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MISSOURI STATE EMPLOYEES' RETIREMENT SYSTEM

ACTUARIAL VALUATION REPORT AS OF JUNE 30, 2022

CONTRIBUTION RATE FOR FISCAL YEAR ENDING JUNE 30, 2024

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September 13, 2022

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, 2022 for the purpose of determining the employer required contribution rate for the fiscal year ending June 30, 2024. 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, 2022. There have been no changes to the plan provisions or actuarial assumptions since the prior valuation.

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, which is after the valuation date of June 30 and therefore not reflected in the asset values in the current valuation. At the Board's direction, the additional contribution of $500 million will be excluded from the valuation assets when calculating the actuarial required contribution rate. It will, however, be reflected in the valuation assets in future valuations for calculations of the funded ratio and unfunded actuarial accrued liability.

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 appropriate actuarial models that were developed for this purpose. These models use 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; changes in economic or demographic assumptions; increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as the end of an amortization period or additional cost or contribution requirements based on the plan's funded 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 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, 2022 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, 2024;
- 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, 2022;
- 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.

Changes Since the Prior Valuation

There have been no changes to the benefit provisions or actuarial assumptions since the prior valuation. However, 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, which is after the valuation date of June 30 and therefore not reflected in the asset values in the current valuation. In calculating the actuarial contribution rate, the unfunded actuarial accrued liability (UAAL) contribution rate, calculated in the current valuation, is determined by amortizing the UAAL, projected to June 30, 2023, using the layered amortization method. At the Board's direction, the additional contribution of $500 million will be excluded from the valuation assets when calculating the UAAL contribution rate which then impacts the actuarial required contribution rate. As a result, the additional contribution had no impact on the current valuation results. It will be reflected in the valuation assets in future valuations for calculations of the funded ratio and unfunded actuarial accrued liability. 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, 2022. A summary of the key results, compared to the prior valuation, is shown in the following table.

	June 30, 2022	June 30, 2021
Unfunded Actuarial Accrued Liability ($M)	$6,515	$6,201
Funded Ratio (Actuarial Assets)	57.72%	58.96%
Normal Cost Rate	8.81%	8.83%
UAAL Amortization Rate	20.49%	19.38%
Total Actuarial Required Contribution Rate	29.30%	28.21%
Member Contribution Rate	(2.04%)	(1.88%)
Employer Contribution Rate	27.26%	26.33%

Experience Impacting the June 30, 2022 Valuation

The key factors impacting the 2022 valuation results include:

- The net rate of return on the market value of assets for fiscal year 2022 was -9.0%, 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 5.1%. This is lower than the assumed return of 6.95% so there was an actuarial loss on assets of $163 million. This increased the unfunded actuarial accrued liability as well as the actuarial required contribution rate (by 0.56%).

- There was a net liability loss of $30 million for fiscal year 2022, 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 were partially offset by an actuarial gain resulting from more deaths than expected, based on actuarial assumptions. The net liability loss increased the UAAL and increased the actuarial required contribution rate (by 0.10%).

- There was a decline of 2.9% in the number of active members in the 2022 valuation (41,595 compared to 42,829 in the prior valuation), continuing the general trend over the last 10-15 years. The decline in active membership has a material impact on the actuarial contribution rate because the contribution on the unfunded actuarial accrued liability (UAAL) is developed based on the assumption that covered payroll will increase 2.25% each year in the future. When the active population declines, covered payroll does not increase as expected so the UAAL contribution rate increases (dollar amount of UAAL payment is divided by smaller payroll). Due to larger salary increases than assumed, total covered payroll was relatively flat from the 2021 to the 2022 valuation. The increase in the actuarial required contribution rate from the actual versus expected covered payroll was 0.32%.

- 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. The number of active members covered by the MSEP 2011 Plan increased from 22,369 in the 2021 valuation to 23,304 in the 2022 valuation, and the percentage of total active members in MSEP 2011 increased from 52% to 56%. The normal cost rate decreased by 0.02% and the effective member contribution rate increased by 0.16% which both served to reduce the actuarial required 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.

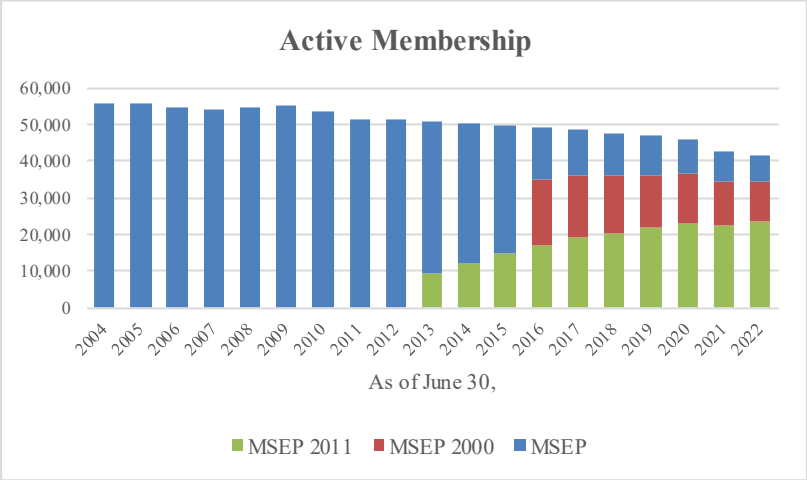
Actual Experience for the Last Plan Year

Numerous factors contributed to the change in the MSEP assets, liabilities, and actuarial required contribution rate between June 30, 2021 and June 30, 2022. The components are examined in the following discussion.

Membership

There was a decline of 2.9% in the number of active members in the current valuation (41,595 compared to 42,829 in the prior valuation). As shown in the following graph, the active membership has declined about 26% over the last 18 years from 55,914 active members in the 2004 valuation to 41,595 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 actives covered by the MSEP or MSEP 2000 Plans leave covered employment and are replaced by new hires. However, the growth in the number of MSEP 2011 members has been limited by the decline in active membership. The number of active members covered by the MSEP 2011 Plan increased from 22,369 in the 2021 valuation to 23,304 in the 2022 valuation, and the percentage of the overall active population grew from 52% to 56%. 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 52,223 last year to 53,648 in the current valuation. In addition, the average benefit amount for this group increased by 2.2%, which is also expected.

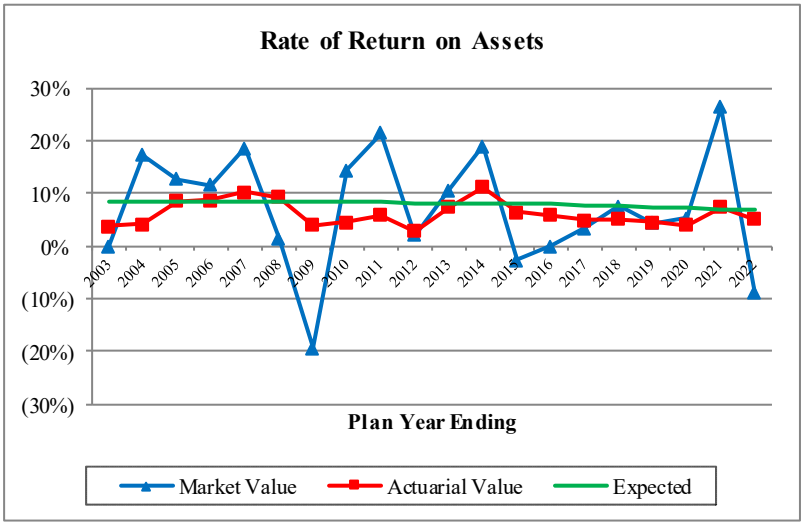
System Assets

As of June 30, 2022, MSEP had net assets of $8.248 billion, when measured on a market value basis, a decrease of $1.272 billion from the value of $9.520 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.

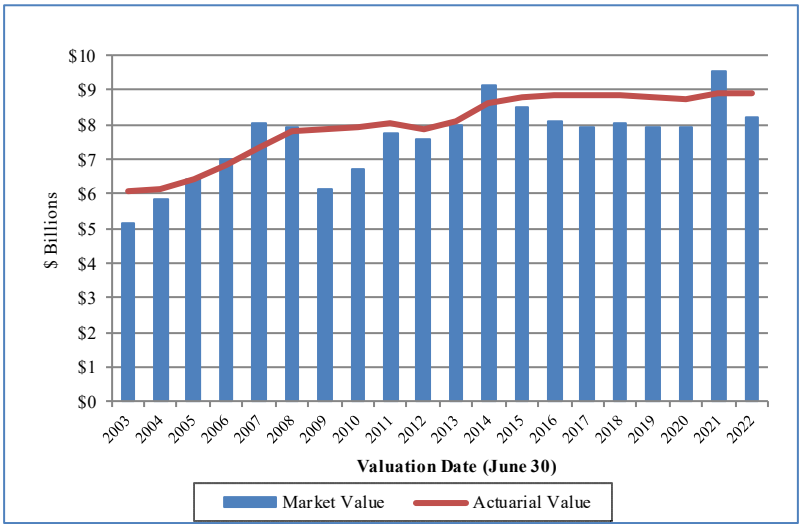
In the current valuation, the actuarial value of assets for MSEP is $8.894 billion, a decrease of $15 million from the prior year. The components of the change in the asset values are shown in the following table.

	Market Value ($M)		Actuarial Value ($M)	
Net Assets, June 30, 2021	$	9,519.93	$	8,909.25
- Employer and Member Contributions	+	516.73	+	516.73
- Miscellaneous Income	+	0.01	+	0.01
- Benefit Payments	-	962.59	-	962.59
- Net Investment Income	-	816.42	+	440.18
- Administrative Expenses	-	9.25	-	9.25
Net Assets, June 30, 2022	$	8,248.41	$	8,894.33
Estimated Net Rate of Return		(9.0%)		5.1%

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 2022 was 5.1%, 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 $163 million. The investment return on the market value of assets for the year ending June 30, 2022 of -9.0%, as reported by MOSERS, was well below the assumed rate of return. As a result, it produced an investment income shortfall for the year ended June 30, 2022 of $1.462 billion. There is currently a net deferred investment loss of $646 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, 2022 in the following table:

	Actuarial Value of Assets	Market Value of Assets
Actuarial Accrued Liability	$15,408,995,032	$15,408,995,032
Value of Assets	8,894,328,756	8,248,414,597
Unfunded Actuarial Accrued Liability	$6,514,666,276	$7,160,580,435
Funded Ratio	57.72%	53.53%

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

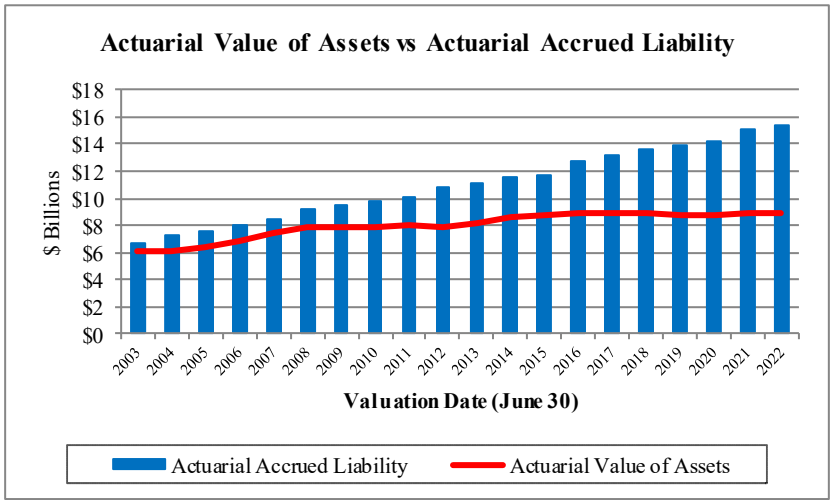
The net change in the UAAL from June 30, 2021 to June 30, 2022 was an increase of $313.3 million. The components of this net change are shown in the following table:

	($ Millions)
Unfunded Actuarial Accrued Liability, June 30, 2021	$6,201.4
- Expected increase due to amortization method	81.1
- Investment experience	163.5
- Liability experience	30.1
- Data/Programming Refinement	41.7
- Other experience	(3.1)
Unfunded Actuarial Accrued Liability, June 30, 2022	$6,514.7

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 less than the interest on the UAAL. As a result, even if all assumptions are met the dollar amount of the UAAL is expected to increase 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 $193.5 million, the combined result of an actuarial loss of $30.1 million on System liabilities and a $163.5 million 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, 2022. The most significant sources of loss were due to larger salary increases and higher cost-of-living adjustments (COLAs) for retirees and beneficiaries than expected. There was also an increase in the UAAL due to data and programming refinements. Programming was adjusted to better reflect the "pop-up" provision (benefit increases if the joint annuitant dies before the member) for all eligible members. Also, new data fields were received from the System to allow a more accurate reflection of when MSEP members switch from the Formula 1 COLA to the Formula 2 COLA. The net impact of all refinements was a $41.7 million increase in the UAAL. A breakdown of the components of actuarial gains and losses can be found in Table 7 of this report.

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.

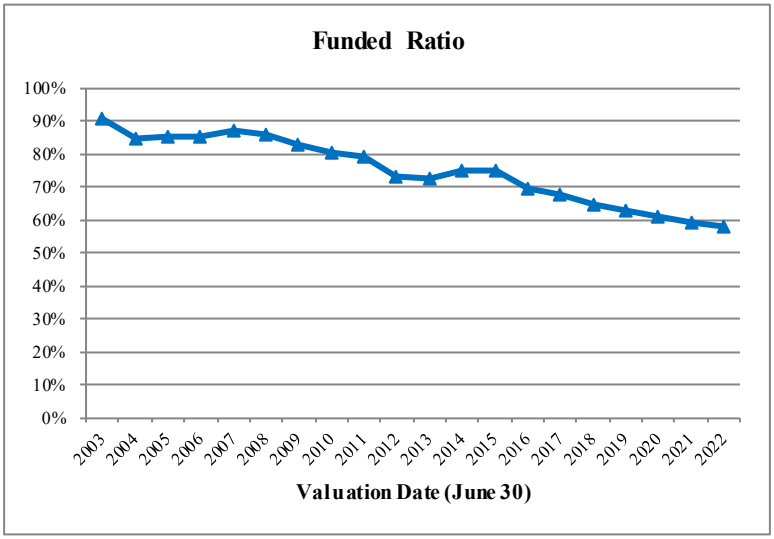


An evaluation of the UAAL on a pure dollar basis may not provide a complete analysis since only the difference between the assets and liabilities (which are both very large numbers) is reflected. Another way to evaluate the UAAL and the progress made in its funding is to track the funded ratio, the ratio 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).

	6/30/2017	6/30/2018	6/30/2019	6/30/2020	6/30/2021	6/30/2022
Using Actuarial Value of Assets:						
- Funded Ratio	67.5%	64.9%	62.9%	61.1%	59.0%	57.7%
- UAAL ($M)	$4,280	$4,782	$5,175	$5,547	$6,201	$6,515
Using Market Value of Assets:						
- Funded Ratio	60.4%	59.0%	56.7%	55.5%	63.0%	53.5%
- UAAL ($M)	$5,207	$5,578	$6,041	$6,348	$5,591	$7,161

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.

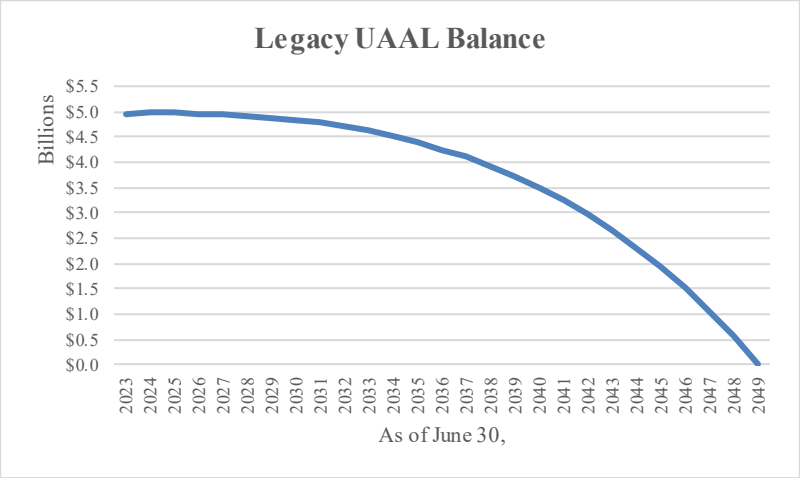
Actuarial Required Contribution Rate

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. This additional contribution will change with actual investment earnings in the future. While it 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.

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:



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

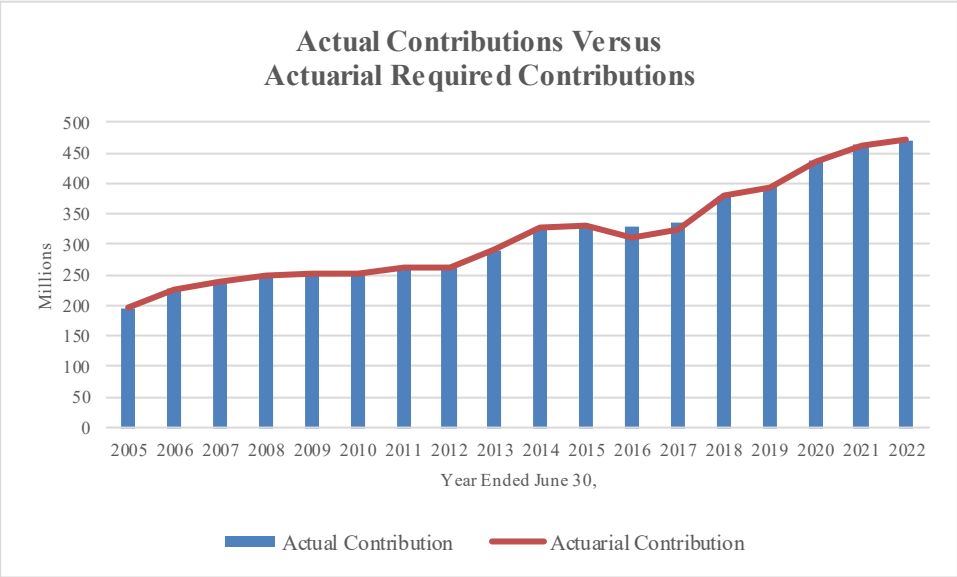
Actuarial Required Contribution Rates	June 30 Valuation 2022	2021
1. Normal Cost Rate	8.81%	8.83%
2. UAAL Contribution Rate	20.49%	19.38%
3. Total Actuarial Required Contribution Rate	29.30%	28.21%
4. Member Contribution Rate	(2.04%)	(1.88%)
5. Employer Contribution Rate	27.26%	26.33%

The total actuarial contribution rate in the June 30, 2022 valuation is 29.30%. The member contribution rate (as a percentage of total covered payroll) is anticipated to be 2.04%, resulting in an employer contribution rate for the fiscal year ending June 30, 2024 of 27.26%.

The following table shows the reconciliation of the Employer Contribution Rate from the June 30, 2021 to the June 30, 2022 valuation:

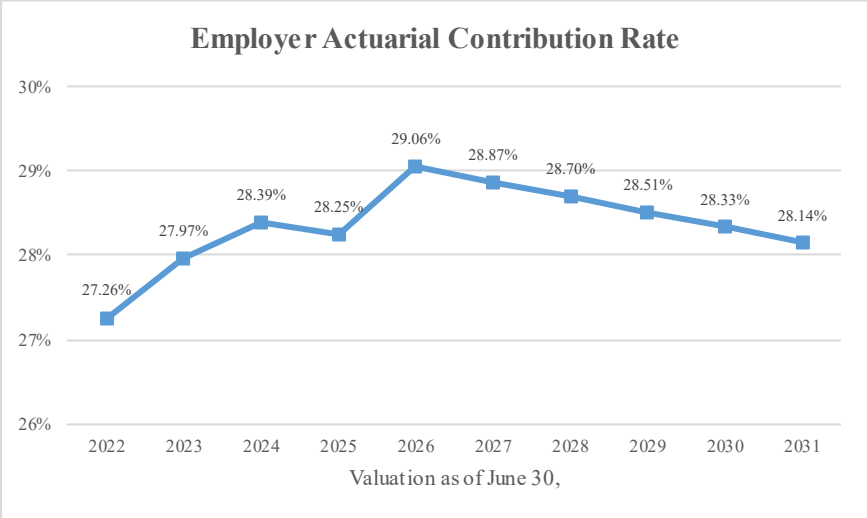
	% of Payroll
6/30/2021 Employer Contribution Rate	**26.33%**
Asset (Gain)/Loss	0.56%
Liability (Gain)/Loss	0.10%
Data/Programming Refinement	0.22%
Projected Payroll Lower than Expected	0.32%
Change in Normal Cost Rate	(0.02%)
Change in Effective Member Contribution Rate	(0.16%)
Other Experience	(0.09%)
6/30/2022 Employer Contribution Rate	**27.26%**

Historically, MOSERS employers have contributed the full actuarial contribution as shown in the graph below which compares the actuarially required contribution and actual contribution amounts:



The actuarially required 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 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 over the next ten years reflects the impact due to the recognition of the current deferred investment experience ($646 million loss). Once the deferred investment experience is recognized, the employer contribution rate begins to decline due to the normal cost rate decreasing from more MSEP 2011 members in the System as well as increases in the effective employee contribution rate.



The net deferred investment loss (actuarial value of assets minus the market value) is $646 million as of June 30, 2022. 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, 2022 actuarial valuation using both the actuarial and market value of assets (see table below):

	Using Actuarial Value of Assets	Using Market Value of Assets
Actuarial Accrued Liability	$15,408,995,032	$15,408,995,032
Asset Value	(8,894,328,756)	(8,248,414,597)
Unfunded Actuarial Accrued Liability	$6,514,666,276	$7,160,580,435
Funded Ratio	57.7%	53.5%
Normal Cost Rate	8.81%	8.81%
UAAL Contribution Rate	20.49%	22.69%
Total Actuarial Required Contribution Rate	29.30%	31.50%
Member Contribution Rate	(2.04%)	(2.04%)
Employer Contribution Rate	27.26%	29.46%

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 Contribution for Fiscal Year Ending	June 30, 2022 June 30, 2024	June 30, 2021 June 30, 2023	% Change
Employer Contribution			
Annual Amount (Estimated)	$576.3	$552.7	4.3%
Percentage of Covered Payroll	27.26%	26.33%	3.5%
Projected Payroll for FYE 2024 and 2023	$2,114	$2,099	0.7%
Benefit Payments During Prior Year	$963	$920	4.7%
Membership			
Number of			
- Active Members	41,595	42,829	(2.9%)
- Retirees and Beneficiaries	53,648	52,223	2.7%
- Terminated Vested Members	17,438	16,959	2.8%
- Leave-of-Absence Members	115	191	(39.8%)
- Long Term Disability Members	599	613	(2.3%)
- Terminated Nonvested Members	28,444	25,613	11.1%
- Total	141,839	138,428	2.5%
- Reported Payroll	$1,973	$1,962	0.6%
Assets			
Market Value (MVA)	$8,248	$9,520	(13.4%)
Actuarial Value (AVA)	$8,894	$8,909	(0.2%)
Ratio - Actuarial Value to Market Value	107.83%	93.58%	
Return on Market Value*	(9.0%)	26.4%	
Return on Actuarial Value	5.1%	7.3%	
Actuarial Information			
Actuarial Accrued Liability (AAL)	$15,409	$15,111	2.0%
Unfunded Actuarial Accrued Liability (UAAL)	$6,515	$6,201	5.1%
Funded Ratio (Actuarial Value of Assets)	57.7%	59.0%	(2.2%)
Ratio of AVA to Reported Payroll	4.5	4.5	
Ratio of AAL to Reported Payroll	7.8	7.7	
Normal Cost Rate	8.81%	8.83%	(0.2%)
UAAL Contribution Rate	20.49%	19.38%	5.7%
Total Actuarial Required Contribution Rate	29.30%	28.21%	3.9%
Member Contribution Rate	(2.04%)	(1.88%)	8.5%
Employer Contribution Rate	27.26%	26.33%	3.5%

* As reported by MOSERS.

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This report presents the actuarial valuation results of the Missouri State Employees' Retirement System as of June 30, 2022. 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.

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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, 2022. 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, 2021 and ending June 30, 2022.

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 1
ASSET SUMMARY

	Market Value	Actuarial Value
1. Assets at June 30, 2021	9,519,930,080	8,909,251,051
2. Contributions		
State Contributions	471,302,256	471,302,256
Employee Contributions	39,809,873	39,809,873
Member Purchases of Service Credit	2,119,195	2,119,195
Service Transfer Contributions	3,494,626	3,494,626
Total	516,725,950	516,725,950
3. Investment Income, Net of Investment Expenses	(816,407,543)	440,185,645
4. Miscellaneous Income	5,852	5,852
5. Benefit Payments and Transfers Out		
Monthly Benefit Payments	868,805,239	868,805,239
BackDROP and Lump Sum Payments	80,000,613	80,000,613
Inactive Vested Lump Sum Payments	695,778	695,778
Service Transfer Payments	4,672,072	4,672,072
Contribution Refunds	8,417,124	8,417,124
Total	962,590,826	962,590,826
6. Administrative and Misc. Expenses	9,248,916	9,248,916
7. Assets at June 30, 2022 (1) + (2) + (3) + (4) - (5) - (6)	8,248,414,597	8,894,328,756
8. Rate of Return, Net of Investment Expenses*	(9.0%)	5.1%

* 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,	2018	2019	2020	2021	2022
A. Market Value of Assets, Beginning of Year	$ 7,941,650,400	$ 8,034,508,424	$ 7,916,465,279	$ 7,910,830,533	$ 9,519,930,080
B. Contributions During Year	413,179,927	429,323,185	476,091,401	504,683,875	516,725,950
C. Miscellaneous Income	0	0	0	80,121	5,852
D. Benefit Payments and Expenses During Year	896,510,729	861,022,406	882,214,402	928,655,535	971,839,742
E. Expected Rate of Return	7.50%	7.25%	7.10%	6.95%	6.95%
F. Expected Net Investment Income	577,826,541	567,126,565	547,898,876	535,319,903	646,085,772
G. Expected Market Value of Assets, End of Year	8,036,146,139	8,169,935,768	8,058,241,154	8,022,258,897	9,710,907,912
H. Market Value of Assets, End of Year	8,034,508,424	7,916,465,279	7,910,830,533	9,519,930,080	8,248,414,597
I. Excess/(Shortfall) of Net Investment Income	$ (1,637,715)	$ (253,470,489)	$ (147,410,621)	$ 1,497,671,183	$ (1,462,493,315)

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)	(529,727,744)	(132,431,936)	*	(264,863,870)
6/30/2018	(1,637,715)	(1,310,172)	(327,543)		0
6/30/2019	(253,470,489)	(152,082,294)	(50,694,098)		(50,694,097)
6/30/2020	(147,410,621)	(58,964,248)	(29,482,124)		(58,964,249)
6/30/2021	1,497,671,183	299,534,237	299,534,237		898,602,709
6/30/2022	(1,462,493,315)	0	(292,498,663)		(1,169,994,652)
Total	(1,294,364,507)	(442,550,221)	(205,900,127)		(645,914,159)

A. Market Value of Assets as of June 30, 2022	$	8,248,414,597
B. Total Deferred Investment Experience	$	(645,914,159)
C. Actuarial Value of Assets as of June 30, 2022 (A. - B.)	$	8,894,328,756
D. Ratio of Actuarial Value to Market Value		107.8%

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

In the previous section, an analysis of System's current assets was given as of June 30, 2022. In this section, the discussion will focus on the commitments (future benefit payments) of the System, which are referred to as its liabilities.

Table 3 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 3 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 4). 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, 2022, as amended by any legislation in the 2022 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 5 contains the actuarial balance sheet for the System. The Entry Age Normal actuarial cost method is used to develop the actuarial accrued liability. Tables 6 and 7 show the gain/(loss) analysis in total and by source for the System. Table 8 shows historical data for gain/(loss) experience by source.

TABLE 3
UNFUNDED ACTUARIAL ACCRUED LIABILITY
As of June 30, 2022

	(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	$5,510,691,860	$702,441,507	$4,808,250,353
Disability benefits likely to be paid to present active members who become totally and permanently disabled	102,953,045	58,768,817	44,184,228
Survivor benefits likely to be paid to widows and children of present active members who die before retiring	60,632,750	17,539,552	43,093,198
Separation benefits likely to be paid to present active members	378,012,536	288,046,311	89,966,225
Active Member Totals	$6,052,290,191	$1,066,796,187	$4,985,494,004
Members on Leave of Absence & LTD			
Service retirement benefits based on service rendered before the valuation date			72,118,749
Terminated Vested Members			
Service retirement benefits based on service rendered before the valuation date			847,197,428
Retired Lives			9,463,674,203
Pending Refunds			40,510,648
Total Actuarial Accrued Liability			$15,408,995,032
Actuarial Value of Assets			8,894,328,756
Unfunded Actuarial Accrued Liability			$6,514,666,276
Funded Ratio			57.7%

TABLE 4
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)
2023	4,965	26	327
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 5
ACTUARIAL BALANCE SHEET

ASSETS		
Actuarial Value of Assets		$ 8,894,328,756
Unfunded Actuarial Accrued Liability		6,514,666,276
Present Value of Future Normal Costs		1,066,796,187
Total Assets		$ 16,475,791,219
LIABILITIES		
Present Value of Future Benefits		
Active members		
Retirement	$ 5,510,691,860	
Withdrawal	378,012,536	
Death	60,632,750	
Disability	102,953,045	
Total		$ 6,052,290,191
Inactive members		
Currently receiving benefits	9,463,674,203	
Not currently receiving benefits	959,826,825	
Total		$ 10,423,501,028
Total Liabilities		$ 16,475,791,219

TABLE 6
ANALYSIS OF GAIN/(LOSS)

	(1) Actuarial Accrued Liabilities	(2) Valuation Assets	(3) = (1) - (2) UAAL
(1) Value at Start of Year	$ 15,110,646,537	8,909,251,051	$ 6,201,395,486
(2) Total Normal Cost From Last Valuation	155,316,052	0	155,316,052
(3) Actual Contributions (Employer and Member)	0	511,112,129	(511,112,129)
(4) Miscellaneous Income	0	5,852	(5,852)
(5) Benefit Payments	(962,590,826)	(962,590,826)	0
(6) Administrative Expenses	0	(9,248,916)	9,248,916
(7) Service Purchases/Transfers	5,613,821	5,613,821	0
(8) Interest on (1) through (7) at 6.95%	1,028,288,007	603,643,580	424,644,427
(9) Expected Value Before Changes	$ 15,337,273,591	$ 9,057,786,691	$ 6,279,486,900
(10) Data/Programming Refinement	41,659,013	0	41,659,013
(11) Expected Value After Changes: (9) + (10)	$ 15,378,932,604	$ 9,057,786,691	$ 6,321,145,913
(12) Actual Value at End of Year	15,408,995,032	8,894,328,756	6,514,666,276
(13) Gain / (Loss)	$ (30,062,428)	$ (163,457,935)	$ (193,520,363)
(14) Gain / (Loss) as Percent of Expected Actuarial Accrued Liability: $15,337,273,591	(0.2%)	(1.1%)	(1.3%)

TABLE 7
GAIN/(LOSS) ANALYSIS BY SOURCE

Type of Activity	Gain or (Loss) for Year Ended 6/30/2022	
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.	($500,000)	(0.0%)
Death-in-Service Benefits. If survivor claims are less than assumed, there is a gain. If more claims, there is a loss.	10,700,000	0.1%
Withdrawal From Employment. If more liabilities are released by withdrawals than assumed, there is a gain. If smaller releases, a loss.	12,900,000	0.1%
Long Term Disability. The occurrence of a gain or loss depends upon the age at disability and the incidence of disability.	(1,100,000)	(0.0%)
Salary Increases. If there are smaller salary increases than assumed, there is a gain. If greater increases, a loss.	(26,700,000)	(0.2%)
Investment Income. If there is greater investment return on assets than assumed, there is a gain. If less return, a loss.	(163,500,000)	(1.1%)
Retiree Mortality. If more deaths than assumed, there is a gain. if fewer deaths, a loss.	22,900,000	0.1%
COLAs. If Cost of Living Adjustments are less than expected, a gain; if more a loss.	(32,400,000)	(0.2%)
Other. Miscellaneous gains and losses resulting from data adjustments, timing of financial transactions, valuation methods, etc.	(15,800,000)	(0.1%)
Gain (or Loss) During Year From Experience	($193,500,000)	(1.3%)

TABLE 8
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			
1998	(56.9)	325.9	9.6	0.2	(0.3)	(1.7)	16.3		(48.3)	244.8	5.5	4,484
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**

* 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 5 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, 2022 actuarial valuation will be used to determine the employer contribution rate for the plan year ending June 30, 2024. 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 9 shows the development of the June 30, 2023 projected UAAL used to develop the UAAL contribution rate. In Table 10, the amortization payment related to the UAAL is developed. Table 11 develops the computed employer contribution rate for the Plan and the estimated amount of required State contributions. Table 12 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 9
PROJECTED UAAL AS OF JUNE 30, 2023

(1) Unfunded Actuarial Accrued Liability at June 30, 2022	$6,514,666,276
(2) Expected Contribution Rate for Year Ending June 30, 2023*	28.21%
(3) Normal Cost Rate for Year Ending June 30, 2023	8.81%
(4) Contribution Rate Applied to UAAL [(2) - (3)]	19.40%
(5) Projected Payroll for the Year After the Valuation Date	$2,067,548,666
(6) Expected UAAL Contribution [(4) * (5)]	$401,104,441
(7) Interest on (1) and (6) to June 30, 2023 at 6.95%	$439,065,039
(8) Projected UAAL at June 30, 2023 [(1) - (6) + (7)]	$6,552,626,874

*The Expected Contribution Rate for FYE 2023 is equal to the employer rate of 26.33% plus the weighted average member rate of 1.88% of payroll from the June 30, 2021 valuation.

TABLE 10
UAAL CONTRIBUTION RATE

Amortization Base	Original Amount	Remaining Payments	Projected June 30, 2023 Balance	Annual Payment*
2018 Legacy UAAL	$ 4,861,507,879	26	$ 4,964,996,865	$ 327,423,886
2019 Assumption Changes	74,340,841	27	75,531,738	4,884,234
2019 Experience Base	259,714,456	27	263,874,929	17,063,383
2020 Assumption Changes	124,766,739	28	126,140,847	8,008,046
2020 Experience Base	196,930,919	28	199,099,800	12,639,841
2021 Assumption Changes	515,859,705	24	515,785,670	35,521,003
2021 Experience Base	152,907,202	24	152,885,257	10,528,865
2022 Experience Base	$ 254,311,768	25	254,311,768	17,126,032
Total			**$ 6,552,626,874**	**$ 433,195,290**

* Payment amount reflects mid-year timing.

1. Total UAAL Amortization Payments	$	433,195,290
2. Expected Payroll for FYE 2024	$	2,114,068,511
3. UAAL Amortization Payment Rate (1) / (2)		20.49%

TABLE 11
COMPUTED EMPLOYER CONTRIBUTION RATE FOR THE FISCAL YEAR ENDING JUNE 30, 2024

ACTUARIAL VALUATION RESULTS AS OF JUNE 30, 2022

	Percent of Payroll		
	MSEP & MSEP 2000	MSEP 2011	Weighted Average
A. Normal Cost			
(1) Service retirement benefits	6.30 %	4.91 %	5.58 %
(2) Termination benefits	1.82	2.52	2.18
(3) Survivor benefits	0.11	0.16	0.14
(4) Disability benefits	0.46	0.46	0.46
(5) Administrative expenses	0.45	0.45	0.45
(6) Total	9.14	8.50	8.81
B. Less Member Contributions	0.00	4.00	2.04
C. Employer Normal Cost [A(6) - B]	9.14	4.50	6.77
D. Unfunded Actuarial Accrued Liabilities (UAAL) (level percent-of-payroll amortization with layered bases)			20.49
E. EMPLOYER CONTRIBUTION RATE [C. + D.]			**27.26 %**
F. ESTIMATED EMPLOYER CONTRIBUTION ($Millions)#			**$576.3**

Illustrative only. Estimated employer contribution amounts (shown in millions) are based on the greater of the Total Computed Employer Contribution Rate and the Policy Minimum 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 12
EARLY PAYMENT AMOUNTS BY DEPARTMENT FOR FISCAL YEAR 2024
(UAAL CONTRIBUTION RATE: 20.49% 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. 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.

				One-Time Payment, Adjusted for Expected Payroll Contributions to Date:			
Department	Expected Payroll for FY 2024	Total FY 2024 UAAL Payments	FY 2024 UAAL Contribution Rate	July 15*	September 1**	November 1***	Additional Payroll Contributions
State of Missouri	1,767,046,471	362,086,756	20.49%	351,105,887	295,056,009	238,703,021	6.77%
Environmental Improvement & Energy Resource Authority	345,989	70,897	20.49%	68,747	57,772	46,738	6.77%
Missouri Agriculture & Small Business Development Authority	150,202	30,778	20.49%	29,845	25,080	20,290	6.77%
Missouri Consolidated Health Care Plan (MCHCP)	3,059,364	626,896	20.49%	607,884	510,843	413,277	6.77%
Missouri Development Finance Board	537,842	110,210	20.49%	106,868	89,808	72,655	6.77%
Missouri Housing Development Commission	8,418,316	1,725,003	20.49%	1,672,689	1,405,665	1,137,195	6.77%
Missouri Public Entity Risk Management Fund	808,091	165,587	20.49%	160,565	134,933	109,162	6.77%
Missouri Technology Corporation	55,467	11,366	20.49%	11,021	9,262	7,493	6.77%
Missouri Wine and Grape Board	316,197	64,792	20.49%	62,827	52,797	42,714	6.77%
Harris Stowe State University	9,944,648	2,037,765	20.49%	1,975,966	1,660,527	1,343,382	6.77%
Lincoln University	15,018,547	3,077,461	20.49%	2,984,132	2,507,751	2,028,793	6.77%
Missouri Southern State University	18,320,766	3,754,121	20.49%	3,640,271	3,059,145	2,474,877	6.77%
Missouri State University	104,281,922	21,368,483	20.49%	20,720,449	17,412,676	14,087,015	6.77%
Missouri Western State University	16,909,364	3,464,910	20.49%	3,359,831	2,823,474	2,284,216	6.77%
Northwest Missouri State University	35,353,438	7,244,298	20.49%	7,024,603	5,903,209	4,775,750	6.77%
Southeast Missouri State University	42,078,536	8,622,343	20.49%	8,360,856	7,026,145	5,684,216	6.77%
State Technical College of Missouri	11,890,618	2,436,515	20.49%	2,362,624	1,985,459	1,606,255	6.77%
Truman State University	29,510,230	6,046,962	20.49%	5,863,578	4,927,528	3,986,415	6.77%
University of Central Missouri	50,022,503	10,250,147	20.49%	9,939,295	8,352,605	6,757,334	6.77%
Total	2,114,068,511	433,195,290	20.49%	420,057,938	353,000,688	285,580,798	6.77%

* One-time payment is for fiscal year payments and assumes no other contributions during the fiscal year have been made.
** Fiscal year payments are assume 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 12
EARLY PAYMENT AMOUNTS BY DEPARTMENT FOR FISCAL YEAR 2024

(continued)

(TOTAL EMPLOYER CONTRIBUTION RATE: 27.26% OF PAYROLL)

Department	Expected Payroll for FY 2024	Total FY 2024 Payments	FY 2024 Contribution Rate	One-Time Payment, Adjusted for Expected Payroll Contributions to Date: July 15*	September 1**	November 1***	Additional Payroll Contributions
State of Missouri	1,767,046,471	481,696,867	27.26%	467,088,628	392,523,485	317,555,104	0.00%
Environmental Improvement & Energy Resource Authority	345,989	94,317	27.26%	91,457	76,857	62,178	0.00%
Missouri Agriculture & Small Business Development Authority	150,202	40,945	27.26%	39,703	33,365	26,993	0.00%
Missouri Consolidated Health Care Plan (MCHCP)	3,059,364	833,983	27.26%	808,691	679,593	549,797	0.00%
Missouri Development Finance Board	537,842	146,616	27.26%	142,170	119,474	96,656	0.00%
Missouri Housing Development Commission	8,418,316	2,294,833	27.26%	2,225,238	1,870,006	1,512,852	0.00%
Missouri Public Entity Risk Management Fund	808,091	220,286	27.26%	213,605	179,506	145,222	0.00%
Missouri Technology Corporation	55,467	15,120	27.26%	14,661	12,321	9,968	0.00%
Missouri Wine and Grape Board	316,197	86,195	27.26%	83,581	70,238	56,823	0.00%
Harris Stowe State University	9,944,648	2,710,911	27.26%	2,628,698	2,209,058	1,787,148	0.00%
Lincoln University	15,018,547	4,094,056	27.26%	3,969,897	3,336,150	2,698,976	0.00%
Missouri Southern State University	18,320,766	4,994,241	27.26%	4,842,783	4,069,690	3,292,417	0.00%
Missouri State University	104,281,922	28,427,252	27.26%	27,565,149	23,164,701	18,740,456	0.00%
Missouri Western State University	16,909,364	4,609,493	27.26%	4,469,703	3,756,168	3,038,774	0.00%
Northwest Missouri State University	35,353,438	9,637,347	27.26%	9,345,079	7,853,248	6,353,350	0.00%
Southeast Missouri State University	42,078,536	11,470,609	27.26%	11,122,744	9,347,130	7,561,914	0.00%
State Technical College of Missouri	11,890,618	3,241,382	27.26%	3,143,082	2,641,326	2,136,857	0.00%
Truman State University	29,510,230	8,044,489	27.26%	7,800,527	6,555,266	5,303,270	0.00%
University of Central Missouri	50,022,503	13,636,134	27.26%	13,222,596	11,111,766	8,989,521	0.00%
Total	2,114,068,511	576,295,076	27.26%	558,817,992	469,609,348	379,918,276	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, 2022 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, 2022. 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.

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, 2022 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 13
PROJECTION OF FUTURE ACTUARIAL VALUATION RESULTS
AS OF JUNE 30, 2022

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

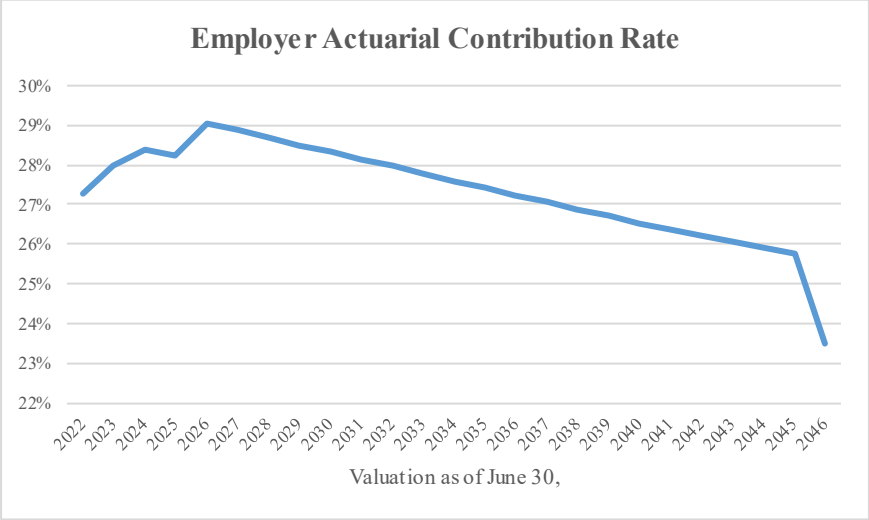
Valuation as of June 30, (1)	Covered Payroll at Valuation (2)	Actuarial Accrued Liability (AAL) (3)	Actuarial Value of Assets (AVA) (4)	Unfunded AAL (5)	Funded Ratio Using AVA (6)	Normal Cost Rate (7)	UAAL Amortization Payment Rate (8)	Actuarial Contribution Rate (9)	Member Contribution Rate (10)	Employer Actuarial Contribution Rate (11)	Estimated Dollar Amount of Employer Contribution* (12)
2022	$2,067,549	$15,408,995	$8,894,329	$6,514,666	57.7%	8.81%	20.49%	29.30%	2.04%	27.26%	$572,894
2023	2,101,593	15,613,566	9,352,403	6,261,164	59.9%	8.73%	21.43%	30.16%	2.19%	27.97%	598,677
2024	2,140,427	15,804,127	9,377,845	6,426,282	59.3%	8.65%	22.09%	30.74%	2.35%	28.39%	619,571
2025	2,182,356	15,974,992	9,574,109	6,400,883	59.9%	8.58%	22.17%	30.75%	2.50%	28.25%	628,876
2026	2,226,109	16,123,866	9,474,377	6,649,489	58.8%	8.52%	23.18%	31.70%	2.64%	29.06%	660,302
2027	2,272,201	16,250,009	9,659,482	6,590,527	59.4%	8.46%	23.19%	31.65%	2.78%	28.87%	669,729
2028	2,319,810	16,359,285	9,866,885	6,492,400	60.3%	8.42%	23.20%	31.62%	2.92%	28.70%	680,018
2029	2,369,401	16,444,001	10,068,860	6,375,141	61.2%	8.37%	23.19%	31.56%	3.05%	28.51%	690,272
2030	2,421,157	16,504,386	10,267,874	6,236,512	62.2%	8.33%	23.17%	31.50%	3.17%	28.33%	701,202
2031	2,475,122	16,543,105	10,468,078	6,075,027	63.3%	8.29%	23.13%	31.42%	3.28%	28.14%	712,213
2032	2,530,963	16,559,992	10,671,718	5,888,274	64.4%	8.26%	23.09%	31.35%	3.39%	27.96%	723,881
2033	2,588,989	16,558,369	10,883,178	5,675,191	65.7%	8.23%	23.03%	31.26%	3.48%	27.78%	735,959
2034	2,649,242	16,539,812	11,106,425	5,433,388	67.1%	8.20%	22.96%	31.16%	3.57%	27.59%	748,236
2035	2,711,983	16,508,108	11,346,973	5,161,135	68.7%	8.18%	22.89%	31.07%	3.65%	27.42%	761,402
2036	2,776,813	16,464,209	11,608,088	4,856,121	70.5%	8.15%	22.80%	30.95%	3.72%	27.23%	774,514
2037	2,844,340	16,411,358	11,895,952	4,515,406	72.5%	8.13%	22.71%	30.84%	3.78%	27.06%	788,785
2038	2,914,948	16,355,242	12,217,973	4,137,269	74.7%	8.11%	22.60%	30.71%	3.84%	26.87%	803,049
2039	2,988,645	16,300,949	12,582,609	3,718,339	77.2%	8.10%	22.49%	30.59%	3.88%	26.71%	818,768
2040	3,065,400	16,253,931	12,998,007	3,255,924	80.0%	8.09%	22.36%	30.45%	3.91%	26.54%	834,654
2041	3,144,890	16,220,019	13,473,737	2,746,282	83.1%	8.08%	22.23%	30.31%	3.93%	26.38%	851,267
2042	3,226,940	16,203,058	14,016,598	2,186,460	86.5%	8.07%	22.10%	30.17%	3.95%	26.22%	868,188
2043	3,311,167	16,206,296	14,633,557	1,572,739	90.3%	8.06%	21.96%	30.02%	3.96%	26.06%	885,405
2044	3,397,564	16,232,571	15,331,377	901,195	94.4%	8.05%	21.83%	29.88%	3.97%	25.91%	903,159
2045	3,485,756	16,282,261	16,114,233	168,028	99.0%	8.04%	21.70%	29.74%	3.98%	25.76%	921,028
2046	3,575,421	16,355,830	16,987,265	(631,435)	103.9%	8.04%	19.44%	27.48%	3.98%	23.50%	861,665

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

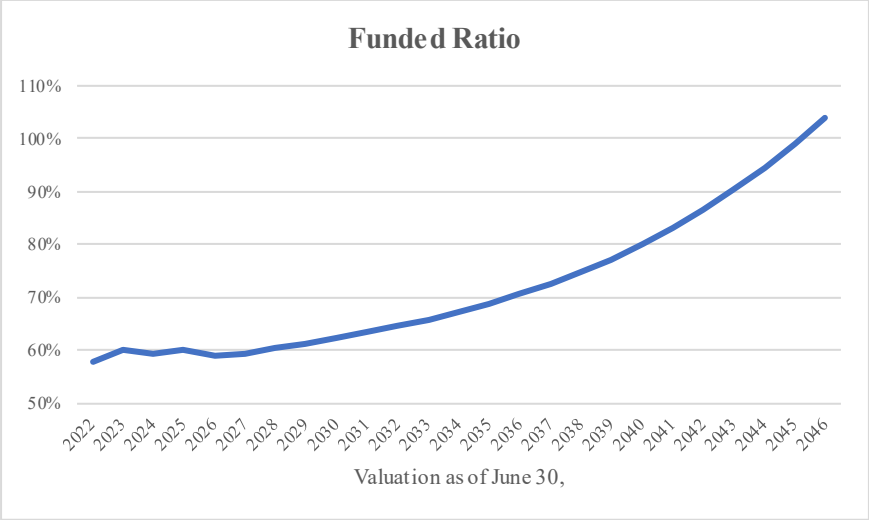
Note: Projections assume the size of the active population remains constant over the projection period and all actuarial assumptions are met in the future.

TABLE 13
PROJECTION OF FUTURE ACTUARIAL VALUATION RESULTS
AS OF JUNE 30, 2022

(continued)



The employer contribution rate is projected to steadily decline after the deferred investment experience has been recognized, due to an increased proportion of the membership being covered under the MSEP 2011 Plan (lower cost and employee contributions).

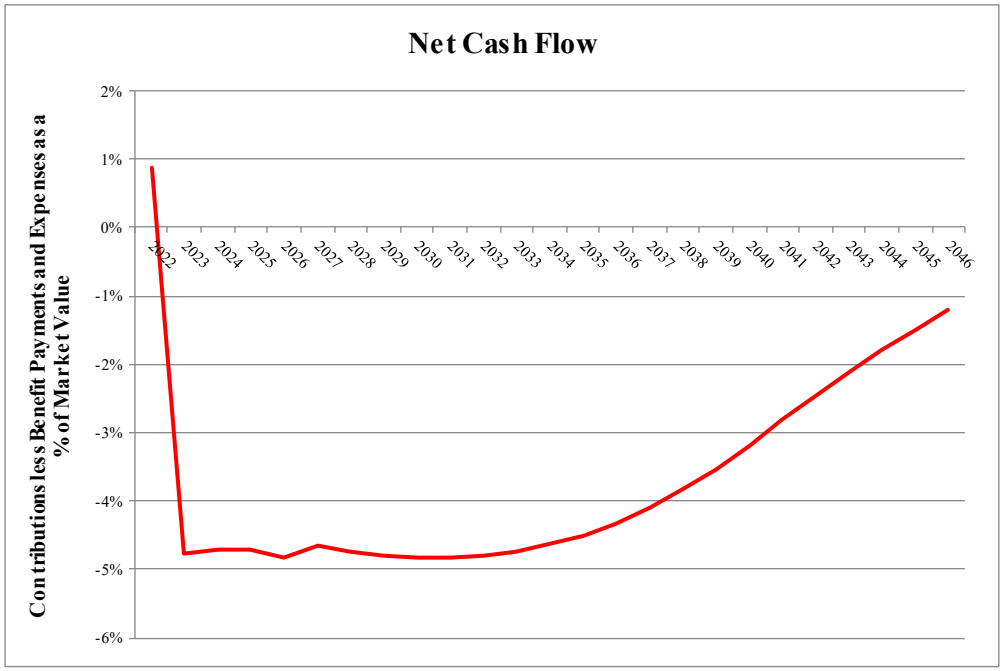


The current results show that the funded ratio is expected to remain around 60% for the next 10 years and then steadily improve. With the current amortization policy, the System is expected to reach full funding by the end of this projection period.

TABLE 14
PROJECTION OF FUTURE NET CASH FLOWS
AS OF JUNE 30, 2022

Projection Based on Assumptions Outlined in Appendix D 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)
2022	$1,083,255	$1,002,040	$9,457	$71,758	$8,248,415	0.87%
2023	615,767	1,030,658	9,670	(424,561)	8,912,061	(4.76%)
2024	645,553	1,063,732	9,887	(428,067)	9,092,382	(4.71%)
2025	670,856	1,098,109	10,110	(437,362)	9,281,610	(4.71%)
2026	684,529	1,131,917	10,337	(457,726)	9,474,377	(4.83%)
2027	720,288	1,158,322	10,570	(448,604)	9,659,482	(4.64%)
2028	734,220	1,191,203	10,808	(467,791)	9,866,885	(4.74%)
2029	749,205	1,222,381	11,051	(484,228)	10,068,860	(4.81%)
2030	764,117	1,249,268	11,300	(496,451)	10,267,874	(4.83%)
2031	779,663	1,274,694	11,554	(506,584)	10,468,078	(4.84%)
2032	795,228	1,296,121	11,814	(512,707)	10,671,718	(4.80%)
2033	811,648	1,315,089	12,080	(515,521)	10,883,178	(4.74%)
2034	828,153	1,329,595	12,351	(513,794)	11,106,425	(4.63%)
2035	845,054	1,342,497	12,629	(510,073)	11,346,973	(4.50%)
2036	862,756	1,351,597	12,913	(501,755)	11,608,088	(4.32%)
2037	880,323	1,355,191	13,204	(488,072)	11,895,952	(4.10%)
2038	898,970	1,353,974	13,501	(468,506)	12,217,973	(3.83%)
2039	917,813	1,347,935	13,805	(443,927)	12,582,609	(3.53%)
2040	937,706	1,337,094	14,115	(413,504)	12,998,007	(3.18%)
2041	957,619	1,323,747	14,433	(380,561)	13,473,737	(2.82%)
2042	978,085	1,308,721	14,758	(345,393)	14,016,598	(2.46%)
2043	998,979	1,292,556	15,090	(308,667)	14,633,557	(2.11%)
2044	1,019,949	1,277,855	15,429	(273,336)	15,331,377	(1.78%)
2045	1,041,544	1,264,517	15,776	(238,750)	16,114,233	(1.48%)
2046	1,063,330	1,253,342	16,131	(206,143)	16,987,265	(1.21%)

* Includes additional $500 million contribution received July 13, 2022.



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.

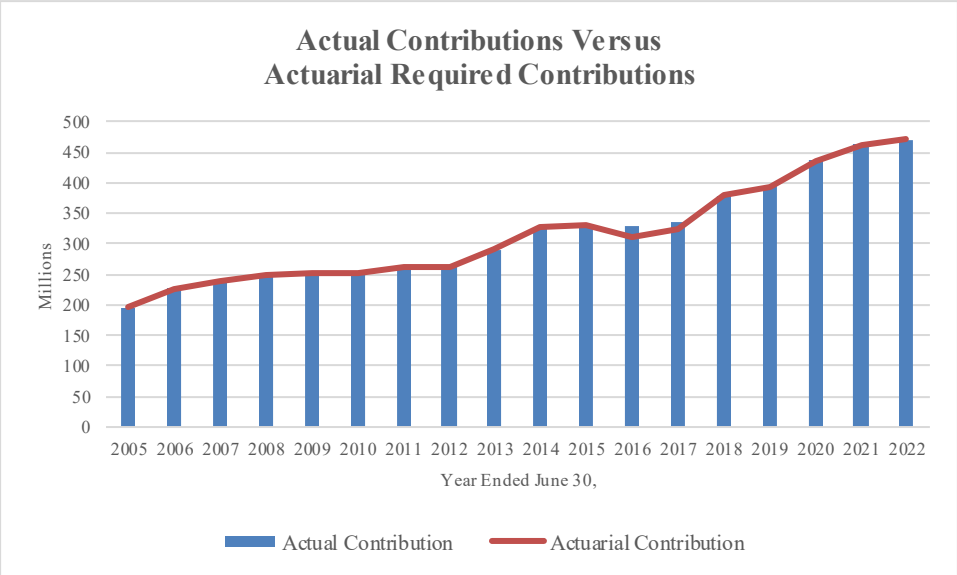
The term "risk" is most commonly associated with an outcome with undesirable results. However, in the actuarial world, risk can be translated as uncertainty. The actuarial valuation process uses many actuarial assumptions to project how future contributions and investment returns will meet the cash flow 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.

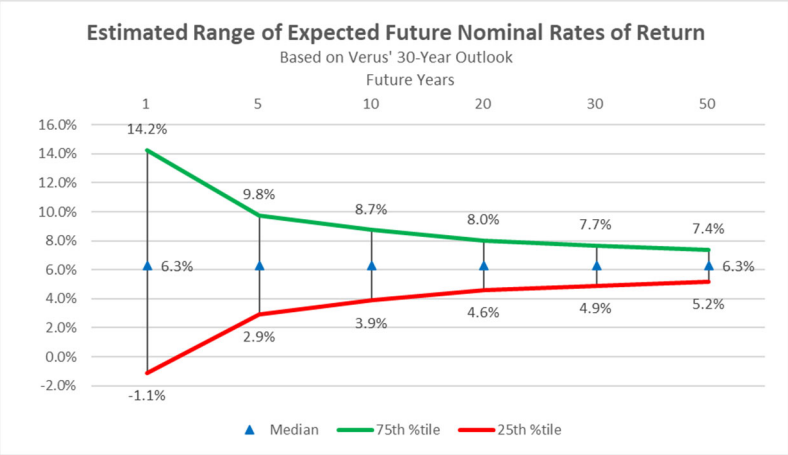
There is typically a direct correlation between healthy, well-funded retirement plans and consistent contributions equal to the full actuarial contribution rate each year. Historically, MOSERS covered employers have contributed the full actuarial rate. However, the System's contributions were slightly above the actuarial rate during FY 2016 and FY 2017 due to minimum contribution rates set in the funding policy. The following graph displays the System's historical contribution levels over the past 18 years.



One of the most positive factors regarding the 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 eleven 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 15). 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.

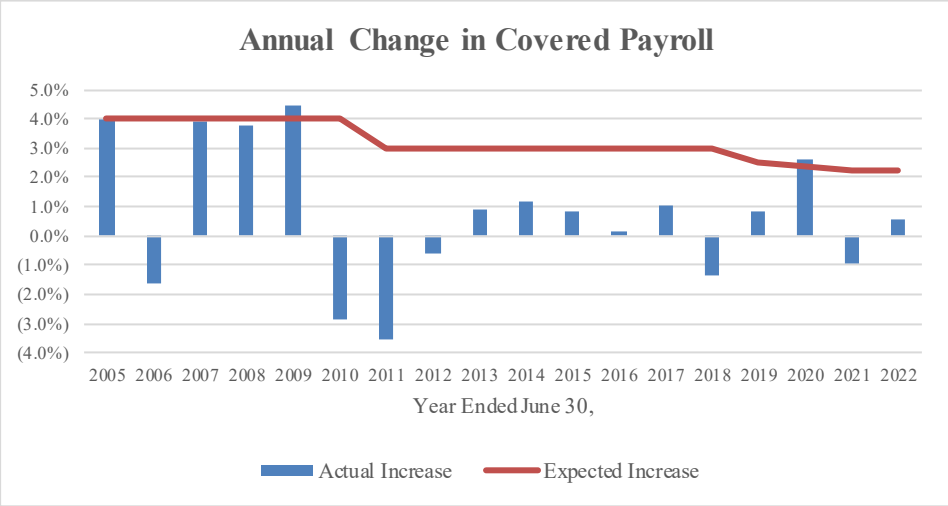
As the graph illustrates, in any single year the rate of return is expected to fall between -1% and 14% about 50% of the time. This volatility in the investment return creates significant risk to funding a retirement plan because of the volatility it creates in the contribution rate. As Table 15 explains, if the actual return is 10% different than the expected return, it would result in an increase in the actuarial contribution rate of 2.81% once the experience is fully recognized in the asset smoothing method (five years).



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 24%. 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 over this period, coupled with low salary increases for state employees, has resulted in actual payroll changes that are far below the expected increase (based on the payroll growth assumption). The following graph shows the actual versus expected payroll growth from 2005 through 2022. 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. 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 15
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%

* 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, 2022 are about 418% of covered payroll. Consequently, underperforming the investment return assumption by 10.00% (i.e., earn -3.05% for one year) is equivalent to about 42% 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 2.81% of payroll once it is fully recognized in the asset smoothing method.

TABLE 15
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.

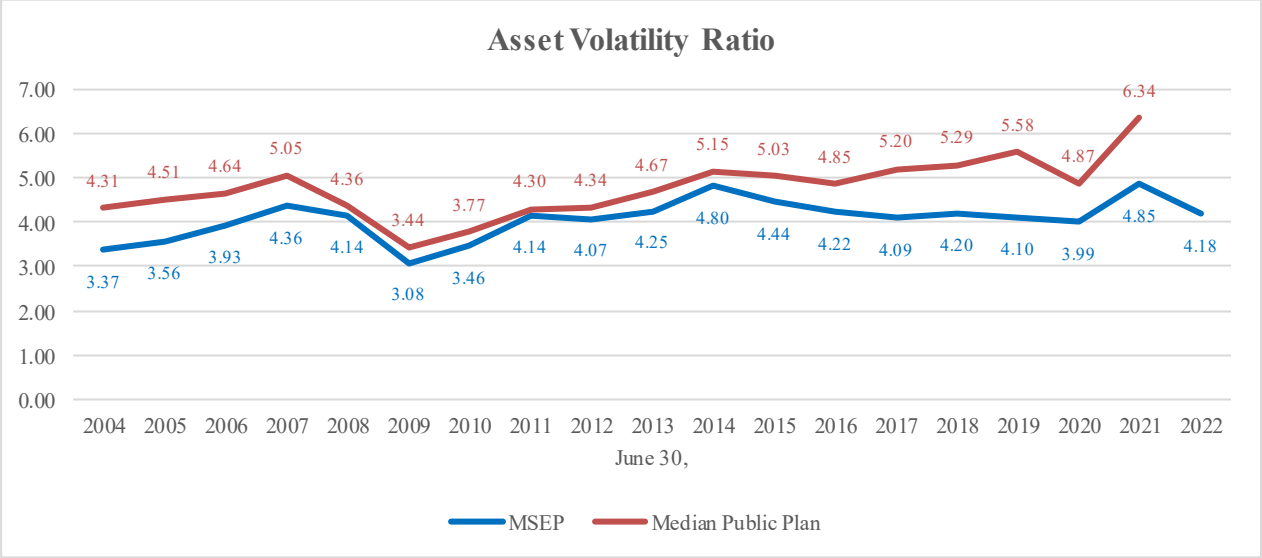


TABLE 16
LIABILITY MATURITY MEASUREMENTS

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

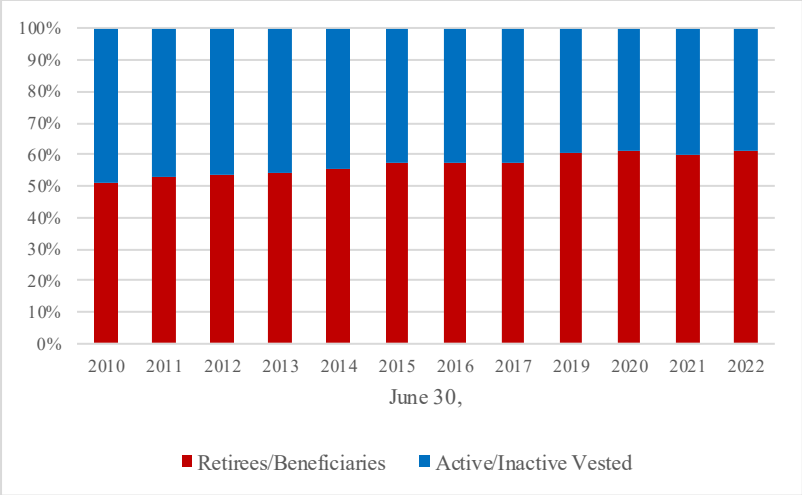
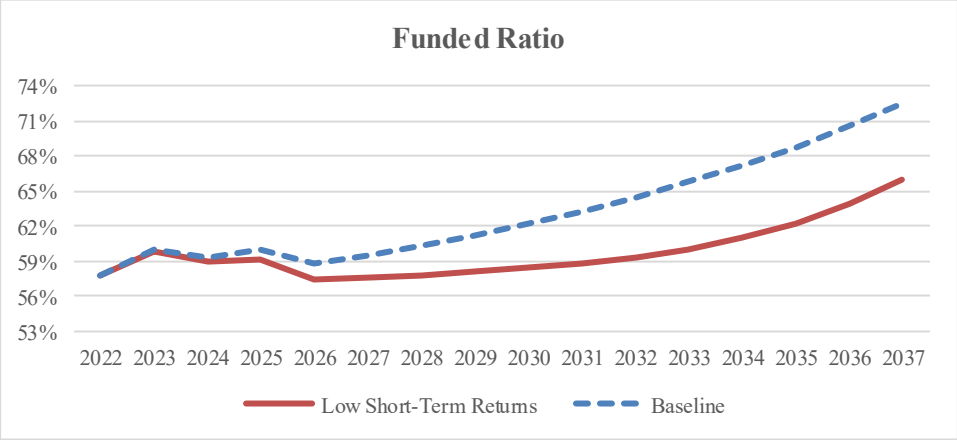


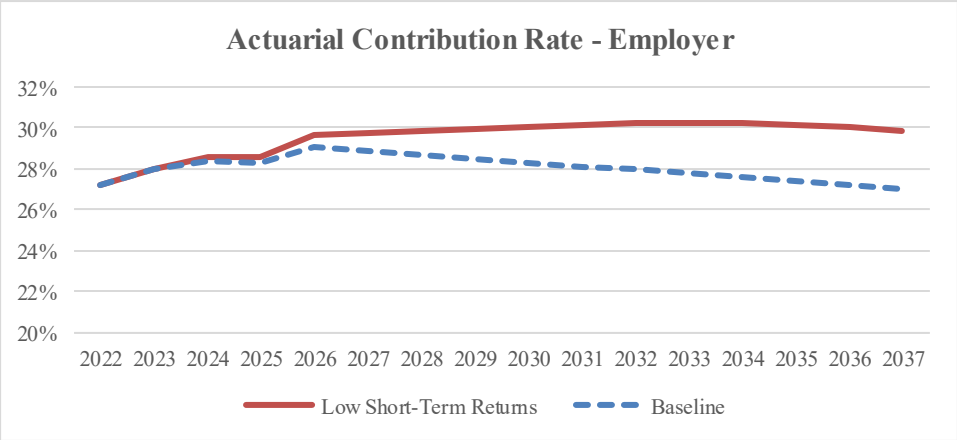
TABLE 17
SCENARIO TESTING

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.

Many investment consultants have been projecting lower returns over the next ten years compared to the longer term (30+ years). The scenario test below shows results if actual investment returns are 1.0% less than assumed (5.95%) over the next 10 years ("Low Short-Term Returns") compared to if all assumptions are met ("Baseline").



In both scenarios, the funded ratio declines slightly over the next four years as deferred investment losses are recognized. In the scenario with low short-term returns, the funded ratio remains steady at around 58% until 2031 (about 5% lower than the baseline scenario), before beginning to increase.

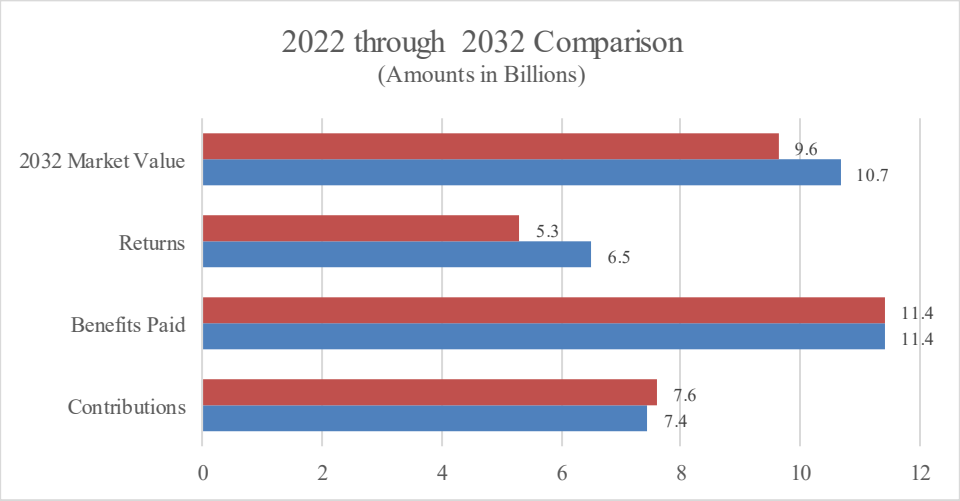


In both scenarios, the employer contribution rate increases for the next four years as deferred investment losses are recognized. In the scenario with low short-term returns, the employer contribution rate remains steady around 30% of pay, while the baseline scenario rate declines after deferred investment losses are recognized due to the normal cost rate decreasing as more MSEP 2011 members are in the System as well as increases in the effective member contribution rate.

TABLE 17
SCENARIO TESTING

(continued)

While it is helpful to see the funded ratio and employer contribution rate trend lines when scenario testing, it can sometimes be difficult to grasp the full impact without analyzing the impact in dollar amounts. The graph below compares the projected 2032 market value of assets under the baseline (blue bars) and the low short-term return scenario (red bars). In addition, the sum over a ten-year period of actual investment returns, benefits paid and contribution to the System are compared.



Under the low short-term return scenario, the 2032 market value of assets is $1.1 billion lower when compared with the baseline. If asset returns are 1.0% lower than assumed for the next ten years, actual investment returns would be $1.2 billion less than assumed. Also note that even though contributions are only slightly higher under the low short-term return scenario ($7.6 billion vs $7.4 billion) over the ten-year period, contributions would continue to be higher in the future as the asset losses flow through the smoothing method.

TABLE 18
COMPARISON OF VALUATION RESULTS UNDER ALTERNATE INVESTMENT RETURN ASSUMPTIONS

($ in millions)

This exhibit compares the key June 30, 2022 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	11.23%	9.93%	8.81%	7.85%	7.03%
Member Contributions	(2.04%)	(2.04%)	(2.04%)	(2.04%)	(2.04%)
Employer Normal Cost	9.19%	7.89%	6.77%	5.81%	4.99%
Unfunded Actuarial Accrued Liability	23.99%	22.24%	20.49%	18.73%	16.97%
Employer Contribution Rate	33.18%	30.13%	27.26%	24.54%	21.96%
Estimated Employer Contribution Amount	$701.4	$637.0	$576.3	$518.8	$464.2
Actuarial Accrued Liability	$17,205.3	$16,265.8	$15,409.0	$14,625.8	$13,908.3
Actuarial Value of Assets	$8,894.3	$8,894.3	$8,894.3	$8,894.3	$8,894.3
Unfunded Actuarial Accrued Liability	$8,310.9	$7,371.5	$6,514.7	$5,731.5	$5,014.0
Funded Ratio	51.7%	54.7%	57.7%	60.8%	63.9%

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 19
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%

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

TABLE 20
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

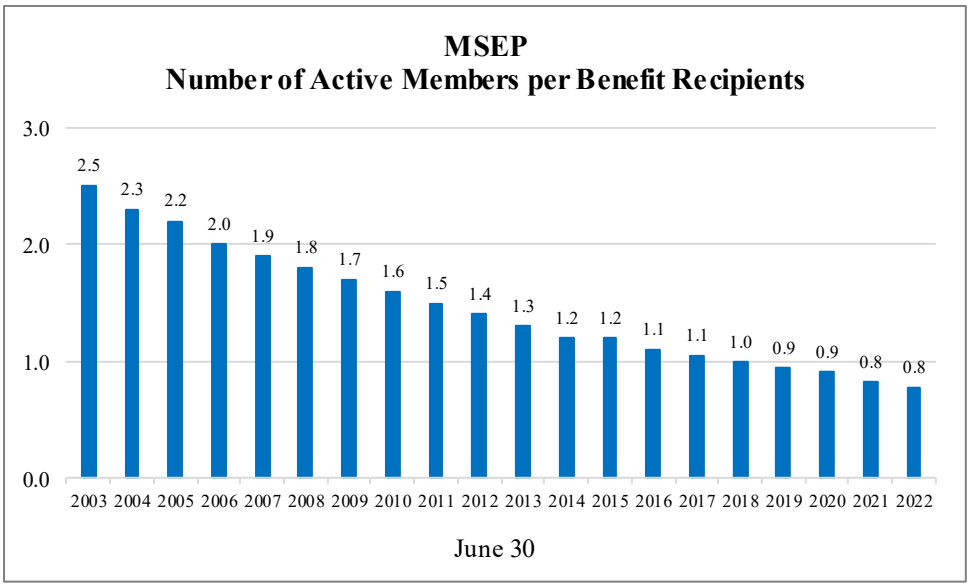
TABLE 21
HISTORICAL EMPLOYER CONTRIBUTIONS

($ in millions)

Fiscal Year Ending	Actuarially Required Employer Contribution	Actual Dollar Amount	Percent Contributed
June 30, 2005	$195.6	$195.6	100.0%
June 30, 2006	227.2	227.2	100.0%
June 30, 2007	239.5	239.5	100.0%
June 30, 2008	249.8	249.8	100.0%
June 30, 2009	252.1	252.1	100.0%
June 30, 2010	251.2	251.2	100.0%
June 30, 2011	263.4	263.4	100.0%
June 30, 2012	263.4	263.4	100.0%
June 30, 2013	290.3	290.3	100.0%
June 30, 2014	326.4	326.4	100.0%
June 30, 2015	329.8	329.8	100.0%
June 30, 2016	310.1	330.0	106.4%
June 30, 2017	322.8	335.2	103.8%
June 30, 2018	379.6	379.6	100.0%
June 30, 2019	394.2	394.2	100.0%
June 30, 2020	436.9	436.9	100.0%
June 30, 2021	463.3	463.3	100.0%
June 30, 2022	471.3	471.3	100.0%

TABLE 22
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



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MEMBER DATA RECONCILIATION

	Active Members	Inactive Vested	Inactive Nonvested	Leave of Absence	Long-term Disability	Retirees and Beneficiaries	Total
As of June 30, 2021	42,829	16,959	25,613	191	613	52,223	138,428
Changes in status:							
a) Retirement	(1,792)	(870)	0	(8)	(62)	2,732	0
b) Death	(98)	(71)	0	0	(17)	(1,807)	(1,993)
c) Non-vested termination	(2,855)	0	2,911	(47)	(9)	0	0
d) Leave of absence	(87)	0	(1)	88	0	0	0
e) Vested termination	(1,759)	1,832	0	(28)	(45)	0	0
f) Contribution refund	(1,050)	(117)	(1,330)	(20)	(6)	0	(2,523)
g) Beneficiary in receipt	0	0	0	0	0	567	567
h) Long-term disability	(107)	(7)	(2)	(11)	127	0	0
h) Disability retirement	0	0	0	0	0	0	0
i) Return to active service	806	(270)	(452)	(62)	(2)	(20)	0
j) Expired benefit	0	0	0	0	0	(46)	(46)
k) Transfer to MPERS	(47)	(26)	0	0	0	0	(73)
k) Data adjustment	(7)	8	(2)	0	0	(1)	(2)
Total changes in status	(6,996)	479	1,124	(88)	(14)	1,425	(4,070)
New entrants	5,762	0	1,707	12	0	0	7,481
Net Change	(1,234)	479	2,831	(76)	(14)	1,425	3,411
As of June 30, 2022	41,595	17,438	28,444	115	599	53,648	141,839

SUMMARY OF MEMBERSHIP DATA

A. ACTIVE MEMBERS	June 30, 2022	June 30, 2021	% Change
1. Number of Active Members			
(a) MSEP	6,907	8,102	(14.7)
(b) MSEP 2000	11,384	12,358	(7.9)
(c) MSEP 2011	23,304	22,369	4.2
(d) Total	41,595	42,829	(2.9)
2. Annualized Reported Salary			
(a) MSEP	$ 384,223,949	$ 433,453,923	(11.4)
(b) MSEP 2000	576,340,229	599,693,363	(3.9)
(c) MSEP 2011	1,012,308,576	928,827,766	9.0
(d) Total	$ 1,972,872,754	$ 1,961,975,052	0.6
3. Accumulated Member Contributions	$ 150,237,663	$ 134,944,772	11.3
4. Active Member Averages			
(a) Age	45.8	45.9	(0.2)
(b) Service	10.9	11.0	(0.9)
(c) Compensation	$ 47,431	$ 45,809	3.5
B. INACTIVE MEMBERS			
1. Number of Inactive Members			
(a) Terminated vested	17,438	16,959	2.8
(b) Terminated nonvested (refund only)	28,444	25,613	11.1
(c) Leave of absence	115	191	(39.8)
(d) Long-term disability	599	613	(2.3)
(e) Total	46,596	43,376	7.4
2. Accumulated Member Contributions	$ 67,081,221	$ 52,852,759	26.9
3. Inactive Member Averages			
(a) Age (vesteds only)	49.1	49.3	(0.4)
(b) Monthly benefit	$ 547	$ 508	7.7
(c) Accumulated member contributions	$ 1,440	$ 1,218	18.2
C. RETIREES, DISABLEDS, AND BENEFICIARIES			
1. Number of Members			
(a) Service retirees	47,537	46,306	2.7
(b) Beneficiaries	6,111	5,917	3.3
(c) Total	53,648	52,223	2.7
2. Total Monthly Benefits			
(a) Service retirees	$ 66,889,324	$ 63,781,600	4.9
(b) Beneficiaries	6,759,756	6,356,879	6.3
(c) Total	$ 73,649,080	$ 70,138,479	5.0
3. Average Age			
(a) Service retirees	71.1	70.9	0.3
(b) Beneficiaries	72.6	72.4	0.3
(c) Total	71.3	71.1	0.3

MEMBERSHIP DATA BY GROUP

Valuation Group	Number	Payroll	Group Averages		
			Salary	Age(yrs.)	Service(yrs.)
Regular State Employees	40,751	$ 1,912,225,449	$ 46,925	45.6	10.7
Elected Officials	6	666,851	111,142	49.7	5.0
Legislative Clerks	4	138,012	34,503	70.5	24.1
Legislators	190	6,904,840	36,341	52.4	4.7
Uniformed Water Patrol	9	696,108	77,345	44.8	19.1
School-Term Salaried Employees	622	50,663,336	81,452	57.4	22.0
Administrative Law Judges	13	1,578,158	121,397	63.5	27.7
Total MSEP	**41,595**	$ **1,972,872,754**	$ **47,431**	**45.8**	**10.9**

The total number of System active members includes 6,907 MSEP members, 11,384 MSEP 2000 members and 23,304 MSEP 2011 members.

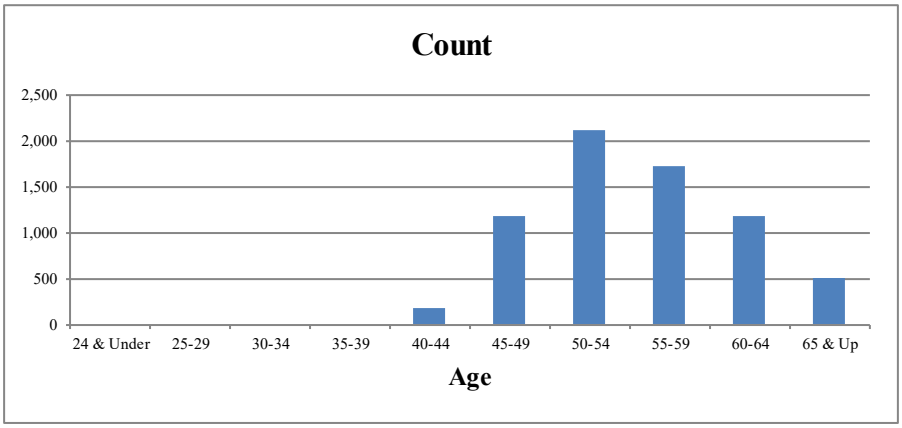
Type of Benefit Payment	No.	Monthly Benefit	Group Averages	
			Benefit	Age(yrs.)
Retirement	47,537	$ 66,889,324	$ 1,407	71.1
Survivor of Active Member	1,784	1,744,457	978	63.9
Survivor of Retired Member	4,327	5,015,299	1,159	76.2
Total MSEP	**53,648**	$ **73,649,080**	$ **1,373**	**71.3**

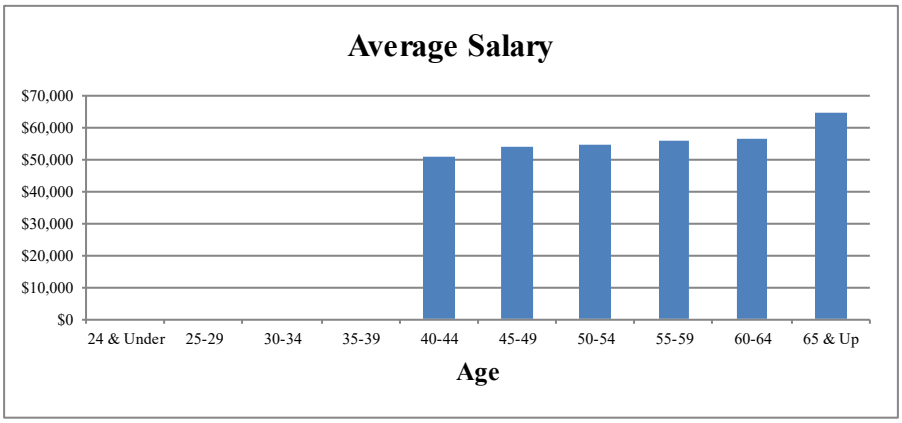
This valuation also includes 17,438 terminated vested members, 28,444 terminated members who have a refund pending, 115 members on leave and 599 members on long-term disability.

ACTIVE MEMBERS
AS OF JUNE 30, 2022

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	44	144	188	2,449,544	7,041,603	9,491,147
45-49	395	790	1,185	22,773,699	40,879,451	63,653,150
50-54	734	1,385	2,119	43,671,896	71,917,543	115,589,439
55-59	671	1,059	1,730	41,749,112	54,820,176	96,569,288
60-64	491	681	1,172	31,533,304	34,472,762	66,006,066
65 & Up	246	267	513	18,507,838	14,407,021	32,914,859
Total	2,581	4,326	6,907	$ 160,685,393	$ 223,538,556	$ 384,223,949

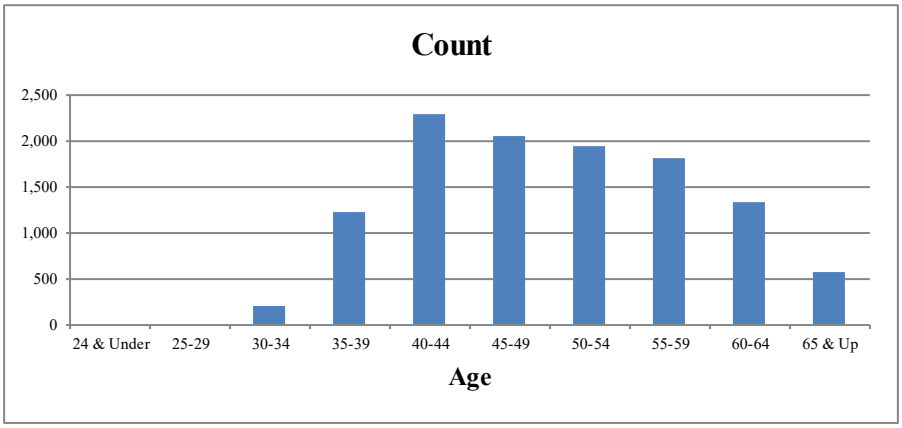


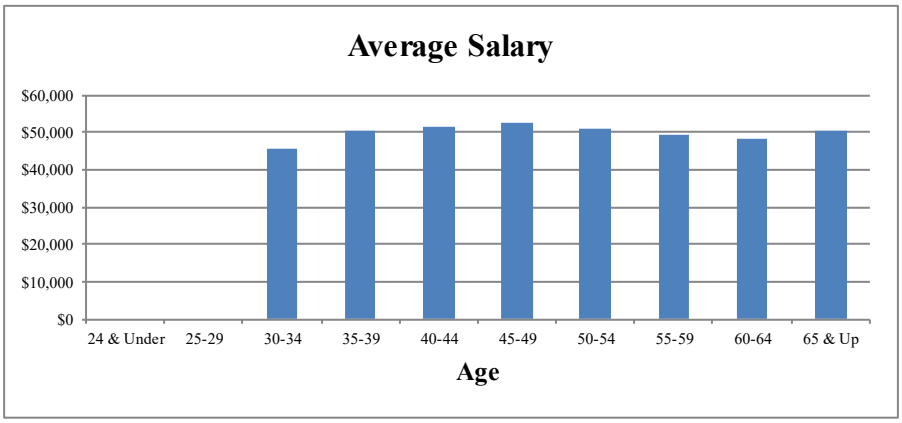


ACTIVE MEMBERS
AS OF JUNE 30, 2022

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	66	132	198	3,076,609	5,912,194	8,988,803
35-39	496	724	1,220	26,442,932	35,212,906	61,655,838
40-44	851	1,428	2,279	46,157,924	71,324,943	117,482,867
45-49	812	1,239	2,051	45,622,803	62,411,060	108,033,863
50-54	746	1,190	1,936	42,355,674	56,586,338	98,942,012
55-59	668	1,136	1,804	36,465,346	52,087,396	88,552,742
60-64	511	815	1,326	27,565,731	36,463,211	64,028,942
65 & Up	247	323	570	13,693,158	14,962,004	28,655,162
Total	4,397	6,987	11,384	$ 241,380,177	$ 334,960,052	$ 576,340,229

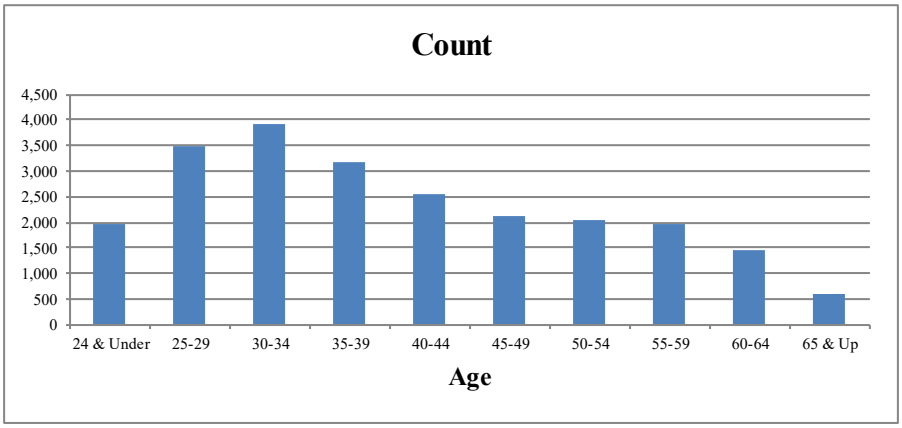


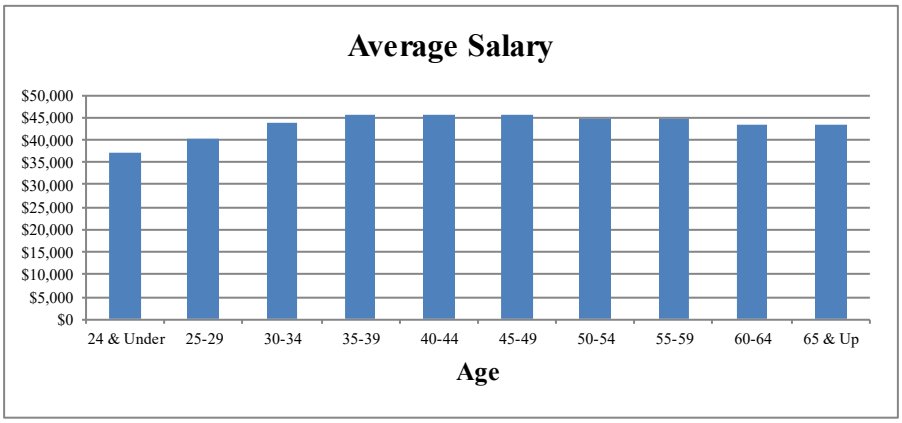


ACTIVE MEMBERS
AS OF JUNE 30, 2022

MSEP 2011

	Count of Members			Reported Annualized Earnings for Current Members		
Age	Male	Female	Total	Male	Female	Total
24 & Under	810	1,169	1,979	$ 32,549,384	$ 41,096,040	$ 73,645,424
25-29	1,427	2,080	3,507	61,046,814	80,181,481	141,228,295
30-34	1,592	2,340	3,932	74,645,849	97,095,880	171,741,729
35-39	1,238	1,925	3,163	60,918,082	83,819,964	144,738,046
40-44	910	1,639	2,549	46,235,185	70,035,043	116,270,228
45-49	731	1,380	2,111	36,648,606	59,475,005	96,123,611
50-54	688	1,355	2,043	33,730,653	57,133,564	90,864,217
55-59	684	1,277	1,961	34,533,099	53,520,937	88,054,036
60-64	543	909	1,452	26,544,576	36,693,736	63,238,312
65 & Up	270	337	607	13,007,293	13,397,385	26,404,678
Total	8,893	14,411	23,304	$ 419,859,541	$ 592,449,035	$ 1,012,308,576

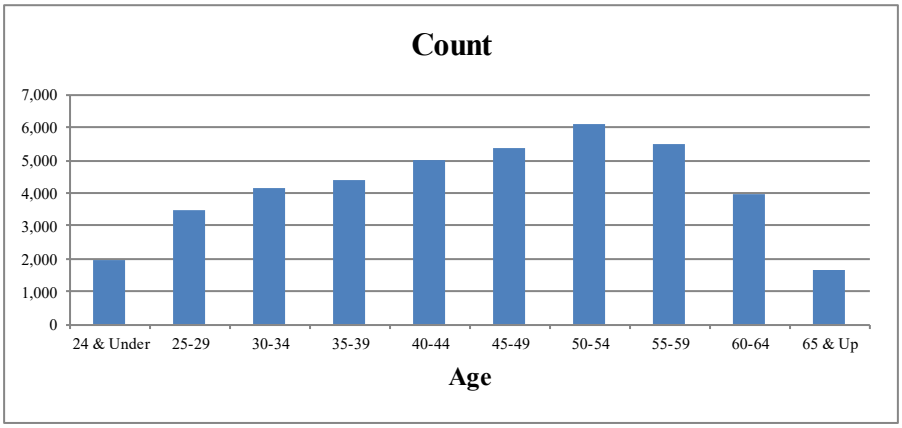


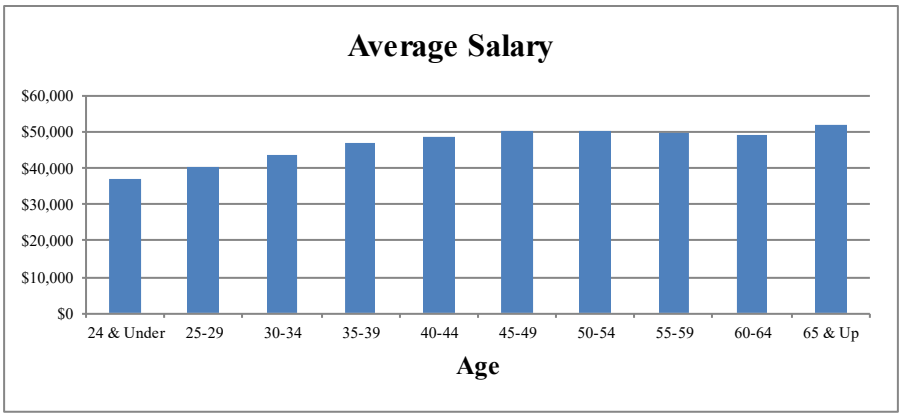


ACTIVE MEMBERS
AS OF JUNE 30, 2022

TOTAL

	Count of Members			Reported Annualized Earnings for Current Members		
Age	Male	Female	Total	Male	Female	Total
24 & Under	810	1,169	1,979	$ 32,549,384	$ 41,096,040	$ 73,645,424
25-29	1,427	2,080	3,507	61,046,814	80,181,481	141,228,295
30-34	1,658	2,472	4,130	77,722,458	103,008,074	180,730,532
35-39	1,734	2,649	4,383	87,361,014	119,032,870	206,393,884
40-44	1,805	3,211	5,016	94,842,653	148,401,589	243,244,242
45-49	1,938	3,409	5,347	105,045,108	162,765,516	267,810,624
50-54	2,168	3,930	6,098	119,758,223	185,637,445	305,395,668
55-59	2,023	3,472	5,495	112,747,557	160,428,509	273,176,066
60-64	1,545	2,405	3,950	85,643,611	107,629,709	193,273,320
65 & Up	763	927	1,690	45,208,289	42,766,410	87,974,699
Total	15,871	25,724	41,595	$ 821,925,111	$ 1,150,947,643	$ 1,972,872,754





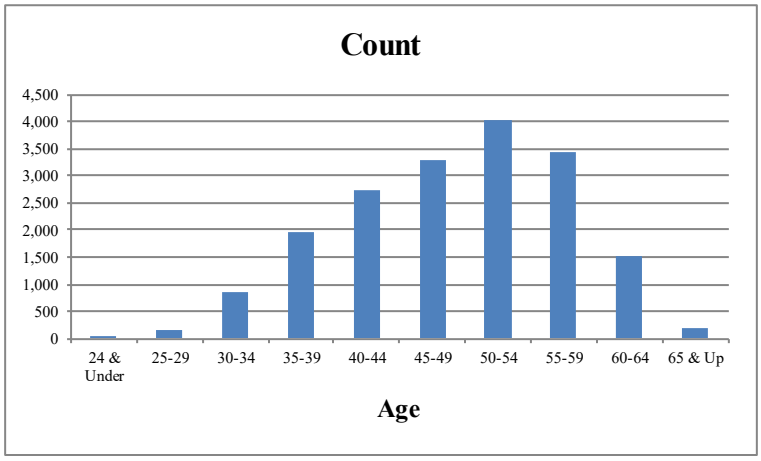
AGE AND SERVICE DISTRIBUTION
AS OF JUNE 30, 2022

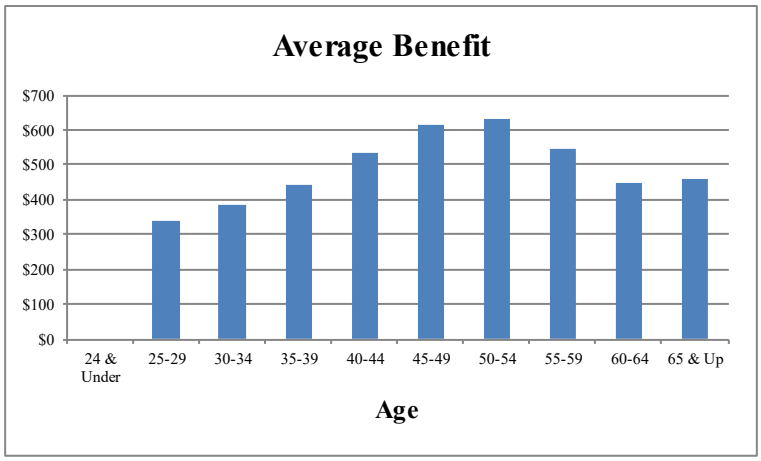
Age		0-4	5-9	10-14	15-19	20-24	25-29	30-34	Over 34	Total
24 & Under	Number	1,970	9	0	0	0	0	0	0	1,979
	Total Salary	$ 73,296,119	$ 349,305	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 73,645,424
	Average Sal.	$ 37,206	$ 38,812	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 37,213
25-29	Number	2,947	555	5	0	0	0	0	0	3,507
	Total Salary	$ 117,068,421	$ 23,908,669	$ 251,205	$ 0	$ 0	$ 0	$ 0	$ 0	$ 141,228,295
	Average Sal.	$ 39,725	$ 43,079	$ 50,241	$ 0	$ 0	$ 0	$ 0	$ 0	$ 40,270
30-34	Number	2,314	1,497	300	19	0	0	0	0	4,130
	Total Salary	$ 96,125,670	$ 69,627,576	$ 14,078,577	$ 898,709	$ 0	$ 0	$ 0	$ 0	$ 180,730,532
	Average Sal.	$ 41,541	$ 46,511	$ 46,929	$ 47,300	$ 0	$ 0	$ 0	$ 0	$ 43,760
35-39	Number	1,747	1,291	895	432	18	0	0	0	4,383
	Total Salary	$ 75,612,783	$ 62,643,812	$ 45,368,723	$ 21,933,139	$ 835,427	$ 0	$ 0	$ 0	$ 206,393,884
	Average Sal.	$ 43,282	$ 48,523	$ 50,691	$ 50,771	$ 46,413	$ 0	$ 0	$ 0	$ 47,090
40-44	Number	1,507	1,096	867	1,028	496	22	0	0	5,016
	Total Salary	$ 66,425,270	$ 52,379,897	$ 43,979,156	$ 53,421,008	$ 25,879,825	$ 1,159,086	$ 0	$ 0	$ 243,244,242
	Average Sal.	$ 44,078	$ 47,792	$ 50,726	$ 51,966	$ 52,177	$ 52,686	$ 0	$ 0	$ 48,494
45-49	Number	1,390	863	684	797	1,130	469	14	0	5,347
	Total Salary	$ 61,809,654	$ 43,065,411	$ 35,119,273	$ 40,474,512	$ 61,001,327	$ 25,590,205	$ 750,242	$ 0	$ 267,810,624
	Average Sal.	$ 44,467	$ 49,902	$ 51,344	$ 50,784	$ 53,983	$ 54,563	$ 53,589	$ 0	$ 50,086
50-54	Number	1,240	952	690	759	1,111	1,098	229	19	6,098
	Total Salary	$ 55,229,612	$ 44,560,877	$ 33,581,969	$ 37,470,461	$ 58,937,235	$ 61,596,872	$ 12,989,138	$ 1,029,504	$ 305,395,668
	Average Sal.	$ 44,540	$ 46,808	$ 48,670	$ 49,368	$ 53,049	$ 56,099	$ 56,721	$ 54,184	$ 50,081
55-59	Number	1,190	865	668	768	920	595	378	111	5,495
	Total Salary	$ 53,484,282	$ 39,988,444	$ 32,198,850	$ 36,356,843	$ 47,948,020	$ 33,994,414	$ 22,567,890	$ 6,637,323	$ 273,176,066
	Average Sal.	$ 44,945	$ 46,229	$ 48,202	$ 47,340	$ 52,117	$ 57,133	$ 59,703	$ 59,796	$ 49,714
60-64	Number	799	694	535	573	595	381	196	177	3,950
	Total Salary	$ 35,455,742	$ 31,188,779	$ 24,893,953	$ 26,740,219	$ 30,105,863	$ 21,766,690	$ 12,626,748	$ 10,495,326	$ 193,273,320
	Average Sal.	$ 44,375	$ 44,941	$ 46,531	$ 46,667	$ 50,598	$ 57,130	$ 64,422	$ 59,296	$ 48,930
65 & Up	Number	317	298	265	222	217	116	100	155	1,690
	Total Salary	$ 13,775,193	$ 13,607,986	$ 12,726,089	$ 11,281,502	$ 11,698,633	$ 6,519,043	$ 7,325,601	$ 11,040,652	$ 87,974,699
	Average Sal.	$ 43,455	$ 45,664	$ 48,023	$ 50,818	$ 53,911	$ 56,199	$ 73,256	$ 71,230	$ 52,056
Total	Number	15,421	8,120	4,909	4,598	4,487	2,681	917	462	41,595
	Total Salary	$ 648,282,746	$ 381,320,756	$ 242,197,795	$ 228,576,393	$ 236,406,330	$ 150,626,310	$ 56,259,619	$ 29,202,805	$ 1,972,872,754
	Average Sal.	$ 42,039	$ 46,961	$ 49,338	$ 49,712	$ 52,687	$ 56,183	$ 61,352	$ 63,210	$ 47,431

INACTIVE VESTED MEMBERS
AS OF JUNE 30, 2022

	Count of Members*			Monthly Deferred Benefits*		
Age	Male	Female	Total	Male	Female	Total
24 & Under	8	8	16	$ 737	$ 3,824	$ 4,561
25-29	69	75	144	22,827	26,296	49,123
30-34	374	493	867	147,753	186,968	334,721
35-39	798	1,155	1,953	379,869	489,153	869,022
40-44	1,029	1,723	2,752	579,930	891,915	1,471,845
45-49	1,204	2,084	3,288	771,608	1,240,305	2,011,913
50-54	1,454	2,561	4,015	1,001,917	1,543,637	2,545,554
55-59	1,215	2,222	3,437	769,017	1,115,344	1,884,361
60-64	491	1,015	1,506	257,119	419,400	676,519
65 & Up	76	98	174	42,159	37,342	79,501
Total	6,718	11,434	18,152	$ 3,972,936	$ 5,954,184	$ 9,927,120

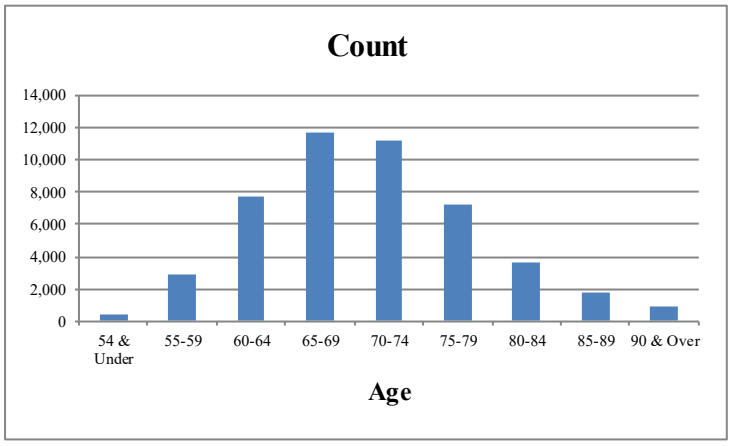
* There are 115 members currently on leave and 599 members on LTD. Their counts and estimated deferred monthly benefits are included.

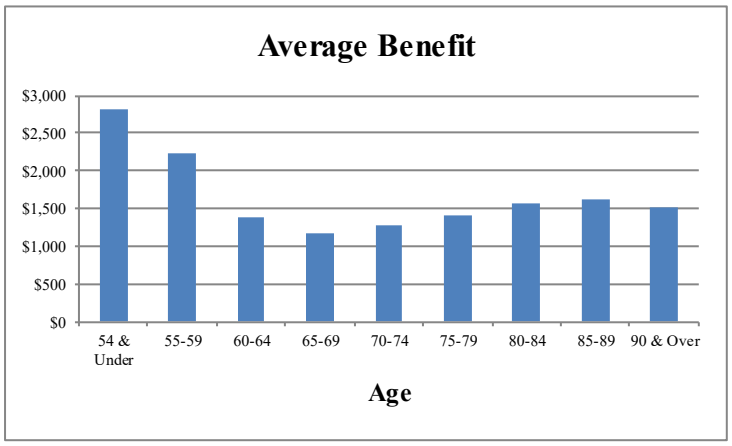




RETIRED MEMBERS
AS OF JUNE 30, 2022

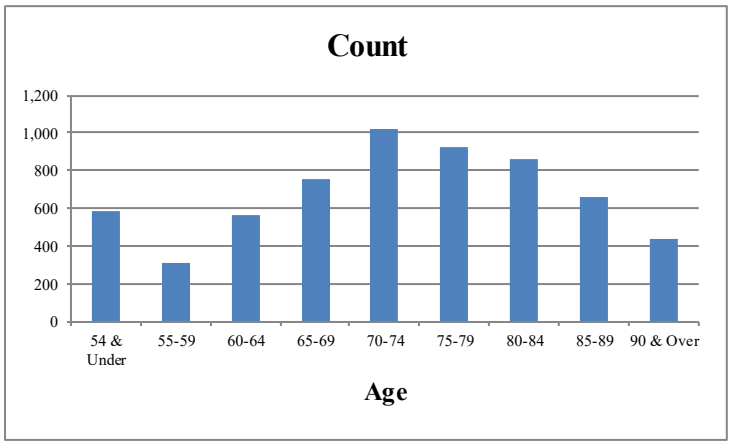
	Count of Members			Monthly Benefits		
Age	Male	Female	Total	Male	Female	Total
54 & Under	159	312	471	$ 467,078	$ 864,047	$ 1,331,125
55-59	1,031	1,818	2,849	2,460,516	3,878,182	6,338,698
60-64	2,665	5,068	7,733	3,947,590	6,772,184	10,719,774
65-69	4,327	7,379	11,706	5,717,741	8,152,260	13,870,001
70-74	4,369	6,826	11,195	6,454,882	7,906,402	14,361,284
75-79	2,944	4,225	7,169	5,163,526	4,951,262	10,114,788
80-84	1,420	2,267	3,687	3,013,663	2,777,382	5,791,045
85-89	627	1,146	1,773	1,466,494	1,436,420	2,902,914
90 & Over	297	657	954	682,286	777,409	1,459,695
Total	17,839	29,698	47,537	$ 29,373,776	$ 37,515,548	$ 66,889,324

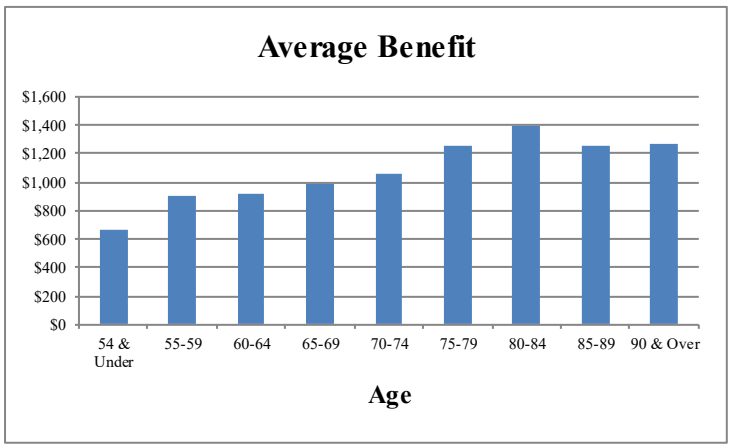




BENEFICIARIES RECEIVING BENEFITS
AS OF JUNE 30, 2022

	Count of Members			Monthly Benefits		
Age	Male	Female	Total	Male	Female	Total
54 & Under	228	354	582	$ 137,796	$ 251,903	$ 389,699
55-59	97	214	311	72,314	210,925	283,239
60-64	155	406	561	112,185	405,450	517,635
65-69	214	539	753	168,505	574,986	743,491
70-74	265	753	1,018	201,174	870,873	1,072,047
75-79	211	717	928	181,364	989,445	1,170,809
80-84	199	662	861	180,180	1,021,613	1,201,793
85-89	161	502	663	132,755	699,953	832,708
90 & Over	104	330	434	75,927	472,408	548,335
Total	1,634	4,477	6,111	$ 1,262,200	$ 5,497,556	$ 6,759,756





RETIRED LIVES BENEFITS PAYABLE AS OF JUNE 30, 2022
TABULATED BY OPTION AND TYPE OF BENEFIT

MSEP Benefits

Type of Benefit	No.	Total Monthly Benefits
Service Retirement		
Life Annuity	5,844	$ 8,568,280
50% Joint and Survivor	5,040	9,362,200
100% Joint and Survivor	3,132	6,345,731
5-Year Certain and Life	138	176,218
10-Year Certain and Life	180	207,370
Survivor Beneficiary	2,722	3,642,519
Total	17,056	28,302,318
Death-in-Service	1,399	1,560,294
Total	**18,455**	**$ 29,862,612**

MSEP 2000 Benefits

Type of Benefit	No.	Total Monthly Benefits
Service Retirement		
Life Annuity	20,499	$ 24,970,906
50% Joint and Survivor	4,713	8,056,183
100% Joint and Survivor	5,782	7,641,809
5-Year Certain and Life	17	24,093
10-Year Certain and Life	914	773,829
15-Year Certain and Life	792	581,051
Survivor Beneficiary	1,600	1,371,814
Total	34,317	43,419,685
Death-in-Service	361	175,096
Total	**34,678**	**$ 43,594,781**

RETIRED LIVES BENEFITS PAYABLE AS OF JUNE 30, 2022
TABULATED BY OPTION AND TYPE OF BENEFIT

MSEP 2011 Benefits

Type of Benefit	No.	Total Monthly Benefits
Service Retirement		
Life Annuity	305	$ 113,777
50% Joint and Survivor	34	12,243
100% Joint and Survivor	105	38,914
5-Year Certain and Life	0	0
10-Year Certain and Life	16	6,346
15-Year Certain and Life	26	10,374
Survivor Beneficiary	5	966
Total	491	182,620
Death-in-Service	24	9,067
Total	**515**	**$ 191,687**

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SALARY INCREASES
DURING PLAN YEAR 2021-2022

Age	Count	Salary Increases	
		Actual*	Expected
Under 20	13	3.0%	7.7%
20 - 24	868	8.3%	5.3%
25 - 29	2,402	7.9%	4.3%
30 - 34	3,286	6.4%	3.8%
35 - 39	3,754	5.7%	3.5%
40 - 44	4,428	4.6%	3.4%
45 - 49	4,848	4.3%	3.2%
50 - 54	5,520	4.0%	3.1%
55 - 59	5,049	3.7%	3.2%
60 - 64	3,464	3.1%	3.2%
65 & Over	1,395	3.2%	3.1%
Total	**35,027**		
Average		**4.6%**	**3.4%**

** Excludes new entrants and terminations.*

	Payroll Growth				
	2022	2021	2020	2019	2018
Actual**	0.56%	-0.96%	2.60%	0.8%	-1.4%
Assumed	2.25%	2.25%	2.35%	2.5%	3.0%

** Based on reported payroll.

ACTIVE MEMBERS WHO RETIRED WITH SERVICE RETIREMENT BENEFITS DURING PLAN YEAR 2021-2022

Age	Male		Female		Total	
	Actual	Expected	Actual	Expected	Actual	Expected
Under 50	2	0.0	4	0.3	6	0.3
50	1	0.3	11	2.6	12	2.9
51	12	2.2	14	6.5	26	8.7
52	19	8.0	27	13.4	46	21.4
53	22	10.5	40	20.9	62	31.5
54	18	13.4	54	27.7	72	41.2
55	24	19.4	39	30.3	63	49.7
56	25	17.8	48	29.8	73	47.6
57	43	28.3	64	39.3	107	67.6
58	41	32.3	81	47.6	122	80.0
59	36	28.4	59	45.7	95	74.0
60	47	34.7	75	50.1	122	84.8
61	46	29.1	69	42.4	115	71.5
62	50	46.1	74	63.7	124	109.7
63	34	35.1	71	51.8	105	86.9
64	45	33.8	71	54.4	116	88.2
65	56	45.4	106	72.6	162	118.0
66	56	40.9	79	54.7	135	95.6
67	19	21.3	21	24.9	40	46.2
68	16	15.9	24	21.7	40	37.5
69	14	14.5	17	15.9	31	30.4
70 & Over	59	68.4	59	66.0	118	134.4
Total	**685**	**545.6**	**1,107**	**782.2**	**1,792**	**1,327.8**

	Male	Female	Total
Average age at retirement	61.7 years	60.9 years	61.2 years
Average service at retirement	22.4 years	22.6 years	22.5 years

ACTIVE MEMBERS WHO BECAME DISABLED DURING PLAN YEAR 2021-2022

Age	Male		Female		Total	
	Actual	Expected	Actual	Expected	Actual	Expected
Under 25	0	0.2	1	0.2	1	0.4
25 - 29	2	0.6	1	0.9	3	1.5
30 - 34	0	1.5	5	2.2	5	3.7
35 - 39	3	2.7	2	4.3	5	6.9
40 - 44	2	4.7	7	8.4	9	13.1
45 - 49	10	7.1	10	12.7	20	19.9
50 - 54	14	9.6	16	16.7	30	26.3
55 - 59	10	8.4	15	15.6	25	24.0
60 & Over	3	4.6	6	7.7	9	12.3
Total	**44**	**39.3**	**63**	**68.8**	**107**	**108.1**

	Male	Female	Total
Average age at disability	50.6 years	49.4 years	49.9 years
Average service at disability	13.6 years	9.7 years	11.3 years

ACTIVE MEMBERS WHO DIED DURING PLAN YEAR 2021-2022

Age	Male		Female		Total	
	Actual	Expected	Actual	Expected	Actual	Expected
Under 30	2	1.0	0	0.6	2	1.6
30 - 34	2	1.3	1	0.9	3	2.2
35 - 39	1	1.7	2	1.4	3	3.1
40 - 44	2	2.1	4	2.1	6	4.2
45 - 49	5	2.8	5	3.0	10	5.8
50 - 54	8	4.6	4	5.2	12	9.8
55 - 59	12	7.0	7	8.0	19	15.0
60 - 64	15	8.0	12	8.2	27	16.2
65 & Over	11	6.6	5	5.6	16	12.2
Total	**58**	**35.1**	**40**	**35.2**	**98**	**70.2**

	Male	Female	Total
Average age at death	56.1 years	55.5 years	55.8 years
Average service at death	16.4 years	15.6 years	16.1 years

Of the 98 active members who died in service during plan year 2021-2022, 92 members had a benefit payable to a survivor.

ACTIVE MEMBERS WHO TERMINATED EMPLOYMENT WITH A DEFERRED BENEFIT DURING PLAN YEAR 2021-2022

Age	Male		Female		Total	
	Actual	Expected	Actual	Expected	Actual	Expected
Under 30	35	20.6	54	31.7	89	52.3
30 - 34	134	73.6	179	102.3	313	175.9
35 - 39	111	78.8	210	122.0	321	200.7
40 - 44	109	77.1	209	132.4	318	209.6
45 - 49	85	68.3	178	115.6	263	184.0
50 - 54	68	66.0	149	118.9	217	184.9
55 - 59	54	36.8	125	73.3	179	110.1
60 & Over	19	10.6	40	20.0	59	30.6
Total	**615**	**431.9**	**1,144**	**716.2**	**1,759**	**1,148.1**

	Male	Female	Total
Average age at termination	41.8 years	43.2 years	42.7 years
Average service at termination	9.8 years	9.8 years	9.8 years

ACTIVE MEMBERS WHO TERMINATED EMPLOYMENT WITHOUT A DEFERRED BENEFIT PAYABLE DURING PLAN YEAR 2021-2022

Age	Male		Female		Total	
	Actual	Expected	Actual	Expected	Actual	Expected
Under 20	15	6.2	15	7.4	30	13.5
20 - 24	242	160.8	423	250.3	665	411.0
25 - 29	366	271.2	610	406.8	976	678.0
30 - 34	264	205.0	422	320.4	686	525.4
35 - 39	141	140.8	285	244.3	426	385.1
40 - 44	98	104.7	215	209.2	313	313.9
45 - 49	71	95.2	191	185.8	262	281.0
50 - 54	69	90.7	150	167.4	219	258.1
55 - 59	48	84.2	124	162.1	172	246.3
60 - 64	30	60.3	82	97.0	112	157.3
65 - 69	15	18.2	19	23.7	34	41.9
70 & Over	6	9.1	4	6.4	10	15.5
Total	**1,365**	**1,246.4**	**2,540**	**2,080.8**	**3,905**	**3,327.1**

Service	Male		Female		Total	
	Actual	Expected	Actual	Expected	Actual	Expected
0 - 1	543	444.7	910	715.4	1,453	1,160.1
1 - 2	324	311.6	680	543.6	1,004	855.1
2 - 3	229	233.3	449	385.4	678	618.7
3 - 4	152	144.4	326	246.2	478	390.6
4 - 5	117	112.4	175	190.2	292	302.6
Total	**1,365**	**1,246.4**	**2,540**	**2,080.8**	**3,905**	**3,327.1**

	Male	Female	Total
Average age at termination	33.8 years	35.2 years	34.7 years
Average service at termination	1.8 years	1.8 years	1.8 years

COMPARISON OF ACTUAL TO EXPECTED DEATHS AMONG RETIRED LIVES (SERVICE RETIREMENT ONLY) DURING PLAN YEAR 2021-2022

Age	Male			Female			Total		
	Actual	Expected	Exposures	Actual	Expected	Exposures	Actual	Expected	Exposures
Under 50	0	0.0	0	0	0.0	0	0	0.0	0
50 - 54	1	0.8	104	1	1.1	229	2	1.9	333
55 - 59	11	8.6	887	12	8.9	1,572	23	17.4	2,459
60 - 64	30	30.0	2,524	43	31.5	4,712	73	61.5	7,236
65 - 69	74	58.9	4,256	112	68.6	7,340	186	127.5	11,596
70 - 74	127	88.6	4,422	171	105.8	6,810	298	194.4	11,232
75 - 79	108	91.3	2,822	128	110.6	4,030	236	201.9	6,852
80 - 84	107	79.5	1,422	130	113.9	2,249	237	193.4	3,671
85 - 89	83	64.1	666	136	114.3	1,216	219	178.4	1,882
90 - 94	42	39.0	254	99	88.9	552	141	127.9	806
95 - 99	15	11.5	52	43	36.8	161	58	48.3	213
100 & Over	1	1.6	5	9	6.6	20	10	8.2	25
Total	**599**	**473.9**	**17,414**	**884**	**687.0**	**28,891**	**1,483**	**1,160.9**	**46,305**
Average Ages	**77.5**	**77.5**	**71.0**	**78.9**	**80.0**	**70.8**	**78.3**	**79.0**	**70.9**

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MSEP (Missouri State Employees' Plan)	MSEP 2000 (Missouri State Employees' Plan 2000)	MSEP 2011 (Missouri State Employees' Plan 2011)
DEFINITIONS **Participants** 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). (2) MSEP active members and vested former members who elect to transfer to the MSEP 2000 plan prior to retirement. (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. (4) MSEP non-vested terminations rehired on or after July 1, 2000. (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). (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 (Missouri State Employees' Plan)	MSEP 2000 (Missouri State Employees' Plan 2000)	MSEP 2011 (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 (Missouri State Employees' Plan)	MSEP 2000 (Missouri State Employees' Plan 2000)	MSEP 2011 (Missouri State Employees' Plan 2011)
ELIGIBILITY FOR BENEFITS		
Normal retirement		
Members of the General Assembly: Age 55 with completion of at least 3 full biennial assemblies.	*Members of the General Assembly:* The earliest of attaining: (1) Age 55 with completion of at least 3 full biennial assemblies. (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:* The earliest of attaining: (1) Age 62 with completion of at least 3 full biennial assemblies. (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: The earliest of attaining: (1) Age 65 with at least 4 years of credited service. (2) Age 60 with at least 15 years of credited service. (3) Age 50 with age plus credited service equal to 80 or more.	*Statewide Elected Officials:* The earliest of attaining: (1) Age 55 with at least 4 years of credited service. (2) Age 50 with age plus credited service equal to 80 or more.	*Statewide Elected Officials:* The earliest of attaining: (1) Age 62 with at least 4 years of credited service as a statewide elected official. (2) Age 55 with age plus credited service equal to 90 or more.
General Employees: The earliest of attaining: (1) Age 65 and active with at least 4 years of credited service. (2) Age 65 with at least 5 years of credited service. (3) Age 60 with at least 15 years of credited service. (4) Age 48 with age plus credited service equal to 80 or more.	*General Employees:* The earliest of attaining: (1) Age 62 with at least 5 years of credited service. (2) Age 48 with age plus credited service equal to 80 or more.	*General Employees:* The earliest of attaining: (1) Age 67 with at least 5 years of credited service. (2) Age 55 with age plus credited service equal to 90 or more.

MSEP (Missouri State Employees' Plan)	MSEP 2000 (Missouri State Employees' Plan 2000)	MSEP 2011 (Missouri State Employees' Plan 2011)
Uniformed Water Patrol Employees: The earliest of attaining: (1) Age 55 and active with at least 4 years of credited service. (2) Age 55 with at least 5 years of credited service. (3) Age 48 with age plus credited service equal to 80 or more. *Administrative Law Judges:* The earliest of attaining: (1) Age 62 and active with at least 12 years of credited service. (2) Age 60 with at least 15 years of credited service. (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 (Missouri State Employees' Plan)	MSEP 2000 (Missouri State Employees' Plan 2000)	MSEP 2011 (Missouri State Employees' Plan 2011)
MONTHLY BENEFITS PAYABLE **Normal Retirement** *Members of the General Assembly:* $150 per month per biennial assembly served. *Statewide Elected Officials:* 1) Less than 12 years of credited service: 1.6% of Average Compensation times years of credited service. 2) 12 or more years of credited service: 50% of pay of the highest elected position held prior to retirement. *General Employees:* 1.6% of Average Compensation times years of credited service. 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. *Uniformed Water Patrol:* 2.13% of Average Compensation times years of credited service.	*Members of the General Assembly:* 1/24 of pay times first 24 years of credited service as a member of the General Assembly. *Statewide Elected Officials:* 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. *General Employees:* 1.7% of Average Compensation times years of credited service. Temporary Benefit: 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:* 1/24 of pay times first 24 years of credited service as a member of the General Assembly. *Statewide Elected Officials:* 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. *General Employees:* 1.7% of Average Compensation times years of credited service. Temporary Benefit: 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 (Missouri State Employees' Plan)	MSEP 2000 (Missouri State Employees' Plan 2000)	MSEP 2011 (Missouri State Employees' Plan 2011)
Administrative Law Judges: 50% of Compensation	Non-Social Security Covered Service: 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: 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. 1) Less than 15 years of service: Normal retirement amount actuarially reduced for years younger than age 65. 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. 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 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. Years of Service / General Assembly / Elected Officials / General Employees 4 / / 100% / 5 / / / 100% 6* / 100% / / *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. Years of Service / General Assembly / Elected Officials / General Employees 4 / / 100% / 5 / / / 100% 6* / 100% / / *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. Years of Service / General Assembly / Elected Officials / General Employees 4 / / 100% / 5 / / / 100% 6* / 100% / / *3 Assemblies, HB1455 prospectively
Death prior to retirement 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 (Missouri State Employees' Plan)	MSEP 2000 (Missouri State Employees' Plan 2000)	MSEP 2011 (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
(Missouri State Employees' Plan)</th><th>MSEP 2000
(Missouri State Employees' Plan 2000)</th><th>MSEP 2011
(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 (Missouri State Employees' Plan)	MSEP 2000 (Missouri State Employees' Plan 2000)	MSEP 2011 (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. Members first hired on or after August 28, 1997 receive COLAs based solely on Formula 2. 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. 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. 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:* 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. *General Employees:* Annual benefit percentage increase equal to the lesser of: i) 80% of the CPI increase, and 5%. 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. 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:* 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. *General Employees:* Annual benefit percentage increase equal to the lesser of: i) 80% of the CPI increase, and 5%. 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. 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 (Missouri State Employees' Plan)	MSEP 2000 (Missouri State Employees' Plan 2000)	MSEP 2011 (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 (Missouri State Employees' Plan)	MSEP 2000 (Missouri State Employees' Plan 2000)	MSEP 2011 (Missouri State Employees' Plan 2011)
BackDROP 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. 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. 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 (Missouri State Employees' Plan)	MSEP 2000 (Missouri State Employees' Plan 2000)	MSEP 2011 (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. 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.

   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 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: <u>MSEP / MSEP 2000</u> 7 months (4 months of unused leave; 3 months of military service purchases) <u>MSEP 2011</u> 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, 2022. It was brought forward to June 30, 2022 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 28 active members in the June 30, 2022 data whose salary is assumed to be $47,500.

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". Most retirement systems have unfunded actuarial accrued liability. They arise each time new benefits are added and each time an actuarial loss is realized.