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The experience and dedication you deserve

North Carolina Retirement Systems

Experience Study Supplement

Larry Langer, ASA, FCA, EA, MAAA
Jonathan Craven, ASA, FCA, EA, MAAA
Wendy Ludbrook, FSA, FCA, EA, MAAA

December 9, 2020



Agenda

- Discuss the Experience Review Process
- Review Key Takeaways/Cost Impact of Recommendations
- Review recommendations for:
 - Economic Assumptions
 - Demographic Assumptions
 - Funding Methods
 - Administrative Factors
- No Board decisions today
 - Boards to review today
 - Provide direction on additional analysis if needed
 - Board scheduled to adopt recommendations at the January Board meeting

The Actuarial Valuation Process

- Over the short term, employer contributions are determined by the annual actuarial valuation based on estimated benefits, expenses and investment return using Assumptions and Funding Methods recommended by the actuary and adopted by the Board through the Experience Review process
- Over the long term, employer contributions are adjusted to reflect actual benefits, expenses and investment return.

Inputs

Member Data

Asset Data

Benefit Provisions

Assumptions

Funding Methods



Results

Actuarial Value of Assets

Actuarial Accrued Liability

Net Actuarial Gain or Loss

Funded Ratio

Benefit Enhancement

Additional Disclosures

Projections

Purpose of the Experience Study

- From GFOA Best Practice **Enhancing Reliability of Actuarial Valuations for Pension Plans**:
 - **Actuarial Experience Study.** While an actuarial gain/loss analysis helps provide a better understanding of a plan's assumed and actual experience during the year, this timeframe is not long enough to identify trends. 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.
- The assumptions and funding methodology of the North Carolina Retirement Systems are reviewed every five years and documented in the Experience Study.
 - The last experience study was reviewed and adopted in January 2016 and first used in the December 31, 2015 valuations.
 - The results of this experience study will be used for the December 31, 2020 through 2024 actuarial valuations.

Experience Study Process

- Based on five-year period from January 1, 2015 – December 31, 2019
 - Compare Experience (“Actual”) with Assumptions (“Expected”)
 - Consider trends observed during the previous Experience Study
- Make Judgments About Future Trends:
 - Plan-Specific Experience vs. National Trends
 - Long-Term vs. Short-Term Factors
- Recommend changes in assumptions and funding methodology as needed based on Actuarial Standards of Practice
 - ASOP 4 - Measuring Pension Obligations and Determining Pension Plan Costs or Contributions
 - ASOP 27 - Selection of Economic Assumptions for Measuring Pension Obligations
 - ASOP 35 – Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations
 - ASOP 44 - Selection and Use of Asset Valuation Methods for Pension Valuations
- Implement effective with the December 31, 2020 Actuarial Valuation, which determines contribution rates effective July 1, 2022
- Next Experience Review is scheduled to be implemented effective with the December 31, 2025 Actuarial Valuation.

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Key Takeaways/Financial Impact

Key Takeaways

Teachers' and State Employees' Retirement System

| Valuation Component Reviewed | Observation | Recommendation | Financial Impact |
|--------------------------------------|-----------------------------------|-------------------------------------|------------------|
| Demographic Assumptions | | | |
| 1 Post-Retirement Mortality Rates | Fewer deaths | Decrease rates | Increase |
| 2 Active Mortality | Limited exposures | Decrease rates | Increase |
| 3 Mortality improvement | SOA projects lower improvement | Update from MP-2015 to MP-2019 | Decrease |
| 4 Service retirement | Fewer retirements | Decrease rates | Decrease |
| 5 Disability retirement | Limited exposures | Decrease rates | Immaterial |
| 6 Termination from active employment | More terminations | Increase rates | Decrease |
| Economic Assumptions | | | |
| 7 Investment return | Lower projected returns | Reduce 0.50% (Alt 1)/ 0.25% (Alt 2) | Increase |
| 8 Inflation | SSA predicts lower | Lower by 0.50% | Increase |
| 9 Individual pay increases | Mixed increases | Adjust closer to experience | Increase |
| 10 Productivity growth | Decrease not as much as inflation | Increase by 0.25% | Increase |
| Funding Method | | | |
| 11 Amortization Method | Current method reasonable | No change | No change |
| 12 Actuarial Cost method | Current method reasonable | Refine method - see below | Decrease |
| 13 Asset valuation method | Current method reasonable | No change | No change |
| 14 Administrative expenses | Expenses lower than assumed | Keep at 0.10% of payroll | No change |

Notes:

1. The Pub-2010 Public Retirement Plans Mortality Tables published by the Society of Actuaries in January 2019 provided a closer fit than the previous table which were based on corporate plan experience, resulting in less modifications.
3. For the fifth consecutive year, the SOA has reduced its projection of mortality improvement, resulting in lower liabilities.
7. Lower investment returns are the largest single source of liability and cost increases
12. The load on normal cost to account for new entrants was increased.
12. The method for calculating terminated vested liability was refined, resulting in a large liability reduction.

Financial Impact

Teachers' and State Employees' Retirement System

Had the proposed assumptions and methods been reflected for the December 31, 2019 Actuarial Valuation, the financial impact would have been as follows:

- The AAL would increase by 2.9% from \$84.87 billion to \$87.32 billion under Alternative 1; under Alternative 2, it would increase by 0.1% to \$84.94 billion.
- The ADEC would increase by 3.01% of payroll from 15.74% to 18.75% under Alternative 1; under Alternative 2, it would increase by 0.63% of payroll to 16.37%.
- The Employer Contribution would increase by 0.60% of payroll from 15.74% to 16.34% under Alternative 1; under Alternative 2 it would increase by 0.13% of payroll to 15.87%.

| | Current Valuation | Reflect Alternative 1 Economic Assumptions | Reflect Demographic Assumptions | Reflect Funding Method | Alternative 1 w/ Five-year Direct Rate Smoothing | Alternative 2 w/ Five-year Direct Rate Smoothing |
|--|----------------------|---|---------------------------------------|------------------------------|---|---|
| Employer Contribution | | | | | | |
| Employer Normal Cost | 5.16% | 6.49% | 5.96% | 6.40% | 6.40% | 5.78% |
| Payment for UAAL | 10.58% | 13.96% | 13.62% | 12.35% | 12.35% | 10.59% |
| Preliminary ADEC* | 15.74% | 20.45% | 19.58% | 18.75% | 18.75% | 16.37% |
| Impact of Direct Rate Smoothing | 0.00% | 0.00% | 0.00% | 0.00% | -2.41% | -0.50% |
| Impact of Rate Stabilization Policy | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Employer Contribution | 15.74% | 20.45% | 19.58% | 18.75% | 16.34% | 15.87% |
| Cumulative Δ in Employer Contribution | | 4.71% | 3.84% | 3.01% | 0.60% | 0.13% |
| Actuarial Accrued Liability (AAL) | \$ 84,873,315,272 | \$ 89,361,980,053 | \$ 88,935,609,166 | \$ 87,319,940,006 | \$ 87,319,940,006 | \$ 84,941,027,914 |
| Actuarial Value of Assets (AVA) | 73,353,759,963 | 73,353,759,963 | 73,353,759,963 | 73,353,759,963 | 73,353,759,963 | 73,353,759,963 |
| Unfunded Accrued Liability (UAAL) | 11,519,555,309 | 16,008,220,090 | 15,581,849,203 | 13,966,180,043 | 13,966,180,043 | 11,587,267,951 |
| Funded Ratio (AVA / AAL) | 86.4% | 82.1% | 82.5% | 84.0% | 84.0% | 86.4% |
| Cumulative Δ in UAAL | | \$ 4,488,664,781 | \$ 4,062,293,894 | \$ 2,446,624,734 | \$ 2,446,624,734 | \$ 67,712,642 |

* Actuarially Determined Employer Contribution. Note that the employer normal cost includes administrative expenses.

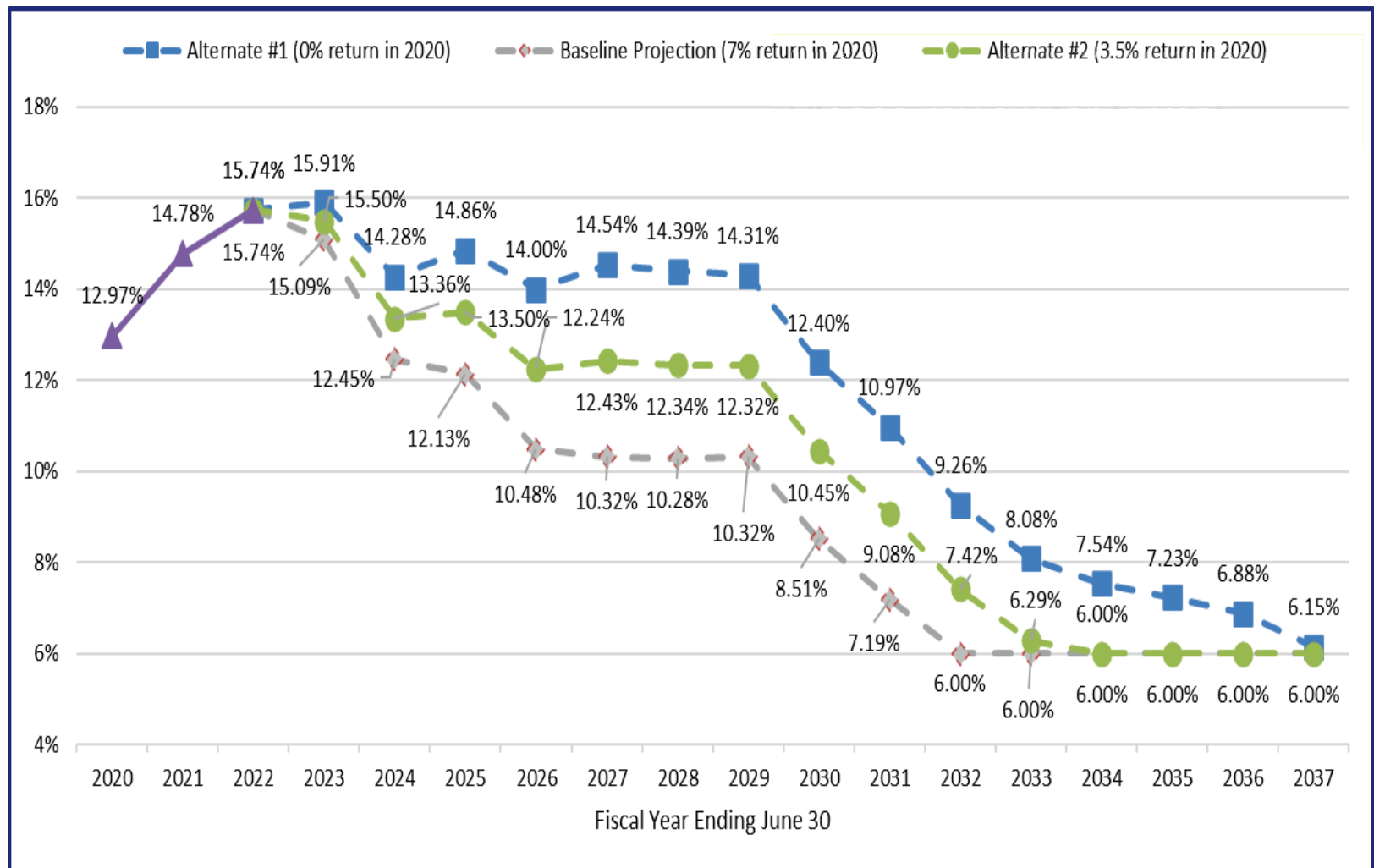
Projections

TSERS

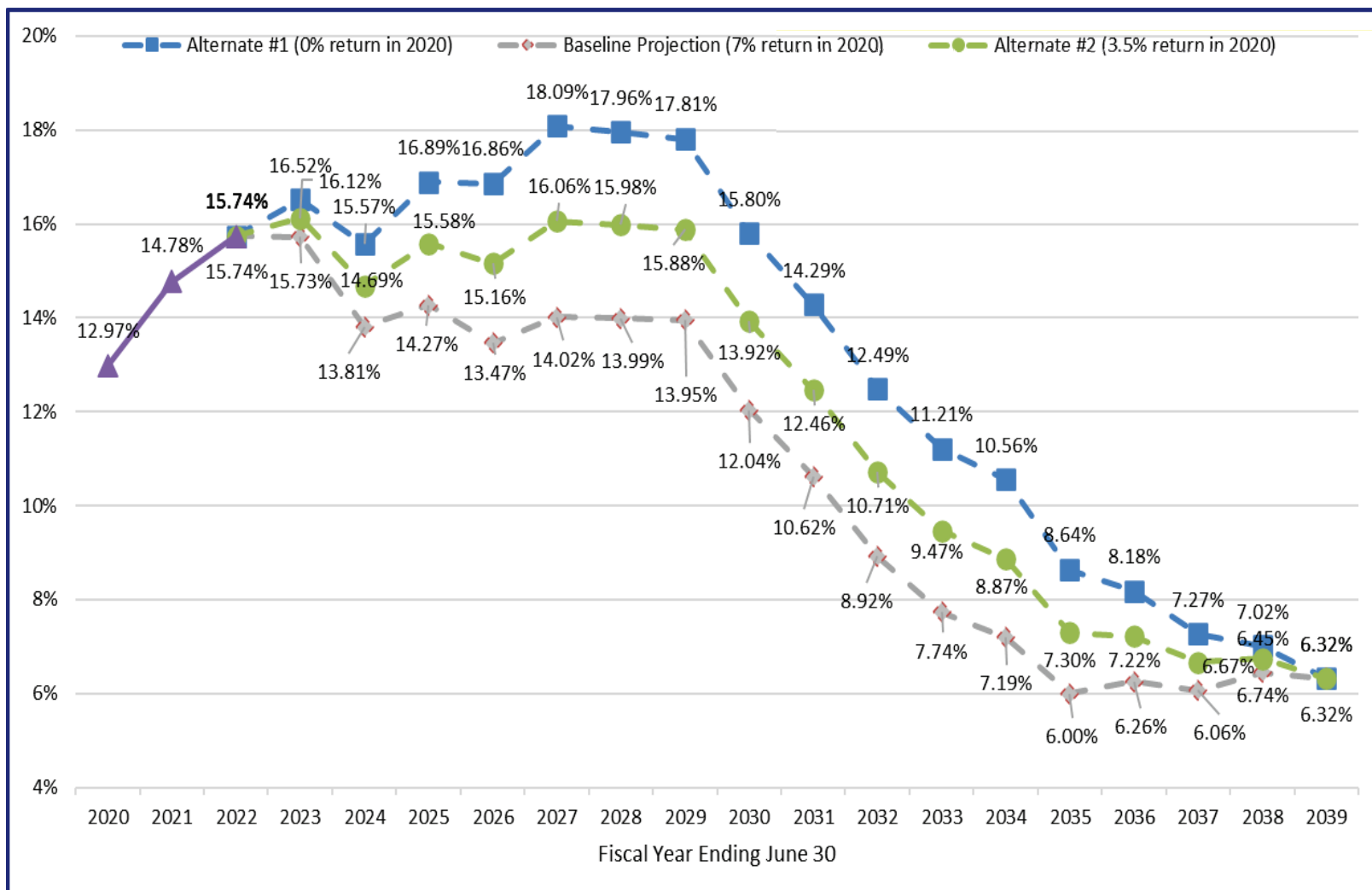


- Projections of contribution requirements and funded status into the future can be helpful planning tools for stakeholders. This section provides such projections. The projections of the actuarial valuation are known as deterministic projections. Deterministic projections are based on one scenario in the future. The baseline deterministic projection is based on December 31, 2019 valuation results.
- Key Projection Assumptions
 - Baseline valuation interest rate of 7.00% for all years for current assumptions and 7.00% for 2020 and 6.5% for all remaining years in conjunction with direct rate smoothing of the employer contribution rate over a 5-year period beginning July 1, 2022.
 - Actuarial assumptions and methods as described in Appendix D of the 12/31/2019 valuation report for current assumptions. Proposed assumptions as described in the 2014-2019 experience study from 12/31/2020 forward for new assumptions. All future demographic experience is assumed to be exactly realized.
 - The contribution rate under the Employer Contribution Rate Stabilization Policy (ECRSP) is contributed until fiscal year ending 2022.
 - The actuarially determined employer contribution rate is contributed for fiscal years ending 2023 and beyond.
 - 0% increase in the total active member population
 - No cost-of-living adjustments granted
 - Future pay increases based on long-term salary increase assumptions
- In addition, we have provided alternate deterministic projections:
 - Estimated 2020 asset return of 0.00%, and 3.50%
 - 6.50% investment return assumption based on:
 - Valuation interest rate of 6.50% for all years in conjunction with direct rate smoothing of the employer contribution rate over a 5-year period beginning July 1, 2022; includes 2.50% inflation.
 - Investment return on market value of assets of 6.50% beginning December 31, 2020.
 - Direct rate smoothing of employer contribution rate over a 5-year period beginning July 1, 2022 through June 30, 2027.

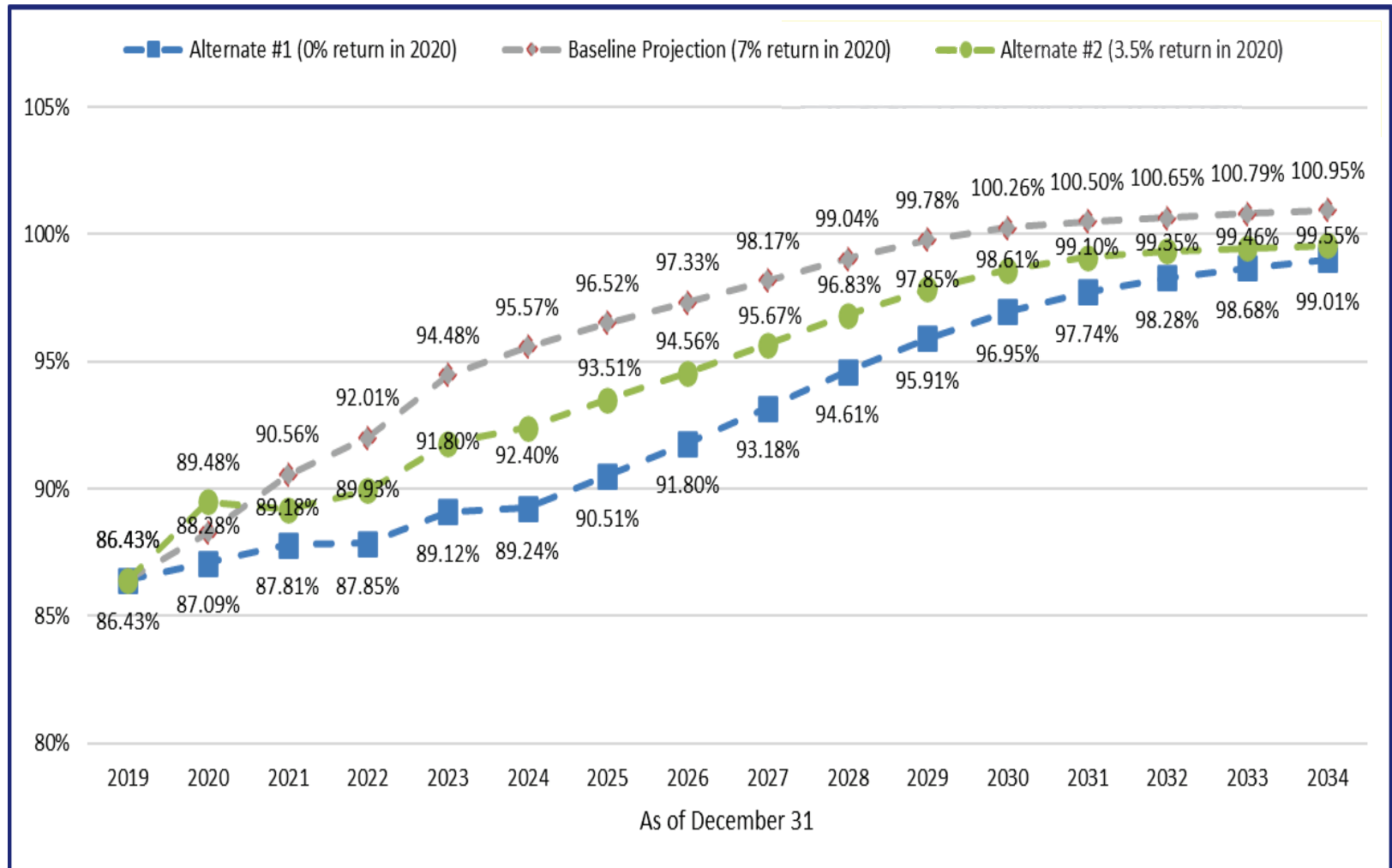
Contribution Rate Projection - Current Assumptions



Contribution Rate Projection - Proposed Assumptions

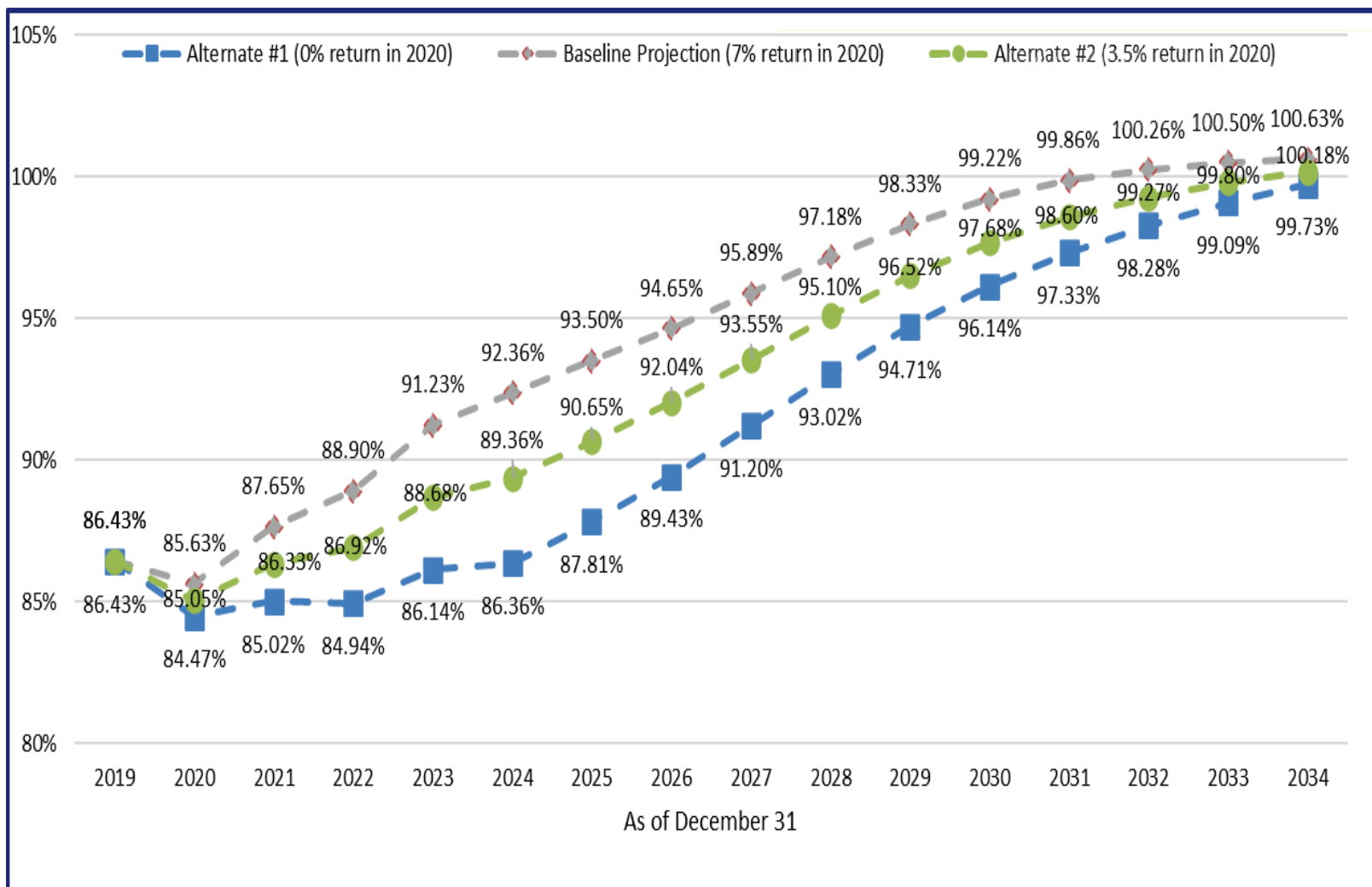


Funded Ratio Projection - Current Assumptions



Funded Ratio

Projection - Proposed Assumptions



Key Takeaways

Consolidated Judicial Retirement System

| Valuation Component Reviewed | Observation | Recommendation | Financial Impact |
|--------------------------------------|-----------------------------------|-------------------------------------|------------------|
| Demographic Assumptions | | | |
| 1 Post-Retirement Mortality Rates | Fewer deaths | Decrease rates | Increase |
| 2 Active Mortality | Limited exposures | Decrease rates | Increase |
| 3 Mortality improvement | SOA projects lower improvement | Update from MP-2015 to MP-2019 | Decrease |
| 4 Service retirement | Fewer retirements | Decrease rates | Decrease |
| 5 Disability retirement | Fewer disabilities | Decrease rates | Immaterial |
| 6 Termination from active employment | More terminations | Increase rates | Decrease |
| Economic Assumptions | | | |
| 7 Investment return | Lower projected returns | Reduce 0.50% (Alt 1)/ 0.25% (Alt 2) | Increase |
| 8 Inflation | SSA predicts lower | Lower by 0.50% | Increase |
| 9 Individual pay increases | Lower Increases | Decrease rates | Increase |
| 10 Productivity growth | Decrease not as much as inflation | Increase by 0.25% | Increase |
| Funding Method | | | |
| 11 Amortization Method | Current method reasonable | No change | No change |
| 12 Actuarial Cost method | Current method reasonable | Refine method - see below | Increase |
| 13 Asset valuation method | Current method reasonable | No change | No change |
| 14 Administrative expenses | Expenses lower than assumed | Reduce to 0.05% of payroll | Decrease |

Notes:

1. The Pub-2010 Public Retirement Plans Mortality Tables published by the Society of Actuaries in January 2019 provided a closer fit than the previous table which were based on corporate plan experience, resulting in less modifications.
3. For the fifth consecutive year, the SOA has reduced its projection of mortality improvement, resulting in lower liabilities.
7. Lower investment returns are the largest single source of liability and cost increases
12. The load on normal cost to account for new entrants was increased.
12. Revised for eligibility service which increased AAL and reduced normal cost.

Financial Impact

Consolidated Judicial Retirement System

Had the proposed assumptions and methods been reflected for the December 31, 2019 Actuarial Valuation, the financial impact would have been as follows:

- The AAL would increase by 6.6% from \$725.45 million to \$773.26 million under Alternative 1; under Alternative 2, it would increase by 4.0% to \$754.7 million.
- The ADEC would increase by 3.03% of payroll from 38.70% to 41.73% under Alternative 1; under Alternative 2, it would decrease by 0.68% of payroll to 38.02%.
- The Employer Contribution would increase by 0.61% of payroll from 38.70% to 39.31% under Alternative 1; under Alternative 2 it would decrease by 0.14% of payroll to 38.56%.

| | Current Valuation | Reflect Alternative 1 Economic Assumptions | Reflect Demographic Assumptions | Reflect Funding Method | Alternative 1 w/ Five-year Direct Rate Smoothing | Alternative 2 w/ Five-year Direct Rate Smoothing |
|--|----------------------|---|---------------------------------------|------------------------------|---|---|
| Employer Contribution | | | | | | |
| Employer Normal Cost | 17.59% | 18.17% | 12.60% | 13.16% | 13.16% | 12.18% |
| Payment for UAAL | 21.11% | 25.80% | 28.57% | 28.57% | 28.57% | 25.84% |
| Preliminary ADEC* | 38.70% | 43.97% | 41.17% | 41.73% | 41.73% | 38.02% |
| Impact of Direct Rate Smoothing | 0.00% | 0.00% | 0.00% | 0.00% | -2.42% | 0.54% |
| Impact of Rate Stabilization Policy | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Employer Contribution | 38.70% | 43.97% | 41.17% | 41.73% | 39.31% | 38.56% |
| Cumulative Δ in Employer Contribution | | 5.27% | 2.47% | 3.03% | 0.61% | -0.14% |
| Actuarial Accrued Liability (AAL) | \$ 725,452,544 | \$ 756,085,704 | \$ 773,258,310 | \$ 773,258,310 | \$ 773,258,310 | \$ 754,695,935 |
| Actuarial Value of Assets (AVA) | 621,547,192 | 621,547,192 | 621,547,192 | 621,547,192 | 621,547,192 | 621,547,192 |
| Unfunded Accrued Liability (UAAL) | 103,905,352 | 134,538,512 | 151,711,118 | 151,711,118 | 151,711,118 | 133,148,743 |
| Funded Ratio (AVA / AAL) | 85.7% | 82.2% | 80.4% | 80.4% | 80.4% | 82.4% |
| Cumulative Δ in UAAL | | \$ 30,633,160 | \$ 47,805,766 | \$ 47,805,766 | \$ 47,805,766 | \$ 29,243,391 |

* Actuarially Determined Employer Contribution. Note that the employer normal cost includes administrative expenses.

Key Takeaways

Legislative Retirement System

| Valuation Component Reviewed | Observation | Recommendation | Financial Impact |
|--------------------------------------|-----------------------------------|-------------------------------------|------------------|
| Demographic Assumptions | | | |
| 1 Post-Retirement Mortality Rates | Fewer deaths | Decrease rates | Increase |
| 2 Active Mortality | Limited exposures | Decrease rates | Increase |
| 3 Mortality improvement | SOA projects lower improvement | Update from MP-2015 to MP-2019 | Decrease |
| 4 Service retirement | Fewer retirements | Decrease rates | Decrease |
| 5 Disability retirement | Fewer disabilities | Decrease rates | Immaterial |
| 6 Termination from active employment | More terminations | Increase rates | Decrease |
| Economic Assumptions | | | |
| 7 Investment return | Lower projected returns | Reduce 0.50% (Alt 1)/ 0.25% (Alt 2) | Increase |
| 8 Inflation | SSA predicts lower | Lower by 0.50% | Increase |
| 9 Individual pay increases | Lower Increases | Increase rates | Increase |
| 10 Productivity growth | Decrease not as much as inflation | Increase by 0.25% | Increase |
| Funding Method | | | |
| 11 Amortization Method | Current method reasonable | No change | No change |
| 12 Actuarial Cost method | Current method reasonable | Refine method - see below | Increase |
| 13 Asset valuation method | Current method reasonable | No change | No change |
| 14 Administrative expenses | Expenses lower than assumed | No change | No change |

Notes:

1. The Pub-2010 Public Retirement Plans Mortality Tables published by the Society of Actuaries in January 2019 provided a closer fit than the previous table which were based on corporate plan experience, resulting in less modifications.
3. For the fifth consecutive year, the SOA has reduced its projection of mortality improvement, resulting in lower liabilities.
7. Lower investment returns are the largest single source of liability and cost increases
12. The load on normal cost to account for new entrants was increased.

Financial Impact

Legislative Retirement System

Had the proposed assumptions and methods been reflected for the December 31, 2019 Actuarial Valuation, the financial impact would have been as follows:

- The AAL would decrease by 0.4% from \$30.27 million to \$30.14 million under Alternative 1; under Alternative 2, it would decrease by 2.6% to \$29.5 million..
- The ADEC would decrease by 2.98% of payroll from 27.15% to 24.17% under Alternative 1; under Alternative 2, it would decrease by 3.77% of payroll to 23.38%.
- The Employer Contribution would decrease by 0.60% of payroll from 27.15% to 26.55% under Alternative 1; under Alternative 2 it would decrease by 0.75% of payroll to 26.40%.

| | Current Valuation | Reflect Alternative 1 Economic Assumptions | Reflect Demographic Assumptions | Reflect Funding Method | Alternative 1 w/ Five-year Direct Rate Smoothing | Alternative 2 w/ Five-year Direct Rate Smoothing |
|---------------------------------------|----------------------|---|---------------------------------------|------------------------------|---|---|
| Employer Contribution | | | | | | |
| Employer Normal Cost | 19.77% | 17.86% | 15.95% | 17.35% | 17.35% | 16.49% |
| Payment for UAAL | 7.38% | 9.91% | 6.82% | 6.82% | 6.82% | 6.89% |
| Preliminary ADEC* | 27.15% | 27.77% | 22.77% | 24.17% | 24.17% | 23.38% |
| Impact of Direct Rate Smoothing | 0.00% | 0.00% | 0.00% | 0.00% | 2.38% | 3.02% |
| Impact of Rate Stabilization Policy | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Employer Contribution | 27.15% | 27.77% | 22.77% | 24.17% | 26.55% | 26.40% |
| Cumulative Δ in Employer Contribution | | 0.62% | -4.38% | -2.98% | -0.60% | -0.75% |
| Actuarial Accrued Liability (AAL) | \$ 30,269,003 | \$ 31,066,842 | \$ 30,136,751 | \$ 30,136,751 | \$ 30,136,751 | \$ 29,495,518 |
| Actuarial Value of Assets (AVA) | 28,028,978 | 28,028,978 | 28,028,978 | 28,028,978 | 28,028,978 | 28,028,978 |
| Unfunded Accrued Liability (UAAL) | 2,240,025 | 3,037,864 | 2,107,773 | 2,107,773 | 2,107,773 | 1,466,540 |
| Funded Ratio (AVA / AAL) | 92.6% | 90.2% | 93.0% | 93.0% | 93.0% | 95.0% |
| Cumulative Δ in UAAL | | \$ 797,839 | \$ (132,252) | \$ (132,252) | \$ (132,252) | \$ (773,485) |

* Actuarially Determined Employer Contribution. Note that the employer normal cost includes administrative expenses.

Key Takeaways

National Guard Pension Fund

| Valuation Component Reviewed | Observation | Recommendation | Financial Impact |
|--------------------------------------|-----------------------------------|-------------------------------------|------------------|
| Demographic Assumptions | | | |
| 1 Post-Retirement Mortality Rates | More deaths | Increase rates | Decrease |
| 2 Active Mortality | Limited exposures | Decrease rates | Increase |
| 3 Mortality improvement | SOA projects lower improvement | Update from MP-2015 to MP-2019 | Decrease |
| 4 Service retirement | More retirements | Increase rates | Increase |
| 5 Disability retirement | N/A | Decrease rates | Immaterial |
| 6 Termination from active employment | More terminations | Increase rates | Decrease |
| Economic Assumptions | | | |
| 7 Investment return | Lower projected returns | Reduce 0.50% (Alt 1)/ 0.25% (Alt 2) | Increase |
| 8 Inflation | SSA predicts lower | Lower by 0.50% | Increase |
| 9 Individual pay increases | Not applicable | Not applicable | Not applicable |
| 10 Productivity growth | Decrease not as much as inflation | Increase by 0.25% | Not applicable |
| Funding Method | | | |
| 11 Amortization Method | Current method reasonable | No change | No change |
| 12 Actuarial Cost method | Current method reasonable | Refine method - see below | Increase |
| 13 Asset valuation method | Current method reasonable | No change | No change |
| 14 Administrative expenses | Expenses volatile | Assume \$150,000 per year | Immaterial |

Notes:

1. The Pub-2010 Public Retirement Plans Mortality Tables published by the Society of Actuaries in January 2019 provided a closer fit than the previous table which were based on corporate plan experience, resulting in less modifications.
3. For the fifth consecutive year, the SOA has reduced its projection of mortality improvement, resulting in lower liabilities.
7. Lower investment returns are the largest single source of liability and cost increases
12. The normal cost was increased by \$725,000 to account for new hires with less than 7 years of service.

Financial Impact

National Guard Pension Fund

Had the proposed assumptions and methods been reflected for the December 31, 2019 Actuarial Valuation, the financial impact would have been as follows:

- The AAL would increase by 3.4% from \$161.8 million to \$167.24 million under Alternative 1; under Alternative 2, it would increase by 0.5% to \$162.58 million.
- The ADEC would increase by \$1,498,074 from \$6,382,278 to \$7,880,352 under Alternative 1; under Alternative 2, it would increase by \$176,633 to \$6,558,911.
- The Employer Contribution would remain unchanged at \$11,031,715 under Alternative 1; under Alternative 2 it would remain unchanged at \$11,031,715.

| | Current Valuation | Reflect Alternative 1 Economic Assumptions | Reflect Demographic Assumptions | Reflect Funding Method | Alternative 1 w/ Five-year Direct Rate Smoothing | Alternative 2 w/ Five-year Direct Rate Smoothing |
|--|----------------------|---|---------------------------------------|------------------------------|---|---|
| Employer Contribution | | | | | | |
| Employer Normal Cost | 329,704 | 388,825 | 321,745 | 1,149,734 | 1,149,734 | 1,124,904 |
| Payment for UAAL | \$ 6,052,574 | \$ 7,260,973 | \$ 6,730,608 | \$ 6,730,618 | \$ 6,730,618 | \$ 5,434,007 |
| Preliminary ADEC* | 6,382,278 | 7,649,798 | 7,052,353 | 7,880,352 | 7,880,352 | 6,558,911 |
| Impact of Direct Rate Smoothing | \$ 0 | \$ 0 | \$ 0 | \$ 0 | \$ 0 | \$ 0 |
| Impact of Rate Stabilization Policy | 4,649,437 | 3,381,917 | 3,979,362 | 3,151,363 | 3,151,363 | 4,472,804 |
| Employer Contribution | \$ 11,031,715 | \$ 11,031,715 | \$ 11,031,715 | \$ 11,031,715 | \$ 11,031,715 | \$ 11,031,715 |
| Cumulative Δ in Employer Contribution | | \$ 0 | \$ 0 | \$ 0 | \$ 0 | \$ 0 |
| Actuarial Accrued Liability (AAL) | \$ 161,797,526 | \$ 171,305,597 | \$ 166,092,709 | \$ 167,242,623 | \$ 167,242,623 | \$ 162,583,545 |
| Actuarial Value of Assets (AVA) | 142,486,044 | 142,486,044 | 142,486,044 | 142,486,044 | 142,486,044 | 142,486,044 |
| Unfunded Accrued Liability (UAAL) | 19,311,482 | 28,819,553 | 23,606,665 | 24,756,579 | 24,756,579 | 20,097,501 |
| Funded Ratio (AVA / AAL) | 88.1% | 83.2% | 85.8% | 85.2% | 85.2% | 87.6% |
| Cumulative Δ in UAAL | | \$ 9,508,071 | \$ 4,295,183 | \$ 5,445,097 | \$ 5,445,097 | \$ 786,019 |

* Actuarially Determined Employer Contribution. Note that the employer normal cost includes administrative expenses.
Direct rate smoothing is not applicable due to Rate Stabilization Policy.

Key Takeaways

Disability Income Plan

| Valuation Component Reviewed | Observation | Recommendation | Financial Impact |
|--------------------------------------|-----------------------------------|-------------------------------------|------------------|
| Demographic Assumptions | | | |
| 1 Post-Retirement Mortality Rates | Fewer deaths | Decrease rates | Increase |
| 2 Active Mortality | Limited exposures | Decrease rates | Increase |
| 3 Mortality improvement | SOA projects lower improvement | Update from MP-2015 to MP-2019 | Decrease |
| 4 Service retirement | Fewer retirements | Decrease rates | Decrease |
| 5 Disability retirement | Fewer disabilities | Decrease rates | Immaterial |
| 6 Termination from active employment | More terminations | Increase rates | Decrease |
| Economic Assumptions | | | |
| 7 Investment return | Lower projected returns | Reduce 0.75% (Alt 1)/ 0.50% (Alt 2) | Increase |
| 8 Inflation | SSA predicts lower | Lower by 0.50% | Increase |
| 9 Individual pay increases | Mixed increases | Adjust closer to experience | Increase |
| 10 Productivity growth | Decrease not as much as inflation | Increase by 0.25% | Increase |
| Funding Method | | | |
| 11 Amortization Method | Current method reasonable | No change | No change |
| 12 Actuarial Cost method | Current method reasonable | Refine method - see below | Increase |
| 13 Asset valuation method | Current method reasonable | No change | No change |
| 14 Administrative expenses | Current assumption reasonable | No change | No change |

Notes:

1. The Pub-2010 Public Retirement Plans Mortality Tables published by the Society of Actuaries in January 2019 provided a closer fit than the previous table which were based on corporate plan experience, resulting in less modifications.
3. For the fifth consecutive year, the SOA has reduced its projection of mortality improvement, resulting in lower liabilities.
7. Lower investment returns are the largest single source of liability and cost increases
12. The load on normal cost to account for new entrants was increased.

Financial Impact

Disability Income Plan

Had the proposed assumptions and methods been reflected for the December 31, 2019 Actuarial Valuation, the financial impact would have been as follows:

- The AAL would decrease by 0.1% from \$326.43 million to \$326.08 million under Alternative 1; under Alternative 2, it would decrease by 0.6% to \$324.31 million..
- The ADEC would increase by 0.02% of payroll from 0.09% to 0.11% under Alternative 1; under Alternative 2, it would increase by 0.02% of payroll to 0.11%.
- The Employer Contribution would remain unchanged at 0.09% under Alternative 1; under Alternative 2 it would remain unchanged at 0.09%.

| | Current Valuation | Reflect Alternative 1 Economic Assumptions | Reflect Demographic Assumptions | Reflect Funding Method | Alternative 1 w/ Five-year Direct Rate Smoothing | Alternative 2 w/ Five-year Direct Rate Smoothing |
|---------------------------------------|----------------------|---|---------------------------------------|------------------------------|---|---|
| Employer Contribution | | | | | | |
| Employer Normal Cost | 0.09% | 0.10% | 0.11% | 0.11% | 0.11% | 0.11% |
| Payment for UAAL | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Preliminary ADEC* | 0.09% | 0.10% | 0.11% | 0.11% | 0.11% | 0.11% |
| Impact of Direct Rate Smoothing | 0.00% | 0.00% | 0.00% | 0.00% | -0.02% | -0.02% |
| Impact of Rate Stabilization Policy | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Employer Contribution | 0.09% | 0.10% | 0.11% | 0.11% | 0.09% | 0.09% |
| Cumulative Δ in Employer Contribution | | 0.01% | 0.02% | 0.02% | 0.00% | 0.00% |
| Actuarial Accrued Liability (AAL) | \$ 326,431,066 | \$ 330,991,993 | \$ 326,079,778 | \$ 326,079,778 | \$ 326,079,778 | \$ 324,311,575 |
| Actuarial Value of Assets (AVA) | 361,335,426 | 361,335,426 | 361,335,426 | 361,335,426 | 361,335,426 | 361,335,426 |
| Unfunded Accrued Liability (UAAL) | (34,904,360) | (30,343,433) | (35,255,648) | (35,255,648) | (35,255,648) | (37,023,851) |
| Funded Ratio (AVA / AAL) | 110.7% | 109.2% | 110.8% | 110.8% | 110.8% | 111.4% |
| Cumulative Δ in UAAL | | \$ 4,560,927 | \$ (351,288) | \$ (351,288) | \$ (351,288) | \$ (2,119,491) |

* Actuarially Determined Employer Contribution. Note that the employer normal cost includes administrative expenses.

Key Takeaways

Fire and Rescue Squad Workers Pension Fund

| Valuation Component Reviewed | Observation | Recommendation | Financial Impact |
|--------------------------------------|-----------------------------------|-------------------------------------|------------------|
| Demographic Assumptions | | | |
| 1 Post-Retirement Mortality Rates | More deaths | Increase rates | Decrease |
| 2 Active Mortality | Limited exposures | Decrease rates | Increase |
| 3 Mortality improvement | SOA projects lower improvement | Update from MP-2015 to MP-2019 | Decrease |
| 4 Service retirement | Fewer retirements | Decrease rates | Decrease |
| 5 Disability retirement | Small group | Decrease rates | Immaterial |
| 6 Termination from active employment | Fewer terminations | Decrease rates | Increase |
| Economic Assumptions | | | |
| 7 Investment return | Lower projected returns | Reduce 0.50% (Alt 1)/ 0.25% (Alt 2) | Increase |
| 8 Inflation | SSA predicts lower | Lower by 0.50% | Increase |
| 9 Individual pay increases | Not applicable | Not applicable | Not applicable |
| 10 Productivity growth | Decrease not as much as inflation | Increase by 0.25% | Not applicable |
| Funding Method | | | |
| 11 Amortization Method | Current method reasonable | No change | No change |
| 12 Actuarial Cost method | Current method reasonable | Refine method - see below | Increase |
| 13 Asset valuation method | Current method reasonable | No change | No change |
| 14 Administrative expenses | Expenses somewhat consistent | no change | No change |

Notes:

1. The Pub-2010 Public Retirement Plans Mortality Tables published by the Society of Actuaries in January 2019 provided a closer fit than the previous table which were based on corporate plan experience, resulting in less modifications.
3. For the fifth consecutive year, the SOA has reduced its projection of mortality improvement, resulting in lower liabilities.
7. Lower investment returns are the largest single source of liability and cost increases
12. The load on normal cost to account for new entrants was increased.

Financial Impact

Fire and Rescue Squad Workers Pension Fund

Had the proposed assumptions and methods been reflected for the December 31, 2019 Actuarial Valuation, the financial impact would have been as follows:

- The AAL would increase by 1.7% from \$482.82 million to \$490.81 million under Alternative 1; under Alternative 2, it would decrease by 1.2% to \$476.87 million..
- The ADEC would increase by \$960,533 from \$15,182,523 to \$16,143,056 under Alternative 1; under Alternative 2, it would decrease by \$1,335,686 to \$13,846,837.
- The Employer Contribution would remain unchanged at \$19,352,208 under Alternative 1; under Alternative 2 it would remain unchanged at \$19,352,208.

| | Current Valuation | Reflect Alternative 1 Economic Assumptions | Reflect Demographic Assumptions | Reflect Funding Method | Alternative 1 w/ Five-year Direct Rate Smoothing | Alternative 2 w/ Five-year Direct Rate Smoothing |
|--|----------------------|---|---------------------------------------|------------------------------|---|---|
| Employer Contribution | | | | | | |
| Employer Normal Cost | 5,899,243 | 6,891,433 | 5,842,163 | 5,842,163 | 5,842,163 | 5,365,284 |
| Payment for UAAL | \$ 9,283,280 | \$ 12,990,298 | \$ 10,300,893 | \$ 10,300,893 | \$ 10,300,893 | \$ 8,481,553 |
| Preliminary ADEC* | 15,182,523 | 19,881,731 | 16,143,056 | 16,143,056 | 16,143,056 | 13,846,837 |
| Impact of Direct Rate Smoothing | \$ 0 | \$ 0 | \$ 0 | \$ 0 | \$ 0 | \$ 0 |
| Impact of Rate Stabilization Policy | 4,169,685 | (529,523) | 3,209,152 | 3,209,152 | 3,209,152 | 5,505,371 |
| Employer Contribution | \$ 19,352,208 | \$ 19,352,208 | \$ 19,352,208 | \$ 19,352,208 | \$ 19,352,208 | \$ 19,352,208 |
| Cumulative Δ in Employer Contribution | | \$ 0 | \$ 0 | \$ 0 | \$ 0 | \$ 0 |
| Actuarial Accrued Liability (AAL) | \$ 482,816,865 | \$ 511,409,026 | \$ 490,805,882 | \$ 490,805,882 | \$ 490,805,882 | \$ 476,866,566 |
| Actuarial Value of Assets (AVA) | 445,876,956 | 445,876,956 | 445,876,956 | 445,876,956 | 445,876,956 | 445,876,956 |
| Unfunded Accrued Liability (UAAL) | 36,939,909 | 65,532,070 | 44,928,926 | 44,928,926 | 44,928,926 | 30,989,610 |
| Funded Ratio (AVA / AAL) | 92.3% | 87.2% | 90.8% | 90.8% | 90.8% | 93.5% |
| Cumulative Δ in UAAL | | \$ 28,592,161 | \$ 7,989,017 | \$ 7,989,017 | \$ 7,989,017 | \$ (5,950,299) |

* Actuarially Determined Employer Contribution. Note that the employer normal cost includes administrative expenses.
Direct rate smoothing is not applicable due to Rate Stabilization Policy.

Key Takeaways

Local Governmental Employees Retirement System - General Employees and Firefighters

| Valuation Component Reviewed | Observation | Recommendation | Financial Impact |
|--------------------------------------|-----------------------------------|-------------------------------------|------------------|
| Demographic Assumptions | | | |
| 1 Post-Retirement Mortality Rates | Fewer deaths | Decrease rates | Increase |
| 2 Active Mortality | Limited exposures | Decrease rates | Increase |
| 3 Mortality improvement | SOA projects lower improvement | Update from MP-2015 to MP-2019 | Decrease |
| 4 Service retirement | Fewer retirements | Decrease rates | Decrease |
| 5 Disability retirement | Fewer disabilities | Decrease rates | Immaterial |
| 6 Termination from active employment | More terminations | Increase rates | Decrease |
| Economic Assumptions | | | |
| 7 Investment return | Lower projected returns | Reduce 0.50% (Alt 1)/ 0.25% (Alt 2) | Increase |
| 8 Inflation | SSA predicts lower | Lower by 0.50% | Increase |
| 9 Individual pay increases | Higher Increases | Increase rates | Increase |
| 10 Productivity growth | Decrease not as much as inflation | Increase by 0.25% | Increase |
| Funding Method | | | |
| 11 Amortization Method | Current method reasonable | No change | No change |
| 12 Actuarial Cost method | Current method reasonable | Refine method - see below | Decrease |
| 13 Asset valuation method | Current method reasonable | No change | No change |
| 14 Administrative expenses | Expenses lower than assumed | Decrease to 0.13% of payroll | Decrease |

Notes:

1. The Pub-2010 Public Retirement Plans Mortality Tables published by the Society of Actuaries in January 2019 provided a closer fit than the previous table which were based on corporate plan experience, resulting in less modifications.
3. For the fifth consecutive year, the SOA has reduced its projection of mortality improvement, resulting in lower liabilities.
7. Lower investment returns are the largest single source of liability and cost increases
12. The load on normal cost to account for new entrants was increased.
12. The method for calculating terminated vested liability was refined, resulting in a large liability reduction.

Financial Impact

Local Governmental Employees Retirement System - General Employees and Firefighters

Had the proposed assumptions and methods been reflected for the December 31, 2019 Actuarial Valuation, the financial impact would have been as follows:

- The AAL would increase by 3.8% from \$30.7 billion to \$31.85 billion under Alternative 1; under Alternative 2, it would increase by 0.8% to \$30.94 billion.
- The ADEC would increase by 3.21% of payroll from 11.27% to 14.48% under Alternative 1; under Alternative 2, it would increase by 0.53% of payroll to 11.80%.
- The Employer Contribution would increase by 0.63% of payroll from 11.35% to 11.98% under Alternative 1; under Alternative 2 it would increase by 0.09% of payroll to 11.44%.

| | Current Valuation | Reflect Alternative 1 Economic Assumptions | Reflect Demographic Assumptions | Reflect Funding Method | Alternative 1 w/ Five-year Direct Rate Smoothing | Alternative 2 w/ Five-year Direct Rate Smoothing |
|---------------------------------------|----------------------|---|---------------------------------------|------------------------------|---|---|
| Employer Contribution | | | | | | |
| Employer Normal Cost | 5.44% | 6.78% | 6.15% | 6.58% | 6.58% | 5.97% |
| Payment for UAAL | 5.83% | 9.25% | 9.09% | 7.90% | 7.90% | 5.83% |
| Preliminary ADEC* | 11.27% | 16.03% | 15.24% | 14.48% | 14.48% | 11.80% |
| Impact of Direct Rate Smoothing | 0.08% | 0.00% | 0.00% | 0.00% | -2.50% | -0.36% |
| Impact of Rate Stabilization Policy | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Employer Contribution | 11.35% | 16.03% | 15.24% | 14.48% | 11.98% | 11.44% |
| Cumulative Δ in Employer Contribution | | 4.68% | 3.89% | 3.13% | 0.63% | 0.09% |
| Actuarial Accrued Liability (AAL) | \$ 30,700,921,303 | \$ 32,580,352,904 | \$ 32,495,359,213 | \$ 31,853,585,336 | \$ 31,853,585,336 | \$ 30,939,433,947 |
| Actuarial Value of Assets (AVA) | 27,435,046,235 | 27,435,046,235 | 27,435,046,235 | 27,435,046,235 | 27,435,046,235 | 27,435,046,235 |
| Unfunded Accrued Liability (UAAL) | 3,265,875,068 | 5,145,306,669 | 5,060,312,978 | 4,418,539,101 | 4,418,539,101 | 3,504,387,712 |
| Funded Ratio (AVA / AAL) | 89.4% | 84.2% | 84.4% | 86.1% | 86.1% | 88.7% |
| Cumulative Δ in UAAL | | \$ 1,879,431,601 | \$ 1,794,437,910 | \$ 1,152,664,033 | \$ 1,152,664,033 | \$ 238,512,644 |

* Actuarially Determined Employer Contribution. Note that the employer normal cost includes administrative expenses.
Note that the AAL and AVA above is for all of LGERS.

Key Takeaways

Local Governmental Employees Retirement System - Law Enforcement Officers

| Valuation Component Reviewed | Observation | Recommendation | Financial Impact |
|--------------------------------------|-----------------------------------|-------------------------------------|------------------|
| Demographic Assumptions | | | |
| 1 Post-Retirement Mortality Rates | More deaths | Increase rates | Decrease |
| 2 Active Mortality | Limited exposures | Decrease rates | Increase |
| 3 Mortality improvement | SOA projects lower improvement | Update from MP-2015 to MP-2019 | Decrease |
| 4 Service retirement | More retirements | Increase rates | Increase |
| 5 Disability retirement | Fewer disabilities | Decrease rates | Immaterial |
| 6 Termination from active employment | More terminations | Increase rates | Decrease |
| Economic Assumptions | | | |
| 7 Investment return | Lower projected returns | Reduce 0.50% (Alt 1)/ 0.25% (Alt 2) | Increase |
| 8 Inflation | SSA predicts lower | Lower by 0.50% | Increase |
| 9 Individual pay increases | Higher Increases | Increase rates | Increase |
| 10 Productivity growth | Decrease not as much as inflation | Increase by 0.25% | Increase |
| Funding Method | | | |
| 11 Amortization Method | Current method reasonable | No change | No change |
| 12 Actuarial Cost method | Current method reasonable | Refine method - see below | Decrease |
| 13 Asset valuation method | Current method reasonable | No change | No change |
| 14 Administrative expenses | Expenses lower than assumed | Keep at zero. | No change |

Notes:

1. The Pub-2010 Public Retirement Plans Mortality Tables published by the Society of Actuaries in January 2019 provided a closer fit than the previous table which were based on corporate plan experience, resulting in less modifications.
3. For the fifth consecutive year, the SOA has reduced its projection of mortality improvement, resulting in lower liabilities.
7. Lower investment returns are the largest single source of liability and cost increases
12. The load on normal cost to account for new entrants was increased.
12. The method for calculating terminated vested liability was refined, resulting in a large liability reduction.

Financial Impact

Local Governmental Employees Retirement System - Law Enforcement Officers

Had the proposed assumptions and methods been reflected for the December 31, 2019 Actuarial Valuation, the financial impact would have been as follows:

- The AAL would increase by 3.8% from \$30.7 billion to \$31.85 billion under Alternative 1; under Alternative 2, it would increase by 0.8% to \$30.94 billion.
- The ADEC would increase by 3.99% of payroll from 12.94% to 16.93% under Alternative 1; under Alternative 2, it would increase by 1.09% of payroll to 14.03%.
- The Employer Contribution would increase by 0.97% of payroll from 12.10% to 13.07% under Alternative 1; under Alternative 2 it would increase by 0.39% of payroll to 12.49%.

| | Current Valuation | Reflect Alternative 1 Economic Assumptions | Reflect Demographic Assumptions | Reflect Funding Method | Alternative 1 w/ Five-year Direct Rate Smoothing | Alternative 2 w/ Five-year Direct Rate Smoothing |
|--|----------------------|---|---------------------------------------|------------------------------|---|---|
| Employer Contribution | | | | | | |
| Employer Normal Cost | 7.11% | 8.84% | 8.60% | 9.03% | 9.03% | 8.20% |
| Payment for UAAL | 5.83% | 9.25% | 9.09% | 7.90% | 7.90% | 5.83% |
| Preliminary ADEC* | 12.94% | 18.09% | 17.69% | 16.93% | 16.93% | 14.03% |
| Impact of Direct Rate Smoothing | -0.84% | 0.00% | 0.00% | 0.00% | -3.86% | -1.54% |
| Impact of Rate Stabilization Policy | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Employer Contribution | 12.10% | 18.09% | 17.69% | 16.93% | 13.07% | 12.49% |
| Cumulative Δ in Employer Contribution | | 5.99% | 5.59% | 4.83% | 0.97% | 0.39% |
| Actuarial Accrued Liability (AAL) | \$ 30,700,921,303 | \$ 32,580,352,904 | \$ 32,495,359,213 | \$ 31,853,585,336 | \$ 31,853,585,336 | \$ 30,939,433,947 |
| Actuarial Value of Assets (AVA) | 27,435,046,235 | 27,435,046,235 | 27,435,046,235 | 27,435,046,235 | 27,435,046,235 | 27,435,046,235 |
| Unfunded Accrued Liability (UAAL) | 3,265,875,068 | 5,145,306,669 | 5,060,312,978 | 4,418,539,101 | 4,418,539,101 | 3,504,387,712 |
| Funded Ratio (AVA / AAL) | 89.4% | 84.2% | 84.4% | 86.1% | 86.1% | 88.7% |
| Cumulative Δ in UAAL | | \$ 1,879,431,601 | \$ 1,794,437,910 | \$ 1,152,664,033 | \$ 1,152,664,033 | \$ 238,512,644 |

* Actuarially Determined Employer Contribution. Note that the employer normal cost includes administrative expenses.
Note that the AAL and AVA above is for all of LGERS.

Projections

LGERS



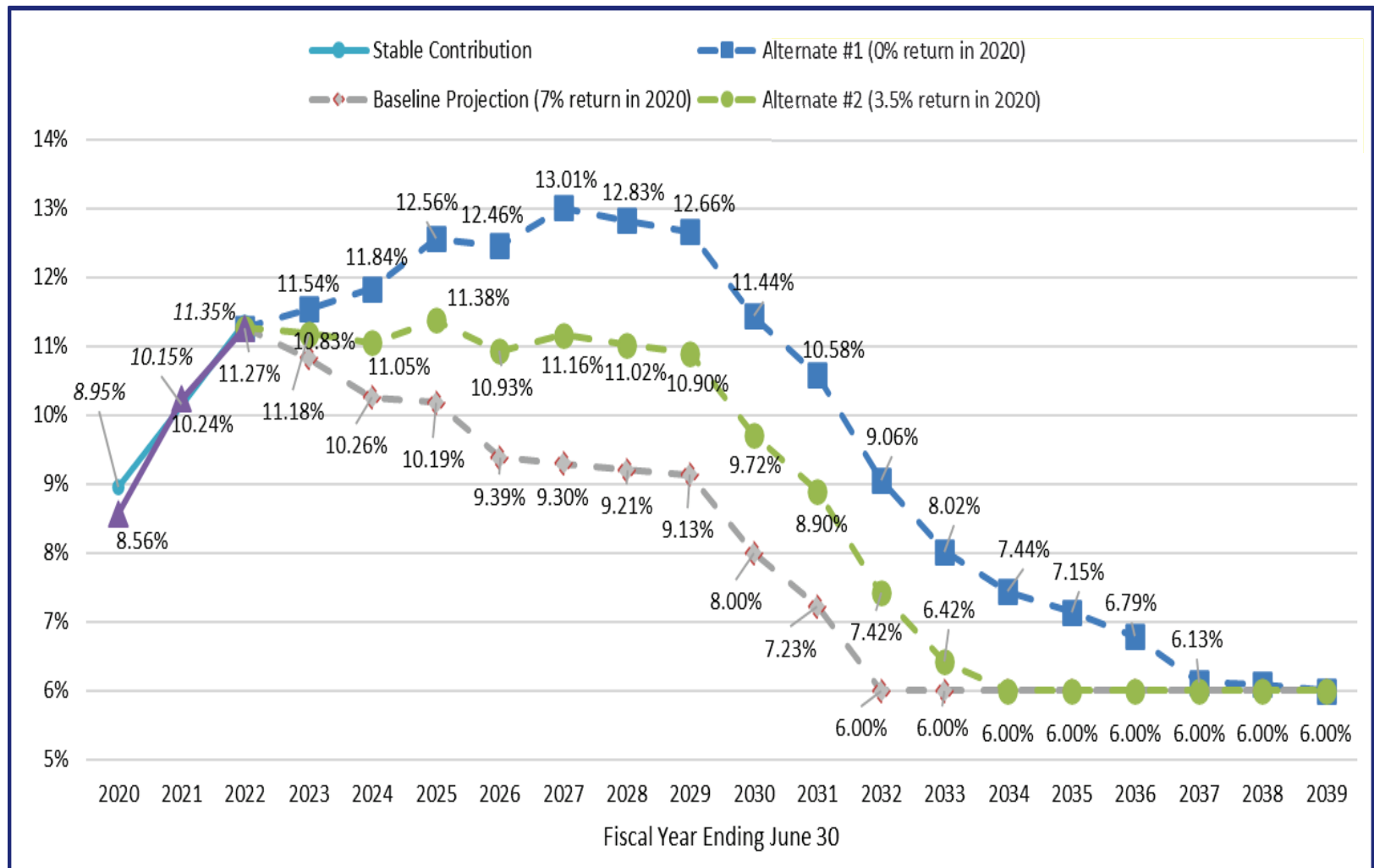
- Projections of contribution requirements and funded status into the future can be helpful planning tools for stakeholders. This section provides such projections. The projections of the actuarial valuation are known as deterministic projections. Deterministic projections are based on one scenario in the future. The baseline deterministic projection is based on December 31, 2018 valuation results and assumptions.
- Key Projection Assumptions
 - Valuation interest rate of 7.00% for all years in conjunction with direct rate smoothing of the employer contribution rate over a 3-year period beginning July 1, 2019.
 - Baseline investment return of 14.88% on market value of assets in calendar 2019 and 7.00% thereafter.
 - Actuarial assumptions and methods as described in Appendix D of the latest actuarial valuation report. All future demographic experience is assumed to be exactly realized.
 - The contribution rate under the Employer Contribution Rate Stabilization Policy (ECRSP) and Direct Rate Smoothing is contributed until fiscal year ending 2022.
 - The actuarially determined employer contribution rate is contributed for fiscal years ending 2023 and beyond.
 - 0% increase in the total active member population
 - No cost-of-living adjustments granted
 - Future pay increases based on long-term salary increase assumptions

Projections LGERS

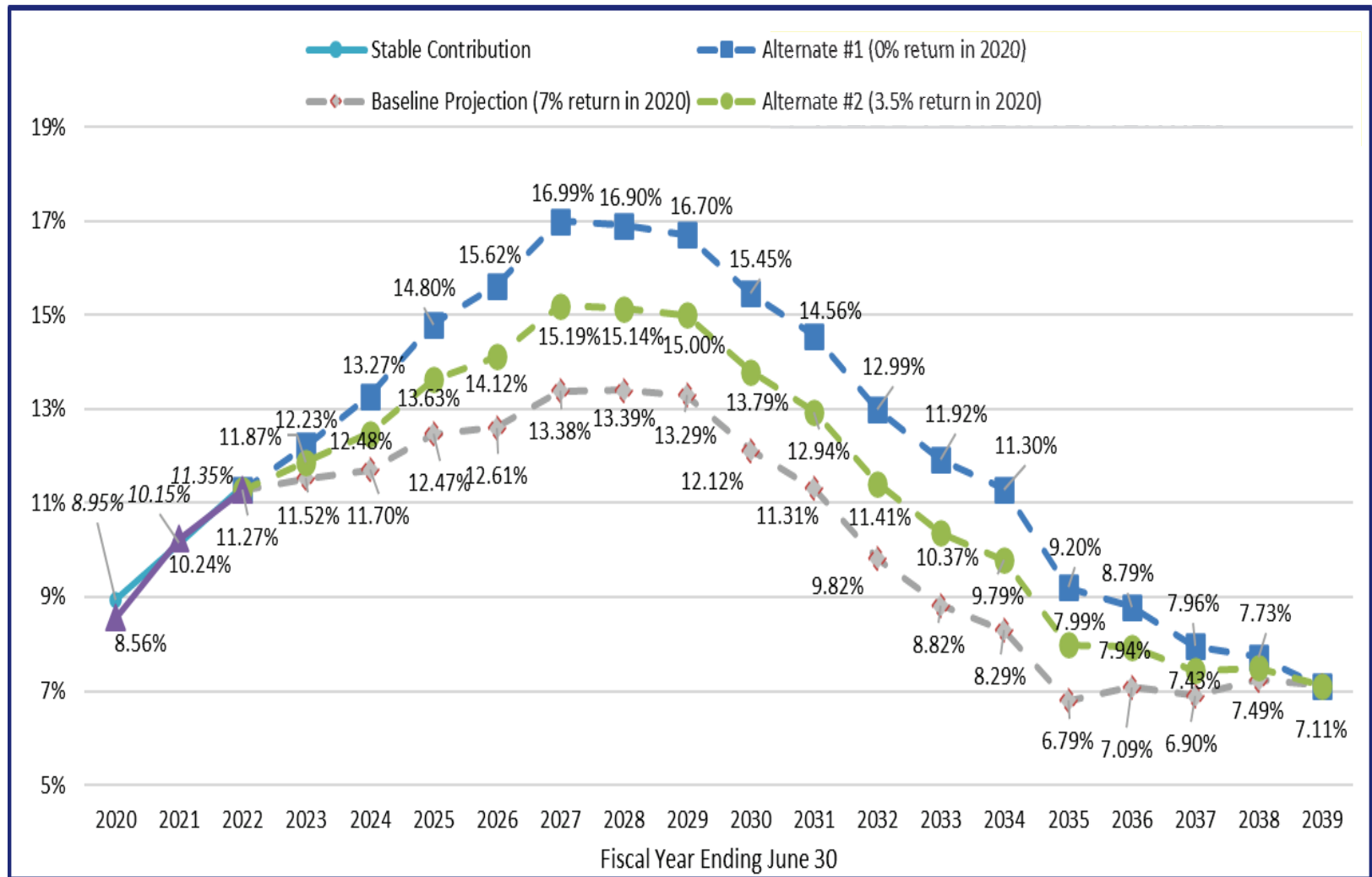


- The revised ECRSP adopted by the Board of Trustees on January 31, 2019 requires that recommended contributions for general employees be set at 8.95% of payroll for fiscal year ending 2020, 10.15% for fiscal year ending 2021, and 11.35% for fiscal year ending 2022, with the following additional adjustments, if applicable:
 - If the underlying actuarially determined employer contribution rate (ADEC) for a given fiscal year is 50% higher than the scheduled employer contribution rate for that fiscal year, the scheduled employer contribution rate for the current and future fiscal years increases 0.50%;
 - If the underlying ADEC for a given fiscal year is 50% lower than the scheduled employer contribution rate for that fiscal year, the scheduled employer contribution rate for the current and future fiscal year decreases 0.50%;
 - If the General Assembly grants any additional COLA beyond the amount of COLA granted by the Board, increases the multiplier for active employees, or changes the benefit structure in a way that has a cost to the system, the schedule of contributions for the current and future fiscal years will be increased by the cost of the benefit enhancement. The cost of any COLA granted by the Board under the authority allowed by statute will not impact the scheduled contribution rates.
 - Contribution rates for law enforcement officers will be 0.75% higher than contribution rates for general employees.
- In addition, we have provided alternate deterministic projections:
 - Estimated 2020 asset return of 0.00%
 - 6.50% investment return assumption based on:
 - Valuation interest rate of 6.50% for all years in conjunction with direct rate smoothing of the employer contribution rate over a 5-year period beginning July 1, 2022; includes 2.50% inflation.
 - Investment return on market value of assets of 6.50% beginning December 31, 2020.
 - Direct rate smoothing of employer contribution rate over a 5-year period beginning July 1, 2022 through June 30, 2027

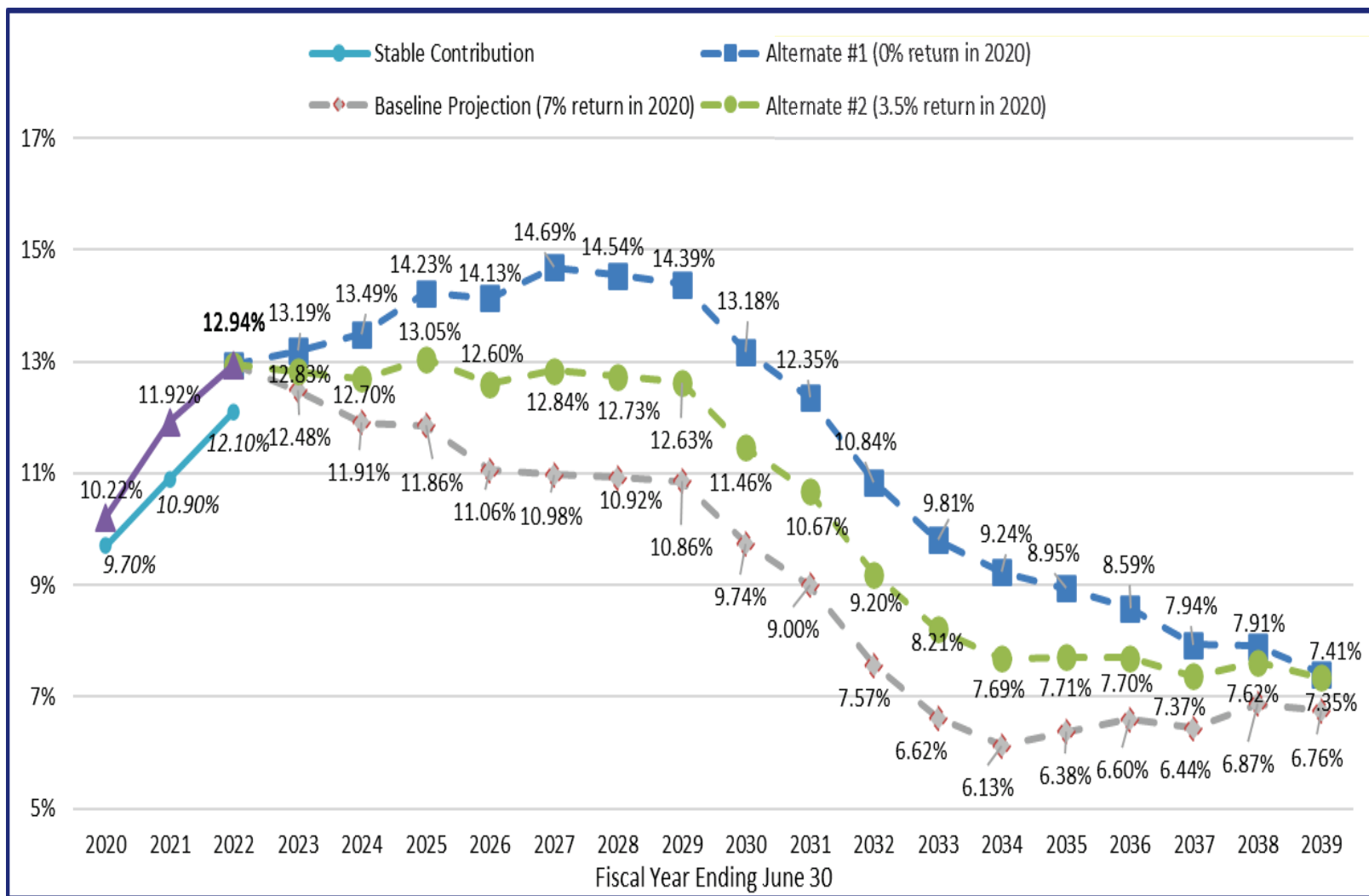
Contribution Rate Projection General Employees and Firefighters- Current Assumptions



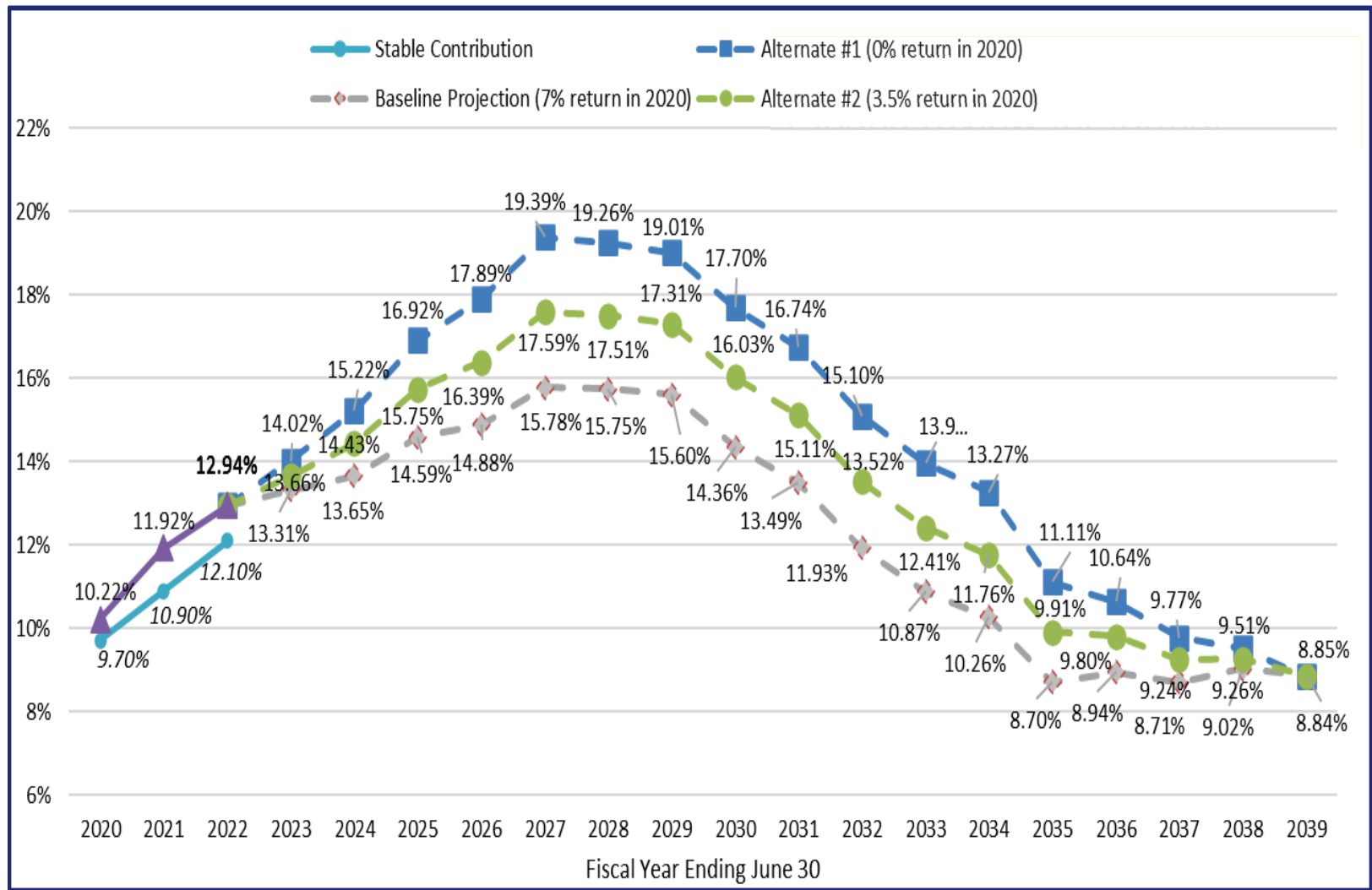
Contribution Rate Projection General Employees and Firefighters- Proposed Assumptions



Contribution Rate Projection Law Enforcement Officers- Current Assumptions

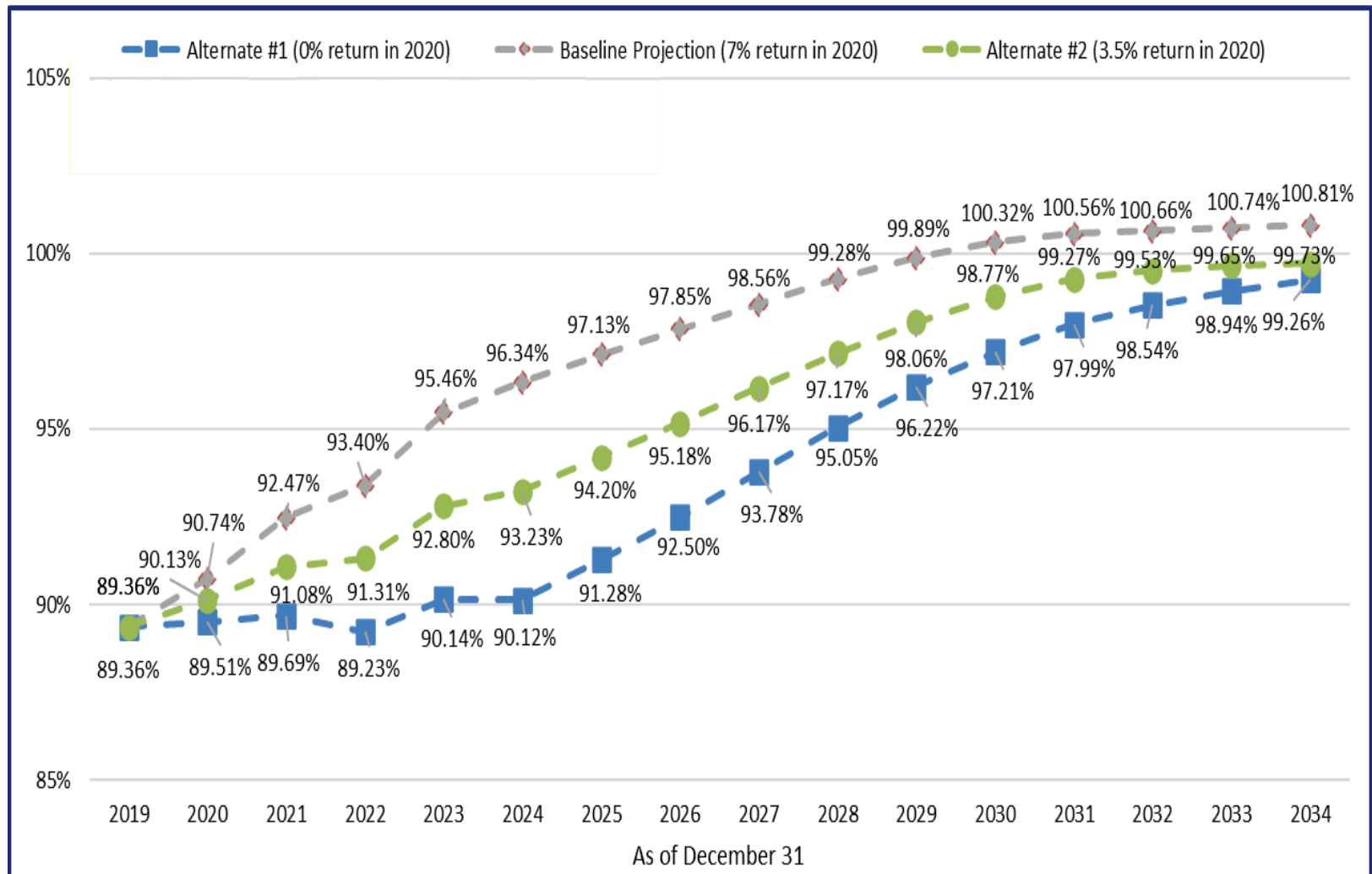


Contribution Rate Projection Law Enforcement Officers- Proposed Assumptions

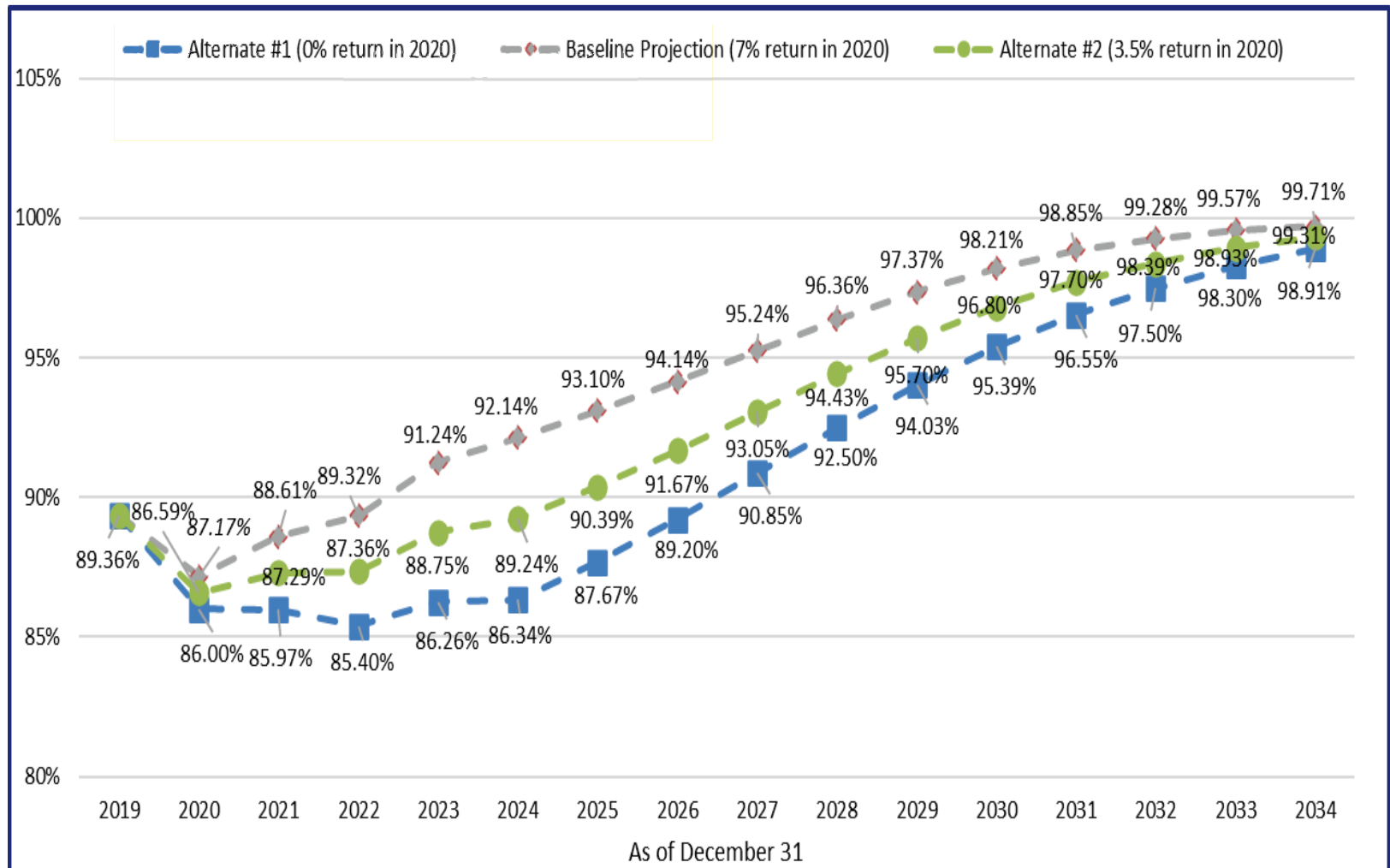


Funded Ratio

Projection - Current Assumptions



Funded Ratio Projection - Proposed Assumptions



Key Takeaways

Register of Deeds' Supplemental Pension Fund

| Valuation Component Reviewed | Observation | Recommendation | Financial Impact |
|--------------------------------------|-----------------------------------|-------------------------------------|------------------|
| Demographic Assumptions | | | |
| 1 Post-Retirement Mortality Rates | Fewer deaths | Decrease rates | Increase |
| 2 Active Mortality | Limited exposures | Decrease rates | Increase |
| 3 Mortality improvement | SOA projects lower improvement | Update from MP-2015 to MP-2019 | Decrease |
| 4 Service retirement | Fewer retirements | Decrease rates | Decrease |
| 5 Disability retirement | Fewer disabilities | Decrease rates | Immaterial |
| 6 Termination from active employment | More terminations | Increase rates | Decrease |
| Economic Assumptions | | | |
| 7 Investment return | Lower projected returns | Reduce 0.75% (Alt 1)/ 0.50% (Alt 2) | Increase |
| 8 Inflation | SSA predicts lower | Lower by 0.50% | Increase |
| 9 Individual pay increases | Higher Increases | Increase rates | Increase |
| 10 Productivity growth | Decrease not as much as inflation | Increase by 0.25% | Increase |
| Funding Method | | | |
| 11 Amortization Method | Current method reasonable | No change | No change |
| 12 Actuarial Cost method | Current method reasonable | Refine method - see below | Increase |
| 13 Asset valuation method | Current method reasonable | No change | No change |
| 14 Administrative expenses | Expenses lower than assumed | Decrease rate | Decrease |

Notes:

1. The Pub-2010 Public Retirement Plans Mortality Tables published by the Society of Actuaries in January 2019 provided a closer fit than the previous table which were based on corporate plan experience, resulting in less modifications.
3. For the fifth consecutive year, the SOA has reduced its projection of mortality improvement, resulting in lower liabilities.
7. Lower investment returns are the largest single source of liability and cost increases
12. The load on normal cost to account for new entrants was increased.
12. Previously unreflected provisions included.

Financial Impact

Register of Deeds' Supplemental Pension Fund

Had the proposed assumptions and methods been reflected for the December 31, 2019 Actuarial Valuation, the financial impact would have been as follows:

- The AAL would increase by 5.8% from \$30.91 million to \$32.71 million under Alternative 1; under Alternative 2, it would increase by 3.1% to \$31.86 million.
- The ADEC would remain unchanged at \$0 under Alternative 1; under Alternative 2, it would remain unchanged at \$0.
- The Employer Contribution would remain unchanged at \$0 under Alternative 1; under Alternative 2 it would remain unchanged at \$0.

| | Current Valuation | Reflect Alternative 1 Economic Assumptions | Reflect Demographic Assumptions | Reflect Funding Method | Alternative 1 w/ Five-year Direct Rate Smoothing | Alternative 2 w/ Five-year Direct Rate Smoothing |
|---------------------------------------|----------------------|---|---------------------------------------|------------------------------|---|---|
| Employer Contribution | | | | | | |
| Employer Normal Cost | 1,079,297 | 1,249,870 | 1,308,822 | 1,353,046 | 1,353,046 | 1,292,084 |
| Payment for UAAL | \$ (1,079,297) | \$ (1,249,870) | \$ (1,308,822) | \$ (1,353,046) | \$ (1,353,046) | \$ (1,292,084) |
| Preliminary ADEC* | 0 | 0 | 0 | 0 | 0 | 0 |
| Impact of Direct Rate Smoothing | \$ 0 | \$ 0 | \$ 0 | \$ 0 | \$ 0 | \$ 0 |
| Impact of Rate Stabilization Policy | 0 | 0 | 0 | 0 | 0 | 0 |
| Employer Contribution | \$ 0 | \$ 0 | \$ 0 | \$ 0 | \$ 0 | \$ 0 |
| Cumulative Δ in Employer Contribution | | \$ 0 | \$ 0 | \$ 0 | \$ 0 | \$ 0 |
| Actuarial Accrued Liability (AAL) | \$ 30,907,611 | \$ 33,374,940 | \$ 33,107,362 | \$ 32,708,957 | \$ 32,708,957 | \$ 31,858,185 |
| Actuarial Value of Assets (AVA) | 50,389,452 | 50,389,452 | 50,389,452 | 50,389,452 | 50,389,452 | 50,389,452 |
| Unfunded Accrued Liability (UAAL) | (19,481,841) | (17,014,512) | (17,282,090) | (17,680,495) | (17,680,495) | (18,531,267) |
| Funded Ratio (AVA / AAL) | 163.0% | 151.0% | 152.2% | 154.1% | 154.1% | 158.2% |
| Cumulative Δ in UAAL | | \$ 2,467,329 | \$ 2,199,751 | \$ 1,801,346 | \$ 1,801,346 | \$ 950,574 |

* Actuarially Determined Employer Contribution. Note that the employer normal cost includes administrative expenses.

Financial Impact

Death Benefit Plans

| | Current Valuation | Alternative 1 | Alternative 2 |
|---|----------------------|------------------|------------------|
| Teachers' and State Employees' Retirement System Death Benefit Plan | | | |
| Liabilities | \$ 169,651,732 | \$ 163,695,331 | \$ 160,918,265 |
| Current Assets | 58,812,369 | 58,812,369 | 58,812,369 |
| Present Value of Future Contributions | 256,670,319 | 254,505,681 | 249,644,940 |
| Surplus / (Deficit) | 145,830,956 | 149,622,719 | 147,539,044 |
| Δ in Surplus/(Deficit) | | 3,791,763 | 1,708,088 |
| Local Governmental Employees' Retirement System Death Benefit Plan | | | |
| Liabilities | \$ 58,975,706 | \$ 52,993,061 | \$ 52,025,503 |
| Current Assets | 88,568,566 | 88,568,566 | 88,568,566 |
| Present Value of Future Contributions | 43,141,531 | 39,207,132 | 38,400,828 |
| Surplus / (Deficit) | 72,734,391 | 74,782,637 | 74,943,891 |
| Δ in Surplus/(Deficit) | | 2,048,246 | 2,209,500 |
| Separate Insurance Benefits Plan for Law Enforcement Officers | | | |
| Liabilities | \$ 37,917,284 | \$ 46,212,762 | \$ 43,414,858 |
| Current Assets | 59,136,649 | 59,136,649 | 59,136,649 |
| Present Value of Future Contributions | 0 | 0 | 0 |
| Surplus / (Deficit) | 21,219,365 | 12,923,887 | 15,721,791 |
| Δ in Surplus/(Deficit) | | (8,295,478) | (5,497,574) |
| Retirees' Contributory Death Benefit Plan | | | |
| Liabilities | \$ 1,266,494,557 | \$ 1,458,950,966 | \$ 1,375,347,090 |
| Current Assets | 271,691,476 | 271,691,476 | 271,691,476 |
| Present Value of Future Contributions | 967,643,306 | 1,039,448,340 | 992,257,484 |
| Surplus / (Deficit) | (27,159,775) | (147,811,150) | (111,398,130) |
| Δ in Surplus/(Deficit) | | (120,651,375) | (84,238,355) |

Items Studied during the Experience Review



Economic Assumptions

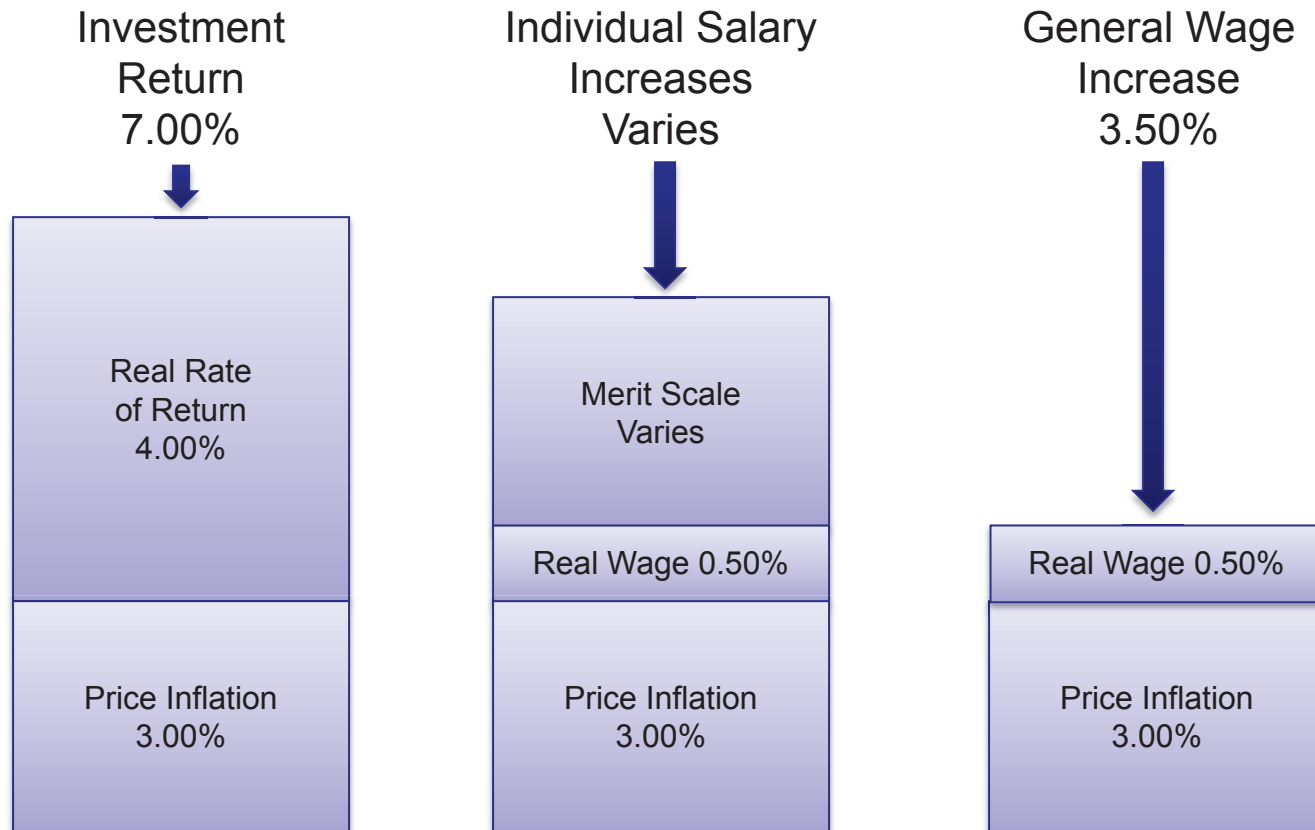
Economic Assumptions

- Inflation
- Investment return
- Real return
- Individual salary increases
- Real wage growth
- Social Security increases
- System payroll growth

Economic Assumptions are assumptions related to money. They tend to be driven by external factors outside of the control of stakeholders.

Economic Assumptions are set based on ASOP 27. They tend to be based on the future economic environment.

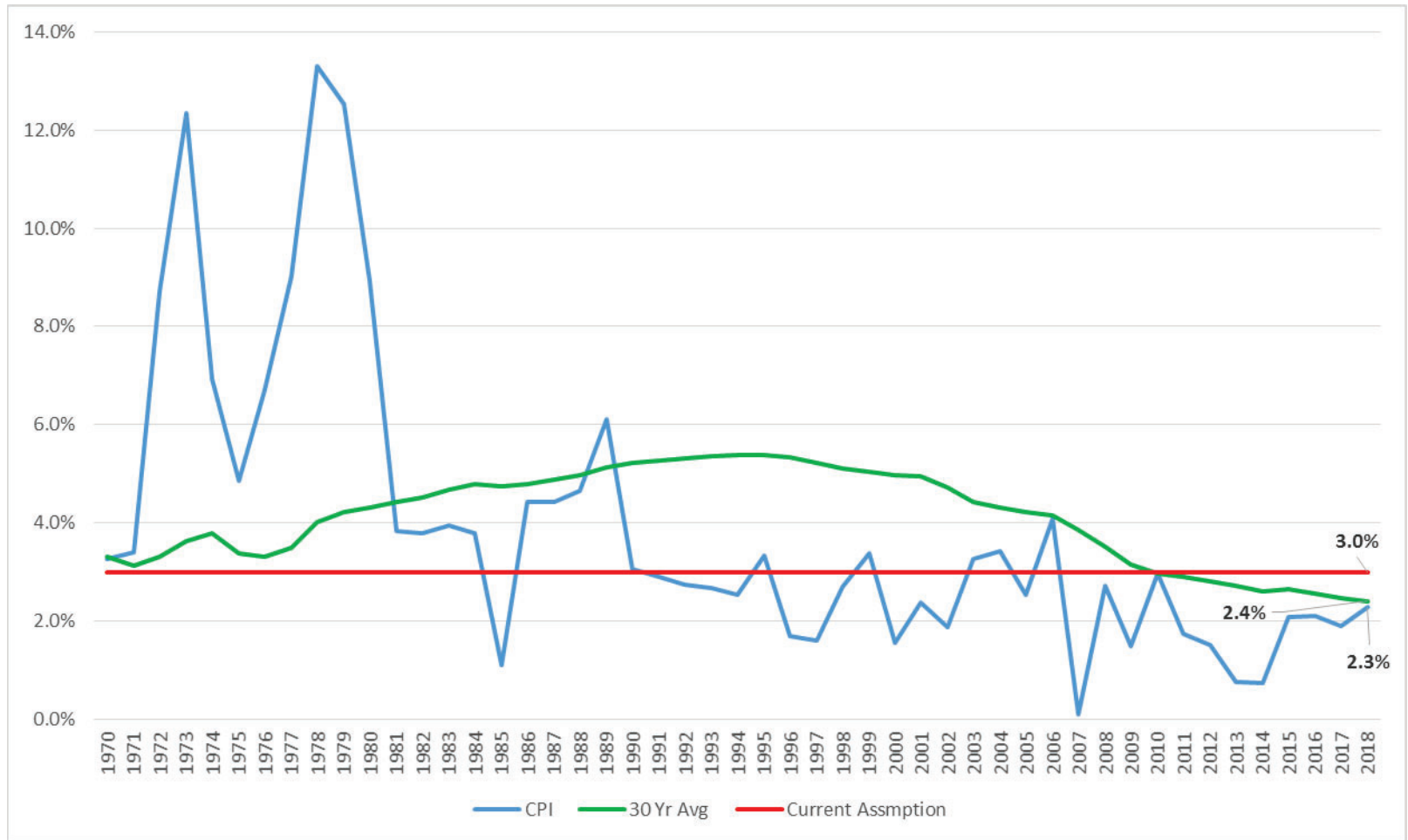
Economic Assumptions Building Block Method



The building block approach used for setting economic assumptions calls for consistency across all assumptions. For example, the same price inflation should be used for the investment return, individual salary increases and general wage increase assumption.

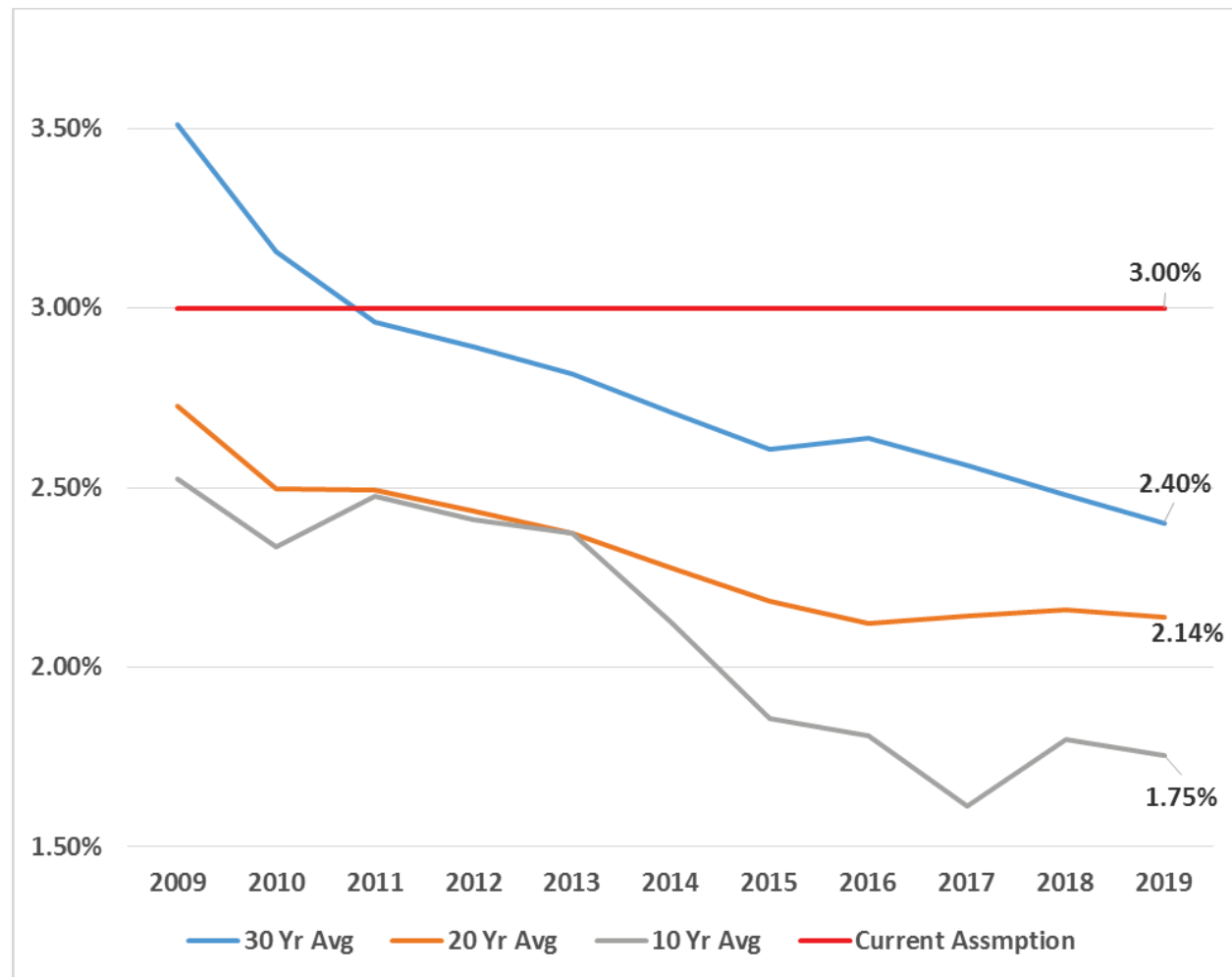


CPI Last 50 Years





Rolling CPI Averages



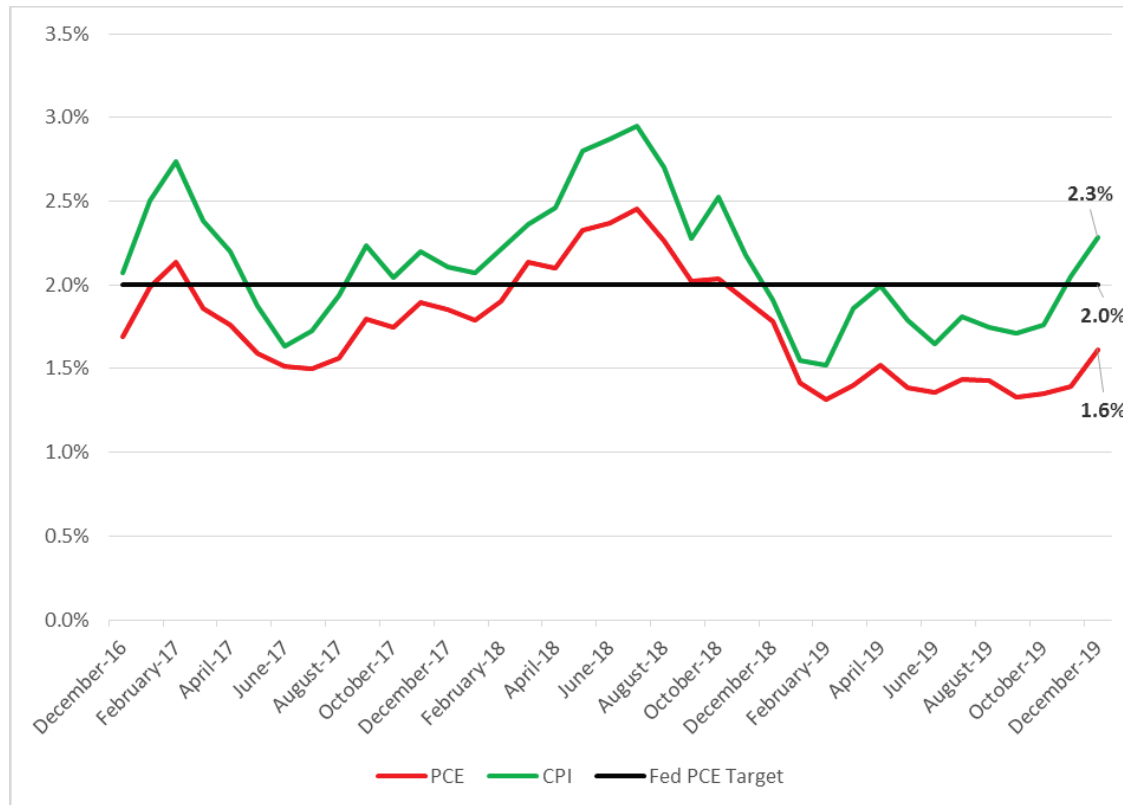
Federal Reserve Board Monetary Policy



- Policy during most of the post WWII period was to combat price inflation
- Policy since 2012 has been to have an inflation target of 2.0%
 - Price index target is the Personal Consumption Expenditures index (PCE)
 - Since 2000, the CPI has averaged 0.5% higher than the PCE
 - Since 2008, the CPI has averaged 0.3% higher than the PCE
- A “symmetric” 2.0% target has been discussed which indicates a willingness to let inflation run higher than the 2.0% target



PCE, PCE Target, and CPI



CPI is based on a fixed basket of consumer goods while the PCE basket of goods changes with substitution.

For example, if there were an outbreak of mad cow disease and the price of beef skyrocketed, the CPI will reflect the total increase in price. If consumers bought less beef and substituted pork, the PCE will reflect the shift in consumer behavior – the basket of goods would change to more pork and less beef.



2020 Social Security Report

Long Range Inflation Assumption*

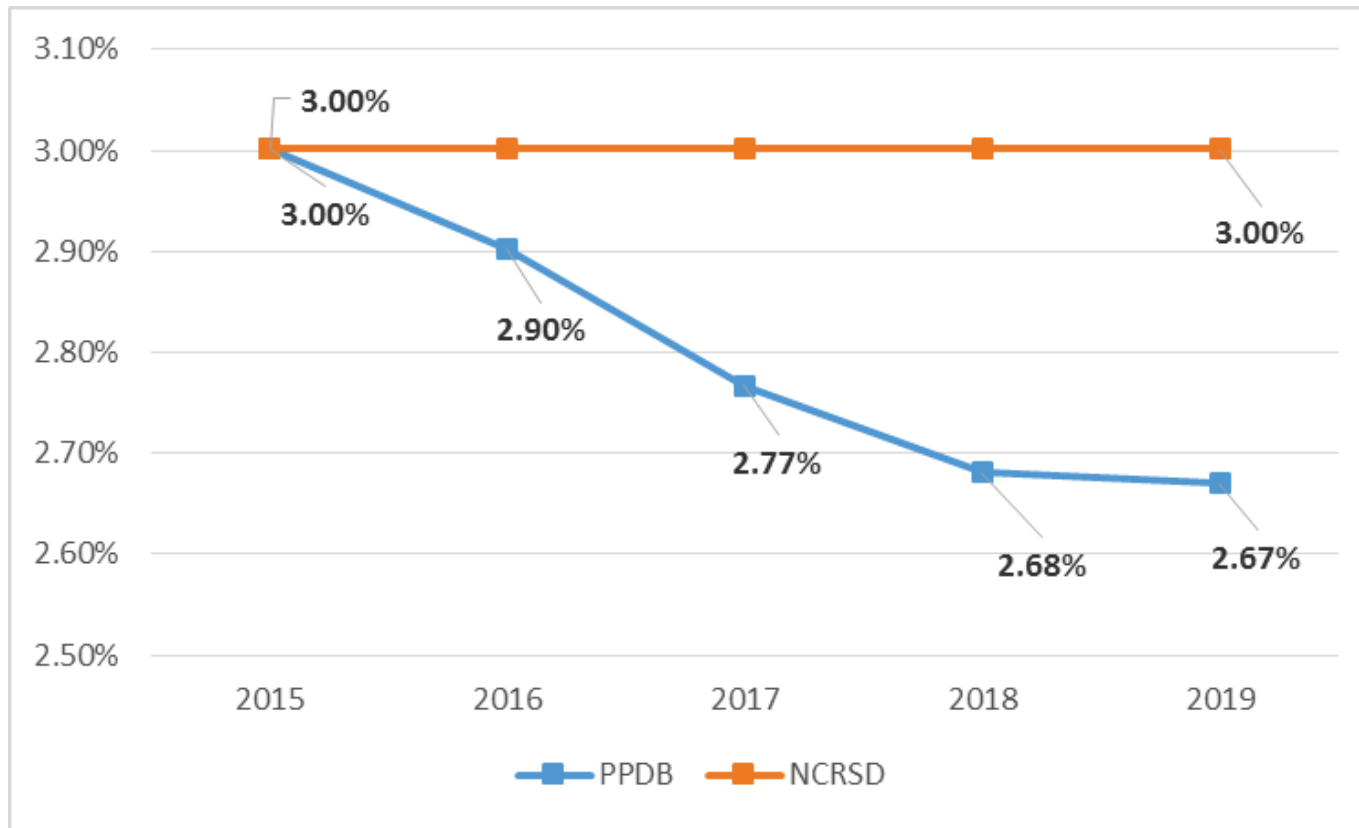


- High: 3.0%
- Intermediate: 2.4%
- Low: 1.8%

*From "The Long-Range Economic Assumptions for the 2020 Trustees Report" authored by the Office of the Chief Actuary of the Social Security Administration dated April 22, 2020

https://www.ssa.gov/OACT/TR/2020/2020_Long-Range_Economic_Assumptions.pdf

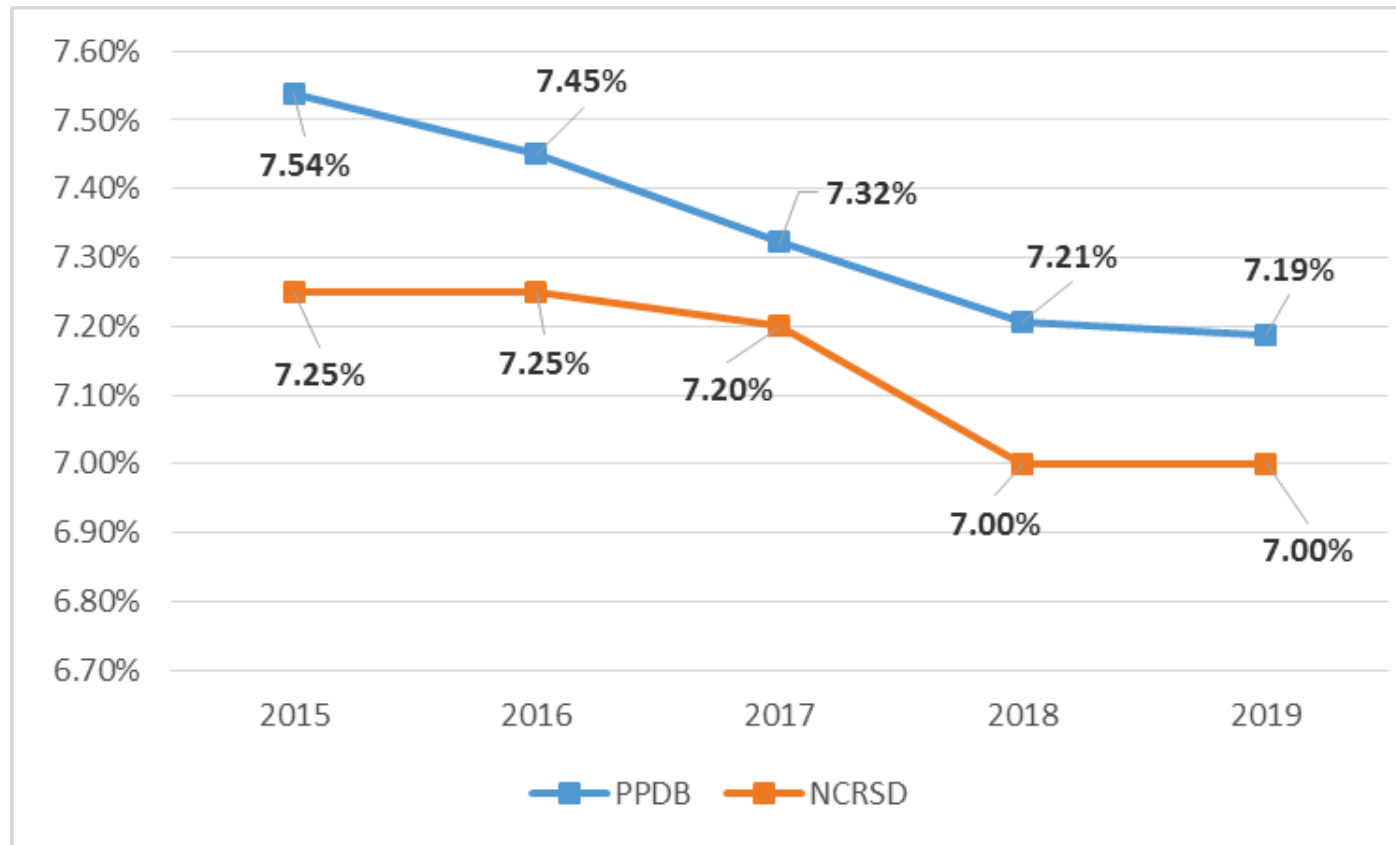
Average Assumed Inflation Rate Public Plans Database*



*From the Center for Retirement Research at Boston College

- <https://publicplansdata.org/>

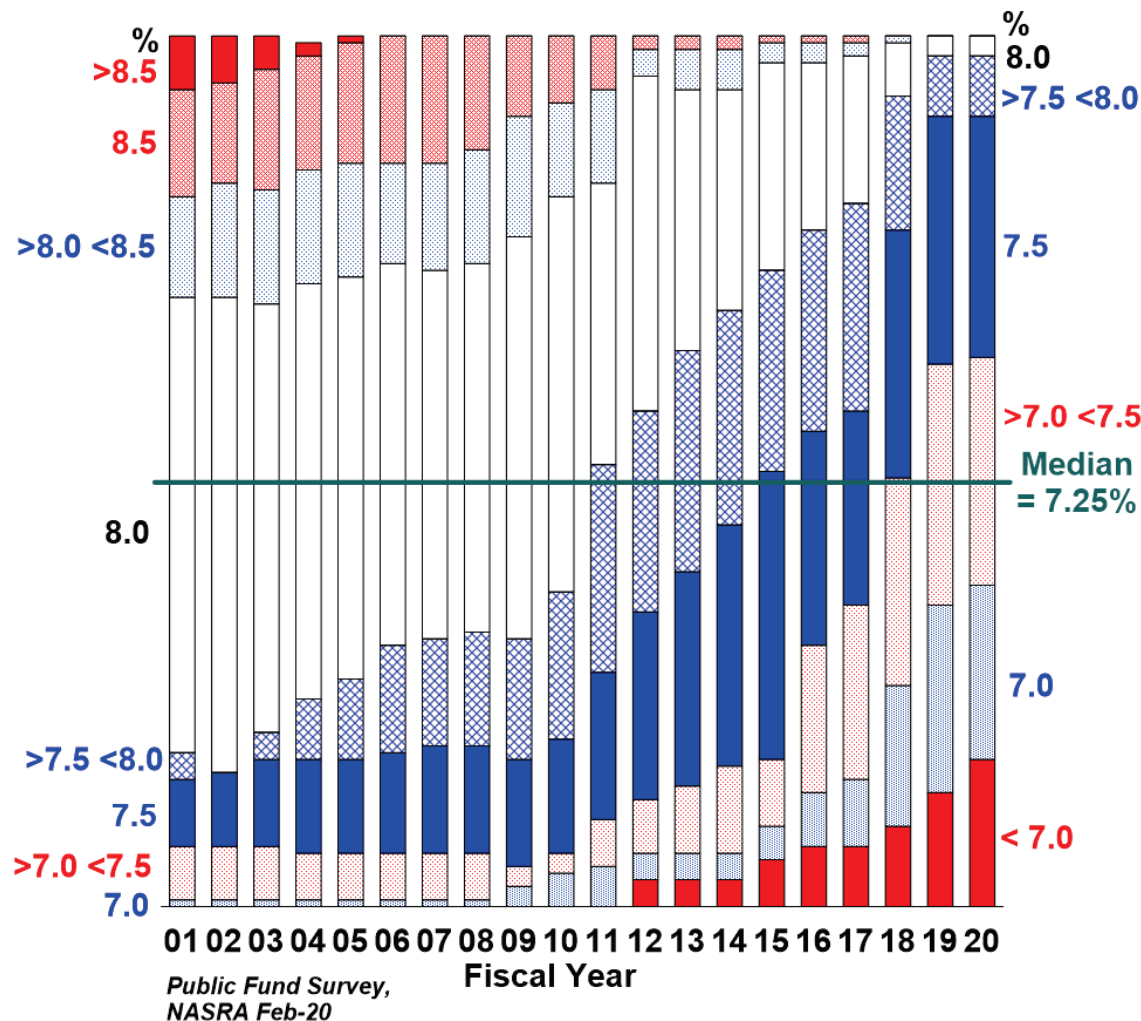
Average Expected Return Assumption Public Plans Database*



*From the Center for Retirement Research at Boston College

- <https://publicplansdata.org/>

Change in Distribution of Public Pension Investment Return Assumptions (NASRA)



<https://www.nasra.org/files/Issue%20Briefs/NASRAInvReturnAssumptBrief.pdf>

The reduction in assumed returns over the past 20 years has been driven by lower expectations of future returns by investment professionals and has resulted in increases in liabilities and employer contribution rates.

The latest information presented to the IAC puts NCRS at the 6th percentile in long-term investment risk, and the 7.0% return assumption is well over 10th percentile among peers.

https://files.nc.gov/nc treasurer/document s/files/IMD/MeetingDocuments/5-20-20_iac_performance_presentation.pdf

Expected Returns - Asset Allocation Studies and Actuarial Assumptions



The following slide was presented at the April 2018 Board Meeting. This information was a primary consideration for reducing the investment return assumption to 7.00%.



Projected returns are based on the asset allocation, which is a key consideration to setting the investment return assumption.

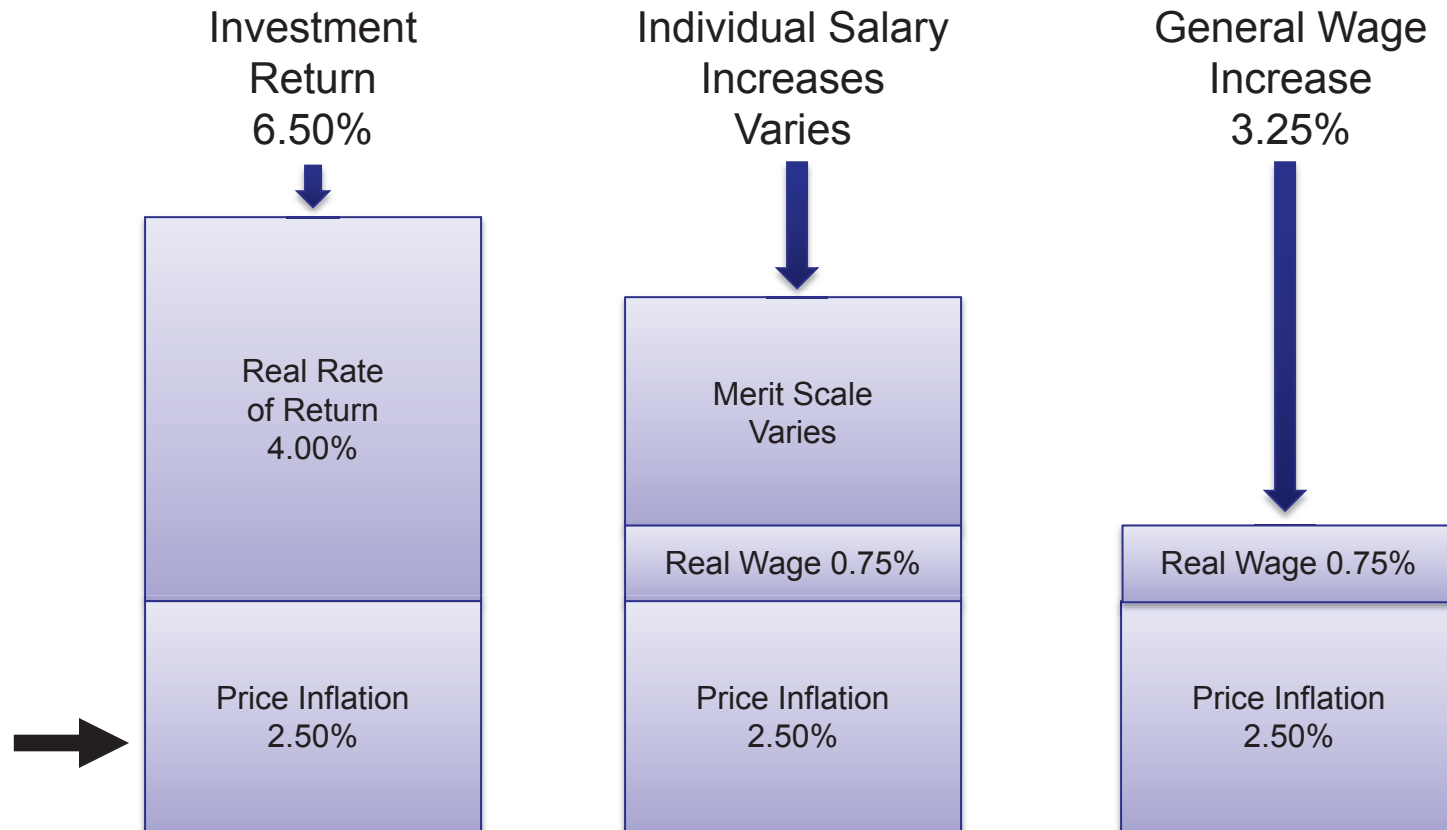
2016 IMD Asset Allocation Study

- Study performed in 2016
 - Based on market conditions and asset allocation as of year-end 2015
 - Incorporates Employer Contribution Rate Stabilization Policies adopted by Boards in 2016
- Expected range of annualized passive compound returns is summarized below
 - All returns are net of expenses
- Both 7.25% (pre-2017 assumption) and 7.20% (adopted in 2017) are somewhat greater than the median 20-year expected return, and close to (but greater than) median 30-year expected return
- At Feb. 2018 Investment Advisory Committee meeting, it was noted that there have been only modest changes in return expectations since the 2016 study, so that there is no urgent need for a new study

| Horizon | 5 th Percentile | 25 th Percentile | 50 th Percentile | 75 th Percentile | 95 th Percentile |
|----------|----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| 10 Years | 0.2% | 4.0% | 5.9% | 8.0% | 11.5% |
| 20 Years | 2.2% | 4.8% | 6.7% | 8.5% | 11.8% |
| 30 Years | 3.1% | 5.3% | 7.1% | 8.7% | 12.0% |

Source: North Carolina Department of State Treasurer and Buck Consulting

Economic Assumptions Building Block Method



The building block approach used for setting economic assumptions calls for consistency across all assumptions. For example, the same price inflation should be used for the investment return, individual salary increases and general wage increase assumption. The reduction in price inflation impacts investment return, individual salary increases and general wage increases.

Salary Increases

- Generally, a participant's compensation will increase over the long term based on Inflation + Productivity Growth + Merit Adjustments
- We recommend Inflation be reduced to 2.50%
- We recommend Productivity Growth be increased to 0.75%. Wage inflation did not decline as much as consumer prices.
- Merit Adjustments are increases in a member's salary unrelated to above
 - CMC removed the current Inflation and Productivity Growth assumption (3.50%) from actual salaries to determine Merit Adjustments for each member over 2015 – 2019
 - We then studied Merit Adjustments by service and employee group
- Overall salary increases were generally lower across all groups
- 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.
- Tables of the proposed salary merit increase rates can be found in the Appendix.

Other Economic Assumptions – Disability Income Plan

- Medical Premium Trend
 - Recommend using the same assumptions as the State Health Plan
- Expected Across-the-Board Salary Increases
 - For disability events that first occur on or after January 1, 1988, extended STD and LTD benefits (before reductions) recommend assuming an increase of 3.25% per year (inflation + productivity). Otherwise, no increases will be assumed.
- Expected Long-term National Average Wage Growth
 - Recommend 3.25% per year (inflation + productivity) for the purposes of calculating Social Security benefits.
- Expected Future Increases in Social Security Benefits
 - For disability events that first occur on or after January 1, 1988, recommend Social Security disability benefits be assumed to increase by 2.50% per year (inflation). Otherwise, no increases will be assumed.

Items Studied during the Experience Review



Demographic Assumptions



Demographic Assumptions

- Mortality
- Retirement
- Termination
- Disability
- Other Demographic Assumptions

Demographic Assumptions are assumptions related to people. They tend to be established based on behavior of the members of the retirement system.

Demographic assumptions are set based on ASOP 35 and should reflect the best estimate of future experience, which is typically informed by studying trends in census information over the experience review period.

Demographic Assumptions

Mortality

Mortality

- Mortality tables vary by age, gender, employee group and health status
 - Current retiree mortality rates are based on RP-2014 tables adjusted to reflect various TSERS and LGERS populations
 - Since the last review public sector tables, collectively known as PUB2010, have been released
 - Tables were released in 2019
 - These tables are a much better fit, requiring less adjustment
 - Some small adjustments, such as setting ages forward or backward, were utilized to fine tune the fit
- Mortality assumption also includes a provision to reflect future mortality improvements
 - Current assumption is based on mortality projection scale MP-2015
 - Since the last review, mortality has increased compared to that predicted by MP-2015. The most recent scale, MP-2019, represents the fifth straight year of increasing mortality
- Cost impact:
 - The change in rates did not change results significantly
 - The change to MP-2019 decreases costs

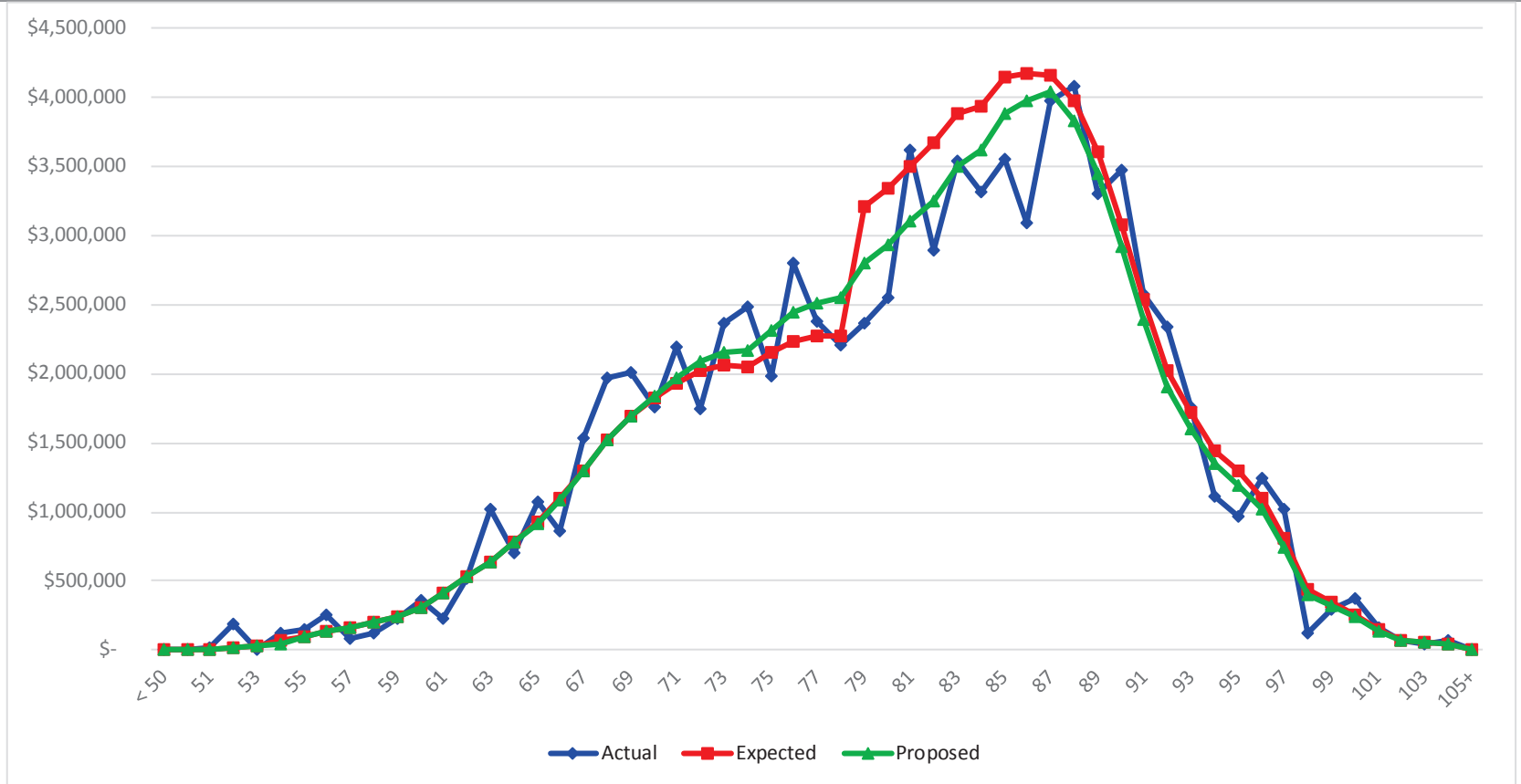
Mortality

- The Active and Disabled mortality assumptions make use of standard tables because they are not a big driver of costs and there is not sufficient experience to warrant adjusting a standard table:
 - Active Mortality: relatively low number of deaths and the potentially lower amount of benefits due than had the member retired.
 - Disabled Mortality: like Actives, infrequency of disability relative to other benefits
- Beneficiary mortality for all systems was grouped together (separated only by gender) as follows to give credibility to the data:
 - CJRS and LRS beneficiaries were determined to exhibit different mortality than the other plans and we recommend an unadjusted standard table for these plans
 - For all other plans we recommend a standard table with adjustments for males and females.
- Please see the Appendix for a description of the tables recommended for each plan and group

Mortality

Decline in Benefit Payments Due To Mortality

- Plan**
- TSERS:**
- Teachers
 - General Employees
 - Other Education
 - Law Enforcement
 - CJRS
 - LRS
 - National Guard
 - DIPNC
 - FRSWPF
 - LGERS:
 - General Employees
 - Fire & Rescue
 - Law Enforcement
 - RODs
 - Death
- Membership**
- Active
- Retiree**
- Disabled
 - Beneficiary
- Gender**
- Males
 - Females
 - Males and Females

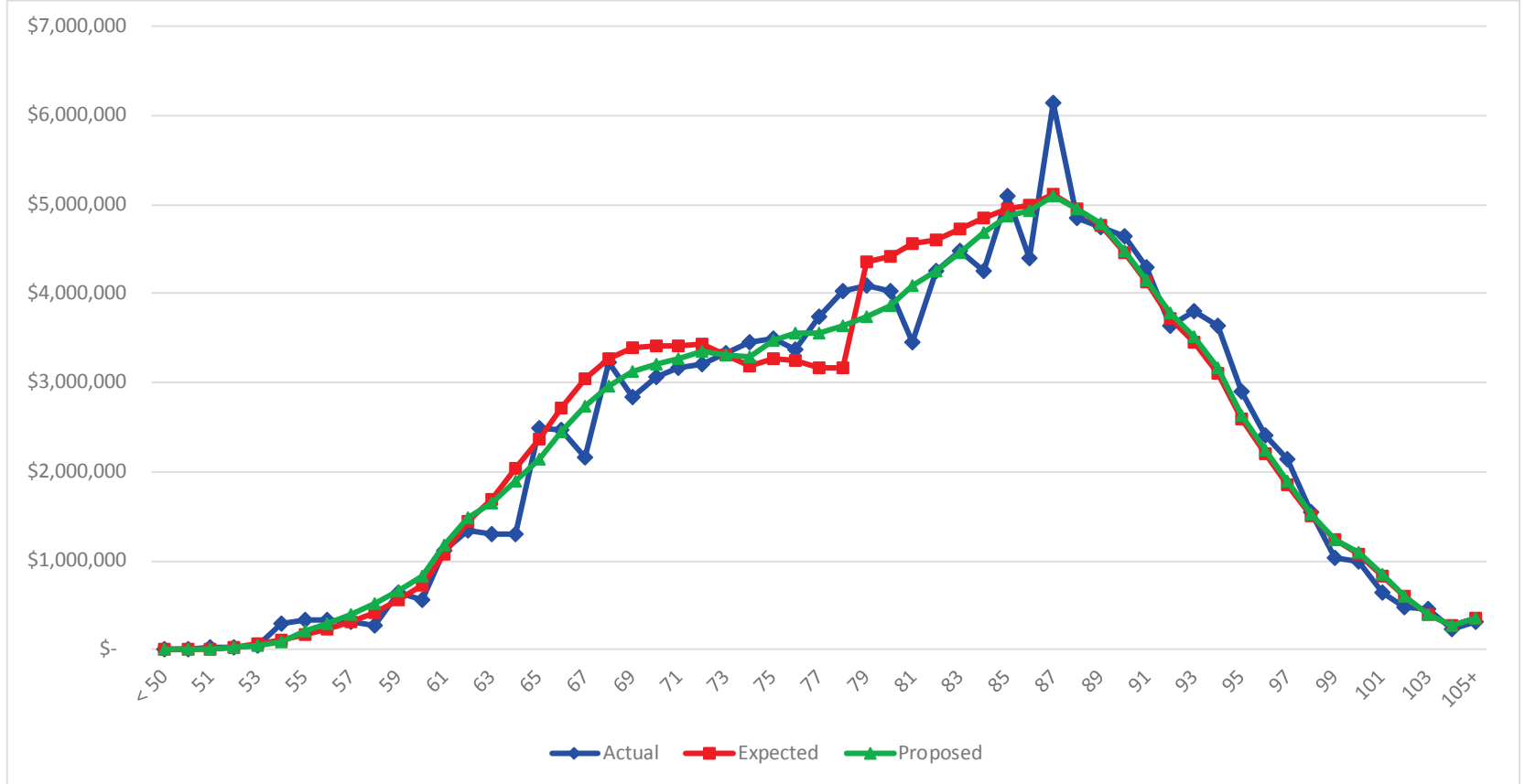


| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: less decline in benefit payments due to mortality over the period than expected overall |
|---------------------------|--------|----------|------------|----------|-------------|--|
| Reduction in benefits \$M | 83.29 | 85.97 | 0.9688 | 82.93 | 1.0043 | |
| Total | 83.29 | 85.97 | 0.9688 | 82.93 | 1.0043 | |
| | | | | | | Recommendation: adjust rates, generally downwards to reflect actual experience |
| | | | | | | Cost Impact: increase |

Mortality

Decline in Benefit Payments Due To Mortality

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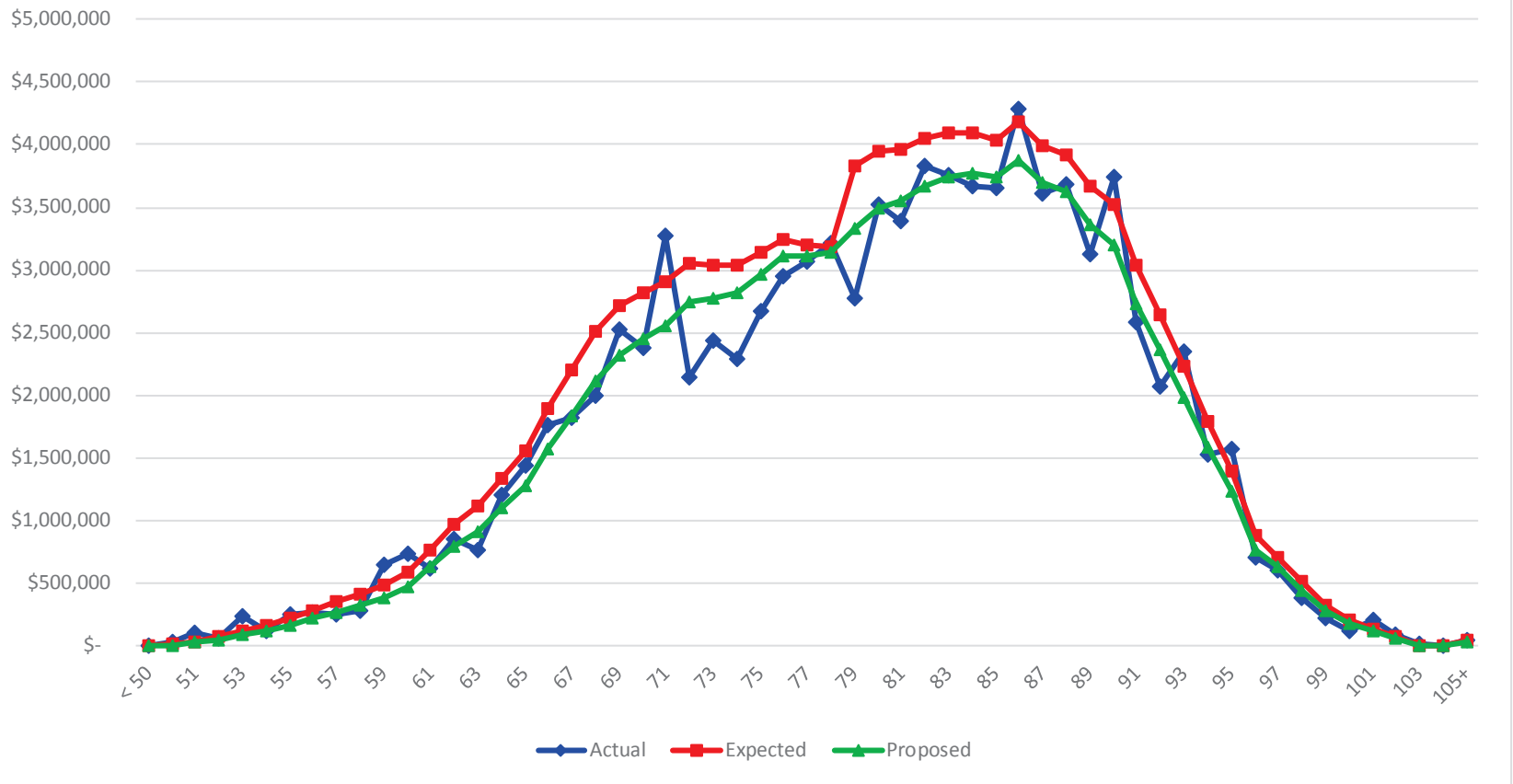


| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: less decline in benefit payments due to mortality over the period than expected overall |
|---------------------------|--------|----------|------------|----------|-------------|--|
| Reduction in benefits \$M | 134.92 | 137.34 | 0.9824 | 135.21 | 0.9978 | |
| Total | 134.92 | 137.34 | 0.9824 | 135.21 | 0.9978 | |
| | | | | | | Recommendation: adjust rates, generally downwards to reflect actual experience |
| | | | | | | Cost Impact: increase |

Mortality

Decline in Benefit Payments Due To Mortality

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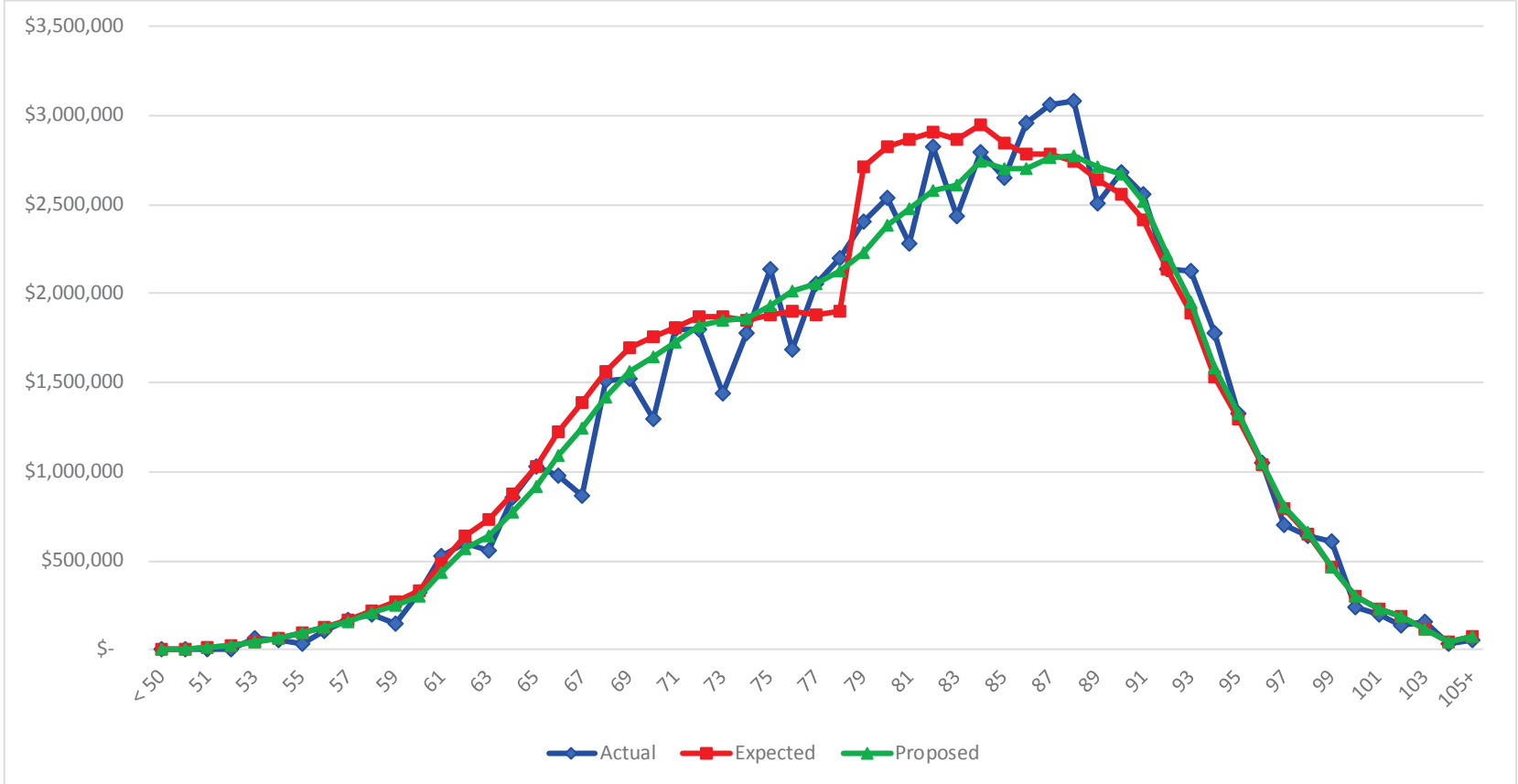


| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: less decline in benefit payments due to mortality over the period than expected overall |
|---------------------------|--------|----------|------------|----------|-------------|--|
| Reduction in benefits \$M | 96.00 | 106.79 | 0.8990 | 95.89 | 1.0011 | |
| Total | 96.00 | 106.79 | 0.8990 | 95.89 | 1.0011 | Recommendation: adjust rates, generally downwards to reflect actual experience |
| | | | | | | Cost Impact: increase |

Mortality

Decline in Benefit Payments Due To Mortality

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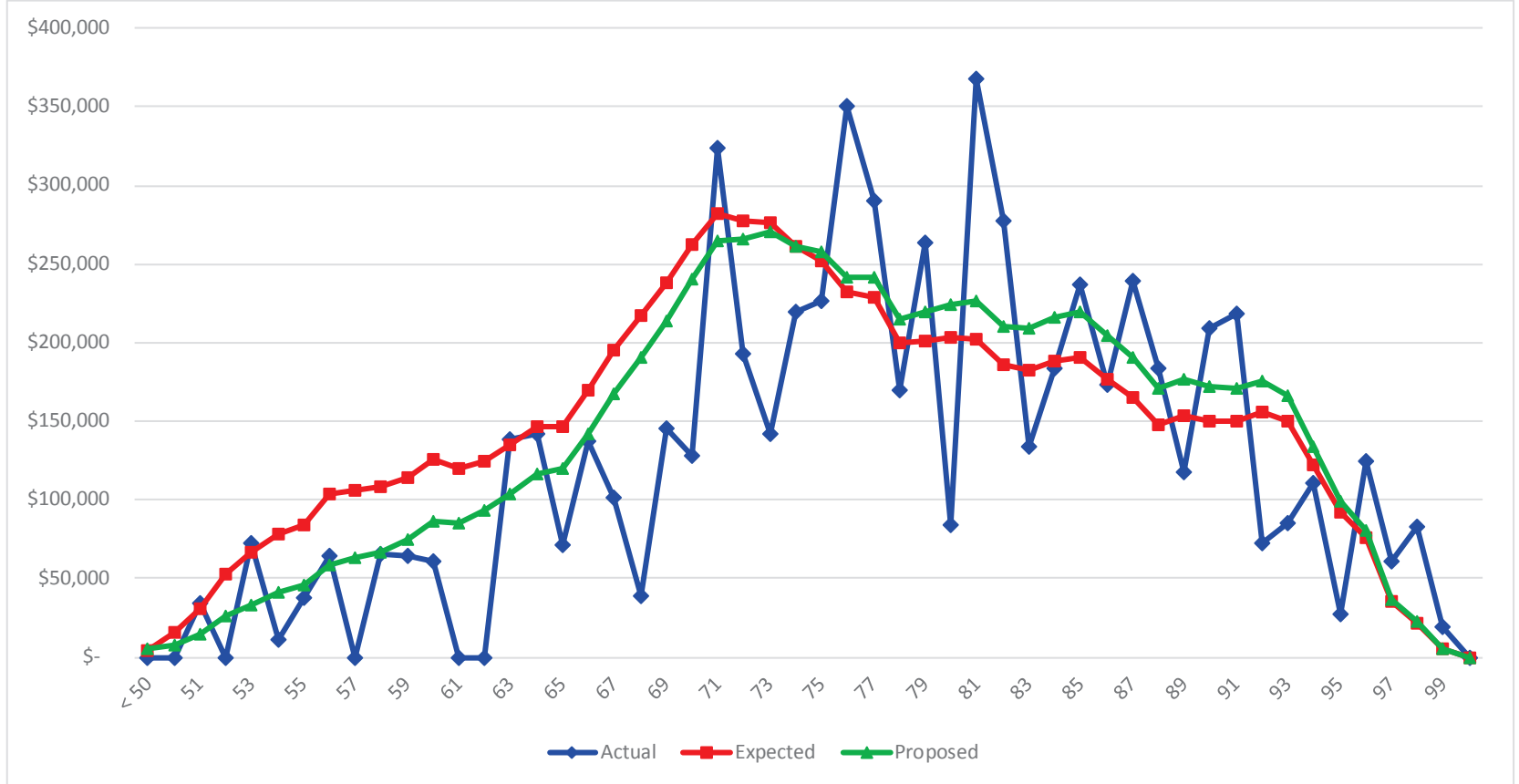


| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: less decline in benefit payments due to mortality over the period than expected overall |
|---------------------------|--------|----------|------------|----------|-------------|--|
| Reduction in benefits \$M | 71.69 | 74.38 | 0.9638 | 71.84 | 0.9979 | |
| Total | 71.69 | 74.38 | 0.9638 | 71.84 | 0.9979 | Recommendation: adjust rates, generally downwards to reflect actual experience |
| | | | | | | Cost Impact: increase |

Mortality

Decline in Benefit Payments Due To Mortality

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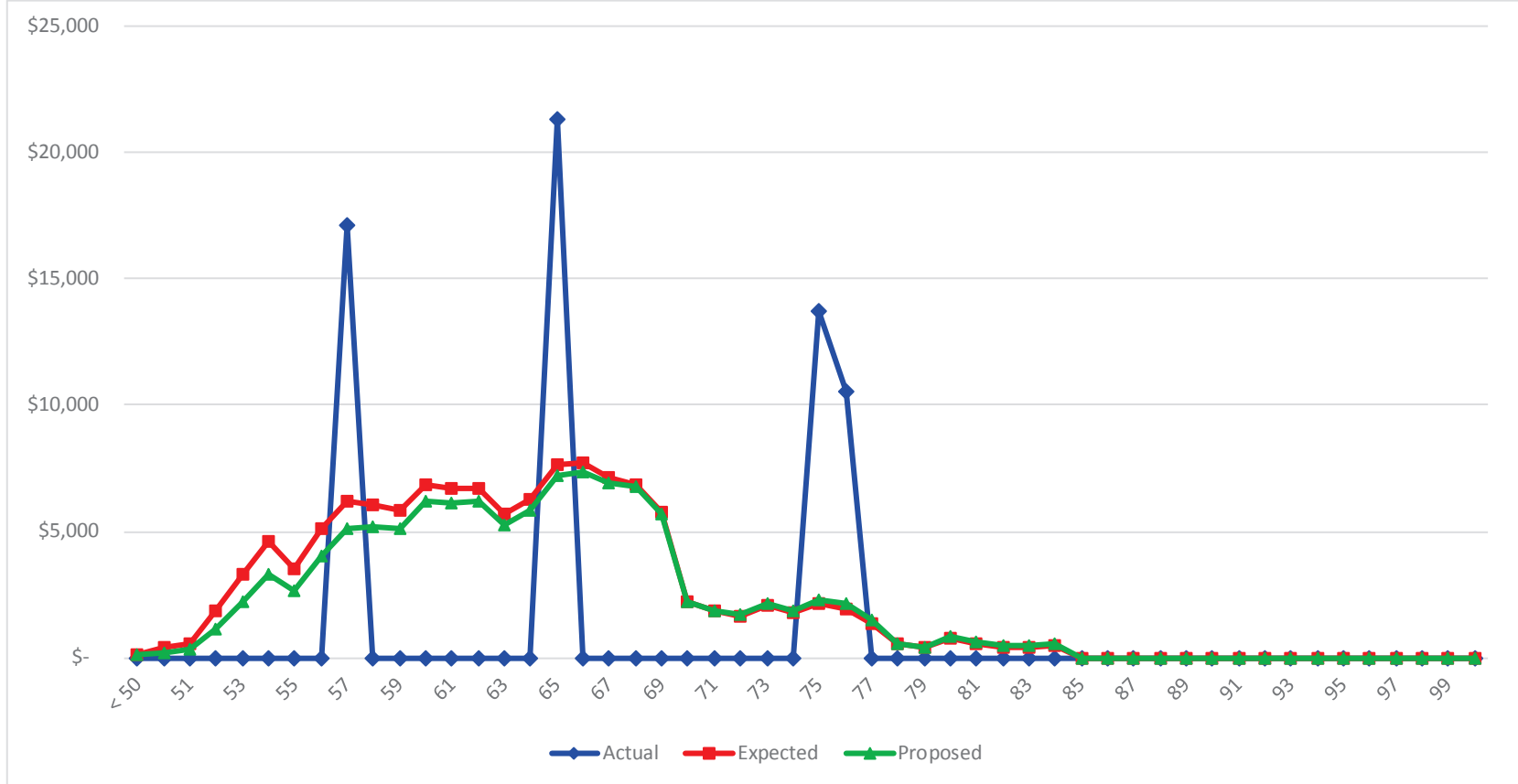


| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: less decline in benefit payments due to mortality over the period than expected overall |
|---------------------------|--------|----------|------------|----------|-------------|---|
| Reduction in benefits \$M | 6.50 | 7.62 | 0.8540 | 7.34 | 0.8855 | |
| Total | 6.50 | 7.62 | 0.8540 | 7.34 | 0.8855 | Recommendation: adjust rates, generally downwards to reflect actual experience Cost Impact: increase |

Mortality

Decline in Benefit Payments Due To Mortality

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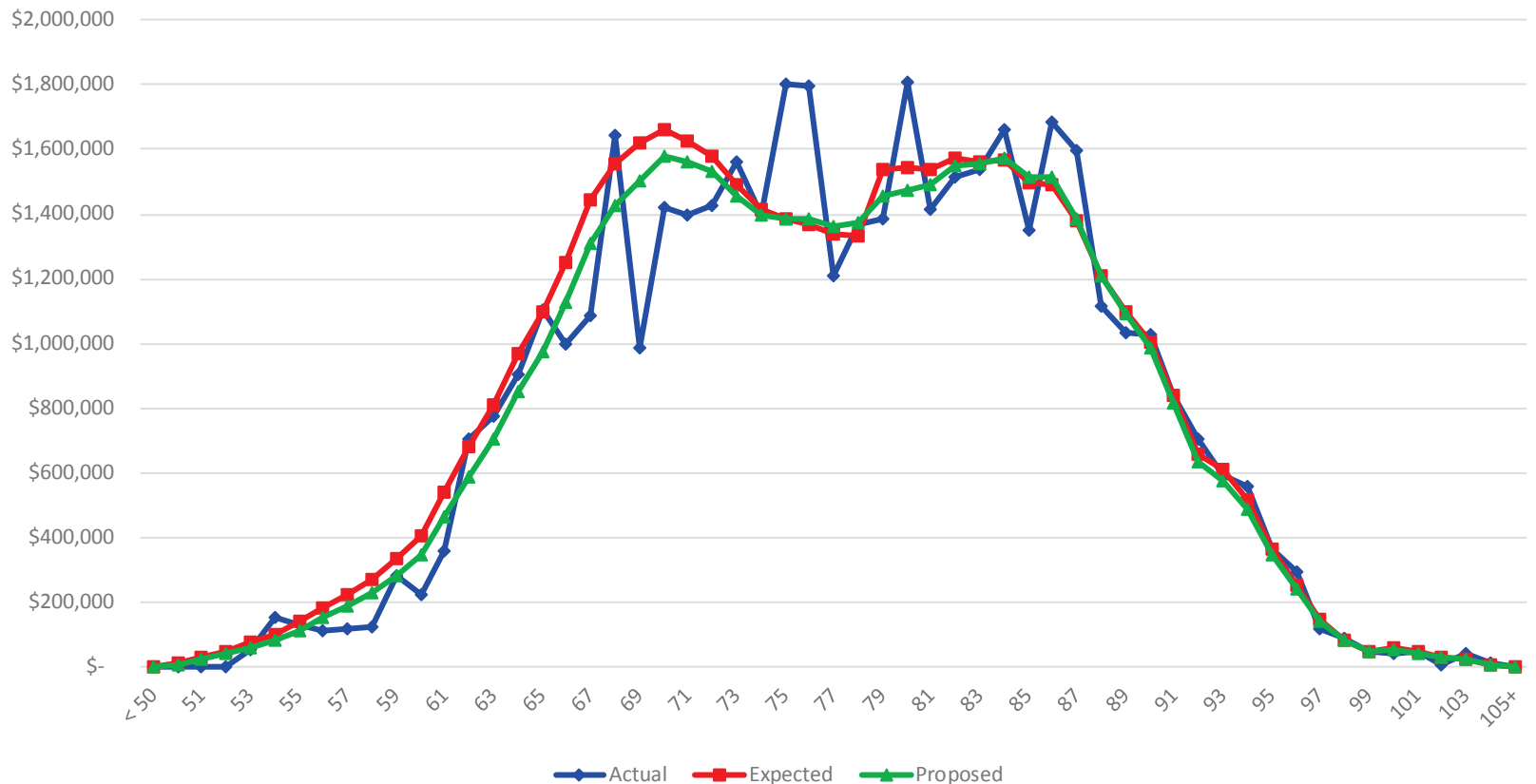


| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: less decline in benefit payments due to mortality over the period than expected overall |
|---------------------------|--------|----------|------------|----------|-------------|--|
| Reduction in benefits \$M | 0.06 | 0.12 | 0.5084 | 0.11 | 0.5568 | |
| Total | 0.06 | 0.12 | 0.5084 | 0.11 | 0.5568 | Recommendation: adjust rates, generally downwards to reflect actual experience |
| | | | | | | Cost Impact: decrease |

Mortality

Decline in Benefit Payments Due To Mortality

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- Membership**
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- Disabled
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 - Females
 - Males and Females

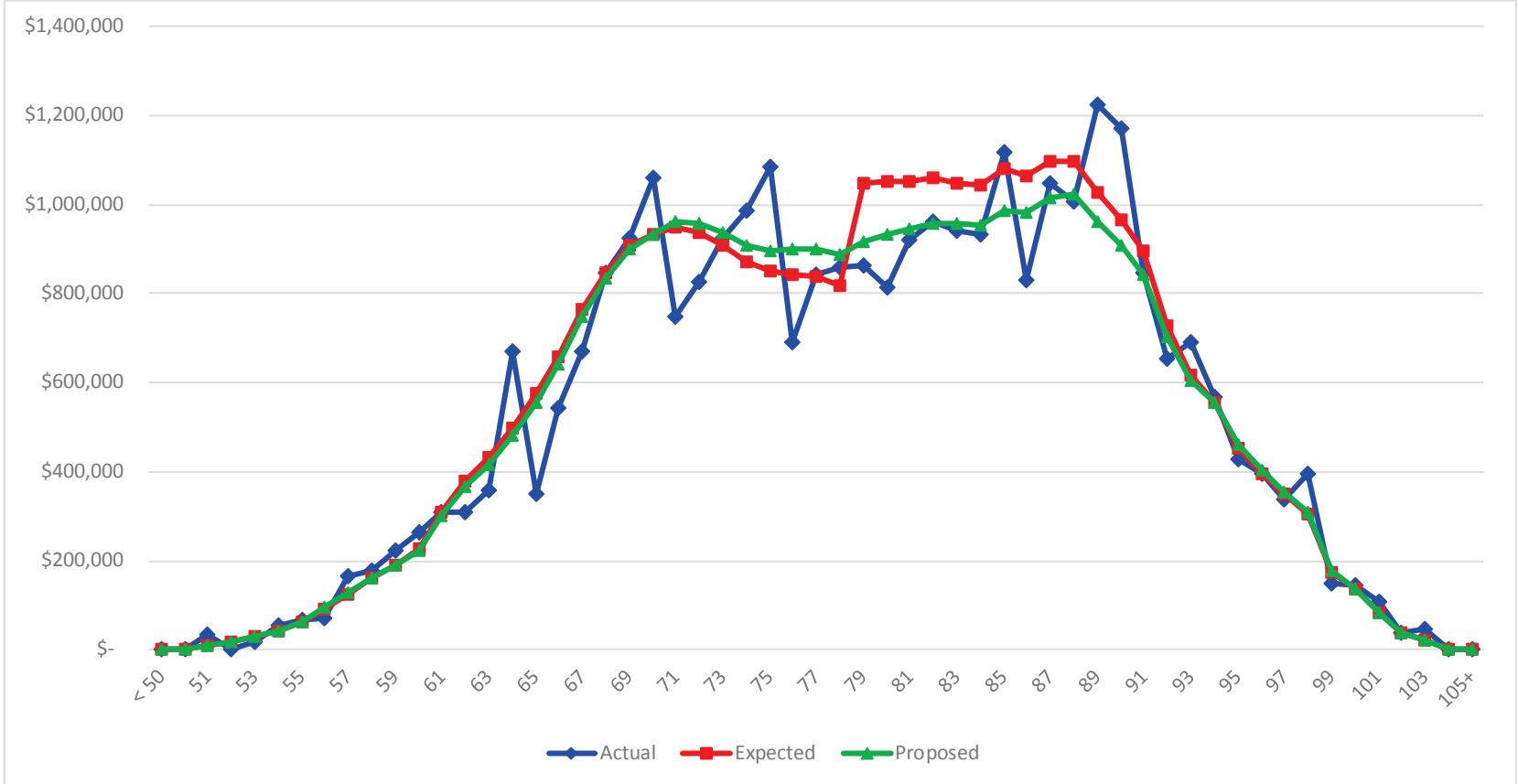


| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: less decline in benefit payments due to mortality over the period than expected overall |
|---------------------------|--------|----------|------------|----------|-------------|--|
| Reduction in benefits \$M | 44.04 | 45.72 | 0.9633 | 43.87 | 1.0038 | |
| Total | 44.04 | 45.72 | 0.9633 | 43.87 | 1.0038 | Recommendation: adjust rates, generally down wards to reflect actual experience |
| | | | | | | Cost Impact: decrease |

Mortality

Decline in Benefit Payments Due To Mortality

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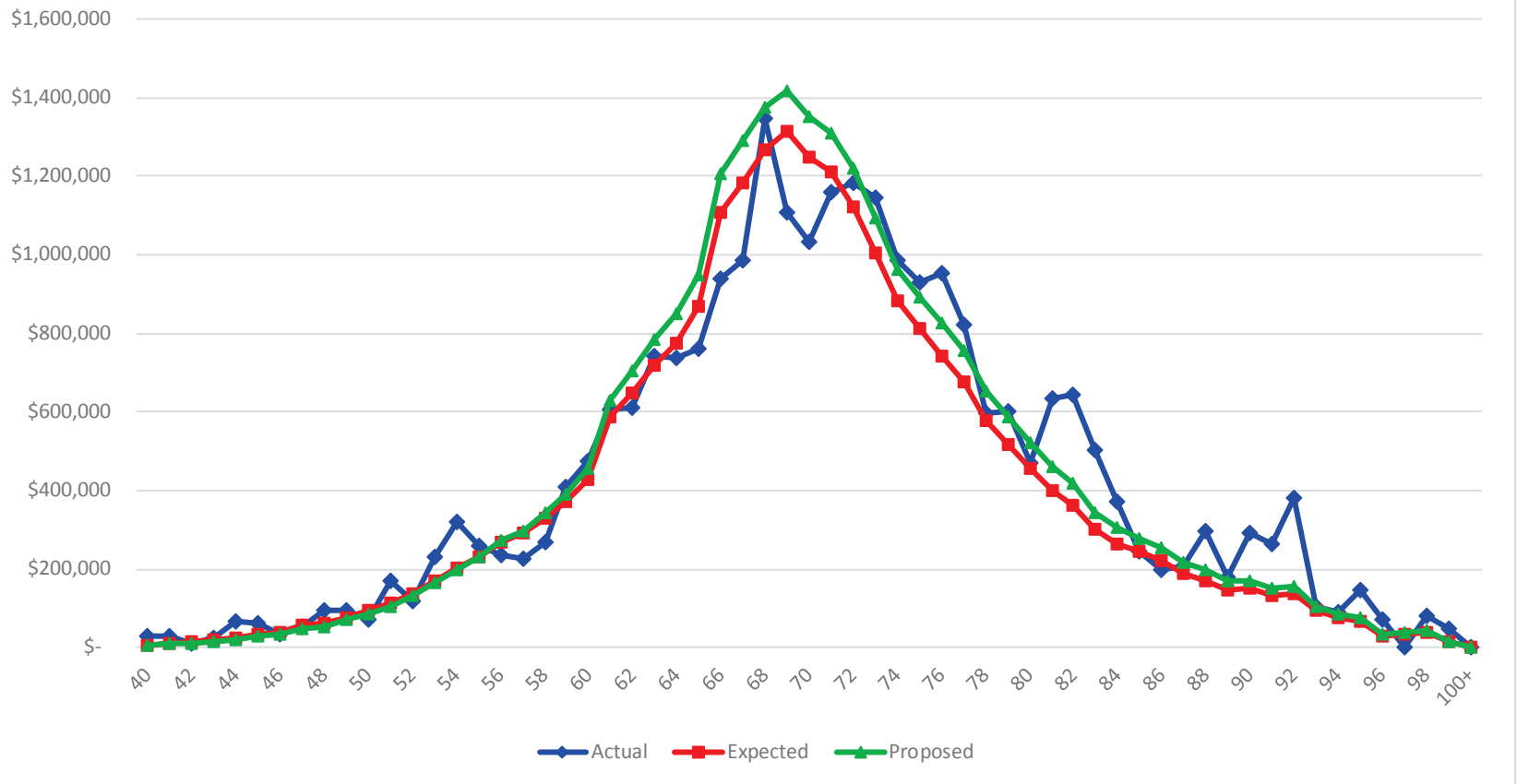


| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: less decline in benefit payments due to mortality over the period than expected overall |
|---------------------------|--------|----------|------------|----------|-------------|--|
| Reduction in benefits \$M | 30.71 | 31.66 | 0.9702 | 30.72 | 0.9999 | |
| Total | 30.71 | 31.66 | 0.9702 | 30.72 | 0.9999 | Recommendation: adjust rates, generally downwards to reflect actual experience |
| | | | | | | Cost Impact: decrease |

Mortality

Decline in Benefit Payments Due To Mortality

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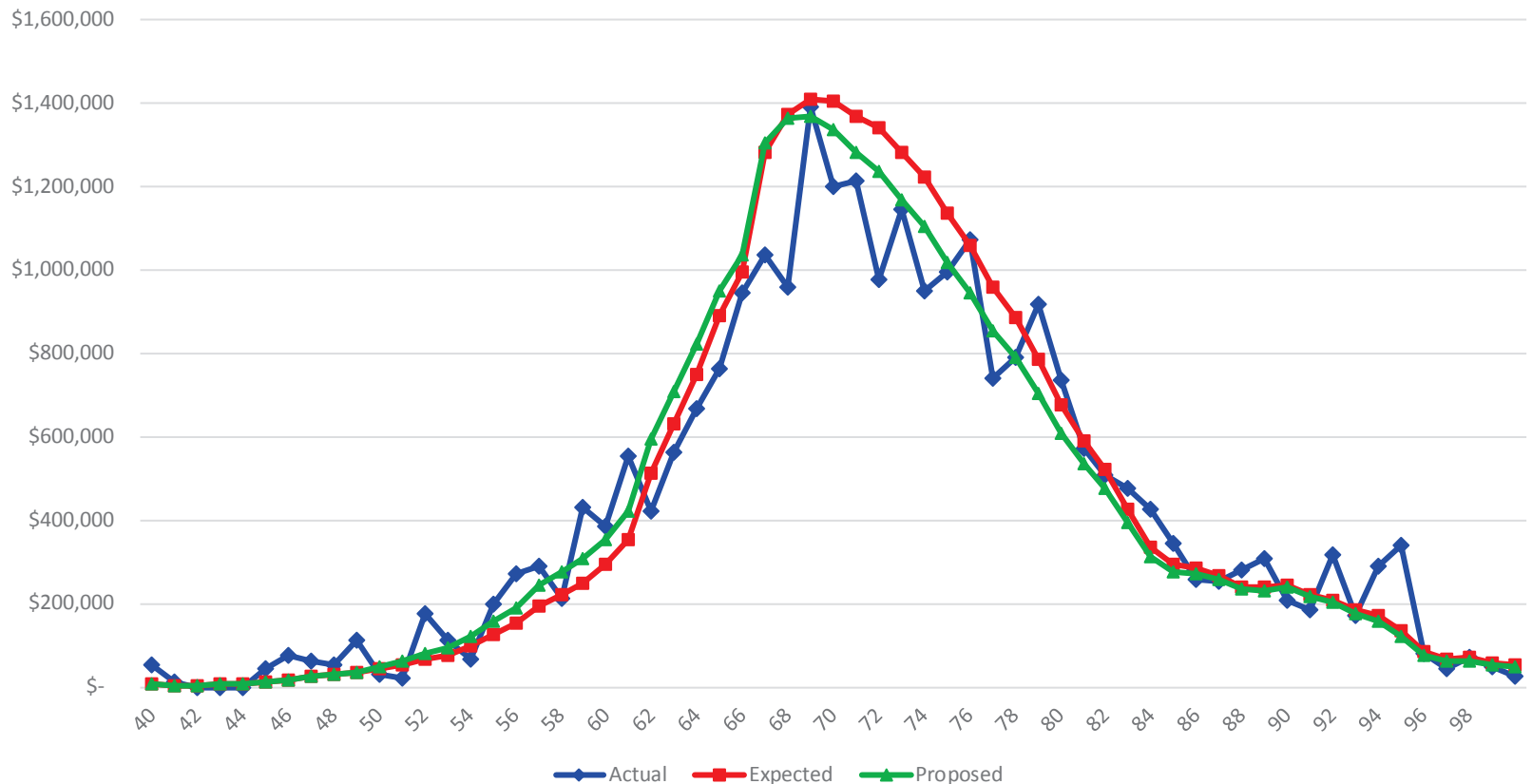


| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: more decline in benefit payments due to mortality over the period than expected overall |
|---------------------------|--------|----------|------------|----------|-------------|--|
| Reduction in benefits \$M | 25.81 | 23.84 | 1.0826 | 25.91 | 26.0785 | |
| Total | 25.81 | 23.84 | 1.0826 | 25.91 | 0.9961 | Recommendation: adjust rates, generally upw ards, to reflect actual experience |
| | | | | | | Cost Impact: minimal |

Mortality

Decline in Benefit Payments Due To Mortality

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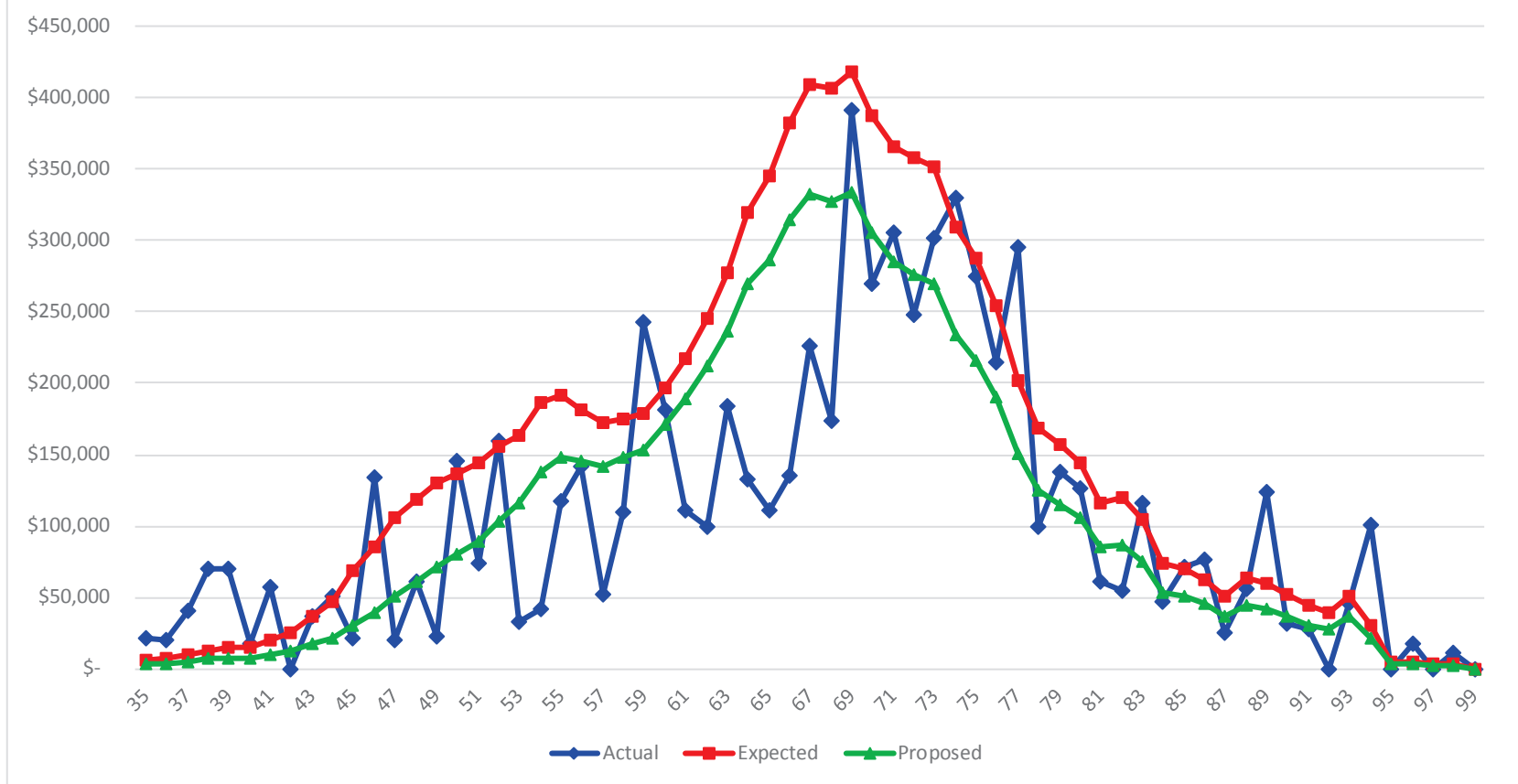


| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: less decline in benefit payments due to mortality over the period than expected overall |
|---------------------------|--------|----------|------------|----------|-------------|--|
| Reduction in benefits \$M | 26.08 | 26.87 | 0.9706 | 26.24 | 26.0785 | |
| Total | 26.08 | 26.87 | 0.9706 | 26.24 | 0.9938 | |
| | | | | | | Recommendation: adjust rates, generally downwards to reflect actual experience |
| | | | | | | Cost Impact: minimal |

Mortality

Decline in Benefit Payments Due To Mortality

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 - Males and Females

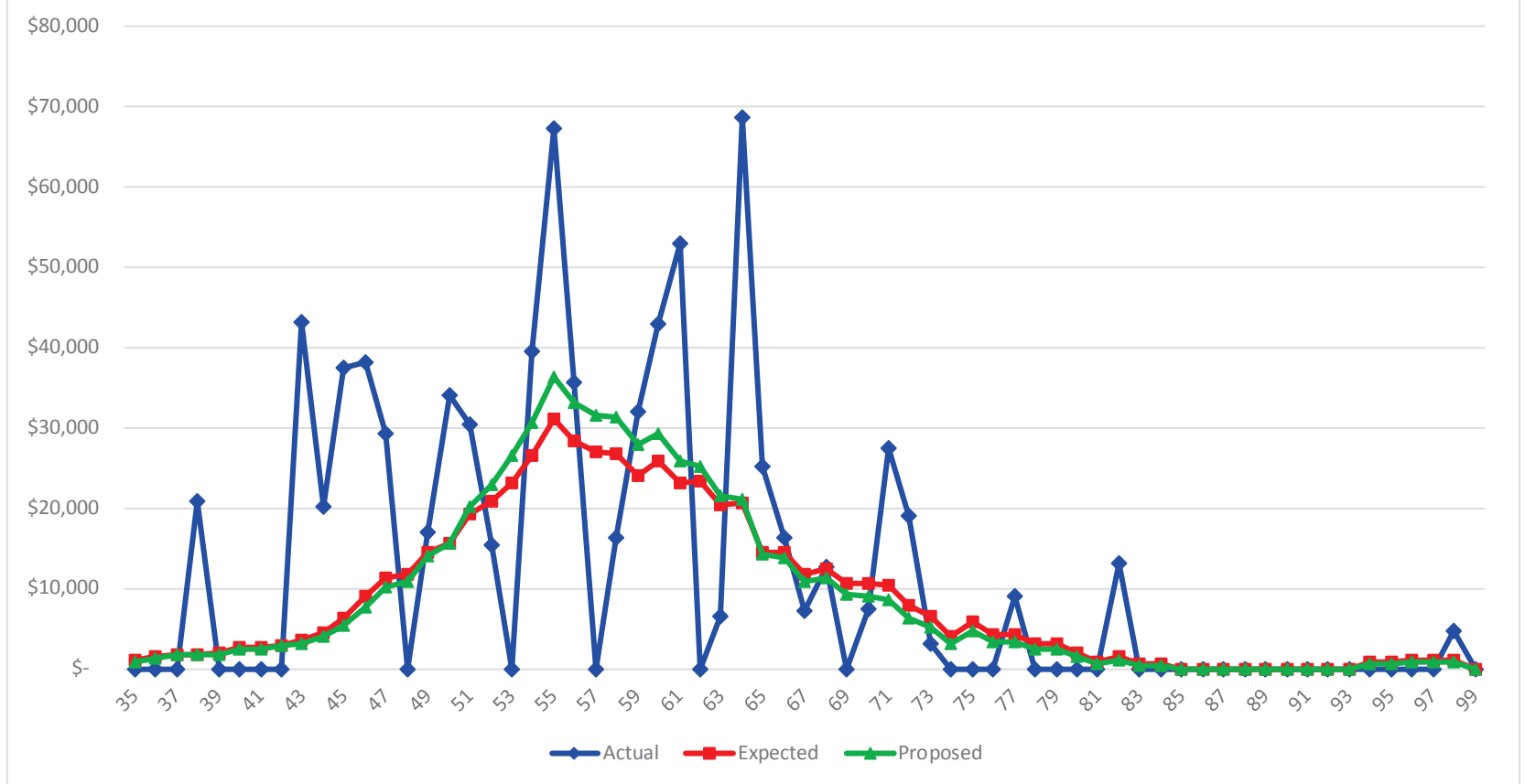


| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: less decline in benefit payments due to mortality over the period than expected overall |
|---------------------------|--------|----------|------------|----------|-------------|--|
| Reduction in benefits \$M | 7.03 | 9.56 | 0.7354 | 7.25 | 0.7937 | |
| Total | 7.03 | 9.56 | 0.7354 | 7.25 | 0.9696 | Recommendation: adjust rates, generally downwards to reflect actual experience Cost Impact: minimal |

Mortality

Decline in Benefit Payments Due To Mortality

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- RODs
 - Death
- Membership**
- Active
 - Retiree
- Disabled**
- Beneficiary
- Gender**
- Males
 - Females
- Males and Females



| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: more decline in benefit payments due to mortality over the period than expected overall |
|---------------------------|--------|----------|------------|----------|-------------|--|
| Reduction in benefits \$M | 0.79 | 0.57 | 1.3917 | 0.59 | 0.7937 | |
| Total | 0.79 | 0.57 | 1.3917 | 0.59 | 1.3498 | Recommendation: adjust rates, generally upwards, to reflect actual experience |
| | | | | | | Cost Impact: minimal |

Mortality

Decline in Benefit Payments Due To Mortality

Plan

TSERS:

- Teachers
- General Employees
- Other Education
- Law Enforcement
- CJRS
- LRS

National Guard

DIPNC

FRSWPF

LGERS:

- General Employees
- Fire & Rescue
- Law Enforcement
- RODs

Death

Membership

Active

Retiree

Disabled

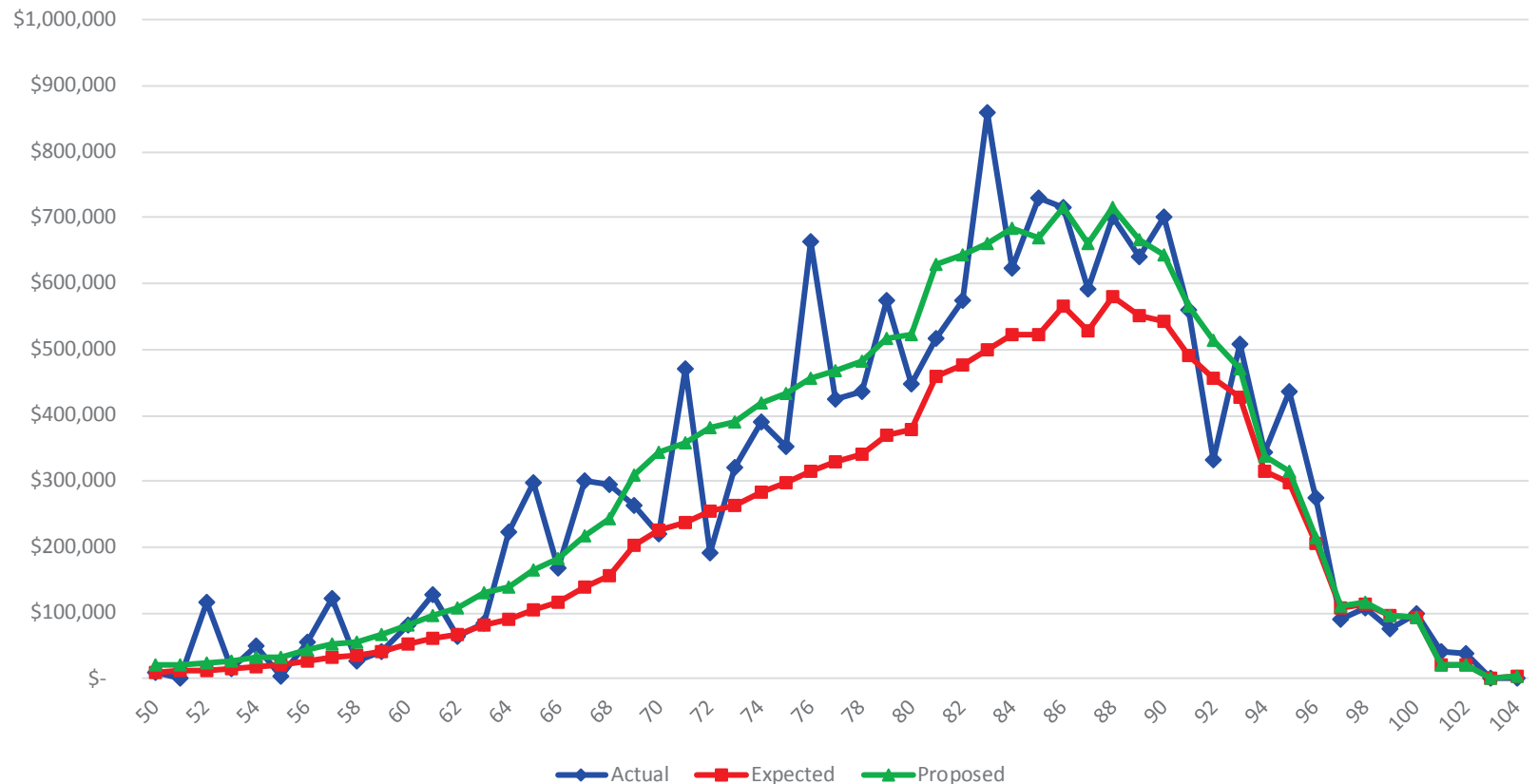
Beneficiary

Gender

Males

Females

Males and Females



| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: more decline in benefit payments due to mortality over the period than expected overall |
|---------------------------|--------|----------|------------|----------|-------------|--|
| Reduction in benefits \$M | 16.44 | 12.47 | 1.3185 | 16.46 | 0.9987 | |
| Total | 16.44 | 12.47 | 1.3185 | 16.46 | 0.9987 | Recommendation: adjust rates, generally upwards, to reflect actual experience |
| | | | | | | Cost Impact: minimal |

Mortality

Decline in Benefit Payments Due To Mortality

Plan

TSERS:

- Teachers
- General Employees
- Other Education
- Law Enforcement

CJRS

LRS

National Guard

DIPNC

FRSWPF

LGERS:

- General Employees
- Fire & Rescue
- Law Enforcement

RODs

Death

Membership

Active

Retiree

Disabled

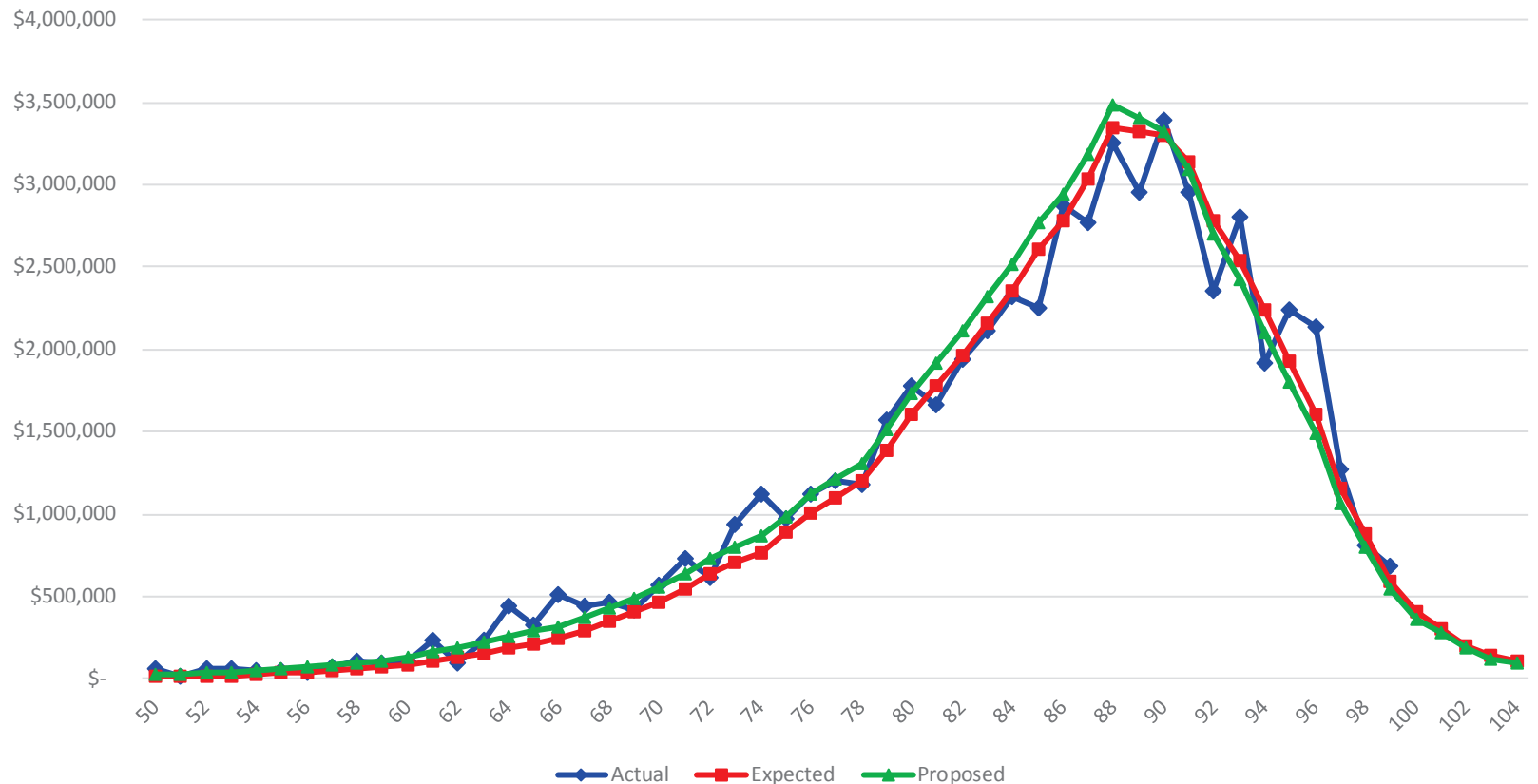
Beneficiary

Gender

Males

Females

Males and Females



| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: more decline in benefit payments due to mortality over the period than expected overall |
|---------------------------|--------|----------|------------|----------|-------------|--|
| Reduction in benefits \$M | 59.12 | 56.80 | 1.0408 | 59.36 | 0.9959 | |
| Total | 59.12 | 56.80 | 1.0408 | 59.36 | 0.9959 | Recommendation: adjust rates, generally upwards, to reflect actual experience |
| | | | | | | Cost Impact: minimal |



Demographic Assumptions



Retirement

Retirement

- Retirement rates 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
- Use of actual experience of the plans is common practice
- The current retirement rates resulted in expected retirements greater than actual retirements for all employee groups other than National Guard and Law Enforcement Officers; proposed rates were adjusted to reflect this experience
- Generally, assuming more (fewer) retirements results in higher (lower) estimated costs
- All retirement eligibility periods were studied for each group, but the age ranges shown on the graphs represent those ranges with the most credibility and may not cover all retirement eligibility periods for each group.

Retirement

Plan

TSERS:

-Teachers

-General Employees

-Other Education

-Law Enforcement

CJRS

LRS

National Guard

DIPNC

FRSWPF

LGERS:

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-Fire & Rescue

-Law Enforcement

RODs

Death

Membership

Active

Retiree

Disabled

Beneficiary

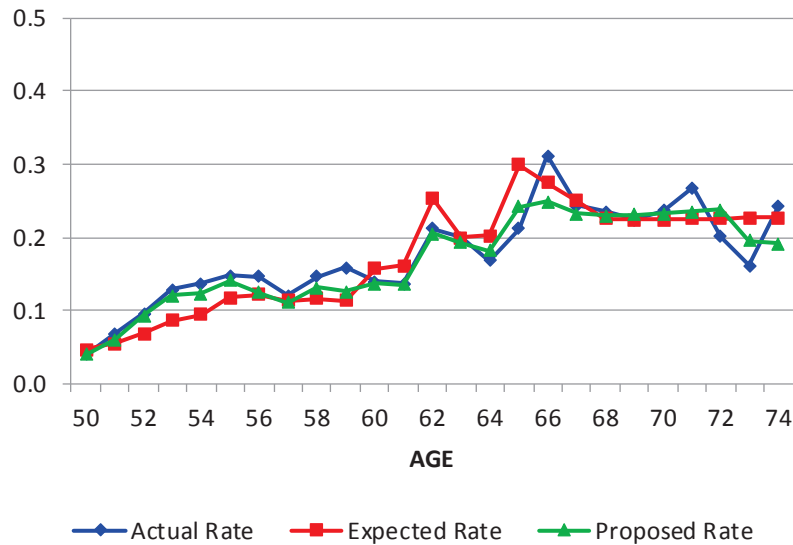
Gender

Males

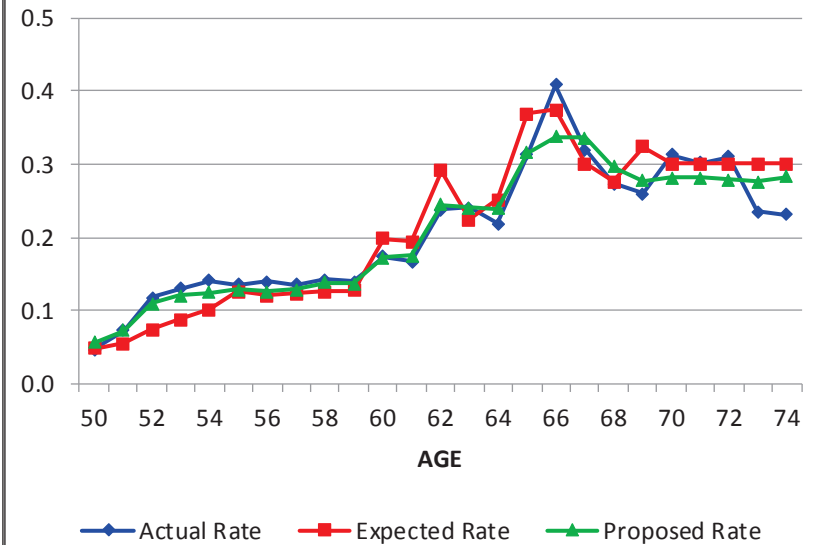
Females

Males and Females

Males



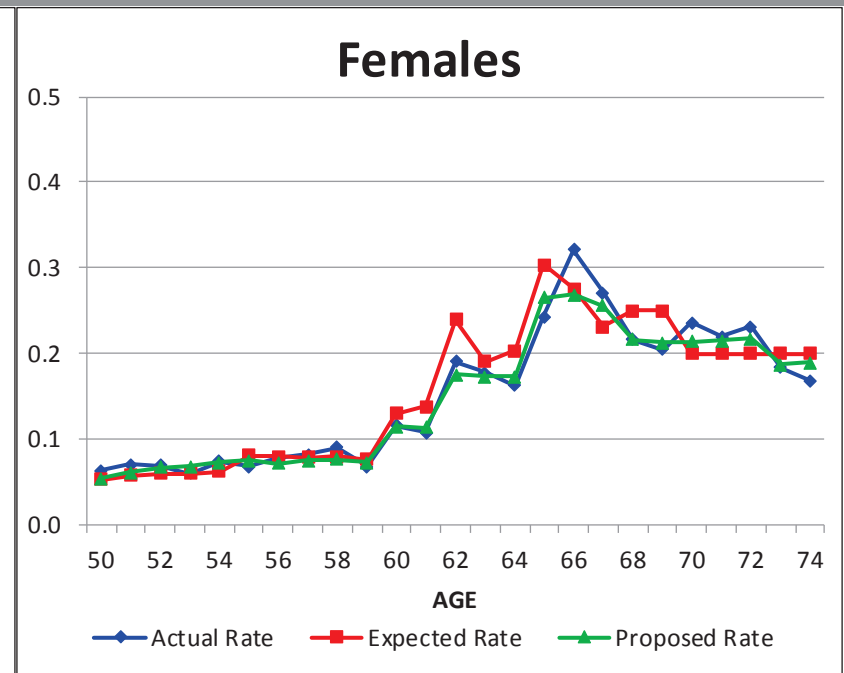
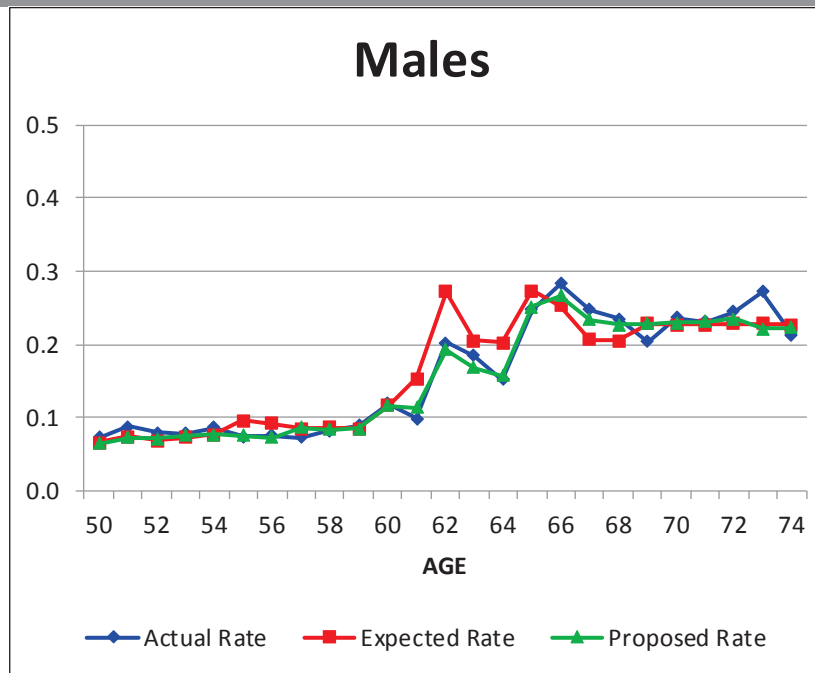
Females



| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: few er retirements over the period than expected overall |
|---------|-----------|-----------|------------|-----------|-------------|--|
| Males | 4,112.00 | 4,392.88 | 0.9361 | 4,202.17 | 0.9785 | |
| Females | 16,948.00 | 17,311.73 | 0.9790 | 16,986.32 | 0.9977 | |
| Total | 21,060 | 21,704.61 | 0.9703 | 21,188.49 | 0.9939 | Recommendation: adjust rates, generally down wards to reflect actual experience Cost Impact: decrease |

Retirement

- Plan
- TSERS:**
- Teachers
- General Employees**
- Other Education
- Law Enforcement
- CJRS
- LRS
- National Guard
- DIPNC
- FRSWPF
- LGERS:
- General Employees
- Fire & Rescue
- Law Enforcement
- RODs
- Death
- Membership**
- Active**
- Retiree
- Disabled
- Beneficiary
- Gender**
- Males**
- Females**
- Males and Females



| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: few er retirements over the period than expected overall |
|---------|----------|-----------|------------|-----------|-------------|--|
| Males | 6,611.00 | 7,585.02 | 0.8716 | 6,828.53 | 0.9681 | Recommendation: adjust rates, generally downw ards to reflect actual experience Cost Impact: decrease |
| Females | 7,990.00 | 9,012.03 | 0.8866 | 8,118.88 | 0.9841 | |
| Total | 14,601 | 16,597.05 | 0.8797 | 14,947.41 | 0.9768 | |

Retirement

Plan

TSERS:

- Teachers
- General Employees

-Other Education

- Law Enforcement

CJRS

LRS

National Guard

DIPNC

FRSWPF

LGERS:

- General Employees

- Fire & Rescue

- Law Enforcement

RODs

Death

Membership

Active

Retiree

Disabled

Beneficiary

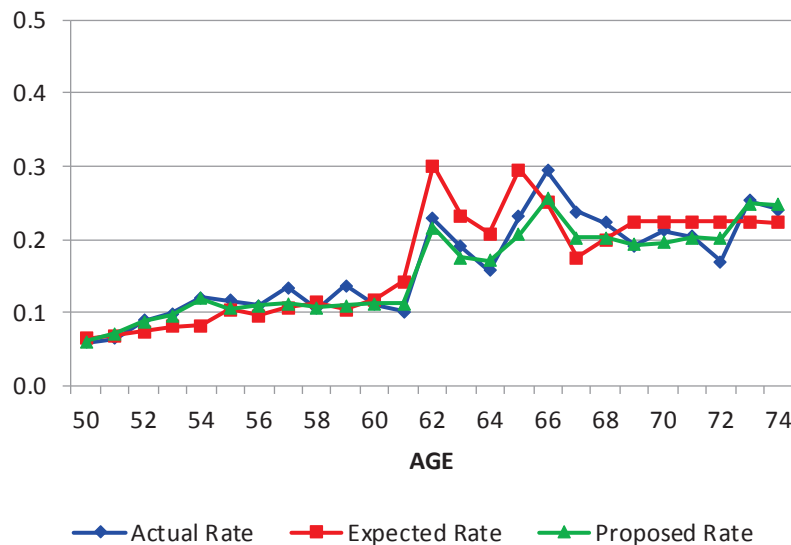
Gender

Males

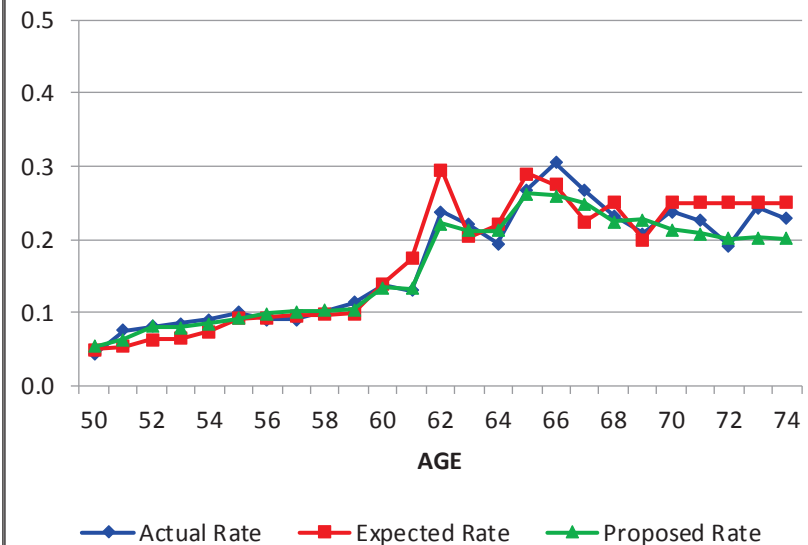
Females

Males and Females

Males



Females



| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: few er retirements over the period than expected overall |
|---------|----------|-----------|------------|----------|-------------|---|
| Males | 2,900.00 | 3,463.93 | 0.8372 | 3,116.94 | 0.9304 | |
| Females | 6,505.00 | 7,087.38 | 0.9178 | 6,631.55 | 0.9809 | |
| Total | 9,405 | 10,551.31 | 0.8914 | 9,748.49 | 0.9648 | Recommendation: adjust rates, generally down wards to reflect actual experience |
| | | | | | | Cost Impact: decrease |

Retirement

Plan

TSERS:

- Teachers
- General Employees
- Other Education

-Law Enforcement

- CJRS
- LRS
- National Guard
- DIPNC
- FRSWPF
- LGERS:
- General Employees
- Fire & Rescue
- Law Enforcement
- RODs
- Death

Membership

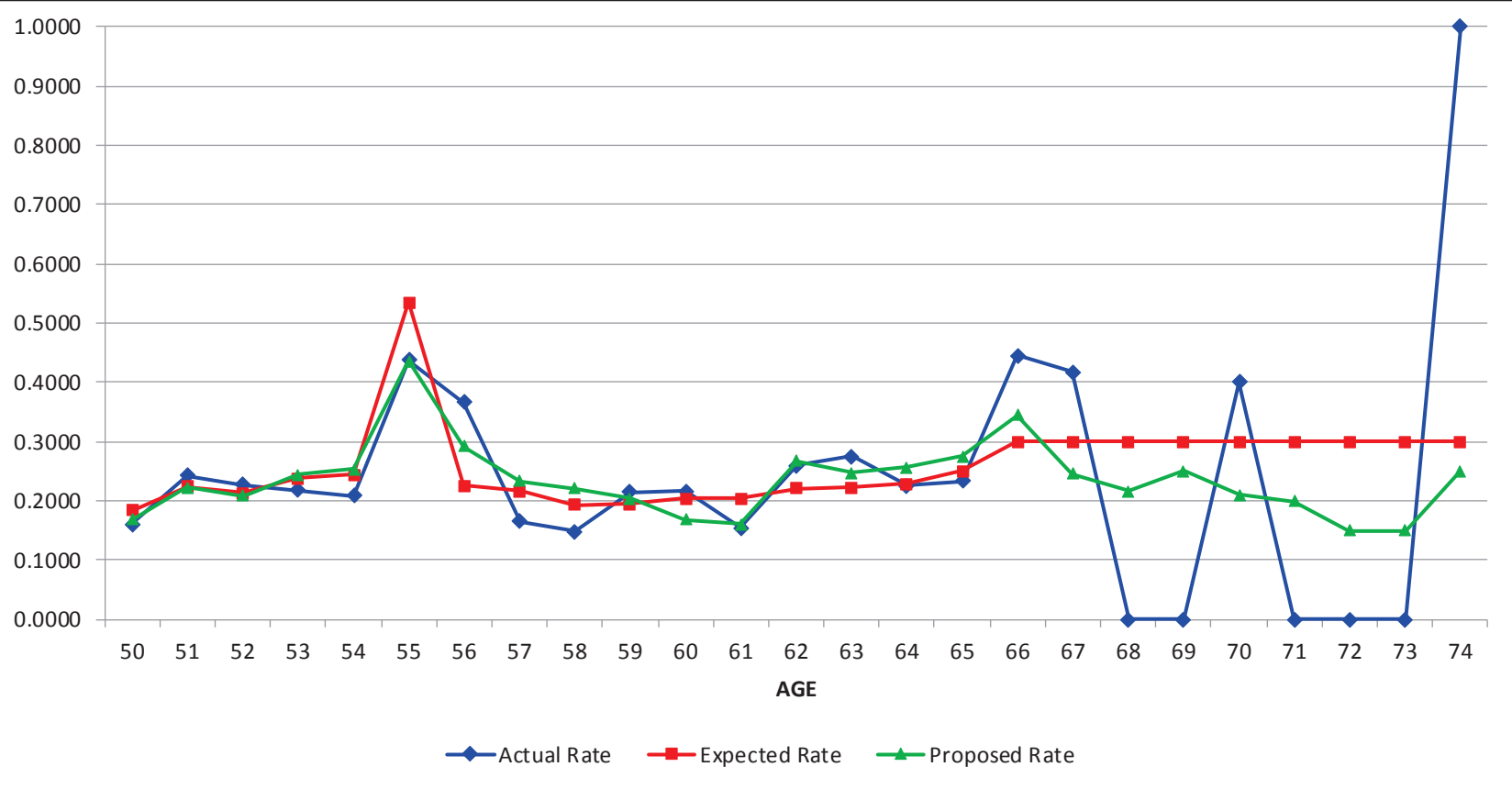
Active

- Retiree
- Disabled
- Beneficiary

Gender

- Males
- Females

Males and Females



| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: more retirements over the period than expected overall |
|-------|--------|----------|------------|----------|-------------|--|
| Males | 754.00 | 697.88 | 1.0804 | 742.05 | 1.0161 | Recommendation: adjust rates, generally upwards, to reflect actual experience Cost Impact: increase |
| Total | 754.00 | 697.88 | 1.0804 | 742.05 | 1.0161 | |

Retirement

Plan

TSERS:

- Teachers
- General Employees
- Other Education
- Law Enforcement

CJRS

- LRS
- National Guard
- DIPNC
- FRSWPF
- LGERS:

- General Employees
- Fire & Rescue
- Law Enforcement
- RODs
- Death

Membership

Active

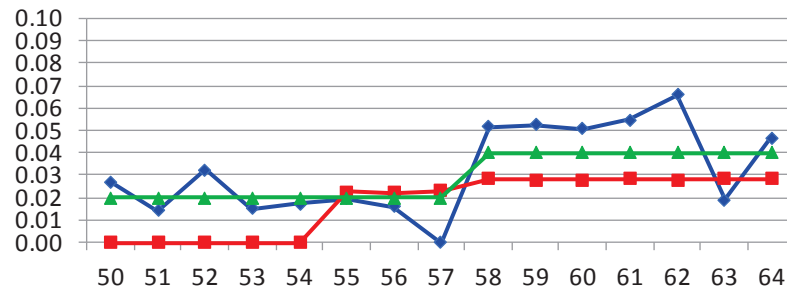
- Retiree
- Disabled
- Beneficiary

Gender

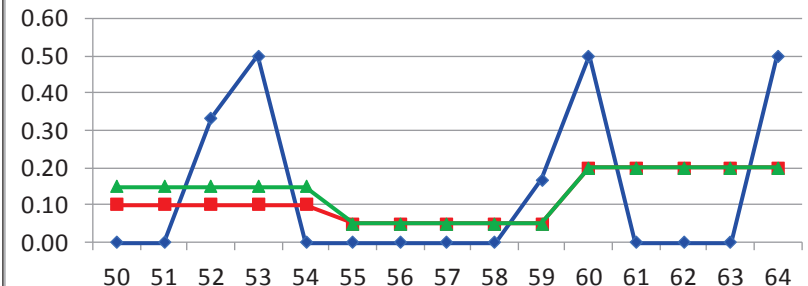
- Males
- Females

Males and Females

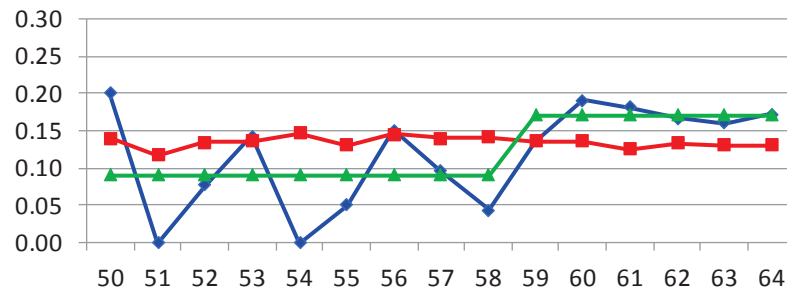
< 65, Svc 5-23 Years of Service



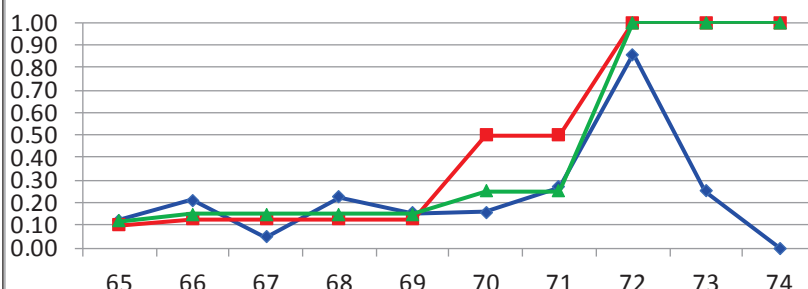
24 Years of Service



25+ Years of Service



> Age 65



◆ Actual Rate ■ Expected Rate ▲ Proposed Rate

| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: few er retirements over the period than expected overall other than the follow ing groups: 5 - 23 years of Service, 24 Years of Service |
|-------------------------|--------|----------|------------|----------|-------------|--|
| 5 - 23 years of Service | 28.00 | 14.67 | 1.9087 | 25.42 | 1.1015 | Recommendation: adjust rates, generally d o w n w a r d s to reflect actual experience |
| 24 Years of Service | 7.00 | 6.60 | 1.0606 | 7.30 | 0.9589 | |
| 25+ Years of Service | 36 | 40.24 | 0.8946 | 37.75 | 0.9536 | Cost Impact: increase |
| > Age 65 | 92 | 118.17 | 0.7785 | 105.60 | 0.8712 | |
| Total | 163 | 179.68 | 0.9072 | 176.07 | 0.9258 | |

Retirement

Plan

TSERS:

- Teachers
- General Employees
- Other Education
- Law Enforcement
- CJRS

LRS

National Guard

DIPNC

FRSWPF

LGERS:

- General Employees
- Fire & Rescue
- Law Enforcement

RODs

Death

Membership

Active

Retiree

Disabled

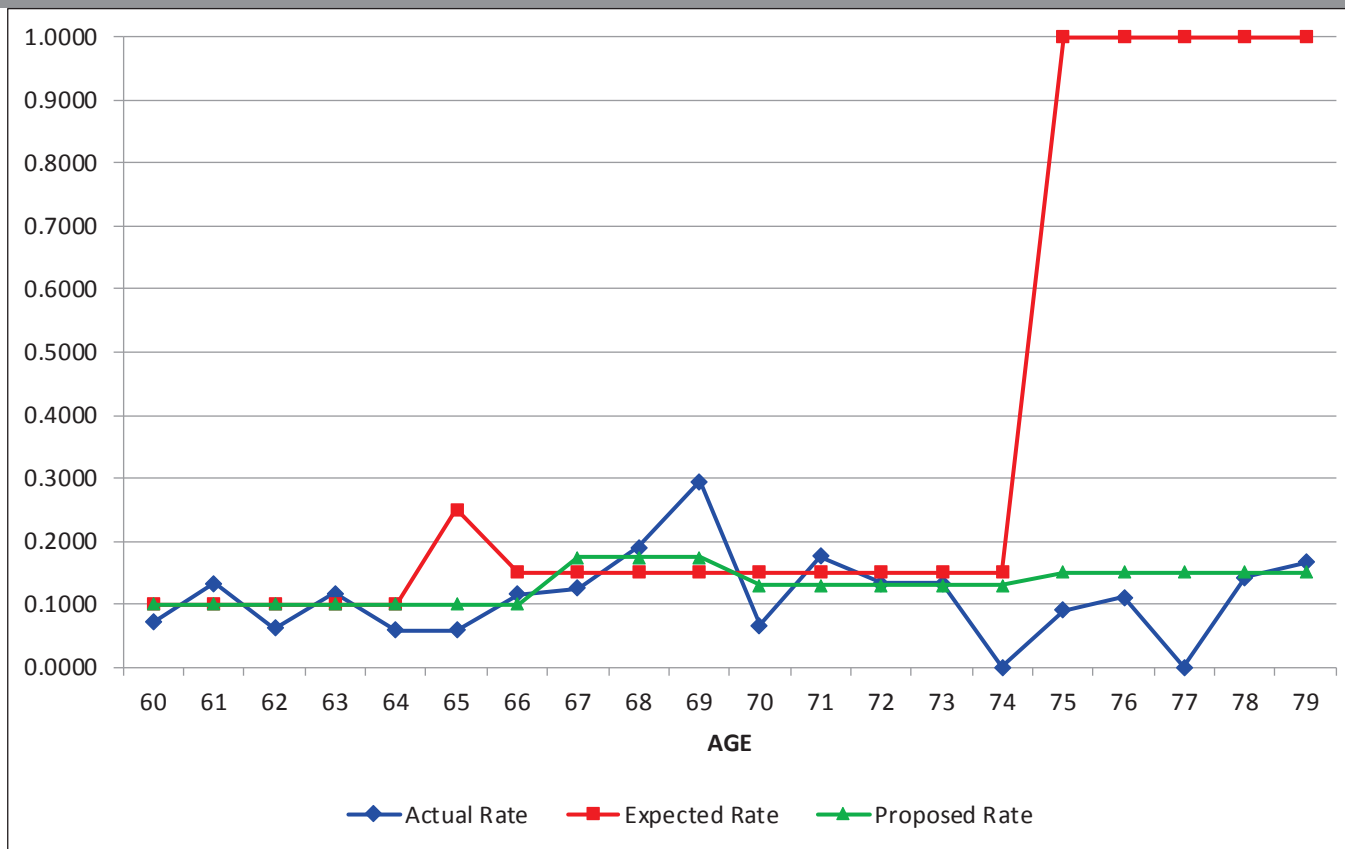
Beneficiary

Gender

Males

Females

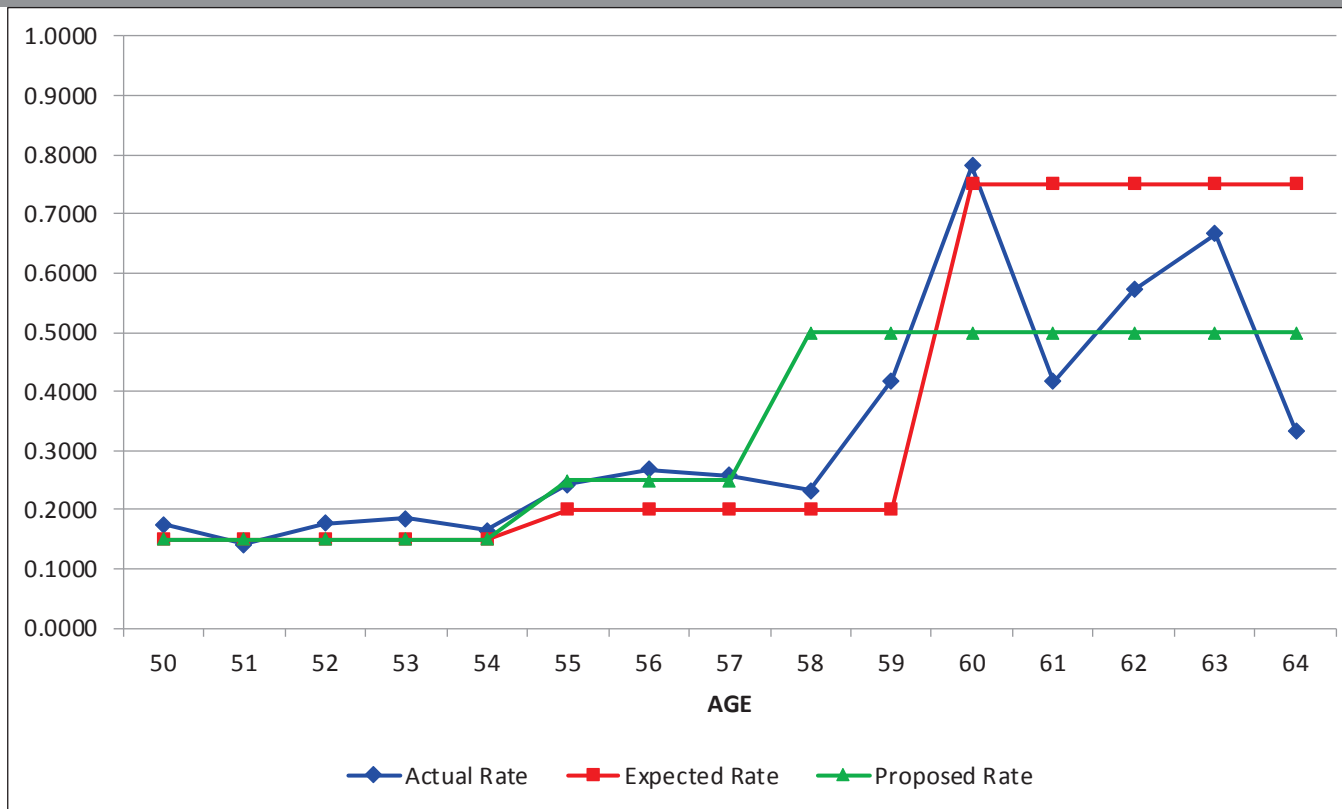
Males and Females



| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: few er retirements over the period than expected overall |
|-------|--------|----------|------------|----------|-------------|---|
| Males | 39.00 | 89.45 | 0.4360 | 51.67 | 0.7548 | |
| Total | 39.00 | 89.45 | 0.4360 | 51.67 | 0.7548 | |
| | | | | | | Recommendation: adjust rates, generally down wards to reflect actual experience |
| | | | | | | Cost Impact: decrease |

Retirement

- Plan**
TSERS:
-Teachers
-General Employees
-Other Education
-Law Enforcement
CJRS
LRS
National Guard
DIPNC
FRSWPF
LGERS:
-General Employees
-Fire & Rescue
-Law Enforcement
RODs
Death
Membership
Active
Retiree
Disabled
Beneficiary
Gender
Males
Females
Males and Females



| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: more retirements over the period than expected overall |
|-------|--------|----------|------------|----------|-------------|---|
| Males | 327.00 | 290.60 | 1.1253 | 324.40 | 1.0080 | |
| Total | 327.00 | 290.60 | 1.1253 | 324.40 | 1.0080 | |
| | | | | | | Recommendation: adjust rates, generally upwards, to reflect actual experience |
| | | | | | | Cost Impact: increase |

Retirement

Plan

TSERS:

- Teachers
- General Employees
- Other Education
- Law Enforcement
- CJRS
- LRS
- National Guard
- DIPNC

FRSWPF

LGERS:

- General Employees
- Fire & Rescue
- Law Enforcement
- RODs
- Death

Membership

Active

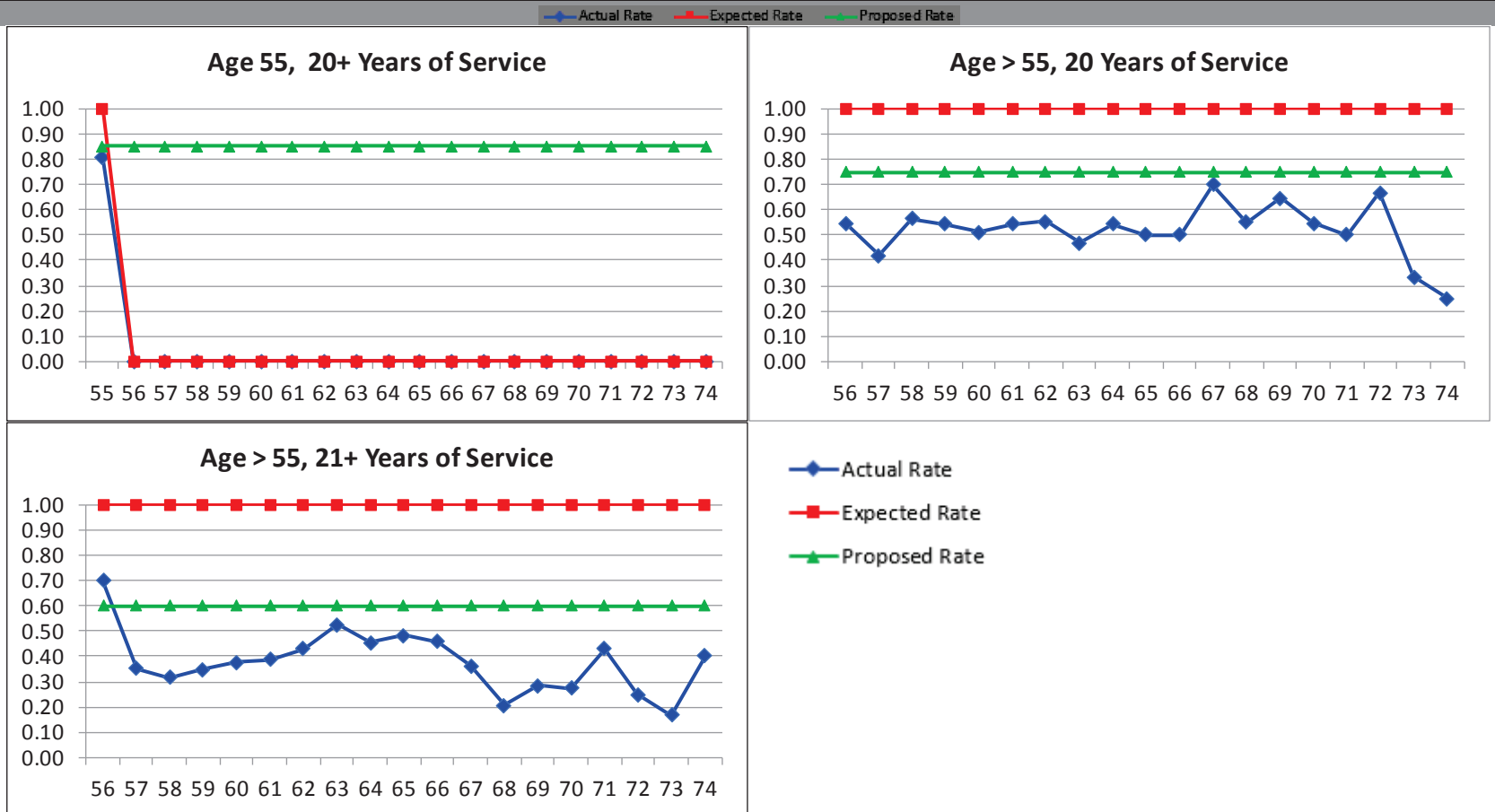
- Retiree
- Disabled
- Beneficiary

Gender

Males

Females

Males and Females



| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: few er retirements over the period than expected overall other than the follow ing groups: Age 55, 20+ Yrs of SVC, > 55, 20 yrs of Service |
|--------------------------|--------|----------|------------|----------|-------------|---|
| Age 55, 20+ Yrs of SVC | - | 28.00 | 14.6700 | 1.91 | 25.4200 | Recommendation: adjust rates, generally down wards to reflect actual experience Cost Impact: decrease |
| > 55, 20 yrs of Service | 7.00 | 6.60 | 1.0606 | 7.30 | 0.9589 | |
| > 55, 21+ Yrs of Service | 36 | 40.24 | 0.8946 | 37.75 | 0.9536 | |
| Total | 43 | 74.84 | 0.5746 | 46.96 | 0.9157 | |

Retirement

Plan

TSERS:

- Teachers
- General Employees
- Other Education
- Law Enforcement
- CJRS
- LRS
- National Guard
- DIPNC
- FRSWPF

LGERS:

-General Employees

- Fire & Rescue
- Law Enforcement

RODs

Death

Membership

Active

Retiree

Disabled

Beneficiary

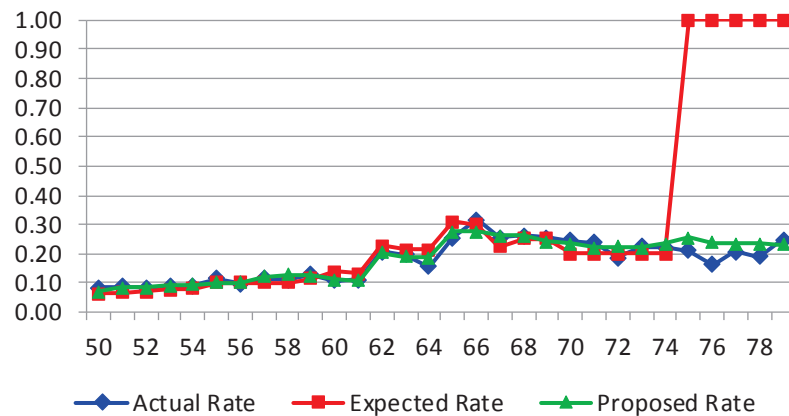
Gender

Males

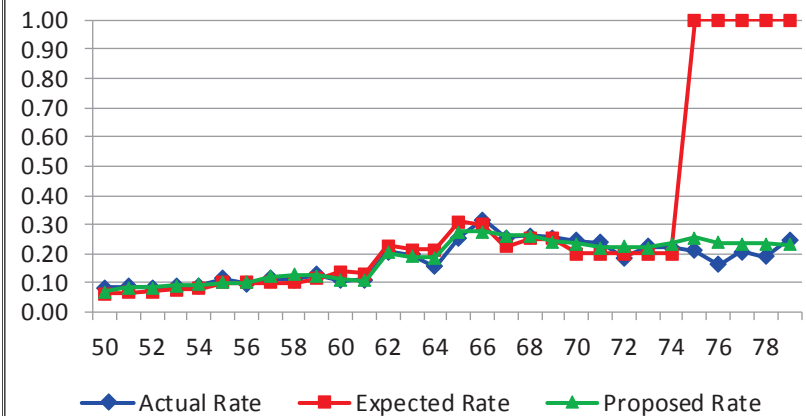
Females

Males and Females

Males



Females



| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: few er retirements over the period than expected overall |
|---------|----------|-----------|------------|-----------|-------------|--|
| Males | 6,359.00 | 7,191.42 | 0.8842 | 6,545.59 | 0.9715 | Recommendation: adjust rates, generally down wards to reflect actual experience Cost Impact: decrease |
| Females | 7,698.00 | 8,828.28 | 0.8720 | 7,844.64 | 0.9813 | |
| Total | 14,057 | 16,019.70 | 0.8775 | 14,390.23 | 0.9768 | |

Retirement

Plan

TSERS:

- Teachers
- General Employees
- Other Education
- Law Enforcement
- CJRS
- LRS
- National Guard
- DIPNC
- FRSWPF

LGERS:

- General Employees

-Fire & Rescue

- Law Enforcement
- RODs
- Death

Membership

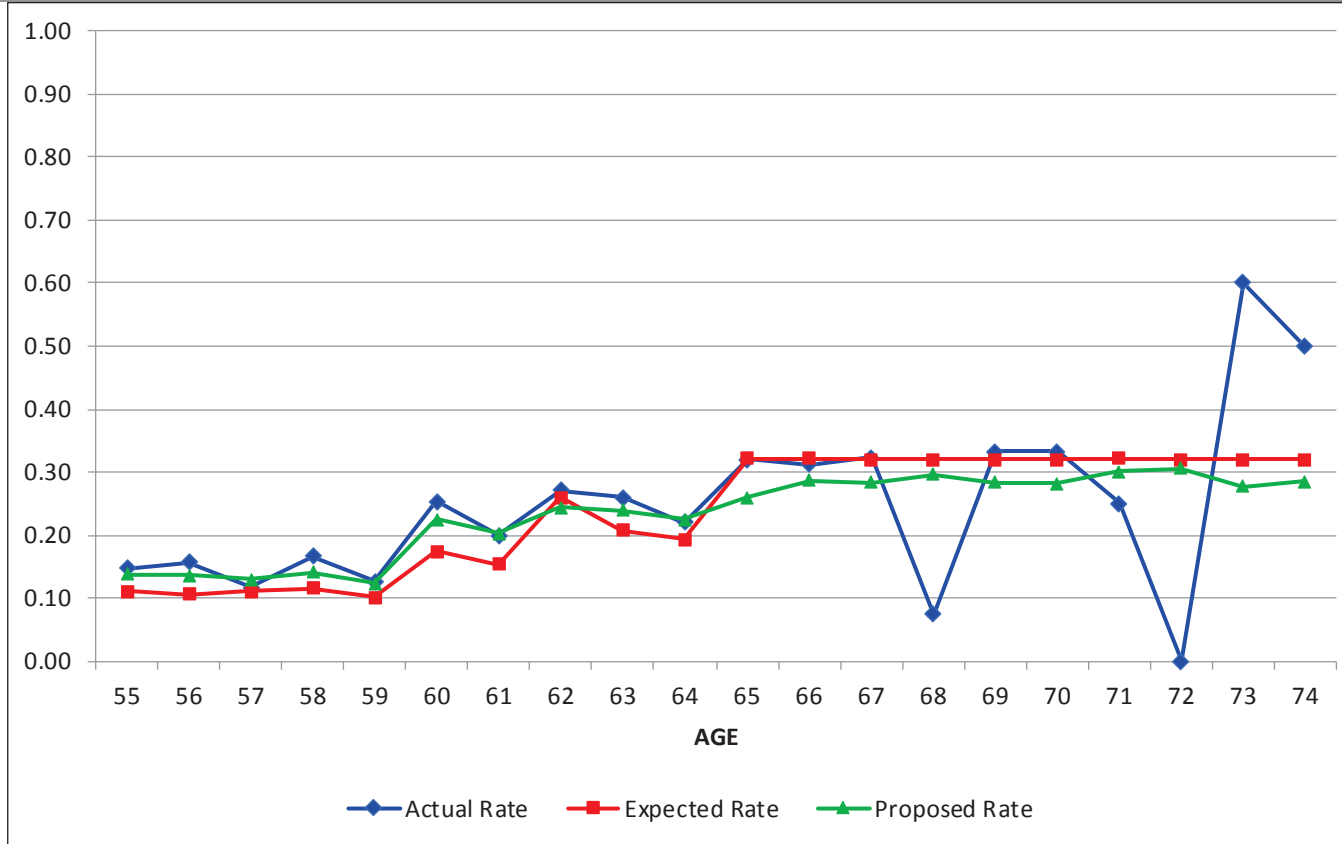
Active

- Retiree
- Disabled
- Beneficiary

Gender

- Males
- Females

Males and Females



| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: more retirements over the period than expected overall |
|-------|----------|----------|------------|----------|-------------|---|
| Total | 1,116.00 | 876.89 | 1.2727 | 1,040.72 | 1.0723 | |
| Total | 1,116.00 | 876.89 | 1.2727 | 1,040.72 | 1.0723 | Recommendation: adjust rates, generally upwards, to reflect actual experience |
| | | | | | | Cost Impact: increase |

Retirement

Plan

TSERS:

- Teachers
- General Employees
- Other Education
- Law Enforcement
- CJRS
- LRS
- National Guard
- DIPNC
- FRSWPF

LGERS:

- General Employees
- Fire & Rescue

-Law Enforcement

RODs

Death

Membership

Active

Retiree

Disabled

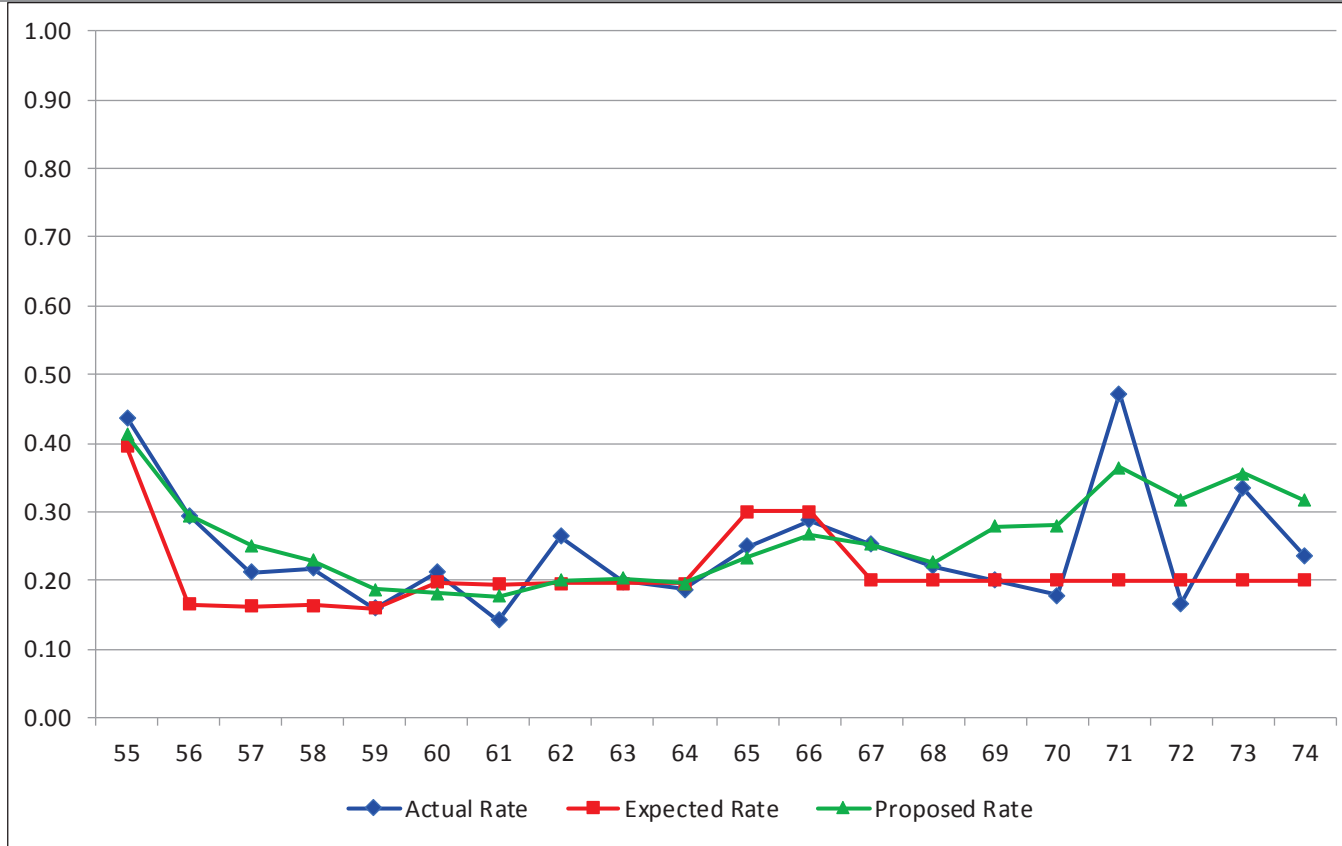
Beneficiary

Gender

Males

Females

Males and Females



| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: more retirements over the period than expected overall |
|-------|----------|----------|------------|----------|-------------|---|
| Total | 2,874.00 | 2,665.77 | 1.0781 | 2,806.94 | 1.0239 | |
| Total | 2,874.00 | 2,665.77 | 1.0781 | 2,806.94 | 1.0239 | |
| | | | | | | Recommendation: adjust rates, generally upwards, to reflect actual experience |
| | | | | | | Cost Impact: increase |

Demographic Assumptions

Termination

Termination

- 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.
 - For TSERS, because disability is handled in the DIPNC plan, the termination rates are inclusive of disability
 - For Fire and Rescue, termination rates are inclusive of lapses
- Rates of termination can vary significantly from plan to plan, employee group and by gender, so use of actual experience of the plan is common practice
- Rates of termination tend to be higher earlier in a member's career, so two sets of rates are developed:
 - 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
- Proposed Termination rates adjusted the current rates to reflect whether actual experience was more or less than expected
- For CJRS, we are recommending adding termination rates for the first time of 2% at all ages
- For valuation purposes termination rates shut off at retirement eligibility
- Generally, assuming more (fewer) terminations results in higher (lower) estimated costs

Termination (<5 Years of Service)

Plan

TSERS:

-Teachers

-General Employees
-Other Education
-Law Enforcement
CJRS
LRS
National Guard
DIPNC
FRSWPF

LGERS:

-General Employees
-Fire & Rescue
-Law Enforcement
RODs
Death

Membership

Active

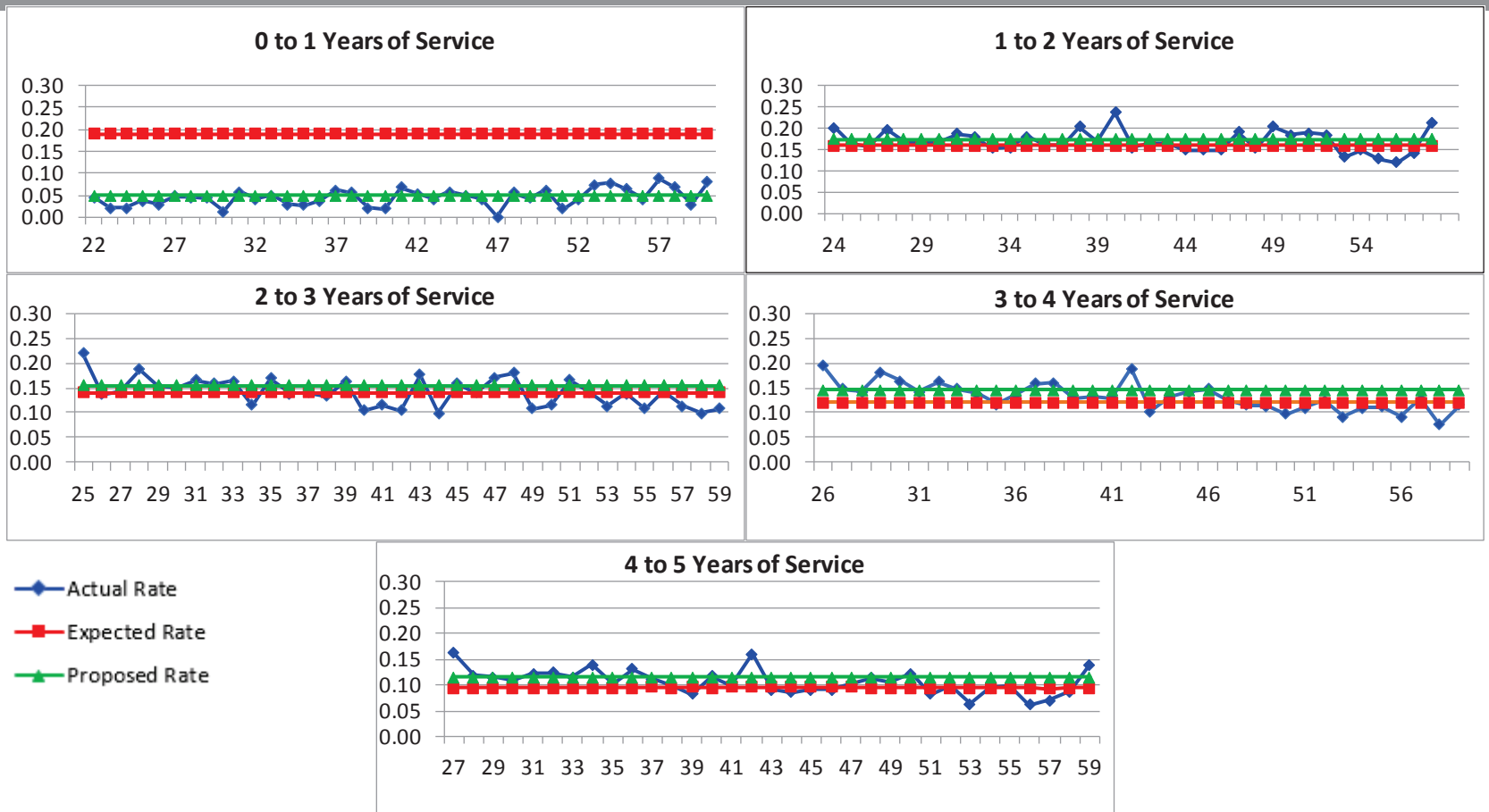
Retiree
Disabled

Beneficiary

Gender

Males

Females
Males and Females



| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: few er terminations with less than 5 years of service over the period than expected overall other than the follow ing groups: 1-2 years, 2-3 years, 3-4 years, 4-5 years |
|-----------|----------|----------|------------|----------|-------------|---|
| 0-1 years | 346.00 | 1,607.97 | 0.2152 | 423.15 | 0.8177 | Recommendation: adjust rates, generally dowa rds to reflect actual experience Cost Impact: minimal |
| 1-2 years | 2,371.00 | 2,116.00 | 1.1205 | 2,314.38 | 1.0245 | |
| 2-3 years | 1,820 | 1,624.14 | 1.1206 | 1,798.16 | 1.0121 | |
| 3-4 years | 1,545 | 1,235.88 | 1.2501 | 1,493.36 | 1.0346 | |
| 4-5 years | 1,036 | 839.58 | 1.2340 | 1,016.49 | 1.0192 | |
| Total | 7,118 | 7,423.57 | 0.9588 | 7,045.52 | 1.0103 | |

Termination (<5 Years of Service)

Plan

TSERS:

-Teachers

-General Employees

-Other Education

-Law Enforcement

CJRS

LRS

National Guard

DIPNC

FRSWPF

LGERS:

-General Employees

-Fire & Rescue

-Law Enforcement

RODs

Death

Membership

Active

Retiree

Disabled

Beneficiary

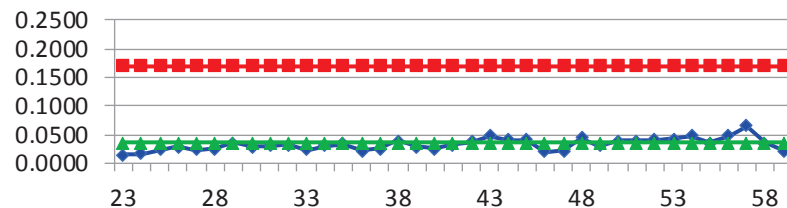
Gender

Males

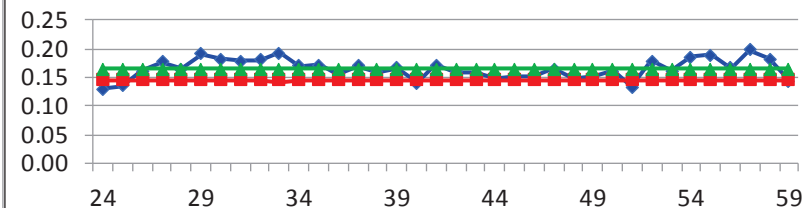
Females

Males and Females

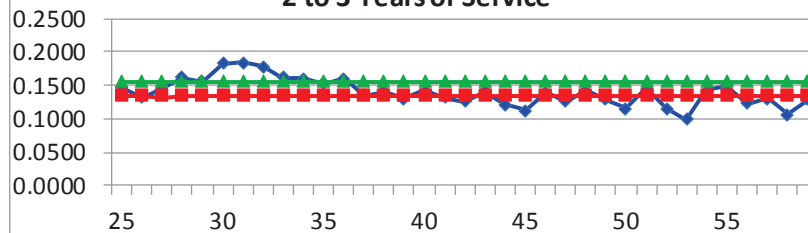
0 to 1 Years of Service



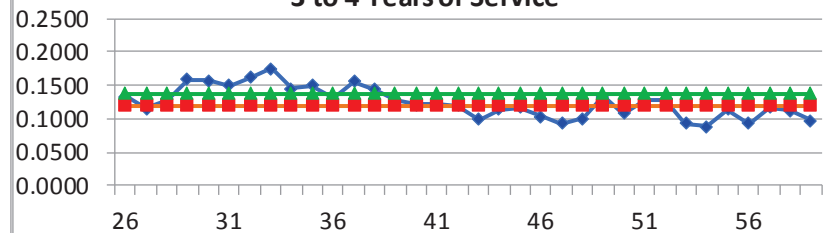
1 to 2 Years of Service



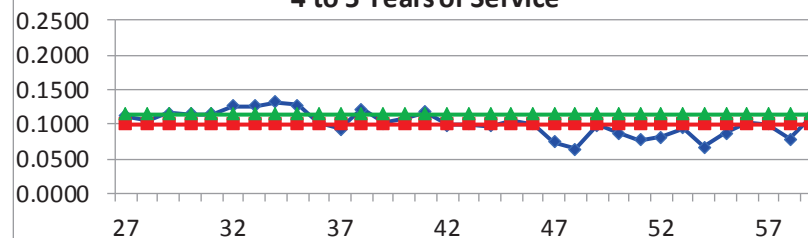
2 to 3 Years of Service



3 to 4 Years of Service



4 to 5 Years of Service



| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: few er terminations with less than 5 years of service over the period than expected overall other than the follow ing groups: 1-2 years, 2-3 years, 3-4 years, 4-5 years |
|-----------|----------|-----------|------------|-----------|-------------|---|
| 0-1 years | 877.00 | 5,265.58 | 0.1666 | 1,084.09 | 0.8090 | Recommendation: adjust rates, generally dowa rds to reflect actual experience Cost Impact: minimal |
| 1-2 years | 7,468.00 | 6,425.60 | 1.1622 | 7,311.48 | 1.0214 | |
| 2-3 years | 6,196 | 5,354.96 | 1.1571 | 6,147.61 | 1.0079 | |
| 3-4 years | 4,973 | 4,239.12 | 1.1731 | 4,857.33 | 1.0238 | |
| 4-5 years | 3,585 | 3,070.60 | 1.1675 | 3,531.19 | 1.0152 | |
| Total | 23,099 | 24,355.86 | 0.9484 | 22,931.70 | 1.0073 | |

Termination (<5 Years of Service)

Plan

TSERS:

-Teachers

-General Employees

-Other Education

-Law Enforcement

CJRS

LRS

National Guard

DIPNC

FRSWPF

LGERS:

-General Employees

-Fire & Rescue

-Law Enforcement

RODs

Death

Membership

Active

Retiree

Disabled

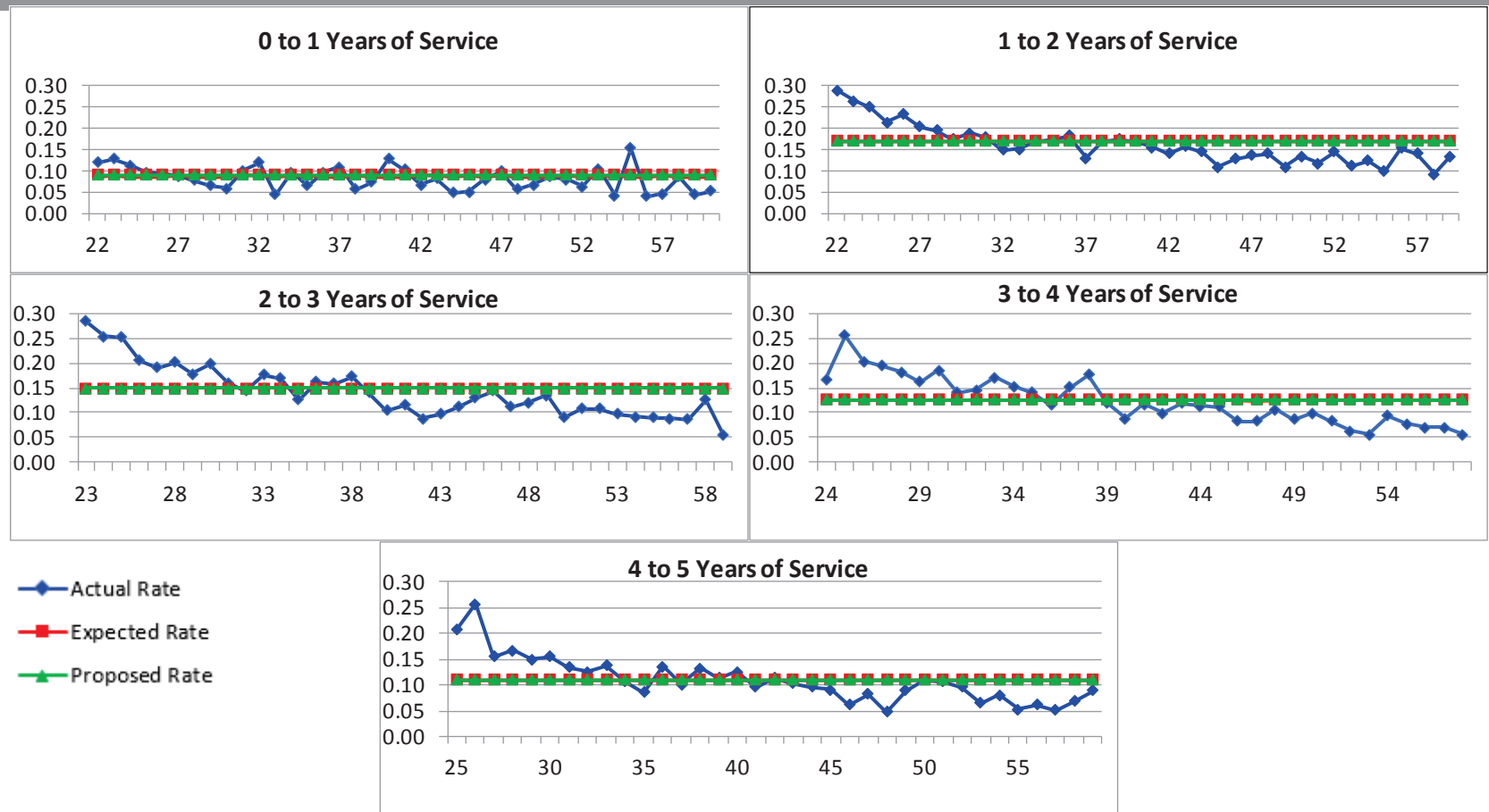
Beneficiary

Gender

Males

Females

Males and Females



| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: more terminations with less than 5 years of service over the period than expected overall other than the following groups: |
|-----------|----------|----------|------------|----------|-------------|---|
| 0-1 years | 578.00 | 1,224.72 | 0.4719 | 612.36 | 0.9439 | 0-1 years |
| 1-2 years | 3,181.00 | 2,865.35 | 1.1102 | 3,142.96 | 1.0121 | Recommendation: adjust rates, generally upwards, to reflect actual experience |
| 2-3 years | 2,414 | 2,062.58 | 1.1704 | 2,379.90 | 1.0143 | Cost Impact: minimal |
| 3-4 years | 1,773 | 1,499.85 | 1.1821 | 1,704.38 | 1.0403 | |
| 4-5 years | 1,327 | 1,073.25 | 1.2364 | 1,311.75 | 1.0116 | |
| Total | 9,273 | 8,725.75 | 1.0627 | 9,151.35 | 1.0133 | |

Termination (<5 Years of Service)

Plan

TSERS:

-Teachers

-General Employees

-Other Education

-Law Enforcement

CJRS

LRS

National Guard

DIPNC

FRSWPF

LGERS:

-General Employees

-Fire & Rescue

-Law Enforcement

RODs

Death

Membership

Active

Retiree

Disabled

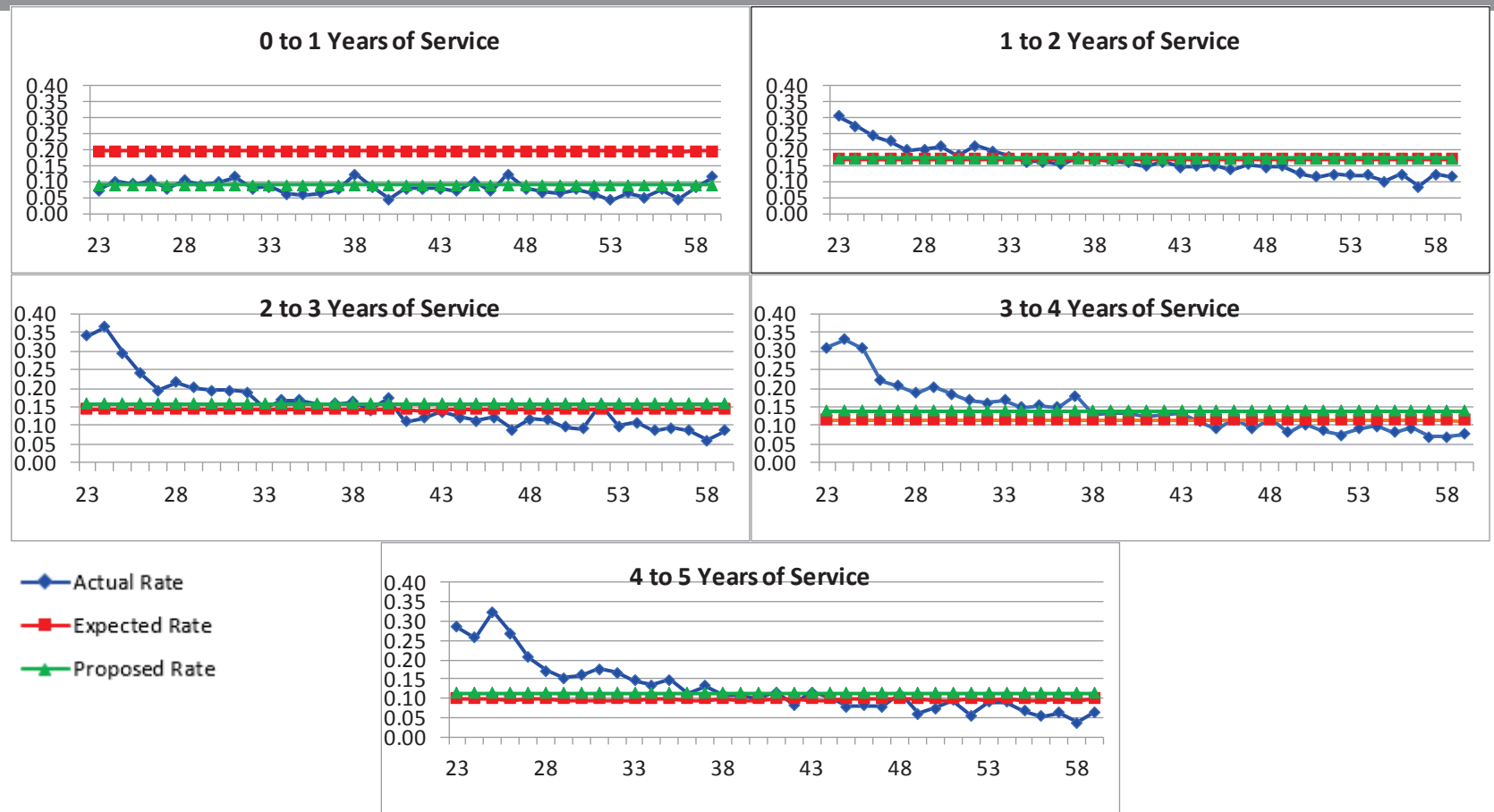
Beneficiary

Gender

Males

Females

Males and Females



| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: more terminations with less than 5 years of service over the period than expected overall other than the following groups: |
|-----------|----------|-----------|------------|-----------|-------------|---|
| 0-1 years | 850.00 | 1,958.67 | 0.4340 | 904.14 | 0.9401 | 0-1 years |
| 1-2 years | 4,381.00 | 4,219.23 | 1.0383 | 4,343.33 | 1.0087 | Recommendation: adjust rates, generally downwards to reflect actual experience |
| 2-3 years | 3,352 | 3,044.49 | 1.1010 | 3,306.71 | 1.0137 | Cost Impact: minimal |
| 3-4 years | 2,481 | 2,033.93 | 1.2198 | 2,476.60 | 1.0018 | |
| 4-5 years | 1,731 | 1,503.10 | 1.1516 | 1,728.57 | 1.0014 | |
| Total | 12,795 | 12,759.42 | 1.0028 | 12,759.34 | 1.0028 | |

Termination (<5 Years of Service)

Plan

TSERS:

- Teachers
- General Employees

-Other Education

- Law Enforcement
- CJRS
- LRS

National Guard

DIPNC

FRSWPF

LGERS:

- General Employees
- Fire & Rescue
- Law Enforcement
- RODs

Death

Membership

Active

Retiree

Disabled

Beneficiary

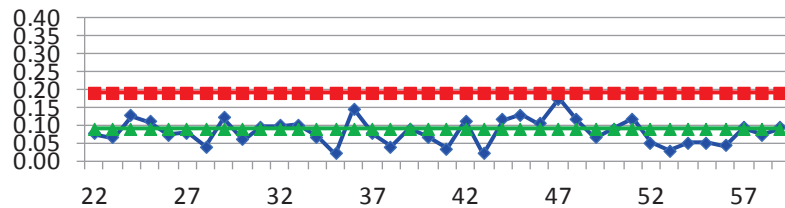
Gender

Males

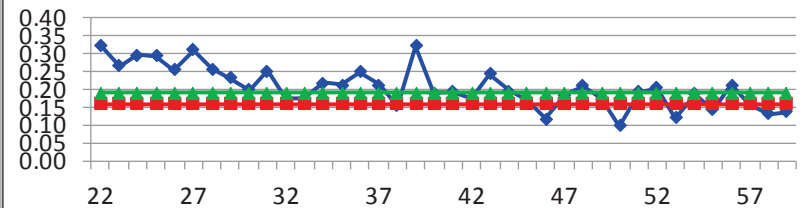
Females

Males and Females

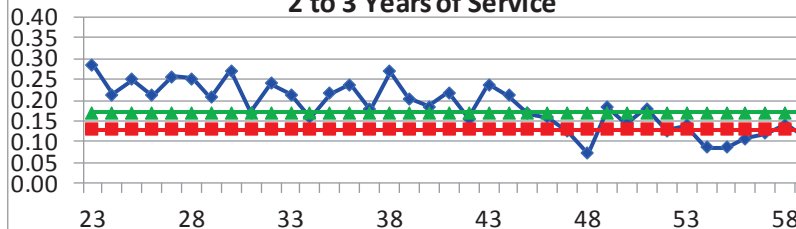
0 to 1 Years of Service



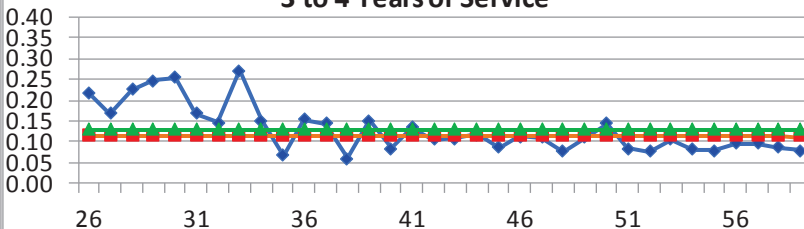
1 to 2 Years of Service



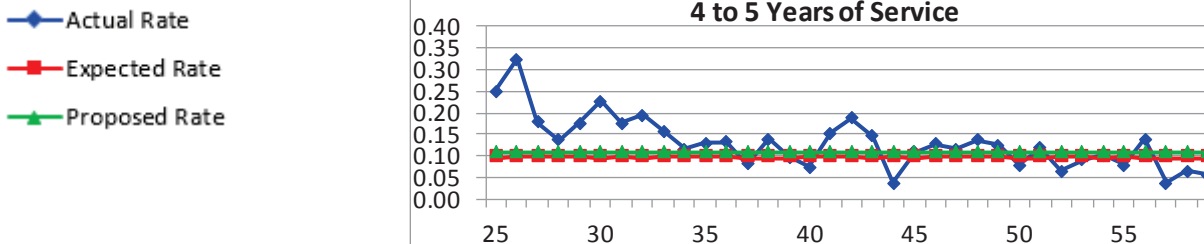
2 to 3 Years of Service



3 to 4 Years of Service



4 to 5 Years of Service



| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: more terminations with less than 5 years of service over the period than expected overall other than the following groups: |
|-----------|----------|----------|------------|----------|-------------|---|
| 0-1 years | 240.00 | 579.69 | 0.4140 | 274.59 | 0.8740 | 0-1 years |
| 1-2 years | 1,256.00 | 991.36 | 1.2669 | 1,177.24 | 1.0669 | Recommendation: adjust rates, generally upwards, to reflect actual experience |
| 2-3 years | 905 | 671.06 | 1.3486 | 877.54 | 1.0313 | Cost Impact: minimal |
| 3-4 years | 598 | 519.90 | 1.1502 | 587.60 | 1.0177 | |
| 4-5 years | 444 | 383.40 | 1.1581 | 421.74 | 1.0528 | |
| Total | 3,443 | 3,145.41 | 1.0946 | 3,338.71 | 1.0312 | |

Termination (<5 Years of Service)

Plan

TSERS:

-Teachers
-General Employees

-Other Education

-Law Enforcement
CJRS
LRS

National Guard
DIPNC

FRSWPF

LGERS:

-General Employees
-Fire & Rescue
-Law Enforcement
RODs
Death

Membership

Active

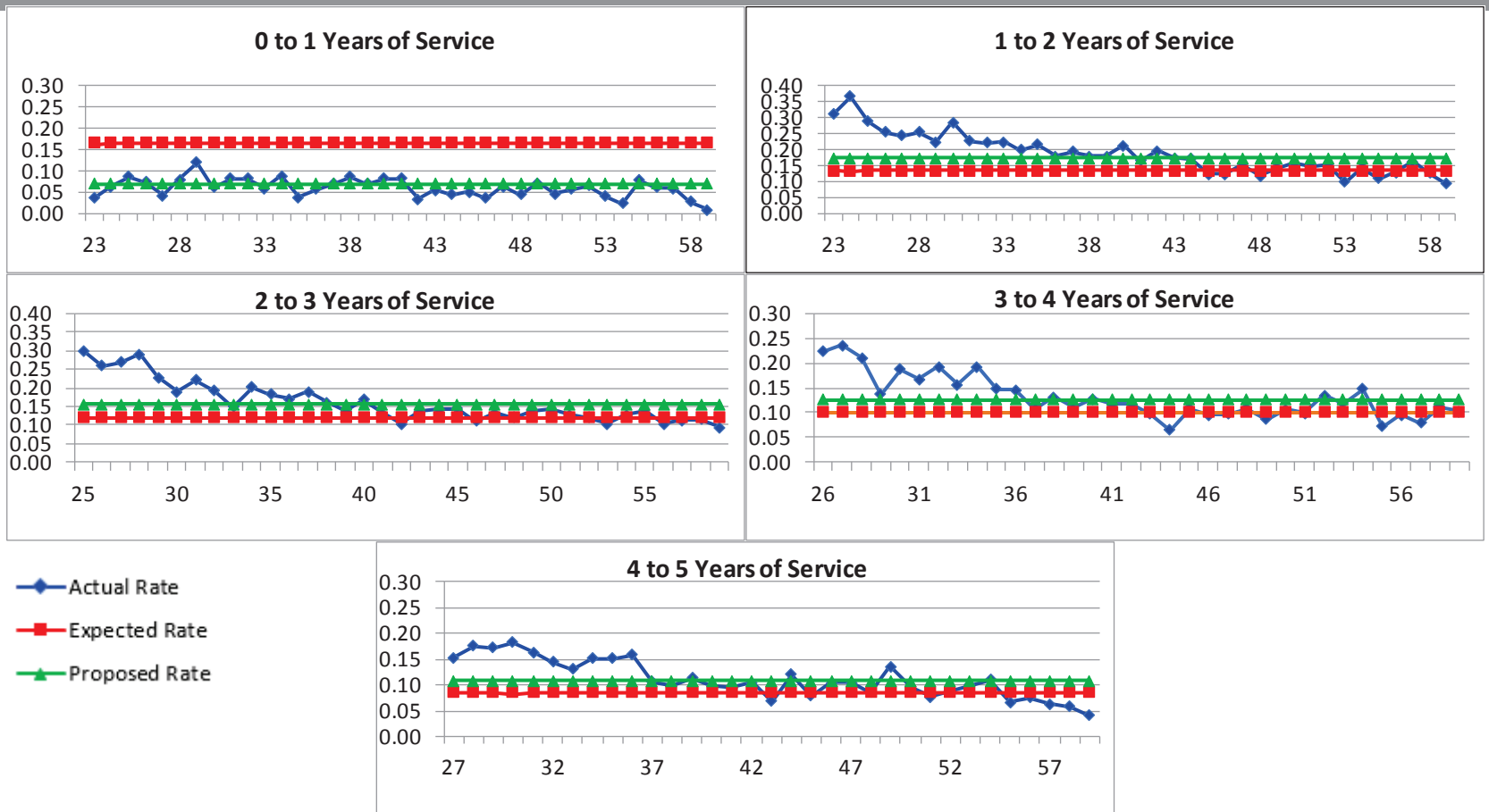
Retiree
Disabled
Beneficiary

Gender

Males

Females

Males and Females



| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: more terminations with less than 5 years of service over the period than expected overall other than the following groups: 0-1 years Recommendation: adjust rates, generally upwards, to reflect actual experience Cost Impact: minimal |
|-----------|----------|----------|------------|----------|-------------|---|
| 0-1 years | 412.00 | 1,112.26 | 0.3704 | 472.08 | 0.8727 | |
| 1-2 years | 2,094.00 | 1,544.36 | 1.3559 | 2,002.00 | 1.0460 | |
| 2-3 years | 1,547 | 1,173.00 | 1.3188 | 1,515.13 | 1.0210 | |
| 3-4 years | 1,032 | 822.80 | 1.2543 | 1,028.50 | 1.0034 | |
| 4-5 years | 768 | 597.66 | 1.2850 | 755.19 | 1.0170 | |
| Total | 5,853 | 5,250.08 | 1.1148 | 5,772.89 | 1.0139 | |

Termination (<5 Years of Service)

Plan

TSERS:

- Teachers
- General Employees
- Other Education

-Law Enforcement

- CJRS
- LRS
- National Guard
- DIPNC
- FRSWPF

LGERS:

- General Employees
- Fire & Rescue
- Law Enforcement
- RODs
- Death

- Membership
- Active
- Retiree
- Disabled
- Beneficiary

- Gender
- Males
- Females

Membership

Active

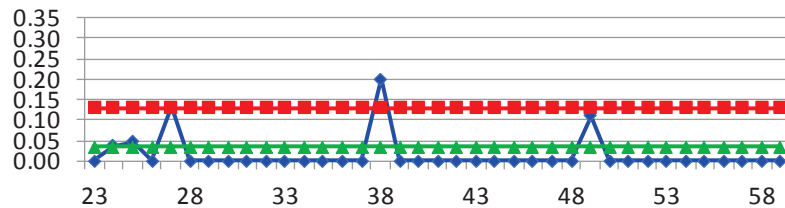
- Retiree
- Disabled
- Beneficiary

Gender

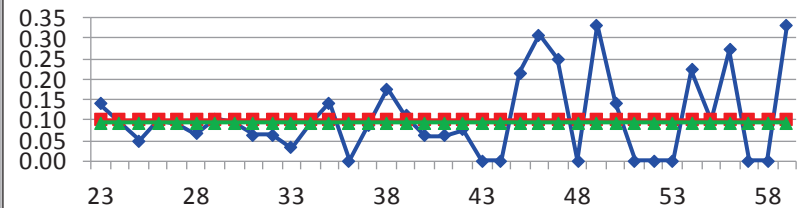
- Males
- Females

Males and Females

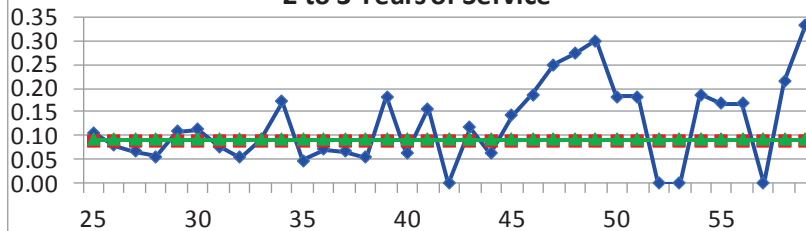
0 to 1 Years of Service



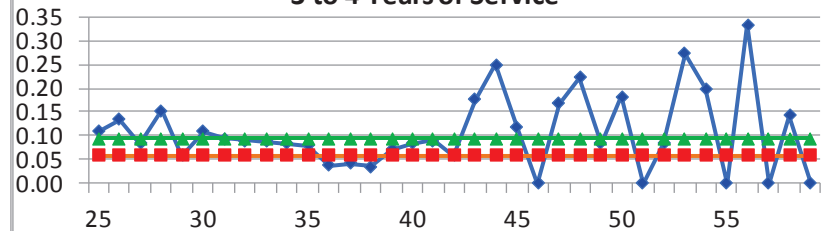
1 to 2 Years of Service



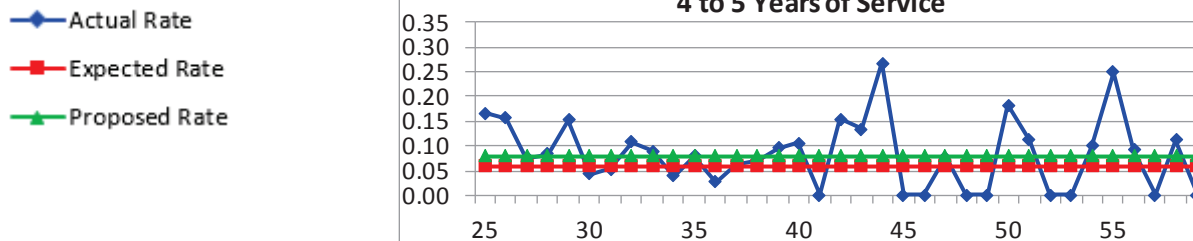
2 to 3 Years of Service



3 to 4 Years of Service



4 to 5 Years of Service



| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: more terminations with less than 5 years of service over the period than expected overall other than the following groups: 0-1 years , 1-2 years |
|-----------|--------|----------|------------|----------|-------------|---|
| 0-1 years | 6.00 | 37.83 | 0.1586 | 10.19 | 0.5891 | |
| 1-2 years | 117.00 | 128.20 | 0.9126 | 118.59 | 0.9866 | |
| 2-3 years | 130 | 123.84 | 1.0497 | 127.28 | 1.0214 | Recommendation: adjust rates, generally upw ards, to reflect actual experience |
| 3-4 years | 129 | 75.36 | 1.7118 | 119.32 | 1.0811 | |
| 4-5 years | 96 | 68.10 | 1.4097 | 90.80 | 1.0573 | Cost Impact: minimal |
| Total | 478 | 433.33 | 1.1031 | 466.17 | 1.0254 | |

Termination (<5 Years of Service)

Plan

TSERS:
-Teachers
-General Employees
-Other Education
-Law Enforcement
CJRS
LRS
National Guard
DIPNC

FRSWPF

LGERS:
-General Employees
-Fire & Rescue
-Law Enforcement
RODs
Death

Membership

Active

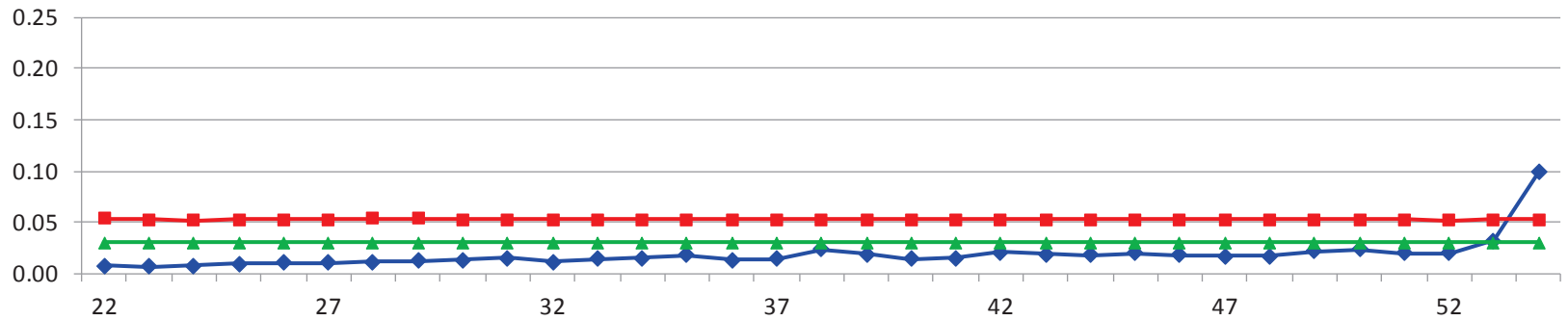
Retiree
Disabled
Beneficiary

Gender

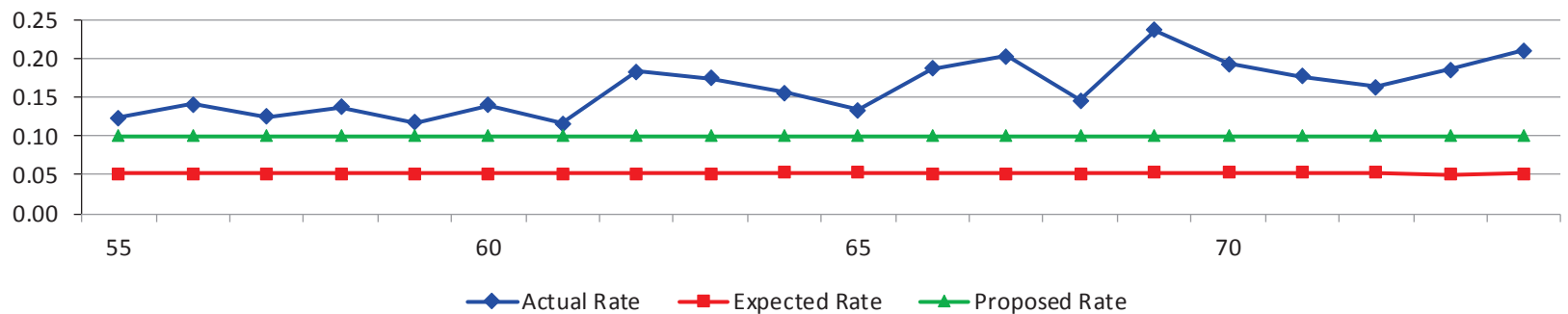
Males
Females

Males and Females

< Age 55, <5 Yrs of Service



> Age 55, < 5 Yrs of Service



| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: few er terminations with less than 5 years of service over the period than expected overall other than the follow ing groups: |
|-----------|--------|----------|------------|----------|-------------|--|
| 0-1 years | 811.00 | 2,915.97 | 0.2781 | 1,654.29 | 0.4902 | 1-2 years |
| 1-2 years | 556.00 | 196.28 | 2.8327 | 376.70 | 1.4760 | Recommendation: adjust rates, generally down wards to reflect actual experience |
| Total | 1,367 | 3,112.25 | 0.4392 | 2,030.99 | 0.6731 | Cost Impact: minimal |

Termination (<5 Years of Service)

Plan

TSERS:

- Teachers
- General Employees
- Other Education
- Law Enforcement
- CJRS
- LRS
- National Guard
- DIPNC
- FRSWPF

LGERS:

- General Employees
- Fire & Rescue
- Law Enforcement

RODs

Death

Membership

Active

Retiree

Disabled

Beneficiary

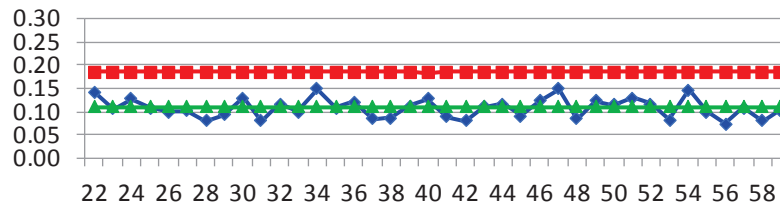
Gender

Males

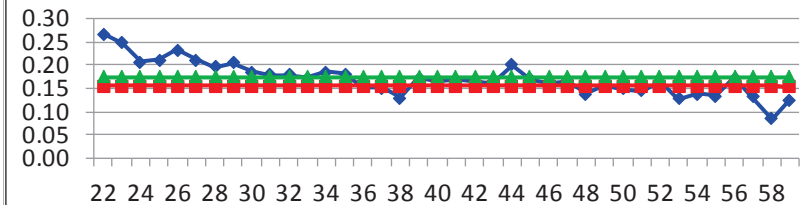
Females

Males and Females

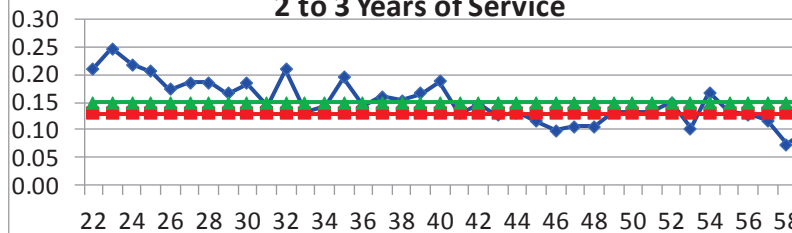
0 to 1 Years of Service



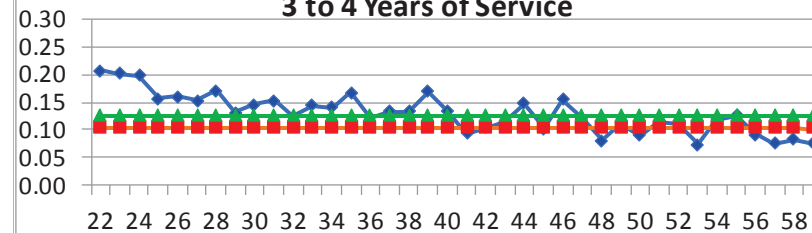
1 to 2 Years of Service



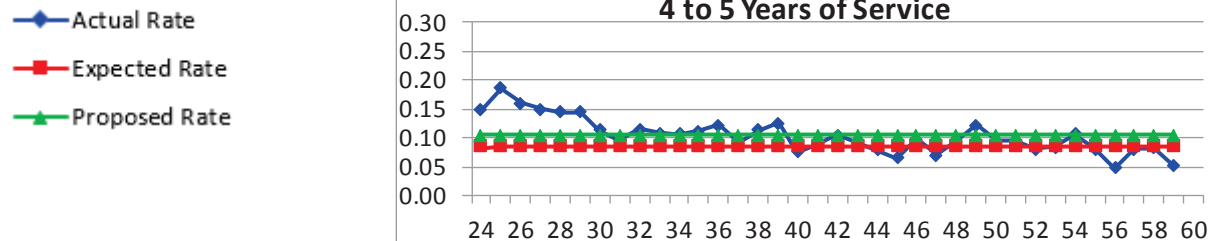
2 to 3 Years of Service



3 to 4 Years of Service



4 to 5 Years of Service



| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: more terminations with less than 5 years of service over the period than expected overall other than the following groups: 0-1 years Recommendation: adjust rates, generally upwards, to reflect actual experience Cost Impact: minimal |
|-----------|----------|----------|------------|-----------|-------------|---|
| 0-1 years | 1,059.00 | 1,827.66 | 0.5794 | 1,086.58 | 0.9746 | |
| 1-2 years | 3,853.00 | 3,324.28 | 1.1590 | 3,753.58 | 1.0265 | |
| 2-3 years | 2,725 | 2,254.98 | 1.2084 | 2,601.90 | 1.0473 | |
| 3-4 years | 1,843 | 1,495.79 | 1.2321 | 1,780.88 | 1.0349 | |
| 4-5 years | 1,258 | 997.07 | 1.2617 | 1,230.92 | 1.0220 | |
| Total | 10,738 | 9,899.78 | 1.0847 | 10,453.85 | 1.0272 | |

Termination (<5 Years of Service)

Plan

TSERS:

- Teachers
- General Employees
- Other Education
- Law Enforcement
- CJRS
- LRS

National Guard

DIPNC

FRSWPF

LGERS:

-General Employees

- Fire & Rescue
- Law Enforcement

RODs

Death

Membership

Active

- Retiree
- Disabled
- Beneficiary

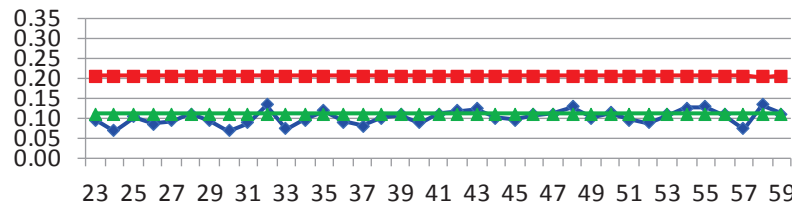
Gender

Males

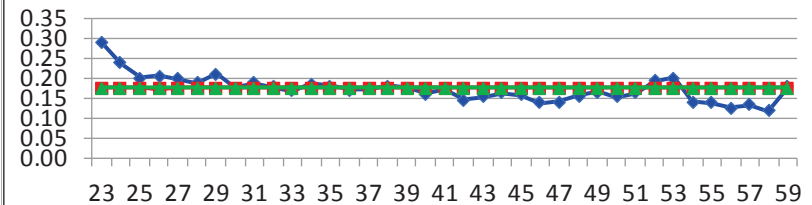
Females

Males and Females

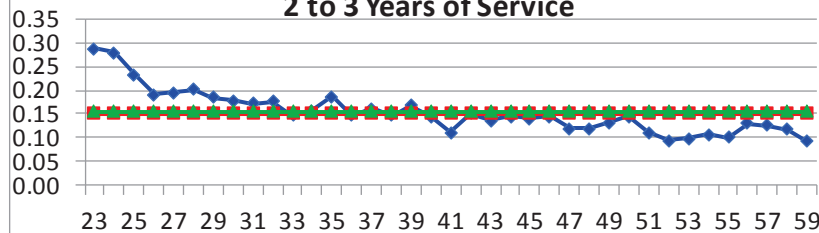
0 to 1 Years of Service



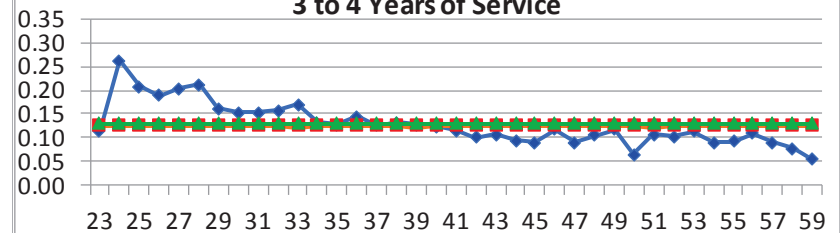
1 to 2 Years of Service



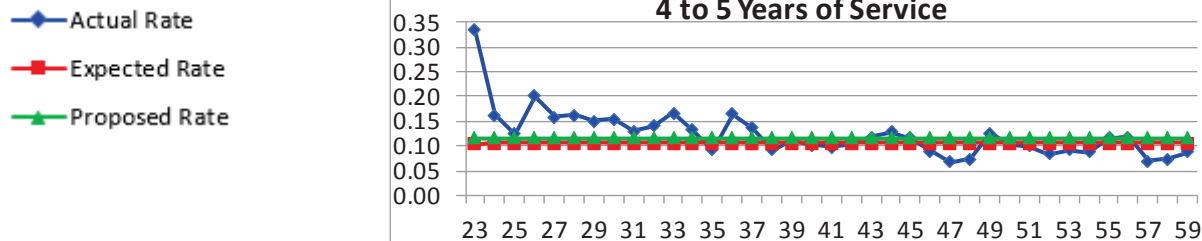
2 to 3 Years of Service



3 to 4 Years of Service



4 to 5 Years of Service



| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: few er terminations with less than 5 years of service over the period than expected overall other than the follow ing groups: 1-2 years, 2-3 years, 3-4 years, 4-5 years |
|-----------|----------|-----------|------------|-----------|-------------|---|
| 0-1 years | 1,139.00 | 2,332.17 | 0.4884 | 1,251.69 | 0.9100 | Recommendation: adjust rates, generally dow nw ards to reflect actual experience Cost Impact: minimal |
| 1-2 years | 4,619.00 | 4,537.52 | 1.0180 | 4,537.05 | 1.0181 | |
| 2-3 years | 3,372 | 3,235.35 | 1.0422 | 3,343.20 | 1.0086 | |
| 3-4 years | 2,315 | 2,202.91 | 1.0509 | 2,290.34 | 1.0108 | |
| 4-5 years | 1,713 | 1,531.66 | 1.1184 | 1,677.74 | 1.0210 | |
| Total | 13,158 | 13,839.61 | 0.9507 | 13,100.01 | 1.0044 | |

Termination (<5 Years of Service)

Plan

TSERS:

- Teachers
- General Employees
- Other Education
- Law Enforcement
- CJRS
- LRS

National Guard

DIPNC

FRSWPF

LGERS:

- General Employees
- Fire & Rescue

-Law Enforcement

RODs

Death

Membership

Active

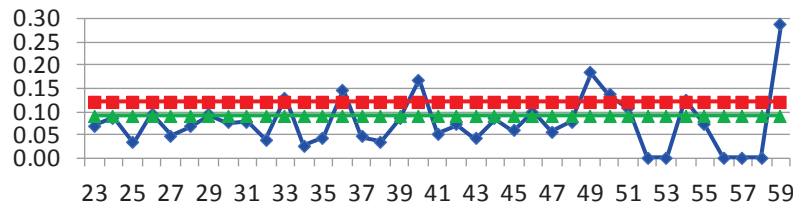
- Retiree
- Disabled
- Beneficiary

Gender

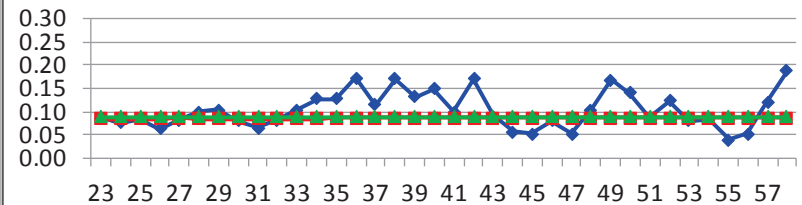
- Males
- Females

Males and Females

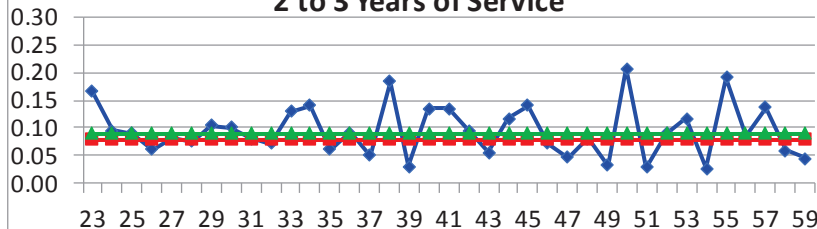
0 to 1 Years of Service



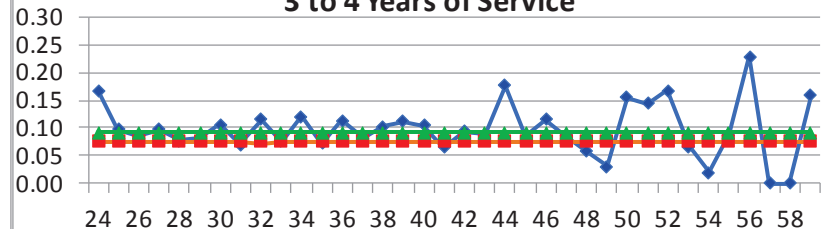
1 to 2 Years of Service



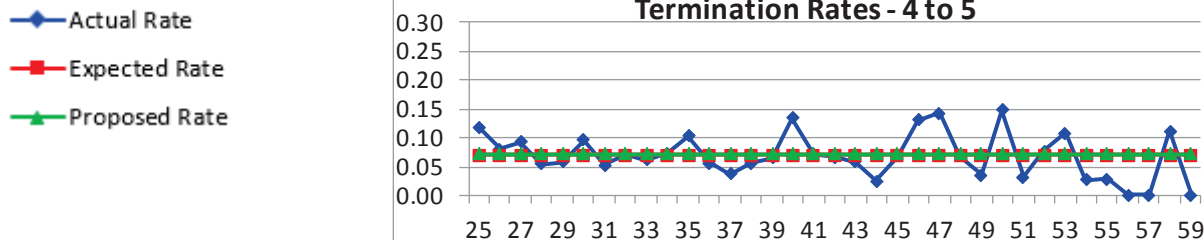
2 to 3 Years of Service



3 to 4 Years of Service



Termination Rates - 4 to 5



| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: more terminations with less than 5 years of service over the period than expected overall other than the following groups: 0-1 years Recommendation: adjust rates, generally upwards, to reflect actual experience Cost Impact: minimal |
|-----------|--------|----------|------------|----------|-------------|---|
| 0-1 years | 148.00 | 242.28 | 0.6109 | 181.71 | 0.8145 | |
| 1-2 years | 584.00 | 539.52 | 1.0824 | 554.84 | 1.0526 | |
| 2-3 years | 583 | 507.36 | 1.1491 | 570.78 | 1.0214 | |
| 3-4 years | 573 | 450.08 | 1.2731 | 554.54 | 1.0333 | |
| 4-5 years | 399 | 380.45 | 1.0488 | 394.04 | 1.0126 | |
| Total | 2,287 | 2,119.69 | 1.0789 | 2,255.90 | 1.0138 | |

Termination (5+ Years of Service)

Plan

TSERS:

-Teachers

-General Employees

-Other Education

-Law Enforcement

CJRS

LRS

National Guard

DIPNC

FRSWPF

LGERS:

-General Employees

-Fire & Rescue

-Law Enforcement

RODs

Death

Membership

Active

Retiree

Disabled

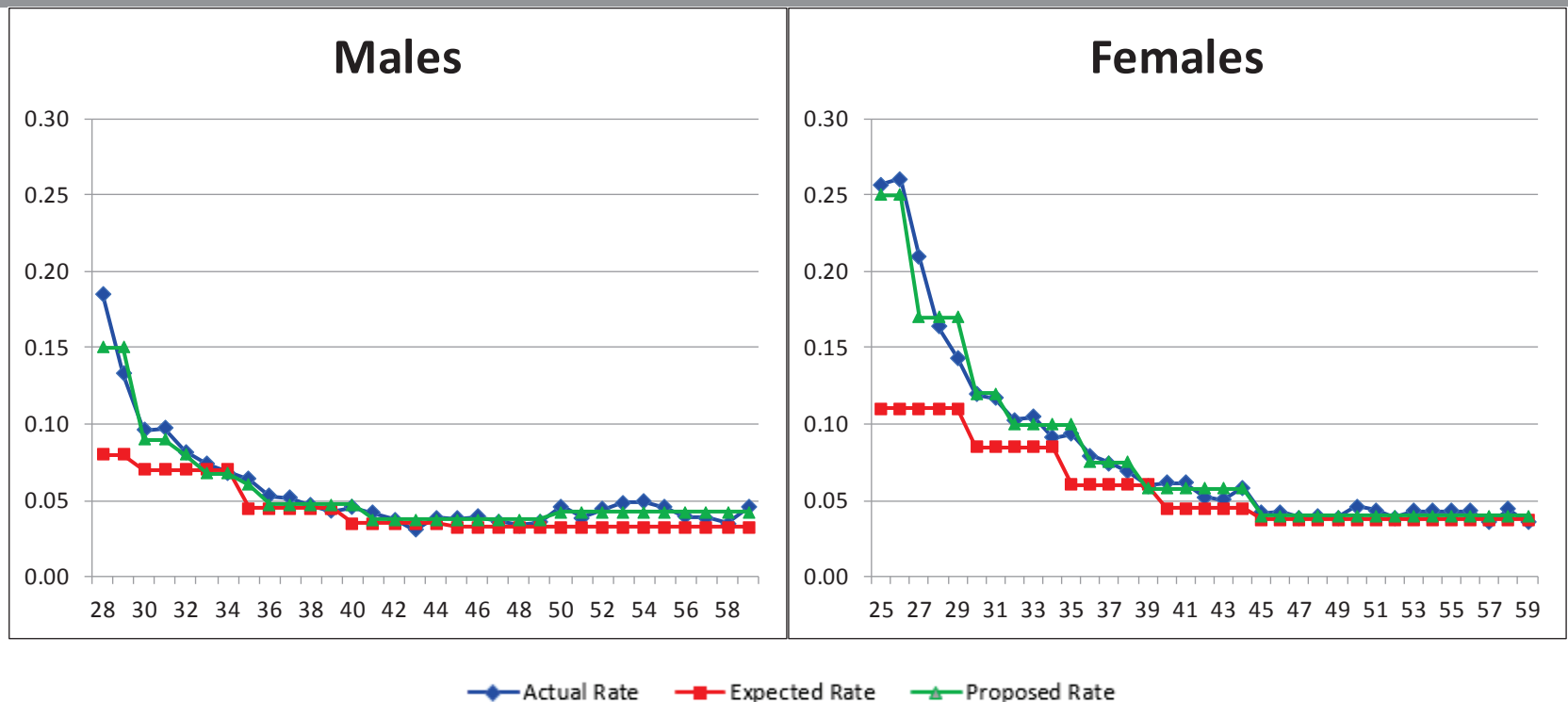
Beneficiary

Gender

Males

Females

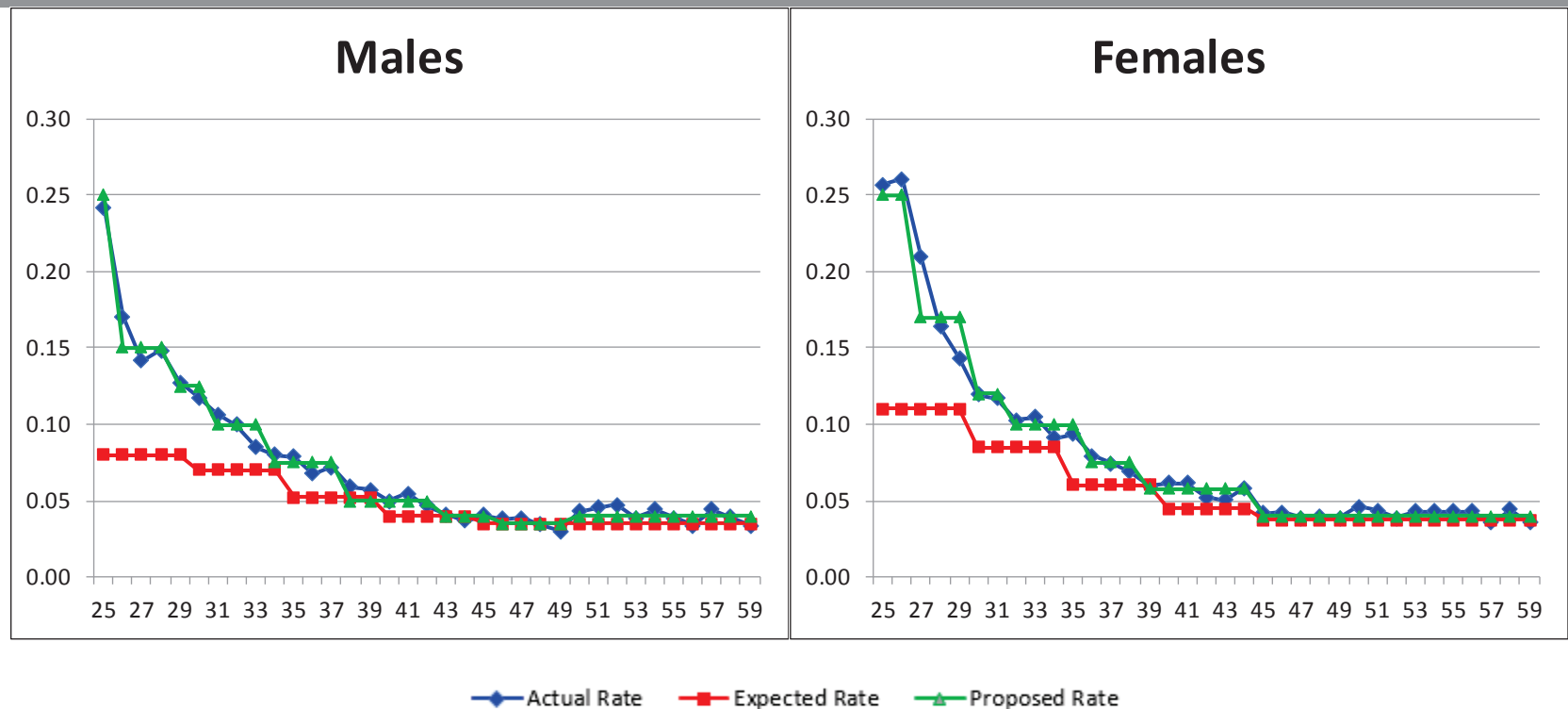
Males and Females



| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: more terminations with more than 5 years of service over the period than expected overall |
|---------|-----------|-----------|------------|-----------|-------------|--|
| Males | 3,818.00 | 3,153.41 | 1.2108 | 3,762.83 | 1.0147 | |
| Females | 15,404.00 | 13,641.03 | 1.1292 | 15,285.14 | 1.0078 | |
| Total | 19,222 | 16,794.44 | 1.1445 | 19,047.98 | 1.0091 | Recommendation: adjust rates, generally upwards, to reflect actual experience |
| | | | | | | Cost Impact: decrease |

Termination (5+ Years of Service)

- Plan**
- TSERS:**
- Teachers
- General Employees**
- Other Education
- Law Enforcement
- CJRS
- LRS
- National Guard
- DIPNC
- FRSWPF
- LGERS:
- General Employees
- Fire & Rescue
- Law Enforcement
- RODs
- Death
- Membership**
- Active**
- Retiree
- Disabled
- Beneficiary
- Gender**
- Males**
- Females**
- Males and Females



| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: more terminations with more than 5 years of service over the period than expected overall |
|---------|----------|-----------|------------|-----------|-------------|--|
| Males | 5,521.00 | 4,577.57 | 1.2061 | 5,479.16 | 1.0076 | |
| Females | 7,646.00 | 6,464.54 | 1.1828 | 7,636.44 | 1.0013 | |
| Total | 13,167 | 11,042.11 | 1.1924 | 13,115.60 | 1.0039 | Recommendation: adjust rates, generally upw ards, to reflect actual experience |
| | | | | | | Cost Impact: decrease |

Termination (5+ Years of Service)

Plan

TSERS:

- Teachers
- General Employees

-Other Education

- Law Enforcement

CJRS

LRS

National Guard

DIPNC

FRSWPF

LGERS:

- General Employees

- Fire & Rescue

- Law Enforcement

RODs

Death

Membership

Active

Retiree

Disabled

Beneficiary

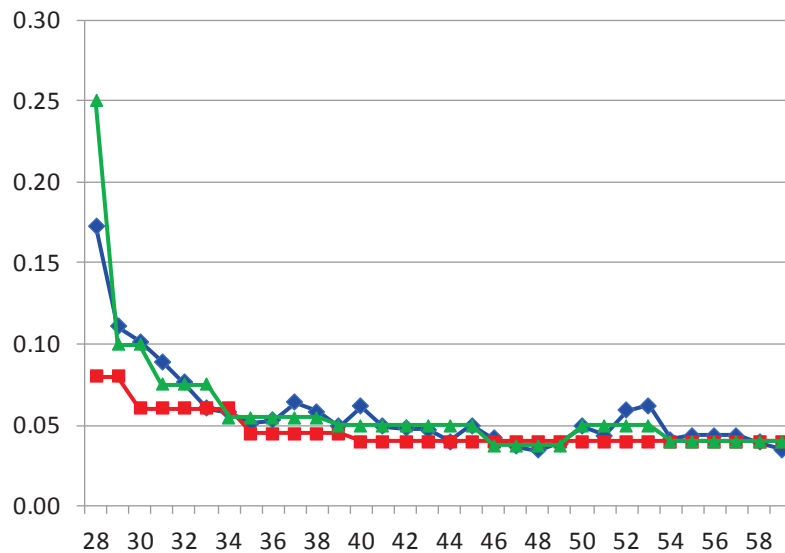
Gender

Males

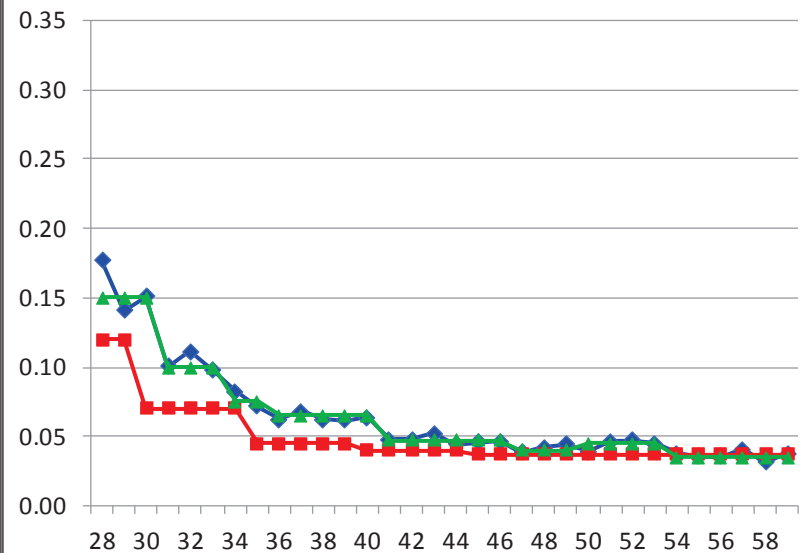
Females

Males and Females

Males



Females



◆ Actual Rate
 ■ Expected Rate
 ▲ Proposed Rate

| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: more terminations with more than 5 years of service over the period than expected overall |
|---------|----------|----------|------------|----------|-------------|--|
| Males | 1,607.00 | 1,371.04 | 1.1721 | 1,589.40 | 1.0111 | |
| Females | 3,896.00 | 3,241.25 | 1.2020 | 3,843.31 | 1.0137 | |
| Total | 5,503 | 4,612.29 | 1.1931 | 5,432.71 | 1.0129 | Recommendation: adjust rates, generally upwards, to reflect actual experience |
| | | | | | | Cost Impact: decrease |

Termination - All Service

Plan

TSERS:

- Teachers
- General Employees
- Other Education
- Law Enforcement
- CJRS

LRS

- National Guard
- DIPNC
- FRSWPF
- LGERS:
- General Employees
- Fire & Rescue
- Law Enforcement
- RODs
- Death

Membership

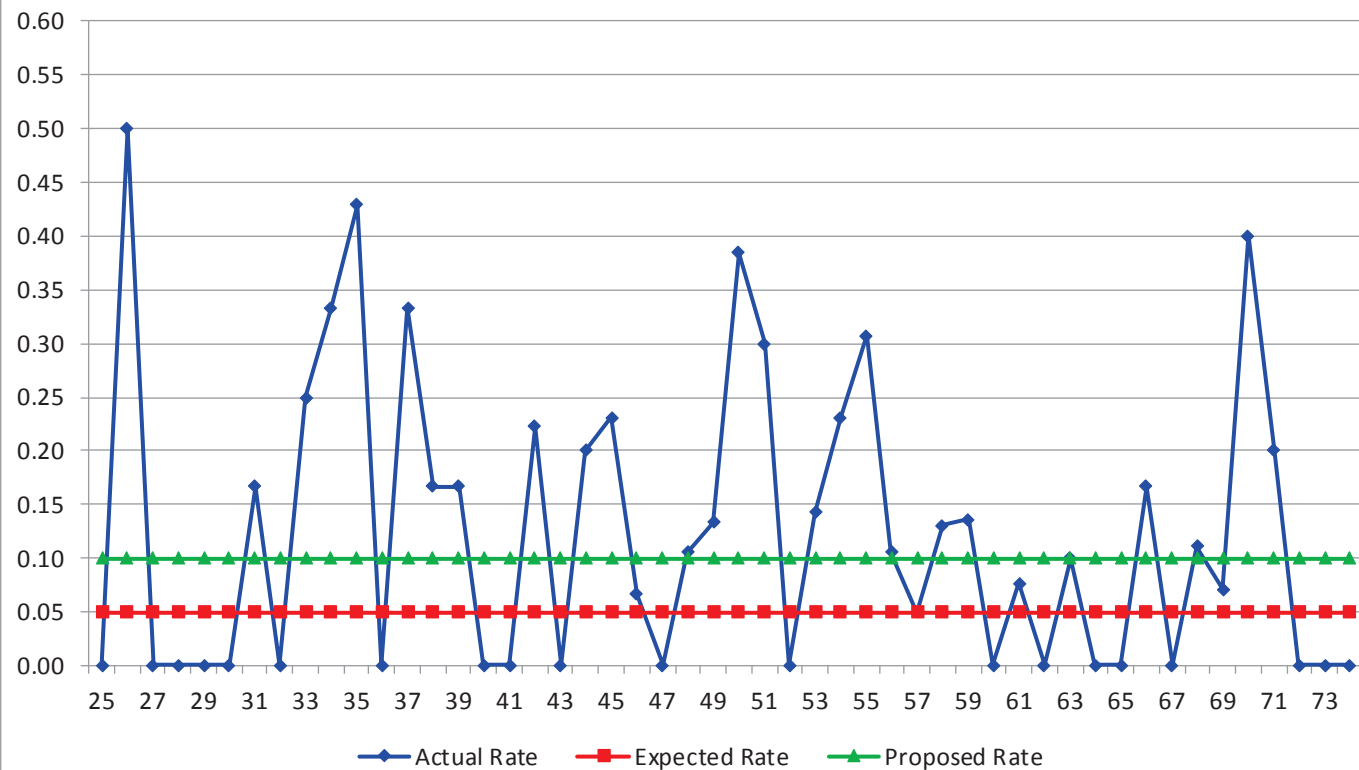
Active

- Retiree
- Disabled
- Beneficiary

Gender

- Males
- Females

Males and Females



| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: more Termination over the period than expected overall |
|-------|--------|----------|------------|----------|-------------|---|
| Total | 67.00 | 26.85 | 2.4953 | 53.70 | 1.2477 | |
| | | | | | | Recommendation: adjust rates, generally upwards, to reflect actual experience |
| | | | | | | Cost Impact: minimal |

Termination (5+ Years of Service)

Plan

TSERS:

- Teachers
- General Employees
- Other Education
- Law Enforcement
- CJRS
- LRS

National Guard

- DIPNC
- FRSWPF
- LGERS:

- General Employees
- Fire & Rescue
- Law Enforcement
- RODs
- Death

Membership

Active

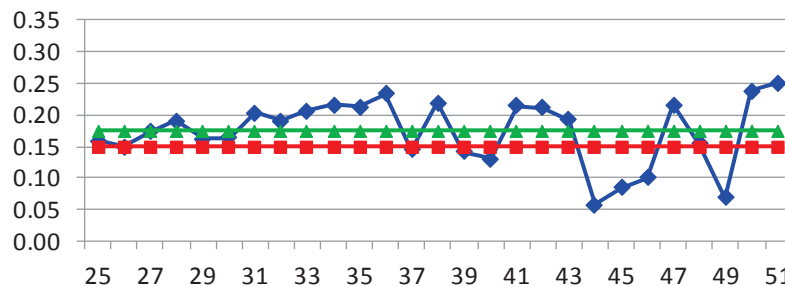
- Retiree
- Disabled
- Beneficiary

Gender

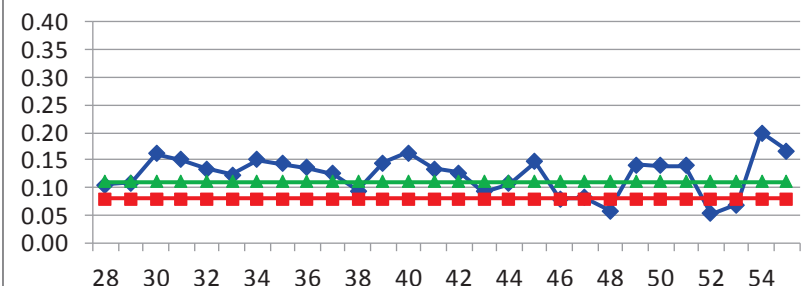
- Males
- Females

Males and Females

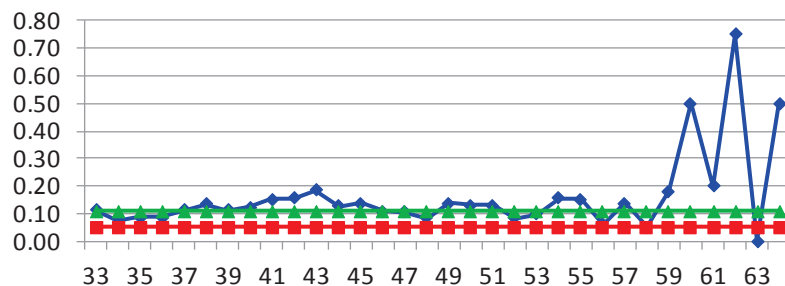
7 to 9 Years of Service



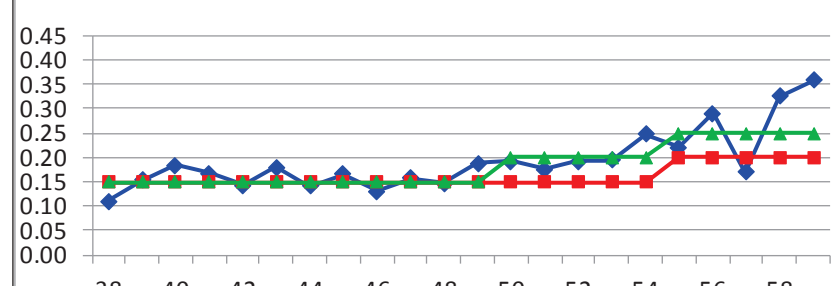
10 to 14 Years of Service



15 to 19 Years of Service



20+ Years of Service

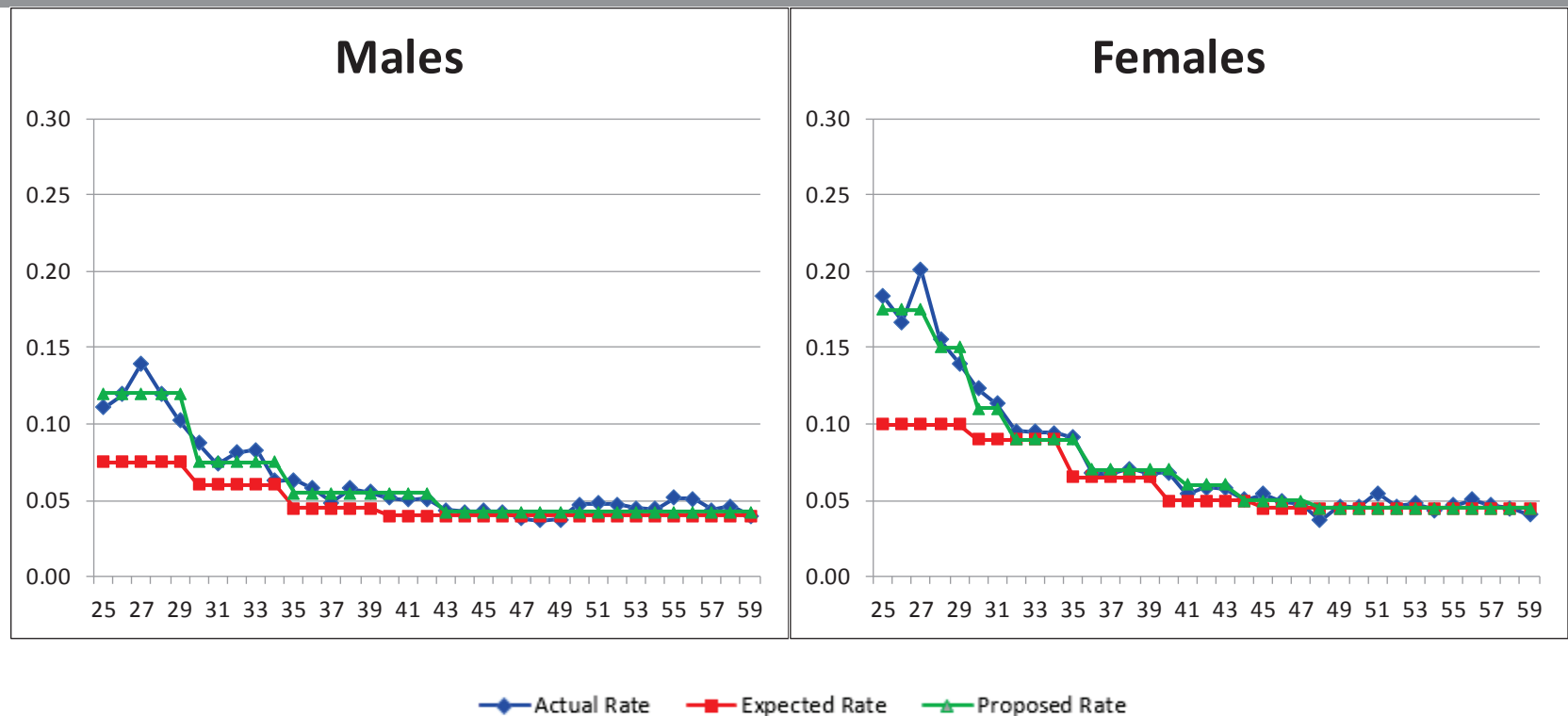


— Actual Rate — Expected Rate — Proposed Rate

| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: more terminations with more than 5 years of service over the period than expected overall |
|---------------------------|----------|----------|------------|----------|-------------|--|
| 7 to 9 Years of Service | 1,329.00 | 1,116.00 | 1.1909 | 1,302.35 | 1.0205 | |
| 10 to 14 Years of Service | 1,098.00 | 660.24 | 1.6630 | 907.83 | 1.2095 | |
| 15 to 20 Years of Service | 730 | 309.05 | 2.3621 | 679.91 | 1.0737 | Recommendation: adjust rates, generally upwards, to reflect actual experience |
| 20+ Years of Service | 938 | 839.10 | 1.1179 | 904.80 | 1.0367 | |
| Total | 4,095 | 2,924.39 | 1.4003 | 3,794.89 | 1.0791 | Cost Impact: decrease |

Termination (5+ Years of Service)

- Plan**
- TSERS:
- Teachers
- General Employees
- Other Education
- Law Enforcement
- CJRS
- LRS
- National Guard
- DIPNC
- FRSWPF
- LGERS:**
- General Employees
- Fire & Rescue
- Law Enforcement
- RODs**
- Death
- Membership**
- Active**
- Retiree
- Disabled
- Beneficiary
- Gender**
- Males**
- Females**
- Males and Females



| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: more terminations with more than 5 years of service over the period than expected overall |
|---------|----------|-----------|------------|-----------|-------------|--|
| Males | 4,925.00 | 4,174.27 | 1.1798 | 4,884.85 | 1.0082 | |
| Females | 6,785.00 | 6,188.16 | 1.0964 | 6,770.28 | 1.0022 | Recommendation: adjust rates, generally upw ards, to reflect actual experience |
| Total | 11,710 | 10,362.43 | 1.1300 | 11,655.13 | 1.0047 | |
| | | | | | | Cost Impact: decrease |

Termination (5+ Years of Service)

Plan

TSERS:

-Teachers
 -General Employees
 -Other Education
 -Law Enforcement
 CJRS
 LRS
 National Guard
 DIPNC
 FRSWPF

LGERS:

-General Employees

-Fire & Rescue

-Law Enforcement
 RODs
 Death

Membership

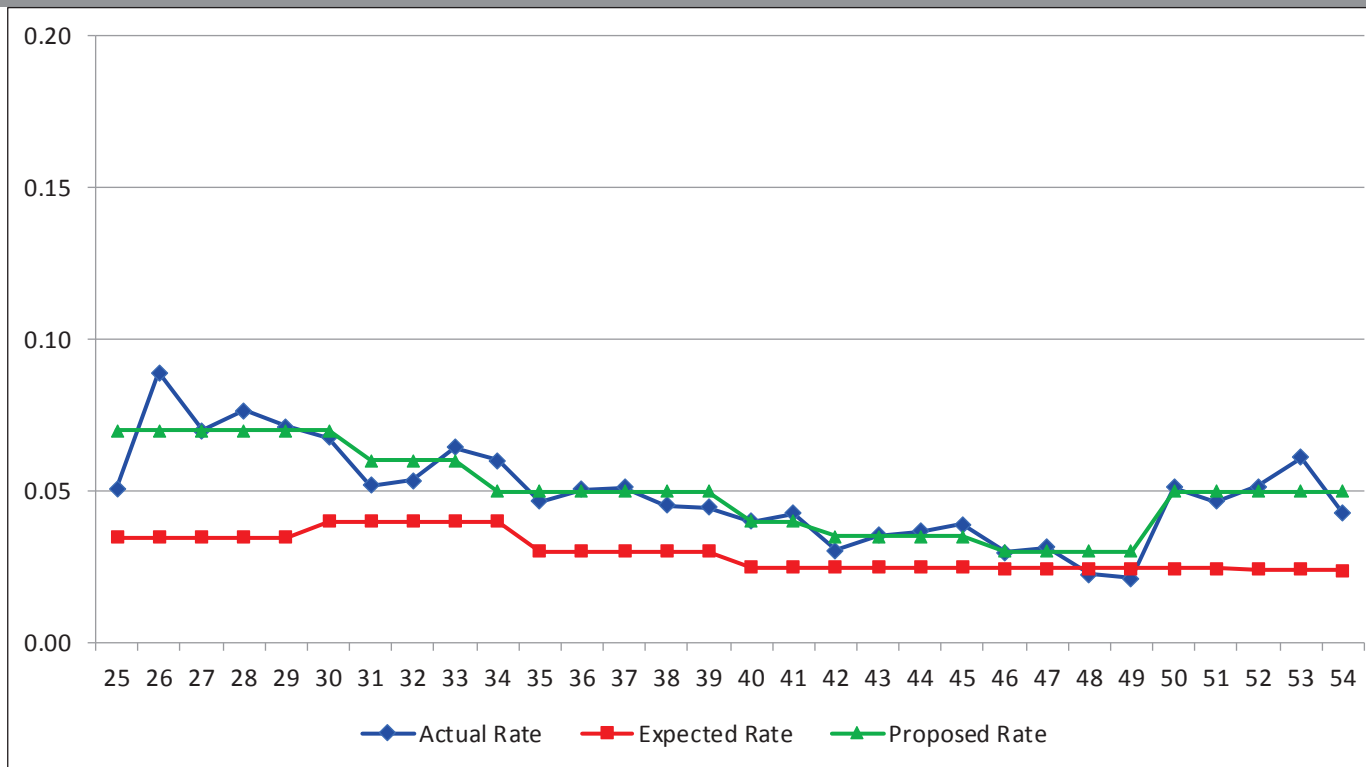
Active

Retiree
 Disabled
 Beneficiary

Gender

Males
 Females

Males and Females



| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: more terminations with more than 5 years of service over the period than expected overall |
|-------|----------|----------|------------|----------|-------------|--|
| Total | 1,557.00 | 1,003.31 | 1.5519 | 1,573.63 | 0.9894 | |
| | | | | | | Recommendation: adjust rates, generally upwards, to reflect actual experience |
| | | | | | | Cost Impact: decrease |

Termination (5+ Years of Service)

Plan

TSERS:

-Teachers
 -General Employees
 -Other Education
 -Law Enforcement
 CJRS
 LRS
 National Guard
 DIPNC
 FRSWPF

LGERS:

-General Employees
 -Fire & Rescue

-Law Enforcement

RODs

Death

Membership

Active

Retiree

Disabled

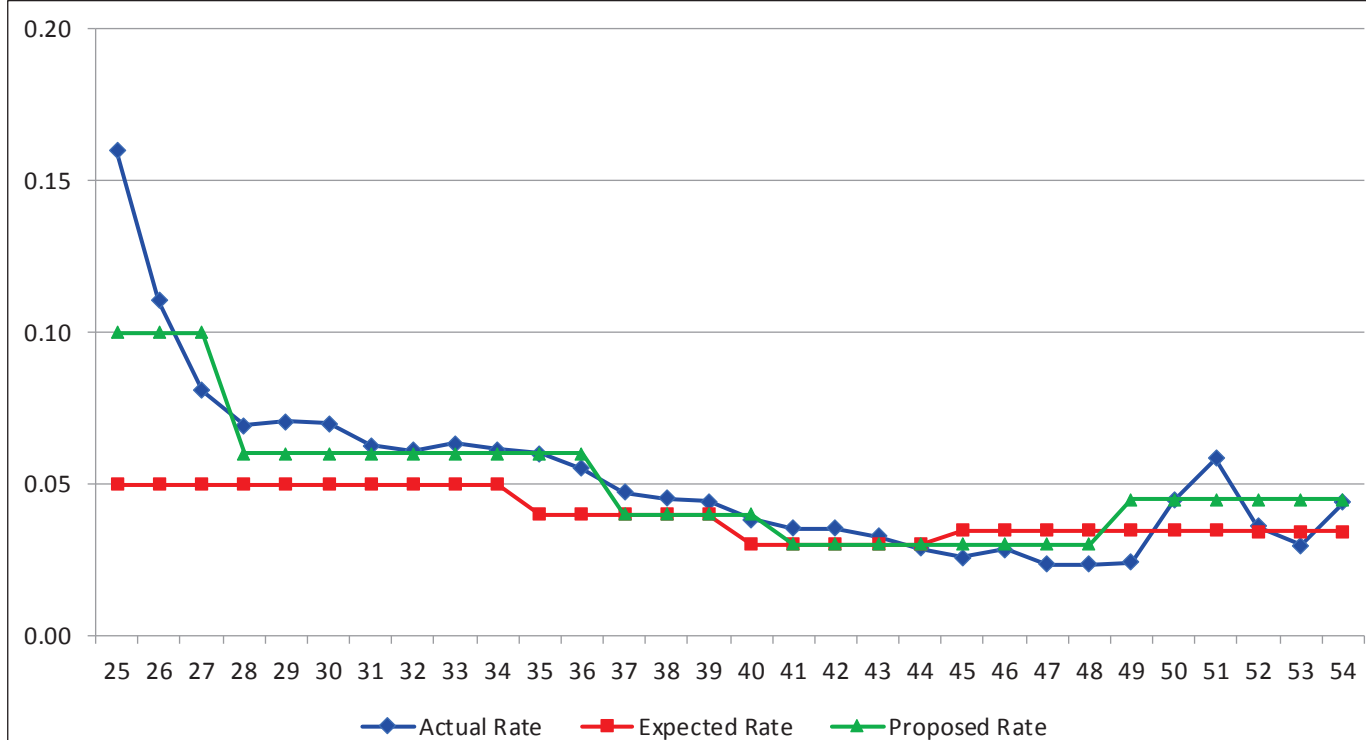
Beneficiary

Gender

Males

Females

Males and Females



| | Actual | Expected | Act to Exp | Proposed | Act to Prop | Observation: more terminations with more than 5 years of service over the period than expected overall |
|-------|----------|----------|------------|----------|-------------|--|
| Total | 2,809.00 | 2,497.43 | 1.1248 | 2,817.83 | 0.9969 | |
| | | | | | | Recommendation: adjust rates, generally upwards, to reflect actual experience |
| | | | | | | Cost Impact: minimal |



Demographic Assumptions



Other Demographic Assumptions

Other Demographic Assumptions: Fire & Rescue Lapsed Members



- Assumption in the Fire & Rescue plan for lapsed members to return to work
- The assumed rate in which a lapsed member returns to active service are based on the number of years that member has been lapsed
- Based on a study in 2015, where there was significant data cleanup and analysis, lapsed members with less than 8 years service were shown to have some probability of returning to work
- The current assumptions were established in 2015 with the first two years as a phase in
- Recommend no change to these assumptions. Will analyze in the next experience study when more experience is available

Other Demographic Assumptions: Leave Conversions



- CMC reviewed the previous five years of data to compare actual vs. expected results
- Recommend no change to the Increase in AFC and Eligibility Service assumptions
- Recommend lowering the Credited Service assumptions for all groups except TSERS-LEO, which we recommend not changing.

| TSERS | Teachers | General | Other Educators | LEO |
|--------|----------|---------|-----------------|------|
| Male | 0.90 | 0.85 | 1.05 | 1.50 |
| Female | 0.70 | 0.55 | 0.80 | 1.50 |

| LGERS | General | LEO | FRW |
|--------|---------|------|------|
| Male | 0.80 | 1.10 | 1.20 |
| Female | 0.60 | 1.10 | 1.20 |

Other Demographic Assumptions: National Guard



- The National Guard plan experiences losses due to not accounting for active members with less than 7 years of service due to lack of available data.
- Over the last 3 years, the plan has averaged approximately 750 of these new entrants with past service averaging 8.4 years.
- The increase in accrued liability each year for new entrants has averaged about \$725,000.
- There has been significant data clean up in the National Guard plan that is still ongoing.
- We will incorporate new data as it becomes available, but in the meantime, we propose loading the normal cost by \$725,000 to anticipate this loss due to new entrants.

Other Demographic Assumptions: Transfers Between Systems



- Periodically members transfer between systems
- Most commonly this happens between LRS/TSERS, CJRS/TSERS and TSERS/LGERS
- These transfers are partially addressed in the annual gain/loss analysis by only counting the ADEC contributions in the reconciliation of UAAL.
- Liability losses are also offset with service purchase and transferred service dollars received by the fund.
- While transfers between TSERS and LGERS are the most common they are likely not material to either system and we recommend no change
- Transfers between LRS/CJRS and TSERS could have an impact on the smaller systems
 - CMC recommends incorporating reciprocity service for CJRS while not assuming any future transferred service will happen
 - LRS was not material and CMC recommends no change

Other Demographic Assumptions: DIPNC



- Disability Claim Termination:
 - Current Assumption: 2012 GLTD table with a 6-month elimination period, including margin and mortality improvement, but no diagnosis definition.
 - Proposed Assumption: 2019 GLTD table with a 6-month elimination period, including margin and mortality improvement, but no diagnosis definition.
- Social Security Disability Approval Rates: recommend no change to the current assumptions due to lack of credible data. We will revisit this assumption at the next experience study.
- Disability Offsets: recommend no change to the current assumptions.

Other Demographic Assumptions: DIPNC & TSERS



- Future Pay for TSERS Disabled Members:
 - Current Assumption: Pay at every future valuation date is the pay the member was receiving at disablement (pay does not increase from valuation to valuation)
 - Proposed Assumption:
 - calculate the number of years from the date of disability (which is currently assumed to be the benefit effective date) to the current valuation date
 - Increase pay by inflation to the valuation date
 - This becomes the pay as of the current valuation date and is then projected forward within the valuation with inflation only.

Other Demographic Assumptions

- CMC reviewed the previous five years of data to compare actual vs expected results for the following assumptions and recommend the following:
 - Marriage Assumption:
 - Current Assumption: Male spouses four years older than female spouses, various percent-married assumptions.
 - Proposed assumptions: Male spouses three years older than female spouses. No change to the percent married assumptions.
 - Line-of-Duty Deaths:
 - No change in the current assumptions due to actual experience being close to the current assumption
 - Fire & Rescue: 10% of deaths are in the line of duty
 - LGERS LEO and Fire/Rescue: 50% of deaths are in the line of duty
 - Contributory Death Benefit Plan Participation Rate:
 - Current Assumption: 50% of non-disabled members elect/ 65% of disabled members elect
 - Proposed assumption: 45% of non-disabled members elect/ 60% of disabled members elect
 - Benefit Commencement Age for Pre-Retirement Terminations:
 - Recommend no change in the current assumptions due to actual experience being close to the current assumption
 - Form of Payment:
 - Currently assumed to be actuarially equivalent to the normal form of payment
 - Recommend no change in the current assumptions
 - CJRS Unremarried Surviving Spouse Benefit:
 - Recommend no change in the current assumptions due to lack of credible data and limited materiality

Items Studied during the Experience Review



Funding Methodology



Funding Methodology

- Actuarial cost method
- Asset valuation method
- Amortization method
- Normal Cost rate
- Administrative expenses
- Terminated Vested valuation
- Employer Contribution Stabilization Policies
- Employer Contribution Phase In Policy
- Plan specific methods

Once the assumptions are determined, the next step is to systematically fund the benefits expected to be paid.

The components of the Funding Methodology define how benefits are systematically funded.

Funding Methodology

- The Funding Methodology is the payment plan for the benefits and is composed of the Actuarial Cost Method, the Asset Valuation Method and Amortization Method.
- The Funding Methodology is rather consistent across the plans except for death benefits. We will focus on plans other than death benefits.
- The Contribution Rate Stabilization Plans will be discussed when the new asset allocation and resulting market expectations are available.
- In general, the Funding Methodology being used is best practice.

The Funding Methodology used by the North Carolina Retirement Systems is a major contributor to NCRS being well funded compared to peers.

Funding Methodology

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 Entry Age Normal as its actuarial cost method
 - This method develops normal costs that stay level as a percent of payroll

The actuarial cost method is consistent with GFOA Best Practices.

<http://www.gfoa.org/core-elements-funding-policy>

Funding Methodology

Asset Valuation Method



- Asset Valuation Methods smooth or average the market value returns over time to alleviate contribution volatility that results from market returns.
 - Asset returns in excess of or less than the expected return on market value of assets reflected over a five-year period
 - Assets corridor: not greater than 120% of market value and not less than 80% of market value

The asset valuation method is consistent with GFOA Best Practices.

<http://www.gfoa.org/core-elements-funding-policy>

Funding Methodology

Amortization Methods



- Amortization Methods determine the payment schedule for unfunded actuarial accrued liability (i.e. the difference between the actuarial accrued liability and actuarial value of assets)
 - Payment level: the payment is determined as a level dollar amount, similar to a mortgage payment
 - Payment period: a 12-year closed amortization period was adopted for fiscal year ending 2012. A new amortization base is created each year based on the prior years' experience.
- For fiscal years beginning subsequent to January 1, 2017, the sum of the "normal contribution" and the "accrued liability contribution" shall not be less than the employee contribution.

When compared to other Public Sector Retirement Systems in the United States, the funding policy is quite aggressive in that the policy pays down the pension debt over a much shorter period of time (12 years) compared to the national average of around 24 years.

In addition, payments are developed to stay level instead of the increasing policy many systems use which results in lower payments early on.

As such it is a best practice among public retirement systems.

Funding Methodology

Normal Cost for New Entrants

- The Normal Cost is the cost of benefits accruing during the year.
 - Traditionally, and for corporate plans, normal cost has been determined for members in the plan as of the valuation date; the value of benefits for members hired in the year after the valuation date is not included, leading to losses
- In the Public Sector it is becoming more common to include the normal cost for this group
- For the December 31, 2017 actuarial valuation, the first valuation CMC performed, we included 25% of the normal cost for new entrants
- We recommend that 100% of the normal cost for new entrants be included

Funding Methodology

Administrative Expenses



- An amount is added to the Normal Cost Rate to take into consideration the administrative expenses paid by the plans each year.
- CMC looked at actual administrative expenses paid by each plan over the last five years, compared this to the current assumption and reviewed with staff.
- Based on this analysis we recommend the following administrative expense assumptions:
 - TSERS: we recommend no change to the current assumption of 0.10% of payroll
 - LGERS: we recommend a change from 0.20% of payroll to 0.13% of payroll
 - CJRS: we recommend a change from 0.75% of normal cost to 0.05% of payroll
 - LRS: we recommend no change to the current assumption of 1.00% of payroll
 - RoDS: we recommend a change from 0.15% of MVA to 0.04% of payroll
 - National Guard: we recommend a change from prior year actual expenses to \$150,000 per year
 - Fire & Rescue: we recommend no change to the current assumption of prior year actual expenses
 - DIPNC: we recommend no change to the current assumption of 0.01% of payroll

Other Demographic Assumptions: Terminated Vested Valuation



- The data provided in LGERS and TSERS for inactive members does not contain all the elements to calculate the member's deferred benefit.
- The liability for these members is currently estimated to be 200% of the member's accumulated contributions.
- Working with Staff a new assumption is being recommended that estimates earnings and AFC for members whose historical data is unavailable:
 - Estimate is based on available data and available contribution balances, projecting backwards assuming 4% salary growth and 4% interest on contribution balances where necessary
- The liability measured under this new method is less by \$1.7B for TSERS and \$0.6B for LGERS

Funding Methodology

Employer Contribution Stabilization Policies



- TSERS and LGERS Employer Contribution Rate Stabilization Policies (ECRSP) were adopted in January 2016.
- ECRSP covers six fiscal years from 7/1/2016 – 6/30/2022.
- The FYE 2023 contribution is determined by the 12/31/2020 actuarial valuations and is not covered by ECRSP.
- Without an extension or replacement of ECRSP, the Actuarially Determined Contribution rates determined in the 12/31/2020 actuarial valuations will be the contribution rates for FYE 2023
- We anticipate developing these with staff before the presentation of the December 31, 2020 actuarial valuation

Funding Methodology

Employer Contribution Phase In Policy



- Changes to actuarial assumptions sometimes cause large increases in the employer contribution rates
 - For example, in the 12/31/2017 valuations the decrease in the discount rate increased employer contribution rates significantly
 - To lessen the impact of these changes, Direct Rate Smoothing was implemented to phase in the employer contribution rate increase over three years
- Recommendations from this experience review will increase employer contribution rates for many plans
- We recommend Direct Rate Smoothing over a period of five years
 - The total immediate change in contribution rate will be phased in over five years.

Funding Methodology

Plan Specific Methods



➤ DIPNC

▪ IBNR Claims:

- IBNR claims are based on the one-year term cost for expected disablements during the year. For long-term disability, a reserve of 14/12 of the term cost is added to account for the waiting time after disability to receive LTD benefits.
- We recommend no change to this method.

➤ RoDS

- For valuation purposes, all members had been valued under provisions for pre-2009 hires due to the immateriality of the difference in benefits
- Beginning with the 12/31/2020 valuation, all members will be valued under the current provisions

Items Studied during the Experience Review



Administrative Factors

Administrative Factors

- The following assumptions will be updated based on the set of assumptions that are adopted by the Boards at the January 2021 Board meeting:
 - Assumptions used for transfer benefit from Supplemental Retirement Plans
 - Assumptions used for withdrawal liability
 - COLA assumption used in service purchases
 - Mortality and interest used for optional forms of benefit
- These assumptions will be first effective January 1, 2022

While not intuitive, these items are reviewed during the experience review.

They tend to be based on the recommendations made for the actuarial valuations, with some adjustments.

Administrative Factors: Contribution Based Benefit Cap



- CBBC Cap Factor
 - Session Law 2014-88 enacted an “Anti-Pension-Spiking Contribution-Based Benefit Cap”
 - These factors were first enacted in October 2015
 - At the October 2020 Board meeting the Boards adopted to continue use of the current factors:
 - 4.5 for TSERS
 - 4.7 for LGERS



APPENDIX

Summary of Assumptions

- Summary of the following assumptions for each plan
 - Mortality
 - Retirement
 - Termination
 - Disability
 - Salary Merit Scale

- Parameters for assumption application:
 - All decrements are assumed to happen in the middle of the year
 - Age and service are determined as of the valuation date and rounded.

Summary of Assumptions

Plan

TSERS:

-Teachers

-General Employees
-Other Education
-Law Enforcement
CJRS
LRS
National Guard
DIPNC
FRSWPF
LGERS:
-General Employees
-Fire & Rescue
-Law Enforcement
RODs
Death

Mortality

Post-Retirement and Vested Termination:

| Group | Gender | Table | Set Back | Set Forward |
|----------|--------|---|----------|-------------|
| Teachers | Male | Pub-2010 Teachers Retirees Below Median | | |

Adjustments:

| Age | Factor |
|------|--------|
| < 83 | 96% |
| 83 | 98% |
| 84 | 100% |
| 85 | 102% |
| 86 | 104% |
| 87 + | 106% |

| Group | Gender | Table | Set Back | Set Forward |
|----------|--------|---|----------|-------------|
| Teachers | Female | Pub-2010 Teachers Retirees Below Median | | |

Adjustments:

| Age | Factor |
|------|--------|
| < 81 | 100% |
| 81 | 101% |
| 82 | 102% |
| 83 | 103% |
| 84 | 104% |
| 85 + | 105% |

Post - Disablement

| Group | Gender | Table | Set Back | Set Forward |
|----------------------------|--------|------------------------------------|----------|-------------|
| Teachers/General/Other Edu | Male | Pub-2010 General Disabled Retirees | | 3 years |
| Teachers/General/Other Edu | Female | Pub-2010 General Disabled Retirees | 1 year | |

Contingent Annuitant

| Group | Gender | Table | Set Back | Set Forward |
|-------|--------|---|----------|-------------|
| All | Male | Pub-2010 Teachers Contingent Annuitant Below Median | | 3 years |
| All | Female | Pub-2010 Teachers Contingent Annuitant Below Median | | 1 year |

Pre-Retirement

| Group | Gender | Table | Set Back | Set Forward |
|----------------------------|-------------|----------------------------|----------|-------------|
| Teachers/General/Other Edu | Male/Female | Pub-2010 General Employees | | |

All mortality tables are benefits weighted

Summary of Assumptions

Plan

TSERS:

-Teachers

-General Employees
-Other Education
-Law Enforcement
CJRS
LRS
National Guard
DIPNC
FRSWPF
LGERS:
-General Employees
-Fire & Rescue
-Law Enforcement
RODs
Death

Sample Rates of:

Retirement

| Male | Service | | | | | | |
|------|---------|--------|--------|--------|--------|--------|--------|
| Age | 5 | 10 | 15 | 20 | 25 | 30 | 35 |
| 50 | | | | 3.0% | 3.0% | 70.0% | 70.0% |
| 55 | | | | 4.5% | 3.0% | 40.0% | 45.0% |
| 60 | 8.5% | 8.0% | 10.0% | 10.0% | 30.0% | 40.0% | 30.0% |
| 65 | 17.5% | 22.5% | 25.0% | 32.5% | 40.0% | 30.0% | 25.0% |
| 70 | 17.5% | 22.5% | 25.0% | 25.0% | 25.0% | 15.0% | 30.0% |
| 75 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |

| Female | Service | | | | | | |
|--------|---------|--------|--------|--------|--------|--------|--------|
| Age | 5 | 10 | 15 | 20 | 25 | 30 | 35 |
| 50 | | | | 5.0% | 4.5% | 65.0% | 75.0% |
| 55 | | | | 5.0% | 4.5% | 40.0% | 37.5% |
| 60 | 8.0% | 10.0% | 10.0% | 13.0% | 25.0% | 50.0% | 37.5% |
| 65 | 25.0% | 30.0% | 25.0% | 35.0% | 47.5% | 45.0% | 40.0% |
| 70 | 22.5% | 25.0% | 30.0% | 30.0% | 30.0% | 40.0% | 32.5% |
| 75 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |

Termination

| Service | Male | Female |
|---------|--------|--------|
| 0 | 5.00% | 3.50% |
| 1 | 17.50% | 16.50% |
| 2 | 15.50% | 15.50% |
| 3 | 14.50% | 13.75% |
| 4 | 11.50% | 11.50% |

After 5 years of membership in the system:

| Age | Male | Female |
|-----|--------|--------|
| 25 | 30.00% | 35.00% |
| 30 | 9.00% | 10.00% |
| 35 | 6.00% | 5.75% |
| 40 | 4.75% | 4.00% |
| 45 | 3.75% | 3.50% |
| 50 | 4.25% | 4.00% |
| 55 | 4.25% | 4.00% |
| 60 | 4.25% | 4.00% |

Summary of Assumptions

Plan

TSERS:

-Teachers

-General Employees

-Other Education

-Law Enforcement

CJRS

LRS

National Guard

DIPNC

FRSWPF

LGERS:

-General Employees

-Fire & Rescue

-Law Enforcement

RODs

Death

Mortality

Post-Retirement and Vested Termination:

| Group | Gender | Table | Set Back | Set Forward |
|-------------------------|--------|---------------------------|----------|-------------|
| General/Other Educators | Male | Pub-2010 General Retirees | | |

Adjustments:

| Age | Factor |
|-----|---------|
| All | 105.50% |

| Group | Gender | Table | Set Back | Set Forward |
|-------------------------|--------|---------------------------|----------|-------------|
| General/Other Educators | Female | Pub-2010 General Retirees | | |

Adjustments:

| Age | Factor |
|------|--------|
| < 76 | 95% |
| 76 | 96% |
| 77 | 97% |
| 78 | 98% |
| 79 | 99% |
| 80 | 100% |
| 81 | 101% |
| 82 | 102% |
| 83 | 103% |
| 84 | 104% |
| 85 | 105% |
| 86 | 106% |
| 87 | 107% |
| 88 | 108% |
| 89 | 109% |
| 90+ | 110% |

Post - Disablement

| Group | Gender | Table | Set Back | Set Forward |
|----------------------------|--------|------------------------------------|----------|-------------|
| Teachers/General/Other Edu | Male | Pub-2010 General Disabled Retirees | | 3 years |
| Teachers/General/Other Edu | Female | Pub-2010 General Disabled Retirees | 1 year | |

Contingent Annuitant

| Group | Gender | Table | Set Back | Set Forward |
|-------|--------|---|----------|-------------|
| All | Male | Pub-2010 Teachers Contingent Annuitant Below Median | | 3 years |
| All | Female | Pub-2010 Teachers Contingent Annuitant Below Median | | 1 year |

Pre-Retirement

| Group | Gender | Table | Set Back | Set Forward |
|----------------------------|-------------|----------------------------|----------|-------------|
| Teachers/General/Other Edu | Male/Female | Pub-2010 General Employees | | |

All mortality tables are benefits weighted

Summary of Assumptions

Plan
TSERS:
-Teachers
-General Employees
-Other Education
-Law Enforcement
CJRS
LRS
National Guard
DIPNC
FRSWPF
LGERS:
-General Employees
-Fire & Rescue
-Law Enforcement
RODs
Death

Sample Rates of:

Retirement

| Male | Service | | | | | | |
|------|---------|--------|--------|--------|--------|--------|--------|
| Age | 5 | 10 | 15 | 20 | 25 | 30 | 35 |
| 50 | | | | 3.0% | 4.0% | 60.0% | 60.0% |
| 55 | | | | 3.0% | 4.0% | 40.0% | 35.0% |
| 60 | 9.0% | 7.0% | 7.0% | 10.0% | 22.5% | 40.0% | 27.0% |
| 65 | 18.0% | 25.0% | 25.0% | 30.0% | 40.0% | 27.5% | 30.0% |
| 70 | 18.0% | 25.0% | 22.5% | 22.5% | 25.0% | 30.0% | 30.0% |
| 75 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |

| Female | Service | | | | | | |
|--------|---------|--------|--------|--------|--------|--------|--------|
| Age | 5 | 10 | 15 | 20 | 25 | 30 | 35 |
| 50 | | | | 3.5% | 4.0% | 40.0% | 40.0% |
| 55 | | | | 4.0% | 4.0% | 40.0% | 25.0% |
| 60 | 7.0% | 8.0% | 9.0% | 9.5% | 20.0% | 40.0% | 25.0% |
| 65 | 20.0% | 25.0% | 30.0% | 30.0% | 35.0% | 35.0% | 30.0% |
| 70 | 15.0% | 20.0% | 22.5% | 25.0% | 35.0% | 30.0% | 30.0% |
| 75 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |

Termination

| Service | Male | Female |
|---------|--------|--------|
| 0 | 9.00% | 9.00% |
| 1 | 17.00% | 17.50% |
| 2 | 15.00% | 15.75% |
| 3 | 12.50% | 14.00% |
| 4 | 11.00% | 11.50% |

After 5 years of membership in the system:

| Age | Male | Female |
|-----|--------|--------|
| 25 | 25.00% | 25.00% |
| 30 | 12.50% | 12.00% |
| 35 | 7.50% | 10.00% |
| 40 | 5.00% | 5.75% |
| 45 | 4.00% | 4.00% |
| 50 | 4.00% | 4.00% |
| 55 | 4.00% | 4.00% |
| 60 | 4.00% | 4.00% |

Summary of Assumptions

Plan

TSERS:

- Teachers
- General Employees

-Other Education

- Law Enforcement
- CJRS
- LRS
- National Guard
- DIPNC
- FRSWPF
- LGERS:
- General Employees
- Fire & Rescue
- Law Enforcement
- RODs
- Death

Sample Rates of:

Retirement

| Male | Service | | | | | | |
|------|---------|--------|--------|--------|--------|--------|--------|
| Age | 5 | 10 | 15 | 20 | 25 | 30 | 35 |
| 50 | | | | 3.5% | 4.5% | 50.0% | 50.0% |
| 55 | | | | 4.0% | 5.0% | 30.0% | 30.0% |
| 60 | 8.0% | 7.0% | 10.0% | 9.0% | 20.0% | 30.0% | 27.5% |
| 65 | 10.0% | 25.0% | 25.0% | 30.0% | 27.5% | 25.0% | 27.5% |
| 70 | 10.0% | 25.0% | 25.0% | 22.5% | 30.0% | 25.0% | 35.0% |
| 75 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |

| Female | Service | | | | | | |
|--------|---------|--------|--------|--------|--------|--------|--------|
| Age | 5 | 10 | 15 | 20 | 25 | 30 | 35 |
| 50 | | | | 4.5% | 4.5% | 40.0% | 50.0% |
| 55 | | | | 4.5% | 6.0% | 30.0% | 30.0% |
| 60 | 7.0% | 9.0% | 10.0% | 10.0% | 30.0% | 37.5% | 30.0% |
| 65 | 17.5% | 25.0% | 25.0% | 30.0% | 35.0% | 30.0% | 35.0% |
| 70 | 15.0% | 20.0% | 22.5% | 20.0% | 27.5% | 20.0% | 35.0% |
| 75 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |

Termination

| Service | Male | Female |
|---------|--------|--------|
| 0 | 9.00% | 7.00% |
| 1 | 19.00% | 17.50% |
| 2 | 17.00% | 15.50% |
| 3 | 13.00% | 12.50% |
| 4 | 11.00% | 10.75% |

After 5 years of membership in the system:

| Age | Male | Female |
|-----|--------|--------|
| 25 | 25.00% | 25.00% |
| 30 | 10.00% | 15.00% |
| 35 | 5.50% | 7.50% |
| 40 | 5.00% | 6.50% |
| 45 | 5.00% | 4.75% |
| 50 | 5.00% | 4.50% |
| 55 | 4.00% | 3.50% |
| 60 | 4.00% | 3.50% |

Summary of Assumptions

Plan

TSERS:

- Teachers
- General Employees
- Other Education

-Law Enforcement

- CJRS
- LRS
- National Guard
- DIPNC
- FRSWPF
- LGERS:
- General Employees
- Fire & Rescue
- Law Enforcement
- RODs
- Death

Mortality

Post-Retirement and Vested Termination:

| Group | Gender | Table | Set Back | Set Forward |
|-------|-------------|--------------------------|----------|-------------|
| LEO | Male/Female | Pub-2010 Safety Retirees | | 1 year |

Adjustments:

| Age | Factor |
|-----|--------|
| All | 97.00% |

We combined the experience of the TSERS LEOs, LGERS LEOs and LGERS Fire/Safety to come up with the public safety rates.

Post - Disablement

| Group | Gender | Table | Set Back | Set Forward |
|-------|-------------|------------------------------------|----------|-------------|
| LEO | Male/Female | Pub-2010 General Disabled Retirees | 3 years | |

Contingent Annuitant

| Group | Gender | Table | Set Back | Set Forward |
|-------|--------|---|----------|-------------|
| All | Male | Pub-2010 Teachers Contingent Annuitant Below Median | | 3 years |
| All | Female | Pub-2010 Teachers Contingent Annuitant Below Median | | 1 year |

Pre-Retirement

| Group | Gender | Table | Set Back | Set Forward |
|-------|-------------|---------------------------|----------|-------------|
| LEO | Male/Female | Pub-2010 Safety Employees | | |

All mortality tables are benefits weighted

Summary of Assumptions

Plan

TSERS:

- Teachers
- General Employees
- Other Education

-Law Enforcement

- CJRS
- LRS
- National Guard
- DIPNC
- FRSWPF
- LGERS:
- General Employees
- Fire & Rescue
- Law Enforcement
- RODs
- Death

Sample Rates of:

Retirement

| Age | Service | | | | | | |
|-----|---------|--------|--------|--------|--------|--------|--------|
| | 5 | 10 | 15 | 20 | 25 | 30 | 35 |
| 50 | | | 4.0% | 5.0% | 5.0% | 90.0% | 80.0% |
| 55 | 20.0% | 20.0% | 35.0% | 35.0% | 50.0% | 90.0% | 65.0% |
| 60 | 10.0% | 20.0% | 12.5% | 25.0% | 25.0% | 50.0% | 50.0% |
| 65 | 15.0% | 45.0% | 25.0% | 25.0% | 25.0% | 50.0% | 50.0% |
| 70 | 25.0% | 15.0% | 25.0% | 25.0% | 25.0% | 25.0% | 50.0% |
| 75 | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |

Termination

| Service | Rate |
|---------|-------|
| 0 | 3.50% |
| 1 | 9.25% |
| 2 | 9.25% |
| 3 | 9.50% |
| 4 | 8.00% |

After 5 years of membership in the system:

| Age | Rate |
|-----|-------|
| 25 | 7.50% |
| 30 | 7.50% |
| 35 | 3.50% |
| 40 | 2.50% |
| 45 | 2.00% |
| 50 | 2.00% |

Summary of Assumptions

Plan
TSERS:
-Teachers
-General Employees
-Other Education
-Law Enforcement

CJRS
LRS
National Guard
DIPNC
FRSWPF
LGERS:
-General Employees
-Fire & Rescue
-Law Enforcement
RODs
Death

Sample Rates for: Salary Merit Scale

| Service | Teachers | General | Other Educators | LEO |
|---------|----------|---------|-----------------|-------|
| 0 | 4.05% | 3.00% | 4.25% | 4.80% |
| 5 | 2.87% | 1.80% | 2.65% | 3.10% |
| 10 | 2.04% | 1.10% | 1.85% | 2.00% |
| 15 | 1.13% | 0.60% | 1.33% | 0.80% |
| 20 | 0.00% | 0.50% | 0.83% | 0.80% |
| 25 | 0.00% | 0.40% | 0.33% | 0.80% |
| 30 | 0.00% | 0.00% | 0.00% | 0.40% |
| >=35 | 0.00% | 0.00% | 0.00% | 0.00% |

Summary of Assumptions

Plan

TSERS:

- Teachers
- General Employees
- Other Education
- Law Enforcement

CJRS

LRS

National Guard

DIPNC

FRSWPF

LGERS:

- General Employees
- Fire & Rescue
- Law Enforcement
- RODs
- Death

Mortality

Post-Retirement and Vested Termination:

| Group | Gender | Table | Set Back | Set Forward |
|-------|-------------|--|----------|-------------|
| | Male/Female | Pub-2010 General Retirees Above Median | | |

Post - Disablement

| Group | Gender | Table | Set Back | Set Forward |
|-------|-------------|------------------------------------|----------|-------------|
| | Male/Female | Pub-2010 General Disabled Retirees | | |

Contingent Annuitant

| Group | Gender | Table | Set Back | Set Forward |
|-------|-------------|---------------------------------------|----------|-------------|
| | Male/Female | Pub-2010 General Contingent Annuitant | | |

Pre-Retirement

| Group | Gender | Table | Set Back | Set Forward |
|-------|-------------|----------------------------|----------|-------------|
| | Male/Female | Pub-2010 General Employees | | |

All mortality tables are benefits weighted

Summary of Assumptions

Plan

TSERS:

- Teachers
- General Employees
- Other Education
- Law Enforcement

CJRS

- LRS
- National Guard
- DIPNC
- FRSWPF
- LGERS:
- General Employees
- Fire & Rescue
- Law Enforcement
- RODs
- Death

Sample Rates of:

Retirement

| Age | Service | | | | | |
|-----|---------|------|------|------|------|------|
| | 5 | 10 | 15 | 20 | 24 | 25+ |
| 50 | 2% | 2% | 2% | 2% | 15% | 9% |
| 55 | 2% | 2% | 2% | 2% | 5% | 9% |
| 60 | 4% | 4% | 4% | 4% | 20% | 17% |
| 65 | 12% | 12% | 12% | 12% | 12% | 12% |
| 70 | 25% | 25% | 25% | 25% | 25% | 25% |
| 72 | 100% | 100% | 100% | 100% | 100% | 100% |

Salary Merit Scale

| Service | Rates |
|---------|-------|
| 0 | 1.50% |
| 5 | 1.00% |
| 10 | 0.50% |
| >=15 | 0.00% |

Termination

| Age | Rate |
|-----|-------|
| 20 | 2.00% |
| 25 | 2.00% |
| 30 | 2.00% |
| 35 | 2.00% |
| 40 | 2.00% |
| 45 | 2.00% |
| 50 | 2.00% |
| 55 | 2.00% |
| 60 | 2.00% |
| 65 | 2.00% |
| 70 | 2.00% |

Disability

| Age | Rate |
|-----|--------|
| 25 | 0.002% |
| 30 | 0.003% |
| 35 | 0.008% |
| 40 | 0.017% |
| 45 | 0.035% |
| 50 | 0.059% |
| 55 | 0.119% |
| 60 | 0.192% |

Summary of Assumptions

Plan

TSERS:

- Teachers
- General Employees
- Other Education
- Law Enforcement
- CJRS

LRS

- National Guard
- DIPNC
- FRSWPF
- LGERS:
- General Employees
- Fire & Rescue
- Law Enforcement
- RODs
- Death

Mortality

Post-Retirement and Vested Termination:

| Group | Gender | Table | Set Back | Set Forward |
|-------|-------------|--|----------|-------------|
| | Male/Female | Pub-2010 General Retirees Above Median | | |

Post - Disablement

| Group | Gender | Table | Set Back | Set Forward |
|-------|-------------|------------------------------------|----------|-------------|
| | Male/Female | Pub-2010 General Disabled Retirees | | |

Contingent Annuitant

| Group | Gender | Table | Set Back | Set Forward |
|-------|-------------|---------------------------------------|----------|-------------|
| | Male/Female | Pub-2010 General Contingent Annuitant | | |

Pre-Retirement

| Group | Gender | Table | Set Back | Set Forward |
|-------|-------------|----------------------------|----------|-------------|
| | Male/Female | Pub-2010 General Employees | | |

All mortality tables are benefits weighted

Summary of Assumptions

Plan

TSERS:

- Teachers
- General Employees
- Other Education
- Law Enforcement
- CJRS

LRS

- National Guard
- DIPNC
- FRSWPF
- LGERS:
- General Employees
- Fire & Rescue
- Law Enforcement
- RODs
- Death

Sample Rates of:

Retirement

| Age | Rate |
|-----|------|
| 60 | 10% |
| 65 | 10% |
| 70 | 13% |
| 75 | 15% |
| 80 | 100% |

Termination

| Age | Rate |
|-----|------|
| 25 | 10% |
| 30 | 10% |
| 35 | 10% |
| 40 | 10% |
| 45 | 10% |
| 50 | 10% |
| 55 | 10% |
| 60 | 10% |
| 65 | 10% |
| 70 | 10% |
| 75+ | 10% |

Disability

| Age | Rate |
|-----|-------|
| 25 | 0.01% |
| 30 | 0.04% |
| 35 | 0.10% |
| 40 | 0.29% |
| 45 | 0.49% |
| 50 | 0.84% |
| 55 | 1.44% |
| 60 | 0.00% |

Summary of Assumptions

Plan

TSERS:

- Teachers
- General Employees
- Other Education
- Law Enforcement
- CJRS
- LRS

National Guard

- DIPNC
- FRSWPF
- LGERS:
- General Employees
- Fire & Rescue
- Law Enforcement
- RODs
- Death

Mortality

Post-Retirement and Vested Termination:

| Group | Gender | Table | Set Back | Set Forward |
|-------|--------|---------------------------|----------|-------------|
| | Male | Pub-2010 General Retirees | | |

Adjustments:

| Age | Factor |
|-----|---------|
| All | 105.50% |

| Group | Gender | Table | Set Back | Set Forward |
|-------|--------|---------------------------|----------|-------------|
| | Female | Pub-2010 General Retirees | | |

Adjustments:

| Age | Factor |
|------|--------|
| < 76 | 95% |
| 76 | 96% |
| 77 | 97% |
| 78 | 98% |
| 79 | 99% |
| 80 | 100% |
| 81 | 101% |
| 82 | 102% |
| 83 | 103% |
| 84 | 104% |
| 85 | 105% |
| 86 | 106% |
| 87 | 107% |
| 88 | 108% |
| 89 | 109% |
| 90+ | 110% |

Post - Disablement

No disabled mortality rates in this plan

Contingent Annuitant

| Group | Gender | Table | Set Back | Set Forward |
|-------|--------|---|----------|-------------|
| | Male | Pub-2010 Teachers Contingent Annuitant Below Median | | 3 years |
| | Female | Pub-2010 Teachers Contingent Annuitant Below Median | | 1 year |

Pre-Retirement

| Group | Gender | Table | Set Back | Set Forward |
|-------|-------------|----------------------------|----------|-------------|
| | Male/Female | Pub-2010 General Employees | | |

All mortality tables are benefits weighted

Summary of Assumptions

Plan

TSERS:

- Teachers
- General Employees
- Other Education
- Law Enforcement
- CJRS
- LRS

National Guard

- DIPNC
- FRSWPF
- LGERS:
- General Employees
- Fire & Rescue
- Law Enforcement
- RODs
- Death

Sample Rates of:

Retirement

| Age | Rate |
|-----|------|
| 50 | 15% |
| 55 | 25% |
| 60 | 50% |
| 65 | 100% |

Termination

| Service | Rate |
|-------------|-------|
| 7-9 years | 17.5% |
| 10-14 years | 11.0% |
| 15-19 years | 11.0% |
| 20+ years | 15.0% |

Summary of Assumptions

Plan

TSERS:

- Teachers
- General Employees
- Other Education
- Law Enforcement
- CJRS
- LRS
- National Guard

DIPNC

FRSWPF

LGERS:

- General Employees
- Fire & Rescue
- Law Enforcement
- RODs
- Death

DIPNC - uses all of the assumptions from TSERS except for Disability

Sample Rates of Disability:

| Age | Male | Female |
|-----|---------|---------|
| 25 | 0.00018 | 0.00014 |
| 30 | 0.00029 | 0.00064 |
| 35 | 0.00059 | 0.00072 |
| 40 | 0.00084 | 0.00120 |
| 45 | 0.00123 | 0.00176 |
| 50 | 0.00230 | 0.00256 |
| 55 | 0.00230 | 0.00336 |
| 60 | 0.00346 | 0.00336 |

Summary of Assumptions

Plan

TSERS:
 -Teachers
 -General Employees
 -Other Education
 -Law Enforcement
 CJRS
 LRS
 National Guard
 DIPNC

FRSWPF

LGERS:
 -General Employees
 -Fire & Rescue
 -Law Enforcement
 RODs
 Death

Mortality

Post-Retirement and Vested Termination:

| Group | Gender | Table | Set Back | Set Forward |
|-------|-------------|--------------------------|----------|-------------|
| | Male/Female | Pub-2010 Safety Retirees | | 1 year |

Adjustments:

| Ages | Factor |
|------|--------|
| All | 97.00% |

We combined the experience of the TSERS LEOs, LGERS LEOs and LGERS Fire/Safety to come up with the public safety rates.

Post - Disablement

| Group | Gender | Table | Set Back | Set Forward |
|-------|-------------|------------------------------------|----------|-------------|
| | Male/Female | Pub-2010 General Disabled Retirees | 3 years | |

Contingent Annuitant

| Group | Gender | Table | Set Back | Set Forward |
|-------|--------|---|----------|-------------|
| | Male | Pub-2010 Teachers Contingent Annuitant Below Median | | 3 years |
| | Female | Pub-2010 Teachers Contingent Annuitant Below Median | | 1 year |

Pre-Retirement

| Group | Gender | Table | Set Back | Set Forward |
|-------|-------------|---------------------------|----------|-------------|
| | Male/Female | Pub-2010 Safety Employees | | |

All mortality tables are benefits weighted

Summary of Assumptions

Plan

TSERS:

- Teachers
- General Employees
- Other Education
- Law Enforcement
- CJRS
- LRS
- National Guard
- DIPNC

FRSWPF

LGERS:

- General Employees
- Fire & Rescue
- Law Enforcement
- RODs
- Death

Sample Rates of:

Retirement

| Age | Service | |
|-----|---------|-----|
| | 20 | 21+ |
| 55 | 85% | 85% |
| 56+ | 75% | 60% |

Termination

| Age | Service | | |
|------|---------|-------|------|
| | < 5 | 5-19 | 20+ |
| < 55 | 3.00% | 1.50% | 100% |
| 55 | 10.00% | 7.50% | 100% |

Disability

| Age | Rate |
|-----|--------|
| 25 | 0.050% |
| 30 | 0.050% |
| 35 | 0.080% |
| 40 | 0.180% |
| 45 | 0.210% |
| 50 | 0.300% |
| 55 | 0.360% |
| 60 | 0.610% |

Summary of Assumptions

Plan

TSERS:

- Teachers
- General Employees
- Other Education
- Law Enforcement
- CJRS
- LRS
- National Guard
- DIPNC
- FRSWPF

LGERS:

-General Employees

- Fire & Rescue
- Law Enforcement
- RODs
- Death

Mortality

Post-Retirement and Vested Termination:

| Group | Gender | Table | Set Back | Set Forward |
|---------|--------|---------------------------|----------|-------------|
| General | Male | Pub-2010 General Retirees | | 2 years |

| | | |
|--------------|------|---------|
| Adjustments: | Age | Factor |
| | < 81 | 96.00% |
| | 81 | 96.80% |
| | 82 | 97.60% |
| | 83 | 98.40% |
| | 84 | 99.20% |
| | 85 + | 100.00% |

| Group | Gender | Table | Set Back | Set Forward |
|---------|--------|---------------------------|----------|-------------|
| General | Female | Pub-2010 General Retirees | | |

| | | |
|--------------|------|---------|
| Adjustments: | Age | Factor |
| | < 92 | 100.00% |
| | 92 | 102.50% |
| | 93 | 105.00% |
| | 94 | 107.50% |
| | 95 + | 110.00% |

Post - Disablement

| Group | Gender | Table | Set Back | Set Forward |
|---------|--------|------------------------------------|----------|-------------|
| General | Male | Pub-2010 General Disabled Retirees | | 3 years |
| General | Female | Pub-2010 General Disabled Retirees | 1 year | |

Contingent Annuitant

| Group | Gender | Table | Set Back | Set Forward |
|-----------------|--------|---|----------|-------------|
| General/LEO/FRW | Male | Pub-2010 Teachers Contingent Annuitant Below Median | | 3 years |
| General/LEO/FRW | Female | Pub-2010 Teachers Contingent Annuitant Below Median | | 1 year |

Pre-Retirement

| Group | Gender | Table | Set Back | Set Forward |
|---------|-------------|----------------------------|----------|-------------|
| General | Male/Female | Pub-2010 General Employees | | |

All mortality tables are benefits weighted

Summary of Assumptions

Plan

TSERS:

-Teachers
-General Employees
-Other Education
-Law Enforcement
CJRS
LRS
National Guard
DIPNC
FRSWPF

LGERS:

-General Employees

-Fire & Rescue
-Law Enforcement
RODs
Death

Sample Rates of:

Retirement

| Male | Service | | | | | | |
|------|---------|--------|--------|--------|--------|--------|--------|
| Age | 5 | 10 | 15 | 20 | 25 | 30 | 35 |
| 50 | | | | 3.0% | 5.5% | 40.0% | 40.0% |
| 55 | | | | 3.0% | 5.5% | 35.0% | 25.0% |
| 60 | 8.0% | 7.0% | 7.0% | 7.5% | 20.0% | 40.0% | 22.5% |
| 65 | 25.0% | 25.0% | 27.5% | 32.5% | 30.0% | 35.0% | 30.0% |
| 70 | 20.0% | 25.0% | 20.0% | 27.5% | 30.0% | 35.0% | 30.0% |
| 75 | 25.0% | 20.0% | 30.0% | 27.5% | 30.0% | 35.0% | 30.0% |
| 80+ | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |

| Female | Service | | | | | | |
|--------|---------|--------|--------|--------|--------|--------|--------|
| Age | 5 | 10 | 15 | 20 | 25 | 30 | 35 |
| 50 | | | | 3.5% | 5.0% | 40.0% | 45.0% |
| 55 | | | | 5.0% | 5.5% | 30.0% | 30.0% |
| 60 | 8.0% | 9.0% | 7.0% | 10.0% | 25.0% | 37.5% | 25.0% |
| 65 | 25.0% | 25.0% | 35.0% | 35.0% | 35.0% | 35.0% | 30.0% |
| 70 | 20.0% | 25.0% | 22.5% | 30.0% | 20.0% | 30.0% | 25.0% |
| 75 | 20.0% | 20.0% | 22.5% | 30.0% | 20.0% | 25.0% | 25.0% |
| 80+ | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |

Termination

| Service | Male | Female |
|---------|--------|--------|
| 0 | 11.00% | 11.00% |
| 1 | 17.50% | 17.50% |
| 2 | 15.00% | 15.50% |
| 3 | 12.50% | 13.00% |
| 4 | 10.50% | 11.50% |

After 5 years of membership in the system:

| Age | Male | Female |
|-----|--------|--------|
| 25 | 12.00% | 17.50% |
| 30 | 7.50% | 11.00% |
| 35 | 5.50% | 9.00% |
| 40 | 5.50% | 7.00% |
| 45 | 4.25% | 5.00% |
| 50 | 4.25% | 4.50% |
| 55 | 4.25% | 4.50% |
| 60 | 4.25% | 4.50% |

Disability

| Age | Male | Female |
|-----|-------|--------|
| 25 | 0.04% | 0.05% |
| 30 | 0.05% | 0.05% |
| 35 | 0.05% | 0.05% |
| 40 | 0.10% | 0.05% |
| 45 | 0.20% | 0.15% |
| 50 | 0.30% | 0.30% |
| 55 | 0.50% | 0.45% |
| 60 | 0.65% | 0.45% |

Summary of Assumptions

Plan

TSERS:
-Teachers
-General Employees
-Other Education
-Law Enforcement
CJRS
LRS
National Guard
DIPNC
FRSWPF

LGERS:

-General Employees
-Fire & Rescue
-Law Enforcement
RODs
Death

Mortality

Post-Retirement and Vested Termination:

| Group | Gender | Table | Set Back | Set Forward |
|---------|-------------|--------------------------|----------|-------------|
| LEO/FRW | Male/Female | Pub-2010 Safety Retirees | | 1 year |

Adjustments:

| Age | Factor |
|-----|--------|
| All | 97.00% |

We combined the experience of the TSERS LEOs, LGERS LEOs and LGERS Fire/Safety to come up with the public safety rates.

Post - Disablement

| Group | Gender | Table | Set Back | Set Forward |
|---------|-------------|------------------------------------|----------|-------------|
| LEO/FRW | Male/Female | Pub-2010 General Disabled Retirees | 3 years | |

Contingent Annuitant

| Group | Gender | Table | Set Back | Set Forward |
|-----------------|--------|---|----------|-------------|
| General/LEO/FRW | Male | Pub-2010 Teachers Contingent Annuitant Below Median | | 3 years |
| General/LEO/FRW | Female | Pub-2010 Teachers Contingent Annuitant Below Median | | 1 year |

Pre-Retirement

| Group | Gender | Table | Set Back | Set Forward |
|---------|-------------|---------------------------|----------|-------------|
| LEO/FRW | Male/Female | Pub-2010 Safety Employees | | |

All mortality tables are benefits weighted

Summary of Assumptions

Plan

TSERS:

- Teachers
- General Employees
- Other Education
- Law Enforcement
- CJRS
- LRS
- National Guard
- DIPNC
- FRSWPF

LGERS:

- General Employees

-Fire & Rescue

- Law Enforcement
- RODs
- Death

Sample Rates of:

Retirement

| Age | Service | | | | | | |
|-----|---------|---------|---------|---------|---------|---------|---------|
| | 5 | 10 | 15 | 20 | 25 | 30 | 35 |
| 50 | | | | 3.25% | 4.25% | 55.00% | 50.00% |
| 55 | 12.00% | 5.75% | 5.75% | 3.25% | 4.25% | 55.00% | 40.00% |
| 60 | 10.00% | 5.75% | 5.75% | 12.50% | 35.00% | 60.00% | 40.00% |
| 65 | 10.00% | 25.00% | 25.00% | 25.00% | 35.00% | 50.00% | 32.50% |
| 70 | 32.00% | 25.00% | 25.00% | 25.00% | 35.00% | 50.00% | 32.50% |
| 75+ | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% | 100.00% |

Termination

| Service | Rate |
|---------|--------|
| 0 | 7.50% |
| 1 | 12.50% |
| 2 | 11.00% |
| 3 | 10.00% |
| 4 | 10.00% |

Disability

| Age | Male | Female |
|-----|-------|--------|
| 25 | 0.06% | 0.06% |
| 30 | 0.10% | 0.09% |
| 35 | 0.07% | 0.24% |
| 40 | 0.40% | 0.38% |
| 45 | 0.40% | 0.48% |
| 50 | 0.80% | 0.76% |
| 55 | 1.20% | 1.76% |
| 60 | 1.50% | 2.76% |

After 5 years of membership in the system:

| Age | Rate |
|-----|-------|
| 25 | 7.00% |
| 30 | 7.00% |
| 35 | 5.00% |
| 40 | 4.00% |
| 45 | 3.50% |
| 50 | 5.00% |
| 55 | 5.00% |

Summary of Assumptions

Plan

TSERS:

- Teachers
- General Employees
- Other Education
- Law Enforcement
- CJRS
- LRS
- National Guard
- DIPNC
- FRSWPF

LGERS:

- General Employees
- Fire & Rescue

-Law Enforcement

- RODs
- Death

Sample Rates of:

Retirement

| Age | Service | | | | | | |
|-----|---------|--------|--------|--------|--------|--------|--------|
| | 5 | 10 | 15 | 20 | 25 | 30 | 35 |
| 50 | | | 4.0% | 3.3% | 3.0% | 90.0% | 82.5% |
| 55 | 17.5% | 22.5% | 30.0% | 37.5% | 55.0% | 90.0% | 50.0% |
| 60 | 17.5% | 15.0% | 12.5% | 25.0% | 25.0% | 35.0% | 25.0% |
| 65 | 35.0% | 20.0% | 25.0% | 25.0% | 25.0% | 35.0% | 30.0% |
| 70 | 15.0% | 35.0% | 40.0% | 25.0% | 40.0% | 35.0% | 27.5% |
| 75+ | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |

Termination

| Service | Rate |
|---------|-------|
| 0 | 9.00% |
| 1 | 8.75% |
| 2 | 9.00% |
| 3 | 9.25% |
| 4 | 7.25% |

Disability

| Age | Male | Female |
|-----|-------|--------|
| 25 | 0.06% | 0.25% |
| 30 | 0.10% | 0.30% |
| 35 | 0.20% | 0.40% |
| 40 | 0.30% | 0.50% |
| 45 | 0.40% | 0.60% |
| 50 | 0.40% | 0.70% |
| 55 | 0.40% | 0.70% |
| 60 | 0.40% | 0.70% |

After 5 years of membership in the system:

| Age | Rate |
|-----|--------|
| 25 | 10.00% |
| 30 | 6.00% |
| 35 | 6.00% |
| 40 | 4.00% |
| 45 | 3.00% |
| 50 | 4.50% |
| 55 | 0.00% |

Summary of Assumptions

Plan

TSERS:

- Teachers
- General Employees
- Other Education
- Law Enforcement
- CJRS
- LRS
- National Guard
- DIPNC
- FRSWPF

LGERS:

- General Employees
- Fire & Rescue
- Law Enforcement

RODs
Death

Sample Rates for:

Salary Merit Scale

| Service | General | LEO | FRW |
|---------|---------|-------|-------|
| 0 | 5.00% | 4.50% | 4.75% |
| 5 | 2.70% | 2.60% | 2.65% |
| 10 | 1.73% | 1.81% | 1.68% |
| 15 | 1.08% | 1.36% | 1.03% |
| 20 | 0.69% | 1.10% | 0.64% |
| 25 | 0.55% | 0.85% | 0.50% |
| 30 | 0.55% | 0.60% | 0.50% |
| 35 | 0.00% | 0.35% | 0.50% |
| >=40 | 0.00% | 0.00% | 0.00% |

Summary of Assumptions

Plan

TSERS:

- Teachers
- General Employees
- Other Education
- Law Enforcement
- CJRS

LRS

National Guard

DIPNC

FRSWPF

LGERS:

- General Employees
- Fire & Rescue
- Law Enforcement

RODs

Death

Mortality

Post-Retirement and Vested Termination:

| Group | Gender | Table | Set Back | Set Forward |
|-------|--------|---------------------------|----------|-------------|
| | Male | Pub-2010 General Retirees | | 2 years |

| Adjustments: | Age | Factor |
|--------------|------|---------|
| | < 81 | 96.00% |
| | 81 | 96.80% |
| | 82 | 97.60% |
| | 83 | 98.40% |
| | 84 | 99.20% |
| | 85 + | 100.00% |

| Group | Gender | Table | Set Back | Set Forward |
|-------|--------|---------------------------|----------|-------------|
| | Female | Pub-2010 General Retirees | | |

| Adjustments: | Age | Factor |
|--------------|------|---------|
| | < 92 | 100.00% |
| | 92 | 102.50% |
| | 93 | 105.00% |
| | 94 | 107.50% |
| | 95 + | 110.00% |

Post-Disablement

| Group | Gender | Table | Set Back | Set Forward |
|-------|--------|------------------------------------|----------|-------------|
| | Male | Pub-2010 General Disabled Retirees | | 3 years |
| | Female | Pub-2010 General Disabled Retirees | 1 year | |

Contingent Annuitant

| Group | Gender | Table | Set Back | Set Forward |
|-------|--------|---|----------|-------------|
| | Male | Pub-2010 Teachers Contingent Annuitant Below Median | | 3 years |
| | Female | Pub-2010 Teachers Contingent Annuitant Below Median | | 1 year |

Pre-Retirement

| Group | Gender | Table | Set Back | Set Forward |
|-------|-------------|----------------------------|----------|-------------|
| | Male/Female | Pub-2010 General Employees | | |

All mortality tables are benefits weighted

Summary of Assumptions

Plan

TSERS:

- Teachers
- General Employees
- Other Education
- Law Enforcement
- CJRS
- LRS
- National Guard
- DIPNC
- FRSWPF
- LGERS:
- General Employees
- Fire & Rescue
- Law Enforcement

RODs

Death

Sample Rates of:

Retirement

| Male | Service | | | | | | |
|------|---------|--------|--------|--------|--------|--------|--------|
| Age | 5 | 10 | 15 | 20 | 25 | 30 | 35 |
| 50 | | | | 3.0% | 5.5% | 40.0% | 40.0% |
| 55 | | | | 3.0% | 5.5% | 35.0% | 25.0% |
| 60 | 8.0% | 7.0% | 7.0% | 7.5% | 20.0% | 40.0% | 22.5% |
| 65 | 25.0% | 25.0% | 27.5% | 32.5% | 30.0% | 35.0% | 30.0% |
| 70 | 20.0% | 25.0% | 20.0% | 27.5% | 30.0% | 35.0% | 30.0% |
| 75 | 25.0% | 20.0% | 30.0% | 27.5% | 30.0% | 35.0% | 30.0% |
| 80+ | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |

| Female | Service | | | | | | |
|--------|---------|--------|--------|--------|--------|--------|--------|
| Age | 5 | 10 | 15 | 20 | 25 | 30 | 35 |
| 50 | | | | 3.5% | 5.0% | 40.0% | 45.0% |
| 55 | | | | 5.0% | 5.5% | 30.0% | 30.0% |
| 60 | 8.0% | 9.0% | 7.0% | 10.0% | 25.0% | 37.5% | 25.0% |
| 65 | 25.0% | 25.0% | 35.0% | 35.0% | 35.0% | 35.0% | 30.0% |
| 70 | 20.0% | 25.0% | 22.5% | 30.0% | 20.0% | 30.0% | 25.0% |
| 75 | 20.0% | 20.0% | 22.5% | 30.0% | 20.0% | 25.0% | 25.0% |
| 80+ | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |

Disability

| Age | Male | Female |
|-----|-------|--------|
| 25 | 0.04% | 0.05% |
| 30 | 0.05% | 0.05% |
| 35 | 0.05% | 0.05% |
| 40 | 0.10% | 0.05% |
| 45 | 0.20% | 0.15% |
| 50 | 0.30% | 0.30% |
| 55 | 0.50% | 0.45% |
| 60 | 0.65% | 0.45% |

Termination

| Service | Male | Female |
|---------|--------|--------|
| 0 | 11.00% | 11.00% |
| 1 | 17.50% | 17.50% |
| 2 | 15.00% | 15.50% |
| 3 | 12.50% | 13.00% |
| 4 | 10.50% | 11.50% |

After 5 years of membership in the system:

| Age | Male | Female |
|-----|--------|--------|
| 25 | 12.00% | 17.50% |
| 30 | 7.50% | 11.00% |
| 35 | 5.50% | 9.00% |
| 40 | 5.50% | 7.00% |
| 45 | 4.25% | 5.00% |
| 50 | 4.25% | 4.50% |
| 55 | 4.25% | 4.50% |
| 60 | 4.25% | 4.50% |

Salary Merit Scale

| Service | Rate |
|---------|-------|
| 0 | 5.00% |
| 5 | 2.70% |
| 10 | 1.73% |
| 15 | 1.08% |
| 20 | 0.69% |
| 25 | 0.55% |
| 30 | 0.55% |
| 35 | 0.00% |
| >=40 | 0.00% |

Summary of Assumptions

Plan

TSERS:

-Teachers

-General Employees

-Other Education

-Law Enforcement

CJRS

LRS

National Guard

DIPNC

FRSWPF

LGERS:

-General Employees

-Fire & Rescue

-Law Enforcement

RODs

Death

The Death Benefits Plan uses the assumptions from the underlying plans



North Carolina
Total Retirement Plans

Other Demographic Assumptions: DIPNC



- Disability Claim Termination: the 2012 GLTD table is still the most recent table available. We recommend no change in the current assumption.
- Social Security Disability Approval Rates: recommend no change to the current assumptions due to lack of credible data. We will revisit this assumption at the next experience study.
- Disability Offsets: recommend no change to the current assumptions.



Funding Methodology Administrative Expenses



- An amount is added to the Normal Cost Rate to take into consideration the administrative expenses paid by the plans each year.
- CMC looked at actual administrative expenses paid by each plan over the last five years, compared this to the current assumption and reviewed with staff.
- Based on this analysis we recommend the following administrative expense assumptions:
 - TSERS: we recommend no change to the current assumption of 0.10% of payroll
 - LGERS: we recommend a change from 0.20% of payroll to 0.13% of payroll
 - CJRS: we recommend a change from 0.75% of normal cost to 0.05% of payroll
 - LRS: we recommend no change to the current assumption of 1.00% of payroll
 - RoDS: we recommend a change from 0.15% of MVA to 0.40% of payroll
 - National Guard: we recommend a change from prior year actual expenses to \$150,000 per year
 - Fire & Rescue: we recommend no change to the current assumption of prior year actual expenses
 - DIPNC: we recommend no change to the current assumption of 0.01% of payroll



Summary of Assumptions

| | Retirement | | | | | | | | Termination | | Disability | | |
|-----|------------|--------|--------|--------|--------|--------|--------|---|-------------|------|------------|-------|--------|
| | Service | | | | | | | | Service | Rate | Age | Male | Female |
| 50 | | | 4.0% | 3.5% | 3.0% | 90.0% | 82.5% | 0 | 9.00% | | 25 | 0.06% | 0.25% |
| 55 | 15.0% | 22.5% | 30.0% | 35.0% | 60.0% | 90.0% | 50.0% | 1 | 8.75% | | 30 | 0.10% | 0.30% |
| 60 | 15.0% | 15.0% | 12.5% | 25.0% | 32.5% | 95.0% | 25.0% | 2 | 9.00% | | 35 | 0.20% | 0.40% |
| 65 | 17.5% | 20.0% | 25.0% | 25.0% | 37.5% | 35.0% | 30.0% | 3 | 9.25% | | 40 | 0.30% | 0.50% |
| 70 | 17.5% | 30.0% | 35.0% | 20.0% | 37.5% | 35.0% | 27.5% | 4 | 7.25% | | 45 | 0.40% | 0.60% |
| 75+ | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% | | | | 50 | 0.40% | 0.70% |
| | | | | | | | | | | | 55 | 0.40% | 0.70% |
| | | | | | | | | | | | 60 | 0.40% | 0.70% |

| After 5 years of membership in the system: | |
|--|--------|
| Age | Rate |
| 25 | 10.00% |
| 30 | 6.00% |
| 35 | 6.00% |
| 40 | 4.00% |
| 45 | 3.00% |
| 50 | 4.50% |
| 55 | 0.00% |