SCHOOL EMPLOYEES RETIREMENT SYSTEM OF OHIO

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LISA J. MORRIS
Executive Director

HELEN M. NINOS
Deputy Executive Director

April 25, 2016

Bethany Rhodes, Director/General Counsel
Ohio Retirement Study Council
30 E. Broad St, 2nd Floor
Columbus, OH 43215

Dear Ms. Rhodes:

In accordance with Section 3309.21(B) of the Ohio Revised Code, enclosed is a copy of the quinquennial actuarial valuation of SERS prepared by its actuary, Cavanaugh Macdonald Consulting, LLC.

Please let me know if I can assist you with any additional information. I can be reached at (614) 222-5801.

Sincerely,

Lisa J. Morris
Executive Director

Enclosure

cc: The Honorable Bill Coley, Chairman, Senate Government Oversight and Reform
The Honorable Anne Gonzales, Chairman, House Health and Aging

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Experience Study

For the Five-Year Period

Ending June 30, 2015

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TABLE OF CONTENTS

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April 18, 2016

Board of Trustees
School Employees Retirement System of Ohio
300 East Broad Street
Suite 100
Columbus, OH 43215-3746

Dear Members of the Board:

We are pleased to submit the results of a study of the economic and demographic experience for the School Employees Retirement System of Ohio (SERS). The purpose of this investigation is to assess the reasonability of the actuarial assumptions for the System. This investigation covers the five-year period from July 1, 2010 to June 30, 2015. As a result of the investigation, it is recommended that revised assumptions be adopted by the Board for future use.

The experience study includes all active members, retired members, and beneficiaries of deceased members. The mortality, disability, and retirement experience was studied separately for males and females. Incidences of withdrawal and compensation increases were investigated without regard to gender.

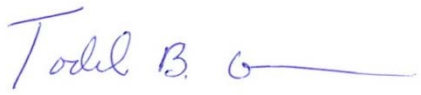
This report shows comparisons between the actual and expected cases of separation from active service, actual and expected number of deaths, and actual and expected salary increases. Tables and graphs are used to show the actual rates of separation from service, the expected rates of separation from service, the actual mortality rates, the expected mortality rates, the expected salary increase rates, and the actual salary increase rates. Where applicable, the proposed rates of separation from service, rates of mortality, and salary increase rates are shown.

The recommended rates of separation from service, rates of mortality, and salary increase rates are shown in Appendix D of this report. In the actuary's judgment, the recommended rates are suitable for use until further experience indicates that modifications are needed.

Actuarial assumptions are used to measure and budget future costs. Changing assumptions will not change the actual cost of future benefits. Once the assumptions have been adopted, the actuarial valuation measures the adequacy of the contribution rates set in the Ohio Revised Code.

The experience study was performed by, and under the supervision of, independent actuaries who are members of the American Academy of Actuaries with experience in performing valuations for public retirement systems. The undersigned meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

Respectfully submitted,



Todd B. Green, ASA, FCA, MAAA
Principal and Consulting Actuary

John J. Garrett, ASA, FCA, MAAA
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Alisa Bennett, FSA, FCA, EA, MAAA
Principal and Consulting Actuary

TBG:JJG\bvb

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Summary of Results

The following summarizes the findings and recommendations with regard to the assumptions utilized by the School Employees Retirement System of Ohio (SERS). Explanations for the recommendations are found in the sections that follow.

Recommended Economic Assumption Changes

The table below lists the three economic assumptions used in the actuarial valuation and their current and proposed rates. We recommend a reduction in the assumed rate of price inflation and a decrease in the assumed rate of real wage growth. For the assumed rate of return on assets we recommend a reduction from 7.75% to 7.50%.

Item	Current	Proposed
Price Inflation	3.25%	3.00%
Investment Return	7.75%	7.50%
Real Wage Growth	0.75%	0.50%

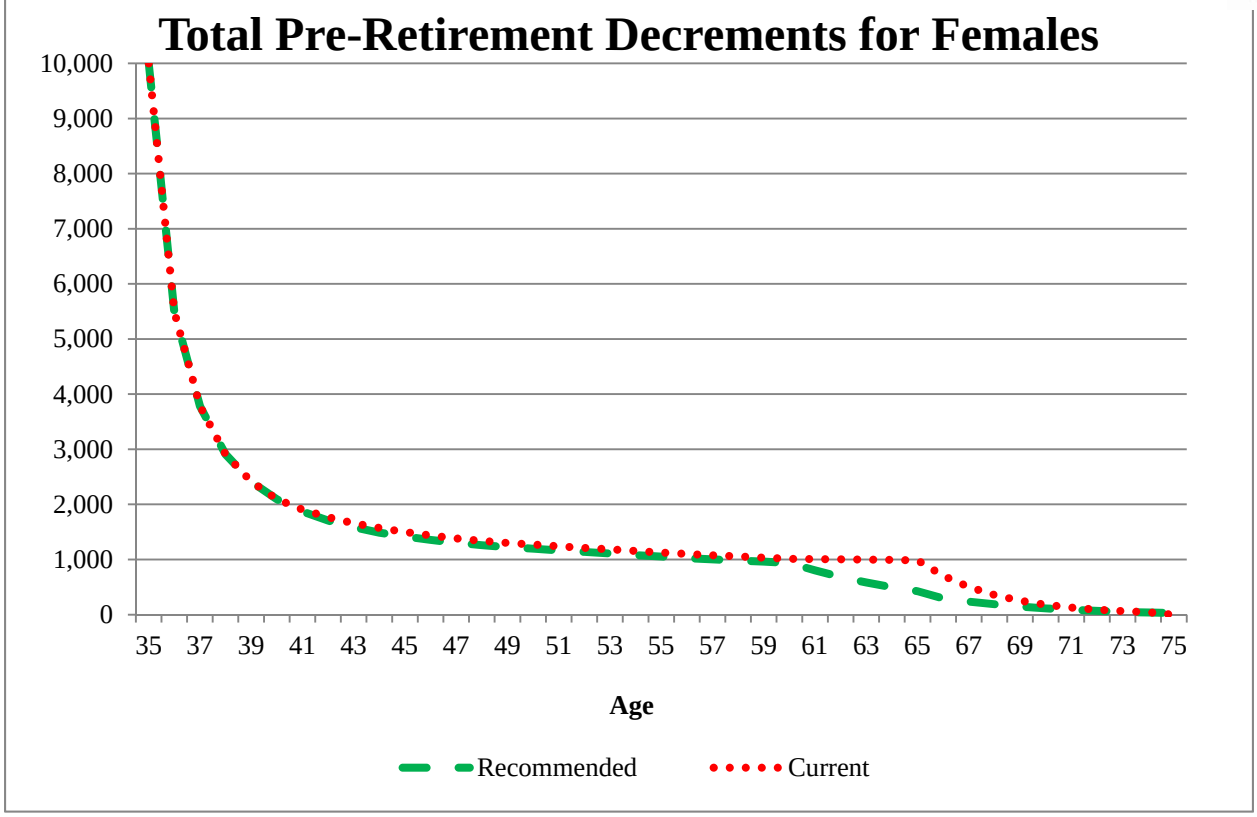
Recommended Demographic Assumption Changes

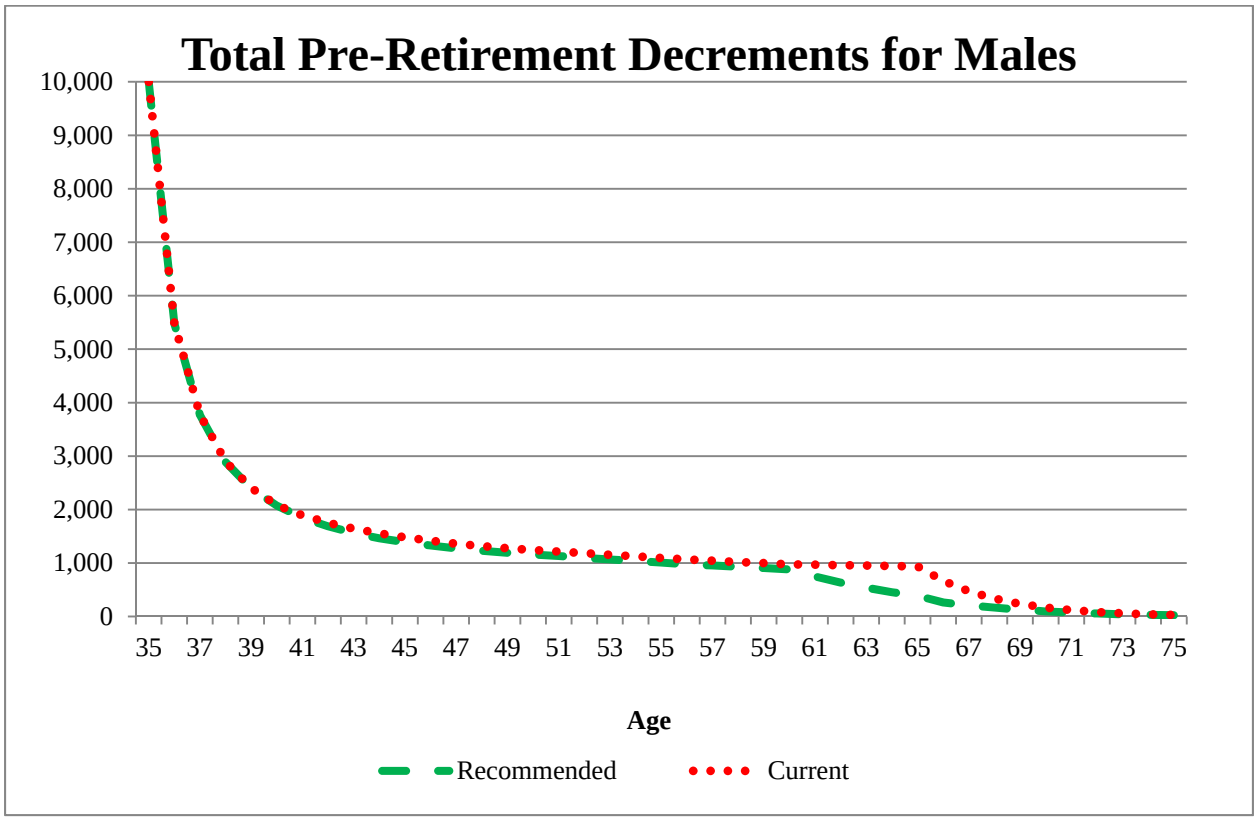
The table below lists the demographic assumptions that we recommend be changed based on the experience of the last five years.

Assumption Changes
Adjust rates of withdrawal
Adjust rates of disability retirements
Adjust rates of pre-retirement, post-retirement and disabled mortality
Adjust rates of service retirement
Decrease assumed rates of compensation increase
Decrease in retiree health care participation for disabled retirees
Decrease in retiree health care spouse coverage assumption

Demographic Impact

The charts on the following page detail the demographic impact of changing decrements for male and female active participants who are 35 years old at the time they become members of SERS. As one can see, the results of the experience study only slightly modify anticipated behavior of the workforce. Overall, the recommendation will increase the withdrawal assumption prior to retirement and decrease the retirement assumption once members are eligible for retirement.


Total Pre-Retirement Decrements for Females
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75
Age
Recommended
Current


Total Pre-Retirement Decrements for Males
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73 75
Age
Recommended
Current

Financial Impact

The tables below highlight the impact on the Basic Benefits Plan and the Retiree Health Care Plan based on the recommended changes noted on the previous page. The tables show the change in the unfunded accrued liability (UAL) and funded status for both Plans of the System as of June 30, 2015. Further cost impact information is provided in Section VI.

BASIC BENEFITS VALUATION

Valuation As of June 30, 2015	Before Change Current Demographic Assumptions Investment Rate of Return = 7.75%	After Change Proposed Demographic Assumptions Investment Rate of Return = 7.50%
UAL	$5,901,601,187	$6,551,490,056
Funded Status		
Pension and Post Retirement Death Benefits	68.80%	66.48%
Medicare Part B	35.27%	33.66%

HEALTH CARE VALUATION

Valuation As of June 30, 2015	Before Change Current Demographic Assumptions = 5.25%	After Change Proposed Demographic Assumptions = 5.25%
UAL	$2,016,150,191	$2,091,211,657
Funded Status	16.84%	16.34%

We are not recommending a change in the investment return for the Health Care Plan (currently 5.25%) so the change shown is due solely to the demographic assumption recommendations. GASB requires the use of a discount rate for health care benefits that is reflective of the source of the funds used to pay those benefits. Since the health care benefits are projected to be fully pay-as-you-go within the next 10 years, a rate close to what would be earned on short-term investments is utilized.

Economic Assumptions

There are three economic assumptions used in performing the actuarial valuation for the School Employees Retirement System of Ohio (SERS). The assumptions are:

- Price Inflation
- Investment Return
- Wage Inflation

The Actuarial Standards Board has issued Actuarial Standard of Practice (ASOP) No. 27, *"Selection of Economic Assumptions for Measuring Pension Obligations,"* which provides guidance to actuaries in selecting economic assumptions – primarily, investment return, discount rate, post-retirement benefit increases, inflation, and compensation increases for the purpose of measuring benefit obligations under defined benefit plans. Professional judgment is used to estimate possible future economic outcomes based on a mixture of past experience and future expectations. In setting the assumption, the actuary should consider a number of factors, including the purpose and nature of the measurement, and appropriate recent and long-term historical economic data, and an estimate of the actuary's expectation about future experience. Finally, the actuary's recommendation should have no significant bias. However, the standard explicitly advises the actuary not to give undue weight to recent experience.

Each economic assumption should individually satisfy this standard. Furthermore, with respect to any particular valuation, each economic assumption should be consistent with every other economic assumption over the measurement period.

In our opinion, the economic assumptions recommended in this report have been developed in accordance with ASOP No. 27. The following table shows our recommendations followed by explanations of each assumption.

Item	Current	Proposed
Price Inflation	3.25%	3.00%
Real Rate of Return	4.50	4.50
Investment Return	7.75%	7.50%
Price Inflation	3.25%	3.00%
Real Wage Growth	0.75	0.50
Wage Inflation	4.00%	3.50%

Price Inflation

Background: Price inflation is used as a component for the investment rate of return assumption, the rate of wage inflation assumption, and the rate of payroll growth assumption. It is important that the price inflation assumption be consistently applied throughout the economic assumptions utilized in an actuarial valuation. This is called for in ASOP No. 27 and is also required to meet the parameters for determining pension liabilities and expense under Governmental Accounting Standards Board (GASB) Statements No. 67 and 68.

The current price inflation assumption is 3.25% per year.

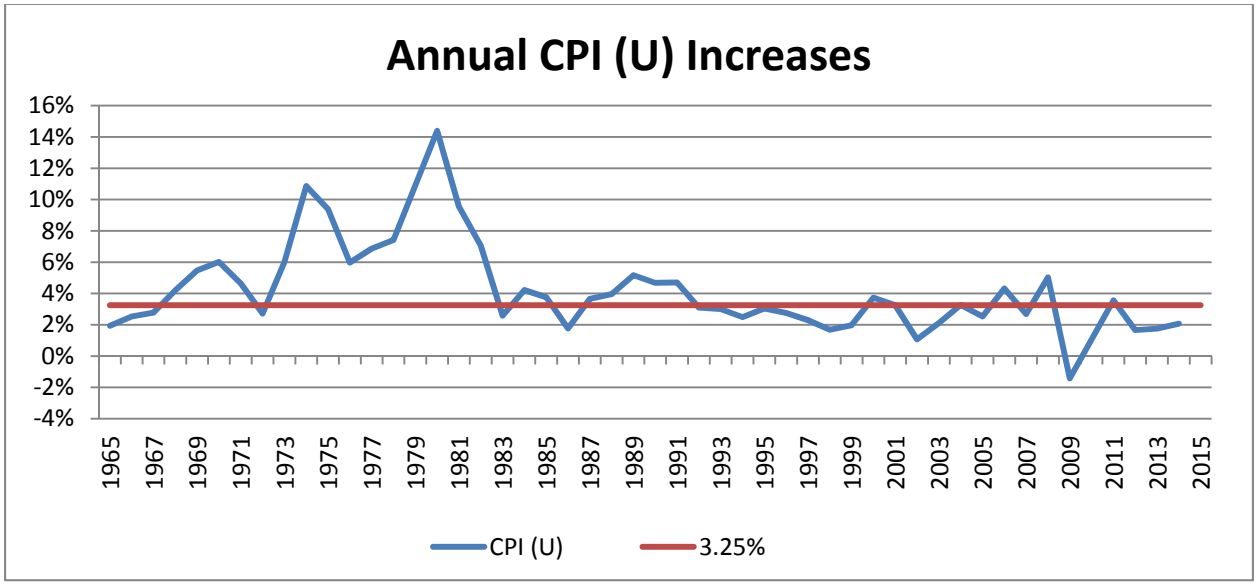
Past Experience: The Consumer Price Index, US City Average, All Urban Consumers, CPI (U), has been used as the basis for reviewing historical levels of price inflation. The level of that index in June of each of the last 50 years is provided in Appendix A.

In analyzing this data, average rates of inflation have been determined by measuring the compound growth rate of the CPI (U) over various time periods. The results are as follows:

Period	Average Annual Rate of Inflation
2010 – 2015	1.83%
2005 – 2015	2.08%
1995 – 2015	2.27%
1985 – 2015	2.70%
1975 - 2015	3.84%
1965 – 2015	4.17%
1926 - 2015	3.03%

Over shorter historic periods, the average annual rate of increase in the CPI (U) has been below 3.00%. The years of high inflation occurring from 1973 to 1982 has a significant impact on the averages over periods which include these rates. We should add that since 1926, the average annual rate of inflation was 3.03%.

The graph below shows the annual increases in the CPI (U) over a 50-year period.



Additional information to consider when determining the reasonable range is obtained from measuring the spread on inflation-protected treasury bills (TIPS) and from the prevailing economic forecasts. The spread between the nominal yield on treasury securities and the inflation indexed nominal yield on TIPS of the same maturity is referred to as the "breakeven rate of inflation" and represents the bond market's expectation of inflation over the period to maturity. The table below provides the calculation of the breakeven rate of inflation as of December 31, 2015 over various periods.

Years to Maturity	Bond Nominal Yield	TIPS Nominal Yield	Breakeven Rate of Inflation
10	2.27%	0.73%	1.54%
20	2.67%	1.07%	1.60%
30	3.01%	1.28%	1.73%

The bond market's expectation for the rate of inflation is significantly lower than historical average annual rates. Additionally, based upon information provided from the "Survey of Professional Forecasters" published by the Philadelphia Federal Reserve Bank, the median expected annual rate of inflation for the 10 years beginning January 1, 2016 is 2.15%.

Recommendation: It is difficult to accurately predict inflation. Current economic forecasts and the bond market suggest lower inflation over the next ten to twenty years (which is a shorter time period than appropriate for our purposes) when compared to the historical averages. In the 2015 OASDI Trustees Report, the Chief Actuary for Social Security bases the 75-year cost projections on an intermediate inflation assumption of 2.7% with a range of 2.0% - 3.4%. We concur in general with a range of 2.0% - 3.4%, and recommend use of an inflation rate of 3.00% per year.

Price Inflation Assumption	
Current	3.25%
Reasonable Range	2.00% - 3.40%
Recommended	3.00%

Investment Return

Background: The assumed investment return is one of the most significant assumptions in the annual actuarial valuation process as it is used to discount the expected benefit payments for all active, inactive, and retired members of the System. Minor changes in this assumption can have a major impact on valuation results. The investment return assumption should reflect the most recent asset allocation target for the funds set by the Board.

The current assumption is 7.75%, consisting of a price inflation assumption of 3.25% and a real rate of return assumption of 4.50%. The return is net of all investment and administrative expenses.

Past Experience: The actuarial value of assets of the System are developed using a widely accepted asset-smoothing methodology that fully recognizes investment gains and losses over a four-year period. The recent experience for the retirement funds over the last five years is shown in the table below.

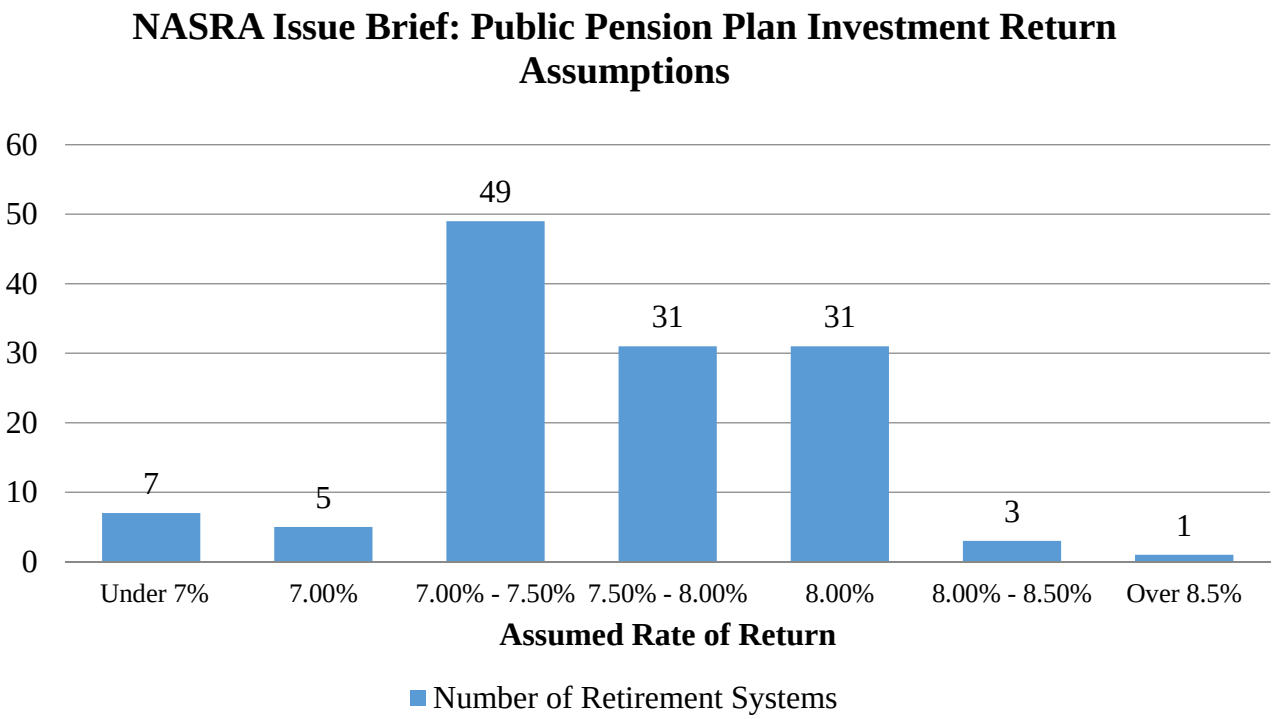
Nominal Total Rate of Return		
Year Ending 6/30	Market Value	Actuarial Value
2011	19.0%	(1.6)%
2012	(0.5)%	1.0%
2013	12.4%	10.1%
2014	16.7%	11.5%
2015	3.2%	8.3%
Average	10.2%	5.9%

Because of the significant variability in historical returns, actuaries are guided not to materially rely on short-term historical returns. We prefer to primarily base the development of the investment return assumption on the forward-looking capital market assumptions utilized by the Board in selecting the asset allocation targets in the latest investment policy. We understand the time horizon for investment professionals' capital market assumptions is commonly shorter than desired by actuaries and can vary significantly over time. We use a "building block" approach which develops an assumed real rate of investment return, and adds an assumed rate of inflation and administrative expenses separately to arrive at the nominal investment rate of return recommendation.

Historical Analysis: The historical 50-year real rate of return of the S&P 500 has averaged 5.60%, and the 50-year real rate of return of intermediate-term government bonds as provided by *Ibbotson SBBI 2014 Classic Yearbook* has averaged 2.81%. By weighting these rates by common allocation of large retirement funds to stocks and bonds (30%/70% to 70%/30%) we construct an initial range for real rates of return to be from 3.48% to 5.34% based solely on historical broad market returns. The following table shows various annualized rates of return based on different time periods and different allocations between equities and bonds.

Time Span In Years	Real Returns by Portfolio Allocation Equities vs. Bonds			
	30%/70%	35%/65%	65%/35%	70%/30%
10	3.89%	4.27%	5.72%	5.92%
20	3.47%	4.04%	5.92%	6.29%
30	3.35%	3.69%	5.67%	6.03%
40	3.75%	4.06%	5.21%	5.37%
50	**3.48%**	3.83%	5.05%	**5.34%**

Peer Analysis: Review of the *NASRA Issue Brief: Public Pension Plan Investment Return Assumptions* update as of December 2015 indicates the median assumed return is 7.75% while the mean is 7.62% and demonstrates a continued trend in declining assumed rates of investment return.



Capital Market Analysis: The current capital market assumptions and the System's asset allocation are shown in Appendix B. Using these capital market assumptions, statistical analysis provides a percentile ranking of real rates of return over various time horizons. The following table provides a summary of the statistical analysis performed. It is important to note the capital market assumptions are short term (10 years) in nature and may reflect a bias based upon recent experience. In contrast, the obligations of the System are anticipated to be very long term in nature. For instance, the projected benefit payments of the System as of June 30, 2015 are anticipated to be paid until the year 2117 and does not reflect future new hires. As stated by ASOP No. 27, the actuary must consider the purpose of the measurement and reflect that the capital market assumptions represent a shorter-term economic outlook compared to the benefit obligation of the System.

Time Span In Years	Mean Real Return	Standard Deviation	Real Returns by Percentile				
			5th	25th	50th	75th	95th
1	4.68%	10.13%	-11.10%	-2.37%	4.20%	11.21%	22.12%
5	4.29	4.50	-2.94	1.21	4.20	7.28	11.86
10	4.25	3.18	-0.90	2.07	4.20	6.36	9.56
20	4.22	2.25	0.56	2.69	4.20	5.73	7.96
30	4.21	1.84	1.22	2.97	4.20	5.44	7.26
40	4.21	1.59	1.61	3.13	4.20	5.28	6.85
50	4.21	1.42	1.88	**3.24**	4.20	**5.16**	6.56

Again, the chart above is based on the capital market assumptions of the investment professionals serving the System. We note that the assumptions provided above are for expected returns in the next 10 years. We utilize those assumptions to produce the percentile ranks of expected returns over longer future time periods. Focusing on the longer time spans, the analysis indicates that over the next 50 years there is a 25% chance that real return will average below 3.24% and a 25% chance they will be above 5.16%. In other words there is a 50% chance the real returns will be between 3.24% and 5.16%.

Administrative Expenses ($ thousands): The investment return is assumed to be net of administrative and investment expenses. The investment return information we have been provided is net of investment-related expenses. The table below compares, for the last five years, the administrative expense levels during the fiscal year to the market value of assets for the system at the end of the fiscal years. All dollar amounts are in thousands.

FY Ending June 30	Administrative Expenses	Market Value of Assets	Expense Ratio
2011	$21,190	$10,974,881	0.19%
2012	21,624	10,686,769	0.20
2013	21,470	11,679,663	0.18
2014	21,856	13,234,742	0.17
2015	21,598	13,205,548	0.16

Over the five-year period, the expense ratio averaged approximately 0.18%, but has clearly trended downward. We recommend a long-term administrative expense ratio of 0.17% be included in the net investment return assumption.

Recommendation: The 25th to 75th percentile real returns projected over a 50-year time span utilizing the capital market assumptions provided by the System's investment staff plus the recommended inflation assumption less the recommended expense ratio using the building block approach of ASOP No. 27 is shown below.

Item	25th Percentile	50th Percentile	75th Percentile
Real Rate of Return	3.24%	4.20%	5.16%
Inflation	3.00	3.00	3.00
Administrative Expenses	(0.17)	(0.17)	(0.17)
Net Investment Return	6.07%	7.03%	7.99%

The current assumed rate of 7.75% is in the upper portion of the range between 6.07% to 7.99%. At this time we are recommending an assumed rate of investment return of 7.50%, which recognizes the trend in lower assumed rates of return indicated in the analysis of the capital market assumptions and the trend of other large public plans. The capital market assumptions of investment professionals are typically produced for nearer-term expectations, whereas the actuarial assumptions are pertinent for much longer time periods. In our experience, the longer-term expected returns are higher in most data we have available to review. The impact of this recommendation is shown in more detail in Section VI.

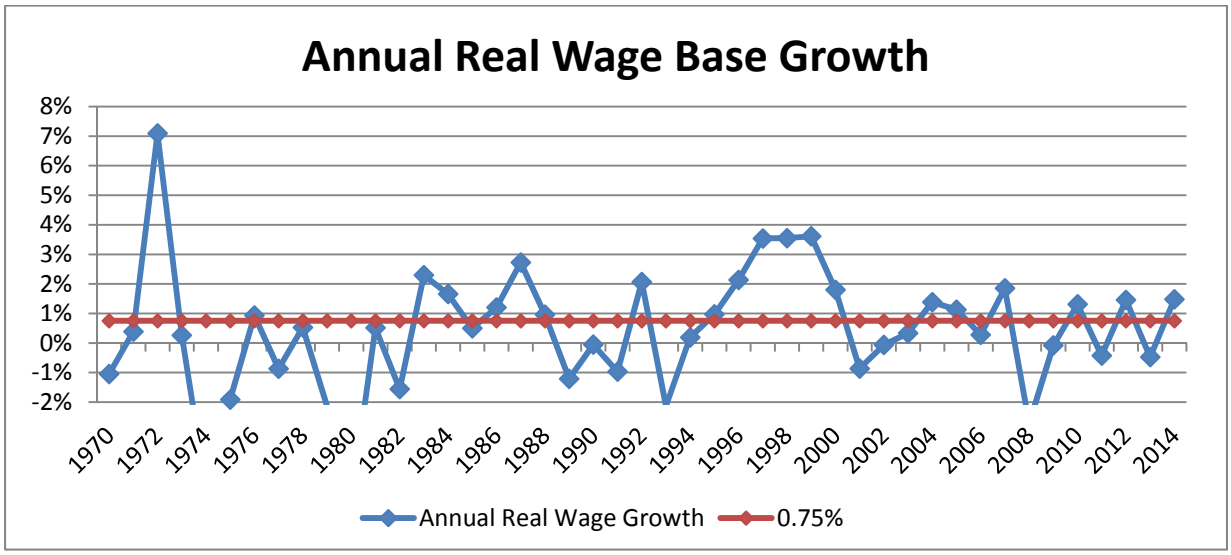
Wage Inflation

Background: The assumed future increases in salaries consist of an inflation component and a component for promotion and longevity, often called merit increases. Merit increases are generally age and/or service-related, and will be studied in the demographic assumption section of the report. Wage inflation normally is above price inflation, which reflects the overall return on labor in the economy. The current wage inflation assumption is 4.00%, or 0.75% above price inflation.

Past Experience: The Social Security Administration publishes data on wage growth in the United States. Appendix C shows the last 50 calendar years' data. As we did in our analysis of inflation, in the table below, we show the wage inflation and a comparison with the price inflation over various time periods. Since updated wage data is only available through 2014, we use that year as the end point.

Period	Wage Inflation	Price Inflation	Real Wage Growth
2004-2014	2.69%	2.31%	0.38%
1994-2014	3.41	2.41	1.00
1984-2014	3.59	2.81	0.78
1974-2014	4.49	4.03	0.46
1964-2014	4.75	4.16	0.59

Thus, over the last 50 years, annual real wage growth has averaged 0.59%. The graph below shows the annual increases in real wage growth over the entire 50-year period.



Recommendation: As with price inflation, we again look at the 2015 OASDI Trustees Report. The Chief Actuary for Social Security bases the 75-year cost projections on an intermediate national wage growth assumption 1.17% greater than the price inflation assumption of 2.7%. We concur in general with a range of 0.5% - 1.8% and favor the lower end of the range based on the minimal evidence of real wage growth in the salary data we analyzed. We recommend use of a 0.50% per year rate at the current time.

Wage Inflation Assumption		
Current	4.00%	
	Range	
Real Wage Growth	0.50%	1.80%
Inflation	3.00	3.00
Total	3.50%	4.80%
Recommended	3.50%	

Demographic Assumptions

There are several demographic assumptions used in the actuarial valuations performed for the School Employees Retirement System of Ohio. They are:

- Rates of Withdrawal
- Rates of Disability Retirement
- Rates of Pre-Retirement Mortality
- Rates of Service Retirement
- Rates of Post-retirement Mortality
- Rates of Post-retirement Disabled Mortality
- Rates of Salary Increase for Merit and Promotions

The Actuarial Standards Board has issued Actuarial Standard of Practice (ASOP) No. 35, *"Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations"*, which provides guidance to actuaries in selecting demographic assumptions for measuring obligations under defined benefit plans. In our opinion, the demographic assumptions recommended in this report have been developed in accordance with ASOP No. 35.

The purpose of a study of demographic experience is to compare what actually happened to the membership during the study period (June 30, 2010 through June 30, 2015) with what was expected to happen based on the assumptions used in the most recent actuarial valuations.

Studies of demographic experience generally involve three steps:

- First, the number of members changing membership status, called decrements, during the study is tabulated by age, duration, sex, group, and membership class (active, retired, etc.).
- Next, the number of members expected to change status is calculated by multiplying certain membership statistics, called exposure, by the expected rates of decrement.
- Finally, the number of actual decrements is compared with the number of expected decrements. The comparison is called the actual to expected ratio (A/E Ratio), and is expressed as a percentage.

In general, if the actual experience differs significantly from the overall expected results, or if the pattern of actual decrements, or rates of decrement, by age, sex, or duration deviates significantly from the expected pattern, new assumptions are considered. Recommended revisions are normally not an exact representation of the experience during the observation period. Professional judgment is required to set assumptions for future experience from past trends and current evidence, including a determination of the amount of weight to assign to the most recent experience.

The remainder of this section presents the results of the demographic study. We have prepared tables that show a comparison of the actual and expected decrements and the overall ratio of actual-to-expected results under the current assumptions. If a change is being proposed, the revised actual-to-expected ratios are shown as well.

Rates of Withdrawal

The rates of withdrawal adopted by the Board are used to determine the expected number of separations from active service that will occur prior to attaining the eligibility requirement for a retirement benefit as a result of resignation or dismissal.

The current assumption utilizes a service-based approach that sets the withdrawal rates based on years of service. Withdrawal experience was investigated without regard to gender.

The analysis of the actual withdrawal experience for all members over the five-year period indicates an overall actual/expected ratio of 109%. This ratio indicates that more members withdrew during the study period than expected. The table on the next page shows in detail the actual/expected ratio by years of service and in total.

EXPERIENCE UNDER CURRENT ASSUMPTIONS

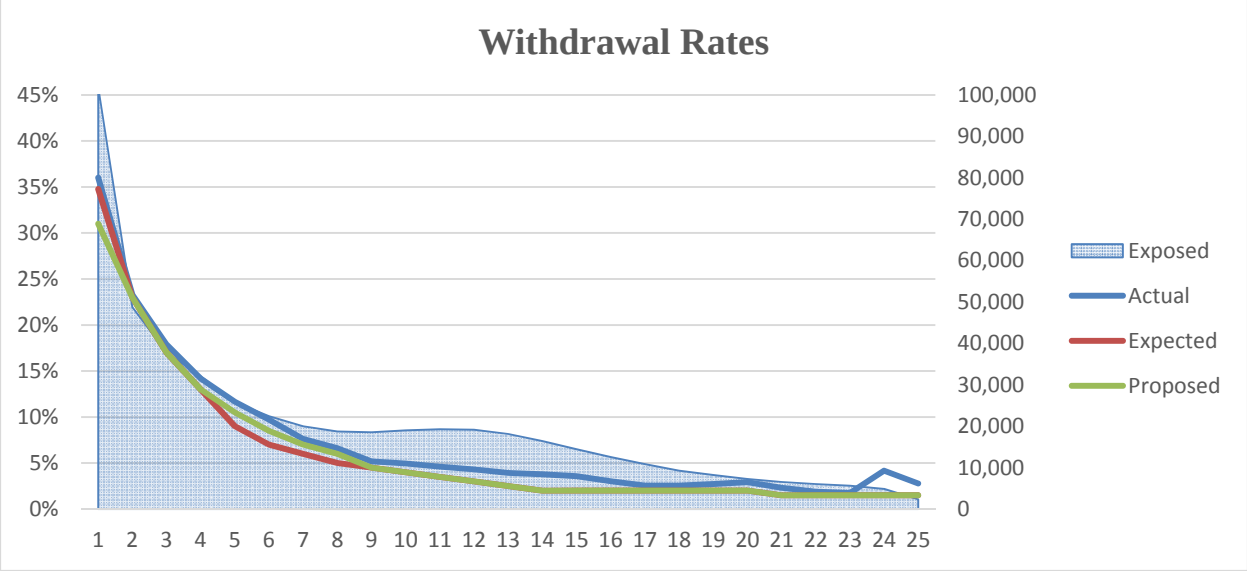
Years of Service	Withdrawal Experience		
	Actual	Expected	Ratio Actual/Expected
Less than 1	12,188	12,384.00	0.98
1	24,553	23,098.41	1.06
2	11,374	11,220.55	1.01
3	6,761	6,427.70	1.05
4	4,549	4,166.89	1.09
5	3,007	2,320.83	1.30
6	2,182	1,570.45	1.39
7	1,522	1,200.12	1.27
8	1,237	936.15	1.32
9	961	834.12	1.15
10	940	759.76	1.24
11	889	675.22	1.32
12	824	574.32	1.43
13	712	453.50	1.57
14	619	328.52	1.88
15	514	289.10	1.78
16	381	251.28	1.52
17	277	217.06	1.28
18	235	185.72	1.27
19	223	164.78	1.35
20	212	144.92	1.46
21	152	98.23	1.55
22	115	90.69	1.27
23	98	84.40	1.16
24	203	72.88	2.79
25	65	35.13	1.85
26	39	27.61	1.41
27	35	23.79	1.47
28	20	20.44	0.98
29	273	16.84	16.21
30	25	1.23	20.33
TOTAL	75,185	68,674.64	1.09

Findings and Recommendations

The data reflects a general increase in the rates of withdrawal for those members with between five and ten years of service and a general decrease in rates of withdrawal for members with more than nine years of service. As a result, we recommend adjusting withdrawal rates to more closely reflect the actual experience. The complete tables of recommended withdrawal rates are shown in Appendix D.

The right axis of the chart represents the number of exposed lives. The exposed lives are the total number of individuals who were subject to termination based upon years of service during the experience period. When recommending assumptions changes, it is important to recognize actual experience in areas of higher exposures versus areas of lower exposures when recommending changes to the assumed withdrawal rates.

The actual average withdrawal rates by years of service during the past five years, the current assumed withdrawal rates, and the recommended withdrawal rates are shown on the left axis.



The actual/expected ratios based on the recommended assumptions are shown in the table on the following page. The overall ratio has been decreased from 109% to 108%.

EXPERIENCE UNDER PROPOSED ASSUMPTIONS

Years of Service	Withdrawal Experience		
	Actual	Proposed	Ratio Actual/Proposed
Less than 1	12,188	12,384.00	0.98
1	24,553	23,098.41	1.06
2	11,374	11,220.55	1.01
3	6,761	6,427.70	1.05
4	4,549	4,166.89	1.09
5	3,007	2,707.64	1.11
6	2,182	1,906.98	1.14
7	1,522	1,400.14	1.09
8	1,237	1,123.38	1.10
9	961	834.12	1.15
10	940	759.76	1.24
11	889	675.22	1.32
12	824	574.32	1.43
13	712	453.50	1.57
14	619	328.52	1.88
15	514	289.10	1.78
16	381	251.28	1.52
17	277	217.06	1.28
18	235	185.72	1.27
19	223	164.78	1.35
20	212	144.92	1.46
21	152	98.24	1.55
22	115	90.69	1.27
23	98	84.41	1.16
24	203	72.89	2.79
25	65	35.13	1.85
26	39	27.62	1.41
27	35	23.79	1.47
28	20	20.45	0.98
29	273	16.85	16.21
30	25	1.23	20.33
TOTAL	75,185	69,785.25	1.08

Rates of Pre-Retirement Mortality

The rates of pre-retirement mortality are used in the actuarial valuation to project the percentage of employees who are expected to terminate due to death.

EXPERIENCE UNDER CURRENT ASSUMPTIONS

Age Group	Pre-Retirement Mortality Experience Males			Pre-Retirement Mortality Experience Females		
	Actual	Expected	Ratio Actual/Expected	Actual	Expected	Ratio Actual/Expected
Under 25	0	1.00	0.00	0	0.48	0.00
25 - 29	0	2.39	0.00	0	1.18	0.00
30 - 34	1	2.86	0.35	0	1.51	0.00
35 - 39	0	2.98	0.00	3	2.94	1.02
40 - 44	4	4.65	0.86	10	7.42	1.35
45 - 49	6	8.56	0.70	29	15.25	1.90
50 - 54	24	16.73	1.43	44	29.49	1.49
55 - 59	34	30.13	1.13	53	48.28	1.10
60 - 64	47	45.17	1.04	63	65.51	0.96
65 & Over	80	92	0.87	71	99.26	0.72
TOTAL	196	206.55	0.95	273	271.32	1.01

Findings and Recommendations

As is typical with most large public pension plans, a small number of deaths occur amongst the active member population during the experience period. The data is not sufficient to recommend a change in the actuarial assumption for pre-retirement mortality that would be expected to accurately predict mortality rates in the future for the active membership. As a result, we recommend the assumed rates of pre-retirement mortality reflect an assumption similar to the assumed rates of post-retirement mortality. Later, we recommend assumed post-retirement mortality rates be based on the RP-2014 Blue Collar Mortality Table, with fully generational projection. We also recommend the same table for pre-retirement mortality rates with the addition of an age set-back of five years for both males and females. An age set-back is the use of an earlier age mortality rate for the age desired (e.g. the rate of a 45-year-old is used for a 50-year-old).

Rates of Disability Retirement

The rates of disability used in the actuarial valuation project the percentage of employees expected to become disabled each year.

Disability experience was investigated separately for males and females.

The analysis of the actual disability experience for male and female members over the five-year experience period yields an actual/expected ratio of 77% and 91% respectively. The table below details the actual/expected ratio by age group and in total, for males and females separately.

EXPERIENCE UNDER CURRENT ASSUMPTIONS

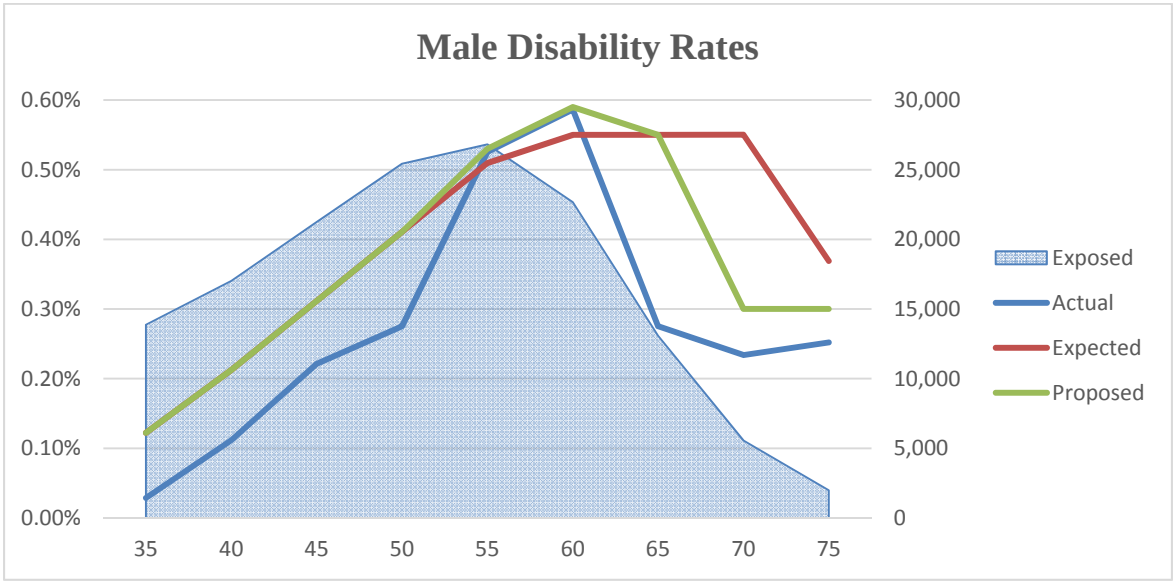
	Disability Experience					
	Males			Females		
			Ratio			Ratio
Age Group	Actual	Expected	Actual/Expected	Actual	Expected	Actual/Expected
Under 20	0	1.53	0.00	0	1.35	0.00
20 - 24	0	5.52	0.00	0	3.19	0.00
25 - 29	0	9.74	0.00	1	4.47	0.22
30 - 34	4	16.95	0.24	7	13.35	0.52
35 - 39	19	36.16	0.53	24	41.97	0.57
40 - 44	47	66.19	0.71	90	104.67	0.86
45 - 49	70	104.50	0.67	178	211.45	0.84
50 - 54	141	136.69	1.03	347	296.56	1.17
55 - 59	133	124.70	1.07	268	238.51	1.12
60 - 64	36	71.95	0.50	54	114.02	0.47
65 & Over	20	38.69	0.52	4	44	0.09
TOTAL	470	612.62	0.77	973	1,073.19	0.91

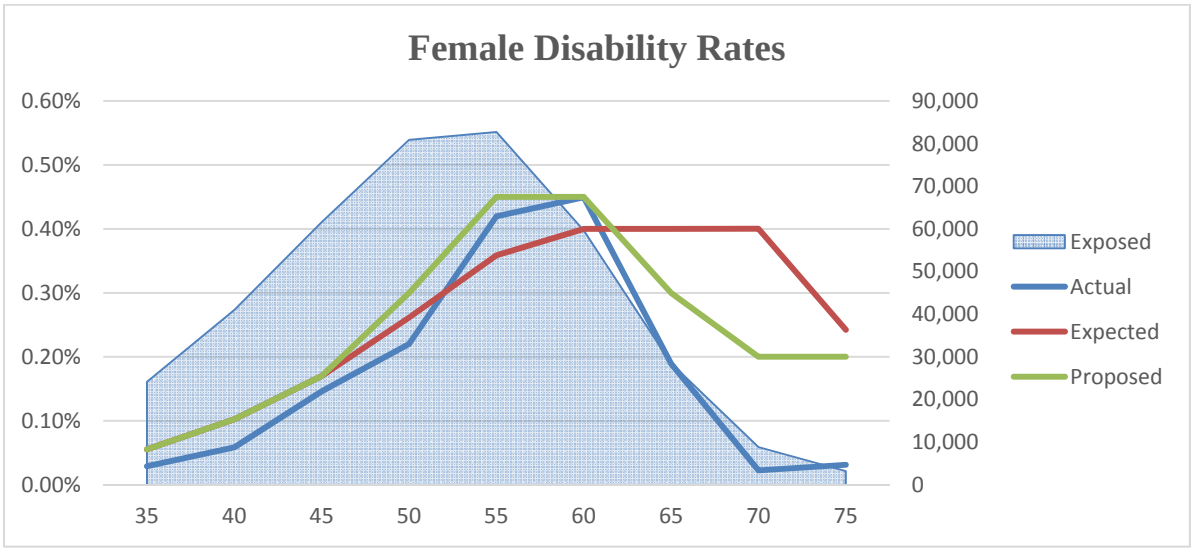
Findings and Recommendations

During the period under investigation, the actual rates of disability retirement were less than expected over most age groups. As a result, we recommend the rates of disability retirement be revised to more closely reflect the experience of the System. The complete table of recommended disability rates is shown in Appendix D.

The right axis of the charts below represents the number of exposed lives. The exposed lives are the total number of individuals who were subject to disability retirement based upon the member's age during the experience period. When recommending assumptions changes, it is important to recognize actual experience in areas of higher exposures versus areas of lower exposures when recommending changes to the assumed disability rates.

The actual average disability rates by years of service during the past five years, the current assumed disability rates, and the recommended disability rates are shown on the left axis.





The actual/expected ratios based on the recommended assumptions are shown in the table below. The total actual/expected ratio is 77% for male members and 84% for female members compared to 77% and 91% respectively for male and female members under the current assumption, however, we have smoothed out the rates to more closely match experience at the older ages.

EXPERIENCE UNDER PROPOSED ASSUMPTIONS

	Disability Experience					
	Males			Females		
			Ratio			Ratio
Age Group	Actual	Proposed	Actual/Expected	Actual	Proposed	Actual/Proposed
Under 20	0	1.53	0.00	0	0.68	0.00
20 - 24	0	5.52	0.00	0	1.60	0.00
25 - 29	0	9.74	0.00	1	4.47	0.22
30 - 34	4	16.95	0.24	7	13.35	0.52
35 - 39	19	36.16	0.53	24	41.97	0.57
40 - 44	47	66.19	0.71	90	104.67	0.86
45 - 49	70	104.50	0.67	178	242.64	0.73
50 - 54	141	142.16	0.99	347	372.17	0.93
55 - 59	133	133.76	0.99	268	268.32	1.00
60 - 64	36	71.95	0.50	54	85.52	0.63
65 & Over	20	22.67	0.88	4	24.08	0.17
TOTAL	470	611.14	0.77	973	1,159.48	0.84

Rates of Retirement

The retirement rates used in the actuarial valuation project the percentage of employees expected to retire during the upcoming year. The Plan provides for two types of retirements based on different eligibility requirements. The first one is for a normal retirement benefit. The second one is for an early retirement benefit which is reduced. Separate decrements have been developed for each type of retirement benefit.

Effective August 1, 2017, the age and service requirements for normal and early retirement will be increased. At this time, there have been no retirements for members retiring with the increased eligibility. Due to the lack of observable experience, separate rates have been developed for this group, based on the experience of the current eligibility. As credible experience becomes available, separate retirement rates for normal and early retirements will be developed for this group.

Normal Retirement – at First Eligibility

In this section we analyzed retirement experience for members who become eligible to retire upon obtaining age 65 and 5 years of service or 30 years of service regardless of age.

The analysis of the actual retirement experience over the five-year period yields an actual/expected ratio of 123% for males and 108% for females.

EXPERIENCE UNDER CURRENT ASSUMPTIONS

Number of Age Based Retirements First Eligible for an Unreduced Benefit						
	Male Members			Female Members		
	Current Rates			Current Rates		
			Ratio			Ratio
Age	Actual	Expected	Actual/Expected	Actual	Expected	Actual/Expected
45 & Under	0	0.00	0.00	0	0.00	0.00
46	1	0.56	1.79	0	0.00	0.00
47	0	0.84	0.00	2	1.25	1.60
48	7	9.80	0.71	9	11.00	0.82
49	12	16.80	0.71	7	10.75	0.65
50	16	17.64	0.91	10	11.75	0.85
51	13	10.08	1.29	13	8.82	1.47
52	14	11.76	1.19	12	11.55	1.04
53	13	13.23	0.98	19	12.81	1.48
54	13	14.28	0.91	27	16.80	1.61
55	26	15.40	1.69	14	17.22	0.81
56	16	11.70	1.37	21	15.13	1.39
57	14	10.08	1.39	32	19.21	1.67
58	18	10.62	1.69	28	19.21	1.46
59	17	11.16	1.52	22	19.04	1.16
60	19	9.00	2.11	40	25.84	1.55
61	14	8.28	1.69	41	28.88	1.42
62	14	10.00	1.40	34	31.60	1.08
63	14	5.94	2.36	50	33.48	1.49
64	8	5.04	1.59	54	31.50	1.71
65	31	36.00	0.86	1,121	1,138.25	0.98
66	19	13.58	1.40	18	8.54	2.11
67	9	11.06	0.81	13	8.68	1.50
68	9	12.18	0.74	11	7.70	1.43
69	13	6.44	2.02	14	7.56	1.85
70	6	6.44	0.93	11	6.86	1.60
71	4	6.30	0.63	9	4.34	2.07
72	9	5.60	1.61	8	4.34	1.84
73	13	4.34	3.00	11	4.48	2.46
74	5	2.66	1.88	5	2.52	1.98
75 & Over	6	18.00	0.33	8	27.00	0.30
TOTAL	353	286.81	1.23	1,646	1,523.11	1.08

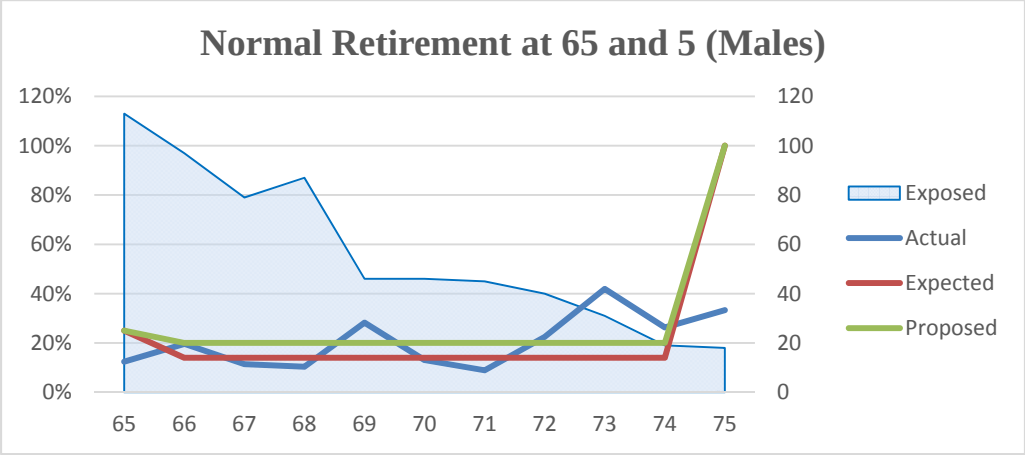
Findings and Recommendations

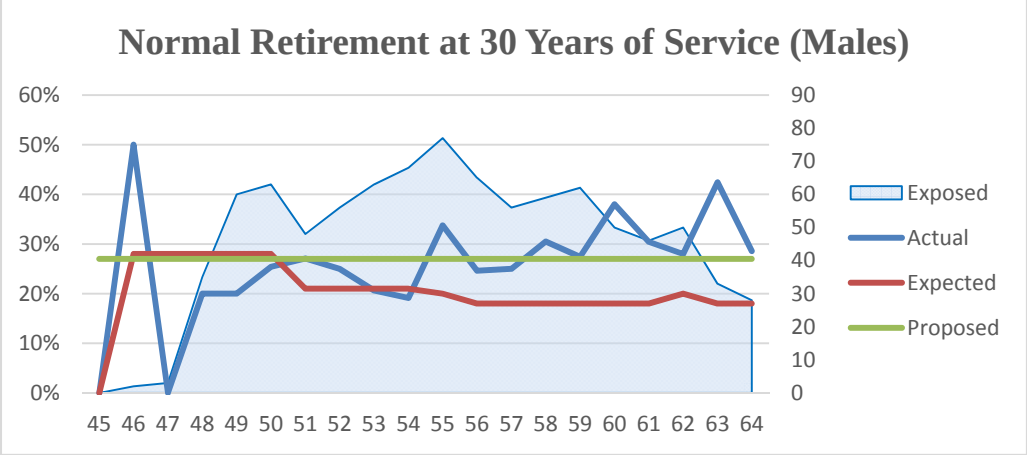
We recommend revising the normal retirement rates to more closely reflect actual experience. The complete tables of recommended retirement rates are shown in Appendix D.

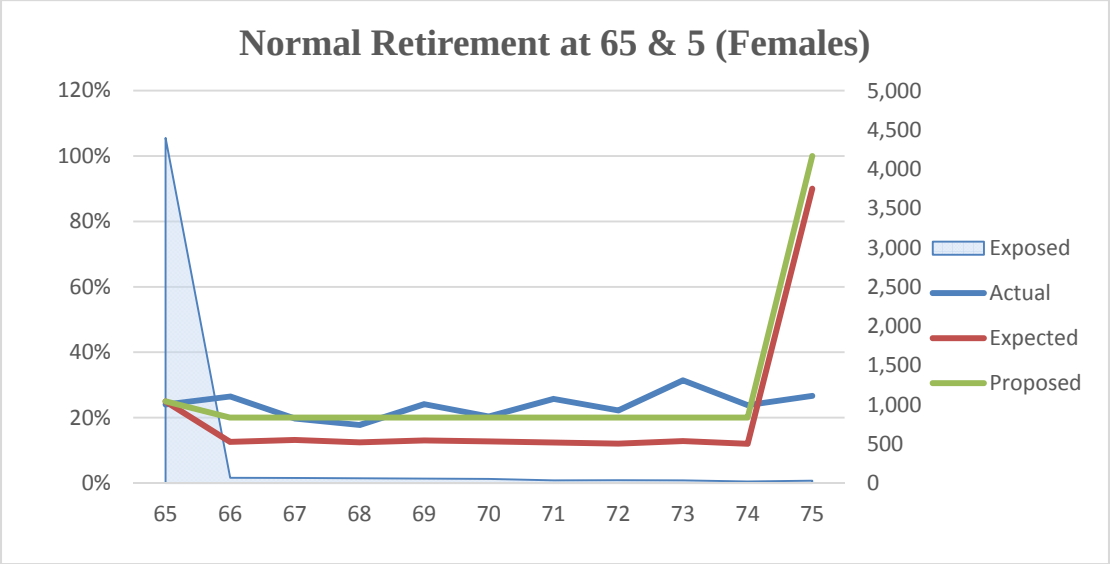
The actual/expected ratios based on the recommended assumptions are 94% compared to 123% for males under the current assumption and 97% compared to 108% for females under the current assumptions.

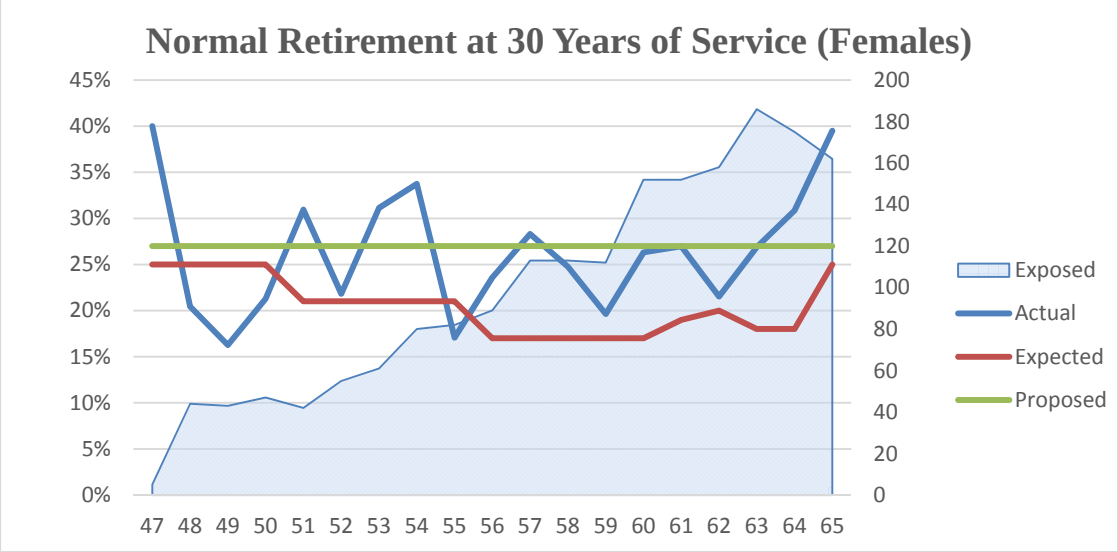
The right axis of the charts below represent the number of exposed lives. The exposed lives are the total number of individuals who were subject to retirement rates based upon the member's age and service during the experience period. When recommending assumptions changes, it is important to recognize actual experience in areas of higher exposures versus areas of lower exposures when recommending changes to the assumed retirement rates.

The actual average retirement rates by age and years of service during the past five years, the current assumed retirement rates, and the recommended retirement rates are shown on the left axis.









The table on the following page shows in detail the actual/expected ratios by individual age and total based on the recommended rates of retirement.

EXPERIENCE UNDER PROPOSED ASSUMPTIONS

Number of Age Based Retirements First Eligible for an Unreduced Benefit						
	Male Members			Female Members		
	Proposed Rates			Proposed Rates		
			Ratio			Ratio
Age	Actual	Proposed	Actual/Proposed	Actual	Proposed	Actual/Proposed
45 & Under	0	0.00	0.00	0	0.00	0.00
46	1	0.54	1.85	0	0.00	0.00
47	0	0.81	0.00	2	1.35	1.48
48	7	9.45	0.74	9	11.88	0.76
49	12	16.20	0.74	7	11.61	0.60
50	16	17.01	0.94	10	12.69	0.79
51	13	12.96	1.00	13	11.34	1.15
52	14	15.12	0.93	12	14.85	0.81
53	13	17.01	0.76	19	16.47	1.15
54	13	18.36	0.71	27	21.60	1.25
55	26	20.79	1.25	14	22.14	0.63
56	16	17.55	0.91	21	24.03	0.87
57	14	15.12	0.93	32	30.51	1.05
58	18	15.93	1.13	28	30.51	0.92
59	17	16.74	1.02	22	30.24	0.73
60	19	13.50	1.41	40	41.04	0.97
61	14	12.42	1.13	41	41.04	1.00
62	14	13.50	1.04	34	42.66	0.80
63	14	8.91	1.57	50	50.22	1.00
64	8	7.56	1.06	54	47.25	1.14
65	31	36.62	0.85	1,121	1,143.24	0.98
66	19	19.40	0.98	18	13.60	1.32
67	9	15.80	0.57	13	13.20	0.98
68	9	17.40	0.52	11	12.40	0.89
69	13	9.20	1.41	14	11.60	1.21
70	6	9.20	0.65	11	10.80	1.02
71	4	9.00	0.44	9	7.00	1.29
72	9	8.00	1.13	8	7.20	1.11
73	13	6.20	2.10	11	7.00	1.57
74	5	3.80	1.32	5	4.20	1.19
75 & Over	6	18.00	0.33	8	30.00	0.27
TOTAL	353	375.10	0.94	1,646	1,696.83	0.97

Retirement after First Eligibility

In this section we analyzed retirement experience for members one year after becoming eligible to retire upon obtaining age 65 and 5 years of service or 30 years of service regardless of age.

The analysis of the actual retirement experience over the five-year period yields an actual/expected ratio of 121% for males and 120% for females.

Number of Age Based Retirements Eligible for an Unreduced Benefit						
	Male Members			Female Members		
	Current Rates			Current Rates		
			Ratio			Ratio
Age	Actual	Expected	Actual/Expected	Actual	Expected	Actual/Expected
45 & Under	0	0.28	0.00	0	0.00	0.00
46	0	0.56	0.00	0	0.25	0.00
47	1	1.12	0.89	0	0.25	0.00
48	2	1.40	1.43	2	1.50	1.33
49	9	14.00	0.64	7	13.00	0.54
50	23	33.32	0.69	10	24.00	0.42
51	30	34.44	0.87	16	28.14	0.57
52	24	39.27	0.61	28	37.38	0.75
53	38	52.08	0.73	35	49.14	0.71
54	49	57.12	0.86	43	53.55	0.80
55	50	59.80	0.84	58	58.17	1.00
56	60	55.80	1.08	57	53.89	1.06
57	59	54.90	1.07	65	53.72	1.21
58	52	46.62	1.12	42	55.08	0.76
59	49	43.38	1.13	84	63.58	1.32
60	57	40.14	1.42	98	70.21	1.40
61	45	31.86	1.41	68	77.33	0.88
62	34	29.60	1.15	112	90.80	1.23
63	26	25.92	1.00	97	91.08	1.06
64	33	23.40	1.41	122	104.04	1.17
65	46	27.25	1.69	173	142.25	1.22
66	321	195.72	1.64	767	502.74	1.53
67	211	159.88	1.32	583	380.24	1.53
68	216	140.14	1.54	409	288.68	1.42
69	173	121.24	1.43	352	233.24	1.51
70	198	103.04	1.92	306	190.40	1.61
71	131	82.04	1.60	250	157.64	1.59
72	97	67.90	1.43	180	127.40	1.41
73	106	56.84	1.86	163	105.28	1.55
74	73	44.52	1.64	126	84.28	1.50
75 & Over	70	256.00	0.27	118	503.00	0.23
TOTAL	2,271	1,882.22	1.21	4,362	3,625.26	1.20

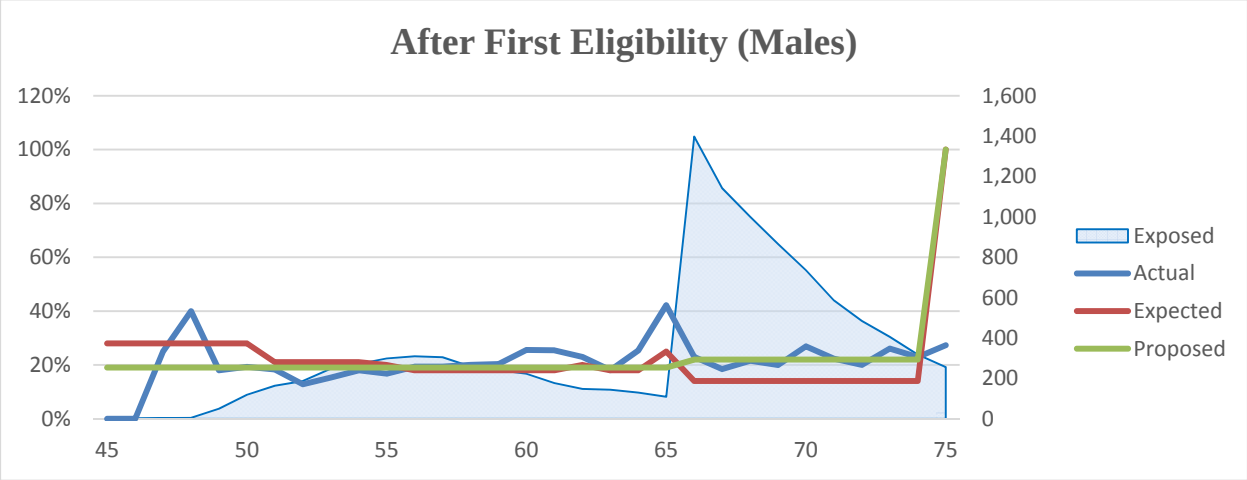
Findings and Recommendations

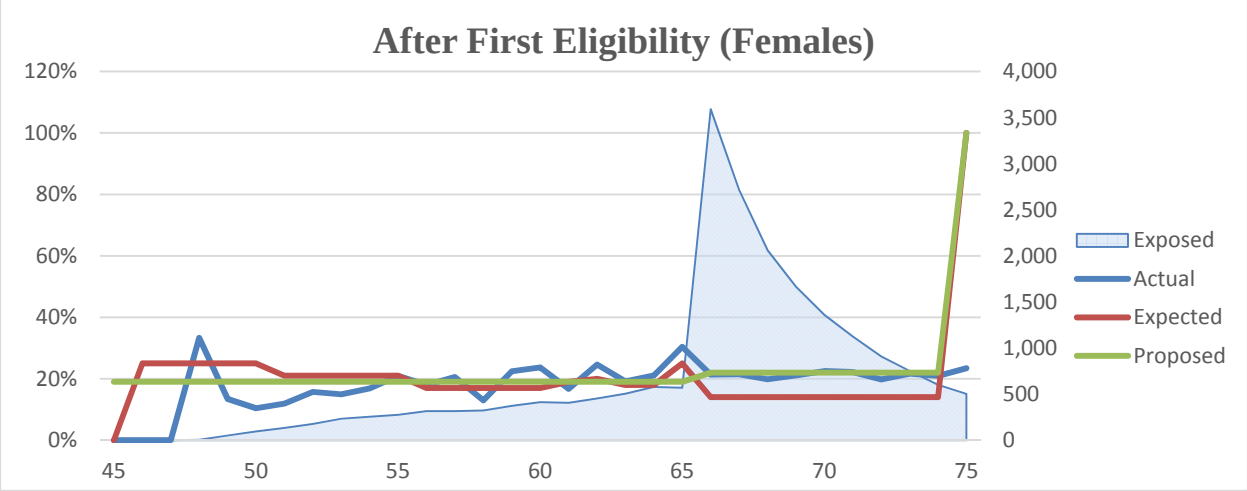
We recommend revising the normal retirement rates to more closely reflect actual experience. The complete tables of recommended retirement rates are shown in Appendix D.

The actual/expected ratios based on the recommended assumptions are 94% compared to 121% for males under the current assumption and 91% compared to 120% for females under the current assumptions.

The right axis of the charts below represents the number of exposed lives. The exposed lives are the total number of individuals who were subject to retirement rates based upon the member's age and service during the experience period. When recommending assumptions changes, it is important to recognize actual experience in areas of higher exposures versus areas of lower exposures when recommending changes to the assumed retirement rates.

The actual average retirement rates by age and years of service during the past five years, the current assumed retirement rates, and the recommended retirement rates are shown on the left axis.





The table below shows in detail the actual/expected ratios by individual age and total based on the recommended rates of retirement.

EXPERIENCE UNDER PROPOSED ASSUMPTIONS

Number of Age Based Retirements Eligible for an Unreduced Benefit						
	Male Members			Female Members		
	Proposed Rates			Proposed Rates		
			Ratio			Ratio
Age	Actual	Proposed	Actual/Proposed	Actual	Proposed	Actual/Proposed
45 & Under	0	0.19	0.00	0	0.00	0.00
46	0	0.38	0.00	0	0.19	0.00
47	1	0.76	1.32	0	0.19	0.00
48	2	0.95	2.11	2	1.14	1.75
49	9	9.50	0.95	7	9.88	0.71
50	23	22.61	1.02	10	18.24	0.55
51	30	31.16	0.96	16	25.46	0.63
52	24	35.53	0.68	28	33.82	0.83
53	38	47.12	0.81	35	44.46	0.79
54	49	51.68	0.95	43	48.45	0.89
55	50	56.81	0.88	58	52.63	1.10
56	60	58.90	1.02	57	60.23	0.95
57	59	57.95	1.02	65	60.04	1.08
58	52	49.21	1.06	42	61.56	0.68
59	49	45.79	1.07	84	71.06	1.18
60	57	42.37	1.35	98	78.47	1.25
61	45	33.63	1.34	68	77.33	0.88
62	34	28.12	1.21	112	86.26	1.30
63	26	27.36	0.95	97	96.14	1.01
64	33	24.70	1.34	122	109.82	1.11
65	46	20.71	2.22	173	108.11	1.60
66	321	307.56	1.04	767	790.02	0.97
67	211	251.24	0.84	583	597.52	0.98
68	216	220.22	0.98	409	453.64	0.90
69	173	190.52	0.91	352	366.52	0.96
70	198	161.92	1.22	306	299.20	1.02
71	131	128.92	1.02	250	247.72	1.01
72	97	106.70	0.91	180	200.20	0.90
73	106	89.32	1.19	163	165.44	0.99
74	73	69.96	1.04	126	132.44	0.95
75 & Over	70	256.00	0.27	118	503.00	0.23
TOTAL	2,271	2,416.01	0.94	4,362	4,787.78	0.91

Early Retirement

In this section we analyzed retirement experience for members one year after becoming eligible for a reduced retirement upon obtaining age 60 and 5 years of service or obtaining age 55 and 5 years of service but prior to becoming eligible for an unreduced retirement.

The analysis of the actual retirement experience over the five-year period yields an actual/expected ratio of 165% for males and 110% for females.

EXPERIENCE UNDER CURRENT ASSUMPTIONS

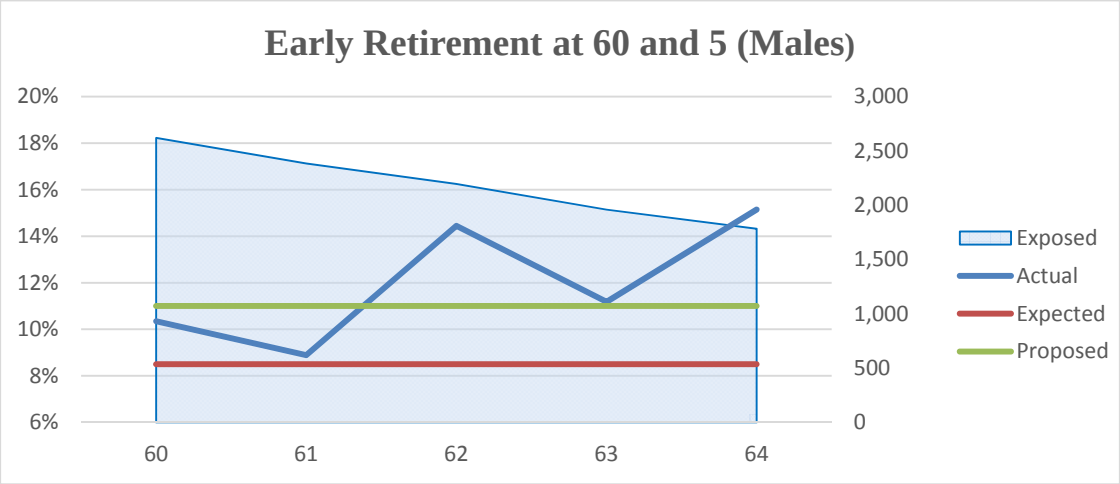
Number of Age Based Retirements Eligible for an Reduced Benefit						
	Male Members			Female Members		
	Current Rates			Current Rates		
			Ratio			Ratio
Age	Actual	Expected	Actual/Expected	Actual	Expected	Actual/Expected
45 & Under	0	0.00	0.00	0	0.00	0.00
46	0	0.00	0.00	0	0.00	0.00
47	0	0.00	0.00	0	0.00	0.00
48	0	0.00	0.00	0	0.00	0.00
49	0	0.00	0.00	0	0.00	0.00
50	0	0.00	0.00	0	0.00	0.00
51	0	0.00	0.00	0	0.00	0.00
52	0	0.00	0.00	0	0.00	0.00
53	0	0.00	0.00	0	0.00	0.00
54	0	0.00	0.00	0	0.00	0.00
55	66	0.00	0.00	104	119.47	0.87
56	34	0.00	0.00	106	134.81	0.79
57	28	0.00	0.00	97	155.74	0.62
58	30	0.00	0.00	113	176.41	0.64
59	34	0.00	0.00	142	191.75	0.74
60	311	222.61	1.40	1,025	958.38	1.07
61	252	202.65	1.24	894	844.28	1.06
62	371	186.58	1.99	905	738.25	1.23
63	268	166.52	1.61	767	636.03	1.21
64	327	151.56	2.16	785	527.26	1.49
65	0	28.25	0.00	0	0.00	0.00
66	0	13.58	0.00	0	0.00	0.00
67	0	11.06	0.00	0	0.00	0.00
68	0	12.18	0.00	0	0.00	0.00
69	0	6.44	0.00	0	0.00	0.00
70	0	6.44	0.00	0	0.00	0.00
71	0	6.30	0.00	0	0.00	0.00
72	0	5.60	0.00	0	0.00	0.00
73	0	4.34	0.00	0	0.00	0.00
74	0	2.66	0.00	0	0.00	0.00
75 & Over	0	18.00	0.00	0	0.00	0.00
TOTAL	1,721	1,044.77	1.65	4,938	4,482.38	1.10

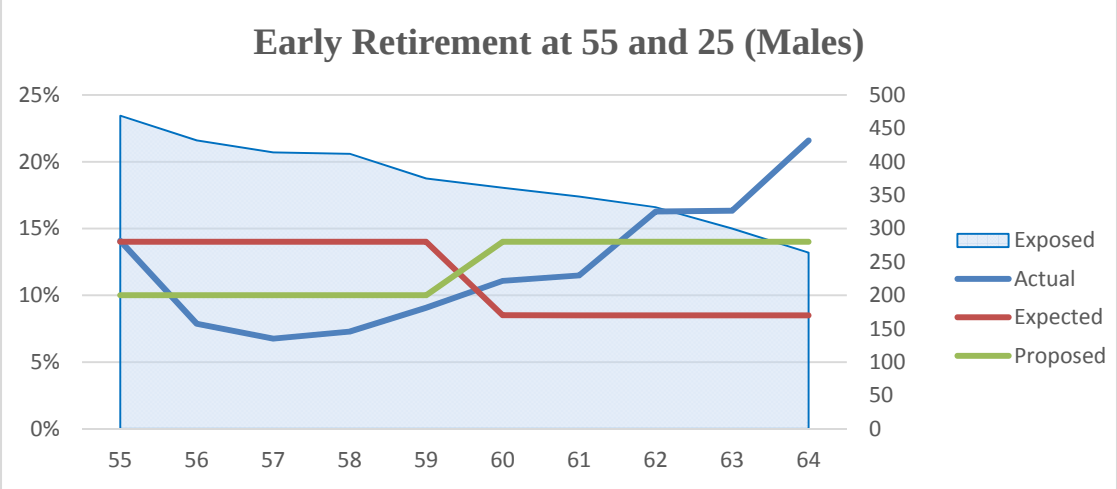
Findings and Recommendations

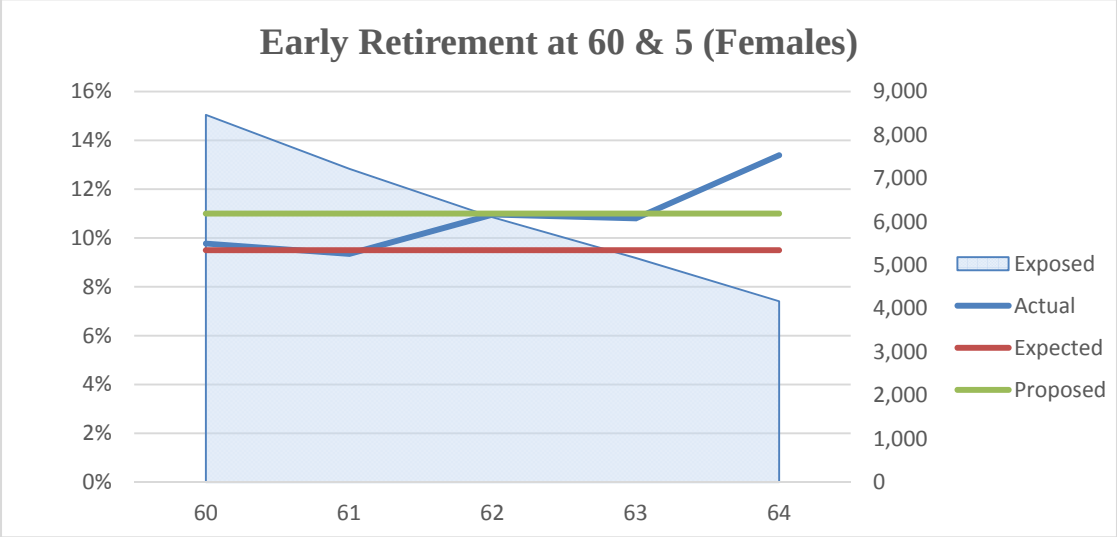
We recommend revising the early retirement rates to more closely reflect actual experience. The complete tables of recommended retirement rates are shown in Appendix D.

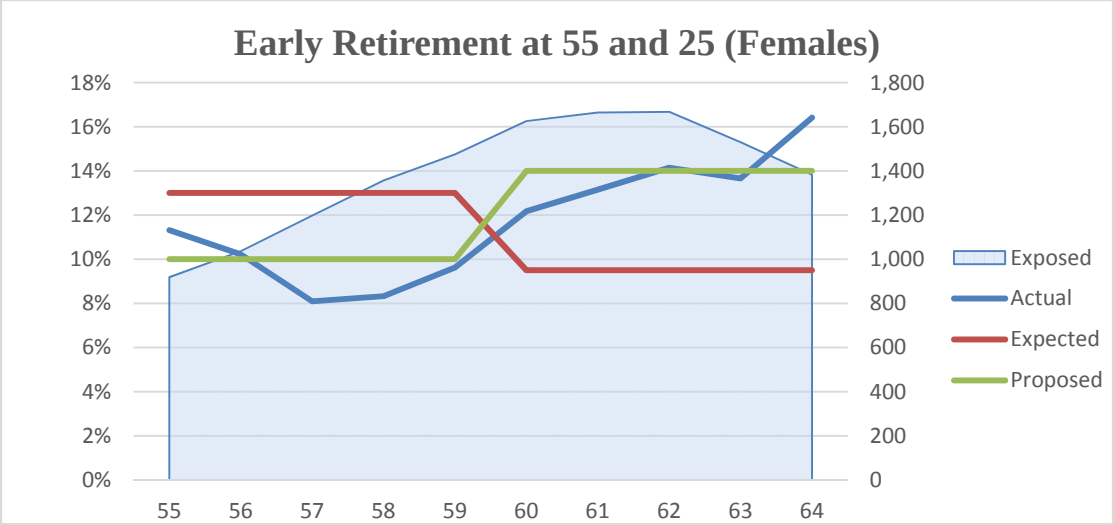
The right axis of the charts below represents the number of exposed lives. The exposed lives are the total number of individuals who were subject to retirement rates based upon the member's age and service during the experience period. When recommending assumptions changes, it is important to recognize actual experience in areas of higher exposures versus areas of lower exposures when recommending changes to the assumed retirement rates.

The actual average retirement rates by age and years of service during the past five years, the current assumed retirement rates, and the recommended retirement rates are shown on the left axis.









The actual/expected ratios based on the recommended assumptions are 105% for males compared to 165% under the current assumptions, and 96% for females compared to 110% under the current assumptions.

The table on the following page details the actual/expected ratios by individual age and total based on the recommended rates of retirement.

EXPERIENCE UNDER PROPOSED ASSUMPTIONS

Number of Age Based Retirements Eligible for an Reduced Benefit						
	Male Members			Female Members		
	Proposed Rates			Proposed Rates		
			Ratio			Ratio
Age	Actual	Proposed	Actual/Proposed	Actual	Proposed	Actual/Proposed
45 & Under	0	0.00	0.00	0	0.00	0.00
46	0	0.00	0.00	0	0.00	0.00
47	0	0.00	0.00	0	0.00	0.00
48	0	0.00	0.00	0	0.00	0.00
49	0	0.00	0.00	0	0.00	0.00
50	0	0.00	0.00	0	0.00	0.00
51	0	0.00	0.00	0	0.00	0.00
52	0	0.00	0.00	0	0.00	0.00
53	0	0.00	0.00	0	0.00	0.00
54	0	0.00	0.00	0	0.00	0.00
55	66	46.90	1.41	104	91.90	1.13
56	34	43.20	0.79	106	103.70	1.02
57	28	41.40	0.68	97	119.80	0.81
58	30	41.20	0.73	113	135.70	0.83
59	34	37.50	0.91	142	147.50	0.96
60	311	338.63	0.92	1,025	1,158.46	0.88
61	252	310.96	0.81	894	1,027.52	0.87
62	371	287.93	1.29	905	904.85	1.00
63	268	257.49	1.04	767	782.35	0.98
64	327	233.09	1.40	785	651.99	1.20
65	0	0.00	0.00	0	0.00	0.00
66	0	0.00	0.00	0	0.00	0.00
67	0	0.00	0.00	0	0.00	0.00
68	0	0.00	0.00	0	0.00	0.00
69	0	0.00	0.00	0	0.00	0.00
70	0	0.00	0.00	0	0.00	0.00
71	0	0.00	0.00	0	0.00	0.00
72	0	0.00	0.00	0	0.00	0.00
73	0	0.00	0.00	0	0.00	0.00
74	0	0.00	0.00	0	0.00	0.00
75 & Over	0	0.00	0.00	0	0.00	0.00
TOTAL	1,721	1,638.30	1.05	4,938	5,123.77	0.96

Rates of Non-Disabled Post-Retirement Mortality

Mortality tables are a fundamental assumption in actuarial valuations. Because benefits are typically paid over a retiree's lifetime, it is important to appropriately reflect what a typical lifetime looks like. In addition, deaths before retirement may also result in the payout of benefits to a spouse or survivor. For valuation purposes, we must consider mortality tables for retirees, beneficiaries of retirees, disabled retirees, and active members.

The post-retirement mortality rates used in the actuarial valuation project the percentage of retirees who are expected to die in a given future year. This assumption is a very important demographic assumption since it typically has the most significant impact on liability projections.

Based upon the long-term trend of mortality improvement, actuaries seek to account for future improvements in longevity, either by directly projecting future improvements or by maintaining a sufficient margin in expected rates of mortality to allow for future improvement.

The analysis of the actual post-retirement mortality experience over the five-year experience study period yields actual/expected ratios of 119% and 118% respectively for males and females. The table below details the actual/expected ratios by individual age group and total.

EXPERIENCE UNDER CURRENT ASSUMPTIONS

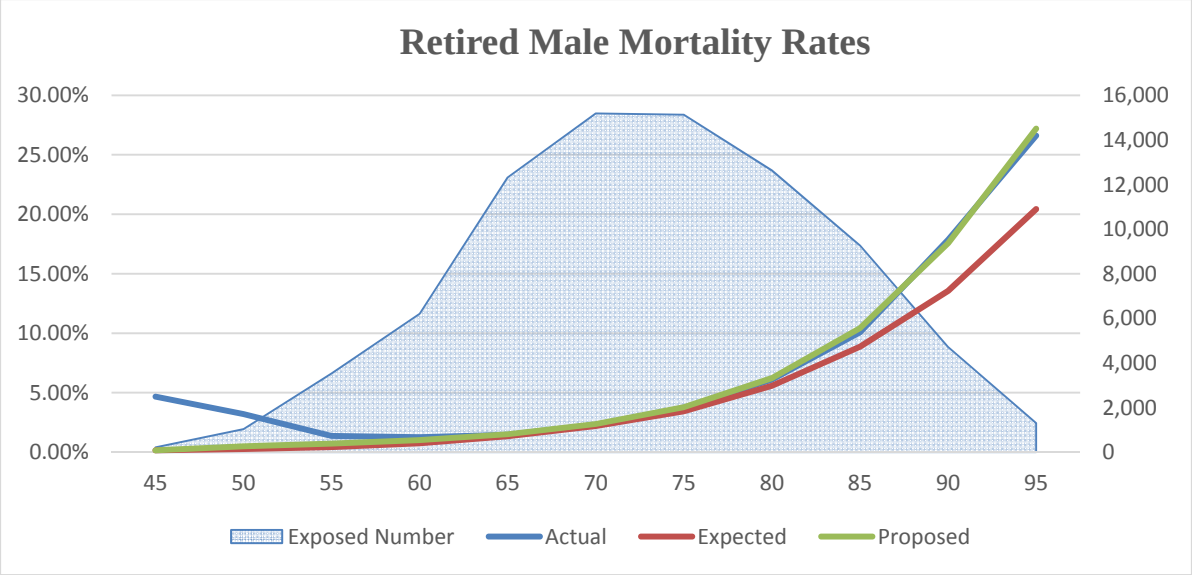
	Post-Retirement Mortality Experience					
	Males			Females		
Age Group	Actual	Expected	Ratio Actual/Expected	Actual	Expected	Ratio Actual/Expected
Under 50	44	0.47	93.62	38	0.38	100.00
50 - 54	33	2.62	12.60	9	1.32	6.82
55 - 59	48	14.76	3.25	15	7.15	2.10
60 - 64	78	46.20	1.69	84	56.25	1.49
65 - 69	180	164.40	1.09	268	283.45	0.95
70 - 74	349	333.05	1.05	565	566.47	1.00
75 - 79	564	518.90	1.09	911	896.17	1.02
80 - 84	772	705.74	1.09	1,474	1,345.53	1.10
85 - 89	933	820.92	1.14	2,203	1,864.60	1.18
90 - 94	842	639.29	1.32	2,429	1,937.14	1.25
95 - 99	347	266.37	1.30	1,457	1,079.12	1.35
100 & Over	52	43.81	1.19	404	306.28	1.32
TOTAL	4,242	3,556.53	1.19	9,857	8343.86	1.18

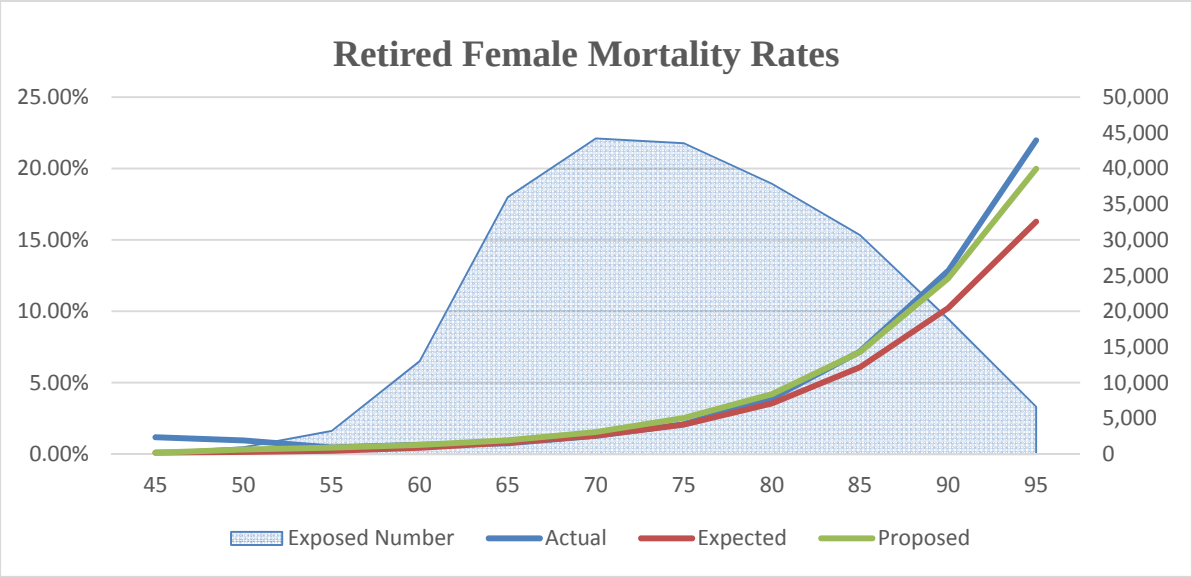
Findings and Recommendations

Experience indicates that overall, more members have died than expected during the study period, resulting in actuarial gains to the system. The table currently in use is the 1994 Group Annuity Mortality Table, set back one year for both men and women. Despite the fact that the current assumption anticipated less deaths than were expected, we recommend adopting the RP-2014 Blue Collar Mortality Table with fully generational projection with Scale BB, 120% of male rates, and 110% of female rates.

The right axis of the charts below represents the number of exposed lives. The exposed lives are the total number of individuals who were subject to mortality rates based upon the benefit recipient's age during the experience period. When recommending assumptions changes, it is important to recognize actual experience in areas of higher exposures versus areas of lower exposures when recommending changes to the assumed retirement rates.

The actual average mortality rates by age during the past five years, the current assumed mortality rates, and the recommended mortality rates are shown on the left axis.





The actual/expected ratios based on the recommended assumptions are 101% for males compared to 119% under the current assumptions and 99% for females compared to 118% under the current assumptions.

The following table details the actual/expected ratios by individual age and total based on the recommended rates of mortality.

EXPERIENCE UNDER PROPOSED ASSUMPTIONS

Age Group	Post-Retirement Mortality Experience					
	Males			Females		
	Actual	Proposed	Ratio Actual/Proposed	Actual	Proposed	Ratio Actual/Proposed
Under 50	44	0.58	75.80	38	0.36	105.62
50 - 54	33	5.03	6.56	9	2.94	3.06
55 - 59	48	25.42	1.89	15	14.32	1.05
60 - 64	78	62.98	1.24	84	82.10	1.02
65 - 69	180	186.53	0.96	268	345.35	0.78
70 - 74	349	358.76	0.97	565	679.15	0.83
75 - 79	564	572.00	0.99	911	1,100.35	0.83
80 - 84	772	785.98	0.98	1,474	1,590.01	0.93
85 - 89	933	965.39	0.97	2,203	2,193.78	1.00
90 - 94	842	828.39	1.02	2,429	2,330.47	1.04
95 - 99	347	354.75	0.98	1,457	1,324.29	1.10
100 & Over	52	43.81	1.19	404	306.28	1.32
TOTAL	4,242	4,189.62	1.01	9,857	9969.40	0.99

Rates of Disabled Post-Retirement Mortality

The disability mortality rates used in the actuarial valuations project the percentage of disabled retirees who are expected to die in the upcoming year for all members. Mortality for disabled retirees is expected to be higher than mortality for non-disabled retirees.

The analysis of the actual disabled mortality over the five-year experience study period yields actual/expected ratio of 98% and 120% respectively for disabled male and female retirees. The table below shows the actual/expected ratios by age groups and in total.

EXPERIENCE UNDER CURRENT ASSUMPTIONS

	Post-Disablement Mortality Experience					
	Males			Females		
Age Group	Actual	Expected	Ratio Actual/Expected	Actual	Expected	Ratio Actual/Expected
Under 35	0	0.04	0.00	0	0.00	0.00
35 - 39	0	0.43	0.00	2	0.35	5.71
40 - 44	0	1.43	0.00	3	2.48	1.21
45 - 49	3	5.75	0.52	15	8.26	1.82
50 - 54	19	17.44	1.09	34	25.17	1.35
55 - 59	33	37.00	0.89	57	58.28	0.98
60 - 64	60	72.96	0.82	83	88.90	0.93
65 - 69	81	72.47	1.12	122	84.60	1.44
70 - 74	41	44.91	0.91	77	67.17	1.15
75 - 79	37	36.97	1.00	97	65.99	1.47
80 - 84	35	28.86	1.21	76	82.82	0.92
85 - 89	30	26.42	1.14	97	73.57	1.32
90 - 94	22	22.95	0.96	55	40.82	1.35
95 & Over	4	5.75	0.70	22	20.35	1.08
TOTAL	365	373.38	0.98	740	618.76	1.20

Findings and Recommendations

Due to the limited experience, this disabled mortality data is not sufficient as the basis for the mortality assumption. As a result, we recommend the use of a more modern base table for disabled mortality. We recommend the RP-2000 Disabled Mortality Table, 90% for male rates, and 100% for female rates with a five-year setback.

The actual/expected ratios based on the recommended assumptions are 109% for males compared to 98% under the current assumptions and 146% for females compared to 120% under the current assumptions.

The following table details the actual/expected ratios by individual age and total based on the recommended rates of mortality.

EXPERIENCE UNDER PROPOSED ASSUMPTIONS

	Post-Disablement Mortality Experience					
	Males			Females		
Age Group	Actual	Proposed	Ratio Actual/Proposed	Actual	Proposed	Ratio Actual/Proposed
Under 35	0	0.04	0.00	0	0.00	0.00
35 - 39	0	0.39	0.00	2	0.13	15.79
40 - 44	0	1.26	0.00	3	0.88	3.41
45 - 49	3	4.96	0.61	15	2.85	5.27
50 - 54	19	18.59	1.02	34	8.42	4.04
55 - 59	33	41.28	0.80	57	29.31	1.94
60 - 64	60	72.04	0.83	83	62.04	1.34
65 - 69	81	76.22	1.06	122	74.80	1.63
70 - 74	41	30.79	1.33	77	71.24	1.08
75 - 79	37	27.69	1.34	97	75.38	1.29
80 - 84	35	23.82	1.47	76	77.35	0.98
85 - 89	30	21.37	1.40	97	60.67	1.60
90 - 94	22	13.36	1.65	55	34.67	1.59
95 & Over	4	2.45	1.63	22	10.36	2.12
TOTAL	365	334.26	1.09	740	508.10	1.46

Rates of Salary Increase Due to Merit and Promotion

Under the "building block" approach recommended in ASOP No. 27, this assumption is composed of three components: inflation, productivity (real wage increases), and merit/promotion. The inflation and productivity components are combined to produce the assumed rates of wage inflation. The rate represents the "across the board" average annual increase in salaries shown in the experience data. The merit component includes the additional increases in salary due to performance, seniority, promotions, etc.

The table below shows the actual/expected ratios for total salary increases over the five-year period.

EXPERIENCE UNDER CURRENT ASSUMPTIONS

Years of Service	Salaries End of Year (in thousands)		
	Actual	Expected	Ratio Actual/Expected
Under 1	761,973	798,365	0.954
1	588,592	610,866	0.964
2	564,031	586,510	0.962
3	552,813	573,649	0.964
4	540,873	559,755	0.966
5	525,391	539,517	0.974
6	508,628	519,327	0.979
7	507,536	518,731	0.978
8	533,606	543,746	0.981
9	565,926	577,152	0.981
10	592,998	603,970	0.982
11	601,331	613,504	0.980
12	588,933	600,577	0.981
13	546,945	558,792	0.979
14	496,273	506,778	0.979
15 & Up	4,557,365	4,667,912	0.976
TOTAL	13,033,214	13,379,151	0.970

Utilizing the "building block" approach, the first step in developing the merit-based rates of increase is to remove the wage inflation component experienced during the investigation period from the actual salary rates of increase. The average annual rate of inflation over the five-year period ending June 30, 2015 was 1.83% and the current assumed real rate of wage inflation (wage inflation above price inflation or CPI) was 0.75%. These combined equal an annual rate of wage inflation of 2.58% over the five-year period. This was 1.42% less than the assumed wage inflation of 4.00%.

The table below provides an analysis concerning the development of the merit component of this assumption for all members. In addition to less-than-expected underlying wage inflation, the average merit increases were less than expected at all service points. Based on prior experience and the future outlook, we recommend lowering the merit component of the compensation increase assumption.

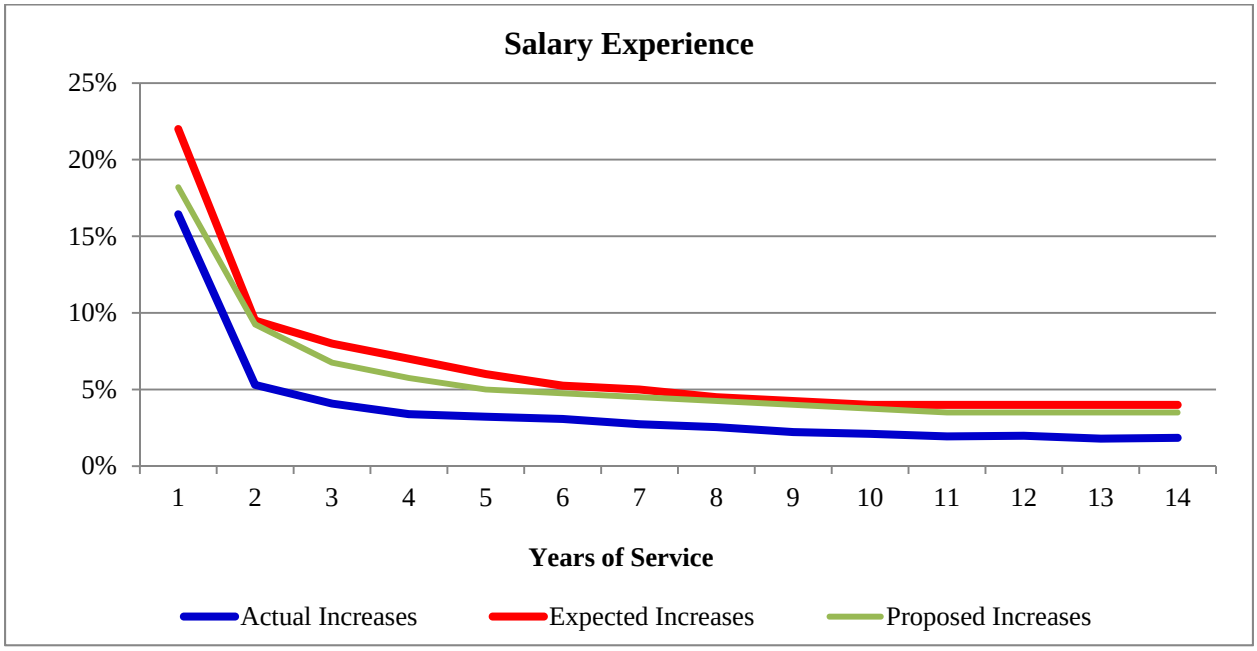
Years of Service	Actual Rate	Actual Merit Increase (Actual Less Wage Inflation)	Assumed Merit Increases
Under 1	16.44%	13.86%	18.00%
1	7.92%	5.34%	8.00%
2	5.30%	2.72%	5.50%
3	4.08%	1.50%	4.00%
4	3.39%	0.81%	3.00%
5	3.22%	0.64%	2.00%
6	3.08%	0.50%	1.25%
7	2.73%	0.15%	1.00%
8	2.55%	-0.03%	0.50%
9	2.22%	-0.36%	0.25%
10	2.11%	-0.47%	0.00%
11	1.94%	-0.64%	0.00%
12	1.98%	-0.60%	0.00%
13	1.80%	-0.78%	0.00%
14	1.84%	-0.74%	0.00%
15 & Up	1.54%	-1.04%	0.00%

Once the merit scale is developed, the assumed rate of service-based total salary increases is determined by compounding the service-based merit rates with the across-the-board rate of wage inflation, which is recommended to be 3.50%.

Findings and Recommendations

Based on the analysis above, it appears that the merit component of the salary increases have been lower than expected during the experience period. The complete tables of recommended total compensation increase rates are shown in Appendix D.

The following graph shows a comparison of actual, current (expected), and proposed rates of total salary increases by years of service.



The actual/expected ratio based on the recommended assumption is shown in the table below. The total actual/expected ratio is 98% compared to 97% under the current assumption.

Years of Service	Salaries End of Year (in thousands)		
	Actual	Proposed	Ratio Actual/Proposed
Under 1	761,973	775,462	0.983
1	588,592	597,231	0.986
2	564,031	573,119	0.984
3	552,813	563,025	0.982
4	540,873	550,600	0.982
5	525,391	534,427	0.983
6	508,628	516,860	0.984
7	507,536	516,261	0.983
8	533,606	542,445	0.984
9	565,926	575,768	0.983
10	592,998	602,518	0.984
11	601,331	612,030	0.983
12	588,933	599,133	0.983
13	546,945	557,449	0.981
14	496,273	505,559	0.982
15 & Up	4,557,365	4,656,689	0.979
TOTAL	13,033,214	13,278,575	0.980

Other Actuarial Assumptions and Methods

Percent Married: Currently 80% of members are assumed to be married with the husband three years older than the wife. This is a common and reasonable assumption and we recommend maintaining this assumption.

Re-hired Retirees: The number of re-hired retirees has increased over the investigation period from 8,089 to 11,616. This result combined with the fact that a portion of employer contributions on re-hired retiree payroll is used to finance the unfunded accrued liability (UAL) suggests there is no material impact on the payroll growth assumption utilized in the actuarial valuation to determine the UAL contribution rate. Therefore no specific re-hired retiree assumption is deemed necessary.

Actuarial Cost Method: The cost method is used to allocate the present value of benefits between past service (actuarial accrued liability) and future service (normal cost). Currently the valuation uses the entry age normal cost method. This is the most widely used cost method of large public sector plans and has demonstrated the highest degree of stability as compared to alternative methods. We recommend no change in the use of this method.

Actuarial Value of Assets: The purpose of the asset smoothing is to dampen the impact that market volatility has on valuation results by spreading the unexpected market gains and losses over several years. Currently, the System uses a four-year smoothing method that recognizes a portion of the difference between the market value of assets and the expected market value of assets, based on the assumed rate of return. The amount recognized each year is 25% of the difference between market value and expected market value. The actuarial value of assets cannot be less than 80% or more than 120% of market value. We recommend no change in the use of this method.

Amortization Method: The unfunded actuarial accrued liability is amortized using a level percentage of payroll method over the amortization period. The payroll growth assumption is used to determine the percentage of payroll required over the remaining amortization period to fully amortize the unfunded liability. The current payroll growth rate is 4.00%. We recommend reducing this assumption so that it remains consistent with our long-term expected rate of wage inflation of 3.50%.

Other Post-Employment Benefit Assumptions

I. Economic Assumptions

In addition to the three economic assumptions used in all of the actuarial valuations performed for Ohio SERS, the Health Care Cost Trend Rates reflect the change in per capita health claims rates over time due to the following factors:

- medical inflation
- utilization
- plan design
- technology improvements

The Actuarial Standards Board has issued Actuarial Standard of Practice (ASOP) No. 6, *"Measuring Retiree Group Benefit Obligations,"* which provides guidance to actuaries in selecting economic assumptions for measuring obligations of post-retirement plans other than pensions. The actuary should not consider aging of the covered population when selecting the trend assumption for projecting future costs, but should consider the following key components in setting the health care cost trend rate as noted in ASOP No. 6:

- inflation
- medical inflation
- definition of covered charges
- frequency of services
- leveraging caused by plan design features not explicitly modeled
- plan participation

When setting assumptions for projecting medical and prescription drug costs, Cavanaugh Macdonald Consulting, LLC (CMC) assumes the health benefit plan cost trend rates will decrease from an initial rate to an ultimate level. CMC's methodology for setting the initial trend rate includes the use of published annual health care inflation surveys in conjunction with actual plan experience, where credible. The initial trend rate assumption is subject to continued update and review with each valuation performed given the volatile nature of medical and prescription drug costs. There are various approaches used to determine the timing and level of decreases to the ultimate trend rate (e.g., multi-year grading period, SOA-Getzen Model). The assumed decrease in medical and prescription drug trend rates reflects the belief that health care inflation cannot indefinitely outstrip the growth rate of employer budgets and the overall economy. As a standard of practice, CMC typically assumes a grading period of five to ten years, depending on the level of change (i.e., larger differences between the initial trend rate and the ultimate trend rate are assumed to require a longer reduction period). For the ultimate trend assumption, CMC looks to the *"Long-Term Projection Assumptions for Medicare and Aggregate National Health Expenditures"* published by Center for Medicare and Medicaid Services on July 22, 2015, which uses a definition of "excess cost growth" as "the difference between (i) the U.S. per capita growth rate in age-gender-adjusted health-care costs and (ii) the per capita growth rate in GDP (both in

constant dollars)." The report shows that "average excess cost growth rates for national health expenditures (NHE) exhibit some volatility depending on which time periods are used for defining averages, but over the long run this differential has generally been above 2 percent per year or just slightly below this level. There are only two periods in which rates of excess cost growth have clearly deviated from a long-term rate of 2 percent." As a standard of practice, CMC believes the use of a "GDP+1.5%" to "GDP+2.5%" assumption is reasonable and CMC typically assumes an ultimate trend rate of 5.0%. As with any standard of practice, the specifics of each plan are reviewed to ensure there is nothing unusual that would necessitate a long-term trend rate that is either higher or lower than what is typical. It appears to be reasonable to use an ultimate rate of 5.0%, as there appears to be nothing unusual about Ohio SERS' medical plans that would necessitate a long-term trend that is either higher or lower than what is typically used for this type of calculation.

Background: In our opinion, the economic assumptions recommended in this report have been developed in accordance with ASOP No. 6. Currently, the short-term health care trend rates are set on an annual basis based on the information and data as previously described, with an ultimate trend rate of 5.0% that is reached after an appropriate grading period.

System-Wide Recommendation: Continue to update the health care trends annually and base the health care trends on Ohio SERS' experience and demographics while taking into account the projected trend from external sources.

II. Coverage Assumptions

The Actuarial Standards Board has issued Actuarial Standard of Practice (ASOP) No. 6, "Measuring Retiree Group Benefit Obligations", which provides guidance to actuaries in selecting coverage assumptions for measuring obligations of post-retirement plans other than pensions. The "Coverage Assumptions" section includes the key components the actuary should consider in setting the coverage assumptions per ASOP No. 6:

- Plan Participation
- Spouse Coverage Eligibility

A. Retirement Health Care Participation Rates

Background: Ohio SERS requires individuals to contribute toward the cost of health care to maintain coverage based on service at retirement, disability status, Medicare eligibility, plan choice, and the coverage tier elected. Some eligible individuals may not elect to be covered, especially if they have coverage available through a spouse or previous employer. The rates of participation are based on experiential data, where available and credible. These rates are considered when selecting the participation assumption for future retirees, as well as the plan eligibility rules, plan choices, and the change in retiree contribution rates over time.

Since plan participation may vary in the future due to anticipated retiree contribution levels and plan choices, the appropriateness of participation rates for both current and future retirees needs to be considered. The availability to opt in and out of the plan at the time of open enrollment also needs to be considered.

Participation rates vary based on type of retirement: service or disability. Thus, the participation rates vary based on this status.

Service Retirements

	Ohio SERS							
	Percentage of Members Electing Coverage							
Service at Retirement	6/30/2011	6/30/2012	6/30/2013	6/30/2014	6/30/2015	Total	Current	Proposed
10-14	40%	36%	32%	28%	25%	32%	25%	25%
15-19	57%	51%	47%	44%	41%	48%	45%	45%
20-24	70%	66%	63%	61%	59%	64%	70%	70%
25-29	82%	79%	77%	75%	74%	77%	75%	75%
30-34	83%	81%	79%	79%	78%	80%	80%	80%
35 +	89%	87%	85%	85%	84%	86%	90%	90%

Disability Retirements

	Ohio SERS							
	Percentage of Members Electing Coverage							
Service at Retirement	6/30/2011	6/30/2012	6/30/2013	6/30/2014	6/30/2015	Total	Current	Proposed
10-14	62%	56%	50%	45%	38%	49%	100%	50%
15-19	75%	69%	66%	61%	57%	65%	100%	70%
20-24	77%	75%	73%	71%	70%	73%	100%	75%
25-29	78%	75%	74%	73%	73%	75%	100%	75%
30-34	83%	81%	80%	82%	79%	81%	100%	80%
35-39	85%	85%	85%	85%	85%	85%	100%	90%
40 +	94%	95%	94%	93%	91%	93%	100%	90%

Based on the actual participation experience over the last five years, split out by years of service at retirement, we recommend maintaining the current participation assumptions for service retirees and changing the participation assumption for disabled retirees from 100% to a graded scale based on years of service.

B. Spouse Coverage Rates

Background: Ohio SERS requires individuals to contribute toward the cost of spousal health care to maintain coverage based on service at retirement, Medicare eligibility, plan choice, and the coverage tier elected. Participant costs to cover a spouse are significantly higher than for single coverage. Therefore, some eligible individuals may not elect to cover a spouse, even if they choose coverage for themselves.

The schedule below lists the percentage of the spouse premium paid by spouses of retirees:

Service Retiree, Disability Recipient, or Member's Qualified Service	Spouse Premium Contribution Percentage
1.5 – 24	100.0%
25 – 29	90.0
30 and over	80.0

The rates of participation are based on actual data. These rates are considered when selecting the spouse coverage assumption for future retirees, as well as the plan eligibility rules, plan choices, and the change in retiree contribution rates over time.

Spouse Coverage

Current rates: 50% Male retirees who participate cover a spouse; 40% Female retirees who participate cover a spouse

Proposed rates: 50% Male retirees who participate cover a spouse; 30% Female retirees who participate cover a spouse

Year	2013	2014	2015
Overall % Retirees Covered	54.37%	52.60%	50.45%
Overall % Spouses of Male Retirees Covered	25.06%	23.56%	22.50%
Overall % Spouses of Female Retirees Covered	16.30%	15.55%	15.03%
% Spouses of Male Retirees Covered – Current Assumptions	27.19%	26.30%	25.48%
% Spouses of Female Retirees Covered – Current Assumptions	21.75%	21.04%	20.38%
% Spouses of Male Retirees Covered – Proposed Assumptions	27.19%	26.30%	25.48%
% Spouses of Female Retirees Covered – Proposed Assumptions	16.31%	15.78%	15.29%

Based on the actual participation experience over the last three years, split out by gender, we recommend changing from the current spouse participation assumption that 50% of participating male retirees cover spouses and 40% of participating female retirees cover spouses to 50% of participating male retirees cover spouses and 30% of participating female retirees cover spouses.

Summary and Cost of Changes

As a result of the experience investigation, we are recommending revised rates of withdrawal, disability, pre-retirement mortality, service retirement, and assumed compensation increases for active members.

We have also provided recommendations for the economic assumptions to use for the Basic Benefit Plan. We recommend maintaining the current rate of return of 5.25% for the Health Care Plan.

When these proposed assumption changes are applied to the June 30, 2015 valuation, the results will change. The change in results represents the financial impact of adopting the proposed assumptions. The impact on the Basic Benefit Plan is shown in the table below. The impact on the Retiree Health Care Plan is shown in the table on the following page.

BASIC BENEFIT PLAN

	Valuation 6/30/2015	Assumption Changes
Employer Contribution Rate:		
Normal Rate	1.26%	0.68%
UAAL	11.76%	13.17%
Total Employer Rate	13.02%	13.85%
Actuarial accrued liability	$18,503,280,961	$19,153,169,830
Actuarial value of assets	$12,601,679,774	$12,601,679,774
UAAL	$5,901,601,187	$6,551,490,056
Amortization Period	27	28

RETIREE HEALTH CARE PLAN

	Valuation 6/30/2015	Assumption Changes
Employer Contribution Rate:		
Normal Rate	2.72%	2.71%
UAAL	2.79%	3.08%
Total Required Employer Rate	5.51%	5.79%
Actuarial accrued liability	$2,424,513,789	$2,499,575,255
Actuarial value of assets	$408,363,598	$408,363,598
UAAL	$2,016,150,191	$2,091,211,657
Solvency Period	2024	2023
Amortization Period	30	30

Historical June CPI (U) Index

Year	CPI (U)	Year	CPI (U)
1964	31.00	1990	129.90
1965	31.60	1991	136.00
1966	32.40	1992	140.20
1967	33.30	1993	144.40
1968	34.70	1994	148.00
1969	36.60	1995	152.50
1970	38.80	1996	156.70
1971	40.60	1997	160.30
1972	41.70	1998	163.00
1973	44.20	1999	166.20
1974	49.00	2000	172.40
1975	53.60	2001	178.00
1976	56.80	2002	179.90
1977	60.70	2003	183.70
1978	65.20	2004	189.70
1979	72.30	2005	194.50
1980	82.70	2006	202.90
1981	90.60	2007	208.35
1982	97.00	2008	218.82
1983	99.50	2009	215.69
1984	103.70	2010	217.96
1985	107.60	2011	217.97
1986	109.50	2012	225.72
1987	113.50	2013	229.48
1988	118.00	2014	233.50
1989	124.10	2015	238.34

Capital Market Assumptions and Asset Allocation

Rates of Return and Standard Deviation by Asset Class

Asset Class	Real Return	Standard Deviation
US Equity	4.75%	17.00%
International Equity	7.00%	20.00%
Fixed Income	1.50%	3.25%
Multi-Asset Strategies	3.00%	5.00%
Real Assets	5.00%	12.00%
Private Equity	8.00%	21.00%
Cash Equivalents	0.50%	1.75%

Asset Class Correlation Coefficients

	US Equity	Int'l Equity	Fixed Income	Multi-Asset Strategies	Real Assets	Private Equity	Cash Equivalents
US Equity	1.00	0.85	-0.16	0.45	0.12	0.66	0.05
International Equity	0.85	1.00	-0.29	0.58	0.08	0.66	-0.05
Fixed Income	-0.16	-0.29	1.00	0.01	-0.16	-0.22	0.25
Multi-Asset Strategies	0.45	0.58	0.01	1.00	0.13	0.40	0.16
Real Assets	0.12	0.08	-0.16	0.13	1.00	0.32	0.13
Private Equity	0.66	0.66	-0.22	0.40	0.32	1.00	0.19
Cash Equivalents	0.05	-0.05	0.25	0.16	0.13	0.19	1.00

Asset Allocation Targets

Asset Class	Allocation Percentage
US Equity	22.50%
International Equity	22.50%
Fixed Income	19.00%
Real Assets	15.00%
Multi-Asset Strategies	10.00%
Private Equity	10.00%
Cash Equivalents	1.00%

Social Security Administration Wage Index

Year	Wage Index	Annual Increase	Year	Wage Index	Annual Increase
1964	$4,576.32		1990	$21,027.98	4.62%
1965	4,658.72	1.80%	1991	21,811.60	3.73
1966	4,938.36	6.00	1992	22,935.42	5.15
1967	5,213.44	5.57	1993	23,132.67	0.86
1968	5,571.76	6.87	1994	23,753.53	2.68
1969	5,893.76	5.78	1995	24,705.66	4.01
1970	6,186.24	4.96	1996	25,913.90	4.89
1971	6,497.08	5.02	1997	27,426.00	5.84
1972	7,133.80	9.80	1998	28,861.44	5.23
1973	7,580.16	6.26	1999	30,469.84	5.57
1974	8,030.76	5.94	2000	32,154.82	5.53
1975	8,630.92	7.47	2001	32,921.92	2.39
1976	9,226.48	6.90	2002	33,252.09	1.00
1977	9,779.44	5.99	2003	34,064.95	2.44
1978	10,556.03	7.94	2004	35,648.55	4.65
1979	11,479.46	8.75	2005	36,952.94	3.66
1980	12,513.46	9.01	2006	38,651.41	4.60
1981	13,773.10	10.07	2007	40,405.48	4.54
1982	14,531.34	5.51	2008	41,334.97	2.30
1983	15,239.24	4.87	2009	40,711.61	-1.51
1984	16,135.07	5.88	2010	41,673.83	2.36
1985	16,822.51	4.26	2011	42,979.61	3.13
1986	17,321.82	2.97	2012	44,321.67	3.12
1987	18,426.51	6.38	2013	44,888.16	1.28
1988	19,334.04	4.93	2014	46,481.52	3.55
1989	20,099.55	3.96			

Recommended Rates of Withdrawal and Salary Increases

Years of Service	Rates of Withdrawal	Rates of Salary Increases
Less than 1	45.00%	18.20%
1	31.00%	9.25%
2	23.00%	6.75%
3	17.00%	5.75%
4	13.00%	5.00%
5	10.50%	4.75%
6	8.50%	4.50%
7	7.00%	4.25%
8	6.00%	4.00%
9	4.50%	3.75%
10	4.00%	3.50%
11	3.50%	3.50%
12	3.00%	3.50%
13	2.50%	3.50%
14	2.00%	3.50%
15	2.00%	3.50%
16	2.00%	3.50%
17	2.00%	3.50%
18	2.00%	3.50%
19	2.00%	3.50%
20	2.00%	3.50%
21	1.50%	3.50%
22	1.50%	3.50%
23	1.50%	3.50%
24	1.50%	3.50%
25	1.50%	3.50%
26	1.50%	3.50%
27	1.50%	3.50%
28	1.50%	3.50%
29	1.50%	3.50%

Recommended Rates of Retirement

Age	Retirement Eligible prior to 8/1/17				Retirement Eligible after 8/1/17			
	Reduced	Reduced (55/25)	First Eligible Unreduced	Subsequent Unreduced	Reduced	Reduced (60/25)	First Eligible Unreduced	Subsequent Unreduced
45			27%	19%				
46			27%	19%				
47			27%	19%				
48			27%	19%				
49			27%	19%				
50			27%	19%				
51			27%	19%				
52			27%	19%				
53			27%	19%				
54			27%	19%				
55		10%	27%	19%				
56		10%	27%	19%				
57		10%	27%	19%			30%	19%
58		10%	27%	19%			30%	19%
59		10%	27%	19%			30%	19%
60	11%	14%	27%	19%		14%	30%	19%
61	11%	14%	27%	19%		14%	30%	19%
62	11%	14%	27%	19%	11%	14%	30%	19%
63	11%	14%	27%	19%	11%	14%	30%	19%
64	11%	14%	27%	19%	11%	14%	30%	19%
65			25%	19%	11%	14%	30%	19%
66			20%	22%	11%	14%	30%	19%
67			20%	22%			30%	19%
68			20%	22%			30%	22%
69			20%	22%			30%	22%
70			20%	22%			30%	22%
71			20%	22%			30%	22%
72			20%	22%			30%	22%
73			20%	22%			30%	22%
74			20%	22%			30%	22%
75			100%	100%			100%	100%

Recommended Rates of Disability

Age	Rates of Disability		Age	Rates of Disability	
	Male	Females		Male	Females
20	0.020%	0.010%	48	0.371%	0.248%
21	0.024%	0.010%	49	0.391%	0.274%
22	0.027%	0.010%	50	0.411%	0.300%
23	0.031%	0.010%	51	0.435%	0.330%
24	0.034%	0.010%	52	0.459%	0.360%
25	0.038%	0.010%	53	0.482%	0.390%
26	0.044%	0.013%	54	0.506%	0.420%
27	0.050%	0.016%	55	0.530%	0.450%
28	0.056%	0.020%	56	0.542%	0.450%
29	0.062%	0.023%	57	0.554%	0.450%
30	0.068%	0.026%	58	0.566%	0.450%
31	0.079%	0.032%	59	0.578%	0.450%
32	0.090%	0.038%	60	0.590%	0.450%
33	0.101%	0.044%	61	0.582%	0.420%
34	0.111%	0.049%	62	0.574%	0.390%
35	0.122%	0.055%	63	0.566%	0.360%
36	0.140%	0.065%	64	0.558%	0.330%
37	0.158%	0.074%	65	0.550%	0.300%
38	0.176%	0.084%	66	0.500%	0.280%
39	0.194%	0.093%	67	0.450%	0.260%
40	0.212%	0.102%	68	0.400%	0.240%
41	0.232%	0.116%	69	0.350%	0.220%
42	0.252%	0.129%	70	0.300%	0.200%
43	0.272%	0.143%	71	0.300%	0.200%
44	0.292%	0.156%	72	0.300%	0.200%
45	0.311%	0.170%	73	0.300%	0.200%
46	0.331%	0.196%	74	0.300%	0.200%
47	0.351%	0.222%	75	0.300%	0.200%