MERCER

MARSH   MERCER   KROLL
GUY CARPENTER   OLIVER WYMAN

July 16, 2009

Oregon Public Employees' Retirement System
Experience Study for December 31, 2008 Actuarial Valuation
- Demographic Assumptions
- Investment Return Assumptions
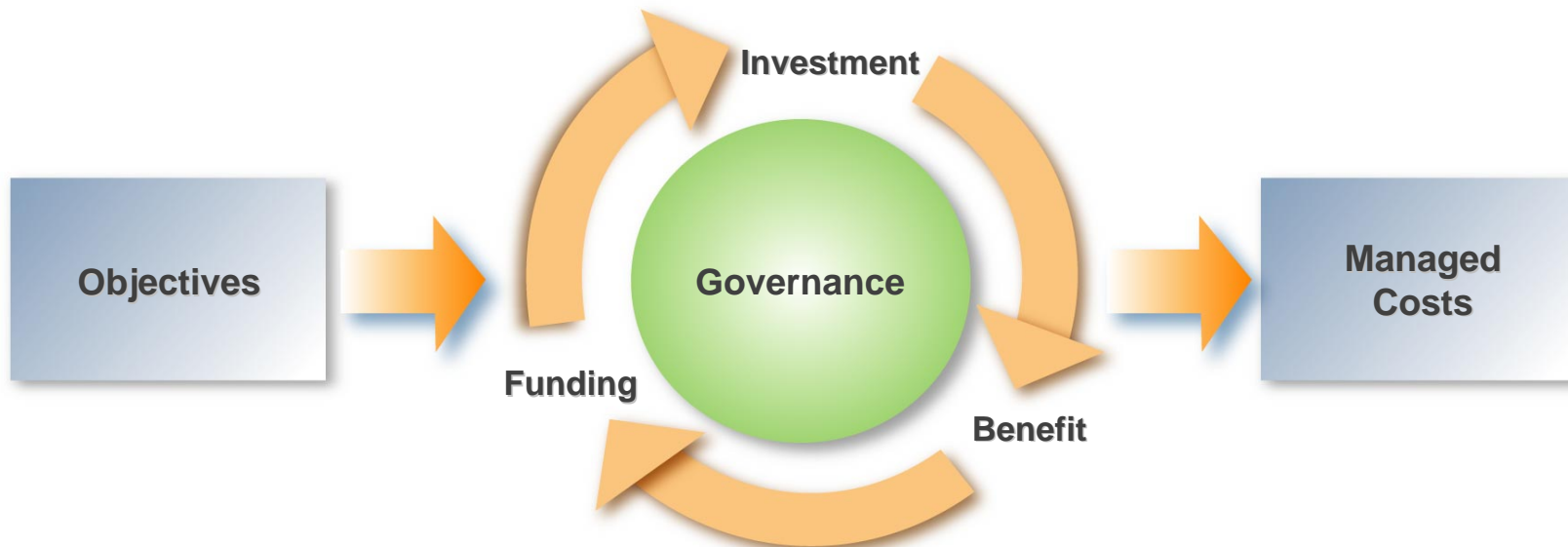
Bill Hallmark and Matt Larrabee

Contents

- Introduction

- Demographic Assumptions

- Investment Return Assumptions

- Decisions (Selection of Economic and Demographic Assumptions)

- Next Steps

- Appendix

Total Contributions = Benefits Paid - Investment Earnings

Actuarial methods/assumptions primarily affect the timing of contributions

Introduction
Objectives for Actuarial Methods and Assumptions

- Transparent

- Predictable and stable rates

- Protect funded status

- Equitable across generations

- Actuarially sound

- GASB compliant

Introduction
Summary of Recommendations

- Two Significant Assumptions to Address
  - Investment Return
    - Mercer capital market assumptions and Strategic Investment Solutions (SIS) capital market assumptions differ significantly
    - Mercer assumptions suggest **decreasing** the investment return assumption to **7.5**%
    - SIS assumptions suggest **increasing** the investment return assumption to at least **8.5**%
  - Healthy Mortality
    - Current assumption is based on a static mortality table adjusted for projected improvements in mortality beyond the experience period
    - Recommendation is to base the assumption on a generational mortality table and match the experience during the study period
    - Generational mortality tables build in projections for future improvement in mortality by creating a separate mortality table for each year of birth
    - A generational mortality table should match future experience more closely than a static table

Introduction
Summary of Recommendations

- Additional assumptions with minor aggregate impact
  - Retirement rates – Added additional service band with different rates
  - Disability rates – Reduced rates to match continued reduction in disability incidence
  - Termination rates – Reduced school district rates and increased SLGRP rates
  - Merit salary increases – Slight increase in long-term rates, but added a two-year freeze on merit increases to reflect the current economic environment
  - Other assumptions
    - Lump sum at retirement – slight reduction in partial lump sum rate
    - Purchase service – increase in waiting time purchases for non-Money Match retirements
    - Refund – reduction in probability of refund before retirement
    - Unused sick leave – minor adjustments to current assumptions for some groups

Demographic Assumptions
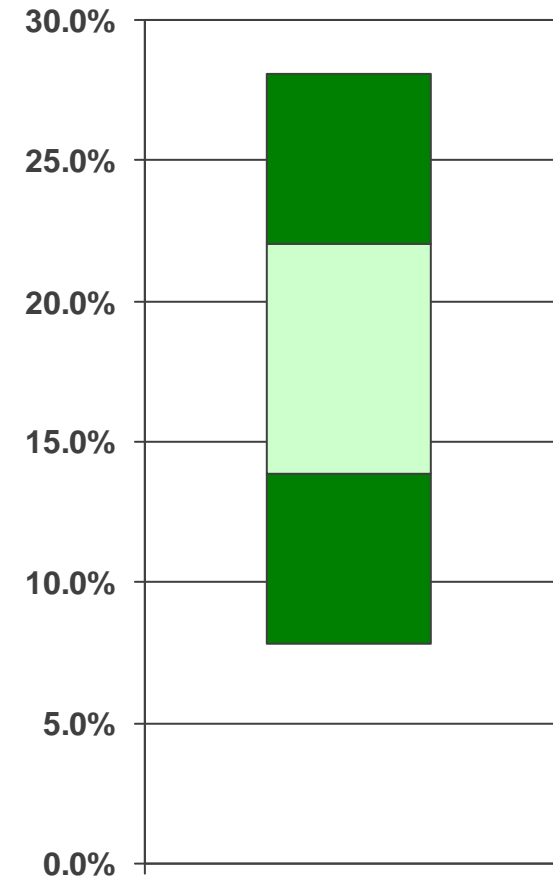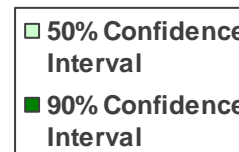
Demographic Assumptions
Overview

- Compared actual experience from January 1, 2005 through December 31, 2008 to expected experience based on assumptions from the December 31, 2007 actuarial valuation

- Actual experience, combined with future expectations, are used to develop recommended assumptions for December 31, 2008 actuarial valuation

- The presentation summarizes those results, primarily for assumptions where significant changes are recommended.

- More details are available in:
  - Our forthcoming written report
  - The appendix of this presentation

Demographic Assumptions
Confidence Intervals

- We have used 50% and 90% confidence intervals in our analysis.

- The 90% confidence interval represents the range around the observed rate that contains the true rate during the period of study with 90% probability

- The size of the confidence interval depends on the number of observations

- If an assumption is outside the 90% confidence interval and there is no other information to explain the observed experience, a change in assumption should be considered.

□ 50% Confidence Interval
■ 90% Confidence Interval

Mortality Assumptions
Summary of Recommendations

	Current Assumption	Recommended Changes
Healthy Retired	RP 2000, **Static** Combined Active/Healthy Retired, Sex distinct	RP 2000, **Generational** Combined Active/Healthy Retired, Sex distinct
▪ School district male ▪ Other GS male ▪ P&F male	No collar, set back 36 months No collar, set back 24 months No collar, set back 12 months	White collar, set back 12 months White collar, no set back Blend 33% blue collar, no set back
▪ School district female ▪ Other female	No collar, set back 36 months No collar, set back 18 months	White collar, set back 18 months Blend 33% blue collar, no set back
Disabled Retired	RP 2000, Static, No Collar Combined Active/Healthy Retired, Sex distinct	RP 2000, Static, No Collar Combined Active/Healthy Retired, Sex distinct
▪ Male ▪ Female	Set forward 36 months, min of 2.50% Set forward 36 months, min of 2.75%	Set forward 60 months, min of 2.25% Set forward 48 months, min of 2.25%
Non-Retired Mortality	% of Healthy Retired Mortality	% of Healthy Retired Mortality
▪ School district male ▪ Other GS male ▪ P&F male	65% 65% 70%	75% 75% 70%
▪ School district female ▪ Other female	50% 55%	50% 50%

Mortality Assumptions
Healthy Retired Mortality

	Exposures	Actual Deaths	Current Assumption		Recommended Assumption	
			Expected Deaths	A/E Ratio	Expected Deaths	A/E Ratio
School District Male	58,543	1,614	1,541	105%	1,613	100%
Other General Service Male*	86,441	2,735	2,632	104%	2,751	99%
Police & Fire Male	19,758	331	337	98%	331	100%
School District Female	113,269	2,683	2,541	106%	2,676	100%
Other Female*	108,247	3,232	2,939	110%	3,196	101%

* Includes beneficiaries.

- The Actual/Expected ratio for healthy retirees under a static table should be approximately 110% in order to anticipate mortality improvement in the future.

- The Actual/Expected ratio for most groups is below 110%.

- The gold standard in mortality assumptions is to use a generational table that anticipates mortality improvements on a generational basis. Because the table has mortality improvements built into it, we can target an A/E ratio of 100%.

- We used "white collar"/"blue collar" adjustments and age set backs to adjust the standard table to match Oregon PERS experience.

Retirement Assumptions
Structure for General Service Members

Groupings		Current Structure			Proposed Structure		
		<15 Years	15 to 29 Years	30+ Years	<15 Years	15 to 29 Years	30+ Years
School Districts	Tier 1						
	Tier 2						
SLGRP / Independent Employers	Tier 1						
	Tier 2						
OPSRP							

- Instead of structuring retirement rates based on Tier, we recommend dividing the less than 30 year assumption into a less than 15 year assumption and a 15 to 29 year assumption (For P&F members, 0 to 12 years and 13 to 24 years).

- This structure will likely track member retirement decisions more closely to the extent those decisions contemplate the amount of the retirement benefit and the affordability of retirement.

Tier 1/Tier 2 - School Districts
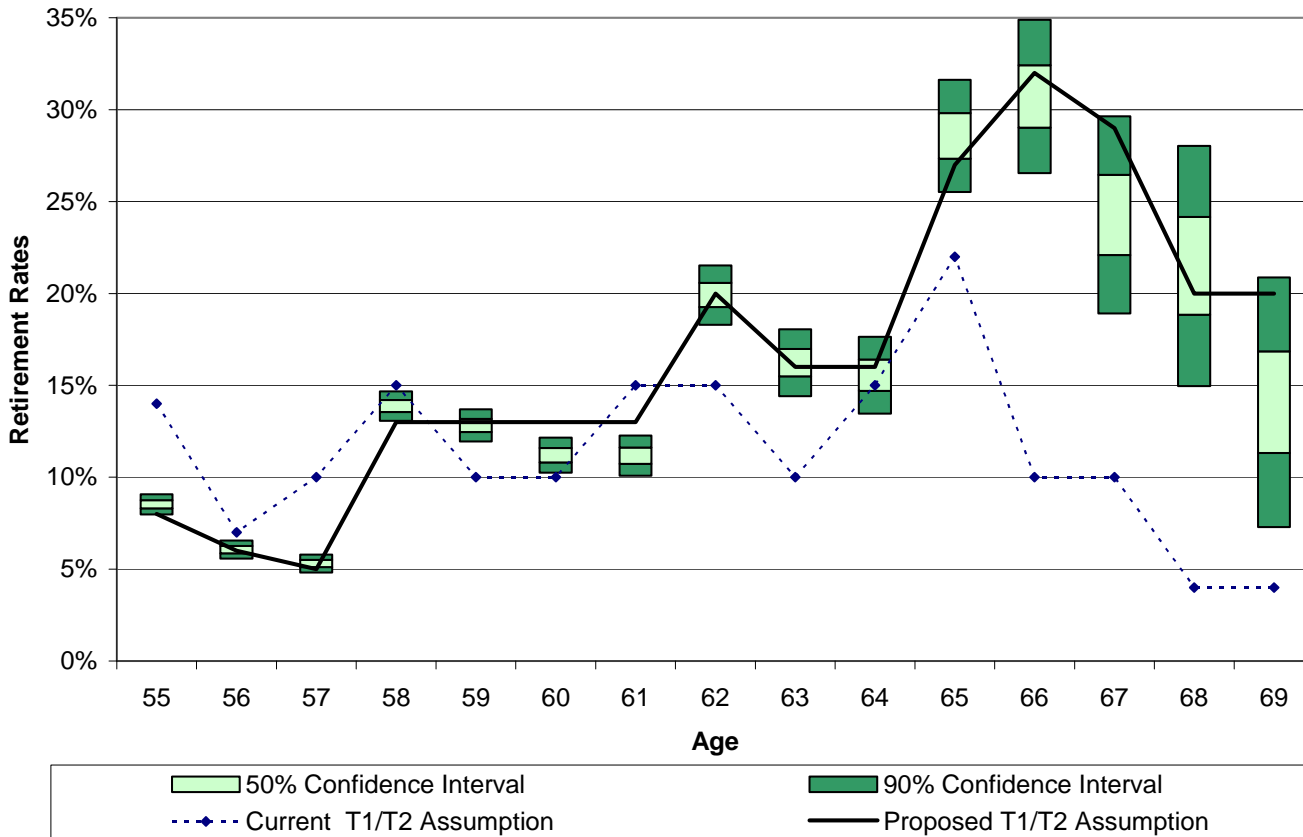**Members with less than 15 Years of Service**

- Retirement decisions by members with less than 15 years of service are likely to be heavily influenced by the availability of resources other than PERS benefits, including:
  - Social Security
  - Prior employment
  - Spousal benefits
  - Savings
- Charts for additional groups can be found in the appendix.

Tier 1/Tier 2 - School Districts

Members with 15 - 29 Years of Service

- Retirement decisions by members with 15 to 29 years of service are likely to be influenced by the structure of PERS benefits as well as the availability of other resources, including:

  – Social Security

  – Prior employment

  – Spousal benefits

  – Savings

- Charts for additional groups can be found in the appendix.

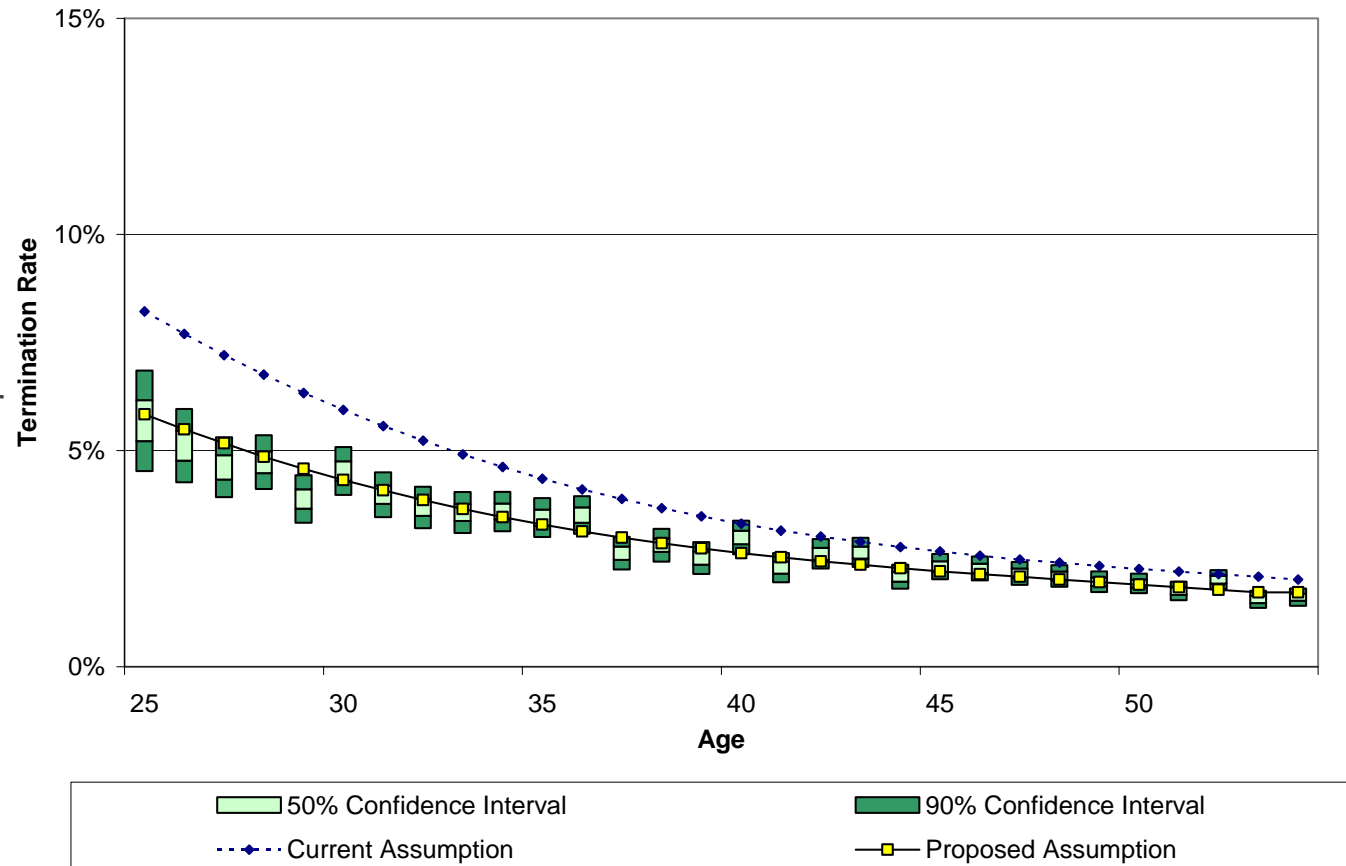## Other General Service

- Current assumptions are set for the following groups:
  - School Districts
  - OHSU
  - SLGRP (GS and P&F)
  - Independent (GS and P&F)

- Recommended changes:
  - Assume 0% merit increase for 2009 and 2010
  - Consolidate SLGRP and Independent Employer assumptions
  - Eliminate separate OHSU assumption

For the merit scale, we studied experience from 2001 through 2008.

Termination Assumptions
Summary of Recommendations

- Adjustments to ultimate termination rates:
  - Modest downward adjustment for School Districts
  - Modest increase for SLGRP

- Adjustment to 3-year select rates:
  - Downward adjustment for all groups to reflect recent experience

- See appendix for additional graphs.

School Districts

Chart axes: Termination Rate (y-axis, 0% to 15%) vs Age (x-axis, 25 to 50)

Legend:
- 50% Confidence Interval
- 90% Confidence Interval
- Current Assumption
- Proposed Assumption

Other Assumptions
Summary of Recommendations

	Current Assumption	Recommended Changes
Duty Disability ▪ Police & Fire ▪ General Service	Age based rates ▪ 0.020% - 0.15% ▪ 0.002% – 0.015%	Percentage of the 1985 Disability Class 1 Rates ▪ 15% (0.005% -- 0.127%) ▪ 1.5% (0.0005% -- 0.013%)
Ordinary Disability	Age based rates ▪ 0.050% – 0.300%	50% of 1985 Disability Class 1 Rates w/ 0.2% cap ▪ 0.015% -- 0.200%
Partial Lump Sum	7% for all years	6% for all years
Total Lump Sum	7% for 2007, declining 0.5% per year until reaching 0%	No Change
Purchase of Credited Service	Non-Money Match Retirements: 45%	Non-Money Match Retirements: 55%
Probability of Refund	General Service: 0% - 22.5% Police & Fire: 0% - 40%	General Service: 0% -- 17.5% Police & Fire: 0% -- 30%
Unused Sick Leave ▪ School District (M) ▪ School District (F) ▪ State General (M) ▪ State General (F) ▪ Local General (M) ▪ Local General (F) ▪ State P&F ▪ Local P&F ▪ Dormant	7.25% 6.75% 5.75% 4.75% 3.50% 3.00% 8.75% 8.75% 3.50%	7.50% No change No change 4.25% 4.25% No change 7.25% 8.25% No change

Retiree Healthcare Assumptions
Summary of Recommendations
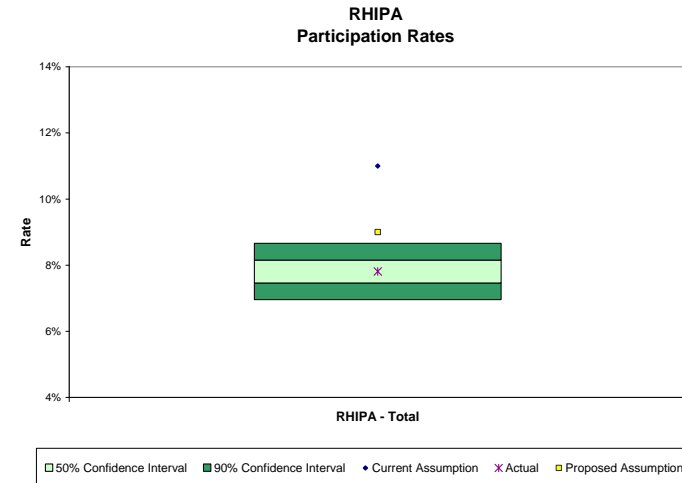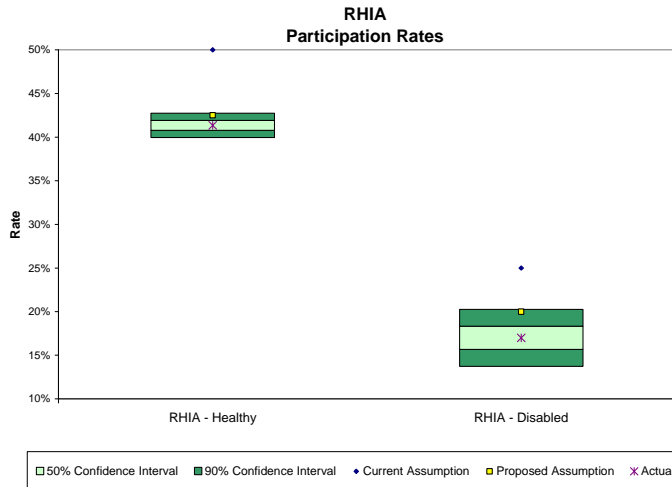
- Participation rates in both RHIA and RHIPA continue to decline.

- The decline for RHIA may be due to the diminishing relevance of the flat dollar subsidy.

- The decline for RHIPA may be due to competition from the PEBB alternative. Changes in the competitive relationship could make participation rates in RHIPA change quickly.

- To remain conservative on these assumptions, we recommend rates at or above the top of the 90% confidence interval.

Investment Return Assumptions

Economic Assumptions
Investment Return

- In our May 29, 2009 Board presentation, we deferred a recommendation on the investment return assumption until the OIC's investment consultant completed their review of capital market assumptions.

- In order to add a broader perspective to the discussion, the chart on the right shows the assumptions used by the 125 large public sector systems in NASRA's survey.

- The current assumption of 8.0% is the median and most common assumption in the survey.
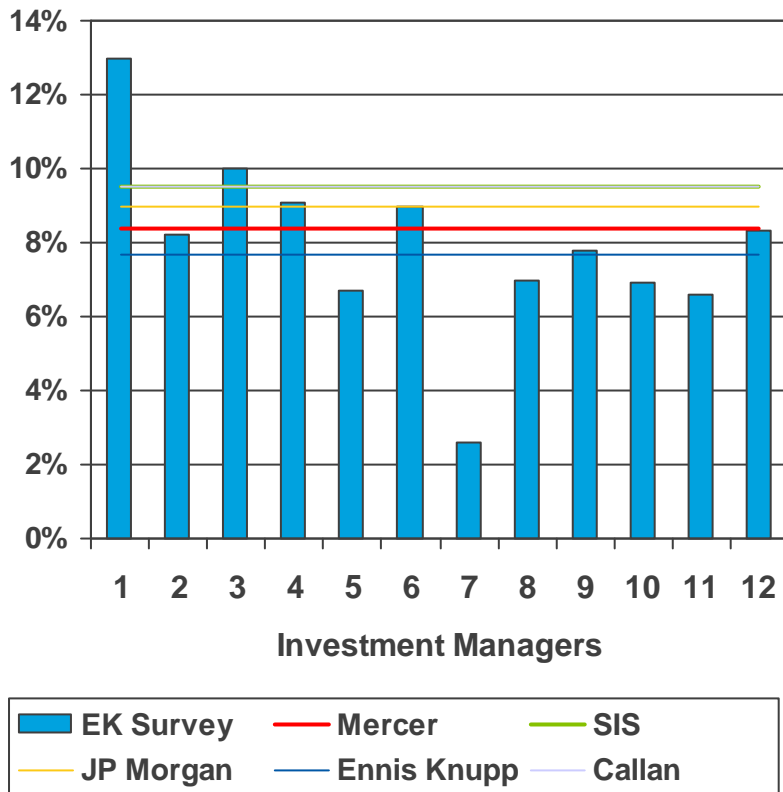
Distribution of Investment Return Assumptions
2007 NASRA Survey Data

Investment Return Assumption (y-axis):
>8.50%, 8.50%, 8.25%, 8.00%, 7.75%, 7.50%, 7.25%, < 7.25%

Number of Plans (x-axis): 0, 20, 40, 60
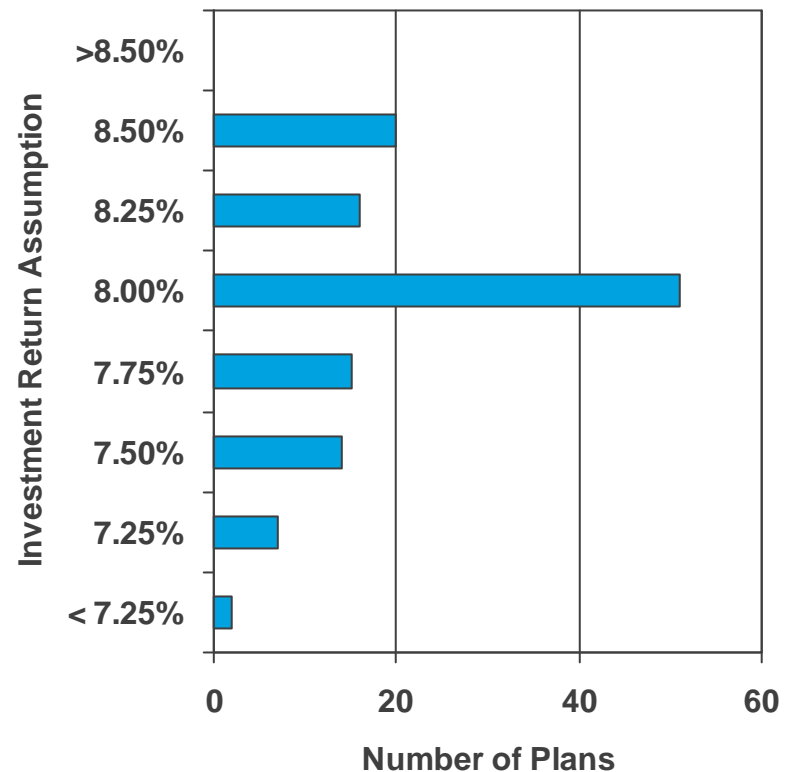
Economic Assumptions
Investment Return

**Capital Market Expectations
Investment Managers/Consultants
Broad US Equity**

- In March 2009, EnnisKnupp conducted a survey of leading investment management firms on long-term market return expectations. The broad US Equity expectations for the 12 managers in the survey are shown in the bars of the chart.

  – Assumptions range from 2.6% to 13.0%.

  – The median assumption is 8.0%.

- The lines on the graph represent the broad US equity expectations for Mercer (8.4%), SIS (9.5%), Callan (9.5%), JP Morgan (9.0%), and EnnisKnupp (7.7%).

Economic Assumptions
Investment Return – Regular Account

Percentile	Mercer	SIS
25th	5.9%	7.0%
35th	6.7%	7.8%
50th	**7.7%**	**8.9%**
65th	8.8%	10.0%
75th	9.6%	10.9%

- The table compares the distribution of expected annualized returns over 20 years for the regular account based on Mercer's and SIS' capital market assumptions.
  - Assumes 25 basis points in expenses and no return for active management.
  - SIS expects an additional 80 basis points of return for active management.
- There is a range of acceptable assumptions. In general, actuaries tend to round their estimates down to be conservative.
  - Improves benefit security
  - Reduces likelihood of contributions increasing to unaffordable levels
- Consequently, based on Mercer's capital market outlook, we recommend 7.5%. However, SIS' capital market outlook would suggest an assumption of at least 8.5%.

Decisions

Estimated Impact of Changes
Ignoring Rate Collar

	Tier 1/Tier 2		OPSRP		RHIA/RHIPA	
	Normal Cost Rate	UAL Rate	Normal Cost Rate	UAL Rate	Normal Cost Rate	UAL Rate
Mortality	0.2%	0.5%	0.2%	0.0%	0.0%	0.0%
Other Demographic Assumptions	0.0%	(0.1%)	(0.2%)	0.0%	0.0%	0.0%
Economic Assumptions and Methods	0.0%	(2.9%)	(0.1%)	0.0%	0.0%	0.3%
Total	**0.2%**	**(2.5%)**	**(0.1%)**	**0.0%**	**0.0%**	**0.3%**
7.5% Assumption	1.5%	1.5%	0.7%	0.0%	0.0%	0.0%
Total	**1.7%**	**(1.0%)**	**0.6%**	**0.0%**	**0.0%`**	**0.3%**

- Estimated impact is shown on a systemwide basis. The impact from rate pool to rate pool (or among individual independent employers) will vary.

- The decrease in the Tier 1/Tier 2 UAL rate is primarily due to the elimination of the 3-year PUC change amortization.

Summary of Recommendations – Methods and Economic Assumptions

	Current Assumption	Recommended Assumption
PUC Change Amortization	3-Year Rolling	Eliminate
RHIA/RHIPA UAL Amortization	20-Year Layered	10-Year Layered
Regular Investment Return	8.00%	7.50% - 8.50%*
Variable Investment Return	8.50%	8.25% - 9.00%**
Health Cost Trend Rate		
▪ 2009 Trend Rate	9.00%	7.00%
▪ Ultimate Trend Rate	5.00%	4.50%
▪ Year Reaching Ultimate Trend	2013	2029
OPSRP Administrative Expenses	$8.5 million	$6.6 million
Percentage of Money Match retirements for allocation between employers	General: 65% P&F: 25%	General: 50% P&F: 15%

* Based on Mercer's capital market assumptions, we recommend 7.5%. However, SIS' capital market assumptions would suggest an assumption of at least 8.5%

** At least 50 basis points greater than regular investment return assumption.

Decisions
Summary of Recommendations – Demographic Assumptions

	Current Assumption	Recommended Assumption
Mortality	Static Tables	Generational Tables
Retirement	2 Service Levels	3 Service Levels
Merit Salary Increases	Ultimate only	0% for 2009 and 2010, then slightly higher ultimate rates
RHIA Participation Rate	Healthy: 50% Disabled: 25%	Healthy: 42.5% Disabled: 20%
RHIPA Participation Rate	11%	9%
Other demographic changes shown in presentation		

Next Steps

- May Board Meeting
  - Experience Study – Methods and Economic Assumptions

- July Board Meeting
  - Experience Study – Investment Return and Demographic Assumptions
  - Board Adoption of Methods and Assumptions for 12/31/2008 and 12/31/2009 Actuarial Valuations

- September Board Meeting
  - 12/31/2008 system-wide actuarial valuation results

- October
  - 12/31/2008 Individual Employer Reports

- November Board Meeting
  - Adoption of actuarial equivalence factors for 2010 and 2011

Appendix

Healthy Retiree Mortality
Aggregate Confidence Intervals and Rates
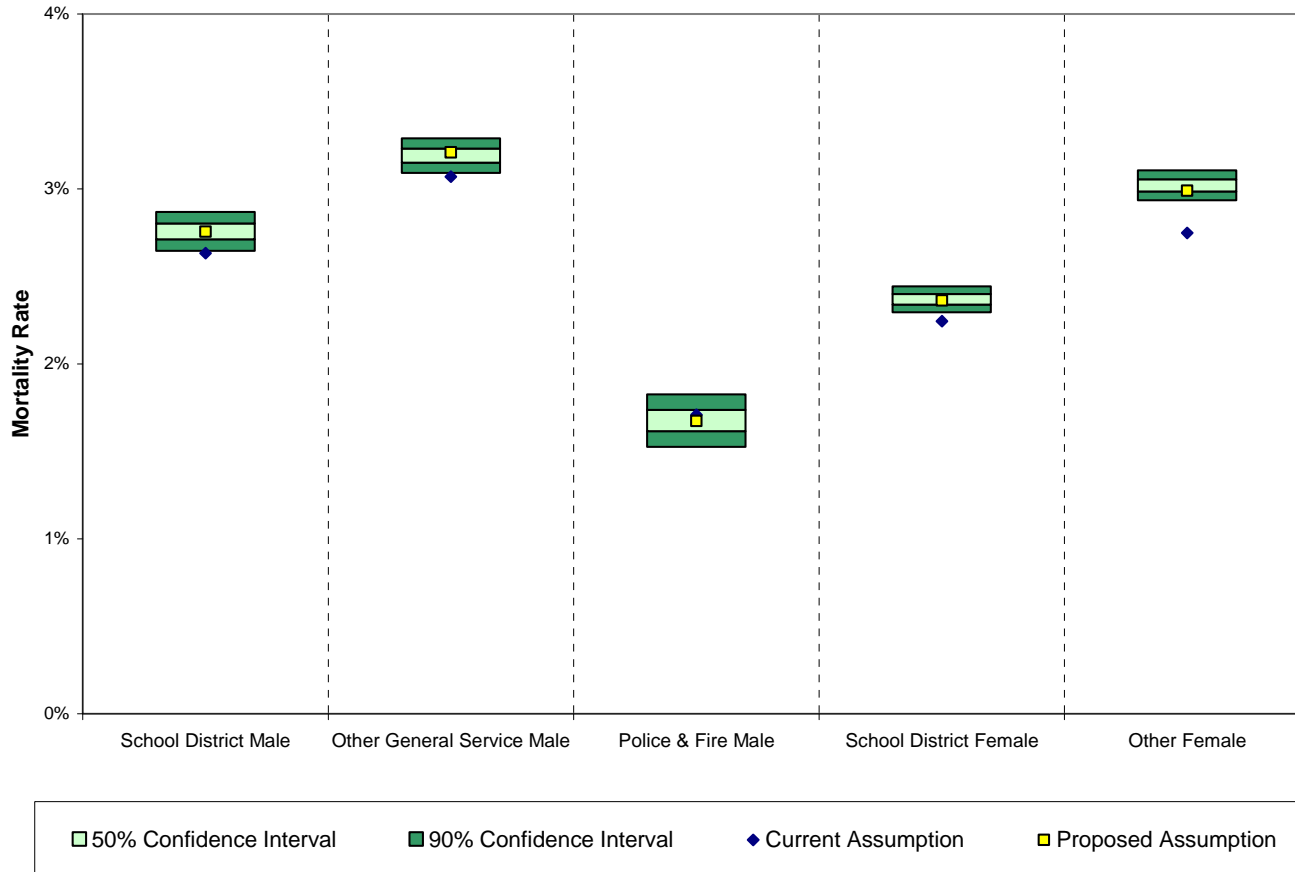
- There are many adjustments that can be applied to the generational mortality table.

- We used an aggregate confidence interval to verify that the adjustments we applied fit each group.

- Note that the aggregate mortality rate is a function of both the group mortality rates and the ages of the members in the group.

- That is, you cannot conclude from this graph that Other General Service Males have the highest mortality and Police & Fire males have the lowest mortality.

Disabled Retiree Mortality

	Exposures	Actual Deaths	Current Assumption		Recommended Assumption	
			Expected Deaths	A/E Ratio	Expected Deaths	A/E Ratio
Male	8,350	350	322	109%	347	101%
Female	8,841	308	325	95%	303	102%

- Although the current rates fall within the aggregate confidence intervals, we are recommending minor adjustments to the disabled mortality tables to bring the A/E ratios closer to 100% and to better fit the experience by age group.

- In particular, the proposed mortality rates are lower at younger ages and higher at older ages.

Disabled Retired Mortality
Aggregate Confidence Intervals and Rates

Legend: □ 50% Confidence Interval ■ 90% Confidence Interval ◆ Current Assumption □ Proposed Assumption
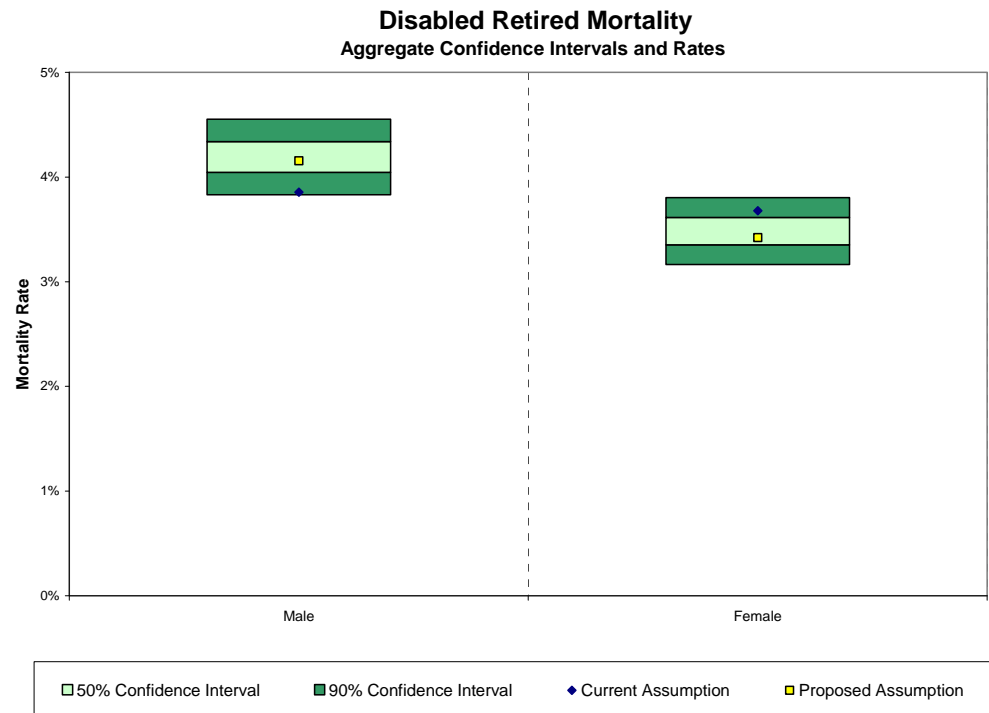
Appendix
Pre-Retirement Mortality

	Exposures	Actual Deaths	Current Assumption		Recommended Assumption	
			Expected Deaths	A/E Ratio	Expected Deaths	A/E Ratio
School District Male	96,122	128	109	118%	126	102%
Other General Service Male	206,228	322	278	116%	321	100%
Police & Fire Male	49,316	47	51	92%	51	92%
School District Female	274,509	165	181	91%	181	91%
Other Female	303,396	254	281	90%	256	99%

- Pre-retirement mortality is set based on a percentage of the healthy retiree mortality rates. The "Current Assumption" is analyzed by applying the current percentage to the new recommended healthy retiree mortality rates.

- The analysis is based on experience for active employees under age 70.

- The target Actual/Expected ratio is 100%.

- Although Police & Fire Male and School District Female are below 100%, the current rates fall within the aggregate confidence interval and thus no changes are recommended for those two groups. For the other groups, we are recommending a change to the percentage applied to the new recommended healthy retiree mortality rates.

Pre-Retirement Mortality (*continued*)

Pre-Retirement Mortality
Aggregate Confidence Intervals and Rates
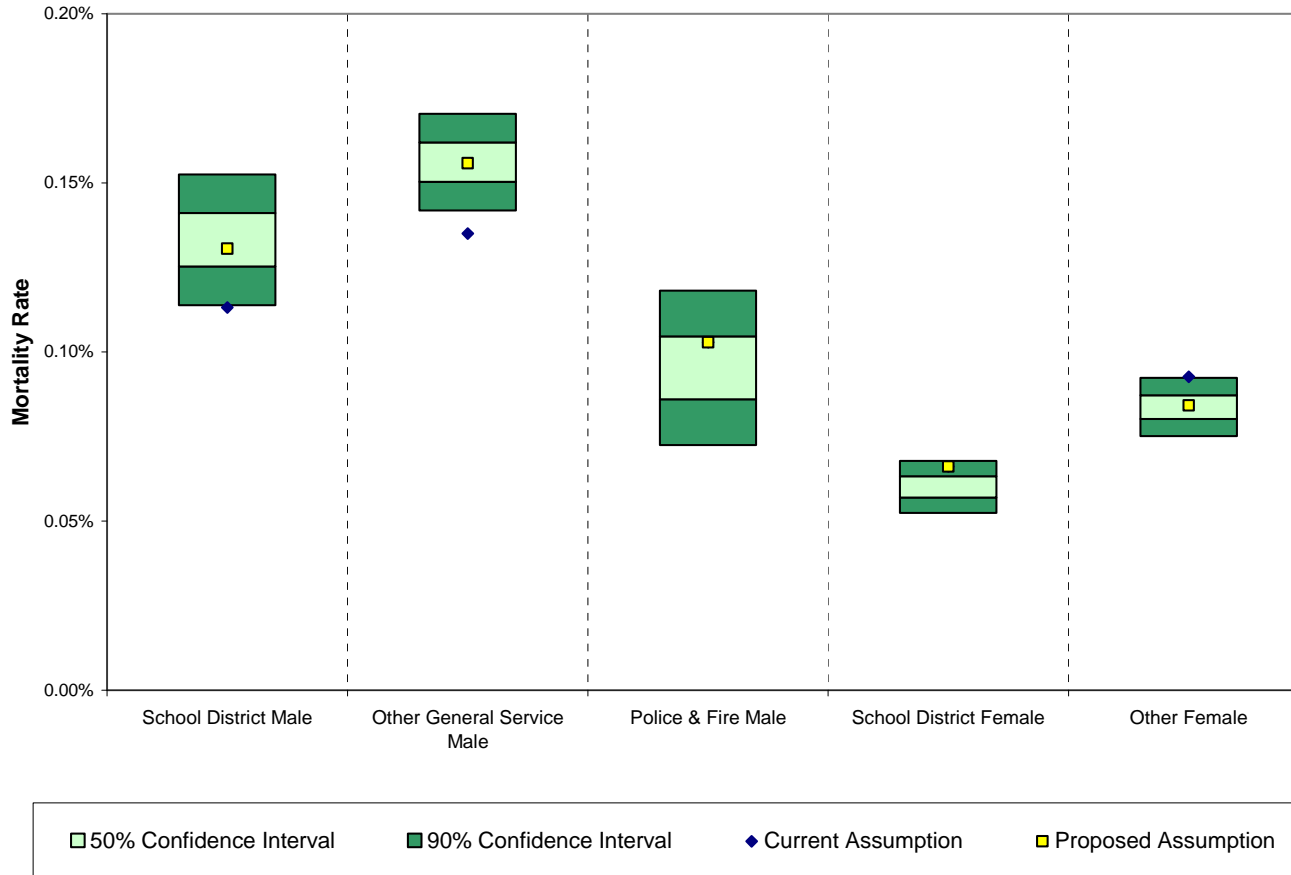
- Changes are recommended to School District Male, Other GS Male, and Other Female so the aggregate rate falls within the confidence interval.

- Note that the aggregate mortality rate is a function of both the group mortality rates and the ages of the members in the group.

Retirement Rates -- General Service with less than 15 Years of Service

Tier 1/Tier 2 - Other General Service
Members with less than 15 Years of Service
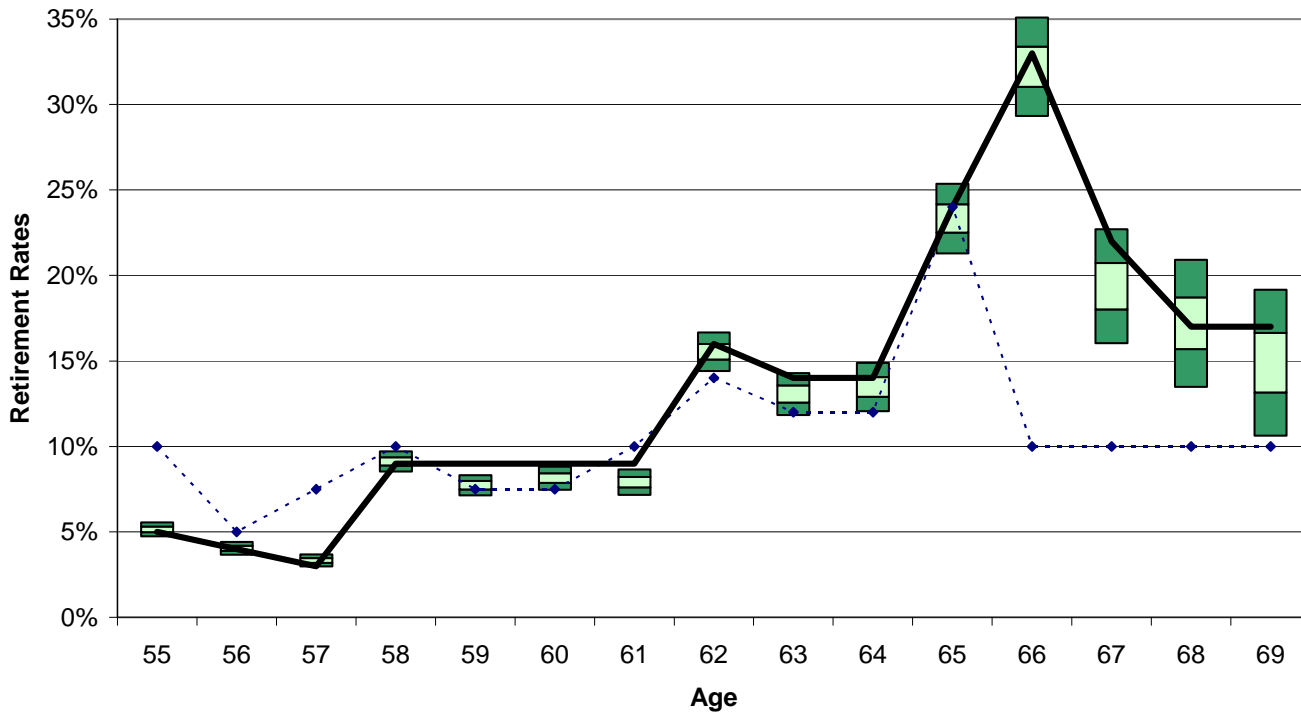
- Retirement decisions by members with less than 15 years of service are likely to be heavily influenced by the availability of resources other than PERS benefits, including:
  - Social Security
  - Prior employment
  - Spousal benefits
  - Savings

OPSRP - General Service

Members with less than 15 Years of Service

- Retirement decisions by members with less than 15 years of service are likely to be heavily influenced by the availability of resources other than PERS benefits, including:
  - Social Security
  - Prior employment
  - Spousal benefits
  - Savings

Tier 1/Tier 2 - Other General Service

Members with 15 - 29 Years of Service

- Retirement decisions by members with 15 to 29 years of service are likely to be influenced by the structure of PERS benefits as well as the availability of other resources, including:
  - Social Security
  - Prior employment
  - Spousal benefits
  - Savings

Retirement Rates -- General Service with 15 to 29 Years of Service

OPSRP - General Service

Members with 15 to 29 Years of Service
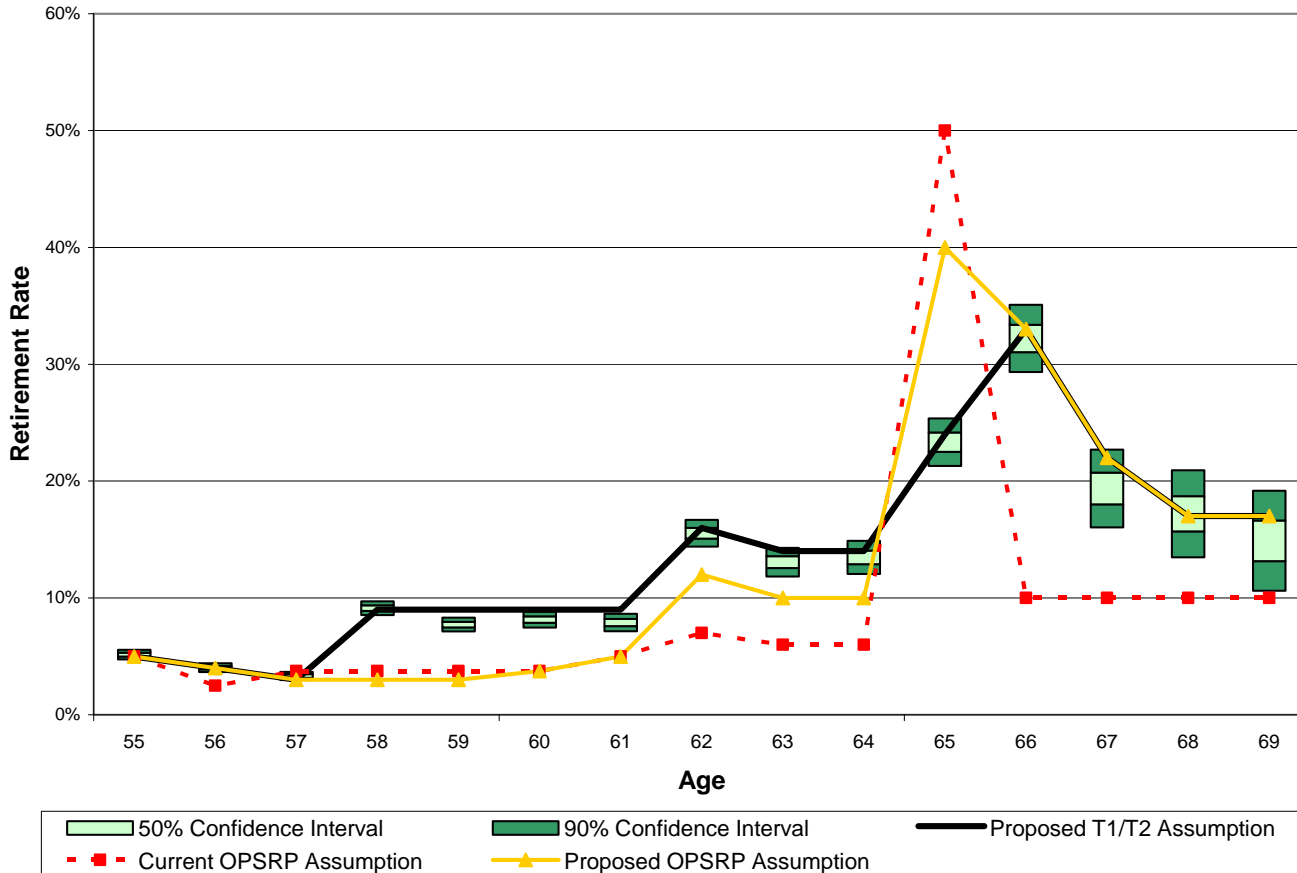
- Retirement decisions by members with 15 to 29 years of service are likely to be influenced by the structure of PERS benefits as well as the availability of other resources, including:
  - Social Security
  - Prior employment
  - Spousal benefits
  - Savings

Tier 1/Tier 2 - General Service

Members with 30+ Years of Service
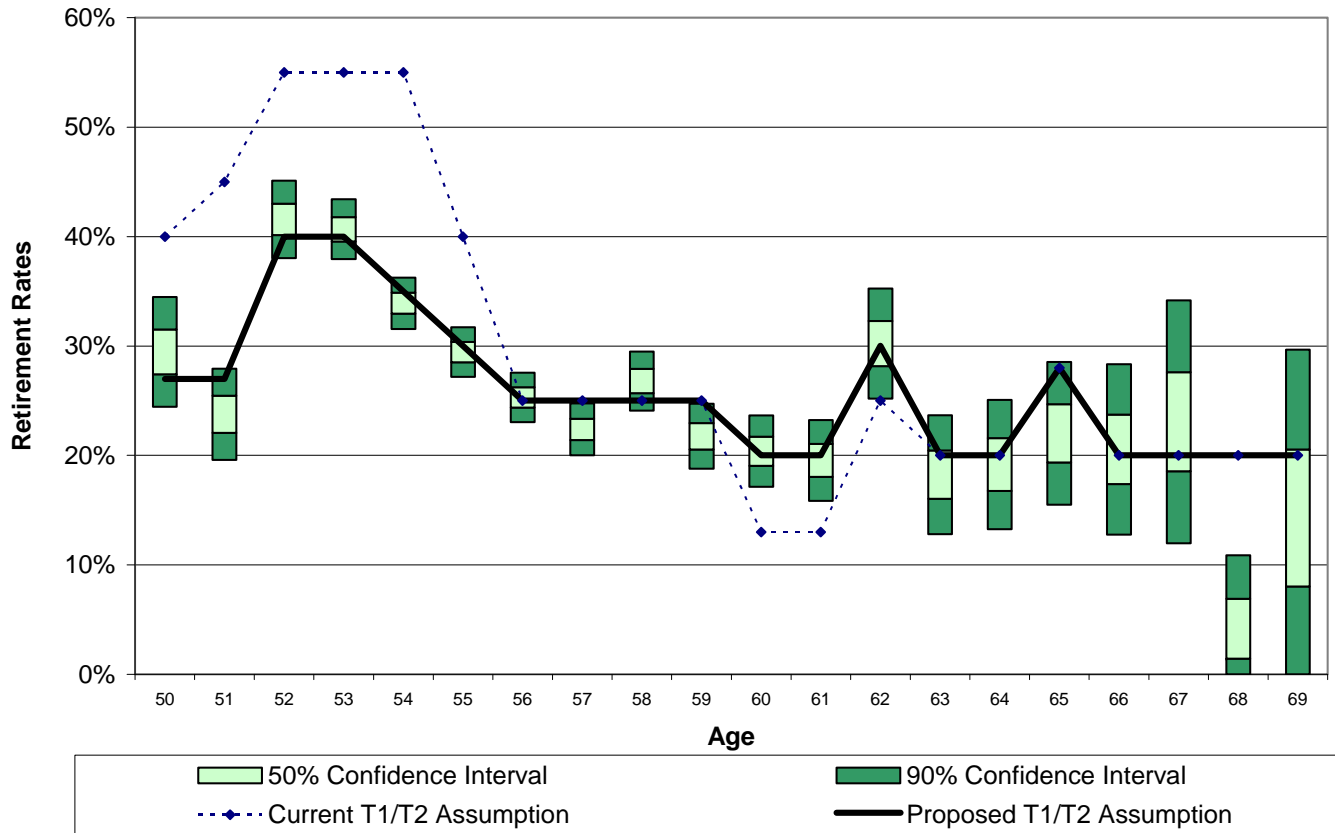
- Retirement decisions by members with 30 or more years of service are heavily influenced by the immediate unreduced benefits available through PERS (after age 58 for OPSRP benefits)

- There has been a continued decline in retirements among this group at the earliest ages, possibly due to the decline in average replacement income from Money Match benefits over the last 5 years

Retirement Rates -- General Service with 30 or More Years of Service

OPSRP - General Service
Members with 30+ Years of Service
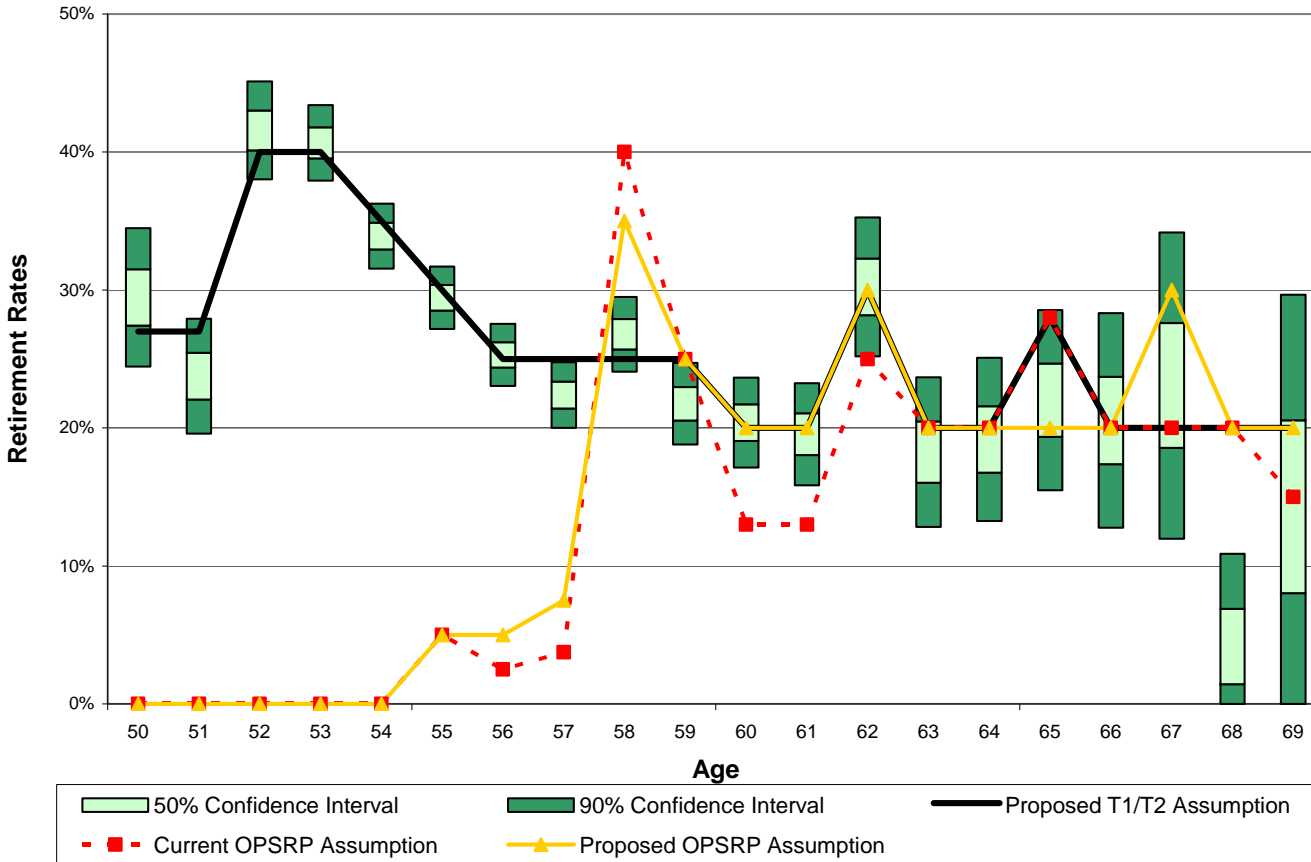
- Retirement decisions by members with 30 or more years of service are heavily influenced by the immediate unreduced benefits available through PERS (after age 58 for OPSRP benefits)

- There has been a continued decline in retirements among this group at the earliest ages, possibly due to the decline in average replacement income from Money Match benefits over the last 5 years

Police & Fire Members

Members with less than 13 Years of Service

- Retirement decisions by members with less than 13 years of service are likely to be heavily influenced by the availability of resources other than PERS benefits, including:
  - Social Security
  - Prior employment
  - Spousal benefits
  - Savings

- These retirement rates are significantly lower than the prior assumption

Retirement Rates – Police & Fire with 13 to 24 Years of Service

Police & Fire Members
Members with 13 to 24 Years of Service
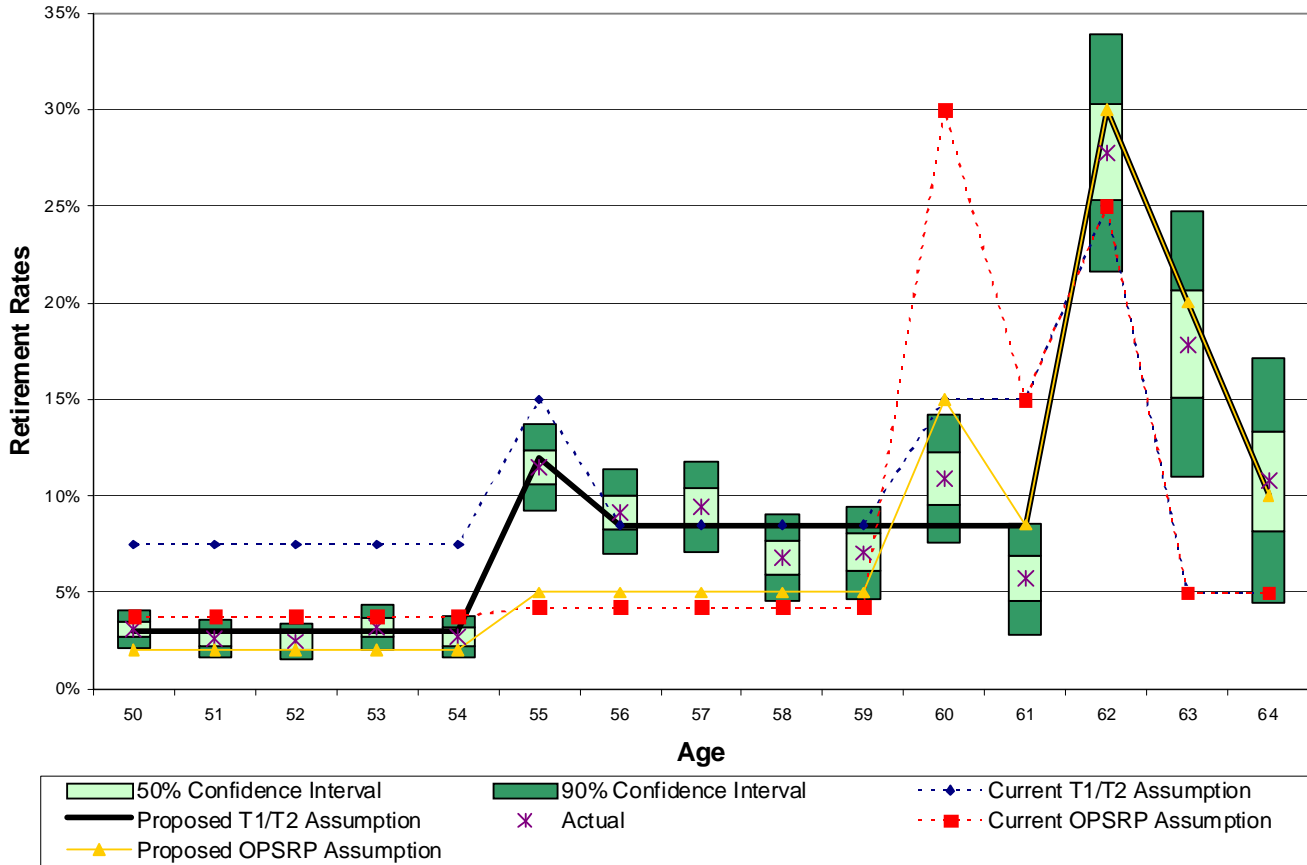
- Retirement rates for members with more than 12 years of service are influenced by the availability of unreduced benefits

- Since there is no reliable OPSRP data, OPSRP assumptions are based on the Tier 1 / Tier 2 patterns and judgments about how the different normal retirement age will affect retirement rates

Police & Fire Members

Members with 25+ Years of Service
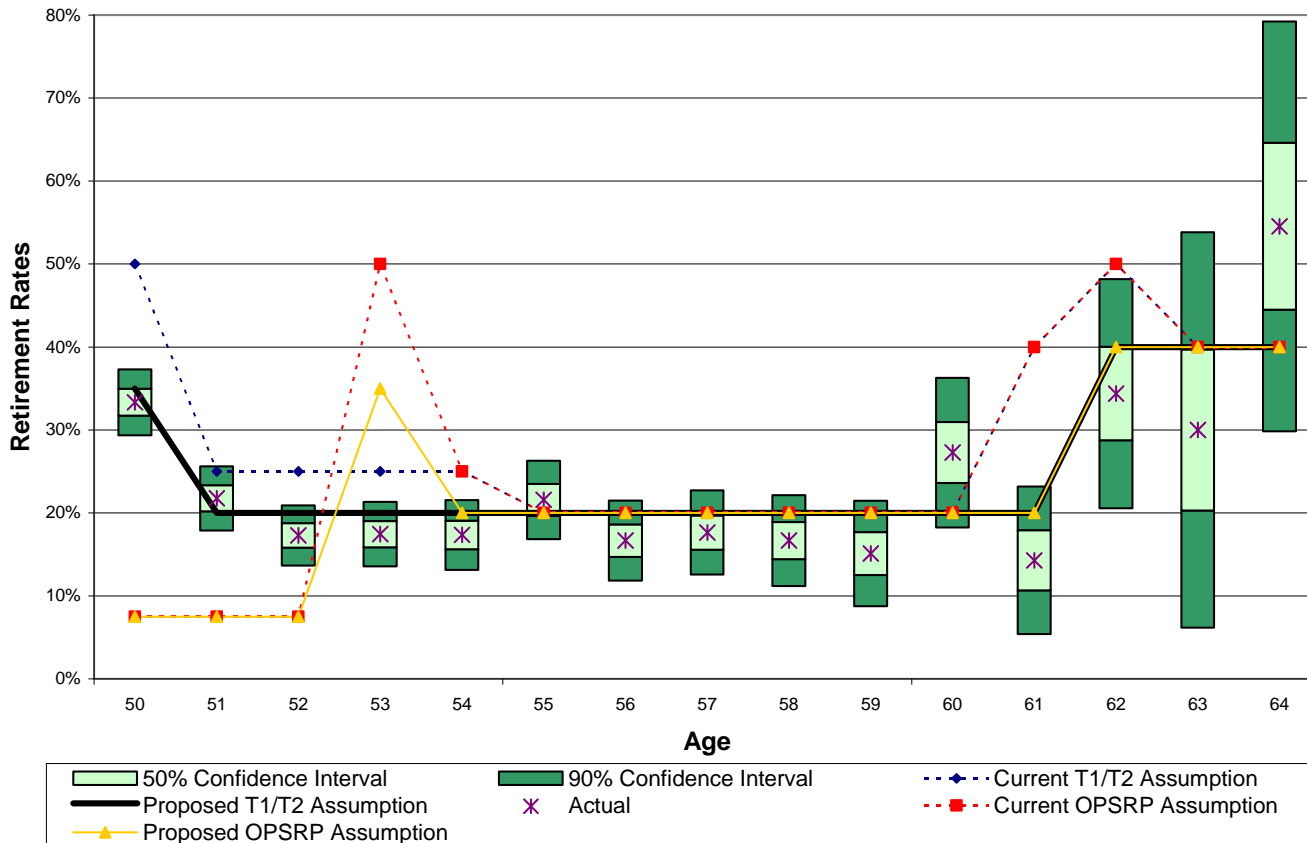
- Retirement rates for members with 25 or more years of service are influenced by the availability of unreduced benefits

- Since there is no reliable OPSRP data, OPSRP assumptions are based on the Tier 1 / Tier 2 patterns and judgments about how the different normal retirement age will affect retirement rates

Appendix
Merit Salary Increases
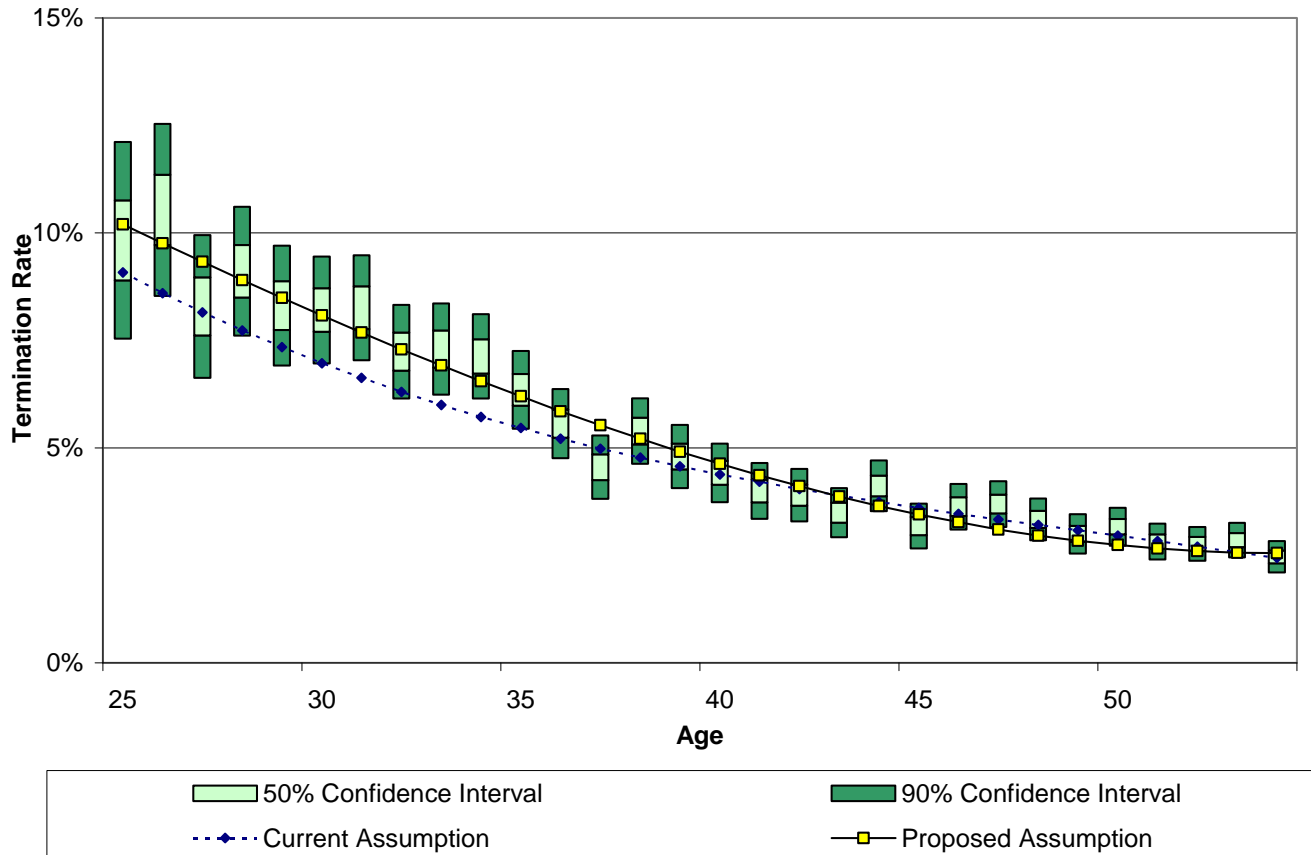
School Districts

- Current assumptions are set for the following groups:
  - School Districts
  - OHSU
  - SLGRP (GS and P&F)
  - Independent (GS and P&F)

- Recommended changes:
  - Assume 0% merit increase for 2009 and 2010
  - Consolidate SLGRP and Independent Employer assumptions
  - Eliminate separate OHSU assumption

For the merit scale, we studied experience from 2001 through 2008.

Police & Fire

- Current assumptions are set for the following groups:
  - School Districts
  - OHSU
  - SLGRP (GS and P&F)
  - Independent (GS and P&F)

- Recommended changes:
  - Assume 0% merit increase for 2009 and 2010
  - Consolidate SLGRP and Independent Employer assumptions
  - Eliminate separate OHSU assumption

For the merit scale, we studied experience from 2001 through 2008.
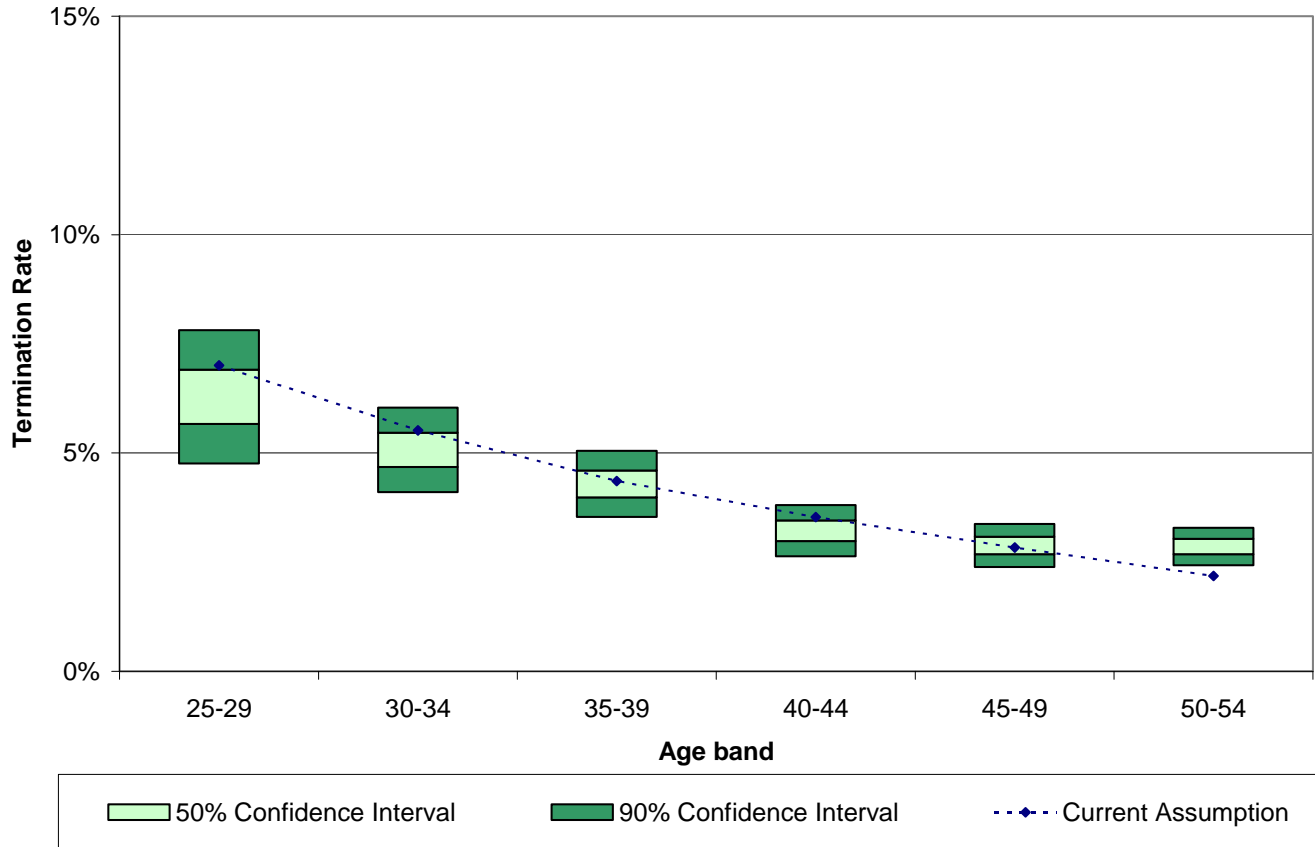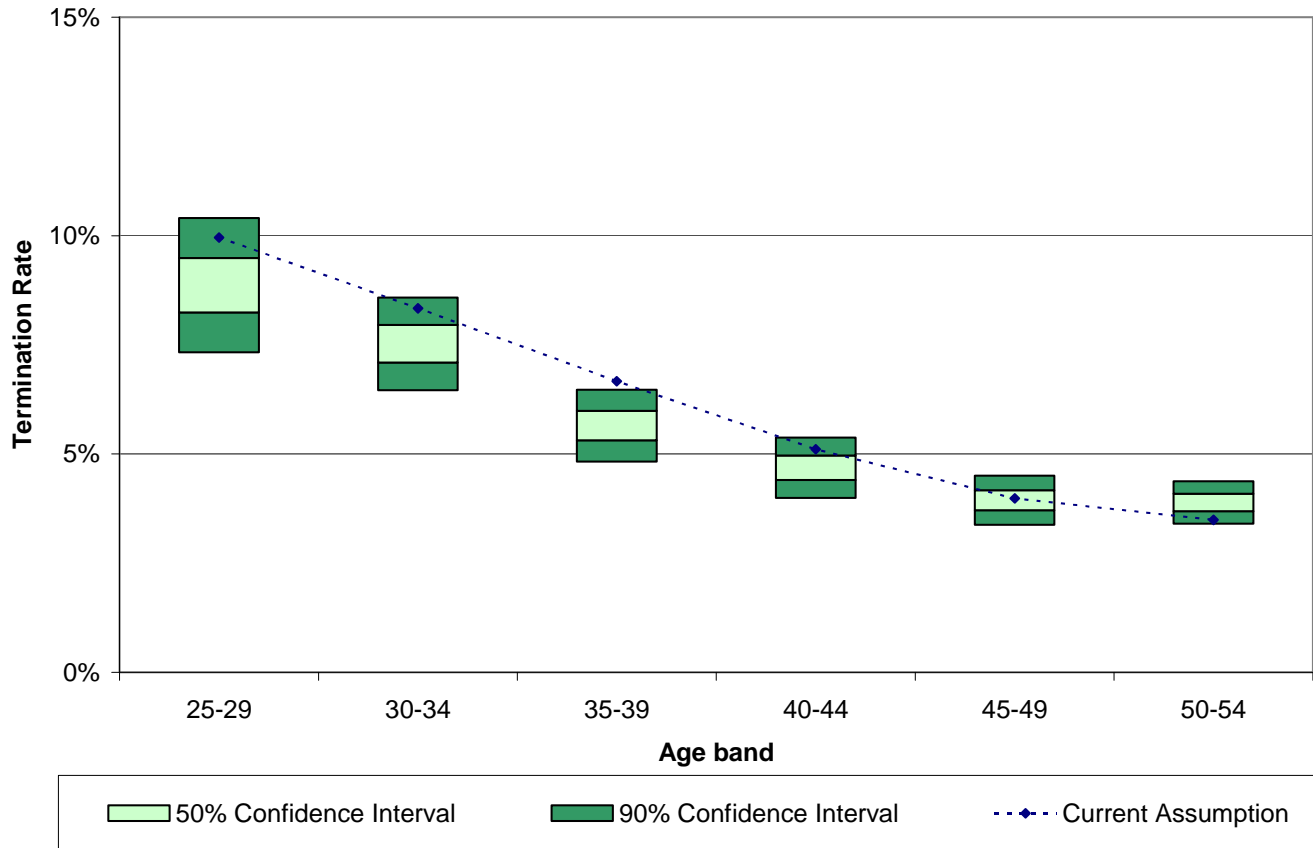
SLGRP General Service Male

- Adjustments to ultimate termination rates:
  - Modest downward adjustment for School Districts
  - Modest increase for SLGRP General Service
  - No changes for Independent Employer General Service
  - No changes for Police & Fire

SLGRP General Service Female

- Adjustments to ultimate termination rates:
  - Modest downward adjustment for School Districts
  - Modest increase for SLGRP General Service
  - No changes for Independent Employer General Service
  - No changes for Police & Fire
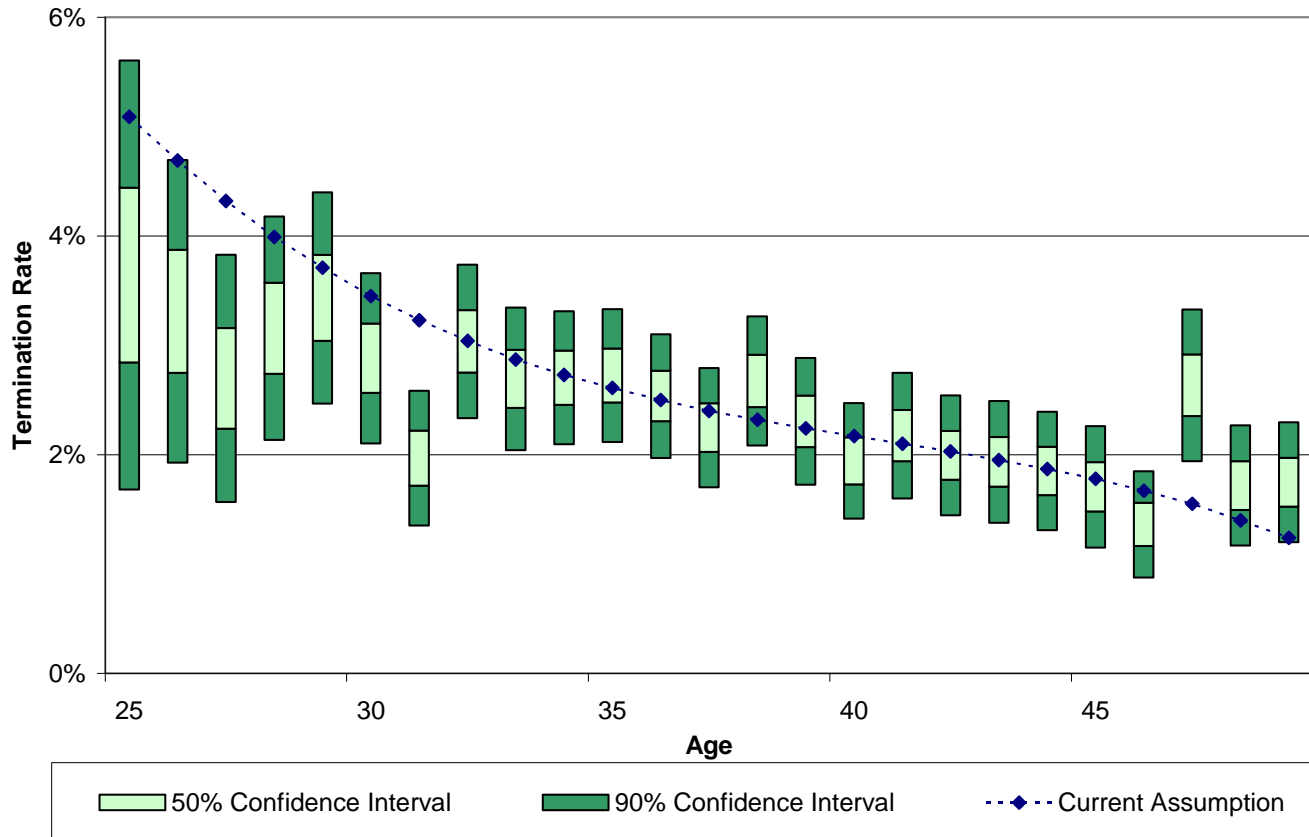
Independent General Service Male

- Adjustments to ultimate termination rates:
  - Modest downward adjustment for School Districts
  - Modest increase for SLGRP General Service
  - No changes for Independent Employer General Service
  - No changes for Police & Fire

Independent General Service Female

- Adjustments to ultimate termination rates:
  - Modest downward adjustment for School Districts
  - Modest increase for SLGRP General Service
  - No changes for Independent Employer General Service
  - No changes for Police & Fire

Ultimate Termination Rates

Police & Fire

- Adjustments to ultimate termination rates:
  - Modest downward adjustment for School Districts
  - Modest increase for SLGRP General Service
  - No changes for Independent Employer General Service
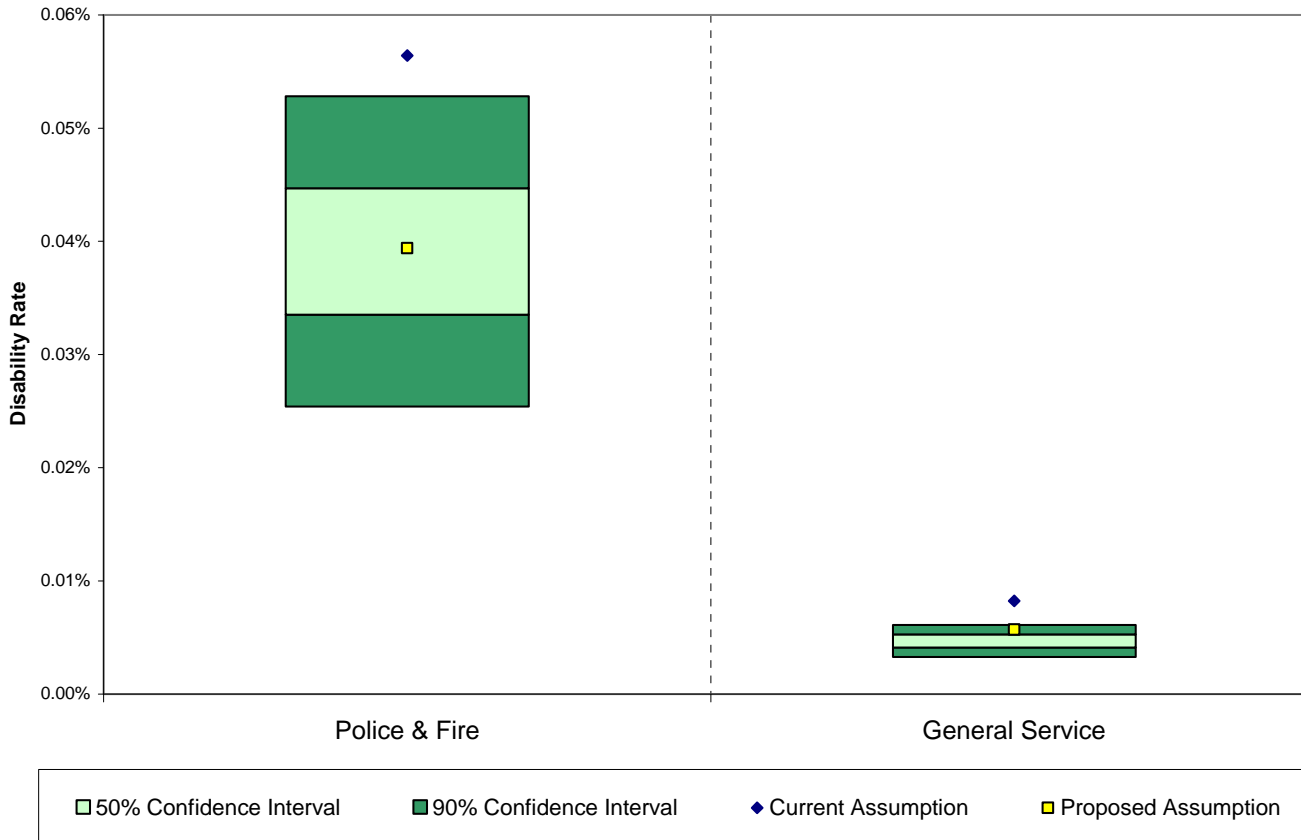 - No changes for Police & Fire

Termination Assumptions
3-Year Select Rates

- Select rates for all groups have been reduced to more closely align with recent experience.

- Additional details are provided in the full report.

Duty Disability Incidence
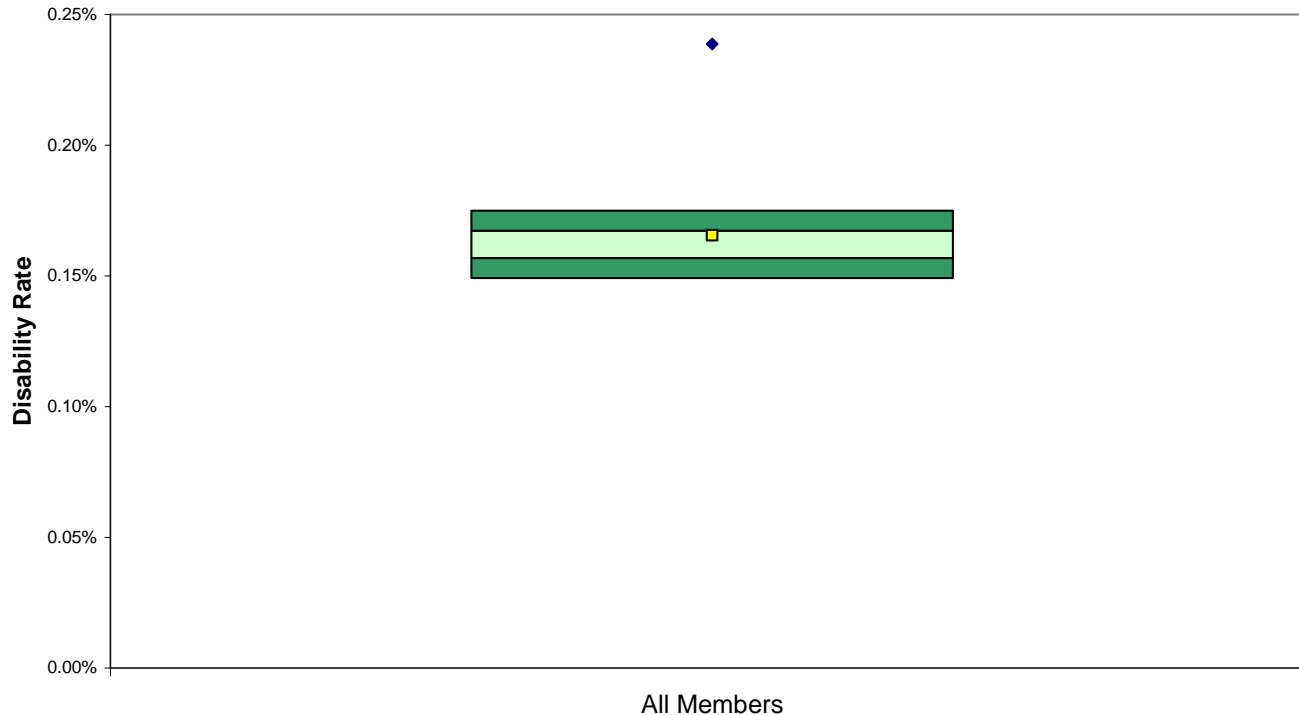
Aggregate Confidence Intervals and Rates

- Duty disability rates have declined since the prior study.

- With limited experience for all 5-year age bands, we recommend adopting a standard table, adjusted to fit within the aggregate confidence interval.

Ordinary Disability Incidence
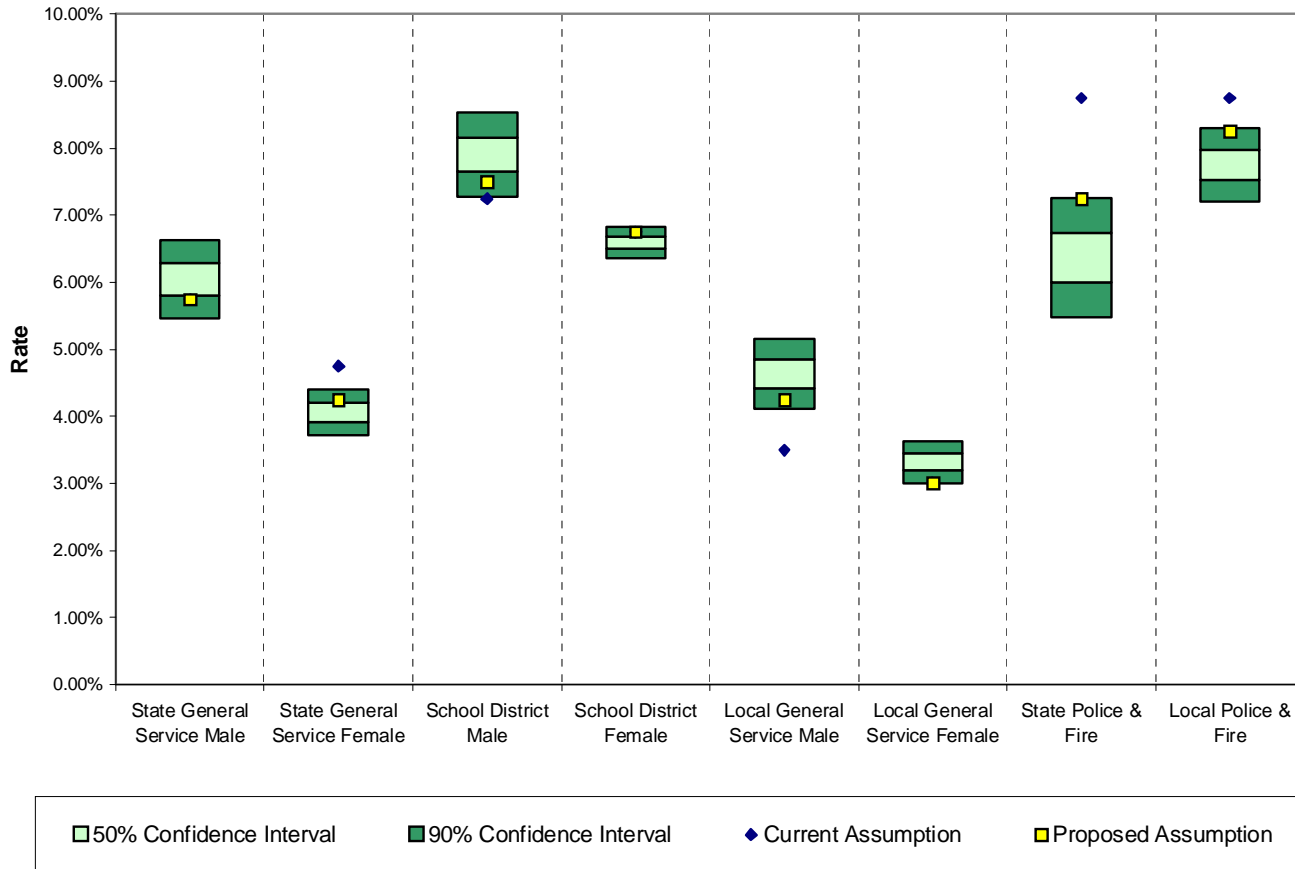### **Aggregate Confidence Intervals and Rates**

- Ordinary disability rates have declined since the prior study.

- With limited experience for all 5-year age bands, we recommend adopting a standard table, adjusted to fit within the aggregate confidence interval.

Unused Sick Leave

- Based on recent experience, we recommend adjusting rates for State General Service Female, School District Male, Local General Service Male, State and Local Police & Fire.

Lump Sum Option at Retirement

- When a member elects a partial lump sum at retirement, they receive their account balance and a reduced annuity.

- When a member elects a total lump sum at retirement, they receive two times their account balance.

- In both cases, the member gives up the value of the COLA on the portion of the annuity they receive in a lump sum.

- If the member's benefit is determined under Full Formula, electing a total lump sum may cause the member to give up a substantial portion of the benefit.

- Consequently, the assumption phases out the total lump sum assumption over a period of time reflecting the transition from Money Match to Full Formula benefits.

Lump Sum Election	Count	Actual %	Current Assumption
Partial LS	824	6.04%	7.00%
Total LS	1,095	8.03%	7.25%*
Annuity	11,720	85.93%	85.25%*
Total Elections	**13,639**	**100%**	**100%**

* "Total" lump sum elections are assumed to decrease 0.5% per year. Amount shown is the average over the experience study period.

Lump Sum Election	Recommended Assumption
Partial LS	6% for all years
Total LS	No Change. 6% for 2009, declining by 0.5% per year until reaching 0.0%

Purchase of Credited Service

- For Money Match retirements, purchasing service credits is roughly cost neutral to the system, so no assumption is recommended for Money Match benefits.
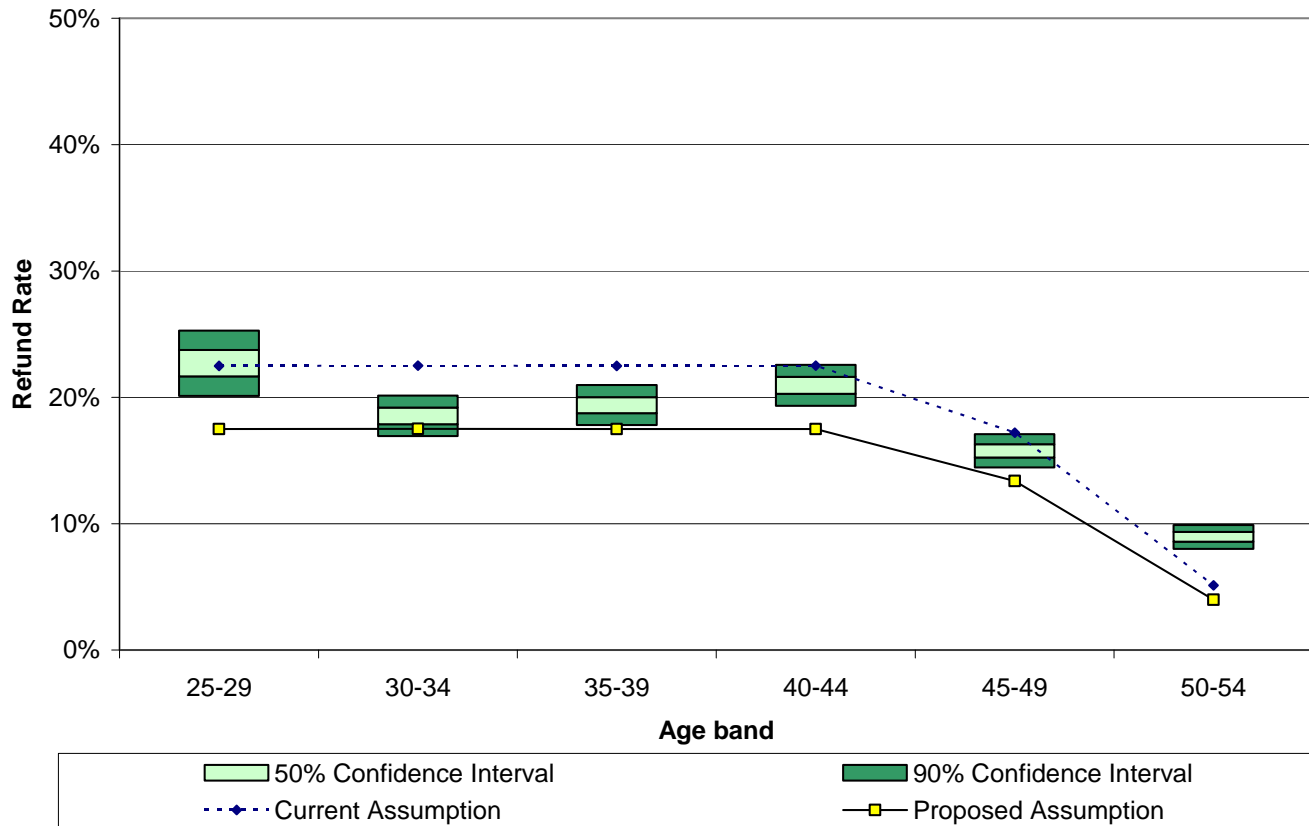
	Count	Number Electing to Purchase Service	Actual %	Current Assumption
Money Match Retirements	5,527	1,742	31%	0%
Non-Money Match Retirements	3,281	1,792	55%	45%

- We recommend increasing the assumed percentage of non-Money Match retirees that elect to purchase service to 55%.
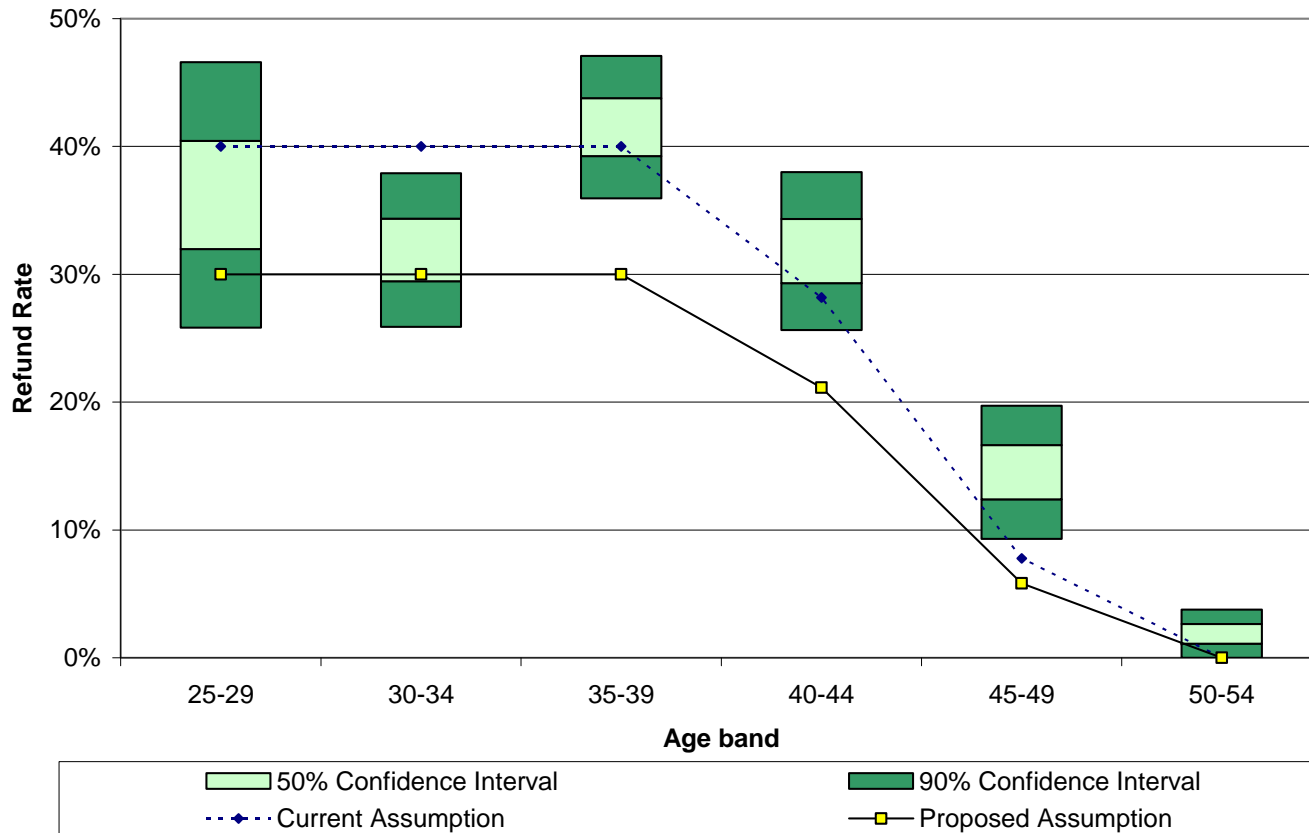
General Service

- This assumption represents the probability that a dormant member will withdraw his/her account balance in the plan before retirement.

- We recommend reduced rates to follow current and anticipated trends.

Police and Fire

- This assumption represents the probability that a dormant member will withdraw his/her account balance in the plan before retirement.

- We recommend reduced rates to follow current and anticipated trends.