Public Employees' Retirement System of New Jersey

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

Produced by Cheiron

February 2020

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February 3, 2020

Board of Trustees
Public Employees' Retirement System of New Jersey
State of New Jersey
Department of the Treasury
Division of Pension and Benefits, CN 295
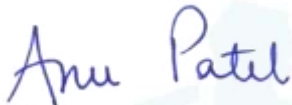Trenton, NJ 08625-0295

Dear Board Members:

The purpose of this report is to present the Actuarial Experience Study of the Public Employees' Retirement System of New Jersey (PERS, the System) in accordance with Title 43, Chapter 15A-19 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 Board 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

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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. The purpose of this experience study is to evaluate whether or not the current assumptions adequately reflect the long-term expectations for PERS, 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 PERS' membership, membership's future behavior or assets that would warrant such frequent or significant changes.

Before summarizing the key results of our experience study, we present in the tables below a historical review of the deviation of actual experience against anticipated experience based on the assumptions used in past actuarial valuations. When experience deviates from the assumptions, liability gains or losses occur. When experience produces consistent liability gains or losses from year to year, assumptions may need to be revised to better reflect actual experience and better anticipate future experience. In the following tables we show a ten year history of the source of changes in the Unfunded Actuarial Liability (UAL) with the liability gains and losses {Liability (G/L} shown in the red box. The other sources of changes in UAL shown in the tables are: investment gains and losses on the Actuarial Value of Assets (AVA) basis, assumption and method changes, plan provision changes, and contributions compared to the tread water level of contributions (normal cost plus interest on the UAL).

Table I-1 Changes in Unfunded Actuarial Liability (Dollar amounts in millions) State										
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total
Discount Rate	8.25%	8.25%	7.95%	7.90%	7.90%	7.90%	7.90%	7.65%	7.50%	7.50%	
Source											
AVA (G)/L	$ 684.9	$ 490.0	$ 243.2	$ 346.2	$ 243.8	$ 87.5	$ 162.4	$ 274.0	$ 171.9	$ 131.0	$2,834.9
Liability (G)/L	350.4	(296.1)	281.3	84.4	47.3	95.3	164.5	21.2	103.2	93.3	944.8
Assumptions/Methods	662.5	0.0	(155.1)	389.7	0.0	10.7	53.2	199.0	328.7	(112.3)	1,376.5
Plan Changes	0.0	(2,203.5)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	(2,203.5)
Contributions	715.7	951.6	682.8	560.5	479.3	1,141.6	672.7	683.4	567.9	460.2	6,915.7
Net UAL Change	$ 2,413.5	$(1,057.9)	$ 1,052.3	$ 1,380.7	$ 770.4	$ 1,335.2	$ 1,052.8	$ 1,177.6	$ 1,171.7	$ 572.1	$9,868.2

Over the last ten years, the State's portion of the System's experience represents liability losses for nine out of the ten years totaling $945 million, of which $218 million of liability losses have occurred since the last experience study.

Table I-2 Changes in Unfunded Actuarial Liability (Dollar amounts in millions) Local Employers										
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Total
Discount Rate	8.25%	8.25%	7.95%	7.90%	7.90%	7.90%	7.90%	7.65%	7.50%	7.50%	
Source											
AVA (G)/L	$ 1,192.7	$ 934.2	$ 590.3	$ 647.7	$ 464.5	$ 129.1	$ 234.6	$ 536.0	$ 263.1	$ 154.9	$5,147.0
Liability (G)/L	157.1	(251.1)	(169.5)	35.8	(49.5)	303.9	90.1	28.9	249.2	161.1	556.0
Assumptions/Methods	907.6	0.0	(203.3)	337.1	0.0	12.6	152.6	252.0	439.2	(176.7)	1,720.9
Plan Changes	0.0	(2,822.6)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	(2,822.6)
Contributions	178.0	218.8	27.6	(70.0)	(20.1)	15.6	(29.6)	20.5	(9.2)	(16.2)	315.4
Net UAL Change	$ 2,435.4	$(1,920.7)	$ 245.0	$ 950.7	$ 394.8	$ 461.2	$ 447.7	$ 837.4	$ 942.2	$ 123.0	$4,916.8

SECTION I – EXECUTIVE SUMMARY

Over the last ten years, the Local employers' portion of the System's experience resulted in liability losses for seven of the ten years totaling $556 million, of which $439 million of liability losses have occurred since the last experience study.

The consistency of liability losses suggests more conservative assumptions are appropriate. The recommended assumptions presented in this report will increase actuarial liabilities and Statutory contributions. This increase is supported by the aggregate experience losses that have occurred during the period since the last experience study and further over the last ten year period. We believe the recommended adjustments to these assumptions should, on average, avoid the consistent net liability losses going forward.

SUMMARY OF ASSUMPTION ANALYSIS

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

- **Retirement rates** – Modify rates based on recent experience.
- **Termination rates** – Update to use termination rate tables that are primarily service based.
- **Disability rates** – Modify rates based on recent experience.
- **Mortality rates** – Update to use newly published Pub-2010 mortality tables with generational mortality improvements using SOA's Scale MP-2018.
- **Price and wage inflation rates –** Modify the inflation assumptions.
- **Salary increase rates –** Update to a service-based salary scale assumption for both the select and ultimate period. The rates during the select period are based on recent experience.

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

SUMMARY OF POTENTIAL CHANGES IN ACTUARIAL METHODS

Actuarial methods describe how the cost of the benefit obligations are calculated and distributed over time as used in an actuarial valuation. For PERS many of these methods are defined in the NJ State Statutes. However, there are a number of details in the methods that are not explicitly defined in statute and used by the actuary. We are monitoring two potential changes to the actuarial methods, one related to the calculation of expected member contributions and one related to the determination of the actuarial liability for non-contributing actives. We may recommend these changes during the next experience review.

- **Expected member contributions** – change the methodology for PERS to conform to the same method used by the other New Jersey Retirement Systems.

SECTION I – EXECUTIVE SUMMARY

- **Non-contributing members reported with a salary** – change the methodology to calculate the liability for these members using the Unit Credit Cost Method instead of their liability reported as part of the Accumulated Savings Fund (ASF).

Further information about the impact of the recommended assumption changes to overall contribution rates can be found on the following pages. We illustrate the cost impact based on the July 1, 2018 valuation results. However, assumption changes adopted by the Board will first impact the July 1, 2019 actuarial valuation.

The body of this report provides additional detail and support for our conclusions and recommendations.

SECTION I – EXECUTIVE SUMMARY

Table I-3				
Cost Impact of Assumption Changes on July 1, 2018 Valuation Results				
State				
	Current Assumptions	**Recommended Assumptions**	**Change in $**	**% Change**
Assets and Liabilities				
Actuarial Liability	$ 23,745,716,631	$ 24,296,077,039	$ 550,360,408	2.3%
Actuarial Value of Assets (AVA)[1]	8,057,092,909	8,057,092,909	0	0.0%
Unfunded Actuarial Liability/(Surplus)	$ 15,688,623,722	$ 16,238,984,130	$ 550,360,408	3.5%
Funded Ratio	33.9%	33.2%		-0.7%
Contribution Amounts				
Gross Normal Cost at End of Year[2]	$ 440,744,343	$ 469,720,265	$ 28,975,922	6.6%
Expected Member Contributions	(347,315,456)	(343,943,461)	3,371,995	-1.0%
State Normal Cost at End of Year[2]	$ 93,428,887	$ 125,776,804	$ 32,347,917	34.6%
Amortization Payment of UAL[2]	1,338,761,984	1,385,361,679	46,599,695	3.5%
Total Statutory Contribution for FYE	$ 1,432,190,871	$ 1,511,138,483	$ 78,947,612	5.5%

[1] Includes discounted State appropriations receivable and Lottery proceeds

[2] Includes Local obligations payable by the State

The total Statutory contribution increased 5.5%, with the State normal cost increasing 34.6% and the UAL amortization payment increasing 3.5%. The increases are primarily driven by the change in the mortality and retirement assumptions. The gross normal cost increased 6.6%. Because the member contribution rate is fixed, the entire increase in normal cost plus the reduction in expected member contributions flow into the State's share of the normal cost resulting in the 34.6% increase in State normal cost.

SECTION I – EXECUTIVE SUMMARY

Table I-4 Cost Impact of Assumption Changes on July 1, 2018 Valuation Results Local Employers				
	Current Assumptions	Recommended Assumptions	Change in $	% Change
Assets and Liabilities				
Actuarial Liability	$ 33,103,627,533	$ 33,815,147,619	$ 711,520,086	2.1%
Actuarial Value of Assets (AVA)[1]	23,264,877,618	23,264,877,618	0	0.0%
Unfunded Actuarial Liability/(Surplus)	$ 9,838,749,915	$ 10,550,270,001	$ 711,520,086	7.2%
Funded Ratio	70.3%	68.8%		-1.5%
Contribution Amounts				
Gross Normal Cost at End of Year[2]	$ 701,726,703	$ 753,623,898	$ 51,897,195	7.4%
Expected Member Contributions	(570,505,006)	(564,966,122)	5,538,884	-1.0%
Net Normal Cost at End of Year	$ 131,221,697	$ 188,657,776	$ 57,436,079	43.8%
BEF Offset of Chapter 133, P.L 2001	(41,208,334)	(45,564,703)	(4,356,369)	10.6%
Employer Normal Cost at End of Year[2]	$ 90,013,363	$ 143,093,073	$ 53,079,710	59.0%
Amortization Payment of UAL[2]	832,962,419	893,207,705	60,245,286	7.2%
ERI and Chapter 19 Payments	20,157,683	20,182,755	25,072	0.1%
Total Statutory Contribution for FYE	$ 943,133,465	$ 1,056,483,533	$ 113,350,068	12.0%
Non-Contributory Group Insurance Contribution	$ 49,734,428	$ 51,051,074	$ 1,316,646	2.6%

[1] Includes discounted State appropriations receivable

[2] Excludes Local obligations payable by the State

SECTION I – EXECUTIVE SUMMARY

The total Statutory contribution increased 12.0% due to the recommended assumption changes, with the employer normal cost increasing 59.0% and the UAL amortization payment increasing 7.2%. The increases are primarily driven by the change in the mortality and retirement assumptions. Though the gross normal cost increased 7.4%, the employer normal cost increased 59.0% due to the following reasons: 1) the member contribution rate is fixed and therefore the entire increase in normal cost flows into the employer's share of the normal cost, 2) the change in assumptions results in lower expected member contributions therefore increasing the employer's share of the normal cost, and 3) the Benefit Enhancement Fund (BEF) offset further reduces the employer's portion of the normal cost making the relative increase in employer normal cost even higher when reviewed as a percent increase (the percent increase changes from 43.8% to 59.0% after the BEF offset).

Note that when comparing the percentage change in the UAL resulting from the recommended assumption changes for the State compared to the Local employers, the impact is larger for Local employers as a percent. The Local employers' actuarial liability increased 2.1% resulting in an increase of 7.2% in the amortization payment of the UAL. In comparison, the State's actuarial liability increased 2.3% resulting in an increase of 3.5% in the amortization payment of the UAL. The State's percentage increase in the amortization payment is less than the Local employers' percentage increase because the State's funded ratio is lower than the Local employers' funded ratio. The higher the funded ratio, the more sensitive the contributions are to changes in unfunded actuarial liability.

These recommended assumption changes, when coupled with the scheduled discount rate reduction, result in a significant increase in employer contributions for the Local employers. As an alternative funding policy to allow these employers to better manage the financial impact, the State could implement a phase-in of the cost impact by spreading the increase over a fixed period. It is suggested that the phase-in coincide with the next experience study. For PERS, that means a phase-in period of three years. A three-year phase-in would work as follows:

- In the first year under the recommended assumptions, the cost impact of the recommended assumptions from the experience study would be established and the net Local employers' contribution would reflect 1/3rd of that cost impact.

- In the following year, the net Local employers' contribution would include 2/3rds of the impact resulting from the experience study assumption changes, plus an amortization of the deferred cost from the first year with interest.

- In the third and final year of the phase-in, the net Local employers' contribution would be the full cost impact, plus an amortization of the deferred cost from the first and second years with interest. This would define the Statutory contribution amount from the assumption changes for all subsequent years.

This phase-in approach does not reduce the ultimate cost of the recommended assumptions, only the timing and the amount of contributions. The contribution shortfalls are incorporated in the ultimate cost following the phase-in period and reflect the unpaid amounts in the first two years plus interest.

SECTION I – EXECUTIVE SUMMARY

The actual cost impact of the assumption changes and any associated phase-in will be determined when the assumptions are first used in the July 1, 2019 actuarial valuation. As an illustrative example, a three-year phase-in of the impact of the recommended assumptions on the Local employers' pension contribution as of July 1, 2018 as described above, assuming 7.50% annual investment returns, would be as follows:

	Table I-5		
	Increase in Employer Contribution Due to Recommended Assumption Changes		
	Local Employers		
	(in millions)		
Year	**Without Phase-In**	**With Phase-In**	**Increase/(Decrease) due to Phase-In**
1	$ 113	$ 38	$ (75)
2	113	81	(32)
3	113	122	9
4+	113	122	9

The increase in Statutory contributions in year three would be expected to continue until the System is fully funded.

SECTION II – CERTIFICATION

The purpose of this report is to provide the results of an Actuarial Experience Study of the Public Employees' Retirement System of New Jersey (PERS) 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 PERS Board of Trustees 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 15A-19 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 also relied on reports prepared by the prior actuary for purposes of reporting on trends and sources of actuarial gains and losses. 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.

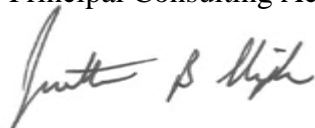This report was prepared for the Public Employees' Retirement System of New Jersey for the purposes described herein. This report is not intended to benefit any other party, and Cheiron assumes no duty or liability to any such party.

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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 PERS, with some adjustments where future experience is expected to differ from historical experience and with deference to standard tables where PERS 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 (A) number of decrements for each membership group compared to the expected (E) 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 may be more appropriate. This could result in the A/E ratio moving further away from 100%. Also, we aggregate members 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 retaining those service bands do not materially improve the quality of 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 with a range anticipated to cover 90% of 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 PERS' experience to that of a standard table.

NON-CONTRIBUTING MEMBERS

The valuation census data provided by the Division of Pensions and Benefits includes non-contributing members. These members previously contributed to the System and, therefore, accrued benefits. However, they no longer contribute or accrue benefits. Typically, these members have terminated employment or applied for a retirement, disability, or death benefit and their paperwork was not processed in time to be reflected in the fiscal year end census data.

SECTION III – DEMOGRAPHIC ASSUMPTIONS

We reviewed the experience among members who became non-contributing members during the four-year period to determine the status reported for these non-contributing members in subsequent years. This experience was used to estimate the proportion of this population that returned to work, elected a refund of their contributions, retired, became disabled, and died.

Based on this experience, for those who became non-contributing members during the study, 20% were assumed to return to active contributing status. Of the 80% of members not assumed to return to work, 0.5% were assumed to have become accidentally disabled, 9.0% of members eligible for ordinary disability were assumed to have become ordinarily disabled, 1.0% were assumed to have died, and all others were assumed to have permanently terminated employment. Among members assumed to terminate employment, those eligible for a retirement benefit were assumed to have retired. Among members assumed to terminate employment prior to eligibility for a retirement benefit, 75% of members eligible for a deferred annuity were assumed to elect the deferred annuity and all other members were assumed to elect a refund of their contributions.

The available experience data is limited because the experience period is relatively short and some non-contributing members maintain that status for several years before electing a refund or returning to work. Therefore, we will continue to monitor this experience and may update the assumptions during the next experience study.

RETIREMENT RATES

The current retirement rates vary by age, service, and State vs. Local employer and are applied to all members who are eligible to retire. As a result, a member who is age 60 with 20 years of service, for example, is assumed to be less likely to retire than a member from the same employer who is age 60 with 25 years of service. In reviewing the data for PERS, we find that at many ages, members are more likely to retire once they have attained 25 years of service, and those with less than 25 years of service are less likely to retire.

PERS is not large enough to provide credible data for each age and service combination, so we recommend assumptions by State or Local employer and service groups separately for Tiers 1-4 and for Tier 5. The actual results shown on the following pages reflect eligible members and retirements in all five tiers.

We did not show results separately by tier because very few members in Tiers 2 through 5 are eligible for retirement. As of June 30, 2018, members in Tiers 2 through 5 can only retire under a service retirement allowance since they do not have sufficient service to meet early retirement eligibility. In addition, Tiers 2 through 4 are closed to new members so there likely will not be significant experience for these tiers. Due to these limited exposures for Tiers 2 through 5, the current rates shown on the following pages are based only on the current Tier 1 retirement rates.

We recommend separate retirement rates for Tier 5 because Tier 5 members need 30 years of service to retire early whereas Tiers 1 through 4 only require 25 years of service to retire early. The recommended retirement rates for Tier 5 members are based on professional judgement due to limited experience.

We recommend separate assumptions for the following service groups, tiers, and employer:

State Tiers 1-4 Members

- Members with less than 25 years of service,
- Members with 25 years of service, and
- Members with 26 or more years of service.

State Tier 5 Members

- Members with less than 25 years of service,
- Members with 25 years of service,
- Members with 26 to 29 years of service,
- Members with 30 years of service, and
- Members with 31 or more years of service.

SECTION III – DEMOGRAPHIC ASSUMPTIONS
RETIREMENT RATES

Local Employers' Tiers 1-4 Members

- Members with less than 25 years of service,
- Members with 25 years of service, and
- Members with 26 or more years of service.

Local Employers' Tier 5 Members

- Members with less than 25 years of service,
- Members with 25 years of service,
- Members with 26 to 29 years of service,
- Members with 30 years of service, and
- Members with 31 or more years of service.

State and Local Employers' Prosecutors

- Members with less than 25 years of service,
- Members with 25 years of service, and
- Members with 26 or more years of service.

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 State Tiers 1-5 members with less than 25 years of service, and Chart III-R1 shows the information graphically along with the 90% confidence interval. For retirements with less than 25 years of service, we recommend retirement rates that are slightly lower than current rates for most ages and 100% retirement at age 75 instead of age 70.

Table III-R1

		Retirements			Retirement Rates			A/E Ratios	
Age	Exposures	Actual	Current	Recommended	Actual	Current	Recommended	Current	Recommended
60	4,289	231	386.0	214.5	5.4%	9.0%	5.0%	60%	108%
61	3,915	185	352.4	195.8	4.7%	9.0%	5.0%	53%	95%
62	3,892	315	567.5	311.4	8.1%	14.6%	8.0%	56%	101%
63	3,447	258	390.9	275.8	7.5%	11.3%	8.0%	66%	94%
64	3,067	239	372.6	245.4	7.8%	12.2%	8.0%	64%	97%
65	2,895	359	469.0	347.4	12.4%	16.2%	12.0%	77%	103%
66	2,382	427	404.9	404.9	17.9%	17.0%	17.0%	105%	105%
67	1,905	299	285.8	304.8	15.7%	15.0%	16.0%	105%	98%
68	1,612	239	241.8	241.8	14.8%	15.0%	15.0%	99%	99%
69	1,281	169	192.2	192.2	13.2%	15.0%	15.0%	88%	88%
70	1,023	178	1,023.0	153.5	17.4%	100.0%	15.0%	17%	116%
71	777	106	777.0	116.6	13.6%	100.0%	15.0%	14%	91%
72	604	90	604.0	90.6	14.9%	100.0%	15.0%	15%	99%
73	483	68	483.0	72.5	14.1%	100.0%	15.0%	14%	94%
74	391	53	391.0	58.7	13.6%	100.0%	15.0%	14%	90%
Total	**31,963**	**3,216**	**6,941.0**	**3,225.5**	**10.1%**	**21.7%**	**10.1%**	**46%**	**100%**
R-squared			**0.054**	**0.985**					

SECTION III – DEMOGRAPHIC ASSUMPTIONS
RETIREMENT RATES

Chart III-R1

State Tiers 1-5 Retirement Rates For Less than 25 Years of Service

Note that the current assumption assumes 100% retirement at age 70 whereas the recommended assumption assumes 100% retirement at age 75.

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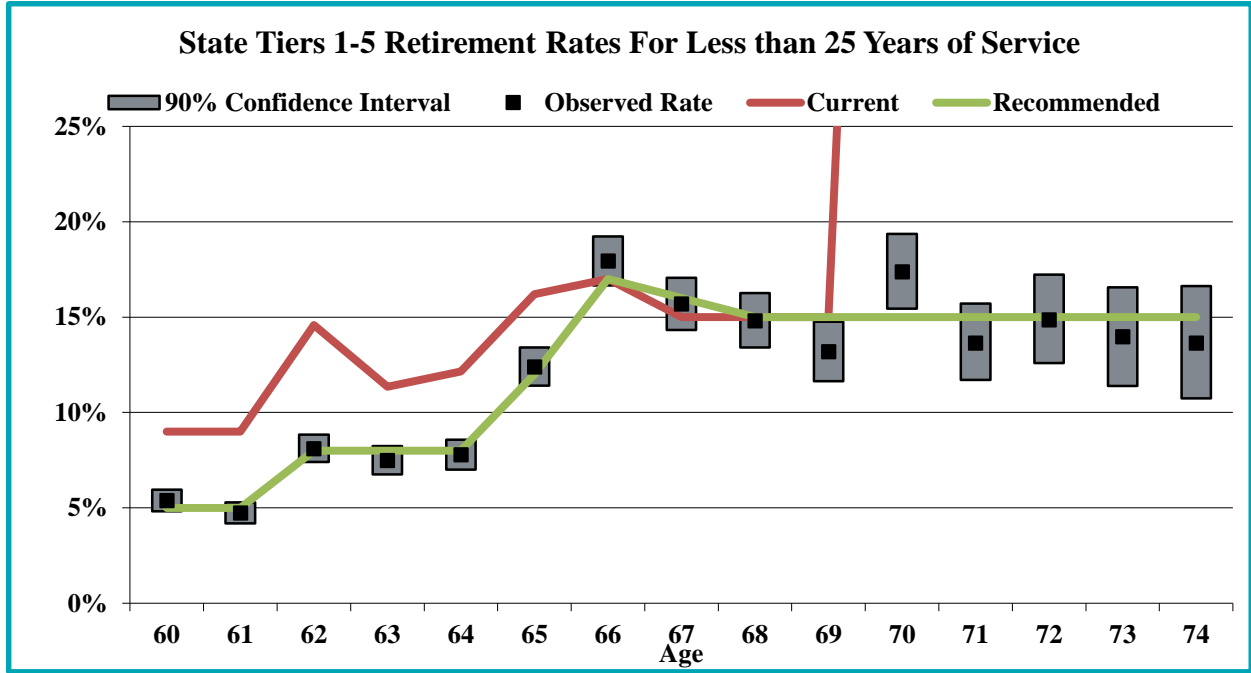
SECTION III – DEMOGRAPHIC ASSUMPTIONS
RETIREMENT RATES

Table III-R2 shows the calculation of actual-to-expected ratios and the r-squared statistic for State Tiers 1-5 members with 25 years of service, and Chart III-R2 shows the information graphically along with the 90% confidence interval. The data shows that the actual retirement rates are generally higher than expected for members younger than 70, so we recommend higher retirement rates for most ages prior to 70 and 100% retirement at age 75 instead of age 70.

Table III-R2

|		Retirements			Retirement Rates			A/E Ratios	
Age	Exposures	Actual	Current	Recommended	Actual	Current	Recommended	Current	Recommended
44	106	2	0.2	3.7	1.9%	0.2%	3.5%	839%	54%
45	131	4	0.3	4.6	3.1%	0.2%	3.5%	1288%	87%
46	167	8	0.6	5.8	4.8%	0.4%	3.5%	1261%	137%
47	234	5	1.2	8.2	2.1%	0.5%	3.5%	408%	61%
48	349	14	3.8	12.2	4.0%	1.1%	3.5%	365%	115%
49	359	11	3.9	12.6	3.1%	1.1%	3.5%	279%	88%
50	325	16	3.6	11.4	4.9%	1.1%	3.5%	448%	141%
51	266	8	2.9	9.3	3.0%	1.1%	3.5%	273%	86%
52	287	17	3.2	17.2	5.9%	1.1%	6.0%	538%	99%
53	261	16	3.7	15.7	6.1%	1.4%	6.0%	430%	102%
54	250	18	3.6	17.5	7.2%	1.4%	7.0%	505%	103%
55	255	43	44.6	44.6	16.9%	17.5%	17.5%	96%	96%
56	224	41	31.4	39.2	18.3%	14.0%	17.5%	131%	105%
57	238	40	30.9	41.7	16.8%	13.0%	17.5%	129%	96%
58	231	53	30.0	46.2	22.9%	13.0%	20.0%	176%	115%
59	205	35	39.0	41.0	17.1%	19.0%	20.0%	90%	85%
60	215	46	19.4	43.0	21.4%	9.0%	20.0%	238%	107%
61	227	68	20.4	68.1	30.0%	9.0%	30.0%	333%	100%
62	199	73	29.0	72.6	36.7%	14.6%	36.5%	252%	101%
63	170	66	19.3	62.1	38.8%	11.3%	36.5%	342%	106%
64	151	53	18.3	55.1	35.1%	12.2%	36.5%	289%	96%
65	170	75	27.5	74.8	44.1%	16.2%	44.0%	272%	100%
66	127	67	21.6	69.9	52.8%	17.0%	55.0%	310%	96%
67	126	63	18.9	63.0	50.0%	15.0%	50.0%	333%	100%
68	99	47	14.9	46.5	47.5%	15.0%	47.0%	316%	101%
69	67	28	10.1	31.5	41.8%	15.0%	47.0%	279%	89%
70	54	29	54.0	25.4	53.7%	100.0%	47.0%	54%	114%
71	40	19	40.0	18.8	47.5%	100.0%	47.0%	48%	101%
72	37	15	37.0	17.4	40.5%	100.0%	47.0%	41%	86%
73	24	12	24.0	11.3	50.0%	100.0%	47.0%	50%	106%
74	15	5	15.0	7.1	33.3%	100.0%	47.0%	33%	71%
Total	**5,609**	**997**	**572.4**	**997.3**	**17.8%**	**10.2%**	**17.8%**	**174%**	**100%**
R-squared			**0.214**	**0.987**					

SECTION III – DEMOGRAPHIC ASSUMPTIONS
RETIREMENT RATES

Chart III-R2

State Tiers 1-5 Retirement Rates For 25 Years of Service
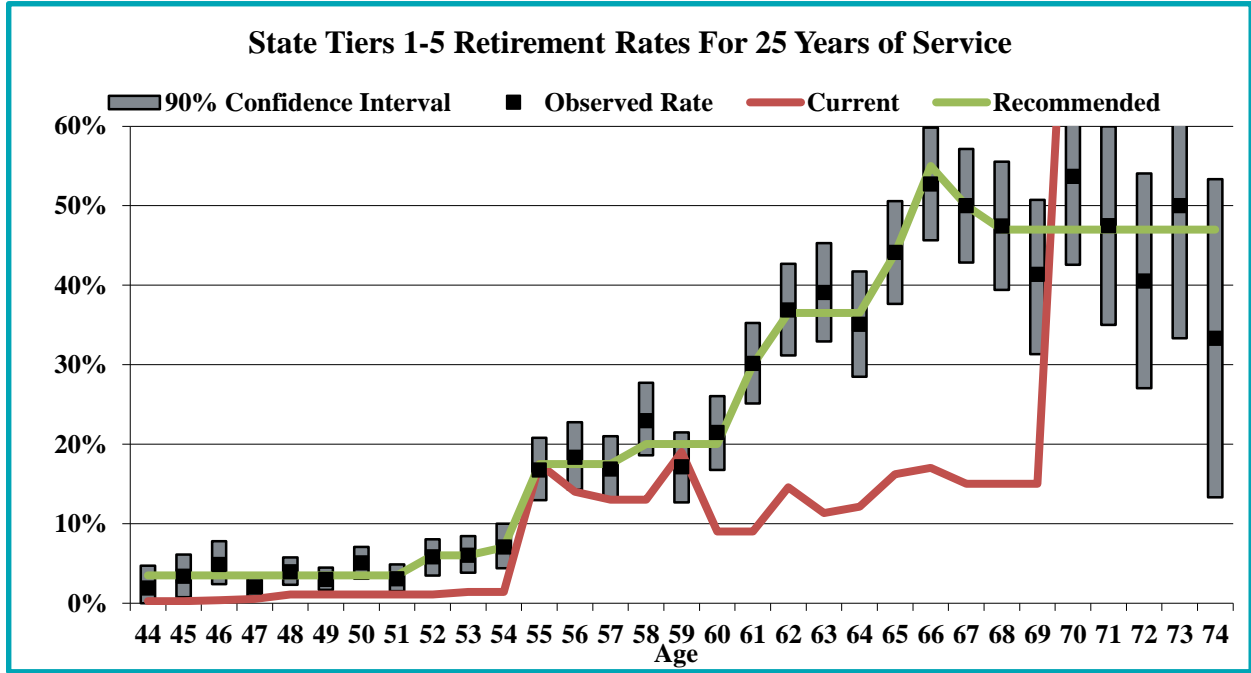
Note that the current assumption assumes 100% retirement at age 70 whereas the recommended assumption assumes 100% retirement at age 75.

SECTION III – DEMOGRAPHIC ASSUMPTIONS
RETIREMENT RATES

Table III-R3 shows the calculation of actual-to-expected ratios and the r-squared statistic for State Tiers 1-5 members with 26 or more years of service, and Chart III-R3 shows the information graphically along with the 90% confidence interval. For retirements with 26 or more years of service, we recommend generally higher rates and 100% retirement at age 75 instead of age 70.
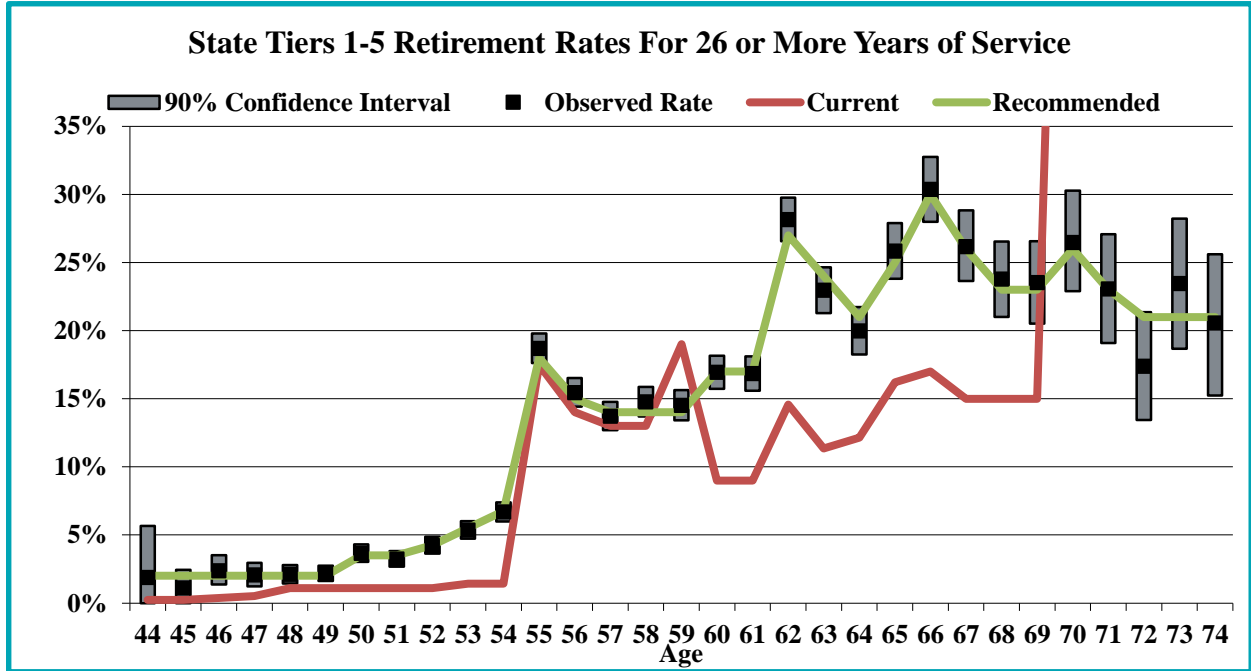
Table III-R3

		Retirements			Retirement Rates			A/E Ratios	
State Tiers 1-5 Retirement Rates For 26 or More Years of Service									
Age	Exposures	Actual	Current	Recommended	Actual	Current	Recommended	Current	Recommended
44	53	1	0.1	1.1	1.89%	0.23%	2.00%	839%	94%
45	247	3	0.6	4.9	1.21%	0.24%	2.00%	512%	61%
46	513	12	1.9	10.3	2.34%	0.38%	2.00%	616%	117%
47	814	17	4.3	16.3	2.09%	0.52%	2.00%	399%	104%
48	1,180	25	13.0	23.6	2.12%	1.10%	2.00%	193%	106%
49	1,671	36	18.4	33.4	2.15%	1.10%	2.00%	196%	108%
50	2,179	80	24.0	76.3	3.67%	1.10%	3.50%	334%	105%
51	2,586	84	28.4	90.5	3.25%	1.10%	3.50%	295%	93%
52	2,923	124	32.2	124.2	4.24%	1.10%	4.25%	386%	100%
53	3,157	169	45.0	173.6	5.35%	1.43%	5.50%	376%	97%
54	3,418	229	48.7	230.7	6.70%	1.43%	6.75%	470%	99%
55	3,503	655	613.0	630.5	18.70%	17.50%	18.00%	107%	104%
56	3,123	483	437.2	468.5	15.47%	14.00%	15.00%	110%	103%
57	2,940	403	382.2	411.6	13.71%	13.00%	14.00%	105%	98%
58	2,879	425	374.3	403.1	14.76%	13.00%	14.00%	114%	105%
59	2,714	394	515.7	380.0	14.52%	19.00%	14.00%	76%	104%
60	2,562	434	230.6	435.5	16.94%	9.00%	17.00%	188%	100%
61	2,375	400	213.8	403.8	16.84%	9.00%	17.00%	187%	99%
62	2,168	610	316.1	585.4	28.14%	14.58%	27.00%	193%	104%
63	1,696	389	192.3	407.0	22.94%	11.34%	24.00%	202%	96%
64	1,409	281	171.2	295.9	19.94%	12.15%	21.00%	164%	95%
65	1,223	316	198.1	305.8	25.84%	16.20%	25.00%	159%	103%
66	986	299	167.6	295.8	30.32%	17.00%	30.00%	178%	101%
67	770	201	115.5	200.2	26.10%	15.00%	26.00%	174%	100%
68	633	151	95.0	145.6	23.85%	15.00%	23.00%	159%	104%
69	512	120	76.8	117.8	23.44%	15.00%	23.00%	156%	102%
70	393	104	393.0	102.2	26.46%	100.00%	26.00%	26%	102%
71	288	66	288.0	66.2	22.92%	100.00%	23.00%	23%	100%
72	253	44	253.0	53.1	17.39%	100.00%	21.00%	17%	83%
73	209	49	209.0	43.9	23.44%	100.00%	21.00%	23%	112%
74	164	34	164.0	34.4	20.73%	100.00%	21.00%	21%	99%
Total	**49,541**	**6,638**	**5,622.9**	**6,571.1**	**13.40%**	**11.35%**	**13.26%**	**118%**	**101%**
R-squared			**0.537**	**0.998**					

SECTION III – DEMOGRAPHIC ASSUMPTIONS
RETIREMENT RATES

Chart III-R3

State Tiers 1-5 Retirement Rates For 26 or More Years of Service

Note that the current assumption assumes 100% retirement at age 70 whereas the recommended assumption assumes 100% retirement at age 75.

There is insufficient data to show tables and charts for Tier 5 members separately. The recommended Tier 5 specific retirement rates are shown in Appendix A.

SECTION III – DEMOGRAPHIC ASSUMPTIONS
RETIREMENT RATES

Table III-R4 shows the calculation of actual-to-expected ratios and the r-squared statistic for Local employers' Tiers 1-5 members with less than 25 years of service, and Chart III-R4 shows the information graphically along with the 90% confidence interval. For retirements with less than 25 years of service, we recommend retirement rates that are generally lower than current rates for most ages and 100% retirement at age 75 instead of age 70.

Table III-R4

Local Employers' Tiers 1-5 Retirement Rates For Less than 25 Years of Service								
		Retirements			Retirement Rates			A/E Ratios	
Age	Exposures	Actual	Current	Recommended	Actual	Current	Recommended	Current	Recommended
60	14,054	669	1,096.2	632.4	4.8%	7.8%	4.5%	61%	106%
61	12,853	545	1,079.7	578.4	4.2%	8.4%	4.5%	50%	94%
62	12,642	1,034	1,699.1	948.2	8.2%	13.4%	7.5%	61%	109%
63	11,023	839	1,157.4	826.7	7.6%	10.5%	7.5%	72%	101%
64	9,640	663	1,012.2	723.0	6.9%	10.5%	7.5%	66%	92%
65	9,193	1,019	1,520.3	1,011.2	11.1%	16.5%	11.0%	67%	101%
66	7,690	1,130	1,211.2	1,153.5	14.7%	15.8%	15.0%	93%	98%
67	6,307	866	860.9	883.0	13.7%	13.7%	14.0%	101%	98%
68	5,413	673	625.2	703.7	12.4%	11.6%	13.0%	108%	96%
69	4,342	504	501.5	564.5	11.6%	11.6%	13.0%	100%	89%
70	3,595	495	3,595.0	467.4	13.8%	100.0%	13.0%	14%	106%
71	2,933	386	2,933.0	381.3	13.2%	100.0%	13.0%	13%	101%
72	2,406	290	2,406.0	312.8	12.1%	100.0%	13.0%	12%	93%
73	2,121	256	2,121.0	275.7	12.1%	100.0%	13.0%	12%	93%
74	1,813	246	1,813.0	235.7	13.6%	100.0%	13.0%	14%	104%
Total	**106,025**	**9,615**	**23,631.7**	**9,697.4**	**9.1%**	**22.3%**	**9.1%**	**41%**	**99%**
R-squared			**0.179**	**0.983**					

SECTION III – DEMOGRAPHIC ASSUMPTIONS
RETIREMENT RATES

Chart III-R4

Local Employers' Tiers 1-5 Retirement Rates For Less than 25 Years of Service
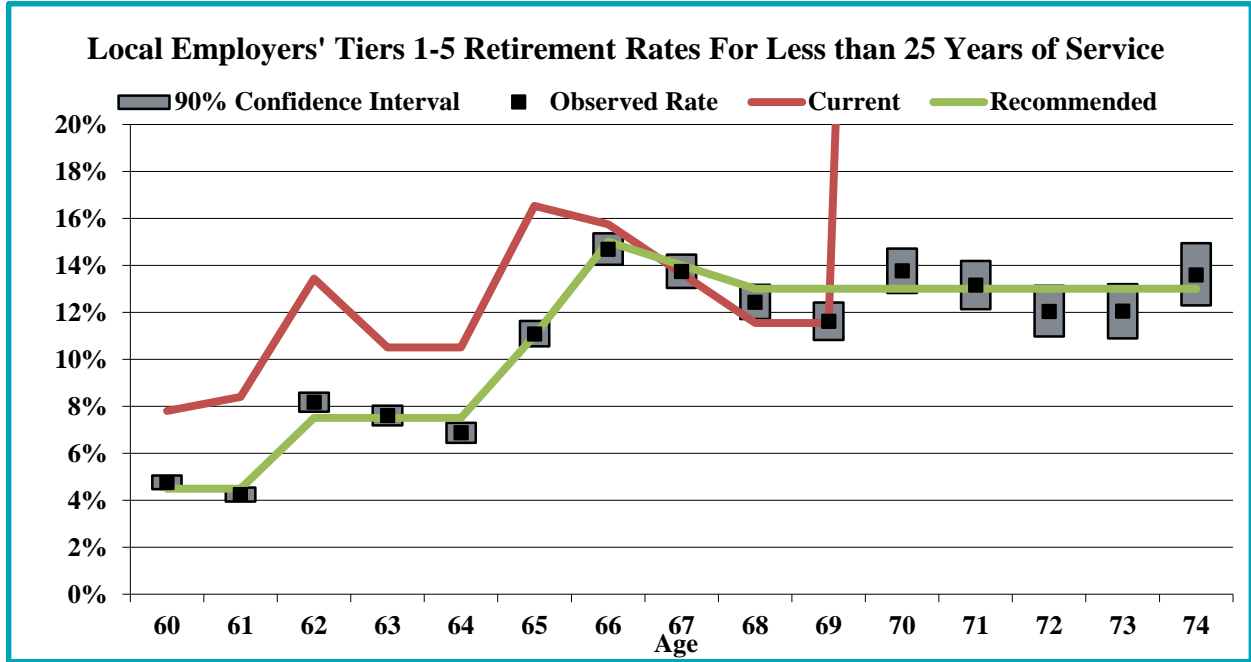
Note that the current assumption assumes 100% retirement at age 70 whereas the recommended assumption assumes 100% retirement at age 75.

SECTION III – DEMOGRAPHIC ASSUMPTIONS
RETIREMENT RATES

Table III-R5 shows the calculation of actual-to-expected ratios and the r-squared statistic for Local employers' Tiers 1-5 members with 25 years of service, and Chart III-R5 shows the information graphically along with the 90% confidence interval. The data shows that the actual retirement rates are generally higher than expected for members younger than 70, so we recommend higher retirement rates for most ages prior to 70 and 100% retirement at age 75 instead of age 70.

Table III-R5

		Retirements			Retirement Rates			A/E Ratios	
Age	**Exposures**	**Actual**	**Current**	**Recommended**	**Actual**	**Current**	**Recommended**	**Current**	**Recommended**
44	214	9	0.3	6.4	4.21%	0.15%	3.00%	2767%	140%
45	260	5	0.4	7.8	1.92%	0.16%	3.00%	1209%	64%
46	313	9	0.7	9.4	2.88%	0.23%	3.00%	1272%	96%
47	315	8	0.9	9.5	2.54%	0.29%	3.00%	867%	85%
48	341	14	1.6	10.2	4.11%	0.46%	3.00%	887%	137%
49	442	13	2.4	13.3	2.94%	0.55%	3.00%	535%	98%
50	446	16	2.8	15.6	3.59%	0.64%	3.50%	564%	102%
51	483	21	3.4	20.5	4.35%	0.71%	4.25%	610%	102%
52	411	19	3.1	19.5	4.62%	0.77%	4.75%	604%	97%
53	427	30	3.3	29.9	7.03%	0.77%	7.00%	918%	100%
54	425	28	3.3	29.8	6.59%	0.77%	7.00%	861%	94%
55	519	78	60.7	77.9	15.03%	11.70%	15.00%	128%	100%
56	518	88	60.6	88.1	16.99%	11.70%	17.00%	145%	100%
57	476	85	55.7	85.7	17.86%	11.70%	18.00%	153%	99%
58	511	92	59.8	92.0	18.00%	11.70%	18.00%	154%	100%
59	594	116	124.7	106.9	19.53%	21.00%	18.00%	93%	108%
60	630	121	49.1	113.4	19.21%	7.80%	18.00%	246%	107%
61	588	105	49.4	105.8	17.86%	8.40%	18.00%	213%	99%
62	585	196	78.6	198.9	33.50%	13.44%	34.00%	249%	99%
63	607	223	63.7	206.4	36.74%	10.50%	34.00%	350%	108%
64	520	166	54.6	176.8	31.92%	10.50%	34.00%	304%	94%
65	465	168	76.9	162.8	36.13%	16.54%	35.00%	218%	103%
66	432	189	68.0	185.8	43.75%	15.75%	43.00%	278%	102%
67	373	149	50.9	149.2	39.95%	13.65%	40.00%	293%	100%
68	321	128	37.1	128.4	39.88%	11.55%	40.00%	345%	100%
69	237	87	27.4	87.7	36.71%	11.55%	37.00%	318%	99%
70	188	69	188.0	69.6	36.70%	100.00%	37.00%	37%	99%
71	159	67	159.0	58.8	42.14%	100.00%	37.00%	42%	114%
72	129	38	129.0	47.7	29.46%	100.00%	37.00%	29%	80%
73	100	36	100.0	37.0	36.00%	100.00%	37.00%	36%	97%
74	82	25	82.0	30.3	30.49%	100.00%	37.00%	30%	82%
Total	**12,111**	**2,398**	**1,597.7**	**2,380.9**	**19.80%**	**13.19%**	**19.66%**	**150%**	**101%**
R-squared			**0.140**	**0.994**					

SECTION III – DEMOGRAPHIC ASSUMPTIONS
RETIREMENT RATES

Chart III-R5

Local Employers' Tiers 1-5 Retirement Rates For 25 Years of Service
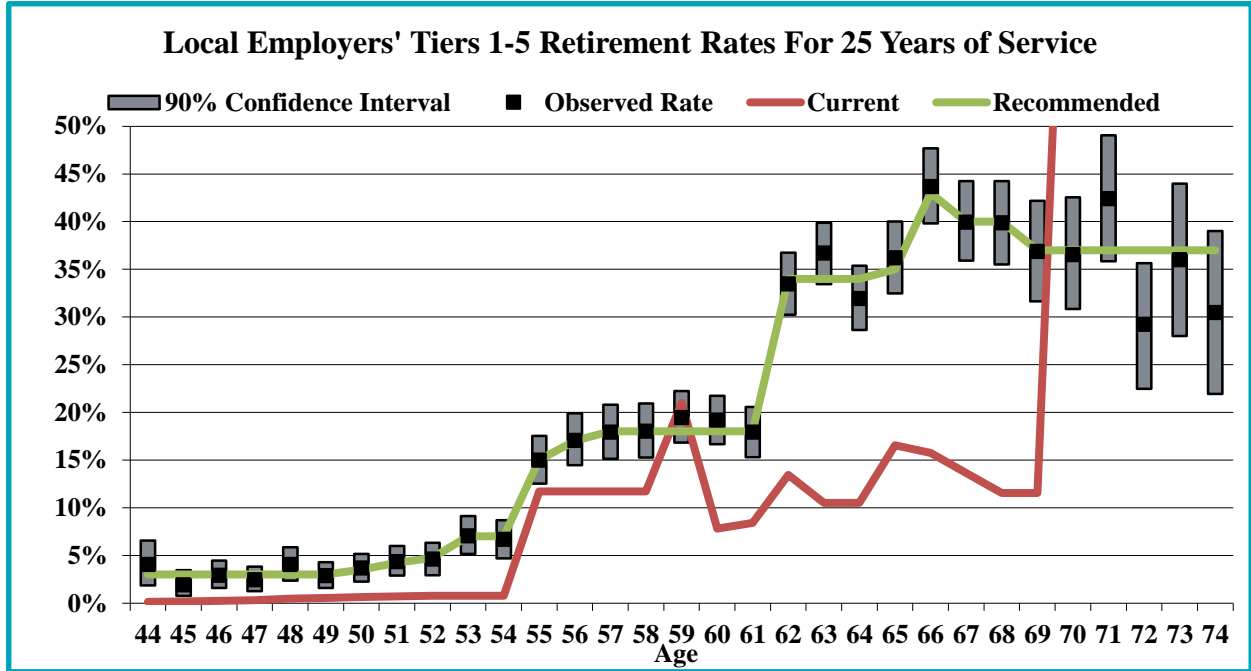
Note that the current assumption assumes 100% retirement at age 70 whereas the recommended assumption assumes 100% retirement at age 75.

SECTION III – DEMOGRAPHIC ASSUMPTIONS
RETIREMENT RATES

Table III-R6 shows the calculation of actual-to-expected ratios and the r-squared statistic for Local employers' Tiers 1-5 members with 26 or more years of service, and Chart III-R3 shows the information graphically along with the 90% confidence interval. For retirements with 26 or more years of service, we recommend generally higher rates and 100% retirement at age 75 instead of age 70.
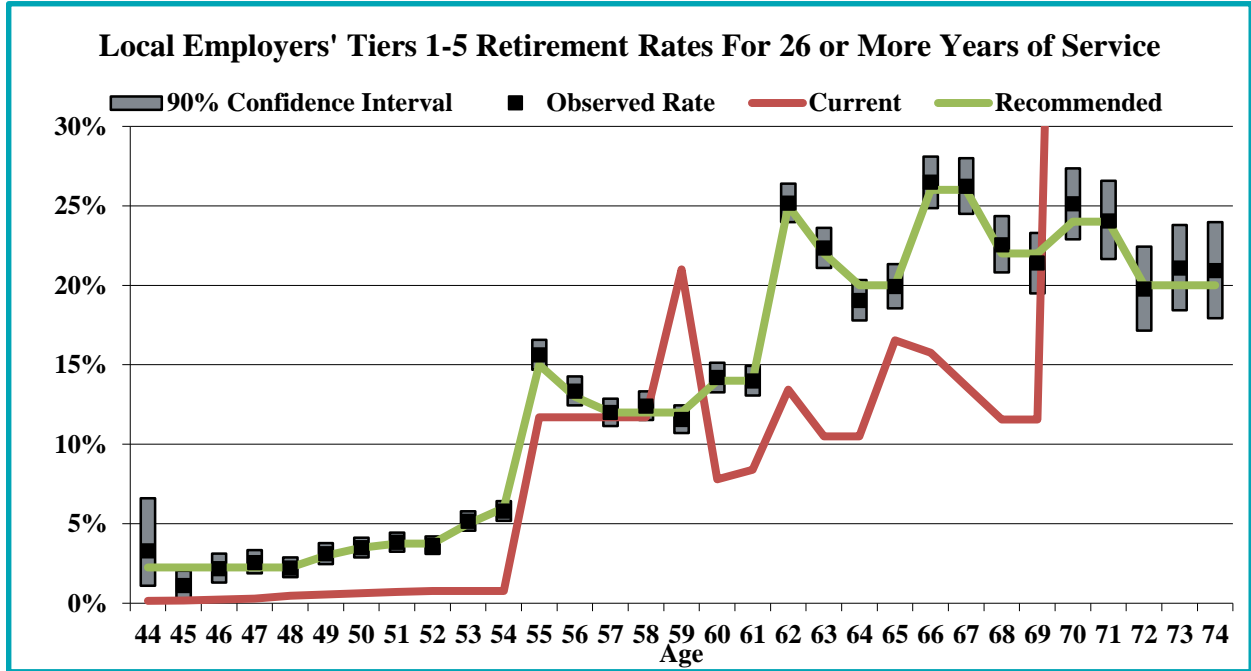
Table III-R6

Local Employers' Tiers 1-5 Retirement Rates For 26 or More Years of Service								
		Retirements			Retirement Rates			A/E Ratios	
Age	Exposures	Actual	Current	Recommended	Actual	Current	Recommended	Current	Recommended
44	91	3	0.1	2.0	3.30%	0.15%	2.25%	2169%	147%
45	394	4	0.6	8.9	1.02%	0.16%	2.25%	639%	45%
46	768	17	1.7	17.3	2.21%	0.23%	2.25%	979%	98%
47	1,224	31	3.6	27.5	2.53%	0.29%	2.25%	864%	113%
48	1,526	34	7.1	34.3	2.23%	0.46%	2.25%	481%	99%
49	1,908	59	10.5	57.2	3.09%	0.55%	3.00%	562%	103%
50	2,427	85	15.4	84.9	3.50%	0.64%	3.50%	551%	100%
51	2,831	109	20.2	106.2	3.85%	0.71%	3.75%	540%	103%
52	3,267	119	25.0	122.5	3.64%	0.77%	3.75%	476%	97%
53	3,558	184	27.2	177.9	5.17%	0.77%	5.00%	676%	103%
54	3,782	219	28.9	226.9	5.79%	0.77%	6.00%	757%	97%
55	4,037	631	472.3	605.6	15.63%	11.70%	15.00%	134%	104%
56	3,835	512	448.7	498.6	13.35%	11.70%	13.00%	114%	103%
57	3,816	458	446.5	457.9	12.00%	11.70%	12.00%	103%	100%
58	3,702	460	433.1	444.2	12.43%	11.70%	12.00%	106%	104%
59	3,687	426	774.3	442.4	11.55%	21.00%	12.00%	55%	96%
60	3,759	534	293.2	526.3	14.21%	7.80%	14.00%	182%	101%
61	3,699	518	310.7	517.9	14.00%	8.40%	14.00%	167%	100%
62	3,528	888	474.2	882.0	25.17%	13.44%	25.00%	187%	101%
63	2,964	662	311.2	652.1	22.33%	10.50%	22.00%	213%	102%
64	2,547	485	267.4	509.4	19.04%	10.50%	20.00%	181%	95%
65	2,274	453	376.1	454.8	19.92%	16.54%	20.00%	120%	100%
66	2,007	532	316.1	521.8	26.51%	15.75%	26.00%	168%	102%
67	1,707	448	233.0	443.8	26.24%	13.65%	26.00%	192%	101%
68	1,499	338	173.1	329.8	22.55%	11.55%	22.00%	195%	102%
69	1,236	265	142.8	271.9	21.44%	11.55%	22.00%	186%	97%
70	1,031	259	1,031.0	247.4	25.12%	100.00%	24.00%	25%	105%
71	813	196	813.0	195.1	24.11%	100.00%	24.00%	24%	100%
72	624	123	624.0	124.8	19.71%	100.00%	20.00%	20%	99%
73	597	126	597.0	119.4	21.11%	100.00%	20.00%	21%	106%
74	513	107	513.0	102.6	20.86%	100.00%	20.00%	21%	104%
Total	**69,651**	**9,285**	**9,191.1**	**9,213.5**	**13.33%**	**13.20%**	**13.23%**	**101%**	**101%**
R-squared			**0.156**	**0.999**					

SECTION III – DEMOGRAPHIC ASSUMPTIONS
RETIREMENT RATES

Chart III-R6

Local Employers' Tiers 1-5 Retirement Rates For 26 or More Years of Service

Note that the current assumption assumes 100% retirement at age 70 whereas the recommended assumption assumes 100% retirement at age 75.

There is insufficient data to show tables and charts for Tier 5 members separately. The recommended Tier 5 specific retirement rates are shown in Appendix A.

SECTION III – DEMOGRAPHIC ASSUMPTIONS
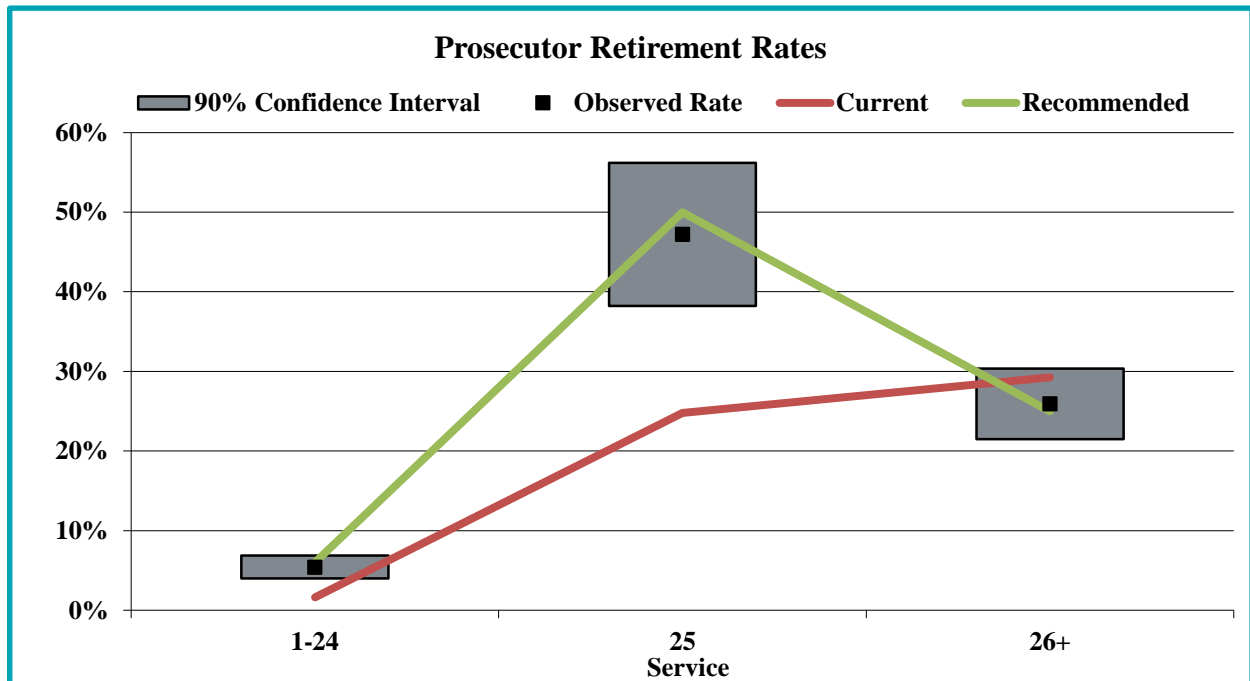### RETIREMENT RATES

Chapter 366, P.L. 2001 provides benefits similar to those of the Police and Firemen's Retirement System (PFRS) to prosecutor members of PERS who are not eligible for enrollment in PFRS. Similar to prior practice we have separately analyzed the retirement pattern of prosecutor members. Chapter 1 P.L. 2010 closed the Prosecutors Part to new members enrolled on or after May 22, 2010.

Table III-R7 shows the calculation of actual-to-expected ratios and the r-squared statistic for State and Local Employers' prosecutors. Chart III-R7 shows the information graphically along with the 90% confidence interval. There was limited experience for each service grouping, so we recommend using the same rate for all ages within a service group.

Table III-R7

		Retirements			Retirement Rates			A/E Ratios	
Service	Exposures	Actual	Current	Recommended	Actual	Current	Recommended	Current	Recommended
1-24	627	34	10.1	37.6	5.4%	1.6%	6.0%	336%	90%
25	89	42	22.1	44.5	47.2%	24.8%	50.0%	190%	94%
26+	270	70	79.0	67.5	25.9%	29.3%	25.0%	89%	104%
Total	**986**	**146**	**111.2**	**149.6**	**14.8%**	**11.3%**	**15.2%**	**131%**	**98%**
R-squared			**0.793**	**0.963**					

Chart III-R7

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 varies by age, service, and State or Local employer. We recommend separate assumptions for the following age, service, employer, and post-termination elections:

Electing a Deferred Annuity

- State members with 10 or more years of service
- Local employers' members with 10 or more years of service

Electing a Refund of Contributions

- State members younger than age 31 with less than 10 years of service
- State members ages 31 or older with less than 10 years of service
- State members with 10 or more years of service
- Local employers' members younger than age 31 with less than 10 years of service
- Local employers' members ages 31 or older with less than 10 years of service
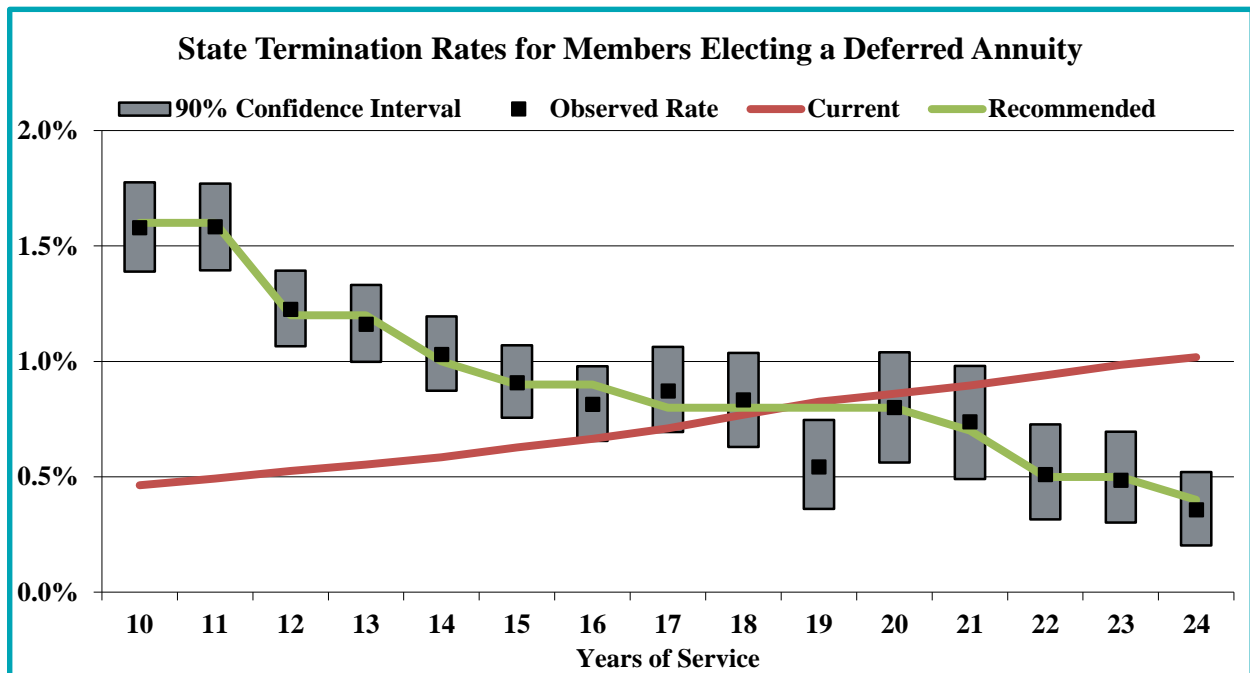- Local employers' members with 10 or more years of service

SECTION III – DEMOGRAPHIC ASSUMPTIONS
TERMINATION RATES

Table III-T1 shows the number of terminations for State members with 10 or more years of service who elect a deferred annuity, our recommended termination rates based on years of service, the calculation of actual-to-expected ratios for each year of service and the r-squared statistic. Chart III-T1 shows the information graphically along with the 90% confidence interval.

Table III-T1

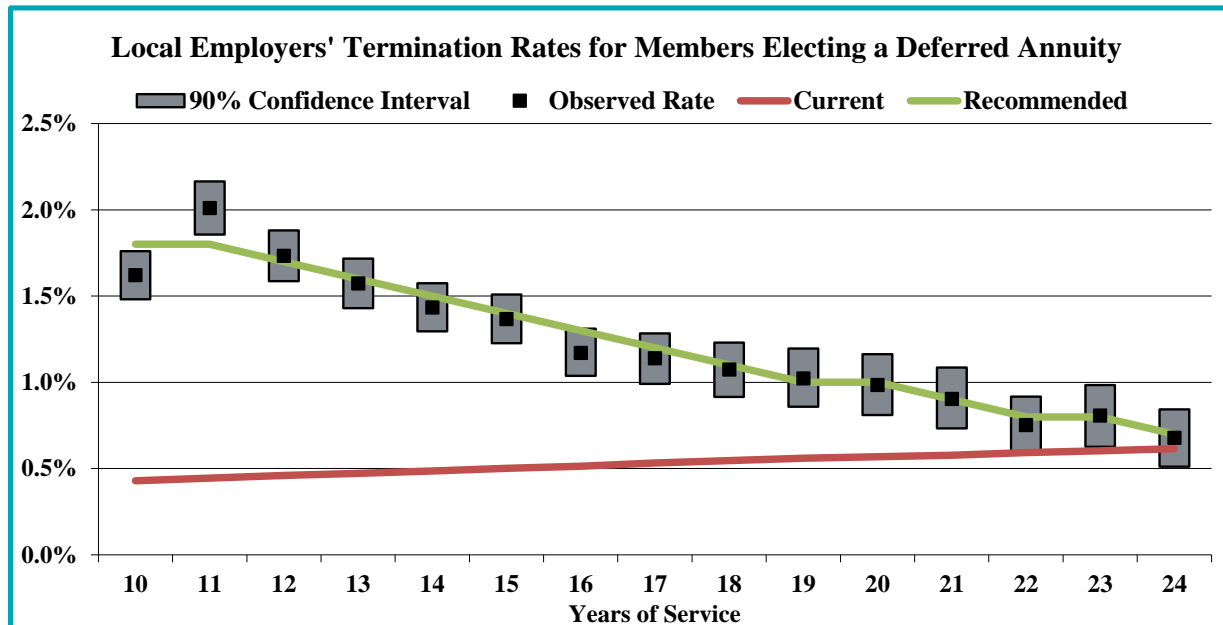|		Terminations			Termination Rates			A/E Ratios	
Service	Exposures	Actual	Current	Recommended	Actual	Current	Recommended	Current	Recommended
10	11,379	180	52.8	182.1	1.58%	0.46%	1.60%	341%	99%
11	11,971	190	59.0	191.5	1.59%	0.49%	1.60%	322%	99%
12	11,916	146	62.7	143.0	1.23%	0.53%	1.20%	233%	102%
13	11,417	133	63.1	137.0	1.16%	0.55%	1.20%	211%	97%
14	10,539	109	61.7	105.4	1.03%	0.59%	1.00%	177%	103%
15	9,528	86	59.8	85.8	0.90%	0.63%	0.90%	144%	100%
16	8,380	68	55.7	75.4	0.81%	0.67%	0.90%	122%	90%
17	7,056	62	50.1	56.4	0.88%	0.71%	0.80%	124%	110%
18	5,403	45	41.5	43.2	0.83%	0.77%	0.80%	108%	104%
19	4,153	23	34.3	33.2	0.55%	0.83%	0.80%	67%	69%
20	3,557	28	30.6	28.5	0.79%	0.86%	0.80%	92%	98%
21	3,264	24	29.2	22.8	0.74%	0.90%	0.70%	82%	105%
22	3,163	16	29.7	15.8	0.51%	0.94%	0.50%	54%	101%
23	3,304	16	32.5	16.5	0.48%	0.98%	0.50%	49%	97%
24	3,453	12	35.2	13.8	0.35%	1.02%	0.40%	34%	87%
Total	108,483	1,138	698.0	1,150.5	1.05%	0.64%	1.06%	163%	99%
R-squared			0.685	0.996					

Chart III-T1

SECTION III – DEMOGRAPHIC ASSUMPTIONS
TERMINATION RATES

Table III-T2 shows the number of terminations for Local employers' members with 10 or more years of service who elect a deferred annuity, our recommended termination rates based on years of service, the calculation of actual-to-expected ratios for each year of service and the r-squared statistic. Chart III-T2 shows the information graphically along with the 90% confidence interval.

Table III-T2

Local Employers' Termination Rates for Members Electing a Deferred Annuity								
		Terminations			Termination Rates			A/E Ratios	
Service	Exposures	Actual	Current	Proposed	Actual	Current	Proposed	Current	Proposed
10	22,604	366	97.1	406.9	1.62%	0.43%	1.80%	377%	90%
11	22,028	443	97.9	396.5	2.01%	0.44%	1.80%	453%	112%
12	20,995	364	96.6	356.9	1.73%	0.46%	1.70%	377%	102%
13	20,141	317	95.3	322.3	1.57%	0.47%	1.60%	333%	98%
14	19,379	278	94.3	290.7	1.43%	0.49%	1.50%	295%	96%
15	18,352	251	91.9	256.9	1.37%	0.50%	1.40%	273%	98%
16	16,484	193	84.7	214.3	1.17%	0.51%	1.30%	228%	90%
17	14,325	163	76.3	171.9	1.14%	0.53%	1.20%	214%	95%
18	11,792	127	64.3	129.7	1.08%	0.55%	1.10%	197%	98%
19	9,790	100	54.8	97.9	1.02%	0.56%	1.00%	182%	102%
20	8,516	84	48.4	85.2	0.99%	0.57%	1.00%	173%	99%
21	7,648	69	44.1	68.8	0.90%	0.58%	0.90%	156%	100%
22	7,201	54	42.7	57.6	0.75%	0.59%	0.80%	126%	94%
23	6,708	54	40.5	53.7	0.81%	0.60%	0.80%	133%	101%
24	6,647	45	40.9	46.5	0.68%	0.62%	0.70%	110%	97%
Total	**212,610**	**2,908**	**1,070.0**	**2,955.8**	**1.37%**	**0.50%**	**1.39%**	**272%**	**98%**
R-squared			**0.883**	**0.982**					

Chart III-T2

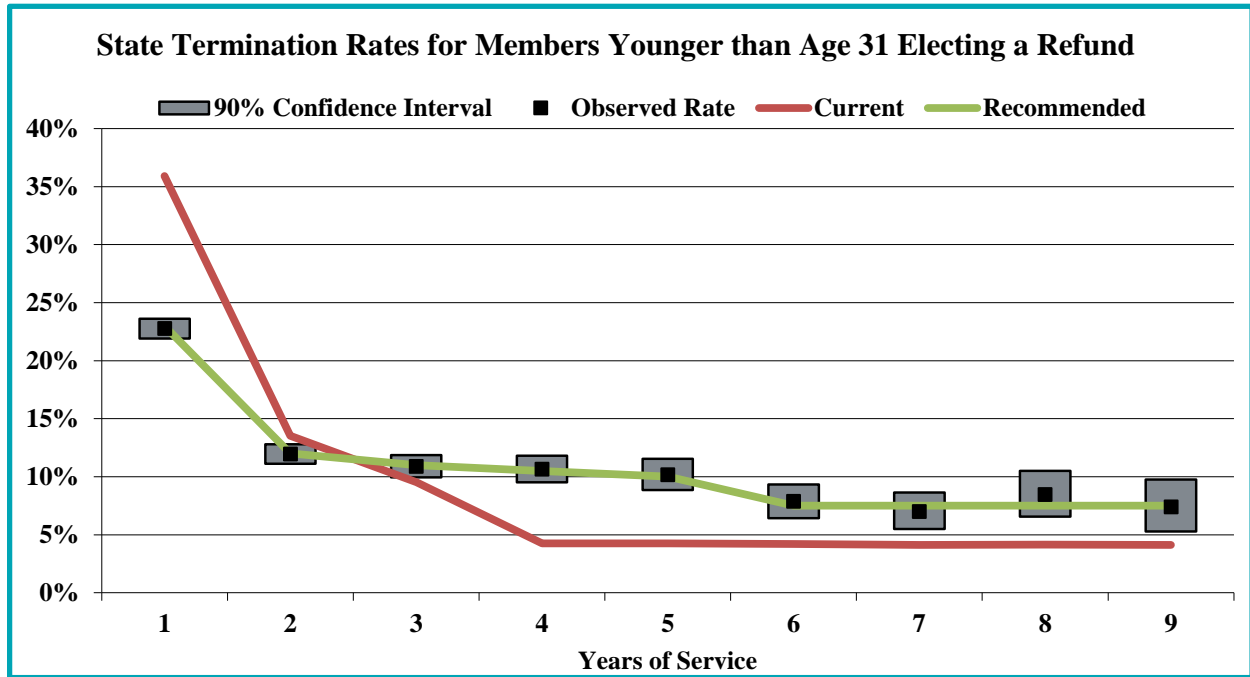Local Employers' Termination Rates for Members Electing a Deferred Annuity

SECTION III – DEMOGRAPHIC ASSUMPTIONS
TERMINATION RATES

Table III-T3 shows the number of terminations for State members younger than age 31 with less than 10 years of service who elect a refund of contributions, our recommended termination rates based on years of service, the calculation of actual-to-expected ratios for each year of service and the r-squared statistic. Chart III-T3 shows the information graphically along with the 90% confidence interval.

Table III-T3

		Terminations			Termination Rates			A/E Ratios	
Service	Exposures	Actual	Current	Recommended	Actual	Current	Recommended	Current	Recommended
1	6,624	1,508	2,379.6	1,523.5	22.77%	35.92%	23.00%	63%	99%
2	4,052	484	548.3	486.2	11.94%	13.53%	12.00%	88%	100%
3	2,866	312	272.9	315.3	10.89%	9.52%	11.00%	114%	99%
4	1,954	208	83.0	205.2	10.64%	4.25%	10.50%	250%	101%
5	1,377	140	58.5	137.7	10.17%	4.25%	10.00%	239%	102%
6	965	76	40.5	72.4	7.88%	4.20%	7.50%	187%	105%
7	729	51	30.1	54.7	7.00%	4.12%	7.50%	170%	93%
8	533	45	22.2	40.0	8.44%	4.16%	7.50%	203%	113%
9	379	28	15.6	28.4	7.39%	4.12%	7.50%	179%	99%
Total	19,479	2,852	3,450.7	2,863.3	14.64%	17.71%	14.70%	83%	100%
R-squared			0.986	1.000					

Chart III-T3

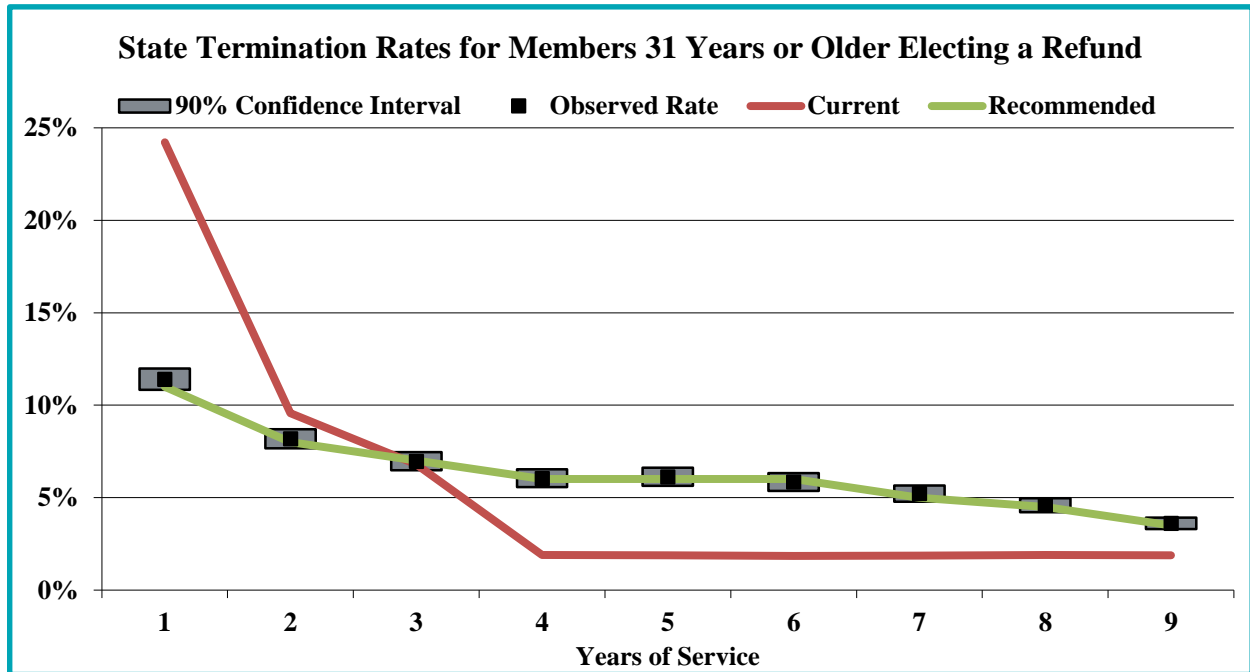State Termination Rates for Members Younger than Age 31 Electing a Refund

SECTION III – DEMOGRAPHIC ASSUMPTIONS
TERMINATION RATES

Table III-T4 shows the number of terminations for State members age 31 or older with less than 10 years of service who elect a refund of contributions, our recommended termination rates based on years of service, the calculation of actual-to-expected ratios for each year of service and the r-squared statistic. Chart III-T4 shows the information graphically along with the 90% confidence interval.

Table III-T4

		Terminations			Termination Rates			A/E Ratios	
Service	Exposures	Actual	Current	Recommended	Actual	Current	Recommended	Current	Recommended
1	8,368	955	2,026.6	920.5	11.41%	24.22%	11.00%	47%	104%
2	7,515	615	718.6	601.2	8.18%	9.56%	8.00%	86%	102%
3	7,156	499	486.0	500.9	6.97%	6.79%	7.00%	103%	100%
4	6,756	408	128.3	405.4	6.04%	1.90%	6.00%	318%	101%
5	6,417	393	120.0	385.0	6.12%	1.87%	6.00%	327%	102%
6	6,430	376	119.0	385.8	5.85%	1.85%	6.00%	316%	97%
7	6,924	362	128.8	346.2	5.23%	1.86%	5.00%	281%	105%
8	8,070	370	153.1	363.2	4.58%	1.90%	4.50%	242%	102%
9	9,483	341	177.9	331.9	3.60%	1.88%	3.50%	192%	103%
Total	**67,119**	**4,319**	**4,058.3**	**4,240.0**	**6.43%**	**6.05%**	**6.32%**	**106%**	**102%**
R-squared			**0.976**	**0.998**					

Chart III-T4

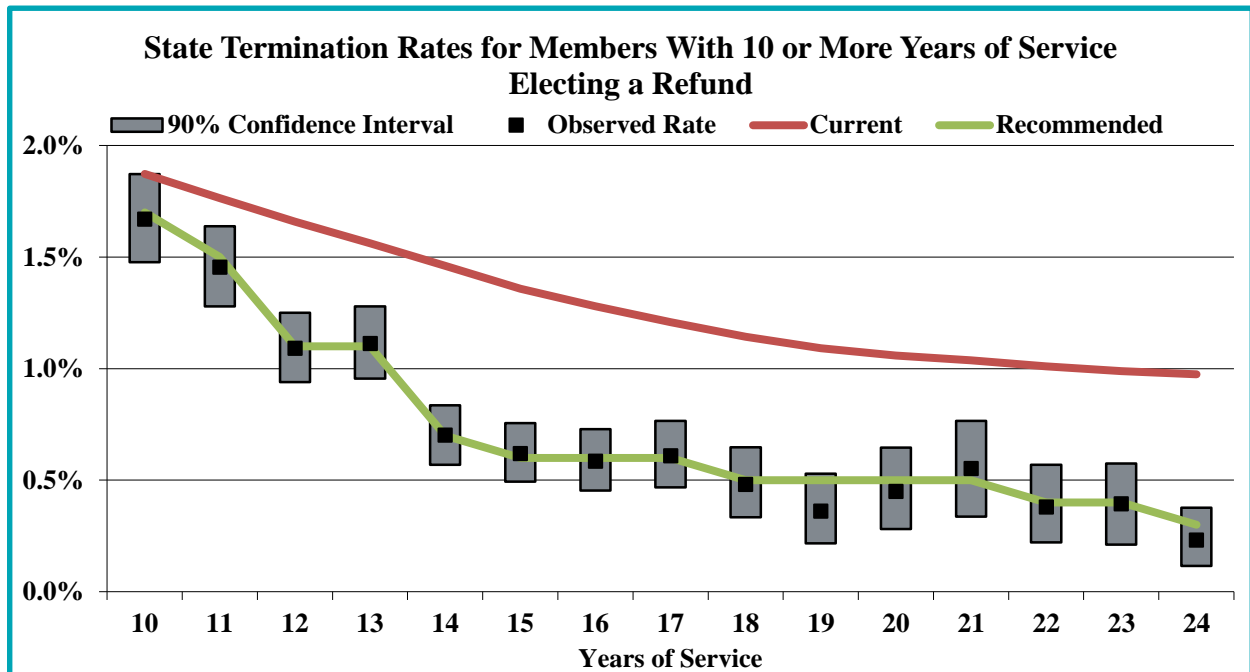State Termination Rates for Members 31 Years or Older Electing a Refund

SECTION III – DEMOGRAPHIC ASSUMPTIONS
TERMINATION RATES

Table III-T5 shows the number of terminations for all State members with 10 or more years of service who elect a refund of contributions, our recommended termination rates based on years of service, the calculation of actual-to-expected ratios for each year of service and the r-squared statistic. Chart III-T5 shows the information graphically along with the 90% confidence interval.

Table III-T5

		Terminations			Termination Rates			A/E Ratios	
Service	Exposures	Actual	Current	Recommended	Actual	Current	Recommended	Current	Recommended
10	11,379	190	213.1	193.4	1.67%	1.87%	1.70%	89%	98%
11	11,971	174	211.2	179.6	1.45%	1.76%	1.50%	82%	97%
12	11,916	130	197.7	131.1	1.09%	1.66%	1.10%	66%	99%
13	11,417	127	178.3	125.6	1.11%	1.56%	1.10%	71%	101%
14	10,539	74	153.9	73.8	0.70%	1.46%	0.70%	48%	100%
15	9,528	59	129.3	57.2	0.62%	1.36%	0.60%	46%	103%
16	8,380	49	107.2	50.3	0.58%	1.28%	0.60%	46%	97%
17	7,056	43	85.2	42.3	0.61%	1.21%	0.60%	50%	102%
18	5,403	26	61.7	27.0	0.48%	1.14%	0.50%	42%	96%
19	4,153	15	45.3	20.8	0.36%	1.09%	0.50%	33%	72%
20	3,557	16	37.6	17.8	0.45%	1.06%	0.50%	43%	90%
21	3,264	18	33.8	16.3	0.55%	1.04%	0.50%	53%	110%
22	3,163	12	31.9	12.7	0.38%	1.01%	0.40%	38%	95%
23	3,304	13	32.7	13.2	0.39%	0.99%	0.40%	40%	98%
24	3,453	8	33.6	10.4	0.23%	0.97%	0.30%	24%	77%
Total	**108,483**	**954**	**1,552.8**	**971.3**	**0.88%**	**1.43%**	**0.90%**	**61%**	**98%**
R-squared			**0.923**	**0.999**					

Chart III-T5

State Termination Rates for Members With 10 or More Years of Service Electing a Refund
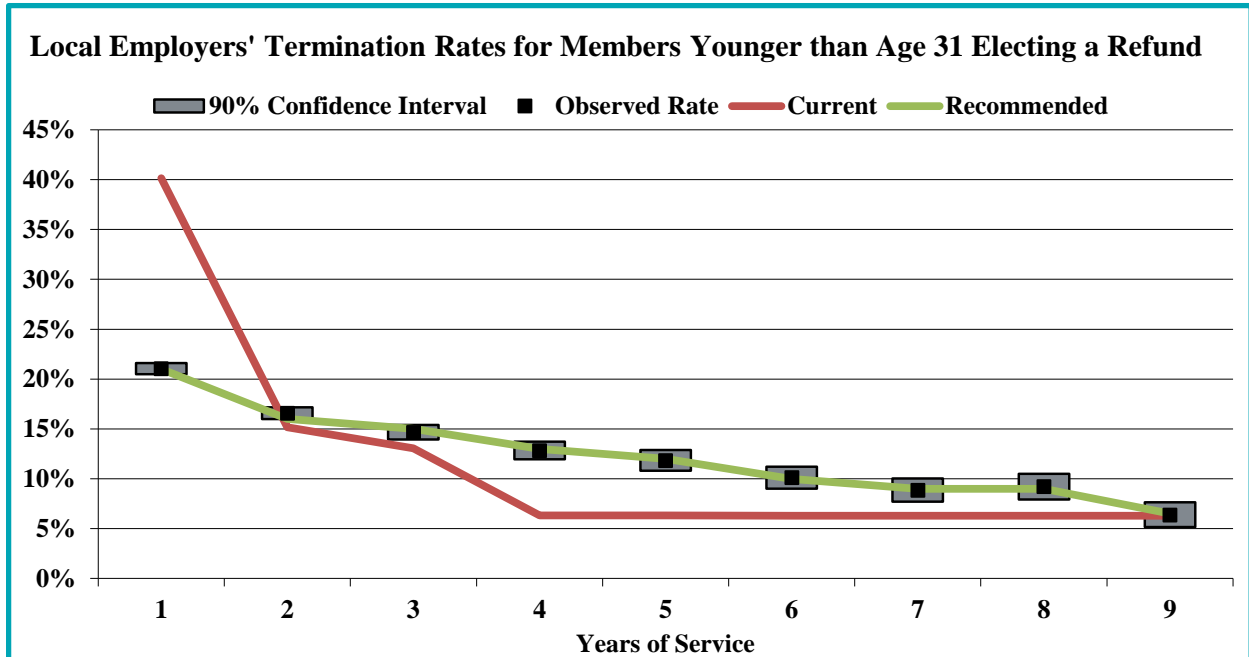
SECTION III – DEMOGRAPHIC ASSUMPTIONS
TERMINATION RATES

Table III-T6 shows the number of terminations for Local employers' members younger than age 31 with less than 10 years of service who elect a refund of contributions, our recommended termination rates based on years of service, the calculation of actual-to-expected ratios for each year of service and the r-squared statistic. Chart III-T6 shows the information graphically along with the 90% confidence interval.

Table III-T6

		Terminations			Termination Rates			A/E Ratios	
Service	Exposures	Actual	Current	Recommended	Actual	Current	Recommended	Current	Recommended
1	14,060	2,959	5,645.7	2,952.6	21.05%	40.15%	21.00%	52%	100%
2	10,289	1,706	1,560.7	1,646.2	16.58%	15.17%	16.00%	109%	104%
3	6,537	959	853.3	980.6	14.67%	13.05%	15.00%	112%	98%
4	3,923	503	248.3	510.0	12.82%	6.33%	13.00%	203%	99%
5	2,616	310	165.6	313.9	11.85%	6.33%	12.00%	187%	99%
6	1,986	201	125.4	198.6	10.12%	6.31%	10.00%	160%	101%
7	1,583	140	99.8	142.5	8.84%	6.30%	9.00%	140%	98%
8	1,313	121	82.8	118.2	9.22%	6.31%	9.00%	146%	102%
9	1,005	64	63.2	65.3	6.37%	6.29%	6.50%	101%	98%
Total	**43,312**	**6,963**	**8,844.8**	**6,927.9**	**16.08%**	**20.42%**	**16.00%**	**79%**	**101%**
R-squared			0.913	1.000					

Chart III-T6

Local Employers' Termination Rates for Members Younger than Age 31 Electing a Refund
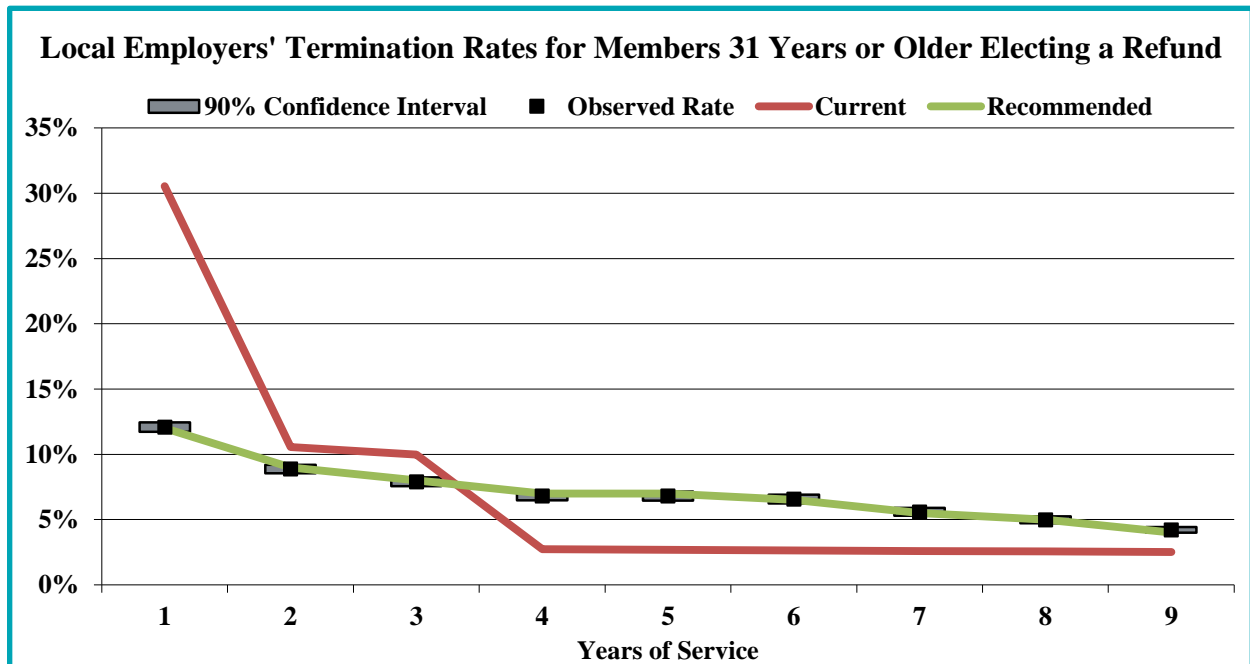
SECTION III – DEMOGRAPHIC ASSUMPTIONS
TERMINATION RATES

Table III-T7 shows the number of terminations for Local employers' members age 31 or older with less than 10 years of service who elect a refund of contributions, our recommended termination rates based on years of service, the calculation of actual-to-expected ratios for each year of service and the r-squared statistic. Chart III-T7 shows the information graphically along with the 90% confidence interval.

Table III-T7

		Terminations			Termination Rates			A/E Ratios	
Service	Exposures	Actual	Current	Recommended	Actual	Current	Recommended	Current	Recommended
1	23,160	2,799	7,072.7	2,779.2	12.09%	30.54%	12.00%	40%	101%
2	21,448	1,903	2,263.4	1,930.3	8.87%	10.55%	9.00%	84%	99%
3	18,119	1,430	1,805.8	1,449.5	7.89%	9.97%	8.00%	79%	99%
4	14,690	1,001	399.2	1,028.3	6.81%	2.72%	7.00%	251%	97%
5	13,641	928	364.7	954.9	6.80%	2.67%	7.00%	254%	97%
6	14,309	939	375.8	930.1	6.56%	2.63%	6.50%	250%	101%
7	16,195	904	419.7	890.7	5.58%	2.59%	5.50%	215%	101%
8	19,180	954	488.9	959.0	4.97%	2.55%	5.00%	195%	99%
9	21,055	886	527.7	842.2	4.21%	2.51%	4.00%	168%	105%
Total	**161,797**	**11,744**	**13,718.0**	**11,764.2**	**7.26%**	**8.48%**	**7.27%**	**86%**	**100%**
R-squared			**0.944**	**0.999**					

Chart III-T7

Local Employers' Termination Rates for Members 31 Years or Older Electing a Refund
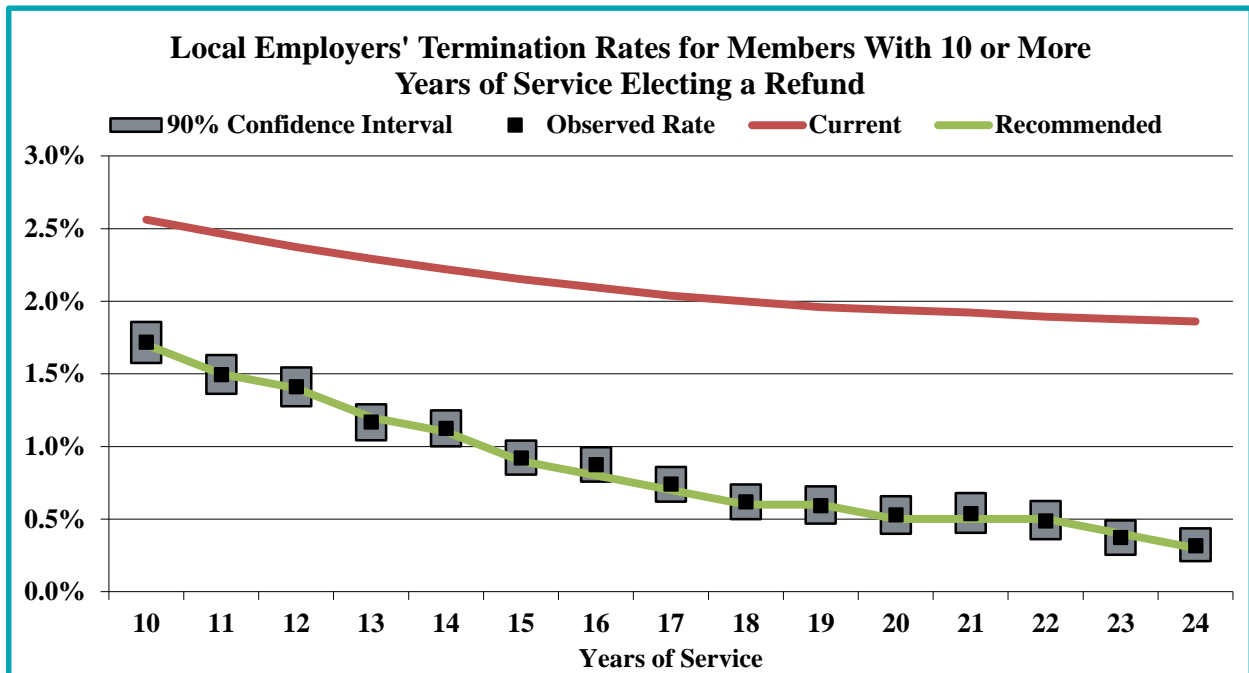
SECTION III – DEMOGRAPHIC ASSUMPTIONS
TERMINATION RATES

Table III-T8 shows the number of terminations for all Local employers' members with 10 or more years of service who elect a refund of contributions, our recommended termination rates based on years of service, the calculation of actual-to-expected ratios for each year of service and the r-squared statistic. Chart III-T8 shows the information graphically along with the 90% confidence interval.

Table III-T8

Local Employers' Termination Rates for Members With 10 or More Years of Service Electing a Refund									
		Terminations			Termination Rates			A/E Ratios	
Service	Exposures	Actual	Current	Recommended	Actual	Current	Recommended	Current	Recommended
10	22,604	388	578.9	384.3	1.72%	2.56%	1.70%	67%	101%
11	22,028	329	543.1	330.4	1.49%	2.47%	1.50%	61%	100%
12	20,995	296	498.1	293.9	1.41%	2.37%	1.40%	59%	101%
13	20,141	235	461.7	241.7	1.17%	2.29%	1.20%	51%	97%
14	19,379	218	430.0	213.2	1.12%	2.22%	1.10%	51%	102%
15	18,352	169	395.0	165.2	0.92%	2.15%	0.90%	43%	102%
16	16,484	144	345.4	131.9	0.87%	2.10%	0.80%	42%	109%
17	14,325	106	291.9	100.3	0.74%	2.04%	0.70%	36%	106%
18	11,792	73	235.7	70.8	0.62%	2.00%	0.60%	31%	103%
19	9,790	58	191.9	58.7	0.59%	1.96%	0.60%	30%	99%
20	8,516	45	165.1	42.6	0.53%	1.94%	0.50%	27%	106%
21	7,648	41	147.0	38.2	0.54%	1.92%	0.50%	28%	107%
22	7,201	35	136.4	36.0	0.49%	1.89%	0.50%	26%	97%
23	6,708	25	125.9	26.8	0.37%	1.88%	0.40%	20%	93%
24	6,647	21	123.7	19.9	0.32%	1.86%	0.30%	17%	105%
Total	212,610	2,183	4,669.8	2,153.9	1.03%	2.20%	1.01%	47%	101%
R-squared			0.965	0.999					

Chart III-T8

Chart III-T8 — Local Employers' Termination Rates for Members With 10 or More Years of Service Electing a Refund
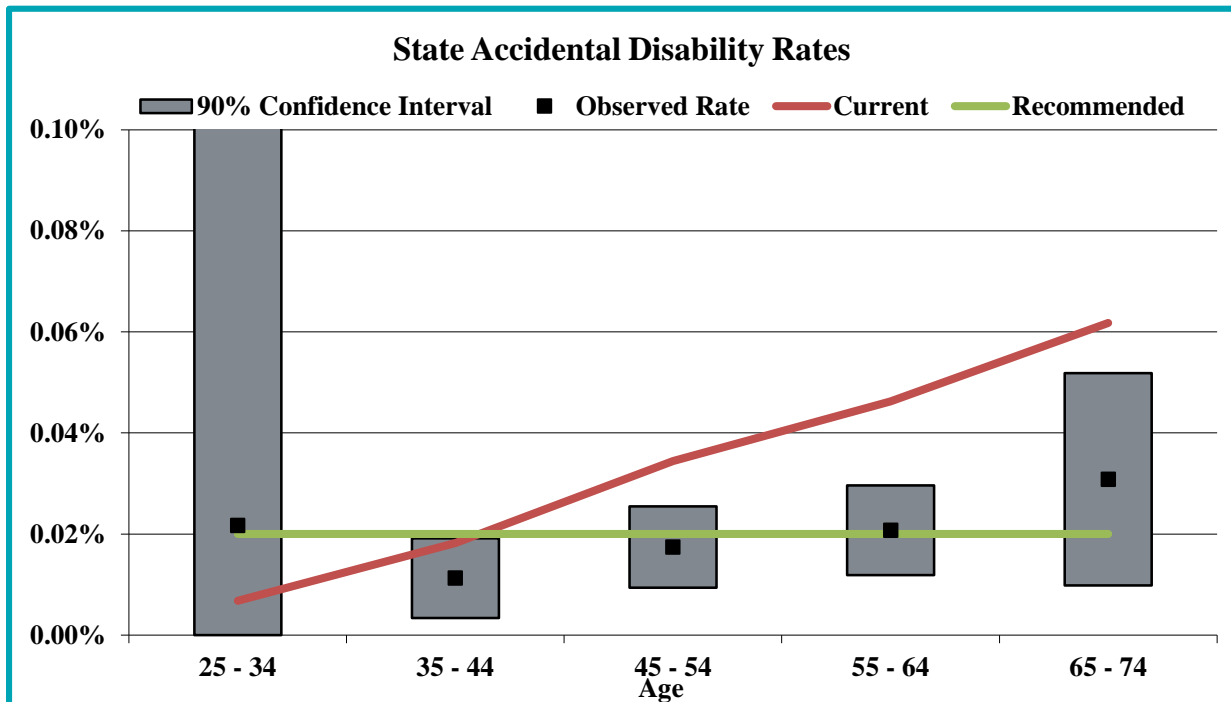
SECTION III – DEMOGRAPHIC ASSUMPTIONS
DISABILITY RATES

Table III-D1 shows the calculation of actual-to-expected ratios and the r-squared statistic for accidental disability for State members. Chart III-D1 shows the information graphically along with the 90% confidence interval. The experience shows very low incidence of accidental disability and therefore we recommend using a flat rate for all ages. The r-squared statistic is slightly lower under the recommended assumption compared to the current assumption. This can sometimes happen when there is a lack of credible data. However, the recommended assumption overall results in an expected level of accidental disabilities that is closer to the actual number of accidental disabilities as measured by the actual-to-expected ratio.

Table III-D1

Age Band	Exposures	Disabilities			Disability Rates			A/E Ratios	
		Actual	Current	Recommended	Actual	Current	Recommended	Current	Recommended
25 - 34	13,959	3	1.0	2.8	0.021%	0.007%	0.020%	315%	107%
35 - 44	48,829	6	8.9	9.8	0.012%	0.018%	0.020%	67%	61%
45 - 54	73,180	13	25.2	14.6	0.018%	0.034%	0.020%	52%	89%
55 - 64	71,007	15	32.8	14.2	0.021%	0.046%	0.020%	46%	106%
65 - 74	18,879	6	11.7	3.8	0.032%	0.062%	0.020%	51%	159%
Total	225,854	43	79.5	45.2	0.019%	0.035%	0.020%	54%	95%
R-squared			0.521	0.452					

Chart III-D1
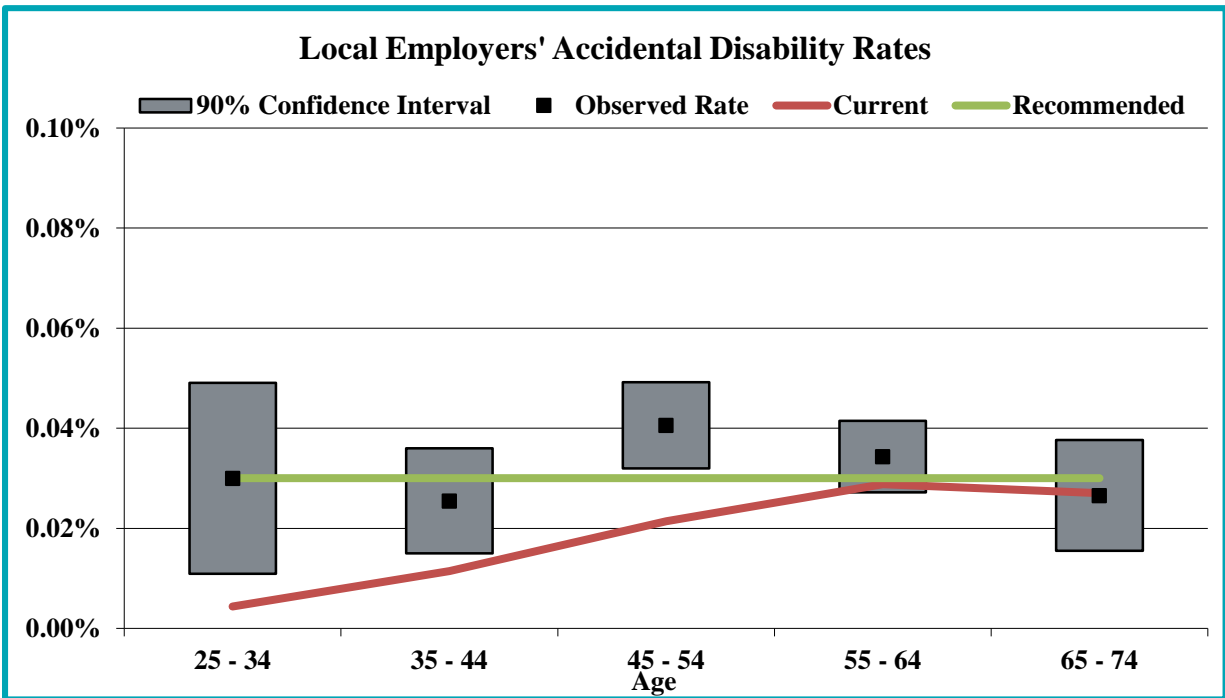

State Accidental Disability Rates

SECTION III – DEMOGRAPHIC ASSUMPTIONS
DISABILITY RATES

Table III-D2 shows the calculation of actual-to-expected ratios and the r-squared statistic for accidental disability for Local employers' members. Chart III-D2 shows the information graphically along with the 90% confidence interval. Recent experience has shown that the incidence rate is fairly consistent across all age bands, so we recommend using a flat rate for all ages.

Table III-D2

| Local Employers' Accidental Disability Rates								
Age Band	Exposures	Disabilities			Disability Rates			A/E Ratios	
		Actual	Current	Recommended	Actual	Current	Recommended	Current	Recommended
25 - 34	22,263	7	1.0	6.7	0.031%	0.004%	0.030%	722%	105%
35 - 44	62,592	16	7.2	18.8	0.026%	0.011%	0.030%	224%	85%
45 - 54	147,874	60	31.7	44.4	0.041%	0.021%	0.030%	189%	135%
55 - 64	181,364	62	52.3	54.4	0.034%	0.029%	0.030%	119%	114%
65 - 74	58,646	16	15.8	17.6	0.027%	0.027%	0.030%	101%	91%
Total	**472,739**	**161**	**107.9**	**141.8**	**0.034%**	**0.023%**	**0.030%**	**149%**	**114%**
R-squared			**0.701**	**0.757**					

Chart III-D2

SECTION III – DEMOGRAPHIC ASSUMPTIONS
DISABILITY RATES

Table III-D3 shows the calculation of actual-to-expected ratios and the r-squared statistic for ordinary disability for State members, and Chart III-D3 shows the information graphically along with the 90% confidence interval. We recommend lowering the rates for most ages.

Table III-D3

Age Band	Exposures	Disabilities			Disability Rates			A/E Ratios	
		Actual	Current	Recommended	Actual	Current	Recommended	Current	Recommended
30 - 34	5,395	14	8.4	9.7	0.259%	0.155%	0.179%	167%	145%
35 - 39	18,523	37	47.0	43.9	0.200%	0.254%	0.237%	79%	84%
40 - 44	20,673	63	72.3	61.1	0.305%	0.350%	0.296%	87%	103%
45 - 49	28,421	101	122.8	98.4	0.355%	0.432%	0.346%	82%	103%
50 - 54	36,958	151	192.2	152.0	0.409%	0.520%	0.411%	79%	99%
55 - 59	37,319	164	254.9	180.6	0.439%	0.683%	0.484%	64%	91%
60 - 64	27,585	172	289.3	153.5	0.624%	1.049%	0.557%	59%	112%
64 - 69	13,081	77	165.9	82.3	0.589%	1.268%	0.629%	46%	94%
70 - 74	4,293	27	60.8	29.6	0.629%	1.417%	0.690%	44%	91%
Total	**192,248**	**806**	**1,213.6**	**811.2**	**0.419%**	**0.631%**	**0.422%**	**66%**	**99%**
R-squared			**0.837**	**0.893**					

Chart III-D3
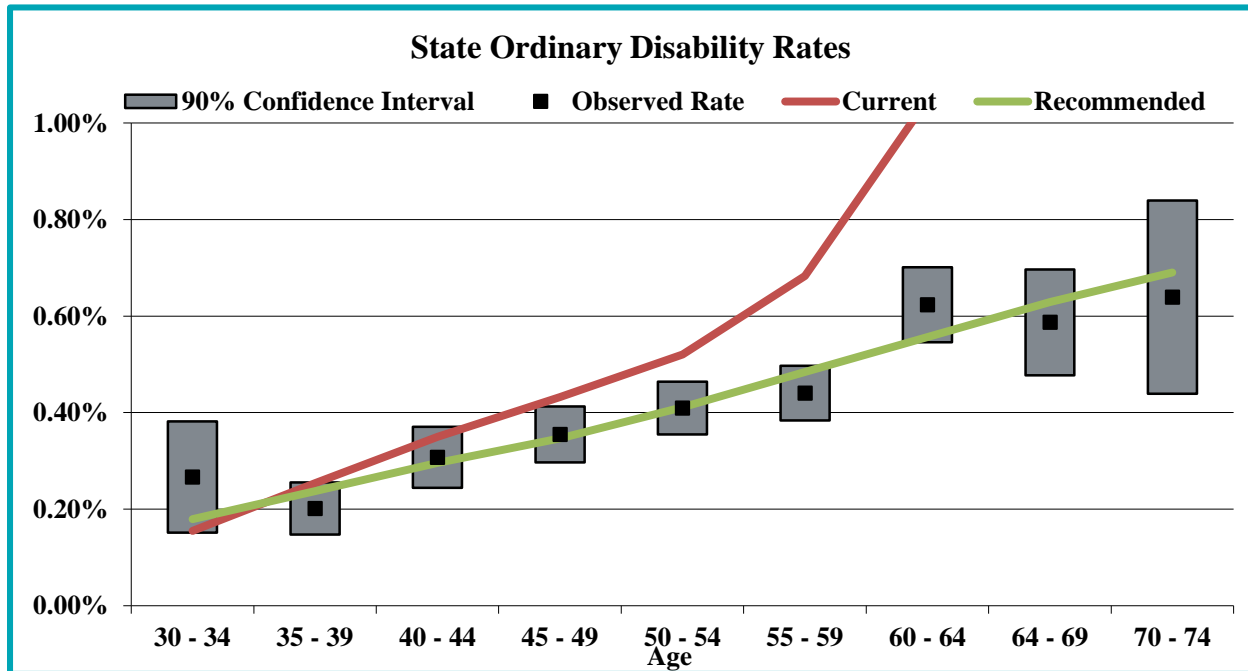

State Ordinary Disability Rates

SECTION III – DEMOGRAPHIC ASSUMPTIONS
DISABILITY RATES

Table III-D4 shows the calculation of actual-to-expected ratios and the r-squared statistic for ordinary disability for Local employers' members, and Chart III-D4 shows the information graphically along with the 90% confidence interval. We recommend lowering the rates for most ages.

Table III-D4

Age Band	Exposures	Disabilities			Disability Rates			A/E Ratios	
		Actual	Current	Recommended	Actual	Current	Recommended	Current	Recommended
30 - 34	8,217	19	10.5	17.9	0.231%	0.128%	0.218%	181%	106%
35 - 39	19,242	50	43.5	46.3	0.260%	0.226%	0.241%	115%	108%
40 - 44	27,289	83	85.1	76.9	0.304%	0.312%	0.282%	98%	108%
45 - 49	47,028	151	185.3	163.5	0.321%	0.394%	0.348%	81%	92%
50 - 54	73,916	275	367.3	312.1	0.372%	0.497%	0.422%	75%	88%
55 - 59	88,188	441	554.8	423.3	0.500%	0.629%	0.480%	79%	104%
60 - 64	72,614	375	596.4	383.4	0.516%	0.821%	0.528%	63%	98%
64 - 69	37,444	202	376.8	215.9	0.539%	1.006%	0.577%	54%	94%
70 - 74	14,922	103	165.6	95.5	0.690%	1.110%	0.640%	62%	108%
Total	**388,860**	**1,699**	**2,385.3**	**1,734.9**	**0.437%**	**0.613%**	**0.446%**	**71%**	**98%**
R-squared			**0.919**	**0.964**					

Chart III-D4
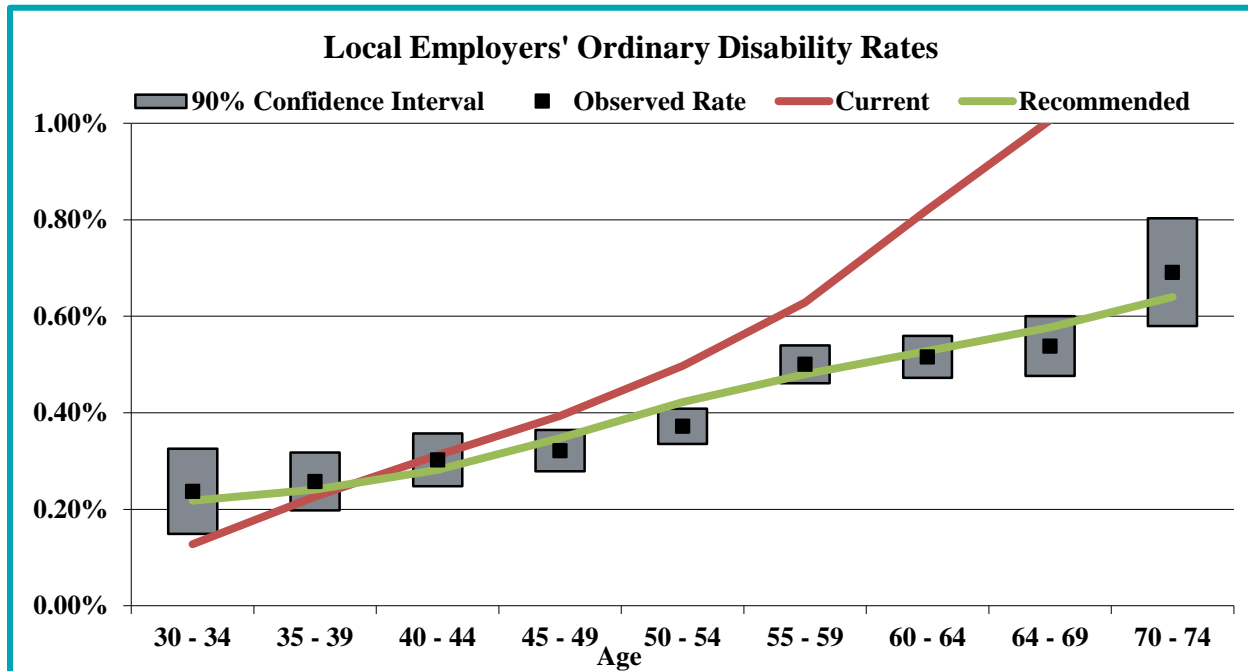
Local Employers' Ordinary Disability Rates

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 salaries if active or higher benefit income if retired, have longer life expectancies than individuals with lower income. It is important for a pension plan to use assumptions that are weighted by income to reflect not just the incidence of a decrement but the impact on liabilities.

SECTION III – DEMOGRAPHIC ASSUMPTIONS
MORTALITY RATES

In the prior study, PERS adopted the following assumptions:

Active members:

- Ordinary mortality: RP-2000 Employee Mortality Tables. For State, the tables are set back four years for males and females. For Local employers, the tables are set back two years for males and seven years for females. The tables are projected on a generational basis from the base year of 2013 using the Conduent Modified 2014 Projection Scale.
- Accidental mortality: 0.001% at all ages with no mortality improvement assumed.

Healthy retirees and beneficiaries: RP-2000 Combined Healthy Mortality Tables, set back one year for males and females, projected on a generational basis using Projection Scale AA from the base year of 2012 to 2013 and the Conduent Modified 2014 Projection Scale thereafter.

Disabled retirees: RP-2000 Disabled Mortality Tables, set back three years for males and set forward one year for females. No mortality improvement is assumed.

There are enough deaths for PERS to provide meaningful statistics in the four-year period. For healthy annuitants, there were 23,451 deaths over this period, for disabled retirees there were 2,304 deaths, and for active members there were 2,106 deaths. For reference, a fully credible sample would include 1,082 deaths. We therefore recommend using the standard Pub-2010 table for general employees with adjustments to account for PERS experience.

We recommend the following mortality table assumptions:

Active members (Non-Annuitants): The standard Pub-2010 General Below-Median Income Employee mortality table *[PubG-2010(B) Employee]* as published by the Society of Actuaries with an 82.2% adjustment for males and 101.4% adjustment for females, and with future improvement from the base year of 2010 on a generational basis using SOA's Scale MP-2018. All pre-retirement deaths are assumed to be ordinary deaths.

Healthy retirees and beneficiaries (Healthy Annuitants): The standard Pub-2010 General Below-Median Income Healthy Retiree mortality table *[PubG-2010(B) Healthy Retiree]* as published by the Society of Actuaries with a 91.4% adjustment for males and 99.7% adjustment for females, and with future improvement from the base year of 2010 on a generational basis using SOA's Scale MP-2018.

Disabled retirees (Disabled Annuitants): The Pub-2010 Non-Safety Disabled Retiree mortality table *[PubNS-2010 Disabled Retiree]* as published by the Society of Actuaries with a 127.7% adjustment for males and 117.2% adjustment for females, and with future improvement from the base year of 2010 on a generational basis using SOA's Scale MP-2018.
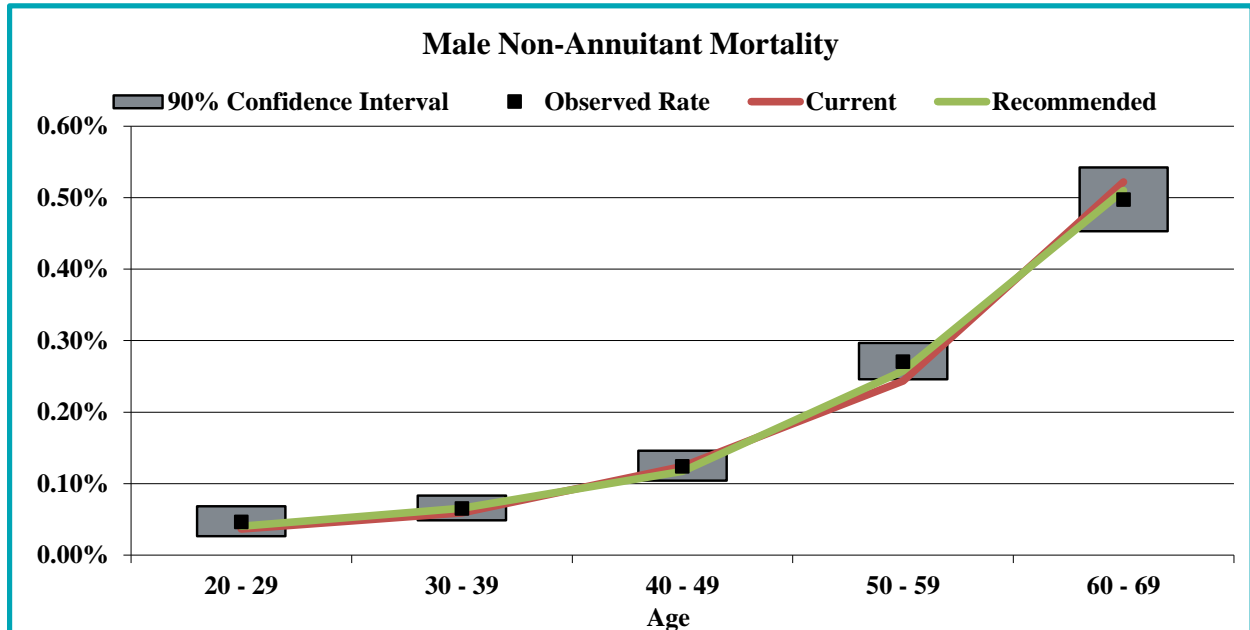
SECTION III – DEMOGRAPHIC ASSUMPTIONS
MORTALITY RATES

Table III-M1 – Active Males

Age Band	Exposures	Actual Deaths	Weighted Exposures	Weighted Deaths			A/E Ratios	
				Actual	Current	Recommended	Current	Recommended
20 - 29	26,279	14	1,019,367,485	475,046	372,843	412,219	127%	115%
30 - 39	57,484	39	2,884,432,904	1,890,863	1,711,771	1,890,745	110%	100%
40 - 49	76,778	105	4,508,732,270	5,601,931	5,592,624	5,278,673	100%	106%
50 - 59	114,237	359	7,250,185,178	19,637,513	17,676,761	18,671,411	111%	105%
60 - 69	67,299	397	4,140,490,942	20,590,976	21,608,525	21,123,425	95%	97%
70 +	13,232	169	638,538,141	5,935,759	5,816,498	6,730,493	102%	88%
Total	**355,309**	**1,083**	**20,441,746,920**	**54,132,088**	**52,779,023**	**54,106,966**	**103%**	**100%**
R-Squared					**0.938**	**0.943**		

Chart III-M1

Male Non-Annuitant Mortality

Legend: 90% Confidence Interval — Observed Rate — Current — Recommended

SECTION III – DEMOGRAPHIC ASSUMPTIONS
MORTALITY RATES

Table III-M2 – Active 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
20 - 29	25,898	2	963,206,198	71,855	190,038	158,156	38%	45%
30 - 39	77,033	28	3,744,531,370	1,314,934	1,104,042	1,315,015	119%	100%
40 - 49	115,535	94	5,726,770,042	4,278,751	3,860,219	4,154,694	111%	103%
50 - 59	193,314	336	9,129,842,735	15,086,692	13,756,620	14,996,085	110%	101%
60 - 69	112,926	419	5,292,305,210	18,010,622	15,960,375	17,637,751	113%	102%
70 +	17,708	144	691,507,554	5,091,883	4,100,448	5,591,619	124%	91%
Total	**542,414**	**1,023**	**25,548,163,109**	**43,854,737**	**38,971,741**	**43,853,321**	**113%**	**100%**
R-Squared					0.936	0.939		

Chart III-M2

Chart III-M2 — Female Non-Annuitant Mortality
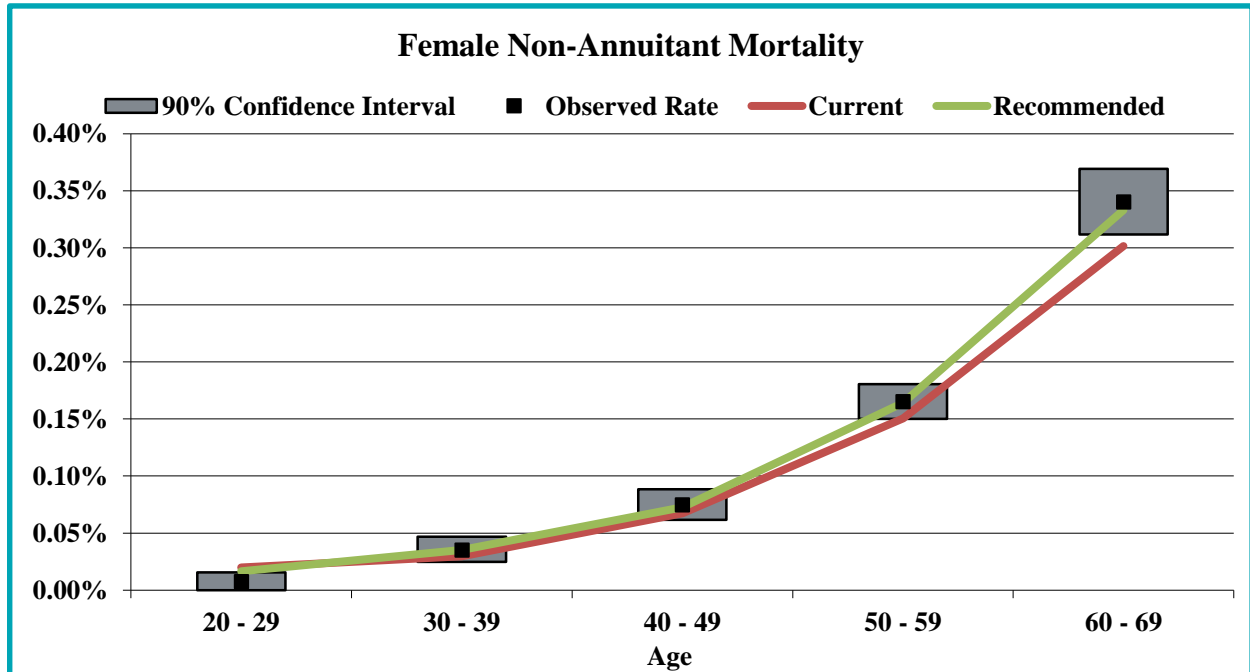
During the four-year period, there were 2,106 deaths in active service. Of these deaths, only two deaths were accidental. Therefore, we recommend assuming that all pre-retirement deaths are ordinary deaths.
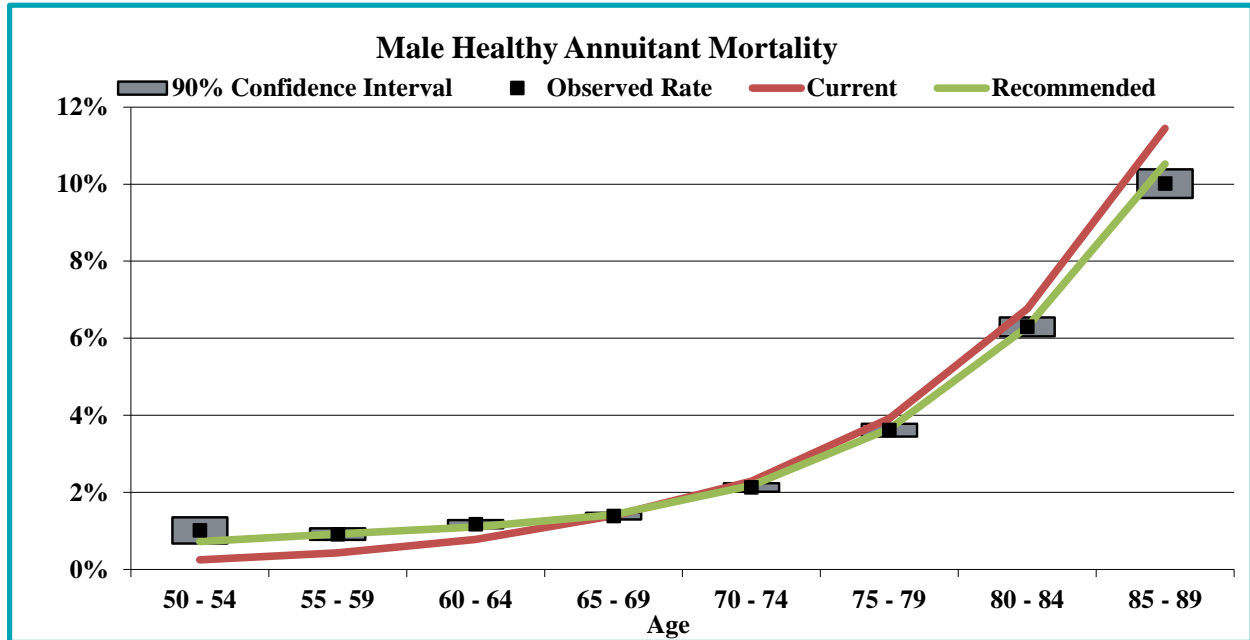
SECTION III – DEMOGRAPHIC ASSUMPTIONS
MORTALITY RATES

Table III-M3 – Healthy Annuitant 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
50 - 54	2,366	24	61,832,378	624,450	152,000	447,265	411%	140%
55 - 59	10,211	98	359,131,674	3,274,238	1,541,632	3,317,542	212%	99%
60 - 64	26,877	341	904,449,182	10,607,849	7,077,981	9,978,788	150%	106%
65 - 69	47,258	726	1,413,412,106	19,575,811	19,713,900	20,087,581	99%	97%
70 - 74	45,362	1,058	1,131,592,625	24,063,919	25,891,611	24,671,738	93%	98%
75 - 79	34,150	1,351	692,675,103	25,015,692	27,126,121	25,256,335	92%	99%
80 - 84	26,219	1,726	470,419,459	29,605,168	31,827,538	29,622,000	93%	100%
85 - 89	17,865	1,936	294,359,605	29,477,287	33,691,533	30,975,611	87%	95%
90 - 94	8,123	1,412	122,123,036	20,372,378	22,376,191	19,693,459	91%	103%
95 +	2,329	610	28,548,099	7,871,146	7,497,182	6,455,943	105%	122%
Total	**220,760**	**9,282**	**5,478,543,267**	**170,487,938**	**176,895,689**	**170,506,262**	**96%**	**100%**
R-Squared					0.957	0.967		

Chart III-M3

SECTION III – DEMOGRAPHIC ASSUMPTIONS
MORTALITY RATES

Table III-M4 – Healthy Annuitant Females

Age Band	Exposures	Actual Deaths	Weighted Exposures	Weighted Deaths			A/E Ratios	
				Actual	Current	Recommended	Current	Recommended
50 - 54	3,258	17	73,903,370	379,852	140,042	334,293	271%	114%
55 - 59	13,681	73	430,582,556	1,855,614	1,394,146	2,238,884	133%	83%
60 - 64	40,622	274	1,051,638,395	6,720,893	6,198,367	6,249,777	108%	108%
65 - 69	74,286	712	1,568,630,649	14,649,511	16,493,147	12,912,942	89%	113%
70 - 74	77,965	1,107	1,402,542,355	18,577,433	24,594,160	19,432,846	76%	96%
75 - 79	62,704	1,648	972,046,246	24,572,389	28,301,651	23,827,420	87%	103%
80 - 84	52,129	2,335	690,129,362	29,783,535	33,150,328	30,758,702	90%	97%
85 - 89	40,519	3,250	459,513,337	35,659,827	37,164,261	37,343,145	96%	95%
90 - 94	22,480	3,101	216,827,117	29,806,203	28,862,765	30,102,408	103%	99%
95 +	7,300	1,652	61,574,428	14,008,436	11,740,768	12,860,718	119%	109%
Total	**394,944**	**14,169**	**6,927,387,815**	**176,013,693**	**188,039,634**	**176,061,135**	**94%**	**100%**
R-Squared					0.958	0.984		

Chart III-M4
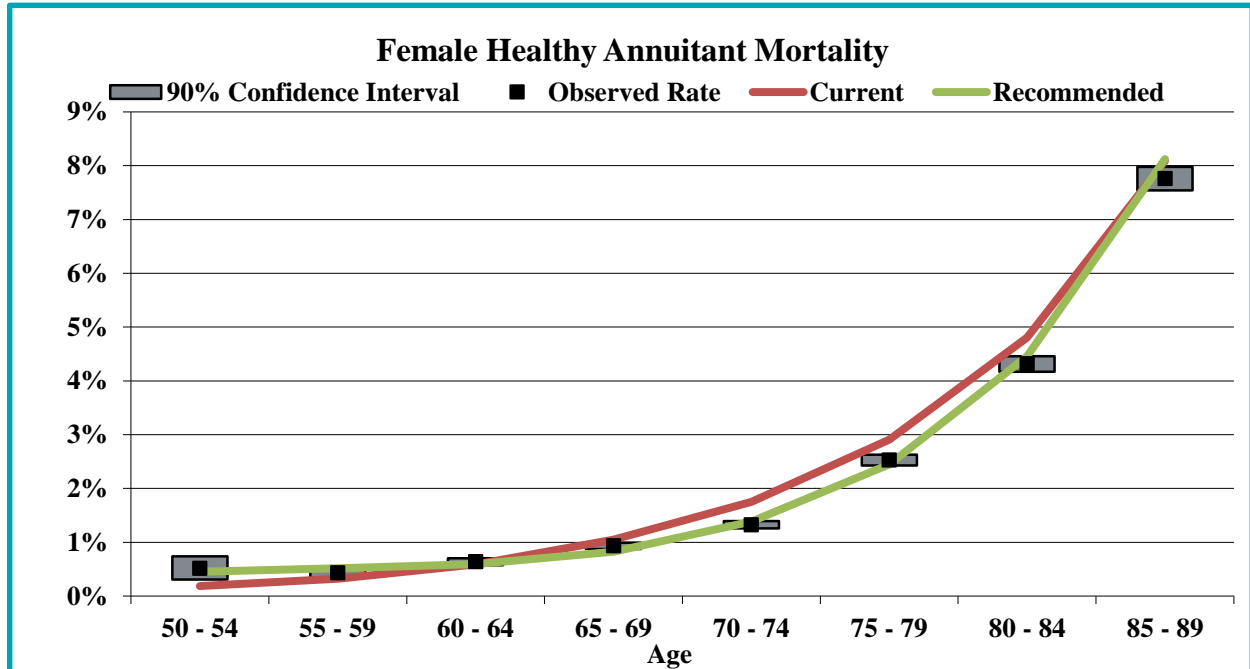
Female Healthy Annuitant Mortality

SECTION III – DEMOGRAPHIC ASSUMPTIONS
MORTALITY RATES

Table III-M5 – Disabled Annuitant 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	1,368	25	30,723,251	575,780	701,500	414,957	82%	139%
50 - 54	2,329	59	52,262,828	1,286,775	1,466,251	1,182,614	88%	109%
55 - 59	3,417	95	72,963,772	1,892,357	2,498,764	2,153,848	76%	88%
60 - 64	4,068	130	86,105,266	2,613,962	3,506,247	3,039,160	75%	86%
65 - 69	4,224	185	84,914,360	3,671,862	4,114,912	3,571,259	89%	103%
70 - 74	3,467	204	66,756,588	3,818,554	3,975,105	3,489,600	96%	109%
75 - 79	2,309	165	40,176,040	2,744,241	3,087,407	2,823,982	89%	97%
80 - 84	1,314	126	22,202,233	2,140,453	2,263,794	2,256,012	95%	95%
85 - 89	459	89	6,299,588	1,157,835	831,275	938,524	139%	123%
90 - 94	134	31	2,073,375	403,104	350,803	469,039	115%	86%
95 +	20	9	244,458	101,759	55,111	73,002	185%	139%
Total	**23,109**	**1,118**	**464,721,759**	**20,406,682**	**22,851,168**	**20,411,995**	**89%**	**100%**
R-Squared					0.908	0.916		

Chart III-M5
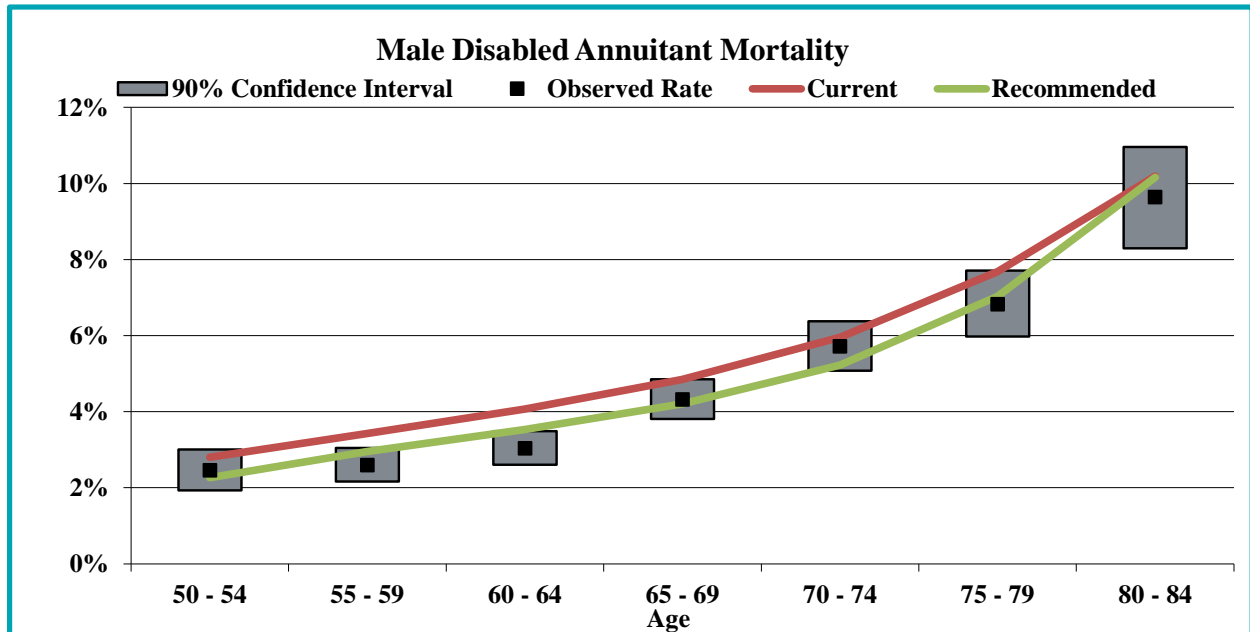
Male Disabled Annuitant Mortality

SECTION III – DEMOGRAPHIC ASSUMPTIONS
MORTALITY RATES

Table III-M6 – Disabled Annuitant Females

Age Band	Exposures	Actual Deaths	Weighted Exposures	Weighted Deaths Actual	Current	Recommended	A/E Ratios Current	Recommended
< 50	1,474	24	30,184,325	490,148	279,851	363,215	175%	135%
50 - 54	2,465	44	49,771,485	894,210	736,205	947,306	121%	94%
55 - 59	4,135	92	77,893,022	1,665,961	1,549,812	1,762,363	107%	95%
60 - 64	5,661	156	104,148,957	2,655,968	2,649,826	2,521,629	100%	105%
65 - 69	6,234	206	110,546,304	3,406,991	3,697,605	3,015,414	92%	113%
70 - 74	5,568	193	93,979,209	3,159,969	4,296,841	3,343,670	74%	95%
75 - 79	3,816	189	61,256,595	3,026,281	3,845,945	3,155,537	79%	96%
80 - 84	1,898	143	27,575,915	2,072,251	2,367,391	2,166,248	88%	96%
85 - 89	790	91	10,188,890	1,136,099	1,210,442	1,225,661	94%	93%
90 - 94	235	36	2,345,127	385,705	383,045	397,338	101%	97%
95 +	47	12	438,272	120,453	96,116	109,066	125%	110%
Total	32,323	1,186	568,328,101	19,014,036	21,113,078	19,007,448	90%	100%
R-Squared					0.901	0.919		

Chart III-M6

Female Disabled Annuitant Mortality
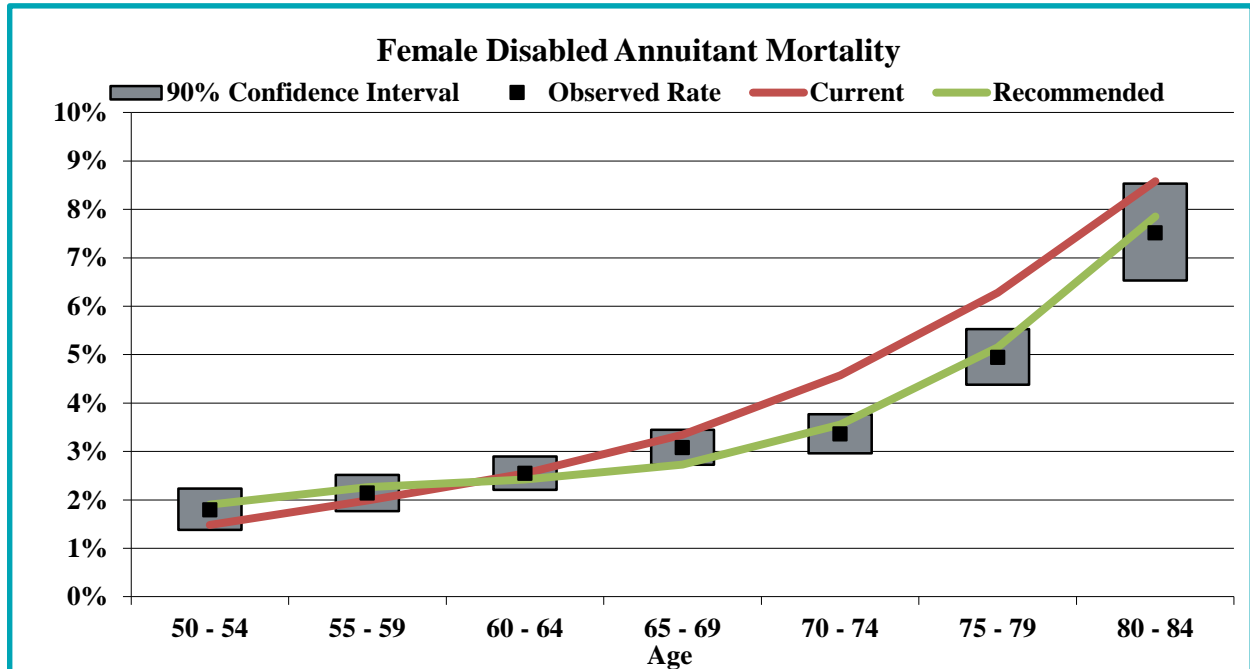
SECTION IV – ECONOMIC ASSUMPTIONS

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 and to determine Local employer Early Retirement Incentive Program (ERI) payments for those Local employers who elected to amortize their ERI liability as a level percent of payroll. 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.
- **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.

Chart IV-1
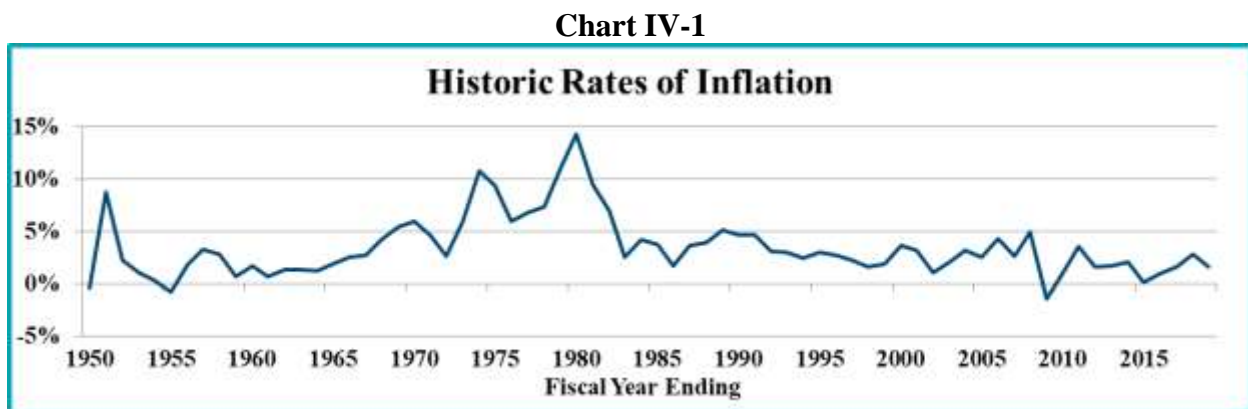
Over the 50 years ending June 2019, the geometric average inflation rate for the U.S. has been about 4.0%, but this average is heavily influenced by the high inflation rates in the 1970s and early 1980s. Over the last 30 years, the geometric average inflation rate has been 2.5%, and it has been only 1.7% over the last ten years.

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

Break-Even Inflation Based on Treasury Bond Yields			
Time to Maturity	Conventional Yield	TIPS Yield	Break Even Inflation
5 Years	1.83%	0.25%	1.58%
10 Years	2.06%	0.31%	1.75%
20 Years	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:

SECTION IV – ECONOMIC ASSUMPTIONS

Chart IV-2
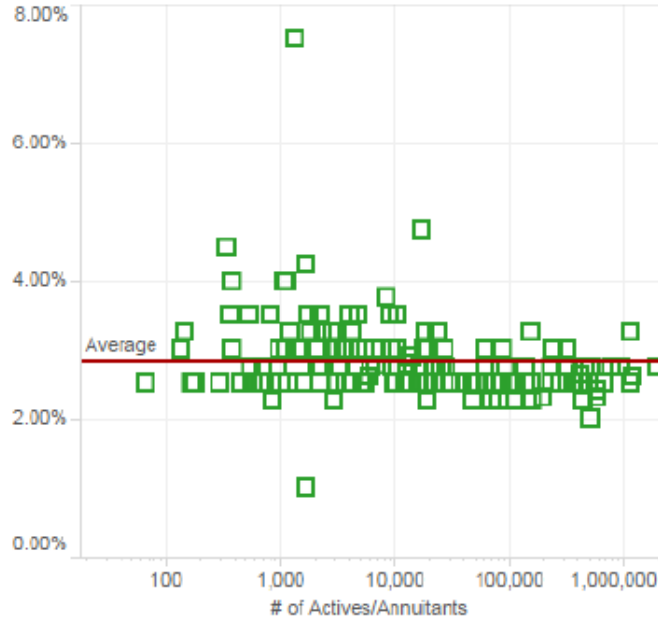
The average inflation assumption among the 167 systems that responded to this study was 2.80%.

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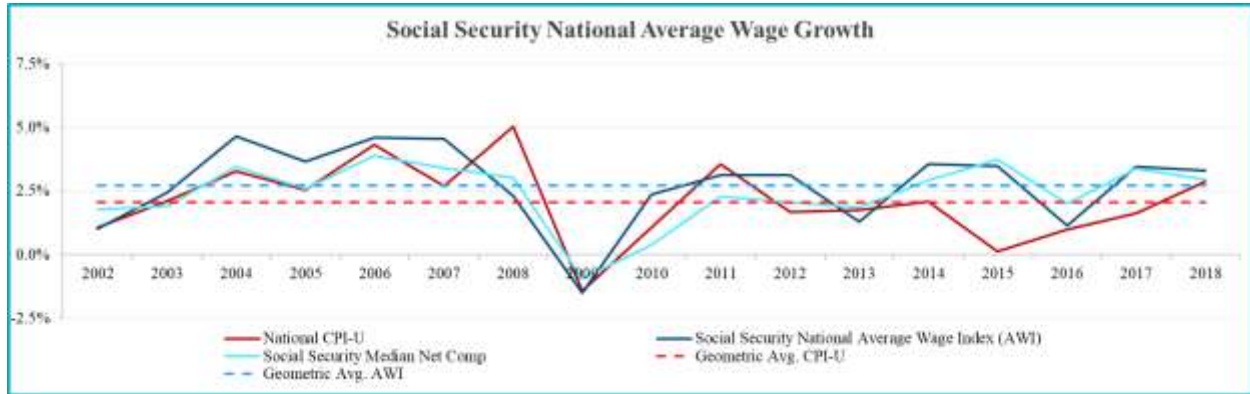
Wage inflation is used in the actuarial valuation to project the Social Security Wage Base in determining the actuarial liability.

SECTION IV – ECONOMIC ASSUMPTIONS

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

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%.

SALARY INCREASE RATE

The salary increase rate represents the year over year increase in pay of continuing actives. Salary increases generally consist of three components: Increases due to cost of living maintenance (inflation), increases related to non-inflationary pressures on base pay (such as productivity increases), and increases in individual pay due to merit, promotion, and longevity.

The current assumption varies by age and time period as shown in the following table. Salary increases are assumed to occur on July 1.

SECTION IV – ECONOMIC ASSUMPTIONS

Age	Period Ending June 30, 2026	Ultimate Period
20	4.15%	5.15%
25	3.90	4.90
30	3.65	4.65
35	3.40	4.40
40	3.15	4.15
45	2.90	3.90
50	2.65	3.65
55	2.40	3.40
60	2.15	3.15
65	1.65	2.65
69	1.65	2.65

Generally, newer employees are more likely to earn a longevity increase or receive a promotion, so their salary increases tend to be greater than those for longer service employees. Therefore, we recommend a service-based salary increase assumption.

The State Treasurer previously recommended using lower salary increases through fiscal year ending 2026 to reflect short-term expectations and higher salary increases thereafter. PERS experience for the period FYE 2015 through FYE 2018 shows that actual salary increases have been relatively close to expected based on the salary increase assumption in effect for those fiscal years. Therefore, we recommend continuing the current select and ultimate salary increase assumptions. For the select period through fiscal year ending 2026, we recommend modifying the rates to better reflect actual experience. The recommended salary increase rates after fiscal year ending 2026 are higher than the select period rates by 1.00% for each year of service.

SECTION IV – ECONOMIC ASSUMPTIONS

In Chart IV-4 we show the total actual salary increases based on years of service for continuing active members for FYE 2015 through FYE 2018 and the recommended assumption through June 30, 2026.

Chart IV-4
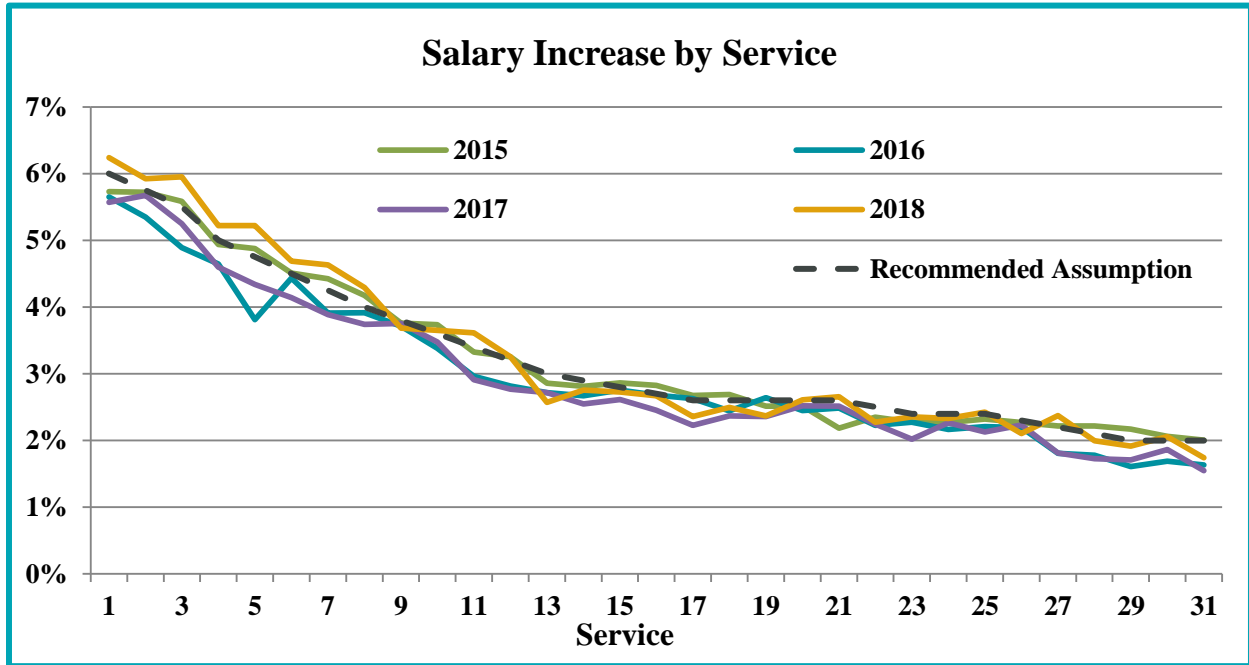
Salary Increase by Service

SECTION V – ACTUARIAL METHODS

Actuarial methods describe how the cost of the benefit obligations are calculated and distributed over time as used in an actuarial valuation. For PERS many of these methods are defined in the NJ State Statutes. However, there are a number of details in the methods that are not explicitly defined in Statute and used by the actuary. We are monitoring two potential changes to the actuarial methods, one related to the expected member contributions and one related to the determination of the actuarial liability for non-contributing actives. We may recommend these changes during the next experience review.

Expected Member Contributions

The Statutory contribution consists of two parts: the employer normal cost contribution and the unfunded actuarial liability (UAL) contribution. The employer normal cost contribution equals the gross normal cost less the expected member contributions. Currently, the PERS expected member contributions are calculated in aggregate as appropriation payroll as reported to us by the Division of Pensions and Benefits (DPB) increased with a year of general payroll inflation (3% in 2018 and 2% under the recommended assumptions), multiplied by the member contribution rate and adjusted with interest.

In contrast, the other New Jersey Retirement Systems calculate expected member contributions on an individual basis using the underlying salary increase assumptions and demographic assumptions, including the probability of members retiring, terminating, dying and becoming disabled. This methodology is consistent with the calculation of the gross normal cost. If PERS used the same methodology, the expected member contributions would be lower and the resulting employer normal cost contribution higher.

We are monitoring this methodology and may recommend a change during the next experience review.

Non-Contributing Active Members

The valuation census data provided by the DPB included non-contributing members. These members previously contributed to the System and, therefore, accrued benefits. However, they no longer contribute or accrue benefits. Typically, these members have terminated employment or applied for a retirement, disability, or death benefit and their paperwork was not processed in time to be reflected in the fiscal year census data.

Currently, all non-contributing members are included in the valuation with a liability based on the reported Accumulated Savings Fund (ASF). We are monitoring this methodology. During the next experience review, we may recommend changing this methodology for non-contributing members reported with salary (for ease, we will call this non-contributing active members going forward). An alternative methodology would be to base the liability for these members on the underlying demographic assumptions using the Unit Credit Cost Method. We observed that non-contributing active status is often a transition status while paperwork is processed, with such members either shifting to a retired status in the next valuation, or returning to contributing status in the next valuation. The Unit Credit Cost Method may better reflect these members' liability

SECTION V – ACTUARIAL METHODS

than the reported ASF or the Projected Unit Credit Cost Method, which is used for contributing active members. The difference between Unit Credit and Projected Unit Credit is that a Unit Credit calculation is based on current salary and a Projected Unit Credit calculation is based on salary projected to expected retirement, disability or death.

For non-contributing members reported without salary (non-contributing inactive members), we recommend continuing to use the current methodology of determining the liability based on the reported Accumulated Savings Fund (ASF). As we collect more data, we will continue to review the appropriateness of this methodology and may recommend changes in the future.

APPENDIX A – SUMMARY OF RECOMMENDED ASSUMPTIONS

1. Salary Increases   Salary increases vary by years of service and time period. Annual salary increases are shown below.

Salary Increases		
Years of Service	**Period Ending June 30, 2026**	**Ultimate Period**
0	6.00%	7.00%
1	6.00	7.00
2	5.75	6.75
3	5.50	6.50
4	5.00	6.00
5	4.75	5.75
6	4.50	5.50
7	4.25	5.25
8	4.00	5.00
9	3.80	4.80
10	3.60	4.60
11	3.40	4.40
12	3.20	4.20
13	3.00	4.00
14	2.90	3.90
15	2.80	3.80
16	2.70	3.70
17-21	2.60	3.60
22	2.50	3.50
23-25	2.40	3.40
26	2.30	3.30
27	2.20	3.20
28	2.10	3.10
29+	2.00	3.00

Salary increases are assumed to occur on July 1.

2. 401(a)(17) Pay Limit $275,000 in 2018 increasing 2.75% per annum, compounded annually.

3. Social Security Wage Base $128,400 in 2018 increasing 3.25% per annum, compounded annually.

APPENDIX A – SUMMARY OF RECOMMENDED ASSUMPTIONS

4. Termination

Termination rates for members electing a refund of contributions are as follows:

	Termination Rates for Members Electing a Refund			
	State		Local Employers'	
Service	Less than 31 Years Old	31 Years or Older	Less than 31 Years Old	31 Years or Older
0	23.00%	11.00%	21.00%	12.00%
1	23.00	11.00	21.00	12.00
2	12.00	8.00	16.00	9.00
3	11.00	7.00	15.00	8.00
4	10.50	6.00	13.00	7.00
5	10.00	6.00	12.00	7.00
6	7.50	6.00	10.00	6.50
7	7.50	5.00	9.00	5.50
8	7.50	4.50	9.00	5.00
9	7.50	3.50	6.50	4.00
10	1.70	1.70	1.70	1.70
11	1.50	1.50	1.50	1.50
12	1.10	1.10	1.40	1.40
13	1.10	1.10	1.20	1.20
14	0.70	0.70	1.10	1.10
15	0.60	0.60	0.90	0.90
16	0.60	0.60	0.80	0.80
17	0.60	0.60	0.70	0.70
18	0.50	0.50	0.60	0.60
19	0.50	0.50	0.60	0.60
20	0.50	0.50	0.50	0.50
21	0.50	0.50	0.50	0.50
22	0.40	0.40	0.50	0.50
23	0.40	0.40	0.40	0.40
24-29	0.30	0.30	0.30	0.30

No termination is assumed after attainment of retirement eligibility.

APPENDIX A – SUMMARY OF RECOMMENDED ASSUMPTIONS

Termination rates for members electing a deferred annuity are as follows:

Termination Rates for Members Electing a Deferred Annuity		
Service	State	Local Employers
< 10	N/A	N/A
10	1.60%	1.80%
11	1.60	1.80
12	1.20	1.70
13	1.20	1.60
14	1.00	1.50
15	0.90	1.40
16	0.90	1.30
17	0.80	1.20
18	0.80	1.10
19	0.80	1.00
20	0.80	1.00
21	0.70	0.90
22	0.50	0.80
23	0.50	0.80
24	0.40	0.70

No termination is assumed after attainment of retirement eligibility.

APPENDIX A – SUMMARY OF RECOMMENDED ASSUMPTIONS

5. Disability

Ordinary disability rates are as follows:

Ordinary Disability Rates					
Age	**State**	**Local Employers**	**Age**	**State**	**Local Employers**
25	0.100%	0.200%	50	0.380%	0.390%
26	0.110	0.200	51	0.395	0.405
27	0.120	0.200	52	0.410	0.420
28	0.130	0.200	53	0.425	0.435
29	0.140	0.200	54	0.440	0.450
30	0.150	0.205	55	0.455	0.460
31	0.160	0.210	56	0.470	0.470
32	0.170	0.215	57	0.485	0.480
33	0.180	0.220	58	0.500	0.490
34	0.190	0.225	59	0.515	0.500
35	0.205	0.230	60	0.530	0.510
36	0.220	0.235	61	0.545	0.520
37	0.235	0.240	62	0.560	0.530
38	0.250	0.245	63	0.575	0.540
39	0.265	0.250	64	0.590	0.550
40	0.275	0.260	65	0.605	0.560
41	0.285	0.270	66	0.620	0.570
42	0.295	0.280	67	0.635	0.580
43	0.305	0.290	68	0.650	0.590
44	0.315	0.300	69	0.665	0.600
45	0.325	0.315	70	0.675	0.615
46	0.335	0.330	71	0.685	0.630
47	0.345	0.345	72	0.695	0.645
48	0.355	0.360	73	0.705	0.660
49	0.365	0.375	74	0.715	0.675

Accidental disability rates are assumed to be 0.02% for all State members and 0.03% for all Local employers' members.

Ordinary disability rates apply upon attainment of 10 years of service and continue through the ultimate retirement age.

Members are assumed to receive the greater of the applicable disability benefit or the early or service retirement benefit, depending on eligibility.

Tier 4 and Tier 5 members are not eligible for the Ordinary or Accidental Disability benefits but the disability rates still apply. Such members terminating under the disability decrement are assumed to separate from service and elect a Deferred Retirement benefit.

APPENDIX A – SUMMARY OF RECOMMENDED ASSUMPTIONS

6. Mortality

Pre-Retirement Mortality: The standard Pub-2010 General Below-Median Income Employee mortality table *[PubG-2010(B) Employee]* as published by the Society of Actuaries with an 82.2% adjustment for males and 101.4% adjustment for females, and with future improvement from the base year of 2010 on a generational basis using SOA's Scale MP-2018. All pre-retirement deaths are assumed to be ordinary deaths.

Healthy Retirees and Beneficiaries (Healthy Annuitants):   The standard Pub-2010 General Below-Median Income Healthy Retiree mortality table *[PubG-2010(B) Healthy Retiree]* as published by the Society of Actuaries with a 91.4% adjustment for males and 99.7% adjustment for females, and with future improvement from the base year of 2010 on a generational basis using SOA's Scale MP-2018.

Disabled Retirees (Disabled Annuitants):   The Pub-2010 Non-Safety Disabled Retiree mortality table *[PubNS-2010 Disabled Retiree]* as published by the Society of Actuaries with a 127.7% adjustment for males and 117.2% adjustment for females, and with future improvement from the base year of 2010 on a generational basis using SOA's Scale MP-2018.

APPENDIX A – SUMMARY OF RECOMMENDED ASSUMPTIONS

7. Retirement

Retirement rates for State Tier 1-4 members are as follows:

	State Tiers 1-4 Retirement Rates		
Age	Less Than 25 Years of Service	25 Years of Service	26 or More Years of Service
< 49	N/A	3.50%	2.00%
49	N/A	3.50	2.00
50	N/A	3.50	3.50
51	N/A	3.50	3.50
52	N/A	6.00	4.25
53	N/A	6.00	5.50
54	N/A	7.00	6.75
55	N/A	17.50	18.00
56	N/A	17.50	15.00
57	N/A	17.50	14.00
58	N/A	20.00	14.00
59	N/A	20.00	14.00
60	5.00	20.00	17.00
61	5.00	30.00	17.00
62	8.00	36.50	27.00
63	8.00	36.50	24.00
64	8.00	36.50	21.00
65	12.00	44.00	25.00
66	17.00	55.00	30.00
67	16.00	50.00	26.00
68	15.00	47.00	23.00
69	15.00	47.00	23.00
70	15.00	47.00	26.00
71	15.00	47.00	23.00
72	15.00	47.00	21.00
73	15.00	47.00	21.00
74	15.00	47.00	21.00
75	100.00	100.00	100.00

Rates apply upon retirement eligibility by tier.

APPENDIX A – SUMMARY OF RECOMMENDED ASSUMPTIONS

Retirement rates for Local employers' Tier 1-4 members are as follows:

Local Employers' Tiers 1-4 Retirement Rates		
Age	Less Than 25 Years of Service	25 Years of Service	26 or More Years of Service
< 49	N/A	3.00%	2.25%
49	N/A	3.00	3.00
50	N/A	3.50	3.50
51	N/A	4.25	3.75
52	N/A	4.75	3.75
53	N/A	7.00	5.00
54	N/A	7.00	6.00
55	N/A	15.00	15.00
56	N/A	17.00	13.00
57	N/A	18.00	12.00
58	N/A	18.00	12.00
59	N/A	18.00	12.00
60	4.50	18.00	14.00
61	4.50	18.00	14.00
62	7.50	34.00	25.00
63	7.50	34.00	22.00
64	7.50	34.00	20.00
65	11.00	35.00	20.00
66	15.00	43.00	26.00
67	14.00	40.00	26.00
68	13.00	40.00	22.00
69	13.00	37.00	22.00
70	13.00	37.00	24.00
71	13.00	37.00	24.00
72	13.00	37.00	20.00
73	13.00	37.00	20.00
74	13.00	37.00	20.00
75	100.00	100.00	100.00

APPENDIX A – SUMMARY OF RECOMMENDED ASSUMPTIONS

Retirement rates for State Tier 5 members are as follows:

Age	State Tier 5 Retirement Rates				
	Less Than 25 Years of Service	**25 Years of Service**	**26 to 29 Years of Service**	**30 Years of Service**	**31 or More Years of Service**
< 49	N/A	N/A	N/A	3.50%	2.00%
49	N/A	N/A	N/A	3.50	2.00
50	N/A	N/A	N/A	3.50	3.50
51	N/A	N/A	N/A	3.50	3.50
52	N/A	N/A	N/A	6.00	4.25
53	N/A	N/A	N/A	6.00	5.50
54	N/A	N/A	N/A	7.00	6.75
55	N/A	N/A	N/A	17.50	18.00
56	N/A	N/A	N/A	17.50	15.00
57	N/A	N/A	N/A	17.50	14.00
58	N/A	N/A	N/A	20.00	14.00
59	N/A	N/A	N/A	20.00	14.00
60	N/A	N/A	N/A	20.00	17.00
61	N/A	N/A	N/A	30.00	17.00
62	N/A	N/A	N/A	36.50	27.00
63	N/A	N/A	N/A	36.50	24.00
64	N/A	N/A	N/A	36.50	21.00
65	12.00	44.00	44.00	44.00	25.00
66	17.00	55.00	30.00	30.00	30.00
67	16.00	50.00	26.00	26.00	26.00
68	15.00	47.00	23.00	23.00	23.00
69	15.00	47.00	23.00	23.00	23.00
70	15.00	47.00	26.00	26.00	26.00
71	15.00	47.00	23.00	23.00	23.00
72	15.00	47.00	21.00	21.00	21.00
73	15.00	47.00	21.00	21.00	21.00
74	15.00	47.00	21.00	21.00	21.00
75	100.00	100.00	100.00	100.00	100.00

APPENDIX A – SUMMARY OF RECOMMENDED ASSUMPTIONS

Retirement rates for Local employers' Tier 5 members are as follows:

	Local Employers' Tier 5 Retirement Rates				
Age	Less Than 25 Years of Service	25 Years of Service	26 to 29 Years of Service	30 Years of Service	31 or More Years of Service
< 49	N/A	N/A	N/A	3.00%	2.25%
49	N/A	N/A	N/A	3.00	3.00
50	N/A	N/A	N/A	3.50	3.50
51	N/A	N/A	N/A	4.25	3.75
52	N/A	N/A	N/A	4.75	3.75
53	N/A	N/A	N/A	7.00	5.00
54	N/A	N/A	N/A	7.00	6.00
55	N/A	N/A	N/A	15.00	15.00
56	N/A	N/A	N/A	17.00	13.00
57	N/A	N/A	N/A	18.00	12.00
58	N/A	N/A	N/A	18.00	12.00
59	N/A	N/A	N/A	18.00	12.00
60	N/A	N/A	N/A	18.00	14.00
61	N/A	N/A	N/A	18.00	14.00
62	N/A	N/A	N/A	34.00	25.00
63	N/A	N/A	N/A	34.00	22.00
64	N/A	N/A	N/A	34.00	20.00
65	11.00	35.00	35.00	35.00	20.00
66	15.00	43.00	26.00	26.00	26.00
67	14.00	40.00	26.00	26.00	26.00
68	13.00	40.00	22.00	22.00	22.00
69	13.00	37.00	22.00	22.00	22.00
70	13.00	37.00	24.00	24.00	24.00
71	13.00	37.00	24.00	24.00	24.00
72	13.00	37.00	20.00	20.00	20.00
73	13.00	37.00	20.00	20.00	20.00
74	13.00	37.00	20.00	20.00	20.00
75	100.00	100.00	100.00	100.00	100.00

Retirement rates for members of Prosecutors Part (Chapter 366, P.L. 2001) are as follows:

- Members with less than 25 years of service: 6.0% for all ages,
- Members with 25 years of service: 50.0% for all ages,
- Members with 26 or more years of service: 25.0% for all ages.

Rates apply upon retirement eligibility. 100% retirement is assumed at age 70.

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 Board on October 14, 2015.

1. Salary Increases	Salary increases vary by age and time period. Representative salary increase rates are shown below.

Salary Increases		
Age	**Period Ending June 30, 2026**	**Ultimate Period**
20	4.15%	5.15%
25	3.90	4.90
30	3.65	4.65
35	3.40	4.40
40	3.15	4.15
45	2.90	3.90
50	2.65	3.65
55	2.40	3.40
60	2.15	3.15
65	1.65	2.65
69	1.65	2.65

Salary increases are assumed to occur on July 1.

2. 401(a)(17) Pay Limit	$275,000 in 2018 increasing 3.00% per annum, compounded annually.
3. Social Security Wage Base	$128,400 in 2018 increasing 4.00% per annum, compounded annually.

APPENDIX B – SUMMARY OF CURRENT ASSUMPTIONS

4. Termination   Representative termination rates are as follows:

	Termination Rates					
	First Year of Service		**Second Year of Service**		**Third Year of Service**	
Age	**State**	**Local**	**State**	**Local**	**State**	**Local**
20	28.90%	40.19%	13.53%	15.12%	9.52%	12.19%
25	36.12	40.19	13.53	15.12	9.52	12.19
30	36.12	38.84	13.53	14.67	9.52	13.32
35	26.14	33.51	10.83	11.74	7.99	10.77
40	21.66	32.05	8.86	10.52	6.37	10.66
45	20.41	31.01	8.26	10.08	5.79	10.36
50	20.41	28.39	7.65	9.58	5.21	9.57
55	20.41	27.96	7.65	9.40	5.21	9.08
60	20.41	22.37	7.65	9.40	5.21	6.84

	Ultimate Rates			
	3+ Years of Service		**10+ Years of Service**	
	Refund		**Deferred Annuity**	
Age	**State**	**Local**	**State**	**Local**
20	4.48%	6.31%	0.00%	0.00%
25	4.69	6.31	0.00	0.00
30	3.82	6.11	0.00	0.03
35	2.86	3.99	0.05	0.03
40	1.80	2.91	0.05	0.05
45	1.22	2.46	0.24	0.16
50	0.90	1.94	1.10	0.64
55	0.88	1.60	1.43	0.77
60	0.88	1.52	0.90	0.77

Both the refund and the deferred annuity ultimate termination rates apply until the attainment of retirement eligibility, after which no termination is assumed.

APPENDIX B – SUMMARY OF CURRENT ASSUMPTIONS

5. Disability

Representative disability rates are as follows:

	Disability Rates			
	Ordinary		**Accidental**	
Age	**State**	**Local**	**State**	**Local**
20	0.005%	0.000%	0.001%	0.001%
25	0.006	0.000	0.001	0.002
30	0.097	0.060	0.004	0.004
35	0.216	0.189	0.011	0.005
40	0.304	0.269	0.020	0.012
45	0.410	0.363	0.023	0.017
50	0.462	0.434	0.035	0.021
55	0.559	0.587	0.047	0.026
60	0.987	0.759	0.041	0.030
65	1.190	0.932	0.061	0.027
69	1.417	1.110	0.062	0.027

Accidental disability rates apply at all ages.

Ordinary disability rates apply upon attainment of 10 years of service and continue through the ultimate retirement age.

Members are assumed to receive the greater of the applicable disability benefit or the early or service retirement benefit, depending on eligibility.

Tier 4 and Tier 5 members are not eligible for the Ordinary or Accidental Disability benefits but the disability rates still apply. Such members terminating under the disability decrement are assumed to separate from service and elect a Deferred Retirement benefit.

6. Mortality

Pre-Retirement Ordinary Mortality: RP-2000 Employee Mortality Tables. For State, the tables are set back four years for males and females. For Local employers, the tables are set back two years for males and seven years for females. The tables are projected on a generational basis from the base year of 2013 using the Conduent Modified 2014 Projection Scale.

Pre-Retirement Accidental Mortality: 0.001% at all ages. No mortality improvement is assumed.

Post-Retirement Healthy Mortality: RP-2000 Combined Healthy Mortality Tables, set back one year for males and females, projected on a generational basis using Projection Scale AA from the base year of 2012 to 2013 and the Conduent Modified 2014 Projection Scale thereafter.

APPENDIX B – SUMMARY OF CURRENT ASSUMPTIONS

<u>Disabled Mortality</u>: RP-2000 Disabled Mortality Tables, set back three years for males and set forward one year for females. No mortality improvement is assumed.

7. Retirement   Representative retirement rates are as follows:

	Tiers 1-5 Retirement Rates			
	Not Eligible for Unreduced Retirement Benefit		**Eligible for Unreduced Retirement Benefit**	
Age	**State**	**Local**	**State**	**Local**
45	0.24%	0.16%	N/A	N/A
50	1.10	0.64	N/A	N/A
55	1.43	0.77	17.50%	11.70%
56	1.43	0.77	14.00	11.70
57	1.43	0.77	13.00	11.70
58	0.90	0.77	13.00	11.70
59	0.90	0.77	19.00	21.00
60	0.90	0.77	9.00	7.80
61	0.90	0.77	9.00	8.40
62	0.90	0.77	14.58	13.44
63	1.50	0.90	11.34	10.50
64	1.50	0.90	12.15	10.50
65	N/A	N/A	16.20	16.54
66	N/A	N/A	17.00	15.75
67	N/A	N/A	15.00	13.65
68	N/A	N/A	15.00	11.55
69	N/A	N/A	15.00	11.55
70	N/A	N/A	100.00	100.00

APPENDIX B – SUMMARY OF CURRENT ASSUMPTIONS

Representative retirement rates for members of Prosecutors Part (Chapter 366, P.L. 2001) are as follows:

	Prosecutors Retirement Rates					
	Less than 20 Years of Service		**20 Years of Service**	**21 to 24 Years of Service**	**25+ Years of Service**	
Age	**State**	**Local**			**State**	**Local**
40	0.00%	0.00%	2.50%	0.00%	23.10%	19.25%
45	0.00	0.00	2.50	0.00	23.10	19.25
50	0.00	0.00	3.75	0.00	23.10	19.25
55	2.59	3.06	5.00	0.00	26.22	21.85
60	2.63	3.06	5.00	0.00	34.17	28.48
65	2.63	3.06	37.50	0.00	100.00	100.00
70	100.00	100.00	100.00	100.00	100.00	100.00