GRS Gabriel Roeder Smith & Company
Consultants & Actuaries

HOUSTON MUNICIPAL EMPLOYEES PENSION SYSTEM

2015 ACTUARIAL EXPERIENCE STUDY

FOR THE 5-YEAR PERIOD ENDING JUNE 30, 2014

GRS
Gabriel Roeder Smith & Company
Consultants & Actuaries
4600 S. Ulster Street
Suite 700
Denver, CO 80237-2882
303.846.3031 phone
303.846.3028 fax
www.gabrielroeder.com

February 25, 2016

Board of Trustees
Houston Municipal Employees Pension System
1201 Louisiana
Suite 900
Houston, TX 77002

Dear Members of the Board:

Subject: Results of 2015 Experience Study

We are pleased to present our report of the results of the 2015 Experience Study for the Houston Municipal Employees Pension System ("HMEPS" or "the System"). It includes our recommendations for new actuarial assumptions to be effective for the July 1, 2015 actuarial valuation, and it describes the estimated actuarial impact produced by these recommendations as though they had been effective for the July 1, 2014 actuarial valuation.

With the Board's approval of the recommendations in this report, we believe the actuarial condition of the System will be more accurately portrayed. We wish to thank the HMEPS staff for their assistance in providing data for this study.

Sincerely,
Gabriel, Roeder, Smith & Company

Joseph P. Newton, FSA, MAAA
Senior Consultant

Lewis Ward
Consultant

j:\2585\2015\exp\hmepsexpstudy2015.doc

TABLE OF CONTENTS

SECTION I

INTRODUCTION

Introduction

A periodic review and selection of the actuarial assumptions is one of many important components of understanding and managing the financial aspects of the Houston Municipal Employees Pension System ("HMEPS" or "the System"). Assumptions that no longer predict the expected experience of the System can result in understated costs or overstated costs resulting in contribution obligations that are not in line with expectations.

A single set of assumptions is typically not expected to be suitable forever. As the actual experience unfolds or the future expectations change, the assumptions should be reviewed and adjusted accordingly.

It is important to recognize that the impact from various outcomes and the ability to adjust from experience deviating from the assumption are not symmetric. As such, the assumption set used in the valuation process needs to represent the best estimate of the future experience of the System and be at least as likely, if not more than likely, to overestimate the future liabilities versus underestimate them.

Using this strategic mindset, each assumption was analyzed compared to the actual experience of HMEPS and general experience of other public employee retirement systems. Changes in certain assumptions and methods are suggested upon this comparison to remove any bias that may exist and to perhaps add in a slight margin for future adverse experience where appropriate. Next, the assumption set as a whole was analyzed for consistency and to ensure that the projection of liabilities was reasonable and consistent with historical trends.

The following report provides our recommended changes to the current actuarial assumptions.

Summary of Process

In determining liabilities, contribution rates and funding periods for retirement plans, actuaries must make assumptions about the future. Among the assumptions that must be made are:

- Retirement rates
- Mortality rates
- Termination rates
- Disability rates
- Investment return rate
- Salary increase rates
- Inflation rate

For some of these assumptions, such as the termination or retirement rates, past experience provides important evidence about the future. For other assumptions, such as the investment return rate, the relationship between past and future results is much less connected. In either case, though, actuaries

should review their assumptions periodically and determine whether these assumptions are consistent with actual past experience and with future expectation.

In conducting experience studies, actuaries generally use data over a period of several years. This is necessary in order to gather enough data so that the results are statistically significant. In addition, if the study period is too short, the impact of the current economic conditions may lead to misleading results. For example, it is known that the strength of the national and local economy can impact salary increase rates and withdrawal rates. Using results gathered during a short-term boom or bust will not be representative of the long-term economic trends. Also, the adoption of new legislation that impacts benefits or compensation may cause a short-term distortion in the experience. For example, if an early retirement window was opened during the study period, we would usually see a short-term spike in the number of retirements followed by a dearth of retirements for the following two-to-four years. Using a longer period to observe the plan's experience reduces the influence of such short-term effects. On the other hand, using a much longer period may not immediately reflect real changes that may be occurring, such as mortality improvement or a change in the ages at which members retire. In our view, using a four-to six-year period appropriately balances these effects.

This study is generally based on experience during the five-year period of July 1, 2009 to June 30, 2014. The last experience study was prepared in 2010, following completion of the July 1, 2009 actuarial valuation report.

In an experience study, we first determine the number of deaths, retirements, etc. that occurred during the period. Then we determine the number expected to occur, based on the current actuarial assumptions. The number "expected" is determined by using the probability of the occurrence at the given age, times the "exposures" at that same age. For example, let's look at a rate of retirement at age 55. The number of exposures can only be those members who are age 55 and eligible for retirement at that time. Thus they are considered "exposed" to that assumption. Finally we calculate the A/E ratio, where "A" is the actual number (of retirements, for example) and "E" is the expected number. If the current assumptions precisely predicted the actual experience the A/E ratio would be 100%. When it varies much from this figure, it is a sign that new assumptions may be needed. Of course we not only look at the assumptions as a whole, but we also review how well they fit the actual results by sex, age, and service.

Finally, if the data leads the actuary to conclude that new tables are needed, the actuary "graduates" or smoothes the results since the raw results can be quite uneven from age to age or from service year to service year.

Please bear in mind that, while the recommended assumption set represents our best estimate, there are other reasonable assumption sets that could be supported. Some reasonable assumption sets would show higher or lower liabilities or costs.

ORGANIZATION OF REPORT

Section II of this report summarizes our recommended changes. Section III contains our findings and a more detailed analysis of our recommendation for each actuarial assumption. The impact of

adopting our recommendations on liabilities and contribution rates is shown in Section IV. Section V shows a summary of the recommended assumptions. Finally, Section VI presents detailed summaries of the data and comparisons of the A/E ratios.

SECTION VI EXHIBITS

The exhibits in Section VI should generally be self-explanatory. For example, on page 65, we show the exhibit analyzing the select and ultimate termination rates for males with less than 10 years of service. The second column shows the total number of male members who terminated during the study period. This excludes members who died, became disabled or retired. Column (3) shows the total exposures. This is the number of male members who could have terminated during any of the years. In this exhibit, the exposures exclude anyone eligible for retirement. A member is counted in each year they could have terminated, so the total shown is the total exposures for the study period. Column (4) shows the probability of termination based on the raw data. That is, it is the result of dividing the actual number of terminations (col. 2) by the number exposed (col. 3). Column (5) shows the current termination rate and column (6) shows the new recommended termination rate. Columns (7) and (8) show the expected numbers of terminations based on the current and proposed termination assumptions.

SECTION II

SUMMARY OF RECOMMENDATIONS

Summary of Recommendations

Our recommended changes to the current actuarial assumptions may be summarized as follows:

Economic Assumptions

1. Reduce the inflation assumption from 3.00% to 2.50%. The current assumption is higher than the long term historical average, the recent historical average, and most sources of future expectations. Lowering the assumption to 2.50% will put the assumption closer to recent inflation levels and closer to the levels expected in the bond market. This will have an impact on the investment return assumption and on wage growth.

2. We recommend no change to the current investment net real return assumption of 5.50% (see discussion below about administrative expenses). Based on a blending of the current capital market assumptions from seven independent sources, the System's target asset allocation, and adjusting for a 15-20 year timeframe, a 5.50% real return is within a reasonable range of expectation.

3. Based on the combination of (1) and (2), reduce the nominal investment return from 8.50% to 8.00%.

4. The current 8.50% assumption is based on earning the 8.50%, net of all investment *and* administrative expenses. This actually equates to a gross assumption in excess of 8.50%. We recommend adding an explicit charge for administrative expenses instead of netting the expenses against the investment return assumption by assuming administrative expenses will be 1.19% of covered payroll, and adding this expense to the contribution rate. This will mimic the approach used in determining the investment return assumption under the accounting rules so that one investment return assumption can be used for each purpose.

5. We recommend increasing the real wage growth assumption from 0.00% to 0.50% above inflation.

6. We recommend increasing the ultimate merit assumption for long-service employees to 0.75%. This means we will assume members with more than 25 years of service will receive increases equal to 3.25% per year which is a net increase of 0.25% compared to the current assumption set. This recommendation reflects a reduction in inflation but the normalization of salary increases for the HMEPS population which historically had been behind the overall economy.

7. In accordance with the observed experience, we are recommending decreasing most of the service-based promotional/longevity components of the salary scale. The net impact of (6) and (7) is almost no change to the aggregate projected salary increases of the current covered employees.

8. We recommend leaving the payroll growth assumption at 3.00%, equal to the general wage growth assumption. The payroll growth assumption has no impact on the liabilities. This assumption is used to determine the contribution rate necessary to amortize the System's UAAL over the period specified in the Board's funding policy.

9. We recommend increasing the interest crediting rate on DROP accounts from 4.25% to 4.65%. This change reflects the new 8% investment return assumption and the impact of volatility and the minimum and maximum crediting rates.

Mortality Assumptions

10. Update the post-retirement mortality tables for non-disabled retirees to the RP-2000 generational mortality tables with blue collar adjustment, adjusted to partially reflect some of the Plan's experience. In addition, project future improvements in longevity using Scale BB. Because of this assumption of continuous improvement, life expectancies for today's younger active members are expected to be materially longer than those of today's retirees, and this has a significant impact on costs and liabilities.

11. Update the disabled post-retirement mortality assumption to be the same table as used for the healthy annuitants, except there will be a five year set-forward, meaning a disabled member age 70 will be valued as if they were a 75-year-old healthy retiree. In addition, add an additional provision to apply a minimum mortality probability of 4% for males and 3% for females to reflect additional impairment for this population.

12. For pre-retirement mortality tables, reduce the multiplier applied to the general tables from 110% to 90% for males and 95% to 80% for females.

Other Demographic Assumptions

13. We recommend no adjustments to the termination patterns expect for small adjustments for males with more than 10 years of service.

14. We recommend small reductions to the retirement patterns for members consistent with experience and future expectations.

15. We recommend small adjustments to the disability patterns for members consistent with experience and future expectations.

16. We recommend increasing the retiree DROP balance payout period from 6 years to 8 years.

17. We recommend no change to the current marriage assumption and spousal age difference.

Actuarial Methods and Policies

18. We recommend no change to the current process of estimating the valuation payroll for the upcoming fiscal year.

19. We recommend no change to the current asset smoothing method or the smoothing period.

20. We recommend no change to the current funding method. The Entry Age Normal cost method (EAN) is the current funding method being used to allocate the actuarial costs of the System. The Entry Age Normal method will generally produce relatively level contribution amounts as a percentage of payroll from year to year, and allocates costs among various generations of taxpayers in a reasonable manner. It is by far the most commonly used actuarial cost method for large public retirement systems. In addition, we recommend continued use of the Ultimate Normal Cost variant of EAN because it produces a funding requirement as a percentage of payroll that is the most stable and predictable over time compared to all other funding methods and variants.

- ***Impact of all recommended changes:***

Item	2014 Valuation	Recommended Assumptions
(1)	(2)	(3)
Total Normal Cost %	5.85%	6.87%
Unfunded Actuarial Accrued Liability ($ in Millions)	$1,798	$2,091
Funded Ratio	58.1%	54.4%
30 Year ARC	27.38%	32.09%*

*For recommended assumptions, 30-year contribution rate includes addition of 1.19% of pay for administrative expenses

SECTION III

ANALYSIS OF EXPERIENCE AND RECOMMENDATIONS

Analysis of Experience and Recommendations

We will begin by covering the economic assumptions: inflation, investment return rate, salary increase assumption, cost-of-living increases, and the payroll growth rate. Next, we will discuss the demographic assumptions: mortality, disability, termination and retirement. Finally, we will discuss the actuarial methods used to calculate the liability, funded status, and contribution rate.

ECONOMIC ASSUMPTIONS

Actuarial Standards of Practice (ASOP) No. 27, Selection of Economic Assumptions for Measuring Pension Obligations, provides guidance to actuaries giving advice on selecting economic assumptions for measuring obligations for defined benefit plans. ASOP No. 27 was revised by the Actuarial Standards Board and effective for actuarial work products with a measurement date on and after September 30, 2014.

As no one knows what the future holds, it is necessary for an actuary to estimate possible future economic outcomes. Recognizing that there is not one right answer, the current standard calls for an actuary to develop a reasonable economic assumption. A reasonable assumption is one that is appropriate for the purpose of the measurement, reflects the actuary's professional judgment, takes into account historical and current economic data that is relevant as of the measurement date, is an estimate of future experience; an observation of market data; or a combination thereof, and has no significant bias except when provisions for adverse deviation or plan provisions that are difficult to measure are included. However, the standard explicitly advises an actuary not to give undue weight to recent experience.

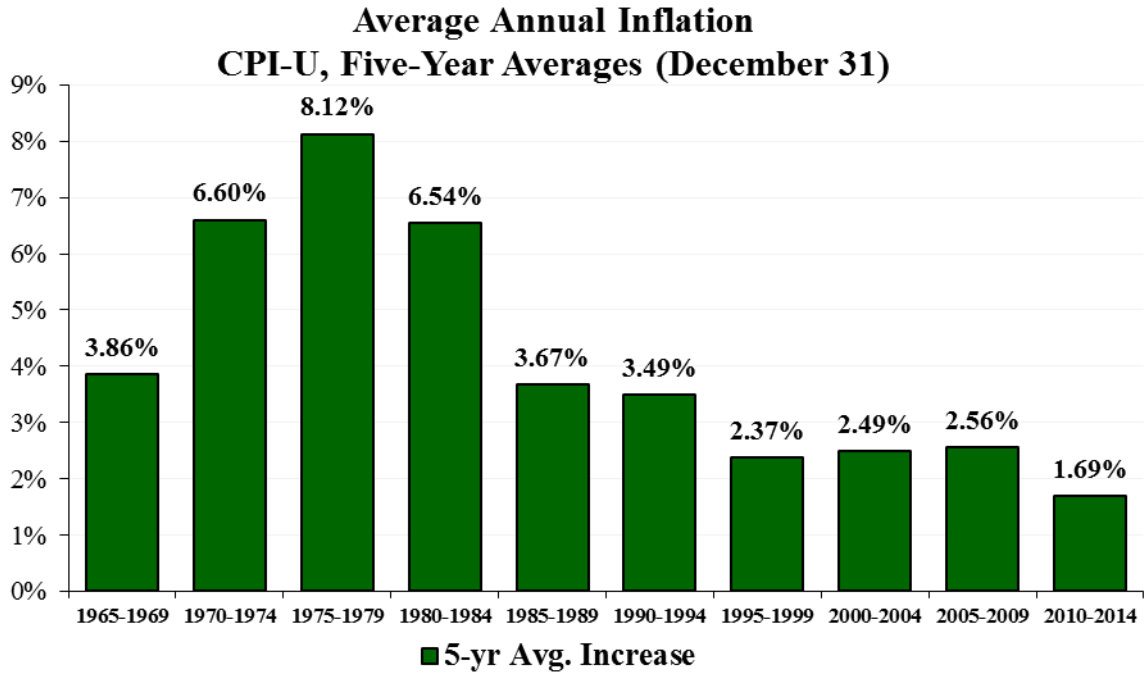
Each economic assumption should individually satisfy this standard. Furthermore, with respect to any particular valuation, each economic assumption should be consistent with every other economic assumption over the measurement period. Generally, the economic assumptions are much more subjective in nature than the demographic assumptions.

INFLATION ASSUMPTION

By "inflation," we mean price inflation, as measured by annual increases in the Consumer Price Index (CPI). This inflation assumption underlies most of the other economic assumptions, including the investment return, salary increases, and payroll growth rate. The current annual inflation assumption is 3.00%.

Actual Change in CPI-U

The chart below shows the average annual inflation, as measured by the increase in the Consumer Price Index (CPI-U) in each of the ten consecutive five-year periods over the last fifty years.



Source: Bureau of Labor Statistics, CPI-U, all items, not seasonally adjusted, Calendar Years

The table below shows the average inflation over various periods, ending December 2014.

Periods Ending Dec. 2014	Average Annual Increase in CPI-U
Last five (5) years	1.69%
Last ten (10) years	2.12%
Last fifteen (15) years	2.25%
Last twenty (20) years	2.28%
Last twenty-five (25) years	2.52%
Last thirty (30) years	2.71%
Since 1913 (first available year)	3.17%

Source: Bureau of Labor Statistics, CPI-U, all items, not seasonally adjusted

Forecasts from Investment Consulting Firms

Most of the investment consulting firms forecast inflation when setting their capital market assumptions. All of the investment consulting firms in our survey, in setting their capital market assumptions, currently assume that inflation will be 2.50% or less. We examined the 2015 capital market assumption sets for seven investment consulting firms: BNY Mellon, Hewitt EnnisKnupp, JP Morgan, Mercer Consulting, Pension Consulting Alliance (PCA), New England Pension Consulting (NEPC), and RV Kuhns. The average assumption for inflation was 2.30%, with a range of 2.11% to 2.50%.

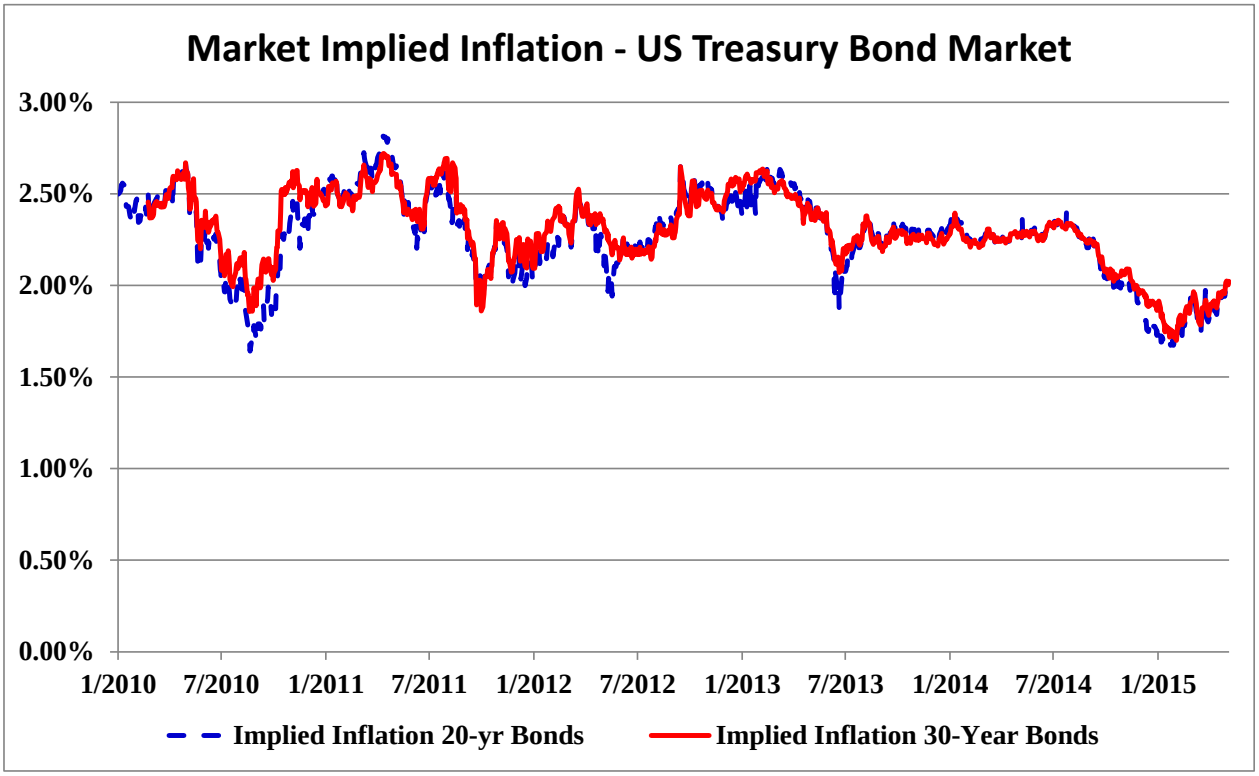
Forecasts from Social Security Administration

In the Social Security Administration's 2014 Trustees Report, the Office of the Chief Actuary is projecting a long-term average annual inflation rate of 2.70% under the intermediate cost assumption. (The low cost assumption was 1.80% and the high cost assumption was 3.80%). The Chief Actuary for the Social Security Administration reduced the intermediate cost assumption by 0.10% from the prior year and narrowed the low cost and high cost scenarios to 2.0% and 3.4%, respectively.

Expectations Implied in the Bond Market

Another source of information about future inflation is the market for U.S. Treasury bonds. The December 31, 2014 yield for a 20-year inflation indexed Treasury bond (20-year TIPS) was 0.68% plus actual inflation. The yield for a 20-year non-indexed U.S. Treasury bond was 2.47%. This means the bond market was predicting that inflation over the next twenty years would average 1.78% = [(1 + 2.47%) / (1 + 0.68%) - 1] per year.

The chart on the following page shows the historical market implied inflation from January 1, 2010 through May 5, 2015.



As the chart shows, the bond market is predicting that average inflation for the years 20 through 30 will not be materially different than the average rate of inflation for the first 20 year period. The chart also shows that this measure can have short-term volatility, and implied inflation has noticeably decreased since July 2014.

Survey of Professional Forecasters

The Philadelphia Federal Reserve conducts a quarterly survey of the Society of Professional Forecasters. Their most recent forecast (first quarter of 2015) predicts inflation over the next ten years (2015 to 2024) will average 2.1% per year. The survey forecasts have also remained relatively stable over the last few years.

Based on this historical and forward looking analysis, we recommend lowering this assumption from 3.00% to 2.50%.

INVESTMENT AND ADMINISTRATIVE EXPENSES

Since the trust fund pays expenses in addition to member benefits and refunds, we must make some assumption about these. Almost all actuaries treat investment expenses as an offset to the investment return assumption. That is, the investment return assumption represents expected return after payment of investment expenses.

In regards to investment expenses, investment consulting firms periodically issue reports that describe their capital market assumptions. The estimates for core investments (i.e., fixed income, equities, and real estate) are generally based on anticipated returns produced by passive index funds that are net of investment related fees. The investment return expectations for the alternative asset class such as private equity and hedge funds are also net of investment expenses. Therefore, we did not make any adjustments to account for investment related expenses. Some of the Retirement Systems may also employ active management investment strategies that result in higher investment expenses compared to strategies that invest in passive index funds. We have assumed that active management strategies would result in the same returns, net of investment expenses, as passive management strategies.

On the other hand, there is a divergence of practice on the handling of administrative expenses. Some actuaries make an assumption that administrative expenses will be some fixed or increasing dollar amount. Others assume that the administrative expenses will be some percentage of the plan's actuarial liabilities or normal cost. And others treat administrative expenses like investment expenses, as an offset to the investment return assumption. For HMEPS, the practice has been to set the investment return assumption as the net return after payment of both investment and administrative expenses. However, the new accounting standards require administrative expenses to be separately accounted for, to produce an investment return assumption that is net of investment expenses, but not administrative expenses. To be consistent with this, we are recommending a change to our approach. The new approach would be to explicitly charge the administrative expenses as a percentage of payroll as an add-on to the normal cost. By changing our methodology for the funding valuation, we will be able to use the same investment return assumption and process for funding and accounting purposes. It will also reduce the burden placed on the investment return for funding future benefits.

In Fiscal Year 2014, the administrative expenses shown in the financial statements were $6.4 million. Compared to the actual fiscal year payroll of $541.2 million suggests the administrative expense was approximately 1.19% of payroll.

We are recommending an administrative load be added to the contribution rate in the funding calculations. Our recommendation is that an assumption be made for the upcoming 5-year period that the administrative expenses will be equal to 1.19% of payroll. This assumption would then be reviewed at each experience study. Because of recent changes in the description of administrative expenses versus investment expenses, we only used the prior fiscal year's actual administrative expenses divided by the prior fiscal year's actual payroll (1.19% of pay for fiscal year 2014) to determine the assumption for the upcoming 5-year period. It is anticipated that in future studies the average or trend of the prior five-year study period will be used.

INVESTMENT RETURN RATE

Currently, HMEPS assumes an annual investment return rate of 8.50%, net of investment and administrative expenses. This is the rate used in discounting future benefit payments in calculating the actuarial present value of benefits as of the valuation date. The current assumption assumes inflation of 3.00% per annum and an annual real rate of return of 5.50%, net of

expenses. So far, we have addressed the inflation assumption and the treatment of expenses. The following discusses the 5.50% real return assumption.

We believe a more appropriate approach to selecting an investment return assumption is to determine the expected portfolio returns, given the fund's targeted allocation and an overall set of capital market assumptions. We looked at the expected real rates of return for the HMEPS portfolio using investment consultants' capital market assumptions.

The following is the fund's current target asset allocation:

Asset Class	Target Allocation
(1)	(2)
Global Equity	35.0%
Private Equity	17.5%
Core Fixed Income	7.5%
High Yield Bonds	7.5%
Real Estate	10.0%
Absolute Return	10.0%
Inflation Linked Assets	12.5%

Because GRS is a benefits consulting firm and does not develop or maintain our own capital market assumptions, we utilized the forward-looking return expectations developed by the following investment consulting firms:

- BNY Mellon
- JP Morgan
- Mercer Consulting
- RV Kuhns
- Hewitt EnnisKnupp
- New England Pension Consultants (NEPC)
- Pension Consulting Alliance (PCA)

These investment consulting firms periodically issue reports that describe their capital market assumptions: that is, their estimates of expected returns, volatility, and correlations. While these assumptions are developed based upon historical analysis, many of these firms also incorporate forward-looking adjustments to better reflect near-term expectations.

When an analysis is performed to determine historical investment performance, calculating an average return based on a geometric basis is more appropriate for measuring the accumulation of wealth because it takes into account the return volatility (a.k.a. volatility drag). However, forecasting returns using a geometric average measure will generally result in a downward biased measure, especially when used as it is in an actuarial valuation to estimate a future value of wealth. On the other hand, forecasting a return using a measure based on an arithmetic average tends to have an upward bias in forward-looking estimates. The following is the synopsis from a 2003 article on this subject in the Financial Analysts Journal:

An unbiased forecast of the terminal value of a portfolio requires compounding of its initial value at its arithmetic mean return for the length of the investment period. Compounding at the arithmetic average historical return, however, results in an upwardly biased forecast. This bias does not necessarily disappear even if the sample average return is itself an unbiased estimator of the true mean, the average is computed from a long data series, and returns are generated according to a stable distribution. In contrast, forecasts obtained by compounding at the geometric average will generally be biased downward. The biases are empirically significant. For investment horizons of 40 years, the difference in forecasts of cumulative performance can easily exceed a factor of 2. And the percentage difference in forecasts grows with the investment horizon, as well as with the imprecision in the estimate of the mean return. For typical investment horizons, the proper compounding rate is in between the arithmetic and geometric values.

Geometric or Arithmetic Mean: A Reconsideration ©2003, Eric Jacquier, Alex Kane, and Alan J. Marcus

Because of these effects, we recommend developing a single best point estimate that is somewhere between these two averages.

Given the plan's current asset allocation and the investment consultant's capital market assumptions, the development of the average nominal return, net of investment expenses, is provided in the following tables. The table on the following page shows the expected nominal return (arithmetic average) for HMEPS using each of the investment consulting firm's capital market assumptions. The forward-looking return expectations were mapped to the target asset class allocation.

Expected Nominal Arithmetic Return for HMEPS Based on Short-Term Capital Market Assumptions
(Return Expectations for the Next 7 to 10 Years)

Investment Consultant	Investment Consultant Expected Net Nominal Return	Investment Consultant Inflation Assumption	Expected Real Return (2)–(3)	Actuary Inflation Assumption	Expected Nominal Return Net of Expenses (4)+(5)*		Standard Deviation of Expected Return (1-Year)
(1)	(2)	(3)	(4)	(5)	(6)		(7)
1	7.45%	2.50%	4.95%	2.50%	7.45%		12.00%
2	7.51%	2.50%	5.01%	2.50%	7.51%		13.90%
3	7.35%	2.20%	5.15%	2.50%	7.65%		12.10%
4	7.44%	2.26%	5.18%	2.50%	7.68%		11.90%
5	7.61%	2.11%	5.51%	2.50%	8.01%		12.50%
6	7.83%	1.87%	5.95%	2.50%	8.45%		14.00%
7	8.81%	2.20%	6.61%	2.50%	9.11%		13.40%
Average	**7.71%**	**2.23%**	**5.48%**	**2.50%**	**7.98%**		**12.83%**

Note: The expected nominal return assumption is based on the arithmetic average.

*It is assumed that active management will generate sufficient alpha to pay for any investment expenses associated with active management and the net impact will be neither positive nor negative to the System, Therefore, no additional investment expenses are assumed.

As can be seen from the previous Table, based on the 2015 capital market assumptions for investment consultant #3, the annual expected rate of return is 7.35%. Based on their inflation assumption of 2.20%, this implies an expected net real return of 5.15%. Adding the plan's 2.50% inflation assumption gives a nominal expected return for HMEPS of 7.65%. The overall 7.98% is the arithmetic average of the seven investment consultants.

In addition to examining the expected one-year return, it is important to review anticipated volatility of the investment portfolio and to understand the range of net returns that could be produced by the investment portfolio. Therefore, the table below provides the 40th, 50th, and 60th percentiles of the 10-year geometric average of the expected nominal return, net of expenses, as well as the probability of exceeding the 8.00% assumption.

Expected Annual Geometric Returns and Return Probabilities
(Based on Short-Term Capital Market Assumptions)

Investment Consultant	Distribution of 20-Year Average Geometric Net Nominal Return			Probability of exceeding
	40th	50th	60th	8.00%
(1)	(2)	(3)	(4)	(5)
1	6.10%	6.77%	7.45%	32.3%
2	5.82%	6.60%	7.38%	32.5%
3	6.27%	6.95%	7.64%	34.9%
4	6.34%	7.01%	7.68%	35.5%
5	6.58%	7.28%	7.98%	39.7%
6	6.77%	7.55%	8.33%	44.2%
7	7.52%	8.27%	9.03%	53.7%
Average	**6.49%**	**7.20%**	**7.93%**	**39.0%**

However, the capital market assumptions provided by the investment consultants and used in the analysis above are based on a 7-10 year investment horizon. Investment consultants develop their forecast assumptions with this time horizon in part because most pension investment management teams use this time period for developing and monitoring their investment strategies.

On the other hand, the investment return assumption used in the actuarial valuation has a much longer investment horizon. Therefore, it may be necessary to identify and reflect differences in the economy and financial markets over the short-term and long-term time horizons.

Expected investment returns can be thought of as the sum of a risk-free rate of return and a risk premium. This is the fundamental premise in the Capital Asset Pricing Model (CAPM) that is used in Modern Portfolio Theory. Riskier investments have a higher risk premium to

compensate the investor for the increased uncertainty. Generally, the risk premium for each asset class is constant over long periods of time. But there can be differences in the risk-free return, depending on the investor's time horizon. We define a risk-free investment as one where the expected return is known with absolute certainty. This also means that the risk-free investment has no default and reinvestment risk. Based on this definition, we believe it is reasonable to benchmark a risk-free rate using zero coupon U.S. Treasury securities. Thus a 10-year risk-free rate is equal to the current yield of a 10-year zero coupon US Treasury bond, and a 16-year zero coupon U.S. Treasury bond is the risk-free rate for a 16-year time horizon. For the longer-term point, we have chosen the 16-year yield because it is close to an approximation of the duration of the liabilities of the System, meaning the average, interest-discounted benefit payment is expected to be paid 16 years form the valuation date (assuming an open group). As of June 3, 2015, the yields of the 10-year and 16-year zero coupon Treasury bonds were 2.42% and 2.83%, respectively. Therefore, it is reasonable to assume that as the investment time horizon expands from 10 years to 16 years, the risk free rate of return and corresponding expected nominal return on the portfolios would be 0.41% higher over the longer, 16-year time horizon.

Adding 0.41% to the 7.20% geometric return from the previous page produces a longer term expected geometric average of 7.61%.

Two investment consulting firms, Hewitt EnnisKnupp and NEPC, develop capital market assumptions with a 30-year investment horizon. Both showed an increase which approximates to the 0.40% additional allowance for time from above.

Based on this analysis, we recommend that HMEPS lower its investment return assumption to at least 8.00%, which is comprised of a 5.50% real return net of investment expenses and a 2.50% inflation assumption. While 8.00% is at the very top end of the reasonable range, current capital market expectations are historically low (and volatile) and HMEPS has historically produced alpha above the benchmarks. However, for illustration, we have also provided the results based on a 7.75% return assumption in Section V, which is closer to the geometric mean return.

SALARY INCREASE RATES

The current salary increase assumption is a service related table that begins with 6.00% annual increases for new members decreasing to 3.00% annual increases for members with 25 or more years of service.

The current assumption is composed of inflation plus an additional component based on the service of an individual. This type of assumption typically has a productivity component as well, which is an additional assumed increase above inflation applicable to all members (real wage growth). Currently, this component is 0.00%, meaning the expected overall increase in the salary schedule is equal to inflation (3.00%).

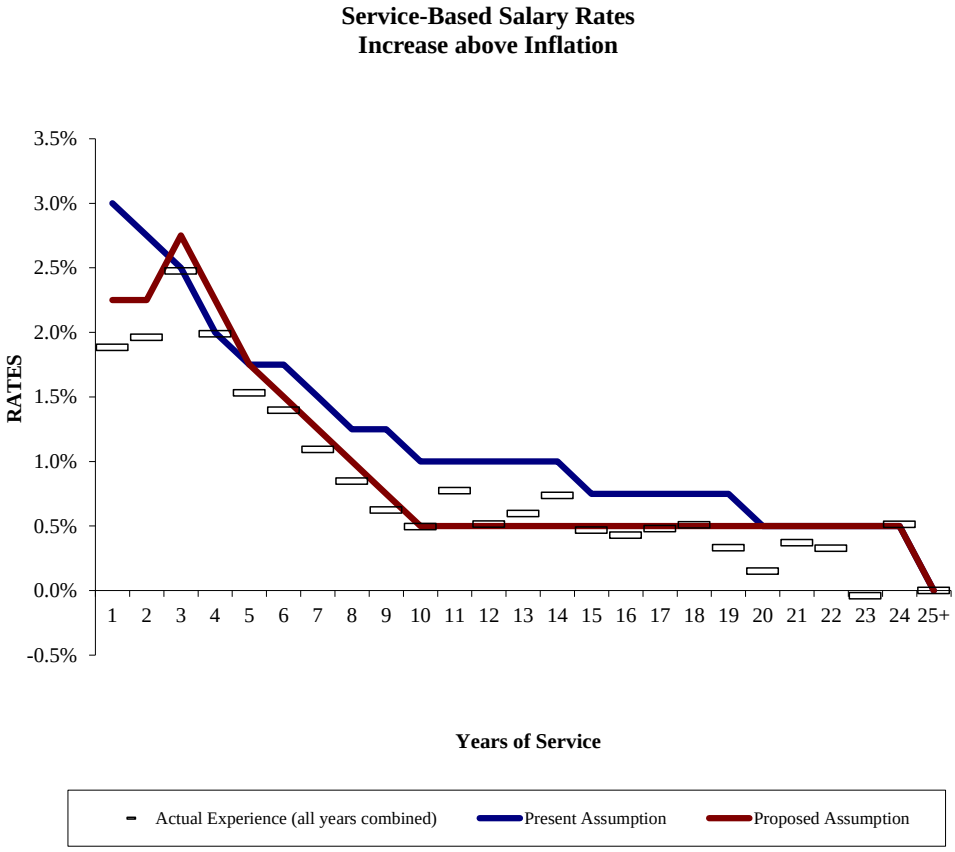
The average pay increases for members who are active in both valuations with more than one year of service are as follows:

Time Period	Compensation Increase	Inflation
FY 2000 to FY 2001	3.50%	3.73%
FY 2001 to FY 2002	0.39%	3.25%
FY 2002 to FY 2003	0.78%	1.07%
FY 2003 to FY 2004	4.18%	2.11%
FY 2004 to FY 2005	2.79%	3.02%
FY 2005 to FY 2006	4.31%	3.89%
FY 2006 to FY 2007	5.16%	2.44%
FY 2007 to FY 2008	7.10%	3.98%
FY 2008 to FY 2009	7.37%	0.75%
FY 2009 to FY 2010	5.52%	1.25%
FY 2010 to FY 2011	3.83%	2.21%
FY 2011 to FY 2012	4.07%	2.74%
FY 2012 to FY 2013	3.15%	1.71%
FY 2013 to FY 2014	3.10%	1.57%
Average – All Years	**3.95%**	**2.41%**
Average – FY 2010 – FY 2014	**3.93%**	**1.90%**

Looking at the productivity component alone, we segregated out members with more than 25 years of service. These members should be past the promotional and step portions of their careers and therefore, we expect them to only receive the general increases granted. The actual productivity increase during the last ten year period was 1.36%, above the assumed 0.00%. However, we believe the increase granted during the first few years of the period were more of "catch up" increases and not a change in the long term expectations because the productivity over the last four years has been 0.77% which is closer to national trends. We are recommending an increase in this assumption to 0.75% above inflation. This is consistent with national trends and current aggregate wage expectations.

However, we are recommending that the assumed increases during the step-rate/promotional period be shifted downward to match the experience over the last ten years. The overall impact of these changes will result in minimal impact to the liabilities due to the changes in overall salary scales.

The following page provides an exhibit with the increases above the inflation assumption (under the current assumption), the actual experience, and the new proposed assumption.



Based on the proposed schedule, the average cumulative increase (including inflation) from hire to year twenty-five will increase 0.01% from 4.32% to 4.33%.

In summary, we are recommending a decrease in the inflation and step-rate/promotional salary increase assumption and an increase to the productivity component. These combined changes will have minimal impact on the liabilities and the contribution requirements.

PAYROLL GROWTH RATE

The salary increase rates discussed above are assumptions applied to individuals. They are used in projecting future benefits. We also use a separate payroll growth assumption, which is currently 3.00% per year, in determining the contribution needed to amortize the unfunded actuarial accrued liability. The amortization payments are calculated to be a level percentage of payroll, therefore, as payroll increases over time, so do the amortization payments. The amortization percentage is dependent on the rate at which payroll is assumed to increase.

Payroll often grows at a rate different from the average pay increases for individual members. Reasons include when older, longer-service members leave employment they are generally replaced with new members who are starting with a lower salary. Because of this, in most populations that

are not growing in size, the growth in total payroll will be smaller than the average pay increase for members. On the other hand, payroll can grow due to an increase in the size of the group.

Another way to estimate this assumption is to produce an open projection assuming reasonable increases in the pay of new members. Theoretically, over the long term, the total payroll for a population of constant size should grow at about the rate that starting pays for new hires increase. These amounts will generally rise with inflation, plus some adjustment for the excess of wage inflation over price inflation, plus an industry-specific adjustment that is commonly applied.

In our study, we have performed open group projections that show payroll will grow on a long term basis equal to our wage inflation assumption of 3.00%. Based on those projections, overall payroll should grow relatively close to the 3.00% baseline assumption.

Given the above results of the expected future patterns, we are recommending no change to the current assumption of 3.00%.

DEMOGRAPHIC ASSUMPTIONS

Actuaries are guided by the Actuarial Standards of Practice (ASOP) adopted by the Actuarial Standards Board (ASB). One of these standards is ASOP No. 35, *Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations*. This standard provides guidance to actuaries giving advice on selecting noneconomic assumptions for measuring obligations under defined benefit plans. We believe the recommended assumptions in this report were developed in compliance with this standard.

POST-RETIREMENT MORTALITY RATES

The longer retirees live and receive their benefits, the larger the liability of the plan, thus increasing the contributions necessary to fund the plan.

The issue of future mortality improvement is one that the governing bodies of our profession have increasingly become more focused on studying and ensuring that the actuarial profession remains on the forefront of this issue. This has resulted in recent changes to the relevant Actuarial Standard of Practice, ASOP 35, and published practice notes. This ASOP now requires pension actuaries to make and disclose an assumption as to expected mortality improvement after the valuation date.

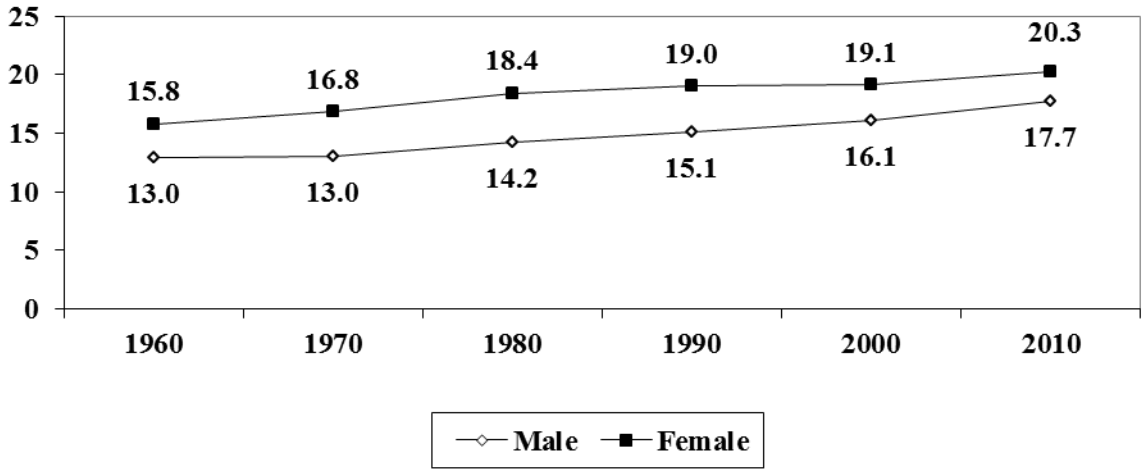
To meet this standard, a recent trend in actuarial models is to use mortality tables that explicitly incorporate projected mortality improvements over time. This type of table (or series of tables) is called "generational mortality." Historically, actuarial models have been constrained to static mortality tables due to two primary reasons: (1) a general belief that there was a limit on the ultimate longevity and (2) the added complexity of a generational mortality type model and limitations in computational power. A static mortality table would be used and updated with each experience study to reflect the most recent mortality. Historically, this would almost always result

in adoption of lower mortality rates increasing the plan's normal cost and creating unfunded past service liabilities.

With advances in computing power, it has become a more mainstream practice to incorporate generational mortality models. The idea behind adopting a generational mortality model is to avoid the experience study "correction" factor. While minor adjustments may need to be made in the future, the constant bias towards needing to reduce mortality rates is avoided.

The expectation of continued increases in longevity is supported by national trends. The following graph provides the expected remaining lifetime in years for a 65 year old retiree measured beginning in 1960. Notice the recent uptrend in female longevity after almost two decades of relatively minimal improvement. This significant change in pattern (most of which has occurred since 2004) has led most of the actuarial profession to agree that future improvements will likely continue.

Life Expectancy in Years, Current Age 65



National Vital Statistics Reports, Vol 58, No 21, June 2010
National Vital Statistics Reports, Vol 60, No 4, January 2011

Based on the recent strengthening of the Standards of Practice, GRS has been increasingly recommending our clients use a fully generational approach for mortality assumptions. By doing this, future mortality rates will be projected to continually decrease each year. Therefore, the life expectancy at age 60 for someone reaching 60 now will not be as long as the life expectancy for someone reaching 60 in 2020, and their life expectancy will not be as long as someone reaching 60 in 2040, etc. The following table provides the life expectancy for individuals retiring in future years, based on the Retirement Pensioners 2000 mortality table (RP-2000) with full generational projection using the Society of Actuaries mortality improvement scale BB.

Proposed Life Expectancy for an Age 60 Retiree in Years					
Gender	**Year of Retirement**				
	2010	2015	2020	2025	2030
Male	23.1	23.7	24.3	24.8	25.4
Female	26.4	26.9	27.4	27.9	28.4

Because of this assumption of continuous improvement, life expectancies for today's younger active members are expected to be materially longer than those of today's retirees. By utilizing generational mortality, the improvement over time is built into the contributions for individual members.

The mortality table currently being used for non-disabled retirees and beneficiaries is the 2000 Retirement Pensioners "static" mortality table (RP-2000), with a scalar applied to better reflect anticipated experience. The table has separate rates for males and females.

When choosing an appropriate mortality assumption, actuaries typically begin with standard mortality tables, unlike when choosing other demographic assumptions. They may choose to adjust these standard mortality tables, however, to reflect various characteristics of the covered group, and to provide for expectations of future mortality improvement (both up to and after the measurement date). If the plan population has sufficient credibility to justify its own mortality table, then the use of such a table also could be appropriate. Factors that may be considered in selecting and/or adjusting a mortality table include the demographics of the covered group, the size of the group and the statistical credibility of its experience, and future mortality improvement.

For this analysis, we compared the results of this analysis to the results of a recent study for a large municipal agent multiple employer plan (the Texas Municipal Retirement System) that covers a large number of municipal employees in the State of Texas. We believe the underlying base table developed in the TMRS experience study is the most relevant table to use for HMEPS.

We first measured the credibility of the dataset to determine whether the standard, unadjusted tables should be used or if statistical analysis of HMEPS specific data was warranted. Based on an example shown in a practice note issued by the American Academy of Actuaries in the fall of 2011, a dataset needs 96 expected deaths for each gender to be declared fully credible with 95% confidence. Other sources state higher requirements, such as 1,000 deaths per gender, if higher levels of confidence or a tighter range are desired. Based on the number of deaths in this analysis (757 for males and 321 for females), we have used the data as if it is mostly credible, but not 100%.

For both genders, the number of deaths fell outside of 1 standard deviation of the number of deaths that would have been expected using the assumptions recently adopted by that large system thus there is statistical and intuitive evidence that the population of HMEPS has lower life expectancies than the population of TMRS.

This is not unexpected. While the regional of the mortality rates are factored in by using the TMRS mortality assumptions, other factors such as demographics of the work force, and the high urbanization of the workforce are both factors that would be expected to produce the higher mortality rates that we see in the actual experience. Another factor is the socio-economic status of the workforce. The average salary for the TMRS employees is 15% - 20% higher than the average salary for City of Houston employees. There is well documented data that shows that retirees with higher incomes have lower mortality rates than similarly situated retirees with lower incomes.

Thus we are recommending use of the same underlying table as used for TMRS, the RP-2000 Combined Healthy Mortality Table with Blue Collar Adjustment for males and females, with the male rates increased by 109% and the female rates increased by 103%, with full generational mortality projections by Scale BB. However, because of the statistical variance, we are adding further scalar multipliers to use 125% of the base table for males and 112% for females. These assumptions create an A/E ratio of 105% for males and 111% for females, so only partial credibility was applied.

DISABLED MORTALITY RATES

The current mortality assumption used for members who have qualified for disability benefits is the 1983 Railroad Retirement Board Disabled Life Table.

There were 71 deaths among the male disabled retirees, and 29 deaths among the female disabled retirees during the last four years. The sample size of this group makes the A/E ratios unreliable as an analytical tool. We instead recommend a change in this assumption to a methodology commonly used for disabled mortality which is to set the healthy mortality rates forward to reflect impairment. We recommend a 5 year set-forward for use in the HMEPS valuation. This means a 70 year old disabled member will have the same mortality rate as a 75 year old healthy member. In addition, we will apply a minimum 4% mortality rate for males and a 3% mortality rate for females to reflect material impairment at earlier ages.

ACTIVE MORTALITY RATES

Mortality across employee groups is generally lower than the mortality rates in the post-retirement mortality tables. It should be noted that this is probably the least material of all of the assumptions.

There were 94 actual deaths during the observation period, while there were 157 expected to occur. This produced an A/E ratio of 60%. Although the number of deaths is not large enough for the results to have significant credibility, we are recommending a change to the assumption to reflect continued anticipated improvement in mortality experience. Specifically, we recommend that the

rates be lowered. Comparing the recommended assumption to actual experience during the observation period increases the A/E ratio from 60% to 74%.

DISABILITY RATES

There were 35 and 17 disabilities among the male and female employees respectively, during the study period. Because most members that become disabled are also eligible to immediately commence retirement benefits, the majority of the members becoming disabled elect to retire rather than apply for disability. Even though the current rates of disability incidence are relatively small, we recommend the Board adopt a slightly updated assumption to better match experience. See the statistical tables on pages 59-62 for more detail of the experience and proposed changes.

RETIREMENT RATES

The valuation currently uses retirement rates that vary by age. There were 884 males and 635 females that retired during the observation period. This only includes members who retired from active status, not who were inactive for over a year before retiring. Based on current assumptions, the analysis shows A/E ratios of 75% and 80% respectively, meaning fewer members retired than expected during the period.

This is consistent with trends across the country as baby-boomers are delaying their retirement to later ages. Similar to our observations with other systems, we believe some of the decrease in retirements from HMEPS is also due to this changing trend. Therefore, we are recommending to slightly reduce the current retirement rates, especially at the earlier eligibility ages.

A/E ratios of less than 100% are conservative, and therefore the newly recommended retirement rates will continue to have an A/E ratio that is less than 100% when compared to prior experience.

Please note that there is not yet any credible experience for Group D members currently eligible to retire. Since there is not any experience to utilize as a starting point to separately set retirement assumptions for this group, the retirement rates for these members will continue to be established using only forward looking expectations. We have recommended no change to these assumptions.

Please note, these recommended changes will slightly decrease the plan's liability and contribution requirements.

TERMINATION RATES

Termination rates reflect members who leave for any reason other than death, disability or service retirement. They apply whether the termination is voluntary or involuntary, and whether the member takes a refund or keeps his/her contributions on deposit in the system. The current termination rates reflect the member's age, service and sex, and we want to continue this practice.

For this analysis, we used 10 years' worth of data to capture a longer economic cycle. For members with less than 10 years of service, the current assumptions produce an A/E ratio for males of 101% and an A/E ratio for females of 98%. This shows the assumptions to closely match the experience and thus we recommend no change.

For members with more than 10 years of service, the current assumptions produce an A/E ratio for males of 116% and an A/E ratio for females of 106%. We recommend a small change to the male pattern mostly to get a better fit to the data by age.

Furthermore, experience continues to exhibit a pattern that suggests utilization of a ten-year select and ultimate withdrawal assumption will more appropriately reflect past (and anticipated future) experience. This means that the member moves through a select period based on age and service and then reaches an "ultimate" period in which all members follow the same pattern, based on age.

VESTED TERMINATING MEMBERS BENEFIT ELECTION ASSUMPTION

Currently it is assumed that all terminated vested contributing members will select the most valuable benefit available to them (either refund of member contributions or a deferred annuity). Additionally, it is assumed members with deferred annuities will commence their retirement benefit at the age they are first eligible to retire. We believe these assumptions are still reasonable and are recommending no change.

DROP ELECTION RATES

Based on plan experience, we believe the current 90% participation assumption should be decreased to 65%. The table below shows recent plan experience concerning DROP participation. Note that because of the modifications to the DROP program to make it more cost neutral, a change to this assumption has a very small impact on the liabilities.

Deferred Retirement Option Plan Participation Rates				
Year of Retirement	2013-2014	2012-2013	2011-2012	2010-2011
DROP Participants in year prior to retirement	190	191	220	135
Total Retirements	300	291	382	252
Percentage of Retirees in DROP	63%	66%	58%	54%

RETIREE DROP PAYOUT DURATION

When a member participates in DROP, they accumulate a DROP account while they continue to work. When they leave employment they have the option of leaving their DROP account monies with HMEPS and to continue to receive interest credits on their DROP accounts. HMEPS credit ½ of the market rate of return on assets of HMEPS for the prior fiscal year with a minimum crediting rate of 2.50% and a maximum crediting rate of 7.50%. Therefore, when HMEPS earns more than 5.00% in a year, HMEPS earns more income on the DROP account than is credited to the DROP account. Based on the expected rate of return and the expected volatility of the portfolio, it is beneficial to HMEPS' funding status for these monies to be left in the system. Currently we assume that future retirees will receive their outstanding DROP accounts in equal installments over a six year period from their retirement date. We analyzed the data for former DROP participants that retired in fiscal year 2007. For these members the DROP accounts as of June 30, 2012 (5 years later) were approximately 93% of the balances at June 30, 2007, and 89% of the original balances as of June 30, 2014 (7 years later). For that reason we are recommending our assumption for the payout period be increased from six years to eight years. We believe this assumption is still conservative because it assumes equal payouts over the 8 year period not a lump sum payment of the entire account at the end of the eight year period.

PERCENT MARRIED AND ASSUMED AGE DIFFERENCE

This assumption is used to reflect the cost of the automatic Joint & 100% Survivor benefit provided to married members upon commencement of retirement benefits as well as estimate how many current retirees have beneficiaries that would continue to receive benefits if the member died. The current assumption is 70% and we are recommending no change at this time. Additionally, we continue to assume males are three years older than their female spouses.

ACTUARIAL METHODS

The Entry Age Normal cost method (EAN) is the current funding method being used to allocate the actuarial costs of the System. The Entry Age Normal method will generally produce relatively level contribution amounts as a percentage of payroll from year to year, and allocates costs among various generations of taxpayers in a reasonable manner. It is by far the most commonly used actuarial cost method for large public retirement systems. In addition, we recommend continued use of the Ultimate Normal Cost variant of EAN because it produces a funding requirement as a percentage of payroll that is the most stable and predictable over time compared to all other funding methods and variants. We continue to believe that this is the method of choice for this plan, since this method usually does the best job of keeping costs level as a percentage of payroll.
We are recommending no change to the asset valuation method.

OTHER ASSUMPTIONS

We have thoroughly reviewed all of these ancillary assumptions, and believe they are generally appropriate and reasonable. Therefore, we recommend no changes to these other assumptions. A listing of all of these assumptions is in Section VI.

SECTION IV

ACTUARIAL IMPACT OF RECOMMENDATIONS

Estimated Actuarial Impact of Recommendations

For illustrative purposes, shown below is a table that compares key statistics from the July 1, 2014 actuarial valuation report before and after taking into account the recommended new assumptions.

Recommended Assumptions based on 8.00% Investment Return Assumption				
	Valuation Results as of July 1, 2014		Change	
Item	Current Assumptions	Recommended Assumptions	Amount	Percent
(1)	(2)	(3)	(4)	(5)
1. Total normal cost %	5.85%	6.87%	1.02%	17.4%
2. Present value of future pay	$3,817	$4,046	$229	6.0%
3. Present value of future benefits for retirees and terminated members	$2,538	$2,691	$153	6.0%
4. Present value of future benefits for active members	$2,070	$2,271	$201	9.7%
5. Total present value of future benefits	$4,608	$4,962	$354	7.7%
6. Actuarial accrued liability	$4,289	$4,582	$294	6.9%
7. Actuarial value of assets	$2,491	$2,491	$0	0.0%
8. Unfunded actuarial accrued liability	$1,798	$2,091	$294	16.3%
9. Funded ratio	58.1%	54.4%	(3.7%)	(6.4%)
10. 30-Year Contribution Rate	27.38%	32.09%*	4.71%	17.2%

All dollar amounts in $ millions

*For recommended assumptions, 30-year contribution rate includes addition of 1.19% of pay for administrative expenses

Estimated Actuarial Impact of Recommendations
Alternate 7.75% Investment Return Assumption

For illustrative purposes, shown below is a table that compares key statistics from the July 1, 2014 actuarial valuation report before and after taking into account the alternate new assumptions.

Alternative Assumptions based on 7.75% Investment Return Assumption				
	Valuation Results as of July 1, 2014		Change	
Item	Current Assumptions	Alternate Assumptions	Amount	Percent
(1)	(2)	(3)	(4)	(5)
11. Total normal cost %	5.85%	7.25%	1.65%	23.9%
12. Present value of future pay	$3,817	$4,107	$290	7.6%
13. Present value of future benefits for retirees and terminated members	$2,538	$2,750	$212	8.4%
14. Present value of future benefits for active members	$2,070	$2,362	$292	14.1%
15. Total present value of future benefits	$4,608	$5,112	$504	10.9%
16. Actuarial accrued liability	$4,289	$4,712	$423	9.9%
17. Actuarial value of assets	$2,491	$2,491	$0	0.0%
18. Unfunded actuarial accrued liability	$1,798	$2,221	$423	23.5%
19. Funded ratio	58.1%	52.9%	(5.2%)	(9.0%)
20. 30-Year Contribution Rate	27.38%	33.33%*	5.95%	21.7%

All dollar amounts in $ millions

*For alternative assumptions, 30-year contribution rate includes addition of 1.19% of pay for administrative expenses

SECTION V

SUMMARY OF ASSUMPTIONS AND METHODS INCORPORATING THE RECOMMENDED ASSUMPTIONS

Summary of Actuarial Methods and Assumptions

Upon adoption by the Board, the following methods and assumptions will be used in preparing the upcoming actuarial valuation as of July 1, 2015.

1. Valuation Date

The valuation date is July 1st of each plan year. This is the date as of which the actuarial present value of future benefits and the actuarial value of assets are determined.

2. Actuarial Cost Method

The actuarial valuation uses the Entry Age Normal actuarial cost method. Under this method, the employer contribution rate is the sum of (i) the employer normal cost rate, and (ii) a rate that will amortize the unfunded actuarial liability.

a. The valuation is prepared on the projected benefit basis, under which the present value, at the investment return rate assumed to be earned in the future (proposed 8.0 percent), of each participant's expected benefit payable at retirement or death is determined, based on his/her age, service, sex and compensation. The calculations take into account the probability of a participant's death or termination of employment prior to becoming eligible for a benefit, as well as the possibility of his/her terminating with a service, disability, or survivor's benefit. Future salary increases are also anticipated. The present value of the expected benefits payable on account of the active participants is added to the present value of the expected future payments to retired participants and beneficiaries to obtain the present value of all expected benefits payable from the Plan on account of the present group of participants and beneficiaries.

b. The employer contributions required to support the benefits of the Plan are determined using a level funding approach, and consist of a normal cost contribution and an accrued liability contribution.

c. The normal contribution is determined using the "entry age normal" method. Under this cost method, a calculation is made to determine the average uniform and constant percentage rate of employer contribution which, if applied to the compensation of each participant during the entire period of his/her anticipated covered service, would be required to meet the cost of all benefits payable on his behalf based on the benefits provisions for new employees hired on or after January 1, 2008.

d. The actuarial accrued liability (AAL) for each member is the difference between their present value of future benefits (PVFB), based on the tier of benefits that apply to the member, and their present value of future normal costs determined using the normal cost rate described in item c above. For inactive and retired members their AAL is equal to their PVFB.

e. The unfunded accrued liability contributions are determined by subtracting the actuarial value of assets from the actuarial accrued liability and amortizing the result over 30 years from the valuation date.

The contribution rate determined by this valuation will not be effective until one year later and the determination of the rate reflects this deferral. It is assumed that there will be no change in the employer normal cost rate due to the deferral, and it is assumed that payments are made uniformly throughout the year.

3. Actuarial Value of Assets

The actuarial value of assets is equal to the market value of assets less a five-year phase in of the excess (shortfall) between expected investment return and actual income. The actual calculation is based on the difference between actual market value and the expected actuarial value of assets each year, and recognizes the cumulative excess return (or shortfall) at a minimum rate of 20% per year. Each year a base is set up to reflect this difference. If the current year's base is of opposite sign to the deferred bases then it is offset dollar for dollar against the deferred bases. Any remaining bases are then recognized over the remaining period for the base (5 less the number of years between the bases year and the valuation year). This is intended to ensure the smoothed value of assets will converge towards the market value in a reasonable amount of time.

Expected earnings are determined using the assumed investment return rate and the beginning of year actuarial value of assets (adjusted for receipts and disbursements during the year). The returns are computed net of investment expenses.

4. Economic Assumptions

a. Investment return: 8.00% per year, compounded annually, composed of an assumed 2.50% inflation rate and a 5.50% net real rate of return. This rate represents the assumed return, net of all investment expenses.

b. Salary increase rate: A 2.50% inflation component, plus a 0.75% general increase, plus a service-related component as follows:

Years of Service	Service-related Component	Total Annual Rate of Increase Including 2.50% Inflation Component and 0.75% General Increase Rate
(1)	(2)	(3)
1	2.25%	5.50%
2	2.25	5.50
3	2.75	6.00
4	2.25	5.50
5	1.75	5.00
6	1.50	4.75
7	1.25	4.50
8	1.00	4.25
9	0.75	4.00
10-24	0.50	3.75
25+	0.00	3.25

c. Payroll growth rate: In the amortization of the unfunded actuarial accrued liability, payroll is assumed to increase 3.00% per year. This increase rate is due to the effect of inflation on salaries and real wage growth, with no allowance for future membership growth.

5. Demographic Assumptions

a. Retirement Rates:

	Expected Retirements per 100 Lives			
	Group A & B Members		Group D Members	
Age	Males	Females	Males	Females
(1)	(2)	(3)	(4)	(5)
45-49	15	12	0	0
50-54	10	11	3	3
55	10	11	4	4
56	10	11	5	5
57	10	11	6	6
58	10	11	7	7
59	10	11	8	8
60	12	11	10	10
61	14	11	13	13
62	16	20	35	35
63	18	18	25	18
64	20	12	18	20
65	20	22	20	20
66-69	20	20	20	19
70-74	20	25	20	19
75+	100	100	100	100

b. DROP Participation

65% of eligible members are assumed to enter DROP at first eligibility.

c. DROP Entry Date

Active members (not already in DROP) are assumed to take advantage of the DROP and enter when first eligible. For members who have already entered DROP, the actual DROP entry date supplied in the data is used.

d. DROP Interest Credit

4.65% per year

e. Mortality rates (active members)

Based on the Retired Pensioners 2000 Mortality Table (combined). Rates are scaled by 90% for male and 80% for female. 90% of the rates are assumed to be for non-service related deaths and 10% for service related deaths.

Sample rates are shown below:

	Rates			
Age	**Non-service related Male**	**Non-service related Female**	**Service related Male**	**Service related Female**
20	0.000279	0.000138	0.000031	0.000015
25	0.000305	0.000149	0.000034	0.000017
30	0.000360	0.000190	0.000040	0.000021
35	0.000626	0.000342	0.000070	0.000038
40	0.000874	0.000508	0.000097	0.000056
45	0.001221	0.000809	0.000136	0.000090
50	0.001732	0.001207	0.000192	0.000134
55	0.002935	0.001956	0.000326	0.000217
60	0.005465	0.003640	0.000607	0.000404
65	0.010317	0.006988	0.001146	0.000776
70	0.017987	0.012054	0.001999	0.001339
75	0.030646	0.020236	0.003405	0.002248

Mortality rates (retired members and beneficiaries):

Healthy Retirees and beneficiaries: Gender-distinct RP2000 Combined Healthy Mortality Tables with Blue Collar Adjustment. Male rates are multiplied by 125% and female rates are multiplied by 112%. The rates are projected on a fully generational basis by scale BB to account for future mortality improvements.

Disabled Retirees: Gender-distinct RP2000 Combined Healthy Mortality Tables with Blue Collar Adjustment. Male rates are multiplied by 125% and female rates are multiplied by 112%. The rates are projected on a fully generational basis by scale BB to account for future mortality improvements. Rates are set-forward five years. A minimum rate of 0.04 is applied to male and 0.03 to female.

Sample rates are shown below:

Attained Age in 2014	Rates			
	Healthy Male	Healthy Female	Disabled Male	Disabled Female
45	0.002149	0.001489	0.040000	0.030000
50	0.002891	0.002108	0.040000	0.030000
55	0.005029	0.002918	0.040000	0.030000
60	0.009369	0.004815	0.040000	0.030000
65	0.016403	0.009835	0.040000	0.030000
70	0.027069	0.017625	0.043632	0.030000
75	0.043632	0.029215	0.071367	0.046301
80	0.071367	0.046301	0.116414	0.078599
85	0.116414	0.078599	0.194603	0.131126
90	0.194603	0.131126	0.298126	0.198245
95	0.298126	0.198245	0.412954	0.255008
100	0.412954	0.255008	0.497358	0.328290

f. Termination Rates and Disability Rates

Termination rates (for causes other than death, disability or retirement):

Termination rates are a function of the member's age and service. Termination rates are not applied after a member becomes eligible for a retirement benefit. Rates at selected ages are shown below.

Probability of Decrement Due to Withdrawal – Male Members

	Years of Service										
Age	0	1	2	3	4	5	6	7	8	9	10+
20	0.3244	0.2682	0.2300	0.2060	0.1926	0.1824	0.1617	0.1507	0.1400	0.1278	0.0541
30	0.2585	0.2146	0.1808	0.1563	0.1396	0.1275	0.1143	0.1057	0.0985	0.0919	0.0449
40	0.2003	0.1645	0.1351	0.1124	0.0954	0.0832	0.0750	0.0683	0.0634	0.0603	0.0357
50	0.1559	0.1258	0.1013	0.0824	0.0681	0.0577	0.0510	0.0454	0.0411	0.0383	0.0265
60	0.1341	0.1083	0.0887	0.0740	0.0634	0.0557	0.0469	0.0407	0.0344	0.0277	0.0173

Probability of Decrement Due to Withdrawal – Female Members

	Years of Service										
Age	0	1	2	3	4	5	6	7	8	9	10+
20	0.2811	0.2574	0.2344	0.2123	0.1912	0.1711	0.1506	0.1282	0.1040	0.0784	0.1385
30	0.2155	0.1943	0.1736	0.1539	0.1356	0.1188	0.1032	0.0879	0.0730	0.0585	0.0795
40	0.1688	0.1460	0.1250	0.1063	0.0903	0.0770	0.0664	0.0581	0.0517	0.0472	0.0367
50	0.1510	0.1223	0.0984	0.0791	0.0645	0.0544	0.0481	0.0452	0.0453	0.0481	0.0339
60	0.1794	0.1373	0.1049	0.0812	0.0653	0.0570	0.0540	0.0552	0.0601	0.0682	0.0339

Rates of Decrement Due to Disability

Age	Males	Females	Service-related Males	Service-related Females
20	0.000004	0.000006	0.000000	0.000001
25	0.000009	0.000013	0.000001	0.000002
30	0.000073	0.000065	0.000005	0.000008
35	0.000318	0.000102	0.000022	0.000013
40	0.000650	0.000234	0.000045	0.000029
45	0.001259	0.000528	0.000087	0.000066
50	0.002195	0.001256	0.000151	0.000157
55	0.003171	0.002021	0.000219	0.000253
60	0.004188	0.002436	0.000289	0.000305

Rates of disability are reduced to zero once a member becomes eligible for retirement.

6. Other Assumptions

a. Projected payroll for contribution purposes: The aggregate projected payroll for the fiscal year following the valuation date is calculated by increasing the actual payroll paid during the previous fiscal year to all members (actives, terminated and retired) by the payroll growth rate and multiplying by the ratio of current active members to the average number of active members during the previous fiscal year.

b. Percent married: 70% of employees are assumed to be married. (No beneficiaries other than the spouse assumed). The 70% assumption is intended to provide sufficient margin to cover the costs of any surviving childredn benefits.

c. Age difference: Male members are assumed to be three years older than their spouses, and female members are assumed to be three years younger than their spouses.

d. Percent electing annuity on death (when eligible): All of the spouses of vested, married participants are assumed to elect an annuity.

e. Percent electing deferred termination benefit: Vested terminating members are assumed to elect a refund or a deferred benefit, whichever is more valuable at the time of termination.

f. There will be no recoveries once disabled.

g. No surviving spouse will remarry.

h. Assumed age for commencement of deferred benefits: Members electing to receive a deferred benefit are assumed to commence receipt at the first age at which unreduced benefits are available.

i. Administrative expenses: The administrative expenses of the plan are added into the employer contribution rate as a percentage of payroll.

j. Pay increase timing: Beginning of (fiscal) year. This is equivalent to assuming that reported pays represent amounts paid to members during the year ended on the valuation date.

k. Decrement timing: Decrements of all types are assumed to occur mid-year.

l. Eligibility testing: Eligibility for benefits is determined based upon the age nearest birthday and service nearest whole year on the date the decrement is assumed to occur.

m. Decrement relativity: Decrement rates are used directly from the experience study, without adjustment for multiple decrement table effects.

n. Incidence of Contributions: Contributions are assumed to be received continuously throughout the year based upon the computed percent of payroll shown in this report, and the actual payroll payable at the time contributions are made.

o. Benefit Service: All members are assumed to accrue 1 year of service each year. Fractional service is used to determine the amount of benefit payable.

p. Retiree Drop Balances Payout Duration: It is assumed that retirees will receive their DROP balances in equal installments over the eight years following retirement.

7. Participant Data

Participant data was supplied on electronic files. There were separate files for (i) active members, (ii) inactive members, and (ii) members and beneficiaries receiving benefits.

The data for active members included birth date, sex, most recent hire date, salary paid during last fiscal year, hours worked by the employee, and employee contribution amounts. For retired members and beneficiaries, the data included date of birth, sex, amount of monthly benefit, and date of retirement. Also included was the member's Group and for members participating in DROP, their account balances and monthly DROP credit.

All Groups except Option-Eligible Participants are assumed to have 100% joint and survivor, prorated by the 70% marriage assumption and reflecting the 3 year spousal age differential. All non-children beneficiaries are assumed to have life only benefits and all children beneficiaries' annuities are assumed to stop at age 21.

Salary for the prior fiscal yeas as well as an annualized rate of pay is provided in the data. The annualized rate increased by one-year's salary increase is the rate of pay the member is assumed to earn in the upcoming fiscal year.

Assumptions were made to correct for missing, bad, or inconsistent data. These had no material impact on the results presented.

8. Group Transfers

We assume no current Group B members will transfer to Group A.

SECTION VI

SUMMARY OF DATA AND EXPERIENCE

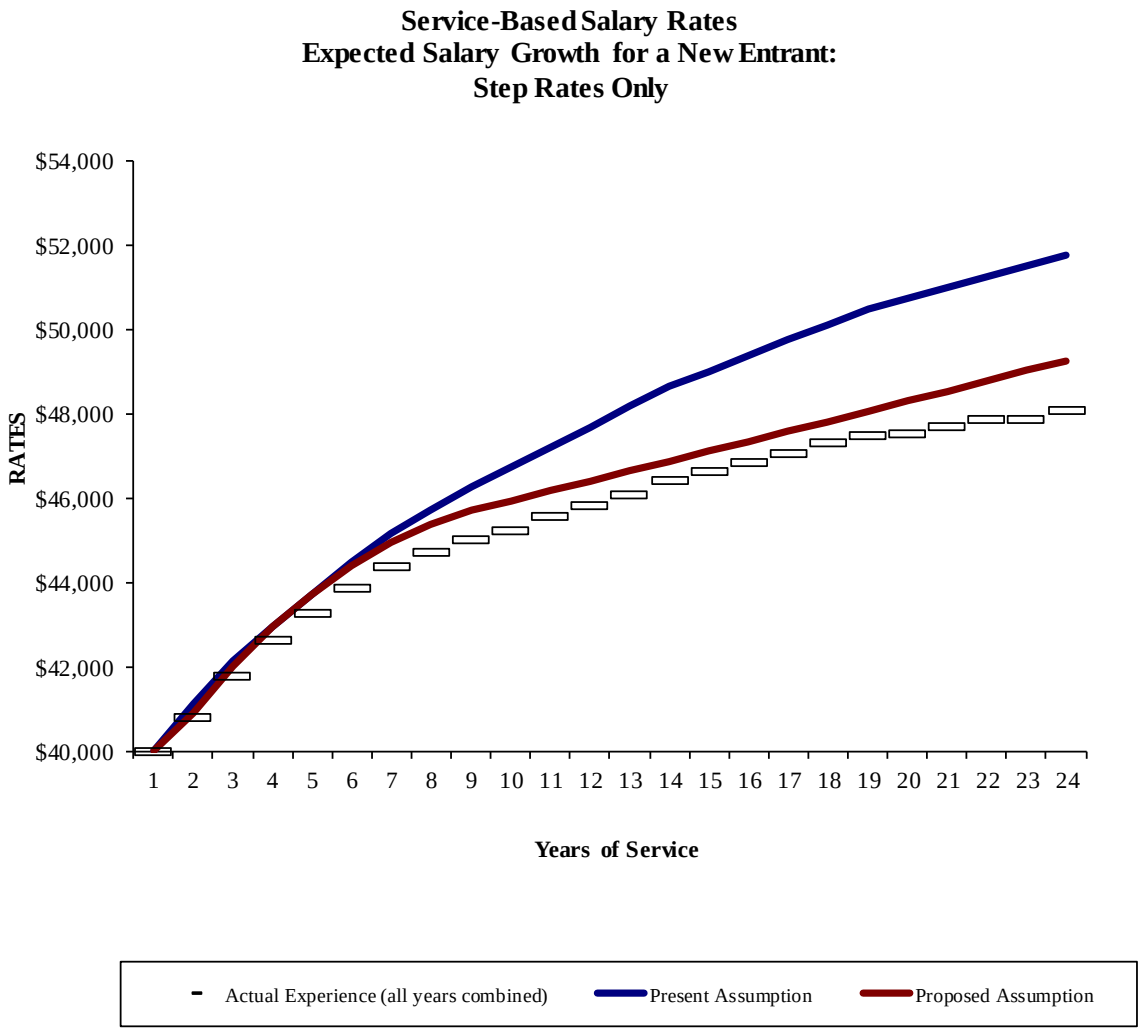
Salary Increase Analysis

Service-Based Salary Rates

Current Salary Scale			04/14 Actual Experience			Proposed Salary Scale	
Years of Service	Total	Step Rate/ Promotional	Total	Above Inflation	Step Rate/ Promotional	Total	Step Rate/ Promotional
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	6.00%	3.00%	5.60%	3.25%	1.88%	5.50%	2.25%
2	5.75%	2.75%	5.67%	3.32%	1.96%	5.50%	2.25%
3	5.50%	2.50%	6.19%	3.84%	2.47%	6.00%	2.75%
4	5.00%	2.00%	5.70%	3.35%	1.99%	5.50%	2.25%
5	4.75%	1.75%	5.24%	2.89%	1.53%	5.00%	1.75%
6	4.75%	1.75%	5.11%	2.76%	1.40%	4.75%	1.50%
7	4.50%	1.50%	4.80%	2.45%	1.09%	4.50%	1.25%
8	4.25%	1.25%	4.56%	2.21%	0.85%	4.25%	1.00%
9	4.25%	1.25%	4.34%	1.99%	0.62%	4.00%	0.75%
10	4.00%	1.00%	4.21%	1.86%	0.49%	3.75%	0.50%
11	4.00%	1.00%	4.49%	2.13%	0.77%	3.75%	0.50%
12	4.00%	1.00%	4.23%	1.88%	0.51%	3.75%	0.50%
13	4.00%	1.00%	4.31%	1.96%	0.60%	3.75%	0.50%
14	4.00%	1.00%	4.45%	2.10%	0.74%	3.75%	0.50%
15	3.75%	0.75%	4.18%	1.83%	0.47%	3.75%	0.50%
16	3.75%	0.75%	4.14%	1.79%	0.43%	3.75%	0.50%
17	3.75%	0.75%	4.19%	1.84%	0.48%	3.75%	0.50%
18	3.75%	0.75%	4.22%	1.87%	0.51%	3.75%	0.50%
19	3.75%	0.75%	4.04%	1.69%	0.33%	3.75%	0.50%
20	3.50%	0.50%	3.86%	1.51%	0.15%	3.75%	0.50%
21	3.50%	0.50%	4.08%	1.73%	0.37%	3.75%	0.50%
22	3.50%	0.50%	4.04%	1.69%	0.33%	3.75%	0.50%
23	3.50%	0.50%	3.67%	1.32%	-0.04%	3.75%	0.50%
24	3.50%	0.50%	4.23%	1.87%	0.51%	3.75%	0.50%
25+	3.00%	0.00%	3.71%	1.36%	0.00%	3.25%	0.00%

Current Inflation Assumption	3.00%	Proposed Inflation Assumption	2.50%
Current Productivity Component	0.00%	Proposed Productivity Component	0.75%
Actual CPI-U Inflation for Period	2.35%		
Apparent Productivity Component	1.36%		

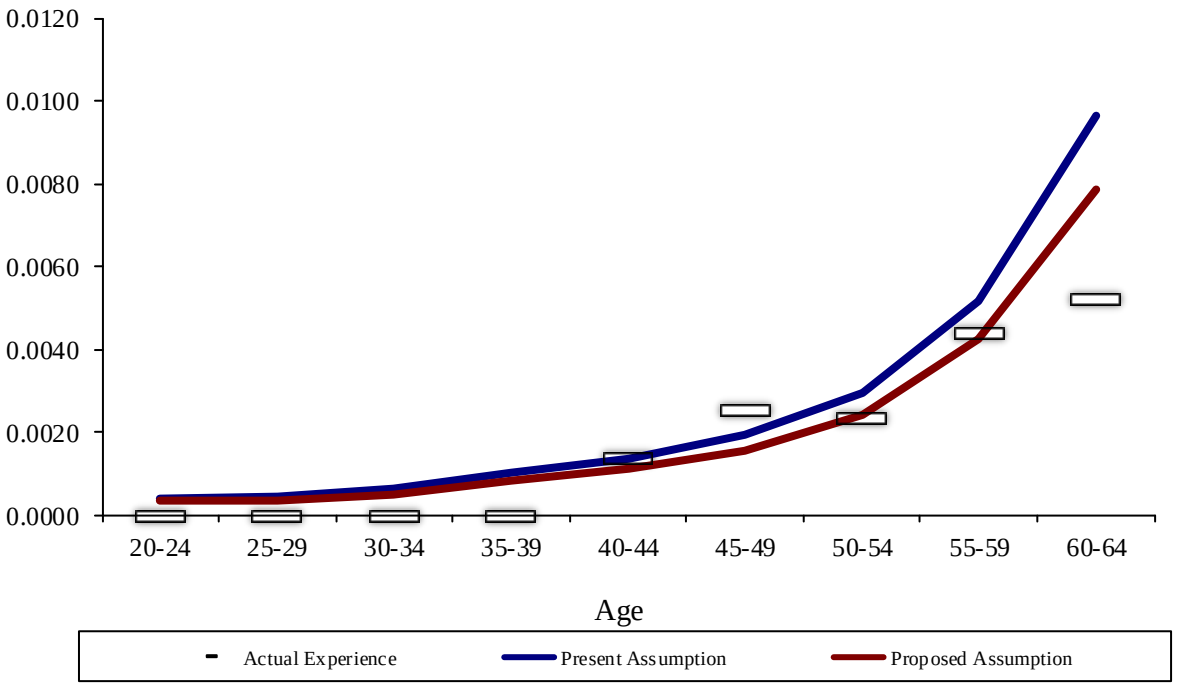
Salary Increase Analysis



Pre-Retirement Mortality – Male

Age	Deaths	Exposure	Crude Rates	Sample Rates		Expected Deaths	
				Old	New	Old	New
Under 20	-	-	N/A	0.03%	0.03%	-	-
20-24	-	28	0.00%	0.04%	0.03%	-	-
25-29	-	546	0.00%	0.04%	0.03%	-	-
30-34	-	1,324	0.00%	0.06%	0.05%	1	1
35-39	-	1,869	0.00%	0.10%	0.08%	2	2
40-44	4	2,917	0.14%	0.13%	0.11%	4	3
45-49	10	3,925	0.25%	0.19%	0.16%	8	6
50-54	11	4,720	0.23%	0.29%	0.24%	14	11
55-59	19	4,319	0.44%	0.52%	0.42%	23	18
60-64	15	2,876	0.52%	0.96%	0.79%	28	22
65-69	4	1,137	0.35%	1.77%	1.45%	19	16
70-74	1	277	0.36%	3.00%	2.46%	8	6
75 and over	2	-	N/A	5.16%	4.22%	-	-
Totals	66	23,938				107	85

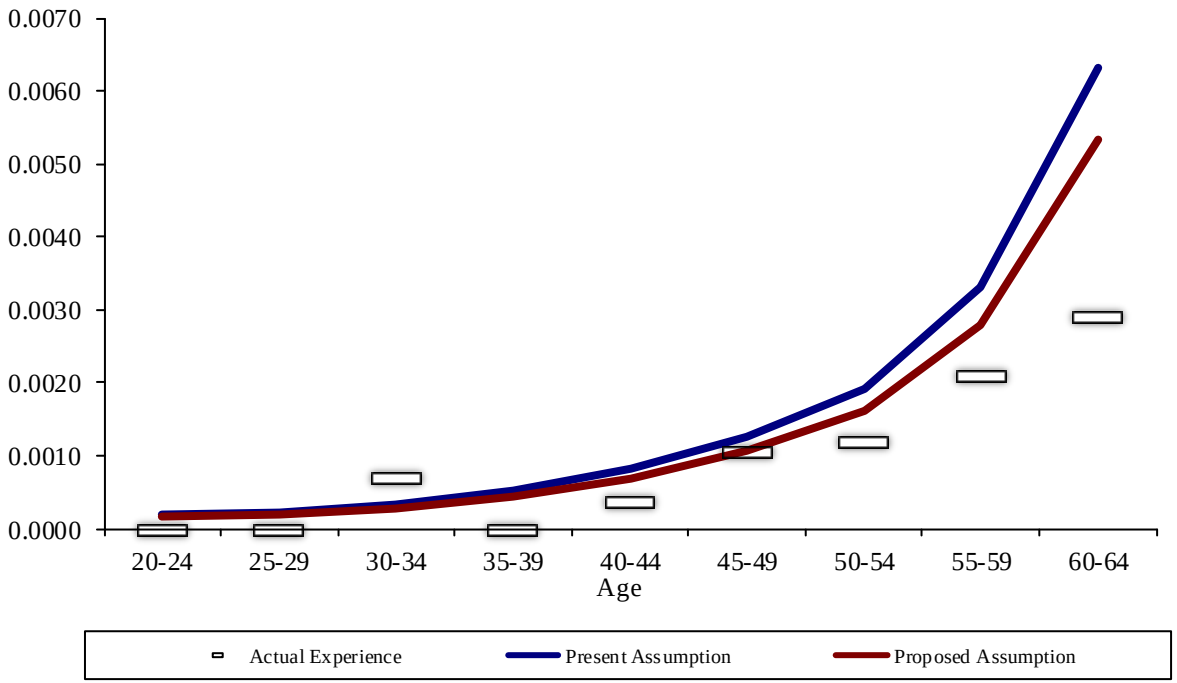
Pre-Retirement Mortality – Male



Pre-Retirement Mortality – Female

Age	Deaths	Exposure	Crude Rates	Sample Rates		Expected Deaths	
				Old	New	Old	New
Under 20	-	-	N/A	0.02%	0.01%	-	-
20-24	-	40	0.00%	0.02%	0.02%	-	-
25-29	-	606	0.00%	0.02%	0.02%	-	-
30-34	1	1,433	0.07%	0.03%	0.03%	1	-
35-39	-	1,743	0.00%	0.05%	0.04%	1	1
40-44	1	2,684	0.04%	0.08%	0.07%	2	2
45-49	4	3,755	0.11%	0.13%	0.11%	5	4
50-54	5	4,214	0.12%	0.19%	0.16%	8	7
55-59	7	3,330	0.21%	0.33%	0.28%	11	9
60-64	6	2,059	0.29%	0.63%	0.53%	13	11
65-69	3	628	0.48%	1.16%	0.97%	7	6
70-74	-	95	0.00%	1.96%	1.65%	2	2
75 and over	1	-	N/A	3.24%	2.73%	-	-
Totals	28	20,587				50	42

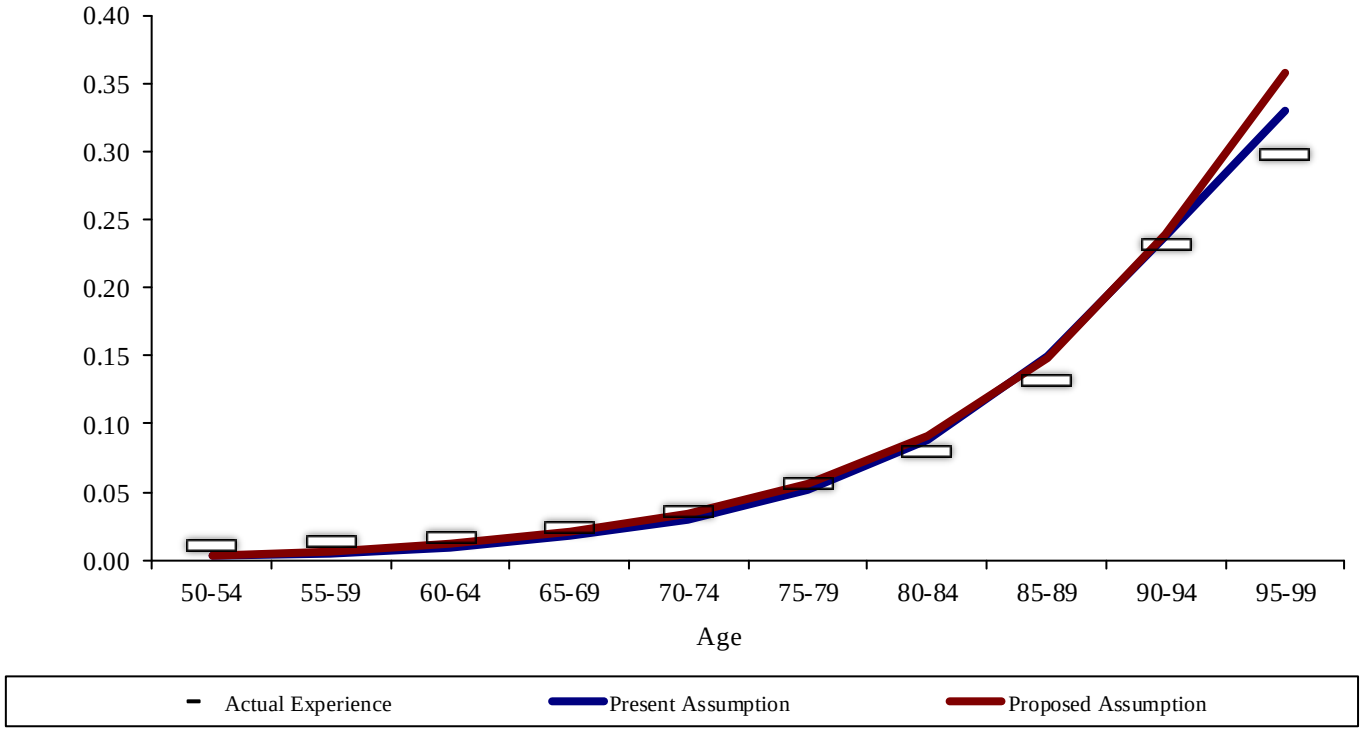
Pre-Retirement Mortality – Female



Post-Retirement Mortality - Male

Age	Deaths	Exposure	Crude Rates	Sample Rates*		Expected Deaths**		A/E	
				Old	New	Old	New	Old	New
50-54	10	948	0.010549	0.002934	0.003623	3	4	333%	250%
55-59	35	2,439	0.014350	0.005162	0.006733	13	17	269%	206%
60-64	69	4,112	0.016780	0.009633	0.012191	41	52	168%	133%
65-69	113	4,747	0.023805	0.017683	0.020919	84	99	135%	114%
70-74	123	3,410	0.036070	0.030009	0.034076	102	116	121%	106%
75-79	134	2,385	0.056184	0.051597	0.055759	122	132	110%	102%
80-84	110	1,386	0.079365	0.088535	0.091416	121	125	91%	88%
85-89	95	712	0.133427	0.149647	0.148391	104	103	91%	92%
90-94	52	224	0.232143	0.238266	0.239488	51	52	102%	100%
95-99	14	47	0.297872	0.329837	0.358649	15	16	93%	88%
100-104	2	10	0.200000	0.408854	0.454486	4	4	50%	50%
105-109	-	-	N\A	0.440000	0.500000	-	-		
Totals	757	20,420				660	720	115%	105%

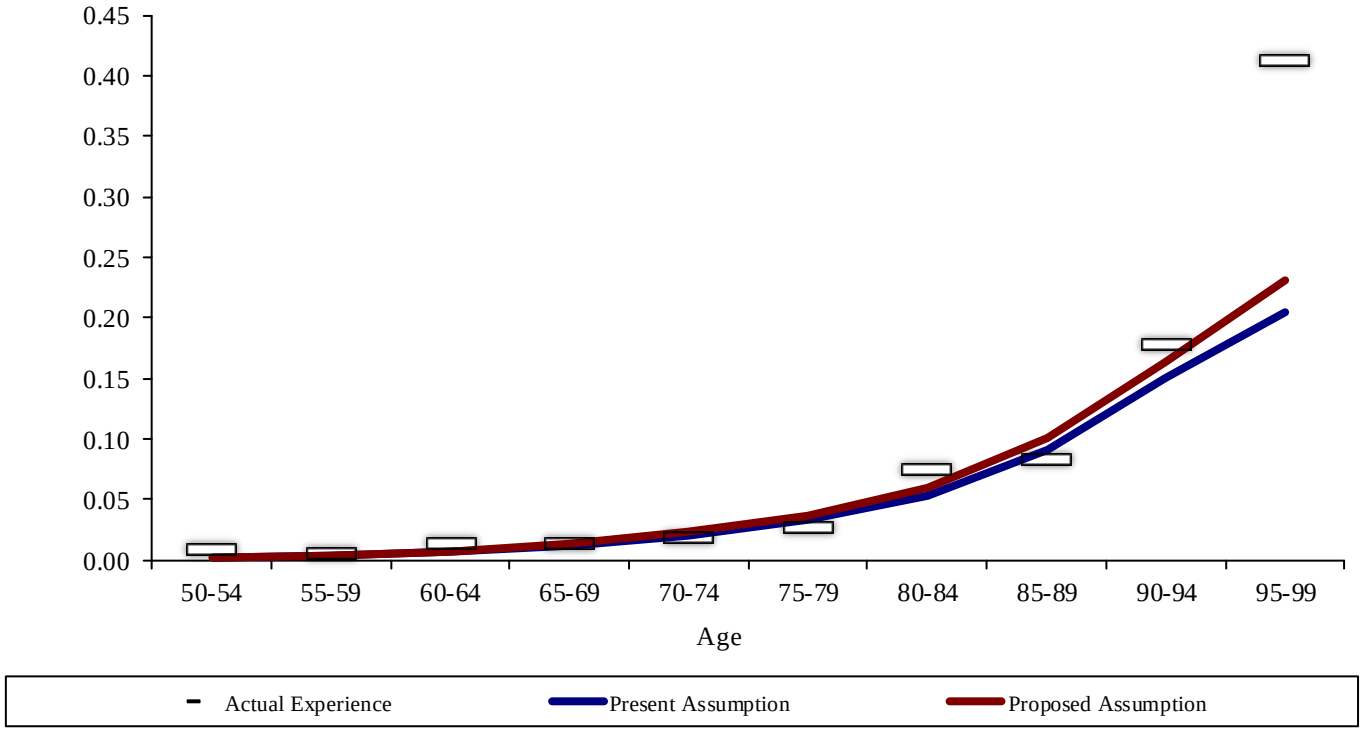
Post-Retirement Mortality - Male



Post-Retirement Mortality – Female

Age	Deaths	Exposure	Crude Rates	Sample Rates*		Expected Deaths**		A/E	
				Old	New	Old	New	Old	New
50-54	8	863	0.009270	0.001917	0.002435	2	2	400%	400%
55-59	13	1,999	0.006503	0.003304	0.003515	7	7	186%	186%
60-64	41	2,933	0.013979	0.006324	0.006651	19	21	216%	195%
65-69	40	2,919	0.013703	0.011555	0.012962	33	38	121%	105%
70-74	34	1,806	0.018826	0.019632	0.022617	35	40	97%	85%
75-79	32	1,197	0.026734	0.032400	0.036191	38	43	84%	74%
80-84	59	786	0.075064	0.053479	0.059073	42	47	140%	126%
85-89	46	555	0.082883	0.091520	0.100432	50	55	92%	84%
90-94	35	195	0.179487	0.149737	0.162698	28	30	125%	117%
95-99	12	29	0.413793	0.204478	0.230672	6	6	200%	200%
100-104	1	2	0.500000	0.241773	0.278830	-	1		
105-109	-	-	N/A	0.306589	0.361452	-	-		
Totals	321	13,284	0.024164			260	290	123%	111%

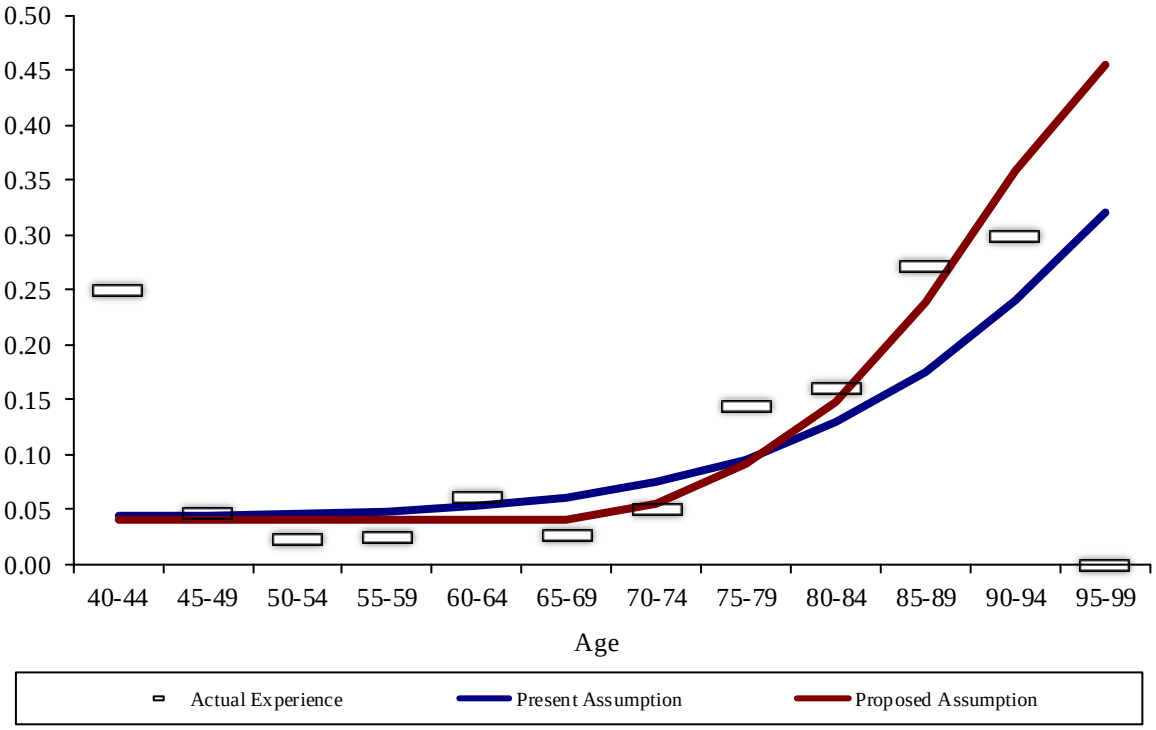
Post-Retirement Mortality – Female



Post-Retirement Mortality – Disabled Male

Age	Deaths	Exposure	Crude Rates	Sample Rates		Expected Deaths		A/E	
				Old	New	Old	New	Old	New
40-44	2	8	25.00%	4.41%	4.00%	-	-	N/A	N/A
45-49	2	42	4.76%	4.44%	4.00%	2	2	100%	100%
50-54	3	129	2.33%	4.53%	4.00%	6	5	50%	60%
55-59	6	244	2.46%	4.78%	4.00%	12	10	50%	60%
60-64	16	261	6.13%	5.33%	4.00%	14	10	114%	160%
65-69	7	262	2.67%	6.11%	4.00%	16	11	44%	64%
70-74	10	196	5.10%	7.47%	5.58%	14	11	71%	91%
75-79	13	90	14.44%	9.55%	9.14%	8	8	163%	163%
80-84	6	37	16.22%	12.98%	14.84%	5	5	120%	120%
85-89	3	11	27.27%	17.48%	23.95%	2	3	150%	100%
90-94	3	10	30.00%	24.02%	35.86%	2	3	150%	100%
95-99	-	-	N/A	32.11%	45.45%	-	-	N/A	N/A
Totals	71	1,290				81	68	88%	104%

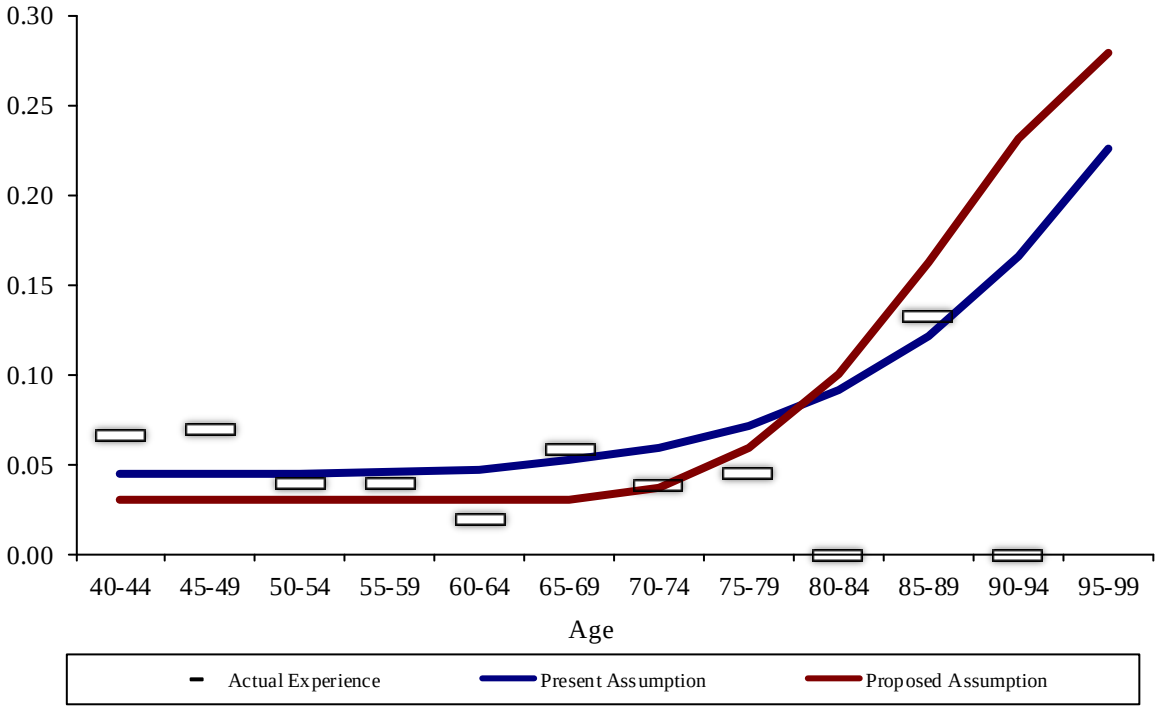
Post-Retirement Mortality – Disabled Male



Post-Retirement Mortality – Disabled Female

Age	Deaths	Exposure	Crude Rates	Sample Rates		Expected Deaths		A/E	
				Old	New	Old	New	Old	New
40-44	1	15	6.67%	4.41%	3.00%	1	0	100%	222%
45-49	3	43	6.98%	4.41%	3.00%	2	1	150%	233%
50-54	3	77	3.90%	4.43%	3.00%	3	2	100%	130%
55-59	5	127	3.94%	4.50%	3.00%	6	4	83%	131%
60-64	3	156	1.92%	4.72%	3.00%	7	5	43%	64%
65-69	5	85	5.88%	5.21%	3.00%	4	3	125%	196%
70-74	4	105	3.81%	5.92%	3.62%	6	4	67%	106%
75-79	2	44	4.55%	7.14%	5.91%	3	3	67%	80%
80-84	-	9	0.00%	9.06%	10.04%	1	1	0%	0%
85-89	2	15	13.33%	12.16%	16.27%	2	2	100%	80%
90-94	-	9	0.00%	16.58%	23.07%	1	2	0%	0%
95-99	1	3		22.54%	27.88%	1	1	100%	100%
Totals	29	688				37	28	79%	104%

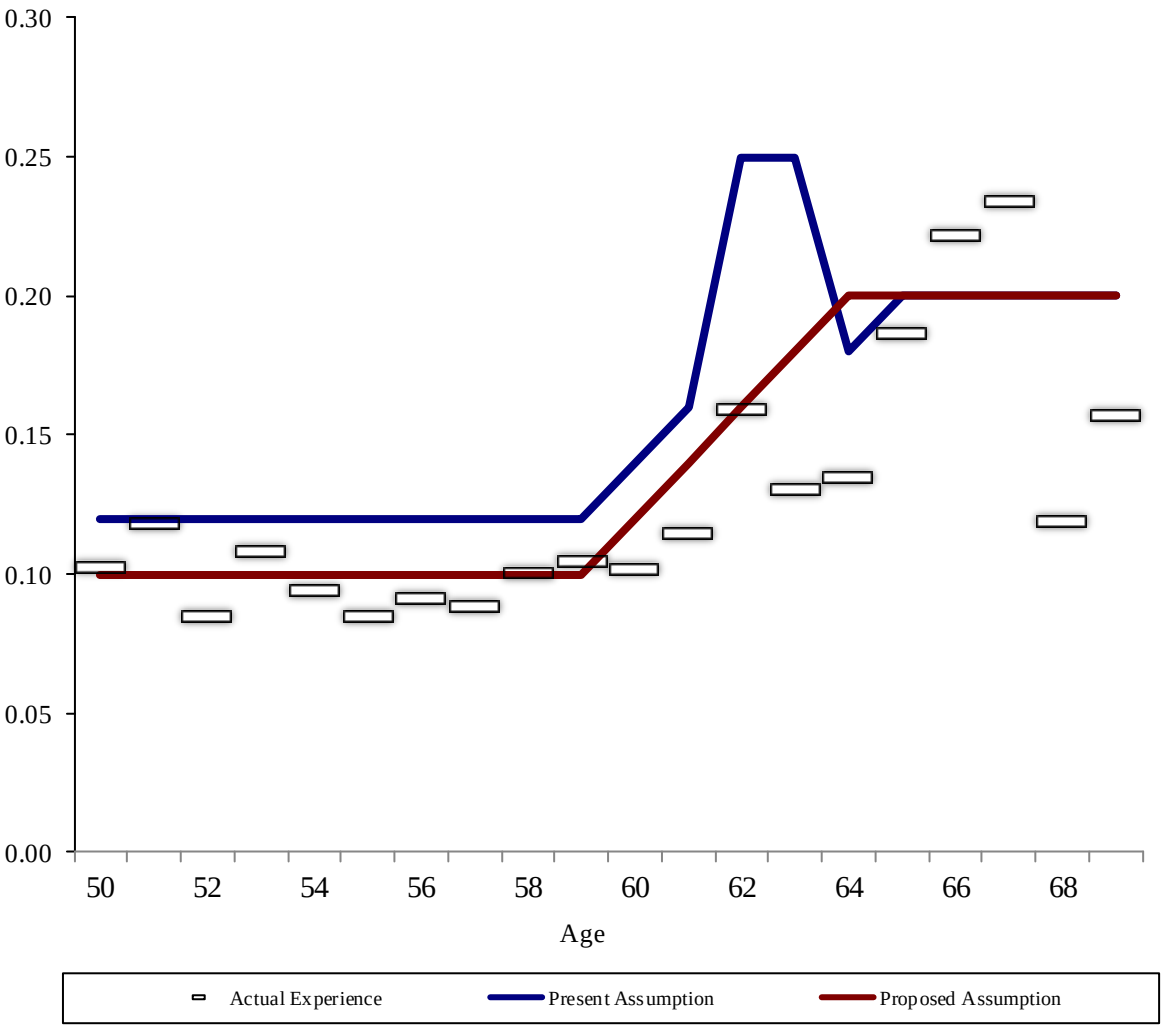
Post-Retirement Mortality – Disabled Female



Retirement Rates – Male

Age	Retirements	Exposure	Crude Rates	Sample Rates		Expected Retirements		A/E	
				Old	New	Old	New	Old	New
< 45	2	-	N/A	15.0%	15.0%	-	-	N/A	N/A
45	-	-	N/A	15.0%	15.0%	-	-	N/A	N/A
46	-	-	N/A	15.0%	15.0%	-	-	N/A	N/A
47	-	-	N/A	15.0%	15.0%	-	-	N/A	N/A
48	2	-	N/A	15.0%	15.0%	-	-	N/A	N/A
49	1	2	50.0%	15.0%	15.0%	-	-	N/A	N/A
50	16	155	10.3%	12.0%	10.0%	19	16	84%	100%
51	23	194	11.9%	12.0%	10.0%	23	19	100%	121%
52	19	224	8.5%	12.0%	10.0%	27	22	70%	86%
53	28	258	10.9%	12.0%	10.0%	31	26	90%	108%
54	28	298	9.4%	12.0%	10.0%	36	30	78%	93%
55	28	330	8.5%	12.0%	10.0%	40	33	70%	85%
56	33	361	9.1%	12.0%	10.0%	43	36	77%	92%
57	34	385	8.8%	12.0%	10.0%	46	39	74%	87%
58	39	387	10.1%	12.0%	10.0%	46	39	85%	100%
59	41	390	10.5%	12.0%	10.0%	47	39	87%	105%
60	38	373	10.2%	14.0%	12.0%	52	45	73%	84%
61	43	373	11.5%	16.0%	14.0%	60	52	72%	83%
62	94	588	16.0%	25.0%	16.0%	148	94	64%	100%
63	66	503	13.1%	25.0%	18.0%	126	91	52%	73%
64	57	421	13.5%	18.0%	20.0%	76	84	75%	68%
65	66	353	18.7%	20.0%	20.0%	71	71	93%	93%
66	66	297	22.2%	20.0%	20.0%	59	59	112%	112%
67	49	209	23.4%	20.0%	20.0%	42	42	117%	117%
68	18	151	11.9%	20.0%	20.0%	30	30	60%	60%
69	20	127	15.7%	20.0%	20.0%	25	25	80%	80%
70	21	100	21.0%	20.0%	20.0%	20	20	105%	105%
71	18	71	25.4%	20.0%	20.0%	14	14	129%	129%
72	8	47	17.0%	20.0%	20.0%	9	9	89%	89%
73	5	38	13.2%	20.0%	20.0%	8	8	63%	63%
74	5	27	18.5%	20.0%	20.0%	5	5	100%	100%
Totals	868	6,662				1,103	948	79%	92%
75 & Over	16	77	20.8%		100.0%	77	77	21%	21%
Total	884	6,739				1,180	1,025	75%	86%

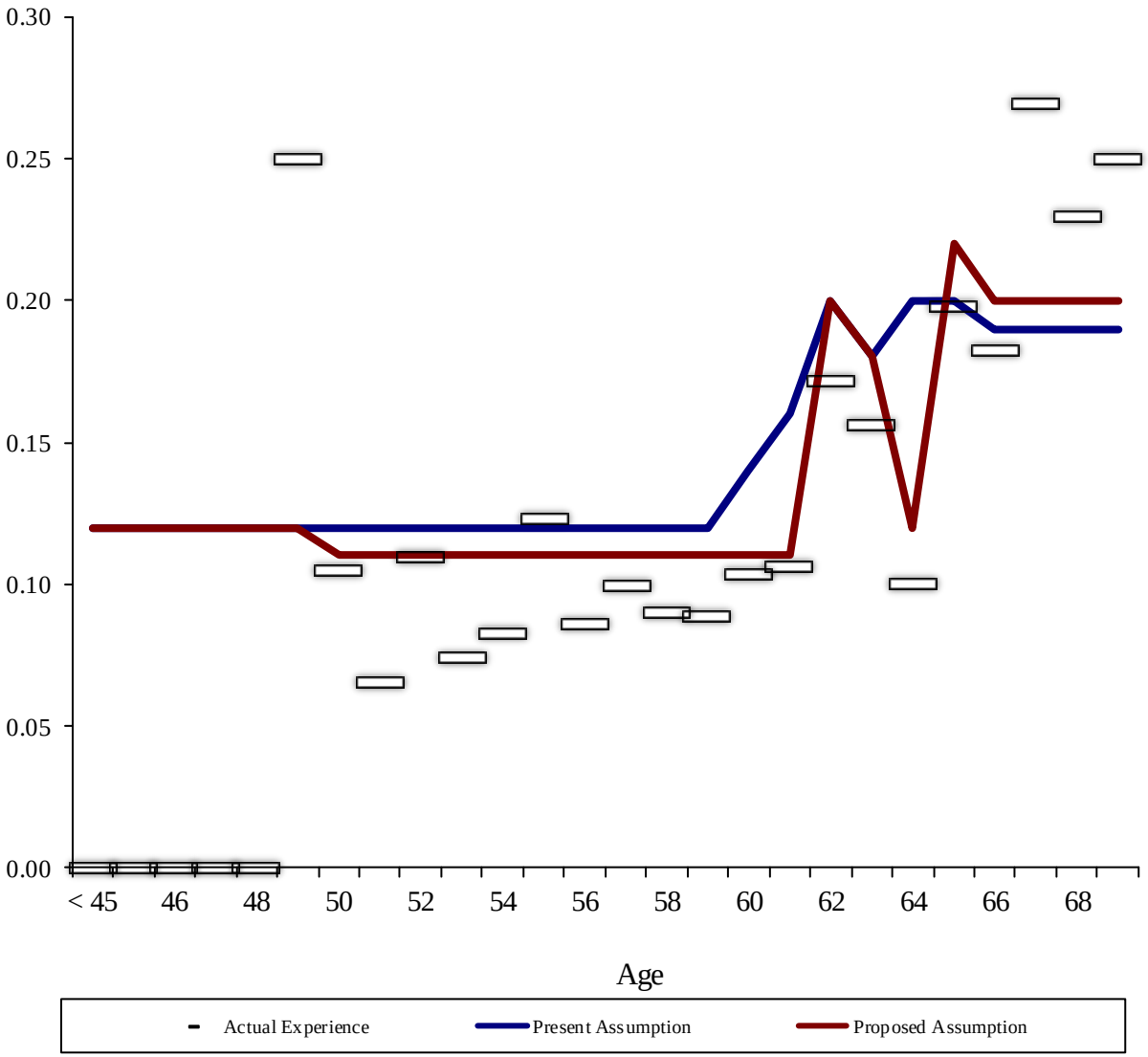
Retirement Rates – Male



Retirement Rates – Female

Age	Retirements	Exposure	Crude Rates	Sample Rates		Expected Retirements		A/E	
				Old	New	Old	New	Old	New
< 45	1	-	N/A	12.0%	12.0%	-	-	N/A	N/A
45	-	-	N/A	12.0%	12.0%	-	-	N/A	N/A
46	-	-	N/A	12.0%	12.0%	-	-	N/A	N/A
47	1	-	N/A	12.0%	12.0%	-	-	N/A	N/A
48	-	-	N/A	12.0%	12.0%	-	-	N/A	N/A
49	1	4	25.0%	12.0%	12.0%	-	-	N/A	N/A
50	18	171	10.5%	12.0%	11.0%	21	19	86%	95%
51	14	213	6.6%	12.0%	11.0%	26	23	54%	61%
52	27	245	11.0%	12.0%	11.0%	29	27	93%	100%
53	19	257	7.4%	12.0%	11.0%	31	28	61%	68%
54	23	277	8.3%	12.0%	11.0%	33	30	70%	77%
55	35	283	12.4%	12.0%	11.0%	34	31	103%	113%
56	25	290	8.6%	12.0%	11.0%	35	32	71%	78%
57	29	291	10.0%	12.0%	11.0%	35	32	83%	91%
58	30	332	9.0%	12.0%	11.0%	40	37	75%	81%
59	28	314	8.9%	12.0%	11.0%	38	35	74%	80%
60	32	308	10.4%	14.0%	11.0%	43	34	74%	94%
61	31	290	10.7%	16.0%	11.0%	46	32	67%	97%
62	72	419	17.2%	20.0%	20.0%	85	84	85%	86%
63	52	333	15.6%	18.0%	18.0%	60	60	87%	87%
64	27	268	10.1%	20.0%	12.0%	54	32	50%	84%
65	43	217	19.8%	20.0%	22.0%	43	48	100%	90%
66	29	159	18.2%	19.0%	20.0%	30	32	97%	91%
67	34	126	27.0%	19.0%	20.0%	24	25	142%	136%
68	17	74	23.0%	19.0%	20.0%	14	15	121%	113%
69	13	52	25.0%	19.0%	20.0%	10	10	130%	130%
70	11	30	36.7%	19.0%	25.0%	6	8	183%	138%
71	4	19	21.1%	19.0%	25.0%	4	5	100%	80%
72	4	18	22.2%	19.0%	25.0%	3	5	133%	80%
73	3	19	15.8%	19.0%	25.0%	4	5	75%	60%
74	2	11	18.2%	19.0%	25.0%	2	3	100%	67%
Totals	625	5,020				750	692	83%	90%
75 & Over	10	43	23.3%		100.0%	43	43	23%	23%
Total	635	5,063				793	735	80%	86%

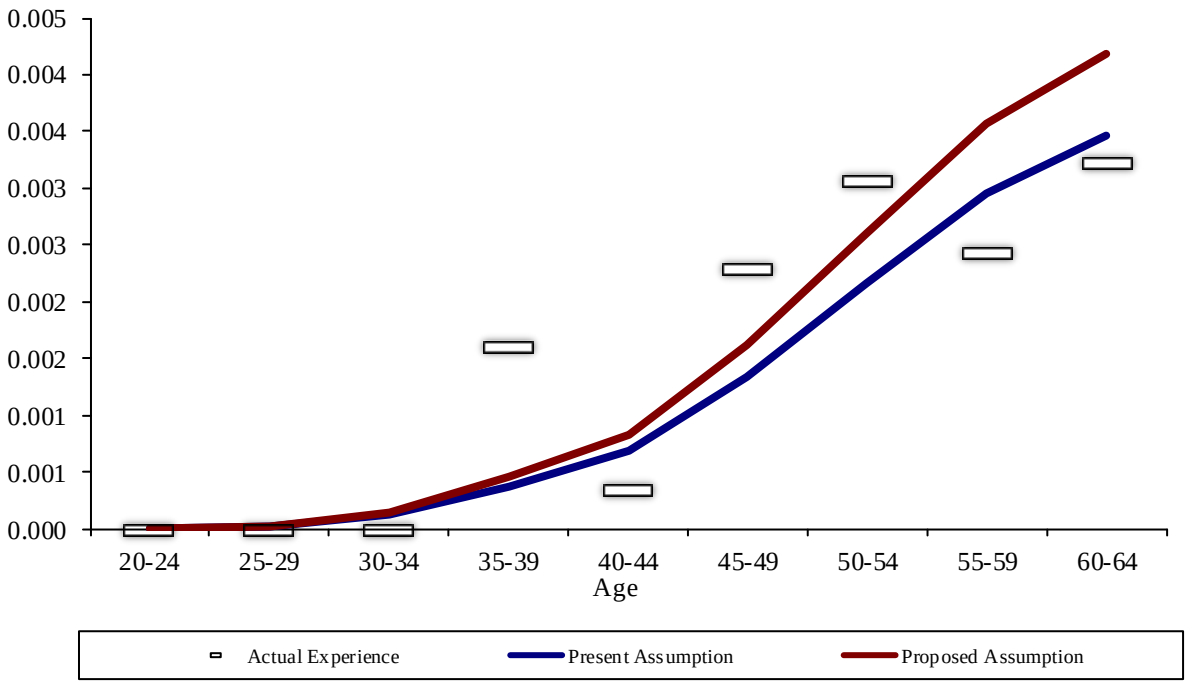
Retirement Rates – Female



Disability Incidence – Male

Age	Disabilities	Exposure	Crude Rates	Sample Rates		Expected Disabilities	
				Old	New	Old	New
Under 20	-	-	N\A	0.00%	0.00%	-	-
20-24	-	28	0.00%	0.00%	0.00%	-	-
25-29	-	546	0.00%	0.00%	0.00%	-	-
30-34	-	1,324	0.00%	0.01%	0.01%	-	-
35-39	3	1,869	0.16%	0.04%	0.05%	1	1
40-44	1	2,917	0.03%	0.07%	0.08%	2	3
45-49	9	3,923	0.23%	0.13%	0.16%	5	6
50-54	11	3,591	0.31%	0.22%	0.26%	8	9
55-59	6	2,466	0.24%	0.29%	0.36%	7	9
60-64	2	619	0.32%	0.35%	0.42%	2	3
65-69	-	-	N\A	0.16%	0.19%	-	-
70-74	-	-	N\A	0.08%	0.10%	-	-
75 and over	-	-	N\A	0.08%	0.10%	-	-
Totals	32	17,283				25	31

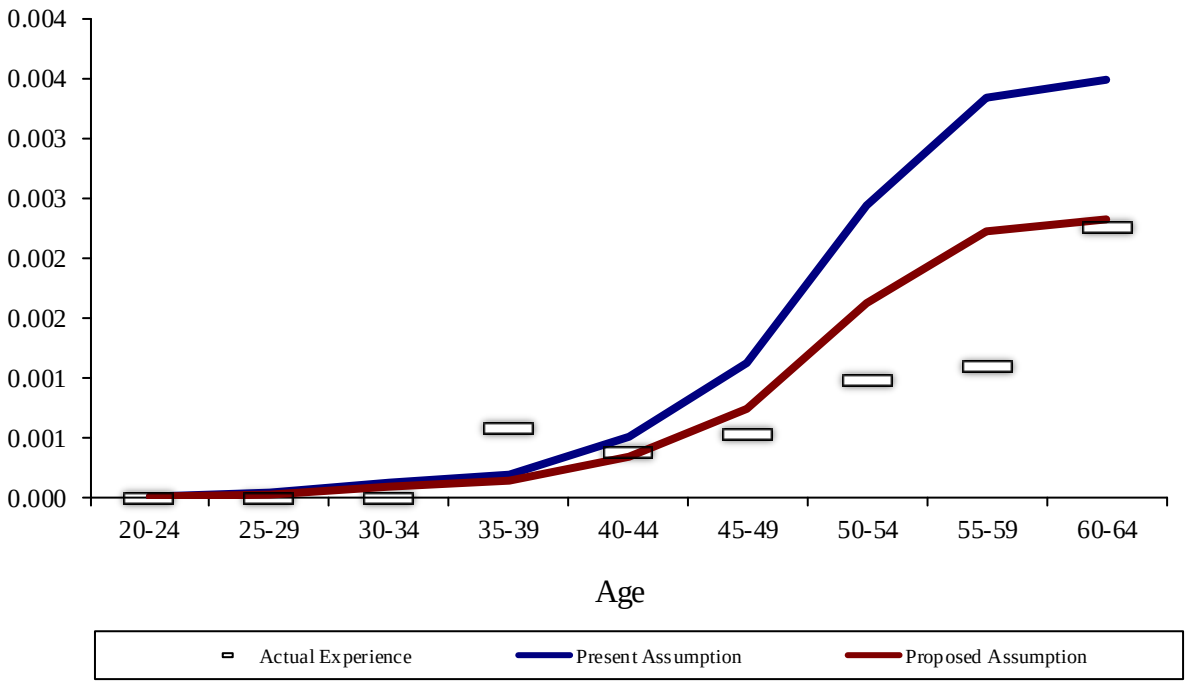
Disability Incidence – Male



Disability Incidence – Female

Age	Disabilities	Exposure	Crude Rates	Sample Rates		Expected Disabilities	
				Old	New	Old	New
Under 20	-	-	N/A	0.000%	0.000%	-	-
20-24	-	40	0.000%	0.001%	0.001%	-	-
25-29	-	606	0.000%	0.003%	0.002%	-	-
30-34	-	1,433	0.000%	0.012%	0.008%	-	-
35-39	1	1,743	0.057%	0.019%	0.013%	-	-
40-44	1	2,684	0.037%	0.051%	0.034%	1	1
45-49	2	3,751	0.053%	0.111%	0.074%	4	3
50-54	3	3,051	0.098%	0.243%	0.162%	7	5
55-59	2	1,820	0.110%	0.333%	0.222%	6	4
60-64	1	441	0.227%	0.349%	0.232%	2	1
65-69	-	-	N/A	0.162%	0.108%	-	-
70-74	-	-	N/A	0.083%	0.055%	-	-
75 and over	-	-	N/A	0.083%	0.055%	-	-
Totals	10	15,569				20	14

Disability Incidence – Female



Withdrawal Incidence – Male (less than 10 years of service)

Age	Withdrawals	Exposure	Expected Withdrawals*	A/E
Under 20	6	19	6	100%
20-24	344	1,327	341	101%
25-29	683	3,694	731	93%
30-34	694	4,570	695	100%
35-39	567	4,597	561	101%
40-44	497	4,834	487	102%
45-49	446	4,811	406	110%
50-54	318	4,271	308	103%
55-59	228	3,473	226	101%
60-64	121	1,534	116	104%
65-69	36	252	14	257%
70-74	7	39	1	700%
75 and over	1	-	-	
Totals	3,948	33,421	3,892	101%

* *Sample rates are taken from midpoint of age group.*

Withdrawal Incidence – Female (less than 10 years of service)

Age	Withdrawals	Exposure	Expected Withdrawals*	A/E
Under 20	6	31	9	67%
20-24	259	1,218	289	90%
25-29	662	4,005	740	89%
30-34	526	4,158	572	92%
35-39	429	3,740	418	103%
40-44	349	3,603	329	106%
45-49	288	3,633	258	112%
50-54	259	3,103	192	135%
55-59	146	2,310	140	104%
60-64	79	875	65	122%
65-69	15	73	4	375%
70-74	1	12	-	
75 and over	-	-	-	
Totals	3,019	26,761	3,016	100%

* *Sample rates are taken from midpoint of age group.*

Withdrawal Incidence – Male
(10 or more years of service)

Age	Withdrawals	Exposure	Crude Rates	Sample Rates*		Expected Withdrawals**	
				Old	New	Old	New
Under 20	-	-	N\A			-	-
20-24	-	-	N\A			-	-
25-29	2	22	0.0909	0.0909	0.0455	2	1
30-34	15	359	0.0418	0.0780	0.0418	28	15
35-39	64	1,446	0.0443	0.0539	0.0380	78	55
40-44	94	3,059	0.0307	0.0356	0.0337	109	103
45-49	113	4,695	0.0241	0.0243	0.0292	114	137
50-54	114	3,946	0.0289	0.0200	0.0248	79	98
55-59	78	1,954	0.0399	0.0200	0.0205	39	40
60-64	30	298	0.1007	0.0201	0.0168	6	5
65-69	6	-	N\A			-	-
70-74	1	-	N\A			-	
75 and over	4	-	N\A			-	
Totals	521	15,779				455	454

* *Sample rates are taken from midpoint of age group.*

** *"Expected withdrawals - New" is calculated as the sum of rates applied to exposure at individual ages. "Expected withdrawals - Old" is the sum of actual probabilities applied in the valuation.*

Withdrawal Incidence – Female
(10 or more years of service)

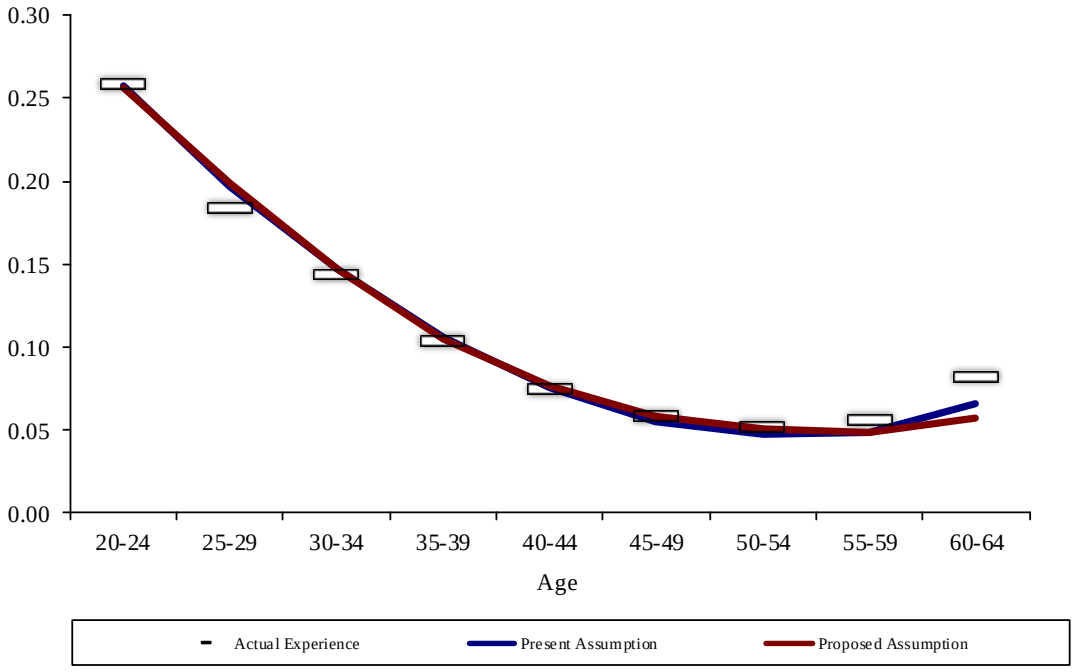
Age	Withdrawals	Exposure	Crude Rates	Sample Rates*		Expected Withdrawals**	
				Old	New	Old	New
Under 20	-	-	N\A			-	-
20-24	-	-	N\A			-	-
25-29	-	14	0.0000	0.0714	0.0714	1	1
30-34	20	422	0.0474	0.0664	0.0664	28	28
35-39	69	1,632	0.0423	0.0453	0.0453	74	74
40-44	118	3,487	0.0338	0.0344	0.0344	120	120
45-49	122	4,757	0.0256	0.0338	0.0338	161	161
50-54	113	3,498	0.0323	0.0340	0.0340	119	119
55-59	73	1,667	0.0438	0.0342	0.0342	57	57
60-64	26	237	0.1097	0.0338	0.0338	8	8
65-69	6	-	N\A			-	-
70-74	-	-	N\A			-	
75 and over	2	-	N\A			-	
Totals	549	15,714				568	568

* *Sample rates are taken from midpoint of age group.*

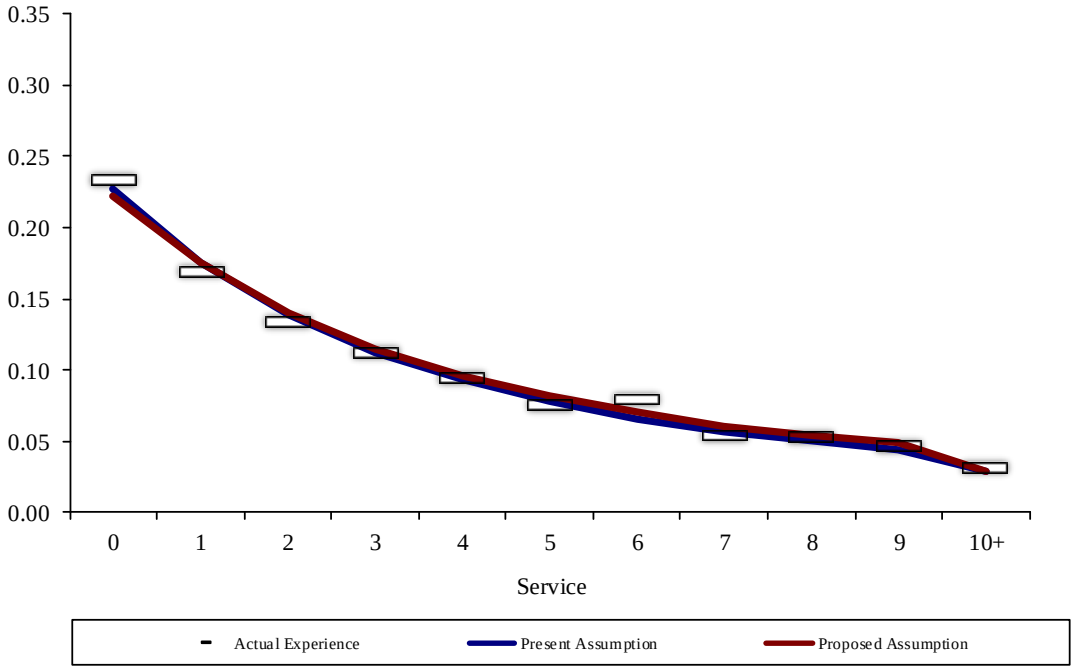
** *"Expected withdrawals - New" is calculated as the sum of rates applied to exposure at individual ages. "Expected withdrawals - Old" is the sum of actual probabilities applied in the valuation.*

Withdrawal – Male

Analysis of Termination Assumption by Age

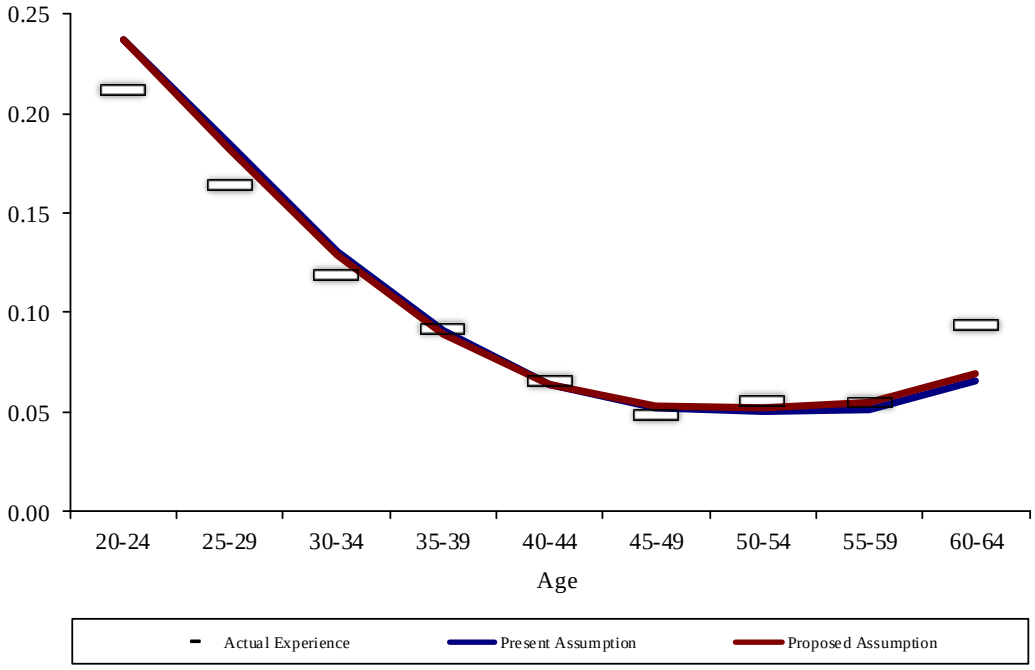


Analysis of Termination Assumption by Service



Withdrawal – Female

Analysis of Termination Assumption by Age



Analysis of Termination Assumption by Service