

# **Judicial Retirement System of New Jersey**

**Actuarial Experience Study for  
July 1, 2014 through June 30, 2018**

**Produced by Cheiron**

**January 2020**

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January 17, 2020

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 an 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 in every three year period. This experience study covers the actuarial experience from July 1, 2014 through June 30, 2018. The report includes analyses and results of our study as well as recommended assumptions for consideration by the State House Commission for changes to several of the actuarial assumptions to be used beginning with the July 1, 2019 actuarial valuation. It also includes the estimated financial impact of these assumption changes.

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

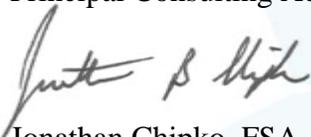
Sincerely,  
Cheiron

A handwritten signature in black ink, appearing to read "J Cranna".

Janet Cranna, FSA, FCA, MAAA, EA  
Principal Consulting Actuary

A handwritten signature in blue ink, appearing to read "Anu Patel".

Anu Patel, FSA, MAAA, EA  
Principal Consulting Actuary

A handwritten signature in black ink, appearing to read "Jonathan Chipko".

Jonathan Chipko, FSA, MAAA, EA  
Consulting Actuary

cc: Kenneth Kent, FSA, FCA, MAAA, EA

**JUDICIAL RETIREMENT SYSTEM OF NEW JERSEY  
EXPERIENCE STUDY AS OF JUNE 30, 2018**

**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. The purpose of this experience study is to evaluate whether or not 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 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** – Update to use the newly published Teachers Above-Median Income Pub-2010 standard mortality tables with generational mortality improvements using SOA's Scale MP-2018.
- **Price and wage inflation rates** – Decrease the inflation assumptions based on recent experience.
- **Salary increase rates** – Modify the rates to comply with Chapter 14, P. L. 2018.

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

Further information about impact of these changes to overall contribution rates can be found on the next page:

**JUDICIAL RETIREMENT SYSTEM OF NEW JERSEY  
EXPERIENCE STUDY AS OF JUNE 30, 2018**

**SECTION I – EXECUTIVE SUMMARY**

<b>Table I-1 Cost Impact of Assumption Changes</b>		
	<b>Current Assumptions</b>	<b>Recommended Assumptions</b>
<b><u>Assets and Liabilities</u></b>		
Actuarial Liability	\$ 670,562,613	\$ 754,258,185
Actuarial Value of Assets (AVA) <sup>1</sup>	209,981,271	209,981,271
Unfunded Actuarial Liability/(Surplus)	\$ 460,581,342	\$ 544,276,914
Funded Ratio	31.3%	27.8%
<b><u>Contribution Amounts</u></b>		
State Normal Cost at End of Year	\$ 13,329,514	\$ 16,941,506
Amortization Payment of UAL	38,997,991	46,084,599
Total Statutory Contribution for FYE	\$ 52,327,505	\$ 63,026,105
<b><u>Difference due to assumption changes</u></b>		
Actuarial Liability		\$ 83,695,572
Actuarial Value of Assets (AVA) <sup>1</sup>		0
Unfunded Actuarial Liability/(Surplus)		\$ 83,695,572
Funded Ratio		-3.5%
State Normal Cost at End of Year		\$ 3,611,992
Amortization Payment of UAL		7,086,608
Total Statutory Contribution for FYE		\$ 10,698,600

<sup>1</sup> Includes discounted State appropriations receivable

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

**JUDICIAL RETIREMENT SYSTEM OF NEW JERSEY  
EXPERIENCE STUDY AS OF JUNE 30, 2018**

**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 actuarial experience over a four year period from July 1, 2014 through June 30, 2018. 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, 2019. 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.

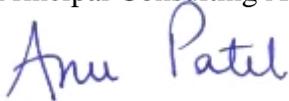
In preparing our report, we relied on information (some oral and some written) supplied by the Division of Pensions and Benefits. This information includes, but is not limited to, the plan provisions, employee data, and financial information. We performed an informal examination of the obvious characteristics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

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.

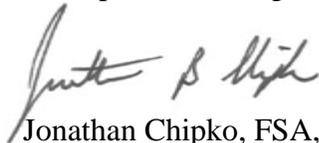
This report was prepared for the Judicial Retirement System of New Jersey for the purposes described herein. This report is not intended to benefit any other party, and Cheiron assumes no duty or liability to any such party.



Janet Cranna, FSA, FCA, MAAA, EA  
Principal Consulting Actuary



Anu Patel, FSA, MAAA, EA  
Principal Consulting Actuary



Jonathan Chipko, FSA, MAAA, EA  
Consulting Actuary

**JUDICIAL RETIREMENT SYSTEM OF NEW JERSEY  
EXPERIENCE STUDY AS OF JUNE 30, 2018**

**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 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 100%, 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 100% 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 fell within a range anticipated to cover 90% of the likely results. (If there is insufficient data to calculate a confidence interval, the confidence interval is shown as the entire range of the graph.) We generally propose 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.

**JUDICIAL RETIREMENT SYSTEM OF NEW JERSEY  
EXPERIENCE STUDY AS OF JUNE 30, 2018**

**SECTION III – DEMOGRAPHIC ASSUMPTIONS  
RETIREMENT RATES**

**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 propose 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. Only four members retired prior to age 60 during the experience period. Therefore, we recommend assuming 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 70, per plan provisions.

**JUDICIAL RETIREMENT SYSTEM OF NEW JERSEY  
EXPERIENCE STUDY AS OF JUNE 30, 2018**

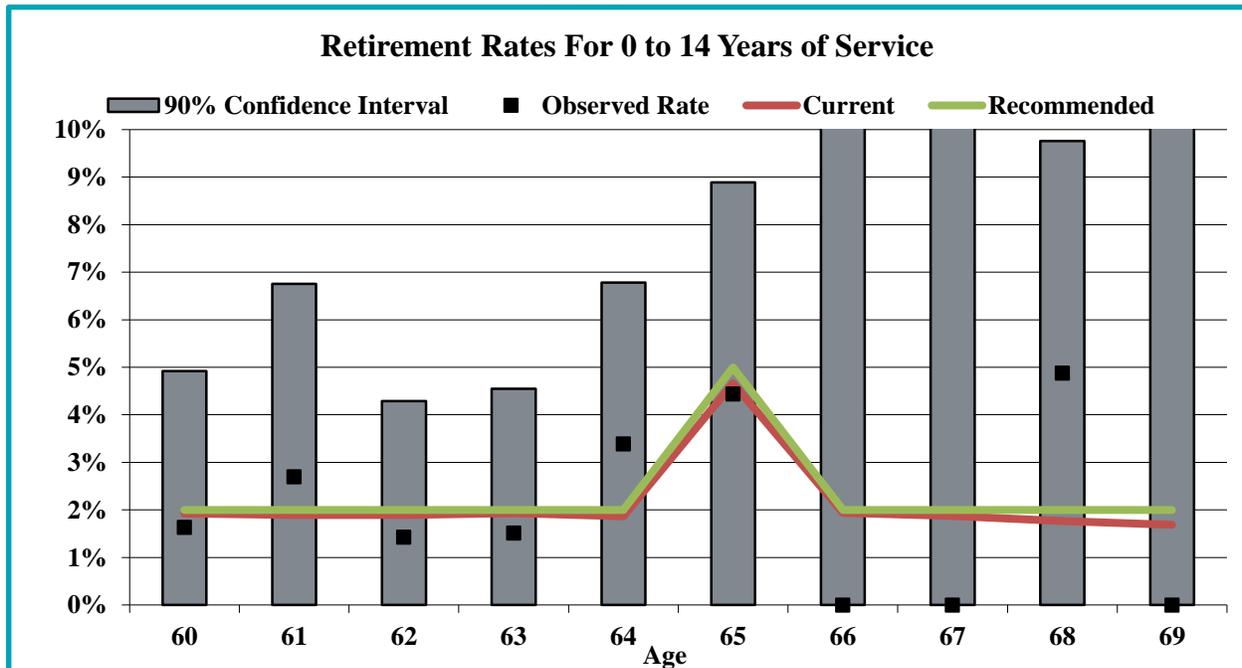
**SECTION III – DEMOGRAPHIC ASSUMPTIONS  
RETIREMENT RATES**

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 retirements based on the assumptions. Based on the experience, we recommend making slight adjustments to the retirement rates at all ages for members with 0 to 14 years of service as shown in the table below to streamline the assumption.

**Table III-R1**

Retirement Rates For 0 to 14 Years of Service									
Age	Exposures	Retirements			Retirement Rates			A/E Ratios	
		Actual	Current	Recommended	Actual	Current	Recommended	Current	Recommended
60	61	1	1.2	1.2	1.64%	1.93%	2.00%	85%	82%
61	74	2	1.4	1.5	2.70%	1.89%	2.00%	143%	135%
62	70	1	1.3	1.4	1.43%	1.89%	2.00%	75%	71%
63	66	1	1.3	1.3	1.52%	1.93%	2.00%	78%	76%
64	59	2	1.1	1.2	3.39%	1.86%	2.00%	182%	169%
65	45	2	2.1	2.3	4.44%	4.67%	5.00%	95%	89%
66	49	0	1.0	1.0	0.00%	1.94%	2.00%	0%	0%
67	44	0	0.8	0.9	0.00%	1.88%	2.00%	0%	0%
68	41	2	0.7	0.8	4.88%	1.77%	2.00%	276%	244%
69	37	0	0.6	0.7	0.00%	1.69%	2.00%	0%	0%
<b>Total</b>	<b>546</b>	<b>11</b>	<b>11.5</b>	<b>12.3</b>	<b>2.01%</b>	<b>2.11%</b>	<b>2.25%</b>	<b>96%</b>	<b>90%</b>
<b>R-squared</b>			<b>0.283</b>	<b>0.302</b>					

**Chart III-R1**



**JUDICIAL RETIREMENT SYSTEM OF NEW JERSEY  
EXPERIENCE STUDY AS OF JUNE 30, 2018**

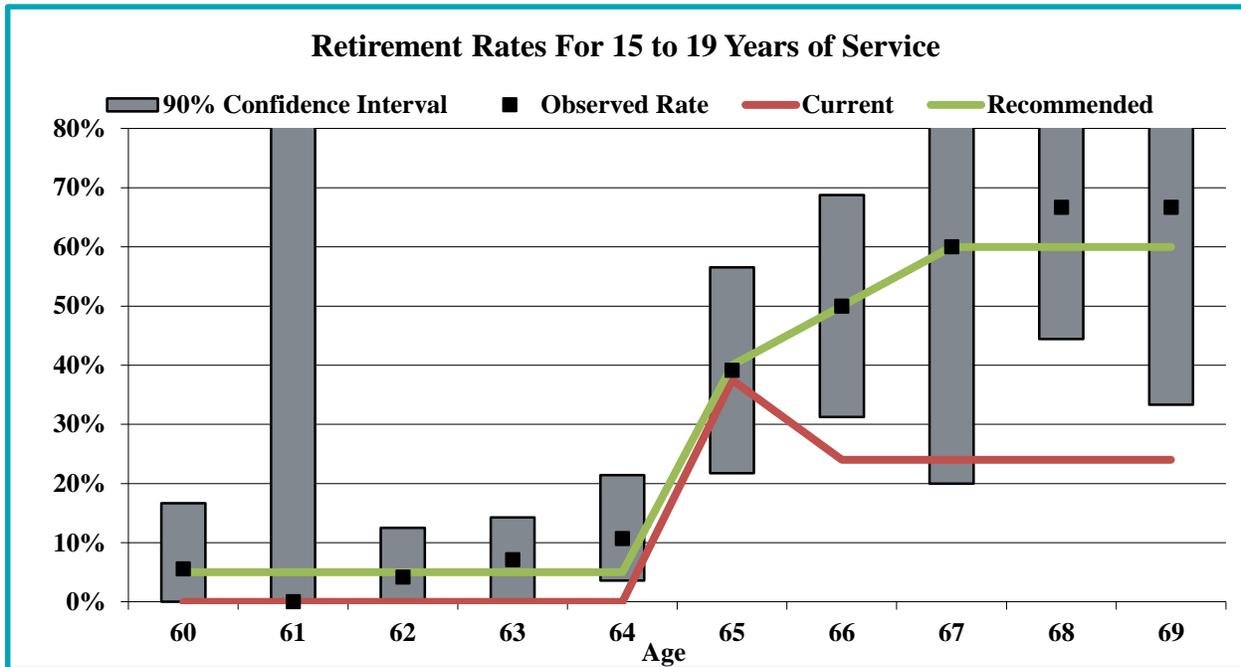
**SECTION III – DEMOGRAPHIC ASSUMPTIONS  
RETIREMENT RATES**

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 higher actual retirement rates than expected under the current assumption. Based on the experience, we recommend increasing the retirement rates at all ages for members with 15 to 19 years of service.

**Table III-R2**

Retirement Rates For 15 to 19 Years of Service									
Age	Exposures	Retirements			Retirement Rates			A/E Ratios	
		Actual	Current	Recommended	Actual	Current	Recommended	Current	Recommended
60	18	1	0.0	0.9	5.56%	0.00%	5.00%	0%	111%
61	18	0	0.0	0.9	0.00%	0.00%	5.00%	0%	0%
62	24	1	0.0	1.2	4.17%	0.00%	5.00%	0%	83%
63	28	2	0.0	1.4	7.14%	0.00%	5.00%	0%	143%
64	28	3	0.0	1.4	10.71%	0.00%	5.00%	0%	214%
65	23	9	8.6	9.2	39.13%	37.50%	40.00%	104%	98%
66	16	8	3.8	8.0	50.00%	24.00%	50.00%	208%	100%
67	5	3	1.2	3.0	60.00%	24.00%	60.00%	250%	100%
68	9	6	2.2	5.4	66.67%	24.00%	60.00%	278%	111%
69	6	4	1.4	3.6	66.67%	24.00%	60.00%	278%	111%
<b>Total</b>	<b>175</b>	<b>37</b>	<b>17.3</b>	<b>35.0</b>	<b>21.14%</b>	<b>9.87%</b>	<b>20.00%</b>	<b>214%</b>	<b>106%</b>
<b>R-squared</b>			<b>0.786</b>	<b>0.954</b>					

**Chart III-R2**



**JUDICIAL RETIREMENT SYSTEM OF NEW JERSEY  
EXPERIENCE STUDY AS OF JUNE 30, 2018**

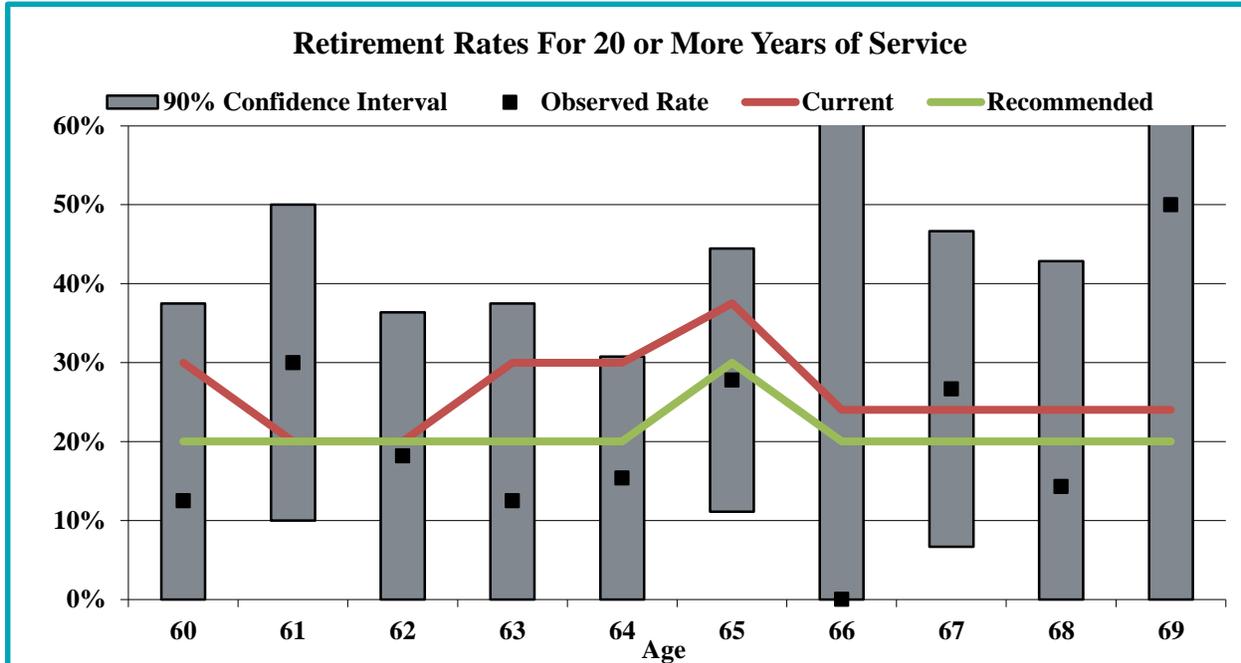
**SECTION III – DEMOGRAPHIC ASSUMPTIONS  
RETIREMENT RATES**

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. For retirements with 20 or more years of service, we recommend decreasing the assumption for ages 60, and 63 through 69.

**Table III-R3**

Retirement Rates For 20 or More Years of Service									
Age	Exposures	Retirements			Retirement Rates			A/E Ratios	
		Actual	Current	Recommended	Actual	Current	Recommended	Current	Recommended
60	8	1	2.4	1.6	12.50%	30.00%	20.00%	42%	63%
61	10	3	2.0	2.0	30.00%	20.00%	20.00%	150%	150%
62	11	2	2.2	2.2	18.18%	20.00%	20.00%	91%	91%
63	8	1	2.4	1.6	12.50%	30.00%	20.00%	42%	63%
64	13	2	3.9	2.6	15.38%	30.00%	20.00%	51%	77%
65	18	5	6.8	5.4	27.78%	37.50%	30.00%	74%	93%
66	11	0	2.6	2.2	0.00%	24.00%	20.00%	0%	0%
67	15	4	3.6	3.0	26.67%	24.00%	20.00%	111%	133%
68	7	1	1.7	1.4	14.29%	24.00%	20.00%	60%	71%
69	4	2	1.0	0.8	50.00%	24.00%	20.00%	208%	250%
<b>Total</b>	<b>105</b>	<b>21</b>	<b>28.5</b>	<b>22.8</b>	<b>20.00%</b>	<b>27.17%</b>	<b>21.71%</b>	<b>74%</b>	<b>92%</b>
<b>R-squared</b>			<b>0.450</b>	<b>0.557</b>					

**Chart III-R3**



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

**JUDICIAL RETIREMENT SYSTEM OF NEW JERSEY  
EXPERIENCE STUDY AS OF JUNE 30, 2018**

**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 825 exposures in the four years of experience, there were only 3 terminations. Given this low rate of terminations, we recommend continuing the current assumption of no terminations.

**Table III-T1**

Termination Rates									
Age Band	Exposures	Terminations			Termination Rates			A/E Ratios	
		Actual	Current	Recommended	Actual	Current	Recommended	Current	Recommended
20-24	0	0	0.0	0.0	0.00%	0.00%	0.00%	0%	0%
25-29	0	0	0.0	0.0	0.00%	0.00%	0.00%	0%	0%
30-34	0	0	0.0	0.0	0.00%	0.00%	0.00%	0%	0%
35-39	2	0	0.0	0.0	0.00%	0.00%	0.00%	0%	0%
40-44	38	1	0.0	0.0	2.63%	0.00%	0.00%	0%	0%
45-49	140	1	0.0	0.0	0.71%	0.00%	0.00%	0%	0%
50-54	247	1	0.0	0.0	0.40%	0.00%	0.00%	0%	0%
55-59	398	0	0.0	0.0	0.00%	0.00%	0.00%	0%	0%
<b>Total</b>	<b>825</b>	<b>3</b>	<b>0.0</b>	<b>0.0</b>	<b>0.36%</b>	<b>0.00%</b>	<b>0.00%</b>	<b>0%</b>	<b>0%</b>
<b>R-squared</b>			<b>0.000</b>	<b>0.000</b>					

**JUDICIAL RETIREMENT SYSTEM OF NEW JERSEY  
EXPERIENCE STUDY AS OF JUNE 30, 2018**

**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 very low incidence of disability and therefore 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	2	0	0.0	0.0	0.00%	0.03%	0.03%	0%	0%
40 - 44	32	0	0.0	0.0	0.00%	0.05%	0.05%	0%	0%
45 - 49	127	0	0.1	0.1	0.00%	0.08%	0.08%	0%	0%
50 - 54	230	0	0.3	0.3	0.00%	0.15%	0.15%	0%	0%
55 - 59	390	1	0.9	0.9	0.26%	0.24%	0.24%	106%	106%
60 - 64	496	0	1.9	1.9	0.00%	0.38%	0.38%	0%	0%
65 - 69	330	1	1.8	1.8	0.30%	0.54%	0.54%	56%	56%
<b>Total</b>	<b>1,607</b>	<b>2</b>	<b>5.1</b>	<b>5.1</b>	<b>0.12%</b>	<b>0.32%</b>	<b>0.32%</b>	<b>39%</b>	<b>39%</b>
<b>R-squared</b>			<b>0.0523</b>	<b>0.0523</b>					

**JUDICIAL RETIREMENT SYSTEM OF NEW JERSEY  
EXPERIENCE STUDY AS OF JUNE 30, 2018**

**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 serve as the primary basis for the assumption which is then modified to better reflect the System’s experience.

The Society of Actuaries (SOA) recently 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 new 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 recently completed project by the SOA concluded that mortality improvement in the U.S over the recent past “differed quite noticeably” from the prior standard projection scales (Scales AA and BB). As a result, we recommend using the MP-2018 scale, which was the most recent mortality improvement projection scale at the time this analysis was prepared.

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.

The recommended mortality tables suggested in this report are based on the steps followed above for the appropriate Pub-2010 mortality tables and the MP-2018 mortality improvement projection scale on a generational basis.

**JUDICIAL RETIREMENT SYSTEM OF NEW JERSEY  
EXPERIENCE STUDY AS OF JUNE 30, 2018**

**SECTION III – DEMOGRAPHIC ASSUMPTIONS  
MORTALITY RATES**

In the prior study, JRS adopted the following assumptions:

**Active members:** RP-2000 Combined Healthy Mortality Tables (unadjusted for males and set forward 3 years for females) projected on a generational basis from the base year of 2000 to 2013 using Projection Scale BB and the Conduent Modified 2014 Projection scale thereafter

**Healthy retirees and beneficiaries:** RP-2000 Combined Healthy Mortality Tables (unadjusted for males and set forward 3 years for females) projected on a generational basis from the base year of 2000 to 2013 using Projection Scale BB and the Conduent Modified 2014 Projection scale thereafter

**Disabled members:** RP-2000 Disability Mortality Tables (set forward 2 years for males and females) without projection

Deaths among active and inactive lives for JRS in a four-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 90 deaths over this period, and for disabled retirees there was one death. For reference, a fully credible sample would include 1,082 deaths. We therefore recommend using a standard Pub-2010 table for Teachers without any adjustments to the standard table.

We recommend the following base mortality table 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.

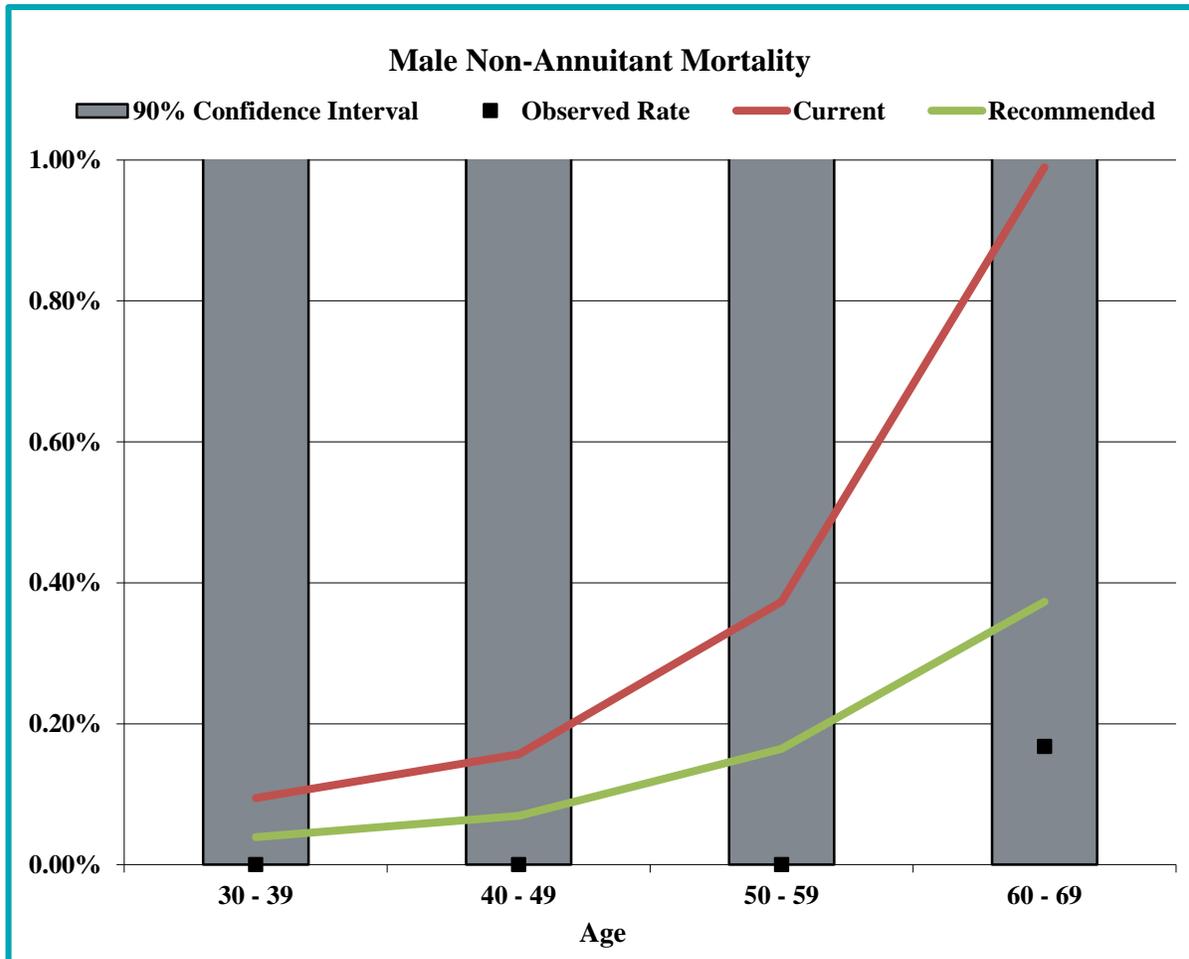
**JUDICIAL RETIREMENT SYSTEM OF NEW JERSEY  
EXPERIENCE STUDY AS OF JUNE 30, 2018**

**SECTION III – DEMOGRAPHIC ASSUMPTIONS  
MORTALITY RATES**

**Table III-M1 – Pre-Retirement Males**

Non-Annuitant Mortality - Base Table for Males								
Age Band	Exposures	Actual Deaths	Weighted Exposures	Weighted Deaths			A/E Ratios	
				Actual	Current	Recommended	Current	Recommended
30 - 39	1	0	165,000	0	156	65	0%	0%
40 - 49	90	0	14,850,000	0	23,280	10,271	0%	0%
50 - 59	372	0	61,633,978	0	230,068	101,373	0%	0%
60 - 69	591	1	98,353,935	165,000	973,288	366,890	17%	45%
<b>Total</b>	<b>1,054</b>	<b>1</b>	<b>175,002,913</b>	<b>165,000</b>	<b>1,226,792</b>	<b>478,599</b>	<b>13%</b>	<b>34%</b>
<b>R-squared</b>					<b>0.070</b>	<b>0.073</b>		

**Chart III-M1**



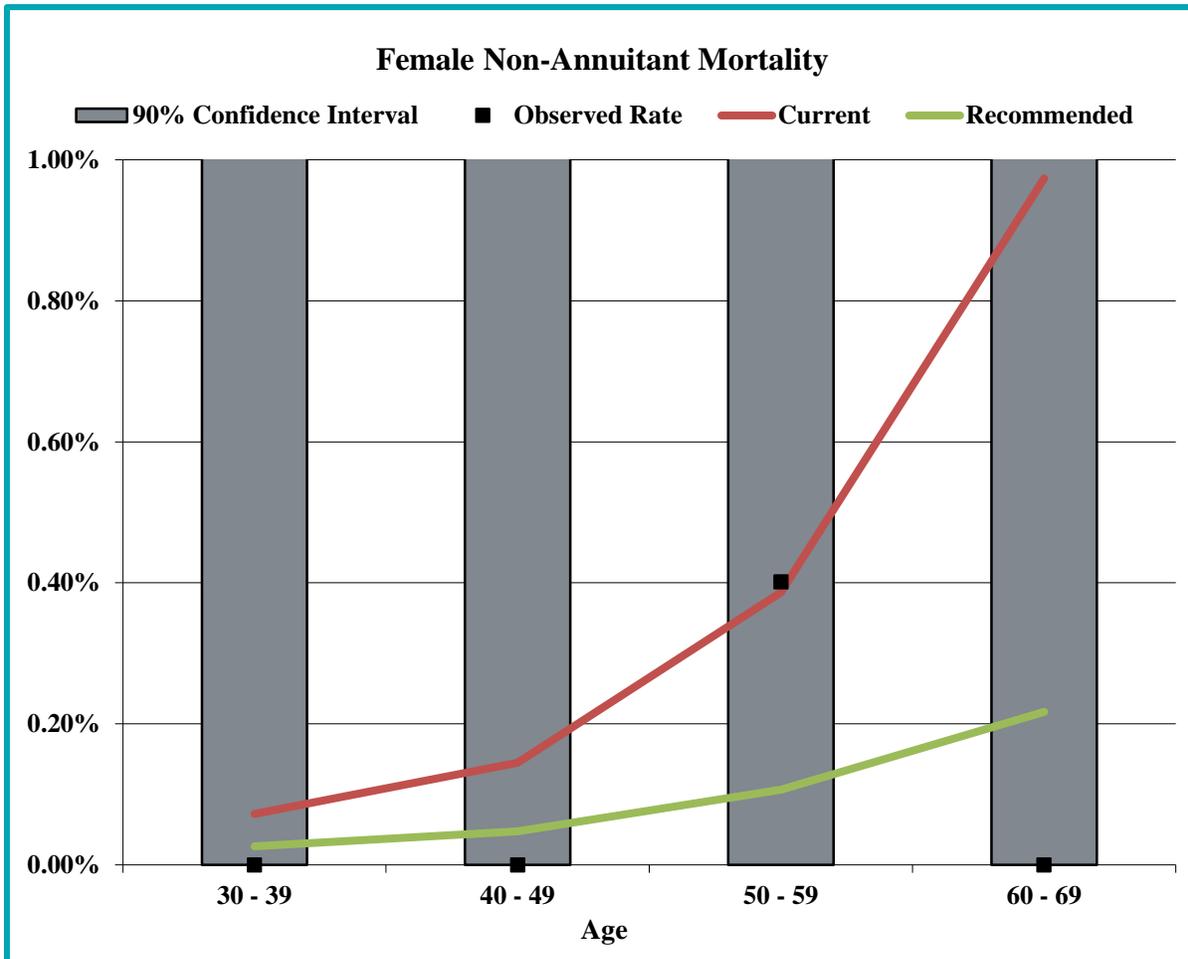
**JUDICIAL RETIREMENT SYSTEM OF NEW JERSEY  
EXPERIENCE STUDY AS OF JUNE 30, 2018**

**SECTION III – DEMOGRAPHIC ASSUMPTIONS  
MORTALITY RATES**

**Table III-M2 – Pre-Retirement Females**

Non-Annuitant Mortality - Base Table for Females								
Age Band	Exposures	Actual Deaths	Weighted Exposures	Weighted Deaths			A/E Ratios	
				Actual	Current	Recommended	Current	Recommended
30 - 39	1	0	165,000	0	119	43	0%	0%
40 - 49	69	0	11,385,000	0	16,498	5,413	0%	0%
50 - 59	248	1	41,116,052	165,000	158,862	43,884	104%	376%
60 - 69	235	0	39,249,917	0	382,159	85,198	0%	0%
<b>Total</b>	<b>553</b>	<b>1</b>	<b>91,915,969</b>	<b>165,000</b>	<b>557,639</b>	<b>134,538</b>	<b>30%</b>	<b>123%</b>
<b>R-squared</b>					<b>0.010</b>	<b>0.006</b>		

**Chart III-M2**



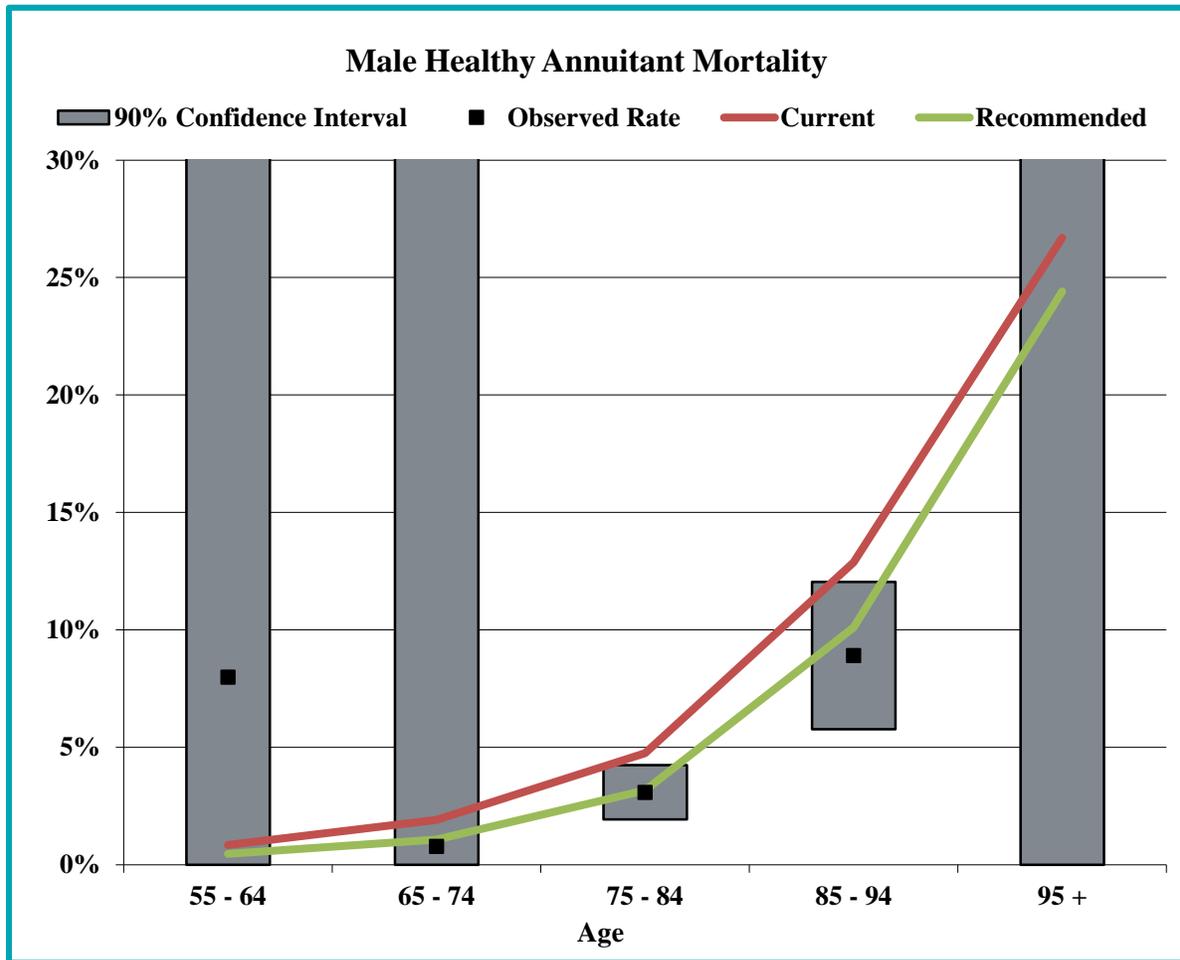
**JUDICIAL RETIREMENT SYSTEM OF NEW JERSEY  
EXPERIENCE STUDY AS OF JUNE 30, 2018**

**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	28	3	2,780,307	222,094	23,381	12,776	950%	1738%
65 - 74	599	5	66,309,556	515,827	1,265,898	709,814	41%	73%
75 - 84	603	18	61,854,949	1,906,379	2,934,268	1,960,769	65%	97%
85 - 94	223	21	21,821,939	1,943,012	2,808,584	2,204,388	69%	88%
95 +	9	4	809,418	332,123	215,983	197,556	154%	168%
<b>Total</b>	<b>1,462</b>	<b>51</b>	<b>153,576,169</b>	<b>4,919,435</b>	<b>7,248,114</b>	<b>5,085,302</b>	<b>68%</b>	<b>97%</b>
<b>R-squared</b>					<b>0.354</b>	<b>0.397</b>		

**Chart III-M3**



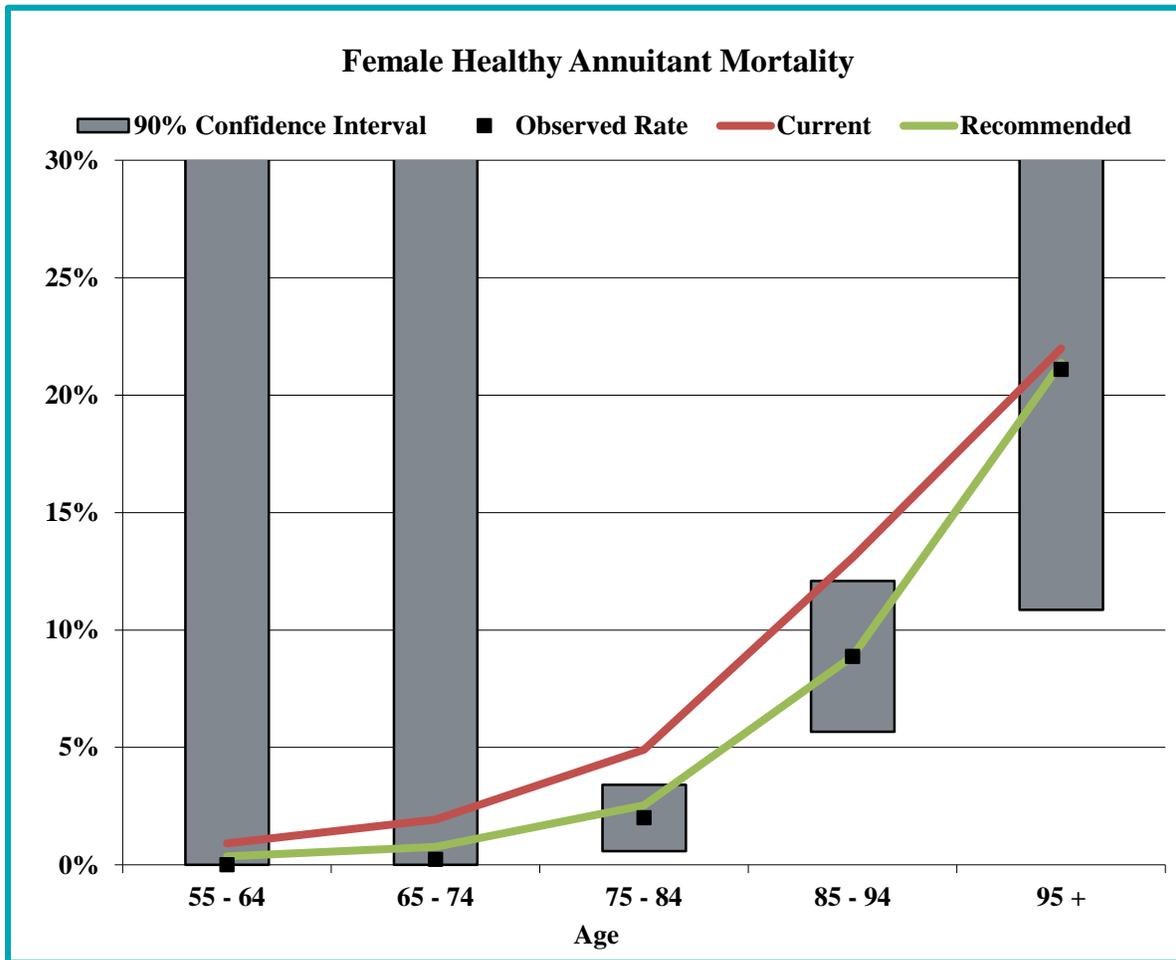
JUDICIAL RETIREMENT SYSTEM OF NEW JERSEY  
EXPERIENCE STUDY AS OF JUNE 30, 2018

SECTION III – DEMOGRAPHIC ASSUMPTIONS  
MORTALITY RATES

Table III-M4 – Healthy Retiree and Survivor Females

Healthy Annuitant Mortality - Base Table for Females									
Age Band	Exposures	Actual Deaths	Weighted Exposures	Weighted Deaths			A/E Ratios		
				Actual	Current	Recommended	Current	Recommended	
55 - 64	25	0	2,230,227	0	20,304	8,225	0%	0%	
65 - 74	280	1	25,682,567	60,000	495,421	196,885	12%	30%	
75 - 84	264	7	17,608,514	351,902	862,641	446,408	41%	79%	
85 - 94	212	23	10,301,021	914,319	1,347,552	915,044	68%	100%	
95 +	43	8	1,679,655	354,391	369,468	359,022	96%	99%	
<b>Total</b>	<b>824</b>	<b>39</b>	<b>57,501,984</b>	<b>1,680,612</b>	<b>3,095,386</b>	<b>1,925,584</b>	<b>54%</b>	<b>87%</b>	
<b>R-squared</b>					<b>0.278</b>	<b>0.390</b>			

Chart II-M4



**JUDICIAL RETIREMENT SYSTEM OF NEW JERSEY  
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**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**

Disabled Annuitant Mortality - Base Table for Males								
Age Band	Exposures	Actual Deaths	Weighted Exposures	Weighted Deaths			A/E Ratios	
				Actual	Current	Recommended	Current	Recommended
< 50	0	0	0	0	0	0	0%	0%
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	8	0	994,688	0	5,568	33,210	0%	0%
70 - 74	8	0	941,984	0	5,642	37,934	0%	0%
75 - 79	0	0	0	0	0	0	0%	0%
80 +	4	0	380,460	0	2,279	88,937	0%	0%
<b>Total</b>	<b>20</b>	<b>0</b>	<b>2,317,132</b>	<b>0</b>	<b>13,489</b>	<b>160,081</b>	<b>0%</b>	<b>0%</b>
<b>R-squared</b>					<b>0.000</b>	<b>0.000</b>		

**Table III-M6 – Disabled Retiree Females**

Disabled Annuitant Mortality - Base Table for Females								
Age Band	Exposures	Actual Deaths	Weighted Exposures	Weighted Deaths			A/E Ratios	
				Actual	Current	Recommended	Current	Recommended
< 50	0	0	0	0	0	0	0%	0%
50 - 54	0	0	0	0	0	0	0%	0%
55 - 59	1	0	115,531	0	342	2,310	0%	0%
60 - 64	3	0	346,593	0	1,228	7,068	0%	0%
65 - 69	5	1	538,884	43,884	3,036	12,726	1446%	345%
70 - 74	0	0	0	0	0	0	0%	0%
75 - 79	0	0	0	0	0	0	0%	0%
80 +	0	0	0	0	0	0	0%	0%
<b>Total</b>	<b>9</b>	<b>1</b>	<b>1,001,008</b>	<b>43,884</b>	<b>4,606</b>	<b>22,104</b>	<b>953%</b>	<b>199%</b>
<b>R-squared</b>					<b>0.268</b>	<b>0.203</b>		

**JUDICIAL RETIREMENT SYSTEM OF NEW JERSEY  
EXPERIENCE STUDY AS OF JUNE 30, 2018**

**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.

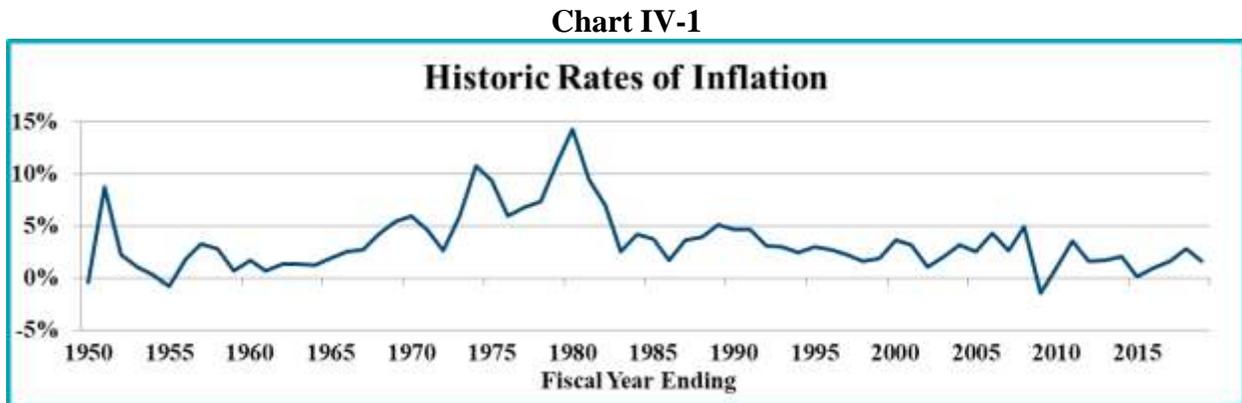
In order to develop recommendations for each of these assumptions, we considered historical data, both nationally and for the System, expectations for the future and assumptions used by other public sector plans.

**PRICE INFLATION**

Long-term price inflation rates are the foundation of other economic assumptions and needs to be reviewed within this study. 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 the CPI-U inflation for the U.S. from 1950 through 2019.



Over the 50 years ending June 2019, 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 only 1.7% over the last ten years.

**JUDICIAL RETIREMENT SYSTEM OF NEW JERSEY  
EXPERIENCE STUDY AS OF JUNE 30, 2018**

**SECTION IV – ECONOMIC ASSUMPTIONS**

**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 2019. 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**

<b>Break-Even Inflation Based on Treasury Bond Yields</b>			
<b>Time to Maturity</b>	<b>Conventional Yield</b>	<b>TIPS Yield</b>	<b>Break Even Inflation</b>
<b>5 Years</b>	1.83%	0.25%	1.58%
<b>10 Years</b>	2.06%	0.31%	1.75%
<b>20 Years</b>	2.36%	0.54%	1.82%

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

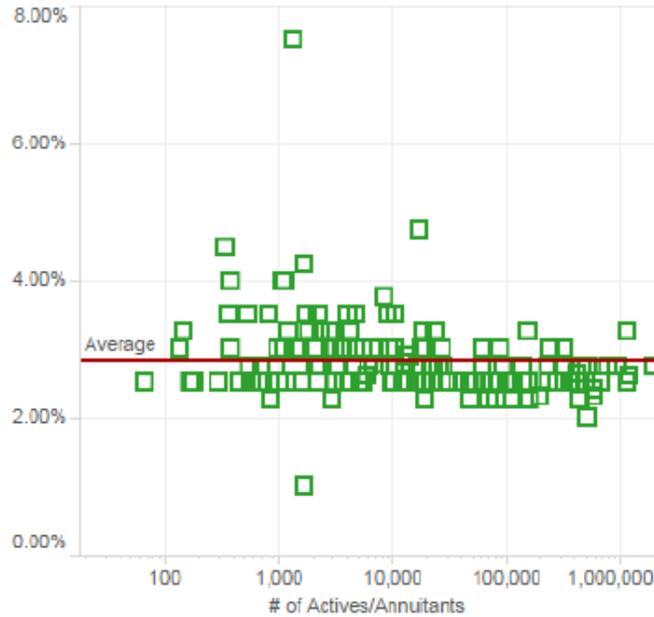
The Federal Reserve Bank of Philadelphia publishes a quarterly survey of professional economic forecasters that includes their forecasts of inflation over the next 10 years. The survey for the third quarter of 2019 shows a median inflation forecast of 2.2%, a minimum forecast of about 1.9%, and a maximum forecast of 3.1%.

The National Conference on Public Employee Retirement Systems (NCPERS) January 2019 Public Retirement Systems Study includes the following graphic of respondents’ inflation assumptions:

**JUDICIAL RETIREMENT SYSTEM OF NEW JERSEY  
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**SECTION IV – ECONOMIC ASSUMPTIONS**

**Chart IV-2**



The average inflation assumption among the 167 systems that responded to this study was 2.80%.

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 2.0% and 3.0%. Given the lower expected inflation, we recommend reducing the assumption from 3.00% to 2.75%. If, at the time of the next review of economic assumptions, the markets and forecasters continue to indicate lower expectations of future inflation, further reductions in 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.

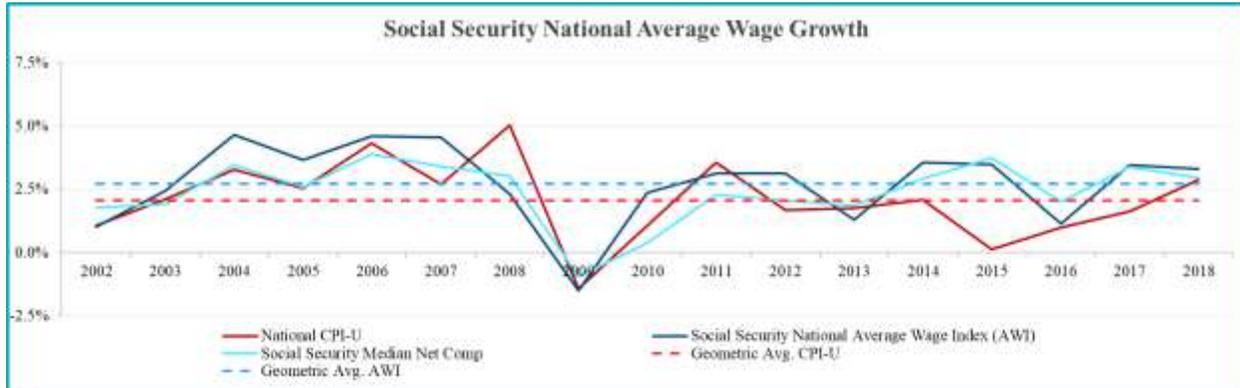
Wage inflation is used in the actuarial valuation to project the Social Security Wage Base in determining the actuarial liability.

Chart IV-3 shows the increase in national average wages (as reported by the Social Security Administration) compared to inflation from 2002 through 2018.

JUDICIAL RETIREMENT SYSTEM OF NEW JERSEY  
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SECTION IV – ECONOMIC ASSUMPTIONS

Chart IV-3



Over this period, national wage inflation averaged approximately 2.7% compared to annual price inflation of 2.00%, making real wage increases about 0.7% above inflation. However, over the same time period, the increase in the median real wage was only 0.3% 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 0.6% - 1.8% going forward in their Social Security solvency projections. However, governmental entities remain under financial stress, and other areas of employee compensation – most notably health care costs and pension contributions – have continued to increase faster than the CPI.

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 is expected to be 3.25%. Note that this assumption does not impact the JRS valuation.

**JUDICIAL RETIREMENT SYSTEM OF NEW JERSEY  
EXPERIENCE STUDY AS OF JUNE 30, 2018**

**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 2025 and 3.00% per year for fiscal years 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 using a salary increase assumption of 4.6% from Fiscal Year Ending (FYE) 2018 to FYE 2019, 4.4% from FYE 2019 to FYE 2020, 2.0% per year for the following five years (from FYE 2020 to FYE 2025), and 2.75% per year thereafter. The ultimate rate of 2.75% is based on the recommended inflation assumption.

**JUDICIAL RETIREMENT SYSTEM OF NEW JERSEY  
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**APPENDIX A – SUMMARY OF RECOMMENDED ASSUMPTIONS**

The demographic assumptions are based on an experience study covering the period July 1, 2014 through June 30, 2018.

**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 Mortality: 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 Retiree Mortality: 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.

**JUDICIAL RETIREMENT SYSTEM OF NEW JERSEY  
EXPERIENCE STUDY AS OF JUNE 30, 2018**

**APPENDIX A – SUMMARY OF RECOMMENDED ASSUMPTIONS**

Pre-Retirement (Non-Annuitants) Mortality: 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.

**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 4.6% from FYE 2018 to FYE 2019, 4.4% from FYE 2019 to FYE 2020, 2.0% per year for the following five years (from FYE 2020 to FYE 2025), and 2.75% per year thereafter.

Salary increases are assumed to occur on January 1.

**6. 401(a)(17)  
Pay Limit**

\$275,000 in 2018 increasing 2.75% per annum, compounded annually.

**JUDICIAL RETIREMENT SYSTEM OF NEW JERSEY  
EXPERIENCE STUDY AS OF JUNE 30, 2018**

**APPENDIX B – SUMMARY OF CURRENT ASSUMPTIONS**

The following are the assumptions used in the actuarial valuation as of July 1, 2018. The economic and demographic assumptions and methods for that valuation were determined in the Actuarial Experience Study performed by the prior actuary covering the period July 1, 2011 – June 30, 2014 and adopted by the State House Commission on October 26, 2015.

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

Age	Rates
30	0.022%
35	0.026
40	0.033
45	0.064
50	0.114
55	0.197
60	0.326
65	0.473

**2. Mortality**                      Healthy Mortality: RP-2000 Combined Healthy Mortality Tables (unadjusted for males and set forward 3 years for females) projected on a generational basis from the base year of 2000 to 2013 using Projection Scale BB and the Conduent Modified 2014 Projection Scale thereafter.

Disabled Mortality: RP-2000 Disability Mortality Tables (set forward 2 years for males and females) without projection.

**JUDICIAL RETIREMENT SYSTEM OF NEW JERSEY  
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**APPENDIX B – SUMMARY OF CURRENT ASSUMPTIONS**

**3. Retirement**

<b>Retirement Rates</b>				
	<b>Age 60 with 20 Years of Judicial Service or Age 65 with 15 Years of Judicial Service</b>	<b>After Age 59 with Less than 12 Years of Judicial Service</b>	<b>After Age 59 with 12 or More Years of Judicial Service (but have not attained 60/20JS or 65/15JS)</b>	<b>Prior to age 60 with 5 Years of Judicial Service and 25 Years of Public Service</b>
Age				
50	0.0%	0.0%	0.0%	0.0%
51	0.0	0.0	0.0	0.0
52	0.0	0.0	0.0	0.0
53	0.0	0.0	0.0	0.0
54	0.0	0.0	0.0	0.0
55	0.0	0.0	0.0	0.0
56	0.0	0.0	0.0	0.0
57	0.0	0.0	0.0	0.0
58	0.0	0.0	0.0	0.0
59	0.0	0.0	0.0	0.0
60	30.0	2.5	0.0	0.0
61	20.0	2.5	0.0	0.0
62	20.0	2.5	0.0	0.0
63	30.0	2.5	0.0	0.0
64	30.0	2.5	0.0	0.0
65	37.5	2.5	10.0	0.0
66	24.0	2.5	0.0	0.0
67	24.0	2.5	0.0	0.0
68	24.0	2.5	0.0	0.0
69	24.0	2.5	0.0	0.0

100% at Age 70

**4. Termination**

None assumed.

**5. Salary  
Increases**

Salaries are assumed to increase by 2.00% per year through fiscal year 2025 and 3.00% per year for fiscal years 2026 and thereafter.

Salary increases are assumed to occur on January 1.

**6. 401(a)(17)  
Pay Limit**

\$275,000 in 2018 increasing 3.00% per annum, compounded annually.