North Dakota Public Employees Retirement System

Experience Review: July 2009 – June 2014

May 21, 2015

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Overview: Purpose of an Experience Study

- An experience study provides the basis for developing recommended assumptions to be used in the annual actuarial valuation
  - Performed on a periodic basis, typically every five years
  - Last experience study for PERS and HPRS was conducted in 2009 for the 5-year period ending June 30, 2009
  - Current study is based on the period July 1, 2009 through June 30, 2014
- Actuarial Standards of Practice #27 and #35 provide guidance on best practices for performing assumption-setting analysis
  - Each assumption should be reasonable and the actuary's best estimate
- Segal's role is to make appropriate "best estimate" recommendations to the Board for each assumption
  - The assumptions are ultimately the Board's responsibility and the Board can adopt all, none, or some of the recommendations of the actuary

Overview: How Assumptions Are Set

- Review past experience
- Compare past experience (“actual”) with assumptions (“expected”)
- Determine trends – make judgments about future
- Develop component parts of each assumption
  - Maintain linkage with investments
  - Maintain internal consistency
- Keep in mind
  - No “right” answer – each assumption is a best estimate
  - Assumptions are long-term

Overview: Actuarial Assumptions

Economic

- Inflation
- Salary increase
- Payroll growth
- Investment return
- Miscellaneous

Demographic

- Termination
- Disability
- Retirement
- Death after retirement
- Death in active service
- Spouse information
- Miscellaneous

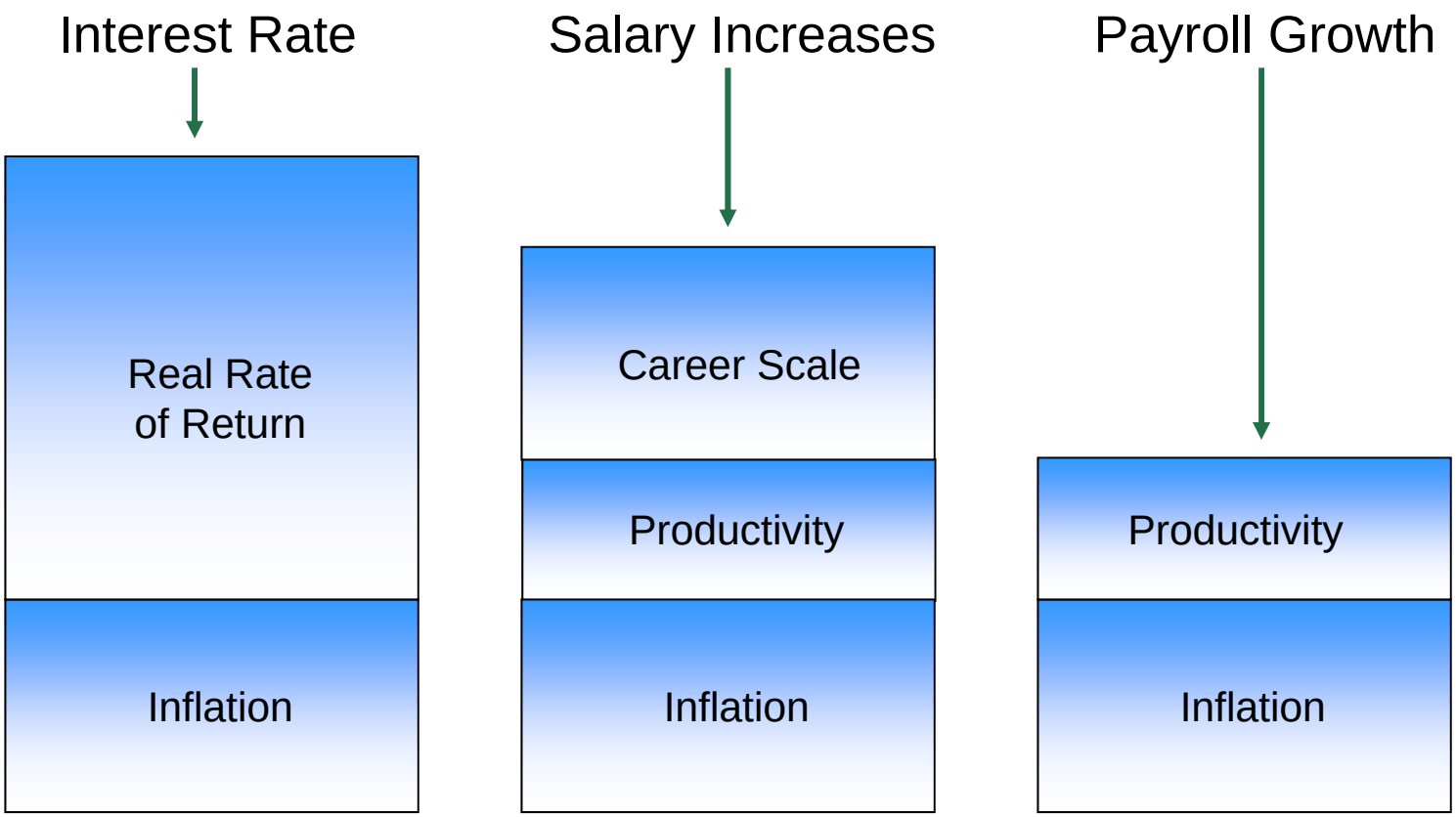
Funding Policy

- Funding method
- Asset valuation method
- Amortization of Unfunded Actuarial Accrued Liability

Actuaries make assumptions as to when and why a member will leave active service and estimate the amount and duration of the pension benefits due.

Building Block Method – Basis for Setting Economic Assumptions

Each economic assumption has 2 or 3 components (or building blocks)



Building blocks should be consistent across all economic assumptions, but may be adjusted for conservatism.

Assumed Rate of Inflation

- Inflation represents the annual increase in the cost of living.
- The inflation assumption, currently 3.50%, indirectly affects the valuation.
  - Inflation is a component of the following economic assumptions:
    - Investment return
    - Payroll growth
    - Individual salary increases
- Segal's recommendation is to lower the long term assumption from 3.50% to 2.75%. This recommendation is based on:
  - Current market expectations indicate that low inflation is expected to continue; and
  - Both Callan and Segal Rogerscasey expect inflation to be less than 2.50% over the next 10-20 years.

Assumed Rate of Inflation *(continued)*

- As of June 30, 2014, the historical national inflation (CPI-U) averages are:
  - 5-year average - 2.02%.
  - 10-year average - 2.31%.
  - 20-year average - 2.41%.
  - 30-year average - 2.81%.
  - 50-year average - 4.16%.
- In addition to historical inflation, other metrics to consider are current market expectations and inflation assumptions used for similar pension plans.

Assumed Rate of Inflation *(continued)*

- By observing the difference between the yields on US Treasury bonds with and without inflation indexing, we can directly calculate the rate of inflation that investors may expect.
- As of June 2014, the yields on 30-year Treasury bonds were as follows:
  - Inflation indexed: 1.03%
  - Non-inflation indexed: 3.39%
  - The difference between these figures is 2.36%.
    - This difference of 2.36% represents one measure of the financial market's current expectations of inflation over the next 30 years.
- Social Security uses three inflation assumptions to project its future financial status:
  - Low inflation of 2.0%;
  - Moderate inflation of 2.7%; and
  - High inflation of 3.4%.

Assumed Rate of Inflation *(continued)*

- The National Association of State Retirement Administrators (NASRA) Public Fund Survey collects general information on 126 public pension systems.
- The median inflation assumption of these 126 systems is 3.00%.
- We recommend that the Board adopt an assumption that falls between:
  - The rate indicated by financial market data; and
  - The median rate used by peer retirement systems.

We recommend that the Board lower the inflation assumption from 3.50% to 2.75%.

Assumed Rate of Payroll Growth

- The amortization of the unfunded actuarial accrued liability (UAAL) is calculated as a level percentage of payroll over a closed period of time.
  - The amortization amount in dollars is expected to increase each year as payroll increases (i.e., amortization payments are back loaded.)
  - The payroll growth assumption is used to estimate the annual increase in total payroll.
- A lower payroll growth assumption is more conservative.
  - A lower payroll growth assumption results in larger amortization payments.
  - For example, a 0% payroll growth assumption uses level amortization payments, similar to a mortgage.
- The current payroll growth assumption is 4% for Judges and 4.50% for all other Systems except Job Service, which does not have a payroll growth assumption. The payroll growth assumption consists of the following components:
  - Inflation: 3.50%
  - Productivity: 1.00% (0.50% for Judges)

Assumed Rate of Payroll Growth *(continued)*

- As the recommended inflation component is 2.75%, we need to examine the productivity component.
- Productivity can be measured as the excess of the increase in the National Average Wage over inflation.
  - The 20-year average of the National Average Wage is 3.4%.
  - The 20-year average inflation is 2.4%.
  - Therefore, productivity has averaged about 1.0% over the last 20 years.
  - We expect productivity in North Dakota to be greater than the national average due to its overall strong economy.
- We recommend increasing the productivity component of the payroll growth assumption to 0.75% for Judges and 1.25% for all other Systems (except Job Service).

Assumed Rate of Payroll Growth *(continued)*

- The following table summarizes the Fund's historical payroll and active population growth:

Year Ended June 30	PERS (excluding Judges)		Judges	
	Covered Payroll ($ in Millions)	Active Members	Covered Payroll ($ in Millions)	Active Members
1995*	$300.3	15,026	$3.1	52
1999	393.8	16,287	3.9	47
2004	496.6	17,590	4.4	46
2009	692.3	19,896	5.4	47
2014	966.5	22,212	7.0	50
Average Change (5-Year)	6.9%	2.2%	5.1%	1.2%
Average Change (10-Year)	6.9%	2.4%	4.7%	0.8%
Average Change (15-Year)	6.2%	2.1%	4.0%	0.4%
Average Change (19-Year)	6.3%	2.1%	4.3%	(0.2)%

** Earliest date available*

Assumed Rate of Payroll Growth *(continued)*

- The following table summarizes the components of the current and recommended payroll growth assumption:

Component	PERS (without Judges) and HPRS		Judges	
	Current	Recommended	Current	Recommended
Inflation	3.50%	2.75%	3.50%	2.75%
Productivity	1.00%	1.25%	0.50%	0.75%
Total	4.50%	4.00%	4.00%	3.50%

- We recommend changing the 4.50% payroll growth assumption for PERS and HPRS to 4.00%.
- We recommend changing the 4.00% payroll growth assumption for Judges to 3.50%.
- The Job Service Plan does not currently use a payroll growth assumption because there is no unfunded actuarial accrued liability. We recommend no change.

Assumed Rate of Individual Salary Increases

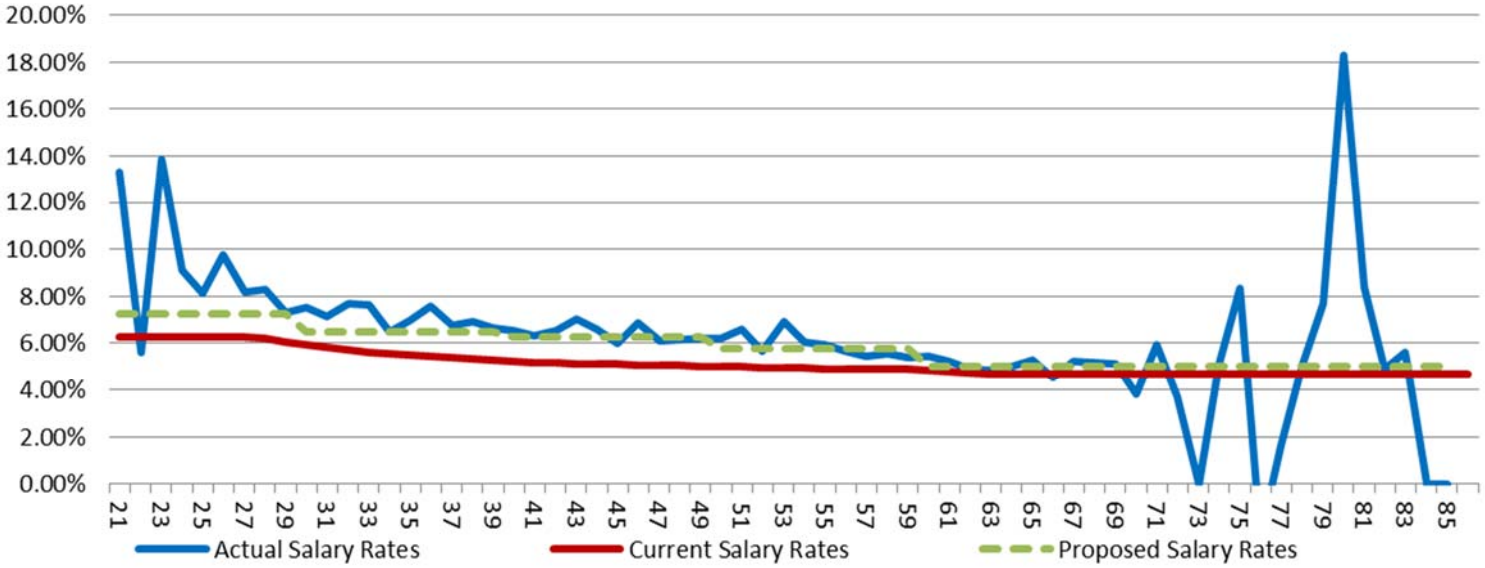
- Individual member salary increases components:
  - Inflation
  - Productivity
  - Promotional and merit increases
- Since promotional and merit increases are unique to each retirement system, as well as State vs. Non-State participants in the Main System, it is appropriate to base this assumption on recent experience.
  - We study the promotional and merit increases (plus productivity) separately from inflation.
  - Between 2009 and 2014, inflation averaged 2.0%.

Assumed Rate of Individual Salary Increases *(continued)*

- The following tables compare the actual and expected individual salary increases over the past 5 years.
- Based on this experience and the fact that service and salary increases have been sources of losses for the past five years, we recommend changing the promotional and merit (and productivity) portion of individual salary increases.
- In the following pages, tables and graphs reviewing the total actual rates of increase, current assumptions and proposed assumptions for individual salary increase assumption by age or years of service, as appropriate, are summarized.

Assumed Rate of Individual Salary Increases – Main System – State Employees

For participants with 3 or more years of service:

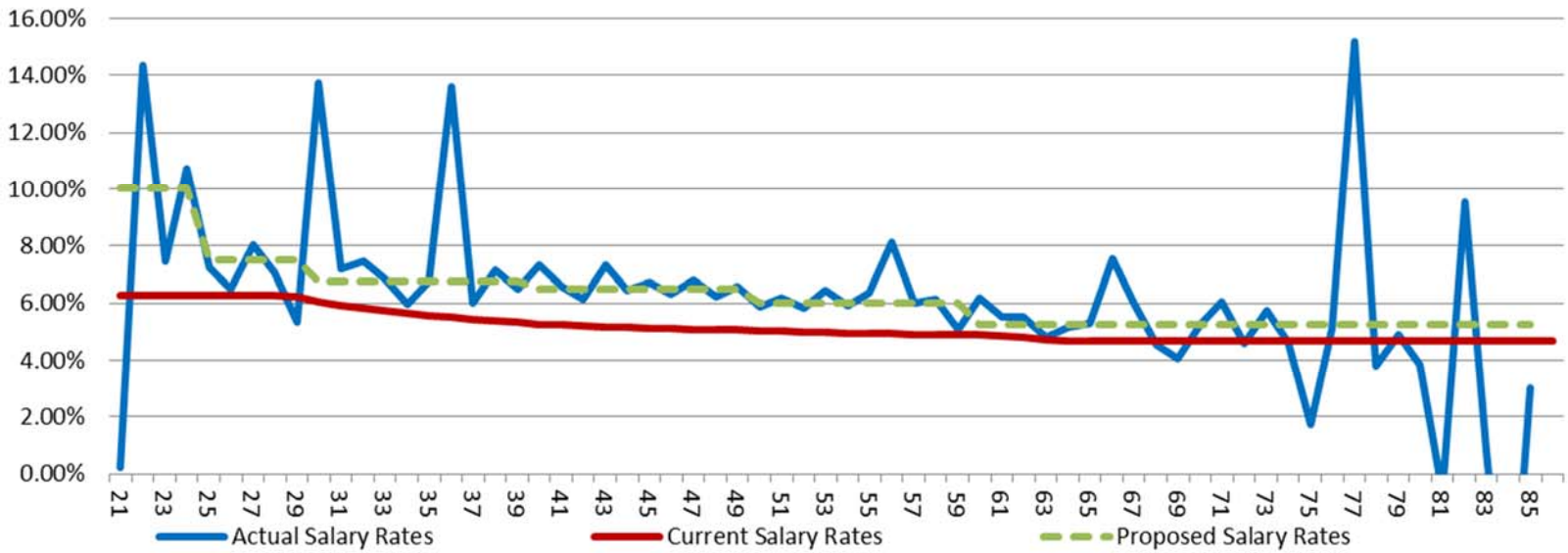


For participants with less than 5 years of service:

Service Range	Actual Salary Increase Rate	Current Salary Increase Rate	Proposed Salary Increase Rate
Less than 1	32.62%	8.25%	12.00%
1	13.20%	7.25%	9.50%
2	7.88%	6.75%	7.25%
3	7.19%	6.50%	N/A
4	7.02%	6.25%	N/A
Weighted Average	14.46%	7.08%	9.69%

Assumed Rate of Individual Salary Increases – Main System – Non-State Employees

For participants with 3 or more years of service:

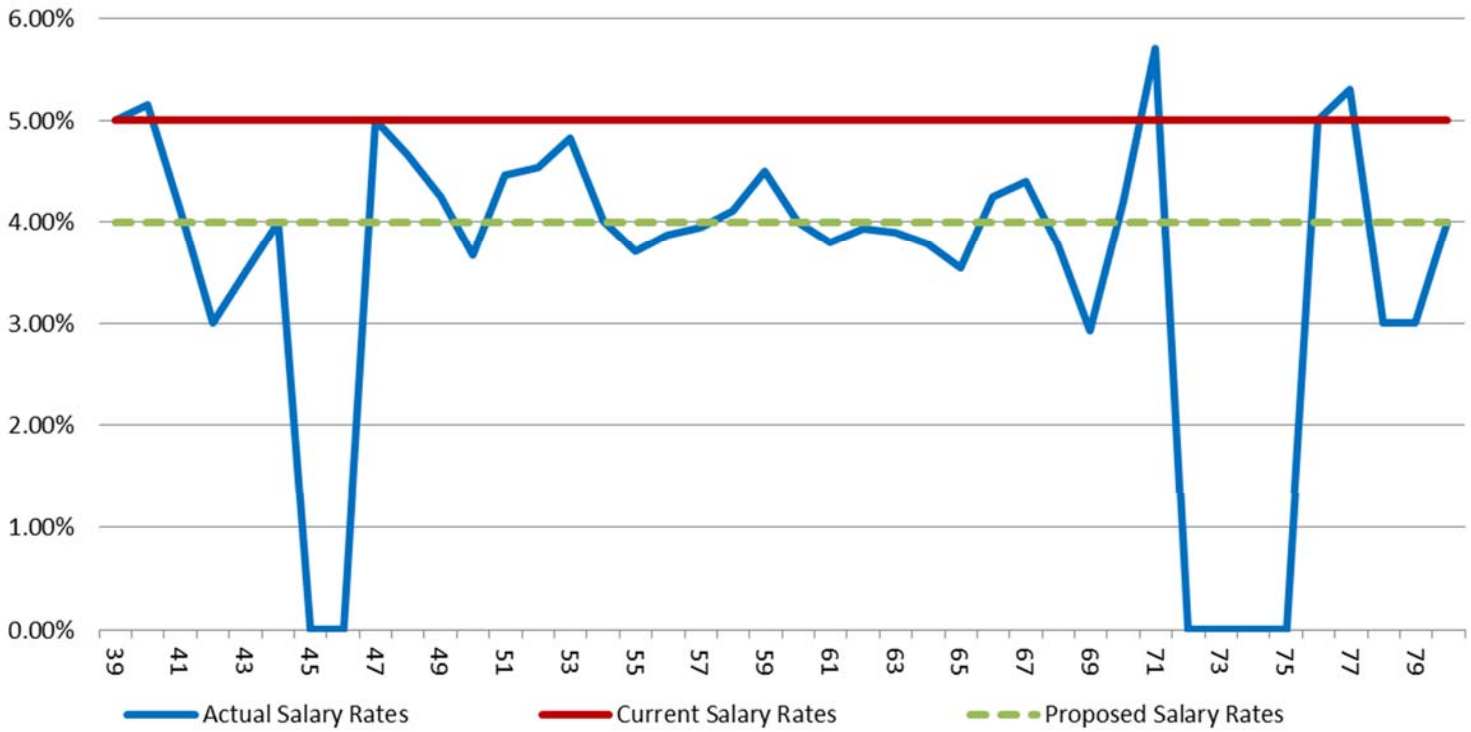


For participants with less than 5 years of service:

Service Range	Actual Salary Increase Rate	Current Salary Increase Rate	Proposed Salary Increase Rate
Less than 1	54.90%	8.25%	15.00%
1	11.18%	7.25%	10.00%
2	9.32%	6.75%	8.00%
3	7.51%	6.50%	N/A
4	7.38%	6.25%	N/A
Weighted Average	20.66%	7.13%	11.27%

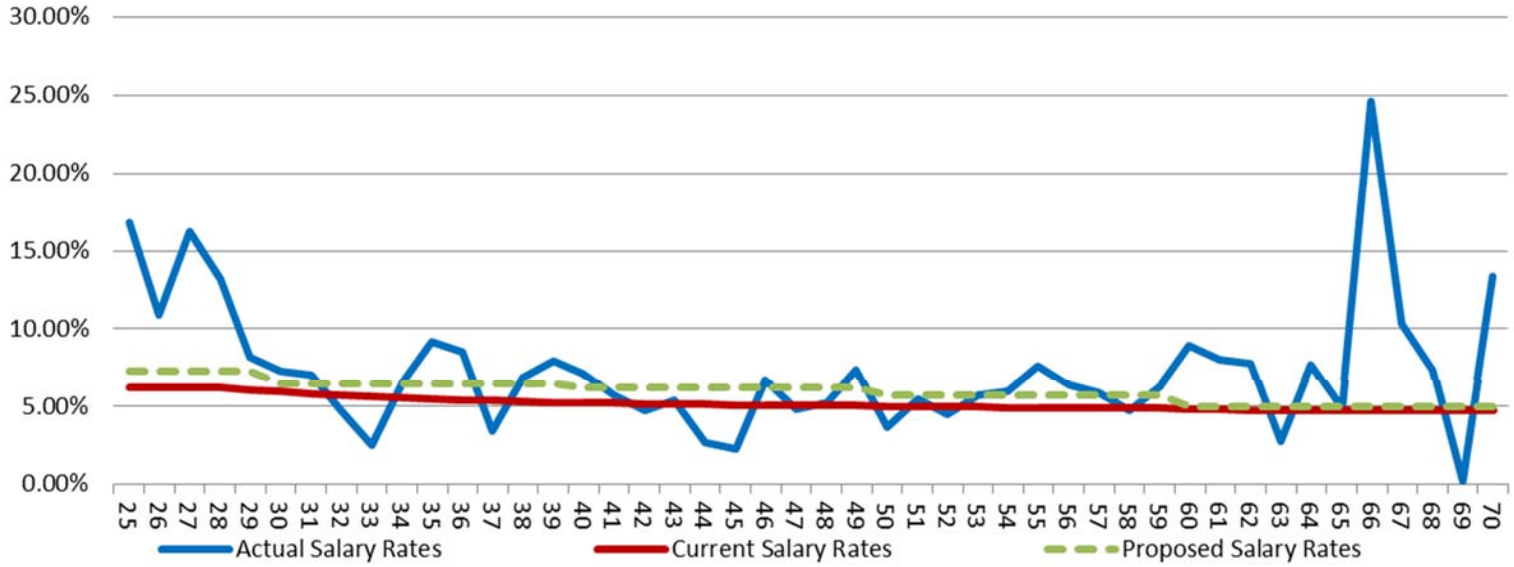
Assumed Rate of Individual Salary Increases – Judges

For participants with 3 or more years of service:



Assumed Rate of Individual Salary Increases – National Guard and Law Enforcement (with and without Prior Service)

For participants with 5 or more years of service:

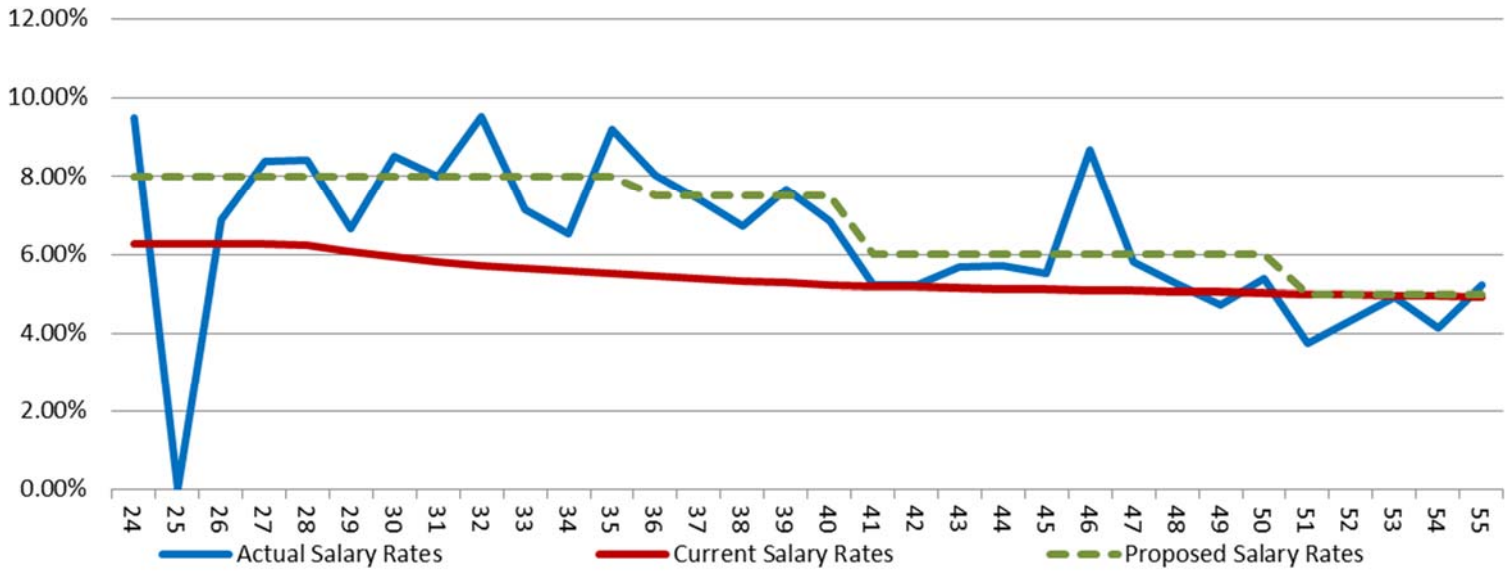


For participants with less than 5 years of service:

Service Range	Actual Salary Increase Rate	Current Salary Increase Rate	Proposed Salary Increase Rate
Less than 1	32.97%	8.25%	20.00%
1	19.08%	7.25%	20.00%
2	24.53%	6.75%	20.00%
3	7.95%	6.50%	10.00%
4	10.88%	6.25%	10.00%
Weighted Average	22.08%	7.25%	17.70%

Assumed Rate of Individual Salary Increases – Highway Patrolmen

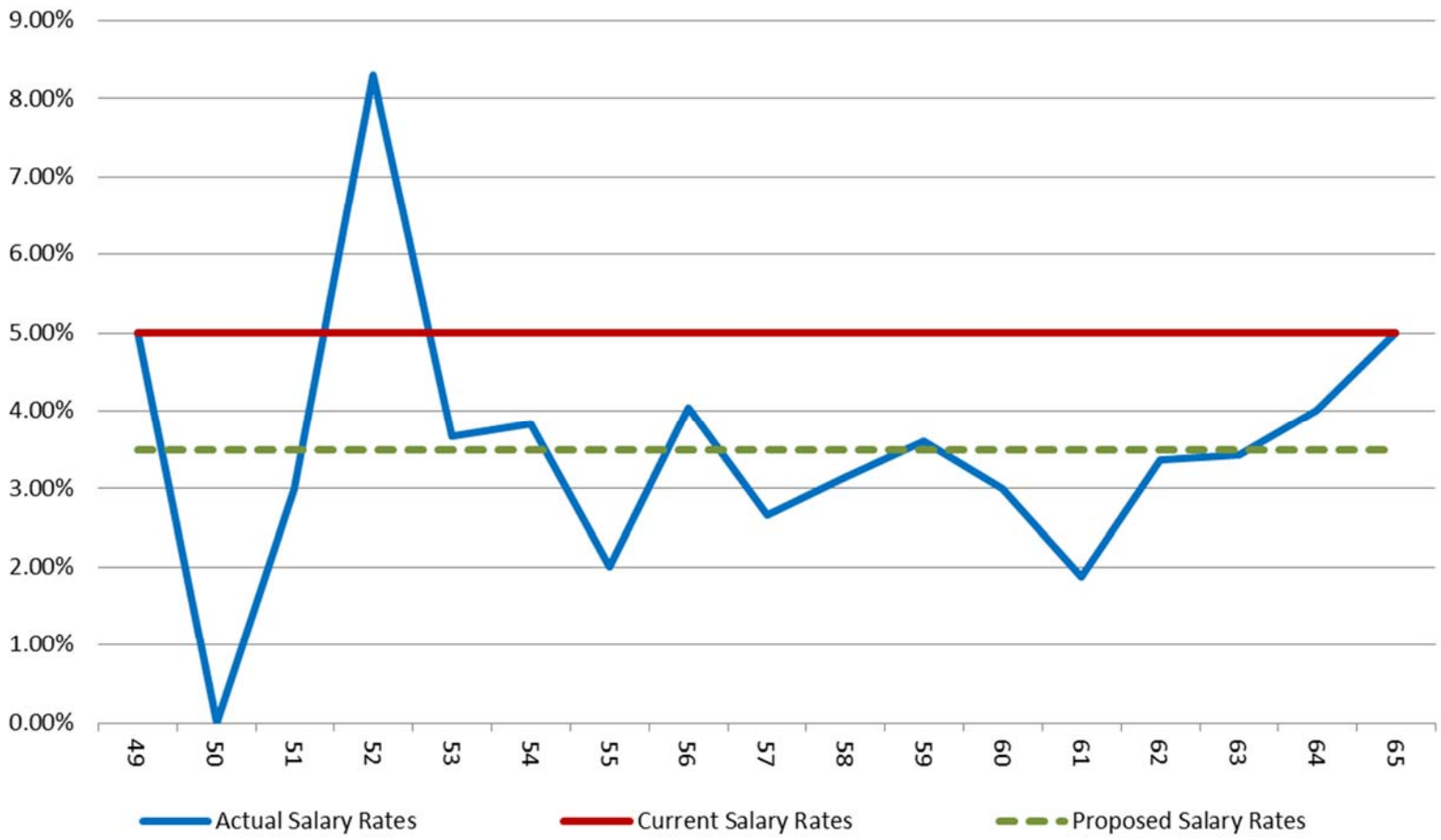
For participants with 3 or more years of service:



For participants with less than 5 years of service:

Service Range	Actual Salary Increase Rate	Current Salary Increase Rate	Proposed Salary Increase Rate
Less than 1	21.30%	8.25%	15.00%
1	10.57%	7.25%	10.00%
2	7.90%	6.75%	8.00%
3	7.81%	6.50%	N/A
4	8.15%	6.25%	N/A
Weighted Average	10.72%	6.96%	10.63%

Assumed Rate of Individual Salary Increases – Job Service



Assumed Rate of Investment Return

- The current investment return assumption of 8.00% consists of two components:
  - Inflation: 3.50%
  - Real rate of return: 4.50%, net of investment expenses
    - Real return represents the excess of what the assets earn over inflation
    - Our approach is to analyze inflation and real return separately
- Currently, the assumed real rate of return is 4.50%, net of expected investment expenses, for all systems except Job Service. For Job Service, the assumed real rate of return is 4.50%, net of expected investment and administrative expenses.
  - For Job Service, we recommend removing the administrative expense from the investment return assumption and adding an explicit load to the normal cost. This approach is required by the Governmental Accounting Standards Board (GASB) for the purpose of producing liabilities used in financial statements.

Assumed Rate of Investment Return *(continued)*

- The following table shows **administrative expenses** from the draft Statements of changes in Plan Net Position over the last 5 years:

Year Ended June 30	Main System	Judges	National Guard	Law Enforcement with Prior Service	Law Enforcement without Prior Service	Highway Patrolmen	Job Service
2014	$2,096,756	$10,677	$3,779	$21,358	$6,151	$27,983	$31,455
2013	2,021,249	10,911	4,041	14,499	8,614	29,237	30,014
2012	1,811,417	16,027	4,416	16,831	8,043	26,674	25,980
2011	1,763,346	9,393	3,966	14,766	5,816	22,734	26,368
2010	1,182,840	10,683	2,894	5,685	12,631	18,154	24,318
Total	$8,875,608	$57,691	$19,096	$73,112	$41,255	$124,782	$138,135
Average	$1,775,122	$11,538	$3,819	$14,622	$8,251	$24,956	$27,627
Assumed	$1,100,000	$7,500	$3,000	$2,500	$7,500	$18,000	$0

- We recommend changing the administrative expense assumption to be equal to the prior year's administrative expenses plus inflation, which will be converted to a percentage of payroll in the actuarially determined contribution rate.
- This assumption will be updated each year.

Assumed Rate of Investment Return *(continued)*

- We have based our analysis of the expected real rate of return on the "Survey of Capital Market Assumptions"*.
  - This survey compiles and averages the capital market assumptions of 23 investment consultants (including Callan and Segal Rogerscasey).
- The calculation of the expected real rate of return based on the survey assumptions are shown on the following slides.
- Note that expected arithmetic returns are used to determine the expected returns by asset class. The portfolio's expected geometric return is estimated by reducing the arithmetic return by half of the portfolio's expected variance.

** Published by Horizon (2014 Edition)*

Assumed Rate of Investment Return *(continued)*

Asset Class	20-Year Annual Arithmetic Real Return	Target Allocation	Weighted Real Return
US Equities Large Cap	7.05%	24%	1.69%
US Equities Small/Mid Cap	8.10%	7%	0.57%
Intl Equities Developed	7.71%	16%	1.23%
Emerging Markets Equities	10.24%	5%	0.51%
US Bonds Core	2.48%	12%	0.30%
US Bonds High Yield	4.71%	5%	0.24%
Intl Debt Developed	2.05%	5%	0.10%
Cash Equivalents	1.11%	1%	0.01%
Real Estate	4.95%	15%	0.74%
Infrastructure	6.16%	5%	0.31%
Private Equities	10.97%	5%	0.55%
Total		**100%**	**6.25%**
Adjustment to Geometric			(0.62)%
Geometric Real Rate of Return			**5.63%**

Assumed Rate of Investment Return *(continued)*

- Using the Fund's target asset allocation and the capital market assumptions from the survey, the expected real rate of return is 5.63%.
  - The expected real rate of return is reduced to account for investment expenses. We do not have specific data on the investment expenses, but for a plan this size, assuming 0.50% to account for investment expenses would be reasonable.
- The expected real rate of return is 5.13%, net of expected investment expenses of 0.50%.

Gross Real Rate of Return	5.63%
Less Investment Expenses	(0.50)%
Net Real Rate of Return	5.13%

Assumed Rate of Investment Return *(continued)*

- Over a 20-year period, the Fund is expected to earn an annual real rate of return of at least 5.11% half of the time.
- Changing the expected real rate of return to 5.00% will increase the likelihood of meeting the expectation over a 20-year period to 52%.
- The following table shows the components of the current and recommended investment return assumption.

Component	Current	Recommended	50/50	8.00%	7.50%
Inflation	3.50%	2.75%	2.75%	2.75%	2.75%
Real Rate of Return, net of expenses	4.50%	5.13%	5.13%	5.13%	5.13%
Risk Adjustment	(0.00)%	(0.13)%	(0.00)%	0.12%	(0.38)%
Total	8.00%	7.75%	7.88%	8.00%	7.50%
Confidence Level	N/A	52%	50%	48%	56%

Miscellaneous Economic Assumptions

- Interest Crediting Rate – Currently this rate is 7.5% for PERS and HPRS, 0.5% lower than the assumed investment return. The rate is 4.00% for Job Service. These rates are set by the Board. If the assumed investment return is changed, the Board may want to review whether these rates should be changed.

- Judges Disability Offset – Currently 50% of those who retire on a disability pension are assumed eligible for Social Security disability with a 3.5% per annum CPI, 5% per annum wage base increase and no Workers' Compensation offset. There have been no disability retirements from the Judges System in the past 5 years. However, since some of the components are economic, we recommend changing the CPI to 2.75% and the wage base increase to 4.25%.

Miscellaneous Economic Assumptions *(continued)*

- Indexing Benefits of Inactive Vested Highway Patrolmen – Vested benefits are indexed at a rate set by the Retirement Board based on the increase in final average salary from date of termination to benefit commencement date, as shown below for the past 10 years:

Year Beginning	Average Annual Increase	Three-Year Average Increase
07/01/2005	4.00%	1.33%
07/01/2006	4.00%	2.67%
07/01/2007	4.00%	4.00%
07/01/2008	4.00%	4.00%
07/01/2009	5.00%	4.33%
07/01/2010	5.00%	4.67%
07/01/2011	2.00%	4.00%
07/01/2012	2.00%	3.00%
07/01/2013	3.00%	2.33%
07/01/2014	3.00%	2.67%
Ten-year average	3.10%	

We recommend reducing the assumption from the current 4.50% to 4.00%.

Miscellaneous Economic Assumptions *(continued)*

- Job Service COLA – The COLA increases for the past 10 years are as follows:

Year Beginning	COLA
07/01/2005	1.30%
07/01/2006	4.60%
07/01/2007	3.30%
07/01/2008	2.24%
07/01/2009	5.80%
07/01/2010	0.00%
07/01/2011	0.00%
07/01/2012	3.30%
07/01/2013	1.70%
07/01/2014	1.50%
Ten-year average	2.37%

We recommend reducing the assumption from the current 5.00% to 3.00%.

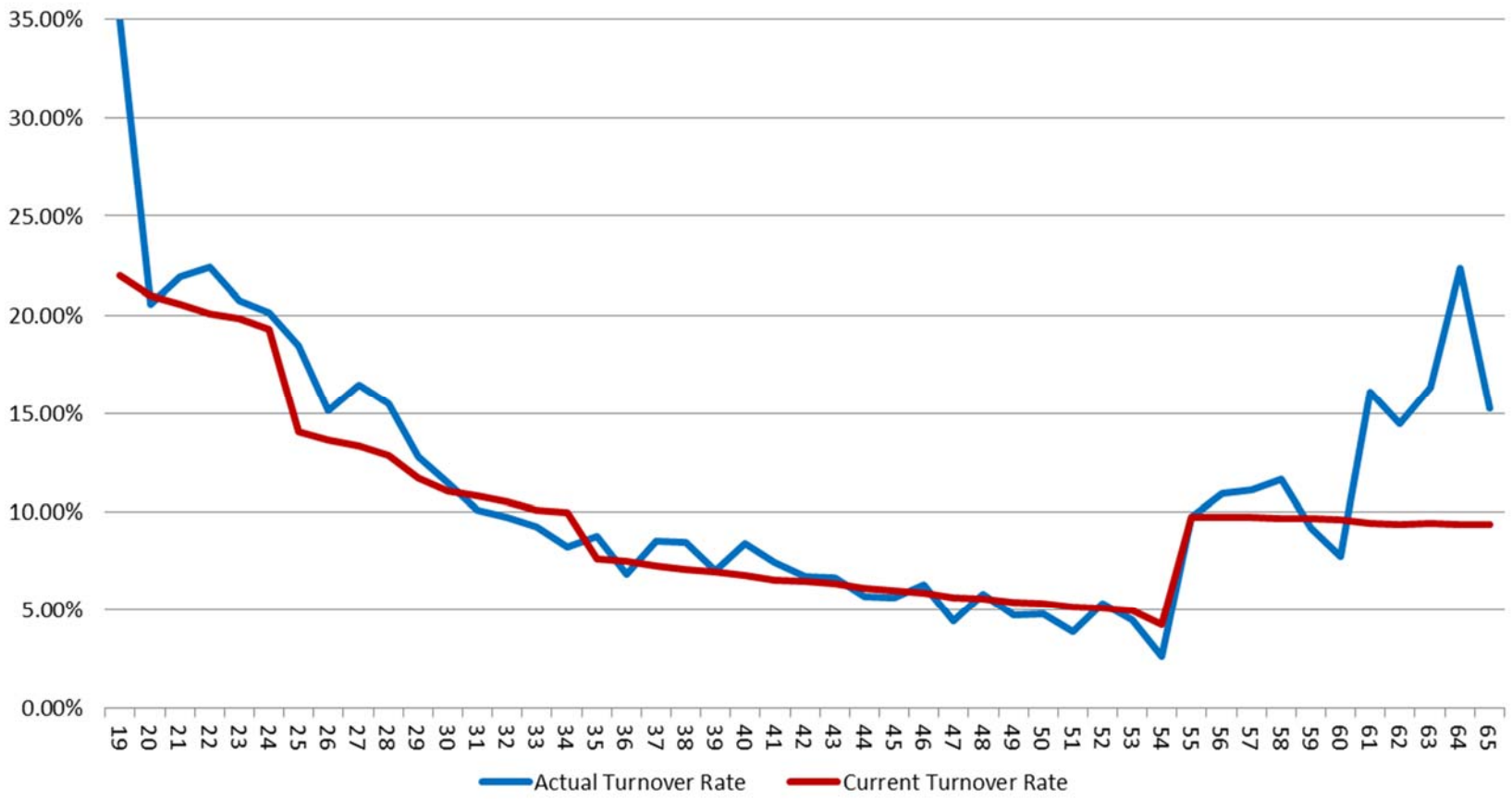
Demographic Assumptions

- Termination
- Disability
- Retirement
- Death after retirement
- Death in active service
- Spouse information
- Miscellaneous

Termination – All Systems

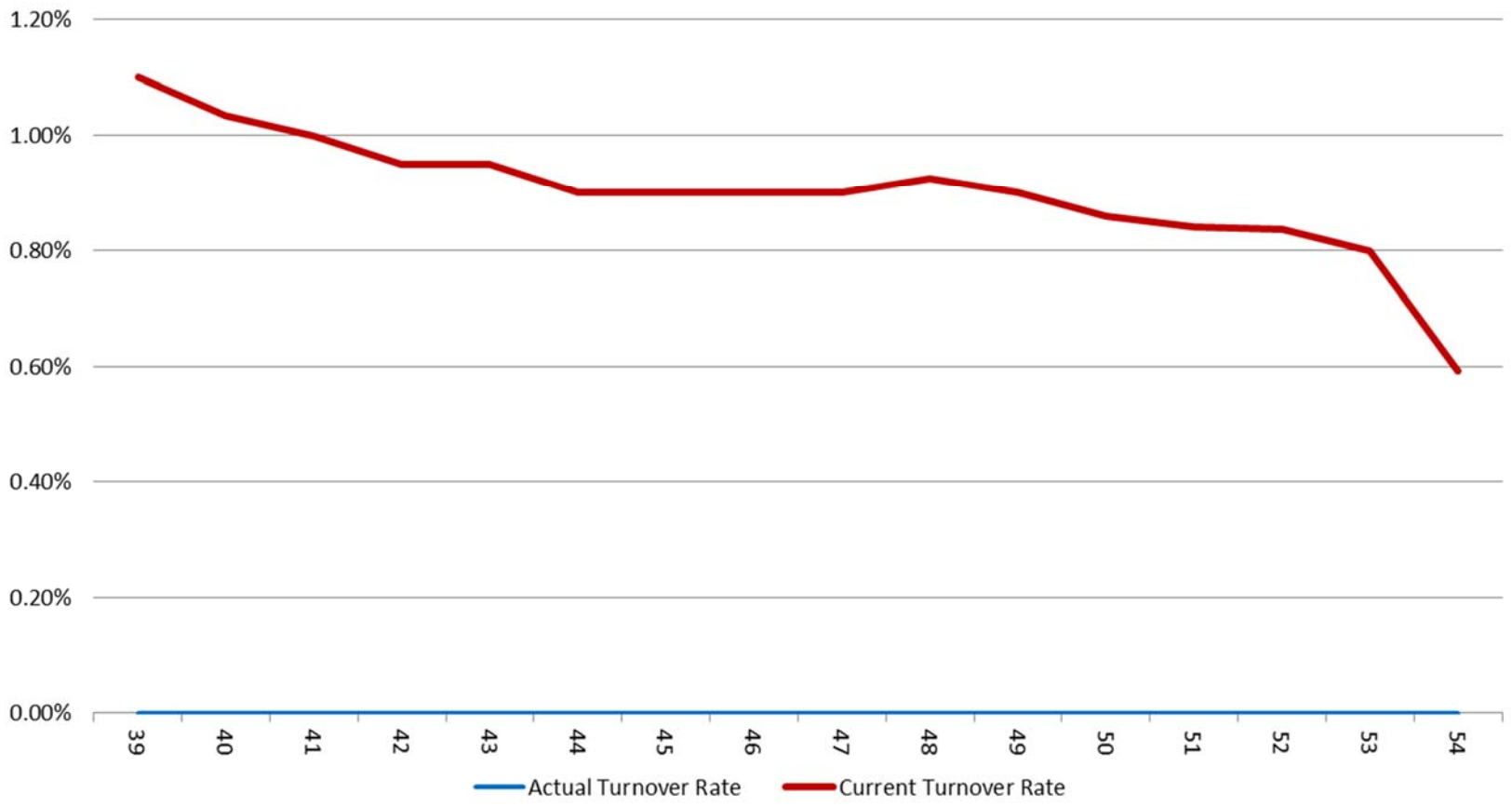
- Current rates are based on age, years of service and System.
- Experience is consistent with the expected rates for all systems except for Judges and National Guard.
- We recommend maintaining the current turnover rates for the Main System.
- No judges have terminated in the past ten years. We recommend eliminating the turnover rates for Judges.
- While the National Guard System has experienced higher than expected turnover in recent years, we suspect that this is a short-term trend and recommend maintaining the current turnover rates that are used for Law Enforcement and National Guard.
- The graphs on the following pages show the actual, expected, and proposed termination rates based on years of service.
- As of July 1, 2014, all active participants in the Job Service plan had met eligibility for retirement. Since the Plan is closed to new entrants, this decrement is no longer applicable in the Job Service plan.

Termination – Main System



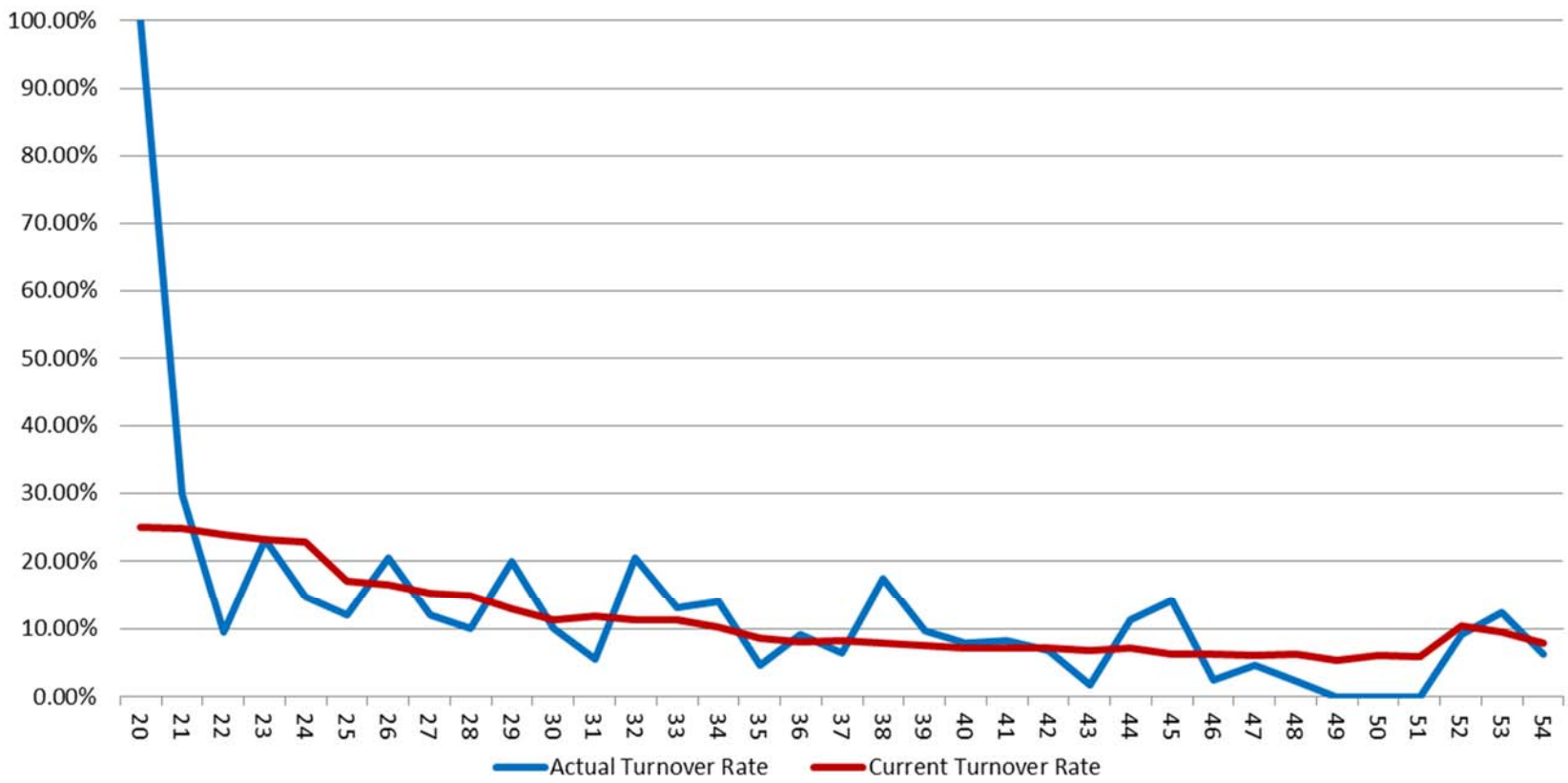
Exposures	Actual Terminations	Expected Terminations	Actual to Expected	Proposed Terminations	Actual to Proposed
76,375	6,271	5,999	105%	No change	No change

Termination – Judges



Exposures	Actual Terminations	Expected Terminations	Actual to Expected	Proposed Terminations	Actual to Proposed
93	0	1	N/A	0	N/A

Termination – Law Enforcement*



Exposures	Actual Terminations	Expected Terminations	Actual to Expected	Proposed Terminations	Actual to Proposed
1,893	198	206	96%	No Change	No Change

** Includes National Guard, Law Enforcement with Prior Service, Law Enforcement without Prior Service and Highway Patrol*

Disability Retirement – All Systems

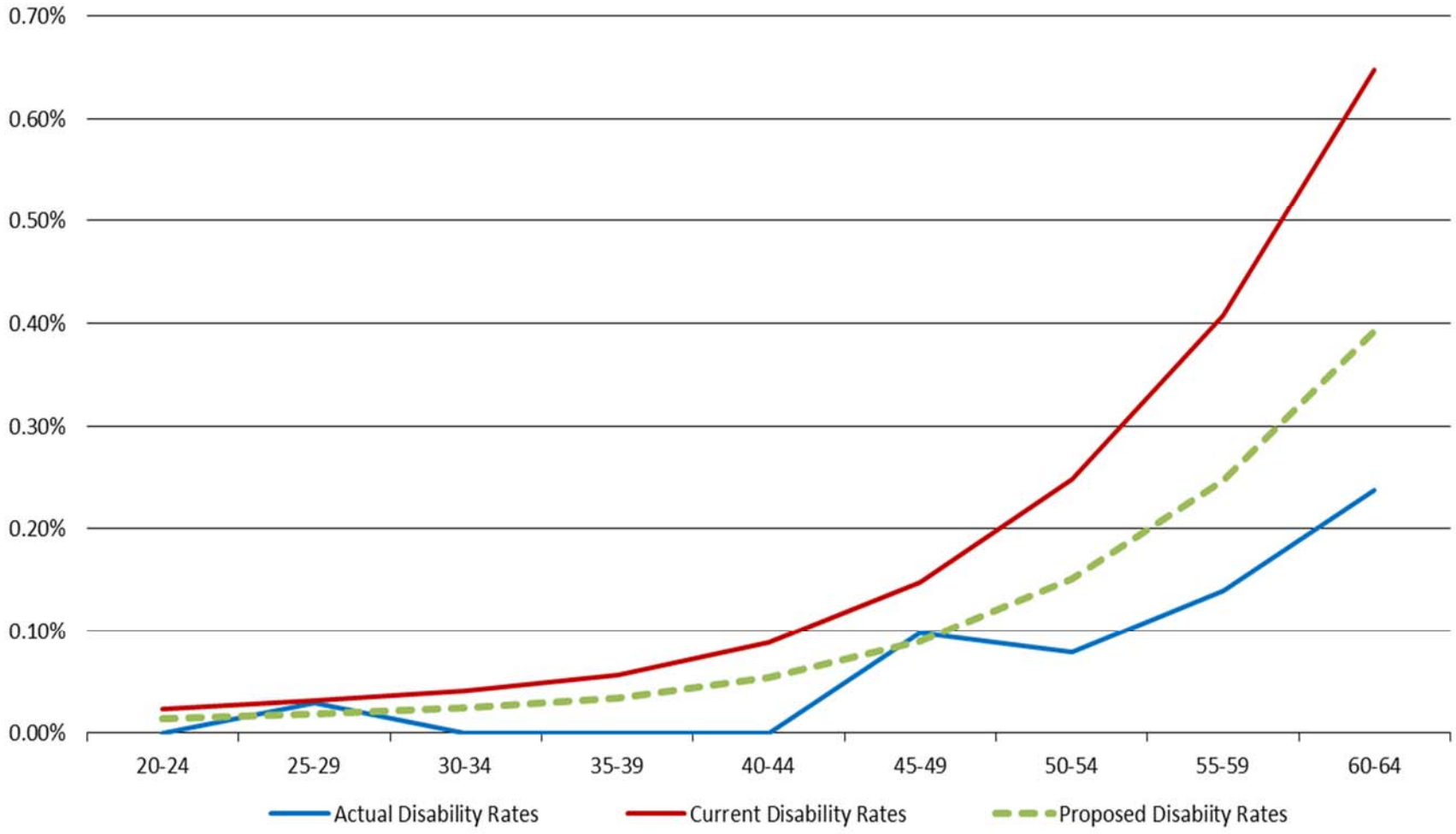
- Rates vary based on member's age.
- From 2009 to 2014:
  - 176 members were expected to start receiving a disability pension; and
  - 58 members actually started receiving a disability pension.
- The experience has been significantly lower than expected.
- From 2004 to 2009, there were 94 new disability pensions awarded.

Disability Retirement – All Systems *(continued)*

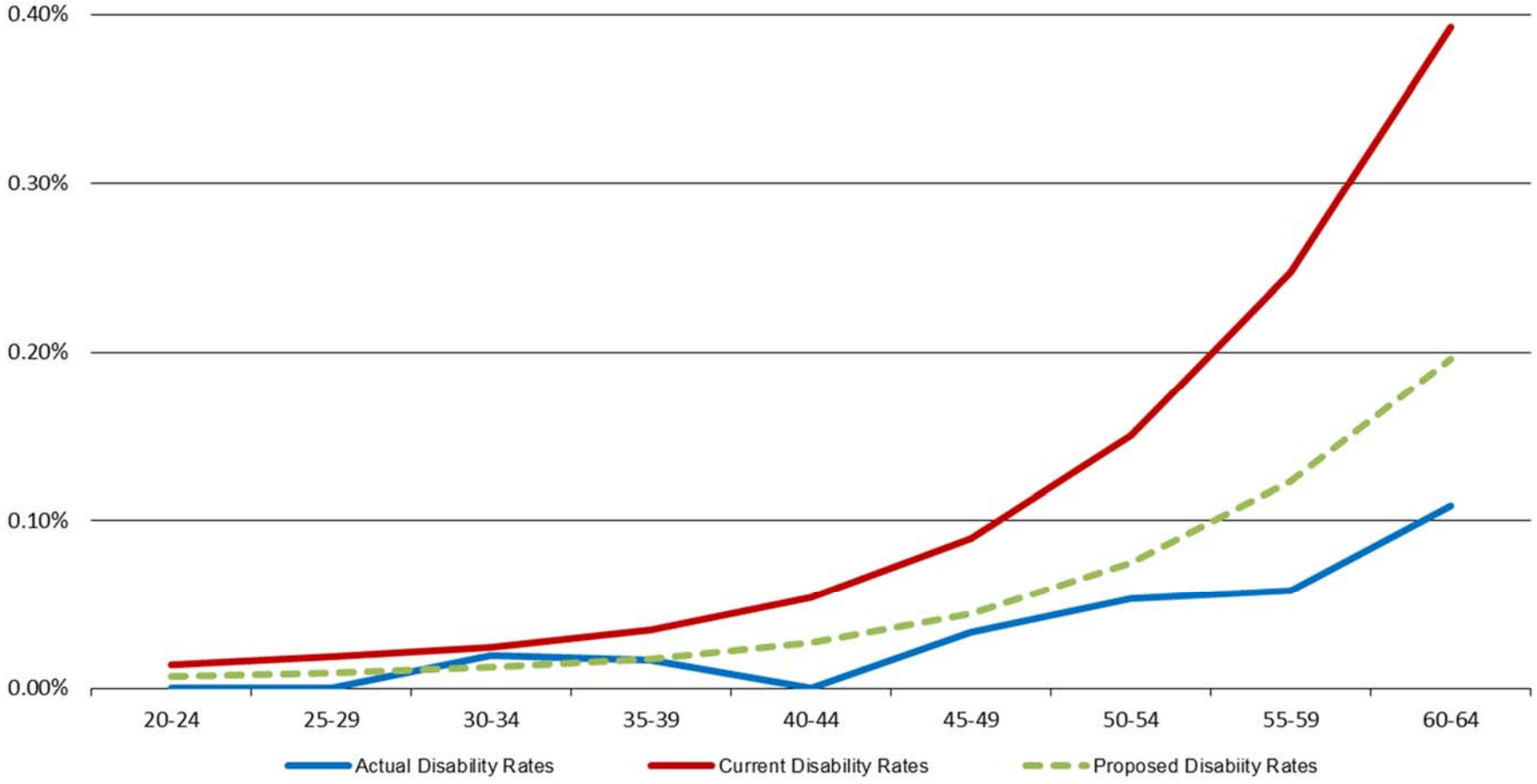
- We recommend lowering the disability rates for all PERS systems as shown below:

Age	Males			Females		
	Current Rate	Observed Rate	Proposed Rate	Current Rate	Observed Rate	Proposed Rate
20 – 24	0.02%	0.00%	0.01%	0.01%	0.00%	0.01%
25 – 29	0.03%	0.03%	0.02%	0.02%	0.00%	0.01%
30 – 34	0.04%	0.00%	0.02%	0.02%	0.02%	0.01%
35 – 39	0.06%	0.00%	0.03%	0.03%	0.02%	0.02%
40 – 44	0.09%	0.00%	0.05%	0.05%	0.00%	0.03%
45 – 49	0.15%	0.10%	0.09%	0.09%	0.03%	0.04%
50 – 54	0.25%	0.08%	0.15%	0.15%	0.05%	0.08%
55 – 59	0.41%	0.14%	0.25%	0.25%	0.06%	0.12%
60 – 64	0.65%	0.24%	0.39%	0.39%	0.11%	0.20%

Disability Retirement - Male



Disability Retirement - Female



Retirement Eligibility

- Eligibility for reduced benefits
  - Main System – Age 55 with three years of service
  - Judges – Age 55 with five years of service
  - National Guard and Law Enforcement – Age 50 with three years of service
  - Highway Patrolmen – Age 50 with ten years of service
  - Job Service
    - Age 52 with five years of service
    - Age 50 with 20 years of service
    - Age 45 with 30 years of service

Retirement Eligibility *(continued)*

- Eligibility for unreduced benefits
  - Main System and Judges - Age 65 or Rule of 85 (age plus service is greater than or equal to 85)
  - National Guard - Age 55 with three years of service
  - Law Enforcement - Age 55 with three years of service or Rule of 85
  - Highway Patrolmen - Age 55 with ten years of service or Rule of 80
  - Job Service
    - Age 62 with five years of service
    - Age 60 with 20 years of service
    - Age 55 with 30 years of service

Active Member Retirements

- Current rates:
  - Vary based on member's age and system.
  - Vary depending on whether the member is eligible for a reduced or unreduced benefit in the Main System.
- We have analyzed retirement experience for the following groups:
  - Eligible for a reduced benefit.
  - Eligible for an unreduced benefit (in Main System).
- The retirement rates take into account each individual's eligibility requirements.

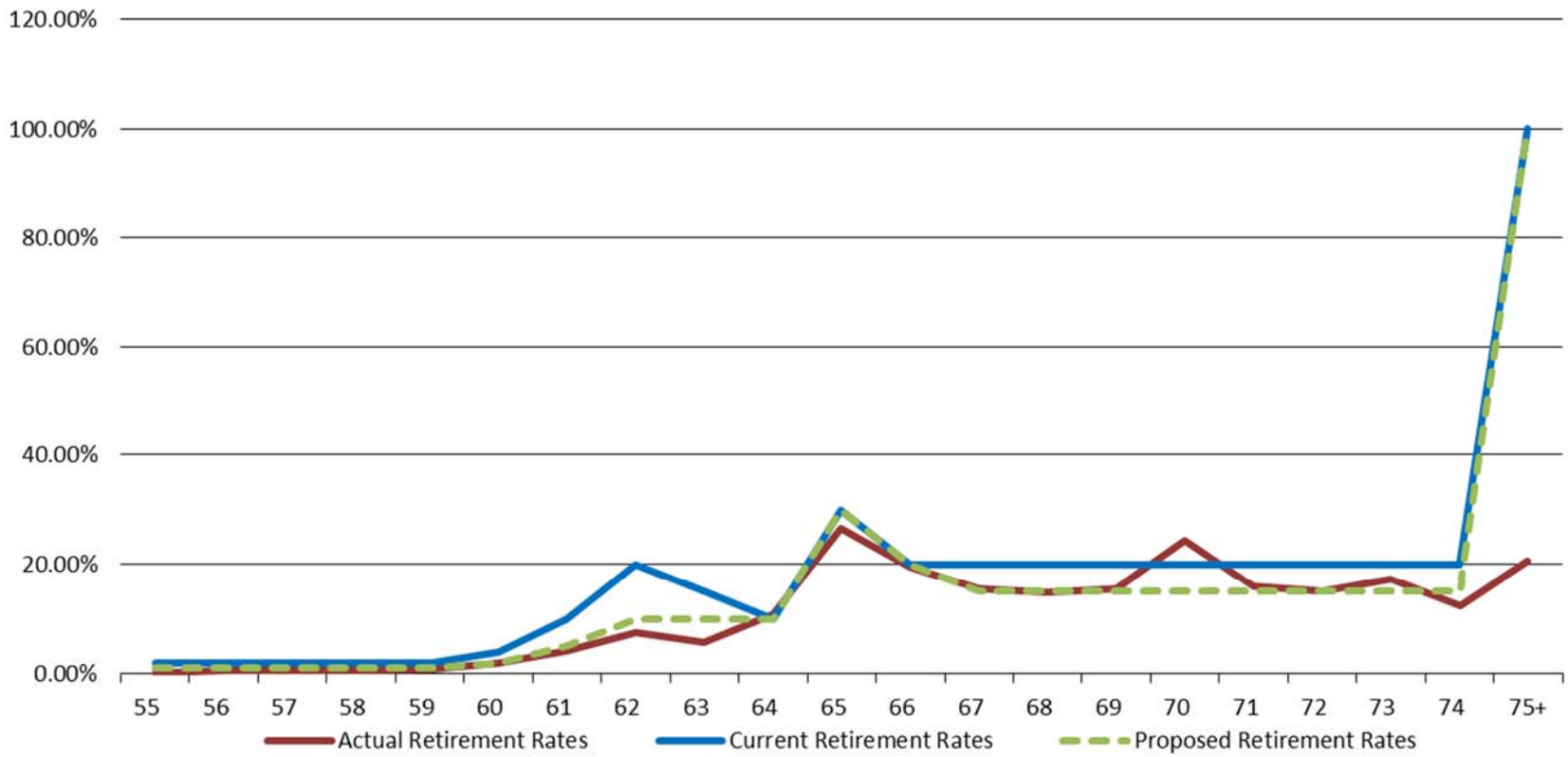
Active Member Retirements – Summary of Experience

- Main System
  - While there were fewer retirements than expected for those eligible for unreduced retirements, the general pattern of retirements was similar to expected. We recommend minor changes to the rates.
  - There were fewer retirements than expected among those eligible for reduced retirement, so we recommend lower rates at most ages.
- Judges
  - There were fewer retirements than expected at older ages, so we recommend lower rates, primarily at older ages.
- National Guard and Law Enforcement
  - There has not been significant retirement experience, however, there have been more retirements than expected before age 55 and fewer retirements than expected after age 55. We recommend raising rates before age 55 and lowering the rates after age 55.

Active Member Retirements – Summary of Experience *(continued)*

- Highway Patrolmen
  - There has not been significant retirement experience; however, there have been fewer retirements than expected and there are currently no active participants over age 55. We recommend lowering the rates before age 55.
- Job Service
  - There has not been significant retirement experience, and eligibility for unreduced benefits has not appeared to affect the retirement rates. There is only one active participant who had not reached eligibility for unreduced retirement as of July 1, 2014 valuation. We recommend consolidating to one table of retirement rates as shown on page 50.

Active Member Retirements – Reduced Benefits for Main System



Exposures	Actual Retirements	Expected Retirements	Actual to Expected	Proposed Retirements	Actual to Proposed
21,975	1,143	2,033	56%	1,512	76%

Active Member Retirements – Unreduced Benefits for Main System

Due to the low number of participants eligible for Rule of 85 for ages less than 53, the difference between the actual and proposed rates is not statistically significant.

Exposures	Actual Retirements	Expected Retirements	Actual to Expected	Proposed Retirements	Actual to Proposed
6,239	869	1,102	79%	883	98%

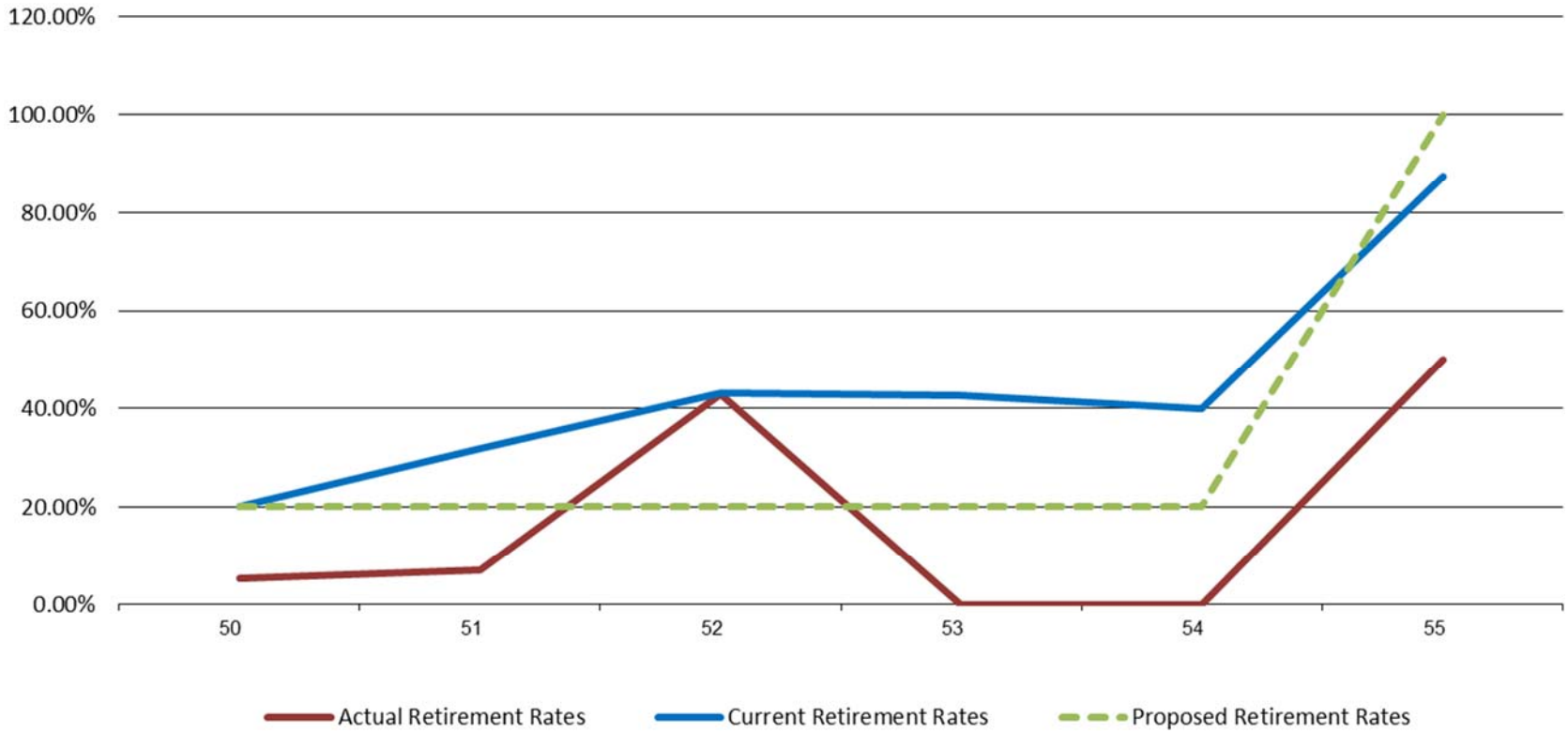
Active Member Retirements – Judges

Exposures	Actual Retirements	Expected Retirements	Actual to Expected	Proposed Retirements	Actual to Proposed
142	9	29	31%	21	43%

Active Member Retirements – National Guard and Law Enforcement

Exposures	Actual Retirements	Expected Retirements	Actual to Expected	Proposed Retirements	Actual to Proposed
159	27	45	60%	29	93%

Active Member Retirements – Highway Patrolmen



Exposures	Actual Retirements	Expected Retirements	Actual to Expected	Proposed Retirements	Actual to Proposed
59	9	20	45%	14	64%

Active Member Retirements – Job Service

Exposures	Actual Retirements	Expected Retirements	Actual to Expected	Proposed Retirements	Actual to Proposed
139	18	14	129%	23	78%

Current retirement rate age bands are shown as zero for groups with no exposures.

Inactive Vested Retirements

- The current assumption is that all inactive vested members will retire as follows:
  - Main System and Judges - Earlier of Age 64 and Unreduced Retirement Age
  - National Guard and Highway Patrol - Age 55
  - Law Enforcement - Earlier of Age 55 and Unreduced Retirement Age
  - Job Service – at first optional retirement age
- Main System:
  - From 2009 to 2014, of the 7,513 inactive vested members eligible to commence benefits, 945 elected to retire. Of these, 411 retired with reduced benefits.
  - We recommend a change to retirement rates consistent with those used for active participants.
  - There is a small subsidy in the early retirement benefit, so this approach is more conservative.
  - This approach should better reconcile the cash flow projections with actual benefit payments.

Exposures	Actual Retirements	Expected Retirements	Actual to Expected
7,513	945	1,560	61%

Inactive Vested Retirements *(continued)*

- Systems other than Main
  - There were very few inactive vested participants in the other systems who were eligible to retire and even fewer that actually retired.
  - We recommend a change to the retirement rates consistent with those used for active participants.

Death After Retirement (Non-Disabled) - All Systems

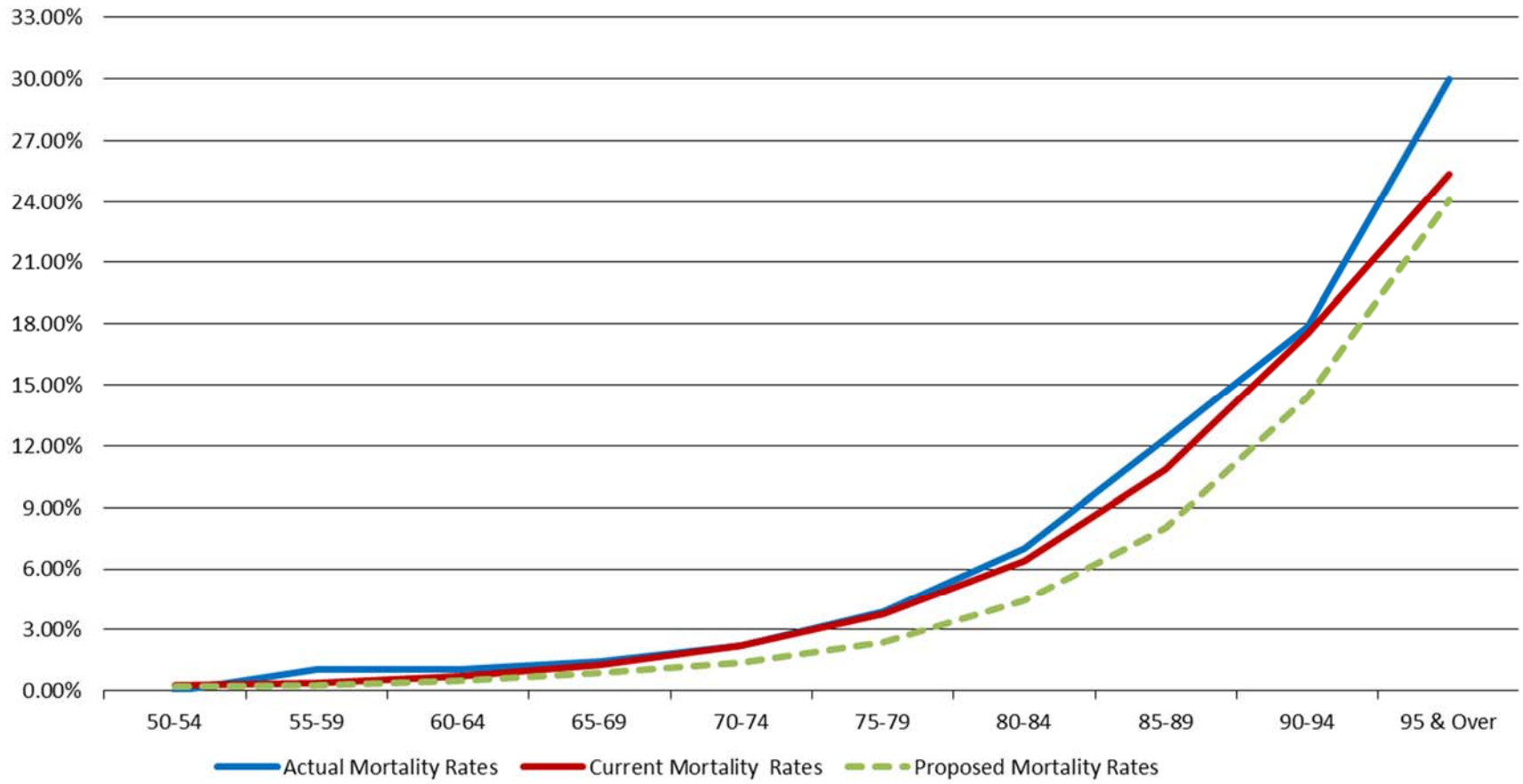
- Rates vary based on gender and age of the annuitant.
- Experience for non-disabled annuitants has been fairly consistent with the current assumption.
- The current male mortality assumption has more than sufficient margin for future mortality improvement. The ratio of actual to expected deaths is 121%. However, the margin in the female mortality assumption has deteriorated to 0%.
- To account for future mortality improvement, we recommend applying the generational mortality improvement scale (SSA 2014 Intermediate Cost) from 2014, for both males and females, and revising the non-disabled mortality assumption for males by changing the setback of the RP-2000 Mortality Table from 3 years to 2 years to reduce the current margin.

Life Expectancies

- The following table shows the future life expectancy (and expected age at death) at various ages using the current and recommended mortality tables, based on age in 2014.

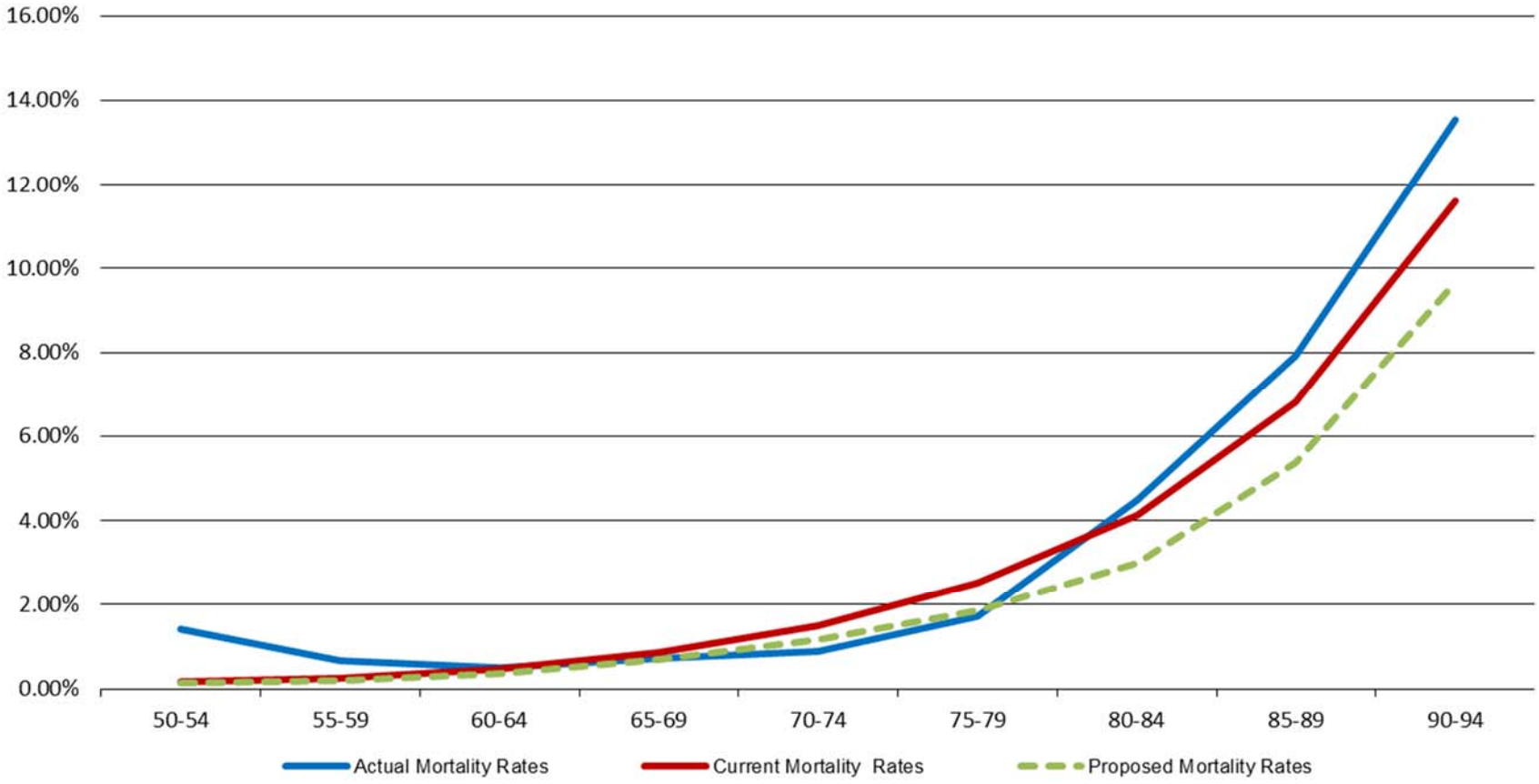
	Male		Female	
Age	Current	Proposed	Current	Proposed
50	33.7 (83.7)	34.8 (84.8)	36.5 (86.5)	38.6 (88.6)
55	29.0 (84.0)	29.8 (84.8)	31.8 (86.8)	33.5 (88.5)
60	24.4 (84.4)	25.0 (85.0)	27.1 (87.1)	28.6 (88.6)
65	20.1 (85.1)	20.4 (85.4)	22.7 (87.7)	23.8 (88.8)
70	16.1 (86.1)	16.2 (86.2)	18.6 (88.6)	19.4 (89.4)
75	12.5 (87.5)	12.4 (87.4)	14.8 (89.8)	15.4 (90.4)
80	9.4 (89.4)	9.2 (89.2)	11.5 (91.5)	11.9 (91.9)

Death After Retirement (Non-Disabled) – Male



Exposures	Actual Deaths	Expected Deaths	Actual to Expected
14,484	546	452	83%

Death After Retirement (Non-Disabled) – Female

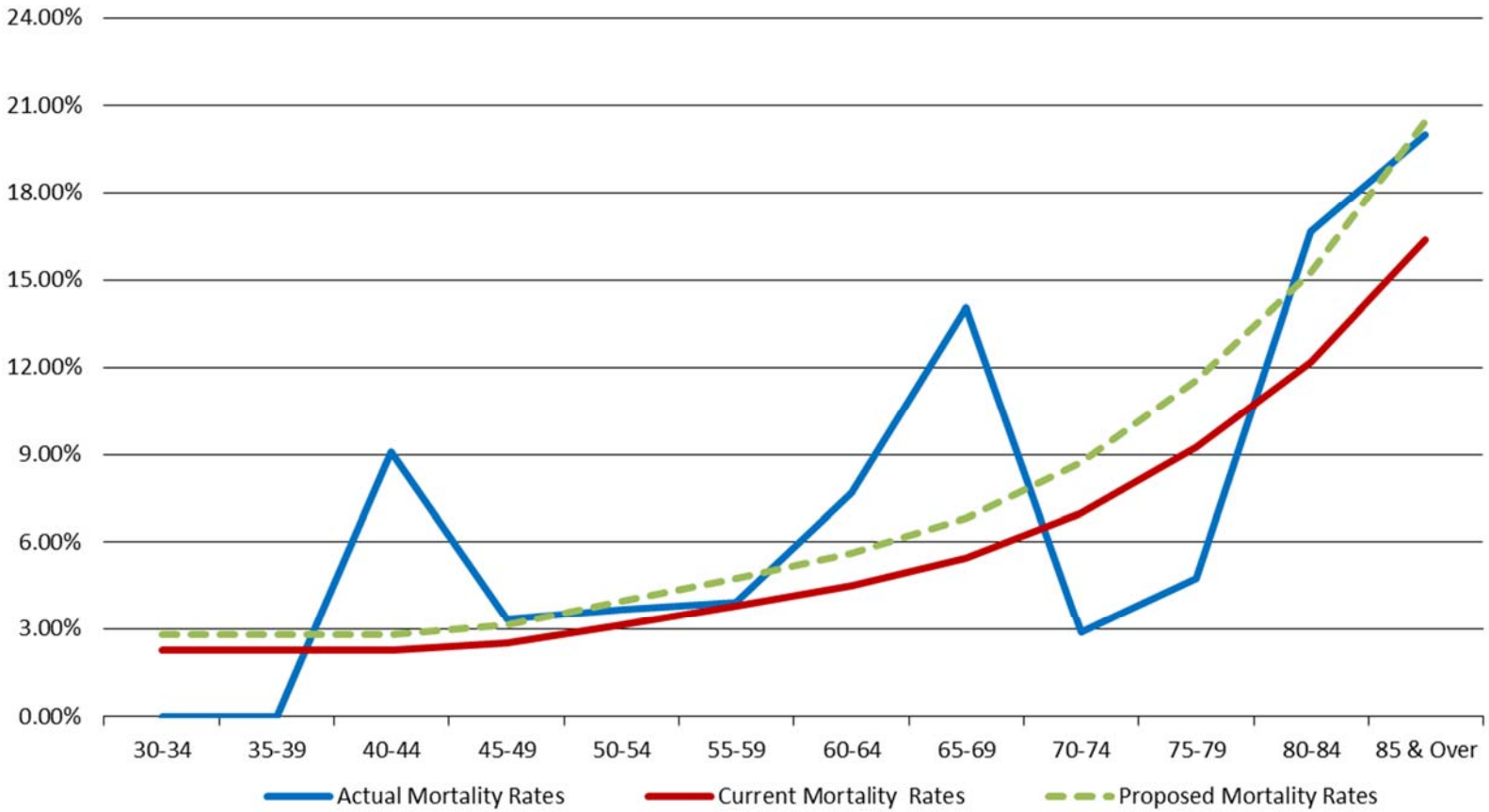


Exposures	Actual Deaths	Expected Deaths	Actual to Expected
19,622	483	485	100%

Death After Retirement (Disabled)

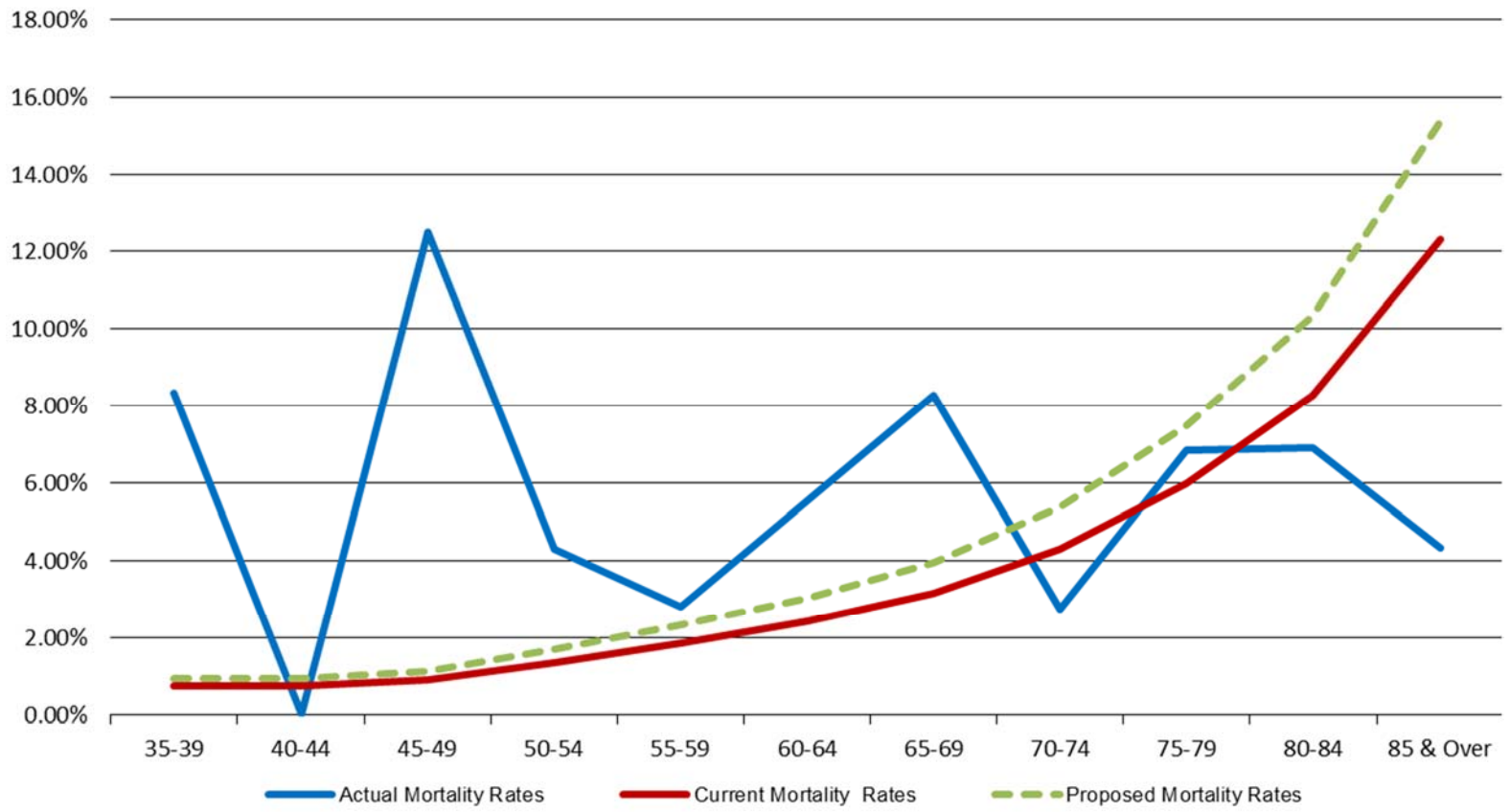
- Rates vary based on gender and age of the annuitant.
- Experience for disabled annuitants has been higher than expected using the current assumption. The ratio of actual to expected deaths is 145%, so there is more than sufficient margin for future mortality improvement.
- We recommend adjusting the current disability mortality table, RP-2000 Disabled Mortality Table, by increasing the mortality rates 25% to match the Fund's experience and build in sufficient margin for future mortality improvement.

Death After Retirement (Disabled) – Male



Exposures	Actual Deaths	Expected Deaths	Actual to Expected	Proposed Deaths	Actual to Proposed
800	59	45	131%	56	105%

Death After Retirement (Disabled) – Female



Exposures	Actual Deaths	Expected Deaths	Actual to Expected	Proposed Deaths	Actual to Proposed
949	50	30	167%	38	132%

Death In Active Service

- Mortality rates apply to active members
- Very few members die in active service.
  - Liability associated with active death is a small percentage of the total liability
  - Plan experience is insufficient to set an assumption
- Since we are adjusting the current RP-2000 Mortality Table for retired lives, we recommend using the same adjusted table for active members.

Spouse Information - PERS

- Current assumptions:
  - 100% of Judges, 80% of non-Judge male and 65% of non-Judge female members are married.
  - Male spouses are three years older than female spouses.
  - 100% of spouses are of opposite gender.
- We have limited data on spouse information. The above assumptions are reasonable and similar to those used by other retirement systems.
- We recommend changing the percent married to 75%, for all members except Judges, to be consistent with similar plans. We recommend no change to the assumption for Judges.
- In addition, all optional forms of payment are actuarially equivalent, so these assumptions are not materially relevant in the calculation of liabilities. However, the assumptions do have a significant effect on the projections of future cash flow.
- If the Benefit Election assumption we are recommending (see page 64) is adopted, the spousal assumptions will only be used for death benefits.

Spouse Information – Highway Patrol

- Current assumptions:
  - 90% of members are married.
  - Male spouses are three years older than female spouses.
  - 100% of spouses are of opposite gender.
- We have limited data on spouse information. The above assumptions are reasonable and similar to those used by other retirement systems. However, 95% of the retirees are taking joint and survivor annuities.
- We recommend changing the percent married to 100% for all participants.
- All optional forms of payment are actuarially equivalent, so these assumptions are not materially relevant in the calculation of liabilities. However, the assumptions do have a significant effect on the projections of future cash flow.
- If the Benefit Election assumption we are recommending (see page 64) is adopted, the spousal assumptions will only be used for death benefits.

Spouse Information – Job Service

- Current assumptions:
  - 85% of members are married.
  - Male spouses are four years older than female spouses.
  - 100% of spouses are of opposite gender.
- We have limited data on spouse information. The above assumptions are reasonable and similar to those used by other retirement systems.
- We recommend no change to the assumption for Job Service.
- All optional forms of payment are actuarially equivalent, so these assumptions are not materially relevant in the calculation of liabilities. However, the assumptions do have a significant effect on the projections of future cash flow.
- If the Benefit Election assumption we are recommending (see page 65) is adopted, the spousal assumptions will only be used for death benefits.

Miscellaneous Assumptions

- Benefit Election – Currently 100% of married participants are assumed to elect the 50% joint & survivor annuity and 100% of the unmarried participants are assumed to elect the life annuity in the PERS and HPRS Systems. PERS experience, except Judges, shows that of those eligible for retirement, 50% of the population elect the life annuity, 42% elect a joint and survivor option, 6% elect a refund of employee contributions and 2% elect other options. We recommend changing this assumption for all PERS systems except Judges, as follows:

50%	elect life annuities
45%	elect 50% joint and survivor annuities
5%	elect refund of employee contributions

Judges System experience shows that all retirees have elected a joint and survivor annuity. We recommend changing the assumption for Judges to all members elect 50% joint and survivor annuities.

HPRS experience shows that 95% of all retirees have elected a joint and survivor annuity. We recommend changing the assumption for HPRS to all members elect 50% joint and survivor annuities.

Miscellaneous Assumptions *(continued)*

- Benefit Election *(continued)* – Currently in the Job Service plan, all participants are assumed to elect the 10-year certain and life annuity. Experience shows that 55% of participants elect the 10-year certain and life annuity and 45% of participants elect the 55% joint and survivor annuity. We recommend changing the assumption to 55% elect the 10-year certain and life annuity and 45% elect the 55% joint and survivor annuity.

- Refund of Employee Contributions (PERS and HPRS) – The current assumption is that vested members terminating from employment will elect a refund of contributions only when the member account balance has a higher value than the annuity they will forfeit by taking a refund. This assumption is consistent with the experience. Of the 559 PERS members who took a refund of employee contributions in fiscal year ending June 30, 2014, only 121 members were vested and only 19 members had 10 or more years of service. We do not recommend changing the assumption regarding which members elect the refund for the PERS systems and HPRS.

Miscellaneous Assumptions *(continued)*

- Refund of Employee Contributions (PERS and HPRS) *(continued)* - Of the participants who do not take the refund of the employee contributions in PERS, 100% of married participants are assumed to elect the 50% joint and survivor annuity and 100% of unmarried participants are assumed to elect the life annuity. However, we recommend changing the election assumption in the PERS systems for those who do not take the refund of employee contributions to 50% elect life annuities and 50% elect joint and survivor annuities. We recommend no change in this assumption for HPRS.
- Account Balance due to Vested Employer Contributions (PEP) (PERS only) – The current assumption is 100% of those who have contributed to a deferred compensation program will continue to do so, but those who have not contributed will not contribute in the future. Experience shows 37% of the July 1, 2014 active population was contributing to a deferred compensation plan, and only 2% of the continuing actives began contributing during the 2013-2014 plan year. Therefore, we do not recommend changing this assumption.

Funding Policy

- Funding Method - The current method used for all plans except Job Service is the Entry Age Cost Method determined as if the current benefit accrual rate had always been in effect. We recommend changing the cost method to the Entry Age Cost Method determined based on the same benefit terms reflected in each employee's actuarial present value of projected benefit payments. Our recommendation brings the cost method in line with the cost method required by GASB.

- Asset Valuation Method – The current Asset Method recognizes 20% of each year's total appreciation (depreciation) beginning with the year of occurrence. After 5 years the appreciation (depreciation) is fully recognized. There is no corridor test that limits how far the actuarial value of assets can deviate from the market value of assets. We are not recommending any changes in the asset valuation method at this time.

Funding Policy *(continued)*

- Amortization of Unfunded Actuarial Accrued Liability (UAAL) - For PERS and HPRS, the Board policy is to amortize the UAAL over an open period of 20 years. **Frequently under this method the UAAL is never paid off, and may increase before it declines. While this is an acceptable method of making payments toward the UAAL, the Board should verify that the method fits with its funding policy goals.**

  The annual payments are determined as a level percent of payroll with payroll expected to increase. The increase, prior to our new recommendations on page 13, was 4.5% per year (4.0% for Judges). Our recommendation is to change the payroll increase to 4.0% per year (3.5% for Judges).

  We recommend that a detailed funding policy review be conducted in the near future to ensure that the funding policy elements meet the Board's objectives.

Summary of Economic Assumptions – Main System

Assumption	Current	Proposed
Inflation	3.50%	2.75%
Productivity	1.00%	1.25%
Payroll Growth	4.50%	4.00%
Salary Scale	Merit rates based on age and years of service plus inflation and productivity.	Less than 3 years of employment: State / Non-State First: 12.00% / 15.00% Second: 9.50% / 10.00% Third: 7.25% / 8.00% Remaining years based on age: State / Non-State Ages 18-24: 7.25% / 10.00% Ages 25-29: 7.25% / 7.50% Ages 30-39: 6.50% / 6.75% Ages 40-49: 6.25% / 6.50% Ages 50-59: 5.75% / 6.00% 60 & Over: 5.00% / 5.25%
Investment Return	8.00%	7.75%
Administrative Expense	$1,100,000	Explicit load to normal cost equal to prior year administrative expenses plus inflation.

Summary of Economic Assumptions - Judges

Assumption	Current	Proposed
Inflation	3.50%	2.75%
Productivity	0.50%	0.75%
Payroll Growth	4.00%	3.50%
Salary Scale	5% for all years	4% for all years
Investment Return	8.00%	7.75%
Administrative Expense	$7,500	Explicit load to normal cost equal to prior year administrative expenses plus inflation.

Summary of Economic Assumptions – National Guard

Assumption	Current	Proposed
Inflation	3.50%	2.75%
Productivity	1.00%	1.25%
Payroll Growth	4.50%	4.00%
Salary Scale	Merit rates based on age and years of service plus inflation and productivity.	Less than 3 years: 20% 4 to 5 years: 10% Remaining years based on age: Ages 18 - 29: 7.25% Ages 30 - 39: 6.50% Ages 40 - 49: 6.25% Ages 50 - 59: 5.75% 60 & Over: 5.00%
Investment Return	8.00%	7.75%
Administrative Expense	$3,000	Explicit load to normal cost equal to prior year administrative expenses plus inflation.

Summary of Economic Assumptions – Law Enforcement with Prior Service

Assumption	Current	Proposed
Inflation	3.50%	2.75%
Productivity	1.00%	1.25%
Payroll Growth	4.50%	4.00%
Salary Scale	Merit rates based on age and years of service plus inflation and productivity.	Less than 3 years: 20% 4 to 5 years: 10% Remaining years based on age: Ages 18 - 29: 7.25% Ages 30 - 39: 6.50% Ages 40 - 49: 6.25% Ages 50 - 59: 5.75% 60 & Over: 5.00%
Investment Return	8.00%	7.75%
Administrative Expense	$2,500	Explicit load to normal cost equal to prior year administrative expenses plus inflation.

Summary of Economic Assumptions – Law Enforcement without Prior Service

Assumption	Current	Proposed
Inflation	3.50%	2.75%
Productivity	1.00%	1.25%
Payroll Growth	4.50%	4.00%
Salary Scale	Merit rates based on age and years of service plus inflation and productivity.	Less than 3 years: 20% 4 to 5 years: 10% Remaining years based on age: Ages 18 - 29: 7.25% Ages 30 - 39: 6.50% Ages 40 - 49: 6.25% Ages 50 - 59: 5.75% 60 & Over: 5.00%
Investment Return	8.00%	7.75%
Administrative Expense	$7,500	Explicit load to normal cost equal to prior year administrative expenses plus inflation.

Summary of Economic Assumptions – Highway Patrolmen

Assumption	Current	Proposed
Inflation	3.50%	2.75%
Productivity	1.00%	1.25%
Payroll Growth	4.50%	4.00%
Salary Scale	Merit rates based on age and years of service plus inflation and productivity.	Less than 3 years of employment: First: 15.00% Second: 10.00% Third: 8.00% Remaining years based on age: Ages 18 - 35: 8.00% Ages 36 - 40: 7.50% Ages 41 - 50: 6.00% Ages 51 & Over: 5.00%
Investment Return	8.00%	7.75%
Administrative Expense	$18,000	Explicit load to normal cost equal to prior year administrative expenses plus inflation.

Summary of Economic Assumptions – Job Service

Assumption	Current	Proposed
Inflation	3.50%	2.75%
Productivity	1.00%	1.25%
Payroll Growth	N/A	N/A
Salary Scale	5.00%	3.50%
Investment Return	8.00%	7.75%
Administrative Expense	Implicitly included in the investment return assumption	Explicit load to normal cost equal to prior year administrative expenses plus inflation.
COLA	5.00%	3.00%

Summary of Demographic Assumptions – Main System

Assumption	Current	Proposed
Termination	Rates based on age and years of service	No change
Disability	Gender-distinct rates based on age	Lower rates at all ages
Active Retirements	Rates based on age and eligibility for unreduced benefits	Adjusted rates based on age and eligibility for unreduced benefits
Inactive Retirements	Earlier of age 64 and unreduced retirement date	Same as new active rates
Healthy Mortality	RP-2000 Combined Healthy Mortality, set back 3 years	RP-2000 Combined Healthy Mortality, set back 2 years for males and 3 years for females, projected generationally using SSA 2014 Intermediate Cost scale from 2014
Disabled Mortality	RP-2000 Disabled Mortality Table set back one year for males (no setback for females)	RP-2000 Disabled Mortality Table set back one year for males (no setback for females) multiplied by 125%
Active Mortality	Healthy Post-Retirement Mortality	Healthy Post-Retirement Mortality
Spouse Information	80% of males and 65% of females are married, male spouses are three years older than female spouses, and 100% of spouses are opposite gender.	75% are married. No other changes.
Benefit election	100% of married elect 50% joint & survivor 100% of non-married elect life annuity	50% elect life annuity 45% elect 50% joint & survivor 5% elect refund of contributions
Refund of Contributions	Only if account balance is higher than value of annuity	No Change
Account balance due to vested Employer Contributions (PEP)	100% of those contributing continue to contribute. Those who haven't contributed will not contribute in the future.	No Change

Summary of Demographic Assumptions – Judges

Assumption	Current	Proposed
Termination	Rates based on age	Eliminate rates
Disability	Gender-distinct rates based on age	Lower rates at all ages
Active Retirements	Rates based on age	Adjusted rates based on age
Inactive Retirements	Earlier of age 64 and unreduced retirement date	Same as new active rates
Healthy Mortality	RP-2000 Combined Healthy Mortality, set back 3 years	RP-2000 Combined Healthy Mortality, set back 2 years for males and 3 years for females, projected generationally using SSA 2014 Intermediate Cost scale from 2014
Disabled Mortality	RP-2000 Disabled Mortality Table set back one year for males (no setback for females)	RP-2000 Disabled Mortality Table set back one year for males (no setback for females) multiplied by 125%
Active Mortality	Healthy Post-Retirement Mortality	Healthy Post-Retirement Mortality
Spouse Information	100% of all participants are married, male spouses are three years older than female spouses, and 100% of spouses are opposite gender.	No changes
Benefit Election	100% of married elect 50% joint & survivor 100% of non-married elect life annuity	100% elect 50% joint & survivor
Refund of Contributions	Only if account balance is higher than value of annuity	No Change

Summary of Demographic Assumptions – National Guard

Assumption	Current	Proposed
Termination	Rates based on age and years of service	No change
Disability	Gender-distinct rates based on age	Lower rates at all ages
Active Retirements	Rates based on age	Adjusted rates based on age
Inactive Retirements	Age 55	Same as new active rates
Healthy Mortality	RP-2000 Combined Healthy Mortality, set back 3 years	RP-2000 Combined Healthy Mortality, set back 2 years for males and 3 years for females, projected generationally using SSA 2014 Intermediate Cost scale from 2014
Disabled Mortality	RP-2000 Disabled Mortality Table set back one year for males (no setback for females)	RP-2000 Disabled Mortality Table set back one year for males (no setback for females) multiplied by 125%
Active Mortality	Healthy Post-Retirement Mortality	Healthy Post-Retirement Mortality
Spouse Information	80% of males and 65% of females are married, male spouses are three years older than female spouses, and 100% of spouses are opposite gender.	75% are married. No other changes.
Benefit Election	100% of married elect 50% joint & survivor 100% of non-married elect life annuity	50% elect life annuity 45% elect 50% joint & survivor 5% elect refund of contributions
Refund of Contributions	Only if account balance is higher than value of annuity	No Change
Account balance due to vested Employer Contributions (PEP)	100% of those contributing continue to contribute. Those who haven't contributed will not contribute in the future.	No Change

Summary of Demographic Assumptions – Law Enforcement with & without Prior Service

Assumption	Current	Proposed
Termination	Rates based on age and years of service	No change
Disability	Gender distinct rates based on age	Lower rates at all ages
Active Retirements	Rates based on age	Adjusted rates based on age
Inactive Retirements	Earlier of age 55 and unreduced retirement date	Same as new active rates
Healthy Mortality	RP-2000 Combined Healthy Mortality, set back 3 years	RP-2000 Combined Healthy Mortality, set back 2 years for males and 3 years for females, projected generationally using SSA 2014 Intermediate Cost scale from 2014
Disabled Mortality	RP-2000 Disabled Mortality Table set back one year for males (no setback for females)	RP-2000 Disabled Mortality Table set back one year for males (no setback for females) multiplied by 125%
Active Mortality	Healthy Post-Retirement Mortality	Healthy Post-Retirement Mortality
Spouse Information	80% of males and 65% of females are married, male spouses are three years older than female spouses, and 100% of spouses are opposite gender.	75% are married. No other changes.
Benefit Election	100% of married elect 50% joint & survivor 100% of non-married elect life annuity	50% elect life annuity 45% elect 50% joint & survivor 5% elect refund of contributions
Refund of Contributions	Only if account balance is higher than value of annuity	No Change
Account balance due to vested Employer Contributions (PEP)	100% of those contributing continue to contribute. Those who haven't contributed will not contribute in the future.	No Change

Summary of Demographic Assumptions – Highway Patrolmen

Assumption	Current	Proposed
Termination	Rates based on age and years of service	No change
Disability	Rates based on age	Lower rates at all ages
Active Retirements	Rates based on age and eligibility for unreduced benefits	Adjusted rates based on age
Inactive Retirements	Age 55	Same as new active rates
Healthy Mortality	RP-2000 Combined Healthy Mortality, set back one year	RP-2000 Combined Healthy Mortality, set back 2 years for males and 3 years for females, projected generationally using SSA 2014 Intermediate Cost scale from 2014
Disabled Mortality	RP-2000 Disabled Mortality Table set back one year for males (no setback for females)	RP-2000 Disabled Mortality Table set back one year for males (no setback for females) multiplied by 125%
Active Mortality	Healthy Post-Retirement Mortality	Healthy Post-Retirement Mortality
Spouse Information	90% of non-retired members are married, male spouses are three years older than female spouses, and 100% of spouses are opposite gender.	100% are married. No other changes.
Benefit Election	100% of married elect 50% joint & survivor 100% of non-married elect life annuity	100% elect 50% joint & survivor
Indexing for benefits of inactive members	4.5% per annum	4.0% per annum
Refund of Contributions	Only if account balance is higher than value of annuity.	No change

Summary of Demographic Assumptions – Job Service

Assumption	Current	Proposed
Termination	Rates based on age	Not applicable
Disability	Rates based on age	Lower rates at all ages
Active Retirements	75% retire when first eligible. The rest retire at Normal Retirement Age	Adjusted rates based on age
Inactive Retirements	100% at first optional retirement age	Same as new active rates
Healthy Mortality	1994 Group Annuity Mortality Table	RP-2000 Combined Healthy Mortality, set back 2 years for males and 3 years for females, projected generationally using SSA 2014 Intermediate Cost scale from 2014
Disabled Mortality	1983 Railroad Retirement Board Disabled Life Mortality Table	RP-2000 Disabled Mortality Table set back one year for males (no setback for females) multiplied by 125%
Active Mortality	Healthy Post-Retirement Mortality	Healthy Post-Retirement Mortality
Spouse Information	85% of all non-retired are married, male spouses are four years older than female spouses, and 100% of spouses are opposite gender.	No change
Benefit Election	All participants are assumed to elect the 10-year certain and life annuity	55% elect 10-year certain and life 45% elect 55% joint and survivor

Cost Impact on Main System
Based on the July 1, 2014 Actuarial Valuation

Description	Current Assumptions	All Proposed Assumptions Except Investment Return	All Proposed Assumptions
Actuarial Accrued Liability	$2,866.5M	$2,769.4M	$2,848.8M
Actuarial Value of Assets	$1,837.9M	$1,837.9M	$1,837.9M
Unfunded Actuarial Accrued Liability	$1,028.6M	$931.5M	$1,010.9M
Funded Percentage	64.1%	66.4%	64.5%
Total Normal Cost including Expenses	$99.1M	$119.4M	$123.9M
Actuarially Determined Employer Contribution Rate	11.06%	12.51%	13.43%
Employer Statutory Rate	7.12%	7.12%	7.12%
Margin / (Deficit)	(3.94)%	(5.39)%	(6.31)%
Effective Amortization Period	Infinite	Infinite	Infinite

Cost Impact on Judges
Based on the July 1, 2014 Actuarial Valuation

Description	Current Assumptions	All Proposed Assumptions Except Investment Return	All Proposed Assumptions
Actuarial Accrued Liability	$39.0M	$36.7M	$37.6M
Actuarial Value of Assets	$35.5M	$35.5M	$35.5M
Unfunded Actuarial Accrued Liability	$3.5M	$1.2M	$2.1M
Funded Percentage	91.0%	96.7%	94.4%
Total Normal Cost including Expenses	$1.3M	$1.3M	$1.3M
Actuarially Determined Employer Contribution Rate	14.80%	11.68%	13.31%
Employer Statutory Rate	17.52%	17.52%	17.52%
Margin / (Deficit)	2.72%	5.84%	4.21%
Effective Amortization Period	9.7 years	2.7 years	5.3 years

Cost Impact on National Guard
Based on the July 1, 2014 Actuarial Valuation

Description	Current Assumptions	All Proposed Assumptions Except Investment Return	All Proposed Assumptions
Actuarial Accrued Liability	$2,944K	$2,782K	$2,859K
Actuarial Value of Assets	$2,586K	$2,586K	$2,586K
Unfunded Actuarial Accrued Liability	$358K	$196K	$273K
Funded Percentage	87.8%	93.0%	90.5%
Total Normal Cost including Expenses	$126K	$152K	$159K
Actuarially Determined Employer Contribution Rate	8.14%	8.74%	9.70%
Employer Statutory Rate	7.00%	7.00%	7.00%
Margin / (Deficit)	(1.14)%	(1.74)%	(2.70)%
Effective Amortization Period	Infinite	Infinite	Infinite

Cost Impact on Law Enforcement with Prior Service Based on the July 1, 2014 Actuarial Valuation

Description	Current Assumptions	All Proposed Assumptions Except Investment Return	All Proposed Assumptions
Actuarial Accrued Liability	$28.0M	$26.7M	$27.5M
Actuarial Value of Assets	$18.0M	$18.0M	$18.0M
Unfunded Actuarial Accrued Liability	$10.0M	$8.7M	$9.5M
Funded Percentage	64.4%	67.4%	65.5%
Total Normal Cost including Expenses	$1.7M	$2.0M	$2.1M
Actuarially Determined Employer Contribution Rate	9.52%	10.59%	11.39%
Employer Statutory Rate	9.81%/10.31%*	9.81%/10.31%*	9.81%/10.31%*
Margin / (Deficit)	0.38%	(0.69)%	(1.49)%
Effective Amortization Period	17.9 years	27.6 years	44.9 years

** 10.31% for BCI*

Cost Impact on Law Enforcement without Prior Service Based on the July 1, 2014 Actuarial Valuation

Description	Current Assumptions	All Proposed Assumptions Except Investment Return	All Proposed Assumptions
Actuarial Accrued Liability	$2,264K	$2,040K	$2,101K
Actuarial Value of Assets	$1,832K	$1,832K	$1,832K
Unfunded Actuarial Accrued Liability	$432K	$208K	$269K
Funded Percentage	80.9%	89.8%	87.2%
Total Normal Cost including Expenses	$440K	$528K	$549K
Actuarially Determined Employer Contribution Rate	7.42%	8.38%	9.01%
Employer Statutory Rate	7.93%	7.93%	7.93%
Margin / (Deficit)	0.51%	(0.45)%	(1.08)%
Effective Amortization Period	10.7 years	Infinite	Infinite

Cost Impact on Highway Patrolmen Based on the July 1, 2014 Actuarial Valuation

Description	Current Assumptions	All Proposed Assumptions Except Investment Return	All Proposed Assumptions
Actuarial Accrued Liability	$75.5M	$75.5M	$77.6M
Actuarial Value of Assets	$54.6M	$54.6M	$54.6M
Unfunded Actuarial Accrued Liability	$20.9M	$20.9M	$23.0M
Funded Percentage	72.3%	72.3%	70.3%
Total Normal Cost including Expenses	$2.1M	$2.3M	$2.4M
Actuarially Determined Employer Contribution Rate	21.70%	23.66%	25.96%
Employer Statutory Rate	19.70%	19.70%	19.70%
Margin / (Deficit)	(2.00)%	(3.95)%	(6.26)%
Effective Amortization Period	25.0 years	34.2 years	51.4 years

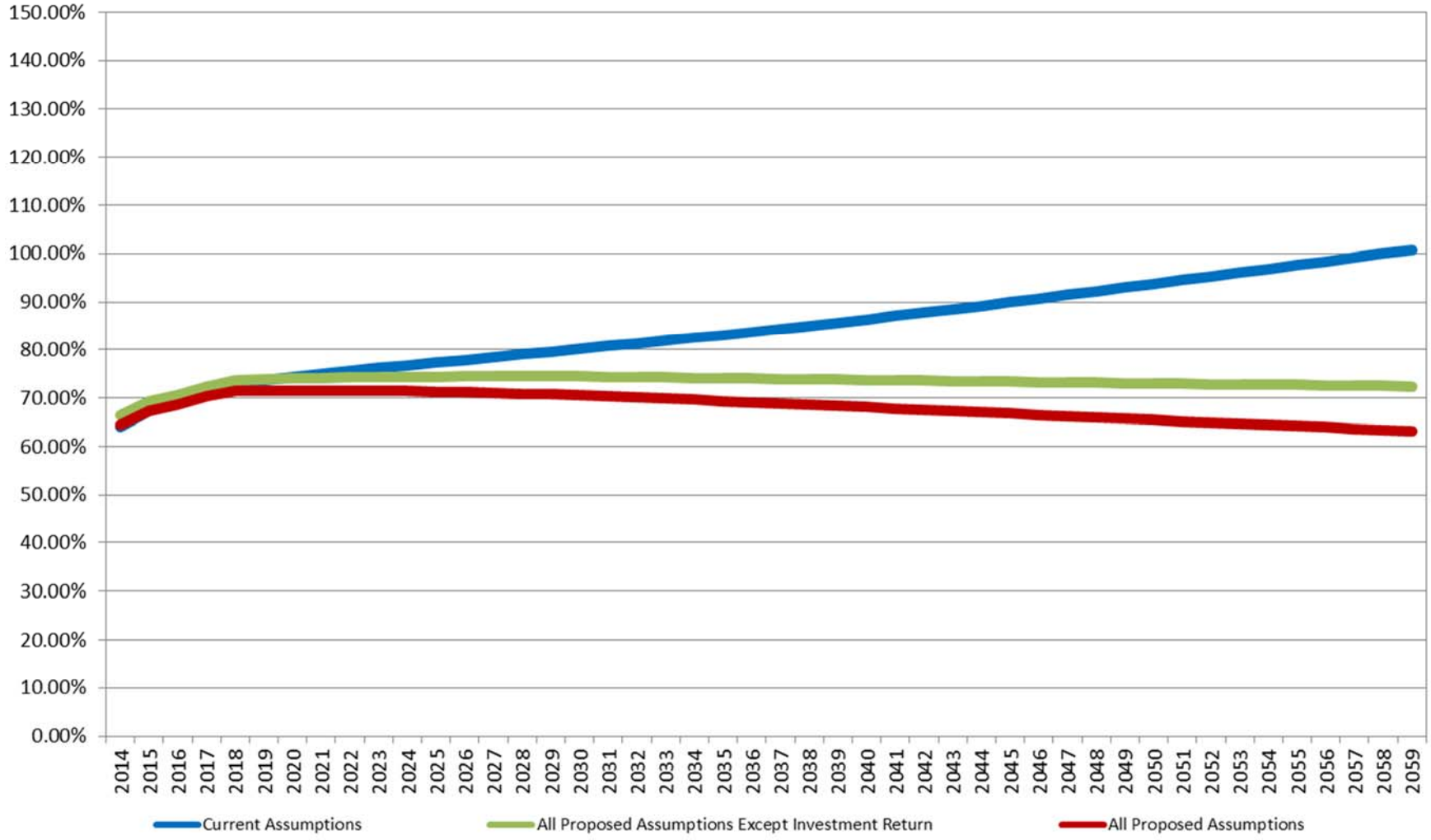
Cost Impact on Job Service
Based on the July 1, 2014 Actuarial Valuation

Description	Current Assumptions	All Proposed Assumptions Except Investment Return	All Proposed Assumptions
Present Value of Benefits	$65.5M	$61.9M	$63.3M
Actuarial Value of Assets	$78.2M	$78.2M	$78.2M
Unfunded Actuarial Accrued Liability	$(12.7)M	$(16.3)M	$(14.9)M
Funded Percentage	119.4%	126.3%	123.4%
Total Normal Cost including Expenses	$0.00M	$0.03M	$0.03M
Actuarially Determined Contribution Rate	0%	0%	0%
Statutory Rate	0%	0%	0%
Margin / (Deficit)	N/A	N/A	N/A
Effective Amortization Period	N/A	N/A	N/A

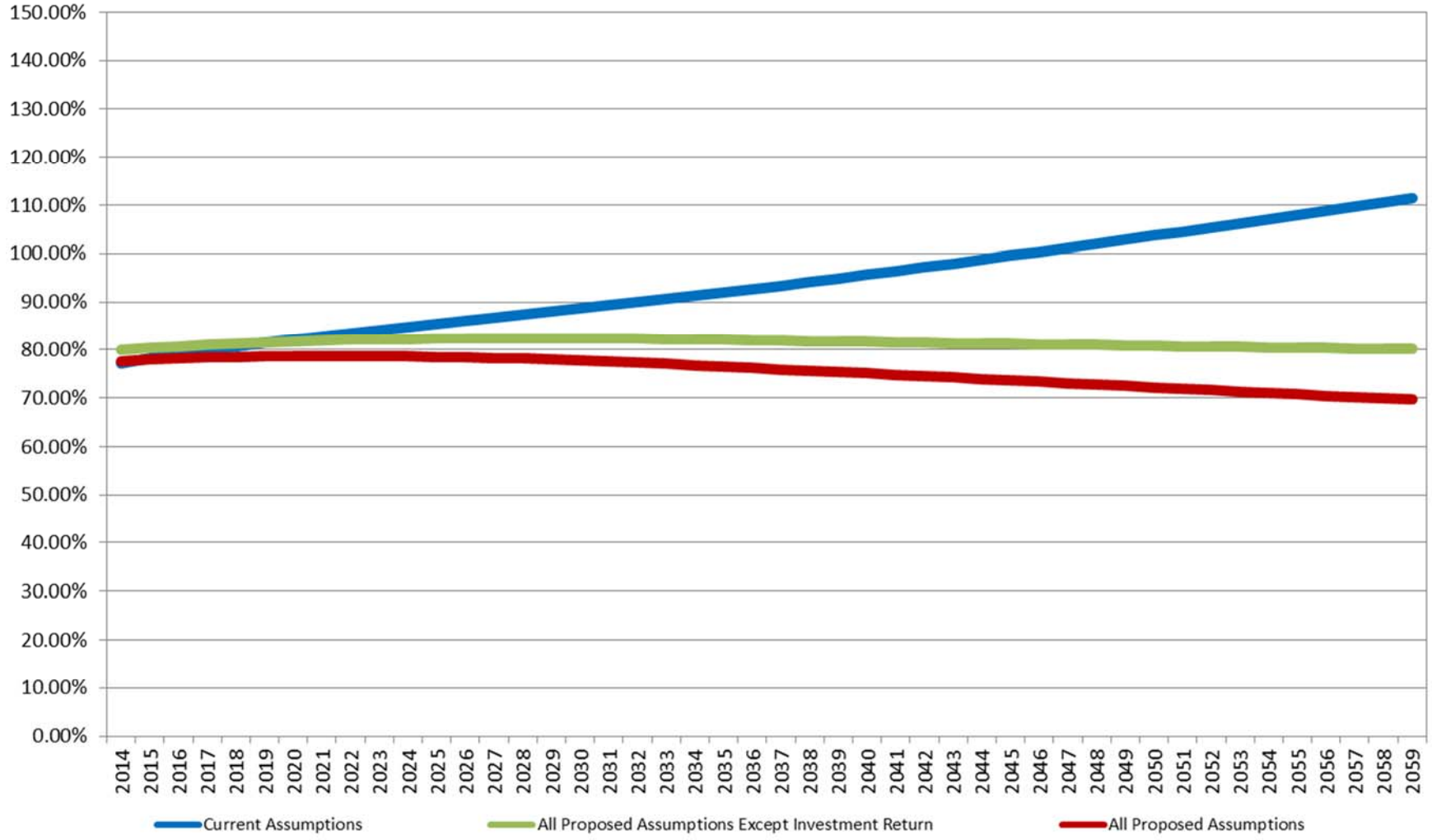
Cost Impact Projections – Main System

- Projections of estimated funded ratios for 45 years
  - Baseline based on July 1, 2014, actuarial valuation using current assumptions
- Includes contribution rates as follows:
  - Member rate is 7.00% for fiscal year ending June 30, 2015 and thereafter
  - Employer rate is 7.12% for fiscal year ending June 30, 2015 and thereafter

Projected Funded Ratios (AVA Basis) – Main System



Projected Funded Ratios (MVA Basis) – Main System



Questions?

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Actuarial Certification

May 21, 2015

We are pleased to submit this presentation on the actuarial experience of the North Dakota Public Employees Retirement System for the period July 1, 2009, through June 30, 2014. This investigation is the basis for our recommendation of the assumptions and methods to be used for the July 1, 2015, actuarial valuation.

All current actuarial assumptions and methods were reviewed as part of this study. Some of our recommendations reflect changes to the assumptions and methods used in the July 1, 2014, actuarial valuation while other current assumptions and methods remain appropriate.

Our analysis was conducted in accordance with generally accepted actuarial principles as prescribed by the Actuarial Standards Board (ASB) and the American Academy of Actuaries. Additionally, the development of all assumptions contained herein is in accordance with ASB Actuarial Standard of Practice (ASOP) No. 27 (*Selection of Economic Assumptions for Measuring Pension Obligations*) and ASOP No. 35 (*Selection of Demographic and Other Non-Economic Assumptions for Measuring Pension Obligations*).

The undersigned actuaries are experienced with performing experience studies for large public-sector pension plans and are qualified to render the opinions contained in this report.

Sincerely,

Brad Ramirez, FSA, MAAA, FCA, EA Vice President & Consulting Actuary	Laura L. Mitchell, MAAA, EA Vice President & Consulting Actuary	Tammy F. Dixon, FSA, MAAA, EA Vice President and Actuary

APPENDIX

- Full schedule of proposed new assumption tables
  - Salary Increase
  - Disability rates
  - Unreduced retirement
  - Reduced retirement
  - Healthy mortality
  - Disabled mortality

APPENDIX
Proposed Salary Increase (Service-Based Rates)

Years of Service	Current Total Salary Increase Rate	State Proposed Total Salary Increase Rate	Non-State Proposed Total Salary Increase Rate	National Guard and Law Enforcement Proposed Total Salary Increase Rate
0	8.25%	12.00%	15.00%	20.00%
1	7.25%	9.50%	10.00%	20.00%
2	6.75%	7.25%	8.00%	20.00%
3	6.50%	N/A	N/A	10.00%
4	6.25%	N/A	N/A	10.00%

For Judges and Job Service, the current salary increase rate is 5.00% regardless of service. The proposed rates are 4.00% for Judges and 3.50% for Job Service regardless of service.

APPENDIX – Proposed Salary Increase (Age-Based Rates) - Main*, National Guard and Law Enforcement

Age	Current Total Salary Increase	Proposed Total Salary Increase	Age	Current Total Salary Increase	Proposed Total Salary Increase
18	6.25%	7.25%	30	5.93%	6.50%
19	6.25%	7.25%	31	5.82%	6.50%
20	6.25%	7.25%	32	5.72%	6.50%
21	6.25%	7.25%	33	5.64%	6.50%
22	6.25%	7.25%	34	5.57%	6.50%
23	6.25%	7.25%	35	5.50%	6.50%
24	6.25%	7.25%	36	5.44%	6.50%
25	6.25%	7.25%	37	5.38%	6.50%
26	6.25%	7.25%	38	5.32%	6.50%
27	6.25%	7.25%	39	5.27%	6.50%
28	6.22%	7.25%	40	5.23%	6.25%
29	6.07%	7.25%	41	5.20%	6.25%

*State Only

APPENDIX – Proposed Salary Increase (Age-Based Rates) - Main*, National Guard and Law Enforcement *(continued)*

Age	Current Total Salary Increase	Proposed Total Salary Increase	Age	Current Total Salary Increase	Proposed Total Salary Increase
42	5.17%	6.25%	54	4.94%	5.75%
43	5.14%	6.25%	55	4.93%	5.75%
44	5.12%	6.25%	56	4.92%	5.75%
45	5.11%	6.25%	57	4.91%	5.75%
46	5.09%	6.25%	58	4.90%	5.75%
47	5.07%	6.25%	59	4.88%	5.75%
48	5.05%	6.25%	60	4.86%	5.00%
49	5.04%	6.25%	61	4.81%	5.00%
50	5.02%	5.75%	62	4.74%	5.00%
51	5.00%	5.75%	63	4.70%	5.00%
52	4.98%	5.75%	64	4.70%	5.00%
53	4.96%	5.75%	65+	4.70%	5.00%

*State Only

APPENDIX – Proposed Salary Increase (Age-Based Rates) - Main Non-State

Age	Current Total Salary Increase	Proposed Total Salary Increase	Age	Current Total Salary Increase	Proposed Total Salary Increase
18	6.25%	7.25%	30	5.93%	6.50%
19	6.25%	7.25%	31	5.82%	6.50%
20	6.25%	7.25%	32	5.72%	6.50%
21	6.25%	7.25%	33	5.64%	6.50%
22	6.25%	7.25%	34	5.57%	6.50%
23	6.25%	7.25%	35	5.50%	6.50%
24	6.25%	7.25%	36	5.44%	6.50%
25	6.25%	7.25%	37	5.38%	6.50%
26	6.25%	7.25%	38	5.32%	6.50%
27	6.25%	7.25%	39	5.27%	6.50%
28	6.22%	7.25%	40	5.23%	6.25%
29	6.07%	7.25%	41	5.20%	6.25%

APPENDIX – Proposed Salary Increase (Age-Based Rates) - Main Non-State *(continued)*

Age	Current Total Salary Increase	Proposed Total Salary Increase	Age	Current Total Salary Increase	Proposed Total Salary Increase
42	5.17%	6.25%	54	4.94%	5.75%
43	5.14%	6.50%	55	4.93%	5.75%
44	5.12%	6.50%	56	4.92%	5.75%
45	5.11%	6.50%	57	4.91%	5.75%
46	5.09%	6.50%	58	4.90%	5.75%
47	5.07%	6.50%	59	4.88%	5.75%
48	5.05%	6.50%	60	4.86%	5.00%
49	5.04%	6.50%	61	4.81%	5.00%
50	5.02%	5.75%	62	4.74%	5.00%
51	5.00%	5.75%	63	4.70%	5.00%
52	4.98%	5.75%	64	4.70%	5.00%
53	4.96%	5.75%	65+	4.70%	5.00%

APPENDIX
Disability Retirement - PERS

Age	Males		Females	
	Current Rate	Proposed Rate	Current Rate	Proposed Rate
20 – 24	0.02%	0.01%	0.01%	0.01%
25 – 29	0.03%	0.02%	0.02%	0.01%
30 – 34	0.04%	0.02%	0.02%	0.01%
35 – 39	0.06%	0.03%	0.03%	0.02%
40 – 44	0.09%	0.05%	0.05%	0.03%
45 – 49	0.15%	0.09%	0.09%	0.04%
50 – 54	0.25%	0.15%	0.15%	0.08%
55 – 59	0.41%	0.25%	0.25%	0.12%
60 – 64	0.65%	0.39%	0.39%	0.20%

APPENDIX
Proposed Unreduced Retirement – Main System

Age	Current Retirement Rate	Proposed Retirement Rate	Age	Current Retirement Rate	Proposed Retirement Rate
50	0.00%	30.00%	63	25.00%	30.00%
51	8.00%	10.00%	64	30.00%	20.00%
52	8.00%	10.00%	65	30.00%	20.00%
53	8.00%	10.00%	66	20.00%	15.00%
54	8.00%	10.00%	67	20.00%	15.00%
55	8.00%	10.00%	68	20.00%	15.00%
56	10.00%	8.00%	69	20.00%	15.00%
57	10.00%	8.00%	70	20.00%	15.00%
58	10.00%	8.00%	71	20.00%	15.00%
59	10.00%	8.00%	72	20.00%	15.00%
60	10.00%	8.00%	73	20.00%	15.00%
61	10.00%	15.00%	74	20.00%	15.00%
62	35.00%	30.00%	75	100.00%	100.00%

APPENDIX
Proposed Reduced Retirement – Main System

Age	Current Retirement Rate	Proposed Retirement Rate
55	2.00%	1.00%
56	2.00%	1.00%
57	2.00%	1.00%
58	2.00%	1.00%
59	2.00%	1.00%
60	40.00%	2.00%
61	10.00%	5.00%
62	20.00%	10.00%
63	15.00%	10.00%
64	10.00%	10.00%
65	30.00%	30.00%

Age	Current Retirement Rate	Proposed Retirement Rate
66	20.00%	20.00%
67	20.00%	15.00%
68	20.00%	15.00%
69	20.00%	15.00%
70	20.00%	15.00%
71	20.00%	15.00%
72	20.00%	15.00%
73	20.00%	15.00%
74	20.00%	15.00%
75	100.00%	100.00%

APPENDIX
Proposed Retirement - Judges

Age	Current Retirement Rate	Proposed Retirement Rate
55	0.00%	10.00%
56	0.00%	10.00%
57	0.00%	10.00%
58	0.00%	10.00%
59	0.00%	10.00%
60	10.00%	10.00%
61	10.00%	10.00%
62	20.00%	10.00%
63	20.00%	10.00%
64	20.00%	10.00%
65	50.00%	20.00%

Age	Current Retirement Rate	Proposed Retirement Rate
66	50.00%	20.00%
67	50.00%	20.00%
68	50.00%	20.00%
69	50.00%	20.00%
70	100.00%	20.00%
71	100.00%	20.00%
72	100.00%	20.00%
73	100.00%	20.00%
74	100.00%	20.00%
75	100.00%	100.00%

APPENDIX – Proposed Retirement - National Guard and Law Enforcement

Age	Current Retirement Rate	Proposed Retirement Rate	Age	Current Retirement Rate	Proposed Retirement Rate
50	0.00%	25.00%	63	20.00%	50.00%
51	0.00%	25.00%	64	50.00%	50.00%
52	0.00%	25.00%	65	100.00%	50.00%
53	0.00%	25.00%	66	100.00%	20.00%
54	0.00%	25.00%	67	100.00%	20.00%
55	20.00%	10.00%	68	100.00%	20.00%
56	20.00%	10.00%	69	100.00%	20.00%
57	20.00%	10.00%	70	100.00%	20.00%
58	20.00%	10.00%	71	100.00%	20.00%
59	20.00%	10.00%	72	100.00%	20.00%
60	20.00%	10.00%	73	100.00%	20.00%
61	20.00%	10.00%	74	100.00%	20.00%
62	20.00%	50.00%	75	100.00%	100.00%

APPENDIX
Proposed Retirement – Job Service

Age	Current Retirement Rate	Proposed Retirement Rate
55	*	15.00%
56	*	15.00%
57	*	15.00%
58	*	15.00%
59	*	15.00%
60	*	15.00%
61	*	15.00%
62	*	15.00%
63	*	15.00%
64	*	15.00%
65	100.00%	100.00%

*75% if first time eligible for optional retirement, otherwise 100% at Normal Retirement Age

APPENDIX
Proposed Healthy Mortality – All Systems

Males

Age	Current Mortality Rate	Proposed Mortality Rate
50	0.17%	0.19%
55	0.27%	0.29%
60	0.47%	0.53%
65	0.88%	1.00%
70	1.61%	1.79%
75	2.73%	3.04%
80	4.69%	5.21%
85	8.05%	8.97%
90	13.60%	15.06%
95	21.66%	23.37%
100	29.99%	31.53%

Females

Age	Current Mortality Rate	Proposed Mortality Rate
50	0.13%	0.13%
55	0.20%	0.20%
60	0.35%	0.35%
65	0.67%	0.66%
70	1.22%	1.22%
75	2.07%	2.07%
80	3.41%	3.41%
85	5.63%	5.63%
90	9.63%	9.63%
95	15.76%	15.76%
100	21.52%	21.52%

Proposed mortality rates above are sample rates for 2014. For actuarial valuation purposes, mortality rates will be projected from 2014 on a generational basis using the SSA 2014 Intermediate Cost Improvement Scale.

APPENDIX
Proposed Disabled Mortality – All Systems

Males

Age	Current Mortality Rate	Proposed Mortality Rate
40	2.26%	2.82%
45	2.26%	2.82%
50	2.77%	3.46%
55	3.42%	4.27%
60	4.07%	5.08%
65	4.83%	6.04%
70	5.96%	7.45%
75	7.75%	9.69%
80	10.34%	12.92%
85	13.49%	16.87%
90	16.92%	21.15%
95	25.07%	31.34%
100	33.02%	41.28%

Females

Age	Current Mortality Rate	Proposed Mortality Rate
40	0.75%	0.93%
45	0.75%	0.93%
50	1.15%	1.44%
55	1.65%	2.07%
60	2.18%	2.73%
65	2.80%	3.50%
70	3.70%	4.70%
75	5.22%	6.53%
80	7.23%	9.04%
85	10.02%	12.53%
90	14.00%	17.51%
95	19.45%	23.41%
100	23.75%	29.68%