GRS | **Gabriel Roeder Smith & Company**
Consultants & Actuaries

MINNESOTA CORRECTIONAL EMPLOYEES RETIREMENT FUND

4-YEAR EXPERIENCE STUDY

JULY 1, 2011 THROUGH JUNE 30, 2015

July 26, 2016

Minnesota State Retirement System
Correctional Employees Retirement Fund

Dear Board of Directors:

The results of the four-year *actuarial experience study* of the Correctional Employees Retirement Fund (CERF) 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 Correctional Employees Retirement Fund.

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

The investigation covered the four-year period from *July 1, 2011 to June 30, 2015*, 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 Correctional 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.
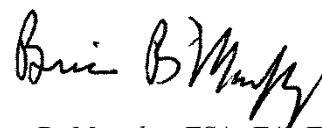
This report has been prepared by actuaries who have substantial experience valuing public employee retirement systems. To the best of our knowledge and belief, the information contained in this report was performed in accordance with Minnesota Statutes Section 356.215 and the requirements of the Standards 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

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

Brian B. Murphy

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

BJW/BBM:sc

ACTUARIAL EXPERIENCE STUDY
2011 - 2015

TABLE OF CONTENTS

Minnesota Correctional Employees Retirement Fund

SECTION A
OVERVIEW AND SUMMARY OF RESULTS

SUMMARY OF FINDINGS

The four-year period (July 1, 2011 to June 30, 2015) 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 Correctional Employees Retirement Fund (CERF). The recommended changes in actuarial assumptions and methods resulting from this experience study are summarized below:

Recommendations:

- Adjust rates of merit and seniority, resulting in an overall increase to the assumed rates of merit and seniority increases:
  - o Proposed rates are 6.75% and 3.40% greater than the current rates in the first two years of employment; minor adjustments to the current rates after the second year of employment.
  - o Proposed rates average approximately 0.5% higher than the current rate.
- Adjust assumed retirement rates:
  - o Increase the assumed unreduced retirements (i.e. Normal Retirement) at ages 56 to 61 and decrease the assumed unreduced retirements at ages 55 and 62-69. The net effect is fewer unreduced retirements than the previous assumption.
  - o No change to the assumed reduced retirements (i.e. Early Retirement). While there were more early retirements than expected over the four year period, we anticipate fewer early retirements in the future due to the change in the early retirement subsidy for retirements after June 30, 2015.
- Adjust assumed termination rates:
  - o Decrease the assumed termination rates in the first two years of employment. While actual experience during the first two years shows more terminations than expected, these proposed rates recognize that the liability decrementing out during the first two years of employment is much less than expected. Increase the assumed termination rate in the third year of employment.
  - o Increase the assumed termination rates for males before age 43 and for females before age 35 and for ages 42-44.
- Decrease rates of disability for ages 40 to 54; remove assumed disability incidence beyond age 54.
- Change the base mortality table to the RP-2014 mortality table, white collar adjustment, and with future improvement projected using scale MP-2015 from a base year of 2006.
- Minor changes to the assumed percent married, age difference and form of payment assumptions.

The recommendations are summarized on the following pages.

Review of economic assumptions (inflation, payroll growth, investment return) and actuarial methods is outside the scope of this experience study. Please refer to GRS' State Employees Retirement Fund experience study dated June 30, 2015.

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; and

- 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, 2012 actuarial valuation based on the results of the most recent experience study. Assumptions in effect prior to June 30, 2015 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. The various assumption changes are described on the following pages.

SUMMARY OF DECREMENT EXPERIENCE
2011 - 2015

Summary of Decrement Experience

Decrement Risk Area	Actual Number	Expected		Change
		Present Assumptions	**Proposed Assumptions**	
Retirement				
Normal Retirement	470	504.6	493.0	(11.6)
Early Retirement	147	96.0	96.0	-
Withdrawal, First Three Years*				
Males	291	261.4	189.4	(72.0)
Females	341	223.2	187.7	(35.5)
Withdrawal, After Three Years				
Males	266	194.9	225.3	30.4
Females	298	182.3	200.5	18.2
Disability				
Males	24	35.0	30.2	(4.8)
Females	16	18.7	16.1	(2.6)
Mortality				
Healthy Retired Lives - Male	85	101.9	82.9	(19.0)
- Female	26	22.8	25.5	2.7
Disabled Retired Lives - Male	12	23.5	15.5	(8.0)
- Female	6	6.3	5.5	(0.8)
Active Lives - Male	13	12.9	10.3	(2.6)
- Female	8	6.5	4.3	(2.1)

* The plan experienced more withdrawals than projected by the present assumptions (632 actual terminations versus 485 expected) during the first three years of employment. However, the liability associated with these members that left the plan during the first three years of employment was about 20% less than expected. The proposed assumptions more closely match the liability-weighted results.

SECTION B
PAY INCREASES

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.

We reviewed total pay increases during the four-year period. Total pay increases from one year to the next can fluctuate based on a number of reasons, including overtime and/or the number of pay periods in a year. 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. Excluding all negative pay increases would have overstated actual pay growth.

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. Based on our review of salary experience for CERF members for the period July 1, 2011 through June 30, 2015, we observed members with longer periods of service averaged about 2.6% for this period. Members with less service received increases that were higher than 2.6% in general. For our analysis of the merit and seniority portion of total salary increase, we assumed 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 CERF members reach a certain length of service, merit and seniority increases are atypical.

Findings

The assumed wage inflation was changed from 3.75% to 3.50% effective July 1, 2015. However, based on the analysis described on the previous page, we estimated the average actual wage inflation component of pay increases was around 2.6% for members of the CERF during the four years of the study. 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 4.97% over the four-year period, ranging from 0.67% in 2013 to 6.45% in 2014. After adjusting for the 2.6% average wage inflation for this period, the average net salary increase (i.e., merit and seniority) averaged 2.37%, ranging from -1.93% to 3.85%. Salaries for correctional employees during this period were impacted by tough economic conditions.

Fiscal Year Ending	Count	Gross		Net*	
		Expected	Actual	Expected	Actual
2012	3,495	4.56%	6.42%	1.06%	3.82%
2013	3,603	4.56%	0.67%	1.06%	-1.93%
2014	3,591	4.53%	6.45%	1.03%	3.85%
2015	3,564	4.54%	6.38%	1.04%	3.78%
Total	**14,253**	**4.55%**	**4.97%**	**1.05%**	**2.37%**

* Net Expected increases are equal to Gross Expected increases minus assumed wage inflation of 3.5%. Net Actual increases are equal to Gross Actual increases minus the estimated actual wage inflation for the period of 2.6%.

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 for less than 18 years of service and lower than assumed for 18 or more years of service.
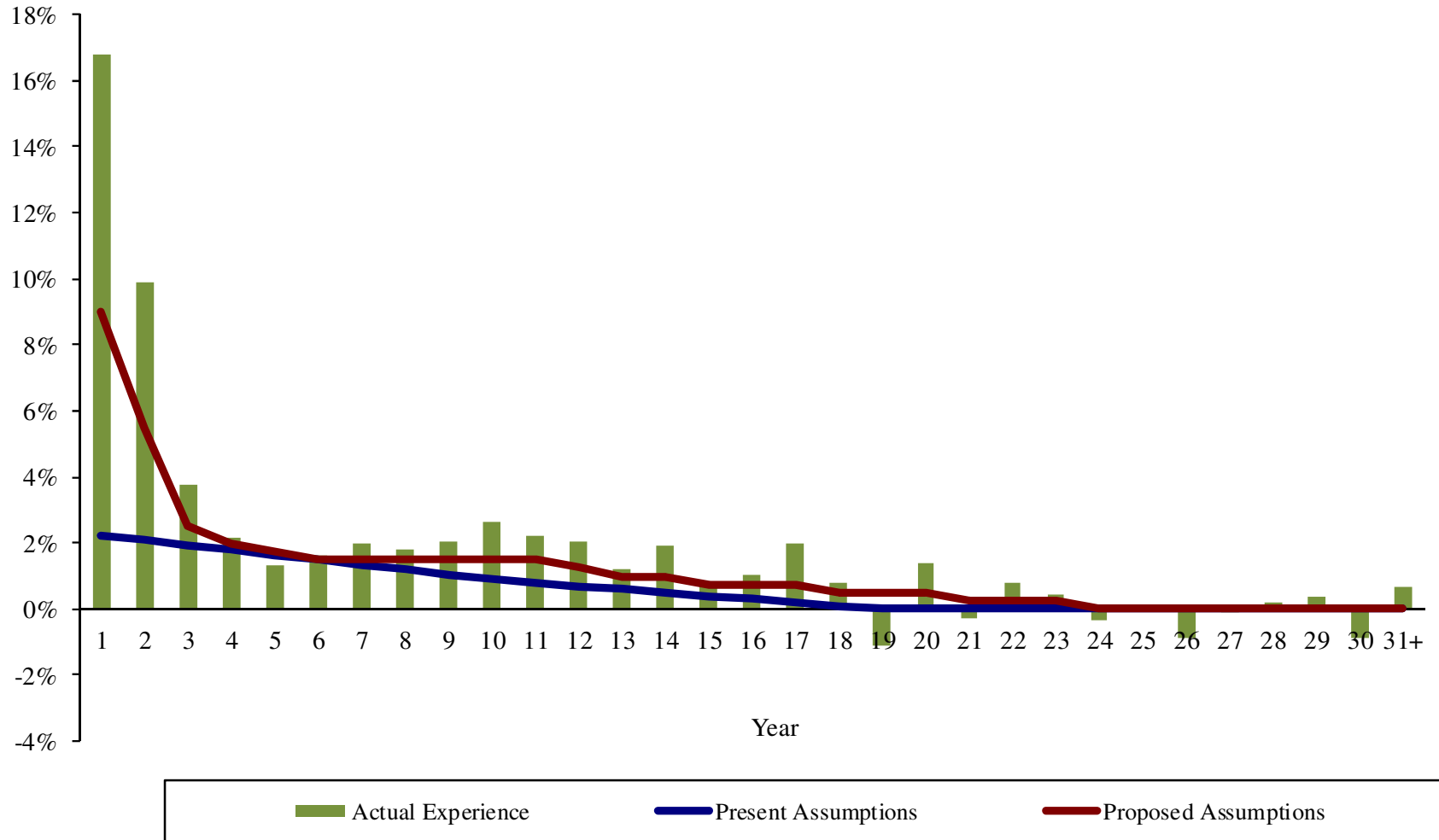
Recommendation

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 four years.

PAY INCREASES DUE TO MERIT AND SENIORITY

Year	Exposures	Total Salary % Increase			Merit & Seniority % Increase		
		Actual	Current	Proposed	Actual	Current	Proposed
1	95	19.40%	5.75%	12.50%	16.80%	2.25%	9.00%
2	1,052	12.52%	5.60%	9.00%	9.92%	2.10%	5.50%
3	873	6.37%	5.45%	6.00%	3.77%	1.95%	2.50%
4	810	4.75%	5.30%	5.50%	2.15%	1.80%	2.00%
5	888	3.94%	5.15%	5.25%	1.34%	1.65%	1.75%
6	1,040	4.21%	5.00%	5.00%	1.61%	1.50%	1.50%
7	1,156	4.56%	4.85%	5.00%	1.96%	1.35%	1.50%
8	1,157	4.42%	4.70%	5.00%	1.82%	1.20%	1.50%
9	941	4.64%	4.55%	5.00%	2.04%	1.05%	1.50%
10	745	5.25%	4.40%	5.00%	2.65%	0.90%	1.50%
11	555	4.85%	4.30%	5.00%	2.25%	0.80%	1.50%
12	498	4.63%	4.20%	4.75%	2.03%	0.70%	1.25%
13	517	3.79%	4.10%	4.50%	1.19%	0.60%	1.00%
14	469	4.55%	4.00%	4.50%	1.95%	0.50%	1.00%
15	422	3.40%	3.90%	4.25%	0.80%	0.40%	0.75%
16	350	3.63%	3.80%	4.25%	1.03%	0.30%	0.75%
17	316	4.57%	3.70%	4.25%	1.97%	0.20%	0.75%
18	372	3.40%	3.60%	4.00%	0.80%	0.10%	0.50%
19	332	1.47%	3.50%	4.00%	-1.13%	0.00%	0.50%
20	334	3.96%	3.50%	4.00%	1.36%	0.00%	0.50%
21	265	2.35%	3.50%	3.75%	-0.25%	0.00%	0.25%
22	178	3.38%	3.50%	3.75%	0.78%	0.00%	0.25%
23	165	3.02%	3.50%	3.75%	0.42%	0.00%	0.25%
24	132	2.27%	3.50%	3.50%	-0.33%	0.00%	0.00%
25	127	2.57%	3.50%	3.50%	-0.03%	0.00%	0.00%
26	96	1.72%	3.50%	3.50%	-0.88%	0.00%	0.00%
27	80	2.53%	3.50%	3.50%	-0.07%	0.00%	0.00%
28	67	2.78%	3.50%	3.50%	0.18%	0.00%	0.00%
29	68	2.97%	3.50%	3.50%	0.37%	0.00%	0.00%
30	56	1.72%	3.50%	3.50%	-0.88%	0.00%	0.00%
31+	97	3.30%	3.50%	3.50%	0.70%	0.00%	0.00%
Total	**14,253**	**4.97%**	**4.55%**	**5.15%**	**2.37%**	**1.05%**	**1.65%**

* Net Expected increases are equal to Gross Expected increases minus assumed wage inflation of 3.5%. Net Actual increases are equal to Gross Actual increases minus the estimated actual wage inflation for the period of 2.6%.

PAY INCREASES DUE TO MERIT AND SENIORITY

Legend: Actual Experience · Present Assumptions · Proposed Assumptions

X-axis: Year (1 through 31+)

SECTION C
RETIREMENT EXPERIENCE

Findings

The benefit provisions of the CERF 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.

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 normal retirement benefit is outlined as follows:

(a) Age 55 and vested. Proportionate Retirement Annuity is available at age 65 and one year of Allowable Service.
(b) 2.40% (2.20% if first hired after June 30, 2010) of Average Salary for each year of Allowable Service, pro-rata for completed months.

The current assumption ends at age 70; in other words, we assume all members currently under the age of 70 will retire by the age of 70. However, for members currently age 70 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 70 since the valuation assumption is all of these members work until the next valuation date and then retire. During the four-year period, there were six actual retirements at ages 70 or older, including two actual retirements at age 70. We believe assuming 100% retirement at age 70 is an appropriately conservative approach.

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 70.

2011-2015 Experience

Age	Actual Retirements	Exposure	Crude Rates	Rates Present	Rates Proposed	Expected Retirements Present	Expected Retirements Proposed	Actual / Expected Present	Actual / Expected Proposed
55	171	482	35.5%	55.0%	45.0%	265.10	216.90	64.5%	78.8%
56	80	315	25.4%	12.0%	20.0%	37.80	63.00	211.6%	127.0%
57	43	252	17.1%	12.0%	15.0%	30.24	37.80	142.2%	113.8%
58	29	205	14.1%	10.0%	15.0%	20.50	30.75	141.5%	94.3%
59	34	172	19.8%	10.0%	15.0%	17.20	25.80	197.7%	131.8%
60	22	138	15.9%	10.0%	15.0%	13.80	20.70	159.4%	106.3%
61	20	111	18.0%	10.0%	15.0%	11.10	16.65	180.2%	120.1%
62	19	87	21.8%	30.0%	25.0%	26.10	21.75	72.8%	87.4%
63	19	62	30.6%	30.0%	25.0%	18.60	15.50	102.2%	122.6%
64	6	44	13.6%	30.0%	25.0%	13.20	11.00	45.5%	54.5%
65	9	45	20.0%	50.0%	30.0%	22.50	13.50	40.0%	66.7%
66	10	27	37.0%	50.0%	30.0%	13.50	8.10	74.1%	123.5%
67	3	14	21.4%	50.0%	25.0%	7.00	3.50	42.9%	85.7%
68	2	9	22.2%	50.0%	25.0%	4.50	2.25	44.4%	88.9%
69	3	7	42.9%	50.0%	40.0%	3.50	2.80	85.7%	107.1%
70+	*	*	N/A	*	100.0%	*	*	N/A	N/A
Totals	**470**	**1,970**	**23.9%**	**25.6%**	**24.9%**	**504.64**	**490.00**	**93.1%**	**95.9%**

* *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 six actual retirements over age 70.*
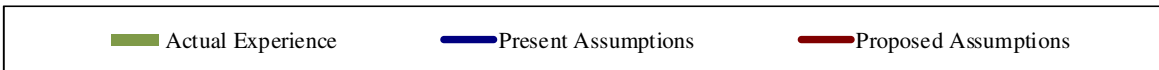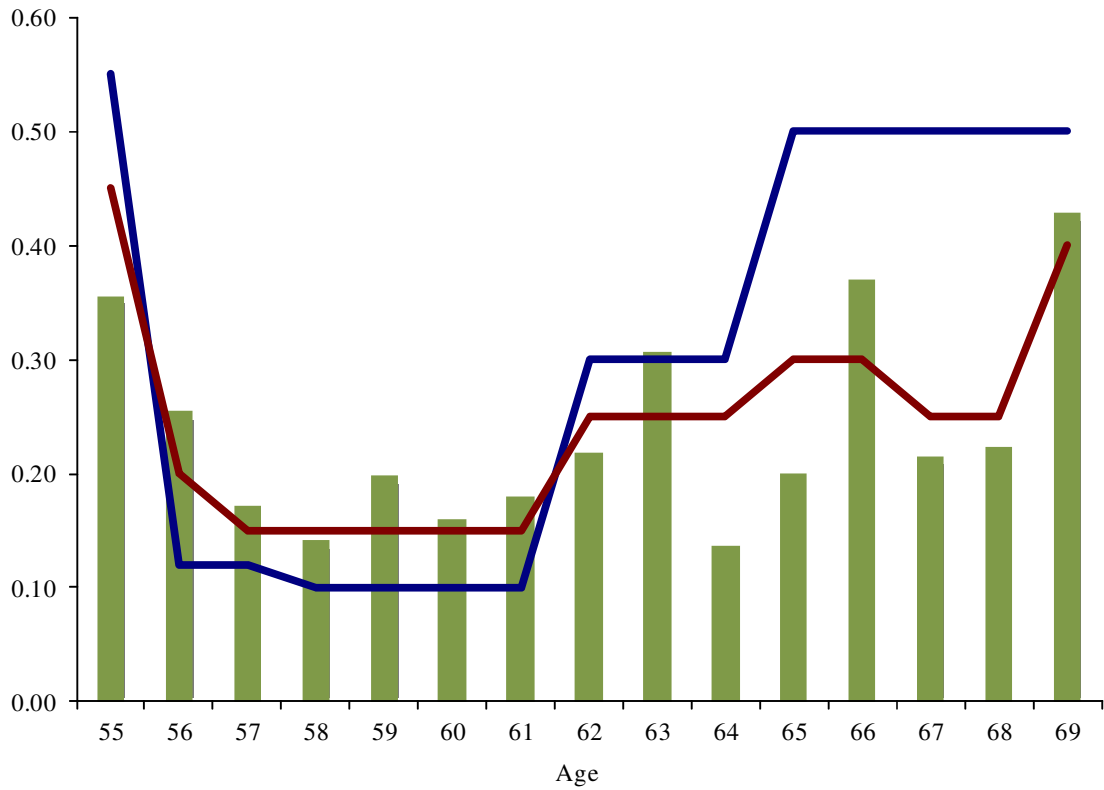
Findings

CERF members may also retire with a reduced benefit prior to the attainment of Normal Retirement. We refer to these cases as early retirements.

The early retirement benefit payable to CERF members is equal to the normal retirement benefit with a reduction for early retirement determined as follows:

> 0.20% (5/12% if first hired after June 30, 2010 or if hired before July 1, 2010 and retire after June 30, 2015) per month each month the member is under age 55.

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 more early retirements than projected by the present assumptions (96 expected versus 147 actual – see totals on the following page), presumably due to the provision that results in lower benefits for early retirements after June 30, 2015.

Recommendation

We anticipate fewer early retirements in the future due to the change in early retirement subsidy; we recommend no change to the early retirement rates at this time.

2011-2015 Experience

Age	Actual Retirements	Exposure	Crude Rates	Rates		Expected Retirements		Actual / Expected	
				Present	Proposed	Present	Proposed	Present	Proposed
50	35	495	7.1%	5.0%	5.0%	24.75	24.75	141.4%	141.4%
51	26	504	5.2%	3.0%	3.0%	15.12	15.12	172.0%	172.0%
52	25	523	4.8%	3.0%	3.0%	15.69	15.69	159.3%	159.3%
53	30	503	6.0%	3.0%	3.0%	15.09	15.09	198.8%	198.8%
54	31	507	6.1%	5.0%	5.0%	25.35	25.35	122.3%	122.3%
Totals	**147**	**2,532**	**5.8%**	**3.8%**	**3.8%**	**96.00**	**96.00**	**153.1%**	**153.1%**
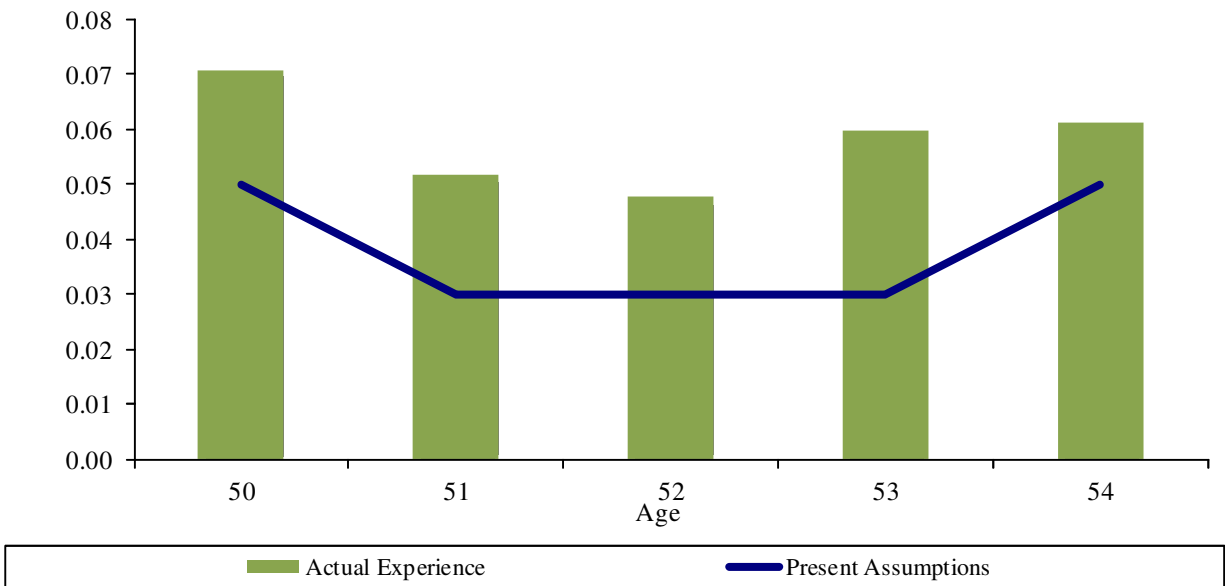
The proposed early retirement rates are equal to Present Assumptions.

Members who terminate are vested according to the following:

    (a) Hired before July 1, 2010: 100% vested after 3 years of Allowable Service
    (b) Hired after June 30, 2010:

          a. 50% vested after 5 years of Allowable Service
          b. 60% vested after 6 years of Allowable Service
          c. 70% vested after 7 years of Allowable Service
          d. 80% vested after 8 years of Allowable Service
          e. 90% vested after 9 years of Allowable Service; and
          f. 100% vested after 10 years of Allowable Service

Vested members are 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. We recommend no change to this assumption.

SECTION D
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 assume a higher rate of termination during the first three years of employment with age-based rates after the t-year select period.

Members are vested after three years of service if hired before July 1, 2010 and are fully vested after ten years of service if hired after June 30, 2010.

Findings

The plan experienced more female withdrawals than projected by the present assumptions (639 actual female terminations versus 406 expected, or approximately 57% more than expected). However, when we reviewed the liability that decremented out of the plan during the prior four-year period, the result was much less dramatic, with only 13% more liability than expected decrementing out of the plan. In fact, the liability that decremented out during the first two years of employment was about 50% less than expected, while the liability that decremented out after the third year of employment was about 17% more than expected.

For male members, the plan also experienced more withdrawals than projected by the present assumptions (557 actual male terminations versus 456 expected, or approximately 22% more than expected). The liability that decremented out of the plan during the prior four-year period was 11% more than expected; similar to female experience, we note that the liability that decremented out during the first two years of employment was about 75% less than expected, while the liability that decremented out after the third year of employment was about 16% more than expected.

Recommendation

We recommend decreasing rates during the first two years of employment, and increasing rates of termination for the third year of employment. For rates beyond the select period, we recommend increasing male rates for ages less than 43 and increasing female rates for ages less than 35 and also for ages 42-44, as indicated on the following page.

WITHDRAWAL EXPERIENCE – SELECT RATES
MALES

2011-2015 Experience, Select Rates*

Year	Actual Withdrawals	Exposure	Crude Rates		Rates		Expected Withdrawals		Actual / Expected	
			Pop. Wght.	Liab. Wght.	Present	Proposed	Present	Proposed	Present	Proposed
1	91	423	21.5%	2.3%	20.0%	10.0%	84.60	42.30	107.6%	215.1%
2	129	845	15.3%	4.7%	15.0%	10.0%	126.75	84.50	101.8%	152.7%
3	71	626	11.3%	14.6%	8.0%	10.0%	50.08	62.60	141.8%	113.4%
Totals	**291**	**1,894**	**15.4%**	**9.1%**	**13.8%**	**10.0%**	**261.43**	**189.40**	**111.3%**	**153.6%**

* *The current withdrawal assumption is based on service for the first three years of employment and based on age after three years of service.*

2011-2015 Experience, Select Rates*

Year	Actual Withdrawals	Exposure	Crude Rates		Rates		Expected Withdrawals		Actual / Expected	
			Pop. Wght.	Liab. Wght.	Present	Proposed	Present	Proposed	Present	Proposed
1	111	412	26.9%	3.0%	20.0%	12.0%	82.40	49.44	134.7%	224.5%
2	160	695	23.0%	9.7%	15.0%	12.0%	104.25	83.40	153.5%	191.8%
3	70	457	15.3%	14.9%	8.0%	12.0%	36.56	54.84	191.5%	127.6%
Totals	**341**	**1,564**	**21.8%**	**10.8%**	**14.3%**	**12.0%**	**223.21**	**187.68**	**152.8%**	**181.7%**

* *The current withdrawal assumption is based on service for the first three years of employment and based on age after three years of service.*

2011-2015 Experience, Ultimate Rates*

Age Group	Actual Withdrawals	Exposure	Crude Rates		Rates		Expected Withdrawals		Actual / Expected	
			Pop. Wght.	Liab. Wght.	Present	Proposed	Present	Proposed	Present	Proposed
Under 25	-	15	0.0%	0.0%	N/A	N/A	1.38	1.50	N/A	0.0%
25-29	49	561	8.7%	8.1%	6.2%	7.2%	34.75	40.28	141.0%	121.6%
30-34	73	1,317	5.5%	4.7%	4.4%	4.8%	57.48	63.16	127.0%	115.6%
35-39	62	1,314	4.7%	4.0%	3.0%	4.1%	39.64	53.83	156.4%	115.2%
40-44	40	1,460	2.7%	2.5%	2.3%	2.6%	33.47	38.35	119.5%	104.3%
45-49	42	1,634	2.6%	1.9%	1.7%	1.7%	28.20	28.20	148.9%	148.9%
Totals	**266**	**6,301**	**4.2%**	**2.8%**	**3.1%**	**3.6%***	**194.92**	**225.32**	**136.5%**	**118.1%**

* Rate shown is a population weighted rate; corresponding liability weighted rate is 2.7%.

* The current withdrawal assumption is based on service for the first three years of employment and based on age after three years of service.

2011-2015 Experience, Ultimate Rates*

Age Group	Actual Withdrawals	Exposure	Crude Rates		Rates		Expected Withdrawals		Actual / Expected	
			Pop. Wght.	Liab. Wght.	Present	Proposed	Present	Proposed	Present	Proposed
Under 25	1	9	11.1%	11.1%	N/A	N/A	0.73	1.08	N/A	92.6%
25-29	62	342	18.1%	16.6%	7.6%	10.0%	25.86	34.34	239.8%	180.5%
30-34	109	865	12.6%	10.2%	7.3%	8.3%	63.26	72.04	172.3%	151.3%
35-39	49	634	7.7%	6.0%	6.7%	6.7%	42.35	42.35	115.7%	115.7%
40-44	44	597	7.4%	5.4%	4.8%	4.9%	28.74	29.37	153.1%	149.8%
45-49	33	694	4.8%	3.4%	3.1%	3.1%	21.35	21.35	154.6%	154.6%
Totals	**298**	**3,141**	**9.5%**	**5.6%**	**5.8%**	**6.4%***	**182.29**	**200.53**	**163.5%**	**148.6%**

* Rate shown is a population weighted rate; corresponding liability weighted rate is 5.0%.
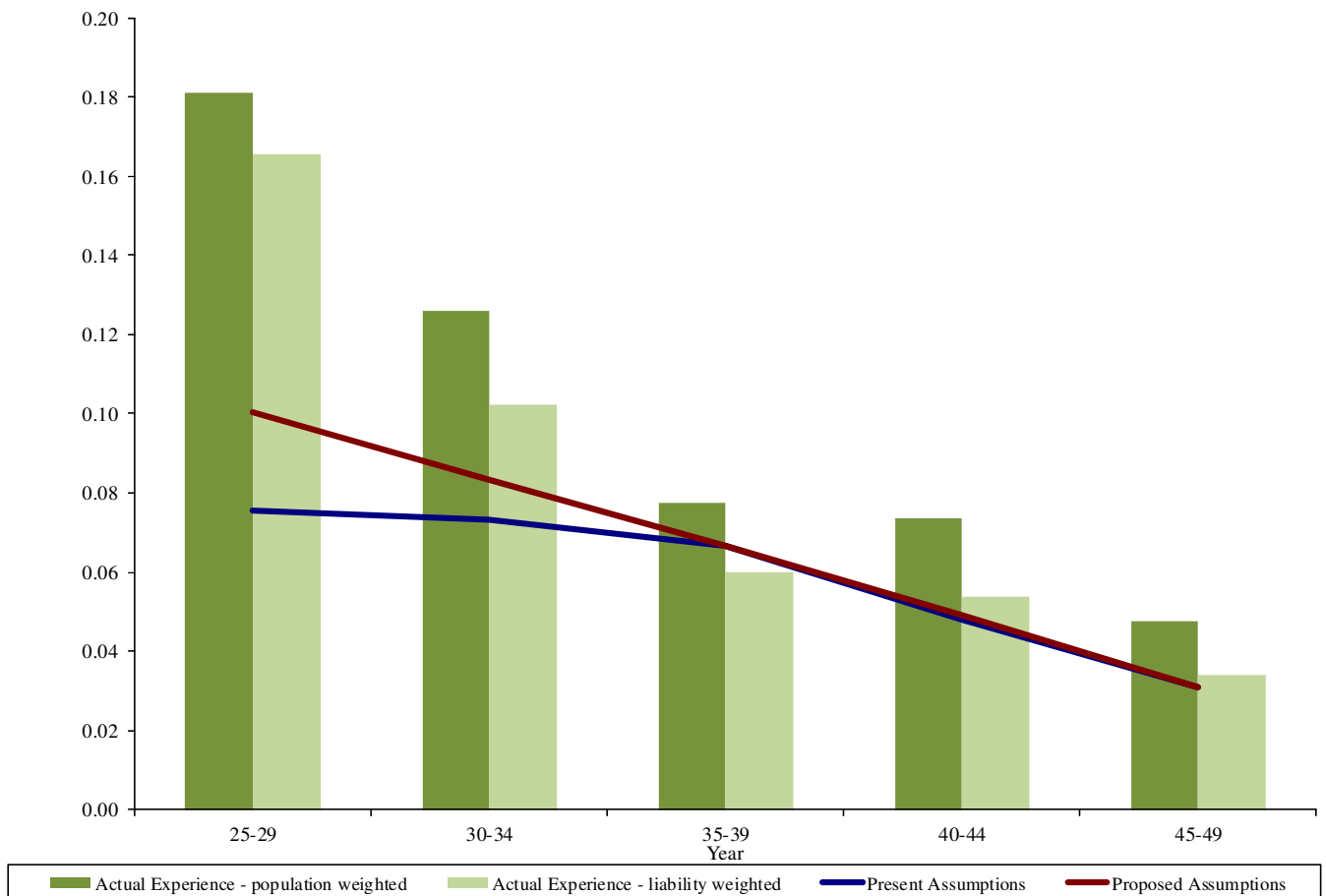
Legend: Actual Experience - population weighted | Actual Experience - liability weighted | Present Assumptions | Proposed Assumptions

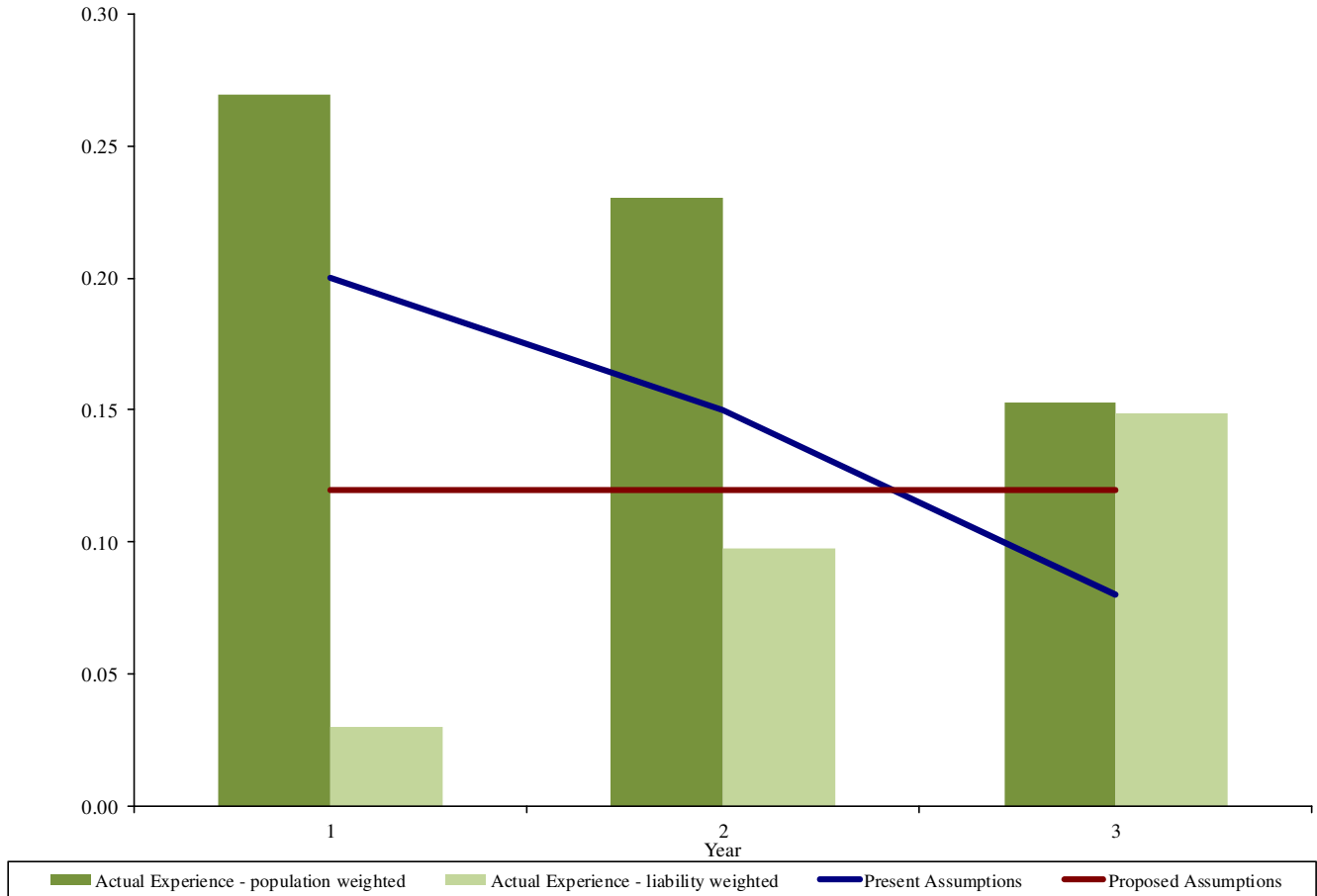** The current withdrawal assumption is based on service for the first three years of employment and based on age after three years of service.*

SECTION E
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.

Payments begin at a disability and end at age 55 (age 65 if disabled prior to July 1, 2009) or the five-year anniversary of the effective date of the disability benefit, whichever is later. Normal retirement benefits are paid thereafter.

We reviewed the disability experience during the four-year period. The results are shown on the following page. Overall, the actual number of disability retirements (40) is lower than the number projected by the present assumption (54 – see chart on the following page). We recommend decreasing rates by 10% for ages 40-47 and 20% for ages 48-54. In addition, we recommend assuming no disabilities after Normal Retirement eligibility.

Recommendation

We recommend adopting lower rates of disability incidence after age 39.

DISABILITY EXPERIENCE
MALES & FEMALES

Age	Disabilities	Exposure	Crude Rates	Sample Rates		Expected Disabilities		Ratio of Actuals/Expecteds	
				Old	New	Old	New	Old	New
20-24	-	294	0.0000	0.0006	0.0006	0.22	0.22	0.0%	0.0%
25-29	-	2,030	0.0000	0.0009	0.0009	1.88	1.88	0.0%	0.0%
30-34	2	2,886	0.0007	0.0012	0.0012	3.51	3.51	56.9%	56.9%
35-39	3	2,343	0.0013	0.0018	0.0018	4.15	4.15	72.3%	72.3%
40-44	5	2,364	0.0021	0.0029	0.0026	6.98	6.28	71.6%	79.6%
45-49	17	2,615	0.0065	0.0049	0.0042	12.91	11.00	131.7%	154.5%
50-54	13	2,787	0.0047	0.0086	0.0069	24.03	19.23	54.1%	67.6%
Totals	**40**	**15,319**	**0.0026**	**0.0036**	**0.0030**	**53.69**	**46.28**	**74.5%**	**86.4%**
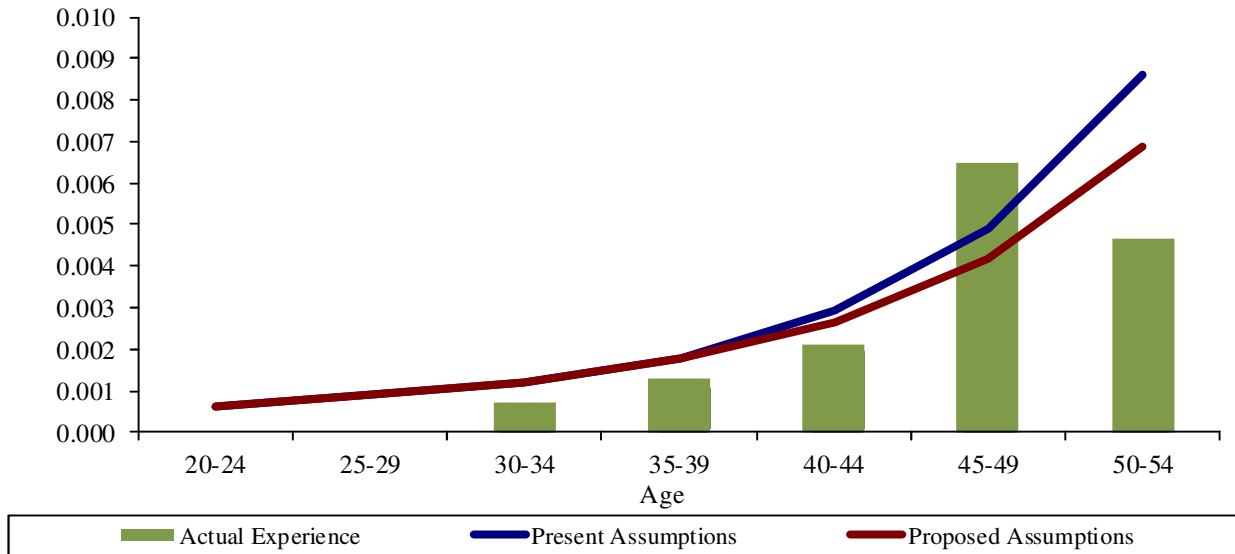
SECTION F
MORTALITY EXPERIENCE

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. In 2015, the SOA released an updated mortality improvement scale called MP-2015. 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 base experience tables and collar-specific experience versions of the RP-2014 tables. The Blue Collar tables have higher mortality rates than the base tables and the White Collar tables have lower mortality than the base 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

Similar to the withdrawal decrement, 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 RP-2014 mortality rates were developed by the Society of Actuaries using benefit-weighted experience. As such, we show both liability-weighted and population-weighted results in the following exhibits.

Healthy Retirees
We reviewed the mortality experience of healthy retirees during the four-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 (111) than projected by the present assumptions (117).

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

The plan experienced fewer deaths among disabled retirees (18) than projected by the present assumptions (30).

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

The plan experienced more deaths among active members (21) than projected by the present assumptions (19).

Recommendations

Given the small number of plan participants, plan-specific experience should not be relied upon to be credible. We recommend adoption of the following RP-2014 mortality tables:

Healthy Male Retirees[1]: RP-2014 Male Healthy Annuitant Mortality Table, adjusted for white collar and mortality improvements using projection scale MP-2015. Male rates are set forward two years.

Healthy Female Retirees[2]: RP-2014 Female Healthy Annuitant Mortality Table, adjusted for white collar and mortality improvements using projection scale MP-2015. Female rates are set forward one year.

Disabled Male Retirees: RP-2014 Male Disabled Mortality Table, adjusted for mortality improvements using projection scale MP-2015.

Disabled Female Retirees: RP-2014 Female Disabled Mortality Table, adjusted for mortality improvements using projection scale MP-2015.

Male Active Members: RP-2014 Male Employee Mortality Table, adjusted for white collar and mortality improvements using projection scale MP-2015.

Female Active Members: RP-2014 Female Employee Mortality Table, adjusted for white collar and mortality improvements using projection scale MP-2015.

The RP-2014 tables as published by the Society of Actuaries (SOA) are based on rates for 2006. The SOA applied eight years of projection scale MP-2014 to produce the rates published as the "RP-2014" table, to be used for calendar year 2014. Recently, the SOA published an update to the MP-2014 projection scale, called MP-2015, which generally reflects lower improvements to life expectancy than MP-2014. All the proposed tables referred to in the above exhibit are based on the appropriate RP-2014 table as published by the Society of Actuaries (i.e. healthy retiree, disabled retiree or employee), projected backwards to 2006 using Scale MP-2014 and projected forward from 2006 using Scale MP-2015. In addition, mortality rates at some ages were adjusted to prevent decreasing mortality rates.

---

[1]   *Report originally stated that rates are set forward one year; corrected February 8, 2017.*
[2]   *Report originally indicated that rates are not set forward; corrected February 8, 2017.*

POST-RETIREMENT MORTALITY EXPERIENCE
HEALTHY MALES

Age	Deaths	Exposure	Crude Rates		Sample Rates		Expected Deaths		Ratio of Actuals/Expecteds	
			Population Weighted	Liability Weighted	Old*	New*	Old*	New*	Old*	New*
50-54	2	176	0.01136	0.00626	0.00434	0.00362	0.75	0.67	266.7%	298.5%
55-59	4	1,021	0.00392	0.00534	0.00502	0.00500	5.24	5.22	76.3%	76.6%
60-64	13	1,443	0.00901	0.00964	0.00869	0.00733	12.56	10.58	103.5%	122.9%
65-69	14	1,135	0.01234	0.01439	0.01472	0.01181	16.27	13.00	86.0%	107.7%
70-74	11	527	0.02087	0.02409	0.02505	0.02041	12.76	10.42	86.2%	105.6%
75-79	9	336	0.02679	0.01931	0.04617	0.03584	15.04	11.72	59.8%	76.8%
80-84	12	174	0.06897	0.06679	0.08578	0.06521	14.62	11.10	82.1%	108.1%
85-89	10	87	0.11494	0.11290	0.15117	0.11949	12.80	10.10	78.1%	99.0%
90-94	7	42	0.16667	0.13052	0.23774	0.19991	9.58	8.01	73.1%	87.4%
95+	3	7	0.42857	0.46762	0.32388	0.29780	2.29	2.11	131.0%	142.2%
Totals	**85**	**4,948**	**0.01718**	**0.01398**	**0.02060**	**0.01676**	**101.91**	**82.93**	**83.4%**	**102.5%**

In order to show the fit for the four-year period of the study, Sample Rates and Expected Deaths were determined using the current/proposed mortality rates projected forward/backward to the mid-point of the study using proposed projection scale.

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.

POST-RETIREMENT MORTALITY EXPERIENCE
HEALTHY MALES

Legend: Actual Experience - population weighted | Actual Experience - liability weighted | Current Assumptions | Proposed Assumptions

X-axis: Age (50-54, 55-59, 60-64, 65-69, 70-74, 75-79, 80-84, 85-89, 90-94, 95+)

POST-RETIREMENT MORTALITY EXPERIENCE
HEALTHY FEMALES

Age	Deaths	Exposure	Crude Rates Population Weighted	Crude Rates Liability Weighted	Sample Rates Old*	Sample Rates New*	Expected Deaths Old*	Expected Deaths New*	Ratio of Actuals/Expecteds Old*	Ratio of Actuals/Expecteds New*
50-54	-	116	0.00000	0.00000	0.00172	0.00245	0.23	0.30	0.0%	0.0%
55-59	4	625	0.00640	0.00488	0.00324	0.00353	2.10	2.25	190.5%	177.8%
60-64	3	678	0.00443	0.00177	0.00531	0.00568	3.57	3.83	84.0%	78.3%
65-69	6	554	0.01083	0.01201	0.00863	0.00917	4.65	4.94	129.0%	121.5%
70-74	4	230	0.01739	0.01854	0.01425	0.01515	3.17	3.36	126.2%	119.0%
75-79	3	125	0.02400	0.01305	0.02359	0.02610	2.85	3.14	105.3%	95.5%
80-84	1	64	0.01563	0.01226	0.03982	0.04705	2.55	2.99	39.2%	33.4%
85-89	3	28	0.10714	0.12176	0.07033	0.08641	1.92	2.36	156.3%	127.1%
90-94	1	5	0.20000	0.28059	0.12212	0.15156	0.59	0.73	169.5%	137.0%
95+	1	6	0.16667	0.08351	0.18551	0.24068	1.19	1.59	84.0%	62.9%
Totals	**26**	**2,431**	**0.01070**	**0.00800**	**0.00939**	**0.01049**	**22.82**	**25.49**	**113.9%**	**102.0%**

In order to show the fit for the four-year period of the study, Sample Rates and Expected Deaths were determined using the current/proposed mortality rates projected forward/backward to the mid-point of the study using proposed projection scale.

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.

POST-RETIREMENT MORTALITY EXPERIENCE
HEALTHY FEMALES

Legend: Actual Experience - population weighted | Actual Experience - liability weighted | Current Assumptions | Proposed Assumptions

X-axis: Age (50-54, 55-59, 60-64, 65-69, 70-74, 75-79, 80-84, 85-89, 90-94, 95+)

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*
35-39	1	20	0.05000	0.02257	0.01010	0.45	0.21	222.2%	476.2%
40-44	1	61	0.01639	0.02257	0.01431	1.38	0.88	72.5%	113.6%
45-49	-	84	0.00000	0.02513	0.01860	2.13	1.58	0.0%	0.0%
50-54	1	112	0.00893	0.03156	0.02219	3.55	2.49	28.2%	40.2%
55-59	4	134	0.02985	0.03804	0.02482	5.06	3.31	79.1%	120.8%
60-64	3	132	0.02273	0.04508	0.02857	5.94	3.76	50.5%	79.8%
65-69	2	66	0.03030	0.05467	0.03561	3.52	2.28	56.8%	87.7%
70-74	-	12	0.00000	0.06973	0.04763	0.82	0.56	0.0%	0.0%
75-79	-	7	0.00000	0.09244	0.06640	0.63	0.45	0.0%	0.0%
80-84	-	-	N/A	0.12201	0.09606	-	-	N/A	N/A
85-89	-	-	N/A	0.15533	0.14381	-	-	N/A	N/A
Totals	**12**	**628**	**0.01911**	**0.03739**	**0.02471**	**23.48**	**15.52**	**51.1%**	**77.3%**

* In order to show the fit for the four-year period of the study, Sample Rates and Expected Deaths were determined using the current/proposed mortality rates projected forward/backward to the mid-point of the study using proposed projection scale.
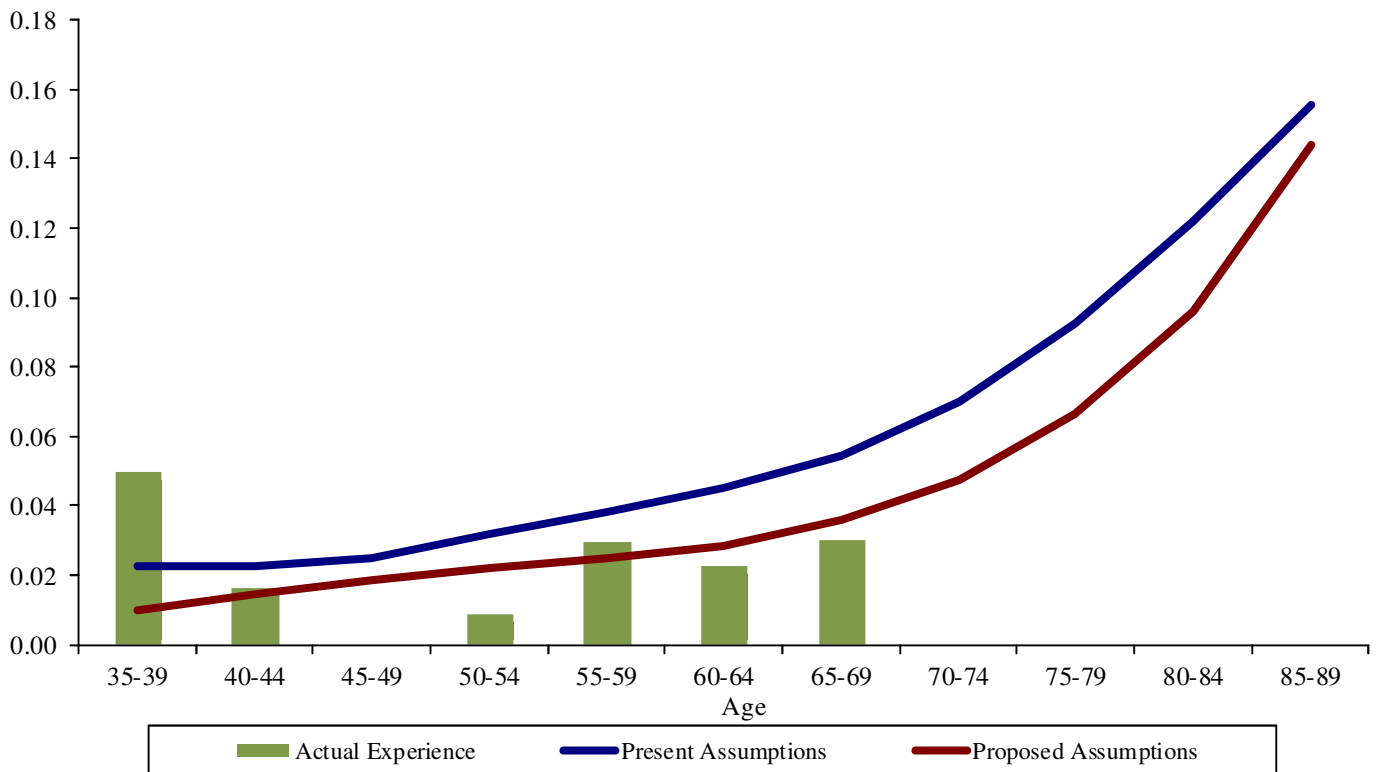
POST-RETIREMENT MORTALITY EXPERIENCE
DISABLED FEMALES

Age	Deaths	Exposure	Crude Rates	Sample Rates		Expected Deaths		Ratio of Actuals/Expecteds	
				Old	New*	Old	New*	Old	New*
35-39	1	12	0.08333	0.00745	0.00542	0.07	0.05	1428.6%	2000.0%
40-44	-	43	0.00000	0.00745	0.00782	0.26	0.27	0.0%	0.0%
45-49	-	43	0.00000	0.00790	0.01032	0.37	0.42	0.0%	0.0%
50-54	1	69	0.01449	0.01158	0.01307	0.86	0.86	116.3%	116.3%
55-59	3	99	0.03030	0.01655	0.01591	1.61	1.40	186.3%	214.3%
60-64	-	59	0.00000	0.02187	0.01902	1.65	1.32	0.0%	0.0%
65-69	1	22	0.04546	0.02817	0.02445	0.67	0.52	149.3%	192.3%
70-74	-	12	0.00000	0.03784	0.03456	0.62	0.49	0.0%	0.0%
75-79	-	2	0.00000	0.05244	0.05129	0.16	0.13	0.0%	0.0%
80-84	-	-	N/A	0.07262	0.07728	-	-	N/A	N/A
85-89	-	-	N/A	0.10069	0.11509	-	-	N/A	N/A
Totals	**6**	**361**	**0.01662**	**0.01737**	**0.01512**	**6.27**	**5.46**	**95.7%**	**109.9%**

* *In order to show the fit for the four-year period of the study, Sample Rates and Expected Deaths were determined using the current/proposed mortality rates projected forward/backward to the mid-point of the study using proposed projection scale.*
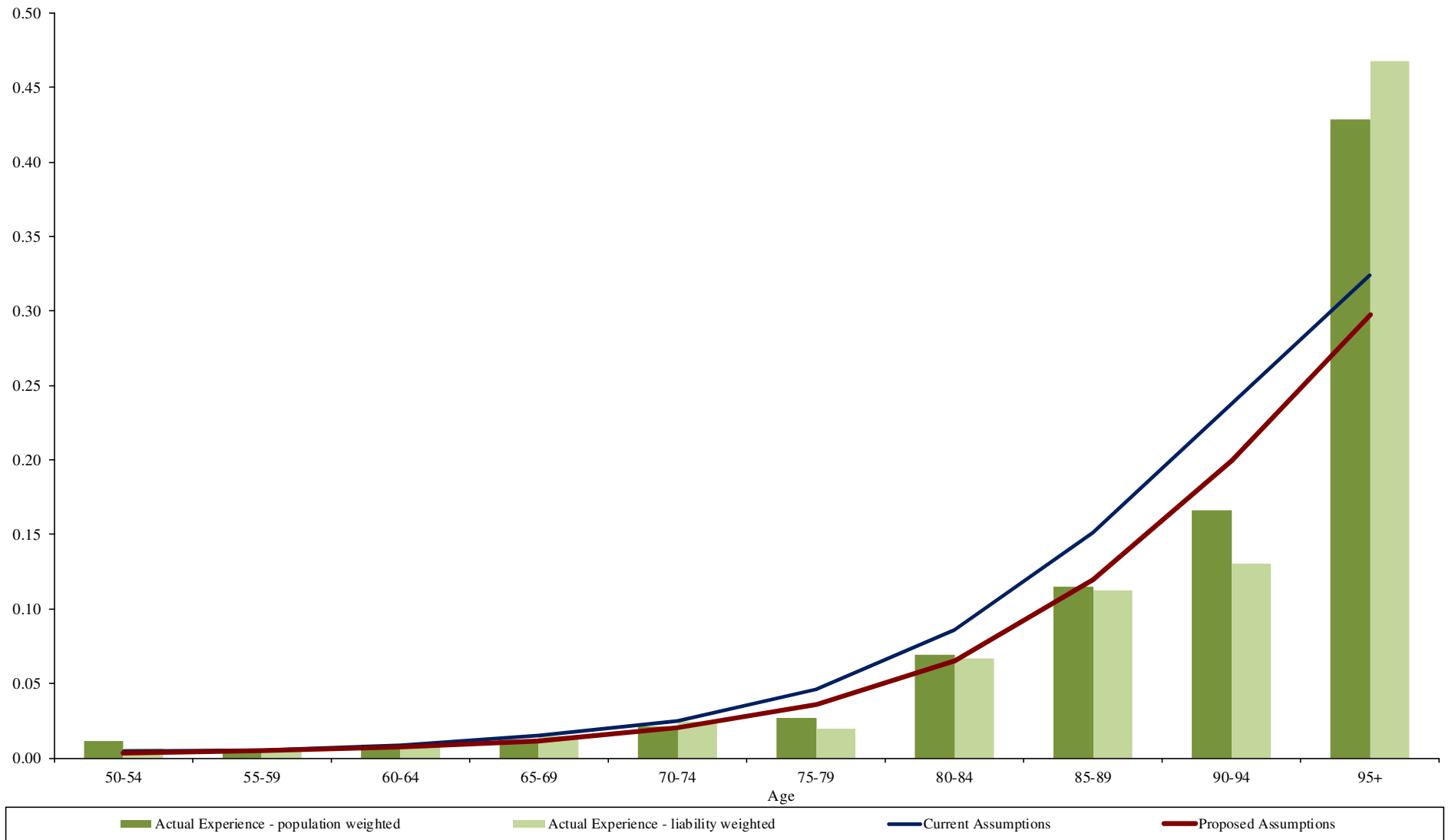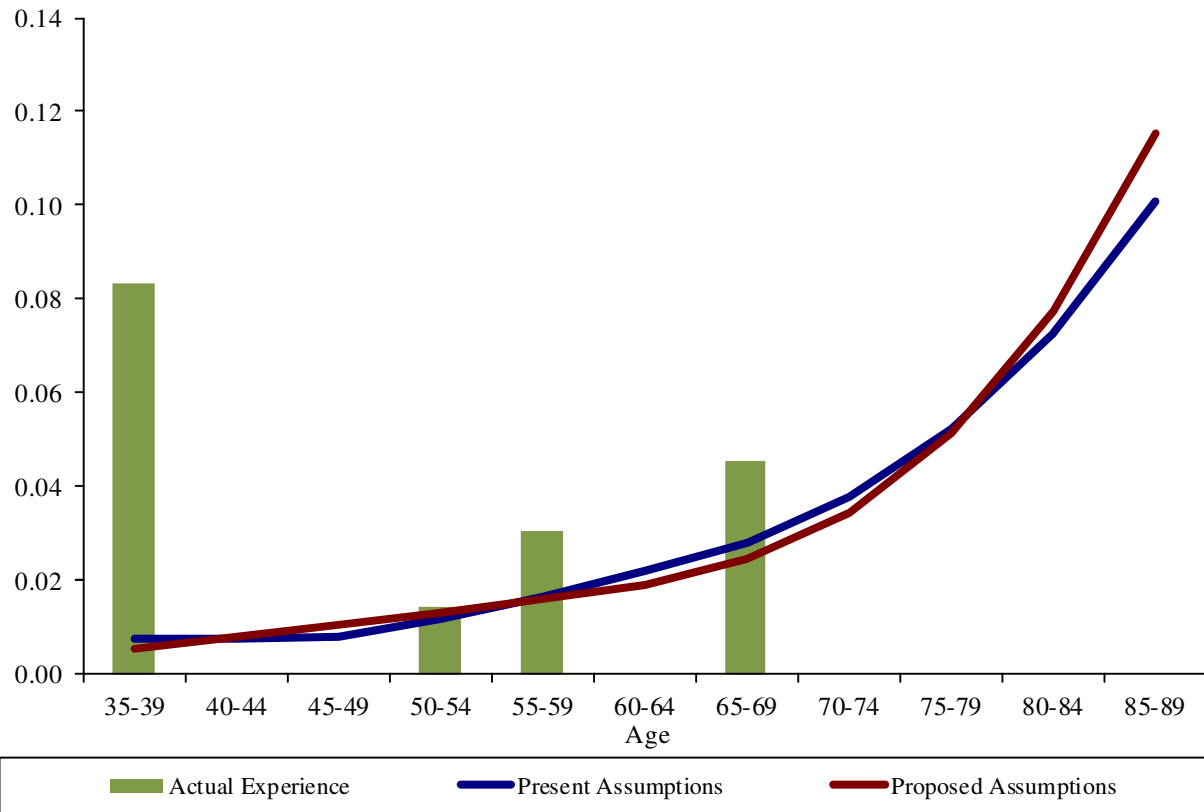
PRE-RETIREMENT MORTALITY EXPERIENCE
HEALTHY MALES

Age	Deaths	Exposure	Crude Rates	Sample Rates		Expected Deaths		Ratio of Actuals/Expecteds	
				Old*	New*	Old*	New*	Old*	New*
Under 20	-	-	N/A	0.00024	0.00025	0.00	0.00	0.0%	0.0%
20-24	-	154	0.00000	0.00029	0.00032	0.05	0.05	0.0%	0.0%
25-29	-	1,222	0.00000	0.00036	0.00031	0.44	0.38	0.0%	0.0%
30-34	1	1,728	0.00058	0.00041	0.00033	0.71	0.57	141.2%	175.4%
35-39	1	1,520	0.00066	0.00066	0.00038	1.00	0.58	100.5%	172.4%
40-44	-	1,595	0.00000	0.00092	0.00052	1.47	0.83	0.0%	0.0%
45-49	4	1,793	0.00223	0.00130	0.00088	2.34	1.58	171.1%	253.2%
50-54	3	1,785	0.00168	0.00175	0.00150	3.12	2.69	96.0%	111.5%
55-59	3	929	0.00323	0.00262	0.00244	2.31	2.15	129.6%	139.4%
60-64	1	297	0.00337	0.00427	0.00420	1.19	1.16	83.9%	86.3%
65-69	-	51	0.00000	0.00663	0.00757	0.31	0.34	0.0%	0.0%
Totals	**13**	**11,074**	**0.00117**	**0.00117**	**0.00093**	**12.95**	**10.33**	**100.4%**	**125.8%**

In order to show the fit for the four-year period of the study, Sample Rates and Expected Deaths were determined using the current/proposed mortality rates projected forward/backward to the mid-point of the study using proposed projection scale.
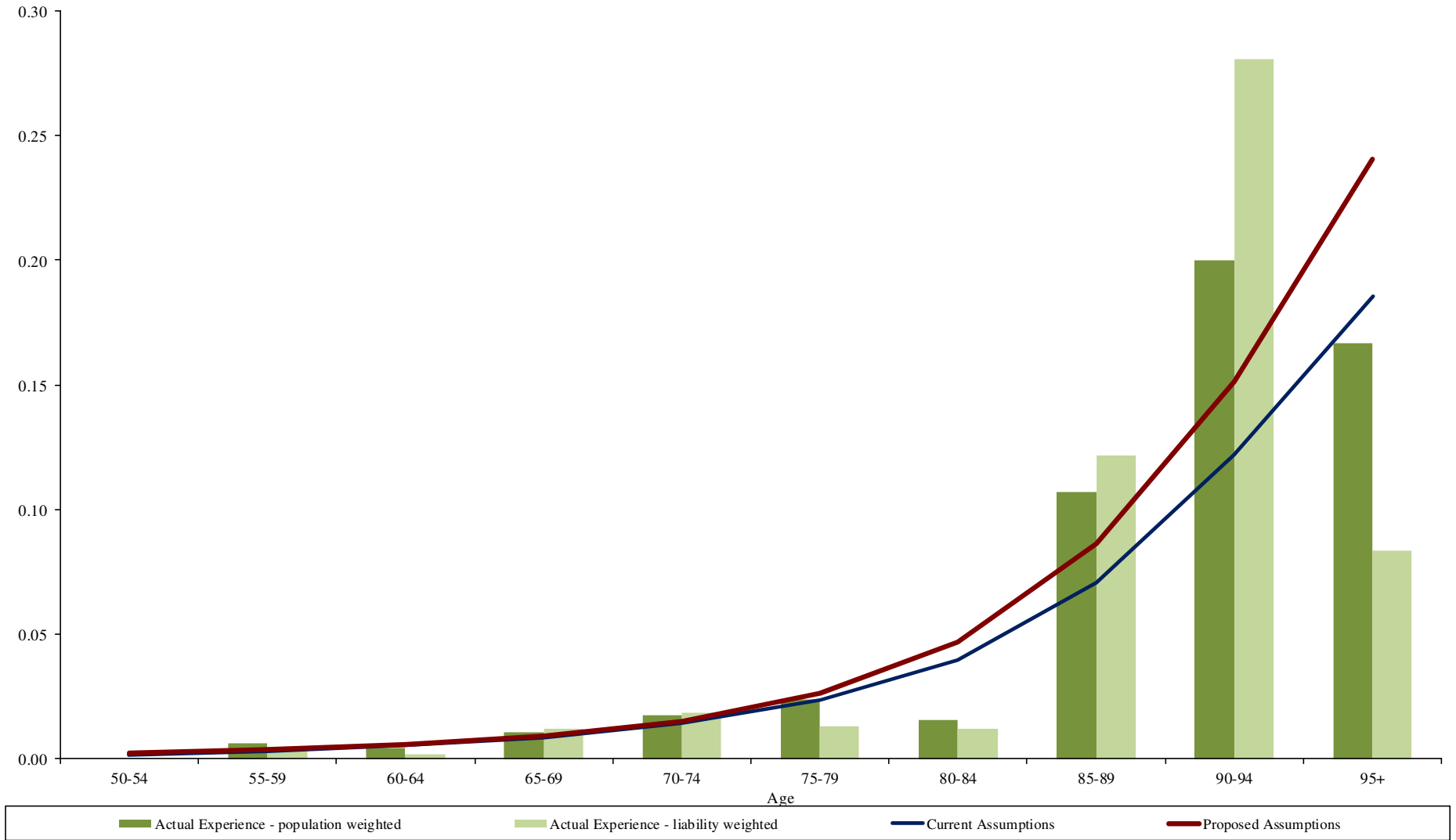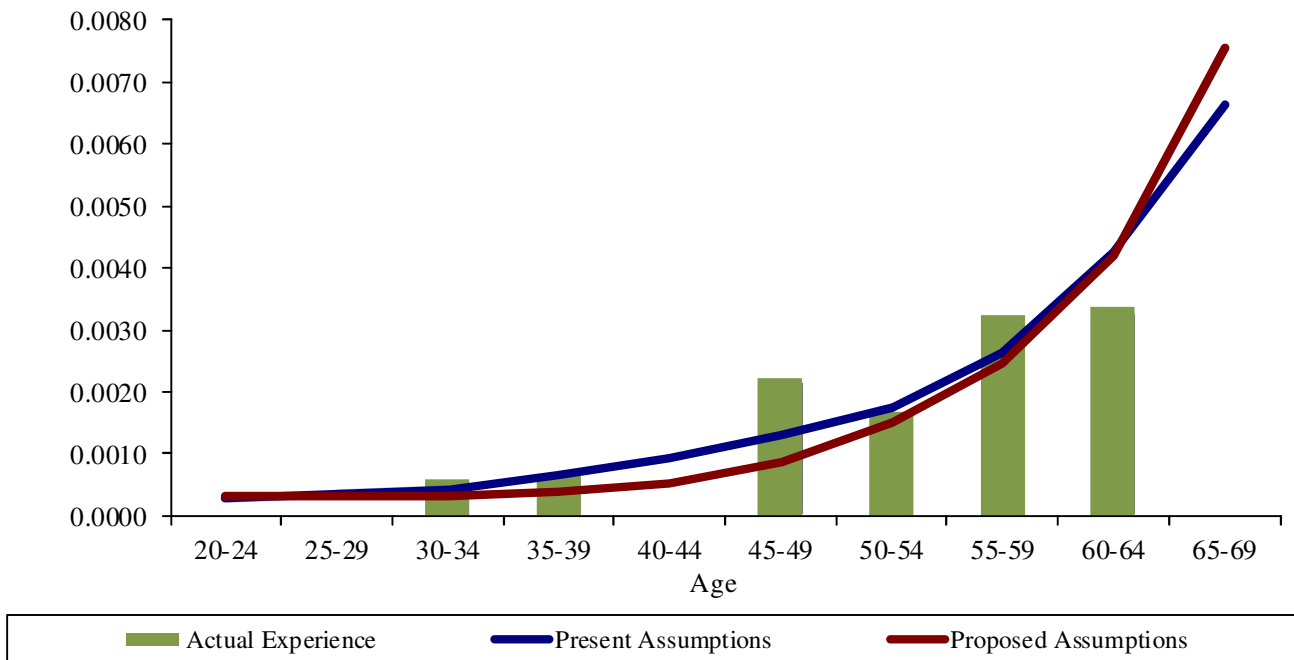
PRE-RETIREMENT MORTALITY EXPERIENCE
HEALTHY FEMALES

Age	Deaths	Exposure	Crude Rates	Sample Rates		Expected Deaths		Ratio of Actuals/Expecteds	
				Old*	New*	Old*	New*	Old*	New*
Under 20	-	-	N/A	0.00014	0.00014	-	-	0.0%	0.0%
20-24	-	140	0.00000	0.00016	0.00014	0.02	0.02	0.0%	0.0%
25-29	-	808	0.00000	0.00021	0.00016	0.16	0.13	0.0%	0.0%
30-34	-	1,158	0.00000	0.00034	0.00021	0.37	0.24	0.0%	0.0%
35-39	-	823	0.00000	0.00049	0.00029	0.37	0.23	0.0%	0.0%
40-44	1	769	0.00130	0.00068	0.00042	0.49	0.32	205.2%	310.4%
45-49	3	822	0.00365	0.00101	0.00070	0.81	0.58	370.4%	521.1%
50-54	1	1,002	0.00100	0.00145	0.00112	1.58	1.13	63.5%	88.8%
55-59	1	631	0.00158	0.00229	0.00170	1.60	1.03	62.5%	96.8%
60-64	1	189	0.00529	0.00377	0.00253	0.78	0.46	128.2%	216.3%
65-69	1	51	0.01961	0.00589	0.00412	0.32	0.19	317.2%	521.7%
Totals	**8**	**6,393**	**0.00125**	**0.00101**	**0.00068**	**6.48**	**4.33**	**123.4%**	**184.7%**

* In order to show the fit for the four-year period of the study, Sample Rates and Expected Deaths were determined using the current/proposed mortality rates projected forward/backward to the mid-point of the study using proposed projection scale.
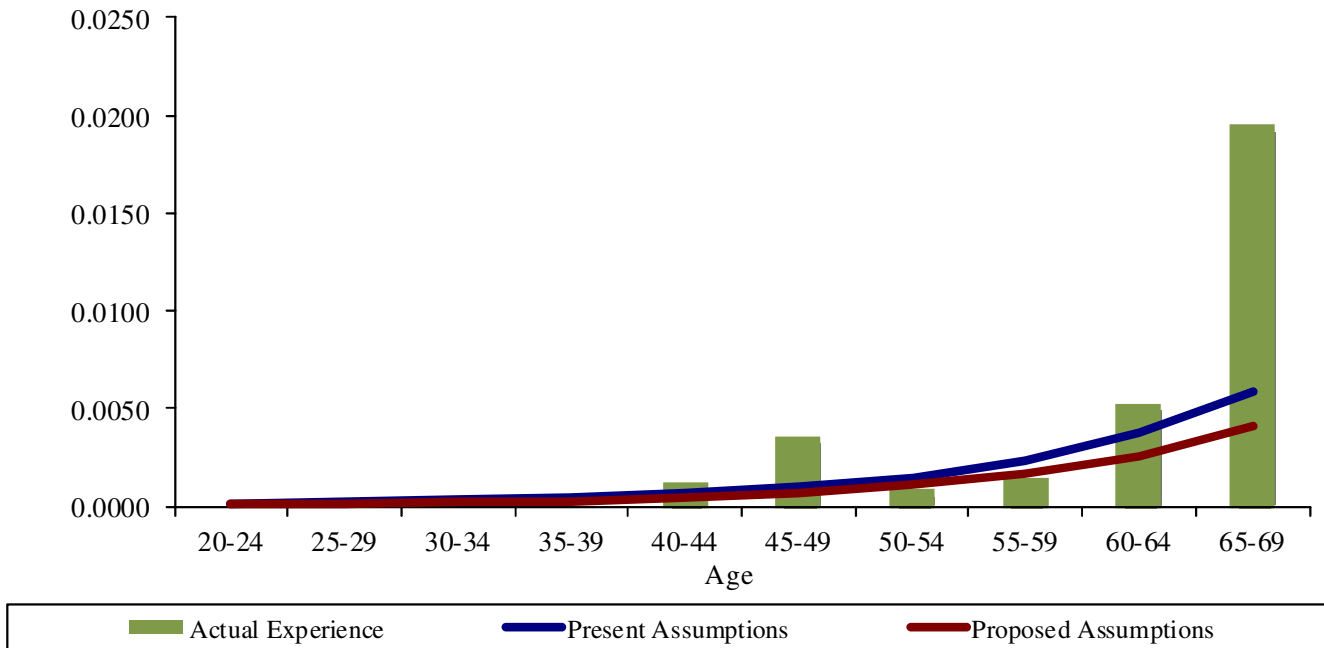
SECTION G
MISCELLANEOUS AND TECHNICAL ASSUMPTIONS

Upon the death of an active married CERF member, a benefit is payable to the surviving spouse. If the CERF member is unmarried at the time of death, the non-spouse beneficiary (estate if no beneficiary) is entitled to a refund of accumulated contributions with interest.

The current valuation assumption is 85% of male and female members are married.

Findings

We reviewed the marital status of healthy members retiring from active status during the four-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	259	344	0.7529	0.8500	0.7500	292.40	258.00	88.6%	100.4%
Females	137	224	0.6116	0.8500	0.7500	190.40	168.00	72.0%	81.5%
Total	**396**	**568**	**0.6972**	**0.8500**	**0.7500**	**482.80**	**426.00**	**82.0%**	**93.0%**

Members who terminated employment and were retirement eligible were included in the retirement analysis in this report but are excluded from this analysis.

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 changing the assumed percentage of members that are married to 75% for both males and females.

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 three years older.

Findings

We reviewed the ages of married new retirees and their beneficiaries during the four-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	259	2.39	3.00	2.00	79.8%	119.7%
Females	137	(1.72)	(3.00)	(2.00)	57.2%	85.8%
Total	396					

The experience shows that actual age differences among new retirees are closer to two years for male and female retirees. This experience is consistent with the experience from the prior study.

Recommendation

We recommend changing the assumed age difference to two years (with males older than females).

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 & 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:	0% elect 15-Year Certain & Life
	10% elect 50% Joint & Survivor option
	10% elect 75% Joint & Survivor option
	40% elect 100% Joint & Survivor option
Females:	0% elect 15-Year Certain & Life
	10% elect 50% Joint & Survivor option
	10% elect 75% Joint & Survivor option
	30% 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 four-year period. The results are shown on the following pages.

We found more married new retirees are electing a joint & survivor option for both males and females.

Recommendation

We recommend increasing the assumed percentage electing joint and survivor annuities, as indicated on the following page, and reducing the assumed percentage electing the single life annuity accordingly.

Male Experience

Form of Payment	Actual Electing Annuity	Married New Retirees	Crude Rates	Sample Rates		Expected Electing Annuity		Ratio of Actuals/Expecteds	
				Old	New	Old	New	Old	New
Life annuity	55	259	0.2124	0.4000	0.2000	103.60	51.80	53.1%	106.2%
15-year certain & life	1	259	0.0039	0.0000	0.0000	0.00	0.00	N/A	N/A
50% joint & survivor	32	259	0.1236	0.1000	0.1500	25.90	38.85	123.6%	82.4%
75% joint & survivor	42	259	0.1622	0.1000	0.1500	25.90	38.85	162.2%	108.1%
100% joint & survivor	129	259	0.4981	0.4000	0.5000	103.60	129.50	124.5%	99.6%
Total	**259**	**259**	**1.0000**	**1.0000**	**1.0000**	**259.00**	**259.00**		

Female Experience

Form of Payment	Actual Electing Annuity	Married New Retirees	Crude Rates	Sample Rates		Expected Electing Annuity		Ratio of Actuals/Expecteds	
				Old	New	Old	New	Old	New
Life annuity	61	137	0.4453	0.5000	0.4500	68.50	61.65	89.1%	98.9%
15-year certain & life	-	137	0.0000	0.0000	0.0000	0.00	0.00	N/A	N/A
50% joint & survivor	15	137	0.1095	0.1000	0.1000	13.70	13.70	109.5%	109.5%
75% joint & survivor	12	137	0.0876	0.1000	0.1000	13.70	13.70	87.6%	87.6%
100% joint & survivor	49	137	0.3577	0.3000	0.3500	41.10	47.95	119.2%	102.2%
Total	**137**	**137**	**1.0000**	**1.0000**	**1.0000**	**137.00**	**137.00**		

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 2027 using Scale AA, set forward one year for males and set back one year for females, blended 70% males, and 6.5% post-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. We will work with MSRS staff to develop appropriate factors.

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 G-7. We recommend that the Liability Adjustments related to Combined Service Annuities be reviewed and updated (we note that the LCPR Actuary is currently working on such a review). 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 annuity benefit when the value of member contributions is greater than the value of the annuity 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 0% and liabilities for former members are increased by 30% 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 H
PROPOSED ASSUMPTION LISTING

PROPOSED ACTUARIAL ASSUMPTIONS
BASED ON 2011-2015 EXPERIENCE STUDY

MERIT AND SENIORITY PAY INCREASES

% Merit & Seniority Increases in Salaries Next Year	
Year	Rate
1	9.00%
2	5.50%
3	2.50%
4	2.00%
5	1.75%
6	1.50%
7	1.50%
8	1.50%
9	1.50%
10	1.50%
11	1.50%
12	1.25%
13	1.00%
14	1.00%
15	0.75%
16	0.75%
17	0.75%
18	0.50%
19	0.50%
20	0.50%
21	0.25%
22	0.25%
23	0.25%
24	0.00%
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
55	45.0%
56	20.0%
57	15.0%
58	15.0%
59	15.0%
60	15.0%
61	15.0%
62	25.0%
63	25.0%
64	25.0%
65	30.0%
66	30.0%
67	25.0%
68	25.0%
69	40.0%
70+*	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.

AGE & SERVICE RETIREMENT PATTERN
REDUCED (EARLY) RETIREMENT

Age	% Retiring
50	5.0%
51	3.0%
52	3.0%
53	3.0%
54	5.0%

WITHDRAWAL

4 or more Years of Service		
Age	Male	Female
25	0.1000	0.1150
26	0.0900	0.1100
27	0.0800	0.1050
28	0.0700	0.1000
29	0.0600	0.0950
30	0.0500	0.0910
31	0.0490	0.0870
32	0.0480	0.0830
33	0.0470	0.0790
34	0.0460	0.0750
35	0.0450	0.0710
36	0.0430	0.0695
37	0.0410	0.0670
38	0.0390	0.0645
39	0.0370	0.0610
40	0.0350	0.0570
41	0.0300	0.0530
42	0.0250	0.0490
43	0.0220	0.0450
44	0.0205	0.0410
45	0.0195	0.0350
46	0.0185	0.0325
47	0.0175	0.0310
48	0.0160	0.0290
49	0.0150	0.0275
50+	0.0000	0.0000

DISABILITY RATES

	% Becoming Disabled	
Age	Male	Female
20	0.05%	0.05%
21	0.05%	0.05%
22	0.07%	0.07%
23	0.07%	0.07%
24	0.08%	0.08%
25	0.08%	0.08%
26	0.08%	0.08%
27	0.09%	0.09%
28	0.09%	0.09%
29	0.11%	0.11%
30	0.11%	0.11%
31	0.12%	0.12%
32	0.12%	0.12%
33	0.13%	0.13%
34	0.13%	0.13%
35	0.15%	0.15%
36	0.16%	0.16%
37	0.17%	0.17%
38	0.20%	0.20%
39	0.21%	0.21%
40	0.22%	0.22%
41	0.24%	0.24%
42	0.26%	0.26%
43	0.29%	0.29%
44	0.32%	0.32%
45	0.35%	0.35%
46	0.39%	0.39%
47	0.43%	0.43%
48	0.44%	0.44%
49	0.49%	0.49%
50	0.54%	0.54%
51	0.61%	0.61%
52	0.68%	0.68%
53	0.77%	0.77%
54	0.86%	0.86%
55	0.00%	0.00%
56	0.00%	0.00%
57	0.00%	0.00%
58	0.00%	0.00%
59	0.00%	0.00%
60	0.00%	0.00%
61	0.00%	0.00%
62	0.00%	0.00%
63	0.00%	0.00%
64	0.00%	0.00%

PROPOSED ACTUARIAL ASSUMPTIONS
BASED ON 2011-2015 EXPERIENCE STUDY

HEALTHY POST-RETIREMENT MORTALITY RATES

Age in 2013	% Dying Next Year* Male	% Dying Next Year* Female	Age in 2013	% Dying Next Year* Male	% Dying Next Year* Female
50	0.3180%	0.2152%	81	5.6781%	4.1054%
51	0.3392%	0.2281%	82	6.4210%	4.6317%
52	0.3609%	0.2431%	83	7.2628%	5.2317%
53	0.3849%	0.2600%	84	8.2116%	5.9115%
54	0.4071%	0.2790%	85	9.2814%	6.6827%
55	0.4331%	0.3004%	86	10.4787%	7.5533%
56	0.4630%	0.3241%	87	11.8112%	8.5260%
57	0.4969%	0.3503%	88	13.2966%	9.6125%
58	0.5342%	0.3794%	89	14.8758%	10.8290%
59	0.5748%	0.4111%	90	16.5230%	12.1527%
60	0.6194%	0.4607%	91	18.2133%	13.5732%
61	0.6689%	0.5118%	92	19.9369%	15.0783%
62	0.7243%	0.5651%	93	21.6807%	16.6610%
63	0.7883%	0.6219%	94	23.5998%	18.3162%
64	0.8623%	0.6826%	95	25.6017%	20.1060%
65	0.9482%	0.7497%	96	27.7012%	22.0058%
66	1.0483%	0.8240%	97	29.8653%	24.0079%
67	1.1640%	0.9070%	98	31.8573%	26.0992%
68	1.2963%	1.0001%	99	33.8733%	28.1204%
69	1.4459%	1.1043%	100	35.8614%	30.1265%
70	1.6148%	1.2207%	101	37.8230%	32.1502%
71	1.8043%	1.3507%	102	39.7199%	34.1679%
72	2.0159%	1.4970%	103	41.5489%	36.1508%
73	2.2521%	1.6615%	104	43.3240%	38.1033%
74	2.5166%	1.8474%	105	44.9844%	40.0067%
75	2.8141%	2.0585%	106	46.5472%	41.8142%
76	3.1502%	2.2985%	107	48.0125%	43.5541%
77	3.5309%	2.5723%	108	49.3726%	45.2048%
78	3.9655%	2.8835%	109	49.8693%	46.7402%
79	4.4617%	3.2383%	110	49.8693%	48.1733%
80	5.0300%	3.6440%			

* *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 from 2006 to the mid-point of this study (2013) using projection scale MP-2015.*

PROPOSED ACTUARIAL ASSUMPTIONS
BASED ON 2011-2015 EXPERIENCE STUDY

DISABLED POST-RETIREMENT MORTALITY RATES

Age in 2013	% Dying Next Year* Male	% Dying Next Year* Female	Age in 2013	% Dying Next Year* Male	% Dying Next Year* Female
20	0.0462%	0.0199%	56	2.4235%	1.5356%
21	0.0638%	0.0275%	57	2.4772%	1.5912%
22	0.0879%	0.0383%	58	2.5358%	1.6468%
23	0.1181%	0.0525%	59	2.5995%	1.7034%
24	0.1544%	0.0699%	60	2.6710%	1.7611%
25	0.1962%	0.0905%	61	2.7515%	1.8240%
26	0.2434%	0.1123%	62	2.8425%	1.8930%
27	0.2952%	0.1364%	63	2.9490%	1.9714%
28	0.3515%	0.1630%	64	3.0703%	2.0617%
29	0.4124%	0.1927%	65	3.2093%	2.1664%
30	0.4777%	0.2260%	66	3.3667%	2.2869%
31	0.5470%	0.2627%	67	3.5416%	2.4258%
32	0.6200%	0.3031%	68	3.7366%	2.5838%
33	0.6953%	0.3465%	69	3.9532%	2.7619%
34	0.7696%	0.3925%	70	4.1909%	2.9615%
35	0.8468%	0.4411%	71	4.4513%	3.1838%
36	0.9261%	0.4914%	72	4.7369%	3.4299%
37	1.0075%	0.5419%	73	5.0480%	3.7015%
38	1.0909%	0.5922%	74	5.3869%	4.0023%
39	1.1762%	0.6419%	75	5.7557%	4.3326%
40	1.2626%	0.6908%	76	6.1581%	4.6942%
41	1.3449%	0.7361%	77	6.5986%	5.0924%
42	1.4293%	0.7815%	78	7.0808%	5.5264%
43	1.5147%	0.8277%	79	7.6091%	6.0001%
44	1.6012%	0.8756%	80	8.1913%	6.5143%
45	1.6894%	0.9263%	81	8.8278%	7.0758%
46	1.7772%	0.9782%	82	9.5325%	7.6786%
47	1.8632%	1.0324%	83	10.3097%	8.3323%
48	1.9459%	1.0841%	84	11.1672%	9.0372%
49	2.0236%	1.1372%	85	12.1077%	9.7913%
50	2.0954%	1.1922%	86	13.1415%	10.5996%
51	2.1630%	1.2491%	87	14.2750%	11.4594%
52	2.2295%	1.3063%	88	15.5161%	12.3690%
53	2.2802%	1.3640%	89	16.8658%	13.3263%
54	2.3270%	1.4218%	90	18.3373%	14.3439%
55	2.3744%	1.4787%			

* The rates shown are RP-2014 mortality for disabled annuitants, with adjustments, if applicable (see Section G). Recommended rates include mortality improvements from 2006 to the mid-point of this study (2013) using projection scale MP-2015.

PROPOSED ACTUARIAL ASSUMPTIONS
BASED ON 2011-2015 EXPERIENCE STUDY

HEALTHY PRE-RETIREMENT MORTALITY RATES

Age in 2013	% Dying Next Year* Male	% Dying Next Year* Female	Age in 2013	% Dying Next Year* Male	% Dying Next Year* Female
20	0.0272%	0.0135%	46	0.0771%	0.0622%
21	0.0301%	0.0135%	47	0.0866%	0.0692%
22	0.0327%	0.0135%	48	0.0973%	0.0766%
23	0.0342%	0.0135%	49	0.1089%	0.0845%
24	0.0342%	0.0135%	50	0.1214%	0.0931%
25	0.0327%	0.0135%	51	0.1350%	0.1022%
26	0.0314%	0.0152%	52	0.1499%	0.1117%
27	0.0305%	0.0157%	53	0.1648%	0.1220%
28	0.0302%	0.0162%	54	0.1809%	0.1327%
29	0.0302%	0.0172%	55	0.1986%	0.1442%
30	0.0310%	0.0182%	56	0.2184%	0.1564%
31	0.0319%	0.0195%	57	0.2410%	0.1692%
32	0.0330%	0.0208%	58	0.2668%	0.1829%
33	0.0341%	0.0223%	59	0.2963%	0.1976%
34	0.0350%	0.0238%	60	0.3301%	0.2134%
35	0.0362%	0.0251%	61	0.3688%	0.2309%
36	0.0371%	0.0266%	62	0.4130%	0.2503%
37	0.0380%	0.0283%	63	0.4640%	0.2722%
38	0.0395%	0.0303%	64	0.5219%	0.2964%
39	0.0413%	0.0325%	65	0.5880%	0.3239%
40	0.0437%	0.0351%	66	0.6623%	0.3627%
41	0.0467%	0.0379%	67	0.7461%	0.4062%
42	0.0505%	0.0413%	68	0.8407%	0.4551%
43	0.0554%	0.0454%	69	0.9475%	0.5097%
44	0.0614%	0.0503%	70	1.0677%	0.5705%
45	0.0685%	0.0559%			

* 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 from 2006 to the mid-point of this study (2013) using projection scale MP-2015.

SECTION I
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 J
APPENDIX

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

2011-2015 Experience

Year	Exposure	Gross Actual Increases	Gross Expected Increases
1	95	19.40%	5.75%
2	1,052	12.52%	5.60%
3	873	6.37%	5.45%
4	810	4.75%	5.30%
5	888	3.94%	5.15%
6	1,040	4.21%	5.00%
7	1,156	4.56%	4.85%
8	1,157	4.42%	4.70%
9	941	4.64%	4.55%
10	745	5.25%	4.40%
11	555	4.85%	4.30%
12	498	4.63%	4.20%
13	517	3.79%	4.10%
14	469	4.55%	4.00%
15	422	3.40%	3.90%
16	350	3.63%	3.80%
17	316	4.57%	3.70%
18	372	3.40%	3.60%
19	332	1.47%	3.50%
20	334	3.96%	3.50%
21	265	2.35%	3.50%
22	178	3.38%	3.50%
23	165	3.02%	3.50%
24	132	2.27%	3.50%
25	127	2.57%	3.50%
26	96	1.72%	3.50%
27	80	2.53%	3.50%
28	67	2.78%	3.50%
29	68	2.97%	3.50%
30	56	1.72%	3.50%
31+	97	3.30%	3.50%
Totals	**14,253**	**4.97%**	**4.55%**

APPENDIX – DETAILED EXPERIENCE ANALYSIS
SALARY INCREASES

2011-2012 Experience

Year	Exposure	Gross Actual Increases	Gross Expected Increases
1	16	19.79%	5.75%
2	152	14.51%	5.60%
3	178	6.43%	5.45%
4	221	6.90%	5.30%
5	398	5.50%	5.15%
6	353	6.11%	5.00%
7	325	6.40%	4.85%
8	241	6.90%	4.70%
9	121	6.29%	4.55%
10	152	6.51%	4.40%
11	126	6.71%	4.30%
12	141	6.18%	4.20%
13	132	5.68%	4.10%
14	108	6.37%	4.00%
15	87	5.81%	3.90%
16	55	5.77%	3.80%
17	106	5.22%	3.70%
18	161	5.46%	3.60%
19	40	4.79%	3.50%
20	75	4.86%	3.50%
21	37	4.13%	3.50%
22	52	5.04%	3.50%
23	38	4.42%	3.50%
24	34	4.06%	3.50%
25	33	5.43%	3.50%
26	14	4.90%	3.50%
27	19	4.34%	3.50%
28	20	5.03%	3.50%
29	22	4.91%	3.50%
30	12	5.32%	3.50%
31+	26	5.03%	3.50%
Totals	**3,495**	**6.42%**	**4.56%**

2012-2013 Experience

Year	Exposure	Gross Actual Increases	Gross Expected Increases
1	28	20.27%	5.75%
2	308	10.00%	5.60%
3	171	1.63%	5.45%
4	165	1.06%	5.30%
5	204	-1.10%	5.15%
6	365	0.40%	5.00%
7	328	-0.13%	4.85%
8	308	-0.32%	4.70%
9	232	-0.04%	4.55%
10	113	0.36%	4.40%
11	144	0.46%	4.30%
12	117	-1.15%	4.20%
13	140	-0.55%	4.10%
14	125	0.21%	4.00%
15	99	-1.26%	3.90%
16	85	-0.75%	3.80%
17	49	-0.98%	3.70%
18	99	-1.32%	3.60%
19	154	-1.81%	3.50%
20	37	-2.21%	3.50%
21	71	-2.16%	3.50%
22	33	-2.21%	3.50%
23	42	0.51%	3.50%
24	36	-2.16%	3.50%
25	29	-2.41%	3.50%
26	30	-2.57%	3.50%
27	13	-5.30%	3.50%
28	17	-2.03%	3.50%
29	18	-1.47%	3.50%
30	18	-1.86%	3.50%
31+	25	-2.22%	3.50%
Totals	**3,603**	**0.67%**	**4.56%**

2013-2014 Experience

Year	Exposure	Gross Actual Increases	Gross Expected Increases
1	27	17.56%	5.75%
2	251	12.32%	5.60%
3	306	8.22%	5.45%
4	144	5.51%	5.30%
5	152	5.09%	5.15%
6	180	6.15%	5.00%
7	339	6.57%	4.85%
8	299	6.44%	4.70%
9	296	5.82%	4.55%
10	212	5.87%	4.40%
11	105	6.07%	4.30%
12	140	7.13%	4.20%
13	115	5.15%	4.10%
14	127	6.87%	4.00%
15	124	4.89%	3.90%
16	95	5.60%	3.80%
17	74	4.76%	3.70%
18	45	5.39%	3.60%
19	92	4.19%	3.50%
20	147	4.99%	3.50%
21	31	4.28%	3.50%
22	66	4.36%	3.50%
23	30	3.39%	3.50%
24	38	4.37%	3.50%
25	31	3.52%	3.50%
26	27	4.66%	3.50%
27	26	3.96%	3.50%
28	14	3.92%	3.50%
29	15	4.04%	3.50%
30	15	2.76%	3.50%
31+	28	5.56%	3.50%
Totals	**3,591**	**6.45%**	**4.53%**

APPENDIX – DETAILED EXPERIENCE ANALYSIS
SALARY INCREASES

2014-2015 Experience

Year	Exposure	Gross Actual Increases	Gross Expected Increases
1	24	20.21%	5.75%
2	341	14.05%	5.60%
3	218	7.44%	5.45%
4	280	4.82%	5.30%
5	134	5.69%	5.15%
6	142	6.80%	5.00%
7	164	6.16%	4.85%
8	309	5.23%	4.70%
9	292	6.48%	4.55%
10	268	6.12%	4.40%
11	180	6.35%	4.30%
12	100	5.71%	4.20%
13	130	5.34%	4.10%
14	109	5.02%	4.00%
15	112	4.00%	3.90%
16	115	4.22%	3.80%
17	87	6.72%	3.70%
18	67	4.06%	3.60%
19	46	4.14%	3.50%
20	75	4.10%	3.50%
21	126	3.90%	3.50%
22	27	4.58%	3.50%
23	55	3.77%	3.50%
24	24	3.03%	3.50%
25	34	3.16%	3.50%
26	25	1.91%	3.50%
27	22	3.90%	3.50%
28	16	4.07%	3.50%
29	13	4.59%	3.50%
30	11	2.23%	3.50%
31+	18	4.98%	3.50%
Totals	**3,564**	**6.38%**	**4.54%**

APPENDIX – DETAILED EXPERIENCE ANALYSIS
RETIREMENT

2011-2015 Experience

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
50	35	495	24.75	141.4%
51	26	504	15.12	172.0%
52	25	523	15.69	159.3%
53	30	503	15.09	198.8%
54	31	507	25.35	122.3%
55	171	482	265.10	64.5%
56	80	315	37.80	211.6%
57	43	252	30.24	142.2%
58	29	205	20.50	141.5%
59	34	172	17.20	197.7%
60	22	138	13.80	159.4%
61	20	111	11.10	180.2%
62	19	87	26.10	72.8%
63	19	62	18.60	102.2%
64	6	44	13.20	45.5%
65	9	45	22.50	40.0%
66	10	27	13.50	74.1%
67	3	14	7.00	42.9%
68	2	9	4.50	44.4%
69	3	7	3.50	85.7%
Totals	**617**	**4,502**	**600.64**	**102.7%**

APPENDIX – DETAILED EXPERIENCE ANALYSIS
RETIREMENT

2011-2012 Experience

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
50	12	137	6.85	175.2%
51	4	139	4.17	95.9%
52	7	138	4.14	169.1%
53	8	119	3.57	224.1%
54	14	146	7.30	191.8%
55	43	121	66.55	64.6%
56	18	74	8.88	202.7%
57	11	65	7.80	141.0%
58	8	50	5.00	160.0%
59	5	36	3.60	138.9%
60	3	31	3.10	96.8%
61	3	28	2.80	107.1%
62	3	13	3.90	76.9%
63	3	11	3.30	90.9%
64	2	11	3.30	60.6%
65	5	15	7.50	66.7%
66	4	6	3.00	133.3%
67	1	2	1.00	100.0%
68	-	2	1.00	0.0%
69	2	4	2.00	100.0%
Totals	**156**	**1,148**	**148.76**	**104.9%**

2012-2013 Experience

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
50	10	134	6.70	149.3%
51	2	128	3.84	52.1%
52	4	138	4.14	96.6%
53	3	130	3.90	76.9%
54	3	109	5.45	55.0%
55	51	132	72.60	70.2%
56	16	83	9.96	160.6%
57	9	56	6.72	133.9%
58	5	54	5.40	92.6%
59	10	46	4.60	217.4%
60	6	30	3.00	200.0%
61	4	30	3.00	133.3%
62	3	27	8.10	37.0%
63	2	11	3.30	60.6%
64	2	8	2.40	83.3%
65	2	10	5.00	40.0%
66	3	9	4.50	66.7%
67	-	2	1.00	0.0%
68	1	1	0.50	200.0%
69	1	2	1.00	100.0%
Totals	**137**	**1,140**	**155.11**	**88.3%**

2013-2014 Experience

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
50	6	118	5.90	101.7%
51	8	126	3.78	211.6%
52	5	126	3.78	132.3%
53	9	134	4.02	223.9%
54	6	127	6.35	94.5%
55	29	105	57.75	50.2%
56	15	80	9.60	156.3%
57	12	66	7.92	151.5%
58	5	46	4.60	108.7%
59	12	49	4.90	244.9%
60	5	36	3.60	138.9%
61	2	24	2.40	83.3%
62	7	25	7.50	93.3%
63	8	23	6.90	115.9%
64	1	10	3.00	33.3%
65	1	7	3.50	28.6%
66	2	7	3.50	57.1%
67	1	4	2.00	50.0%
68	-	2	1.00	0.0%
69	-	-	-	N/A
Totals	**134**	**1,115**	**142.00**	**94.4%**

2014-2015 Experience

Age	Actual Retirements	Exposure	Expected Retirements	Actual/ Expected
50	7	106	5.30	132.1%
51	12	111	3.33	360.4%
52	9	121	3.63	247.9%
53	10	120	3.60	277.8%
54	8	125	6.25	128.0%
55	48	124	68.20	70.4%
56	31	78	9.36	331.2%
57	11	65	7.80	141.0%
58	11	55	5.50	200.0%
59	7	41	4.10	170.7%
60	8	41	4.10	195.1%
61	11	29	2.90	379.3%
62	6	22	6.60	90.9%
63	6	17	5.10	117.6%
64	1	15	4.50	22.2%
65	1	13	6.50	15.4%
66	1	5	2.50	40.0%
67	1	6	3.00	33.3%
68	1	4	2.00	50.0%
69	-	1	0.50	0.0%
Totals	**190**	**1,099**	**154.77**	**122.8%**

APPENDIX – DETAILED EXPERIENCE ANALYSIS
TERMINATIONS, SERVICE <3 YEARS

2011-2015 Experience

	Males				Females				Total			
Year	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected
1	91	423	84.60	107.6%	111	412	82.40	134.7%	202	835	167.00	121.0%
2	129	845	126.75	101.8%	160	695	104.25	153.5%	289	1,540	231.00	125.1%
3	71	626	50.08	141.8%	70	457	36.56	191.5%	141	1,083	86.64	162.7%
Totals	**291**	**1,894**	**261.43**	**111.3%**	**341**	**1,564**	**223.21**	**152.8%**	**632**	**3,458**	**484.64**	**130.4%**

APPENDIX – DETAILED EXPERIENCE ANALYSIS
TERMINATIONS, SERVICE <3 YEARS

2011-2012 Experience

	Males				Females				Total			
Year	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected
1	23	100	20.00	115.0%	38	101	20.20	188.1%	61	201	40.20	151.7%
2	27	150	22.50	120.0%	36	116	17.40	206.9%	63	266	39.90	157.9%
3	15	123	9.84	152.4%	8	89	7.12	112.4%	23	212	16.96	135.6%
Totals	**65**	**373**	**52.34**	**124.2%**	**82**	**306**	**44.72**	**183.4%**	**147**	**679**	**97.06**	**151.5%**

2012-2013 Experience

	Males				Females				Total			
Year	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected
1	15	100	20.00	75.0%	16	81	16.20	98.8%	31	181	36.20	85.6%
2	31	237	35.55	87.2%	34	180	27.00	125.9%	65	417	62.55	103.9%
3	13	112	8.96	145.1%	11	71	5.68	193.7%	24	183	14.64	163.9%
Totals	**59**	**449**	**64.51**	**91.5%**	**61**	**332**	**48.88**	**124.8%**	**120**	**781**	**113.39**	**105.8%**

APPENDIX – DETAILED EXPERIENCE ANALYSIS
TERMINATIONS, SERVICE <3 YEARS

2013-2014 Experience

	Males				Females				Total			
Year	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected
1	29	117	23.40	123.9%	22	103	20.60	106.8%	51	220	44.00	115.9%
2	31	221	33.15	93.5%	32	175	26.25	121.9%	63	396	59.40	106.1%
3	14	200	16.00	87.5%	17	150	12.00	141.7%	31	350	28.00	110.7%
Totals	**74**	**538**	**72.55**	**102.0%**	**71**	**428**	**58.85**	**120.6%**	**145**	**966**	**131.40**	**110.4%**

2014-2015 Experience

	Males				Females				Total			
Year	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected
1	24	106	21.20	113.2%	35	127	25.40	137.8%	59	233	46.60	126.6%
2	40	237	35.55	112.5%	58	224	33.60	172.6%	98	461	69.15	141.7%
3	29	191	15.28	189.8%	34	147	11.76	289.1%	63	338	27.04	233.0%
Totals	**93**	**534**	**72.03**	**129.1%**	**127**	**498**	**70.76**	**179.5%**	**220**	**1,032**	**142.79**	**154.1%**

2011-2015 Experience, Service >3 Years

	Males				Females				Total			
Age Group	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected
Under 25	-	15	1.39	0.0%	1	9	0.73	136.8%	1	24	2.12	47.1%
25-29	49	561	34.79	140.8%	62	342	25.86	239.7%	111	903	60.65	183.0%
30-34	73	1,317	57.50	127.0%	109	865	63.26	172.3%	182	2,182	120.76	150.7%
35-39	62	1,314	39.64	156.4%	49	634	42.35	115.7%	111	1,948	81.99	135.4%
40-44	40	1,460	33.46	119.5%	44	597	28.74	153.1%	84	2,057	62.20	135.1%
45-49	42	1,634	28.25	148.7%	33	694	21.35	154.5%	75	2,328	49.60	151.2%
Totals	**266**	**6,301**	**195.03**	**136.4%**	**298**	**3,141**	**182.30**	**163.5%**	**564**	**9,442**	**377.33**	**149.5%**

APPENDIX – DETAILED EXPERIENCE ANALYSIS
TERMINATIONS, SERVICE >3 YEARS

2011-2012 Experience, Service >3 Years

Age Group	Males Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Females Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Total Actual Terminations	Exposure	Expected Terminations	Actual/ Expected
Under 25	-	9	0.85	0.0%	-	1	0.08	0.0%	-	10	0.93	0.0%
25-29	16	187	11.64	137.5%	22	129	9.76	225.5%	38	316	21.40	177.6%
30-34	21	316	13.87	151.4%	45	224	16.41	274.3%	66	540	30.28	218.0%
35-39	17	327	9.90	171.7%	12	151	10.04	119.5%	29	478	19.94	145.4%
40-44	11	392	9.00	122.2%	12	153	7.39	162.5%	23	545	16.39	140.4%
45-49	15	414	7.15	209.8%	8	187	5.78	138.5%	23	601	12.93	177.9%
Totals	**80**	**1,645**	**52.41**	**152.6%**	**99**	**845**	**49.45**	**200.2%**	**179**	**2,490**	**101.86**	**175.7%**

2012-2013 Experience, Service >3 Years

Age Group	Males Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Females Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Total Actual Terminations	Exposure	Expected Terminations	Actual/ Expected
Under 25	-	4	0.36	0.0%	-	-	-	N/A	-	4	0.36	0.0%
25-29	11	143	8.90	123.6%	12	91	6.88	174.5%	23	234	15.78	145.8%
30-34	12	324	14.25	84.2%	12	210	15.37	78.1%	24	534	29.62	81.0%
35-39	12	327	9.85	121.8%	11	152	10.14	108.5%	23	479	19.99	115.1%
40-44	7	362	8.31	84.2%	12	144	6.97	172.1%	19	506	15.28	124.3%
45-49	2	405	7.05	28.4%	8	185	5.70	140.4%	10	590	12.75	78.4%
Totals	**44**	**1,565**	**48.72**	**90.3%**	**55**	**782**	**45.05**	**122.1%**	**99**	**2,347**	**93.77**	**105.6%**

2013-2014 Experience, Service >3 Years

	Males				Females				Total			
Age Group	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected
Under 25	-	1	0.09	0.0%	-	1	0.08	0.0%	-	2	0.17	0.0%
25-29	8	121	7.36	108.7%	11	62	4.68	235.1%	19	183	12.04	157.8%
30-34	19	332	14.38	132.1%	20	211	15.43	129.6%	39	543	29.81	130.8%
35-39	12	321	9.61	124.9%	14	158	10.60	132.0%	26	479	20.21	128.6%
40-44	11	354	8.08	136.1%	8	148	7.17	111.6%	19	502	15.25	124.6%
45-49	11	406	7.02	156.7%	4	164	5.04	79.3%	15	570	12.06	124.4%
Totals	**61**	**1,535**	**46.54**	**131.1%**	**57**	**744**	**43.00**	**132.6%**	**118**	**2,279**	**89.54**	**131.8%**

2014-2015 Experience, Service >3 Years

	Males				Females				Total			
Age Group	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected	Actual Terminations	Exposure	Expected Terminations	Actual/ Expected
Under 25	-	1	0.09	0.0%	1	7	0.57	175.1%	1	8	0.66	151.3%
25-29	14	110	6.89	203.2%	17	60	4.55	373.7%	31	170	11.44	271.0%
30-34	21	345	15.00	140.0%	32	220	16.06	199.2%	53	565	31.06	170.6%
35-39	21	339	10.28	204.3%	12	173	11.57	103.7%	33	512	21.85	151.0%
40-44	11	352	8.07	136.3%	12	152	7.21	166.4%	23	504	15.28	150.5%
45-49	14	409	7.03	199.1%	13	158	4.84	268.6%	27	567	11.87	227.5%
Totals	**81**	**1,556**	**47.36**	**171.0%**	**87**	**770**	**44.80**	**194.2%**	**168**	**2,326**	**92.16**	**182.3%**

APPENDIX – DETAILED EXPERIENCE ANALYSIS
DISABILITY RETIREMENTS

2011-2015 Experience

Age Group	Males Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected	Females Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected	Total Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected
Under 20	-	-	-	N/A	-	-	-	N/A	-	-	-	N/A
20-24	-	154	0.11	0.0%	-	140	0.10	0.0%	-	294	0.22	0.0%
25-29	-	1,222	1.13	0.0%	-	808	0.75	0.0%	-	2,030	1.88	0.0%
30-34	-	1,728	2.11	0.0%	2	1,158	1.40	109.9%	2	2,886	3.51	109.9%
35-39	3	1,520	2.69	111.4%	-	823	1.45	0.0%	3	2,343	4.15	72.3%
40-44	4	1,595	4.73	84.7%	1	769	2.26	44.3%	5	2,364	6.98	71.6%
45-49	11	1,793	8.84	124.4%	6	822	4.07	147.5%	17	2,615	12.91	131.7%
50-54	6	1,785	15.39	39.0%	7	1,002	8.64	81.0%	13	2,787	24.03	54.1%
Totals	**24**	**9,797**	**35.01**	**68.6%**	**16**	**5,522**	**18.68**	**85.7%**	**40**	**15,319**	**53.69**	**74.5%**

2011-2012 Experience

Age Group	Males Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected	Females Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected	Total Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected
Under 20	-	-	-	N/A	-	-	-	N/A	-	-	-	N/A
20-24	-	34	0.03	0.0%	-	21	0.02	0.0%	-	55	0.04	0.0%
25-29	-	300	0.28	0.0%	-	229	0.21	0.0%	-	529	0.50	0.0%
30-34	-	407	0.49	0.0%	-	272	0.33	0.0%	-	679	0.82	109.9%
35-39	1	373	0.66	152.3%	-	186	0.33	0.0%	1	559	0.99	101.4%
40-44	3	423	1.25	240.5%	1	189	0.55	181.0%	4	612	1.80	222.2%
45-49	1	447	2.21	45.4%	1	221	1.09	91.6%	2	668	3.30	60.7%
50-54	3	449	3.87	77.6%	3	266	2.28	131.4%	6	715	6.15	97.6%
Totals	**8**	**2,433**	**8.78**	**91.2%**	**5**	**1,384**	**4.82**	**103.8%**	**13**	**3,817**	**13.59**	**95.6%**

2012-2013 Experience

Age Group	Males Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected	Females Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected	Total Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected
Under 20	-	-	-	N/A	-	-	-	N/A	-	-	-	N/A
20-24	-	33	0.02	0.0%	-	31	0.02	0.0%	-	64	0.05	0.0%
25-29	-	311	0.29	0.0%	-	200	0.19	0.0%	-	511	0.47	0.0%
30-34	-	423	0.52	0.0%	1	264	0.32	314.0%	1	687	0.83	109.9%
35-39	2	370	0.66	304.6%	-	193	0.34	0.0%	2	563	1.00	200.2%
40-44	1	390	1.15	87.1%	-	185	0.54	0.0%	1	575	1.69	59.0%
45-49	1	447	2.17	46.1%	2	206	1.02	195.3%	3	653	3.19	94.0%
50-54	2	450	3.83	52.2%	-	244	2.09	0.0%	2	694	5.93	33.8%
Totals	**6**	**2,424**	**8.63**	**69.5%**	**3**	**1,323**	**4.53**	**66.2%**	**9**	**3,747**	**13.17**	**68.4%**

APPENDIX – DETAILED EXPERIENCE ANALYSIS
DISABILITY RETIREMENTS

2013-2014 Experience

Age Group	Males Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected	Females Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected	Total Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected
Under 20	-	-	-	N/A	-	-	-	N/A	-	-	-	N/A
20-24	-	49	0.04	0.0%	-	35	0.03	0.0%	-	84	0.06	0.0%
25-29	-	305	0.28	0.0%	-	182	0.17	0.0%	-	487	0.45	0.0%
30-34	-	445	0.54	0.0%	1	299	0.36	275.9%	1	744	0.91	109.9%
35-39	-	382	0.68	0.0%	-	209	0.37	0.0%	-	591	1.05	0.0%
40-44	-	390	1.16	0.0%	-	189	0.55	0.0%	-	579	1.71	0.0%
45-49	5	451	2.23	224.1%	1	204	1.00	99.5%	6	655	3.24	185.4%
50-54	1	454	3.94	25.4%	1	248	2.14	46.8%	2	702	6.07	32.9%
Totals	**6**	**2,476**	**8.87**	**67.6%**	**3**	**1,366**	**4.62**	**65.0%**	**9**	**3,842**	**13.49**	**66.7%**

2014-2015 Experience

Age Group	Males Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected	Females Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected	Total Actual Disabilities	Exposure	Expected Disabilities	Actual/ Expected
Under 20	-	-	-	N/A	-	-	-	N/A	-	-	-	N/A
20-24	-	38	0.03	0.0%	-	53	0.04	0.0%	-	91	0.07	0.0%
25-29	-	306	0.28	0.0%	-	197	0.18	0.0%	-	503	0.46	0.0%
30-34	-	453	0.55	0.0%	-	323	0.39	0.0%	-	776	0.95	109.9%
35-39	-	395	0.70	0.0%	-	235	0.41	0.0%	-	630	1.11	0.0%
40-44	-	392	1.17	0.0%	-	206	0.61	0.0%	-	598	1.78	0.0%
45-49	4	448	2.24	178.6%	2	191	0.95	211.4%	6	639	3.19	188.4%
50-54	-	432	3.76	0.0%	3	244	2.13	140.9%	3	676	5.89	51.0%
Totals	**4**	**2,464**	**8.73**	**45.8%**	**5**	**1,449**	**4.71**	**106.1%**	**9**	**3,913**	**13.44**	**67.0%**

2011-2015 Experience

Age Group	Males Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Females Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
50-54	2	176	0.75	266.7%	-	116	0.23	0.0%
55-59	4	1,021	5.24	76.3%	4	625	2.10	190.5%
60-64	13	1,443	12.56	103.5%	3	678	3.57	84.0%
65-69	14	1,135	16.27	86.0%	6	554	4.65	129.0%
70-74	11	527	12.76	86.2%	4	230	3.17	126.2%
75-79	9	336	15.04	59.8%	3	125	2.85	105.3%
80-84	12	174	14.62	82.1%	1	64	2.55	39.2%
85-89	10	87	12.80	78.1%	3	28	1.92	156.3%
90-94	7	42	9.58	73.1%	1	5	0.59	169.5%
95+	3	7	2.29	131.0%	1	6	1.19	84.0%
Totals	**85**	**4,948**	**101.91**	**83.4%**	**26**	**2,431**	**22.82**	**113.9%**

2011-2012 Experience

Age Group	Males				Females			
	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
50-54	-	38	0.16	0.0%	-	21	0.04	0.0%
55-59	1	247	1.28	78.1%	-	135	0.44	0.0%
60-64	3	352	3.08	97.4%	3	158	0.84	357.1%
65-69	7	221	3.18	220.1%	1	100	0.82	122.0%
70-74	1	109	2.71	36.9%	-	47	0.65	0.0%
75-79	3	70	3.07	97.7%	-	26	0.59	0.0%
80-84	2	41	3.39	59.0%	-	13	0.51	0.0%
85-89	3	21	3.01	99.7%	-	6	0.40	0.0%
90-94	1	10	2.19	45.7%	-	1	0.13	0.0%
95+	-	2	0.65	0.0%	-	1	0.20	0.0%
Totals	**21**	**1,111**	**22.72**	**92.4%**	**4**	**508**	**4.62**	**86.6%**

2012-2013 Experience

Age Group	Males				Females			
	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
50-54	1	46	0.20	500.0%	-	29	0.06	0.0%
55-59	2	250	1.27	157.5%	2	149	0.50	400.0%
60-64	4	358	3.09	129.4%	-	158	0.83	0.0%
65-69	1	274	3.91	25.6%	-	131	1.10	0.0%
70-74	2	121	2.99	66.9%	2	46	0.64	312.5%
75-79	2	75	3.32	60.2%	1	32	0.72	138.9%
80-84	3	44	3.67	81.7%	1	16	0.64	156.3%
85-89	2	23	3.47	57.6%	1	7	0.51	196.1%
90-94	2	9	2.16	92.6%	-	1	0.15	0.0%
95+	1	2	0.68	147.1%	-	1	0.21	0.0%
Totals	**20**	**1,202**	**24.76**	**80.8%**	**7**	**570**	**5.36**	**130.6%**

APPENDIX – DETAILED EXPERIENCE ANALYSIS
POST-RETIREMENT MORTALITY

2013-2014 Experience

Age Group	Males Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Females Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
50-54	-	51	0.22	0.0%	-	26	0.05	0.0%
55-59	-	264	1.36	0.0%	-	171	0.58	0.0%
60-64	2	357	3.11	64.3%	-	164	0.87	0.0%
65-69	1	303	4.32	23.1%	2	153	1.28	156.3%
70-74	3	139	3.30	90.9%	1	63	0.87	114.9%
75-79	1	93	4.19	23.9%	1	31	0.71	140.8%
80-84	2	40	3.42	58.5%	-	18	0.73	0.0%
85-89	4	25	3.75	106.7%	1	6	0.44	227.3%
90-94	2	9	2.10	95.2%	-	1	0.10	0.0%
95+	1	2	0.65	153.8%	-	2	0.38	0.0%
Totals	**16**	**1,283**	**26.42**	**60.6%**	**5**	**635**	**6.01**	**83.2%**

2014-2015 Experience

Age Group	Males Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Females Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
50-54	1	41	0.17	588.2%	-	40	0.08	0.0%
55-59	1	260	1.33	75.2%	2	170	0.58	344.8%
60-64	4	376	3.28	122.0%	-	198	1.03	0.0%
65-69	5	337	4.86	102.9%	3	170	1.45	206.9%
70-74	5	158	3.76	133.0%	1	74	1.01	99.0%
75-79	3	98	4.46	67.3%	1	36	0.83	120.5%
80-84	5	49	4.14	120.8%	-	17	0.67	0.0%
85-89	1	18	2.57	38.9%	1	9	0.57	175.4%
90-94	2	14	3.13	63.9%	1	2	0.21	476.2%
95+	1	1	0.31	322.6%	1	2	0.40	250.0%
Totals	**28**	**1,352**	**28.01**	**100.0%**	**10**	**718**	**6.83**	**146.4%**

2011-2015 Experience

Age Group	Males				Females			
	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
35-39	1	12	0.27	369.2%	1	10	0.07	1342.3%
45-49	1	56	1.26	79.1%	-	35	0.26	0.0%
45-49	-	77	1.87	0.0%	-	43	0.37	0.0%
50-54	1	105	3.18	31.4%	1	68	0.86	116.0%
55-59	2	140	5.12	39.0%	2	90	1.61	124.0%
60-64	4	131	5.73	69.8%	1	73	1.65	60.6%
65-69	3	82	4.22	71.0%	1	23	0.67	148.6%
70-74	-	16	1.03	0.0%	-	16	0.62	0.0%
75-79	-	8	0.68	0.0%	-	3	0.16	0.0%
80-84	-	1	0.10	0.0%	-	-	-	N/A
85-89	-	-	-	N/A	-	-	-	N/A
>= 90	-	-	-	N/A	-	-	-	N/A
Totals	**12**	**628**	**23.48**	**51.1%**	**6**	**361**	**6.27**	**95.7%**

APPENDIX – DETAILED EXPERIENCE ANALYSIS
DISABLED MORTALITY

2011-2012 Experience

Age Group	Males Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Females Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
35-39	-	5	0.11	0.0%	-	2	0.01	0.0%
45-49	1	12	0.27	369.2%	-	11	0.08	0.0%
45-49	-	18	0.44	0.0%	-	10	0.09	0.0%
50-54	1	25	0.76	132.4%	1	15	0.19	525.1%
55-59	-	28	1.00	0.0%	-	23	0.41	0.0%
60-64	3	37	1.59	188.4%	1	14	0.31	318.5%
65-69	2	14	0.71	280.0%	-	5	0.15	0.0%
70-74	-	3	0.20	0.0%	-	3	0.12	0.0%
75-79	-	1	0.09	0.0%	-	-	-	N/A
80-84	-	-	-	N/A	-	-	-	N/A
85-89	-	-	-	N/A	-	-	-	N/A
>= 90	-	-	-	N/A	-	-	-	N/A
Totals	**7**	**143**	**5.18**	**135.2%**	**2**	**83**	**1.37**	**146.1%**

2012-2013 Experience

Age Group	Males Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Females Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
35-39	1	4	0.09	1107.6%	1	3	0.02	4474.3%
45-49	-	16	0.36	0.0%	-	12	0.09	0.0%
45-49	-	17	0.42	0.0%	-	8	0.07	0.0%
50-54	-	26	0.79	0.0%	-	18	0.23	0.0%
55-59	1	34	1.23	81.0%	-	23	0.41	0.0%
60-64	-	29	1.26	0.0%	-	16	0.36	0.0%
65-69	-	20	1.02	0.0%	1	6	0.18	559.1%
70-74	-	3	0.20	0.0%	-	3	0.11	0.0%
75-79	-	2	0.17	0.0%	-	1	0.05	0.0%
80-84	-	-	-	N/A	-	-	-	N/A
85-89	-	-	-	N/A	-	-	-	N/A
>= 90	-	-	-	N/A	-	-	-	N/A
Totals	**2**	**151**	**5.54**	**36.1%**	**2**	**90**	**1.52**	**131.4%**

APPENDIX – DETAILED EXPERIENCE ANALYSIS
DISABLED MORTALITY

2013-2014 Experience

		Males				Females		
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
35-39	-	2	0.05	0.0%	-	2	0.01	0.0%
45-49	-	16	0.36	0.0%	-	8	0.06	0.0%
45-49	-	18	0.44	0.0%	-	11	0.09	0.0%
50-54	-	26	0.78	0.0%	-	18	0.23	0.0%
55-59	-	39	1.43	0.0%	2	24	0.43	460.8%
60-64	1	34	1.51	66.4%	-	18	0.41	0.0%
65-69	-	21	1.09	0.0%	-	5	0.14	0.0%
70-74	-	4	0.25	0.0%	-	5	0.19	0.0%
75-79	-	3	0.26	0.0%	-	1	0.05	0.0%
80-84	-	-	-	N/A	-	-	-	N/A
85-89	-	-	-	N/A	-	-	-	N/A
>= 90	-	-	-	N/A	-	-	-	N/A
Totals	**1**	**163**	**6.16**	**16.2%**	**2**	**92**	**1.61**	**124.0%**

2014-2015 Experience

		Males				Females		
Age Group	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
41-44	-	1	0.02	0.0%	-	3	0.02	0.0%
45-49	-	12	0.27	0.0%	-	4	0.03	0.0%
50-54	-	24	0.58	0.0%	-	14	0.12	0.0%
55-59	-	28	0.85	0.0%	-	17	0.22	0.0%
60-64	1	39	1.45	68.7%	-	20	0.36	0.0%
65-69	-	31	1.37	0.0%	-	25	0.57	0.0%
70-74	1	27	1.40	71.3%	-	7	0.20	0.0%
75-79	-	6	0.38	0.0%	-	5	0.20	0.0%
80-84	-	2	0.17	0.0%	-	1	0.06	0.0%
85-89	-	1	0.10	0.0%	-	-	-	N/A
>=90	-	-	-	N/A	-	-	-	N/A
Totals	**2**	**171**	**6.61**	**30.3%**	**-**	**96**	**1.77**	**0.0%**

2011-2015 Experience

Age Group	Males				Females			
	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
Under 20	-	-	-	N/A	-	-	-	N/A
20-24	-	154	0.05	0.0%	-	140	0.02	0.0%
25-29	-	1,222	0.44	0.0%	-	808	0.17	0.0%
30-34	1	1,728	0.71	141.2%	-	1,158	0.39	0.0%
35-39	1	1,520	1.00	100.5%	-	823	0.40	0.0%
40-44	-	1,595	1.47	0.0%	1	769	0.52	192.5%
45-49	4	1,793	2.34	171.1%	3	822	0.84	359.2%
50-54	3	1,785	3.12	96.0%	1	1,002	1.46	68.7%
55-59	3	929	2.31	129.6%	1	631	1.38	72.6%
60-64	1	297	1.19	83.9%	1	189	0.68	146.0%
65-69	-	51	0.31	0.0%	1	51	0.28	355.4%
Totals	**13**	**11,074**	**12.95**	**100.4%**	**8**	**6,393**	**6.14**	**130.3%**

APPENDIX – DETAILED EXPERIENCE ANALYSIS
PRE-RETIREMENT MORTALITY

2011-2012 Experience

Age Group	Males Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Females Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
Under 20	-	-	-	N/A	-	-	-	N/A
20-24	-	34	0.01	0.0%	-	21	0.00	0.0%
25-29	-	300	0.11	0.0%	-	229	0.05	0.0%
30-34	1	407	0.17	604.2%	-	272	0.09	0.0%
35-39	-	373	0.24	0.0%	-	186	0.09	0.0%
40-44	-	423	0.39	0.0%	-	189	0.13	0.0%
45-49	-	447	0.58	0.0%	2	221	0.22	892.0%
50-54	-	449	0.79	0.0%	-	266	0.39	0.0%
55-59	1	221	0.55	181.4%	1	147	0.31	317.7%
60-64	-	58	0.23	0.0%	-	45	0.16	0.0%
65-69	-	13	0.08	0.0%	1	16	0.09	1117.3%
Totals	**2**	**2,725**	**3.14**	**63.6%**	**4**	**1,592**	**1.54**	**260.4%**

2012-2013 Experience

Age Group	Males Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Females Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
Under 20	-	-	-	N/A	-	-	-	N/A
20-24	-	33	0.01	0.0%	-	31	0.01	0.0%
25-29	-	311	0.11	0.0%	-	200	0.04	0.0%
30-34	-	423	0.17	0.0%	-	264	0.09	0.0%
35-39	-	370	0.24	0.0%	-	193	0.09	0.0%
40-44	-	390	0.36	0.0%	-	185	0.13	0.0%
45-49	-	447	0.58	0.0%	-	206	0.21	0.0%
50-54	1	450	0.78	127.7%	1	244	0.35	283.2%
55-59	-	228	0.57	0.0%	-	160	0.35	0.0%
60-64	-	69	0.27	0.0%	1	42	0.15	655.8%
65-69	-	10	0.06	0.0%	-	14	0.08	0.0%
Totals	**1**	**2,731**	**3.16**	**31.7%**	**2**	**1,539**	**1.50**	**133.5%**

APPENDIX – DETAILED EXPERIENCE ANALYSIS
PRE-RETIREMENT MORTALITY

2013-2014 Experience

Age Group	Males Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Females Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
Under 20	-	-	-	N/A	-	-	-	N/A
20-24	-	49	0.02	0.0%	-	35	0.01	0.0%
25-29	-	305	0.11	0.0%	-	182	0.04	0.0%
30-34	-	445	0.18	0.0%	-	299	0.10	0.0%
35-39	1	382	0.25	397.5%	-	209	0.10	0.0%
40-44	-	390	0.36	0.0%	1	189	0.13	789.4%
45-49	3	451	0.59	509.1%	1	204	0.21	484.0%
50-54	2	454	0.80	251.0%	-	248	0.36	0.0%
55-59	-	229	0.57	0.0%	-	160	0.35	0.0%
60-64	1	79	0.32	315.1%	-	49	0.18	0.0%
65-69	-	12	0.07	0.0%	-	8	0.04	0.0%
Totals	**7**	**2,796**	**3.27**	**213.9%**	**2**	**1,583**	**1.52**	**131.8%**

2014-2015 Experience

Age Group	Males Actual Deaths	Exposure	Expected Deaths	Actual/ Expected	Females Actual Deaths	Exposure	Expected Deaths	Actual/ Expected
Under 20	-	-	-	N/A	-	-	-	N/A
20-24	-	38	0.01	0.0%	-	53	0.01	0.0%
25-29	-	306	0.11	0.0%	-	197	0.04	0.0%
30-34	-	453	0.19	0.0%	-	323	0.11	0.0%
35-39	-	395	0.26	0.0%	-	235	0.12	0.0%
40-44	-	392	0.36	0.0%	-	206	0.14	0.0%
45-49	1	448	0.59	169.9%	-	191	0.19	0.0%
50-54	-	432	0.76	0.0%	-	244	0.36	0.0%
55-59	2	251	0.62	321.9%	-	164	0.36	0.0%
60-64	-	91	0.37	0.0%	-	53	0.19	0.0%
65-69	-	16	0.10	0.0%	-	13	0.07	0.0%
Totals	**3**	**2,822**	**3.37**	**89.0%**	**-**	**1,679**	**1.59**	**0.0%**