North Carolina Local Governmental Employees' Retirement System

Investigation of Demographic and Economic Experience
Five-Year Period from January 1, 2010 – December 31, 2014

Board of Trustees Meeting

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buckconsultants

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Local Plans Covered

- Local Governmental Employees' Retirement System
- Firefighters' and Rescue Squad Workers' Pension Fund

Plans to be Covered in January 2016

- Register of Deeds' Supplemental Pension Fund
- Death Benefit Plans

Agenda

- Experience Review Process
- Review of Demographic Assumptions
- Review of Economic Assumptions
- Review of Funding Methods
- Cost Impact of Proposed Assumptions and Method Changes

The Valuation Process

INPUT

- Member Data
- Asset Data
- Benefit Provisions
- Actuarial Assumptions
- Funding Methodology

RESULTS

- Actuarial Value of Assets
- Actuarial Accrued Liability
- Net Actuarial Gain or Loss
- Funded Ratio
- Employer Contributions

Over the short term, contributions are determined by the actuarial valuation based upon estimated investment return, benefits and expenses using assumptions and methods recommended by the actuary and adopted by the Board. Over the long term, contributions are adjusted to reflect actual investment return, benefits and expenses.

Actuarial Assumptions

- Actuarial assumptions bridge the gap between the information that we know with reasonable certainty as of the valuation date – age, gender, service, pay or benefits of the members – and what may happen in the future.
- The actuarial assumptions of the North Carolina Retirement Systems are reviewed every five years in a process known as an Experience Review.
  - The last experience review was prepared as of December 31, 2009 and first used in the December 31, 2009 valuation.
  - The results of this review will be used with the December 31, 2015 valuation.
- Detailed summaries of current actuarial assumptions are provided in the most recent actuarial valuation reports prepared for these two systems.

Actuarial Assumptions – 12/31/2014 LGERS Valuation

- **Demographic**
  - Mortality
    - Based on RP-2000 mortality tables adjusted for NCRS experience
    - Projected improvements based on Scale AA
  - Service Retirement
    - Varies by age, gender, service and employee group
    - Study reduced retirement and unreduced retirement
  - Disability
    - Varies by age, gender, and employee group
  - Termination
    - Varies by gender and employee group
    - Varies by service prior to five years of service and by age after five years of service
  - Leave Conversions
    - Adjustments to service and pay at retirement
    - Varies by gender and employee group

- **Economic**
  - Rate of Return (7.25%)
  - Inflation (3.00%)
  - Productivity Growth (0.5%)
  - Merit Pay Increases:

Years of Service	General Employees	Firefighters	Law Enforcement Officers
0	4.25%	5.05%	4.35%
5	3.00%	4.05%	3.60%
10	1.95%	3.10%	2.85%
15	1.70%	2.35%	2.15%
20	1.50%	1.70%	1.72%
25	1.50%	1.50%	1.60%
30	1.50%	1.50%	1.60%
35	1.50%	1.50%	1.60%

This is a summary of the assumptions currently used in the actuarial valuation of LGERS.

Assumptions are generally split into two broad categories – demographic assumptions and economic assumptions. Demographic assumptions are assumptions related to people, while economic assumptions relate to money.

Actuarial Assumptions – 12/31/2014 FRSWPF Valuation

- **Demographic**
  - Mortality
    - Based on RP-2000 mortality tables adjusted for NCRS experience
    - Projected improvements based on Scale AA
  - Service Retirement
    - 100% age at age 55
  - Disability
    - Based on LGERS firefighters
  - Termination and Lapse Assumption
    - Termination varies by service
    - Lapse assumption adjustments based on preliminary data audit findings
    - Full select and ultimate lapse assumption to be developed upon completion of full data audit
    - Termination assumptions to be adjusted accordingly
    - Beyond the scope of this experience review

- **Economic**
  - Rate of Return (7.25%)
  - Inflation (3.00%)
  - Productivity Growth: Not applicable
  - Merit Pay Increases: Not applicable

This is a summary of the assumptions currently used in the actuarial valuation of FRSWPF.

Assumptions are generally split into two broad categories – demographic assumptions and economic assumptions. Demographic assumptions are assumptions related to people, while economic assumptions relate to money.

Experience Review Process

- Based on Five-Year Experience Review for Period January 1, 2010 – December 31, 2014
- Consider trends observed during the previous Experience Review
- Compare Experience ("Actual") with Assumptions ("Expected")
- Make Judgments About Future Trends:
  - Plan-Specific Experience vs. National Trends
  - Long-Term vs. Short-Term Factors
- Recommend changes in assumptions as needed
- Implement effective with the December 31, 2015 Actuarial Valuation
- For full sets of rates see corresponding reports

"Enhancing Reliability of Actuarial Valuations for Pension Plans" by the GFOA

Engage the actuary to perform additional services to validate the actuarial assumptions used for the valuation. Such services include…Actuarial Experience Study. An actuarial experience study reviews the differences between a plan's assumed and actual experience over multiple years (typically 3 to 5), with the goal of examining the trends related to actual experience and recommending changes to assumptions, if needed.

Key Takeaways - LGERS

Assumption	Observed Experience Relative to Expectations	Recommendation	Impact on Costs
1. Mortality	Fewer Deaths	Decrease Rates and Update Mortality Improvement Projection Scale	Significant Increase
2. Service retirement	Fewer Retirements	Decrease Rates	Slight Decrease
3. Disability retirement	Fewer Disabilities	Decrease Rates	Slight Decrease
4. Termination from active employment	Fewer Terminations	Decrease Rates	Slight Increase
5. Leave conversions at retirement	Varies by Group	Varies by Group	Immaterial
6. Investment return	Current Assumption Reasonable	No Change	N/A
7. Merit pay increases	Lower Increases	Decrease Rates	Significant Decrease
8. Inflation	Current Assumption Reasonable	No Change	N/A
9. Productivity growth	Current Assumption Reasonable	No Change	N/A
10. Amortization method	Current Assumption Reasonable	No Change	N/A
11. Actuarial cost method	Inconsistent to Other Systems	Move to Entry Age	Increase
12. Asset valuation method	Not Transparent or Predictable	5-year Smoothing	Slight Decrease

Notes:

1. The mortality assumption was the source of the largest increase in costs. While we did observe fewer deaths than expected over the past few years, the increase in costs was driven more by the increase in mortality improvements suggested by national studies

6. The current investment return assumption of 7.25% remains reasonable

7. The merit increase assumption was the source of the largest decrease in costs as salaries continued to fall short of the long-term assumptions

Overall, the net impact on liabilities was an increase

Key Takeaways - FRSWPF

Assumption	Observed Experience Relative to Expectations	Recommendation	Impact on Costs
1. Mortality	Fewer Deaths	Decrease Rates and Update Mortality Improvement Projection Scale	Significant Increase
2. Service retirement	In-Service Distributions	No Change	N/A
3. Disability retirement	Fewer Disabilities	Decrease Rates (with LGERS)	Slight Decrease
4. Termination from active employment	Under Data Audit Review	N/A	N/A
5. Lapse assumption	Under Data Audit Review	N/A	N/A
6. Investment return	Current Assumption Reasonable	No Change	N/A
7. Merit pay increases	N/A	N/A	N/A
8. Inflation	Current Assumption Reasonable	No Change	N/A
9. Productivity growth	N/A	N/A	N/A
10. Amortization method	Current Assumption Reasonable	No Change	N/A
11. Actuarial cost method	Current Assumption Reasonable	No Change	N/A
12. Asset valuation method	Not Transparent or Predictable	5-year Smoothing	Slight Decrease

Notes:

1. The mortality assumption was the source of the largest increase in costs. While we did observe fewer deaths than expected over the past few years, the increase in costs was driven more by the increase in mortality improvements suggested by national studies

6. The current investment return assumption of 7.25% remains reasonable

Overall, the net impact on liabilities was an increase

Demographic Assumptions

Post-Retirement and Active Mortality

Retirement

Termination

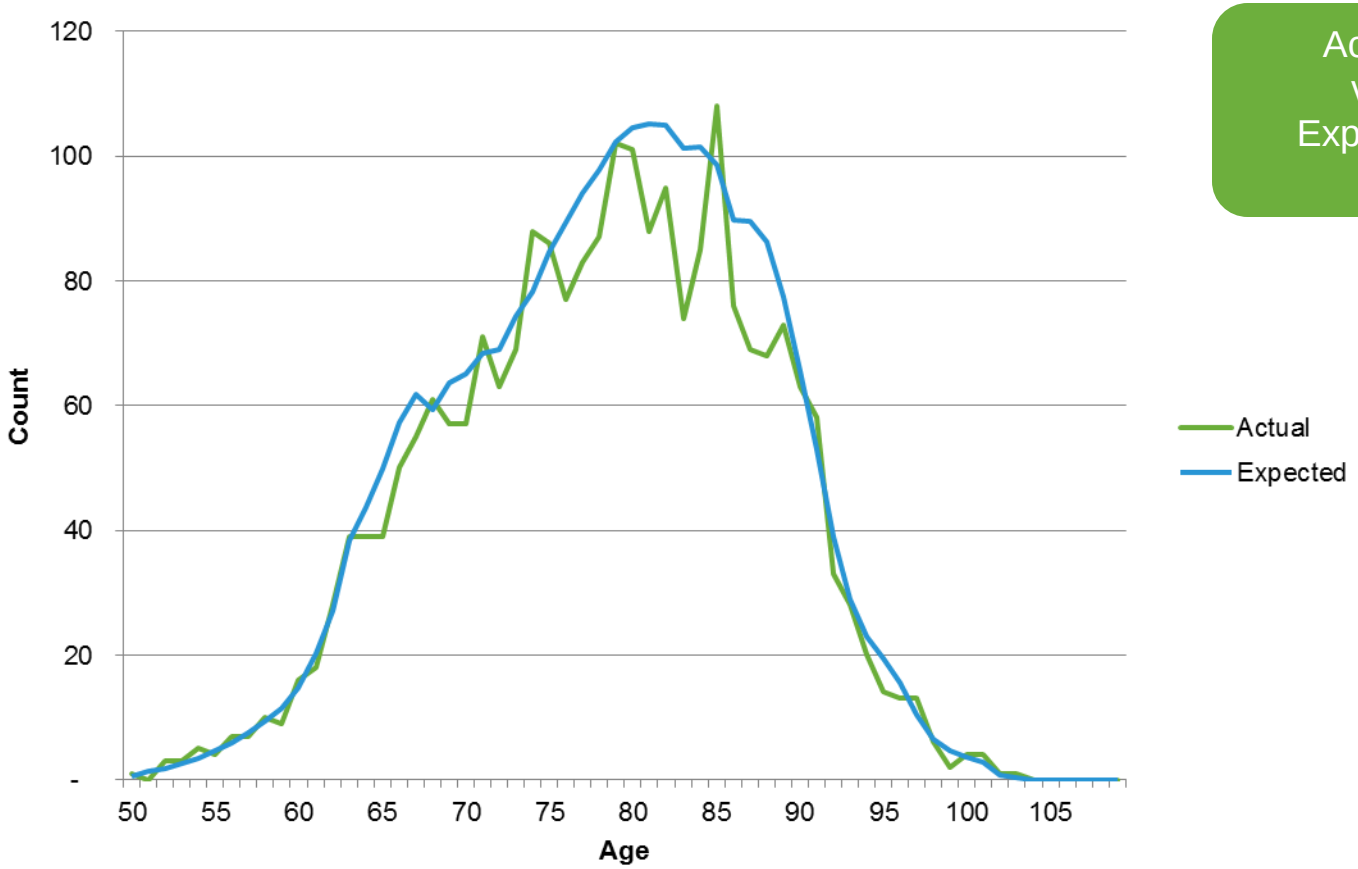
Disability

Leave Conversions

Mortality Rates - Considerations

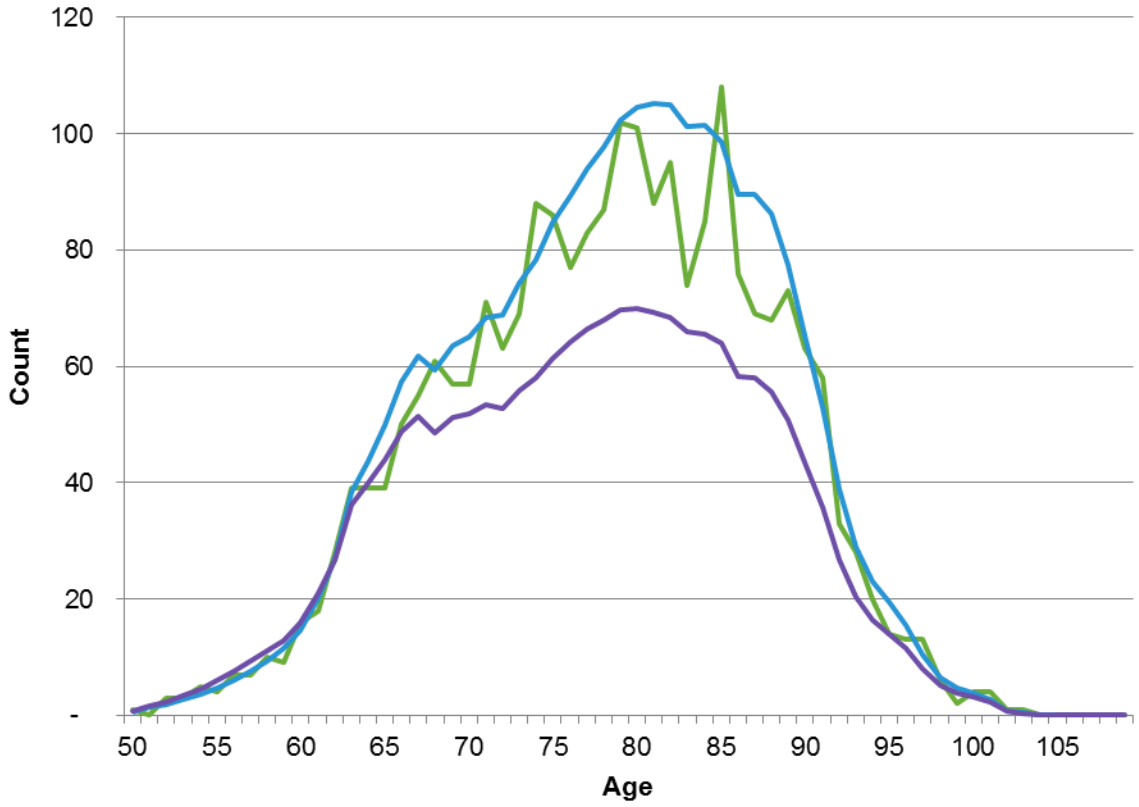
- Mortality tables vary by age, gender, employee group and health status
- Current mortality rates
  - Based on RP-2000 mortality tables released in 2003
  - Adjusted to LGERS population based on results of December 31, 2009 experience study
  - Includes provision to reflect future mortality improvements based on mortality projection Scale AA (for members healthy at retirement, not disabled at retirement)
- Recent studies of the U.S. Population have determined that overall rates of mortality have decreased faster than predicted by Scale AA
  - Project that longevity will continue to improve
  - Society of Actuaries released new mortality tables to reflect improved base mortality rates (RP-2014) and mortality improvement rates (MP-2014)
- In most age groups, the experience review showed actual observed mortality rates significantly lower than expected mortality rates based on current tables

Post-Retirement Mortality – Male General Employees



Observation: Actual experience shows slightly fewer observed deaths at most ages than expected based on current mortality tables

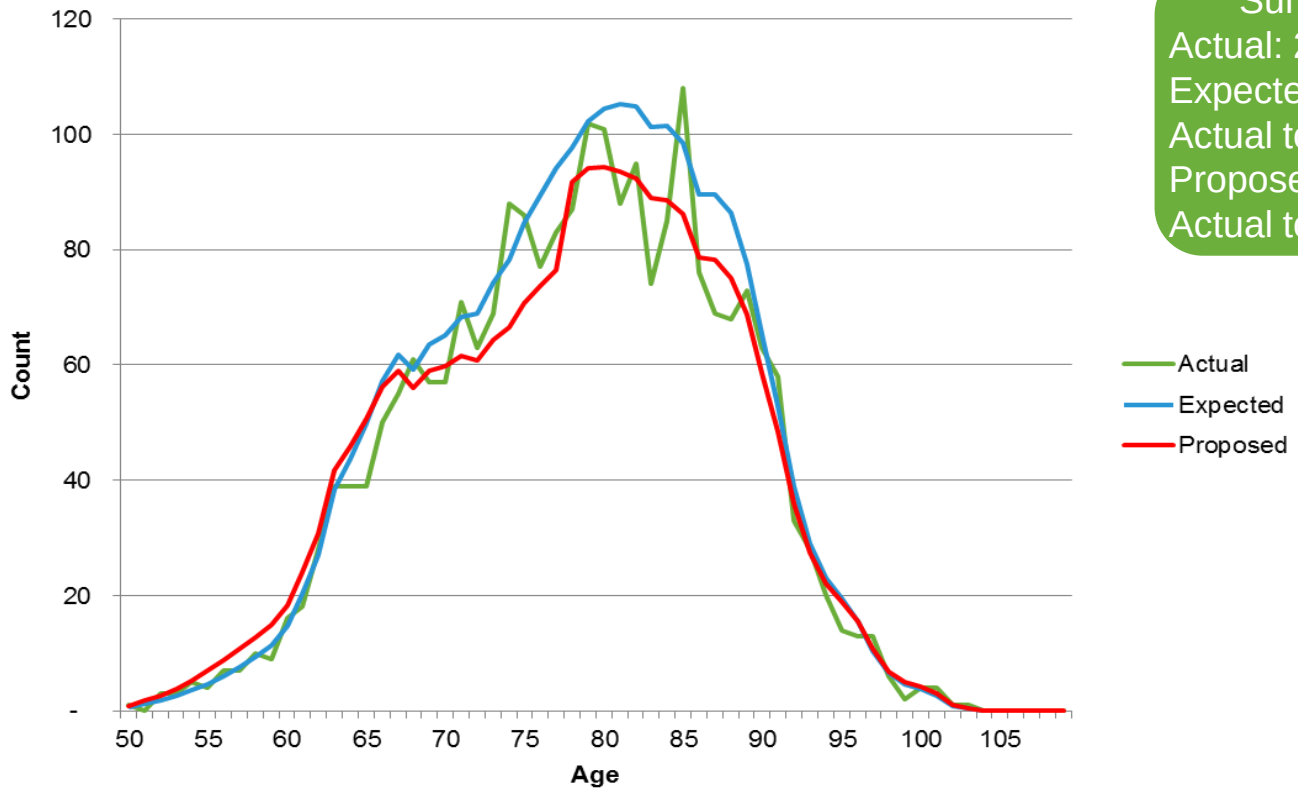
Post-Retirement Mortality – Male General Employees



Actual
vs.
Expected
vs.
RP-2014

Observation: The base mortality table for males released by the Society of Actuaries (RP-2014) is NOT a good fit for Male General Employees as it predicts significantly fewer deaths than those observed

Post-Retirement Mortality – Male General Employees



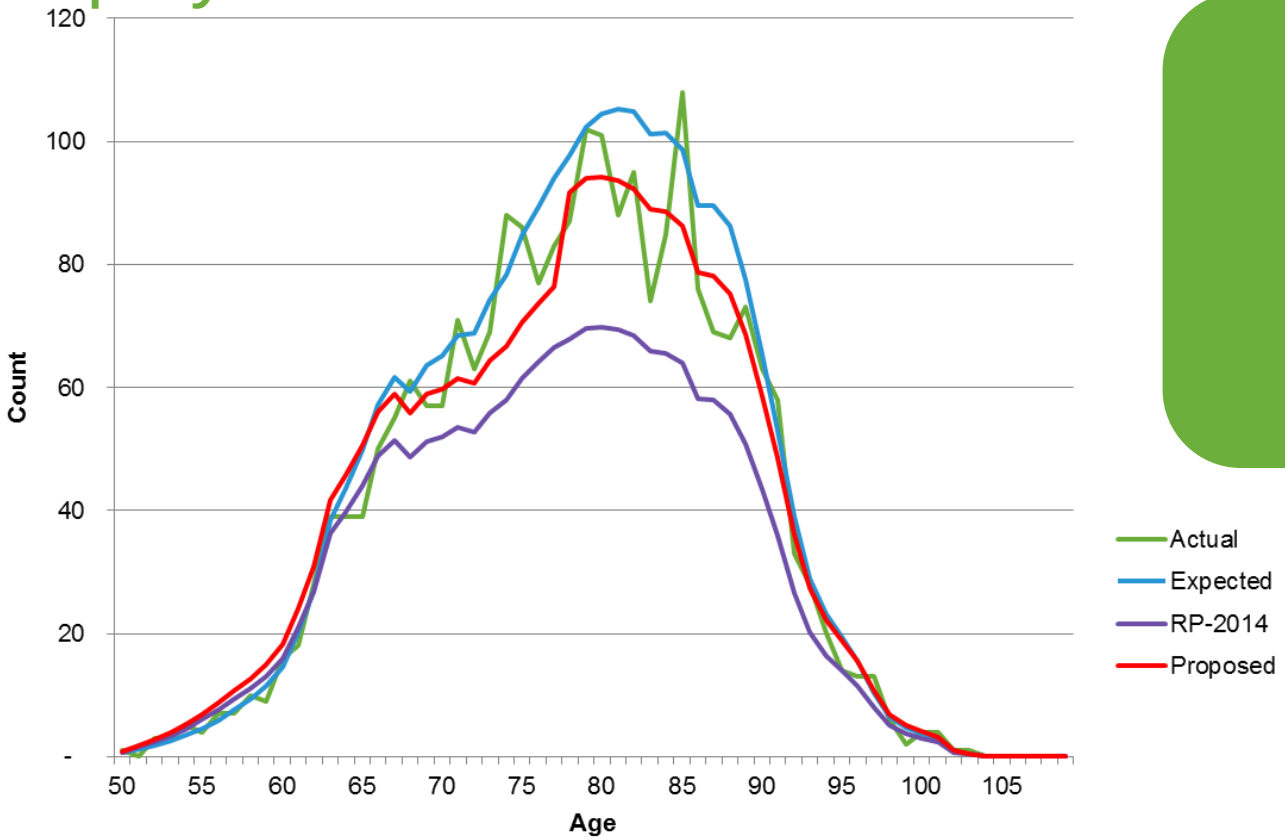
Summary Metrics:
Actual: 2,333
Expected: 2,541
Actual to Expected: 92%
Proposed: 2,332
Actual to Proposed: 100%

Observation: By grouping ages 50 to 77 and grouping ages 78 and over, we have enough credible data to make a better fit to the observed experience

Recommendation: Update base rates to RP-2014 multiplied by 115% for ages under 78 and by 135% for ages 78 and over

Impact: Significant increase in liability

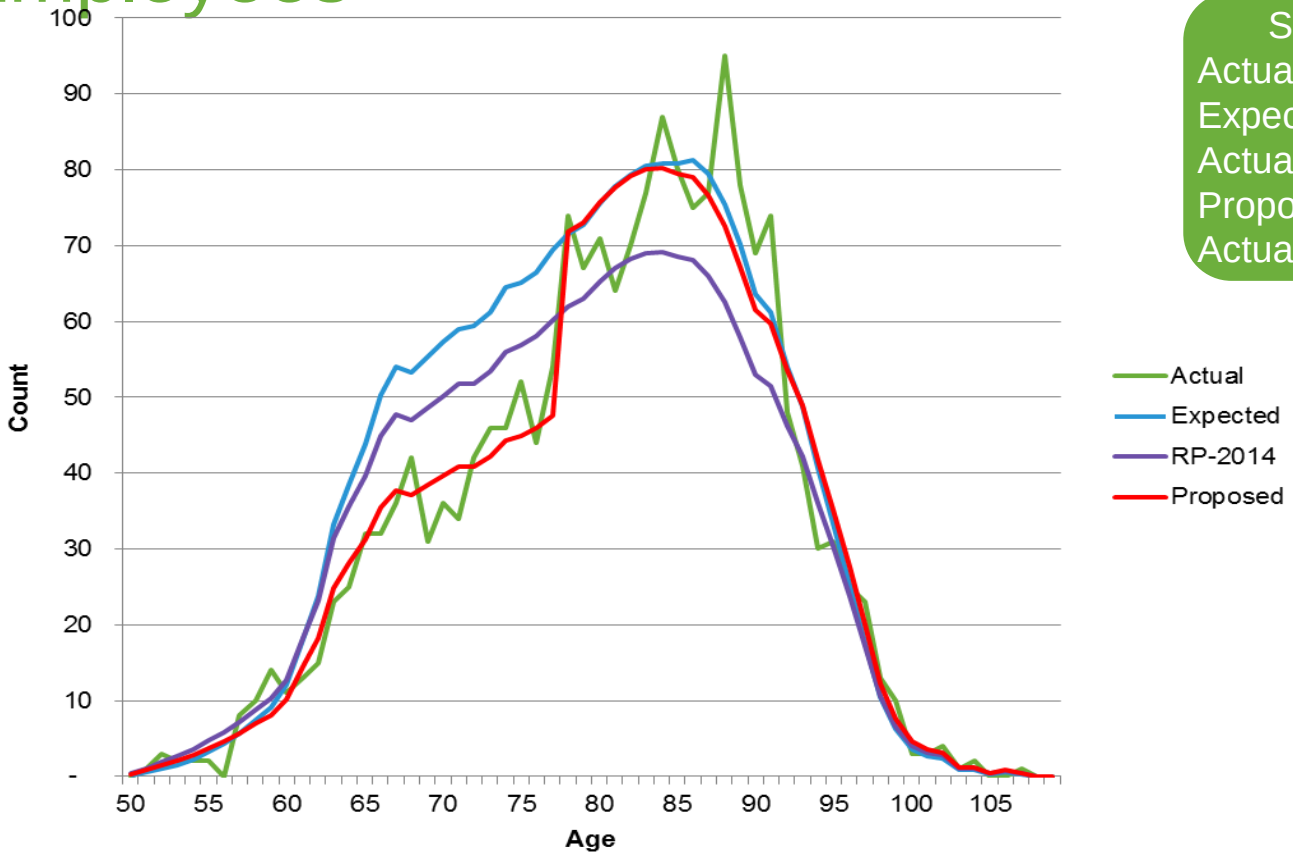
Post-Retirement Mortality – Male General Employees



Actual
vs.
Expected
vs.
RP-2014
vs.
Proposed

Observation: This process was reviewed for all employee groups and retirement systems. Where credible data exists (typically 1,082 observed deaths for fully credible groupings), we have proposed tables that are adjusted to fit the observed data. A few groups are partially credible and a few groups do not have enough credible date to justify moving beyond RP-2014 (e.g., Firefighters, Rescue Squad Workers, Law Enforcement)

Post-Retirement Mortality – Female General Employees



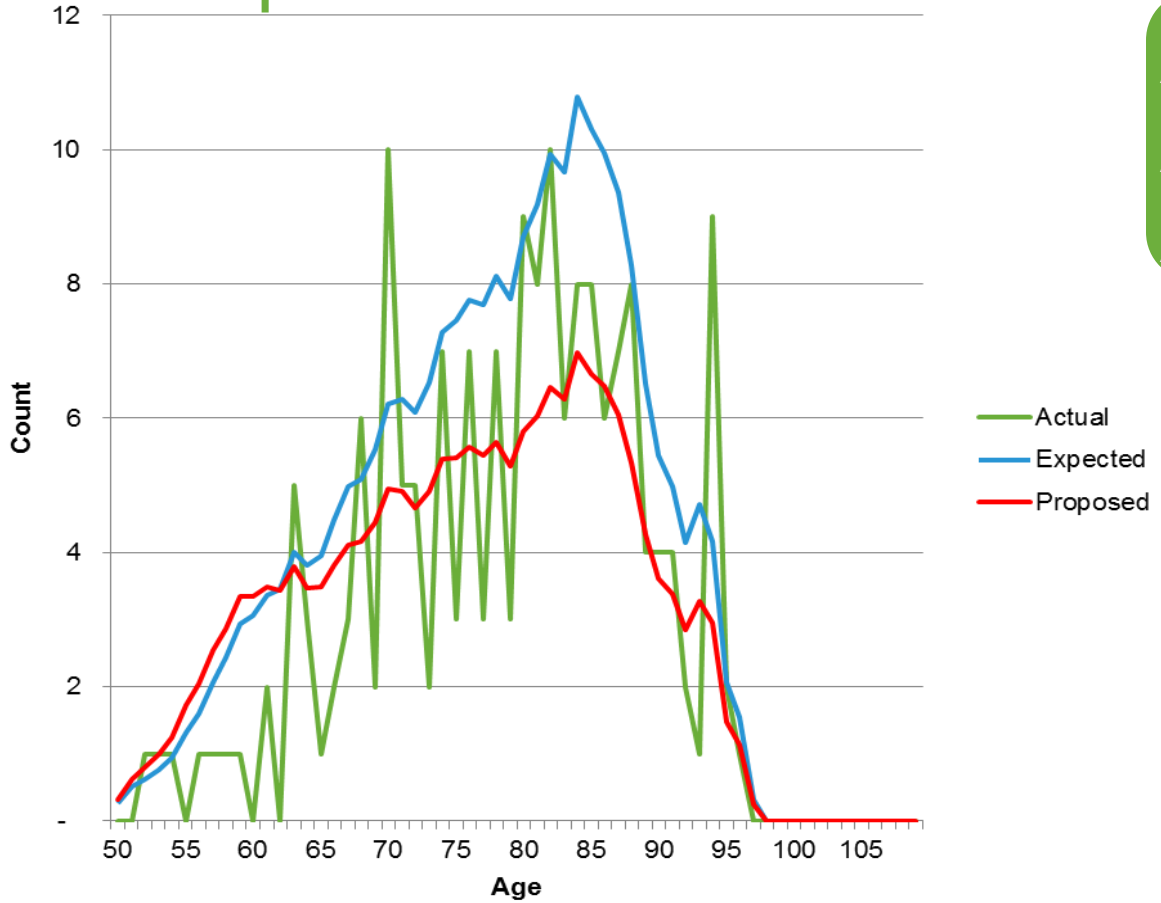
Summary Metrics:
Actual: 1,949
Expected: 2,217
Actual to Expected: 88%
Proposed: 1,955
Actual to Proposed: 100%

Observation: Significant differences occurred over the period

Recommendation: Update base rates to RP-2014 rates multiplied by 79% for ages under 78 and by 116% for ages 78 and over

Impact: Significant increase in liability

Post-Retirement Mortality – Male Firefighters and Rescue Squad Workers



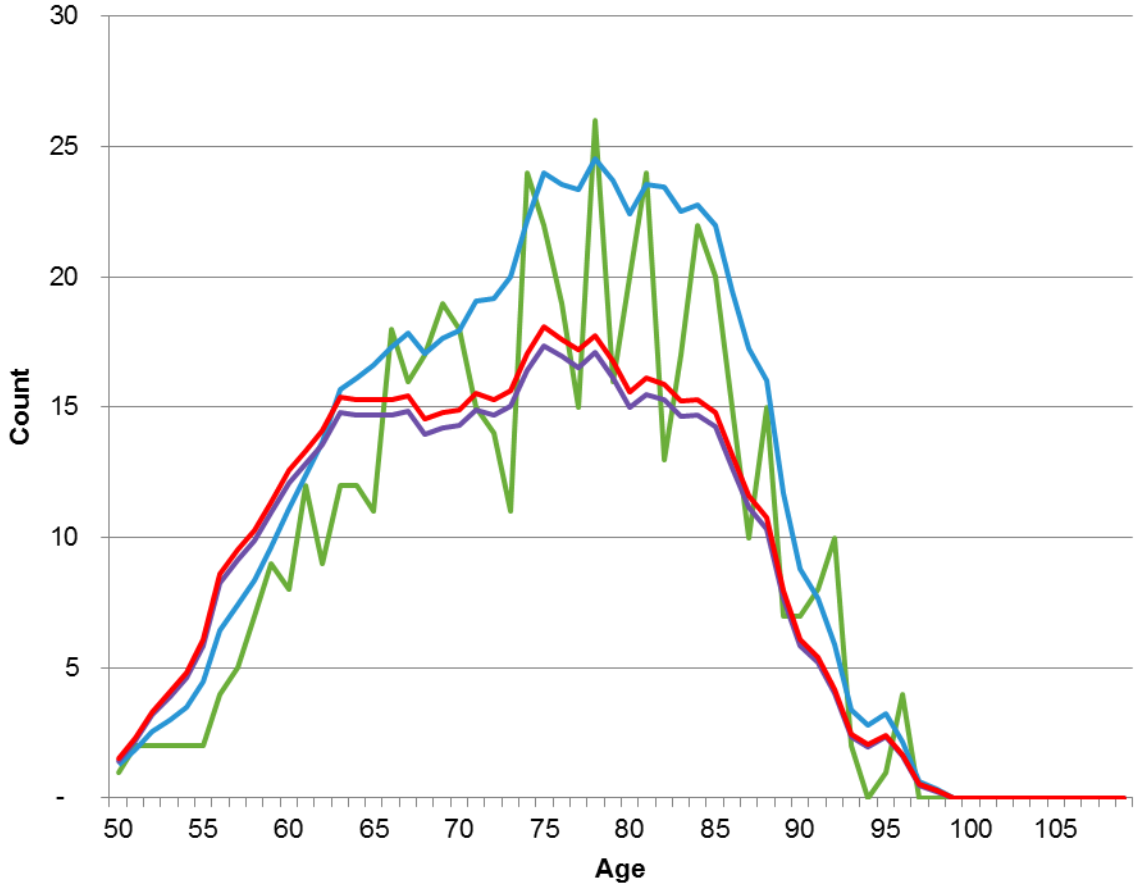
Summary Metrics:
Actual: 180
Expected: 246
Actual to Expected: 73%
Proposed: 186
Actual to Proposed: 97%

Observation: Too few observed deaths to modify tables based on experience

Recommendation: Update base rates to RP-2014 for both LGERS and FRSWPF

Impact: Increase in liability

Post-Retirement Mortality – Male Law Enforcement Officers



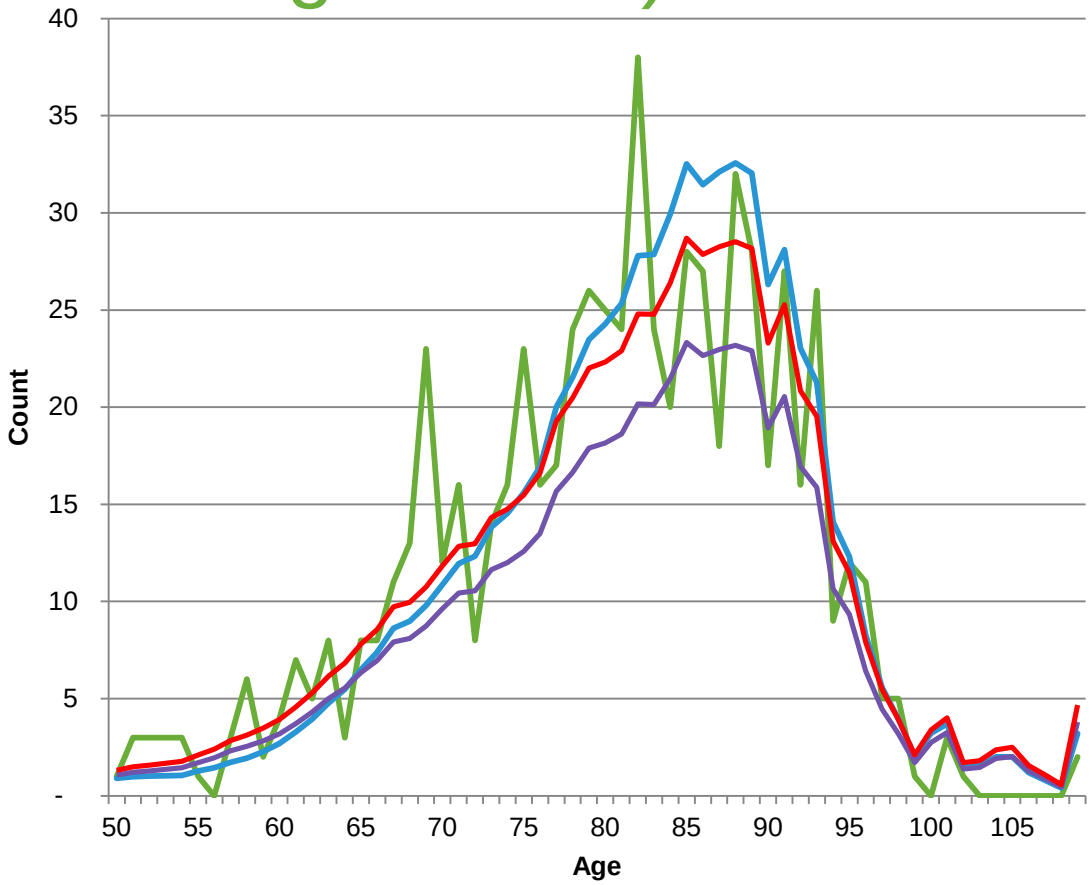
Summary Metrics:
Actual: 545
Expected: 658
Actual to Expected: 83%
Proposed: 537
Actual to Proposed: 101%

Observation: Significant differences occurred over the period

Recommendation: Update base rates to RP-2014 rates multiplied by 104% for all ages

Impact: Significant increase in liability

Post-Retirement Mortality – Male Beneficiaries (including TSERS)



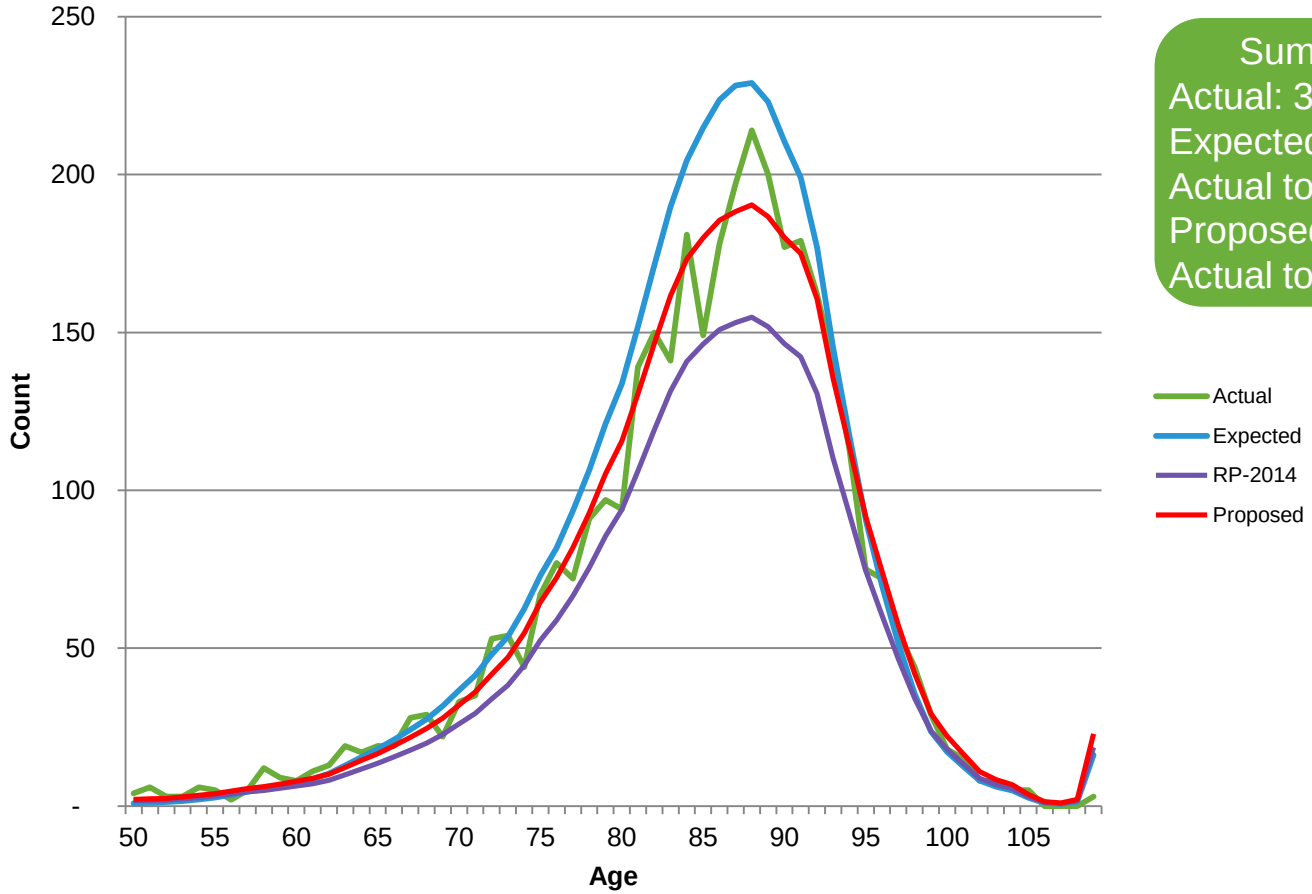
Summary Metrics:
Actual: 702
Expected: 700
Actual to Expected: 100%
Proposed: 677
Actual to Proposed: 104%

Observation: TSERS and LGERS experience for beneficiaries of deceased retirees have been combined to give more credibility to the data. Actual mortality rates are much higher than for service retirements.

Recommendation: Update base rates to RP-2014 multiplied by 123% for all ages

Impact: Increase in liability

Post-Retirement Mortality – Female Beneficiaries (including TSERS)



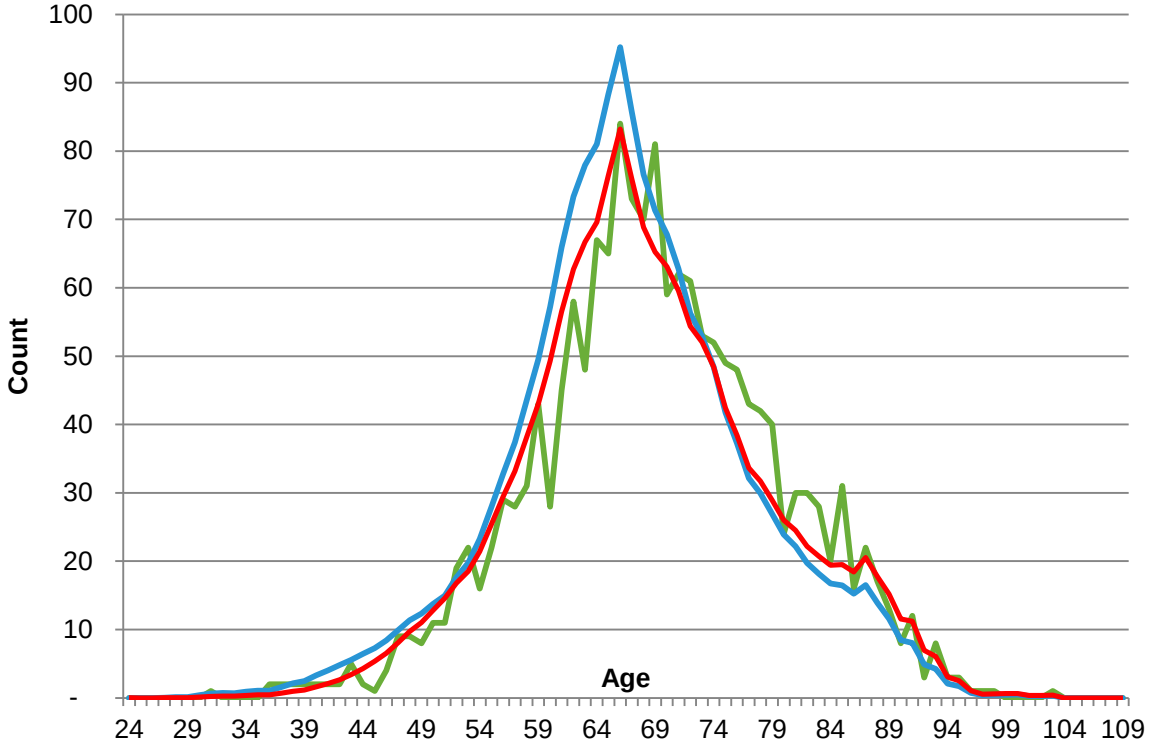
Summary Metrics:
Actual: 3,633
Expected: 4,088
Actual to Expected: 89%
Proposed: 3,646
Actual to Proposed: 100%

Observation: TSERS and LGERS experience for beneficiaries of deceased retirees have been combined to give more credibility to the data. Actual mortality rates are much higher than for service retirements.

Recommendation: Update base rates to RP-2014 multiplied by 123% for all ages

Impact: Significant increase in liability

Post-Retirement Mortality – Male Disabled (including TSERS)



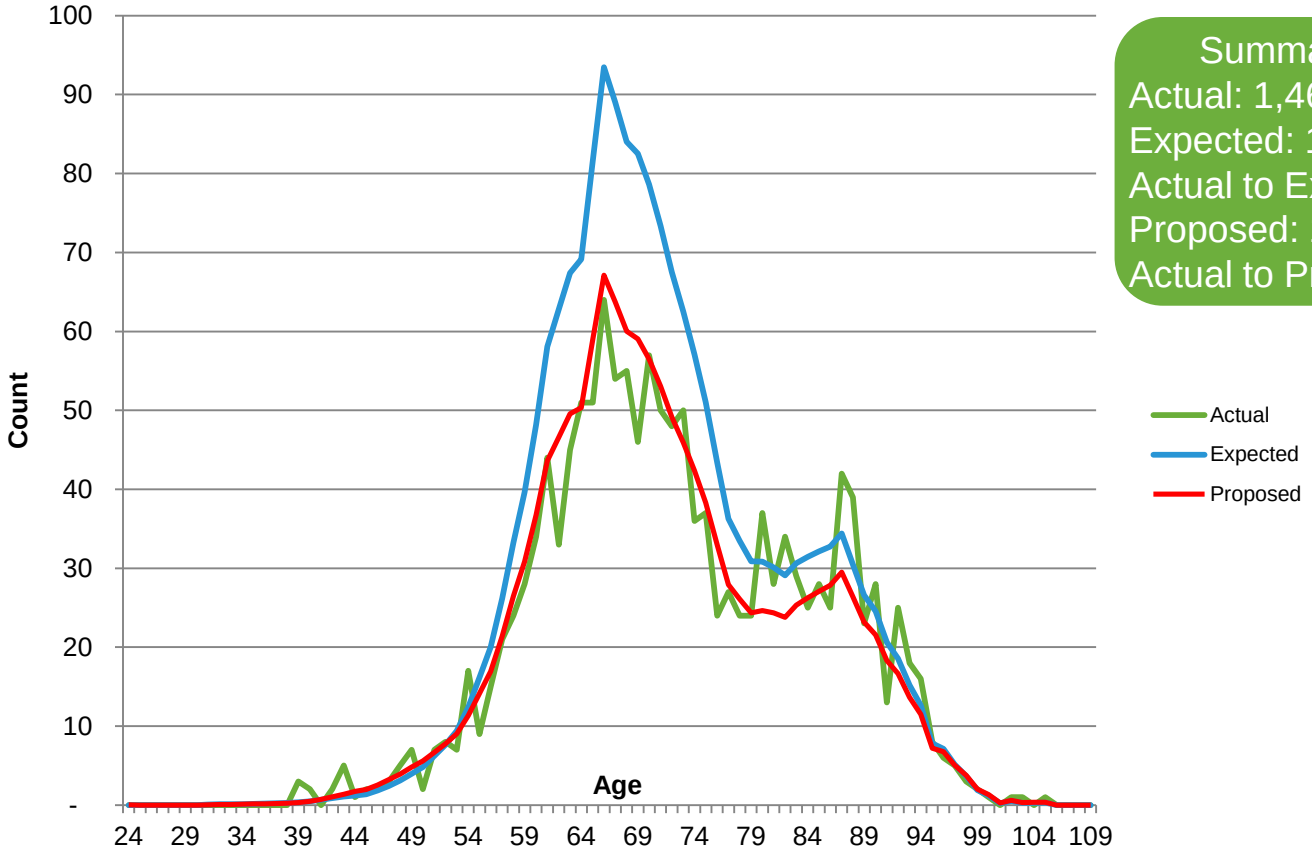
Summary Metrics:
Actual: 1,685
Expected: 1,802
Actual to Expected: 94%
Proposed: 1,691
Actual to Proposed: 100%

Observation: TSERS and LGERS experience for members disabled at retirement have been combined to give more credibility to the data. Actual mortality rates are very close to RP-2014 Disabled mortality table recently released by Society of Actuaries

Recommendation: Update base rates to RP-2014 Disabled mortality multiplied by 103% for all ages

Impact: Significant increase in liability

Post-Retirement Mortality – Female Disabled (including TSERS)



Summary Metrics:
Actual: 1,462
Expected: 1,893
Actual to Expected: 77%
Proposed: 1,474
Actual to Proposed: 99%

Observation: TSERS and LGERS experience for members disabled at retirement have been combined to give more credibility to the data. Actual mortality rates are very close to RP-2014 Disabled mortality table recently released by Society of Actuaries

Recommendation: Update base rates to RP-2014 Disabled mortality multiplied by 99% for all ages

Impact: Significant increase in liability

Post-Retirement Mortality (Summary)

Number of Post-Retirement Deaths

Type of Retiree		Actual	Expected	Actual ÷ Expected	Proposed	Actual ÷ Proposed
Service Retirement	General Employees Male	2,333	2,541	92%	2,332	100%
	General Employees Female	1,949	2,217	88%	1,955	100%
	Firefighters Male	180	246	73%	186	97%
	Law Enforcement Officers Male	545	658	83%	537	101%
Beneficiary*	Male	702	700	100%	677	104%
	Female	3,633	4,088	89%	3,646	100%
Disability*	Male	1,685	1,802	94%	1,691	100%
	Female	1,462	1,893	77%	1,474	99%

* Data shown includes TSERS. Mortality rates for members disabled at retirement and survivors of deceased members were studied based on the combined experience of TSERS and LGERS.

Observation: Fewer members have died than expected almost across all groupings

Recommendation: Update base rates from LGERS adjusted versions of RP-2000 tables to LGERS adjusted versions of RP-2014 tables for both LGERS and FRSWPF

Cost impact: Significant increase in liability

Active Mortality

Mortality for actives is not a big driver of costs because of the number of deaths and the potentially lower amount of benefits than had the member retired.

Observation: Over the last five years, fewer actives died than expected. The number of deaths was too few for meaningful credibility.

Recommendation: Update base rates from adjusted versions of RP-2000 tables to RP-2014 employee tables for both LGERS and FRSWPF

Cost impact: Immaterial

Mortality Improvement

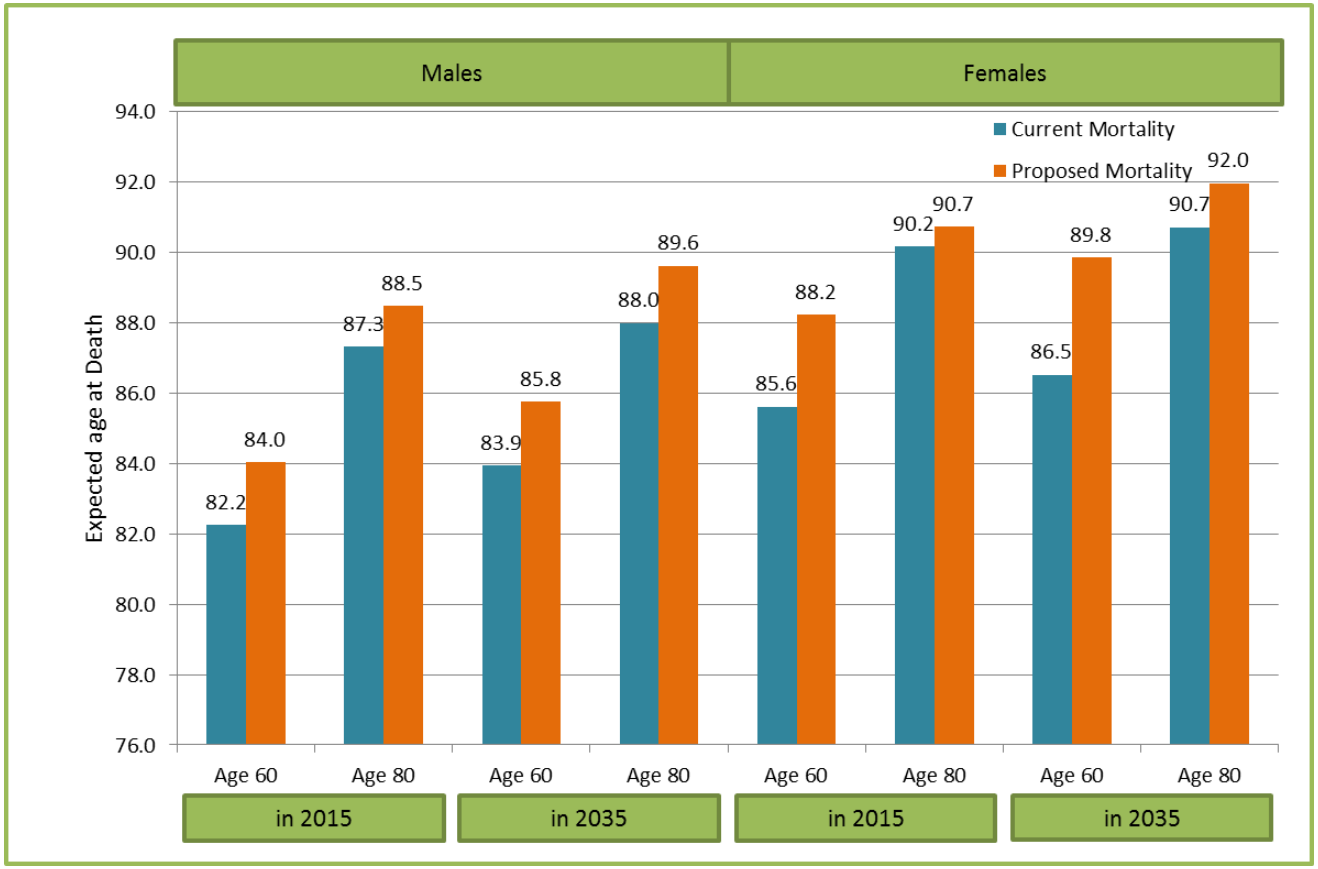
We have seen continued and steady improvement in mortality rates over time. Actuarial Standard of Practice No. 35 states that the actuary should "include an assumption as to expected mortality improvement after the measurement date." Based on the recommendation contained in the December 31, 2004 experience review, the Board in 2006 adopted generational mortality based on rates of mortality improvement known as Scale AA. The use of scale AA was recommended for the December 31, 2009 experience review. At that time no other projection scales had been developed. Since the last experience study, the Society of Actuaries (SOA) conducted a mortality study and determined that the overall rates of mortality improvement in the US have differed from those predicted by Scale AA. In November 2014, the SOA released projection scale MP-2014. There are alternate viewpoints on the use of Scale MP-2014. First, there are those that believe that MP-2014 is unduly conservative with unrealistic mortality improvement rates. Emerging experience since the data was collected by the SOA seems to support that contention. Second, many systems reflect mortality improvements for a set period of years into the future, not forever. These alternate viewpoints suggest using mortality tables that project shorter life expectancy than those based on MP-2014. All that being said, North Carolina Retirement Systems have been consistently ahead of the curve in updating mortality tables and improvement scales. In addition, MP-2014 is based on more current data and has a two-dimensional improvement assumption that is a function of both age and calendar year.

Observation: SOA Study indicates that overall rates of mortality in the US have decreased faster than predicted by Scale AA (adopted by the Board in 2006)

Recommendation: Update from projection Scale AA to MP-2014; project base mortality rates to the valuation date using MP-2014; project forward generationally from the valuation date using MP-2014

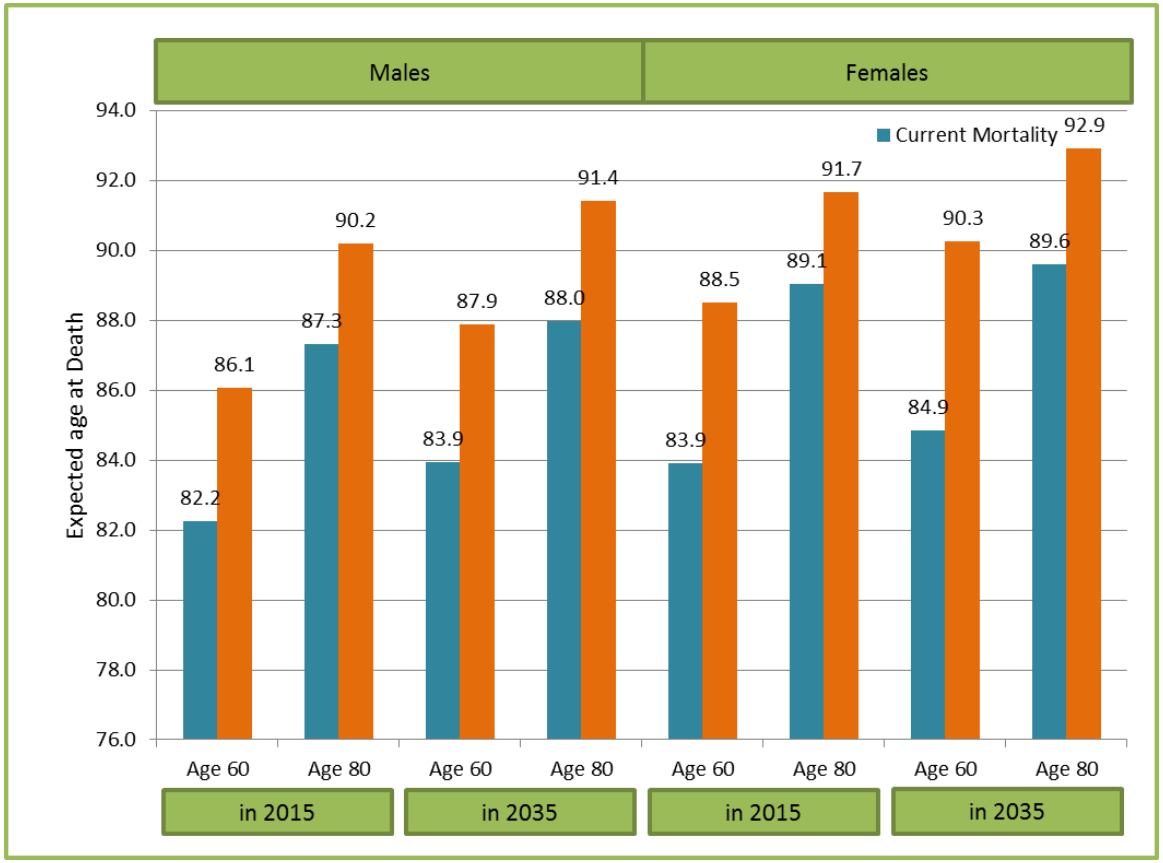
Cost impact: Significant increase in liability

Expected Ages at Death – General Employees (Service Retirements)



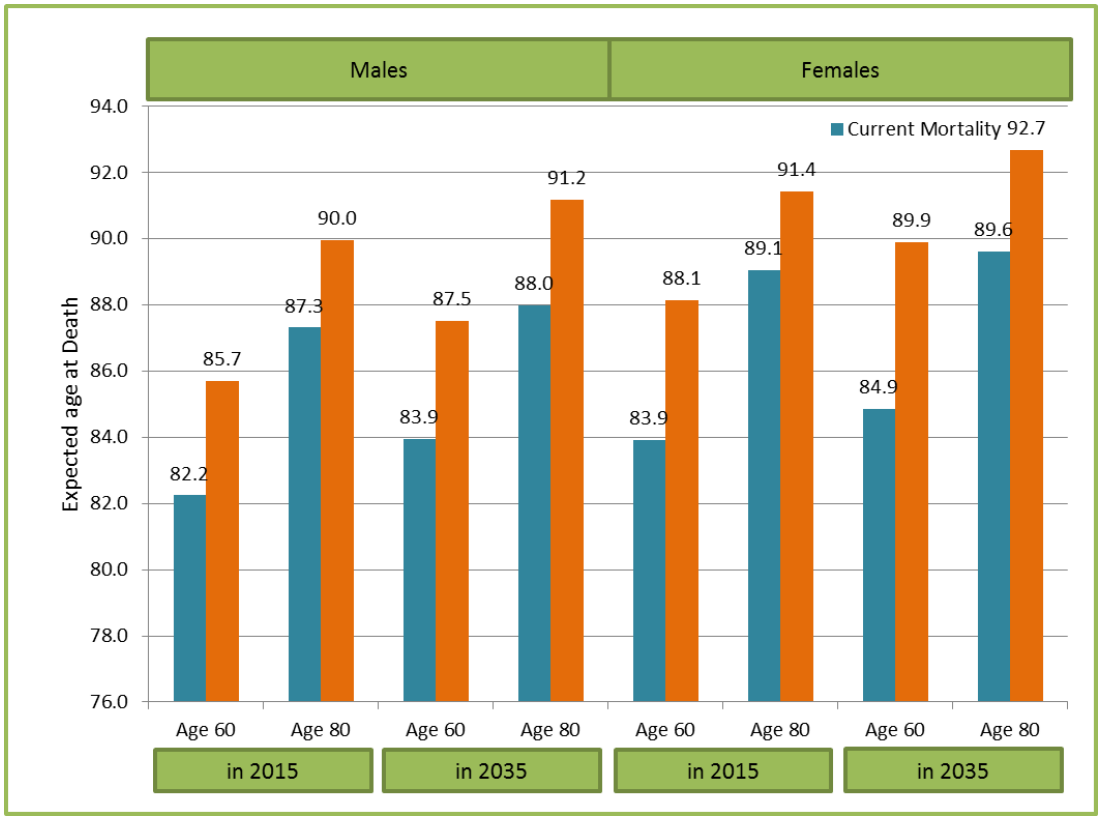
The expected ages at death shown above are based on the current and proposed mortality assumptions. The ages at death under the proposed assumptions are significantly later than those under current assumptions for the ages and genders shown. Note that we show expected age at death in 2015 and 2035 to illustrate the impact of generational mortality improvement.

Expected Ages at Death – Firefighters and Rescue Squad Workers (Service Retirements)



The expected ages at death shown above are based on the current and proposed mortality assumptions. The ages at death under the proposed assumptions are significantly later than those under current assumptions for the ages and genders shown. Note that we show expected age at death in 2015 and 2035 to illustrate the impact of generational mortality improvement.

Expected Ages at Death – Law Enforcement Officers (Service Retirements)

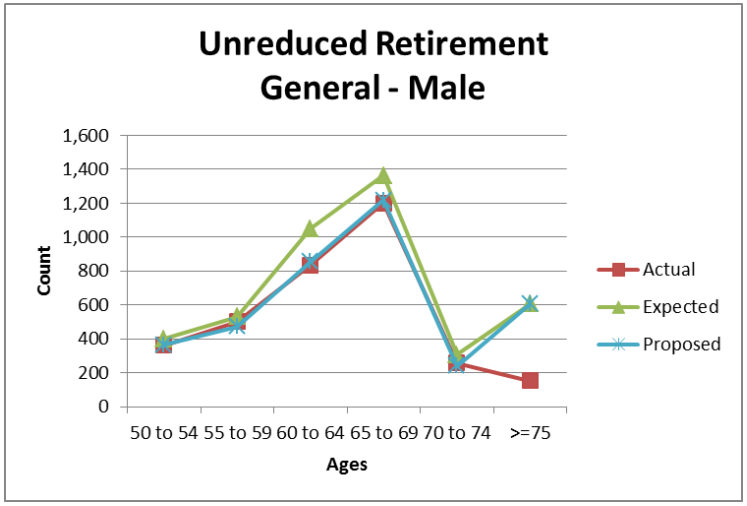


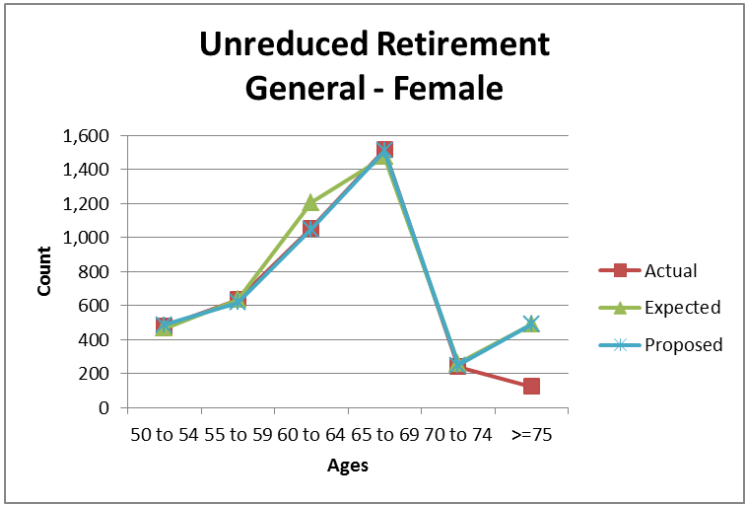
The expected ages at death shown above are based on the current and proposed mortality assumptions. The ages at death under the proposed assumptions are significantly later than those under current assumptions for the ages and genders shown. Note that we show expected age at death in 2015 and 2035 to illustrate the impact of generational mortality improvement.

Retirement Rates - Considerations

- Retirement rates that vary by age, gender, employee group and type of retirement (i.e., reduced and unreduced)
- The current retirement rates are based on the recommendation made in the prior experience study.
- The retirement rates result in expected retirements greater than actual retirements for both unreduced retirements and reduced retirements for all employee groups other than law enforcement officers
- Use of actual experience of the plan is common practice
- Generally, assuming more retirements results in higher estimated costs
- FRSWPF allows in-service distribution of pensions after attaining age 55 and 20 years of service – propose continued assumption of 100% retirement upon eligibility

Retirement Rates – Unreduced – General Employees





Summary Metrics (Male):
Actual: 3,380
Expected: 4,331
Actual to Expected: 78%
Proposed: 3,822
Actual to Proposed: 88%

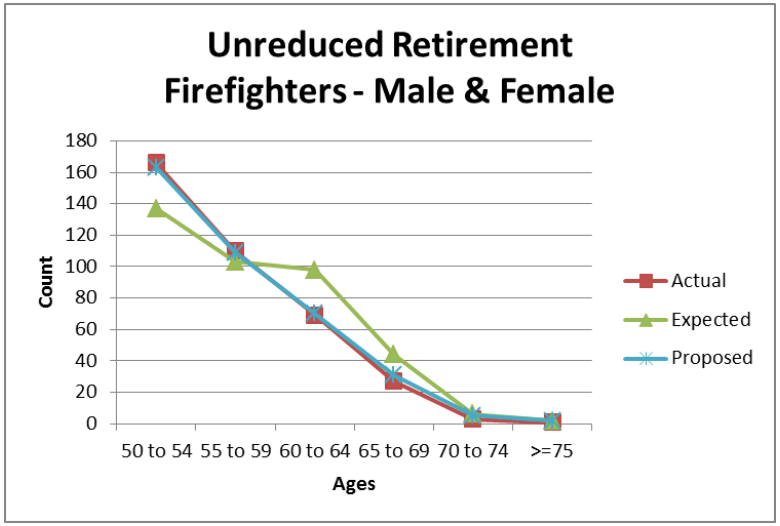
Summary Metrics (Female):
Actual: 4,095
Expected: 4,573
Actual to Expected: 90%
Proposed: 4,449
Actual to Proposed: 92%

Observation: There were fewer retirements than expected for both males and females

Recommendation: Decrease rates of retirement to reflect experience

Impact: Slight decrease in costs

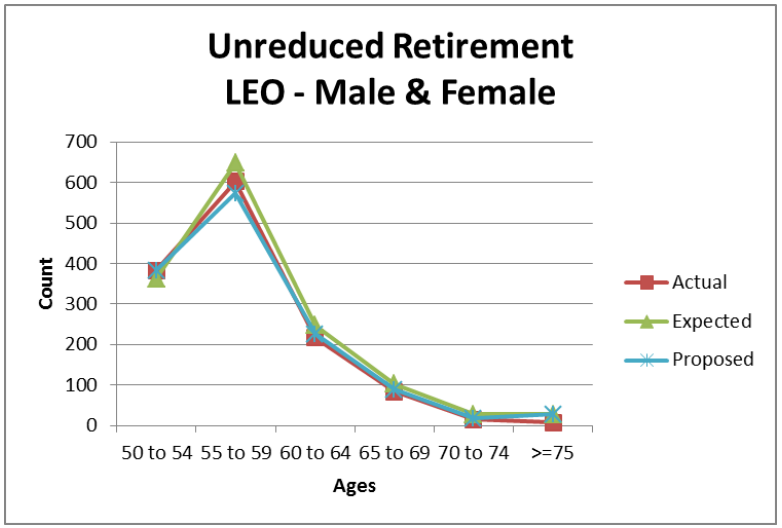
Retirement Rates – Unreduced – Firefighters and Rescue Squad Workers



Summary Metrics (Male):
Actual: 413
Expected: 418
Actual to Expected: 99%
Proposed: 413
Actual to Proposed: 100%

Observation: No significant differences over the period
Recommendation: Small change in rates at certain ages to reflect experience
Impact: Immaterial

Retirement Rates – Unreduced – Law Enforcement Officers



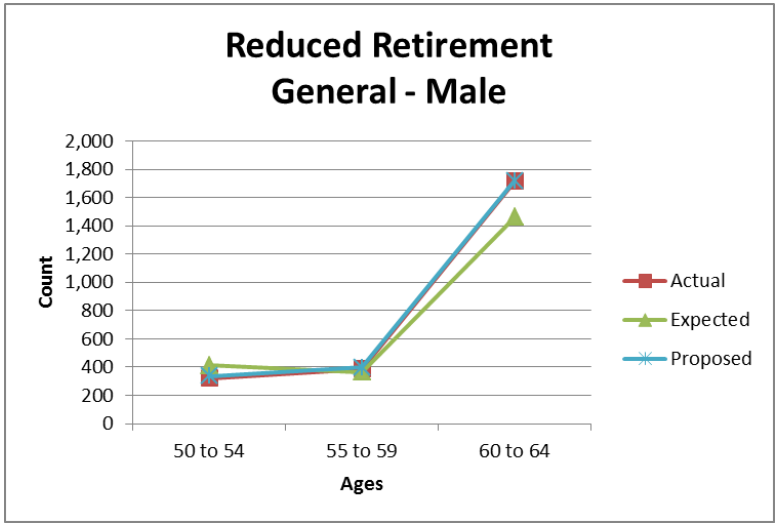
Summary Metrics (Male):
Actual: 1,417
Expected: 1,509
Actual to Expected: 94%
Proposed: 1,413
Actual to Proposed: 100%

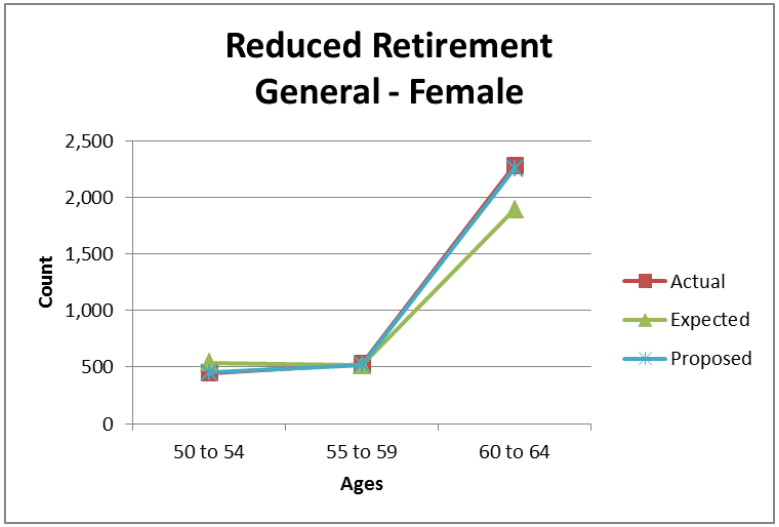
Observation: There were fewer retirements than expected for combined genders

Recommendation: Decrease rates of retirement to reflect experience

Impact: Slight decrease in costs

Retirement Rates – Reduced – General Employees





Summary Metrics (Male):
Actual: 2,426
Expected: 2,240
Actual to Expected:108%
Proposed: 2,452
Actual to Proposed: 99%

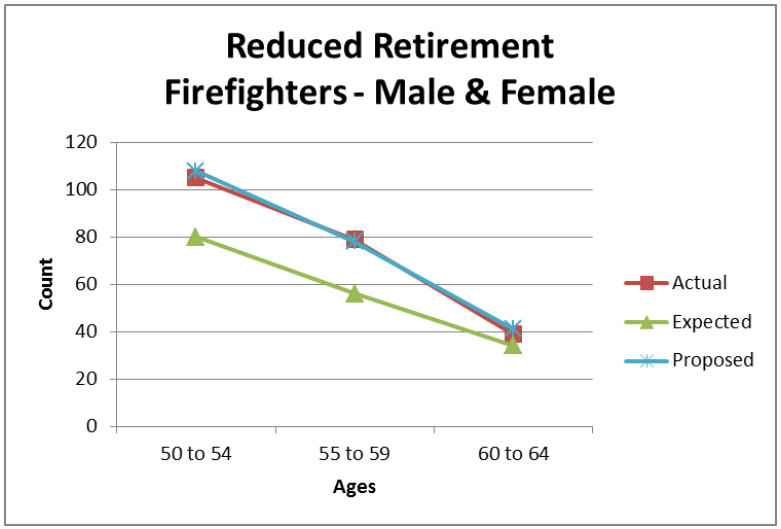
Summary Metrics (Female):
Actual: 3,257
Expected: 2,948
Actual to Expected: 110%
Proposed: 3,231
Actual to Proposed: 101%

Observation: There were more retirements than expected for both males and females

Recommendation: Increase rates of retirement to reflect experience

Impact: Slight increase in costs

Retirement Rates – Reduced – Firefighters and Rescue Squad Workers



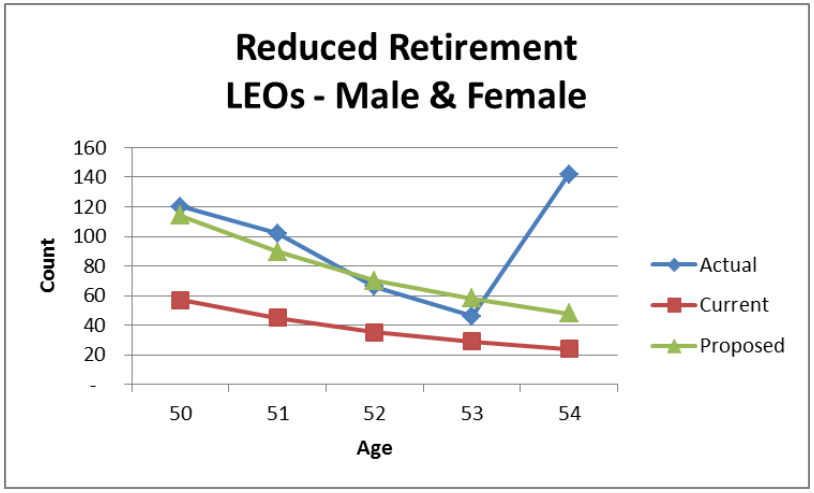
Summary Metrics (Male):
Actual: 223
Expected: 170
Actual to Expected: 131%
Proposed: 227
Actual to Proposed: 98%

Observation: There were more retirements than expected for the combined genders

Recommendation: Increase rates of retirement to reflect experience

Impact: Slight increase in costs

Retirement Rates – Reduced – Law Enforcement



Summary Metrics (Male):
Actual: 476
Expected: 190
Actual to Expected: 251%
Proposed: 380
Actual to Proposed: 125%

Observation: There were more retirements than expected for the combined genders. However, data suggests that leave conversions at retirement allow many of the actual retirements to receive unreduced benefits.

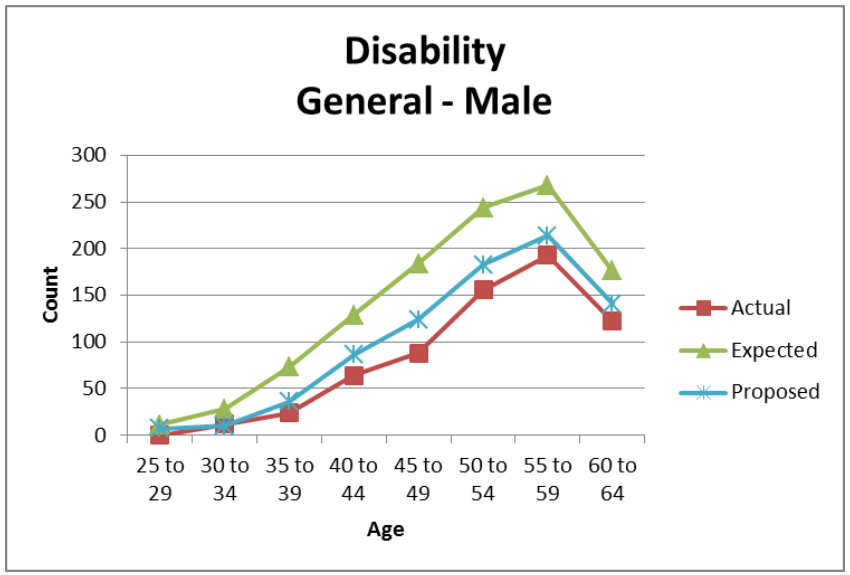
Recommendation: Increase rates of retirement to reflect experience

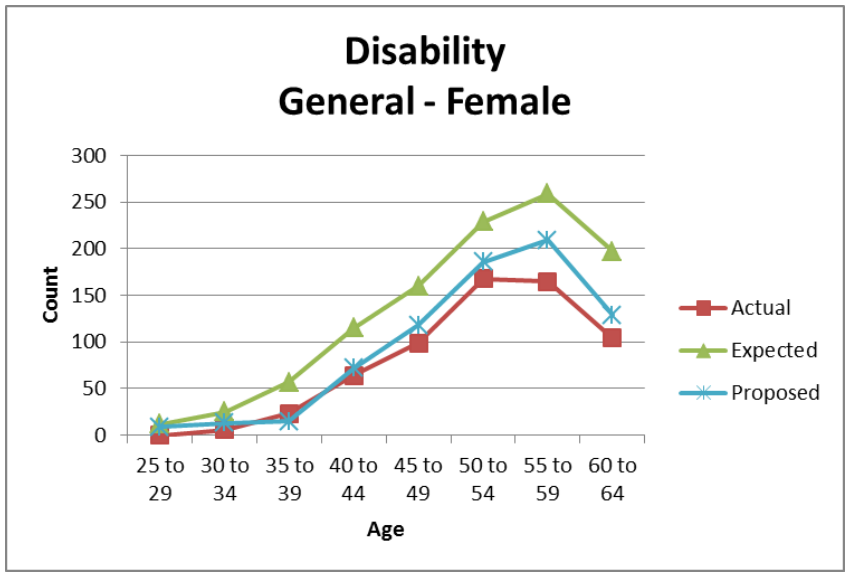
Impact: Slight increase in costs

Disability Rates - Considerations

- Disability rates measure the probability that a member will become disabled and receive a disability retirement benefit
- LGERS currently uses disability rates that vary by age and gender
- Generally, assuming more disabilities results in higher estimated costs

Disability Rates – General Employees





Summary Metrics (Male):
Actual: 659
Expected: 1,115
Actual to Expected: 59%
Proposed: 803
Actual to Proposed: 82%

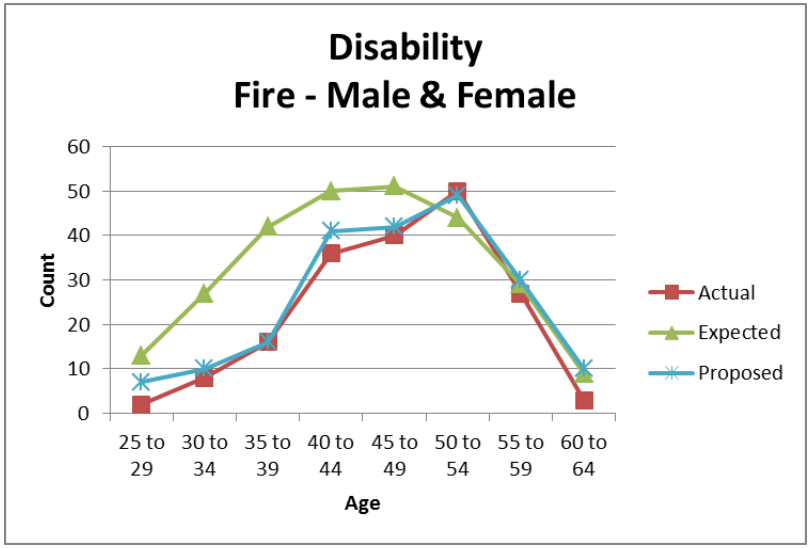
Summary Metrics (Female):
Actual: 629
Expected: 1,056
Actual to Expected: 60%
Proposed: 753
Actual to Proposed: 84%

Observation: There were fewer disabilities than expected for both males and females

Recommendation: Decrease rates of disability to reflect experience

Impact: Slight decrease in costs

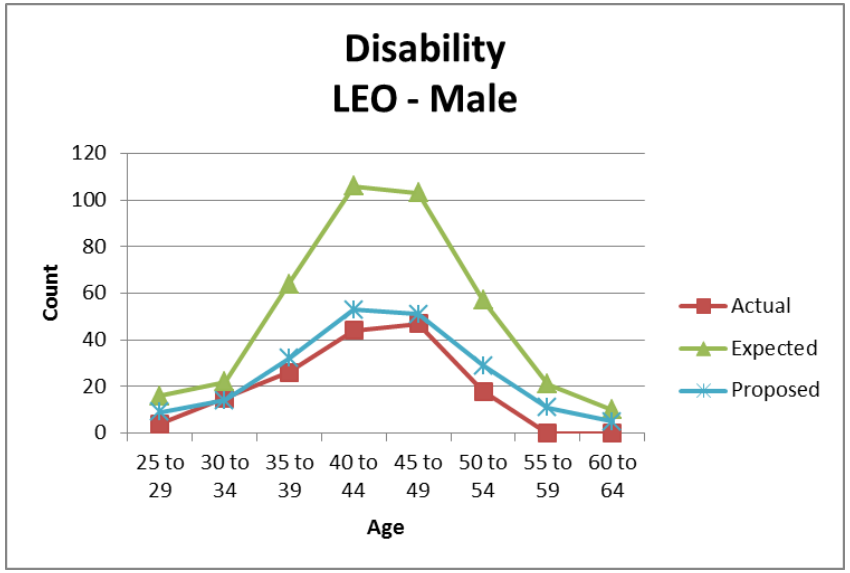
Disability Rates – Firefighters and Rescue Squad Workers

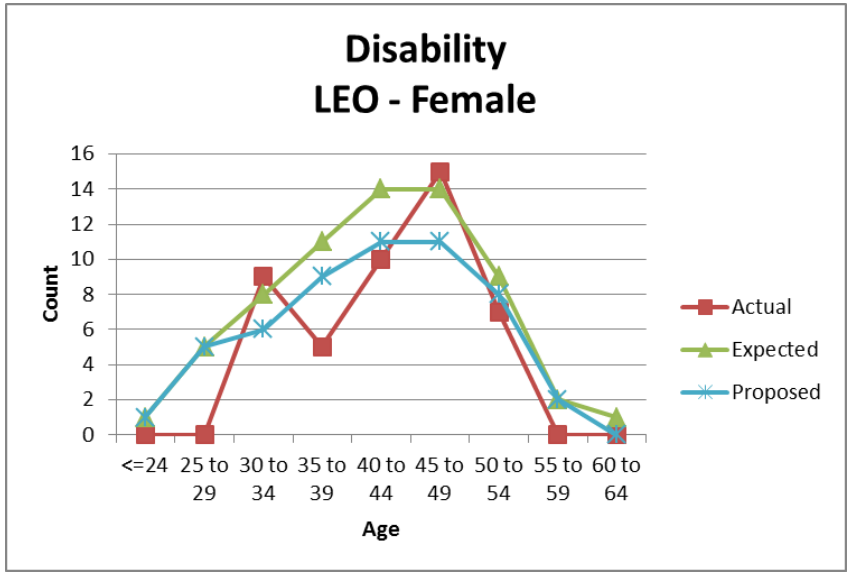


Summary Metrics (Male):
Actual: 182
Expected: 269
Actual to Expected: 68%
Proposed: 208
Actual to Proposed: 88%

Observation: There were fewer disabilities than expected for the combined genders
Recommendation: Decrease rates of disability to reflect experience; apply rates to LGERS and FRSWPF
Impact: Slight decrease in costs

Disability Rates – Law Enforcement Officers





Summary Metrics (Male):
Actual: 154
Expected: 403
Actual to Expected: 38%
Proposed: 206
Actual to Proposed: 75%

Summary Metrics (Female):
Actual: 46
Expected: 65
Actual to Expected: 71%
Proposed: 53
Actual to Proposed: 87%

Observation: There were fewer disabilities than expected for both males and females

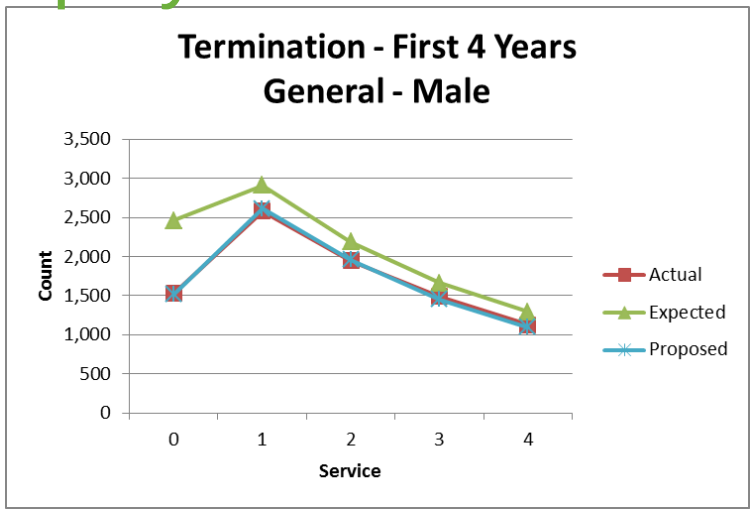
Recommendation: Decrease rates of disability to reflect experience

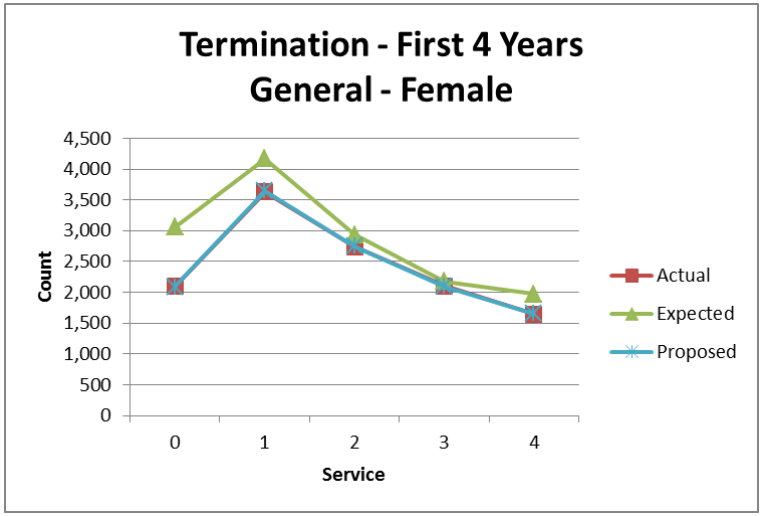
Impact: Slight decrease in costs

Termination Rates - Considerations

- The valuation anticipates that members may leave active service for reasons other than retirement, disability and death. We refer to these other reasons as termination.
- Rates of termination can vary significantly from plan to plan
- Use of actual experience of the plan is common practice
- Generally, assuming more terminations results in lower estimated costs
- Rates of termination tend to be higher earlier in a member's career. So we use two sets of rates:
  - A set of rates for the first five years of a member's career. These rates are higher than those assumed in the rest of the career and vary based on the member's service
  - A set of rates for the rest of a member's career that vary based on the member's age
- Rates of termination also vary by gender and employee group (i.e., general employees, firefighters, rescue squad workers, law enforcement)

Termination Rates (<5 Years Service) – General Employees





Summary Metrics (Male):
Actual: 8,674
Expected: 10,515
Actual to Expected: 82%
Proposed: 8,647
Actual to Proposed: 100%

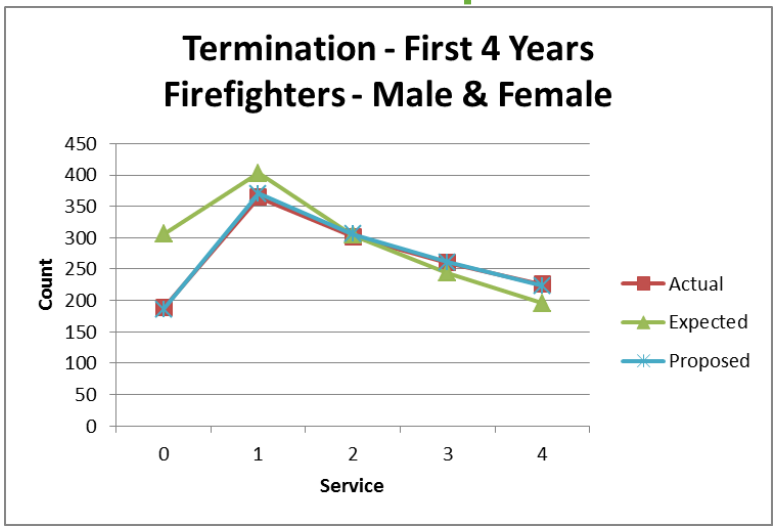
Summary Metrics (Female):
Actual: 12,217
Expected: 14,307
Actual to Expected: 85%
Proposed: 12,234
Actual to Proposed: 100%

Observation: There were fewer terminations than expected for both males and females

Recommendation: Decrease rates of termination to reflect experience

Impact: Slight increase in costs

Termination Rates (<5 Years Service) – Firefighters and Rescue Squad Workers



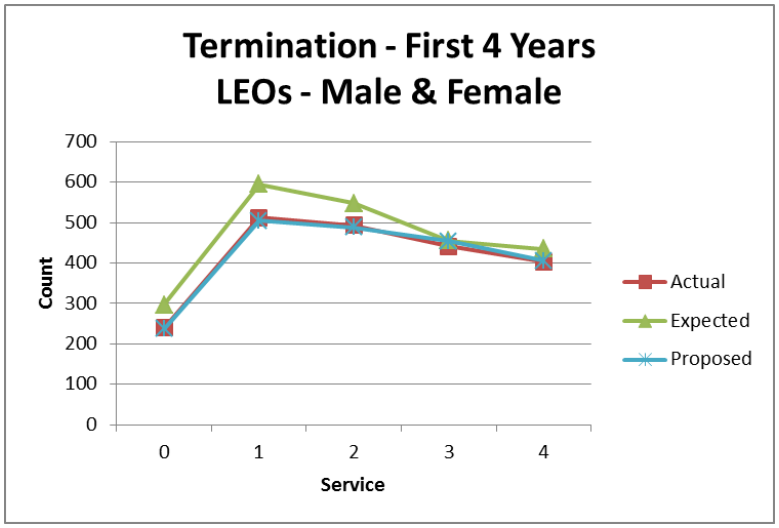
Summary Metrics (Male):
Actual: 1,341
Expected: 1,453
Actual to Expected: 92%
Proposed: 1,346
Actual to Proposed: 100%

Observation: There were fewer terminations than expected for the combined genders

Recommendation: Decrease rates of termination to reflect experience

Impact: Slight increase in costs

Termination Rates (<5 Years Service) – Law Enforcement Officers



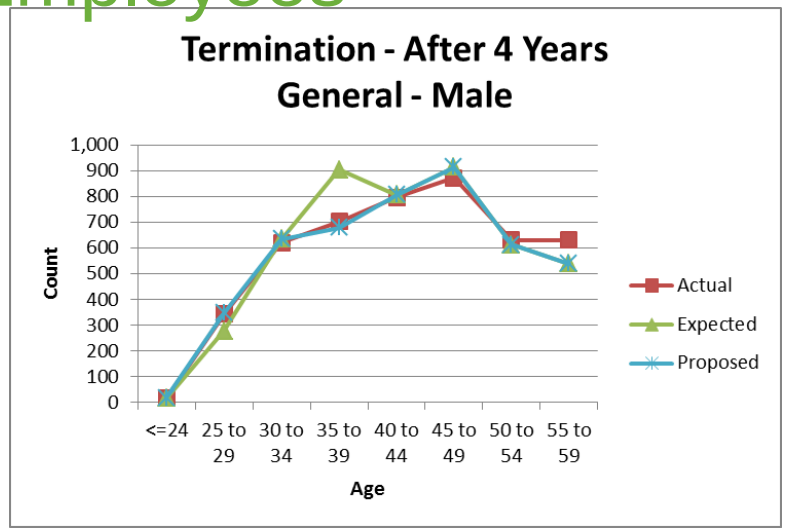
Summary Metrics (Male):
Actual: 2,090
Expected: 2,330
Actual to Expected: 90%
Proposed: 2,090
Actual to Proposed: 100%

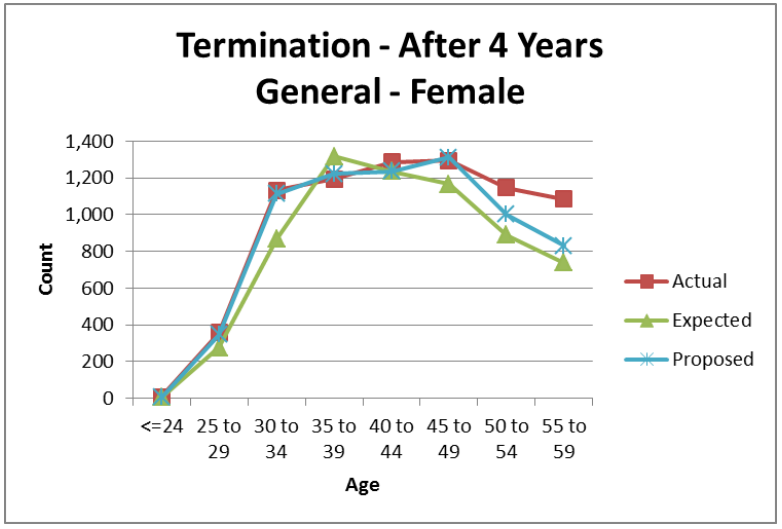
Observation: There were fewer terminations than expected for the combined genders

Recommendation: Decrease rates of termination to reflect experience

Impact: Slight increase in costs

Termination Rates (5+ Years Service) – General Employees





Summary Metrics (Male):
Actual: 4,616
Expected: 4,709
Actual to Expected: 98%
Proposed: 4,555
Actual to Proposed: 101%

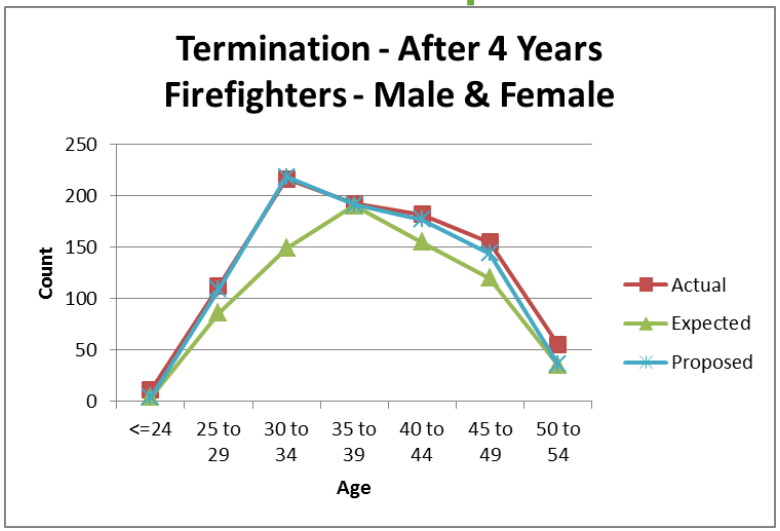
Summary Metrics (Female):
Actual: 7,506
Expected: 6,493
Actual to Expected: 116%
Proposed: 7,067
Actual to Proposed: 106%

Observation: There were fewer terminations than expected for males and more terminations than expected for females

Recommendation: Decrease rates of termination for males and increase rates of termination for females to reflect experience

Impact: Slight decrease in costs

Termination Rates (5+Years Service) – Firefighters and Rescue Squad Workers



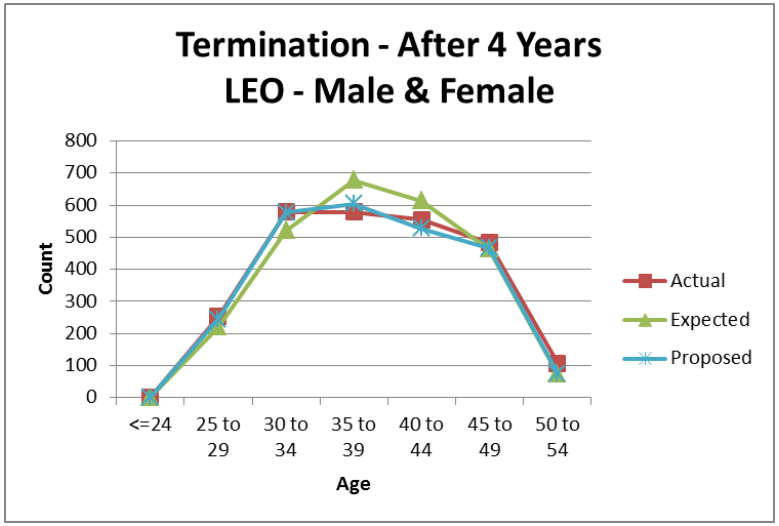
Summary Metrics (Male):
Actual: 923
Expected: 739
Actual to Expected: 125%
Proposed: 879
Actual to Proposed: 105%

Observation: There were more terminations than expected for firefighters and rescue squad workers

Recommendation: Increase rates of termination to reflect experience

Impact: Slight decrease in costs

Termination Rates (5+ Years Service) – Law Enforcement



Summary Metrics (Male):
Actual: 2,554
Expected: 2,571
Actual to Expected: 99%
Proposed: 2,495
Actual to Proposed: 102%

Observation: Not significant difference between actual and expected number of terminations

Recommendation: Slight change in rates to reflect experience at certain ages

Impact: Immaterial

Leave Conversions – Increase in Creditable Service for LGERS

Increase in Creditable Service (Years)	Actual	Expected	Actual ÷ Expected	Proposed	Actual ÷ Proposed
General Employees					
Male	0.94	0.90	104%	0.95	99%
Female	0.65	0.65	100%	0.65	100%
Fire and Rescue					
Combined	1.24	1.25	99%	1.25	99%
Law Enforcement					
Combined	1.17	1.25	94%	1.20	98%

The valuation anticipates that retirees will receive service credits for unused sick leave or unused vacation leave.

Observation: Conversion of unused sick leave and unused vacation leave to service credits has not differed significantly from expected for female general employees and all fire and rescue, has increased for male general employees, and has decreased for law enforcement officers

Recommendation: Adjust factors to reflect experience

Cost Impact: Immaterial

Leave Conversions – Increase in Average Final Compensation (AFC) for LGERS

Increase in AFC	Actual	Expected	Actual ÷ Expected	Proposed	Actual ÷ Proposed
General Employees	1.37	2.00	68%	1.50	91%
Fire and Rescue	2.07	1.00	207%	1.75	119%
Law Enforcement	1.67	1.50	111%	1.50	111%

The valuation anticipates that some retirees from active service will convert unused vacation leave to additional compensation.

Observation: The conversion of unused vacation leave to additional compensation has generally decreased for general employees and increased for fire and rescue

Recommendation: Adjust factors to reflect experience

Cost Impact: Immaterial

Administrative Expense

- LGERS – we recommend no change to current assumption of 0.20% of payroll for general employees, firefighters, and rescue squad workers
- FRSWPF – we recommend no change to current assumption based on prior year's actual expenses

Economic Assumptions

Inflation

Investment Return

Salary Increases

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ASOP 27

- Provides guidance to actuaries in selecting economic assumptions
  - General Selection Process
    - Identify components, if any, of the assumption
    - Evaluate relevant data
      - Review appropriate recent and long-term historical economic data
      - The actuary should not give undue weight to recent experience
      - Some historical economic data may not be appropriate due to changes in the underlying environment
    - Consider factors specific to the measurement
    - Consider other general factors
      - The actuary should consider the balance between refined economic assumptions and materiality
      - The actuary may incorporate the views of experts but the selection or advice should reflect the actuary's professional judgment
    - Select a reasonable assumption
      - See next slide
  - After completing these steps for each economic assumption, the actuary should review the set of economic assumptions for consistency and make appropriate adjustments if necessary

ASOP 27 – Selecting a Reasonable Assumption

Recent ASOP 27 Change in Determining the Reasonableness of a Selected Assumption

- Previously: Use a "best-estimate" range
  - Assumption is reasonable if selected from within a range over which it was "more likely than not" to fall
- New: Apply best-estimate standard
  - Each economic assumption selected by the actuary should be reasonable.
  - For this purpose, an assumption is reasonable if it has the following characteristics:
    - It is appropriate for the purpose of the measurement
    - Reflects the actuary's professional judgment
    - Takes into account historical and current economic data that is relevant as of the measurement date
    - Reflects the actuary's estimate of future experience, the actuary's observation of the estimates inherent in market data, or a combination thereof; and
    - Has no significant bias

Current Economic Assumptions

Inflation (General and Wage)	3.00% per year
Real Rate of Return	4.25% per year
Nominal Rate of Return	7.25% per year
Real Wage Growth (productivity)	0.50% per year
Merit Adjustments (Individual Salary Increases related to performance, promotion, etc.)	Vary by service and employee group

Inflation

Buck inflation modeling considerations	Short-term calibration to current economic conditions Intermediate calibration to inflation forecasts Long term calibration to inflation forecasts and historical average inflation
Expectations of future	Data points: 3.32%: 100-year average through 1915-2014 2.15%: Survey of Professional Forecasters - 3Q2015 2.0%-3.4%: 2014 & 2015 OASDI Trustees Report 3.25%: Average rate used by public retirement systems[1] 3.00% Buck assumption
Proposed rate of inflation	3.00%

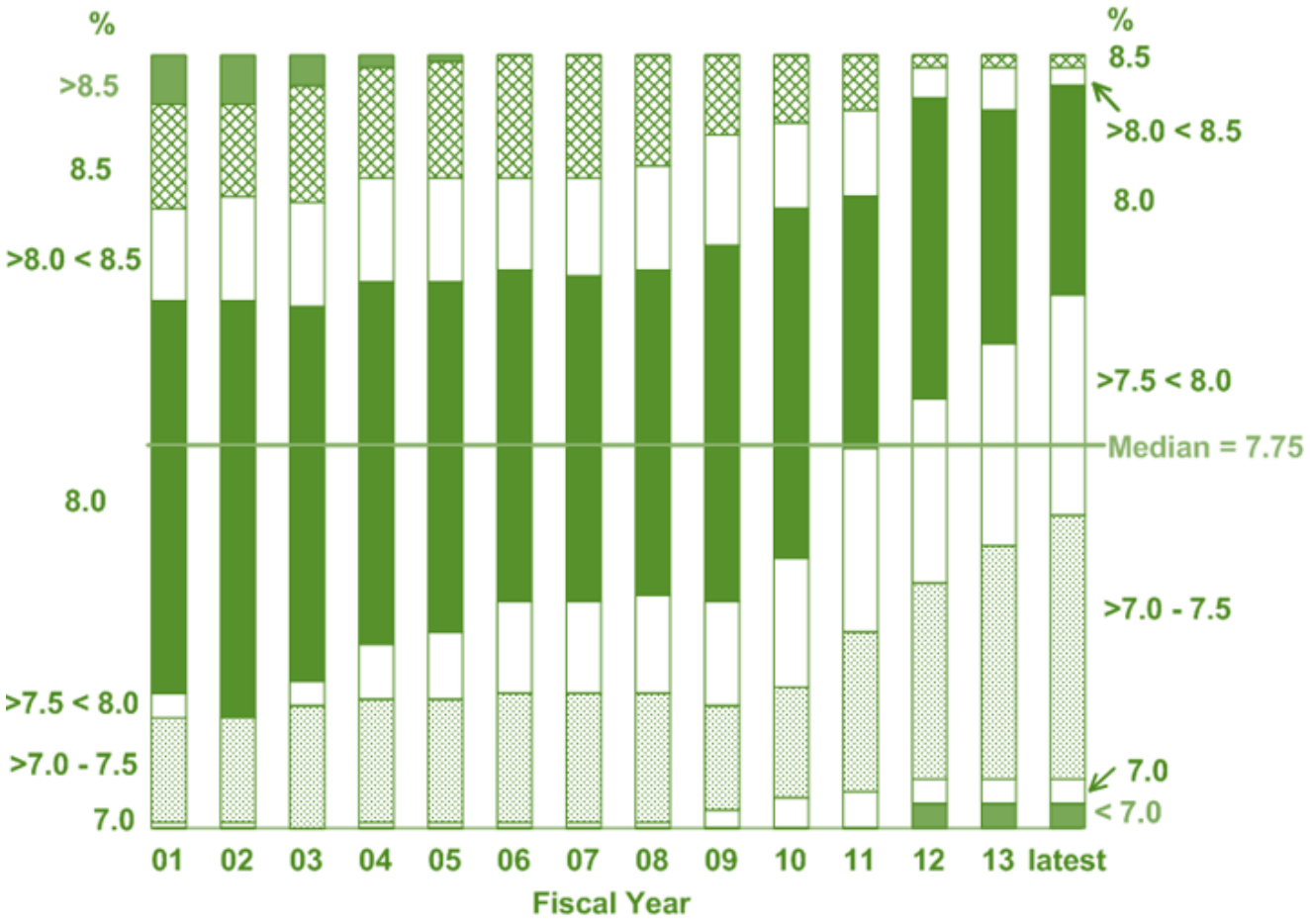
[1] Public Funds Survey Summary of Findings for FY 2013

Investment Return Assumption - Considerations

- Use Expected Rates of Return by Asset Class Based Upon Accepted Industry Practice
- Determine Aggregate Real Return for Board's Target Asset Allocation Policy
- Recent investment performance is driven by economic and capital market factors that may or may not persist over the longer term over different economic and capital market cycles
- Actuarial Standards of Practice allow for the inclusion of a margin of conservatism
  - All else being equal, a lower return assumption is easier to achieve and has a higher likelihood of securing the benefits by increasing future contributions
  - Historically North Carolina Retirement Systems has been on lower end of the range of assumptions selected by state retirement systems

Investment Return

Change in distribution of public pension investment return assumptions, FY 01 through May 2015, compiled by NASRA based on Public Fund Survey.



As seen in this survey, the trend in public pension plan investment return assumptions has been a steady decrease over the past 15 years. At 7.25%, North Carolina Retirement Systems continues to be well below the median rates shown in the survey.

Investment Return

Asset Class	Allocation
Fixed Income – Investment Grade	28.00%
Cash	1.00%
Public Equity	42.00%
Private equity	6.00%
Non-Core Real Estate	3.00%
Fixed Income – Opportunistic	7.00%
Inflation Sensitive	6.00%
Core Real Estate	5.00%
Multi-Strategy	2.00%
	100.00%

The assumed rate of return is based on the target asset allocation and the expectation of future asset returns for each asset class. The current return assumption of 7.25% was last reviewed and adopted at the July, 2010 Board of Trustees meeting in conjunction with all economic assumptions.

On the next slide we have estimated nominal and real returns over various time periods based on this allocation and Buck's current return expectations.

Nominal and Real Returns - Buck Estimate

Compound (Geometric) Returns over Projected Periods

	1-Year	5-Year	10-Year	15-Year	20-Year	25-Year	30-Year
Nominal							
75th Percentile	10.25%	8.79%	9.00%	9.38%	9.65%	9.84%	9.89%
60th Percentile	7.51%	7.14%	7.66%	8.18%	8.41%	8.85%	8.95%
50th Percentile	5.85%	6.06%	6.88%	7.48%	7.85%	8.23%	8.43%
40th Percentile	3.96%	5.04%	6.15%	6.78%	7.29%	7.62%	7.87%
25th Percentile	0.98%	3.11%	4.81%	5.74%	6.37%	6.65%	6.96%
Real							
75th Percentile	8.28%	6.87%	6.77%	6.71%	6.77%	6.84%	6.89%
60th Percentile	5.62%	5.14%	5.44%	5.69%	5.77%	5.91%	6.00%
50th Percentile	3.72%	4.02%	4.57%	4.97%	5.16%	5.35%	5.58%
40th Percentile	1.85%	2.80%	3.74%	4.23%	4.54%	4.81%	4.98%
25th Percentile	-1.20%	0.87%	2.29%	3.11%	3.56%	3.82%	3.96%

Based on 2015 assumptions. Amounts shown are net of investment expenses.

The current assumption of 7.25% is expected to be achieved on average at least 60% of the time over time horizons of 20 years and beyond. In the next 20 years, earning 7.25% is less likely to occur.

Current standards of practice suggest the use of an assumption that falls within the 40th and 50th percentile of projected returns based on the long term asset allocation. This is a change from the last time we reviewed the assumed rate of return, where the Actuarial Standards of Practice defined the range as between the 25th and 75th percentiles. Under the previous guidelines, Buck restricted the range to returns that were between the 25th and 50th percentiles.

Based on the above, the 7.25% investment return assumption can be maintained.

As an indication of the sensitivity of contributions to changes in the assumption, a 7.00% assumed investment return would increase the LGERS annual required contributions by about 2.1% of payroll.

Salary Increases

- Generally, a participant's compensation will increase over the long term based on:
  - Inflation,
  - Productivity Growth (or Real Wage Growth), and
  - Merit Adjustments
- The assumption used to measure the anticipated year-to-year change in compensation is referred to as the assumed Annual Rate of Salary Increase
  - Building-block approach to setting assumption (Inflation plus Productivity plus Merit)
  - Merit adjustments vary by service and employee group

Productivity Growth (or Real Wage Growth)

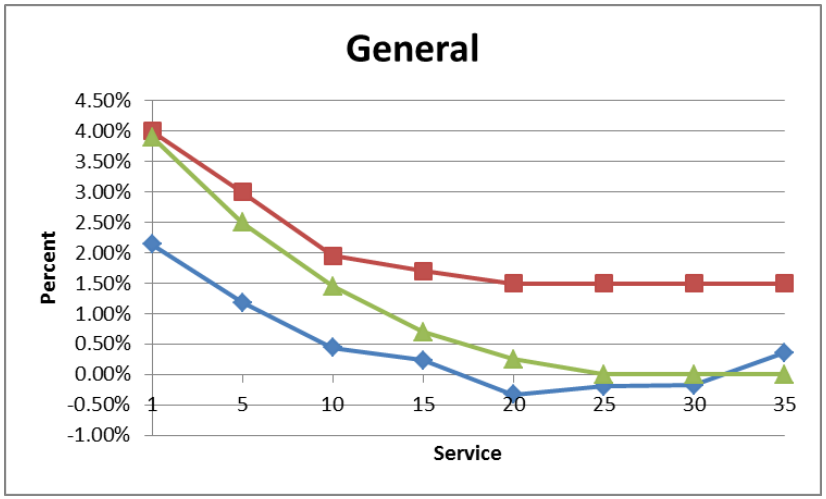
- Across the board pay increases in addition to inflation
- Generally, measures increases in productivity
- Over the past 30 years State employees have received about 0.05% per year across the board pay increases over inflation (0.24% per year over last 31 years)
  - While data regarding across the board increases for Local employers is not readily available, it is expected that the economic factors contributing to productivity growth apply similarly to both State and Local employers
- 2014 OASDI Trustees Report uses an annual expectation of 1.1%
  - Please note that assumptions utilized for the OASDI report are applicable nationally but may not necessarily be indicative of experience or expectations regionally or on a state-by-state basis

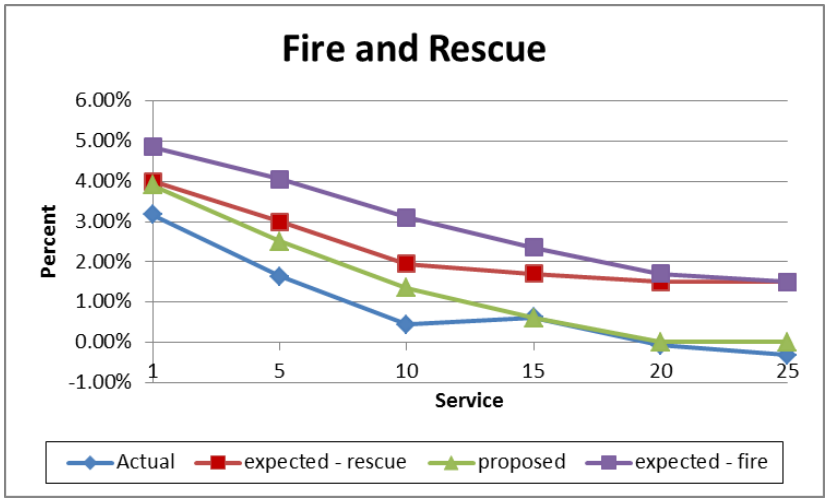
Proposed Rate of Real Wage Growth: 0.5%

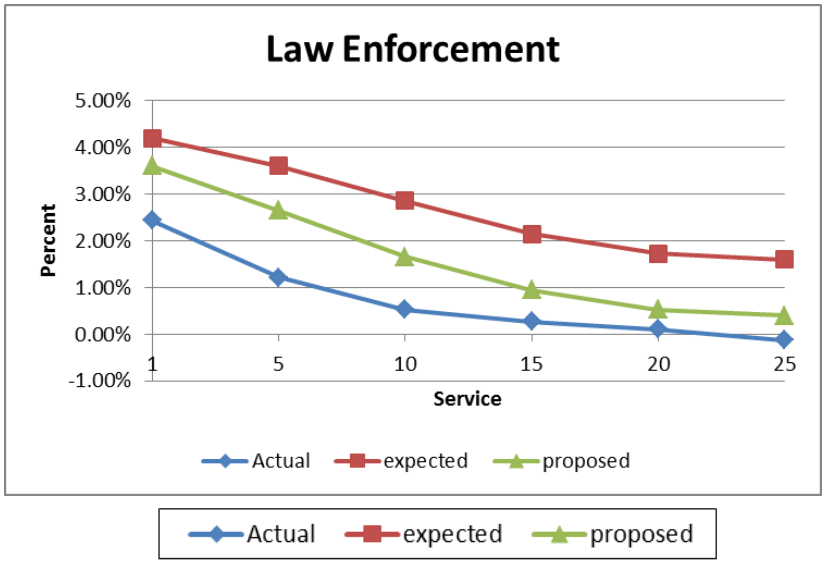
Merit Adjustments

- Increases in a member's salary that are not related to across-the-board type increase (i.e., inflation and productivity)
- Includes elements of salary increase due to promotions and longevity
- Reviewed actual salary increases from 2010 – 2014
  - Removed inflation and productivity increase components
  - Studied merit adjustments by service and employee group
  - See next slide
- The valuation anticipates salary increases for members during their career
- Higher (lower) salary increases result in higher (lower) estimated benefits and higher (lower) projected costs.
- Because contributions are financed over projected payroll, higher (lower) salary increases tend to defer (accelerate) employer contributions.

Proposed Merit Adjustments by Employee Group

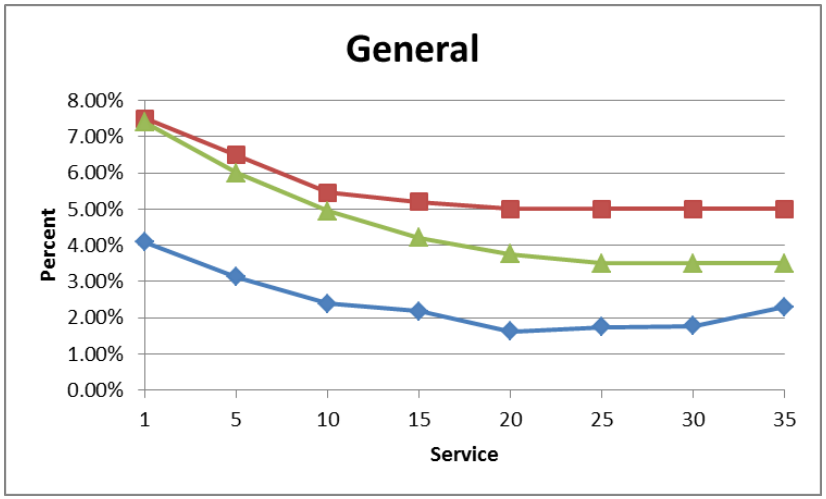


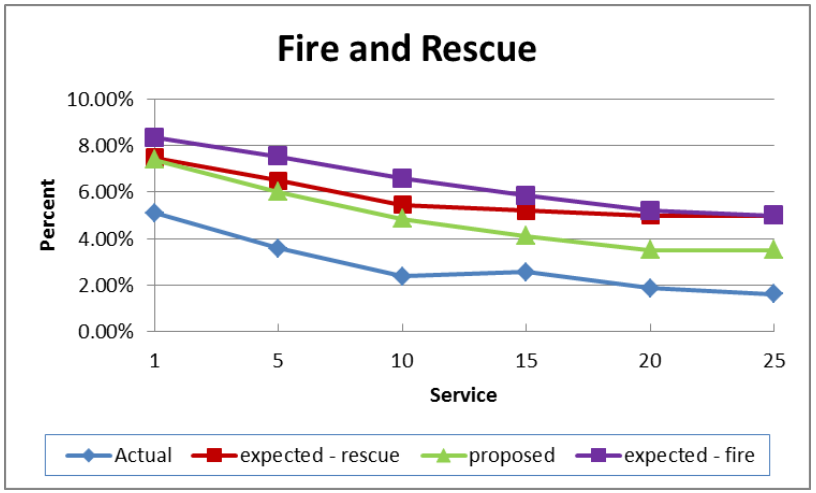


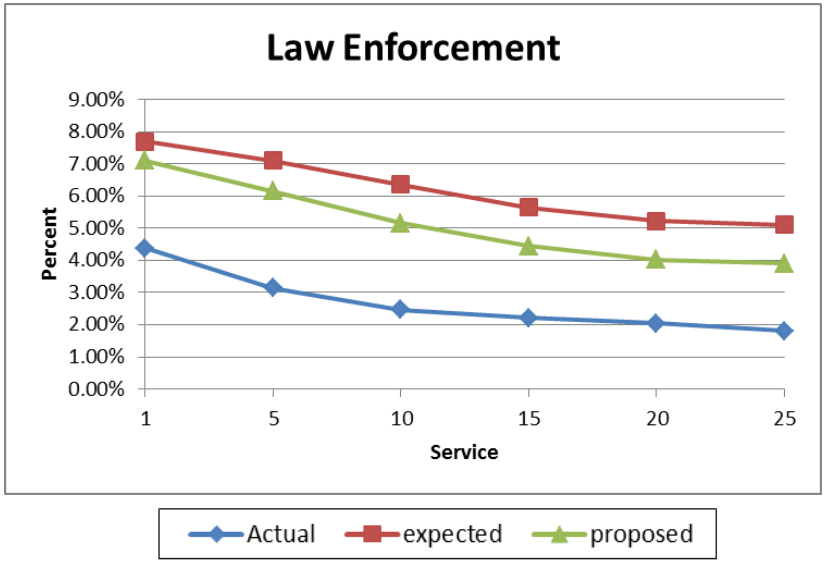


Actual
expected
proposed

Proposed Salary Increases by Employee Group







Salary Increases

- Observation: Salary increases continue to be significantly less than expected. Service continues to be a better indicator of salary increases than age.

- Recommendation: Reduce rates at all ages and base rates on service. Minimum increase for later career is 3.50%, which is the sum of the inflation assumption (3.00%) and the productivity assumptions (0.50%).

- Cost impact: Significant decrease in liability

Funding Methodology

Asset Valuation Methods

Actuarial Costs Method

Amortization Method

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Asset Valuation Methods

- Asset Valuation Methods smooth or average the market value returns over time to alleviate contribution volatility
  - ASOP 44 provides guidance to actuaries in selecting and recommending asset valuation methods
  - Actuarial value of assets should fall within a reasonable range around the market value and differences between the market value and the actuarial value should be recognized within a reasonable period of time
  - Sufficiently narrow ranges or sufficiently short periods are also reasonable
- Current asset valuation method reflects 20% of difference between expected actuarial value and market value, with a corridor of 80%-to-120% of market value of assets
- Current method is smooth but not as transparent or predictable as other methods

We recommend that the current asset valuation method for LGERS and FRSWPF be modified to reflect a five-year smoothing method. An overview of the method is shown on the next slide.

Proposed Asset Valuation Method

- The proposed asset method is based upon a smoothed market value method. Under this method, asset returns in excess of or less than the expected return on market value of assets will be reflected in the actuarial value of assets over a five-year period. The calculation of the Actuarial Value of Assets is based on the following formula:

$$MV - 80\% \times G/(L)_1 - 60\% \times G/(L)_2 - 40\% \times G/(L)_3 - 20\% \times G/(L)_4$$

where:

MV	=	the market value of assets as of the valuation date
$G/(L)_i$	=	the asset gain or (loss) for the i-th year preceding the valuation date (i.e., actual return on market value of assets less expected return on market value of assets)

- Propose to set actuarial value equal to market value as of December 31, 2014, which will *increase* actuarial value of assets by $62.6 million for LGERS and by $2.4 million for FRSWPF
- May increase market volatility over the next 5 years

Actuarial Cost Method

- Actuarial Cost Methods allocate costs to the actuarial accrued liability (i.e., the amount of money that should be in the fund) for past service and normal cost (i.e., the cost of benefits accruing during the year) for current service.
  - The Board of Trustees has adopted the frozen entry age cost method
  - Separate initial valuations for each employer to account for prior service. We have recommended the frozen entry age method to allow for each employer to pay for the initial cost of joining
  - Normal cost captures payment for all other unfunded liability. So for LGERS, normal cost effectively includes both the cost of benefits accruing during the year and the debt payment
  - Effective amortization period is dictated by demographics of active members and actuarial assumptions
- Entry Age Normal used by over 85% of public sector plans
- GASB has also adopted Entry Age Normal for all accounting calculations

We recommend the entry age normal cost method be adopted for LGERS with separate initial unfunded liabilities maintained for those that joined the system prior to November 1, 2015

Amortization Methods

- Based on proposed changed to the entry age normal cost method, an amortization method (i.e., the payment schedule for unfunded actuarial accrued liability) needs to be established for LGERS.
- We propose the same amortization method utilized by TSERS, including:
  - Payment level: the payment is determined as a level dollar amount, similar to a mortgage payment
  - Payment period: a 12-year closed amortization period. A new amortization base is created each year based on the prior years' experience.
  - Timing adjustment: Interest adjustment applied to reflect 1½-year delay in contribution between valuation and beginning of fiscal year.

We recommend changing LGERS to a 12-year, level dollar closed amortization period consistent with the State systems. When compared to other Public Sector Retirement Systems in the United States, the 12-year closed amortization is quite aggressive, paying down the pension debt over a much shorter period of time compared to the national average of around 24 years.

Board Recommendations

Economic Assumptions

General and Wage Inflation – Proposed Rate of 3.00%

Real Rate of Return – Proposed Rate of 4.25%

Real Wage Growth – Proposed Rate of 0.50%

Funding Methodology

Asset Smoothing – Reset actuarial value to market value as of December 31, 2014; change to five-year smoothing method

Actuarial Cost Method – Update to Entry Age Normal for LGERS

Amortization Method – Update to 12-year, level dollar closed amortization for LGERS

Cost Impact – LGERS

Had the proposed assumptions and methods been reflected for the December 31, 2014 annual actuarial valuation, the impact would have been a net increase in costs:

- The actuarial accrued liability, or the amount of assets that should be in the fund, would be 2.2% higher, increasing from $22.7 billion to $23.2 billion
- The net change in Annual Required Contributions (ARC) as a percentage of payroll would have decreased from 6.39% to 5.70% for general employees and firefighters and would have decreased from 6.87% to 7.31% for law enforcement officers.
- Resetting the asset smoothing method as of December 31, 2014 will increase actuarial value of assets by $62.6 million
- For sensitivity purposes, the final column below shows the impact of the proposed assumptions and methods with an additional change to 7.00% discount rate.

	Current Valuation	Reflecting Mortality Changes	Reflecting Salary Increase Changes	Reflecting All Assumption Changes	Reflect Asset Smoothing	Final Results Reflecting Entry Age		Final Results Assuming 7% Discount Rate
General and Firefighters	6.39%	9.29%	6.63%	5.98%	5.83%	5.70%		7.81%
Law Enforcement Officers	6.87%	9.77%	7.11%	6.46%	6.31%	7.31%		9.55%
Cumulative Change								
General and Firefighters		2.90%	0.24%	(0.41)%	(0.56)%	(0.69)%		1.42%
Law Enforcement Officers		2.90%	0.24%	(0.41)%	(0.56)%	0.44%		2.68%

Key Takeaways - LGERS

Assumption	Observed Experience Relative to Expectations	Recommendation	Impact on Costs
1. Mortality	Fewer Deaths	Decrease Rates and Update Mortality Improvement Projection Scale	Significant Increase
2. Service retirement	Fewer Retirements	Decrease Rates	Slight Decrease
3. Disability retirement	Fewer Disabilities	Decrease Rates	Slight Decrease
4. Termination from active employment	Fewer Terminations	Decrease Rates	Slight Increase
5. Leave conversions at retirement	Varies by Group	Varies by Group	Immaterial
6. Investment return	Current Assumption Reasonable	No Change	N/A
7. Merit pay increases	Lower Increases	Decrease Rates	Significant Decrease
8. Inflation	Current Assumption Reasonable	No Change	N/A
9. Productivity growth	Current Assumption Reasonable	No Change	N/A
10. Amortization method	Current Assumption Reasonable	No Change	N/A
11. Actuarial cost method	Inconsistent to Other Systems	Move to Entry Age	Increase
12. Asset valuation method	Not Transparent or Predictable	5-year Smoothing	Slight Decrease

Notes:

1. The mortality assumption was the source of the largest increase in costs. While we did observe fewer deaths than expected over the past few years, the increase in costs was driven more by the increase in mortality improvements suggested by national studies

6. The current investment return assumption of 7.25% remains reasonable

7. The merit increase assumption was the source of the largest decrease in costs as salaries continued to fall short of the long-term assumptions

Overall, the net impact on liabilities was an increase

Cost Impact – FRSWPF

Had the proposed assumptions and methods been reflected for the December 31, 2014 annual actuarial valuation, the impact would have been a net increase in costs:

- The actuarial accrued liability, or the amount of assets that should be in the fund, would be 8.4% higher, increasing from $418.9 million to $454.3 million
- The net change in Annual Required Contributions (ARC) would have increased from $12,830,706 to $17,827,571
- Resetting the asset smoothing method as of December 31, 2014 will increase actuarial value of assets by $2.4 million
- For sensitivity purposes, the final column below shows the impact of the proposed assumptions and methods with an additional change to 7.00% discount rate.

	Current Valuation	Reflecting Mortality Changes	Reflecting All Assumptions Changes	Final Results Reflecting Asset Smoothing		Final Results Assuming 7% Discount Rate
Normal Cost	$6,620,072	$7,269,961	$7,109,033	$7,109,033		$7,711,840
Accrued Liability	6,210,634	10,999,033	11,052,797	10,718,538		12,382,483
Total	$12,830,706	$18,268,994	$18,161,830	$17,827,571		$20,094,323
Cumulative Change		$5,438,288	$5,331,124	$4,996,865		$7,263,617

Key Takeaways - FRSWPF

Assumption	Observed Experience Relative to Expectations	Recommendation	Impact on Costs
1. Mortality	Fewer Deaths	Decrease Rates and Update Mortality Improvement Projection Scale	Significant Increase
2. Service retirement	In-Service Distributions	No Change	N/A
3. Disability retirement	Fewer Disabilities	Decrease Rates (with LGERS)	Slight Decrease
4. Termination from active employment	Under Data Audit Review	N/A	N/A
5. Lapse assumption	Under Data Audit Review	N/A	N/A
6. Investment return	Current Assumption Reasonable	No Change	N/A
7. Merit pay increases	N/A	N/A	N/A
8. Inflation	Current Assumption Reasonable	No Change	N/A
9. Productivity growth	N/A	N/A	N/A
10. Amortization method	Current Assumption Reasonable	No Change	N/A
11. Actuarial cost method	Current Assumption Reasonable	No Change	N/A
12. Asset valuation method	Not Transparent or Predictable	5-year Smoothing	Slight Decrease

Notes:

1. The mortality assumption was the source of the largest increase in costs. While we did observe fewer deaths than expected over the past few years, the increase in costs was driven more by the increase in mortality improvements suggested by national studies

6. The current investment return assumption of 7.25% remains reasonable

Overall, the net impact on liabilities was an increase

Disclosures

- Buck's work product contained herein was prepared exclusively for the Board of Trustees and Staff of NCRS. It is a complex, technical analysis that assumes a high level of knowledge concerning the operations of NCRS.
- No third party recipient of Buck's work product should rely upon Buck's work product absent involvement of Buck or without our approval. Third parties recipients inclined to present our work product should engage NCRS and Buck during the presentation process to ensure that this work product is appropriately represented. If this is not desirable, such recipients should engage qualified professionals for advice appropriate to their own specific needs.
- The consultants who worked on this assignment are pension actuaries with significant experience in public funds like NCRS. Buck's advice is not intended to be a substitute for qualified legal or accounting counsel.

Certification

The results were prepared under the direction of Larry Langer and Michael Ribble who meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. These results have been prepared in accordance with all applicable Actuarial Standards of Practice, and we are available to answer questions about them.

Future actuarial measurements may differ significantly from current measurements due to plan experience differing from that anticipated by the economic and demographic assumptions, increases or decreases expected as part of the natural operation of the methodology used for these measurements, and changes in plan provisions or applicable law.

Except where otherwise indicated, an analysis of the potential range of such future differences is beyond the scope of this report.

Larry Langer, FCA, ASA, EA, MAAA
Principal, Consulting Actuary

Michael Ribble, FSA, EA, MAAA
Principal, Consulting Actuary

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Questions?

THANK YOU

buckconsultants

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North Carolina Local Governmental Employees' Retirement System

Statement of the Results of the Experience Investigation and Recommended Revised Tables for Adoption by the Board of Trustees

Prepared as of December 31, 2014

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October 8, 2015

Board of Trustees
Teachers' and State Employees'
Retirement System of North Carolina
3200 Atlantic Avenue
Raleigh, NC 27604

Members of the Board:

An investigation of the mortality, service and compensation experience of members and beneficiaries of the North Carolina Local Governmental Employees' Retirement System (the "Retirement System") has been made in accordance with Section 28(o) of Chapter 128 of the North Carolina General Statutes. This investigation covers the five-year period from January 1, 2010 December 31, 2014. As a result of the investigation, it is recommended that revised tables be adopted by the Board for future use.

In addition to the investigation required by Section 28(o) of Chapter 135 of the North Carolina General Statutes, the experience with regard to the conversion of leave to additional service and compensation and the marriage and administrative expense assumptions have also been reviewed. As a result of this review, it is recommended that revised assumptions with regard to leave conversion be adopted by the Board for future use.

Experience for Active Members

The data were tabulated separately for general employees, firefighters and rescue squad workers and law enforcement officers, and, where sufficient data exists, for males and females. The number of members expected to separate from active service was obtained using the rates currently used for the valuations and the members exposed to the rates. The expected separations were then compared with the actual separations. Based on the comparison of actual separations to expected separations and taking into account reasonable expectations of the future, proposed assumption changes have been made. The non-inflationary, nonproductively component of the salary scale was developed by analyzing active versus expected merit increases during the five-year period.

The results of the investigation indicate that, in our view, the assumed salary increases, the leave conversion assumptions and the rates of separation from active service due to withdrawal, mortality, disability and retirement do not accurately reflect the actual and anticipated experience of the Retirement System. As a result of the investigation, new active service tables have been developed that more closely reflect the actual experience of the membership.

Experience for Retired Members and Survivors of Deceased Members

An investigation of the experience for beneficiaries was prepared separately by gender, cause of retirement, and for general employees, firefighters and rescue squad workers and law enforcement officers. The expected deaths were determined by applying the assumed rates of mortality used for valuation purposes to the number of members in each retirement category. A comparison was then made between the expected and actual deaths in each retirement category.

The results of the investigation indicate that the assumed rates of mortality do not accurately reflect the actual and expected experience of the Retirement System. As a result of the investigation, we are recommending new mortality tables.

Summary

This report contains tables showing a comparison of the actual and expected cases of separation from active service, salary increases due to merit and actual and expected number of deaths among retired members and survivors of deceased members. A comparison between the rates presently in use and the recommended revised rates are also shown in this report. The table of contents outlines the material contained in this report.

The recommended rates of separation from active service, rates of salary increase and other demographic assumptions are shown in the attached tables in Schedule A of this report. In the actuary's judgment, the rates recommended are suitable for use until further experience indicates that modifications are desirable.

We have also included, in Schedule A, the economic assumptions and funding methods related to the December 31, 2014 valuation of the Retirement System, but such economic assumptions and funding methods are not part of the scope of this experience investigation report.

Future actuarial measurements may differ significantly from current measurements due to plan experience differing from that anticipated by the economic and demographic assumptions, increases or decreases expected as part of the natural operation of the methodology used for these measurements, and changes in plan provisions or applicable law. Because of limited scope, Buck performed no analysis of the potential range of such future differences.

The undersigned meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained in this report. This report has been prepared in accordance with all applicable Actuarial Standards of Practice, and we are available to answer questions about it.

Respectfully submitted,

Michael A. Ribble, FSA, EA, MAAA
Principal, Consulting Actuary

Larry Langer, ASA, EA, MAAA
Principal, Consulting Actuary

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Table of Contents

Section 1: Post-Retirement Mortality

The Retirement System currently uses mortality tables that vary by age, gender, employee group (i.e., general employees including rescue squad workers, firefighters, and law enforcement officers) and health status (i.e., disabled and healthy). The current mortality rates are based on published tables and based on studies that cover significant portions of the U.S. population. The healthy mortality rates also contain a provision to reflect future mortality improvements. The following table shows that, at most age groups, the current mortality tables result in expected mortality rates significantly higher than the actual mortality rates. In addition, recent studies of the U.S. population have determined that the rates of mortality improvement in the U.S. have differed from those predicted by the projection scale currently in use (Scale AA). Further, the current mortality tables do not provide for mortality improvements for members disabled at retirement.

Therefore, we are recommending that the Board adopt a set of mortality tables that better reflect the experience of the Retirement System. The recommended mortality tables are also based on recent studies that cover significant portions of the U.S. population, allow for future mortality improvements based on recent studies (Scale MP-2014) and apply mortality improvement to all members, including those disabled at retirement. Scale MP-2014 includes a two-dimensional improvement assumption that is a function of both age and calendar year.

In addition, the data reporting for employee groups has been changed such that rescue squad workers are now being reported with firefighters. In the past, rescue squad workers were reported as general employees.

It should be noted that mortality rates for disabled members and survivors of deceased members of the Retirement System were studied based on the experience of such members from this Retirement System and the Teachers' and State Employees' Retirement System of North Carolina. As such, the following table reflects the experience of both systems for disabled members and for beneficiaries of deceased members.

Section 1: Post-Retirement Mortality

Post-Retirement Mortality

General - Male

Age	Exposed	Actual	Expected	Actual to Expected Ratio	Proposed	Actual to Proposed Ratio
<=54	2,032	14	10	140%	14	100%
55 to 64	18,528	177	183	97%	215	82%
65 to 74	28,082	610	647	94%	594	103%
75 to 84	14,615	878	986	89%	864	102%
85 to 94	3,755	596	651	92%	579	103%
>=95	200	58	64	91%	66	88%
Total	67,212	2,333	2,541	92%	2,332	100%

General - Female

Age	Exposed	Actual	Expected	Actual to Expected Ratio	Proposed	Actual to Proposed Ratio
<=54	2,150	8	6	133%	8	100%
55 to 64	23,038	121	155	78%	125	97%
65 to 74	36,747	377	558	68%	388	97%
75 to 84	18,236	660	739	89%	676	98%
85 to 94	6,054	667	655	102%	640	104%
>=95	501	116	104	112%	118	98%
Total	86,726	1,949	2,217	88%	1,955	100%

Firefighters & Rescue Squad Workers - Male

Age	Exposed	Actual	Expected	Actual to Expected Ratio	Proposed	Actual to Proposed Ratio
<=54	662	3	3	69%	4	75%
55 to 64	3,179	14	28	76%	30	47%
65 to 74	2,409	43	56	88%	45	96%
75 to 84	1,269	64	87	83%	59	108%
85 to 94	388	53	68	82%	45	118%
>=95	13	3	4	83%	3	100%
Total	7,920	180	246	73%	186	97%

Section 1: Post-Retirement Mortality

Post-Retirement Mortality

Law Enforcement Officers - Male

Age	Exposed	Actual	Expected	Actual to Expected Ratio	Proposed	Actual to Proposed Ratio
<=54	2,607	9	13	69%	16	56%
55 to 64	11,762	80	105	76%	117	68%
65 to 74	8,130	163	185	88%	154	106%
75 to 84	3,557	194	234	83%	166	117%
85 to 94	692	94	115	82%	79	119%
>=95	21	5	6	83%	5	100%
Total	26,769	545	658	83%	537	101%

Beneficiaries - Male

Age	Exposed	Actual	Expected	Actual to Expected Ratio	Proposed	Actual to Proposed Ratio
<=54	3,218	29	8	363%	8	363%
55 to 64	3,409	39	29	134%	41	95%
65 to 74	4,862	129	105	123%	114	113%
75 to 84	3,673	237	233	102%	215	110%
85 to 94	1,647	228	273	84%	244	93%
>=95	159	40	52	77%	55	73%
Total	16,968	702	700	100%	677	104%

Beneficiaries - Female

Age	Exposed	Actual	Expected	Actual to Expected Ratio	Proposed	Actual to Proposed Ratio
<=54	5,720	40	10	400%	13	308%
55 to 64	10,018	101	77	131%	81	125%
65 to 74	18,128	336	365	92%	322	104%
75 to 84	24,739	1,109	1,326	84%	1,144	97%
85 to 94	14,761	1,710	1,968	87%	1,696	101%
>=95	1,457	337	342	99%	390	86%
Total	74,823	3,633	4,088	89%	3,646	100%

Disabled - Male

Age	Exposed	Actual	Expected	Actual to Expected Ratio	Proposed	Actual to Proposed Ratio
Total	43,178	1,685	1,802	94%	1,691	100%

Disabled - Female

Age	Exposed	Actual	Expected	Actual to Expected Ratio	Proposed	Actual to Proposed Ratio
Total	50,872	1,462	1,893	77%	1,474	99%

Section 2: Active Mortality

The Retirement System currently uses mortality tables that vary by age, gender and employee group (i.e., general employees including rescue squad workers, firefighters, law enforcement officers). The current mortality rates are based on published tables and based on recent studies that cover significant portions of the U.S. population. The mortality rates also contain a provision to reflect future mortality improvements. The following table shows that, at most age groups, the current mortality tables result in expected mortality rates in excess of the actual mortality rates.

Therefore, we are recommending that the Board adopt a set of mortality tables that better reflect the experience of the Retirement System. Due to the low number of observed and reported pre-retirement deaths at any given age the recommended mortality tables are the corresponding active employee table to the post-retirement rates recommended. The recommended mortality tables continue to vary by age and gender.

In addition, the data reporting for employee groups as been changed such that rescue squad workers are now being reported with firefighters. In the past, rescue squad workers were reported as general employees. For this experience review, active member mortality for rescue squad workers has been studied with firefighters.

Section 2: Active Mortality

Active Member Mortality

General - Male

Age	Exposed	Actual	Expected	Actual to Expected Ratio	Proposed	Actual to Proposed Ratio
<=29	21,848	3	9	33%	14	21%
30 to 39	43,231	14	36	39%	31	45%
40 to 49	59,659	52	92	57%	79	66%
50 to 59	57,251	117	177	66%	196	60%
60 to 69	22,900	95	151	63%	184	52%
>=70	2,352	17	38	45%	51	33%
Total	207,241	298	503	59%	555	54%

General - Female

Age	Exposed	Actual	Expected	Actual to Expected Ratio	Proposed	Actual to Proposed Ratio
<=29	21,884	1	4	25%	6	17%
30 to 39	55,167	13	23	57%	22	59%
40 to 49	75,026	35	73	48%	68	51%
50 to 59	76,266	79	174	45%	162	49%
60 to 69	27,226	66	128	52%	109	61%
>=70	1,725	14	12	117%	17	82%
Total	257,294	208	414	50%	384	54%

Firefighters & Rescue Squad Workers & Law Enforcement Officers - Male

Age	Exposed	Actual	Expected	Actual to Expected Ratio	Proposed	Actual to Proposed Ratio
<=29	25,486	6	9	67%	16	38%
30 to 39	43,838	18	37	49%	32	56%
40 to 49	43,715	20	65	31%	55	36%
50 to 59	15,199	28	42	67%	47	60%
60 to 69	2,217	6	14	43%	18	33%
>=70	144	0	2	0%	3	0%
Total	130,599	78	169	46%	171	46%

Section 3: Rates of Retirement

The Retirement System currently uses retirement rates that vary by age, gender, employee group (i.e., general employees including rescue squad workers, firefighters, law enforcement officers) and type of retirement (i.e., reduced and unreduced). The current retirement rates are based on the recommendation of the prior experience study. The following table shows that, in total, the retirement rates result in expected retirements greater than actual.

Therefore, we are recommending that the Board adopt a set of retirement rates that better reflect the experience of the Retirement System and the expectations for future retirements.

As was the case for other separations from active service, rescue squad workers have been studied with firefighters.

Section 3: Rates of Retirement

Unreduced Retirement

General - Male

Age	Exposed	Actual	Expected	Actual to Expected Ratio	Proposed	Actual to Proposed Ratio
<=49	256	70	77	91%	68	103%
50 to 54	1,620	361	400	90%	365	99%
55 to 59	2,422	502	529	95%	471	107%
60 to 64	3,191	836	1,049	80%	854	98%
65 to 69	4,493	1,201	1,364	88%	1,219	99%
>=70	1,831	410	912	45%	845	49%
Total	13,813	3,380	4,331	78%	3,822	88%

General - Female

Age	Exposed	Actual	Expected	Actual to Expected Ratio	Proposed	Actual to Proposed Ratio
<=49	174	44	44	100%	45	98%
50 to 54	1,993	479	465	103%	487	98%
55 to 59	2,716	636	634	100%	616	103%
60 to 64	3,777	1,056	1,205	88%	1,051	100%
65 to 69	5,129	1,517	1,476	103%	1,511	100%
>=70	1,528	363	749	48%	739	49%
Total	15,317	4,095	4,573	90%	4,449	92%

Firefighters & Rescue Squad Workers - Male & Female

Age	Exposed	Actual	Expected	Actual to Expected Ratio	Proposed	Actual to Proposed Ratio
<=49	100	37	28	132%	33	112%
50 to 54	503	166	137	121%	163	102%
55 to 59	303	110	103	107%	109	101%
60 to 64	216	69	98	70%	70	99%
65 to 69	95	27	44	61%	31	87%
>=70	16	4	8	50%	7	57%
Total	1,233	413	418	99%	413	100%

Law Enforcement Officers - Male & Female

Age	Exposed	Actual	Expected	Actual to Expected Ratio	Proposed	Actual to Proposed Ratio
<=49	148	109	92	118%	98	111%
50 to 54	660	383	363	106%	383	100%
55 to 59	2,662	603	649	93%	573	105%
60 to 64	1,176	217	247	88%	225	96%
65 to 69	343	83	103	81%	88	94%
>=70	118	22	55	40%	46	48%
Total	5,107	1,417	1,509	94%	1,413	100%

Section 3: Rates of Retirement

Reduced Retirement

General - Male

Age	Exposed	Actual	Expected	Actual to Expected Ratio	Proposed	Actual to Proposed Ratio
50 to 54	7,051	322	414	78%	335	96%
55 to 59	5,705	388	365	106%	399	97%
60 to 64	11,338	1,716	1,461	117%	1,718	100%
Total	24,094	2,426	2,240	108%	2,452	99%

General - Female

Age	Exposed	Actual	Expected	Actual to Expected Ratio	Proposed	Actual to Proposed Ratio
50 to 54	8,796	446	540	83%	453	98%
55 to 59	7,532	528	514	103%	520	102%
60 to 64	14,527	2,283	1,894	121%	2,258	101%
Total	30,855	3,257	2,948	110%	3,231	101%

Firefighters & Rescue Squad Workers - Male & Female

Age	Exposed	Actual	Expected	Actual to Expected Ratio	Proposed	Actual to Proposed Ratio
50 to 54	1,889	105	80	131%	108	97%
55 to 59	1,453	79	56	141%	78	101%
60 to 64	352	39	34	115%	41	95%
Total	3,694	223	170	131%	227	98%

Law Enforcement Officers - Male & Female

Age	Exposed	Actual	Expected	Actual to Expected Ratio	Proposed	Actual to Proposed Ratio
50 to 54	4,746	476	190	251%	380	125%
Total	4,746	476	190	251%	380	125%

Section 4: Termination Rates

Termination rates measure the probability that a member will leave prior to retirement eligibility. The Retirement System currently uses termination rates that vary by age, gender, and employee group (i.e., general employees including rescue squad workers, firefighters, law enforcement officers). The current termination rates are based on the recommendation of the prior experience study. The following table shows that, in total, the termination rates result in expected terminations greater than actual terminations.

Therefore, we are recommending that the Board adopt a set of termination rates that better reflect the experience of the Retirement System and the expectations for future terminations.

As was the case for other separations from active service, rescue squad workers have been studied with firefighters.

Section 4: Termination Rates

Termination - First 4 Years

General - Male

Service	Exposed	Actual	Expected	Actual to Expected Ratio	Proposed	Actual to Proposed Ratio
0	8,207	1,530	2,462	62%	1,518	101%
1	16,864	2,582	2,909	89%	2,614	99%
2	15,083	1,949	2,187	89%	1,961	99%
3	13,855	1,488	1,663	89%	1,455	102%
4	12,935	1,125	1,294	87%	1,099	102%
Total	66,944	8,674	10,515	82%	8,647	100%

General - Female

Service	Exposed	Actual	Expected	Actual to Expected Ratio	Proposed	Actual to Proposed Ratio
0	10,199	2,097	3,060	69%	2,091	100%
1	20,827	3,630	4,165	87%	3,645	100%
2	18,342	2,741	2,935	93%	2,751	100%
3	16,744	2,100	2,177	96%	2,093	100%
4	15,756	1,649	1,970	84%	1,654	100%
Total	81,868	12,217	14,307	85%	12,234	100%

Firefighters & Rescue Squad Workers - Male & Female

Service	Exposed	Actual	Expected	Actual to Expected Ratio	Proposed	Actual to Proposed Ratio
0	1,430	188	306	61%	186	101%
1	3,520	365	403	91%	370	99%
2	3,224	302	304	99%	306	99%
3	3,073	260	244	107%	261	100%
4	2,975	226	196	115%	223	101%
Total	14,222	1,341	1,453	92%	1,346	100%

Law Enforcement Officers - Male & Female

Service	Exposed	Actual	Expected	Actual to Expected Ratio	Proposed	Actual to Proposed Ratio
0	1,978	240	297	81%	237	101%
1	5,946	512	595	86%	505	101%
2	6,094	493	548	90%	488	101%
3	6,058	441	455	97%	454	97%
4	5,796	404	435	93%	406	100%
Total	25,872	2,090	2,330	90%	2,090	100%

Section 4: Termination Rates

Termination - After 4 Years

General - Male

Age	Exposed	Actual	Expected	Actual to Expected Ratio	Proposed	Actual to Proposed Ratio
<=24	235	16	16	100%	18	89%
25 to 29	4,635	343	278	123%	348	99%
30 to 34	10,593	622	636	98%	636	98%
35 to 39	15,089	704	905	78%	679	104%
40 to 44	20,154	797	806	99%	806	99%
45 to 49	22,867	872	915	95%	915	95%
50 to 54	15,325	631	613	103%	613	103%
55 to 59	13,492	631	540	117%	540	117%
Total	102,390	4,616	4,709	98%	4,555	101%

General - Female

Age	Exposed	Actual	Expected	Actual to Expected Ratio	Proposed	Actual to Proposed Ratio
<=24	58	9	5	180%	6	150%
25 to 29	3,462	357	277	129%	346	103%
30 to 34	12,367	1,132	866	131%	1,113	102%
35 to 39	18,801	1,195	1,316	91%	1,222	98%
40 to 44	24,739	1,285	1,237	104%	1,237	104%
45 to 49	29,155	1,296	1,166	111%	1,312	99%
50 to 54	22,236	1,146	889	129%	1,001	114%
55 to 59	18,436	1,086	737	147%	830	131%
Total	129,254	7,506	6,493	116%	7,067	106%

Firefighters & Rescue Squad Workers - Male & Female

Age	Exposed	Actual	Expected	Actual to Expected Ratio	Proposed	Actual to Proposed Ratio
<=24	128	11	4	275%	4	275%
25 to 29	3,105	112	86	130%	109	103%
30 to 34	5,457	216	149	145%	218	99%
35 to 39	6,374	192	190	101%	191	101%
40 to 44	7,094	182	155	117%	177	103%
45 to 49	5,759	155	120	129%	144	108%
50 to 54	1,431	55	35	157%	36	153%
Total	29,348	923	739	125%	879	105%

Law Enforcement Officers - Male & Female

Age	Exposed	Actual	Expected	Actual to Expected Ratio	Proposed	Actual to Proposed Ratio
<=24	26	2	1	200%	1	200%
25 to 29	4,902	253	221	114%	245	103%
30 to 34	11,549	578	521	111%	577	100%
35 to 39	15,091	578	678	85%	604	96%
40 to 44	17,574	554	613	90%	527	105%
45 to 49	13,310	482	463	104%	466	103%
50 to 54	2,137	107	74	145%	75	143%
Total	64,589	2,554	2,571	99%	2,495	102%

Section 5: Disability Rates

Disability rates measure the probability that a member will become disabled and receive a disability retirement benefit. The Retirement System currently uses disability rates that vary by age, gender, and employee group (i.e., general employees including rescue squad workers, firefighters, law enforcement officers). The current disability rates are based, in total, the disability rates result in expected disabilities greater than actual disabilities.

Therefore, we are recommending that the Board adopt a set of disability rates that better reflect the experience of the Retirement System and the expectations for future disabilities.

As was the case for other separations from active service, rescue squad workers have been studied with firefighters.

Section 5: Disability Rates

Disability

General - Male

Age	Exposed	Actual	Expected	Actual to Expected Ratio	Proposed	Actual to Proposed Ratio
<=24	6,058	0	2	0%	2	0%
25 to 29	15,790	0	11	0%	7	0%
30 to 34	19,869	12	28	43%	10	120%
35 to 39	23,362	24	73	33%	36	67%
40 to 44	28,590	64	129	50%	86	74%
45 to 49	31,069	88	184	48%	124	71%
50 to 54	30,447	156	244	64%	183	85%
55 to 59	26,804	193	268	72%	214	90%
60 to 64	17,633	122	176	69%	141	87%
Total	199,622	659	1,115	59%	803	82%

General - Female

Age	Exposed	Actual	Expected	Actual to Expected Ratio	Proposed	Actual to Proposed Ratio
<=24	3,990	0	2	0%	2	0%
25 to 29	17,894	0	12	0%	9	0%
30 to 34	25,201	6	25	24%	13	46%
35 to 39	29,966	23	57	40%	15	153%
40 to 44	35,765	64	115	56%	72	89%
45 to 49	39,261	99	160	62%	118	84%
50 to 54	41,494	168	229	73%	186	90%
55 to 59	34,772	165	259	64%	209	79%
60 to 64	21,526	104	197	53%	129	81%
Total	249,869	629	1,056	60%	753	84%

Firefighters & Rescue Squad Workers - Male & Female

Age	Exposed	Actual	Expected	Actual to Expected Ratio	Proposed	Actual to Proposed Ratio
<=24	3,273	0	4	0%	3	0%
25 to 29	7,483	2	13	15%	7	29%
30 to 34	8,087	8	27	30%	10	80%
35 to 39	8,058	16	42	38%	16	100%
40 to 44	8,311	36	50	72%	41	88%
45 to 49	6,459	40	51	78%	42	95%
50 to 54	4,196	50	44	114%	49	102%
55 to 59	1,896	27	29	93%	30	90%
60 to 64	608	3	9	33%	10	30%
Total	48,371	182	269	68%	208	88%

Section 5: Disability Rates

Disability

Law Enforcement Officers - Male

Age	Exposed	Actual	Expected	Actual to Expected Ratio	Proposed	Actual to Proposed Ratio
<=24	3,559	0	4	0%	2	0%
25 to 29	12,785	4	16	25%	9	44%
30 to 34	13,929	15	22	68%	14	107%
35 to 39	15,900	26	64	41%	32	81%
40 to 44	17,600	44	106	42%	53	83%
45 to 49	12,831	47	103	46%	51	92%
50 to 54	7,143	18	57	32%	29	62%
55 to 59	2,667	0	21	0%	11	0%
60 to 64	1,212	0	10	0%	5	0%
Total	87,626	154	403	38%	206	75%

Law Enforcement Officers - Female

Age	Exposed	Actual	Expected	Actual to Expected Ratio	Proposed	Actual to Proposed Ratio
<=24	481	0	1	0%	1	0%
25 to 29	1,944	0	5	0%	5	0%
30 to 34	2,103	9	8	113%	6	150%
35 to 39	2,193	5	11	45%	9	56%
40 to 44	2,167	10	14	71%	11	91%
45 to 49	1,801	15	14	107%	11	136%
50 to 54	1,146	7	9	78%	8	88%
55 to 59	270	0	2	0%	2	0%
60 to 64	68	0	1	0%	0	N/A
Total	12,173	46	65	71%	53	87%

Section 6: Individual Salary Increase Rates

Individual salary increase rates reflect the increases in a member's salary that are not related to across-the-board type increases (i.e., inflation and productivity). The salary increase rates include elements of salary increase due to promotions and longevity (collectively referred to as "merit increases"). The analysis for these rates is based on actual versus expected merit increases (i.e. removing the effects of inflation and productivity) for the five-year period of this investigation. Using this comparison, all salaries reflect recent experience such that prior inflation and productivity increases are consistent and can be ignored. We are recommending that the Board adopt a set of salary increase rates that reflect the experience of the Retirement System and the expectations for future increases.

As was the case with separations from active service, rescue squad workers have been studied with firefighters.

General

Service	Average Prior Year Salaries (in 000s)	Average Actual Merit-Only Salaries (in 000s)	Actual Underlying Merit Increase	Average Expected Merit-Only Salaries (in 000s)	Expected Merit Increase	Actual to Expected Ratio	Average Proposed Merit-Only Salaries (in 000s)	Proposed Merit Increase	Actual to Proposed Ratio
1 to 5	37,102	37,665	1.52%	38,450	3.63%	98.0%	38,294	3.21%	98.4%
6 to 10	41,572	41,890	0.76%	42,567	2.39%	98.4%	42,325	1.81%	99.0%
11 to 15	45,753	45,920	0.37%	46,609	1.87%	98.5%	46,221	1.02%	99.3%
16 to 20	49,644	49,676	0.06%	50,448	1.62%	98.5%	49,852	0.42%	99.6%
21 to 25	54,666	54,601	-0.12%	55,514	1.55%	98.4%	54,724	0.11%	99.8%
26 to 30	58,868	58,901	0.06%	59,782	1.55%	98.5%	58,868	0.00%	100.1%
31+	65,961	66,027	0.10%	66,936	1.48%	98.6%	65,961	0.00%	100.1%

Fire

Service	Average Prior Year Salaries (in 000s)	Average Actual Merit-Only Salaries (in 000s)	Actual Underlying Merit Increase	Average Expected Merit-Only Salaries (in 000s)	Expected Merit Increase	Actual to Expected Ratio	Average Proposed Merit-Only Salaries (in 000s)	Proposed Merit Increase	Actual to Proposed Ratio
1 to 5	38,481	39,244	1.98%	40,105	4.22%	97.9%	39,711	3.20%	98.8%
6 to 10	44,318	44,715	0.90%	45,762	3.26%	97.7%	45,114	1.80%	99.1%
11 to 15	50,861	51,186	0.64%	52,171	2.57%	98.1%	51,329	0.92%	99.7%
16 to 20	56,990	57,112	0.21%	58,083	1.92%	98.3%	57,096	0.19%	100.0%
21 to 25	61,651	61,475	-0.29%	62,642	1.61%	98.1%	61,651	0.00%	99.7%
26 to 30	66,494	66,615	0.18%	67,526	1.55%	98.7%	66,494	0.00%	100.2%
31+	75,485	75,567	0.11%	76,612	1.49%	98.6%	75,485	0.00%	100.1%

Law Enforcement Officers

Service	Average Prior Year Salaries (in 000s)	Average Actual Merit-Only Salaries (in 000s)	Actual Underlying Merit Increase	Average Expected Merit-Only Salaries (in 000s)	Expected Merit Increase	Actual to Expected Ratio	Average Proposed Merit-Only Salaries (in 000s)	Proposed Merit Increase	Actual to Proposed Ratio
1 to 5	39,103	39,809	1.80%	40,680	4.03%	97.9%	40,317	3.10%	98.7%
6 to 10	44,980	45,398	0.93%	46,452	3.27%	97.7%	45,909	2.06%	98.9%
11 to 15	52,026	52,223	0.38%	53,324	2.50%	97.9%	52,656	1.21%	99.2%
16 to 20	58,731	58,847	0.20%	59,873	1.94%	98.3%	59,130	0.68%	99.5%
21 to 25	64,206	64,210	0.01%	65,296	1.70%	98.3%	64,491	0.44%	99.6%
26 to 30	67,652	67,969	0.47%	68,772	1.66%	98.8%	67,897	0.36%	100.1%
31+	76,975	77,034	0.08%	77,658	0.89%	99.2%	77,120	0.19%	99.9%

Section 7: Leave Conversions

Under the Retirement System, unused vacation leave may increase a member's average final compensation (AFC) or a member's creditable service and unused sick leave may increase a member's creditable service. The following table shows the increases in AFC and creditable service for recently retired members, based on data provided by the Retirement Systems Division.

Based on this information, we are recommending that the Board adopt the following assumptions for leave conversions of members expected to retire with unreduced benefits. Please note that the creditable service is split between the creditable service used to determine eligibility for benefits and the eligibility used to determine the benefit. This distinction is made to comply with the requirements for actuarial valuation software where eligibility for retirement and other benefits are based on ages and services that are integers.

Increase in AFC	Actual	Expected	Actual ÷ Expected	Proposed	Actual ÷ Proposed
General Employees	1.37	2.00	68%	1.50	91%
Fire and Rescue	2.07	1.00	207%	1.75	119%
Law Enforcement	1.67	1.50	111%	1.50	111%

Increase in Creditable Service (Years)	Actual	Expected	Actual ÷ Expected	Proposed Credited	Actual ÷ Proposed	Proposed Eligibility
General Employees						
Male	0.94	0.90	104%	0.95	99%	1.00
Female	0.65	0.65	100%	0.65	100%	1.00
Fire and Rescue						
Combined	1.24	1.25	99%	1.25	99%	1.00
Law Enforcement						
Combined	1.17	1.25	94%	1.20	98%	1.00

Section 8: Other Assumptions

We are recommending no changes in the administrative expense or marriage assumptions. As complete data is not available for inactive members, the liability for inactive members is based on a percentage of their accumulated contributions. The current percentage is 200%. We are not recommending a change in this percentage, as it already includes a margin of conservatism.

Section 9: Summary and Cost of Changes

As a result of the experience investigation, we are recommending revised rates of withdrawal, mortality, retirement and salary increase for active members, and revised rates of mortality for retired members and survivors of deceased members. In addition, we are recommending revised rates of projected mortality improvements to apply to all base retirement rates. Finally, we are recommending revised assumptions for leave conversions.

Based on the results of the December 31, 2014 valuation and these proposed demographic assumptions, the total liability of the Retirement System will decrease from $28,456,762,124 to $28,034,405,687 and the normal required contribution rate component of the annual required contribution will decrease from 6.39% of payroll to 5.98% of payroll for general employees and firefighters, and decrease from 6.87% of payroll to 6.46% of payroll for law enforcement officers. However, it is our understanding that such assumptions, if adopted, would be applied to the December 31, 2015 valuation.

If the Board of Trustees approves these recommendations, the attached set of resolutions may be used. In the actuary's judgment, the rates recommended are suitable for use until further experience indicates that modifications are desirable

Note: The cost impacts shown above only apply to demographic-type assumptions. Economic assumptions including investment return, real rate of return, general and wage inflation and real wage growth are not included in this report. Additionally, funding methods such as asset valuation method, actuarial cost method and amortization method are not included in this report. These economic assumptions and funding methodologies are not required by Section 28(o) of Chapter 128 of the General Statues.

Appendix A: Statement of Actuarial Assumptions and Methods

INTEREST RATE: 7.25% per annum, compounded annually.

INFLATION: Both general and wage inflation are assumed to be 3.00% per annum.

REAL WAGE GROWTH: 0.50% per annum.

ADMINISTRATIVE EXPENSES: 0.20% of payroll for general employees and firefighters.

MARRIAGE ASSUMPTION: 100% married with the male spouses four years older than female spouses.

REPORTED COMPENSATION: Calendar year compensation as furnished by the system's office.

VALUATION COMPENSATION: Reported compensation adjusted to reflect the assumed rate of pay as of the valuation date.

ACTUARIAL COST METHOD: Projected benefit method with aggregate level normal cost and frozen accrued liability. Gains and losses are reflected in normal cost.

ASSET VALUATION METHOD: Actuarial value. The actuarial value of assets recognizes a portion of the difference between the market value of assets and the expected actuarial value of assets, based on the assumed valuation rate of return. The amount recognized each year is 20% of the difference between market value and expected actuarial value. The actuarial value of assets is not allowed to be greater than 120% of the market value of assets or less than 80% of the market value of assets.

TIMING OF ASSUMPTIONS: All withdrawals, deaths, disabilities, retirements and salary increases are assumed to occur July 1 of each year.

LEAVE CONVERSIONS:

	General		Fire and Rescue		Law Enforcement	
	Males	Females	Males	Females	Males	Females
Increase in AFC						
	1.50%	1.50%	1.75%	1.75%	1.50%	1.50%
Increase in Creditable Service (years)						
Credited	0.95	0.65	1.25	1.25	1.20	1.20
Eligibility	1.00	1.00	1.00	1.00	1.00	1.00

DEATHS AFTER RETIREMENT (NON-DISABLED): According to the RP-2014 Mortality tables for retirees. For male general employees, these tables are multiplied by 115% for ages under 78 and by 135% for ages 78 and over and for female general employees multiplied by 79% for ages under 78 and by 116% for ages 78 and over. For all law enforcement officers, these tables are multiplied by 104%. The tables are unadjusted for firefighters and rescue squad workers. For survivors of deceased members these tables are multiplied by 123% for both males and females at all ages. The active employee rates of RP-2014 are used for ages less than 50.

Appendix A: Statement of Actuarial Assumptions and Methods

DEATHS AFTER DISABILITY: According to the RP-2014 Mortality tables for disabled annuitants multiplied by 103% for males and 99% for females.

DEATHS PRIOR TO RETIREMENT: According to the RP-2014 Mortality tables for active employees.

MORTALITY PROJECTION (NON-DISABLED): All mortality rates are projected from 2014 using Scale MP-2014.

LIABILITY FOR INACTIVE MEMBERS: The data provided for inactive members does not contain all the elements to calculate the member's deferred benefit. The liability for these members is estimated to be 200% of the member's accumulated contributions.

Appendix A: Statement of Actuarial Assumptions and Methods

LGERS Retirement Rates

General - Male

	Service									
Age	<=3	4	5 to 19	20 to 23	24	25	26 to 28	29	30	>=31
<=48	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
49	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.275	0.275	0.150
50 to 54	0.000	0.000	0.000	0.030	0.030	0.070	0.070	0.275	0.275	0.150
55 to 58	0.000	0.000	0.000	0.050	0.050	0.100	0.100	0.250	0.250	0.150
59	0.000	0.000	0.000	0.050	0.050	0.100	0.100	0.250	0.350	0.200
60	0.000	0.000	0.100	0.100	0.150	0.275	0.275	0.275	0.300	0.250
61	0.000	0.000	0.100	0.100	0.275	0.300	0.225	0.225	0.225	0.225
62	0.000	0.000	0.200	0.200	0.350	0.400	0.300	0.300	0.300	0.300
63	0.000	0.000	0.200	0.200	0.250	0.275	0.275	0.275	0.275	0.275
64	0.000	0.000	0.200	0.200	0.250	0.275	0.275	0.275	0.275	0.275
65	0.000	0.150	0.300	0.300	0.300	0.350	0.350	0.350	0.350	0.350
66	0.000	0.150	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300
67	0.000	0.150	0.225	0.225	0.225	0.225	0.225	0.225	0.225	0.225
68	0.000	0.150	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
69	0.000	0.150	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
70 to 74	0.000	0.150	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200
>=75	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Appendix A: Statement of Actuarial Assumptions and Methods

LGERS Retirement Rates

General - Female

	Service										
Age	<=3	4	5	6 to 19	20 to 23	24	25	26 to 28	29	30	>=31
>=48	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
49	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.300	0.200
50 to 54	0.000	0.000	0.000	0.000	0.045	0.045	0.060	0.060	0.250	0.300	0.200
55	0.000	0.000	0.000	0.000	0.060	0.060	0.085	0.085	0.250	0.300	0.200
56	0.000	0.000	0.000	0.000	0.060	0.060	0.085	0.085	0.275	0.275	0.200
57	0.000	0.000	0.000	0.000	0.060	0.060	0.085	0.085	0.275	0.250	0.200
58	0.000	0.000	0.000	0.000	0.060	0.060	0.085	0.085	0.275	0.250	0.200
59	0.000	0.000	0.000	0.000	0.060	0.060	0.085	0.085	0.275	0.275	0.200
60	0.000	0.000	0.110	0.110	0.110	0.200	0.300	0.275	0.350	0.350	0.250
61	0.000	0.000	0.110	0.110	0.110	0.225	0.225	0.225	0.225	0.225	0.225
62	0.000	0.000	0.200	0.200	0.200	0.350	0.425	0.350	0.350	0.350	0.350
63	0.000	0.000	0.200	0.200	0.200	0.275	0.275	0.275	0.275	0.275	0.275
64	0.000	0.000	0.200	0.200	0.200	0.275	0.275	0.250	0.250	0.250	0.250
65	0.000	0.150	0.350	0.350	0.350	0.350	0.350	0.350	0.350	0.350	0.350
66	0.000	0.150	0.250	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300
67 to 69	0.000	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
70 to 74	0.000	0.150	0.150	0.250	0.250	0.250	0.250	0.250	0.250	0.250	0.250
>=75	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Appendix A: Statement of Actuarial Assumptions and Methods

LGERS Retirement Rates

Firefighters & Rescue Squad Workers - Male & Female

	Service								
Age	<=3	4	5 to 19	20 to 23	24	25 to 28	29	30	>=31
<=48	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
49	0.000	0.000	0.000	0.000	0.000	0.000	0.325	0.325	0.325
50 to 54	0.000	0.000	0.000	0.025	0.025	0.085	0.325	0.325	0.325
55 to 59	0.000	0.000	0.025	0.025	0.025	0.130	0.500	0.500	0.275
60	0.000	0.000	0.058	0.058	0.325	0.325	0.325	0.325	0.325
61	0.000	0.000	0.058	0.058	0.325	0.325	0.325	0.325	0.325
62	0.000	0.000	0.220	0.220	0.325	0.325	0.325	0.325	0.325
63	0.000	0.000	0.140	0.140	0.325	0.325	0.325	0.325	0.325
64	0.000	0.000	0.140	0.140	0.325	0.325	0.325	0.325	0.325
65 to 74	0.000	0.325	0.325	0.325	0.325	0.325	0.325	0.325	0.325
>=75	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Appendix A: Statement of Actuarial Assumptions and Methods

LGERS Retirement Rates

Law Enforcement - Male & Female

	Service								
Age	<=3	4	5	6 to 14	15 to 27	28	29	30	>=31
<=48	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
49	0.000	0.000	0.000	0.000	0.000	0.000	0.700	0.400	0.400
50 to 54	0.000	0.000	0.000	0.000	0.080	0.080	0.700	0.400	0.400
55	0.000	0.000	0.000	0.325	0.325	0.750	0.750	0.750	0.400
56 to 59	0.000	0.100	0.100	0.150	0.150	0.225	0.225	0.225	0.300
60 to 64	0.000	0.100	0.100	0.200	0.200	0.225	0.225	0.225	0.200
65	0.000	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300
66	0.000	0.300	0.300	0.300	0.300	0.300	0.300	0.300	0.300
67 to 74	0.000	0.200	0.200	0.200	0.200	0.200	0.200	0.200	0.200
>=75	0.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Appendix A: Statement of Actuarial Assumptions and Methods

LGERS Termination Rates

General - Male

	Service					
Age	0	1	2	3	4	>=5
<=24	0.185	0.1550	0.130	0.105	0.085	0.075
25 to 29	0.185	0.1550	0.130	0.105	0.085	0.075
30 to 34	0.185	0.1550	0.130	0.105	0.085	0.060
35 to 39	0.185	0.1550	0.130	0.105	0.085	0.045
40 to 44	0.185	0.1550	0.130	0.105	0.085	0.040
45 to 49	0.185	0.1550	0.130	0.105	0.085	0.040
>=50	0.185	0.1550	0.130	0.105	0.085	0.040

General - Female

	Service					
Age	0	1	2	3	4	>=5
<=24	0.205	0.175	0.150	0.125	0.105	0.100
25 to 29	0.205	0.175	0.150	0.125	0.105	0.100
30 to 34	0.205	0.175	0.150	0.125	0.105	0.090
35 to 39	0.205	0.175	0.150	0.125	0.105	0.065
40 to 44	0.205	0.175	0.150	0.125	0.105	0.050
45 to 49	0.205	0.175	0.150	0.125	0.105	0.045
>=50	0.205	0.175	0.150	0.125	0.105	0.045

Firefighters & Rescue Squad Workers - Male & Female

	Service					
Age	0	1	2	3	4	>=5
<=24	0.130	0.105	0.095	0.085	0.075	0.035
25 to 29	0.130	0.105	0.095	0.085	0.075	0.035
30 to 34	0.130	0.105	0.095	0.085	0.075	0.040
35 to 39	0.130	0.105	0.095	0.085	0.075	0.030
40 to 44	0.130	0.105	0.095	0.085	0.075	0.025
45 to 49	0.130	0.105	0.095	0.085	0.075	0.025
>=50	0.130	0.105	0.095	0.085	0.075	0.025

Law Enforcement - Male & Female

	Service					
Age	0	1	2	3	4	>=5
<=24	0.120	0.085	0.080	0.075	0.070	0.050
25 to 29	0.120	0.085	0.080	0.075	0.070	0.050
30 to 34	0.120	0.085	0.080	0.075	0.070	0.050
35 to 39	0.120	0.085	0.080	0.075	0.070	0.040
40 to 44	0.120	0.085	0.080	0.075	0.070	0.030
45 to 49	0.120	0.085	0.080	0.075	0.070	0.035
>=50	0.120	0.085	0.080	0.075	0.070	0.035

Appendix A: Statement of Actuarial Assumptions and Methods

LGERS Salary Merit Scales

Service	General	Firefighters & Rescue Squad Workers	Law Enforcement	Service	General	Firefighters & Rescue Squad Workers	Law Enforcement
0	0.0425	0.0425	0.0385	26	0.0000	0.0000	0.0038
1	0.0390	0.0390	0.0360	27	0.0000	0.0000	0.0036
2	0.0355	0.0355	0.0335	28	0.0000	0.0000	0.0034
3	0.0320	0.0320	0.0310	29	0.0000	0.0000	0.0032
4	0.0285	0.0285	0.0285	30	0.0000	0.0000	0.0030
5	0.0250	0.0250	0.0265	31	0.0000	0.0000	0.0028
6	0.0225	0.0225	0.0245	32	0.0000	0.0000	0.0026
7	0.0200	0.0200	0.0225	33	0.0000	0.0000	0.0024
8	0.0175	0.0175	0.0205	34	0.0000	0.0000	0.0022
9	0.0150	0.0150	0.0185	35	0.0000	0.0000	0.0020
10	0.0145	0.0135	0.0165	36	0.0000	0.0000	0.0016
11	0.0130	0.0120	0.0150	37	0.0000	0.0000	0.0012
12	0.0115	0.0105	0.0135	38	0.0000	0.0000	0.0008
13	0.0100	0.0090	0.0120	39	0.0000	0.0000	0.0004
14	0.0085	0.0075	0.0105	40	0.0000	0.0000	0.0000
15	0.0070	0.0060	0.0095	41	0.0000	0.0000	0.0000
16	0.0060	0.0045	0.0085	42	0.0000	0.0000	0.0000
17	0.0050	0.0030	0.0075	43	0.0000	0.0000	0.0000
18	0.0040	0.0015	0.0065	44	0.0000	0.0000	0.0000
19	0.0030	0.0000	0.0055	45	0.0000	0.0000	0.0000
20	0.0025	0.0000	0.0052	46	0.0000	0.0000	0.0000
21	0.0020	0.0000	0.0049	47	0.0000	0.0000	0.0000
22	0.0015	0.0000	0.0046	48	0.0000	0.0000	0.0000
23	0.0010	0.0000	0.0043	49	0.0000	0.0000	0.0000
24	0.0005	0.0000	0.0042	>=50	0.0000	0.0000	0.0000
25	0.0000	0.0000	0.0040				

Appendix A: Statement of Actuarial Assumptions and Methods

LGERS Disability Rates

Age	General		Firefighters & Rescue Squad Workers		Law Enforcement		Age	General		Firefighters & Rescue Squad Workers		Law Enforcement	
	Male	Female	Male	Female	Male	Female		Male	Female	Male	Female	Male	Female
15	0.00040	0.00050	0.00100	0.00060	0.00040	0.00200	41	0.00300	0.00200	0.00500	0.00400	0.00300	0.00500
16	0.00040	0.00050	0.00100	0.00060	0.00040	0.00200	42	0.00300	0.00200	0.00550	0.00420	0.00300	0.00500
17	0.00040	0.00050	0.00100	0.00060	0.00040	0.00200	43	0.00300	0.00200	0.00550	0.00440	0.00300	0.00500
18	0.00040	0.00050	0.00100	0.00060	0.00040	0.00200	44	0.00300	0.00200	0.00550	0.00460	0.00300	0.00500
19	0.00040	0.00050	0.00100	0.00060	0.00040	0.00200	45	0.00400	0.00300	0.00550	0.00480	0.00400	0.00600
20	0.00040	0.00050	0.00100	0.00060	0.00040	0.00200	46	0.00400	0.00300	0.00550	0.00500	0.00400	0.00600
21	0.00040	0.00050	0.00100	0.00060	0.00040	0.00200	47	0.00400	0.00300	0.00750	0.00520	0.00400	0.00600
22	0.00040	0.00050	0.00100	0.00060	0.00040	0.00200	48	0.00400	0.00300	0.00750	0.00540	0.00400	0.00600
23	0.00040	0.00050	0.00100	0.00060	0.00040	0.00200	49	0.00400	0.00300	0.00750	0.00560	0.00400	0.00600
24	0.00040	0.00050	0.00100	0.00060	0.00060	0.00200	50	0.00600	0.00350	0.01000	0.00760	0.00400	0.00700
25	0.00040	0.00050	0.00100	0.00060	0.00060	0.00250	51	0.00600	0.00400	0.01100	0.00960	0.00400	0.00700
26	0.00040	0.00050	0.00100	0.00060	0.00060	0.00250	52	0.00600	0.00450	0.01200	0.01160	0.00400	0.00700
27	0.00040	0.00050	0.00100	0.00060	0.00060	0.00250	53	0.00600	0.00500	0.01300	0.01360	0.00400	0.00700
28	0.00050	0.00050	0.00100	0.00060	0.00060	0.00250	54	0.00600	0.00550	0.01400	0.01560	0.00400	0.00700
29	0.00050	0.00050	0.00100	0.00060	0.00100	0.00250	55	0.00800	0.00600	0.01500	0.01760	0.00400	0.00700
30	0.00050	0.00050	0.00100	0.00090	0.00100	0.00300	56	0.00800	0.00600	0.01500	0.01960	0.00400	0.00700
31	0.00050	0.00050	0.00100	0.00120	0.00100	0.00300	57	0.00800	0.00600	0.01500	0.02160	0.00400	0.00700
32	0.00050	0.00050	0.00100	0.00150	0.00100	0.00300	58	0.00800	0.00600	0.01500	0.02360	0.00400	0.00700
33	0.00050	0.00050	0.00150	0.00180	0.00100	0.00300	59	0.00800	0.00600	0.01500	0.02560	0.00400	0.00700
34	0.00050	0.00050	0.00150	0.00210	0.00100	0.00300	60	0.00800	0.00600	0.01500	0.02760	0.00400	0.00700
35	0.00050	0.00050	0.00150	0.00240	0.00200	0.00400	61	0.00800	0.00600	0.01500	0.02960	0.00400	0.00700
36	0.00150	0.00050	0.00150	0.00270	0.00200	0.00400	62	0.00800	0.00600	0.01500	0.00300	0.00400	0.00700
37	0.00150	0.00050	0.00150	0.00300	0.00200	0.00400	63	0.00800	0.00600	0.01500	0.03000	0.00400	0.00700
38	0.00200	0.00050	0.00200	0.00330	0.00200	0.00400	64	0.00800	0.00600	0.01500	0.03000	0.00400	0.00700
39	0.00200	0.00050	0.00300	0.00360	0.00200	0.00400	>=65	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
40	0.00300	0.00200	0.00400	0.00380	0.00300	0.00500							

Appendix B: Resolution to the Board

ADOPTION OF TABLES HEREIN PRESENTED

In order that the tables herein presented may have the official approval of the Board of Trustees, the following resolutions are recommended for adoption.

WHEREAS, The investigation of the mortality, service and compensation experience of the members of the North Carolina Local Governmental Employees' Retirement System that was prepared as of December 31, 2014 indicated that the active service tables and mortality tables previously adopted by the Board of Trustees require modification in order that they may reflect more closely the actual past experience of the membership, and

WHEREAS, The actuary has prepared new tables of rates which he recommends for adoption, therefore, be it

RESOLVED, That the Board of Trustees, acting in accordance with Section 28(o) of Chapter 128 of the North Carolina General Statutes and upon the recommendation of the actuary, hereby discontinues the use in calculating the State's rates of contribution and in valuing the liabilities of the System of the active service tables and mortality tables previously used and approves for use instead the attached tables, and be it further

RESOLVED, That the use of the new tables in the valuation as of December 31, 2015 and in all actuarial valuations thereafter, is hereby approved. The Board of Trustees of the North Carolina Local Governmental Employees' Retirement System approved the preceding resolution at a meeting held on October 22, 2015.

BOARD OF TRUSTEES,
NORTH CAROLINA LOCAL GOVERNMENTAL
EMPLOYEES' RETIREMENT SYSTEM

By .....
Secretary

Attest: