Stanislaus County Employees' Retirement Association

Actuarial Experience Study
July 1, 2009 through June 30, 2012

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Executive Summary

Purpose

The purpose of this Actuarial Experience Study is to review the actuarial experience of the Stanislaus County Employees' Retirement Association (StanCERA, the Plan) during the period from July 1, 2009 through June 30, 2012.

The Plan's demographic experience – observed rates of retirement, withdrawal, vested termination, transfer, disability, and death – were compared with the experience expected under the actuarial assumptions adopted to determine Plan liabilities and cost, and revised assumptions are recommended as appropriate. Other demographic assumptions – such as commencement ages for deferred vested members and terminal pay loads – were also studied.

In addition, the plan's economic assumptions were reviewed. The economic assumptions include the assumed rates of inflation, COLA increases, investment return, and active payroll growth.

The purpose of this Section of the Study is to give the reader a quick summary of the major conclusions that have been reached. Details are presented in later sections of this Report.

Prior Experience Studies

The most recent Experience Study for the Plan was conducted by EFI in 2010, covering the period from July 1, 2006 through June 30, 2009. Based on that study, withdrawal and termination rates were updated, longevity and promotion pay assumptions were changed to be service-based, mortality assumptions were changed to incorporate the RP 2000 tables with mortality improvement, a terminal pay load to account for vacation cash outs was introduced, and the rate of return, inflation and COLA rates were lowered.

Retirement Rates

Over the past three years, actual rates of retirement have been somewhat lower than current actuarial assumptions would predict for the Safety members. Therefore, new sets of assumed retirement rates are proposed, bringing assumptions closer into line with experience.

For the Miscellaneous members, actual experience has been in close accord with assumptions, so no changes to the current assumed retirement rates are proposed.

Termination Rates

Overall, the total number of terminations (withdrawals, vested terminations and transfers) was higher than expected for both

Safety and male Miscellaneous members. The total number of terminations for female Miscellaneous members was less than expected. We have proposed separate male and female Miscellaneous termination rates, increasing the male rates, and reducing the female rates. We have also proposed increases in the termination rates for Safety members of both sexes.

We recommend assuming that 50% of Miscellaneous and 35% of Safety terminations before 10 years of service will take a refund, and that 20% of Miscellaneous and 10% of Safety terminations after nine years of service will take a refund. We recommend maintaining the assumption that 25% of Miscellaneous and 50% of Safety vested terminations be considered as transfers to a reciprocal employer.

Disability Rates

We recommended in our prior experience study to aggregate the disability experience of this study with the prior study. Some of the disability data reported during these combined Studies was quite limited; there were no ordinary (non-duty) reported disabilities among Safety members, and only six duty-related reported disabilities among the Miscellaneous members.

Based on the aggregated disability experience reported in this Study, we recommend that the current ordinary disability and Safety duty-related disability rates should be maintained until the next experience study. We also recommend that the Miscellaneous duty-related disability rates be reduced to reflect actual experience more closely.

Longevity and Promotion Pay Increases

The current actuarial assumption for members is that the pay of active members will increase by 3.75% per year due to inflation, and an additional 0.50% to 4.00% for Miscellaneous members and 0.50% to 8.00% for Safety members for merit, longevity and promotion, depending on the service of the member. Smaller increases are assumed after three years of service for General members.

An analysis of the average pay of active members by service reveals that these patterns of increases are still appropriate: Pay increases remain steeper in the early years of employment.

Mortality Rates

Mortality experience among active and retired members and their survivors in this Study was in reasonable agreement with assumptions, with the actual number of deaths slightly lower than expected. Recent changes in actuarial standards require that actuaries explicitly disclose their assumptions about future improvements in mortality. The current assumptions leave a small margin for future decreases in mortality. We recommend waiting to update mortality until the next study, when new Society of Actuaries tables will be available.

Other Demographic Assumptions and Methods

We have recommended increasing the accumulated vacation time load for Safety retirement and disability benefits from 1.0% to 2.5%.

We have also recommended modifying the Entry Age Normal funding methodology from Entry-Age-to-Decrement to Entry-Age-to-Final-Decrement, and to change from Aggregate to Individual Normal Cost calculation. These changes were recommended by Segal in the actuarial audit performed for the County, and both these methods will be required in new GASB standards. Although the changes would increase in Plan cost, the modification would result in a one-time improvement to the funding ratio.

Economic Assumptions

The current inflation assumption of 3.50% could be considered high, based on the opinions of experts and information which can be discerned from the investment markets. Accordingly, we propose a reduction in the inflation assumption from 3.50% to 3.25%, and a reduction in the payroll growth assumption from 3.75% to 3.50%.

We propose keeping the current real return assumption of 4.50%, which would correspond to a reduction in the nominal annual rate of return from 8.00% to 7.75%

We recommend that no changes be made to the rate of expected COLA growth (2.7%) at this time.

Impact on Plan Costs

The following table shows the expected impact of the proposed assumption changes on the current employer contribution rate and funding ratio, based on preliminary actuarial valuation results as of June 30, 2012.

	Increase in Actuarial Cost (% Payroll)	Funding Ratio
June 30, 2012 Valuation	**18.09%**	**79.07%**
Economic Assumptions	1.80%	(2.13%)
Admin Expenses	0.98%	0.00%
Demographic Rates	(0.06%)	0.02%
Vacation Pay Load	0.10%	(0.09%)
Results Before Method Change	**20.91%**	**76.87%**
Actuarial Methods	2.12%	4.72%
Results After Method Change	**23.03%**	**81.59%**

The impact of the recommended demographic assumption changes - rates of retirement, termination, and disability - do not represent a significant departure from current assumptions.

Therefore, in aggregate, Plan contribution rates will not be greatly affected by changes in demographic assumptions. Revised economic assumptions are another matter: Changes to the inflation and investment return assumptions, and the addition of an explicit administrative expense assumption, will increase the actuarial contribution rate by approximately 2.8% of pay. The changes to the actuarial methods will result in an increase in employer contributions of approximately 2.1%, but a relative improvement in the funding ratio of nearly 5%.

Should all of the recommendations in this Report be adopted, an increase in the total actuarial employer contribution rate of approximately 5% will result. Employee contributions rates will be recomputed using the revised assumptions, and will also increase.

California Pension Reform

The California Public Employees' Pension Reform Act (PEPRA, AB 340) was enacted into law in 2012. Members joining StanCERA on and after January 1, 2013 will receive different benefits, with different eligibility rules, than current members. Consequently, they may experience different rates of termination, disability, and retirement than current Plan members.

This Experience Study is concerned only with current Plan members. As new members join the Plan with the benefits mandated by PEPRA, their actuarial experience will be monitored to determine if different assumptions are warranted for them.

Organization of Report

The first section of the Report deals with decrements among active members and also includes consideration of other demographic assumptions, such as the merit component of pay increases and recommendations regarding terminal pay loads.

The second section of the Report deals with mortality among active and inactive members.

The third section of the Report concerns economic assumptions.

A final section presents methodological details.

To the best of our knowledge, this report and its contents have been prepared in accordance with generally recognized and accepted actuarial principles and practices which are consistent with the Code of Professional Conduct and applicable Actuarial Standards of Practice set out by the Actuarial Standards Board. Furthermore, as credentialed actuaries, we meet the Qualification Standards of the American Academy of Actuaries to render the opinion contained in this report. This report does not address any contractual or legal issues. We are not attorneys and our firm does not provide any legal services or advice.

This Report was prepared exclusively for StanCERA for the purpose described herein. This Report is not intended to benefit any third party, and neither Cheiron nor EFI Actuaries assumes any duty or liability to any such party. We will be happy to answer any

questions from StanCERA Board or staff regarding the Report's methodology or conclusions.

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Active Decrements

Service Retirement (Miscellaneous)

Current Assumption

Summary of Experience versus Current Assumptions (Ages 50-69, 10+ Years of Service)

	Eligible Exposure	Actual Retirements	Expected Retirements	Actual to Expected Ratio
Males	854	99	101.5	97.5%
Females	2,325	255	251.1	101.5%
Combined	**3,179**	**354**	**352.7**	**100.4%**

	Actual Average Age	Expected Average Age
Males	59.9	59.6
Females	59.2	59.0
Combined	**59.4**	**59.2**

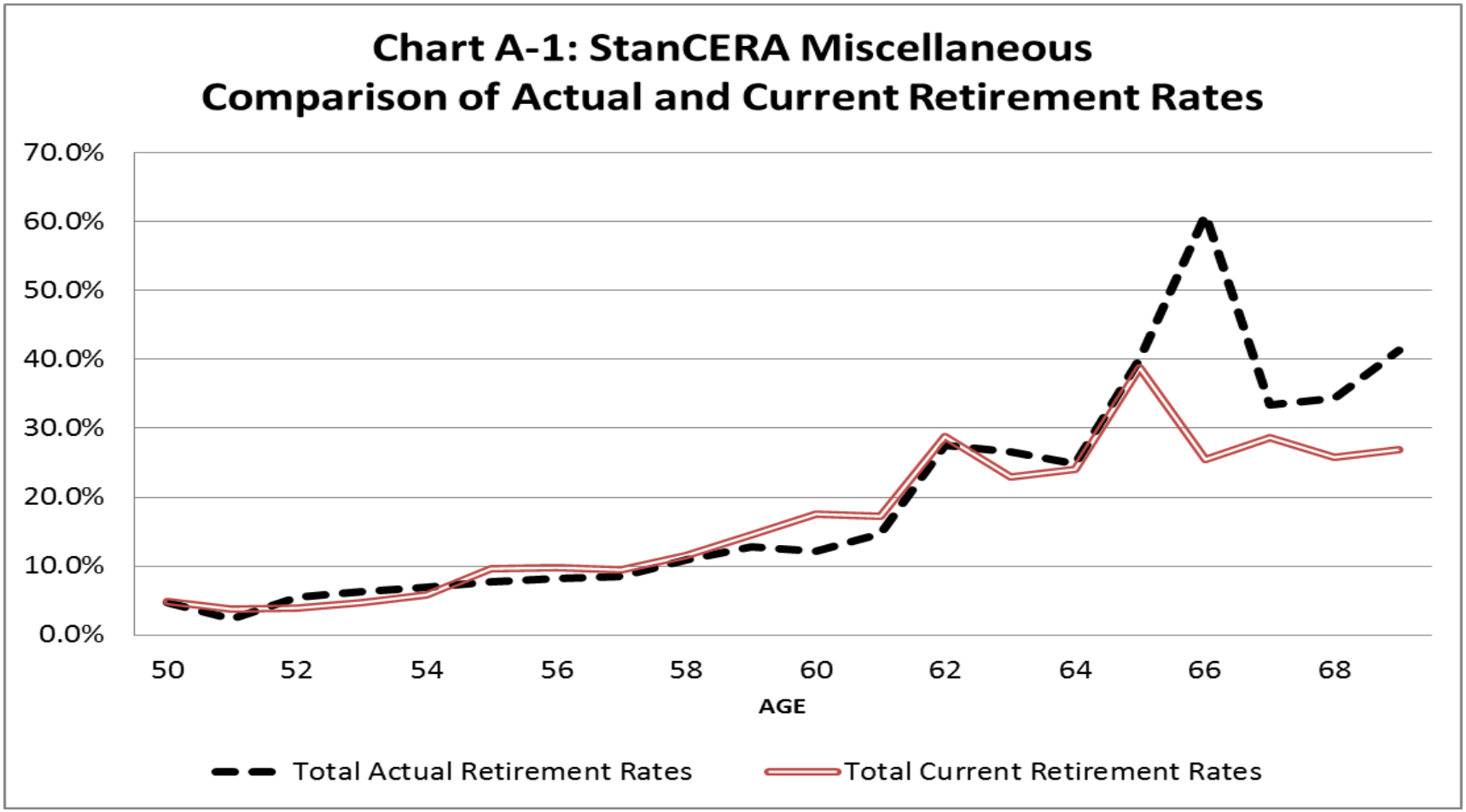
- Miscellaneous members are currently eligible to retire at age 70, age 50 (55 for Tier 3 members) with 10 years of membership or at any age with 30 or more years of Eligibility Service.
- Members recorded in the data as a vested termination or transfer while eligible for a service retirement benefit were counted as a service retirement, since they are eligible to begin receiving their benefit immediately.
- There were several members who appeared to retire with less than ten years of service; none have been assumed to retire in the past. These members may have had service with a reciprocal employer.
- We excluded the exposures and decrements for those above age 70 from this analysis.

It is common practice within public sector plans to assume that all members over age 70 will retire immediately.

- Average age among actual member retirements agreed well with that predicted by the actuarial assumptions.
- **Recommendation**
- Because the actual rates of retirement by age were in close agreement with those expected, we have not proposed any changes to the expected service retirement rates. See Chart A-1 below for more details.
- We have not proposed introducing rates for those less than age 70 with less than ten years of service. The impact of such retirements on Plan cost is not expected to be material. However, we will continue to monitor the frequency and circumstances of these retirements.
- No change is recommended to the assumption that all members are assumed to retire immediately at age 70, regardless of service. Only 0.2% of all active exposures were for members over age 70, so this assumption should have very little impact on plan cost.

Miscellaneous Retirement Rates – Current (with 10+ years of service)

Age	Rate
50	5.0%
51	4.0%
52	4.0%
53	5.0%
54	6.0%
55	10.0%
56	10.0%
57	10.0%
58	12.0%
59	15.0%
60	18.0%
61	18.0%
62	30.0%
63	25.0%
64	25.0%
65	40.0%
66	30.0%
67	30.0%
68	30.0%
69	30.0%
70+	100.0%



In reviewing Chart A-1, we can see that the current assumed retirement rates fit the actual retirement rates reasonably well by age.

Service Retirement (Safety)

Current Assumption

Summary of Experience versus Current Assumptions (Ages 40-59)

	Eligible Exposure	Actual Retirements	Expected Retirements	Actual to Expected Ratio
Male	239	27	34.5	78.4%
Female	62	11	6.4	171.9%
Combined	**301**	**38**	**40.9**	**93.0%**

	Actual Average Age	Expected Average Age
Male	52.9	53.0
Female	52.7	51.4
Combined	**52.8**	**52.8**

- Safety members are currently eligible to retire at age 70, age 50 with 10 years of service, or at any age with 20 or more years of service.
- Members recorded as a vested termination or transfer while eligible for a service retirement benefit are counted as a retirement, since they are eligible to begin receiving their benefit immediately.
- When developing the proposed assumptions we combined the experience of the genders; the amount of female experience is small.
- We excluded the exposures and decrements for those younger than 40 and older than 60 years old; there have been very few retirements at these ages.

Recommendation

Summary of Experience versus Proposed Assumptions (Ages 40-59)

	Eligible Exposure	Actual Retirements	Expected Retirements	Actual to Expected Ratio
Male	239	27	28.7	94.2%
Female	62	11	5.9	188.0%
Combined	**301**	**38**	**34.5**	**110.1%**

	Actual Average Age	Expected Average Age
Male	52.9	52.5
Female	52.7	51.0
Combined	**52.8**	**52.2**

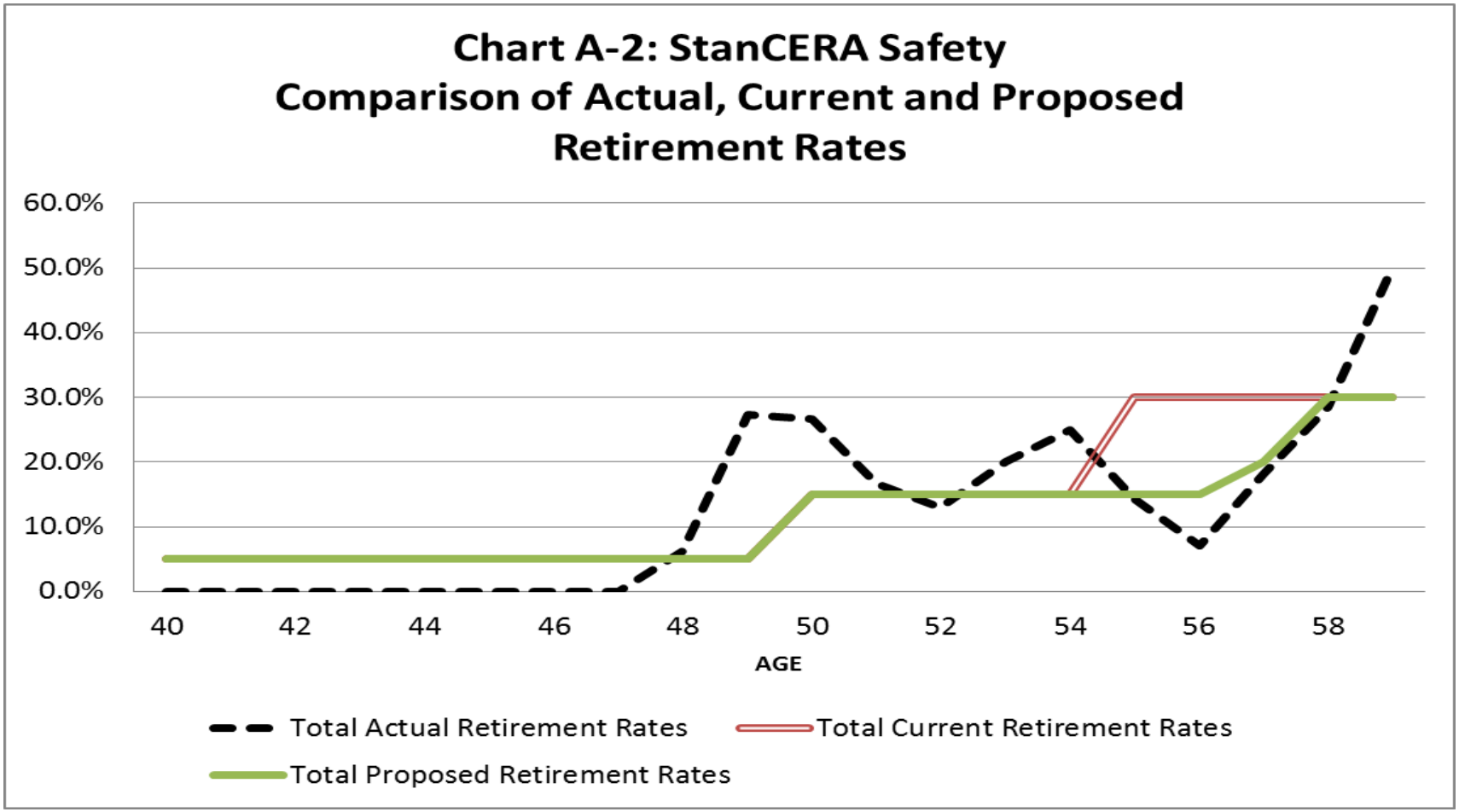
- New rates are proposed reflecting lower expected retirement rates for ages 55 through 57. See Chart A-2.
- The new assumptions do not fully reflect the lower rates reflected in the actual experience during the last three years. There were more retirements observed during the prior Experience Study, so we have suggested rates between those in this Study and the prior Study.
- The experience of this Study can be combined with that of the next Experience Study to determine whether the change in retirement behavior is continuing.
- Maintaining a single set of rates for both males and females is recommended, due to the limited amount of female experience.
- We continue to assume all members with 10 years of service will retire at age 60.

Safety Retirement Rates - Current

Age	Rate
40 – 44	5.0%
45 – 49	5.0%
50	15.0%
51	15.0%
52	15.0%
53	15.0%
54	15.0%
55	30.0%
56	30.0%
57	30.0%
58	30.0%
59	30.0%
60+	100.0%

Safety Retirement Rates – Proposed

Age	Rate
40 – 44	5.0%
45 – 49	5.0%
50	15.0%
51	15.0%
52	15.0%
53	15.0%
54	15.0%
55	**15.0%**
56	**15.0%**
57	**20.0%**
58	30.0%
59	30.0%
60+	100.0%



In reviewing Chart A-2, we see that the proposed assumptions match actual experience better than the prior assumptions at the higher ages.

Termination – Withdrawals, Vested and Non-Vested Terminations and Transfers (Miscellaneous)

Current Assumption

Summary of Experience versus Current Assumptions

	Eligible Exposure	Actual Withdrawals	Expected Withdrawals	Actual to Expected Ratio
Male	1,828	118	108.3	109.0%
Female	5,286	251	296.7	84.6%
Combined	**7,114**	**369**	**405.0**	**91.1%**

	Actual Average Age	Expected Average Age
Male	40.5	41.0
Female	39.7	40.3
Combined	**40.0**	**40.5**

- A withdrawal occurs when a member terminates employment and withdraws his or her member contributions. A vested or non-vested termination applies to active members who terminate and leave their member contributions on deposit with the Plan. A transfer occurs if a member terminates and continues working with a reciprocal employer.
- For this analysis, we have combined the withdrawal, termination and transfer assumptions to develop a single assumption for terminations. Separately, we have analyzed the percentages of those terminating who withdraw, leave contributions on deposit, or transfer.
- Currently, a single set of service-based termination rates is assumed for both males and females. No terminations are assumed to occur once a member is eligible for retirement.
- Termination rates are strongly related to service, steadily decreasing as service increases (see Chart A-3). Male and female rates were different in early years of employment.

Recommendation

Summary of Experience versus Proposed Assumptions

	Eligible Exposure	Actual Withdrawals	Expected Withdrawals	Actual to Expected Ratio
Male	1,828	118	116.4	101.4%
Female	5,286	251	281.5	89.2%
Combined	**7,114**	**369**	**397.9**	**92.7%**

	Actual Average Age	Expected Average Age
Male	40.5	40.8
Female	39.7	40.5
Combined	**40.0**	**40.6**

- We have proposed separating male and female termination rates, lowering female rates from zero to two years of service, and raising male rates at zero, two and three years of service to better match experience (see Chart A-3).
- We recommend assuming that 50% of those terminating with less than ten years of service will take a refund, as will 20% of those terminating with five or more years of service.
- We also recommend maintaining the current assumption that 25% of vested terminated Miscellaneous members are reciprocal terminations.
- We recommend continuing the assumption that no withdrawals will occur once a member is eligible to retire.

Miscellaneous Termination Rates – Current Representative Rates

Service	All Ages
0	18.5%
1	14.0%
2	9.4%
3	7.9%
4	7.1%
5	5.0%
10	3.5%
15	2.9%
20	1.5%
25	1.3%
30	0.0%

No terminations are assumed for participants eligible for service retirement.

Rates include withdrawals and vested terminations.

Miscellaneous Termination Rates – Proposed Representative Rates

Service (All Ages)	Males	Females
0	**24.0%**	**14.0%**
1	**14.0%**	**9.4%**
2	**11.7%**	**7.9%**
3	**9.4%**	**7.9%**
4	7.1%	7.1%
5	5.0%	5.0%
10	3.5%	3.5%
15	2.9%	2.9%
20	1.5%	1.5%
25	1.3%	1.3%
30	0.0%	0.0%

No terminations are assumed for participants eligible for service retirement.

Rates include withdrawals and vested terminations.

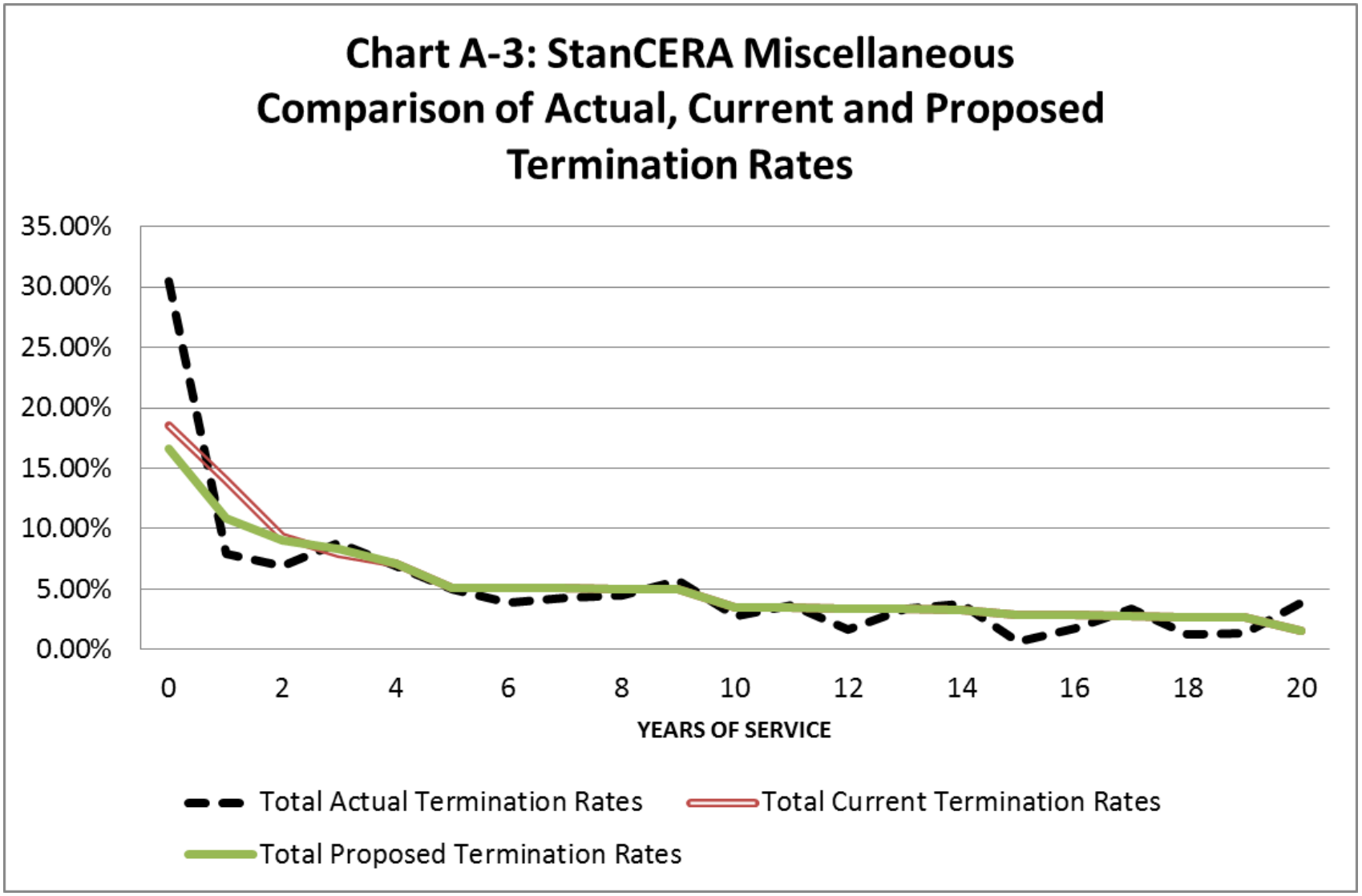


Chart A-3 shows that proposed reduced withdrawal rates for those with less than five years of service more accurately reflect the actual data.

Termination – Withdrawals, Vested and Non-Vested Terminations and Transfers (Safety)

Current Assumption

Summary of Experience versus Current Assumptions

	Eligible Exposure	Actual Terminations	Expected Terminations	Actual to Expected Ratio
Male	1,356	79	61.3	129.0%
Female	365	21	16.2	129.5%
Combined	**1,721**	**100**	**77.5**	**129.1%**

	Actual Average Age	Expected Average Age
Male	32.5	34.5
Female	31.7	33.2
Combined	**32.3**	**34.2**

- A withdrawal occurs when a member terminates employment and withdraws his or her member contributions. A vested or non-vested termination applies to active members who terminate and leave their member contributions on deposit with the Plan. A transfer occurs if the terminated member continues working with a reciprocal employer.
- For this analysis, we have combined the withdrawal, termination and transfer assumptions to develop a single assumption for terminations. Separately, we have analyzed the percentages of those terminating who withdraw, leave contributions on deposit, or transfer.
- Currently, a single set of service-based termination rates are assumed for both males and females.
- No terminations are assumed to occur once a member is eligible for retirement.
- Termination rates are strongly related to service, steadily decreasing as service increases (see Chart A-4).

Recommendation

Summary of Experience versus Proposed Assumptions

	Eligible Exposure	Actual Terminations	Expected Terminations	Actual to Expected Ratio
Male	1,356	79	66.2	119.4%
Female	365	21	17.3	121.6%
Combined	**1,721**	**100**	**83.5**	**119.8%**

	Actual Average Age	Expected Average Age
Male	32.5	33.9
Female	31.7	32.8
Combined	**32.3**	**33.7**

- The largest difference was in the first two years of service. As there are few exposures in those years of service, we also looked at the experience from the prior experience study.
- The combined experience from 2006 to 2012 still showed actual terminations to be higher than expected at years of low service, but not at the levels experienced in the last three years.
- We have proposed increases to the termination rates below four years of service and decreases at thirteen and fourteen years of service to better match experience (see Chart A-4).
- We recommend assuming that 35% of those terminating with less than ten years of service will take a refund, as will 10% of those terminating with ten or more years of service. We also recommend maintaining the current assumption that 50% of vested terminated Safety members are reciprocal terminations.
- We recommend continuing the assumption that no withdrawals will occur once a member is eligible to retire. Maintaining a single set of rates for both males and females is recommended, due to the limited amount of female experience.

Safety Termination Rates – Current Representative Rates

Service	All Ages
0	13.0%
1	10.5%
2	9.0%
3	7.5%
4	6.0%
5	3.7%
10	3.4%
15	1.9%
20	0.0%

No terminations are assumed for participants eligible for service retirement.

Rates include withdrawals and vested terminations.

Safety Termination Rates – Proposed Representative Rates

Service	All Ages
0	**15.0%**
1	**15.0%**
2	**10.5%**
3	**10.0%**
4	6.0%
5	3.7%
10	3.4%
15	1.9%
20	0.0%

No terminations are assumed for participants eligible for service retirement.

Rates include withdrawals and vested terminations.

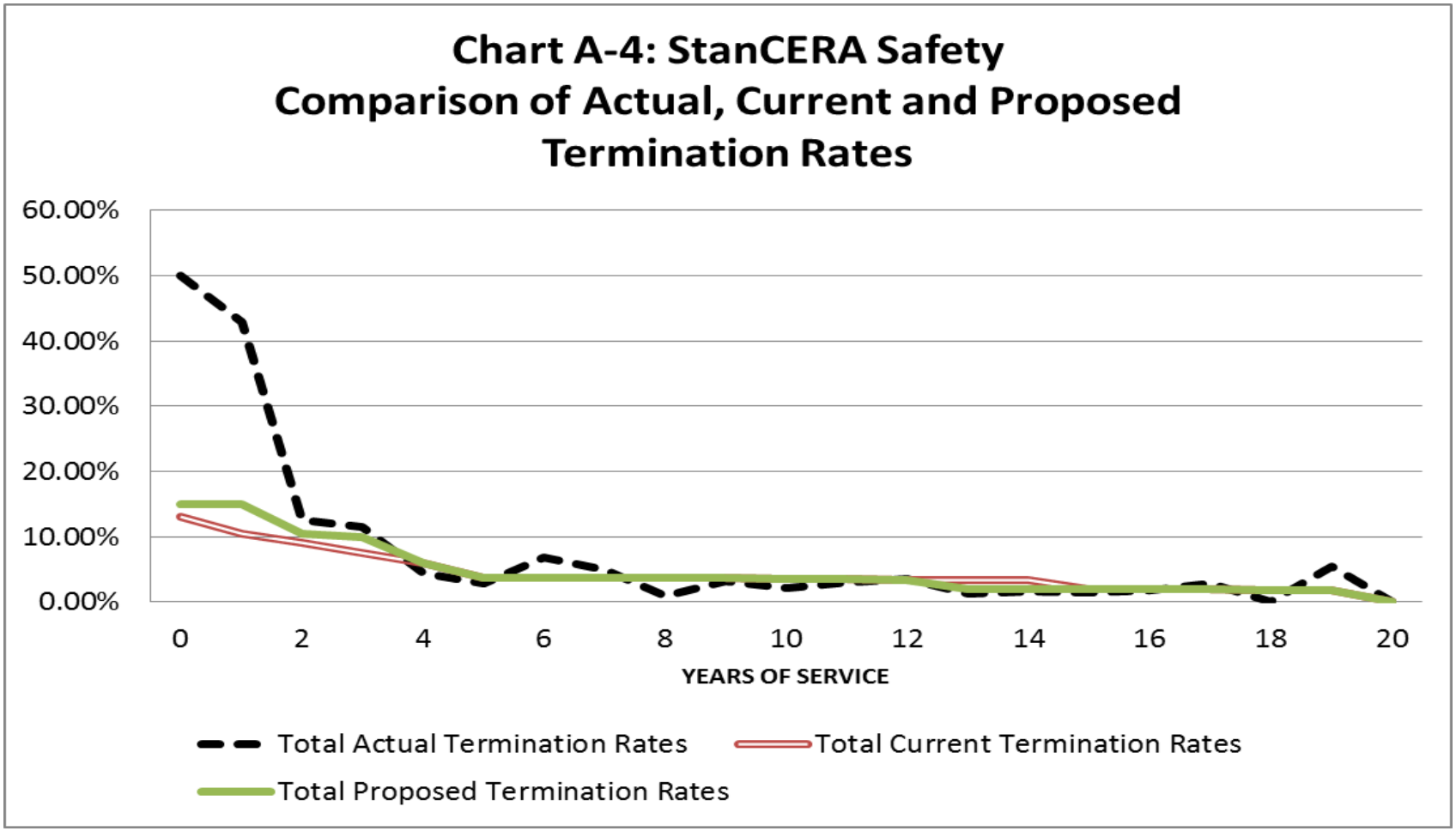


Chart A-4 shows the proposed withdrawal rates - reduced for those with less than five years of service, more accurately reflecting the actual data.

Ordinary Disability (Miscellaneous)

Current Assumption

Summary of Experience versus Current Assumptions

2006-2012	Eligible Exposure	Actual Disabilities	Expected Disabilities	Actual to Expected Ratio
Male	4,189	3	5.4	56.0%
Female	12,125	14	14.3	97.9%
Combined	**16,314**	**17**	**19.7**	**86.5%**

	Actual Average Age	Expected Average Age
Male	48.3	53.1
Female	49.9	53.3
Combined	**49.6**	**53.2**

- As we suggested in our prior study, we combined the data from this Experience Study with our prior Study in order to obtain a larger set of exposures from which to draw conclusions.
- Members are eligible for non-service-connected disability retirement if they are permanently disabled at any age after earning five years of service.
- Current assumptions for service-connected disabilities are based on age and gender, and applied to those members who have at least five years of service.
- The disability data reported over the experience study period is extremely limited.

Recommendation

- The number of non-duty disabilities occurring has been close to the number assumed. Because of this, we propose maintaining the current assumptions until the next experience study.

Current Representative Assumed Rates

Age	Male	Female
22	0.020%	0.003%
27	0.036%	0.005%
32	0.035%	0.013%
37	0.049%	0.039%
42	0.071%	0.057%
47	0.109%	0.098%
52	0.154%	0.142%
57	0.209%	0.231%
62	0.269%	0.307%

Ordinary Disability (Safety)

Current Assumption

Summary of Experience versus Current Assumptions

2006-2012	Eligible Exposure	Actual Disabilities	Expected Disabilities	Actual to Expected Ratio
Male	2,328	0	2.4	0.0%
Female	616	0	0.5	0.0%
Combined	**2,944**	**0**	**2.9**	**0.0%**

- As we suggested in our prior study, we combined the data from this Experience Study with our prior Study in order to obtain a larger set of exposures from which to draw conclusions.
- Members are eligible for non-service-connected disability retirement if they are permanently disabled at any age after earning five years of service.
- Current assumptions for non-service-connected disabilities are based on age, and applied to those members who have at least five years of service.
- Because of the limited amount of female data available, combined sex rates are used.

  The disability data reported over the current and prior experience study periods is extremely limited; there were no non-service connected disabilities reported during the combined study periods, and less than three expected.

Recommendation

- Because of the lack of data, we propose maintaining the current assumptions until the next experience study.
- The experience of the current period can be combined with that of the next period to obtain a better sample from which to develop conclusions.

Current Representative Assumed Rates

Age	Rate
22	0.026%
27	0.048%
32	0.046%
37	0.065%
42	0.095%
47	0.145%
52	0.205%
57	0.279%

Duty Disability (Miscellaneous)

Current Assumption

Summary of Experience versus Current Assumptions

2006-2012	Eligible Exposure	Actual Disabilities	Expected Disabilities	Actual to Expected Ratio
Males	5,615	4	6.5	61.1%
Females	15,816	2	6.2	32.4%
Combined	**21,431**	**6**	**12.7**	**47.2%**

	Actual Average Age	Expected Average Age
Males	54.5	52.1
Females	54.0	53.0
Combined	**54.3**	**52.5**

- As we suggested in our prior Study, we combined the data from this Experience Study with our prior Study in order to obtain a larger set of exposures from which to draw conclusions.
- Members are eligible for service-connected disability retirement if they are permanently disabled in the line of duty at any age or service level.
- Current assumptions for service-connected disabilities are based on age and gender, and are applied to all Miscellaneous members.
- The number of actual male and female duty-related disabilities was below the expected number in the most recent six-year period.

Recommendation

Summary of Experience versus Proposed Assumptions

	Eligible Exposure	Actual Disabilities	Expected Disabilities	Actual to Expected Ratio
Males	5,615	4	4.4	91.7%
Females	15,816	2	2.1	97.2%
Combined	**21,431**	**6**	**6.4**	**93.4%**

	Actual Average Age	Expected Average Age
Males	54.5	52.1
Females	54.0	53.0
Combined	**54.3**	**52.4**

- The current Miscellaneous male rates were reduced by 33% and female rates were reduced by 67% to produce new duty disability rates. These rates produce a lower overall number of expected disabilities.

Miscellaneous Duty Disability Rates – Current Representative Rates

Age	Male	Female
22	0.010%	0.001%
27	0.018%	0.001%
32	0.035%	0.003%
37	0.049%	0.010%
42	0.071%	0.021%
47	0.109%	0.037%
52	0.154%	0.058%
57	0.209%	0.087%
62	0.269%	0.115%

Miscellaneous Duty Disability Rates – Proposed Representative Rates

Age	Male	Female
22	**0.007%**	**0.000%**
27	**0.012%**	**0.000%**
32	**0.023%**	**0.001%**
37	**0.033%**	**0.001%**
42	**0.047%**	**0.007%**
47	**0.078%**	**0.012%**
52	**0.103%**	**0.019%**
57	**0.140%**	**0.029%**
62	**0.180%**	**0.038%**

Duty Disability (Safety)

Current Assumption

Summary of Experience versus Current Assumptions

2006-2012	Eligible Exposure	Actual Disabilities	Expected Disabilities	Actual to Expected Ratio
Males	3,273	16	24.4	65.6%
Females	886	3	5.6	53.4%
Combined	**4,159**	**19**	**30.0**	**63.3%**

	Actual Average Age	Expected Average Age
Males	43.1	43.3
Females	47.3	40.9
Combined	**43.7**	**42.9**

- As we suggested in our prior Study, we combined the data from this Experience Study with our prior Study in order to obtain a larger set of exposures from which to draw conclusions.
- Members are eligible for service-connected disability retirement if they are permanently disabled in the line of duty at any age or service level.
- Current assumptions for service-connected disabilities are based on age, and are applied to all Safety members.
- Because of the limited amount of female data available, combined sex rates are used.
- The number of actual male and female duty-related disabilities was below the expected number in the most recent three-year period (7 actual vs. 15 expected). This was also true for the prior Experience Study audit, though the difference was much smaller (12 actual vs. 15 expected).

Recommendation

- The number of excessive expected disabilities appears greatest at the lower ages; however there are still relatively few exposures in those age groups, even with six years of experience. Although the overall rate of disability was significantly lower than expected during this period, the number expected was still quite small, and the experience during the prior period was close to that expected.
- There is frequently a lag between when disabilities occur and when they are approved; therefore, there could be a number of disabilities which occurred during the Study period, but have not yet been reported.
- Therefore no changes to the rates have been proposed. We will continue to monitor the number of duty disabilities, and will likely recommend a reduction in the rates at the time of the next Experience Study if the recent patterns are sustained.

Miscellaneous Duty Disability Rates – Current Representative Rates

Age	Rate
22	0.162%
27	0.324%
32	0.557%
37	0.804%
42	1.004%
47	1.254%
52	1.658%
57	1.937%

Longevity and Promotion Pay Increases (Miscellaneous)

Pay increases consist of three components: Increases due to cost of living maintenance (inflation), increases related to non-inflationary pressures on base pay (such as productivity increases), and increases in individual pay due to merit, promotion, and longevity. Only increases due to merit (promotion and longevity) are considered here; increases due to cost of living and non-inflationary base pay factors are addressed in a later section of this report.

Current Assumption

Years of Service	Assumed Increase
0 – 4	4.00%
5 – 9	2.00%
10 – 19	1.00%
20+	0.50%

- The current assumptions are based on service.
- In the charts below, the average pay of the active members as of June 30, 2012 has been plotted against service. For example, the average pay for Miscellaneous members with two years of service is about $50,000.
- In addition, a line of best fit, given the prior age-based pay assumptions is applied to the average pay data (the red line in Chart A-5). This line provides a visual indicator of how well the expected age-based pay increases are correlated with the actual data.

Recommendation

- No new rates have been proposed. The current service-related assumptions closely match the line of best fit.
- The line of best fit based on the service-related assumptions is shown by the black line in Chart A-5.
- Note: This is called a *transverse* study of longevity and promotion pay increases; for a more detailed description of this type of study and its benefits, see the methodology section at the end of this report.

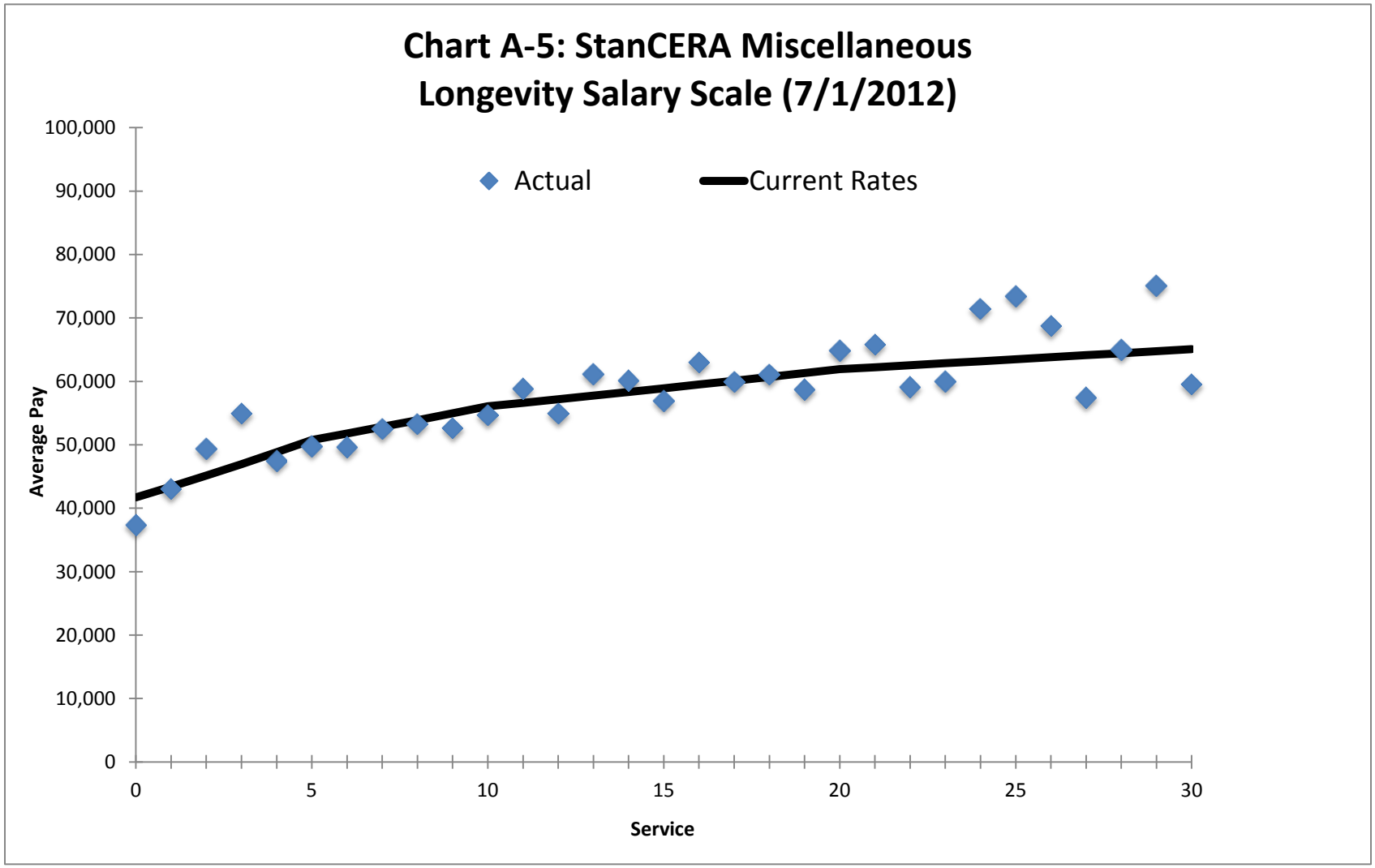


Chart A-5: StanCERA Miscellaneous
Longevity Salary Scale (7/1/2012)
Actual
Current Rates
Average Pay
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
0
5
10
15
20
25
30
Service

Longevity and Promotion Pay Increases (Safety)

Current Assumption

Years of Service	Assumed Increase
0	8.00%
1	7.00%
2	6.00%
3	5.00%
4	4.00%
5 - 9	2.00%
10 - 29	1.00%
30+	0.50%

- The current assumptions are based on service.
- In the charts below, the average pay of the active members as of June 30, 2012 has been plotted against service. For example, the average pay for Safety members with six years of service is about $60,000.
- In addition, a line of best fit, given the prior age-based pay assumptions is applied to the average pay data (the red line in Chart A-6). This line provides a visual indicator of how well the expected age-based pay increases are correlated with the actual data.

Recommendation

- No new rates have been proposed. The current service-related assumptions closely match the line of best fit.
- The line of best fit based on the service-related assumptions is shown by the black line in Chart A-6.

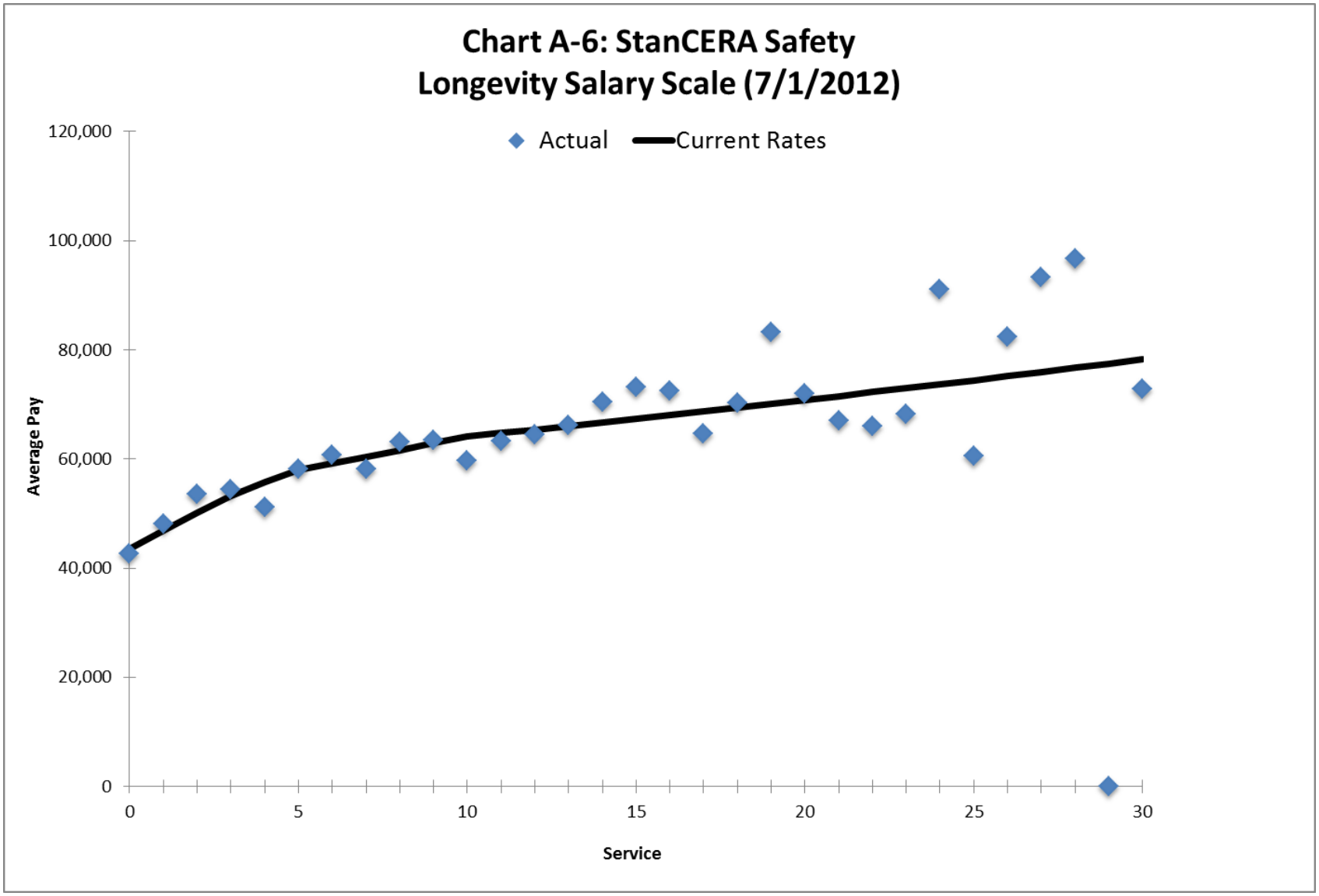


Chart A-6: StanCERA Safety
Longevity Salary Scale (7/1/2012)
Actual
Current Rates
120,000
100,000
80,000
60,000
40,000
20,000
0
Average Pay
0
5
10
15
20
25
30
Service

Mortality (Non-Disabled)

Current Assumptions (Miscellaneous & Safety)

Summary of Experience versus Current Assumptions

ACTIVE	Eligible Exposure	Actual Deaths	Expected Deaths	Actual to Expected Ratio
Males (09-12)	4,318	9	7.8	115.3%
Females (09-12)	8,055	9	13.2	68.3%
Males (06-09)	4,630	8	7.4	107.5%
Females (06-09)	8,679	13	12.2	106.4%
Combined	**25,682**	**39**	**40.6**	**96.0%**

RETIRED & SURVIVING SPOUSES	Eligible Exposure	Actual Deaths	Expected Deaths	Actual to Expected Ratio
Males (09-12)	2,908	79	78.2	101.0%
Females (09-12)	4,779	142	129.8	109.4%
Males (06-09)	2,573	76	69.5	109.3%
Females (06-09)	4,115	112	111.9	100.1%
Combined	**14,375**	**409**	**389.4**	**105.0%**

ALL PARTICIPANTS	Eligible Exposure	Actual Deaths	Expected Deaths	Actual to Expected Ratio
Males (09-12)	7,226	88	86.0	102.3%
Females (09-12)	12,834	151	142.9	105.6%
Males (06-09)	7,203	84	76.9	109.2%
Females (06-09)	12,794	125	124.1	100.7%
Combined	**40,057**	**448**	**430.1**	**104.2%**

- The current actuarial assumptions for non-disabled active, and retired members and their beneficiaries are the RP2000 Combined Healthy Tables (without age adjustment) projected from 2000 to 2020 using Projection Scale AA.
- Mortality was updated from 1994 GAM Mortality Tables in the prior Study.
- Experience has been aggregated with the prior Study to ensure adequate exposure, and to assist in the analysis of the underlying trends. The analysis now includes six years of experience (2006-2012).
- Actual deaths among active members are frequently below actuarial assumptions, as is the case for this Study on an aggregate basis. Active members often become disabled or retire when they are in poor health, so these deaths are reported in the inactive categories.
- The actuarial standards for selecting mortality assumptions have changed. Actuarial Standards of Practice (ASOP) #35 explicitly requires that actuaries disclose an assumption about future improvements in mortality:

  "Include an assumption as to expected mortality improvement after the measurement date. This assumption should be disclosed… even if the actuary concludes than an assumption of zero future improvement is reasonable… 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."

Recommendation	
• The current assumptions provide a small margin between the number of actual deaths and the number expected, for the active members, retired members, and their beneficiaries. We will continue to monitor mortality experience, and determine if further modifications to the assumptions may be needed in future years. • We propose continuing the use of the special table for duty-related active Safety deaths. The amount of data available is too limited to develop a separate new table.	

Mortality (Disabled)

Current Assumptions (Miscellaneous & Safety)

Summary of Experience versus Current Assumptions

	Eligible Exposure	Actual Deaths	Expected Deaths	Actual to Expected Ratio
Males (09-12)	512	9	12.6	71.7%
Females (09-12)	406	10	8.7	115.3%
Males (06-09)	507	13	9.1	142.5%
Females (06-09)	410	11	9.4	117.4%
Combined	**1,835**	**43**	**39.7**	**108.3%**

- The current actuarial assumptions for disabled members are the RP2000 Combined Healthy Tables projected from 2000 to 2020 using Projection Scale AA with a seven year age set-forward.
- Mortality was updated from the 1981 Disability Mortality Tables for General and Safety Members published by the Society of Actuaries in the prior study.
- Experience has been aggregated with the prior Study to ensure adequate exposure, and to assist in the analysis of the underlying trends. The analysis now includes six years of experience (2006-2012).

Recommendation

- As with non-disabled mortality, the current assumptions provide a small margin between the number of actual deaths and the number expected, for the disabled members. We will continue to monitor mortality experience, and determine if further modifications to the assumptions may be needed in future years.

Summary of Experience

In this section, we look at a summary of experience. This will provide a sense of how well the current demographic assumptions predicted experience in aggregate over the years studied. It will also give an indication as to how the assumption changes proposed within this study would have performed during the same time period.

Summary of Demographic Experience

			Current Assumptions		Proposed Assumptions	
Assumption	**Expo-sure**	**Actual**	**Expect**	**A/E Ratio**	**Expect**	**A/E Ratio**
Retirement	3,480	392	394	100%	387	101%
Termination & Withdrawal	8,835	469	482	97%	481	97%
Disability[1]	25,590	42	65	65%	59	71%
Mortality[2]	41,892	491	470	104%	470	104%

[1] Includes Disabilities from 2006-2012

[2] Miscellaneous and Safety, Healthy and Disabled Mortality combined, 2006-2012

Other Demographic Assumption and Methods

Terminal (Vacation) Pay Load • Many members are able to cash out some or all of their unused vacation time in the year prior to retirement; the cashed out pay is then included in the members' final average compensation. • The current terminal payout assumption is that pay for computing retirement benefits is increased by 3.5% due to terminal payments for Miscellaneous members, and by 1.0% for Safety members. • Over 600 retirements and vested terminations occurred during the past three years and were analyzed to determine the impact of vacation cash outs. In each case, the actual final average compensation used in the member's official retirement calculation was compared to the pay contained in the most recent actuarial valuation data file, adjusted for expected pay increases from the valuation date to the date of retirement.	**Recommendation** • Our analysis of the last three years of retirement and termination benefits indicated that Miscellaneous members final average compensation is 3.6% higher than expected, and Safety members is 2.7% higher than expected. Based on this analysis, we propose retaining the 3.5% load to the compensation used in the final year of the averaging period for determining projected retirement benefits for Miscellaneous members, and increasing the 1.0% assumed load to 2.5% for Safety members. • These terminal pay loads are only applied to retirement benefits, and will be limited to full career benefits (i.e. where the career length is at least 20 years).
Commencement Age for Deferred Vested Members • Currently, Miscellaneous members with a deferred vested benefit (including those working for a reciprocal employer) are assumed to begin receiving benefits at age 58 (65 for Tier 3). Safety members are assumed to have their benefits commence at age 53.	**Recommendation** • Our analysis showed that the actual commencement age for deferred vested members was close to the current assumptions. We recommend retaining assumptions used in the prior Study.

Actuarial Cost Method

- When EFI assumed the role of the actuarial consultant to the Plan, a change was implemented to the methodology used to compute the entry age normal cost. Under this methodology (known as Entry-Age-to-Decrement), the costs are completed as a level percentage of pay for each individual benefit type (retirement, disability, etc.), spread over the period of time during which the member is eligible for that benefit. Under the traditional approach (known as Entry-Age-to-Final-Decrement), costs are computed for all benefits as a whole, spread over the entire expected career length of the member.
- EFI's alternate methodology (known as Entry-Age-to-Decrement) remains an acceptable method for determining an actuarially sufficient funding contribution. However, the Government Accounting Standards Board (GASB) has adopted new pension accounting standards requiring the use of the traditional, career-length approach to Entry Age Normal liability calculations.
- Under Entry-Age-to-Final-Decrement, the normal cost for an individual should remain level throughout their career. However, even if all assumptions are met exactly, the funded ratio for each individual will fluctuate above and below 100% during their career.
- Under Entry-Age-to-Decrement funding, the normal cost for an individual will decline somewhat over time, as the member moves past eligibility for certain benefits, while the funded ratio will remain constant at 100% if all assumptions are met.
- Under Entry-Age-to-Decrement funding, a comparison of the normal cost between Tiers with different benefit levels may prove difficult: the Tier with the richer benefits may appear to have a lower normal cost if the population of this Tier is closer to retirement age on average.
- EFI maintained one element of the actuarial cost method upon assuming the role of consultant: the use of an aggregate normal cost calculation, wherein the normal cost is computed for each tier based on the total present value of benefits and accrued liability for that tier.
- The new GASB standards require the use of a different method for computing the normal cost: the individual normal cost method, wherein the normal cost is computed for each individual and then added together to get an overall normal cost.
- The California Actuarial Advisory Panel (CAAP) has issued a draft document outlining recommended funding policies for public sector pension plans in California. Although both the Entry-Age-to-Decrement and Aggregate Normal Cost methods are described as "acceptable" practices (with conditions, for the Aggregate Normal Cost), the CAAP has described the Entry-Age-Final and Individual Normal Cost methods as "model."

Recommendation

- We recommend two changes to the funding methodology for determining the actuarial cost of the Plan: using an individual normal cost calculation for each member, and calculating the entry age on a full career basis (Entry-Age-to-Final-Decrement), rather than for each potential individual benefit.
- These revised methodologies represent a simpler and more traditional approach to determining Plan cost, and will avoid the problem of having separate and distinct liability and normal cost calculations for the Plan's funding requirements versus the accounting statements.
- The impact on current cost from changing methods is to increase the normal cost and lower the accrued liability. The net impact on the current contribution is to increase cost by 2.1% of payroll, as the normal cost is paid over a shorter period (the remaining career of the active employees) than the unfunded liability (24 years as of the current valuation). The long-term impact is negligible, since actual benefit payments and investment earnings will determine the ultimate contribution requirements.
- These changes would also result in an improvement in the funded ratio by approximately 4.7%, because the accrued liability is lower under the Entry-Age-Final-Decrement method.

Economic Assumptions

Introduction

Economic assumptions utilized in the development of actuarial liabilities and costs for a defined benefit plan include:

- The inflation assumption;
- The real investment return assumption;
- The real growth in pay relative to inflation; and
- COLA increases relative to inflation.

While we look to the past for indications of future economic behavior, we must also consider how the future may be expected to be different. In order to reflect the long-term nature of defined benefit plan funding in the development of these economic assumptions, it is appropriate to focus on long term trends.

Inflation

While historical trends are not entirely indicative of the future, they do often serve as a useful guide in determination of assumptions. However, there are elements of the future economic environment that may differ from the past due to structural changes. An important and fundamental case in point is the rate of inflation, which underlies each of the three elements of economic assumptions listed above.

Chart E-1 below shows the average rate of inflation over 30-year periods, with the earliest such period ending in 1955 and the latest ending in 2011. We note in the chart that inflation seemed to be increasing steadily until the 1990's when it leveled off and began to decrease. Examination of Chart E-1 may lead to an assumption that inflation is likely to be quite high, perhaps in the range of 4% to 5% annually.

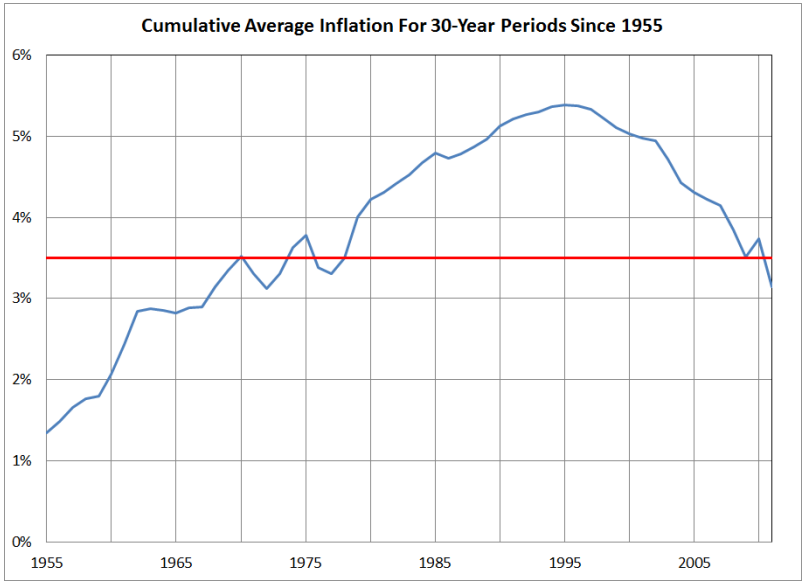


Chart E-1: Average Past Inflation

However, there are a number of reasons to believe that future inflation levels will not be as high as Chart E-1 would seem to suggest.

- An important reason for the high rate of inflation in the averages above is the nine-year period 1973-81 when inflation

averaged 9.2% per year.

- The years 1973-81 featured unprecedented levels of household formation. The demand for new houses, cars, office space and equipment caused by the maturation of the post-war baby boom may have largely been responsible for the inflation during these years. Since 1982, increases have been in the range 0.1% to 4.6% with one exception (6.1% in 1990), averaging 3.0% per year.

- The population of the United States is aging, which implies a greater likelihood of low inflation in the future. This has been observed in other countries with aging populations, such as Japan.

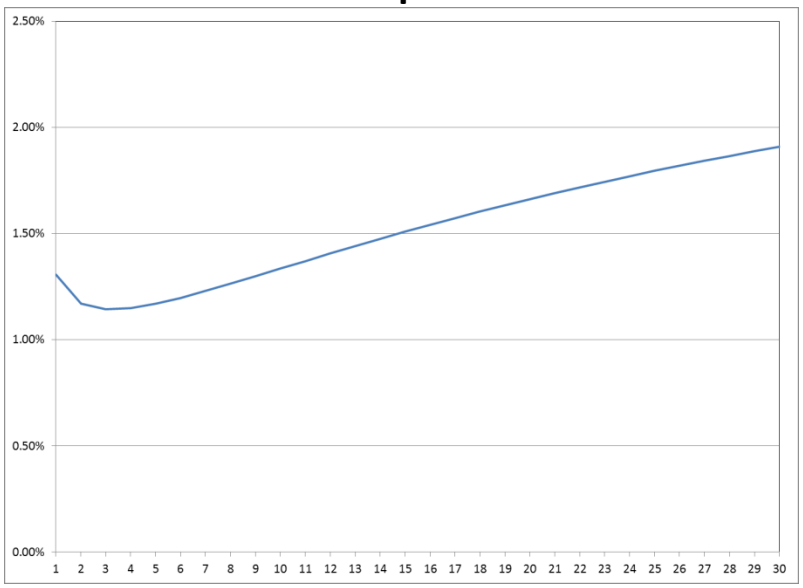
- Currently, the Federal Open Market Committee has policies in place to control inflation, making future levels more likely to remain relatively low.

- The Survey of Professional Forecasters, a quarterly publication of the Research Department of the Philadelphia Reserve Bank, indicates that national inflation levels are expected to be in the 2.50% on average over the next ten years.

- Financial markets offer evidence of what investors expect inflation to be in future years. Various securities, such as Treasury inflation-protected securities (TIPS), provide the necessary data for these analyses. As an example, a recent publication by the Federal Reserve Bank of Cleveland attempts to incorporate some of this market data. It contained the following 30-year projection of expected inflation rates.

- SIS, the investment consultant retained by StanCERA, bases their capital market assumptions on an assumption that average inflation over the next 10 years will be 2.40%.

Chart E-2: Expected Inflation



(Source: Cleveland Federal Reserve website. As of February 1, 2012)

An assumption of below 3% may appear to match well with current market and professional expectations. However, the predictions of future inflation by experts are not unanimous. Some commentators note that the large current and expected future deficits increase the likelihood of higher levels of inflation in the future. Also, historical data shows that periods of higher inflation can and do occur.

A change from the current 3.5% assumption to an assumption lower than 3.0% would represent a sudden and drastic change in the assumptions, which is not advisable. Therefore, we recommend reducing the inflation assumption from 3.5% to 3.25%, a moderate

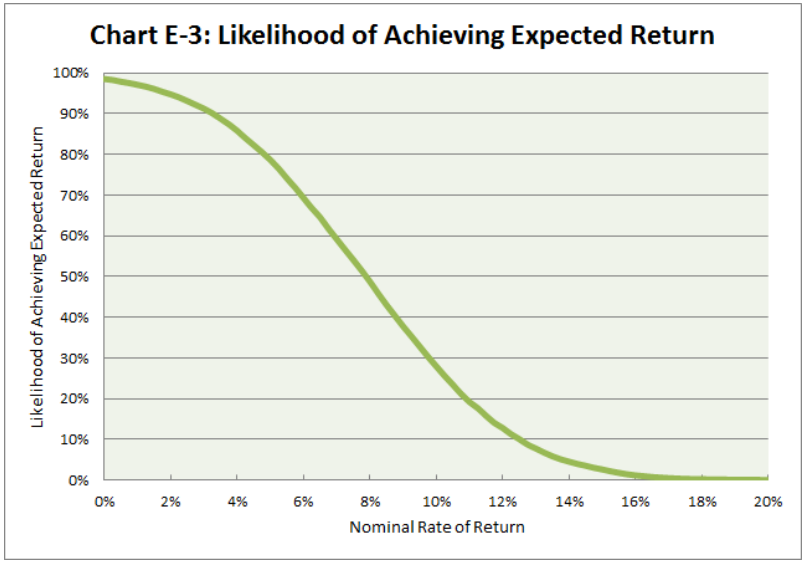
but still significant reduction. This represents a substantial decline in the inflation assumption over the past several years – from 4% in the 2008 valuation to the current recommendation of 3.25%. If, at the time of the next experience study, the markets and forecasters continue to indicate lower expectations of future inflation, further reductions in the assumption could be considered.

Investment Return

The investment return assumption depends on the anticipated average level of inflation and the anticipated average *real rate of return.* The real rate of return is the investment return in excess of underlying inflation. The expected average real rate of return is heavily dependent on asset mix: The portion of assets in stocks, bonds, and cash. A typical asset allocation is about 60% in equities and 40% in fixed income securities.

In the Chart E-3 below, we have simulated the real return derived using StanCERA's actual target allocation (adopted as of November, 2012) of 38.2% domestic equity, 18.0% international equity, 29.8% fixed income, 3.5% real estate, 7.5% direct lending, and 3.0% infrastructure The simulated returns are derived by statistical sampling, using the following algorithm:

1. The expected returns, standard deviation and correlation matrix for each asset class were provided by the investment consultant (SIS).
2. The expected returns for each class were modified to adjust for the difference in the inflation assumption used by the investment consultant (2.4%) and the proposed inflation assumption used for actuarial purposes (3.25%).
3. 10,000 simulation trials for repeated ten year periods were run, and the mean geometric return was computed for each of the ten year re-sampling periods.
4. Given the distribution of returns, we have created a chart that shows the likelihood of the geometric mean return for a specific trial exceeding a specified assumption over a ten year period.



The mean return from this simulation was 7.81%, for a real return of 4.56%. Note that the curve crosses the 50% likelihood threshold right around this point, meaning that chances are slightly better than 50/50 that a 7.75% return would be achieved over a ten year period.

This matches very well with the expectations of the investment consultant; a recent projection from SIS also showed an expected real return of 4.6% (7.0% nominal minus 2.4% inflation) for the same portfolio.

However, EFI recommends the use of a slightly lower real return assumption than indicated by the mean geometric return, in order to provide a small measure of conservatism, based partly on the impact of the excess earnings policy.

The Board has adopted an excess earnings and reserve policy which significantly limit the conditions under which future investment earnings above a certain level could be diverted from the valuation assets used to fund the basic Plan benefits.

At the time of the last experience study, we performed a stochastic projection of the expected net investment return on the assets used to pay the basic benefits of the Plan, with and without the excess earnings policy, and found that the impact of the excess earnings policy was expected to be de minimis. Therefore we did not recommend an explicit adjustment to the investment return assumption.

Although the policy has been designed to minimize the possibility of "excess" earnings being diverted when the Plan is in a negative funding position, there is still a nonzero potential for assets being used for purposes other than being made available to pay the basic Plan benefits if the funding level of the Plan improves.

We noted above that a reasonable inflation assumption is around 3.25%. We recommend a nominal annual return assumption of 7.75%, representing no change in the real return assumption (4.5%), with the exception that the return assumption is no longer expected to be net of administrative expenses as described below.

Administrative Expenses

The returns discussed above are expected to be net of investment expenses; administrative expenses are not addressed. According to Article 31580.2 of the '37 Act, administrative expenses (excluding certain technology expenses) may not exceed 0.20% of the *accrued liabilities* of the retirement system. Over the past three years, administrative expenses have averaged about 0.16% of the *assets* of the retirement system.

New changes to the GASB accounting statements require that the discount rate for accounting purposes will need to be determined net of investment, but not administrative, expenses in future years; a separate line item for administrative expenses will be included in the determination of pension expense.

Accordingly, we recommend that StanCERA begin to include an additional cost item for expected annual administrative expenses in the actuarial cost calculation. For the valuation as of July 1, 2012, we recommend an assumption of $2,100,000, based on an analysis of administrative expense items that have been paid out of Plan assets over the past few years. This represents a cost of approximately 1.0% of payroll.

Payroll Growth

Components of the payroll growth assumptions are:

- Inflation, and

- Other payroll growth not offset by salary reduction caused by replacement of terminating employees by new entrants.

  Such increases are often attributed to productivity gains. Other factors contributing to non-inflationary base salary increases include growth in the active workforce, bargaining pressures, competition among local employers, and workforce demographic issues.

The inflationary component is the assumed CPI (with a recommended rate of 3.25%). In general we recommend that long range gains due to productivity, the collective bargaining process or other pressures should be assumed to be zero or minimal. While productivity tends to increase in many sectors of the economy, any long-term assumption of salary growth beyond inflation carries with it an assumed improvement in *relative* standard of living.

It is acceptable to assume some additional level of base payroll increase beyond general inflation. Again, potential reasons contributing to the increase may include the presence of strong union representation in the collective bargaining process, competition in hiring among other similar employers, and regional factors – such as the local inflation index exceeding the national average, as has proven the case in Northern California.

Accordingly, EFI recommends maintaining a non-inflationary base payroll growth assumption of 0.25% annually. Therefore, the annual expected increase in base payroll would be 3.50%, reduced from 3.75% in the most recent valuation. This increase will be applied to all continuing active members, and to starting pay for new entrants when projections of future populations are required.

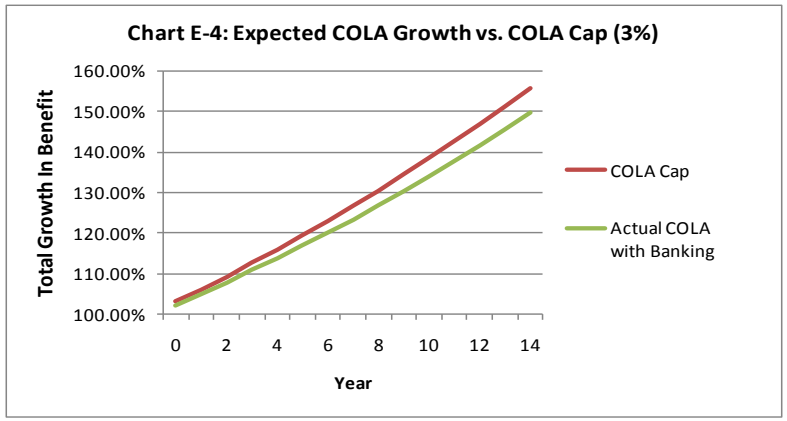
COLA Growth

Most members of StanCERA are eligible to receive automatic Cost of Living Adjustments (COLAs), based on the growth in the Bay Area Consumer Price Index (CPI) and reflecting various a 3% cap on the annual COLA increase. Any increase in the CPI above the 3% maximum increase can be banked for future years in which the change in the CPI is below 3%.

It is necessary to determine an assumed rate of COLA growth, reflecting both inflation (i.e. the growth in the CPI) and the interaction of the CPI with the 3% COLA cap. Currently, it is assumed that the COLA will grow by 3.0% per year.

We have produced statistical simulations of inflation, similar to our modeling of the investment return assumption, and then modeled how the COLA maxima and the banking process for each group interact with the changes in CPI.

Chart E-4 below demonstrates how the expected growth in the COLA is expected to be below the cap, even if the expected increase in the CPI (3.25% based on our earlier recommendation) is higher than the cap itself (3.0% in this example). This is because if there is not a significant bank already in existence (such as in the early years of retirement) and there are years in which inflation is below the cap, this shortfall will not be made up in future years.



Based on a 3.25% recommended inflation assumption, we recommend an assumed COLA growth rate of 2.7% per year, the same assumed rate currently being used. The recommended reduction in the inflation assumption from 3.5% to 3.25% is not expected to have a significant impact on the long-term rate of growth in the COLA.

Methodology

Purposes of the Experience Study

The first goal of this Experience Study is to review the recent past demographic experience of the Plan. We seek to understand the behavior of the participating members so that we can recommend actuarial assumptions concerning future demographic experience.

The second goal of this Study is to recommend economic assumptions to be used in computing liabilities and costs. These economic assumptions include the expected rate of return on Plan assets and the anticipated rate of increase in the Consumer Price Index (CPI). These assumptions are determined based on the investment strategy adopted by the Plan and on the past behavior of the capital markets and the CPI, and on future expectations.

Once adopted, the assumptions recommended by this Study will be used to determine future liabilities and costs and for purposes of evaluating prospective changes in benefits, eligibility conditions, and other aspects of the Plan's operations.

Importance of Accurate Assumptions

The liabilities and costs calculated in actuarial valuations and cost studies are based on a projection of future conditions. The actuary makes assumptions concerning the rates of retirement, withdrawal, termination, disability, and death among plan members. In addition, the actuary must project future earnings on plan assets, inflation, and growth in the pay of active members.

The actuary sets assumptions based on future expectations. In setting demographic assumptions, such as rates of retirement, the past experience of the covered group of employees is often the best predictor of future behavior. When establishing economic assumptions, such as the expected return on plan assets, the historical behavior of the investment markets can serve as a guide.

Actuarial funding methods are designed so that, if the actuarial assumptions are met, plan costs will generally be a level percentage of member pay from year to year. If actual economic or demographic experience varies from that assumed, plan costs will rise or fall accordingly. Therefore, it is worth the effort to make our best estimate of future conditions so that the plan costs computed by the actuary will be as stable and predictable as possible.

Methodology (Demographic Assumptions)

One goal of this Study is to compute the probability of death, disability, retirement, withdrawal, or termination leading to a vested benefit at each age for active members and the probability of death at each age for inactive members.

To this end, we proceed as follows:

- We count the number of members leaving for each cause during the term of the Study. This is the number of decrements.
- We count the number of members who could have left for each cause during the Study. This is the exposure.
- When the exposure is sufficient, we divide the number of decrements by the exposure at each combination of age and

service for an employee group to determine the probability of leaving due to the cause in question.

When there is insufficient exposure to derive statistically reliable rates by age and service, we may combine exposures and decrements for groups of ages and service. Alternatively, we may compare the total number of actual decrements with the total number of decrements predicted by a standard actuarial table, and adopt a table that predicts decrements, in total, reasonably close to those that have been observed.

Where the rate of decrement is low and the underlying causes of the decrement in question are not expected to change significantly with time (for instance, for non-duty Safety disability rates), we may combine the most recent experience with data from prior experience studies.

For the study of the merit (longevity and promotion) components of individual pay increases, we generally choose to use a *transverse* study. A reliable way to assess average increases in pay due to merit is to analyze average pay versus service for the current active members of a plan. With a homogeneous group of any size at all, the pattern of promotions and longevity increases during the career of an average employee is clearly visible in this analysis. This is a transverse study of longevity and promotion pay increases: The data is taken as of a particular point in time. *Longitudinal* studies, which use changes in pay collected over several years, are often unreliable due to the effects of inflation, collective bargaining, and management decisions during the term of the study.

Methodology (Economic Assumptions)

The Plan's economic assumptions are critically important in computing actuarial liabilities and costs. A careful determination of these assumptions requires an analysis of the past performance of the capital markets and the Plan's future investment outlook.

To this end, we proceed as follows:

- Based on a detailed analysis of recent past history and reasonable expectations for the future, a long term projection of the rate of inflation is determined.
- Based on the Plans' investment strategy and historical rates of return on various asset classes, the long term *real* rate of return on assets is projected. This is the return on assets in excess of inflation.
- The projected rate of inflation is combined with the assumption concerning merit pay increases to project future members' pay.
- The projected rate of inflation is combined with a model of the COLA provisions to project future growth in retiree benefits.
- The rate of inflation is combined with the estimated real return on assets to determine the overall return on assets.

Any estimate of future inflation and asset returns is difficult. Over time, there will be actuarial gains and losses as experience deviates from our assumptions.