GRS Gabriel Roeder Smith & Company
Consultants & Actuaries

# MINNESOTA STATE EMPLOYEES RETIREMENT FUND

## 6-YEAR EXPERIENCE STUDY

## JULY 1, 2008 THROUGH JUNE 30, 2014

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June 30, 2015

Minnesota State Retirement System
State Employees Retirement Fund

Dear Board of Directors:

The results of the six-year ***actuarial experience study*** of the State Employees Retirement Fund (SERF) are presented in this report. The investigation was conducted for the purpose of updating the actuarial assumptions used in valuing the actuarial liabilities of the State Employees Retirement Fund.

The investigation was based upon the statistical data furnished for annual active member and retired life actuarial valuations concerning members who died, withdrew, became disabled or retired during the six-year period of the study by the Minnesota State Retirement System (MSRS). We checked for internal and year-to-year consistency, but did not otherwise audit the data. We are not responsible for the accuracy or completeness of the information provided by MSRS.

The investigation covered the six-year period from ***July 1, 2008 to June 30, 2014***, and was carried out using generally accepted actuarial principles and techniques.

**We believe that the actuarial assumptions recommended in this experience study report represent individually and in the aggregate reasonable estimates of future experience of the State Employees Retirement Fund**.

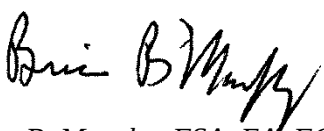
This report should not be relied on for any purpose other than that described above. It was prepared at the request of MSRS and is intended for use by the Retirement System and those designated or approved by the Board. This report may be provided to parties other than MSRS only in its entirety and only with the permission of the Board.

This report has been prepared by actuaries who have substantial experience valuing public employee retirement systems. To the best of our knowledge and belief, the information contained in this report was performed in accordance with Minnesota Statutes Section 356.215 and the requirements of the Standards for Actuarial Work established by the Legislative Commission on Pensions and Retirement. We certify that, to the best of our knowledge, this report is complete and accurate and was made in accordance with standards of practice promulgated by the Actuarial Standards Board.

Brian Murphy and Bonnie Wurst are independent of the plan sponsor and are Members of the American Academy of Actuaries (MAAA) and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. In addition, Mr. Murphy meets the requirements of "approved actuary" under Minnesota Statutes Section 356.215, Subdivision 1, Paragraph (c).

Respectfully submitted,

*Bonita J. Wurst, ASA, EA, MAAA*



*Brian B. Murphy, FSA, EA, FCA, MAAA*

BJW/BBM:dj

# ACTUARIAL EXPERIENCE STUDY
# 2008 - 2014

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# SECTION A

## OVERVIEW AND SUMMARY OF RESULTS

# SUMMARY OF FINDINGS

The six-year period (July 1, 2008 to June 30, 2014) covered by this experience study provided sufficient data to form a basis for recommending changes in some of the assumptions and/or methods used in actuarial valuations of the State Employees Retirement Fund (SERF). The recommended changes in actuarial assumptions and methods resulting from this experience study are summarized below:

Recommendations:

- Decrease the current 8.0% select / 8.5% ultimate investment return assumption (8.0% for all years effective July 1, 2015) to an investment return assumption in the range of 7.00% to 8.00%.
- Decrease the price inflation assumption from 3.00% to 2.75%.
- Decrease the wage inflation (i.e., payroll growth) assumption from 3.75% to 3.50%.
- Adjust rates of merit and seniority, resulting in a overall increase to the assumed rates of merit and seniority increases:
  - Proposed rates are 3.75% and 3.65% greater than the current rates in the first two years of employment; minor adjustments to the current rates after the second year of employment.
  - Average proposed rate averages approximately 0.4% higher than current rate.
  - When combined with the proposed reduction in wage inflation, proposed salary increase rates average approximately 0.2% higher than the current rate.
- Adjust assumed retirement rates:
  - Lower the assumed unreduced retirements (i.e., Normal Retirement) at ages 65 and 69.
  - Lower the assumed Rule of 90 retirements at all ages except age 56.
  - Proposed distinct early retirement rates for Tier 1 and Tier 2 members.
    - Slight adjustments to rates for Tier 1 members.
    - Lower the rates for Tier 2 members.
- Change the assumed rates of withdrawal (termination of membership before eligible to retire):
  - Proposed rates are service-based for all years.
  - Generally, proposed rates are higher than current rates for years 3 – 9 and lower than current rates after 15 years.
- Change rates of disability for females to approximately 75% of current rates. Lower rates of disability for males by utilizing the same disability rates as for females.
- Change the base mortality table to the RP-2014 mortality table, white collar adjustment, with rates age adjusted for some tables in order to better fit observed plan experience and with future improvement projected using scale MP-2014; generally results in a decrease in assumed mortality rates at most ages.
- No change in the actuarial funding method.
- No change in amortization policy.
- A minor change to the post-retirement benefit increase funding policy.
- Change Minnesota Standards for Actuarial Work requirements related to projected payroll.
- Change the assumed married percentage for male members from 85% to 80%, and from 70% to 65% for female members.
- Minor changes to the form of payment assumptions.

The recommendations are summarized on the following pages.

# INTRODUCTION

Each year as of June 30, the actuarial liabilities of the System are valued. In order to perform the valuation, assumptions must be made regarding the future experience of the System with regard to the following risk areas:

- Rates of **withdrawal** of active members (leaving before eligible to retire).
- Rates of **disability** among active members.
- Patterns of **pay increases** to active members.
- Rates of **retirement** among active members.
- Rates of **mortality** among active members, retirees, and beneficiaries.
- Long-term rates of **investment return** to be generated by the assets of the System.

Assumptions should be carefully chosen and continually monitored. An unrealistic set of assumptions can lead to:

- Understated costs resulting in either an inability to pay benefits when due, or gradual increases in required contributions as time progresses;
- Overstated costs resulting in an unnecessarily large burden on the current generation of employers and taxpayers.

All actuarial assumptions are prescribed by Minnesota Statutes, the Legislative Commission on Pensions and Retirement or the MSRS Board of Directors.

A single set of assumptions will not be suitable indefinitely. Things change, and our understanding of things (whether or not they are changing) also changes. The package of assumptions is then adjusted to reflect basic experience trends -- but not random year to year fluctuations. Actuarial assumptions were last revised for the June 30, 2010, 2011 and 2012 actuarial valuations based on the results of the most recent experience study. Assumptions in effect prior to June 30, 2014 are ignored for purposes of this report.

No single experience period should be given full credibility in the setting of actuarial valuation assumptions. When we see significant differences between what is expected from our assumptions and the actual experience, we generally recommend a change in assumptions that produces results somewhere between the actual and expected experience. In this way, with each experience study the actuarial assumptions become better and better representations of actual experience. Consequently, temporary conditions that might influence a particular experience study period will not unduly influence the choice of long-term assumptions.

We are recommending certain changes in assumptions and methods. The various assumption changes and their impact on the required contribution are described on the following pages.

# SUMMARY OF DECREMENT EXPERIENCE
# 2008 - 2014

**Summary of Decrement Experience**

| Decrement Risk Area | Actual Number | Expected | | |
|---|---|---|---|---|
| | | Present Assumptions | Proposed Assumptions | Change |
| *Unreduced Retirement* | | | | |
| Normal Retirement | 1,695 | 1,948.5 | 1,859.4 | (89.1) |
| Rule of 90 | 2,841 | 4,021.5 | 3,257.2 | (764.3) |
| *Reduced Retirement* | | | | |
| Tier 1 Early Retirement | 1,641 | 1,908.7 | 1,730.4 | (178.3) |
| Tier 2 Early Retirement | 2,141 | 3,431.4 | 2,580.9 | (850.6) |
| *Withdrawal* | | | | |
| Males | 6,601 | 6,349.2 | 6,037.4 | (311.8) |
| Females | 10,871 | 10,095.8 | 9,969.0 | (126.7) |
| *Disability* | | | | |
| Males | 234 | 416.3 | 274.3 | (142.0) |
| Females | 252 | 404.7 | 310.9 | (93.8) |
| *Mortality* | | | | |
| Healthy Retired Lives - Male | 2,403 | 2,412.7 | 2,383.8 | (28.9) |
| - Female | 1,936 | 2,134.4 | 1,839.3 | (295.1) |
| Disabled Retired Lives - Male | 209 | 255.7 | 200.1 | (55.6) |
| - Female | 178 | 216.9 | 178.1 | (38.9) |
| Active Lives - Male | 230 | 223.2 | 215.7 | (7.5) |
| - Female | 159 | 230.0 | 149.5 | (80.5) |

# SECTION B

## ECONOMIC ASSUMPTIONS

# ECONOMIC ASSUMPTIONS – INTRODUCTION

Economic assumptions include **long-term rates of investment return** (net of administrative and investment expenses), **inflation** (the across-the-board portion of salary increases), **payroll growth**, and pay increases due to **merit and seniority**. Unlike demographic activities, economic activities do not lend themselves to analysis solely on the basis of internal historical patterns because both salary increases and investment return are affected more by external forces; namely inflation (both wage and price), general productivity changes and the local economic environment which defy accurate long-term prediction. Estimates of economic activities are generally selected on the basis of the expectations in an inflation-free environment and then both long-term rates of investment return and wage inflation are increased by some provision for long-term inflation.

Current economic assumptions for the State Employees Retirement Fund (SERF) are as follows:

| | |
|---|---|
| **Investment Return** | |
| **- current** | 8.00% through June 30, 2017; 8.50% thereafter |
| **- effective July 1, 2015** | 8.00% for all years |
| **Inflation** | 3.00% |
| **Payroll Growth** | 3.75% |

The remainder of this section addresses the economic assumptions other than pay increases due to merit and seniority. Pay increases due to merit and seniority are addressed in Section C.

Sources considered in the analysis of the economic assumptions included:

- Future expectations of the State Board of Investment (SBI) for the State of Minnesota, including information in SBI memos dated July 22 and August 28, 2014
- Future expectations of other investment consultants
- 2014 Social Security Trustees Report
- Historical observations of inflation statistics and investment returns
- U.S. Department of the Treasury yield curve rates (www.treasury.gov)
- National Average Wage Index

# ECONOMIC ASSUMPTIONS – ASOP NO. 27

Guidance regarding the selection of economic assumptions for measuring pension obligations is provided by Actuarial Standards of Practice (ASOP) No. 27. 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 payroll growth and inflation assumptions.

The recently adopted revision of ASOP No. 27 (applicable to valuation dates on or after September 30, 2014) defines a reasonable economic assumption as an assumption that has the following characteristics:

(a) It is appropriate for the purpose of the measurement;
(b) It reflects the actuary's professional judgment;
(c) It takes into account historical and current economic data that is relevant as of the valuation date;
(d) It reflects the actuary's estimate of future experience, the actuary's observation of the estimates inherent in market data, or a combination thereof; and
(e) It has 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 and disclosed under section 3.5.1, or when alternative assumptions are used for the assessment of risk.

**Inflation.** Over the past 60 years, price inflation has averaged 3.7%. This result is heavily affected by the high inflationary period of the 1970s and early 1980s. During the past decade, price inflation averaged 2.1%.

| Calendar Year Period | Inflation (CPI) |
|---|---|
| 1950-1959 | 2.2% |
| 1960-1969 | 2.5% |
| 1970-1979 | 7.4% |
| 1980-1989 | 5.1% |
| 1990-1999 | 2.9% |
| 2000-2009 | 2.5% |
| 2010 | 1.5% |
| 2011 | 3.0% |
| 2012 | 1.7% |
| 2013 | 1.5% |
| 2014 | 0.8% |
| | |
| **Last 5 Years** | **1.7%** |
| **Last 10 Years** | **2.1%** |
| **Last 20 Years** | **2.3%** |
| **Last 30 Years** | **2.7%** |
| **Last 40 Years** | **3.8%** |
| **Last 50 Years** | **4.1%** |
| **Last 60 Years** | **3.7%** |

The SBI currently uses a 3.0% price inflation assumption in the development of its capital market assumptions.

Most of the investment consulting firms, in setting their capital market assumptions, currently assume that inflation will be less than 3.00%. We examined the capital market assumption sets for eight investment consulting firms. The average assumption for inflation was 2.36%, with a range of 2.11% to 3.00%. However, the investment consulting firms typically set their assumptions based on a shorter time horizon, while actuaries must make much longer projections.

# ECONOMIC ASSUMPTIONS – INFLATION

The 2014 Social Security Trustees report uses 2.7% as the long-range intermediate price inflation assumption. The low-cost assumption is 3.4%, and the high-cost assumption is 2.0%. (The Social Security program benefits from high inflation through faster earnings and revenue growth). The long-term intermediate assumption decreased slightly since 2013, from 2.8% to 2.7%.

Treasury Inflation Protected Securities (TIPS) are government bonds which are adjusted upward or downward for actual changes in inflation. Real yields on TIPS at "constant maturity" are interpolated by the U.S. Treasury from the Treasury's daily real yield curve. The spread between yield curve rates and real yield curve rates gives insight into market expectations for inflation. As of June 30, 2014, the spread on a 30-year basis was 2.35%.

It is difficult to ignore the steady march downwards in inflation statistics over the last 25 years. We believe that it is appropriate to recognize this trend in future inflation assumptions. **Based upon the reviewed data, we recommend the inflation assumption be reduced from 3.00% to 2.75%.** (Remember that the selected payroll growth and investment return assumptions should be consistent with the final selected inflation assumption.)

# ECONOMIC ASSUMPTIONS – PAYROLL GROWTH

Payroll growth (wage inflation) represents the expected growth in total payroll for a stable population. Increases or decreases in covered population that lead to a change in total payroll are not reflected in this assumption. 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 current payroll growth assumption is 3.75%, which is comprised of a 3.00% price inflation assumption plus a real wage growth assumption of 0.75%. The payroll growth assumption is used to develop the amount necessary to amortize the unfunded actuarial accrued liability using the level percent of pay methodology.

Over the past 50 years, wage inflation (as measured by increases in the National Average Earnings) has averaged 4.8%. This would imply a real growth rate of 0.7% over the last 50 years (i.e., 4.8% wage inflation - 4.1% price inflation). In the past five decades, we have experienced real growth rate of wages ranging from (0.9%) to 1.6%. The past decade saw a real growth rate of wages of 0.4%. The 2014 Social Security Trustees report uses 1.1% as the long-range intermediate real-wage differential assumption. The low-cost assumption is 1.8% and the high-cost assumption is 0.5%.

**Based upon the data reviewed, we recommend maintaining the current real wage growth assumption of 0.75%. When combined with the recommended 2.75% price inflation, the recommended payroll growth assumption is 3.50%.**

**Investment Return.** The investment return assumption is the actuarial assumption that has the largest impact on actuarial valuation results. Since one of MSRS' objectives is the receipt of level contributions over time, the discount rate assumption is set equal to the investment return assumption.

It is our understanding that the SBI's most recent asset allocation study resulted in an expected net rate of return of 8.25%, comprised of an inflation assumption of 3.00%, a real rate of return assumption of 5.36%, and an investment expense assumption of 0.11%. SBI's expectations are based on capital market assumptions provided by a variety of investment professionals.

MSRS' Comprehensive Annual Financial Report for the fiscal year ending June 30, 2014 includes the following investment return statistics:

- SBI retirement funds returned 6.6 percentage points above the CPI over the last 20 years.
- The average return over the ten-year period ending June 30, 2014 was 8.4%.

The following chart shows the estimated annual investment return on an actuarial and market value basis for each year in the six-year period under consideration:

**Estimated Annual Investment Return**

| Fiscal Year Ending | Actuarial Value of Assets | Market Value of Assets |
|---|---|---|
| June 30, 2009 | 2.9% | -19.1% |
| June 30, 2010 | 2.1% | 15.5% |
| June 30, 2011 | 5.1% | 23.7% |
| June 30, 2012 | 4.0% | 2.6% |
| June 30, 2013 | 6.3% | 14.5% |
| June 30, 2014 | 14.5% | 18.6% |
| **Average annual investment return July 1, 2008 to June 30, 2014** | **5.7%** | **8.3%** |

Presented below is the current target asset allocation, provided to GRS by the SBI for use in this study:

| Asset Class | Asset Allocation |
|---|---|
| Domestic Equity | 45% |
| International Equity | 15 |
| U.S. Fixed Income | 18 |
| Alternative Investments | 20 |
| Cash | 2 |

Additionally, the SBI provided the following clarifications:

- Domestic equities are currently managed to the Russell 3000 benchmark which is comprised of 92% large cap and 8% small cap stocks.
- International equities are currently managed to the MSCI ACWI ex U.S. benchmark which is comprised of 79% developed markets and 21% emerging market equities.
- The percentage weightings for SBI's alternative investment portfolio (market value and unfunded commitments) as of June 30, 2014 are 12.4% private equity, 1.4% real estate, 3.7% resources, and 2.5% yield-oriented investments.
- The "sub-asset classes" shown above are not "targets." Managers have discretion to actively manage their portfolios within the target asset allocation shown on the prior page.

Based upon the target asset allocation, we made the following assumptions about detailed asset classes within the broad target asset classes:

| Asset Classes | Final |
|---|---|
| Cash | 2.00% |
| US Stock - Large Cap | 22.50% |
| US Stock - Small Cap | 22.50% |
| Int'l Equity | 7.50% |
| Emerging Mkts Eq | 7.50% |
| US Corporate Bonds | 12.00% |
| Government Bonds | 6.00% |
| Real Estate | 1.50% |
| Private Equity | 12.50% |
| Other Alternatives | 6.00% |
| | 100.00% |

Because GRS is a benefits consulting firm and does not provide investment advice, we reviewed capital market assumptions of eight independent investment consulting firms. We excluded assumptions for two of the firms because they applied to time horizons of less than 10 years.

These investment consulting firms periodically issue reports that describe their capital market assumptions, that is, their estimates of expected returns, volatility, and correlations. Our analysis is based on the GRS Capital Market Assumption Modeler released May 22, 2015. For confidentiality purposes, the exhibits are shown in order by expected return with the names of the firms omitted. While these assumptions are developed based upon historical analysis, many of these firms also incorporate forward looking adjustments to better reflect near-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.

Given the Plan's long-term policy target asset allocation and the capital market assumptions from the investment consultants, the development of the average nominal return, net of investment expenses, is provided in the table below:

| Investment Consultant | Investment Consultant Expected Nominal Return | Investment Consultant Inflation Assumption | Expected Real Return (2)–(3) | Actuary Inflation Assumption | Expected Nominal Return (4)+(5) | Investment Expenses | Nominal Return Net of Expenses (6)-(7) | Deviation of Expected Return (1-Year) |
|---|---|---|---|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| 1 | 6.26% | 2.12% | 4.14% | 2.75% | 6.89% | 0.10% | 6.79% | 13.70% |
| 2 | 7.00% | 2.26% | 4.74% | 2.75% | 7.49% | 0.10% | 7.39% | 12.70% |
| 3 | 7.58% | 2.50% | 5.08% | 2.75% | 7.83% | 0.10% | 7.73% | 14.20% |
| 4 | 7.66% | 2.11% | 5.55% | 2.75% | 8.30% | 0.10% | 8.20% | 14.60% |
| 5 | 8.02% | 2.20% | 5.82% | 2.75% | 8.57% | 0.10% | 8.47% | 14.10% |
| 6 | 8.40% | 2.20% | 6.20% | 2.75% | 8.95% | 0.10% | 8.85% | 15.40% |
| **Average** | **7.49%** | **2.23%** | **5.26%** | **2.75%** | **8.01%** | **0.10%** | **7.91%** | **14.12%** |

We have determined for each firm the expected nominal return rate, then subtracted that firm's expected inflation to arrive at their expected real return in column (4). Then we have added back our suggested 2.75% inflation assumption and subtracted the expense assumption to get a net nominal return shown in column (8). The results are based upon an investment expense assumption for active management of equity and fixed income securities of 10 basis points. Because the asset classes that the investment firms use are not identical to those contained in SBI's target asset allocation, there is a certain amount of subjectivity involved in developing the figures in the chart. The figures should be considered as approximate guides to judgment, rather than exact scientific numbers.

In a volatile investment environment, gains and losses do not offset each other. For example if an investor enters Period 1 with a $1 Million portfolio and experiences a 50% loss, the investor has $500,000 at the end of Period 1. If, then in Period 2, the investor experiences a 50% gain, the investor has $750,00 at the end of Period 2, and has still not recovered from the loss. The same thing would happen if the gains and losses occurred in the reverse order. This effect is called "volatility drag." Therefore, it is important to consider both the expected return and the anticipated volatility of the investment portfolio in order to estimate the long-term net return that could be expected to be produced by the investment portfolio. The following table provides the 25th, 50th, and 75th percentiles of the 20-year geometric average of the expected nominal return, net of investment expenses. The table also shows the probability of exceeding the current ultimate 8.50% assumption, as well as alternate possible assumptions of 8.00% or 7.00%.

| Investment Consultant | Distribution of 20-Year Average Geometric Net Nominal Return | | | Probability of Exceeding | Probability of Exceeding | Probability of Exceeding |
|---|---|---|---|---|---|---|
| | 25th | 50th | 75th | 8.50% | 8.00% | 7.00% |
| (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| 1 | 3.88% | 5.90% | 7.96% | 20% | 25% | 36% |
| 2 | 4.75% | 6.63% | 8.54% | 25% | 31% | 45% |
| 3 | 4.69% | 6.78% | 8.92% | 29% | 35% | 47% |
| 4 | 5.06% | 7.21% | 9.40% | 34% | 40% | 53% |
| 5 | 5.46% | 7.54% | 9.66% | 38% | 44% | 57% |
| 6 | 5.48% | 7.74% | 10.06% | 41% | 47% | 59% |
| **Average** | **4.89%** | **6.97%** | **9.09%** | **31%** | **37%** | **50%** |

Another point of view comes from the *Report of the Blue Ribbon Panel on Public Pension Plan Funding* dated February 2014. The independent Panel was commissioned by the Society of Actuaries to develop recommendations for strengthening public plan funding. Page 28 of the report states "The Panel believes the assumed rate of return should be set at the median expected return, which should be based on the geometric mean return. A simple arithmetic mean return, which has a less than 50 percent chance of being realized in future years, should not be used. Plans should be using rates of return that they believe can be achieved over the next 20- to 30-year period with a 50 percent probability. The Panel does not believe the rate should be aggressively conservative, as doing so may lead to a surplus."

Given that using the expected arithmetic return is expected to result in gains and losses that offset each other over the long term, but recognizing that a level of conservatism may be desirable (which would suggest using the expected geometric return), **we suggest that MSRS consider an investment return assumption in the range of 7.00% to 8.00%.** Based upon an earlier draft of this study, the assumption will be lowered to 8% for all years effective July 1, 2015. If capital markets do not improve measurably over the next several years, the next experience study will likely include a recommendation to lower the investment return assumption further.

MSRS should note that the selection of an investment return assumption at the upper end of this range results in a higher risk of increased actuarial contributions in the future. The recent statutory change in discount rate improved the odds of achieving the assumed rate in the long run from 31% to 37%. Since the probability of achieving the 8% return in the long run is only 37%, there is a 63% chance that calculated contributions based on an 8% return would be insufficient. The probabilities of achieving the assumed rate of return would be improved to 40% for a 7.75% assumed rate and to 43% for a 7.50% assumed rate. It would be appropriate to continue reducing the assumed investment return below 8.00% so that the odds of achieving the assumed return in the long run are improved. The investment return assumption would have to be lowered to 7% in order to have a 50% probability of being realized. On the surface, it would appear that the assumption should be lowered all the way to 7% to achieve 50% probability. But a change that large might result in contribution levels that in the future might prove to be overstated. In reviewing these results, readers should be aware that an analysis done at a different time could produce quite different recommendations.

# SECTION C

## PAY INCREASES

# PAY INCREASES DUE TO MERIT AND SENIORITY

Pay increases granted to active members typically consist of two pieces:

- An across-the-board, economic type of increase granted to most or all members of the group. This increase is typically tied to inflation or cost of living changes, and

- An increase as a result of merit and seniority. This increase is typically related to the performance of an individual and includes promotions and increased years of experience.

The assumption for across-the-board increases is the pay inflation assumption discussed in Section B. The merit and seniority portion of pay increases is discussed on this page.

We reviewed the merit and seniority pay increases during the six-year period. For each year, we excluded individual pay increases that were more than 30% and also excluded individual pay increases that were less than -30%. While this was a relatively small number of records, the experience distorted the experience of the overall group.

In order to study the merit and seniority portion of the salary increase assumption, it is necessary to separate out the portion attributable to wage inflation. General inflation, as measured by the change in the Consumer Price Index, has averaged about 1.3% over the six-year period ending June 30, 2014. During the six-year period ending December 31, 2013, the increase in the national average earnings has been about 1.7%, or 0.4% higher than inflation. Based on our review of salary experience for SERF members for the period July 1, 2008 through June 30, 2014, we observed that members with longer periods of service averaged about 1.7% for this period, which is equal to the national average. Members with less service received increases that were higher than 1.7% in general. For our analysis of the merit and seniority portion of total salary increase, we assumed that the salary increase amount in excess of the total salary increase for the longer-service members (i.e., those with 20 or more years of service) was attributable to wage inflation only. This assumes that once members reach a certain length of service, merit and seniority increases are no longer provided.

## Findings

The assumed wage inflation was 3.75% for the period of the study. However, due to low price inflation and real wage growth during the period (as described in Section B), we estimated that during the six years of the study, the average actual wage inflation component of pay increases was around 1.7% for members of the SERF. This estimated actual increase was subtracted from the actual pay increases to obtain the estimated merit/seniority portion of the pay increases. It should be noted that the results of the analysis are very sensitive to the estimated wage inflation component.

Gross actual salary increases averaged 3.13% over the six-year period, ranging from 1.38% in 2010 to 5.25% in 2009. After adjusting for the 1.7% average wage inflation for this period, the average net salary increase (i.e., merit and seniority) averaged 1.43%, ranging from -0.32% to 3.55%. Salaries for state employees during this period were impacted by tough economic conditions, including one or more years of a mandatory salary freeze and a shut-down of state government in 2011.

| Fiscal Year Ending | Count | Gross | | Net* | |
|---|---|---|---|---|---|
| | | Expected | Actual | Expected | Actual |
| 2009 | 40,702 | 4.71% | 5.25% | 0.96% | 3.55% |
| 2010 | 42,068 | 4.76% | 1.38% | 1.01% | -0.32% |
| 2011 | 40,908 | 4.68% | 2.33% | 0.93% | 0.63% |
| 2012 | 40,013 | 4.63% | 2.06% | 0.88% | 0.36% |
| 2013 | 39,942 | 4.66% | 3.45% | 0.91% | 1.75% |
| 2014 | 40,212 | 4.72% | 4.36% | 0.97% | 2.66% |
| **Total** | **243,845** | **4.69%** | **3.13%** | **0.94%** | **1.43%** |

** Net Expected increases are equal to Gross Expected increases minus assumed wage inflation of 3.75%. Net Actual increases are equal to Gross Actual increases minus the estimated actual wage inflation for the period of 1.7%.*

The results of our analysis are shown on the following page. Using the techniques described above, observed merit and seniority pay increases were generally higher than the presently assumed increases. However, when combined with the recommended decrease in payroll growth assumption, the result is a modest increase in proposed gross salary increases.

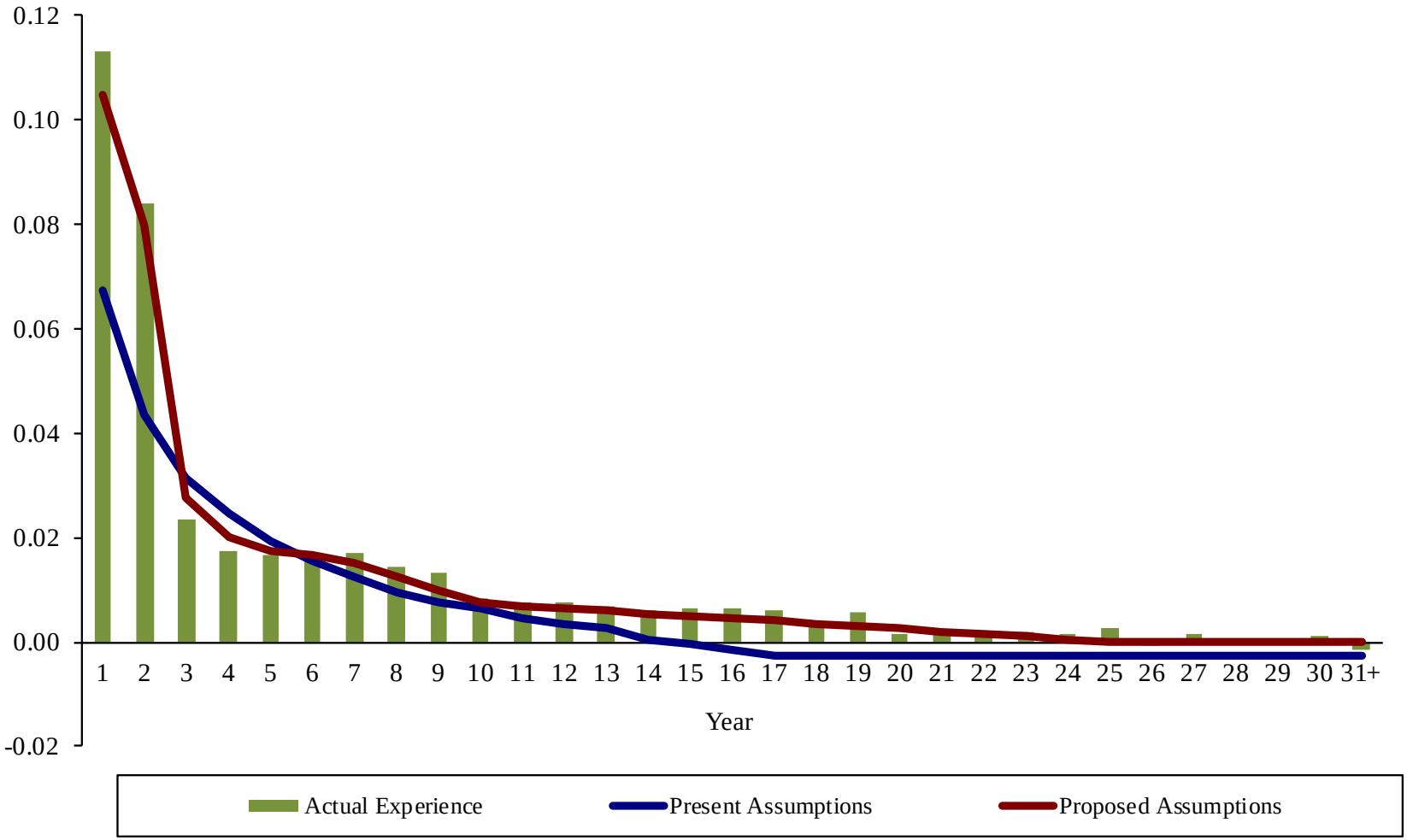
## Recommendation

*We recommend adjustments to the current merit/seniority pay increase assumption as shown on the following page. The proposed rates take into account the economic conditions of the prior six years.*

# PAY INCREASES DUE TO MERIT AND SENIORITY

| Year | Exposures | Total Salary % Increase | | | Merit & Seniority % Increase | | |
|---|---|---|---|---|---|---|---|
| | | Actual | Current | Proposed | Actual | Current | Proposed |
| 1 | 1,547 | 13.00% | 10.50% | 14.00% | 11.30% | 6.75% | 10.50% |
| 2 | 15,892 | 10.11% | 8.10% | 11.50% | 8.41% | 4.35% | 8.00% |
| 3 | 15,722 | 4.05% | 6.90% | 6.25% | 2.35% | 3.15% | 2.75% |
| 4 | 14,428 | 3.46% | 6.20% | 5.50% | 1.76% | 2.45% | 2.00% |
| 5 | 13,403 | 3.36% | 5.70% | 5.25% | 1.66% | 1.95% | 1.75% |
| 6 | 12,053 | 3.37% | 5.30% | 5.15% | 1.67% | 1.55% | 1.65% |
| 7 | 10,673 | 3.41% | 5.00% | 5.00% | 1.71% | 1.25% | 1.50% |
| 8 | 9,518 | 3.14% | 4.70% | 4.75% | 1.44% | 0.95% | 1.25% |
| 9 | 9,128 | 3.03% | 4.50% | 4.50% | 1.33% | 0.75% | 1.00% |
| 10 | 8,792 | 2.54% | 4.40% | 4.25% | 0.84% | 0.65% | 0.75% |
| 11 | 8,646 | 2.45% | 4.20% | 4.20% | 0.75% | 0.45% | 0.70% |
| 12 | 8,577 | 2.44% | 4.10% | 4.15% | 0.74% | 0.35% | 0.65% |
| 13 | 8,009 | 2.37% | 4.00% | 4.10% | 0.67% | 0.25% | 0.60% |
| 14 | 7,217 | 2.31% | 3.80% | 4.05% | 0.61% | 0.05% | 0.55% |
| 15 | 6,413 | 2.34% | 3.70% | 4.00% | 0.64% | -0.05% | 0.50% |
| 16 | 5,720 | 2.36% | 3.60% | 3.95% | 0.66% | -0.15% | 0.45% |
| 17 | 5,098 | 2.31% | 3.50% | 3.90% | 0.61% | -0.25% | 0.40% |
| 18 | 4,588 | 1.99% | 3.50% | 3.85% | 0.29% | -0.25% | 0.35% |
| 19 | 4,843 | 2.29% | 3.50% | 3.80% | 0.59% | -0.25% | 0.30% |
| 20 | 4,944 | 1.85% | 3.50% | 3.75% | 0.15% | -0.25% | 0.25% |
| 21 | 5,008 | 1.90% | 3.50% | 3.70% | 0.20% | -0.25% | 0.20% |
| 22 | 5,001 | 1.82% | 3.50% | 3.65% | 0.12% | -0.25% | 0.15% |
| 23 | 4,990 | 1.88% | 3.50% | 3.60% | 0.18% | -0.25% | 0.10% |
| 24 | 4,992 | 1.84% | 3.50% | 3.55% | 0.14% | -0.25% | 0.05% |
| 25 | 4,754 | 1.97% | 3.50% | 3.50% | 0.27% | -0.25% | 0.00% |
| 26 | 4,423 | 1.64% | 3.50% | 3.50% | -0.06% | -0.25% | 0.00% |
| 27 | 4,015 | 1.85% | 3.50% | 3.50% | 0.15% | -0.25% | 0.00% |
| 28 | 3,724 | 1.71% | 3.50% | 3.50% | 0.01% | -0.25% | 0.00% |
| 29 | 3,694 | 1.71% | 3.50% | 3.50% | 0.01% | -0.25% | 0.00% |
| 30 | 3,696 | 1.81% | 3.50% | 3.50% | 0.11% | -0.25% | 0.00% |
| 31+ | 24,337 | 1.56% | 3.50% | 3.50% | -0.14% | -0.25% | 0.00% |
| **Total** | **243,845** | **3.13%** | **4.69%** | **4.88%** | **1.43%** | **0.94%** | **1.38%** |

# PAY INCREASES DUE TO MERIT AND SENIORITY



# SECTION D

## RETIREMENT EXPERIENCE

# AGE AND SERVICE UNREDUCED (NORMAL) RETIREMENT

**Findings**

The benefit provisions of the SERF establish the minimum age and service requirements for unreduced or normal retirement. However, the actual cost of retirement is determined by when members actually retire. The assumption about timing of retirements is a major ingredient in cost calculations. Note that higher rates of retirement with full benefits generally results in higher computed contributions, and vice-versa. Eligible Tier 2 members retiring at age 65 with an unreduced benefit were included with the Tier 2 members retiring at age 65 with a reduced benefit, for purposes of determining proposed retirement rates.

Some members are eligible for retirement but elect to defer the benefit. We included these terminations as retirements for the purposes of this study.

The current assumption ends at age 71; in other words, we assume all members currently under the age of 71 will retire by the age of 71. However, for members currently age 71 or older, we assume retirement one year after the valuation date (effectively 18 months due to mid-year decrementing), as required by the Minnesota Standards for Actuarial Work. As such, there are no exposures for ages over 71 since the valuation assumption is all of these members work until the next valuation date and then retire. During the six year period, there were 199 actual retirements at ages 71 or older, including 52 actual retirements at age 71. We believe assuming 100% retirement at age 71 is an appropriately conservative approach.

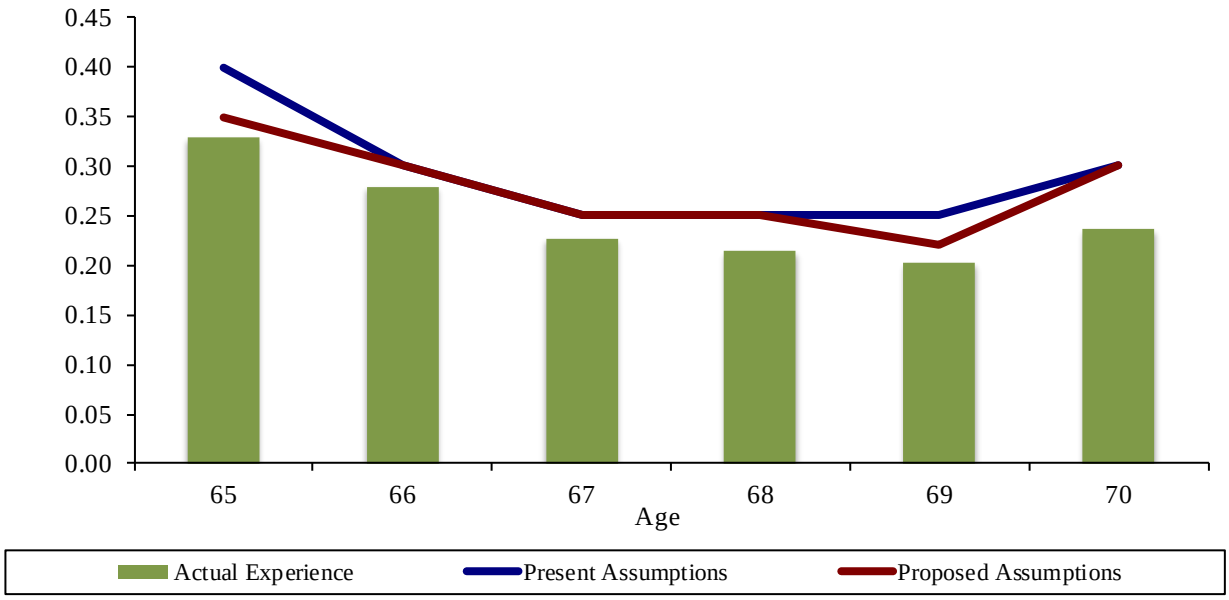
# AGE AND SERVICE UNREDUCED (NORMAL) RETIREMENT

## Recommendations

*We recommend minor changes to the retirement rates as indicated below. In addition, we recommend the Minnesota Standards for Actuarial Work be modified to remove the requirement that members currently over age 70 delay retirement one year and instead assume these members retire mid-year, the same as members younger than age 71.*

| Age | Actual Retirements | Exposure | Crude Rates | Rates | | Expected Retirements | | Actual / Expected | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Present | Proposed | Present | Proposed | Present | Proposed |
| 65 | 468 | 1,423 | 32.9% | 40.0% | 35.0% | 569.20 | 498.05 | 82.2% | 94.0% |
| 66 | 543 | 1,943 | 27.9% | 30.0% | 30.0% | 582.90 | 582.90 | 93.2% | 93.2% |
| 67 | 287 | 1,261 | 22.8% | 25.0% | 25.0% | 315.25 | 315.25 | 91.0% | 91.0% |
| 68 | 175 | 816 | 21.4% | 25.0% | 25.0% | 204.00 | 204.00 | 85.8% | 85.8% |
| 69 | 121 | 596 | 20.3% | 25.0% | 22.0% | 149.00 | 131.12 | 81.2% | 92.3% |
| 70 | 101 | 427 | 23.7% | 30.0% | 30.0% | 128.10 | 128.10 | 78.8% | 78.8% |
| 71+ | * | * | N/A | 100.0% | * | 0.00 | 0.00 | N/A | N/A |
| **Totals** | **1,695** | **6,466** | | | | **1,948.45** | **1,859.42** | **87.0%** | **91.2%** |

* *The current assumption prescribed by the Minnesota Standards for Actuarial Work is that members who have reached 100% retirement eligibility will delay retirement one year. Therefore, even though there are members that are over age 70, these members are not included in the Exposures since retirement is assumed to be delayed one year. There were 199 actual retirements over age 70.*



# RULE OF 90 (UNREDUCED) EARLY RETIREMENT

## Findings

MSRS members who were hired prior to July 1, 1989 may retire with an unreduced benefit when age plus service is at least 90 years. We refer to these cases as Rule of 90 early retirements.

Generally, because of the subsidized early retirement benefit, these members' are expected to retire at a higher rate than those members that don't qualify for Rule of 90. Generally, higher rates of early retirement generally result in higher computed contributions due to the enhanced benefit, and vice-versa.

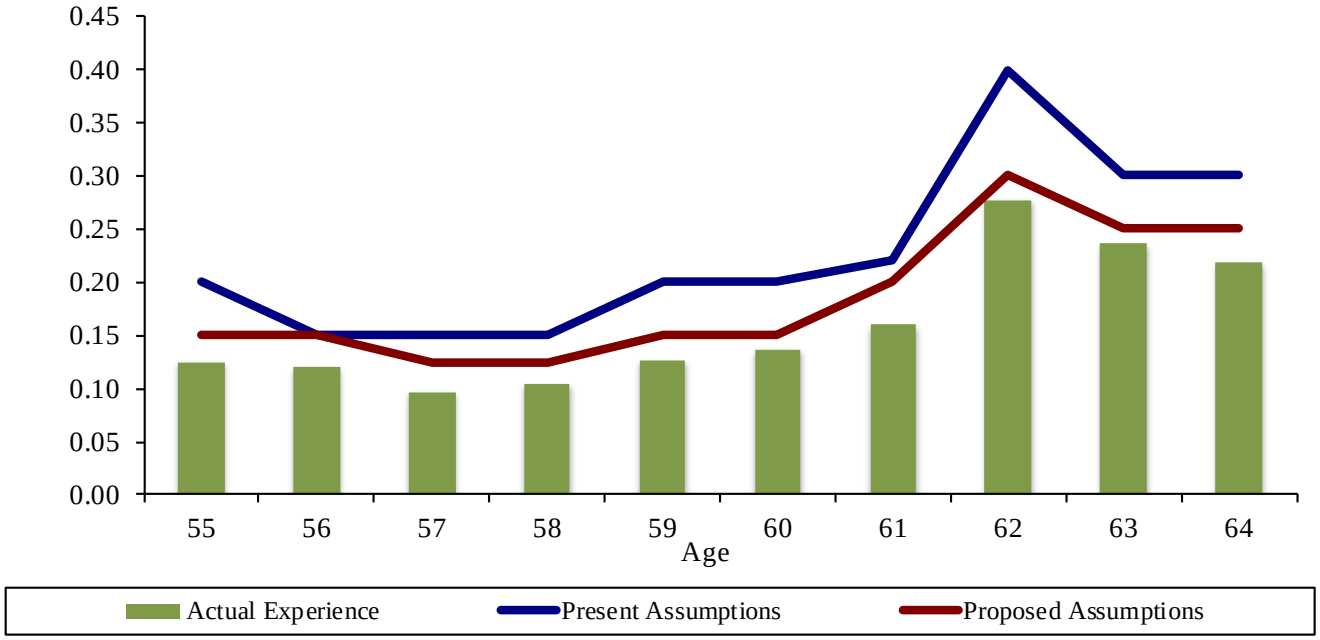
We reviewed the experience during the study period. Overall, the plan experienced fewer Rule of 90 early retirements than projected by the present assumptions (4,021 expected versus 2,841 actual – see totals on the following page). Similar experience was observed in the 2004 – 2008 period.

## Recommendation

*We recommend lowering the assumed Rule of 90 retirement rates to reflect the lower utilization observed over the last 10 years.*

# RULE OF 90 (UNREDUCED) EARLY RETIREMENT

| Age | Actual Retirements | Exposure | Crude Rates | Rates | | Expected Retirements | | Actual / Expected | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Present | Proposed | Present | Proposed | Present | Proposed |
| 55 | 75 | 596 | 12.6% | 20.0% | 15.0% | 119.20 | 89.40 | 62.9% | 83.9% |
| 56 | 129 | 1,070 | 12.1% | 15.0% | 15.0% | 160.50 | 160.50 | 80.4% | 80.4% |
| 57 | 157 | 1,607 | 9.8% | 15.0% | 12.5% | 241.05 | 200.88 | 65.1% | 78.2% |
| 58 | 210 | 2,005 | 10.5% | 15.0% | 12.5% | 300.75 | 250.63 | 69.8% | 83.8% |
| 59 | 288 | 2,272 | 12.7% | 20.0% | 15.0% | 454.40 | 340.80 | 63.4% | 84.5% |
| 60 | 327 | 2,374 | 13.8% | 20.0% | 15.0% | 474.80 | 356.10 | 68.9% | 91.8% |
| 61 | 378 | 2,359 | 16.0% | 22.0% | 20.0% | 518.98 | 471.80 | 72.8% | 80.1% |
| 62 | 607 | 2,182 | 27.8% | 40.0% | 30.0% | 872.80 | 654.60 | 69.5% | 92.7% |
| 63 | 387 | 1,637 | 23.6% | 30.0% | 25.0% | 491.10 | 409.25 | 78.8% | 94.6% |
| 64 | 283 | 1,293 | 21.9% | 30.0% | 25.0% | 387.90 | 323.25 | 73.0% | 87.5% |
| **Totals** | **2,841** | **17,395** | | | | **4,021.48** | **3,257.20** | **70.6%** | **87.2%** |



# TIER 1 REDUCED EARLY RETIREMENT

## Findings

SERF members who were hired prior to July 1, 1989 (Tier 1 members) may also retire with a reduced benefit prior to the attainment of Normal Retirement. We refer to these cases as Tier 1 early retirements.

The early retirement benefit payable to Tier 1 members is the greater of (a) or (b):

(a) 1.2% of average salary for each of the first ten years of service and 1.7% for each subsequent year with a reduction equal to 0.25% for each month the member is under age 65 (or age 62 if 30 or more years of service)
(b) 1.7% of average salary for each year of service with actuarial reduction for each month the member is under age 65

Generally, because of the subsidized early retirement benefit, these members' are expected to retire at a higher rate than Tier 2 members who don't receive an early retirement subsidy, but not as high as Tier 1 members who have attained Rule of 90. Generally, higher rates of early retirement generally result in higher computed contributions due to the enhanced benefit, and vice-versa.

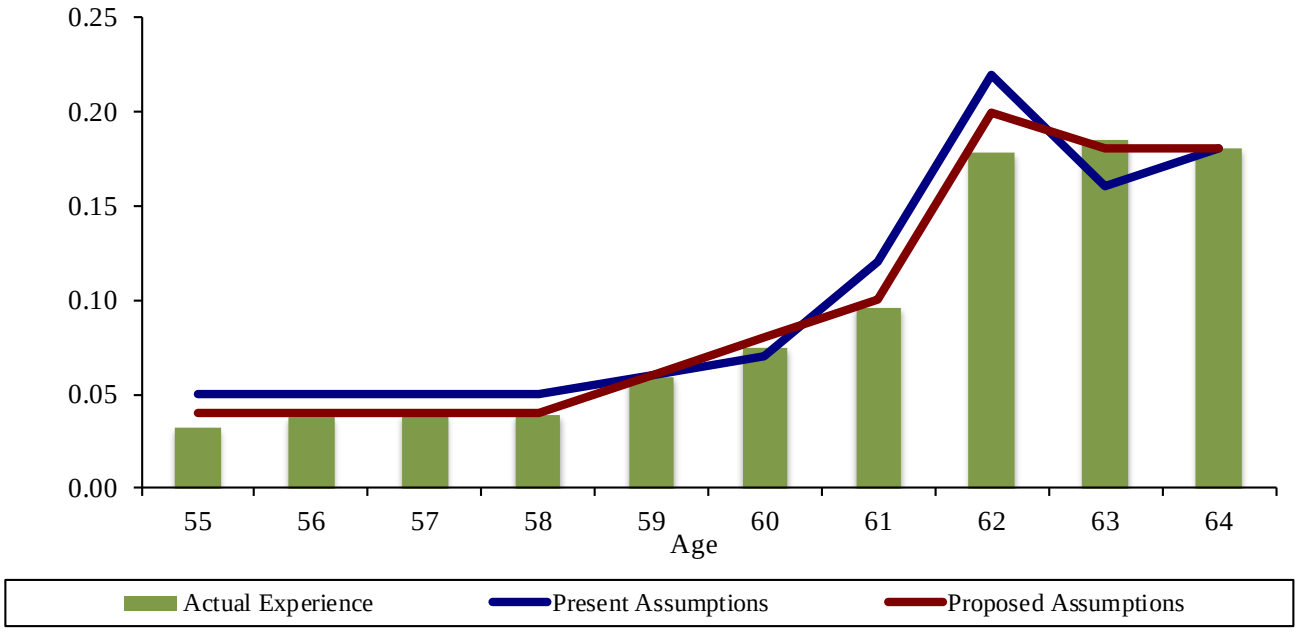
We reviewed the experience during the study period. Overall, the plan experienced fewer Tier 1 reduced early retirements than projected by the present assumptions (1,909 expected versus 1,641 actual – see totals on the following page).

## Recommendation

*We recommend slight adjustments to the Tier 1 Reduced early retirement rates, as indicated on the next page. Furthermore, given the variance in early retirement patterns for Tier 1 versus Tier 2 members, we recommend distinct early retirement rates for Tier 1 members.*

# TIER 1 REDUCED EARLY RETIREMENT

| Age | Actual Retirements | Exposure | Crude Rates | Rates | | Expected Retirements | | Actual / Expected | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Present | Proposed | Present | Proposed | Present | Proposed |
| 55 | 140 | 4,336 | 3.2% | 5.0% | 4.0% | 216.80 | 173.44 | 64.6% | 80.7% |
| 56 | 156 | 4,086 | 3.8% | 5.0% | 4.0% | 204.30 | 163.44 | 76.4% | 95.4% |
| 57 | 146 | 3,689 | 4.0% | 5.0% | 4.0% | 184.45 | 147.56 | 79.2% | 98.9% |
| 58 | 123 | 3,136 | 3.9% | 5.0% | 4.0% | 156.80 | 125.44 | 78.4% | 98.1% |
| 59 | 161 | 2,687 | 6.0% | 6.0% | 6.0% | 161.22 | 161.22 | 99.9% | 99.9% |
| 60 | 169 | 2,246 | 7.5% | 7.0% | 8.0% | 157.22 | 179.68 | 107.5% | 94.1% |
| 61 | 181 | 1,874 | 9.7% | 12.0% | 10.0% | 224.88 | 187.40 | 80.5% | 96.6% |
| 62 | 270 | 1,514 | 17.8% | 22.0% | 20.0% | 333.08 | 302.80 | 81.1% | 89.2% |
| 63 | 181 | 977 | 18.5% | 16.0% | 18.0% | 156.32 | 175.86 | 115.8% | 102.9% |
| 64 | 114 | 631 | 18.1% | 18.0% | 18.0% | 113.58 | 113.58 | 100.4% | 100.4% |
| **Totals** | **1,641** | **25,176** | | | | **1,908.65** | **1,730.42** | **86.0%** | **94.8%** |



# TIER 2 REDUCED EARLY RETIREMENT

## Findings

SERF members who were hired after June 30, 1989 (Tier 2 members) may retire with a reduced benefit prior to the attainment of Normal Retirement. We refer to these cases as Tier 2 early retirements.

The Tier 2 early retirement benefit is the actuarial equivalent of the member's Normal Retirement benefit. In other words, there is no subsidy for early retirement. Generally, because of the actuarially equivalent early retirement reduction, these members' benefits have about the same value as the deferred benefit to which they would be eligible if they did not request early commencement of the benefit. Higher rates of early retirement generally result in slightly lower computed contributions, and vice-versa.

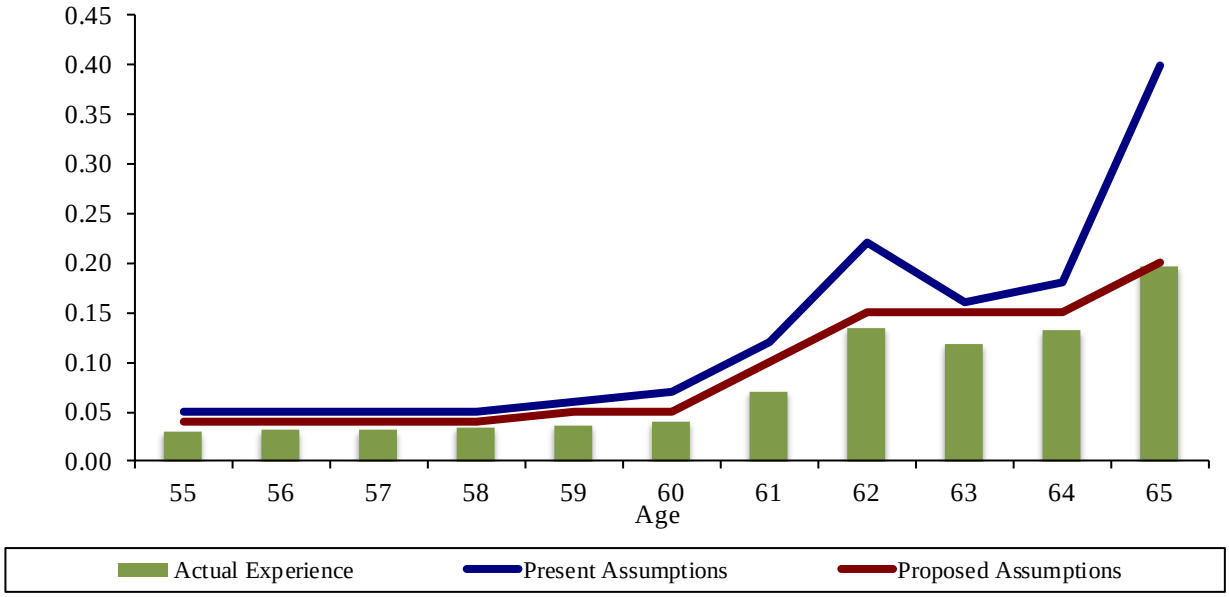
We reviewed the experience during the study period. Overall, the plan experienced fewer Tier 2 reduced early retirements than projected by the present assumptions (3,431 expected versus 2,141 actual – see totals on the following page). Eligible Tier 2 members retiring at age 65 with an unreduced benefit were included with the Tier 2 members retiring at age 65 with a reduced benefit, for purposes of determining proposed retirement rates.

## Recommendation

*We recommend lowering the Tier 2 early retirement rates as indicated on the next page. Furthermore, given the variance in early retirement patterns for Tier 1 versus Tier 2 members, we recommend distinct early retirement rates for Tier 2 members.*

# TIER 2 REDUCED EARLY RETIREMENT

| Age | Actual Retirements | Exposure | Crude Rates | Rates | | Expected Retirements | | Actual / Expected | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Present | Proposed | Present | Proposed | Present | Proposed |
| 55 | 144 | 4,682 | 3.1% | 5.0% | 4.0% | 234.10 | 187.28 | 61.5% | 76.9% |
| 56 | 143 | 4,473 | 3.2% | 5.0% | 4.0% | 223.65 | 178.92 | 63.9% | 79.9% |
| 57 | 136 | 4,210 | 3.2% | 5.0% | 4.0% | 210.50 | 168.40 | 64.6% | 80.8% |
| 58 | 143 | 4,065 | 3.5% | 5.0% | 4.0% | 203.25 | 162.60 | 70.4% | 87.9% |
| 59 | 140 | 3,768 | 3.7% | 6.0% | 5.0% | 226.08 | 188.40 | 61.9% | 74.3% |
| 60 | 141 | 3,455 | 4.1% | 7.0% | 5.0% | 241.85 | 172.75 | 58.3% | 81.6% |
| 61 | 222 | 3,118 | 7.1% | 12.0% | 10.0% | 374.16 | 311.80 | 59.3% | 71.2% |
| 62 | 360 | 2,669 | 13.5% | 22.0% | 15.0% | 587.18 | 400.35 | 61.3% | 89.9% |
| 63 | 249 | 2,104 | 11.8% | 16.0% | 15.0% | 336.64 | 315.60 | 74.0% | 78.9% |
| 64 | 216 | 1,629 | 13.3% | 18.0% | 15.0% | 293.22 | 244.35 | 73.7% | 88.4% |
| 65 | 247 | 1,252 | 19.7% | 40.0% | 20.0% | 500.80 | 250.40 | 49.3% | 98.6% |
| **Totals** | **2,141** | **35,425** | | | | **3,431.43** | **2,580.85** | **62.4%** | **83.0%** |



# RETIREMENT FROM DEFERRED STATUS

Members who terminate after completing three years of service (five if hired after June 30, 2010) are vested and entitled to either a refund of employee contributions, with interest, or a deferred retirement benefit.

While some members actually elect a refund even if it is less valuable than the deferred annuity, the current valuation assumption is that members will elect a refund only if it is more valuable than the deferred annuity. When a member elects a refund that is less valuable than his or her deferred annuity (or when a member elects the deferred annuity even if the refund is more valuable), the plan experiences a small liability gain. Since the current valuation assumption results in very small gains to the plan we recommend no change to this assumption.

For those deferred vested members for whom the deferred benefit is more valuable than a refund, the current valuation assumption is that the member will commence benefits at Normal Retirement Age. Except for long-service members hired prior to July 1, 1989 that may qualify for a subsidized reduction when a member elects to commence benefits prior to Normal Retirement Age, the benefit is reduced on an actuarial equivalent basis, meaning there is no liability gain or loss to the plan. We recommend no change to this set of assumptions.

# SECTION E

## WITHDRAWAL EXPERIENCE

# WITHDRAWAL EXPERIENCE

Members who leave active employment, for reasons other than retirement or death, may be eligible for the following payments from the pension trust:

- A refund of employee contributions, or
- A deferred retirement benefit, if they are vested

Deferred retirement benefits are based on the pay and service credit at the time of withdrawal. The benefit is increased with augmentation from termination until commencement and is payable at Normal Retirement (or at Early Retirement with a reduction). Consequently, members who withdraw receive much less from the plan than members who stay in employment until retirement. Higher rates of withdrawal result in lower computed contributions, and vice-versa.

Our experience with similar systems has shown that sometimes the use of assumptions based solely on counts of people terminating employment does not always reduce the size of the gain or loss in a particular decrement. Sometimes this can be due to the relative magnitude of the actuarial accrued liability of the members that decrement, rather than number counts alone. For example, consider a plan with only two members who are both the same age and assume member one has an actuarial accrued liability of $10,000 and member two has an actuarial accrued liability of $90,000. If one of the members leaves and forfeits all of his or her liability, the rate of decrement is one out of two for a rate of 50%. However, the magnitude of the net gain or loss to the system is affected much more if member two leaves employment than if member one leaves employment.

As a result, we have added a column in the following tables that shows the liability-weighted rates. This represents the crude rate of decrement on a liability weighted basis as opposed to strictly a number count basis. The liability weighted rates were found to be more highly correlated with withdrawal than with other decrements. This makes some intuitive sense, since termination decisions are often made based on how much the member has to gain or lose if they change jobs, whereas death and disability is typically not a decision at all, but rather an event that happens to someone.

Some members are eligible for retirement but elect to defer the benefit and are consequently reported for the valuation as a termination with a deferred benefit. We included these terminations as retirements for the purpose of this study.

Current valuation termination rates for members are gender-specific with a 3-year select period.

# WITHDRAWAL EXPERIENCE

## Findings

Overall, the plan experienced more withdrawals than projected by the present assumptions (17,472 actual terminations versus 16,342 expected). However, when we reviewed the liability that decremented out of the plan during the prior six-year period, the plan experienced less liability decrementing from the plan due to more terminations than expected.

## Recommendation

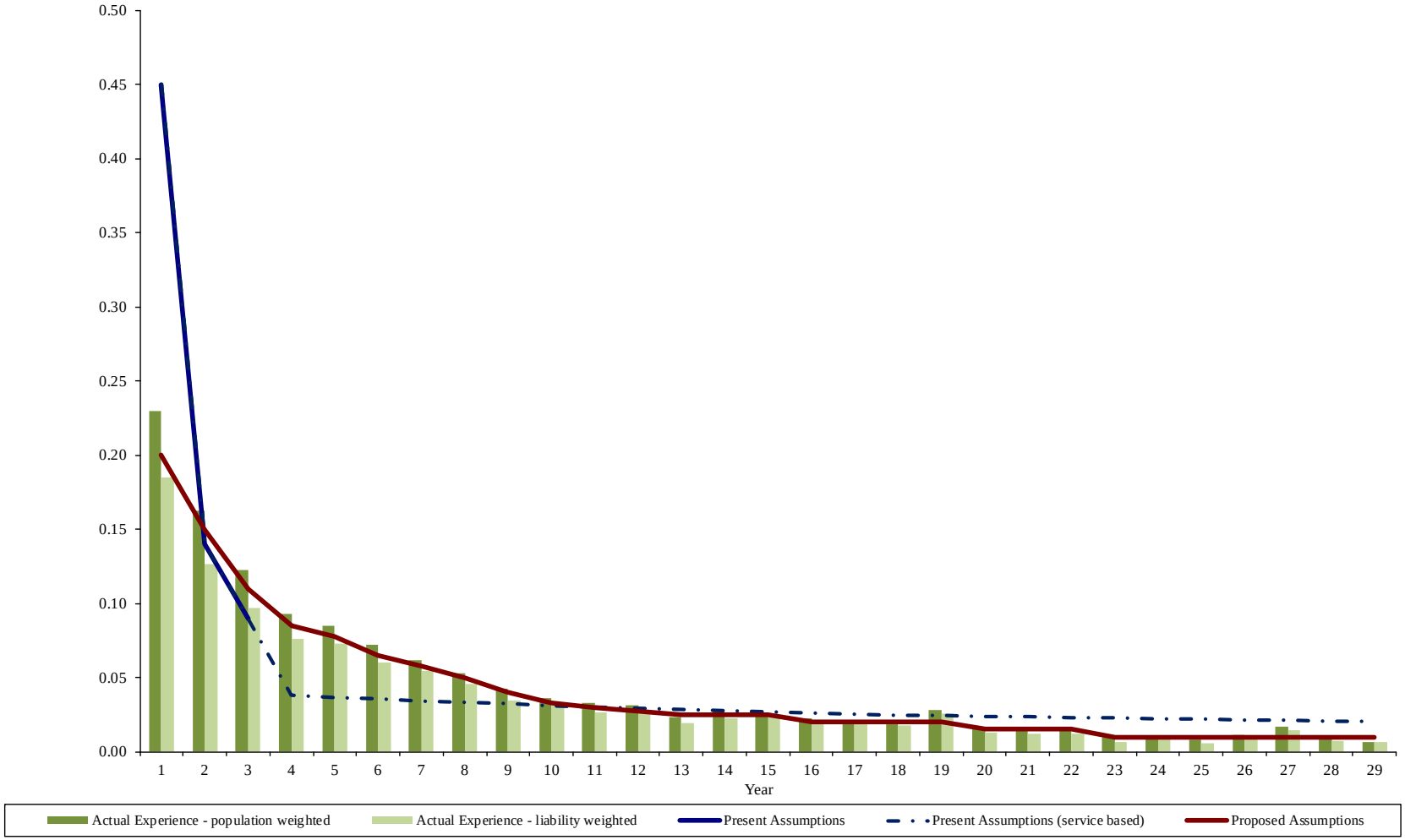
*As we examined the patterns of withdrawal, the experience has a strong relationship to service. We recommend a service-based withdrawal table. We have based the proposed rates on a blend of the population and liability-weighted experience. In the next experience study, the proposed rates can be adjusted if needed to reflect ten years of service-based and liability-weighted experience.*

# WITHDRAWAL EXPERIENCE
# MALES

| Year | Withdrawals | Exposure | Crude Rates | | Sample Rates | | Expected Withdrawals | | Ratio of Actuals/Expecteds | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Population Weighted | Liability Weighted | Old* | New | Old* | New | Old | New |
| 1 | 1,118 | 4,873 | 0.2294 | 0.1850 | 0.4500 | 0.2000 | 2,192.85 | 974.60 | 51.0% | 114.7% |
| 2 | 1,707 | 10,524 | 0.1622 | 0.1263 | 0.1400 | 0.1500 | 1,473.36 | 1,578.60 | 115.9% | 108.1% |
| 3 | 1,012 | 8,260 | 0.1225 | 0.0972 | 0.0900 | 0.1100 | 743.40 | 908.60 | 136.1% | 111.4% |
| 4 | 583 | 6,259 | 0.0931 | 0.0759 | 0.0380 | 0.0850 | 237.63 | 532.02 | 245.3% | 109.6% |
| 5 | 472 | 5,570 | 0.0847 | 0.0730 | 0.0366 | 0.0775 | 203.93 | 431.68 | 231.5% | 109.3% |
| 6 | 343 | 4,743 | 0.0723 | 0.0596 | 0.0352 | 0.0650 | 167.05 | 308.30 | 205.3% | 111.3% |
| 7 | 248 | 4,012 | 0.0618 | 0.0541 | 0.0340 | 0.0575 | 136.27 | 230.69 | 182.0% | 107.5% |
| 8 | 186 | 3,507 | 0.0530 | 0.0460 | 0.0332 | 0.0500 | 116.38 | 175.35 | 159.8% | 106.1% |
| 9 | 139 | 3,306 | 0.0420 | 0.0347 | 0.0321 | 0.0400 | 106.23 | 132.24 | 130.8% | 105.1% |
| 10 | 113 | 3,148 | 0.0359 | 0.0317 | 0.0311 | 0.0325 | 97.85 | 102.31 | 115.5% | 110.4% |
| 11 | 99 | 3,050 | 0.0325 | 0.0266 | 0.0300 | 0.0300 | 91.64 | 91.50 | 108.0% | 108.2% |
| 12 | 94 | 3,037 | 0.0310 | 0.0254 | 0.0292 | 0.0275 | 88.74 | 83.52 | 105.9% | 112.5% |
| 13 | 64 | 2,804 | 0.0228 | 0.0194 | 0.0285 | 0.0250 | 79.79 | 70.10 | 80.2% | 91.3% |
| 14 | 68 | 2,500 | 0.0272 | 0.0227 | 0.0275 | 0.0250 | 68.78 | 62.50 | 98.9% | 108.8% |
| 15 | 58 | 2,195 | 0.0264 | 0.0230 | 0.0267 | 0.0250 | 58.56 | 54.88 | 99.0% | 105.7% |
| 16 | 42 | 1,894 | 0.0222 | 0.0191 | 0.0259 | 0.0200 | 49.09 | 37.88 | 85.6% | 110.9% |
| 17 | 32 | 1,665 | 0.0192 | 0.0192 | 0.0253 | 0.0200 | 42.20 | 33.30 | 75.8% | 96.1% |
| 18 | 27 | 1,460 | 0.0185 | 0.0178 | 0.0248 | 0.0200 | 36.17 | 29.20 | 74.6% | 92.5% |
| 19 | 41 | 1,477 | 0.0278 | 0.0255 | 0.0243 | 0.0200 | 35.85 | 29.54 | 114.4% | 138.8% |
| 20 | 23 | 1,487 | 0.0155 | 0.0131 | 0.0238 | 0.0150 | 35.40 | 22.31 | 65.0% | 103.1% |
| 21 | 22 | 1,482 | 0.0148 | 0.0122 | 0.0234 | 0.0150 | 34.66 | 22.23 | 63.5% | 99.0% |
| 22 | 22 | 1,436 | 0.0153 | 0.0120 | 0.0230 | 0.0150 | 33.04 | 21.54 | 66.6% | 102.1% |
| 23 | 13 | 1,380 | 0.0094 | 0.0066 | 0.0226 | 0.0100 | 31.15 | 13.80 | 41.7% | 94.2% |
| 24 | 13 | 1,376 | 0.0094 | 0.0090 | 0.0221 | 0.0100 | 30.36 | 13.76 | 42.8% | 94.5% |
| 25 | 10 | 1,300 | 0.0077 | 0.0059 | 0.0218 | 0.0100 | 28.28 | 13.00 | 35.4% | 76.9% |
| 26 | 13 | 1,145 | 0.0114 | 0.0097 | 0.0214 | 0.0100 | 24.47 | 11.45 | 53.1% | 113.5% |
| 27 | 16 | 958 | 0.0167 | 0.0142 | 0.0211 | 0.0100 | 20.17 | 9.58 | 79.3% | 167.0% |
| 28 | 7 | 818 | 0.0086 | 0.0072 | 0.0208 | 0.0100 | 17.00 | 8.18 | 41.2% | 85.6% |
| 29 | 5 | 782 | 0.0064 | 0.0068 | 0.0206 | 0.0100 | 16.09 | 7.82 | 31.1% | 63.9% |
| 30 and over | 11 | 2,688 | 0.0041 | 0.0036 | 0.0196 | 0.0100 | 52.80 | 26.88 | 20.8% | 40.9% |
| **Totals** | **6,601** | **89,136** | **0.0741** | **0.0324** | **0.0712** | **0.0677** | **6,349.19** | **6,037.36** | **104.0%** | **109.3%** |

** The current withdrawal assumption is based on service for the first three years of employment and based on age after three years of service. In this exhibit, the age-based expected withdrawals are re-categorized on a service basis to illustrate the strong correlation to service.*

# WITHDRAWAL EXPERIENCE
# MALES

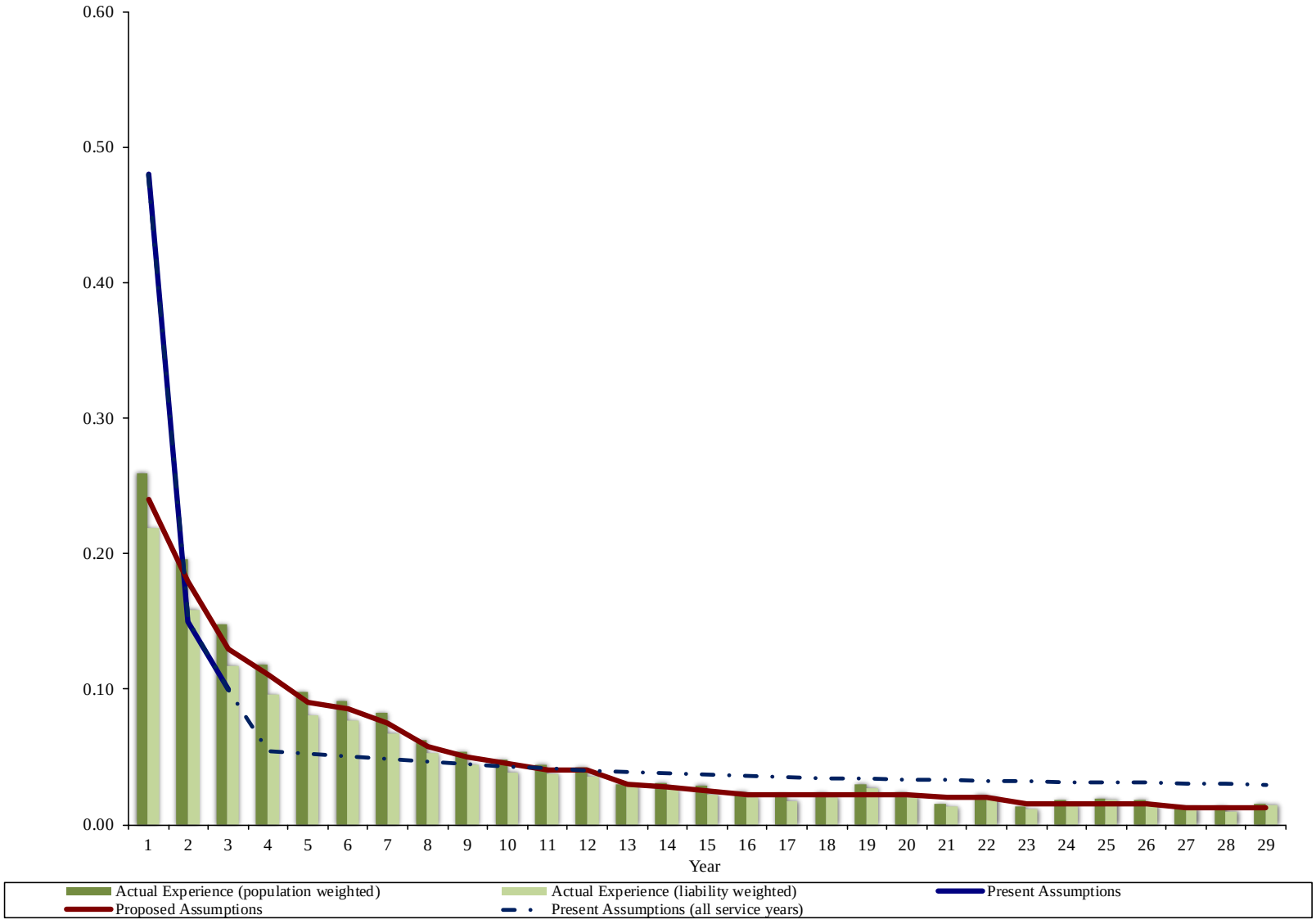


# WITHDRAWAL EXPERIENCE
# FEMALES

| Year | Withdrawals | Exposure | Crude Rates | | Sample Rates | | Expected Withdrawals | | Ratio of Actuals/Expecteds | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Population Weighted | Liability Weighted | Old* | New | Old* | New | Old | New |
| 1 | 1,798 | 6,926 | 0.2596 | 0.2185 | 0.4800 | 0.2400 | 3,324.48 | 1,662.24 | 54.1% | 108.2% |
| 2 | 2,765 | 14,107 | 0.1960 | 0.1586 | 0.1500 | 0.1800 | 2,116.05 | 2,539.26 | 130.7% | 108.9% |
| 3 | 1,632 | 11,071 | 0.1474 | 0.1172 | 0.1000 | 0.1300 | 1,107.10 | 1,439.23 | 147.4% | 113.4% |
| 4 | 1,039 | 8,768 | 0.1185 | 0.0959 | 0.0542 | 0.1100 | 474.81 | 964.48 | 218.8% | 107.7% |
| 5 | 753 | 7,701 | 0.0978 | 0.0803 | 0.0520 | 0.0900 | 400.74 | 693.09 | 187.9% | 108.6% |
| 6 | 617 | 6,732 | 0.0917 | 0.0766 | 0.0502 | 0.0850 | 337.93 | 572.22 | 182.6% | 107.8% |
| 7 | 478 | 5,796 | 0.0825 | 0.0677 | 0.0486 | 0.0750 | 281.74 | 434.70 | 169.7% | 110.0% |
| 8 | 305 | 4,910 | 0.0621 | 0.0523 | 0.0466 | 0.0575 | 229.03 | 282.33 | 133.2% | 108.0% |
| 9 | 239 | 4,464 | 0.0535 | 0.0442 | 0.0446 | 0.0500 | 199.24 | 223.20 | 120.0% | 107.1% |
| 10 | 195 | 4,091 | 0.0477 | 0.0386 | 0.0430 | 0.0450 | 175.96 | 184.10 | 110.8% | 105.9% |
| 11 | 171 | 3,838 | 0.0446 | 0.0375 | 0.0415 | 0.0400 | 159.36 | 153.52 | 107.3% | 111.4% |
| 12 | 154 | 3,626 | 0.0425 | 0.0357 | 0.0400 | 0.0400 | 145.00 | 145.04 | 106.2% | 106.2% |
| 13 | 97 | 3,229 | 0.0300 | 0.0286 | 0.0387 | 0.0300 | 124.83 | 96.87 | 77.7% | 100.1% |
| 14 | 89 | 2,879 | 0.0309 | 0.0263 | 0.0376 | 0.0275 | 108.20 | 79.17 | 82.3% | 112.4% |
| 15 | 72 | 2,459 | 0.0293 | 0.0225 | 0.0368 | 0.0250 | 90.57 | 61.48 | 79.5% | 117.1% |
| 16 | 51 | 2,097 | 0.0243 | 0.0202 | 0.0359 | 0.0225 | 75.31 | 47.18 | 67.7% | 108.1% |
| 17 | 40 | 1,813 | 0.0221 | 0.0176 | 0.0352 | 0.0225 | 63.80 | 40.79 | 62.7% | 98.1% |
| 18 | 39 | 1,662 | 0.0235 | 0.0204 | 0.0344 | 0.0225 | 57.17 | 37.40 | 68.2% | 104.3% |
| 19 | 51 | 1,698 | 0.0300 | 0.0274 | 0.0339 | 0.0225 | 57.59 | 38.21 | 88.6% | 133.5% |
| 20 | 39 | 1,648 | 0.0237 | 0.0205 | 0.0335 | 0.0225 | 55.18 | 37.08 | 70.7% | 105.2% |
| 21 | 24 | 1,608 | 0.0149 | 0.0131 | 0.0328 | 0.0200 | 52.68 | 32.16 | 45.6% | 74.6% |
| 22 | 35 | 1,573 | 0.0223 | 0.0202 | 0.0322 | 0.0200 | 50.66 | 31.46 | 69.1% | 111.3% |
| 23 | 20 | 1,491 | 0.0134 | 0.0114 | 0.0317 | 0.0150 | 47.29 | 22.37 | 42.3% | 89.4% |
| 24 | 26 | 1,453 | 0.0179 | 0.0146 | 0.0314 | 0.0150 | 45.63 | 21.80 | 57.0% | 119.3% |
| 25 | 26 | 1,346 | 0.0193 | 0.0183 | 0.0311 | 0.0150 | 41.92 | 20.19 | 62.0% | 128.8% |
| 26 | 23 | 1,257 | 0.0183 | 0.0146 | 0.0308 | 0.0150 | 38.66 | 18.86 | 59.5% | 122.0% |
| 27 | 15 | 1,158 | 0.0130 | 0.0122 | 0.0304 | 0.0125 | 35.19 | 14.48 | 42.6% | 103.6% |
| 28 | 15 | 1,122 | 0.0134 | 0.0100 | 0.0300 | 0.0125 | 33.70 | 14.03 | 44.5% | 106.9% |
| 29 | 17 | 1,103 | 0.0154 | 0.0149 | 0.0296 | 0.0125 | 32.64 | 13.79 | 52.1% | 123.3% |
| 30 and over | 46 | 4,828 | 0.0095 | 0.0087 | 0.0276 | 0.0100 | 133.30 | 48.28 | 34.5% | 95.3% |
| **Totals** | **10,871** | **116,454** | **0.0934** | **0.0405** | **0.0867** | **0.0856** | **10,095.76** | **9,969.01** | **107.7%** | **109.0%** |

** The current withdrawal assumption is based on service for the first three years of employment and based on age after three years of service. In this exhibit, the age-based expected withdrawals are re-categorized on a service basis to illustrate the strong correlation to service.*

# WITHDRAWAL EXPERIENCE
# FEMALES



# SECTION F

## DISABILITY EXPERIENCE

# DISABILITY EXPERIENCE

## Findings

The assumed rates of disability (leaving active service due to injury or illness while not entitled to age and service retirement benefits) are a minor ingredient in cost calculations, since the incidence of disability is low. Higher rates of disability generally result in somewhat higher computed contributions, and vice-versa.

We reviewed the disability experience during the six year period. The results are shown on the following page. Overall, the actual number of disability retirements (486) is almost half of the number projected by the present assumption (821 – see chart on the following page). We recommend lowering rates at every age.

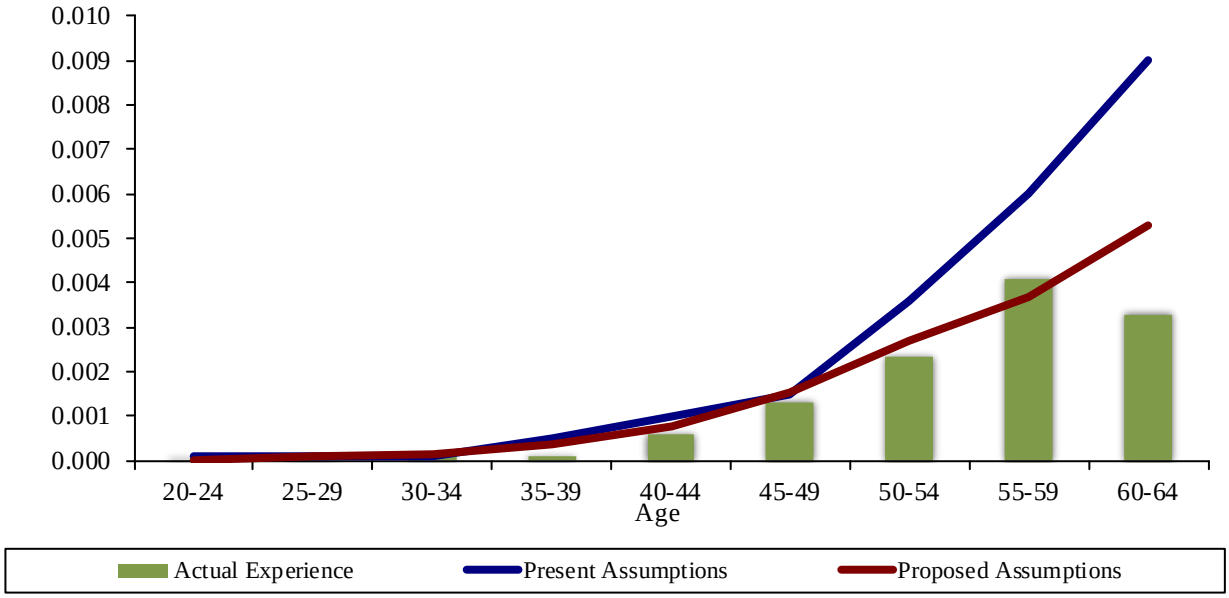
## Recommendation

*We recommend adopting lower rates of disability incidence and adopting the same table for males and females.*

# DISABILITY EXPERIENCE
# MALES

## Male Disability Table

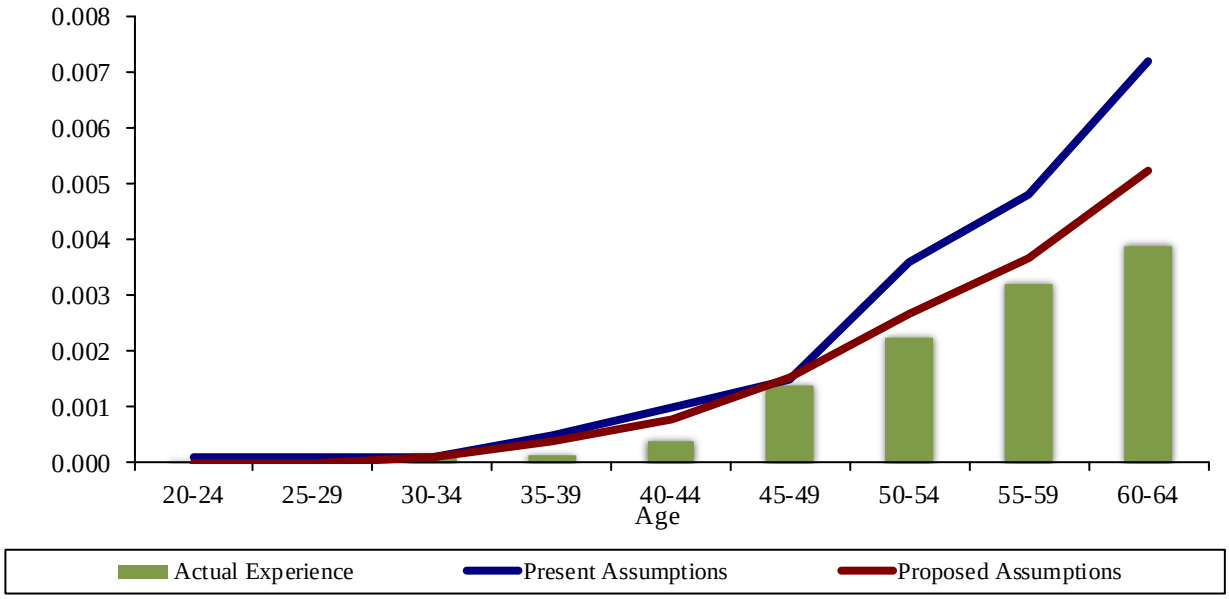
| Age | Disabilities | Exposure | Crude Rates | Sample Rates | | Expected Disabilities | | Ratio of Actuals/Expecteds | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Old | New | Old | New | Old | New |
| 20-24 | 0 | 2,251 | 0.0000 | 0.0001 | 0.0000 | 0.23 | 0.00 | 0.0% | 0.0% |
| 25-29 | 0 | 8,811 | 0.0000 | 0.0001 | 0.0001 | 0.88 | 0.88 | 0.0% | 0.0% |
| 30-34 | 1 | 11,224 | 0.0001 | 0.0001 | 0.0001 | 1.35 | 1.35 | 74.1% | 74.1% |
| 35-39 | 1 | 11,227 | 0.0001 | 0.0005 | 0.0004 | 5.66 | 4.30 | 17.7% | 23.3% |
| 40-44 | 8 | 13,482 | 0.0006 | 0.0010 | 0.0008 | 13.60 | 10.32 | 58.8% | 77.5% |
| 45-49 | 23 | 17,477 | 0.0013 | 0.0015 | 0.0015 | 28.67 | 26.57 | 80.2% | 86.6% |
| 50-54 | 51 | 21,945 | 0.0023 | 0.0036 | 0.0027 | 81.20 | 58.71 | 62.8% | 86.9% |
| 55-59 | 97 | 23,765 | 0.0041 | 0.0060 | 0.0037 | 143.99 | 87.76 | 67.4% | 110.5% |
| 60-64 | 53 | 16,044 | 0.0033 | 0.0090 | 0.0053 | 140.76 | 84.45 | 37.7% | 62.8% |
| **Totals** | **234** | **126,226** | **0.0019** | **0.0033** | **0.0022** | **416.34** | **274.34** | **56.2%** | **85.3%** |



# DISABILITY EXPERIENCE
# FEMALES

## Female Disability Table

| Age | Disabilities | Exposure | Crude Rates | Sample Rates | | Expected Disabilities | | Ratio of Actuals/Expecteds | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Old | New | Old | New | Old | New |
| 20-24 | 0 | 3,596 | 0.0000 | 0.0001 | 0.0000 | 0.36 | 0.00 | 0.0% | 0.0% |
| 25-29 | 0 | 13,163 | 0.0000 | 0.0001 | 0.0000 | 1.32 | 1.32 | 0.0% | 0.0% |
| 30-34 | 2 | 15,246 | 0.0001 | 0.0001 | 0.0001 | 1.82 | 1.82 | 109.9% | 109.9% |
| 35-39 | 2 | 14,392 | 0.0001 | 0.0005 | 0.0004 | 7.24 | 5.50 | 27.6% | 36.4% |
| 40-44 | 7 | 17,166 | 0.0004 | 0.0010 | 0.0008 | 17.32 | 13.16 | 40.4% | 53.2% |
| 45-49 | 31 | 22,252 | 0.0014 | 0.0015 | 0.0015 | 36.62 | 33.94 | 84.7% | 91.3% |
| 50-54 | 62 | 27,543 | 0.0023 | 0.0036 | 0.0027 | 97.58 | 73.58 | 63.5% | 84.3% |
| 55-59 | 86 | 26,714 | 0.0032 | 0.0048 | 0.0037 | 131.19 | 98.16 | 65.6% | 87.6% |
| 60-64 | 62 | 15,876 | 0.0039 | 0.0072 | 0.0053 | 111.23 | 83.41 | 55.7% | 74.3% |
| **Totals** | **252** | **155,948** | **0.0016** | **0.0026** | **0.0020** | **404.68** | **310.89** | **62.3%** | **81.1%** |



# SECTION G

## MORTALITY EXPERIENCE

# MORTALITY EXPERIENCE

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, if at all.

*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 valuation include a provision for future mortality improvement.

*The New Mortality Tables and Projection Scale*

The Society of Actuaries (SOA) released updated mortality tables late in 2014 which reflect the improvement in longevity of the studied group of private pension plan participants, and which also reflects projected future improvements for current and future generations of participants. The new mortality table is called the RP-2014 table. The mortality improvement scale is called the MP-2014 improvement scale. The mortality improvement scale is applied to the RP-2014 table to show the improvements in mortality that are expected to occur.

The SOA has developed combined experience tables and collar-specific experience versions of the RP-2014 tables. The Blue Collar tables have higher mortality rates than the combined tables and the White Collar tables have lower mortality than the combined tables.

*Mortality Improvement Observations at a National Level*

The updated mortality and mortality improvement tables show that among males age 65, overall longevity rose 2.0 years, from 84.6 in 2000 to 86.6 in 2014. Saying it another way, men age 65 in the year 2000 were expected to live to be 84.6 years old. Men age 65 in the year 2014 were expected to live to be 86.6 years old. For women age 65, overall longevity rose 2.4 years, from age 86.4 in 2000 to age 88.8 in 2014.

**Findings**

Healthy Retirees

We reviewed the mortality experience of healthy retirees during the six year period. Due to potential anti-selection bias as well as data needs which are outside the scope of the annual valuation process, we did not include beneficiary and survivor mortality experience in our study. The results are shown on the following pages.

The plan experienced slightly fewer deaths among males (2,403) than projected by the present assumptions (2,413). While this seems like a fairly good fit, the fit at some age groups is not ideal. The actual number of deaths among retired females (1,936) was less than the number projected by the present assumptions (2,091), and the actual number of female deaths at ages 60-64 and 70-85 was far below expected.

Disabled Retirees

We reviewed the mortality experience of disabled retirees during the six-year period. The results are shown on the following pages.

The plan experienced fewer deaths among disabled males (209) than projected by the present assumptions (256) and the actual number of male deaths at ages 60 to 80 was far below expected. The actual number of deaths among disabled females (178) was less than the number projected by the present assumptions (217), and the actual number of female deaths at ages 70 to 84 was far below expected.

Active Members

We reviewed the mortality experience among active members during the six-year period. The results are shown on the following pages.

The actual number of male deaths among active members (230) was generally consistent with the number projected by the present assumption (223). The plan experienced fewer deaths among females (159) than projected by the present assumptions (230) and the actual number of female deaths was significantly lower than expected at every age group expect those in the 35 to 39 year age group.

**Recommendations**

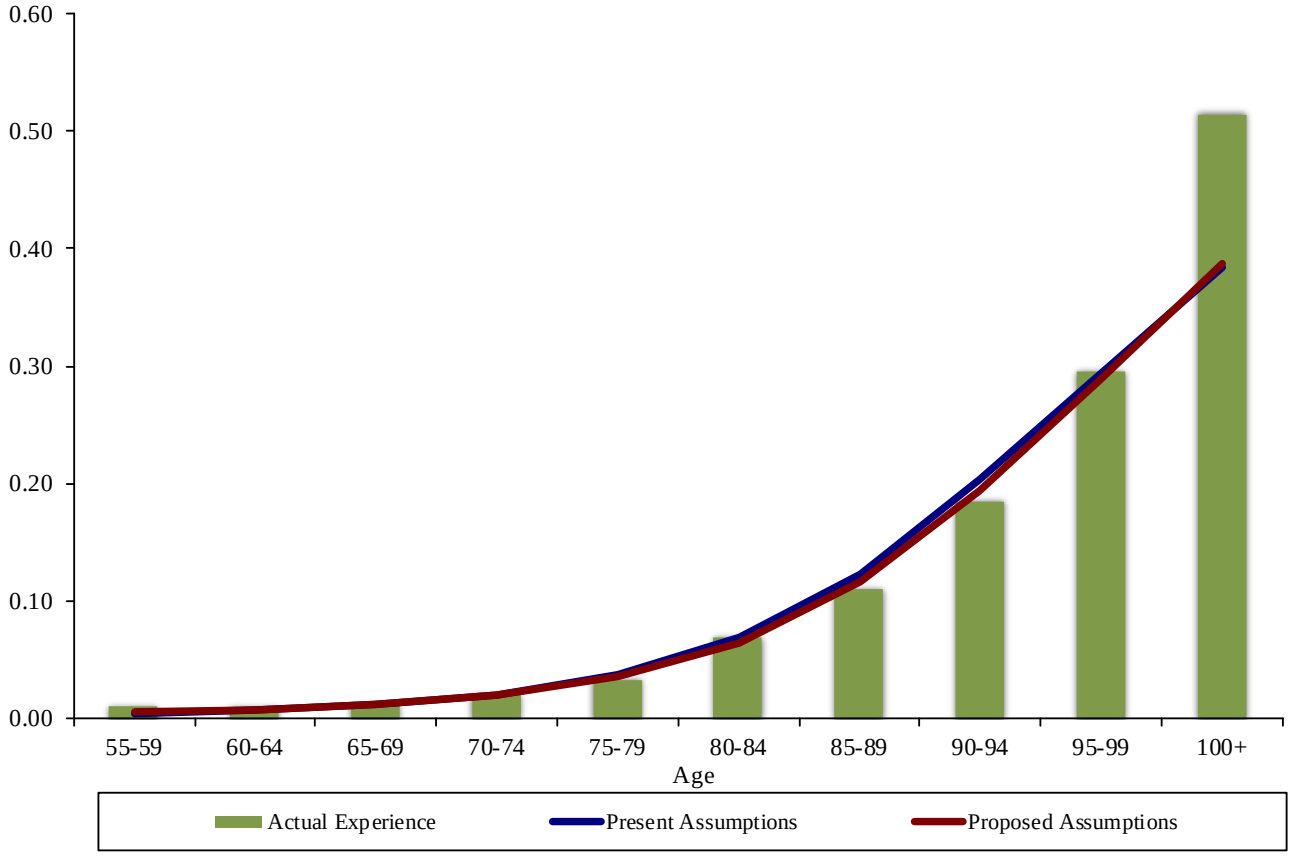
*We did not find a published standard table that fit the observed experience at all ages. We focused on cohorts of members that represented a large percentage of counts and liability for each group. For post-retirement mortality, this group included the retirees in the 60 to 89 age group (92% of the total); for post-disability mortality, this group included disabled retirees in the 50 to 79 age group (90% of the total). As such, we recommend adoption of the RP-2014 mortality tables, with age adjustments in order to produce a better fit to observed experience. We recommend adoption of the following mortality tables:*

| | |
|---|---|
| Healthy Male Retirees: | RP-2014 Male Healthy Annuitant Mortality Table, adjusted for white collar and mortality improvements using projection scale MP-2014. Rates are set forward two years. |
| Healthy Female Retirees: | RP-2014 Female Healthy Annuitant Mortality Table, adjusted for white collar and mortality improvements using projection scale MP-2014. |
| Disabled Male Retirees: | RP-2014 Male Disabled Mortality Table, adjusted for mortality improvements using projection scale MP-2014. Rates are set forward two years. |
| Disabled Female Retirees: | RP-2014 Female Disabled Mortality Table, adjusted for mortality improvements using projection scale MP-2014. Rates are set forward four years. |
| Male Active Members: | RP-2014 Male Employee Mortality Table, adjusted for white collar and mortality improvements using projection scale MP-2014. Rates are set forward one year. |
| Female Active Members: | RP-2014 Female Employee Mortality Table, adjusted for white collar and mortality improvements using projection scale MP-2014. |

# POST-RETIREMENT MORTALITY EXPERIENCE
# HEALTHY MALES

| Age | Deaths | Exposure | Crude Rates | Sample Rates | | Expected Deaths | | Ratio of Actuals/Expecteds | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Old | New* | Old | New* | Old | New* |
| 55-59 | 30 | 2,949 | 0.010173 | 0.004602 | 0.005297 | 14.04 | 15.6 | 213.7% | 192.1% |
| 60-64 | 125 | 12,719 | 0.009828 | 0.007044 | 0.007556 | 93.81 | 96.1 | 133.2% | 130.1% |
| 65-69 | 218 | 18,382 | 0.011859 | 0.012339 | 0.011930 | 225.09 | 219.3 | 96.9% | 99.4% |
| 70-74 | 295 | 14,278 | 0.020661 | 0.020384 | 0.020423 | 285.79 | 291.6 | 103.2% | 101.2% |
| 75-79 | 358 | 10,642 | 0.033640 | 0.037073 | 0.035837 | 388.25 | 381.4 | 92.2% | 93.9% |
| 80-84 | 509 | 7,358 | 0.069176 | 0.068910 | 0.064694 | 497.23 | 476.0 | 102.4% | 106.9% |
| 85-89 | 475 | 4,311 | 0.110183 | 0.122921 | 0.116701 | 511.71 | 503.1 | 92.8% | 94.4% |
| 90-94 | 280 | 1,513 | 0.185063 | 0.204206 | 0.194422 | 294.36 | 294.2 | 95.1% | 95.2% |
| 95-99 | 96 | 325 | 0.295385 | 0.293163 | 0.288554 | 90.70 | 93.8 | 105.8% | 102.4% |
| 100+ | 17 | 33 | 0.515152 | 0.384386 | 0.386667 | 11.74 | 12.8 | 144.8% | 133.2% |
| **Totals** | **2,403** | **72,510** | **0.033140** | **0.033274** | **0.032876** | **2,412.72** | **2,383.8** | **99.6%** | **100.8%** |

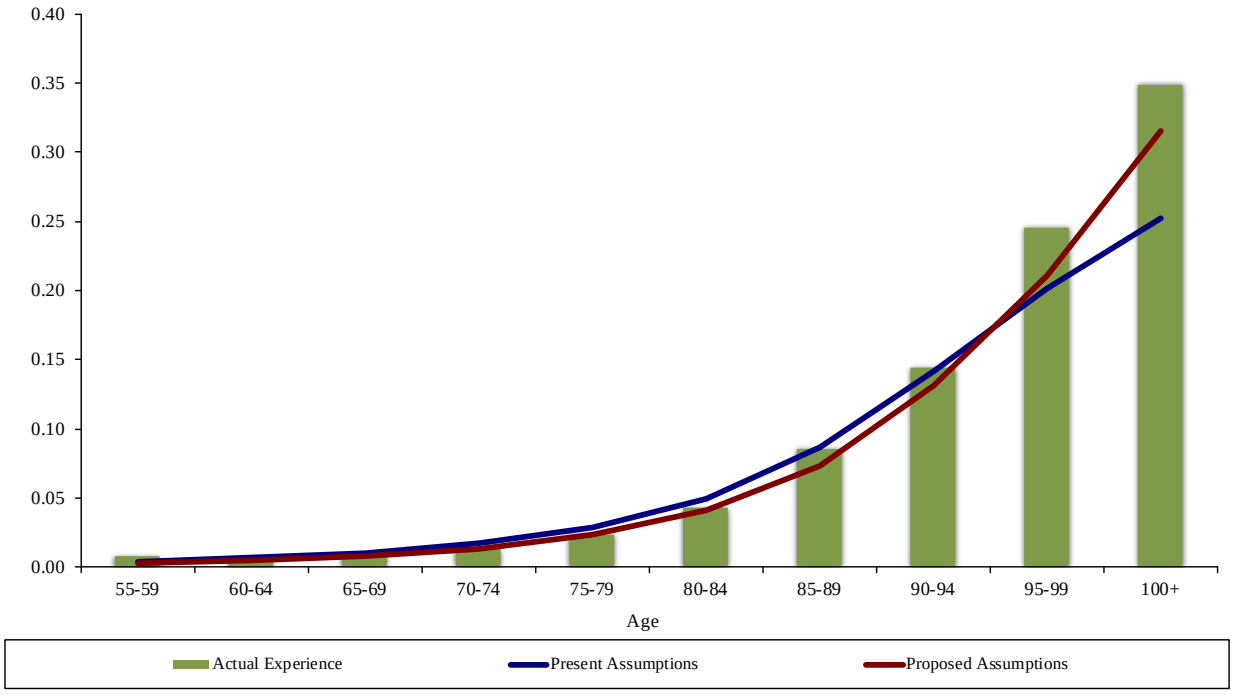
* *In order to show the fit for the six-year period of the study, New Sample Rates and New Expected Deaths were determined using the proposed mortality rates for 2014 projected backwards to the mid-point of the study using projection scale MP-2014.*



# POST-RETIREMENT MORTALITY EXPERIENCE
# HEALTHY FEMALES

| Age | Deaths | Exposure | Crude Rates | Sample Rates | | Expected Deaths | | Ratio of Actuals/Expecteds | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Old | New* | Old | New* | Old | New* |
| 55-59 | 27 | 3,919 | 0.006890 | 0.004317 | 0.003368 | 16.92 | 13.20 | 159.6% | 204.5% |
| 60-64 | 65 | 12,863 | 0.005053 | 0.006648 | 0.005363 | 85.51 | 68.99 | 76.0% | 94.2% |
| 65-69 | 158 | 18,072 | 0.008743 | 0.010601 | 0.008517 | 191.59 | 153.92 | 82.5% | 102.7% |
| 70-74 | 159 | 13,716 | 0.011592 | 0.017374 | 0.013774 | 238.30 | 188.93 | 66.7% | 84.2% |
| 75-79 | 210 | 9,311 | 0.022554 | 0.028830 | 0.023230 | 268.44 | 216.29 | 78.2% | 97.1% |
| 80-84 | 303 | 7,288 | 0.041575 | 0.049418 | 0.041157 | 360.16 | 299.95 | 84.1% | 101.0% |
| 85-89 | 428 | 5,046 | 0.084820 | 0.086566 | 0.073751 | 436.81 | 372.15 | 98.0% | 115.0% |
| 90-94 | 351 | 2,447 | 0.143441 | 0.142072 | 0.131275 | 347.65 | 321.23 | 101.0% | 109.3% |
| 95-99 | 189 | 772 | 0.244819 | 0.201749 | 0.211049 | 155.75 | 162.93 | 121.3% | 116.0% |
| 100+ | 46 | 132 | 0.348485 | 0.251970 | 0.315909 | 33.26 | 41.70 | 138.3% | 110.3% |
| **Totals** | **1,936** | **73,566** | **0.026317** | **0.029013** | **0.025002** | **2,134.39** | **1,839.29** | **90.7%** | **105.3%** |

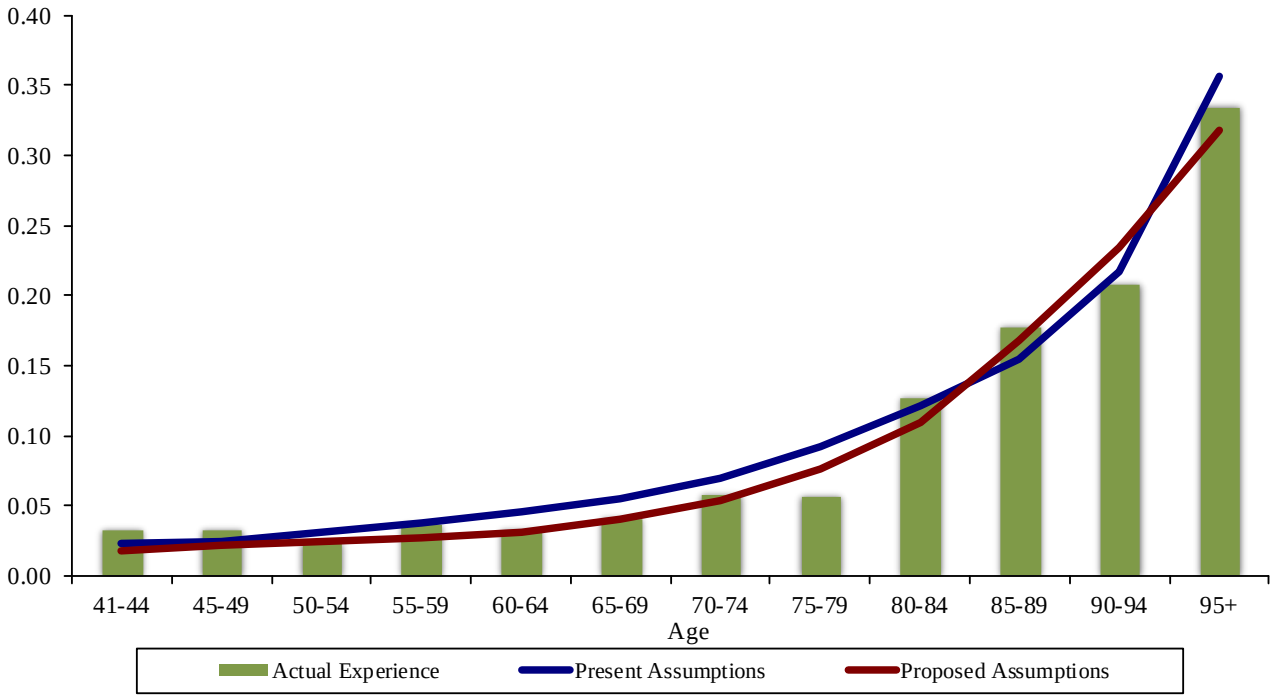
** In order to show the fit for the six-year period of the study, New Sample Rates and New Expected Deaths were determined using the proposed mortality rates for 2014 projected backwards to the mid-point of the study using projection scale MP-2014.*



# POST-RETIREMENT MORTALITY EXPERIENCE
# DISABLED MALES

| Age | Deaths | Exposure | Crude Rates | Sample Rates | | Expected Deaths | | Ratio of Actuals/Expecteds | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Old | New* | Old | New* | Old | New* |
| 41-44 | 1 | 31 | 0.032258 | 0.022571 | 0.018065 | 0.70 | 0.56 | 142.9% | 178.6% |
| 45-49 | 4 | 124 | 0.032258 | 0.025127 | 0.021613 | 3.19 | 2.68 | 125.4% | 149.3% |
| 50-54 | 9 | 388 | 0.023196 | 0.031563 | 0.024021 | 12.46 | 9.32 | 72.2% | 96.6% |
| 55-59 | 32 | 898 | 0.035635 | 0.038040 | 0.026637 | 34.51 | 23.92 | 92.7% | 133.8% |
| 60-64 | 43 | 1,337 | 0.032162 | 0.045078 | 0.031556 | 60.19 | 42.19 | 71.4% | 101.9% |
| 65-69 | 35 | 869 | 0.040276 | 0.054672 | 0.040219 | 47.03 | 34.95 | 74.4% | 100.1% |
| 70-74 | 31 | 544 | 0.056985 | 0.069727 | 0.054007 | 37.34 | 29.38 | 83.0% | 105.5% |
| 75-79 | 15 | 267 | 0.056180 | 0.092440 | 0.075843 | 24.31 | 20.25 | 61.7% | 74.1% |
| 80-84 | 16 | 127 | 0.125984 | 0.122012 | 0.109134 | 15.14 | 13.86 | 105.7% | 115.4% |
| 85-89 | 15 | 85 | 0.176471 | 0.155326 | 0.168118 | 13.10 | 14.29 | 114.5% | 105.0% |
| 90-94 | 6 | 29 | 0.206897 | 0.216827 | 0.233793 | 5.92 | 6.78 | 101.4% | 88.5% |
| 95+ | 2 | 6 | 0.333333 | 0.356303 | 0.318333 | 1.76 | 1.91 | 113.6% | 104.7% |
| **Totals** | **209** | **4,705** | **0.044421** | **0.054336** | **0.042527** | **255.65** | **200.09** | **81.8%** | **104.5%** |

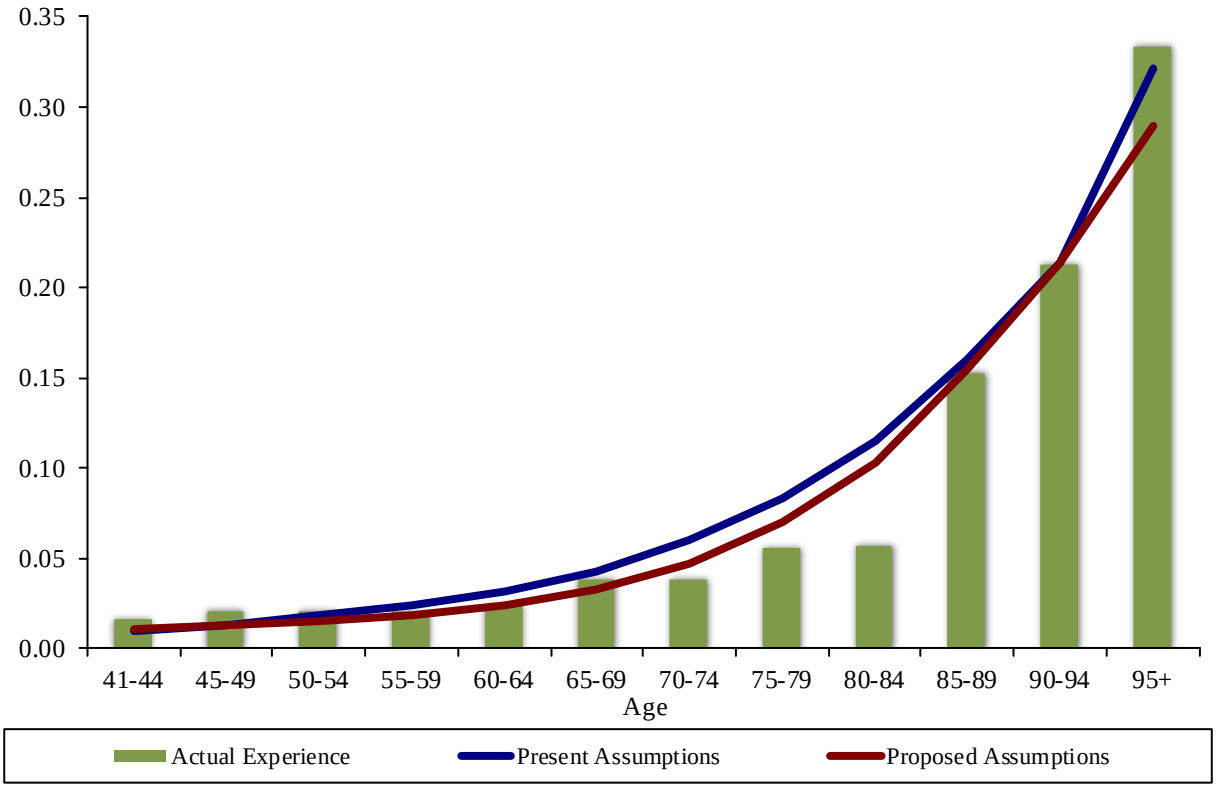
** In order to show the fit for the six-year period of the study, New Sample Rates and New Expected Deaths were determined using the proposed mortality rates for 2014 projected backwards to the mid-point of the study using projection scale MP-2014.*



# POST-RETIREMENT MORTALITY EXPERIENCE
# DISABLED FEMALES

| Age | Deaths | Exposure | Crude Rates | Sample Rates | | Expected Deaths | | Ratio of Actuals/Expecteds | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Old | New* | Old | New* | Old | New* |
| 41-44 | 1 | 61 | 0.016393 | 0.009388 | 0.010820 | 0.59 | 0.66 | 169.5% | 151.5% |
| 45-49 | 6 | 284 | 0.021127 | 0.013486 | 0.012993 | 3.97 | 3.69 | 151.1% | 162.6% |
| 50-54 | 14 | 671 | 0.020864 | 0.018655 | 0.015395 | 12.74 | 10.33 | 109.9% | 135.5% |
| 55-59 | 23 | 1,138 | 0.020211 | 0.024150 | 0.018664 | 27.71 | 21.24 | 83.0% | 108.3% |
| 60-64 | 32 | 1,345 | 0.023792 | 0.031503 | 0.023673 | 42.33 | 31.84 | 75.6% | 100.5% |
| 65-69 | 34 | 884 | 0.038462 | 0.043058 | 0.032195 | 37.48 | 28.46 | 90.7% | 119.5% |
| 70-74 | 20 | 518 | 0.038610 | 0.059778 | 0.046660 | 30.35 | 24.17 | 65.9% | 82.7% |
| 75-79 | 14 | 251 | 0.055777 | 0.082675 | 0.069880 | 20.47 | 17.54 | 68.4% | 79.8% |
| 80-84 | 8 | 140 | 0.057143 | 0.115050 | 0.102500 | 15.72 | 14.35 | 50.9% | 55.7% |
| 85-89 | 13 | 85 | 0.152941 | 0.160581 | 0.154235 | 13.61 | 13.11 | 95.5% | 99.2% |
| 90-94 | 10 | 47 | 0.212766 | 0.214092 | 0.214255 | 9.77 | 10.07 | 102.4% | 99.3% |
| 95+ | 3 | 9 | 0.333333 | 0.320882 | 0.290000 | 2.20 | 2.61 | 136.4% | 114.9% |
| **Totals** | **178** | **5,433** | **0.032763** | **0.039930** | **0.032776** | **216.94** | **178.07** | **82.1%** | **100.0%** |

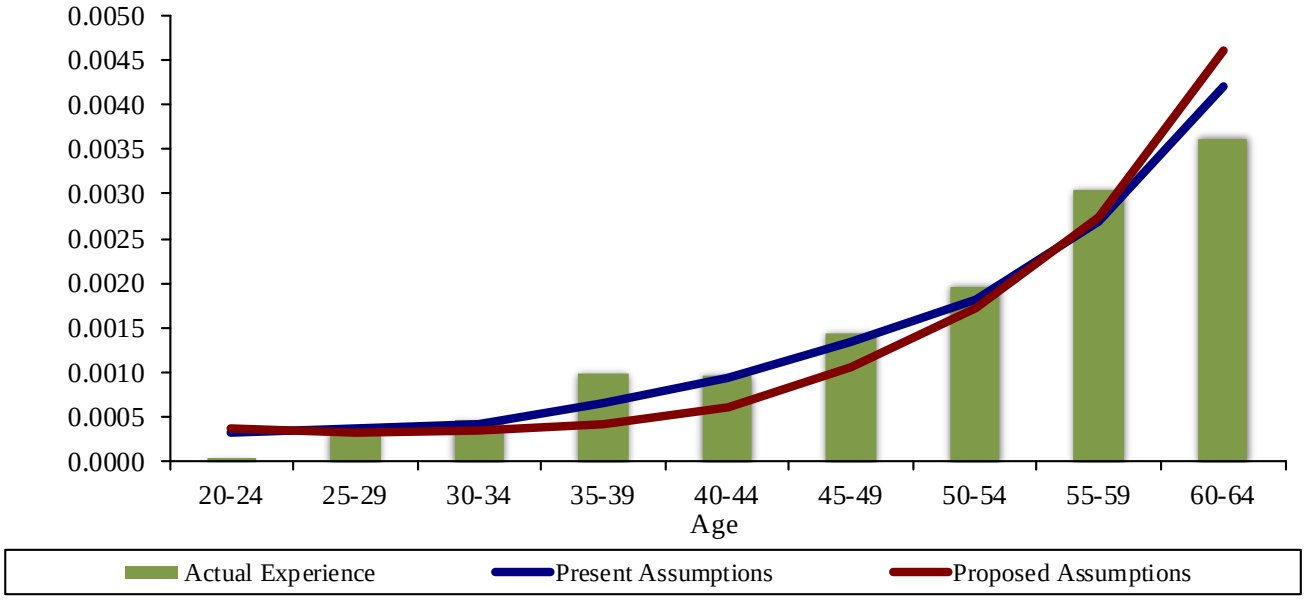
* *In order to show the fit for the six-year period of the study, New Sample Rates and New Expected Deaths were determined using the proposed mortality rates for 2014 projected backwards to the mid-point of the study using projection scale MP-2014.*



# PRE-RETIREMENT MORTALITY EXPERIENCE
# HEALTHY MALES

| Age | Deaths | Exposure | Crude Rates | Sample Rates | | Expected Deaths | | Ratio of Actuals/Expecteds | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Old | New | Old | New | Old | New |
| Under 20 | 0 | 97 | 0.0000 | 0.0003 | 0.0003 | 0.03 | 0.03 | 0.0% | 0.0% |
| 20-24 | 0 | 2,251 | 0.0000 | 0.0003 | 0.0004 | 0.71 | 0.84 | 0.0% | 0.0% |
| 25-29 | 3 | 8,811 | 0.0003 | 0.0004 | 0.0003 | 3.21 | 2.91 | 93.3% | 103.1% |
| 30-34 | 5 | 11,224 | 0.0004 | 0.0004 | 0.0004 | 4.63 | 3.99 | 107.9% | 125.3% |
| 35-39 | 11 | 11,227 | 0.0010 | 0.0007 | 0.0004 | 7.47 | 4.76 | 147.3% | 231.1% |
| 40-44 | 13 | 13,482 | 0.0010 | 0.0009 | 0.0006 | 12.63 | 8.31 | 103.0% | 156.4% |
| 45-49 | 25 | 17,477 | 0.0014 | 0.0013 | 0.0011 | 23.49 | 18.38 | 106.4% | 136.0% |
| 50-54 | 43 | 21,945 | 0.0020 | 0.0018 | 0.0017 | 39.80 | 37.67 | 108.0% | 114.1% |
| 55-59 | 72 | 23,765 | 0.0030 | 0.0027 | 0.0027 | 63.88 | 65.01 | 112.7% | 110.8% |
| 60-64 | 58 | 16,044 | 0.0036 | 0.0042 | 0.0046 | 67.32 | 73.78 | 86.2% | 78.6% |
| **Totals** | **230** | **126,323** | **0.0018** | **0.0018** | **0.0017** | **223.16** | **215.68** | **103.1%** | **106.6%** |

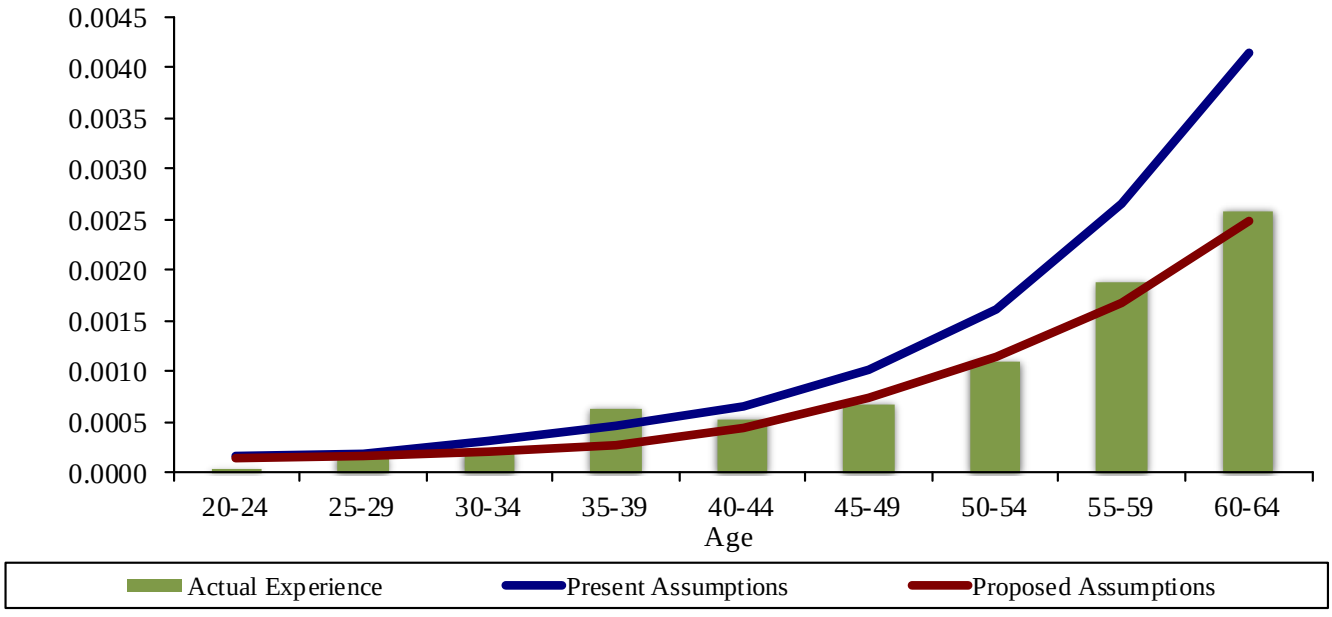
** In order to show the fit for the six-year period of the study, New Sample Rates and New Expected Deaths were determined using the proposed mortality rates for 2014 projected backwards to the mid-point of the study using projection scale MP-2014.*



# PRE-RETIREMENT MORTALITY EXPERIENCE
# HEALTHY FEMALES

| Age | Deaths | Exposure | Crude Rates | Sample Rates | | Expected Deaths | | Ratio of Actuals/Expecteds | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Old | New* | Old | New* | Old | New* |
| Under 20 | 0 | 180 | 0.0000 | 0.0002 | 0.0002 | 0.03 | 0.03 | 0.0% | 0.0% |
| 20-24 | 0 | 3,596 | 0.0000 | 0.0002 | 0.0002 | 0.60 | 0.54 | 0.0% | 0.0% |
| 25-29 | 2 | 13,163 | 0.0002 | 0.0002 | 0.0002 | 2.60 | 2.15 | 77.0% | 93.0% |
| 30-34 | 3 | 15,246 | 0.0002 | 0.0003 | 0.0002 | 4.94 | 3.12 | 60.7% | 96.2% |
| 35-39 | 9 | 14,392 | 0.0006 | 0.0005 | 0.0003 | 6.57 | 4.04 | 137.0% | 222.8% |
| 40-44 | 9 | 17,166 | 0.0005 | 0.0007 | 0.0004 | 11.26 | 7.57 | 80.0% | 118.9% |
| 45-49 | 15 | 22,252 | 0.0007 | 0.0010 | 0.0007 | 22.74 | 16.49 | 66.0% | 91.0% |
| 50-54 | 30 | 27,543 | 0.0011 | 0.0016 | 0.0011 | 44.45 | 31.38 | 67.5% | 95.6% |
| 55-59 | 50 | 26,714 | 0.0019 | 0.0027 | 0.0017 | 71.02 | 44.76 | 70.4% | 111.7% |
| 60-64 | 41 | 15,876 | 0.0026 | 0.0041 | 0.0025 | 65.82 | 39.40 | 62.3% | 104.1% |
| **Totals** | **159** | **156,128** | **0.0010** | **0.0015** | **0.0010** | **230.02** | **149.48** | **69.1%** | **106.4%** |

** In order to show the fit for the six-year period of the study, New Sample Rates and New Expected Deaths were determined using the proposed mortality rates for 2014 projected backwards to the mid-point of the study using projection scale MP-2014.*



# SECTION H

## ACTUARIAL METHODS

# ASSET VALUATION METHOD

## Background

Employer contribution calculations are based on a smoothed asset valuation method (the actuarial value of assets). Such smoothed valuation methods aid in developing a contribution amount calculated to remain approximately level from year to year.

Per Minnesota Statute 356.215(f), the actuarial value of assets is based on a five-year moving average of expected and market values determined as follows:

- At the end of each plan year, an average asset value is calculated as the average of the market asset value at the beginning and end of the fiscal year, net of investment income for the fiscal year;
- The investment gain or (loss) is equal to the excess of actual investment income over the expected investment income based on the average asset value as calculated above;
- The investment gain or (loss) so determine is recognized over five years at 20% per year; and
- The asset value is the sum of the expected asset value plus the schedule recognition of investment gains or (losses) during the current and the preceding four plan years.

During periods when investment performance exceeds the assumed rate, the actuarial value of assets will tend to be less than the market value of assets. During periods when investment performance is less than the assumed rate, the actuarial value of assets will tend to be greater than the market value of assets. If assumed rates are exactly realized for four consecutive years, the actuarial value of assets will become equal to market value of assets.

This asset valuation method satisfies current standards of practice, which require that the asset valuation method reflect some function of market value, be unbiased in relation to market value, and recognize gains and losses consistently and over a reasonable period.

In 2007, the Actuarial Standards Board issued a standard on asset valuation methods which requires that the asset valuation method bear a reasonable relationship to current market value. There may be some concern that if the deviation between the funding value of assets and the market value of assets becomes too large, it could be considered unreasonable. The alternative to allowing large deviations usually involves setting upper and lower bounds (corridors) for the relationship between funding value and market value. Once a corridor limit is reached, any further market experience in the same direction is recognized immediately, which can introduce substantial fluctuations in the results of the actuarial valuation. If a 20% corridor were applied to the June 30, 2014 actuarial value of assets, it would not change the numerical result (the asset value would be unchanged).

## Recommendation

*We recommend continued use of the current asset valuation method. MSRS should continue to consider results based on the market value of assets as well as the actuarial value of assets, especially when the two values are significantly different.*

# FUNDING POLICY – ACTUARIAL FUNDING METHOD

An actuarial funding method is a set of techniques for conversion of the actuarial present values of benefits into contribution information. Minnesota Statute requires the actuary to use the entry age actuarial cost method, characterized by:

1. Normal Cost – the level percent of payroll contribution, paid from each member's date of plan entry to date of retirement, which will accumulate enough assets at retirement to fund the member's projected benefits from retirement to death.

2. Actuarial Accrued Liability – the assets which would have accumulated to date had contributions been made at the level of the normal cost since the date of the first benefit accrual, all actuarial assumptions had been exactly realized, and there had been no benefit changes.

The total contribution produced by an actuarial method is the total of the normal cost and an amount to amortize any unfunded actuarial accrued liability.

The entry age actuarial method is the most prevalent funding method in the public sector. It is appropriate for the public sector because it produces costs that remain stable as a percentage of payroll over time, resulting in intergenerational equity for taxpayers.

**Recommendations**

*We recommend continued use of the entry age actuarial cost method.*

# FUNDING POLICY – AMORTIZATION

## Amortization Period

Minnesota Statute 356.215, Subdivision 11 specifies the established date for full funding of the State Employees Retirement Fund (SERF). A provision that re-determines the statutory amortization date when the unfunded actuarial accrued liability increases due to changes in benefits, assumptions, or methods resulted in the amortization date moving from June 30, 2040 to June 30, 2041 in 2014.

The June 30, 2014 actuarial valuation amortizes the UAAL over a 27-year period. We suggest that the present practice of decreasing the amortization period each year by one year (like a typical mortgage) be continued.

Past practice has typically been to re-establish a new 30-year statutory amortization period occasionally in order to minimize volatility and manage cost requirements. This practice shifts costs to the future. In lieu of this, MSRS could consider using a shorter maximum period, such as 15, 20 or 25 years. Actuarial practice, including Governmental Accounting Standards Board policy, is moving toward shorter amortization periods than in the past. Another option to consider is the use of "layered" amortization – which continues to amortize the initial unfunded liability over the closed amortization period, but spreads out gains and losses as they occur over a separate closed period. This methodology maintains steady progress toward eliminating the unfunded liability, but mitigates the volatility caused by gains and losses. We would be happy to provide more information and analysis on this topic.

## Amortization Method

Because SERF is an open retirement plan (new employees enter the plan), level percent of payroll amortization payments are used.

Longer amortization periods combined with the level percent of pay methodology results in initial payments that are less than the "interest only" payment on the unfunded actuarial accrued liability, i.e., "negative amortization." Payments less than the interest only amount will result in the UAAL increasing for an initial period of time. With 26 years remaining as of June 30, 2015, calculated SERF amortization payments are expected to be less than the interest only amount.

It should be noted that actual growth in SERF payroll over the past six years has fallen short of the expected rate of 3.75% (proposed payroll growth rate is 3.50%). When payroll grows slower than expected, contributions collected will also be less than expected, and insufficient to eliminate the UAAL by the statutory amortization date. Some plans address this issue by not permitting the payroll growth assumption to exceed the actual average growth rate over the past 5 years. If payroll growth continues to fall short of expectations, a method change should be considered.

## Recommendation

*We recommend continued use of the current amortization policy of reducing the amortization period each year by one year until the next study, at which point the method should be re-evaluated.. We also recommend continued use of the level percent of payroll amortization method.*

### Valuation of Future Post-Retirement Benefit Increases

If the plan has reached the funding ratio threshold required to pay a 2.5% benefit increase, Minnesota Statutes require the 2.5% benefit increase rate to be reflected in the liability calculations. If the plan has not yet reached the threshold required to pay a 2.5% benefit increase, Minnesota Statutes require a projection to be performed to determine the expected attainment of the funding ratio threshold, and the expected reversion to a 2.5% benefit increase rate must be reflected in the liability calculations. As of June 30, 2014, based on projection methodology described in the SERF valuation report, the benefit increase rate was assumed to increase to 2.5% on January 1, 2016. The date will be re-determined as of each valuation date.

### Recommendation

*We recommend continued use of the methodologies described above, with one refinement. We recommend that the benefit increase date assumed for valuation purposes never be later than the statutory amortization date. This will produce required contributions that are more consistent with the funding policy goal of eliminating unfunded liabilities by the statutory amortization date.*

Required contributions are expressed as a percent of payroll. The Minnesota Standards for Actuarial Work state that the projected payroll will be developed from the reported payroll in the base year by increasing each person's pay by one full year's pay increase according to the actuarial salary scale. This appears to make sense on the surface, but in our judgement such a calculation is not fully in compliance with level percent of payroll funding. There are two issues:

1. With respect to the total payroll used for the amortization of the unfunded liability: Total payroll is expected to increase at 3.75% according to the actuarial assumptions. (This experience study is proposing a change to this assumption, from 3.75% to 3.50%). The total payroll, increased at the assumed payroll growth rate (currently 3.75%) is the proper series of payroll amounts over which to fund the unfunded liability. The first year payroll stated in the Minnesota Standards is not consistent with this principle.
2. With respect to the normal cost dollar amount: The normal cost percentage for active members is developed as the ratio of the present value of future benefits at entry age to the present value of future pay at entry age. The present value of future pay must take into account both the timing of pay increases within the year, and the probability that an individual may exit the active member group during the year. The first year payroll stated in the Minnesota Standards is not mathematically consistent with this principle since it assumes the member will earn an entire year of payroll, even though there may be a probability of decrement for the member during the year.

**Recommendation**

*We recommend that the Minnesota Standards for Actuarial Work be amended to be less prescriptive and more principles-based, so that the actuaries for the Systems may use their best judgment to calculate contribution rates and liabilities in a mathematically consistent manner and in accordance with actuarial standards of practice.*

# SECTION I

## MISCELLANEOUS AND TECHNICAL ASSUMPTIONS

# MARITAL STATUS

Married members will frequently make different annuity selections than non-married members. The current valuation assumption is 85% of male members are married and 70% of female members are married. Actual marital status is used for retired members.

## Findings

We reviewed the marital status of healthy members retiring from active status during the six-year period. The results are shown below.

| Gender | Married New Retirees | Total New Retirees | Crude Rates | Sample Rates | | Expected Married Retirees | | Ratio of Actuals/Expecteds | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Old | New | Old | New | Old | New |
| Males | 2,985 | 3,851 | 0.7751 | 0.8500 | 0.8000 | 3,273.35 | 3,080.80 | 91.2% | 96.9% |
| Females | 2,165 | 3,563 | 0.6076 | 0.7000 | 0.6500 | 2,494.10 | 2,315.95 | 86.8% | 93.5% |
| **Total** | **5,150** | **7,414** | **0.6946** | | | **5,767.45** | **5,396.75** | **89.3%** | **95.4%** |

The experience shows that fewer new retirees are married than expected. This experience is consistent with the experience from the prior study.

## Recommendation

*We recommend lowering the assumed percentage of members that are married to 80% for males and 65% for females.*

# AGE OF SURVIVOR

Joint & Survivor annuity benefit amounts are determined based on the member's and survivor's age. Currently, the valuation assumes that male members have a beneficiary three years younger and female members have a beneficiary two years older.

## Findings

We reviewed the ages of married new retirees and their beneficiaries during the six-year period. The results are shown below.

| Gender | Married New Retirees | Average Age Difference | Expected Age Difference | | Ratio of Actuals/Expecteds | |
|---|---|---|---|---|---|---|
| | | | Old | New | Old | New |
| Males | 2,985 | 2.64 | 3.00 | 3.00 | 87.9% | 87.9% |
| Females | 2,165 | (1.88) | (2.00) | (2.00) | 93.8% | 93.8% |
| **Total** | **5,150** | | | | | |

The experience shows that the age differences are slightly less than expected, but still consistent with the current assumption when viewed in whole years. This experience is consistent with the experience from the prior study.

## Recommendation

*We recommend no change to the age difference assumption for new married retirees.*

Upon retirement, a member can elect any of the following forms of payment:

- Single life annuity – the benefit is paid for the lifetime of the member. No benefit is payable to a beneficiary upon the member's death.
- 15-Year Certain and Life – a reduced benefit is paid for the lifetime of the member. If the member dies before 180 payments have been made, the benefit continues to be paid to a beneficiary until 180 payments have been made.
- 50% Joint & Survivor – a reduced benefit is paid for the lifetime of the member. Upon death of the member, 50% of the benefit is paid to a beneficiary. If the beneficiary predeceases the member, the benefit reverts back to the single life annuity amount.
- 75% Joint & Survivor – a reduced benefit is paid for the lifetime of the member. Upon death of the member, 75% of the benefit is paid to a beneficiary. If the beneficiary predeceases the member, the benefit reverts back to the single life annuity amount.
- 100% Joint & Survivor – a reduced benefit is paid for the lifetime of the member. Upon death of the member, 100% of the benefit is paid to a beneficiary. If the beneficiary predeceases the member, the benefit reverts back to the single life annuity amount.

There is no actuarial reduction for the bounce-back feature (i.e., this is subsidized by the plan). Married members retiring from active status are currently assumed to elect annuities as follows:

| | |
|---|---|
| Males: | 15% elect 50% Joint & Survivor option |
| | 10% elect 75% Joint & Survivor option |
| | 50% elect 100% Joint & Survivor option |
| Females: | 15% elect 50% Joint & Survivor option |
| | 0% elect 75% Joint & Survivor option |
| | 25% elect 100% Joint & Survivor option |

Remaining married and unmarried members are assumed to elect the Single Life option.

**Findings**

We reviewed the benefit elections of married new retirees and their beneficiaries during the six-year period. The results are shown on the following pages.

We found slightly more married new retirees are electing the 75% joint & survivor option for both males and females and slightly more married females are electing the 100% joint & survivor option.

**Recommendation**

*We recommend increasing the assumed percentage of males electing the 75% joint and survivor annuity from 10% to 15% and reducing the assumed percentage of males electing the single life annuity accordingly. Similarly, we recommend increasing the assumed percentage of females electing the 75% and 100% joint & survivor annuity from 0% to 10% and from 25% to 30%, respectively and reducing the assumed percentage of females electing the single life annuity accordingly.*

*Male Experience*

| Form of Payment | Actual Electing Annuity | Married New Retirees | Crude Rates | Sample Rates Old | Sample Rates New | Expected Electing Annuity Old | Expected Electing Annuity New | Ratio of Actuals/Expecteds Old | Ratio of Actuals/Expecteds New |
|---|---|---|---|---|---|---|---|---|---|
| Life annuity | 520 | 2,985 | 0.1742 | 0.2500 | 0.2000 | 746.25 | 597.00 | 69.7% | 87.1% |
| 15-year certain & life | 27 | 2,985 | 0.0090 | 0.0000 | 0.0000 | 0.00 | 0.00 | N/A | N/A |
| 50% joint & survivor | 382 | 2,985 | 0.1280 | 0.1500 | 0.1500 | 447.75 | 447.75 | 85.3% | 85.3% |
| 75% joint & survivor | 436 | 2,985 | 0.1461 | 0.1000 | 0.1500 | 298.50 | 447.75 | 146.1% | 97.4% |
| 100% joint & survivor | 1,620 | 2,985 | 0.5427 | 0.5000 | 0.5000 | 1,492.50 | 1,492.50 | 108.5% | 108.5% |
| **Total** | **2,985** | **2,985** | **1.0000** | **1.0000** | **1.0000** | **2,985.00** | **2,985.00** | | |

*Female Experience*

| Form of Payment | Actual Electing Annuity | Married New Retirees | Crude Rates | Sample Rates Old | Sample Rates New | Expected Electing Annuity Old | Expected Electing Annuity New | Ratio of Actuals/Expecteds Old | Ratio of Actuals/Expecteds New |
|---|---|---|---|---|---|---|---|---|---|
| Life annuity | 924 | 2,165 | 0.4268 | 0.6000 | 0.4500 | 1,299.00 | 974.25 | 71.1% | 94.8% |
| 15-year certain & life | 41 | 2,165 | 0.0189 | 0.0000 | 0.0000 | 0.00 | 0.00 | N/A | N/A |
| 50% joint & survivor | 353 | 2,165 | 0.1630 | 0.1500 | 0.1500 | 324.75 | 324.75 | 108.7% | 108.7% |
| 75% joint & survivor | 232 | 2,165 | 0.1072 | 0.0000 | 0.1000 | 0.00 | 216.50 | N/A | 107.2% |
| 100% joint & survivor | 615 | 2,165 | 0.2841 | 0.2500 | 0.3000 | 541.25 | 649.50 | 113.6% | 94.7% |
| **Total** | **2,165** | **2,165** | **1.0000** | **1.0000** | **1.0000** | **2,165.00** | **2,165.00** | | |

# ACTUARIAL EQUIVALENT OPTIONAL FORM FACTORS

Joint and Survivor benefits are actuarially equivalent to the Single-life annuity. Current actuarial equivalent factors are based on the RP-2000 mortality table for healthy annuitants, white collar adjustment, projected to 2025, blended 55% males, 6.5% post-retirement interest and 8.5% pre-retirement interest.

**Recommendation**

*We recommend the actuarial equivalent factors be updated to reflect changes in expected mortality, interest rate, and benefit increase assumption, as applicable.*

# PROPOSED MISCELLANEOUS AND TECHNICAL ASSUMPTIONS

## Background

A number of miscellaneous and technical assumptions are used in the actuarial valuation. The present assumptions are listed on the following page.

## Recommendation

*Miscellaneous and Technical Assumptions are listed on page I-7. We recommend that the Liability Adjustments related to Combined Service Annuities be reviewed and updated. This assumption has been unchanged since 2002. We recommend continued use of the other Miscellaneous and Technical Assumptions.*

| | |
|---|---|
| ***Benefit Service*** | Exact fractional service is used to determine the amount of benefit payable. |
| ***Decrement Operation*** | Withdrawal decrements do not operate during retirement eligibility. |
| ***Decrement Timing*** | Decrements of all types are assumed to occur mid-year. |
| ***Eligibility Testing*** | Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur. |
| ***Forfeitures*** | For vested separations from service, it is assumed that members separating will withdraw their contributions and forfeit an employer financed benefit when the value of member contributions is greater than the value of the employer financed benefit. |
| ***Incidence of Contributions*** | Contributions are assumed to be received on a monthly basis, per the Standards of Actuarial Work. |
| ***Liability Adjustments*** | Liabilities for active members are increased by 1.20% and liabilities for former members are increased by 40.00% to account for the effect of some participants having eligibility for a Combined Service Annuity. We are unable to judge the reasonableness of this assumption without additional data and without performing a substantial amount of additional work beyond the scope of this assignment. |
| ***Pay Increase Timing*** | Pay increases were assumed to be at the beginning of the fiscal year. This is equivalent to assuming that reported pays represent amounts paid to members during the year ended on the valuation date. |
| ***Service Credit Accruals*** | Members were assumed to accrue one year of service credit per year. |

# SECTION J

## PROPOSED ASSUMPTION LISTING

# PROPOSED ACTUARIAL ASSUMPTIONS
# BASED ON 2008-2014 EXPERIENCE STUDY

## MERIT AND SENIORITY PAY INCREASES

| % Merit & Seniority Increases in Salaries Next Year | |
|---|---|
| **Year** | **Rate** |
| 1 | 10.50% |
| 2 | 8.00% |
| 3 | 2.75% |
| 4 | 2.00% |
| 5 | 1.75% |
| 6 | 1.65% |
| 7 | 1.50% |
| 8 | 1.25% |
| 9 | 1.00% |
| 10 | 0.75% |
| 11 | 0.70% |
| 12 | 0.65% |
| 13 | 0.60% |
| 14 | 0.55% |
| 15 | 0.50% |
| 16 | 0.45% |
| 17 | 0.40% |
| 18 | 0.35% |
| 19 | 0.30% |
| 20 | 0.25% |
| 21 | 0.20% |
| 22 | 0.15% |
| 23 | 0.10% |
| 24 | 0.05% |
| 25 | 0.00% |
| 26 | 0.00% |
| 27 | 0.00% |
| 28 | 0.00% |
| 29 | 0.00% |
| 30 | 0.00% |
| 31+ | 0.00% |

# AGE & SERVICE RETIREMENT PATTERN
## UNREDUCED (NORMAL) RETIREMENT

| Age | % Retiring |
|---|---|
| 65 | 35.0% |
| 66 | 30.0% |
| 67 | 25.0% |
| 68 | 25.0% |
| 69 | 22.0% |
| 70 | 30.0% |
| 71+* | 100.0% |

** The current assumption prescribed by the Minnesota Standards for Actuarial Work is that members who have reached 100% retirement eligibility will delay retirement one year.*

# RULE OF 90 RETIREMENT PATTERN

| Age | % Retiring |
|---|---|
| 55 | 15.0% |
| 56 | 15.0% |
| 57 | 12.5% |
| 58 | 12.5% |
| 59 | 15.0% |
| 60 | 15.0% |
| 61 | 20.0% |
| 62 | 30.0% |
| 63 | 25.0% |
| 64 | 25.0% |

# AGE & SERVICE RETIREMENT PATTERN
# TIER 1 REDUCED (EARLY) RETIREMENT

| Age | % Retiring |
|---|---|
| 55 | 4.0% |
| 56 | 4.0% |
| 57 | 4.0% |
| 58 | 4.0% |
| 59 | 6.0% |
| 60 | 8.0% |
| 61 | 10.0% |
| 62 | 20.0% |
| 63 | 18.0% |
| 64 | 18.0% |

# AGE & SERVICE RETIREMENT PATTERN
# TIER 2 REDUCED (EARLY) RETIREMENT

| Age | % Retiring |
|---|---|
| 55 | 4.0% |
| 56 | 4.0% |
| 57 | 4.0% |
| 58 | 4.0% |
| 59 | 5.0% |
| 60 | 5.0% |
| 61 | 10.0% |
| 62 | 15.0% |
| 63 | 15.0% |
| 64 | 15.0% |
| 65 | 20.0% |

# WITHDRAWAL

| Year | % Withdrawals | |
|---|---|---|
| | Male | Female |
| 1 | 0.2000 | 0.2400 |
| 2 | 0.1500 | 0.1800 |
| 3 | 0.1100 | 0.1300 |
| 4 | 0.0850 | 0.1100 |
| 5 | 0.0775 | 0.0900 |
| 6 | 0.0650 | 0.0850 |
| 7 | 0.0575 | 0.0750 |
| 8 | 0.0500 | 0.0575 |
| 9 | 0.0400 | 0.0500 |
| 10 | 0.0325 | 0.0450 |
| 11 | 0.0300 | 0.0400 |
| 12 | 0.0275 | 0.0400 |
| 13 | 0.0250 | 0.0300 |
| 14 | 0.0250 | 0.0275 |
| 15 | 0.0250 | 0.0250 |
| 16 | 0.0200 | 0.0225 |
| 17 | 0.0200 | 0.0225 |
| 18 | 0.0200 | 0.0225 |
| 19 | 0.0200 | 0.0225 |
| 20 | 0.0150 | 0.0225 |
| 21 | 0.0150 | 0.0200 |
| 22 | 0.0150 | 0.0200 |
| 23 | 0.0100 | 0.0150 |
| 24 | 0.0100 | 0.0150 |
| 25 | 0.0100 | 0.0150 |
| 26 | 0.0100 | 0.0150 |
| 27 | 0.0100 | 0.0125 |
| 28 | 0.0100 | 0.0125 |
| 29 | 0.0100 | 0.0125 |
| 30+ | 0.0100 | 0.0100 |

# DISABILITY RATES

| Age | % Becoming Disabled | |
|---|---|---|
| | Male | Female |
| 20 | 0.00% | 0.00% |
| 21 | 0.00% | 0.00% |
| 22 | 0.00% | 0.00% |
| 23 | 0.00% | 0.00% |
| 24 | 0.00% | 0.00% |
| 25 | 0.01% | 0.01% |
| 26 | 0.01% | 0.01% |
| 27 | 0.01% | 0.01% |
| 28 | 0.01% | 0.01% |
| 29 | 0.01% | 0.01% |
| 30 | 0.01% | 0.01% |
| 31 | 0.01% | 0.01% |
| 32 | 0.01% | 0.01% |
| 33 | 0.01% | 0.01% |
| 34 | 0.02% | 0.02% |
| 35 | 0.02% | 0.02% |
| 36 | 0.03% | 0.03% |
| 37 | 0.04% | 0.04% |
| 38 | 0.05% | 0.05% |
| 39 | 0.05% | 0.05% |
| 40 | 0.06% | 0.06% |
| 41 | 0.07% | 0.07% |
| 42 | 0.08% | 0.08% |
| 43 | 0.08% | 0.08% |
| 44 | 0.09% | 0.09% |
| 45 | 0.11% | 0.11% |
| 46 | 0.13% | 0.13% |
| 47 | 0.15% | 0.15% |
| 48 | 0.17% | 0.17% |
| 49 | 0.19% | 0.19% |
| 50 | 0.22% | 0.22% |
| 51 | 0.24% | 0.24% |
| 52 | 0.27% | 0.27% |
| 53 | 0.29% | 0.29% |
| 54 | 0.31% | 0.31% |
| 55 | 0.32% | 0.32% |
| 56 | 0.34% | 0.34% |
| 57 | 0.36% | 0.36% |
| 58 | 0.40% | 0.40% |
| 59 | 0.43% | 0.43% |
| 60 | 0.47% | 0.47% |
| 61 | 0.50% | 0.50% |
| 62 | 0.54% | 0.54% |
| 63 | 0.58% | 0.58% |
| 64 | 0.61% | 0.61% |

# HEALTHY POST-RETIREMENT MORTALITY RATES

| Age | % Dying Next Year* | |
|---|---|---|
| | Male | Female |
| 50 | 0.3413% | 0.2142% |
| 51 | 0.3623% | 0.2231% |
| 52 | 0.3830% | 0.2333% |
| 53 | 0.4051% | 0.2451% |
| 54 | 0.4239% | 0.2589% |
| 55 | 0.4456% | 0.2749% |
| 56 | 0.4705% | 0.2937% |
| 57 | 0.4991% | 0.3157% |
| 58 | 0.5319% | 0.3415% |
| 59 | 0.5693% | 0.3713% |
| 60 | 0.6123% | 0.4052% |
| 61 | 0.6622% | 0.4580% |
| 62 | 0.7202% | 0.5136% |
| 63 | 0.7878% | 0.5722% |
| 64 | 0.8665% | 0.6340% |
| 65 | 0.9578% | 0.6998% |
| 66 | 1.0629% | 0.7709% |
| 67 | 1.1833% | 0.8482% |
| 68 | 1.3198% | 0.9336% |
| 69 | 1.4732% | 1.0283% |
| 70 | 1.6448% | 1.1338% |
| 71 | 1.8363% | 1.2512% |
| 72 | 2.0493% | 1.3825% |
| 73 | 2.2876% | 1.5295% |
| 74 | 2.5546% | 1.6945% |
| 75 | 2.8546% | 1.8804% |
| 76 | 3.1945% | 2.0905% |
| 77 | 3.5799% | 2.3278% |
| 78 | 4.0193% | 2.5969% |
| 79 | 4.5205% | 2.9019% |
| 80 | 5.0937% | 3.2485% |

| Age | % Dying Next Year* | |
|---|---|---|
| | Male | Female |
| 81 | 5.7483% | 3.6432% |
| 82 | 6.4946% | 4.0928% |
| 83 | 7.3409% | 4.6048% |
| 84 | 8.2975% | 5.1897% |
| 85 | 9.3767% | 5.8550% |
| 86 | 10.5885% | 6.6120% |
| 87 | 11.9449% | 7.4712% |
| 88 | 13.4623% | 8.4402% |
| 89 | 15.0937% | 9.5303% |
| 90 | 16.8062% | 10.7584% |
| 91 | 18.5861% | 12.1057% |
| 92 | 20.4197% | 13.5608% |
| 93 | 22.3119% | 15.1140% |
| 94 | 24.2797% | 16.7637% |
| 95 | 26.3234% | 18.5044% |
| 96 | 28.4533% | 20.3296% |
| 97 | 30.6450% | 22.2484% |
| 98 | 32.6592% | 24.2632% |
| 99 | 34.6837% | 26.3662% |
| 100 | 36.6897% | 28.3940% |
| 101 | 38.6496% | 30.4138% |
| 102 | 40.5468% | 32.4406% |
| 103 | 42.3753% | 34.4664% |
| 104 | 44.1234% | 36.4558% |
| 105 | 45.7681% | 38.4134% |
| 106 | 47.3151% | 40.3081% |
| 107 | 48.7553% | 42.1251% |
| 108 | 50.0859% | 43.8604% |
| 109 | 50.5287% | 45.5000% |
| 110 | 50.3920% | 47.0361% |

** The rates shown are RP-2014 mortality for healthy annuitants, with adjustments, if applicable (see Section G). Recommended rates include adjustments for white collar and mortality improvements using projection scale MP-2014.*

# DISABLED POST-RETIREMENT MORTALITY RATES

| Age | % Dying Next Year* | |
|---|---|---|
| | Male | Female |
| 20 | 0.0993% | 0.0735% |
| 21 | 0.1326% | 0.0941% |
| 22 | 0.1720% | 0.1165% |
| 23 | 0.2170% | 0.1410% |
| 24 | 0.2670% | 0.1673% |
| 25 | 0.3210% | 0.1960% |
| 26 | 0.3787% | 0.2273% |
| 27 | 0.4405% | 0.2611% |
| 28 | 0.5062% | 0.2979% |
| 29 | 0.5757% | 0.3378% |
| 30 | 0.6488% | 0.3810% |
| 31 | 0.7256% | 0.4273% |
| 32 | 0.8032% | 0.4771% |
| 33 | 0.8850% | 0.5297% |
| 34 | 0.9711% | 0.5848% |
| 35 | 1.0614% | 0.6421% |
| 36 | 1.1559% | 0.7005% |
| 37 | 1.2536% | 0.7576% |
| 38 | 1.3534% | 0.8145% |
| 39 | 1.4503% | 0.8711% |
| 40 | 1.5470% | 0.9269% |
| 41 | 1.6422% | 0.9814% |
| 42 | 1.7346% | 1.0345% |
| 43 | 1.8237% | 1.0867% |
| 44 | 1.9087% | 1.1354% |
| 45 | 1.9884% | 1.1823% |
| 46 | 2.0628% | 1.2285% |
| 47 | 2.1316% | 1.2749% |
| 48 | 2.1941% | 1.3209% |
| 49 | 2.2512% | 1.3675% |
| 50 | 2.3047% | 1.4154% |
| 51 | 2.3466% | 1.4653% |
| 52 | 2.3843% | 1.5182% |
| 53 | 2.4226% | 1.5746% |
| 54 | 2.4639% | 1.6351% |
| 55 | 2.5118% | 1.7004% |
| 56 | 2.5675% | 1.7703% |
| 57 | 2.6323% | 1.8463% |
| 58 | 2.7081% | 1.9285% |
| 59 | 2.7958% | 2.0184% |
| 60 | 2.8970% | 2.1180% |
| 61 | 3.0132% | 2.2291% |
| 62 | 3.1450% | 2.3538% |
| 63 | 3.2930% | 2.4941% |
| 64 | 3.4577% | 2.6526% |
| 65 | 3.6395% | 2.8305% |
| 66 | 3.8385% | 3.0298% |
| 67 | 4.0565% | 3.2512% |
| 68 | 4.2937% | 3.4965% |
| 69 | 4.5516% | 3.7674% |
| 70 | 4.8322% | 4.0648% |
| 71 | 5.1385% | 4.3909% |
| 72 | 5.4717% | 4.7478% |
| 73 | 5.8361% | 5.1365% |
| 74 | 6.2346% | 5.5601% |
| 75 | 6.6703% | 6.0195% |
| 76 | 7.1497% | 6.5182% |
| 77 | 7.6754% | 7.0591% |
| 78 | 8.2543% | 7.6441% |
| 79 | 8.8904% | 8.2755% |
| 80 | 9.5924% | 8.9590% |
| 81 | 10.3661% | 9.6938% |
| 82 | 11.2205% | 10.4843% |
| 83 | 12.1607% | 11.3336% |
| 84 | 13.1953% | 12.2395% |
| 85 | 14.3351% | 13.2057% |
| 86 | 15.5864% | 14.2418% |
| 87 | 16.9564% | 15.3852% |
| 88 | 18.4567% | 16.6287% |
| 89 | 19.9666% | 17.9605% |
| 90 | 21.4793% | 19.3760% |

** The rates shown are RP-2014 mortality for disabled annuitants, with adjustments, if applicable (see Section G). Recommended rates include mortality improvements using projection scale MP-2014.*

# HEALTHY PRE-RETIREMENT MORTALITY RATES

| Age | % Dying Next Year* | |
|---|---|---|
| | Male | Female |
| 20 | 0.0342% | 0.0149% |
| 21 | 0.0370% | 0.0148% |
| 22 | 0.0384% | 0.0147% |
| 23 | 0.0388% | 0.0149% |
| 24 | 0.0362% | 0.0152% |
| 25 | 0.0344% | 0.0154% |
| 26 | 0.0332% | 0.0157% |
| 27 | 0.0325% | 0.0162% |
| 28 | 0.0325% | 0.0167% |
| 29 | 0.0328% | 0.0174% |
| 30 | 0.0335% | 0.0183% |
| 31 | 0.0345% | 0.0193% |
| 32 | 0.0355% | 0.0204% |
| 33 | 0.0366% | 0.0217% |
| 34 | 0.0378% | 0.0230% |
| 35 | 0.0388% | 0.0243% |
| 36 | 0.0401% | 0.0258% |
| 37 | 0.0418% | 0.0277% |
| 38 | 0.0440% | 0.0299% |
| 39 | 0.0468% | 0.0325% |
| 40 | 0.0504% | 0.0355% |
| 41 | 0.0546% | 0.0390% |
| 42 | 0.0601% | 0.0431% |
| 43 | 0.0665% | 0.0478% |
| 44 | 0.0740% | 0.0532% |
| 45 | 0.0828% | 0.0592% |

| Age | % Dying Next Year* | |
|---|---|---|
| | Male | Female |
| 46 | 0.0925% | 0.0657% |
| 47 | 0.1031% | 0.0729% |
| 48 | 0.1147% | 0.0802% |
| 49 | 0.1272% | 0.0879% |
| 50 | 0.1405% | 0.0960% |
| 51 | 0.1549% | 0.1042% |
| 52 | 0.1696% | 0.1130% |
| 53 | 0.1854% | 0.1222% |
| 54 | 0.2027% | 0.1321% |
| 55 | 0.2221% | 0.1429% |
| 56 | 0.2444% | 0.1546% |
| 57 | 0.2701% | 0.1675% |
| 58 | 0.3000% | 0.1816% |
| 59 | 0.3347% | 0.1973% |
| 60 | 0.3748% | 0.2145% |
| 61 | 0.4210% | 0.2338% |
| 62 | 0.4741% | 0.2551% |
| 63 | 0.5346% | 0.2787% |
| 64 | 0.6033% | 0.3045% |
| 65 | 0.6802% | 0.3333% |
| 66 | 0.7667% | 0.3733% |
| 67 | 0.8636% | 0.4177% |
| 68 | 0.9723% | 0.4672% |
| 69 | 1.0939% | 0.5223% |
| 70 | 1.2298% | 0.5837% |

** The rates shown are RP-2014 mortality for employees, with adjustments, if applicable (see Section G). Recommended rates include adjustments for white collar and mortality improvements using projection scale MP-2014.*

# SECTION K

## GLOSSARY

# GLOSSARY

The following glossary is intended to provide definitions of a number of terms which are used throughout this report and which are somewhat unique to the discussion of an Experience Study.

**Actuarial Decrement.** The actual number of decrements which occurred during the study. This number is a straight tabulation of the actual number of occurrences of the particular decrement in question. Normally, the actual number of decrements will be subdivided by age and possibly sex.

**Aggregate Assumptions.** Assumptions which vary only by sex and/or age. The impact of year of service on the decrement is ignored. All experience is combined by age and/or sex without regard to service. Rates of death and disablement are more appropriate to aggregate measurement in a retirement system.

**Crude Rate of Decrement.** The rate of decrement determined by dividing the actual number of the respective decrement for that age and sex by the corresponding exposure for that age and sex. The rate is described as a crude rate because no smoothing or elimination of statistical fluctuations has been made. It is indicative of the underlying true rate of the decrement and is the basis used in graduation to obtain the graduated or tabular rate.

**Decrements.** The decrements are the means by which a member ceases to be a member. For active members, the decrements are death, withdrawal, service retirement, and disability retirement. For retired members, the only decrement is death. The purpose of the Experience Study is to determine the underlying rates of each decrement.

**Expected Decrement.** This is the number of occurrences of a given decrement expected to occur for a given age and sex based on the number of lives exposed to the risk of the particular decrement and the current assumed rate for that decrement. It may also be referred to as the tabular number of decrements. It is the number of deaths, withdrawals, retirements, or disabilities (whichever is applicable) that would have actually occurred had the actuarial assumptions been exactly realized.

**Exposure.** The number of lives exposed to a given risk of decrement for a particular age and sex. It represents the number of members who could have potentially died, retired, become disabled, or withdrawn at that particular age and for that particular sex. This term will also be described as "the number exposed to a given risk."

**Graduated Rates.** Graduation is the mathematical process by which a set of crude rates of a particular type is translated into graduated or tabular rates. The graduation process attempts to smooth out statistical fluctuations and to arrive at a set of rates that adequately fit the underlying actual experience of the crude rates that are being graduated. The graduation process involves smoothing the results, but at the same time trying to fit the results to be consistent with the original data. It requires that the actuary exercise his or her judgment in what the underlying shape of the risk curve should look like.

**Interpolated Rates.** For the active rates of decrement (death, disability, retirement, and withdrawal), the actuary will develop graduated rates based on quinquennial age groupings (see definition). To arrive at the rates of decrement for ages between two quinquennial ages, the graduated quinquennial rates must be interpolated for these intermediate ages. The interpolated results are arrived at by applying a mathematical interpolation formula to the quinquennial graduated rates.

**Merit and Seniority Pay Increase Rate.** The portion of the total salary scale which varies by service. It reflects the impact of moving up the salary grid in a given year, rather than the increase in the overall grid. It includes the salary increase associated with promotions during the year.

**Quinquennial Age Groupings.** For the active decrements, it is preferable to group the experience in five-year age groups for graduation and analysis purposes so as to minimize statistical fluctuations resulting from a lack of exposure which may occur for individual ages. Quinquennial age grouping is the five-year age grouping which is used to develop the graduated rates of decrement for active membership. The quinquennial age is the central age of the five-year grouping.

# SECTION L

## APPENDIX

# APPENDIX – DETAILED EXPERIENCE ANALYSIS

In this section, we present the annual experience for each major assumption that was analyzed for the study. Please note that totals may not sum correctly due to rounding of intermediate results.

# APPENDIX – DETAILED EXPERIENCE ANALYSIS
# SALARY INCREASES

**2008-2014 Experience**

| Year | Exposure | Gross Actual Increases | Gross Expected Increases |
|---|---|---|---|
| 1 | 1,547 | 13.00% | 10.50% |
| 2 | 15,892 | 10.11% | 8.10% |
| 3 | 15,722 | 4.05% | 6.90% |
| 4 | 14,428 | 3.46% | 6.20% |
| 5 | 13,403 | 3.36% | 5.70% |
| 6 | 12,053 | 3.37% | 5.30% |
| 7 | 10,673 | 3.41% | 5.00% |
| 8 | 9,518 | 3.14% | 4.70% |
| 9 | 9,128 | 3.03% | 4.50% |
| 10 | 8,792 | 2.54% | 4.40% |
| 11 | 8,646 | 2.45% | 4.20% |
| 12 | 8,577 | 2.44% | 4.10% |
| 13 | 8,009 | 2.37% | 4.00% |
| 14 | 7,217 | 2.31% | 3.80% |
| 15 | 6,413 | 2.34% | 3.70% |
| 16 | 5,720 | 2.36% | 3.60% |
| 17 | 5,098 | 2.31% | 3.50% |
| 18 | 4,588 | 1.99% | 3.50% |
| 19 | 4,843 | 2.29% | 3.50% |
| 20 | 4,944 | 1.85% | 3.50% |
| 21 | 5,008 | 1.90% | 3.50% |
| 22 | 5,001 | 1.82% | 3.50% |
| 23 | 4,990 | 1.88% | 3.50% |
| 24 | 4,992 | 1.84% | 3.50% |
| 25 | 4,754 | 1.97% | 3.50% |
| 26 | 4,423 | 1.64% | 3.50% |
| 27 | 4,015 | 1.85% | 3.50% |
| 28 | 3,724 | 1.71% | 3.50% |
| 29 | 3,694 | 1.71% | 3.50% |
| 30 | 3,696 | 1.81% | 3.50% |
| 31+ | 24,337 | 1.56% | 3.50% |
| **Totals** | **243,845** | **3.13%** | **4.69%** |

**2008-2009 Experience**

| Year | Exposure | Gross Actual Increases | Gross Expected Increases |
|---|---|---|---|
| 1 | 241 | 14.22% | 10.50% |
| 2 | 3,072 | 11.96% | 8.10% |
| 3 | 3,086 | 6.29% | 6.90% |
| 4 | 2,289 | 5.95% | 6.20% |
| 5 | 1,873 | 5.81% | 5.70% |
| 6 | 1,226 | 5.21% | 5.30% |
| 7 | 1,493 | 5.32% | 5.00% |
| 8 | 1,726 | 5.48% | 4.70% |
| 9 | 1,993 | 5.16% | 4.50% |
| 10 | 1,646 | 4.89% | 4.40% |
| 11 | 1,594 | 4.87% | 4.20% |
| 12 | 1,223 | 4.55% | 4.10% |
| 13 | 893 | 4.73% | 4.00% |
| 14 | 858 | 4.40% | 3.80% |
| 15 | 953 | 4.05% | 3.70% |
| 16 | 856 | 3.92% | 3.60% |
| 17 | 876 | 3.92% | 3.50% |
| 18 | 684 | 4.18% | 3.50% |
| 19 | 1,173 | 3.94% | 3.50% |
| 20 | 987 | 4.47% | 3.50% |
| 21 | 1,039 | 4.08% | 3.50% |
| 22 | 894 | 3.91% | 3.50% |
| 23 | 878 | 3.97% | 3.50% |
| 24 | 806 | 3.68% | 3.50% |
| 25 | 870 | 3.67% | 3.50% |
| 26 | 640 | 3.73% | 3.50% |
| 27 | 586 | 4.32% | 3.50% |
| 28 | 625 | 3.40% | 3.50% |
| 29 | 839 | 3.29% | 3.50% |
| 30 | 793 | 3.43% | 3.50% |
| 31+ | 3,990 | 3.42% | 3.50% |
| **Totals** | **40,702** | **5.25%** | **4.71%** |

**2009-2010 Experience**

| Year | Exposure | Gross Actual Increases | Gross Expected Increases |
|---|---|---|---|
| 1 | 227 | 13.87% | 10.50% |
| 2 | 3,009 | 8.47% | 8.10% |
| 3 | 3,425 | 1.93% | 6.90% |
| 4 | 2,876 | 1.15% | 6.20% |
| 5 | 2,183 | 1.10% | 5.70% |
| 6 | 1,778 | 1.51% | 5.30% |
| 7 | 1,154 | 1.15% | 5.00% |
| 8 | 1,433 | 0.90% | 4.70% |
| 9 | 1,660 | 0.89% | 4.50% |
| 10 | 1,923 | 0.83% | 4.40% |
| 11 | 1,592 | 0.76% | 4.20% |
| 12 | 1,548 | 1.02% | 4.10% |
| 13 | 1,188 | 0.76% | 4.00% |
| 14 | 872 | 0.55% | 3.80% |
| 15 | 852 | 0.45% | 3.70% |
| 16 | 917 | 0.77% | 3.60% |
| 17 | 822 | 0.80% | 3.50% |
| 18 | 839 | 0.29% | 3.50% |
| 19 | 656 | 0.63% | 3.50% |
| 20 | 1,138 | 0.14% | 3.50% |
| 21 | 938 | 0.23% | 3.50% |
| 22 | 983 | 0.30% | 3.50% |
| 23 | 853 | 0.42% | 3.50% |
| 24 | 838 | 0.29% | 3.50% |
| 25 | 761 | 0.45% | 3.50% |
| 26 | 831 | 0.30% | 3.50% |
| 27 | 610 | 0.27% | 3.50% |
| 28 | 549 | -0.06% | 3.50% |
| 29 | 593 | -0.02% | 3.50% |
| 30 | 790 | -0.03% | 3.50% |
| 31+ | 4,230 | 0.06% | 3.50% |
| **Totals** | **42,068** | **1.38%** | **4.76%** |

**2010-2011 Experience**

| Year | Exposure | Gross Actual Increases | Gross Expected Increases |
|---|---|---|---|
| 1 | 192 | 13.88% | 10.50% |
| 2 | 2,042 | 9.50% | 8.10% |
| 3 | 2,822 | 3.51% | 6.90% |
| 4 | 3,090 | 2.99% | 6.20% |
| 5 | 2,614 | 2.32% | 5.70% |
| 6 | 2,024 | 2.27% | 5.30% |
| 7 | 1,675 | 2.65% | 5.00% |
| 8 | 1,096 | 1.94% | 4.70% |
| 9 | 1,346 | 1.99% | 4.50% |
| 10 | 1,598 | 1.97% | 4.40% |
| 11 | 1,817 | 2.02% | 4.20% |
| 12 | 1,515 | 1.62% | 4.10% |
| 13 | 1,490 | 1.53% | 4.00% |
| 14 | 1,140 | 1.46% | 3.80% |
| 15 | 836 | 1.51% | 3.70% |
| 16 | 826 | 1.46% | 3.60% |
| 17 | 868 | 1.40% | 3.50% |
| 18 | 784 | 1.47% | 3.50% |
| 19 | 785 | 1.63% | 3.50% |
| 20 | 622 | 1.27% | 3.50% |
| 21 | 1,077 | 1.03% | 3.50% |
| 22 | 889 | 1.17% | 3.50% |
| 23 | 930 | 1.16% | 3.50% |
| 24 | 792 | 1.20% | 3.50% |
| 25 | 795 | 1.45% | 3.50% |
| 26 | 704 | 1.14% | 3.50% |
| 27 | 763 | 0.97% | 3.50% |
| 28 | 558 | 0.97% | 3.50% |
| 29 | 507 | 0.77% | 3.50% |
| 30 | 535 | 1.26% | 3.50% |
| 31+ | 4,176 | 1.31% | 3.50% |
| **Totals** | **40,908** | **2.33%** | **4.68%** |

**2011-2012 Experience**

| Year | Exposure | Gross Actual Increases | Gross Expected Increases |
|---|---|---|---|
| 1 | 204 | 11.37% | 10.50% |
| 2 | 2,021 | 8.73% | 8.10% |
| 3 | 2,053 | 3.33% | 6.90% |
| 4 | 2,538 | 2.65% | 6.20% |
| 5 | 2,788 | 2.40% | 5.70% |
| 6 | 2,384 | 2.97% | 5.30% |
| 7 | 1,855 | 2.41% | 5.00% |
| 8 | 1,569 | 1.88% | 4.70% |
| 9 | 1,039 | 2.53% | 4.50% |
| 10 | 1,276 | 1.82% | 4.40% |
| 11 | 1,500 | 1.65% | 4.20% |
| 12 | 1,727 | 1.71% | 4.10% |
| 13 | 1,458 | 1.76% | 4.00% |
| 14 | 1,414 | 1.58% | 3.80% |
| 15 | 1,088 | 1.54% | 3.70% |
| 16 | 790 | 0.80% | 3.60% |
| 17 | 785 | 1.40% | 3.50% |
| 18 | 833 | 0.98% | 3.50% |
| 19 | 743 | 0.90% | 3.50% |
| 20 | 737 | 0.52% | 3.50% |
| 21 | 583 | 0.57% | 3.50% |
| 22 | 1,024 | 0.57% | 3.50% |
| 23 | 833 | 0.84% | 3.50% |
| 24 | 873 | 0.35% | 3.50% |
| 25 | 762 | 0.74% | 3.50% |
| 26 | 747 | 0.16% | 3.50% |
| 27 | 667 | 0.65% | 3.50% |
| 28 | 712 | 0.74% | 3.50% |
| 29 | 512 | 0.51% | 3.50% |
| 30 | 483 | 1.48% | 3.50% |
| 31+ | 4,015 | 0.64% | 3.50% |
| **Totals** | **40,013** | **2.06%** | **4.63%** |

**2012-2013 Experience**

| Year | Exposure | Gross Actual Increases | Gross Expected Increases |
|---|---|---|---|
| 1 | 384 | 12.79% | 10.50% |
| 2 | 2,483 | 11.00% | 8.10% |
| 3 | 1,969 | 4.35% | 6.90% |
| 4 | 1,830 | 4.57% | 6.20% |
| 5 | 2,299 | 4.32% | 5.70% |
| 6 | 2,526 | 3.95% | 5.30% |
| 7 | 2,174 | 3.57% | 5.00% |
| 8 | 1,708 | 3.20% | 4.70% |
| 9 | 1,481 | 2.99% | 4.50% |
| 10 | 988 | 2.44% | 4.40% |
| 11 | 1,208 | 2.80% | 4.20% |
| 12 | 1,434 | 2.95% | 4.10% |
| 13 | 1,643 | 2.44% | 4.00% |
| 14 | 1,392 | 2.94% | 3.80% |
| 15 | 1,351 | 2.54% | 3.70% |
| 16 | 1,052 | 2.58% | 3.60% |
| 17 | 757 | 2.32% | 3.50% |
| 18 | 744 | 2.15% | 3.50% |
| 19 | 799 | 2.10% | 3.50% |
| 20 | 710 | 2.00% | 3.50% |
| 21 | 698 | 2.27% | 3.50% |
| 22 | 553 | 2.31% | 3.50% |
| 23 | 967 | 2.25% | 3.50% |
| 24 | 769 | 1.92% | 3.50% |
| 25 | 822 | 2.06% | 3.50% |
| 26 | 721 | 1.69% | 3.50% |
| 27 | 710 | 2.03% | 3.50% |
| 28 | 625 | 2.29% | 3.50% |
| 29 | 664 | 2.00% | 3.50% |
| 30 | 477 | 1.58% | 3.50% |
| 31+ | 4,004 | 1.51% | 3.50% |
| **Totals** | **39,942** | **3.45%** | **4.66%** |

**2013-2014 Experience**

| Year | Exposure | Gross Actual Increases | Gross Expected Increases |
|---|---|---|---|
| 1 | 299 | 12.18% | 10.50% |
| 2 | 3,265 | 10.47% | 8.10% |
| 3 | 2,367 | 5.23% | 6.90% |
| 4 | 1,805 | 4.77% | 6.20% |
| 5 | 1,646 | 5.46% | 5.70% |
| 6 | 2,115 | 4.69% | 5.30% |
| 7 | 2,322 | 4.53% | 5.00% |
| 8 | 1,986 | 4.34% | 4.70% |
| 9 | 1,609 | 3.84% | 4.50% |
| 10 | 1,361 | 3.56% | 4.40% |
| 11 | 935 | 2.90% | 4.20% |
| 12 | 1,130 | 3.71% | 4.10% |
| 13 | 1,337 | 3.74% | 4.00% |
| 14 | 1,541 | 2.88% | 3.80% |
| 15 | 1,333 | 3.31% | 3.70% |
| 16 | 1,279 | 3.80% | 3.60% |
| 17 | 990 | 3.67% | 3.50% |
| 18 | 704 | 3.51% | 3.50% |
| 19 | 687 | 3.51% | 3.50% |
| 20 | 750 | 2.62% | 3.50% |
| 21 | 673 | 3.02% | 3.50% |
| 22 | 658 | 3.70% | 3.50% |
| 23 | 529 | 2.95% | 3.50% |
| 24 | 914 | 3.58% | 3.50% |
| 25 | 744 | 3.25% | 3.50% |
| 26 | 780 | 3.18% | 3.50% |
| 27 | 679 | 3.09% | 3.50% |
| 28 | 655 | 2.74% | 3.50% |
| 29 | 579 | 2.72% | 3.50% |
| 30 | 618 | 2.98% | 3.50% |
| 31+ | 3,922 | 2.53% | 3.50% |
| **Totals** | **40,212** | **4.36%** | **4.72%** |

**2008-2014 Experience**

| Age | Actual Retirements | Exposure | Expected Retirements | Actual/ Expected |
|---|---|---|---|---|
| 55 | 75 | 596 | 119.20 | 62.9% |
| 56 | 129 | 1,070 | 160.50 | 80.4% |
| 57 | 157 | 1,607 | 241.05 | 65.1% |
| 58 | 210 | 2,005 | 300.75 | 69.8% |
| 59 | 288 | 2,272 | 454.40 | 63.4% |
| 60 | 327 | 2,374 | 474.80 | 68.9% |
| 61 | 378 | 2,359 | 518.98 | 72.8% |
| 62 | 607 | 2,182 | 872.80 | 69.5% |
| 63 | 387 | 1,637 | 491.10 | 78.8% |
| 64 | 283 | 1,293 | 387.90 | 73.0% |
| **Totals** | **2,841** | **17,395** | **4,021.48** | **70.6%** |

# APPENDIX – DETAILED EXPERIENCE ANALYSIS
# RULE OF 90 RETIREMENT

**2008-2009 Experience**

| Age | Actual Retirements | Exposure | Expected Retirements | Actual/ Expected |
|---|---|---|---|---|
| 55 | 12 | 85 | 17.00 | 70.6% |
| 56 | 17 | 196 | 29.40 | 57.8% |
| 57 | 20 | 256 | 38.40 | 52.1% |
| 58 | 18 | 283 | 42.45 | 42.4% |
| 59 | 31 | 337 | 67.40 | 46.0% |
| 60 | 36 | 347 | 69.40 | 51.9% |
| 61 | 55 | 349 | 76.78 | 71.6% |
| 62 | 77 | 288 | 115.20 | 66.8% |
| 63 | 39 | 189 | 56.70 | 68.8% |
| 64 | 35 | 139 | 41.70 | 83.9% |
| **Totals** | **340** | **2,469** | **554.43** | **61.3%** |

**2009-2010 Experience**

| Age | Actual Retirements | Exposure | Expected Retirements | Actual/ Expected |
|---|---|---|---|---|
| 55 | 14 | 109 | 21.80 | 64.2% |
| 56 | 18 | 162 | 24.30 | 74.1% |
| 57 | 34 | 299 | 44.85 | 75.8% |
| 58 | 28 | 341 | 51.15 | 54.7% |
| 59 | 36 | 355 | 71.00 | 50.7% |
| 60 | 46 | 388 | 77.60 | 59.3% |
| 61 | 57 | 365 | 80.30 | 71.0% |
| 62 | 96 | 336 | 134.40 | 71.4% |
| 63 | 48 | 234 | 70.20 | 68.4% |
| 64 | 34 | 162 | 48.60 | 70.0% |
| **Totals** | **411** | **2,751** | **624.20** | **65.8%** |

**2010-2011 Experience**

| Age | Actual Retirements | Exposure | Expected Retirements | Actual/ Expected |
|---|---|---|---|---|
| 55 | 16 | 121 | 24.20 | 66.1% |
| 56 | 32 | 187 | 28.05 | 114.1% |
| 57 | 30 | 247 | 37.05 | 81.0% |
| 58 | 55 | 359 | 53.85 | 102.1% |
| 59 | 82 | 413 | 82.60 | 99.3% |
| 60 | 89 | 408 | 81.60 | 109.1% |
| 61 | 92 | 408 | 89.76 | 102.5% |
| 62 | 127 | 349 | 139.60 | 91.0% |
| 63 | 85 | 270 | 81.00 | 104.9% |
| 64 | 67 | 209 | 62.70 | 106.9% |
| **Totals** | **675** | **2,971** | **680.41** | **99.2%** |

# APPENDIX – DETAILED EXPERIENCE ANALYSIS
# RULE OF 90 RETIREMENT

**2011-2012 Experience**

| Age | Actual Retirements | Exposure | Expected Retirements | Actual/ Expected |
|---|---|---|---|---|
| 55 | 16 | 104 | 20.80 | 76.9% |
| 56 | 14 | 180 | 27.00 | 51.9% |
| 57 | 26 | 247 | 37.05 | 70.2% |
| 58 | 44 | 333 | 49.95 | 88.1% |
| 59 | 44 | 399 | 79.80 | 55.1% |
| 60 | 58 | 404 | 80.80 | 71.8% |
| 61 | 89 | 356 | 78.32 | 113.6% |
| 62 | 115 | 350 | 140.00 | 82.1% |
| 63 | 85 | 268 | 80.40 | 105.7% |
| 64 | 67 | 221 | 66.30 | 101.1% |
| **Totals** | **558** | **2,862** | **660.42** | **84.5%** |

**2012-2013 Experience**

| Age | Actual Retirements | Exposure | Expected Retirements | Actual/ Expected |
|---|---|---|---|---|
| 55 | 6 | 86 | 17.20 | 34.9% |
| 56 | 23 | 175 | 26.25 | 87.6% |
| 57 | 23 | 297 | 44.55 | 51.6% |
| 58 | 29 | 336 | 50.40 | 57.5% |
| 59 | 51 | 389 | 77.80 | 65.6% |
| 60 | 47 | 407 | 81.40 | 57.7% |
| 61 | 39 | 445 | 97.90 | 39.8% |
| 62 | 87 | 385 | 154.00 | 56.5% |
| 63 | 52 | 308 | 92.40 | 56.3% |
| 64 | 45 | 274 | 82.20 | 54.7% |
| **Totals** | **402** | **3,102** | **724.10** | **55.5%** |

**2013-2014 Experience**

| Age | Actual Retirements | Exposure | Expected Retirements | Actual/ Expected |
|---|---|---|---|---|
| 55 | 11 | 91 | 18.20 | 60.4% |
| 56 | 25 | 170 | 25.50 | 98.0% |
| 57 | 24 | 261 | 39.15 | 61.3% |
| 58 | 36 | 353 | 52.95 | 68.0% |
| 59 | 44 | 379 | 75.80 | 58.0% |
| 60 | 51 | 420 | 84.00 | 60.7% |
| 61 | 46 | 436 | 95.92 | 48.0% |
| 62 | 105 | 474 | 189.60 | 55.4% |
| 63 | 78 | 368 | 110.40 | 70.7% |
| 64 | 35 | 288 | 86.40 | 40.5% |
| **Totals** | **455** | **3,240** | **777.92** | **58.5%** |

# APPENDIX – DETAILED EXPERIENCE ANALYSIS
# NON-RULE OF 90 RETIREMENT

**2008-2014 Experience**

| Age | Actual Retirements | Exposure | Expected Retirements | Actual/ Expected |
|---|---|---|---|---|
| 55 | 284 | 9,018 | 450.90 | 63.0% |
| 56 | 299 | 8,559 | 427.95 | 69.9% |
| 57 | 282 | 7,899 | 394.95 | 71.4% |
| 58 | 266 | 7,201 | 360.05 | 73.9% |
| 59 | 301 | 6,455 | 387.30 | 77.7% |
| 60 | 310 | 5,701 | 399.07 | 77.7% |
| 61 | 403 | 4,992 | 599.04 | 67.3% |
| 62 | 630 | 4,183 | 920.26 | 68.5% |
| 63 | 430 | 3,081 | 492.96 | 87.2% |
| 64 | 330 | 2,260 | 406.80 | 81.1% |
| 65 | 715 | 2,675 | 1,070.00 | 66.8% |
| 66 | 543 | 1,943 | 582.90 | 93.2% |
| 67 | 287 | 1,261 | 315.25 | 91.0% |
| 68 | 175 | 816 | 204.00 | 85.8% |
| 69 | 121 | 596 | 149.00 | 81.2% |
| 70 | 101 | 427 | 128.10 | 78.8% |
| **Totals** | **5,477** | **67,067** | **7,288.53** | **75.1%** |

# APPENDIX – DETAILED EXPERIENCE ANALYSIS
# NON-RULE OF 90 RETIREMENT

**2008-2009 Experience**

| Age | Actual Retirements | Exposure | Expected Retirements | Actual/ Expected |
|---|---|---|---|---|
| 55 | 51 | 1,522 | 76.10 | 67.0% |
| 56 | 53 | 1,443 | 72.15 | 73.5% |
| 57 | 46 | 1,325 | 66.25 | 69.4% |
| 58 | 37 | 1,131 | 56.55 | 65.4% |
| 59 | 37 | 1,032 | 61.92 | 59.8% |
| 60 | 46 | 837 | 58.59 | 78.5% |
| 61 | 60 | 758 | 90.96 | 66.0% |
| 62 | 77 | 512 | 112.64 | 68.4% |
| 63 | 34 | 329 | 52.64 | 64.6% |
| 64 | 31 | 243 | 43.74 | 70.9% |
| 65 | 89 | 332 | 132.80 | 67.0% |
| 66 | 57 | 225 | 67.50 | 84.4% |
| 67 | 28 | 142 | 35.50 | 78.9% |
| 68 | 16 | 99 | 24.75 | 64.6% |
| 69 | 7 | 74 | 18.50 | 37.8% |
| 70 | 11 | 59 | 17.70 | 62.1% |
| **Totals** | **680** | **10,063** | **988.29** | **68.8%** |

**2009-2010 Experience**

| Age | Actual Retirements | Exposure | Expected Retirements | Actual/ Expected |
|---|---|---|---|---|
| 55 | 46 | 1,501 | 75.05 | 61.3% |
| 56 | 40 | 1,417 | 70.85 | 56.5% |
| 57 | 48 | 1,292 | 64.60 | 74.3% |
| 58 | 48 | 1,216 | 60.80 | 78.9% |
| 59 | 44 | 1,024 | 61.44 | 71.6% |
| 60 | 56 | 949 | 66.43 | 84.3% |
| 61 | 58 | 755 | 90.60 | 64.0% |
| 62 | 100 | 673 | 148.06 | 67.5% |
| 63 | 56 | 426 | 68.16 | 82.2% |
| 64 | 43 | 291 | 52.38 | 82.1% |
| 65 | 99 | 335 | 134.00 | 73.9% |
| 66 | 65 | 266 | 79.80 | 81.5% |
| 67 | 31 | 169 | 42.25 | 73.4% |
| 68 | 22 | 113 | 28.25 | 77.9% |
| 69 | 21 | 85 | 21.25 | 98.8% |
| 70 | 20 | 67 | 20.10 | 99.5% |
| **Totals** | **797** | **10,579** | **1,084.02** | **73.5%** |

# APPENDIX – DETAILED EXPERIENCE ANALYSIS
# NON-RULE OF 90 RETIREMENT

**2010-2011 Experience**

| Age | Actual Retirements | Exposure | Expected Retirements | Actual/ Expected |
|---|---|---|---|---|
| 55 | 44 | 1,547 | 77.35 | 56.9% |
| 56 | 56 | 1,407 | 70.35 | 79.6% |
| 57 | 45 | 1,324 | 66.20 | 68.0% |
| 58 | 56 | 1,196 | 59.80 | 93.6% |
| 59 | 70 | 1,109 | 66.54 | 105.2% |
| 60 | 45 | 908 | 63.56 | 70.8% |
| 61 | 106 | 836 | 100.32 | 105.7% |
| 62 | 140 | 661 | 145.42 | 96.3% |
| 63 | 95 | 559 | 89.44 | 106.2% |
| 64 | 61 | 351 | 63.18 | 96.5% |
| 65 | 134 | 383 | 153.20 | 87.5% |
| 66 | 79 | 250 | 75.00 | 105.3% |
| 67 | 60 | 203 | 50.75 | 118.2% |
| 68 | 32 | 133 | 33.25 | 96.2% |
| 69 | 26 | 93 | 23.25 | 111.8% |
| 70 | 13 | 59 | 17.70 | 73.4% |
| **Totals** | **1,062** | **11,019** | **1,155.31** | **91.9%** |

**2011-2012 Experience**

| Age | Actual Retirements | Exposure | Expected Retirements | Actual/ Expected |
|---|---|---|---|---|
| 55 | 51 | 1,520 | 76.00 | 67.1% |
| 56 | 50 | 1,484 | 74.20 | 67.4% |
| 57 | 45 | 1,288 | 64.40 | 69.9% |
| 58 | 51 | 1,203 | 60.15 | 84.8% |
| 59 | 60 | 1,068 | 64.08 | 93.6% |
| 60 | 58 | 988 | 69.16 | 83.9% |
| 61 | 74 | 849 | 101.88 | 72.6% |
| 62 | 112 | 714 | 157.08 | 71.3% |
| 63 | 83 | 486 | 77.76 | 106.7% |
| 64 | 81 | 435 | 78.30 | 103.4% |
| 65 | 140 | 442 | 176.80 | 79.2% |
| 66 | 93 | 265 | 79.50 | 117.0% |
| 67 | 40 | 176 | 44.00 | 90.9% |
| 68 | 40 | 144 | 36.00 | 111.1% |
| 69 | 28 | 102 | 25.50 | 109.8% |
| 70 | 24 | 67 | 20.10 | 119.4% |
| **Totals** | **1,030** | **11,231** | **1,204.91** | **85.5%** |

# APPENDIX – DETAILED EXPERIENCE ANALYSIS
# NON-RULE OF 90 RETIREMENT

**2012-2013 Experience**

| Age | Actual Retirements | Exposure | Expected Retirements | Actual/ Expected |
|---|---|---|---|---|
| 55 | 37 | 1,509 | 75.45 | 49.0% |
| 56 | 50 | 1,437 | 71.85 | 69.6% |
| 57 | 53 | 1,392 | 69.60 | 76.1% |
| 58 | 37 | 1,204 | 60.20 | 61.5% |
| 59 | 34 | 1,128 | 67.68 | 50.2% |
| 60 | 47 | 1,007 | 70.49 | 66.7% |
| 61 | 55 | 915 | 109.80 | 50.1% |
| 62 | 104 | 837 | 184.14 | 56.5% |
| 63 | 76 | 619 | 99.04 | 76.7% |
| 64 | 42 | 433 | 77.94 | 53.9% |
| 65 | 134 | 572 | 228.80 | 58.6% |
| 66 | 115 | 471 | 141.30 | 81.4% |
| 67 | 47 | 213 | 53.25 | 88.3% |
| 68 | 31 | 164 | 41.00 | 75.6% |
| 69 | 23 | 112 | 28.00 | 82.1% |
| 70 | 14 | 88 | 26.40 | 53.0% |
| **Totals** | **899** | **12,101** | **1,404.94** | **64.0%** |

**2013-2014 Experience**

| Age | Actual Retirements | Exposure | Expected Retirements | Actual/ Expected |
|---|---|---|---|---|
| 55 | 55 | 1,419 | 70.95 | 77.5% |
| 56 | 50 | 1,371 | 68.55 | 72.9% |
| 57 | 45 | 1,278 | 63.90 | 70.4% |
| 58 | 37 | 1,251 | 62.55 | 59.2% |
| 59 | 56 | 1,094 | 65.64 | 85.3% |
| 60 | 58 | 1,012 | 70.84 | 81.9% |
| 61 | 50 | 879 | 105.48 | 47.4% |
| 62 | 97 | 786 | 172.92 | 56.1% |
| 63 | 86 | 662 | 105.92 | 81.2% |
| 64 | 72 | 507 | 91.26 | 78.9% |
| 65 | 119 | 611 | 244.40 | 48.7% |
| 66 | 134 | 466 | 139.80 | 95.9% |
| 67 | 81 | 358 | 89.50 | 90.5% |
| 68 | 34 | 163 | 40.75 | 83.4% |
| 69 | 16 | 130 | 32.50 | 49.2% |
| 70 | 19 | 87 | 26.10 | 72.8% |
| **Totals** | **1,009** | **12,074** | **1,451.06** | **69.5%** |

# APPENDIX – DETAILED EXPERIENCE ANALYSIS
# TERMINATIONS, SERVICE <3 YEARS

**2008-2014 Experience**

| Males | | | | | Females | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Year | Actual Terminations | Exposure | Expected Terminations | Actual/ Expected | Year | Actual Terminations | Exposure | Expected Terminations | Actual/ Expected |
| 1 | 1,118 | 4,873 | 2,192.85 | 51.0% | 1 | 1,798 | 6,926 | 3,324.48 | 54.1% |
| 2 | 1,707 | 10,524 | 1,473.36 | 115.9% | 2 | 2,765 | 14,107 | 2,116.05 | 130.7% |
| 3 | 1,012 | 8,260 | 743.40 | 136.1% | 3 | 1,632 | 11,071 | 1,107.10 | 147.4% |
| **Totals** | **3,837** | **23,657** | **4,409.61** | **87.0%** | **Totals** | **6,195** | **32,104** | **6,547.63** | **94.6%** |

# APPENDIX – DETAILED EXPERIENCE ANALYSIS
# TERMINATIONS, SERVICE <3 YEARS

**2008-2009 Experience**

| Males | | | | | Females | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Year | Actual Terminations | Exposure | Expected Terminations | Actual/ Expected | Year | Actual Terminations | Exposure | Expected Terminations | Actual/ Expected |
| 1 | 218 | 844 | 379.80 | 57.4% | 1 | 378 | 1,345 | 645.60 | 58.6% |
| 2 | 323 | 2,050 | 287.00 | 112.5% | 2 | 524 | 2,903 | 435.45 | 120.3% |
| 3 | 139 | 1,405 | 126.45 | 109.9% | 3 | 322 | 2,317 | 231.70 | 139.0% |
| **Totals** | **680** | **4,299** | **793.25** | **85.7%** | **Totals** | **1,224** | **6,565** | **1,312.75** | **93.2%** |

**2009-2010 Experience**

| Males | | | | | Females | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Year | Actual Terminations | Exposure | Expected Terminations | Actual/ Expected | Year | Actual Terminations | Exposure | Expected Terminations | Actual/ Expected |
| 1 | 158 | 763 | 343.35 | 46.0% | 1 | 252 | 922 | 442.56 | 56.9% |
| 2 | 251 | 1,802 | 252.28 | 99.5% | 2 | 442 | 2,531 | 379.65 | 116.4% |
| 3 | 178 | 1,674 | 150.66 | 118.1% | 3 | 281 | 2,309 | 230.90 | 121.7% |
| **Totals** | **587** | **4,239** | **746.29** | **78.7%** | **Totals** | **975** | **5,762** | **1,053.11** | **92.6%** |

**2010-2011 Experience**

| Males | | | | | Females | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Year | Actual Terminations | Exposure | Expected Terminations | Actual/ Expected | Year | Actual Terminations | Exposure | Expected Terminations | Actual/ Expected |
| 1 | 153 | 656 | 295.20 | 51.8% | 1 | 221 | 829 | 397.92 | 55.5% |
| 2 | 232 | 1,510 | 211.40 | 109.7% | 2 | 347 | 1,808 | 271.20 | 127.9% |
| 3 | 155 | 1,496 | 134.64 | 115.1% | 3 | 310 | 2,039 | 203.90 | 152.0% |
| **Totals** | **540** | **3,662** | **641.24** | **84.2%** | **Totals** | **878** | **4,676** | **873.02** | **100.6%** |

# APPENDIX – DETAILED EXPERIENCE ANALYSIS
# TERMINATIONS, SERVICE <3 YEARS

**2011-2012 Experience**

| Males | | | | | Females | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Year | Actual Terminations | Exposure | Expected Terminations | Actual/ Expected | Year | Actual Terminations | Exposure | Expected Terminations | Actual/ Expected |
| 1 | 172 | 692 | 311.40 | 55.2% | 1 | 268 | 999 | 479.52 | 55.9% |
| 2 | 246 | 1,439 | 201.46 | 122.1% | 2 | 437 | 1,941 | 291.15 | 150.1% |
| 3 | 175 | 1,253 | 112.77 | 155.2% | 3 | 230 | 1,441 | 144.10 | 159.6% |
| **Totals** | **593** | **3,384** | **625.63** | **94.8%** | **Totals** | **935** | **4,381** | **914.77** | **102.2%** |

**2012-2013 Experience**

| Males | | | | | Females | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Year | Actual Terminations | Exposure | Expected Terminations | Actual/ Expected | Year | Actual Terminations | Exposure | Expected Terminations | Actual/ Expected |
| 1 | 183 | 909 | 409.05 | 44.7% | 1 | 348 | 1,416 | 679.68 | 51.2% |
| 2 | 304 | 1,667 | 233.38 | 130.3% | 2 | 452 | 2,131 | 319.65 | 141.4% |
| 3 | 161 | 1,081 | 97.29 | 165.5% | 3 | 227 | 1,358 | 135.80 | 167.2% |
| **Totals** | **648** | **3,657** | **739.72** | **87.6%** | **Totals** | **1,027** | **4,905** | **1,135.13** | **90.5%** |

**2013-2014 Experience**

| Males | | | | | Females | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Year | Actual Terminations | Exposure | Expected Terminations | Actual/ Expected | Year | Actual Terminations | Exposure | Expected Terminations | Actual/ Expected |
| 1 | 234 | 1,009 | 454.05 | 51.5% | 1 | 331 | 1,415 | 679.20 | 48.7% |
| 2 | 351 | 2,056 | 287.84 | 121.9% | 2 | 563 | 2,793 | 418.95 | 134.4% |
| 3 | 204 | 1,351 | 121.59 | 167.8% | 3 | 262 | 1,607 | 160.70 | 163.0% |
| **Totals** | **789** | **4,416** | **863.48** | **91.4%** | **Totals** | **1,156** | **5,815** | **1,258.85** | **91.8%** |

# APPENDIX – DETAILED EXPERIENCE ANALYSIS
# TERMINATIONS, SERVICE >3 YEARS

**2008-2014 Experience**

| Males | | | | | Females | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Age Group** | **Actual Terminations** | **Exposure** | **Expected Terminations** | **Actual/ Expected** | **Age Group** | **Actual Terminations** | **Exposure** | **Expected Terminations** | **Actual/ Expected** |
| Under 20 | - | - | - | N/A | Under 20 | - | - | - | N/A |
| 20-24 | 26 | 216 | 13.43 | 193.5% | 20-24 | 50 | 369 | 29.74 | 168.1% |
| 25-29 | 414 | 3,728 | 200.24 | 206.8% | 25-29 | 738 | 5,666 | 420.52 | 175.5% |
| 30-34 | 572 | 7,463 | 334.11 | 171.2% | 30-34 | 1,017 | 10,152 | 684.58 | 148.6% |
| 35-39 | 502 | 8,479 | 301.01 | 166.8% | 35-39 | 713 | 10,816 | 516.27 | 138.1% |
| 40-44 | 433 | 10,864 | 324.70 | 133.4% | 40-44 | 684 | 13,662 | 561.94 | 121.7% |
| 45-49 | 406 | 15,015 | 373.46 | 108.7% | 45-49 | 735 | 19,020 | 659.19 | 111.5% |
| 50-54 | 411 | 19,714 | 392.66 | 104.7% | 50-54 | 739 | 24,665 | 675.87 | 109.3% |
| **Totals** | **2,764** | **65,479** | **1,939.60** | **142.5%** | **Totals** | **4,676** | **84,350** | **3,548.12** | **131.8%** |

# APPENDIX – DETAILED EXPERIENCE ANALYSIS
# TERMINATIONS, SERVICE >3 YEARS

**2008-2009 Experience**

| Males | | | | | Females | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Age Group | Actual Terminations | Exposure | Expected Terminations | Actual/ Expected | Age Group | Actual Terminations | Exposure | Expected Terminations | Actual/ Expected |
| Under 20 | - | - | - | N/A | Under 20 | - | - | - | N/A |
| 20-24 | 4 | 40 | 2.49 | 160.4% | 20-24 | 13 | 75 | 6.06 | 214.5% |
| 25-29 | 63 | 607 | 32.64 | 193.0% | 25-29 | 93 | 870 | 64.65 | 143.9% |
| 30-34 | 69 | 1,020 | 45.64 | 151.2% | 30-34 | 145 | 1,421 | 95.89 | 151.2% |
| 35-39 | 72 | 1,341 | 47.30 | 152.2% | 35-39 | 106 | 1,701 | 80.89 | 131.0% |
| 40-44 | 66 | 1,859 | 55.43 | 119.1% | 40-44 | 93 | 2,330 | 95.57 | 97.3% |
| 45-49 | 68 | 2,689 | 67.01 | 101.5% | 45-49 | 132 | 3,516 | 121.89 | 108.3% |
| 50-54 | 65 | 3,515 | 70.07 | 92.8% | 50-54 | 114 | 4,247 | 116.54 | 97.8% |
| **Totals** | **407** | **11,071** | **320.56** | **127.0%** | **Totals** | **696** | **14,160** | **581.50** | **119.7%** |

**2009-2010 Experience**

| Males | | | | | Females | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Age Group | Actual Terminations | Exposure | Expected Terminations | Actual/ Expected | Age Group | Actual Terminations | Exposure | Expected Terminations | Actual/ Expected |
| Under 20 | - | - | - | N/A | Under 20 | - | - | - | N/A |
| 20-24 | 2 | 42 | 2.62 | 76.5% | 20-24 | 4 | 87 | 7.01 | 57.1% |
| 25-29 | 44 | 635 | 34.23 | 128.6% | 25-29 | 109 | 998 | 74.15 | 147.0% |
| 30-34 | 48 | 1,136 | 51.00 | 94.1% | 30-34 | 113 | 1,568 | 105.85 | 106.8% |
| 35-39 | 60 | 1,329 | 47.05 | 127.5% | 35-39 | 84 | 1,703 | 81.10 | 103.6% |
| 40-44 | 49 | 1,816 | 54.33 | 90.2% | 40-44 | 92 | 2,328 | 95.78 | 96.1% |
| 45-49 | 66 | 2,652 | 66.09 | 99.9% | 45-49 | 122 | 3,428 | 118.96 | 102.6% |
| 50-54 | 64 | 3,433 | 68.30 | 93.7% | 50-54 | 100 | 4,264 | 116.98 | 85.5% |
| **Totals** | **333** | **11,043** | **323.60** | **102.9%** | **Totals** | **624** | **14,376** | **599.83** | **104.0%** |

# APPENDIX – DETAILED EXPERIENCE ANALYSIS
# TERMINATIONS, SERVICE >3 YEARS

**2010-2011 Experience**

| Males | | | | | Females | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Age Group | Actual Terminations | Exposure | Expected Terminations | Actual/ Expected | Age Group | Actual Terminations | Exposure | Expected Terminations | Actual/ Expected |
| Under 20 | - | - | - | N/A | Under 20 | - | - | - | N/A |
| 20-24 | 9 | 55 | 3.41 | 264.3% | 20-24 | 12 | 90 | 7.27 | 165.1% |
| 25-29 | 88 | 699 | 37.63 | 233.9% | 25-29 | 139 | 1,138 | 84.61 | 164.3% |
| 30-34 | 75 | 1,261 | 56.76 | 132.1% | 30-34 | 142 | 1,753 | 118.33 | 120.0% |
| 35-39 | 69 | 1,408 | 50.12 | 137.7% | 35-39 | 104 | 1,775 | 84.79 | 122.7% |
| 40-44 | 56 | 1,817 | 54.53 | 102.7% | 40-44 | 103 | 2,393 | 98.64 | 104.4% |
| 45-49 | 49 | 2,668 | 66.43 | 73.8% | 45-49 | 114 | 3,312 | 114.86 | 99.3% |
| 50-54 | 55 | 3,306 | 65.74 | 83.7% | 50-54 | 112 | 4,251 | 116.66 | 96.0% |
| **Totals** | **401** | **11,214** | **334.62** | **119.8%** | **Totals** | **726** | **14,712** | **625.16** | **116.1%** |

**2011-2012 Experience, Service >3 Years**

| Males | | | | | Females | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Age Group | Actual Terminations | Exposure | Expected Terminations | Actual/ Expected | Age Group | Actual Terminations | Exposure | Expected Terminations | Actual/ Expected |
| Under 20 | - | - | - | N/A | Under 20 | - | - | - | N/A |
| 20-24 | 6 | 39 | 2.44 | 245.8% | 20-24 | 11 | 69 | 5.55 | 198.2% |
| 25-29 | 91 | 732 | 39.44 | 230.7% | 25-29 | 144 | 1,102 | 81.87 | 175.9% |
| 30-34 | 115 | 1,382 | 61.97 | 185.6% | 30-34 | 221 | 1,886 | 127.23 | 173.7% |
| 35-39 | 79 | 1,434 | 50.98 | 155.0% | 35-39 | 124 | 1,863 | 89.02 | 139.3% |
| 40-44 | 69 | 1,868 | 55.92 | 123.4% | 40-44 | 128 | 2,337 | 96.25 | 133.0% |
| 45-49 | 72 | 2,549 | 63.20 | 113.9% | 45-49 | 104 | 3,196 | 110.70 | 93.9% |
| 50-54 | 63 | 3,248 | 64.57 | 97.6% | 50-54 | 117 | 4,168 | 114.26 | 102.4% |
| **Totals** | **495** | **11,252** | **338.53** | **146.2%** | **Totals** | **849** | **14,621** | **624.88** | **135.9%** |

# APPENDIX – DETAILED EXPERIENCE ANALYSIS
# TERMINATIONS, SERVICE >3 YEARS

**2012-2013 Experience**

| | Males | | | | Females | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Age Group | Actual Terminations | Exposure | Expected Terminations | Actual/ Expected | Age Group | Actual Terminations | Exposure | Expected Terminations | Actual/ Expected |
| Under 20 | - | - | - | N/A | Under 20 | - | - | - | N/A |
| 20-24 | 2 | 20 | 1.25 | 160.5% | 20-24 | 7 | 34 | 2.73 | 256.7% |
| 25-29 | 55 | 555 | 29.70 | 185.2% | 25-29 | 140 | 836 | 61.83 | 226.4% |
| 30-34 | 117 | 1,370 | 61.10 | 191.5% | 30-34 | 203 | 1,794 | 120.81 | 168.0% |
| 35-39 | 95 | 1,439 | 51.13 | 185.8% | 35-39 | 144 | 1,878 | 89.82 | 160.3% |
| 40-44 | 90 | 1,797 | 53.62 | 167.9% | 40-44 | 134 | 2,198 | 90.43 | 148.2% |
| 45-49 | 76 | 2,290 | 56.82 | 133.8% | 45-49 | 141 | 2,879 | 99.65 | 141.5% |
| 50-54 | 74 | 3,159 | 63.06 | 117.4% | 50-54 | 144 | 3,966 | 108.51 | 132.7% |
| **Totals** | **509** | **10,630** | **316.67** | **160.7%** | **Totals** | **913** | **13,585** | **573.79** | **159.1%** |

**2013-2014 Experience**

| | Males | | | | Females | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Age Group | Actual Terminations | Exposure | Expected Terminations | Actual/ Expected | Age Group | Actual Terminations | Exposure | Expected Terminations | Actual/ Expected |
| Under 20 | - | - | - | N/A | Under 20 | - | - | - | N/A |
| 20-24 | 3 | 20 | 1.23 | 243.5% | 20-24 | 3 | 14 | 1.13 | 266.7% |
| 25-29 | 73 | 500 | 26.61 | 274.3% | 25-29 | 113 | 722 | 53.41 | 211.6% |
| 30-34 | 148 | 1,294 | 57.64 | 256.8% | 30-34 | 193 | 1,730 | 116.46 | 165.7% |
| 35-39 | 127 | 1,528 | 54.44 | 233.3% | 35-39 | 151 | 1,896 | 90.65 | 166.6% |
| 40-44 | 103 | 1,707 | 50.87 | 202.5% | 40-44 | 134 | 2,076 | 85.26 | 157.2% |
| 45-49 | 75 | 2,167 | 53.92 | 139.1% | 45-49 | 122 | 2,689 | 93.13 | 131.0% |
| 50-54 | 90 | 3,053 | 60.92 | 147.7% | 50-54 | 152 | 3,769 | 102.93 | 147.7% |
| **Totals** | **619** | **10,269** | **305.63** | **202.5%** | **Totals** | **868** | **12,896** | **542.97** | **159.9%** |

# APPENDIX – DETAILED EXPERIENCE ANALYSIS
# DISABILITY RETIREMENTS

**2008-2014 Experience**

| Males | | | | | Females | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Age Group** | **Actual Disabilities** | **Exposure** | **Expected Disabilities** | **Actual/ Expected** | **Age Group** | **Actual Disabilities** | **Exposure** | **Expected Disabilities** | **Actual/ Expected** |
| Under 20 | - | - | - | N/A | Under 20 | - | - | - | N/A |
| 20-24 | - | 2,251 | 0.23 | 0.0% | 20-24 | - | 3,596 | 0.36 | 0.0% |
| 25-29 | - | 8,811 | 0.88 | 0.0% | 25-29 | - | 13,163 | 1.32 | 0.0% |
| 30-34 | 1 | 11,224 | 1.35 | 74.2% | 30-34 | 2 | 15,246 | 1.82 | 109.9% |
| 35-39 | 1 | 11,227 | 5.66 | 17.7% | 35-39 | 2 | 14,392 | 7.24 | 27.6% |
| 40-44 | 8 | 13,482 | 13.60 | 58.8% | 40-44 | 7 | 17,166 | 17.32 | 40.4% |
| 45-49 | 23 | 17,477 | 28.67 | 80.2% | 45-49 | 31 | 22,252 | 36.62 | 84.6% |
| 50-54 | 51 | 21,945 | 81.20 | 62.8% | 50-54 | 62 | 27,543 | 97.58 | 63.5% |
| 55-59 | 97 | 23,765 | 143.99 | 67.4% | 55-59 | 86 | 26,714 | 131.19 | 65.6% |
| 60-64 | 53 | 16,044 | 140.76 | 37.7% | 60-64 | 62 | 15,876 | 111.23 | 55.7% |
| **Totals** | **234** | **126,226** | **416.34** | **56.2%** | **Totals** | **252** | **155,948** | **404.67** | **62.3%** |

# APPENDIX – DETAILED EXPERIENCE ANALYSIS
# DISABILITY RETIREMENTS

**2008-2009 Experience**

| Males | | | | | Females | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Age Group | Actual Disabilities | Exposure | Expected Disabilities | Actual/ Expected | Age Group | Actual Disabilities | Exposure | Expected Disabilities | Actual/ Expected |
| Under 20 | - | - | - | N/A | Under 20 | - | - | - | N/A |
| 20-24 | - | 484 | 0.05 | 0.0% | 20-24 | - | 845 | 0.08 | 0.0% |
| 25-29 | - | 1,528 | 0.15 | 0.0% | 25-29 | - | 2,397 | 0.24 | 0.0% |
| 30-34 | - | 1,621 | 0.20 | 0.0% | 30-34 | 1 | 2,360 | 0.28 | 356.6% |
| 35-39 | - | 1,876 | 0.97 | 0.0% | 35-39 | - | 2,467 | 1.27 | 0.0% |
| 40-44 | 1 | 2,321 | 2.36 | 42.4% | 40-44 | 2 | 3,051 | 3.10 | 64.4% |
| 45-49 | 9 | 3,160 | 5.15 | 174.7% | 45-49 | 11 | 4,236 | 6.96 | 158.1% |
| 50-54 | 9 | 3,890 | 14.37 | 62.6% | 50-54 | 10 | 4,816 | 17.02 | 58.8% |
| 55-59 | 22 | 4,053 | 24.49 | 89.8% | 55-59 | 13 | 4,229 | 20.68 | 62.9% |
| 60-64 | 5 | 2,248 | 19.49 | 25.6% | 60-64 | 10 | 2,041 | 14.18 | 70.5% |
| **Totals** | **46** | **21,181** | **67.22** | **68.4%** | **Totals** | **47** | **26,442** | **63.82** | **73.6%** |

**2009-2010 Experience**

| Males | | | | | Females | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Age Group | Actual Disabilities | Exposure | Expected Disabilities | Actual/ Expected | Age Group | Actual Disabilities | Exposure | Expected Disabilities | Actual/ Expected |
| Under 20 | - | - | - | N/A | Under 20 | - | - | - | N/A |
| 20-24 | - | 464 | 0.05 | 0.0% | 20-24 | - | 715 | 0.07 | 0.0% |
| 25-29 | - | 1,524 | 0.15 | 0.0% | 25-29 | - | 2,315 | 0.23 | 0.0% |
| 30-34 | 1 | 1,747 | 0.21 | 476.6% | 30-34 | - | 2,426 | 0.29 | 0.0% |
| 35-39 | - | 1,849 | 0.95 | 0.0% | 35-39 | - | 2,403 | 1.23 | 0.0% |
| 40-44 | 1 | 2,284 | 2.30 | 43.5% | 40-44 | 2 | 2,955 | 2.98 | 67.1% |
| 45-49 | 7 | 3,130 | 5.10 | 137.3% | 45-49 | 6 | 4,046 | 6.64 | 90.3% |
| 50-54 | 9 | 3,832 | 14.21 | 63.3% | 50-54 | 12 | 4,786 | 16.91 | 71.0% |
| 55-59 | 12 | 4,006 | 24.29 | 49.4% | 55-59 | 18 | 4,345 | 21.27 | 84.6% |
| 60-64 | 12 | 2,513 | 21.90 | 54.8% | 60-64 | 14 | 2,345 | 16.34 | 85.7% |
| **Totals** | **42** | **21,349** | **69.15** | **60.7%** | **Totals** | **52** | **26,336** | **65.97** | **78.8%** |

# APPENDIX – DETAILED EXPERIENCE ANALYSIS
# DISABILITY RETIREMENTS

**2010-2011 Experience**

| Males | | | | | Females | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Age Group | Actual Disabilities | Exposure | Expected Disabilities | Actual/ Expected | Age Group | Actual Disabilities | Exposure | Expected Disabilities | Actual/ Expected |
| Under 20 | - | - | - | N/A | Under 20 | - | - | - | N/A |
| 20-24 | - | 380 | 0.04 | 0.0% | 20-24 | - | 607 | 0.06 | 0.0% |
| 25-29 | - | 1,486 | 0.15 | 0.0% | 25-29 | - | 2,192 | 0.22 | 0.0% |
| 30-34 | - | 1,835 | 0.22 | 0.0% | 30-34 | 1 | 2,485 | 0.29 | 340.5% |
| 35-39 | - | 1,806 | 0.91 | 0.0% | 35-39 | - | 2,293 | 1.15 | 0.0% |
| 40-44 | 4 | 2,224 | 2.22 | 180.4% | 40-44 | 1 | 2,877 | 2.88 | 34.7% |
| 45-49 | 1 | 3,074 | 5.03 | 19.9% | 45-49 | 3 | 3,806 | 6.25 | 48.0% |
| 50-54 | 4 | 3,661 | 13.59 | 29.4% | 50-54 | 11 | 4,693 | 16.60 | 66.3% |
| 55-59 | 20 | 4,026 | 24.40 | 82.0% | 55-59 | 14 | 4,427 | 21.76 | 64.3% |
| 60-64 | 12 | 2,716 | 23.82 | 50.4% | 60-64 | 8 | 2,517 | 17.63 | 45.4% |
| **Totals** | **41** | **21,208** | **70.37** | **58.3%** | **Totals** | **38** | **25,897** | **66.84** | **56.9%** |

**2011-2012 Experience**

| Males | | | | | Females | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Age Group | Actual Disabilities | Exposure | Expected Disabilities | Actual/ Expected | Age Group | Actual Disabilities | Exposure | Expected Disabilities | Actual/ Expected |
| Under 20 | - | - | - | N/A | Under 20 | - | - | - | N/A |
| 20-24 | - | 347 | 0.03 | 0.0% | 20-24 | - | 545 | 0.05 | 0.0% |
| 25-29 | - | 1,484 | 0.15 | 0.0% | 25-29 | - | 2,139 | 0.21 | 0.0% |
| 30-34 | - | 1,894 | 0.23 | 0.0% | 30-34 | - | 2,539 | 0.30 | 0.0% |
| 35-39 | 1 | 1,798 | 0.90 | 110.9% | 35-39 | 2 | 2,288 | 1.14 | 174.9% |
| 40-44 | - | 2,250 | 2.26 | 0.0% | 40-44 | - | 2,847 | 2.85 | 0.0% |
| 45-49 | 4 | 2,891 | 4.78 | 83.7% | 45-49 | 5 | 3,604 | 5.93 | 84.3% |
| 50-54 | 11 | 3,587 | 13.33 | 82.5% | 50-54 | 12 | 4,559 | 16.16 | 74.3% |
| 55-59 | 17 | 3,910 | 23.69 | 71.7% | 55-59 | 17 | 4,461 | 21.89 | 77.7% |
| 60-64 | 6 | 2,645 | 23.23 | 25.8% | 60-64 | 9 | 2,705 | 18.95 | 47.5% |
| **Totals** | **39** | **20,806** | **68.60** | **56.8%** | **Totals** | **45** | **25,687** | **67.49** | **66.7%** |

# APPENDIX – DETAILED EXPERIENCE ANALYSIS
# DISABILITY RETIREMENTS

**2012-2013 Experience**

| Males | | | | | Females | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Age Group | Actual Disabilities | Exposure | Expected Disabilities | Actual/ Expected | Age Group | Actual Disabilities | Exposure | Expected Disabilities | Actual/ Expected |
| Under 20 | - | - | - | N/A | Under 20 | - | - | - | N/A |
| 20-24 | - | 284 | 0.03 | 0.0% | 20-24 | - | 421 | 0.04 | 0.0% |
| 25-29 | - | 1,344 | 0.13 | 0.0% | 25-29 | - | 2,031 | 0.20 | 0.0% |
| 30-34 | - | 2,029 | 0.25 | 0.0% | 30-34 | - | 2,666 | 0.32 | 0.0% |
| 35-39 | - | 1,852 | 0.92 | 0.0% | 35-39 | - | 2,370 | 1.17 | 0.0% |
| 40-44 | 1 | 2,226 | 2.25 | 44.4% | 40-44 | 1 | 2,768 | 2.80 | 35.8% |
| 45-49 | - | 2,619 | 4.34 | 0.0% | 45-49 | 2 | 3,339 | 5.52 | 36.2% |
| 50-54 | 12 | 3,517 | 12.97 | 92.5% | 50-54 | 9 | 4,407 | 15.66 | 57.5% |
| 55-59 | 12 | 3,890 | 23.57 | 50.9% | 55-59 | 10 | 4,621 | 22.74 | 44.0% |
| 60-64 | 13 | 2,909 | 25.64 | 50.7% | 60-64 | 10 | 3,000 | 21.09 | 47.4% |
| **Totals** | **38** | **20,670** | **70.10** | **54.2%** | **Totals** | **32** | **25,623** | **69.55** | **46.0%** |

**2013-2014 Experience**

| Males | | | | | Females | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Age Group | Actual Disabilities | Exposure | Expected Disabilities | Actual/ Expected | Age Group | Actual Disabilities | Exposure | Expected Disabilities | Actual/ Expected |
| Under 20 | - | - | - | N/A | Under 20 | - | - | - | N/A |
| 20-24 | - | 292 | 0.03 | 0.0% | 20-24 | - | 463 | 0.05 | 0.0% |
| 25-29 | - | 1,445 | 0.14 | 0.0% | 25-29 | - | 2,089 | 0.21 | 0.0% |
| 30-34 | - | 2,098 | 0.26 | 0.0% | 30-34 | - | 2,770 | 0.33 | 0.0% |
| 35-39 | - | 2,046 | 1.01 | 0.0% | 35-39 | - | 2,571 | 1.27 | 0.0% |
| 40-44 | 1 | 2,177 | 2.21 | 45.2% | 40-44 | 1 | 2,668 | 2.71 | 36.9% |
| 45-49 | 2 | 2,603 | 4.28 | 46.8% | 45-49 | 4 | 3,221 | 5.32 | 75.2% |
| 50-54 | 6 | 3,458 | 12.74 | 47.1% | 50-54 | 8 | 4,282 | 15.23 | 52.5% |
| 55-59 | 14 | 3,880 | 23.55 | 59.5% | 55-59 | 14 | 4,631 | 22.85 | 61.3% |
| 60-64 | 5 | 3,013 | 26.68 | 18.7% | 60-64 | 11 | 3,268 | 23.04 | 47.7% |
| **Totals** | **28** | **21,012** | **70.90** | **39.5%** | **Totals** | **38** | **25,963** | **71.00** | **53.5%** |

**2008-2014 Experience**

| | Males | | | | | Females | | | |
|---|---|---|---|---|---|---|---|---|---|
| Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected | Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected |
| 55-59 | 30 | 2,949 | 14.04 | 213.7% | 55-59 | 27 | 3,919 | 16.92 | 159.6% |
| 60-64 | 125 | 12,719 | 93.81 | 133.2% | 60-64 | 65 | 12,863 | 85.51 | 76.0% |
| 65-69 | 218 | 18,382 | 225.09 | 96.9% | 65-69 | 158 | 18,072 | 191.59 | 82.5% |
| 70-74 | 295 | 14,278 | 285.79 | 103.2% | 70-74 | 159 | 13,716 | 238.30 | 66.7% |
| 75-79 | 358 | 10,642 | 388.25 | 92.2% | 75-79 | 210 | 9,311 | 268.44 | 78.2% |
| 80-84 | 509 | 7,358 | 497.23 | 102.4% | 80-84 | 303 | 7,288 | 360.16 | 84.1% |
| 85-89 | 475 | 4,311 | 511.71 | 92.8% | 85-89 | 428 | 5,046 | 436.81 | 98.0% |
| 90-94 | 280 | 1,513 | 294.36 | 95.1% | 90-94 | 351 | 2,447 | 347.65 | 101.0% |
| 95-99 | 96 | 325 | 90.70 | 105.8% | 95-99 | 189 | 772 | 155.75 | 121.3% |
| 100+ | 17 | 33 | 11.74 | 144.8% | 100+ | 46 | 132 | 33.26 | 138.3% |
| **Totals** | **2,403** | **72,510** | **2,412.72** | **99.6%** | **Totals** | **1,936** | **73,566** | **2,134.39** | **90.7%** |

# APPENDIX – DETAILED EXPERIENCE ANALYSIS
# POST-RETIREMENT MORTALITY

**2008-2009 Experience**

| | Males | | | | Females | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected | Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected |
| 55-59 | 10 | 608 | 3.00 | 333.3% | 55-59 | 8 | 672 | 2.92 | 274.0% |
| 60-64 | 20 | 1,929 | 14.38 | 139.1% | 60-64 | 13 | 1,818 | 12.05 | 107.9% |
| 65-69 | 27 | 2,559 | 32.40 | 83.3% | 65-69 | 21 | 2,393 | 25.74 | 81.6% |
| 70-74 | 44 | 2,104 | 44.10 | 99.8% | 70-74 | 30 | 1,900 | 33.51 | 89.5% |
| 75-79 | 58 | 1,637 | 61.34 | 94.6% | 75-79 | 35 | 1,381 | 41.07 | 85.2% |
| 80-84 | 73 | 1,197 | 82.84 | 88.1% | 80-84 | 41 | 1,203 | 60.30 | 68.0% |
| 85-89 | 64 | 636 | 76.44 | 83.7% | 85-89 | 69 | 783 | 68.62 | 100.6% |
| 90-94 | 34 | 218 | 42.50 | 80.0% | 90-94 | 69 | 398 | 57.39 | 120.2% |
| 95-99 | 9 | 46 | 12.82 | 70.2% | 95-99 | 23 | 109 | 21.90 | 105.0% |
| 100+ | 3 | 8 | 2.87 | 104.5% | 100+ | 10 | 22 | 5.56 | 179.9% |
| **Totals** | **342** | **10,942** | **372.69** | **91.8%** | **Totals** | **319** | **10,679** | **329.06** | **96.9%** |

**2009-2010 Experience**

| | Males | | | | Females | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected | Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected |
| 55-59 | 7 | 519 | 2.53 | 276.7% | 55-59 | 4 | 646 | 2.81 | 142.3% |
| 60-64 | 24 | 1,999 | 14.83 | 161.8% | 60-64 | 9 | 1,899 | 12.61 | 71.4% |
| 65-69 | 48 | 2,677 | 33.55 | 143.1% | 65-69 | 21 | 2,568 | 27.55 | 76.2% |
| 70-74 | 47 | 2,179 | 44.90 | 104.7% | 70-74 | 20 | 2,019 | 35.48 | 56.4% |
| 75-79 | 72 | 1,701 | 63.14 | 114.0% | 75-79 | 35 | 1,410 | 41.43 | 84.5% |
| 80-84 | 86 | 1,209 | 83.46 | 103.0% | 80-84 | 62 | 1,228 | 61.32 | 101.1% |
| 85-89 | 80 | 683 | 82.28 | 97.2% | 85-89 | 82 | 814 | 71.09 | 115.3% |
| 90-94 | 51 | 235 | 46.47 | 109.7% | 90-94 | 65 | 383 | 54.74 | 118.7% |
| 95-99 | 10 | 49 | 13.77 | 72.6% | 95-99 | 35 | 129 | 25.88 | 135.2% |
| 100+ | 7 | 7 | 2.55 | 274.5% | 100+ | 6 | 17 | 4.27 | 140.5% |
| **Totals** | **432** | **11,258** | **387.48** | **111.5%** | **Totals** | **339** | **11,113** | **337.18** | **100.5%** |

# APPENDIX – DETAILED EXPERIENCE ANALYSIS
# POST-RETIREMENT MORTALITY

**2010-2011 Experience**

| | Males | | | | | Females | | | |
|---|---|---|---|---|---|---|---|---|---|
| Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected | Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected |
| 55-59 | 5 | 472 | 2.27 | 220.3% | 55-59 | 3 | 635 | 2.75 | 109.1% |
| 60-64 | 20 | 2,108 | 15.78 | 126.7% | 60-64 | 10 | 2,091 | 14.01 | 71.4% |
| 65-69 | 31 | 2,830 | 35.48 | 87.4% | 65-69 | 22 | 2,741 | 29.46 | 74.7% |
| 70-74 | 57 | 2,200 | 44.74 | 127.4% | 70-74 | 29 | 2,175 | 38.22 | 75.9% |
| 75-79 | 59 | 1,758 | 64.53 | 91.4% | 75-79 | 38 | 1,459 | 42.63 | 89.1% |
| 80-84 | 82 | 1,209 | 82.73 | 99.1% | 80-84 | 54 | 1,199 | 59.70 | 90.5% |
| 85-89 | 84 | 717 | 85.61 | 98.1% | 85-89 | 79 | 833 | 72.43 | 109.1% |
| 90-94 | 55 | 241 | 47.51 | 115.8% | 90-94 | 58 | 380 | 54.05 | 107.3% |
| 95-99 | 24 | 54 | 15.22 | 157.7% | 95-99 | 32 | 128 | 25.64 | 124.8% |
| 100+ | 1 | 3 | 1.02 | 98.0% | 100+ | 3 | 23 | 5.69 | 52.7% |
| **Totals** | **418** | **11,592** | **394.89** | **105.9%** | **Totals** | **328** | **11,664** | **344.58** | **95.2%** |

**2011-2012 Experience**

| | Males | | | | | Females | | | |
|---|---|---|---|---|---|---|---|---|---|
| Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected | Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected |
| 55-59 | 3 | 454 | 2.14 | 140.2% | 55-59 | 3 | 685 | 2.97 | 101.0% |
| 60-64 | 24 | 2,310 | 17.02 | 141.0% | 60-64 | 13 | 2,267 | 15.17 | 85.7% |
| 65-69 | 42 | 3,139 | 38.47 | 109.2% | 65-69 | 31 | 3,054 | 32.49 | 95.4% |
| 70-74 | 56 | 2,371 | 47.32 | 118.3% | 70-74 | 23 | 2,323 | 40.42 | 56.9% |
| 75-79 | 49 | 1,789 | 65.22 | 75.1% | 75-79 | 22 | 1,543 | 44.15 | 49.8% |
| 80-84 | 96 | 1,205 | 81.04 | 118.5% | 80-84 | 49 | 1,226 | 60.42 | 81.1% |
| 85-89 | 93 | 750 | 88.07 | 105.6% | 85-89 | 65 | 841 | 72.59 | 89.5% |
| 90-94 | 42 | 252 | 48.63 | 86.4% | 90-94 | 59 | 411 | 58.06 | 101.6% |
| 95-99 | 15 | 57 | 15.87 | 94.5% | 95-99 | 25 | 126 | 25.64 | 97.5% |
| 100+ | - | 2 | 0.72 | 0.0% | 100+ | 8 | 25 | 6.35 | 126.0% |
| **Totals** | **420** | **12,329** | **404.50** | **103.8%** | **Totals** | **298** | **12,501** | **358.26** | **83.2%** |

# APPENDIX – DETAILED EXPERIENCE ANALYSIS
# POST-RETIREMENT MORTALITY

**2012-2013 Experience**

| | Males | | | | | Females | | | |
|---|---|---|---|---|---|---|---|---|---|
| Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected | Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected |
| 55-59 | 2 | 432 | 1.98 | 101.0% | 55-59 | 6 | 656 | 2.81 | 213.5% |
| 60-64 | 26 | 2,298 | 16.75 | 155.2% | 60-64 | 16 | 2,401 | 15.89 | 100.7% |
| 65-69 | 32 | 3,450 | 41.30 | 77.5% | 65-69 | 37 | 3,480 | 36.41 | 101.6% |
| 70-74 | 45 | 2,598 | 50.67 | 88.8% | 70-74 | 37 | 2,556 | 43.91 | 84.3% |
| 75-79 | 66 | 1,846 | 66.32 | 99.5% | 75-79 | 36 | 1,683 | 47.55 | 75.7% |
| 80-84 | 82 | 1,245 | 82.38 | 99.5% | 80-84 | 52 | 1,222 | 59.74 | 87.0% |
| 85-89 | 72 | 748 | 87.69 | 82.1% | 85-89 | 65 | 872 | 74.74 | 87.0% |
| 90-94 | 58 | 280 | 53.77 | 107.9% | 90-94 | 48 | 426 | 60.21 | 79.7% |
| 95-99 | 18 | 61 | 16.88 | 106.6% | 95-99 | 45 | 142 | 28.97 | 155.3% |
| 100+ | 3 | 6 | 2.10 | 142.9% | 100+ | 10 | 21 | 5.46 | 183.2% |
| **Totals** | **404** | **12,964** | **419.84** | **96.2%** | **Totals** | **352** | **13,459** | **375.69** | **93.7%** |

**2013-2014 Experience**

| | Males | | | | | Females | | | |
|---|---|---|---|---|---|---|---|---|---|
| Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected | Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected |
| 55-59 | 3 | 464 | 2.11 | 142.2% | 55-59 | 3 | 625 | 2.66 | 112.8% |
| 60-64 | 11 | 2,075 | 15.05 | 73.1% | 60-64 | 4 | 2,387 | 15.78 | 25.3% |
| 65-69 | 38 | 3,727 | 43.88 | 86.6% | 65-69 | 26 | 3,836 | 39.94 | 65.1% |
| 70-74 | 46 | 2,826 | 54.05 | 85.1% | 70-74 | 20 | 2,743 | 46.76 | 42.8% |
| 75-79 | 54 | 1,911 | 67.70 | 79.8% | 75-79 | 44 | 1,835 | 51.60 | 85.3% |
| 80-84 | 90 | 1,293 | 84.78 | 106.2% | 80-84 | 45 | 1,210 | 58.69 | 76.7% |
| 85-89 | 82 | 777 | 91.63 | 89.5% | 85-89 | 68 | 903 | 77.35 | 87.9% |
| 90-94 | 40 | 287 | 55.48 | 72.1% | 90-94 | 52 | 449 | 63.21 | 82.3% |
| 95-99 | 20 | 58 | 16.14 | 123.9% | 95-99 | 29 | 138 | 27.72 | 104.6% |
| 100+ | 3 | 7 | 2.48 | 121.0% | 100+ | 9 | 24 | 5.93 | 151.8% |
| **Totals** | **387** | **13,425** | **433.30** | **89.3%** | **Totals** | **300** | **14,150** | **389.64** | **77.0%** |

# APPENDIX – DETAILED EXPERIENCE ANALYSIS
# DISABLED MORTALITY

**2008-2014 Experience**

| Males | | | | | Females | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected | Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected |
| 41-44 | 1 | 31 | 0.70 | 142.9% | 41-44 | 1 | 61 | 0.59 | 169.5% |
| 45-49 | 4 | 124 | 3.19 | 125.4% | 45-49 | 6 | 284 | 3.97 | 151.1% |
| 50-54 | 9 | 388 | 12.46 | 72.2% | 50-54 | 14 | 671 | 12.74 | 109.9% |
| 55-59 | 32 | 898 | 34.51 | 92.7% | 55-59 | 23 | 1,138 | 27.71 | 83.0% |
| 60-64 | 43 | 1,337 | 60.19 | 71.4% | 60-64 | 32 | 1,345 | 42.33 | 75.6% |
| 65-69 | 35 | 869 | 47.03 | 74.4% | 65-69 | 34 | 884 | 37.48 | 90.7% |
| 70-74 | 31 | 544 | 37.34 | 83.0% | 70-74 | 20 | 518 | 30.35 | 65.9% |
| 75-79 | 15 | 267 | 24.31 | 61.7% | 75-79 | 14 | 251 | 20.47 | 68.4% |
| 80-84 | 16 | 127 | 15.14 | 105.7% | 80-84 | 8 | 140 | 15.72 | 50.9% |
| 85-89 | 15 | 85 | 13.10 | 114.5% | 85-89 | 13 | 85 | 13.61 | 95.5% |
| 90-94 | 6 | 29 | 5.92 | 101.4% | 90-94 | 10 | 47 | 9.77 | 102.4% |
| 95+ | 2 | 6 | 1.76 | 113.6% | 95+ | 3 | 9 | 2.20 | 136.4% |
| **Totals** | **209** | **4,705** | **255.65** | **81.8%** | **Totals** | **178** | **5,433** | **216.94** | **82.1%** |

# APPENDIX – DETAILED EXPERIENCE ANALYSIS
# DISABLED MORTALITY

**2008-2009 Experience**

| | Males | | | | | Females | | | |
|---|---|---|---|---|---|---|---|---|---|
| Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected | Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected |
| 41-44 | - | 4 | 0.09 | 0.0% | 41-44 | 1 | 18 | 0.18 | 566.7% |
| 45-49 | - | 24 | 0.61 | 0.0% | 45-49 | 2 | 57 | 0.79 | 251.8% |
| 50-54 | 1 | 78 | 2.50 | 40.0% | 50-54 | 3 | 132 | 2.51 | 119.5% |
| 55-59 | 9 | 175 | 6.72 | 133.9% | 55-59 | 4 | 188 | 4.58 | 87.3% |
| 60-64 | 10 | 194 | 8.66 | 115.5% | 60-64 | 4 | 177 | 5.51 | 72.6% |
| 65-69 | 4 | 123 | 6.68 | 59.9% | 65-69 | 2 | 128 | 5.42 | 36.9% |
| 70-74 | 5 | 79 | 5.32 | 94.0% | 70-74 | 5 | 61 | 3.52 | 142.2% |
| 75-79 | 2 | 38 | 3.51 | 57.1% | 75-79 | 1 | 41 | 3.36 | 29.7% |
| 80-84 | 3 | 20 | 2.43 | 123.6% | 80-84 | 3 | 16 | 1.78 | 168.7% |
| 85-89 | 4 | 19 | 2.90 | 137.8% | 85-89 | 2 | 20 | 3.10 | 64.4% |
| 90-94 | - | 3 | 0.58 | 0.0% | 90-94 | 2 | 7 | 1.41 | 141.6% |
| 95+ | - | 1 | 0.27 | 0.0% | 95+ | - | 1 | 0.24 | 0.0% |
| **Totals** | **38** | **758** | **40.26** | **94.4%** | **Totals** | **29** | **846** | **32.40** | **89.5%** |

**2009-2010 Experience**

| | Males | | | | | Females | | | |
|---|---|---|---|---|---|---|---|---|---|
| Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected | Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected |
| 41-44 | 1 | 6 | 0.14 | 738.4% | 41-44 | - | 9 | 0.09 | 0.0% |
| 45-49 | 2 | 25 | 0.65 | 306.5% | 45-49 | 2 | 61 | 0.84 | 237.6% |
| 50-54 | 4 | 75 | 2.42 | 165.0% | 50-54 | 4 | 124 | 2.36 | 169.2% |
| 55-59 | 7 | 162 | 6.23 | 112.4% | 55-59 | 9 | 184 | 4.50 | 200.2% |
| 60-64 | 6 | 207 | 9.24 | 64.9% | 60-64 | 8 | 209 | 6.57 | 121.9% |
| 65-69 | 8 | 132 | 7.19 | 111.2% | 65-69 | 4 | 128 | 5.48 | 72.9% |
| 70-74 | 6 | 83 | 5.66 | 106.1% | 70-74 | 3 | 70 | 4.06 | 73.8% |
| 75-79 | 3 | 42 | 3.94 | 76.2% | 75-79 | 2 | 37 | 3.05 | 65.7% |
| 80-84 | 2 | 14 | 1.67 | 119.8% | 80-84 | 1 | 20 | 2.18 | 45.9% |
| 85-89 | 5 | 20 | 3.04 | 164.6% | 85-89 | 4 | 18 | 2.88 | 139.0% |
| 90-94 | - | 4 | 0.82 | 0.0% | 90-94 | - | 7 | 1.46 | 0.0% |
| 95+ | - | 1 | 0.28 | 0.0% | 95+ | - | 1 | 0.24 | 0.0% |
| **Totals** | **44** | **771** | **41.28** | **106.6%** | **Totals** | **37** | **868** | **33.71** | **109.8%** |

# APPENDIX – DETAILED EXPERIENCE ANALYSIS
# DISABLED MORTALITY

**2010-2011 Experience**

| Males | | | | | Females | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected | Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected |
| 41-44 | - | 5 | 0.11 | 0.0% | 41-44 | - | 10 | 0.10 | 0.0% |
| 45-49 | - | 23 | 0.60 | 0.0% | 45-49 | - | 50 | 0.70 | 0.0% |
| 50-54 | - | 63 | 2.02 | 0.0% | 50-54 | 4 | 110 | 2.08 | 192.6% |
| 55-59 | 3 | 154 | 5.90 | 50.8% | 55-59 | 3 | 193 | 4.68 | 64.1% |
| 60-64 | 8 | 228 | 10.25 | 78.0% | 60-64 | 3 | 225 | 7.06 | 42.5% |
| 65-69 | 7 | 128 | 6.95 | 100.7% | 65-69 | 5 | 139 | 5.91 | 84.6% |
| 70-74 | 6 | 92 | 6.32 | 94.9% | 70-74 | 1 | 81 | 4.71 | 21.2% |
| 75-79 | - | 37 | 3.41 | 0.0% | 75-79 | 3 | 41 | 3.41 | 88.1% |
| 80-84 | 4 | 22 | 2.60 | 154.1% | 80-84 | 3 | 21 | 2.38 | 126.2% |
| 85-89 | 2 | 13 | 2.05 | 97.4% | 85-89 | 1 | 13 | 2.15 | 46.6% |
| 90-94 | 2 | 6 | 1.25 | 159.9% | 90-94 | 1 | 8 | 1.68 | 59.6% |
| 95+ | - | 1 | 0.30 | 0.0% | 95+ | - | 2 | 0.49 | 0.0% |
| **Totals** | **32** | **772** | **41.76** | **76.6%** | **Totals** | **24** | **893** | **35.33** | **67.9%** |

**2011-2012 Experience**

| Males | | | | | Females | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected | Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected |
| 41-44 | - | 8 | 0.18 | 0.0% | 41-44 | - | 9 | 0.08 | 0.0% |
| 45-49 | - | 20 | 0.52 | 0.0% | 45-49 | 1 | 44 | 0.62 | 161.7% |
| 50-54 | 2 | 55 | 1.76 | 113.4% | 50-54 | 1 | 103 | 1.95 | 51.3% |
| 55-59 | 8 | 148 | 5.69 | 140.6% | 55-59 | 4 | 191 | 4.62 | 86.5% |
| 60-64 | 8 | 241 | 10.91 | 73.4% | 60-64 | 6 | 248 | 7.81 | 76.8% |
| 65-69 | 4 | 142 | 7.73 | 51.8% | 65-69 | 9 | 146 | 6.22 | 144.8% |
| 70-74 | 7 | 95 | 6.63 | 105.6% | 70-74 | 2 | 92 | 5.39 | 37.1% |
| 75-79 | 1 | 38 | 3.44 | 29.0% | 75-79 | 1 | 38 | 3.09 | 32.4% |
| 80-84 | 3 | 25 | 2.96 | 101.3% | 80-84 | - | 25 | 2.77 | 0.0% |
| 85-89 | 2 | 10 | 1.57 | 127.6% | 85-89 | 1 | 14 | 2.33 | 43.0% |
| 90-94 | 3 | 7 | 1.43 | 209.2% | 90-94 | 4 | 8 | 1.73 | 231.1% |
| 95+ | - | 1 | 0.32 | 0.0% | 95+ | 2 | 2 | 0.51 | 391.5% |
| **Totals** | **38** | **790** | **43.14** | **88.1%** | **Totals** | **31** | **920** | **37.11** | **83.5%** |

# APPENDIX – DETAILED EXPERIENCE ANALYSIS
# DISABLED MORTALITY

**2012-2013 Experience**

| Males | | | | | Females | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected | Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected |
| 41-44 | - | 5 | 0.11 | 0.0% | 41-44 | - | 7 | 0.07 | 0.0% |
| 45-49 | 2 | 18 | 0.46 | 433.6% | 45-49 | 1 | 38 | 0.53 | 187.5% |
| 50-54 | 1 | 57 | 1.82 | 55.0% | 50-54 | 2 | 105 | 2.00 | 100.2% |
| 55-59 | 3 | 133 | 5.12 | 58.6% | 55-59 | 2 | 185 | 4.50 | 44.4% |
| 60-64 | 7 | 235 | 10.63 | 65.9% | 60-64 | 6 | 242 | 7.60 | 79.0% |
| 65-69 | 7 | 158 | 8.50 | 82.4% | 65-69 | 7 | 171 | 7.20 | 97.2% |
| 70-74 | 2 | 100 | 6.91 | 28.9% | 70-74 | 1 | 102 | 6.06 | 16.5% |
| 75-79 | 4 | 50 | 4.51 | 88.8% | 75-79 | 3 | 42 | 3.42 | 87.6% |
| 80-84 | 2 | 21 | 2.48 | 80.5% | 80-84 | - | 27 | 3.04 | 0.0% |
| 85-89 | 1 | 13 | 2.01 | 49.8% | 85-89 | 1 | 11 | 1.75 | 57.2% |
| 90-94 | 1 | 4 | 0.85 | 117.6% | 90-94 | 1 | 8 | 1.63 | 61.2% |
| 95+ | 1 | 1 | 0.33 | 302.8% | 95+ | - | 1 | 0.24 | 0.0% |
| **Totals** | **31** | **795** | **43.72** | **70.9%** | **Totals** | **24** | **939** | **38.04** | **63.1%** |

**2013-2014 Experience**

| Males | | | | | Females | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected | Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected |
| 41-44 | - | 3 | 0.07 | 0.0% | 41-44 | - | 8 | 0.08 | 0.0% |
| 45-49 | - | 14 | 0.35 | 0.0% | 45-49 | - | 34 | 0.49 | 0.0% |
| 50-54 | 1 | 60 | 1.94 | 51.7% | 50-54 | - | 97 | 1.85 | 0.0% |
| 55-59 | 2 | 126 | 4.85 | 41.2% | 55-59 | 1 | 197 | 4.83 | 20.7% |
| 60-64 | 4 | 232 | 10.50 | 38.1% | 60-64 | 5 | 244 | 7.79 | 64.2% |
| 65-69 | 5 | 186 | 9.98 | 50.1% | 65-69 | 7 | 172 | 7.25 | 96.6% |
| 70-74 | 5 | 95 | 6.50 | 76.9% | 70-74 | 8 | 112 | 6.62 | 120.9% |
| 75-79 | 5 | 62 | 5.51 | 90.8% | 75-79 | 4 | 52 | 4.14 | 96.5% |
| 80-84 | 2 | 25 | 3.00 | 66.7% | 80-84 | 1 | 31 | 3.57 | 28.0% |
| 85-89 | 1 | 10 | 1.53 | 65.3% | 85-89 | 4 | 9 | 1.40 | 285.3% |
| 90-94 | - | 5 | 0.98 | 0.0% | 90-94 | 2 | 9 | 1.85 | 107.9% |
| 95+ | 1 | 1 | 0.27 | 373.8% | 95+ | 1 | 2 | 0.48 | 207.3% |
| **Totals** | **26** | **819** | **45.48** | **57.2%** | **Totals** | **33** | **967** | **40.35** | **81.8%** |

# APPENDIX – DETAILED EXPERIENCE ANALYSIS
# PRE-RETIREMENT MORTALITY

**2008-2014 Experience**

| | Males | | | | | Females | | | |
|---|---|---|---|---|---|---|---|---|---|
| Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected | Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected |
| Under 20 | - | 97 | 0.03 | 0.0% | Under 20 | - | 180 | 0.03 | 0.0% |
| 20-24 | - | 2,251 | 0.71 | 0.0% | 20-24 | - | 3,596 | 0.60 | 0.0% |
| 25-29 | 3 | 8,811 | 3.21 | 93.3% | 25-29 | 2 | 13,163 | 2.60 | 77.0% |
| 30-34 | 5 | 11,224 | 4.63 | 107.9% | 30-34 | 3 | 15,246 | 4.94 | 60.7% |
| 35-39 | 11 | 11,227 | 7.47 | 147.3% | 35-39 | 9 | 14,392 | 6.57 | 137.0% |
| 40-44 | 13 | 13,482 | 12.63 | 103.0% | 40-44 | 9 | 17,166 | 11.26 | 80.0% |
| 45-49 | 25 | 17,477 | 23.49 | 106.4% | 45-49 | 15 | 22,252 | 22.74 | 66.0% |
| 50-54 | 43 | 21,945 | 39.80 | 108.0% | 50-54 | 30 | 27,543 | 44.45 | 67.5% |
| 55-59 | 72 | 23,765 | 63.88 | 112.7% | 55-59 | 50 | 26,714 | 71.02 | 70.4% |
| 60-64 | 58 | 16,044 | 67.32 | 86.2% | 60-64 | 41 | 15,876 | 65.82 | 62.3% |
| **Totals** | **230** | **126,323** | **223.16** | **103.1%** | **Totals** | **159** | **156,128** | **230.02** | **69.1%** |

# APPENDIX – DETAILED EXPERIENCE ANALYSIS
# PRE-RETIREMENT MORTALITY

**2008-2009 Experience**

| | Males | | | | | Females | | | |
|---|---|---|---|---|---|---|---|---|---|
| Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected | Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected |
| Under 20 | - | 34 | 0.01 | 0.0% | Under 20 | - | 48 | 0.01 | 0.0% |
| 20-24 | - | 484 | 0.16 | 0.0% | 20-24 | - | 845 | 0.14 | 0.0% |
| 25-29 | - | 1,528 | 0.56 | 0.0% | 25-29 | - | 2,397 | 0.49 | 0.0% |
| 30-34 | - | 1,621 | 0.68 | 0.0% | 30-34 | - | 2,360 | 0.78 | 0.0% |
| 35-39 | 3 | 1,876 | 1.28 | 234.8% | 35-39 | 1 | 2,467 | 1.17 | 85.4% |
| 40-44 | 4 | 2,321 | 2.24 | 178.4% | 40-44 | - | 3,051 | 2.09 | 0.0% |
| 45-49 | 3 | 3,160 | 4.39 | 68.4% | 45-49 | 2 | 4,236 | 4.50 | 44.4% |
| 50-54 | 4 | 3,890 | 7.39 | 54.1% | 50-54 | 10 | 4,816 | 8.01 | 124.9% |
| 55-59 | 15 | 4,053 | 11.33 | 132.4% | 55-59 | 11 | 4,229 | 11.34 | 97.0% |
| 60-64 | 7 | 2,248 | 9.65 | 72.5% | 60-64 | 7 | 2,041 | 8.48 | 82.5% |
| **Totals** | **36** | **21,215** | **37.68** | **95.5%** | **Totals** | **31** | **26,490** | **37.01** | **83.8%** |

**2009-2010 Experience**

| | Males | | | | | Females | | | |
|---|---|---|---|---|---|---|---|---|---|
| Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected | Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected |
| Under 20 | - | 16 | 0.00 | 0.0% | Under 20 | - | 28 | 0.00 | 0.0% |
| 20-24 | - | 464 | 0.15 | 0.0% | 20-24 | - | 715 | 0.12 | 0.0% |
| 25-29 | 1 | 1,524 | 0.56 | 178.4% | 25-29 | - | 2,315 | 0.46 | 0.0% |
| 30-34 | 1 | 1,747 | 0.72 | 138.2% | 30-34 | - | 2,426 | 0.79 | 0.0% |
| 35-39 | 1 | 1,849 | 1.25 | 80.2% | 35-39 | 4 | 2,403 | 1.12 | 355.9% |
| 40-44 | 2 | 2,284 | 2.17 | 92.2% | 40-44 | 1 | 2,955 | 1.98 | 50.5% |
| 45-49 | 7 | 3,130 | 4.28 | 163.5% | 45-49 | 3 | 4,046 | 4.23 | 71.0% |
| 50-54 | 9 | 3,832 | 7.15 | 125.8% | 50-54 | 6 | 4,786 | 7.85 | 76.4% |
| 55-59 | 12 | 4,006 | 11.05 | 108.6% | 55-59 | 8 | 4,345 | 11.61 | 68.9% |
| 60-64 | 10 | 2,513 | 10.70 | 93.5% | 60-64 | 6 | 2,345 | 9.73 | 61.7% |
| **Totals** | **43** | **21,365** | **38.03** | **113.1%** | **Totals** | **28** | **26,364** | **37.90** | **73.9%** |

# APPENDIX – DETAILED EXPERIENCE ANALYSIS
# PRE-RETIREMENT MORTALITY

**2010-2011 Experience**

| | Males | | | | | Females | | | |
|---|---|---|---|---|---|---|---|---|---|
| Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected | Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected |
| Under 20 | - | 15 | 0.00 | 0.0% | Under 20 | - | 32 | 0.01 | 0.0% |
| 20-24 | - | 380 | 0.12 | 0.0% | 20-24 | - | 607 | 0.10 | 0.0% |
| 25-29 | - | 1,486 | 0.54 | 0.0% | 25-29 | - | 2,192 | 0.43 | 0.0% |
| 30-34 | - | 1,835 | 0.75 | 0.0% | 30-34 | - | 2,485 | 0.81 | 0.0% |
| 35-39 | 3 | 1,806 | 1.20 | 249.5% | 35-39 | 1 | 2,293 | 1.05 | 94.9% |
| 40-44 | 1 | 2,224 | 2.08 | 48.2% | 40-44 | 3 | 2,877 | 1.89 | 159.1% |
| 45-49 | 4 | 3,074 | 4.15 | 96.4% | 45-49 | 2 | 3,806 | 3.91 | 51.2% |
| 50-54 | 7 | 3,661 | 6.70 | 104.5% | 50-54 | 6 | 4,693 | 7.60 | 79.0% |
| 55-59 | 11 | 4,026 | 10.91 | 100.8% | 55-59 | 8 | 4,427 | 11.82 | 67.7% |
| 60-64 | 13 | 2,716 | 11.50 | 113.0% | 60-64 | 10 | 2,517 | 10.47 | 95.5% |
| **Totals** | **39** | **21,223** | **37.96** | **102.7%** | **Totals** | **30** | **25,929** | **38.08** | **78.8%** |

**2011-2012 Experience**

| | Males | | | | | Females | | | |
|---|---|---|---|---|---|---|---|---|---|
| Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected | Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected |
| Under 20 | - | 9 | 0.00 | 0.0% | Under 20 | - | 25 | 0.00 | 0.0% |
| 20-24 | - | 347 | 0.11 | 0.0% | 20-24 | - | 545 | 0.09 | 0.0% |
| 25-29 | - | 1,484 | 0.54 | 0.0% | 25-29 | - | 2,139 | 0.42 | 0.0% |
| 30-34 | - | 1,894 | 0.78 | 0.0% | 30-34 | 2 | 2,539 | 0.82 | 243.9% |
| 35-39 | 1 | 1,798 | 1.19 | 84.0% | 35-39 | - | 2,288 | 1.04 | 0.0% |
| 40-44 | 1 | 2,250 | 2.09 | 47.9% | 40-44 | 2 | 2,847 | 1.84 | 108.9% |
| 45-49 | 5 | 2,891 | 3.87 | 129.3% | 45-49 | 4 | 3,604 | 3.64 | 109.9% |
| 50-54 | 7 | 3,587 | 6.44 | 108.6% | 50-54 | 4 | 4,559 | 7.30 | 54.8% |
| 55-59 | 9 | 3,910 | 10.41 | 86.4% | 55-59 | 7 | 4,461 | 11.81 | 59.3% |
| 60-64 | 9 | 2,645 | 11.06 | 81.4% | 60-64 | 7 | 2,705 | 11.20 | 62.5% |
| **Totals** | **32** | **20,815** | **36.48** | **87.7%** | **Totals** | **26** | **25,712** | **38.16** | **68.1%** |

# APPENDIX – DETAILED EXPERIENCE ANALYSIS
# PRE-RETIREMENT MORTALITY

**2012-2013 Experience**

| | Males | | | | | Females | | | |
|---|---|---|---|---|---|---|---|---|---|
| Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected | Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected |
| Under 20 | - | 15 | 0.00 | 0.0% | Under 20 | - | 23 | 0.00 | 0.0% |
| 20-24 | - | 284 | 0.09 | 0.0% | 20-24 | - | 421 | 0.07 | 0.0% |
| 25-29 | - | 1,344 | 0.49 | 0.0% | 25-29 | 2 | 2,031 | 0.39 | 506.9% |
| 30-34 | 1 | 2,029 | 0.84 | 119.5% | 30-34 | 1 | 2,666 | 0.86 | 116.5% |
| 35-39 | 3 | 1,852 | 1.22 | 246.7% | 35-39 | - | 2,370 | 1.06 | 0.0% |
| 40-44 | 4 | 2,226 | 2.06 | 194.4% | 40-44 | 1 | 2,768 | 1.77 | 56.4% |
| 45-49 | 2 | 2,619 | 3.45 | 58.0% | 45-49 | 1 | 3,339 | 3.32 | 30.1% |
| 50-54 | 8 | 3,517 | 6.17 | 129.7% | 50-54 | 1 | 4,407 | 6.99 | 14.3% |
| 55-59 | 9 | 3,890 | 10.18 | 88.4% | 55-59 | 8 | 4,621 | 12.22 | 65.4% |
| 60-64 | 14 | 2,909 | 12.04 | 116.2% | 60-64 | 7 | 3,000 | 12.42 | 56.4% |
| **Totals** | **41** | **20,685** | **36.53** | **112.2%** | **Totals** | **21** | **25,646** | **39.10** | **53.7%** |

**2013-2014 Experience**

| | Males | | | | | Females | | | |
|---|---|---|---|---|---|---|---|---|---|
| Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected | Age Group | Actual Deaths | Exposure | Expected Deaths | Actual/ Expected |
| Under 20 | - | 8 | 0.00 | 0.0% | Under 20 | - | 24 | 0.00 | 0.0% |
| 20-24 | - | 292 | 0.09 | 0.0% | 20-24 | - | 463 | 0.07 | 0.0% |
| 25-29 | 2 | 1,445 | 0.52 | 384.7% | 25-29 | - | 2,089 | 0.40 | 0.0% |
| 30-34 | 3 | 2,098 | 0.86 | 347.7% | 30-34 | - | 2,770 | 0.88 | 0.0% |
| 35-39 | - | 2,046 | 1.33 | 0.0% | 35-39 | 3 | 2,571 | 1.13 | 265.4% |
| 40-44 | 1 | 2,177 | 2.00 | 50.1% | 40-44 | 2 | 2,668 | 1.69 | 118.2% |
| 45-49 | 4 | 2,603 | 3.36 | 119.1% | 45-49 | 3 | 3,221 | 3.14 | 95.5% |
| 50-54 | 8 | 3,458 | 5.95 | 134.5% | 50-54 | 3 | 4,282 | 6.71 | 44.7% |
| 55-59 | 16 | 3,880 | 10.00 | 160.0% | 55-59 | 8 | 4,631 | 12.21 | 65.5% |
| 60-64 | 5 | 3,013 | 12.37 | 40.4% | 60-64 | 4 | 3,268 | 13.52 | 29.6% |
| **Totals** | **39** | **21,020** | **36.48** | **106.9%** | **Totals** | **23** | **25,987** | **39.77** | **57.8%** |