State Employees' Retirement System of Illinois

2021 Actuarial Experience Study

July 1, 2018 — June 30, 2021

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July 15, 2022

Board of Trustees
State Employees' Retirement System
2101 South Veterans Parkway
Springfield, Illinois 62794-9255

Subject: 2021 Actuarial Experience Study

Dear Members of the Board:

We are pleased to present our report on the results of the 2021 Actuarial Experience Study for the State Employees' Retirement System of Illinois ("SERS" or "System"). The purpose of the study is to evaluate the continued appropriateness of the actuarial assumptions used in the annual actuarial valuation by comparing actual experience to expected experience. Our study was primarily based on census information for the period from July 1, 2018, to June 30, 2021, as provided by SERS staff and used for recent actuarial valuations. The recommended salary increase assumption was based on experience from July 1, 2015, to June 30, 2021, to reflect member pay freezes in 2015 through 2019, and the subsequent retroactive pay increases as of June 30, 2021. The recommended mortality table assumption was based on experience from July 1, 2015, to June 30, 2020, in order to improve credibility and remove extraordinary mortality experience in 2021 due to the effects of Covid-19. This report includes our recommended assumptions and methods effective for the June 30, 2022, actuarial valuation. It also provides the actuarial impact produced by these recommendations as though they had been effective for the June 30, 2021, actuarial valuation.

Pursuant to Public Act 99-0232, effective August 3, 2015, the five state systems shall conduct an actuarial experience study at least once every three years.

Our study includes a review of the experience associated with the following actuarial assumptions:

- Price inflation;
- Investment return;
- General wage inflation and payroll growth;
- Salary increases;
- Mortality;
- Retirement;
- Withdrawal (Turnover);
- Accelerated pension benefit payment program election;
- Deferred Vested member benefit adjustment; and
- Unused sick leave and optional service purchase adjustment.

Actuarial assumptions are set by the Board of Trustees. With the Board's approval of the recommendations in this report, we believe the actuarial condition of the System will be more accurately portrayed. The Board's decisions should be based on the appropriateness of each recommendation individually, not on their collective effect on the funding period or the unfunded liability.

This report should not be relied on for any purpose other than the purpose stated. This report may be provided to parties other than SERS only in its entirety and only with the permission of SERS. GRS is not responsible for unauthorized use of this report.

The results of the experience study and recommended assumptions set forth in this report are based on the data and actuarial techniques and methods previously described, and upon the provisions of the System as of the most recent actuarial valuation date, June 30, 2021. To the best of our knowledge, the information contained in this report is accurate and fairly presents the experience of members participating in the System for the period July 1, 2018, to June 30, 2021, as adjusted for the salary and mortality experience periods. All calculations have been made in conformity with generally accepted actuarial principles and practices, and with the Actuarial Standards of Practice issued by the Actuarial Standards Board.

This report was prepared using our proprietary valuation model and related software which, in our professional judgment, has the capability to provide results that are consistent with the purposes of the valuation, and has no material limitations or known weaknesses. We performed tests to ensure that the model reasonably represents that which is intended to be modeled.

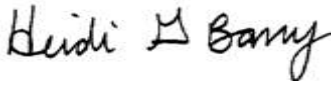
Alex Rivera, Heidi G. Barry, and Jeffrey T. Tebeau are Members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein.

The signing actuaries are independent of the plan sponsor.

We believe that the proposed actuarial assumptions that are the result of this experience study represent a reasonable estimate of expected future experience of the State Employees' Retirement System of Illinois.

Respectfully submitted,
Gabriel, Roeder, Smith & Company

Alex Rivera, F.S.A., E.A., M.A.A.A., F.C.A.
Senior Consultant



Heidi G. Barry, A.S.A., M.A.A.A., F.C.A.
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SECTION A

EXECUTIVE SUMMARY

Executive Summary

The results of the three-year experience review of the State Employees' Retirement System of Illinois are presented in this report. Public Act 99-0232 requires an experience review once every three years.

The last comparable experience review was prepared for the period from July 1, 2015, to June 30, 2018. In this report, actual experience is compared to expected experience for the three-year period from July 1, 2018, to June 30, 2021, in order to evaluate and update the actuarial assumptions used for the most recent actuarial valuation as of June 30, 2021. Due to extraordinary salary and mortality experience from July 1, 2018, to June 30, 2021, the experience period was adjusted for these two assumptions. The recommended salary increase assumption was based on experience from July 1, 2015, to June 30, 2021, to reflect member pay freezes in 2015 through 2019, and the subsequent retroactive pay increases as of June 30, 2021. The recommended mortality table assumption was based on experience from July 1, 2015, to June 30, 2020, in order to improve credibility and remove extraordinary mortality experience in 2021 due to the effects of Covid-19. The cost impact of the updated assumptions was measured as of June 30, 2021. The updated actuarial assumptions are effective beginning with the actuarial valuation as of June 30, 2022.

Based on our review of the actuarial experience, we recommend the following updates to the principal actuarial valuation assumptions:

- Maintain the assumed investment return assumption of 6.75 percent.
- Maintain the price inflation assumption of 2.25 percent.
- Maintain general payroll growth assumption of 2.75 percent.
- Update the salary increase assumption to better reflect observed experience
- Update the mortality tables to the Pub 2010 Below-Median Income General Healthy Retiree and Employee Mortality Tables for members covered under the Regular Benefit formula, and the Pub 2010 Below-Median Income Public Safety Healthy Retiree and Employee Mortality Tables for members covered under the Alternative Benefit formula, with adjustments for the Plan's credibility factors and future mortality improvements using Scale MP-2021.
- Slightly decrease normal retirement rates and early retirement rates.
- Slightly increase termination rates for members eligible for Tier 1 benefits and Tier 2 regular benefits. Slightly decrease termination rates for members eligible for Tier 2 alternative benefits.
- Update the COLA Buyout election assumption from 40 percent to 42 percent for Alternative members not covered by Social Security, and from 35 to 38 percent for Alternative members covered by Social Security.

Based on the preceding recommended assumptions, the actuarial liability as of June 30, 2021, and the fiscal year 2023 statutory contributions, are expected to change as follows:

Actuarial Valuation as of June 30, 2021 ($ in millions)	Actuarial Liability as of June 30, 2021		Fiscal Year 2023 Statutory Contribution	
Baseline	$ 51,828		$ 2,485	
Impact due to:				
• Mortality Table Changes	(537)	-1.0%	(17)	-0.7%
• Other Demographic Assumption Changes	(330)	-0.6%	(12)	-0.5%
Total Impact	$ (867)	-1.6%	$ (29)	-1.2%
After Recommended Changes	$ 50,961		$ 2,456	

The funded ratio as of June 30, 2021, and the fiscal year 2023 Statutory Contribution as a percent of pay, are expected to change as follows:

Actuarial Valuation as of June 30, 2021	Funded Ratio based on Market Value of Assets	Fiscal Year 2023 Statutory Contribution as a Percent of Pay
Baseline	46.0%	51.0%
Impact due to:		
• Mortality Table Changes	0.5%	-0.3%
• Other Demographic Assumption Changes	0.3%	-0.2%
Total Impact	0.8%	-0.5%
After Recommended Changes	46.8%	50.5%

As shown in the above tables, costs are expected to decrease due to the mortality assumption change and demographic assumption changes.

The remainder of the report is an integral part of the Experience Study and includes:

- An introduction to key factors that were included in the study;
- An analysis of the experience and assumption recommendations;
- Cost impact of the proposed assumption changes; and
- Tables showing the recommended actuarial assumptions.

SECTION B

INTRODUCTION

Introduction

Background

For any pension plan, actuarial assumptions are selected that are intended to provide reasonable estimates of future expected events, such as investment returns, interest crediting, and patterns of retirement, turnover, and mortality. These assumptions, along with an actuarial cost method, an asset valuation method, the employee census data, and the System's provisions, are used to determine the actuarial liabilities and overall actuarially determined funding requirements for the System. The true cost to the System over time will be the actual benefit payments and expenses required by the System's provisions for the participant group under the System. To the extent the actual experience deviates from the actuarial assumptions, experience gains and losses will occur. These gains (losses) then serve to reduce (increase) future actuarially determined contributions and increase (reduce) the funded ratio.

A periodic review and update of the actuarial assumptions is one of many important components of understanding and managing the financial aspects of the State Employees' Retirement System of Illinois. Use of outdated or inappropriate assumptions can result in understated costs, which will lead to higher future contribution requirements, or perhaps an inability to pay benefits when due; or, on the other hand, produce overstated costs which place an unnecessarily large burden on the current generation of members, employers, and taxpayers.

A single set of actuarial assumptions is typically not expected to be suitable forever. As the actual experience unfolds or the future expectations change, the assumptions should be reviewed and adjusted accordingly.

It is important to recognize that the impact from various outcomes and the ability to adjust from experience deviating from the assumption are not symmetric. Due to compounding economic forces, legal limitations, and moral obligations, outcomes from underestimating future liabilities are much more difficult to manage than outcomes of overestimates. That asymmetric risk should be considered when the assumption set, investment policy, and funding policy are created. As such, the assumption set used in the actuarial valuation process needs to represent the best estimate of the future experience of the System and be at least as likely, if not more than likely, to overestimate the future liabilities versus underestimating them.

Using this strategic mindset, each assumption was analyzed compared to the actual experience of the System and general experience of other large public employee retirement funds. Changes in certain assumptions and methods are suggested based upon this comparison to remove any bias that may exist and to perhaps add in a slight margin for future adverse experience where appropriate. Next, the assumption set as a whole was analyzed for consistency and to ensure that the projection of liabilities was reasonable and consistent with historical trends.

Actuarial Standards of Practice ("ASOPs")

The Actuarial Standards Board ("ASB") provides guidance on measuring the costs of financing a retirement program through the following Actuarial Standards of Practices ("ASOPs"):

(1) ASOP No. 4, *Measuring Pension Obligations and Determining Pension Plan Costs or Contributions*;
(2) ASOP No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations*;
(3) ASOP No. 35, *Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations*;
(4) ASOP No. 44, *Selection and Use of Asset Valuation Methods for Pension Valuations*; and
(5) ASOP No. 51, *Assessment and Disclosure of Risk Associated with Measuring Pension Obligations and Determining Pension Plan Contributions*

The recommended assumptions provided in this report are consistent with the preceding actuarial standards of practice.

Summary of Process

In determining liabilities and contribution rates for retirement plans, actuaries must make assumptions about the future. The actuarial assumptions are usually divided into two categories:

- Economic assumptions, which include:
  - Assumed rate of price inflation (as measured by the change in the Consumer Price Index for all Urban consumers)
    - Underlies all other economic assumptions
    - Basis for cost-of-living increases for members hired on or after January 1, 2011
  - Assumed long-term rate of return on investments
    - Rate at which projected benefits are reduced to present value
    - Rate for reversionary annuity factors
  - General wage increases
    - Reflects inflationary forces on increases in pay for all members
  - Rate of payroll growth
    - Reflects expectation of growth in total payroll and affects level percent of pay statutory contribution
- Demographic assumptions, which include:
  - Mortality rates
  - Retirement rates
  - Withdrawal (Turnover) rates

For some of these assumptions, such as the mortality rates, past experience provides important evidence about the future. For others, such as the investment return assumption, the link between past and future results is much weaker. In either case, actuaries should review the System's assumptions periodically and determine whether these assumptions are consistent with both actual past experience and anticipated future experience.

The last such actuarial experience study was performed following the June 30, 2018, actuarial valuation and the recommendations were first effective with the June 30, 2019, actuarial valuation. For this

experience study, we have reviewed the System's experience for many of the assumptions for the three-year period from July 1, 2018, through June 30, 2021. Salary experience was reviewed for the period from July 1, 2015, to June 30, 2021. Mortality experience was reviewed for the period from July 1, 2015, to June 30, 2020.

In conducting experience studies, actuaries generally use data over a period of several years. This is necessary in order to gather enough data so that the results are statistically significant. In addition, if the study period is too short, the impact of the current economic conditions may lead to misleading results. It is known, for example, that the health of the general economy can impact salary increase rates and withdrawal rates. Using results gathered during a short-term boom or bust period will not be representative of the long-term trends in these assumptions. Also, the adoption of legislation, such as plan improvements or changes in salary schedules, will sometimes cause a short-term distortion in the experience. For example, if an early retirement window was opened during the study period, we would usually see a short-term spike in the number of retirements followed by a decline of retirements for the following two to four years. Using a longer period prevents giving too much weight to such short-term effects. On the other hand, using a much longer period could dampen real changes that may be occurring, such as mortality improvement or a change in the ages at which members retire.

In an experience study, we first determine the number of deaths, retirements, etc. that occurred during the period. Then we determine the number expected to occur, based on the current actuarial assumptions. The number of “expected” decrements is determined by multiplying the probability of the occurrence at the given age by the “exposures” at that same age. For example, consider a rate of retirement of 5.00 percent at age 55. The number of exposures can only be those members who are age 55 and eligible for retirement at that time. Thus, they are considered “exposed” to that assumption. Finally, we calculate the A/E ratio, where "A" is the actual number (of retirements, for example) and "E" is the expected number. If the current assumptions were “perfect,” the A/E ratio would be 100 percent. When it varies much from this figure, it is a sign that new assumptions may be needed. However, in some cases we prefer to set our assumptions to produce an A/E ratio a little above or below 100 percent, in order to introduce some conservatism. Of course, we not only look at the assumptions as a whole, but we also review how well they fit the actual results by gender, by age, and by service.

If the data leads the actuary to conclude that new tables are needed, the actuary may "graduate" or smooth the results, since the raw results can be quite uneven from age to age or from service to service.

Please bear in mind while the recommended assumption set represents our best estimate, there are other reasonable assumptions sets that could be supported. Some other reasonable assumption sets would show higher or lower liabilities or costs.

Summary of Recommendations

Our recommended changes to the current actuarial assumptions are summarized as follows:

Economic Assumptions

- **Price inflation**: We recommend maintaining the rate of price inflation of 2.25 percent.

- **Investment return**: We recommend maintaining the nominal investment return assumption of 6.75 percent. Based on blended capital market assumptions from independent sources and the System's current asset allocation, over the next 20 years the likelihood assets will earn at least 6.75 percent per year is 48.61 percent. Based on a shorter 10-year horizon, the likelihood assets will earn at least 6.75 percent is 37.95 percent.

- **Payroll growth assumption:** We recommend maintaining the general payroll growth assumption of 2.75 percent, which reflects an underlying general price inflation assumption of 2.25 percent.

- **Salary increase**: We recommend updating the salary increase assumption to better reflect observed experience.

Mortality Assumptions

- We recommend updating post-retirement mortality tables to the Pub-2010 Below-Median Income General Healthy Retiree Mortality tables for Regular Formula members and the Pub-2010 Below-Median Income Public Safety Healthy Retiree Mortality tables for Alternative Formula members.

- We recommend maintaining pre-retirement mortality tables for active employees as the Pub-2010 General Employee Mortality tables for Regular Formula members and the Pub-2010 Public Safety Employee Mortality tables for Alternative Formula members.

- We also recommend assuming mortality rates will improve in the future using a fully generational approach, with the most recently published projection scale, MP-2021.

- We recommend applying scaling factors to the base mortality tables; i.e., Pub-2010 General Tables and Public Safety tables, to partially reflect observed mortality experience to the extent it is credible.

Other Demographic Assumptions

- **Normal retirement rates**: Overall, the actual rates of retirement were lower than expected. We recommend slightly decreasing the overall rates to better reflect observed experience.

- **Early retirement rates**: Overall, experience was generally lower than expected. We recommend slightly decreasing the overall rates to better reflect observed experience.

- **Turnover rates:** Overall, the observed experience showed that more members terminated employment than expected. We recommend increasing the rates of termination, for most of the covered groups.

- **Load for inactive members eligible for deferred vested pension benefits:** Based on recent experience, we recommend changing the current assumption of 11 percent to 15 percent for Regular Formula members and 9 percent to 13 percent for Alterative Formula members. This load represents additional cost due to participation in a reciprocal system.

- **Marriage assumption:** We recommend maintaining the current assumption of 85 percent of active male participants and 65 percent of active female participants. Actual marital status at benefit commencement is used for retired members, if available.

- **Unused sick leave and optional service purchases:** We recommend increasing the current assumption of increasing each current and future active member's service from 4.5 months to 5.0 months to reflect additional service credit received at retirement due to converting unused sick leave and vacation days and purchasing applicable optional service.

- **Disability load:** We recommend maintaining the current disability load on the normal cost as a percentage of pay because in general disabled members receive disability benefits for a short period and are considered active members for valuation purposes.

SECTION C

ANALYSIS OF EXPERIENCE AND RECOMMENDATIONS

Economic Assumptions

Economic assumptions reflect the effects of economic forces on the projections of retirement benefits payable from the System and in the discounting of those benefits to present value. These assumptions are based, at their core, on the assumed level of price inflation. Each economic assumption is then developed from expected spreads over price inflation. The key economic assumptions are:

- Assumed Rate of Inflation – The rate of price inflation (as measured by the Consumer Price Index for all Urban consumers) which underlies the remainder of the economic assumptions.
- Assumed Rate of Investment Return – The rate at which projected future benefits under the pension plan are reduced to present value.
- Rate of General Annual Pay Increases – This reflects inflationary forces on increases in pay for individual members.

Actuarial Standard of Practice No. 27

Actuarial Standard of Practice No. 27, Selection of Economic Assumptions for Measuring Pension Obligations, provides guidance to actuaries on giving advice on selecting economic assumptions for measuring obligations for defined benefit plans. ASOP No. 27 was revised and adopted by the Actuarial Standards Board (ASB) in June 2020. The standard requires that the selected economic assumptions be consistent with each other. That is, the selection of the investment return assumption should be consistent with the selection of the wage inflation and price inflation assumptions.

As no one knows what the future holds, it is necessary for an actuary to estimate possible future economic outcomes. Recognizing that there is not one right answer, the current standard calls for an actuary to develop a reasonable economic assumption. ASOP No. 27 (Doc. No. 197), adopted by the Actuarial Standards Board (ASB) in June 2020, defines a reasonable economic assumption as an assumption that has the following characteristics:

1. It is appropriate for the purpose of the measurement;
2. It reflects the actuary's professional judgment;
3. It takes into account current and historical data that is relevant to selecting the assumption for the measurement date, to the extent such relevant data is reasonably available;
4. It reflects the actuary's estimate of future experience, the actuary's observation of the estimates inherent in market data (if any), or a combination thereof; and
5. It is expected to have no significant bias (i.e., it is not significantly optimistic or pessimistic), except when provisions for adverse deviation or plan provisions that are difficult to measure are included (as discussed in Section 3.5.1) or when alternative assumptions are used for the assessment of risk, in accordance with ASOP No. 51, *Assessment and Disclosure of Risk Associated with Measuring Pension Obligations and Determining Pension Plan Contributions*.

However, the standard explicitly advises an actuary not to give undue weight to recent experience.

Each economic assumption should individually satisfy this standard. Furthermore, with respect to any particular actuarial valuation, each economic assumption should be consistent with every other economic assumption over the measurement period. Generally, the economic assumptions are much more subjective in nature than the demographic assumptions.

Economic Assumptions

Inflation Assumption

By "inflation," we mean price inflation, as measured by annual increases in the Consumer Price Index (CPI). This inflation assumption underlies most of the other economic assumptions. It impacts investment return, salary increases, and overall payroll growth. The current annual inflation assumption is 2.25 percent.

Over the three-year period from June 2018 through June 2021, the CPI-U has increased at an average annual rate of 2.54 percent. **However, the assumed inflation rate is only weakly tied to past results.**

The following table shows the average inflation over various periods, ending June 2021.

Fiscal Year	Annual Increase in CPI-U
2016-17	1.63%
2017-18	2.87%
2018-19	1.65%
2019-20	0.65%
2020-21	5.39%
3-Year Average	2.54%
5-Year Average	2.43%
10-Year Average	1.87%
20-Year Average	2.14%
25-Year Average	2.23%
30-Year Average	2.33%
40-Year Average	2.78%
50-Year Average	3.88%

Future Inflation Expectations

Since price inflation is relatively volatile and is subject to a number of influences not based on recent history, economic assumptions are less reliably based on recent past experience than are the demographic assumptions. Therefore, it is important not to give undue weight to recent experience. We must also consider future expectations as well.

Although historically high increases in CPI were observed in 2021 and into 2022, persisting long-term trends in these measures are generally in line with the current assumption. We will continue to monitor this assumption based on the spectrum of expectations from various sources.

One source of information about future inflation is the market for US Treasury bonds. Simplistically, the difference in yield between non-indexed and indexed treasury bonds should be a reasonable estimate of what the bond market expects on a forward-looking basis for inflation. According to inflation rate forecasts from the Federal Reserve Bank of St. Louis, as of January 1, 2022, the difference for 20-year bonds implies that inflation over the next 20 years would average 2.46 percent. The difference in yield for 30-year bonds implies 2.24 percent inflation over the next 30 years.

Economic Assumptions

The following tables present a summary of inflation rate forecasts from the Federal Reserve.

Federal Reserve Bank of Cleveland	July 2018	July 2019	July 2020	July 2021	January 2022
30-Year Expectation	2.32%	2.06%	1.85%	2.02%	2.13%
20-Year Expectation	2.23%	1.89%	1.63%	1.85%	1.99%
10-Year Expectation	2.10%	1.68%	1.35%	1.62%	1.80%
5-Year Expectation	2.03%	1.59%	1.24%	1.55%	1.73%

Federal Reserve Bank of St. Louis	July 2018	July 2019	July 2020	July 2021	January 2022
30-Year Breakeven Inflation	2.13%	1.80%	1.60%	2.23%	2.24%
20-Year Breakeven Inflation	2.10%	1.82%	1.61%	2.39%	2.46%
10-Year Breakeven Inflation	2.11%	1.69%	1.34%	2.32%	2.44%

However, this analysis is known to be imperfect, as it ignores the inflation risk premium that buyers of US Treasury bonds often demand as well as possible differences in liquidity between US Treasury bonds and Treasury Inflation Protected Securities (TIPS).

Another point of reference is the Social Security Administration's (SSA) 2021 Trustees Report, in which the Office of the Chief Actuary is projecting a long-term average ultimate annual inflation rate of 2.40 percent under the intermediate cost assumption. The ultimate inflation assumption is 1.80 percent and 3.00 percent, respectively, in the low cost and high cost projection scenarios. The Social Security Trustees report uses the ultimate rates for their 75-year projections, much longer than the longest horizon we can discern from Treasuries and TIPS.

We also surveyed the inflation assumption used by various investment consulting firms. In our sample of these firms, the inflation assumption ranged from 1.92 percent to 3.10 percent, with an average of 2.19 percent in the short term (10 years or less) and 2.22 percent in the long term (20 to 30 years).

Economic Assumptions

The following table provides inflation forecasts from various sources.

Forward-Looking Price Inflation Forecasts[a]	
Congressional Budget Office[b]	
5-Year Annual Average	2.58%
10-Year Annual Average	2.49%
Federal Reserve Bank of Philadelphia[c]	
5-Year Annual Average	2.90%
10-Year Annual Average	2.55%
Federal Reserve Bank of Cleveland[d]	
10-Year Expectation	1.76%
20-Year Expectation	1.94%
30-Year Expectation	2.09%
Federal Reserve Bank of St. Louis[e]	
10-Year Breakeven Inflation	2.46%
20-Year Breakeven Inflation	2.51%
30-Year Breakeven Inflation	2.27%
U.S. Department of the Treasury[f]	
10-Year Breakeven Inflation	2.37%
20-Year Breakeven Inflation	2.42%
30-Year Breakeven Inflation	2.32%
50-Year Breakeven Inflation	2.38%
100-Year Breakeven Inflation	2.43%
Social Security Trustees[g]	
Ultimate Intermediate Assumption	2.40%

[a]End of the Fourth Quarter, 2021. Version 2022-02-17 by Gabriel, Roeder, Smith & Company

[b]*The Budget and Economic Outlook: 2021 to 2031,* Release Date: July 2021, Consumer Price Index (CPI-U), Percentage Change from Year to Year, 5-Year Annual Average (2021 - 2025), 10-Year Annual Average (2021 - 2030).

[c]*Fourth Quarter 2021 Survey of Professional Forecasters,* Release Date: November, 15, 2021, Headline CPI, Annualized Percentage Points, 5-Year Annual Average (2021 - 2025), 10-Year Annual Average (2021 - 2030).

[d]Inflation Expectations, Model output date: December 1, 2021.

[e]The breakeven inflation rate represents a measure of expected inflation derived from X-Year Treasury Constant Maturity Securities and X-Year Treasury Inflation-Indexed Constant Maturity Securities. Observation date: December, 2021.

[f]The Treasury Breakeven Inflation (TBI) Curve, Monthly Average Rates, December, 2021.

[g]*The 2021 Annual Report of The Board of Trustees of The Federal Old-Age And Survivors Insurance and Federal Disability Insurance Trust Funds,* August 31, 2021, Long-range (75-year) assumptions, Intermediate, Consumer Price Index (CPI-W), for 2024 and later.

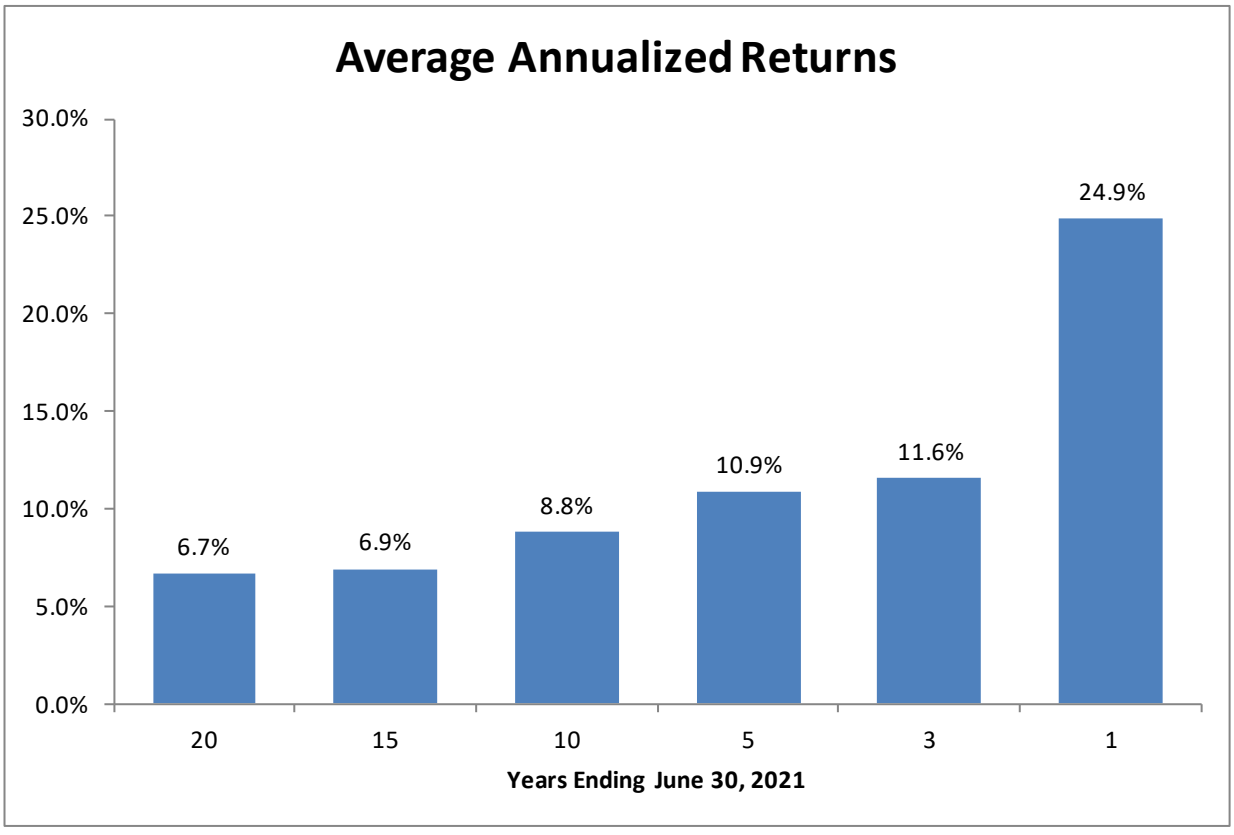
Recommendation

Based on this information, our opinion is that it would be reasonable to maintain the current price inflation assumption of 2.25 percent. It is important to remember any change in this assumption also affects all other economic assumptions, as shown in the following discussion.

Investment Return Assumption

The investment return assumption is one of the principal assumptions used in any actuarial valuation of a retirement plan. It is used to discount future expected benefit payments to the actuarial valuation date in order to determine the liabilities of the plans. Even a small change to this assumption can produce significant changes to the liabilities and contribution rates. Currently, it is assumed that future investment returns will average 6.75 percent per year, net of investment expenses.

The chart below shows the historical annualized history of the System's market returns through fiscal year end 2021.



Real Return

The allocation of assets within the universe of investment options will have a significant impact on the overall performance. Therefore, it is meaningful to identify the range of expected returns based on the fund's targeted allocation of investments and an overall set of capital market assumptions.

Economic Assumptions

Based on information provided by SERS and ISBI, following is a table with the System's current target asset allocation and capital market assumptions based on a 20-year horizon:

Asset Category	Current Target	Annualized Compounded Return	Annualized Average Return	Annualized Standard Deviation
U.S. Equity	23.00%	6.80%	8.40%	18.00%
Developed Foreign Equity	13.00%	7.10%	8.90%	19.00%
Emerging Market Equity	8.00%	8.10%	11.00%	24.00%
Private Equity	9.00%	9.10%	13.00%	28.00%
Intermediate Investment Grade Bonds	15.00%	1.80%	1.90%	4.00%
Long-term Government Bonds	5.00%	2.50%	3.20%	12.00%
TIPS	3.00%	1.80%	2.00%	7.00%
High Yield	1.00%	4.20%	4.80%	11.00%
Bank Loans	1.00%	4.00%	4.40%	9.00%
Opportunistic Debt - Direct Lending	2.25%	6.70%	7.70%	14.00%
Opportunistic Debt - Mezzanine Debt	2.25%	6.90%	8.20%	16.00%
Opportunistic Debt - Distressed Debt	2.25%	7.00%	9.20%	21.00%
Opportunistic Debt - Real Estate Debt	2.25%	6.00%	7.60%	18.00%
Core Real Estate	10.00%	5.50%	6.20%	12.00%
Infrastructure	3.00%	9.00%	11.40%	22.00%
Total	**100.00%**			

Based on page 6 of the 2021 ISBI Asset Allocation Review and Risk Analysis report issued by Meketa Investment Group.

The following table shows a comparison of the probability of exceeding 6.75 percent over the next 20 years based on the 2021 ISBI Asset Allocation Review and Risk Analysis report issued by Meketa Investment Group and the GRS projection model and Meketa's capital market assumptions:

Projection Model	Return	Inflation Assumption	Probability of Exceeding Return Over Next 20 Years
Meketa[1]	6.75%	2.10%	50.50%
GRS	6.75%	2.25%	46.60%

[1] *Based on page 7 of the 2021 ISBI Asset Allocation Review and Risk Analysis report issued by Meketa Investment Group.*

We applied the System's target asset allocation, and performed an analysis using capital market assumptions from a sample of 12 nationally known investment consulting firms. Five of the firms provided capital market expectations for longer-time horizons (20 to 30 years). All twelve firms provided capital market expectations for shorter-time horizons (10 years or less).

These firms periodically issue reports that describe their capital market assumptions; that is, their estimates of expected returns, volatility, and correlations among the different asset classes. The assumptions for most of the investment firms are for 2021. While some of these assumptions may be based upon historical analysis, many of these firms also incorporate forward-looking adjustments to better reflect near-term and long-term expectations. The estimates for core investments (i.e., fixed income, equities, and real estate) are generally based on anticipated returns produced by passive index funds.

Economic Assumptions

The current nominal investment return assumption of 6.75 percent is based on an inflation assumption of 2.25 percent and a real return of 4.50 percent.

Given the System's current target asset allocation and the capital market assumptions from the investment firms, the development of the average nominal return, net of investment expenses, is provided in the following tables.

Short-term Investment Horizon (10 years or less) Assumptions – One-Year Arithmetic Returns

Investment Firm	Investment Firm Expected Nominal Return Net of Expenses	Investment Firm Inflation Assumption	Expected Real Return (2)–(3)	Actuary Inflation Assumption	Expected Nominal One-year Arithmetic Return Net of Expenses (4)+(5)	Annualized Standard Deviation of Expected Return
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	5.59%	2.15%	3.44%	2.25%	5.69%	12.09%
2	5.80%	2.21%	3.59%	2.25%	5.84%	12.34%
3	5.82%	2.00%	3.82%	2.25%	6.07%	12.05%
4	5.72%	2.00%	3.72%	2.25%	5.97%	10.97%
5	6.28%	2.34%	3.94%	2.25%	6.19%	12.59%
6	5.81%	2.01%	3.80%	2.25%	6.05%	10.84%
7	6.33%	2.40%	3.93%	2.25%	6.18%	11.90%
8	6.00%	2.00%	4.00%	2.25%	6.25%	12.39%
9	6.25%	2.01%	4.24%	2.25%	6.49%	12.38%
10	6.38%	2.11%	4.27%	2.25%	6.52%	11.79%
11	7.52%	3.10%	4.42%	2.25%	6.67%	13.10%
12	6.92%	1.92%	4.99%	2.25%	7.24%	12.27%
Average	**6.20%**	**2.19%**	**4.02%**	**2.25%**	**6.27%**	**12.06%**

Long-term Investment Horizon (20 to 30 years) Assumptions – One-Year Arithmetic Returns

Investment Firm	Investment Firm Expected Nominal Return Net of Expenses	Investment Firm Inflation Assumption	Expected Real Return (2)–(3)	Actuary Inflation Assumption	Expected Nominal One-year Arithmetic Return Net of Expenses (4)+(5)	Annualized Standard Deviation of Expected Return
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	7.01%	2.20%	4.81%	2.25%	7.06%	12.05%
2	8.30%	2.30%	6.00%	2.25%	8.25%	13.10%
3	7.63%	2.31%	5.32%	2.25%	7.57%	12.27%
4	6.70%	2.20%	4.50%	2.25%	6.75%	12.34%
5	7.06%	2.11%	4.95%	2.25%	7.20%	11.81%
Average	**7.34%**	**2.22%**	**5.11%**	**2.25%**	**7.36%**	**12.31%**

Based on each investment firm's assumptions, we estimated the expected real return of the System's portfolio (col. (4)). Next, based on the actuary's recommended inflation, we estimated the expected one-year arithmetic return net of expenses (col. (6)). The average one-year arithmetic return is 6.27 percent using short-term investment horizon assumptions, and 7.36 percent using long-term investment horizon assumptions. Based on the capital market assumptions for Meketa and the current price inflation assumption of 2.25%, the average one-year arithmetic return is 7.24 percent.

Long-Term Capital Market Assumption Set (CMA)	CMA Expected Nominal Return	CMA Inflation Assumption	Expected Real Return (2)–(3)	Actuary Inflation Assumption	Expected Nominal One-year Arithmetic Return Net of Expenses (4)+(5)	Annualized Standard Deviation of Expected Return
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Meketa	7.13%	2.14%	4.99%	2.25%	7.24%	12.59%

However, in addition to examining the expected one-year arithmetic return, it is important to review anticipated volatility of the investment portfolio and understand the range of long-term net returns that could be expected to be produced by the investment portfolio.

The following tables provide the 40th, 50th, and 60th percentiles of the geometric average (10-year for short-term investment horizon and 20-year for long-term investment horizon) of the expected nominal return, net of expenses based on the recommended inflation assumption of 2.25 percent. The tables also show the probability of exceeding the baseline 6.75 percent assumption and alternative lower assumptions.

Short-term Investment Horizon (10 years or less) – Annualized 10-Year Geometric Returns

Investment Firm	Distribution of 10-Year Average Geometric Net Nominal Return 40th	50th	60th	Probability of Exceeding 6.75%	Probability of Exceeding 6.50%	Probability of Exceeding 6.25%
(1)	(2)	(3)	(4)	(5)	(6)	(6)
1	4.05%	5.01%	5.97%	32.40%	34.77%	37.20%
2	4.15%	5.13%	6.11%	33.82%	36.18%	38.61%
3	4.44%	5.39%	6.35%	36.04%	38.52%	41.05%
4	4.53%	5.40%	6.28%	34.85%	37.54%	40.30%
5	4.46%	5.46%	6.46%	37.20%	39.60%	42.04%
6	4.65%	5.50%	6.37%	35.79%	38.54%	41.35%
7	4.58%	5.52%	6.47%	37.14%	39.68%	42.26%
8	4.56%	5.54%	6.53%	37.81%	40.26%	42.75%
9	4.80%	5.78%	6.77%	40.17%	42.66%	45.19%
10	4.94%	5.88%	6.82%	40.69%	43.32%	45.98%
11	4.85%	5.88%	6.92%	41.62%	44.00%	46.40%
12	5.58%	6.55%	7.53%	47.91%	50.51%	53.10%
Average	**4.63%**	**5.59%**	**6.55%**	**37.95%**	**40.46%**	**43.02%**

Long-term Investment Horizon (20 to 30 years) – Annualized 20-Year Geometric Returns

Investment Firm	Distribution of 20-Year Average Geometric Net Nominal Return 40th	50th	60th	Probability of Exceeding 6.75%	Probability of Exceeding 6.50%	Probability of Exceeding 6.25%
(1)	(2)	(3)	(4)	(5)	(6)	(6)
1	5.71%	6.39%	7.07%	44.62%	48.33%	52.07%
2	6.73%	7.46%	8.20%	59.73%	63.05%	66.29%
3	6.19%	6.88%	7.57%	51.86%	55.53%	59.15%
4	5.35%	6.04%	6.73%	39.77%	43.32%	46.93%
5	5.90%	6.56%	7.22%	47.07%	50.87%	54.68%
Average	**5.98%**	**6.66%**	**7.36%**	**48.61%**	**52.22%**	**55.82%**

Meketa (20 years)

Investment Firm	Distribution of 20-Year Average Geometric Net Nominal Return 40th	50th	60th	Probability of Exceeding 6.75%	Probability of Exceeding 6.50%	Probability of Exceeding 6.25%
(1)	(2)	(3)	(4)	(5)	(6)	(6)
Meketa	5.80%	6.51%	7.22%	46.55%	50.12%	53.69%

As these tables indicate, the average expected rate of return at the 50th percentile based on (1) the System's current target asset allocation, (2) the current inflation assumption of 2.25 percent and (3) the capital market assumptions from the investment firms is 5.59 percent under the shorter-term investment horizon and 6.66 percent under the longer-term investment horizon. Based on the capital market assumptions from Meketa, the average expected rate of return at the 50th percentile is 6.51 percent.

Additionally, the average results of the investment firms with shorter-term expectations indicate there is about a 37.95 percent chance that the System will produce an average return that exceeds 6.75 percent in the next 10 years, a 40.46 percent chance that the average return exceeds 6.50 percent, and a 43.02 percent chance that the average return exceeds 6.25 percent.

The average results of the investment firms with longer-term expectations indicate there is about a 48.61 percent chance that the System will produce an average return that exceeds 6.75 percent in the next 20 years, a 52.22 percent chance that the average return exceeds 6.50 percent, and a 55.82 percent chance that the average return exceeds 6.25 percent.

A key factor to consider when evaluating short-term or long-term investment projections is the relative level of assets available to pay benefits over the next 10 years to 25 years. Using current assumptions and liability measures as of June 30, 2021, the present value of benefits expected to be paid over the next 10 years make up about 48 percent of the accrued liability. The market value of assets at June 30, 2021, is sufficient to cover about 89 percent of the present value of projected benefits for the 10-year period.

Consequently, it is important to consider both short-term and long-term expectations when setting economic assumptions.

Recommendation

Based on our analysis of the expected investment return and the current target asset allocation, we recommend maintaining the investment return assumption of 6.75 percent for the actuarial valuation as of June 30, 2021, reflecting an inflation assumption of 2.25 percent.

We recommend that the assumed investment return be monitored for continued appropriateness between experience reviews. Also, any significant changes in the target asset allocation of the System may warrant an additional review of the rate of return assumption.

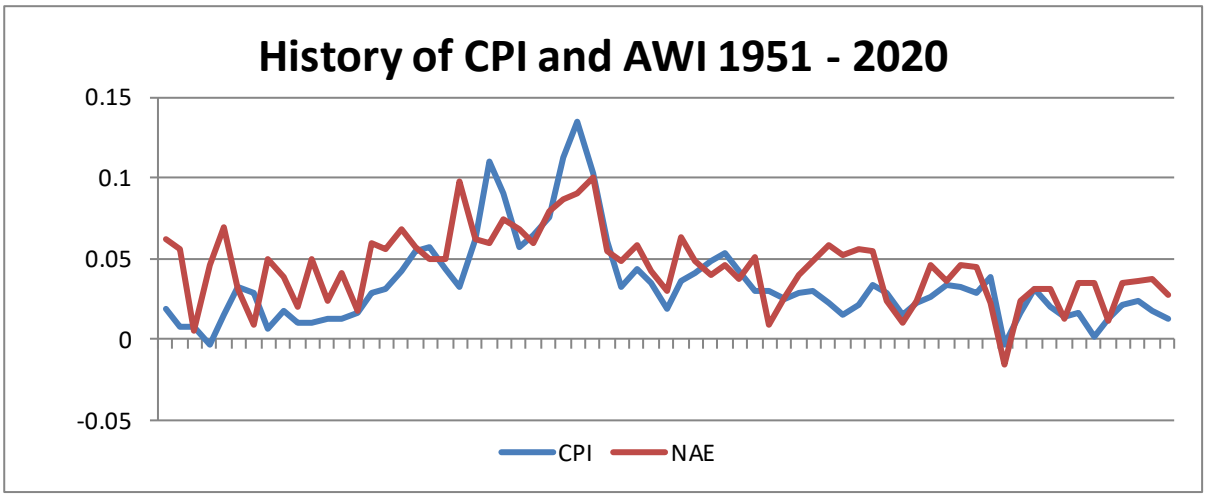
We believe that this assumption can be supported by the Actuarial Standard of Practice No. 27. Under the Standard, all economic assumptions must be selected to be consistent with the purpose of the measurement. The purpose of the measurement is to determine the contribution rate which will lead to the accumulation of assets to pay benefits when due.

General Wage Inflation and Payroll Growth

A General Wage Inflation ("GWI") assumption represents the real wage growth over time in the general economy. It is the assumption on how much the pay scales themselves will change year to year, not necessarily how much the pay increases received by individuals are, or even necessarily how the payroll in total may change, which can be affected by population changes, etc. Wage inflation consists of two components, (1) a portion due to pure price inflation (i.e., increases due to changes in the CPI), and (2) increases in average salary levels in excess of pure price inflation (i.e., increases due to changes in productivity levels, supply and demand in the labor market and other macroeconomic factors).

The Average Wage Index ("AWI"), formerly named the National Average Earnings ("NAE"), series published in connection with the operation of the Social Security program is a useful proxy for measuring general changes in wage levels in the economy. Increases in AWI typically exceed increases in the Consumer Price Index ("CPI"), although there are periods where the patterns are reversed. The economic argument for wages exceeding prices in the long run is that CPI is based on the prices of a fixed basket of goods whereas wages reflect innovations, real productivity growth, labor supply and demand, and other factors in addition to pure price inflation.

The following graph compares CPI and AWI over the past 70 years.



Economic Assumptions

The following table shows the average inflation and increase in the AWI through 2020.

Years	Annual Increases in		
	Prices (CPI-U)	Wages (AWI)	Difference
1961-1970	2.25%	4.44%	2.19%
1971-1980	7.82%	7.30%	-0.52%
1981-1990	4.72%	5.41%	0.69%
1991-2000	2.80%	4.34%	1.54%
2001-2010	2.39%	2.63%	0.24%
2011-2020	1.73%	2.93%	1.20%
3-Year Average	2.54%	3.40%	0.86%
5-Year Average	2.43%	2.95%	0.53%
10-Year Average	1.87%	2.93%	1.06%
20-Year Average	2.14%	2.78%	0.64%
25-Year Average	2.23%	3.30%	1.07%
30-Year Average	2.33%	3.30%	0.96%
40-Year Average	2.78%	3.80%	1.02%
50-Year Average	3.88%	4.49%	0.62%
60-Year Average	3.59%	4.48%	0.89%
65-Year Average	3.41%	4.44%	1.03%

Since 1951, for the national economy as a whole, wage inflation has been about 1.00 percent higher than price inflation each year. For the last 10 years, for the national economy as a whole, wage inflation has been 2.93 percent, outpacing price inflation by about 1.20 percent. However, that spread will likely be viewed as overstated due to the historically low inflation during the past decade.

As with the investment return assumption, past experience does not necessarily dictate future expectations. Current expectations are mixed on whether price and wage inflation will remain low in the short term, particularly due to the after effects of recent federal government spending. For a long-term view, the 2021 Annual Report from the Trustees of the Social Security Administration (SSA) assumes an intermediate average ultimate CPI of 2.40 percent over the next 75 years and an ultimate intermediate growth assumption for average wages in covered employment of 3.55 percent. The SSA report provides alternate “High-cost” assumptions of 1.80 percent CPI/2.33 percent wages and “Low-cost” assumptions of 3.00 percent CPI/4.77 percent wages.

Recommendation

While the ongoing pressure on the ability of states to sustain across the board increases in wages is consistent with historical norms, we do not believe there is justification to increase the assumption for productivity increases; in other words, to increase the assumed gap between price increases and wage growth. In fact, we recommend maintaining the assumption for productivity increases of 0.50 percent. Combining this recommendation with our recommendation for price inflation of 2.25 percent implies a wage inflation assumption of 2.75 percent. These assumptions are summarized below:

	SERS Wage Inflation and Payroll Growth Assumption	
	Current Assumption	Recommended Assumption
Price Inflation	2.25%	2.25%
Productivity Increases	0.50%	0.50%
Total Wage Inflation	2.75%	2.75%

Salary Increase

Most actuaries recommend salary increase assumptions that include elements which depend on the member's age or service. Generally, younger or shorter-service employees receive higher merit and promotion salary increases. As the employee's age or service increases, these salary increases tend to decrease.

During the experience period, plan members earned an average salary increase of 3.85 percent per year which was slightly lower than the assumed average salary increase of 4.04 percent per year.

The recommended salary increase assumption is based on experience from July 1, 2015, to June 30, 2021, to reflect member pay freezes in 2015 through 2019, and the subsequent retroactive pay increases as of June 30, 2021.

This assumption was developed using both Tier One and Tier Two data and is applicable to both Tier One and Tier Two members.

Table I and Graph I compare the salary experience, current assumptions, and recommended assumptions by years of service for each of the following:

- Table I – Salary Experience by Age
- Graph I – Salary Experience by Age

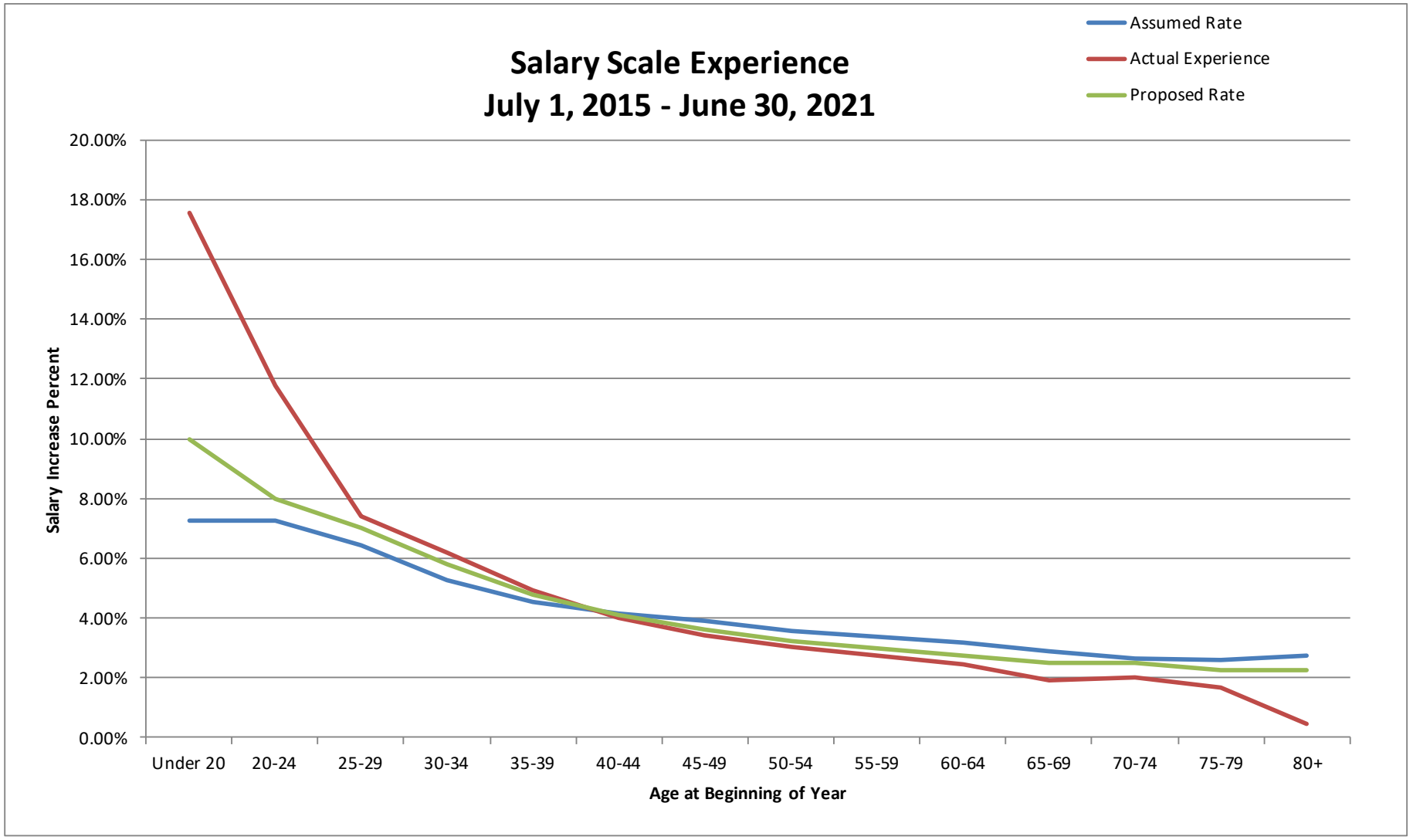
Economic Assumptions

Table I

Age at Beginning of Year	Number	Actual		Expected Current Year	Actual Real Increase[1]	Actual Total Increase	Expected Real Increase[2]	Expected Total Increase	Proposed Real Increase[3]	Proposed Total Increase
		Prior Year	Current Year							
Under 20	265	5,414,392	6,365,178	5,806,945	15.37%	17.56%	5.00%	7.25%	7.75%	10.00%
20-24	5,862	258,847,893	289,386,197	277,595,493	9.61%	11.80%	4.99%	7.24%	5.75%	8.00%
25-29	23,382	1,250,663,336	1,343,289,613	1,330,874,224	5.22%	7.41%	4.16%	6.41%	4.76%	7.01%
30-34	32,671	1,969,782,965	2,091,508,622	2,073,508,925	3.99%	6.18%	3.02%	5.27%	3.56%	5.81%
35-39	36,737	2,452,199,976	2,573,370,775	2,563,146,235	2.75%	4.94%	2.27%	4.52%	2.52%	4.77%
40-44	43,355	3,192,920,182	3,321,373,135	3,325,878,061	1.83%	4.02%	1.91%	4.16%	1.83%	4.08%
45-49	55,031	4,302,588,181	4,448,801,027	4,470,056,309	1.21%	3.40%	1.64%	3.89%	1.35%	3.60%
50-54	53,772	4,192,138,512	4,318,203,302	4,341,809,727	0.82%	3.01%	1.32%	3.57%	0.98%	3.23%
55-59	45,283	3,465,090,219	3,559,573,192	3,582,076,963	0.54%	2.73%	1.13%	3.38%	0.74%	2.99%
60-64	27,307	2,073,382,614	2,123,717,484	2,139,535,586	0.24%	2.43%	0.94%	3.19%	0.50%	2.75%
65-69	9,627	739,400,260	753,508,666	760,768,891	-0.28%	1.91%	0.64%	2.89%	0.25%	2.50%
70-74	2,943	218,805,641	223,224,574	224,558,718	-0.17%	2.02%	0.38%	2.63%	0.25%	2.50%
75-79	775	54,134,218	55,026,803	55,533,771	-0.54%	1.65%	0.34%	2.59%	0.00%	2.25%
80+	237	16,088,661	16,164,254	16,531,099	-1.72%	0.47%	0.50%	2.75%	0.00%	2.25%
Total	**337,247**	**24,191,457,050**	**25,123,512,822**	**25,167,680,947**	**1.66%**	**3.85%**	**1.79%**	**4.04%**	**1.66%**	**3.91%**

[1] Total increase less average inflation of 2.19 percent.
[2] Total increase less assumed inflation of 2.25 percent.
[3] Total proposed increase less proposed inflation of 2.25 percent.

Graph I


Salary Scale Experience
July 1, 2015 - June 30, 2021
Assumed Rate
Actual Experience
Proposed Rate
20.00%
18.00%
16.00%
14.00%
12.00%
10.00%
8.00%
6.00%
4.00%
2.00%
0.00%
Salary Increase Percent
Under 20
20-24
25-29
30-34
35-39
40-44
45-49
50-54
55-59
60-64
65-69
70-74
75-79
80+
Age at Beginning of Year

Demographic Assumptions

The following pages present the analysis of the demographic assumptions. These assumptions include assumed rates of mortality among active and retired members, retirement patterns, turnover patterns, and disability patterns. These patterns generally take the form of tables of rates of incidence based on age and/or years of service.

Absent any significant changes in benefit provisions, these assumptions generally exhibit reasonable consistency over periods of time. As a result, each demographic assumption is normally reviewed by relating actual experience to that assumed over the recent past.

Actuarial Standard of Practice No. 35 – Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations

ASOP No. 35 applies to actuaries when they are selecting demographic and all other assumptions not covered by ASOP No. 27, Selection of Economic Assumptions for Measuring Pension Obligations, to measure obligations under any defined benefit pension plan that is not a social insurance program as described in Section 1.2, Scope, of ASOP No. 32, Social Insurance.

The actuary should identify the types of demographic assumptions to use for a specific measurement. In doing so, the actuary should determine the following:

(a) The purpose and nature of the measurement;
(b) The plan provisions or benefits and factors that will affect the timing and value of any potential benefit payments;
(c) The characteristics of the obligation to be measured (such as measurement period, pattern of plan payments over time, open or closed group, and volatility);
(d) The contingencies that give rise to benefits or result in loss of benefits;
(e) The significance of each assumption; and
(f) The characteristics of the covered group.

Not every contingency requires a separate assumption. For example, for a plan that is expected to provide benefits of equal value to employees who voluntarily terminate employment or become disabled, retire, or die, the actuary may use an assumption that reflects some or all of the above contingencies in combination rather than selecting a separate assumption for each.

Analysis Approach

The analysis of demographic experience is conducted for each assumption using a measure known as the "Actual to Expected (A/E) Ratio." The A/E Ratio is simply the ratio of the actual number of occurrences of the event to which the assumption applies (e.g., deaths or retirements) to the number expected to occur in accordance with the assumption. An A/E Ratio of 1.00 indicates that the assumption precisely predicted the number of occurrences. An A/E Ratio exceeding 1.00 indicates that the assumption underestimated actual experience. Conversely, an A/E Ratio lower than 1.00 indicates that the assumption overestimated actual experience.

Demographic Assumptions

These are statistical analyses. As a result, there are several considerations we must keep in mind as we analyze these ratios:

1. An actuarial assumption is designed to reflect average experience over long periods of time (30-50 years). As a result:
   (a) A deviation between actual experience and that expected from our assumptions for one or two years does not necessarily mean that the assumption should be changed.
   (b) A change in actuarial assumption should result if the experience indicates a consistent pattern which is different from that assumed over a period of years.
2. The larger the amount of data available, the more reliable the statistics used in the analysis. As a result:
   (a) Events that occur with great frequency (e.g., general employment turnover) are more credibly predictable than those occurring less frequently (e.g., active member death).
   (b) In all cases, data covering the entire study period produces more credible results than data for a single year.
   (c) Year by year experience is helpful only in identifying trends and determining whether the three-year data is truly reflective of the entire period.

For most demographic assumptions the analysis is based on actuarial valuation data for the three-year period from July 1, 2018, to June 30, 2021. For the recommended mortality table assumption, the analysis is based on experience from July 1, 2015, to June 30, 2020, in order to improve credibility and remove the extraordinary mortality experience in 2021 due to the effects of Covid-19.

Mortality Assumption

Mortality

Post-retirement mortality is an important component in cost calculations and should be updated from time to time to reflect current and expected future longevity improvements. Pre-retirement mortality is a relatively minor component in cost calculations. The frequency of pre-retirement deaths is so low that mortality assumptions based on actual experience can only be produced for very large retirement systems.

Actuarial Standards of Practice

Actuarial Standards of Practice (ASOP) No. 35 Disclosure Section 4.1.1 states, "The disclosure of the mortality assumption should contain sufficient detail to permit another qualified actuary to understand the provision made for future mortality improvement. If the actuary assumes zero mortality improvement after the measurement date, the actuary should state that no provision was made for future mortality improvement." The current mortality rates used in the actuarial valuation include a provision for future mortality improvement.

The Pub-2010 Mortality Tables

The Society of Actuaries (SOA) and Retirement Plans Experience Committee (RPEC) initiated a study in January 2015 with the primary focus of a comprehensive review of recent mortality experience of public retirement plans in the United States. The previous study for the RP-2014 Mortality Tables only included data from private pension plans. The main objectives of the study were to develop mortality tables based exclusively on public sector pension plan experience, and provide new insights into the composition of gender-specific pension mortality by factors such as job category (e.g., Teachers, Public Safety, General), salary/benefit amount, health status (i.e., healthy or disabled), geographic region, and duration since event. Additional information on the background, data, and process is available in the *Pub-2010 Public Retirement Plans Mortality Tables Report* published by the SOA and RPEC.

The 2019 through 2021 actuarial valuations utilized these public sector tables.

Mortality Assumption

Findings

The mortality experience was reviewed on a benefit weighted basis for retired members in pay status and on a headcount basis for active members. The observed experience was compared to the current mortality tables and updated baseline mortality tables:

- Current Regular Benefit Formula mortality tables: Pub-2010 General Healthy Retiree Mortality Tables with a scaling factor of 111% for both males and females, set forward one year for females and projected for fully generational mortality improvements from 2010 using Scale MP-2018
- Current Alternative Benefit Formula mortality tables: Pub-2010 Public Safety Healthy Retiree Mortality Tables with a scaling factor of 110% for males and 105% for females, and projected for fully generational mortality improvements from 2010 using Scale MP-2018
- Proposed Regular Benefit Formula ***baseline*** mortality tables: Pub-2010 Below-Median Income General Healthy Retiree Mortality Tables and projected for fully generational mortality improvements from 2010 using Scale MP-2021
- Proposed Alternative Benefit Formula ***baseline*** mortality tables: Pub-2010 Below-Median Income Public Safety Healthy Retiree Mortality Tables and projected for fully generational mortality improvements from 2010 using Scale MP-2021

Data from July 1, 2020 to June 30, 2021 was excluded due to the COVID-19 pandemic. In order to increase the credibility of the data for the experience analysis, data from the prior experience study covering July 1, 2015 to June 30, 2018 was included for a total of five years of mortality data.

The following tables, applicable to retired member mortality experience, compare the actual benefit weighted deaths to the expected benefit weighted deaths using the current tables, proposed baseline tables, and the recommended tables with credibility scaling.

Mortality Assumption

The following table uses the General Healthy Retirees benefit-weighted mortality tables and applies to SERS retirees covered under the Regular Benefit formula.

	General Retirees Benefit Weighted Deaths ($ in 10,000)			
Retiree Experience	Expected Using Current Mortality Table	Actual	Expected Using Baseline Mortality Table Without Scaling Pub-2010 Below-Median Income General Healthy Retiree [a]	Expected Using Proposed Mortality Table With Scaling Pub-2010 Below-Median Income General Healthy Retiree [b]
Male Retirees	$9,004	$9,281	$10,225	$9,281
Female Retirees	$7,637	$7,772	$6,749	$7,772

[a] *Baseline Table: Pub-2010 Below-Median Income General Healthy Retiree.*
[b] *Proposed Table: Pub-2010 Below-Median Income General Healthy Retiree, with a scaling factor of 91% for males and 115% for females.*

When compared to the current mortality tables, the experience on a benefit weighted basis shows that actual experience is above expectation for males and females.

When compared to the current mortality tables, the proposed mortality tables are expected to produce slightly higher benefit weighted deaths overall.

We applied credibility and "best-fit" factors to the baseline mortality tables to recognize a portion of the observed mortality experience. The credibility factor applies more weight to the observed mortality experience as the sample size of the group and number of deaths increases. The "best-fit" factor compares actual deaths during the experience period to expected deaths during the period using a base mortality table.

The following table shows the development of the scaling factor that is applied to the recommended base mortality tables (Pub-2010 Below-Median Income General Healthy Retiree Mortality) for SERS annuitants covered under the Regular Benefit Formula.

	General Retirees Benefit Weighted Deaths ($ in 10,000)					
Retiree Experience	Fully Credible Target Deaths Using Baseline Table [a,b] (a)	Observed Deaths (b)	Expected Deaths Using Baseline Table (c)	Credibility Factor (d)=(b/a)$^{1/2}$	Best Fit Factor (e)=(b)/(c)	Scaling Factor Applied to Baseline Table (d) x (e) + [1-(d)] x 100%
Male Retirees	$5,249	$9,281	$10,225	100%	91%	91%
Female Retirees	$3,586	$7,772	$6,749	100%	115%	115%

[a] *Baseline Table: Pub-2010 Below-Median General Healthy Retiree.*
[b] *Minimum number of expected benefit weighted deaths needed for plan experience to be fully credible.*

Mortality Assumption

The following table uses the Public Safety Healthy Retirees benefit-weighted mortality tables and applies to SERS retirees covered under Alternative Benefit Formula.

	Public Safety Retirees Benefit Weighted Deaths ($ in 10,000)			
Retiree Experience	Expected Using Current Mortality Table	Actual	Expected Using Baseline Mortality Table Without Scaling Pub-2010 Below-Median Income Public Safety Healthy Retiree [a]	Expected Using Proposed Mortality Table With Scaling Pub-2010 Below-Median Income Public Safety Healthy Retiree [b]
Male Retirees	$5,000	$5,366	$5,580	$5,386
Female Retirees	$722	$790	$733	$755

[a] *Baseline Table: Pub-2010 Below-Median Income Public Safety Healthy Retiree.*

[b] *Proposed Table: Pub-2010 Below-Median Income Public Safety Healthy Retiree, with a scaling factor of 97% for males and 103% for females.*

Although the experience has limited credibility, when compared to the current mortality table the experience on a benefit weighted basis shows that actual experience is above expectation for males and females.

When compared to the current mortality tables, the proposed mortality tables are expected to produce slightly higher benefit weighted deaths overall.

We applied credibility and "best-fit" factors to the baseline mortality tables to recognize a portion of the observed mortality experience. The credibility factor applies more weight to the observed mortality experience as the sample size of the group and number of deaths increases. The "best-fit" factor compares actual deaths during the experience period to expected deaths during the period using a base mortality table.

The following table shows the development of the scaling factor that is applied to the recommended base mortality tables (Pub-2010 Below-Median Income Public Safety Healthy Retiree Mortality) for SERS annuitants covered under the Alternative Benefit Formula.

	Public Safety Retirees Benefit Weighted Deaths ($ in 10,000)					
Retiree Experience	Fully Credible Target Deaths Using Baseline Table [a,b] (a)	Observed Deaths (b)	Expected Deaths Using Baseline Table (c)	Credibility Factor (d)=(b/a)$^{1/2}$	Best Fit Factor (e)=(b)/(c)	Scaling Factor Applied to Baseline Table (d) x (e) + [1-(d)] x 100%
Male Retirees	$7,248	$5,366	$5,580	86%	96%	97%
Female Retirees	$5,363	$790	$733	38%	108%	103%

[a] *Baseline Table: Pub-2010 Public Safety Healthy Retiree.*

[b] *Minimum number of expected liability weighted deaths needed for plan experience to be fully credible.*

Mortality Assumption

The experience for active members is even less credible when compared to the experience of retired members.

Current mortality assumptions for active members are based on the following:

- General Employees: Pub-2010 General Employee Mortality Tables with a scaling factor of 89% for males and 95% for females, set back two years for males and set back one year for females.
- Public Safety Employees: Pub-2010 Public Safety Employee Mortality Tables with a scaling factor of 96% for males and 108% for females.
- These tables also include generational mortality improvements using the MP-2018 two-dimensional mortality improvement scales.
- Five percent of deaths among active employees are assumed to be in the performance of their duty.

The following tables use the General Employees headcount-weighted mortality tables and apply to SERS members covered under the SERS Regular Benefit Formula.

	General Employees Headcount Weighted Deaths			
Pre-Retirement Experience	Expected Using Current Mortality Table	Actual	Expected Using Baseline Mortality Table Without Scaling Pub-2010 General Employee[a]	Expected Using Proposed Mortality Table With Scaling Pub-2010 General Employee [b]
Male Members	162	102	213	180
Female Members	133	115	152	140

[a] *Baseline Table: Pub-2010 General Employee.*
[b] *Proposed Table: Pub-2010 General Employee, with a scaling factor of 84% for males and 92% for females.*

The following table shows the development of the scaling factor that is applied to the recommended base mortality table (Pub-2010 General Employee) for SERS employees covered under the Regular Benefit Formula.

	General Employees Headcount Weighted Deaths					
Active Member Experience	Fully Credible Target Deaths Using Baseline Table [a] (a)	Observed Deaths (b)	Expected Deaths Using Baseline Table (c)	Credibility Factor (d)=(b/a)$^{1/2}$	Best Fit Factor (e)=(b)/(c)	Scaling Factor Applied to Baseline Table (d) x (e) + [1-(d)] x 100%
Male Employees	1,082	102	213	31%	48%	84%
Female Employees	1,082	115	152	33%	76%	92%

[a] *Baseline Table: Pub-2010 General Employee.*

Mortality Assumption

The following tables use the Public Safety Employees headcount-weighted mortality tables and apply to SERS members covered under the Alternative Benefit Formula.

	Public Safety Headcount Weighted Deaths			
Pre-Retirement Experience	Expected Using Current Mortality Table	Actual	Expected Using Baseline Mortality Table Without Scaling Pub-2010 Public Safety Employee [a]	Expected Using Proposed Mortality Table With Scaling Pub-2010 Public Safety Employee [b]
Male Members	95	60	102	93
Female Members	26	24	25	25

[a] *Baseline Table: Pub-2010 Public Safety Employee.*

[b] *Proposed Table: Pub-2010 Public Safety Employee, with a scaling factor of 96% for males and 108% for females.*

The following table shows the development of the scaling factor that is applied to the recommended base mortality table (Pub-2010 Public Safety Employee) for SERS employees covered under the Alternative Benefit Formula.

	Public Safety Headcount Weighted Deaths					
Active Member Experience	Fully Credible Target Deaths Using Baseline Table [a] (a)	Observed Deaths (b)	Expected Deaths Using Baseline Table (c)	Credibility Factor (d)=(b/a)$^{1/2}$	Best Fit Factor (e)=(b)/(c)	Scaling Factor Applied to Baseline Table (d) x (e) + [1-(d)] x 100%
Male Employees	1,082	60	102	24%	59%	90%
Female Employees	1,082	24	25	15%	98%	100%

[a] *Baseline Table: Pub-2010 Public Safety Employee.*

Mortality Assumption

Recommendation

We reviewed the mortality experience separately for active members and retirees during the three-year study period. Details of the results are shown on the following pages.

Following is a summary of the current mortality assumptions:

General Employees and Retirees	Proposed Mortality Table	Male Set Back Years	Female Set Back Years	Male Scaling Factor	Female Scaling Factor
Pre-retirement	Pub-2010 General Employee, sex distinct	2	1	89%	95%
Post-retirement	Pub-2010 General Healthy Retiree sex distinct	0	-1	111%	111%

Public Safety Employees and Retirees	Proposed Mortality Table	Male Set Back Years	Female Set Back Years	Male Scaling Factor	Female Scaling Factor
Pre-retirement	Pub-2010 Public Safety Employee, sex distinct	0	0	96%	108%
Post-retirement	Pub-2010 Public Safety Healthy Retiree, sex distinct	0	0	110%	105%

Future mortality improvements are reflected by projecting the base mortality tables forward from the year 2010 using the MP-2018 projection scale.

Following is a summary of the recommended mortality assumptions:

General Employees and Retirees	Proposed Mortality Table	Male Scaling Factor	Female Scaling Factor
Pre-retirement	Pub-2010 General Employee, sex distinct	84%	92%
Post-retirement	Pub-2010 Below-Median Income General Healthy Retiree sex distinct	91%	115%

Public Safety Employees and Retirees	Proposed Mortality Table	Male Scaling Factor	Female Scaling Factor
Pre-retirement	Pub-2010 Public Safety Employee, sex distinct	90%	100%
Post-retirement	Pub-2010 Below-Median Income Public Safety Healthy Retiree, sex distinct	97%	103%

Future mortality improvements are reflected by projecting the base mortality tables forward from the year 2010 using the MP-2021 projection scale.

Mortality Assumption

A Note about Mortality Rates

The recommended mortality assumptions include generational mortality improvements, which means that the probability of a 60-year-old retired male dying in any particular year is lower for a 60-year-old born in 1994 than a 60-year-old born in 1954.

The use of generational mortality tables is based on the assumption that life expectancy increases from generation to generation. Simply put, this means that the life expectancy of someone born in 1994 is greater than that of someone born in 1954.

The following tables contain the mortality experience for the experience study period:

- Table II(a) and Graphs II(a)(i) and II(a)(ii) – Post-Retirement Mortality Experience – General
- Table II(b) and Graphs II(b)(i) and II(b)(ii) – Post-Retirement Mortality Experience – Public Safety
- Table II(c) and Graphs II(c)(i) and II(c)(ii) – Pre-Retirement Mortality Experience – General
- Table II(d) and Graphs II(d)(i) and II(d)(ii) – Pre-Retirement Mortality Experience – Public Safety

Mortality Assumption

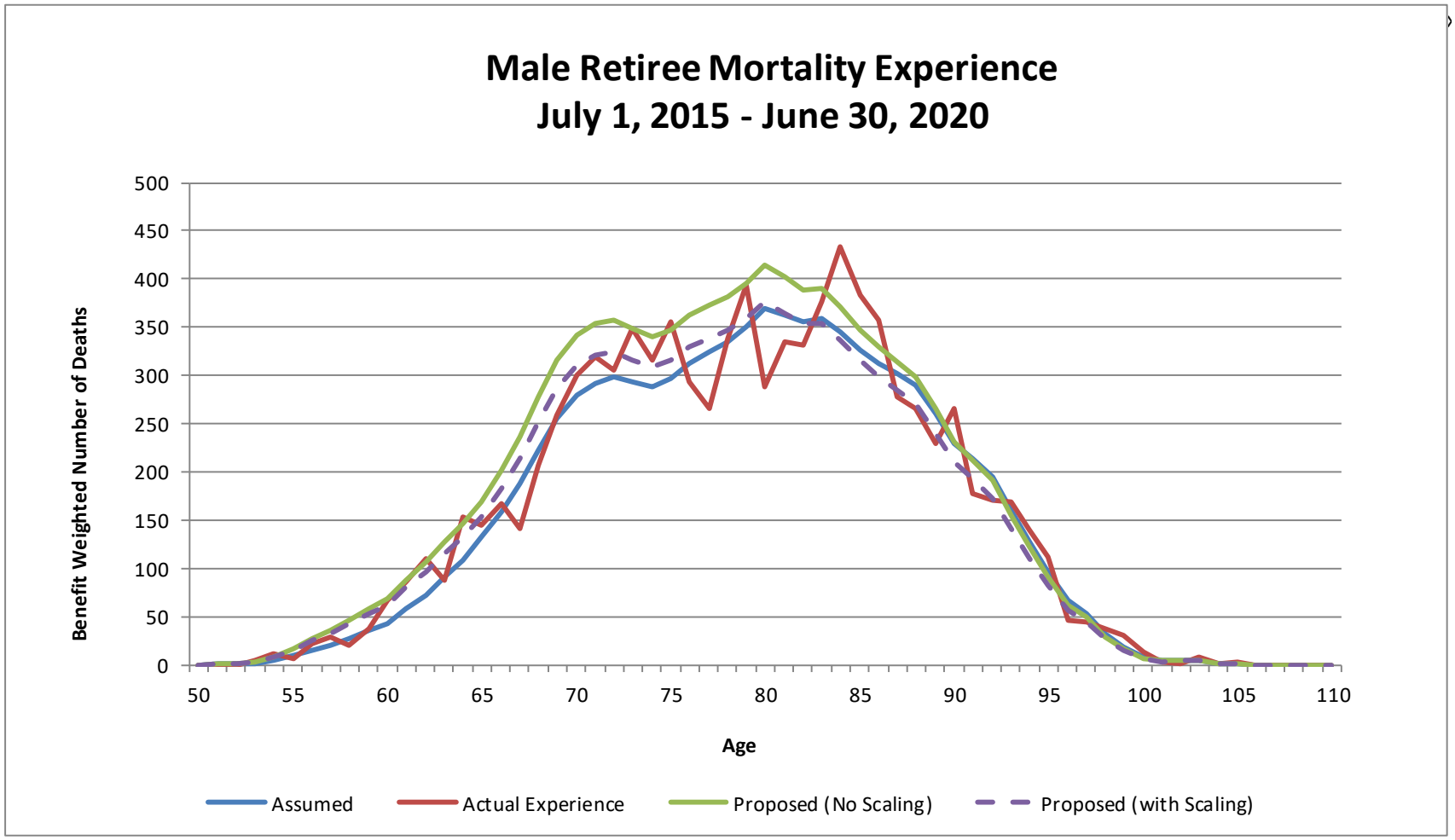
Table II(a) General

Male Retiree Mortality Experience										
	Actual Experience			Current Assumptions			Proposed Assumptions			
	Benefit Weighted ($ in 10,000)		Actual	Expected	Assumed	Actual /	Expected	Proposed	Actual /
Age	Exposures	Deaths	Rate	Deaths	Rate	Expected	Deaths	Rate	Expected
Under 54	$ 1,488	$ 16	1.076%	$ 6	0.417%	2.58	$ 11	0.746%	1.44
55-59	18,050	114	0.633%	105	0.582%	1.09	165	0.914%	0.69
60-64	44,078	502	1.140%	372	0.844%	1.35	486	1.102%	1.03
65-69	77,266	918	1.188%	958	1.239%	0.96	1,089	1.410%	0.84
70-74	74,192	1,589	2.141%	1,450	1.955%	1.10	1,579	2.128%	1.01
75-79	47,241	1,647	3.486%	1,620	3.429%	1.02	1,688	3.573%	0.98
80-84	29,254	1,764	6.031%	1,792	6.124%	0.98	1,784	6.097%	0.99
85-89	13,679	1,512	11.052%	1,490	10.896%	1.01	1,411	10.313%	1.07
90-94	5,161	923	17.879%	924	17.908%	1.00	827	16.025%	1.12
95-99	1,007	269	26.677%	264	26.256%	1.02	223	22.191%	1.20
100-104	56	26	46.336%	21	37.638%	1.23	17	31.084%	1.49
105+	2	2	100.000%	1	45.582%	2.19	1	37.541%	2.66
Totals:	**$ 311,475**	**$ 9,281**	**2.980%**	**$ 9,004**	**2.891%**	**1.03**	**$ 9,281**	**2.980%**	**1.00**
Female Retiree Mortality Experience									
Under 54	$ 2,440	$ 4	0.150%	$ 8	0.319%	0.47	$ 13	0.526%	0.29
55-59	26,854	149	0.555%	111	0.413%	1.34	161	0.599%	0.93
60-64	64,137	384	0.599%	371	0.579%	1.03	442	0.690%	0.87
65-69	81,928	802	0.979%	731	0.893%	1.10	761	0.928%	1.05
70-74	65,145	1,118	1.716%	989	1.518%	1.13	1,010	1.551%	1.11
75-79	42,439	1,194	2.813%	1,162	2.738%	1.03	1,175	2.768%	1.02
80-84	24,704	1,277	5.168%	1,246	5.044%	1.02	1,238	5.010%	1.03
85-89	13,565	1,204	8.872%	1,289	9.502%	0.93	1,267	9.341%	0.95
90-94	6,884	1,049	15.236%	1,112	16.156%	0.94	1,102	16.013%	0.95
95-99	1,971	470	23.860%	485	24.611%	0.97	473	24.019%	0.99
100-104	339	106	31.248%	119	35.263%	0.89	117	34.472%	0.91
105+	28	16	56.016%	13	47.609%	1.18	13	47.517%	1.18
Totals:	**$ 330,433**	**$ 7,772**	**2.352%**	**$ 7,637**	**2.311%**	**1.02**	**$ 7,772**	**2.352%**	**1.00**
Grand Totals:	**$ 641,907**	**$ 17,053**	**2.657%**	**$ 16,641**	**2.592%**	**1.02**	**$ 17,053**	**2.657%**	**1.00**

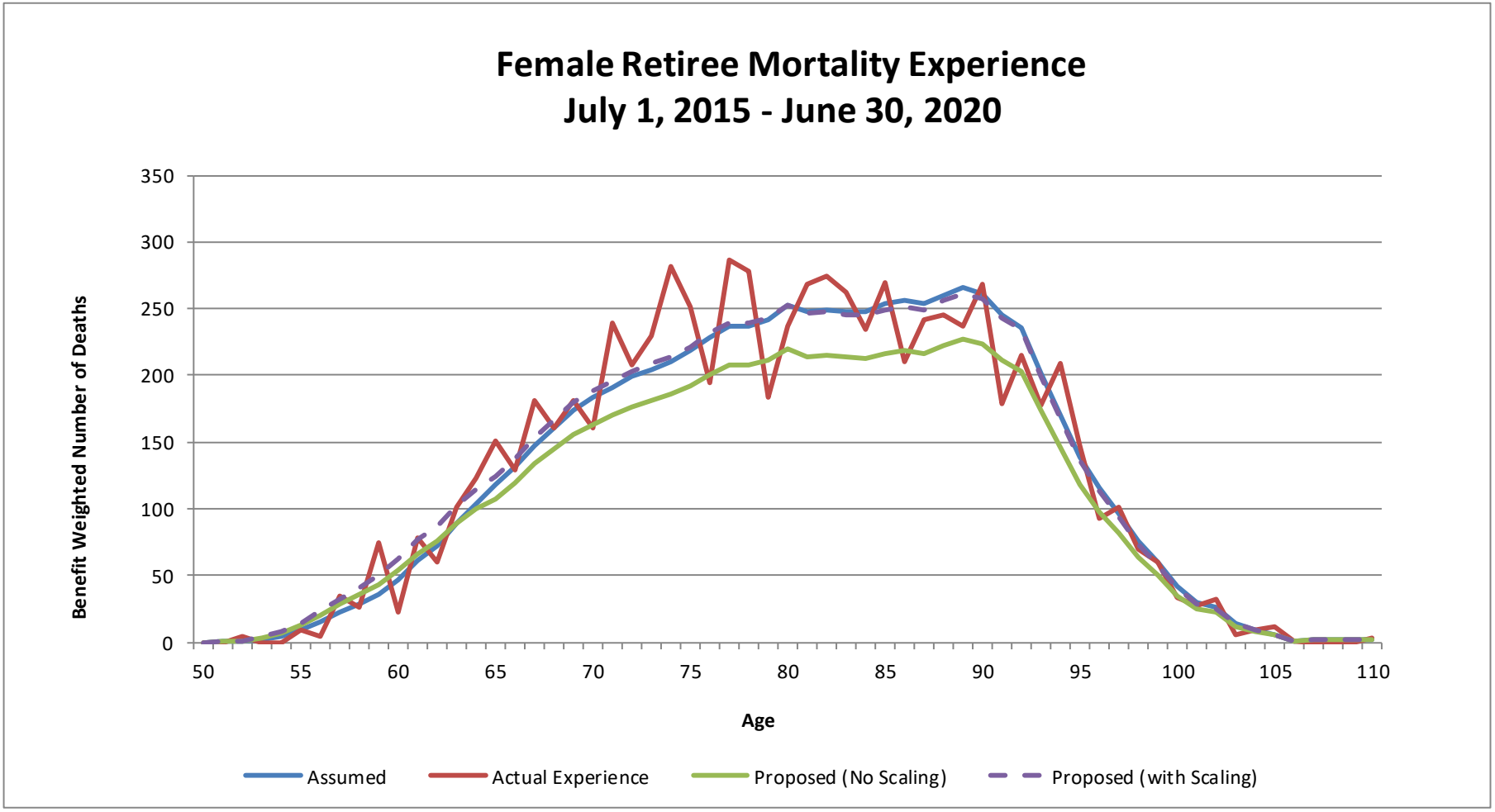
Expected deaths under the current and proposed assumptions are on a liability weighted basis.

Mortality Assumption

Graph II(a)(i) General Male



Graph II(a)(ii) General Female

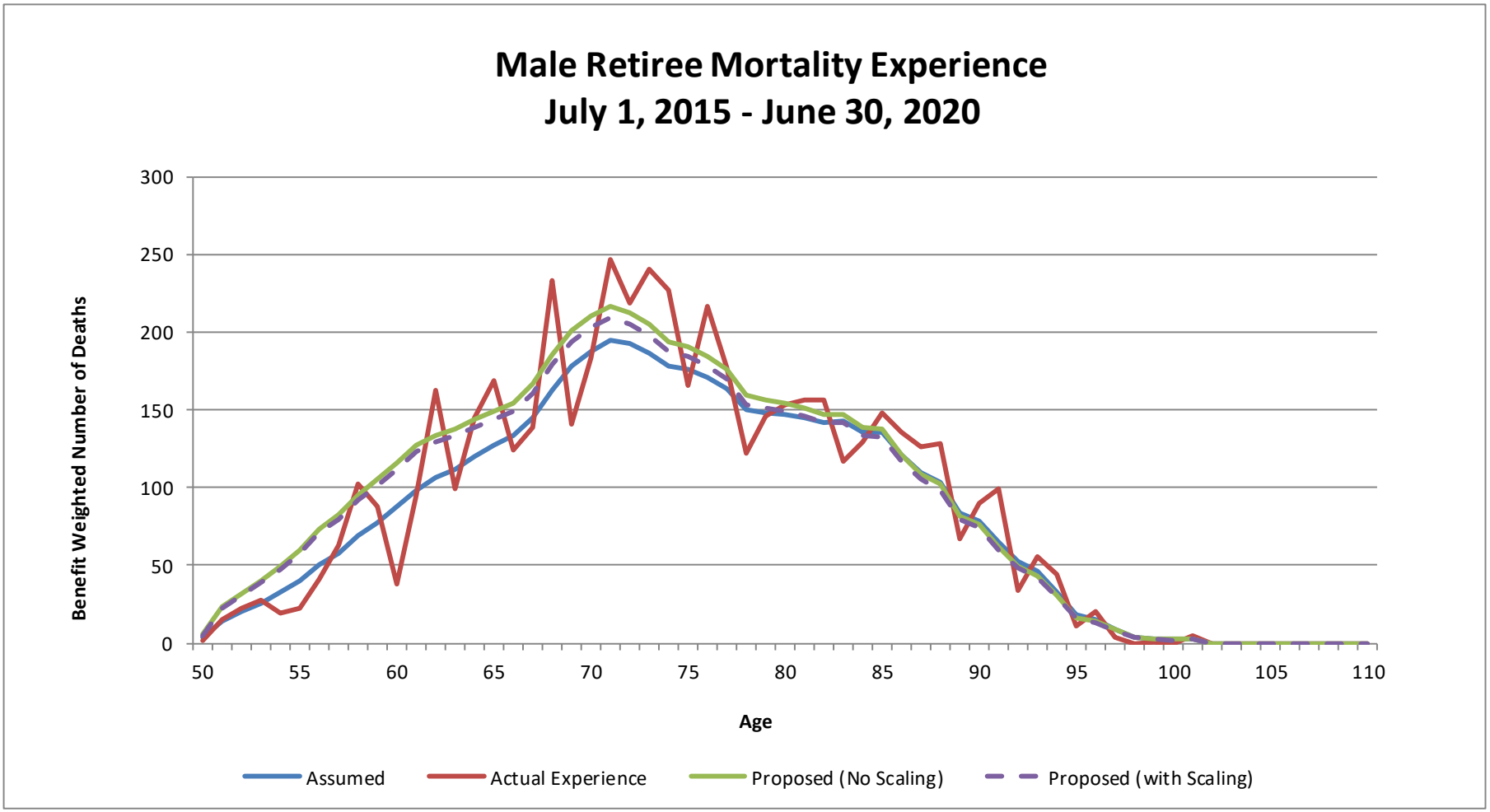


Mortality Assumption

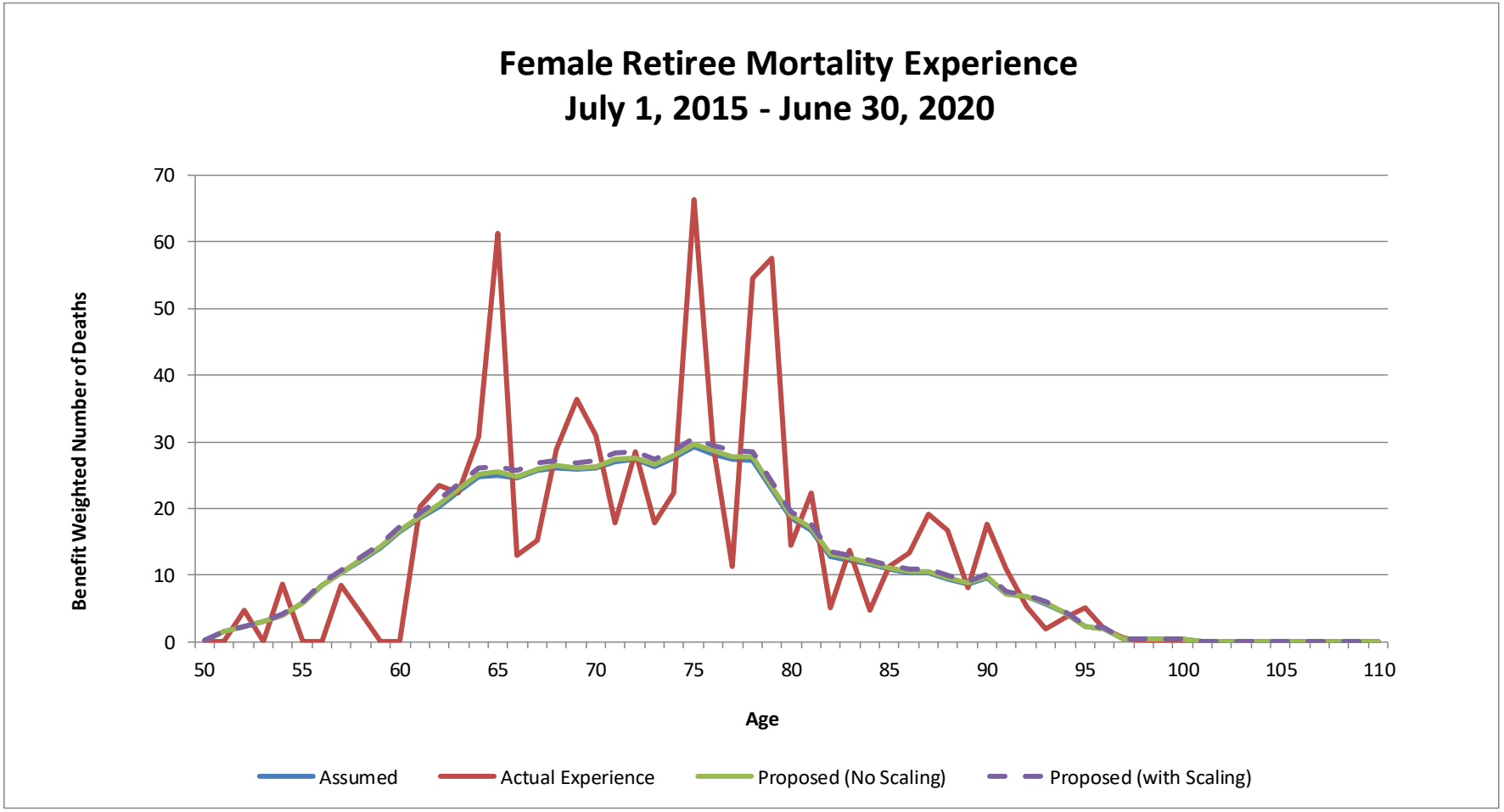
Table II(b) Public Safety

Male Retiree Mortality Experience										
	Actual Experience			Current Assumptions			Proposed Assumptions			
	Benefit Weighted ($ in 10,000)		Actual	Expected	Assumed	Actual /	Expected	Proposed	Actual /
Age	Exposures	Deaths	Rate	Deaths	Rate	Expected	Deaths	Rate	Expected
Under 54	$ 37,397	$ 85	0.227%	$ 96	0.257%	0.88	$ 144	0.384%	0.59
55-59	69,738	316	0.453%	295	0.424%	1.07	401	0.575%	0.79
60-64	72,454	538	0.743%	524	0.723%	1.03	636	0.877%	0.85
65-69	61,845	804	1.301%	746	1.206%	1.08	826	1.336%	0.97
70-74	46,753	1,116	2.387%	938	2.006%	1.19	1,002	2.143%	1.11
75-79	22,816	827	3.626%	808	3.541%	1.02	835	3.661%	0.99
80-84	11,007	712	6.469%	713	6.475%	1.00	711	6.456%	1.00
85-89	4,874	604	12.394%	554	11.365%	1.09	532	10.912%	1.14
90-94	1,453	322	22.167%	275	18.906%	1.17	254	17.461%	1.27
95-99	180	36	19.919%	48	26.487%	0.75	43	23.782%	0.84
100-104	14	4	33.002%	5	35.378%	0.93	4	31.379%	1.05
105+	-	-		-			-		
Totals:	**$ 328,530**	**$ 5,366**	**1.633%**	**$ 5,000**	**1.522%**	**1.07**	**$ 5,386**	**1.640%**	**1.00**
Female Retiree Mortality Experience									
Under 54	$ 5,237	$ 14	0.258%	$ 11	0.214%	1.21	$ 12	0.220%	1.17
55-59	13,795	13	0.091%	51	0.370%	0.25	53	0.384%	0.24
60-64	17,219	97	0.562%	103	0.596%	0.94	108	0.625%	0.90
65-69	13,584	155	1.139%	127	0.935%	1.22	133	0.977%	1.17
70-74	8,512	118	1.381%	134	1.577%	0.88	140	1.646%	0.84
75-79	4,930	219	4.449%	135	2.738%	1.63	141	2.868%	1.55
80-84	1,521	60	3.957%	72	4.742%	0.83	76	4.984%	0.79
85-89	591	69	11.619%	50	8.387%	1.39	52	8.850%	1.31
90-94	240	39	16.370%	33	13.891%	1.18	35	14.586%	1.12
95-99	27	8	28.116%	6	20.558%	1.37	6	20.795%	1.35
100-104	2	-	0.000%	0	28.514%	0.00	0	28.218%	0.00
105+	-	-		-			-		
Totals:	**$ 65,658**	**$ 790**	**1.204%**	**$ 722**	**1.100%**	**1.09**	**$ 755**	**1.151%**	**1.05**
Grand Totals:	**$ 394,188**	**$ 6,156**	**1.562%**	**$ 5,723**	**1.452%**	**1.08**	**$ 6,142**	**1.558%**	**1.00**

Graph II(b)(i) Public Safety Male



Graph II(b)(ii) Public Safety Female

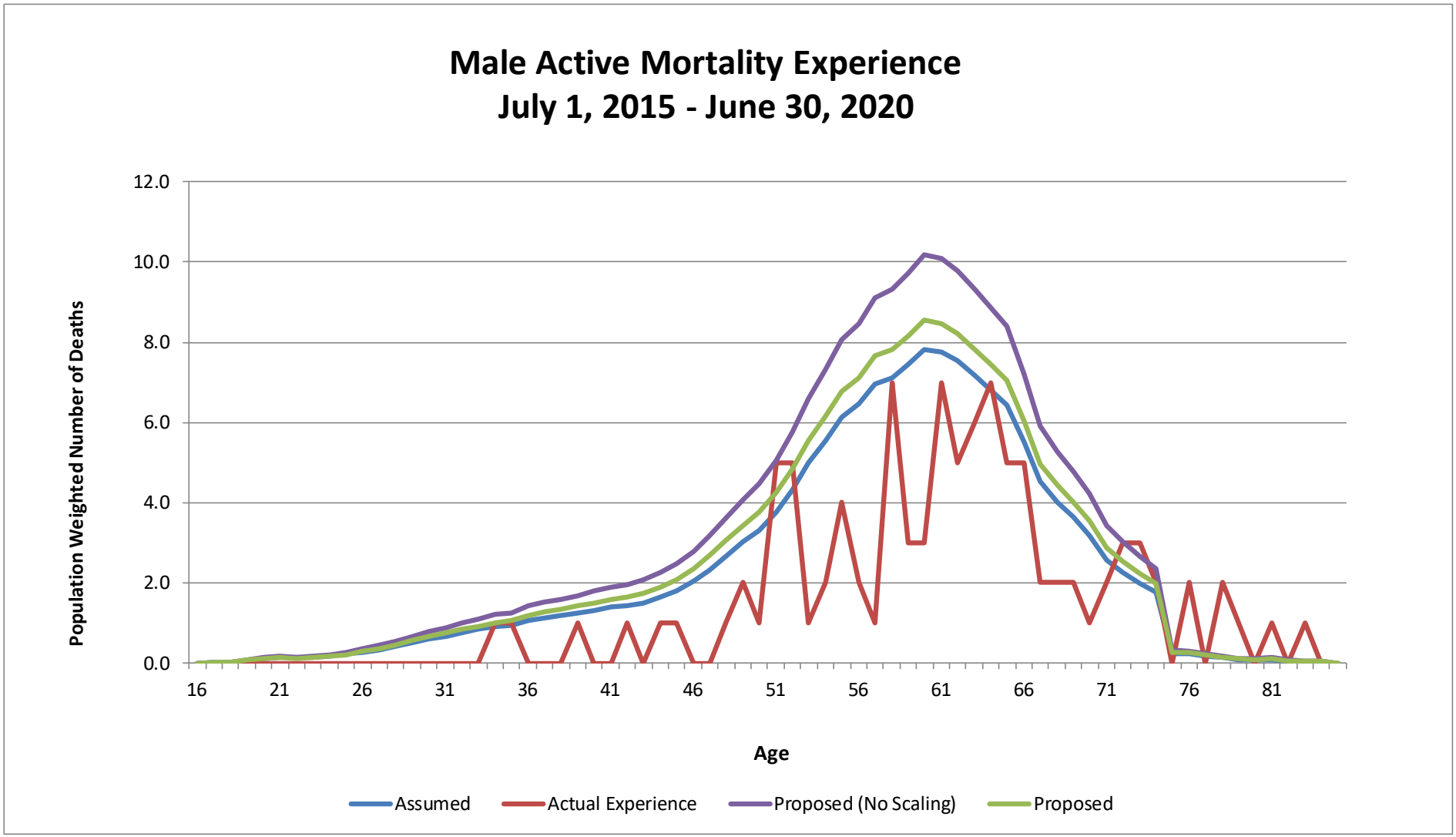


Mortality Assumption

Table II(c) Active General

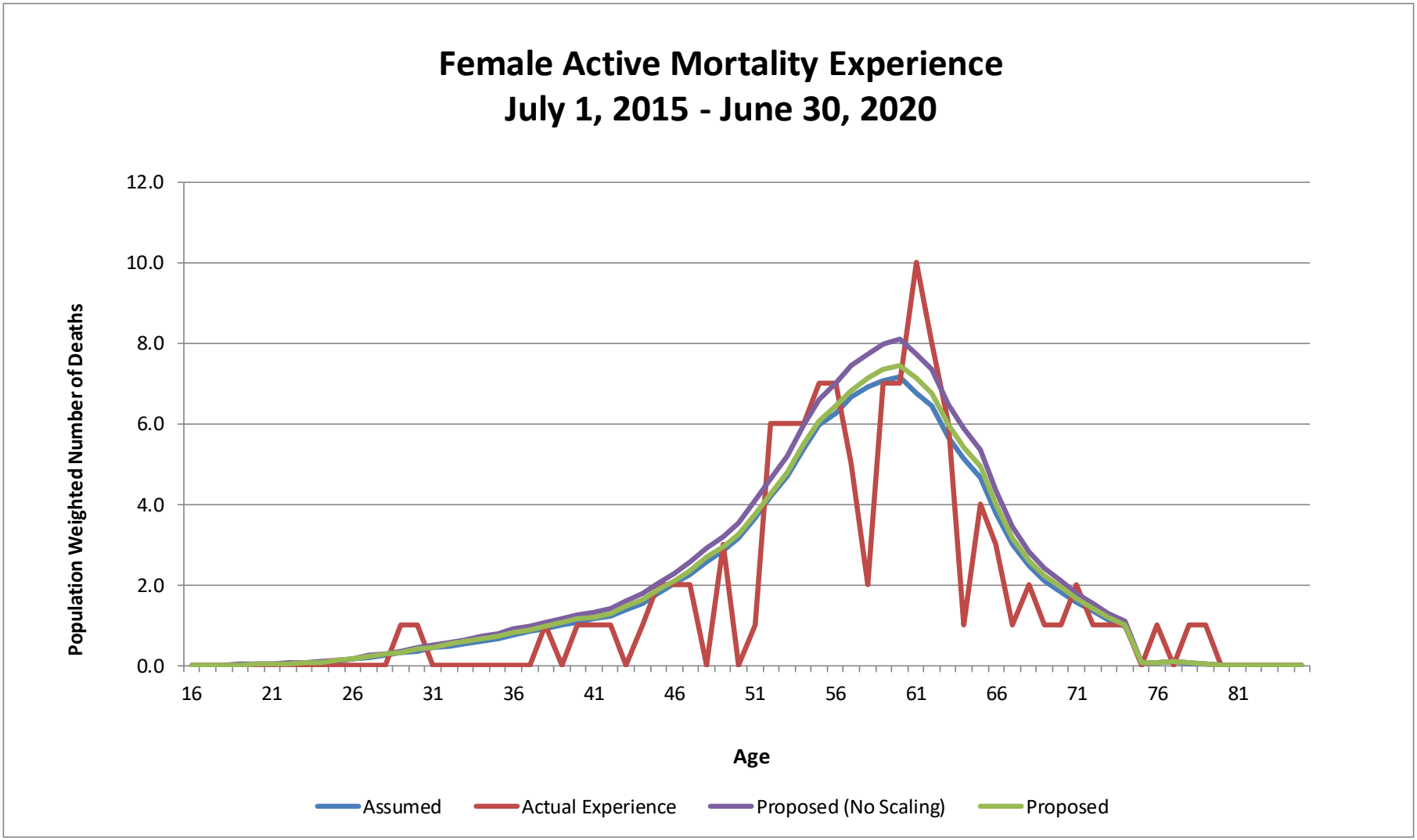
Male Active Mortality Experience									
	Actual Experience			Current Assumptions			Proposed Assumptions		
	Population Weighted			Expected	Assumed	Actual /	Expected	Proposed	Actual /
Age	Exposures	Deaths	Actual Rate	Deaths	Rate	Expected	Deaths	Rate	Expected
Under 20	256	0	0.000%	0	0.000%		0	0.000%	
20-24	2,049	0	0.000%	1	0.049%	0.00	1	0.049%	0.00
25-29	4,664	0	0.000%	2	0.043%	0.00	2	0.043%	0.00
30-34	7,503	1	0.013%	4	0.053%	0.25	4	0.053%	0.25
35-39	8,745	2	0.023%	6	0.069%	0.33	6	0.069%	0.33
40-44	9,647	2	0.021%	7	0.073%	0.29	8	0.083%	0.25
45-49	11,934	4	0.034%	12	0.101%	0.33	14	0.117%	0.29
50-54	14,602	14	0.096%	22	0.151%	0.64	25	0.171%	0.56
55-59	14,623	17	0.116%	34	0.233%	0.50	38	0.260%	0.45
60-64	10,846	28	0.258%	37	0.341%	0.76	41	0.378%	0.68
65-69	5,213	16	0.307%	24	0.460%	0.67	27	0.518%	0.59
70-74	1,795	11	0.613%	12	0.669%	0.92	13	0.724%	0.85
75 and over	100	7	7.000%	1	1.000%	7.00	1	1.000%	7.00
Totals:	**91,977**	**102**	**0.111%**	**162**	**0.176%**	**0.63**	**180**	**0.196%**	**0.57**
Less than 60:	**74,023**	**40**	**0.054%**	**88**	**0.119%**	**0.45**	**98**	**0.132%**	**0.41**
Female Active Mortality Experience									
	Population Weighted			Expected	Assumed	Actual /	Expected	Proposed	Actual /
Age	Exposures	Deaths	Actual Rate	Deaths	Rate	Expected	Deaths	Rate	Expected
Under 20	182	0	0.000%	0	0.000%		0	0.000%	
20-24	1,868	0	0.000%	0	0.000%		0	0.000%	
25-29	6,333	1	0.016%	1	0.016%	1.00	1	0.016%	1.00
30-34	9,988	1	0.010%	2	0.020%	0.50	3	0.030%	0.33
35-39	12,192	1	0.008%	4	0.033%	0.25	4	0.033%	0.25
40-44	13,932	4	0.029%	6	0.043%	0.67	7	0.050%	0.57
45-49	17,793	9	0.051%	12	0.067%	0.75	12	0.067%	0.75
50-54	20,773	19	0.091%	21	0.101%	0.90	22	0.106%	0.86
55-59	21,140	28	0.132%	33	0.156%	0.85	34	0.161%	0.82
60-64	14,316	32	0.224%	31	0.217%	1.03	33	0.231%	0.97
65-69	5,192	11	0.212%	16	0.308%	0.69	17	0.327%	0.65
70-74	1,393	6	0.431%	7	0.503%	0.86	7	0.503%	0.86
75 and over	32	3	9.375%	0	0.000%		0	0.000%	
Totals:	**125,134**	**115**	**0.092%**	**133**	**0.106%**	**0.86**	**140**	**0.112%**	**0.82**
Less than 60:	**104,201**	**63**	**0.060%**	**79**	**0.076%**	**0.80**	**83**	**0.080%**	**0.76**
Grand Totals:	**217,111**	**217**	**0.100%**	**295**	**0.136%**	**0.74**	**320**	**0.147%**	**0.68**
Less than 60:	**178,224**	**103**	**0.058%**	**167**	**0.094%**	**0.62**	**181**	**0.102%**	**0.57**

Graph II(c)(i) Active General Male



Expected deaths under the current and proposed assumptions are on a population weighted basis.

Graph II(c)(ii) Active General Female



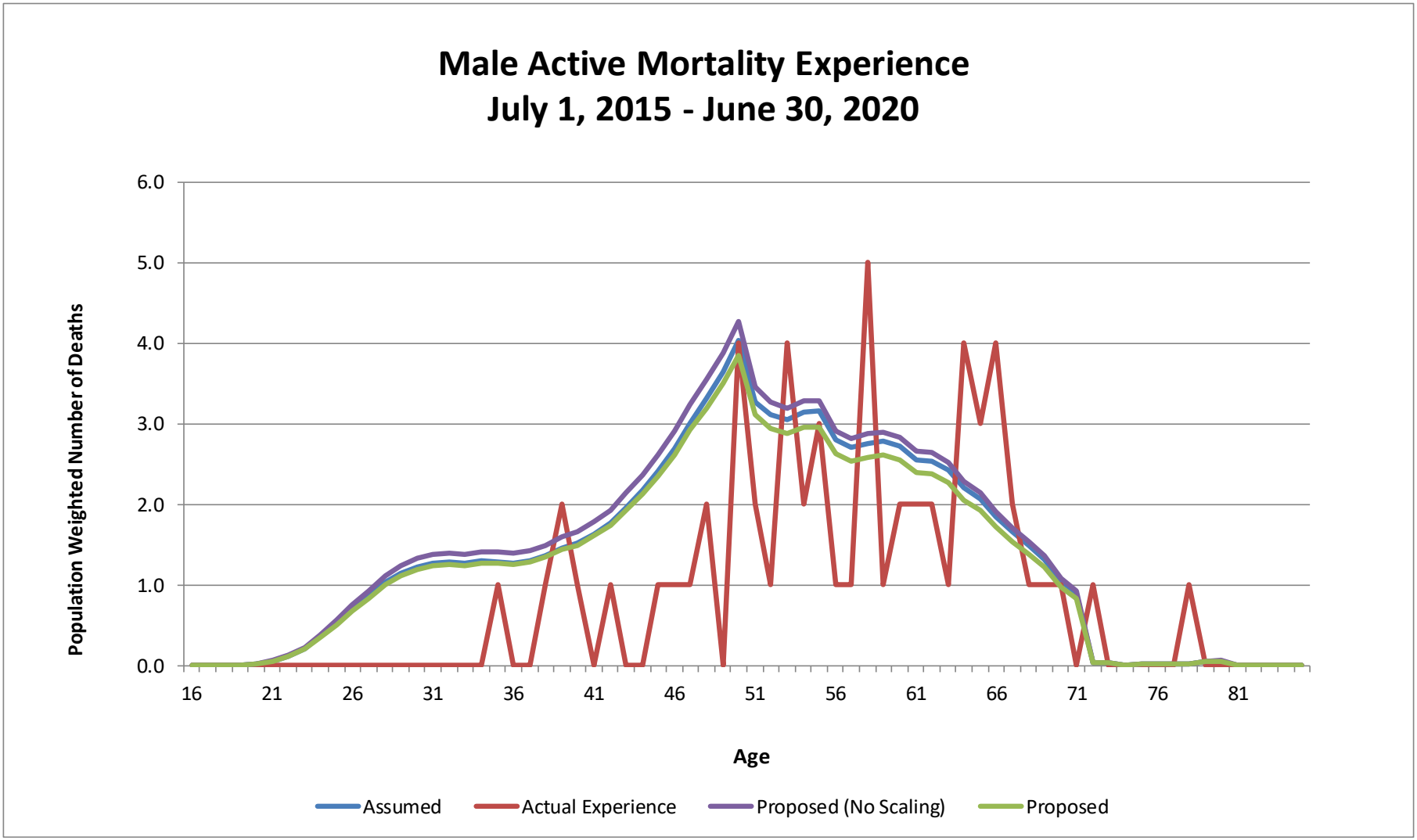
Expected deaths under the current and proposed assumptions are on a population weighted basis.

Mortality Assumption

Table II(d) Active Public Safety

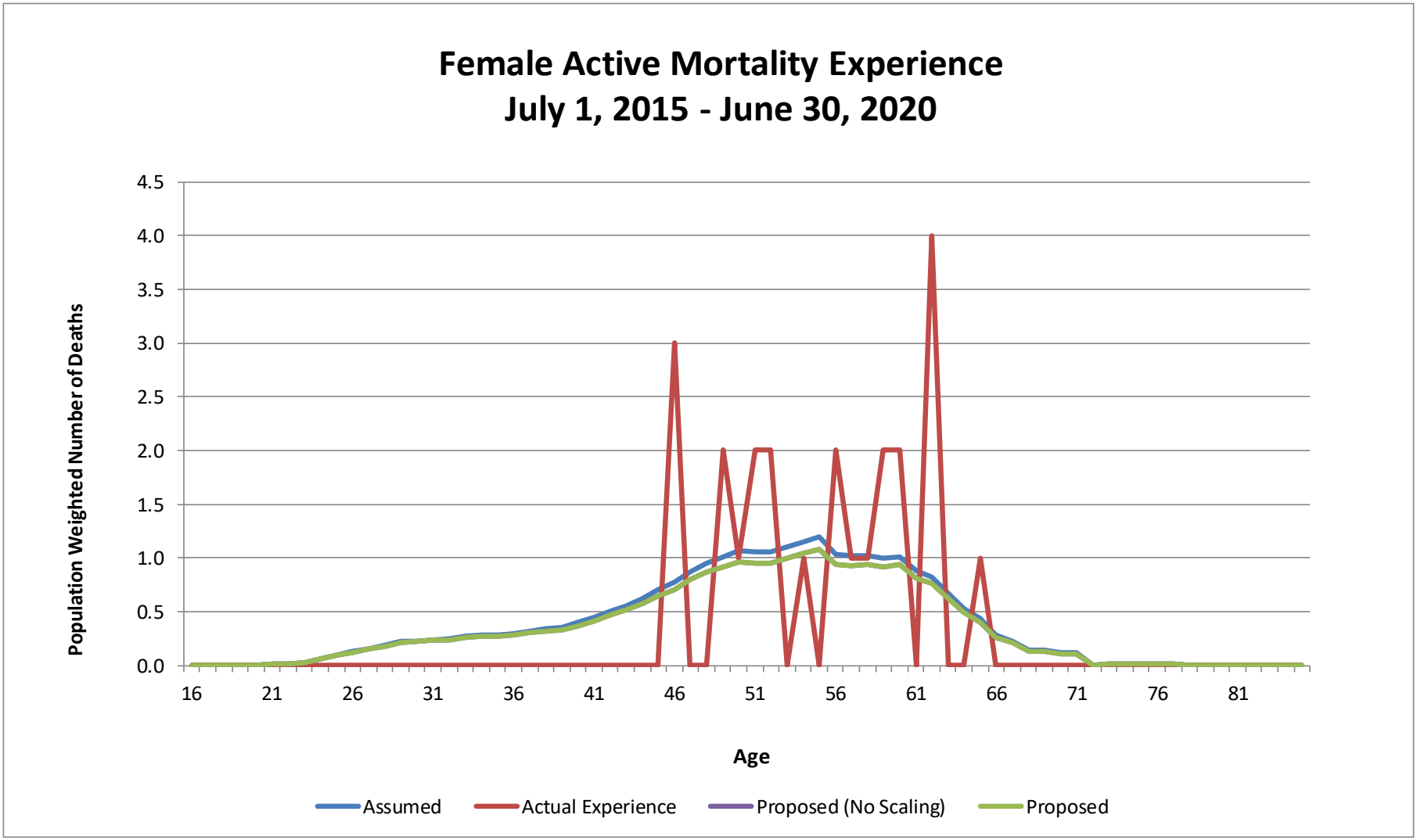
Male Active Mortality Experience									
	Actual Experience			Current Assumptions			Proposed Assumptions		
	Population Weighted			Expected	Assumed	Actual /	Expected	Proposed	Actual /
Age	Exposures	Deaths	Actual Rate	Deaths	Rate	Expected	Deaths	Rate	Expected
Under 20	4	0	0.000%	0	0.000%		0	0.000%	
20-24	1,739	0	0.000%	1	0.058%	0.00	1	0.058%	0.00
25-29	8,444	0	0.000%	4	0.047%	0.00	4	0.047%	0.00
30-34	10,536	0	0.000%	6	0.057%	0.00	6	0.057%	0.00
35-39	9,848	4	0.041%	7	0.071%	0.57	7	0.071%	0.57
40-44	11,867	2	0.017%	9	0.076%	0.22	9	0.076%	0.22
45-49	15,675	5	0.032%	15	0.096%	0.33	15	0.096%	0.33
50-54	12,053	13	0.108%	17	0.141%	0.76	16	0.133%	0.81
55-59	6,445	11	0.171%	14	0.217%	0.79	13	0.202%	0.85
60-64	3,518	11	0.313%	12	0.341%	0.92	12	0.341%	0.92
65-69	1,504	11	0.731%	8	0.532%	1.38	8	0.532%	1.38
70-74	237	2	0.844%	2	0.844%	1.00	2	0.844%	1.00
75 and over	8	1	12.500%	0	0.000%		0	0.000%	
Totals:	**81,878**	**60**	**0.073%**	**95**	**0.116%**	**0.63**	**93**	**0.114%**	**0.65**
Less than 60:	**76,611**	**35**	**0.046%**	**73**	**0.095%**	**0.48**	**71**	**0.093%**	**0.49**
Female Active Mortality Experience									
	Population Weighted			Expected	Assumed	Actual /	Expected	Proposed	Actual /
Age	Exposures	Deaths	Actual Rate	Deaths	Rate	Expected	Deaths	Rate	Expected
Under 20	0	0		0			0		
20-24	509	0	0.000%	0	0.000%		0	0.000%	
25-29	2,599	0	0.000%	1	0.038%	0.00	1	0.038%	0.00
30-34	2,973	0	0.000%	1	0.034%	0.00	1	0.034%	0.00
35-39	2,812	0	0.000%	2	0.071%	0.00	2	0.071%	0.00
40-44	3,651	0	0.000%	3	0.082%	0.00	2	0.055%	0.00
45-49	4,843	5	0.103%	4	0.083%	1.25	4	0.083%	1.25
50-54	4,272	6	0.140%	5	0.117%	1.20	5	0.117%	1.20
55-59	2,843	6	0.211%	5	0.176%	1.20	5	0.176%	1.20
60-64	1,618	6	0.371%	4	0.247%	1.50	4	0.247%	1.50
65-69	370	1	0.270%	1	0.270%	1.00	1	0.270%	1.00
70-74	45	0	0.000%	0	0.000%		0	0.000%	
75 and over	3	0	0.000%	0	0.000%		0	0.000%	
Totals:	**26,538**	**24**	**0.090%**	**26**	**0.098%**	**0.92**	**25**	**0.094%**	**0.96**
Less than 60:	**24,502**	**17**	**0.069%**	**21**	**0.086%**	**0.81**	**20**	**0.082%**	**0.85**
Grand Totals:	**108,416**	**84**	**0.077%**	**121**	**0.112%**	**0.69**	**118**	**0.109%**	**0.71**
Less than 60:	**101,113**	**52**	**0.051%**	**94**	**0.093%**	**0.55**	**91**	**0.090%**	**0.57**

Graph II(d)(i) Active Public Safety Male



Expected deaths under the current and proposed assumptions are on a population weighted basis.

Graph II(d)(ii) Active Public Safety Female



Expected deaths under the current and proposed assumptions are on a population weighted basis.

Retirement Assumption

Retirement

The System provisions establish the minimum eligibility requirements for retirement as follows:
Upon termination of State service, a member is eligible for a pension at age 60 with at least eight years of pension credit or at any age with 35 or more years of credit.

General formula members are eligible for a retirement annuity if the sum of the member's age plus years (and whole months) of pension credit equals or exceeds 85. General formula members between ages 55 and 60 with at least 25 years of pension credit are eligible for a retirement annuity reduced by one-half of 1 percent for each month the member is under age 60. Certain positions in the Department of Corrections were placed under the general formula effective July 1, 2005.

Members serving in a position in which service toward the Alternative Retirement Annuity may be earned are eligible to receive the Alternative Retirement Annuity at age 50 with at least 25 years of alternative pension credit or at age 55 with at least 20 years of alternative pension credit in such a position. Security employees of the Department of Human Services were placed under the alternative formula, effective January 1, 2001. Certain members of the Department of Transportation and the Toll Highway Authority were placed under the alternative formula effective August 1, 2001.

The above provisions apply to Tier One members only.

Retirement cost, however, is determined not by the minimum eligibility requirements, but by the ages at which members actually retire. The valuation does not assume that everyone retires at earliest eligibility. The assumption about the timing of retirement once eligibility has been established is a major component in cost calculations. Note that higher rates of retirement at earlier retirement ages or years of service upon attaining retirement eligibility generally result in higher actuarially determined contributions, and vice versa.

Experience during the last three years was considered in the analysis shown on the following pages. The "Exposures" column shows the number of employees eligible to retire at various years of service or ages throughout the experience period. An individual could potentially be counted up to three times if eligible each year in the period. By tabulating employees in this fashion we are able to answer the question: "For all employees eligible at condition X, how many retired?"

Retirement Assumption

Tier One

Normal Retirement Experience – Regular Formula

Current and past experience has shown that retirement rates under this System are correlated with age. Currently, the System uses age-based rates with higher rates at key ages, with 100 percent retirement at age 75. We recommend the following changes:

- For both male and female members, a decrease in overall rates to reflect the actual experience of the System.

Applying the proposed rates to historical data generates the following number of retirements by age at retirement:

	Regular Formula - Number of Retirements					
	Male Members			Female Members		
Nearest Age	Actual	Current Assumption	Proposed Assumption	Actual	Current Assumption	Proposed Assumption
50-54	97	100	97	191	182	188
55-59	392	430	426	578	673	652
60-64	654	722	697	1018	1184	1119
65-69	481	563	505	612	699	670
70-74	155	171	165	149	164	164
75+	67	360	360	62	292	292
Total	**1,846**	**2,346**	**2,250**	**2,610**	**3,194**	**3,085**
Total Excluding 75+	**1,779**	**1,986**	**1,890**	**2,548**	**2,902**	**2,793**

Early Retirement Experience – Regular Formula

Early retirement experience for male and female members was generally lower than the current early retirement rates. We recommend the following changes:

- For male members, we recommend a decrease in the rate at age 57 and no change to the rate at ages 55, 56, 58, and 59.
- For female members, we recommend an increase in the rate at age 55 and a decrease in the rates from ages 56 to 59.

Retirement Experience and Recommendations

The tables and graphs on the following pages show experience for normal and early retirement.

- Table III(a) and Graph III(a) – Normal Retirement Experience – Male
- Table III(b) and Graph III(b) – Normal Retirement Experience – Female
- Table III(c) and Graph III(c) – Early Retirement Experience – Male
- Table III(d) and Graph III(d) – Early Retirement Experience – Female

Retirement Assumption

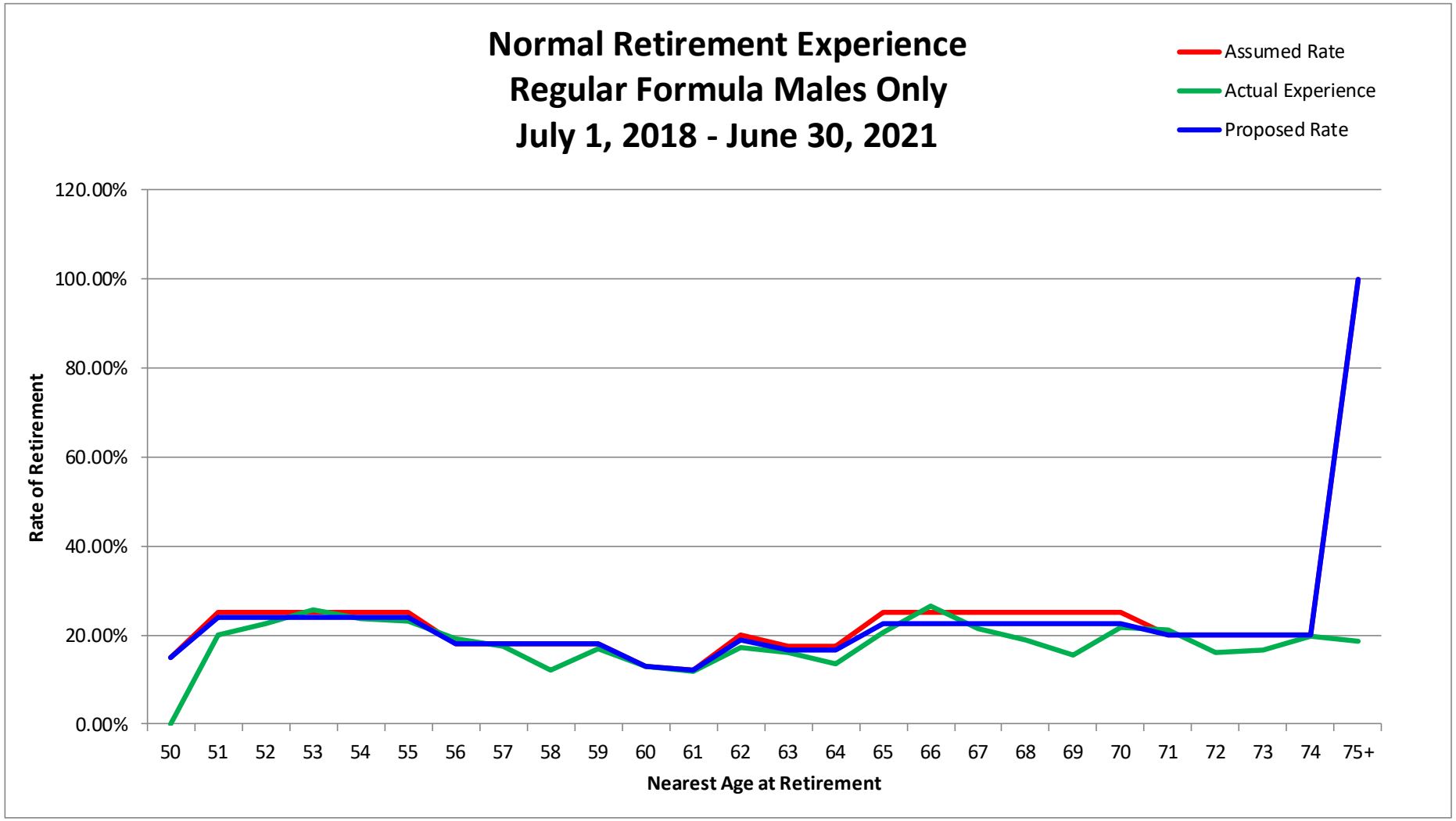
Tier One Regular Formula Male
Normal Retirement

Table III(a)

Normal Retirement Experience- Regular Formula Male Members									
	Actual Experience			Current Assumptions			Proposed Assumptions		
Nearest Age @ Retirement	Exposures	Retirements	Actual Rate	Expected Retirements	Assumed Rate	Actual / Expected	Expected Retirements	Proposed Rate	Actual / Expected
50	0	0		0	15.0%		0	15.0%	
51	5	1	20.0%	1	25.0%	1.0	1	24.0%	1.0
52	40	9	22.5%	10	25.0%	0.9	10	24.0%	0.9
53	109	28	25.7%	27	25.0%	1.0	26	24.0%	1.1
54	248	59	23.8%	62	25.0%	1.0	60	24.0%	1.0
55	355	82	23.1%	89	25.0%	0.9	85	24.0%	1.0
56	430	83	19.3%	77	18.0%	1.1	77	18.0%	1.1
57	466	82	17.6%	84	18.0%	1.0	84	18.0%	1.0
58	496	60	12.1%	89	18.0%	0.7	89	18.0%	0.7
59	505	85	16.8%	91	18.0%	0.9	91	18.0%	0.9
60	1,154	150	13.0%	150	13.0%	1.0	150	13.0%	1.0
61	1,014	120	11.8%	122	12.0%	1.0	122	12.0%	1.0
62	923	159	17.2%	185	20.0%	0.9	175	19.0%	0.9
63	784	127	16.2%	137	17.5%	0.9	129	16.5%	1.0
64	731	98	13.4%	128	17.5%	0.8	121	16.5%	0.8
65	673	139	20.7%	168	25.0%	0.8	151	22.5%	0.9
66	566	150	26.5%	142	25.0%	1.1	127	22.5%	1.2
67	422	90	21.3%	106	25.0%	0.8	95	22.5%	0.9
68	323	61	18.9%	81	25.0%	0.8	73	22.5%	0.8
69	264	41	15.5%	66	25.0%	0.6	59	22.5%	0.7
70	222	48	21.6%	56	25.0%	0.9	50	22.5%	1.0
71	198	42	21.2%	40	20.0%	1.1	40	20.0%	1.1
72	157	25	15.9%	31	20.0%	0.8	31	20.0%	0.8
73	127	21	16.5%	25	20.0%	0.8	25	20.0%	0.8
74	96	19	19.8%	19	20.0%	1.0	19	20.0%	1.0
75+	360	67	18.6%	360	100.0%	0.2	360	100.0%	0.2
Totals:	**10,668**	**1,846**	**17.3%**	**2,346**	**22.0%**	**0.8**	**2,250**	**21.1%**	**0.8**
Excluding 75+:	**10,308**	**1,779**	**17.3%**	**1,986**	**19.3%**	**0.9**	**1,890**	**18.3%**	**0.9**

Tier One

Graph III(a)



Retirement Assumption

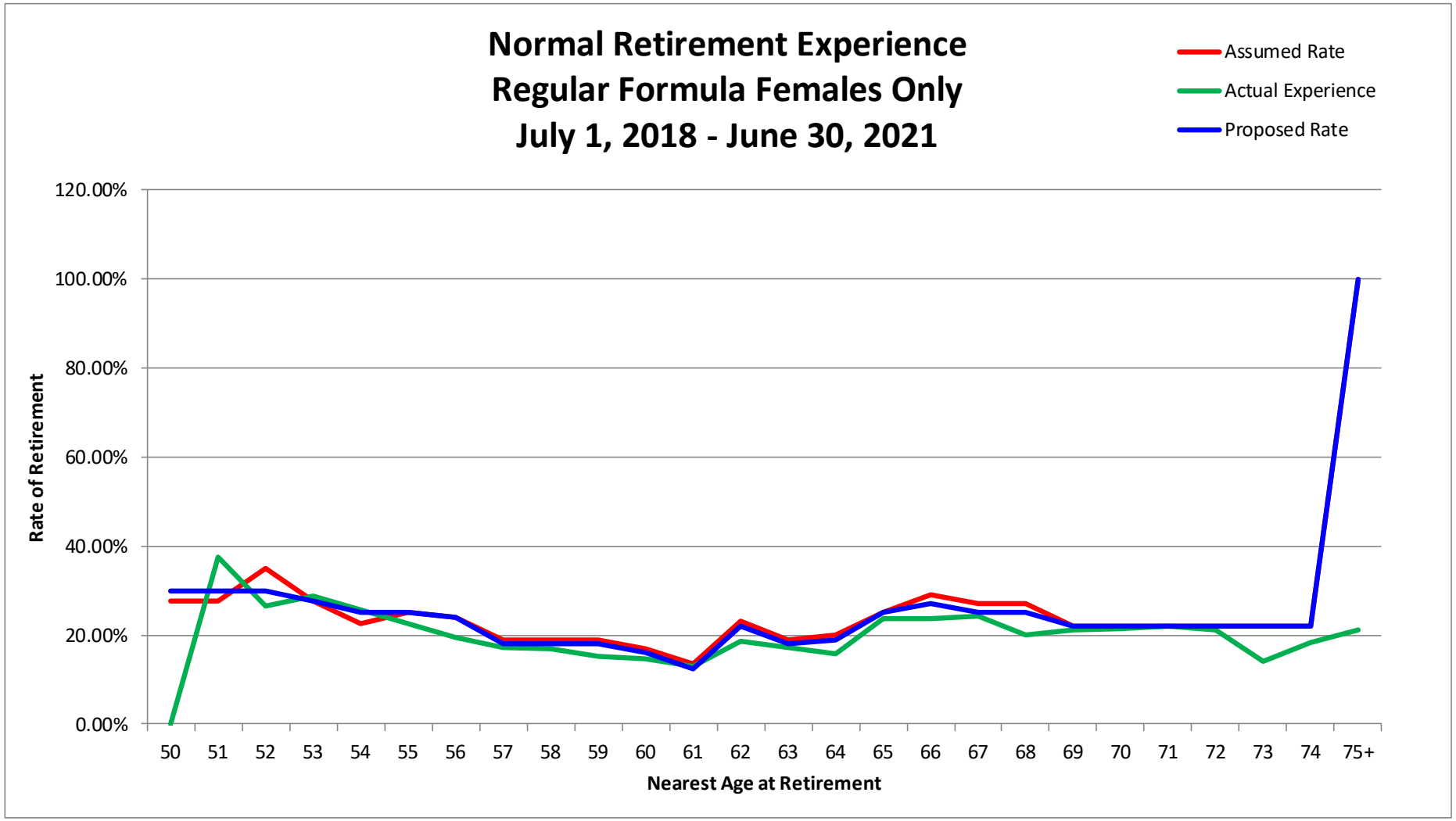
Tier One Regular Formula Female
Normal Retirement

Table III(b)

Normal Retirement Experience - Regular Formula Female Members									
	Actual Experience			Current Assumptions			Proposed Assumptions		
Nearest Age @ Retirement	Exposures	Retirements	Actual Rate	Expected Retirements	Assumed Rate	Actual / Expected	Expected Retirements	Proposed Rate	Actual / Expected
50	0	0		0	27.5%		0	30.0%	
51	16	6	37.5%	4	27.5%	1.5	5	30.0%	1.2
52	87	23	26.4%	30	35.0%	0.8	26	30.0%	0.9
53	236	68	28.8%	65	27.5%	1.0	65	27.5%	1.0
54	367	94	25.6%	83	22.5%	1.1	92	25.0%	1.0
55	524	118	22.5%	131	25.0%	0.9	131	25.0%	0.9
56	602	117	19.4%	144	24.0%	0.8	144	24.0%	0.8
57	654	112	17.1%	124	19.0%	0.9	118	18.0%	0.9
58	704	119	16.9%	134	19.0%	0.9	127	18.0%	0.9
59	735	112	15.2%	140	19.0%	0.8	132	18.0%	0.8
60	1,693	247	14.6%	288	17.0%	0.9	271	16.0%	0.9
61	1,482	191	12.9%	200	13.5%	1.0	185	12.5%	1.0
62	1,323	247	18.7%	304	23.0%	0.8	291	22.0%	0.8
63	1,080	186	17.2%	205	19.0%	0.9	194	18.0%	1.0
64	935	147	15.7%	187	20.0%	0.8	178	19.0%	0.8
65	830	196	23.6%	208	25.0%	0.9	208	25.0%	0.9
66	649	154	23.7%	188	29.0%	0.8	175	27.0%	0.9
67	494	120	24.3%	133	27.0%	0.9	124	25.0%	1.0
68	382	77	20.2%	103	27.0%	0.7	96	25.0%	0.8
69	306	65	21.2%	67	22.0%	1.0	67	22.0%	1.0
70	230	49	21.3%	51	22.0%	1.0	51	22.0%	1.0
71	163	36	22.1%	36	22.0%	1.0	36	22.0%	1.0
72	146	31	21.2%	32	22.0%	1.0	32	22.0%	1.0
73	106	15	14.2%	23	22.0%	0.7	23	22.0%	0.7
74	98	18	18.4%	22	22.0%	0.8	22	22.0%	0.8
75+	292	62	21.2%	292	100.0%	0.2	292	100.0%	0.2
Totals:	**14,134**	**2,610**	**18.5%**	**3,194**	**22.6%**	**0.8**	**3,085**	**21.8%**	**0.8**
Excluding 75+:	**13,842**	**2,548**	**18.4%**	**2,902**	**21.0%**	**0.9**	**2,793**	**20.2%**	**0.9**

Tier One

Graph III(b)



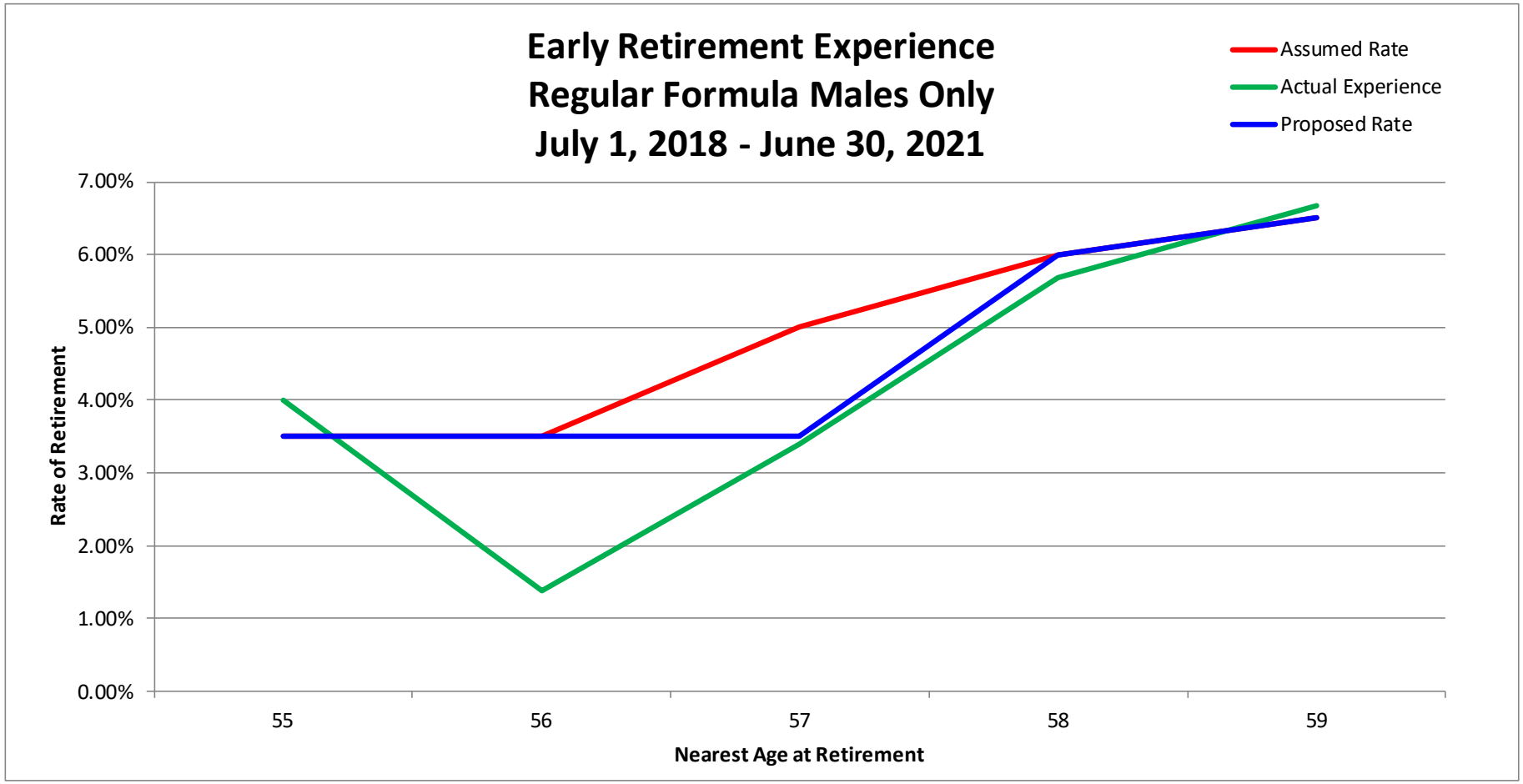
Tier One Regular Formula Male
Early Retirement

Table III(c)

Early Retirement Experience - Regular Formula Male Members									
	Actual Experience			Current Assumptions			Proposed Assumptions		
Nearest Age @ Retirement	Exposures	Retirements	Actual Rate	Expected Retirements	Assumed Rate	Actual / Expected	Expected Retirements	Proposed Rate	Actual / Expected
55	275	11	4.0%	10	3.5%	1.1	10	3.5%	1.1
56	217	3	1.4%	8	3.5%	0.4	8	3.5%	0.4
57	147	5	3.4%	7	5.0%	0.7	5	3.5%	1.0
58	88	5	5.7%	5	6.0%	1.0	5	6.0%	1.0
59	45	3	6.7%	3	6.5%	1.0	3	6.5%	1.0
Totals:	**772**	**27**	**3.5%**	**33**	**4.3%**	**0.8**	**31**	**4.0%**	**0.9**

Tier One

Graph III(c)



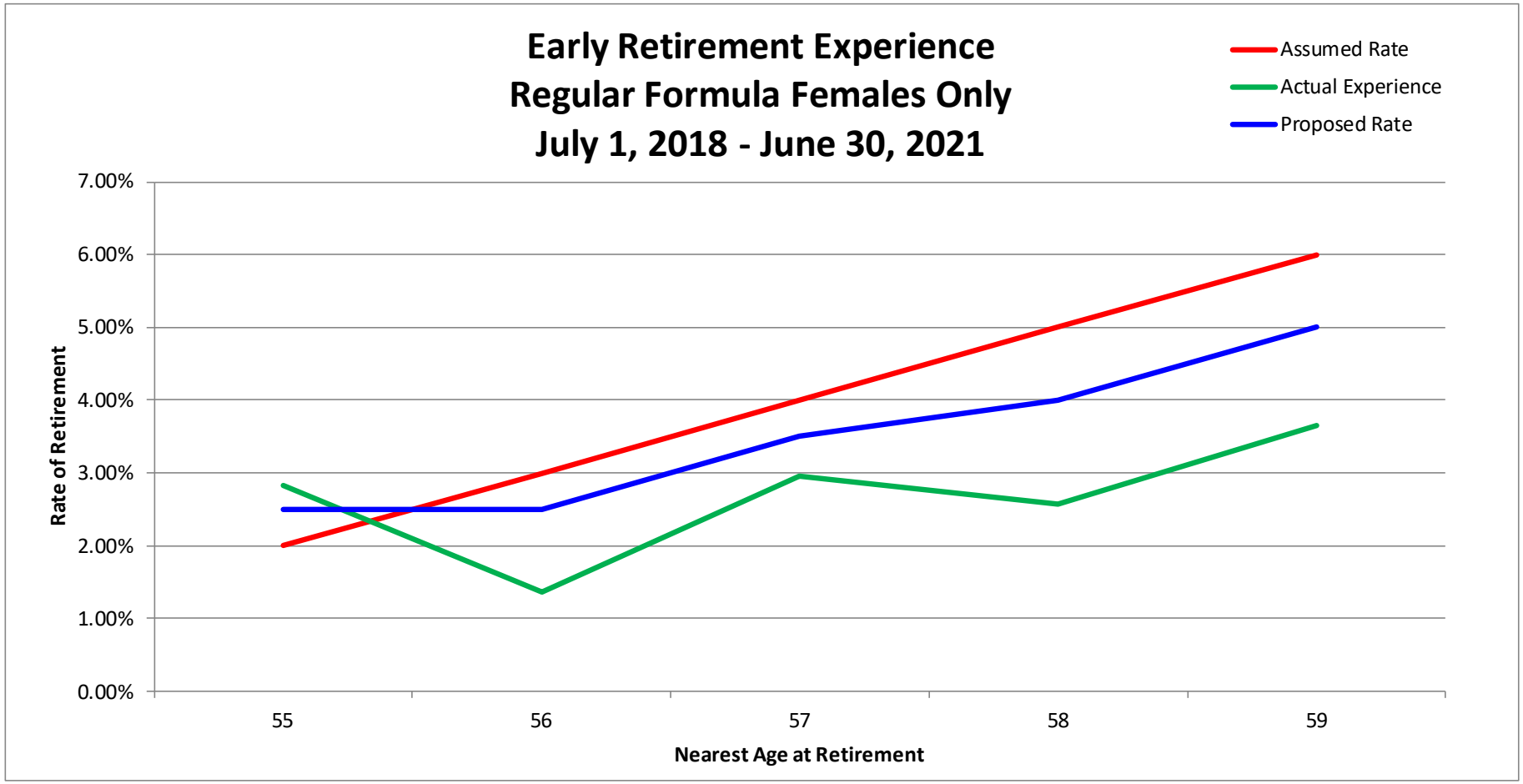
Tier One Regular Formula Female
Early Retirement

Table III(d)

Early Retirement Experience - Regular Formula Female Members									
	Actual Experience			Current Assumptions			Proposed Assumptions		
Nearest Age @ Retirement	Exposures	Retirements	Actual Rate	Expected Retirements	Assumed Rate	Actual / Expected	Expected Retirements	Proposed Rate	Actual / Expected
55	388	11	2.8%	8	2.0%	1.4	10	2.5%	1.1
56	293	4	1.4%	9	3.0%	0.4	7	2.5%	0.6
57	203	6	3.0%	8	4.0%	0.8	7	3.5%	0.9
58	155	4	2.6%	8	5.0%	0.5	6	4.0%	0.7
59	82	3	3.7%	5	6.0%	0.6	4	5.0%	0.8
Totals:	**1,121**	**28**	**2.5%**	**38**	**3.4%**	**0.7**	**34**	**3.0%**	**0.8**

Tier One

Graph III(d)



Retirement Assumption

Tier One

Normal Retirement Experience – Alternative Formula

Current and past experience has shown that retirement rates under this System are correlated with age. Currently, the System uses age-based rates with higher rates at key ages, with 100 percent retirement at age 72.

Generally speaking, members are eligible to receive alternative formula benefits provided they are age 50 with at least 25 years of alternative formula pension credit or at age 55 with at least 20 years of alternative formula pension credit. During the analysis, it was noted that a number of members working in positions in which alternative formula pension credit is accrued were retiring based upon regular formula eligibility. As a result, we continue to recommend that this experience be recognized and accounted for in the valuation. We have developed separate rates for those members who could potentially retire based upon regular formula eligibility and benefit provisions.

For member's eligible for retirement based upon the alternative formula eligibility, we are recommending changes to the rates to reflect the actual experience of the System.

For alternative formula members eligible for retirement under the alternative formula provisions, applying the proposed rates to historical data generates the following number of retirements by age at retirement:

	Alternative Formula - Number of Retirements					
	Male Members			Female Members		
Nearest Age	Actual	Current Assumption	Proposed Assumption	Actual	Current Assumption	Proposed Assumption
50-54	670	759	710	161	160	160
55-59	400	445	413	171	210	187
60-64	199	213	213	102	132	123
65-69	101	92	92	39	46	46
70-74	20	50	44	4	12	12
75+	5	11	11	4	4	4
Total	**1,395**	**1,570**	**1,483**	**481**	**564**	**532**
Total Excluding 75+	**1,390**	**1,559**	**1,472**	**477**	**560**	**528**

Retirement Assumption

Tier One

For alternative formula members eligible for retirement under the regular formula provisions, applying the proposed rates to historical data generates the following number of retirements by age at retirement:

Nearest Age	Alternative Formula - Number of Retirements					
	Male Members			Female Members		
	Actual	Current Assumption	Proposed Assumption	Actual	Current Assumption	Proposed Assumption
60-64	45	66	59	17	32	24
65-69	61	61	63	15	19	19
70-71	8	14	13	3	4	4
72+	16	75	75	3	13	13
Total	**130**	**216**	**210**	**38**	**68**	**60**
Total Excluding 72+	**114**	**141**	**135**	**35**	**55**	**47**

The tables and graphs on the following pages show experience for normal and early retirement.

- Table III(e) and Graph III(e) – Normal Retirement Experience – Alternative Formula Male Members – Eligible for Retirement Under the Alternative Formula Provisions
- Table III(f) and Graph III(f) – Normal Retirement Experience – Alternative Formula Female Members – Eligible for Retirement Under the Alternative Formula Provisions
- Table III(g) and Graph III(g) – Normal Retirement Experience – Alternative Formula Male Members – Eligible for Retirement Under the Regular Formula Provisions
- Table III(h) and Graph III(h) – Normal Retirement Experience – Alternative Formula Female Members – Eligible for Retirement Under the Regular Formula Provisions

Retirement Assumption

Tier One Alternative Formula Male

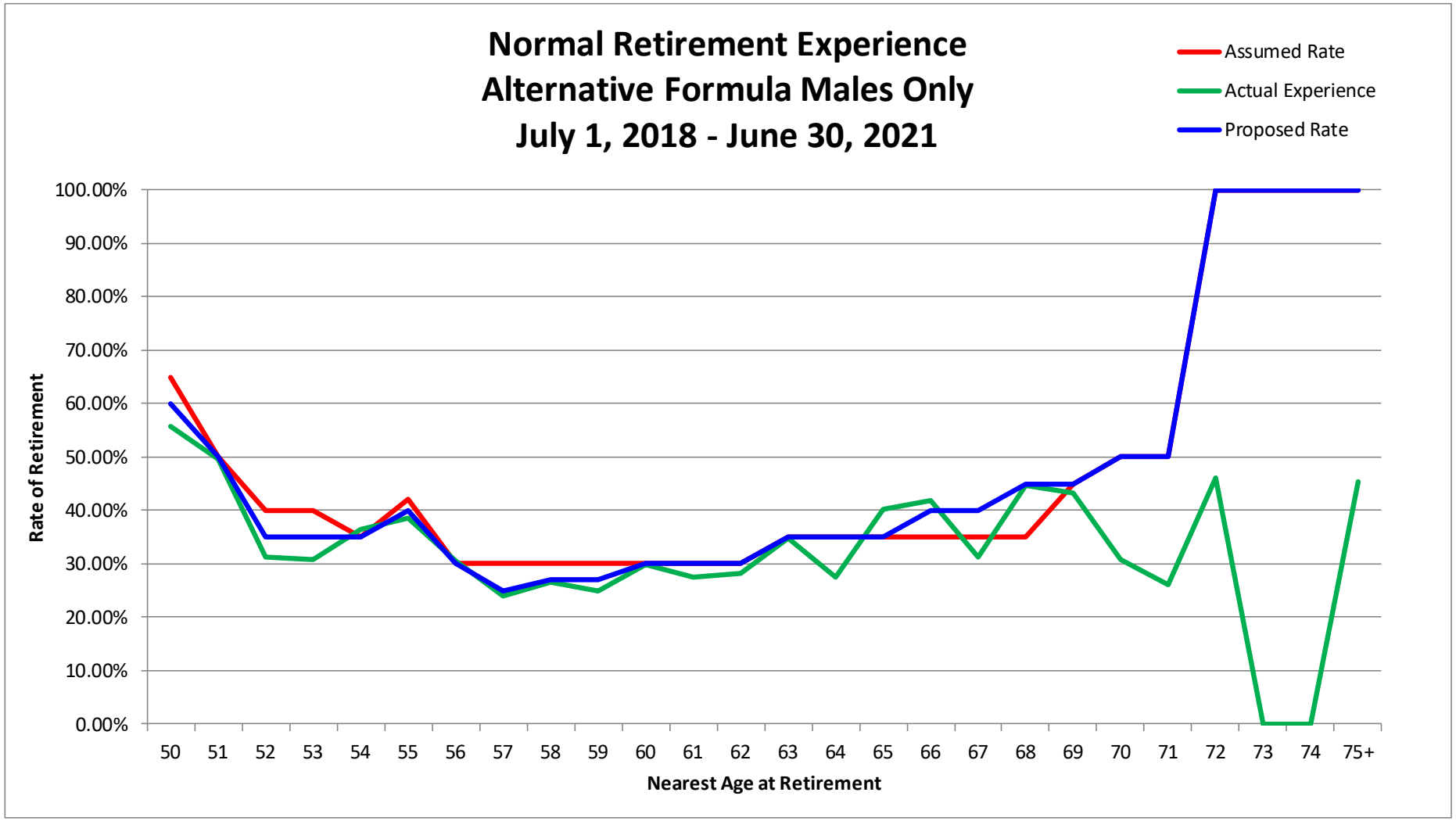
Table III(e)

Normal Retirement Experience - Alternative Formula Male Members									
	Actual Experience			Current Assumptions			Proposed Assumptions		
Nearest Age @ Retirement	Exposures	Retirements	Actual Rate	Expected Retirements	Assumed Rate	Actual / Expected	Expected Retirements	Proposed Rate	Actual / Expected
50	605	337	55.7%	393	65.0%	0.9	363	60.0%	0.9
51	296	147	49.7%	148	50.0%	1.0	148	50.0%	1.0
52	199	62	31.2%	80	40.0%	0.8	70	35.0%	0.9
53	188	58	30.9%	75	40.0%	0.8	66	35.0%	0.9
54	181	66	36.5%	63	35.0%	1.0	63	35.0%	1.0
55	410	158	38.5%	172	42.0%	0.9	164	40.0%	1.0
56	265	81	30.6%	80	30.0%	1.0	80	30.0%	1.0
57	230	55	23.9%	69	30.0%	0.8	58	25.0%	0.9
58	215	57	26.5%	65	30.0%	0.9	58	27.0%	1.0
59	196	49	25.0%	59	30.0%	0.8	53	27.0%	0.9
60	187	56	29.9%	56	30.0%	1.0	56	30.0%	1.0
61	157	43	27.4%	47	30.0%	0.9	47	30.0%	0.9
62	117	33	28.2%	35	30.0%	0.9	35	30.0%	0.9
63	112	39	34.8%	39	35.0%	1.0	39	35.0%	1.0
64	102	28	27.5%	36	35.0%	0.8	36	35.0%	0.8
65	82	33	40.2%	29	35.0%	1.1	29	35.0%	1.1
66	55	23	41.8%	19	35.0%	1.2	19	40.0%	1.2
67	48	15	31.3%	17	35.0%	0.9	17	40.0%	0.9
68	38	17	44.7%	13	35.0%	1.3	13	45.0%	1.3
69	30	13	43.3%	14	45.0%	0.9	14	45.0%	0.9
70	26	8	30.8%	13	50.0%	0.6	10	50.0%	0.8
71	23	6	26.1%	12	50.0%	0.5	9	50.0%	0.7
72	13	6	46.2%	13	100.0%	0.5	13	100.0%	0.5
73	5	0	0.0%	5	100.0%	0.0	5	100.0%	0.0
74	7	0	0.0%	7	100.0%	0.0	7	100.0%	0.0
75+	11	5	45.5%	11	100.0%	0.5	11	100.0%	0.5
Totals:	**3,798**	**1,395**	**36.7%**	**1,570**	**41.3%**	**0.9**	**1,483**	**39.0%**	**0.9**
Excluding 75+:	**3,787**	**1,390**	**36.7%**	**1,559**	**41.2%**	**0.9**	**1,472**	**38.9%**	**0.9**

Retirement Assumption

Tier One

Graph III(e)



Retirement Assumption

Tier One Alternative Formula Female

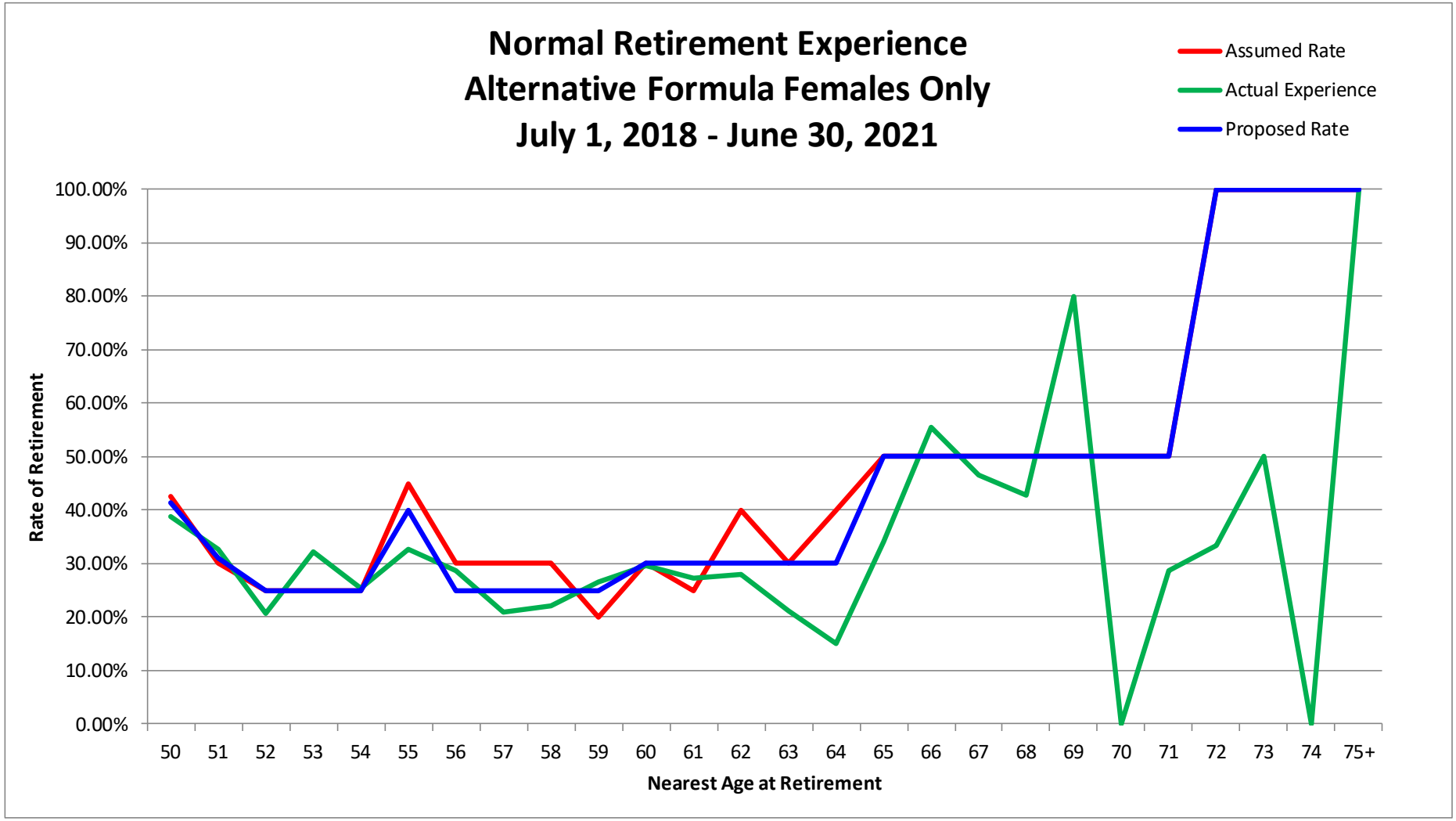
Table III(f)

Normal Retirement Experience - Alternative Formula FeFem Members									
	Actual Experience			Current Assumptions			Proposed Assumptions		
Nearest Age @ Retirement	Exposures	Retirements	Actual Rate	Expected Retirements	Assumed Rate	Actual / Expected	Expected Retirements	Proposed Rate	Actual / Expected
50	134	52	38.8%	57	42.5%	0.9	56	41.5%	0.9
51	113	37	32.7%	34	30.0%	1.1	35	31.0%	1.1
52	87	18	20.7%	22	25.0%	0.8	22	25.0%	0.8
53	96	31	32.3%	24	25.0%	1.3	24	25.0%	1.3
54	91	23	25.3%	23	25.0%	1.0	23	25.0%	1.0
55	211	69	32.7%	95	45.0%	0.7	84	40.0%	0.8
56	136	39	28.7%	41	30.0%	1.0	34	25.0%	1.1
57	100	21	21.0%	30	30.0%	0.7	25	25.0%	0.8
58	91	20	22.0%	27	30.0%	0.7	23	25.0%	0.9
59	83	22	26.5%	17	20.0%	1.3	21	25.0%	1.0
60	98	29	29.6%	29	30.0%	1.0	29	30.0%	1.0
61	92	25	27.2%	23	25.0%	1.1	28	30.0%	0.9
62	82	23	28.0%	33	40.0%	0.7	25	30.0%	0.9
63	76	16	21.1%	23	30.0%	0.7	23	30.0%	0.7
64	60	9	15.0%	24	40.0%	0.4	18	30.0%	0.5
65	44	15	34.1%	22	50.0%	0.7	22	50.0%	0.7
66	18	10	55.6%	9	50.0%	1.1	9	50.0%	1.1
67	15	7	46.7%	8	50.0%	0.9	8	50.0%	0.9
68	7	3	42.9%	4	50.0%	0.8	4	50.0%	0.8
69	5	4	80.0%	3	50.0%	1.3	3	50.0%	1.3
70	4	0	0.0%	2	50.0%	0.0	2	50.0%	0.0
71	7	2	28.6%	4	50.0%	0.5	4	50.0%	0.5
72	3	1	33.3%	3	100.0%	0.3	3	100.0%	0.3
73	2	1	50.0%	2	100.0%	0.5	2	100.0%	0.5
74	1	0	0.0%	1	100.0%	0.0	1	100.0%	0.0
75+	4	4	100.0%	4	100.0%	1.0	4	100.0%	1.0
Totals:	**1,660**	**481**	**29.0%**	**564**	**34.0%**	**0.9**	**532**	**32.0%**	**0.9**
Excluding 75+:	**1,656**	**477**	**28.8%**	**560**	**33.8%**	**0.9**	**528**	**31.9%**	**0.9**

Retirement Assumption

Tier One

Graph III(f)



Tier One Alternative Formula Male
Eligible for Retirement under the Regular Formula Provisions

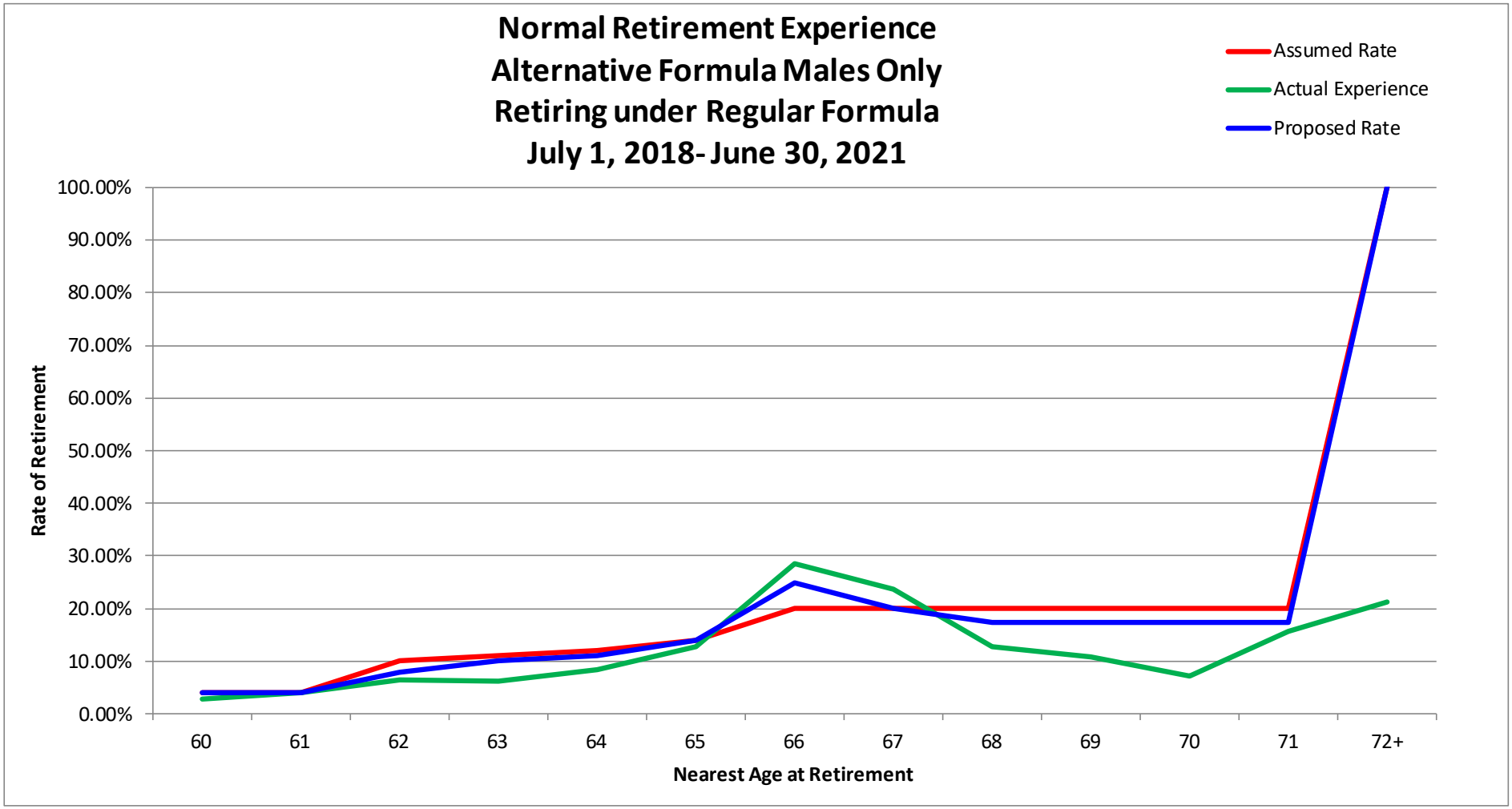
Table III(g)

Normal Retirement Experience - Alternative Formula Male Members - Eligible for Retirement under the Regular Formula Provisions									
	Actual Experience			Current Assumptions			Proposed Assumptions		
Nearest Age @ Retirement	Exposures	Retirements	Actual Rate	Expected Retirements	Assumed Rate	Actual / Expected	Expected Retirements	Proposed Rate	Actual / Expected
60	211	6	2.8%	8	4.0%	0.8	8	4.0%	0.8
61	177	7	4.0%	7	4.0%	1.0	7	4.0%	1.0
62	169	11	6.5%	17	10.0%	0.6	14	8.0%	0.8
63	160	10	6.3%	18	11.0%	0.6	16	10.0%	0.6
64	131	11	8.4%	16	12.0%	0.7	14	11.0%	0.8
65	118	15	12.7%	17	14.0%	0.9	17	14.0%	0.9
66	77	22	28.6%	15	20.0%	1.5	19	25.0%	1.2
67	55	13	23.6%	11	20.0%	1.2	11	20.0%	1.2
68	47	6	12.8%	9	20.0%	0.7	8	17.5%	0.8
69	46	5	10.9%	9	20.0%	0.6	8	17.5%	0.6
70	42	3	7.1%	8	20.0%	0.4	7	17.5%	0.4
71	32	5	15.6%	6	20.0%	0.8	6	17.5%	0.8
72+	75	16	21.3%	75	100.0%	0.2	75	100.0%	0.2
Totals:	**1,340**	**130**	**9.7%**	**216**	**16.1%**	**0.6**	**210**	**15.7%**	**0.6**
Excluding 72+:	**1,265**	**114**	**9.0%**	**141**	**11.1%**	**0.8**	**135**	**10.7%**	**0.8**

Retirement Assumption

Tier One

Graph III(g)



Tier One Alternative Formula Female
Eligible for Retirement under the Regular Formula Provisions

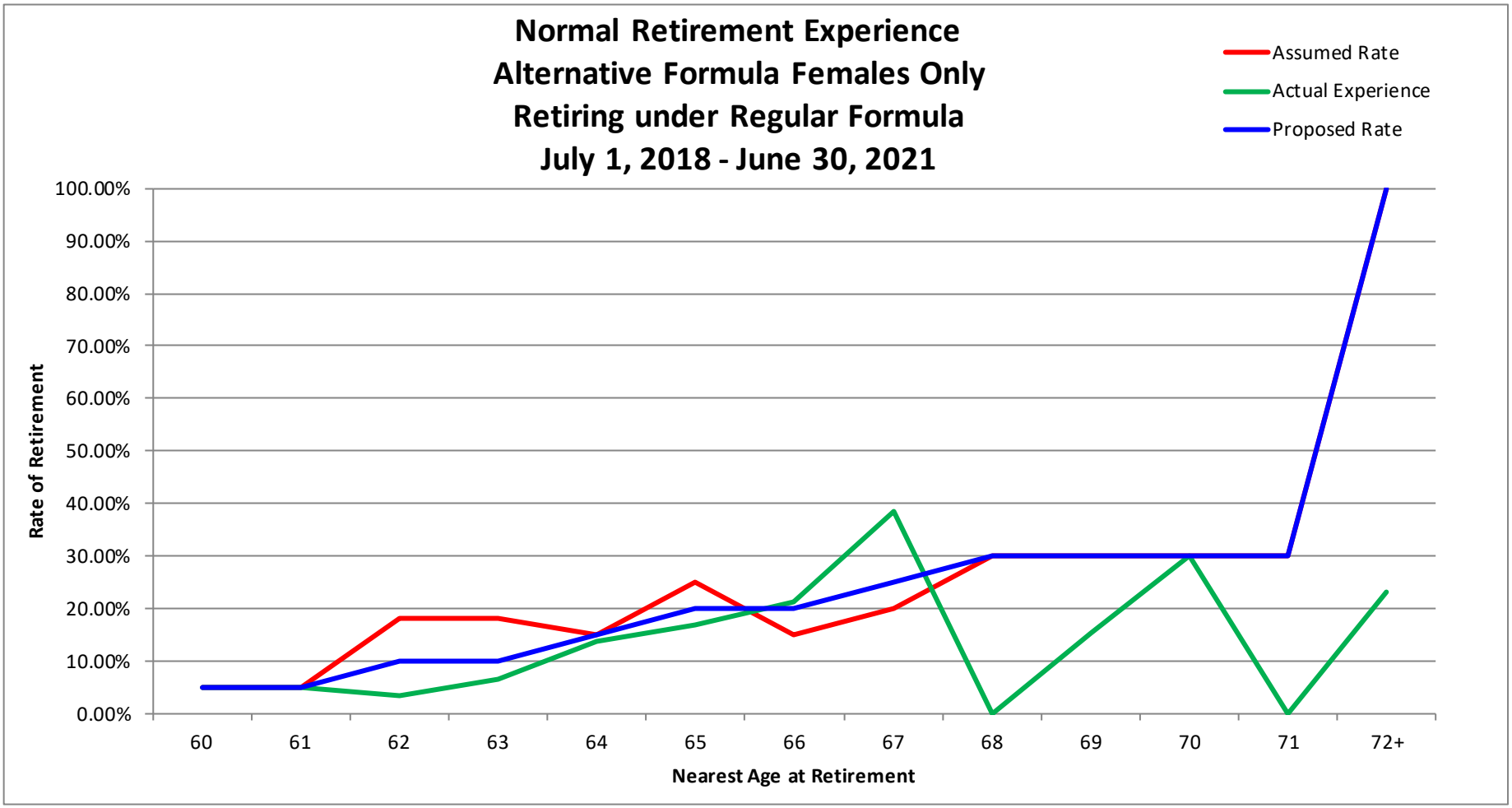
Table III(h)

Normal Retirement Experience - Alternative Formula Female Members - Eligible for Retirement under the Regular Formula Provisions									
	Actual Experience			Current Assumptions			Proposed Assumptions		
Nearest Age @ Retirement	Exposures	Retirements	Actual Rate	Expected Retirements	Assumed Rate	Actual / Expected	Expected Retirements	Proposed Rate	Actual / Expected
60	84	4	4.8%	4	5.0%	1.0	4	5.0%	1.0
61	62	3	4.8%	3	5.0%	1.0	3	5.0%	1.0
62	63	2	3.2%	11	18.0%	0.2	6	10.0%	0.3
63	47	3	6.4%	8	18.0%	0.4	5	10.0%	0.6
64	37	5	13.5%	6	15.0%	0.8	6	15.0%	0.8
65	24	4	16.7%	6	25.0%	0.7	5	20.0%	0.8
66	19	4	21.1%	3	15.0%	1.3	4	20.0%	1.0
67	13	5	38.5%	3	20.0%	1.7	3	25.0%	1.7
68	10	0	0.0%	3	30.0%	0.0	3	30.0%	0.0
69	13	2	15.4%	4	30.0%	0.5	4	30.0%	0.5
70	10	3	30.0%	3	30.0%	1.0	3	30.0%	1.0
71	2	0	0.0%	1	30.0%	0.0	1	30.0%	0.0
72+	13	3	23.1%	13	100.0%	0.2	13	100.0%	0.2
Totals:	**397**	**38**	**9.6%**	**68**	**17.1%**	**0.6**	**60**	**15.1%**	**0.6**
Excluding 72+:	**384**	**35**	**9.1%**	**55**	**14.3%**	**0.6**	**47**	**12.2%**	**0.7**

Retirement Assumption

Tier One

Graph III(h)



Tier Two Regular Formula

Since there was limited retirement experience for Tier Two members, the current retirement assumptions were developed based upon our future expectation of the group's behavior. During the experience period, there were fewer retirements than expected, although experience was limited.

We are recommending slight adjustments to the retirement rates for Tier Two members eligible for regular formula benefits.

	Members Eligible For Early Retirement			
Nearest Age	Current Assumed Rate		Proposed Assumed Rate	
at Retirement	Male	Female	Male	Female
62	30%	30%	30%	30%
63	15%	15%	15%	15%
64	15%	15%	15%	15%
65	15%	15%	15%	15%
66	15%	15%	15%	15%

	Members Eligible For Normal Retirement			
Nearest Age	Current Assumed Rate		Proposed Assumed Rate	
at Retirement	Male	Female	Male	Female
67	50.0%	50.0%	50.0%	50.0%
68	35.0%	35.0%	32.5%	32.5%
69	35.0%	35.0%	32.5%	32.5%
70	35.0%	35.0%	32.5%	32.5%
71	20.0%	20.0%	20.0%	20.0%
72	20.0%	20.0%	20.0%	20.0%
73	20.0%	20.0%	20.0%	20.0%
74	20.0%	20.0%	20.0%	20.0%
75	100.0%	100.0%	100.0%	100.0%

Tier Two Alternative Formula

For Tier Two members eligible for alternative formula benefits, we recommend rates that are generally consistent with the age-based retirement rates developed for Tier One members retiring with alternative formula benefits for ages 61 and older. For members retiring at age 60, we recommend slight adjustment to the retirement rates.

	Members Eligible For Normal Retirement			
Nearest Age at Retirement	Current Assumed Rate		Proposed Assumed Rate	
	Male	Female	Male	Female
60	50%	50%	50%	50%
61	30%	25%	25%	30%
62	30%	40%	25%	35%
63	35%	30%	30%	30%
64	35%	40%	30%	35%
65	35%	50%	30%	50%
66	35%	50%	30%	50%
67	35%	50%	30%	50%
68	35%	50%	30%	50%
69	45%	50%	40%	50%
70	50%	50%	45%	50%
71	50%	50%	45%	50%
72	100%	100%	100%	100%

Turnover Assumption

Turnover

Currently, turnover rates are based solely on service. The experience supports maintaining this structure.

Turnover experience during the last three years was considered in the analysis shown on the following pages. The "Exposures" column shows the number of employees at various years of service throughout the experience period.

The "Turnover" column shows the number of employees at various ages who have gone from active status for reasons other than retirement and death. This includes members moving to inactive status and members terminating and receiving a refund of contributions, and disabled members.

This assumption was analyzed for both Tier One and Tier Two members.

There were fewer terminations than expected under the current assumptions for Tier Two members eligible for regular formula benefits. We recommend decreasing the rates for these members.

For the remaining groups, there were more terminations than expected under the current assumptions. Based on our analysis, we recommend increasing the rates for Tier One members and Tier Two members eligible for alternative formula benefits.

The tables and graphs on the following pages show termination experience by age.

- Table IV(a) and Graph IV(a) – Regular Formula Tier 1 by Service –Male
- Table IV(b) and Graph IV(b) – Regular Formula Tier 1 by Service – Female
- Table IV(c) and Graph IV(c) – Alternative Formula Tier 1 by Service – Male
- Table IV(d) and Graph IV(d) – Alternative Formula Tier 1 by Service – Female
- Table IV(e) and Graph IV(e) – Regular Formula Tier 2 by Service – Male
- Table IV(f) and Graph IV(f) – Regular Formula Tier 2 by Service – Female
- Table IV(g) and Graph IV(g) – Alternative Formula Tier 2 by Service – Male
- Table IV(h) and Graph IV(h) – Alternative Formula Tier 2 by Service – Female

Table IV(a)

Termination Experience by Service - Regular Formula Male Tier 1 Members											
Service (End of Year)	Actual Experience					Current Assumptions			Proposed Assumptions		
	Exposures	Turnover	Rehires	Net Turnover	Actual Rate[1]	Expected Turnover	Assumed Rate	Actual/ Expected[2]	Expected Turnover	Proposed Rate	Actual/ Expected[2]
1	72	19	0	19	26.39%	17	24.00%	0.9	17	24.00%	0.9
2	460	56	13	43	9.35%	41	9.00%	1.0	41	9.00%	1.0
3	495	48	27	21	4.24%	37	7.50%	1.8	35	7.00%	1.7
4	431	28	16	12	2.78%	28	6.50%	2.3	26	6.00%	2.2
5	399	36	10	26	6.52%	24	6.00%	0.9	24	6.00%	0.9
6	439	22	9	13	2.96%	20	4.60%	1.5	18	4.10%	1.4
7	441	27	10	17	3.85%	20	4.50%	1.2	20	4.50%	1.2
8	404	21	3	18	4.46%	16	4.00%	0.9	16	4.00%	0.9
9	622	36	10	26	4.18%	19	3.00%	0.7	19	3.00%	0.7
10	817	26	9	17	2.08%	25	3.00%	1.5	25	3.00%	1.5
11	965	40	14	26	2.69%	29	3.00%	1.1	29	3.00%	1.1
12	875	34	7	27	3.09%	22	2.50%	0.8	22	2.50%	0.8
13	918	28	8	20	2.18%	23	2.50%	1.2	23	2.50%	1.2
14	870	30	6	24	2.76%	22	2.50%	0.9	22	2.50%	0.9
15	828	34	6	28	3.38%	17	2.00%	0.6	21	2.50%	0.8
16	748	23	3	20	2.67%	15	2.00%	0.8	17	2.25%	0.9
17	814	19	7	12	1.47%	16	2.00%	1.3	16	2.00%	1.3
18	937	30	14	16	1.71%	19	2.00%	1.2	19	2.00%	1.2
19	1,108	26	5	21	1.90%	22	2.00%	1.0	22	2.00%	1.0
20	1,213	22	4	18	1.48%	24	2.00%	1.3	24	2.00%	1.3
21	1,237	28	5	23	1.86%	25	2.00%	1.1	25	2.00%	1.1
22	1,064	20	3	17	1.60%	21	2.00%	1.2	21	2.00%	1.2
23	828	20	2	18	2.17%	17	2.00%	0.9	17	2.00%	0.9
24	683	18	3	15	2.20%	14	2.00%	0.9	14	2.00%	0.9
25	553	14	4	10	1.81%	8	1.50%	0.8	11	2.00%	1.1
26	431	19	2	17	3.94%	6	1.50%	0.4	9	2.00%	0.5
27	423	9	2	7	1.65%	6	1.50%	0.9	8	2.00%	1.1
28	405	18	1	17	4.20%	6	1.50%	0.4	8	2.00%	0.5
29	384	15	0	15	3.91%	6	1.50%	0.4	8	2.00%	0.5
30+	850	106	3	103	12.12%	13	1.50%	0.1	13	2.00%	0.1
	20,714	**872**	**206**	**666**	**3.22%**	**578**	**2.79%**	**0.9**	**590**	**2.85%**	**0.9**

[1] Reflects actual turnover net of inactive members who returned to active service.

[2] Actual to expected ratio based on net turnover.

Graph IV(a)

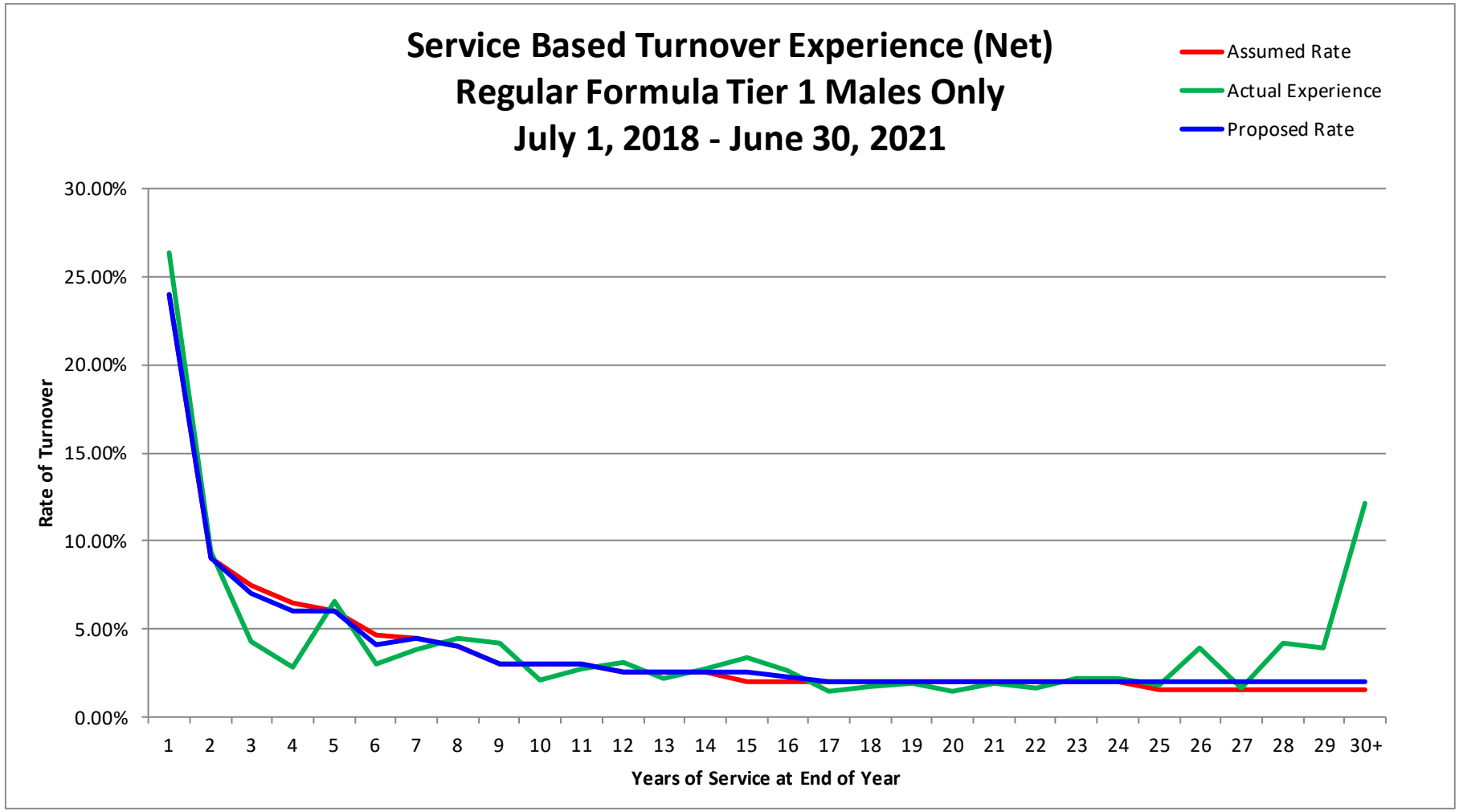

Service Based Turnover Experience (Net)
Regular Formula Tier 1 Males Only
July 1, 2018 - June 30, 2021
Assumed Rate
Actual Experience
Proposed Rate
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
Rate of Turnover
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30+
Years of Service at End of Year

Table IV(b)

Termination Experience by Service - Regular Formula Female Tier 1 Members											
Service (End of Year)	Actual Experience					Current Assumptions			Proposed Assumptions		
	Exposures	Turnover	Rehires	Net Turnover	Actual Rate[1]	Expected Turnover	Assumed Rate	Actual/ Expected[2]	Expected Turnover	Proposed Rate	Actual/ Expected[2]
1	82	16	0	16	19.51%	18	22.00%	1.1	18	22.00%	1.1
2	752	84	21	63	8.38%	68	9.00%	1.1	68	9.00%	1.1
3	933	63	40	23	2.47%	61	6.50%	2.7	51	5.50%	2.2
4	875	63	27	36	4.11%	48	5.50%	1.3	48	5.50%	1.3
5	819	45	12	33	4.03%	37	4.50%	1.1	37	4.50%	1.1
6	909	36	14	22	2.42%	41	4.50%	1.9	36	4.00%	1.6
7	926	31	18	13	1.40%	37	4.00%	2.8	32	3.50%	2.5
8	780	34	22	12	1.54%	31	4.00%	2.6	27	3.50%	2.3
9	933	60	23	37	3.97%	33	3.50%	0.9	33	3.50%	0.9
10	1,090	47	19	28	2.57%	38	3.50%	1.4	38	3.50%	1.4
11	1,330	65	14	51	3.83%	40	3.00%	0.8	40	3.00%	0.8
12	1,319	62	20	42	3.18%	40	3.00%	1.0	40	3.00%	1.0
13	1,425	60	13	47	3.30%	36	2.50%	0.8	36	2.50%	0.8
14	1,398	61	13	48	3.43%	35	2.50%	0.7	35	2.50%	0.7
15	1,246	28	17	11	0.88%	31	2.50%	2.8	31	2.50%	2.8
16	1,132	33	11	22	1.94%	28	2.50%	1.3	28	2.50%	1.3
17	1,142	42	11	31	2.71%	23	2.00%	0.7	23	2.00%	0.7
18	1,343	32	9	23	1.71%	27	2.00%	1.2	27	2.00%	1.2
19	1,703	43	14	29	1.70%	34	2.00%	1.2	34	2.00%	1.2
20	1,947	67	14	53	2.72%	39	2.00%	0.7	39	2.00%	0.7
21	1,883	59	15	44	2.34%	28	1.50%	0.6	33	1.75%	0.8
22	1,490	34	10	24	1.61%	22	1.50%	0.9	26	1.75%	1.1
23	1,157	35	6	29	2.51%	17	1.50%	0.6	20	1.75%	0.7
24	925	23	5	18	1.95%	14	1.50%	0.8	16	1.75%	0.9
25	760	20	6	14	1.84%	11	1.50%	0.8	13	1.75%	0.9
26	650	18	3	15	2.31%	6	1.00%	0.4	10	1.50%	0.7
27	557	15	2	13	2.33%	6	1.00%	0.5	8	1.50%	0.6
28	511	11	2	9	1.76%	5	1.00%	0.6	8	1.50%	0.9
29	461	18	0	18	3.90%	5	1.00%	0.3	7	1.50%	0.4
30+	1,201	145	7	138	11.49%	5	1.00%	0.0	18	1.50%	0.1
	31,679	**1,350**	**388**	**962**	**3.04%**	**864**	**2.73%**	**0.9**	**880**	**2.78%**	**0.9**

[1] Reflects actual turnover net of inactive members who returned to active service.

[2] Actual to expected ratio based on net turnover.

Graph IV(b)

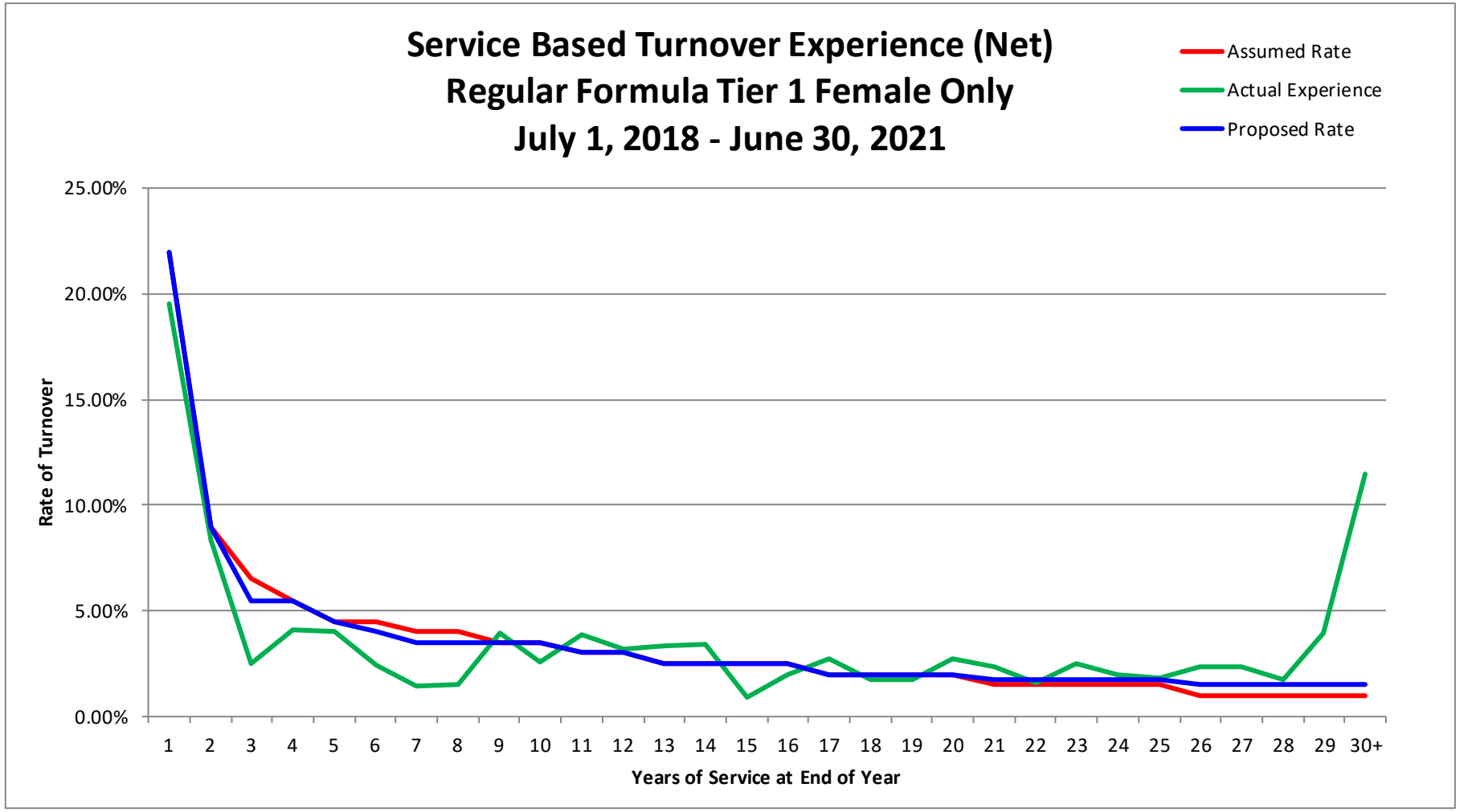

Service Based Turnover Experience (Net)
Regular Formula Tier 1 Female Only
July 1, 2018 - June 30, 2021
Assumed Rate
Actual Experience
Proposed Rate
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
Rate of Turnover
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30+
Years of Service at End of Year

Table IV(c)

Termination Experience by Service- Alternative Formula Male Tier 1 Members											
Service (End of Year)	Actual Experience					Current Assumptions			Proposed Assumptions		
	Exposures	Turnover	Rehires	Net Turnover	Actual Rate[1]	Expected Turnover	Assumed Rate	Actual/ Expected[2]	Expected Turnover	Proposed Rate	Actual/ Expected[2]
1	19	0	0	0	0.00%	1	5.25%		1	3.00%	
2	113	10	4	6	5.31%	5	4.25%	0.8	3	3.00%	0.5
3	163	14	14	0	0.00%	7	4.25%		5	3.00%	
4	195	12	12	0	0.00%	8	4.25%		6	3.00%	
5	228	18	15	3	1.32%	10	4.25%	3.3	7	3.00%	2.3
6	272	10	10	0	0.00%	8	3.00%		8	3.00%	
7	278	10	4	6	2.16%	8	3.00%	1.3	8	3.00%	1.3
8	298	17	4	13	4.36%	9	3.00%	0.7	9	3.00%	0.7
9	855	24	5	19	2.22%	17	2.00%	0.9	17	2.00%	0.9
10	1,152	32	8	24	2.08%	23	2.00%	1.0	23	2.00%	1.0
11	1,277	31	14	17	1.33%	19	1.50%	1.1	19	1.50%	1.1
12	838	22	5	17	2.03%	13	1.50%	0.8	13	1.50%	0.8
13	727	18	5	13	1.79%	11	1.50%	0.8	11	1.50%	0.8
14	631	14	1	13	2.06%	9	1.50%	0.7	9	1.50%	0.7
15	727	14	3	11	1.51%	11	1.50%	1.0	11	1.50%	1.0
16	776	11	5	6	0.77%	12	1.50%	2.0	12	1.50%	2.0
17	890	13	3	10	1.12%	13	1.50%	1.3	13	1.50%	1.3
18	1,353	13	12	1	0.07%	20	1.50%	20.0	20	1.50%	20.0
19	1,537	28	10	18	1.17%	23	1.50%	1.3	23	1.50%	1.3
20	1,669	52	5	47	2.82%	21	1.25%	0.4	25	1.50%	0.5
21	1,499	29	9	20	1.33%	19	1.25%	1.0	22	1.50%	1.1
22	1,418	20	7	13	0.92%	18	1.25%	1.4	21	1.50%	1.6
23	1,245	24	6	18	1.45%	16	1.25%	0.9	19	1.50%	1.1
24	1,087	29	6	23	2.12%	14	1.25%	0.6	16	1.50%	0.7
25	772	34	5	29	3.76%	8	1.00%	0.3	12	1.50%	0.4
26	379	30	4	26	6.86%	4	1.00%	0.2	6	1.50%	0.2
27	194	6	2	4	2.06%	2	1.00%	0.5	3	1.50%	0.8
28	96	15	1	14	14.58%	1	1.00%	0.1	1	1.50%	0.1
29	78	14	1	13	16.67%	1	1.00%	0.1	1	1.50%	0.1
30+	101	22	6	16	15.84%	1	1.00%	0.1	1	1.50%	0.1
	20,867	**586**	**186**	**400**	**1.92%**	**332**	**1.59%**	**0.8**	**345**	**1.65%**	**0.9**

[1] Reflects actual turnover net of inactive members who returned to active service.

[2] Actual to expected ratio based on net turnover.

Graph IV(c)

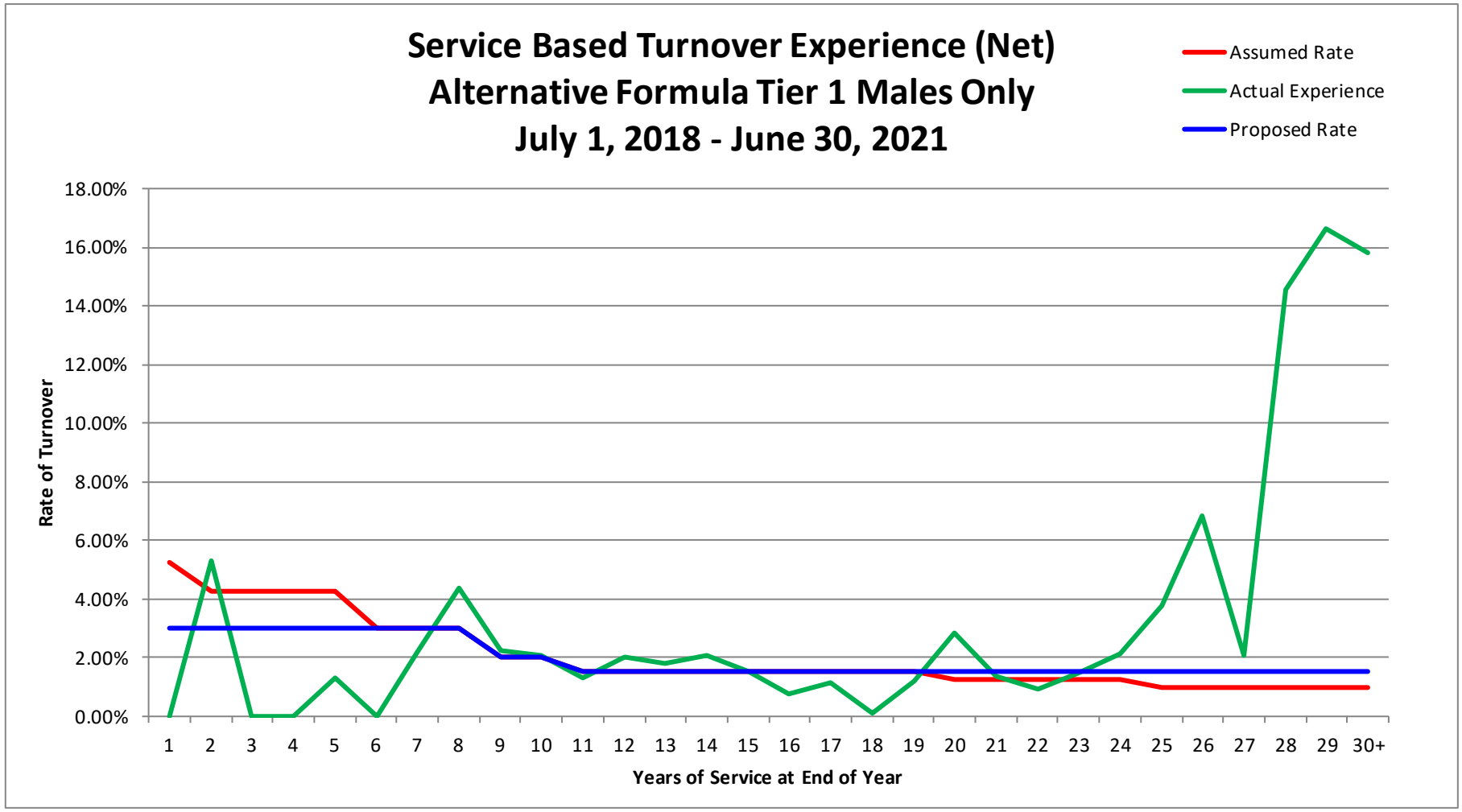

Service Based Turnover Experience (Net)
Alternative Formula Tier 1 Males Only
July 1, 2018 - June 30, 2021
Assumed Rate
Actual Experience
Proposed Rate
Rate of Turnover
18.00%
16.00%
14.00%
12.00%
10.00%
8.00%
6.00%
4.00%
2.00%
0.00%
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30+
Years of Service at End of Year

Table IV(d)

Termination Experience by Service - Alternative Formula Female Tier 1 Members											
Service (End of Year)	Actual Experience					Current Assumptions			Proposed Assumptions		
	Exposures	Turnover	Rehires	Net Turnover	Actual Rate[1]	Expected Turnover	Assumed Rate	Actual/ Expected[2]	Expected Turnover	Proposed Rate	Actual/ Expected[2]
1	12	3	0	3	25.00%	1	7.00%	0.3	1	7.00%	0.3
2	107	10	2	8	7.48%	6	7.00%	0.8	6	7.00%	0.8
3	183	7	5	2	1.09%	7	6.50%	3.5	7	6.50%	3.5
4	180	8	4	4	2.22%	7	6.00%	1.8	7	6.00%	1.8
5	145	6	4	2	1.38%	9	6.00%	4.5	9	6.00%	4.5
6	241	13	9	4	1.66%	9	5.00%	2.3	9	5.00%	2.3
7	331	9	4	5	1.51%	7	4.00%	1.4	7	4.00%	1.4
8	363	2	2	0	0.00%	4	3.00%		4	3.00%	
9	290	6	0	6	2.07%	4	2.00%	0.7	4	2.00%	0.7
10	247	9	0	9	3.64%	6	2.00%	0.7	6	2.00%	0.7
11	207	7	3	4	1.93%	7	2.00%	1.8	7	2.00%	1.8
12	227	12	3	9	3.96%	5	1.75%	0.6	5	1.75%	0.6
13	231	10	2	8	3.46%	4	1.75%	0.5	4	1.75%	0.5
14	230	6	1	5	2.17%	4	1.75%	0.8	4	1.75%	0.8
15	339	4	1	3	0.88%	4	1.75%	1.3	4	1.75%	1.3
16	424	8	4	4	0.94%	4	1.75%	1.0	4	1.75%	1.0
17	532	2	1	1	0.19%	3	1.50%	3.0	3	1.50%	3.0
18	557	2	2	0	0.00%	5	1.50%		5	1.50%	
19	536	5	4	1	0.19%	6	1.50%	6.0	6	1.50%	6.0
20	445	10	4	6	1.35%	5	1.25%	0.8	5	1.25%	0.8
21	373	10	1	9	2.41%	5	1.25%	0.6	5	1.25%	0.6
22	339	11	7	4	1.18%	5	1.25%	1.3	5	1.25%	1.3
23	284	4	3	1	0.35%	4	1.25%	4.0	4	1.25%	4.0
24	224	6	2	4	1.79%	4	1.25%	1.0	4	1.25%	1.0
25	140	11	4	7	5.00%	2	1.00%	0.3	2	1.00%	0.3
26	88	7	0	7	7.95%	1	1.00%	0.1	1	1.00%	0.1
27	83	4	1	3	3.61%	1	1.00%	0.3	1	1.00%	0.3
28	75	3	1	2	2.67%	0	1.00%	0.0	0	1.00%	0.0
29	43	5	0	5	11.63%	0	1.00%	0.0	0	1.00%	0.0
30+	31	6	2	4	12.90%	0	1.00%	0.0	0	1.00%	0.0
	7,507	**206**	**76**	**130**	**1.73%**	**129**	**2.13%**	**1.0**	**129**	**2.13%**	**1.0**

[1] Reflects actual turnover net of inactive members who returned to active service.

[2] Actual to expected ratio based on net turnover.

Graph IV(d)

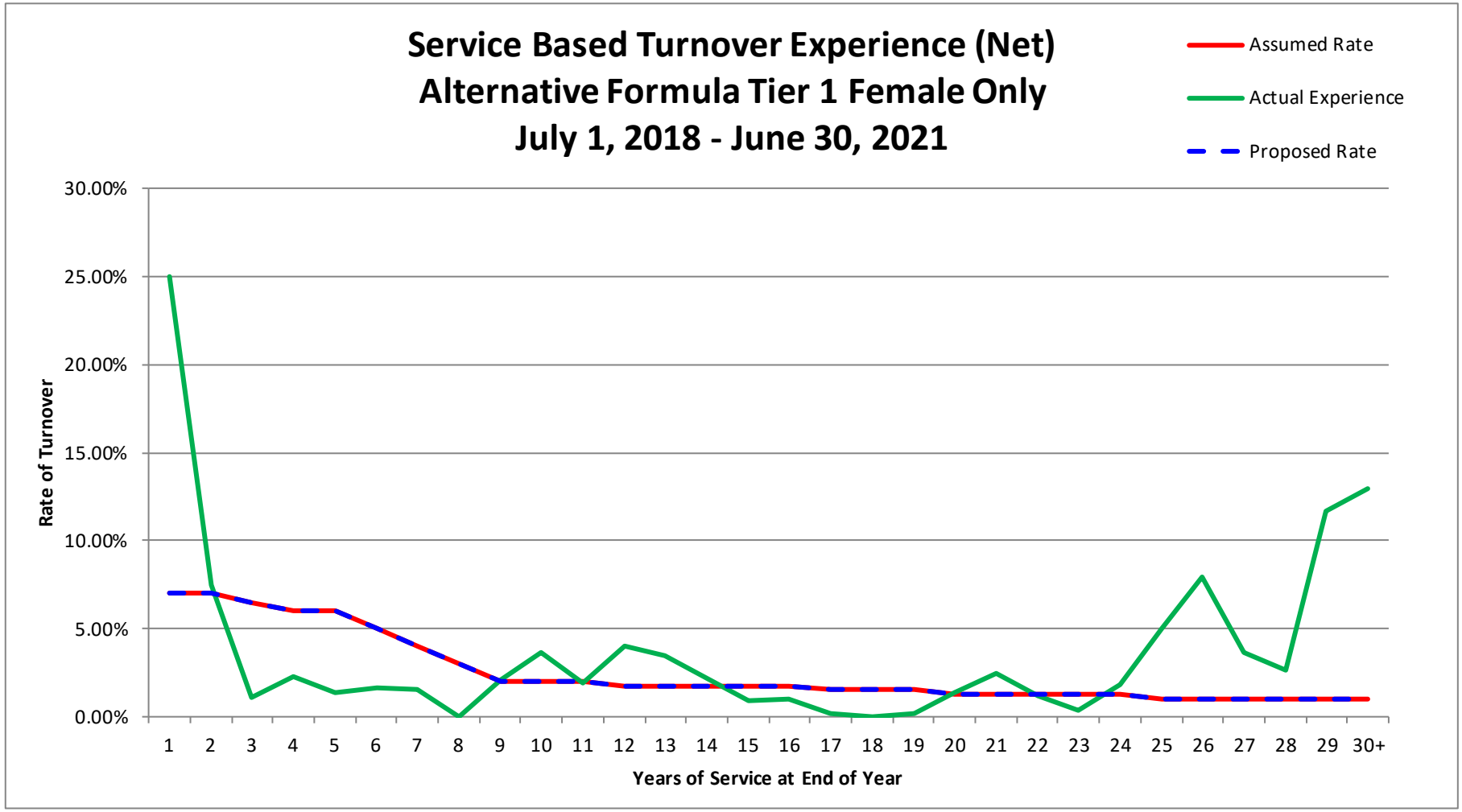

Service Based Turnover Experience (Net)
Alternative Formula Tier 1 Female Only
July 1, 2018 - June 30, 2021
Assumed Rate
Actual Experience
Proposed Rate
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
Rate of Turnover
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30+
Years of Service at End of Year

Table IV(e)

Termination Experience by Service - Regular Formula Male Tier 2 Members												
Service (End of Year)	Actual Experience					Current Assumptions			Proposed Assumptions			
	Exposures	Turnover	Rehires	Net Turnover	Actual Rate[1]	Expected Turnover	Assumed Rate	Actual/ Expected[2]	Expected Turnover	Proposed Rate	Actual/ Expected[2]	
1	1,217	476	0	476	39.11%	365	30.00%	0.8	402	33.00%	0.8	
2	4,555	867	76	791	17.37%	752	16.50%	1.0	752	16.50%	1.0	
3	3,617	349	225	124	3.43%	253	7.00%	2.0	217	6.00%	1.8	
4	2,801	218	123	95	3.39%	196	7.00%	2.1	168	6.00%	1.8	
5	2,511	175	52	123	4.90%	163	6.50%	1.3	144	5.75%	1.2	
6	2,450	124	21	103	4.20%	135	5.50%	1.3	123	5.00%	1.2	
7	2,245	99	28	71	3.16%	112	5.00%	1.6	101	4.50%	1.4	
8	1,816	58	11	47	2.59%	91	5.00%	1.9	82	4.50%	1.7	
9	1,201	44	12	32	2.66%	36	3.00%	1.1	36	3.00%	1.1	
10	649	26	3	23	3.54%	19	3.00%	0.8	19	3.00%	0.8	
11	187	14	1	13	6.95%	6	3.00%	0.4	6	3.00%	0.4	
12	15	1	0	1	6.67%	0	2.50%	0.4	0	2.50%	0.4	
13	10	0	0	0	0.00%	0	2.50%		0	2.50%		
14	4	2	0	2	50.00%	0	2.50%	0.1	0	2.50%	0.1	
15	1	1	0	1	100.00%	0	2.00%	0.0	0	2.00%	0.0	
16	0	0	0	0		0	2.00%		0	2.00%		
17	0	0	0	0		0	2.00%		0	2.00%		
18	0	0	0	0		0	2.00%		0	2.00%		
19	0	0	0	0		0	2.00%		0	2.00%		
20	0	0	0	0		0	2.00%		0	2.00%		
21	0	0	0	0		0	2.00%		0	2.50%		
22	0	0	0	0		0	2.00%		0	2.50%		
23	0	0	0	0		0	2.00%		0	2.50%		
24	0	0	0	0		0	2.00%		0	2.50%		
25	0	0	0	0		0	1.50%		0	2.00%		
26	0	0	0	0		0	1.50%		0	2.00%		
27	0	0	0	0		0	1.50%		0	2.00%		
28	0	0	0	0		0	1.50%		0	2.00%		
29	0	0	0	0		0	1.50%		0	2.00%		
30+	0	0	0	0		0	1.50%		0	2.00%		
	23,279	**2,454**	**552**	**1,902**	**8.17%**	**2,129**	**9.14%**	**1.1**	**2,051**	**8.81%**	**1.1**	

[1] Reflects actual turnover net of inactive members who returned to active service.

[2] Actual to expected ratio based on net turnover.

Graph IV(e)

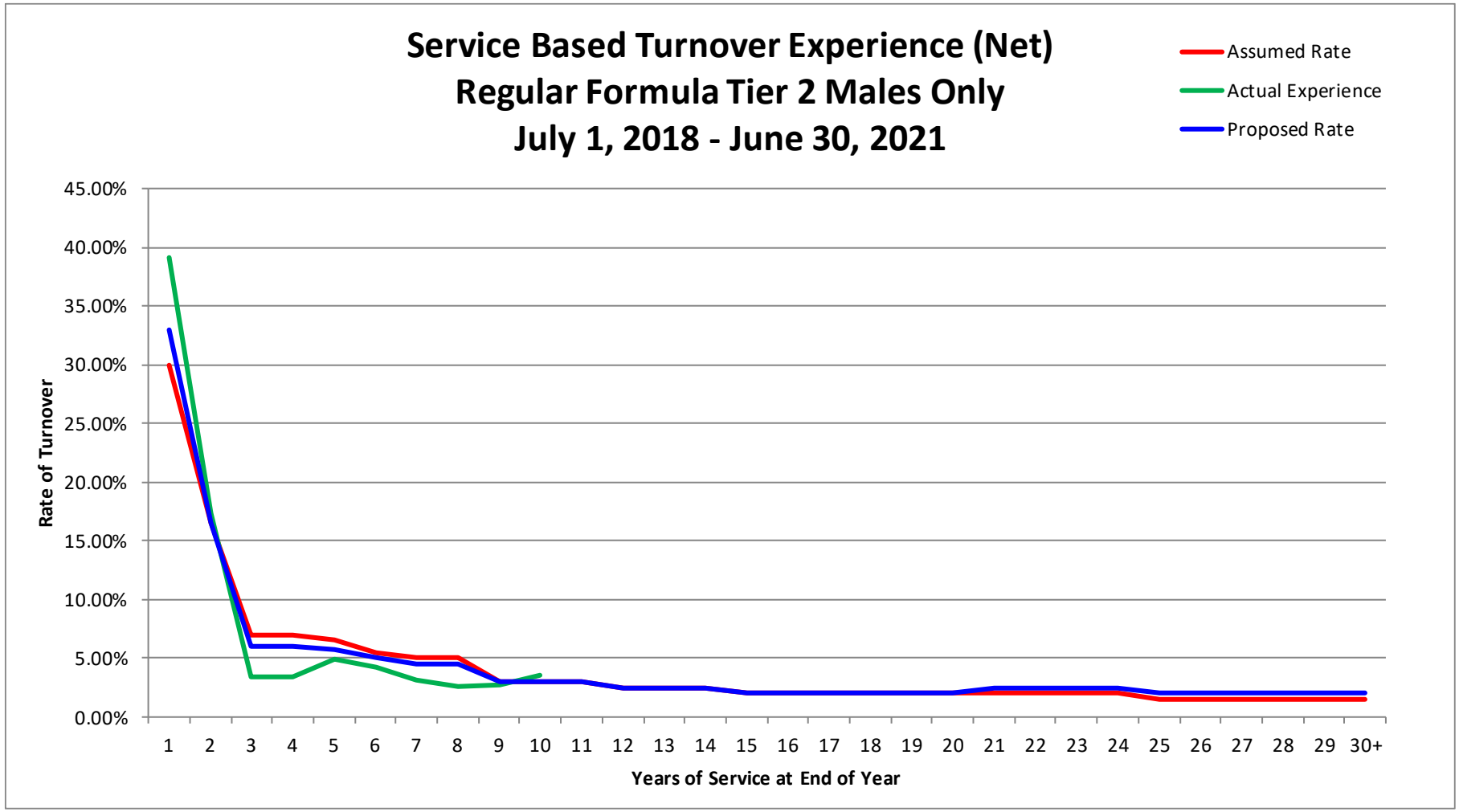

Service Based Turnover Experience (Net)
Regular Formula Tier 2 Males Only
July 1, 2018 - June 30, 2021
Assumed Rate
Actual Experience
Proposed Rate
45.00%
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
Rate of Turnover
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30+
Years of Service at End of Year

Table IV(f)

Termination Experience by Service - Regular Formula Female Tier 2 Members												
Service (End of Year)	Actual Experience					Current Assumptions			Proposed Assumptions			
	Exposures	Turnover	Rehires	Net Turnover	Actual Rate[1]	Expected Turnover	Assumed Rate	Actual/ Expected[2]	Expected Turnover	Proposed Rate	Actual/ Expected[2]	
1	1,472	448	0	448	30.43%	397	27.00%	0.9	412	28.00%	0.9	
2	6,082	995	41	954	15.69%	973	16.00%	1.0	912	15.00%	1.0	
3	4,690	427	99	328	6.99%	422	9.00%	1.3	375	8.00%	1.1	
4	3,562	285	71	214	6.01%	285	8.00%	1.3	249	7.00%	1.2	
5	3,114	221	47	174	5.59%	234	7.50%	1.3	202	6.50%	1.2	
6	3,275	193	49	144	4.40%	213	6.50%	1.5	180	5.50%	1.3	
7	2,839	127	43	84	2.96%	170	6.00%	2.0	142	5.00%	1.7	
8	2,040	82	33	49	2.40%	102	5.00%	2.1	82	4.00%	1.7	
9	1,089	43	20	23	2.11%	38	3.50%	1.7	33	3.00%	1.4	
10	580	16	3	13	2.24%	20	3.50%	1.5	20	3.50%	1.5	
11	207	7	3	4	1.93%	6	3.00%	1.5	6	3.00%	1.5	
12	2	0	0	0	0.00%	0	3.00%		0	3.00%		
13	0	0	0	0		0	2.50%		0	2.50%		
14	0	0	0	0		0	2.50%		0	2.50%		
15	0	0	0	0		0	2.50%		0	2.50%		
16	0	0	0	0		0	2.50%		0	2.50%		
17	0	0	0	0		0	2.00%		0	2.00%		
18	0	0	0	0		0	2.00%		0	2.00%		
19	0	0	0	0		0	2.00%		0	2.00%		
20	0	0	0	0		0	2.00%		0	2.00%		
21	0	0	0	0		0	1.50%		0	1.50%		
22	0	0	0	0		0	1.50%		0	1.50%		
23	0	0	0	0		0	1.50%		0	1.50%		
24	0	0	0	0		0	1.50%		0	1.50%		
25	0	0	0	0		0	1.50%		0	1.50%		
26	0	0	0	0		0	1.00%		0	1.50%		
27	0	0	0	0		0	1.00%		0	1.50%		
28	0	0	0	0		0	1.00%		0	1.50%		
29	0	0	0	0		0	1.00%		0	1.50%		
30+	0	0	0	0		0	1.00%		0	1.50%		
	28,952	2,844	409	2,435	8.41%	2,860	9.88%	1.2	2,613	9.03%	1.1	

[1] Reflects actual turnover net of inactive members who returned to active service.

[2] Actual to expected ratio based on net turnover.

Graph IV(f)

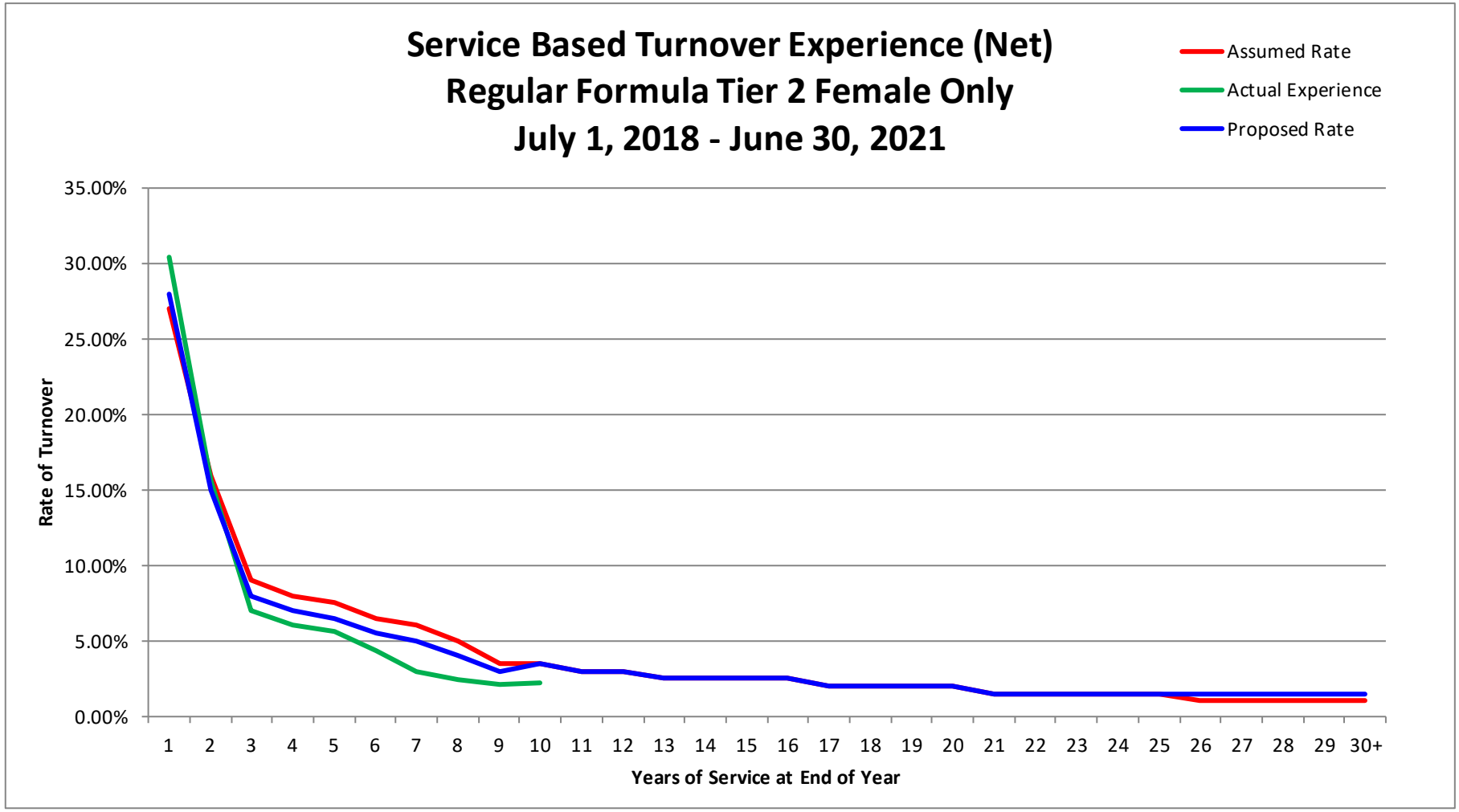

Service Based Turnover Experience (Net)
Regular Formula Tier 2 Female Only
July 1, 2018 - June 30, 2021
Assumed Rate
Actual Experience
Proposed Rate
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
Rate of Turnover
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30+
Years of Service at End of Year

Table IV(g)

Termination Experience by Service - Alternative Formula Male Tier 2 Members												
Service (End of Year)	Actual Experience					Current Assumptions			Proposed Assumptions			
	Exposures	Turnover	Rehires	Net Turnover	Actual Rate[1]	Expected Turnover	Assumed Rate	Actual/ Expected[2]	Expected Turnover	Proposed Rate	Actual/ Expected[2]	
1	404	49	0	49	12.13%	32	8.00%	0.7	40	10.00%	0.8	
2	2,175	201	6	195	8.97%	152	7.00%	0.8	174	8.00%	0.9	
3	2,198	164	15	149	6.78%	126	5.75%	0.8	137	6.25%	0.9	
4	2,019	120	9	111	5.50%	111	5.50%	1.0	111	5.50%	1.0	
5	2,040	113	11	102	5.00%	66	3.25%	0.6	87	4.25%	0.9	
6	1,798	78	16	62	3.45%	54	3.00%	0.9	54	3.00%	0.9	
7	1,494	38	8	30	2.01%	45	3.00%	1.5	37	2.50%	1.2	
8	1,055	24	8	16	1.52%	32	3.00%	2.0	24	2.25%	1.5	
9	804	16	7	9	1.12%	16	2.00%	1.8	12	1.50%	1.3	
10	437	8	5	3	0.69%	9	2.00%	3.0	7	1.50%	2.3	
11	194	6	3	3	1.55%	3	1.50%	1.0	3	1.50%	1.0	
12	6	1	0	1	16.67%	0	1.50%	0.0	0	1.50%	0.0	
13	5	0	0	0	0.00%	0	1.50%		0	1.50%		
14	6	0	0	0	0.00%	0	1.50%		0	1.50%		
15	3	1	0	1	33.33%	0	1.50%	0.0	0	1.50%	0.0	
16	0	0	0	0		0	1.50%		0	1.50%		
17	0	0	0	0		0	1.50%		0	1.50%		
18	0	0	0	0		0	1.50%		0	1.50%		
19	0	0	0	0		0	1.50%		0	1.50%		
20	0	0	0	0		0	1.25%		0	1.50%		
21	0	0	0	0		0	1.25%		0	1.50%		
22	0	0	0	0		0	1.25%		0	1.50%		
23	0	0	0	0		0	1.25%		0	1.50%		
24	0	0	0	0		0	1.25%		0	1.50%		
25	0	0	0	0		0	1.00%		0	1.50%		
26	0	0	0	0		0	1.00%		0	1.50%		
27	0	0	0	0		0	1.00%		0	1.50%		
28	0	0	0	0		0	1.00%		0	1.50%		
29	0	0	0	0		0	1.00%		0	1.50%		
30+	0	0	0	0		0	1.00%		0	1.50%		
	14,638	**819**	**88**	**731**	**4.99%**	**646**	**4.41%**	**0.9**	**686**	**4.69%**	**0.9**	

[1] Reflects actual turnover net of inactive members who returned to active service.

[2] Actual to expected ratio based on net turnover.

Graph IV(g)

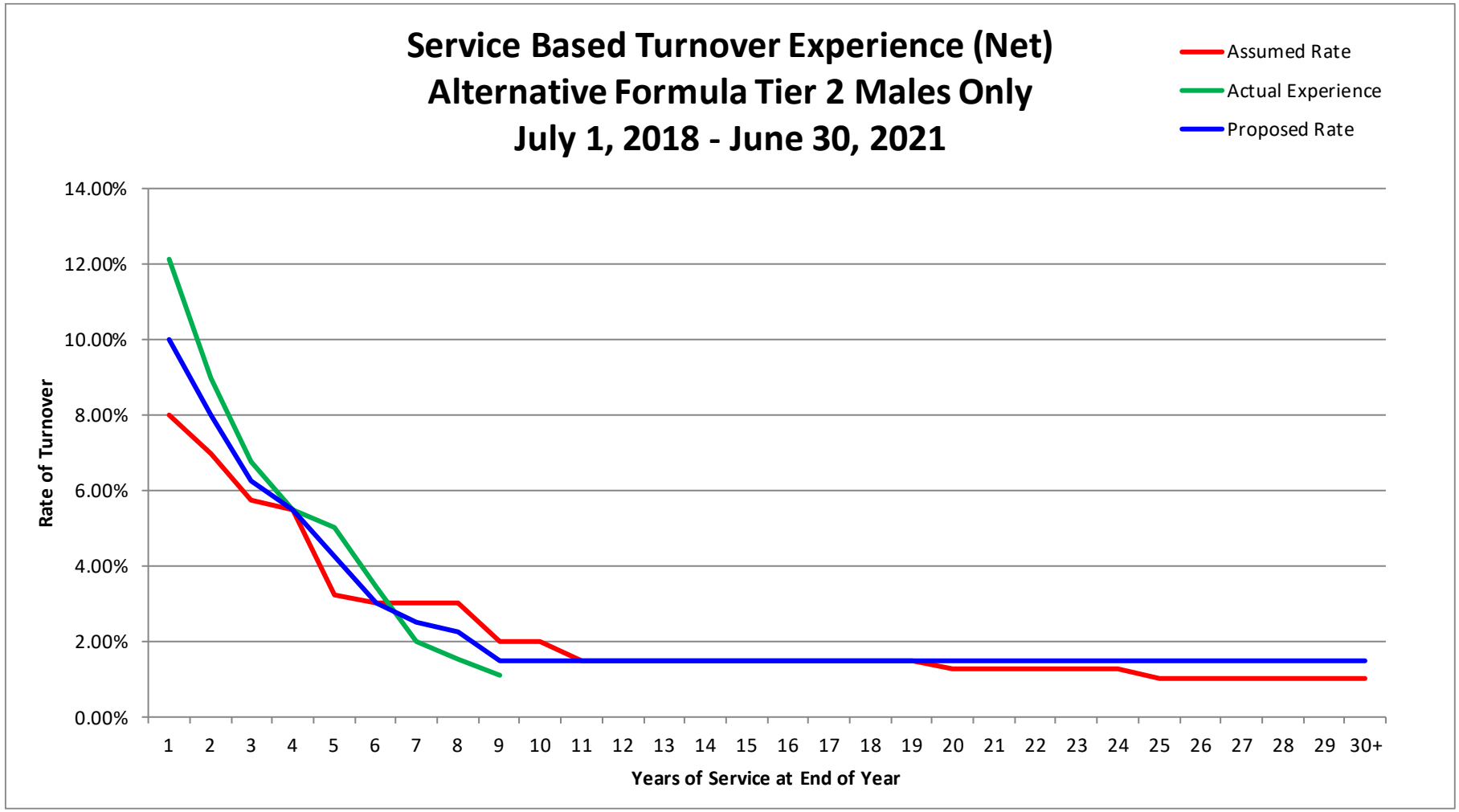

Service Based Turnover Experience (Net)
Alternative Formula Tier 2 Males Only
July 1, 2018 - June 30, 2021
Assumed Rate
Actual Experience
Proposed Rate
Rate of Turnover
14.00%
12.00%
10.00%
8.00%
6.00%
4.00%
2.00%
0.00%
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30+
Years of Service at End of Year

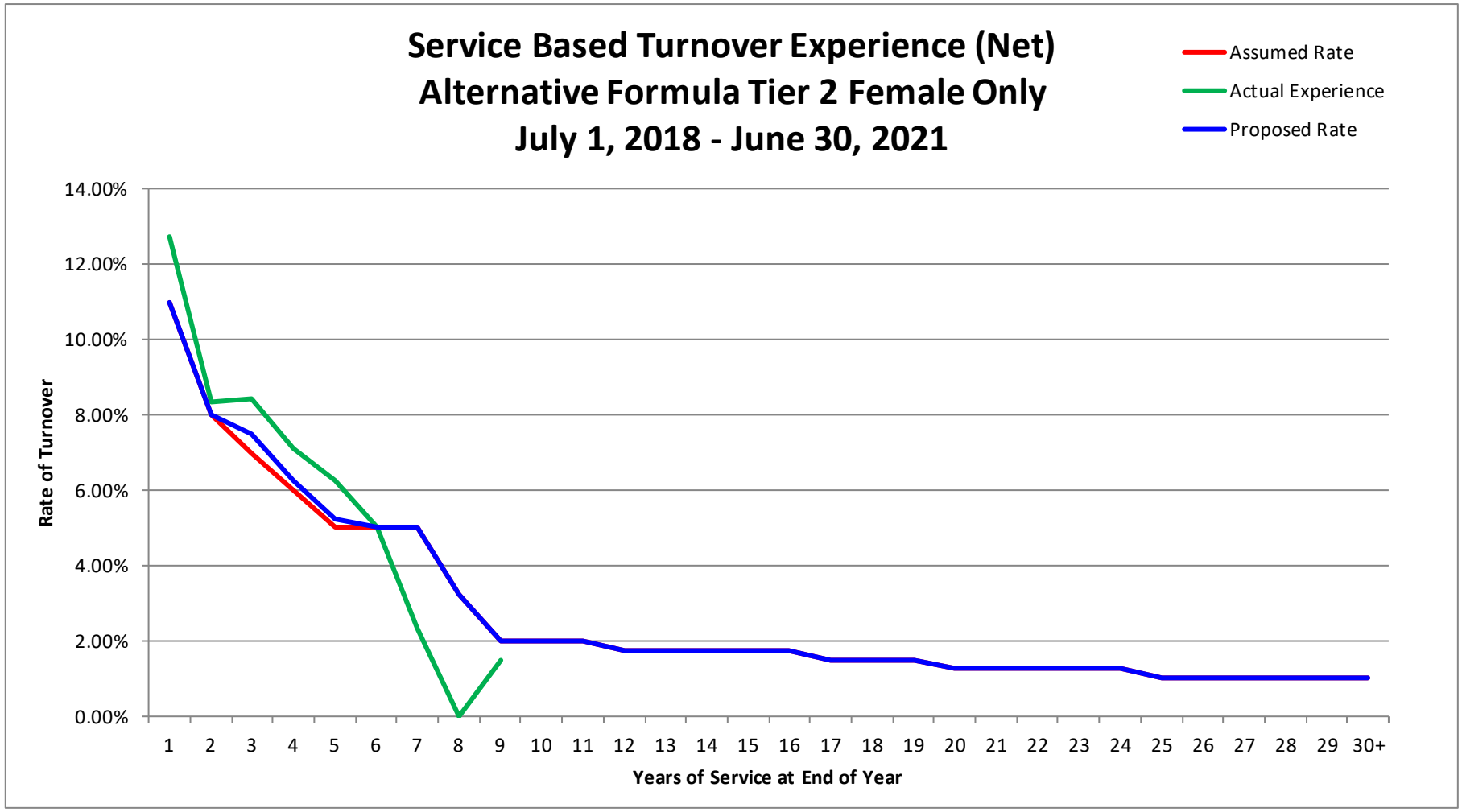
Table IV(h)

Termination Experience by Service - Alternative Formula Female Tier 2 Members												
Service (End of Year)	Actual Experience					Current Assumptions			Proposed Assumptions			
	Exposures	Turnover	Rehires	Net Turnover	Actual Rate[1]	Expected Turnover	Assumed Rate	Actual/ Expected[2]	Expected Turnover	Proposed Rate	Actual/ Expected[2]	
1	212	27	0	27	12.74%	23	11.00%	0.9	23	11.00%	0.9	
2	1,256	113	8	105	8.36%	100	8.00%	1.0	100	8.00%	1.0	
3	1,127	113	18	95	8.43%	79	7.00%	0.8	85	7.50%	0.9	
4	818	66	8	58	7.09%	49	6.00%	0.8	51	6.25%	0.9	
5	655	49	8	41	6.26%	33	5.00%	0.8	34	5.25%	0.8	
6	619	36	5	31	5.01%	31	5.00%	1.0	31	5.00%	1.0	
7	470	20	9	11	2.34%	24	5.00%	2.2	24	5.00%	2.2	
8	322	7	10	0	0.00%	10	3.25%		10	3.25%		
9	203	6	3	3	1.48%	4	2.00%	1.3	4	2.00%	1.3	
10	121	3	2	1	0.83%	2	2.00%	2.0	2	2.00%	2.0	
11	45	1	1	0	0.00%	1	2.00%		1	2.00%		
12	1	1	1	0	0.00%	0	1.75%		0	1.75%		
13	0	0	0	0		0	1.75%		0	1.75%		
14	0	0	0	0		0	1.75%		0	1.75%		
15	0	0	0	0		0	1.75%		0	1.75%		
16	0	0	0	0		0	1.75%		0	1.75%		
17	0	0	0	0		0	1.50%		0	1.50%		
18	0	0	0	0		0	1.50%		0	1.50%		
19	0	0	0	0		0	1.50%		0	1.50%		
20	0	0	0	0		0	1.25%		0	1.25%		
21	0	0	0	0		0	1.25%		0	1.25%		
22	0	0	0	0		0	1.25%		0	1.25%		
23	0	0	0	0		0	1.25%		0	1.25%		
24	0	0	0	0		0	1.25%		0	1.25%		
25	0	0	0	0		0	1.00%		0	1.00%		
26	0	0	0	0		0	1.00%		0	1.00%		
27	0	0	0	0		0	1.00%		0	1.00%		
28	0	0	0	0		0	1.00%		0	1.00%		
29	0	0	0	0		0	1.00%		0	1.00%		
30+	0	0	0	0		0	1.00%		0	1.00%		
	5,849	442	73	372	6.36%	356	6.09%	1.0	365	6.24%	1.0	

[1] Reflects actual turnover net of inactive members who returned to active service.

[2] Actual to expected ratio based on net turnover.

Graph IV(h)


Service Based Turnover Experience (Net)
Alternative Formula Tier 2 Female Only
July 1, 2018 - June 30, 2021
Assumed Rate
Actual Experience
Proposed Rate
14.00%
12.00%
10.00%
8.00%
6.00%
4.00%
2.00%
0.00%
Rate of Turnover
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30+
Years of Service at End of Year

Marriage Assumption

85.0 percent of active male participants and 65.0 percent of active female participants are assumed to be married. The female spouse is assumed to be three years younger than the male spouse for active member valuation purposes. Actual marital status at benefit commencement is used for retirees, if available; otherwise the active marriage assumptions are used for retirees.

Load for Inactive Members Eligible for Deferred Vested Pension Benefits

Currently, deferred vested liability is increased by 11 percent for Regular Formula members and 9 percent for Alternative Formula members to account for increases in final average salary due primarily to participation in a reciprocal system.

For inactive members who retired from July 1, 2018, to June 30, 2021, the ratio of actual retirement benefits to estimated retirement benefits was approximately 15 percent for Regular Formula members and 13 percent for Alternative Formula members. We recommend an assumption of 15 percent for Regular Formula members and 13 percent for Alternative Formula members.

	2019	2020	2021	Total
Number of deferred vested members who retired during the year				
Regular formula members	225	248	235	248
Alternative formula members	47	33	42	33
Average estimated monthly benefits				
Regular formula members	$ 1,428	$ 1,609	$ 1,593	$ 1,609
Alternative formula members	$ 4,129	$ 3,509	$ 4,283	$ 3,509
Average updated monthly benefits at retirement				
Regular formula members	$ 1,635	$ 1,844	$ 1,841	$ 1,844
Alternative formula members	$ 4,778	$ 3,965	$ 4,755	$ 3,965
Average percentage increase in estimated benefits at retirement				
Regular formula members	15%	15%	16%	15%
Alternative formula members	16%	13%	11%	13%

Data excludes member records with percentage increases in the top 9% and bottom 9%.

Unused Sick Leave and Optional Service Purchases

Members who have accumulated unused sick leave and vacation days at retirement are eligible to receive additional service credit to increase their retirement benefits. In addition, members who qualify for optional service may purchase optional service credit prior to retirement. We have reviewed data provided by the System regarding the number of new retirees each year that have either received additional service credit for unused sick leave or have purchased optional service. Based on this analysis, we recommend increasing each current and future active member's service by 5.0 months to reflect additional service credit received at retirement.

Fiscal Year	New Retirees	New Retirees with Unused Sick Leave	New Retirees with No Unused Sick Leave	Total Unused Sick Leave Years	Average Unused Sick Leave Years
2019	2,954	2,122	832	595	0.280
2020	2,598	1,836	762	499	0.272
2021	2,747	2,089	658	595	0.285
Total	**8,299**	**6,047**	**2,252**	**1,688**	**0.279**

Percent of New Retirees who Receive Additional Service Due to Unused Sick Leave	**72.86%**
Average Years of Unused Sick Leave for New Retirees During Fiscal Years 2019-2021	**0.2792**
Expected Years of Unused Sick Leave at Retirement for Current and Future Active Members	**0.2034**

Fiscal Year	New Retirees	New Retirees with Optional Service	New Retirees with No Optional Service	Total Optional Service Years	Average Optional Service Years
2019	1,566	1,537	29	345	0.224
2020	1,278	1,234	44	260	0.211
2021	1,477	1,455	22	337	0.232
Total	**4,321**	**4,226**	**95**	**943**	**0.223**

Percent of New Retirees who Purchase Optional Service	**97.80%**
Average Years of Optional Service for New Retirees During Fiscal Years 2019-2021	**0.2230**
Expected Years of Optional Service Purchased at Retirement for Current and Future Active Members	**0.2181**
Total Years Service is Increased	**0.4216**

Disability

Because members who receive disability benefits typically spend less than one year on disability, they are assumed to return to work and are considered active members. There is currently a load of 1.46 percent of pay on the normal cost applied to reflect the near-term cash flow. We have reviewed the history of disability benefit payments as disclosed in the System's Financial Statements. Based on this analysis, we recommend maintaining the load on the normal cost as a percentage of pay, which is approximately equal to 110 percent of the most recent disability benefit payments to reflect the near-term cash flow. This assumption will be updated at each valuation date as experience emerges.

	Total Disability Benefit Payments	Covered Payroll	Disability Payments as a % of Payroll	Annual Increase in Disability Payments
2020	61,015,233	4,523,879,000	1.35%	1.85%
2019	59,904,085	4,601,379,000	1.30%	-3.53%
2018	62,093,337	4,243,742,000	1.46%	0.98%
2017	61,492,093	4,195,778,000	1.47%	2.78%

Accelerated Pension Benefit Payment Program Election Assumption

In accordance with Public Act 100-0587 and Public Act 101-0010,

- Eligible Tier 1 active members may elect the "COLA Buyout", through June 1, 2024, in which the member receives reduced and delayed COLA benefits at retirement and an accelerated pension benefit payment.
- Eligible inactive Tier 1 and Tier 2 members may elect the "Total Buyout", through May 31, 2024, in which the member receives an accelerated pension benefit payment in lieu of an annuity at retirement.

With respect to the COLA Buyout, 20 percent of Regular Formula members, 42 percent of Alternative Formula members not covered by Social Security, and 38 percent of Alternative Formula members covered by Social Security, are assumed to elect the COLA Buyout. The election percentages are based on experience through June 2022 as provided by SERS. With respect to the Total Buyout, 2 percent are assumed to elect the Total Buyout. The election percentages apply until the end of each Buyout Program; i.e., June 1, 2024, for the COLA Buyout and May 31, 2024, for the Total Buyout.

The following table shows Accelerated Pension Benefit Payments available experience through June 2022, and updated assumptions:

Group	Elected Buyout	Declined Buyout	Observed Rate	Prior Assumption	Updated Assumption
COLA Buyout					
Regular Formula	1,507	5,733	21%	20%	20%
Alternative Formula not covered by Social Security	129	156	45%	40%	42%
Alternative Formula covered by Social Security	989	1,440	41%	35%	38%
Total Buyout	72	3,328	2%	2%	2%

The Total Buyout rate is based on limited experience data given the low incidence of election.

SECTION D

COST IMPACT

Cost Impact

The impact of adopting the recommended assumptions is summarized in the following tables. The results are based on the June 30, 2021, actuarial valuation.

		Valuation Baseline	Experience Study	
			6.75% Discount Rate Changing Mortality Tables	6.75% Discount Rate Changing all Demographic Assumptions
1	Number of Members			
	a. Active	62,253	62,253	62,253
	b. Inactive:			
	i. Eligible for deferred vested pension benefits (57 based on SERS service alone. An additional 117 are eligible when reciprocal service is added to SERS service).	3,825	3,825	3,825
	ii. Eligible for return of contributions only	24,497	24,497	24,497
	c. Current Benefit Recipients:			
	i. Retirement annuities	62,426	62,426	62,426
	ii. Survivor annuities	11,707	11,707	11,707
	iii. Disability annuities	1,806	1,806	1,806
	d. Eligible for Deferred Benefits:			
	i. Retirement annuities	57	57	57
	ii. Survivor annuities	117	117	117
	e. Total	166,688	166,688	166,688
2	Covered Payroll Provided by System	$ 4,705,248,957	$ 4,705,248,957	$ 4,705,248,957
3	Annualized Benefit Payments Currently Being Made			
	a. Retirement (Includes those eligible for deferred benefits)	$ 2,633,050,570	$ 2,633,050,570	$ 2,633,050,570
	b. Survivor (Includes those eligible for deferred benefits)	189,612,453	189,612,453	189,612,453
	c. Disability	52,830,180	52,830,180	52,830,180
	d. Total	$ 2,875,493,202	$ 2,875,493,202	$ 2,875,493,202
4	Actuarial Liability—Annuitants			
	a. Current Benefit Recipients:			
	i. Retirement annuities	$ 34,548,462,497	$ 34,229,742,981	$ 34,229,742,981
	ii. Survivor annuities	1,959,703,347	1,938,017,347	1,938,017,347
	iii. Disability annuities	487,778,734	481,851,170	471,844,084
	b. Eligible for Deferred Benefits:			
	i. Retirement annuities	6,938,366	6,831,361	6,831,361
	ii. Survivor annuities	7,944,151	7,836,298	7,836,298
	c. Total	$ 37,010,827,095	$ 36,664,279,157	$ 36,654,272,071

Cost Impact

		Valuation Baseline	Experience Study: 6.75% Discount Rate Changing Mortality Tables	Experience Study: 6.75% Discount Rate Changing all Demographic Assumptions
5	Actuarial Liability—Inactive Members			
	a. Eligible for Deferred Vested Pension Benefits	$ 804,042,441	$ 789,412,405	$ 821,229,718
	b. Eligible for Return of Contributions Only	60,565,168	60,565,168	60,565,168
	c. Total	$ 864,607,609	$ 849,977,573	$ 881,794,886
6	Active Members			
	a. Pension Benefits	$ 9,526,398,891	$ 9,442,445,509	$ 9,153,300,598
	b. Cost-of-Living Adjustments	3,892,944,540	3,805,015,118	3,697,476,635
	c. Death Benefits			
	i. Occupational	$ 10,096,916	$ 10,531,721	$ 10,617,133
	ii. Non-occupational	89,647,989	92,258,505	93,294,829
	iii. Refund	50,035,784	50,145,927	46,074,418
	iv. Total	$ 149,780,689	$ 152,936,153	$ 149,986,380
	d. Disability	$ -	$ -	$ -
	e. Withdrawal	383,921,580	376,462,018	424,615,562
	f. Total	$ 13,953,045,700	$ 13,776,858,798	$ 13,425,379,175
7	Total Actuarial Liability (4 + 5 + 6)	$ 51,828,480,404	$ 51,291,115,528	$ 50,961,446,132
8	Market Value of Assets (MVA)	$ 23,824,987,723	$ 23,824,987,723	$ 23,824,987,723
9	Unfunded Actuarial Liability Based on MVA (7 – 8)	$ 28,003,492,681	$ 27,466,127,805	$ 27,136,458,409
10	Funded Percentage Based on MVA (8 ÷ 7)	45.97%	46.45%	46.75%
11	Actuarial Value of Assets (AVA)	$ 21,323,630,719	$ 21,323,630,719	$ 21,323,630,719
12	Unfunded Actuarial Liability Based on AVA (7 – 11)	$ 30,504,849,685	$ 29,967,484,809	$ 29,637,815,413
13	Funded Percentage Based on AVA (11 ÷ 7) [a]	41.14%	41.57%	41.84%
14	Total Normal Cost	900,826,194	890,796,341	868,675,153
15	Employee Contributions	$ 270,614,883	$ 270,614,883	$ 270,614,883
16	Annual Employer Normal Cost	$ 630,211,311	$ 620,181,458	$ 598,060,270
	(% uncapped payroll)	13.39%	13.18%	12.71%

[a] *The funded status measure is appropriate for assessing the need for future contributions. The funded status is not appropriate for assessing the sufficiency of plan assets to cover the estimated cost of settling the plan's benefit obligations.*

Cost Impact

Actuarial Valuation Date: June 30, 2021 Fiscal Year Ending: June 30, 2023	Valuation Baseline	6.75% Discount Rate Changing Mortality Tables	6.75% Discount Rate Changing all Demographic Assumptions
Estimated Statutory Contributions:			
· Annual Amount[a]	$ 2,484,585,000	$ 2,467,870,000	$ 2,456,338,000
· Percentage of Projected Capped Payroll for Fiscal Year	51.015%	50.673%	50.479%
Actuarially Determined Contribution[b] (ADC):			
· Annual Amount	$ 3,045,940,587	$ 2,991,109,585	$ 2,947,777,111
· Percentage of Projected Capped Payroll for Fiscal Year	62.541%	61.417%	60.578%
Membership			
· Number of			
- Active Members	62,253	62,253	62,253
- Inactives - Eligible for Deferred Vested Benefit	3,825	3,825	3,825
- Inactives - Eligible for Return of Contributions	24,497	24,497	24,497
- Members Receiving Payments	75,939	75,939	75,939
- Members Eligible for Deferred Benefits	174	174	174
- Total	166,688	166,688	166,688
· Covered Uncapped Payroll Provided by System	$ 4,705,248,957	$ 4,705,248,957	$ 4,705,248,957
· Projected Capped Payroll For Fiscal Year[c]	$ 4,870,303,812	$ 4,870,186,834	$ 4,866,059,889
· Annualized Benefit Payments	$ 2,875,493,203	$ 2,875,493,203	$ 2,875,493,203
Assets			
· Market Value of Assets (MVA)	$ 23,824,987,723	$ 23,824,987,723	$ 23,824,987,723
· Actuarial Value of Assets (AVA)	$ 21,323,630,719	$ 21,323,630,719	$ 21,323,630,719
· Return on MVA	24.86%	24.86%	24.86%
· Return on AVA	10.67%	10.67%	10.67%
· Ratio – AVA to MVA	89.50%	89.50%	89.50%
Actuarial Information			
· Employer Normal Cost Amount	$ 630,211,311	$ 620,181,458	$ 598,060,270
· Actuarial Accrued Liability (AAL)	$ 51,828,480,404	$ 51,291,115,528	$ 50,961,446,132
· Unfunded Actuarial Accrued Liability (UAAL)	$ 30,504,849,685	$ 29,967,484,809	$ 29,637,815,413
· Funded Ratio based on AVA	41.14%	41.57%	41.84%
· UAAL as % of Covered Payroll	648.32%	636.89%	629.89%
· Funded Ratio based on MVA	45.97%	46.45%	46.75%

[a] The estimated statutory contribution amounts for fiscal years 2022 and 2023 are based on projected capped payrolls for fiscal years 2022 and 2023, respectively, using June 30, 2021, census data.

[b] For contributions in fiscal years ending on and after June 30, 2017, the Board adopted a recommended policy used to develop the Actuarially Determined Contribution (ADC) as defined in GASB Statements Nos. 67 and 68. The policy adopted by the Board calculates the ADC as the Normal Cost plus a 25-year level percent of capped payroll closed-period amortization of the Unfunded Accrued Liability. As of June 30, 2021, the remaining amortization period is 19 years. The ADC is used for financial reporting purposes only.

[c] Based on June 30, 2021, census data.

Cost Impact

Actuarial Accrued Liability and Actuarial Value of Assets
Determined as of June 30, 2021
($ in millions)

Year	Actuarial Accrued Liability			Actuarial Value of Assets		
		Experience Study			Experience Study	
	Valuation Baseline	6.75% Discount Rate Changing Mortality Tables	6.75% Discount Rate Changing all Demographic Assumptions	Valuation Baseline	6.75% Discount Rate Changing Mortality Tables	6.75% Discount Rate Changing all Demographic Assumptions
2022	$ 53,175	$ 52,591	$ 52,220	$ 23,411	$ 23,412	$ 23,415
2023	54,449	53,819	53,406	25,320	25,305	25,303
2024	55,656	54,978	54,525	27,172	27,133	27,120
2025	56,786	56,060	55,566	29,025	28,952	28,920
2026	57,830	57,054	56,520	30,103	29,986	29,928
2031	61,750	60,718	59,987	34,814	34,398	34,152
2036	63,704	62,417	61,504	40,289	39,529	39,041
2041	64,042	62,532	61,478	48,102	46,958	46,190
2043	63,951	62,365	61,267	52,325	51,015	50,122
2045	63,844	62,194	61,056	57,463	55,976	54,947

Normal cost rate includes administrative expenses.
State contribution based on the requirements of Public Act 88-0593, as amended by Public Act 90-0065, Public Act 94-0004, Public Act 96-0043, and Public Act 100-0023.
Total expenses include benefit payments, refunds, and administrative expenses.
Actuarial accrued liability and assets are measured at Plan Year End.
Total payroll is capped for members hired after December 31, 2010, as defined in Public Act 96-0889.

Cost Impact

Required State Contribution
Determined as of June 30, 2021
($ in millions)

Year	Contribution Dollar		
		Experience Study	
	Valuation Baseline	6.75% Discount Rate Changing Mortality Tables	6.75% Discount Rate Changing all Demographic Assumptions
2022	$ 2,586	$ 2,586	$ 2,586
2023	2,485	2,468	2,456
2024	2,462	2,436	2,416
2025	2,440	2,404	2,375
2026	2,427	2,381	2,343
2031	2,577	2,518	2,463
2036	3,068	3,005	2,942
2041	3,428	3,360	3,292
2043	3,595	3,525	3,453
2045	3,772	3,698	3,624
Total Cont. Through 2045	**$ 70,139**	**$ 68,805**	**$ 67,533**
Present Value of Total Cont.	**$ 33,267**	**$ 32,681**	**$ 32,141**

Contribution Percent		
	Experience Study	
Valuation Baseline	6.75% Discount Rate Changing Mortality Tables	6.75% Discount Rate Changing all Demographic Assumptions
53.89%	53.89%	53.89%
51.01%	50.67%	50.48%
49.76%	49.23%	48.91%
48.53%	47.81%	47.37%
47.45%	46.55%	45.98%
45.89%	44.80%	44.10%
49.23%	48.13%	47.45%
49.23%	48.13%	47.45%
49.23%	48.13%	47.45%
49.23%	48.13%	47.45%

Normal cost rate includes administrative expenses.
State contribution based on the requirements of Public Act 88-0593, as amended by Public Act 90-0065, Public Act 94-0004, Public Act 96-0043, and Public Act 100-0023.
Total expenses include benefit payments, refunds, and administrative expenses.
Actuarial accrued liability and assets are measured at Plan Year End.
Total payroll is capped for members hired after December 31, 2010, as defined in Public Act 96-0889.

Unfunded Accrued Liability and Funded Ratio
Determined as of June 30, 2021
($ in millions)

Year	Unfunded Accrued Liability			Funded Ratio		
		Experience Study			Experience Study	
	Valuation Baseline	6.75% Discount Rate Changing Mortality Tables	6.75% Discount Rate Changing all Demographic Assumptions	Valuation Baseline	6.75% Discount Rate Changing Mortality Tables	6.75% Discount Rate Changing all Demographic Assumptions
2022	$ 29,763	$ 29,179	$ 28,805	44.03%	44.52%	44.84%
2023	29,129	28,514	28,103	46.50%	47.02%	47.38%
2024	28,484	27,845	27,405	48.82%	49.35%	49.74%
2025	27,761	27,107	26,646	51.11%	51.65%	52.05%
2026	27,727	27,068	26,592	52.05%	52.56%	52.95%
2031	26,936	26,319	25,835	56.38%	56.65%	56.93%
2036	23,414	22,888	22,463	63.24%	63.33%	63.48%
2041	15,941	15,574	15,288	75.11%	75.09%	75.13%
2043	11,626	11,350	11,145	81.82%	81.80%	81.81%
2045	6,382	6,218	6,109	90.00%	90.00%	90.00%

Normal cost rate includes administrative expenses.
State contribution based on the requirements of Public Act 88-0593, as amended by Public Act 90-0065, Public Act 94-0004, Public Act 96-0043, and Public Act 100-0023.
Total expenses include benefit payments, refunds, and administrative expenses.
Actuarial accrued liability and assets are measured at Plan Year End.
Total payroll is capped for members hired after December 31, 2010, as defined in Public Act 96-0889.

SECTION E

RECOMMENDED ACTUARIAL ASSUMPTIONS

Actuarial Cost Method as Mandated by 40 ILCS 5/14-131, Adopted June 30, 1989

The projected unit credit normal cost method is used. Under this method, the projected pension at retirement age is first calculated and the present value at the individual member's current or attained age is determined. The normal cost for the member for the current year is equal to the actuarial present value divided by the member's projected service at retirement. The normal cost for the plan for the year is the sum of the individual normal costs.

The actuarial liability at any point in time is the present value of the projected pensions at that time less the present value of future normal costs.

For ancillary benefits for active members, in particular death and survivor benefits, termination benefits and the post-retirement increases, the same procedure as outlined above is followed.

Estimated annual administrative expenses are added to the normal cost.

For actuarial valuation purposes, as well as projection purposes, an actuarial value of assets is used.

Mortality

Recommended mortality assumptions for general employees and retirees covered under the Regular Benefit Formula are shown in the following table.

General Employees and Retirees	Proposed Mortality Table	Male Scaling Factor	Female Scaling Factor
Pre-retirement	Pub-2010 General Employee, sex distinct	84%	92%
Post-retirement	Pub-2010 Below-Median Income General Healthy Retiree sex distinct	91%	115%

Recommended mortality assumptions for Public Safety employees and retirees covered under the Alternative Benefit Formula are shown in the following table.

Public Safety Employees and Retirees	Proposed Mortality Table	Male Scaling Factor	Female Scaling Factor
Pre-retirement	Pub-2010 Public Safety Employee, sex distinct	90%	100%
Post-retirement	Pub-2010 Below-Median Income Public Safety Healthy Retiree, sex distinct	97%	103%

Interest

6.75 percent per year, compounded annually, net of investment expenses.

General Inflation

2.25 percent per year, compounded annually.

This assumption serves as the basis for the determination of Tier Two annual increases that are equal to the lesser of 3.0 percent or one-half of the annual increase in the consumer price index-u during the preceding 12-month calendar year and are not compounded.

Marriage Assumption

85.0 percent of active male participants and 65.0 percent of active female participants are assumed to be married. Actual marital status at benefit commencement is used for retirees , if available; otherwise the active marriage assumptions are used for retirees.

Social Security Offset for Survivor Benefits

No offset assumption for male surviving spouses, because it is assumed their own PIA is as great as their spouses' PIA. Sixty percent of married male members are assumed to have a dual income household. For the dual income household, it is assumed the offset at age 60 is 45.0 percent of the original survivor benefit. It is assumed the offset at age 62 is 10.0 percent of the original survivor benefit. Furthermore, it is assumed that 50 percent of retirees on or after July 1, 2009, will elect to remove the offset provision. In exchange for the removal, the member's retirement annuity is reduced by 3.825 percent monthly as mandated by Statutes.

Termination

Illustrative rates of withdrawal from the plan are as follows for Tier One members:

Service Based Withdrawal - Tier 1 Members				
Service (End of Year)	Regular Formula Employees		Alternative Formula Employees	
	Males	Females	Males	Females
1	0.2400	0.2200	0.0300	0.0700
2	0.0900	0.0900	0.0300	0.0700
3	0.0700	0.0550	0.0300	0.0650
4	0.0600	0.0550	0.0300	0.0600
5	0.0600	0.0450	0.0300	0.0600
6	0.0410	0.0400	0.0300	0.0500
7	0.0450	0.0350	0.0300	0.0400
8	0.0400	0.0350	0.0300	0.0300
9	0.0300	0.0350	0.0200	0.0200
10	0.0300	0.0350	0.0200	0.0200
11	0.0300	0.0300	0.0150	0.0200
12	0.0250	0.0300	0.0150	0.0175
13	0.0250	0.0250	0.0150	0.0175
14	0.0250	0.0250	0.0150	0.0175
15	0.0250	0.0250	0.0150	0.0175
16	0.0225	0.0250	0.0150	0.0175
17	0.0200	0.0200	0.0150	0.0150
18	0.0200	0.0200	0.0150	0.0150
19	0.0200	0.0200	0.0150	0.0150
20	0.0200	0.0200	0.0150	0.0125
21	0.0200	0.0175	0.0150	0.0125
22	0.0200	0.0175	0.0150	0.0125
23	0.0200	0.0175	0.0150	0.0125
24	0.0200	0.0175	0.0150	0.0125
25	0.0200	0.0175	0.0150	0.0100
26	0.0200	0.0150	0.0150	0.0100
27	0.0200	0.0150	0.0150	0.0100
28	0.0200	0.0150	0.0150	0.0100
29	0.0200	0.0150	0.0150	0.0100
30+	0.0200	0.0150	0.0150	0.0100

It is assumed that terminated employees will not be rehired. The rates apply only to employees who have not fulfilled the service requirement necessary for retirement at any given age.

Salary Increases

Illustrative rates of increase per individual employee per year, compounded annually:

Age	Annual Increase
25	7.41%
30	6.29%
35	5.19%
40	4.36%
45	3.79%
50	3.38%
55	3.08%
60	2.84%
65	2.60%
70	2.50%
75	2.35%
80	2.25%

The underlying salary increase assumption is based on a wage inflation assumption of 2.75 percent per year, comprised of 2.25 percent for general inflation plus 0.50 percent for productivity increases. The total salary increases shown above include general inflation, productivity increases, and an age-based component for merit, promotion, and longevity. The total annual increase on and after age 80 equals 2.25%.

Disability

Because members who receive disability benefits typically spend less than one year on disability, they are considered active members. Therefore, a load of 1.46 percent of pay on the normal cost is applied to reflect the near-term cash flow. This assumption is based on 110 percent of the most recent disability benefit payment information as a percent of payroll and will be updated at each actuarial valuation date as experience emerges.

415(b) and 401(a)(17) Limits

No explicit assumption is made with respect to these items.

Accelerated Pension Benefit Payment Program Election Assumption

In accordance with Public Act 100-0587 and Public Act 101-0010,

- Eligible Tier 1 active members may elect the "COLA Buyout," through June 1, 2021, in which the member receives reduced and delayed COLA benefits at retirement and an accelerated pension benefit payment.
- Eligible inactive Tier 1 and Tier 2 members may elect the "Total Buyout," through May 31, 2021, in which the member receives an accelerated pension benefit payment in lieu of an annuity at retirement.

With respect to the COLA Buyout, 20 percent of Regular Formula members, 42 percent of Alternative Formula members not covered by Social Security, and 38 percent of Alternative Formula members

covered by Social Security are assumed to elect the COLA Buyout. The election percentages are based on experience through June 2022 as provided by SERS. With respect to the Total Buyout, 2 percent are assumed to elect the Total Buyout. The election percentages apply until the end of each Buyout Program; i.e., June 1, 2024, for the COLA Buyout and May 31, 2024, for the Total Buyout.

The following table shows Accelerated Pension Benefit Payments available experience through June 2022, and updated assumptions:

Group	Elected Buyout	Declined Buyout	Observed Rate	Prior Assumption	Updated Assumption
COLA Buyout					
Regular Formula	1,507	5,733	21%	20%	20%
Alternative Formula not covered by Social Security	129	156	45%	40%	42%
Alternative Formula covered by Social Security	989	1,440	41%	35%	38%
Total Buyout	72	3,328	2%	2%	2%

Data related to the Total Buyout is based on experience through July 2021.

Population Projection

For purposes of determining annual appropriation as a percent of total covered payroll, the size of the active group is assumed to remain level at the number of actives as of the actuarial valuation date. New entrants are assumed to enter with an average age and an average pay as disclosed below. New entrants are assumed to have the same demographic profile as new entrants in the 15 years prior to the actuarial valuation date. The average increase in uncapped payroll for the projection period is 2.75 percent per year. New entrants not covered by Social Security are assumed to participate in the Tier 2 defined benefit plan.

New Entrant Benefit Groups												
Age Group	New Entrants Eligible for Regular Formula Benefits who are Covered by Social Security		New Entrants Eligible for Regular Formula Benefits who are not Covered by Social Security		New Entrants in Positions Formerly Eligible for Alternative Formula Benefits who are Covered by Social Security and are now Eligible for Regular Formula Benefits		New Entrants Eligible for Alternative Formula Benefits who are Covered by Social Security		New Entrants in Positions Formerly Eligible for Alternative Formula Benefits who are not Covered by Social Security and are now Eligible for Regular Formula Benefits		New Entrants Eligible for Alternative Formula Benefits who are not Covered by Social Security		Total	
	No.	Salary	No.	Salary	No.	Salary	No.	Salary	No.	Salary	No.	Salary	No.	Salary
Under 20	141	5,333,379			88	4,394,166	17	906,883					246	10,634,428
20-24	2,697	111,782,719	22	1,135,880	1,831	95,804,133	354	18,871,443	309	21,323,403	2	76,303	5,215	248,993,881
25-29	4,866	235,945,129	33	1,926,960	2,091	115,474,006	434	25,449,629	443	32,244,381	4	149,034	7,871	411,189,139
30-34	4,234	226,276,866	23	1,510,365	1,174	68,957,019	320	20,489,817	208	15,276,765	7	275,095	5,966	332,785,927
35-39	3,728	207,130,855	6	284,514	790	48,918,881	254	16,561,088	68	5,052,015	4	163,170	4,850	278,110,523
40-44	3,440	198,152,546	8	589,912	632	41,015,357	207	14,170,345	39	2,906,912	1	46,555	4,327	256,881,627
45-49	3,067	177,435,976	6	417,324	446	28,773,587	183	12,434,770	11	852,850			3,713	219,914,507
50-54	2,560	150,623,086	5	392,086	289	19,103,224	113	7,928,789	16	1,304,897	1	42,176	2,984	179,394,258
55-59	1,655	95,258,997	11	796,064	145	9,438,882	49	3,249,088	13	1,141,722			1,873	109,884,753
60-64	591	33,239,302			41	2,605,186	15	1,006,776	2	198,413			649	37,049,677
65-69	42	2,390,105			7	449,923	2	161,564					51	3,001,592
70 & Over														
Total	27,021	$ 1,443,568,960	114	$ 7,053,105	7,534	$ 434,934,364	1,948	$ 121,230,192	1,109	$ 80,301,358	19	$ 752,333	37,745	$ 2,087,840,312
Avg. Salary		$ 53,424		$ 61,869		$ 57,730		$ 62,233		$ 72,409		$ 39,596		$ 55,314
Avg. Age		37.82		33.60		31.70		34.07		28.77		27.57		36.12
Percent Male		42%		84%		71%		67%		90%		100%		50%

Retirement – Tier One

Employees are assumed to retire in accordance with the rates shown below. The rates apply only to employees who have fulfilled the service requirement necessary for retirement at any given age.

Retirement Rates for Regular Formula Employees		
Age	Males	Females
50	15.00%	30.00%
51	24.00%	30.00%
52	24.00%	30.00%
53	24.00%	27.50%
54	24.00%	25.00%
55	24.00%	25.00%
56	18.00%	24.00%
57	18.00%	18.00%
58	18.00%	18.00%
59	18.00%	18.00%
60	13.00%	16.00%
61	12.00%	12.50%
62	19.00%	22.00%
63	16.50%	18.00%
64	16.50%	19.00%
65	22.50%	25.00%
66	22.50%	27.00%
67	22.50%	25.00%
68	22.50%	25.00%
69	22.50%	22.00%
70	22.50%	22.00%
71	20.00%	22.00%
72	20.00%	22.00%
73	20.00%	22.00%
74	20.00%	22.00%
75	100.00%	100.00%

Early Retirement Rates for Regular Formula Employees		
Age	Males	Females
55	3.50%	2.50%
56	3.50%	2.50%
57	3.50%	3.50%
58	6.00%	4.00%
59	6.50%	5.00%

Retirement Rates for Alternative Formula Employees				
	Eligible for Alternative Formula Benefits Only		Eligible for Regular Formula Benefits Only	
Age	Males	Females	Males	Females
50	60.00%	41.50%	N/A	N/A
51	50.00%	31.00%	N/A	N/A
52	35.00%	25.00%	N/A	N/A
53	35.00%	25.00%	N/A	N/A
54	35.00%	25.00%	N/A	N/A
55	40.00%	40.00%	N/A	N/A
56	30.00%	25.00%	N/A	N/A
57	25.00%	25.00%	N/A	N/A
58	27.00%	25.00%	N/A	N/A
59	27.00%	25.00%	N/A	N/A
60	30.00%	30.00%	4.00%	5.00%
61	30.00%	30.00%	4.00%	5.00%
62	30.00%	30.00%	8.00%	10.00%
63	35.00%	30.00%	10.00%	10.00%
64	35.00%	30.00%	11.00%	15.00%
65	35.00%	50.00%	14.00%	20.00%
66	40.00%	50.00%	25.00%	20.00%
67	40.00%	50.00%	20.00%	25.00%
68	45.00%	50.00%	17.50%	30.00%
69	45.00%	50.00%	17.50%	30.00%
70	50.00%	50.00%	17.50%	30.00%
71	50.00%	50.00%	17.50%	30.00%
72	100.00%	100.00%	100.00%	100.00%

Assets

Assets available for benefits are determined as described on page 52 of the valuation report. The asset valuation method is prescribed by statute, and does not appear to allow a corridor; therefore, a corridor has not been established.

Expenses

As estimated and advised by SERS staff, based on current expenses and are expected to increase in relation to the projected capped payroll.

Spouse's Age

The female spouse is assumed to be three years younger than the male spouse for active member valuation purposes.

Children

It is assumed that married members have 2.2 children, one year apart in age.

The age of the youngest child of a deceased employee at his date of death is assumed to be as follows:

Age at Death of Employee	Age of Youngest Child	Age at Death of Employee	Age of Youngest Child
20	2	40	6
25	3	45	8
30	4	50	10
35	5	55	12
		60	14

Overtime and Shift Differentials

Reported earnings include base pay alone. It is assumed that overtime and shift differentials will increase total payroll by 3.5 percent over reported earnings.

Load for Inactive Members Eligible for Deferred Vested Pension Benefits

Load of 15 percent for Regular Formula members and 13 percent for Alternative Formula members. The load reflects a liability attributable to inactive members eligible for deferred vested pension benefits for potential increases in final average salary due to participation in a reciprocal system after termination.

Unused Sick Leave and Optional Service Purchases

Current and future active member's service is increased 5.0 months to account for increases of service at retirement due to converting unused sick leave and vacation days and purchasing applicable optional service.

Missing Data

If year-to-date earnings were not available, then the monthly pay rate is used. If both year-to-date earnings and the monthly pay rate are not available, the annual rate of pay is assumed to be the rate of pay for the population as a whole on the actuarial valuation date. For members with less than a year of service, the annual rate of pay is based on the greater of year-to-date earnings or annualized pay rate. If a birth date was not available, the member was assumed to be age 35.

Decrement Timing

All decrements are assumed to occur mid-year.

Decrement Relativity

Decrement rates are used directly from the experience study, without adjustment for multiple decrement table effects.

Decrement Operation

Disability and turnover decrements do not operate after a member reaches retirement eligibility.

Eligibility Testing

Eligibility for benefits is determined based upon the age nearest birthday and service on the date the decrement is assumed to occur.

Assumptions as a Result of Public Act 96-0889 Adopted June 30, 2016

Members hired after December 31, 2010, are assumed to make contributions on salary up to the final average compensation cap in a given year until this plan provision or administrative procedure is clarified.

State contributions, expressed as a percentage of pay, are calculated based upon capped pay.

Members hired after December 31, 2010, eligible for the regular formula benefits will retire according to the following age-based retirement rates:

Retirement Rates for Regular Formula Employees			
Age	Employees Eligible For Normal Retirement	Age	Employees Eligible For Early Retirement
67	50.00%	62	30.00%
68	32.50%	63	15.00%
69	32.50%	64	15.00%
70	32.50%	65	15.00%
71	20.00%	66	15.00%
72	20.00%		
73	20.00%		
74	20.00%		
75	100.00%		

Members hired after December 31, 2010, eligible for the alternative formula benefits will retire according to the following age-based retirement rates:

Retirement Rates for Alternative Formula Employees Tier 2 Members		
Age	Males	Females
60	50.00%	50.00%
61	25.00%	30.00%
62	25.00%	35.00%
63	30.00%	30.00%
64	30.00%	35.00%
65	30.00%	50.00%
66	30.00%	50.00%
67	30.00%	50.00%
68	30.00%	50.00%
69	40.00%	50.00%
70	45.00%	50.00%
71	45.00%	50.00%
72	100.00%	100.00%

Illustrative rates of withdrawal from the plan are as follows for members hired after December 31, 2010:

Service Based Withdrawal - Tier 2 Members				
Service (End of Year)	Regular Formula Employees		Alternative Formula Employees	
	Males	Females	Males	Females
1	0.3300	0.2800	0.1000	0.1100
2	0.1650	0.1500	0.0800	0.0800
3	0.0600	0.0800	0.0625	0.0750
4	0.0600	0.0700	0.0550	0.0625
5	0.0575	0.0650	0.0425	0.0525
6	0.0500	0.0550	0.0300	0.0500
7	0.0450	0.0500	0.0250	0.0500
8	0.0450	0.0400	0.0225	0.0325
9	0.0300	0.0300	0.0150	0.0200
10	0.0300	0.0350	0.0150	0.0200
11	0.0300	0.0300	0.0150	0.0200
12	0.0250	0.0300	0.0150	0.0175
13	0.0250	0.0250	0.0150	0.0175
14	0.0250	0.0250	0.0150	0.0175
15	0.0200	0.0250	0.0150	0.0175
16	0.0200	0.0250	0.0150	0.0175
17	0.0200	0.0200	0.0150	0.0150
18	0.0200	0.0200	0.0150	0.0150
19	0.0200	0.0200	0.0150	0.0150
20	0.0200	0.0200	0.0150	0.0125
21	0.0250	0.0150	0.0150	0.0125
22	0.0250	0.0150	0.0150	0.0125
23	0.0250	0.0150	0.0150	0.0125
24	0.0250	0.0150	0.0150	0.0125
25	0.0200	0.0150	0.0150	0.0100
26	0.0200	0.0150	0.0150	0.0100
27	0.0200	0.0150	0.0150	0.0100
28	0.0200	0.0150	0.0150	0.0100
29	0.0200	0.0150	0.0150	0.0100
30+	0.0200	0.0150	0.0150	0.0100

State Contributions under P.A. 93-0002

In general, for each year during the life of the GOB program, the state contributions to the System are to be calculated as follows:

1. Calculation of the contribution maximum
    a. A projection of contributions will be made from the actuarial valuation date to June 30, 2045. Such projection will be based on hypothetical asset values determined using the following assumptions:
        i) That the System had received no portion of the general obligation bond proceeds in excess of the scheduled contributions for the remainder of fiscal 2003 and for the entirety of 2004,
        ii) That the hypothetical state contributions had been made each fiscal year from 2005 through the actuarial valuation date, based on the funding process in place prior to P.A. 93-0002 (without regard to prior state minimum requirements),
        iii) That the actual amounts of member contributions and the actual cash outflows (benefit payments, refunds and administrative expenses) for each year prior to the actuarial valuation date were realized, and
        iv) That the hypothetical fund earned returns in each prior fiscal year equal to the rate of total return actually earned by the retirement fund in that year.
    b. The hypothetical asset values developed in a., above, will not exceed the actual assets of the fund.
    c. A projection of maximum contributions for each year of the GOB program will be performed each year, by reducing the contributions produced in a., above, by the respective amount of debt service allocated to the System for each year.
2. Calculation of the contribution with GOB proceeds
    a. The basic projection of state contributions from the actuarial valuation date through June 30, 2045, will be made, taking into account all assets of the System, including the GOB proceeds.
    b. State contribution rates (expressed as a percentage of covered pay), in the pattern required by the funding sections of the statutes, are calculated.
    c. In those projections, the dollars of state contributions which are added to assets each year during the GOB program are limited by the contribution maximum. Because the bonds are to be liquidated by the end of fiscal 2033, there is no contribution maximum thereafter.

State Contributions under P.A. 94-0004

The following is an excerpt from the Illinois Compiled statutes 40 ILCS 5/14-108.3 (f)-(g):

> (f) The System shall determine the amount of the increase in the present value of future benefits resulting from the granting of early retirement incentives under this Section and shall report that amount to the Governor and the Commission on Government Forecasting and Accountability on or after the effective date of this amendatory Act of the 93rd General Assembly and on or before November 15, 2004. Beginning with State fiscal year 2008, the increase reported under this subsection (f) shall be included in the calculation of the required State contribution under Section 14-131.
>
> (g) In addition to the contributions otherwise required under this Article, the State shall appropriate and pay to the System an amount equal to $70,000,000 in State fiscal years 2004 and 2005.

State Contributions under P.A. 96-0043

The following is an excerpt from the Illinois Compiled statutes 40 ILCS 5/14-131:

> (g) For purposes of determining the required State contribution to the System, the value of the System's assets shall be equal to the actuarial value of the System's assets, which shall be calculated as follows:
>
> > As of June 30, 2008, the actuarial value of the System's assets shall be equal to the market value of the assets as of that date. In determining the actuarial value of the System's assets for fiscal years after June 30, 2008, any actuarial gains or losses from investment return incurred in a fiscal year shall be recognized in equal annual amounts over the five-year period following that fiscal year.
>
> (h) For purposes of determining the required State contribution to the System for a particular year, the actuarial value of assets shall be assumed to earn a rate of return equal to the System's actuarially assumed rate of return.

State Contributions under P.A. 100-0023

Public Act ("P.A.") 100-0023, effective July 6, 2017, modified the State's funding policy to include smoothing State contribution rate increases or decreases due to changes in actuarial assumptions, including investment return assumptions, over a five-year period in equal annual amounts beginning in fiscal year 2018. In addition, changes in actuarial or investment assumptions that increased or decreased the State contribution rate in fiscal years 2014 through 2017 are to be smoothed over a five-year period in equal annual amounts, applying only to the portion of the five-year phase-in that is applicable to fiscal years on and after 2018.

Following the preceding legislation, we have calculated the required contribution, the results are shown in the summary section of this report.

Phase-in of the Financial Impact of Assumption Changes

Following is a table with the recognition schedule for the phase-in of actuarial assumption changes required under Public Act 100-0023. The following actuarial assumption changes were made:

1. Beginning with the June 30, 2014, actuarial valuation, there were changes to the economic and demographic assumptions.
2. Beginning with the June 30, 2016, actuarial valuation, there were changes to the economic and demographic assumptions.
3. Beginning with the June 30, 2018, actuarial valuation, there were changes to the economic assumptions.
4. Beginning with the June 30, 2019, actuarial valuation, there were changes to the economic and demographic assumptions.
5. Beginning with the June 30, 2021, actuarial valuation, there were changes to the demographic assumptions.
6. Beginning with the June 30, 2021, actuarial valuation, there were changes to the demographic assumptions due to an experience review. [a]

Valuation Year Ending June 30,	2016	2017	2018	2019	2020	2021	2021	2022	2023	2024	2025
Applicable Fiscal Year Ending June 30,	2018	2019	2020	2021	2022	2023	2023	2024	2025	2026	2027
						$ in Millions After Impact of GOB Proceeds					
Contribution Before Assumption Change											
(1) Contribution Dollar	$ 2,018.671	$ -	$ 2,291.303	$ 2,393.439	$ -	$ 2,485.315	$ 2,483.184				
(2) Contribution Rate	45.027%	0.000%	52.026%	53.337%	0.000%	51.030%	50.986%				
Contribution After Assumption Change											
(3) Contribution Dollar	$ 2,327.633	$ -	$ 2,302.720	$ 2,377.901	$ -	$ 2,483.184	$ 2,406.692				
(4) Contribution Rate	52.095%	0.000%	52.411%	53.263%	0.000%	50.986%	49.459%				
(5) Assumption Change Impact as a Percentage of Capped Payroll [(4) - (2)]	7.068%	0.000%	0.385%	-0.074%	0.000%	-0.044%	-1.527%				
(6) Assumption Change Impact Recognized This Year (5-year Recognition)											
(6a) From This Year	1.414%	0.000%	0.077%	-0.015%	0.000%		-0.314%				
(6b) From One Year Ago	0.000%	1.414%	0.000%	0.077%	-0.015%		0.000%	-0.314%			
(6c) From Two Years Ago	1.010%	0.000%	1.414%	0.000%	0.077%		-0.015%	0.000%	-0.314%		
(6d) From Three Years Ago	0.000%	1.010%	0.000%	1.414%	0.000%		0.077%	-0.015%	0.000%	-0.314%	
(6e) From Four Years Ago	0.000%	0.000%	1.010%	0.000%	1.412%		0.000%	0.077%	-0.014%	0.000%	-0.315%
(6f) Total Recognized Assumption Change Impact	2.424%	2.424%	2.501%	1.476%	1.474%		-0.252%	-0.252%	-0.328%	-0.314%	-0.315%

[a] *The June 30, 2021, phase-in adjustments for the change in assumptions due to the experience review study will be re-measured as of June 30, 2022, and will become effective beginning with the June 30, 2022, actuarial valuation.*