Seattle City Employees' Retirement System

Investigation of Experience

January 1, 2014 through December 31, 2017

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Retirement Board
Seattle City Employees' Retirement System
720 Third Avenue, Suite 900
Seattle, WA 98104

Dear Members of the Board:

It is a pleasure to submit this report of our investigation of the experience of the Seattle City Employees' Retirement System (SCERS) for the period January 1, 2014 through December 31, 2017. The results of this investigation are the basis for recommended changes in actuarial assumptions for the actuarial valuation to be performed as of January 1, 2018. Note that this report covers both the assumptions for active members and retired members.

The purpose of this report is to communicate the results of our review of the actuarial methods and the economic and demographic assumptions to be used in the completion of the upcoming valuation. Several of our recommendations represent changes from the prior methods or assumptions and are designed to better anticipate the emerging experience of the System.

We have provided financial information showing the estimated impact of the recommended assumptions, if they had been reflected in the January 1, 2017 actuarial valuation. We believe the recommended assumptions provide a reasonable estimate of anticipated experience affecting SCERS. Nevertheless, the emerging costs will vary from those presented in this report to the extent that actual experience differs from that projected by the actuarial assumptions. Future actuarial measurements may differ significantly from the current measurements presented in this report due to factors such as the following:

- Plan experience differing from the actuarial assumptions,
- Future changes in the actuarial assumptions,
- Increases or decreases expected as part of the natural operation of the methodology used for these measurements (such as potential additional contribution requirements due to changes in the plan's funded status), and
- Changes in the plan provisions or accounting standards.

Due to the scope of this assignment, we did not perform an analysis of the potential range of such measurements.

In preparing this report, we relied, without audit, on information (some oral and some in writing) supplied by SCERS staff. This information includes, but is not limited to, statutory provisions, employee data, and financial information. We used SCERS' benefit provisions as stated in our January 1, 2017 Actuarial Valuation report. We found this information to be reasonably consistent and comparable with information used for other purposes. The

experience study results depend on the integrity of this information. If any of this information is inaccurate or incomplete, our results may be different and our calculations need to be revised.

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The consultants who worked on this assignment are pension actuaries. Milliman's advice is not intended to be a substitute for qualified legal or accounting counsel.

On the basis of the foregoing, we hereby certify that, to the best of our knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices.

We would like to acknowledge the help in the preparation of the data for this investigation given by the SCERS staff. We look forward to our discussions and the opportunity to respond to your questions and comments at your next meeting.

We are members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

Respectfully submitted,

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Table of Contents

Section 1 Executive Summary and Recommendations

Actuarial valuations are based on certain underlying assumptions. Determining the adequacy of the contribution rate is dependent on these assumptions that the actuary uses to project the future benefit payments and then to discount the value of future benefits to determine the present values. Thus, the assumptions are integral in assisting the system in adequately pre-funding the benefits prior to retirement.

Overview

To assess the reasonableness of the assumptions used in the valuation, they should be studied regularly. This process is called an investigation of experience (or experience study).

Summary of Results

This section describes the key findings of this investigation of experience of the Seattle City Employees' Retirement System (SCERS) for the period January 1, 2014 through December 31, 2017. We are recommending several changes to the demographic assumptions. Additionally, we are recommending certain changes to the current economic assumptions; we have also shown alternative options for the economic assumptions, which we believe would also be reasonable.

It should be noted that this experience study covers a four-year period. We take into account both the results of the current and prior study when making recommendations for changes to assumptions, in an attempt to identify short-term vs. long-term trends.

The following table shows a summary of our recommendations.

Assumption	Proposed Change
Inflation	Reduce to 2.75% (or alternative 3.00%)
Investment Return	Reduce to 7.00% (or alternative 7.25%)
Wage Growth	Reduce to 3.50% (or alternative 3.75%)
Membership Growth	Reduce to 0.00% (or alternative 0.50%)
Interest on post-2011 contributions	Reduce to 4.00% (or alternative 4.25%)
Admin. Expenses	Increase to 0.80%
Merit Salary Scale	Reduce rates at lower service levels
Death while Active	Reduce Rates
Retirement	Various Adjustments
Disability	No Change
Retired Mortality	Reduce Rates
Termination	No Change
Probability of Refund	Reduce rates at lower service levels

Summary of Results (continued)

If adopted, the recommended assumptions would result in an increase in the total contribution rate required to pay off the Unfunded Actuarial Accrued Liability (UAAL) over a 26-year period as of the January 1, 2017 actuarial valuation and would result in a decrease in the Funded Ratio of the system as of that date. This is discussed further in the Financial Impact section at the end of the Executive Summary. Some additional scenarios were studied; the financial impact of those scenarios is also shown at the end of this section.

Economic Assumptions

Section 2 of this report discusses the economic assumptions: price inflation, general wage growth (includes price inflation and productivity), the variable interest rate credited to member contributions made on or after January 1, 2012, and the investment return assumption. We have proposed that the Board reduce each of these assumptions by 0.50% from the current economic assumptions.

We have also shown an alternative set of assumptions where the investment return assumption is reduced to 7.25% and the other assumptions tied to inflation are also reduced by 0.25%. A fuller discussion of these assumptions is included in Section 2 of this report.

As discussed in Section 2, SCERS' investment consultant, New England Pension Consultants (NEPC) is projecting a median return of approximately 7.5% net of expenses for the next 30 years; whereas, Milliman is projecting a median net return of 6.3%. This primary cause of this difference is likely NEPC's higher assumed long-term inflation and a greater assumed reversion to historical averages for equity returns than Milliman is forecasting. Generally, when we see a significant difference in expectations, it is beneficial to look at other investment consultants. However, most investment consultants limit their capital market assumptions to a 10-year time horizon, so there is not a very good direct comparison.

Where there is a lot of information on capital market assumptions available is for 10-year or shorter projections. For this period, a significant majority are projecting returns of less than 7.0% (based on SCERS' asset allocation), some less than 6.0%. Although, we believe a 30-year period is appropriate for setting the investment return assumption, the first 10 years will have a material impact on the 30-year return. This strong consensus for lower returns during the next 10 years and the fact that we have more confidence in near-term forecasts than longer term projections is part of the reason we are recommending a lower return assumption.

Note that, generally speaking, we make recommendations for changes to demographic assumptions based on tangible evidence to back up those recommendations. In contrast, the economic assumptions tend to be more subjective; we have proposed a recommended and an alternative set of assumptions, but there may be other combinations of assumptions which we would also consider reasonable for valuation purposes.

Economic Assumptions (continued)

We also reviewed the active membership growth assumption, which is currently 0.5%. We recommend that SCERS reduce this assumption to 0.00%. This way, if active membership growth does occur in the future, the gains on the contribution rate will be recognized as such growth occurs, rather than being pre-recognized gains in the valuation that may not actually occur. We have also shown as an alternative retaining the active membership growth assumption of 0.50% per year. We believe that either of these assumptions would be reasonable.

Administrative Expenses

Administrative expenses are calculated as a percentage of active payroll for SCERS, and are included as a component of the ongoing Normal Cost of benefits as a percentage of pay. As of the January 1, 2017 valuation, the total Normal Cost of benefits was 15.83% of payroll, which included an assumption of 0.60% of payroll for administrative expenses.

Over the last several years, administrative expenses have been higher as a percentage of payroll (see Section 2). A portion of this increase has been due to costs related to the new pension administration system which are expected to decline over the next few years. After adjusting for the related costs, there still appeared to be a material increase in administrative expenses relative to the total system payroll. Therefore, we are recommending an increase in the administrative expense assumption from 0.60% of payroll to 0.80% of payroll.

This increase will increase the Normal Cost Rate and the Total Contribution Rate needed by 0.20%, all else being equal.

Individual Salary Increases Due to Promotion and Longevity (Merit)

Section 3 discusses the individual salary increases due to promotion and longevity – the merit component of salaries. Overall, the results of our salary study show increases somewhat less than the current rates predicted. We are recommending lower rates of salary increase during the earlier portion of a member's career.

Death While Active

Section 4 discusses the results of death from active status. Overall, the actual number of deaths from active status was greater than the current assumptions predicted. This is indicated by an actual-to-expected ratio of 114%. That is, there were 14% more active deaths than the current assumptions would have predicted.

We are recommending an update to the assumptions to be based on the Society of Actuaries' recent mortality study, with an adjustment to reflect SCERS experience.

Deaths While Active

Gender	Actual	Expected	Act/Exp	Proposed	Act/Prop
Male	26	27	96%	31	84%
Female	24	17	138%	21	116%
Total	**50**	**44**	**114%**	**52**	**96%**

Retired Mortality

Section 5 discusses the rates of mortality among service retirees, disabled retirees, and beneficiaries.

Overall, the number of actual deaths was very close to expected for total service and disabled retiree deaths during the study period, with actual retiree deaths being 99% of those estimated by the current assumptions. Note that beneficiary mortality is not explicitly studied. See Section 5 for details.

We are recommending mortality rates be updated to be based on the most recent standard tables, RP-2014 (Retired Pensioner Mortality 2014), multiplied by 95%. The actual number of retiree deaths during the prior four-year period was 103% of that expected by the proposed assumptions.

We are also recommending updating the table that projects future mortality improvement to the MP-2014 Ultimate projection scale. Projection scales reflect gradual year-to-year improvement in mortality that is expected to occur in the future. This approach is sometimes referred to as "generational mortality" because it results in the succeeding generation of members living longer than the preceding one. Overall, the proposed mortality assumptions combined with the projection scale would result in moderate increases in life expectancy compared to the prior assumption.

See Section 5 for further details in setting the retired mortality assumption.

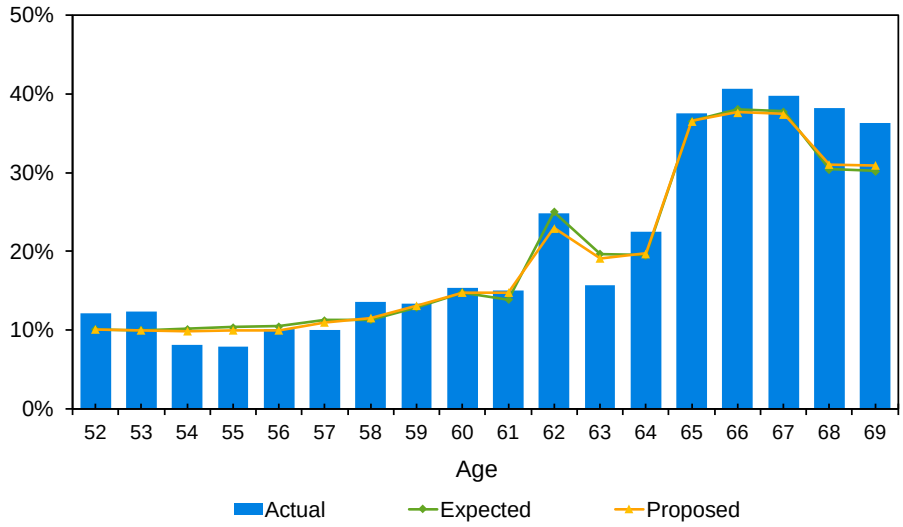
Service Retirement

Section 6 discusses the rates of service retirement. Currently in the actuarial valuation, the retirement assumptions are split into three segments: members eligible for reduced retirement benefits, members eligible for unreduced retirement benefits who have less than 30 years of service, and members eligible for unreduced retirement benefits who have 30 or more years of service. For this study, we are recommending combining the assumptions for the two unreduced segments, as there was not a material difference in retirement rates for the less than and greater than 30 years of service groups.

Overall, the actual number of service retirements was close to what the assumptions predicted in aggregate, although experience at some ages was higher and at some ages was lower than expected. We are recommending small adjustments to better reflect the experience over the study period.

Service Retirement (continued)

The following graph shows the results for all members eligible for unreduced retirement in aggregate (regardless of service level).



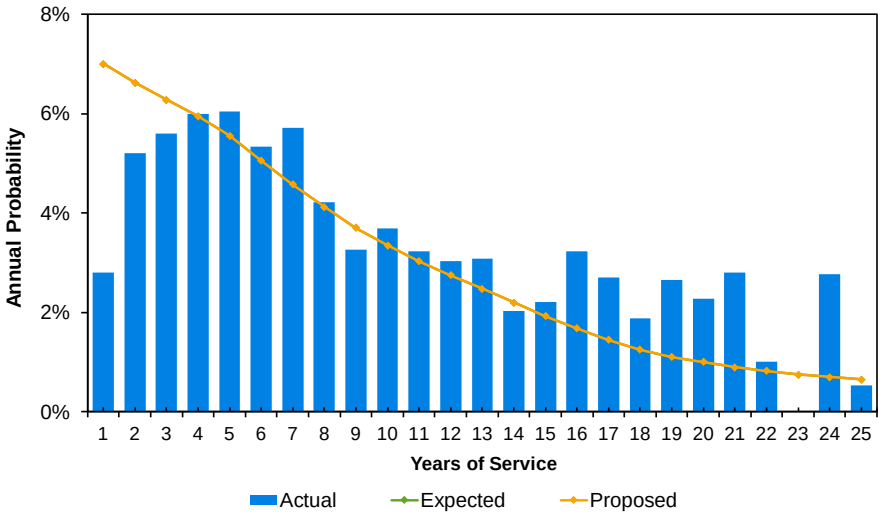
We are also recommending various adjustments to the rates of retirement with reduced benefits. See Section 6 of this report for further details.

Disability Retirement

Section 7 discusses rates of disability retirement. Over the four-year study period, there were eight disability retirements compared to four expected. We are recommending no change to the rates of disability due to the small sample size.

Termination

Section 8 discusses other terminations of employment. Overall, the actual number of terminations was 8% less than projected by the current assumptions. We are recommending no change to the termination rates as shown in the following graph (males and females combined).



Probability of Refund upon Vested Termination

Section 9 discusses the probability of refund upon vested termination. The actual number of refunds for vested members at termination was less than the number predicted by the current assumptions for members with less than 20 years of service.

We are recommending lowering the rates of refund at termination for the lower service levels based on the results of this study. We are not recommending any changes for the refund assumptions at 20 years of service or more.

Miscellaneous Assumptions

There are other assumptions recommended that fall under the category of "miscellaneous" assumptions.

Probability of Marriage or Registered Domestic Partner: Currently, 60% of active members are assumed to have a spouse or eligible domestic partner for purposes of the SCERS' death benefit. We recommend no change to this assumption. We do not receive information regarding actual death from active status with eligible beneficiary. This assumption has a very minor impact on the valuation, and we believe the continued use of 60% is reasonable and consistent with the assumptions used by other systems.

Mortality Tables used for Optional Factors: Currently, the factors for conversion at retirement between optional benefit forms are calculated based on mortality tables that reflect the 2017 valuation mortality assumption base tables, with static projection to 2025 and a 50%/50% male/female unisex blend. We recommend the mortality tables for optional factors be updated to reflect the proposed adjustments (95% of the RP-2014 Healthy Annuitant tables) to male and female service retiree mortality. We recommend the static projection to 2025 (using MP-2014 Ultimate projection scale) and the 50%/50% male/female blend continue to be used.

Financial Impact of Recommended Assumptions

The following exhibit is designed to give the reader an idea of how the proposed assumption changes may affect key valuation measurements. The proposed changes increase the Total Contribution Rate needed to amortize the UAAL over 26 years beginning January 1, 2017 and decrease the Funded Ratio as of that date.

The estimated financial impact was evaluated by performing additional valuations with the January 1, 2017 valuation data and reflecting the proposed assumption changes. This allows us to assess the relative financial impact of the various proposed changes. Note that the relative impact of the various assumption changes by component is somewhat dependent on the order in which they are evaluated.

Note that these are just estimates of the relative impact of specific changes. The actual January 1, 2018 valuation results will vary due to actuarial experience during the period, such as the change in payroll and the actual investment return. Additionally, partial recognition of deferred asset losses as of the January 1, 2017 valuation, as well as the actuarial gain on assets for the 2017 year, will apply for the January 1, 2018 actuarial valuation, but are not reflected here.

Financial Impact of Recommended Assumptions (continued)

It should be noted that if the new retired mortality and/or a new investment return assumption are adopted by the Board, it will impact the factors used in the calculation of member benefits under optional forms of payment. Additionally, the mortality, investment return, and member crediting rate assumptions affect the calculation of the minimum SCERS' benefit for Plan 1 members, which is equal to twice the member contributions with interest converted to a monthly annuity.

A decrease in the investment return assumption or interest crediting rate, or an improvement in the retired mortality assumption, would reduce the monthly annuities paid under this formula. We have reflected the expected impact of an immediate update of the new assumptions on the annuity factors used in the valuation. This has the impact of somewhat offsetting the impact of reducing the investment return assumption on the total contribution rate required to amortize the UAAL.

	Total Contribution To Amortize UAAL Over 26 Years	Funded Ratio
January 1, 2017 Valuation	**25.00%**	**68.1%**
Demographic Assumptions		
Termination Rates/Probability of Refund	0.03%	0.0%
Rates of Retirement	0.03%	0.0%
Rates of Active Death/Disability	-0.01%	0.0%
Merit Salary	-0.09%	0.0%
Retired Mortality	0.69%	-1.3%
Subtotal Demographic Change	0.65%	-1.3%
January 1, 2017 Valuation with Demographic Changes	**25.65%**	**66.8%**
Economic Changes- Scenario #1		
Recommended Economic Assumptions[(1)]		
7.00% Inv. Return, 3.50% Wage Growth, 2.75% CPI and 4.00% Member Crediting Rate	1.60%	-2.1%
Administrative Expense	0.20%	0.0%
Combined Change	**2.45%**	**-3.4%**
January 1, 2017 Valuation with Demo + Econ Changes	**27.45%**	**64.7%**
Economic Changes- Scenario #2		
Alternative Economic Assumptions[(1)]		
7.25% Inv. Return, 3.75% Wage Growth, 3.00% CPI and 4.25% Member Crediting Rate	0.89%	-0.9%
Administrative Expense	0.20%	0.0%
Combined Change	**1.74%**	**-2.1%**
January 1, 2017 Valuation with Demo + Econ Changes	**26.74%**	**66.0%**
Additional Impact of Reducing Membership Growth Assumption		
Reduce to 0.00%	**0.66%**	**0.0%**

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Section 2 Economic Assumptions

Actuarial Standard 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 under defined benefit plans. Because no one knows what the future holds, the best an actuary can do is to use professional judgment 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.

Recent changes in ASOP No. 27 have restricted what assumptions satisfy the standard. In particular, previously any assumption within the "best-estimate" range (a wide range in our opinion) was likely to satisfy the standard. To meet the new standard, the assumption "reflects the actuary's estimate of future experience" and "it has no significant bias (i.e., it is not significantly optimistic or pessimistic)…" We believe this reduces the range of assumptions that would be considered reasonable.

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.

After completing the selection process, the actuary should review the set of economic assumptions for consistency. This may lead the actuary to recommend the same inflation component in each of the economic assumptions proposed.

This section will discuss the economic assumptions. In our opinion, the economic assumptions recommended in this report have been developed in accordance with ASOP No. 27. The table on the following page summarizes our recommended changes, as well as an alternative set that would also be considered reasonable. Note that these are not the only sets of assumptions that would be considered reasonable.

We are recommending a reduction of 0.50% in the investment return assumption, accompanied by corresponding reductions in the price inflation and wage growth assumptions.

Economic Assumptions (continued)

In addition, we have shown an alternative set of economic assumptions with a 0.25% reduction in the investment return, inflation, and wage growth assumptions.

Note that under both alternatives, we have allowed for either a population growth assumption of 0.00% or 0.50%. We are recommending a population growth assumption of 0.00%; however, we believe an assumption of 0.50% is supported by historical patterns and would also be considered reasonable.

The following table shows our recommendations, as well as the alternative set of assumptions:

Economic Assumptions	Current Assumptions	Recommended Assumptions	Alternative Assumptions
Investment Return Assumption[1]	7.50%	7.00%	7.25%
Consumer Price Inflation	3.25%	2.75%	3.00%
Real Wage Inflation	0.75%	0.75%	0.75%
Wage Growth *(price inflation plus wage inflation)*	4.00%	3.50%	3.75%
Active Membership Growth	0.50%	0.00%[2]	0.00%[2]
Payroll Growth *(wage & membership growth)*	4.52%	3.50%	3.75%
Interest on Post-2011 Contributions	4.75%	4.00%	4.25%

[1] *Net of investment expenses.*
[2] *0.50% is also a reasonable assumption.*

1. Consumer Price Inflation and Member Contribution Crediting Rate

Use in the Valuation

When we refer to inflation in this report, we are generally referring to price inflation. The inflation assumption has an indirect impact on the results of the actuarial valuation through the development of the assumptions for investment return, general wage increases, payroll increase assumptions, and the interest crediting assumption for member contributions made after December 31, 2011. It also has a direct impact on the valuation results as it will be used to determine the expected floor COLA payment.

The long-term relationship between inflation and investment return has long been recognized by economists. The basic principle is that the investors demand a "real return" – the excess of actual investment returns over inflation. If inflation rates are expected to be high, investors will demand investment returns that are also expected to be high enough to exceed inflation, while lower inflation rates will result in lower expected investment returns, at least in the long run.

The current valuation assumption for inflation is 3.25% per year. Our recommendation is to lower the assumption to 2.75% (with a reduction to 3.00% under the alternative assumptions).

Historical Perspective

The data for inflation shown below is based on the national Consumer Price Index, US City Average, All Urban Consumers (CPI-U) as published by the Bureau of Labor Statistics.

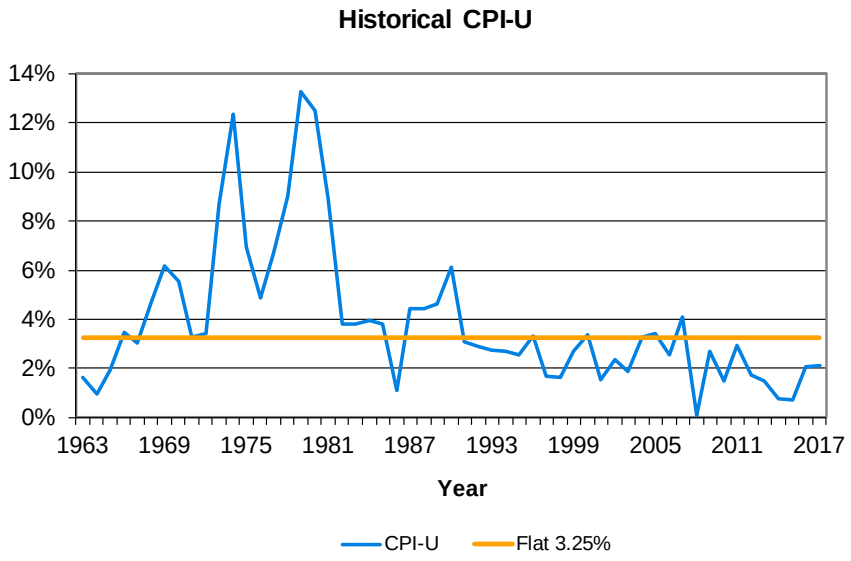
Although economic activities in general, and inflation in particular, do not lend themselves to prediction on the basis of historical analysis, historical patterns and-long term trends are a factor to be considered in developing the inflation assumption.

There are numerous ways to review historical data, with significantly differing results. The tables below show the compounded annual inflation rate for various 10-year periods, as well as for the 75-year period ended in December 2017. Note that the 75-year average is heavily influenced by the inflation of the late 1970's and early 1980's.

Decade	CPI Increase
2008-2017	1.6%
1998-2007	2.7%
1988-1997	3.4%
1978-1987	6.4%
1968-1977	6.2%
Prior 75 Years	
1943-2017	3.6%

Historical Perspective (continued)

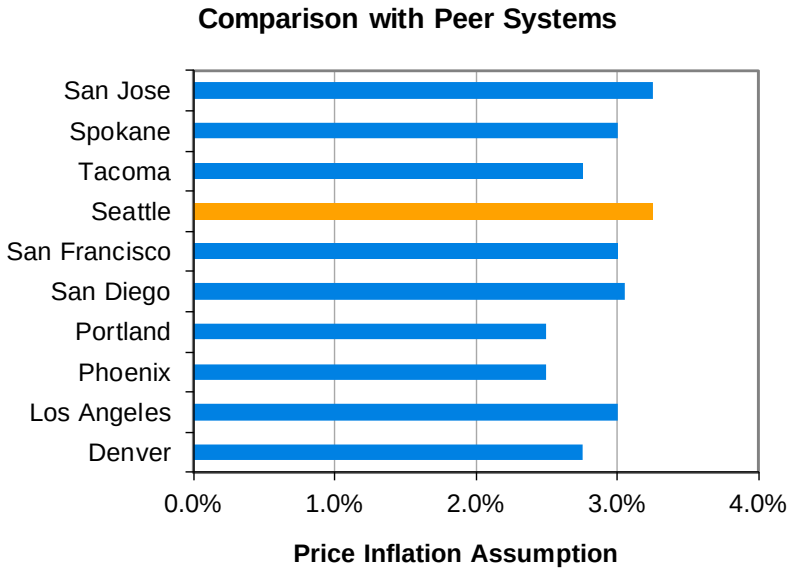
The following graph shows historical national CPI increases. Note that the actual CPI increase has been less than 3.25% for most of the last 25 years.



Peer System Comparison

According to the *Public Fund Survey* (a survey of approximately 100 statewide systems), the average inflation assumption for statewide systems has been steadily declining. As of the most recent study, the median inflation assumption was 3.00%.

Looking at SCERS' peer systems (major cities in the western U.S.), most systems are at 3.00% or less, reflecting a shift downwards in the price inflation assumption over the last several years.



Forecasts of Inflation

Since the U.S. Treasury started issuing inflation indexed bonds, it is possible to determine the break-even rate of inflation anticipated by the financial markets by comparing the yields on inflation for indexed bonds with traditional fixed government bonds. Current market prices as of May 2018 suggest investors expect inflation to be about 2.1% over the next 30 years.

We also considered other forecasts of inflation over a long-term time horizon. Although many economists have been forecasting inflation lower than the current assumption of 3.25%, these forecasts are generally over a shorter time period (10 years or less) than may be appropriate for a pension valuation. One economic forecast with a time frame long enough to suit our purposes is the expected increase in the CPI by the Office of the Chief Actuary for the Social Security Administration. In the 2017 Trustees Report, the projected average annual increase in the CPI over the next 75 years under the intermediate cost assumptions was 2.60%.

SCERS' current inflation assumption is higher than that being forecast for the U.S. by SCERS' investment consulting firm, New England Pension Consultants (NEPC), in their January 2018 capital market assumptions. NEPC is projecting 2.5% inflation over a shorter-term 5-7 year time horizon, and 2.75% inflation over a longer-term 30-year time horizon.

Recommendation

The consumer price inflation assumption impacts SCERS' funding as it is used to project the Floor COLA payments. It is also used directly affects the wage growth assumption.

Given the future expectations of inflation, we recommend that the inflation assumption be reduced from 3.25% to 2.75% per year. We are also recommending a corresponding decrease in the general wage growth and investment return assumptions, as outlined in following sections.

We have also shown an alternative assumption of 3.00%, which we also believe is reasonable, although somewhat on the higher side.

We believe that the recommended and alternative assumption satisfy both the current and the revised version of ASOP No. 27.

Consumer Price Inflation	
Current Assumption	3.25%
Proposed Assumption	2.75%
Alternative Assumption	3.00%

Crediting Rate on Member Contributions

For member contributions made on or after January 1, 2012, an annual interest credit is determined which may vary from year to year. This rate is based on the prior 12 months' average yield on 30-year U.S. Treasury Bonds, with a maximum credit interest rate equal to 5.75%. Note that, for member contributions made prior to this date, a flat 5.75% annual interest credit applies.

The current assumption for interest crediting for the post-2011 contributions is 4.75% per year. If the inflation assumption is reduced, we recommend reducing the interest credit assumption by the same amount, as the total yield on Treasuries will be influenced by inflation expectations and capital market assumptions. We also recommend an additional 0.25% reduction to reflect the change in procedure for crediting interest. Previously, an additional 0.25% was added to the 30-year Treasury rate, and this no longer applies. Thus, our recommendation for the assumed crediting rate on member contributions made on or after January 1, 2012 is 4.00% if inflation of 2.75% is adopted; or 4.25% if inflation of 3.00% is adopted.

2. Wage Growth

Use in the Valuation

Estimates of future salaries are based on two types of assumptions: 1) general wage increase and 2) merit increase. Rates of increase in the general wage level of the membership are directly related to inflation, while individual salary increases due to promotion and longevity generally occur even in the absence of inflation. The promotion and longevity assumptions, referred to as the merit scale, will be reviewed with the other demographic assumptions.

The current assumption is for 0.75% wage growth above the inflation assumption.

Historical Perspective

We have used statistics from the Social Security Administration on the National Average Wage back to 1951. For years prior to 1951, we studied the Total Private Nonagricultural Wages as published in *Historical Statistics of the U.S., Colonial Times to 1970*.

There are numerous ways to review this data. For consistency with our observations of other indices, the table below shows the compounded annual rates of wage growth for various 10-year periods. The excess of wage growth over price inflation represents "productivity" or the increase in the standard of living (also called the real wage inflation rate).

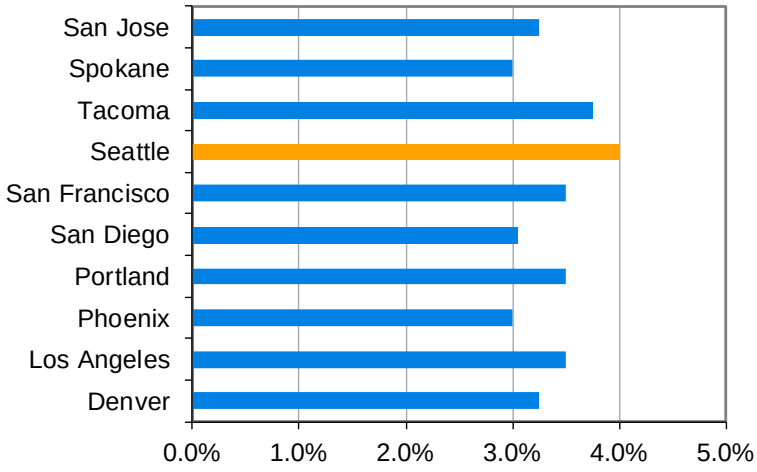
Decade	Wage Growth	CPI Increase	Real Wage Inflation
2008-2017	2.1%	1.6%	0.5%
1998-2007	4.0%	2.7%	1.3%
1988-1997	4.1%	3.4%	0.7%
1978-1987	6.5%	6.4%	0.1%
1968-1977	6.5%	6.2%	0.3%
Prior 75 Years			
1943-2017	4.7%	3.6%	1.1%

Peer System Comparison

The *Public Fund Survey* does not report the average wage growth assumption. Based on our experience with other systems, we believe the average for this group would be somewhat lower than SCERS' assumption of 4.0%.

Looking at SCERS' peer systems (major cities in the western United States), the current wage growth assumption is the highest of the group.

Comparison with Peer Systems



Forecasts of Future Wages

Wage inflation has been projected by the Office of the Chief Actuary of the Social Security Administration. In the 2017 Trustees Report, the long-term annual increase in the National Average Wage is estimated to be 1.2% higher than the Social Security intermediate inflation assumption of 2.6% per year.

Recommendation

Real wage inflation over the last 10 years has been 0.5%, lower than SCERS current assumption; however, over the last 20 years it has been somewhat higher. We believe future real wage inflation will remain around this level and are proposing no change in the assumption.

Real Wage Inflation Rate	
Current Assumption	0.75%
Proposed Assumption	0.75%

The wage growth assumption is the total of the consumer price inflation assumption and the real wage inflation rate. If the real wage inflation assumption remains 0.75% and the price inflation assumption is reduced to 2.75%, this would result in a total wage growth assumption of 3.50%. If the price inflation assumption is lowered to 3.00% and the real wage inflation is held at 0.75%, the total wage growth assumption would be 3.75%.

3. Active Membership Growth and Payroll Increase Assumption

Use in the Valuation

The membership growth assumption does not impact the actuarial accrued liability, the UAAL, or the normal cost rate. However, it does impact the calculation of the required contribution rate to finance the UAAL. This is because it is treated as a component of the payroll increase assumption.

When a membership growth assumption is applied, the total aggregate payroll of the system is expected to increase by both the payroll growth assumption, and the membership growth assumption. This effectively reduces the calculated contribution rate as a percentage of payroll needed to finance the UAAL because payroll for anticipated future members is already being considered as of the valuation.

The current assumption in use by SCERS is that the active population will grow at a rate of 0.5% per year. The only impact of this assumption on the valuation results is to reduce the calculated contribution rate needed since we assume greater future payroll on which to make UAAL contributions due to membership growth.

Historical Perspective

Over the last 10 years, active membership in SCERS has increased 0.5% per year on average, consistent with the current population growth assumption. Over longer periods, the increase has generally been greater than 0.5%.

This historical growth is illustrated in the table below.

SCERS Active Membership Growth

Valuation Year	Contributing Members	Annual Growth[1]
1998	7,926	-0.9%
1999	7,779	-1.9%
2000	8,669	11.4%
2002	8,758	0.5%
2004	8,382	-2.2%
2006	8,521	0.8%
2007	8,587	0.4%
2008	8,842	3.0%
2010	9,071	1.3%
2011	8,599	-5.2%
2012	8,430	-2.0%
2013	8,465	0.4%
2014	8,603	1.6%
2015	8,746	1.7%
2016	8,882	1.6%
2017	9,151	3.0%
2018	9,283	1.4%

1. Equivalent annual growth; for data spanning two-year periods, annual growth assumes even growth over both years.

Average Annual Growth Over Last 20 Years	**0.79%**

Comments

Very few public retirement systems have a non-zero active membership growth assumption. If a positive growth in active membership is assumed and future growth is less than the assumption, this will result in increasing contribution rates as a percentage of payroll in the future (all other things being equal). Conversely, if no growth in active membership is assumed and there is future growth, this will result in decreasing contribution rates as a percentage of payroll off into the future. An assumption of growth in active membership results in a lower calculated contribution rate as a level percentage of pay, all else being equal.

We recommend that SCERS adopt an active membership growth assumption of 0.00%. This way, if active membership growth does occur in the future, the gains on the contribution rate will be recognized as such growth occurs, rather than being pre-recognized gains in the valuation that may not actually occur. We have also shown the impact of an alternative active membership growth assumption of 0.50% per year. We believe that either of these assumptions would be reasonable and would satisfy the requirements of ASOP 27.

Payroll Increase Assumption

The assumption for growth in the aggregate payroll of SCERS is a combination of the wage growth and active membership growth assumptions (currently 4.00% and 0.50%, respectively). The current payroll increase assumption is therefore equal to 4.52%. Note that the components are multiplicative, so the assumption is slightly greater than just adding the two together.

Recommendation for Active Membership Growth Assumption

We recommend that the payroll increase assumption remain equal to the combined impact of the wage growth assumption and assumed changes in active membership. Since our recommendations for these two components are 3.50% and 0.00%, we recommend that the payroll growth assumption be set at 3.50%, although alternative combinations including either a 3.50% or 3.75% wage growth assumption and a 0.00% of 0.50% active membership growth assumption would be reasonable.

Active Membership Growth	
Current Assumption	0.50%
Proposed Assumption	0.00%
Alternative Assumption	0.50%

4. Investment Return

Use in the Valuation

The investment return assumption is one of the primary determinants in the calculation of the expected cost of the System's benefits, providing a discount of the future benefit payments that reflects the time value of money. This assumption has a direct impact on the calculation of liabilities, normal costs, member contribution rates, and the factors for optional forms of benefits. The current investment return assumption for SCERS is 7.50% per year, net of investment-related expenses.

Method to Develop Recommended Investment Return

Per the guidance of ASOP No. 27, we have determined a recommendation for the long-term investment return assumption, as well as an alternative investment return assumption. We believe that either of these assumptions is reasonable for use in funding calculations for SCERS; however, it is important that the reasonableness of the investment return assumption be considered not only in isolation, but also in connection with the other economic assumptions being adopted.

ASOP No. 27 indicates that an assumption is reasonable only if it has no significant bias (i.e., it is neither significantly optimistic nor pessimistic, although provision for adverse deviation is allowed).

To estimate the expected long-term investment return, we have used both NEPC's and Milliman's 2018 assumptions for capital markets for the next 30 years. We have then combined the long-term capital market assumptions with SCERS' current target asset allocation. The target asset allocation, along with the capital market assumptions, are summarized in the following table:

Expected Return Calculation

		NEPC		Milliman	
Asset Category	Allocation Percent	Geometric Expected Return	Standard Deviation	Geometric Expected Return	Standard Deviation
Global Equity	48%	8.2%	18.2%	6.0%	18.9%
Private Equity	9%	9.5%	23.0%	7.5%	30.0%
Core Fixed Income	16%	3.7%	6.0%	4.2%	4.6%
Credit Fixed Income	7%	6.6%	11.2%	6.5%	10.0%
Real Estate	12%	6.9%	13.4%	5.4%	17.6%
Infrastructure	3%	6.3%	12.0%	6.3%	18.7%
Diversifying Strategies	5%	6.3%	9.1%	5.6%	13.0%
Estimated Gross Return		7.6%	12.6%	6.4%	12.1%
Passive Inv. Expenses[(1)]		-0.1%		-0.1%	
Net Return / Std Dev		**7.5%**	**12.6%**	**6.3%**	**12.1%**

1. Assumed investment expenses includes estimated passive management fees for public equity and fixed income, investment consulting fees, custodial fees, and investment costs related to internal investment staff.

Method to Develop Recommended Investment Return (continued)

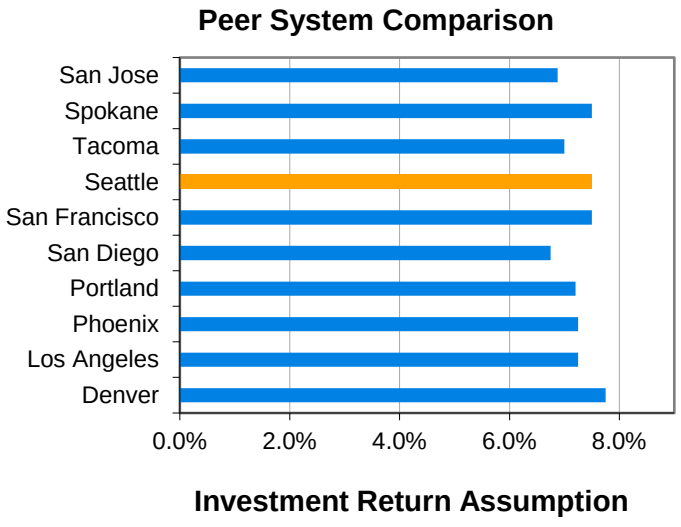
Combining the capital market assumptions with the target asset allocation policy, NEPC has calculated the 30-year expected rate of return to be 7.6% as shown in the previous table. Adjusting for estimated investment expenses on a passively-managed basis, the expected median return on a geometric basis for SCERS' assets and NEPC capital market assumptions is 7.5%. That is, there is an estimated 50% probability the return will exceed 7.5% and a 50% probability the return will be less than 7.5% under NEPC's capital market assumptions.

Note that for purposes of our analysis of the investment return assumption, we have only accounted for passive management fees and other fixed investment expenses. The reasoning for this is that for asset classes where passive management is available, SCERS would not use active management unless there was an expectation that the returns net of fees would be at least as great as the net return using passive management. For asset classes where passive management is not available, our understanding is that NEPC's capital market assumptions are net of investment expenses

We have mapped SCERS' target asset allocation to asset classes for which Milliman has developed long-term capital market assumptions, based on our understanding of the nature of the various investments and additional information provided by NEPC. The mapped allocation, as well as Milliman's long-term capital market assumptions for real return by asset class and the overall long-term expected return on the portfolio, are also shown in the preceding table. Based on this analysis, Milliman's median return is significantly less at 6.3%. This difference is primarily due to Milliman's lower expectations on public and private equity. Also, Milliman capital market assumptions reflect a lower forecast of long-term U.S. inflation than NEPC: 2.30% vs 2.75%.

Peer System Comparison

Looking at SCERS' peer systems (major cities in the western United States), the current investment return assumption is in the mainstream, although slightly on the high side, with the average for the group being 7.25%.



Additional Discussion

Milliman's and NEPC's expected future returns are estimates based on a number of factors. Neither is intended as a prediction. Ultimately, future returns will be greater than the assumed return in some years and less in others, and will likely differ from whatever the assumption that is adopted. The ultimate cost to the system will be the benefit payments made; however, the returns assumption will dictate the timing of the contributions needed to fund those benefit payments. Using a lower return assumption will tend to result in higher contributions in the near term and lower contributions in the longer term than if a higher assumption is adopted.

As with virtually any estimate of the future, experts will have differing opinions, so it is not surprising that Milliman and NEPC differ. As noted, the primary difference in the expected return is due to the difference in the assumptions for public and private equity. This is likely due to NEPC's higher assumed long-term inflation and a greater assumed reversion to historical averages for equity returns than Milliman is forecasting.

Generally, when we see a significant difference in expectations, it is beneficial to look at other investment consultants. However, most investment consultants limit their capital market assumptions to a 10-year time horizon, so there is not a very good direct comparison. At the March Investment Committee meeting, NEPC did provide some analysis comparing their capital market assumptions to other consultants. Based on our review of these materials, it appears NEPC has somewhat more optimistic expectations than other consultants, although it is a very small sample. On the "Takeaways" slide of their presentation, NEPC notes:

> *Return expectations have fallen over the last several years due to continued low interest rates, generally strong asset class returns and modest inflation and economic growth forecasts*
>
> *NEPC's long-term (30 year) return expectation for SCERS total portfolio of 7.6%* suggests that the current return assumption of 7.5% is defendable*
>
> *Other perspectives suggest that the return assumption should be revised lower during the 2018 experience study*
>
> **Does not incorporate an expense haircut, which Milliman is likely to apply of approximately 0.1%*

We agree with these comments.

Where there is a lot of information on capital market assumptions available is for 10-year or shorter projections. For this period, a significant majority are projecting returns of less than 7.0% (based on SCERS' asset allocation), some less than 6.0%. Although, we believe a 30-year period is appropriate for setting the investment return assumption, the first 10 years will have a material impact on the 30-year return. This strong consensus for lower returns during the next 10 years and the fact that we have more confidence in near-term forecasts than longer term projections is part of the reason we are recommending a lower return assumption.

Cost Implications of Changes in Investment Return Assumption

In most retirement systems with variable contribution rates, such as SCERS, the greatest factor contributing to the volatility of contribution rates is the return on investments. If, in the future, the full actuarial assumption of 7.50% is not met, there would likely be an increase in the employer contribution rates.

The member contribution rates are fixed in the municipal code. Therefore, any experience gain or loss in investments is not expected to directly impact the member contribution rates but will impact the employer contribution rates.

To assist the Board in understanding the sensitivity to changes in the assumptions, we revalued the January 1, 2017 valuation results using the recommended assumptions, including the economic assumptions that were adopted at the June meeting. These results are shown at the end of the Executive Summary.

Conclusion

Based on SCERS' target asset allocation, we are recommending a reduction in the investment return assumption to 7.00%. Alternatively, it would be reasonable to reduce the return assumption to 7.25% as this is supported by NEPC's long-term expectations. Under either assumption we are relying on the "views of experts," in this case NEPC, to establish that the assumption is reasonable, as permitted under ASOP 27.

Investment Return (net of investment expenses)	
Current Assumption	7.50%
Proposed Assumption	**7.00%**
Alternative Assumption	7.25%

5. Administrative Expenses

Administrative Expenses

Future administrative expenses are recognized in the normal cost rate. The expected dollar amount is expressed as a percent of payroll. The current assumption is that administrative expenses will be 0.60% of payroll.

The administrative expenses reported in SCERS' financial statements for the last 10 years are shown in the following table. Note that the reported amounts also include expenses related to internal investment staff.

($millions)			
Year	Covered Payroll	Admin. Expense	Expense Ratio
2008	$572	$2.04	0.36%
2009	581	2.42	0.42
2010	563	3.30	0.59
2011	557	3.47	0.62
2012	568	3.34	0.59
2013	598	5.06	0.85
2014	631	5.33	0.84
2015	642	8.21	1.28
2016	709	9.25	1.30
2017	733	12.13	1.65

There has been a significant increase during that period. Our understanding is that a portion of the increase is due to development costs associated with SCERS' new pension administration system and that these costs will decrease over the next few years. We have therefore accounted for this in our estimate of future administrative expenses.

Secondly, our understanding is that the administrative expenses reported by SCERS include those associated with SCERS' internal investment staff. Based on a rough allocation of 80% administrative / 20% investment, we have reflected the 20% portion as an investment expense as part of the investment return assumption.

Recommendation

The reported administrative expenses have been greater than 1.0% over the last few years. After adjusting for short-term costs due to the new pension administration system and expenses related to internal investment work, we are recommending the administrative expense assumption be increased from 0.60% to 0.80%.

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Section 3 Salary Increases Due to Promotion and Longevity (Merit)

Estimates of future salaries are based on assumptions for two types of increases:

1) Increases in each individual's salary due to promotion or longevity, which occur even in the absence of inflation (merit increases); and

2) Increases in the general wage level of the membership, which are directly related to inflation and increases in productivity.

In Section 2 we propose that the second of these rates, the general wage inflation, be reduced from 4.00% to 3.50%.

The purpose of this section is to examine the first source of these increases, due to promotion or longevity.

Results

Exhibit 3-1 shows the actual merit increases over a 15-year period. Note that this is longer than the four-year study period because our goal is to not give undue weight to recent experience, as indicated by the guidelines of the actuarial standards of practice. Increases were higher earlier in a member's career (lower service) and then decreased over time, consistent with the current assumptions; however, the actual increases were somewhat lower than the increases expected by the assumptions.

Recommendation

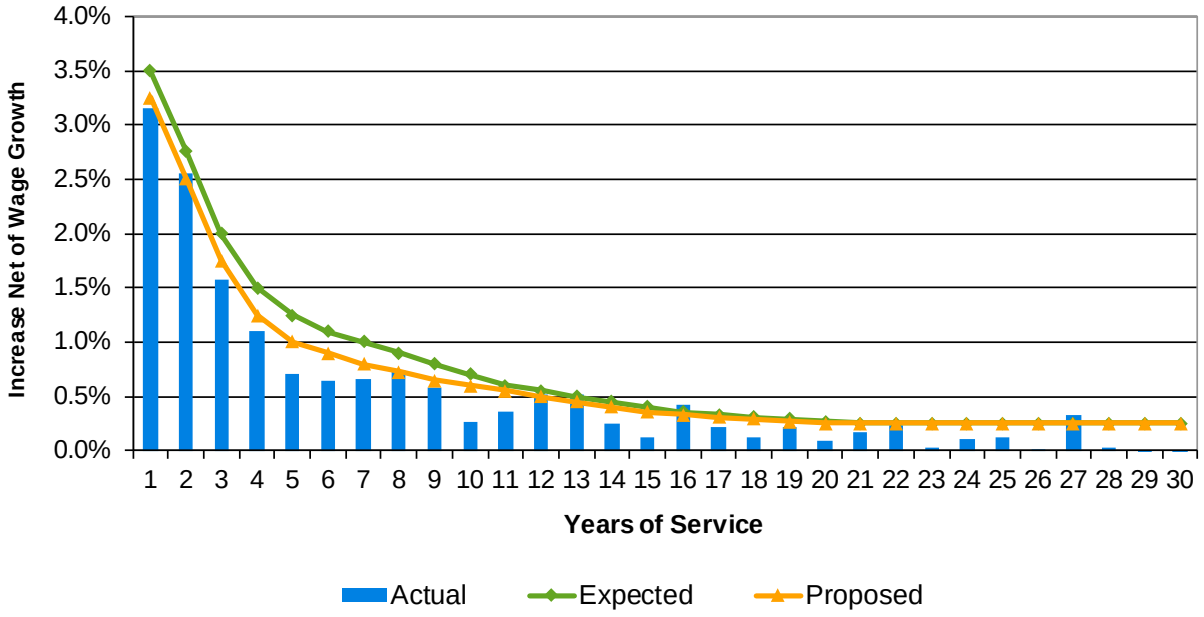
We are recommending reduced rates of salary increase in the earlier years of employment, to reflect the lower-than-expected experience.

The recommended rates are shown on Exhibit 3-1.

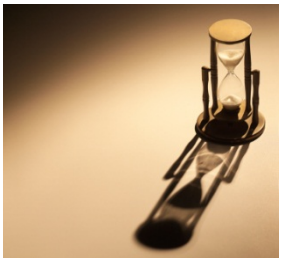
Exhibit 3-1

Total Annual Rates of Increase in Salary Due to Merit and Longevity

Males and Females



Section 4 Death While Active



In this section, we discuss the analysis of actual and expected death rates of active members. Mortality among active members has only a very small financial impact on the system's liabilities.

For current and future retired members, mortality has a much more significant impact. This section only refers to the experience of active members. An analysis of mortality for retired and disabled members is found in Section 5 of this report.

Results

For male active members, actual deaths were close to the number of expected deaths. For female active members, more deaths than expected occurred. Overall, there were 50 deaths from active status during the study period, while the assumptions predicted 44 deaths. The results are shown in the following table.

Deaths While Active

Gender	Actual	Expected	Act/Exp
Male	26	27	96%
Female	24	17	138%
Total	**50**	**44**	**114%**

Recommendation

The current assumptions use the RP 2000 Employee Tables for Males and Females, with a six-year setback to account for better-than-average mortality. Although the current mortality tables are reasonable, we are recommending updating them to reflect a more recent study of active mortality table (RP-2014).

The current assumptions are projected for expected future improvements in mortality using Projection Scale AA on a fully generational basis. We are recommending an update to the projection scale based on recent studies to the MP-2014 Ultimate projection scale on a fully generational basis.

The proposed rates result in an Actual-to-Proposed ratio of 96%, as shown in the following table.

Deaths While Active

Gender	Actual	Expected	Act/Exp	Proposed	Act/Prop
Male	26	27	96%	31	84%
Female	24	17	138%	21	116%
Total	**50**	**44**	**114%**	**52**	**96%**

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Section 5 Retired Mortality

In this section, we discuss the analysis of actual and expected rates of death among retired members. The assumption for retired mortality is an important one, as it is a key driver of actuarial liabilities. The assumption for retiree life expectancy directly determines the number of years over which we expect retirees will receive benefit payments.

Mortality has been improving in this country and is expected to continue to improve. Recent studies by the Society of Actuaries have shown marked increases in life expectancies since its previous study in 2000. In October 2014, the Society of Actuaries released a set of RP-2014 tables as part of their mortality study. As these tables reflect the general population, we believe they are reasonable to use as base tables with adjustments to specifically fit them to SCERS experience. We recommend using generational mortality tables to account for projected future improvements in mortality. Generational mortality is reflected by including a mortality improvement scale that projects small annual decreases in mortality rates. Therefore generational mortality explicitly assumes that members born more recently will live longer than the members born before them.

The Actuarial Standards of Practice require expected future mortality improvements to be considered in selecting the assumption. Using generational mortality tables achieves this. If generational mortality tables are not used, a margin in the mortality assumption should be used to account for future improvements in mortality.

The current assumptions, based on the prior investigation of experience study, use generational projections of expected future improvements in mortality according to Projection Scale AA.

Exhibits 5-1 through 5-3 show the actual and expected rates of mortality among service and disability retirees as follows:

Exhibit 5-1: Mortality Among Service Retirees – Males
Exhibit 5-2: Mortality Among Service Retirees – Females
Exhibit 5-3: Mortality Among Disabled Retirees – Males and Females

Results and Recommendations

The results of the current study show that the actual retired mortality experience during the study period was reasonably consistent with the rates of mortality predicted by the current assumptions.

We are recommending updating the mortality tables to reflect recent SCERS experience as well as recent mortality studies by the Society of Actuaries. SCERS uses standard mortality tables adjusted to best fit the patterns of mortality among its retirees. The recommended mortality rates are based on the RP-2014 Healthy Annuitant Mortality table and the RP-2014 Disabled Retiree table, adjusted by 95% to reflect SCERS experience and assume generational mortality improvement based on the MP-2014 Ultimate projection scale.

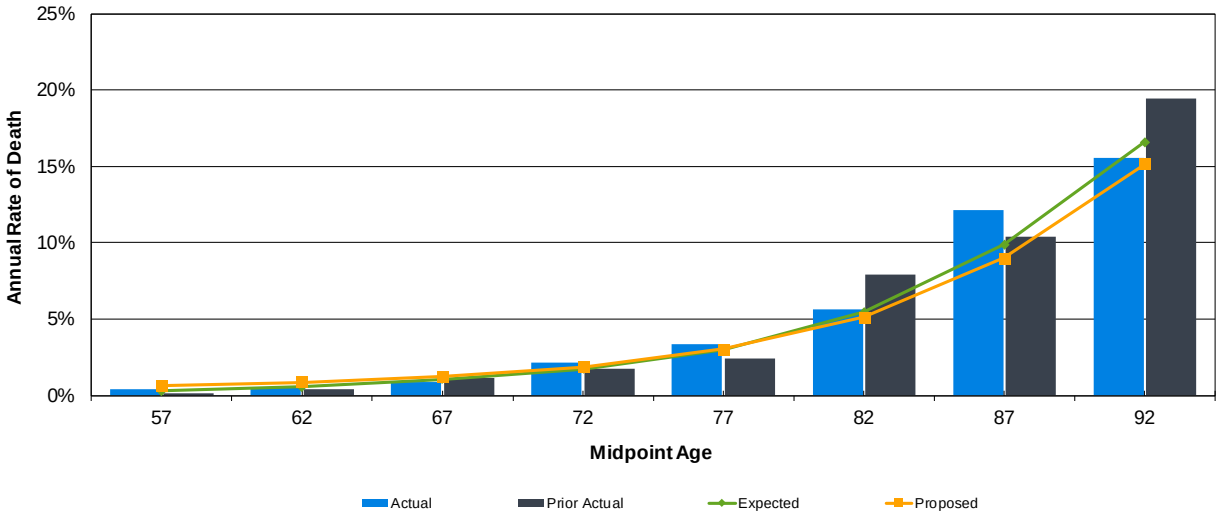
Results and Recommendations (continued)

Note that the actual/proposed ratio for each of the Service Retiree groups is close to or exceeds 100%. Generally speaking, all else being equal, we would prefer a ratio greater than or equal to 100%, as this indicates that more deaths occur (actual) than had been anticipated (proposed) by the assumption, so that enough money has been set aside to pay ongoing benefits. However, although the count basis actual/proposed ratio shown in this analysis is higher than 100%, there is a well-established correlation between higher benefit level and lower rates of mortality. Therefore, for purposes of the actuarial valuation, an actual/proposed ratio higher than 100% does not necessarily mean we are explicitly assuming fewer deaths than expected on a liability-weighted basis. We believe the margins shown in the recommended assumptions are reasonable for valuation purposes, particularly in light of the fact that benefit-weighted mortality will reduce the margin shown in the actual/proposed ratio.

In previous actuarial valuations, we have used the same mortality assumptions for beneficiaries as we used for service retirees. We recommend continuing this practice, as the data related to service retirees is more statistically significant and there is no reason to believe that the mortality of beneficiaries should be significantly different from that of service retirees of the same sex.

Exhibit 5-1

Mortality Among Service Retirees – Males



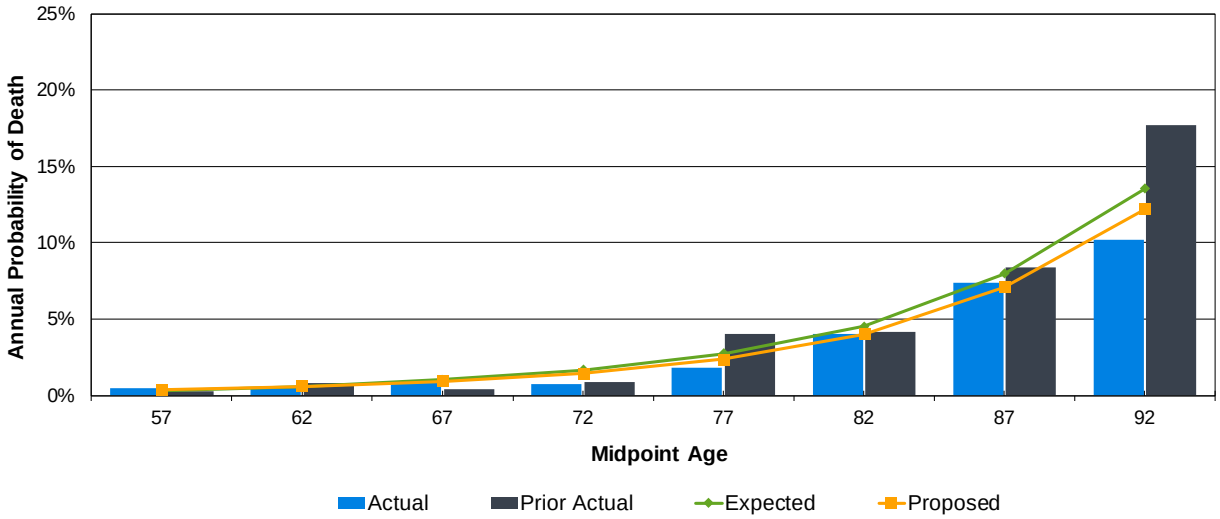
	Expected	Actual	Proposed
Total Count	388	412	385
Actual / Expected	106%		107%

Expected Mortality = RP2000 Combined Healthy Mortality Male set back two years.
Proposed Mortality = RP2014 Healthy Annuitant Mortality Male, adjusted by 95%.

Generational projection with Scale AA assumed for expected mortality, MP-2014 Ultimate for proposed mortality.

Exhibit 5-2

Mortality Among Service Retirees – Females



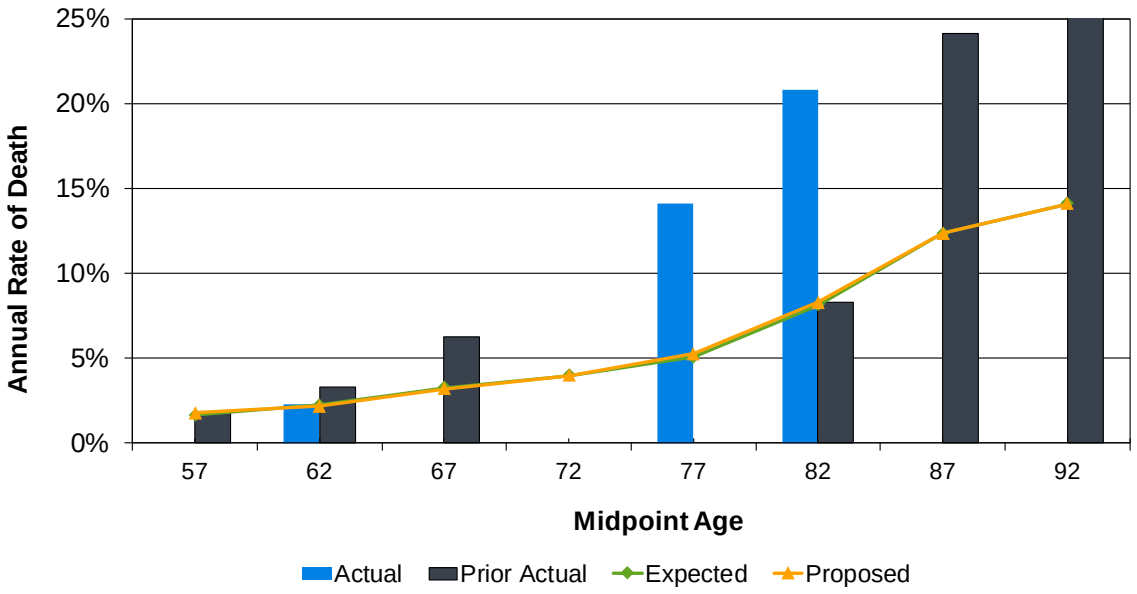
	Expected	Actual	Proposed
Total Count	225	191	203
Actual / Expected	85%		94%

Expected Mortality = RP2000 Combined Healthy Mortality Female set back one year.
Proposed Mortality = RP2014 Healthy Annuitant Mortality Female, adjusted by 95%.

Generational projection with Scale AA assumed for expected mortality, MP-2014 Ultimate for proposed mortality.

Exhibit 5-3

Mortality Among Disabled Retirees – Males and Females



	Expected	Actual	Proposed
Total Count	8	9	8
Actual / Expected	113%		113%

Expected Mortality = RP2000 Disabled Mortality for Males and Females, set back 4 years.
Proposed Mortality = RP2014 Disabled Mortality for Males and Females, adjusted by 95%.

Generational projection with Scale AA assumed for expected mortality, MP-2014 Ultimate for proposed mortality.

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Section 6 Service Retirements

Exhibits 6-1 through 6-4 show the actual and expected rates of service retirement. Our analysis of rates of service retirement was by attained age. We study the retirement rates for members eligible to retire with a reduced benefit separately from the rates for members eligible to retire with a full 2% formula benefit. Additionally, we also study retirements for those with 30 or more years of service separately.

Exhibits 6-1 through 6-4 study retirements for the following eligibility groups:

- Exhibit 6-1: Reduced Benefits – Male
- Exhibit 6-2: Reduced Benefits – Female
- Exhibit 6-3: Full Benefits – Males
- Exhibit 6-4: Full Benefits – Females

Results – Reduced Benefits

The requirements for early retirement with a reduced benefit are age 52 with 20 years of service, age 57 with 10 years of service, or age 62 with five years of service. Exhibits 6-1 and 6-2 show the rates of retirement for members eligible to retire with a reduced benefit. The actual pattern and number of retirements was generally lower than expected over the study period, with the total number of reduced retirements equal to 90% of the expected number.

Retirements with Reduced Benefits			
Gender	**Actual**	**Expected**	**Act/Exp**
Male	147	167	88%
Female	124	133	93%
Total	**271**	**300**	**90%**

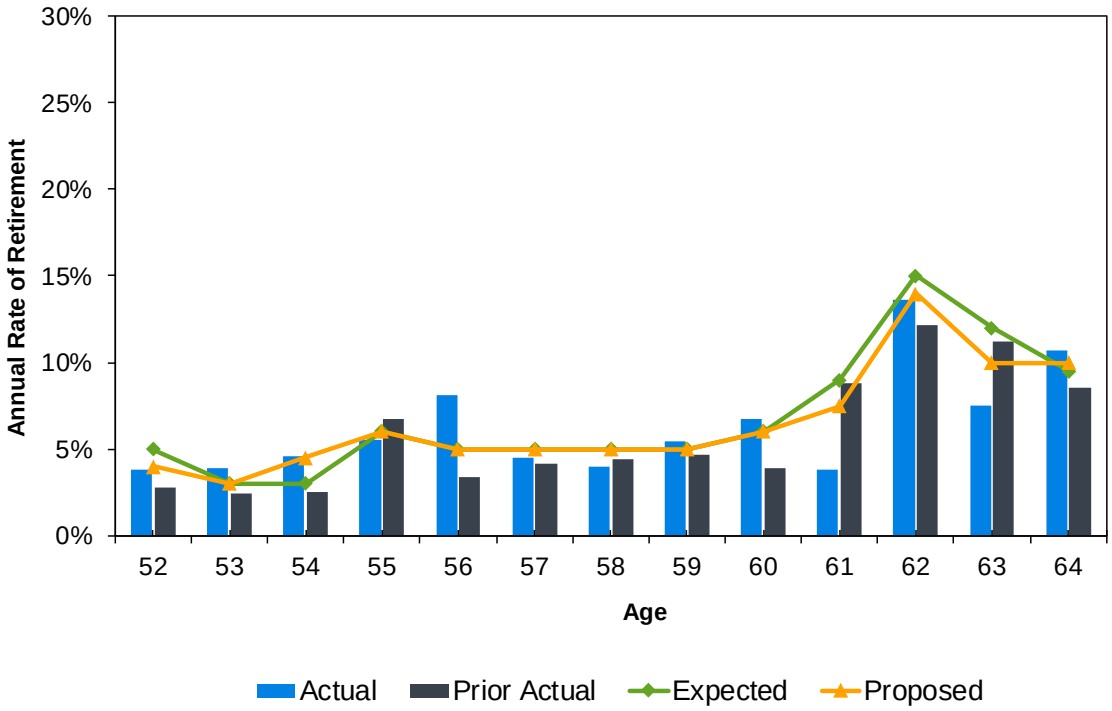
Recommendation – Reduced Benefits

Based on the results of the study, we are recommending small increases to the rates of reduced retirement for most of the early ages and small reduction in some of the later ages. In making our recommendation, we considered the results of both the current and prior investigation of experience studies (as shown in the graphs below). The proposed rates result in an Actual-to-Proposed ratio of 95%, as shown in the following table, and are shown in Exhibits 6-1 and 6-2.

Retirements with Reduced Benefits			
Gender	**Actual**	**Proposed**	**Act/Prop**
Male	147	158	93%
Female	124	128	97%
Total	**271**	**286**	**95%**

Exhibit 6-1

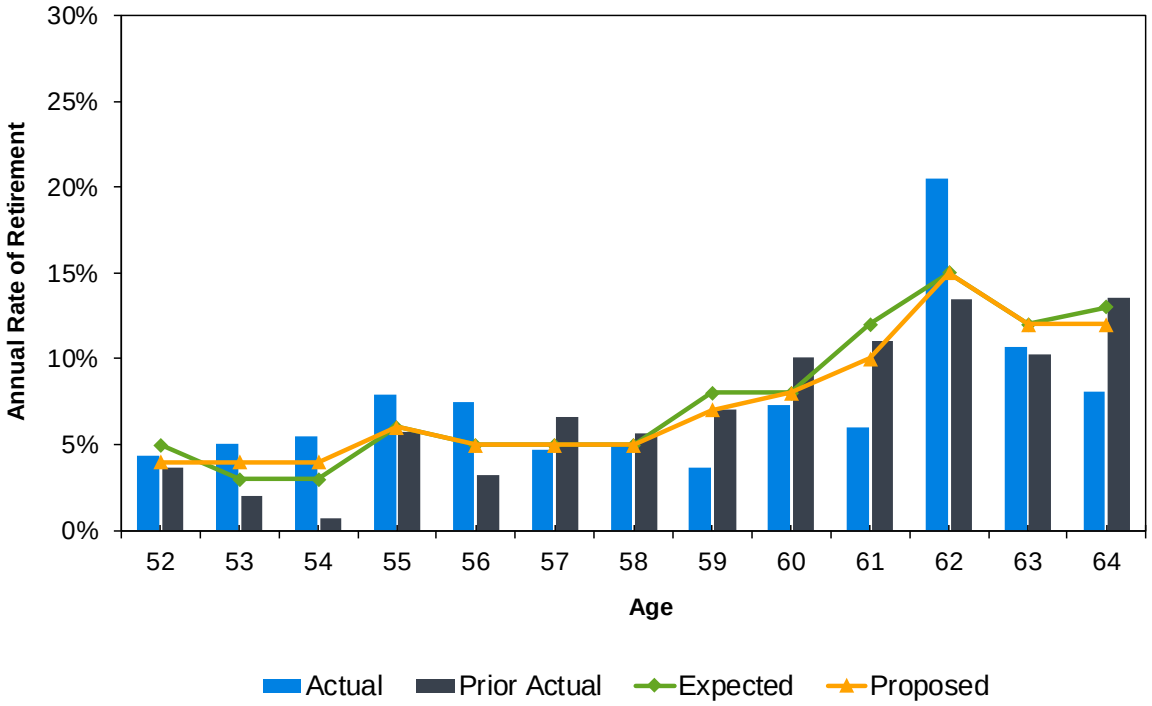
Retirement with Reduced Benefits – Males



	2014-2017 Data		
	Expected	Actual	Proposed
Total Count	167	147	158
Actual / Expected	88%		93%

Exhibit 6-2

Retirement with Reduced Benefits – Females



	2014-2017 Data		
	Expected	Actual	Proposed
Total Count	133	124	128
Actual / Expected	93%		97%

Results – Unreduced Benefits

Members who are eligible for the full 2% service benefit with no reduction have higher assumed retirement rates than those only eligible for reduced benefits. This is consistent with the results of this study as shown in Exhibits 6-3 and 6-4 (full benefits) when compared to Exhibits 6-1 and 6-2 (reduced benefits).

In previous studies, we split the group eligible for unreduced benefits into those with less than and those with more 30 years of service. For this study, we did not notice a significant difference for those with less than 30 years of service compared to those with more than 30 years of service. Therefore, after reviewing the results, we combined the assumption for members eligible for unreduced benefits into one group, regardless of the years of service.

In general, the actual number of retirements was close to that projected by the current assumptions, with retirements with less than 30 years of service tending to be higher than the assumption and retirements with 30 or more years of service tending to lower than the assumption.

Retirements with Unreduced Benefits

Gender	Actual	Expected	Act/Exp
Male	500	466	107%
Female	489	482	102%
Total	**989**	**948**	**104%**

Recommendation – Unreduced Benefits

We are recommending the rates of unreduced retirement be adjusted to combine the less than and greater than 30 years of service groups. This resulted in small changes overall.

A comparison of the actual and proposed retirements under the recommended assumptions is shown in the table below.

Retirements with Unreduced Benefits

Gender	Actual	Proposed	Act/Prop
Male	500	481	104%
Female	489	493	99%
Total	**989**	**974**	**102%**

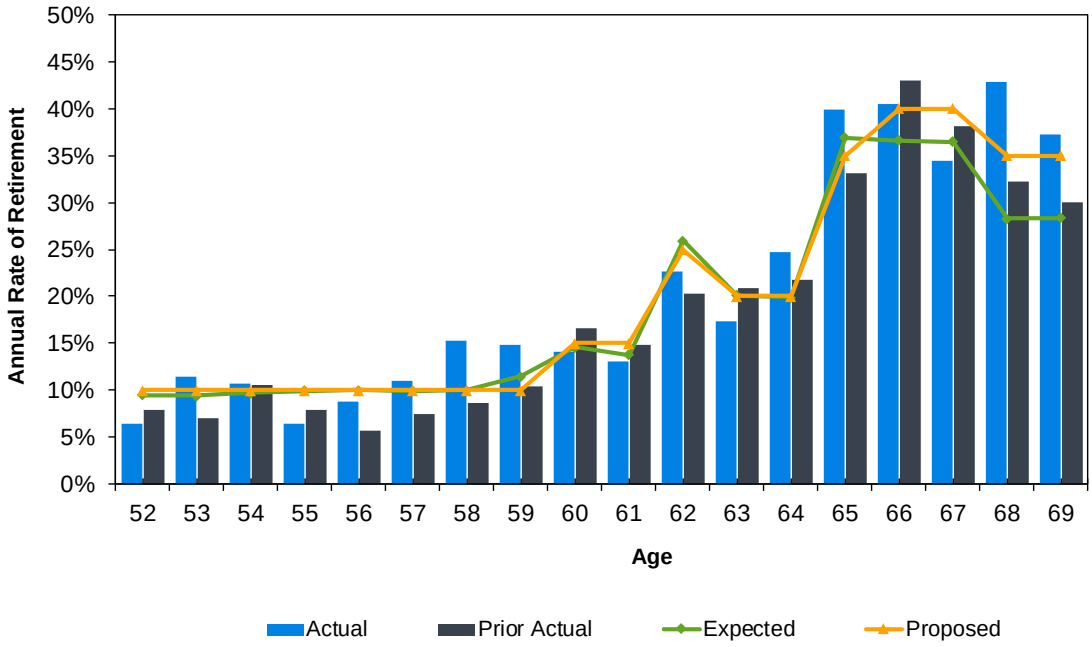
Recommendation – Plan 2

The prior analysis and recommendations were for Plan 1. For Plan 2, we do not have any retirement experience to analyze. Based on our experience working with other systems with multiple plans of benefits, we expect the plan with the lower benefits to have lower retirement ages at the younger ages.

Our recommendation for Plan 2 is to use 80% of the Plan 1 retirement rates at ages less than 62. At age 62 and later, we recommend using the same retirement rates for Plan 1 and Plan 2.

Exhibit 6-3

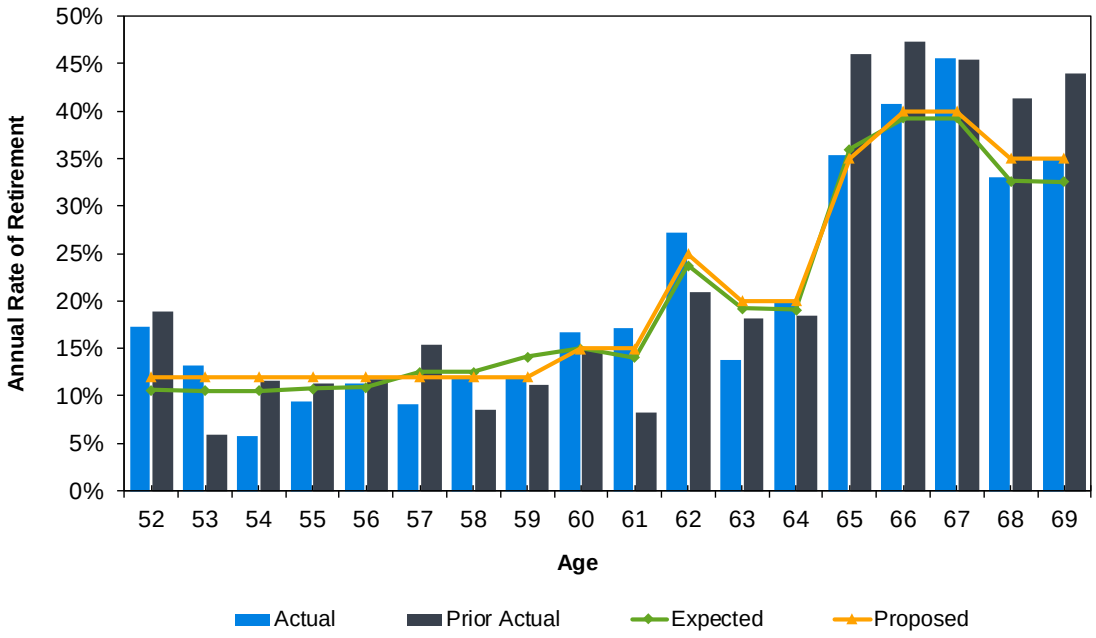
Retirement with Unreduced Benefits – Males



	2014-2017 Data		
	Expected	Actual	Proposed
Total Count	466	500	481
Actual / Expected	107%		104%

Exhibit 6-4

Retirement with Unreduced Benefits – Females



	2014-2017 Data		
	Expected	Actual	Proposed
Total Count	482	489	493
Actual / Expected	102%		99%

Section 7 Disability Retirement

The City's Long-Term Disability (LTD) Insurance benefits are reduced by any disability retirement benefits payable by the System. As a result, almost all disabled members elect to receive full 100% LTD benefits and delay receiving retirement benefits until normal service retirement age is reached. The result is very few disabilities occur within SCERS and the overall financial impact of this assumption on the System is very small.

Results

Over the four-year study period, there were eight disability retirements compared to four expected.

Disability Retirement			
Gender	**Actual**	**Expected**	**Act/Exp**
Male	6	2	246%
Female	2	2	100%
Total	**8**	**4**	**200%**

Recommendation

We are recommending no change to the disability assumption because of the low number of disability retirements each year. Because of the extremely small size of this group, it is possible that the actual rates of disability retirement may show greater variance from year to year than most assumptions. However, as discussed above, the impact of this assumption on the valuation is very small.

Disability Retirement			
Gender	**Actual**	**Proposed**	**Act/Prop**
Male	6	2	246%
Female	2	2	100%
Total	**8**	**4**	**200%**

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Section 8 Other Terminations of Employment

This section of the report summarizes the results of our study of terminations of employment for reasons other than death, service retirement, or disability. Rates of termination vary by years of service – the greater the years of service, the less likely a member is to terminate employment.

The current assumptions also vary by gender, with females having a slightly higher probability of terminating than males.

Overall, the actual number of terminations was slightly lower than the number projected by the current assumptions (95% of expected).

Results

Termination - All Years of Service[1]

Gender	Actual	Expected	Act/Exp
Male	443	437	101%
Female	468	522	90%
Total	**911**	**959**	**95%**

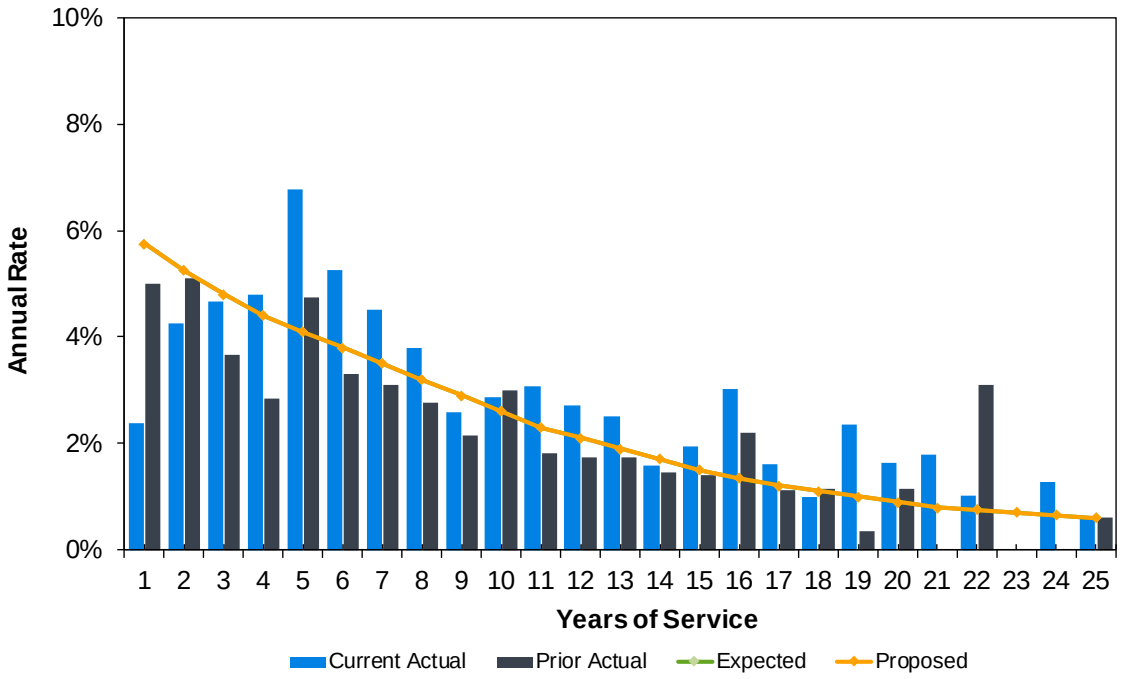
1. Experience for members with <1 year of service excluded.

Recommendation

We have recommended no adjustments to the rates of assumed termination, as shown in Exhibits 8-1 and 8-2.

Exhibit 8-1

Termination by Years of Service – Males

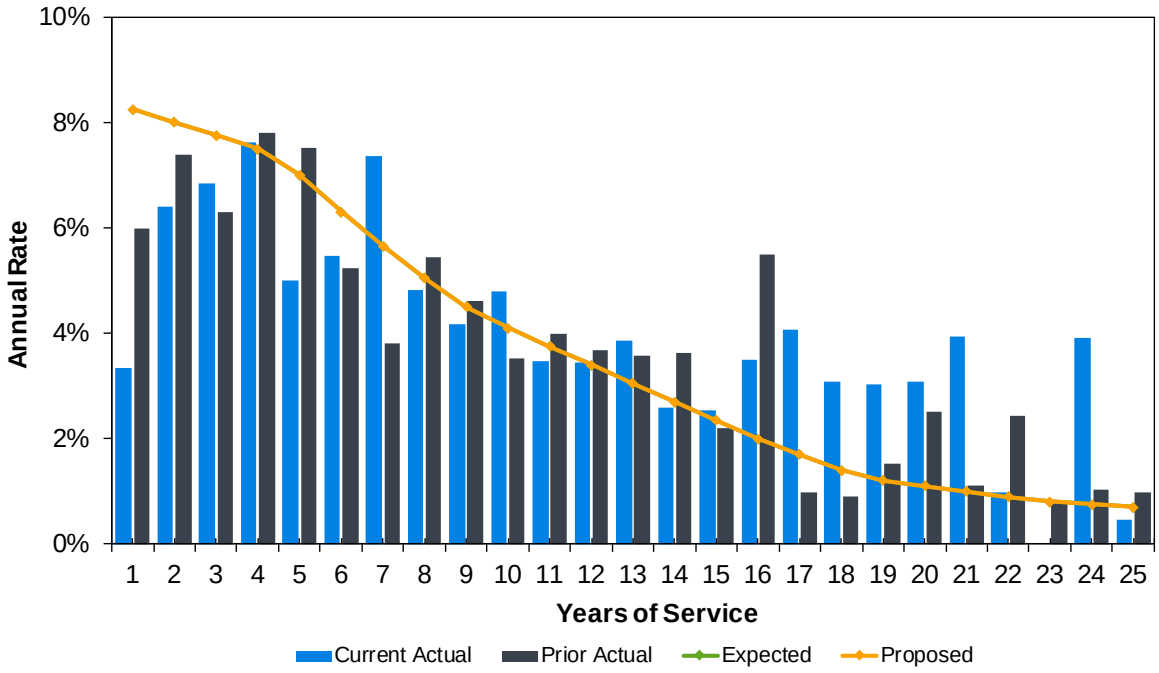


	All Years (Excludes First Year)		
	Expected	Actual	Proposed
Total Count	437	443	437
Actual / Expected	101%		101%

	Service of 10 Years or More		
	Expected	Actual	Proposed
Total Count	82	109	82
Actual / Expected	133%		133%

Exhibit 8-2

Termination by Years of Service – Females



	All Years (Excludes First Year)		
	Expected	Actual	Proposed
Total Count	522	468	522
Actual / Expected	90%		90%

	Service of 10 Years or More		
	Expected	Actual	Proposed
Total Count	99	131	99
Actual / Expected	132%		132%

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Section 9 Probability of Refund upon Vested Termination

This section of the report deals with the rates at which employees elect a refund of their contributions upon termination of service. It only considers vested members who are not yet eligible for service retirement. Under the current assumptions, members who terminate at younger ages have a greater probability of electing to withdraw their contributions. All non-vested members are assumed to take a refund at termination.

Results

Exhibit 9-1 summarizes the results of our study. The results are consistent with our assumptions in that members have a higher likelihood of electing a refund at younger ages; however, the actual rates are a bit lower than expected at younger ages. Overall, the number of refunds for members with less than 20 years of service is 73% of what the assumptions predicted.

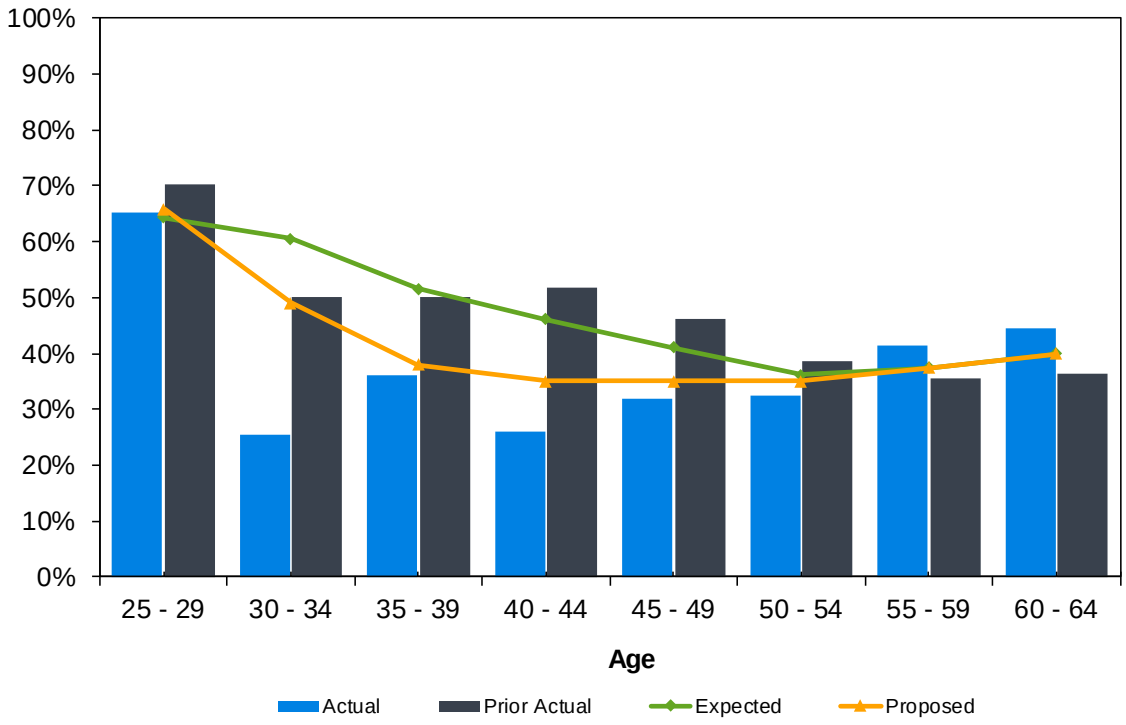
We use a separate assumption for the probability of refund among members who terminate with 20 or more years of service. Among this group, the actual number of refunds was 175% of the expected number, but it was based on a small sample size (seven actual refunds, versus four expected).

Recommendation

Based on the experience from both the current and the prior experience studies, we are recommending reductions to the assumed rates at which members withdraw their contributions in the System for ages less than 55. Given the small sample size, we are not recommending any changes for the rate of refund for members with 20 or more years of service.

Exhibit 9-1

Probability of Refund upon Vested Termination – Males and Females



	Less than 20 Years of Service		
	Expected	Actual	Proposed
Total Count	254	185	216
Actual / Expected	73%		86%

	20 Years or More of Service		
	Expected	Actual	Proposed
Total Count	4	7	4
Actual / Expected	175%		175%

Section 10 Actuarial Methods

Actuarial Methods

In addition to the assumptions used in the valuation, we reviewed the actuarial methods. We are not recommending any changes to these assumptions.

- **Cost Method:** The actuarial valuation is prepared using the entry age actuarial cost method. We believe that this cost method is appropriate for SCERS' valuation. It is also the cost method that is required for financial reporting under GASB Statements 67 and 68. We recommend no change. Note that this is by far the most popular method used for public sector retirement systems, as it results in more stability in normal costs and provides a level allocation of costs over each individual's working lifetime.

- **Level Percent of Pay vs. Level Dollar:** A significant majority of public pension systems fund on a level percent of pay basis, as SCERS does. A minority use the level dollar approach. Using the level dollar method results in higher calculated contribution rates in the short term and ultimately a higher level of funding.

- **Valuation of Assets:** SCERS uses a five-year smoothing method to determine the actuarial value of assets used in the valuation. We believe this is an appropriate method for variable contribution rate plans.

  For reference, five-year asset smoothing is the most common asset smoothing period among public systems (based on the Public Fund Survey).

Appendix A: Summary of Proposed Assumptions

This section of the report describes the actuarial procedures and assumptions used in this valuation. The assumptions used in this valuation were adopted by the SCERS Board at its June 2018 meeting.

The actuarial assumptions used in the valuation are intended to estimate the future experience of the members of the System and of the System itself in areas that affect the projected benefit flow and anticipated investment earnings. Any variations in future experience from that expected from these assumptions will result in corresponding changes in the estimated costs of the System's benefits. Table A-1 summarizes the actuarial assumptions.

Table A-2 presents expected annual salary increases for various years of service. Tables A-3 through A-6 show rates of decrement for service retirement, disability, mortality, and other terminations of employment. Table A-7 shows probabilities of refund upon termination.

Changes from Prior Assumptions

Where we have proposed changes from the prior assumptions, these changes are highlighted in yellow.

Actuarial Cost Method

The actuarial valuation was prepared using the entry age actuarial cost method. Under this method, the actuarial present value of the projected benefits of each individual included in the valuation is allocated as a level percentage of the individual's projected compensation between entry age and assumed exit. The portion of this actuarial present value allocated to a valuation year is called the normal cost. The portion of this actuarial present value not provided for at a valuation date by the sum of (a) the actuarial value of the assets, and (b) the actuarial present value of future normal costs is called the unfunded actuarial accrued liability or UAAL. The UAAL is amortized as a level percentage of the projected salaries of present and future members of the System.

Records and Data

The data used in the valuation consist of financial information; records of age, sex, service, salary, contribution rates and account balances of contributing members; and records of age, sex, and amount of benefit for retired members and beneficiaries. All of the data were supplied by the System and are accepted for valuation purposes without audit.

Replacement of Terminated Members

The ages at entry and distribution by sex of future members are assumed to average the same as those of the present members they replace. If the number of active members should increase, it is further assumed that the average entry age of the larger group will be the same, from an actuarial standpoint, as that of the present group. Under these assumptions, the normal cost rates for active members will not vary with the termination of present members.

Employer Contributions

The City contribution rate is determined as of the prior year's valuation such that the combined member and City contribution rate is sufficient to amortize the UAAL over a closed 30-year period beginning January 1, 2013. The amortization payment is based on a level percent of pay.

Administrative Expense

The annual contribution assumed to be necessary to meet general administrative expenses of the system, excluding investment expenses, is 0.80% of members' salaries. This figure is included in the calculation of the normal cost rate.

Valuation of Assets

The assets are valued using a five-year smoothing method based on the difference between the expected market value and the actual market value of the assets in each year. The expected market value is the prior year's market value increased with the net increase in the cash flow, all increased with interest during the past fiscal year at the expected investment return rate assumption.

Investment Earnings

The annual rate of investment earnings of the assets of the System is assumed to be 7.00%. This rate is compounded annually and is net of investment expenses.

Postretirement Benefit Increases

Postretirement benefit increases include:

- Automatic 1.5% Annual COLA – This benefit applies to all members.
- 65% Restoration of Purchasing Power (ROPP) – The member's benefit is the greater of 65% of the annual initial benefit adjusted for CPI or their applicable benefit. This minimum benefit is available to all retirees and beneficiaries. The financial impact of the ROPP benefit is valued assuming an annual price inflation rate of 2.75%.

Additional contingent COLA increases that were adopted in 2001, but not effective until the System reaches at least a 100% funding ratio, are not included in the valuation results.

Valuation Services

The projected salary for the valuation year is equal to the member's hourly pay rate multiplied by 2088 with the following adjustments:

- Annualized pay for members who entered in year preceding valuation year.
- Multiplied hourly pay rate by minimum of 1,040 and actual hours worked in prior year for part-time employees.

Future Salaries

Table A-2 illustrates the rates of future (after the valuation year) salary increases assumed for the purpose of the valuation. In addition to increases in salary due to promotions and longevity, this scale includes an assumed 3.50% per annum rate of increase in the general wage level of the membership.

Service Retirement

Table A-3 shows the annual assumed rates of retirement among members eligible for service retirement or reduced retirement. Separate rates are also used during the first year a member is eligible for service retirement.

Disability	The rates of disability used in this valuation are illustrated in Table A-4. It is assumed that one-third of all disabilities are duty related and two-thirds occur while off duty.
Mortality	The mortality rates used in this valuation are illustrated in Table A-5. A written description of each table used is included in Table A-1.
Other Terminations of Employment	The rates of assumed future withdrawal from active service for reasons other than death, disability, or retirement are shown for representative ages in Table A-6. Note that this assumption only applies to members who terminate and are not yet eligible for retirement.
Probability of Refund	Terminating members may forfeit a vested right to a deferred benefit if they elect a refund of their accumulated contributions. Table A-7 gives the assumed probability that, at selected ages, a terminating member will elect to receive a refund of his accumulated contributions instead of a deferred benefit. If a member terminates with more than 20 years of service, there is assumed to be a 20% probability that the member will elect a refund. Note that the probability of refund assumption only applies to members who terminate with a vested benefit and are not yet eligible for retirement.
Interest on Member Contributions	Interest on member contributions made prior to January 1, 2012 is assumed to accrue at a rate of 5.75% per annum, compounded annually. Interest on member contributions made on or after January 1, 2012 is assumed to accrue at 4.00%.
Portability	The cost of portability with other public retirement systems is not included in this valuation.
Probability of Marriage	We assumed 60% of the active members are married or have a registered domestic partner.
Commencement for Terminated Vested Members	Vested members who terminate but elect to leave their contributions in the System are assumed to commence receiving benefits at age 62.

Table A-1

Summary of Valuation Assumptions

January 1, 2017

I.	Economic assumptions	
	A. Price inflation	2.75%
	B. General wage increases	3.50
	C. Investment return	7.00
	D. Increase in membership	0.00
	E. Interest on member accounts	5.75/4.00[1]
II.	Demographic assumptions	
	A. Salary increases due to promotion and longevity	Table A-2
	B. Retirement	Table A-3
	C. Disability	Table A-4
	D. Mortality[2] among contributing members	Table A-5
	Men	RP 2014 Employees Table for Males, adjusted by 60%.
	Women	RP 2014 Employees Table for Females, adjusted by 95%.
	E. Mortality[2] among service retired members and beneficiaries	Table A-5
	Men	RP2014 Healthy Annuitant Males, adjusted by 95%.
	Women	RP2014 Healthy Annuitant Females, adjusted by 95%.
	F. Mortality[2] among disabled members	Table A-5
	Men	RP2014 Disabled Males, adjusted by 95%.
	Women	RP2014 Disabled Females, adjusted by 95%.
	G. Other terminations of employment	Table A-6
	H. Probabilities of refund on termination	Table A-7

1. Member contributions made prior to January 1, 2012 are assumed to accrue interest at 5.75%; contributions made on or after that date are assumed to accrue at 4.00%.

2. All mortality tables are generational using the MP-2014 Ultimate projection scale to reflect future mortality improvement.

Table A-2

Future Salaries – Plans 1 and 2

Annual Rate of Increase

Years of Service	Promotion and Longevity	Total[1]
0 to 1	4.25%	7.90%
1 to 2	3.25	6.86
2 to 3	2.50	6.09
3 to 4	1.75	5.31
4 to 5	1.25	4.79
9 to 10	0.65	4.17
14 to 15	0.40	3.91
19 to 20	0.29	4.05
24 to 25	0.27	3.78
29 to 30	0.25	3.76
35 or more	0.25	3.76

1. Total rate shown reflects compounded effect of merit increase and assumed wage growth of 3.50%.

Table A-3

Retirement – Plan 1[1]

	Annual Probability			
	Male		Female	
Age	Eligible for Reduced Benefits	Eligible for Full Benefits	Eligible for Reduced Benefits	Eligible for Full Benefits
Less than 50	0.0%	8.0%	0.0%	10.0%
50	4.0	8.0	4.0	10.0
51	4.0	8.0	4.0	10.0
52	4.0	10.0	4.0	12.0
53	3.0	10.0	4.0	12.0
54	4.5	10.0	4.0	12.0
55	6.0	10.0	6.0	12.0
56	5.0	10.0	5.0	12.0
57	5.0	10.0	5.0	12.0
58	5.0	10.0	5.0	12.0
59	5.0	10.0	7.0	12.0
60	6.0	15.0	8.0	15.0
61	7.5	15.0	10.0	15.0
62	14.0	25.0	15.0	25.0
63	10.0	20.0	12.0	20.0
64	10.0	20.0	12.0	20.0
65		35.0		35.0
66		40.0		40.0
67		40.0		40.0
68		35.0		35.0
69-74		35.0		35.0
75		(2)		(2)

1. For Plan 2, assume 80% of the Plan 1 retirement rates at ages less than 62. Same retirement rates for ages 62 and later for Plan 1 and 2.
2. Immediate retirement is assumed for every person age 75 or over.

Table A-4

Disability – Plans 1 and 2[1]

Age	Annual Rates	
	Male	Female
20	.00%	.00%
25	.00	.00
30	.02	.02
35	.02	.02
40	.03	.03
45	.03	.03
50	.04	.04
55	.04	.04
60	.04	.04
65	.00	.00

1. It is assumed that one-third of all disabilities are duty related and two-thirds are non-duty related.

Table A-5

Mortality – Plans 1 and 2

	Annual Probability[1]					
	Contributing Members		Members Retired for Service and Beneficiaries of Members		Disabled Members	
Age	Males	Females	Males	Females	Males	Females
22	0.03 %	0.02 %	0.11 %	0.04 %	0.81 %	0.21 %
27	0.03	0.02	0.10	0.04	0.75	0.24
32	0.03	0.02	0.11	0.06	0.79	0.32
37	0.03	0.03	0.13	0.08	0.92	0.42
42	0.04	0.05	0.17	0.11	1.21	0.62
47	0.07	0.08	0.28	0.19	1.75	0.97
52	0.12	0.12	0.45	0.29	2.05	1.23
57	0.20	0.18	0.62	0.39	2.33	1.47
62	0.35	0.27	0.84	0.58	2.69	1.74
67	0.61	0.43	1.23	0.92	3.29	2.21
72	N/A	N/A	1.91	1.48	4.29	3.10
77	N/A	N/A	3.11	2.43	5.88	4.57
82	N/A	N/A	5.27	4.11	8.47	6.79
87	N/A	N/A	9.22	7.22	12.72	10.02
92	N/A	N/A	15.91	12.66	19.20	14.74

Annual Projected Mortality Improvement

Age	All Groups
67 & Less	1.00 %
72	1.00
77	1.00
82	1.00
87	0.97
92	0.90
97	0.77
102	0.55
107	0.34
112	0.13
115	-

1. Mortality rates are those applicable for the fiscal year beginning in 2014. Annual projected improvements are assumed in the following years under the schedule shown. For example, the annual mortality rate for an 82-year old male in fiscal year beginning in 2017 is 5.118% calculated as follows:

Age 82 rate in 2017 = Age 82 rate in 2014 with 3 years improvement
= 5.27497% x (100.0% - 1.0%) x (100.0% - 1.0%) x (100.0% - 1.0%)
= 5.118%

Table A-6

Other Terminations of Employment Among Members Not Eligible to Retire – Plans 1 and 2

Years of Service	Annual Rates for Males	Annual Rates for Females
0 to 1	6.5%	8.5%
1 to 2	5.8	8.3
2 to 3	5.3	8.0
3 to 4	4.8	7.8
4 to 5	4.4	7.5
5 to 6	4.1	7.0
6 to 7	3.8	6.3
7 to 8	3.5	5.7
8 to 9	3.2	5.1
9 to 10	2.9	4.5
10 to 11	2.6	4.1
11 to 12	2.3	3.8
12 to 13	2.1	3.4
13 to 14	1.9	3.1
14 to 15	1.7	2.7
15 to 16	1.5	2.4
16 to 17	1.4	2.0
17 to 18	1.2	1.7
18 to 19	1.1	1.4
19 to 20	1.0	1.2
20 to 21	0.9	1.1
21 to 22	0.8	1.0
22 to 23	0.8	0.9
23 to 24	0.7	0.8
24 to 25	0.7	0.8
25 to 26	0.6	0.7
26 to 27	0.6	0.7
27 to 28	0.5	0.6
28 to 29	0.5	0.6
29 to 30	0.4	0.5
30 and up	0.5	0.5

Table A-7

Probability of Refund – Plans 1 and 2

Age	Probabilities of Refund upon Termination[1]
25	70.0%
30	58.0
35	40.0
40	35.0
45	35.0
50	35.0
55	36.0
60	40.0

1. If service is 20 or more years at termination, probability of refund is equal to 20%.