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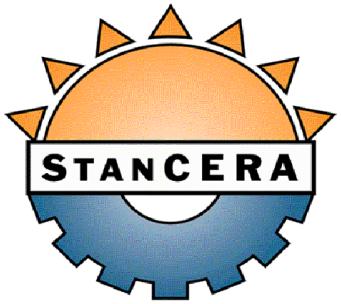
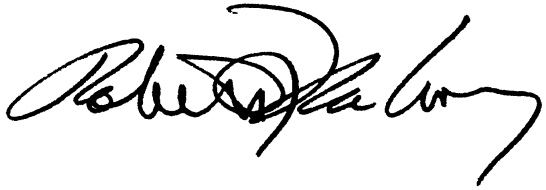


Stanislaus County Employees' Retirement Association

Actuarial Experience Study
July 1, 2006 through June 30, 2009

Gregory M. Stump, FSA

Graham A. Schmidt, ASA



Robert T. McCrory, FSA

Prepared July 15, 2010

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Contents

Executive Summary

Purpose

The purpose of this Actuarial Experience Study is to review the actuarial experience of the Stanislaus County Employees' Retirement Association (the Plan) during the period from July 1, 2006 through June 30, 2009.

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 the prior actuary (Buck Consultants) in 2006, covering the period from July 1, 2003 through June 30, 2006. Based on that study, several demographic assumption rates were updated for Miscellaneous and Safety members.

A parallel Experience Study was completed for the same period by the auditing actuary (Milliman). This parallel study identified several inappropriate assumptions from the Buck report, and in some instances, recommended replacement assumptions. A number of these replacement assumptions (including revised rates of retirement, termination and withdrawal) were included in the June 30, 2008 and 2009 actuarial valuations.

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, no changes to the current assumed retirement rates are proposed.

Withdrawal Rates

Overall, the number of withdrawals among Miscellaneous and Safety members was less than predicted by the current assumptions. We have proposed a reduction to the rates of withdrawal in the first five years of employment for both groups. We continue to recommend that no withdrawals should be assumed for members eligible for a service retirement.

Termination Rates

Overall, the number of other terminations (vested terminations and transfers) was higher than expected for both Miscellaneous and Safety members. Currently, no such terminations have been assumed in the first five years of service – anyone leaving during this time is expected to withdraw their contributions. We have proposed introducing termination and transfer rates for both groups in the first five years of service, to reflect the presence of a significant number of these decrements in the data during the three year study period.

Disability Rates

The disability data reported during this Study was quite limited; there were no ordinary (non-duty) reported disabilities among Safety members, and only three duty-related reported disabilities among the Miscellaneous members.

We have recommended that the current ordinary disability assumptions should be maintained until the next experience study. We have recommended that the Miscellaneous female and Safety duty-related disability rates should be reduced. In addition, to improve the exposure and reliability of the disability analysis, we recommend aggregating the experience of the current period with that of the next study.

Longevity and Promotion Pay Increases

The current actuarial assumption for Miscellaneous and Safety members is that the pay for active employees will increase by 4.0% per year from inflation and an additional amount for merit, longevity and promotion, depending on the age of an individual member. The assumed age-based increase ranges from 4.7% at age 20 to 0.5% at ages 35 and higher for Miscellaneous members, and from 2.9% at age 20 down to 0.5% at ages 35 and higher for Safety.

We have recommended replacing the age-based merit pay assumptions with a set of service-based assumptions. The pay for Miscellaneous members is assumed to increase by an additional 0.75% to 4.00% for merit, longevity and promotion, depending on the service of the member (with higher increases at earlier levels of service). The pay for Safety members is assumed to increase by an additional 0.50% to 8.00%, depending on the service of the member.

Mortality Rates

Mortality experience among active and retired members and their survivors in this Study was in reasonable agreement with assumptions, with the number of deaths being slightly less than expected. However, expectations are that mortality experience will improve in the future. In addition, a recent study by the Society of Actuaries discovered that members with higher benefit amounts have lower rates of death than members with lower benefits. These two factors indicate that mortality rates should be more conservative than they are currently, with lower rates of assumed death.

Therefore, we have proposed the use of the RP 2000 mortality tables, with modifications to the tables using a Projection Scale that has been suggested by the Society of Actuaries for incorporating expected mortality improvements.

Other Demographic Assumptions and Methods

We have recommended the application of a terminal pay load when projecting final average compensation for retirement benefits, to account for the practice of vacation cash outs that occur in the year before retirement, particularly among management employees.

We have recommended a reduction in the assumed benefit commencement age for deferred vested members, to better reflect the actual behavior that has occurred during the course of the current and prior experience studies.

Modifications have also been proposed for the Entry Age Normal funding methodology and the method for determining the total actuarial normal cost. These changes are being recommended to bring the funding methodologies of the Plan into closer alignment with traditional approaches, and in anticipation of potential future changes to the government accounting standards. Although the changes would have an increasing impact on Plan cost, the modification would result in a moderate one-time improvement in the funding ratio.

Economic Assumptions

The current inflation assumption of 4.0% 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 4.0% to 3.5%, and a reduction in the payroll growth assumption from 4.0% to 3.75%.

We also propose a reduction in the nominal semi-annual rate of return from 4.0% to 3.875%, corresponding to a reduction in the annual effective rate from 8.16% to 7.90%. This represents a slight increase in the real return assumption (the level of expected investment return above inflation), from 4.16% to 4.40%.

We propose a revised rate of expected COLA growth (2.7%), which is derived from simulations of the future level of inflation and is below the 3% COLA cap.

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 the actuarial valuation results as of June 30, 2009.

	Increase in Actuarial Cost (% Payroll)	Funding Ratio
June 30, 2009 Valuation	**19.56%**	**70.86%**
Service-based Merit Pay	1.13%	(0.30%)
Vacation Pay Load	0.72%	(0.80%)
Deferral Age	0.51%	(0.58%)
Demographic Rates (Excluding Mortality)	(0.82%)	0.19%
Mortality Rates	0.64%	(0.78%)
Economic Assumptions	(0.20%)	0.27%
Actuarial Methods (EAN)	2.31%	4.17%
Total Change	**4.29%**	**2.17%**
Revised Results	**23.85%**	**73.03%**

Overall, there are three main assumption changes (the use of service-based merit pay increases, the terminal pay loads associated with vacation cash outs, and the reduction in the deferred vested assumed benefit commencement age) that relate to current assumptions which clearly do not accurately represent the emerging experience of the Plan. All of three of these issues were identified by Milliman during the course of their actuarial audit. The combined impact of these three proposed assumption changes constitutes over half the increase in cost (2.2% of payroll).

The impact of all the other recommended changes - economic assumptions and demographic rates of retirement, termination, disability and mortality - do not represent a significant departure from current assumptions. Therefore, in aggregate Plan costs will not be greatly affected by these proposed changes. The changes to the actuarial methods would result in an increase in cost of approximately 2.3%, but a relative improvement in the funding ratio of over 4%.

Should all of the recommendations in this Report be adopted, an increase in the total actuarial cost of approximately 2.2% would result. The employee contributions will also be recomputed as a result of the revised assumptions, and may offset some of the increased cost for the employer.

Organization of Report

The first section of the Report deals with decrements among active members and also includes consideration 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.

The report has been prepared in accordance with generally accepted actuarial methods and procedures. EFI will be happy to answer any questions from StanCERA Board or staff regarding its 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	738	86	84.2	102.1%
Females	1,753	174	183.8	94.7%
Combined	**2,491**	**260**	**268.0**	**97.0%**

	Actual Average Age	Expected Average Age
Males	58.5	58.7
Females	58.1	58.3
Combined	**58.3**	**58.4**

- 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.
- Analysis of retirement rates by pay – in which both exposure and decrements are measured by the annual pay of the member – showed that actuarial experience on this basis was very close to that discussed above, in which exposures and decrements are measured in lives.

  Therefore, there is no evidence that salary level had a material impact on retirement rates.

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. 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. Less than 0.2% of all active exposures were for members over age 70, so this assumption should have very little impact on plan cost.

  Experience emerging at CalPERS and other plans indicates that retirement rates have been fluctuating significantly from year to year. Current economic conditions may be playing a role in this.

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%
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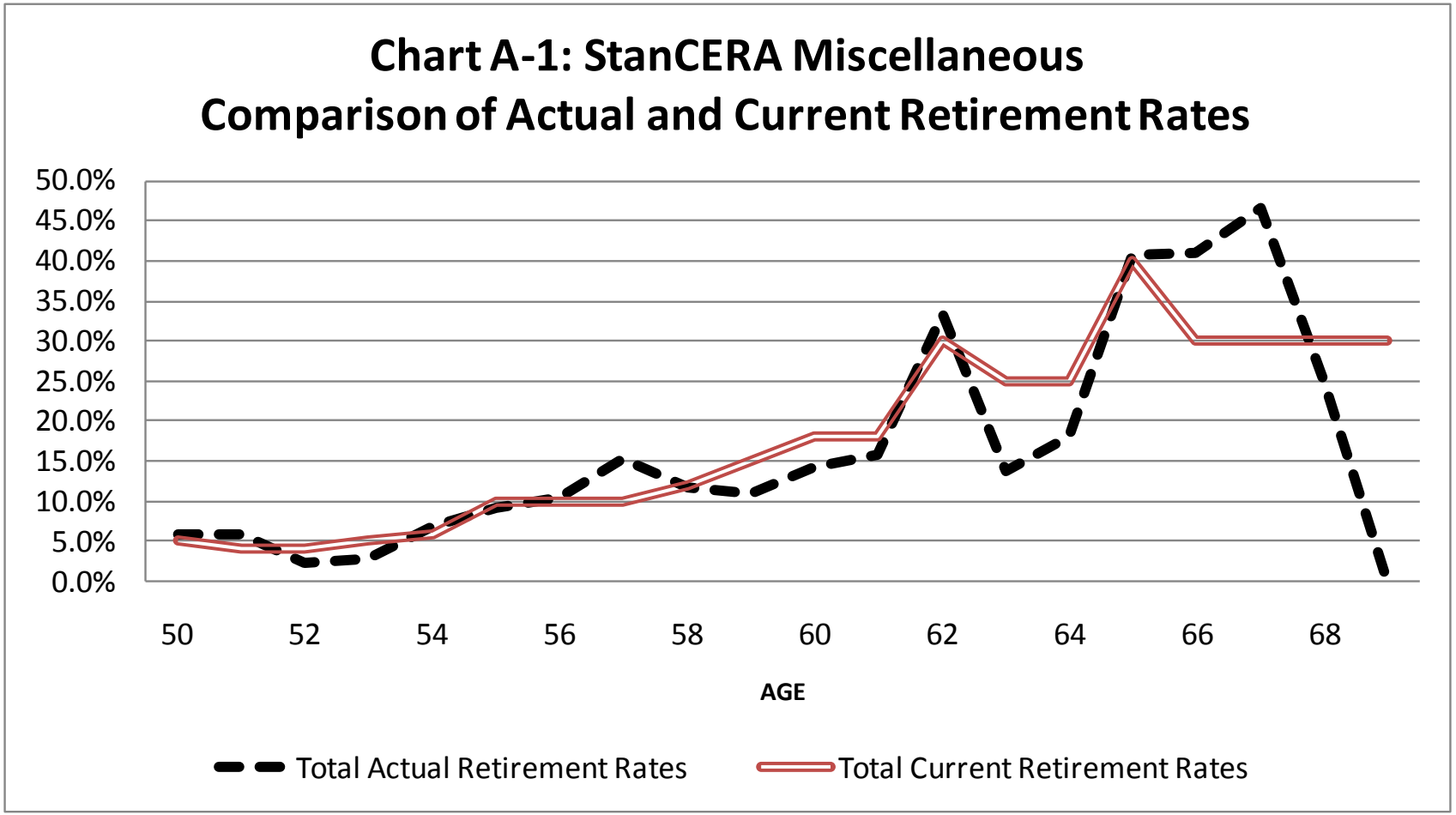
65	40.0%
66	30.0%
67	30.0%
68	30.0%
69	30.0%
70+	100.0%



In reviewing Chart A-1, we can see that the current assumptions provide a reasonable fit to the actual retirement rates 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	173	21	36.9	56.9%
Female	36	5	6.5	77.5%
Combined	**209**	**26**	**43.4**	**60.0%**

	Actual Average Age	Expected Average Age
Male	51.9	51.9
Female	52.0	49.7
Combined	**51.9**	**51.6**

- 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 were 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.
- There were several members who appeared to retire with less than 10 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 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	173	21	25.8	81.6%
Female	36	5	4.0	125.0%
Combined	**209**	**26**	**29.8**	**87.4%**

	Actual Average Age	Expected Average Age
Male	51.9	52.8
Female	52.0	50.9
Combined	**51.9**	**52.6**

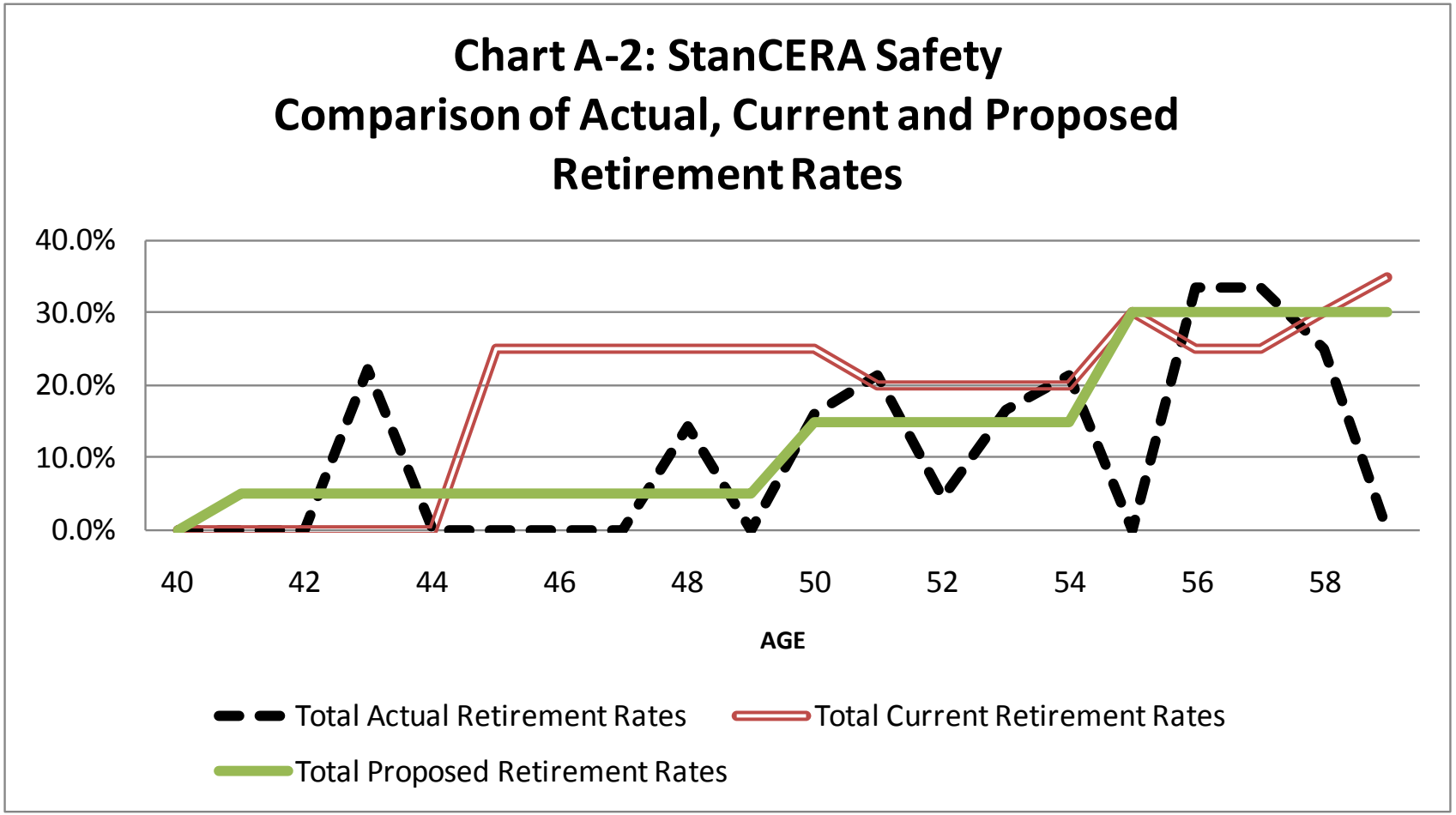
- New rates are proposed – reflecting lower expected retirement rates at the younger ages. See Chart A-2.
- The new assumptions do not move all the way to the lower rates reflected in the actual experience during the last three years. There were more retirements observed during the prior experience study period, therefore we have suggested intermediate rates.
- The experience of the current period can then be combined with that of the next period 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	0.0%
45 – 49	25.0%
50	25.0%
51	20.0%
52	20.0%
53	20.0%
54	20.0%
55	30.0%
56	25.0%
57	25.0%
58	30.0%
59	35.0%
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	30.0%
56	30.0%
57	30.0%
58	30.0%
59	30.0%
60+	100.0%



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

Termination –Withdrawals (Miscellaneous)

Current Assumption

Summary of Experience versus Current Assumptions

	Eligible Exposure	Actual Withdrawals	Expected Withdrawals	Actual to Expected Ratio
Male	2,195	104	114.6	90.8%
Female	6,453	227	311.4	72.9%
Combined	**8,648**	**331**	**426.0**	**77.7%**

	Actual Average Age	Expected Average Age
Male	38.7	39.5
Female	38.9	38.4
Combined	**38.8**	**38.7**

- A withdrawal (or non-vested termination) occurs when a member terminates employment and withdraws his or her member contributions.
- Currently, a single set of service-based withdrawal rates are assumed for both males and females.
- No withdrawals are assumed to occur once a member is eligible for retirement.
- Withdrawal rates are strongly related to service, steadily decreasing as service increases (see Chart A-3). Male and female rates were similar.

Recommendation

Summary of Experience versus Proposed Assumptions

	Eligible Exposure	Actual Withdrawals	Expected Withdrawals	Actual to Expected Ratio
Male	2,195	104	91.3	113.9%
Female	6,453	227	249.9	90.8%
Combined	**8,468**	**331**	**341.2**	**97.0%**

	Actual Average Age	Expected Average Age
Male	38.7	39.7
Female	38.9	38.8
Combined	**38.8**	**39.0**

- We have proposed reductions to the withdrawal rates below five years of service to better match experience (see Chart A-3).
- We recommend continuing the assumption that no withdrawals will occur once a member is eligible to retire. In their parallel experience study audit for the prior period, Milliman confirmed that this assumption is appropriate.

Miscellaneous Withdrawal Rates – Current Representative Rates

Service	All Ages
0	18.0%
1	12.0%
2	8.5%
3	6.5%
4	5.5%
5	2.0%
10	1.5%
15	0.9%
20	0.3%
25	0.1%
30	0.0%

No withdrawals are assumed for participants eligible for service retirement.

Miscellaneous Withdrawal Rates – Proposed Representative Rates

Service	All Ages
0	13.5%
1	9.0%
2	6.4%
3	4.9%
4	4.1%
5	2.0%
10	1.5%
15	0.9%
20	0.3%
25	0.1%
30	0.0%

No withdrawals are assumed for participants eligible for service retirement.

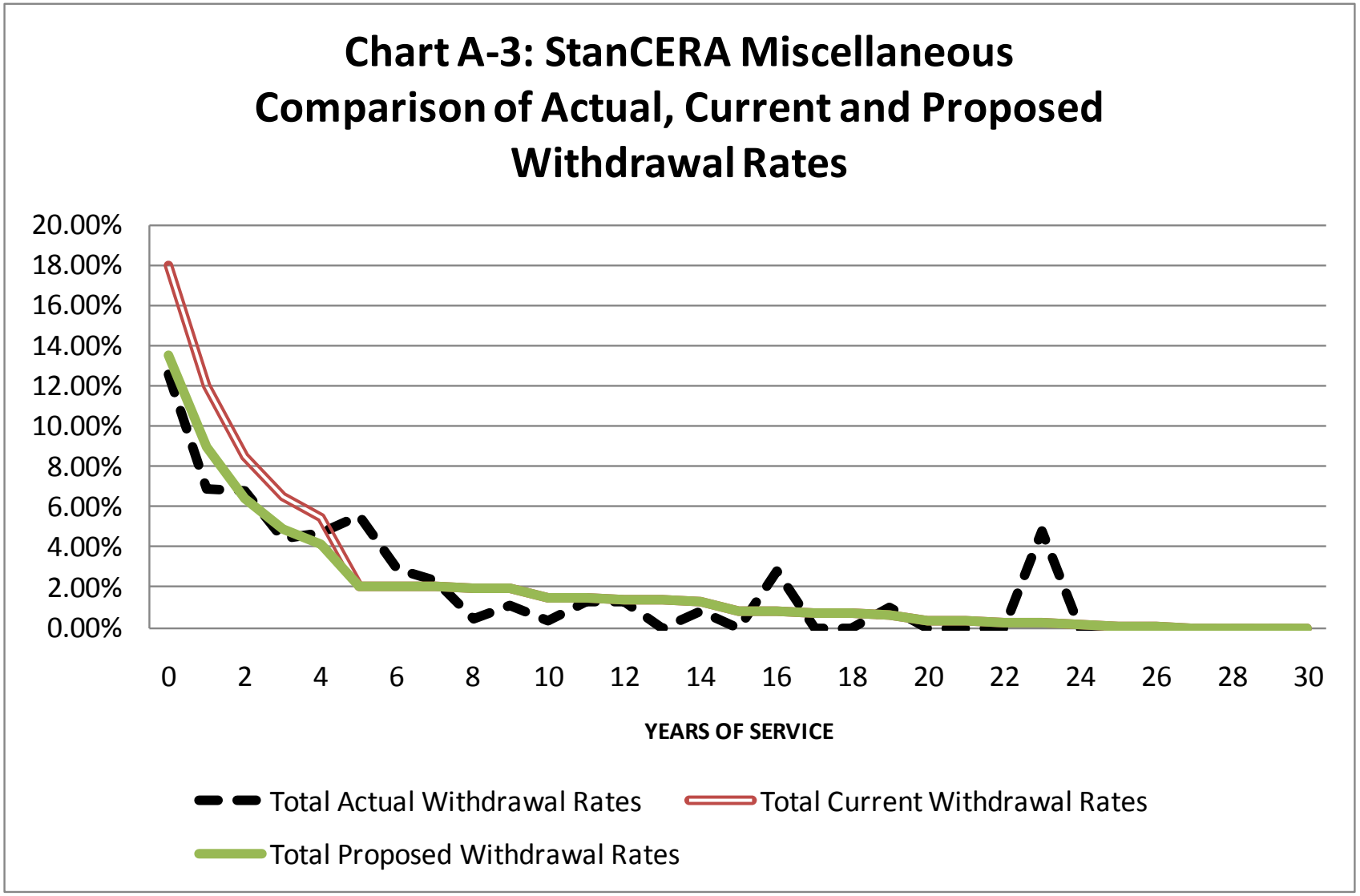


Chart A-3 shows the proposed reduced withdrawal rates for those with less than five years of service, more accurately reflecting the actual data.

Termination –Withdrawals (Safety)

Current Assumption

Summary of Experience versus Current Assumptions

	Eligible Exposure	Actual Withdrawals	Expected Withdrawals	Actual to Expected Ratio
Male	1,505	30	48.0	62.5%
Female	423	13	13.9	93.6%
Combined	**1,928**	**43**	**61.9**	**69.5%**

	Actual Average Age	Expected Average Age
Male	29.4	31.4
Female	31.3	29.8
Combined	**30.0**	**31.1**

- A withdrawal (or non-vested termination) occurs when a member terminates employment and withdraws his or her member contributions.
- Currently, a single set of service-based withdrawal rates are assumed for both males and females.
- No withdrawals are assumed to occur once a member is eligible for retirement.
- Withdrawal 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 Withdrawals	Expected Withdrawals	Actual to Expected Ratio
Male	1,505	30	39.0	76.8%
Female	423	13	11.4	114.2%
Combined	**1,928**	**43**	**50.4**	**85.3%**

	Actual Average Age	Expected Average Age
Male	29.4	31.9
Female	31.3	30.1
Combined	**30.0**	**31.5**

- We have proposed reductions to the withdrawal rates below five years of service to better match experience (see Chart A-4).
- We recommend continuing the assumption that no withdrawals will occur once a member is eligible to retire. In their parallel experience study, Milliman confirmed that this assumption is appropriate.
- Maintaining a single set of rates for both males and females is recommended, due to the limited amount of female experience.

Safety Withdrawal Rates – Current Representative Rates

Service	All Ages
0	12.0%
1	8.0%
2	6.0%
3	4.5%
4	3.5%
5	1.2%
10	0.9%
15	0.7%
20	0.0%

No withdrawals are assumed for participants eligible for service retirement.

Safety Withdrawal Rates – Proposed Representative Rates

Service	All Ages
0	8.0%
1	6.0%
2	5.0%
3	4.0%
4	3.0%
5	1.2%
10	0.9%
15	0.7%
20	0.0%

No withdrawals are assumed for participants eligible for service retirement.

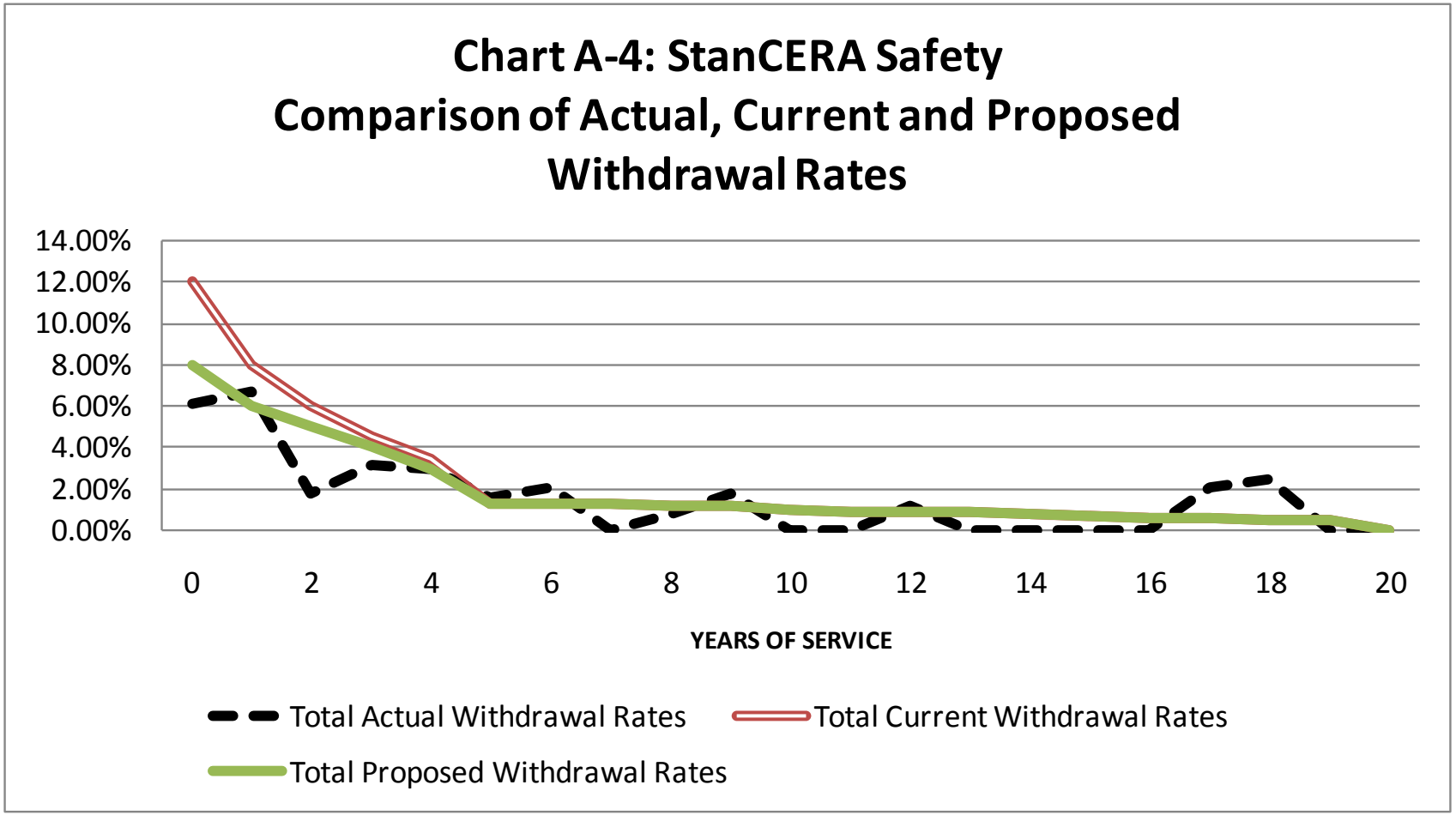


Chart A-4 shows the proposed withdrawal rates - reduced for those with less than five years of service, more accurately reflecting the actual data.

Termination – Vested Terminations and Transfers (Miscellaneous)

Current Assumption

Summary of Experience versus Current Assumptions

	Eligible Exposure	Actual Terminations	Expected Terminations	Actual to Expected Ratio
Male	2,195	83	29.5	281.6%
Female	6,453	211	90.5	233.2%
Combined	**8,648**	**294**	**120.0**	**245.1%**

	Actual Average Age	Expected Average Age
Male	41.3	44.2
Female	40.4	43.5
Combined	**40.6**	**43.6**

- Vested terminations apply to active members who terminate and leave their member contributions on deposit with the Plan. A transfer occurs if the member continues working with a reciprocal employer.
- No vested terminations or transfers are currently assumed to occur before five years of service, or once a member is eligible for service retirement. Service-based rates are assumed thereafter.
- Termination rates are strongly related to service, decreasing as service increases. Unisex rates are used.
- Staff has clarified that members who reach age 70 can receive a benefit from the Plan if they have left their contributions on deposit, regardless of whether they had five years of service at termination.
- Approximately 25% of the vested terminations for Miscellaneous members were reported to be reciprocal transfers.

Recommendation

Summary of Experience versus Proposed Assumptions

	Eligible Exposure	Actual Terminations	Expected Terminations	Actual to Expected Ratio
Male	2,195	83	69.1	120.2%
Female	6,453	211	198.1	106.5%
Combined	**8,648**	**294**	**267.1**	**110.1%**

	Actual Average Age	Expected Average Age
Male	41.3	41.4
Female	40.4	40.6
Combined	**40.6**	**40.8**

- The data has shown that a significant number of members who terminate with less than five years of service will leave their contributions in the Plan. We propose new termination/transfer rates for those with less than five years of service.
- We have proposed minor adjustments to the termination rates for those with at least five years of service.
- We recommend maintaining the assumption that no terminations or transfers will occur once a member is eligible for service retirement.
- We recommend reducing the assumption that 50% of vested terminations are assumed to be reciprocal transfers, to reflect the 25% level reflected in the actual data. This mirrors the experience reported in the last experience study audit.
- Expected average age at termination is in closer agreement with actual experience under the proposed assumptions.

Miscellaneous Vested Termination and Transfer Rates – Current Representative Rates

Service	Rate
0	0.0%
1	0.0%
2	0.0%
3	0.0%
4	0.0%
5	2.5%
10	2.0%
15	1.7%
20	1.3%
25	1.1%
30	0.0%

No terminations are assumed for participants eligible for a service retirement benefit. 50% of all members who terminate with a deferred benefit are assumed to go to work for a reciprocal employer.

Miscellaneous Vested Termination and Transfer Rates – Proposed Representative Rates

Service	Rate
0	5.0%
1	5.0%
2	3.0%
3	3.0%
4	3.0%
5	3.0%
10	2.0%
15	2.0%
20	1.2%
25	1.2%
30	0.0%

No terminations are assumed for participants eligible for a service retirement benefit. 25% of all members who terminate with a deferred benefit are assumed to go to work for a reciprocal employer.

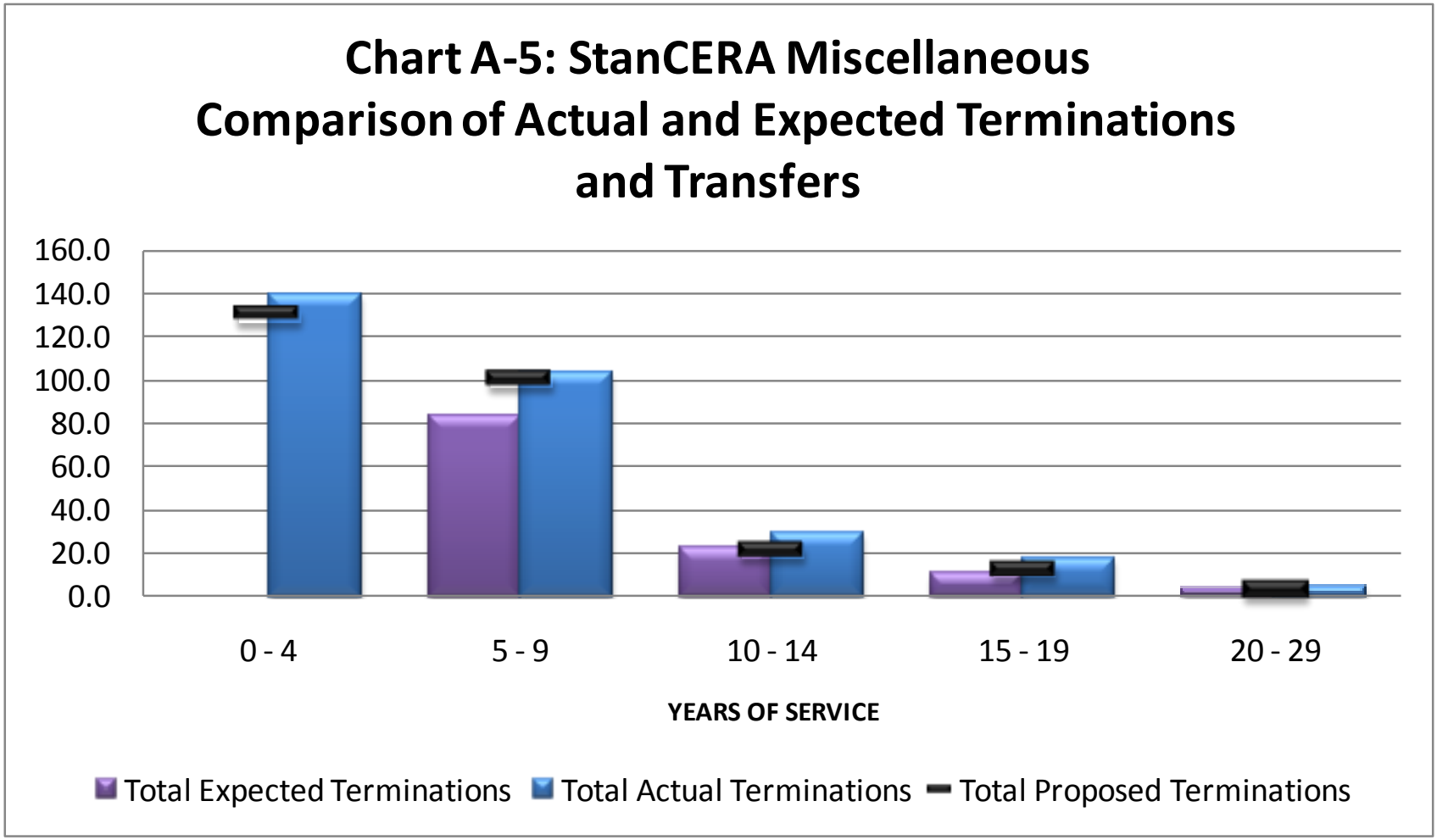


Chart A-5 shows the number of actual and expected vested terminations (including reciprocal transfers) by service level for Miscellaneous members.

Termination – Vested Terminations and Transfers (Safety)

Current Assumption

Summary of Experience versus Current Assumptions

	Eligible Exposure	Actual Terminations	Expected Terminations	Actual to Expected Ratio
Male	1,505	52	13.6	382.1%
Female	423	19	3.7	514.4%
Combined	**1,928**	**71**	**17.3**	**410.3%**

	Actual Average Age	Expected Average Age
Male	33.9	38.5
Female	32.0	36.7
Combined	**33.4**	**38.1**

- Vested terminations apply to active members who terminate and leave their member contributions on deposit with the Plan. A transfer occurs if the member continues working with a reciprocal employer.
- No vested terminations or transfers are currently assumed to occur before five years of service, or once a member is eligible for service retirement. Service-based rates are assumed thereafter.
- Termination rates are strongly related to service, decreasing as service increases. Unisex rates are used.
- The current rates significantly underestimated the number of vested terminations and transfers.
- Approximately 50% of the vested terminations for Safety members were reported to be reciprocal transfers.

Recommendation

Summary of Experience versus Proposed Assumptions

	Eligible Exposure	Actual Terminations	Expected Terminations	Actual to Expected Ratio
Male	1,505	52	44.4	117.2%
Female	423	19	12.5	151.9%
Combined	**1,928**	**71**	**56.9**	**124.8%**

	Actual Average Age	Expected Average Age
Male	33.9	34.1
Female	32.0	31.9
Combined	**33.4**	**33.6**

- The data has shown that a significant number of members who terminate with less than five years of service will leave their contributions in the Plan. We propose new termination/transfer rates for those with less than five years of service (see Chart A-6)
- We have proposed adjustments to the termination rates for those with at least five years of service. The proposed rates more closely match the actual experience for various levels of service (Chart A-7).
- We recommend maintaining the assumption that no terminations or transfers will occur once a member is eligible for service retirement.
- We recommend maintaining the assumption that 50% of vested terminations are assumed to be reciprocal transfers.
- Expected average age at termination is in closer agreement with actual experience under the proposed assumptions.

Safety Vested Termination and Transfer Rates Rates – Current Representative Rates

Service	Rate
0	0.0%
1	0.0%
2	0.0%
3	0.0%
4	0.0%
5	1.5%
10	1.3%
15	1.3%
20	0.0%

No terminations are assumed for participants eligible for a service retirement benefit. 50% of all members who terminate with a deferred benefit are assumed to go to work for a reciprocal employer.

Safety Vested Termination and Transfer Rates Rates – Proposed Representative Rates

Service	Rate
0	5.0%
1	4.5%
2	4.0%
3	3.5%
4	3.0%
5	2.5%
10	2.5%
15	1.3%
20	0.0%

No terminations are assumed for participants eligible for a service retirement benefit. 50% of all members who terminate with a deferred benefit are assumed to go to work for a reciprocal employer.

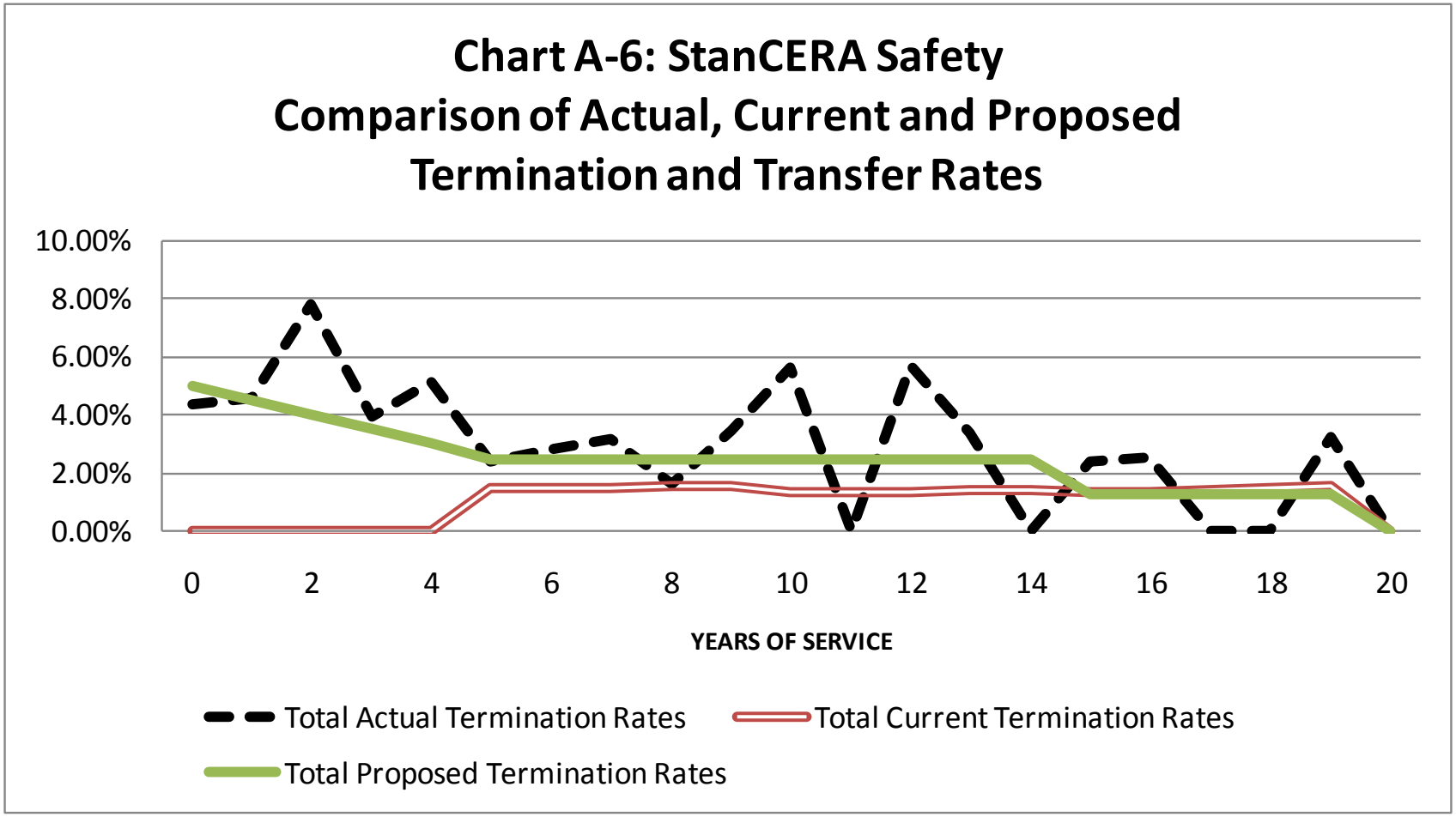


Chart A-6 shows the current and proposed vested termination and transfer rates – with a positive proposed rate for those with less than five years of service and higher rates for those with five to fourteen years of service, more accurately reflecting the actual data.

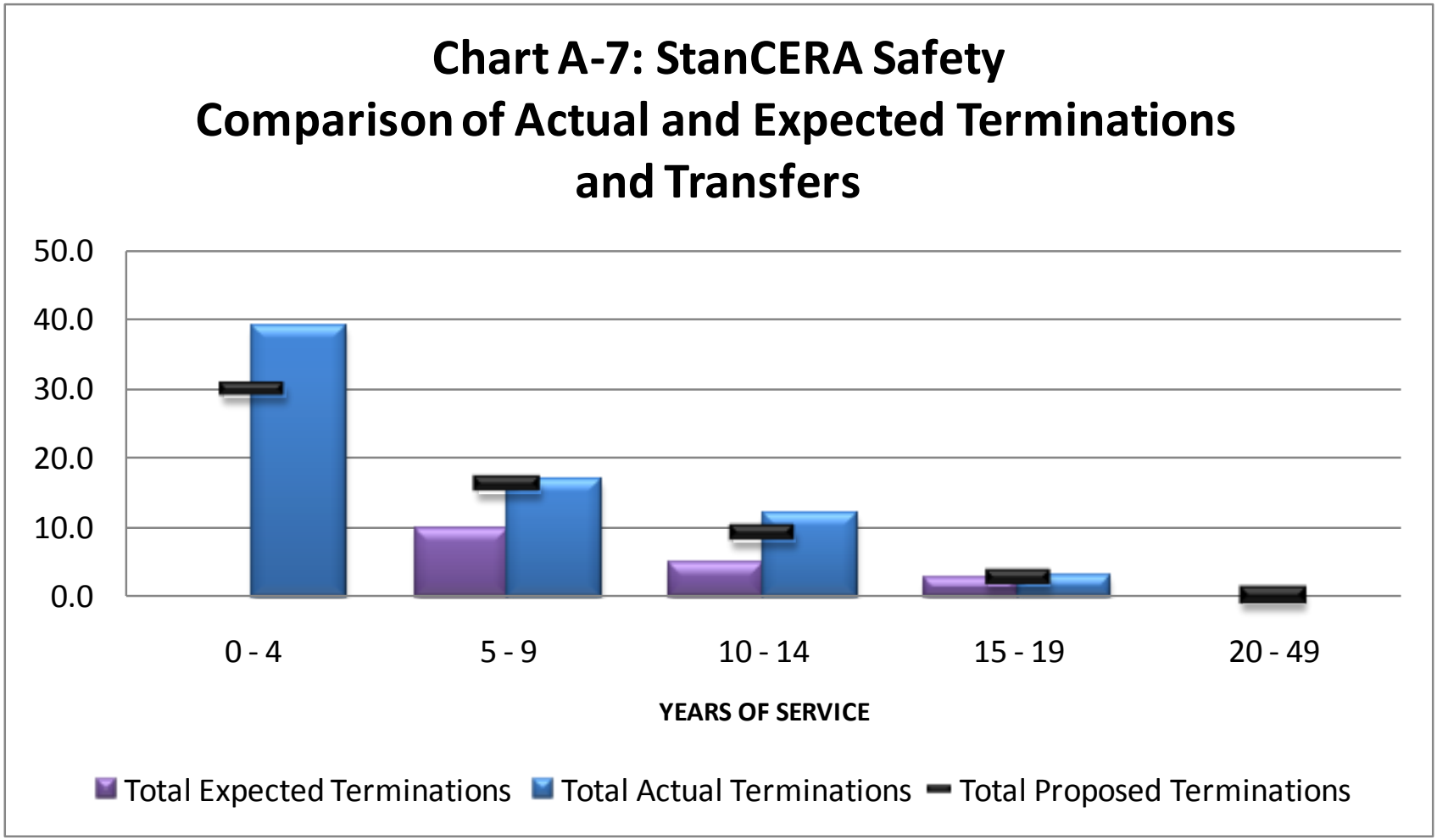


Chart A-7 shows the number of actual and expected terminations (including vested terminations and reciprocal transfers) by service level for Safety members.

Ordinary Disability (Miscellaneous)

Current Assumption

Summary of Experience versus Current Assumptions

	Eligible Exposure	Actual Disabilities	Expected Disabilities	Actual to Expected Ratio
Male	2,032	2	2.7	74.5%
Female	5,740	8	6.8	116.9%
Combined	**7,772**	**10**	**9.5**	**104.9%**

	Actual Average Age	Expected Average Age
Male	49.0	52.8
Female	50.0	52.8
Combined	**49.8**	**52.8**

- 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 very close to the number assumed. Because of this, and the paucity of the experience, 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 more robust sample from which to formulate conclusions.

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

	Eligible Exposure	Actual Disabilities	Expected Disabilities	Actual to Expected Ratio
Male	1,110	0	1.1	0.0%
Female	288	0	0.3	0.0%
Combined	**1,398**	**0**	**1.4**	**0.0%**

- 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, unisex rates are used.
- The disability data reported over the experience study period is extremely limited; there were no non-service connected disabilities reported during the study period, and less than two 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 more robust sample from which to formulate 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

	Eligible Exposure	Actual Disabilities	Expected Disabilities	Actual to Expected Ratio
Males	2,933	2	3.4	59.4%
Females	8,206	1	6.1	16.5%
Combined	**11,139**	**3**	**9.4**	**31.8%**

	Actual Average Age	Expected Average Age
Males	46.5	51.8
Females	55.0	52.5
Combined	**49.3**	**52.3**

- 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 three-year period. However, Milliman's prior experience study audit stated that there were slightly more service-connected disabilities than expected (10 actual vs. 8.9 expected).

Recommendation

Summary of Experience versus Proposed Assumptions

	Eligible Exposure	Actual Disabilities	Expected Disabilities	Actual to Expected Ratio
Males	2,933	2	3.4	59.4%
Females	8,206	1	3.0	33.0%
Combined	**11,139**	**3**	**6.4**	**46.9%**

	Actual Average Age	Expected Average Age
Males	46.5	51.8
Females	55.0	52.5
Combined	**49.3**	**52.1**

- The current Miscellaneous female rates were reduced by 50% to produce new duty disability rates. These rates produce a lower overall number of expected disabilities
- No change is recommended to the Miscellaneous male duty disability rates.
- Because of the paucity of the experience, we propose combining the experience of the current period with that of the next period to obtain a more robust sample from which to formulate conclusions.

Miscellaneous Duty Disability Rates – Current Representative Rates

Age	Male	Female
22	0.010%	0.001%
27	0.018%	0.003%
32	0.035%	0.006%
37	0.049%	0.020%
42	0.071%	0.042%
47	0.109%	0.074%
52	0.154%	0.116%
57	0.209%	0.174%
62	0.269%	0.231%

Miscellaneous Duty Disability Rates – Proposed 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%

Duty Disability (Safety)

Current Assumption

Summary of Experience versus Current Assumptions

	Eligible Exposure	Actual Disabilities	Expected Disabilities	Actual to Expected Ratio
Males	1,678	10	13.7	72.8%
Females	459	2	3.2	63.1%
Combined	**2,137**	**12**	**16.9**	**71.0%**

	Actual Average Age	Expected Average Age
Males	44.3	41.9
Females	48.0	39.2
Combined	**44.9**	**41.4**

- 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, unisex 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. This was also true for the prior experience study audit (13 actual vs. 15.6 expected).

Recommendation

Summary of Experience versus Proposed Assumptions

	Eligible Exposure	Actual Disabilities	Expected Disabilities	Actual to Expected Ratio
Males	1,678	10	12.0	83.2%
Females	459	2	2.7	73.7%
Combined	**2,137**	**12**	**14.7**	**81.4%**

	Actual Average Age	Expected Average Age
Males	44.3	43.0
Females	48.0	40.2
Combined	**44.9**	**42.5**

- The number of excessive expected disabilities appears greatest at the lower ages. Therefore new unisex rates are proposed which reflect lower service-connected disability rates below age 45 (see Chart A-8).
- Because of the lack of data, we propose combining the experience of the current period with that of the next period to obtain a more robust sample from which to formulate conclusions.

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%

Miscellaneous Duty Disability Rates – Proposed Representative Rates

Age	Rate
22	0.122%
27	0.243%
32	0.418%
37	0.603%
42	0.904%
47	1.254%
52	1.658%
57	1.937%

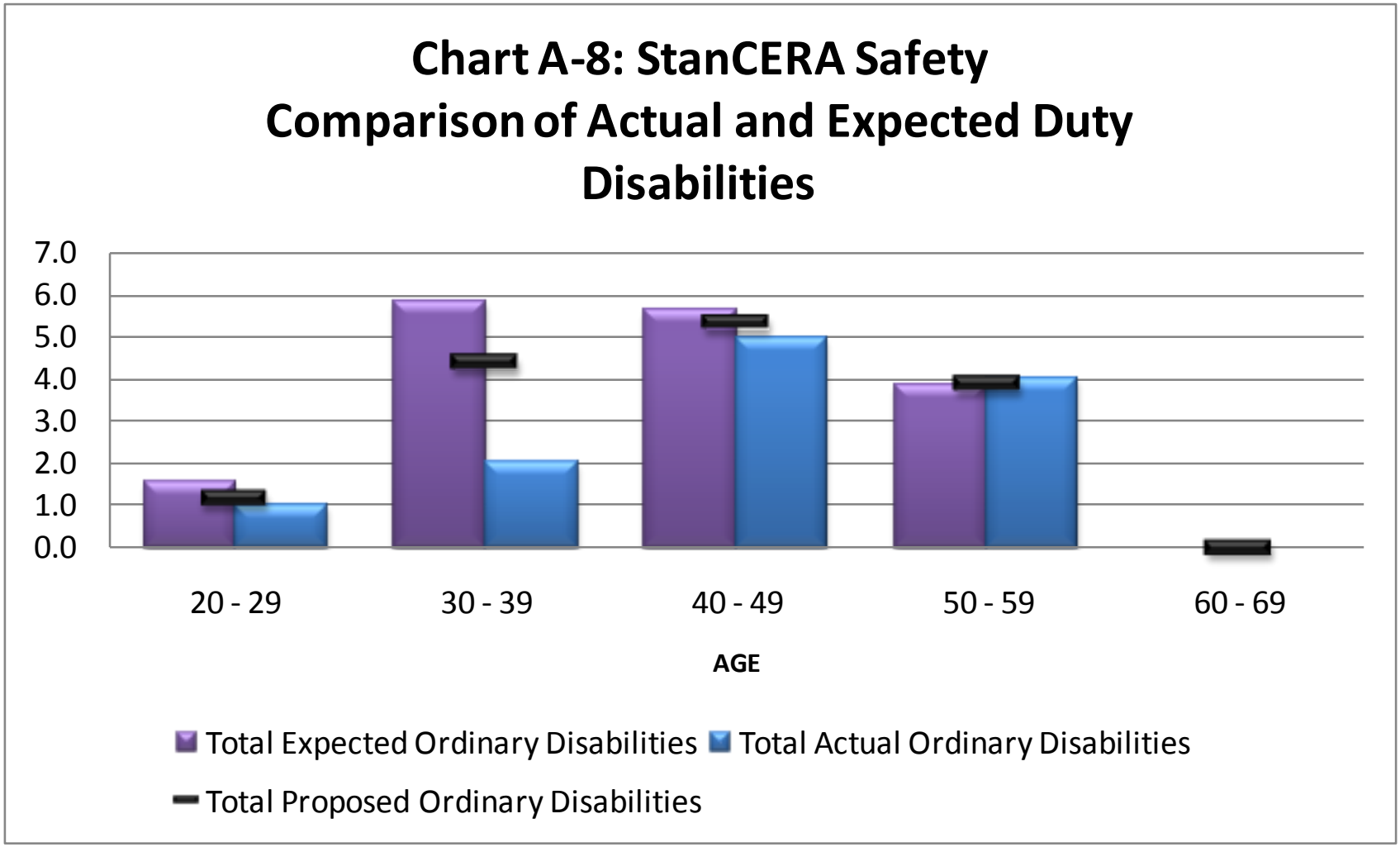


Chart A-8 shows the number of actual and expected duty disabilities by age level for Safety members.

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

Age	Current Representative Assumed Increase
22	4.28%
27	3.01%
32	2.26%
37	0.47%
42	0.46%
47	0.45%
52	0.55%
57	0.54%

- The current assumptions, developed by the prior actuary, are based on age.
- In the charts below, the average pay of the active members as of June 30, 2009 has been plotted against service. For example, the average pay for members with 1 year 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-9). This line provides a visual indicator of how well the expected age-based pay increases are correlated with the actual data.

Recommendation

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

- New rates have been proposed that are based on service, rather than age. We have repeatedly found that individual longevity and promotion pay increases are more closely related to career length than age.
- The line of best fit based on the new service-related assumptions (the black line in Chart A-9) is a better fit to the data than the age-based assumptions.
- In their experience study audit, Milliman also recommended that the merit increase assumption be based on years of service.
- 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.

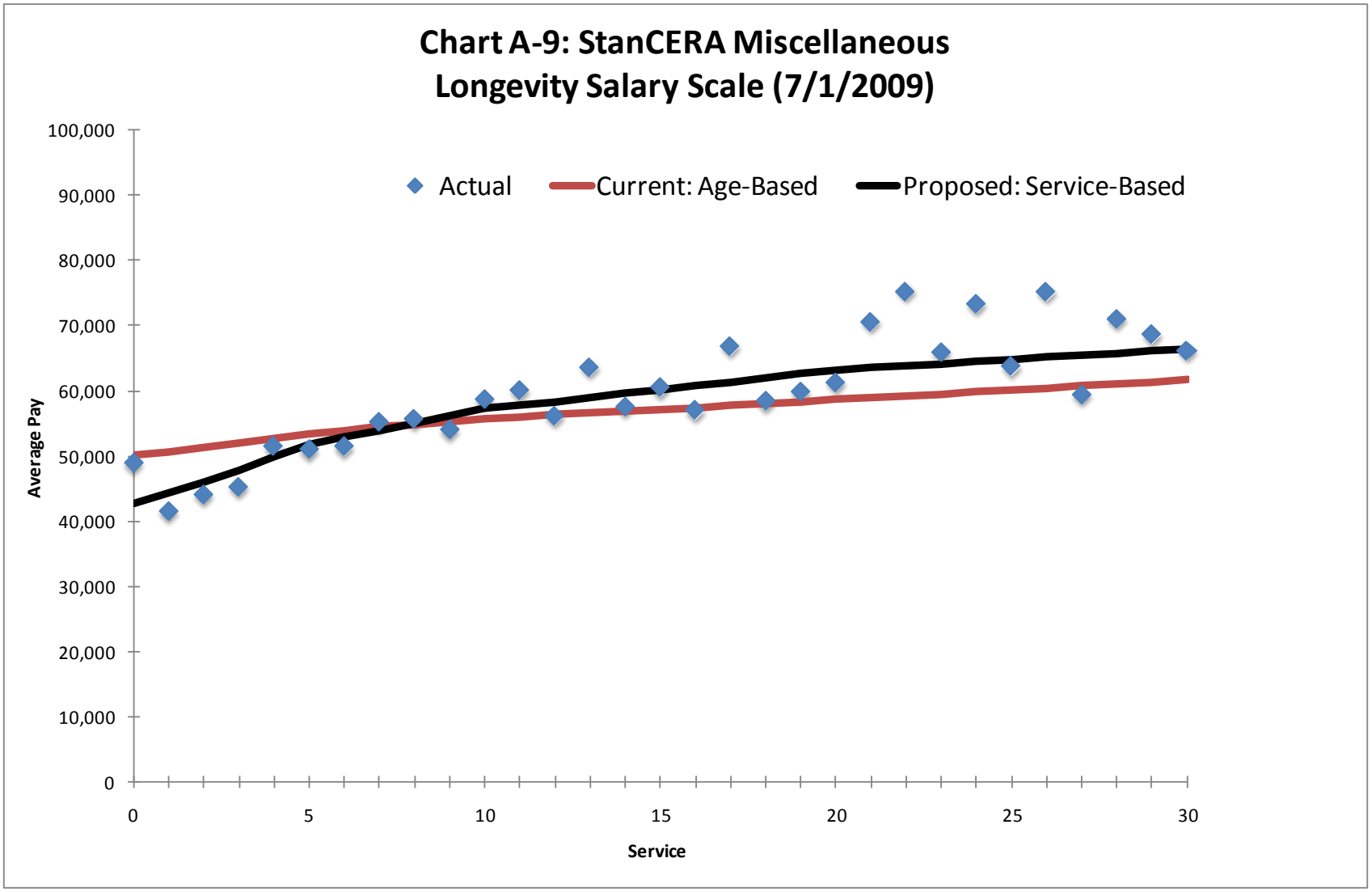


Chart A-9: StanCERA Miscellaneous
Longevity Salary Scale (7/1/2009)
Actual
Current: Age-Based
Proposed: Service-Based
Average Pay
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
0
5
10
15
20
25
30
Service

Longevity and Promotion Pay Increases (Safety)

Current Assumption

Age	Current Representative Assumed Increase
22	2.74%
27	1.93%
32	1.30%
37	0.45%
42	0.55%
47	0.54%
52	0.52%
57	0.51%

- The current assumptions, developed by the prior actuary, are based on age.

Recommendation

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%

- New rates have been proposed that are based on service, rather than age. We have repeatedly found that individual longevity and promotion pay increases are more closely related to career length than age.
- The line of best fit based on the new service-related assumptions (the black line in Chart A-10) is a better fit to the data than the age-based assumptions.

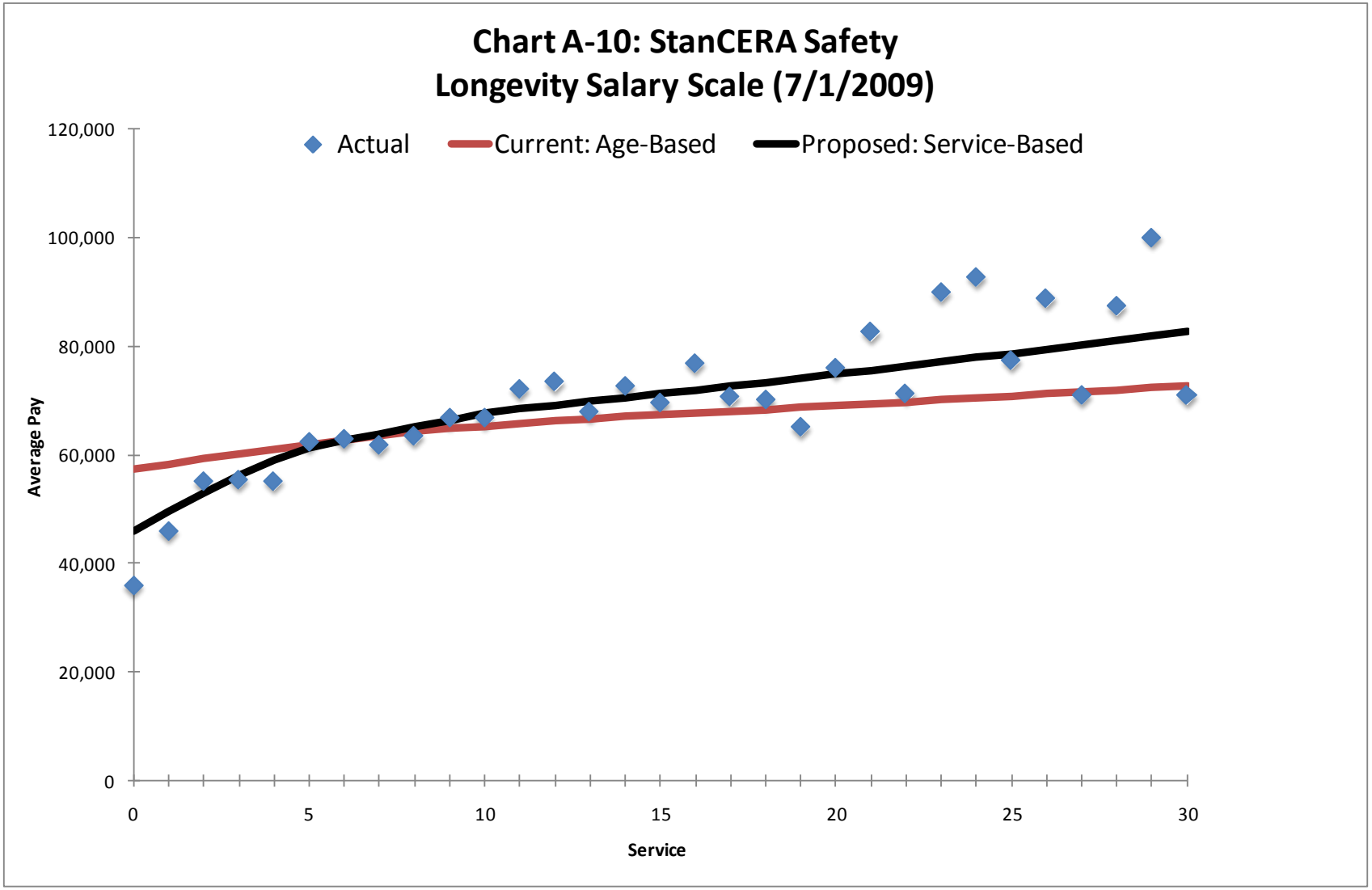


Chart A-10: StanCERA Safety
Longevity Salary Scale (7/1/2009)
Actual
Current: Age-Based
Proposed: Service-Based
Average Pay
120,000
100,000
80,000
60,000
40,000
20,000
0
0
5
10
15
20
25
30
Service

Mortality

Current Assumptions (Miscellaneous & Safety)

Summary of Experience versus Current Assumptions

ACTIVE	Eligible Exposure	Actual Deaths	Expected Deaths	Actual to Expected Ratio
Males	4,630	8	8.0	100.5%
Females	8,679	13	11.3	114.8%
Combined	**13,309**	**21**	**19.3**	**108.9%**

RETIRED & SURVIVING SPOUSES	Eligible Exposure	Actual Deaths	Expected Deaths	Actual to Expected Ratio
Males	2,573	76	80.3	94.6%
Females	4,115	112	108.2	103.5%
Combined	**6,688**	**188**	**188.5**	**99.7%**

DISABLED	Eligible Exposure	Actual Deaths	Expected Deaths	Actual to Expected Ratio
Males	507	13	7.4	176.0%
Females	410	11	9.6	115.1%
Combined	**917**	**24**	**16.9**	**141.6%**

ALL PARTICIPANTS	Eligible Exposure	Actual Deaths	Expected Deaths	Actual to Expected Ratio
Males	7,710	97	95.7	101.4%
Females	13,204	136	129.1	105.3%
Combined	**20,914**	**233**	**224.8**	**103.7%**

- The Society of Actuaries suggested a methodology for projecting mortality improvements using these tables. Using a **Projection Scale AA**, the RP2000 Tables are adjusted for mortality improvements since the base year of the Tables (2000).
- Although experience has matched reasonably closely in aggregate under the current assumptions, we prefer to have a positive margin between the actual number of deaths and the predicted number of deaths (i.e. an actual to expected ratio greater than 100%) for two reasons:

  1. Overall mortality is expected to improve in future years.
  2. The RP2000 Tables were designed using benefit-weighted (rather than participant-weighted) data. This is because members with larger benefits tend to have lower mortality rates, at least at younger ages. Applying the tables on a participant basis, while accurately predicting the *number* of deaths, will tend to underestimate the liabilities.

     For example, the ratio of the number of actual to expected deaths among male retirees and beneficiaries appears rather close under the current assumptions - 94.6% for the most recent three year period. However, the ratio is substantially lower (87.6%) when calculated using benefit-weighting, rather than just the number of deaths. This indicates that the male mortality assumptions require strengthening.

  Both these factors (mortality improvement and benefit-weighting) have a larger impact on the recommendations for male mortality rates than female, since the benefit-weighting affect tends to have a larger impact on the liabilities for male

• The current actuarial assumption is that retired members and their beneficiaries will experience mortality in accordance with the 1994 GAM Mortality Tables, with no age adjustment. [Age adjustments are sometimes made to the age of each member; either setting their age forward or backward, based on whether the member is anticipated to higher or lower life expectancy, versus the given mortality table. For example, using a two year set-back indicates a longer life expectancy than using unadjusted rates.] • All Safety members currently use the male tables, and their beneficiaries are assumed to be female. • The current actuarial assumption is that active members will experience non-duty related mortality in accordance with separate tables – with different rates for Safety members, and for male and female Miscellaneous members. • Active Safety members are assumed to experience line of duty deaths in accordance with a special table. All deaths among active Miscellaneous members are assumed to be non-duty-related. • The experience for Safety members is quite limited, especially among female members. We recommend using the same assumptions for Miscellaneous and Safety, particularly since the current data does not indicate a substantial difference in mortality experience between the two groups. • The RP 2000 Tables, published by the Society of Actuaries, are the most current ones generally used for pension funding.	participants and male mortality is projected to improve more quickly than female mortality. • 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. • For all populations, we recommend the use of sex distinct tables (i.e. using the RP2000 female tables for female Safety members.) A significant portion (approximately 20%) of the current active Safety members is female. In their experience study audit, Milliman also recommended using sex distinct rates for Safety members. • The proposed assumptions provide a small margin between the number of actual deaths and the number expected, for the active member, retired members and beneficiaries and disabled members. We will continue to monitor mortality experience, and determine if further projections may be needed in future years.

• The actual to expected ratio was 93% during the period of the prior experience study (2003-2006), providing additional evidence that the current mortality assumptions should be strengthened. • We propose the use of the RP2000 Combined Healthy Tables (without age adjustment) for healthy retired members and beneficiaries, but projecting those tables from 2000 to 2020 using Projection Scale AA. • We propose the use of the projected RP2000 Combined Healthy Tables (projected to 2020, without age adjustment) for the non-duty related mortality experience of the active members. These assumptions would have provided a reasonable fit to the actual data over the recent period. • We also propose the use of the projected RP2000 Combined Healthy Tables (projected to 2020, with a seven year age set-forward) for the mortality experience of the disabled members. These assumptions would have provided a better fit than the current assumptions to the actual data over the recent period (129.8% vs. 141.6%).	

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	2,700	286	311	92%	298	96%
Termination & Withdrawal	10,576	739	625	118%	716	103%
Disability	13,276	25	37	67%	32	78%
Mortality[1]	20,914	233	225	104%	220	106%

[1] Miscellaneous and Safety, Healthy and disabled Mortality combined

Other Demographic Assumption and Methods

Terminal (Vacation) Pay Load	Recommendation
• Many members are able to cash out some or all of their vacation time in the year prior to retirement; the cashed out pay then gets included in the members' final average compensation. • This terminal payout is not currently included in the assumptions related to projections of pay. In their audit, Milliman recommended that the next experience study address this issue. • Management employees can cash out up to 232 hours of vacation pay (316 hours for retirements prior to 2010). Non-management members can cash out 40 or 60 hours of vacation credit, and may be able to do so twice in the pay averaging period before retirement. • Staff have reported that nearly all management employees take full advantage of the cash out policy, and that cash out levels are also high (over 75%) among non-management employees. • Over 160 retirements that occurred during the past two years 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.	• An analysis of the individual retirement calculations revealed that nearly all of the differences between the projected pay based on the actuarial valuation data and the actual final average compensation could be explained by the vacation cash outs. • Based on this analysis, we propose the use of a 3.5% load to the compensation used in the final year of the averaging period for determining projected retirement benefits for Miscellaneous members, and a 1.0% load for Safety members. • The data used to determine these assumptions was weighted by member payroll: although management employees make up only six percent of the active workforce, the payroll associated with these members represents over 12% of the total active payroll. Weighting the data by payroll helps properly assess the higher cash out benefits available to management employees. • These terminal pay loads are only to be applied to retirement benefits, and will be limited to full career benefits (i.e. where the career length is at least 20 years). • We will continue to monitor terminal pay experience and adjust this assumption as necessary. Modifications may also be necessary if there are any changes to the vacation cash out policies (such as the recent change from 316 to 232 eligible hours for management).

Commencement Age for Deferred Vested Members	**Recommendation**
• Currently, Miscellaneous members with a deferred vested benefit (including those working for a reciprocal employer) are assumed to commence receiving benefits at age 62 (65 for Tier 3). Safety members are assumed to have their benefits commence at age 55. • In their actuarial audit of the prior experience study, Milliman expressed a concern that members will start receiving benefits before these expected ages, particularly Safety members, who can begin receiving a full, unreduced retirement benefit at age 50. • During the period of the prior study (2003-2006), Milliman observed an average commencement age of 57 for Miscellaneous members and 52 for Safety members. • The average commencement age for the period of this study (2006-2009) was 53 for Safety, 58 for Miscellaneous.	• We recommend a change to the assumed commencement age for deferred vested members, using an expected commencement age of 53 for Safety members and 58 for Miscellaneous members. • The use of this revised assumption will lead to a more accurate estimate of the liabilities and costs of the Plan, since deferred vested members will be assumed to receive benefits sooner and for a longer period of time.

Actuarial Cost Method

- The prior actuary, Buck Consultants, used a variation of the traditional approach to determining Plan cost under the Entry Age Normal funding method. Under this approach, the future normal costs are determined for the Plan as a whole, and then spread over the average career length of the active members.
- Under the traditional method for determining the actuarial cost of the Plan, the annual normal cost is determined separately for each member of the Plan, and then summed together.
- When EFI took over as the actuarial consultant, a change was implemented to the methodology used to compute the entry age normal cost. Under this methodology, 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, costs are competed for all benefits as a whole, spread over the entire expected career length of the member.
- Although EFI's alternate methodology remains an acceptable method for determining an actuarially sufficient funding contribution, the Government Accounting Standards Board is considering changes to the pension accounting standards that may require the use of the traditional, career-length approach to Entry Age Normal liability calculations.
- As was stated in the 2008 actuarial valuation report, the revised methodology tends to be slightly more conservative, in the sense that it generally assigns a higher portion of the total cost to prior service, resulting in a lower funding ratio.

Recommendation

- We recommend a change to the funding methodologies 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, rather than for each potential individual benefit.
- These revised methodologies represent a simpler and more traditional approach to determining Plan cost.
- The impact of these changes would be an increase in the current employer contribution rate, accompanied by an improvement in the funding ratio.

Economic Assumptions

Introduction

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

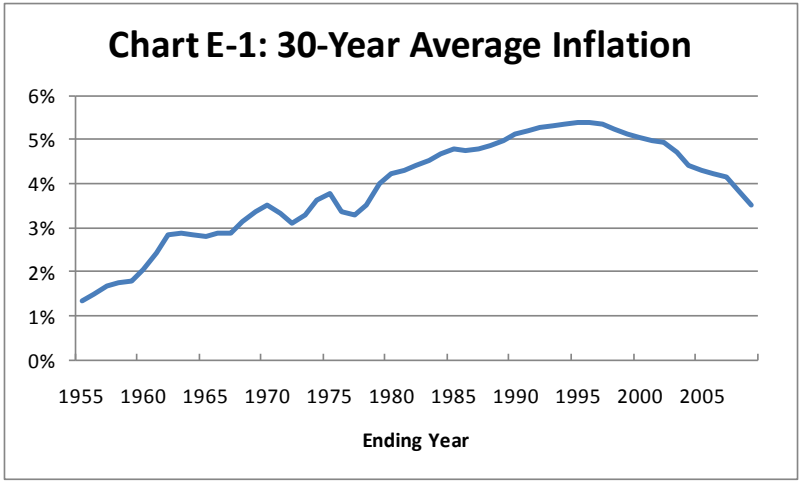
- The inflation assumption;
- The real investment return assumption;
- The real growth in pay relative to inflation; and
- COLA increases relative to inflation.

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 2008. 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.



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.

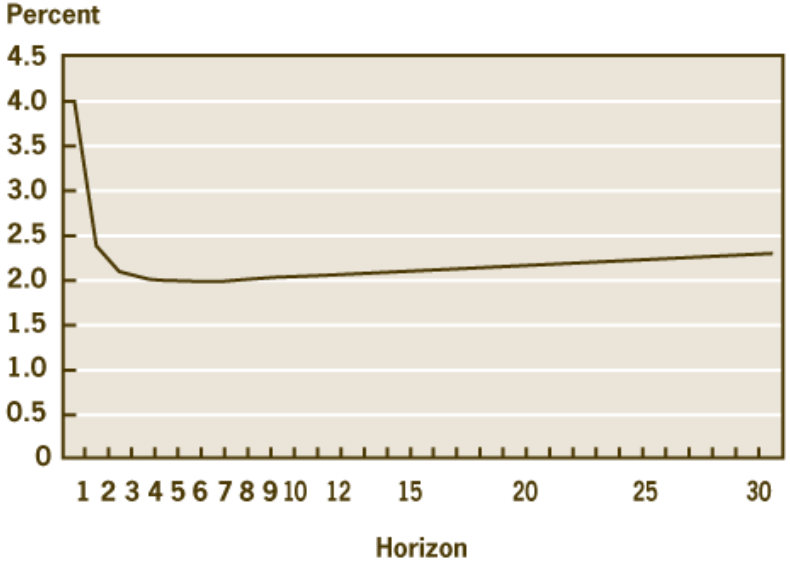
- The population of the United States is aging, which implies a greater likelihood of low inflation in the future. This has been observed in other countries with aging populations, such as Japan.

- 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.

Chart E-2: Expected Inflation



(Source: Joseph G. Haubrich, Cleveland Federal Reserve website. As of September 1, 2009) (http://www.clevelandfed.org/research/commentary/2009/0809.cfm#back2fn2)

An assumption of 2.5% to 3.0% 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.

A change from the current 4% assumption to a 3% or lower assumption would represent a sudden and drastic change in the

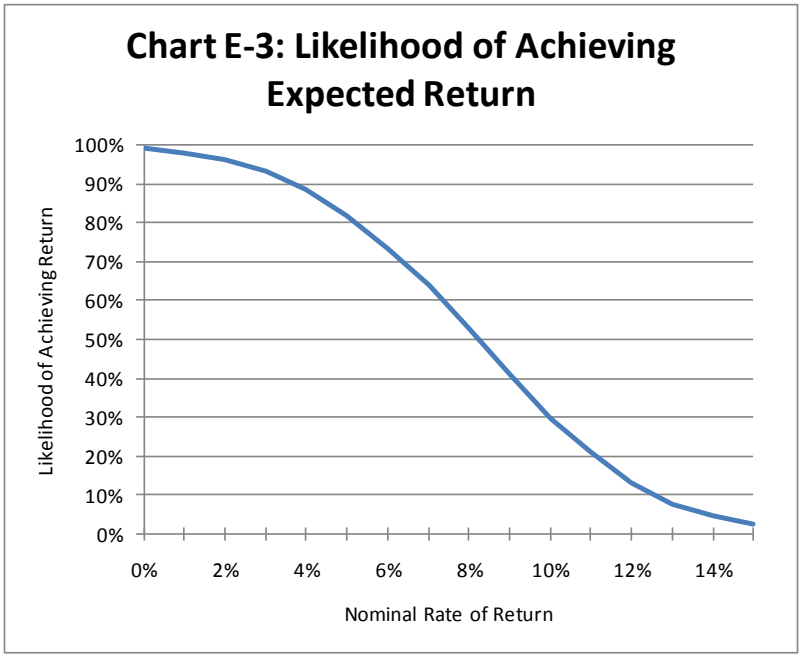
assumptions, which is not advisable. Therefore, we recommend reducing the inflation assumption from 4% to 3.5%, a moderate but still significant reduction. If, at the time of the next experience study, the markets and forecasters continue to indicate lower expectations of future inflation, further reductions 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 (as of May, 2010) of 41.4% domestic equity, 20% international equity, 37.1% fixed income, and 1.5% real estate. 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 (3.5%).
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, after adjusting for administrative expenses.



According to Article 31580.2 of the '37 Act, administrative expenses (excluding certain technology expenses) may not exceed 0.18% of the assets of the retirement system. The simulated rates of return in Chart E-3 are reduced by 0.18% to allow for these expenses.

The mean return from this simulation was 8.09%, for a real return of 4.59%. Note that the curve crosses the 50% likelihood

threshold right around this point, meaning that chances are slightly better than 50/50 that an 8% return would be achieved over a ten year period.

This matches reasonably well with the expectations of the investment consultant; a recent projection from SIS showed an expected real return of 4.6% (7.2% nominal minus 2.4% inflation and 0.2% administrative expenses) for the same portfolio.

However, EFI recommends the use of a slightly lower real return assumption than indicated by the mean geometric return, based partly on the impact of the excess earnings policy. The Board is in the process of adopting an excess earnings and reserve policy which provides for the possibility of future investment earnings above a certain level being diverted from the valuation assets used to fund the basic Plan benefits.

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 the 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 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 as summarized in the following outline:

1. Excess earnings are defined as the amount by which the actuarial rate of return is above the expected return.
2. The percentage of excess earnings that may be used for non-valuation purposes (subject to the approval of the Board) is defined by the funding ratio – with no such earnings to be designated unless the Plan is at least 90% funded
3. The employer contribution rate is required to be at least equal to the normal cost, net of employee contributions.

Based on 1,000 simulations of the StanCERA investment portfolio and reflecting the impact of the funding and excess earnings policies, we were able to compute the average geometric return over a 20 year period – net of any assets diverted by the excess earning policy for non-valuation purposes. We concluded that the excess earnings policy led to an average reduction in the net investment earnings by 0.20% over this period.

We noted above that a reasonable inflation assumption is around 3.5%. We recommend a nominal return assumption of 7.90% - approximately 0.2% less than the 8.09% mean return shown in our earlier simulation. A 7.90% annual return corresponds to a 7.75% rate compounded semi-annually (using 3.875% interest every six months), and represents an increase in the real return assumption from 4.16% to 4.40%.

The actuarial cost generated using a real return of 4.40% and an inflation assumption of 3.50% (nominal rate 7.90%) is very similar to that using a real return of 4.16% and an inflation assumption of 4.00% (nominal rate 8.16%). Therefore, the two sets of assumptions are equally conservative, from an actuarial cost perspective.

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.

There is currently no assumed growth beyond the growth due to inflation. 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 the use of a small a non-inflationary base payroll growth assumption, at a level of 0.25% annually. Therefore, the annual expected increase in base payroll will be 3.75%, reduced from 4.00% in the most recent valuation. This increase will be applied to all continuing active members, in addition to acting as the increase in starting pay for new entrants when projections of future populations are required.

COLA Growth

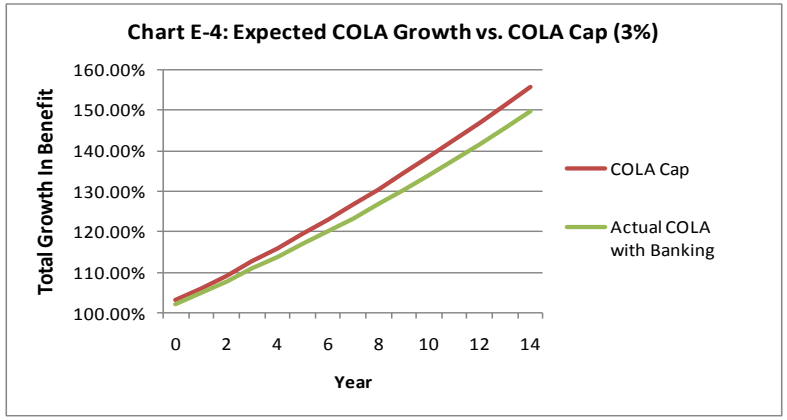
Most members of StanCERA are eligible to receive automatic Cost of Living Adjustments (COLAs), based on the growth in the Bay Area Consumer Price Index (CPI) and reflecting various a 3% cap on the annual COLA increase. Any increase in the CPI above the 3% maximum increase can be banked for future years 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 (3.5% 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 3.5% recommended inflation assumption, we recommend an assumed COLA growth rate of 2.7% per year, which represents a reduction from the 3.0% currently used.

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.