Celebrating 20 years

Judicial Retirement System of New Jersey

Actuarial Experience Study for July 1, 2018 through June 30, 2021

Produced by Cheiron

November 2022

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CHEIRON

November 9, 2022

State House Commission
Judicial Retirement System of New Jersey
State of New Jersey
Department of the Treasury
Division of Pension and Benefits, CN 295
Trenton, NJ 08625-0295

Dear Commission Members:

The purpose of this report is to present the Actuarial Experience Study of the Judicial Retirement System of New Jersey (JRS, the System) in accordance with Title 43, Chapter 6A-31 of the NJ State Statute. This Statute requires the actuary to conduct an actuarial investigation into the mortality, service and salary experience of the members and beneficiaries of the System at least once every three years.

This study covers the actuarial experience from July 1, 2018 through June 30, 2021. The report includes analyses and results of our study as well as recommended assumptions for consideration by the State House Commission to be used beginning with the July 1, 2022 actuarial valuation. It also includes the estimated financial impact of these assumption changes. The prior experience study was performed by Cheiron and covered the period July 1, 2014 through June 30, 2018.

If you have any questions about the report or would like additional information, please let us know.

Sincerely,
Cheiron

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SECTION I – EXECUTIVE SUMMARY

Actuarial assumptions (economic and demographic) are intended to be long-term in nature, and should be both individually reasonable and consistent in the aggregate. That is particularly important considering the major economic impact and consequential changes in membership behavior due to the COVID-19 pandemic which may be short term in nature. The purpose of this experience study is to evaluate whether the current assumptions adequately reflect the long-term expectations for JRS, and if not, to recommend adjustments. It is important to note that frequent and significant changes in the actuarial assumptions are not typically recommended, unless there are known fundamental changes in expectations of the economy, or with respect to JRS's membership or assets that would warrant such frequent or significant changes.

SUMMARY OF ASSUMPTION ANALYSIS

This experience study specifically analyzes and makes the following recommendations for to the following assumptions.

- **Retirement rates** – Modify the rates based on experience.
- **Termination rates** – Continue the current assumption of no termination rates.
- **Disability rates** – No changes to the current assumption.
- **Mortality rates** – Continue to use Pub-2010 base mortality tables. Update generational mortality improvement scale to MP-2021.
- **Family composition** – Continue with the current assumption for percent married. Modify the age difference between males and females based on recent experience.
- **Price and wage inflation rates –** Continue with the current assumption.
- **Salary increase rates –** Continue the current assumption consistent with Chapter 14, P. L. 2018.

The recommended changes to the assumptions would decrease the actuarial liability and the Statutory contributions.

Further information about the impact of these changes to overall contribution rates and funded status can be found on the next page.

SECTION I – EXECUTIVE SUMMARY

	Current Assumptions		Recommended Assumptions	
Table I-1				
Cost Impact of Assumption Changes on July 1, 2021 Valuation Results				
Assets and Liabilities				
Actuarial Liability	$	854,306,065	$	843,903,393
Actuarial Value of Assets (AVA)[1]		249,915,574		249,915,574
Unfunded Actuarial Liability/(Surplus)	$	604,390,491	$	593,987,819
Funded Ratio		29.3%		29.6%
Contribution Amounts				
State Normal Cost at End of Year	$	18,528,672	$	18,124,357
Amortization Payment of UAL		49,796,898		48,939,802
Total Statutory Contribution for FYE	$	68,325,570	$	67,064,159
Difference due to assumption changes				
Actuarial Liability			$	(10,402,672)
Actuarial Value of Assets (AVA)[1]				0
Unfunded Actuarial Liability/(Surplus)			$	(10,402,672)
Funded Ratio				0.3%
State Normal Cost at End of Year			$	(404,315)
Amortization Payment of UAL				(857,096)
Total Statutory Contribution for FYE			$	(1,261,411)

[1] Includes discounted State appropriations receivable

The body of this report provides details and support for our conclusions and recommendations for the assumptions.

SECTION II – CERTIFICATION

The purpose of this report is to provide the results of an Actuarial Experience Study of the Judicial Retirement System of New Jersey (JRS) covering the three year period from July 1, 2018 through June 30, 2021. This report is for the use of the Division of Pensions and Benefits and the State House Commission in selecting assumptions to be used in actuarial valuations beginning July 1, 2022. This experience study was completed in accordance with the provisions of Title 43, Chapter 6A-31 of the NJ State Statute which requires periodic review of the experience of the System.

In preparing our report, we relied on information (some oral and some written) supplied by the Division of Pensions and Benefits. This information includes, but is not limited to, the plan provisions, employee data, and financial information. We performed an informal examination of the obvious characteristics of the data for reasonableness and consistency in accordance with Actuarial Standard of Practice No. 23, Data Quality.

Cheiron utilizes ProVal, an actuarial valuation software leased from Winklevoss Technologies (WinTech) to calculate liabilities and project benefit payments. We have relied on WinTech as the developer of ProVal. We have reviewed ProVal and have a basic understanding of it and have used ProVal in accordance with its original intended purpose. We have not identified any material inconsistencies in assumptions or output of ProVal that would affect this actuarial valuation.

This report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices and our understanding of the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board as well as applicable laws and regulations. Furthermore, as credentialed actuaries we meet the Qualification Standards of the American Academy of Actuaries to render the opinion contained in this report. This report does not address any contractual or legal issues. We are not attorneys and our firm does not provide any legal services or advice.

This report was prepared for the Judicial Retirement System of New Jersey for the purposes described herein. This report is not intended to benefit any other party, and Cheiron assumes no duty or liability to any such party.

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SECTION III – DEMOGRAPHIC ASSUMPTIONS

Demographic assumptions are used to predict membership behavior, including rates of retirement, termination, disability, and mortality. These assumptions are based primarily on the historical experience of JRS, with some adjustments where future experience is expected to differ from historical experience and with deference to standard tables where JRS experience is not fully credible, which means there is insufficient data to support an assumption, and a standard table is available.

ANALYSIS OF DEMOGRAPHIC ASSUMPTIONS

For all of the demographic assumptions, we determined the ratio of the actual number of decrements for each membership group compared to the expected number of decrements (A/E ratio or actual-to-expected ratio). Generally, the goal is to get as close as possible to an A/E ratio of 100%. Appropriate assumptions are often dependent on the amount of data available, and if there is insufficient data, then the best assumption may be a reflection of standard tables. For example, there are typically relatively low incidences of pre-retirement deaths so using standard mortality tables are more appropriate. This could result in the A/E ratio being further away from 100%. Also, we aggregate participants for demographic assumptions review when the data at individual ages is no longer credible. For example, we may reduce the number of service bands for an assumption with low incidences, if those service bands do not materially improve the results.

We also calculate an r-squared statistic for each assumption. R-squared measures how well the assumption fits the actual data and can be thought of as the percentage of the variation in actual data explained by the assumption. Ideally, r-squared would equal 1.000, although this is never the case in reality. Any recommended assumption change should increase the r-squared compared to the current assumption making it closer to 1.000 unless the pattern of future decrements is expected to be different from the pattern experienced during the period of study.

In addition, we calculated the 90% confidence interval, which represents the range within which the true decrement rate during the experience study period is expected to fall 90% of the time. In the graphs, the black squares represent the actual experience observed and the gray bars represent the 90% confidence interval around that experience. The red and green lines represent the current and recommended assumptions, respectively. When the recommended assumption is the same as the current assumption, the green line sits over the red line and the red line does not show. Where there is sufficient experience, the confidence interval is relatively narrow, and where there is little experience, the confidence interval can be very wide.We generally recommend assumption changes when the current assumption is outside the 90% confidence interval of the observed experience. However, adjustments are made to account for differences between future expectations and historical experience, to account for the past experience represented by the current assumption, and to maintain a neutral to slight conservative bias in the selection of the assumption. For mortality rates, we compare JRS's experience to that of a standard table.

RETIREMENT RATES

The current retirement rates vary by age and service as a judge and are applied to all members who are eligible to retire. As a result, a judge who is age 60 with 10 years of service as a judge, for example, is assumed to be less likely to retire than a judge who is age 60 with 25 years of service as a judge. In reviewing the data for JRS, we find that at many ages, members with more service as a judge are generally more likely to retire than members with fewer years of service as a judge. JRS is not large enough to justify assumptions for each age and service combination, so we recommend separate assumptions by service groups for members:

- Members with less than 15 years of service as a judge,
- Members with 15 to 19 years of service as a judge, and
- Members with 20 or more years of service as a judge.

Members are eligible to retire prior to age 60 only if they have 25 or more years in aggregate of public service. Due to the demographic make-up of the group, few, if any, members attain 25 years of service as a judge prior to age 60. As such, members who retire prior to age 60 generally do so based on non-judicial service. No members retired prior to age 60 during the experience period. Therefore, we recommend continuing to assume no retirements prior to age 60.

Likewise, few members utilized non-judicial service when retiring after attaining age 60.

The following exhibits focus on members age 60 and above and on service as a judge only. In the interest of brevity, further references to years of service mean years of service as a judge.

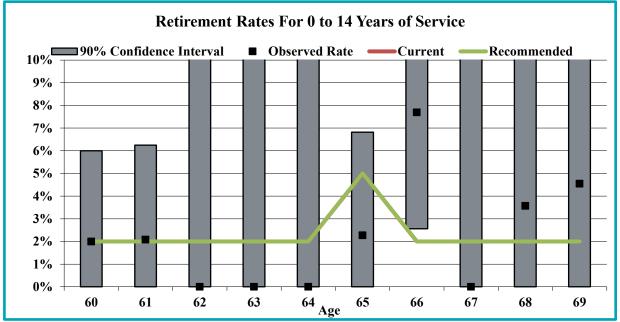The ultimate retirement age remains at age 70, per plan provisions.

SECTION III – DEMOGRAPHIC ASSUMPTIONS
RETIREMENT RATES

In Table III-R1 we show the calculation of actual-to-expected ratios and the r-squared statistic for members with less than 15 years of service, and Chart III-R1 shows the information graphically along with the 90% confidence interval. For this group, the actual experience was very close to the expected number of assumed retirements. Based on the experience, we recommend no change to the retirement rates for members with 0 to 14 years of service as shown in the table below.

Table III-R1

		Retirements			Retirement Rates			A/E Ratios	
Age	Exposures	Actual	Current	Recommended	Actual	Current	Recommended	Current	Recommended
60	50	1	1.0	1.0	2.00%	2.00%	2.00%	100%	100%
61	48	1	1.0	1.0	2.08%	2.00%	2.00%	104%	104%
62	52	0	1.0	1.0	0.00%	2.00%	2.00%	0%	0%
63	47	0	0.9	0.9	0.00%	2.00%	2.00%	0%	0%
64	48	0	1.0	1.0	0.00%	2.00%	2.00%	0%	0%
65	44	1	2.2	2.2	2.27%	5.00%	5.00%	45%	45%
66	39	3	0.8	0.8	7.69%	2.00%	2.00%	385%	385%
67	33	0	0.7	0.7	0.00%	2.00%	2.00%	0%	0%
68	28	1	0.6	0.6	3.57%	2.00%	2.00%	179%	179%
69	22	1	0.4	0.4	4.55%	2.00%	2.00%	227%	227%
Total	**411**	**8**	**9.5**	**9.5**	**1.95%**	**2.32%**	**2.32%**	**84%**	**84%**
R-squared			**0.001**	**0.001**					

Chart III-R1

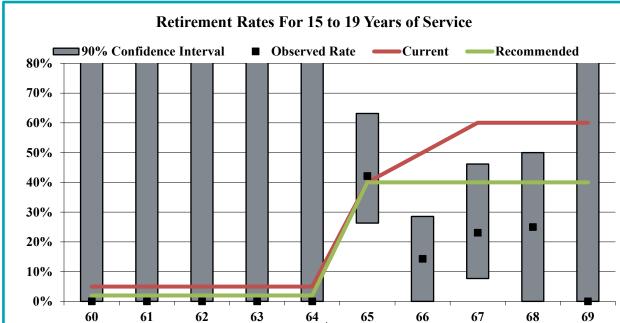Retirement Rates For 0 to 14 Years of Service

SECTION III – DEMOGRAPHIC ASSUMPTIONS
RETIREMENT RATES

Table III-R2 shows the calculation of actual-to-expected ratios and the r-squared statistic for members with service between 15 and 19 years, and Chart III-R2 shows the information graphically along with the 90% confidence interval. The data shows there are fewer actual retirements compared to the expected number of retirements under the current assumption. Based on the experience, we recommend decreasing the retirement rates at all ages, except age 65, for members with 15 to 19 years of service.

Table III-R2

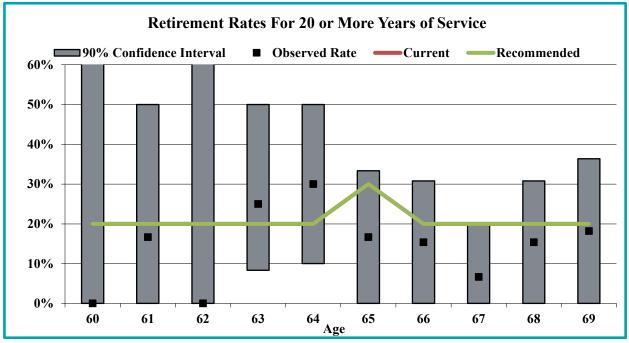|		Retirements			Retirement Rates			A/E Ratios	
Age	Exposures	Actual	Current	Recommended	Actual	Current	Recommended	Current	Recommended
60	14	0	0.7	0.3	0.00%	5.00%	2.00%	0%	0%
61	13	0	0.7	0.3	0.00%	5.00%	2.00%	0%	0%
62	16	0	0.8	0.3	0.00%	5.00%	2.00%	0%	0%
63	12	0	0.6	0.2	0.00%	5.00%	2.00%	0%	0%
64	15	0	0.8	0.3	0.00%	5.00%	2.00%	0%	0%
65	19	8	7.6	7.6	42.11%	40.00%	40.00%	105%	105%
66	14	2	7.0	5.6	14.29%	50.00%	40.00%	29%	36%
67	13	3	7.8	5.2	23.08%	60.00%	40.00%	38%	58%
68	8	2	4.8	3.2	25.00%	60.00%	40.00%	42%	63%
69	3	0	1.8	1.2	0.00%	60.00%	40.00%	0%	0%
Total	127	15	32.5	24.2	11.81%	25.59%	19.06%	46%	62%
R-squared			0.657	0.817					

Chart III-R2

SECTION III – DEMOGRAPHIC ASSUMPTIONS
RETIREMENT RATES

Table III-R3 shows the calculation of actual-to-expected ratios and the r-squared statistic for members with 20 or more years of service, and Chart III-R3 shows the information graphically along with the 90% confidence interval. Based on the experience, we recommend no change to the retirement rates for members with 20 or more years of service.

Table III-R3

		Retirements			Retirement Rates			A/E Ratios	
Age	Exposures	Actual	Current	Recommended	Actual	Current	Recommended	Current	Recommended
60	2	0	0.4	0.4	0.00%	20.00%	20.00%	0%	0%
61	6	1	1.2	1.2	16.67%	20.00%	20.00%	83%	83%
62	5	0	1.0	1.0	0.00%	20.00%	20.00%	0%	0%
63	12	3	2.4	2.4	25.00%	20.00%	20.00%	125%	125%
64	10	3	2.0	2.0	30.00%	20.00%	20.00%	150%	150%
65	12	2	3.6	3.6	16.67%	30.00%	30.00%	56%	56%
66	13	2	2.6	2.6	15.38%	20.00%	20.00%	77%	77%
67	15	1	3.0	3.0	6.67%	20.00%	20.00%	33%	33%
68	13	2	2.6	2.6	15.38%	20.00%	20.00%	77%	77%
69	11	2	2.2	2.2	18.18%	20.00%	20.00%	91%	91%
Total	**99**	**16**	**21.0**	**21.0**	**16.16%**	**21.21%**	**21.21%**	**76%**	**76%**
R-squared			**0.377**	**0.377**					

Chart III-R3

See Appendices A and B for a full listing of the recommended and current rates.

SECTION III – DEMOGRAPHIC ASSUMPTIONS
TERMINATION RATES

Termination rates reflect the frequency at which active members leave employment for reasons other than retirement, death, or disability. The current assumption is that no vested or non-vested member terminates. The experience shows that of the 602 exposures in the three years of experience, there were only 11 terminations. Given the historically low rate of terminations and the potentially unusual workforce changes during the COVID-19 pandemic, we recommend continuing the current assumption of no terminations.

Table III-T1

Termination Rates								
Service Band	Exposures	Terminations			Termination Rates			A/E Ratios	
		Actual	Current	Recommended	Actual	Current	Recommended	Current	Recommended
0 - 4	279	8	0.0	0.0	2.87%	0.00%	0.00%	0%	0%
5 - 9	199	2	0.0	0.0	1.01%	0.00%	0.00%	0%	0%
10 - 14	97	1	0.0	0.0	1.03%	0.00%	0.00%	0%	0%
15 +	27	0	0.0	0.0	0.00%	0.00%	0.00%	0%	0%
Total	602	11	0.0	0.0	1.83%	0.00%	0.00%	0%	0%
R-squared			0.000	0.000					

SECTION III – DEMOGRAPHIC ASSUMPTIONS
DISABILITY RATES

The following table shows the calculation of actual-to-expected ratios and the r-squared statistic for terminations due to disability. The experience shows no incidence of disability over the past three years. Since there has historically been very low incidence of disability, we recommend continuing the current assumption.

Table III-D1

Disability Rates								
Age Band	Exposures	Disabilities			Disability Rates			A/E Ratios	
		Actual	Current	Recommended	Actual	Current	Recommended	Current	Recommended
35 - 39	4	0	0.0	0.0	0.00%	0.03%	0.03%	0%	0%
40 - 44	24	0	0.0	0.0	0.00%	0.05%	0.05%	0%	0%
45 - 49	100	0	0.1	0.1	0.00%	0.09%	0.09%	0%	0%
50 - 54	193	0	0.3	0.3	0.00%	0.14%	0.14%	0%	0%
55 - 59	283	0	0.7	0.7	0.00%	0.24%	0.24%	0%	0%
60 - 64	350	0	1.3	1.3	0.00%	0.38%	0.38%	0%	0%
65 - 69	287	0	1.6	1.6	0.00%	0.54%	0.54%	0%	0%
Total	**1,241**	**0**	**4.0**	**4.0**	**0.00%**	**0.32%**	**0.32%**	**0%**	**0%**
R-squared			**0.000**	**0.000**					

SECTION III – DEMOGRAPHIC ASSUMPTIONS
MORTALITY RATES

Mortality assumptions are typically developed separately by gender. Unlike most of the other demographic assumptions that rely exclusively on the experience of the plan, for mortality, standard mortality tables and projection scales, reflecting future life expectancy improvements, serve as the primary basis for the assumption which is then modified to better reflect the System's experience.

The Society of Actuaries (SOA) completed an extensive mortality study of public pension plan experience and issued a set of mortality tables named the Pub-2010 mortality tables which provide insights into the composition of gender-specific pension mortality by factors such as job category (e.g. General Employees, Teachers, Public Safety), salary/benefit amount, health status (e.g. healthy or disabled), geographic region and duration since event.

In addition, there has been a long history of mortality improvement among pensioners in the U.S., and there is an expectation that mortality rates will continue to improve in the future. The SOA annually publishes a mortality improvement scale that reflects continued mortality improvement trends. The SOA's MP-2021 scale is the most recent mortality improvement projection scale at the time this analysis was prepared. However, the MP-2021 scale reflects historical mortality data through calendar year 2019. The COVID -19 pandemic may have caused a temporary change in mortality patterns.

The steps in our analysis of the mortality assumptions are as follows:

1. Select a standard mortality table that reflects the anticipated experience of the System.
2. Compare actual experience of the System to what would have been predicted by the selected standard table for the period of the experience study.
3. Adjust the standard table either fully or partially depending on the level of credibility for the System's experience. This adjusted table is called the base table.
4. Select an appropriate standard mortality improvement projection scale and apply it to the base table.

Similar to the methodology used to develop the Pub-2010 tables, when actual experience of the System is compared to that of the standard table, the experience is weighted based on the amount of income (salary for pre-retirement mortality and pension benefit for post-retirement mortality). Mortality studies in the U.S. have consistently shown that individuals with higher income have longer life expectancies than individual with lower income. It is important for a pension plan to use assumptions that are weighted to reflect the impact on liability.

SECTION III – DEMOGRAPHIC ASSUMPTIONS
MORTALITY RATES

In the prior study, JRS adopted the following assumptions:

Active members (Non-Annuitants): The standard Pub-2010 Teachers Above-Median Income Employee mortality table *[PubT-2010(A) Employee]* as published by the Society of Actuaries, unadjusted, and with future improvement from the base year of 2010 on a generational basis using SOA's Scale MP-2018.

Healthy retirees and beneficiaries (Healthy Annuitants): The standard Pub-2010 Teachers Above-Median Income Healthy Retiree mortality table *[PubT-2010(A) Healthy Retiree]* as published by the Society of Actuaries, unadjusted, and with future improvement from the base year of 2010 on a generational basis using SOA's Scale MP-2018.

Disabled members (Disabled Annuitants): The Pub-2010 Non-Safety Disabled Retiree mortality table *[PubNS-2010 Disabled Retiree]* as published by the Society of Actuaries, unadjusted, and with future improvement from the base year of 2010 on a generational basis using SOA's Scale MP-2018.

Deaths among active and inactive lives for JRS in a three-year period represent a relatively small sample size and may not provide meaningful statistics. There were only two active deaths in total which does not provide a large enough sampling to analyze this group in detail. For healthy retirees and survivors there were 76 deaths over this period, and for disabled retirees there were no deaths. For reference, a fully credible sample would include 1,082 deaths. We therefore recommend continuing to use the same standard Pub-2010 tables for Teachers without any adjustments.

We note that the recommended standard tables do not always match the experience as well as in the prior experience study. However, the COVID-19 pandemic may have caused a temporary change in mortality patterns. Future mortality experience may be more similar to experience in the prior study.

We recommend no changes to the base mortality tables and updating the mortality improvement scale from MP-2018 to MP-2021 as described below:

Active members (Non-Annuitants): The standard Pub-2010 Teachers Above-Median Income Employee mortality table *[PubT-2010(A) Employee]* as published by the Society of Actuaries, unadjusted, and with future improvement from the base year of 2010 on a generational basis using SOA's Scale MP-2021.

Healthy retirees and beneficiaries (Healthy Annuitants): The standard Pub-2010 Teachers Above-Median Income Healthy Retiree mortality table *[PubT-2010(A) Healthy Retiree]* as published by the Society of Actuaries, unadjusted, and with future improvement from the base year of 2010 on a generational basis using SOA's Scale MP-2021.

Disabled members (Disabled Annuitants): The Pub-2010 Non-Safety Disabled Retiree mortality table *[PubNS-2010 Disabled Retiree]* as published by the Society of Actuaries, unadjusted, and with future improvement from the base year of 2010 on a generational basis using SOA's Scale MP-2021.
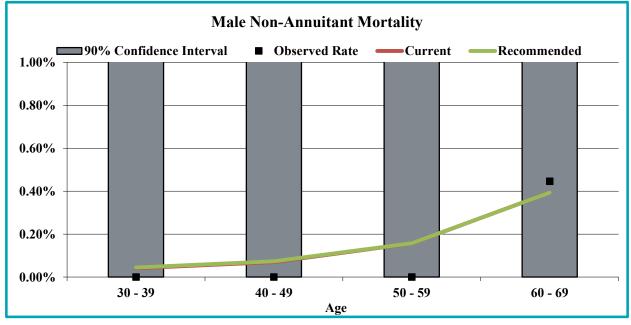
SECTION III – DEMOGRAPHIC ASSUMPTIONS
MORTALITY RATES

Table III-M1 – Active Males

Age Band	Exposures	Actual Deaths	Weighted Exposures	Weighted Deaths			A/E Ratio	
				Actual	Current	Recommended	Current	Recommended
30 - 39	3	0	543,000	0	223	244	0%	0%
40 - 49	62	0	11,102,000	0	7,749	8,140	0%	0%
50 - 59	293	0	53,052,787	0	82,983	83,559	0%	0%
60 - 69	464	2	84,712,473	378,000	333,726	332,976	113%	114%
Total	**822**	**2**	**149,410,260**	**378,000**	**424,681**	**424,919**	**89%**	**89%**
R-squared					**0.167**	**0.168**		

Chart III-M1

Table III-M2 – Active Females

Age Band	Exposures	Actual Deaths	Weighted Exposures	Weighted Deaths			A/E Ratio	
				Actual	Current	Recommended	Current	Recommended
30 - 39	1	0	173,000	0	54	55	0%	0%
40 - 49	62	0	11,150,000	0	5,543	5,458	0%	0%
50 - 59	183	0	33,121,731	0	35,837	34,987	0%	0%
60 - 69	206	0	37,695,272	0	87,074	86,602	0%	0%
Total	**452**	**0**	**82,140,003**	**0**	**128,508**	**127,103**	**0%**	**0%**
R-squared					**0.000**	**0.000**		

Chart III-M2
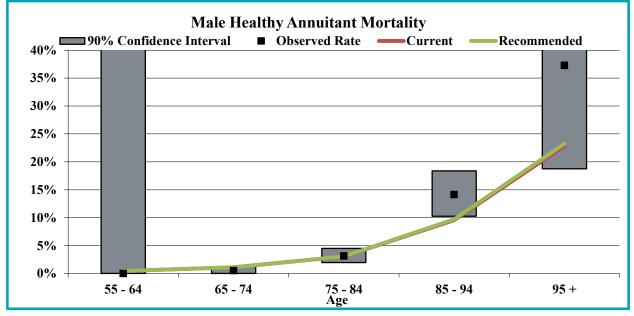

Female Non-Annuitant Mortality

SECTION III – DEMOGRAPHIC ASSUMPTIONS
MORTALITY RATES

Table III-M3 – Healthy Retiree and Survivor Males

Healthy Annuitant Mortality - Base Table for Males								
Age Band	Exposures	Actual Deaths	Weighted Exposures	Weighted Deaths			A/E Ratios	
				Actual	Current	Recommended	Current	Recommended
55 - 64	15	0	1,163,071	0	5,216	5,227	0%	0%
65 - 74	413	2	44,842,115	247,500	500,461	496,193	49%	50%
75 - 84	513	16	53,745,046	1,704,504	1,636,485	1,642,907	104%	104%
85 - 94	185	27	18,338,728	2,594,038	1,752,131	1,780,267	148%	146%
95 +	16	6	1,590,754	593,383	363,488	370,162	163%	160%
Total	**1,142**	**51**	**119,679,714**	**5,139,425**	**4,257,780**	**4,294,755**	**121%**	**120%**
R-squared					**0.509**	**0.514**		

Chart III-M3

SECTION III – DEMOGRAPHIC ASSUMPTIONS
MORTALITY RATES

Table III-M4 – Healthy Retiree and Survivor Females

Age Band	Exposures	Actual Deaths	Weighted Exposures	Weighted Deaths			A/E Ratios	
				Actual	Current	Recommended	Current	Recommended
55 - 64	13	0	1,365,696	0	5,197	5,192	0%	0%
65 - 74	218	1	20,562,143	84,975	157,718	155,833	54%	55%
75 - 84	249	3	20,002,010	269,001	490,220	489,878	55%	55%
85 - 94	174	12	9,278,090	667,371	794,253	803,712	84%	83%
95 +	41	9	1,768,661	512,206	376,108	380,812	136%	135%
Total	**695**	**25**	**52,976,600**	**1,533,553**	**1,823,496**	**1,835,427**	**84%**	**84%**
R-squared					**0.373**	**0.375**		

Chart III-M4

Female Healthy Annuitant Mortality

SECTION III – DEMOGRAPHIC ASSUMPTIONS
MORTALITY RATES

For disabled mortality, given the low exposures and limited data, we have only included the tables in the report and do not show the graphs.

Table III-M5 – Disabled Retiree Males

Age Band	Exposures	Actual Deaths	Weighted Exposures	Weighted Deaths Actual	Weighted Deaths Current	Weighted Deaths Recommended	A/E Ratios Current	A/E Ratios Recommended
50 - 54	0	0	0	0	0	0	0%	0%
55 - 59	0	0	0	0	0	0	0%	0%
60 - 64	0	0	0	0	0	0	0%	0%
65 - 69	3	0	388,224	0	13,546	13,443	0%	0%
70 - 74	8	0	1,000,245	0	39,833	39,470	0%	0%
75 - 79	4	0	458,988	0	22,726	22,629	0%	0%
80 - 84	0	0	0	0	0	0	0%	0%
85 - 89	0	0	0	0	0	0	0%	0%
90 +	3	0	285,345	0	82,333	83,556	0%	0%
Total	**18**	**0**	**2,132,802**	**0**	**158,438**	**159,098**	**0%**	**0%**
R-squared					**0.000**	**0.000**		

Table III-M6 – Disabled Retiree Females

Age Band	Exposures	Actual Deaths	Weighted Exposures	Weighted Deaths Actual	Weighted Deaths Current	Weighted Deaths Recommended	A/E Ratios Current	A/E Ratios Recommended
50 - 54	0	0	0	0	0	0	0%	0%
55 - 59	0	0	0	0	0	0	0%	0%
60 - 64	5	0	528,062	0	11,073	11,053	0%	0%
65 - 69	1	0	115,531	0	2,503	2,495	0%	0%
70 - 74	3	0	371,250	0	10,206	10,067	0%	0%
75 - 79	0	0	0	0	0	0	0%	0%
80 - 84	0	0	0	0	0	0	0%	0%
85 - 89	0	0	0	0	0	0	0%	0%
90 +	0	0	0	0	0	0	0%	0%
Total	**9**	**0**	**1,014,843**	**0**	**23,783**	**23,615**	**0%**	**0%**
R-squared					**0.000**	**0.000**		

SECTION III – DEMOGRAPHIC ASSUMPTIONS
FAMILY COMPOSITION

In the event of a member death, pension benefits may extend to a surviving spouse. Spousal demographic information is important in determining the value of their potential future benefit. However, marital information is not always readily available. In the case of an unmarried active member, they could marry before commencing benefits. Even married retirees are sometimes reported without a beneficiary date of birth. With this uncertainty, we make assumptions regarding the frequency with which participants are married at the time of benefit commencement as well as the age difference between the retirees and their spouses.

We currently assume the following:

- For members not currently receiving a benefit, 90% of members are assumed married to spouses of the opposite sex.
- Males are assumed to be three years older than females.

Based on healthy and disabled retirees that have commenced between July 1, 2018 and June 30, 2021, approximately 87.0% are married with males being older than females by an average of 1.5 years.

As a result, we recommend the following:

- The percent married assumption for active members remains unchanged at 90%.
- The age difference between males and females is reduced from three years to two years.

SECTION IV – ECONOMIC ASSUMPTIONS

The economic assumptions used in actuarial valuations are intended to be long-term in nature and should be both individually reasonable and consistent with each other. The specific assumptions analyzed in this report are:

- **Price inflation** – used to project increases in the 401(a)(17) pay limit. This assumption is also used indirectly as an underlying component of other economic assumptions.
- **Wage inflation** – across the board wage growth which is used to project the Social Security Wage Base. Note that this assumption does not impact the JRS valuation.
- **Salary increase rate** – used to project expected increases in pay for active members in determining liabilities and costs of the System.

We have not studied the investment rate of return assumption since that assumption is set by the NJ State Treasurer.

In order to develop recommendations for each of these assumptions, we considered historical data, both nationally and for the System, expectations for the future and assumptions used by other public sector plans.

PRICE INFLATION

Long-term price inflation rates are the foundation of other economic assumptions. In a growing economy, wages and investments are expected to grow at the underlying inflation rate plus an additional real growth rate, whether it reflects productivity in terms of wages, or risk premiums in terms of investments.
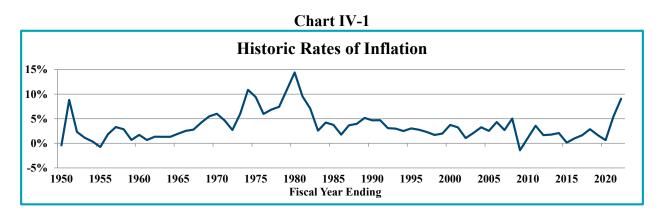
Historical Data

Chart IV-1 below shows inflation based on CPI-U for the U.S. by individual year from 1950 through 2022.

Chart IV-1

SECTION IV – ECONOMIC ASSUMPTIONS

Over the 50 years ending June 2022, the geometric average inflation rate for the U.S. has been about 4.0%, but this average is heavily influenced by the high inflation rates in the 1970s and early 1980s. Over the last 30 years, the geometric average inflation rate has been 2.5%, and it has been 2.6% over the last ten years.

Inflation broke from the recent long-term trend with annual rates of 5.4% and 9.1% for the years ending June 2021 and 2022, respectively. This short-term deviation bears monitoring but does not require an immediate revision to expectations. Economic assumptions frequently deviate significantly from expectations. Often those deviations are followed by offsetting deviations in the opposite direction. The assumptions used in actuarial valuations are long-term in nature and are not necessarily driven by the most recent events. That is particularly important considering the major economic impact of the recent COVID-19 pandemic.

Future Expectations

A measure of the market consensus of expected future inflation rates is the difference in yields between conventional Treasury bonds and Treasury inflation-protected securities (TIPS) at the same maturity. Table IV-1 shows the yields on both types of bonds and the break-even inflation rate as of August 2022. Break-even inflation is the level of inflation needed for an investment in TIPS to "break even" with an investment in conventional treasury bonds of the same maturity.

Table IV-1

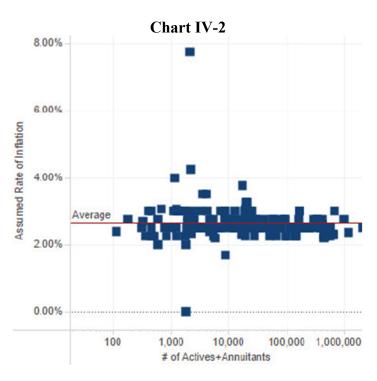| Break-Even Inflation Based on Treasury Bond Yields			
Time to Maturity	Conventional Yield	TIPS Yield	Break Even Inflation
5 Years	3.03%	0.34%	2.69%
10 Years	2.90%	0.39%	2.51%
20 Years	3.35%	0.65%	2.70%

Data Source: Federal Reserve, Constant Maturity Yields, Monthly Series

The Federal Reserve Bank of Philadelphia publishes a quarterly survey of professional economic forecasters that includes their forecasts of inflation over the next 10 years. The survey for the third quarter of 2022 shows a median inflation forecast of 2.8%, a minimum forecast of about 2.1%, and a maximum forecast of 4.5%.

The National Conference on Public Employee Retirement Systems (NCPERS) February 2022 Public Retirement Systems Study includes the following graphic of respondents' inflation assumptions:

Chart IV-2

The average inflation assumption among the 156 systems that responded to this study was 2.70%.

Based on all of these considerations, we believe a reasonable range for long-term price inflation for use in the System's actuarial valuations is between 2.25% and 3.25%. Despite recent high inflation, we recommend keeping the current assumption of 2.75% as it aligns with longer term expectations from both markets and forecasters. If, at the time of the next review of economic assumptions, higher inflation persists and expectations for the future increase, increases to the assumption could be considered.

WAGE INFLATION

Wage inflation can be thought of as the annual across-the-board increase in wages. Individuals often receive salary increases in excess of the wage inflation rate, and we study these increases as a part of the merit salary scale assumption. Wage inflation generally exceeds price inflation by some margin reflecting the history of increased purchasing power.
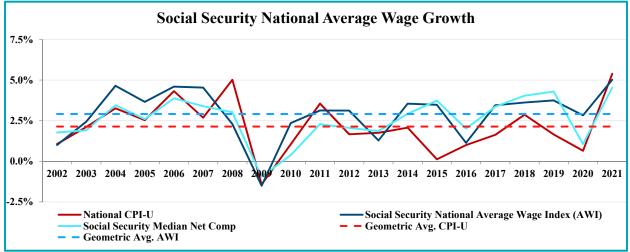
Wage inflation is used in the actuarial valuation to project the Social Security Wage Base in determining the actuarial liability.

Chart IV-3 shows the increase in national average wages (as reported by the Social Security Administration) compared to inflation from 2002 through 2021.

SECTION IV – ECONOMIC ASSUMPTIONS

Chart IV-3

Over this period, national wage inflation averaged approximately 2.9% compared to annual price inflation of 2.1%, making real wage increases about 0.8% above inflation. However, over the same time period, the increase in the median real wage was only 0.4% per year, as much of the growth in wages was clustered at the top end of the wage scale.

It is acceptable to assume some additional level of base payroll increase beyond general inflation. Potential reasons contributing to the increase may include the presence of strong union representation in the collective bargaining process, competition in hiring among other similar employers, and regional factors – such as the local inflation index exceeding the national average. Also, the Social Security Administration projects real wage growth of 0.5% - 1.8% going forward in their Social Security solvency projections included in the 2022 annual Trustees Report. However, recent higher rates of inflation have resulted in negative real wage growth for US workers, and the expectation of higher inflation in the short term is anticipated to continue to put downward pressure on real wages, at least in the short term.

We recommend maintaining a small non-inflationary base payroll growth assumption of 0.5% annually. As a result, after factoring in inflation, the annual expected wage base increase assumption remains at 3.25%. Note that this assumption does not impact the JRS valuation.

SECTION IV – ECONOMIC ASSUMPTIONS

SALARY INCREASE RATE

The salary increase rate represents the year over year increase in pay of continuing actives. The current assumption is 2.00% per year through fiscal year ending 2025 and 2.75% per year for fiscal years ending 2026 and thereafter.

Based on salary information provided to us, members of the System did not receive salary increases on an annual basis from 2010 to 2017. Chapter 14, P. L. 2018 (N. J. State Statute 2B: 2-4) granted salary increases to judges as follows: $8,000 increase beginning January 1, 2018, $8,000 increase beginning January 1, 2019, and $8,000 increase beginning January 1, 2020. In addition, beginning on January 1, 2021 and on the January 1 of each year for four years thereafter, the amount of the annual salary determined for the prior calendar year shall be adjusted annually by the State Treasurer in direct proportion to the percent change in the Consumer Price Index over a 12-month period beginning November 1 and ending October 31. For this purpose, "Consumer Price Index" means the Consumer Price Index for All Urban Consumers, New York-Northern New Jersey-Long Island Metropolitan Area, All Items (1982-84=100), as published by the Bureau of Labor Statistics in the United States Department of Labor. An adjustment in the annual payment shall be made only if the percent change in the Consumer Price Index for the period specified is greater than zero. Such an annual adjustment shall in no event be greater than two percent.

For JRS, the salary scale is not dependent on the age or service of members but is based on a standard rate increase by job category for all active members. Based on the salary increases already granted through Chapter 14, P. L. 2018, we recommend continuing to use the current salary increase assumption of 2.0% per year through the fiscal year ending 2025 and 2.75% per year thereafter. The ultimate rate of 2.75% is based on the recommended inflation assumption.

APPENDIX A – SUMMARY OF RECOMMENDED ASSUMPTIONS

The demographic assumptions are based on an experience study covering the period July 1, 2018 through June 30, 2021.

1. Disability   Disability rates are as follows:

Age	Rates	Age	Rates
20	0.019%	45	0.064%
21	0.020	46	0.071
22	0.020	47	0.080
23	0.020	48	0.091
24	0.021	49	0.102
25	0.021	50	0.114
26	0.021	51	0.126
27	0.021	52	0.142
28	0.022	53	0.157
29	0.022	54	0.177
30	0.022	55	0.197
31	0.023	56	0.218
32	0.024	57	0.218
33	0.024	58	0.269
34	0.026	59	0.296
35	0.026	60	0.326
36	0.028	61	0.354
37	0.028	62	0.383
38	0.030	63	0.412
39	0.030	64	0.442
40	0.033	65	0.473
41	0.036	66	0.510
42	0.043	67	0.550
43	0.047	68	0.599
44	0.054	69	0.652

2. Mortality   Healthy Retirees (Healthy Annuitants): The Pub-2010 Teachers Above-Median Income Healthy Retiree mortality table *[PubT-2010(A) Healthy Retiree]* as published by the Society of Actuaries, unadjusted, and with future improvement from the base year of 2010 on a generational basis using SOA's Scale MP-2021.

Disabled Retiree (Disabled Annuitants): The Pub-2010 Non-Safety Disabled Retiree mortality table *[PubNS-2010 Disabled Retiree]* as published by the Society of Actuaries, unadjusted, and with future improvement from the base year of 2010 on a generational basis using SOA's Scale MP-2021.

APPENDIX A – SUMMARY OF RECOMMENDED ASSUMPTIONS

<u>Pre-Retirement (Non-Annuitants)</u>**:** The Pub-2010 Teachers Above-Median Income Employee mortality table *[PubT-2010(A) Employee]* as published by the Society of Actuaries, unadjusted, and with future improvement from the base year of 2010 on a generational basis using SOA's Scale MP-2021.

3. Retirement

Retirement rates are as follows:

Age	Less than 15 Years of Judicial Service	15-19 Years of Judicial Service	20 or more Years of Judicial Service
< 60	0.0%	0.0%	0.0%
60	2.0	2.0	20.0
61	2.0	2.0	20.0
62	2.0	2.0	20.0
63	2.0	2.0	20.0
64	2.0	2.0	20.0
65	5.0	40.0	30.0
66	2.0	40.0	20.0
67	2.0	40.0	20.0
68	2.0	40.0	20.0
69	2.0	40.0	20.0
70	100.0	100.0	100.0

4. Termination

None assumed.

5. Salary Increases

Salaries are assumed to increase 2.0% per year through the fiscal year ending 2025 and 2.75% per year thereafter.

Salary increases are assumed to occur on January 1.

6. 401(a)(17) Pay Limit

$290,000 in 2021 increasing 2.75% per annum, compounded annually.

7. Family Composition Assumptions

For members not currently receiving a benefit, 90% of members are assumed married to spouses of the opposite sex. Males are assumed to be two years older than females.

APPENDIX A – SUMMARY OF RECOMMENDED ASSUMPTIONS

For purposes of the optional form of payment death benefit for members currently in receipt, beneficiary status is based on the beneficiary allowance reported. If no beneficiary date of birth is provided, the beneficiary is assumed to be the member's spouse of the opposite sex with males assumed to be two years older than females.

For purposes of the statutory death benefit for members currently in receipt, 100% of participants are assumed married to spouses of the opposite sex, with the exception of those members who elected Optional Forms A, B, C or D and are currently in receipt of their maximum retirement allowance. The spouse is assumed to be the reported beneficiary. If no beneficiary date of birth is provided, males are assumed to be two years older than females.

No additional dependent children or parents are assumed.

Current dependents under age 21 are assumed to receive a benefit until age 21. Current dependents over age 21 are assumed to receive a benefit for the remainder of their lifetime.

APPENDIX B – SUMMARY OF CURRENT ASSUMPTIONS

The following are the assumptions used in the actuarial valuation as of July 1, 2021. The economic and demographic assumptions and methods for that valuation were the results of the Experience Study covering the period July 1, 2014 – June 30, 2018, which was approved by the State House Commission on July 2, 2020.

1. **Disability**   Disability rates are as follows:

Age	Rates	Age	Rates
20	0.019%	45	0.064%
21	0.020	46	0.071
22	0.020	47	0.080
23	0.020	48	0.091
24	0.021	49	0.102
25	0.021	50	0.114
26	0.021	51	0.126
27	0.021	52	0.142
28	0.022	53	0.157
29	0.022	54	0.177
30	0.022	55	0.197
31	0.023	56	0.218
32	0.024	57	0.218
33	0.024	58	0.269
34	0.026	59	0.296
35	0.026	60	0.326
36	0.028	61	0.354
37	0.028	62	0.383
38	0.030	63	0.412
39	0.030	64	0.442
40	0.033	65	0.473
41	0.036	66	0.510
42	0.043	67	0.550
43	0.047	68	0.599
44	0.054	69	0.652

2. **Mortality**   Healthy Retiree (Healthy Annuitants): The Pub-2010 Teachers Above-Median Income Healthy Retiree mortality table *[PubT-2010(A) Healthy Retiree]* as published by the Society of Actuaries, unadjusted, and with future improvement from the base year of 2010 on a generational basis using SOA's Scale MP-2018.

Disabled Retiree (Disabled Annuitants): The Pub-2010 Non-Safety Disabled Retiree mortality table *[PubNS-2010 Disabled Retiree]* as published by the Society of Actuaries, unadjusted, and with future improvement from the base year of 2010 on a generational basis using SOA's Scale MP-2018.

APPENDIX B – SUMMARY OF CURRENT ASSUMPTIONS

> Pre-Retirement (Non-Annuitants)**:** The Pub-2010 Teachers Above-Median Income Employee mortality table *[PubT-2010(A) Employee]* as published by the Society of Actuaries, unadjusted, and with future improvement from the base year of 2010 on a generational basis using SOA's Scale MP-2018.

3. Retirement   Retirement rates are as follows:

Age	Less than 15 Years of Judicial Service	15-19 Years of Judicial Service	20 or more Years of Judicial Service
< 60	0.0%	0.0%	0.0%
60	2.0	5.0	20.0
61	2.0	5.0	20.0
62	2.0	5.0	20.0
63	2.0	5.0	20.0
64	2.0	5.0	20.0
65	5.0	40.0	30.0
66	2.0	50.0	20.0
67	2.0	60.0	20.0
68	2.0	60.0	20.0
69	2.0	60.0	20.0
70	100.0	100.0	100.0

4. Termination   None assumed.

5. Salary Increases   Salaries are assumed to increase by 2.00% per year through fiscal year ending 2025 and 2.75% per year thereafter.

Salary increases are assumed to occur on January 1.

6. 401(a)(17) Pay Limit $290,000 in 2021 increasing 2.75% per annum, compounded annually.

7. Family Composition Assumptions   For members not currently in receipt, 90% of members are assumed married to spouses of the opposite sex. Males are assumed to be three years older than females.

For purposes of the optional form of payment death benefit for members currently in receipt, beneficiary status is based on the beneficiary allowance reported. If no beneficiary date of birth is provided, the beneficiary is assumed to be the member's spouse of the opposite sex with males assumed to be three years older than females.

APPENDIX B – SUMMARY OF CURRENT ASSUMPTIONS

For purposes of the statutory death benefit for members currently in receipt, 100% of participants are assumed married to spouses of the opposite sex, with the exception of those members who elected Optional Forms A, B, C or D and are currently in receipt of their maximum retirement allowance. The spouse is assumed to be the reported beneficiary. If no beneficiary date of birth is provided, males are assumed to be three years older than females.

No additional dependent children or parents are assumed.

Current dependents under age 21 are assumed to receive a benefit until age 21. Current dependents over age 21 are assumed to receive a benefit for the remainder of their lifetime.