



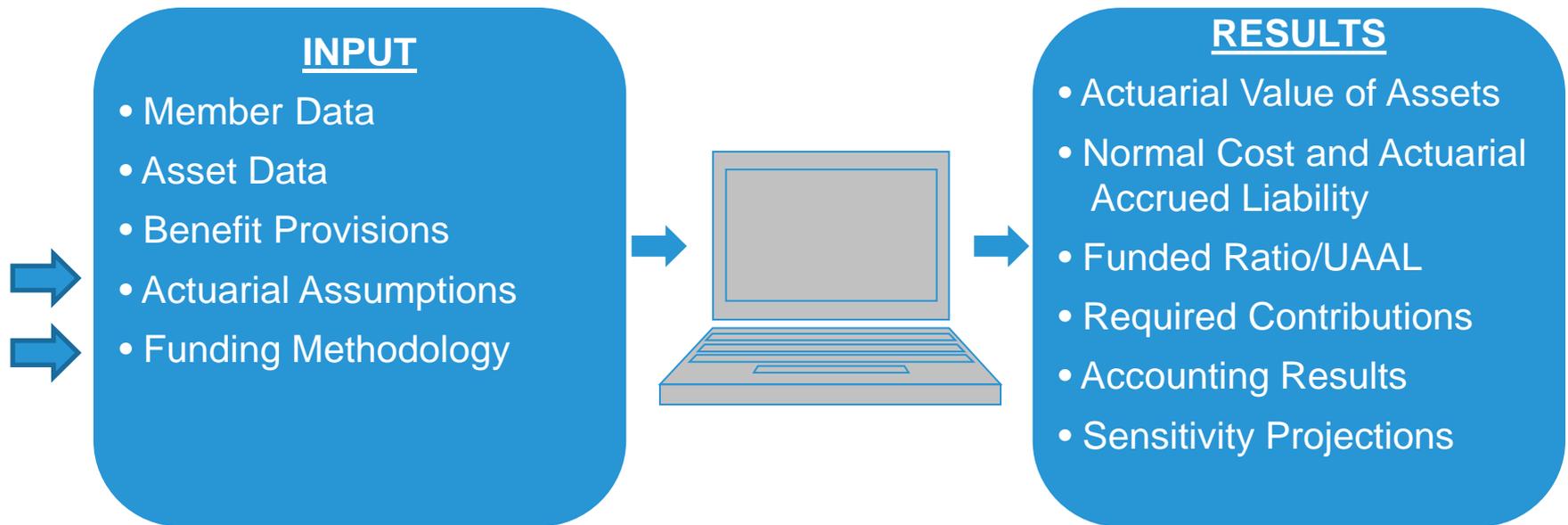
# Teachers' Retirement System of the State of Illinois

Investigation of Demographic and Economic Experience  
Three-Year Period from July 1, 2011 – June 30, 2014

August 13, 2015

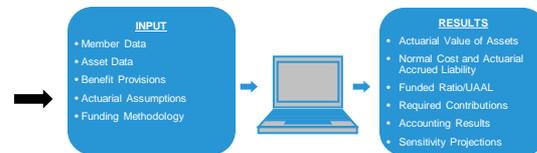
Larry Langer, Paul Wilkinson and Kai Petersen

# The Valuation Process



Over the short term, contributions are determined by the actuarial valuation based upon estimated investment return, benefits and expenses using assumptions and methods recommended by the actuary and adopted by the Board. Over the long term, contributions are adjusted to reflect actual investment return, benefits and expenses.

# Actuarial Assumptions

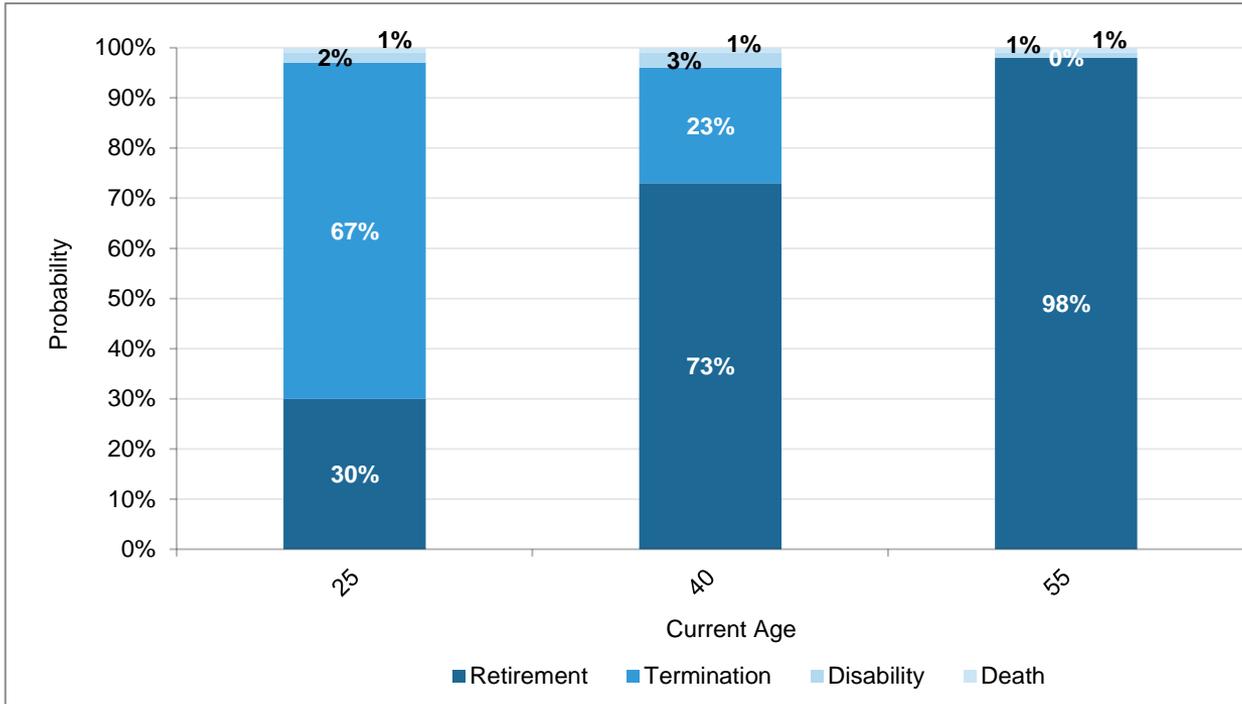
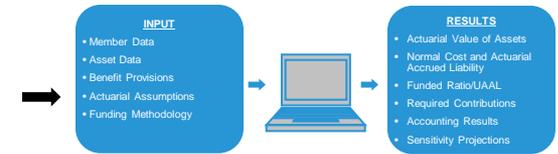


- Actuarial assumptions bridge the gap between the information that we know with reasonable certainty as of the valuation date – age, gender, service, pay or benefits of the members – and what may happen in the future.
- In first half of 2014, Buck Consultants prepared an interim review of the assumed interest rate, underlying inflation assumption and other related economic assumptions as a result of a proposed change in investment portfolio by the Board. At the June 24, 2014 Board meeting, the Board of Trustees adopted the following changes recommended by Buck Consultants for the June 30, 2014 valuation:
  - lower investment return from 8.00% to 7.50%
  - lower rate of inflation from 3.25% to 3.00%
  - lower all rates of salary increase by 0.25%
  - lower the Tier II pay cap increases from 1.625% to 1.50%
  - lower the Tier II COLA increases from 1.625% to 1.40%

The actuarial assumptions of TRS are reviewed every three to five years in a process known as an Experience Review. The last experience review was prepared as of June 30, 2011 and first used in the June 30, 2012 valuation. The results of this review will be used with the June 30, 2015 valuation.

A detailed summary of the actuarial assumptions is provided in Section 6.3 of the actuarial report.

# Actuarial Assumptions (continued)

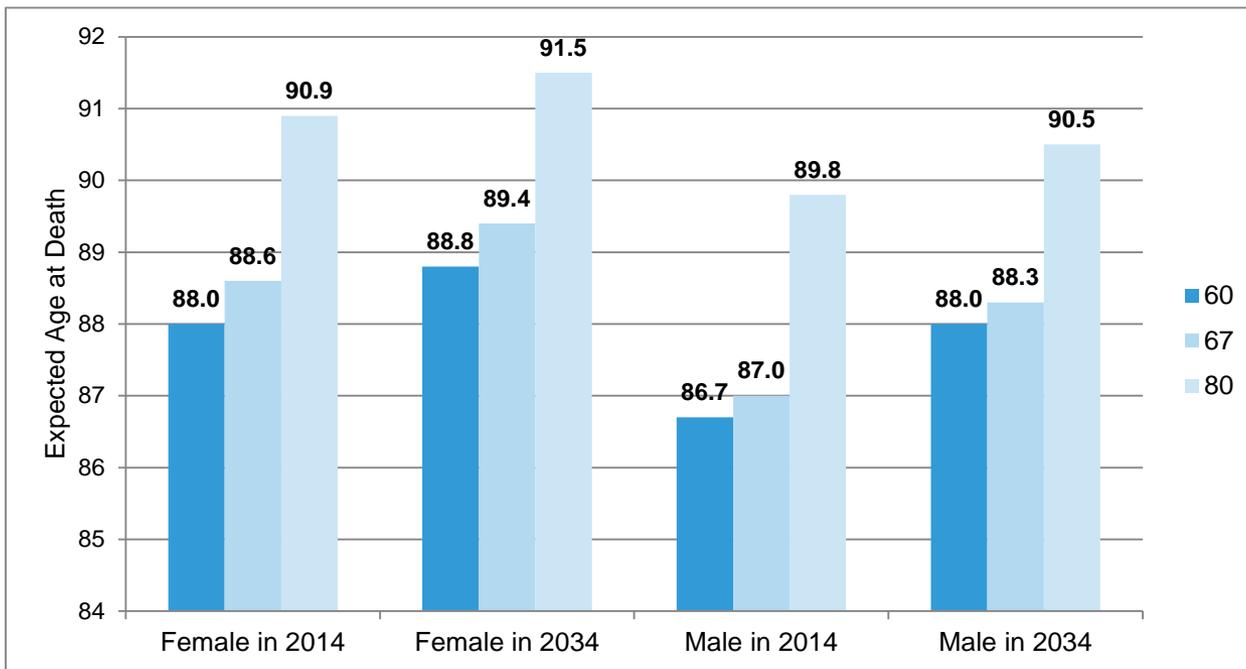
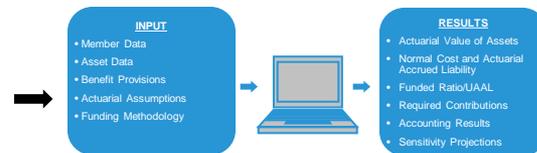


The probability of members retiring, terminating, becoming disabled or dying during their career at illustrative rates is in the exhibit.

Demographic assumptions describe future events that relate to people such as retirement rates, termination rates, disability rates, and mortality rates. Not surprising, as a member ages they are more likely to retire. The rates are developed to model what we expect to occur within TRS.

A detailed summary of the actuarial assumptions is provided in Section 6.3 of the actuarial report.

# Actuarial Assumptions (continued)

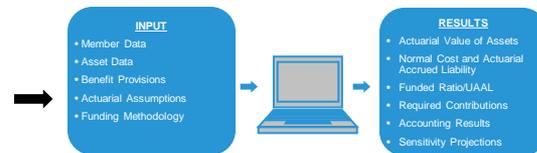


Mortality is a large driver of costs for Retirement Systems. The longer a member is expected to live, the higher the expected costs.

The expected ages at death shown above are based on the assumptions used for the 2014 valuation. Note that we show expected age at death in 2014 and 2034 as illustrative values. The valuation uses what is known as generational mortality. Each future generation is expected to live longer than the prior. Finally, females continue to live longer than males, although the gap is shrinking.

A detailed summary of the actuarial assumptions is provided in Section 6.3 of the actuarial report.

# Actuarial Assumptions (continued)



- Economic assumptions describe future events that relate to money such as the interest rate, salary increases, the real return, and payroll growth.
  - The investment return assumption is 7.50% per year. This assumption was adopted for use beginning with the June 30, 2014 actuarial valuation.
  - Salary increases vary by age. Members at age 25 are expected to receive a pay increase of 9.00%; members from age 50 and beyond are expected to receive a pay increase of 4.75%. This assumption was adopted for use beginning with the June 30, 2014 actuarial valuation.
  - The inflation assumption is 3.00% annually. This assumption was first adopted with the June 30, 2014 actuarial valuation.

A detailed summary of the actuarial assumptions is provided in Section 6.3 of the actuarial report.

# Experience Review Process

- Based on Three-Year Experience Review for Period July 1, 2011 - June 30, 2014
- Take into consideration trends seen during the previous Experience Review
- Compare Experience (“Actual”) with Assumptions (“Expected”)
- Make Judgments About Future Trends:
  - Plan Specific Experience vs. National Trends
  - Long-Term vs. Short-Term Factors
- Recommend changes in assumptions as needed

## “Enhancing Reliability of Actuarial Valuations for Pension Plans” by the GFOA

Engage the actuary to perform additional services to validate the actuarial assumptions used for the valuation. Such services include...Actuarial Experience Study. An actuarial experience study reviews the differences between a plan's assumed and actual experience over multiple years (typically 3 to 5), with the goal of examining the trends related to actual experience and recommending changes to assumptions, if needed.

# Key Takeaways

Assumption	Observed experience relative to expectations	Recommendation	Impact on costs
1. Termination from active employment:	More terminations	Increase rates	Decrease
2. Disability retirement:	Fewer disabilities	Decrease rates	Decrease
3. Regular service retirement:	More retirements	Increase rates	Increase
4. Mortality:	Fewer deaths	Decrease rates	Increase
5. Utilization of ERO:	Lower utilization	Decrease rates	Decrease
6. Optional Service and Sick Leave Service:	Lower utilization	Decrease rates	Decrease
7. Salary and Severance:	Lower increases	Decrease rates	Decrease
8. Tier 2 COLA and Pay Cap:	Lower increases	Decrease rates	Decrease
9. Investment return:	N/A	Keep the same	N/A

- Generally, the trends we see above were a continuation of trends that we observed in the last experience review.
- The mortality assumption was the source of the largest increase in costs. While we did observe fewer deaths than expected over the past few years, the increase in costs was driven more by the increase in mortality improvements suggested by national studies
- The salary and severance assumption was the source of the largest decrease in costs as salaries continued to fall short of the long term assumptions
- We do not recommend a decrease in the current investment return of 7.5%.
- Overall, the net impact on liabilities was an increase.
- Funding Policy should be legislated to Actuarial Math 2.0; Funding Policy is outside of the Board's direct control.

# Actuarial Assumptions - Demographic

- Termination
  - With less than 5 years of service
  - With at least 5 years of service
- Disability Retirement
- Regular Service Retirement
  - Rates of Retirement
  - Utilization of ERO
  - Optional and Sick Leave Service at Retirement
- Death After Retirement
  - Service Retirees
  - Disability Retirees
  - Beneficiaries
- Death in Active Service

For Demographic assumptions, we generally compare the number of members that we expected to terminate, become disabled, retire and die with the respective actual amounts. We then recommend adjustments to the rates to reflect the more recent actual trends.

# Termination

Number of Terminations			Actual
	Actual	Expected	÷ Expected
With less than 5 years of service			
Male	1,662	1,436	116%
Female	5,666	5,185	109%
With 5 or more years of service			
Male	1,385	1,375	101%
Female	6,133	6,363	96%

The valuation anticipates that members terminate. Rates of termination can vary significantly plan to plan and use of actual experience of the plan to set the rate is common. Generally, anticipating more terminations means that less contributions are needed.

**Observation:** Over the last three years, more members with less than 5 years of service have terminated than expected and fewer members with more than 5 years of service have terminated than expected.

**Recommendation:** Increase the rates of termination for members with less than 5 years of service and lower rates of termination for members with more than 5 years of service to reflect recent trend.

**Cost impact:** Slight decrease in liability

# Disability

Number of Disablements	Actual ÷ Expected		
	<u>Actual</u>	<u>Expected</u>	<u>Expected</u>
Male	72	64	112%
Female	358	435	82%

The valuation anticipates that members become disabled. Rates of disability can vary significantly plan to plan, but typically teachers experience far fewer disabilities than other occupations such as public safety. Use of actual experience of the plan to set the rate is common. Impact varies based on the disability provisions.

Observation: Over the last three years, males have experienced more disabilities and females fewer disabilities than expected

Recommendation: Increase rates for males and decrease rates for females to reflect recent trend

Cost impact: Slight decrease in liability

# Service Retirements

Number of Retirements	Actual ÷ Expected		
	Actual	Expected	Expected
Under 60	5,965	5,849	102%
60 - 64	5,194	4,579	113%
65-69	1,128	982	115%
Over 69	156	417	37%
Total	12,443	11,827	105%

The valuation anticipates that members become retired, but not just at first eligibility. Rates of retirement can vary significantly plan to plan. Use of actual experience of the plan to set the rate is common. Generally, earlier retirement results in higher costs.

Observation: Over the last three years, members have retired earlier than expected

Recommendation: Increase rates of retirement to reflect recent trend

Cost impact: Increase in liability

# Utilization of ERO

Number of ERO Elections						
	Age					
	55	56	57	58	59	Total
Actual	141	264	138	142	138	823
Expected	432	1,039	762	639	502	3,376
A ÷ E	33%	25%	18%	22%	27%	24%

The valuation anticipates that some retirees will utilize the Early Retirement Option (ERO) to avoid the early retirement reduction provisions.

Observation: Over the last three years, ERO utilization has decreased significantly.

Recommendation: Decrease rates of ERO elections to reflect recent trend

Cost impact: Decrease in liability

# Mortality

Number of In-Service Deaths			Actual ÷ Expected
	<u>Actual</u>	<u>Expected</u>	<u>Expected</u>
Female	130	189	69%
Male	56	86	65%

Mortality for actives is not a big driver of costs because of the number of deaths and the potentially lower amount of benefits than had the member retired.

Observation: Over the last three years, fewer actives died than expected. The number of deaths was too few for meaningful credibility.

Recommendation: Update base rates from adjusted versions of RP-2000 tables (projected to 2009) to the RP-2014 table. Use “White Collar” rates.

Cost impact: Increase in liability

# Mortality

Number of Post-Retirement Deaths			Actual ÷ Expected
Type of Retiree	Actual	Expected	Expected
Service Retirement			
Female	3,781	3,949	96%
Male	2,230	2,195	102%
Beneficiary			
Female	1,108	980	113%
Male	702	622	113%
Disability	Less than 100 expected, low credibility		

Mortality for annuitants is a large driver of costs for Retirement Systems. The longer a member is expected to live, the higher the expected costs.

Observation: Over the last three years, fewer female annuitants have died than expected and more male annuitants have died than expected. More beneficiaries have died than expected. Deaths from disability retirements are too few for meaningful credibility.

Recommendation: Update base rates from TRS adjusted versions of RP-2000 tables (projected to 2009) to TRS adjusted versions of RP-2014 tables. Use “White Collar” for service retirements, no collar adjustment for beneficiaries, and unadjusted disability mortality table for disability retirements.

Cost impact: Increase in liability

# Mortality Improvement

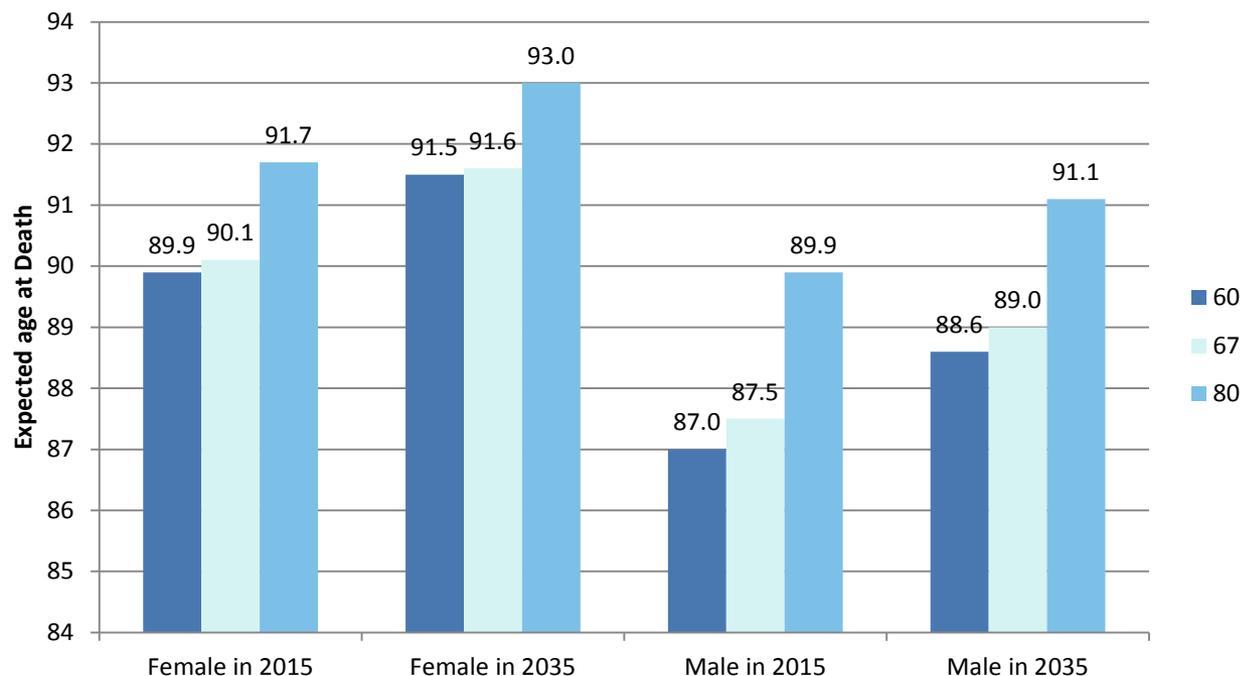
As noted in prior experience studies, we have seen continued and steady improvement in mortality rates over time. Actuarial Standards of Practice No. 35 states that the actuary should “include an assumption as to expected mortality improvement after the measurement date.” Based on the recommendation contained in the last experience review, the Board in 2012 adopted generational mortality based on rate of mortality improvement known as Scale AA. Since the last experience study, the Society of Actuaries (SOA) conducted a mortality study and determined that the rates of mortality improvement in the US have differed quite substantially from those predicted in 2012 by Scale AA. The SOA study, published Nov. 2014, produced projection scale MP-2014. There are those that believe that MP-2014 is unduly conservative with unrealistic mortality improvement rates. Emerging experience since the data was collected by the SOA seems to support that contention. Many systems reflect mortality improvements for a set period of years into the future, not forever. For TRS, reflecting more mortality improvements results in a higher impact because we assume fully generational mortality, where mortality improvements continue forever. Illinois pension funding requires us to look into the future to 2045, so the projection of mortality improvement is a more impactful assumption for TRS than for other systems.

Observation: SOA Studies indicate that mortality improvement has increased substantially since the Board adopted Scale AA, but experience since the study indicates that the substantial improvement is undue.

Recommendation: Update from projection Scale AA to MP-2014.

Cost impact: Increase in liability

# Mortality



The expected ages at death shown above are based on the proposed mortality assumptions for service retirees. The ages at death are more than a year longer than current assumptions. Note that we show expected age at death in 2015 and 2035 to illustrate the impact of generational mortality improvement.

# Optional and Sick Leave Service Credits

	<u>Average # of years of credit</u>		Actual
	<u>Actual</u>	<u>Expected</u>	÷ <u>Expected</u>
<b>Optional Service</b>	0.61	0.70	0.87
<b>Sick Leave</b>	1.01	1.32	0.77

The valuation anticipates that some retirees will purchase optional service credits and/or receive unused sick leave credits.

Observation: Over the last three years, utilization of optional service and unused sick leave credits has declined

Recommendation: Assume optional service at retirement will average 0.6 years, and average unused sick leave will average 1.0 years.

Cost Impact: Decrease in liability

On average, members pay for approximately 25% of the cost of optional service. (Members pay the full cost of some types of service.)

# Severance Pay

	<u>All Service Retirees</u>		Actual ÷ <u>Expected</u>
	<u>Actual</u>	<u>Expected</u>	
<b>Utilization</b>	19.56%	20.00%	0.98
<b>% of Earnings</b>	1.84%	6.00%	0.31

The valuation anticipates that some retirees from active service will receive severance payments.

Observation: Over the last three years, the average severance payment has declined

Recommendation: The percent of retirees from active service assumed to receive severance payments and the amount of such severance payments, will be based on the assumption that 20% of retirees will receive severance pay and the average severance payment will be 3% of other pensionable earnings in the last year of payment

Cost Impact: Decrease in liability

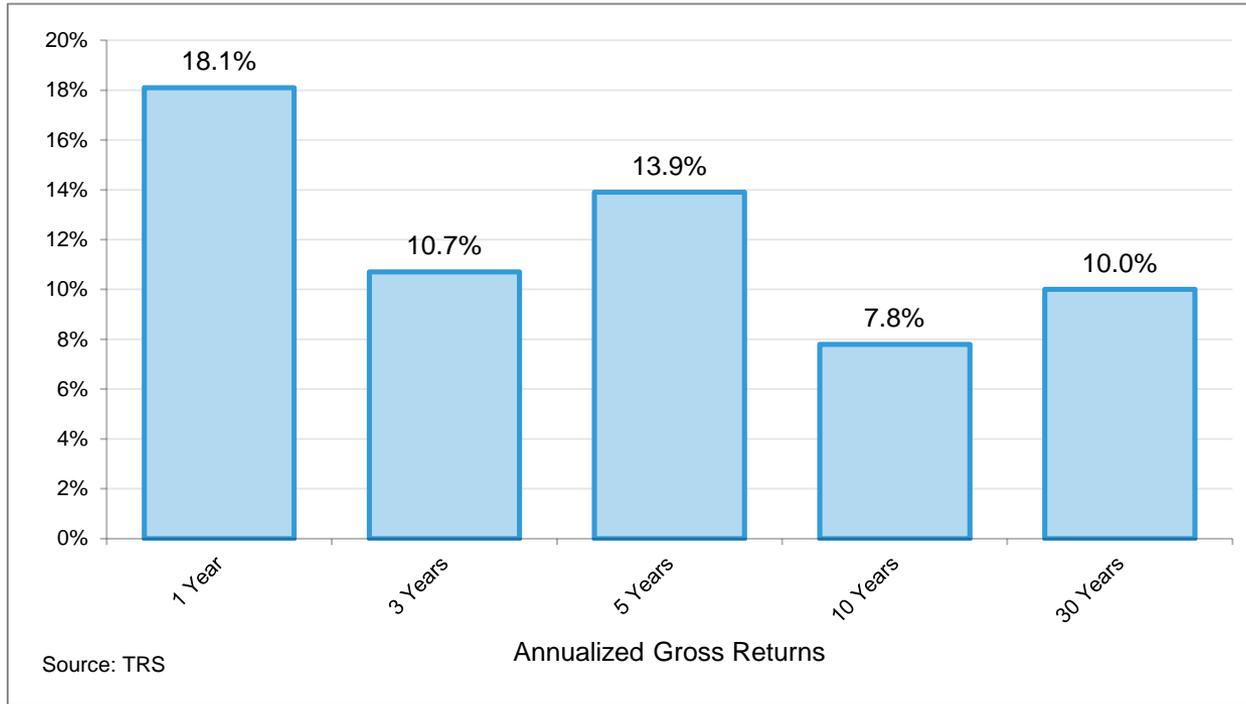
# Setting Economic Assumptions

- Review Past Experience
- Review General Practice
- Develop Component Parts of Each Assumption
  - Maintain Linkage With Investments
  - Maintain Internal Consistency
- Make Judgment About Future

# Investment Return Assumption - Considerations

- Short-Term Returns Not Indicative of Long-Term Return
- Use Expected Rates of Return by Asset Class Based Upon Accepted Industry Practice
- Determine Aggregate Real Return for Board's Target Asset Allocation Policy
- Include Margin of Conservatism
- All else being equal, a lower return assumption is easier to achieve and has a higher likelihood of securing the benefits by increasing future contributions

# Investment Return

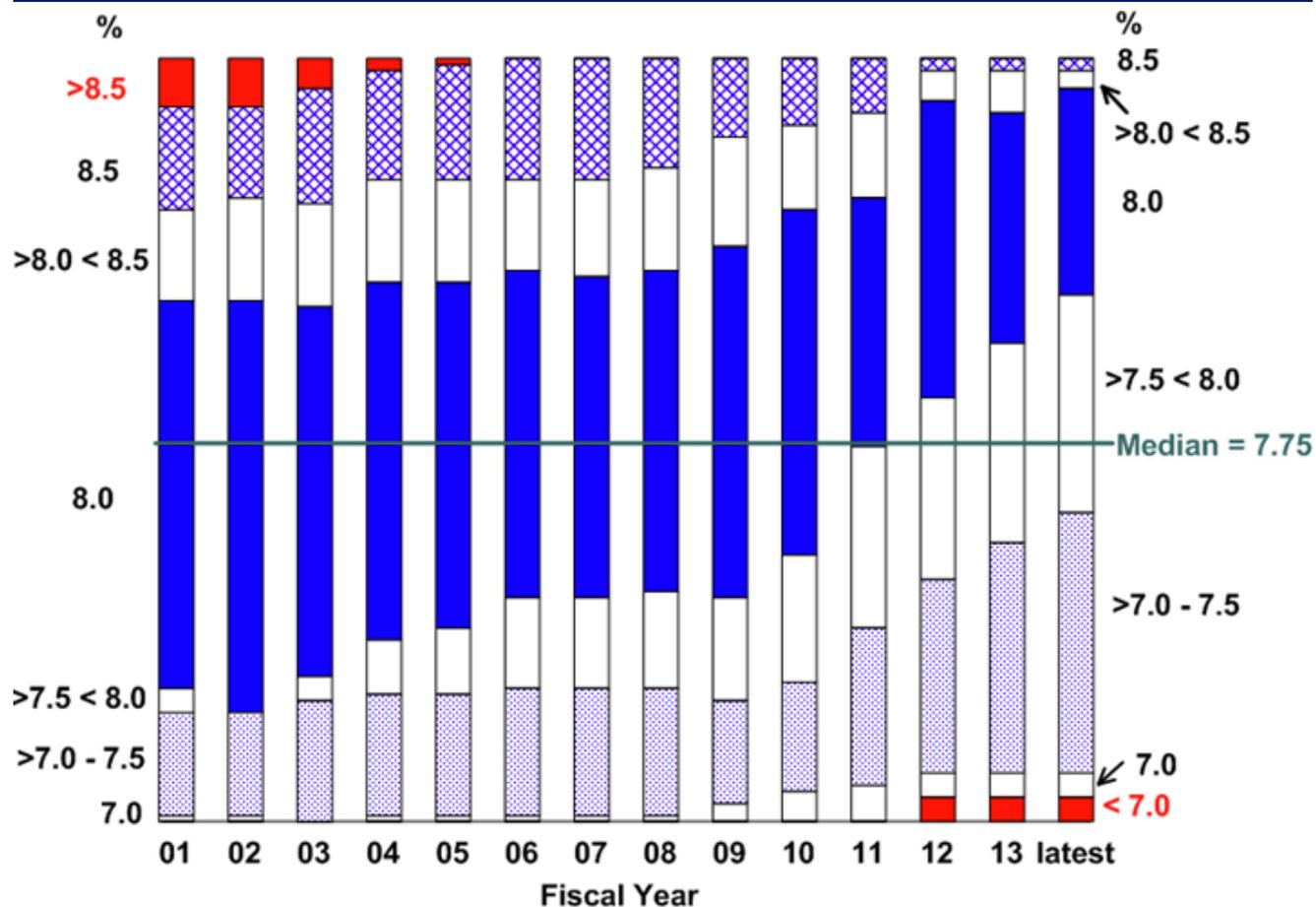


This exhibit contains annualized *gross* returns over various periods of time ending June 30, 2014. These amounts are gross of expenses, while the assumed rate of return used for the valuation is net of expenses.

Annualized gross returns, after adjusting for expenses, have been greater than the assumed rate of return of 8.00% (8.50% prior to 2012) except for the 10 year period where the returns were dominated by the impact of the Great Recession. Note that the current 7.5% return is for the period beginning June 30, 2014.

# Investment Return

Change in distribution of public pension investment return assumptions, FY 01 through May 2015, compiled by NASRA based on Public Fund Survey.



As seen in this survey, the trend in public pension plan investment return assumptions has been a steady decrease over the past 15 years. TRS has mirrored this pattern, with the Board reducing the assumption from 8.5% to 8.0% effective with the June 30, 2012 valuation and from 8.0% to 7.5% effective with the June 30, 2014 valuation.

# Investment Return

<b>Asset Class</b>	<b>Allocation</b>
Domestic Equity	18.00%
International Equity	18.00%
Fixed Income	16.00%
Real Estate	15.00%
Private Equity	14.00%
Real Return	11.00%
Absolute Return	8.0%
Short Term Invest.	0.0%
	<hr/>
	100.00%

The assumed rate of return is based on the target asset allocation and the expectation of future asset returns for each asset class. The current return assumption of 7.5% was last reviewed and adopted at the June 24, 2014 Board of Trustees meeting in conjunction with an asset allocation study. This allocation is unchanged from that meeting.

On the next slide we have estimated nominal and real returns over various time periods based on this allocation and Buck's current return expectations.

# Buck Estimate Nominal and Real

Compound (Geometric) Returns over Projected Periods							
	1-Year	5-Year	10-Year	15-Year	20-Year	25-Year	30-Year
<b>Nominal</b>							
75th Percentile	11.13%	9.50%	9.71%	9.99%	10.27%	10.46%	10.48%
60th Percentile	8.21%	7.74%	8.14%	8.60%	8.83%	9.29%	9.41%
50th Percentile	6.64%	6.63%	7.12%	7.82%	8.22%	8.49%	8.77%
40th Percentile	4.86%	5.53%	6.39%	7.07%	7.50%	7.82%	8.11%
25th Percentile	1.75%	3.46%	5.12%	5.94%	6.42%	6.78%	7.13%
<b>Real</b>							
75th Percentile	9.09%	7.47%	7.16%	7.18%	7.26%	7.29%	7.30%
60th Percentile	6.38%	5.67%	5.85%	6.05%	6.16%	6.31%	6.38%
50th Percentile	4.55%	4.54%	4.99%	5.35%	5.57%	5.76%	5.82%
40th Percentile	2.84%	3.35%	4.07%	4.66%	4.93%	5.09%	5.34%
25th Percentile	-0.24%	1.50%	2.83%	3.50%	3.98%	4.12%	4.38%

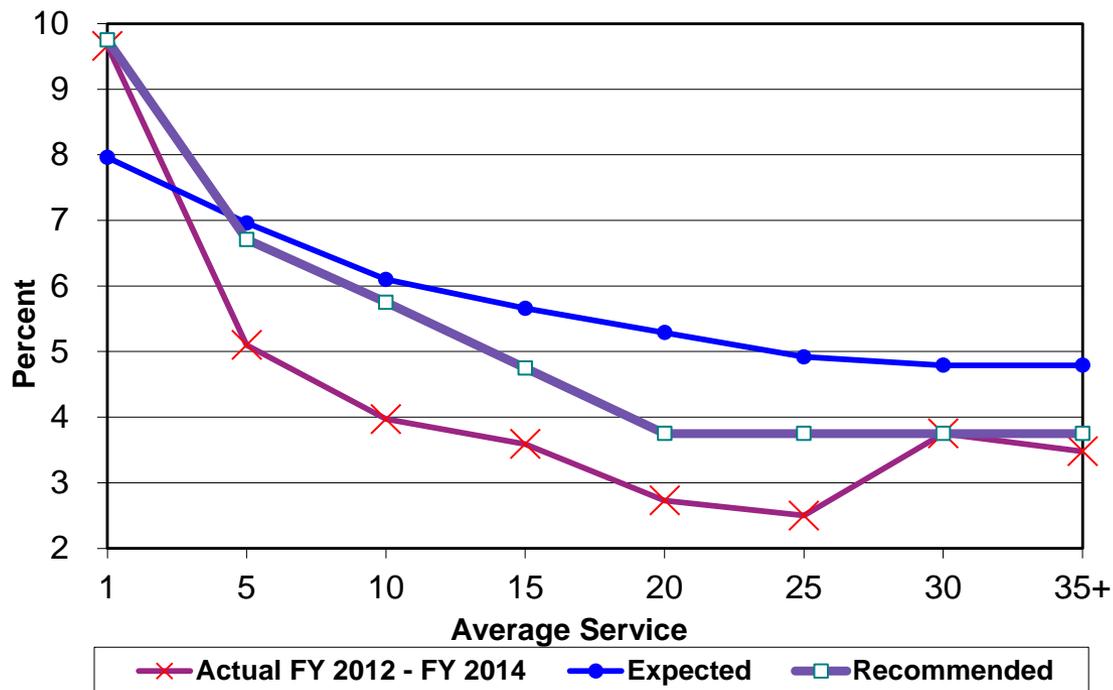
Based on 2015 assumptions. Amounts shown are net of investment expenses at 70 bp.

Current standards of practice suggest the use of an assumption that falls within the 40<sup>th</sup> and 50<sup>th</sup> percentile of projected returns based on the long term asset allocation. This is a change from the last time we reviewed the assumed rate of return, where the Actuarial Standards of Practice defined the range as between the 25<sup>th</sup> and 75<sup>th</sup> percentiles. Under these guidelines, Buck restricted the range to returns that were between the 25<sup>th</sup> and 50<sup>th</sup> percentiles.

Based on the above, the 7.50% investment return assumption can be maintained.

The current assumption of 7.50% is expected to be achieved between 40% and 50% of the time over the next 10 years. There are currently unrecognized asset gains to partially offset returns below 7.5%. Over longer periods, we expect the return to be achieved over 60% of the time based on Buck expectations.

# Salary Increases



The valuation anticipates salary increases for members during their career. Higher (lower) salary increases results in higher (lower) estimated benefits and higher (lower) projected costs. Given contributions are financed over projected payroll, higher (lower) salary increases tend to backload (frontload) employer contributions.

Observation: Salary increases continue to be significantly less than expected. In addition, service seems to be a better indicator of salary increases than age.

Recommendation: Reduce rates at all ages and base rates on service. Minimum increase for later career is 3.75%, which is the sum of the inflation assumption (3.00%) and the productivity assumptions (0.75%).

Cost impact: Decrease in liability

# Inflation, Real Return, Tier 2 COLA and Pay Cap

- Current TRS inflation assumption is 3.00% per year
  - Recommendation: Maintain current assumption
- Current TRS real rate of return assumption is 4.50%
  - Recommendation: Maintain current assumption to coordinate with investment return and inflation
    - Investment return assumption of 7.50% equates to a real return of 4.50%
- Tier 2 COLA and Pay Cap is the lesser of one half of CPI or 3%, and cannot decrease
  - Applying these limitations to our projections of inflation underlying the projections on the previous page, we expect the annual increase to be 1.38%
  - Use 1.4% assumption for both assumptions

# Cost Impact

Had the proposed assumptions been reflected for the June 30, 2014 annual actuarial valuation, the impact would have been a net increase in costs:

- The actuarial accrued liability, or the amount of assets that should be in the fund, would be 0.5% higher, increasing from \$103.7 billion to \$104.2 billion
- The normal cost, or cost of benefits accruing during the year, would be 6% lower, decreasing from \$2.0 billion to \$1.9 billion.
- The projected state contribution would increase from \$3.7 billion to \$3.8 billion. This is due in part to the increase in liability and to the frontloading of contributions due to lower projected salary in the future, as well as lower member contributions in the future.

Changes with larger impacts include:

- Mortality changes increased projected life expectancy and increased costs by about 2.5%
- Salary changes decreased projected benefits and decreased costs by about 2.0%
- Lower utilization of ERO decreased costs by about 0.5%

# Funding Policy Recommendation - Actuarial Math 2.0

We propose that the following Actuarial Math 2.0 be considered as the next generation of actuarial math, replacing the two versions that have been certified by the Board in the past

- Replace the projected unit credit cost method with the entry age normal cost method
- Keep the current asset valuation method (including no corridor)
- Update amortization policy as follows:
  - 20 year closed amortization of UAAL
  - Use layered amortization, with new UAAL being amortized over 20 years regardless of source
  - Amortization payment increase at the rate of future State revenue growth. For purposes of this illustration, we assume revenue grows at 2% per year
  - Minimum total contribution is no less than the normal cost in any given year

A quote from the 2014 valuation report:

“By funding based on Illinois Math instead of Actuarial Math, the State has put the retirement security for the 390,000 current and former educators in the State of Illinois at risk. Meaningful funding reform should be implemented now.”

# Key Takeaways

Assumption	Observed experience relative to expectations	Recommendation	Impact on costs
1. Termination from active employment:	More terminations	Increase rates	Decrease
2. Disability retirement:	Fewer disabilities	Decrease rates	Decrease
3. Regular service retirement:	More retirements	Increase rates	Increase
4. Mortality:	Fewer deaths	Decrease rates	Increase
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8. Tier 2 COLA and Pay Cap:	Lower increases	Decrease rates	Decrease
9. Investment return:	N/A	Keep the same	N/A

- Generally, the trends we see above were a continuation of trends that we observed in the last experience review.
- The mortality assumption was the source of the largest increase in costs. While we did observe fewer deaths than expected over the past few years, the increase in costs was driven more by the increase in mortality improvements suggested by national studies.
- The salary and severance assumption was the source of the largest decrease in costs as salaries continued to fall short of the long term assumptions.
- We do not recommend a decrease in the current investment return of 7.5%.
- Overall, the net impact on liabilities was an increase.
- Funding Policy should be legislated to Actuarial Math 2.0; Funding Policy is outside of the Board's direct control.

# Certification

The results were prepared under the direction of Larry Langer and Paul Wilkinson who meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinions contained herein. These results have been prepared in accordance with all applicable Actuarial Standards of Practice, and we are available to answer questions about them.

Future actuarial measurements may differ significantly from current measurements due to plan experience differing from that anticipated by the economic and demographic assumptions, increases or decreases expected as part of the natural operation of the methodology used for these measurements, and changes in plan provisions or applicable law.

Larry Langer, FCA, ASA, EA, MAAA  
Principal, Consulting Actuary

Paul Wilkinson, ASA, EA, MAAA  
Director, Consulting Actuary

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# Disclosures

- Buck's work product contained herein was prepared exclusively for the Board of Trustees and Staff of TRS. It is a complex, technical analysis that assumes a high level of knowledge concerning the operations of TRS.
- No third party recipient of Buck's work product should rely upon Buck's work product absent involvement of Buck or without our approval. Furthermore, because of past experience with previous work we have prepared for TRS, we feel obliged to strongly discourage third party recipients from misstating the results set forth in this work product. Third parties recipients inclined to present our work product should engage TRS and Buck during the presentation process to ensure that this work product is appropriately represented. If this is not desirable, such recipients should engage qualified professionals for advice appropriate to their own specific needs.
- The consultants who worked on this assignment are pension actuaries with significant experience in public funds like TRS. Buck's advice is not intended to be a substitute for qualified legal or accounting counsel.



Questions?  
Thank you.



Ready For Real Business