Projecting Mortality Improvements

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Review of Actuarial Assumptions

Review of Actuarial Assumptions

- Actuarial assumptions are reviewed once every 4 years
- Consistent with:
  - Board policy ACT-95-95-05D

Review of Actuarial Assumptions

- Last review of demographic assumption was completed in winter of 2010.
  - Board approved new demographic assumptions in April 2010.
- Last review of economic assumption was completed in winter of 2012.
  - Board approved new economic assumptions in March 2012.

Review of Actuarial Assumptions

- Work on the current experience study started in 2012.
- Reviewing all demographic assumptions
  - Retirement, termination, disability, mortality
  - Salary increases (merit, seniority and promotion)
- Reviewing economic assumptions
  - Inflation, payroll growth, discount rate

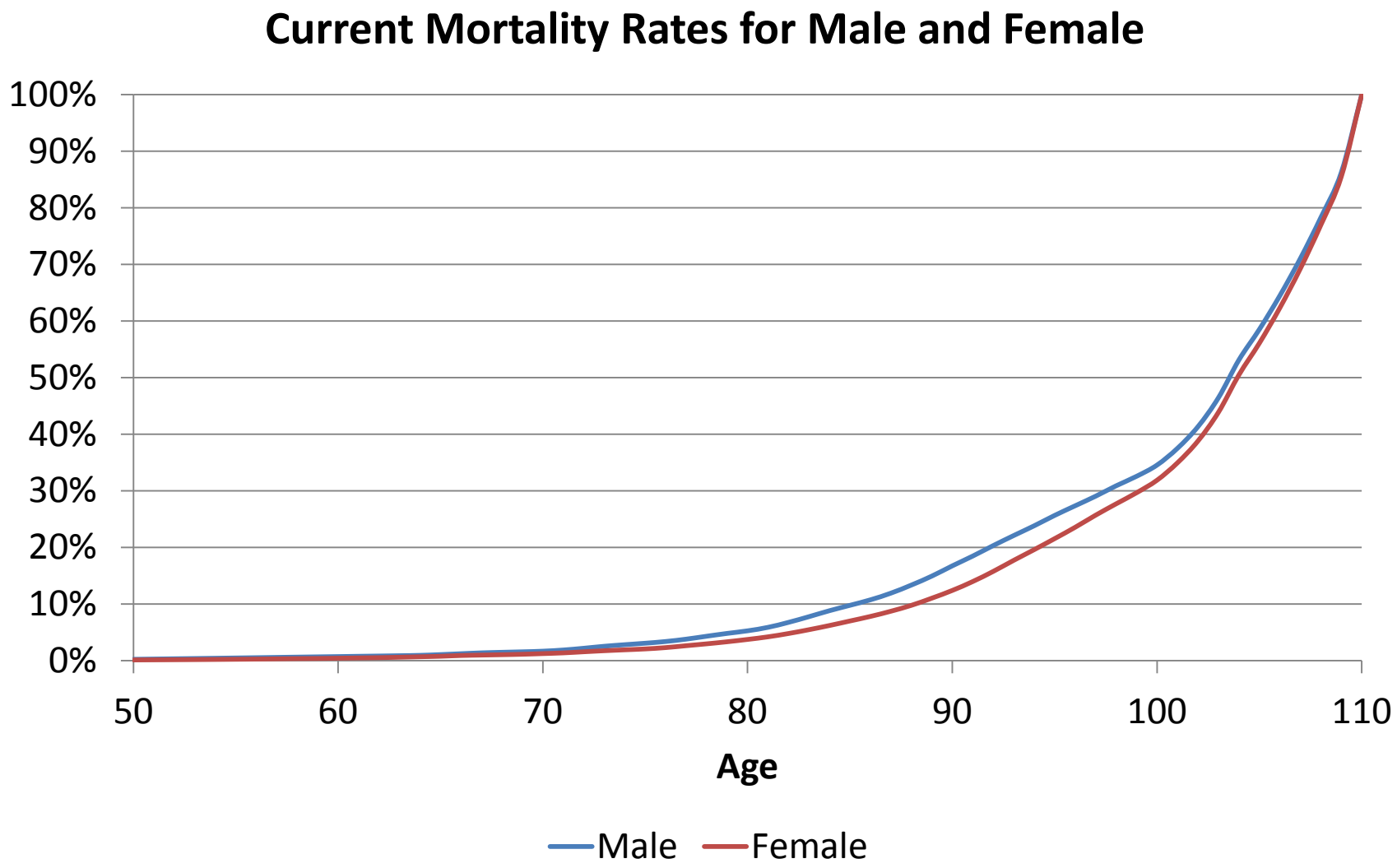
Review of Actuarial Assumptions

- Preliminary recommendations for new assumptions in December
- Adoption of new assumptions in February
- Part of the "CalPERS Path to a Sound and Sustainable Fund"
- http://www.calpers.ca.gov/eip-docs/about/press/news/invest-corp/timeline.pdf

Mortality Tables

Mortality Assumption

- Actuaries use mortality tables in actuarial valuations to project benefit payments in the future
- Mortality tables consist of a probability of death at each age


Current Mortality Rates for Male and Female
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
50
60
70
80
90
100
110
Age
Male
Female

Life Expectancy

Age	Male	Female
55	82.3	85.3
60	83.0	85.7
65	83.9	86.4
70	85.0	87.3

(Based on Current Assumptions)

Mortality Tables

- Published tables
  - 1994 Group Annuity Mortality (GAM 94)
  - RP 2000
- System specific tables
  - Systems large enough to derive their own tables
    - CalPERS, CalSTRS

Mortality Tables

- Mortality tables generally reflect mortality patterns prior to the study period
- Do not reflect potential improvements in mortality after the study period
- It would be inappropriate to use GAM 1994 in a 2013 actuarial valuation without applying some kind of mortality improvements

Methods to Project Mortality Improvements

Mortality Improvements

- Actuaries have various ways to adjust mortality tables to reflect mortality improvements
- Common methods:
  - Setback
  - Mortality improvement scales
  - Setback and improvement scales

Setback

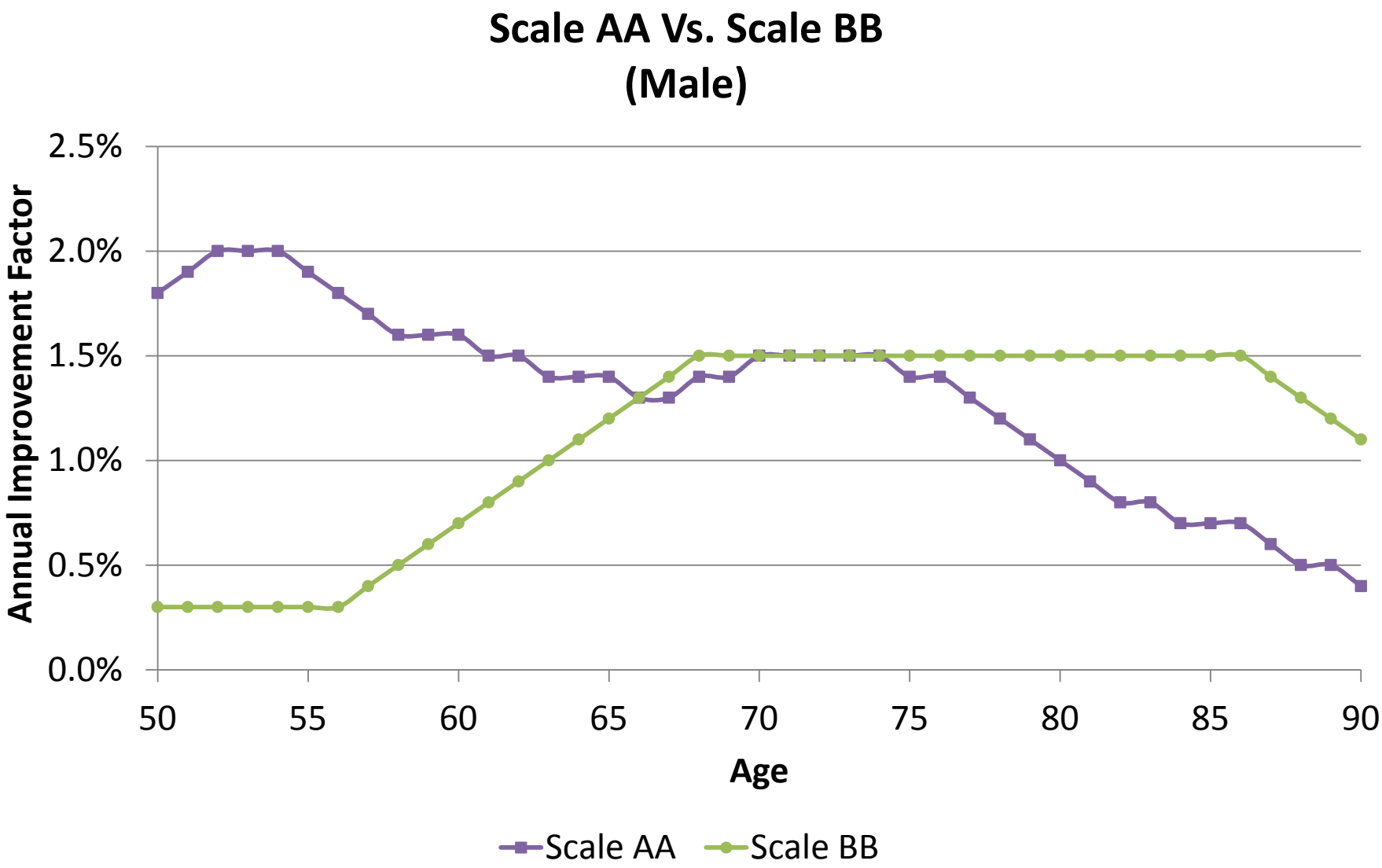
- Apply mortality improvements by using the mortality rates for lower ages and apply them to older ages.
- Example:
  - 5 year setback
  - Use age 50 mortality rates for a 55 year old

Mortality Improvements Scales

- The Society of Actuaries has published scales over time to provide tools to actuaries in estimating future mortality improvements

Mortality Improvements Scales

- Scale AA
  - Has been standard since mid 1990s
- Scale BB
  - New standard table
  - Issued in 2012


Scale AA Vs. Scale BB
(Male)
Annual Improvement Factor
2.5%
2.0%
1.5%
1.0%
0.5%
0.0%
50
55
60
65
70
75
80
85
90
Age
Scale AA
Scale BB

Example Using Scale BB

- Scale BB
- Improvement factor at 65: 1.2%
- Current age 65 male mortality rate: 1.056%
- With one year of mortality improvement, age 65 male mortality rate is projected to be:

  1.056% * (1-.012) = 1.043%

Mortality Improvements Scales

- There are two ways to use mortality improvement scales to project future mortality improvements:
  - Static
  - Generational

Static Mortality Improvements

- A fixed number of years is selected for improvements
- All mortality rates are adjusted for the number of years based on the selected scale

Generational Mortality Improvements

- One year of mortality improvement is added each year into the future when performing actuarial projections

Improvement Method at CalPERS

- Static has been used historically
- Currently assumptions were based on the 2002-2007 period
- 5 years of static mortality improvement was applied using scale AA

Improvement Method at CalPERS

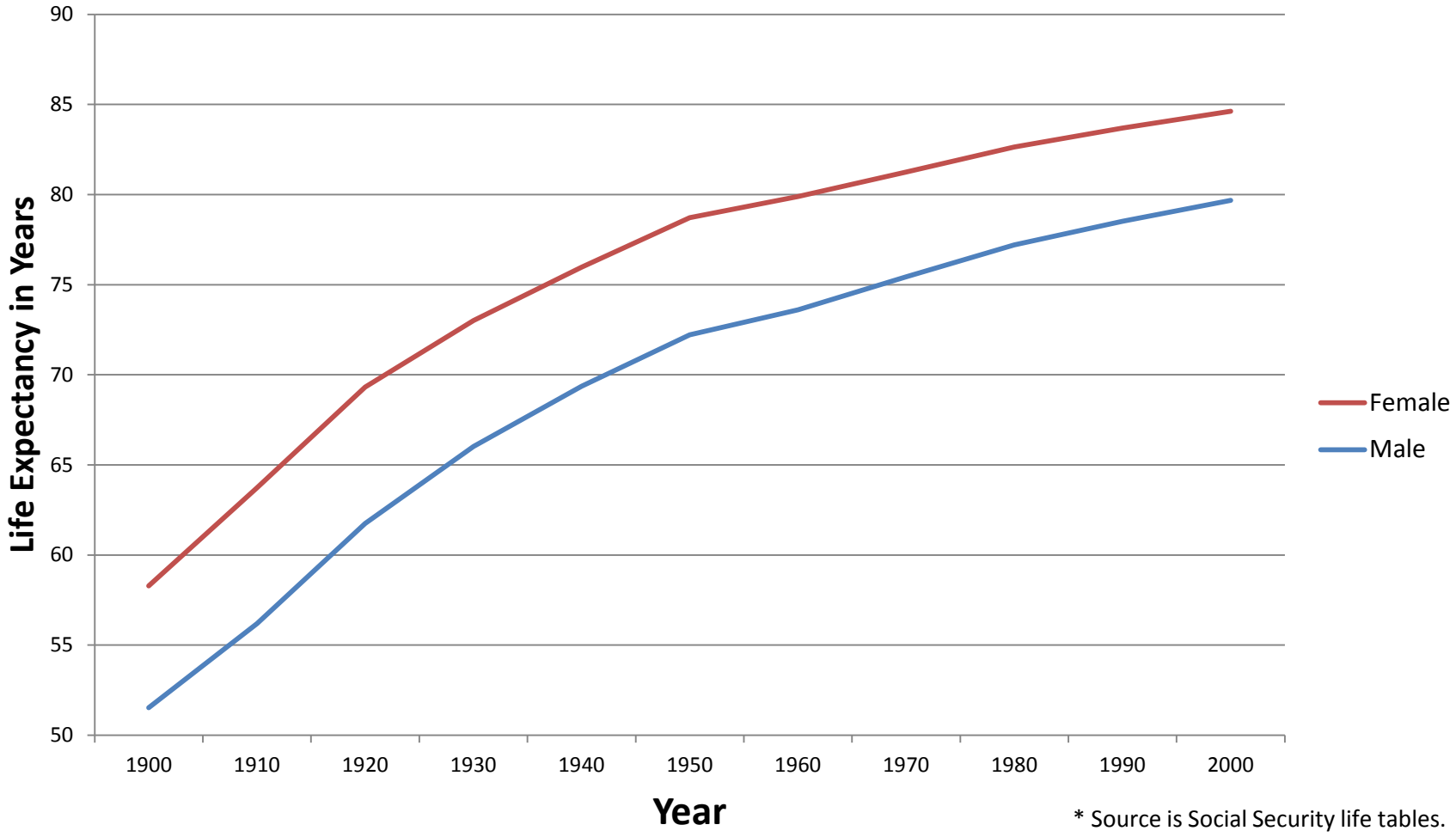
- Best would be to apply generational mortality improvements
- Cannot do so - current system limitations

Why are Mortality Improvements Needed

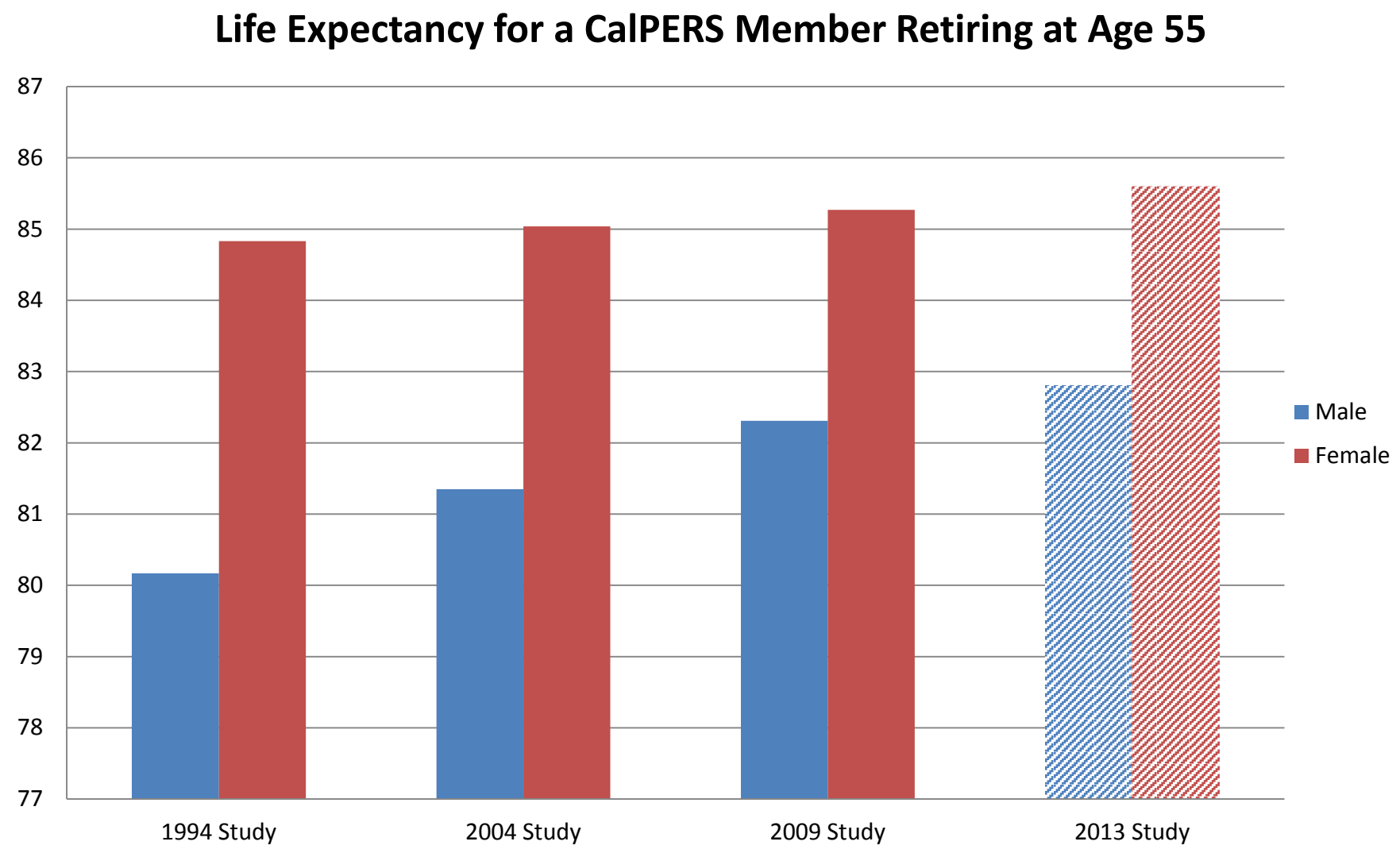
Everyone is Living Longer

- Life expectancy in US and for CalPERS members has steadily improved over the last century

Life Expectancy at Birth by Year (1900 - 2000)



* Source is Social Security life tables.


Life Expectancy for a CalPERS Member Retiring at Age 55
87
86
85
84
83
82
81
80
79
78
77
1994 Study
2004 Study
2009 Study
2013 Study
Male
Female

Actuarial Standards of Practice

- Actuarial Standards Board (ASB) promulgates actuarial standards of practice (ASOPs)
- ASOPs apply to actuaries providing actuarial services in the United States

Actuarial Standards of Practice

- Two ASOPs governs the selection of actuarial assumptions used in valuations of pension plans
  - ASOP # 27:Selection of Economic Assumptions for Measuring Pension Obligations
  - ASOP #35: Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations

ASOP #35

- Addresses the selection of demographic assumptions
- Amended in May 2011 to address mortality improvements
- Quote from release letter:

"As mortality rates have continued to decline over time, concern has increased about the impact of potential future mortality improvements on the magnitude of pension commitments."

ASOP #35

- Another Quote:

"The resources reviewed by the Pension Committee showed that demographers generally expect that mortality will continue to improve. These resources noted that some scientists argue that human life has biological limits, and that the rate of mortality improvement could slow as a result of obesity or other emerging health issues, but that such limits and countervailing factors do not alter the scientific consensus of likely continuing improvements in mortality."

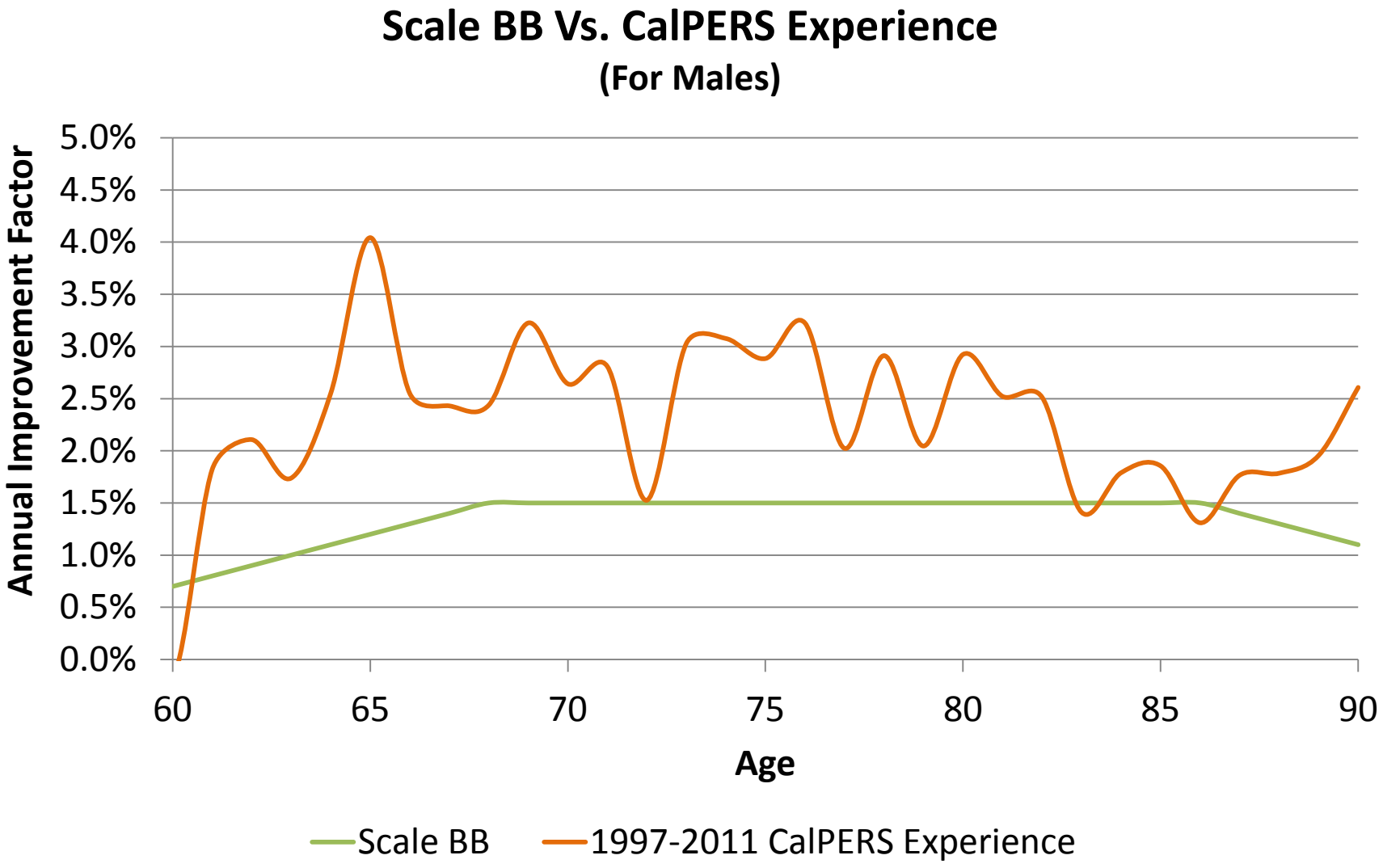
ASOP #35

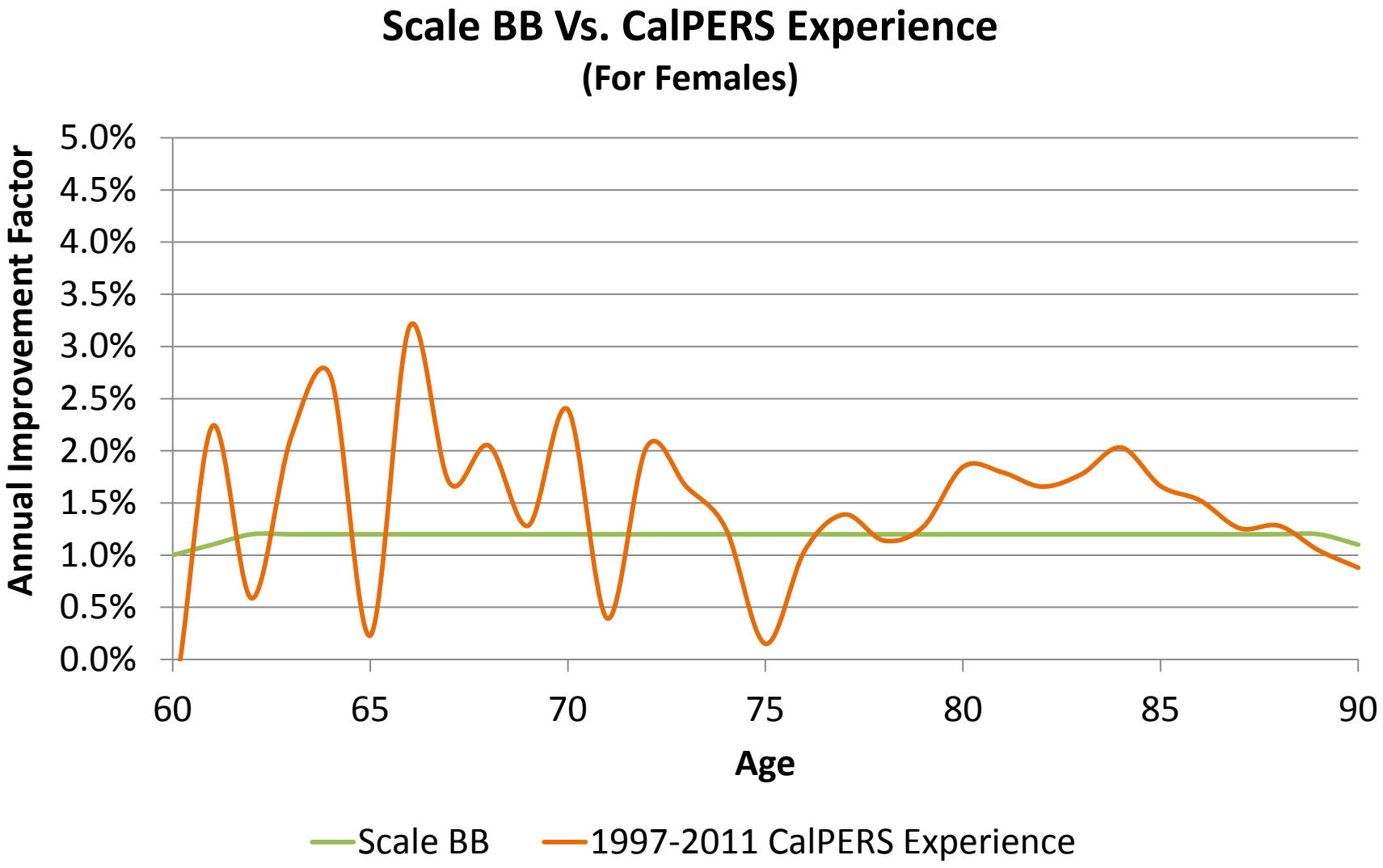
- Section 3.5.3 states:
- “The actuary should consider the effect of mortality improvement both prior to and subsequent to the measurement date.”
- “Note that the existence of uncertainty about the occurrence or magnitude of future mortality improvement does not by itself mean that an assumption of zero future improvement is a reasonable assumption.”

Why are Improvements Needed?

- Necessary to ensure proper funding of the system
- Necessary to avoid liability losses
- Necessary to comply with ASOP
- Failure to reflect mortality improvements would shift costs to the future

How Much Improvement?

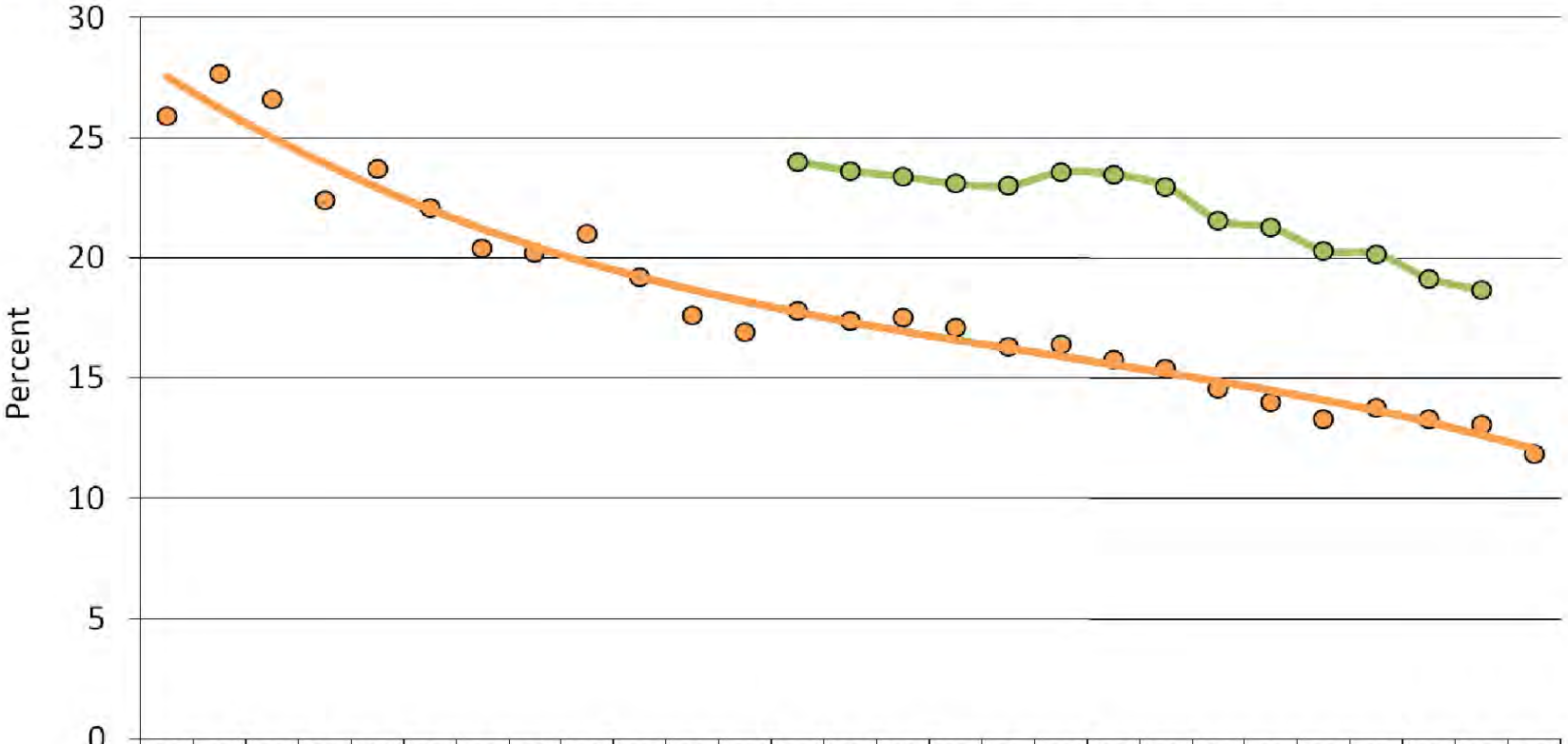

Scale BB Vs. CalPERS Experience
(For Males)
Annual Improvement Factor
5.0%
4.5%
4.0%
3.5%
3.0%
2.5%
2.0%
1.5%
1.0%
0.5%
0.0%
60
65
70
75
80
85
90
Age
Scale BB
1997-2011 CalPERS Experience


Scale BB Vs. CalPERS Experience
(For Females)
Annual Improvement Factor
5.0%
4.5%
4.0%
3.5%
3.0%
2.5%
2.0%
1.5%
1.0%
0.5%
0.0%
60
65
70
75
80
85
90
Age
Scale BB
1997-2011 CalPERS Experience

Uncertain Future

- Risk of either over or under projecting
- Many factors can impact mortality rates (up or down)
  - Smoking prevalence
  - Medical breakthrough
  - Obesity and diabetes
  - Socioeconomic status

Smoking prevalence among California and U.S. minus California adults, 1984-2010

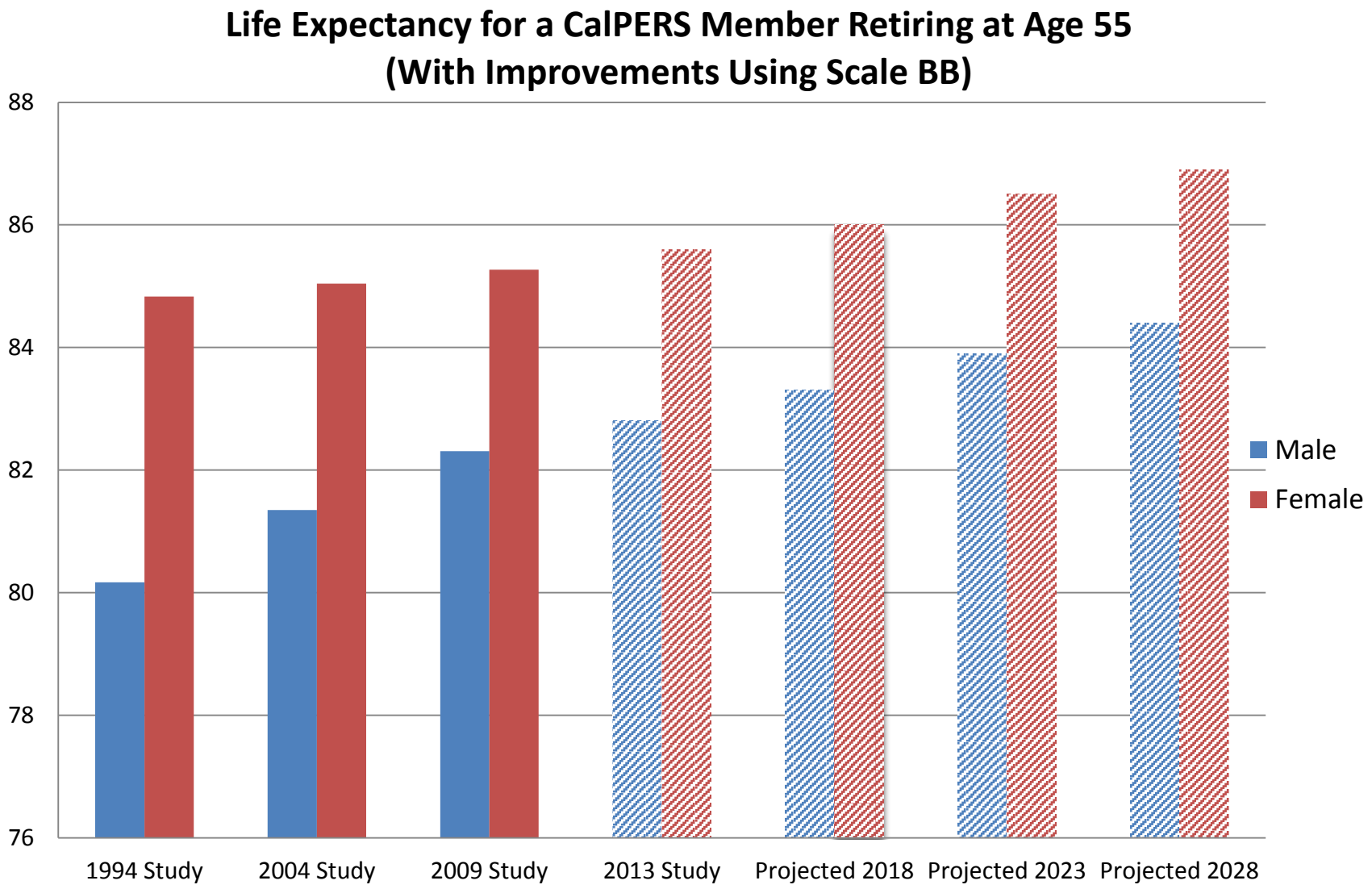


	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10
CA	25.9	27.7	26.6	22.4	23.7	22.1	20.4	20.2	21.0	19.2	17.6	16.9	17.8	17.4	17.5	17.1	16.3	16.4	15.8	15.4	14.6	14.0	13.3	13.8	13.3	13.1	11.9
US-CA													24.0	23.6	23.4	23.1	23.0	23.6	23.5	23.0	21.6	21.3	20.3	20.2	19.1	18.7	

Source: Behavioral Risk Factor Surveillance System (BRFSS) 1984-2010.
The data are weighted to the 2000 California population. State BRFSS data are weighted to 2000 national population based on each states population.
Note an adjustment was made to address the change of smoking definition in 1996 that included more occasional smokers.
Prepared by: California Department of Public Health, California Tobacco Control Program, April 2011.

Projecting Improvements

- Likely to use Scale BB
- Static
- Question that remains is how many years into the future
  - 7 year is needed just to bring the mortality rates in line with the valuation dates where they will be used
  - 5 year is what was done in years past
  - Looking at anywhere between 10 and 20 years


Life Expectancy for a CalPERS Member Retiring at Age 55
(With Improvements Using Scale BB)
88
86
84
82
80
78
76
1994 Study
2004 Study
2009 Study
2013 Study
Projected 2018
Projected 2023
Projected 2028
Male
Female

Potential Impact on Rates

Potential Impact on Rates

- Changes in mortality rates, including improvements, will increase employer rate
- Will impact normal cost
- Could impact member contribution rate
  - PEPRA requires new PEPRA members to pay 50% of normal cost
  - Member rate changes when normal cost increase by more than 1% of payroll

Potential Impact on Rates

- Impact will be different for each employer
- Reasons:
  - Plan demographics
  - Ratio of liability to payroll

Potential Impact on Rates

	10 Year of Mortality Improvements	15 Year of Mortality improvements	20 Year of Mortality improvements
Estimated Impact on Total Normal Cost	0.2% to 0.4% of Payroll	0.3% to 0.6% of Payroll	0.5% to 0.8% of Payroll
Estimated Impact on Member Rate	No Impact	No Impact	No Impact
Impact on Employer Rate (Year 1)	0.4% to 0.9% of Payroll	0.7% to 1.4% of Payroll	1.0% to 1.8% of Payroll
Impact on Employer Rate (Year 6)	1.4% to 3.9% of Payroll	2.1% to 4.9% of Payroll	2.8% to 6.4% of Payroll

* Based on a sample of 10 plans.

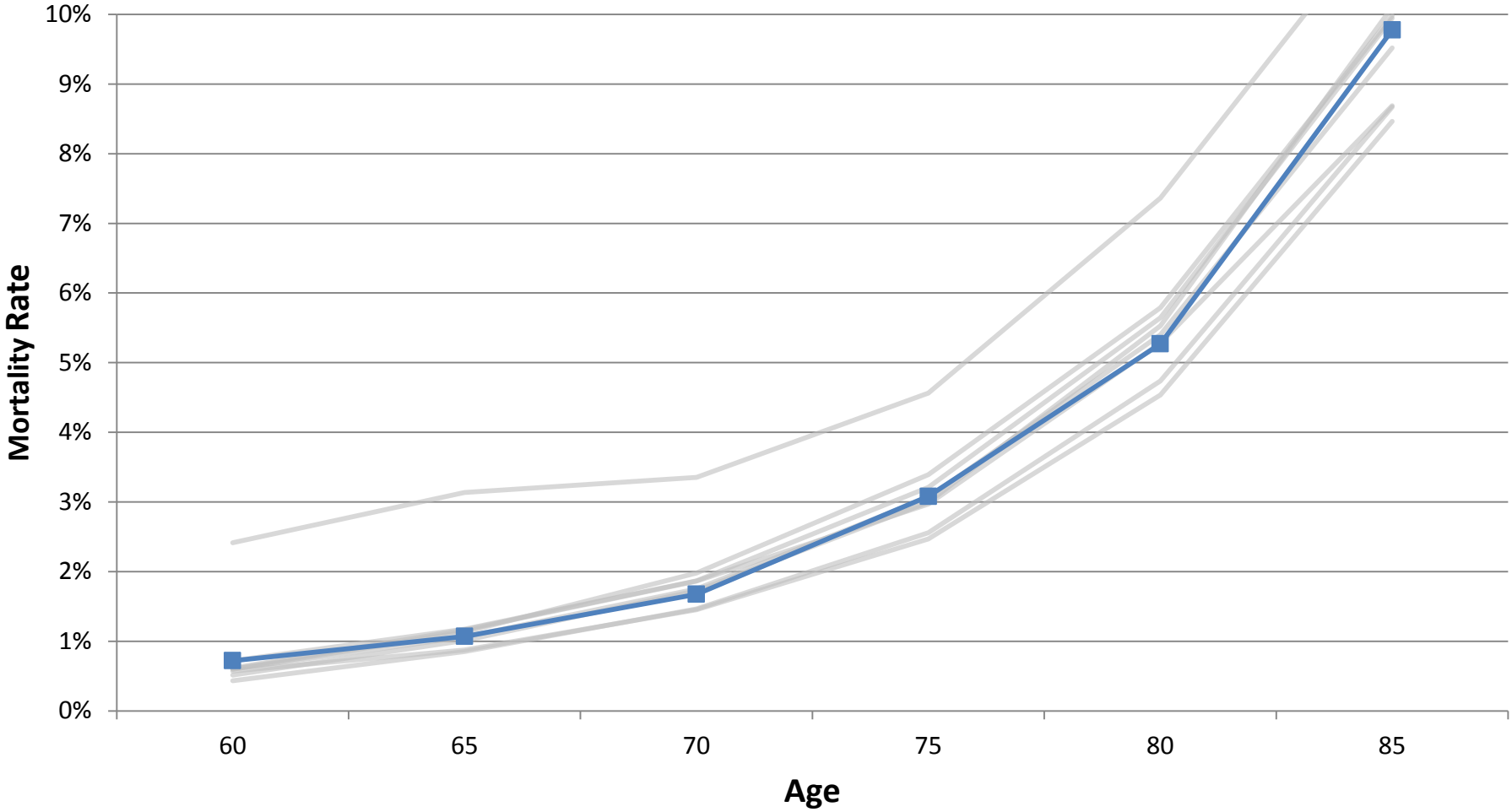
What Other Retirement Systems are Doing

Non-California Systems

- In a review of 24 Non-California Pension Plans, 18 had provisions for mortality improvement:

Scale AA	Setback Only	Scale AA & Setback	Scale BB	Other
10	1	4	1	2

Male Mortality Rates for CalPERS and Non California Pension Plans (Ages 60 to 85)

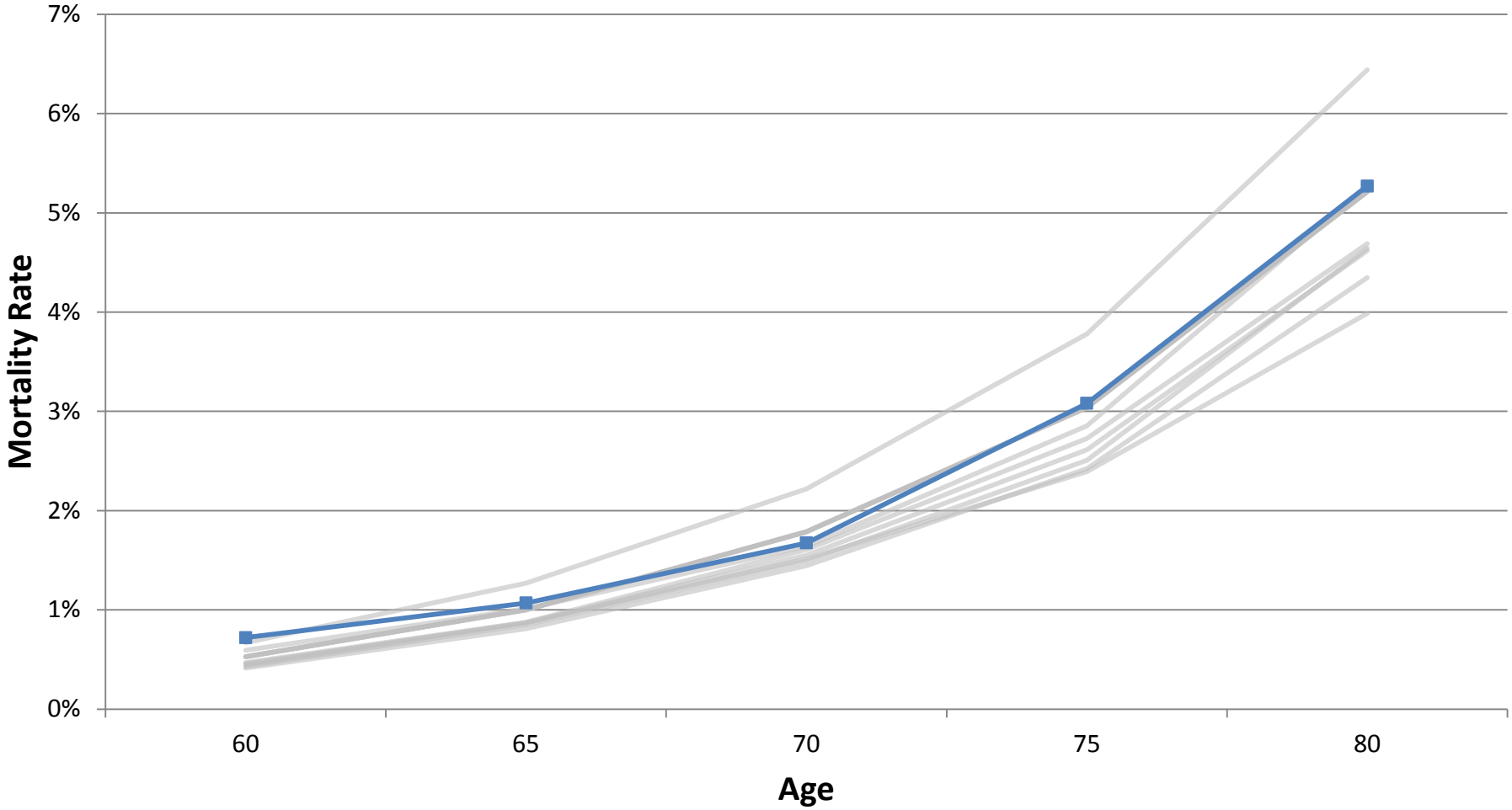


California Systems

- In a review of 14 California Pension Plans, 11 had provisions for mortality improvement:

Scale AA	Setback Only	Scale AA & Setback	Scale BB	Other
1	4	6	0	0

Male Mortality Rates for CalPERS and Other California Pension Plans (Ages 60 to 80)



Closing Comments

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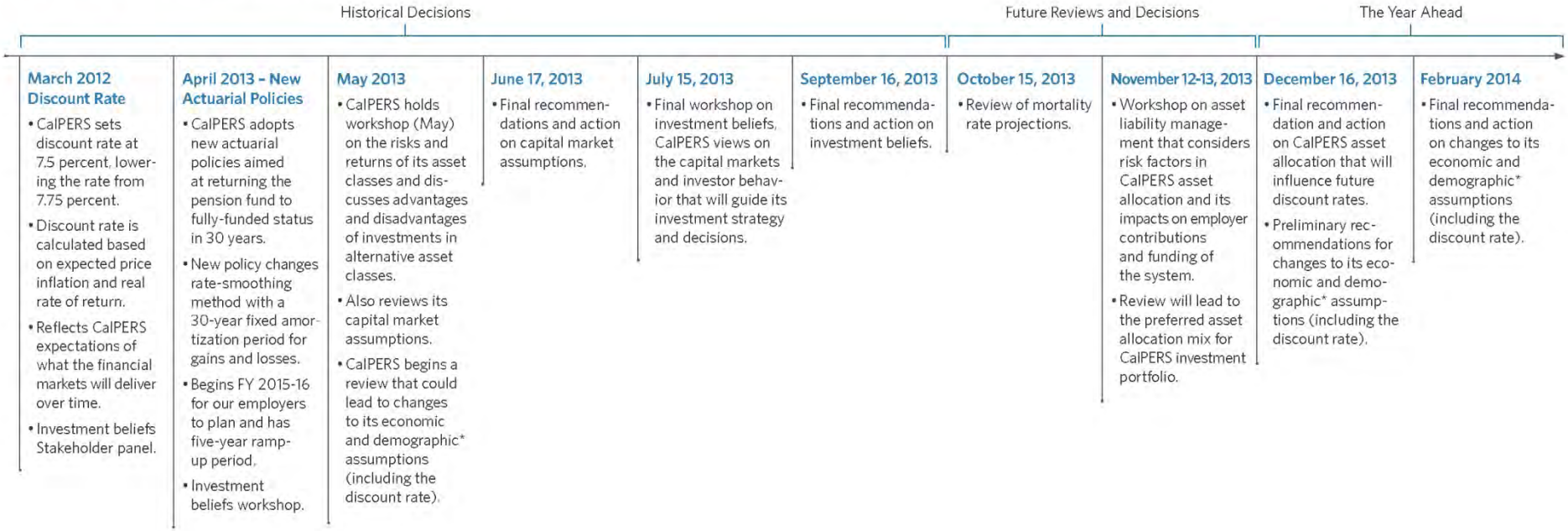
- Mortality improvements are necessary to ensure the proper funding of the system
- Questions are:
  - How much improvement?
  - How to build it into employer contributions?

CalPERS Path to a Sound and Sustainable Fund

Actions to strengthen integrity, will likely increase contributions

As stewards of the System, CalPERS must ensure that the pension fund is sustainable over multiple generations. Our strategic plan calls for us to take an integrated view of our assets and liabilities and to take steps designed to achieve a fully funded plan. (Note: timeline is subject to change.)

Read supporting material at ***www.calpers.ca.gov/alm***



CalPERS

Updated 10/08/13

*Examples of demographic assumptions include retirement rates, employment trends, disability rates, salary rate projections, and mortality rate projections.

Questions?

Appendix

Reference Material

- Scale BB Report

  http://www.soa.org/Files/Research/Exp-Study/research-mortality-improve-bb-report.pdf

- Literature review on mortality improvement rates in the U.S.

  www.soa.org/files/research/exp-study/research-2013-lit-review.pdf