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# *MISSOURI STATE EMPLOYEES' RETIREMENT SYSTEM*

# ACTUARIAL VALUATION REPORT AS OF JUNE 30, 2023

## CONTRIBUTION RATE FOR FISCAL YEAR ENDING JUNE 30, 2025

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November 3, 2023

Board of Trustees
Missouri State Employees' Retirement System
907 Wildewood Drive
Jefferson City, MO 65102

Dear Members of the Board:

At your request, we performed an actuarial valuation of the Missouri State Employees' Retirement System (MOSERS) as of June 30, 2023 for the purpose of determining the employer required contribution rate for the fiscal year ending June 30, 2025. This report provides valuation results for the Missouri State Employees' Plan (MSEP). The major findings of the valuation are contained in this report, which reflects the benefit provisions in place on June 30, 2023. There have been no changes to the plan provisions or actuarial assumptions since the prior valuation, but at their September 21, 2023 meeting, the Board voted to increase the minimum employer contribution rate from 16.97% of pay for all years to 28.75% of pay in FYE 2025, 30.25% of pay in FYE 2026, and 32.00% of pay thereafter. The minimum contribution rate still expires once the System reaches a funded ratio of 80%.

During the 2022 Missouri General Assembly, legislation was passed and signed by the Governor that provided for an additional contribution to the System of $500 million. The funds were received by MOSERS on July 13, 2022. At the Board's direction, the accumulated balance of the additional contribution of $500 million is included in the determination of the funded ratio and unfunded actuarial accrued liability but is excluded from the valuation assets when calculating the actuarial required contribution rate.

In preparing our report, we relied, without audit, on information (some oral and some in writing) supplied by the System's staff. This information includes, but is not limited to, statutory provisions, member data and financial information. We found this information to be reasonably consistent and comparable with the information received in the prior year. The valuation results depend on the integrity of this information. If any of this information is inaccurate or incomplete, our results may be different and our calculations may need to be revised.

We further certify that all costs, liabilities, rates of interest and other factors for MSEP have been determined on the basis of actuarial assumptions and methods which are individually reasonable (taking into account the experience of each Plan and reasonable expectations); and which, in combination, offer the best estimate of anticipated experience affecting MSEP. Nevertheless, the emerging costs will vary from those presented in this report to the extent actual experience differs from that projected by the actuarial assumptions. The MOSERS Board has the final decision regarding the appropriateness of the assumptions and adopted them as indicated in Appendix D.

In order to prepare the results in this report, we have utilized actuarial models that were developed to measure liabilities and develop actuarial costs. These models include tools that we have produced and tested, along with commercially available valuation software that we have reviewed to confirm the appropriateness and accuracy of the output. In utilizing these models, we develop and use input parameters and assumptions about future contingent events along with recognized actuarial approaches to develop the needed results. Future actuarial measurements may differ significantly from the current measurements presented in this report due to such factors as the following: plan experience differing from that anticipated by the economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded status); and changes in plan provisions or applicable law. Due to the limited scope of our assignment, we did not perform an analysis of the potential range of future measurements.

The actuarial computations presented in this report are for purposes of determining the funding amounts for MSEP as set out in the Missouri state statutes. The calculations in the enclosed report have been made on a basis consistent with our understanding of MOSERS' funding policy. Determinations for purposes other than meeting these requirements may be significantly different from the results contained in this report. Accordingly, additional determinations may be needed for other purposes. For example, actuarial computations for purposes of fulfilling financial accounting requirements for the System under Governmental Accounting Standards No. 67 and No. 68 will be presented in separate reports.

The consultants who worked on this assignment are pension actuaries with substantive experience valuing public retirement systems. Cavanaugh Macdonald's advice is not intended to be a substitute for qualified legal or accounting counsel.

On the basis of the foregoing, we hereby certify that, to the best of our knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices. We are members of the American Academy of Actuaries and meet the Qualification Standards to render the actuarial opinion contained herein. We are available to answer any questions on the material contained in the report or to provide explanations or further details as may be appropriate.

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

Sincerely,

Patrice Beckham

Patrice A. Beckham, FSA, EA, FCA, MAAA
Principal and Consulting Actuary

Bryan K. Hoge, FSA, EA, FCA, MAAA
Consulting Actuary

This report presents the results of the June 30, 2023 actuarial valuation of the Missouri State Employees' Plan (MSEP). The primary purposes of performing the actuarial valuation are to:

- Determine the employer contribution rate, as defined in the Missouri state statutes and set out in the Board's funding policy, for the fiscal year ending June 30, 2025;
- Disclose asset and liability measurements as well as the current funded status of MSEP on the valuation date;
- Compare the actual and expected experience of MSEP during the plan year ended June 30, 2023;
- Assess and disclose the key risks associated with funding the System; and
- Analyze and report on trends in MSEP contributions, assets and liabilities over the past several years.

There have been no changes to the benefit provisions or actuarial assumptions since the prior valuation. However, at their September 21, 2023 meeting, the Board voted to increase the minimum employer contribution rate from 16.97% of pay for all years to 28.75% of pay in FYE 2025, 30.25% of pay in FYE 2026, and 32.00% of pay thereafter. The minimum contribution rate still expires once the System reaches a funded ratio of 80%. As a result of the new minimum employer contribution rate, the required employer contribution rate for FYE 2025 is 28.75% of payroll rather than 27.35% under the prior funding policy. The estimated dollar amount of employer contribution for FYE 2025 is $688 million.

During the 2022 Missouri General Assembly, legislation was passed and signed by the Governor that provided for an additional contribution to the System of $500 million. The funds were received by MOSERS on July 13, 2022. At the Board's direction, the accumulated balance of the additional contribution of $500 million will be excluded from the valuation assets when calculating the unfunded actuarial accrued liability contribution rate, which then impacts the actuarial required contribution rate. As a result, the additional contribution is being reflected in the valuation results for the first time in the June 30, 2023 actuarial valuation. The determination of the actuarial contribution rate in future years will not reflect the impact of the additional contribution until so directed by the MOSERS Board.

The actuarial valuation results provide a "snapshot" view of the System's financial condition on the measurement date of June 30, 2023. A summary of the key results, compared to the prior valuation, is shown in the following table.

| | June 30, 2023 | June 30, 2022 |
|---|---|---|
| Unfunded Actuarial Accrued Liability ($M) | $6,860 | $6,515 |
| Funded Ratio (Actuarial Assets) | 57.63% | 57.72% |
| Normal Cost Rate | 8.74% | 8.81% |
| UAAL Amortization Rate | 20.88% | 20.49% |
| Total Actuarial Required Contribution Rate | 29.62% | 29.30% |
| Member Contribution Rate | (2.27%) | (2.04%) |
| Actuarial Employer Contribution Rate | 27.35% | 27.26% |
| Required Employer Contribution Rate* | 28.75% | 27.26% |
| Employer Contribution Amount ($M) | $688.0 | $576.3 |

* The System's contribution policy minimum employer contribution rate is 28.75% of pay for FYE 2025, 30.25% of pay for FYE 2026 and 32% of pay thereafter. The minimum contribution rate will be in effect until the System reaches an 80% funded ratio.

## Experience Impacting the June 30, 2023 Valuation

The key factors impacting the 2023 valuation results include:

- The net rate of return on the market value of assets for fiscal year 2023 was 2.5%, as reported by MOSERS. However, due to the use of an asset smoothing method, the rate of return on the actuarial value of assets was 3.4%. This is lower than the assumed return of 6.95% so there was an actuarial loss on assets of $334 million. This increased the unfunded actuarial accrued liability as well as the actuarial required contribution rate (by 1.00%).

- There was a net liability loss of $565 million during fiscal year 2023, i.e., the actuarial accrued liability was higher than expected. The most significant sources of loss were larger salary increases and higher cost-of-living adjustments (COLAs) for retirees and beneficiaries than expected. The losses from salary and COLA experience being larger than expected, based on actuarial assumptions. The net liability loss increased the UAAL and increased the actuarial required contribution rate (by 1.70%).

- There was an increase of 3.6% in the number of active members in the 2023 valuation (43,088 compared to 41,595 in the prior valuation). The increase in the number of active members, coupled with salary increases that were higher than expected, resulted in an increase in covered payroll of 12.8% from the prior valuation, significantly greater than the assumed increase of 2.25%. As a result, the actuarial required contribution rate decreased by 2.39% of pay.

- Because the benefit structure is different for MSEP 2011 members, including an employee contribution rate of 4.0%, the ongoing cost of the System (normal cost) declines as a larger percentage of active members are covered by MSEP 2011. The number of active members covered by the MSEP 2011 Plan increased from 23,304 in the 2022 valuation to 26,511 in the 2023 valuation, and the percentage of total active members in MSEP 2011 increased from 56% to 62%. The normal cost rate decreased by 0.07% and the effective member contribution rate increased by 0.23% which both served to reduce the actuarial employer contribution rate.

Further detail on the changes and actuarial experience affecting the valuation results can be found in the following sections of this Executive Summary.

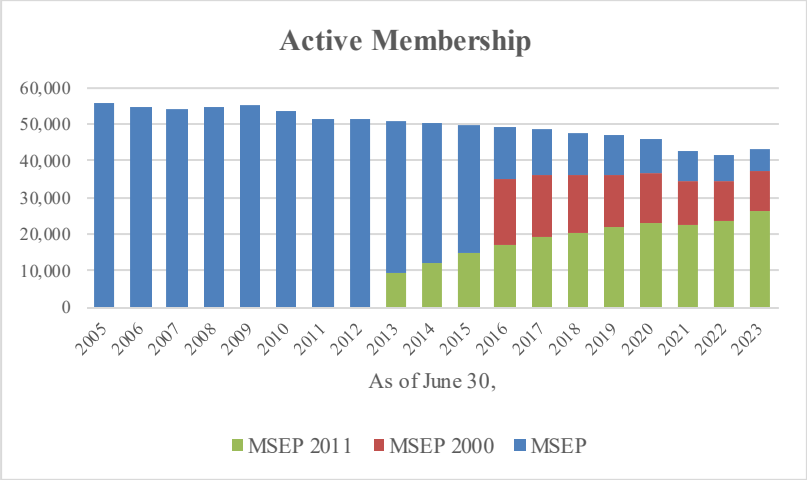
## Actual Experience for the Last Plan Year

Numerous factors contributed to the change in the MSEP assets, liabilities, and actuarial required contribution rate between June 30, 2022 and June 30, 2023. The components are examined in the following discussion.

### *Membership*

There was an increase of 3.6% in the number of active members in the current valuation (43,088 compared to 41,595 in the prior valuation). However, as shown in the following graph, the longer-term trend in the active membership still shows it has declined about 23% over the last 19 years from 55,914 active members in the 2004 valuation to 43,088 in the current valuation. A decline in the size of the active membership puts pressure on the system's actuarial contribution rate because covered payroll generally does not

increase, as assumed, and consequently, the UAAL amortization payment is higher as a percent of covered payroll. Note that while the UAAL amortization contribution rate is higher when covered payroll does not increase as assumed, the dollar amount of the UAAL amortization payment is the same.




Note: Split between MSEP and MSEP 2000 is not available prior to June 30, 2016.
MSEP 2011 active counts are not available for June 30, 2011 or June 30, 2012.

The percentage of active members covered by the MSEP 2011 Plan has increased each year as active members covered by the MSEP or MSEP 2000 Plan leave covered employment and are replaced by new hires. The number of active members covered by the MSEP 2011 Plan increased from 23,304 in the 2022 valuation to 26,511 in the 2023 valuation, and the percentage of the overall active population grew from 56% to 62%. Because the benefit structure is different for MSEP 2011 members, including an employee contribution rate of 4%, the ongoing cost of the System (normal cost) declines as a larger percentage of active members are covered by MSEP 2011.

As is expected in a mature retirement system, the number of members receiving benefits increased from 53,648 last year to 54,709 in the current valuation. In addition, the average benefit amount for this group increased by 4.1%. While the increase to average benefit amounts is higher than anticipated due to recent high inflation, it is still expected that the average benefit amounts will increase over time due to salary and COLA increases.

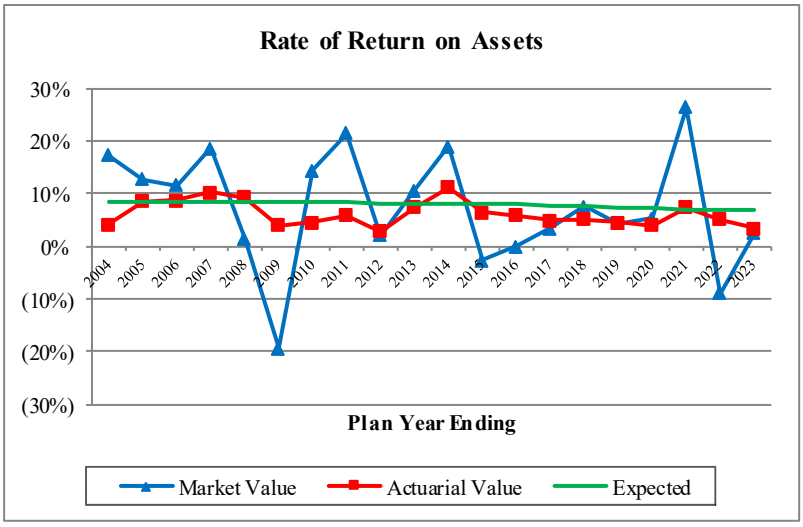
### *System Assets*

As of June 30, 2023, MSEP had net assets of $8.558 billion, when measured on a market value basis, an increase of $309 million from the value of $8.248 billion in the prior valuation. However, the market value of assets is not used directly in the calculation of the unfunded actuarial accrued liability and the employer actuarial contribution rate. An asset valuation method, which smoothes the effect of market fluctuations, is applied to determine the value of assets used in the valuation, called the "actuarial value of assets". The current asset valuation method was implemented in the June 30, 2018 valuation. Under this method, the difference between the dollar amount of the actual and assumed investment return on the market value of assets is recognized evenly over a closed five-year period. In addition, to transition from the prior to the new smoothing method, the total unrecognized investment experience as of June 30, 2017 ($927 million) was established on a schedule that evenly recognizes the amount over a closed seven-year period beginning June 30, 2018.

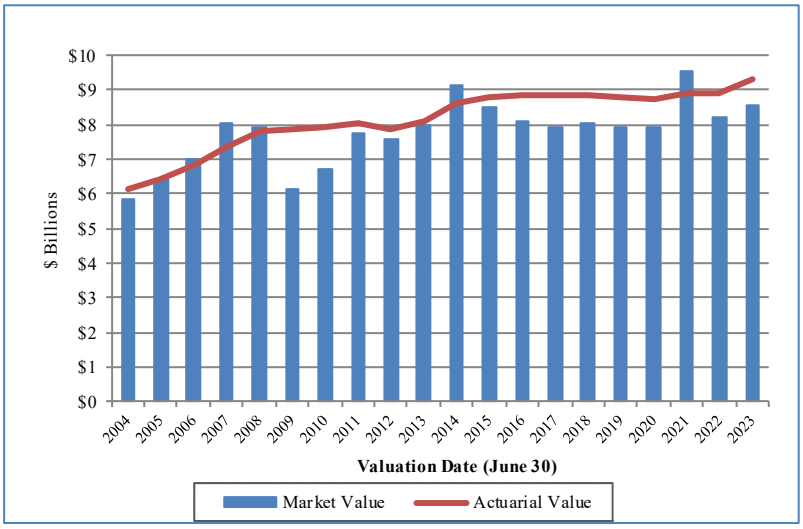
In the current valuation, the actuarial value of assets for MSEP is $9.331 billion, an increase of $437 million from the prior year. The components of the change in the asset values are shown in the following table.

| | Market Value ($M) | | Actuarial Value ($M) | |
|---|---|---|---|---|
| **Net Assets, June 30, 2022** | $ | 8,248.41 | $ | 8,894.33 |
| - Employer and Member Contributions | + | 1,134.31 | + | 1,134.31 |
| - Miscellaneous Income | + | 0.00 | + | 0.00 |
| - Benefit Payments | - | 991.55 | - | 991.55 |
| - Net Investment Income | + | 177.60 | + | 305.10 |
| - Administrative Expenses | - | 10.98 | - | 10.98 |
| **Net Assets, June 30, 2023** | $ | 8,557.79 | $ | 9,331.21 |
| Estimated Net Rate of Return | | 2.5% | | 3.4% |

Due to the scheduled recognition of the current and prior investment experience in the asset smoothing method, the estimated rate of return on the actuarial value of assets for fiscal year 2023 was 3.4%, which is lower than the assumed investment return of 6.95% for that period. As a result, there was an actuarial loss on the smoothed value of assets of $334 million. The investment return on the market value of assets for the year ending June 30, 2023 of 2.5%, as reported by MOSERS, was below the assumed rate of return. As a result, it produced an investment income shortfall for the year ended June 30, 2023 of $416 million. There is currently a net deferred investment loss of $773 million (actuarial value of assets exceeds market value). Please see Section 3 of this report for more detailed information on the market and actuarial value of assets.




*The rate of return of the actuarial value of assets has been less volatile than the market value return, illustrating the benefit of using an asset smoothing method. However, during this time period, the rate of return on actuarial assets has been at or below the assumed rate of return for most years, resulting in actuarial losses.*




*An asset smoothing method is used to mitigate the volatility in the market value of assets. By using a smoothing method, the actuarial (or smoothed) value can be, and actually should be, both above or below the pure market value at different times.*

*Note the asset smoothing method changed with the 2018 valuation.*

### *System Liabilities*

The actuarial accrued liability is that portion of the present value of future benefits that will not be paid by future normal costs. The difference between this liability and the actuarial value of assets as of the valuation date is called the unfunded actuarial accrued liability. The dollar amount of the UAAL is reduced if the contributions to the System exceed the normal cost for the year plus interest on the prior year's UAAL.

The UAAL, using both the actuarial and market value of assets, is shown as of June 30, 2023 in the following table:

| | Actuarial Value of Assets | Market Value of Assets |
|---|---|---|
| Actuarial Accrued Liability | $16,190,813,686 | $16,190,813,686 |
| Value of Assets | 9,331,207,050 | 8,557,793,248 |
| Unfunded Actuarial Accrued Liability | $6,859,606,636 | $7,633,020,438 |
| Funded Ratio | 57.63% | 52.86% |

See Section 4 of the report for the detailed development of the UAAL.

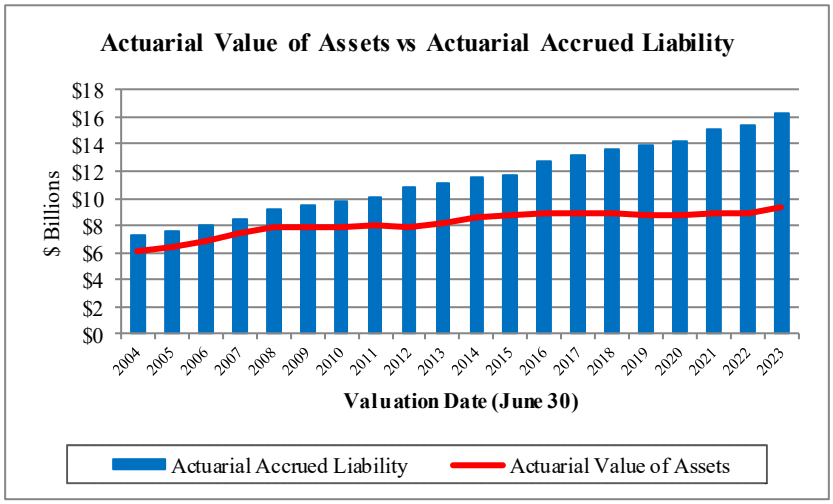
The net change in the UAAL from June 30, 2022 to June 30, 2023 was an increase of $344.9 million. The components of this net change are shown in the following table:

| | ($ Millions) |
|---|---|
| **Unfunded Actuarial Accrued Liability, June 30, 2022** | $6,514.7 |
| - Expected increase due to amortization method | 38.0 |
| - Investment experience | 333.7 |
| - Liability experience | 564.9 |
| - Additional contributions | (533.3) |
| - Other experience | (58.4) |
| **Unfunded Actuarial Accrued Liability, June 30, 2023** | $6,859.6 |

As shown above, various components impacted the dollar amount of the UAAL. The UAAL is amortized as a level-percent of payroll. This methodology results in dollar amounts of payment that are lower in the early part of the amortization period but increase each year in the future with the assumed payroll growth assumption (currently 2.25%). Given the amortization period and the actuarial assumptions, the current amortization payment is first expected be greater than the interest on the UAAL beginning with FYE 2024. As a result, even if all assumptions had been met the dollar amount of the UAAL was expected to increase during the prior year, as evidenced in the first row in the table above.

Actuarial gains (losses), which result from actual experience that is more (less) favorable than anticipated based on the actuarial assumptions in place in the prior valuation, are reflected in the UAAL and are measured as the difference between the expected UAAL and the actual UAAL, reflecting any changes due to actuarial assumptions and methods, or benefit provision changes. Overall, MSEP experienced a net actuarial loss of $898.7 million, the combined result of an actuarial loss of $564.9 million on System liabilities and a $333.7 million actuarial loss on actuarial assets. The liability loss was the net result of various components of actuarial gains and losses for the year ending June 30, 2023. The most significant sources of loss were larger salary increases and higher cost-of-living adjustments (COLAs) for retirees and beneficiaries than expected, based on actuarial assumptions.

As the following graph of historical actuarial assets and liabilities shows, the System's liabilities have grown faster than the System's assets since the 2009 valuation. Some of the growth is due to significant changes in the actuarial assumptions during this timeframe, including lowering the investment return assumption from 8.50% to 6.95%. As a result, the unfunded portion of the actuarial accrued liability has increased.

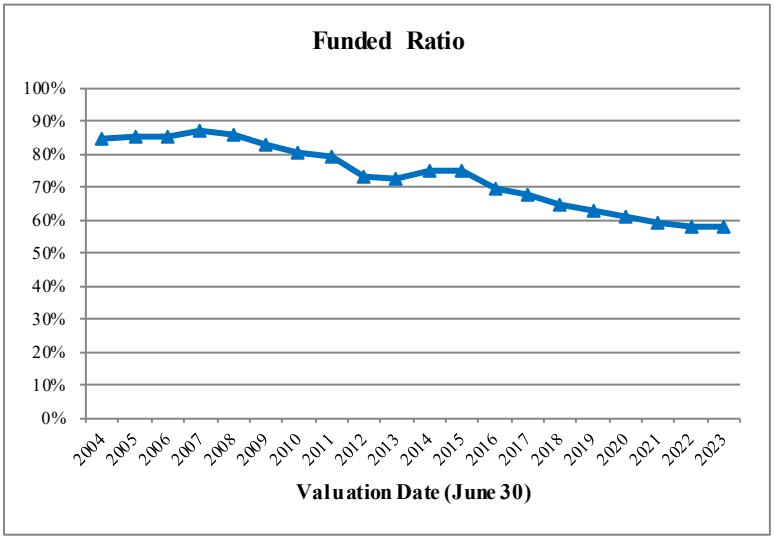



An evaluation of the UAAL on a pure dollar basis may not provide a complete analysis since only the difference between the assets and liabilities (which are both very large numbers) is reflected. Another way to evaluate the UAAL and the progress made in its funding is to track the funded ratio, the ratio of the actuarial value of assets to the actuarial accrued liability. The funded status information, using both the actuarial value of assets and the market value of assets, is shown below (in millions).

| | 6/30/2018 | 6/30/2019 | 6/30/2020 | 6/30/2021 | 6/30/2022 | 6/30/2023 |
|---|---|---|---|---|---|---|
| Using Actuarial Value of Assets: | | | | | | |
| - Funded Ratio | 64.9% | 62.9% | 61.1% | 59.0% | 57.7% | 57.6% |
| - UAAL ($M) | $4,782 | $5,175 | $5,547 | $6,201 | $6,515 | $6,860 |
| Using Market Value of Assets: | | | | | | |
| - Funded Ratio | 59.0% | 56.7% | 55.5% | 63.0% | 53.5% | 52.9% |
| - UAAL ($M) | $5,578 | $6,041 | $6,348 | $5,591 | $7,161 | $7,633 |

Note that the funded ratio does not indicate whether or not the System assets are sufficient to settle benefits earned to date. The funded ratio, by itself, also may not be indicative of future funding requirements. As shown in the table above, the funded ratios differ using the market value of assets.

The funded ratio over a longer period is shown in the following graph:




As the graph above shows, the System's funded ratio has declined over the past 20 years. It is important to note that historical trends are not simply a reflection of past investment performance and other actuarial experience. Changes to actuarial assumptions and methods, benefit provisions and the System's funding policy have also had a significant impact on valuation results over time. The Board adopted new assumptions several times during this period which had the general impact of decreasing the funded ratio.

### *Required Employer Contribution Rate*

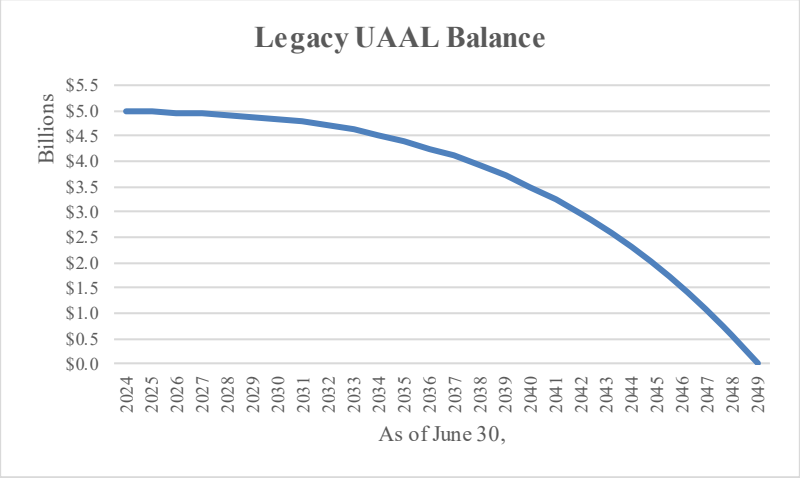
The System is funded by contributions from employers (actuarially determined) and from employees hired after December 31, 2010 (4.00% of pay). Under the Entry Age Normal cost method, the actuarial required contribution rate consists of two components:

- A "normal cost" for the portion of projected liabilities allocated by the actuarial cost method to service of members during the year following the valuation date, which includes a component for administrative expenses.
- An "unfunded actuarial accrued liability contribution" for the excess of the portion of projected liabilities allocated to service to date over the actuarial value of assets.

Under the System's current funding policy, the UAAL contribution rate is determined by amortizing the UAAL using the layered amortization method. To implement this method, the projected UAAL developed in the June 30, 2018 valuation was amortized as a level-percent of payroll over a closed, 30-year period and subsequent changes in the UAAL due to actuarial gains/losses or assumption changes were separately financed by establishing amortization bases and payments, as a level percentage of payroll, over closed 30-year periods. Effective with the June 30, 2021 valuation, the amortization period for new bases changed to a closed 25-year period. However, the bases established prior to June 30, 2021 continue to be amortized on their original schedule. As required by statute, any change in the UAAL due to modification of the System's benefit structure is amortized over a closed period of 20 years. The total UAAL amortization payment is the sum of the payment amounts for each of the amortization bases (layers). On July 13, 2022, the State of Missouri made an additional contribution of $500 million. While this contribution will be reflected in the calculation of the System's funded ratio and UAAL, it will not be reflected in calculating the UAAL contribution rate.

At their September 21, 2023 meeting, the Board voted to increase the minimum employer contribution rate from 16.97% of pay for all years to 28.75% of pay in FYE 2025, 30.25% of pay in FYE 2026, and 32.00% of pay thereafter. Employers are required to make contributions based on the greater of the applicable minimum contribution rate and the employer share of the total actuarial required contribution rate. The minimum contribution rate will no longer affect the calculation of the required employer contribution rate once the System reaches an 80% funded ratio.

The level-percent of payroll methodology for UAAL payments results in dollar payment amounts that are lower than the level-dollar payment method in the early portion of the amortization period but increase each year in the future with the assumed payroll growth assumption (currently 2.25%). Because the UAAL contribution rate is determined as a level-percent of payroll, the dollar amount of the UAAL contribution is scheduled to increase 2.25% each year in the future, even if all actuarial assumptions are met. If covered payroll increases, as expected based on the assumption, the UAAL contribution rate will remain stable. However, if actual payroll increases are lower than 2.25% the UAAL contribution rate will increase. Note that with this payment methodology the dollar amount of the legacy UAAL base is expected to hold steady for about five years before starting to decline as illustrated in the following graph:




Please note that the use of closed amortization periods, coupled with the State contributing at least the actuarial employer contribution each year, will result in the System being fully funded by the end of the amortization period, if all actuarial assumptions are met. Based on the current valuation, the full funded date is expected to occur during the June 30, 2044 valuation, which reflects the additional $500 million contribution made on July 13, 2022. In our opinion, the amortization policy meets the requirements of Actuarial Standard of Practice Number 4. We would also note that the contributions during FY 2024 (calculated in the June 30, 2022 valuation) are expected to be greater than the normal cost plus interest on the UAAL during that period.

In our professional judgement, the funding policy adopted by the Board of Trustees produces a reasonable actuarial required contribution as defined in Actuarial Standard of Practice Number 4. Contributions are developed with the intent of being level as a percentage of covered payroll, assuming the number of active members remains stable. Furthermore, the funding policy is expected to accumulate sufficient assets to make all future benefit payments as they become due, if all assumptions are met.

See Section 5 of the report for the detailed development of the total actuarial required contribution rate as well as the required employer contribution rate, which is summarized in the following table:

| Employer Contribution Rates | June 30 Valuation 2023 | 2022 |
|---|---|---|
| 1. Normal Cost Rate | 8.74% | 8.81% |
| 2. UAAL Contribution Rate | 20.88% | 20.49% |
| 3. Total Actuarial Required Contribution Rate | 29.62% | 29.30% |
| 4. Member Contribution Rate | (2.27%) | (2.04%) |
| 5. Actuarial Employer Contribution Rate | 27.35% | 27.26% |
| 6. Required Employer Contribution Rate* | 28.75% | 27.26% |

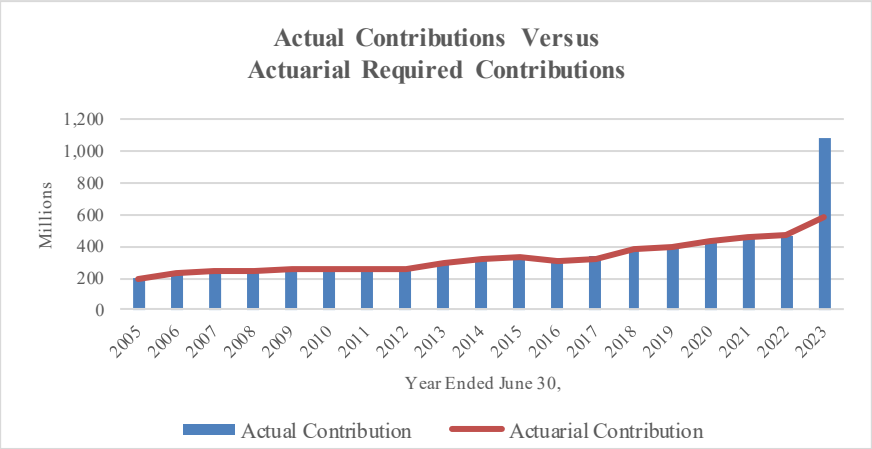
* The System's contribution policy minimum employer contribution rate is 28.75% of pay in FYE 2025, 30.25% of pay in FYE 2026, and 32.00% of pay thereafter.

The total actuarial required contribution rate in the June 30, 2023 valuation is 29.62%. The member contribution rate (as a percentage of total covered payroll) is anticipated to be 2.27%, resulting in an employer share of the total actuarial required contribution rate for FYE 2025 of 27.35%. Because this is below the applicable minimum required employer contribution rate for FYE 2025 of 28.75%, the required employer contribution rate for FYE 2025 is 28.75% of pay.

The following table shows the reconciliation of the actuarial employer contribution rate from the June 30, 2022 to the June 30, 2023 valuation:

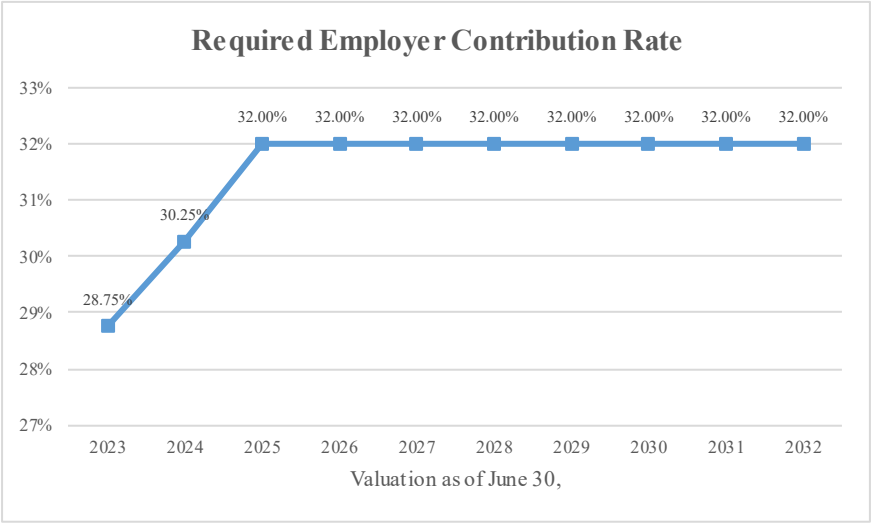
| | % of Payroll |
|---|---|
| **6/30/2022 Actuarial Employer Contribution Rate** | **27.26%** |
| Asset (Gain)/Loss | 1.00% |
| Liability (Gain)/Loss | 1.70% |
| Projected Payroll Higher than Expected | |
| - Increase in Active Membership | (0.85%) |
| - Increase in Projected Payroll | (1.54%) |
| Change in Normal Cost Rate | (0.07%) |
| Change in Effective Member Contribution Rate | (0.23%) |
| Other Experience | 0.08% |
| **6/30/2023 Actuarial Employer Contribution Rate** | **27.35%** |

Historically, MOSERS employers have contributed at least the full actuarial employer contribution as shown in the graph below, which compares the actuarial contribution to the actual contribution amounts for employers:




The actuarial employer contribution rate, which is determined based on the snapshot of the System taken on each valuation date, is anticipated to increase over the short-term as the deferred investment experience is recognized through the asset smoothing method. Anticipated increases in member contributions, as a percentage of total payroll, are expected to decrease the employer share of the total actuarial required contribution rate. To the extent the size of the active group continues to decline in future years, there may be a slower increase in the effective member contribution rate. Future experience (both investment and demographic), which is not modeled here, will also have an impact on the ultimate level of MSEP contributions.

The following graph of the projected employer contribution rate shows the new minimum employer contribution rates adopted by the Board are expected to impact employer contributions over the next decade. The minimum employer contribution rates are projected to continue to impact employer contributions until the System reaches an 80% funded ratio in the 2038 valuation, assuming all actuarial assumptions are met.



The net deferred investment loss (actuarial value of assets minus the market value) is $773 million as of June 30, 2023. Absent favorable investment experience in future years, the net deferred investment loss will eventually be reflected in the actuarial value of assets in future years. While the use of an asset smoothing method is a common procedure for public retirement systems, it is important to recognize the potential impact of the deferred investment experience. This is accomplished by comparing the key valuation results from the June 30, 2023 actuarial valuation using both the actuarial and market value of assets (see the following table):

| | Using Actuarial Value of Assets | Using Market Value of Assets |
|---|---|---|
| Actuarial Accrued Liability | $16,190,813,686 | $16,190,813,686 |
| Asset Value | (9,331,207,050) | (8,557,793,248) |
| Unfunded Actuarial Accrued Liability | $6,859,606,636 | $7,633,020,438 |
| Funded Ratio | 57.6% | 52.9% |
| Normal Cost Rate | 8.74% | 8.74% |
| UAAL Contribution Rate | 20.88% | 23.16% |
| Total Actuarial Required Contribution Rate | 29.62% | 31.90% |
| Member Contribution Rate | (2.27%) | (2.27%) |
| Actuarial Employer Contribution Rate | 27.35% | 29.63% |

A typical retirement plan faces many different risks. The term "risk" is most commonly associated with an outcome with undesirable results. However, in the actuarial world risk can be translated as uncertainty. The actuarial valuation process uses many actuarial assumptions to project how future contributions and investment returns will meet the cash flow needs for future benefit payments. Of course, we know that actual experience will not unfold exactly as anticipated by the assumptions and that uncertainty, whether favorable or unfavorable, creates risk. Actuarial Standard of Practice Number 51 defines risk as the potential of actual future measurements to deviate from expected results due to actual experience that is different than the actuarial assumptions. Risk evaluation is an important part of managing a defined benefit plan. Please see Section 7 of this report for an in-depth discussion of the specific risks facing MOSERS.

The next page contains a comprehensive summary of valuation results for the current and prior year. Detailed exhibits deriving the results can be found in the following sections.

# SUMMARY OF PRINCIPAL RESULTS
**($ in millions)**

| Valuation Date<br>Contribution for Fiscal Year Ending | June 30, 2023<br>June 30, 2025 | June 30, 2022<br>June 30, 2024 | % Change |
|---|---|---|---|
| **Employer Contribution** | | | |
| Annual Amount (Estimated) | $688.0 | $576.3 | 19.4% |
| Percentage of Covered Payroll | 28.75% | 27.26% | 5.5% |
| Projected Payroll for FYE 2025 and 2024 | $2,393 | $2,114 | 13.2% |
| **Benefit Payments During Prior Year** | $992 | $963 | 3.0% |
| **Membership** | | | |
| Number of | | | |
| - Active Members | 43,088 | 41,595 | 3.6% |
| - Retirees and Beneficiaries | 54,709 | 53,648 | 2.0% |
| - Terminated Vested Members | 17,651 | 17,438 | 1.2% |
| - Leave-of-Absence Members | 106 | 115 | (7.8%) |
| - Long Term Disability Members | 548 | 599 | (8.5%) |
| - Terminated Nonvested Members | 31,575 | 28,444 | 11.0% |
| - Total | 147,677 | 141,839 | 4.1% |
| - Reported Payroll | $2,225 | $1,973 | 12.8% |
| **Assets** | | | |
| Market Value (MVA) | $8,558 | $8,248 | 3.8% |
| Actuarial Value (AVA) | $9,331 | $8,894 | 4.9% |
| Ratio - Actuarial Value to Market Value | 109.03% | 107.83% | |
| Return on Market Value* | 2.5% | (9.0%) | |
| Return on Actuarial Value | 3.4% | 5.1% | |
| **Actuarial Information** | | | |
| Actuarial Accrued Liability (AAL) | $16,191 | $15,409 | 5.1% |
| Unfunded Actuarial Accrued Liability (UAAL) | $6,860 | $6,515 | 5.3% |
| Funded Ratio (Actuarial Value of Assets) | 57.6% | 57.7% | (0.2%) |
| Ratio of AVA to Reported Payroll | 4.2 | 4.5 | |
| Ratio of AAL to Reported Payroll | 7.3 | 7.8 | |
| Normal Cost Rate | 8.74% | 8.81% | (0.8%) |
| UAAL Contribution Rate | 20.88% | 20.49% | 1.9% |
| Total Actuarial Required Contribution Rate | 29.62% | 29.30% | 1.1% |
| Member Contribution Rate | (2.27%) | (2.04%) | 11.3% |
| Actuarial Employer Contribution Rate | 27.35% | 27.26% | 0.3% |
| Required Employer Contribution Rate** | 28.75% | 27.26% | 5.5% |

* As reported by MOSERS.

** The System's contribution policy minimum employer contribution rate is 28.75% of pay for FYE 2025, 30.25% of pay for FYE 2026 and 32% of pay thereafter. The minimum contribution rate will be in effect until the System reaches an 80% funded ratio.

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This report presents the actuarial valuation results of the Missouri State Employees' Retirement System as of June 30, 2023. This valuation was prepared at the request of the MOSERS Board.

Please pay particular attention to our actuarial certification letter, where the guidelines employed in the preparation of this report are outlined. We also comment on the sources and reliability of both the data and the actuarial assumptions upon which our findings are based. Those comments are the basis for our certification that this report is complete and accurate to the best of our knowledge and belief.

A summary of the findings which result from this valuation is presented in the previous section. Section 3 describes the assets and investment experience of the System. Sections 4 and 5 describe how the obligations of the System are to be met under the System's funding policy. Section 6 contains projections of future valuation results, assuming all actuarial assumptions are met. Section 7 discloses key maturity measurements and discusses the key risks facing the funding of the System. Section 8 includes some historical funding information that was required by the Governmental Accounting Standards Board (GASB) in the past, as well as member information for the annual report.

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In many respects, an actuarial valuation can be thought of as an inventory process. The inventory is taken as of the actuarial valuation date, which for this valuation is June 30, 2023. On that date, the assets available for the payment of benefits are appraised. The assets are compared with the liabilities of the System, which are generally in excess of assets. The actuarial process then leads to a method of determining the contributions needed by members and the employer in the future to balance the System assets and liabilities.

**Market Value of Assets**

The current market value represents the "snapshot" or "cash-out" value of System assets as of the valuation date. In addition, the market value of assets provides a basis for measuring investment performance from time to time. Table 1 shows a summary of changes to both the market and the actuarial value assets for the year beginning June 30, 2022 and ending June 30, 2023.

**Actuarial Value of Assets**

Neither the market value of assets, representing a "cash-out" value of System assets, nor the book values of assets, representing the cost of investments, may be the best measure of the System's ongoing ability to meet its obligations.

To arrive at a suitable value of assets for the actuarial valuation, a technique for determining the actuarial value of assets is used which dampens swings in the market value while still indirectly recognizing market values.

Table 2 shows the development of the actuarial value of assets (AVA) as of the valuation date.

Table 3 shows the development of the actuarial value of assets (AVA) as of the valuation date, that will be used to calculate the employer contribution rate.

# TABLE 1
# ASSET SUMMARY

| | Market Value | Actuarial Value |
|---|---|---|
| 1. Assets at June 30, 2022 | 8,248,414,597 | 8,894,328,756 |
| 2. Contributions | | |
| State Contributions | 580,661,379 | 580,661,379 |
| Additional State Contributions | 500,000,000 | 500,000,000 |
| Employee Contributions | 48,487,731 | 48,487,731 |
| Member Purchases of Service Credit | 1,591,102 | 1,591,102 |
| Service Transfer Contributions | 3,573,592 | 3,573,592 |
| Total | 1,134,313,804 | 1,134,313,804 |
| 3. Investment Income, Net of Investment Expenses | 177,598,790 | 305,098,433 |
| 4. Miscellaneous Income | 646 | 646 |
| 5. Benefit Payments and Transfers Out | | |
| Monthly Benefit Payments | 917,235,787 | 917,235,787 |
| BackDROP and Lump Sum Payments | 61,834,625 | 61,834,625 |
| Inactive Vested Lump Sum Payments | 72,129 | 72,129 |
| Service Transfer Payments | 4,426,152 | 4,426,152 |
| Contribution Refunds | 7,981,346 | 7,981,346 |
| Total | 991,550,039 | 991,550,039 |
| 6. Administrative and Misc. Expenses | 10,984,550 | 10,984,550 |
| 7. Assets at June 30, 2023<br>(1) + (2) + (3) + (4) - (5) - (6) | 8,557,793,248 | 9,331,207,050 |
| 8. Rate of Return, Net of Investment Expenses* | 2.5% | 3.4% |

* Based on the approximation formula: (2 x I) / (A+B-I), where
I = Investment Increment
A = Beginning of year asset value
B = End of year asset value

Market Value return reported by MOSERS

# TABLE 2
# DEVELOPMENT OF ACTUARIAL VALUE OF ASSETS

Under the current asset smoothing method, the difference between the dollar amount of actual and assumed investment return on the market value of assets will be recognized evenly over a closed five-year period. The method was first implemented with the June 30, 2018 valuation. Deferred asset experience as of June 30, 2017 is recognized evenly over a closed seven-year period, beginning June 30, 2018.

| Fiscal Year End June 30, | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|
| A. Market Value of Assets, Beginning of Year | $ 8,034,508,424 | $ 7,916,465,279 | $ 7,910,830,533 | $ 9,519,930,080 | $ 8,248,414,597 |
| B. Required Contributions During Year | 429,323,185 | 476,091,401 | 504,683,875 | 516,725,950 | 634,313,804 |
| C. Additional Contributions | 0 | 0 | 0 | 0 | 500,000,000 |
| D. Miscellaneous Income | 0 | 0 | 80,121 | 5,852 | 646 |
| E. Benefit Payments and Expenses During Year | 861,022,406 | 882,214,402 | 928,655,535 | 971,839,742 | 1,002,534,589 |
| F. Expected Rate of Return | 7.25% | 7.10% | 6.95% | 6.95% | 6.95% |
| G. Expected Net Investment Income | 567,126,565 | 547,898,876 | 535,319,903 | 646,085,772 | 593,939,072 |
| H. Expected Market Value of Assets, End of Year | 8,169,935,768 | 8,058,241,154 | 8,022,258,897 | 9,710,907,912 | 8,974,133,530 |
| I. Market Value of Assets, End of Year | 7,916,465,279 | 7,910,830,533 | 9,519,930,080 | 8,248,414,597 | 8,557,793,248 |
| J. Excess/(Shortfall) of Net Investment Income | $ (253,470,489) | $ (147,410,621) | $ 1,497,671,183 | $ (1,462,493,315) | $ (416,340,282) |

# TABLE 2
# DEVELOPMENT OF ACTUARIAL VALUE OF ASSETS

**(continued)**

The table below shows the development of gain/(loss) to be recognized in the current year:

| Plan Year Ended | Asset Gain/(Loss) | Gain/(Loss) Recognized in Prior Years | Gain/(Loss) Recognized This Year | | Gain/(Loss) Deferred to Future Years |
|---|---|---|---|---|---|
| 6/30/2017 | (927,023,550) | (662,159,680) | (132,431,936) | * | (132,431,934) |
| 6/30/2019 | (253,470,489) | (202,776,392) | (50,694,097) | | 0 |
| 6/30/2020 | (147,410,621) | (88,446,372) | (29,482,124) | | (29,482,125) |
| 6/30/2021 | 1,497,671,183 | 599,068,474 | 299,534,237 | | 599,068,472 |
| 6/30/2022 | (1,462,493,315) | (292,498,663) | (292,498,663) | | (877,495,989) |
| 6/30/2023 | (416,340,282) | 0 | (83,268,056) | | (333,072,226) |
| **Total** | (1,709,067,074) | (646,812,633) | (288,840,639) | | (773,413,802) |

| | | |
|---|---|---|
| A. Market Value of Assets as of June 30, 2023 | $ | 8,557,793,248 |
| B. Total Deferred Investment Experience | $ | (773,413,802) |
| C. Actuarial Value of Assets as of June 30, 2023 (A. - B.) | $ | 9,331,207,050 |
| D. Ratio of Actuarial Value to Market Value | | 109.0% |

* The unrecognized investment experience as of June 30, 2017 is recognized over a closed seven-year period.

The table below shows the scheduled recognition of current deferred investment gains/(losses):

| Plan Year Ended | Gain/(Loss) Deferred to Future Years | Gain/(Loss) to be Recognized in Plan Year Ending June 30, 2024 | 2025 | 2026 | 2027 |
|---|---|---|---|---|---|
| 6/30/2017 | (132,431,934) | (132,431,934) | | | |
| 6/30/2020 | (29,482,125) | (29,482,124) | | | |
| 6/30/2021 | 599,068,472 | 299,534,237 | 299,534,235 | | |
| 6/30/2022 | (877,495,989) | (292,498,663) | (292,498,663) | (292,498,663) | |
| 6/30/2023 | (333,072,226) | (83,268,056) | (83,268,056) | (83,268,056) | (83,268,058) |
| **Total** | (773,413,802) | (238,146,540) | (76,232,484) | (375,766,719) | (83,268,058) |

# TABLE 3
# DEVELOPMENT OF ACTUARIAL VALUE OF ASSETS
# USED TO CALCULATE THE EMPLOYER CONTRIBUTION RATE

| Fiscal Year End June 30, | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|
| A. Market Value of Assets, Beginning of Year | $ 8,034,508,424 | $ 7,916,465,279 | $ 7,910,830,533 | $ 9,519,930,080 | $ 8,248,414,597 |
| B. Contributions During Year | 429,323,185 | 476,091,401 | 504,683,875 | 516,725,950 | 634,313,804 |
| C. Miscellaneous Income | 0 | 0 | 80,121 | 5,852 | 646 |
| D. Benefit Payments and Expenses During Year | 861,022,406 | 882,214,402 | 928,655,535 | 971,839,742 | 1,002,534,589 |
| E. Expected Rate of Return | 7.25% | 7.10% | 6.95% | 6.95% | 6.95% |
| F. Expected Net Investment Income | 567,126,565 | 547,898,876 | 535,319,903 | 646,085,772 | 560,684,083 |
| G. Expected Market Value of Assets, End of Year | 8,169,935,768 | 8,058,241,154 | 8,022,258,897 | 9,710,907,912 | 8,440,878,541 |
| H. Market Value of Assets, End of Year* | 7,916,465,279 | 7,910,830,533 | 9,519,930,080 | 8,248,414,597 | 8,045,599,245 |
| I. Excess/(Shortfall) of Net Investment Income | $ (253,470,489) | $ (147,410,621) | $ 1,497,671,183 | $ (1,462,493,315) | $ (395,279,296) |

* Does not reflect the additional contribution of $500 million made on July 13, 2022. The accumulated value of the additional $500 million contribution as of June 30, 2023 is $512,194,003.

# TABLE 3
# DEVELOPMENT OF ACTUARIAL VALUE OF ASSETS USED TO CALCULATE THE EMPLOYER CONTRIBUTION RATE

**(continued)**

| Plan Year Ended | Asset Gain/(Loss) | Gain/(Loss) Recognized in Prior Years | Gain/(Loss) Recognized This Year | | Gain/(Loss) Deferred to Future Years |
|---|---|---|---|---|---|
| 6/30/2017 | (927,023,550) | (662,159,680) | (132,431,936) | * | (132,431,934) |
| 6/30/2019 | (253,470,489) | (202,776,392) | (50,694,097) | | 0 |
| 6/30/2020 | (147,410,621) | (88,446,372) | (29,482,124) | | (29,482,125) |
| 6/30/2021 | 1,497,671,183 | 599,068,474 | 299,534,237 | | 599,068,472 |
| 6/30/2022 | (1,462,493,315) | (292,498,663) | (292,498,663) | | (877,495,989) |
| 6/30/2023 | (395,279,296) | 0 | (79,055,859) | | (316,223,437) |
| **Total** | (1,688,006,088) | (646,812,633) | (284,628,442) | | (756,565,013) |

| | | |
|---|---|---|
| A. Market Value of Assets as of June 30, 2023 | $ | 8,045,599,245 |
| B. Total Deferred Investment Experience | $ | (756,565,013) |
| C. Actuarial Value of Assets as of June 30, 2023 (A. - B.) | $ | 8,802,164,258 |

* The unrecognized investment experience as of June 30, 2017 is recognized over a closed seven-year period.

In the previous section, an analysis of System's current assets was given as of June 30, 2023. In this section, the discussion will focus on the commitments (future benefit payments) of the System, which are referred to as its liabilities.

Table 4 contains an analysis of the actuarial present value of all future benefits (PVFB) for contributing members, inactive members, retirees and their beneficiaries. The liabilities summarized in Table 4 include the actuarial present value of all future benefits expected to be paid with respect to each member. For an active member, this value includes measures of both benefits already earned and future benefits expected to be earned. For all members, active and retired, the value extends over benefits earnable and payable for the rest of their lives and, if an optional benefit is chosen, for the lives of their surviving spouses.

The actuarial assumptions used to determine liabilities are based on the results of the latest experience study. These assumptions are outlined in Appendix D.

The Board's funding policy amortizes the UAAL using a "layered" bases method. Under this method, the "Legacy UAAL", as determined in the June 30, 2018 valuation, is amortized over a closed 30-year period (see Table 5). Effective June 30, 2021, subsequent changes in the UAAL due to actuarial gains/losses or assumption changes are separately financed by establishing amortization bases and payments, as a level percentage of payroll, over closed 25-year periods. Bases established prior to June 30, 2021 will continue to be amortized on their original schedule. Any change in the System's benefit structure shall be amortized over a closed period of 20 years, as set out in state statutes. The total UAAL amortization payment is the sum of the payments for each of the amortization bases. Note that the use of closed amortization periods will result in the System being fully funded at the end of the amortization period, if all actuarial assumptions are met.

All liabilities reflect the benefit provisions in place as of June 30, 2023, as amended by any legislation in the 2023 Legislative Session.

**Actuarial Accrued Liability**

A fundamental principle in financing the liabilities of a retirement program is that the cost of its benefits should be related to the period in which benefits are earned, rather than to the period of benefit distribution. An actuarial cost method is a mathematical technique that allocates the present value of future benefits into annual costs. In order to do this allocation, it is necessary for the funding method to "breakdown" the present value of future benefits into two components:

(1) that which is attributable to the past and
(2) that which is attributable to the future.

Actuarial terminology calls the part attributable to the past the "past service liability" or the "actuarial accrued liability." The portion allocated to the future is known as the present value of future normal costs, with the specific piece of it allocated to the current year being called the "normal cost." Table 6 contains the actuarial balance sheet for the System. The Entry Age Normal actuarial cost method is used to develop the actuarial accrued liability. Tables 7 and 8 show the gain/(loss) analysis in total and by source for the System. Table 9 shows historical data for gain/(loss) experience by source.

# TABLE 4
# UNFUNDED ACTUARIAL ACCRUED LIABILITY
## As of June 30, 2023

| | (1) Actuarial Present Value | (2) Present Value of Future Normal Cost Contributions | (3) = (1) - (2) Actuarial Accrued Liabilities |
|---|---|---|---|
| **Active Members** | | | |
| Service retirement benefits based on service rendered before and likely to be rendered after valuation date | $5,805,573,752 | $775,000,690 | $5,030,573,062 |
| Disability benefits likely to be paid to present active members who become totally and permanently disabled | 114,056,468 | 65,773,124 | 48,283,344 |
| Survivor benefits likely to be paid to widows and children of present active members who die before retiring | 67,392,373 | 19,977,778 | 47,414,595 |
| Separation benefits likely to be paid to present active members | 417,419,881 | 322,388,061 | 95,031,820 |
| Active Member Totals | $6,404,442,474 | $1,183,139,653 | $5,221,302,821 |
| **Members on Leave of Absence & LTD** Service retirement benefits based on service rendered before the valuation date | | | 66,049,220 |
| **Terminated Vested Members** Service retirement benefits based on service rendered before the valuation date | | | 920,233,637 |
| **Retired Lives** | | | 9,939,272,500 |
| **Pending Refunds** | | | 43,955,508 |
| **Total Actuarial Accrued Liability** | | | $16,190,813,686 |
| **Actuarial Value of Assets** | | | 9,331,207,050 |
| **Unfunded Actuarial Accrued Liability** | | | $6,859,606,636 |
| **Funded Ratio** | | | 57.6% |

# TABLE 5
# AMORTIZATION SCHEDULE FOR LEGACY UAAL

The legacy UAAL base, established in the June 30, 2018 valuation, is the largest component of the total UAAL. To illustrate the impact of the level percent of payroll methodology, the amortization schedule for the legacy base is shown below. Note that this schedule is based on the underlying assumptions used in this valuation including an investment return assumption of 6.95% and an assumed payroll growth of 2.25%. Any change in these assumptions in the future will impact the projected UAAL amortization schedule for the legacy UAAL.

| As of June 30 | Outstanding Balance (BOY) | Amortization Years Remaining | Contributions ($M) |
|---|---|---|---|
| 2024 | 4,971 | 25 | 335 |
| 2025 | 4,971 | 24 | 342 |
| 2026 | 4,962 | 23 | 350 |
| 2027 | 4,945 | 22 | 358 |
| 2028 | 4,919 | 21 | 366 |
| 2029 | 4,882 | 20 | 374 |
| 2030 | 4,834 | 19 | 383 |
| 2031 | 4,775 | 18 | 391 |
| 2032 | 4,702 | 17 | 400 |
| 2033 | 4,615 | 16 | 409 |
| 2034 | 4,513 | 15 | 418 |
| 2035 | 4,394 | 14 | 428 |
| 2036 | 4,257 | 13 | 437 |
| 2037 | 4,101 | 12 | 447 |
| 2038 | 3,923 | 11 | 457 |
| 2039 | 3,723 | 10 | 467 |
| 2040 | 3,499 | 9 | 478 |
| 2041 | 3,247 | 8 | 489 |
| 2042 | 2,968 | 7 | 500 |
| 2043 | 2,657 | 6 | 511 |
| 2044 | 2,313 | 5 | 522 |
| 2045 | 1,934 | 4 | 534 |
| 2046 | 1,516 | 3 | 546 |
| 2047 | 1,056 | 2 | 559 |
| 2048 | 552 | 1 | 571 |
| 2049 | 0 | 0 | 0 |

# TABLE 6
# ACTUARIAL BALANCE SHEET

| | | |
|---|---|---|
| ASSETS | | |
| Actuarial Value of Assets | | $ 9,331,207,050 |
| Unfunded Actuarial Accrued Liability | | 6,859,606,636 |
| Present Value of Future Normal Costs | | 1,183,139,653 |
| Total Assets | | $ 17,373,953,339 |
| LIABILITIES | | |
| Present Value of Future Benefits | | |
| Active members | | |
| Retirement | $ 5,805,573,752 | |
| Withdrawal | 417,419,881 | |
| Death | 67,392,373 | |
| Disability | 114,056,468 | |
| Total | | $ 6,404,442,474 |
| Inactive members | | |
| Currently receiving benefits | 9,939,272,500 | |
| Not currently receiving benefits | 1,030,238,365 | |
| Total | | $ 10,969,510,865 |
| Total Liabilities | | $ 17,373,953,339 |

# TABLE 7
# ANALYSIS OF GAIN/(LOSS)

| | (1) Actuarial Accrued Liabilities | (2) Valuation Assets | (3) = (1) - (2) UAAL |
|---|---|---|---|
| (1) Value at Start of Year | $ 15,408,995,032 | $ 8,894,328,756 | $ 6,514,666,276 |
| (2) Total Normal Cost From Last Valuation | 155,261,603 | 0 | 155,261,603 |
| (3) Actual Contributions (Employer and Member) | 0 | 1,129,149,110 | (1,129,149,110) |
| (4) Miscellaneous Income | 0 | 646 | (646) |
| (5) Benefit Payments | (991,550,039) | (991,550,039) | 0 |
| (6) Administrative Expenses | 0 | (10,984,550) | 10,984,550 |
| (7) Service Purchases/Transfers | 5,164,694 | 5,164,694 | 0 |
| (8) Interest on (1) through (7) at 6.95% | 1,048,014,668 | 638,830,106 | 409,184,562 |
| (9) Expected Value Before Changes | $ 15,625,885,958 | $ 9,664,938,723 | $ 5,960,947,235 |
| (10) Other Changes | 0 | 0 | 0 |
| (11) Expected Value After Changes: (9) + (10) | $ 15,625,885,958 | $ 9,664,938,723 | $ 5,960,947,235 |
| (12) Actual Value at End of Year | 16,190,813,686 | 9,331,207,050 | 6,859,606,636 |
| (13) Gain / (Loss) | $ (564,927,728) | $ (333,731,673) | $ (898,659,401) |
| (14) Gain / (Loss) as Percent of Expected Actuarial Accrued Liability: $15,625,885,958 | (3.6%) | (2.1%) | (5.8%) |

# TABLE 8
# GAIN/(LOSS) ANALYSIS BY SOURCE

| Type of Activity | Gain or (Loss) for Year Ended 6/30/2023 | |
|---|---|---|
| **Age & Service Retirements.** If members retire at older ages or with lower final average pay than assumed, there is a gain. If younger ages or higher average pays, a loss. | ($30,000,000) | (0.2%) |
| **Death-in-Service Benefits.** If survivor claims are less than assumed, there is a gain. If more claims, there is a loss. | 5,900,000 | 0.0% |
| **Withdrawal From Employment.** If more liabilities are released by withdrawals than assumed, there is a gain. If smaller releases, a loss. | (30,100,000) | (0.2%) |
| **Long Term Disability.** The occurrence of a gain or loss depends upon the age at disability and the incidence of disability. | (1,700,000) | (0.0%) |
| **Salary Increases.** If there are smaller salary increases than assumed, there is a gain. If greater increases, a loss. | (317,000,000) | (2.0%) |
| **Investment Income.** If there is greater investment return on assets than assumed, there is a gain. If less return, a loss. | (333,700,000) | (2.1%) |
| **Retiree Mortality.** If more deaths than assumed, there is a gain. if fewer deaths, a loss. | 8,100,000 | 0.1% |
| **COLAs.** If Cost of Living Adjustments are less than expected, a gain; if more a loss. | (175,200,000) | (1.1%) |
| **Other.** Miscellaneous gains and losses resulting from data adjustments, timing of financial transactions, valuation methods, etc. | (25,000,000) | (0.2%) |
| **Gain (or Loss) During Year From Experience** | ($898,700,000) | (5.8%) |

Note: Percentages may not add due to rounding.

# TABLE 9
# HISTORICAL EXPERIENCE GAINS AND LOSSES BY SOURCE

| Year Ending June 30 | Gain (Loss) By Risk Area | | | | | | | | | Total Exper. Gain (Loss) | Exper. Gain (Loss) as % of AAL | Accrued Liability Beginning of Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Salary Increases | Investments | Age & Service Retirement | Disability | Death In-Service | Withdrawal | Death Retired Lives& | COLAs | Other | | | |
| 1999 | (21.9) | 299.8 | (1.3) | (0.3) | (0.9) | 1.7 | 10.5 | | (58.1) | 229.5 | 4.7 | 4,919 |
| 2000* | (6.4) | 162.0 | 1.7 | (0.5) | (0.7) | 8.9 | 18.5 | | (34.7) | 148.8 | 2.7 | 5,506 |
| 2001* | (23.2) | (67.9) | (59.8) | (1.0) | (0.2) | (28.2) | (13.1) | | (66.1) | (259.5) | (4.4) | 5,921 |
| 2002 | 115.0 | (284.6) | (14.4) | (0.5) | (1.3) | (21.4) | 37.1 | | (62.6) | (232.8) | (3.8) | 6,065 |
| 2003 | 7.7 | (314.1) | (27.2) | (0.6) | (2.6) | (14.6) | 9.6 | | (63.1) | (404.9) | (6.5) | 6,294 |
| 2004* | (40.0) | (240.1) | (51.5) | (1.4) | (1.3) | (6.7) | (4.3) | | (53.8) | (399.1) | (6.0) | 6,662 |
| 2005 | (3.4) | (196.6) | 3.1 | (2.0) | (1.7) | (0.9) | (11.7) | | (35.5) | (248.7) | (3.4) | 7,230 |
| 2006 | (29.5) | 38.0 | (1.7) | (2.3) | (2.4) | 15.5 | (21.1) | | (3.6) | (7.1) | (0.1) | 7,578 |
| 2007 | (11.5) | 179.4 | (17.3) | (2.1) | (2.4) | 3.8 | (29.7) | | (43.0) | 77.2 | 1.0 | 8,013 |
| 2008* | (10.5) | 78.3 | (22.9) | (2.0) | (3.4) | 6.6 | 8.7 | | (49.8) | 5.0 | 0.1 | 8,500 |
| 2009* | (15.9) | (354.3) | 8.8 | (1.5) | 0.0 | (31.3) | (39.8) | | (37.6) | (471.6) | (5.2) | 9,128 |
| 2010 | 23.2 | (313.6) | (19.0) | 8.4 | 8.0 | (30.6) | 4.7 | | (56.9) | (375.8) | (3.9) | 9,495 |
| 2011 | 49.6 | (204.0) | (52.8) | 10.8 | 7.5 | (21.0) | 32.7 | | (60.4) | (237.6) | (2.4) | 9,853 |
| 2012* | 12.3 | (447.2) | (24.3) | 8.3 | 8.9 | 8.1 | 10.3 | | (53.6) | (477.2) | (4.7) | 10,124 |
| 2013** | 60.4 | (313.7) | 6.7 | 11.1 | 7.4 | 2.0 | (7.7) | (3.1) | (70.4) | (307.3) | (2.8) | 10,794 |
| 2014 | 52.6 | 249.5 | (6.9) | (4.2) | (2.5) | (12.7) | 6.3 | 18.0 | (68.3) | 231.8 | 2.1 | 11,135 |
| 2015 | 51.4 | (137.9) | (29.1) | (1.6) | (0.5) | 15.6 | 18.9 | 30.0 | (54.0) | (107.2) | (0.9) | 11,495 |
| 2016*** | (59.3) | (320.4) | 7.5 | (1.2) | 3.0 | (8.3) | 16.9 | 50.3 | (70.0) | (381.5) | (3.3) | 11,728 |
| 2017* | 17.0 | (232.1) | (53.3) | (0.6) | 6.2 | (28.2) | 14.3 | 68.3 | (2.2) | (210.5) | (1.6) | 12,751 |
| 2018*** | 85.3 | (202.1) | (51.8) | (0.9) | 7.2 | (38.0) | 20.1 | 43.3 | 17.9 | (119.0) | (0.9) | 13,152 |
| 2019* | 24.9 | (241.2) | (26.4) | (2.3) | 7.1 | 1.5 | 6.4 | 29.5 | (44.2) | (244.7) | (1.8) | 13,613 |
| 2020* | (60.6) | (274.4) | (19.2) | (3.1) | 7.1 | (4.1) | 9.1 | 20.2 | 3.7 | (321.3) | (2.3) | 13,958 |
| 2021* | (128.0) | 30.8 | (34.8) | (1.3) | 12.4 | (35.6) | 17.8 | 45.4 | (5.9) | (99.2) | (0.7) | 14,258 |
| 2022 | (26.7) | (163.5) | (0.5) | (1.1) | 10.7 | 12.9 | 22.9 | (32.4) | (15.8) | (193.5) | (1.3) | 15,111 |
| **2023** | **(317.0)** | **(333.7)** | **(30.0)** | **(1.7)** | **5.9** | **(30.1)** | **8.1** | **(175.2)** | **(25.0)** | **(898.7)** | **(5.8)** | **15,409** |

* Revision in assumptions.
** Revision in asset valuation method.
*** Revision in assumptions & asset valuation method.
& Prior to the 2013 valuation, this amount included COLAs.

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The previous two sections were devoted to a discussion of the assets and liabilities of the Missouri State Employees' Retirement System. Table 6 indicates that current assets fall short of meeting the present value of future benefits (total liability). This is expected in all but a completely closed fund, where no further contributions are anticipated. In an active system, there will almost always be a difference between the actuarial value of assets and total liabilities. This deficiency has to be made up by future contributions and investment returns. An actuarial valuation sets out a schedule of future contributions that will fund this deficiency in an orderly fashion.

The method used to determine the incidence of the contributions in various years is called the actuarial cost method. Under an actuarial cost method, the contributions required to meet the difference between current assets and current liabilities are allocated each year between two elements: (1) the normal cost rate and (2) the unfunded actuarial accrued liability contribution rate.

The term "fully funded" is often applied to a system in which contributions at the normal cost rate are sufficient to pay for the benefits of existing employees as well as for those of new employees. More often than not, systems are not fully funded, either because of past benefit improvements that have not been completely funded or because of actuarial deficiencies that have occurred because experience has not been as favorable as anticipated by the actuarial assumptions. Under these circumstances, an unfunded actuarial accrued liability (UAAL) exists. Likewise, when the actuarial value of assets is greater than the actuarial accrued liability, a surplus exists.

**Description of Contribution Rate Components**

The Entry Age Normal (EAN) actuarial cost method is used for the valuation. Under that method, the normal cost for each year from entry age to assumed exit age is a constant percentage of the member's year by year projected compensation. The portion of the present value of future benefits not provided by the present value of future normal costs is the actuarial accrued liability. The unfunded actuarial accrued liability represents the difference between the actuarial accrued liability and the actuarial value of assets as of the valuation date. The UAAL is calculated each year and reflects experience gains and losses.

In general, contributions are computed in accordance with a level percent-of-payroll funding objective. The contribution rate based on the June 30, 2023 actuarial valuation will be used to determine the employer contribution rate for the plan year ending June 30, 2025. In this context, the term "contribution rate" means the percentage, which is applied to a particular active member payroll to determine the actual employer contribution amount (i.e., in dollars) for the group.

**Contribution Rate Summary**

Table 10 shows the development of the June 30, 2024 projected UAAL used to develop the UAAL contribution rate. In Table 11, the amortization payment related to the UAAL is developed. Table 12 develops the required employer contribution rate for the Plan and the estimated amount of required employer contributions. Table 13 shows estimated contribution amounts for each department if the employer contributions are paid early on July 15, September 1 or November 1. Amounts are shown for both the UAAL payment only and the total employer contribution.

The contribution rates shown in this report are based on the actuarial assumptions and cost methods described in Appendix D.

# TABLE 10
# PROJECTED UAAL AS OF JUNE 30, 2024

| | |
|---|---|
| (1) Actuarial Accrued Liability at June 30, 2023 | $16,190,813,686 |
| (2) Actuarial Value of Assets for UAAL Contribution Rate | $8,802,164,258 |
| (3) Unfunded Actuarial Accrued Liability at June 30, 2023 [(1) - (2)] | $7,388,649,428 |
| (4) Expected Contribution Rate for Year Ending June 30, 2024* | 29.30% |
| (5) Normal Cost Rate for Year Ending June 30, 2024 | 8.74% |
| (6) Contribution Rate Applied to UAAL [(4) - (5)] | 20.56% |
| (7) Projected Payroll for the Year After the Valuation Date | $2,340,527,024 |
| (8) Expected UAAL Contribution [(6) * (7)] | $481,212,356 |
| (9) Interest on (1) and (6) to June 30, 2024 at 6.95% | $497,069,875 |
| (10) Projected UAAL at June 30, 2024 [(3) - (8) + (9)] | $7,404,506,947 |

*The Expected Contribution Rate for FYE 2024 is equal to the employer rate of 27.26% plus the weighted average member rate of 2.04% of payroll from the June 30, 2022 valuation.

# TABLE 11
# UAAL CONTRIBUTION RATE

We believe the use of the layered amortization policy with new bases over 25 years and the remainder of the legacy base over 25 years, complies with Actuarial Standard of Practice Number 4. This policy will fully amortize the individual, as well as the total, unfunded actuarial accrued liability within a reasonable timeframe and/or reduce the amount of the UAAL by a reasonable amount within a sufficiently short period.

| Amortization Base | Original Amount | Remaining Payments | Projected June 30, 2024 Balance | Annual Payment* |
|---|---|---|---|---|
| 2018 Legacy UAAL | $ 4,861,507,879 | 25 | $ 4,971,453,388 | $ 334,790,924 |
| 2019 Assumption Changes | 74,340,841 | 26 | 75,730,083 | 4,994,130 |
| 2019 Experience Base | 259,714,456 | 26 | 264,567,860 | 17,447,309 |
| 2020 Assumption Changes | 124,766,739 | 27 | 126,625,984 | 8,188,227 |
| 2020 Experience Base | 196,930,919 | 27 | 199,865,538 | 12,924,238 |
| 2021 Assumption Changes | 515,859,705 | 23 | 514,898,149 | 36,320,226 |
| 2021 Experience Base | 152,907,202 | 23 | 152,622,185 | 10,765,765 |
| 2022 Experience Base | 254,311,768 | 24 | 254,275,270 | 17,511,368 |
| 2023 Experience Base | $ 844,468,490 | 25 | 844,468,490 | 56,868,759 |
| **Total** | | | **$ 7,404,506,947** | **$ 499,810,946** |

* Payment amount reflects mid-year timing.

| | |
|---|---|
| 1. Total UAAL Amortization Payments | $ 499,810,946 |
| 2. Expected Payroll for FYE 2025 | $ 2,393,188,882 |
| 3. UAAL Amortization Payment Rate (1) / (2) | 20.88% |

# TABLE 12
# REQUIRED EMPLOYER CONTRIBUTION RATE FOR THE FISCAL YEAR ENDING JUNE 30, 2025

## ACTUARIAL VALUATION RESULTS AS OF JUNE 30, 2023

| | Percent of Payroll | | |
|---|---|---|---|
| | MSEP & MSEP 2000 | MSEP 2011 | Weighted Average |
| A. Normal Cost | | | |
| (1) Service retirement benefits | 6.32 % | 4.89 % | 5.49 % |
| (2) Termination benefits | 1.80 | 2.46 | 2.18 |
| (3) Survivor benefits | 0.11 | 0.16 | 0.14 |
| (4) Disability benefits | 0.45 | 0.46 | 0.46 |
| (5) Administrative expenses | 0.47 | 0.47 | 0.47 |
| (6) Total | 9.15 | 8.44 | 8.74 |
| B. Less Member Contributions | 0.00 | 4.00 | 2.27 |
| C. Employer Normal Cost [A(6) - B] | 9.15 | 4.44 | 6.47 |
| D. Unfunded Actuarial Accrued Liabilities (UAAL) (level percent-of-payroll amortization with layered bases) | | | 20.88 |
| **E. ACTUARIAL EMPLOYER CONTRIBUTION RATE [C. + D.]** | | | **27.35 %** |
| **F. POLICY MINIMUM EMPLOYER CONTRIBUTION RATE** | | | **28.75 %** |
| **G. ESTIMATED EMPLOYER CONTRIBUTION ($Millions)#** | | | **$688.0** |

At their September 21, 2023 meeting, the Board adopted a new Policy Minimum Employer Contribution Rate of 28.75% of pay in FYE 2025, 30.25% of pay in FYE 2026, and 32.00% of pay thereafter. The Policy Minimum Employer Contribution Rate continues until the System reaches an 80% funded ratio.

# Illustrative only. Estimated employer contribution amounts (shown in millions) are based on the greater of the Actuarial Employer Contribution Rate and the Policy Minimum Employer Contribution Rate shown, and the valuation payroll projected two years to the applicable fiscal year using the valuation assumption of 2.25% per year.

# TABLE 13
# EARLY PAYMENT AMOUNTS BY DEPARTMENT FOR FISCAL YEAR 2025
# (UAAL CONTRIBUTION RATE: 22.28% OF PAYROLL)

Section 104.436, RSMo. describes the certified contribution rate a department shall pay in accordance with its ordinary course payrolls during each fiscal year. Per a Board Rule adopted during 2020, a department may elect to pre-pay the amount for the unfunded actuarial accrued liabilities (UAAL) only or the total contribution which also includes the normal cost rate, at July 15, September 1, or November 1. For purposes of this exhibit, the UAAL contribution rate is calculated as the excess of the required employer contribution rate over the employer share of the normal cost rate. At the end of the fiscal year, actual payroll will be compared to assumed payroll and an adjustment will be made to the total contributions paid, as either an additional amount paid by the department or a credit to reduce future payments.

This exhibit is for informational purposes only and all payment amounts should be confirmed with MOSERS. Payment amounts are adjusted to payment dates using the assumed rate of return (6.95%) used in the actuarial funding valuation and assuming all scheduled payments are made prior to the one-time payment date.

| Department | Expected Payroll for FY 2025 | Total FY 2025 UAAL Payment | FY 2025 UAAL Contribution Rate | One-Time Payment, Adjusted for Expected Payroll Contributions to Date: July 15* | September 1** | November 1*** | Additional Payroll Contributions |
|---|---|---|---|---|---|---|---|
| State of Missouri | 2,033,808,429 | 453,132,519 | 22.28% | 439,390,540 | 369,247,067 | 298,724,269 | 6.47% |
| Environmental Improvement & Energy Resource Authority | 380,841 | 84,851 | 22.28% | 82,278 | 69,143 | 55,937 | 6.47% |
| Missouri Agriculture & Small Business Development Authority | 166,317 | 37,055 | 22.28% | 35,931 | 30,195 | 24,428 | 6.47% |
| Missouri Consolidated Health Care Plan (MCHCP) | 3,526,250 | 785,649 | 22.28% | 761,823 | 640,207 | 517,933 | 6.47% |
| Missouri Development Finance Board | 408,634 | 91,044 | 22.28% | 88,283 | 74,190 | 60,020 | 6.47% |
| Missouri Housing Development Commission | 9,420,967 | 2,098,991 | 22.28% | 2,035,336 | 1,710,419 | 1,383,744 | 6.47% |
| Missouri Public Entity Risk Management Fund | 878,920 | 195,823 | 22.28% | 189,884 | 159,572 | 129,095 | 6.47% |
| Missouri Technology Corporation | 60,068 | 13,383 | 22.28% | 12,977 | 10,905 | 8,823 | 6.47% |
| Missouri Wine and Grape Board | 220,265 | 49,075 | 22.28% | 47,587 | 39,990 | 32,352 | 6.47% |
| Harris Stowe State University | 9,454,071 | 2,106,367 | 22.28% | 2,042,488 | 1,716,429 | 1,388,607 | 6.47% |
| Lincoln University | 15,032,263 | 3,349,188 | 22.28% | 3,247,618 | 2,729,175 | 2,207,927 | 6.47% |
| Missouri Southern State University | 17,721,634 | 3,948,380 | 22.28% | 3,828,639 | 3,217,442 | 2,602,940 | 6.47% |
| Missouri State University | 111,681,467 | 24,882,631 | 22.28% | 24,128,025 | 20,276,273 | 16,403,691 | 6.47% |
| Missouri Western State University | 17,881,113 | 3,983,912 | 22.28% | 3,863,093 | 3,246,396 | 2,626,365 | 6.47% |
| Northwest Missouri State University | 37,050,731 | 8,254,903 | 22.28% | 8,004,560 | 6,726,727 | 5,441,984 | 6.47% |
| Southeast Missouri State University | 41,447,519 | 9,234,507 | 22.28% | 8,954,456 | 7,524,983 | 6,087,781 | 6.47% |
| State Technical College of Missouri | 13,486,098 | 3,004,703 | 22.28% | 2,913,581 | 2,448,462 | 1,980,828 | 6.47% |
| Truman State University | 27,703,906 | 6,172,430 | 22.28% | 5,985,241 | 5,029,769 | 4,069,129 | 6.47% |
| University of Central Missouri | 52,859,389 | 11,777,072 | 22.28% | 11,419,913 | 9,596,860 | 7,763,948 | 6.47% |
| Total | 2,393,188,882 | 533,202,483 | 22.28% | 517,032,253 | 434,494,204 | 351,509,801 | 6.47% |

* One-time payment is for fiscal year payments and assumes no other contributions during the fiscal year have been made.
** Fiscal year payments are assumed to be made for all of July and August, in addition to the one-time payment.
*** Fiscal year payments are assumed to be made for all of July, August, September and October, in addition to the one-time payment.

# TABLE 13
# EARLY PAYMENT AMOUNTS BY DEPARTMENT FOR FISCAL YEAR 2025

**(continued)**

## (TOTAL EMPLOYER CONTRIBUTION RATE: 28.75% OF PAYROLL)

| Department | Expected Payroll for FY 2025 | Total FY 2025 Payments | FY 2025 Contribution Rate | One-Time Payment, Adjusted for Expected Payroll Contributions to Date: July 15* | September 1** | November 1*** | Additional Payroll Contributions |
|---|---|---|---|---|---|---|---|
| State of Missouri | 2,033,808,429 | 584,719,923 | 28.75% | 566,987,342 | 476,474,558 | 385,472,293 | 0.00% |
| Environmental Improvement & Energy Resource Authority | 380,841 | 109,492 | 28.75% | 106,171 | 89,222 | 72,182 | 0.00% |
| Missouri Agriculture & Small Business Development Authority | 166,317 | 47,816 | 28.75% | 46,366 | 38,964 | 31,522 | 0.00% |
| Missouri Consolidated Health Care Plan (MCHCP) | 3,526,250 | 1,013,797 | 28.75% | 983,052 | 826,119 | 668,338 | 0.00% |
| Missouri Development Finance Board | 408,634 | 117,482 | 28.75% | 113,919 | 95,733 | 77,449 | 0.00% |
| Missouri Housing Development Commission | 9,420,967 | 2,708,528 | 28.75% | 2,626,387 | 2,207,116 | 1,785,577 | 0.00% |
| Missouri Public Entity Risk Management Fund | 878,920 | 252,690 | 28.75% | 245,027 | 205,911 | 166,584 | 0.00% |
| Missouri Technology Corporation | 60,068 | 17,270 | 28.75% | 16,746 | 14,073 | 11,385 | 0.00% |
| Missouri Wine and Grape Board | 220,265 | 63,326 | 28.75% | 61,406 | 51,603 | 41,747 | 0.00% |
| Harris Stowe State University | 9,454,071 | 2,718,045 | 28.75% | 2,635,616 | 2,214,871 | 1,791,851 | 0.00% |
| Lincoln University | 15,032,263 | 4,321,776 | 28.75% | 4,190,711 | 3,521,714 | 2,849,099 | 0.00% |
| Missouri Southern State University | 17,721,634 | 5,094,970 | 28.75% | 4,940,457 | 4,151,772 | 3,358,821 | 0.00% |
| Missouri State University | 111,681,467 | 32,108,422 | 28.75% | 31,134,682 | 26,164,400 | 21,167,240 | 0.00% |
| Missouri Western State University | 17,881,113 | 5,140,820 | 28.75% | 4,984,916 | 4,189,134 | 3,389,048 | 0.00% |
| Northwest Missouri State University | 37,050,731 | 10,652,085 | 28.75% | 10,329,043 | 8,680,134 | 7,022,308 | 0.00% |
| Southeast Missouri State University | 41,447,519 | 11,916,162 | 28.75% | 11,554,785 | 9,710,201 | 7,855,642 | 0.00% |
| State Technical College of Missouri | 13,486,098 | 3,877,253 | 28.75% | 3,759,669 | 3,159,483 | 2,556,050 | 0.00% |
| Truman State University | 27,703,906 | 7,964,873 | 28.75% | 7,723,325 | 6,490,388 | 5,250,784 | 0.00% |
| University of Central Missouri | 52,859,389 | 15,197,074 | 28.75% | 14,736,198 | 12,383,739 | 10,018,559 | 0.00% |
| Total | 2,393,188,882 | 688,041,804 | 28.75% | 667,175,818 | 560,669,135 | 453,586,479 | 0.00% |

* One-time payment is for fiscal year payments and assumes no other contributions during the fiscal year have been made.
** Fiscal year payments are assumed to be made for all of July and August, in addition to the one-time payment.
*** Fiscal year payments are assumed to be made for all of July, August, September, and October, in addition to the one-time payment.

The June 30, 2023 valuation results present the System's financial status at a single point in time and contribution requirements for a single fiscal year. Historical valuation results allow analysis of past trends, but no insight into future trends. A projection model provides insight into the longer-term trend of (1) the projected Employer contributions; (2) the projected System funded status (ratio of actuarial assets over liabilities); (3) net cash flow patterns; and (4) the unfunded actuarial accrued liability (actuarial accrued liability minus actuarial assets). Projections can also be used to demonstrate how sensitive the valuation results are to the key variables being modeled. Such sensitivity analysis can be found in Section 7 of this report.

For MSEP, projections are particularly important and insightful due to the multiple-tiered benefit structure. The current valuation produces a normal cost and actuarial accrued liability based on the composition of active members on the valuation date, June 30, 2023. Without a tiered structure, systems can assume that the normal cost, as a percentage of payroll, will remain relatively level. However, since all new employees are covered under a lower cost benefit structure, until all new employees are covered under MSEP 2011 benefits, the normal cost percentage will continue to decrease. In addition, MSEP 2011 members are the only group making employee contributions, so projections allow for the projected payroll to be segregated by tier so that total future contributions reflect an estimate of the amounts to be contributed by employees.

The member data (active and in-pay status) is projected for each year in the future using current assumptions. After the first year, a new-member profile is used to estimate the demographics of new employees replacing members who are projected to terminate, retire, die or become disabled in future years. ***For this modeling, the number of active members is assumed to remain level over the projection period.*** To the extent that assumption does not occur, i.e., the size of the active membership declines or increases, the actual valuation results are expected to be different than those shown here.

Unless otherwise noted, the projections in this section assume that all actuarial assumptions are met in all future years, including the investment return assumption, and that the Employer makes contributions equal to the full amount of the actuarially determined contribution, as calculated by the valuation, based on the Board's Funding Policy. The projections are based on the current plan provisions and assume that all new members joining after June 30, 2023 will make employee contributions and participate in the MSEP 2011 plan.

**The projections do not predict the System's financial condition or its ability to pay benefits in the future and do not provide any guarantee of future financial soundness of the System nor do they, on their own, indicate future funding requirements.** Over time, a defined benefit plan's total cost will depend on a number of factors, including the amount of benefits paid, the number of people paid benefits, plan expenses and the amount of earnings on assets invested to pay benefits. These amounts, and other variables, are uncertain and unknowable at the time the projections were prepared. Because not all of the assumptions will unfold exactly as expected, actual results will differ from the projections shown.

# TABLE 14
# PROJECTION OF FUTURE ACTUARIAL VALUATION RESULTS
# AS OF JUNE 30, 2023

**Projection Based on Assumptions Outlined in Appendix D**
**(Amounts in thousands)**

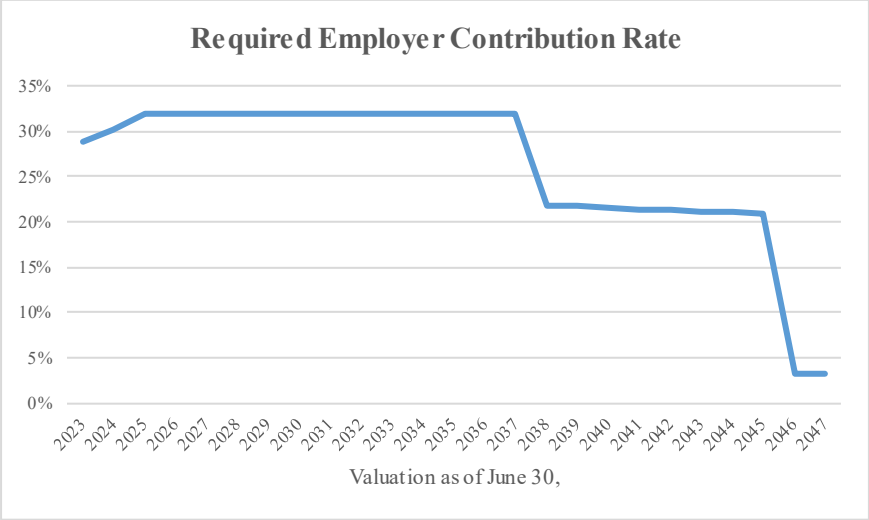
| Valuation as of June 30, (1) | Covered Payroll at Valuation (2) | Actuarial Accrued Liability (AAL) (3) | Actuarial Value of Assets (AVA) (4) | Unfunded AAL (5) | Funded Ratio Using AVA (6) | Normal Cost Rate (7) | UAAL Amortization Payment Rate (8) | Actuarial Contribution Rate (9) | Member Contribution Rate (10) | Employer Contribution Rate (11) | Estimated Dollar Amount of Employer Contribution* (12) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2023 | $2,340,527 | $16,190,814 | $9,331,207 | $6,859,607 | 57.6% | 8.74% | 20.88% | 29.62% | 2.27% | 28.75% | $684,161 |
| 2024 | 2,379,692 | 16,399,236 | 9,285,645 | 7,113,591 | 56.6% | 8.66% | 21.71% | 30.37% | 2.41% | 30.25% | 733,092 |
| 2025 | 2,423,444 | 16,593,382 | 9,438,883 | 7,154,499 | 56.9% | 8.59% | 21.91% | 30.50% | 2.55% | 32.00% | 790,720 |
| 2026 | 2,471,000 | 16,767,309 | 9,327,689 | 7,439,620 | 55.6% | 8.54% | 22.80% | 31.34% | 2.69% | 32.00% | 806,881 |
| 2027 | 2,521,502 | 16,919,748 | 9,555,602 | 7,364,146 | 56.5% | 8.48% | 22.80% | 31.28% | 2.82% | 32.00% | 823,708 |
| 2028 | 2,574,088 | 17,049,375 | 9,873,786 | 7,175,588 | 57.9% | 8.43% | 22.55% | 30.98% | 2.95% | 32.00% | 841,219 |
| 2029 | 2,628,810 | 17,163,226 | 10,208,723 | 6,954,503 | 59.5% | 8.38% | 22.26% | 30.64% | 3.07% | 32.00% | 859,527 |
| 2030 | 2,686,022 | 17,252,688 | 10,555,096 | 6,697,592 | 61.2% | 8.33% | 21.92% | 30.25% | 3.19% | 32.00% | 878,567 |
| 2031 | 2,745,522 | 17,320,462 | 10,918,571 | 6,401,891 | 63.0% | 8.29% | 21.55% | 29.84% | 3.30% | 32.00% | 898,262 |
| 2032 | 2,807,070 | 17,367,735 | 11,303,691 | 6,064,045 | 65.1% | 8.26% | 21.13% | 29.39% | 3.40% | 32.00% | 918,749 |
| 2033 | 2,871,090 | 17,397,040 | 11,716,340 | 5,680,701 | 67.3% | 8.23% | 20.66% | 28.89% | 3.49% | 32.00% | 940,016 |
| 2034 | 2,937,550 | 17,409,552 | 12,161,298 | 5,248,254 | 69.9% | 8.20% | 20.14% | 28.34% | 3.58% | 32.00% | 962,147 |
| 2035 | 3,006,708 | 17,409,034 | 12,646,229 | 4,762,805 | 72.6% | 8.17% | 19.58% | 27.75% | 3.66% | 32.00% | 984,986 |
| 2036 | 3,078,082 | 17,396,465 | 13,176,583 | 4,219,882 | 75.7% | 8.15% | 18.96% | 27.11% | 3.73% | 32.00% | 1,008,751 |
| 2037 | 3,152,348 | 17,375,092 | 13,760,055 | 3,615,037 | 79.2% | 8.13% | 18.29% | 26.42% | 3.79% | 32.00% | 1,033,640 |
| 2038 | 3,230,124 | 17,350,937 | 14,407,538 | 2,943,399 | 83.0% | 8.10% | 17.56% | 25.66% | 3.84% | 21.82% | 722,505 |
| 2039 | 3,311,205 | 17,329,337 | 15,129,697 | 2,199,640 | 87.3% | 8.09% | 17.46% | 25.55% | 3.87% | 21.68% | 736,178 |
| 2040 | 3,395,654 | 17,316,027 | 15,589,302 | 1,726,725 | 90.0% | 8.08% | 17.36% | 25.44% | 3.91% | 21.53% | 749,919 |
| 2041 | 3,483,136 | 17,316,840 | 16,108,376 | 1,208,464 | 93.0% | 8.07% | 17.25% | 25.32% | 3.93% | 21.39% | 764,373 |
| 2042 | 3,573,505 | 17,335,935 | 16,694,453 | 641,482 | 96.3% | 8.06% | 17.13% | 25.19% | 3.95% | 21.24% | 778,715 |
| 2043 | 3,666,266 | 17,376,955 | 17,354,386 | 22,569 | 99.9% | 8.05% | 17.02% | 25.07% | 3.96% | 21.11% | 794,049 |
| 2044 | 3,761,482 | 17,442,714 | 18,094,342 | (651,628) | 103.7% | 8.05% | 16.91% | 24.96% | 3.97% | 20.99% | 809,933 |
| 2045 | 3,858,663 | 17,533,692 | 18,919,083 | (1,385,391) | 107.9% | 8.03% | 16.81% | 24.84% | 3.98% | 20.86% | 825,514 |
| 2046 | 3,957,401 | 17,649,991 | 19,833,248 | (2,183,257) | 112.4% | 8.03% | -0.69% | 7.34% | 3.98% | 3.36% | 136,348 |
| 2047 | 4,057,962 | 17,791,026 | 20,840,331 | (3,049,305) | 117.1% | 8.03% | -0.72% | 7.31% | 3.99% | 3.32% | 138,136 |

* Amounts shown are contributions in the fiscal year ending two years after the valuation date.

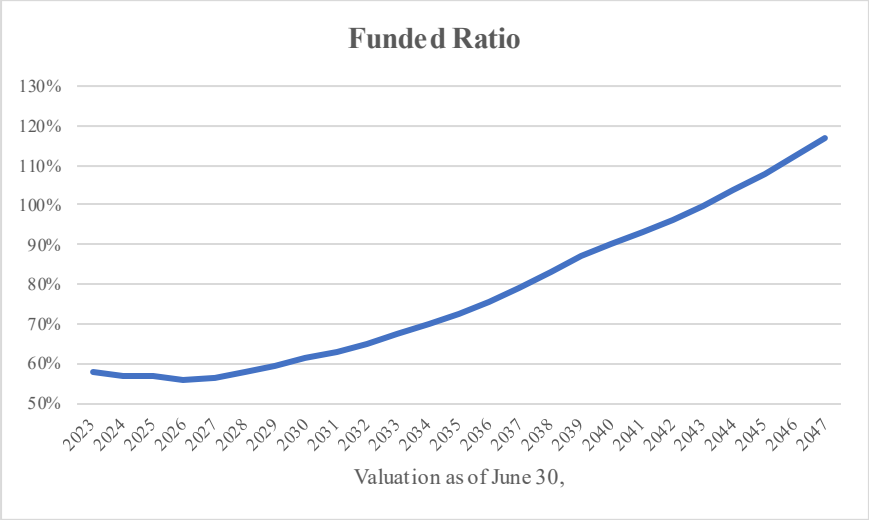
Note: Projections assume the size of the active population remains constant over the projection period and all actuarial assumptions are met in the future.

# TABLE 14
# PROJECTION OF FUTURE ACTUARIAL VALUATION RESULTS
# AS OF JUNE 30, 2023

**(continued)**



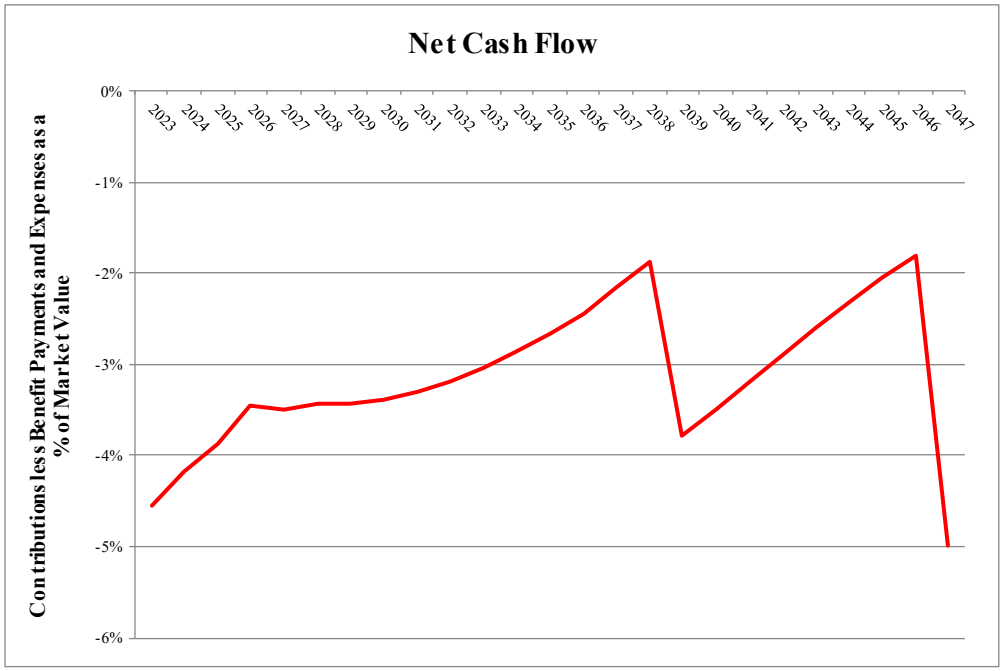

The employer contribution rate is projected to remain at the minimum contribution rate level until the Plan reaches 80% funded in the June 30, 2038 valuation. The employer contribution rate then continues to steadily decline until the plan reaches a 100% funded ratio, at which point employers begin to contribute their share of the normal cost rate.




The current results show that the funded ratio is expected to improve rapidly after the current deferred investment losses are recognized, largely due to the Board's decision to increase the minimum employer contribution rate until the plan reaches 80% funded and their policy to not recognize the additional $500 million contributed during FY 2023 when calculating the required employer contribution rate.

# TABLE 15
# PROJECTION OF FUTURE NET CASH FLOWS
# AS OF JUNE 30, 2023

| Projection Based on Assumptions Outlined in Appendix D<br>Amounts in thousands | | | | | | |
|---|---|---|---|---|---|---|
| Valuation as of June 30, (1) | Total Contributions (2) | Benefit Payments (3) | Administrative Expenses (4) | Net Cash Flows (5) | Market Value of Assets (MVA) (6) | Net Cash Flow as a % of MVA (7) |
| 2023 | $685,774 | $1,063,437 | $11,232 | ($388,895) | $8,557,793 | (4.54%) |
| 2024 | 738,180 | 1,092,867 | 11,484 | (366,171) | 8,750,378 | (4.18%) |
| 2025 | 791,497 | 1,127,402 | 11,743 | (347,648) | 8,979,848 | (3.87%) |
| 2026 | 853,730 | 1,162,084 | 12,007 | (320,361) | 9,244,421 | (3.47%) |
| 2027 | 874,709 | 1,196,933 | 12,277 | (334,501) | 9,555,602 | (3.50%) |
| 2028 | 896,297 | 1,223,429 | 12,553 | (339,686) | 9,873,786 | (3.44%) |
| 2029 | 918,769 | 1,257,070 | 12,836 | (351,136) | 10,208,723 | (3.44%) |
| 2030 | 941,988 | 1,286,740 | 13,125 | (357,877) | 10,555,096 | (3.39%) |
| 2031 | 966,149 | 1,314,104 | 13,420 | (361,374) | 10,918,571 | (3.31%) |
| 2032 | 990,896 | 1,337,810 | 13,722 | (360,636) | 11,303,691 | (3.19%) |
| 2033 | 1,016,366 | 1,359,461 | 14,031 | (357,126) | 11,716,340 | (3.05%) |
| 2034 | 1,042,537 | 1,376,566 | 14,346 | (348,376) | 12,161,298 | (2.86%) |
| 2035 | 1,069,787 | 1,392,162 | 14,669 | (337,044) | 12,646,229 | (2.67%) |
| 2036 | 1,097,644 | 1,403,967 | 14,999 | (321,322) | 13,176,583 | (2.44%) |
| 2037 | 1,126,334 | 1,409,634 | 15,337 | (298,637) | 13,760,055 | (2.17%) |
| 2038 | 1,156,061 | 1,410,322 | 15,682 | (269,942) | 14,407,538 | (1.87%) |
| 2039 | 849,655 | 1,405,974 | 16,035 | (572,354) | 15,129,697 | (3.78%) |
| 2040 | 867,590 | 1,396,931 | 16,395 | (545,737) | 15,589,302 | (3.50%) |
| 2041 | 886,110 | 1,385,177 | 16,764 | (515,831) | 16,108,376 | (3.20%) |
| 2042 | 904,811 | 1,371,472 | 17,141 | (483,802) | 16,694,453 | (2.90%) |
| 2043 | 923,532 | 1,356,777 | 17,527 | (450,772) | 17,354,386 | (2.60%) |
| 2044 | 943,003 | 1,343,598 | 17,922 | (418,516) | 18,094,342 | (2.31%) |
| 2045 | 963,122 | 1,332,271 | 18,325 | (387,473) | 18,919,083 | (2.05%) |
| 2046 | 983,018 | 1,323,341 | 18,737 | (359,060) | 19,833,248 | (1.81%) |
| 2047 | 295,014 | 1,315,832 | 19,159 | (1,039,977) | 20,840,331 | (4.99%) |



# RISK MEASURES

Actuarial Standards of Practice are issued by the Actuarial Standards Board and are binding on credentialed actuaries practicing in the United States. These standards generally identify what the actuary should consider, document and disclose when performing an actuarial assignment. In September 2017, Actuarial Standard of Practice Number 51, *Assessment and Disclosure of Risk in Measuring Pension Obligations*, (ASOP 51) was issued as final with application to measurement dates on or after November 1, 2018. This ASOP, which applies to funding valuations, actuarial projections, and actuarial cost studies of proposed plan changes, was first applicable for the June 30, 2019 actuarial valuation for the Missouri State Employees' Retirement System (MOSERS or System).

A typical retirement plan faces many different risks, but the greatest risk is the inability to make benefit payments when due. If plan assets are depleted, benefits may not be paid which could create legal and litigation risk or the plan could become "pay as you go". This risk is why consistent funding of the full actuarial contribution rate, based on reasonable assumptions and methods, is so critical to the successful funding of a retirement system.

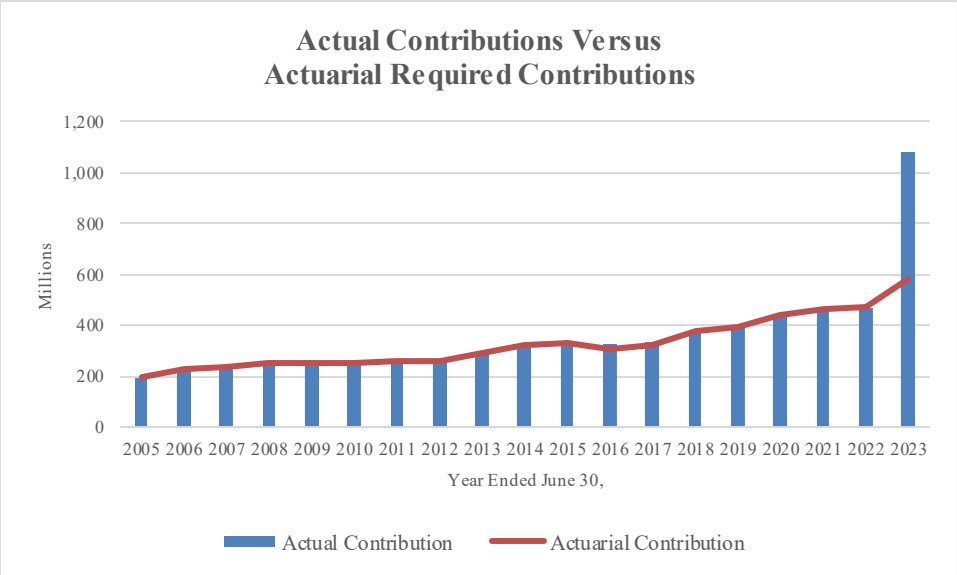
The term "risk" is most commonly associated with an outcome with undesirable results. However, in the actuarial world, risk can be translated as uncertainty. The actuarial valuation process uses many actuarial assumptions to project how future contributions and investment returns will meet the cash flow needs for future benefit payments. Of course, we know that actual experience will not unfold exactly as anticipated by the assumptions and that uncertainty, whether favorable or unfavorable, creates risk. ASOP 51 defines risk as the potential of actual future measurements to deviate from expected results due to actual experience that is different than the actuarial assumptions.

The various risk factors for a given plan can have a significant impact – positive or negative – on the actuarial projection of liability and contribution rates.

There are a number of risks inherent in the funding of a defined benefit plan. These include:

- economic risks, such as investment return and price inflation;
- demographic risks such as mortality, payroll growth, aging population, declining active membership and retirement ages;
- external risks such as the regulatory and political environment.

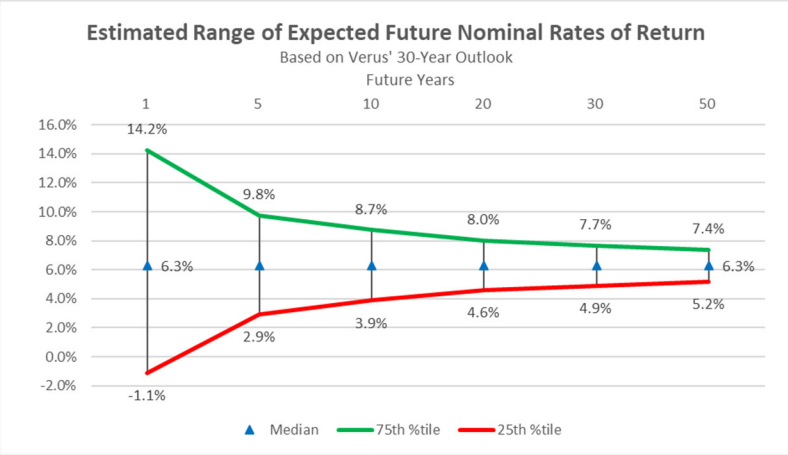
There is typically a direct correlation between healthy, well-funded retirement plans and consistent contributions equal to or greater than the full actuarial contribution rate each year. Historically, MOSERS covered employers have contributed the full actuarial rate. However, the System's contributions were slightly above the actuarial rate during FY 2016 and FY 2017 due to minimum contribution rates set in the funding policy. Additionally, the State of Missouri contributed an additional $500 million during FY 2023. The following graph displays the System's historical contribution levels over the past 19 years.




One of the most positive factors regarding MOSERS' funding is the commitment by covered employers to make contributions that are at least equal to the actuarial required contribution. This disciplined approach to funding has been illustrated by consistently contributing the full actuarial required contribution amount even with the increases that have occurred in the recent past. Despite the fact the full actuarial contribution rate has been contributed, the MSEP Plan is only 58% funded. Additional analysis of the Plan's historical funding indicates that the funded ratio was close to 100% in 2001. Several factors have occurred since that time which have impacted the funded status of the Plan. The actuarial assumptions or methods have been changed eight times in the last twelve years, resulting in an ultimate reduction in the investment return assumption from 8.50% in the 2011 valuation to 6.95% in the 2020 valuation. In addition, actual investment experience over this period has lagged the assumption causing a decline in the funded ratio. However, to the extent the State continues to fund the full actuarial contribution rate in the future, we would expect the funded ratio to steadily improve if the actuarial assumptions are met.

The most significant risk factor for most systems is investment return because of the volatility of returns and the size of plan assets compared to payroll (see Table 16). Given the underlying capital market assumptions provided by MOSERS' investment consultant, Verus, in 2021 when the experience study was performed and the System's asset allocation, the distribution of returns over time is illustrated in the graph on the next page.

As the graph illustrates, in any single year the rate of return is expected to fall between -1% and 14% about 50% of the time. This volatility in the investment return creates significant risk to funding a retirement plan because of the volatility it creates in the contribution rate. As Table 16 explains, if the actual return is 10% different than the expected return, it would result in an increase in the actuarial contribution rate of 2.59% once the experience is fully recognized in the asset smoothing method (five years).

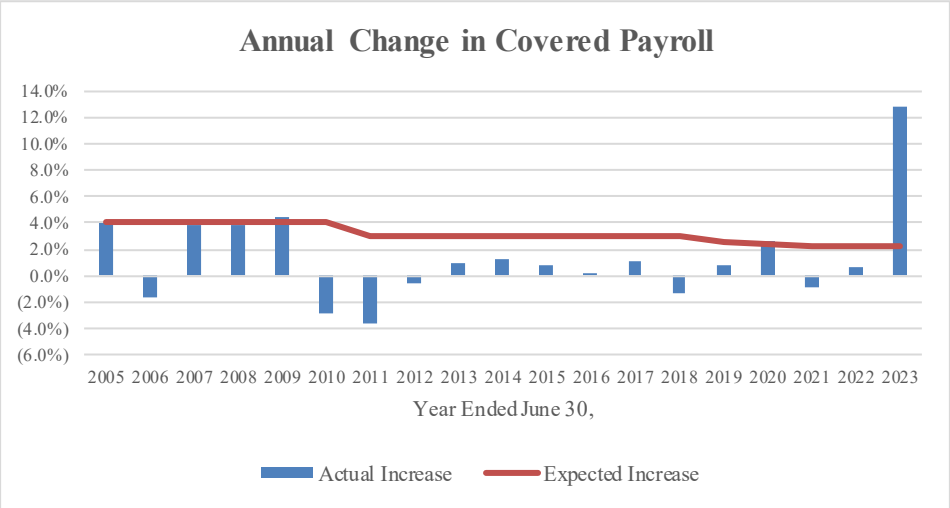



Under the revised Actuarial Standards of Practice (ASOP) No. 4 effective for valuations after February 15, 2023, we are required to include a low-default-risk obligation measure of the System's liability in our funding valuation report. This is an informational disclosure as described below and would not be appropriate for assessing the funding progress or health of the plan. This measure uses the unit credit cost method and reflects all the assumptions and provisions of the funding valuation except the discount rate is derived from considering low-default-risk fixed income securities. We considered the FTSE Pension Discount Curve based on market bond rates published by the Society of Actuaries as of June 30, 2023, with the 30-year spot rate used for all durations beyond 30. Using these assumptions, we calculate a liability of $18,353,603,000. This amount approximates the termination liability if the plan (or all covered employment) ended on the valuation date and all of the accrued benefits had to be paid with cash-flow matched bonds. This assurance of funded status and benefit security is typically more relevant for corporate plans than for governmental plans since governments rarely have the need or option to completely terminate a plan.

A key demographic risk for all retirement systems, including MOSERS, is improvements in mortality (longevity) greater than anticipated. While the actuarial assumptions reflect small, continuous improvements in mortality experience over time and these assumptions are refined every experience study, the risk arises because there is a possibility of some sudden shift, perhaps from a significant medical breakthrough that could quickly increase liabilities. Likewise, there is some possibility of a significant public health crisis that could result in a significant number of additional deaths in a short time period, as experienced with the COVID-19 pandemic. This type of event is also significant, although more easily absorbed. While either of these events could happen, it represents a small probability and thus represents much less risk than the volatility associated with investment returns.

Another funding risk for the MSEP Plan is the decline in the active membership. The active member count has been steadily declining since 2009 as shown in the following graph, with an overall decrease of about 22%. This is important because the unfunded actuarial accrued liability (UAAL) is amortized with payments that are calculated as a level-percent of payroll. When payroll does not grow as expected, the UAAL contribution rate increases because the dollar amount of the UAAL payment is divided by a smaller payroll amount. The reduction in the number of active members also mutes the positive impact of the MSEP 2011 Plan on the employer contribution rate.


The decline in the number of active members and low salary increases over much of this period has resulted in actual payroll changes that have been far below the expected increase (based on the payroll growth assumption). The following graph shows the actual versus expected payroll growth from FY 2005 through FY 2023. In the early part of the period, actual increases were reasonably close to the expected increase, but since 2009 – when the number of active members started to decline – actual payroll growth has been low and even negative. Despite the large spike during FY 2023, the average annual percentage change to payroll was +1.3% during this 19-year period, which is well below the current payroll growth assumption. While this does not necessarily impact the amount of the UAAL payment directly, it does cause the UAAL contribution rate to be higher.




Many of the public retirement systems were created shortly after World War II. In general, the aging of the population, including the retirement of the baby boomers, along with earlier retirement eligibility has created a shift in the demographics of most systems. This change is not unexpected and has, in fact, been anticipated in the funding of the retirement system. Even though it was anticipated, the demographic shift and maturing of the plans have increased the risk associated with funding the system. The following exhibits summarize certain historical information that indicates how certain key risk metrics have changed over time due to the maturing of the retirement system.

# TABLE 16
# HISTORICAL ASSET VOLATILITY RATIOS

As a retirement system matures, the size of the market value of assets is expected to increase relative to the covered payroll of active members, on which the System is funded. The size of the plan assets relative to covered payroll, sometimes referred to as the asset volatility ratio, is an important indicator of the contribution risk for the System. The higher this ratio, the more sensitive a plan's contribution rate is to investment return volatility. In other words, it will be harder to recover from investment losses with increased contribution rates.

| Valuation Date | Market Value of Assets | Covered Payroll | Asset Volatility Ratio | Change in ACR with a Return 10% Different than Assumed* |
|---|---|---|---|---|
| 6/30/2004 | 5,859,486,975 | 1,737,454,454 | 3.37 | 2.27% |
| 6/30/2005 | 6,431,033,445 | 1,806,600,560 | 3.56 | 2.40% |
| 6/30/2006 | 6,983,737,684 | 1,777,277,138 | 3.93 | 2.65% |
| 6/30/2007 | 8,056,993,537 | 1,846,643,330 | 4.36 | 2.94% |
| 6/30/2008 | 7,934,030,312 | 1,916,527,398 | 4.14 | 2.79% |
| 6/30/2009 | 6,163,086,701 | 2,002,402,087 | 3.08 | 2.07% |
| 6/30/2010 | 6,727,623,355 | 1,945,095,321 | 3.46 | 2.33% |
| 6/30/2011 | 7,768,709,373 | 1,875,569,816 | 4.14 | 2.79% |
| 6/30/2012 | 7,581,882,309 | 1,864,069,493 | 4.07 | 2.74% |
| 6/30/2013 | 7,993,837,570 | 1,880,212,950 | 4.25 | 2.86% |
| 6/30/2014 | 9,136,781,826 | 1,902,719,928 | 4.80 | 3.23% |
| 6/30/2015 | 8,516,654,912 | 1,918,527,768 | 4.44 | 2.99% |
| 6/30/2016 | 8,109,161,214 | 1,921,528,936 | 4.22 | 2.84% |
| 6/30/2017 | 7,945,358,298 | 1,941,969,786 | 4.09 | 2.75% |
| 6/30/2018 | 8,034,508,424 | 1,915,143,002 | 4.20 | 2.83% |
| 6/30/2019 | 7,916,465,279 | 1,930,764,635 | 4.10 | 2.76% |
| 6/30/2020 | 7,910,830,533 | 1,980,910,473 | 3.99 | 2.69% |
| 6/30/2021 | 9,519,930,080 | 1,961,975,052 | 4.85 | 3.27% |
| 6/30/2022 | 8,248,414,597 | 1,972,872,754 | 4.18 | 2.81% |
| 6/30/2023 | 8,557,793,248 | 2,225,164,914 | 3.85 | 2.59% |

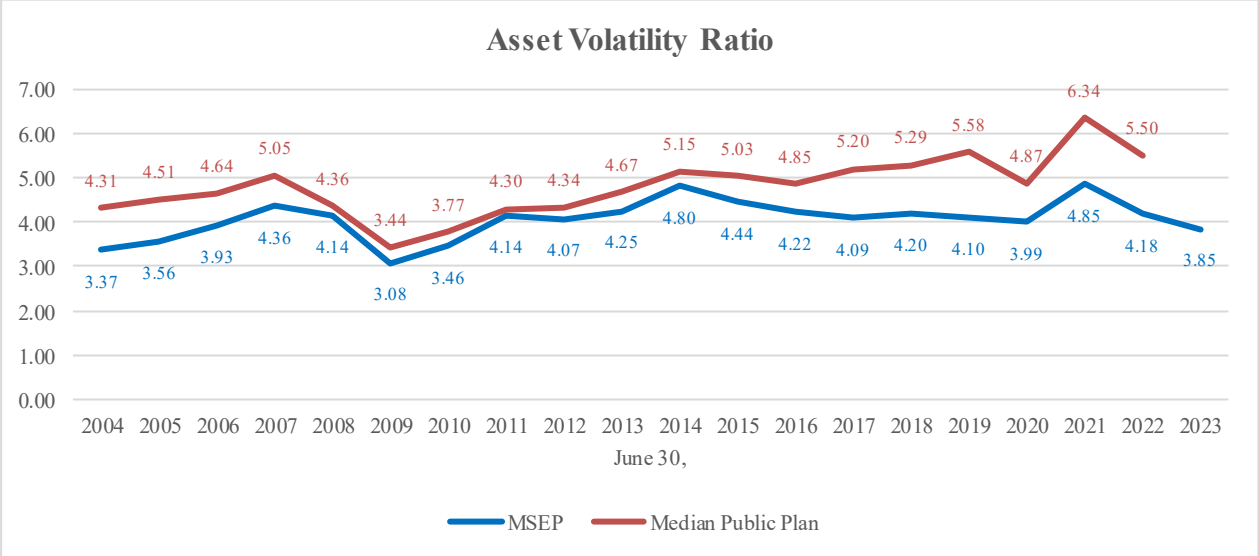
* The impact of asset smoothing is not reflected in the impact on the Actuarial Contribution Rate (ACR). Current year assumptions are used for all years shown.

The assets as of June 30, 2023 are about 385% of covered payroll. Consequently, underperforming the investment return assumption by 10.00% (i.e., earn -3.05% for one year) is equivalent to about 39% of payroll. While the actual impact of this experience in the first year is mitigated by the asset smoothing method and amortization of the UAAL, this table illustrates the risk associated with volatile investment returns. Such an event in one year would be expected to increase the actuarial contribution rate by 2.59% of payroll once it is fully recognized in the asset smoothing method.

# TABLE 16
# HISTORICAL ASSET VOLATILITY RATIOS

**(continued)**

The following graph shows a comparison of MSEP's historical asset volatility ratios and the historical median asset volatility ratio for a group of large public plans that are tracked in the Public Plan Database. The pattern of the change in the asset volatility ratio for MSEP over time is similar to that observed in the Public Plan Database. When asset values drop significantly (like in 2009), the ratio drops as well. MSEP's funded ratio is lower than the median funded ratio for systems in the Public Plan Database. This fact, coupled with the reduction in active members/covered payroll over the last decade, likely explains the lower asset volatility ratio.

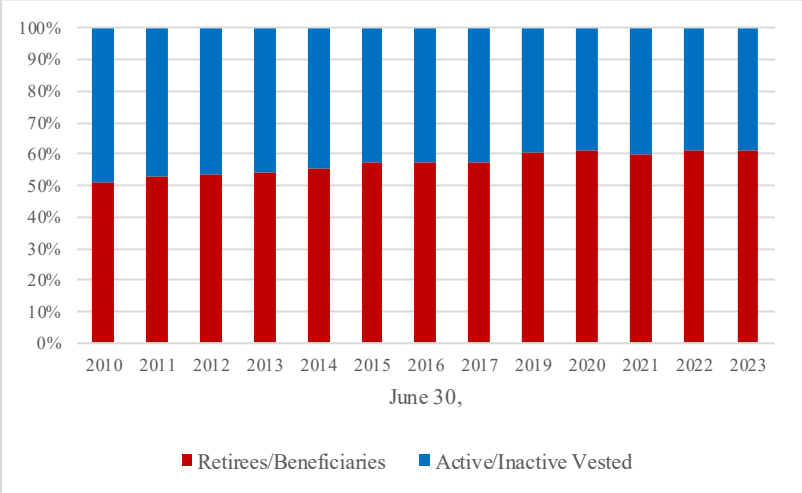


# TABLE 17
# LIABILITY MATURITY MEASUREMENTS

Most public sector retirement systems have been in operation for many years. As a result, they have aging plan populations, and in some cases declining active populations, resulting in an increasing ratio of retirees to active members and a growing percentage of retiree liability. The retirement of the remaining baby boomers over the next decade is expected to further exacerbate the aging of the retirement system population. With more of the total liability residing with retirees, investment volatility has a greater impact on the funding of the system since it is more difficult to restore the system financially after losses occur when there is comparatively less payroll over which to spread costs.

Projections provide the most effective way of analyzing the impact of these changes on future funding measures, but studying several key metrics from the valuation can also provide some valuable insight.

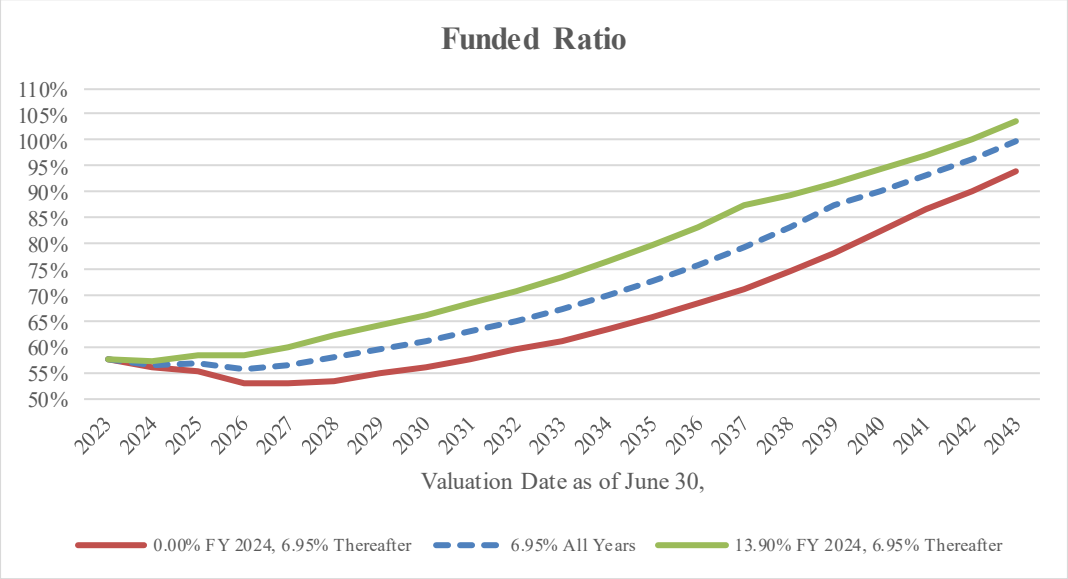
| Fiscal Year End | Retiree Liability (a) | Total Actuarial Accrued Liability (b) | Retiree Percentage (a) / (b) | Covered Payroll (c) | Ratio (b) / (c) |
|---|---|---|---|---|---|
| 6/30/10 | 5,012,677,769 | 9,853,155,445 | 50.87% | 1,945,095,321 | 5.07 |
| 6/30/11 | 5,357,794,617 | 10,123,544,043 | 52.92% | 1,875,569,816 | 5.40 |
| 6/30/12 | 5,749,411,068 | 10,793,651,577 | 53.27% | 1,864,069,493 | 5.79 |
| 6/30/13 | 6,062,654,441 | 11,134,637,484 | 54.45% | 1,880,212,950 | 5.92 |
| 6/30/14 | 6,347,728,717 | 11,494,571,835 | 55.22% | 1,902,719,928 | 6.04 |
| 6/30/15 | 6,695,661,737 | 11,727,618,410 | 57.09% | 1,918,527,768 | 6.11 |
| 6/30/16 | 7,305,895,284 | 12,751,162,753 | 57.30% | 1,921,528,936 | 6.64 |
| 6/30/17 | 7,559,623,100 | 13,152,273,895 | 57.48% | 1,941,969,786 | 6.77 |
| 6/30/18 | 8,073,692,664 | 13,612,763,961 | 59.31% | 1,915,143,002 | 7.11 |
| 6/30/19 | 8,430,014,943 | 13,957,626,309 | 60.40% | 1,930,764,635 | 7.23 |
| 6/30/20 | 8,701,290,590 | 14,258,408,888 | 61.03% | 1,980,910,473 | 7.20 |
| 6/30/21 | 9,037,922,330 | 15,110,646,537 | 59.81% | 1,961,975,052 | 7.70 |
| 6/30/22 | 9,463,674,203 | 15,408,995,032 | 61.42% | 1,972,872,754 | 7.81 |
| 6/30/23 | 9,939,272,500 | 16,190,813,686 | 61.39% | 2,225,164,914 | 7.28 |



# TABLE 18
# SCENARIO TESTING

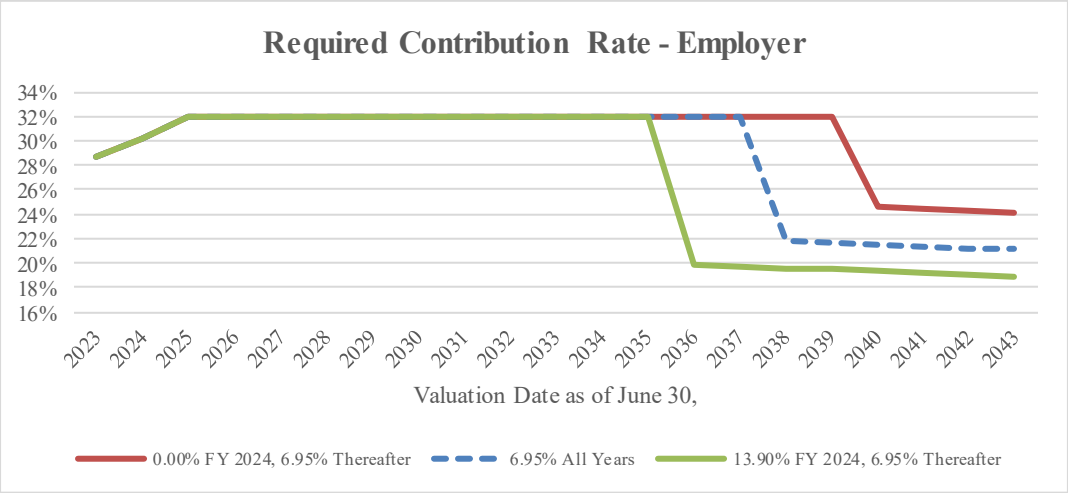
As mentioned earlier, the most significant risk factor for most systems is investment return. There are many different tools that can be useful when assessing investment risk. One of these tools is to perform scenario testing using a projection model. Scenario testing is choosing one set of specific criteria to compare against another set of specific criteria, also known as a "what if" scenario. The scenario testing illustrated below shows the impact to the System's funded ratio and required employer contribution rate if the asset return during the upcoming year (FYE 2024) is at, above or below the currently assumed 6.95% return. The projections assume the actual return on assets will be as follows:

- Scenario 1: 6.95% return in all years (the current assumption)
- Scenario 2: 0.00% return in FYE 2024, then 6.95% thereafter
- Scenario 3: 13.90% return in FYE 2024, then 6.95% thereafter




In each scenario, the funded ratio declines slightly at first as deferred investment losses are recognized. Once the deferred investment losses have been recognized, the funded ratio improves rapidly until reaching 80%, at which point it continues to improve but at a more gradual pace. This illustrates the positive impact of the Board's decision on September 21, 2023 to increase the contribution policy minimum employer contribution rate from 16.97% of pay for all years to 28.75% of pay for FYE 2025, 30.25% of pay for FYE 2026 and 32.00% of pay thereafter. The minimum employer contribution rate will be in effect until the System reaches an 80% funded ratio, which is unchanged from the prior policy. Under the scenario where the System earns 6.95% in all years, the funded ratio is expected to reach 80% in the June 30, 2038 valuation, which sets the employer contribution rate for FYE 2040.

Another element to the Board's funding policy that is expected to help improve the System's funded status more rapidly was its election to not recognize the additional $500 million contribution made on July 13, 2022 when calculating the System's UAAL contribution rate. This will result in more contributions being made to the System in the future. The determination of the actuarial contribution rate in future years will not reflect the impact of the additional contribution until so directed by the MOSERS Board




As shown in the graph above, the minimum contribution rate is expected to impact the required employer contribution rate for the next decade. This is true even under the scenario whether the System earns a 13.90% return on assets during FYE 2024. However, once the System reaches 80% funded ratio and the policy minimum employer contribution rate expires, the employer contribution rates drops by 8% to 12% of pay the following year.

# TABLE 19
# COMPARISON OF VALUATION RESULTS UNDER ALTERNATE INVESTMENT RETURN ASSUMPTIONS

**($ in millions)**

This exhibit compares the key June 30, 2023 valuation results under five (5) different investment return assumptions to illustrate the impact of different assumptions on the funding of the System. Note that only the investment return assumption is changed, as identified in the heading below. All other assumptions are unchanged for purposes of this analysis.

| **Investment Return Assumption** | **5.95%** | **6.45%** | **6.95%** | **7.45%** | **7.95%** |
|---|---|---|---|---|---|
| **Contributions** | | | | | |
| Total Normal Cost | 11.13% | 9.84% | 8.74% | 7.80% | 6.99% |
| Member Contributions | (2.27%) | (2.27%) | (2.27%) | (2.27%) | (2.27%) |
| Employer Normal Cost | 8.86% | 7.57% | 6.47% | 5.53% | 4.72% |
| Unfunded Actuarial Accrued Liability | 23.99% | 22.44% | 20.88% | 19.33% | 17.76% |
| Actuarial Employer Contribution Rate | 32.85% | 30.01% | 27.35% | 24.86% | 22.48% |
| **Required Employer Contribution Rate*** | 32.85% | 30.01% | 28.75% | 28.75% | 28.75% |
| **Estimated Employer Contribution Amount** | $786.2 | $718.2 | $688.0 | $688.0 | $688.0 |
| **Actuarial Accrued Liability** | $18,072.7 | $17,088.4 | $16,190.8 | $15,370.4 | $14,618.8 |
| **Actuarial Value of Assets** | $9,331.2 | $9,331.2 | $9,331.2 | $9,331.2 | $9,331.2 |
| **Unfunded Actuarial Accrued Liability** | $8,741.5 | $7,757.2 | $6,859.6 | $6,039.1 | $5,287.5 |
| **Funded Ratio** | 51.6% | 54.6% | 57.6% | 60.7% | 63.8% |

* The System's contribution policy minimum employer contribution rate is 28.75% of pay for FYE 2025.

Note: All other assumptions are unchanged for purposes of this sensitivity analysis.
Numbers may not add due to rounding.

# HISTORICAL FUNDING AND OTHER INFORMATION

This section of the report provides a historical perspective on the System's funding and contribution practices, along with other information that may be of interest.

The information required for financial reporting by the System and participating employers is established by the Governmental Accounting Standards Board (GASB). GASB 67 separates accounting and financial reporting from funding requirements by creating disclosure and reporting requirements that are independent of the basis used for funding the System. A separate report that contains all of the information and exhibits of an actuarial nature that are necessary for the System's financial reporting under GASB 67 will be issued in the future.

GASB Statement No. 68 establishes standards for the measurement, recognition, and display of pension expense and related liabilities. Annual pension cost is measured and disclosed on the accrual basis of accounting. A separate report containing all of the pertinent information under GASB 68 reporting will also be prepared in the future.

# TABLE 20
# SCHEDULE OF FUNDING PROGRESS

**($ in millions)**

| Actuarial Valuation Date | Actuarial Value of Assets (a) | Actuarial Accrued Liability (AAL) (b) | Unfunded Actuarial Accrued Liability (UAAL) (b - a) | Funded Ratio (a / b) | Covered Payroll (c) | UAAL as a % of Covered Payroll [(b - a) / c] |
|---|---|---|---|---|---|---|
| June 30, 2004* | $6,118 | $7,230 | $1,112 | 84.6% | $1,737 | 64.0% |
| June 30, 2005 | 6,435 | 7,578 | 1,143 | 84.9% | 1,807 | 63.3% |
| June 30, 2006 | 6,837 | 8,013 | 1,176 | 85.3% | 1,777 | 66.2% |
| June 30, 2007 | 7,377 | 8,500 | 1,123 | 86.8% | 1,847 | 60.8% |
| June 30, 2008* | 7,838 | 9,128 | 1,290 | 85.9% | 1,917 | 67.3% |
| June 30, 2009* | 7,876 | 9,495 | 1,619 | 83.0% | 2,002 | 80.9% |
| June 30, 2010 | 7,923 | 9,853 | 1,930 | 80.4% | 1,945 | 99.2% |
| June 30, 2011 | 8,022 | 10,124 | 2,102 | 79.2% | 1,876 | 112.0% |
| June 30, 2012* | 7,897 | 10,794 | 2,897 | 73.2% | 1,864 | 155.4% |
| June 30, 2013* | 8,096 | 11,135 | 3,039 | 72.7% | 1,880 | 161.6% |
| June 30, 2014 | 8,638 | 11,495 | 2,857 | 75.1% | 1,903 | 150.1% |
| June 30, 2015 | 8,792 | 11,728 | 2,936 | 75.0% | 1,919 | 153.0% |
| June 30, 2016* | 8,878 | 12,751 | 3,873 | 69.6% | 1,922 | 201.5% |
| June 30, 2017* | 8,872 | 13,152 | 4,280 | 67.5% | 1,942 | 220.4% |
| June 30, 2018* | 8,830 | 13,613 | 4,782 | 64.9% | 1,915 | 249.7% |
| June 30, 2019* | 8,782 | 13,958 | 5,175 | 62.9% | 1,931 | 268.0% |
| June 30, 2020* | 8,711 | 14,258 | 5,547 | 61.1% | 1,981 | 280.0% |
| June 30, 2021* | 8,909 | 15,111 | 6,201 | 59.0% | 1,962 | 316.1% |
| June 30, 2022 | 8,894 | 15,409 | 6,515 | 57.7% | 1,973 | 330.2% |
| June 30, 2023 | 9,331 | 16,191 | 6,860 | 57.6% | 2,225 | 308.3% |

* Revision to actuarial assumptions and/or methods.
Note: Information before 2017 was produced by prior actuary. Numbers may not add due to rounding.

# TABLE 21
# SHORT-TERM SOLVENCY TEST

| Fiscal Year End | Member Contributions (1) | Current Retirees and Beneficiaries (2) | Active and Inactive Members, Employer Financed Portion (3) | Actuarial Value of Assets Available for Benefits | Percentage of Actuarial Liabilities Covered by Actuarial Value of Assets Available for (1) | (2) | (3) |
|---|---|---|---|---|---|---|---|
| 2010 | $ 0 | $ 5,012,677,769 | $ 4,840,477,676 | $ 7,923,377,393 | 100.0 | 100.0 | 60.1 |
| 2011 | 599,761 | 5,357,794,617 | 4,765,149,665 | 8,022,481,408 | 100.0 | 100.0 | 55.9 |
| 2012 | 5,431,451 | 5,749,411,068 | 5,038,809,058 | 7,897,167,203 | 100.0 | 100.0 | 42.5 |
| 2013 | 14,507,994 | 6,062,654,441 | 5,057,475,049 | 8,096,436,929 | 100.0 | 100.0 | 39.9 |
| 2014 | 27,111,467 | 6,347,728,717 | 5,119,731,651 | 8,637,758,955 | 100.0 | 100.0 | 44.2 |
| 2015 | 42,731,658 | 6,695,631,737 | 4,989,255,015 | 8,792,485,658 | 100.0 | 100.0 | 41.2 |
| 2016 | 60,618,379 | 7,305,895,284 | 5,384,649,090 | 8,878,057,191 | 100.0 | 100.0 | 28.1 |
| 2017 | 78,979,370 | 7,559,623,100 | 5,513,671,425 | 8,872,381,848 | 100.0 | 100.0 | 22.4 |
| 2018 | 103,784,514 | 8,073,692,664 | 5,435,286,783 | 8,830,410,210 | 100.0 | 100.0 | 12.0 |
| 2019 | 128,255,311 | 8,430,014,943 | 5,399,356,055 | 8,782,383,977 | 100.0 | 100.0 | 4.2 |
| 2020 | 157,133,312 | 8,701,290,590 | 5,399,984,986 | 8,711,224,151 | 100.0 | 98.3 | 0.0 |
| 2021 | 187,797,531 | 9,037,922,330 | 5,884,926,676 | 8,909,251,051 | 100.0 | 96.5 | 0.0 |
| 2022 | 217,318,884 | 9,463,674,203 | 5,728,001,945 | 8,894,328,756 | 100.0 | 91.7 | 0.0 |
| 2023 | 255,269,694 | 9,939,272,500 | 5,996,271,492 | 9,331,207,050 | 100.0 | 91.3 | 0.0 |

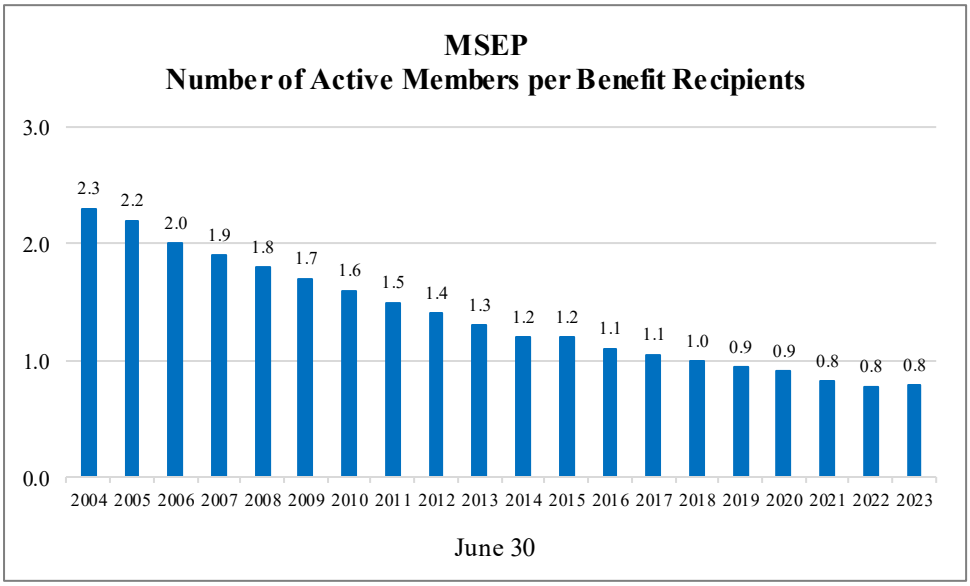
# TABLE 22
# HISTORICAL EMPLOYER CONTRIBUTIONS

**($ in millions)**

| Fiscal Year Ending | Actuarial Employer Contribution Rate | Actuarial Employer Contribution | Actual Dollar Amount | Percent Contributed |
|---|---|---|---|---|
| June 30, 2005 | 10.64% | $195.6 | $195.6 | 100.0% |
| June 30, 2006 | 12.59% | 227.2 | 227.2 | 100.0% |
| June 30, 2007 | 12.78% | 239.5 | 239.5 | 100.0% |
| June 30, 2008 | 12.84% | 249.8 | 249.8 | 100.0% |
| June 30, 2009 | 12.53% | 252.1 | 252.1 | 100.0% |
| June 30, 2010 | 12.75% | 251.2 | 251.2 | 100.0% |
| June 30, 2011 | 13.81% | 263.4 | 263.4 | 100.0% |
| June 30, 2012 | 13.97% | 263.4 | 263.4 | 100.0% |
| June 30, 2013 | 14.45% | 290.3 | 290.3 | 100.0% |
| June 30, 2014 | 16.98% | 326.4 | 326.4 | 100.0% |
| June 30, 2015 | 16.97% | 329.8 | 329.8 | 100.0% |
| June 30, 2016 | 15.95% | 310.1 | 330.0 | 106.4% |
| June 30, 2017 | 16.34% | 322.8 | 335.2 | 103.8% |
| June 30, 2018 | 19.45% | 379.6 | 379.6 | 100.0% |
| June 30, 2019 | 20.21% | 394.2 | 394.2 | 100.0% |
| June 30, 2020 | 21.77% | 436.9 | 436.9 | 100.0% |
| June 30, 2021 | 22.88% | 463.3 | 463.3 | 100.0% |
| June 30, 2022 | 23.51% | 471.3 | 471.3 | 100.0% |
| June 30, 2023 | 26.33% | 580.7 | 1,080.7 | 186.1% |

# TABLE 23
# HISTORICAL MEMBER STATISTICS

| Valuation Date June 30 | Active Members | | | | Retired Members | | | |
|---|---|---|---|---|---|---|---|---|
| | Number | Payroll $ Millions | Average Salary $ | % Incr. | Number | Active/ Retired | Annual Benefits $ Millions | % Incr. |
| 2004 | 55,914 | $1,737 | $31,074 | | 24,757 | 2.3 | $324.6 | |
| 2005 | 55,944 | 1,807 | 32,293 | 3.9 | 25,780 | 2.2 | 348.1 | 7.2 |
| 2006 | 54,493 | 1,777 | 32,615 | 1.0 | 27,052 | 2.0 | 373.6 | 7.3 |
| 2007 | 54,363 | 1,847 | 33,969 | 4.2 | 28,692 | 1.9 | 406.4 | 8.8 |
| 2008 | 54,542 | 1,917 | 35,139 | 3.4 | 30,132 | 1.8 | 434.6 | 6.9 |
| 2009 | 55,057 | 2,002 | 36,370 | 3.5 | 31,637 | 1.7 | 465.4 | 7.1 |
| 2010 | 53,478 | 1,945 | 36,372 | 0.0 | 33,251 | 1.6 | 493.7 | 6.1 |
| 2011 | 51,660 | 1,876 | 36,306 | (0.2) | 35,315 | 1.5 | 525.6 | 6.5 |
| 2012 | 51,332 | 1,864 | 36,314 | 0.0 | 37,308 | 1.4 | 558.6 | 6.3 |
| 2013 | 50,833 | 1,880 | 36,988 | 1.9 | 39,139 | 1.3 | 589.9 | 5.6 |
| 2014 | 50,621 | 1,903 | 37,588 | 1.6 | 41,000 | 1.2 | 618.7 | 4.9 |
| 2015 | 49,980 | 1,919 | 38,386 | 2.1 | 42,964 | 1.2 | 650.9 | 5.2 |
| 2016 | 49,464 | 1,922 | 38,847 | 1.2 | 44,828 | 1.1 | 680.8 | 4.6 |
| 2017 | 48,910 | 1,942 | 39,705 | 2.2 | 46,560 | 1.1 | 710.2 | 4.3 |
| 2018 | 47,806 | 1,915 | 40,061 | 0.9 | 48,207 | 1.0 | 744.9 | 4.9 |
| 2019 | 46,864 | 1,931 | 41,199 | 2.8 | 49,696 | 0.9 | 779.9 | 4.7 |
| 2020 | 45,999 | 1,981 | 43,064 | 4.5 | 50,857 | 0.9 | 810.5 | 3.9 |
| 2021 | 42,829 | 1,962 | 45,809 | 6.4 | 52,223 | 0.8 | 841.7 | 3.8 |
| 2022 | 41,595 | 1,973 | 47,431 | 3.5 | 53,648 | 0.8 | 883.8 | 5.0 |
| 2023 | 43,088 | 2,225 | 51,642 | 8.9 | 54,709 | 0.8 | 937.8 | 6.1 |



# TABLE 24
# RETIREES AND BENEFICIARIES ADDED AND REMOVED DURING FISCAL YEAR ENDED JUNE 30, 2023

| | Added to Rolls | | Removed from Rolls | | Rolls at End of Year | | |
|---|---|---|---|---|---|---|---|
| Benefit Type | Number | Annual Allowances | Number | Annual Allowances | Number | Annual Allowances | Average Annual Allowances |
| Retirees | 2,407 | $71,324,181 | 1,472 | $23,958,297 | 48,472 | $850,037,772 | $17,537 |
| Beneficiaries | 470 | 10,739,133 | 344 | 4,044,621 | 6,237 | 87,811,584 | 14,079 |

Note: This schedule is intended to show a 10-year history. Additional years will be reported as they become available.

# TABLE 25
# BENEFIT RECIPIENTS BY TYPE AND OPTION ELECTED

| | | Type of Retirement | | | |
|---|---|---|---|---|---|
| Amount of Monthly Benefit | Number of Benefit Recipients | Normal Retirement | Early Retirement | Survivor of Active | Survivor of Retired |
| 1-500 | 13,509 | 6,023 | 5,548 | 619 | 1,319 |
| 501-1,000 | 11,434 | 7,141 | 2,487 | 523 | 1,283 |
| 1,001-1,500 | 9,719 | 8,044 | 664 | 269 | 742 |
| 1,501-2,000 | 7,100 | 6,384 | 192 | 139 | 385 |
| 2,001-2,500 | 4,688 | 4,311 | 66 | 87 | 224 |
| 2,501-3,000 | 3,017 | 2,797 | 27 | 43 | 150 |
| 3,001-3,500 | 1,763 | 1,609 | 12 | 32 | 110 |
| 3,501-4,000 | 1,136 | 1,047 | 11 | 14 | 64 |
| Over 4,000 | 2,343 | 2,101 | 8 | 36 | 198 |
| Total | 54,709 | 39,457 | 9,015 | 1,762 | 4,475 |

| | Option Elected | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Amount of Monthly Benefit | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| 1-500 | 37 | 554 | 561 | 1,697 | 0 | 3,105 | 62 | 7,493 |
| 501-1,000 | 44 | 317 | 240 | 2,480 | 2 | 2,538 | 26 | 5,787 |
| 1,001-1,500 | 25 | 155 | 116 | 2,427 | 0 | 2,334 | 3 | 4,659 |
| 1,501-2,000 | 18 | 105 | 53 | 1,774 | 0 | 1,522 | 2 | 3,626 |
| 2,001-2,500 | 6 | 56 | 35 | 1,199 | 0 | 1,086 | 1 | 2,305 |
| 2,501-3,000 | 8 | 23 | 17 | 837 | 0 | 738 | 0 | 1,394 |
| 3,001-3,500 | 3 | 12 | 9 | 471 | 0 | 481 | 0 | 787 |
| 3,501-4,000 | 1 | 14 | 0 | 318 | 0 | 313 | 0 | 490 |
| Over 4,000 | 9 | 16 | 7 | 726 | 0 | 815 | 0 | 770 |
| Total | 151 | 1,252 | 1,038 | 11,929 | 2 | 12,932 | 94 | 27,311 |

1) Life Income with 60 Guaranteed Payments
2) Life Income with 120 Guaranteed Payments
3) Life Income with 180 Guaranteed Payments
4) Joint & 50% Survivor
5) Joint & 75% Survivor
6) Joint & 100% Survivor
7) Automatic Minor Survivor
8) No Survivor Option (includes pop-ups)

# TABLE 26A
# AVERAGE MONTHLY BENEFIT AMOUNTS

## Total MSEP

| Members Retiring During Fiscal Year | | Years Credited Service by Category | | | | | | | All Members |
|---|---|---|---|---|---|---|---|---|---|
| | | <5 | 5-10 | 11-15 | 16-20 | 21-25 | 26-30 | 31+ | |
| 2023 | Average monthly benefit | $415 | $321 | $602 | $983 | $1,340 | $1,970 | $2,545 | $1,150 |
| | Average final salary | $7,077 | $2,857 | $3,157 | $3,648 | $3,773 | $4,481 | $4,838 | $3,679 |
| | Number of retirees | 9 | 527 | 395 | 357 | 485 | 447 | 187 | 2,407 |

Notes: COLA increases and temporary benefits payable under MSEP 2000 until age 62 are excluded from the above table.
This schedule is intended to show a 10-year history. Additional years will be reported as they become available.

# TABLE 26B
# AVERAGE MONTHLY BENEFIT AMOUNTS

## General Employees*

| Members Retiring During Fiscal Year | | Years Credited Service by Category | | | | | | | All Members |
|---|---|---|---|---|---|---|---|---|---|
| | | <5 | 5-10 | 11-15 | 16-20 | 21-25 | 26-30 | 31+ | |
| 2023 | Average monthly benefit | $313 | $302 | $575 | $976 | $1,340 | $1,970 | $2,545 | $1,148 |
| | Average final salary | $7,534 | $2,840 | $3,146 | $3,651 | $3,773 | $4,481 | $4,838 | $3,679 |
| | Number of retirees | 7 | 514 | 386 | 355 | 485 | 447 | 187 | 2,381 |

* Excludes legislators, elected officials, water patrol, and administrative law judges.

Notes: COLA increases and temporary benefits payable under MSEP 2000 until age 62 are excluded from the above table.
This schedule is intended to show a 10-year history. Additional years will be reported as they become available.

# TABLE 26C
# AVERAGE MONTHLY BENEFIT AMOUNTS

## Legislators

| Members Retiring During Fiscal Year | | Years Credited Service by Category | | | | | | | All Members |
|---|---|---|---|---|---|---|---|---|---|
| | | <5 | 5-10 | 11-15 | 16-20 | 21-25 | 26-30 | 31+ | |
| 2023 | Average monthly benefit | $511 | $900 | $1,487 | $2,314 | $0 | $0 | $0 | $1,224 |
| | Average final salary | $3,142 | $3,142 | $3,142 | $3,142 | $0 | $0 | $0 | $3,142 |
| | Number of retirees | 1 | 11 | 8 | 2 | 0 | 0 | 0 | 22 |

Notes: COLA increases are excluded from the above table.
This schedule is intended to show a 10-year history. Additional years will be reported as they become available.

# TABLE 26D
# AVERAGE MONTHLY BENEFIT AMOUNTS

## Elected Officials

| Members Retiring During Fiscal Year | | Years Credited Service by Category | | | | | | | All Members |
|---|---|---|---|---|---|---|---|---|---|
| | | <5 | 5-10 | 11-15 | 16-20 | 21-25 | 26-30 | 31+ | |
| 2023 | Average monthly benefit | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| | Average final salary | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| | Number of retirees | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Notes: COLA increases are excluded from the above table.
This schedule is intended to show a 10-year history. Additional years will be reported as they become available.

# TABLE 26E
# AVERAGE MONTHLY BENEFIT AMOUNTS

## Uniformed Water Patrol

| Members Retiring During Fiscal Year | | Years Credited Service by Category | | | | | | | All Members |
|---|---|---|---|---|---|---|---|---|---|
| | | <5 | 5-10 | 11-15 | 16-20 | 21-25 | 26-30 | 31+ | |
| 2023 | Average monthly benefit | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| | Average final salary | $0 | $0 | $0 | $0 | $0 | $0 | $0 | $0 |
| | Number of retirees | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Notes: COLA increases and temporary benefits payable under MSEP 2000 until age 62 are excluded from the above table.
This schedule is intended to show a 10-year history. Additional years will be reported as they become available.

# TABLE 26F
# AVERAGE MONTHLY BENEFIT AMOUNTS

## Administrative Law Judges and Legal Advisors

| | | Years Credited Service by Category | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Members Retiring During Fiscal Year | | <5 | 5-10 | 11-15 | 16-20 | 21-25 | 26-30 | 31+ | All Members |
| 2023 | Average monthly benefit | $1,030 | $1,913 | $3,750 | $0 | $0 | $0 | $0 | $2,152 |
| | Average final salary | $7,808 | $5,708 | $7,500 | $0 | $0 | $0 | $0 | $6,681 |
| | Number of retirees | 1 | 2 | 1 | 0 | 0 | 0 | 0 | 4 |

Notes: COLA increases are excluded from the above table.
This schedule is intended to show a 10-year history. Additional years will be reported as they become available.

# TABLE 27
# RETIREES AND BENEFICIARIES TABULATED BY FISCAL YEAR OF RETIREMENT

| Fiscal Year of Retirement | Number | Total Annual Benefit | Average Monthly Benefit |
|---|---|---|---|
| 1983 and prior | 22 | $135,640 | $514 |
| 1984 | 11 | 97,276 | 737 |
| 1985 | 20 | 171,001 | 713 |
| 1986 | 27 | 255,840 | 790 |
| 1987 | 40 | 444,648 | 926 |
| 1988 | 47 | 808,681 | 1,434 |
| 1989 | 61 | 1,208,721 | 1,651 |
| 1990 | 67 | 1,015,946 | 1,264 |
| 1991 | 100 | 2,118,866 | 1,766 |
| 1992 | 142 | 2,707,084 | 1,589 |
| 1993 | 198 | 4,226,424 | 1,779 |
| 1994 | 208 | 4,180,578 | 1,675 |
| 1995 | 320 | 6,440,594 | 1,677 |
| 1996 | 366 | 8,163,674 | 1,859 |
| 1997 | 408 | 8,823,839 | 1,802 |
| 1998 | 500 | 11,466,607 | 1,911 |
| 1999 | 618 | 14,073,594 | 1,898 |
| 2000 | 691 | 15,358,145 | 1,852 |
| 2001 | 1,562 | 34,104,295 | 1,819 |
| 2002 | 1,107 | 21,159,964 | 1,593 |
| 2003 | 1,246 | 24,804,645 | 1,659 |
| 2004 | 1,756 | 32,845,880 | 1,559 |
| 2005 | 1,237 | 21,379,726 | 1,440 |
| 2006 | 1,428 | 23,319,383 | 1,361 |
| 2007 | 1,721 | 28,947,190 | 1,402 |
| 2008 | 1,762 | 28,542,378 | 1,350 |
| 2009 | 1,852 | 30,442,894 | 1,370 |
| 2010 | 1,942 | 30,613,073 | 1,314 |
| 2011 | 2,506 | 41,378,158 | 1,376 |
| 2012 | 2,368 | 36,217,526 | 1,275 |
| 2013 | 2,473 | 36,482,966 | 1,229 |
| 2014 | 2,482 | 37,434,444 | 1,257 |
| 2015 | 2,810 | 43,444,846 | 1,288 |
| 2016 | 2,811 | 44,501,807 | 1,319 |
| 2017 | 2,769 | 47,892,097 | 1,441 |
| 2018 | 2,914 | 50,361,358 | 1,440 |
| 2019 | 2,664 | 45,995,650 | 1,439 |
| 2020 | 2,642 | 43,543,262 | 1,373 |
| 2021 | 3,019 | 52,587,849 | 1,452 |
| 2022 | 3,263 | 56,553,689 | 1,444 |
| 2023 | 2,529 | 43,599,118 | 1,437 |
| Total | 54,709 | $937,849,356 | $1,429 |

# MEMBER DATA RECONCILIATION

| | Active Members | Inactive Vested | Inactive Nonvested | Leave of Absence | Long-term Disability | Retirees and Beneficiaries | Total |
|---|---|---|---|---|---|---|---|
| As of June 30, 2022 | 41,595 | 17,438 | 28,444 | 115 | 599 | 53,648 | 141,839 |
| Changes in status: | | | | | | | |
| a) Retirement | (1,607) | (714) | 0 | (4) | (82) | 2,407 | 0 |
| b) Death | (56) | (55) | 0 | 0 | (9) | (1,721) | (1,841) |
| c) Non-vested termination | (2,521) | 0 | 2,554 | (26) | (7) | 0 | 0 |
| d) Leave of absence | (69) | (2) | (5) | 76 | 0 | 0 | 0 |
| e) Vested termination | (1,435) | 1,485 | 0 | (12) | (38) | 0 | 0 |
| f) Contribution refund | (906) | (157) | (1,196) | (11) | (8) | 0 | (2,278) |
| g) Beneficiary in receipt | 0 | 0 | 0 | 0 | 0 | 470 | 470 |
| h) Long-term disability | (71) | (16) | 0 | (9) | 96 | 0 | 0 |
| h) Disability retirement | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| i) Return to active service | 977 | (313) | (576) | (40) | (4) | (44) | 0 |
| j) Expired benefit | 0 | 0 | 0 | 0 | 0 | (51) | (51) |
| k) Transfer to MPERS | (43) | (21) | 0 | 0 | 0 | 0 | (64) |
| k) Data adjustment | (9) | 6 | (4) | 0 | 0 | 0 | (7) |
| Total changes in status | (5,740) | 213 | 773 | (26) | (52) | 1,061 | (3,771) |
| New entrants | 7,233 | 0 | 2,358 | 17 | 1 | 0 | 9,609 |
| Net Change | 1,493 | 213 | 3,131 | (9) | (51) | 1,061 | 5,838 |
| As of June 30, 2023 | 43,088 | 17,651 | 31,575 | 106 | 548 | 54,709 | 147,677 |

# SUMMARY OF MEMBERSHIP DATA

| A. ACTIVE MEMBERS | June 30, 2023 | June 30, 2022 | % Change |
|---|---|---|---|
| 1. Number of Active Members | | | |
| (a) MSEP | 5,896 | 6,907 | (14.6) |
| (b) MSEP 2000 | 10,681 | 11,384 | (6.2) |
| (c) MSEP 2011 | 26,511 | 23,304 | 13.8 |
| (d) Total | 43,088 | 41,595 | 3.6 |
| 2. Annualized Reported Salary | | | |
| (a) MSEP | $ 358,298,595 | $ 384,223,949 | (6.7) |
| (b) MSEP 2000 | 596,449,028 | 576,340,229 | 3.5 |
| (c) MSEP 2011 | 1,270,417,291 | 1,012,308,576 | 25.5 |
| (d) Total | $ 2,225,164,914 | $ 1,972,872,754 | 12.8 |
| 3. Accumulated Member Contributions | $ 177,453,774 | $ 150,237,663 | 18.1 |
| 4. Active Member Averages | | | |
| (a) Age | 45.2 | 45.8 | (1.3) |
| (b) Service | 10.1 | 10.9 | (7.3) |
| (c) Compensation | $ 51,642 | $ 47,431 | 8.9 |
| **B. INACTIVE MEMBERS** | | | |
| 1. Number of Inactive Members | | | |
| (a) Terminated vested | 17,651 | 17,438 | 1.2 |
| (b) Terminated nonvested (refund only) | 31,575 | 28,444 | 11.0 |
| (c) Leave of absence | 106 | 115 | (7.8) |
| (d) Long-term disability | 548 | 599 | (8.5) |
| (e) Total | 49,880 | 46,596 | 7.0 |
| 2. Accumulated Member Contributions | $ 77,815,920 | $ 67,081,221 | 16.0 |
| 3. Inactive Member Averages | | | |
| (a) Age (vesteds only) | 49.4 | 49.1 | 0.6 |
| (b) Monthly benefit | $ 569 | $ 547 | 4.0 |
| (c) Accumulated member contributions | $ 1,560 | $ 1,440 | 8.3 |
| **C. RETIREES, DISABLEDS, AND BENEFICIARIES** | | | |
| 1. Number of Members | | | |
| (a) Service retirees | 48,472 | 47,537 | 2.0 |
| (b) Beneficiaries | 6,237 | 6,111 | 2.1 |
| (c) Total | 54,709 | 53,648 | 2.0 |
| 2. Total Monthly Benefits | | | |
| (a) Service retirees | $ 70,836,481 | $ 66,889,324 | 5.9 |
| (b) Beneficiaries | 7,317,632 | 6,759,756 | 8.3 |
| (c) Total | $ 78,154,113 | $ 73,649,080 | 6.1 |
| 3. Average Age | | | |
| (a) Service retirees | 71.4 | 71.1 | 0.4 |
| (b) Beneficiaries | 73.0 | 72.6 | 0.6 |
| (c) Total | 71.6 | 71.3 | 0.4 |

# MEMBERSHIP DATA BY GROUP

| Valuation Group | Number | Payroll | Group Averages | | |
|---|---|---|---|---|---|
| | | | Salary | Age(yrs.) | Service(yrs.) |
| Regular State Employees | 42,299 | $ 2,166,866,321 | $ 51,227 | 45.0 | 10.0 |
| Elected Officials | 5 | 579,440 | 115,888 | 51.4 | 5.3 |
| Legislative Clerks | 3 | 139,095 | 46,365 | 68.3 | 29.7 |
| Legislators | 196 | 7,335,785 | 37,427 | 52.0 | 3.9 |
| Uniformed Water Patrol | 8 | 717,807 | 89,726 | 46.3 | 20.3 |
| School-Term Salaried Employees | 563 | 47,752,326 | 84,818 | 57.0 | 21.6 |
| Administrative Law Judges | 14 | 1,774,140 | 126,724 | 64.2 | 27.2 |
| **Total MSEP** | **43,088** | $ **2,225,164,914** | $ **51,642** | **45.2** | **10.1** |

The total number of System active members includes 5,896 MSEP members, 10,681 MSEP 2000 members and 26,511 MSEP 2011 members.

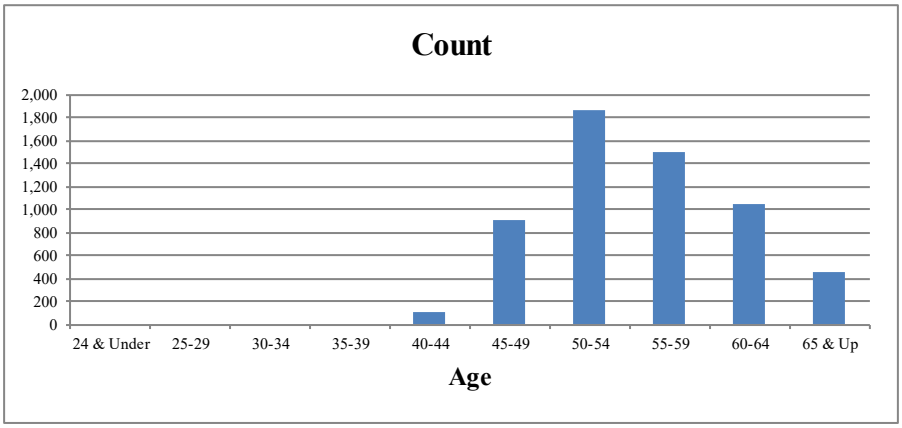
| Type of Benefit Payment | No. | Monthly Benefit | Group Averages | |
|---|---|---|---|---|
| | | | Benefit | Age(yrs.) |
| Retirement | 48,472 | $ 70,836,481 | $ 1,461 | 71.4 |
| Survivor of Active Member | 1,762 | 1,813,713 | 1,029 | 64.4 |
| Survivor of Retired Member | 4,475 | 5,503,919 | 1,230 | 76.4 |
| **Total MSEP** | **54,709** | $ **78,154,113** | $ **1,429** | **71.6** |

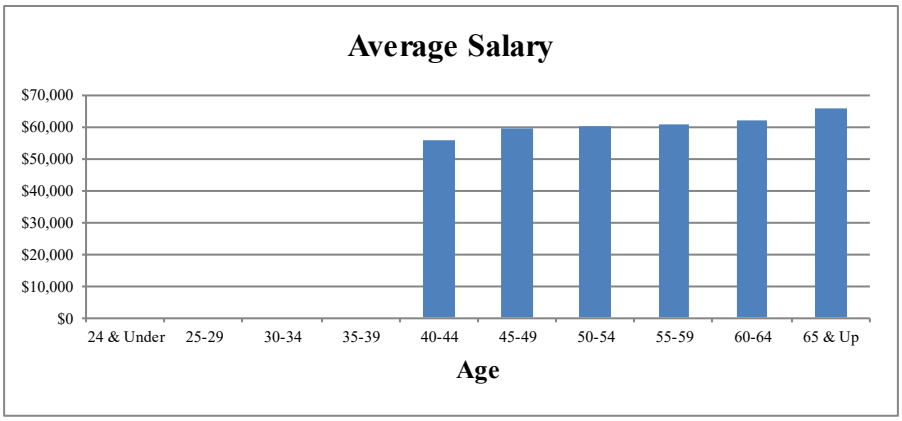
This valuation also includes 17,651 terminated vested members, 31,575 terminated members who have a refund pending, 106 members on leave and 548 members on long-term disability.

# ACTIVE MEMBERS
# AS OF JUNE 30, 2023

## MSEP

| | Count of Members | | | Reported Annualized Earnings for Current Members | | |
|---|---|---|---|---|---|---|
| Age | Male | Female | Total | Male | Female | Total |
| 24 & Under | 0 | 0 | 0 | $ 0 | $ 0 | $ 0 |
| 25-29 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30-34 | 0 | 0 | 0 | 0 | 0 | 0 |
| 35-39 | 0 | 0 | 0 | 0 | 0 | 0 |
| 40-44 | 27 | 91 | 118 | 1,569,457 | 4,990,368 | 6,559,825 |
| 45-49 | 292 | 612 | 904 | 18,618,585 | 35,132,847 | 53,751,432 |
| 50-54 | 654 | 1,216 | 1,870 | 42,598,469 | 69,361,825 | 111,960,294 |
| 55-59 | 551 | 940 | 1,491 | 36,985,293 | 53,639,995 | 90,625,288 |
| 60-64 | 436 | 613 | 1,049 | 30,686,346 | 34,232,595 | 64,918,941 |
| 65 & Up | 231 | 233 | 464 | 17,232,481 | 13,250,334 | 30,482,815 |
| Total | 2,191 | 3,705 | 5,896 | $ 147,690,631 | $ 210,607,964 | $ 358,298,595 |

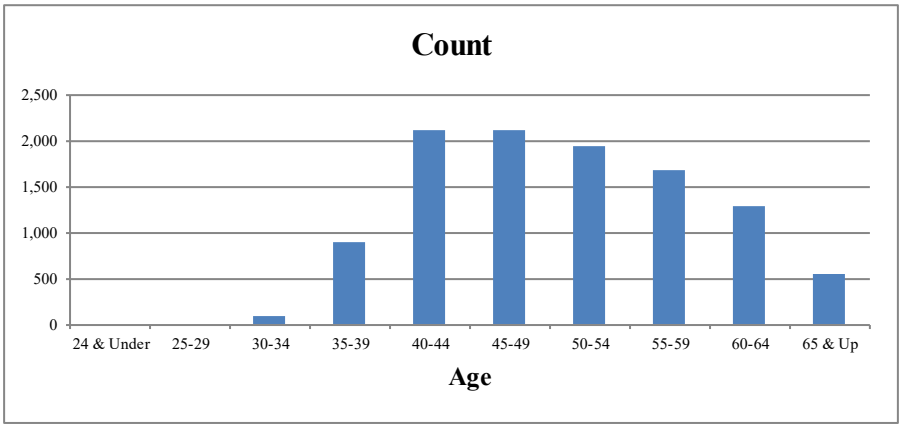


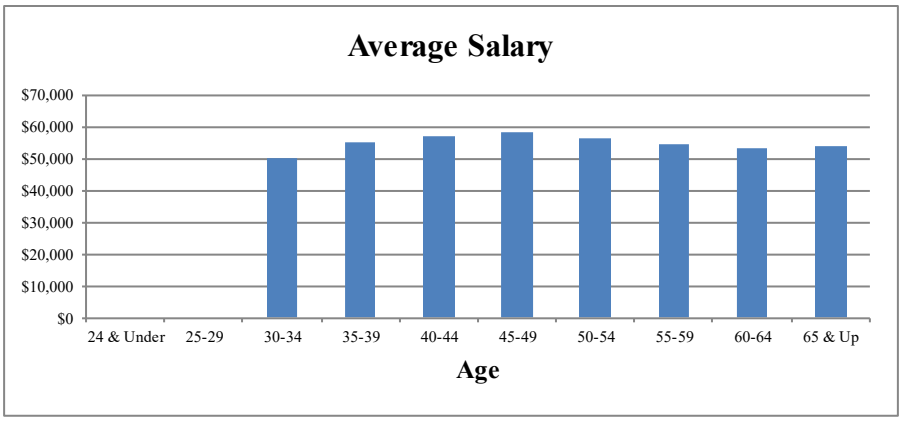



# ACTIVE MEMBERS
# AS OF JUNE 30, 2023

## MSEP 2000

| | Count of Members | | | Reported Annualized Earnings for Current Members | | |
|---|---|---|---|---|---|---|
| Age | Male | Female | Total | Male | Female | Total |
| 24 & Under | 0 | 0 | 0 | $ 0 | $ 0 | $ 0 |
| 25-29 | 0 | 0 | 0 | 0 | 0 | 0 |
| 30-34 | 34 | 67 | 101 | 1,682,449 | 3,362,166 | 5,044,615 |
| 35-39 | 355 | 547 | 902 | 20,540,435 | 29,314,533 | 49,854,968 |
| 40-44 | 798 | 1,305 | 2,103 | 47,386,882 | 72,592,820 | 119,979,702 |
| 45-49 | 829 | 1,278 | 2,107 | 50,689,919 | 71,704,407 | 122,394,326 |
| 50-54 | 749 | 1,191 | 1,940 | 46,550,848 | 62,649,804 | 109,200,652 |
| 55-59 | 649 | 1,036 | 1,685 | 38,960,887 | 52,575,848 | 91,536,735 |
| 60-64 | 491 | 806 | 1,297 | 28,602,703 | 40,303,763 | 68,906,466 |
| 65 & Up | 229 | 317 | 546 | 13,437,118 | 16,094,446 | 29,531,564 |
| Total | 4,134 | 6,547 | 10,681 | $ 247,851,241 | $ 348,597,787 | $ 596,449,028 |

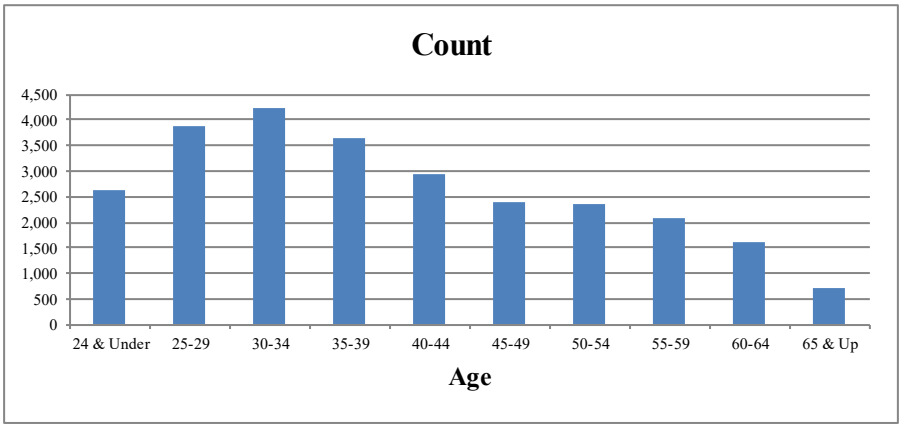


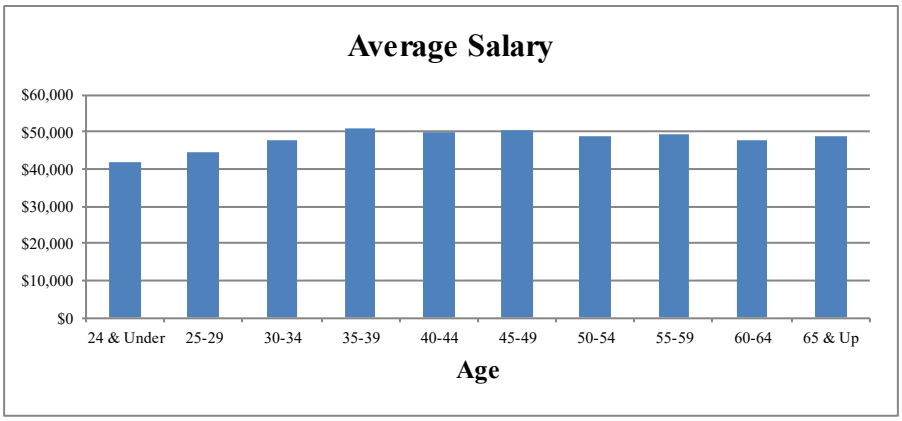



# ACTIVE MEMBERS
# AS OF JUNE 30, 2023

## MSEP 2011

| | Count of Members | | | Reported Annualized Earnings for Current Members | | |
|---|---|---|---|---|---|---|
| Age | Male | Female | Total | Male | Female | Total |
| 24 & Under | 1,093 | 1,520 | 2,613 | $ 48,688,112 | $ 60,269,283 | $ 108,957,395 |
| 25-29 | 1,579 | 2,301 | 3,880 | 74,774,666 | 98,965,749 | 173,740,415 |
| 30-34 | 1,696 | 2,545 | 4,241 | 86,465,531 | 116,798,021 | 203,263,552 |
| 35-39 | 1,405 | 2,226 | 3,631 | 75,522,122 | 108,570,077 | 184,092,199 |
| 40-44 | 996 | 1,947 | 2,943 | 54,042,657 | 93,499,605 | 147,542,262 |
| 45-49 | 840 | 1,555 | 2,395 | 46,625,201 | 74,106,612 | 120,731,813 |
| 50-54 | 797 | 1,574 | 2,371 | 41,882,539 | 74,466,595 | 116,349,134 |
| 55-59 | 739 | 1,363 | 2,102 | 40,050,444 | 63,548,389 | 103,598,833 |
| 60-64 | 620 | 1,004 | 1,624 | 32,821,329 | 44,516,584 | 77,337,913 |
| 65 & Up | 296 | 415 | 711 | 15,531,198 | 19,272,577 | 34,803,775 |
| Total | 10,061 | 16,450 | 26,511 | $ 516,403,799 | $ 754,013,492 | $ 1,270,417,291 |

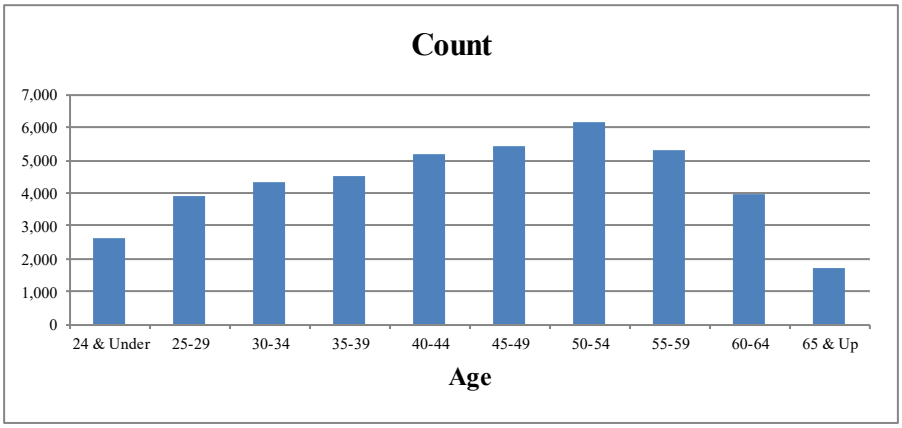


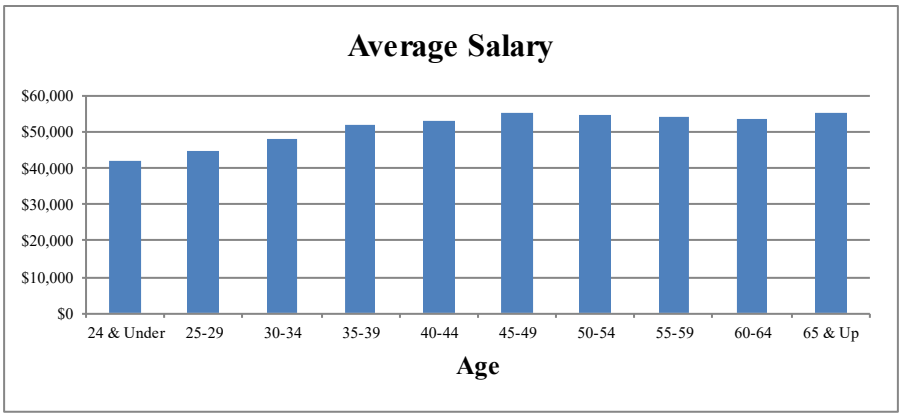



# ACTIVE MEMBERS
# AS OF JUNE 30, 2023

## TOTAL

| | Count of Members | | | Reported Annualized Earnings for Current Members | | |
|---|---|---|---|---|---|---|
| Age | Male | Female | Total | Male | Female | Total |
| 24 & Under | 1,093 | 1,520 | 2,613 | $ 48,688,112 | $ 60,269,283 | $ 108,957,395 |
| 25-29 | 1,579 | 2,301 | 3,880 | 74,774,666 | 98,965,749 | 173,740,415 |
| 30-34 | 1,730 | 2,612 | 4,342 | 88,147,980 | 120,160,187 | 208,308,167 |
| 35-39 | 1,760 | 2,773 | 4,533 | 96,062,557 | 137,884,610 | 233,947,167 |
| 40-44 | 1,821 | 3,343 | 5,164 | 102,998,996 | 171,082,793 | 274,081,789 |
| 45-49 | 1,961 | 3,445 | 5,406 | 115,933,705 | 180,943,866 | 296,877,571 |
| 50-54 | 2,200 | 3,981 | 6,181 | 131,031,856 | 206,478,224 | 337,510,080 |
| 55-59 | 1,939 | 3,339 | 5,278 | 115,996,624 | 169,764,232 | 285,760,856 |
| 60-64 | 1,547 | 2,423 | 3,970 | 92,110,378 | 119,052,942 | 211,163,320 |
| 65 & Up | 756 | 965 | 1,721 | 46,200,797 | 48,617,357 | 94,818,154 |
| Total | 16,386 | 26,702 | 43,088 | $ 911,945,671 | $ 1,313,219,243 | $ 2,225,164,914 |



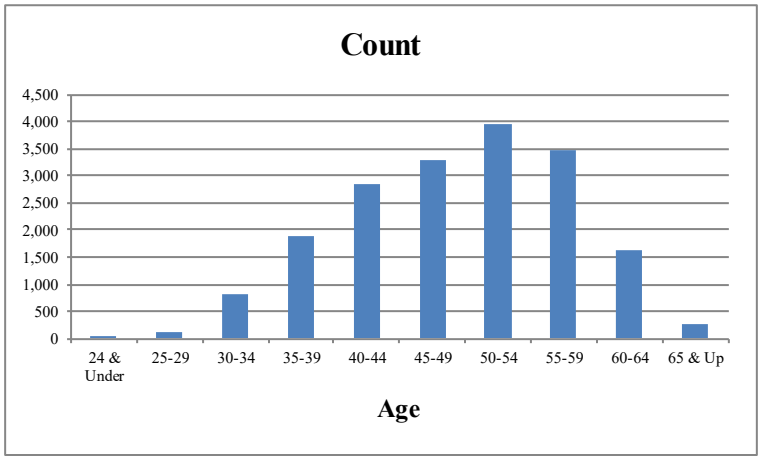
# AGE AND SERVICE DISTRIBUTION
# AS OF JUNE 30, 2023

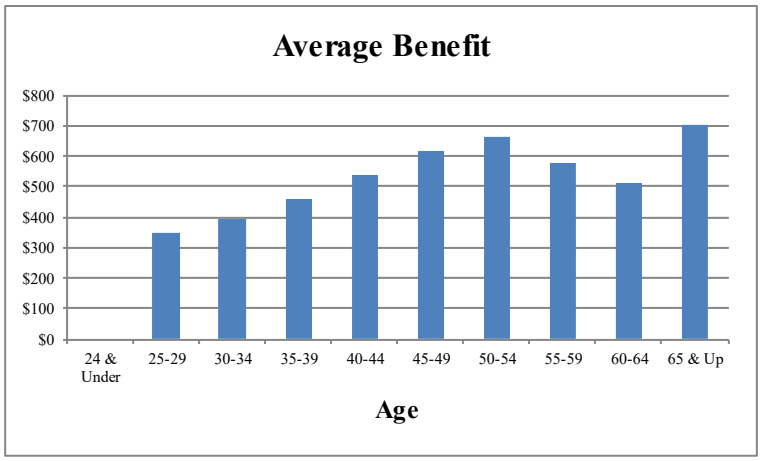
| Age | | 0-4 | 5-9 | 10-14 | 15-19 | 20-24 | 25-29 | 30-34 | Over 34 | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 24 & Under | Number | 2,596 | 17 | 0 | 0 | 0 | 0 | 0 | 0 | 2,613 |
| | Total Salary | $ 108,164,524 | $ 792,871 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 108,957,395 |
| | Average Sal. | $ 41,666 | $ 46,639 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 41,698 |
| 25-29 | Number | 3,345 | 530 | 5 | 0 | 0 | 0 | 0 | 0 | 3,880 |
| | Total Salary | $ 148,053,253 | $ 25,438,848 | $ 248,314 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 173,740,415 |
| | Average Sal. | $ 44,261 | $ 47,998 | $ 49,663 | $ 0 | $ 0 | $ 0 | $ 0 | $ 0 | $ 44,778 |
| 30-34 | Number | 2,623 | 1,402 | 299 | 18 | 0 | 0 | 0 | 0 | 4,342 |
| | Total Salary | $ 119,488,428 | $ 72,021,839 | $ 15,866,083 | $ 931,817 | $ 0 | $ 0 | $ 0 | $ 0 | $ 208,308,167 |
| | Average Sal. | $ 45,554 | $ 51,371 | $ 53,064 | $ 51,768 | $ 0 | $ 0 | $ 0 | $ 0 | $ 47,975 |
| 35-39 | Number | 2,017 | 1,274 | 827 | 400 | 15 | 0 | 0 | 0 | 4,533 |
| | Total Salary | $ 96,260,341 | $ 68,109,340 | $ 45,971,678 | $ 22,781,149 | $ 824,659 | $ 0 | $ 0 | $ 0 | $ 233,947,167 |
| | Average Sal. | $ 47,725 | $ 53,461 | $ 55,588 | $ 56,953 | $ 54,977 | $ 0 | $ 0 | $ 0 | $ 51,610 |
| 40-44 | Number | 1,807 | 1,031 | 772 | 1,064 | 460 | 30 | 0 | 0 | 5,164 |
| | Total Salary | $ 86,998,695 | $ 54,163,372 | $ 43,847,603 | $ 60,803,002 | $ 26,514,981 | $ 1,754,136 | $ 0 | $ 0 | $ 274,081,789 |
| | Average Sal. | $ 48,145 | $ 52,535 | $ 56,797 | $ 57,146 | $ 57,641 | $ 58,471 | $ 0 | $ 0 | $ 53,075 |
| 45-49 | Number | 1,503 | 885 | 681 | 811 | 1,036 | 478 | 12 | 0 | 5,406 |
| | Total Salary | $ 73,111,172 | $ 48,431,224 | $ 38,623,571 | $ 45,975,141 | $ 61,316,815 | $ 28,661,188 | $ 758,460 | $ 0 | $ 296,877,571 |
| | Average Sal. | $ 48,643 | $ 54,725 | $ 56,716 | $ 56,689 | $ 59,186 | $ 59,961 | $ 63,205 | $ 0 | $ 54,916 |
| 50-54 | Number | 1,499 | 881 | 672 | 764 | 1,019 | 1,089 | 244 | 13 | 6,181 |
| | Total Salary | $ 73,064,662 | $ 45,234,265 | $ 36,557,240 | $ 40,815,061 | $ 59,454,156 | $ 65,928,268 | $ 15,720,693 | $ 735,735 | $ 337,510,080 |
| | Average Sal. | $ 48,742 | $ 51,344 | $ 54,401 | $ 53,423 | $ 58,346 | $ 60,540 | $ 64,429 | $ 56,595 | $ 54,604 |
| 55-59 | Number | 1,263 | 801 | 652 | 713 | 783 | 597 | 356 | 113 | 5,278 |
| | Total Salary | $ 61,242,505 | $ 41,105,168 | $ 35,249,925 | $ 37,208,697 | $ 43,680,308 | $ 36,563,961 | $ 23,360,384 | $ 7,349,908 | $ 285,760,856 |
| | Average Sal. | $ 48,490 | $ 51,317 | $ 54,064 | $ 52,186 | $ 55,786 | $ 61,246 | $ 65,619 | $ 65,043 | $ 54,142 |
| 60-64 | Number | 855 | 719 | 525 | 585 | 522 | 394 | 199 | 171 | 3,970 |
| | Total Salary | $ 40,466,884 | $ 36,288,143 | $ 26,432,970 | $ 29,702,539 | $ 29,212,048 | $ 24,026,914 | $ 14,094,327 | $ 10,939,495 | $ 211,163,320 |
| | Average Sal. | $ 47,330 | $ 50,470 | $ 50,349 | $ 50,774 | $ 55,962 | $ 60,982 | $ 70,826 | $ 63,974 | $ 53,190 |
| 65 & Up | Number | 357 | 323 | 241 | 241 | 186 | 134 | 103 | 136 | 1,721 |
| | Total Salary | $ 17,671,140 | $ 16,045,989 | $ 12,602,187 | $ 12,582,560 | $ 10,853,161 | $ 8,222,544 | $ 6,840,185 | $ 10,000,388 | $ 94,818,154 |
| | Average Sal. | $ 49,499 | $ 49,678 | $ 52,291 | $ 52,210 | $ 58,350 | $ 61,362 | $ 66,410 | $ 73,532 | $ 55,095 |
| Total | Number | 17,865 | 7,863 | 4,674 | 4,596 | 4,021 | 2,722 | 914 | 433 | 43,088 |
| | Total Salary | $ 824,521,604 | $ 407,631,059 | $ 255,399,571 | $ 250,799,966 | $ 231,856,128 | $ 165,157,011 | $ 60,774,049 | $ 29,025,526 | $ 2,225,164,914 |
| | Average Sal. | $ 46,153 | $ 51,842 | $ 54,643 | $ 54,569 | $ 57,661 | $ 60,675 | $ 66,492 | $ 67,034 | $ 51,642 |

# INACTIVE VESTED MEMBERS
# AS OF JUNE 30, 2023

| | Count of Members* | | | Monthly Deferred Benefits* | | |
|---|---|---|---|---|---|---|
| Age | Male | Female | Total | Male | Female | Total |
| 24 & Under | 5 | 9 | 14 | $ 150 | $ 3,262 | $ 3,412 |
| 25-29 | 57 | 72 | 129 | 17,094 | 27,578 | 44,672 |
| 30-34 | 345 | 466 | 811 | 138,853 | 181,305 | 320,158 |
| 35-39 | 781 | 1,117 | 1,898 | 374,978 | 495,802 | 870,780 |
| 40-44 | 1,097 | 1,748 | 2,845 | 639,824 | 895,908 | 1,535,732 |
| 45-49 | 1,202 | 2,092 | 3,294 | 779,496 | 1,246,609 | 2,026,105 |
| 50-54 | 1,434 | 2,508 | 3,942 | 1,023,399 | 1,579,336 | 2,602,735 |
| 55-59 | 1,231 | 2,253 | 3,484 | 806,926 | 1,202,777 | 2,009,703 |
| 60-64 | 548 | 1,086 | 1,634 | 333,545 | 498,707 | 832,252 |
| 65 & Up | 106 | 148 | 254 | 89,090 | 89,778 | 178,868 |
| Total | 6,806 | 11,499 | 18,305 | $ 4,203,355 | $ 6,221,062 | $ 10,424,417 |

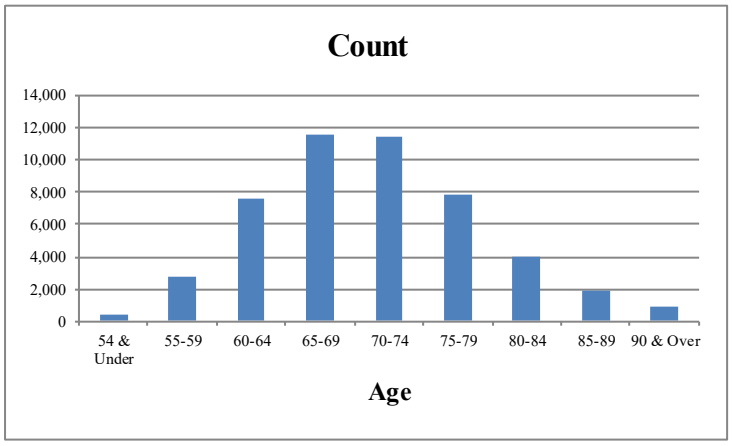
* There are 106 members currently on leave and 548 members on LTD. Their counts and estimated deferred monthly benefits are included.

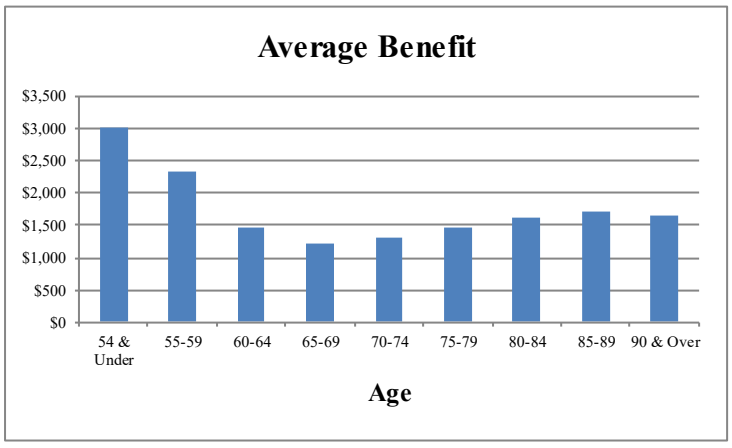


# RETIRED MEMBERS
# AS OF JUNE 30, 2023

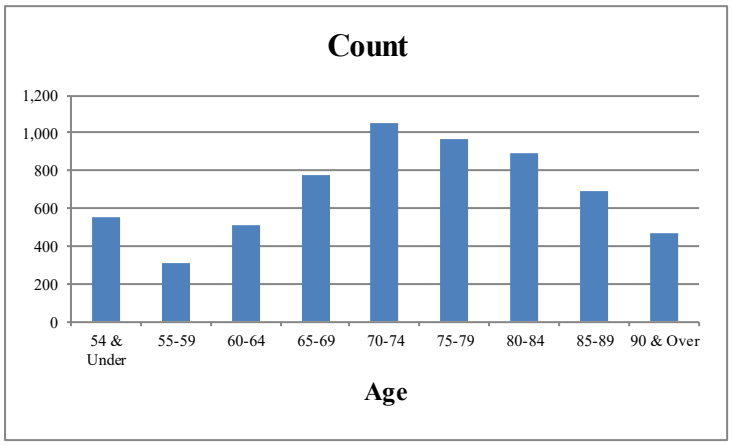
| | Count of Members | | | Monthly Benefits | | |
|---|---|---|---|---|---|---|
| Age | Male | Female | Total | Male | Female | Total |
| 54 & Under | 163 | 313 | 476 | $ 510,516 | $ 918,807 | $ 1,429,323 |
| 55-59 | 992 | 1,755 | 2,747 | 2,480,705 | 3,938,038 | 6,418,743 |
| 60-64 | 2,648 | 4,908 | 7,556 | 4,144,268 | 6,879,577 | 11,023,845 |
| 65-69 | 4,194 | 7,399 | 11,593 | 5,711,262 | 8,515,064 | 14,226,326 |
| 70-74 | 4,431 | 7,022 | 11,453 | 6,670,991 | 8,495,753 | 15,166,744 |
| 75-79 | 3,184 | 4,614 | 7,798 | 5,637,672 | 5,660,839 | 11,298,511 |
| 80-84 | 1,553 | 2,452 | 4,005 | 3,394,622 | 3,056,378 | 6,451,000 |
| 85-89 | 679 | 1,206 | 1,885 | 1,643,069 | 1,603,863 | 3,246,932 |
| 90 & Over | 299 | 660 | 959 | 727,374 | 847,683 | 1,575,057 |
| Total | 18,143 | 30,329 | 48,472 | $ 30,920,479 | $ 39,916,002 | $ 70,836,481 |

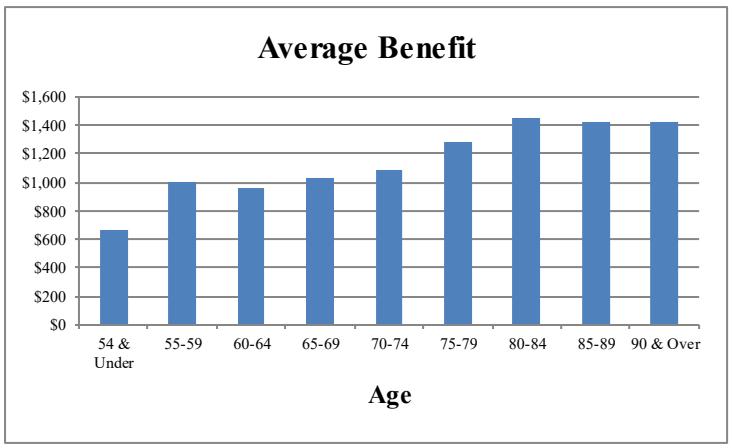


# BENEFICIARIES RECEIVING BENEFITS
# AS OF JUNE 30, 2023

| | Count of Members | | | Monthly Benefits | | |
|---|---|---|---|---|---|---|
| Age | Male | Female | Total | Male | Female | Total |
| 54 & Under | 204 | 351 | 555 | $ 121,483 | $ 246,095 | $ 367,578 |
| 55-59 | 106 | 208 | 314 | 92,248 | 221,191 | 313,439 |
| 60-64 | 140 | 371 | 511 | 95,342 | 392,910 | 488,252 |
| 65-69 | 222 | 559 | 781 | 181,245 | 626,854 | 808,099 |
| 70-74 | 278 | 771 | 1,049 | 228,574 | 914,029 | 1,142,603 |
| 75-79 | 234 | 735 | 969 | 197,886 | 1,048,458 | 1,246,344 |
| 80-84 | 204 | 692 | 896 | 188,955 | 1,110,790 | 1,299,745 |
| 85-89 | 158 | 530 | 688 | 145,254 | 834,523 | 979,777 |
| 90 & Over | 116 | 358 | 474 | 89,197 | 582,598 | 671,795 |
| Total | 1,662 | 4,575 | 6,237 | $ 1,340,184 | $ 5,977,448 | $ 7,317,632 |



# RETIRED LIVES BENEFITS PAYABLE AS OF JUNE 30, 2023
# TABULATED BY OPTION AND TYPE OF BENEFIT

## MSEP Benefits

| Type of Benefit | No. | Total Monthly Benefits |
|---|---|---|
| Service Retirement | | |
| Life Annuity | 5,743 | $ 8,937,320 |
| 50% Joint and Survivor | 4,920 | 9,606,194 |
| 100% Joint and Survivor | 3,090 | 6,538,375 |
| 5-Year Certain and Life | 137 | 197,647 |
| 10-Year Certain and Life | 174 | 201,271 |
| Survivor Beneficiary | 2,755 | 3,963,141 |
| Total | 16,819 | 29,443,948 |
| Death-in-Service | 1,355 | 1,605,506 |
| **Total** | **18,174** | **$ 31,049,454** |

## MSEP 2000 Benefits

| Type of Benefit | No. | Total Monthly Benefits |
|---|---|---|
| Service Retirement | | |
| Life Annuity | 21,134 | $ 26,781,436 |
| 50% Joint and Survivor | 4,844 | 8,623,918 |
| 100% Joint and Survivor | 5,988 | 8,216,447 |
| 5-Year Certain and Life | 13 | 15,992 |
| 10-Year Certain and Life | 944 | 827,506 |
| 15-Year Certain and Life | 818 | 626,675 |
| Survivor Beneficiary | 1,712 | 1,538,691 |
| Total | 35,453 | 46,630,665 |
| Death-in-Service | 371 | 193,942 |
| **Total** | **35,824** | **$ 46,824,607** |

# RETIRED LIVES BENEFITS PAYABLE AS OF JUNE 30, 2023
# TABULATED BY OPTION AND TYPE OF BENEFIT

## MSEP 2011 Benefits

| Type of Benefit | No. | Total Monthly Benefits |
|---|---|---|
| Service Retirement | | |
| Life Annuity | 398 | $ 155,161 |
| 50% Joint and Survivor | 54 | 22,290 |
| 100% Joint and Survivor | 152 | 61,012 |
| 5-Year Certain and Life | 0 | 0 |
| 10-Year Certain and Life | 26 | 10,345 |
| 15-Year Certain and Life | 37 | 14,893 |
| Survivor Beneficiary | 8 | 2,086 |
| Total | 675 | 265,787 |
| Death-in-Service | 36 | 14,265 |
| **Total** | **711** | **$ 280,052** |

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# SALARY INCREASES
# DURING PLAN YEAR 2022-2023

| Age | Count | Salary Increases | |
|---|---|---|---|
| | | Actual* | Expected |
| Under 20 | 30 | 26.0% | 8.3% |
| 20 - 24 | 980 | 13.0% | 6.0% |
| 25 - 29 | 2,536 | 13.2% | 5.1% |
| 30 - 34 | 3,317 | 12.4% | 4.5% |
| 35 - 39 | 3,736 | 11.5% | 4.2% |
| 40 - 44 | 4,362 | 11.2% | 3.9% |
| 45 - 49 | 4,809 | 10.5% | 3.6% |
| 50 - 54 | 5,520 | 10.0% | 3.5% |
| 55 - 59 | 4,733 | 9.4% | 3.5% |
| 60 - 64 | 3,460 | 8.9% | 3.5% |
| 65 & Over | 1,396 | 8.7% | 3.5% |
| **Total** | **34,879** | | |
| **Average** | | **10.6%** | **3.9%** |

** Excludes new entrants and terminations.*

| | Payroll Growth | | | | |
|---|---|---|---|---|---|
| | 2023 | 2022 | 2021 | 2020 | 2019 |
| Actual** | 12.79% | 0.56% | -0.96% | 2.60% | 0.8% |
| Assumed | 2.25% | 2.25% | 2.25% | 2.35% | 2.5% |

** Based on reported payroll.

# ACTIVE MEMBERS WHO RETIRED WITH SERVICE RETIREMENT BENEFITS DURING PLAN YEAR 2022-2023

| Age | Male | | Female | | Total | |
|---|---|---|---|---|---|---|
| | Actual | Expected | Actual | Expected | Actual | Expected |
| Under 50 | 1 | 0.3 | 2 | 0.5 | 3 | 0.9 |
| 50 | 2 | 0.3 | 5 | 2.2 | 7 | 2.6 |
| 51 | 13 | 2.6 | 26 | 6.6 | 39 | 9.2 |
| 52 | 17 | 8.7 | 36 | 19.6 | 53 | 28.2 |
| 53 | 18 | 11.4 | 31 | 20.4 | 49 | 31.8 |
| 54 | 22 | 13.8 | 30 | 23.3 | 52 | 37.1 |
| 55 | 24 | 17.8 | 49 | 31.8 | 73 | 49.5 |
| 56 | 30 | 20.2 | 50 | 34.0 | 80 | 54.2 |
| 57 | 18 | 23.5 | 39 | 38.3 | 57 | 61.9 |
| 58 | 39 | 26.5 | 55 | 38.1 | 94 | 64.6 |
| 59 | 48 | 32.0 | 52 | 46.0 | 100 | 78.0 |
| 60 | 32 | 29.8 | 84 | 51.3 | 116 | 81.1 |
| 61 | 33 | 27.8 | 52 | 41.0 | 85 | 68.8 |
| 62 | 51 | 44.6 | 70 | 64.6 | 121 | 109.2 |
| 63 | 36 | 31.6 | 48 | 44.9 | 84 | 76.5 |
| 64 | 46 | 37.7 | 55 | 52.4 | 101 | 90.1 |
| 65 | 53 | 41.9 | 87 | 68.3 | 140 | 110.2 |
| 66 | 41 | 35.1 | 62 | 51.0 | 103 | 86.1 |
| 67 | 28 | 21.9 | 44 | 28.9 | 72 | 50.8 |
| 68 | 18 | 17.4 | 25 | 21.3 | 43 | 38.7 |
| 69 | 15 | 12.4 | 14 | 16.3 | 29 | 28.7 |
| 70 & Over | 50 | 70.7 | 56 | 64.7 | 106 | 135.4 |
| **Total** | **635** | **528.0** | **972** | **765.3** | **1,607** | **1,293.3** |

| | Male | Female | Total |
|---|---|---|---|
| Average age at retirement | 61.8 years | 61.0 years | 61.3 years |
| Average service at retirement | 22.2 years | 22.6 years | 22.5 years |

# ACTIVE MEMBERS WHO BECAME DISABLED DURING PLAN YEAR 2022-2023

| Age | Male | | Female | | Total | |
|---|---|---|---|---|---|---|
| | Actual | Expected | Actual | Expected | Actual | Expected |
| Under 25 | 0 | 0.2 | 0 | 0.2 | 0 | 0.4 |
| 25 - 29 | 0 | 0.6 | 1 | 0.9 | 1 | 1.5 |
| 30 - 34 | 1 | 1.4 | 1 | 2.1 | 2 | 3.5 |
| 35 - 39 | 2 | 2.6 | 2 | 4.1 | 4 | 6.7 |
| 40 - 44 | 5 | 4.6 | 2 | 8.1 | 7 | 12.8 |
| 45 - 49 | 2 | 7.0 | 1 | 12.2 | 3 | 19.2 |
| 50 - 54 | 11 | 9.2 | 11 | 16.7 | 22 | 25.9 |
| 55 - 59 | 9 | 7.8 | 12 | 14.0 | 21 | 21.8 |
| 60 & Over | 4 | 4.8 | 7 | 7.9 | 11 | 12.7 |
| **Total** | **34** | **38.2** | **37** | **66.2** | **71** | **104.4** |

| | Male | Female | Total |
|---|---|---|---|
| Average age at disability | 51.2 years | 52.9 years | 52.1 years |
| Average service at disability | 10.5 years | 8.4 years | 9.4 years |

# ACTIVE MEMBERS WHO DIED DURING PLAN YEAR 2022-2023

| Age | Male | | Female | | Total | |
|---|---|---|---|---|---|---|
| | Actual | Expected | Actual | Expected | Actual | Expected |
| Under 30 | 1 | 1.1 | 2 | 0.6 | 3 | 1.6 |
| 30 - 34 | 0 | 1.3 | 0 | 0.9 | 0 | 2.1 |
| 35 - 39 | 0 | 1.7 | 3 | 1.4 | 3 | 3.1 |
| 40 - 44 | 1 | 2.1 | 1 | 2.1 | 2 | 4.2 |
| 45 - 49 | 4 | 2.8 | 5 | 2.9 | 9 | 5.7 |
| 50 - 54 | 7 | 4.5 | 4 | 5.2 | 11 | 9.7 |
| 55 - 59 | 7 | 6.5 | 1 | 7.4 | 8 | 13.9 |
| 60 - 64 | 5 | 7.9 | 4 | 8.0 | 9 | 15.9 |
| 65 & Over | 4 | 6.3 | 7 | 5.9 | 11 | 12.2 |
| **Total** | **29** | **34.1** | **27** | **34.3** | **56** | **68.4** |

| | Male | Female | Total |
|---|---|---|---|
| Average age at death | 55.4 years | 53.1 years | 54.3 years |
| Average service at death | 15.6 years | 15.3 years | 15.5 years |

Of the 56 active members who died in service during plan year 2022-2023, 51 members had a benefit payable to a survivor.

# ACTIVE MEMBERS WHO TERMINATED EMPLOYMENT WITH A DEFERRED BENEFIT DURING PLAN YEAR 2022-2023

| Age | Male | | Female | | Total | |
|---|---|---|---|---|---|---|
| | Actual | Expected | Actual | Expected | Actual | Expected |
| Under 30 | 18 | 19.8 | 46 | 28.0 | 64 | 47.8 |
| 30 - 34 | 89 | 66.4 | 120 | 95.5 | 209 | 161.9 |
| 35 - 39 | 103 | 76.8 | 157 | 115.2 | 260 | 192.0 |
| 40 - 44 | 104 | 72.3 | 148 | 122.3 | 252 | 194.5 |
| 45 - 49 | 77 | 65.5 | 111 | 108.6 | 188 | 174.1 |
| 50 - 54 | 55 | 60.0 | 132 | 119.1 | 187 | 179.1 |
| 55 - 59 | 44 | 35.3 | 104 | 68.2 | 148 | 103.5 |
| 60 & Over | 53 | 12.3 | 74 | 21.0 | 127 | 33.3 |
| **Total** | **543** | **408.4** | **892** | **677.8** | **1,435** | **1,086.2** |

| | Male | Female | Total |
|---|---|---|---|
| Average age at termination | 44.0 years | 44.6 years | 44.4 years |
| Average service at termination | 10.9 years | 10.9 years | 10.9 years |

# ACTIVE MEMBERS WHO TERMINATED EMPLOYMENT WITHOUT A DEFERRED BENEFIT PAYABLE DURING PLAN YEAR 2022-2023

| Age | Male | | Female | | Total | |
|---|---|---|---|---|---|---|
| | Actual | Expected | Actual | Expected | Actual | Expected |
| Under 20 | 17 | 9.6 | 30 | 14.5 | 47 | 24.1 |
| 20 - 24 | 236 | 176.9 | 374 | 254.6 | 610 | 431.5 |
| 25 - 29 | 306 | 280.6 | 473 | 414.2 | 779 | 694.8 |
| 30 - 34 | 235 | 211.1 | 320 | 320.2 | 555 | 531.2 |
| 35 - 39 | 140 | 150.2 | 194 | 245.5 | 334 | 395.7 |
| 40 - 44 | 112 | 119.5 | 195 | 228.9 | 307 | 348.4 |
| 45 - 49 | 73 | 104.5 | 164 | 197.6 | 237 | 302.1 |
| 50 - 54 | 65 | 96.6 | 151 | 189.5 | 216 | 286.1 |
| 55 - 59 | 60 | 88.4 | 93 | 158.8 | 153 | 247.2 |
| 60 - 64 | 39 | 66.8 | 81 | 102.4 | 120 | 169.2 |
| 65 - 69 | 19 | 20.4 | 28 | 30.6 | 47 | 51.0 |
| 70 & Over | 11 | 10.7 | 11 | 8.7 | 22 | 19.4 |
| **Total** | **1,313** | **1,335.2** | **2,114** | **2,165.5** | **3,427** | **3,500.8** |

| Service | Male | | Female | | Total | |
|---|---|---|---|---|---|---|
| | Actual | Expected | Actual | Expected | Actual | Expected |
| 0 - 1 | 602 | 599.6 | 1,042 | 987.6 | 1,644 | 1,587.2 |
| 1 - 2 | 292 | 298.1 | 427 | 464.1 | 719 | 762.2 |
| 2 - 3 | 161 | 187.2 | 278 | 309.5 | 439 | 496.7 |
| 3 - 4 | 166 | 152.3 | 226 | 241.3 | 392 | 393.6 |
| 4 - 5 | 92 | 98.0 | 141 | 163.1 | 233 | 261.0 |
| **Total** | **1,313** | **1,335.2** | **2,114** | **2,165.5** | **3,427** | **3,500.8** |

| | Male | Female | Total |
|---|---|---|---|
| Average age at termination | 34.9 years | 35.8 years | 35.5 years |
| Average service at termination | 1.7 years | 1.6 years | 1.6 years |

# COMPARISON OF ACTUAL TO EXPECTED DEATHS AMONG RETIRED LIVES (SERVICE RETIREMENT ONLY) DURING PLAN YEAR 2022-2023

| Age | Male | | | Female | | | Total | | |
|---|---|---|---|---|---|---|---|---|---|
| | Actual | Expected | Exposures | Actual | Expected | Exposures | Actual | Expected | Exposures |
| Under 50 | 0 | 0.0 | 0 | 0 | 0.0 | 1 | 0 | 0.0 | 1 |
| 50 - 54 | 1 | 0.9 | 123 | 0 | 1.1 | 239 | 1 | 2.1 | 362 |
| 55 - 59 | 5 | 8.6 | 885 | 12 | 9.0 | 1,596 | 17 | 17.5 | 2,481 |
| 60 - 64 | 29 | 29.5 | 2,493 | 44 | 31.2 | 4,658 | 73 | 60.7 | 7,151 |
| 65 - 69 | 65 | 57.4 | 4,160 | 83 | 68.2 | 7,302 | 148 | 125.6 | 11,462 |
| 70 - 74 | 123 | 89.6 | 4,489 | 130 | 107.5 | 6,974 | 253 | 197.1 | 11,463 |
| 75 - 79 | 114 | 99.4 | 3,104 | 147 | 121.9 | 4,517 | 261 | 221.3 | 7,621 |
| 80 - 84 | 100 | 86.2 | 1,560 | 144 | 122.6 | 2,434 | 244 | 208.8 | 3,994 |
| 85 - 89 | 74 | 64.1 | 675 | 118 | 116.4 | 1,239 | 192 | 180.5 | 1,914 |
| 90 - 94 | 63 | 41.9 | 277 | 103 | 84.8 | 534 | 166 | 126.7 | 811 |
| 95 - 99 | 21 | 15.4 | 70 | 44 | 42.0 | 184 | 65 | 57.4 | 254 |
| 100 & Over | 2 | 1.3 | 4 | 7 | 6.3 | 19 | 9 | 7.6 | 23 |
| **Total** | **597** | **494.3** | **17,840** | **832** | **711.0** | **29,697** | **1,429** | **1,205.3** | **47,537** |
| **Average Ages** | **78.4** | **77.7** | **71.3** | **79.6** | **80.0** | **71.0** | **79.1** | **79.1** | **71.1** |

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| MSEP<br>(Missouri State Employees' Plan) | MSEP 2000<br>(Missouri State Employees' Plan 2000) | MSEP 2011<br>(Missouri State Employees' Plan 2011) |
|---|---|---|
| **DEFINITIONS**<br><br>**Participants**<br><br>All MOSERS members, vested former members, retirees and survivors who first became members prior to July 1, 2000 and who do **not** elect to transfer to the MSEP 2000 plan. Election is made at the time benefits commence. | (1) All new employees who first become members on or after July 1, 2000, except full-time teaching and senior administrative personnel of the regional colleges and universities hired on or after July 1, 2002 who will be participants in the Colleges and Universities Retirement Plan (CURP).<br>(2) MSEP active members and vested former members who elect to transfer to the MSEP 2000 plan prior to retirement.<br>(3) MSEP retirees who elect to transfer to the MSEP 2000 plan during the election window from July 1, 2000 through June 30, 2001, and their survivors.<br>(4) MSEP non-vested terminations rehired on or after July 1, 2000.<br>(5) Members hired prior to January 1, 2011 participating in the CURP for six years may elect to change to MOSERS. Transferred service is for vesting purposes only. | (1) All new employees who first become employees on or after January 1, 2011, except full-time teaching and senior administrative personnel of the regional colleges and universities hired on or after July 1, 2002 who will be participants in the Colleges and Universities Retirement Plan (CURP).<br>(2) Members hired on or after January 1, 2011 participating in the CURP for six years may elect to change to MOSERS. Transferred service is for vesting purposes only. |

| MSEP<br>(Missouri State Employees' Plan) | MSEP 2000<br>(Missouri State Employees' Plan 2000) | MSEP 2011<br>(Missouri State Employees' Plan 2011) |
|---|---|---|
| **Final average earnings** | | |
| The average annual compensation of a member for the three consecutive years of service during which pay was highest (overtime pay is included for purposes of determining Average Compensation). Non-recurring lump sum payments are excluded. Unused sick leave may be converted to additional credited service (usable only for benefit computation, not eligibility). | The average annual compensation of a member for the three consecutive years of service during which pay was highest (overtime pay is included for purposes of determining Average Compensation). Non-recurring lump sum payments are excluded. Unused sick leave may be converted to additional credited service (usable only for benefit computation, not eligibility). | The average annual compensation of a member for the three consecutive years of service during which pay was highest (overtime pay is included for purposes of determining Average Compensation). Non-recurring lump sum payments are excluded. Unused sick leave may be converted to additional credited service (usable only for benefit computation, not eligibility). |
| **Member contributions** | | |
| None. | Same as MSEP. | 4.0% of salary, with interest credited to member contributions based on the 52-week Treasury bill rate (4% prior to June 30, 2014). |

| MSEP<br>(Missouri State Employees' Plan) | MSEP 2000<br>(Missouri State Employees' Plan 2000) | MSEP 2011<br>(Missouri State Employees' Plan 2011) |
|---|---|---|
| **ELIGIBILITY FOR BENEFITS** | | |
| **Normal retirement** | | |
| *Members of the General Assembly:*<br>Age 55 with completion of at least 3 full biennial assemblies. | *Members of the General Assembly:*<br>The earliest of attaining:<br>(1) Age 55 with completion of at least 3 full biennial assemblies.<br>(2) Age 50 with completion of at least 3 full biennial assemblies and with age plus credited service equal to 80 or more. | *Members of the General Assembly:*<br>The earliest of attaining:<br>(1) Age 62 with completion of at least 3 full biennial assemblies.<br>(2) Age 55 with completion of at least 3 full biennial assemblies and with age plus credited service equal to 90 or more. |
| *Statewide Elected Officials:*<br>The earliest of attaining:<br>(1) Age 65 with at least 4 years of credited service.<br>(2) Age 60 with at least 15 years of credited service.<br>(3) Age 50 with age plus credited service equal to 80 or more. | *Statewide Elected Officials:*<br>The earliest of attaining:<br>(1) Age 55 with at least 4 years of credited service.<br>(2) Age 50 with age plus credited service equal to 80 or more. | *Statewide Elected Officials:*<br>The earliest of attaining:<br>(1) Age 62 with at least 4 years of credited service as a statewide elected official.<br>(2) Age 55 with age plus credited service equal to 90 or more. |
| *General Employees:*<br>The earliest of attaining:<br>(1) Age 65 and active with at least 4 years of credited service.<br>(2) Age 65 with at least 5 years of credited service.<br>(3) Age 60 with at least 15 years of credited service.<br>(4) Age 48 with age plus credited service equal to 80 or more. | *General Employees:*<br>The earliest of attaining:<br>(1) Age 62 with at least 5 years of credited service.<br>(2) Age 48 with age plus credited service equal to 80 or more. | *General Employees:*<br>The earliest of attaining:<br>(1) Age 67 with at least 5 years of credited service.<br>(2) Age 55 with age plus credited service equal to 90 or more. |

| MSEP<br>(Missouri State Employees' Plan) | MSEP 2000<br>(Missouri State Employees' Plan 2000) | MSEP 2011<br>(Missouri State Employees' Plan 2011) |
|---|---|---|
| *Uniformed Water Patrol Employees:*<br>The earliest of attaining:<br>(1) Age 55 and active with at least 4 years of credited service.<br>(2) Age 55 with at least 5 years of credited service.<br>(3) Age 48 with age plus credited service equal to 80 or more.<br><br>*Administrative Law Judges:*<br>The earliest of attaining:<br>(1) Age 62 and active with at least 12 years of credited service.<br>(2) Age 60 with at least 15 years of credited service.<br>(3) Age 55 with at least 20 years of credited service. | | |
| **Early retirement for general employees** | | |
| Age 55 with at least 10 years of credited service. | Age 57 with at least 5 years of credited service. | Age 62 with at least 5 years of credited service. |

| MSEP<br>(Missouri State Employees' Plan) | MSEP 2000<br>(Missouri State Employees' Plan 2000) | MSEP 2011<br>(Missouri State Employees' Plan 2011) |
|---|---|---|
| **MONTHLY BENEFITS PAYABLE**<br><br>**Normal Retirement**<br><br>*Members of the General Assembly:*<br>$150 per month per biennial assembly served.<br><br>*Statewide Elected Officials:*<br>1) Less than 12 years of credited service: 1.6% of Average Compensation times years of credited service.<br>2) 12 or more years of credited service: 50% of pay of the highest elected position held prior to retirement.<br><br>*General Employees:*<br>1.6% of Average Compensation times years of credited service.<br><br>2.1% of Average Compensation times years of credited service for any period of non-social security covered employment transferred from the Public School Retirement System.<br><br>*Uniformed Water Patrol:*<br>2.13% of Average Compensation times years of credited service. | *Members of the General Assembly:*<br>1/24 of pay times first 24 years of credited service as a member of the General Assembly.<br><br>*Statewide Elected Officials:*<br>1/24 of pay (of the highest elected position held prior to retirement) times the first 12 years of credited service as a statewide elected official.<br><br>*General Employees:*<br>1.7% of Average Compensation times years of credited service.<br><br>Temporary Benefit:<br>If member retires between ages 48 and 62 with age plus credited service equal to 80 or more, a temporary benefit is payable until the attainment of the minimum age at which reduced social security benefits are payable, in the amount of 0.8% of Average Compensation times years of credited service. | *Members of the General Assembly:*<br>1/24 of pay times first 24 years of credited service as a member of the General Assembly.<br><br>*Statewide Elected Officials:*<br>1/24 of pay (of the highest elected position held prior to retirement) times the first 12 years of credited service as a statewide elected official.<br><br>*General Employees:*<br>1.7% of Average Compensation times years of credited service.<br><br>Temporary Benefit:<br>If member retires between ages 55 and 62 with age plus credited service equal to 90 or more, a temporary benefit is payable until the attainment of the minimum age at which reduced social security benefits are payable, in the amount of 0.8% of Average Compensation times years of credited service. |

| MSEP<br>(Missouri State Employees' Plan) | MSEP 2000<br>(Missouri State Employees' Plan 2000) | MSEP 2011<br>(Missouri State Employees' Plan 2011) |
|---|---|---|
| *Administrative Law Judges:*<br>50% of Compensation | Non-Social Security Covered Service:<br>2.5% of Average Compensation times years of credited service for any period of non-social security covered employment transferred from the Public School Retirement System. | Non-Social Security Covered Service:<br>2.5% of Average Compensation times years of credited service for any period of non-social security covered employment transferred from the Public School Retirement System. |
| **Early retirement for general employees** | | |
| Normal retirement amount reduced by ½% for each month that retirement precedes eligibility for normal retirement.<br>1) Less than 15 years of service: Normal retirement amount actuarially reduced for years younger than age 65.<br>2) 15 years but less than 20 years of service, and less than the number of years of service necessary for age and service to total 80: Normal retirement amount actuarially reduced for years younger than age 60.<br>3) 20 or more years of service, but less than the number of years of service necessary for age and service to total 80: Normal retirement amount reduced for years younger than the 80 and out eligibility date. | Normal retirement amount reduced by ½% for each month that retirement precedes eligibility for normal retirement, age 62. | Normal retirement amount reduced by ½% for each month that retirement precedes eligibility for normal retirement, age 67. |

| MSEP (Missouri State Employees' Plan) | MSEP 2000 (Missouri State Employees' Plan 2000) | MSEP 2011 (Missouri State Employees' Plan 2011) |
|---|---|---|
| **Vested deferred benefits**<br><br>Benefits for employees who terminate prior to eligibility for an immediate benefit are considered to be vested in accordance with the following schedule (benefits commence at the age the individual would have been eligible for early or normal retirement, considering years of credited service). Unused sick leave is not converted.<br><br>Years of Service / General Assembly / Elected Officials / General Employees<br>4 / / 100% / <br>5 / / / 100%<br>6* / 100% / /<br>*3 Assemblies | Benefits for employees who terminate prior to eligibility for an immediate benefit are considered to be vested in accordance with the following schedule (benefits commence at age 57 for early retirement or 62 for normal retirement). Unused sick leave is not converted. CURP to MOSERS transfers with 6 years of service are immediately vested.<br><br>Years of Service / General Assembly / Elected Officials / General Employees<br>4 / / 100% / <br>5 / / / 100%<br>6* / 100% / /<br>*3 Assemblies, HB1455 prospectively | Benefits for employees who terminate prior to eligibility for an immediate benefit are considered to be vested in accordance with the following schedule (benefits commence at age 67 normal retirement). Unused sick leave is not converted.<br><br>Years of Service / General Assembly / Elected Officials / General Employees<br>4 / / 100% / <br>5 / / / 100%<br>6* / 100% / /<br>*3 Assemblies, HB1455 prospectively |
| **Death prior to retirement**<br><br>The surviving spouse benefit is computed as if the member had been normal retirement age on the date of death and elected the joint and 100% survivor optional form of payment, provided the member had at least 5 years of credited service and was married on the date of death. If no eligible spouse survives, 80% of the member's life income annuity is paid to eligible children until age 21. If the death is duty related, the service requirement is waived and the minimum | The surviving spouse benefit is computed as if the member had been normal retirement age on the date of death and elected the joint and 100% survivor optional form of payment, provided the member had at least 5 years of credited service (3 full assemblies for a member of the General Assembly, 4 years of credited service for a statewide elected official). If no eligible spouse survives, 80% of the member's life income annuity is paid to eligible children until age 21. If the death is duty related, the service requirement is waived | The surviving spouse benefit is computed as if the member had been normal retirement age on the date of death and elected the joint and 100% survivor optional form of payment, provided the member had at least 5 years of credited service (2 full assemblies for a member of the General Assembly, 4 years of credited service for a statewide elected official). If no eligible spouse survives, 80% of the member's life income annuity is paid to eligible children until age 21. If the death is duty related, the service requirement is waived |

| MSEP<br>(Missouri State Employees' Plan) | MSEP 2000<br>(Missouri State Employees' Plan 2000) | MSEP 2011<br>(Missouri State Employees' Plan 2011) |
|---|---|---|
| spouse benefit is 50% of Average Compensation (rate of compensation for members of the General Assembly). | and the minimum spouse benefit is 50% of Average Compensation (rate of compensation for members of the General Assembly). | and the minimum spouse benefit is 50% of Average Compensation (rate of compensation for members of the General Assembly). |
| **Death after retirement** | | |
| 50% of the benefit the retired member was receiving on the date of death (the normal form of payment), or the benefit payable under the joint and survivor or period certain form of payment, if the member elected an optional form of payment at time of retirement and provided the member was married on their date of retirement. Effective July 1, 2000, a member who is not married at retirement but marries thereafter may designate a spouse as beneficiary within one year of marriage. Additionally, a member may designate a new spouse as beneficiary within one year of marriage in the event of the death of the spouse the member was married to at the date of retirement (this provision does not apply to period certain annuities). | The benefit payable under the joint and survivor or period certain form of payment, if the member elected an optional form of payment at time of retirement. A member who is not married at retirement but marries thereafter may designate a spouse as beneficiary within one year of marriage. Additionally, a member may designate a new spouse as beneficiary within one year of marriage in the event of the death of the spouse the member was married to at the date of retirement (this provision does not apply to period certain annuities). | The benefit payable under the joint and survivor or period certain form of payment, if the member elected an optional form of payment at time of retirement. A member who is not married at retirement but marries thereafter may designate a spouse as beneficiary upon completion of one year of marriage. Additionally, a member may designate a new spouse as beneficiary upon completion of one year of marriage in the event of the death of the spouse the member was married to at the date of retirement (this provision does not apply to period certain annuities). |

<table>
<tr><th>MSEP<br>(Missouri State Employees' Plan)</th><th>MSEP 2000<br>(Missouri State Employees' Plan 2000)</th><th>MSEP 2011<br>(Missouri State Employees' Plan 2011)</th></tr>
<tr><td>

**Disability**

Normal retirement benefits become payable at the time the member is eligible for normal retirement, and are computed based on: i) the service that would have accrued to the member if active employment had continued; and ii) the member's rate of pay at the time of disability (if the member retires on or after August 28, 1999, the member's rate of pay is based on the rate of pay at the time of disability indexed to the time of benefit commencement). An exception is Uniformed Water Patrol employees who are eligible for an immediate occupational disability benefit equal to 50% of pay at time of disability.

**Post-retirement benefit adjustments**

Benefits are increased to retired members (including survivors) annually in accordance with the following formulas:

<table>
<tr><th>Increase in CPI</th><th>Formula 1 Benefit Increase</th><th>Formula 2 Benefit Increase</th></tr>
<tr><td>5.00% or less</td><td>4%</td><td>80% of CPI increase</td></tr>
<tr><td>5.01% - 6.24%</td><td>80% of CPI increase</td><td>80% of CPI increase</td></tr>
<tr><td>6.25% or more</td><td>5%</td><td>5%</td></tr>
</table>

</td><td>

Normal retirement benefits become payable at the time the member is eligible for normal retirement, and are computed based on: i) the service that would have accrued to the member if active employment had continued; and ii) the member's rate of pay at the time of disability indexed to the time of benefit commencement. The annual percentage increase in the pay used to compute benefits is the lesser of: i) 80% of the CPI increase and ii) 5%.

Benefits are increased to retired members (including survivors) annually in accordance with the following:

*Members of the General Assembly:*
Benefit is adjusted annually based on the increase in the pay for an active member of the General Assembly.

</td><td>

Normal retirement benefits become payable at the time the member is eligible for normal retirement, and are computed based on: i) the service that would have accrued to the member if active employment had continued; and ii) the member's rate of pay at the time of disability indexed to the time of benefit commencement. The annual percentage increase in the pay used to compute benefits is the lesser of: i) 80% of the CPI increase and ii) 5%.

Benefits are increased to retired members (including survivors) annually in accordance with the following:

*Members of the General Assembly:*
Benefit is adjusted annually based on the increase in the pay for an active member of the General Assembly.

</td></tr>
</table>

| MSEP<br>(Missouri State Employees' Plan) | MSEP 2000<br>(Missouri State Employees' Plan 2000) | MSEP 2011<br>(Missouri State Employees' Plan 2011) |
|---|---|---|
| Members first hired prior to August 28, 1997 receive COLAs based on Formula 1 until an aggregate increase of 65% is reached. At that point subsequent COLAs based on Formula 2 are granted.<br><br>Members first hired on or after August 28, 1997 receive COLAs based solely on Formula 2.<br><br>Statewide Elected Officials with 12 or more years of service have their benefit adjusted annually based on the increase in the pay for an active statewide elected official in the member's highest elected position.<br><br>Members who are fully vested and work beyond age 65 will have their monthly benefit increased upon retirement. The percentage increase in benefit is equal to all COLAs for the years between age 65 and date of retirement, not to exceed 65% and counts toward the Formula 1 65% maximum.<br><br>Timing of Increase: Benefits are adjusted on the anniversary of the effective date of retirement for most members. Members retiring under the BackDROP provisions have an anniversary based on the retroactive starting date for the BackDROP. | *Statewide Elected Officials:*<br>Benefit is adjusted annually based on the increase in the pay for an active statewide elected official in the retired member's highest elected position.<br><br>*General Employees:*<br>Annual benefit percentage increase equal to the lesser of: i) 80% of the CPI increase, and 5%.<br><br>CPI: For the basis of determining CPI, the average monthly reported CPI for the prior calendar year is divided by the average monthly reported CPI for the second prior calendar year to determine the current year increases, if any. If this amount is less than one, benefits are not reduced, nor is there any cumulative effect on future years' determination of CPI.<br><br>Timing of Increase: Benefits are adjusted on the anniversary of the effective date of retirement for most members. Members retiring under the BackDROP provisions have an anniversary based on the retroactive starting date for the BackDROP. | *Statewide Elected Officials:*<br>Benefit is adjusted annually based on the increase in the pay for an active statewide elected official in the retired member's highest elected position.<br><br>*General Employees:*<br>Annual benefit percentage increase equal to the lesser of: i) 80% of the CPI increase, and 5%.<br><br>CPI: For the basis of determining CPI, the average monthly reported CPI for the prior calendar year is divided by the average monthly reported CPI for the second prior calendar year to determine the current year increases, if any. If this amount is less than one, benefits are not reduced, nor is there any cumulative effect on future years' determination of CPI.<br><br>Timing of Increase: Benefits are adjusted on the anniversary of the effective date of retirement. For inactive vested General Employees who enter retirement, the first COLA will not be granted until the second anniversary of the effective date of retirement. |

| MSEP<br>(Missouri State Employees' Plan) | MSEP 2000<br>(Missouri State Employees' Plan 2000) | MSEP 2011<br>(Missouri State Employees' Plan 2011) |
|---|---|---|
| **Pop-up provision** | | |
| Benefits to members who choose a survivor form of payment and whose spouse precedes the member in death, will "pop-up" or revert to the amount the member would have received had he/she not elected a survivor option. | Same. | Same. |
| **Portability** | | |
| Purchase/Transfer Provisions (in addition to military). Effective August 28, 1999, a member may purchase up to four years of non-federal full-time Missouri public service, provided the member is not vested in another retirement system for that same service. | Purchase/Transfer Provisions (in addition to military). A member may purchase up to four years of non-federal full-time Missouri public service, provided the member is not vested in another retirement system for that same service. Local vested service credit granted after 10 years of state service if the other retirement plan agrees to transfer assets equal to the accrued liability to MOSERS. | May purchase qualifying public sector service at full actuarial cost. |

| MSEP<br>(Missouri State Employees' Plan) | MSEP 2000<br>(Missouri State Employees' Plan 2000) | MSEP 2011<br>(Missouri State Employees' Plan 2011) |
|---|---|---|
| **BackDROP**<br><br>To be eligible to participate in the BackDROP, a member must have been eligible to retire under normal retirement age and/or service conditions for at least two years. A retroactive starting date is established for BackDROP purposes which is the later of: 1) the member's normal retirement date or 2) five years prior to the annuity starting date under the retirement plan selected by the member.<br><br>A member may elect the BackDROP period for the accumulation of the BackDROP account in 12 month increments prior to their actual retirement date or back to the earliest possible date. This results in a BackDROP period of one to five years depending upon the individual situation.<br><br>A theoretical BackDROP account is accumulated that includes 90% of the value of the benefit payments that would have been paid during the BackDROP period had the member retired at the retroactive starting date with their respective option election. These payments include applicable post-retirement benefit increases. | Same as MSEP. | Not eligible for the BackDROP. |

| MSEP<br>(Missouri State Employees' Plan) | MSEP 2000<br>(Missouri State Employees' Plan 2000) | MSEP 2011<br>(Missouri State Employees' Plan 2011) |
|---|---|---|
| The member is paid the resulting lump sum value of the BackDROP account as of the annuity starting date or as three equal annual installments beginning at the annuity starting date.<br><br>The annuity benefit payable from the actual retirement date is computed with years of service and average pay as of the retroactive starting date for the BackDROP. Post-retirement benefit increases that occurred during the BackDROP period are applied in the calculation of the monthly annuity. | | |

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## ACTUARIAL METHODS

1. **Calculation of Normal Cost and Actuarial Accrued Liability:** The funding method used to determine the normal cost and actuarial accrued liability was the Entry Age Actuarial Cost Method described below.

   **Entry Age Actuarial Cost Method**

   Under the entry age normal cost method, the actuarial present value of each member's projected benefit is allocated on a level basis over the member's compensation between the entry age of the member and their assumed exit age. The portion of the actuarial present value allocated to the valuation year is called the normal cost. The actuarial present value of benefits allocated to prior years of service is called the actuarial accrued liability. The unfunded actuarial accrued liability represents the difference between the actuarial accrued liability and the actuarial value of assets as of the valuation date. The unfunded actuarial accrued liability is calculated each year and reflects experience gains/losses.

2. **Calculation of the Actuarial Value of Assets:** Calculation of the Actuarial Value of Assets (AVA): The Board adopted the current asset smoothing method effective with the June 30, 2018 valuation. Under this method, the difference between the actual and assumed investment return on the market value of assets is recognized evenly over a five-year period. No corridor is used with the new method. In addition, the total unrecognized investment experience as of June 30, 2017 will be recognized evenly over a seven-year period beginning June 30, 2018.

3. **Amortization of the Unfunded Actuarial Accrued Liability (UAAL):** Beginning with the June 30, 2018 valuation, the UAAL is amortized using a "layered" approach. Under this method, the "Legacy UAAL", as determined in the June 30, 2018 valuation, is amortized over a closed 30-year period. Effective June 30, 2021, subsequent changes in the UAAL due to actuarial gains/losses or assumption changes are separately financed by establishing amortization bases and payments, as a level percentage of payroll, over closed 25-year periods. Bases established prior to June 30, 2021 will continue to be amortized on their original schedule. Any change in the System's benefit structure shall be amortized over a closed period of 20 years, as set out in state statutes. The total UAAL amortization payment is the sum of the payments for each of the amortization bases.

   If the System has a negative UAAL (surplus), all prior amortization bases will be eliminated, and a new, single amortization base shall be established and funded over an open 30-year amortization period until the valuation indicates a positive UAAL exists. At that time, the amortization base shall be re-established equal to the amount of the UAAL and amortized over a closed 25-year period.

   On July 13, 2022, the State of Missouri made an additional contribution of $500 million to the MOSERS investment fund. This additional contribution will grow with investment returns in the future, and it will be reflected in the System's funded ratio and UAAL. However, the accumulated value of the additional contribution will not be reflected in the valuation assets when calculating the UAAL contribution rate.

### Changes in Methods and Assumptions since the Prior Year

There have been no changes since the prior valuation.

## ACTUARIAL ASSUMPTIONS

An experience study which analyzed the System's economic and demographic assumptions was performed in 2021 and the results were presented to the Board. The assumptions listed below are a result of that experience study. The next experience study is scheduled for 2026.

**Economic Assumptions**

1. Investment Return — 6.95%, compounded annually, net of investment expenses.

2. Inflation — 2.25% per year

3. Salary Increases — Rates vary by service. Sample rates are as follows:

| | Rates by Service | | | |
|---|---|---|---|---|
| Years | Inflation | Productivity | Merit | Total |
| 0 | 2.25% | 0.25% | 7.50% | 10.00% |
| 1 | 2.25 | 0.25 | 2.50 | 5.00 |
| 2 | 2.25 | 0.25 | 2.25 | 4.75 |
| 3 | 2.25 | 0.25 | 2.00 | 4.50 |
| 4 | 2.25 | 0.25 | 1.85 | 4.35 |
| 5 | 2.25 | 0.25 | 1.70 | 4.20 |
| 10 | 2.25 | 0.25 | 1.00 | 3.50 |
| 15 | 2.25 | 0.25 | 0.75 | 3.25 |
| 20 | 2.25 | 0.25 | 0.50 | 3.00 |
| 25+ | 2.25 | 0.25 | 0.25 | 2.75 |

General Assembly members have a flat 2.50% assumption.

For disabled members, salaries are assumed to be indexed at a rate of 2.50% per year.

4. Payroll Growth — 2.25% per year

5. Cost-of-Living Adjustment (COLA) — 4.00% on a compounded basis when a minimum COLA of 4.00% is in effect.

   1.80% on a compounded basis when no minimum COLA is in effect.

6. Interest on Member Contributions — 1.50% per year

7. Administrative Expenses — Actual prior year expenses, included in normal cost rate.

**Demographic Assumptions**

1. Mortality — The mortality assumption includes an appropriate level of conservatism that reflects expected future mortality improvement.

   a. Post-retirement (Retirees) — Pub-2010 General Members Below Median Healthy Retiree mortality table, scaled by 104%, set back two years for males and set forward one year for females. Mortality projected generationally from 2010 to 2020 using Scale MP-2020 and 75% of Scale MP-2020 for years after 2020.

   b. Post-retirement (Beneficiaries) — Pub-2010 General Members Below Median Contingent Survivor mortality table, set back two years for males and set forward one year for females. Mortality projected generationally from 2010 to 2020 using Scale MP-2020 and 75% of Scale MP-2020 for years after 2020.

   c. Pre-retirement — Pub-2010 General Members Below Median Employee mortality table, set back two years for males and set forward one year for females. Mortality projected generationally from 2010 to 2020 using Scale MP-2020 and 75% of Scale MP-2020 for years after 2020.

   d. Long-term disability — Pub-2010 Non-Safety Disabled Retiree mortality table, without mortality projection.

2. Retirement

**MSEP**

| Early Retirement | |
|---|---|
| Age | Rate |
| 55-56 | 1% |
| 57-59 | 2 |
| 60-61 | 8 |
| 62 | 25 |
| 63-64 | 5 |

| Unreduced Retirement | |
|---|---|
| Age | Rate |
| 48-61 | 17% |
| 62 | 21 |
| 63-64 | 17 |
| 65-66 | 30 |
| 67-69 | 25 |
| 70 | 40 |
| 71-77 | 25 |
| 78 | 100 |

**MSEP 2000**

| Early Retirement | |
|---|---|
| Age | Rate |
| 57-59 | 3% |
| 60-61 | 5 |

| Unreduced Retirement | |
|---|---|
| Age | Rate |
| 48-57 | 35% |
| 58-60 | 20 |
| 61 | 12 |
| 62 | 16 |
| 63 | 12 |
| 64 | 20 |
| 65 | 27 |
| 66 | 30 |
| 67-69 | 25 |
| 70 | 30 |
| 71-77 | 25 |
| 78 | 100 |

**MSEP 2011**

| Early Retirement | |
|---|---|
| Age | Rate |
| 62-64 | 10% |
| 65 | 15 |
| 66 | 20 |

| Unreduced Retirement | |
|---|---|
| Age | Rate |
| 55-57 | 40% |
| 58-66 | 15 |
| 67-77 | 20 |
| 78 | 100 |

3. Termination

**General Employees**

| Sample Rates | |
|---|---|
| Service | Rate |
| 1 | 27.00% |
| 5 | 12.75 |
| 10 | 7.00 |
| 15 | 4.30 |
| 20 | 2.25 |
| 25 | 1.25 |

**Elected Officials and Legislators**

| Service | Rate |
|---|---|
| 0-3 | 5.00% |
| 4-7 | 12.00 |
| 8+ | 35.00 |

4. Disability

| Sample Rates | |
|---|---|
| Age | Rate |
| 25 | 0.03% |
| 30 | 0.07 |
| 35 | 0.11 |
| 40 | 0.22 |
| 45 | 0.32 |
| 50 | 0.43 |
| 55 | 0.54 |
| 60 | 0.59 |
| 65 | 0.64 |

**Other Assumptions**

| | |
|---|---|
| 1. Form of Payment | MSEP – 50% joint and survivor<br>MSEP 2000 and MSEP 2011 – Straight life annuity |
| 2. Marital Status | |
| a. Percent married | 65% married at retirement, 50% of those dying in active service are married. |
| b. Spouse's age | Females assumed to be three years younger than males. |
| 3. Pre-Retirement Death | 2% of pre-retirement deaths are assumed to be duty related. |
| 4. Pay Increase Timing | Beginning of the fiscal year. |
| 5. Decrement Timing | Decrements of all types are assumed to occur mid-year. |
| 6. Eligibility Testing | Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur. |
| 7. Benefit Service | Exact fractional service is used to determine the amount of the benefit payable. |
| 8. Decrement Relativity | Decrement rates are used directly from the experience study, without adjustment for multiple decrement table effects. |
| 9. Decrement Operation | Disability and withdrawal do not operate during normal retirement eligibility. |
| 10. Other Liability Adjustments | Pre-Retirement Survivor Benefits for Spouse of Terminated Vested Member |

| Age | Male/Female |
|---|---|
| <30 | 1.56/1.42 |
| 30-39 | 1.26/1.20 |
| 40-49 | 1.11/1.08 |
| >=50 | 1.02/1.02 |

These factors are used to estimate the cost of immediate unreduced survivor annuities upon the death of a vested member under the MSEP and MSEP 2000 plans.

| | |
|---|---|
| 11. Incidence of Contributions | Contributions are assumed to be received continuously throughout the year based upon the computed percent of payroll shown in this report, and the actual payroll payable at the time contributions are made. New entrant normal cost contributions are applied to the funding of new entrant benefits. |
| 12. MSEP 2000 Election | All regular state employees hired on or before June 30, 2000 are assumed to elect MSEP 2000 prior to age 62 if eligible for the benefit and MSEP on or after age 62. Elected Officials, General Assembly, and Uniformed Water Patrol Members hired before July 1, 2000 are assumed to elect MSEP at retirement. |
| 13. Service Adjustment | It is assumed that each member will be granted months of service credit for unused leave and military service purchases at retirement in the following amounts:<br><br><u>MSEP / MSEP 2000</u><br><br>7 months (4 months of unused leave; 3 months of military service purchases)<br><br><u>MSEP 2011</u><br><br>5 months (5 months of unused leave; not eligible for military service purchases) |
| 14. Forfeitures | For MSEP 2011 members only: Value the greater of the refund amount or the present value of the deferred benefit. |
| 15. Salary and Benefit Limits | For purposes of the valuation, no limits were applied to member compensation or benefits. |
| 16. Commencement age for deferred vested benefit | Normal Retirement Date |

### Data Adjustments

Active and retired member data was reported as of May 31, 2023. It was brought forward to June 30, 2023 by adding one month of service for all active members, one month of contributions and interest for MSEP 2011 members, and the June COLA for certain retired members. Financial information continues to be reported as of June 30. This procedure was instituted to provide sufficient time for the Board of Trustees to certify the appropriate contribution rate prior to the October 1 statutory deadline.

Active members reported with less than a $100 annualized salary were assumed to receive the average active member pay. As a result, there are 52 active members in the June 30, 2023 data whose salary is assumed to be $51,750.

When the option of choosing plans is available, terminated vested members are reported with two records, one with benefits under the MSEP plan and one with benefits under the MSEP 2000 plan. Because it is unknown what the member will elect at retirement, both records are valued and the plan that produces the higher present value of future benefits is used for valuation purposes.

For any retired member who has elected a joint and survivor benefit yet has no beneficiary date of birth provided, it was assumed that the beneficiary is 3 years younger for male retirees and 3 years older for female retirees.

## TECHNICAL VALUATION PROCEDURES

### ***Other Valuation Procedures***

Salary increases are assumed to apply to annual amounts.

Decrements are assumed to occur mid-year, except that immediate retirement is assumed for those who are at or above the age at which retirement rates are 100%.

No actuarial liability is included for participants who terminated without being vested prior to the valuation date, except those due a refund of contributions.

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| | |
|---|---|
| **Actuarial Accrued Liability** | The difference between the actuarial present value of system benefits and the actuarial value of future normal costs. Also referred to as "accrued liability" or "actuarial liability". |
| **Actuarial Assumptions** | Estimates of future experience with respect to rates of mortality, disability, turnover, retirement, rate or rates of investment income and salary increases. Decrement assumptions (rates of mortality, disability, turnover and retirement) are generally based on past experience, often modified for projected changes in conditions. Economic assumptions (salary increases and investment income) consist of an underlying rate in an inflation-free environment plus a provision for a long-term average rate of inflation. |
| **Accrued Service** | Service credited under the system which was rendered before the date of the actuarial valuation. |
| **Actuarial Equivalent** | A single amount or series of amounts of equal actuarial value to another single amount or series of amounts, computed on the basis of appropriate assumptions. |
| **Actuarial Cost Method** | A mathematical budgeting procedure for allocating the dollar amount of the actuarial present value of retirement system benefit between future normal cost and actuarial accrued liability. Sometimes referred to as the "actuarial funding method". |
| **Experience Gain (Loss)** | The difference between actual experience and actuarial assumptions anticipated experience during the period between two actuarial valuation dates. |
| **Actuarial Present Value** | The amount of funds currently required to provide a payment or series of payments in the future. It is determined by discounting future payments at predetermined rates of interest and by probabilities of payment. |
| **Amortization** | Paying off an interest-discounted amount with periodic payments of interest and principal, as opposed to paying off with lump sum payment. |
| **Normal Cost** | The actuarial present value of retirement system benefits allocated to the current year by the actuarial cost method. |
| **Unfunded Actuarial Accrued Liability** | The difference between actuarial accrued liability and the valuation assets. Sometimes referred to as "unfunded actuarial liability" or "unfunded accrued liability".<br><br>Most retirement systems have unfunded actuarial accrued liability. They arise each time new benefits are added and each time an actuarial loss is realized. |

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