Wisconsin Retirement System

2012-2014 Experience Study

December 2015

GRS
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Background

- The assumptions must be reasonable individually and in the aggregate
- The assumptions should be reviewed periodically in light of recent plan experience and economic environment
- Understated liabilities/costs can lead to:
  - Inability to pay benefits when due, or
  - Sharp increases in required contributions in the future

Background

- Overstated liabilities/costs can lead to:
  - Benefit levels kept below the level that could be supported by the computed rate, or
  - Larger burden on the current generation of participants, employers and taxpayers (shifting costs between generations)
- A single set of assumptions is not suitable indefinitely
- Things change, along with our understanding of things

Experience Study Method

- Data was tabulated from the last three annual gain/loss analyses
- Trends were compared with those observed in prior studies
- Confirming trends were given more credibility than non-confirming trends
- Philosophy: Don't overreact to results from any single experience period. It is better to make a series of small changes in the right direction, rather than a single large change that could turn out with hindsight to be very wrong.

Liability Weighting

- Certain decrements have continued to experience losses (or gains) despite adjusting rates in previous experience studies
- Consistent with the prior study, we analyzed the data to see if this could be due to a tendency for human behavior to be influenced by the amount of liability that would be affected
- The analysis showed that people with high liabilities are more likely to retire than other eligible people
- The analysis also showed that people with low liabilities are more likely to quit than other people of the same age
- In recognition of these results, we analyze certain assumptions based on relative liability in addition to pure population statistics

Demographic Assumptions

Summary of Withdrawal Experience Example – University Females

Less than 10 Years of Service at Assumed Termination

Service Index	Withdrawals	Exposure	Population Weighted Rates	Liability Weighted Rates	Sample Rates		Expected Withdrawals	
					Present	Proposed	Present	Proposed
1	216	1,317	0.1640	0.0909	0.2200	0.1600	290	211
2	408	2,408	0.1694	0.1515	0.1500	0.1500	361	361
3	361	2,260	0.1597	0.1328	0.1250	0.1300	283	294
4	230	1,944	0.1183	0.1060	0.1000	0.1000	194	194
5	188	1,740	0.1080	0.1028	0.0950	0.0990	165	172
6	151	1,543	0.0979	0.0875	0.0800	0.0840	123	130
7	88	1,405	0.0626	0.0588	0.0700	0.0640	98	90
8	70	1,196	0.0585	0.0549	0.0600	0.0570	72	68
9	56	1,132	0.0495	0.0440	0.0500	0.0470	57	53
10	51	1,015	0.0502	0.0437	0.0400	0.0420	41	43
Totals (10 and under)	1,819	15,960	0.1140	0.0734	0.0741	0.0735	1,684	1,616

In this example, the population weighted rate would have led to an increase in the assumed withdrawal rate. The assumed rate was actually reduced slightly in order to move toward the liability weighted rate.

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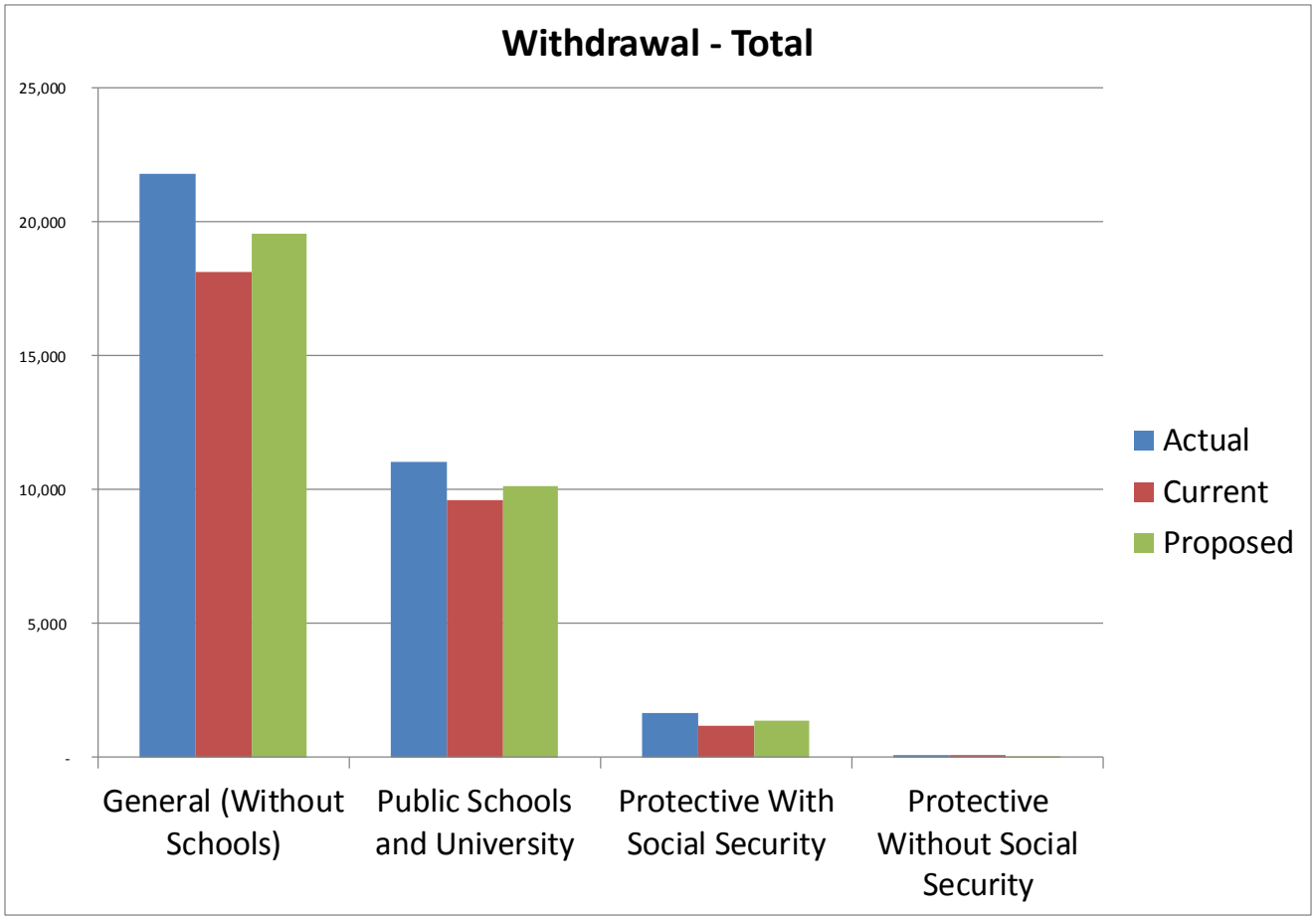
Summary of Withdrawal Experience Results (liability based)



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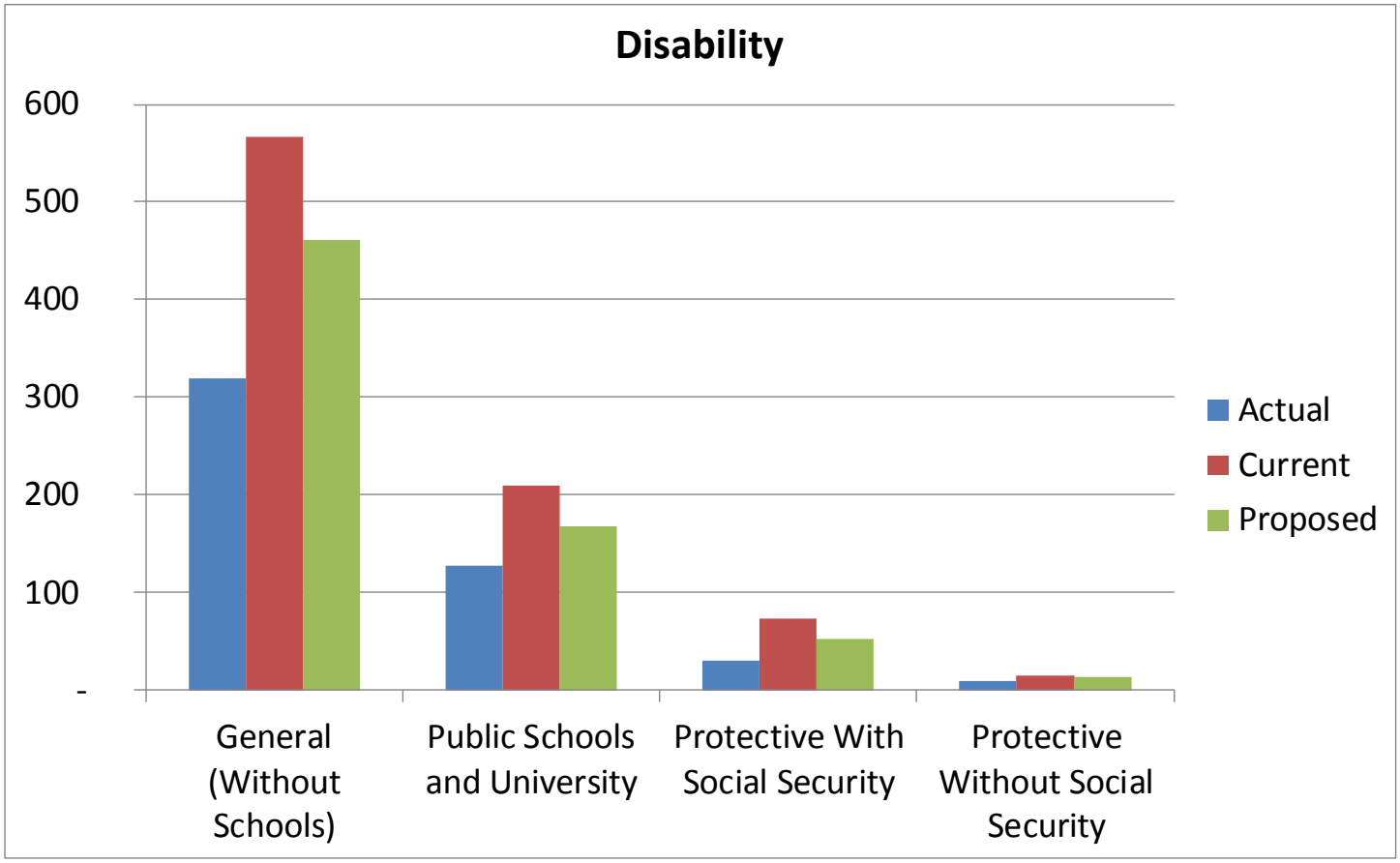
Summary of Disability Experience Results (population based)



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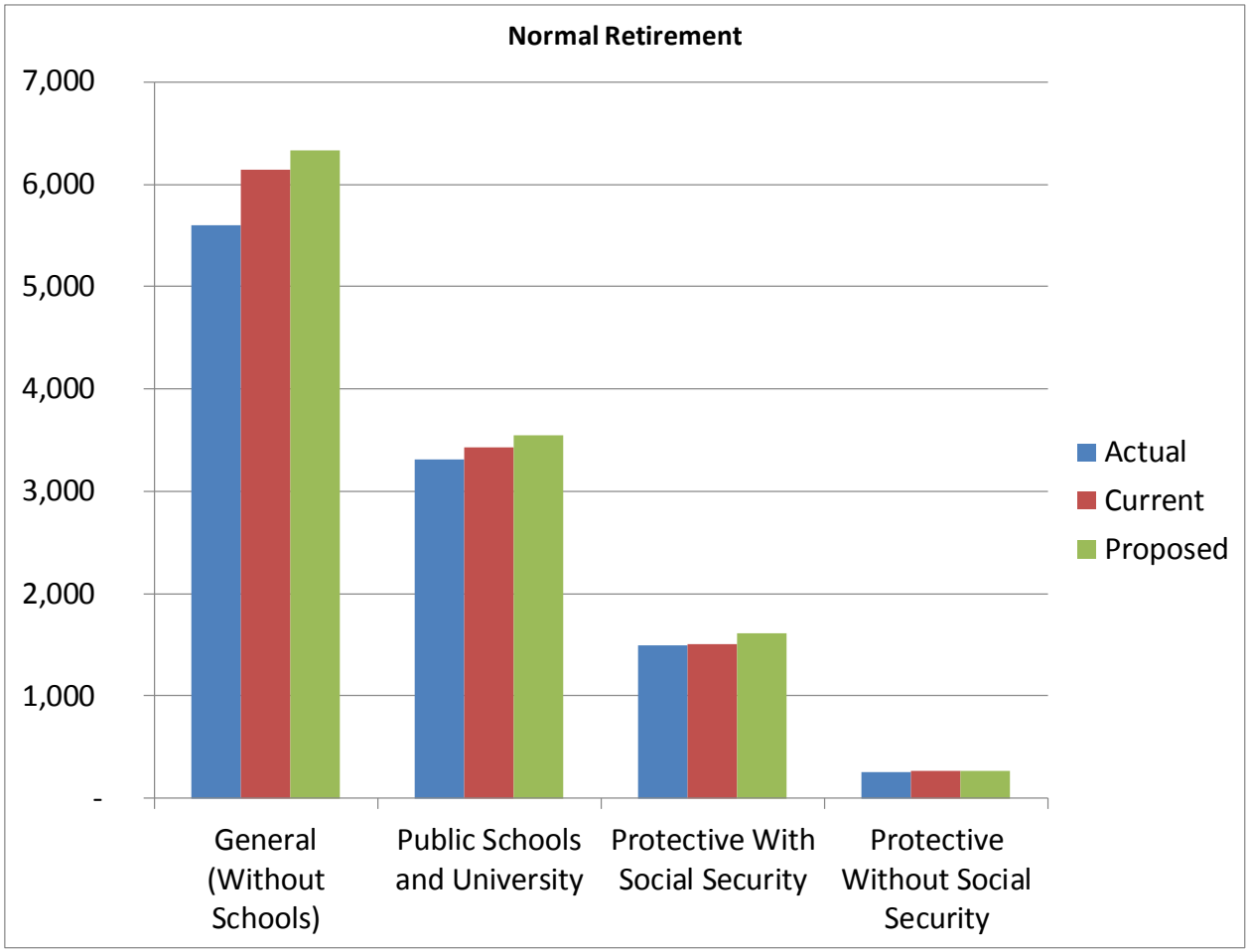
Summary of Normal Retirement Experience Results (liability based)



The figures shown are for people below age 75.

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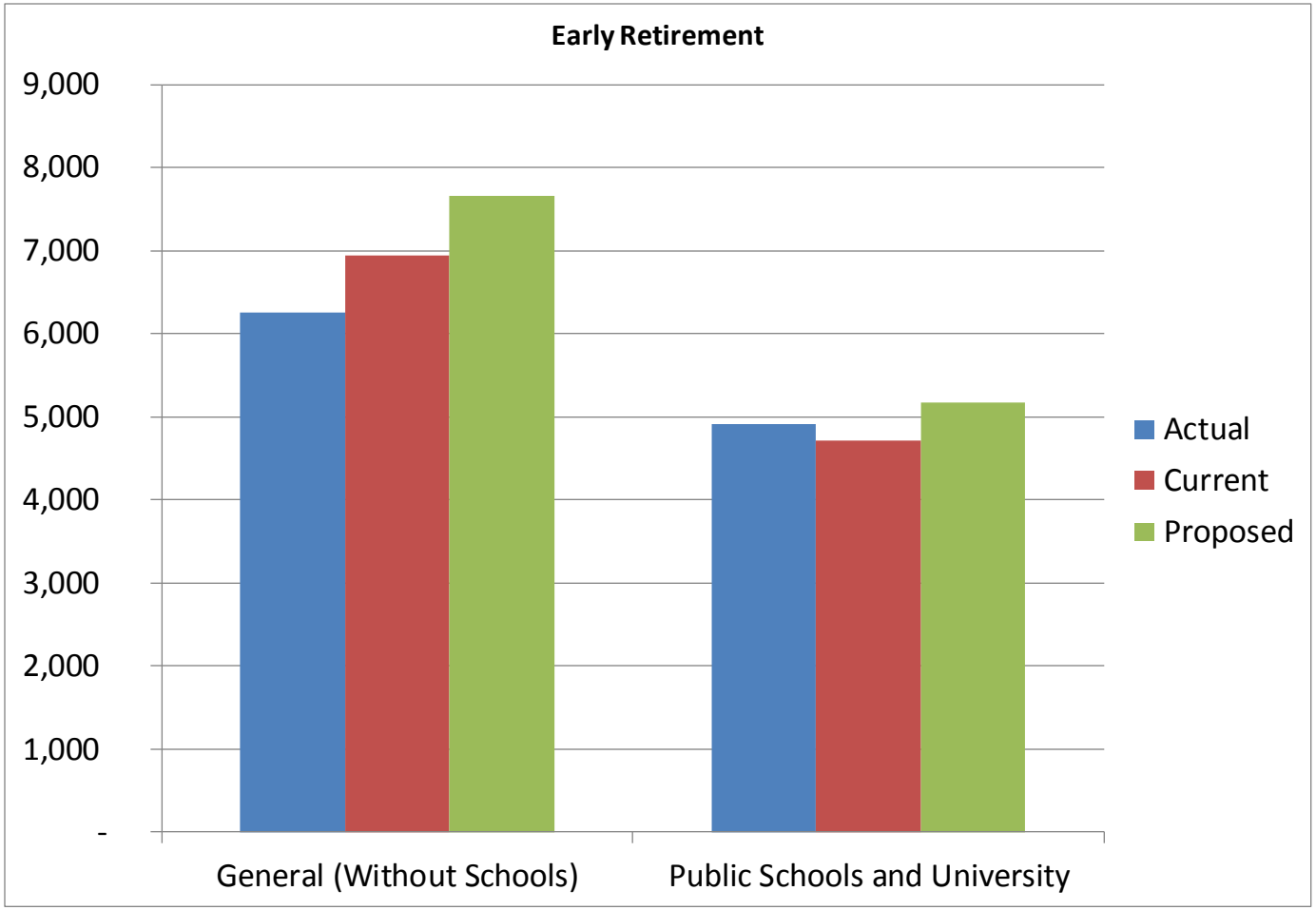
Summary of Early Retirement Experience Results (liability based)



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Mortality Experience

- Actuarial Standards of Practice now require disclosures with regard to the mortality assumption
- Actuary must state provisions made for future mortality improvements
- Unlike other assumptions where we gradually adjust rates towards the actual experience, most demographers expect future mortality rates to continue to decrease
- Two common ways to anticipate future improvement
  - Fully generational – develop a set of rates for every year of birth, or
  - Static projection - project current rates to some future year

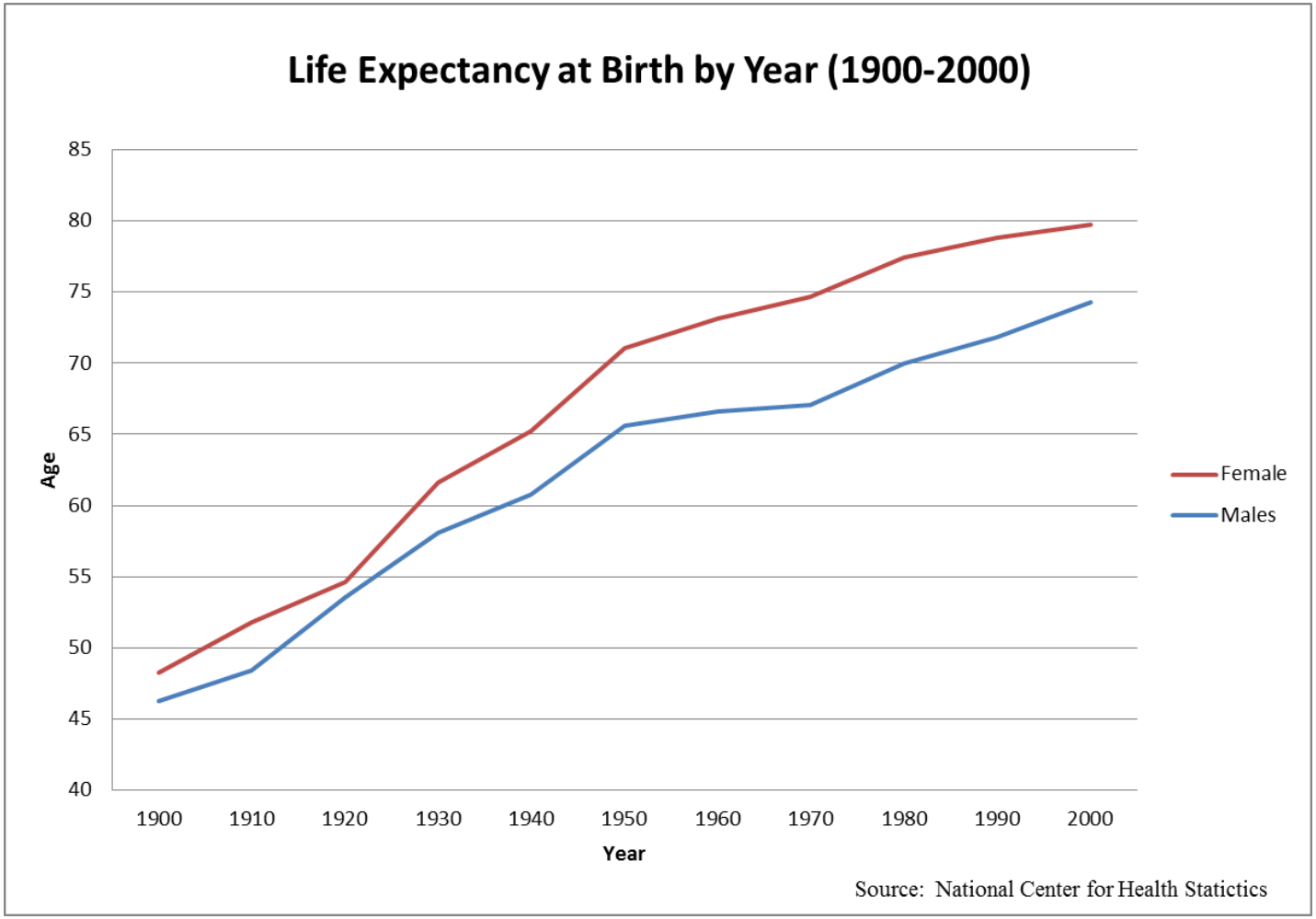
WRS Issue

- In WRS, it is important not to let anticipated future mortality improvements have an undue effect on dividends payable to current retirees
- Prior study (using static projection) resulted in phasing into the current mortality over 3 years for retirees and immediate recognition for actives
- In this study we are proposing a similar retiree phase-in approach, however, the mortality tables that we are recommending will incorporate the fully generational method

Future Mortality Improvement

- Factors resulting in future mortality improvements
  - Persistent trend of last 100 years
  - Medical advances
  - Greater emphasis on disease management
  - Lifestyle changes
  - Higher education
- Factors resulting in leveling off of future mortality improvement
  - Diminishing returns on medical research
  - High Cost or access to medical care
  - Possible emergence of new diseases
  - Obesity
  - Low level of education
  - Ultimate limits to human lifespan

Mortality Experience



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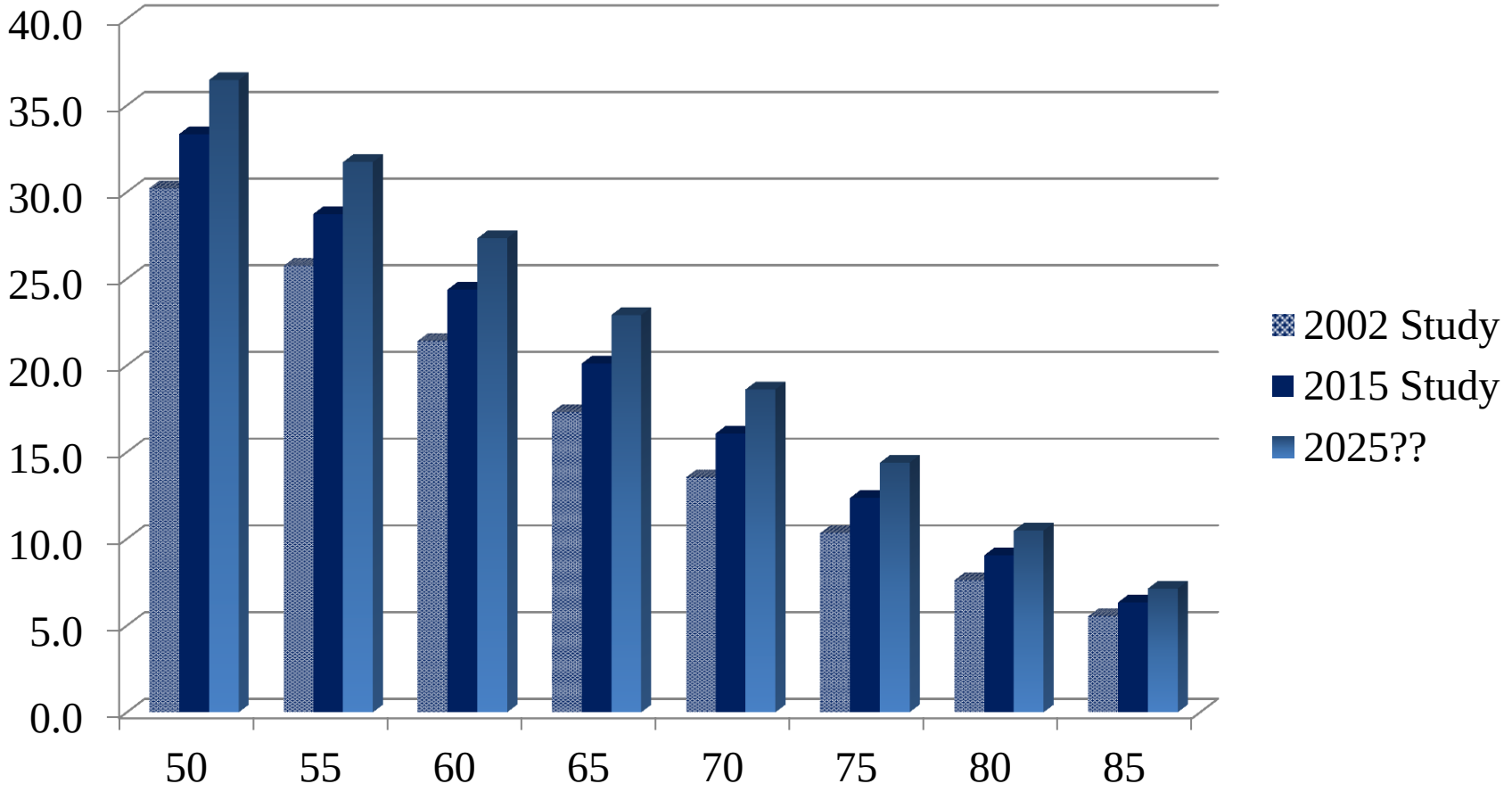
Male Life Expectancy



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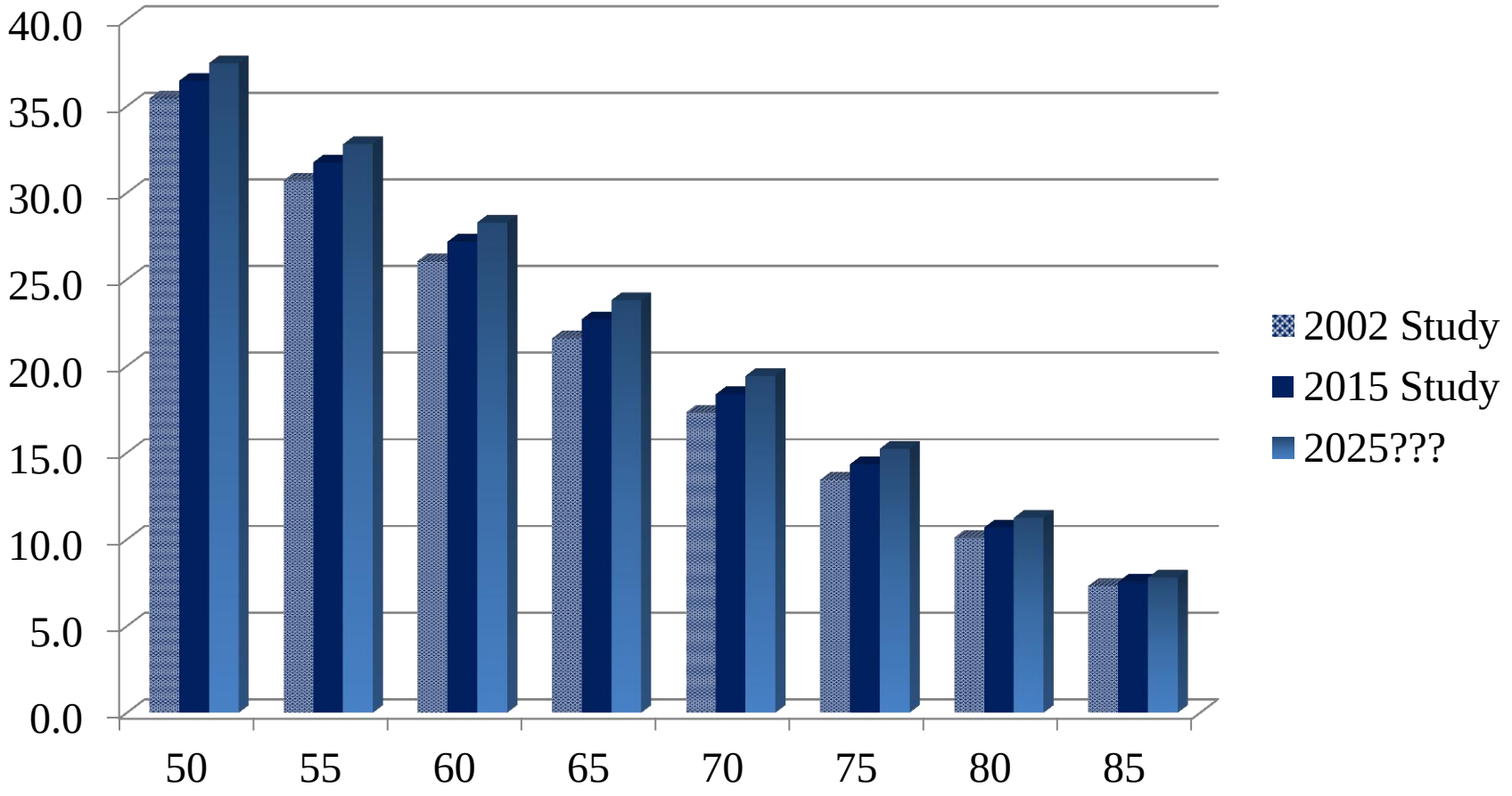
Female Life Expectancy



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Mortality Experience

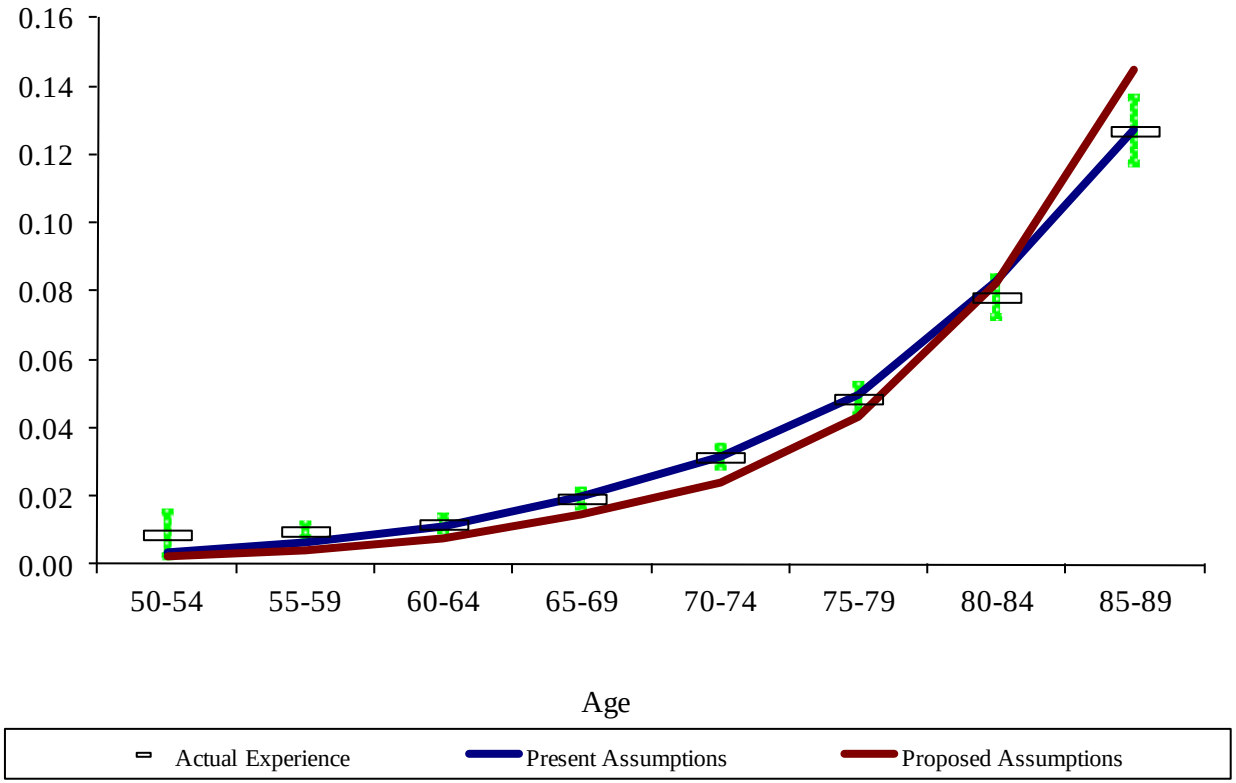
- Why is it necessary to recognize future improvements in mortality?
  - Ensure adequate funding
  - Avoid persistent liability losses
  - Need to comply with ASOPs
  - Failure to do so would likely shift costs to future generations

Mortality Experience

- Society of Actuaries (SOA) recently released (October 2014) new RP-2014 mortality tables and MP-2014 projection scale (recently updated to MP-2015)
- Two methods to account for future improvements:
  - Static projection of improvement to some future year (one dimensional)
  - Fully generational table based on both age and year of birth (two dimensional)
- SOA (and actuarial community in general) strongly recommend 'fully generational' method
- So what does 'fully generational' look like?

Mortality Experience

- Old tables looked like this:



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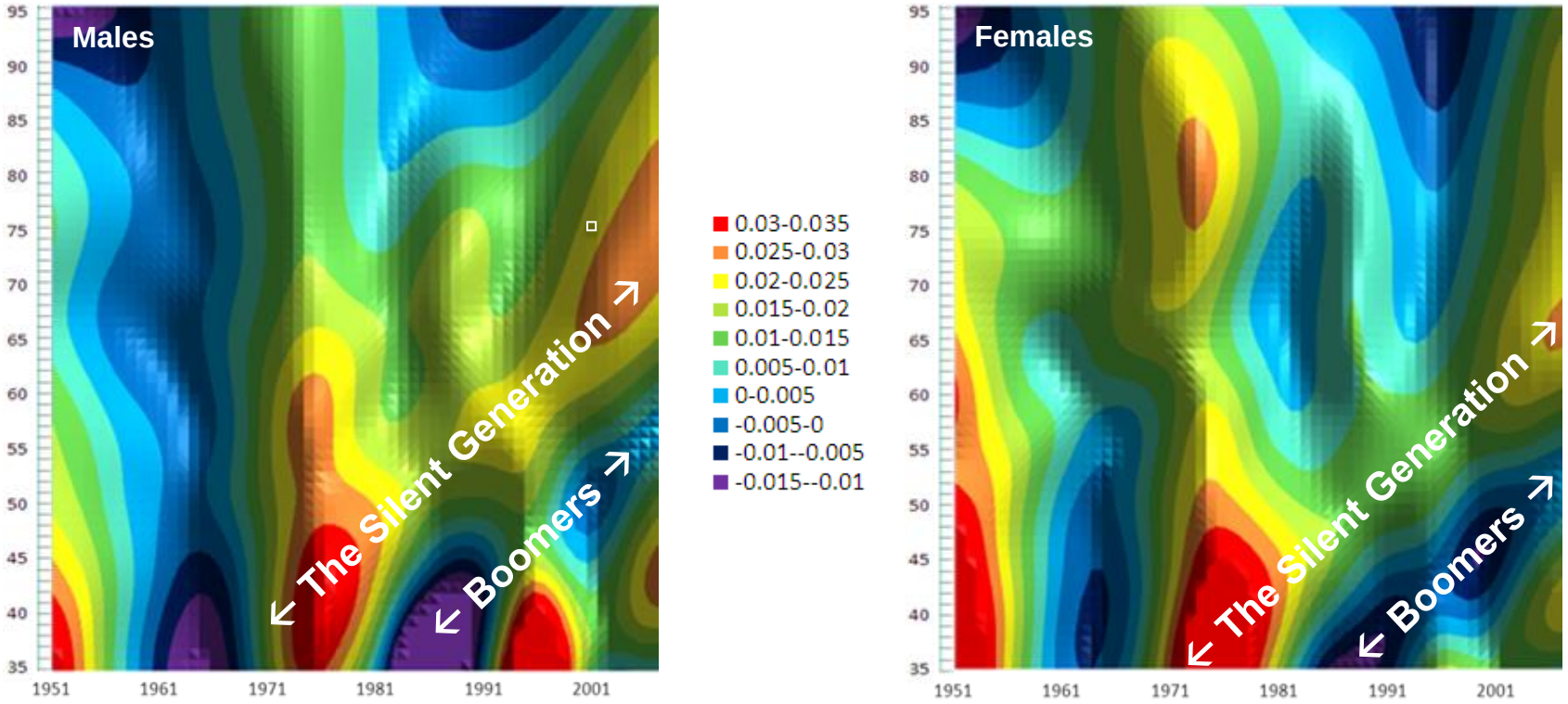
Mortality Experience

- New Tables look like this:

Historical MI rates developed from SSA mortality data



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Mortality Experience

- Old mortality tables had a single mortality rate for every age (one dimensional).
- New mortality tables have mortality rates for every age and every date of birth (two dimensional)

Mortality Experience - Example

Year of Retirement	Age	Life Expectancy Male	Life Expectancy Female
2014	65	18.9	23.2
2024	65	19.8	24.1
2034	65	20.7	24.9
2044	65	21.5	25.7

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Comparison to Other Systems

Ratio of mortality rates
(Rates of other statewide systems divided by WRS rates)

	System 1	System 2	System 3	System 4
Males ages 65 to 69	122%	161%	125%	180%
Females ages 65 to 69	118%	174%	108%	139%
Males ages 85 to 89	103%	120%	108%	106%
Females ages 85 to 89	106%	132%	104%	105%

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Mortality Recommendation

- Overall, mortality experience was close to expected.
- However, WRS members are living longer compared to most peers as well as compared to current published tables (RP 2014)
- For active lives, recommend using the current mortality table and projecting future improvement with 50% of the MP-2015 mortality improvement scale (fully generational)
- For retired lives, recommend phasing into the new table over the next three years
  - Results in mortality reserve of approximately 0.5% per year from current table
  - This is done to smooth out the impact on dividends
  - With fully generational mortality tables, the need to have a phase-in for retirees should eventually disappear (or be much smaller)

Historical Mortality Improvement Impact on Dividends

Year	Decrease
2006	0.5%
2007	0.5%
2008	0.5%
2009	0.3%
2010	0.3%
2011	0.4%
2012	0.3%
2013	0.3%
2014	0.4%
2015	0.5%
2016	0.5%
2017	0.5%

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Economic Assumptions

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Current Economic Assumptions

Price Inflation	2.0% to 2.7%
Wage Inflation	3.2%
Net Investment Return	7.2%

These assumptions were reset in 2010 based on SWIB input, and confirmed in the 2012 experience study

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Comments on Economic Assumption Selection

- We are not investment experts, we consider the following items:
  - Historical Patterns
  - Forward Expectations of Investment Consultants
  - Investment Policy
  - Funding Levels
  - Comparison to Other Systems
  - Actuarial Standards of Practice
- Typically a Board's decision with input from Investment Experts and Actuary

Historical Price and Wage Inflation

Year	Annual Increase in		
	Prices (CPI-U)	Wages (NAE)	Difference
1955-1964	1.6%	3.8%	2.2%
1965-1974	5.2%	5.8%	0.6%
1975-1984	7.3%	7.2%	-0.1%
1985-1994	3.6%	3.9%	0.3%
1995-2004	2.4%	4.1%	1.7%
2005-2014	2.1%	2.8%	0.7%
3-Year Avg	1.3%	2.9%	1.6%
5-Year Avg	1.7%	2.8%	1.1%
10-Year Avg	2.1%	2.8%	0.7%
20-Year Avg	2.3%	3.4%	1.1%
30-Year Avg	2.7%	3.6%	0.9%
50-Year Avg	4.1%	4.8%	0.7%

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Price Inflation

- Long-term averages approach 4%, while shorter term averages are below 2%
- Investment consulting firm's expectations are generally less than 3%
- 2015 annual report of the Social Security Trustees uses 2.7% as the intermediate assumption
- This assumption is not explicitly used in the valuation, but is a building block for other assumptions
- Recommend setting assumption at 2.7%

Wage Inflation

- Long-term averages approach 5% while shorter term averages vary between 3% and 3.5%
- WRS has averaged 2.8% since 1990
- Results in a reasonable range of 3.0% to 3.5%
- Current 3.2% assumption is consistent with price inflation assumption
- **Recommend no change to the 3.2% wage inflation assumption at this time; this assumption therefore applies real wage growth of about 0.5% per year**

Investment Return – Capital Markets

- GRS does not provide investment advice
- Looked at capital market assumptions from eight different investment consulting firms
- Based on history but incorporates forward looking assumptions
- Shorter term horizon than actuarial calculations
- May be a little biased by current conditions

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Arithmetic Results

Investment Consultant	Investment Consultant Expected Nominal Return	Investment Consultant Inflation Assumption	Expected Real Return (2)–(3)	Actuary Inflation Assumption	Expected Nominal Return (4)+(5)	Plan Incurred Administrative Expenses	Expected Nominal Return Net of Expenses (6)-(7)		Standard Deviation of Expected Return (1-Year)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)		(9)
1	6.37%	2.12%	4.25%	2.70%	6.95%	0.03%	6.92%		14.10%
2	7.30%	2.50%	4.80%	2.70%	7.50%	0.03%	7.47%		15.00%
3	7.61%	2.50%	5.11%	2.70%	7.81%	0.03%	7.78%		14.40%
4	7.46%	2.25%	5.21%	2.70%	7.91%	0.03%	7.88%		14.80%
5	7.75%	2.11%	5.64%	2.70%	8.34%	0.03%	8.31%		15.10%
6	8.05%	2.26%	5.79%	2.70%	8.49%	0.03%	8.46%		14.20%
7	8.13%	2.20%	5.93%	2.70%	8.63%	0.03%	8.60%		14.30%
8	8.44%	2.20%	6.24%	2.70%	8.94%	0.03%	8.91%		15.50%
Average	**7.64%**	**2.27%**	**5.37%**	**2.70%**	**8.07%**	**0.03%**	**8.04%**		**14.68%**

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Geometric Results over 20 Years

Investment Consultant	Distribution of 20-Year Average Geometric Net Nominal Return			Probability of exceeding
	25th	50th	75th	7.20%
(1)	(2)	(3)	(4)	(5)
1	3.91%	5.98%	8.10%	34.8%
2	4.22%	6.42%	8.67%	40.7%
3	4.70%	6.81%	8.97%	45.1%
4	4.68%	6.86%	9.08%	45.8%
5	5.04%	7.26%	9.52%	50.7%
6	5.42%	7.51%	9.65%	54.0%
7	5.55%	7.65%	9.79%	55.7%
8	5.51%	7.79%	10.12%	56.9%
Average	**4.88%**	**7.03%**	**9.24%**	**48.0%**

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Investment Return Comments

- Consultants not in agreement
- Significant range of results
- Results in range of 7.0% (median) to 8.0% arithmetic average (mean)
- Based on averages of averages

Investment Return Comments

- Investment return assumption has become a hot topic in the press
  - Various groups (rating agencies, media, retirement study groups) are reporting liabilities and funded ratios using lower (risk adjusted) interest rates
  - These alternate measurements are often estimated by general rules of thumb without specific knowledge of the System itself
- Relationship between investment return and liabilities for the WRS are not well understood by the general public

Investment Return Comments

- The actual assumed return used for valuation purposes is a combination of three components
  - Retirees are valued at 5.0%
  - Active post-retirement liability is valued at 5.0% (this is due to the non-guaranteed nature of the dividend)
  - Active pre-retirement liability is valued at 7.2%
- The actual net effective rate for the entire System can be said to be 5.5%

Investment Return Recommendation

- Investment return lowered from 7.8% to 7.2% in 2010
- NEPC indicates 5-7 year return of 6.1% and a 30 year expected return of 7.4%
- Continue to monitor in light of performance and asset allocation changes
- Recommend no changes to this assumption at this time

Summary of Experience Study Changes

Assumption	Recommendation	Financial Impact
Withdrawal Rates	Higher Rates	Decrease
Disability Rates	Lower Rates	Decrease
Pay Increases Due to Seniority	Lower Rates	Decrease
Retirement Rates	Lower Rates	Decrease
Pre and Post-Retirement Mortality	Lower Rates	Increase
Interest rate	No Change	N/A
Wage Inflation	No Change	N/A
Price Inflation	No Change	N/A
Total	**Various**	**Increase**

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Hypothetical Valuation Results December 31, 2014

- New assumptions will first be used in 2015 valuation
- Will first impact rates in 2017
- Rates increased primarily due to changes in mortality, partially offset by decreases from other changes
- Rates for Protective occupations are more sensitive to changes in assumptions due to higher ratio of liabilities to payroll

	General and Executive & Elected	Protective With S.S.	Protective Without S.S.
Present 2016 Normal Cost Rate	**13.2%**	**16.0%**	**19.8%**
Hypothetical Rate Change Due to New Assumptions	**0.3%**	**1.0%**	**1.1%**

Actual 2017 rates will be determined in connection with the 2015 valuation and will take into account experience during 2015. The rate changes may be greater or less than suggested above.

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Implementation Schedule

- Active and Inactive Lives Valuation:
  12/31/2015
- Retired Lives Valuation:
  12/31/2015
- Option Factors:
  No change at this time – re-evaluated in the next experience study

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