# FIREFIGHTERS' RETIREMENT SYSTEM

EXPERIENCE STUDY
2020
(Revised – September 2020)

# G. S. CURRAN & COMPANY, LTD.

**Actuarial Services**

**10555 N. Glenstone Place • Baton Rouge, Louisiana 70810 • (225)769-4825**

Gary S. Curran, FCA, MAAA, ASA, EA
Consulting Actuary

Gregory M. Curran, FCA, MAAA, ASA, EA
Consulting Actuary


September 24, 2020

Board of Trustees
Firefighters' Retirement System
3100 Brentwood Drive
Baton Rouge, Louisiana 70809

Ladies and Gentlemen:

Please note that this revised report has corrected a typo related to describing the process used in the mortality table selection process. This typo has no effect on the mortality rates.

We are pleased to present our report on the actuarial experience study of the Firefighters' Retirement System. Unless otherwise stated, this study was performed based on the actuarial data for the Fiscal 2014 through Fiscal 2019 valuations. This report was prepared for the purpose of setting appropriate assumptions for use in the actuarial funding and financial reporting valuations beginning in Fiscal 2020.

This report was prepared exclusively for the Firefighters' Retirement System for a specific limited purpose. It is not for the use or benefit of any third party for any purpose.

The undersigned actuaries are members of the American Academy of Actuaries and have met the qualification standards for the American Academy of Actuaries to render the actuarial opinions incorporated in this report, and are available to provide further information or answer any questions with respect to this valuation.

Sincerely,

G. S. CURRAN & COMPANY, LTD.

By: _____ _____

Gary Curran, F.C.A., M.A.A.A., A.S.A. Gregory Curran, F.C.A., M.A.A.A., A.S.A.

# TABLE OF CONTENTS

# Introduction

Periodic studies of plan experience are a necessary part of the process used in determining the actuarially required contributions for a retirement system. Since future costs are based on the amount and timing of future benefits, it is essential that estimates reflect (to the extent possible) the future experience of the plan. It is improbable that future experience will exactly mirror past experience for the plan, but a first step in estimating the future is to know the past and understand those factors which may cause future experience to be different from the past. Hence, in setting actuarial assumptions, it is often necessary to adjust raw past experience to account for factors which will have an impact on the future, such as expected changes in economic conditions or new benefit structures. Also, past experience may be of limited value where the size of the group or frequency of events (such as disability) is relatively small. In these cases, judgment is called for in order to separate out random fluctuations from trends.

This study was conducted prior to the actuarial valuation of June 30, 2020 in order to analyze various components of the plan's experience over the course of the last several years. In particular, demographic experience was examined over the period from July 1, 2014 through June 30, 2019. In limited areas a longer period was reviewed in order to incorporate cyclical fluctuations in the study. The scope of the study included economic statistics such as the rate of inflation, the expected long-term rate of return for the Firefighters' Retirement System (FRS) target allocation portfolio, and the rate of salary increase. In addition, this study includes a review of plan utilization factors, such as decrements including withdrawal, retirement, DROP entry, post-DROP retirement, and disability rates. Also, a plan mortality study was conducted. Other factors, such as vesting election percentage, DROP participation period, percent retiring at end of DROP, average post-DROP period, family statistics, and actuarial equivalence factors were also reviewed.

The source data used for the studies were the corrected valuation databases provided by the system for the annual actuarial valuation. Each year when the data is submitted for the valuation it is validated by checking it for reasonableness and consistency with prior year data. Items such as dates of birth, service credit, compensation, beneficiary information, and other factors are subjected to various screening criteria. In cases where unusual or inconsistent data are detected, the data is returned to the system's staff for correction or verification. For this study, the corrected databases from the valuations for each year from June 30, 2014 through June 30, 2019, were used.

For most of the studies, raw rates were developed for each year and then averaged either arithmetically or geometrically. Where appropriate, the results were then smoothed using Whitaker-Henderson Type B methods and/or ad hoc grouping of cells in order to reduce random fluctuations. The smoothed data was reviewed and then adjusted, if necessary, to account for short-term effects, such as the economic conditions during the study period. Some assumptions were also adjusted to preserve internal consistency in the assumption set.

# Economic Assumptions

## Valuation Interest Rate

**Background:**

The current rate of interest at which all future payments from the plan are discounted is 7.15%. This means that all invested funds are assumed to earn (on average compounded over time) interest of 7.15% per year. If the fund earns less than this amount in the short run, contributions will rise to cover the shortfall. Conversely, if the fund earns more than 7.15%, contributions will decrease. In the long run, a failure to earn the assumed rate of return would jeopardize the ability of the fund to pay promised benefits.

Any assumption is subject to error, but the rate of return assumption is probably the one single assumption that the valuation is most sensitive to. Hence, great care is required in choosing the proper assumed rate of return. Several inputs are available to determine the rate. First, inputs from the system's asset consultants and the system's asset allocation can be used to determine future return expectations. In addition, other consultants' return expectations can be considered. Prior history of system results cannot be used as a basis of setting future expected rates of return, but they may be considered as a factor in arriving at future results. The choice of an assumed rate of return must also comply with the relevant standards set by the actuarial and accounting professions.

**Process:**

In order to determine future expected returns, we have gathered information from the system's investment consultant, NEPC. The information collected includes the expected rate of return for each asset class included in the system's current target asset allocation as well as the variance and correlation coefficients for each asset class together with the weighting for each class in the latest investment target allocations. In addition, we have gathered similar information from numerous other consultants and investment firms to produce average values for each of the categories included in the system's current target asset allocation. We focused our consultant average assumptions on investment consultants and management firms with at least 20 year forward looking capital market assumptions in order to best model expected long-term returns.

By using these results we were able to produce average estimates for the "long term" expected geometric portfolio rate of return. In our opinion, the use of long term investment return assumptions is most appropriate for a pension fund situated like FRS. Such assumptions do not "time the market" by focusing too heavily on investment firms' near term expectations which can be heavily influenced by recent investment events.

In making our calculations, we recognize that in addition to investment management fees there are certain investment related expenses that the system must bear. Such costs reduce system

earnings and therefore should offset the expected net rate of return. Based on the expectation that active investment vehicles selected by the Board are expected to earn a rate of return greater than a similar passive investment by an amount at least equal to their fees, we assume that investment managers, in aggregate, produce sufficient alpha to offset their investment management fees.

Based upon the amounts budgeted for investment consulting and custodial fees, we have adjusted expected returns by 0.04% of assets.

**Past Fund Performance:**

Geometric average market rates of return through June 30, 2019 for the retirement system for various periods are given below.

| | |
|---|---|
| 5 Years | 4.3% |
| 10 Years | 6.7% |
| 15 Years | 5.0% |
| 20 Years | 4.4% |
| 25 Years | 5.8% |

**What other funds are doing:**

During any review of the long-term expected rate of return assumption, questions inevitably arise regarding the assumptions of other similarly situated public plans. Although our process of setting a reasonable range for the long-term expected rate of return assumption is not directly influenced by assumptions set by other retirement systems, the Board may consider such data informative in selecting an assumption within the reasonable range. To this end, we have found the following surveys which may provide the Board with information related to other public retirement systems:

The National Conference on Public Employee Retirement Systems (NCPERS) and Cobalt Community Research surveyed 155 state, local, and provincial governmental pension funds between September and December of 2019 and found that 82% of the funds are considering lowering or have lowered their assumed rate of return in 2019. The average investment assumption for the NCPERS survey was 7.24% in 2019, down from 7.34% in 2018. Also, the aggregated inflation assumption in 2019 was 2.8%, which is about the same as it was in 2018.

The National Association of State Retirement Administrators (NASRA) website contains a survey of Investment Return Assumptions by Plan as of December 2019 which includes assumptions for 129 public retirement systems. Within this survey, the average assumed rate of return was 7.22%. In the February 2019 NASRA Issue Brief (the most recent one available), with survey results as of September 30, 2018, the average assumed rate of return was 7.36% and the average assumed rate of inflation was 2.8%.

It is clear from such surveys that reductions in the long-term expected rate of return assumption have become common in the public defined benefit plan community. Because each system has its own unique investment portfolio and funding situation, we recommend that the Board not put too much emphasis on these specific rates in making decisions regarding the future valuation of the Firefighters' Retirement System.

**Future Performance:**

We believe that the information given above related to the past performance of this fund should not be used in setting expectations of future performance because of the impact of write downs of previous investments and significant shifts in the plan's target asset allocation. Although not used in setting future expectations for this fund, the expectations of future performance expressed by other funds can give insight and context to the assumed rate of return to be used by this fund. In comparing assumed rates for various funds, a variety of factors can lead to significantly different results. These factors include the asset allocations of the funds, the use of passive versus active management, the selection of individual managers, and the appetite of the system for investment risk.

When reviewing the past performance of the fund, it is important to note that future performance may be quite unlike the past. In attempting to forecast future fund performance, some view of the past is indispensable, but future conditions may vary significantly from those of the past. In addition, the current and future target asset allocation policy may vary significantly with that of the past. Among the factors which may change over time are things such as GDP growth, government debt and borrowing, Federal Reserve Policy, government spending, changes in productivity, trade imbalances, economic recessions, and governmental policies on a range of issues. To the extent that macroeconomic factors change, both real rates of return and inflation can vary from past trends. Typical inputs in forecasting future performance include real rates of return by asset class as well as expectations for inflation. Estimates for these factors are made by investment consultants, investment management firms, and governmental entities.

**Data Inputs:**

The data inputs we have collected as part of our process in determining recommendations for the assumed rate of return included the target asset allocation given in the system's investment policy statement, the expected rates of return and standard deviation for each asset class together with correlation coefficients for each asset class. We have used our 2020 consultant average information to model future returns based upon the Fund's current policy targets. Since the allocation to Global Asset Allocation represents investments from many different asset classes, we asked NEPC to provide a breakdown based on the core asset classes shown below. Based on their response, the 10% allocation was broken down as 2.50% to U.S Core Fixed Income, 0.20% to U.S. High Yield Fixed Income, 0.80% to International Core Fixed Income, 0.20% to Emerging Market Fixed Income, 2.40% to U.S. Large Cap Equities, 0.35% to U.S. Small Cap Equities, 0.35% to U.S. Mid Cap Equities, 2.60% to International Developed Equities, 0.40% to

Emerging Market Equities, and 0.20% to Commodities. The allocations adjusted for the allocation to Global Asset Allocation are shown below:

| | **FRS Policy Target** |
|---|---|
| US Core Fixed Income | 28.50% |
| US High Yield Fixed Income | 0.20% |
| International Fixed Income | 0.80% |
| Emerging Market Fixed Income | 5.20% |
| US Large Cap Equities | 22.40% |
| US Small Cap Equities | 4.10% |
| US Mid Cap Equities | 4.10% |
| International Developed Equities | 17.60% |
| Emerging Market Equities | 6.90% |
| Private Equities | 4.00% |
| Direct Real Estate | 6.00% |
| Commodities | 0.20% |

Estimated Arithmetic Real Rates of Return computed based on information provided by NEPC regarding long-term geometric returns and standard deviation:

| | **Est. Real Return** |
|---|---|
| US Core Fixed Income | 1.09% |
| US High Yield Fixed Income | 3.83% |
| International Fixed Income | 0.11% |
| Emerging Market Fixed Income | 4.33% |
| US Large Cap Equities | 5.46% |
| US Small Cap Equities | 6.49% |
| US Mid Cap Equities | 6.49% |
| International Developed Equities | 6.39% |
| Emerging Market Equities | 10.31% |
| Private Equities | 10.99% |
| Direct Real Estate | 4.23% |
| Commodities | 3.93% |

Estimated Standard Deviations provided by NEPC are as follows:

| | **Standard Deviations** |
|---|---|
| US Core Fixed Income | 6.01% |
| US High Yield Fixed Income | 12.50% |
| International Fixed Income | 10.00% |
| Emerging Market Fixed Income | 13.00% |
| US Large Cap Equities | 16.50% |
| US Small Cap Equities | 20.00% |
| US Mid Cap Equities | 20.00% |
| International Developed Equities | 20.50% |
| Emerging Market Equities | 28.00% |
| Private Equities | 24.58% |
| Direct Real Estate | 13.00% |
| Commodities | 19.00% |

Correlation Coefficients taken from NEPC Estimates are as follows:

| Asset Class | US Core Fixed Income | US High Yield Fixed Income | Int'l Fixed Income | Emerging Market Fixed Income | US Large Cap Equities | US Small Cap Equities | US Mid Cap Equities | Int'l Developed Equities | Emerging Market Equities | Private Equities | Direct Real Estate | Commodities |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| US Core Fixed Income | 1 | | | | | | | | | | | |
| US High Yield Fixed Income | 0.24 | 1 | | | | | | | | | | |
| International Fixed Income | 0.49 | 0.12 | 1 | | | | | | | | | |
| Emerging Market Fixed Income | 0.32 | 0.67 | 0.54 | 1 | | | | | | | | |
| US Large Cap Equities | 0.09 | 0.61 | 0.11 | 0.62 | 1 | | | | | | | |
| US Small Cap Equities | 0.02 | 0.65 | 0.06 | 0.61 | 0.87 | 1 | | | | | | |
| US Mid Cap Equities | 0.02 | 0.65 | 0.06 | 0.61 | 0.87 | 1 | 1 | | | | | |
| Int'l Developed Equities | 0.09 | 0.56 | 0.34 | 0.73 | 0.75 | 0.7 | 0.7 | 1 | | | | |
| Emerging Market Equities | 0.04 | 0.61 | 0.15 | 0.84 | 0.69 | 0.69 | 0.69 | 0.73 | 1 | | | |
| Private Equities | 0.04 | 0.68 | 0.78 | 0.68 | 0.9 | 0.95 | 0.95 | 0.78 | 0.75 | 1 | | |
| Direct Real Estate | 0.13 | 0.46 | 0.11 | 0.36 | 0.37 | 0.42 | 0.42 | 0.33 | 0.32 | 0.42 | 1 | |
| Commodities | 0 | 0.31 | 0.21 | 0.41 | 0.3 | 0.33 | 0.33 | 0.37 | 0.39 | 0.35 | 0.16 | 1 |

The inflation estimate provided by NEPC is 2.50%.

Although we review the assumed rate of return based upon the projections provided by the system's investment consultant, we have built a set of average values by averaging inputs from a total of seven different investment consultants and investment management firms where information on long-term expected returns was available. Using the consultant average assumptions we produced our reasonable range for the long-term expected rate of return. The inputs of our study are shown below.

Consultant Average Estimated Long-Term Real Rates of Return are as follows:

| | **Est. Real Return** |
|---|---|
| US Core Fixed Income | 1.00% |
| US High Yield Fixed Income | 3.30% |
| International Core Fixed Income | 0.56% |
| Emerging Market Fixed Income | 3.40% |
| US Large Cap Equities | 5.50% |
| US Small Cap Equities | 6.52% |
| US Mid Cap Equities | 6.10% |
| International Developed Equities | 6.24% |
| Emerging Market Equities | 8.61% |
| Private Equities | 10.29% |
| Direct Real Estate | 4.20% |
| Commodities | 3.07% |

Consultant Average Estimated Long-Term Standard Deviations are as follows:

| | **Standard Deviations** |
|---|---|
| US Core Fixed Income | 4.83% |
| US High Yield Fixed Income | 9.80% |
| International Core Fixed Income | 9.03% |
| Emerging Market Fixed Income | 10.62% |
| US Large Cap Equities | 16.98% |
| US Small Cap Equities | 20.87% |
| US Mid Cap Equities | 19.17% |
| International Developed Equities | 18.69% |
| Emerging Market Equities | 24.07% |
| Private Equities | 22.58% |
| Direct Real Estate | 12.78% |
| Commodities | 18.51% |

Average Long-Term Correlation Coefficients are as follows:

| Asset Class | US Core Fixed Income | US High Yield Fixed Income | Int'l Fixed Income | Emerging Market Fixed Income | US Large Cap Equities | US Small Cap Equities | US Mid Cap Equities | Int'l Developed Equities | Emerging Market Equities | Private Equities | Direct Real Estate | Commodities |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| US Core Fixed Income | 1.00 | | | | | | | | | | | |
| US High Yield Fixed Income | 0.26 | 1.00 | | | | | | | | | | |
| International Fixed Income | 0.55 | 0.25 | 1.00 | | | | | | | | | |
| Emerging Market Fixed Income | 0.38 | 0.74 | 0.61 | 1.00 | | | | | | | | |
| US Large Cap Equities | 0.08 | 0.60 | 0.21 | 0.56 | 1.00 | | | | | | | |
| US Small Cap Equities | 0.01 | 0.63 | 0.10 | 0.55 | 0.88 | 1.00 | | | | | | |
| US Mid Cap Equities | 0.05 | 0.66 | 0.15 | 0.60 | 0.92 | 0.97 | 1.00 | | | | | |
| International Developed Equities | 0.09 | 0.58 | 0.41 | 0.65 | 0.80 | 0.71 | 0.74 | 1.00 | | | | |
| Emerging Market Equities | 0.07 | 0.60 | 0.30 | 0.71 | 0.70 | 0.67 | 0.69 | 0.81 | 1.00 | | | |
| Private Equities | -0.05 | 0.61 | 0.28 | 0.51 | 0.78 | 0.83 | 0.83 | 0.74 | 0.69 | 1.00 | | |
| Direct Real Estate | -0.01 | 0.32 | 0.10 | 0.21 | 0.41 | 0.33 | 0.34 | 0.37 | 0.31 | 0.50 | 1.00 | |
| Commodities | -0.02 | 0.33 | 0.24 | 0.43 | 0.32 | 0.32 | 0.35 | 0.40 | 0.44 | 0.37 | 0.22 | 1.00 |

The average inflation estimate for the consultant average group is 2.23%. This average is within our reasonable range for long-term inflation but is lower than our recommended long-term inflation rate of 2.5%.

**Results of the Review of the Valuation Interest Rate Assumption:**

In order to forecast future nominal rates of return, an assumption must be made about the future rate of inflation. The nominal rates of return have been modeled based on expected long-term inflation and expected long-term real rates of return for each asset class. As part of the process of setting this assumption, we have given consideration to the inflation estimates provided by the system's investment consultant and other consultants along with estimates from the Federal Reserve, the Social Security administration and various other forecasters. Note that estimates do vary by source, but virtually all long term estimates are in the 2.00% to 2.75% range. Certainly, recent annual inflation rates have been below even the lower end of this range and if these recent rates persist, it could be much less likely that the nominal rates of return will be as high as investment consultants or the average forecasts project. On the other hand, if rates return to more "normal" levels (i.e., historical averages), higher nominal rates may be expected. There is also a fundamental difference in the time horizon in many of the forecasts. Many forecasts focus on the upcoming ten year period while institutions such as the Social Security Administration use a much longer time horizon. On average, the current shorter term forecasts produce lower expected inflation rates than long-term forecasts. In other economic environments, these shorter term forecasts could produce significantly higher expectations. In fact, events like the recent economic turmoil due to Covid-19 could cause significant changes in shorter term projections of inflation and rates of return. Although such events will affect long-term capital market assumptions, it is our expectation that they will be less influenced by recent events whether positive or negative. In our opinion, retirement systems like the Firefighters' Retirement System are better served by consistently setting their return expectations based on a long-term time horizon. For the purposes of developing the assumed rates of return for FRS we have used 2.50% as the assumed long term rate of inflation.

A simple sum of the cross-products of consultant average nominal arithmetic rates of return for each asset class multiplied by the target asset allocation for those asset classes, reduced by 0.04% to account for non-manager investment expenses, produces a rate of return of 7.04%. This assumes annual rebalancing and no return volatility. Including the effect of volatility and annual, efficient rebalancing, we have determined that the expected rate of return on the fund's target investment portfolio based on our 2020 consultant average real rates of return, standard deviations, and correlation coefficients and using an assumed rate of inflation of 2.50 is 6.54%.

In order to better understand how the system's investment portfolio might perform under a variety of investment scenarios, we have performed a series of 10,000 stochastic trials. These simulations are based on the inputs contained within our 2020 consultant average long-term projections of rates of return, standard deviations, and correlation coefficients for each asset class. All of these were input into our model assuming a normal distribution of annual returns, and then ten thousand trial simulations were run over a 30 year investment horizon. The results of these trials are as follows:

Average Arithmetic Rate of Return: 7.04%

Average Geometric Rate of Return: 6.46%

Standard Deviation of the Long term rate of Return: 11.28%

Range of the 40$^{th}$ through 60$^{th}$ Percentile: 5.99% to 7.06%

Probability of exceeding 7.00% geometric rate of return over 30 years: 41%

Probability of exceeding 6.50% geometric rate of return over 30 years: 50%

**Recommendations Regarding the Valuation Interest Rate Assumption:**

In formulating our recommended reasonable range for the assumed rate of return, we have focused on the 10,000 stochastic trials developed using the 2020 consultant average forecasts. Within that range the selection of the assumed rate of return is somewhat subjective, but there are a number of factors that may be considered. These include the desire to protect the benefit security of the participants, the recognition of the effect of costs on sponsors' budgets, the recognition that asset allocations can and frequently are changed to respond to different market conditions and sponsor cost levels. In addition, the setting of the assumed rate of return, involves an element of risk for the plan, and it may be advisable to consider how much risk the plan is exposed to in other areas related to funding. It would also be advisable to set the assumed rate at such a level that costs are more likely to fall due to gains than rise due to losses. Based upon a reasonable range of 5.99% to 7.06% and the Board's planned reduction in the assumed rate of return from 7.15% in the fiscal 2019 actuarial valuation to 7.10% for the fiscal 2020 actuarial valuation, it is clear that a larger reduction in the assumed rate of return is warranted. The Board should weigh the factors mentioned above in deciding the assumed rate of return to be used in future actuarial valuations.

## Rates of Salary Increase

The rate at which the pay for individuals increases each year is a significant factor in determining normal costs and accrued liabilities for a "final average compensation" defined benefit pension plan. Pay increases for members contain several components. First, the general level of inflation in the economy will put upward pressure on wages. Secondly, members usually receive some merit increase in most, if not, every year. Finally, a certain segment of the population will receive promotions or advances in pay grades each year. An analysis of the valuation data will not be sufficient to identify each of these individual factors but will give information about the aggregate amount of pay increase for each member in each year. The rate of pay increase varies each fiscal year, but by combining several years a trend can be derived. Some plans exhibit a tendency of higher percentage increases in pay in the earlier years of employment. If the trend is pronounced, a salary scale which varies by employment duration can be developed.

The table below gives the existing assumed salary increase rates together with the raw rates developed in the experience study along with the draft rates recommended for use in the June 30, 2020 valuation. The reviews of average salary increase include rates of salary increases during the current study period (2014 – 2019). The weighted average geometric mean rate at each service duration was reviewed. A review of the raw rates, adjusted for the difference in projected inflation versus the rate of inflation during the study period, demonstrates that during the study period the rate of salary increase was slightly lower than the prior assumption at many durations. In setting the final assumption rates, consideration was given to the economic circumstances of the study period and projected future rates of inflation embedded in the valuation interest rate used for the 2019 actuarial valuation. Based on the pattern of inflation-adjusted salary increase rates, it was determined that a two stage assumption would be most appropriate. The draft assumption was based on average rates in durations 1-2 and average rates at durations above 2 years.

**Rates of Salary Increase:**

| Completed Service Years | Existing Rates | Inflation-Adjusted Raw Rates† | Draft Assumption Rates for Fiscal 2020 |
|---|---|---|---|
| 1 | 14.75% | 13.35% | 14.10% |
| 2 | 14.75% | 14.45% | 14.10% |
| 3 | 5.50% | 6.01% | 5.20% |
| 4 | 5.50% | 5.81% | 5.20% |
| 5 | 5.50% | 5.41% | 5.20% |
| 6 | 5.50% | 5.25% | 5.20% |
| 7 | 5.50% | 5.30% | 5.20% |
| 8 | 5.50% | 5.19% | 5.20% |
| 9 | 5.50% | 4.85% | 5.20% |

| Completed Service Years | Existing Rates | Inflation-Adjusted Raw Rates† | Draft Assumption Rates for Fiscal 2020 |
|---|---|---|---|
| 10 | 5.50% | 5.13% | 5.20% |
| 11 | 5.50% | 6.32% | 5.20% |
| 12 | 5.50% | 5.76% | 5.20% |
| 13 | 5.50% | 5.15% | 5.20% |
| 14 | 5.50% | 5.88% | 5.20% |
| 15 | 5.00% | 5.07% | 5.20% |
| 16 | 5.00% | 4.53% | 5.20% |
| 17 | 5.00% | 5.58% | 5.20% |
| 18 | 5.00% | 5.31% | 5.20% |
| 19 | 5.00% | 4.85% | 5.20% |
| 20 | 5.00% | 4.87% | 5.20% |
| 21 | 5.00% | 4.81% | 5.20% |
| 22 | 5.00% | 4.96% | 5.20% |
| 23 | 5.00% | 4.77% | 5.20% |
| 24 | 5.00% | 4.69% | 5.20% |
| 25 | 4.50% | 4.39% | 5.20% |
| 26 | 4.50% | 4.76% | 5.20% |
| 27 | 4.50% | 5.26% | 5.20% |
| 28 | 4.50% | 5.45% | 5.20% |
| 29 | 4.50% | 5.57% | 5.20% |
| 30 | 4.50% | 5.87% | 5.20% |
| Above 30 | 4.50% | N/A * | 5.20% |

† Adjusted for observed average inflation over the 5-year study period.

* Actual rates for durations above 30 are unstable due to minimal exposures with such service credit.

# Decrement Assumptions

## Rates of Withdrawal

The cost structure of a retirement system is a function of many factors. Included in these factors is the rate at which members withdraw from service. Members may withdraw for many reasons including death, retirement, disability, or simply to leave employment for a host of other reasons. Generally, when the term "withdrawal" is used in the context of a retirement system it refers to terminating covered employment for reasons other than death, retirement, or disability. Nevertheless, when a member terminates, he/she may otherwise be entitled to deferred or early retirement benefits. Typically, increases in rates of termination or withdrawal reduce plan costs although this may depend on the particulars of which age or service categories are involved. The withdrawal decrement is usually expressed as rates which apply to either age or service groups. If sufficient data is available, rates may be developed for combinations of age and service groups. The rates used in the June 30, 2019 valuation were based solely on service. After a review of withdrawal patterns, we chose to continue to have withdrawal rates based on service categories, which are adjusted to account for members rejoining the system after a previous termination. Analysis of the rates for the system produced the following results:

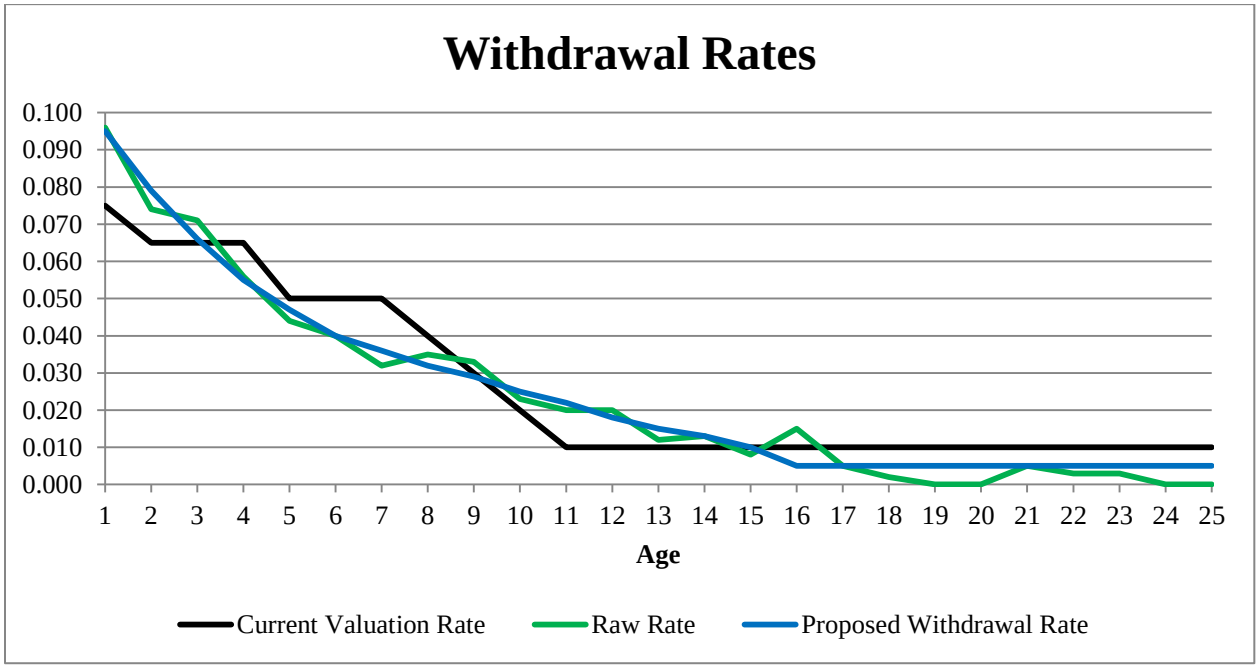
| Exposures | Actual Net Withdrawals | Expected Net Withdrawals (prior Assumption) | Ratio of Actual to Expected Net Withdrawals |
|---|---|---|---|
| 18,491 | 657 | 660 | 99% |

While the existing rates produce total expected withdrawals that are very close to those measured in the study period, we believe the proposed rates provide a better fit at each service duration. In setting the final recommended rates, the raw data smoothed based on the Whittaker-Henderson Type B method with 4 degrees of freedom and a fit coefficient of 5,000.

**Net Withdrawal Rates:**

| Service Duration (≤) | Existing Rates | Experience Study Raw Rates | Draft Assumption Rates for Fiscal 2020 |
|---|---|---|---|
| 1 | 0.075 | 0.096 | 0.095 |
| 2 | 0.065 | 0.074 | 0.079 |
| 3 | 0.065 | 0.071 | 0.066 |
| 4 | 0.065 | 0.056 | 0.055 |
| 5 | 0.050 | 0.044 | 0.047 |
| 6 | 0.050 | 0.040 | 0.040 |
| 7 | 0.050 | 0.032 | 0.036 |
| 8 | 0.040 | 0.035 | 0.032 |
| 9 | 0.030 | 0.033 | 0.029 |
| 10 | 0.020 | 0.023 | 0.025 |

| Service Duration (≤) | Existing Rates | Experience Study Raw Rates | Draft Assumption Rates for Fiscal 2020 |
|---|---|---|---|
| 11 | 0.010 | 0.020 | 0.022 |
| 12 | 0.010 | 0.020 | 0.018 |
| 13 | 0.010 | 0.012 | 0.015 |
| 14 | 0.010 | 0.013 | 0.013 |
| 15 | 0.010 | 0.008 | 0.010 |
| 16 | 0.010 | 0.015 | 0.005 |
| 17 | 0.010 | 0.005 | 0.005 |
| 18 | 0.010 | 0.002 | 0.005 |
| 19 | 0.010 | 0.000 | 0.005 |
| 20 | 0.010 | 0.000 | 0.005 |
| 21 | 0.010 | 0.005 | 0.005 |
| 22 | 0.010 | 0.003 | 0.005 |
| 23 | 0.010 | 0.003 | 0.005 |
| 24 | 0.010 | 0.000 | 0.005 |
| 25 & Over | 0.010 | N/A | 0.005 |



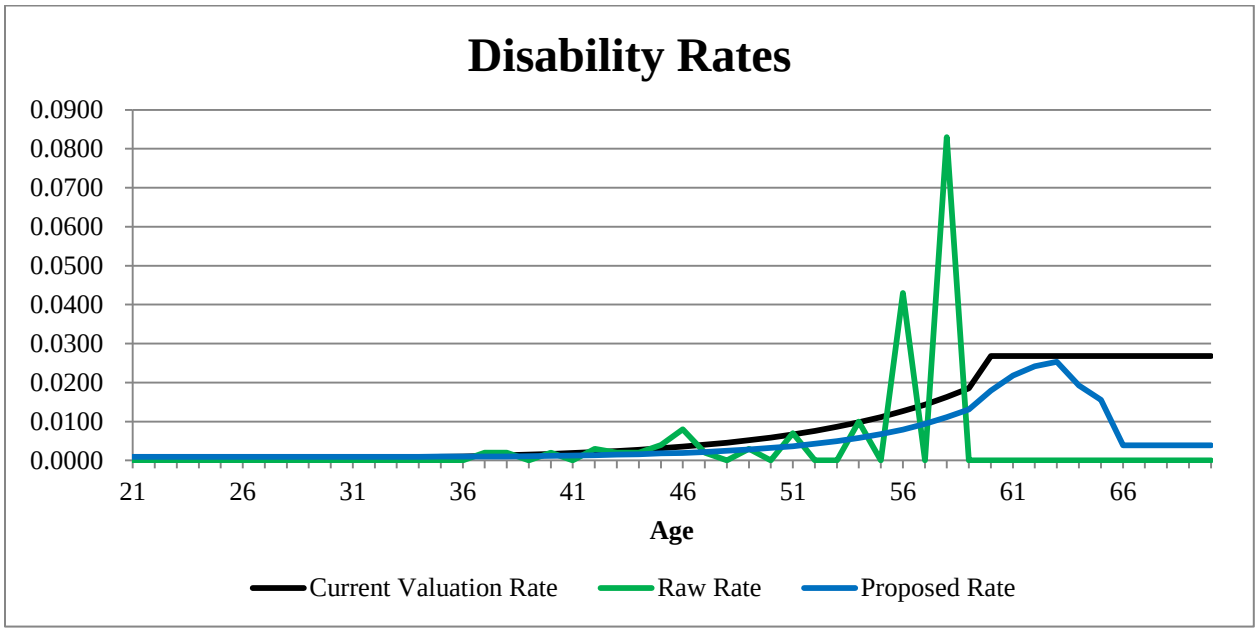
## Rates of Disability

Analysis of disability experience presents special problems. Relative to the general population of a retirement system, disability claims are relatively rare. As a result, for most plans there is insufficient data to construct a disability table or even make a comparison of rates for individual ages. The more practical solution to the problem is to compare the overall actual incidence of disability to the expected claims according to a standard table during the study period. The ratio of actual incidence of disability to the expected incidence of disability can then be used to adjust the standard table for usage by the plan. Hence, if the standard table projects 20 disability retirements in the study period and there are actually only 15, then a multiplier of 0.75 could be applied to the factors in the table for use as a plan assumption subject to adjustment if the actuary believes this result is a good representation of future experience. For this study, Table S-12 of rates of immediate disability retirement found in the 27th valuation of the Railroad Retirement System (10 – 19 years of service cohort) was used as the standard of measure. The existing rates used a multiplier of 0.55 and the table of disability rates from the 21st valuation of the Railroad Retirement System (10 – 19 years of service cohort).

| Exposures | Actual | Expected Current Table | Ratio of Actual to Expected |
|---|---|---|---|
| 13,358 | 19 | 28.85 | 66% |

Based on the plan's experience and changes in the base rates contained within the updated Railroad Retirement System study, we propose a multiplier of 0.75. This will use an updated standard table, bring the assumed rates closer to experience, and still leave some margin for adverse deviation.

| Exposures | Actual | Expected Proposed Table | Ratio of Actual to Expected |
|---|---|---|---|
| 13,358 | 19 | 19.68 | 97% |



## Rates of Retirement

The rates at which members retire can have a significant effect on pension costs. A frequent misunderstanding of pension cost accruals is that the full value of every individual member's pension is accrued at the time the member is first eligible for retirement. In reality, many members, if not the majority, work past first eligibility and that reality is built into the structure of plan costs. Under most circumstances, higher rates of retirement lead to higher plan costs since members have more years to receive benefits and the plan sponsor has fewer years to fund those benefits. Rates of retirement are generally age specific. Additionally, if the data review finds that members are significantly more likely to retire in the year of first eligibility than other years, a modifier of the age specific rate is sometimes applied as a multiplier in the year in which the member first reaches retirement eligibility.

A comparison of projected to actual retirement rates indicated actual rates are significantly below current assumptions.

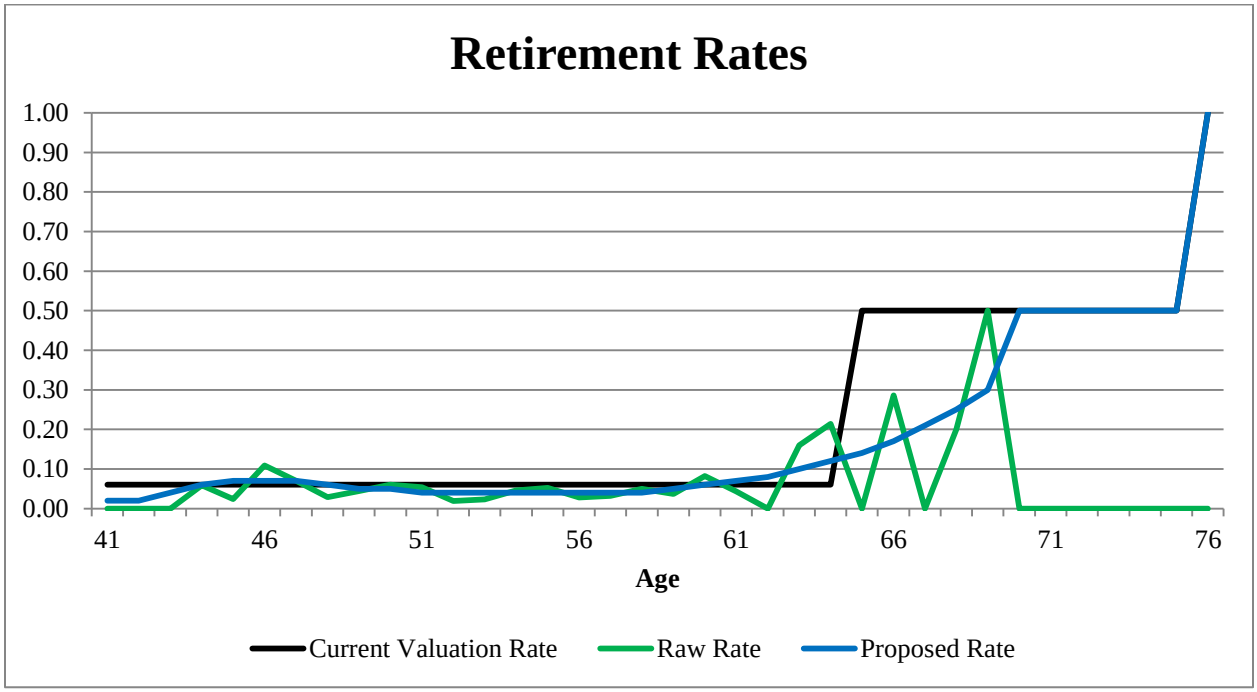
| Exposures | Actual | Expected | Ratio of Actual to Expected |
|---|---|---|---|
| 2,697 | 130 | 172.8 | 75% |

For the valuation assumptions, the existing rates are listed below. These rates apply only to those individuals eligible to retire. In reviewing data related to actual retirements during the study period, we did not find that retirements at first eligibility showed a material difference with the general age based rates. Hence, we have elected not to apply a multiplier to the rates of retirement at first eligibility.

The retirement decrement analysis included those who retired during the year but did not meet the normal retirement eligibility requirements by the end of year. This group includes members who retired under a reciprocal agreement, where the data used in the valuation did not reflect service in the other system. In addition, it included members who retired after purchasing or transferring service credit during the year of retirement or under early retirement eligibility rules. Due to a lack of exposures, ad hoc adjustments were made to the smoothed experience data at high and low member ages. The raw data based on age was smoothed based on the Whittaker-Henderson Type B method with 4 degrees of freedom and a fit coefficient of 5,000.

**Rates of Retirement:**

| Age | Existing Base Rates | Experience Study Raw Rates | Draft Assumption Rates for Fiscal 2020 |
|---|---|---|---|
| 41 | 0.06 | 0.000 | 0.02 |
| 42 | 0.06 | 0.000 | 0.02 |
| 43 | 0.06 | N/A | 0.04 |
| 44 | 0.06 | 0.059 | 0.06 |
| 45 | 0.06 | 0.024 | 0.07 |
| 46 | 0.06 | 0.109 | 0.07 |
| 47 | 0.06 | 0.070 | 0.07 |
| 48 | 0.06 | 0.029 | 0.06 |
| 49 | 0.06 | 0.044 | 0.05 |
| 50 | 0.06 | 0.060 | 0.05 |
| 51 | 0.06 | 0.054 | 0.04 |
| 52 | 0.06 | 0.019 | 0.04 |
| 53 | 0.06 | 0.023 | 0.04 |
| 54 | 0.06 | 0.046 | 0.04 |
| 55 | 0.06 | 0.052 | 0.04 |
| 56 | 0.06 | 0.028 | 0.04 |
| 57 | 0.06 | 0.032 | 0.04 |
| 58 | 0.06 | 0.050 | 0.04 |
| 59 | 0.06 | 0.037 | 0.05 |
| 60 | 0.06 | 0.082 | 0.06 |
| 61 | 0.06 | 0.043 | 0.07 |
| 62 | 0.06 | 0.000 | 0.08 |
| 63 | 0.06 | 0.160 | 0.10 |
| 64 | 0.06 | 0.214 | 0.12 |
| 65 | 0.50 | 0.000 | 0.14 |
| 66 | 0.50 | 0.286 | 0.17 |
| 67 | 0.50 | 0.000 | 0.21 |
| 68 | 0.50 | 0.200 | 0.25 |
| 69 | 0.50 | 0.500 | 0.30 |
| 70 | 0.50 | N/A | 0.50 |
| 71 | 0.50 | N/A | 0.50 |
| 72 | 0.50 | N/A | 0.50 |
| 73 | 0.50 | N/A | 0.50 |
| 74 | 0.50 | N/A | 0.50 |
| 75 | 0.50 | N/A | 0.50 |
| 76 & Over | 1.00 | N/A | 1.00 |




## Rates of DROP Entry

The rates at which members enter the DROP are similar to rates of retirement insofar as their effect on overall plan costs. Generally, higher DROP entry rates will produce higher plan cost for the same reasons higher retirement rates will increase costs. As with retirement rates, the rates usually vary by age with the possible application of a multiplier at the point of first eligibility to recognize a propensity for members to enter the DROP with greater frequency at the age at which they first become eligible.

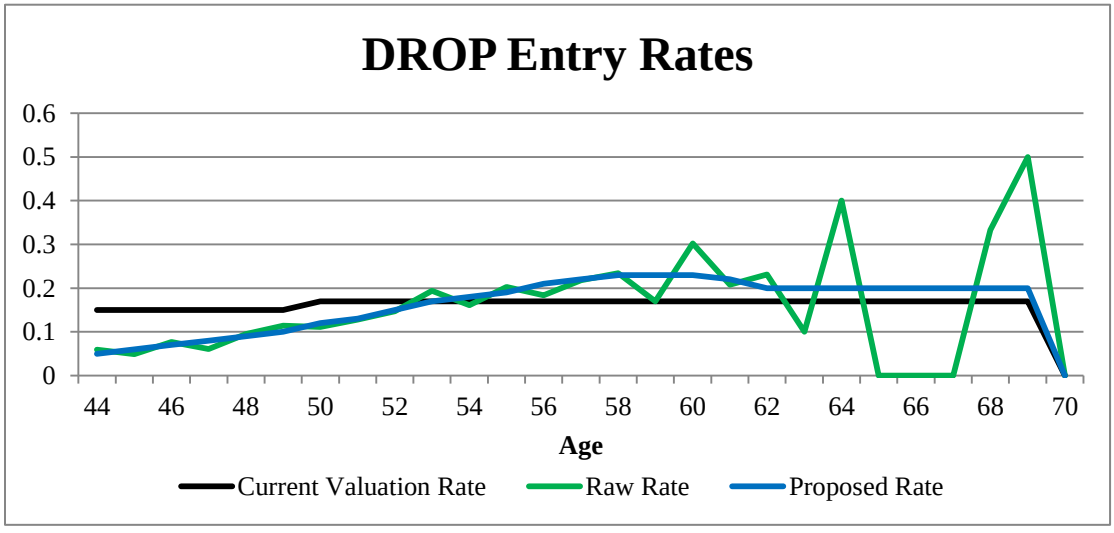
| Exposures | Actual | Expected | Ratio of Actual to Expected |
|---|---|---|---|
| 2,392 | 347 | 395 | 88% |

The DROP analysis included those who entered DROP during the year but did not meet the normal retirement eligibility requirements by the end of year. These include those who entered DROP under a reciprocal agreement, after purchasing service during the year, or those who entered under early retirement eligibility rules. In addition, the raw data based on age was smoothed based on the Whittaker-Henderson Type B method with 4 degrees of freedom and a fit coefficient of 5,000. Ad hoc rates were set at the upper ages where there were very few exposures available for study.

Our analysis did not find that members exhibit larger rates of DROP entry at their age of first eligibility. Therefore, no multiplier at first eligibility is recommended.

**DROP Entry Rates:**

| Age | Existing Rates | Experience Study Raw Rates | Draft Assumption Rates for Fiscal 2020 |
|---|---|---|---|
| 44 | 0.15 | 0.059 | 0.05 |
| 45 | 0.15 | 0.049 | 0.06 |
| 46 | 0.15 | 0.077 | 0.07 |
| 47 | 0.15 | 0.061 | 0.08 |
| 48 | 0.15 | 0.095 | 0.09 |
| 49 | 0.15 | 0.114 | 0.10 |
| 50 | 0.17 | 0.111 | 0.12 |
| 51 | 0.17 | 0.128 | 0.13 |
| 52 | 0.17 | 0.147 | 0.15 |
| 53 | 0.17 | 0.194 | 0.17 |
| 54 | 0.17 | 0.161 | 0.18 |
| 55 | 0.17 | 0.203 | 0.19 |
| 56 | 0.17 | 0.184 | 0.21 |
| 57 | 0.17 | 0.218 | 0.22 |
| 58 | 0.17 | 0.234 | 0.23 |
| 59 | 0.17 | 0.170 | 0.23 |
| 60 | 0.17 | 0.302 | 0.23 |
| 61 | 0.17 | 0.208 | 0.22 |
| 62 | 0.17 | 0.231 | 0.20 |
| 63 | 0.17 | 0.100 | 0.20 |
| 64 | 0.17 | 0.400 | 0.20 |
| 65 | 0.17 | 0.000 | 0.20 |
| 66 | 0.17 | 0.000 | 0.20 |
| 67 | 0.17 | 0.000 | 0.20 |
| 68 | 0.17 | 0.333 | 0.20 |
| 69 | 0.17 | 0.500 | 0.20 |
| 70 & Over | 0.00 | N/A | 0.00 |



## Rates of Post-DROP Retirement

The rates at which members retire after they have completed DROP can have a somewhat significant effect on pension costs. Under most circumstances, higher rates of retirement lead to higher plan costs since members have more years to receive benefits and the plan sponsor has fewer years to fund those benefits. Rates of retirement are generally age specific.

| Exposures | Actual | Expected | Ratio of Actual to Expected |
|---|---|---|---|
| 322 | 78 | 81 | 96% |

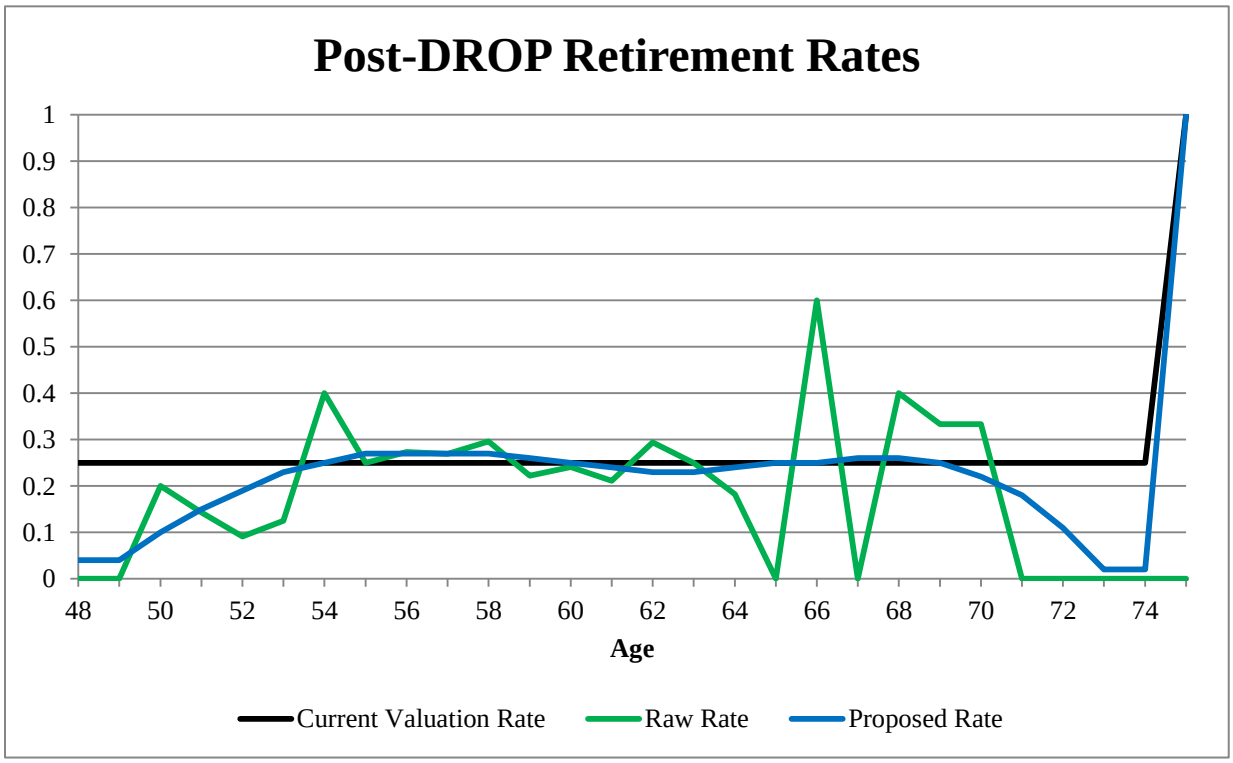
A comparison of projected to actual Post-DROP retirement rates indicated actual rates are above and below current assumptions at different ages. The current post-DROP retirement assumption is a single uniform equivalent rate of 0.25. The proposed rates vary by age according to the experience gathered. Please note these rates only apply to members who return to work after completing the DROP plan and then subsequently retire.

For the valuation assumptions, the base rates are listed below. The raw data based on age was smoothed based on the Whittaker-Henderson Type B method with 4 degrees of freedom and a fit coefficient of 5,000. Ad hoc adjustments were made to rates for low and high ages due to lack of exposures.

**Post-DROP Retirement Rates:**

| Age | Existing Rates | Experience Study Raw Rates | Draft Assumption Rates for Fiscal 2020 |
|---|---|---|---|
| 48 | 0.25 | 0.000 | 0.04 |
| 49 | 0.25 | 0.000 | 0.04 |
| 50 | 0.25 | 0.200 | 0.10 |
| 51 | 0.25 | 0.143 | 0.15 |
| 52 | 0.25 | 0.091 | 0.19 |
| 53 | 0.25 | 0.125 | 0.23 |
| 54 | 0.25 | 0.400 | 0.25 |
| 55 | 0.25 | 0.250 | 0.27 |
| 56 | 0.25 | 0.273 | 0.27 |
| 57 | 0.25 | 0.269 | 0.27 |
| 58 | 0.25 | 0.296 | 0.27 |
| 59 | 0.25 | 0.222 | 0.26 |
| 60 | 0.25 | 0.241 | 0.25 |
| 61 | 0.25 | 0.211 | 0.24 |

| Age | Existing Rates | Experience Study Raw Rates | Draft Assumption Rates for Fiscal 2020 |
|---|---|---|---|
| 62 | 0.25 | 0.294 | 0.23 |
| 63 | 0.25 | 0.250 | 0.23 |
| 64 | 0.25 | 0.182 | 0.24 |
| 65 | 0.25 | 0.000 | 0.25 |
| 66 | 0.25 | 0.600 | 0.25 |
| 67 | 0.25 | 0.000 | 0.26 |
| 68 | 0.25 | 0.400 | 0.26 |
| 69 | 0.25 | 0.333 | 0.25 |
| 70 | 0.25 | 0.333 | 0.22 |
| 71 | 0.25 | 0.000 | 0.18 |
| 72 | 0.25 | 0.000 | 0.11 |
| 73 | 0.25 | 0.000 | 0.02 |
| 74 | 0.25 | 0.000 | 0.02 |
| 75 & Above | 1 | N/A | 1.00 |



## Mortality Rates

The determination of the appropriate rates of mortality to be utilized for the assessment of costs and liabilities of a retirement system is a complex process. It is important to remember that a retirement system is composed of several unique subgroups which may have mortality characteristics which differ significantly from each other. Obviously, mortality rates for regular retirees are of primary importance since the longevity of pensioners determines how long benefits will be paid to these members. In addition to this group, mortality of disability retirees, employees, and beneficiaries must also be considered. Furthermore, the active group may itself be composed of subgroups which will differ in their mortality characteristics. Mortality will vary between males and females and among various categories of employees such as blue or white collar. There are a number of other factors which may be considered which will affect the actual observed mortality rates for each subgroup. Gathering data for mortality analysis can present several challenges. Since mortality rates are expressed as the probability of death at each age, a large amount of data is required to have credible experience for each age group. For a very large retirement system such as the Social Security System, with millions of participants, enough data is available to construct a complete table at those ages that members receive retirement benefits. For retirement systems with only a few thousand participants, the construction of a complete table solely from plan data is not possible. Hence, there is typically some reliance on standard tables to aid in assessing the proper mortality rates to utilize for a plan valuation or for other purposes such as determining actuarial equivalence for option factors or early retirement.

An additional complexity in determining mortality rates is the nature of the rates themselves, which have experienced a secular reduction due to the impact of mortality improvement as medical advancements and lifestyle changes have combined to increase life expectancy over the last two centuries. This trend must be incorporated into the mortality assumptions utilized if sufficient assets are to be accumulated to fund future retirements and to properly value the costs of those currently retired. As a result, it has been common practice to modify mortality tables by projecting the existing mortality rates forward for future improvement. The latest advancement in the modeling of future mortality improvement is called generational mortality. Generational mortality determines the appropriate rate of mortality in each year for each individual by utilizing age based mortality rates from a base mortality table and age and birth year based mortality improvement scales. This develops mortality that varies both by the age and year of birth of the member, essentially developing an appropriate mortality table for each member.

The appropriate mortality rates for regular retirees were determined by comparing the experience of the plan to that of a standard table. In order to mitigate the problems associated with the relatively small size of the data set, data was combined into five-year age groups and a comparison was made between the actual deaths and associated benefit payments and the projected deaths and associated benefit payments based on a selected standard table.

The standard tables selected for comparison were the sex-distinct 2010 Public Retirement Plans Mortality Tables (Pub-2010) for Safety Healthy Retirees, projected to 2017 using full

generational mortality based on sex-distinct MP2019 mortality improvement scales, as published by the Society of Actuaries. These tables were developed by the Society of Actuaries and released in January 2019 using data from public pension systems across the United States. The projection of the base tables to 2017 is necessary to account for mortality improvement through the central year of the study period which was July 1, 2014 through June 30, 2019. In addition to publishing tables based upon the total dataset, the Society of Actuaries provided below and above median income tables for groups whose average income levels are better aligned with the $25^{th}$ or $75^{th}$ percentile of safety retirees included in the development of these tables. A review of the average salary of active members in the 2011 valuation (which aligns with the year of published income levels in the Pub-2010 study) finds that the average active member of this system had an annual salary of $48,044 in fiscal 2011. This most closely aligns with the below median experience within the Pub-2010 mortality tables. Therefore, we selected the below median mortality tables for use as the base tables in the mortality study.

Although there are valid reasons to believe that beneficiary mortality will not exactly match retiree mortality, developing separate tables for beneficiaries would prove difficult due to a lack of data. Furthermore, the socio-economic group from which the beneficiaries are drawn should closely match that of the retirees. Therefore, the rates of mortality developed for the retirees were also applied to beneficiaries. There is a Pub-2010 mortality table with specific mortality rates for contingent beneficiaries who are in payment status. Since the present value of benefits for this group is relatively small (6% of the total) compared to the complete retired lives group and since the mortality differences in this table are relatively small, we have elected to apply retiree mortality to contingent beneficiaries in payment as well.

In order to determine the proper scaling of these mortality tables for annuitants and beneficiaries, we reviewed the rate of Louisiana mortality as compared to the national mortality rate reported in the June 24, 2019 National Vital Statistics Report *Deaths: Final Data for 2017* from the Centers for Disease Control and Prevention (CDC). This report indicated that Louisiana mortality is approximately 20% greater than the U.S. average. Since the pension plan's population may not reflect all of the population elements measured in the statewide population's statistics used in the CDC's mortality and morbidity report (infant mortality, for example), we have limited the adjustment for Louisiana mortality to 15% greater than the standard table.

It is not possible to construct a mortality table directly from the plan experience due to the size of the plan. Hence a process known as "credibility weighting" is used to develop mortality probabilities based on both the plan experience and that given in standard tables. The greater the number of deaths during the experience period, the greater the credibility and the more the actuary can rely on plan experience in developing mortality probabilities. If the plan has 1,082 or more deaths during a study period, then it is deemed to have full credibility insofar as the number of expected deaths. However, this number must be further adjusted for benefit dispersion, or the level of variation in benefits. If a plan has less than full credibility, mortality is based on a weighted average of the plan's mortality experience and the standard table utilized.

We measured the number of deaths as 157 for males and 67 for females during the 5-year study period. After adjusting for the benefit dispersion, the required number of deaths for full credibility is 1,331 for males and 1,626 for females. Given this methodology, we found that the data exhibited 34% credibility for males and 20% credibility for females. The final mortality draft assumptions were developed by credibility weighting these results with 115% of the Pub-2010 Safety Below-Median mortality tables.

In the final analysis, we elected to use the Pub-2010 Safety Below-Median Healthy Retiree Table adjusted to take into account a portion of the increased mortality in Louisiana and to account for the credibility of the plan's own mortality data. As a result, male mortality was set equal to 105% of the Pub-2010 Safety Below-Median Healthy Retiree Table for males and female mortality was set equal to 115% of the Pub-2010 Safety Below-Median Healthy Retiree Table for females, each adjusted for full generational mortality using the MP2019 scale.

Below is a comparison of the total dollar-weighted exposures and deaths, along with the total dollar-weighted and credibility-adjusted deaths, and the dollar-weighted deaths from the proposed mortality table for males and females in the study period.

**Males:**

| Total Exposures | Total Actual Deaths | Total Credibility Weighted Deaths | Total Deaths Based on Proposed Table |
|---|---|---|---|
| $5,057,782 | $397,069 | $468,492 | $464,655 |

**Females:**

| Total Exposures | Total Actual Deaths | Total Credibility Weighted Deaths | Total Deaths Based on Proposed Table |
|---|---|---|---|
| $625,288 | $83,412 | $85,736 | $86,819 |

Given the way data is collected and stored on the system's database, there may be no reliable way to track active employee mortality for the plan. Members who are unmarried or who have no children or who have low levels of service credit may not be eligible for survivor benefits beyond a refund of employee contributions. As a result, some deaths may not be recorded as such on the system's database. In addition, some employees may simply withdraw contributions if they are in the midst of a final illness and are unable to work and not eligible for disability benefits. Hence in the absence of evidence to the contrary, the use of standard tables for active employee mortality may be the only practical alternative. Therefore, the Pub-2010 Safety Below-Median Employee Tables for males and females were selected for employee mortality with the same full generational MP2019 scale for mortality improvement and the same multipliers as the annuitant mortality tables (i.e., 105% for males and 115% for females).

Since we have minimal experience for disabled lives mortality, the standard Pub-2010 Safety Total Dataset Disabled Retiree Tables for males and females were selected for disabled lives mortality with the same full generational MP2019 scale for mortality improvement as the annuitant mortality tables and the same multipliers as the annuitant mortality tables (i.e., 105% for males and 115% for females).

# Other Assumptions

In addition to the above-mentioned assumptions, we have studied the following: vesting election percentage, DROP participation period, percent retiring at end of DROP, average post-DROP period, and family statistics.

## Vesting Election Percentage

Members with twelve or more years of service are vested and are entitled to a deferred retirement benefit if they don't meet the age requirements to begin receiving a retirement benefit. However, in our experience not all members who become vested elect to receive a deferred benefit. Instead, some terminated vested members elect to receive a refund of contributions and forego all rights to a future benefit.

Previously, our assumption for those who are vested at termination and elect deferred benefits in lieu of contribution refunds was 70%.

Recent experience has shown that the number of participants electing to receive a deferred benefit has not changed meaningfully over the 5-year study period. Thus, we have elected to maintain the existing vesting election percentage of 70% for all tiers.

## Drop and Post-DROP Participation

There are three assumptions that we reviewed that affect the members as they reach the end of their DROP participation period. These factors can have a significant impact on plan costs. We previously assumed that all persons who enter the DROP would participate for 3 years and retire at the end of the DROP participation period.

**DROP Participation Period**

The first assumption is DROP participation period, which is an assumption that affects how long a participant will remain in DROP after first entering. The maximum DROP participation period is three years for FRS. We did not find significant evidence to change our assumption that members who participate in DROP will remain for the full three years.

| Number of Participants Exiting DROP | Existing DROP Participation Assumption | Experience Study Average DROP Participation | Proposed DROP Participation Assumption |
|---|---|---|---|
| 252 | 3 years | 2.75 years | 3 years |

**Percent retiring at end of DROP**

The second assumption is the percent retiring at the end of DROP. Past valuations assumed that members always retire at the end of DROP. However, we find that over the most recent five year

period only 72% of DROP participants in the plan retired at the end of the DROP period. Therefore, we recommend changing this assumption to assume that 75% of members retire at the end of the DROP participation period.

| Number of Participants Exiting DROP | Existing Percent Retiring Assumption | Experience Study Percent Retiring | Proposed Percent Retiring Assumption |
|---|---|---|---|
| 252 | 100% | 72% | 75% |

**Average Post-DROP Period**:

The third assumption affecting DROP participants is the assumed number of years that a member continues to work after exiting DROP. In previous valuations we assumed that 100% of DROP participants retired at the end of their DROP participation period. Therefore, we did not have an assumed average Post-DROP period. A review of the most recent three year period finds that on average those who remain employed after completing DROP, work an additional 3 years. Despite this, we elected to assume that members remain employed after DROP for only 2 years in order to maintain some conservatism.

| Number of Post-DROP Participants | Existing Average Post-DROP Period Assumption | Experience Study Average Post-DROP Period | Proposed Average Post-DROP Period Assumption |
|---|---|---|---|
| 198 | 0 years | 3.15 years | 2 years |

To summarize, all persons who enter DROP are assumed to participate for 3 years and 75% are assumed to retire at the end of DROP participation with 25% assumed to work 2 years post-DROP and then retire.

## Family Statistics

The value of plan survivor benefits varies according to certain family statistics. In order to determine the actuarial value of these benefits, assumptions must be made regarding the composition of the family. These characteristics include the percentage of members who are married, the percentage of members with children along with the average number and ages of the children. Also, since benefit values are dependent upon the age of the recipient, it is important to know the average age difference between husbands and wives. System data rarely includes sufficient information regarding most of the above factors. As a result, outside sources of information are often used to set assumptions related to family composition. These sources include information published by the United States Census Bureau or information from the Social Security System or Railroad Retirement System.

Since there was no practical way to determine system specific assumptions for these statistics, valuation assumptions were selected from information obtained from reports published by such outside sources. With regard to the percentage of members assumed to be married, in the 2019 Table A1: Marital Status of People 15 Years and Over, by Age, Sex, and Personal Earnings provided by the U.S. Census Bureau indicated that the percentage of the population which is married has continued to decline. Previous valuations assumed that 70% of members are married. Based on the percentage of members over the age of 50 that are married, we did not find significant evidence to change this assumption. Information related to the average age of children, the percentage of families with children, and the average number of children was obtained from the 2019 Table F1: Family Households, by Type, Age of Own Children, Age of Family Members, and Age of Householder provided by the U.S. Census Bureau.

The table below gives a sample of the existing and proposed values used for the following family statistics: percentage of families with children, average number of children per family, and average age of children per family.

**Family Statistics**

| Member's Age | Existing Assumption % with Children | Proposed Assumption % with Children | Existing Assumption Number of Children | Proposed Assumption Number of Children | Existing Assumption Average Age | Proposed Assumption Average Age |
|---|---|---|---|---|---|---|
| 25 | 70% | 60% | 1.84 | 1.77 | 5 | 4 |
| 35 | 86% | 82% | 2.13 | 2.11 | 9 | 8 |
| 45 | 75% | 63% | 1.70 | 1.75 | 12 | 11 |
| 55 | 22% | 11% | 1.42 | 1.42 | 14 | 14 |
| 65 | 4% | 2% | 1.45 | 1.50 | 15 | 14 |

# Actuarial Equivalence Factors

The proper administration of a governmental pension plan requires the use of certain actuarial equivalence calculations (which are performed outside of the annual actuarial valuation process). Since assumptions are inherent in any actuarial equivalence calculation, the assumptions required for such calculations have been studied as a part of this plan experience study. Although the mortality and interest assumptions adopted for use in the actuarial valuation may be found to be appropriate for determining actuarial equivalence, there are circumstances where such assumptions are modified for both practical and theoretical reasons. Valuation assumptions are developed to be used for the general population of the retirement system. However, actuarial equivalence factors are frequently used for specific subgroups of the plan where members are allowed the option of selecting from various forms of payment. Under such circumstances, the retirement system will frequently experience anti-selection. Anti-selection refers to the potential for a plan member to use information unknown to the retirement system related to their own personal situation that leads to higher costs than the actuarial modeling would expect. Anti-selection is a larger actuarial concern in cases where the system is making calculations that only affect a small group of members or a single member.

Federal court rulings have required the use of unisex mortality in making certain calculations related to benefit form, despite the actual difference between mortality experienced by males and females. To produce a unisex mortality assumption for certain actuarial equivalence calculations, male and female mortality may be blended. This allows the system to determine actuarial equivalence in the same way for male and female members while protecting the system by recognizing that the expected mortality impact on the plan will lie between the male and female tables. Where applicable, we have included a description of the recommended assumptions as to the male and female percentage used to determine the unisex mortality assumption. We have identified the following areas where actuarial equivalence assumptions are used to make calculations related to plan members and retirees:

1. Single Life and Joint & Survivor Option Equivalence
2. Disability award lifetime equivalence
3. Sick and Annual Leave Conversion
4. DROP Lump Sum Conversion into a Cash Refund Lifetime Annuity
5. Individual cost calculations related to actuarial transfers or purchases of service credit or accrual rate upgrade

Finally, in determining actuarial equivalence factors we have made all calculations based upon the fact that benefits are paid at the beginning of each month for that month. Therefore, all annuities are assumed to be due annuities for actuarial equivalence.

**Single Life and Joint & Survivor Option Equivalence**

The basic retirement, DROP, and disability benefit provisions within the FRS statutes describe the benefit payable to a member for his or her lifetime with no provision for any beneficiary to receive benefits after their death. R.S. 11:2259 describes certain alternative payment options available to retirees and DROP participants. These alternate forms of benefit payment provide benefits payable after the member's death and for the lifetime of his/her spouse or named beneficiary. The statutes state that a member may elect, at the time of retirement, to receive reduced retirement benefits based upon an approved optional form which is the actuarial equivalent of his/her retirement allowance. In order to facilitate the calculation of benefits upon the retirement of members, a set of option reduction factors is prepared by the actuary for the system's staff. These factors are determined based upon appropriate mortality and interest assumptions. Based upon the results of the system's mortality and interest rate studies contained within this experience study, these factors will need to be updated. In order to allow the system's staff the ability to continue offering benefits and to provide estimates of future benefits in a timely fashion, we recommend that the updated factors be approved for retirement dates beginning on or after July 1, 2021.

In order to provide a single set of reduction factors for each option provided within the statutes that can be applied to all members (male and female), option factors have been determined based upon unisex mortality tables which are created by weighting male and female mortality. The recommended weights for determining the unisex mortality table to be used in single life option factors were set based upon the gender mix in the population of active members above age 50. A review of the 2019 valuation database finds that a blend of 90% male and 10% female mortality is appropriate. The recommended weights for determining the unisex mortality tables to be used in joint & survivor option factors were set based upon a weighted average portion of benefits being paid under Options 2 and 3 to males and females. A review of the 2019 valuation database confirms that the current blend of 100% male and 0% female mortality remains appropriate. This indicates that despite the fact that the Fund has a population that is 10% female, the population of retirees who have elected reduced benefits in order to provide lifetime benefits to a designated beneficiary are primarily male.

Although this experience study recommends that the plan's annual actuarial valuation be run based upon fully generational mortality assumptions which incorporate mortality improvement scales, we recommend the use of static mortality tables for option reduction. The use of fully generational mortality tables for option calculation purposes would result in significant problems related to the number of calculations and factors that would result. With static tables, factors exist for each member and beneficiary age combination. Generational tables would produce factors for every age and year of birth combination. Thus, each set of option factors would have to be updated every year. In place of this approach, we recommend the use of static mortality tables projected forward to a fixed year to account for mortality improvement. Although including mortality improvement in an actuarial valuation of liabilities generally results in larger liabilities, the opposite is generally true for optional reductions since the reduction factor is

largely tied to the expected period over which the average member will receive benefits before requiring payment to a contingent beneficiary. Therefore, in order to offset potential anti-selection in option selections, we have only included mortality improvement to the midpoint of the next experience study five year period. We recommend that option factors be based upon the Pub-2010 Safety Below-Median Healthy Retiree Mortality Tables projected with mortality improvement using the MP2019 mortality improvement scales to 2022 multiplied by the same multipliers as discussed in the mortality section.

**Disability Award Lifetime Equivalences**

R.S. 11:221 describes the Board's authority to modify disability benefits based on certain outside earnings. The system considers the "whole life annuity equivalent" of any qualifying financial award (such as a lump sum settlement paid to the disabled retiree in conjunction with a work related injury from employer-provided workers' compensation coverage) to be outside earnings when determining the relevant benefit offset.

In order to determine the "whole life annuity equivalent" of any financial award, the system must adopt appropriate mortality, interest, and unisex assumptions.

Based upon the recommended change to disabled lives mortality within this experience study, we recommend the use of the base disabled mortality table (the Pub-2010 Safety Below-Median Disabled Retiree Tables for males and females) projected with mortality improvement using the MP2019 mortality improvement scale to 2022 and multiplied by the same multipliers as discussed in the mortality section.

Finally, we based our recommendation related to the appropriate unisex assumptions on the retirement benefits of disabled retirees who retired during the most valuation year. Our review of the 2019 valuation database confirms that the current blend of 90% male and 10% female remains appropriate.

**Sick and Annual Leave Conversion**

R.S. 11:2254.1 stipulates that employers may elect to allow its employees to convert unused earned leave to service credit. For members who convert unused sick and annual leave into additional membership service when computing their retirement or DROP benefits, their employer is responsible for paying into the system an amount which, on an actuarial basis, totally offsets the increase in accrued liability of the system resulting from the conversion.

In order to properly charge employers for the actuarial cost of such leave, the system must stipulate the mortality and interest assumptions for determining such actuarial equivalence. Since these payments are made by employers, the costs are determined without the use of unisex mortality.

Based upon the recommended change to retired lives mortality within this experience study, we recommend the use of the base sex-distinct mortality tables (105% of the PUB2010 Safety Healthy Retiree Table for males and 115% of the PUB2010 Safety Healthy Retiree Table for

females) each projected with mortality improvement using the appropriate MP2019 mortality improvement scale forward from 2022 by the plan's liability duration of 11 years, or through 2033. Projecting past 2022 by the liability duration is meant to add a small margin to offset potential anti-selection.

**DROP Lump Sum Conversion into a Cash Refund Lifetime Annuity**

For members who complete their DROP participation period and terminate the employment that makes them eligible for membership in FRS, instead of receiving a lump sum payment from their DROP account balance, they may elect to receive a lifetime annuity payment equal in actuarial value to the lump sum.

Based upon the recommended change to retired lives mortality within this experience study, we recommend the use of the base sex-distinct mortality tables (105% of the Pub-2010 Safety Below-Median Healthy Retiree Table for males and 115% of the Pub-2010 Safety Below-Median Healthy Retiree Table for females) each projected with mortality improvement using the appropriate MP2019 mortality improvement scale forward from 2022 by the plan's liability duration of 11 years, or through 2033. Projecting past 2022 by the liability duration is meant to help offset a portion of the impact of anti-selection.

Should the Board wish to further protect from the impact of anti-selection related to the conversion of DROP lump sum balances into cash refund lifetime annuities, the interest rate used to determine the lifetime annuity equivalent payments could be lowered below the valuation interest rate.

**Individual Cost Calculations Related to Transfers or Purchases of Service Credit or Accrual Rate Upgrades**

Since the actuarial cost of transfers of service credit, purchases of service credit, purchases of military service credit, and upgrades of accrual rates associated with transferred service involve the use of the actuarial valuation of a member's liability before and after the transaction, a set of valuation parameters is needed to make the calculation. Finalized parameters are not known until a valuation is complete and the Board of Trustees has accepted the funding valuation report. Therefore, in order to avoid delays in calculating the actuarial cost of transfers or purchases, we recommend that the Board recognize that such calculations performed during any fiscal year will be made based upon the valuation parameters described in the actuarial valuation report last approved as of the beginning of the fiscal year. For example, for calculations made between July 1, 2021, and June 30, 2022, the parameters (including mortality and interest assumptions) contained in the 2020 actuarial valuation report would be used.

The Fund's practice has been to make such calculations on a sex distinct basis. Since we are aware of no guidance as to a requirement to run transfers and purchases on a unisex basis, we intend to continue the historical practice, unless the Board votes otherwise.

# Glossary

**Credibility Weighted Experience:** Process by which the experience of a group is averaged with a standard table by weighting each of the two inputs. The larger the group from which the experience is drawn, the greater the weight assigned to its results. In cases where the group is relatively small, greater weight is given to the standard table.

**Decrement:** A factor reducing the population of a retirement system such as death, retirement, disability, or withdrawal from service.

**Duration:** The number of years of service a member has, rounded up to the next whole number (e.g. a member with 5.2 years of service is in the $6^{th}$ duration).

**Exposure:** The number of persons multiplied by the number of years such persons are subject to a rate of decrement

**Whitaker-Henderson Method:** Mathematical process by which data is smoothed in order to remove random fluctuations from the underlying trend. Thus, individual data points are converted to a smooth curve by a mathematical formula.