

HOUSTON POLICE OFFICERS' PENSION SYSTEM
2014 ACTUARIAL EXPERIENCE STUDY
FOR THE 5-YEAR PERIOD ENDING JUNE 30, 2013

October 24, 2014

Board of Trustees
Houston Police Officers' Pension System
602 Sawyer
Suite 300
Houston, TX 77007

Subject: Results of the 2014 Experience Study for HPOPS

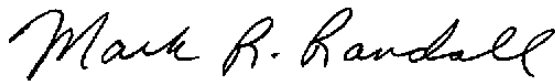
Dear Members of the Board:

We are pleased to present our report of the results of the 2014 Actuarial Experience Investigation Study for the Houston Police Officers' Pension System ("HPOPS" or "the System"). It includes our recommendations for new actuarial assumptions to be effective for the July 1, 2014 actuarial valuation, and it describes the estimated actuarial impact produced by these recommendations as though they had been effective for the July 1, 2013 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. The Board's decisions should be based on the appropriateness of each recommendation individually, not on their collective effect on the funding period or the unfunded liability.

We wish to thank the Executive Director, John Lawson, and the entire HPOPS staff for its assistance in providing the necessary data for this study.

Respectfully submitted,



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Table of Contents

		Page
	COVER LETTER	
Section I	EXECUTIVE SUMMARY	2
Section II	INTRODUCTION	8
Section III	ANALYSIS OF EXPERIENCE AND RECOMMENDATIONS	12
Section IV	ACTUARIAL IMPACT OF RECOMMENDATIONS	27
Section V	SUMMARY OF RECOMMENDATIONS	29
Section VI	SUMMARY OF ASSUMPTIONS AND METHODS, INCORPORATING RECOMMENDED ASSUMPTIONS	31
Section VII	SUMMARY OF DATA AND EXPERIENCE	40

SECTION I

EXECUTIVE SUMMARY

Executive Summary

- *Summary of recommendations:*

1. Recommend decreasing the inflation assumption from 3.00% to 2.75% per year
 - Based on the building block approach to the economic assumptions, decreasing the inflation assumption by 0.25% has the impact of decreasing the assumptions for nominal investment return, salary increases for individual members, and the projected payroll growth assumptions by the same 0.25%, and the future assumed COLAs and the DROP interest credit by a fraction of the 0.25%
 - Recommend changing the administrative expense assumption from being an implicit piece of the investment return assumption to being an explicit addition to the normal cost as a percentage of payroll
2. Recommend decreasing the investment return assumption from 8.50% to 8.00%
 - 0.25% from the decrease in inflation and 0.25% decrease in the real rate of return.
 - New assumption is 5.25% real rate of return, net of investment expenses
3. Recommend lowering the assumed DROP crediting rate from 7.0% to 6.4%
 - Recommend lowering the assumed COLA from 2.80% to 2.70%
 - Recommend decreasing the productivity component of the ultimate salary scale by 0.25%.
 - Recommend decreasing the Payroll Growth Rate from 3.50% to 2.75%,
 - based on a combination of the decrease in inflation, decrease in the productivity component of the salary scale, and recognition of the current demographics
 - Recommend updating the assumption for Post-Retirement Mortality and to build in generational improvements in mortality for the future
4. Recommend adding a small modification to the asset valuation method to ensure that all gains and losses from a specific year are fully recognized within a closed 5-year period
5. Recommend decreasing the rates of termination
6. Recommend modifying retirement rates, extending working careers
7. Recommend reducing the disability expectations
8. Recommend lowering active mortality expectations
9. Recommend modifying the assumption that members take their DROP balance in a lump sum at retirement to assume that members will take their DROP balance in equal installments over a 10 year period. This will include current members in PROP taking equal installments over the next 10 years

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

Item	2013 Valuation	Recommended Assumptions
(1)	(2)	(3)
Total Normal Cost %	30.16%	30.86%
Unfunded Actuarial Accrued Liability (\$ in Millions)	\$939	\$1,010
Funded Ratio	81.3%	80.1%
30 Year ARC	36.01%	38.43%

• *Summary of all recommended changes:*

Assumption (years of experience used in analysis)	Impact on Valuation	Actual	Expected based on current assumptions	A/E Ratio (current assumptions)	A/E Ratio (proposed assumptions)	Range of Reasonableness	Ideal Target Measure	Recommendation	Comments
Inflation (20 years)	Building Block	2.43%	3.00%	81%	88%	2.50%-3.00%	N/A	Lower to 2.75%	Based on national averages and economic expectations
Investment Return (Real) (20 years)	Major	5.84%	5.25%	N/A	N/A	Between arithmetic and geometric mean of expected returns based on target asset allocation	50% percentile	Lower assumption to 8.00%	Based on inflation plus expected net real rate of return, analysis includes target asset allocation and capital market assumptions
Salary Scale - Ultimate compared to Inflation (9 years)	Medium to Major	-0.68%	-0.50%	136%	90%	Usually up to 2.00% above inflation	Based on national averages, client experience, expectations	Decrease to 0.75% below Inflation, offset by increased Step-Rates	-0.75% is subtracted from the 2.75% inflation assumption to produce a 2.00% Ultimate Rate
Salary Scale - Select above Ultimate Rate (9 years)	Medium to Major	4.07%	3.78%	99.2%	100.2%	85%-115%	100%-105%	Increase to match experience	Heavy impact on the normal cost, should be heavily data driven using plan experience over an extended period
Payroll Growth (20 years, above inflation)	Medium	1.26%	0.50%	NA	NA	Based on national averages, client experience, best estimates	Inflation to Inflation plus 1.00%	Decrease to equal inflation assumption, retirements over the short term will dampen growth	

Assumption (years of experience used in analysis)	Impact on Valuation	Actual	Expected	A/E Ratio (current assumptions)	A/E Ratio (proposed assumptions)	Range of Reasonableness	Ideal Target Measure	Recommendation	Comments
Healthy Post-retirement mortality (5 years)	Major	221	216	102%	95%	Approximately 100%	Approximately 100%	Change to include explicit projections for continued improvement in mortality, change to mimic TMRS assumptions	Expected amount of time benefits will be payable once a member retires (only male counts used)
Active-mortality (5 years)	Minor	33	44	76%	86%	60%-110%	85%-95%	Decrease expectation	Moving from 76% to 86% is a large move, due to small population size, updated assumption not solely based on experience
Disabled Post-retirement mortality (5 years)	Medium	4	14	40%	67%	Approximately 100%	Approximately 100%	Change to mimic TMRS assumptions for disabled members	Very small data set, minor impact, due to small population size, updated assumption not solely based on experience
Rates of Retirement (5 years)	Medium	755	1,340	56%	75%	85%-105%	85%-95%	Recommend lower expectation	
Rates of Withdrawal - (5 years)	Medium	181	260	70%	104%	90%-120%	102%-108%	Recommend lowering expectations based on experience	Increases the probability of reaching a retirement
Rates of Disability (5 years)	Minor	33	78	42%	60%	80%-110%	85%-95%	Recommend lowering expectations based on experience	

Asset Valuation Method: The recommendation is to continue using an asset method with a 5-year smoothing period but with a small modification. The current method recognizes 20% of the difference between the expected actuarial value of assets and the market value each year to approximate 5 year smoothing. The proposed new method would add a provision that could accelerate the recognition process in a longer term trend in either direction to ensure that a large gain or loss is fully recognized within the 5 year timeframe.

Actuarial Funding Method: The recommendation is to keep the current use of the Projected Unit Credit cost method.

SECTION II

INTRODUCTION

Introduction

Summary of Process

A periodic review and selection of the actuarial assumptions is one of many important components of understanding and managing the financial aspects of HPOPS. Use of outdated or inappropriate assumptions can result in understated costs which will lead to higher future contribution requirements or perhaps an inability to pay benefits when due; or, on the other hand, produce overstated costs which place an unnecessarily large burden on the current generation of members, employers, and taxpayers.

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. Due to compounding economic forces, legal limitations, and moral obligations outcomes from underestimating future liabilities are much more difficult to manage than outcomes of overestimates, and that un-symmetric risk should be considered when the assumption set, investment policy and funding policy are created. 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 HPOPS and general experience of other large 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.

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
- Turnover rates
- Disability rates
- Investment return rate
- Salary increase rates
- Inflation rate

For some of these assumptions, such as the turnover or retirement rates, past experience provides important evidence about the future. For other assumptions, such as the investment return rate, the link between past and future results is much weaker. 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. It is known, for example, 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 were 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.

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 from 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 of 50% 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, by age, and by service.

Please note it often is appropriate to graduate or smooth the results since the actual experience 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 assumptions sets that could be supported. Some reasonable assumption sets would show higher or lower liabilities or costs.

ORGANIZATION OF REPORT

Section III contains our findings and recommendations for each actuarial assumption. The impact of adopting our recommendations on liabilities and contribution rates is shown in Section IV. Section V summarizes the recommended changes. Section VI presents a summary of all the actuarial assumptions and methods, including the recommended changes.

Section VII Exhibits Revised for HPOPS

The exhibits in Section VII should generally be self-explanatory. For example, on page XX, we show the exhibit analyzing the termination rates for HPOPS. The second column shows the total number of members who terminated during the study period. This excludes members who died, became disabled or retired. Column (3), labeled "Total Count" shows the total exposures. This is the number of members who could have terminated during any of the years. On this exhibit, the exposures exclude anyone eligible for retirement. A member is counted in each year he could have terminated, so the total shown is the total exposures for the five-year 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. Columns (9) and (10) show the Actual-to-Expected ratios under the current and proposed termination assumptions.

SECTION III

ANALYSIS OF EXPERIENCE AND RECOMMENDATIONS

Analysis of Experience and Recommendations

We will begin by discussing the economic assumptions: inflation, the investment return rate, the salary increase assumption, the cost-of-living increases (COLAs), the payroll growth rate and the DROP interest crediting 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 on giving advice on selecting economic assumptions for measuring obligations for defined benefit plans.

Generally, the economic assumptions are much more subjective in nature than the demographic assumptions. As no one knows what the future holds, it is necessary for the actuary to estimate possible future economic outcomes. These estimates are based on a mixture of past experience, future expectations, and professional judgment. 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. However, the standard explicitly advises the actuary not to give undue weight to recent experience.

Recognizing that there is not one right answer, the current standard calls for the actuary to develop a best-estimate range for each economic assumption, and then recommend a specific point within that range. 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.

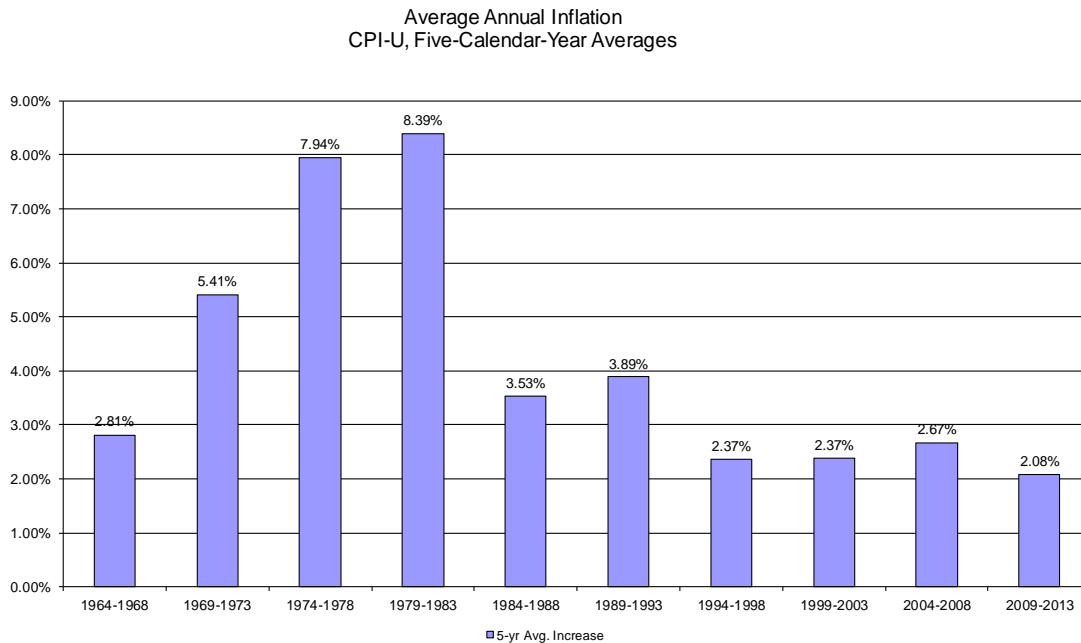
Please note that ASOP No. 27 was revised and adopted by the Actuarial Standards Board (ASB) in September 2013. Since this revised standard is now effective for any actuarial work products with a measurement date on or after October 1, 2014, our recommended economic assumptions are intended to comply with this revised practice standard.

INFLATION RATE

“Inflation,” refers to price inflation, as measured by annual increases in the Consumer Price Index (CPI). This inflation assumption underlies all of the other economic assumptions we employ. It impacts investment return, salary increases, and cost-of-living increases (COLAs) in retiree benefits. The current annual inflation assumption is 3.00%.

The chart on the following page shows the average annual inflation in each of the ten consecutive five-year periods over the last fifty years.

HOUSTON POLICE OFFICERS' PENSION SYSTEM



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

The table below shows the average inflation over various periods, ending December 2013:

Periods Ending Dec. 2013	Average Annual Increase in CPI-U
Last five (5) years	2.08%
Last ten (10) years	2.37%
Last fifteen (15) years	2.37%
Last twenty (20) years	2.37%
Last twenty-five (25) years	2.67%
Last thirty (30) years	2.82%
Since 1913 (first available year)	3.20%

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

As you can see, inflation has been relatively low over the last 30 years.

Most investment consulting firms, in setting their capital market assumptions, currently assume that inflation will be less than 3.00%. We examined the 2014 capital market assumption sets for eight investment consulting firms. The average assumption for inflation was 2.48%, with a range of 2.20% to 3.00%. However, the investment consulting firms typically set their assumptions based on a five or ten year outlook, while actuaries must make much longer projections.

In the Social Security Administration's 2013 Trustees Report, the Office of the Chief Actuary is projecting a long-term average annual inflation rate of 2.80% under the intermediate cost

assumption. (The low cost assumption was 1.80% and the high cost assumption was 3.80%.) These inflation assumptions have remained unchanged for the last several years.

Another source of information about future inflation is the market for U.S. Treasury bonds. The December 31, 2013 yield for a 20-year inflation indexed Treasury bond (20-year TIPS) was 1.23% plus actual inflation. The yield for a 20-year non-indexed U.S. Treasury bond was 3.54%. This means that on that day the bond market was predicting that inflation over the next twenty years would average 2.28% $[(1 + 3.54\%) / (1 + 1.23\%) - 1]$ per year. One year earlier, as of December 31, 2012, the spread between the 20-year inflation protected and constant maturity bonds was only marginally higher, with a difference of 2.38%, so there has been little change in this expectation. The imputed 30-year inflation level is close to the 20-year level, being 2.26% and 2.46% at December 31, 2013 and December 31, 2012, respectively.

Also, the Philadelphia Federal Reserve conducts a quarterly survey of the Society of Professional Forecasters. Their most recent forecast (first quarter of 2014) was for inflation over the next ten years (i.e. 2014 through 2023) to average 2.30% per year. The survey forecasts have also remained relatively stable over the last few years.

As a result, we recommend lowering this assumption to 2.75%. Based on the building block approach to the economic assumptions, decreasing the inflation assumption by 0.25% has the impact of decreasing the assumptions for nominal investment return, salary increases for individual members, and the projected payroll growth assumptions by the same 0.25%, and the future assumed COLAs and the DROP interest credit by a fraction of the 0.25%

COST-OF-LIVING (COLAs) INCREASE ASSUMPTION

Monthly benefits for participants receiving payments are increased each April 1 by 80% of the increase in the Consumer Price Index for All Urban Consumers (CPI-U) for the preceding year, with a minimum of 2.4% and a maximum of 8%. The current assumption is that this calculation will yield an average cost-of-living-increase of 2.80%.

The table below summarizes the average inflation and the average cumulative cost-of-living-increase based on the above provision over various periods ending June 2013:

HOUSTON POLICE OFFICERS' PENSION SYSTEM

Periods Ending December 2013	Average Annual Increase in CPI-U	Average COLA based on current formula
Last five (5) years	2.08%	2.40%
Last ten (10) years	2.37%	2.54%
Last twenty (20) years	2.37%	2.50%
Last thirty (30) years	2.82%	2.72%
Last fifty (50) years	4.12%	3.51%
Since 1913 (first available year)	3.20%	3.44%

In addition, we calculated the mean COLA assuming that CPI increases are distributed normally with a mean of 2.75% and a standard deviation of 1.25% to be 2.72%. Based on the analysis, we are recommending a decrease in this assumption to 2.70% per annum.

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.

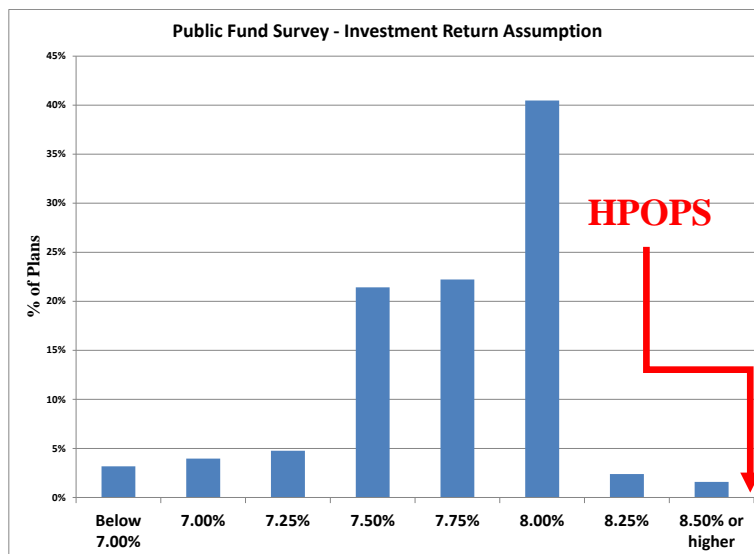
For investment expenses, investment consulting firms periodically issue reports that describe their capital market assumptions. The estimates for core investments (i.e., fixed income, equities, and real estate) are generally based on anticipated returns produced by passive index funds that are net of 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. Historically, the practice for HPOPS 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 the use of an assumption that is net only of investment expenses. For consistency and to keep from having different assumptions between the two valuations, we are recommending a change to make the administrative assumption an explicit load on the normal cost equal to the actual administrative expenses from the prior fiscal year rolled forward with one payroll growth rate.

INVESTMENT RETURN RATE

Currently, HPOPS assumes an annual investment return rate of 8.50%. 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. Similar to the inflation assumption, past performance is not a reliable indicator of future performance, even when averaged over a long time period. Also, the actual asset allocation of the trust fund will significantly impact the overall performance, so returns achieved under a different allocation are not meaningful.

The Public Fund Survey (PFS) is a joint venture of the National Association of State Retirement Administrators (NASRA) and the National Council on Teacher Retirement (NCTR). More than 85% of all state and local government pension assets and members in the U.S. are represented in this survey. The latest PFS shows that the median investment return assumption for large public plans is 7.90%. The survey median has slightly decreased from 8.00% in the same survey conducted last year. Subtracting the rate of inflation assumed for each plan gives a median real rate of return of 4.50%, which is slightly lower than the real rate of return assumption used by HPOPS. However, not all of the information supplied to the survey from peer systems is actually the inflation assumption, but instead the wage inflation assumption, making the comparable median higher than 4.50%. While we do not recommend the selection of an assumption based on prevalence information, it is still informative to identify where HPOPS is compared to its peers. Here is a chart showing the distribution of the investment return assumptions in the Public Fund Survey:



Source: Public Fund Survey (n=126). Median investment return assumption: 7.90% nominal return.

Clearly, the current 8.50% assumption is at the high end of the above range. In addition, the data on the survey typically lags by 12-18 months and the percentage using 8.00% or below would be higher if more current data were available.

Asset Allocation

The actual asset allocation of the trust fund will significantly impact the overall performance, so returns achieved under a different allocation are not meaningful. More importantly, the real rates of return for many asset classes, especially equities, vary so dramatically from year to year that even a ten-year period is not long enough to provide reasonable guidance.

We believe a better approach to selecting an investment return assumption is to determine the median expected portfolio return given the fund's targeted allocation and an overall set of capital market assumptions. Because GRS is a benefits consulting firm and does not provide investment advice, we looked at the results under the capital market assumptions developed by six independent investment consulting firms.

Per information received from HPOPS, the Fund's current target asset allocation is as follows:

Asset Class	Target Allocation
US Stocks	18.0%
International Stocks	14.8%
Emerging Market Stocks	5.8%
Private Equity	10.0%
Cash	0.5%
Global Fixed Income (hedged)	6.0%
High Yield	5.0%
Hedge Funds	9.0%
TIPS	7.5%
Real Assets	1.0%
Risk Parity	15.0%
EM Debt	4.5%
LC Debt	3.0%
Total	100.0%

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)
- Towers Watson

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.

HOUSTON POLICE OFFICERS' PENSION SYSTEM

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.

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 25th, 50th, and 75th percentiles of the 10-year geometric average of the expected nominal return, net of expenses, as well as the probability of exceeding the current 8.50% assumption.

**Expected Annual Geometric Returns and Return Probabilities
(Based on Current Capital Market Assumptions)**

Investment Consultant	Distribution of 10-Year Average Geometric Net Nominal Return			Probability of exceeding 8.50% *
	25th	50th	75th	
(1)	(2)	(3)	(4)	(5)
1	3.87%	6.84%	9.90%	35.7%
2	5.27%	7.57%	9.93%	39.5%
3	4.72%	7.40%	10.15%	39.3%
4	4.39%	7.39%	10.48%	40.3%
5	5.07%	7.82%	10.65%	43.5%
6	5.46%	8.04%	10.69%	45.3%
7	5.57%	8.40%	11.31%	49.1%
8	6.67%	9.39%	12.18%	58.7%
Average	5.13%	7.86%	10.66%	43.9%

Notice that only one consultant would support the current 8.50% assumption and the average of the group would only expect a 44% probability of exceeding the 8.50%.

However, the capital market assumptions provided by the investment consultants and used in the analysis above are based on a 7 to 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 appropriate to reflect differences in the economy and financial markets over the short-term and long-term time horizon by having an assumption slightly higher than the numbers provided above.

Based on this analysis, we recommend that HPOPS decrease the investment return assumption to an 8.00% investment return assumption, which is comprised of a 5.25% net real return and a 2.75% inflation assumption.

Based on the capital market assumption sets above, there is slightly less than a 50% (48.7%) likelihood of attaining a 8.00% investment return over the next 10 years, the probability is projected to be above 50% over a longer time horizon.

We believe this recommendation satisfies the best-estimate requirement under ASOP No. 27 as revised and adopted in September 2013. Also, this recommendation is consistent with the recommendations regarding the use of an investment return assumption that is estimated to be realizable at least 50% of the time from a report released by the Society of Actuaries Blue Ribbon Panel on public pension plan funding in February 2014.

DROP INTEREST CREDITING RATE

DROP balances are increased by the actual average 5 year return of the System, with a minimum of 3% and a maximum of 7%. The current assumption is that this calculation will yield an average credit of 7.00%.

The table below summarizes the average return and the average cumulative credit based on the above provision over various periods ending June 2013:

Periods Ending June 2013	Average Investment Return	Average cumulative DROP interest credit based on current formula
Last five (5) years	4.40%	4.20%
Last ten (10) years	8.44%	5.16%
Last twenty (20) years	8.27%	5.85%
Last thirty (30) years	9.08%	6.23%

In addition, we calculated the mean expected credit assuming that investment returns are distributed normally with a mean of 8.00% and an annual standard deviation of 11.00% to be 5.89%. Based on the analysis, we are recommending a decrease in this assumption from 7.0% to 6.4% per annum.

SALARY INCREASE RATES

The current salary increase assumption is a service related table that begins with 14.50% annual increases for new members decreasing to 2.50% annual increases for members with 18 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/below inflation applicable to all members.

Looking at just the productivity component, we segregated out members with more than 18 years of service and studied this group alone. These members should be past the promotional and step portions of their careers and, therefore, only receive the general increases granted. The actual productivity increase during the five year period was a negative 0.68%, meaning the general salary increases have been less than inflation for this group. We recommend decreasing this assumption so that general salary increases will be -0.75% less than inflation, or 2.00%.

The HPOPS data alone supports a productivity decrease. In addition, we believe it is reasonable because:

- The national statistics show a continuing decrease in the spread between wage inflation and price inflation.
- Data for the last three years of the period supports the lower assumption. During this period, members with at least 18 years of service received 1.13% below assumed inflation.
- We expect increasing pressure on salaries due to the projected increases in the costs for HPOPS and other benefit programs (healthcare).

The net impact is an increase in the step rate/promotional portion of the salary scale. Based on this new schedule, the lower inflation assumption, and the decrease in the general increase assumption, the cumulative increases from service years one to eighteen decreased approximately 3.5%. This translates into a new member's projected salary being lower by 3.5% at the end of 18 years than under the old assumption.

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 3.50% 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.

Total payroll in the HPOPS plan has grown on average 2.70% over the last ten years and 4.60% over the last twenty years.

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. However, current GASB standards prohibit retirement systems from projecting anticipated membership growth in setting the payroll growth assumption.

If the 0.9% membership growth rate is removed from the twenty year payroll growth rate of 4.60%, the net payroll growth without the impact of new membership is 3.7% (approximately 1.3% above inflation). However, because of the large segment of the population eligible for retirement, the future payroll growth (assuming no membership growth) is expected to be below these long term historical averages.

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 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 between 2.00% and 2.75% per year. Thus, the current and future demographics of the active population are very likely to suppress future overall payroll growth.

Given the above, we believe a reasonable range for this assumption is between 2.00% and 2.75%. We are recommending lowering this assumption to equal the 2.75% inflation assumption.

This change has no impact on the liabilities of the System, but does impact the contribution rates because it is used to project out future payrolls that will be the basis of future contributions. By assuming there will be less payroll in the future to make contributions on, the contribution rate must increase to reproduce the appropriate amount of dollars into the fund. This change and the change to the assumed salary increases for individual members largely offset each other.

DEMOGRAPHIC ASSUMPTIONS

As previously mentioned, 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.

When choosing an appropriate mortality assumption, actuaries typically use 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.

The mortality table currently being used for non-disabled retirees and beneficiaries is the 1994 Group Annuity Mortality Table. The table has separate rates for males and females. Because of the small number of female lives in the dataset, we performed the analysis on the male population only and then assume the female population will compare similarly.

We first measured the credibility of the dataset to determine whether the standard, unadjusted tables should be used or if statistical analysis of HPOPS 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 (221), we have used the data as if it is partially credible.

As discussed, 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, including public safety. The 221 deaths fall within 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 populations of HPOPS and TMRS are likely similar.

Thus we are recommending use of the RP-2000 Combined 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.

DISABLED MORTALITY RATES

We are recommending the RP-2000 table for disabled lives with no adjustment to male and female rates and fully generational mortality, projected using scale BB.

ACTIVE MORTALITY RATES

Mortality across employee groups is generally lower than the mortality rates in the post-retirement mortality tables. The plan currently uses the same mortality rates for active employees are used for healthy retirees, except with a 75% multiplier.

HOUSTON POLICE OFFICERS' PENSION SYSTEM

There were 33 actual deaths during the observation period, while there were 44 expected to occur. This produced an A/E ratio of 76%. Although the number of deaths isn't large enough for the results to have significant credibility, we are recommending a change to the assumption based on internal and national trends.

We recommend assuming that active mortality rates are 50% of the post-retirement mortality rates, with a flat 0.0003 added to the rates, which will increase the A/E ratio from 76% to 86%. The flat 0.0003 is based on HPOPS specific data which shows a relatively steady rate of mortality during the working career, which would be intuitive with a Police population.

DISABILITY RATES

There were 33 new disabled retirees during the period compared to 78 expected during the period. We are recommending a reduction in this assumption. The recommended assumption produces an A/E ratio of 60% compared to the current 42%.

RETIREMENT RATES

The valuation currently uses retirement rates that vary by age and service. In addition, the same retirement tables are currently used for members hired prior to 2004 and those hired after, except for a 30% load at age 55 for members hired after 2004 to represent the potential "pent up" demand for retirement.

There were 755 retirements during the five-year period. This includes only members who retired from active status. It excludes those who were inactive for over a year before retiring. The analysis shows A/E ratios of 56%, meaning many fewer members retired than expected during the period.

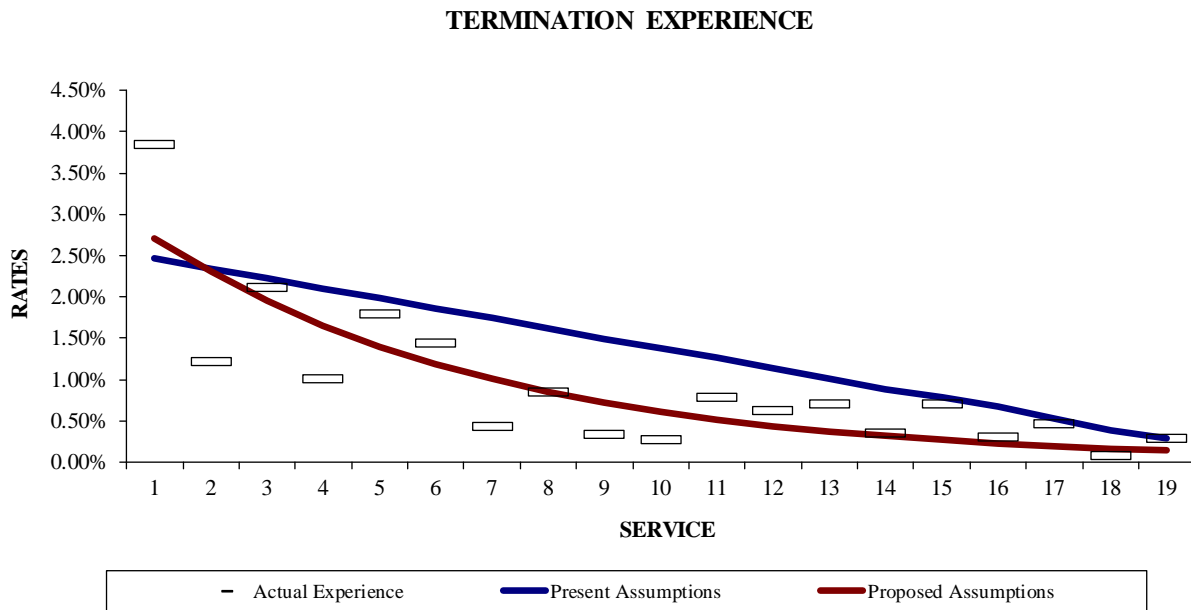
This is consistent with trends across the country as baby-boomers are not retiring as fast as anticipated. Also, a large part of this behavior is because of the DROP program. Therefore, we are recommending changes to the retirement patterns to extend working careers. For more detail, please see Section VI.

This recommendation will lower the liabilities and contribution requirements for the System.

Retirement Expectations						
			Current Assumptions		Proposed Assumptions	
Age	Exposure	Actual	Expected	A/E ratio	Expected	A/E ratio
40-49	4,526	119	193	62%	220	54%
50-54	4,113	258	379	68%	273	95%
55-59	2,135	246	489	50%	289	85%
60-64	585	118	172	69%	119	99%
65+	107	14	107	13%	107	13%
Totals	11,466	755	1,340	56%	1,008	75%

TERMINATION RATES

The termination assumption usually has little impact on a public safety actuarial valuation as the turnover experience of public safety groups tends to be very low. 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 account balance on deposit in HPOPS. The current termination rates reflect the member's age and service. The following exhibit illustrates the results of the analysis, grouped by service.



As shown, actual termination rates are lower than the current assumption. We are recommending a reduction in this assumption, which will increase the probability a member reaches retirement and thus increases the costs of the System.

PAYOUT OF DROP/PLOP BALANCES

The current model assumes members in DROP take their DROP balance as a lump sum at retirement and that members in the PROP program take their balance immediately. The data shows this is too conservative of an assumption as most members are taking advantage of the professional money management and tax advantages of the PLOP program and are leaving their money with the System for several years. We are recommending a change to assume that members will take their DROP balances in 10 equal installments after retirement. For members in PLOP, we will assume they take their balance in 10 equal installments following the valuation date.

OTHER ASSUMPTIONS AND REFUNDS

There are other assumptions made in the course of a valuation, such as the percentage of members who are married, the age difference between members and spouses, the likelihood that a terminating employee will take a refund, etc. 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.

ACTUARIAL METHODS

We have reviewed the actuarial cost method being used – the Projected Unit cost method – and we continue to believe that this is the method of choice for this plan.

In addition, we are recommending a minor change to the asset valuation method. The recommendation is to continue using an asset method with a 5-year smoothing period but with a small modification. The current method recognizes 20% of the difference between the expected actuarial value of assets and the market value each year to approximate 5 year smoothing. The proposed method would add a provision that could accelerate the recognition process in a longer term trend in either direction to ensure that a large gain or loss is fully recognized within the 5 year timeframe.

ADMINISTRATIVE PROCEDURES

We have reviewed the current processes used to determine default ages, salaries, genders, etc. for missing or inconsistent data and have made appropriate changes, as warranted.

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, 2013 actuarial valuation report before and after taking into account the recommended new assumptions.

Item	2013 Valuation	Recommended Assumptions
(1)	(2)	(3)
Total Normal Cost %	30.16%	30.86%
Unfunded Actuarial Accrued Liability (\$ in Millions)	\$939	\$1,010
Funded Ratio	81.3%	80.1%
30 Year ARC	36.01%	38.43%

All dollar amounts in \$ millions

SECTION V

SUMMARY OF RECOMMENDATIONS

Summary of Recommendations

Our recommendations may be summarized as follows:

1. Recommend decreasing the inflation assumption from 3.00% to 2.75% per year
2. Recommend changing the administrative expense assumption from being an implicit piece of the investment return assumption to being an explicit addition to the normal cost as a percentage of payroll
3. Recommend decreasing the investment return assumption from 8.50% to 8.00%
4. Recommend lowering the assumed DROP crediting rate from 7.0% to 6.4%
5. Recommend lowering the assumed COLA from 2.80% to 2.70%
6. Recommend decreasing the productivity component of the ultimate salary scale by 0.25%
7. Recommend decreasing the Payroll Growth Rate from 3.50% to 2.75%
8. Recommend updating the assumption for Post-Retirement Mortality and to build in generational improvements in mortality for the future
9. Recommend decreasing the rates of termination
10. Recommend modifying retirement rates, extending working careers
11. Recommend reducing the disability expectations
12. Recommend lowering active mortality expectations
13. Recommend modifying the assumption that members take their DROP balance in a lump sum at retirement to assume that members will take their DROP balance in equal installments over a 10 year period. This will include current members in PROP taking equal installments over the next 10 years
14. Recommendation is to continue using an asset method with a 5-year smoothing period but with a small modification. The proposed method would add a provision that could accelerate the recognition process in a longer term trend in either direction to ensure that a large gain or loss is fully recognized within the 5 year timeframe
15. Recommend continued use of the Projected Unit Credit cost method

SECTION VI

SUMMARY OF ASSUMPTIONS
AND METHODS INCORPORATING
THE RECOMMENDED ASSUMPTIONS

Summary of Actuarial Methods and Assumptions

The following methods and assumptions were used in preparing the July 1, 2014 actuarial valuation report.

1. Valuation Date

The valuation date is as of July 1st, the first day 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 (currently 8.00%), 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 contribution and an accrued liability contribution.
- c. The normal contribution is determined using the "entry age normal" method. Under this 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 new 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 October 9, 2004.

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, but the determination of the rate does not reflect 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) over 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 2.75% inflation rate and a 5.25% net real rate of return. This rate represents the assumed return, net of all investment expenses.
- b. Cost of Living Adjustment (COLA): Monthly benefits for participants receiving payments are increased each April 1 by 80% of the increase in the Consumer Price Index for All Urban Consumers (CPI-U) for the preceding year, with a minimum of 2.40% and a maximum of 8.00%. For this valuation, the annual COLA is assumed to be 2.70%.
- c. Salary increase rate: A service-related component, plus a 2.00% ultimate salary increase component, as follows:

d.

Years of Service	Service-related Component	Total Annual Rate of Increase Including 2.00% Inflation & Productivity Component
(1)	(2)	(3)
1	12.00%	14.00%
2	9.00%	11.00%
3	7.25%	9.25%
4	6.00%	8.00%
5	5.50%	7.50%
6	5.00%	7.00%
7	4.25%	6.25%
8	4.00%	6.00%
9	3.50%	5.50%
10	3.25%	5.25%
11	3.00%	5.00%
12	2.75%	4.75%
13	2.50%	4.50%
14	2.25%	4.25%
15	2.00%	4.00%
16	1.75%	3.75%
17	1.50%	3.50%
18 and Over	0.00%	2.00%

e. Payroll growth rate: In the amortization of the unfunded actuarial accrued liability, payroll is assumed to increase 2.75% per year. This increase rate is solely due to the effect of inflation on salaries, with no allowance for future membership growth.

5. Demographic Assumptions

a. Retirement Rates

Age	Service		
	<25	25 - 29	30+
40-49	4.0%	6.0%	10.0%
50-54	4.0%	6.0%	10.0%
55-59	6.8%	10.2%	17.0%
60-64	9.6%	14.4%	24.0%
65 +	100.0%	100.0%	100.0%

For members hired after October 9, 2004, 30% is added to the retirement rate at age 55.

b. DROP Participation

100% of eligible active participants are assumed to elect the DROP.

c. DROP Entry Date

Active members (not already in DROP) are assumed to take advantage of the DROP and enter when first eligible. Participants are assumed to elect the maximum duration for the back DROP, up to 20 years.

d. DROP Interest Credit

A minimum of 3.00% interest will be credited to existing DROP accounts with a maximum of 6.40%. If the System's actuary certifies that past service costs are fully funded, the credit may be as high as 10.00%. For this actuarial valuation, the drop interest credit is assumed to be 6.40%.

e. Withdrawal of DROP and PROP Balances

Members are assumed to withdraw balances in equal annual installments over 10 years.

f. Mortality rates (for active and retired members)

- **Healthy retirees** - The Gender-distinct RP2000 Combined Healthy Mortality Tables with Blue Collar Adjustment are used with male rates multiplied by 109% and female rates multiplied by 103%. The rates are projected on a fully generational basis by scale BB to account for future mortality improvements.
- **Disabled males and females** – The gender-distinct RP2000 Disabled Retiree Mortality Tables are used without adjustment. The rates are projected on a fully generational basis by scale BB to account for future mortality improvements.
- **Active members** - The Gender-distinct RP2000 Combined Healthy Mortality Tables with Blue Collar Adjustment are used with male rates multiplied by 54% and female rates multiplied by 51%. The rates are projected on a fully generational basis by scale BB to account for future mortality improvements. An additive factor of .0003 is applied to all active mortality rates.

Sample rates are shown below for 2014:

Age	Healthy Retired Males	Healthy Retired Females	Disabled Males	Disabled Females	Healthy Active Males	Healthy Active Females
(1)	(2)	(3)	(4)	(5)	(6)	(7)
25	0.04%	0.02%	2.19%	0.72%	0.05%	0.04%
30	0.08%	0.03%	2.19%	0.72%	0.07%	0.04%
35	0.11%	0.05%	2.19%	0.72%	0.09%	0.06%
40	0.15%	0.09%	2.19%	0.72%	0.10%	0.07%
45	0.19%	0.14%	2.19%	0.72%	0.12%	0.10%
50	0.26%	0.20%	2.81%	1.12%	0.16%	0.13%
55	0.44%	0.27%	3.44%	1.57%	0.25%	0.17%
60	0.84%	0.46%	3.92%	1.98%	0.45%	0.26%
65	1.50%	0.95%	4.45%	2.48%	0.77%	0.50%
70	2.51%	1.70%	5.38%	3.34%	1.27%	0.87%
75	4.04%	2.82%	7.06%	4.63%	2.03%	1.43%
80	6.61%	4.47%	9.40%	6.41%	3.31%	2.24%

g. Termination Rates and Disability Rates

Termination rates (for causes other than death, disability or retirement) are a function of the member's service and are not applied after a member becomes eligible for a retirement benefit. Disability rates are age-based and not applied for members in the DROP or those members eligible to back DROP. Rates at selected ages and service levels are shown below.

Service Based Rates of Termination		
Service	Male	Female
1	2.71%	2.71%
3	1.95%	1.95%
5	1.40%	1.40%
7	1.01%	1.01%
9	0.72%	0.72%
11	0.52%	0.52%
13	0.37%	0.37%
15	0.27%	0.27%
17	0.19%	0.19%
19	0.14%	0.14%
20 +	0.10%	0.10%

Age Based Rates of Disability		
Age	Male	Female
20	0.1149%	0.1149%
25	0.1145%	0.1145%
30	0.1197%	0.1197%
35	0.1321%	0.1321%
40	0.1516%	0.1516%
45	0.1785%	0.1785%
50	0.2126%	0.2126%
55	0.2538%	0.2538%
60	0.3023%	0.3023%

6. Other Assumptions

- a. Percent married: 90% of employees are assumed to be married. (No beneficiaries other than the spouse assumed.)
- b. 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.
- c. Percent electing annuity on death (when eligible): All of the spouses of vested, married participants are assumed to elect an annuity.

- d. Percent electing deferred termination benefit: 50% of vested terminating members are assumed to elect a refund rather than take a deferred benefit at age 60.
- e. There will be no recoveries once disabled.
- f. No surviving spouse will remarry.
- g. 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.
- h. Administrative expenses: Administrative expenses are included in the employer normal cost rate.
- i. 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.
- j. Decrement timing: Decrements of all types are assumed to occur mid-year.
- k. 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.
- l. Decrement relativity: Decrement rates are converted to probabilities in order to account for multiple decrements.
- m. Incidence of Contributions: Contributions are assumed to be received continuously throughout the year based upon the computed percent of payroll shown in our Report, and the actual payroll payable at the time contributions are made.
- n. Benefit Service: All members are assumed to accrue one year of service each year. Exact fractional service is used to determine the amount of benefit payable.

7. Participant Data

Participant data was supplied in electronic files. There were separate files for (i) active members, (ii) inactive members, and (iii) 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 income.

All healthy and disabled retirees are assumed to have 100% joint and survivor annuities, prorated by the 90% marriage assumption and reflecting the three year spousal age differential described above. All beneficiaries are assumed to have life annuity only benefits.

Salary supplied for the current year was based on the earnings for the year preceding the valuation date. This salary was adjusted by the salary increase rate for one year.

In fiscal years when a 27th pay period occurs the individual pays for employees who were employed throughout the year will be adjusted by multiplying their reported pay by the ratio of 26/27. In years that have only 26 pay periods no adjustment would be needed.

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

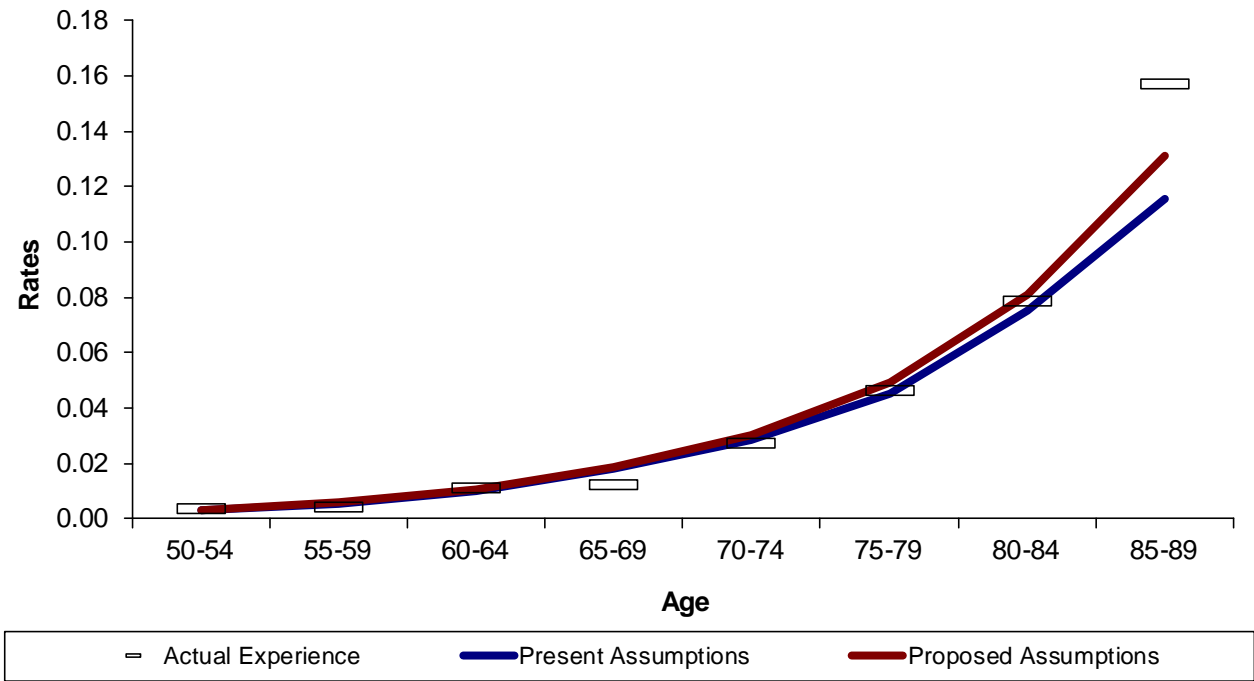
SECTION VII

SUMMARY OF DATA AND EXPERIENCE

**HOUSTON POLICE OFFICERS' PENSION SYSTEM
POST-RETIREMENT MORTALITY - HEALTHY MALE**

Age	Actual Deaths	Total Count	Actual Rate	Assumed Rate		Expected Deaths		Actual/Expected	
				Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
50-54	5	# 1,344	0.372%	0.321%	0.317%	4.0	4.0	125%	125%
55-59	11	# 2,592	0.424%	0.558%	0.589%	15.0	16.0	73%	69%
60-64	36	# 3,182	1.131%	1.015%	1.073%	32.0	34.0	113%	106%
65-69	22	# 1,804	1.220%	1.803%	1.850%	32.0	33.0	69%	67%
70-74	37	# 1,344	2.753%	2.848%	3.017%	38.0	41.0	97%	90%
75-79	46	# 989	4.651%	4.517%	4.936%	44.0	48.0	105%	96%
80-84	36	# 457	7.877%	7.553%	8.093%	33.0	36.0	109%	100%
85-89	22	# 140	15.714%	11.567%	13.123%	16.0	18.0	138%	122%
90-94	6	# 13	46.15%	18.228%	21.073%	2.0	3.0	300%	200%
95-99	-	# -	N/A	26.882%	31.400%	0	0	N/A	N/A
100-104	-	# -	N/A	35.033%	39.711%	0	0	N/A	N/A
105-109	-	# -	N/A	44.194%	43.600%	0	0	N/A	N/A
Other	2	# 565	0.354%			1.1	1.2	179%	163%
Totals	223	12,430	1.794%	0.000%	0.000%	217.1	234.2	103%	95%
65-74	59	3,148				70.0	74.0	84%	80%
75-84	82	1,446				77.0	84.0	106%	98%
85-94	28	153				18.0	21.0	156%	133%

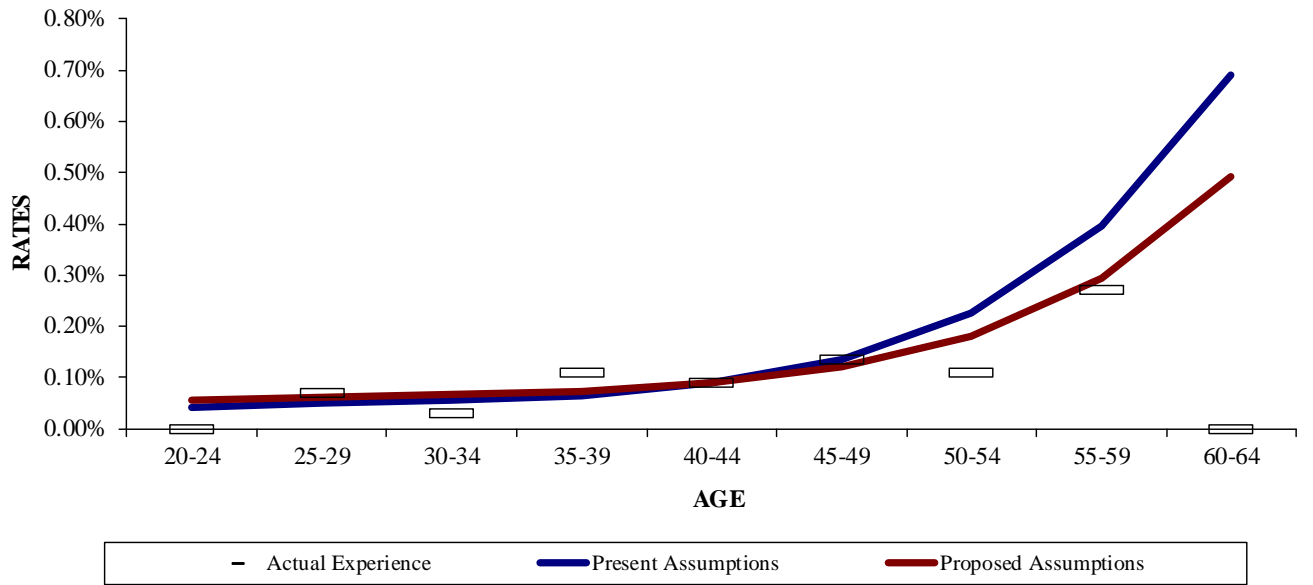
POST-RETIREMENT MORTALITY - MALE



**HOUSTON POLICE OFFICERS' PENSION SYSTEM
ACTIVE MORTALITY EXPERIENCE**

Age (1)	Actual Deaths (2)	Total Count (3)	Actual Rate (4)	Assumed Rate		Expected Deaths		Actual/Expected	
				Current (5)	Proposed (6)	Current (7)	Proposed (8)	Current (2) / (7) (9)	Proposed (2) / (8) (10)
Under 20	-	-	N/A	0.0323%	0.0215%	-	-	N/A	N/A
20-24	-	341	0.0000%	0.0411%	0.0557%	0.1	0.2	0.000%	0.000%
25-29	2	2,804	0.0713%	0.0492%	0.0628%	1.4	1.8	145%	114%
30-34	1	3,363	0.0297%	0.0568%	0.0678%	1.9	2.3	52%	44%
35-39	5	4,598	0.1087%	0.0644%	0.0729%	3.0	3.4	169%	149%
40-44	6	6,602	0.0909%	0.0894%	0.0897%	5.9	5.9	102%	101%
45-49	8	5,960	0.1342%	0.1359%	0.1206%	8.1	7.2	99%	111%
50-54	5	4,597	0.1088%	0.2265%	0.1810%	10.4	8.3	48%	60%
55-59	6	2,209	0.2716%	0.3957%	0.2933%	8.7	6.5	69%	93%
60-64	-	593	0.0000%	0.6914%	0.4907%	4.1	2.9	0%	0%
Totals	33	31,067	0.1062%	0.1405%	0.1236%	43.6	38.4	76%	86%

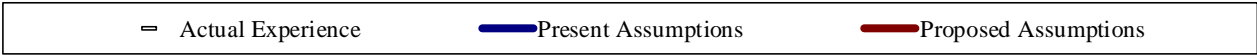
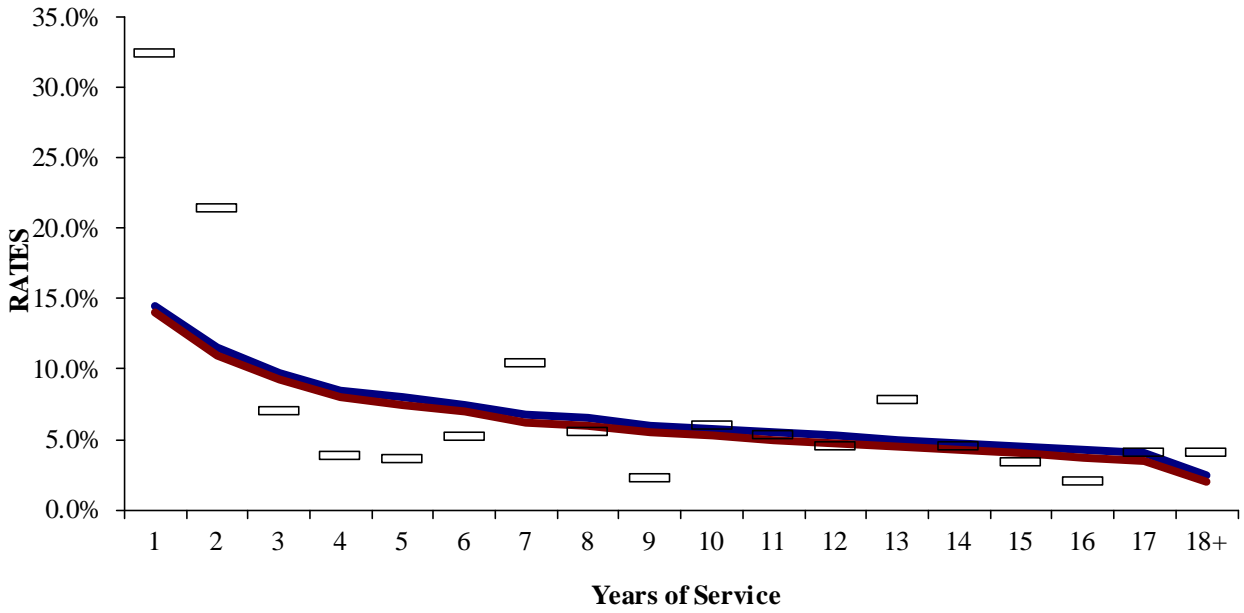
ACTIVE MORTALITY EXPERIENCE



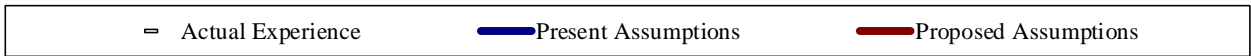
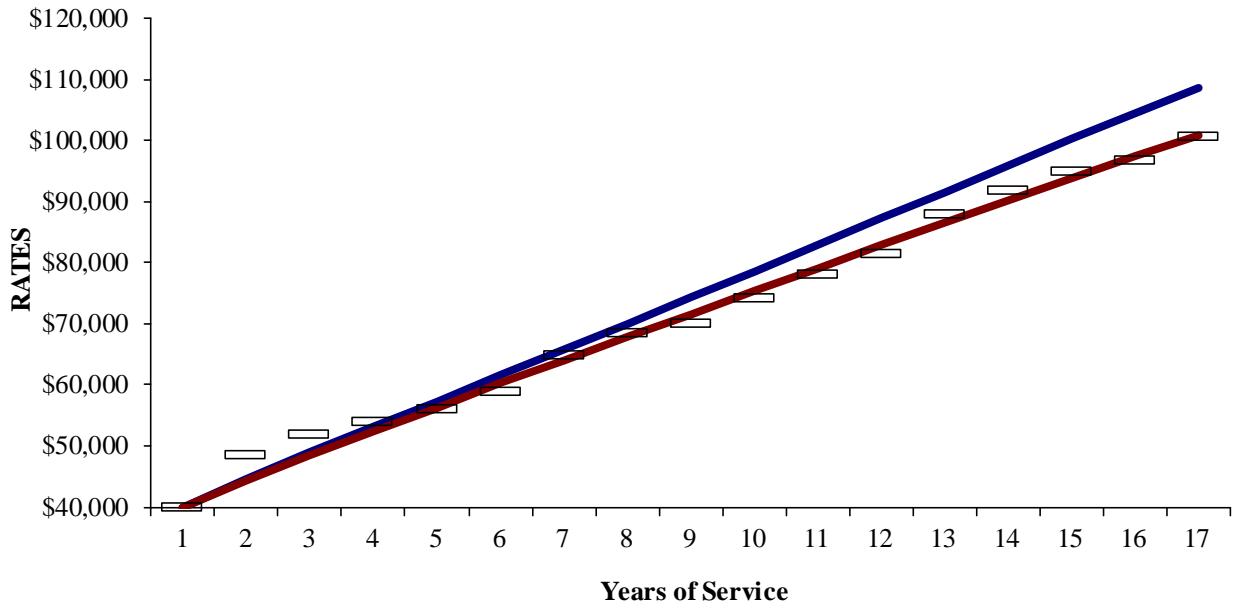
**HOUSTON POLICE OFFICERS' PENSION SYSTEM
SERVICE BASED SALARY EXPERIENCE**

Years of Service	Current Salary Scale		Actual Experience			Proposed Salary Scale	
	Total	Step Rate/ Promotional	Total	Above Inflation	Step Rate/ Promotional	Total	Step Rate/ Promotional
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	14.50%	12.00%	32.39%	29.64%	29.89%	14.00%	12.00%
2	11.50%	9.00%	21.35%	18.60%	18.85%	11.00%	9.00%
3	9.75%	7.25%	7.01%	4.26%	4.51%	9.25%	7.25%
4	8.50%	6.00%	3.81%	1.06%	1.31%	8.00%	6.00%
5	8.00%	5.50%	3.61%	0.86%	1.11%	7.50%	5.50%
6	7.50%	5.00%	5.18%	2.43%	2.68%	7.00%	5.00%
7	6.75%	4.25%	10.42%	7.67%	7.92%	6.25%	4.25%
8	6.50%	4.00%	5.47%	2.72%	2.97%	6.00%	4.00%
9	6.00%	3.50%	2.20%	-0.55%	-0.30%	5.50%	3.50%
10	5.75%	3.25%	5.99%	3.24%	3.49%	5.25%	3.25%
11	5.50%	3.00%	5.25%	2.50%	2.75%	5.00%	3.00%
12	5.25%	2.75%	4.46%	1.71%	1.96%	4.75%	2.75%
13	5.00%	2.50%	7.76%	5.01%	5.26%	4.50%	2.50%
14	4.75%	2.25%	4.44%	1.69%	1.94%	4.25%	2.25%
15	4.50%	2.00%	3.32%	0.57%	0.82%	4.00%	2.00%
16	4.25%	1.75%	2.02%	-0.74%	-0.49%	3.75%	1.75%
17	4.00%	1.50%	4.06%	1.31%	1.56%	3.50%	1.50%
18+	2.50%	0.00%	4.08%	1.33%	1.58%	2.00%	0.00%
Current Inflation Assumption			3.00%	Proposed Inflation Assumption			2.75%
Current Productivity Component			-0.50%	Proposed Productivity Component			-0.75%
Actual CPI-U Inflation for Period			2.02%				
Apparent Productivity Component			0.00%				

**Service-Based Salary Rates
Total Salary Increase**



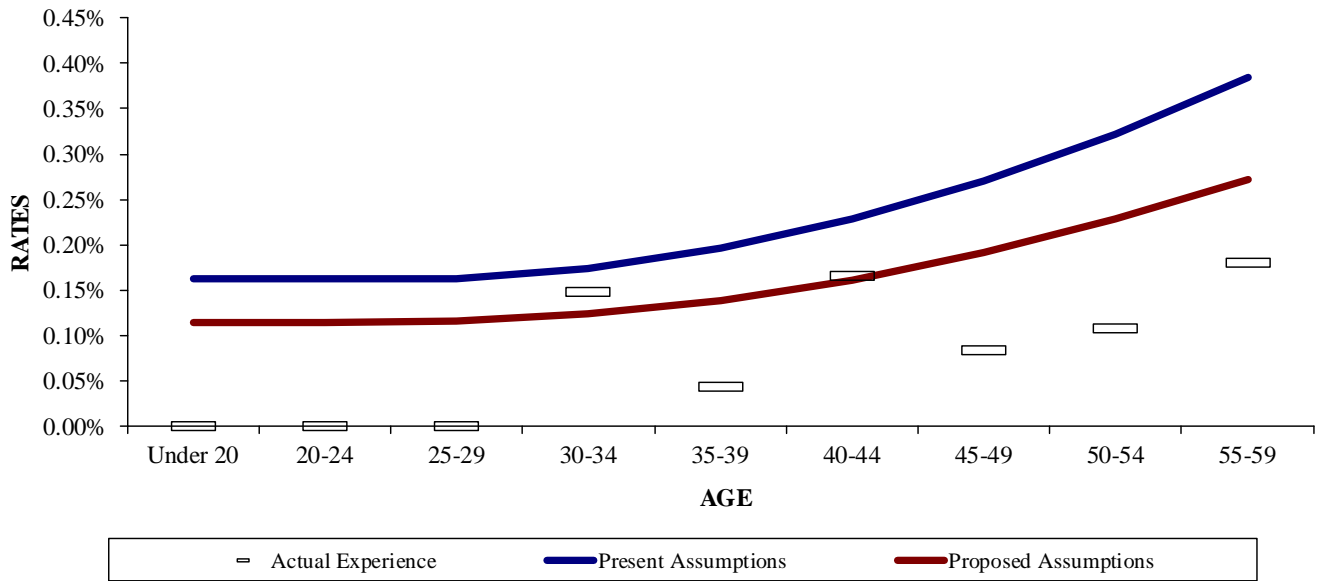
Service-Based Salary Rates
Expected Salary Growth for a New Entrant



**HOUSTON POLICE OFFICERS' PENSION SYSTEM
DISABILITY EXPERIENCE**

Age	Actual Disabilities	Total Count	Actual Rate	Assumed Rate		Expected Disabilities		Actual/Expected	
				Current	Proposed	Current	Proposed	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Under 20	-	-	N/A	0.162%	0.115%	-	-	N/A	N/A
20-24	-	341	0.000%	0.162%	0.115%	1.0	-	0%	N/A
25-29	-	2,804	0.000%	0.163%	0.116%	5.0	4.0	0%	0%
30-34	5	3,363	0.149%	0.175%	0.124%	6.0	4.0	83%	125%
35-39	2	4,598	0.043%	0.196%	0.139%	9.0	6.0	22%	33%
40-44	11	6,602	0.167%	0.228%	0.162%	15.0	11.0	73%	100%
45-49	5	5,960	0.084%	0.270%	0.191%	16.0	12.0	31%	42%
50-54	5	4,597	0.109%	0.322%	0.228%	15.0	10.0	33%	50%
55-59	4	2,209	0.181%	0.384%	0.272%	8.0	6.0	50%	67%
60-64	1	593	0.169%	0.457%	0.324%	3.0	2.0	33%	50%
Totals	33	31,067	0.106%	0.250%	0.176%	78.0	55.0	42%	60%

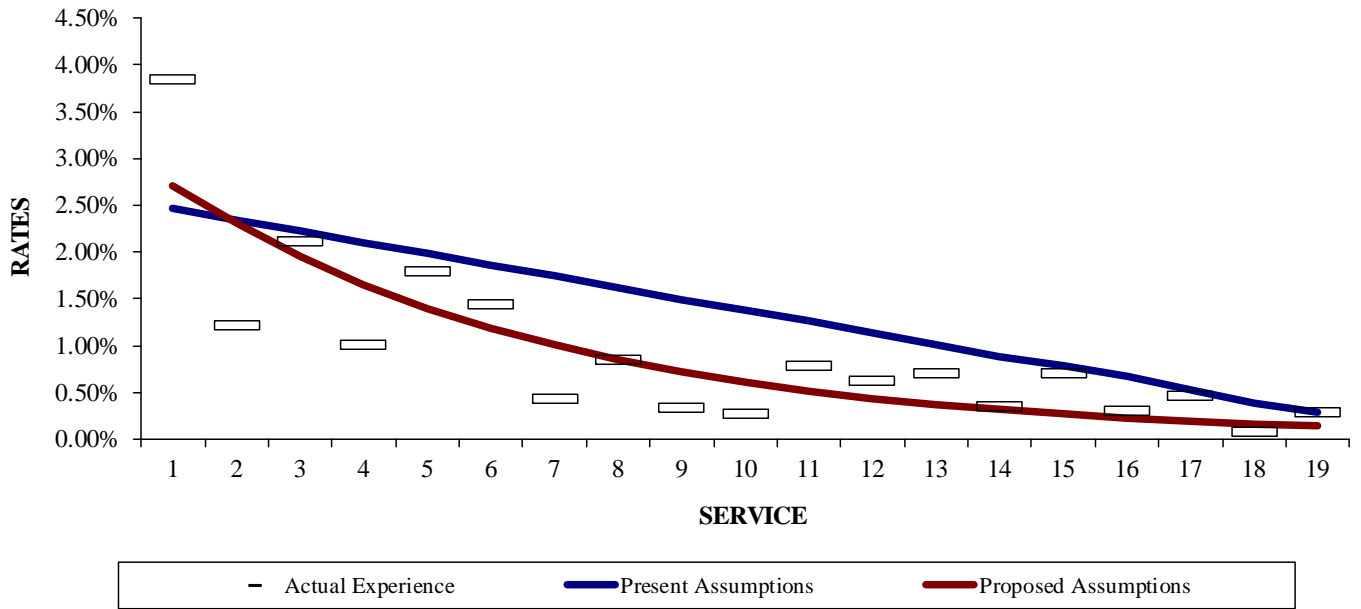
DISABILITY EXPERIENCE



**HOUSTON POLICE OFFICERS' PENSION SYSTEM
TERMINATION EXPERIENCE**

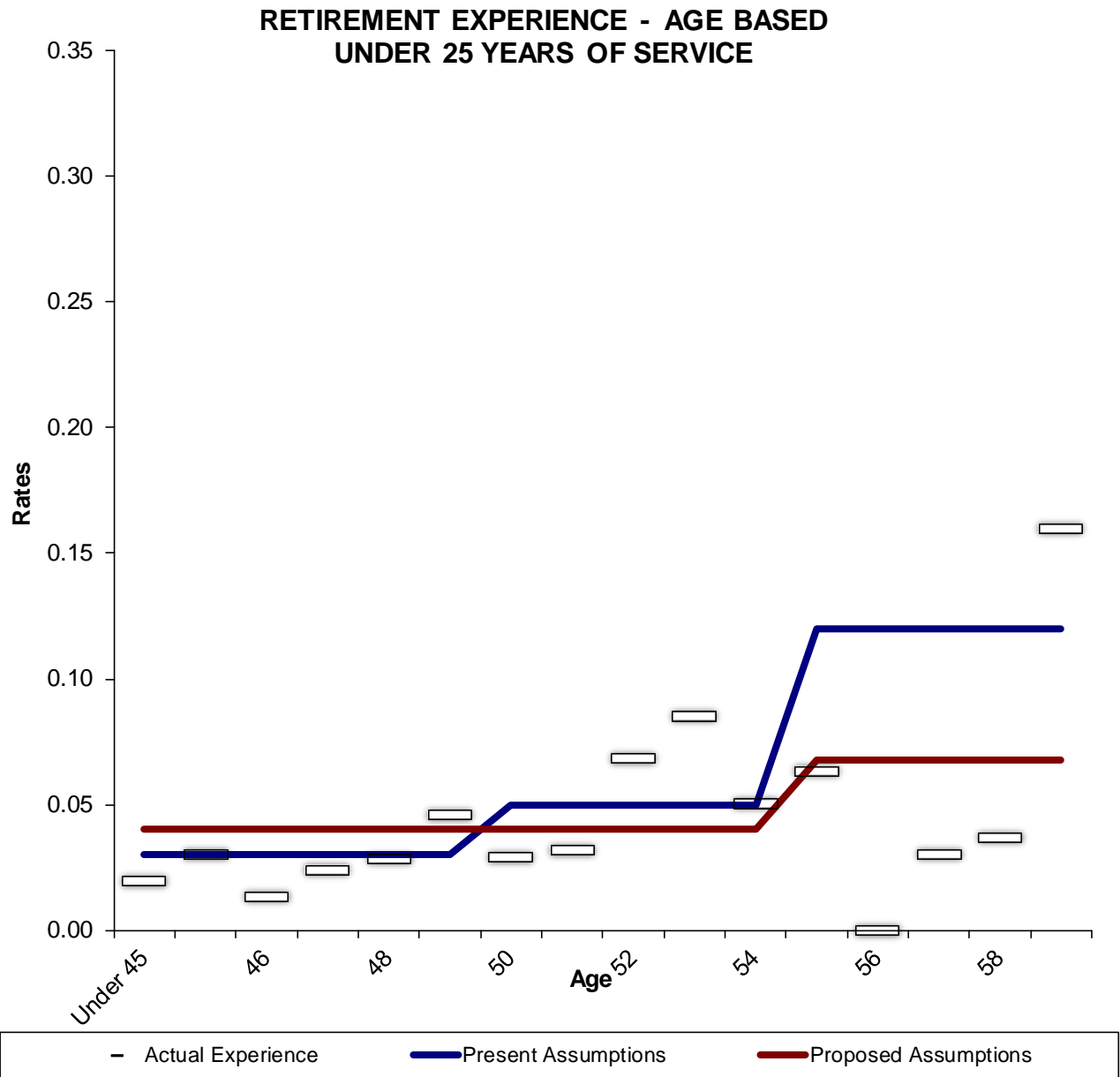
Service	Actual Withdrawal	Total Count	Actual Rate	Assumed Rate		Expected Withdrawal		Actual/Expected	
				Current	Proposed	Current	Proposed	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	33	857	0.0385	0.0246	0.0271	21.1	23.2	156%	142%
2	15	1,224	0.0123	0.0234	0.0230	28.6	28.2	52%	53%
3	32	1,507	0.0212	0.0222	0.0195	33.5	29.4	96%	109%
4	13	1,293	0.0101	0.0210	0.0165	27.2	21.3	48%	61%
5	19	1,054	0.0180	0.0198	0.0140	20.9	14.8	91%	129%
6	12	833	0.0144	0.0186	0.0119	15.5	9.9	77%	121%
7	3	687	0.0044	0.0175	0.0101	12.0	6.9	25%	43%
8	5	587	0.0085	0.0162	0.0085	9.5	5.0	53%	100%
9	2	603	0.0033	0.0149	0.0072	9.0	4.3	22%	46%
10	2	745	0.0027	0.0138	0.0061	10.3	4.5	19%	44%
11	6	770	0.0078	0.0126	0.0052	9.7	4.0	62%	150%
12	5	790	0.0063	0.0114	0.0044	9.0	3.5	56%	144%
13	7	989	0.0071	0.0101	0.0037	10.0	3.7	70%	191%
14	4	1,133	0.0035	0.0088	0.0032	10.0	3.6	40%	110%
15	9	1,277	0.0070	0.0078	0.0027	10.0	3.4	90%	261%
16	4	1,332	0.0030	0.0068	0.0023	9.0	3.1	44%	131%
17	6	1,304	0.0046	0.0054	0.0019	7.0	2.5	86%	242%
18	1	1,286	0.0008	0.0039	0.0016	5.0	2.1	20%	49%
19	3	1,026	0.0029	0.0029	0.0014	3.0	1.4	100%	209%
Totals	181	19,297	0.0094	0.0135	0.0091	260.3	174.8	70%	104%

TERMINATION EXPERIENCE



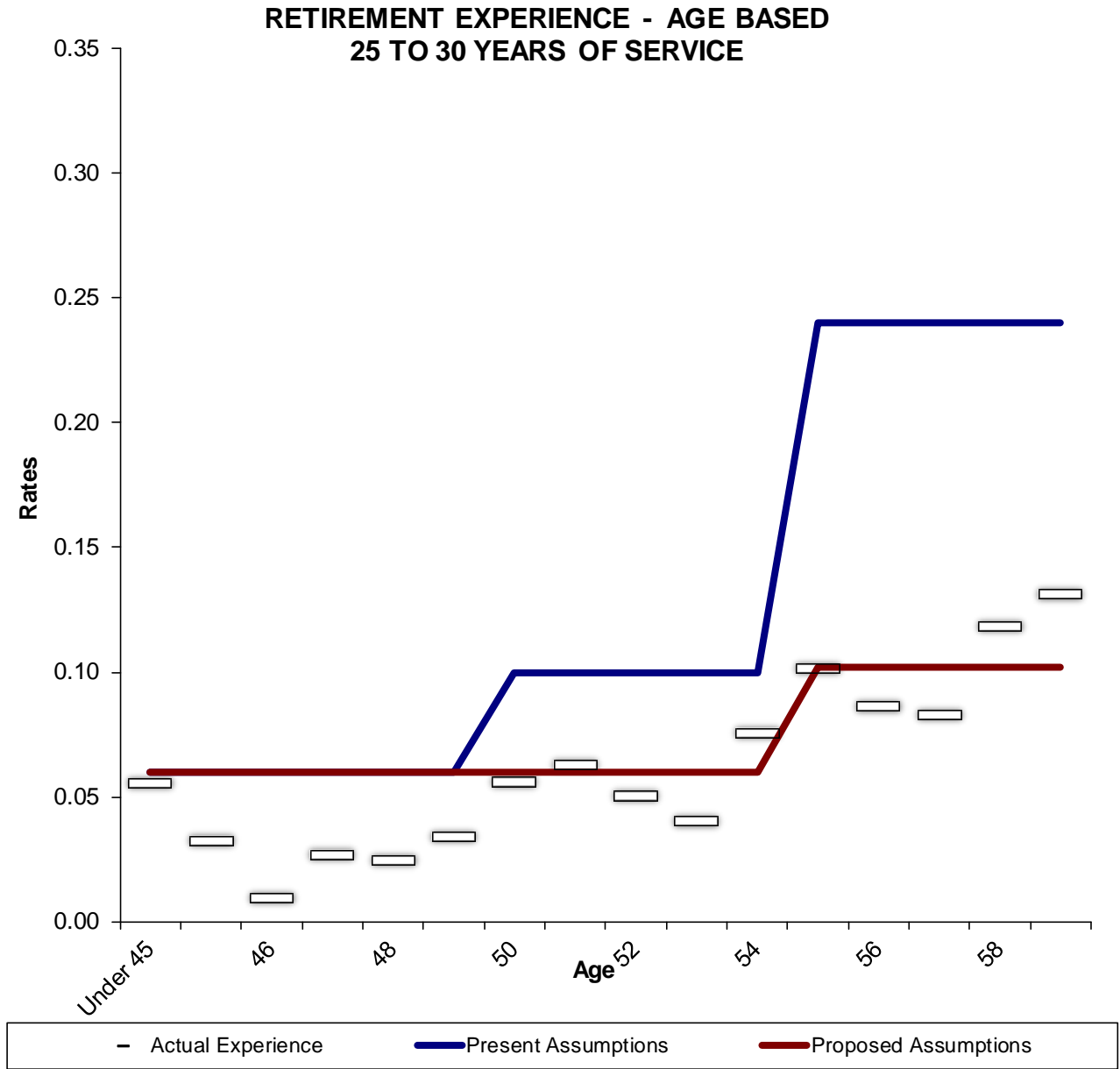
**HOUSTON POLICE OFFICERS' PENSION SYSTEM
RETIREMENT EXPERIENCE - AGE BASED, <25 YEARS OF SERVICE**

Age	Actual Retirement	Total Count	Actual Rate	Assumed Rate		Expected Retirement		Actual/Expected	
				Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Under 45	13	675	0.019	0.030	0.040	20.3	27.0	64%	48%
45	14	462	0.030	0.030	0.040	13.9	18.5	101%	76%
46	6	450	0.013	0.030	0.040	13.5	18.0	44%	33%
47	10	420	0.024	0.030	0.040	12.6	16.8	79%	60%
48	10	352	0.028	0.030	0.040	10.6	14.1	95%	71%
49	12	262	0.046	0.030	0.040	7.9	10.5	153%	115%
50	6	208	0.029	0.050	0.040	10.4	8.3	58%	72%
51	5	156	0.032	0.050	0.040	7.8	6.2	64%	80%
52	8	117	0.068	0.050	0.040	5.9	4.7	137%	171%
53	8	94	0.085	0.050	0.040	4.7	3.8	170%	213%
54	4	79	0.051	0.050	0.040	4.0	3.2	101%	127%
55	4	63	0.063	0.120	0.068	7.6	4.3	53%	93%
56	0	45	0.000	0.120	0.068	5.4	3.1	0%	0%
57	1	33	0.030	0.120	0.068	4.0	2.2	25%	45%
58	1	27	0.037	0.120	0.068	3.2	1.8	31%	54%
59	4	25	0.160	0.120	0.068	3.0	1.7	133%	235%
60	2	12	0.167	0.150	0.096	1.8	1.2	111%	174%
61	2	5	0.400	0.150	0.096	0.8	0.5	267%	417%
62	0	2	0.000	0.150	0.096	0.3	0.2	0%	0%
63	0	2	0.000	0.150	0.096	0.3	0.2	0%	0%
64	1	1	1.000	0.150	0.096	0.2	0.1	667%	1042%
Subtotal	111	3,490	0.032	0.039	0.042	137.8	146.2	81%	76%
65 & Over	0	7	0.000	1.000	1.000	7.0	7.0	0%	0%
Total	111	3,497	0.032	0.041	0.044	144.8	153.2	77%	72%



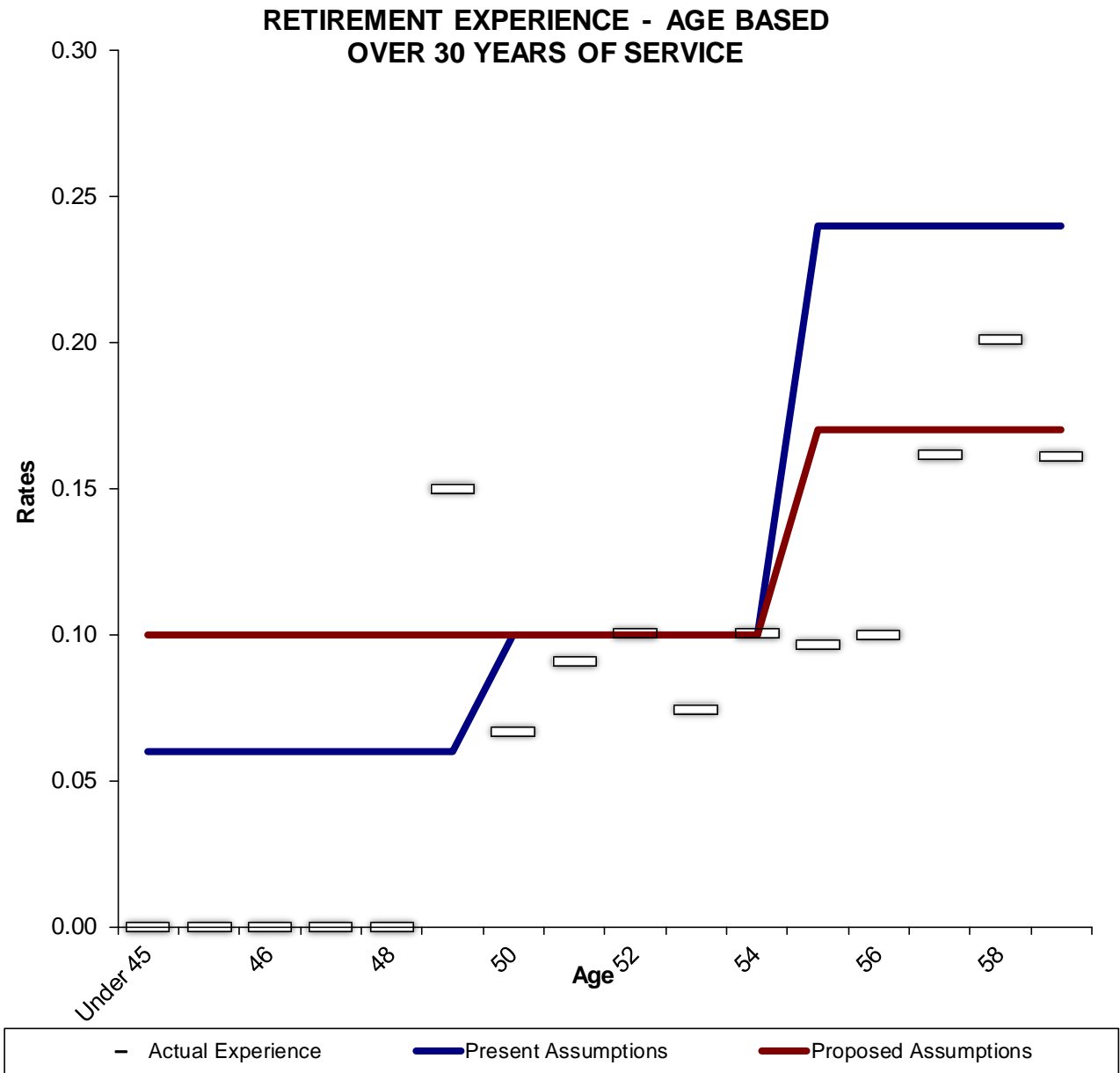
**HOUSTON POLICE OFFICERS' PENSION SYSTEM
RETIREMENT EXPERIENCE - AGE BASED, 25-30 YEARS OF SERVICE**

Age	Actual Retirement	Total Count	Actual Rate	Assumed Rate		Expected Retirement		Actual/Expected	
				Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Under 45	1	18	0.056	0.060	0.060	1.1	1.1	93%	93%
45	3	92	0.033	0.060	0.060	5.5	5.5	54%	54%
46	2	215	0.009	0.060	0.060	12.9	12.9	16%	16%
47	10	377	0.027	0.060	0.060	22.6	22.6	44%	44%
48	13	534	0.024	0.060	0.060	32.0	32.0	41%	41%
49	22	648	0.034	0.060	0.060	38.9	38.9	57%	57%
50	36	644	0.056	0.100	0.060	64.4	38.6	56%	93%
51	38	608	0.063	0.100	0.060	60.8	36.5	63%	104%
52	26	517	0.050	0.100	0.060	51.7	31.0	50%	84%
53	16	397	0.040	0.100	0.060	39.7	23.8	40%	67%
54	24	317	0.076	0.100	0.060	31.7	19.0	76%	126%
55	24	237	0.101	0.240	0.102	56.9	24.2	42%	99%
56	16	185	0.086	0.240	0.102	44.4	18.9	36%	85%
57	13	157	0.083	0.240	0.102	37.7	16.0	35%	81%
58	15	127	0.118	0.240	0.102	30.5	13.0	49%	116%
59	13	99	0.131	0.240	0.102	23.8	10.1	55%	129%
60	8	77	0.104	0.300	0.144	23.1	11.1	35%	72%
61	15	59	0.254	0.300	0.144	17.7	8.5	85%	177%
62	6	29	0.207	0.300	0.144	8.7	4.2	69%	144%
63	3	12	0.250	0.300	0.144	3.6	1.7	83%	174%
64	4	8	0.500	0.300	0.144	2.4	1.2	167%	347%
Subtotal	308	5,357	0.057	0.114	0.069	610.0	370.8	50%	83%
65 & Over	2	8	0.250	1.000	1.000	8.0	8.0	25%	25%
Total	310	5,365	0.058	0.115	0.071	618.0	378.8	50%	82%



**HOUSTON POLICE OFFICERS' PENSION SYSTEM
RETIREMENT EXPERIENCE - AGE BASED, >30 YEARS OF SERVICE**

Age	Actual Retirement	Total Count	Actual Rate	Assumed Rate		Expected Retirement		Actual/Expected	
				Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Under 45	0	0	N\A	0.060	0.100	0.0	0.0	N\A	N\A
45	0	0	N\A	0.060	0.100	0.0	0.0	N\A	N\A
46	0	0	N\A	0.060	0.100	0.0	0.0	N\A	N\A
47	0	0	N\A	0.060	0.100	0.0	0.0	N\A	N\A
48	0	1	0.000	0.060	0.100	0.1	0.1	0%	0%
49	3	20	0.150	0.060	0.100	1.2	2.0	250%	150%
50	6	90	0.067	0.100	0.100	9.0	9.0	67%	67%
51	13	143	0.091	0.100	0.100	14.3	14.3	91%	91%
52	20	199	0.101	0.100	0.100	19.9	19.9	101%	101%
53	19	255	0.075	0.100	0.100	25.5	25.5	75%	75%
54	29	289	0.100	0.100	0.100	28.9	28.9	100%	100%
55	28	290	0.097	0.240	0.170	69.6	49.3	40%	57%
56	28	280	0.100	0.240	0.170	67.2	47.6	42%	59%
57	37	229	0.162	0.240	0.170	55.0	38.9	67%	95%
58	38	189	0.201	0.240	0.170	45.4	32.1	84%	118%
59	24	149	0.161	0.240	0.170	35.8	25.3	67%	95%
60	31	123	0.252	0.300	0.240	36.9	29.5	84%	105%
61	15	90	0.167	0.300	0.240	27.0	21.6	56%	69%
62	14	70	0.200	0.300	0.240	21.0	16.8	67%	83%
63	9	57	0.158	0.300	0.240	17.1	13.7	53%	66%
64	8	38	0.211	0.300	0.240	11.4	9.1	70%	88%
Subtotal	322	2,512	0.128	0.193	0.153	485.1	383.7	66%	84%
65 & Over	12	92	0.130	1.000	1.000	92.0	92.0	13%	13%
Total	334	2,604	0.128	0.222	0.183	577.1	475.7	58%	70%



**HOUSTON POLICE OFFICERS' PENSION SYSTEM
RETIREMENT EXPERIENCE - AGE BASED, ALL YEARS OF SERVICE**

Age	Actual Retirement	Total Count	Actual Rate	Assumed Rate		Expected Retirement		Actual/Expected	
				Current	Proposed	Current (3) * (5)	Proposed (3) * (6)	Current (2) / (7)	Proposed (2) / (8)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Under 45	14	693	0.020	0.031	0.041	21.3	28.1	66%	50%
45	17	554	0.031	0.035	0.043	19.4	24.0	88%	71%
46	8	665	0.012	0.040	0.046	26.4	30.9	30%	26%
47	20	797	0.025	0.044	0.049	35.2	39.4	57%	51%
48	23	887	0.026	0.048	0.052	42.7	46.2	54%	50%
49	37	930	0.040	0.052	0.055	47.9	51.4	77%	72%
50	48	942	0.051	0.089	0.059	83.8	56.0	57%	86%
51	56	907	0.062	0.091	0.063	82.9	57.0	68%	98%
52	54	833	0.065	0.093	0.067	77.5	55.6	70%	97%
53	43	746	0.058	0.094	0.071	69.9	53.1	62%	81%
54	57	685	0.083	0.094	0.075	64.6	51.1	88%	112%
55	56	590	0.095	0.227	0.132	134.0	77.8	42%	72%
56	44	510	0.086	0.229	0.136	117.0	69.5	38%	63%
57	51	419	0.122	0.231	0.136	96.6	57.2	53%	89%
58	54	343	0.157	0.231	0.137	79.1	46.9	68%	115%
59	41	273	0.150	0.229	0.136	62.5	37.1	66%	110%
60	41	212	0.193	0.292	0.197	61.8	41.8	66%	98%
61	32	154	0.208	0.295	0.199	45.5	30.6	70%	105%
62	20	101	0.198	0.297	0.210	30.0	21.2	67%	94%
63	12	71	0.169	0.296	0.220	21.0	15.6	57%	77%
64	13	47	0.277	0.297	0.221	14.0	10.4	93%	125%
Subtotal	741	11,359	0.065	0.109	0.079	1,233.0	900.7	60%	82%
65 & Over	14	107	0.131	1.000	1.000	107.0	107.0	13%	13%
Total	755	11,466	0.066	0.117	0.088	1,340.0	1,007.7	56%	75%

