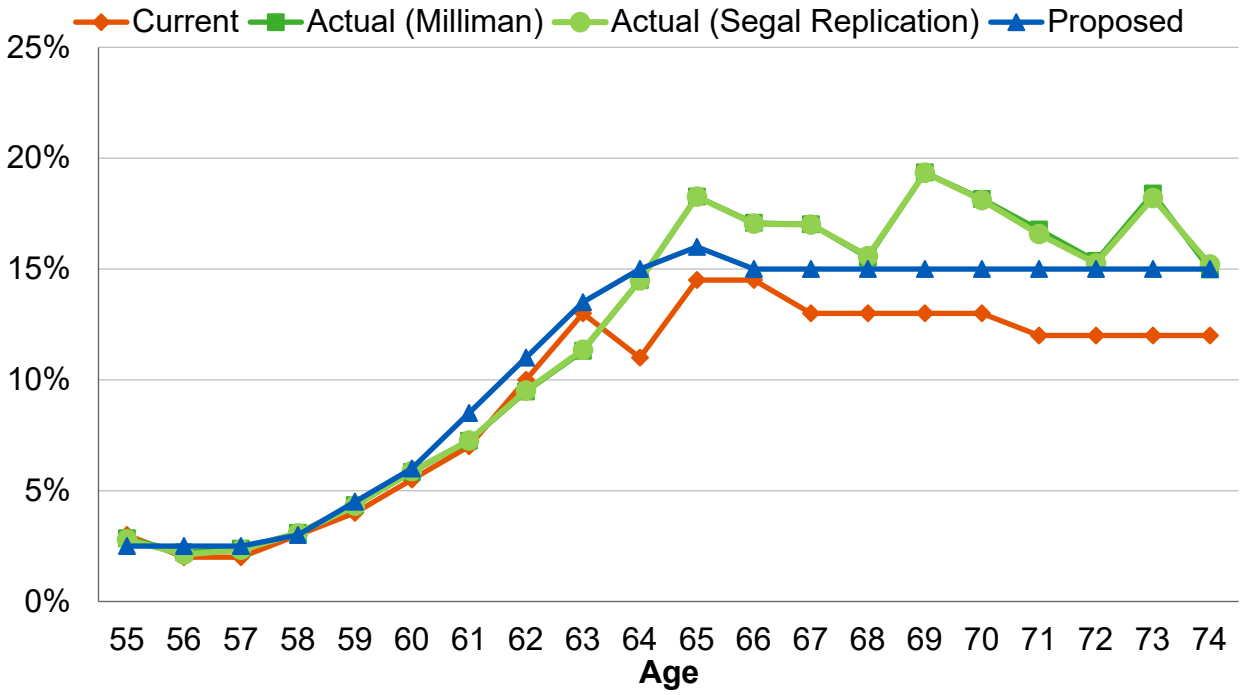
Service Retirement Rates

2% at 60 Tier: Service 10 – 14, Male



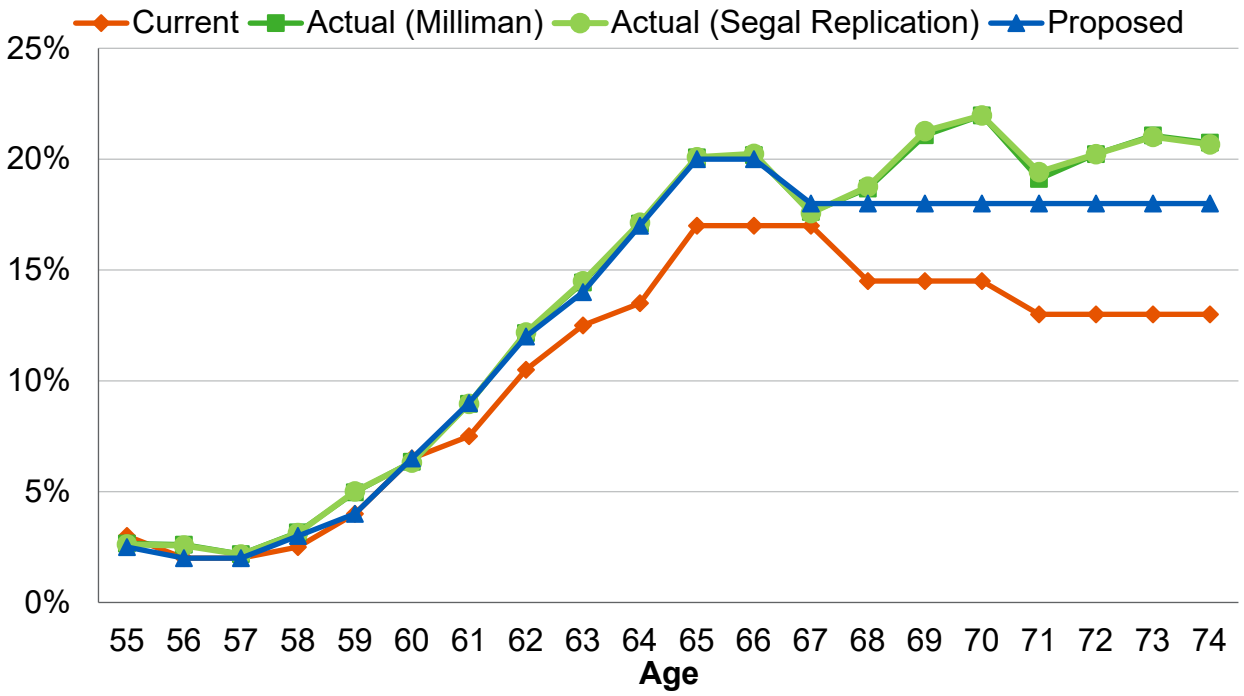
Service Retirement Rates

2% at 60 Tier: Service 10 – 14, Female



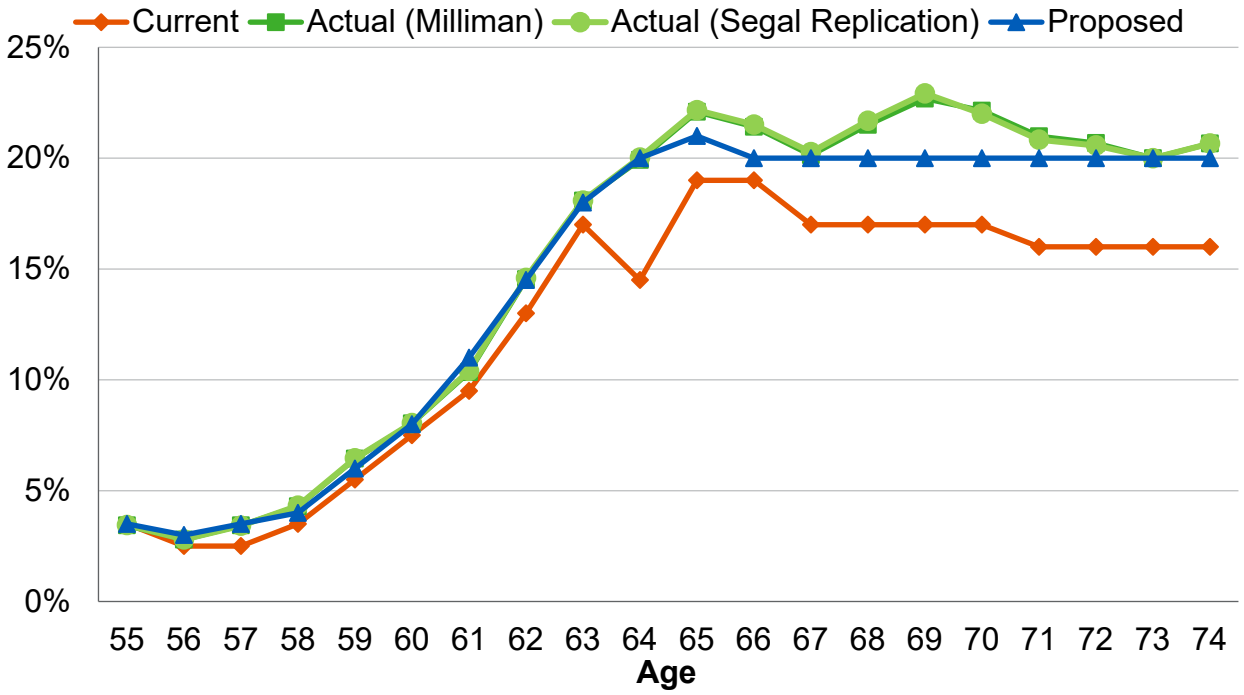
Service Retirement Rates

2% at 60 Tier: Service 15 – 19, Male



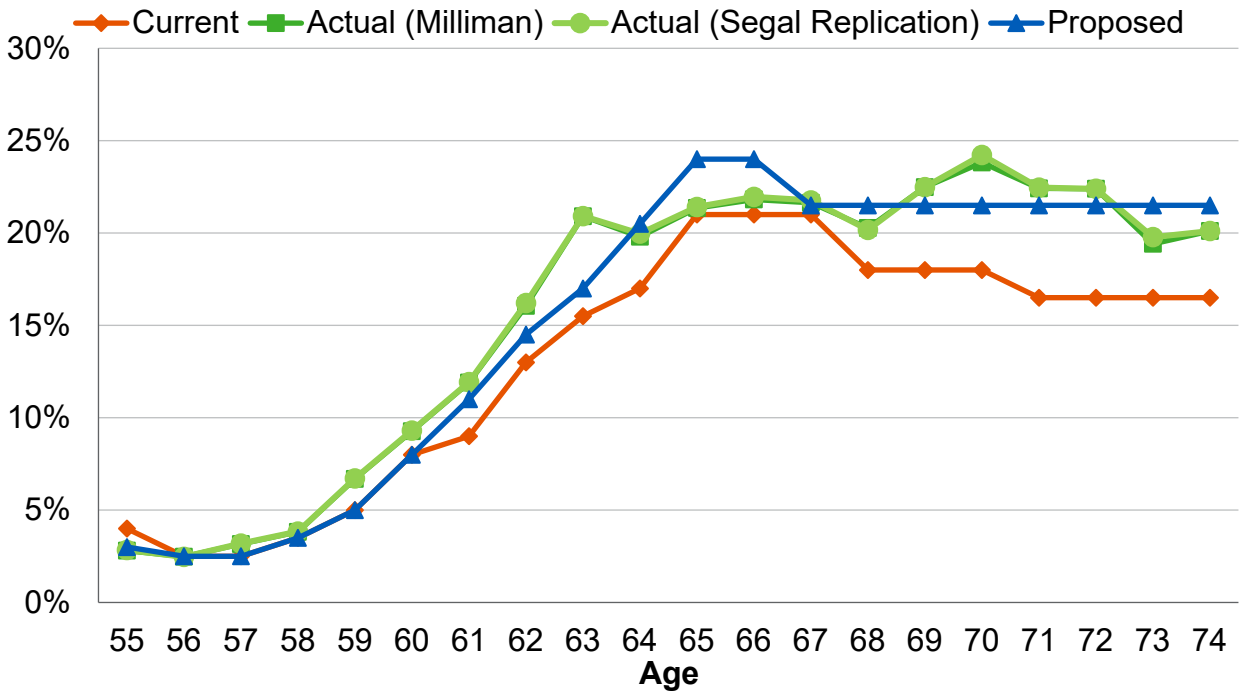
Service Retirement Rates

2% at 60 Tier: Service 15 – 19, Female



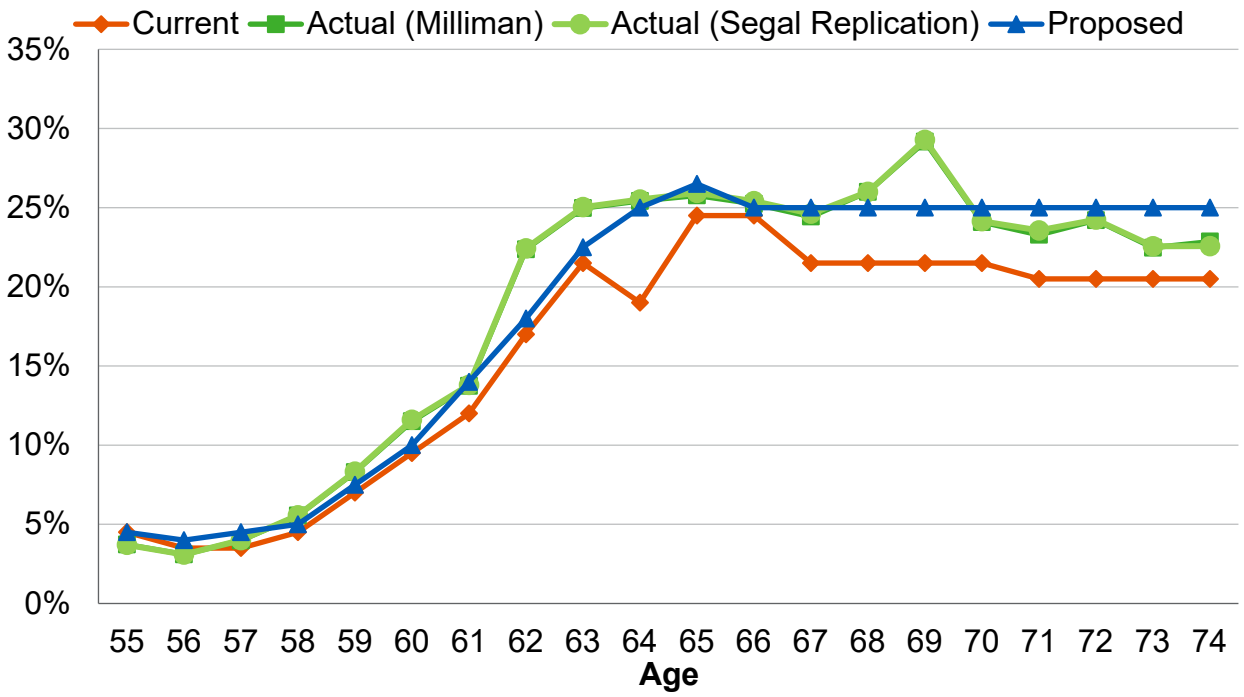
Service Retirement Rates

2% at 60 Tier: Service 20 – 24, Male



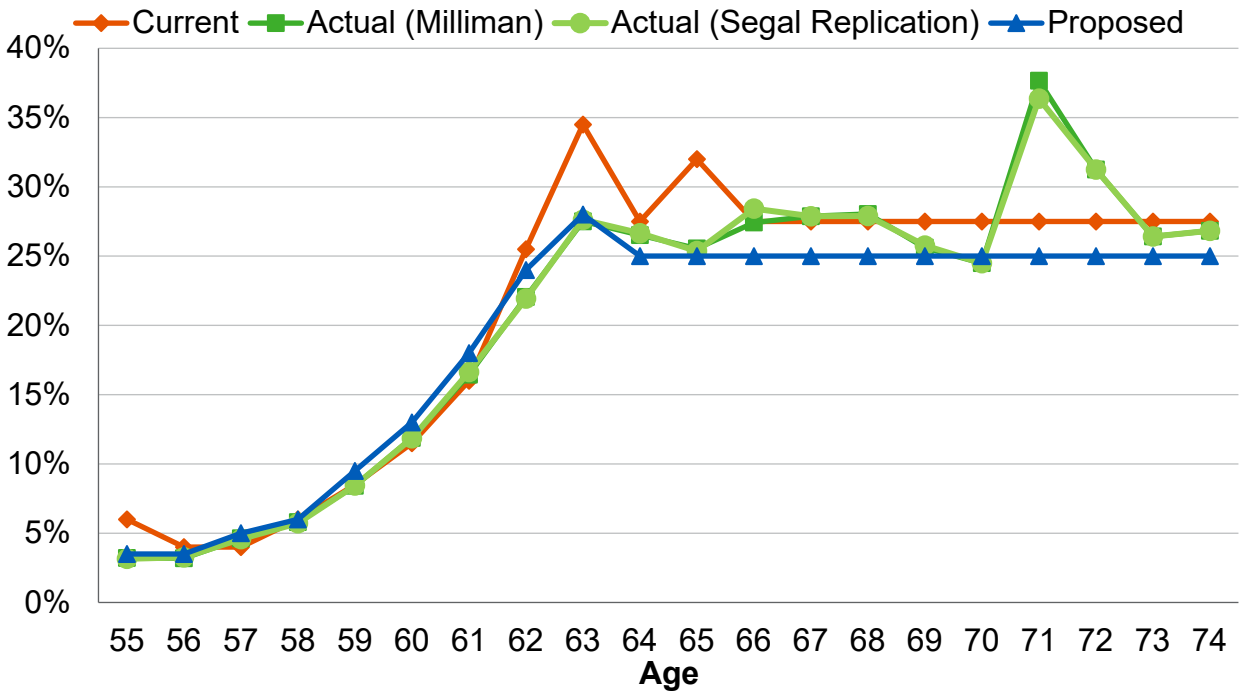
Service Retirement Rates

2% at 60 Tier: Service 20 – 24, Female



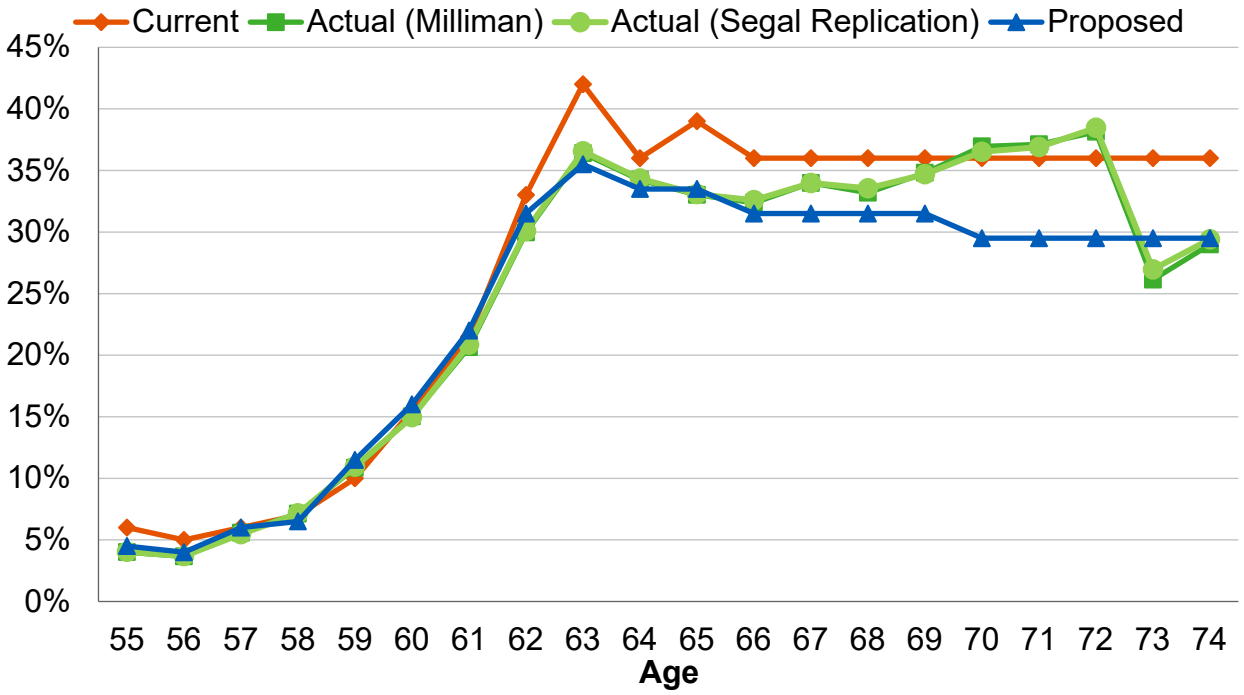
Service Retirement Rates

2% at 60 Tier: Service 25, Male



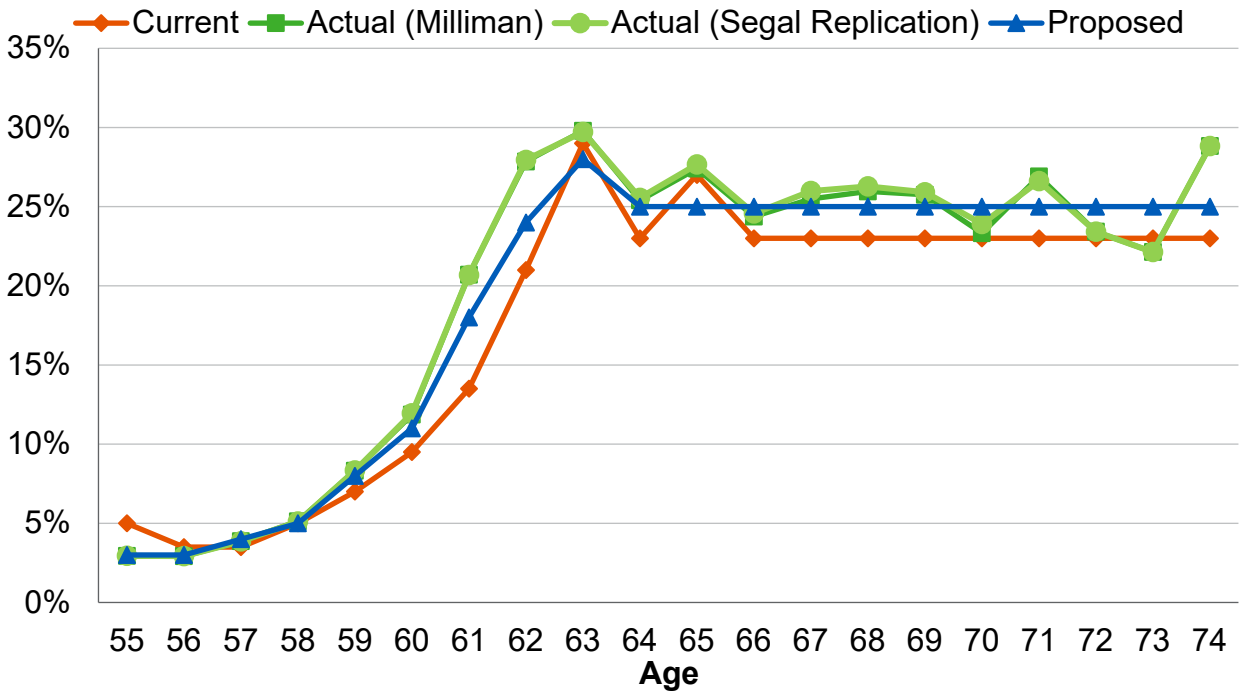
Service Retirement Rates

2% at 60 Tier: Service 25, Female



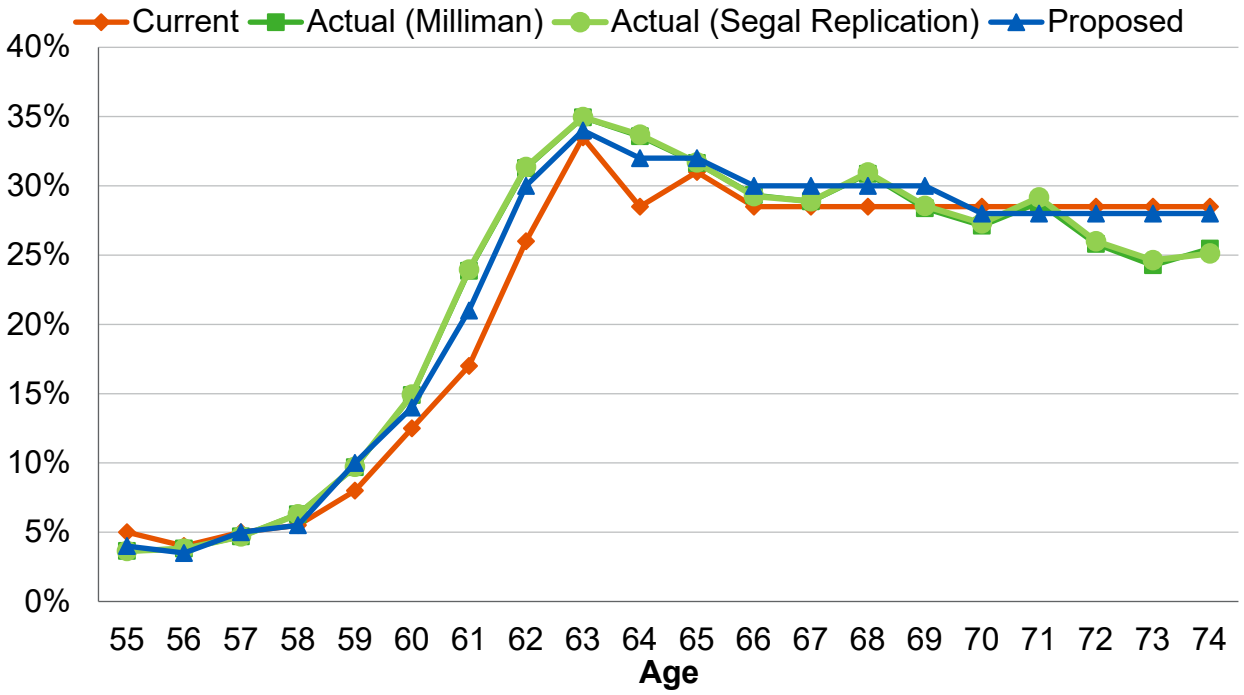
Service Retirement Rates

2% at 60 Tier: Service 26 – 29, Male



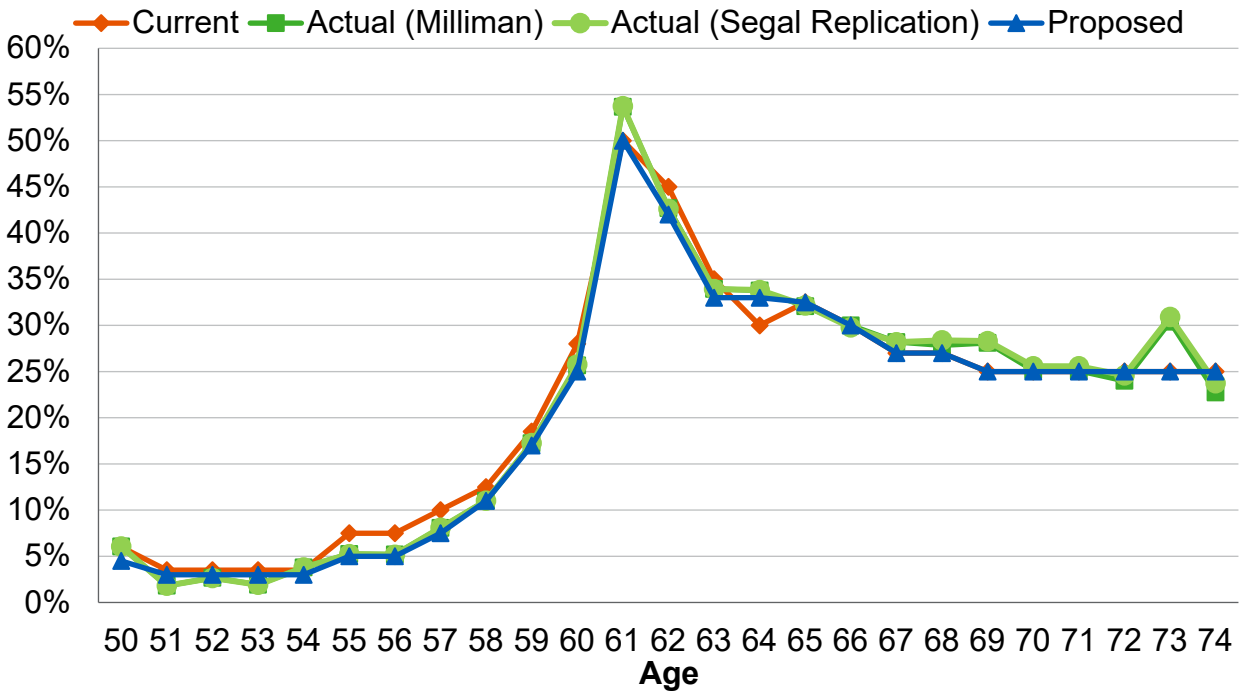
Service Retirement Rates

2% at 60 Tier: Service 26 – 29, Female



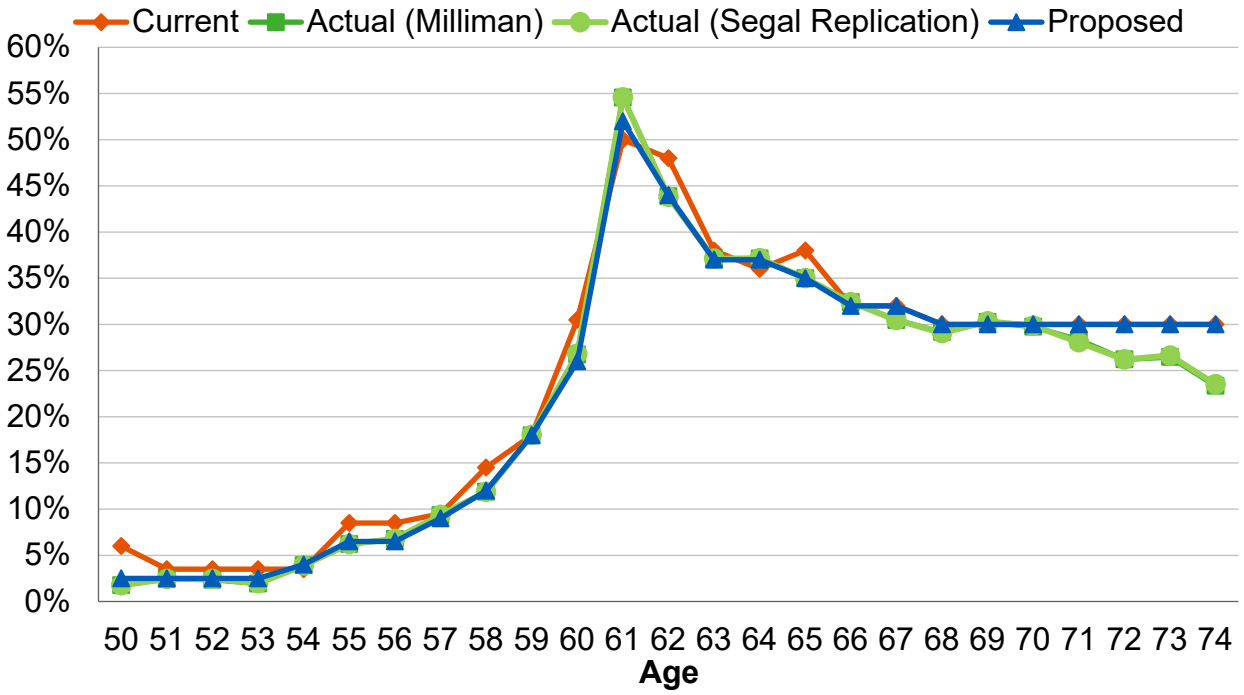
Service Retirement Rates

2% at 60 Tier: Service 30 And Over, Male



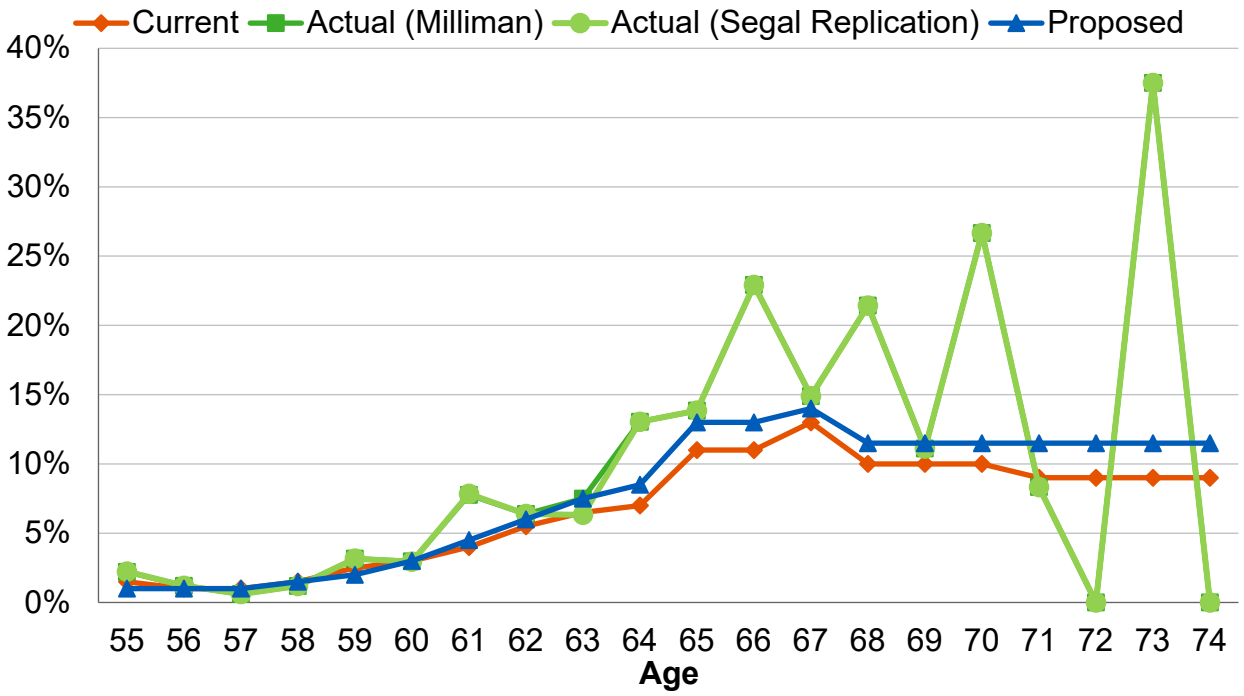
Service Retirement Rates

2% at 60 Tier: Service 30 And Over, Female



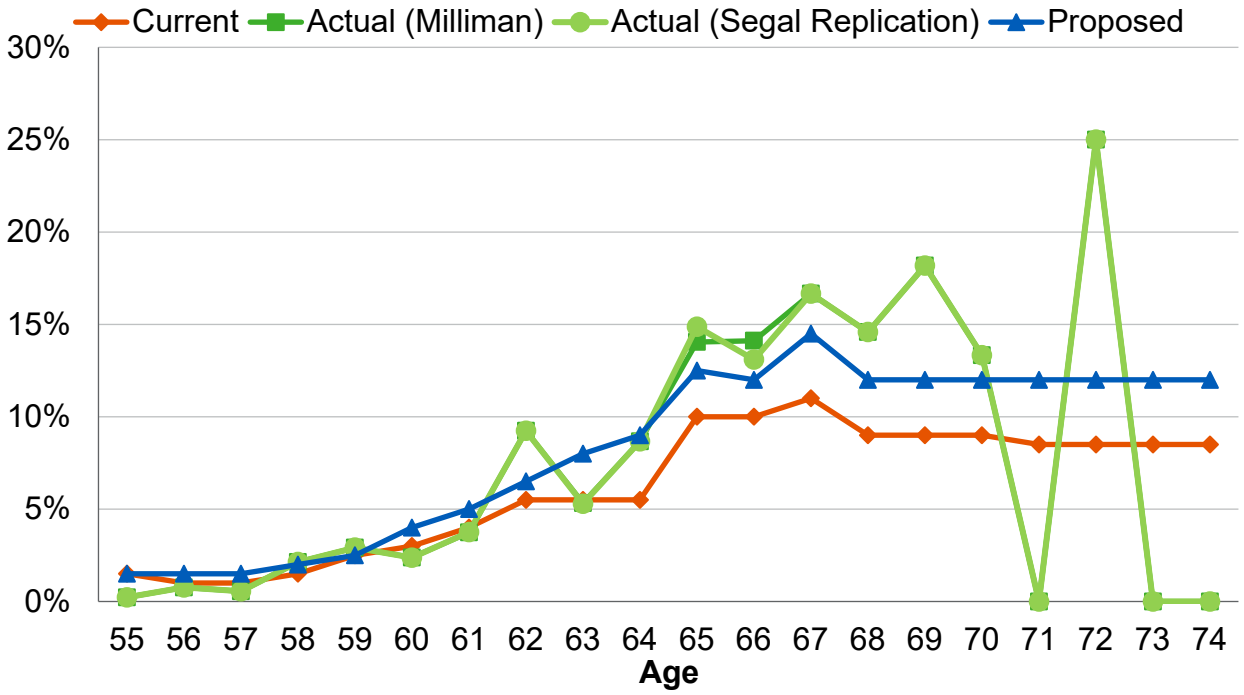
Service Retirement Rates

2% at 62 Tier: Service 5 – 9, Male



Service Retirement Rates

2% at 62 Tier: Service 5 – 9, Female



Disability retirement

Milliman maintained the current assumed disability rates for Coverage A, and decreased the assumed disability rates for Coverage B. **Segal closely matches Milliman's analysis of the actual disability retirement experience, and the proposed assumptions are reasonable**.

Although the actual disability rates for Coverage A males were lower than the assumed disability rates, the number of actual disability retirements in this group over the 15-year period is very small and the experience is not very credible, so it is reasonable to maintain the current assumption.

The actual, expected, and proposed counts of disability retirement over the most recent 15 years are shown in the tables below. Graphs on subsequent pages show the current and proposed disability retirement assumptions and the actual experience over the 15-year period.

Disability Retirement, Coverage A – Male

Result	Milliman	Segal Replication	% Difference
Actual	261	262	0.4%
Expected	292	292	0.0%
Proposed	292	292	0.0%
Actual ÷ Expected	**90%**	**90%**	
Actual ÷ Proposed	**90%**	**90%**	

Disability Retirement, Coverage A – Female

Result	Milliman	Segal Replication	% Difference
Actual	842	845	0.4%
Expected	833	833	0.0%
Proposed	833	833	0.0%
Actual ÷ Expected	**101%**	**101%**	
Actual ÷ Proposed	**101%**	**101%**	

Disability Retirement, Coverage B – Male

Result	Milliman	Segal Replication	% Difference
Actual	1,435	1,438	0.2%
Expected	1,914	1,918	0.2%
Proposed	1,567	1,570	0.2%
Actual ÷ Expected	**75%**	**75%**	
Actual ÷ Proposed	**92%**	**92%**	

Disability Retirement, Coverage B – Female

Result	Milliman	Segal Replication	% Difference
Actual	4,318	4,314	(0.1%)
Expected	5,103	5,103	0.0%
Proposed	4,749	4,750	0.0%
Actual ÷ Expected	**85%**	**85%**	
Actual ÷ Proposed	**91%**	**91%**	

We agree that it is reasonable to maintain separate disability retirement rates for males and females. The actual female disability rates are consistently higher than those for males.

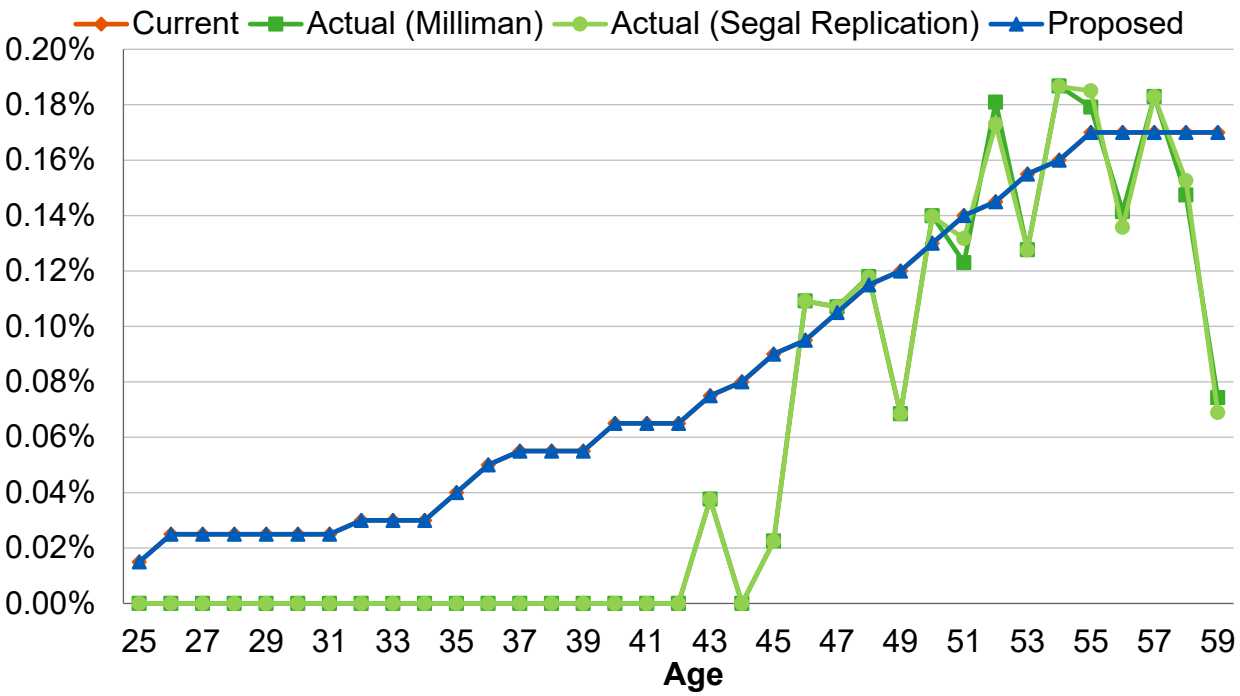
The incidence of disability retirements has been gradually declining since a 15-year high in the year ended June 30, 2013, including a steeper decline in the year ended June 30, 2020. Using a 15-year period smooths out some of the year-to-year variation. **We recommend that Milliman continue to monitor disability retirement trends to see if they return to pre-2020 levels or remain low at their current levels.**

Disability retirement counts

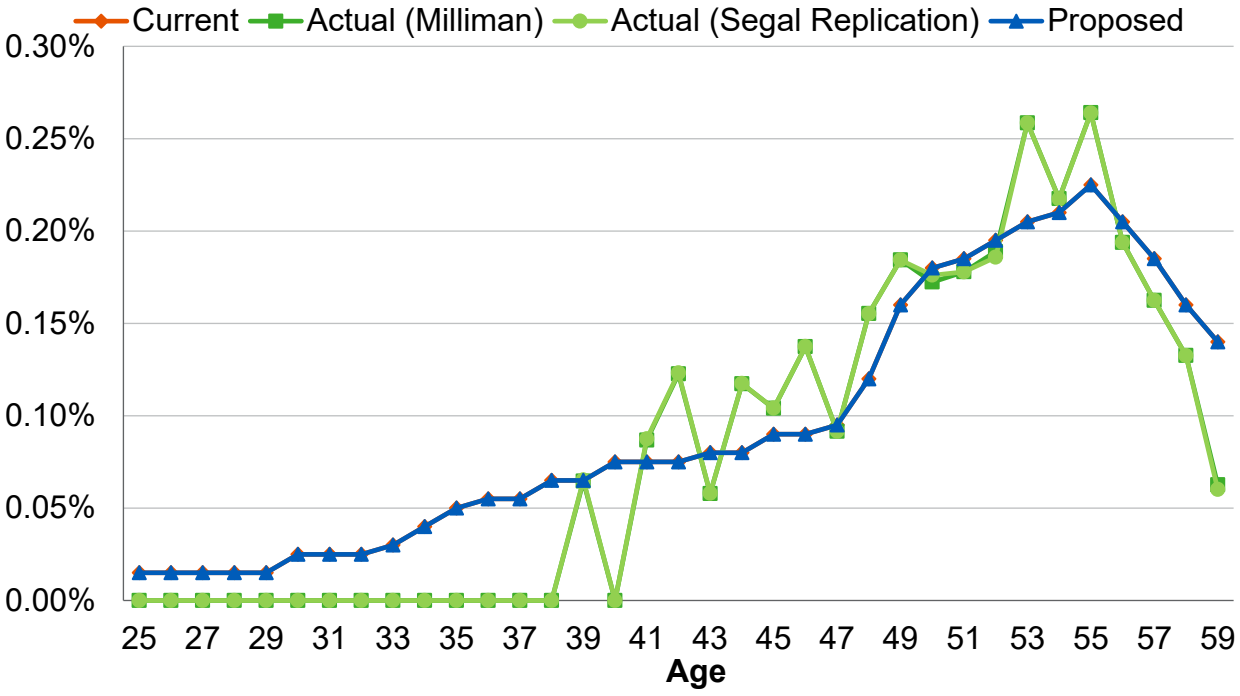
The disability retirements include members who moved from active to disabled status and members who moved from inactive to disabled status. This is consistent with administrative practices at many retirement systems where some members temporarily move to inactive status before their disability benefit commences.

We recommend that Milliman consider if it would be reasonable to also include members who moved from service retirement to disability retirement status for the same reason as described above. We estimate that taking this approach in the 2024 experience analysis would have increased the aggregate 15-year observed disability rate from 0.104% to 0.109%.

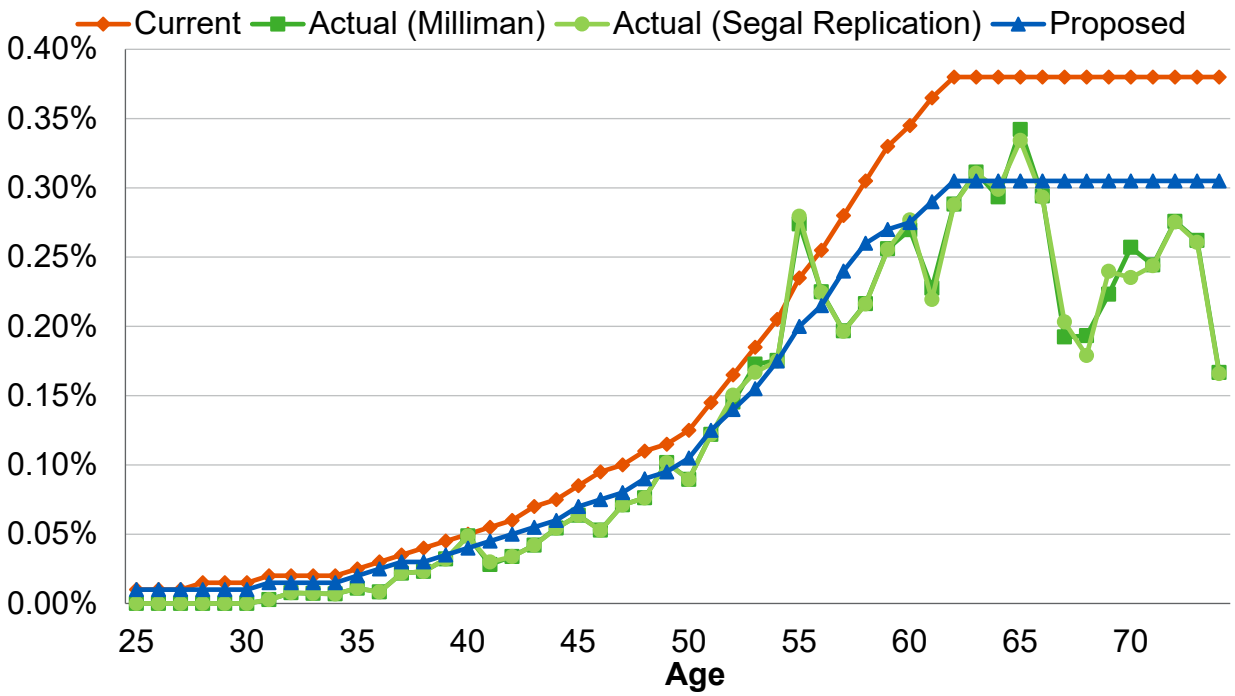
Disability Retirement Rates
Coverage A: Male



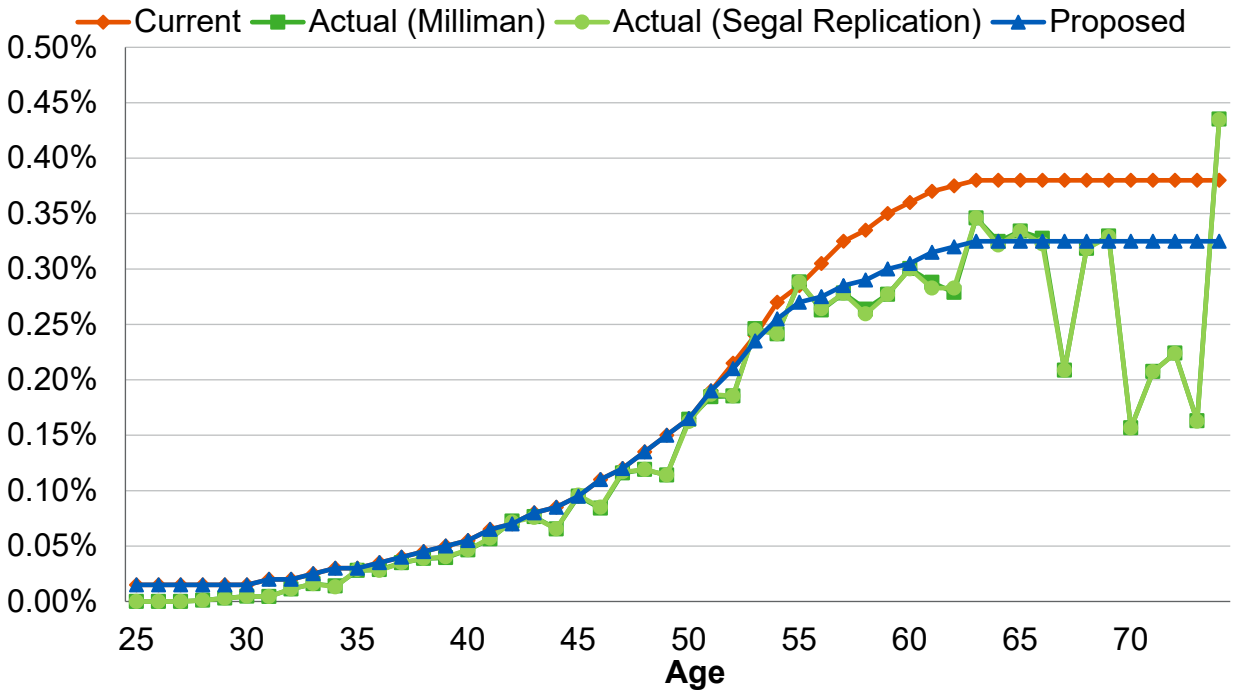
Disability Retirement Rates
Coverage A: Female



Disability Retirement Rates
Coverage B: Male



Disability Retirement Rates
Coverage B: Female



Termination

Milliman has increased the assumed termination rates at some service levels and decreased the assumed termination rates at other service levels. Although there are some discrepancies above 25 years of elapsed service, **Segal matches most of Milliman's analysis of the actual termination experience, and the proposed assumptions are reasonable.**

The termination rates are specifically net termination rates. When analyzing the assumption, the number of terminations at a given level of elapsed service is offset by the number returning to work at that same service level. Rather than recognizing an actuarial loss when rehires occur, this assumption is intended to anticipate some level of inactive members returning to work.

The termination rates are also weighted by service credit. This means that within a given elapsed service group, members with more service credit (such as full-time members) have a higher weight to their experience.

The actual, expected, and proposed service-weighted counts of termination over the most recent 15 years are shown below. Graphs on subsequent pages show the current and proposed termination assumptions and the actual experience over the 15-year period.

Termination – Male

Result	Milliman	Segal Replication	% Difference
Actual (Elapsed Service 0-24)	166,225	161,670	(2.7%)
Actual (Elapsed Service 25-29)	8,592	5,393	(37.2%)
Actual (Elapsed Service 30+)	(2,128)	(5,106)	139.9%
Actual (Total)	172,689	161,957	(6.2%)
Expected	180,132	180,246	0.1%
Proposed	177,096	177,203	0.1%
Actual ÷ Expected	**96%**	**90%**	
Actual ÷ Proposed	**98%**	**91%**	

Termination – Female

Result	Milliman	Segal Replication	% Difference
Actual (Elapsed Service 0-24)	379,790	364,269	(4.1%)
Actual (Elapsed Service 25-29)	25,019	15,559	(37.8%)
Actual (Elapsed Service 30+)	(1,697)	(9,469)	458.0%
Actual (Total)	403,112	370,359	(8.1%)
Expected	426,819	426,106	(0.2%)
Proposed	406,708	406,087	(0.2%)
Actual ÷ Expected	**94%**	**87%**	
Actual ÷ Proposed	**99%**	**91%**	

Actual net terminations

Discrepancies at high service

As with the other assumptions, Segal's replication is an attempt to match Milliman's counts using the methodology they have described in the report and in conversations with us. We have some discrepancies in actual net terminations, but we do not believe they would have a material impact on the proposed assumptions.

We have a fairly close match for members with less than 25 years of elapsed service, which make up around 88% of the termination exposures over the 15-year period. Although not shown in the report, Milliman also provided us with their five-year experience, and we have an even closer match over the most recent five-year period.

Above 25 years of service, Segal counts fewer terminations and more rehires than Milliman, which combine to a lower number of net terminations. However, the assumed termination rates are already very low for members with high service, and we do not believe an even lower observed incidence of termination would materially change the termination rates that are proposed.

Additionally, a significant portion of the discrepancy is for members with 30 or more years of elapsed service, where the net terminations are negative, and Segal's count is more negative than Milliman's. Under either count, the conclusion is similar in that the termination rate for 30 or more years of elapsed service should be close to zero. This is also not a material termination rate as less than 1% of the termination exposures have 30 or more years of service.

Finally, the discrepancy at higher years of elapsed service is magnified by the fact that termination experience is weighted by service credit. On a headcount-weighted basis, our results are much closer to Milliman's than on a service-weighted basis. Our headcounts are lower than Milliman's by 2.7% and 3.3% for males and females respectively, compared to 6.2% and 8.1% when reflecting the service weights.

Although we had a conversation with Milliman about their termination methodology, and received many helpful responses, the discrepancies suggest there may still be some methodological differences between Milliman and Segal. **We recommend that Milliman consider adding more detail to the report about how terminations and rehires were counted.**

Member statuses

We understand from conversations with Milliman that terminations also include active records that dropped off from the data file from one year to the next and who were not eligible to retire. We included these records in our counts of termination, as well as active records that moved to blank or non-member status. This improved the match to Milliman's results, and the approach is reasonable.

As noted in the valuation report, some members included in the active count have their liabilities included in the inactive liabilities if they were reported with no annual compensation. We understand from conversations with Milliman that these members are considered inactive for the

purpose of evaluating the termination and refund assumptions. **We recommend that Milliman consider describing this approach in the report.**

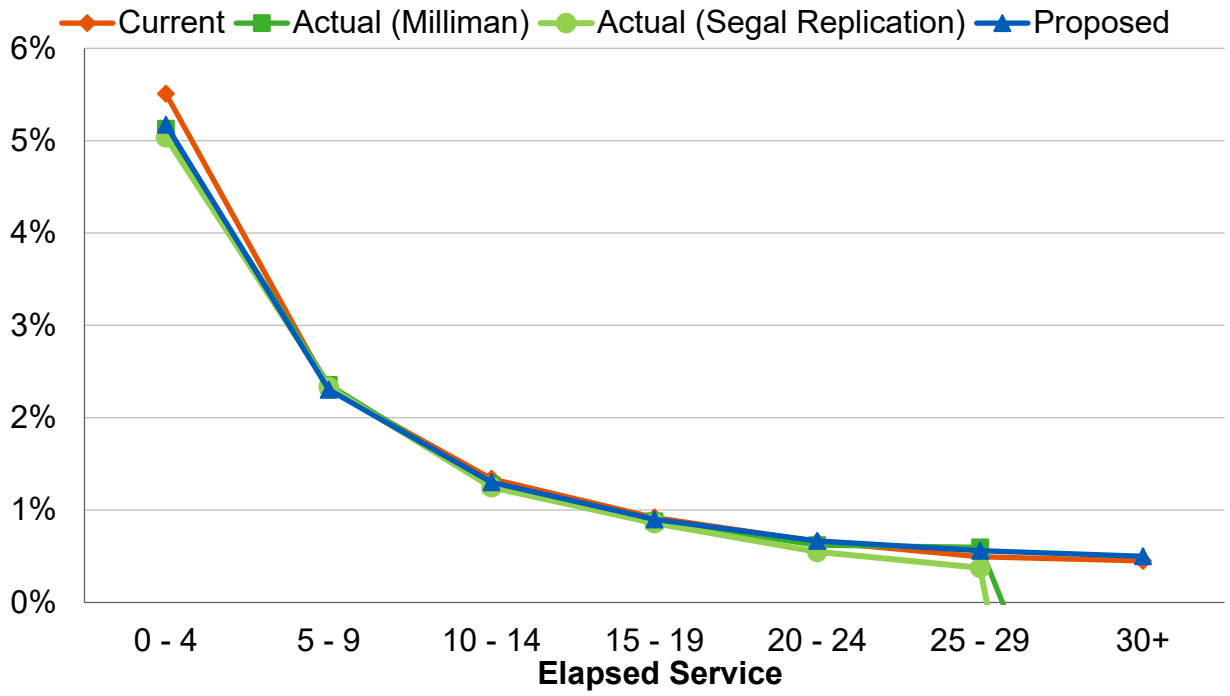
Service retirement eligibility

As Milliman mentioned in the report, they have excluded members eligible for service retirement from the analysis of the termination assumptions. This is a reasonable approach.

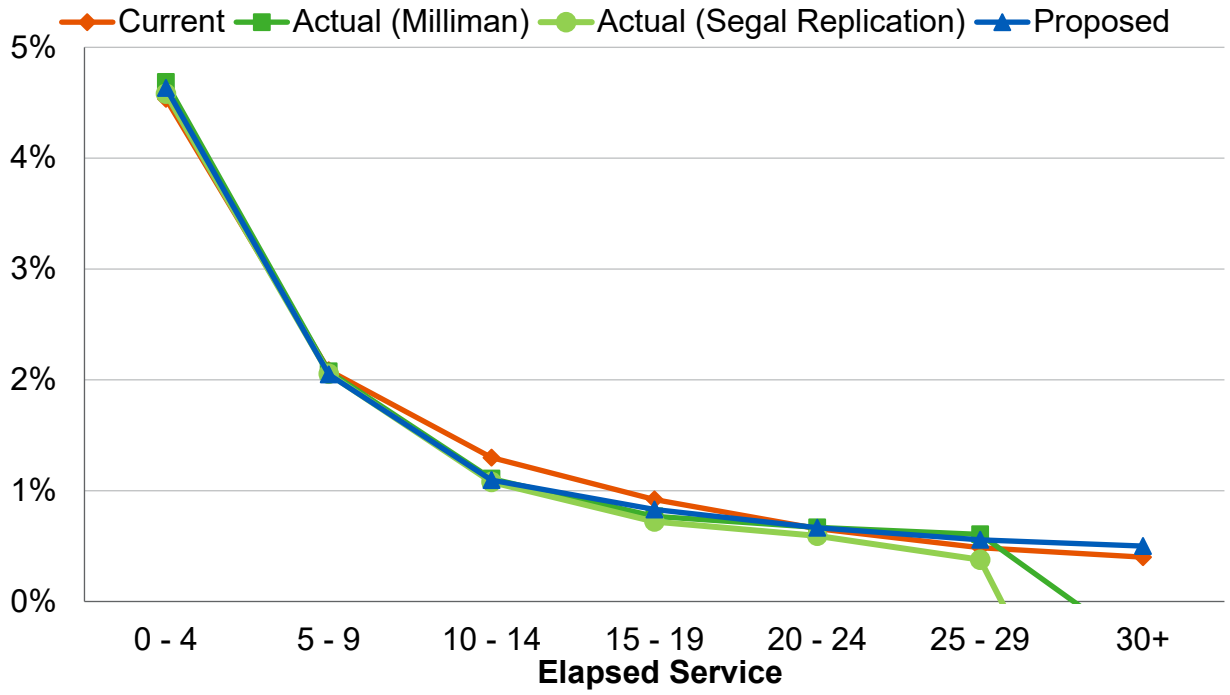
However, the rehires that are subtracted from the termination count at each level of elapsed service include all rehires, regardless of whether they are eligible for service retirement. **We recommend that Milliman consider applying the exclusion for retirement eligibility to rehires as well, so that the groups are analyzed on the same basis.** We estimate that excluding retirement-eligible rehires would increase the termination rates by approximately 0.65% on average for 0-9 years of elapsed service, and by approximately 0.25% for 10-29 years of elapsed service. The impact would be small, and the termination rates as already proposed are reasonable to use for the valuation.

Alternatively, if Milliman believes it is more reasonable to include all rehires, regardless of retirement eligibility, we recommend that Milliman consider mentioning this approach and its rationale in the report.

Grouped Termination Rates
Male



Grouped Termination Rates
Female



Probability of refund

Milliman has decreased the assumed refund percentages. **Segal did not match Milliman's analysis of the actual refund experience. However, we reviewed the proposed assumptions and believe they are reasonable.**

The assumption for the probability that a terminating member will elect a refund of contributions is closely linked with the termination assumption described above. Again, we had a conversation with Milliman about their methodology and received many helpful responses, but the discrepancies suggest there may still be some methodological differences between Milliman and Segal.

Methodology

The actual refund probability over the 15-year period is calculated as a fraction: number of members with refunds divided by total number of members with terminations.

For the numerator (refunds), our understanding is that Milliman is including all members moving from active or inactive status into a refund status. This would anticipate members who terminate with a vested benefit then subsequently take a refund. There are no exclusions of members who are eligible for service retirement.

For the denominator (terminations), our understanding is that Milliman is including members moving from active status into inactive or refund status, net of members moving from inactive to active status (rehires). The only exclusions of members who are eligible for service retirement are for members moving from active status into inactive status.

Similar to our comment for terminations, **we recommend that Milliman consider applying the exclusion of members who are eligible for service retirement to all members in the calculation, so the groups are analyzed on the same basis.**

We would also note that the denominator (terminations) is not calculated the same way as either the gross terminations or the net terminations for the analysis of the termination assumption. **For simplicity and consistency, we recommend that Milliman consider using the same group to study these two closely linked assumptions.**

Alternatively, if Milliman believes the current approach is more reasonable, we recommend that they consider providing additional detail in the report about how the refund percentages were calculated and the corresponding rationale.

Review

Although we did not match Milliman's counts using the above methodology, we calculated the actual refund experience using a simplified approach in order to review the reasonability of the proposed assumptions, and we agree that they are reasonable.

Under our approach for illustration purposes, the denominator (terminations) is made up of all terminations for non-retirement eligible members, without any adjustment for rehires, and the numerator (refunds) is made up of the subset of that group who took refunds, plus non-retirement eligible members moving from vested to refund status.

The following table illustrates the actual aggregate refund percentage for this group, as well as Milliman's current and proposed assumptions when applied to this group. This is an average across all entry ages and service categories for members with five or more years of service. We believe this result supports Milliman's decision to lower the refund assumptions.

Current Aggregate Assumption	Actual Aggregate Refund Percentage (Segal)	Proposed Aggregate Assumption
42%	21%	30%

Although we did not match the exact numbers used to set the assumptions, we also reviewed the proposed assumptions for each entry age category and believe them to be reasonable. Furthermore, we would note that changes in the refund assumption do not significantly affect CalSTRS' liabilities when compared to the impact of the other assumption changes in the experience analysis.

Medicare Premium Payment (MPP) Assumptions

We reviewed Milliman's 2024 experience analysis of the assumptions specific to the Medicare Premium Payment (MPP) Program and found the recommendations to be reasonable.

Investment return assumption and discount rate

The funding liabilities developed for the MPP are based on a discount rate of 7.00%, which is equal to the DB Program's long-term investment return assumption. However, because the plan is effectively funded on a pay-as-you-go basis, the discount rate used for GASB 74/75 reporting is based on prevailing 20-year, municipal bond yields. Milliman did not recommend any change to these assumptions and methodologies. **Similarly, we found the assumptions to be reasonable and consistent with the purpose of the respective measurements.**

Medical trend rates

Milliman's only recommended change to the MPP specific assumptions was an update to the medical trend rates. In their 2024 experience analysis, Milliman cites historical and predicted increases as well as the 2023 Medicare Trustees report as sources for their recommended trend assumptions. We found Milliman's recommendations to be consistent with the Trustees report's projection of individual Part B premiums and projection of slower Part A growth relative to Part B. It's worth noting that almost all the MPP liability is attributable to the Part A premium payment. The proposed trend rates reflect higher initial growth compared to the current assumptions, but lower long-term growth rates. **We believe the proposed assumptions are reasonable and consistent with the 2023 Medicare Trustees report and other models for long-term medical inflation.**

	Part A Trend Current	Part A Trend Proposed	Part B Trend Current	Part B Trend Proposed
First 10 years	4.30%	5.40%	5.50%	6.62%
10 – 19 years	5.00%	4.93%	5.10%	5.59%
20 – 29 years	4.90%	4.32%	4.50%	4.54%
30+	4.30%	4.09%	4.40%	4.26%

MPP Program participation rates

The Medicare Part A participation rates estimate the likelihood that a current retiree who is not currently enrolled in the MPP will enroll during the next year. The Part A premium payment is for a group of retirees who do not qualify for free Medicare Part A coverage, mainly because they were hired prior to April of 1986. Due to the various eligibility requirements, including the participant's age when their district completed a Medicare Division election, the census data does not include a flag that identifies retirees who could potentially participate in the MPP. As a result, Milliman's assumption was developed for and applied to only the retirees hired prior to April of 1986 and retired prior to July of 2012. The following table provides Segal's analysis of the rates of enrollment based on eight years of experience from July 1, 2014, to June 30, 2022.

Age	Segal Enrollees	Milliman Enrollees	Segal Enrollment Percentage	Milliman Enrollment Percentage	Current Assumption
64	338	469	1.73%	1.83%	2.00%
65	201	59	0.76%	0.17%	0.20%
66	12	12	0.03%	0.02%	0.02%
67	8	10	0.02%	0.01%	0.02%
68	10	7	0.02%	0.01%	0.02%
69	6	5	0.01%	0.01%	0.02%
70-74	21	16	0.01%	0.00%	0.02%
75-84	15	13	0.00%	0.00%	0.02%
All Ages	**620**	**591**	**0.05%**	**0.04%**	**0.06%**
A/E Ratio					**96.1%**

Although our analysis had some differences with Milliman's at ages 64 and 65, which was likely due to how the age-bands were defined, the rates we observed confirm the overall reasonableness of the current assumption. We found the overall ratio of actual new participants to expected new participants (A/E Ratio) to be 96.1%, which indicates the current assumption has been slightly conservative. **We agree with Milliman that no changes are needed to the current assumption.**

It's worth noting that the closed group of potential new MPP participants has been rapidly declining in recent years. Based on our analysis, the number of new MPP enrollees for the six years prior to June 30, 2022, was 93 (in FYE17), 79, 46, 27, 13, and 12 (in FYE22). We estimate there were less than 200 retirees that could meet the MPP eligibility requirements and who were under the age of 65 as of June 30, 2022.

A separate analysis is not required for the Part B penalty payment portion of the MPP as no new Part B participation is anticipated.

Content of Experience Analysis Report

Actuarial Standards of Practice

The discussion of the economic and demographic assumptions in Milliman's report complies with generally accepted actuarial principles and practices which are consistent with the core requirements of the Actuarial Standards of Practice and the Code of Professional Conduct and Qualifications Standards for Public Statements of Actuarial Opinion of the American Academy of Actuaries.

Actuarial Standard of Practice No. 41 (Actuarial Communications), Section 3.2 states: *In the actuarial report, the actuary should state the actuarial findings, and identify the methods, procedures, assumptions, and data used by the actuary with sufficient clarity that another actuary qualified in the same practice area could make an objective appraisal of the reasonableness of the actuary's work as presented in the actuarial report.*

While Milliman's report includes a significant amount of information that another actuary can use to make an objective appraisal of the reasonableness of their work, **there are some areas where we recommend that Milliman consider adding additional detail.** These are described throughout the demographic assumptions section above, and include the following:

- Selection of retiree records included in the analysis of the impact of one-year final compensation.
- Calculation of the actual general wage inflation over the 15-year study period.
- Calculation of the benefit weights used to evaluate the mortality assumption.
- Rationale for using custom mortality tables over published mortality tables published by the Society of Actuaries.
- Selection of terminated, rehired, and refund records included in the analysis of the termination and refund assumptions.

Executive summary

We appreciate Milliman's executive summary as a general discussion of the rationale and impact of the assumption changes. While it is a lengthy summary due in part to the complexity of the plan and the assumptions, **we believe the tables on pages 2 and 10 add particularly high value for CalSTRS and other stakeholders as an overview of the assumption changes and most important results.** We also appreciate that the summary of the cost impacts is itemized by assumption or assumption category. These tables from Milliman's report are shown below for reference.

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)

	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%**

Actuarial methods

In this replication and review report, we have followed the order of assumptions and methods in Milliman's experience analysis report. We believe it is somewhat counterintuitive to discuss actuarial methods in between economic assumptions and demographic assumptions, and **we recommend that Milliman consider an order in which the assumptions sections are not separated by the actuarial methods.**

Additionally, Milliman's discussion in the actuarial methods section focuses on the actuarial cost method and the asset valuation method. Although CalSTRS' Funding Plan is generally not under Milliman's power to adjust, **we recommend that Milliman consider expanding the discussion in this section to comment on the implications of the Funding Plan as they do directly affect actuarial funding policies.**

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