

STATE OF ILLINOIS  
DEPARTMENT OF INSURANCE  
ACTUARIAL EXPERIENCE STUDY  
September 26, 2012



September 26, 2012

Travis March  
Deputy Director – Public Pensions  
Department of Insurance  
320 W. Washington, Room 575  
Springfield, IL 62767

Re: Final Actuarial Experience Study

Dear Travis:

As requested, we have performed an actuarial experience study to review certain economic and demographic assumptions that are currently being used for purposes of valuing Pension Funds regulated by Article 3 (Police Officers) and Article 4 (Firefighters) of the Illinois Pension Code.

In the course of the analysis, we compiled experience for the numerous (650+) Funds valued by the Department of Insurance for the years 2004 through 2011. While we cannot verify the accuracy of all the information provided, the supplied information was reviewed for consistency and reasonableness. As a result of this review, we have no reason to doubt the substantial accuracy of the information and believe it has produced appropriate results.

The purpose of this study is to review the current economic and demographic actuarial assumptions to determine which changes, if any, are necessary in order to achieve the objective of developing costs that are stable, predictable, and represent our best estimate of anticipated future experience. It is important to remember that the ultimate cost of any Pension Fund is independent of the actuarial assumptions used during the valuation process. Ultimately, the cost will be the sum of the benefits paid from the Fund and the administrative expenses incurred, less any net investment gains received.

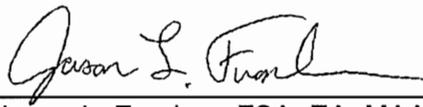
The specific assumptions investigated throughout the remainder of this study are as follows:

- Retirement Rates
- Withdrawal Rates
- Mortality Rates
- Disability Rates
- Investment Return
- Salary Increases
- Payroll Growth Rate
- Tier 2 Cost-of-Living Adjustment

The balance of this Report presents details of the experience analysis. The undersigned looks forward to meeting with the Department of Insurance in order to discuss the Report and answer any pending questions concerning its contents.

Respectfully submitted,

FOSTER & FOSTER INC.

By:   
Jason L. Franken, FSA, EA, MAAA

## ACTUARIAL STANDARDS OF PRACTICE

### Background

The Actuarial Standards Board has provided coordinated guidance through of a series of Actuarial Standards of Practice (ASOP) for measuring pension obligations and determining pension plan costs or contributions. The ASOPs that apply specifically to valuing pensions are as follows:

- ASOP No. 4, *Measuring Pension Obligations and Determining Pension Plan Costs or Contributions*, which ties together the standards shown below, provides guidance on actuarial cost methods, and addresses overall considerations for measuring pension obligations and determining plan costs or contributions
- ASOP No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations*
- ASOP No. 35, *Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations*
- ASOP No. 44, *Selection and Use of Asset Valuation Methods for Pension Valuations*

Please note that the contents displayed throughout the remainder of this report are in compliance and consistent with the above mentioned Actuarial Standards of Practice. When applicable, further details of the ASOP associated with the reviewed actuarial assumption will be provided in the experience analysis, which is the basis for the remainder of the report.

### Additional Required Communications

Please keep in mind that future actuarial measurements may differ significantly from current measurements due to such factors as the following:

- Plan experience differing from that anticipated by the economic or demographic assumptions
- Changes in economic or demographic assumptions
- Increases or decreases expected as part of the natural operation of the methodology used (such as the end of an amortization period)
- Changes in plan provisions or applicable law

The data used for purposes of this report was compiled from the Pension Annual Statement System under the direction of the Illinois Department of Insurance.

## EXPERIENCE REVIEW SUMMARY

Foster & Foster performed an experience study on valuation data for the years 2004 through 2011. The purpose of this study is to update the assumptions used by the Department of Insurance in its valuation of the Article 3 and Article 4 Pension Funds in the State of Illinois. Below is a summary of our key findings and proposed changes. The remainder of the document outlines our analysis and documents our recommendations.

- **Retirement Rates:** The retirement rates determine the age at which members who are eligible for normal retirement commence payments. In general, members have retired later than anticipated by the old assumption. We recommend the rates for the both the police and fire plans be updated to better reflect the later retirements that have occurred since 2004.
- **Withdrawal Rates:** We recommend a slight change to the withdrawal rates to reflect experience since 2004. The old table understates withdrawal at the early ages and overstates it in the later ages.
- **Mortality Rates:** In prior valuations, the 1971 Group Annuity Mortality table has been used to determine the liabilities for Article 3 and Article 4 pension funds. We recommend a change to the RP 2000 Combined Healthy Mortality table, with Blue Collar Adjustment for healthy lives and the RP 2000 Disabled Retiree Mortality Table for disabled lives. The experience since 2004 suggests that changing to the RP 2000 Blue Collar table is reflective of the actual experience. At this point, we do not believe an adjustment to the table for future mortality improvements is necessary. We will monitor the experience over the next few years and adjust the table as needed.
- **Disability Rates:** We recommend a change in the disability rates to reflect experience since 2004. The disability incidence was significantly higher than previously assumed. Additionally, based on historical experience, we will assume that 70% of police disabilities and 90% of fire disabilities are service-related. As a result, a majority of disabled members will be entitled to the more generous disability benefits.
- **Investment Return:** Article 3 and Article 4 plans are subject to varying levels of investment restrictions. For example, a plan with less than \$2.5 million can only invest up to 10% in equities while a plan with more than \$10 million can invest up to at least 55% in equities. As a result, the best-estimate of the future investment returns varies dramatically from plan to plan. We do not believe it is appropriate to have a single investment return assumption for every plan. We recommend implementing a four tier assumption based on a plan's asset level. After consulting investment professionals, we believe that an assumption of 5.00% for the smallest plans increasing to 6.75% for the largest plans provides a best-estimate assumption for all plans.
- **Salary Increases:** Historically, the salary increase assumption has been a flat 5.5% for all active members. Based on our analysis, we recommend changing the assumption to be based upon service. The salary increases begin as high as 12% in a member's early years and grades to 4% over the course of a career. This approach more accurately reflects the increases a member will receive over his career.

- **Payroll Growth Rate:** We recommend the implementation of an explicit payroll growth assumption of 4.5%. Previously, the payroll growth assumption was assumed to be the same as the salary scale (i.e., 5.5%). This overstates the historical growth in payroll for police and fire departments across Illinois and defers a disproportionate share of the amortization payments to future generations of taxpayers.
- **Tier 2 Cost-of-Living Adjustment:** With the introduction of Tier 2 benefits for individuals first becoming a member in an Article 3 or Article 4 fund on or after January 1, 2011, a new assumption is required to estimate the future cost-of-living an adjustment for these members. The Tier 2 COLA is defined as the lesser of 3.0% or one-half of the annual unadjusted percentage increase in the Consumer Price Index-U for the 12 months ending with the September proceeding each November 1. Additionally, this rate will be used to project the maximum annual salary cap (\$106,800 in 2011). We recommend a rate of 1.25% for both purposes.

## EXPERIENCE ANALYSIS

### **Demographic Assumptions**

ASOP No. 35, *Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations*, provides guidance to actuaries in selecting (including giving advice on selecting) demographic and other noneconomic assumptions for measuring obligations under defined benefit pension plans.

Over the following pages, the following demographic assumptions will be reviewed:

- Retirement Rates
- Withdrawal Rates
- Mortality Rates
- Disability Rates

Generally, demographic assumptions are based on actual plan experience with additional considerations for current trends. ASOP No. 35 states “the actuary should use professional judgment to estimate possible future outcomes based on past experience and future expectations, and select assumptions based upon application of that professional judgment.” ASOP No. 35 also states that “a reasonable assumption is one that is expected to appropriately model the contingency being measured and is not anticipated to produce significant cumulative actuarial gains or losses...the actuary should not give undue weight to past experience when selecting demographic assumptions.”

Demographic assumptions generally remain consistent over time, absent significant changes in plan provisions. Therefore, the best true indicator of future experience is past experience. For each assumption, the study compares actual experience for that time period to assumptions used in the valuations.

Note that actuarial assumptions reflect average experience over long periods of time. A change in actuarial assumptions generally results when experience over a period of years indicates a consistent pattern. Proposed changes to the demographic assumptions better reflect actual Fund experience over the studied time period. The proposed changes also meet the objective of developing costs that are stable, predictable, and represent our best estimate of anticipated future experience.

## **Retirement Rates**

### **Overview**

A retirement rate is the associated probability at a specific point in time that a Member will retire, given that they have attained the eligibility requirements for retirement. The associated cost due to retirement experience is determined by the age at which Members actually retire. Higher rates of retirement at earlier ages generally results in higher costs to the plans.

The current requirements for Normal Retirement eligibility according to the Illinois Pension Code are as follows:

1. Members hired prior to 1/1/2011 (Tier 1): Age 50 with completion of 20 years of service
2. Member hired on and after 1/1/2011 (Tier 2): Age 55 with completion of 10 years of service

### **Current Assumption**

The current retirement rate assumption for the Article 3 and Article 4 pension plans reflects an age-based formula: a 40% probability of retirement at age 50 and linear progression from 5.3% for age 51 and continuing until the 100% retirement assumption at age 69.

### **Experience**

The charts and graphs on the following pages illustrate the relationship between actual retirement experience over the last six years and expected experience based on the current assumption. Experience was determined separately for the Police Funds and for the Fire Funds. The "Eligible Members" column sums the total number of Members eligible to retire at each age for each year of experience.

When comparing these assumptions to the actual experience shown on the following graphs, it is evident that the actual retirement rate for Members at age 50 is far lower than the current assumption. Additionally, the probabilities of retirement are relatively stable for ages 50-54 and then begin to slowly increase from that point as the Members get older.

- Table 1: Retirement Experience – Police Funds
- Graph 1: Retirement Experience – Police Funds
- Table 2: Retirement Experience – Fire Funds
- Graph 2: Retirement Experience – Fire Funds

### **Proposed Assumption**

We are recommending changes to the assumed retirement rates for both the Police and Fire Funds which will more closely resemble the actual experience realized over the studied time period. Note that Tier 2 retirement rates shall not begin until age 55 because of the new eligibility requirement for Tier 2 members. However, we recommend using the same probabilities of retirement at the respective ages as proposed on the following charts. Generally, the proposed rates reflect reductions in assumed probabilities for all ages and provide for more stable retirement probabilities at each age.

An illustration of the expected retirements using the proposed rates is included in the graphs listed above.

The proposed rates represent a better model for the actual retirement experience and therefore shall be an improved predictor of future retirement experience.

# Illinois Department of Insurance

## Public Pension Division - Police Plans

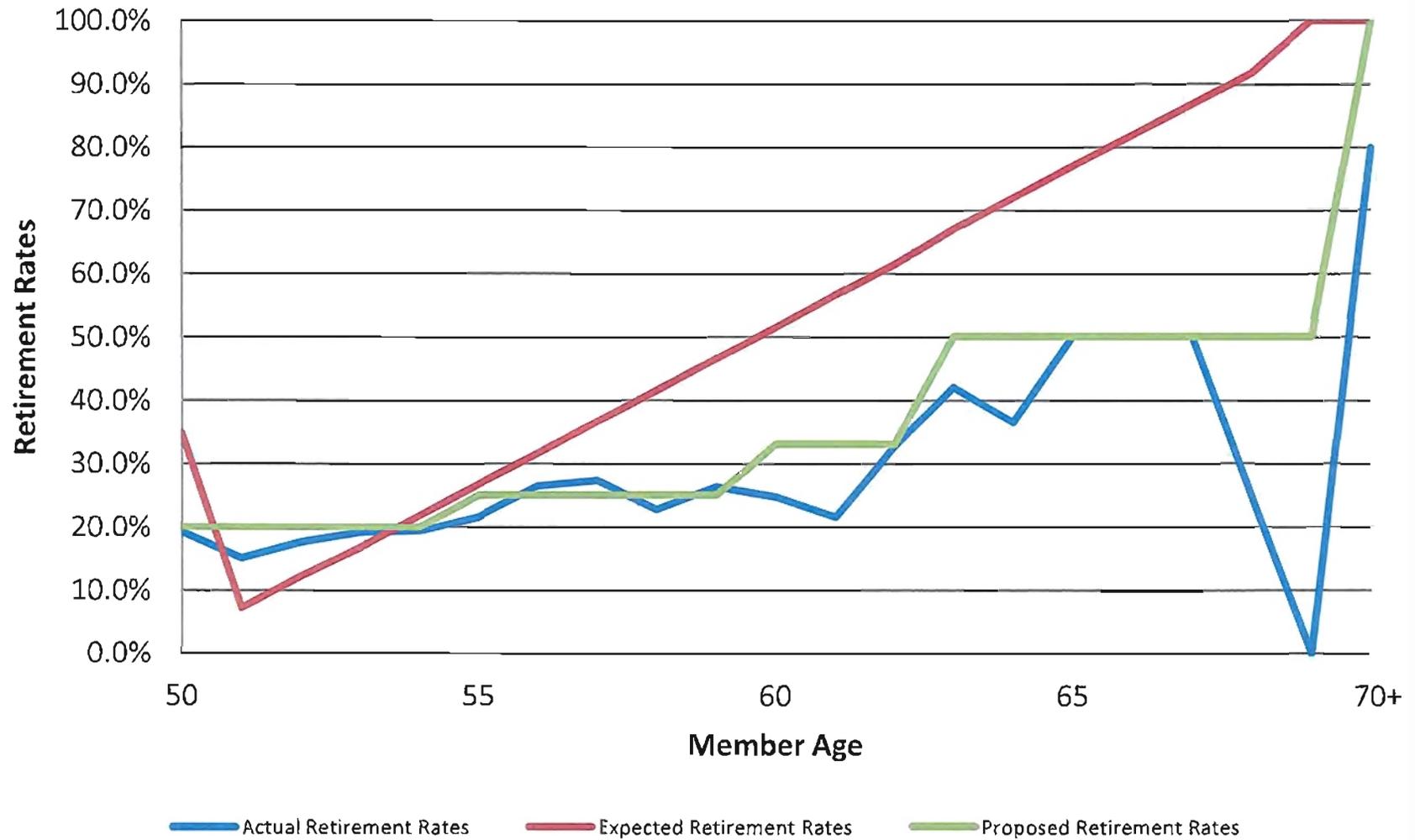
Table 1 - Retirement Experience - Police\*

Age	Eligible Members	Actual Retirements	Expected Retirements	Actual Retirement Rates	Expected Retirement Rates	Proposed Retirement Rates
50	1,380	265	480	19.2%	34.8%	20.0%
51	1,204	182	88	15.1%	7.3%	20.0%
52	1,074	189	132	17.6%	12.3%	20.0%
53	935	179	157	19.1%	16.8%	20.0%
54	769	149	168	19.4%	21.9%	20.0%
55	643	139	172	21.6%	26.7%	25.0%
56	545	144	172	26.4%	31.5%	25.0%
57	406	111	149	27.3%	36.6%	25.0%
58	299	68	124	22.7%	41.5%	25.0%
59	213	56	99	26.3%	46.5%	25.0%
60	190	47	98	24.7%	51.4%	33.0%
61	139	30	79	21.6%	56.6%	33.0%
62	113	37	69	32.7%	61.4%	33.0%
63	69	29	46	42.0%	67.0%	50.0%
64	41	15	30	36.6%	72.0%	50.0%
65	24	12	18	50.0%	77.0%	50.0%
66	12	6	10	50.0%	81.9%	50.0%
67	6	3	5	50.0%	86.8%	50.0%
68	4	1	4	25.0%	91.8%	50.0%
69	3	0	3	0.0%	100.0%	50.0%
70+	5	4	5	80.0%	100.0%	100.0%
<b>Total**</b>	<b>8,074</b>	<b>1,666</b>	<b>2,108</b>	<b>20.6%</b>	<b>26.1%</b>	<b>22.7%</b>

\*Data from Valuation Year 2004 through 2010 sorted by Member Age.

\*\*Total rates are based on the number of incidences divided by the number of exposures and do not represent an average of the numbers above.

## Graph 1: Retirement Experience Police Plans



# Illinois Department of Insurance

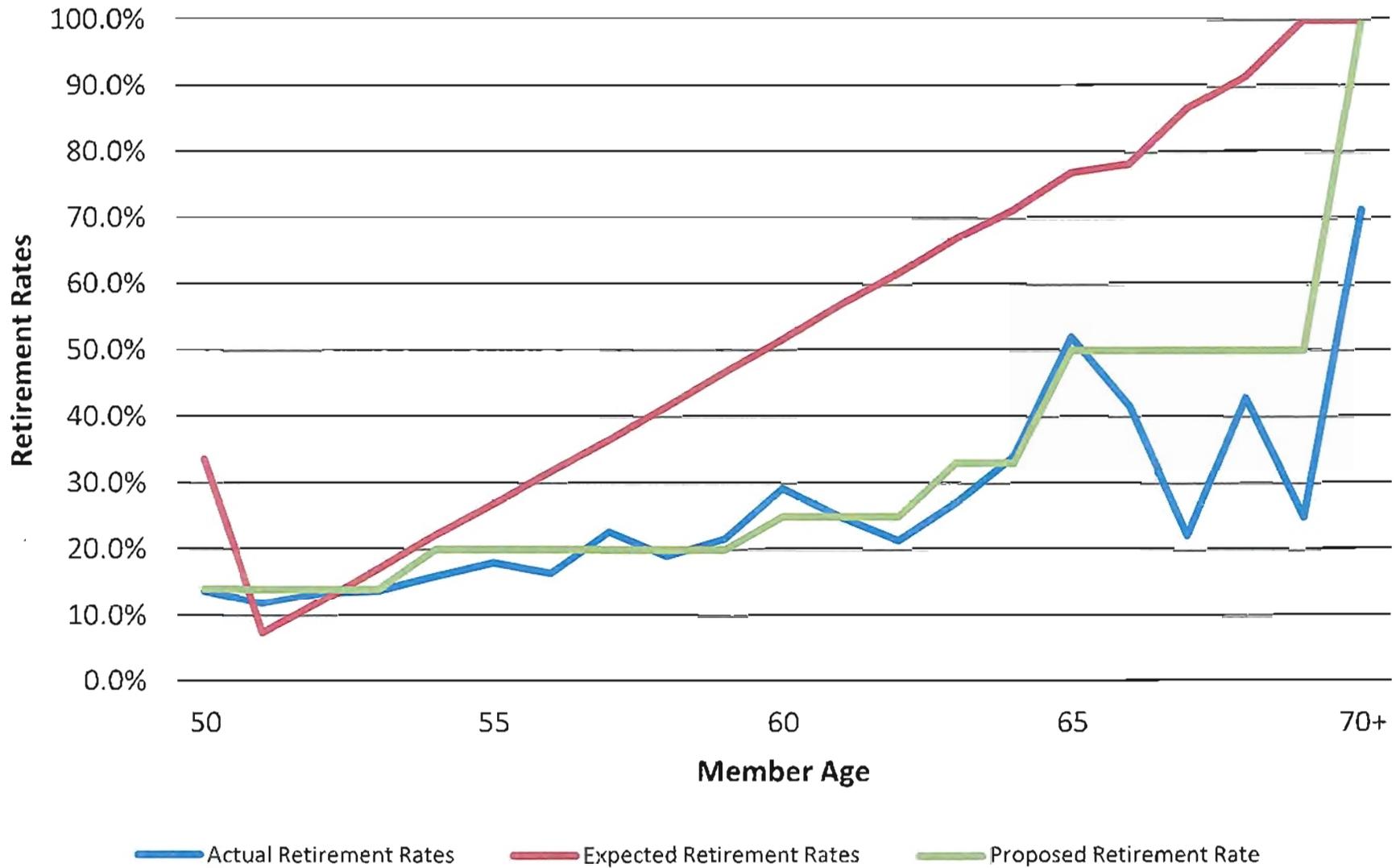
## Public Pension Division - Fire Plans

Table 2 - Retirement Experience - Fire\*

Age	Eligible Members	Actual Retirements	Expected Retirements	Actual Retirement Rates	Expected Retirement Rates	Proposed Retirement Rates
50	1,043	143	350	13.7%	33.6%	14.0%
51	951	113	71	11.9%	7.5%	14.0%
52	908	122	110	13.4%	12.1%	14.0%
53	862	119	148	13.8%	17.1%	14.0%
54	742	119	164	16.0%	22.2%	20.0%
55	625	113	168	18.1%	26.8%	20.0%
56	485	80	154	16.5%	31.8%	20.0%
57	383	87	140	22.7%	36.5%	20.0%
58	278	53	115	19.1%	41.5%	20.0%
59	199	43	93	21.6%	46.7%	20.0%
60	147	43	76	29.3%	51.6%	25.0%
61	100	25	57	25.0%	56.9%	25.0%
62	84	18	52	21.4%	61.7%	25.0%
63	70	19	47	27.1%	67.0%	33.0%
64	47	16	34	34.0%	71.3%	33.0%
65	25	13	19	52.0%	77.0%	50.0%
66	12	5	9	41.7%	78.3%	50.0%
67	9	2	8	22.2%	86.7%	50.0%
68	7	3	6	42.9%	91.6%	50.0%
69	4	1	4	25.0%	100.0%	50.0%
70+	7	5	7	71.4%	100.0%	100.0%
<b>Total</b>	<b>6,988</b>	<b>1,142</b>	<b>1,832</b>	<b>16.3%</b>	<b>26.2%</b>	<b>17.6%</b>

\*Data from Valuation Year 2004 through 2010 sorted by Member Age.

## Graph 2: Retirement Experience Fire Plans



## **Withdrawal Rates**

### **Overview**

The withdrawal rate, or termination rate, is the probability that a Member will separate employment from a cause other than disability, death, or retirement. This includes members who terminate and receive a refund of contributions.

### **Current Assumption**

The current withdrawal assumption is based on age, with no rates assumed beyond age 49. The table reflects higher withdrawal rates for younger Members.

### **Experience**

The following charts compare actual termination experience to the current assumption. For younger, shorter service Members, actual termination rates exceeded the expected rates. However, for older, longer service members, actual termination rates were less than the expected rates.

Note that because a Tier 1 Member will not attain Normal Retirement eligibility until 20 years of service, any Member hired after age 30 will have an earliest retirement age after age 50. The experience on the following pages shows that Members over age 50 do terminate employment prior to reaching Normal Retirement eligibility. This should be reflected in the withdrawal assumption.

- Table 3: Withdrawal Experience – Police Funds
- Graph 3: Withdrawal Experience – Police Funds
- Table 4: Withdrawal Experience – Fire Funds
- Graph 4: Withdrawal Experience – Fire Funds

### **Proposed Assumption**

We are proposing higher termination rates for shorter service members and lower rates for higher service members. The changes apply to both the Police Funds and Fire Funds and are applicable for both Tier 1 and Tier 2 Members.

In addition, to properly reflect terminations after age 50, but before normal retirement eligibility, we believe it is necessary to extend the range of termination rates beyond age 49.

The proposed rates are detailed in the experience charts.

## Illinois Department of Insurance

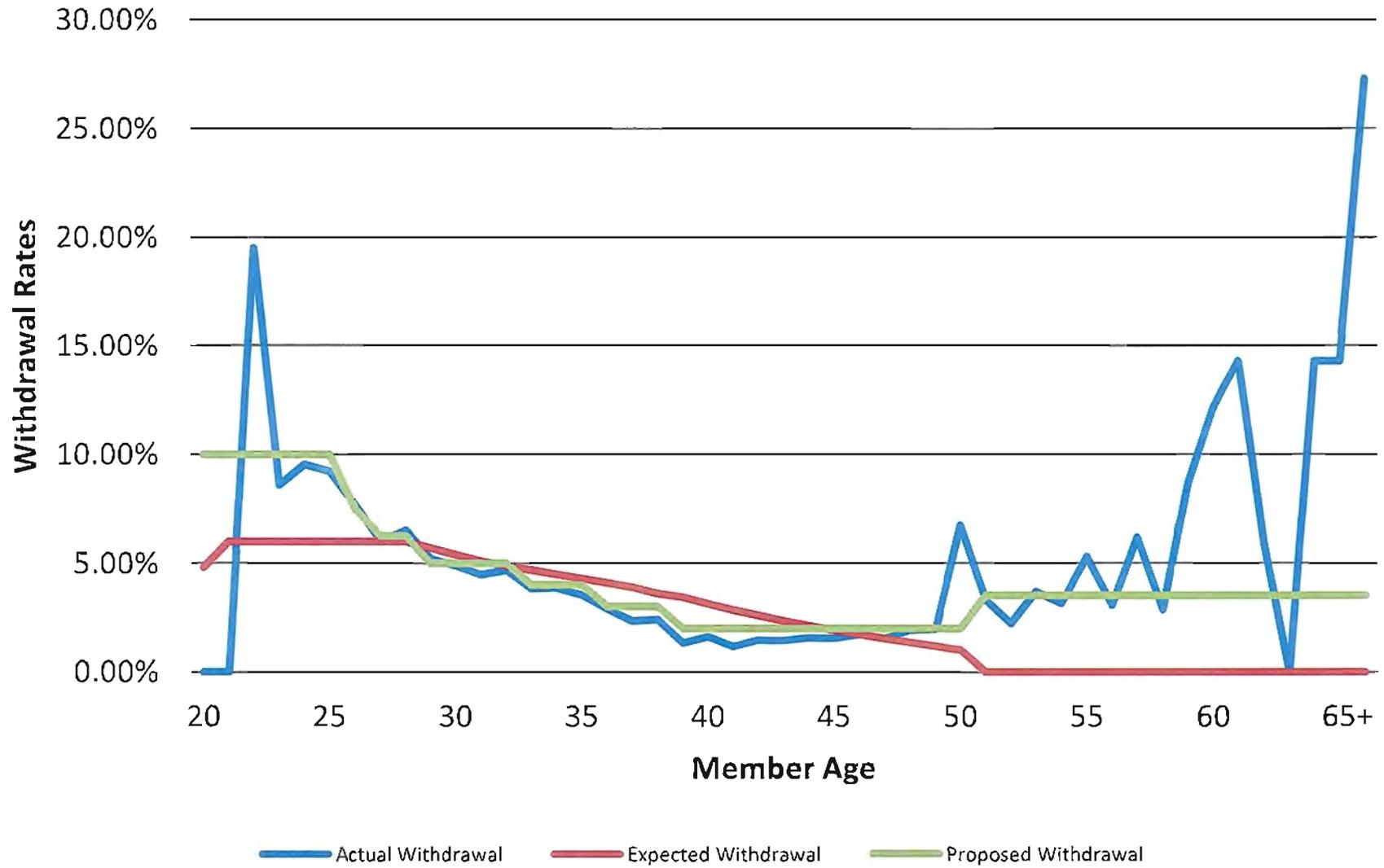
### Public Pension Division - Police Plans

Table 3: Withdrawal Experience - Police\*

Age	Exposures	Actual Terminations	Expected Terminations	Actual Withdrawal	Expected Withdrawal	Proposed Withdrawal
<20	5	0	0	0.00%	4.80%	10.00%
20	1	0	0	0.00%	6.00%	10.00%
21	41	8	2	19.51%	6.00%	10.00%
22	209	18	13	8.61%	6.00%	10.00%
23	712	68	43	9.55%	6.00%	10.00%
24	1,288	119	77	9.24%	6.00%	10.00%
25	1,717	132	103	7.69%	6.00%	7.50%
26	1,997	120	120	6.01%	6.00%	6.25%
27	2,258	147	135	6.51%	6.00%	6.25%
28	2,432	127	139	5.22%	5.70%	5.00%
29	2,551	125	138	4.90%	5.40%	5.00%
30	2,627	118	134	4.49%	5.10%	5.00%
31	2,768	130	136	4.70%	4.90%	5.00%
32	2,873	110	135	3.83%	4.70%	4.00%
33	3,115	120	140	3.85%	4.50%	4.00%
34	3,376	119	145	3.52%	4.30%	4.00%
35	3,492	101	143	2.89%	4.09%	3.00%
36	3,579	84	139	2.35%	3.89%	3.00%
37	3,573	86	128	2.41%	3.59%	3.00%
38	3,539	47	122	1.33%	3.43%	2.00%
39	3,319	54	104	1.63%	3.12%	2.00%
40	3,108	36	88	1.16%	2.84%	2.00%
41	2,999	44	78	1.47%	2.59%	2.00%
42	2,833	41	67	1.45%	2.35%	2.00%
43	2,595	41	55	1.58%	2.13%	2.00%
44	2,389	37	46	1.55%	1.93%	2.00%
45	2,256	39	39	1.73%	1.73%	2.00%
46	2,128	33	33	1.55%	1.54%	2.00%
47	2,026	39	28	1.93%	1.36%	2.00%
48	1,969	39	23	1.98%	1.19%	2.00%
49	1,994	134	20	6.72%	1.02%	2.00%
50	484	16	0	3.31%	0.00%	3.50%
51	402	9	0	2.24%	0.00%	3.50%
52	326	12	0	3.68%	0.00%	3.50%
53	254	8	0	3.15%	0.00%	3.50%
54	208	11	0	5.29%	0.00%	3.50%
55	163	5	0	3.07%	0.00%	3.50%
56	130	8	0	6.15%	0.00%	3.50%
57	105	3	0	2.86%	0.00%	3.50%
58	81	7	0	8.64%	0.00%	3.50%
59	66	8	0	12.12%	0.00%	3.50%
60	14	2	0	14.29%	0.00%	3.50%
61	17	1	0	5.88%	0.00%	3.50%
62	11	0	0	0.00%	0.00%	3.50%
63	7	1	0	14.29%	0.00%	3.50%
64	7	1	0	14.29%	0.00%	3.50%
65+	11	3	0	27.27%	0.00%	3.50%
<b>Total</b>	<b>72,055</b>	<b>2,411</b>	<b>2,573</b>	<b>3.35%</b>	<b>3.57%</b>	<b>3.52%</b>

\*Data from Valuation Year 2004 through 2010 sorted by Member Age.

### Graph 3: Withdrawal Experience Police Plans



## Illinois Department of Insurance

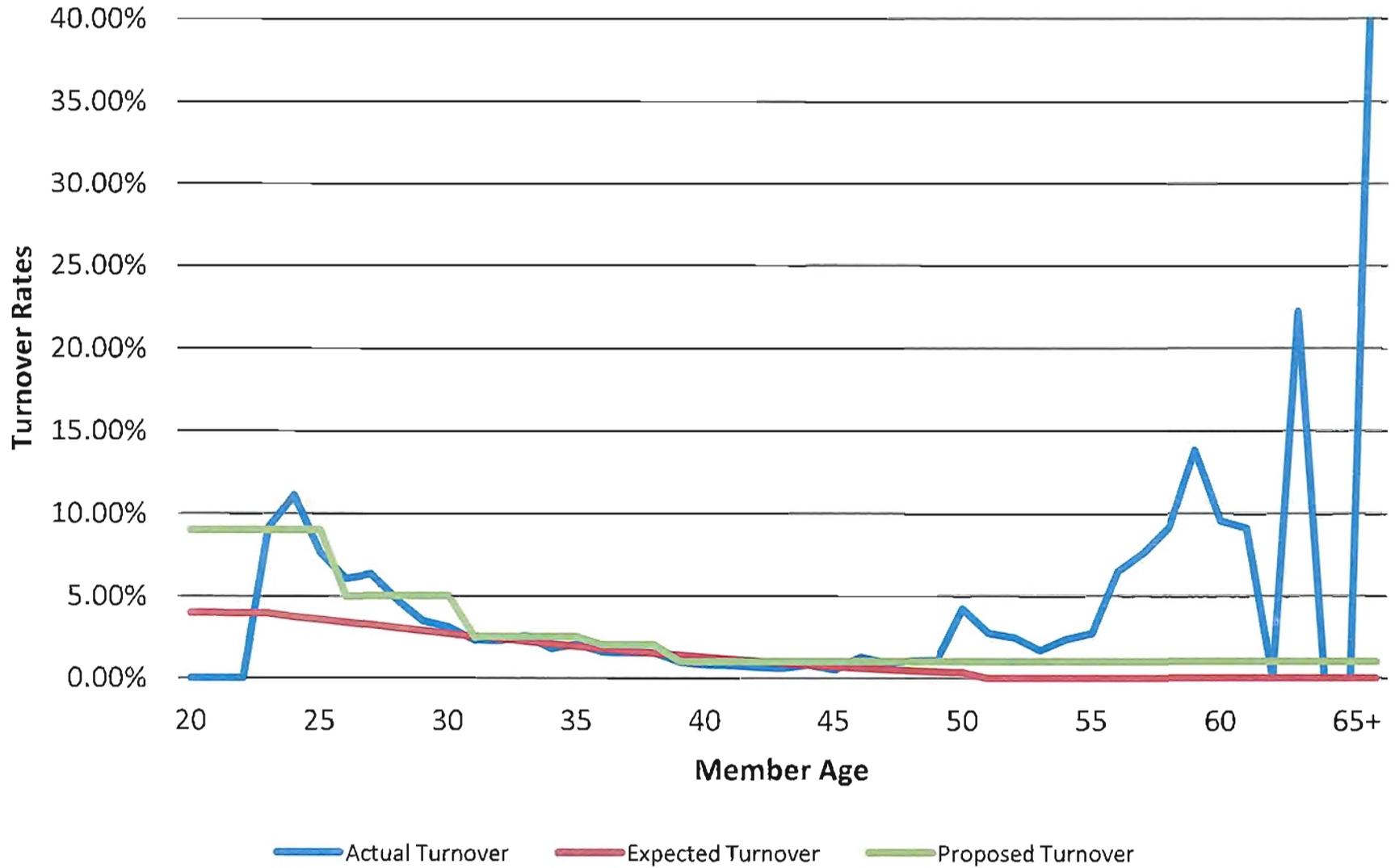
### Public Pension Division - Fire Plans

Table 4: Withdrawal Experience - Fire\*

Age	Exposures	Actual Terminations	Expected Terminations	Actual Withdrawal	Expected Withdrawal	Proposed Withdrawal
<20	2	0	0	0.00%	4.02%	9.00%
20	4	0	0	0.00%	4.02%	9.00%
21	13	0	1	0.00%	3.98%	9.00%
22	131	12	5	9.16%	3.98%	9.00%
23	325	36	12	11.08%	3.77%	9.00%
24	550	42	20	7.64%	3.61%	9.00%
25	758	46	26	6.07%	3.44%	5.00%
26	965	61	32	6.32%	3.27%	5.00%
27	1,138	54	35	4.75%	3.08%	5.00%
28	1,321	46	38	3.48%	2.91%	5.00%
29	1,449	45	40	3.11%	2.73%	5.00%
30	1,549	36	40	2.32%	2.56%	2.50%
31	1,637	37	39	2.26%	2.40%	2.50%
32	1,727	44	39	2.55%	2.24%	2.50%
33	1,856	33	39	1.78%	2.08%	2.50%
34	1,965	40	38	2.04%	1.93%	2.50%
35	2,041	32	37	1.57%	1.79%	2.00%
36	2,077	32	34	1.54%	1.65%	2.00%
37	2,105	32	32	1.52%	1.52%	2.00%
38	2,085	20	29	0.96%	1.39%	1.00%
39	1,979	16	25	0.81%	1.26%	1.00%
40	1,939	15	22	0.77%	1.14%	1.00%
41	1,965	13	20	0.66%	1.02%	1.00%
42	1,968	12	18	0.61%	0.92%	1.00%
43	1,968	16	16	0.81%	0.81%	1.00%
44	1,947	10	14	0.51%	0.71%	1.00%
45	1,911	24	12	1.26%	0.62%	1.00%
46	1,861	17	10	0.91%	0.54%	1.00%
47	1,761	18	8	1.02%	0.47%	1.00%
48	1,713	18	7	1.05%	0.41%	1.00%
49	1,648	69	6	4.19%	0.35%	1.00%
50	512	14	0	2.73%	0.00%	1.00%
51	407	10	0	2.46%	0.00%	1.00%
52	301	5	0	1.66%	0.00%	1.00%
53	213	5	0	2.35%	0.00%	1.00%
54	148	4	0	2.70%	0.00%	1.00%
55	93	6	0	6.45%	0.00%	1.00%
56	53	4	0	7.55%	0.00%	1.00%
57	44	4	0	9.09%	0.00%	1.00%
58	29	4	0	13.79%	0.00%	1.00%
59	21	2	0	9.52%	0.00%	1.00%
60	11	1	0	9.09%	0.00%	1.00%
61	8	0	0	0.00%	0.00%	1.00%
62	9	2	0	22.22%	0.00%	1.00%
63	3	0	0	0.00%	0.00%	1.00%
64	2	0	0	0.00%	0.00%	1.00%
65+	2	1	0	50.00%	0.00%	1.00%
<b>Total</b>	<b>46,214</b>	<b>938</b>	<b>693</b>	<b>2.03%</b>	<b>1.50%</b>	<b>2.08%</b>

\*Data from Valuation Year 2004 through 2010 sorted by Member Age.

# Graph 4: Withdrawal Experience Fire Plans



## **Mortality Rates**

### **Overview**

The rate of mortality is the probability of death at a given age. While mortality is a contingency for both the active and retiree populations, it has the greatest cost implications for retirees.

As mortality rates have continued to decline over time, concern has increased about the impact of potential future mortality improvement on the magnitude of pension commitments. ASOP No. 35 discusses the importance of actuaries considering mortality improvements when measuring pension obligations. Specifically, an actuary should adjust mortality rates to reflect mortality improvement prior to the measurement date and include an assumption regarding the expected mortality improvement after the measurement date, if reasonable.

### **Current Assumption**

The current mortality assumption was established under the 1971 Group Annuity Mortality Table for Males and Females.

### **Experience**

The charts and graphs listed below compare actual experience to expected experience using the current and proposed assumption tables. Experience was reviewed separately for retirees and active members and was reviewed for Police and Fire Funds in total to increase the credible experience.

- Table 5: Active Mortality Experience – 1971 GAM
- Graph 5: Active Mortality Experience – 1971 GAM
- Table 6: Active Mortality Experience – RP2000CH w/ BC Adj. (Proposed Table)
- Graph 6: Active Mortality Experience – RP2000CH w/ BC Adj. (Proposed Table)
- Table 7: Retiree Mortality Experience – 1971 GAM
- Graph 7: Retiree Mortality Experience – 1971 GAM
- Table 8: Retiree Mortality Experience – RP2000CH w/ BC Adj. (Proposed Table)
- Graph 8: Retiree Mortality Experience – RP2000CH w/ BC Adj. (Proposed Table)

For both retirees and active members, the results show there were fewer deaths than expected under the current assumption.

### **Proposed Assumption**

The current mortality table is outdated and does not represent a reasonable prediction of future mortality rates at this point in time.

#### *Retirees*

Despite trends of mortality improvement among the general population, the retiree mortality experience examined for 2004 through 2010 indicates these trends have not materialized fully for the Police and Fire population. Therefore, we recommend updating the mortality assumption to the RP 2000 Combined Healthy Mortality table, with Blue Collar Adjustment.

This population has not experienced the same level of mortality improvements observed in the general population. As a result, we do not recommend projecting the table further to reflect additional improvement. Future experience will be monitored and the mortality assumption will be updated accordingly.

*Actives*

As for retirees, we recommend an update to the RP 2000 Combined Healthy Mortality Table with Blue Collar Adjustment. While this table assumes heavier rates of mortality than experienced historically, given the low rates on incidence actually experienced, it represents a reasonable estimate of anticipated experience.

*Disableds*

The experience for the disabled population is less credible than the general retiree population. Therefore, we propose using a disabled retiree mortality table that reflects more general trends in mortality experience. Since mortality for disabled populations is generally heavier than healthy populations, we propose use of the RP 2000 Disabled Retiree Mortality Table. While Article 3 and Article 4 have a broader definition of disability than what is considered under this table, we do not believe multiple mortality tables are needed for this group.

# Illinois Department of Insurance

## Public Pension Division - Police and Fire Plans

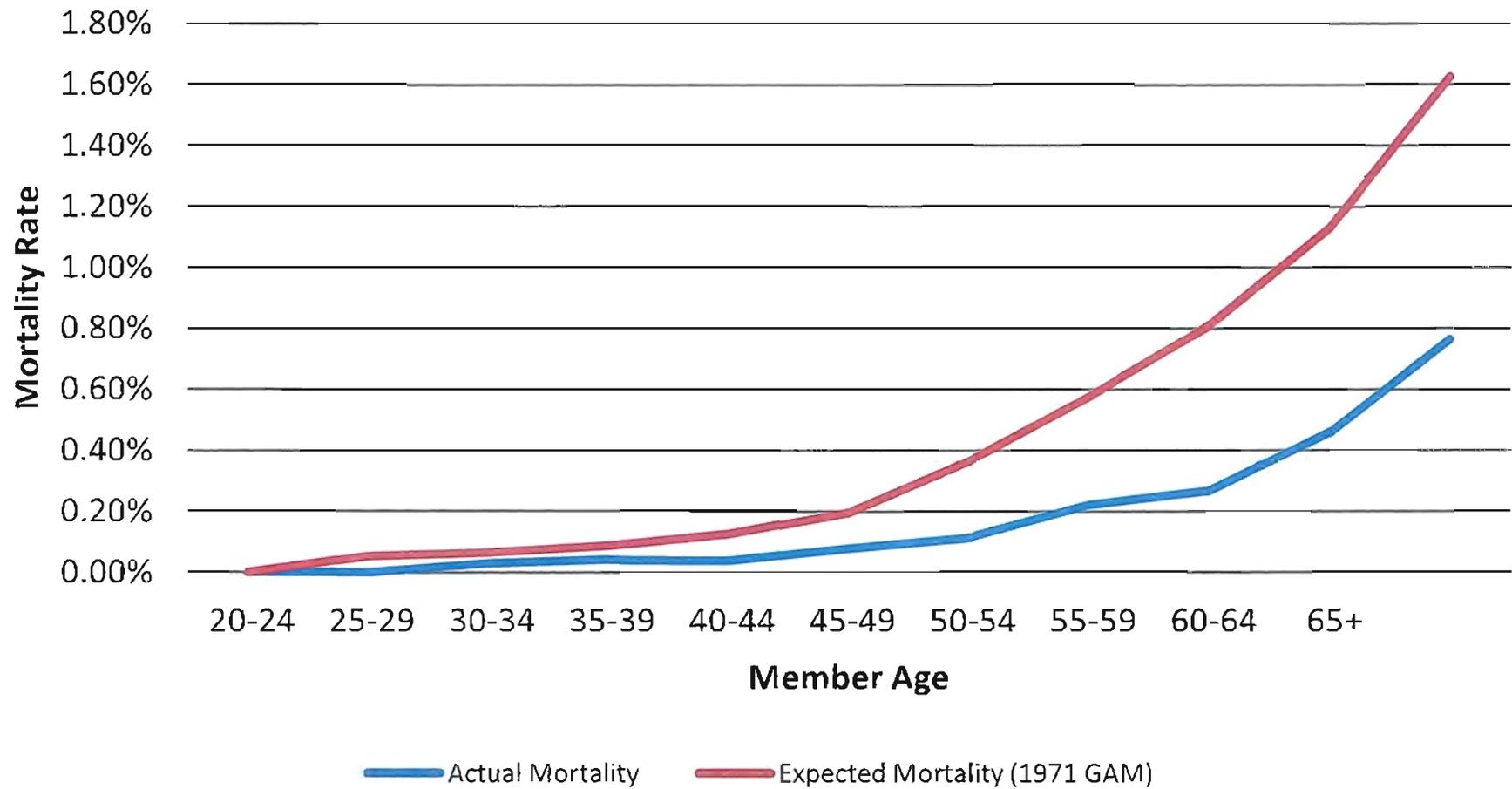
Table 5: Active Mortality Experience - 1971 GAM\*

Age	Exposures	Actual Deaths	Expected Deaths**	Actual Mortality	Expected Mortality**
<20	7	0	0	0.00%	0.00%
20-24	3,274	0	2	0.00%	0.05%
25-29	16,586	5	11	0.03%	0.06%
30-34	23,493	10	21	0.04%	0.09%
35-39	27,789	11	35	0.04%	0.12%
40-44	23,711	19	47	0.08%	0.20%
45-49	19,267	22	70	0.11%	0.36%
50-54	13,123	29	76	0.22%	0.58%
55-59	4,860	13	39	0.27%	0.81%
60-64	1,089	5	12	0.46%	1.13%
65+	131	1	2	0.76%	1.63%
<b>Total</b>	<b>133,330</b>	<b>115</b>	<b>314</b>	<b>0.09%</b>	<b>0.24%</b>

\*Data from Valuation Year 2004 through 2010 sorted by Member Age.

\*\*Expected experience based on current assumption: 1971 GAM

## Graph 5: Active Mortality Experience Police and Fire Plans



# Illinois Department of Insurance

## Public Pension Division - Police and Fire Plans

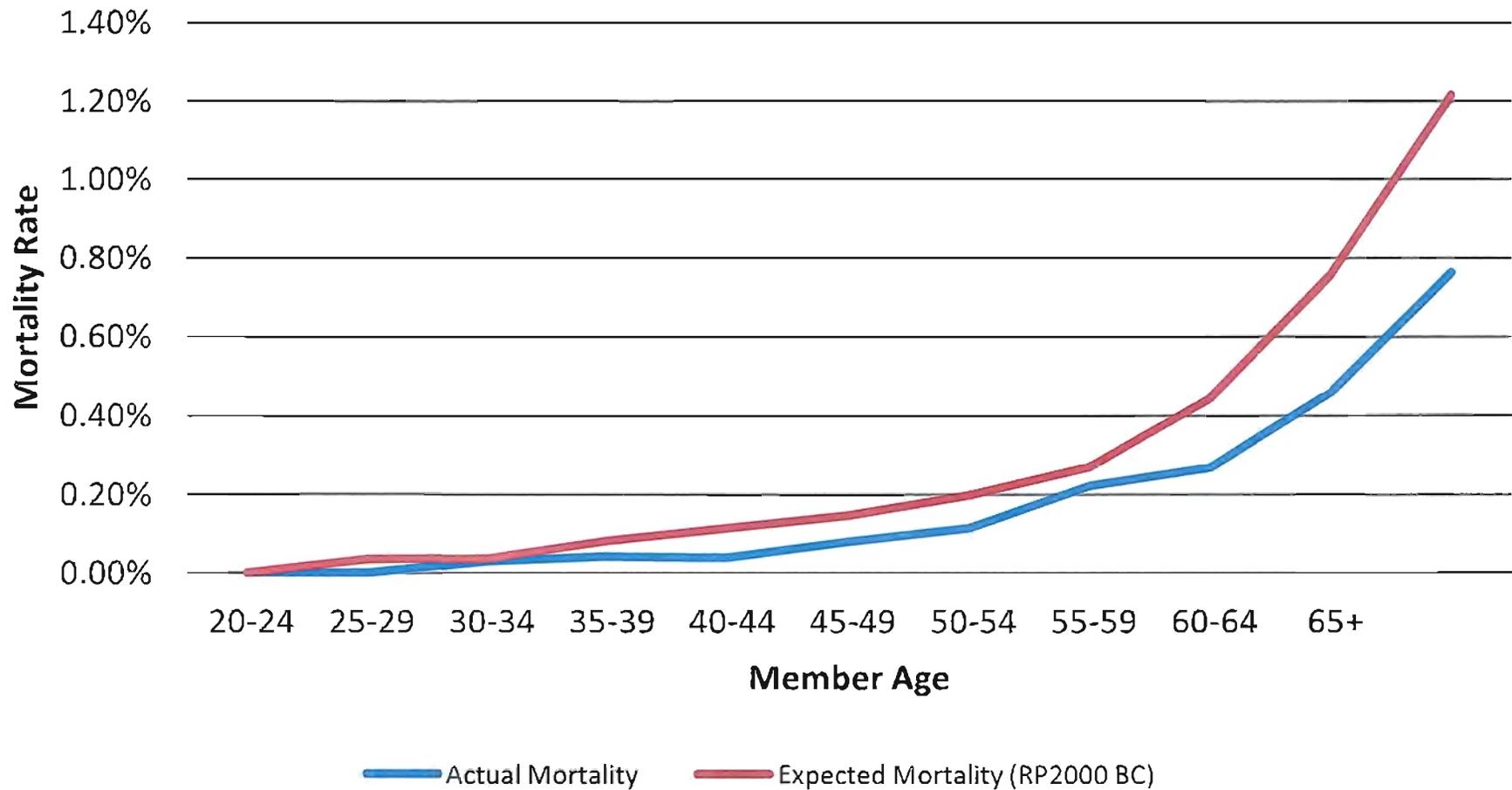
Table 6: Active Mortality Experience - RP 2000CH, with BC Adj.\*

Age	Exposures	Actual Deaths	Expected Deaths**	Actual Mortality	Expected Mortality**
<20	7	0	0	0.00%	0.00%
20-24	3,274	0	1	0.00%	0.03%
25-29	16,586	5	6	0.03%	0.04%
30-34	23,493	10	19	0.04%	0.08%
35-39	27,789	11	32	0.04%	0.11%
40-44	23,711	19	35	0.08%	0.15%
45-49	19,267	22	38	0.11%	0.20%
50-54	13,123	29	35	0.22%	0.27%
55-59	4,861	13	22	0.27%	0.44%
60-64	1,089	5	8	0.46%	0.76%
65+	131	1	2	0.76%	1.21%
<b>Total</b>	<b>133,331</b>	<b>115</b>	<b>198</b>	<b>0.09%</b>	<b>0.15%</b>

\*Data from Valuation Year 2004 through 2010 sorted by Member Age.

\*\*Expected experience based on proposed assumption: RP 2000 Combined Healthy with Blue Collar Adjustment

## Graph 6: Active Mortality Experience Police and Fire Plans



# Illinois Department of Insurance

## Public Pension Division - Police and Fire Plans

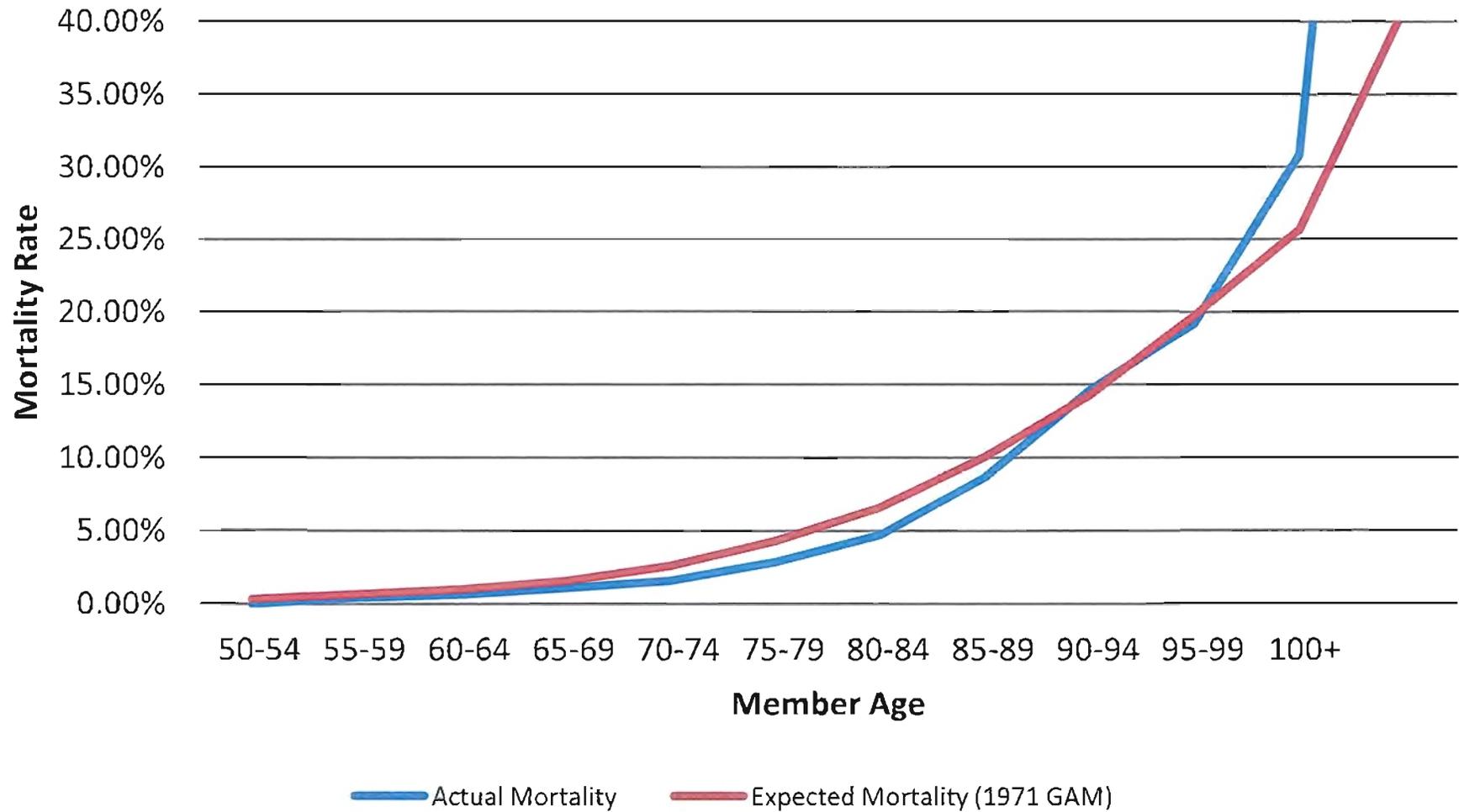
Table 7: Retiree Mortality Experience - 1971 GAM\*

Age	Exposures	Actual Deaths	Expected Deaths**	Actual Mortality	Expected Mortality**
<50	12	0	0	0.00%	0.33%
50-54	5,554	23	38	0.41%	0.68%
55-59	11,842	75	120	0.63%	1.01%
60-64	12,347	136	195	1.10%	1.58%
65-69	9,459	151	246	1.60%	2.60%
70-74	6,448	185	278	2.87%	4.31%
75-79	4,655	220	307	4.73%	6.59%
80-84	2,713	235	273	8.66%	10.05%
85-89	788	115	113	14.59%	14.28%
90-94	219	42	43	19.18%	19.73%
95-99	68	21	17	30.88%	25.71%
100+	2	2	1	100.00%	41.00%
<b>Total</b>	<b>54,107</b>	<b>1,205</b>	<b>1,631</b>	<b>2.23%</b>	<b>3.01%</b>

\*Data from Valuation Year 2004 through 2010 sorted by Member Age.

\*\*Expected experience based on current assumption: 1971 GAM

## Graph 7: Retiree Mortality Experience Police and Fire Plans



# Illinois Department of Insurance

## Public Pension Division - Police and Fire Plans

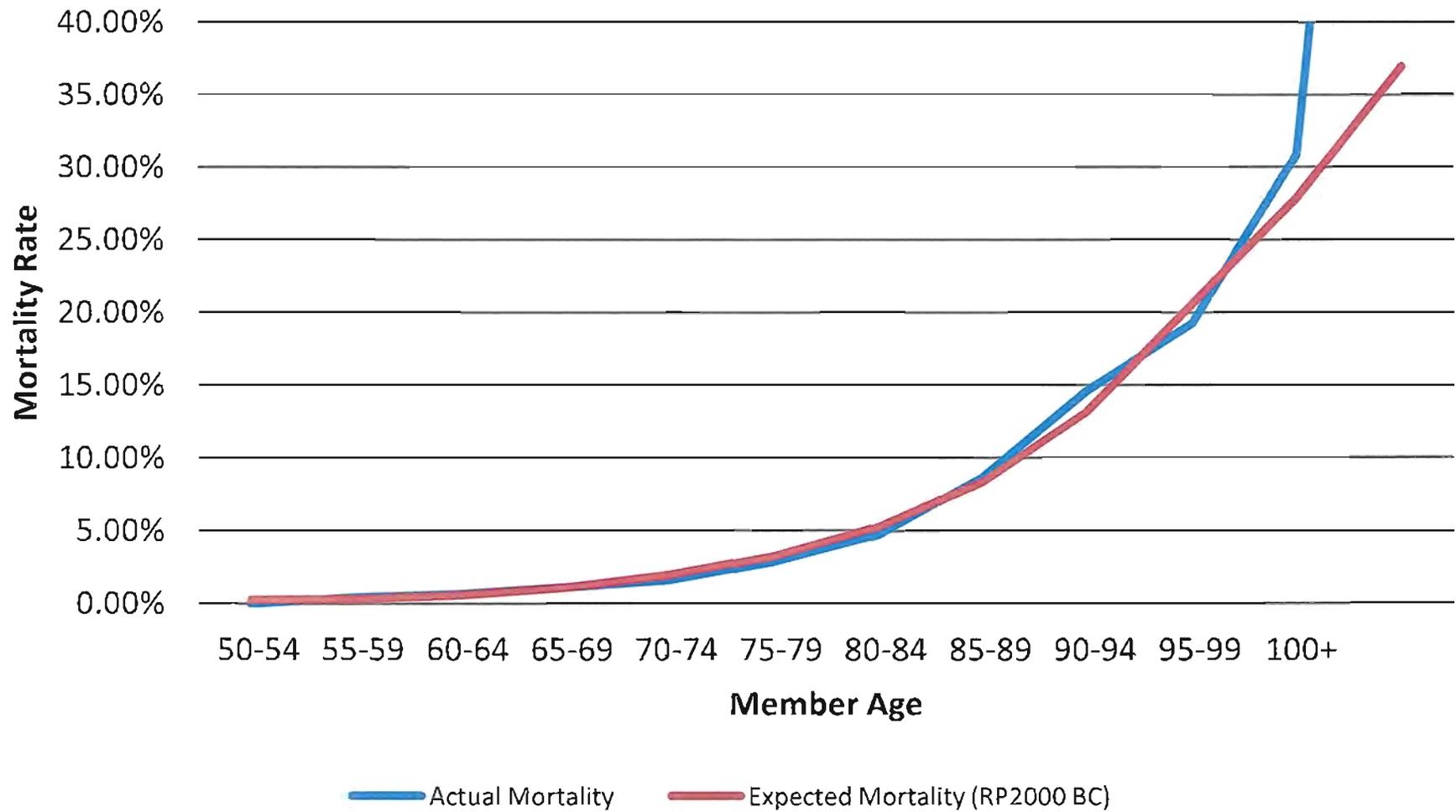
Table 8: Retiree Mortality Experience - RP2000CH with BC Adj\*

Age	Exposures	Actual Deaths	Expected Deaths**	Actual Mortality	Expected Mortality**
<50	12	0	0	0.00%	0.25%
50-54	5,554	23	18	0.41%	0.32%
55-59	11,842	75	68	0.63%	0.58%
60-64	12,347	136	133	1.10%	1.08%
65-69	9,459	151	182	1.60%	1.93%
70-74	6,448	185	207	2.87%	3.21%
75-79	4,655	220	244	4.73%	5.25%
80-84	2,713	235	227	8.66%	8.35%
85-89	788	115	104	14.59%	13.17%
90-94	219	42	45	19.18%	20.53%
95-99	68	21	19	30.88%	27.88%
100+	2	2	1	100.00%	37.00%
<b>Total</b>	<b>54,107</b>	<b>1,205</b>	<b>1,248</b>	<b>2.23%</b>	<b>2.31%</b>

\*Data from Valuation Year 2004 through 2010 sorted by Member Age.

\*\*Expected experience based on proposed assumption: RP 2000 Combined Healthy with Blue Collar Adjustment

## Graph 8: Retiree Mortality Experience Police and Fire Plans



## **Disability Rates**

### **Overview**

The disability rate assumption is the probability that a Member will become disabled while he or she is an active participant in the Fund.

The overall cost due to disability depends on the plan's disability provisions. For the Article 3 and Article 4 plans, the benefit provisions for Members who separate employment due to disability are different than the provisions for Normal Retirement and can be more valuable. It is possible that an active Member who is already eligible to retire becomes disabled, and as a result of that disability, is entitled to receive a larger immediate benefit than if he or she had retired.

It is also important to note that the level of disability benefits received depends on whether the disability was service-related or non-service-related. For example, to receive benefits for non-service-related disabilities in the Firefighter funds, there is a seven year eligibility requirement. Therefore, to measure the liabilities associated with the disability contingency, an assumption for the portion of disabilities due to service-related disabilities is necessary.

Determining future incidence of disability is difficult. Therefore, a review of past experience compared to the current assumption will provide the basis for examining the assumption.

### **Current Assumption**

Currently, the assumed disability rates are expressed by age, with the probabilities of disability being higher for Firefighters at each age when compared to the assumed disability rates for Police Officers.

### **Experience**

As can be seen on the following tables, the overall disability experience has been about 50% higher than expected. While there was nearly no incidence of disability at younger ages, the number of disabilities from age 30 (age 27 for police) and beyond were higher than expected based on current assumed rates.

We also reviewed the incidence of service-related disabilities versus non-service-related disabilities. Over the studied period, approximately 90% of the Fire disabilities and approximately 70% of Police disabilities were service-related.

- Table 9: Disability Experience – Police Funds
- Graph 9: Disability Experience – Police Funds
- Table 10: Disability Experience – Fire Funds
- Graph 10: Disability Experience – Fire Funds

**Proposed Assumption**

We recommend the following changes to the disability assumptions. We believe they will more accurately reflect the associated costs of the disability provisions.

- Lower rates of disability for ages less than 30 (age 27 for Police) with increased rates beginning at age 30. This will address the higher incidence of disability experienced in the population.
- The addition of an assumption for rate of service-related disabilities:
  - 90% rate of service-related disabilities for the Fire Funds
  - 70% rate of service-related disabilities for the Police Funds.

## Illinois Department of Insurance

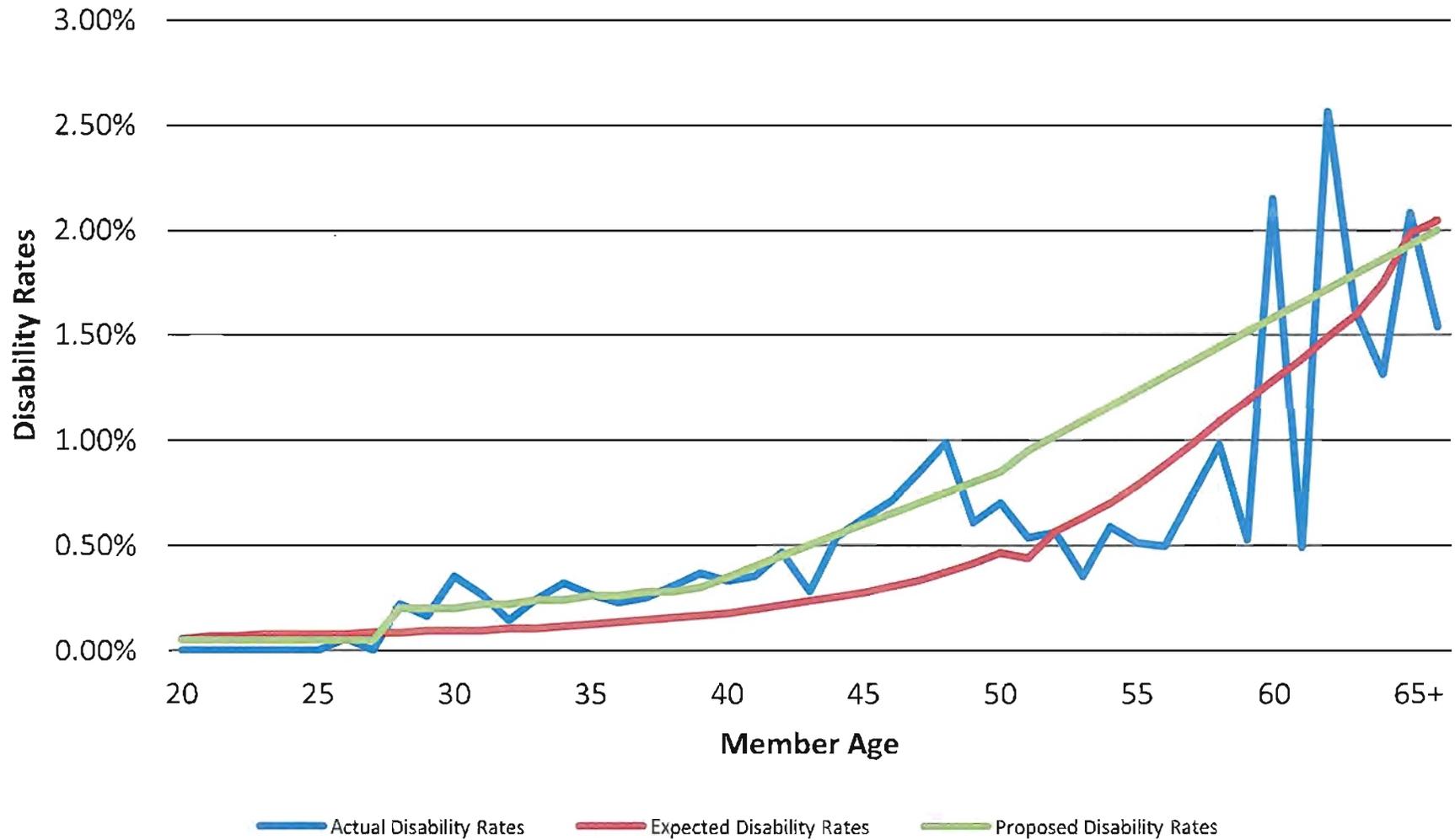
### Public Pension Division - Police Plans

Table 9: Disability Experience - Police\*

Age	Exposures	Actual Disabilities	Expected Disabilities	Actual Disability Rates	Expected Disability Rates	Proposed Rates
<20	5	0	0	0.00%	0.05%	0.05%
20	1	0	0	0.00%	0.07%	0.05%
21	41	0	0	0.00%	0.07%	0.05%
22	209	0	0	0.00%	0.08%	0.05%
23	712	0	1	0.00%	0.08%	0.05%
24	1,288	0	1	0.00%	0.08%	0.05%
25	1,717	1	1	0.06%	0.08%	0.05%
26	1,997	0	2	0.00%	0.09%	0.05%
27	2,258	5	2	0.22%	0.09%	0.20%
28	2,432	4	2	0.16%	0.10%	0.20%
29	2,551	9	2	0.35%	0.10%	0.20%
30	2,627	7	3	0.27%	0.10%	0.22%
31	2,768	4	3	0.14%	0.11%	0.22%
32	2,873	7	3	0.24%	0.11%	0.24%
33	3,115	10	4	0.32%	0.12%	0.24%
34	3,376	9	4	0.27%	0.13%	0.26%
35	3,492	8	5	0.23%	0.14%	0.26%
36	3,579	9	5	0.25%	0.15%	0.28%
37	3,573	11	6	0.31%	0.16%	0.28%
38	3,539	13	6	0.37%	0.17%	0.30%
39	3,319	11	6	0.33%	0.18%	0.35%
40	3,108	11	6	0.35%	0.20%	0.40%
41	2,999	14	7	0.47%	0.22%	0.45%
42	2,833	8	7	0.28%	0.24%	0.50%
43	2,595	14	7	0.54%	0.26%	0.55%
44	2,389	15	7	0.63%	0.28%	0.60%
45	2,256	16	7	0.71%	0.31%	0.65%
46	2,128	18	7	0.85%	0.34%	0.70%
47	2,026	20	8	0.99%	0.38%	0.75%
48	1,969	12	8	0.61%	0.42%	0.80%
49	1,994	14	9	0.70%	0.47%	0.85%
50	1,864	10	8	0.54%	0.44%	0.95%
51	1,606	9	9	0.56%	0.57%	1.02%
52	1,400	5	9	0.36%	0.63%	1.09%
53	1,189	7	8	0.59%	0.70%	1.16%
54	977	5	8	0.51%	0.79%	1.23%
55	805	4	7	0.50%	0.88%	1.30%
56	675	5	7	0.74%	0.98%	1.37%
57	511	5	6	0.98%	1.09%	1.44%
58	380	2	5	0.53%	1.19%	1.51%
59	279	6	4	2.15%	1.29%	1.58%
60	204	1	3	0.49%	1.38%	1.65%
61	156	4	2	2.56%	1.49%	1.72%
62	124	2	2	1.61%	1.59%	1.79%
63	76	1	1	1.32%	1.75%	1.86%
64	48	1	1	2.08%	1.99%	1.93%
65+	65	1	1	1.54%	2.05%	2.00%
<b>Total</b>	<b>80,128</b>	<b>318</b>	<b>208</b>	<b>0.40%</b>	<b>0.26%</b>	<b>0.46%</b>

\*Data from Valuation Year 2004 through 2010 sorted by Member Age.

## Graph 9: Disability Experience Police Plans



# Illinois Department of Insurance

## Public Pension Division - Fire Plans

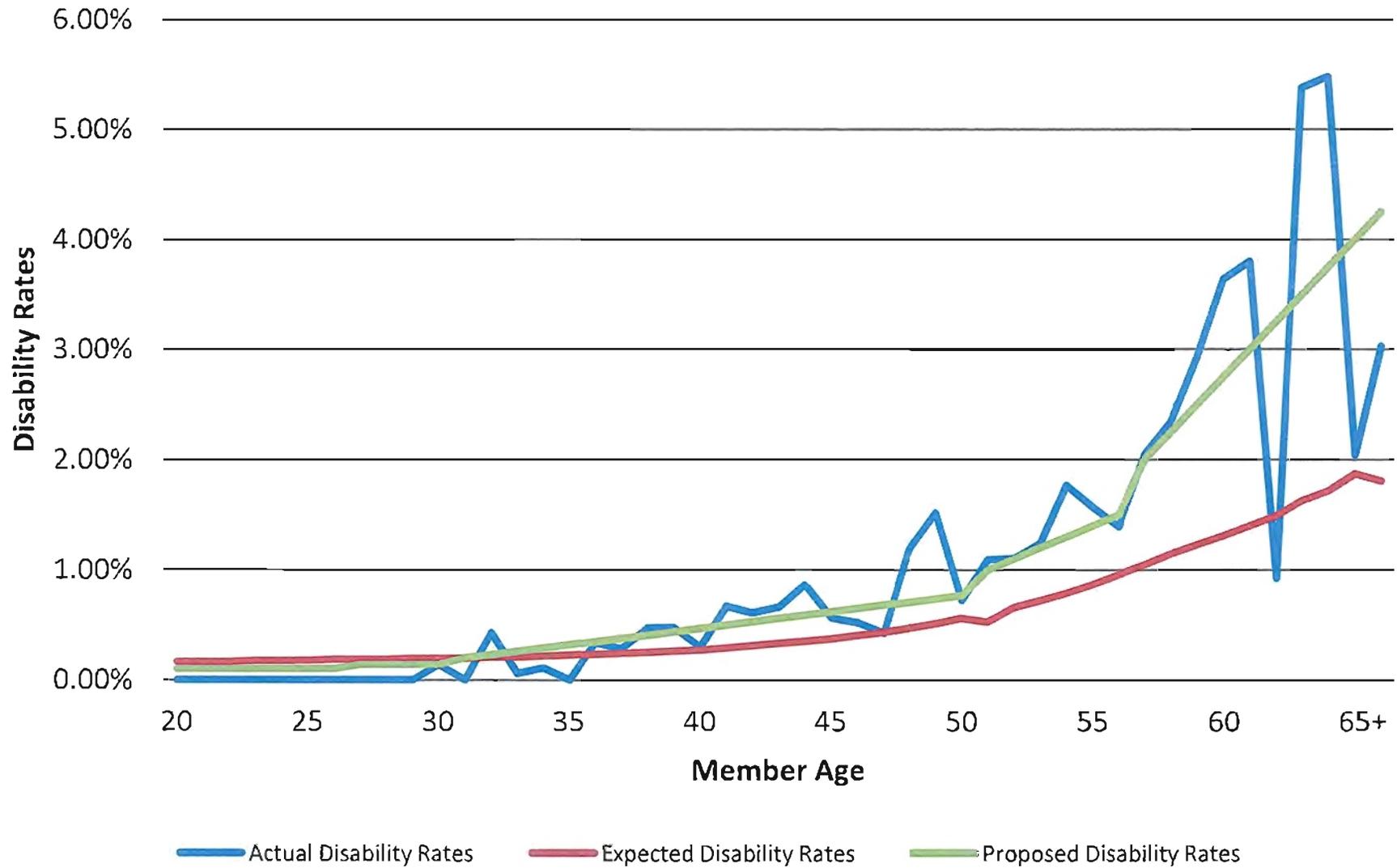
Table 10: Disability Experience - Fire\*

Age	Exposures	Actual Disabilities	Expected Disabilities	Actual Disability Rates	Expected Disability Rates	Proposed Disability Rates
<20	2	0	0	0.00%	0.17%	0.10%
20	4	0	0	0.00%	0.17%	0.10%
21	13	0	0	0.00%	0.17%	0.10%
22	131	0	0	0.00%	0.18%	0.10%
23	325	0	1	0.00%	0.18%	0.10%
24	550	0	1	0.00%	0.18%	0.10%
25	758	0	1	0.00%	0.19%	0.10%
26	965	0	2	0.00%	0.19%	0.14%
27	1,138	0	2	0.00%	0.19%	0.14%
28	1,321	0	3	0.00%	0.20%	0.14%
29	1,449	2	3	0.14%	0.20%	0.14%
30	1,549	0	3	0.00%	0.20%	0.20%
31	1,637	7	3	0.43%	0.21%	0.23%
32	1,727	1	4	0.06%	0.21%	0.26%
33	1,856	2	4	0.11%	0.22%	0.29%
34	1,965	0	4	0.00%	0.23%	0.32%
35	2,041	7	5	0.34%	0.24%	0.35%
36	2,077	6	5	0.29%	0.25%	0.38%
37	2,105	10	5	0.48%	0.26%	0.41%
38	2,085	10	6	0.48%	0.27%	0.44%
39	1,979	6	6	0.30%	0.28%	0.47%
40	1,939	13	6	0.67%	0.30%	0.50%
41	1,965	12	6	0.61%	0.32%	0.53%
42	1,968	13	7	0.66%	0.34%	0.56%
43	1,968	17	7	0.86%	0.36%	0.59%
44	1,947	11	7	0.57%	0.38%	0.62%
45	1,911	10	8	0.52%	0.41%	0.65%
46	1,861	8	8	0.43%	0.44%	0.68%
47	1,761	21	8	1.19%	0.48%	0.71%
48	1,713	26	9	1.52%	0.52%	0.74%
49	1,648	12	9	0.73%	0.57%	0.77%
50	1,555	17	8	1.09%	0.54%	1.00%
51	1,358	15	9	1.10%	0.67%	1.10%
52	1,209	15	9	1.24%	0.73%	1.20%
53	1,075	19	9	1.77%	0.79%	1.30%
54	890	14	8	1.57%	0.87%	1.40%
55	718	10	7	1.39%	0.96%	1.50%
56	538	11	6	2.04%	1.05%	2.00%
57	427	10	5	2.34%	1.15%	2.25%
58	307	9	4	2.93%	1.23%	2.50%
59	220	8	3	3.64%	1.31%	2.75%
60	158	6	2	3.80%	1.41%	3.00%
61	108	1	2	0.93%	1.49%	3.25%
62	93	5	2	5.38%	1.63%	3.50%
63	73	4	1	5.48%	1.72%	3.75%
64	49	1	1	2.04%	1.88%	4.00%
65+	66	2	1	3.03%	1.81%	4.25%
<b>Total</b>	<b>53,202</b>	<b>341</b>	<b>209</b>	<b>0.64%</b>	<b>0.39%</b>	<b>0.62%</b>

\*Data from Valuation Year 2004 through 2010 sorted by Member Age.

# Graph 10: Disability Experience

## Fire Plans



## **Economic Assumptions**

ASOP No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations*, provides guidance to actuaries in selecting (including giving advice on selecting) economic assumptions – primarily investment return, discount rate, and salary scale – for measuring obligations under defined benefit pension plans.

Throughout the remainder of this section, we have used the standards set forth in ASOP No. 27 as a guideline for reviewing and if applicable, selecting proposed changes to the following economic actuarial assumptions:

- Investment Return
- Salary Increases
- Payroll Growth Rate (used for amortizing the Unfunded Actuarial Accrued Liability)
- Cost-of-Living

Please keep in mind that ASOP No. 27 states that “the best an actuary can do is to use professional judgment to estimate possible future economic outcomes based on past experience and future expectations, and to select assumptions based upon that application of professional judgment.”

## **Investment Return Assumption**

### **Overview**

The investment return assumption used in actuarial valuations should be set in accordance with Actuarial Standard of Practice No. 27. The ASOP requires that the investment return assumption fall within a best-estimate range of anticipated future experience. Therefore, the assumption should be set based on the long-term expectation of the plan as determined by the investment policy statement, target asset allocation and capital market assumptions. These factors are not consistent for all of the Article 3 and Article 4 Plans in the State so we reviewed hypothetical portfolios developed based on typical Article 3 and Article 4 Plans across the State.

The Illinois Pension Code contains strict investment limitations for Article 3 and Article 4 Pension Plans based on the asset level of each respective fund. These limitations lead to dramatic variations in the target asset allocations of small funds and large funds. Therefore, we do not believe a single investment return assumption for all of the Article 3 and Article 4 plans is appropriate. We suggest implementing an investment return assumptions that varies based on the market value of asset level of the plan. We recommend adoption of a tiered assumption based on the specific breakpoints outlined in the Illinois Pension Code. The applicable assumption will vary based on the following portfolios sizes:

Portfolio 1: Less than \$2.5 million

Portfolio 2: Less than \$5.0 million but more than \$2.5 million

Portfolio 3: Less than \$10.0 million but more than \$5.0 million

Portfolio 4: More than \$10.0 million

As time passes, we would expect the smaller portfolios (i.e., Portfolios 1 – 3) to grow with investment earnings and contributions and migrate to the larger portfolios where they can invest a larger portion of the assets in equities. Our analysis factors in the increasing expectations so a plan that is currently in Portfolio 1 will not be subject to those severe restrictions for the life of the plan.

### **Summary of Capital Market Assumptions**

In setting the investment return assumption, we relied on 20-year capital market assumptions provided by Raymond James. Additionally, we reviewed capital market assumptions provided by other investment institutions to ensure the reasonableness of the information provided by Raymond James.

The capital market assumptions are forward-looking data points based on economic models for equity, fixed income and other investments.

The equity capital market assumptions are based on the concepts of dividend discount model and economic theory. The inputs for forward equity returns are based on expectations for real economic growth, inflation, dividends and P/E expansion or contraction. These expectations are geometrically linked to produce the long-term assumptions.

Fixed income capital market assumptions are determined based on current yields, spreads, default expectations, currencies and other factors. These are adjusted based on the most likely path of interest rates as well as the impact of the spreads, default rates, recoveries, real rates, inflation, etc.

### Current Assumptions

A table summarizing the capital market assumption by asset class is included below. These assumptions are based on a building-block approach where the returns are a combination of components. For example, the current U.S. Large Cap Equity is approximately 8.3%. This rate includes and assumed rate of inflation of 2.5%, a real economic growth assumption of 2.7% and dividends of 2.3%. Geometrically linking these returns together gives an expected rate of return of approximately 7.6%. Combining this with an expected alpha of 0.65% (for active management) brings us to the 8.3% assumption. The assumed standard deviation is 20%. Each asset class in the U.S. is beta adjusted to account for additional risk and expected return. This same process is repeated for each region of the world to determine non-U.S. assumptions.

	Mean-Variance Assumptions			
	20-Yr Assumptions		Intermediate Gross Rate of Return	
	Geometric	STD	10Yr	5-Yr
US Large Cap Equity	8.3%	20.0%	8.3%	8.5%
US Small/Mid Cap Equity	9.3%	23.0%	9.2%	9.2%
Non-US Developed Large Cap Equity Unhedged	8.4%	19.7%	8.4%	8.7%
Emerging Markets Equity Unhedged	10.5%	26.0%	10.8%	11.1%
US Corporate Bonds	4.2%	6.0%	3.0%	0.7%
US Government Fixed Income	3.2%	7.0%	2.1%	0.1%
US Cash	3.0%	1.3%	2.5%	1.7%
Global Real Estate - REITS	8.3%	15.8%	8.3%	8.3%
Commodities - Long Only	4.9%	18.0%	4.8%	4.8%
Inflation	2.5%	1.8%		
Real GDP Growth	2.7%	1.9%		
Nominal GDP Growth	5.3%	2.3%		

## Portfolio Returns

Four model portfolios were created using the parameters provided and optimal allocations. Conservative constraints were used to create each of the four portfolios. The table below lists the four portfolio allocations as well as the expected gross return using the 10 year and 20 year assumptions. The portfolio returns and standard deviations were created using the forward-looking capital market assumptions with a mean variance optimizer. The assumptions developed in this section assume a plan remains within the same portfolio for the life of the fund and does not consider migration to the larger portfolios.

	Portfolio 1	Portfolio 2	Portfolio 3	Portfolio 4
<b>Portfolio Asset Level</b>	<b>Less Than \$2.5 M</b>	<b>\$2.5 - 5.0 M</b>	<b>\$5.0 - 10 M</b>	<b>\$10.0 M or More</b>
<b>Large Cap</b>	7.50%	10.50%	11.25%	12.75%
<b>Small-to-Mid Cap</b>	2.50%	3.50%	4.75%	6.25%
<b>U.S. Equity</b>	10.00%	14.00%	16.00%	19.00%
<b>Developed Non-U.S. Equity</b>	0.00%	10.00%	13.00%	16.00%
<b>Emerging Market Equities</b>	0.00%	4.00%	6.00%	8.00%
<b>Total International Equity</b>	0.00%	14.00%	19.00%	24.00%
<b>Total Equity</b>	<b>10.00%</b>	<b>28.00%</b>	<b>35.00%</b>	<b>43.00%</b>
<b>Global Real Estate</b>	0.00%	3.00%	5.00%	7.00%
<b>Commodities</b>	0.00%	4.00%	5.00%	5.00%
<b>Total Alternatives</b>	<b>0.00%</b>	<b>7.00%</b>	<b>10.00%</b>	<b>12.00%</b>
<b>Total Fixed Income</b>	<b>90.00%</b>	<b>65.00%</b>	<b>55.00%</b>	<b>45.00%</b>
<b>10 Year Assumption</b>	3.76%	5.45%	6.11%	6.71%
<b>20 Year Assumption</b>	4.87%	6.26%	6.79%	7.26%

## Plan Progression and Returns

Over time, a plan will migrate from one portfolio allocation to another as the asset level increases with contributions and investment earnings. A plan could start with Portfolio 1 (10% equity) and over time migrate to Portfolio 2 and so on until it ends with Portfolio 4 (at least 55% equity and alternatives). There are four potential paths a plan could take: start in Portfolio 1 and

end in Portfolio 4, start with Portfolio 2 and end with Portfolio 4, start with Portfolio 3 and end with Portfolio 4 and, lastly, start in Portfolio 4 and remain there. There are numerous other possibilities; however, these seem most plausible given growth in assets under management by capital appreciation and contributions to the plan. It is assumed that a plan will migrate upward to the next portfolio every 10 years. Some plans will move to the next tier in a period less than 10 years while some plans may never leave its current tier. The 10 year assumption is intended to represent the average of all the plans in the State. The table below lists the return for each of the three scenarios and is calculated by looking at the average return for each of the portfolios during the holding periods. These are long-term assumptions and are tied to the capital market assumptions listed above.

The model used in our analysis develops gross returns and does not incorporate the investment fees incurred in achieving those returns. As a result, an additional adjustment is needed to determine the recommended assumption for each of the portfolios. Generally, a plan tends to pay 35 to 50 basis points for the fixed income investments within their portfolio and 75 to 100 basis points for equity investments in the portfolio. The smaller plans typically fall on the higher end of each range but are invested primarily in fixed income investments. Therefore, we believe an assumption of 55 basis points is reflective of the fees paid by each of the portfolios.

The table below summarizes the development of the expected net-of-fees rate of return for each of the portfolios:

Scenario	Expected Gross Rate of Return	Expected Investment Fees	Expected Net-of-Fees Rate of Return
Start in Portfolio 1 to Portfolio 4	5.57%	0.55%	5.02%
Start in Portfolio 2 to Portfolio 4	6.52%	0.55%	6.00%
Start in Portfolio 3 to Portfolio 4	7.02%	0.55%	6.47%
Start in Portfolio 4	7.26%	0.55%	6.71%

### Proposed Assumption

As described above, we do not believe a single investment return assumption is appropriate for Article 3 and Article 4 funds due to the investment restrictions outlined in the Illinois Pension Code. We recommend changing the current assumption of 7.0% for all plans to the tiered rates summarized below.

Scenario	Proposed Assumption
Funds Less Than \$2.5 Million	5.00%
Funds Between \$2.5 and \$5.0 Million	6.00%
Funds Between \$5.0 and \$10.0 Million	6.50%
Funds More Than \$10.0 Million	6.75%

We believe that each rate falls within the best-estimate range and is more reflective of the actual returns that will be earned by these plans over the long-term. Lowering the assumption from 7.0% will result in a larger tax levy for all funds since we are assuming investment income is replaced by contributions from the plan sponsor. Obviously, the requirements will increase by a larger percentage for the smaller funds. Unfortunately, this is the reality due to the investment restrictions facing these funds.

### Historical Returns

While not used to set the assumption, attached is a summary of historical returns by Fund size for both Police and Fire Funds. This information is intended to outline the returns these plans have earned since 2004. Note that given the increased allowable equity percentages as portfolio size increases, returns generally increase with the size of the Fund.

- Table 11: Average Historical Returns by Fund Size – Police
- Table 12: Average Historical Returns by Fund Size – Fire

**Illinois Department of Insurance**  
**Police Plans**  
**Table 11: Average Historical Returns by Fund Size**

Investment Return History (Net-of-Fees)  
 Grouped by Asset Totals

<b>Total Assets in Plan (in Millions)</b>	<b>Average Investment Return*</b>
Greater than 10	6.05%
5 - 10	5.48%
2.5 - 5	4.55%
Less than 2.5	3.37%

\*Average Investment Returns were calculated using the annual investment returns from 2004 through 2011.

**Illinois Department of Insurance  
Fire Plans  
Table 12: Average Historical Returns by Fund Size**

Investment Return History (Net-of-Fees)  
Grouped by Asset Totals

<b>Total Assets in Plan (in Millions)</b>	<b>Average Investment Return*</b>
Greater than 10	5.92%
5 - 10	5.26%
2.5 - 5	4.61%
Less than 2.5	3.20%

\*Average Investment Returns were calculated using the annual investment returns from 2004 through 2011.

## **Salary Increases**

### **Overview**

The salary increase assumption is used to project a Member's salary from the valuation date until the assumed retirement age. Salary increase assumptions are typically represented as a flat salary scale assumption or as a service-based assumption. A flat salary scale assumption assumes that a Member will get the same rate of salary increase for all years, whereas a service-based table may assume different rates based on the Member's longevity with the Fund.

The salary increase assumption plays an important role in measuring individual pension costs and obligations.

### **Current Assumption**

Currently, the valuation assumes a flat salary increase rate equal to 5.5% per year.

### **Experience**

To assess the current 5.5% assumed annual increase and provide a basis for an updated assumption, we have reviewed the actual salary experience over the studied time period.

On the following pages, we have included a service-based chart for both the Police and Fire Funds that compares the actual experience to the current assumption. Historically, Members received higher average salary increases toward the beginning of their careers and lower average salary increases later in their careers.

- Table 13: Average Salary Increases by Service – Police
- Graph 13: Average Salary Increases by Service – Police
- Table 14: Average Salary Increases by Service – Fire
- Graph 14: Average Salary Increases by Service – Fire

### **Proposed Assumption**

Given these results, we propose changing from a flat salary scale assumption to a service-based assumption. The proposed increase rates for both the Police and Fire Funds are applicable to Tier 1 and Tier 2 Members and can be seen on the following charts, along with graphs to show a visual representation of how the actual and proposed increase rates compare to the current flat 5.5% per year assumption.

## Illinois Department of Insurance

### Public Pension Division - Police Plans

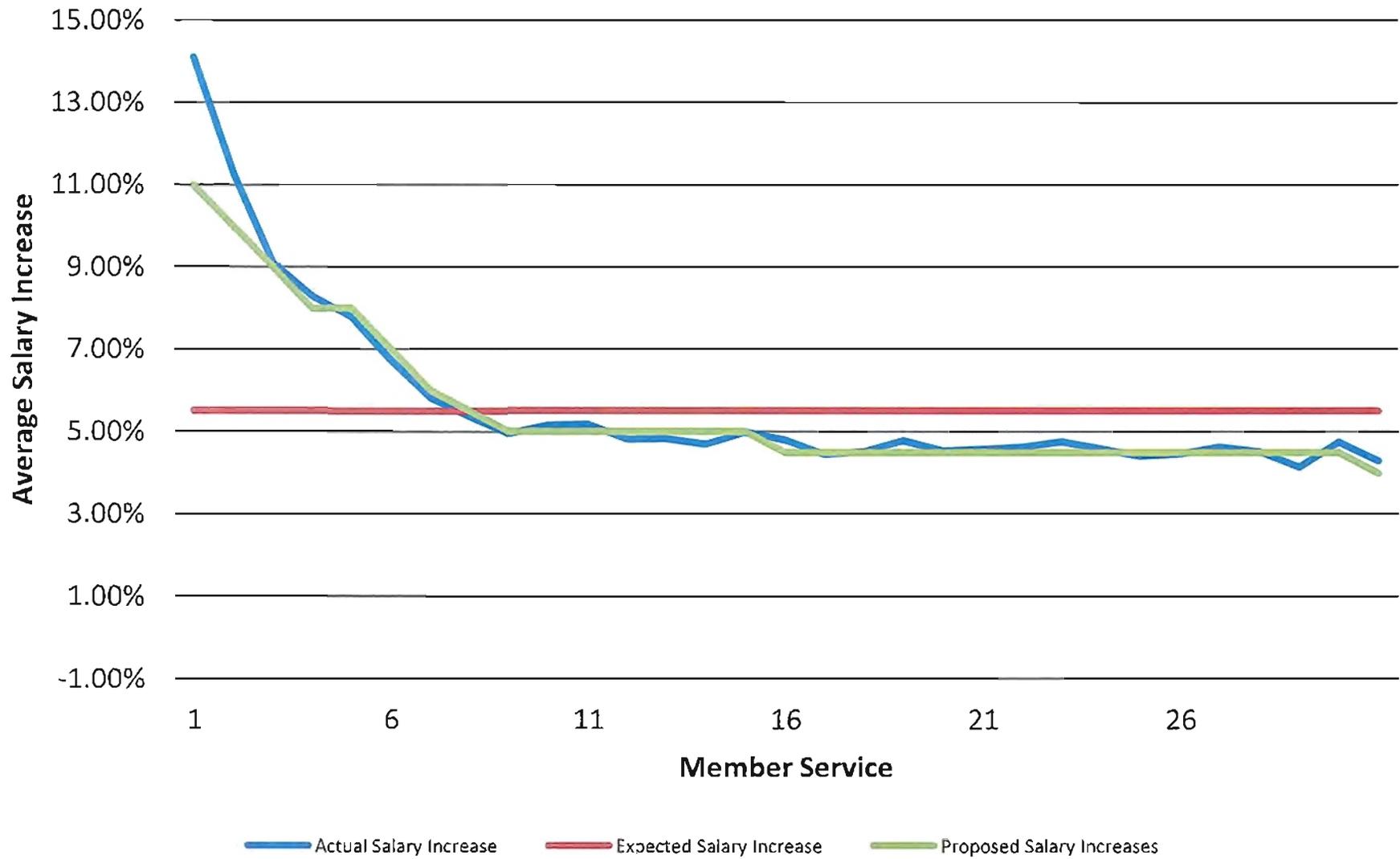
Table 13: Average Salary Increases by Service - Police\*

Service	Eligible Members	Prior Year Salary**	Actual Salary**	Expected Salary**	Actual Salary Increase	Expected Salary Increase	Proposed Salary Increase
0	2,383	105,884	120,816	111,707	14.10%	5.50%	11.00%
1	4,178	197,768	220,096	208,645	11.29%	5.50%	10.00%
2	4,006	204,188	222,769	215,419	9.10%	5.50%	9.00%
3	3,902	209,819	227,222	221,359	8.29%	5.50%	8.00%
4	3,805	213,236	229,838	224,964	7.79%	5.50%	8.00%
5	3,785	220,470	235,302	232,596	6.73%	5.50%	7.00%
6	3,739	225,114	238,228	237,495	5.83%	5.50%	6.00%
7	3,714	228,840	241,120	241,426	5.37%	5.50%	5.50%
8	3,573	225,148	236,299	237,531	4.95%	5.50%	5.00%
9	3,436	218,311	229,547	230,318	5.15%	5.50%	5.00%
10	3,199	207,166	217,888	218,560	5.18%	5.50%	5.00%
11	2,873	189,896	199,049	200,340	4.82%	5.50%	5.00%
12	2,681	180,215	188,923	190,127	4.83%	5.50%	5.00%
13	2,540	172,078	180,165	181,543	4.70%	5.50%	5.00%
14	2,549	174,445	183,142	184,039	4.99%	5.50%	5.00%
15	2,484	171,299	179,523	180,720	4.80%	5.50%	4.50%
16	2,487	173,082	180,788	182,601	4.45%	5.50%	4.50%
17	2,484	174,867	182,781	184,485	4.53%	5.50%	4.50%
18	2,401	171,265	179,453	180,685	4.78%	5.50%	4.50%
19	2,282	165,932	173,468	175,058	4.54%	5.50%	4.50%
20	1,931	142,837	149,377	150,693	4.58%	5.50%	4.50%
21	1,608	121,266	126,880	127,936	4.63%	5.50%	4.50%
22	1,354	102,649	107,535	108,295	4.76%	5.50%	4.50%
23	1,190	90,931	95,107	95,932	4.59%	5.50%	4.50%
24	1,175	89,046	92,973	93,944	4.41%	5.50%	4.50%
25	1,125	84,683	88,466	89,340	4.47%	5.50%	4.50%
26	1,089	81,947	85,746	86,454	4.64%	5.50%	4.50%
27	1,024	78,952	82,525	83,295	4.52%	5.50%	4.50%
28	880	69,321	72,198	73,134	4.15%	5.50%	4.50%
29	619	49,510	51,861	52,233	4.75%	5.50%	4.50%
30+	1,165	95,246	99,344	100,484	4.30%	5.50%	4.00%
<b>Total</b>	<b>75,661</b>	<b>4,835,410</b>	<b>5,118,428</b>	<b>5,101,358</b>	<b>5.85%</b>	<b>5.50%</b>	<b>5.73%</b>

\*Data from Valuation Year 2004 through 2010 sorted by Member Service.

\*\*All salary figures are shown as 1,000's.

### Graph 13: Average Salary Increases - Police



# Illinois Department of Insurance

## Public Pension Division - Fire Plans

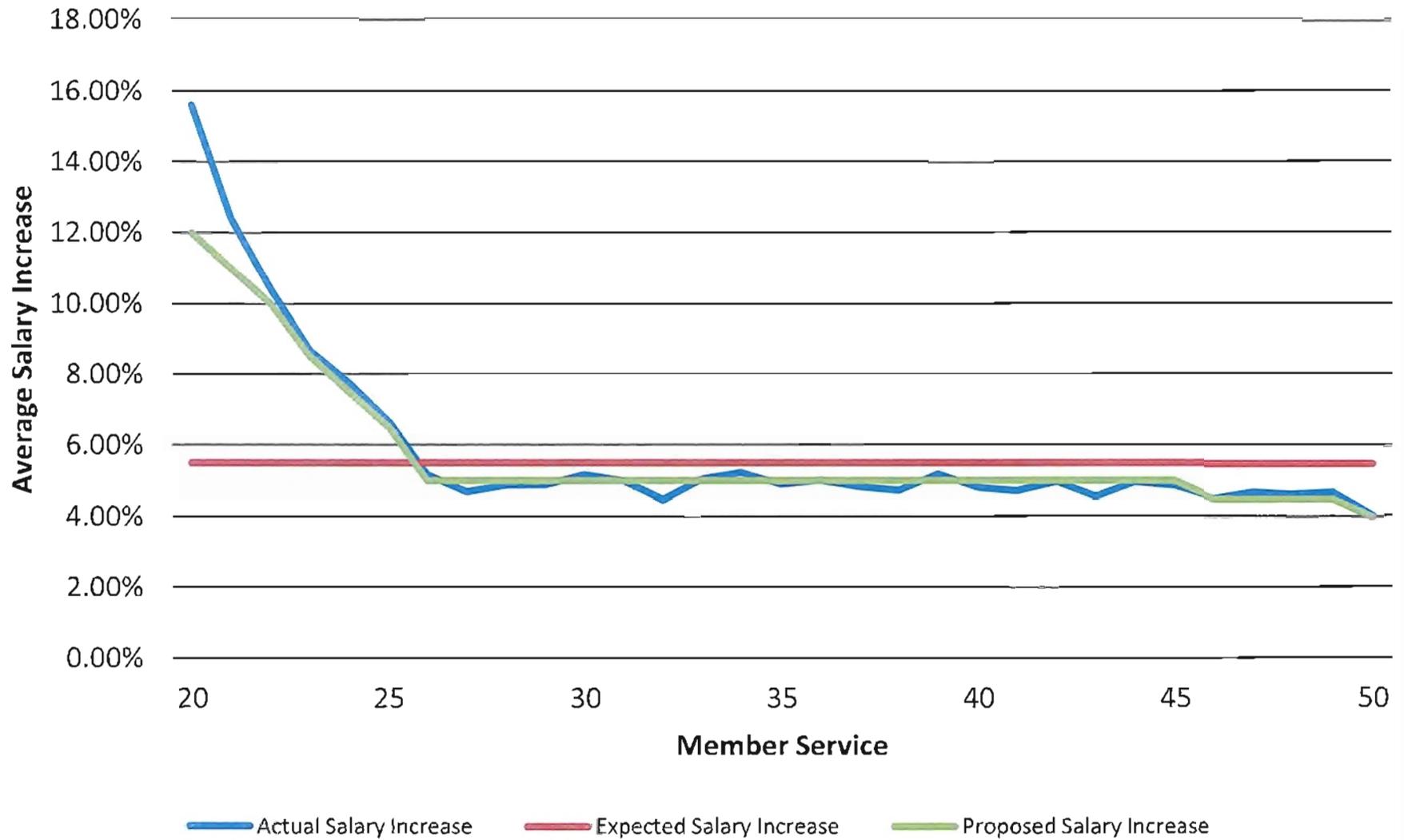
Table 14: Average Salary Increases by Service - Fire\*

Service	Eligible Members	Prior Year Salary**	Actual Salary**	Expected Salary**	Actual Salary Increase	Expected Salary Increase	Proposed Salary Increase
0	1,701	76,634	88,600	80,849	15.62%	5.50%	12.00%
1	2,752	133,278	149,803	140,609	12.40%	5.50%	11.00%
2	2,536	132,337	146,102	139,615	10.40%	5.50%	10.00%
3	2,405	133,783	145,374	141,141	8.66%	5.50%	8.50%
4	2,325	134,712	145,151	142,121	7.75%	5.50%	7.50%
5	2,267	136,722	145,830	144,242	6.66%	5.50%	6.50%
6	2,261	140,483	147,747	148,210	5.17%	5.50%	5.00%
7	2,291	144,654	151,433	152,610	4.69%	5.50%	5.00%
8	2,247	143,647	150,655	151,548	4.88%	5.50%	5.00%
9	2,162	139,466	146,271	147,136	4.88%	5.50%	5.00%
10	2,015	131,217	138,002	138,434	5.17%	5.50%	5.00%
11	1,950	129,821	136,306	136,962	4.99%	5.50%	5.00%
12	1,849	125,788	131,416	132,707	4.47%	5.50%	5.00%
13	1,770	121,016	127,126	127,672	5.05%	5.50%	5.00%
14	1,744	120,252	126,539	126,866	5.23%	5.50%	5.00%
15	1,740	121,362	127,303	128,037	4.90%	5.50%	5.00%
16	1,689	118,981	124,943	125,525	5.01%	5.50%	5.00%
17	1,663	119,283	125,046	125,844	4.83%	5.50%	5.00%
18	1,655	120,913	126,633	127,563	4.73%	5.50%	5.00%
19	1,543	114,086	119,997	120,361	5.18%	5.50%	5.00%
20	1,347	101,634	106,524	107,224	4.81%	5.50%	5.00%
21	1,155	87,710	91,848	92,534	4.72%	5.50%	5.00%
22	1,014	78,158	82,048	82,457	4.98%	5.50%	5.00%
23	930	72,149	75,442	76,118	4.56%	5.50%	5.00%
24	878	66,833	70,152	70,508	4.97%	5.50%	5.00%
25	889	67,719	71,017	71,443	4.87%	5.50%	5.00%
26	858	66,506	69,514	70,164	4.52%	5.50%	4.50%
27	822	64,533	67,568	68,082	4.70%	5.50%	4.50%
28	710	56,730	59,366	59,850	4.65%	5.50%	4.50%
29	533	43,203	45,233	45,580	4.70%	5.50%	4.50%
30+	1,037	82,884	86,250	87,444	4.06%	5.50%	4.00%
<b>Total</b>	<b>50,738</b>	<b>3,326,495</b>	<b>3,525,239</b>	<b>3,509,456</b>	<b>5.97%</b>	<b>5.50%</b>	<b>5.84%</b>

\*Data from Valuation Year 2004 through 2010 sorted by Member Age.

\*\*All salary figures are shown as 1,000's.

## Graph 14: Average Salary Increases - Fire



## **Payroll Growth Rate**

### **Overview**

The payroll growth rate is the assumption used to predict how the aggregate payroll of a Fund will increase on average from one year to the next. It is a necessary assumption when valuing a Pension Fund because it is used for purposes of amortizing the Unfunded Actuarial Accrued Liabilities. Currently, the payroll growth assumption is equal to the salary increase assumption, which is 5.5% per year.

The payroll growth assumption should reflect factors other than the expected individual salary increases year over year. In addition, it is important to consider the growth (or reduction) in the active population for a Fund. For example, if each active Member of a population happens to receive a 5.5% salary increase, but in that same time no Members terminate employment and 5 additional Members are hired onto the workforce, then the payroll will have grown by greater than 5.5% for that year. Likewise, the aggregate payroll of a Fund could decrease from one year to the next if a number of people retire or terminate over the course of the year. The payroll for any Fund is also affected as longer service Members who are earning higher salaries begin to retire and are replaced with new entrants with lower pay. The purpose of the payroll growth rate is to determine a long-term expected average of the rate in which payroll will grow, even if the year-over-year experience does not always follow the pattern of the assumption.

### **Experience**

In the course of this analysis, we have determined that the average payroll growth for Police Funds was approximately 4.3% and the average payroll growth for Fire Funds was approximately 4.4% over the studied time period. Additionally, in reviewing the historical payroll over the past 10 years for 200 public pension funds outside of the State of Illinois, we have determined that the average increase over the 10 year period falls between 3.0 – 5.0%. Given the overall experience, we are recommending a reduction in the payroll growth assumption from 5.5% to 4.5% per year.

## **Tier 2 Cost-of-Living Adjustment**

### **Overview**

Currently, since the cost-of-living adjustment (COLA) for the plans is a flat 3 percent, the valuations do not reflect a COLA assumption. The 3 percent increases specified in the statute are valued.

However, the pension changes introduced in 2011 provide for the following COLA for Tier 2 Members: An annual increase each January 1 equal to the lesser of 3.0% or one-half of the annual unadjusted percentage increase in the Consumer Price Index-U for the 12 months ending with the September proceeding each November 1. The COLA is applied to the original pension amount after the attainment of age 60 or first anniversary of the pension start date, whichever is later. Since the COLA will vary depending on the value of the CPI-U, future valuations will need to reflect a COLA assumption for Tier 2 Members.

### **Experience**

To determine an appropriate assumption for the expected future COLA's that Tier 2 Members will receive, we have reviewed the annual average increase in the CPI-U over the past 20 years. The chart on the following page shows that the average increase over this time period is approximately 2.5%.

- Table 15: Historical CPI Increases

### **Proposed Assumption**

We are recommending that a COLA assumption of 1.25% be incorporated into future valuations for Tier 2 Members.

**Consumer Price Index - All Urban Consumers**  
1992 - 2011

Table 15: Historical CPI Increases

<u>Year Ending</u>	<u>CPI Return</u>
2011	2.96%
2010	1.50%
2009	2.72%
2008	0.09%
2007	4.08%
2006	2.56%
2005	3.39%
2004	3.26%
2003	1.88%
2002	2.40%
2001	1.55%
2000	3.37%
1999	2.67%
1998	1.61%
1997	1.73%
1996	3.28%
1995	2.56%
1994	2.66%
1993	2.73%
1992	2.95%
20-Year Average	<b>2.49%</b>

## Recommended Assumption Sets

### **Police Pension Assumption Set**

#### *Active and Retiree Mortality*

RP2000 Combined Healthy Mortality Table with a Blue Collar Adjustment with no projection. It is assumed that 5% of active deaths are service-related.

#### *Disabled Mortality*

RP2000 Disabled Retiree Mortality with no projection.

#### *Investment Return Assumption*

Varies by asset level of fund with 5.00% for funds with less than \$2.5 million, 6.00% for funds with between \$2.5 million and \$5.0 million, 6.50% for funds with between \$5.0 million and \$10.0 million and 6.75% for funds with more than \$10.0 million

#### *Retirement Rates*

The retirement rates for the plan are as follows:

Age	Rate	Age	Rate
50	20%	60	33%
51	20%	61	33%
52	20%	62	33%
53	20%	63	50%
54	20%	64	50%
55	25%	65	50%
56	25%	66	50%
57	25%	67	50%
58	25%	68	50%
59	25%	69	50%
		70+	100%

### Withdrawal Rates

The withdrawal rates for the plan are as follows:

Age	Rate	Age	Rate
20	10.00%	35	3.00%
21	10.00%	36	3.00%
22	10.00%	37	3.00%
23	10.00%	38	2.00%
24	10.00%	39	2.00%
25	7.50%	40	2.00%
26	6.25%	41	2.00%
27	6.25%	42	2.00%
28	5.00%	43	2.00%
29	5.00%	44	2.00%
30	5.00%	45	2.00%
31	5.00%	46	2.00%
32	4.00%	47	2.00%
33	4.00%	48	2.00%
34	4.00%	49	2.00%
		50+	3.50%

### Disability Rates

The disability rates for the plan are outlined in the table below. 70% of the disabilities are assumed to be service-related.

Age	Rate	Age	Rate	Age	Rate
20	0.05%	35	0.26%	50	0.95%
21	0.05%	36	0.28%	51	1.02%
22	0.05%	37	0.28%	52	1.09%
23	0.05%	38	0.30%	53	1.16%
24	0.05%	39	0.35%	54	1.23%
25	0.05%	40	0.40%	55	1.30%
26	0.05%	41	0.45%	56	1.37%
27	0.20%	42	0.50%	57	1.44%
28	0.20%	43	0.55%	58	1.51%
29	0.20%	44	0.60%	59	1.58%
30	0.22%	45	0.65%	60	1.65%
31	0.22%	46	0.70%	61	1.72%
32	0.24%	47	0.75%	62	1.79%
33	0.24%	48	0.80%	63	1.86%
34	0.26%	49	0.85%	64	1.93%
				65+	2.00%

### *Salary Increases*

The salary increases for the plan are as follows:

Service	Salary Increase	Service	Salary Increase	Service	Salary Increase
0	11.0%	10	5.0%	20	4.5%
1	10.0%	11	5.0%	21	4.5%
2	9.0%	12	5.0%	22	4.5%
3	8.0%	13	5.0%	23	4.5%
4	8.0%	14	5.0%	24	4.5%
5	7.0%	15	4.5%	25	4.5%
6	6.0%	16	4.5%	26	4.5%
7	5.5%	17	4.5%	27	4.5%
8	5.0%	18	4.5%	28	4.5%
9	5.0%	19	4.5%	29	4.5%
				30+	4.0%

### *Payroll Growth*

4.5% per year

### *Marital Status*

80% of Members are assumed to be married.

### *Spouse's Age*

Males are assumed to be three years older than females

### *Tier 2 Cost-of-Living Adjustment*

1.25%

## Fire Pension Assumption Set

### *Active and Retiree Mortality*

RP2000 Combined Healthy Mortality Table with a Blue Collar Adjustment with no projection. It is assumed that 5% of active deaths are service-related.

### *Disabled Mortality*

RP2000 Disabled Retiree Mortality with no projection.

### *Investment Return Assumption*

Varies by asset level of fund with 5.00% for funds with less than \$2.5 million, 6.00% for funds with between \$2.5 million and \$5.0 million, 6.50% for funds with between \$5.0 million and \$10.0 million and 6.75% for funds with more than \$10.0 million

### *Retirement Rates*

The retirement rates for the plan are as follows:

Age	Rate	Age	Rate
50	14%	60	25%
51	14%	61	25%
52	14%	62	25%
53	14%	63	33%
54	20%	64	33%
55	20%	65	50%
56	20%	66	50%
57	20%	67	50%
58	20%	68	50%
59	20%	69	50%
		70+	100%

*Withdrawal Rates*

The withdrawal rates for the plan are as follows:

Age	Rate	Age	Rate
20	9.00%	35	2.00%
21	9.00%	36	2.00%
22	9.00%	37	2.00%
23	9.00%	38	1.00%
24	9.00%	39	1.00%
25	5.00%	40	1.00%
26	5.00%	41	1.00%
27	5.00%	42	1.00%
28	5.00%	43	1.00%
29	5.00%	44	1.00%
30	2.50%	45	1.00%
31	2.50%	46	1.00%
32	2.50%	47	1.00%
33	2.50%	48	1.00%
34	2.50%	49	1.00%
		50+	1.00%

### Disability Rates

The disability rates for the plan are outlined in the table below. 90% of the disabilities are assumed to be service-related.

Age	Rate	Age	Rate	Age	Rate
20	0.10%	35	0.35%	50	1.00%
21	0.10%	36	0.38%	51	1.10%
22	0.10%	37	0.41%	52	1.20%
23	0.10%	38	0.44%	53	1.30%
24	0.10%	39	0.47%	54	1.40%
25	0.10%	40	0.50%	55	1.50%
26	0.10%	41	0.53%	56	2.00%
27	0.14%	42	0.56%	57	2.25%
28	0.14%	43	0.59%	58	2.50%
29	0.14%	44	0.62%	59	2.75%
30	0.14%	45	0.65%	60	3.00%
31	0.20%	46	0.68%	61	3.25%
32	0.23%	47	0.71%	62	3.50%
33	0.26%	48	0.74%	63	3.75%
34	0.29%	49	0.77%	64	4.00%
				65+	4.25%

### *Salary Increases*

The salary increases for the plan are as follows:

Service	Salary Increase	Service	Salary Increase	Service	Salary Increase
0	12.00%	10	5.00%	20	5.00%
1	11.00%	11	5.00%	21	5.00%
2	10.00%	12	5.00%	22	5.00%
3	8.50%	13	5.00%	23	5.00%
4	7.50%	14	5.00%	24	5.00%
5	6.50%	15	5.00%	25	5.00%
6	5.00%	16	5.00%	26	4.50%
7	5.00%	17	5.00%	27	4.50%
8	5.00%	18	5.00%	28	4.50%
9	5.00%	19	5.00%	29	4.50%
				30+	4.00%

### *Payroll Growth*

4.5% per year

### *Marital Status*

80% of Members are assumed to be married.

### *Spouse's Age*

Males are assumed to be three years older than females

### *Tier 2 Cost-of-Living Adjustment*

1.25%