

State of Arizona

**Public Safety Personnel Retirement System
Correction Officers Retirement Plan
Elected Officers Retirement Plan**

Actuarial Audit Report

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June 29, 2007

Mr. Jim Hacking
Executive Director
Public Safety Personnel Retirement System of Arizona
3010 E. Camelback, Suite 200
Phoenix, AZ 85016

Re: Actuarial Audit Report

Dear Mr. Hacking:

The enclosed report presents the findings and comments resulting from a detailed review of the June 30, 2006 actuarial valuations and experience studies performed by Rodwan Consulting Company (Rodwan) for the three plans administered by Public Safety Personnel Retirement System of Arizona (APSPRS):

- (1) the Public Safety Personnel Retirement System (PSPRS),
- (2) the Correction Officers Retirement Plan (CORP), and
- (3) the Elected Officials' Retirement Plan (EORP).

An overview of our major findings is included in the Executive Summary section of the report. More detailed commentary on our review process is included in the latter sections.

In preparing this report, we relied, without audit, on information (some oral and some in writing) supplied by APSPRS staff. This information includes, but is not limited to, statutory provisions, employee data, and financial information. In our examination of these data, we have found them to be reasonably consistent and comparable with data used for other purposes. Since the audit results are dependent on the integrity of the data supplied, the results can be expected to differ if the underlying data is incomplete or missing. It should be noted that if any data or other information is inaccurate or incomplete, our calculations may need to be revised.

On the basis of the foregoing, we hereby certify that, to the best of our knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices which are consistent with the Actuarial Standards of Practice promulgated by the Actuarial Standards Board and the applicable Guides to Professional Conduct, amplifying Opinions, and supporting Recommendations of the American Academy of Actuaries.



Public Safety Personnel Retirement System of Arizona

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Milliman's work product was prepared exclusively for APSPRS for a specific and limited purpose. It is a complex, technical analysis that assumes a high level of knowledge concerning APSPRS operations, and uses APSPRS data, which Milliman has not audited. It is not for the use or benefit of any third party for any purpose. Any third party recipient of Milliman's work product who desires professional guidance should not rely upon Milliman's work product, but should engage qualified professionals for advice appropriate to its own specific needs.

We would like to express our appreciation to both Sandy Rodwan and the APSPRS staff for their cooperation in supplying the data and information on which this report is based.

We are members of the American Academy of Actuaries and meet the Qualification Standards of the American Academy of Actuaries to render the actuarial opinion contained herein.

We respectfully submit the following report, and we look forward to discussing it with you.

Sincerely,

Patrice A. Beckham, FSA, EA, MAAA
Consulting Actuary

Nick J. Collier, ASA, EA, MAAA
Consulting Actuary

Brent A. Banister, FSA, EA, MAAA
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PAB/NJC/BAB/nlo

**Public Safety Personnel Retirement System of Arizona
Actuarial Audit Report**

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Public Safety Personnel Retirement System of Arizona Actuarial Audit Report

Section 1

Executive Summary

Purpose and Scope of the Actuarial Audit

This actuarial audit reviews the June 30, 2006 actuarial valuations and the July 1, 2001 – June 30, 2006 experience studies performed by the Public Safety Personnel Retirement System of Arizona's (APSPRS refers to the combined plans of PSPRS, CORP and EORP) retained actuary, Rodwan Consulting Company (Rodwan). The purpose of the audit is to verify that the results presented in their reports are actuarially sound and reasonable.

As requested, the following tasks were performed in this audit:

- ✓ verification of demographic data;
- ✓ review of application of the assumptions and methodology for compliance with the funding standards;
- ✓ confirmation of the valuation results, including a determination of actuarial accrued liability, normal cost, and contribution rates; and
- ✓ replication of the experience study to determine the reasonableness of the actuarial assumptions;
- ✓ quantification of recommended changes.

Audit Conclusion

The valuations provide a reasonable estimate of each of the three plan's current funded positions based on the valuation methods and assumptions. Going forward though, we recommend changes be made in the calculation of the employer contribution rates, as we found that the average contribution rates were understated by roughly 2.0% of payroll, or more depending on the Plan.

In our opinion, the inflation assumption of 5.0% is high. This, in conjunction with the impact of allocating 50% of all market value returns above 9% to the Future Benefit Increase Reserve (FBIR), results in the investment return assumption of 8.5% being extremely aggressive. That is, it is highly unlikely that the plans will be able to achieve the 8.5% return on a long-term basis, given the use of a significant portion of excess returns to fund COLAs from the FBIR. If the investment return assumption were lowered, this would result in a significant increase in the plans' actuarial accrued liabilities and contribution rates.

Milliman's approach to performing an experience study was different than Rodwan's. Please see Section 8 for a detailed discussion of the difference in methodology. We believe our approach is a superior approach and is the more common approach used in the industry. This basic difference in how exposures and decrements were developed created differences in the observed rates which were significant in some situations. Therefore, the assumptions developed by Milliman differ from Rodwan's recommendations. We believe our recommended assumptions are a better expectation of future experience and are more consistent with how the valuation software will apply the assumptions.

The most significant recommended change regarding the demographic assumptions relates to the mortality assumption. We believe there should be some reflection of future mortality improvements in the valuation assumption. Our recommendation is to use the projection scale that was recommended by the Society of Actuaries Retirement Plans Experience Committee with the RP-2000 Table to project mortality improvements.

Summary of Most Significant Issues

For this actuarial audit, we reviewed both the June 30, 2006 actuarial valuations for each Plan and the experience studies for the period July 1, 2001 to June 30, 2006. Based on our analysis, we believe several changes are necessary to more accurately reflect the emerging liabilities and funding requirements of the plans. It should be noted that we provide estimates of the financial impact of these recommended changes later in this report. These estimates are in aggregate for all employers in each of the three plans; the financial impact on each individual employer will vary depending to their individual circumstances. Because there is some interaction amongst these items, the total cost impact may not exactly equal the sum of the individual cost changes.

For the valuations, we identify several technical issues which have a material impact on the calculation of contribution rates. For the experience study, our biggest concern is the investment return assumption. If this is lowered, as our analysis indicates is needed, it could result in a significant increase in the calculated contribution rates. We have compiled a complete list of our recommended changes, as well as some other issues to consider, in Section 7 for the valuations and Section 18 for the experience studies. The four most significant issues, along with our recommendations, are as follows:

1. Investment Return Assumption

Issue: We believe the inflation assumption of 5.0%, which is a component of the investment return assumption (as well as the wage inflation assumption), is very high compared with both historical experience and current expectations (see page 31 for more discussion). In addition, removing one-half of the favorable investment experience over 9.0% has a dramatic impact on the net investment return for the Fund. When the impact of this provision is reflected, along with a more reasonable inflation assumption, it appears unlikely that the Fund can earn an 8.5% net return compounded over the long run.

Recommendation: We recommend the investment return be lowered. There will need to be discussion with the Board on the specific rate. Our preference would be 7.5%, but 8.0% would at least move the assumption within what we consider the reasonable range (discussed later in this report).

Cost Impact: A change in the investment return assumption can significantly increase the liabilities and contribution rates. We estimated the impact of moving to a 7.5% investment return assumption and a 4.5% general wage growth assumption for PSPRS. The change increased the actuarial accrued liability by over 10% and the average employer contribution rate by about 7% of pay.

2. Calculation of Projected Benefits

Issue: There were several issues with Rodwan's calculations where we believe their calculations did not accurately reflect the timing of events. Specifically, in projecting the value of future benefits payable to active members, they assume that members will leave active employment in the middle of the year; however, the salary and service used in their calculation of the member's projected benefits at that time do not take into account the last half year of service. This understates the value of the benefits.



Recommendation: Change the valuation calculations in future years to reflect the half year of service and salary increase in the year the member is assumed to leave active service.

Cost Impact: We estimate that this change would increase the contribution rate for PSPRS and CORP by around 1.5% of pay and about 2.0% of pay for EORP.

3. Calculation of Normal Cost Rate

Issue: In determining the normal cost rate, Rodwan's calculations assume that contributions are paid at the beginning of the year; whereas, in practice, they are received throughout the year. An interest adjustment is needed to reflect this delay. This results in an understatement of the cost of the benefits.

Recommendation: Change the calculation of the normal cost rate to reflect the fact that contributions are received throughout the year.

Cost Impact: We estimate that this change would increase the contribution rate for PSPRS and EORP by around 1.0% of pay and about 0.7% of pay for CORP.

4. Mortality Assumption

Issue: Rodwan recommended moving to the RP-2000 Table for all groups, but did not address how, or whether, adjustments for future mortality improvements should be made. It is generally accepted that mortality rates will continue to improve and it is prudent to either have a 'margin' in the rates used (predict fewer deaths than actually occur) or project future mortality improvements directly. ASOP 35 states that actuaries "should consider...the likelihood and extent of mortality improvements in the future." The Society of Actuaries Retirement Plans' Experience Committee which developed the RP-2000 Table, recommended "the use of Scale AA for projecting mortality rates beyond the year 2000" with that table.

Recommendation: We strongly recommend that one of the projection methods mentioned previously be used. Our preference would be to use the generational projection scale provided with the RP-2000 Table to project future mortality improvements.

Cost Impact: This change is expected to increase costs. We estimate the impact for PSPRS as 1.5% of liabilities and 60% increase in the contribution rate. The change for CORP and EORP would be similar. Please note that this cost impact is for the reflection of the generational mortality projection, and is in addition to any change arising from Rodwan's proposed change to the RP-2000 Table.

Summary of Audit Results

Our conclusions concerning the primary issues of this review are as follows:

- **Membership Data:** We performed tests on both the raw data supplied by the APSPRS staff and the processed data used by Rodwan in the valuation. Based on this review, we concluded that the data used is appropriate and complete. Overall, we matched Rodwan's data very closely.
- **Actuarial Value of Assets:** We have reviewed the calculation of the actuarial value of assets used in the June 30, 2006 valuation. We found the methodology used to be reasonable and in compliance with the proposed actuarial standards of practice. The seven-year period used to smooth asset gains and losses is a longer period compared to the period used by most other public retirement systems, but we do not consider it unreasonably long. However, given the use of a longer smoothing period, we recommend implementing a corridor of 80% to 120% of market value. We were able to match all calculations, although we do note that the Future



Benefit Increase Reserve used by Rodwan differed slightly from the value reported in the CAFR for CORP and EORP.

- **Actuarial Accrued Liabilities and Costs:** We independently calculated the costs and actuarial accrued liabilities of PSPRS, CORP and EORP. Overall, the total actuarial accrued liability for each plan matched those calculated by Rodwan within an acceptable level; however, there was a material difference in the normal cost rate calculated by Rodwan versus the rate we calculated. Although there was some difference due to benefit provisions that were not accurately reflected, the majority of the difference was due to issues with the actuarial calculations, particularly how the contribution rates are developed. We are recommending a number of changes to the calculations of the active actuarial accrued liabilities and the normal cost rate that will impact employer contribution rates, including those discussed earlier. These recommendations are discussed in detail in the body of the report.
- **Funding:** We reviewed both how the systems are funded and the application of the actuarial cost method. Each of the systems is being funded on a generally acceptable basis, albeit at the minimum level. We recommend that the current approach be reviewed when contributions rates stabilize or decrease and consideration be given to strengthening the funding by lowering the amortization period or, at a minimum, closing the 30 year period.
- **Other Comments:** We recommend several changes for more complete disclosure in the valuation reports. None of these changes has cost impact.
- **Recommendations & Considerations:** In Section 7 of the report we have summarized all of our recommendations and comments from the replication of the valuation report for consideration in future valuations.



**Public Safety Personnel Retirement System of Arizona
Actuarial Audit Report**

PART A

REPLICATION OF ACTUARIAL VALUATIONS



Milliman

This work product was prepared solely for the Public Safety Personnel Retirement System of Arizona (APSPRS) for the purposes described herein and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work.

Public Safety Personnel Retirement System of Arizona Actuarial Audit Report

Section 2

Membership Data

Audit Conclusion

We performed tests on both the raw data supplied by APSPRS staff and the processed data used by Rodwan in the valuation. Based on this review, we feel the data used is appropriate and complete. Overall, we matched Rodwan's data very closely.

Comments

Overall, the data process appears to be thorough and accurate. We would add the following comments:

- **Raw Data:** The APSPRS staff provided us with the same data that was supplied to Rodwan for use in the actuarial valuation.
- ✓ **Completeness:** The data contained all necessary fields to perform the actuarial valuation.
- ✓ **Quality:** We compared the APSPRS data to information reported in the System's CAFR. The data appeared to be consistent with the totals shown in the CAFR. We do have two minor comments:
 - 1) There were instances where dates or numbers provided in the Excel data file showed up as text. Also, we noted in very few instances where birthdates were from the wrong century (e.g., a person with a date of birth in 2047).
 - 2) There were individuals whose health subsidy exceeded the maximum amount in the statute. We reviewed this situation with staff and were informed that the amount shown on the data is the total amount paid. In some cases, members are receiving payments both from PSPRS and from the state retirement system. PSPRS pays both subsidies, but is reimbursed for the state portion. Rodwan should review how they are valuing these individuals.

We do not believe either of these issues, if corrected, would materially change the overall valuation results.

Parallel Data Processing: We performed independent edits on the raw data and then compared our results with the valuation data edited and used by Rodwan. We found our results to be a very close match with theirs. A summary of all plans in aggregate is shown in Exhibit 2-1 on the following page. Note that the "Milliman" column reflects the PSPRS data after adjustments by Milliman. The "Rodwan" column reflects the actual data used in Rodwan's valuations. A detailed comparison by plan is shown in Appendix A.

**Exhibit 2-1
Member Statistics**

	Rodwan	Milliman	Ratio Milliman/Rodwan
<i>Active Members</i>			
Total Number	30,038	30,040	100.0%
Average Age	38.6	38.6	100.0%
Average Service	7.9	7.9	100.0%
Average Annual Salary	\$ 52,138	\$ 52,128	100.0%
<i>Retirees and Survivors</i>			
Total Number	9,726	9,725	100.0%
Average Monthly Pension	\$ 2,837	\$ 2,837	100.0%
<i>DROP Participants</i>			
Total Number	1,746	1,746	100.0%
Average Monthly Pension	\$ 4,205	\$ 4,205	100.0%

Public Safety Personnel Retirement System of Arizona Actuarial Audit Report

Section 3

Actuarial Value of Assets

Audit Conclusion

We have reviewed the calculation of the actuarial value of assets used in the June 30, 2006 valuation. We found the methodology used to be reasonable and in compliance with the proposed actuarial standards of practice. The seven-year period used to smooth asset gains and losses is a longer period compared to the period used by most other public retirement systems, but we do not consider it unreasonably long. However, given the use of a longer smoothing period, we recommend implementing a corridor of 80% to 120% of market value. We were able to match all calculations, although we do note that the Future Benefit Increase Reserve used by Rodwan differed slightly from the value reported in the CAFR for CORP and EORP.

Comments

The method used to determine the actuarial value of assets smoothes asset gains and losses by reflecting one-seventh of the difference between the market-related value and the expected value, based on the actuarial assumed rate of return. Prior to 2003 gains and losses were smoothed over four years. Asset smoothing methods are used by most public retirement systems, with the most common period being five years (i.e., one-fifth recognition). Although most of our clients use a shorter smoothing period, we do not consider seven years unreasonably long.

There has been some movement by other public systems toward longer periods. We believe this is in reaction to the extreme market volatility and the corresponding increases in contribution rates we have seen in the past decade.

While there has been some movement to longer smoothing periods by public plans, the reverse is true in the private sector. Both minimum funding requirements and accounting standards in the private sector are moving to shorter smoothing periods, and possibly no smoothing for accounting numbers. The Governmental Accounting Standards Board (GASB) has a research project underway to review the current rules for financial reporting for retirement plans. GASB has often followed the actions of the Financial Accounting Standards Board (FASB), so there is a chance that GASB may change the current rules and limit the smoothing period permitted in developing the Annual Required Contribution (ARC).

We performed an independent calculation of the actuarial value of assets. We were able to match all calculations, although we did notice one discrepancy with the CAFR. The Future Benefit Increase Reserve (FBIR) amount shown in the Rodwan valuation report did not match the value shown in the CAFR for CORP or EORP. If the FBIR amount reported in the CAFR were used, it would cause a change in the actuarial value of assets of the two plans of less than 1%.

In the calculation of the actuarial valuation of assets, the value of the FBIR is removed. We believe this is an appropriate adjustment to reflect that the reserve is designated for benefits, and therefore actuarial accrued liabilities, that are not reflected in the valuation.

To calculate each employer's contribution rate, the actuarial valuation of assets must be allocated to each employer. The actuarial value of assets for each employer is the sum of the book value of the employer and member reserves multiplied by the ratio of the total actuarial value of assets to the total book value of assets. We agree that this is a reasonable method and confirmed that it was applied correctly.

When a smoothing method is applied, the actuarial value of assets will deviate from the market value of assets. Many systems apply a corridor; that is, the actuarial value of assets is not allowed to deviate from the market value by more than a certain percentage. The purpose of a corridor is to keep the actuarial value of assets within a reasonable range of the market value. The current asset method does not have a corridor.

We generally recommend a corridor of 20%; that is, the actuarial value of assets is constrained to a value between 80% and 120% of the market value of assets. Because the System uses a longer smoothing period, the application of a corridor is even more important to ensure the actuarial value of assets does not stray too far from the market value. Note that if a corridor of 20% had been applied, it would not have impacted the 2006 valuation results; however, it would have affected some of the prior valuations.



Public Safety Personnel Retirement System of Arizona Actuarial Audit Report

Section 4

Actuarial Accrued Liabilities and Costs

Audit Conclusion

We independently calculated the costs and actuarial accrued liabilities of PSPRS, CORP and EORP. Overall, our total actuarial accrued liability for each plan matched those calculated by Rodwan within an acceptable level; however, there was a material difference in the normal cost rate calculated by Rodwan versus the rate we calculated. Although there was some difference due to benefit provisions that were not accurately reflected, the majority of the difference was due to issues with the actuarial calculations, particularly how the contribution rates are developed. We are recommending a number of changes to the calculations of the active actuarial accrued liabilities and the normal cost rate that will impact employer contribution rates.

Comments

We independently calculated the actuarial accrued liabilities for all members based on the following:

- ✓ **Data** – We used the data provided by APSPRS staff. As discussed in Section 2, we confirmed that this data was consistent with the valuation data used by Rodwan.
- ✓ **Assumptions** – We used the assumptions disclosed in the 2006 actuarial valuation reports. This information was provided to us electronically by Rodwan.
- ✓ **Methods** – We used the actuarial methods disclosed in the 2006 actuarial valuation reports. This was supplemented by discussions between Rodwan and Milliman on the technical application of these methods.
- ✓ **Benefits** – We incorporated the benefits for all plans into our valuation system. We obtained this information from the Summary of Benefits and the Statutes included on APSPRS website.

We performed a detailed comparison by plan and type of benefit for the actuarial accrued liability computed in our parallel valuation with those calculated by Rodwan. In addition, we reviewed the detailed calculations from Rodwan's valuation system for several individuals. Based on this analysis, we noticed a number of issues. These issues fall into two categories:

- 1) benefit provisions that are not reflected correctly; and
- 2) actuarial calculation and timing issues.

The former has only a small impact; the latter has a material impact on the normal cost rate and therefore, the actuarial contribution rate.

We programmed our valuation system to mimic Rodwan's valuation techniques. In doing this, we were able to match Rodwan's calculations very closely (we were within 0.5% of the actuarial accrued liability for each plan). We then adjusted our valuation system to more accurately reflect the actual benefit provisions and used what we believe to be the proper techniques with regard to the actuarial calculation and timing issues. This had a minimal impact on the actuarial accrued liabilities, but materially increased the normal cost rate.

Exhibit 4-1 shows a summary of this analysis for each plan. The Milliman numbers are from the revised valuation run (i.e., our preferred approach). A more detailed comparison is shown in Appendix B. The total actuarial accrued liabilities (AAL) are within approximately 1.0% for the three plans. For the Normal Cost rate, the relative difference is approximately 10% (discussed later).

Exhibit 4-1
Comparison of Actuarial Accrued Liabilities and Normal Cost Rate
(Dollar Amounts in Millions)

	Rodwan	Milliman	Ratio Milliman/Rodwan
Actuarial Accrued Liability			
PSPRS	\$ 6,495.0	\$ 6,547.4	100.8%
CORP	981.2	994.6	101.4%
EORP	391.4	394.2	100.7%
Total AAL - All Plans	\$ 7,867.6	\$ 7,936.2	100.9%
Total Normal Cost Rate (Employer + Member)			
PSPRS	17.73%	19.54%	110.2%
CORP	14.03%	15.69%	111.8%
EORP	23.59%	26.08%	110.6%

There were several technical flaws in Rodwan’s coding for several benefit provisions. These changes do not have a significant impact on the total actuarial accrued liability (AAL); however, we recommend that these be corrected in future valuations. There are a few other issues with the benefit provisions that we identified but did not quantify. We recommend that these be reviewed in future valuations. The changes that we are recommending for valuing the benefits are summarized below.

The impact of making the following changes is relatively small with regard to the actuarial accrued liability. However, there is a material impact to the normal cost rate and the resulting contribution rates. We have quantified the impact of each of the issues on the AAL in Exhibit 4-2. We have shown the impact on the normal cost rate as part of the total contribution rate later in this section (See Exhibit 4-3).

A1. Active Duty Death Benefit (PSPRS): The duty death benefit specified in the statute is 100% of average monthly compensation. Rodwan’s calculations use double the disability benefit (with adjustment for marriage). When the disability benefit is greater than 50% of compensation, this results in a death benefit that is greater than 100% of compensation. This overstates the actuarial accrued liabilities and normal cost rate. The duty death benefit is a relatively small portion of the overall liability and normal cost, so the financial impact is not large.

A2. Refund/Deferred Retirement Benefit (CORP): When members terminate active employment and are not eligible to begin retirement benefits, they may either elect to take a refund of their contributions with the applicable match or wait until they are eligible for service retirement. Rodwan is valuing the benefit as if the member could take a refund of their contributions and also receive a deferred service retirement benefit. This is effectively double-counting the benefit; however, Rodwan is not valuing the employer match on the member contributions. The impact of these issues are somewhat offsetting, so we do not believe there is a significant financial impact; however, we recommend that this be corrected in future valuations to be consistent with the plan’s benefit provisions.

- A3. Disability Retirement Benefit (CORP):** The CORP statutes (38-886C) state the accidental disability benefit is the better of 50% of compensation or the benefit based on actual compensation and service. Rodwan is only valuing the 50% of compensation portion. This understates the actuarial accrued liabilities and normal cost rate. The disability benefit is a relatively small portion of the overall liability and normal cost, so the financial impact is not large.
- A4. Calculation of Average Compensation (All Plans):** The average compensation amount used in Rodwan's calculations is based on the earnings for the three years prior to the age when the member is assumed to leave active employment. That is, if a member retires at age 55.5 (note that for valuation purposes members are assumed to leave active employment at mid-year), average compensation is based on ages 52, 53, & 54. This method does not take into account the most recent six months (i.e., the earnings in the last half year, in this case compensation from age 55.0 to 55.5). Excluding the last half year, which is assumed to have greater earnings than previous periods, underestimates the average compensation and therefore the amount of the benefit. This understates the actuarial accrued liabilities and normal cost rate.
- A5. Calculation of Service (All Plans):** Similar to the issue with average compensation, service during the year the member is assumed to leave active employment is not reflected. For example, if a member is age 50 with 25 years of service at the valuation date and is assumed to leave active employment at mid-year (age 50.5), Rodwan is calculating projected benefit amounts based on 25 years of service, not the 25.5 years of service the member would have completed by that time. This also affects how the actuarial accrued liability and normal cost are calculated. Excluding the final half year underestimates the member's projected retirement benefit. However, using the lower projected service in the calculation of the accrued portion of the projected benefit tends to somewhat offset the impact in the calculation of the actuarial accrued liability. Overall, this has minimal impact on the actuarial accrued liabilities, but understates the normal cost rate.
- A6. Assumption Ages (PSPRS):** The disability and withdrawal rates for PSPRS are off by one year in Rodwan's valuation program. For example, the disability rate at age 50 is actually being applied to age 51. This resulted in a small understatement of the actuarial accrued liabilities and normal cost rate.
- A7. Probability of Retirement (EORP):** All active members age 70 and above are assumed to have a 100% probability of retirement; however, Rodwan is using 20% at all ages 70 and above if the member has 20 years or more of service. This results in a small understatement of the actuarial accrued liabilities and normal cost rate.



Exhibit 4-2
Impact of Recommended Changes on Actuarial Accrued Liability
(Dollar Amounts in Millions)

	PSPRS	CORP	EORP
Actuarial Accrued Liability			
Milliman Calculation / Rodwan Methods	\$ 6,490.4	\$ 983.5	\$ 389.5
Adjustments for			
A1. Active Duty Death Benefit (PSPRS)	(13.1)	-	-
A2. Refund / Deferred Ret. Benefit (CORP)	-	0.1	-
A3. Disability Retirement Benefit (CORP)	-	0.5	-
A4. Average Compensation (All Plans)	68.3	14.6	3.3
A5. Calculation of Service (All Plans)	(3.2)	(4.1)	(0.7)
A6. Assumption Ages (PSPRS)	5.0	-	-
A7. Probability of Retirement (EORP)	-	-	2.1
Total Adjustments	<u>57.0</u>	<u>11.1</u>	<u>4.7</u>
Milliman Calculation	\$ 6,547.4	\$ 994.6	\$ 394.2
Rodwan Calculation	6,495.0	981.2	391.4
Milliman/Rodwan Ratio	100.8%	101.4%	100.7%

There are a few other issues which we believe should be reviewed; however, we have not quantified these as either the cost impact is estimated to be negligible, or it is not clear that a change is necessary. These issues are as follows:

- 1. Health Subsidy Reimbursements (All Plans):** It is our understanding there are a number of retirees whose health subsidy amount includes payments from both PSPRS and the state retirement system. PSPRS makes these payments and the state system reimburses PSPRS for their share. Rodwan should review how these members are being valued to ensure the correct liability is reflected.
- 2. Final Average Period (EORP):** On page 10 of the June 30 2006 EORP valuation report, it says "For elected officials whose membership commenced before July 17, 1994, average yearly salary will generally be final salary at termination of service." Our understanding is that current procedures base benefits on the three-year average; however, it is likely this feature will be reflected pending the settlement of a lawsuit. Rodwan should review how they are reflecting this in the valuation process.

Contribution Rates

We independently calculated the individual employer contribution rates based on both Rodwan and Milliman's valuation results. We found two main areas (other than the benefit valuation issues discussed earlier) where Rodwan's calculations deviated from what we believe is the technically correct approach. We also note one area where we would perform the calculation differently; however, we are not recommending a change for that area, just noting our preference. The impact of the recommended changes is shown in Exhibit 4-3.

B1. Calculation of Normal Cost Rate (All Plans):

Rodwan is calculating the normal cost rate as $NC\% = NC\$ / \text{Payroll}$

where:

NC\$ is the present value, at the beginning of the year, of the anticipated increase in the actuarial accrued liability for service performed during the year.

Payroll is projected payroll for 12 months following valuation date.

This is the appropriate method to calculate the normal cost rate under the PUC method, if the normal cost were paid into the System on July 1. Since contributions are paid throughout the year, the payroll for the year should be discounted to the beginning of the year to get an "apples-to-apples" comparison. Alternatively, the dollar amount of normal cost could be increased to mid-year, which would yield a similar result. This has no impact on the actuarial accrued liabilities, but materially understates the normal cost rate by about 1% of pay and therefore understates the total contribution rate.

B2. UAAL Contribution Rate – Payroll (All Plans): For the UAAL contribution rate, Rodwan's calculation assumes that the prior year's payroll goes up immediately by the wage inflation (plus some merit) on the valuation date. Then, in the amortization calculation, they assume continual payroll increases throughout each future year starting with the valuation date. This is effectively crediting an extra half year of payroll increase in the current and each future year. This results in a small understatement of the UAAL rate (approximately one-half year's worth of payroll increase). The largest impact was for the PSPRS system where it increased the contribution rate by 18 basis points.

B3. UAAL Contribution Rate – Contribution Lag (All Plans): Rodwan's UAAL contribution rate calculation assumes that the new contribution rate is effective immediately on the valuation date. In reality, there is a one-year lag before the new rate is effective. Although this is not our preferred approach, we believe it is somewhat common among actuaries. Unlike the items 1 and 2 listed above which will always understate the contribution rate if a UAAL exists, this method may result in a slightly higher or lower rate depending on what the prior year rate was. In the long term, the difference between this method and our preferred method which recognizes the lag should not be significant. As noted above, we are not recommending a change to this method.

Exhibit 4-3
Impact of Recommended Changes on Aggregate Employer Contribution Rate
(Values Expressed as a % of Payroll)

	PSPRS	CORP	EORP
Employer Contribution as a % of Pay			
Milliman Calculation / Rodwan Methods	16.34%	6.66%	19.37%
Adjustments for			
A1. Active Duty Death Benefit (PSPRS)	-0.15%	-	-
A2. Refund / Deferred Ret. Benefit (CORP)	-	-0.41%	-
A3. Disability Retirement Benefit (CORP)	-	0.02%	-
A4. Average Compensation (All Plans)	0.82%	0.54%	0.84%
A5. Calculation of Service (All Plans)	0.56%	1.01%	1.24%
A6. Assumption Ages (PSPRS)	0.09%	-	-
A7. Probability of Retirement (EORP)	-	-	0.47%
B1. Normal Cost Method (All Plans)	0.93%	0.69%	1.04%
B2. UAAL Amortization Method (All Plans)	0.18%	0.02%	0.10%
Total Adjustments	2.43%	1.87%	3.69%
Milliman Calculation	18.77%	8.53%	23.06%
Rodwan Calculation	16.53%	6.70%	20.21%
Milliman/Rodwan Ratio	113.6%	127.2%	114.1%



Public Safety Personnel Retirement System of Arizona Actuarial Audit Report

Section 5

Funding

Audit Conclusion

We reviewed both how the systems are funded and the application of the actuarial cost method. Each of the systems is being funded on a generally acceptable basis, albeit at the minimum level. We recommend that the current approach be reviewed when contributions rates stabilize or decrease and consideration be given to strengthening the funding. In particular, a 30 year open amortization period will result in a continually increasing unfunded actuarial accrued liability.

Additionally, the actuarial cost method used, Projected Unit Credit (PUC), will generally produce the minimum short-term costs. As a result of the cost method and amortization method period, the current contribution level should be considered as the minimum funding level.

Comments

For all three systems, the contribution rate is determined as the sum of the normal cost and an amortization payment on the UAAL over a 30 year period. The amortization period is open, which means it is reset to 30 years on each future valuation date.

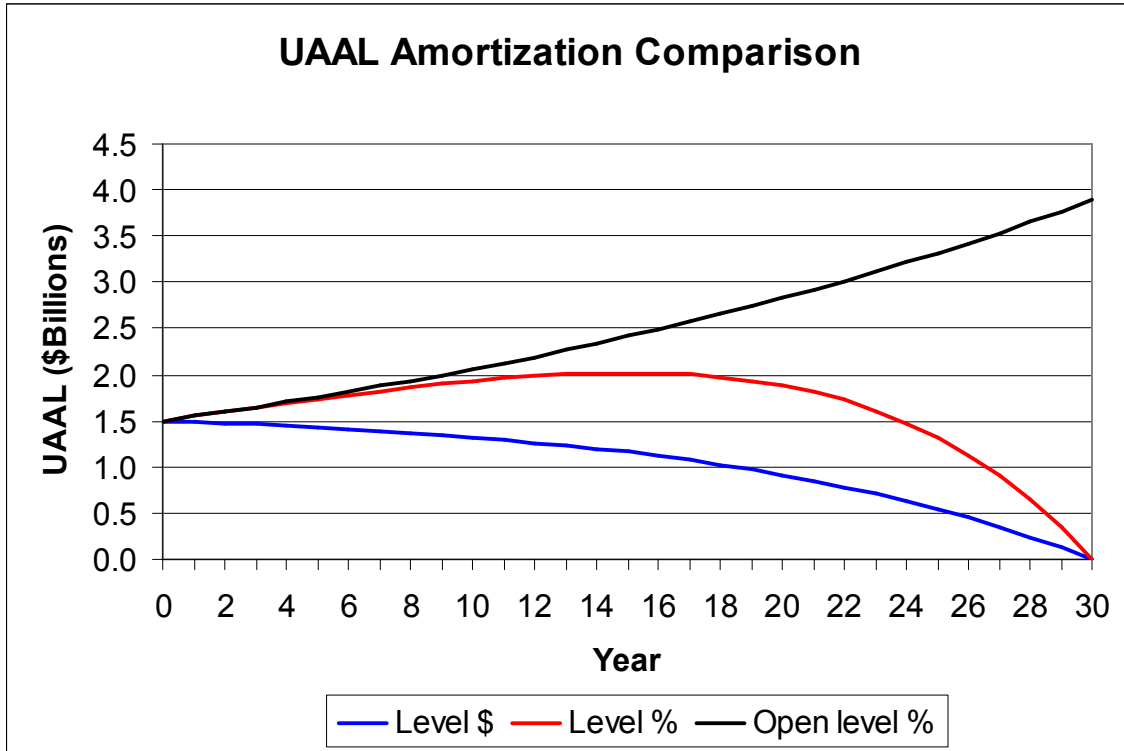
We reviewed the funding from two perspectives:

- 1) Is the required funding appropriate?
- 2) Is the actuarial methodology appropriately applied?

Appropriate Funding Level

The Government Accounting Standards Board (GASB) provides general guidelines on the appropriate funding of a public retirement system. In general, the guidelines expect each system to receive contributions equal to the normal cost plus a payment to amortize either the UAAL or surplus amount. Under GASB, the payment on a positive UAAL amount should be at least equal to a 30-year amortization payment. In our experience, the GASB standard of 30-year amortization of the UAAL is too often being considered as a funding target. In our view, this should be considered a minimum funding standard. Frequently, the implications of funding the UAAL as a level percentage of payroll over a 30 year period are not fully understood. This financing mechanism results in a UAAL payment that does not pay the interest on the UAAL in the early years. As a result, the UAAL increases for over 15 years before starting to decline. If a 30 year amortization period is reset to 30 each year (open amortization period) the UAAL increases steadily. The latter approach can also create significant inequities between generations of members and taxpayers. We point this out to assist the Board in setting funding policy and contribution rates.

The graph below illustrates the impact of various amortization methodologies:



The funding ratios (actuarial assets divided by actuarial accrued liabilities) for PSPRS, CORP and EORP as of June 30, 2006 are 77%, 94% and 98% respectively. As a comparison, the Fiscal Year 2006 Public Funds Survey published by the National Association of State Retirement Administrators (NASRA) shows that statewide systems on average have a funding ratio of about 86%.

Funded Ratio	
PSPRS	77%
CORP	94%
EORP	90%
Average Statewide Systems (FY 2006)	86%

Although the Funded Ratio is a common comparative benchmark for public plans, it only measures the current funding status of a system and does not take into consideration its future funding condition. In order for a plan to be considered actuarially sound, the current and expected future assets of the plan must equal or exceed the expected future benefit obligations, regardless of the current Funding Ratio.

The actuarial cost method allocates the current benefit obligations into those that are expected to be covered by the current assets, the Actuarial Accrued Liability, and those expected to be covered by future contributions, or the Present Value of Future Normal Cost contributions. If this basic equivalence is not expected to be met, then the funding is considered to be actuarially unsound. If the current assets do not equal the Actuarial Accrued Liability, then an Unfunded Actuarial Accrued Liability exists and the Funding Ratio is less than 100%. Future contributions must be sufficient to amortize this UAAL amount as well as the Normal Cost amounts.

We generally recommend that employers contribute to the retirement systems at a higher level than a 30-year amortization requires. It should be noted that by using an open amortization period of this length, the UAAL amount is projected to increase every year in the future even if all actuarial assumptions are met. That is, the UAAL will continue to increase indefinitely and never be paid off.

That being said, we understand that the purpose of the change to the current funding policy was to provide some short-term relief to employers. It may be appropriate for these short-term purposes; however, we believe that over the long term, the funding requirements should be strengthened by using a shorter amortization period or at a minimum closing the 30 year amortization period.

Actuarial Cost Method

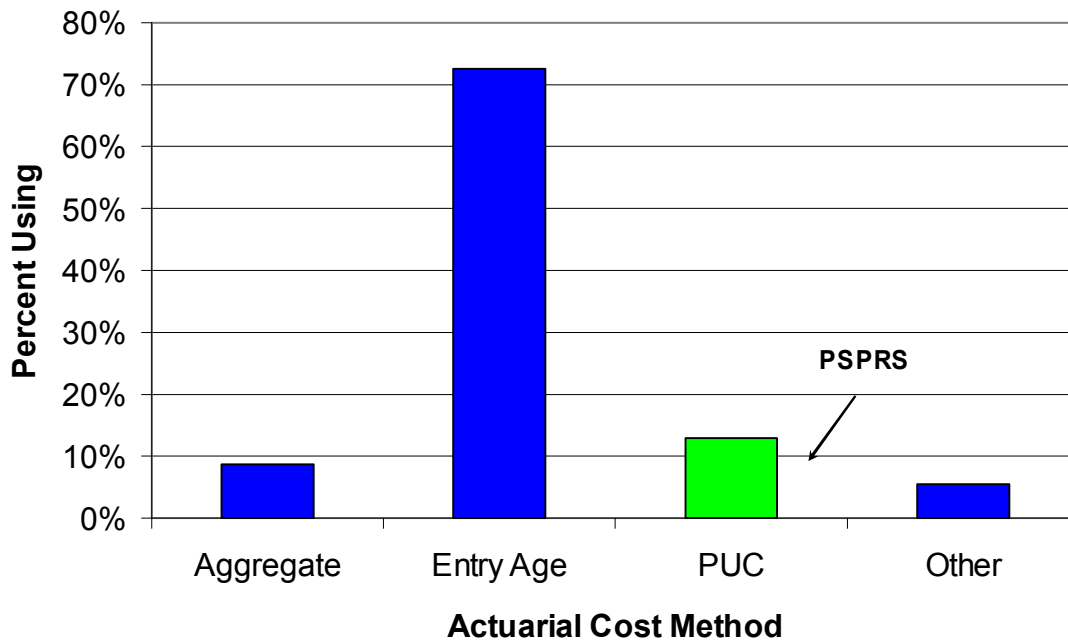
The purpose of any actuarial cost method is to allocate the cost of future benefits to specific time periods. Most public plans follow one of a group of generally accepted funding methods, which allocate the cost over the members' working years. In this way, benefits are financed during the time in which services are provided.

The projected unit credit (PUC) actuarial cost method is being employed in the valuation of all three systems. Under the PUC method, normal costs are determined for each individual member as the increase in the value of the projected benefit based on the service allocated to the valuation year. Under this method, the normal cost for a member will increase as the member ages. Unless the population is stable, maintaining a stable average attained age, the costs as a percentage of payroll will either increase or decrease in total as the average age of the population either increases or decreases.

Our preference is to use the entry age method. The entry age cost method, which creates theoretically level contribution rates, is the most popular method for public sector retirement systems. We believe this is because it does a superior job of producing stable contributions as a percentage of an increasing payroll and, therefore, is more likely to produce intergenerational equity for the tax payers.

In our experience with other systems that use the Projected Unit Credit (PUC) funding method, we found that over time the average attained age of the group increased, causing a gradual but constant increase in the normal cost rate. Unlike the average attained age, which even in a large retirement system may increase because of the aging of the workforce, the entry age tends to be more constant. Thus, the entry age cost method can usually be expected to produce more stable contribution rates over time.

As mentioned earlier, the entry age cost method is the most common method used by public sector retirement systems. Projected unit credit is the second most popular method. The 2006 Public Funds Survey shows that about 13% of statewide systems are using the PUC funding method, as illustrated in the graph on the following page.



GASB Disclosure

The current calculated Annual Required Contributions (ARC) and GASB compliance rates are being amortized over a 30-year period (20 years for plans with excess assets) and are based on the Projected Unit Credit cost method. These satisfy the GASB reporting requirements. Our comments on the accounting disclosures are very minor:

- ✓ **Cost Method (All Plans)** – The cost method shown in Section 6 of each of Rodwan’s June 30, 2006 valuation reports lists the actuarial cost method as Individual Entry Age. This should be changed to Projected Unit Credit. Note that this is correctly stated in the financial section of the CAFR, although it might be helpful to indicate that the numbers prior to 2005 were based on the Individual Entry Age cost method.
- ✓ **Amortization Period (All Plans)** – In the financial section of each of the June 30, 2006 CAFRs, the text description under the Schedule of Funding Progress says: “Those employers whose account had an unfunded accrued liability as of June 30, 2005 have a 30-year amortization period.” This implies that employers that have excess assets as of June 30, 2005 but later develop a UAAL would not use a 30-year period. This sentence should read (changes underlined): “Those employers whose account has an unfunded accrued liability on or after June 30, 2005 have a 30-year amortization period in that year.”
- ✓ **Assumptions in CAFR (EORP)** – On page 36 of the June 30, 2006 EORP CAFR, the projected salary increase assumption should indicate a flat increase of 5.0% only – not a 5.5% rate of increase plus merit.

Public Safety Personnel Retirement System of Arizona Actuarial Audit Report

Section 6

Other Comments

Audit Conclusion

We recommend several changes for more complete disclosure in the valuation reports. None of these changes has any cost impact.

Comments

Report Disclosure

The valuation reports have an aggregate gain / loss exhibit that shows changes in the UAAL different from those that were expected. It would be helpful to the outside reader if this exhibit showed an additional breakdown which quantified changes due to the actual investment return, the actual increase in salaries and other changes in actuarial accrued liabilities separately, instead of lumping them together.

A number of the assumptions and methods used were not disclosed in the valuation reports. Specifically, we would recommend adding the following to Section Four of each of the reports (Actuarial Assumptions and Methods):

1. Method used for allocation of actuarial value of assets by employer.
2. Assumption for probability of marriage.
3. Assumption for probability of electing coverage under the health subsidy.
4. Assumption regarding what type of death or disability benefit the member will receive.
5. Method used to estimate the additional liability for pre-89 hires.
6. In the summary of assumptions, Winslow Fire Fighters are listed in both the High and Low separation groups. They should be deleted from the low separation group.

Public Safety Personnel Retirement System of Arizona Actuarial Audit Report

Section 7

Summary of Recommendations & Considerations (Valuation)

Recommended Changes which have a Material Impact:

We strongly recommend the following changes be made:

- ✓ **Calculation of Normal Cost Rate (All Plans):** Revise the normal cost rate calculation to be consistent with contributions that are paid throughout the year, not at the beginning of the year. See Section 4 for details.
- ✓ **Calculation of Average Compensation (All Plans):** Include the final half-year of earnings in the average compensation calculation. See Section 4 for details.
- ✓ **Calculation of Service (All Plans):** Include the final half-year of service in the in the projected benefit calculation. See Section 4 for details.

Recommended Changes with a Minor Impact:

Although these changes will not materially impact the valuation results, we recommend they be made to more accurately reflect the plan provisions. We have listed the recommended changes in the approximate order of importance:

- ✓ **UAAL Contribution Rate (All Plans):** Revise the UAAL rate calculation to better reflect the payroll increase assumption. See Section 4 for details.
- ✓ **Active Duty Death Benefit (PSPRS):** Revise valuation calculations to use 100% of compensation for duty death benefit. See Section 4 for details.
- ✓ **Accidental Disability Retirement Benefit (CORP):** Revise valuation calculations to value greater of 50% of compensation and the benefit based on actual compensation and service. See Section 4 for details.
- ✓ **Refund / Deferred Retirement Benefit (CORP):** Revise valuation calculations to value greater of refund of contributions with employer match and deferred retirement benefit. See Section 4 for details.
- ✓ **Application of Assumptions (PSPRS):** Correct disability and withdrawal rates to be consistent with member's age. Rates currently being applied are off by one year. See Section 4 for details.
- ✓ **Retirement Assumption (EORP):** Correct retirement assumption to be 100% probability at age 70 and later. See Section 4 for details.

Other Minor Recommendations:

These changes do not impact the valuation results, but would provide better disclosure:

- ✓ **Valuation Report (All Plans):** Provide more complete disclosure of the methods and assumptions used in the valuation. See Section 6 for details.
- ✓ **Accounting Information (All Plans):** Make minor corrections to text in both the CAFRs and valuation reports. See Section 5 for details.

Other Considerations:

We are not recommending changes, but these are issues that should be considered in the future. We have listed these considerations in rough the approximate of importance:

- ✓ **Strengthen Funding (All Plans):** Consider moving to a shorter or closed amortization period for employers with a UAAL. Consider moving back to the entry age normal cost method. The current method meets generally accepted funding principles; however, it is our opinion that stronger funding should be considered in the future. See Section 5 for details.
- ✓ **Actuarial Value of Assets (All Plans):** Confirm that the Future Benefit Increase Reserve used in the valuation is consistent with the value reported in the CAFR. See Section 3 for details.
- ✓ **Asset Corridor:** Consider adding a corridor so that the actuarial value of assets remains reasonably related to market value when there is significant volatility. See Section 3 for details.
- ✓ **Final Average Period (EORP):** Review whether it is appropriate to reflect a one-year final average period for EORP members who hired prior to July 17, 1994. See Section 4 for details.
- ✓ **Actuarial Valuation Data (All Plans):** PSPRS staff should review valuation data supplied to the retained actuary for the following (See Section 2 for details):
 - Dates formatted as text.
 - Birth Dates in the wrong century.
- ✓ **Contribution Lag:** Consider reflecting the one-year lag in the implementation of the new contribution rate in the calculation of the UAAL contribution rate. See Section 4 for details.



**Public Safety Personnel Retirement System of Arizona
Actuarial Audit Report**

PART B

REPLICATION OF EXPERIENCE STUDY

Public Safety Personnel Retirement System of Arizona Actuarial Audit Report

Section 8

Introduction

Overview

The retained actuary for the Public Safety Personnel Retirement System of Arizona (APSPRS), Rodwan Consulting Company (Rodwan), generally performs an experience study every 5 years. A five year study was performed for the five years ending June 30, 2003. As a result of the actuarial audit performed by Segal and new retirement provisions for the Deferred Retirement Option (DROP), another five year experience study was performed for the five year period ending June 30, 2006. Milliman, Inc. was retained to perform an independent, replication audit of this experience study to ascertain that the results presented are reasonable, accurate and applied consistently with industry standards.

Experience studies are a blend of careful statistical analysis, the professional judgment and experience of the actuary, and the input of the staff who administer the System. There is rarely a single right way to analyze the data – in fact, we often analyze it more than one way because of the additional insight that may be gained. Experience studies also generate large volumes of summarized data. Consequently, a replication audit of an experience study can be expected to have some differences in the tabulated calculated or summarized numbers. We generally would expect, however, that even with these differences the same general trends will be indicated.

The development economic assumptions necessarily must rely on data regarding the U.S., and even the global economy. For the demographic analysis, the primary source of information is the membership data of the system so the tabulated results of actual occurrences should be fairly well defined, even if different techniques are used to prepare the tabulations. However, individual actuaries may interpret those results differently and arrive at differing recommendations.

The general approach for demographic analysis is to determine an experience decrement rate (e.g. the probability of retiring, terminating, dying, etc.) by considering how many people decremented during the study period compared to the number who could have decremented for that reason (e.g. retired). This “number eligible to decrement” is called the exposure. Usually, these decrement rates are developed based on age, service, or both. When the latter is done, exposures and decrements must be tabulated for each age/service combination to be studied.

One of the major challenges in replicating the demographic portion of an experience study is the initial sorting of the data into the exposures to be used for the analysis. The actuary must determine how age and service will be calculated for each individual who is subject to a specified decrement (like death, disability, retirement, etc). Variants in such things as attained age versus age nearest birthday or how service is to be rounded can lead to shifts in the exposure data. Ideally the actuary will develop exposures based upon how their valuation software will apply the assumptions in the valuation calculations, to minimize distortions in the valuation results.

Finally, different actuaries may choose to include or exclude certain records based on relevance. For instance, if a system requires 5 years of service to receive a retirement benefit, many actuaries might choose to exclude from the tabulations of termination rates those individuals who are over 65 with less than 5 years. Technically the individuals are subject to exposure for termination rather than retirement, but analyzing these few records will not provide any insight into the general trends.

While there are some steps that may vary by actuary, there are others that we believe should not vary. First, the member who decremented should be assigned to the same age/service grouping to which they are assigned in the exposure grouping. For example, if an active member is assigned to the age 43 with 15 years of service category of members at the start of the year and dies during the year, the death should be assigned to age 43/15 YOS exposure group, even if the member had passed his birthday or completed another year of service prior to death. Secondly, records that were excluded from the exposures should not be considered in the count of decrements. This would mean that someone who was hired in after the start of a fiscal year and terminated before year end would not count as a decrement since he or she was not counted in the exposures for the year. Finally, there should be consistency with how the results will be used. If the valuation software will assume that a member may no longer terminate once eligible to retire (a common feature), exposures for withdrawal and retirement should be mutually exclusive, i.e. those eligible to retire are excluded from the exposure for withdrawal.

Initially we asked Rodwan how members would be grouped for purposes of creating exposure. They indicated that age was calculated as “age last birthday” or attained age and service was truncated (rounded down to whole years). Based on our understanding of the valuation software Rodwan is using, it appears the experience study is grouping exposures and calculating age/service on a different basis than how it will be used by the valuation software. We suggest the retained actuary modify how members’ ages and service are determined when the next experience study is performed to make the experience study tabulations consistent with their valuation program.

Very late in the replication process, we discovered that Rodwan took a very different approach to developing exposures and decrements than Milliman. The study period is July 1, 2001 to June 30, 2006. Under Rodwan’s approach, exposures are based on the active census data for July 1, 2001 and July 1, 2006, weighted by 0.50 and other years’ data are weighted by 1.00. (We had understood that the exposure were based on the July 1, 2001 through July 1, 2005 data sets with each year weighted equally.)

Rodwan tabulated the count of decrements directly from the census data provided by the System. Individuals were not tracked from year to year in the study period (seriatim approach). The exposure group to which the decrement is assigned is based on the age/service at the time of decrement (not the age/service for them in the exposure). In our opinion, this approach has several shortcomings:

- There are some age/service groupings where the number of decrements divided by the exposures is greater than 1.00.
- During the study period, the dispatchers were allowed to join the CORP Plan. Thus, there are few dispatchers reported in the earlier years. Most were added for the July 1, 2006 valuation. Due to Rodwan’s approach, they had a high number of dispatchers in the study period counted as exposures even though they had little or no opportunity to decrement.
- There are high retirement rates at 20 and 25 years of service when special provisions are effective. In many cases, since service is truncated in developing the tabulated exposures, retiring members have 19 or 24 years of service at the beginning of the year for exposure grouping. For PSPRS, Rodwan divided the year 20 decrements by the year 19 exposure and used this logic for all other groupings. However, this approach was not used for either CORP or EORP, which seems inconsistent.

Milliman's standard approach for an experience study is to use a "seriatim approach" whereby individual members are tracked for each year in the study (from 7/1/01 to 7/1/02, from 7/1/02 to 7/1/03, etc.) and their status at the beginning and end of the year is determined. The exposure is developed for each year of the study based on the status of members on the valuation date and decrements are assigned on an individual basis to the exposure in which they were grouped at the beginning of the year. We believe this approach is a superior approach and is the more common approach used in the industry. This basic difference in how exposures and decrements were developed created differences in the observed rates which were significant in some situations. Therefore, Milliman's results differ from Rodwan's results. We believe our recommended assumptions are a better expectation of future experience and are more consistent with how the valuation software will use them.

We will refer to "current" and "proposed" actuarial assumptions. The current assumptions are those used in the actuarial valuations prepared as of June 30, 2006. The "proposed" assumptions are those recommended for use in the valuation as of June 30, 2007 by Rodwan Consulting Company. The "Milliman proposed" assumptions are those we recommend as a result of our replication experience study.

Throughout this report, we refer to certain assumptions and experience as "Rodwan" and "Milliman". The "Rodwan" assumptions are those developed by Rodwan Consulting Company in the most recent experience study.

The "Milliman" assumptions are those we would recommend for use in future valuations. Our recommendations for changes in assumptions are based on our professional judgment and experience with other public retirement systems. Since we do not have prior experience with the System, our recommended assumptions closely follow the actual experience during the study period. If the study period is believe to be unusual in some way so that future experience is expected to differ, our recommended assumption should be modified to reflect future expectations. Rodwan did not apparently make any such adjustment in developing their recommendations and we do not have a basis for suggesting any either, other than our recommendation to make provision for future mortality improvements, i.e. longer life expectancies.

Our recommendation of a change in an assumption does not necessarily indicate that those currently in use or recommended by Rodwan are inappropriate; it does indicate that we believe our recommendation to better reflect experience during the study period.

The same economic assumptions apply to all three retirement systems (Public Safety, Correctional Officers, and Elected Officials) as the plan assets are commingled for investment purposes. The economic assumptions (investment return and general wage increase) are discussed in Section B of this report. The demographic assumptions are discussed in Section C of this audit report.

General Comments

The experience study report issued by Rodwan Consulting Company is very brief and contains very little discussion of the results observed in the study and the basis for any recommended changes. As a result, it is difficult to assess their recommendations for assumption changes.

The standard approach for analyzing the demographic results of an experience study is to compare the actual occurrences during the study period to those expected using the current actuarial assumptions and those expected using the proposed new assumptions. These figures are referred to as the Actual/Expected (A/E) Ratios. If experience during the study period is viewed as being representative of long-term expectations, ratios larger than 100% on the current basis indicate that the rates may need to be raised; ratios smaller than 100% indicate that rates may need to be lowered. This key measurement is not included in any of the analysis performed by Rodwan Consulting Company and we find this to be a major shortcoming of the study. The A/E Ratio provides a reader with basic information on how well the current assumptions predicted actual experience during the study period. Revised A/E Ratios (developed using expected decrements based on the new, proposed assumption) also provide an easy way to determine how much the current assumption has been changed and to what degree the assumption fits observed experience. For purposes of our analysis and discussion, we have included the A/E Ratio for Rodwan's results based on Rodwan's tabulations and Milliman's results, based on Milliman's tabulations. When proposed assumptions are shown, the A/E ratios are based on Milliman's tabulations.

Actuarial Standards of Practice (ASOP) provide guidance to actuaries when selecting actuarial assumptions. ASOP 27 addresses the development of economic assumptions for pension plans and ASOP 35 addresses demographic assumptions for pension plans. We followed these ASOPs in the development of our recommended assumptions in this report.

It is typical for the actuary to estimate the impact of the proposed set of assumptions on key valuation measurements like the actuarial liability and normal cost as part of the Experience Study Report. This information is not included in Rodwan's report.

The choice of economic assumptions (inflation, investment return and wage growth) is discussed in Section B of this report. These assumptions are generally chosen on the basis of expectations as to the effect of future economic conditions on the operation of the System.

Section C of this report will show the results of our replication study of demographic assumptions and the graphs in Appendix A will present the information in a different format. The exhibits are detailed comparisons between actual and expected events (death, retirement, termination, etc.) on both the current assumptions and Rodwan's and Milliman's proposed assumptions.

The Public Safety Personnel Retirement Systems of Arizona covers members in three Plans:

1. Public Safety (PSPRS)
2. Correctional Officers (CORP)
3. Elected Officials (EORP)

The benefit provisions for each Plan and the characteristics of each group differs (or are expected to differ) so separate analysis is provided for each plan. Based on conversations with the retained actuary, the current split of employers in PSPRS into "small" and "large" has not been reviewed for a number of years. A quick review of employers by group indicated that it might be desirable to review the current categorization of employers by size into the small and large groups. We did not attempt such a reclassification since it was beyond the scope of our assignment.

Our Philosophy

Similar to an actuarial valuation, the tabulation of actual and expected experience is a fairly mechanical process. Given the same methodology for determining exposure and decrements, one would expect to see little difference in tabulated results from one actuary to another. However, the setting of assumptions is a different story, as it is more art than science. As a result, we may recommend different assumptions even when the results tabulated by Milliman are close to Rodwan's. To better understand our thought process, here is a brief summary of our philosophy:

- **Don't overreact:** When we see significant changes in experience, we generally do not adjust our rates to reflect the entire difference. Since experience can be expected to vary over time due to random fluctuations, we do not want to make frequent changes in the assumptions merely to reflect these random, short-term fluctuations. Thus, we will generally recommend rates somewhere between the old rates and the new experience. If the experience during the next study shows the same result, we would probably recognize this trend at that point. On the other hand, if the experience returns closer to its prior level, we will not have overreacted thereby creating unnecessary volatility in the employer contribution rates.
- **Anticipate Trends:** If there is an identified trend that is expected to continue, we believe that this should be recognized. An example of this is the retiree mortality assumption. It is an established trend that people are continuing to live longer; therefore, it is appropriate to build in a margin to reflect future decreases in mortality rates (i.e. to reflect expected increases in life expectancy).
- **Simplify:** We consider what factors affect each assumption. In general, we attempt to identify which factors are significant and eliminate the ones that do not significantly improve accuracy.

Public Safety Personnel Retirement System of Arizona Actuarial Audit Report

Section 9

Economic Assumptions

Audit Conclusion

The economic assumptions (inflation, investment return, and across-the-board salary increases) used in the valuation of a defined benefit plan are a critical component of the actuarial process and, in our opinion, deserve a thorough and comprehensive analysis in the experience study due to their impact on the valuation results. Rodwan's report included some basic information on actual experience during the study period, but there was no longer-term historical information or discussion included in the report to support their recommendations. While the set of assumptions may meet the consistency requirement of Actuarial Standards of Practice No. 27 (ASOP 27), from the documentation in the report there is no evidence that standards of ASOP 27 were followed. We believe the current set of economic assumptions is extremely aggressive and should be reconsidered.

We offer the following comments with respect to the economic assumptions recommended by Rodwan:

- The inflation assumption of 5.0% is very high compared with both historical experience and current expectations. We believe the reasonable range for this assumption is 2.0% - 4.0%. (ASOP 27 defined the "best estimate range" as "the narrowest range within which the actuary reasonably expects that the actual results, compounded over the measurement period, are more likely than not to fall.") See pages 31-33 for a more detailed discussion of the inflation assumption. Most of the public plans Milliman serves are using 3.0% to 3.5%, which we believe is a better long term estimate of future inflation.
- Removing one-half of the favorable investment experience over 9.0% and transferring it to the Future Benefit Increase Reserve (FBIR) has a dramatic impact on the net investment return for the Fund. As a result, we believe that the current investment return assumption of 8.5% is very aggressive. Based on our modeling with a 3.5% inflation assumption, there is about an 85% probability that the assumption will not be met. Given Ennis Knupp's capital market assumptions, which reflect a 2.5% inflation assumption, there is less than a 5% probability that the 8.5% assumption will be met. We strongly recommend the investment return assumption be lowered. An assumption of 7.5% would be our recommendation.
- In the development of the reasonable range for the investment return assumption, we used Ennis Knupp's assumptions, which include an additional net return of 1.4% from active management, without additional risk. This seems to be an optimistic expectation, which may or may not occur. We would prefer to set the actuarial investment return assumption assuming no net additional return due to active management. While it may be quite reasonable to develop an investment strategy intended to achieve such additional return, assuming that you will succeed in achieving them over the next 50 to 100 years- which is the measurement period covered by the actuarial valuation- seems unduly optimistic in the context of an actuarial valuation.
- Inflation is also a component of the general wage increase ("across the board") assumption. Based on our comments above regarding the inflation assumption, we also think the general wage increase assumption recommended by Rodwan is high. Our recommendation would be a price inflation of 3.0% to 3.5% plus 1.0% productivity for a total of 4.0% to 4.5%.

Discussion

The current economic assumptions are:

- Inflation: 5.0%
- Investment return: 8.5%
- General wage increase: 5.5%

Rodwan is recommending no change in the set of economic assumptions. They recommend that the “Fund Manager should consult with its investment advisor regarding the potential returns given the asset allocation.”

We believe the 5.0% inflation assumption is high. The Public Funds Survey, which is completed by NASRA each year, indicates that the median inflation rate reported is 3.5%. Only one other state-wide system reported an assumed inflation rate of 5.0%. Because the inflation assumption is a component of the investment return assumption, the choice of an inflation assumption also has an impact on the investment return assumption. Given the same real rate of return, a higher inflation assumption will result in a higher expected rate of return.

The impact of the higher inflation assumption is further complicated by the provision that removes one-half of the investment return over 9.0% and places it in the Future Benefit Increase Reserve (FBIR). This feature will be referred to in this report as “the excess return allocation”. This provision requires dynamic modeling of potential returns and the impact of the excess return allocation on the actual net rate of return for the Fund. Rodwan provided no real analysis of the investment return assumption and did not discuss the impact of the excess return allocation provision in their commentary. After a thorough analysis, discussed below, we believe that the 8.5% rate of return is very aggressive given the long term expectation for net returns, taking into account the excess return allocation provision.

Our analysis and documentation of the development of each economic assumption is set out below. We believe after carefully reading these sections, the reasons for our concerns and comments will be clear.

Actuarial Standard of Practice No. 27: Selection of Economic Assumptions

The Actuarial Standards Board has adopted Actuarial Standard of Practice (ASOP) No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations*. This standard provides guidance to actuaries giving advice on selecting economic assumptions for measuring obligations under defined benefit plans, such as the Public Safety Personnel Retirement System of Arizona.

Because no one knows what the future holds, the best an actuary can do is to use professional judgment to estimate possible future economic outcomes. These estimates are based on a mixture of past experience, future expectations, and professional judgment. The actuary should consider a number of factors, including the purpose and nature of the measurement, and appropriate recent and long-term historical economic data. However, the standard explicitly advises the actuary not to give undue weight to recent experience.

Recognizing that there is not one “right answer”, the standard calls for the actuary to develop a best estimate range for each economic assumption, and then recommend a specific point within that range. Each economic assumption should individually satisfy this standard.

After completing the selection process, the actuary should review the set of economic assumptions for consistency. This may require the actuary to use the same inflation component in each of the economic assumptions selected. However, if a change occurs in one assumption, the actuary needs to consider if the change would modify other economic assumptions as well.

An actuary's best-estimate range with respect to a particular measurement of pension obligations may change from time to time due to changing conditions or emerging plan experiences. The actuary may change assumptions frequently in certain situations, even if the best-estimate range has not changed materially, and less frequently in other situations. Even if assumptions are not changed, we believe that the actuary should be satisfied that each of the economic assumptions selected for a particular measurement complies with *Actuarial Standard of Practice No. 27.*, unless that assumption has been prescribed by someone with the authority to do so.

In our opinion, the economic assumptions in the following recommended range would satisfy the guidance contained in ASOP No. 27.

	Current Assumption	Rodwan's Proposed Assumption	Milliman's Recommended Assumption Range
A. Investment Return	8.5%	8.5%	6.67% - 8.13%
B. Price Inflation	5.0%	5.0%	2.0% - 4.0%
C. Real Wage Inflation	0.5%	0.5%	0.5% - 1.5%

Both the investment return and price inflation assumptions are outside of what we view as a reasonable range.

INFLATION

Use in the Valuation: Inflation as referred to here means price inflation. The inflation assumption has an indirect impact on the results of the actuarial valuation through the development of the assumptions for investment return, general wage increase and the payroll increase assumption. It does not have a direct impact on the valuation results.

The long-term relationship between inflation and investment return has long been recognized by economists. The basic principle is that the investors demand a "real return" – the excess of actual investment returns over inflation. If inflation rates are expected to be high, investors will demand expected investment returns that are also expected to be high enough to exceed inflation, while lower inflation rates will result in lower demanded expected investment returns, at least in the long run.

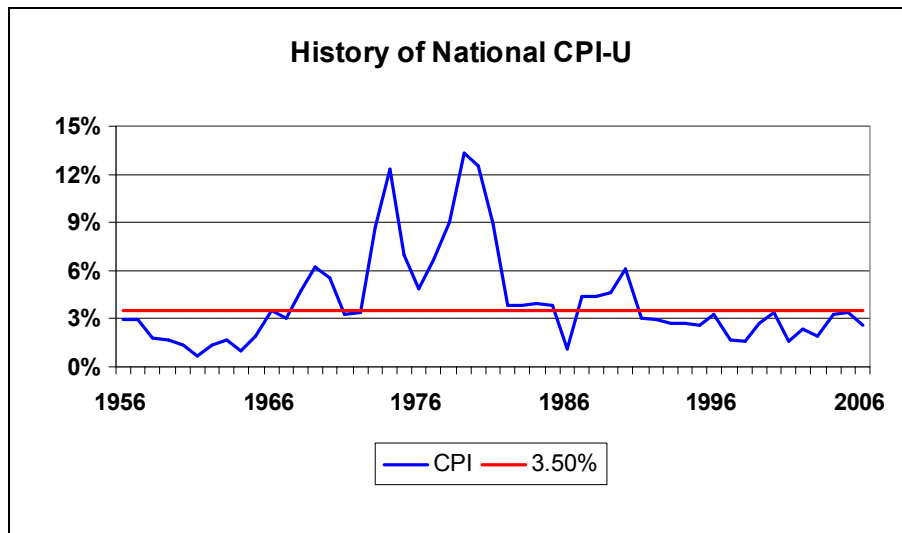
Historical Perspective: The data for inflation shown below is based on the national Consumer Price Index, US City Average, All Urban Consumers (CPI-U) as published by the Bureau of Labor Statistics. The data for periods ending in December of each year is documented in Exhibit 1 at the end of this section.

Although economic activities in general - and inflation in particular - do not lend themselves to prediction on the basis of historical analysis, historical patterns and long term trends are a factor to be considered in developing the inflation assumption.

There are numerous ways to review historical data, with significantly differing results. The tables below show the compounded annual inflation rate for various ten-year periods, and for longer periods ended in December of 2006.

Decade	CPI
1996-06	2.4%
1986-96	3.7%
1976-86	6.6%
1966-76	5.9%
1956-66	1.8%

Period	CPI
1996-06	2.4%
1986-06	3.1%
1976-06	4.2%
1966-06	4.6%
1956-06	4.1%
1946-06	3.8%
75 years	3.6%



Forecasts of Inflation: Since the U.S. Treasury started issuing inflation indexed bonds, it is possible to determine the approximate rate of inflation anticipated by the financial markets by comparing the yields on inflation indexed bonds with traditional fixed government bonds. Current market prices suggest investors expect inflation to be about 2.5% over the next ten years.

Although most economists forecast lower inflation, they are generally looking at a shorter time horizon than is appropriate for a pension valuation. To consider a longer, similar time frame, we looked at the expected increase in the CPI by the Office of the Chief Actuary for the Social Security Administration. In the April 2007 report, the annual increase in the CPI over the next 30 years was estimated to be 2.8%, under the intermediate cost assumptions. The lower cost assumption used a forecast of 1.8% and the high cost assumption used a forecast of 3.8%; this implies a reasonable range of 1.8% to 3.8%.

Reasonable Range and Recommendation: We believe that a range for inflation between 2.0% and 4.0% is reasonable for an actuarial valuation of a retirement system. Inflation has averaged 4.0% over the last 50 years; however it has averaged almost a full percent less over the last 20 years. Also, current economic forecasts, in particular those of Social Security, are predicting lower rates in the future. Given these facts, our recommended inflation assumption would be 3.5%.

Consumer Price Inflation	
Current Assumption	5.0%
Reasonable Range	2.0% - 4.0%
Recommended Assumption	3.5%

INVESTMENT RETURN

Based on our lower inflation assumption and modeling we performed to determine the impact of allocating one-half of investment returns over 9.0% to the FBIR, we believe the current investment return assumption of 8.5% is extremely aggressive and lies outside the reasonable range for net investment returns.

Use In The Valuation: The investment return assumption is one of the primary determinants in the calculation of the expected cost of the System’s benefits, providing a discount of the estimated future benefit payments to reflect the time value of money. This assumption has a direct impact on the calculations of actuarial accrued liabilities, normal cost and contribution rates. The valuation interest rate should represent the long-term rate of return on the actuarial value of assets, considering the fund’s asset allocation policy, expected long term real rates of return on the specific asset classes, the underlying inflation rate, and investment and administrative expenses.

The current assumption for investment return is 8.5% per year, net of all investment-related and administrative expenses and net of transfers to the FBIR Fund.

Historical Perspective: One of the inherent problems with analyzing historical data is that the results can look significantly different depending on the time frame used if the year-to-year results vary widely. Even though history provides a valuable perspective for setting this assumption, the economy of the past will not necessarily be the economy of the future, nor is recent experience necessarily a good predictor for future long term experience.

Method to Determine Best-Estimate Range for Investment Return

It is our understanding that the System recently adopted a new asset allocation, based on consulting advice from their investment consultants, Ennis Knupp. The following chart sets out the new asset allocation, the expected real rate of return for each class, and the additional return, net of fees, expected from using active management, based on Ennis Knupp’s assumptions.

Asset Class	Target Asset Allocation	Expected Real Rate of Return	Manager Value Added
U.S. Equity	44.0%	6.4%	1.5%
Non-US Equity	21.0%	7.5%	2.0%
U.S. Fixed Income	20.0%	3.3%	0.5%
Unleveraged Real Estate	6.0%	5.2%	4.0%
Private Equity	6.0%	11.9%	0.0%
Cash Equivalents	1.0%	0.5%	0.0%
Hybrid Strategies	<u>2.0%</u>	5.5%	3.0%
Total Portfolio	100.0%		

Milliman's calculated the best-estimate range for investment return based upon the target asset allocation adopted by the Fund Manager. As input to this calculation, we used the capital market assumptions developed by Ennis Knupp, which assumed investment related expenses (for passive management) of 0.04%, and our recommended inflation assumption of 3.5%. We then used the model to project future returns based on the capital market assumptions, the asset allocation, and assumed annual rebalancing.

Using properties of the lognormal distribution, we calculated the 25th and 75th percentiles of the long-term total return distribution. This becomes our best-estimate range because 50% of the outcomes are expected to fall within this range and it is the narrowest range with 50% of the probable outcomes.

The capital market assumptions were combined with the target asset allocation policy to generate expected rates of returns which were then added to the inflation assumption. The real rate of return is subject to significant year-to-year volatility as measured by the standard deviation. Volatility over time will lower the mean real rate of return but diversification by asset class will reduce the volatility and narrow the range of expected total returns for the entire portfolio. The model provides a guide to see if it is a reasonable to expect this return to compound over longer periods of time. The results are summarized on the following page.

Expected Return with 3.5% Inflation and Ennis Knupp's Capital Market Assumptions

Horizon In Years	Mean	Standard Deviation	Percentile Results for Nominal Rate of Return				
			5 th	25 th	50 th	75 th	95 th
1	10.92%	12.96%	(9.02%)	1.85%	10.17%	19.17%	33.44%
5	10.32%	5.75%	(1.13%)	6.37%	10.17%	14.10%	20.02%
10	10.24%	4.06%	3.70%	7.46%	10.17%	12.94%	17.04%
25	10.2%	2.57%	6.03%	8.45%	10.17%	11.91%	14.47%
50	10.18%	1.81%	7.22%	8.95%	10.17%	11.40%	13.19%

In the first year, the median nominal return is 10.17%, but due to the volatility associated with the asset allocation, the range of probable outcomes is extremely large. For example, in the first year there is a 5% chance the nominal rate of return will be less than a negative 9.02% and a 5% chance it will be greater than 33.44%. As the time horizon lengthens, the range narrows.

Over a 50-year time horizon, there is a 25% chance the nominal rate of return will be less than 8.95% and a 25% chance the return will be greater than 11.4% (bold numbers on the bottom line in the table above). Therefore, we can say the return is just as likely to be within the range from 8.95% to 11.40% as not. The median return over 50 years is expected to be 10.17%. However, this analysis does not reflect the impact of the current provision under which one-half of any return on the market value of assets over 9.00% is allocated to the Future Benefit Increase Reserve (FBIR), which is used to make cost of living adjustment payments to retirees. It is our understanding that once transferred, these funds cannot come back to the Plan's Trust Fund later, even if needed.

A fund with an asset allocation like APSPRS', which is heavily invested in equities, can expect volatile returns including many years above 9.0% and many below 9.0%. Given reasonable expectations for inflation, it is highly improbable to average 8.5% when one-half of the high returns are given away, as illustrated below. Coincidentally, the recommended asset mix would have earned an annualized rate of return of about 9.0% over the last 10 calendar years so it was used in the following illustration:

Calendar Year	Historical Rate of Return of Recommended Asset Mix*	Cumulative Value of a \$1.00 Investment	Net Return After Diverting Half a Return Above 9%	Net Cumulative Value of a \$1.00 Investment
1997	18.8%	\$1.19	13.9%	\$1.14
1998	19.4%	\$1.42	14.2%	\$1.30
1999	20.8%	\$1.71	14.9%	\$1.49
2000	(4.2)%	\$1.64	(4.2)%	\$1.43
2001	(8.1)%	\$1.51	(8.1)%	\$1.32
2002	(11.0)%	\$1.34	(11.0)%	\$1.17
2003	24.8%	\$1.68	16.9%	\$1.37
2004	12.9%	\$1.89	11.0%	\$1.52
2005	8.8%	\$2.06	8.8%	\$1.65
2006	15.3%	\$2.38	12.2%	\$1.85
Annual Arithmetic Average	9.8%		6.9%	
10-Year Annualized Return	9.0%		6.4%	

*Based on the returns for representative market indices.

In order to model the impact of the excess return allocation provision on the Fund, we did Monte Carlo simulations using Ennis Knupp's capital market assumptions and reflecting the provision. Based on this analysis, the reasonable range shown earlier (8.95% to 11.40%) is reduced to 6.72% to 8.18% due to the impact of the excess return allocation. Note that the actual compounded return over the past decade falls below this reasonable range.

Investment-Related and Administrative Expenses

The investment return used for the valuation is assumed to be net of all investment-related and administrative expenses. The development of the reasonable range above included a reduction of 4 basis points for investment expenses. Presumably, the cost of active management is netted out in the additional return provided to the Fund.

The other type of expense to be covered by the investment return is administrative expenses. The table below shows the ratio of administrative expenses to assets over the last five years. The expense ratio is calculated as the total expenses divided by the beginning asset balance.

(\$ million)	Administrative Expenses	Market Value Assets (\$M)	Administrative
2006	\$3.0	\$4,906	0.06%
2005	1.6	4,608	0.03
2004	1.1	4,310	0.03
2003	0.8	3,833	0.02
2002	0.7	3,696	0.02

This information was taken from the System's Comprehensive Annual Financial Reports (CAFR). Based on this information, it seems reasonable to assume that administrative expenses represent about 0.05% of the System's assets.

Reasonable Range and Recommendation: Based on guidance in *ASOP No. 27*, we conclude that a reasonable range for the gross investment return is 6.72% to 8.18%, after reflecting the excess return allocation to the FBIR. This range needs to be lowered to reflect the administrative expenses assumed to be paid from the investment return. Given an assumed administrative expense ratio of 5 basis points, we believe that a range between 6.67% and 8.13% is reasonable for an actuarial valuation of a retirement system with APSPRS' asset allocation policy.

Components of Return	Percentile Results		
	25th	50th	75th
Real Investment Return	3.22%	3.97%	4.68%
Assumed Inflation	3.50%	3.50%	3.50%
Administrative Expenses	(0.05%)	(0.05%)	(0.05%)
Net Investment Return	6.67%	7.42%	8.13%

Since 8.5% is above the high point of what we believe to be the reasonable range for this assumption, we believe the current assumption is very aggressive. Based on the above analysis, there is only about a 15% chance that the rate of return will be 8.5% or greater and an 85% chance it will be less than 8.5%.

If inflation is closer to the 2.5% predicted by Ennis Knupp, the probability of a net return of 8.5% is less than 5%. We believe it would be prudent for the Fund Manager to lower the assumed rate of return to reflect the impact of the excess return allocation, so there is a greater probability of reaching that return over the long run.

Investment Return	
Current Assumption	8.50%
Reasonable Range	6.67% - 8.13%
Recommended Assumption	7.50%

GENERAL WAGE GROWTH

Based on our earlier comments regarding the current assumption for inflation, we also believe 5.5% is aggressive for the general wage increase assumption because it is predicting higher future salary increases than we believe is reasonable. Rodwan's productivity component is 0.5%. Our recommendation would be to increase this assumption to 1.0%. Coupled with the lower inflation assumption of 3.5%, the resulting general wage increase assumption is 4.5%.

Use in the Valuation: Estimates of future salaries are based on two types of assumptions. Rates of increase in the general wage level of the membership are directly related to inflation while individual salary increases due to promotion and longevity (referred to as the merit scale) occur even in the absence of inflation. The merit scale will be reviewed with the other demographic assumptions. This section will address the general wage growth assumption (inflation plus "across-the-board" increases).

As part of determining the System's funding, the amortization period for the unfunded actuarial accrued liability (UAAL) is determined based on amortization payments developed as a level percent of payroll. The general wage increase assumption is used to project covered payroll in future years which determines the contribution to fund the UAAL.

The current wage growth assumption is 0.5% above the price inflation rate, or 5.5% per year.

Historical Perspective: We have used statistics from the Social Security System on the National Average Wage back to 1951 (please note that 2005 is the most recent published data). For years prior to 1951, we studied the Total Private Nonagricultural Wages as published in *Historical Statistics of the U.S., Colonial Times to 1970*. The data for each year is documented in Exhibit 2 at the end of this section.

There are numerous ways to review this data. For consistency with our observations of CPI, the table below shows the compounded annual rates of wage growth for various 10-year periods, and for longer periods ended in 2005.

The excess of wage growth over price inflation represents "productivity" or the increase in the standard of living, (also called the real wage inflation rate). The following table shows the compounded wage growth over various periods, along with the comparable inflation rate for the same period. The differences represent the real wage inflation rate. The data for each year is documented in Exhibit 3 at the end of this section.

Decade	Wage Growth	CPI Incr.	Real Wage Inflation
1996-2005	4.1%	2.5%	1.6%
1986-1995	3.9%	3.5%	0.4%
1976-1985	7.2%	7.0%	(0.2)%
1966-1975	5.8%	5.7%	0.1%
1956-1965	3.8%	1.7%	2.1%

Period	Wage Growth	CPI Incr.	Real Wage Inflation
1996-2005	4.1%	2.5%	1.6%
1986-2005	4.0%	3.0%	1.0%
1976-2005	5.1%	4.3%	0.8%
1966-2005	5.3%	4.7%	0.6%
1956-2005	5.0%	4.1%	1.1%
1931-2005	4.7%	3.4%	1.3%

There has been debate on the issue of whether public sector employees will receive, over the long term, the same rewards for productivity as employees in the private sector, where productivity is more readily measurable. To our knowledge, no definitive research has been completed on this topic. Nevertheless, it is our opinion that public sector employees will probably be rewarded, even if there is a time lag, with the same productivity increases as those participating in the remainder of the economy. We believe that this is likely because the public sector will need to compete with the private sector for employees.

Forecasts of Future Wages: The wage index we used for the historical analysis has been projected forward by the Office of the Chief Actuary of the Social Security Administration. In a report in April, 2007, the annual increase in the National Average Wage Index over the next 30 years under the intermediate cost assumption was forecast to be 3.9%, 1.1% higher than the Social Security intermediate inflation assumption of 2.8% per year. The range of the assumed real wage inflation in the 2007 Trustees report was 0.6% to 1.6% per year.

Reasonable Range and Recommendation: Based on our judgment, we believe that a range between 0.5% and 1.5% is reasonable. Our recommendation would be that the long-term assumed real wage inflation rate be increased to 1.0% per year.

Real Wage Inflation	
Current Assumption	0.5%
Reasonable Range	0.5% - 1.5%
Recommended Assumption	1.0%

Based on the recommended inflation assumption of 3.5%, and the range for the real wage inflation rate of 0.5% to 1.5% a range between 4.0% and 5.0% is reasonable for the general wage growth assumption. We recommend the general wage assumption be set to 4.5%.

General Wage Growth	
Current Assumption	5.5%
Reasonable Range	4.0% - 5.0%
Recommended Assumption	4.5%

Because this assumption is used as the payroll growth assumption in the amortization of the UAAL, lowering the assumption will increase the UAAL payment and the resulting contribution rate, assuming the same UAAL.

Payroll Increase Assumption: The UAAL is amortized as a level percentage of payroll in determining contribution rates as a percentage of pay. Payroll growth increases lower than expected have a negative effect on determining the UAAL contribution rate, as a greater percentage of pay will be required to fund the UAAL over a smaller expected payroll. Likewise, payroll growth increases greater than expected have a positive effect on determining the UAAL contribution rate, as a lower percentage of pay will be required to fund the UAAL over a larger expected payroll. For PSPRS, where individual employer contribution rates are determined, the System may want to consider using separate assumptions for individual employers. The following general comments indicate potential areas of further study:

- **Size:** Small employers tend to have more volatility in their payroll. By assigning a lower payroll increase assumption to these employers, the probability that the actual payroll will be less than the expected payroll can be reduced, since when this occurs, it generally results in an increase in contribution rates.
- **Experience:** There is usually some correlation between historical and future increases in payroll. For example, a rural area may have more of a flat payroll, whereas a more urban area may be experiencing larger increases in payroll.
- **Minimum/Maximum:** If you use payroll growth assumptions for individual employers, the payroll increase for any employer should not be greater than the wage growth assumption or less than 0.0%.



Exhibit 1

U.S. Consumer Price Index

December of:	<i>Index</i>	<i>Increase</i>	December of:	<i>Index</i>	<i>Increase</i>
1928	17.1				
1929	17.2	0.6%	1969	37.7	6.2%
1930	16.1	-6.4	1970	39.8	5.6
1931	14.6	-9.3	1971	41.1	3.3
1932	13.1	-10.3	1972	42.5	3.4
1933	13.2	0.8	1973	46.2	8.7
1934	13.4	1.5	1974	51.9	12.3
1935	13.8	3.0	1975	55.5	6.9
1936	14.0	1.4	1976	58.2	4.9
1937	14.4	2.9	1977	62.1	6.7
1938	14.0	-2.8	1978	67.7	9.0
1939	14.0	0.0	1979	76.7	13.3
1940	14.1	0.7	1980	86.3	12.5
1941	15.5	9.9	1981	94.0	8.9
1942	16.9	9.0	1982	97.6	3.8
1943	17.4	3.0	1983	101.3	3.8
1944	17.8	2.3	1984	105.3	3.9
1945	18.2	2.2	1985	109.3	3.8
1946	21.5	18.1	1986	110.5	1.1
1947	23.4	8.8	1987	115.4	4.4
1948	24.1	3.0	1988	120.5	4.4
1949	23.6	-2.1	1989	126.1	4.6
1950	25.0	5.9	1990	133.8	6.1
1951	26.5	6.0	1991	137.9	3.1
1952	26.7	0.8	1992	141.9	2.9
1953	26.9	0.7	1993	145.8	2.7
1954	26.7	-0.7	1994	149.7	2.7
1955	26.8	0.4	1995	153.5	2.5
1956	27.6	3.0	1996	158.6	3.3
1957	28.4	2.9	1997	161.3	1.7
1958	28.9	1.8	1998	163.9	1.6
1959	29.4	1.7	1999	168.3	2.7
1960	29.8	1.4	2000	174.0	3.4
1961	30.0	0.7	2001	176.7	1.6
1962	30.4	1.3	2002	180.9	2.4
1963	30.9	1.6	2003	184.3	1.9
1964	31.2	1.0	2004	190.3	3.3
1965	31.8	1.9	2005	196.8	3.4
1966	32.9	3.5	2006	201.8	2.5
1967	33.9	3.0			
1968	35.5	4.7			

Exhibit 2

National Average Wage Index

	<i>Index</i>	<i>Increase</i>		<i>Index</i>	<i>Increase</i>
1927	\$1,159.14				
1928	1,162.53	0.3%	1968	\$5,571.76	6.9%
1929	1,196.88	3.0	1969	5,893.76	5.8
1930	1,164.95	(2.7)	1970	6,186.24	5.0
1931	1,086.09	(6.8)	1971	6,497.08	5.0
1932	954.02	(12.2)	1972	7,133.80	9.8
1933	892.58	(6.4)	1973	7,580.16	6.3
1934	929.34	4.1	1974	8,030.76	5.9
1935	968.53	4.2	1975	8,630.92	7.5
1936	1,008.20	4.1	1976	9,226.48	6.9
1937	1,071.58	6.3	1977	9,779.44	6.0
1938	1,047.39	(2.3)	1978	10,556.03	7.9
1939	1,076.41	2.8	1979	11,479.46	8.7
1940	1,106.41	2.8	1980	12,513.46	9.0
1941	1,228.81	11.1	1981	13,773.10	10.1
1942	1,455.70	18.5	1982	14,531.34	5.5
1943	1,661.79	14.2	1983	15,239.24	4.9
1944	1,796.28	8.1	1984	16,135.07	5.9
1945	1,865.46	3.9	1985	16,822.51	4.3
1946	2,009.14	7.7	1986	17,321.82	3.0
1947	2,205.08	9.8	1987	18,426.51	6.4
1948	2,370.53	7.5	1988	19,334.04	4.9
1949	2,430.52	2.5	1989	20,099.55	4.0
1950	2,570.33	5.8	1990	21,027.98	4.6
1951	2,799.16	8.9	1991	21,811.60	3.7
1952	2,973.32	6.2	1992	22,935.42	5.2
1953	3,139.44	5.6	1993	23,132.67	0.9
1954	3,155.64	0.5	1994	23,753.53	2.7
1955	3,301.44	4.6	1995	24,705.66	4.0
1956	3,532.36	7.0	1996	25,913.90	4.9
1957	3,641.72	3.1	1997	27,426.00	5.8
1958	3,673.80	0.9	1998	28,861.44	5.2
1959	3,855.80	5.0	1999	30,469.84	5.6
1960	4,007.12	3.9	2000	32,154.82	5.5
1961	4,086.76	2.0	2001	32,921.92	2.4
1962	4,291.40	5.0	2002	33,252.09	1.0
1963	4,396.64	2.5	2003	34,064.95	2.4
1964	4,576.32	4.1	2004	35,648.55	4.6
1965	4,658.72	1.8	2005	36,952.94	3.7
1966	4,938.36	6.0			
1967	5,213.44	5.6			

Exhibit 3

Annual Rates of Price and Wage Inflation

<u>Plan Year Ends</u>	<u>National Wage Index</u>	<u>National Price CPI Index</u>	<u>National Implied Productivity Increase</u>
1985	4.3%	3.8%	0.5%
1986	3.0%	1.1%	1.8%
1987	6.4%	4.4%	2.0%
1988	4.9%	4.4%	0.5%
1989	4.0%	4.6%	-0.7%
1990	4.6%	6.1%	-1.5%
1991	3.7%	3.1%	0.7%
1992	5.2%	2.9%	2.3%
1993	0.9%	2.7%	-1.9%
1994	2.7%	2.7%	0.0%
1995	4.0%	2.5%	1.5%
1996	4.9%	3.3%	1.6%
1997	5.8%	1.7%	4.1%
1998	5.2%	1.6%	3.6%
1999	5.6%	2.7%	2.9%
2000	5.5%	3.4%	2.1%
2001	2.4%	1.5%	0.8%
2002	1.0%	2.4%	-1.4%
2003	2.4%	1.9%	0.6%
2004	4.6%	3.3%	1.4%
2005	3.7%	3.4%	0.3%
Geometric Averages			
5-year period			
1986 - 1990	4.6%	4.1%	0.5%
1991 - 1995	3.3%	2.8%	0.5%
1994 - 2000	5.4%	2.5%	2.9%
2001 - 2005	2.8%	2.5%	0.3%
10-year period			
1986 - 1995	3.9%	3.5%	0.4%
1996 - 2005	4.1%	2.5%	1.6%
15-year period			
1986 - 2000	4.4%	3.1%	1.3%
1991 - 2005	3.8%	2.6%	1.2%

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Section 10

Introduction to Demographic Assumptions

Actuarial Standard of Practice No. 35: Selection of Demographic Assumptions

Actuarial Standard of Practice No. 35 (ASOP 35) addresses the selection of demographic and other non-economic assumptions used in measuring pension obligations. *ASOP 35* states that the actuary should use professional judgment to estimate possible future outcomes based on past experience and future expectations, and select assumptions based upon application of that professional judgment. The actuary should select reasonable demographic assumptions in light of the particular characteristics of the defined benefit plan that is the subject of the measurement. A reasonable assumption is one that is expected to appropriately model the contingency being measured and is not anticipated to produce significant cumulative actuarial gains or losses over the measurement period.

ASOP No. 35 Steps

The actuary should follow the following steps in selecting the demographic assumptions:

1. **Identify the types of assumptions.** Types of demographic assumptions include but are not limited to retirement, mortality, termination of employment, disability, election of optional forms of payment, administrative expenses, family composition, and treatment of missing or incomplete data. The actuary should consider the purpose and nature of the measurement, the materiality of each assumption, and the characteristics of the covered group in determining which types of assumptions should be incorporated into the actuarial model.
2. **Consider the relevant assumption universe.** The relevant assumption universe includes experience studies or published tables based on the experience of other representative populations, the experience of the plan sponsor, the effects of plan design, and general trends.
3. **Consider the assumption format.** The assumption format includes whether assumptions are based on parameters such as gender, age, service or calendar year. The actuary should consider the impact the format may have on the results, the availability of relevant information, the potential to model anticipated plan experience, and the size of the covered population.
4. **Select the Specific Assumptions.** In selecting an assumption the actuary should consider the potential impact of future plan design changes as well as the factors listed above.
5. **Evaluate the Reasonableness of the Selected Assumption.** The assumption should be expected to appropriately model the contingency being measured. The assumption should not be anticipated to produce significant actuarial gains or losses.

ASOP No. 35 General Considerations and Application

Each individual demographic assumption should satisfy the criteria of *ASOP 35*. In selecting demographic assumptions the actuary should also consider the internal consistency between the assumptions, materiality, cost effectiveness, and the combined effect of all assumptions. At each measurement date the actuary should consider whether the selected assumptions continue to be reasonable, but the actuary is not required to do a complete assumption study at each measurement date. In our opinion, the demographic assumptions recommended by Milliman in this report have been developed in accordance with *ASOP 35*.

The purpose of a study of demographic experience is to compare what actually happened to the individual members of the System during the study period (June 30, 2001, through June 30, 2006) with what was expected to happen based on the actuarial assumptions. Five years is a relatively short observation period. We believe it would be beneficial to consider the experience from the previous observation period when practical to do so. As Milliman did not have access to the detailed information from that report, we have based our recommendations on the results of the current study only.

Studies of demographic experience generally involve three steps:

- First, the number of members changing membership status, called decrements, during the study is tabulated by age, duration, sex, group, and membership class (active, retired, etc.).
- Next, the number of members expected to change status is calculated by multiplying certain membership statistics, called exposure, by the expected rates of decrement.
- Finally, the number of actual decrements is compared with the number of expected decrements. The comparison is called the actual to expected ratio (A/E Ratio), and is expressed as a percentage.

In general, if the actual experience differs significantly from the overall expected results, or if the pattern of actual decrements, or rates of decrement, by age, sex, or duration deviates significantly from the expected pattern, new assumptions are considered. Recommended revisions are normally not an exact representation of the experience during the observation period. Judgment is required to predict future experience from past trends and current evidence, including a determination of the amount of weight to assign to the most recent experience.

When changes in assumptions are recommended, revised rates of decrement are usually tested by using them to recalculate the expected number of decrements during the study period, with the results shown as revised A/E Ratios.

Salary adjustments, other than the economic assumption for wage inflation, are treated as demographic assumptions. However, the method of investigation needed for salaries is different from that used for the decrements.

It takes a fair amount of data to perform a credible study of demographic assumptions. Because the membership of EORP is small, some assumptions have been selected based more on our professional judgment of reasonable future outcomes than actual experience.

The demographic assumptions studied by Rodwan and replicated by Milliman were:

- Retiree Mortality
- Active Mortality
- Retirement
- Disability
- Termination of Employment
- Merit Salary Scale (not studied by Rodwan)
- Miscellaneous Assumptions

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Section 11 Retiree Mortality

Audit Conclusion

The post-retirement mortality assumption is one of the most important demographic assumptions because it impacts how long pension payments are expected to be paid. We agree with the retained actuary that a change in the mortality table is necessary and we agree, in general, with their recommendation of the RP-2000 Table. Rodwan recommends using the RP-2000 Table, unadjusted, for all three Plans. We believe certain adjustments should be made to the RP-2000 Table to better fit the observed experience for each Plan. Although we agree with the general recommendation to update the mortality table, Rodwan's calculations and analysis as presented do not generally support the recommendation being made. Rodwan provided us with the spreadsheet that contained the detailed calculations from the experience study. Based on our review of those spreadsheets, we have the following observations:

- The preferred approach in analyzing mortality experience is to analyze each group expected to exhibit different mortality separately. Healthy retirees, disabled retirees and beneficiaries/survivors were aggregated for purposes of Rodwan's study. We believe they should be studied separately.
- In Rodwan's study the mortality rates at each age that are applied to all exposures (both healthy and disabled) to obtain the "expected" count were based on the mortality assumption for disabled retirees. This resulted in a higher number of expected deaths and thus a lower A/E Ratio for healthy retirees.
- The number of actual deaths for the Public Safety group in Rodwan's report was much lower than our count (326 vs. 515). We reviewed the information in the 2006 Comprehensive Annual Financial Report (CAFR) for the system, which showed a total of 581 members removed from the rolls during the study period. Upon further review, Rodwan concurred that our number was correct. Our revised A/E ratio using the RP-2000 Table was 97% for Healthy Males, the largest group.
- The exposure Rodwan used for the CORP plan is much higher than Milliman's. Based on counts of in-pay status members in the CAFR, we believed our results were correct and asked Rodwan to review their work. They concurred that our count of exposure is correct. The impact of this error is somewhat mitigated by the fact that Rodwan also showed a significantly higher number of deaths than Milliman so the A/E Ratio is not as different from Milliman's as might be expected. However, we believe there are problems in the development of Rodwan's numbers. They should be corrected so that a sound analysis can be completed.
- The number of deaths for male retirees in EORP was very low compared to the expected count in Rodwan's report (A/E ratio 67%). Our analysis was consistent with an A/E ratio of 64%. If the RP-2000 Table is used, the A/E ratio increases only to 78%. This is still far below 100% and although the size of the group is small, there is a strong correlation between mortality and income level. Because this plan covers judges (although not exclusively) it is likely that group has better than average mortality. We would recommend adjusting the RP-2000 Table by using an age setback. A two year setback results in an A/E ratio of 96%.



- Rodwan recommends moving to the RP-2000 Table for all groups. They did not address how, or whether, adjustments for future mortality improvements should be made. It is generally accepted that mortality rates will continue to improve and it is prudent to either have a ‘margin’ in the rates used (predict fewer deaths than actually occur) or project future mortality improvements directly. ASOP 35 states that actuaries “should consider...the likelihood and extent of mortality improvements in the future.” The Society of Actuaries Retirement Plans’ Experience Committee which developed the RP-2000 Table, recommended “the use of Scale AA for projecting mortality rates beyond the year 2000” with that table. We strongly recommend that one of the projection methods mentioned previously be used. Our preference would be to use the generational projection scale provided with the RP-2000 Table to project future mortality improvements.

Analysis

Mortality rates vary by male and female as well as healthy retirees versus disabled retirees. Beneficiary mortality is often not studied separately because complete data is usually not available (if the beneficiary dies before the retiree, their death is often not reported).

The valuation currently uses separate mortality assumptions for male and female members, as shown below:

Healthy Males	1971 GAM Table Projected to 2000 (Male)
Healthy Females	1971 GAM Table Projected to 2000, (Male) setback 6 years
Disabled Males	1971 GAM Table Projected to 1984 (Male)
Disabled Females	1971 GAM Table Projected to 1984, (Male) setback 6 years

If the A/E Ratio is greater than 100% the assumptions have predicted fewer deaths than actually occurred, and with an A/E Ratio less than 100% the assumptions have predicted more deaths than have occurred. Because future improvements in mortality are expected, an A/E ratio greater than 100% is desired to allow a “margin” for future mortality improvements unless mortality improvements are being addressed in another manner, such as a projection scale.

Rodwan’s report aggregates all experience into one group: healthy retirees, disabled retirees, and beneficiaries. In a separate table, male and female experience is shown separately; however this analysis combines both retiree (healthy and disabled) and beneficiary mortality experience. In our opinion, this is not an appropriate approach for analyzing mortality. By aggregating experience it is more difficult to distinguish trends that might be exhibited by reviewing these groups separately. For comparative purposes only, we have included our results on an aggregated basis. We also show our results for each group, which is used to develop our recommended assumptions.

The mortality of beneficiaries applies to the survivors of members who were receiving benefits under a joint and survivor option. There is generally incomplete data on the mortality experience of beneficiaries prior to the death of the member because there is no requirement that the beneficiary death be reported to the System. Most often, the mortality assumption for the beneficiaries is set equal to the mortality assumption of the retired members. We recommend following this methodology.

There is also little data for disabled retirees. We used a five year age set forward from the healthy retiree assumption for the disabled retiree mortality assumption.

Public Safety

Gender	Rodwan's Results			Milliman's Results		
	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio
Male	249	460	54%	380	461	83%
Female	77	97	79%	135	103	132%
Total	326	557	59%	515	564	91%

As can be observed in the table above, the A/E ratios from Rodwan's report are extremely low. In investigating the spreadsheet Rodwan used in their analysis, we discovered that the disabled mortality assumption was being used for all groups instead of the healthy retiree assumption for healthy retirees and disabled mortality assumption for disabled retirees. As a result, Rodwan's expected deaths were overstated.

Further investigation into the calculations indicated that our exposure was within 1% of Rodwan's but the actual count of deaths was very different. Due to the significant difference in the count of actual deaths, we looked for an independent source of comparable data. The 2006 CAFR showed the following information for members in pay status:

Year Ended	Removed From The Rolls
2006	164
2005	103
2004	119
2003	104
2002	<u>91</u>
Total	581

We would expect the number of deaths to be lower than the number removed from the rolls because that count includes payments stopped to child beneficiaries reaching the maximum age. Given this fact, the numbers in the CAFR are closer to our observed experience than Rodwan's. Furthermore, if Rodwan's results are correct, it would indicate this group has significantly better mortality than the RP-2000 Table, which does not seem reasonable. Rodwan has confirmed there is a problem with their analysis.

As mentioned earlier, the analysis of mortality should be performed on distinct subgroups expected to exhibit different mortality. The following summarizes Milliman's analysis.

Group	Milliman's Results			Milliman Proposed A/E Ratio
	Actual	Expected	A/E Ratio	
Healthy-Male	318	416	76%	97%
Healthy-Female	117	99	118%	101%
Disabled -Male	59	48	123%	103%
Disabled -Female	2	1	144%	92%
Beneficiaries - Male	3	0	N/A	N/A
Beneficiaries - Female	16	3	464%	430%
Total	515	567	91%	103%

Based on the results of the analysis shown above, we agree that a different mortality assumption is needed. The retained actuary recommended changing to the RP 2000 Table, but there was no justification for this change other than it is the most recent table issued by the Society of Actuaries. In fact, as discussed earlier, the data presented in Rodwan's report does not support this recommended change for the Public Safety group. Typically, when a new assumption is recommended, its appropriateness is tested by developing a new A/E ratio using the new assumption for the expected count. Rodwan did not include such analysis in their report which makes it difficult to evaluate their recommendation without additional analysis, so we prepared such an analysis. The developers of the RP-2000 Table recommend the use of a projection scale to model improvements in mortality in each future year. Since the study period covered the period June 30, 2001 to June 30, 2006, we projected mortality rates to the midpoint date of 2003 for purposes of developing the expected number of deaths at each age under the proposed assumption. As is shown in the chart above, the RP-2000 Table provides a good fit for the actual mortality observed for males in the study period, with a resulting A/E Ratio of 97%. There is less data for female retirees, but based on the observed experience, we recommend a one year set forward for healthy female retirees. The resulting A/E Ratio for females is 101%.

As stated earlier, it is generally accepted that mortality rates will continue to improve in future years and as a result, it is prudent to either have a "margin" for future mortality improvements (use lower mortality rates in the current valuation) or project future mortality improvements directly. Our preference is the latter approach using Scale AA, as published with the RP-2000 Table, as long as it does not create problems on the administrative side for the System.

The change to the RP-2000 Table will increase the actuarial accrued liabilities and costs of the System. If mortality improvements are projected for future years, the costs will be higher as the valuation will reflect longer expected payment periods for the benefits from the System. If mortality improvements are not projected, but do occur, actuarial losses will arise and cost will increase in future years.

Correctional Officers

Gender	Rodwan's Results			Milliman's Results		
	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio
Male	244	278	88%	107	111	96%
Female	91	64	142%	54	24	225%
Total	335	342	98%	161	135	119%

For the CORP plan, our results were again significantly different than Rodwan's. Using Rodwan's spreadsheet, we analyzed the exposures (number of people at each age during the study period), the actual deaths and the expected number of deaths. Rodwan's exposure for the 5 year study period was 16,657, an average of 3,331 per year. Milliman's exposure during the study period was 7,085, an average of 1,417 per year. In order to evaluate the reasonableness of our exposure, we tried to find an independent source of comparable data.

Based on the 2006 CAFR, the information regarding the number of members receiving benefit payments and removed from the rolls is shown in the table below. The number of total people receiving benefits during this period is close to our exposure. The number removed from the rolls would include those receiving under a certain period where the period ended and child beneficiaries who have reached the maximum age. Therefore, it seems reasonable to expect the actual number of decrements to be somewhat lower than the total removed from the rolls during the study period. We believe the data from the CAFR supports Milliman's results.

Year Ended	Total	Removed From Rolls
June 30, 2005	1,733	46
June 30, 2004	1,536	61
June 30, 2003	1,363	32
June 30, 2002	1,218	32
June 30, 2001	<u>1,040</u>	<u>30</u>
Total	6,890	201

The following table summarizes the results of our analysis by group. The size of the group is smaller than Public Safety and thus less credible. The female retirees are a smaller group than male retirees. The number of members in the disabled retirees and beneficiaries groups is so small, little credibility can be assigned to the actual experience.

Group	Milliman's Results			Milliman Proposed A/E Ratio
	Actual	Expected	A/E Ratio	
Healthy-Male	100	109	92%	100%
Healthy-Female	44	23	194%	157%
Disabled -Male	5	2	251%	174%
Disabled -Female	1	1	95%	49%
Beneficiaries - Males	2	0	N/A	N/A
Beneficiaries - Females	9	0	N/A	N/A
Total	161	135	119%	121%

While the RP-2000 Table was a very good fit for male Public Safety members, an adjustment to the Table is necessary to better fit the observed experience for CORP. We recommend a two year set forward for both healthy male and female retirees (a 55 year old member is treated as if he/she was age 57) and a 7 year age set forward for disabled retirees. As we mentioned earlier, we recommend using the Projection Scale to anticipate mortality improvements in the future. The resulting A/E ratios using the proposed assumption are shown in the table above.

Elected Officials

The number of retired members in the EORP Plan is considerably smaller than CORP or PSPRS. Due to the size of the group, the credibility of the experience observed is even lower than the other two groups. However, it is still valuable to analyze the experience as an indication of the general fit of the current assumption.

As with the CORP and PSPRS plans, Rodwan aggregated all in-pay data for their analysis. We do not believe this is appropriate and our analysis by group is shown later. For comparative purposes, we aggregated our experience on the same basis as Rodwan (shown below). Our results here were very close to Rodwan's.

Gender	Rodwan's Results			Milliman's Results		
	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio
Male	66	98	67%	68	102	67%
Female	43	46	93%	47	48	98%
Total	109	144	76%	115	150	77%

Our analysis by group is summarized below. We agree with the recommendation to change the mortality table to the RP-2000 Table, but believe an age adjustment is appropriate. Given reasonable expectations of mortality for this group and the experience of the group, we recommend using the RP-2000 Table with a two year setback for males and a one year setback for female retirees.

Group	Milliman's Results			Milliman Proposed A/E Ratio
	Actual	Expected	A/E Ratio	
Healthy-Male	64	100	64%	96%
Healthy-Female	47	47	100%	103%
Disabled -Male	4	2	208%	192%
Disabled -Female	0	1	0%	0%
Beneficiaries Male	0	0	N/A	N/A
Beneficiaries Female	0	0	N/A	N/A
Total	115	150	77%	100%

Summary

The following chart compares Milliman's and Rodwan's recommendations for healthy retirees.

Males	Rodwan		Milliman	
		Age Adjustment		Age Adjustment
PSPRS	RP-2000	0	RP-2000	0
CORP	RP-2000	0	RP-2000	+2
EORP	RP-2000	0	RP-2000	-2
Females				
PSPRS	RP-2000	0	RP-2000	+1
CORP	RP-2000	0	RP-2000	+2
EORP	RP-2000	0	RP-2000	-1

RP-2000 = RP-2000 Healthy Annuitant Table.



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Section 12

Active Member Death

Audit Conclusion

In general, we agree with the recommendation to move to the RP-2000 Table. However, we believe some age adjustments are needed to better reflect the observed experience. Rodwan does not indicate whether they intend for the plans to use the RP-2000 Employee Table for actives and the RP-2000 Healthy Annuitant Table for retirees or the Combined Table for both. Our preference is to use the Employees Table for actives (even if they are eligible to retire) and the Healthy Annuitant Table for retirees.

Analysis

This assumption is used to predict the payment of pre-retirement death benefits. Most public safety plans provide a more generous death benefit if the member dies while in the line of duty (duty related). This is the case with the PSPRS and CORP plans so an assumption as to what percentage of active deaths is duty related is appropriate. Rodwan assumes that 100% of all deaths in active service are duty related. This is a conservative assumption as higher benefits are assumed to be paid for all pre-retirement death. Typically duty related death is assumed to be 5-10% of all pre-retirement deaths, a relatively low percentage of the total. Because the probability of death while active is very small, a change in this assumption is unlikely to have a large impact on the total contribution rate.

Mortality typically varies by age and gender, but is also known to vary by income level and by working versus non-working employees. Due to the small number of female members, we have not included any analysis related to gender. Our recommendation to use the RP-2000 Employees Table will reflect the expectation of better mortality for working members as compared to retired members of the same age. Rodwan did not develop active exposure by gender so analysis for males alone is not available. There are not a sufficient number of active females to produce credible results. A summary of our analysis for males follows:

Plan	Milliman's Results			
	Actual	Expected	A/E Ratio	Revised A/E
PSPRS-Male	55	121	45%	82%
CORP- Male	70	85	82%	123%
EORP-Male	5	11	45%	125%
Total	130	217	60%	102%

A similar pattern occurred in the deaths of active members as was seen in retiree deaths. The CORP group exhibited the worst mortality (higher number of actual deaths compared to expected) of the three plans and EORP exhibited the best mortality of the plans.

The RP-2000 Table, which is being recommended for use for the retiree group, includes a table for actively working members, called the RP-2000 Employee Table. Rodwan recommended moving to the RP-2000 Table for active mortality as well as retiree mortality, but did not indicate whether the Employee Table was recommended or the Combined Table (which would be used for both active and retirees).

The following chart compares Milliman’s and Rodwan’s recommendations:

The following chart compares Milliman’s and Rodwan’s recommendations for healthy retirees.

Active Mortality				
	Rodwan		Milliman	
		Age Adjustment		Age Adjustment
Males				
PSPRS	RP-2000	0	RP-2000	-1
CORP	RP-2000	0	RP-2000	+3
EORP	RP-2000	0	RP-2000	-2
Females				
PSPRS	RP-2000	0	RP-2000	+2
CORP	RP-2000	0	RP-2000	+3
EORP	RP-2000	0	RP-2000	-1

RP-2000 = RP-2000 Employee Table. Please note, Rodwan did not specify use of Combined or Employee Table.

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Section 13 Service Retirement

Audit Conclusion

The difference in methodologies used by Rodwan and Milliman in developing the exposure and decrements resulted in differences in the retirement rates recommended by each firm. In general, Milliman's set of rates is lower, particularly with years of service 20 and 25. We offer a couple of observations from our analysis:

- There were 174 of the 660 DROPs reported in the 2002 data that actually had dates of termination in the last part of June 2001 (presumably elected DROP effective 7/1/01). Thus, these members apparently retired prior to the study period. Another 29 retirees fell into the same category. In the data processing for our experience study, these members were not included as active members in the July 1, 2001 data and therefore were not included in the exposure for that year. Since they are not included in the exposure, they are not counted as "decrements" (actual DROPs and retirements) in the July 1, 2001 to June 30, 2002 plan year.
- We weighted the exposure and decrements by salary and then studied the retirement experience. There was only a significant difference in results for the Police Small group. We expect that this is because there is more variance in the salary levels of members employed by smaller Police employers than the other groups. We suggest that the retained actuary consider using a similar methodology in future experience studies to determine if it is appropriate to develop a retirement assumption based on this approach.
- Because Rodwan truncated service for purposes of categorizing members for the experience study (and Milliman did to try and match Rodwan's numbers), members who are in the "19 years of service" grouping at the beginning of the year actually have between 19.0 – 19.99 years of service and thus will be eligible to retire under the "20 and out" provision during the year. In the experience study for Public Safety, Rodwan divided the actual decrements at 20 years of service by the exposure at 19 years of service and used that rate for the probability of retiring with 20 years of service. Likewise, the actual decrements at 21 years of service are divided by the exposure for 20 years of service and so on. Milliman's standard approach matched the members decrementing to the exposure grouping to which they were assigned at the beginning of the year. As a result, Rodwan has retirement rates beginning at year 20 and Milliman has retirement rates beginning with year 19. The "Year 19" rates would be applied in the valuation software to members who had 19 years of service on the valuation date but reached 20 years during the upcoming year. We prefer our approach given the methodology for determining age and service. We believe it develops more appropriate probabilities of retirement. This difference had a more significant impact on the years where spikes occur, like 20 and 25 years of service. In general, Milliman's rates are lower than Rodwan's.
- The same trend in retirement rates for years 20 and 25 were exhibited for CORP and we believe the same reasons apply.
- For EORP, it appears that the election cycle has a significant impact on retirement and termination rates as might be expected. Therefore, the observed retirement rates over a five year period will vary depending on whether there are two or three years of high turnover (elections occurred) in the study period. We believe this pattern should be considered and appropriate adjustments made in developing retirement rates, ensuring the same number of "high" and "low" years of experience are included. We note that the current study period had more low years (3 out of 5 years).



Analysis

Service retirement measures the change in status from active membership directly to retirement. This assumption does not include the retirement patterns of the retirees who terminated from active membership prior to being eligible to retirement, nor does it include disability retirement experience.

The retirement eligibility provisions and benefit provisions vary for PSPRS, CORP and EORP, as well as the member demographics of each plan. Therefore, we studied the retirement experience of each group separately.

Public Safety

A member can first retire with unreduced benefits at 20 years of service or following attainment of age 62 with 15 years of service. The amount of the normal pension at 20 years of credited service is 50% of average monthly salary (AMS) with 2% for each year over 20 up to 25 years of credited service. With 25 or more years of service, the accrual rate is 2.5% for each year (maximum 80% of AMS).

Members with at least 20 years of service may elect to enter the DROP (Deferred Retirement Option Plan) for up to 60 months. During the DROP period, the frozen accrued pension is deposited into the member's DROP account and credited with interest. The DROP account is paid at the time of actual retirement. Neither the member nor the employer makes contributions on the member's pay while he is in DROP.

For the valuation, a member who elects DROP generally has the same impact as a member who retires, with the exception of valuing the medical subsidy. Currently, the retirement rates reflect the combined impact of both regular service retirement and DROP. We believe this is an acceptable approach but it does overstate the cost of the medical subsidy. The weakness in a combined assumption is that it may be harder to isolate the costs associated with changes in plan design that impact the DROP or the behavior of members electing DROP. Because the DROP is being heavily used by members, any proposed changes to the DROP program should be carefully reviewed to assure that the use of a combined assumption does not distort the estimated impact of the proposed change.

The following is a comparison of the actual to expected service retirements, including DROP, for the study period. This is summarized data for all years of service. For detailed analysis by year, see the exhibits for retirement experience in Appendix D.

	Rodwan			Milliman			A/E Ratio - Proposed	
	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio	Rodwan	Milliman
Police Large	1,549	1,200	129%	1,373	1,283	107%	96%	99%
Police Small	534	218	245%	428	236	181%	88%	98%
Fire Large	704	708	99%	673	714	94%	112%	98%
Fire Small	172	64	269%	145	88	165%	83%	95%
Total	2,959	2,190	135%	2,619	2,321	113%	97%	98%

Rodwan has a significantly higher number of actual retirements/DROPs than Milliman. There were 174 of the DROPs reported in the 2002 data that actually had dates of termination in late June 2001 and probably had a July 1, 2001 retirement date. Another 29 retirees fall into this category. In our processing, these members would not have been active members in the July 1, 2001 data and therefore were not included in the exposure for that year. Since they are not included in the exposure, they also are not counted as “decrements” (actual DROPs/retirements) in the July 1, 2001 to June 30, 2002 year. It appears that Rodwan might have included them in the actual decrements for the study period. We believe this issue explains most of the difference in the count of actual DROP/retirement between Rodwan and Milliman. We believe that the retained actuary should review their data and findings with respect to this issue to see if she concurs. It appears that somewhat lower retirement rates could be considered in light of this issue.

The DROP was first available July 1, 2001 so we thought that the experience in the initial year might differ from subsequent experience. We studied the experience both including and excluding the first year and, while there was a somewhat higher number of members electing DROP that year, we believe that there was not a significant difference.

Valuation Date:	2002	2003	2004	2005	2006	Total
DROP	660	404	110	309	408	1,891
Retirements	184	179	198	236	271	1,068
Totals	476	583	308	545	679	2,959

Because Rodwan truncated service for purposes of categorizing members for the experience study (and Milliman did also to try to match Rodwan’s numbers), members who have 19 years of service at the beginning of the year will be eligible to retire under the “20 and out” provision during the year. In the experience study for Public Safety, Rodwan divided the actual decrements at 20 years of service by the exposure at 19 years of service and used that rate for the probability of retiring with 20 years of service. Likewise, the actual decrements at 21 years of service are divided by the exposure for 20 years of service and so on. Using our methodology, Milliman matched the members decrementing to the exposure grouping to which they were assigned at the beginning of the year. As a result, Rodwan has retirement rates beginning at year 20 and Milliman has retirement rates beginning with year 19. We believe that our approach provides a better forecast of future retirement and DROP experience. This difference had a more significant impact on the years where spikes occur, like 20 and 25 years of service. In general, Milliman’s rates are somewhat lower than Rodwan’s.

Due to the high percentage of members electing to retire/DROP at durations 20 and 25, we also studied the distribution of retirements by age at those two durations. As might be expected, there was a lower probability of retirement at the younger ages, up to about age 50 and then it increased. Although using a pure durational based assumption is acceptable, and in this case is probably conservative, we suggest that the retained actuary include analysis reflecting both age and service in the next study to see if this approach might provide a better estimate of future liabilities.

Because PSPRS covers many diverse employers, we thought it might be informative to analyze the retirement experience by multiplying the exposure and decrement by the salary of the member and then performing the analysis of actual versus expected. This approach essentially weights the experience by salary, giving higher paid members more impact on the final result. Because the member’s benefit is directly related to their salary, this is a better reflection of the impact of retirement behavior on the liability of the System. Therefore, this approach should create smaller amounts of actuarial gains/losses as measured from year to year in the valuation reports.

The following summarizes our experience showing the A/E ratio on both a count (traditional) and a liability weighted basis:

	A/E Ratio - Current		A/E Ratio – Rodwan Proposed	
	Count	Weighted	Count	Weighted
Police Large	107%	112%	96%	98%
Police Small	181%	104%	88%	49%
Fire Large	94%	99%	112%	110%
Fire Small	165%	157%	83%	80%
Total	112%	109%	97%	94%

These results indicate there is more variance in the salary levels of members employed by smaller Police employers. Within the other groups there is less diversity in the groups’ salaries. We suggest that the retained actuary consider using this method (or an alternative methodology to deal with this issue) to determine if their results are consistent with Milliman’s. If so, we recommend implementing retirement assumptions based on this new approach.

Correctional Officers

A corrections officer may retire with unreduced benefit at 20 years of service, age 62 and 10 years of service or any combination of age plus service equal to 80.

The amount of the normal pension at 20 years of credited service is 50% of average monthly salary (AMS) with 2% for each year over 20 up to 25 years of credited service. With 25 or more years of service, the accrual rate is 2.5% for each year (maximum 80% of AMS).

The current retirement assumption is an age based assumption. Rodwan provided analysis on the age based assumption as well as on a service based assumption. Given the eligibility requirement for normal retirement (unreduced benefits) and the benefit structure, which provides incentive to continue in service to 25 years of service, we concur that a service based assumption is the preferred approach. The findings of the experience study are summarized below.

	Rodwan			Milliman			Proposed A/E Ratio	
	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio	Rodwan	Milliman
Age Based	908	743	122%	778	785	99%	N/A	N/A
Service Based	618	N/A	N/A	596	N/A	N/A	73%	93%

Because Rodwan truncated service for purposes of categorizing members for the experience study (and Milliman did the same to try and match Rodwan’s numbers), members who have 19 years of service at the beginning of the year will be eligible to retire under the “20 and out” provision during the year. Unlike the methodology Rodwan used to develop the retirement rates for PSPRS, for CORP Rodwan divided the actual decrements at 20 years of service by the exposure at 20 years of service and used that rate for the probability of retiring with 20 years of service. Again, however, Rodwan does not “match” the decrements to the exposure for the period so there are differences in Rodwan’s and Milliman observed experience. It is unclear

to us how those members with 19 years of service at the beginning of each year in the study period were treated. We prefer our approach and we believe it develops more appropriate probabilities of retirement. As with PSPRS, this difference had a more significant impact on the years where spikes in the rates occur, like 20 and 25 years of service.

Rodwan also recommended assuming that those who do not qualify for retirement before age 62 will retire at age 62. There was no analysis or discussion in Rodwan’s report, but based on observed experience we believe this is a reasonable assumption.

Elected Officials

An elected official may retire upon meeting one of the following criteria:

- 20 Years of Service
- Age 60 with 25 years of service
- Age 62 with 10 years of service
- Age 65 with 5 years of service

In addition, a member with 5 years of service may retire early at any age. The reduction for early commencement is capped at 30%.

The current assumption is an age based assumption. Given that members can retire with 5 years of service and there is a maximum reduction to their benefit, we agree with Rodwan that a service based assumption is appropriate. Rodwan recommends a service based assumption for those with over 5 years of service.

Due to the small size of the group, the results are not entirely credible on their own. Furthermore, there is considerable variation in retirement rates by age because of the small number of exposures at each age. We did not include those with less than 20 years of service in our eligible exposure. Therefore we cannot develop an assumption on the same basis as Rodwan. Although our recommended assumption varies from Rodwan’s, we believe the same technical issues discussed for PSPRS and CORP also explain most of the differences in Rodwan and Milliman’s results.

	Rodwan			Milliman			A/E Ratio - Proposed	
	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio	Rodwan	Milliman
Age and < 20 YOS	60	149	41%	43	50	86%	N/A	N/A
Service and > 20 YOS	57	N/A	N/A	30	27	111%	N/A	85%

Another issue worth noting is the impact that election cycles appear to have on the EORP experience. As the chart below indicates, there is a two-year cycle in both the number of terminations and retirements.

	Fiscal Year Ending June 30				
	2002	2003	2004	2005	2006
Terminations	18	47	22	37	17
Retirements	<u>20</u>	<u>53</u>	<u>23</u>	<u>51</u>	<u>18</u>
Total	38	100	45	88	35

The observed retirement rates over a five year period will vary depending on whether there are two or three years of high turnover (elections occurred) in the study period. For example, using a four year period from 7/1/02 to 6/30/06 would have resulted in higher observed rates. We believe this pattern should be considered and appropriate adjustments made in developing retirement rates, ensuring the same number of “high” and “low” years of experience are included. We note that the current study period had more low years (3 out of 5 years). In developing Milliman’s recommended assumption, we used only the last 4 years of the study period to recognize the issue.



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Section 14

Termination of Employment (Withdrawal)

Audit Conclusion

The current and recommended assumption for termination of employment uses a select and ultimate approach. The select period is five years and the same assumption applies to all similarly situated members (e.g. all members with 1 year of service have the same probability of withdrawing). The ultimate rates, which apply after five years of service, are age based. The retained actuary recommends changes to the termination rates, based on the observed experience, but maintains the five year select and ultimate approach.

As pointed out earlier in this report, there can be different ways to develop the exposure and decrements in performing an experience study. Our approach was very different than Rodwan's and consequently there are differences in our findings and conclusions. Our methodology does not include those members who are hired and terminate within the same plan year, i.e. hired after July 1 and terminated before the next July 1. (The reason we do this is we are trying to develop an assumption to apply to members included in future actuarial valuations with respect to their termination rates. Including members who never were included in a valuation can distort the experience we are attempting to measure.) It appears that Rodwan included the number of such members in the count of decrements but did not include them in the exposure. We believe this key difference in processing the data for the experience study accounts for the biggest differences in the actual counts for termination of employment. We would note that, using the Projected Unit Credit cost method, the termination rates in the first year have minimal impact on the actuarial accrued liability and contribution rates.

- While we concur that using a select and ultimate assumption for termination of employment is the preferred approach, our analysis indicates that there are significant differences in PSPRS and CORP in experience for those with more than ten years of service as compared to those with between five and ten years. Initially we thought the select period should be extended to ten years for PSPRS and CORP. After our final analysis, we developed termination of employment assumptions that are totally service based.
- We agree with Rodwan's recommendation to extend the select period from 5 to 8 years for EORP.
- For EORP, it appears that the election cycle has a significant impact on termination rates as might be expected. Therefore, the observed termination rates over a five year period will vary depending on whether there are two or three years of high turnover (elections occurred) in the study period. We believe this pattern should be considered and appropriate adjustments made in developing termination rates, ensuring the same number of "high" and "low" years of experience. We note that the current study period had more low years (3 out of 5 years).
- For EORP, there is a wide range of salaries for active members. We performed analysis based on weighting the exposures and decrements by salary, which indicated much lower termination rates than on a pure count basis. We recommend the retained actuary use this approach for EORP due to the wide variance in salaries for members. This should serve to minimize the magnitude to future actuarial gains and losses due to this assumption.

- The data for PSPRS is split into four groups for purposes of the experience study: Police Large, Police Small, Fire Large, Fire Small. There is some concern that subdividing the data into smaller component parts will result in more variance in results and less credible experience data. In conjunction with reviewing the categorization of employers into these 4 groups, the retained actuary should evaluate the credibility of the data of each group and decide how best to use the available data. The retained actuary should also consider the desirability of using reduced termination assumptions for very small groups where the most likely result may be that no members will terminate during most years. For such small groups, using average experience-based assumptions can be expected to generate continual actuarial losses and contribution rate increases during years where no members terminate.

Analysis

This section of the report summarizes the results of our study of terminations of employment for reasons other than death, retirement, or disability. Rates of termination can vary by both age, years of service and gender. In general, rates of termination are usually highest in the early years of employment. The current assumptions are service based, for the first five years and then age based. The results of our replication of termination of employment experience are summarized by plan below.

Public Safety

Because of expected differences in certain key assumptions, including termination of employment, by size of employer, Public Safety experience is analyzed in four separate groups: Police Large, Police Small, Fire Large and Fire Small. As mentioned earlier in this report, it does not appear that these grouping have been reviewed recently. We recommend the retained actuary revisit the classification of employers into these four categories to ensure the set of assumptions being used is appropriate for each employer. In addition, for very small employers (less than 25 members) we believe it may be more appropriate to assume no termination of employment as opposed to using a set of termination rates. When the group is very small, there is a greater potential for volatile contribution rates because the actual experience of one member is a large percentage of the total group. If a termination of employment assumption is used in these cases, it may lead to rising contribution rates if members do not leave as anticipated by the assumption. A more conservative approach would be to assume no turnover which will result in a decrease in the contribution rate when a member actually leaves prior to retirement, death or disability.

Because of the technical issues discussed earlier, the differences between Rodwan's results and ours are to be expected. There are however, two key differences which we note:

- (1) There are a number of people who begin employment and then terminate within the same fiscal year. Based on the difference in counts, it appears that Rodwan included these people in the number of actual terminations in Year < 1. Based on our review of their spreadsheet, however, we do not believe they have been added to the exposures, and therefore are not reflected in the expected decrements. This leads to an overstatement of the actual to expected ratio and a higher termination rate for Year < 1. Since these individuals enter and leave the System in the same year, they would never appear as active members in the valuation process. In our processing, we excluded them from both the exposure (and therefore the expected count) and the actual count of terminations. While we believe this is more consistent with how the assumptions would be applied in the valuation software, we note that the initial year termination rates are of very minimal impact when using the Projected Unit Credit funding method.

- (2) Once a member is eligible to retire, the termination assumption ceases and the retirement assumption replaces it. We believe Rodwan’s valuation software uses this approach. In Rodwan’s analysis, however, individuals who are eligible to retire are still included in the exposure for purposes of developing expected terminations. This overstates the expected number and thus understates the actual to expected ratios. We recommend this be corrected, although the low rates involved will not likely result in material adjustments to the contribution rate.

A summary of Rodwan’s and Milliman’s findings by group is shown below. As mentioned earlier, there are significant differences in the actual count of terminations. The most significant difference is for service less than one year where members who were hired and terminated within the same fiscal year were treated differently by Rodwan and Milliman. The revised A/E ratio uses Rodwan’s recommended rates but uses Milliman data.

Police Large

Service	Rodwan			Milliman			A/E Ratio - Proposed	
	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio	Rodwan	Milliman
0 < 1	657	501	131%	276	487	57%	45%	103%
1 < 2	85	185	46%	98	193	51%	108%	108%
2 < 3	82	66	124%	75	67	112%	96%	96%
3 < 4	62	55	113%	59	57	104%	86%	104%
4 < 5	48	45	107%	46	45	102%	82%	102%
5+	302	216	140%	270	179	151%	106%	111%
Total	1,236	1,068	116%	824	1,028	80%	71%	105%

Police Small

Service	Rodwan			Milliman			A/E Ratio - Proposed	
	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio	Rodwan	Milliman
0 < 1	515	504	102%	283	493	57%	57%	96%
1 < 2	155	240	65%	120	236	51%	76%	102%
2 < 3	142	112	127%	113	115	98%	82%	98%
3 < 4	97	108	90%	87	102	85%	85%	85%
4 < 5	83	68	122%	93	67	139%	115%	99%
5+	376	245	153%	310	210	148%	93%	101%
Total	1,368	1,277	107%	1,0067	1,223	82%	77%	97%

Fire Large

Service	Rodwan			Milliman			A/E Ratio - Proposed	
	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio	Rodwan	Milliman
0 < 1	40	51	78%	20	51	39%	45%	105%
1 < 2	7	16	44%	10	18	56%	111%	100%
2 < 3	4	11	36%	8	13	62%	133%	89%
3 < 4	6	6	100%	9	7	129%	129%	113%
4 < 5	6	4	150%	9	4	225%	129%	113%
5+	26	27	96%	31	21	148%	135%	119%
Total	89	115	77%	87	114	76%	91%	109%

Fire Small

Service	Rodwan			Milliman			A/E Ratio - Proposed	
	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio	Rodwan	Milliman
0 < 1	90	124	73%	78	113	69%	87%	99%
1 < 2	71	83	86%	51	72	71%	82%	100%
2 < 3	50	40	125%	40	38	105%	83%	105%
3 < 4	42	39	108%	37	37	100%	79%	100%
4 < 5	42	35	120%	37	32	116%	93%	116%
5+	124	116	107%	94	97	97%	81%	106%
Total	419	437	96%	337	389	87%	84%	103%

We also investigated the experience beyond the five year select period by duration to determine if it would be appropriate to extend the select period. We found that there is a significant difference in the experience for members with between years 5 and 10 as compared to those with more than 10 years as shown below. We believe it would provide a better estimate of the actuarial accrued liabilities of the system if the select period was extended to 10 years. As we considered the experience for members with five to nine years of service and then those with 10 or more, no age based trend was evident. Therefore, our final set of recommended rates is service based only.

A/E Ratio (current assumptions)				
Service	Police Large	Police Small	Fire Large	Fire Small
5-10 Years	237%	193%	240%	119%
10+ Years	71%	96%	64%	70%
Total	151%	148%	148%	97%

Correctional Officers

Rodwan analyzed the termination rates separately for Correctional Officers and Dispatchers and recommended different assumptions for each group. Based on the data we were supplied by the System, the data item to identify dispatchers was first included in the data in 2003. In that year, there were 26 members identified as dispatchers. In the 2004 and 2005 data, there were 55 such members. In the 2006 data, there were around 300. In Rodwan's spreadsheet, the total exposure for the five year period for dispatchers was 1,429 or nearly 300 per year. The differences in how Milliman and Rodwan created exposures for the study period (Rodwan includes 1/2 of the June 30, 2006 data in their exposure) may partially explain the higher number of dispatchers in Rodwan's exposure. Given the significant changes in the dispatcher membership during the study period, we do not believe that Rodwan's methodology and results provide a reasonable basis for setting an assumption for the dispatchers group. If a separate assumption is to be used, we recommend the change be delayed until the next experience study when more data will be available and it will be more consistent throughout the study period.

Correctional Officers

Service	Rodwan			Milliman			A/E Ratio - Proposed	
	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio	Rodwan	Milliman
0 < 1	3,814	2,971	129%	2,433	2,797	87%	104%	104%
1 < 2	2,194	1,853	119%	1,448	1,757	82%	103%	103%
2 < 3	1,518	1,193	127%	990	1,132	87%	100%	100%
3 < 4	1,038	727	143%	682	652	105%	105%	105%
4 < 5	709	480	147%	499	442	113%	100%	100%
5+	1,973	1,478	134%	1,294	1,135	114%	99%	99%
Total	11,246	8,702	129%	7,346	7,915	93%	102%	102%

Again, a significant amount of the difference in the results is due to differences in Rodwan's methodology versus Milliman's. We believe that Rodwan included members hired and terminated within the same year, while Milliman's approach did not. In addition, because Rodwan uses the age/service at actual decrement, members terminating during the year may fall into a different exposure grouping under Rodwan's and Milliman's methods. These differences make it difficult to come to a conclusion with respect to Rodwan's recommended assumptions.

The same analysis of termination experience was performed for CORP for members with 5 through 10 years of service as was performed for the Public Safety group. The same trend existed for CORP with much higher terminations during years 5 to 10 versus 10 and above, as the table below illustrates. We believe the select period should be extended to ten years. As we reviewed the experience and developed our assumptions, no age based trend was evident. Therefore, our final set of recommended rates are service based only.

Years of Service	A/E Ratio
5-10 Years	151%
10+ years	60%
Total	114%

Elected Officials

Rodwan recommends extending the select period from 5 to 8 years. There was no discussion in the report, but presumably, the 8 year period correlates with the two term limit that applies for elected officials. While we agree that extending the period improves the estimation of actuarial accrued liabilities, there is a wide range of salary levels in this plan (28% of members earn under \$25,000 and 35% earn over \$95,000). It is likely that the higher paid/longer service members are the Judges and, therefore, more of the liability of the Plan resides with these members. Therefore, the termination of employment pattern for the judges has a greater impact on the contribution rate than that of the elected officials. We agree with Rodwan’s suggestion that an identifier be included in the data to indicate which members are judges so separate analysis can be performed on this group. Given that the data in this study did not allow separate analysis by group, we “weighted” the experience by salary to attempt to provide more weight to the higher paid members. Our findings are shown both by count and salary weighted in the charts below:

Analysis By Count

Service	Rodwan			Milliman		
	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio
0 < 1	34	18	189%	12	28	43%
1 < 2	21	18	117%	24	24	100%
2 < 3	12	17	71%	7	24	29%
3 < 4	11	17	65%	22	20	110%
4 < 5	25	14	179%	12	20	60%
5 < 6	6	10	60%	8	16	50%
6 < 7	15	10	150%	5	18	28%
7 < 8	7	9	78%	15	14	107%
8 < 9	16	8	200%	7	14	50%
9+	19	57	33%	14	65	22%
Total	166	178	93%	126	243	52%

Analysis Weighted By Salary (All Milliman Data)

Service	A/E Ratio (current assumptions)	
	Count	Weighted
0 < 1	43%	43%
1 < 2	100%	73%
2 < 3	29%	29%
3 < 4	110%	63%
4 < 5	60%	29%
5 < 6	50%	11%
6 < 7	28%	13%
7 < 8	107%	42%
8 < 9	50%	19%
9+	22%	68%

As the previous chart illustrates, the termination experience is very different when the experience is analyzed on a salary weighted basis versus a pure count basis. Many of the members who are leaving have lower salaries and those with higher salary have lower termination rates. Given that most of the higher paid members are probably judges, this is not surprising. This analysis implies that rates should be lower overall, which is not consistent with Rodwan’s recommendations. Alternatively, separate assumptions should be set for elected officials and judges, or separate assumptions for high versus low paid members.

Another issue worth noting is the impact that election cycles appear to have on the EORP experience. As the chart below indicates, there is a two-year cycle in both the number of terminations and retirements.

	Fiscal Year Ending June 30				
	2002	2003	2004	2005	2006
Terminations	18	47	22	37	17
Retirements	<u>20</u>	<u>53</u>	<u>23</u>	<u>51</u>	<u>18</u>
Total	38	100	45	88	35

Because the active membership is reasonably stable from year to year, the observed termination rates can vary depending on which years are included in the study. Using a four year period from 7/1/02 to 6/30/06 would have resulted in higher observed rates. We believe that this pattern should be considered and appropriate adjustments made in studying termination experience. We do not disagree with estimating actuarial accrued liabilities using a rate reflecting an average of high and low years; however, the number of high and low years should be balanced in the development of the assumptions, which did not occur in this study.

In developing our recommended assumption, we excluded the experience for 2002 so there was an equal number of high and low years. We also developed assumptions by years of service but aggregated two years of experience to create more exposure and to smooth out the experience of election years.

A summary of our findings is shown below:

Service	Actual	Expected	A/E Ratio	Proposed A/E Ratio
0 ≤ 1	23	29	79%	105%
2 < 4	18	24	75%	100%
4 < 6	13	19	68%	93%
6 < 8	3	6	50%	92%
, 10	6	9	92%	92%
10	6	9	67%	98%*

This assumption was developed on a salary weighted basis

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Section 15

Disability

Audit Conclusion

Our comments and recommendations are set out below:

- In PSPRS, all disabilities are assumed to be service related, which is conservative. Based on available information, a high percentage of all disabilities are duty related. Assuming that 100% of all disabilities are accidental (service related), anticipates higher benefit payments and therefore results in higher actuarial accrued liabilities/costs, although probably not significantly higher.
- For PSPRS, we concur with most of Rodwan's proposed changes. We would make a few modifications in the rates at older ages for the two Fire groups.
- In CORP, actual disabilities were much lower than expected using the current assumption (A/E Ratio of 19%). The retained actuary did not suggest lowering disability rates because of possible legislation that would impact disability retirement. If new legislation would increase the number of expected disabilities, a higher disability assumption should be used to estimate the cost impact of that legislation so decision makers can understand the expected cost impact of that legislation. If the legislation were enacted, the disability rates should then be modified for future actuarial valuations. However, retaining a disability assumption that overestimates the number of expected disabilities under current law is not justified simply because legislation *may* be enacted that would be expected to increase the number of disabilities.
- Given the small size of the group and the very low incidence of disabilities, we recommend eliminating the disability assumption for EORP.

Public Safety

The Public Safety Personnel Retirement System allows a member to start receiving benefits prior to eligibility for service retirement if they become disabled. There are four types of disability retirement:

- Ordinary (not-service related): Physical condition which totally and permanently prevents performance of a reasonable range of duties or a mental condition which totally and permanently prevents any substantial gainful employment.
- Accidental (service related): Total and permanent disability, incurred in performance of duty, preventing performance of a reasonable range of duties within the employee's job classification.
- Temporary: Termination of employment prior to normal retirement eligibility by reason of temporary disability.
- Catastrophic: Physical, and not a psychological, condition incurred in performance of duty which totally and permanently prevents engaging in any gainful employment.

The current assumption for disability assumes that all disabilities that occur are accidental. The data indicates that over 85% of all disabilities were service related so this is a reasonable assumption to simplify the valuation process. However, it does result in slightly higher costs than if a separate assumption was used for ordinary versus accidental disability.



As mentioned above, it is assumed that all disability retirements will be accidental. However, separate disability rates are used for the four groups: Police Large, Police Small, Fire Large, and Fire Small. Therefore, separate analysis was performed for each group. The table below indicates the number of actual and expected disabilities during the study period and the resulting A/E Ratios. For purposes of this presentation, disability experience for both males and females are aggregated. In general, ratios below 100% indicate fewer disabilities than expected and ratios above 100% indicate more disabilities than expected based on the current assumptions.

Gender	Rodwan's Results			Milliman's Results			Proposed A/E Ratio	
	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio	Rodwan	Milliman
Police Large	149	110	135%	136	114	119%	103%	103%
Police Small	101	57	177%	88	58	152%	100%	100%
Fire Large	30	34	88%	18	35	50%	72%	78%
Fire Small	26	30	87%	25	29	86%	119%	104%
Total Police	250	167	150%	224	172	130%	102%	102%
Total Fire	56	64	88%	43	64	67%	93%	91%
Grand Total	306	231	132%	267	236	113%	100%	100%

There were more disability retirements for Police than expected during the study period and fewer than expected for Fire members. Rodwan recommends changing the disability rates for all four groups. We agree with the recommended rates for the two Police groups but would make some modifications in the rates at the older ages for the Fire groups.

- We also analyzed the data by gender to see if differences exist and, if so, whether they are significant enough to use separate assumptions. Again, as we subdivide the data into the different component pieces, the individual pieces become less credible because of the size of the underlying data (exposure). However, the results were interesting. Based on this limited data, female members of both Police and Fire had higher disability rates than males. Please note that the number of disabilities is very small in total for females and especially so for female firefighters. While we would not recommend gender distinct disability rates based on this study period alone, the differences we observed appear to make a case for analyzing the data by gender in future experience studies to determine whether to ultimately use gender specific disability rates.

Gender	Milliman's Results (Male)			Milliman's Results (Female)		
	Actual	Expected	A/E Ratio	Actual	Expected	A/E Ratio
Police Large	106	102	104%	30	12	250%
Police Small	73	53	138%	15	5	300%
Fire Large	16	34	47%	2	1	200%
Fire Small	22	28	79%	3	1	300%
Total	217	217	100%	50	19	263%

Correctional Officers

For corrections officers, accidental disability retirement is available if a member is injured in the performance of his duties which totally and permanently prevent him from performing a reasonable range of duties in his department and was the result of either physical contact with an inmate, responding to a confrontational situation with an inmate or a job-related motor vehicle accident. A corrections officer who becomes incapacitated for any gainful employment, as the direct and proximate result of performance of duty as a corrections officer, may be retired under a total and permanent disability.

Based on the information shown in Rodwan's Experience Study, the number of actual disabilities during the study period was significantly lower than expected (25 actual vs. 112 expected for an A/E ratio of 22%). Milliman's results were similar, with an A/E ratio of 19%.

Rodwan's recommendation is to keep the current assumption because there is pending legislation which may expand disability coverage. We believe lower rates would be appropriate based on current law. If new legislation would increase the number of expected disabilities, a higher disability assumption should be used to estimate the cost impact of that legislation so decision makers can understand the expected cost impact of that legislation. If the legislation were enacted, the disability rates should then be modified for future actuarial valuations. But retaining a disability assumption that overestimates the number of expected disabilities under current law is not justified because legislation *may* be enacted that would be expected to increase the number of disabilities.

Elected Officials

The disability rates used in Rodwan's experience study as current rates are not those used in the valuation. This did not have a direct impact on Rodwan's analysis of actual experience. However, their comment about their recommended rates being lowered from the current rates is inaccurate. The proposed assumption is actually higher than the current disability rates at most ages.

However, given the small size of the membership we believe it would be appropriate to eliminate the assumption completely. Given the type of employment, the size of the group, and the low probability of disablement we would expect very few disabilities. There were only 7 disabilities in total during the entire five year study period. We believe that eliminating the assumption would be a case of simplification without losing accuracy.

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Section 16

Merit Salary Scale

Audit Conclusion

Rodwan's report did not specifically address the merit salary scale as a demographic assumption. We believe that Rodwan's experience study should include analysis on this key assumption. Very little analysis is provided for salary experience in Rodwan's report and what is included addresses only total salary increase experience during the study period. We recommend that Rodwan split the salary increase assumption into two components: (1) the general wage increase and (2) the merit scale. Each should be studied separately, with a specific recommendation made for each. Earlier in this report, we developed our recommendation of 4.50% for the general wage increase assumption. In this section we will develop a recommendation with respect to the merit salary scale.

The current salary increase assumption is age based. Typically, there is a stronger correlation of salary increases to service than age. Therefore, we included both an analysis on an age based assumption and a service related assumption. If the age based assumption is retained for future valuations, we recommend the retained actuary include analysis by year of service as well as age in the next experience study.

Our specific recommendations are as follows:

- We recommend considering a change to a service based merit salary assumption for PSPRS and CORP. We find there is usually a stronger correlation of salary increases to years of service as compared to age.
- The actual merit increases observed during this study period for PSPRS and CORP appear to be high based on actual inflation and wage growth. Part of this may be due to the fact that most of the study period is post-September 11, 2001, which could have had an impact on salary experience. The recommended service based assumption for the merit scale produces salary increases that are lower than the actual experience observed in this study period. If the System is interested in adopting this type of assumption, further discussion is needed before the assumption is finalized.
- The membership of EORP is small and the Plan covers both judges and elected officials. Rodwan recommended that the valuation data indicate whether the member is a judge so data is available to study that group separately in the next experience study. We agree with this recommendation.
- Actual increases for EORP were extremely low during the study period, with an average increase over the period of 1% compared to 5% expected. Our experience with other plans that cover Judges is that salary increases will be low for several years with a "catch up" at some point in time. We believe it is appropriate to have no merit scale for this plan. Therefore, based on the inflation and wage increase assumptions we recommended earlier were implemented, we would lower the salary increase assumption to either 3.5% (inflation only) or 4.5% (general wage increase).



Analysis

Estimates of future salaries are based on assumptions for two types of increases:

1. Increases in each individual's salary due to promotion or longevity (often called merit scale), and
2. Increases in the general wage level of the membership, which are directly related to price and wage inflation.

Earlier in this report, we recommended that the second of these rates, general wage inflation be set to 4.5% (3.5% price inflation and 1.0% real wage inflation).

Although future salary increases are the result of two components, it is difficult to isolate the true salary adjustment due to inflation and productivity. Therefore, the experience study usually reviews total salary increases for the period. We generally try to identify the percentage increase attributable to general wage growth, thereby isolating the merit scale. Our standard approach has been to study the actual salary increases by duration (years of service), assuming those members with a high number of years receive little, if any, increase due to promotions or increased seniority (longevity). We also consider what the actual national wage growth was during the study period.

Price inflation during the study period (2001-2006) was 2.8% as compared to the current assumption of 5.0%. Based on that, we would have expected actual wage increases to be about 2% lower than the assumed rates. However, there also is a lag between the occurrence of actual inflation and the time the wage increase is granted based on that experience. Thus, at any point in time, general salary increases are more likely to be impacted by the actual inflation in the past several years as compared to the current year. Inflation for the period 1998 to 2003 was about 2.5% and the change in the National Average Wage during that period was about 3.4%. Although inflation was 2.5% lower than the assumption, real wage growth was about 0.5% higher than the current assumption of 0.5% so the net difference was about 2.0%. Based on this analysis, we would have expected to see salary increases that were close to 1.5% to 2.0% lower than the assumed rate. We did not observe this for Public Safety or CORP, as discussed below.

Public Safety

As is often the case, there was variance in the amount of actual salary increases by year. Overall and in most years, the actual increases exceeded those expected. Given that the expectation was that actual increases should be lower than the assumed rate by 2.0%, the actual increases observed were rather surprising. Without comparable data for prior years, it is difficult to determine if the increases were a "catch up" from lower increases in the past or not. This may be one area where the System or the retained actuary has insight into the data that we, as the auditing actuary, do not have. For purposes of developing the merit scale for discussion purposes in this report, we assumed a general wage increase of 5.5% for PSPRS and CORP and isolated the merit scale by subtracting 5.5% from the total observed salary increase. This approach, together with the general salary increase assumption, produces a total salary scale that is lower than the actual increases observed during the study period, which is not ideal. If the Fund Manager is interested in using our recommended assumption for salary increases based on service, we would like to have further discussions with staff and the retained actuary before the assumption is finalized.

The summary of findings is shown below:

Year End	Actual Increase	Assumed Increase	A/E Ratio
2006	7.6%	6.1%	125%
2005	6.3%	6.1%	103%
2004	4.9%	6.1%	80%
2003	7.4%	6.1%	121%
2002	8.3%	6.1%	136%
Total	6.9%	6.1%	113%

Because many of the other assumptions are split into the four groupings of Police/Fire and Small/Large, we also analyzed the salary experience separately for each group, with the following results:

	Actual Salary Increase	Expected Salary Increase
Police Large	6.4%	6.1%
Police-Small	7.5%	6.2%
Fire Large	6.4%	5.9%
Fire-Small	8.8%	6.0%
Total	6.9%	6.1%

Because the system develops individual contribution rates for employers, the pattern above may be worth discussing. At a minimum we would recommend studying this again in the next experience study to see if the same trend is observed. It may be that using different salary increase assumptions by group would provide more appropriate contribution rates.

Correctional Officers

The overall salary increase experience observed during the study period for CORP was very close to that expected, even though price and wage inflation were lower than the current assumptions. As mentioned for PSPRS, we believe a service based assumption might better predict future salary increases for members. We isolated the merit scale in the same way as we did for PSPRS. However, the salary data for those with 25 or more years of service indicated a general wage increase of 4.0% during this period. The resulting merit scale, along with our recommended general wage growth assumption, produces lower salary increases than observed during the study period. If the Fund Manager is interested in using our recommended assumption for salary increases based on service, we would like to have further discussions with staff and the retained actuary before the assumption is finalized.

Year End	Actual Increase	Assumed Increase	A/E Ratio
2006	3.9%	6.3%	62%
2005	6.4%	6.1%	105%
2004	3.7%	6.3%	59%
2003	6.3%	6.1%	103%
2002	8.7%	6.0%	145%
Total	5.9%	6.2%	95%

Elected Officials

There are several challenges related to salary analysis for members of EORP. The Plan covers both judges and elected officials and it is likely that their salary amounts and salary increase patterns are very different. In a different section of the report, Rodwan suggested collecting information regarding which members are judges and we agree that such an identifier would be useful for analysis in a number of areas. In our experience, it is common for salary increases for judges to be very low, almost flat for a number of years and then to “catch up” with a significant increase in one year. We suspect that this is what accounts for the very low increases in most of the years in the study period, but we do not have actual data to support this. The retained actuary or System staff may have some insight into this situation.

Rodwan is recommending the 5.0% inflation assumption be maintained and therefore, their salary increase assumption cannot be lower than 5.0% if the assumptions are to be consistent. Our recommended general salary growth assumption was 4.5% so we would have used a slightly lower salary increase assumption. It can be argued that “productivity” increases don’t really apply to this group, in which case a 3.5% salary increase assumption might be appropriate. Again, as the auditing actuary we have no background with EORP and prior experience so further discussion would be needed before taking such action.

Year End	Actual Increase	Assumed Increase	A/E Ratio
2006	0.4%	5.0%	8%
2005	0.4%	5.0%	8%
2004	0.7%	5.0%	14%
2003	2.9%	5.0%	58%
2002	0.5%	5.0%	10%
Total	1.0%	5.0%	20%

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Section 17

Cost Impact of Recommended Assumptions

In order to determine the significance of the differences in Milliman and Rodwan’s recommended assumptions, baseline liabilities and costs were calculated using Milliman’s recommended valuation procedures and the current assumptions. The cost impact of moving to Rodwan’s recommended set of assumptions, in aggregate, was then determined. Each of the demographic assumptions recommended by Milliman was then changed and valuation results compiled, thereby measuring the impact of each assumption change on the contribution rate. The investment return assumption was lowered to 8.0% and the cost impact was determined (see Appendix C for results). The final calculations were based on our recommended investment return assumption of 7.5%. A summary of results is shown below:

	PSPRS	CORP	EORP
<i>Employer Contribution as a % of Pay</i>			
Baseline Results	18.77%	8.53%	23.06%
Adjustment for:			
Rodwan Recommended Assumptions	0.22%	-1.67%	0.02%
Milliman Recommended Demographic Assumptions	0.64%	-0.02%	-0.49%
Milliman Recommended Interest Rate of 7.5%	6.43%	3.41%	7.69%
Total Adjustments	7.29%	1.72%	7.22%
Milliman Recommended Assumptions	26.06%	10.25%	30.28%
Milliman Recommended/Baseline	138.8%	120.2%	131.3%

For purposes of this analysis “Milliman’s assumptions” refer to those developed in this report. If we were the retained actuary for the System, we would have approached the experience study differently as far as classifying members into age and service groupings. We expect this would have some impact on the results of the experience study and the ultimate assumptions recommended. Therefore, the reader should not assume the contribution rates shown here would be the contribution rates developed if all of Milliman’s methods and assumptions were implemented.

In addition, we valued the recommended salary increase assumptions shown in this report. This assumption is based only on years of service. Because the salary experience in the study period was so unusual (as discussed earlier) we believe more discussion is needed before the service-based merit scale assumption is adopted and used in the valuation.

Public Safety Personnel Retirement System of Arizona Actuarial Audit Report

Section 18

Summary of Recommendations (Experience Study)

We suggest the following recommendations be considered when performing the next experience study:

- ✓ Perform the experience studies on a seriatim basis, tracking each member from the beginning to end of each year in the study period.
- ✓ Develop exposures for each decrement in a manner that reflects eligibility for the decrement. Consideration should also be given to how the valuation software will apply the resulting rates.
- ✓ Include a more comprehensive analysis of economic assumptions including inflation, general wage growth, and investment return and provide support for recommended assumptions.
- ✓ Demonstrate that assumptions are developed in accordance with Actuarial Standards of Practice.
- ✓ In developing the net investment return assumption, provide specific analysis of the impact of the allocation of one-half of all investment returns on the market value of assets over 9% to the FBIR.
- ✓ Analyze and report findings separately for healthy retirees and disabled retirees and also for males and females.
- ✓ Reflect future mortality improvements (longer life expectancy) by (a) including a margin (rates lower than currently observed) or (b) using a generational approach using a projection scale to model future improvements. The RP-2000 Mortality Tables Report recommends a way to develop an appropriate margin if that option (a) is selected. We recommend option (b) if the valuation software will allow such an approach.
- ✓ Review the groupings of employers into Police Small and Large and Fire Small and Large.
- ✓ Include salary or liability weighting in analyzing demographic assumptions, particularly for groups whose salary/service is not similar.
- ✓ Include the same number of “high” and “low” years of experience when analyzing experience and setting termination and retirement assumptions for EORP.
- ✓ Extend the select period for PSPRS and CORP to 10 years or alternatively, consider using a pure durational assumption for termination of employment.
- ✓ Analyze experience in EORP separately for Judges and other members. If judges cannot be identified, consider salary or liability weighted analysis.
- ✓ Include specific analysis on the merit salary scale. Consider changing to a pure service based assumption. Include analysis in PSPRS by subgroup.



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APPENDICES



**Public Safety Personnel Retirement System of Arizona
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Appendix A

Detailed Data Summary

PSPRS

	Rodwan	Milliman	Ratio Milliman/Rodwan
Active Members			
Total Number	17,324	17,326	100.0%
Average Age	37.4	37.4	100.0%
Average Service	9.0	9.0	100.0%
Average Annual Salary	\$ 61,977	\$ 61,962	100.0%
Retirees and Survivors			
Total Number	6,974	6,974	100.0%
Average Monthly Pension	\$ 3,176	\$ 3,176	100.0%
DROP Participants			
Total Number	1,746	1,746	100.0%
Average Monthly Pension	\$ 4,205	\$ 4,205	100.0%

CORP

	Rodwan	Milliman	Ratio Milliman/Rodwan
Active Members			
Total Number	11,914	11,914	100.0%
Average Age	39.3	39.3	100.0%
Average Service	6.2	6.2	100.0%
Average Annual Salary	\$ 36,742	\$ 36,737	100.0%
Retirees and Survivors			
Total Number	1,955	1,954	100.1%
Average Monthly Pension	\$ 1,589	\$ 1,589	100.0%

**Appendix A
(continued)**

EORP

	Rodwan	Milliman	Ratio Milliman/Rodwan
Active Members			
Total Number	800	800	100.0%
Average Age	54.3	54.3	100.0%
Average Service	8.3	8.3	100.0%
Average Annual Salary	\$ 68,370	\$ 68,370	100.0%
Retirees and Survivors			
Total Number	797	797	100.0%
Average Monthly Pension	\$ 2,932	\$ 2,932	100.0%



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Appendix B

**Replication of Valuations
Detailed Comparison of Results**

(Dollar Amounts in Millions)

PSPRS			
	Rodwan	Milliman	Ratio Milliman/Rodwan
Actuarial Accrued Liability (AAL)			
Retirees and Survivors	\$ 2,743.4	2,735.5	99.7%
DROP Participants	1,284.6	1,300.0	101.2%
Inactive Members	13.1	13.3	101.5%
Active Members (Detail Below)	<u>2,453.9</u>	<u>2,498.6</u>	101.8%
Total AAL	\$ 6,495.0	\$ 6,547.4	100.8%
Employer Contribution as a % of Pay			
Gross Normal Cost %	17.73%	19.54%	110.2%
Less Member Contribution %	<u>-7.65%</u>	<u>-7.65%</u>	100.0%
Employer Normal Cost %	10.08%	11.89%	118.0%
UAAL Contribution %	<u>6.45%</u>	<u>6.88%</u>	106.8%
Total Employer Rate	16.53%	18.78%	113.6%

	Rodwan	Milliman	Ratio Milliman/Rodwan
Active AAL by Benefit Type			
Service Retirement	\$ 2,020.0	\$ 2,066.4	102.3%
Disability Retirement	140.9	153.0	108.6%
Death while in Active Status	160.8	145.5	90.5%
Refund	55.2	58.8	106.5%
Health Subsidy	<u>77.0</u>	<u>74.9</u>	97.3%
Total Active AAL	\$ 2,453.9	\$ 2,498.6	101.8%



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**Public Safety Personnel Retirement System of Arizona
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**Appendix B
(continued)**

CORP			
	Rodwan	Milliman	Ratio Milliman/Rodwan
Actuarial Accrued Liability (AAL)			
Retirees and Survivors	\$ 384.5	386.5	100.5%
Inactive Members	12.9	13.3	103.1%
Active Members (Detail Below)	583.8	594.8	101.9%
Total AAL	\$ 981.2	\$ 994.6	101.4%
Employer Contribution as a % of Pay			
Gross Normal Cost %	14.03%	15.69%	111.8%
Less Member Contribution %	-7.96%	-7.96%	100.0%
Employer Normal Cost %	6.07%	7.73%	127.3%
UAAL Contribution %	0.63%	0.80%	126.7%
Total Employer Rate	6.70%	8.53%	127.3%

	Rodwan	Milliman	Ratio Milliman/Rodwan
Active AAL by Benefit Type			
Service Retirement*	\$ 429.2	\$ 398.3	92.8%
Disability Retirement	22.5	22.8	101.3%
Death while in Active Status	45.1	44.7	99.1%
Refund*	58.2	101.3	174.1%
Health Subsidy	28.8	27.7	96.2%
Total Active AAL	\$ 583.8	\$ 594.8	101.9%

* Milliman's correction to the refund/deferred retirement benefit results in a different allocation between the service retirement and refund benefit.



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**Appendix B
(continued)**

EORP

	Rodwan	Milliman	Ratio Milliman/Rodwan
Actuarial Accrued Liability (AAL)			
Retirees and Survivors	\$ 248.3	247.3	99.6%
Inactive Members	4.0	4.7	117.5%
Active Members (Detail Below)	<u>139.1</u>	<u>142.2</u>	102.2%
Total AAL	\$ 391.4	\$ 394.2	100.7%
Employer Contribution as a % of Pay			
Gross Normal Cost %	23.59%	26.08%	110.6%
Less Member Contribution %	<u>-7.00%</u>	<u>-7.00%</u>	100.0%
Employer Normal Cost %	16.59%	19.08%	115.0%
UAAL Contribution %	<u>3.62%</u>	<u>3.98%</u>	109.9%
Total Employer Rate	20.21%	23.06%	114.1%

	Rodwan	Milliman	Ratio Milliman/Rodwan
Active AAL by Benefit Type*			
Service Retirement	\$ -	\$ 124.2	N/A
Disability Retirement	-	5.7	N/A
Death while in Active Status	-	6.7	N/A
Refund	-	0.4	N/A
Health Subsidy	<u>-</u>	<u>5.2</u>	N/A
Total Active AAL	\$ 139.1	\$ 142.2	102.2%

* Detail by benefit type was not available.



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Appendix C

**Cost Impact of Recommended Assumption Changes
Detailed Comparison of Actuarial Accrued Liabilities**
(Dollar Amounts in Millions)

	PSPRS	CORP	EORP
Actuarial Accrued Liability			
Baseline Results	\$ 6,547.4	\$ 994.6	\$ 394.2
Adjustment for Rodwan Recommended Assumptions	68.9	(19.0)	4.1
Rodwan Recommended Assumptions	\$ 6,616.3	\$ 975.6	\$ 398.3
Rodwan Recommended/Baseline	101.1%	98.1%	101.0%
Adjustments for Milliman Recommendations			
• Mortality	78.1	0.6	18.1
• Probability of Retirement	17.0	3.7	(11.6)
• Probability of Termination	17.2	22.4	0.5
• Probability of Disability	0.3	(9.7)	(4.1)
• Salary Increases	(94.1)	(21.0)	(2.9)
Total Demographic Changes	18.5	(4.0)	0.0
Milliman Recommendations with 8.5% Interest	\$6,634.8	\$971.6	\$398.3
Milliman Recommended/Rodwan Recommended Ratio	100.3%	99.6%	100.0%
• Interest Rate 8.0%	342.9	45.7	26.4
Milliman Recommendations with 8.0% Interest	\$6,977.7	\$1,017.3	\$424.7
Milliman Recommended/Rodwan Recommended Ratio	105.5%	104.3%	106.6%
• Interest Rate 7.5%	414.5	63.6	21.2
Milliman Recommendations with 7.5% Interest	\$7,392.2	\$1,080.9	\$445.9
Milliman Recommended/Rodwan Recommended Ratio	111.7%	110.8%	112.0%

Note: Baseline results are Milliman June 30, 2006 valuation results, as shown in Section 4.



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**Appendix C
(continued)**

**Cost Impact of Recommended Assumption Changes
Detailed Comparison of Actuarial Contribution Rates**

	PSPRS	CORP	EORP
Employer Contribution as a % of Pay			
Baseline Results	18.77%	8.53%	23.06%
Adjustment for Rodwan Recommendations	0.22%	(1.67)%	0.02%
Rodwan Recommended Assumptions	18.99%	6.86%	23.08%
Rodwan Recommended/Baseline	101.1%	80.4%	100.1%
Adjustments for Milliman Recommendations			
• Mortality	0.54%	0.14%	2.75%
• Probability of Retirement	(0.01)%	(0.06)%	(1.64)%
• Probability of Termination	0.36%	1.22%	0.39%
• Probability of Disability	0.01%	(0.63)%	(1.36)%
• Salary Increases	(0.26)%	(0.69)%	(0.63)%
Total Demographic Changes	0.64%	0.02%	(0.49)%
Milliman Recommendations with 8.5% Interest	19.63%	6.84%	22.59%
Milliman Recommended/Rodwan Recommended Ratio	103.4%	99.7%	97.9%
• Interest Rate 8.0%	3.02%	1.57%	4.11%
Milliman Recommendations with 8.0% Interest	22.65%	8.41%	26.70%
Milliman Recommended/Rodwan Recommended Ratio	119.3%	122.6%	115.7%
• Interest Rate 7.5%	3.41%	1.84%	3.58%
Milliman Recommendations with 7.5% Interest	26.06%	10.25%	30.28%
Milliman Recommended/Rodwan Recommended Ratio	137.2%	149.4%	131.2%

Note: Baseline results are Milliman June 30, 2006 valuation results, as shown in Section 4



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Appendix D

Experience Study Exhibits

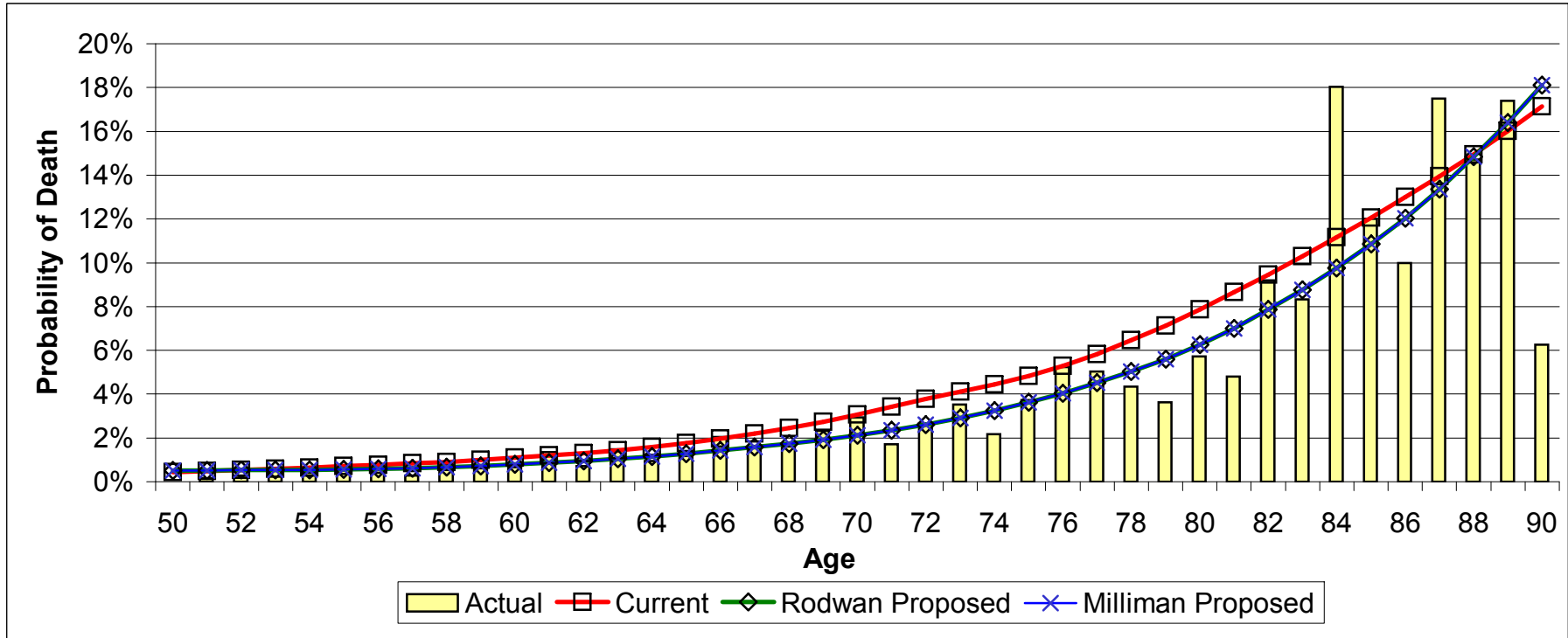
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-1

Probability of Death - Healthy Retirees

PSRS - Males



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Count	307	400	308	308
Actual/Expected		77%	100%	100%

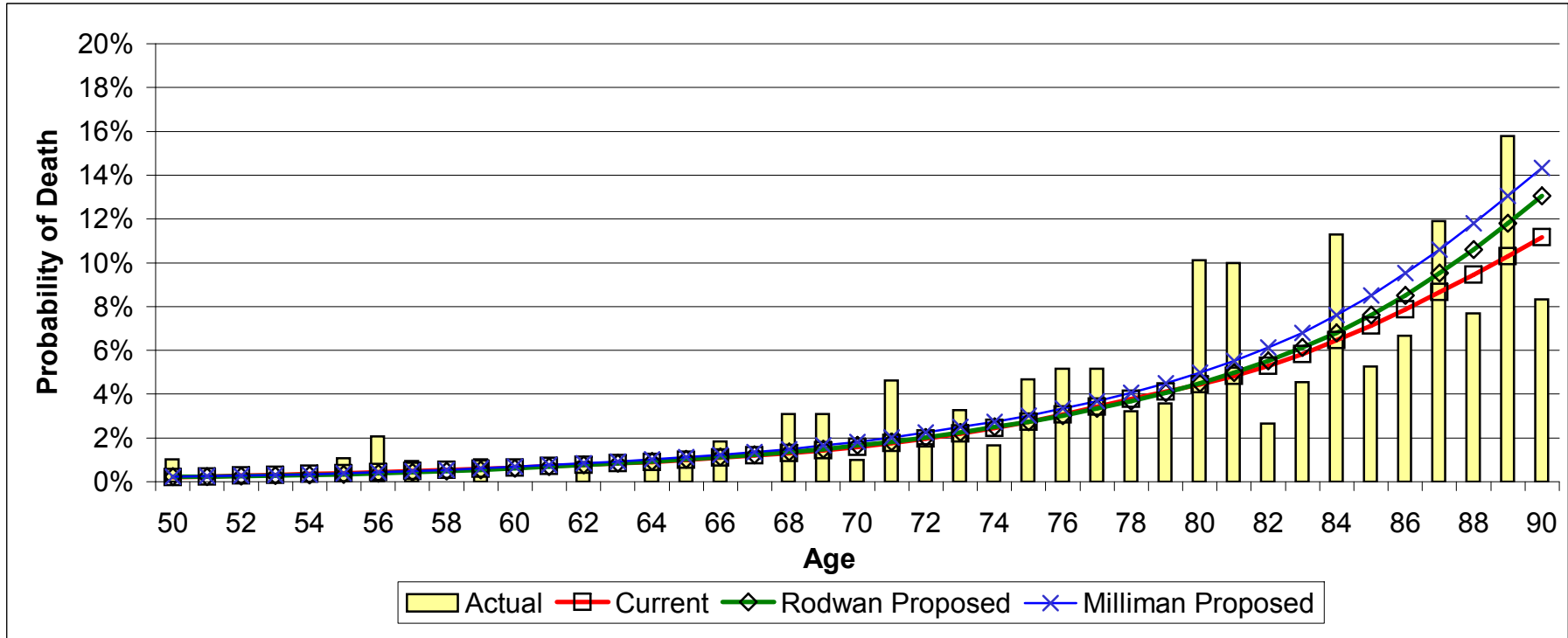
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-2

Probability of Death - Healthy Retirees

PSRS - Females



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Count	102	82	85	95
Actual/Expected		124%	120%	108%

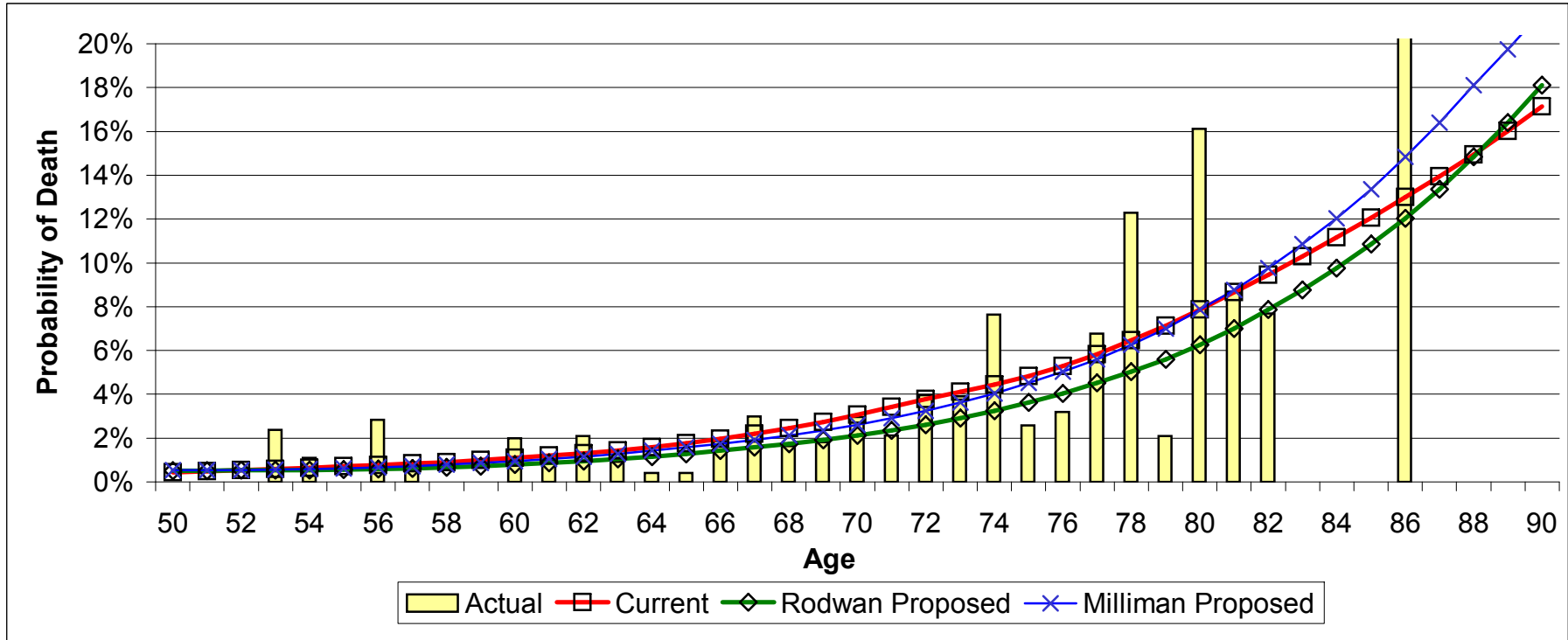
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-3

Probability of Death - Healthy Retirees

CORP - Males



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Count	99	107	79	97
Actual/Expected		92%	125%	102%



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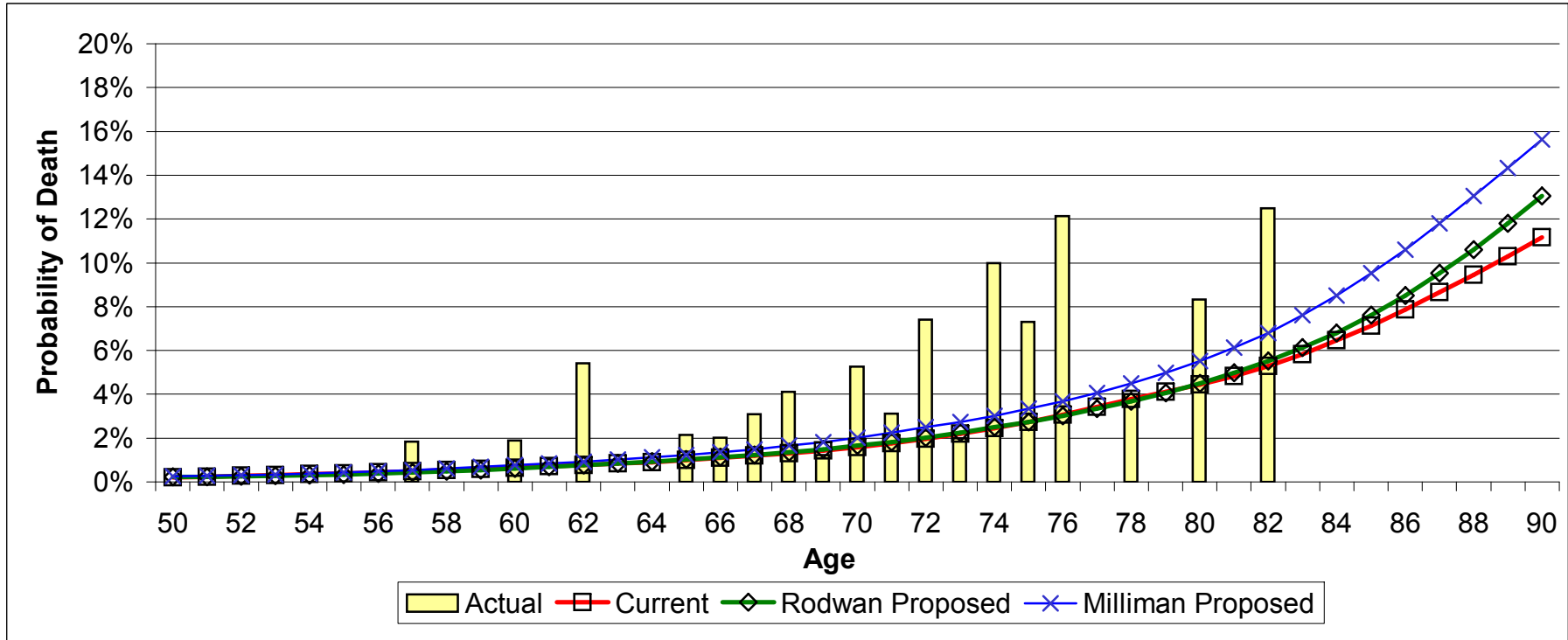
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-4

Probability of Death - Healthy Retirees

CORP - Females



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Count	44	22	23	28
Actual/Expected		196%	195%	160%

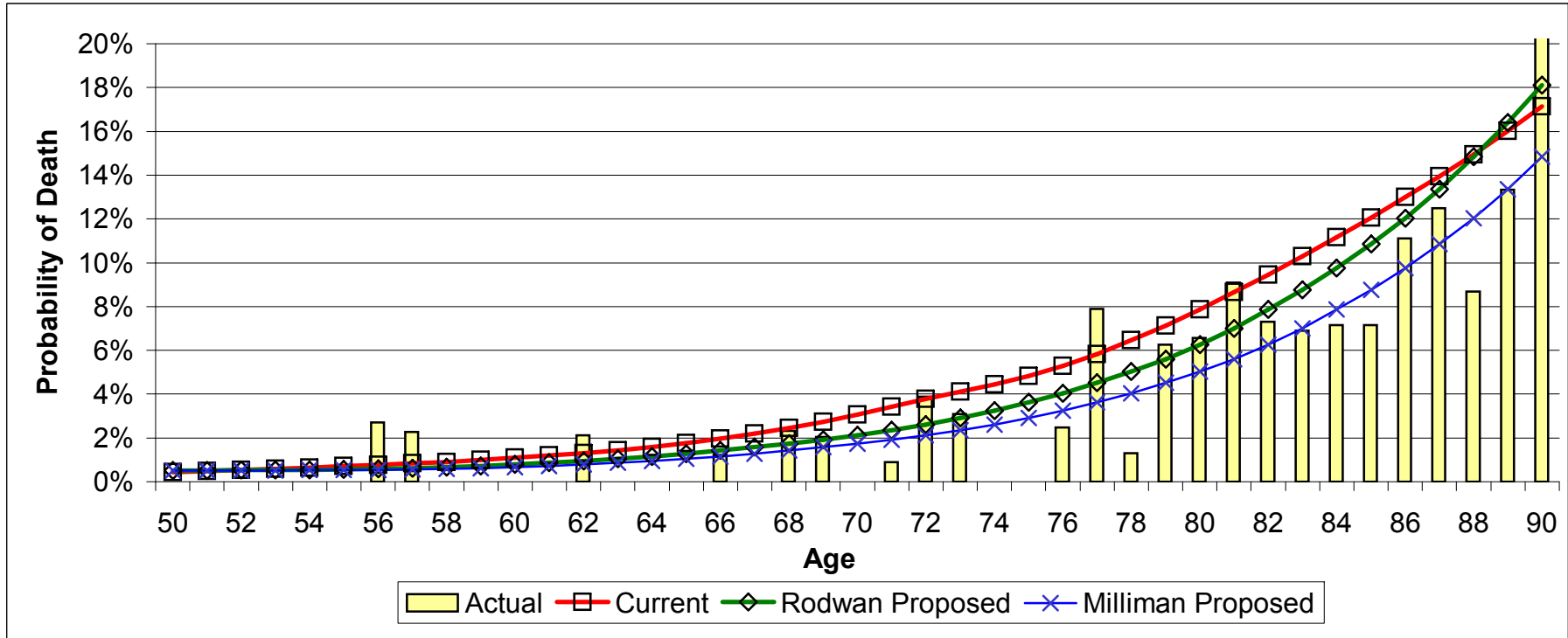
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-5

Probability of Death - Healthy Retirees

EORP - Males



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Count	60	93	75	60
Actual/Expected		64%	80%	99%

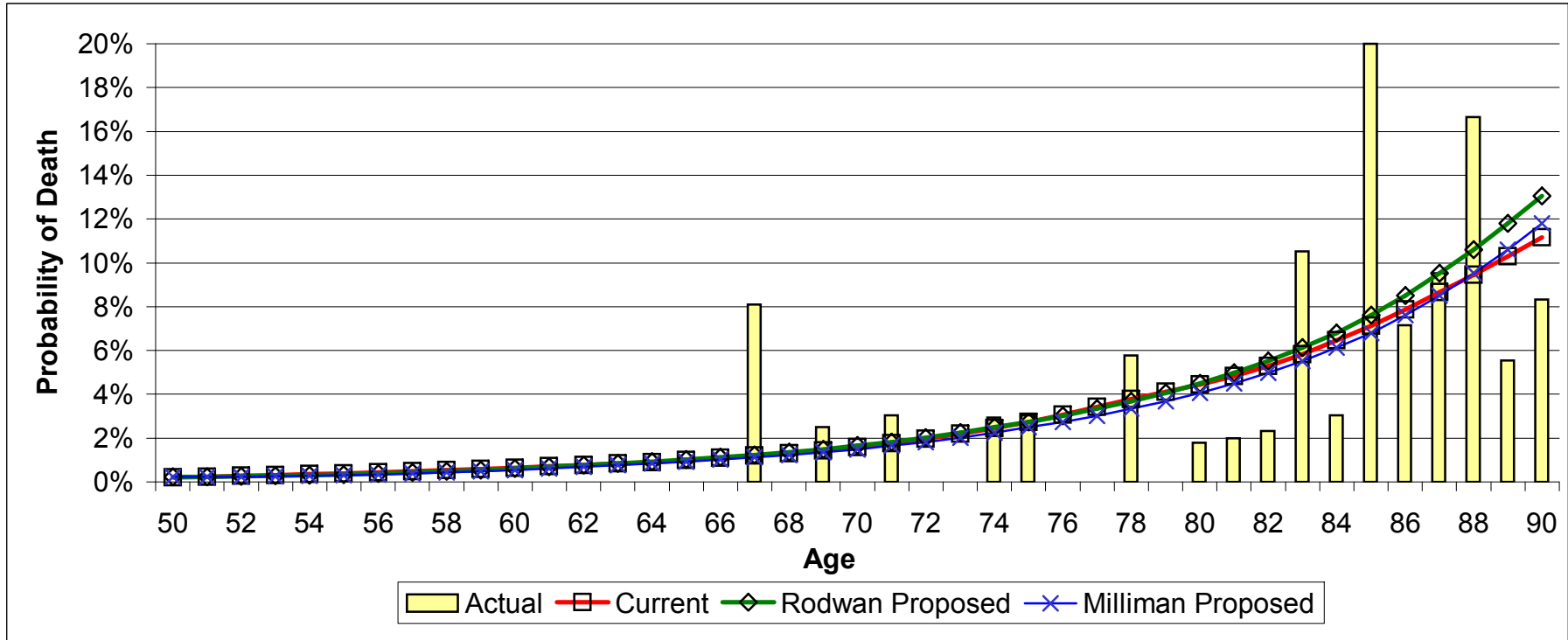
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-6

Probability of Death - Healthy Retirees

EORP - Females



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Count	33	38	39	35
Actual/Expected		88%	84%	93%



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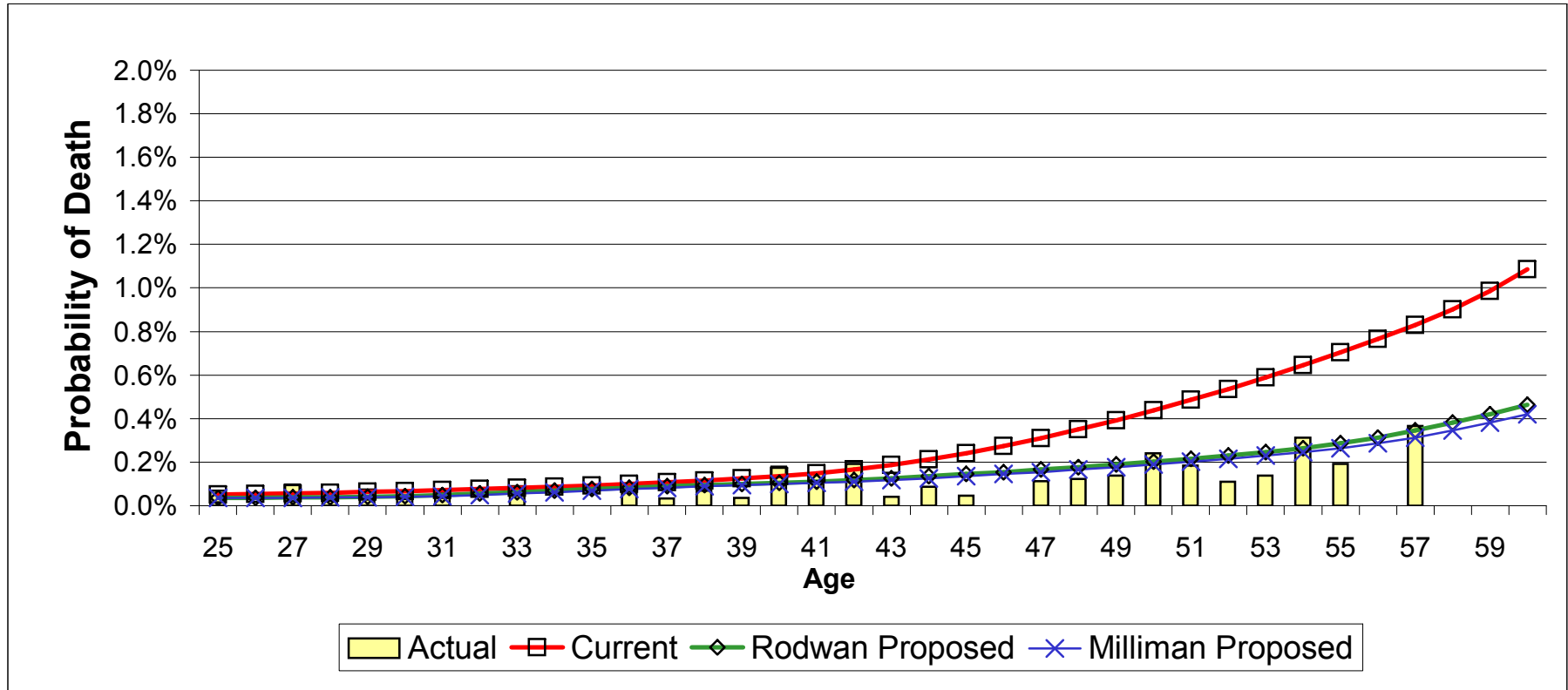
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-7

Probability of Death - Active Members

PSRS-Males



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Proposed Assumptions
Total Count	55	121	72	67
Actual/Expected		45%	76%	82%



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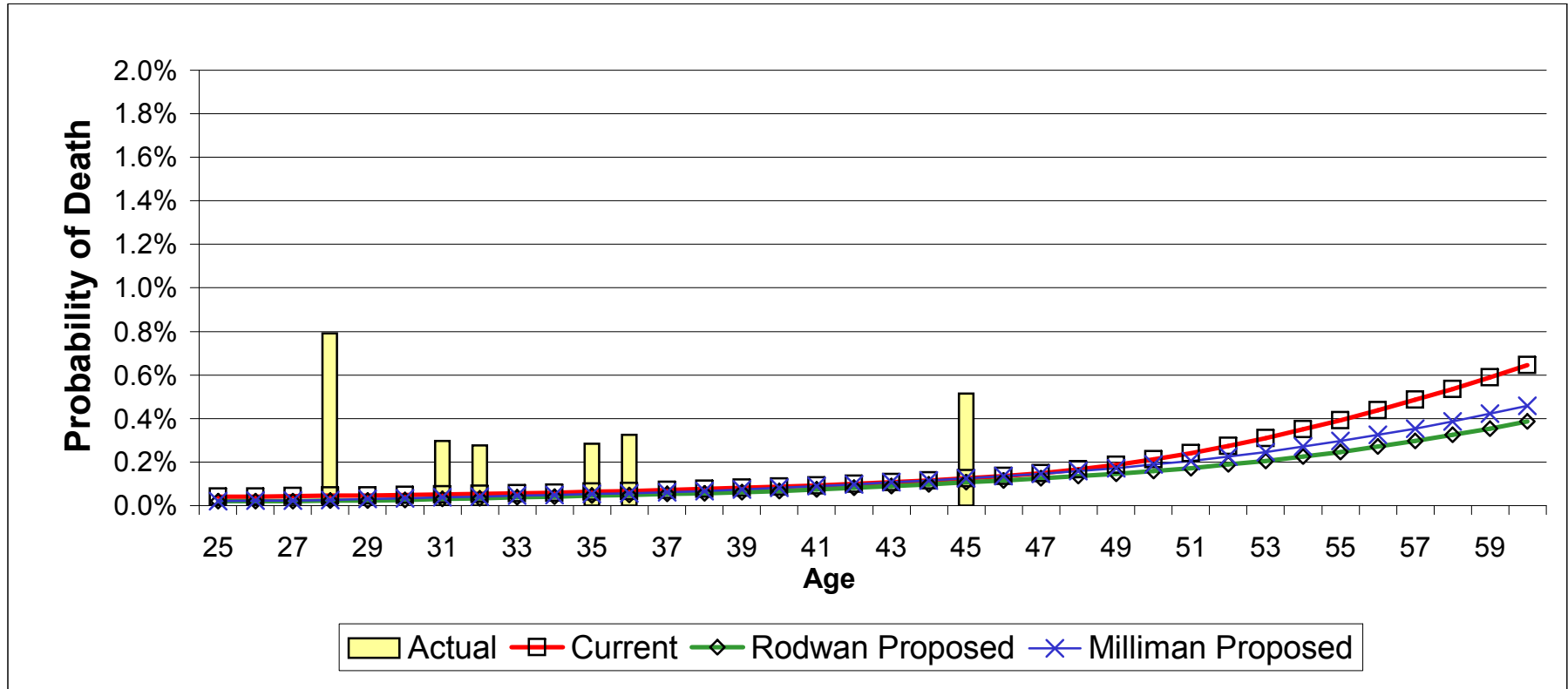
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-8

Probability of Death - Active Members

PSRS-Females



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Proposed Assumptions
Total Count	7	6	4	5
Actual/Expected		117%	175%	140%



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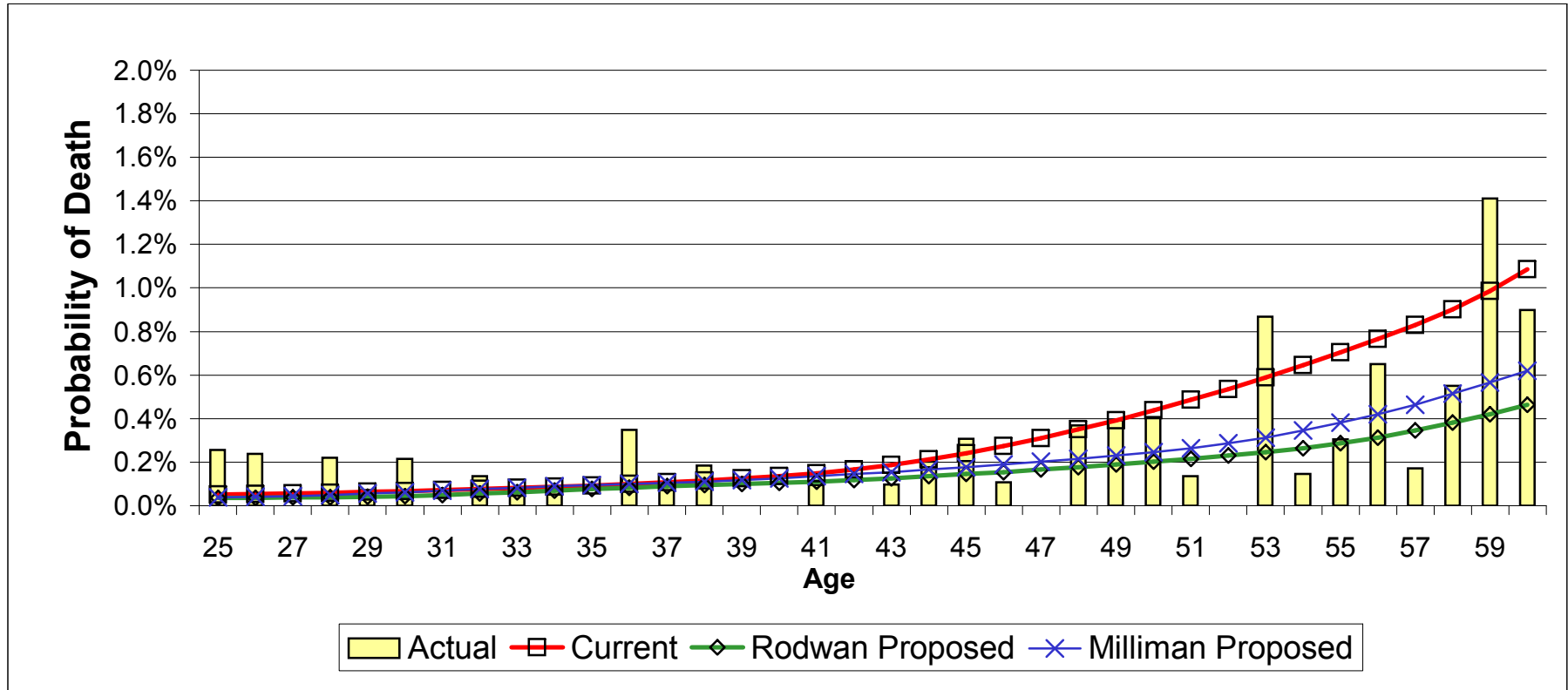
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-9

Probability of Death - Active Members

CORP-Males



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Proposed Assumptions
Total Count	70	85	45	57
Actual/Expected		82%	156%	123%



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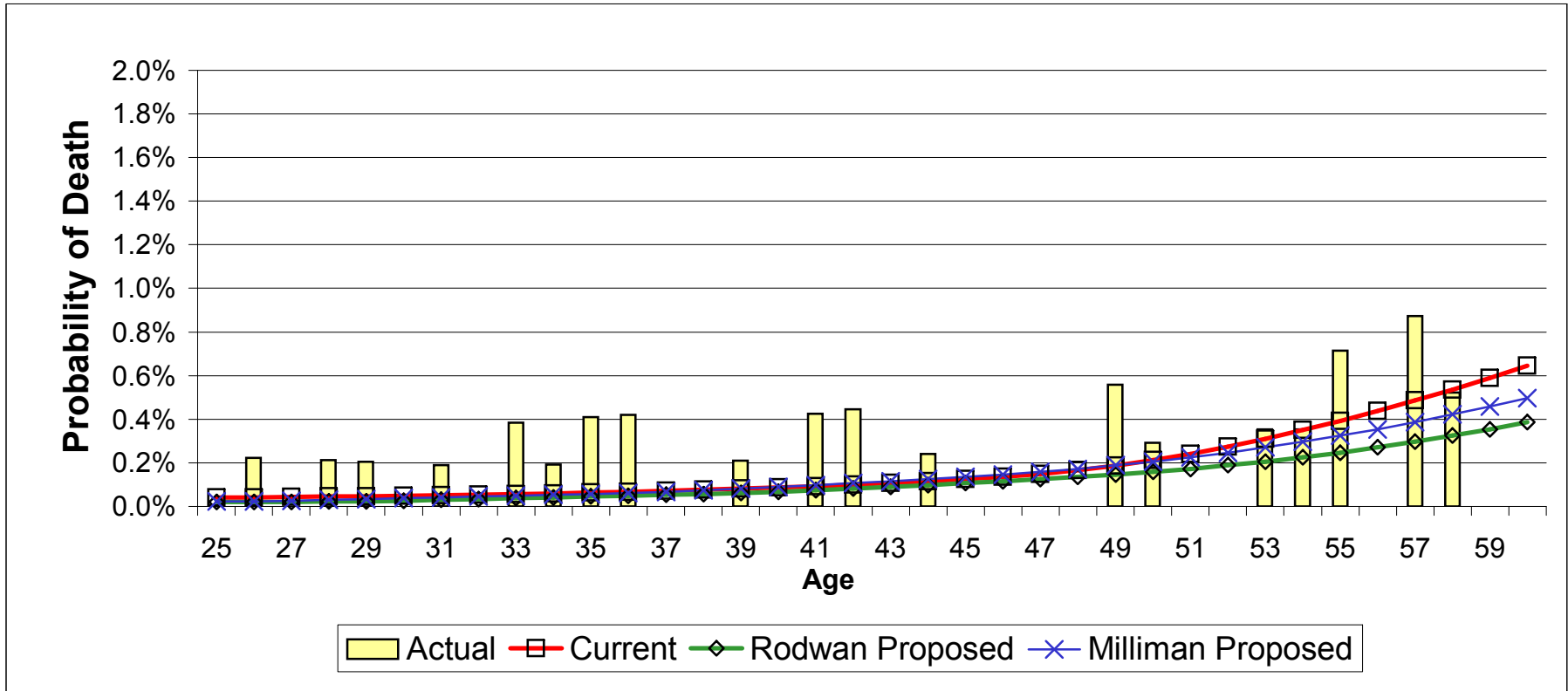
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-10

Probability of Death - Active Members

CORP-Females



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Proposed Assumptions
Total Count	27	20	14	18
Actual/Expected		135%	193%	150%



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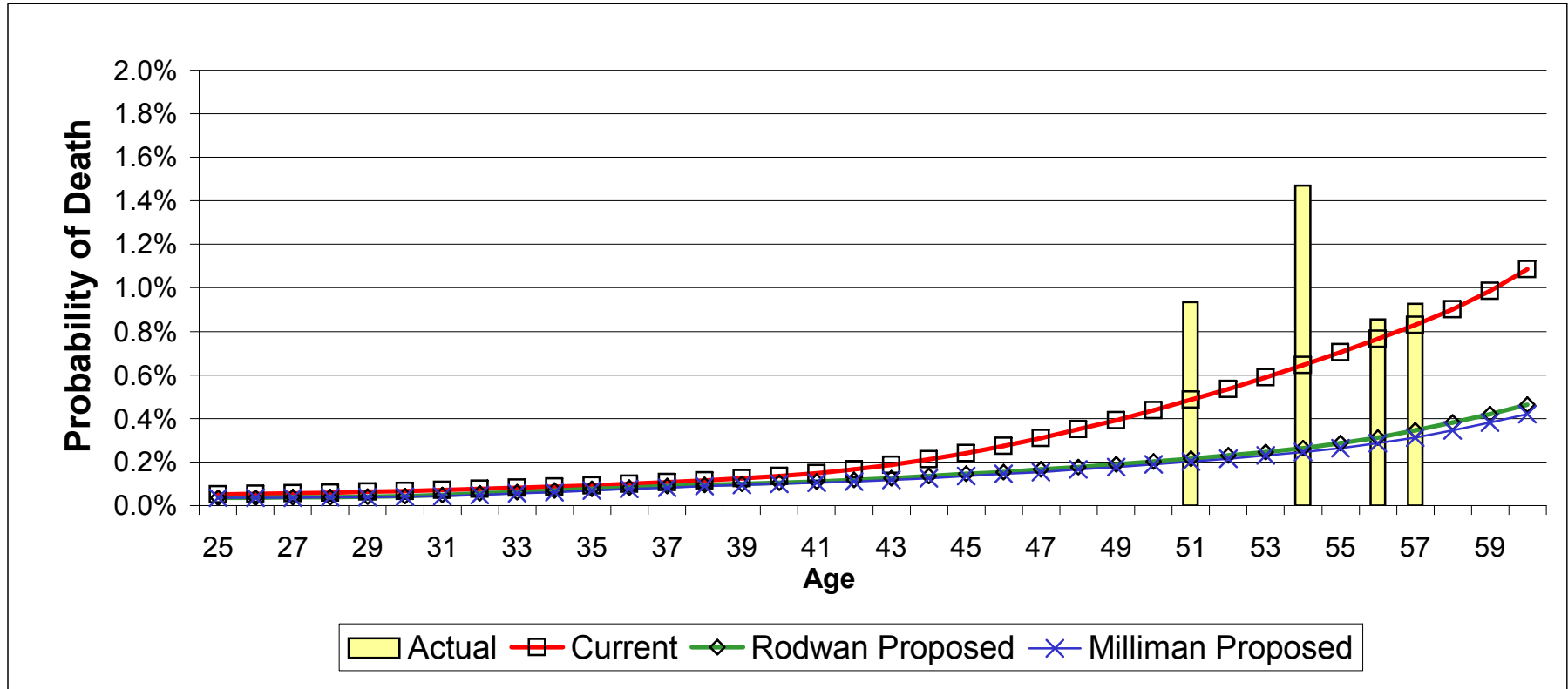
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-11

Probability of Death - Active Members

EORP-Males



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Proposed Assumptions
Total Count	5	11	5	4
Actual/Expected		45%	100%	125%



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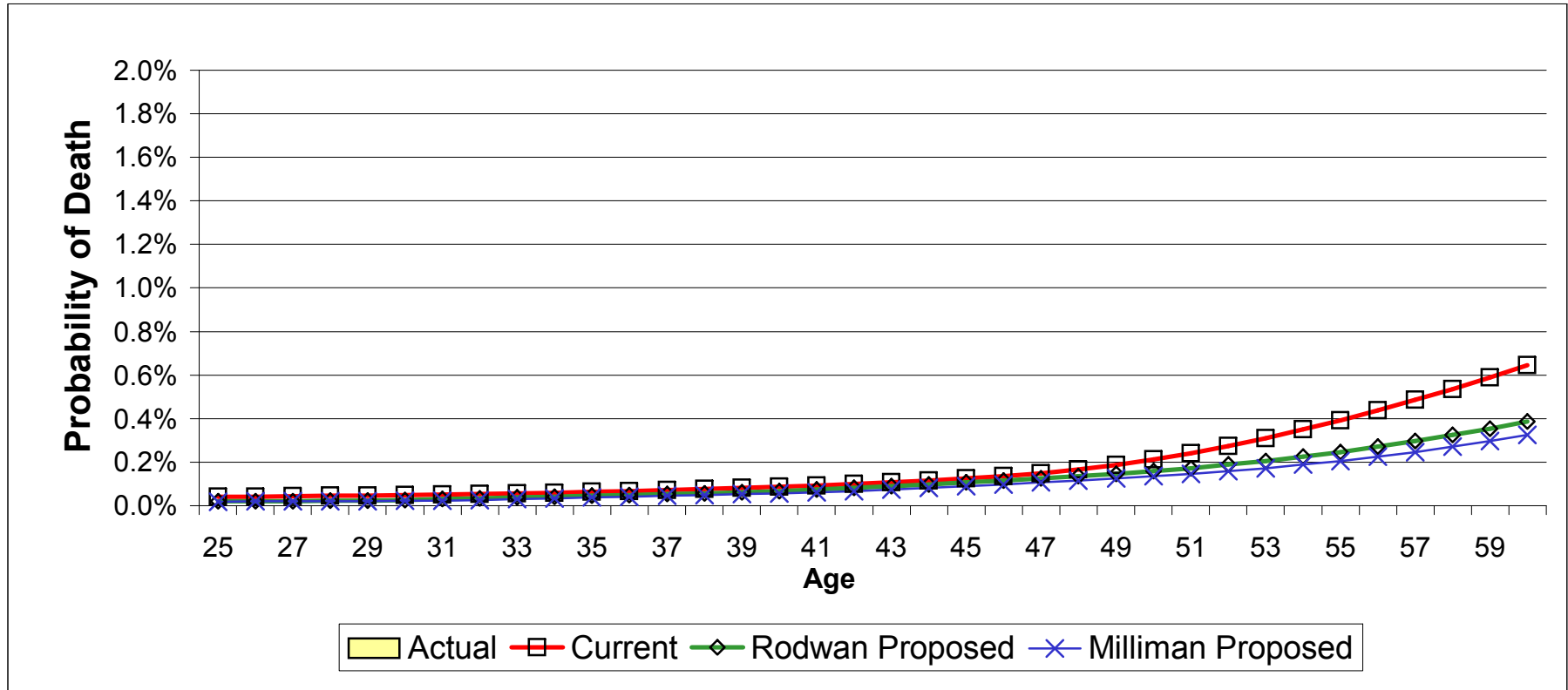
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-12

Probability of Death - Active Members

EORP-Females



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Proposed Assumptions
Total Count	-	3	2	1
Actual/Expected		0%	0%	0%



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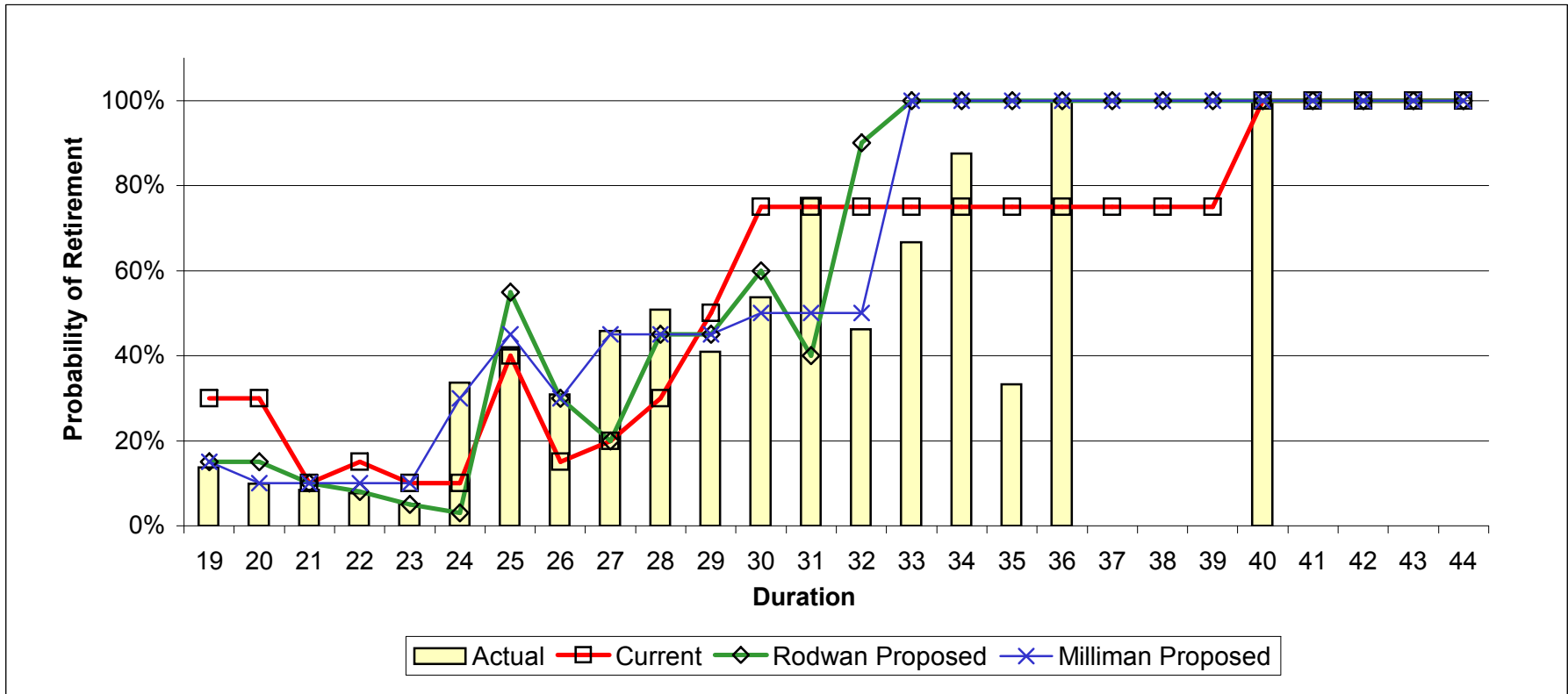
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-13

Retirement Rates - Regular and DROP

Fire - Large



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	673	714	601	689
Actual/Expected		94%	112%	98%

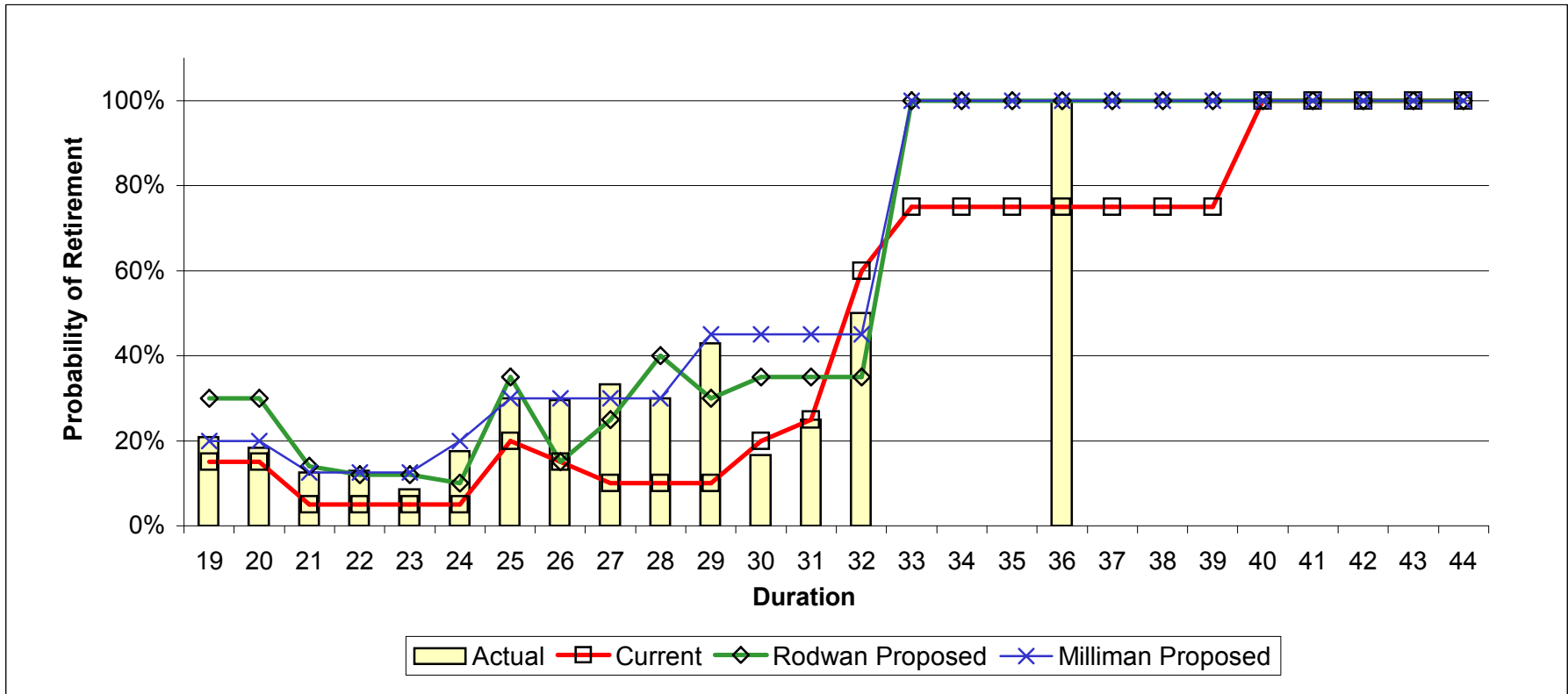
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-14

Retirement Rates - Regular and DROP

Fire - Small



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	145	89	177	155
Actual/Expected		163%	82%	94%



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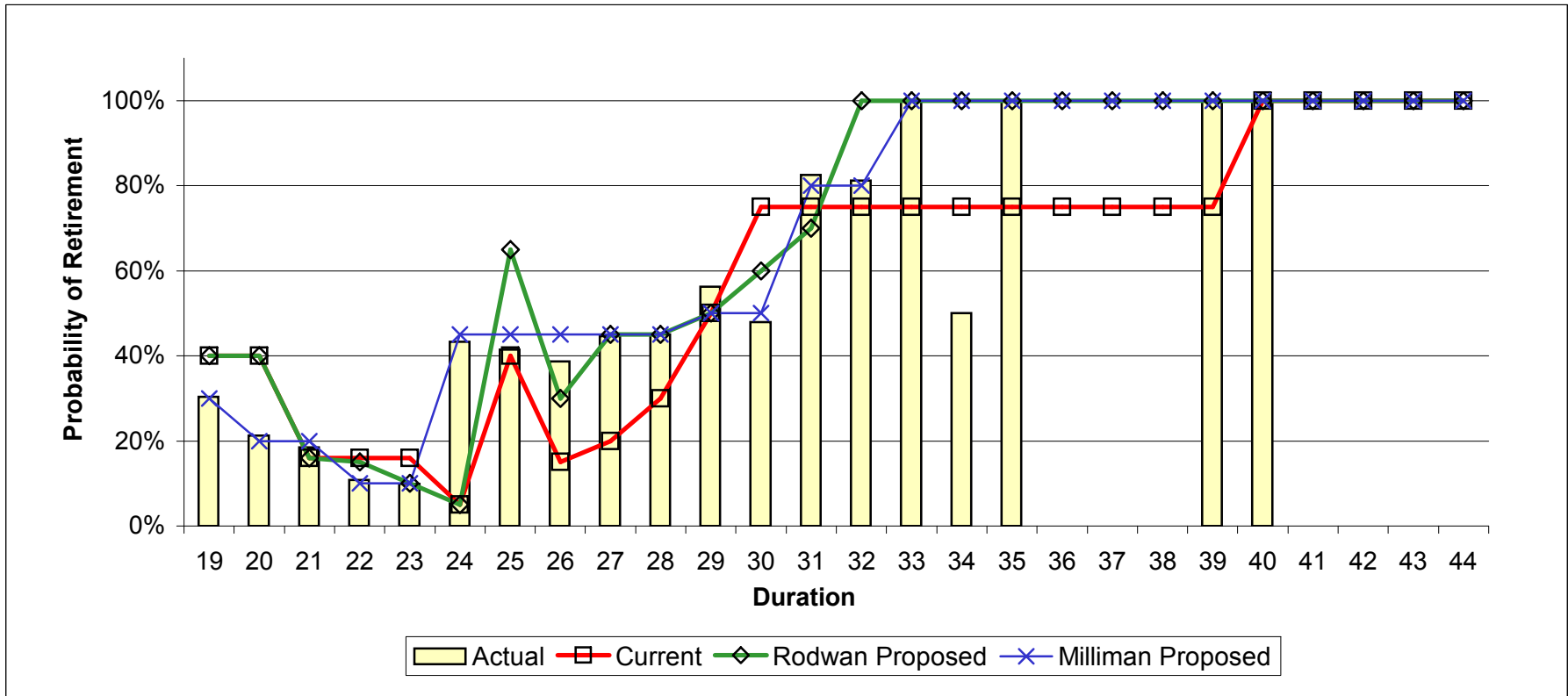
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-15

Retirement Rates - Regular and DROP

Police - Large



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	1,373	1,290	1,442	1,399
Actual/Expected		106%	95%	98%



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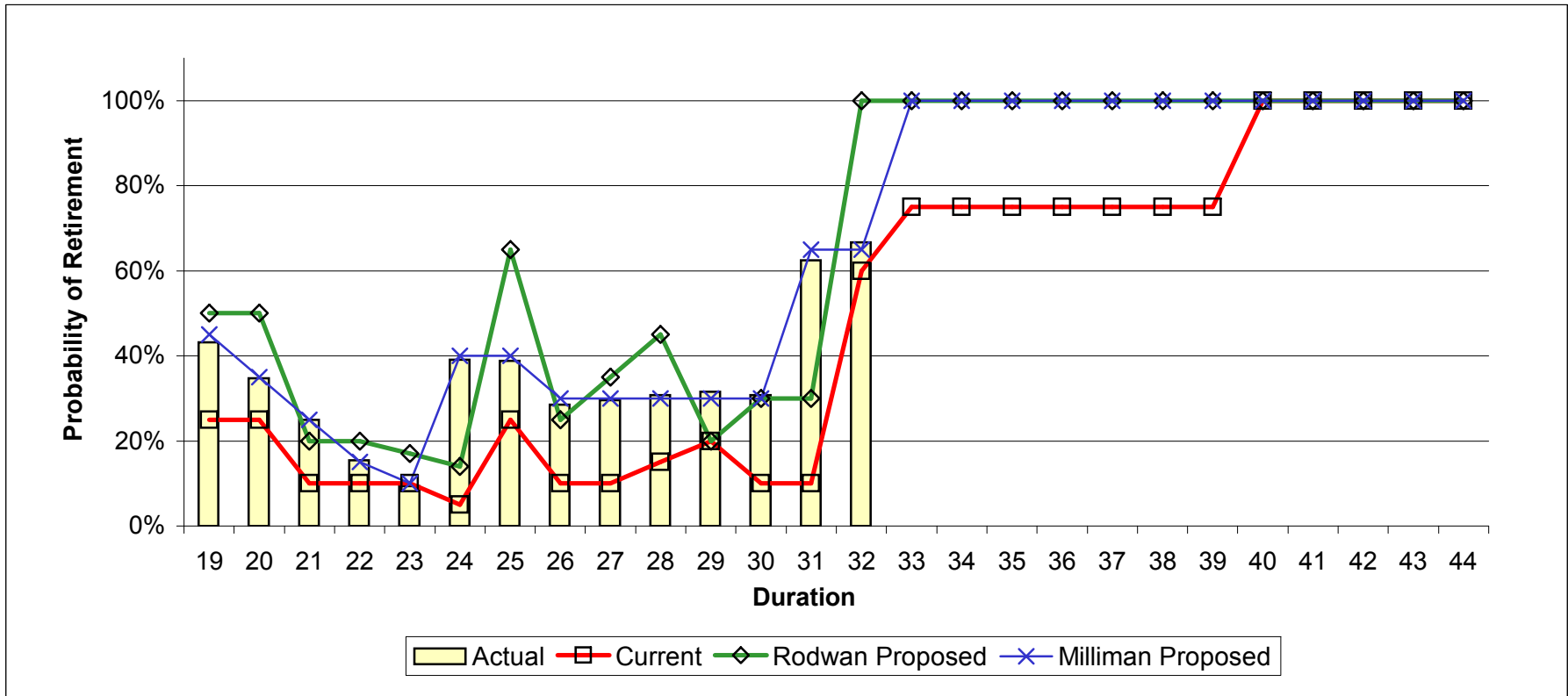
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-16

Retirement Rates - Regular and DROP

Police - Small



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	428	236	489	438
Actual/Expected		181%	88%	98%



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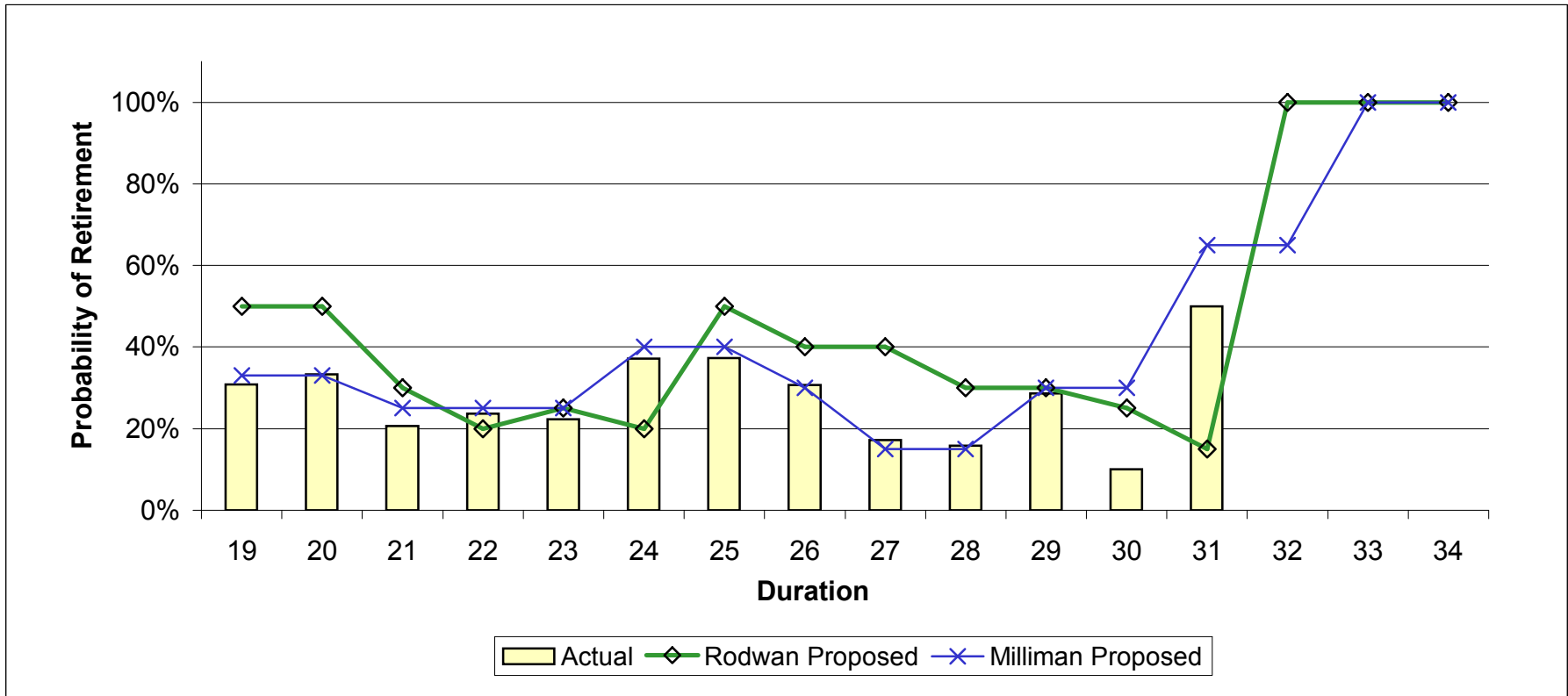
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-17

Retirement Rates

CORP



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	596	NA	820	639
Actual/Expected		NA	73%	93%

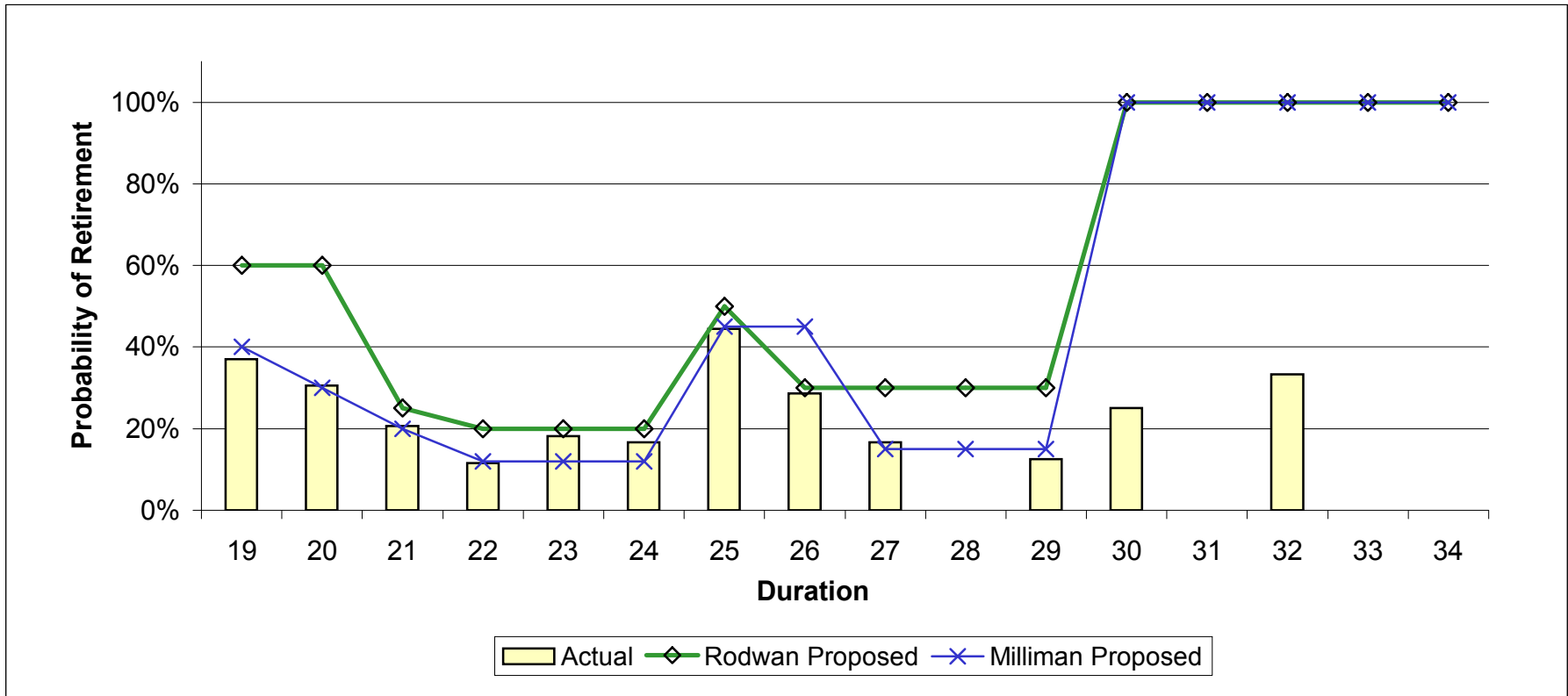
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-18

Retirement Rates

EORP



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	58	NA	103	72
Actual/Expected		NA	56%	81%

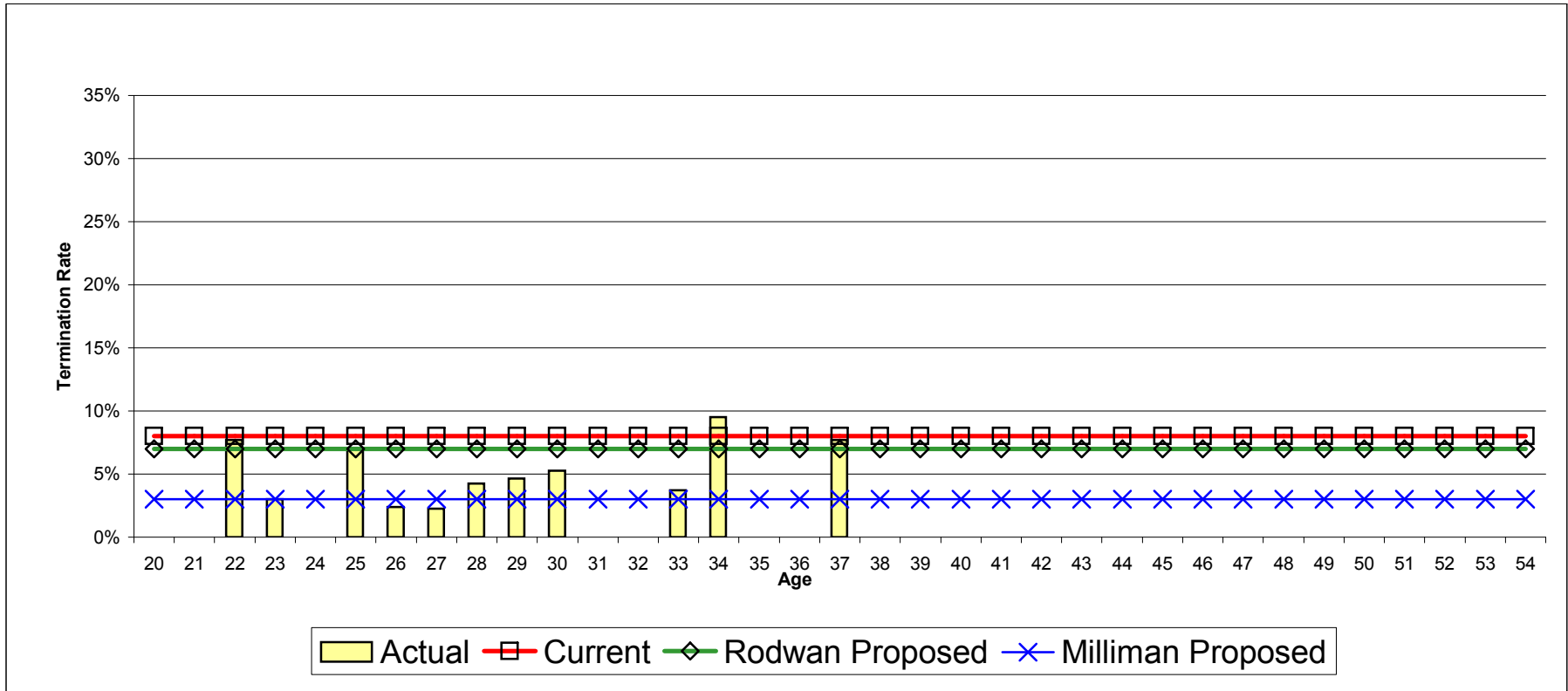
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-19

Termination of Employment

Fire - Large - Year 0



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	20	51	44	19
Actual/Expected		39%	45%	105%



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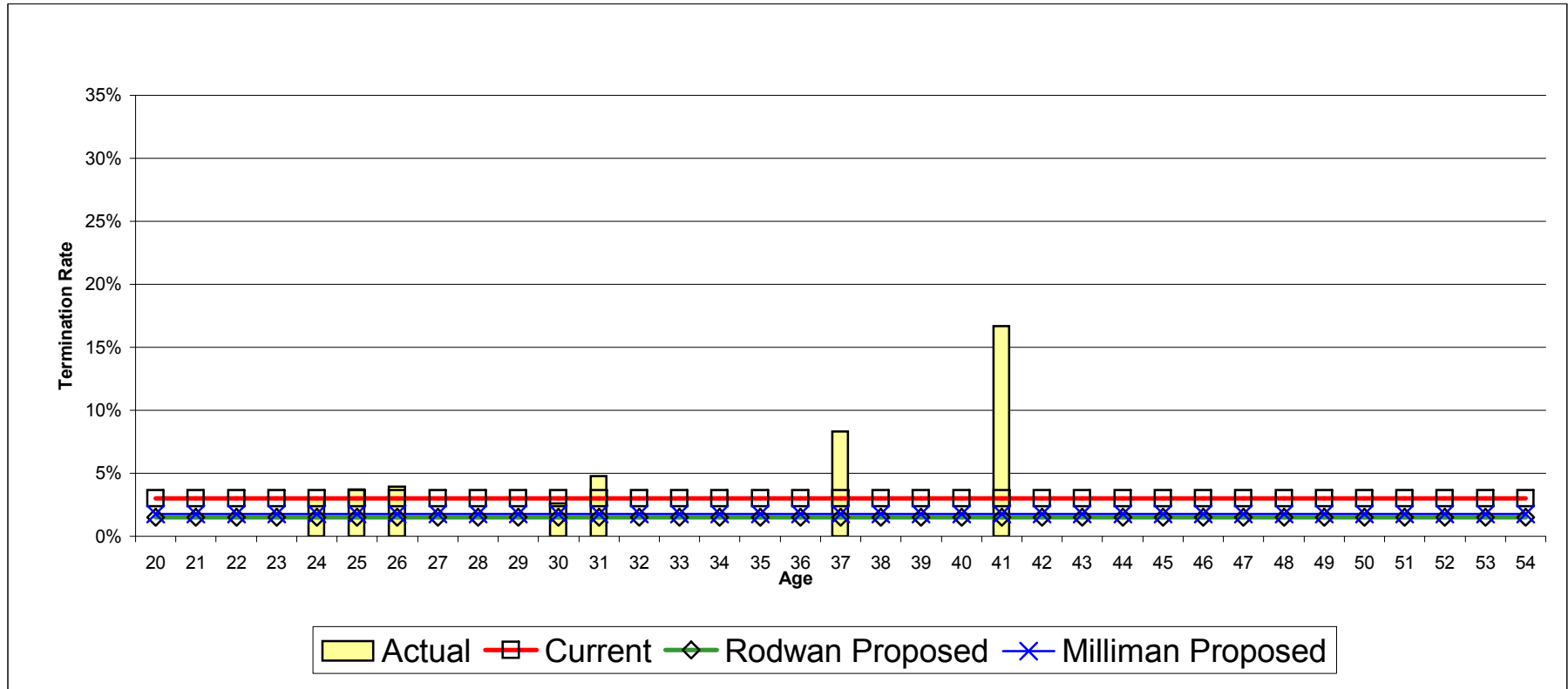
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-20

Termination of Employment

Fire - Large - Year 1



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	10	18	9	10
Actual/Expected		56%	111%	100%



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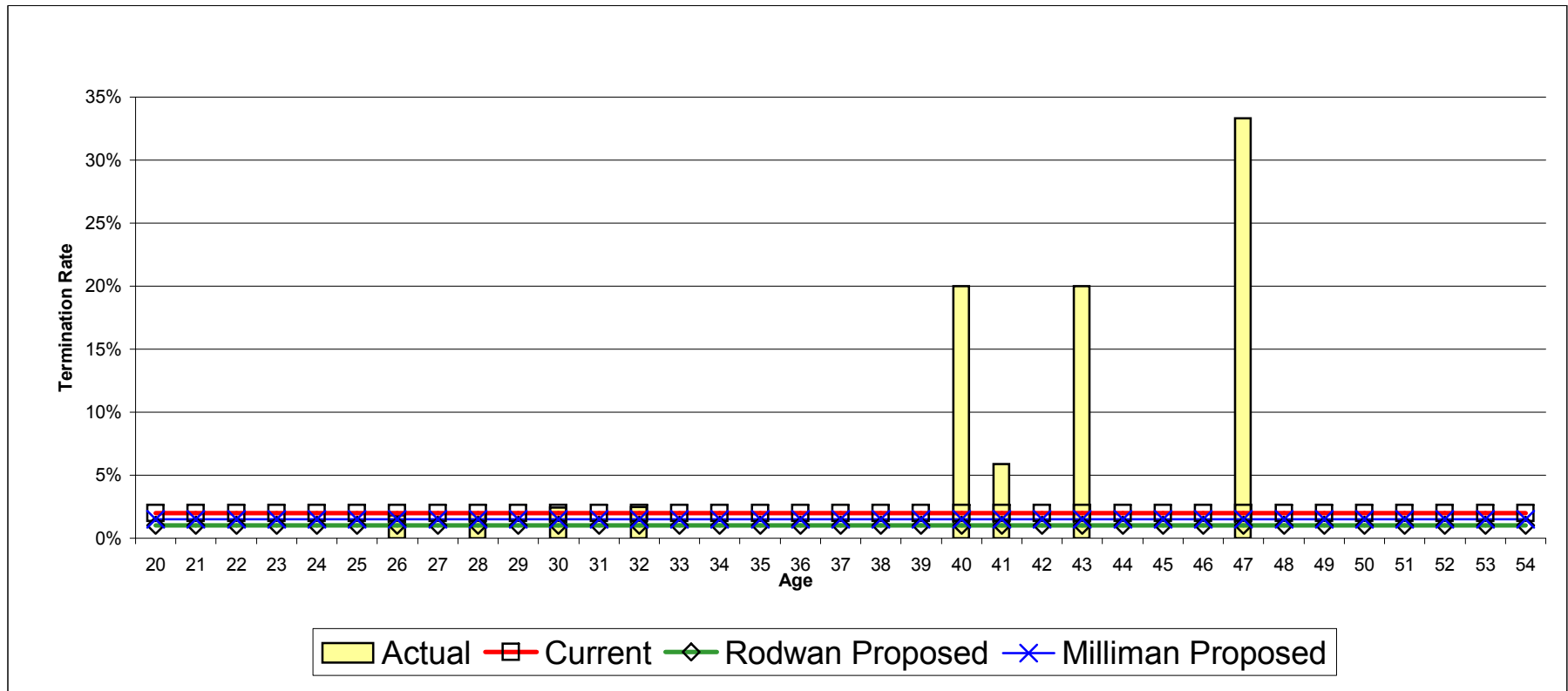
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-21

Termination of Employment

Fire - Large - Year 2

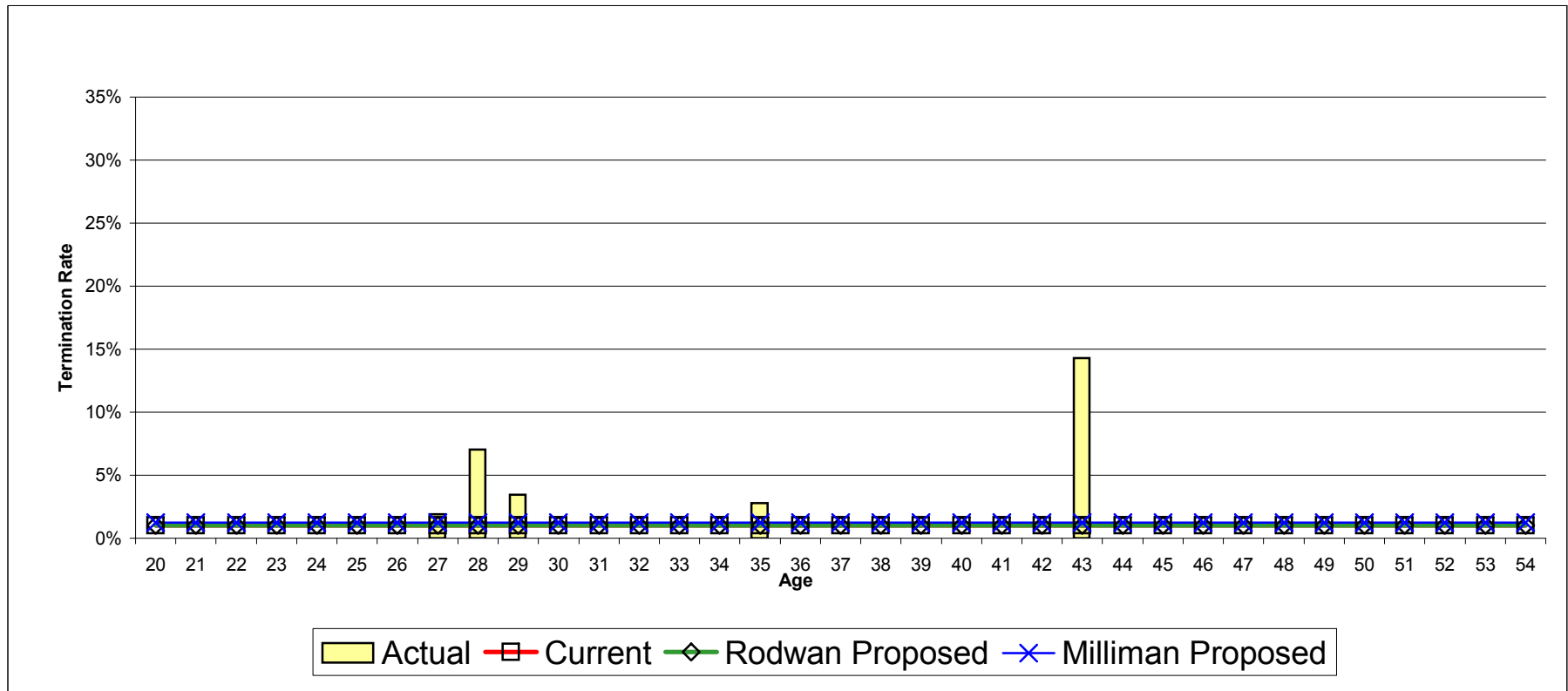


	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	8	13	6	9
Actual/Expected		62%	133%	89%



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Arizona Public Safety Retirement System
Audit of Experience Study 2001-2006
Exhibit C-22
Termination of Employment
Fire - Large - Year 3

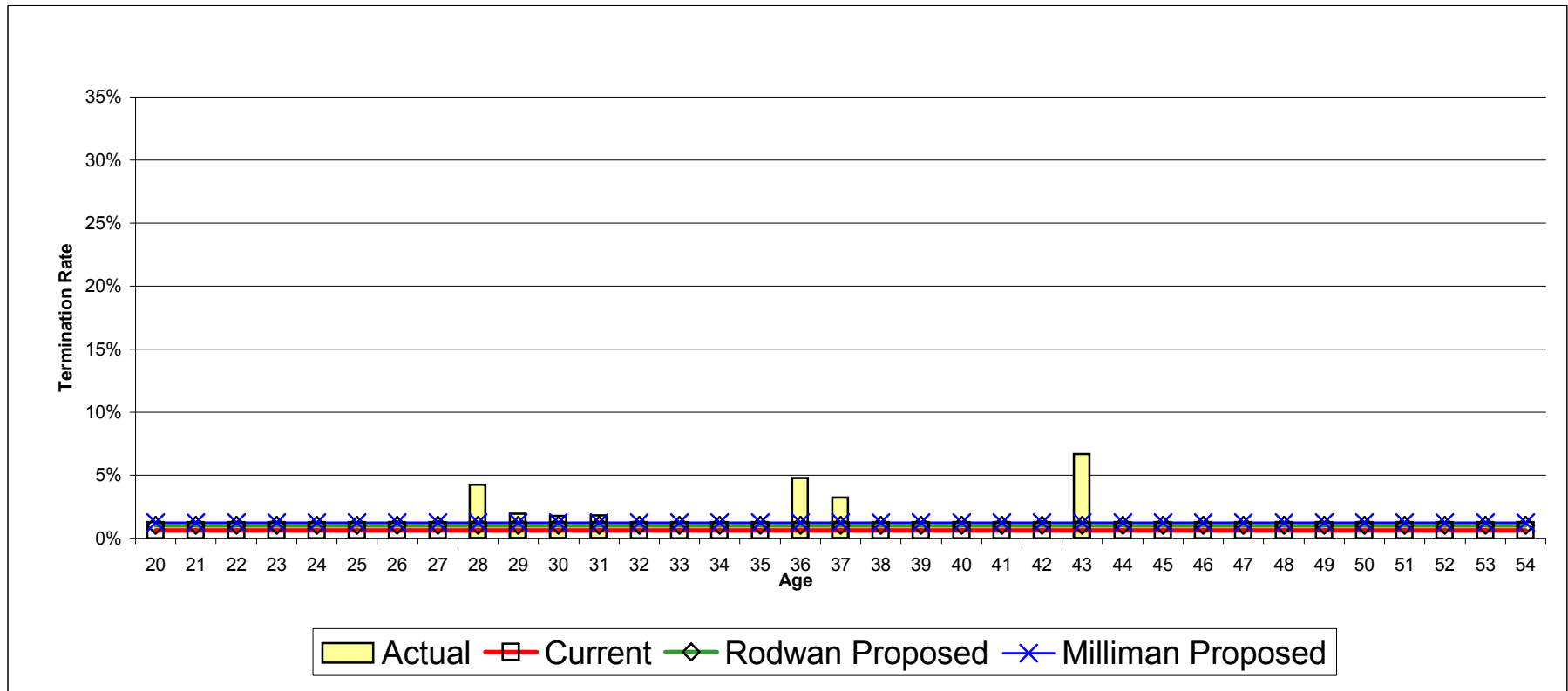


	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	9	7	7	8
Actual/Expected		129%	129%	113%



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Arizona Public Safety Retirement System
Audit of Experience Study 2001-2006
Exhibit C-23
Termination of Employment
Fire - Large - Year 4



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	9	4	7	8
Actual/Expected		225%	129%	113%



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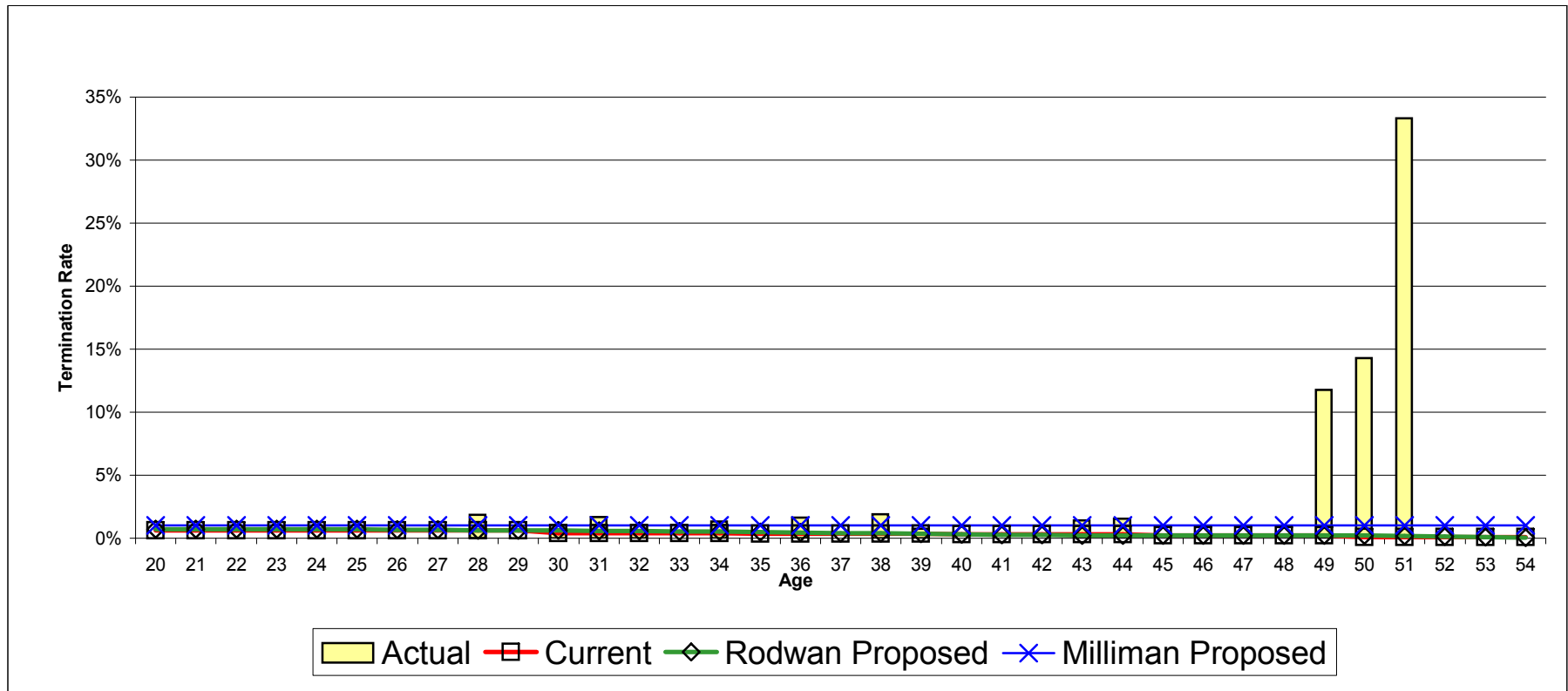
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-24

Termination of Employment

Fire - Large - Years 5-10

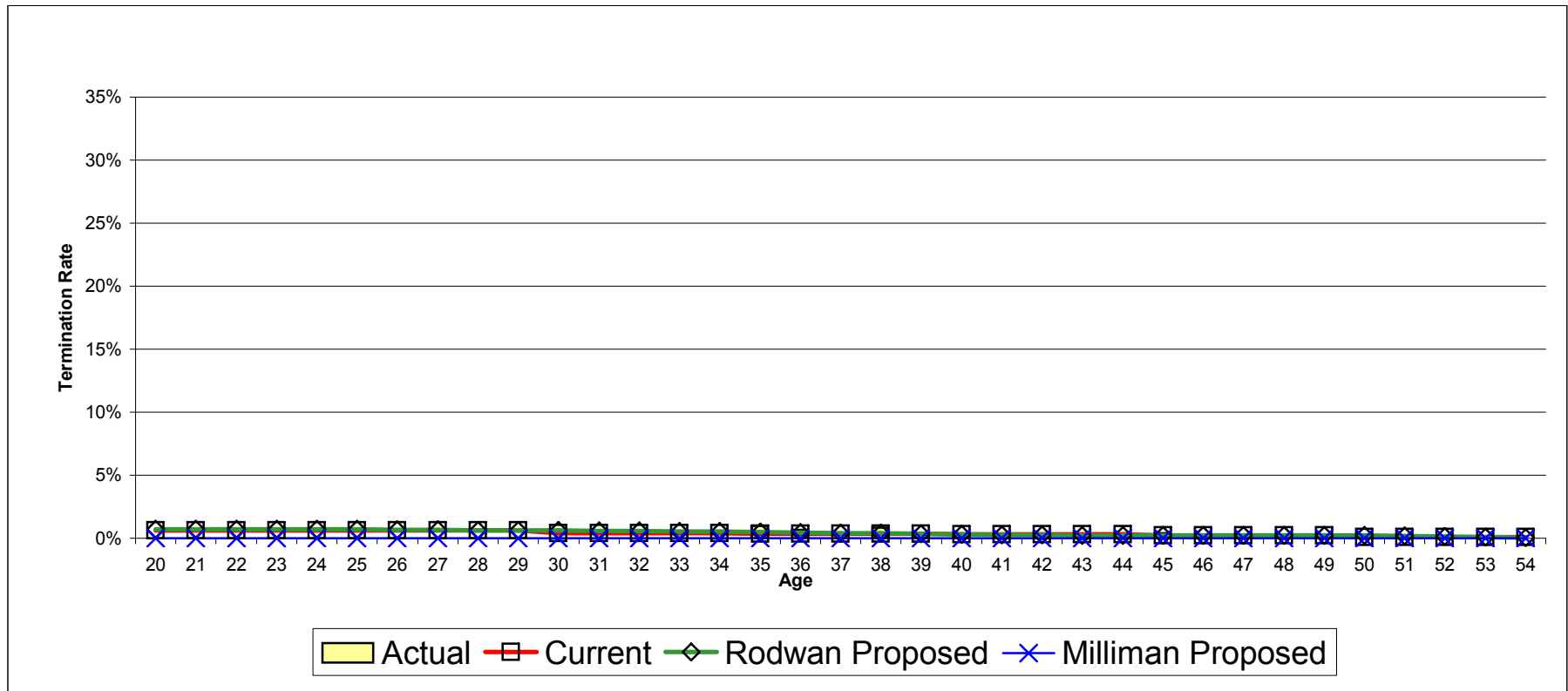


	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	24	10	12	26
Actual/Expected		240%	200%	92%



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Arizona Public Safety Retirement System
Audit of Experience Study 2001-2006
Exhibit C-25
Termination of Employment
Fire - Large - Years 10+



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	7	11	11	-
Actual/Expected		64%	64%	#DIV/0!



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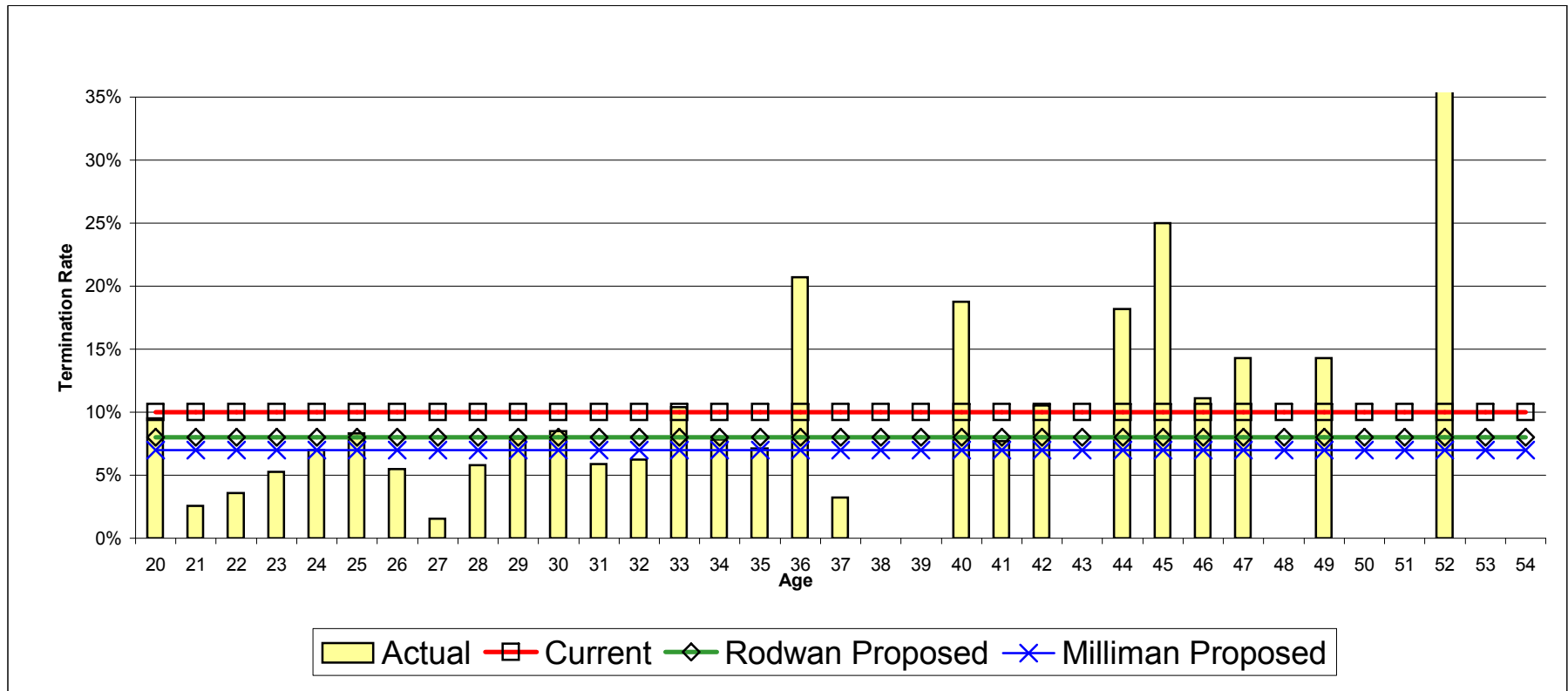
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-26

Termination of Employment

Fire - Small - Year 0



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	78	113	90	79
Actual/Expected		69%	87%	99%



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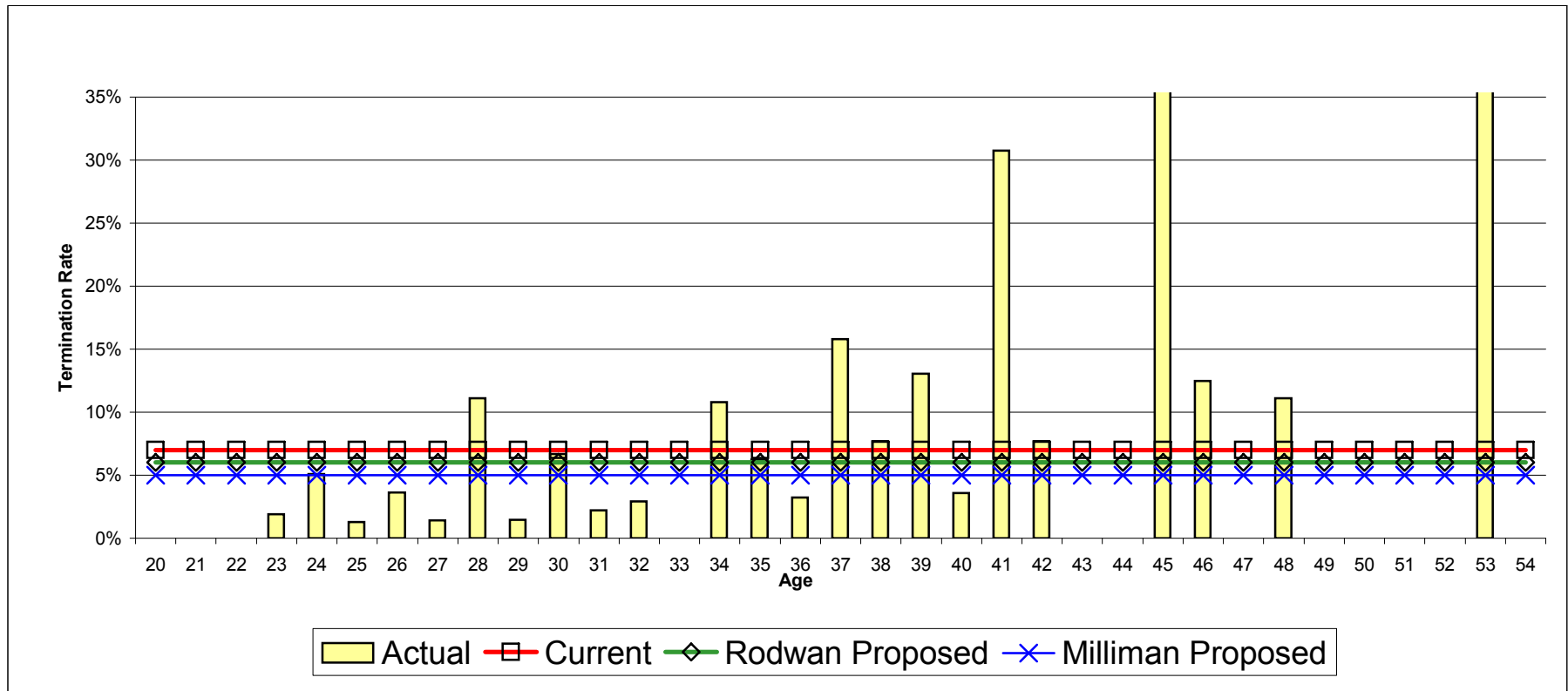
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-27

Termination of Employment

Fire - Small - Year 1



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	51	72	62	51
Actual/Expected		71%	82%	100%

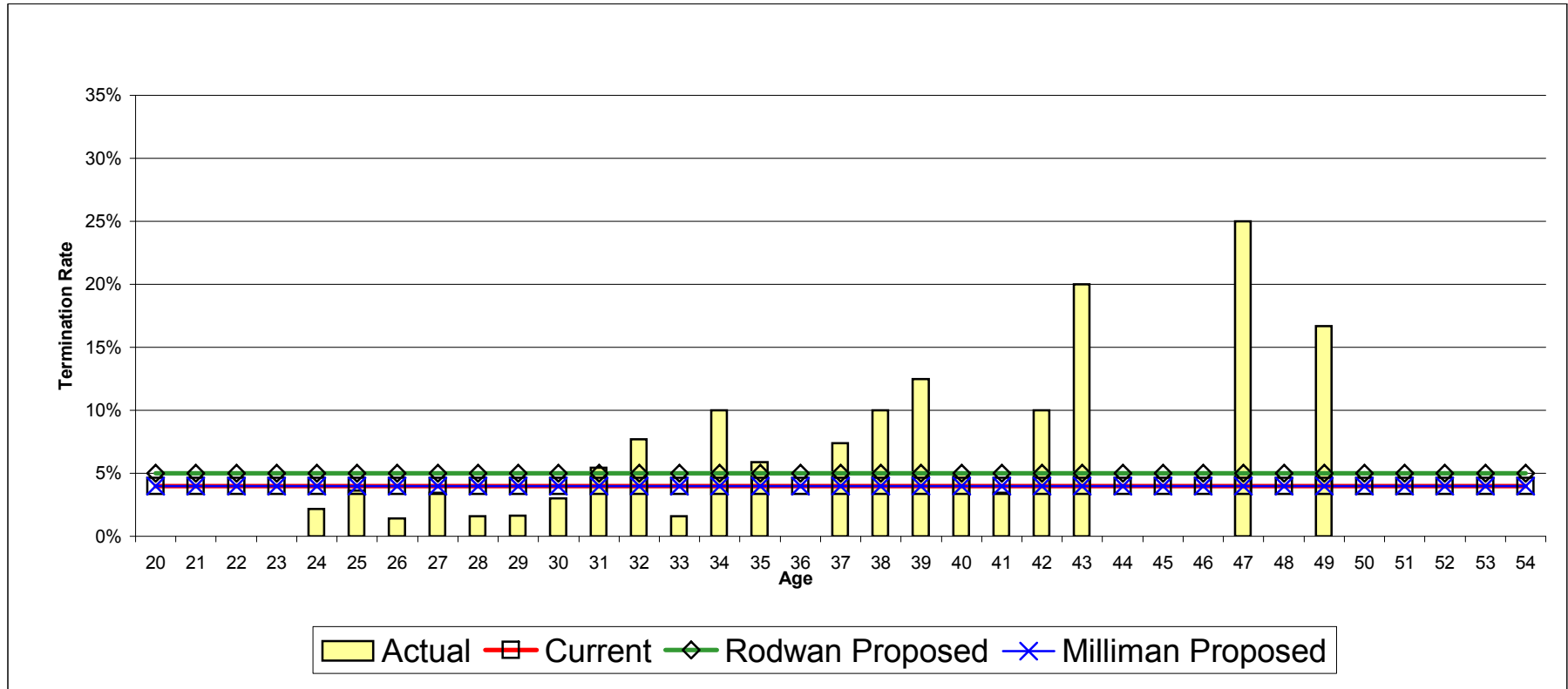
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-28

Termination of Employment

Fire - Small - Year 2



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	40	38	48	38
Actual/Expected		105%	83%	105%



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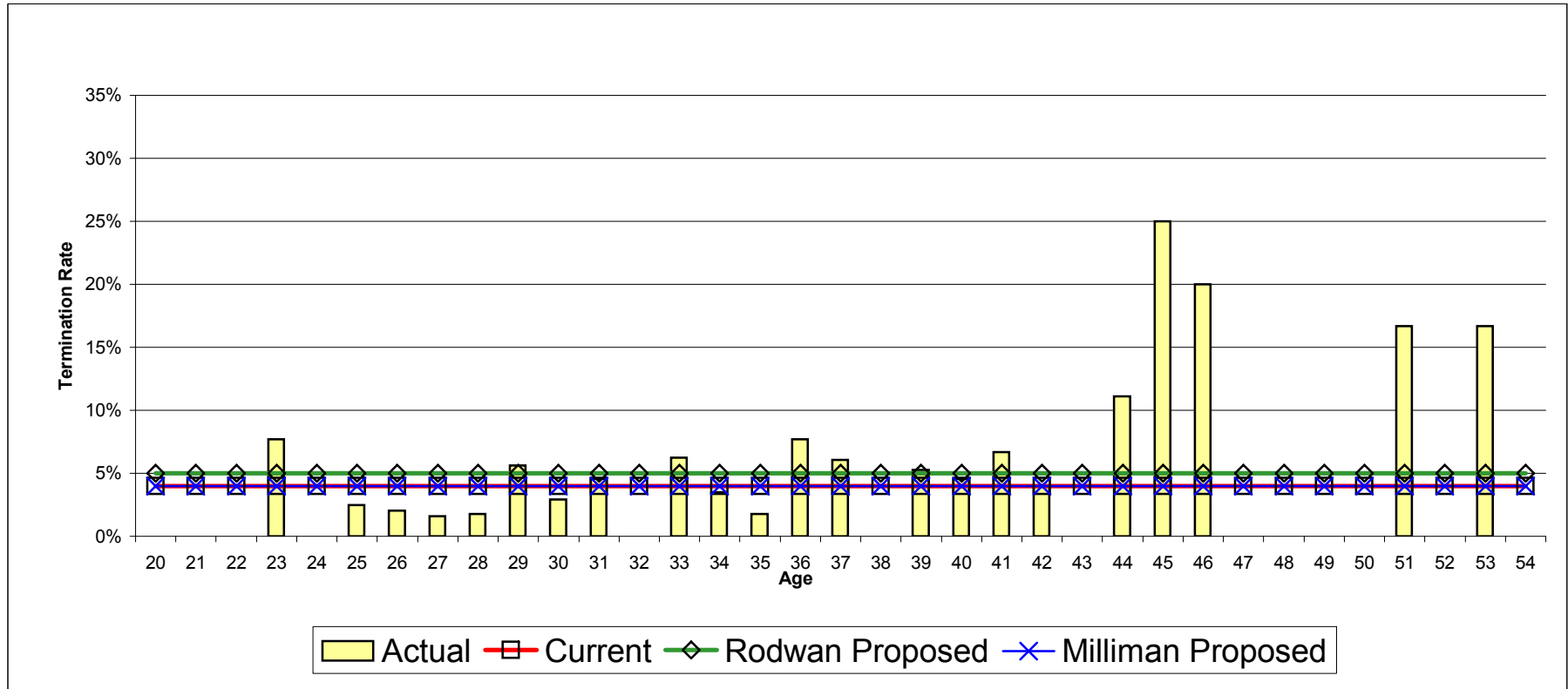
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-29

Termination of Employment

Fire - Small - Year 3



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	37	37	47	37
Actual/Expected		100%	79%	100%

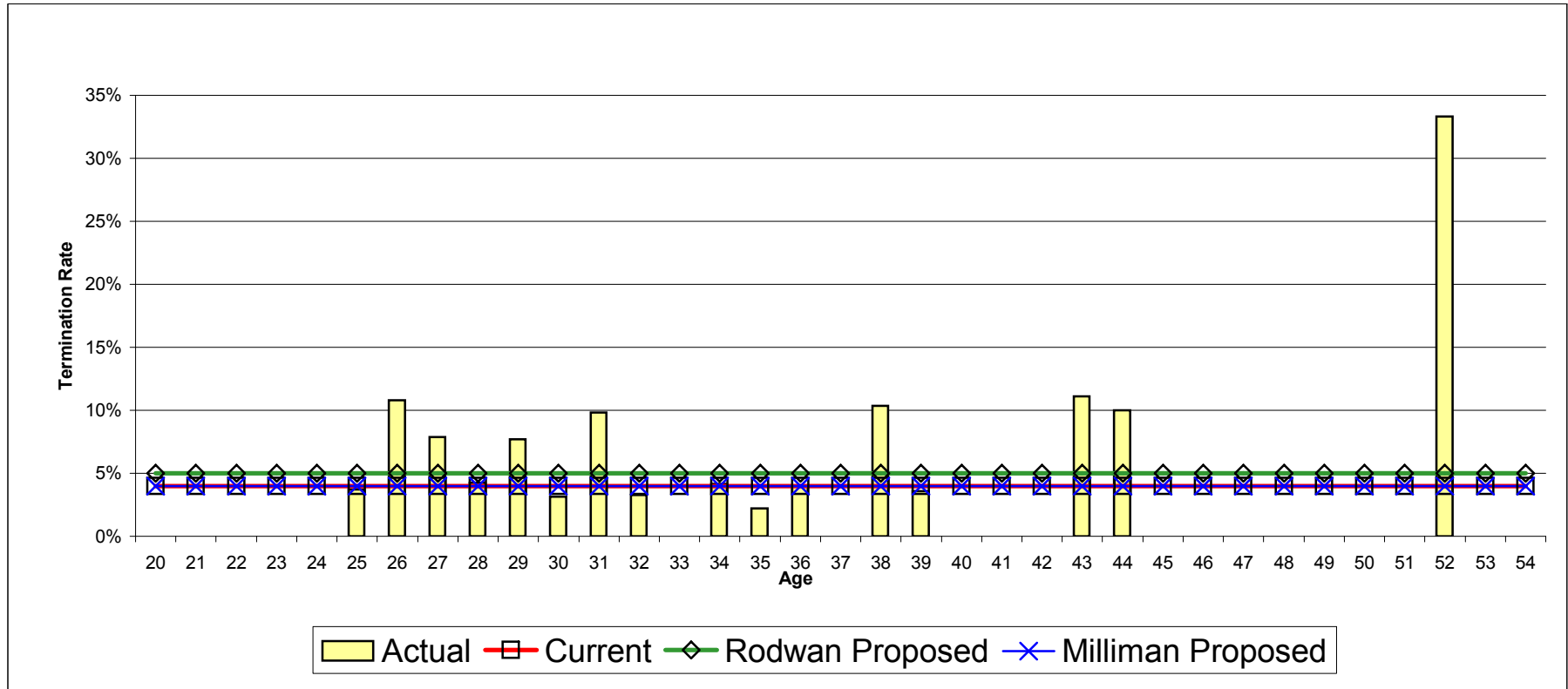
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-30

Termination of Employment

Fire - Small - Year 4



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	37	32	40	32
Actual/Expected		116%	93%	116%



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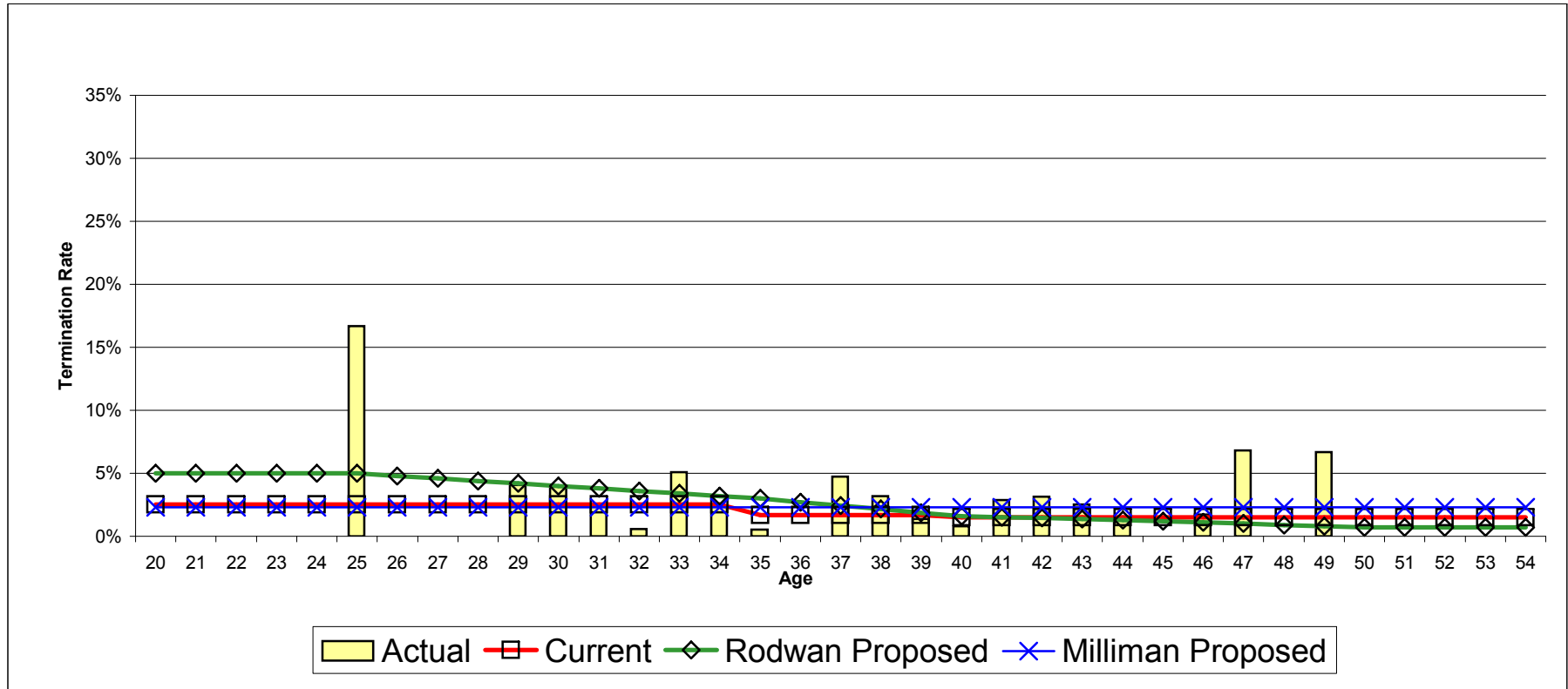
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-31

Termination of Employment

Fire - Small - Years 5-10

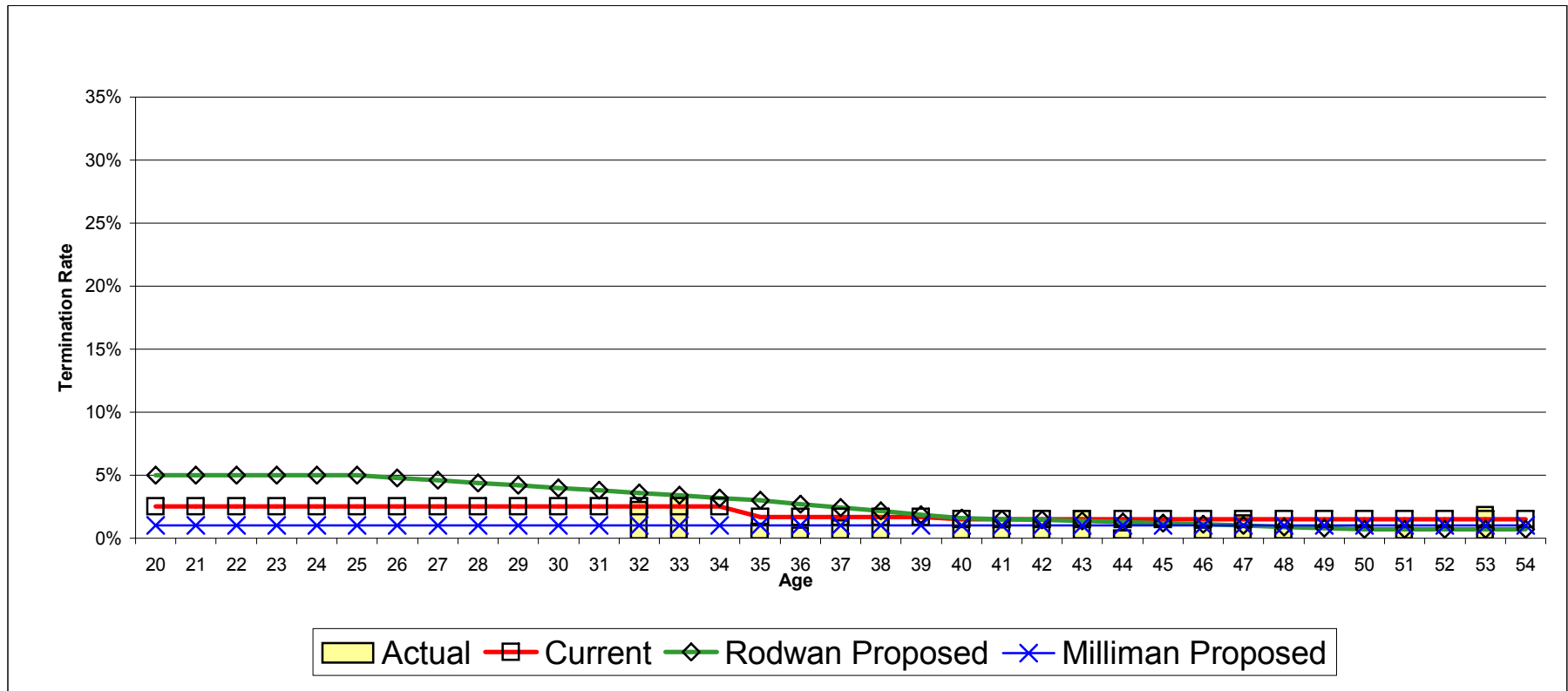


	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	64	54	73	63
Actual/Expected		119%	88%	102%



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Arizona Public Safety Retirement System
Audit of Experience Study 2001-2006
Exhibit C-32
Termination of Employment
Fire - Small - Years 10+



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	30	43	43	26
Actual/Expected		70%	70%	115%



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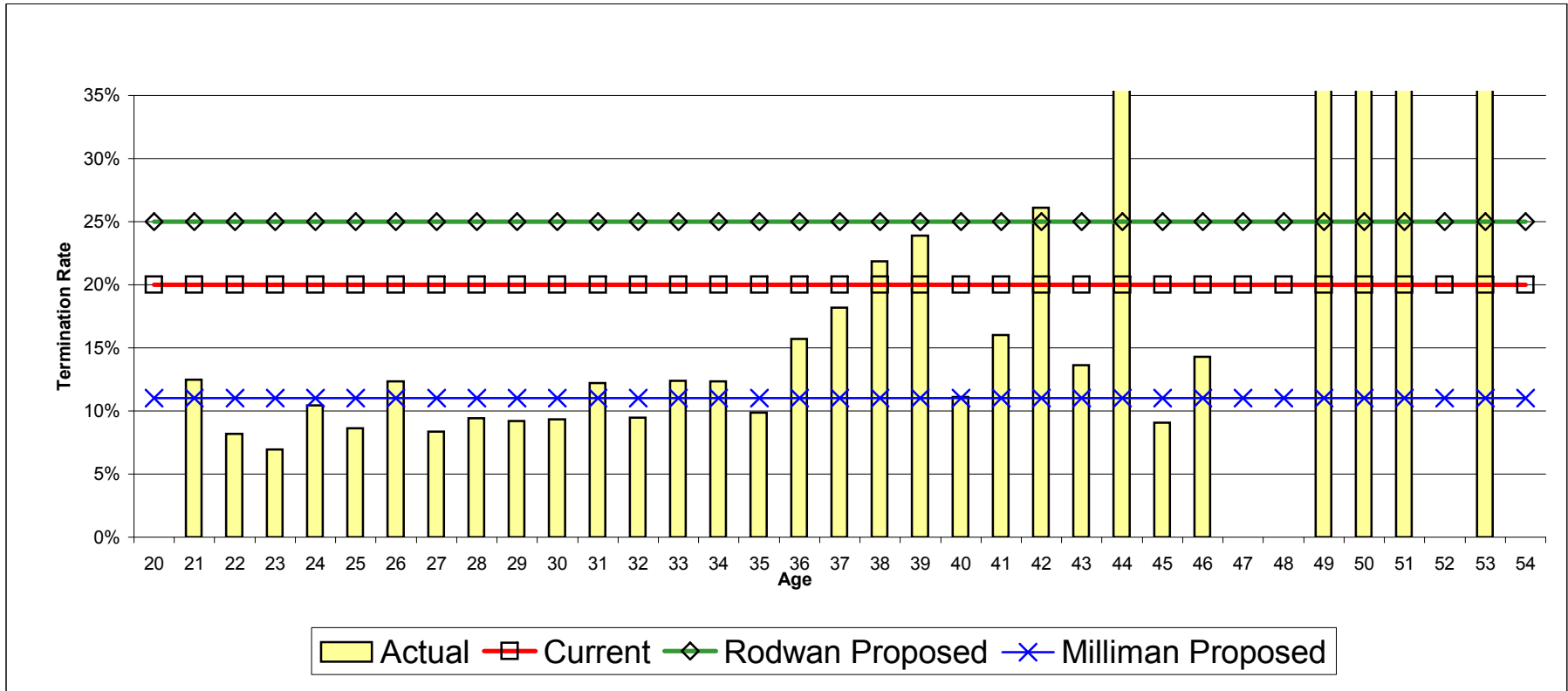
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-33

Termination of Employment

Police - Large - Year 0



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	276	487	609	268
Actual/Expected		57%	45%	103%



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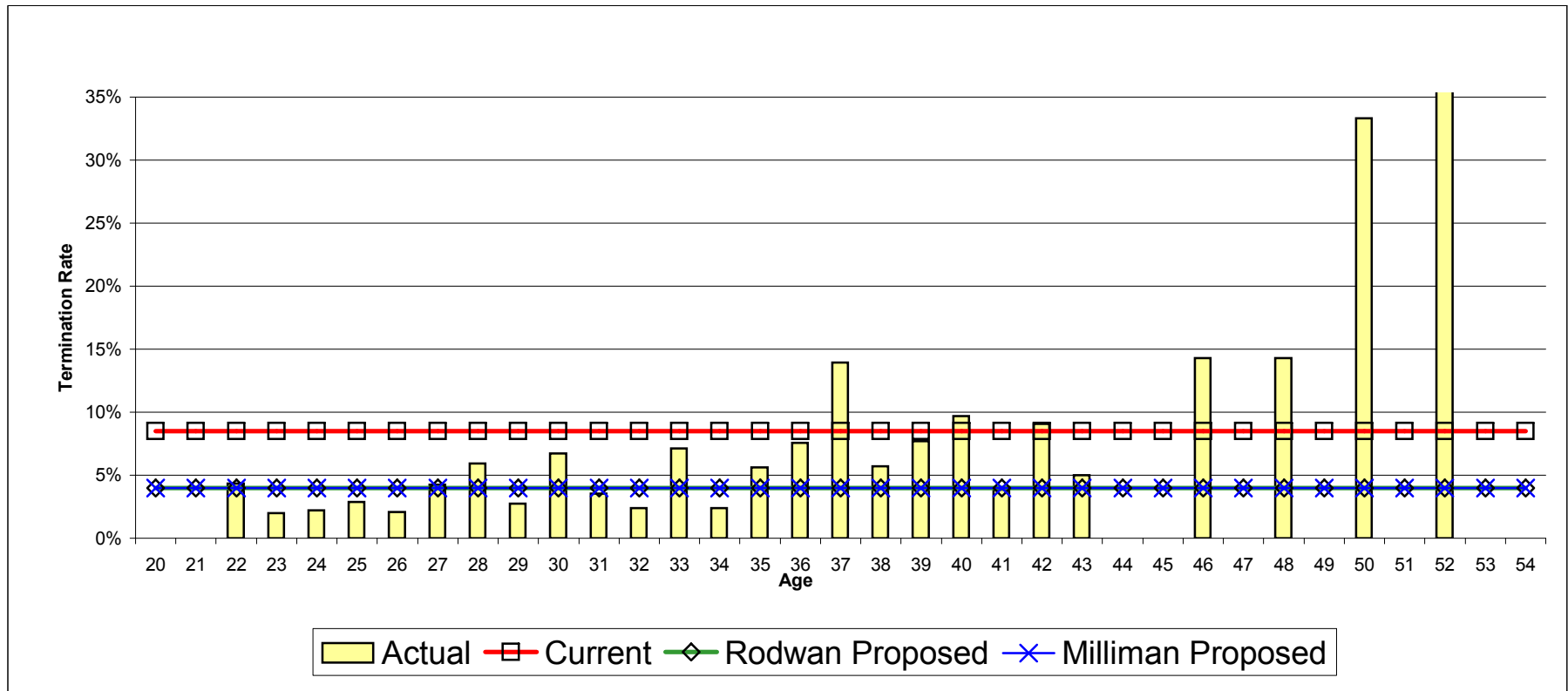
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-34

Termination of Employment

Police - Large - Year 1



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	98	193	91	91
Actual/Expected		51%	108%	108%



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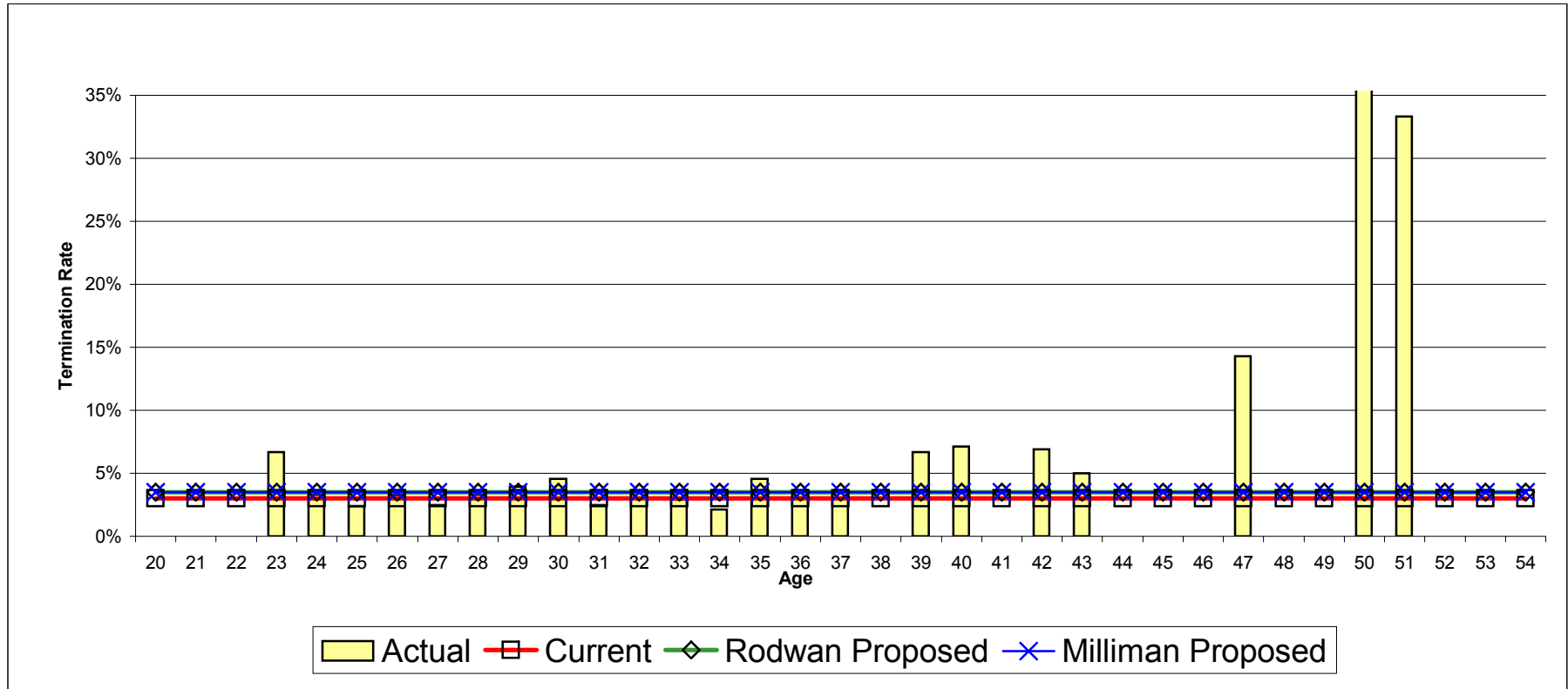
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-35

Termination of Employment

Police - Large - Year 2



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	75	67	78	78
Actual/Expected		112%	96%	96%

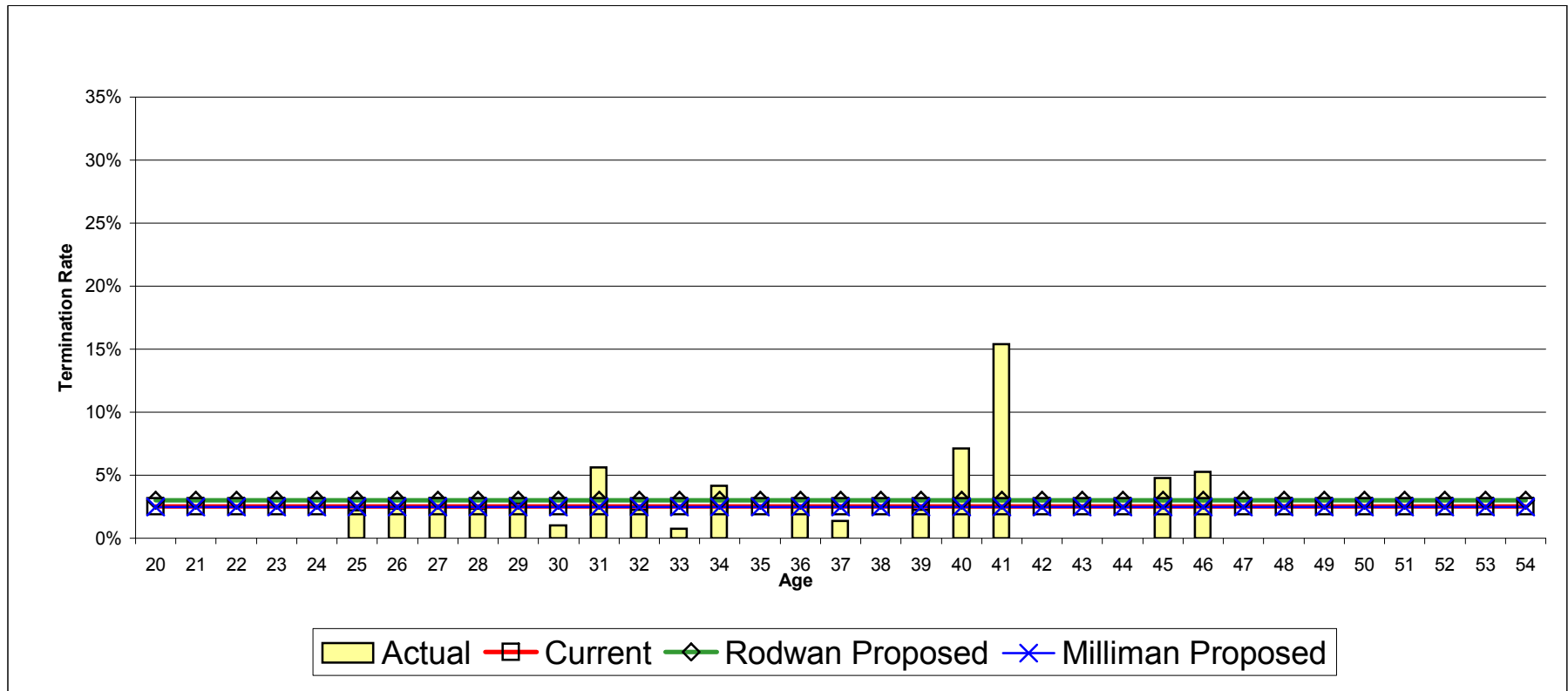
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-36

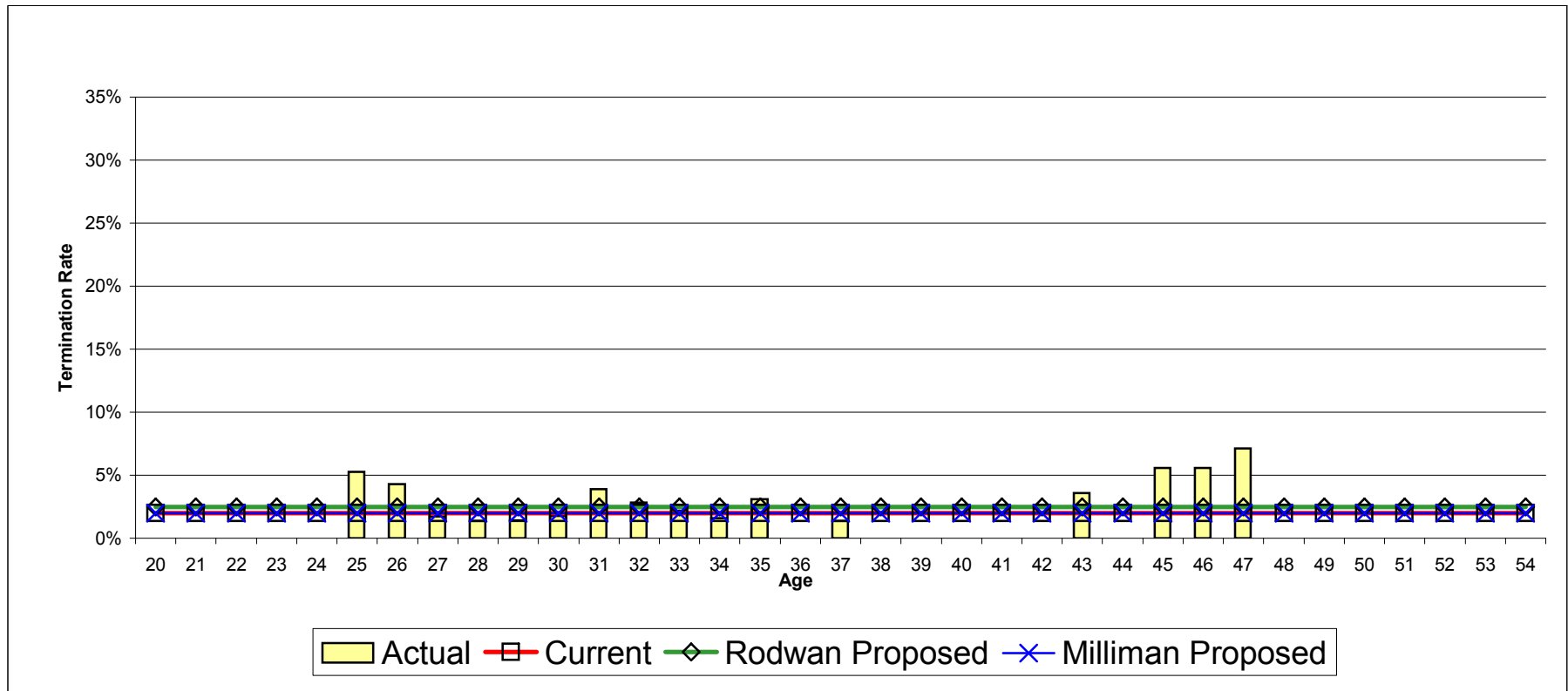
Termination of Employment

Police - Large - Year 3



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	59	57	69	57
Actual/Expected		104%	86%	104%

Arizona Public Safety Retirement System
Audit of Experience Study 2001-2006
Exhibit C-37
Termination of Employment
Police - Large - Year 4



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	46	45	56	45
Actual/Expected		102%	82%	102%



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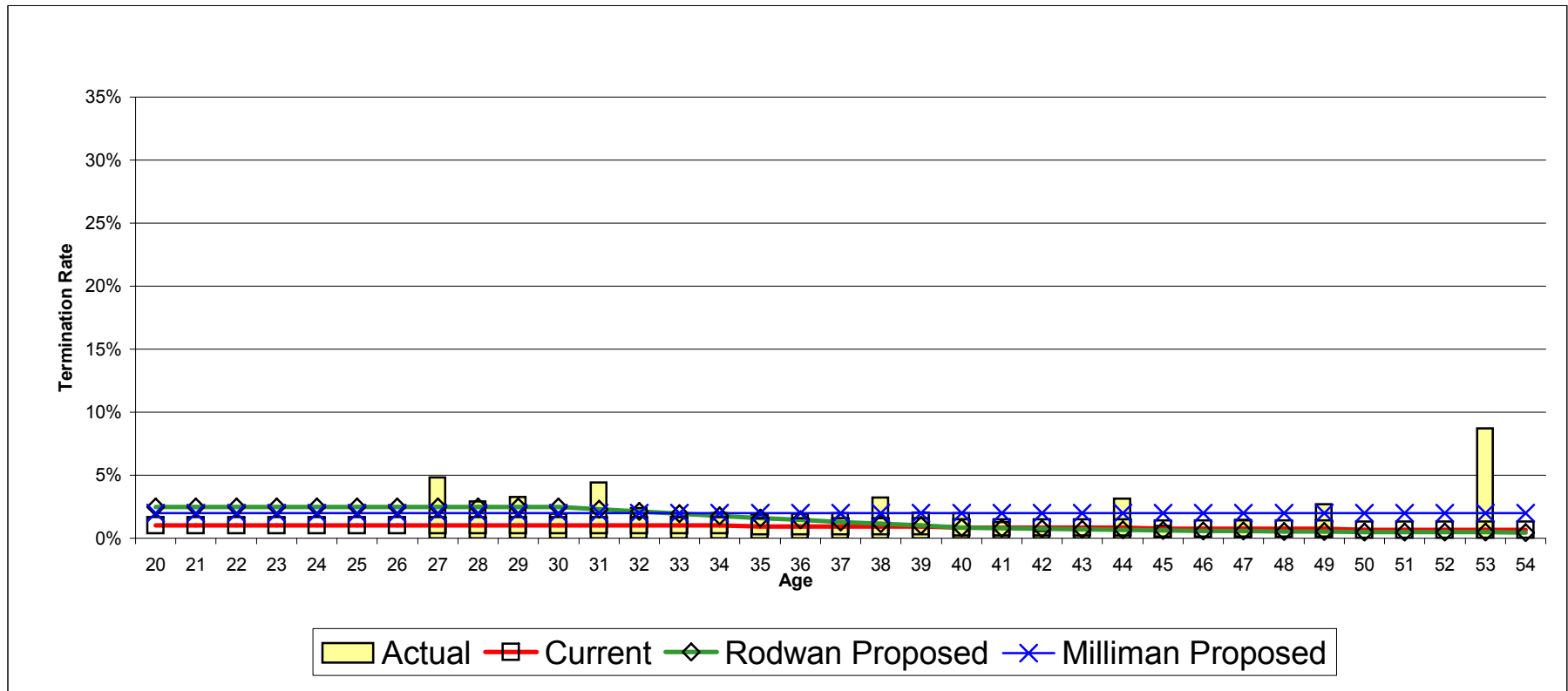
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-38

Termination of Employment

Police - Large - Years 5-10



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	204	86	152	179
Actual/Expected		237%	134%	114%



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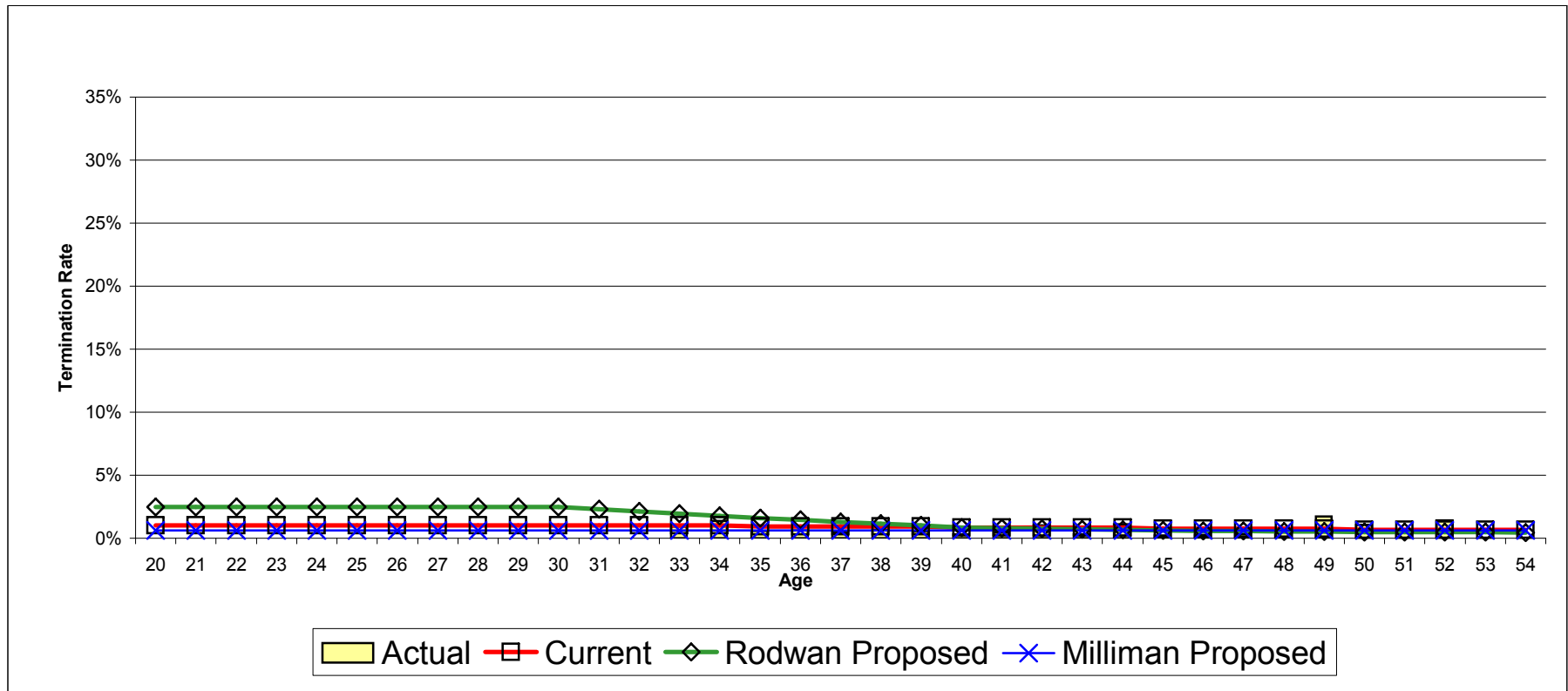
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-39

Termination of Employment

Police - Large - Years 10+



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	66	93	103	64
Actual/Expected		71%	64%	103%



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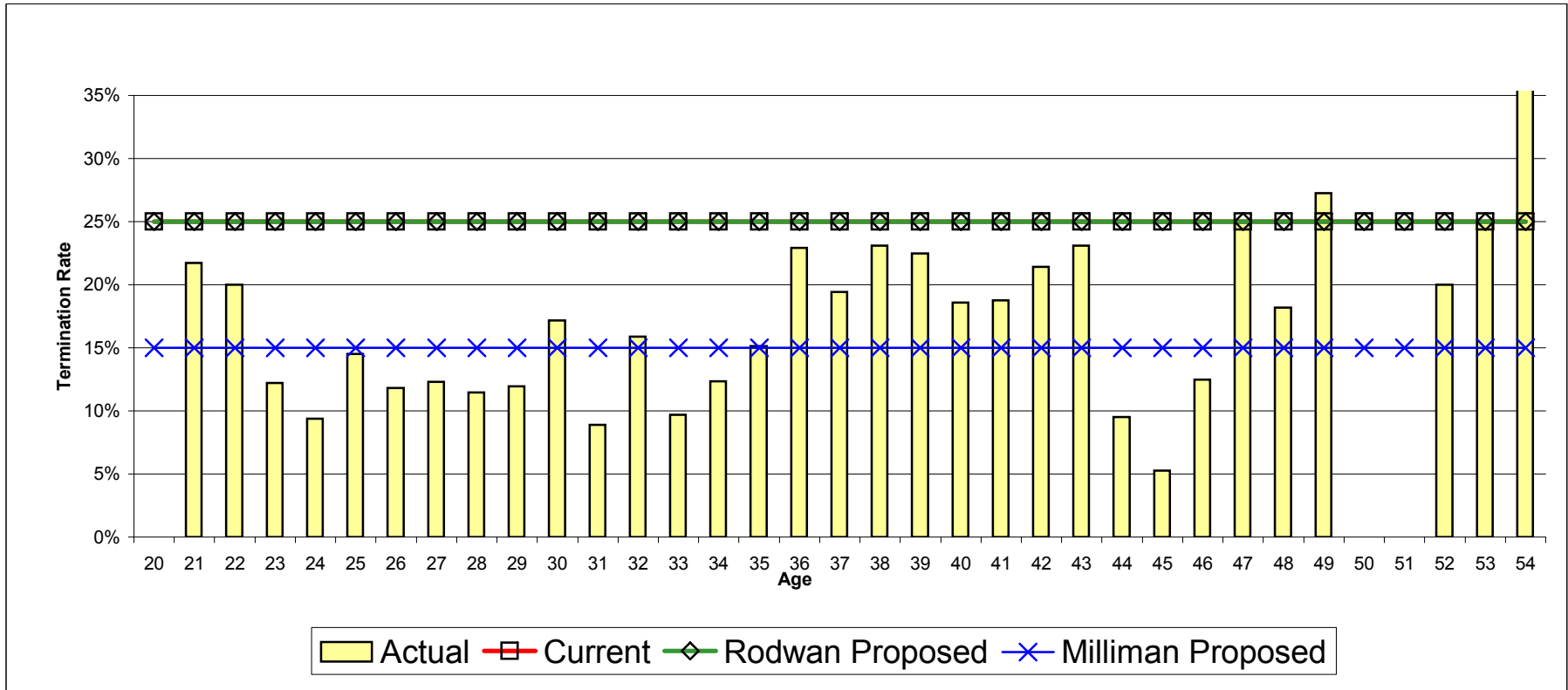
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-40

Termination of Employment

Police - Small - Year 0



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	283	493	493	296
Actual/Expected		57%	57%	96%



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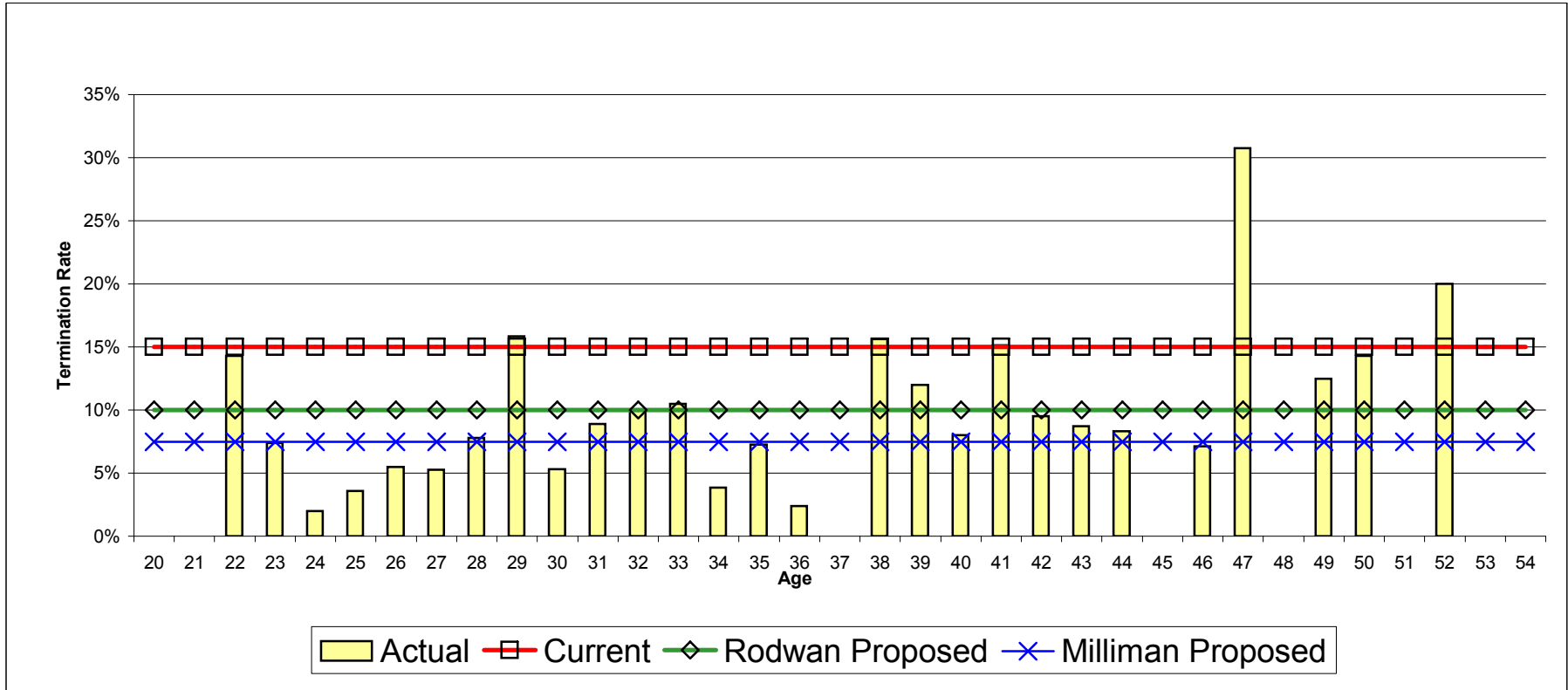
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-41

Termination of Employment

Police - Small - Year 1



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	120	236	157	118
Actual/Expected		51%	76%	102%



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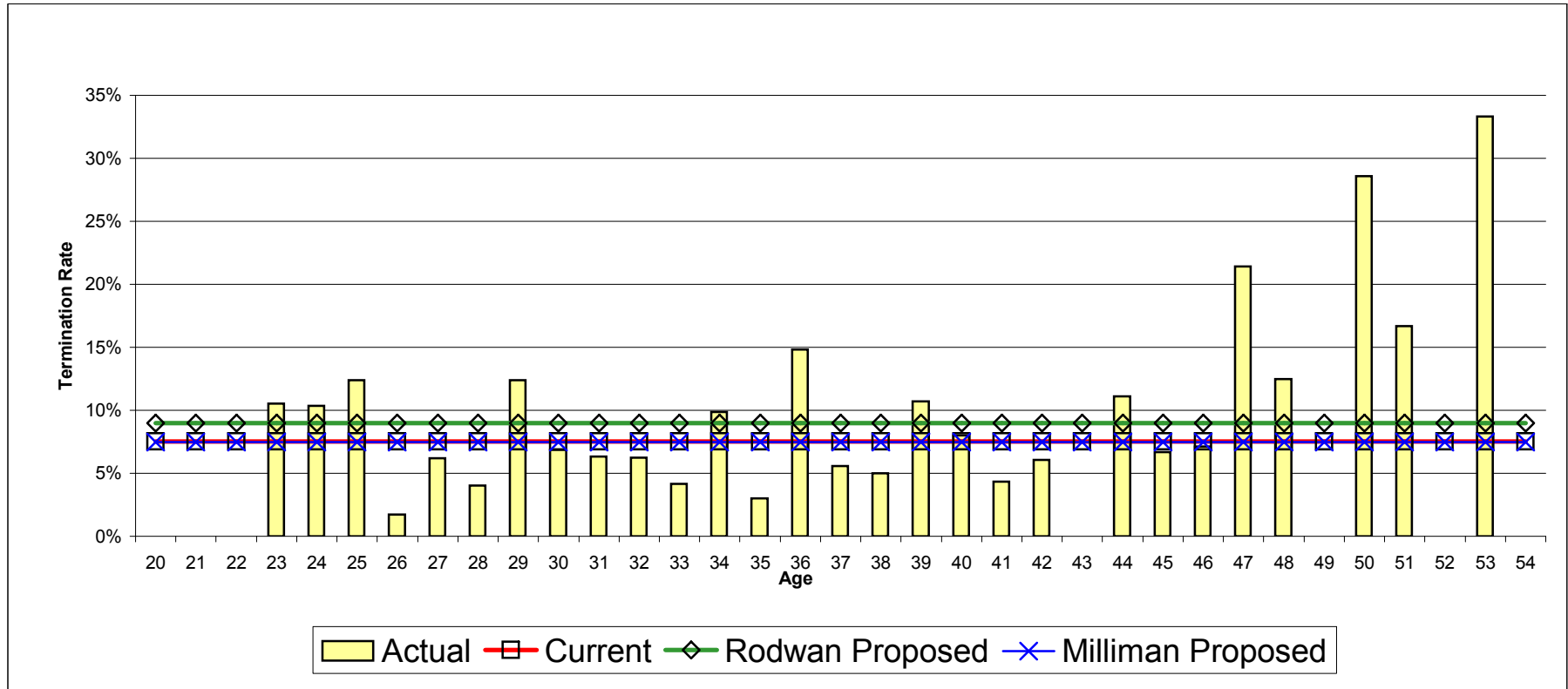
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-42

Termination of Employment

Police - Small - Year 2



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	113	115	138	115
Actual/Expected		98%	82%	98%



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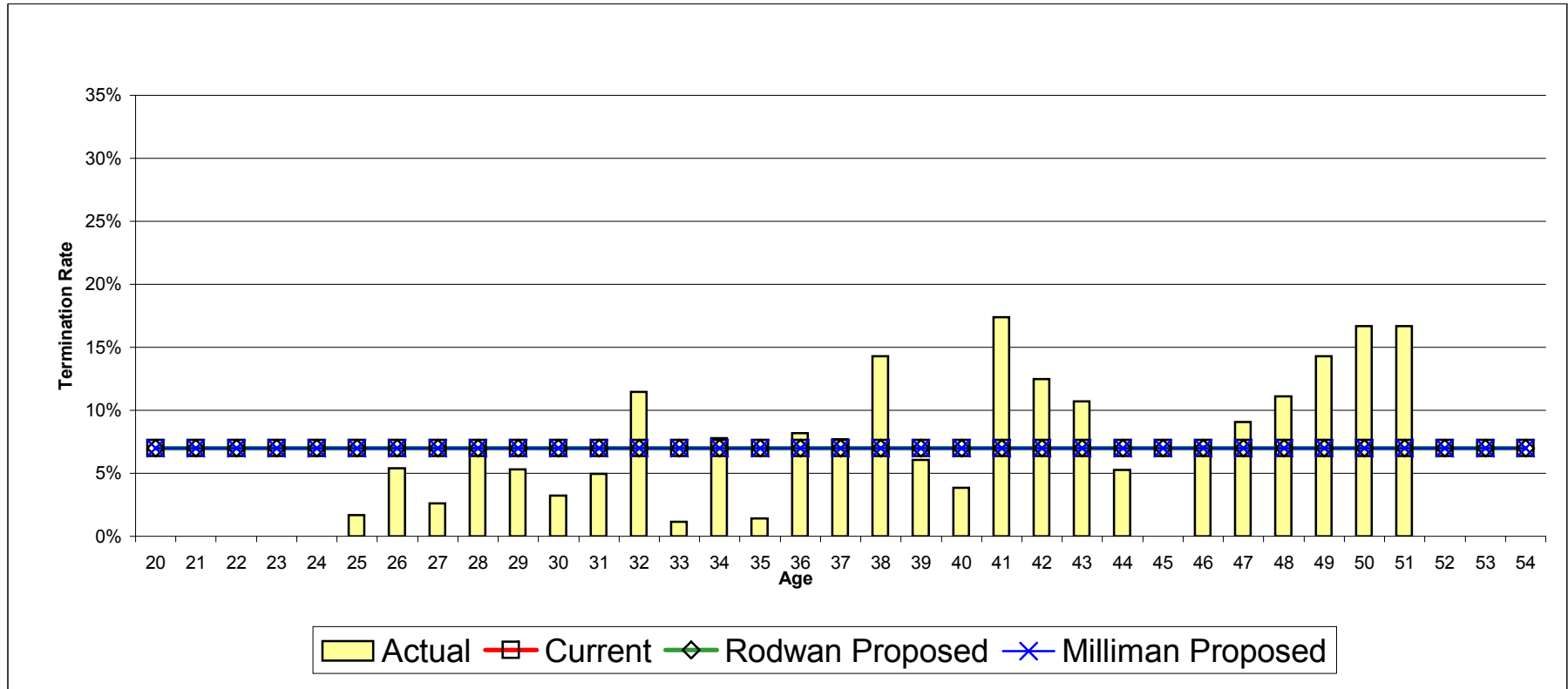
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-43

Termination of Employment

Police - Small - Year 3



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	87	102	102	102
Actual/Expected		85%	85%	85%



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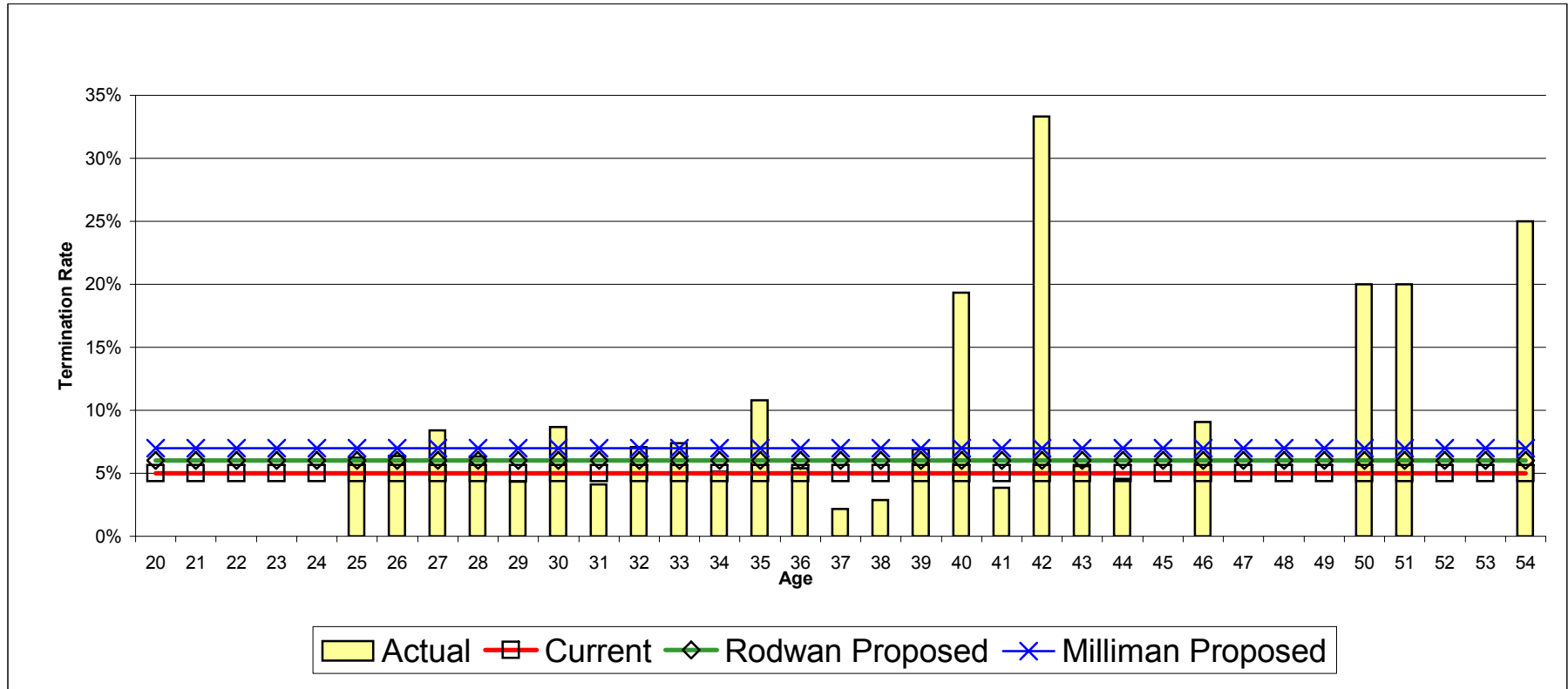
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-44

Termination of Employment

Police - Small - Year 4



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	93	67	81	94
Actual/Expected		139%	115%	99%



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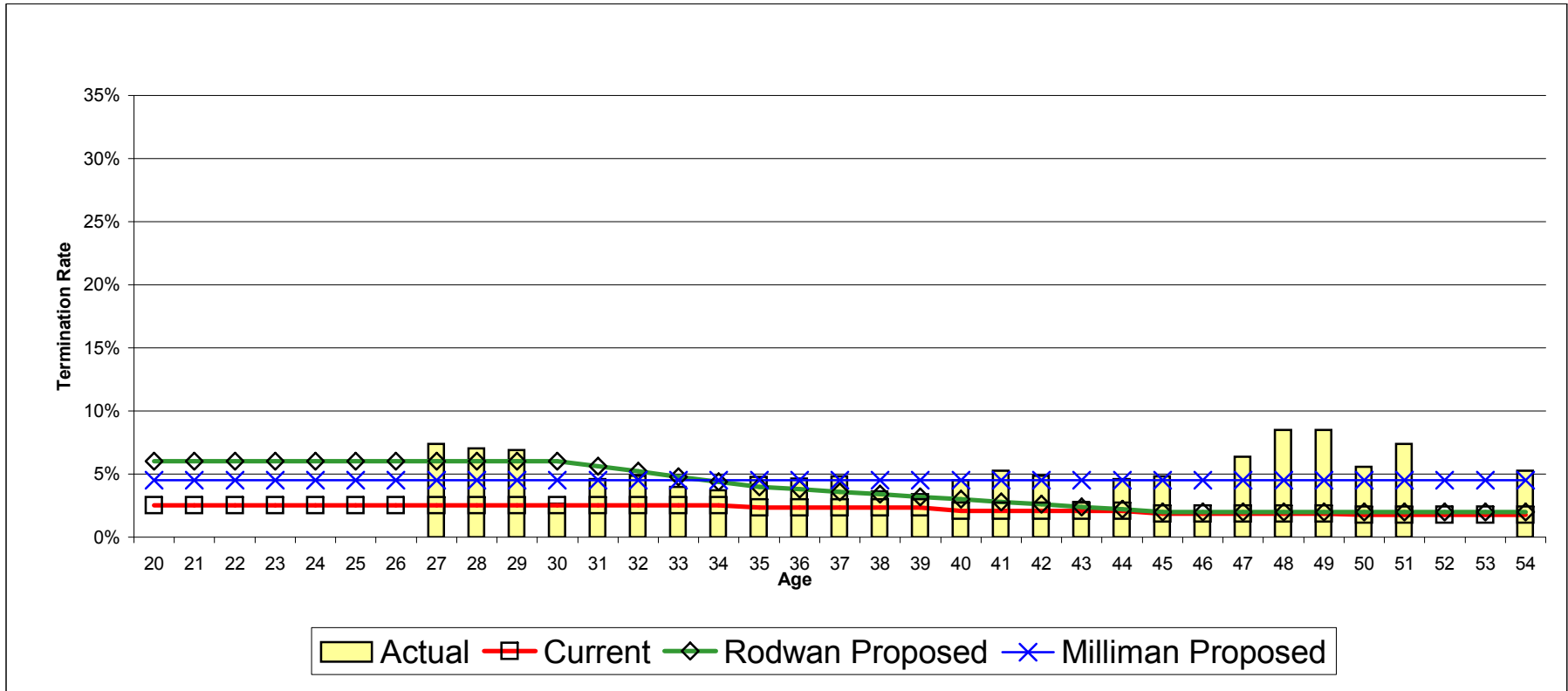
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-45

Termination of Employment

Police - Small - Years 5-10



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	216	112	201	215
Actual/Expected		193%	107%	100%



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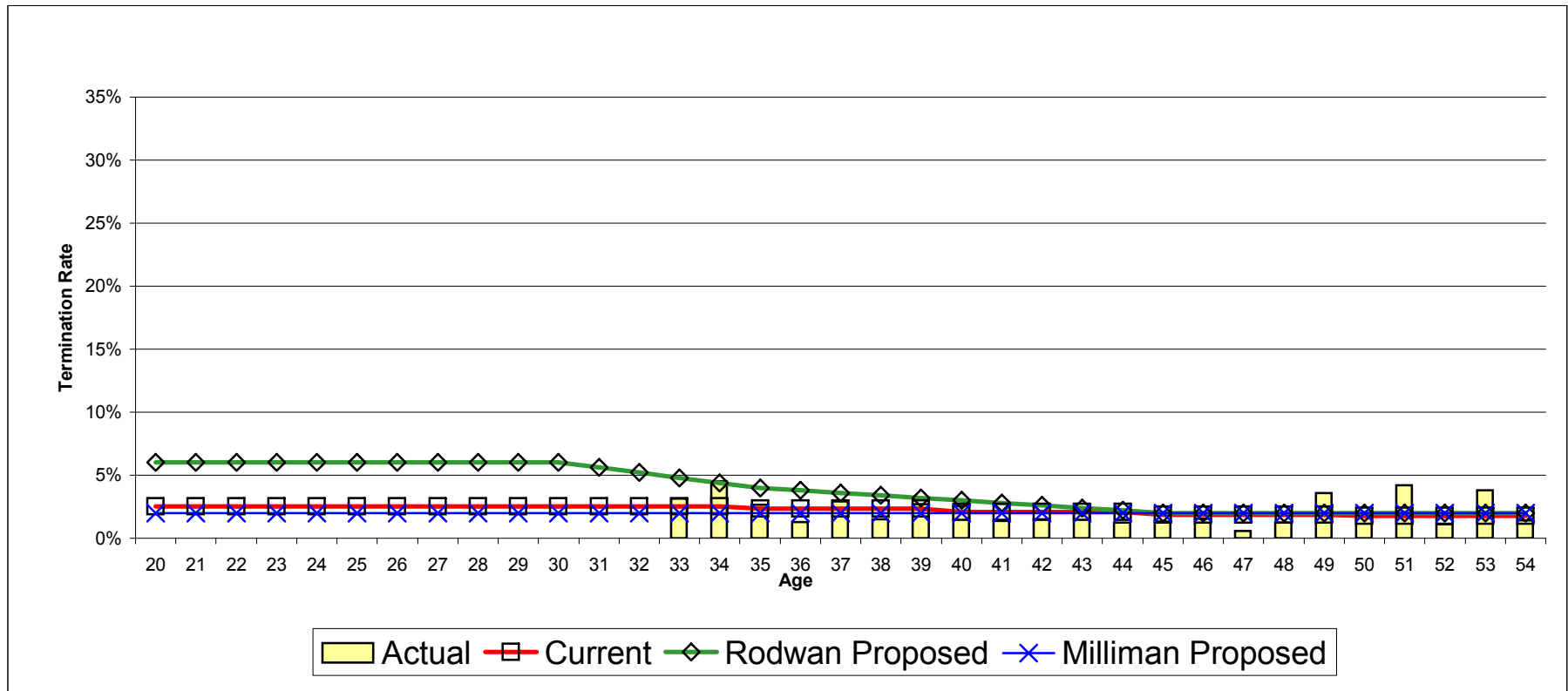
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-46

Termination of Employment

Police - Small - Years 10+



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	94	98	131	92
Actual/Expected		96%	72%	102%



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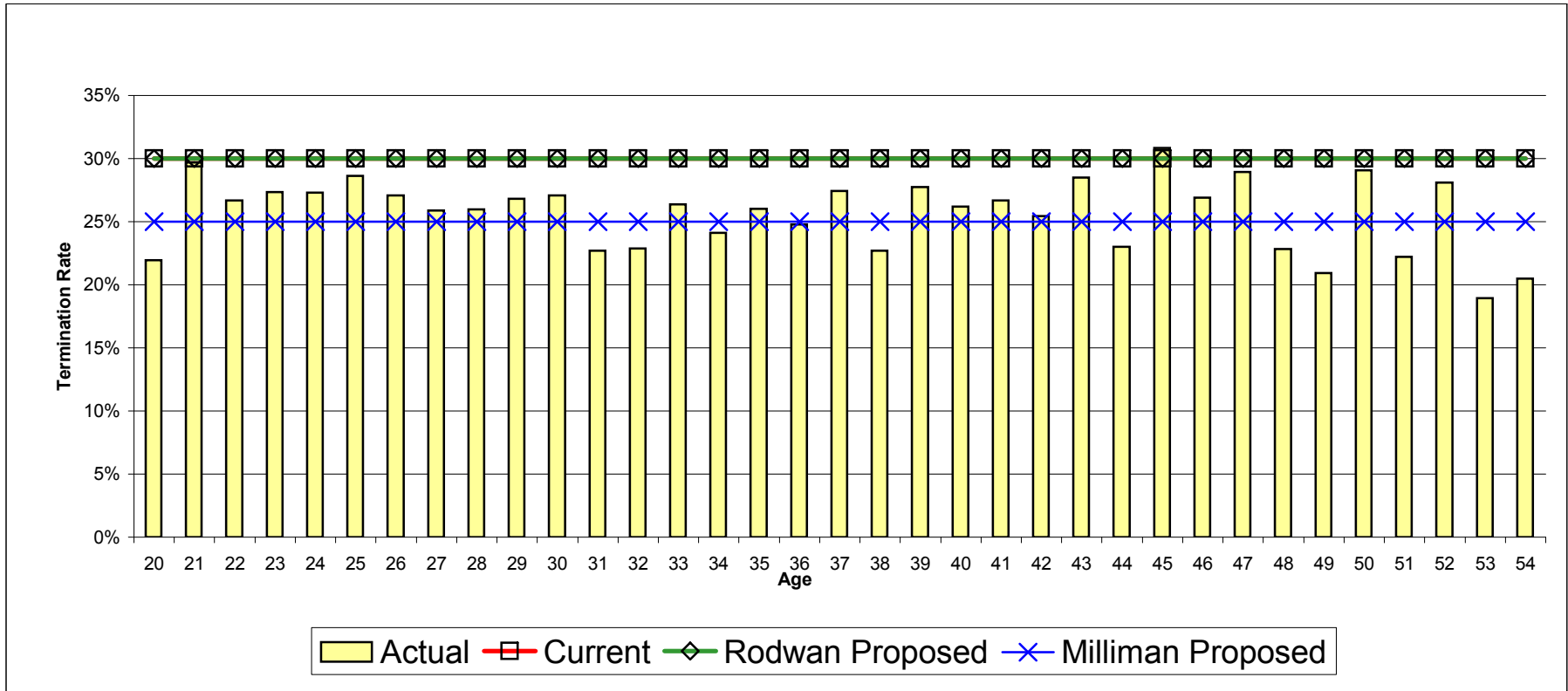
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-47

Termination of Employment

CORP - Year 0



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	2,433	2,797	2,797	2,331
Actual/Expected		87%	87%	104%



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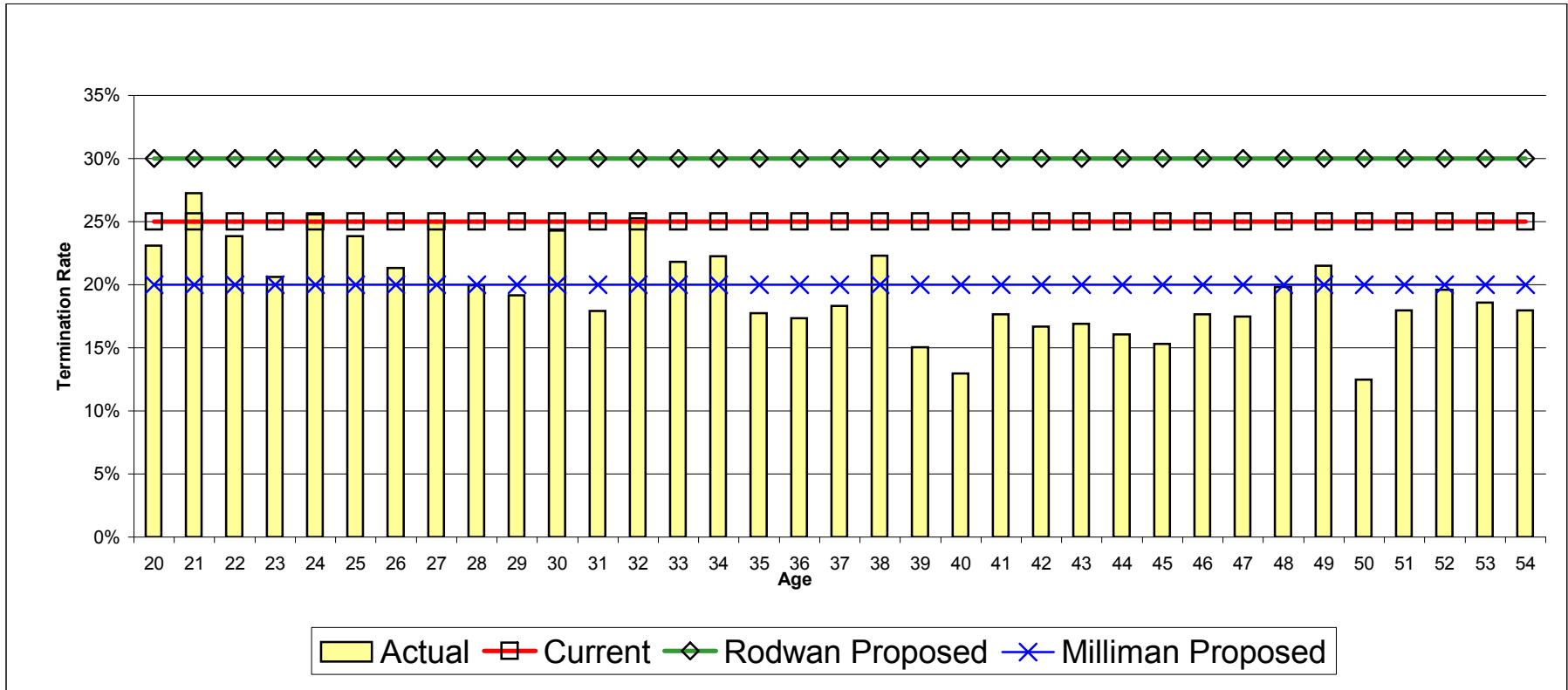
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-48

Termination of Employment

CORP - Year 1



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	1,448	1,757	2,108	1,405
Actual/Expected		82%	69%	103%



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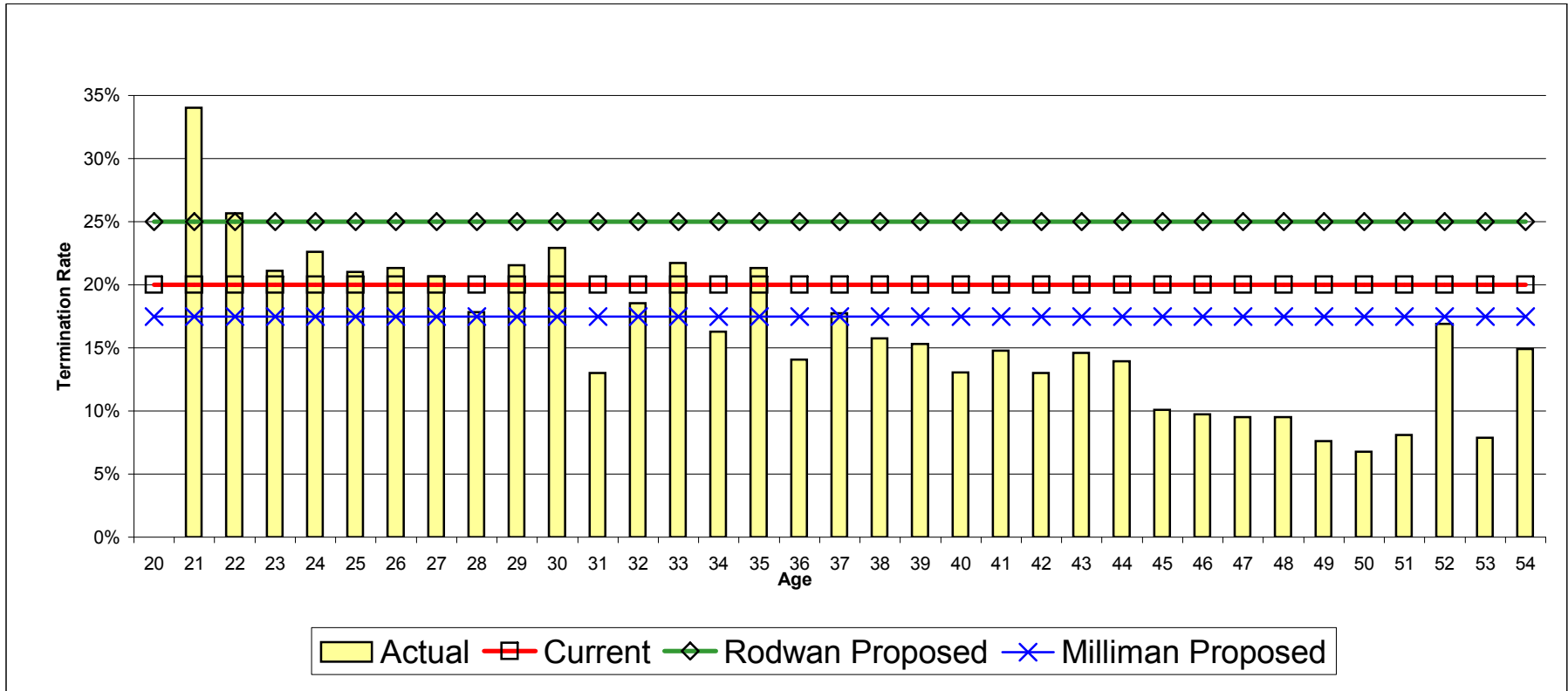
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-49

Termination of Employment

CORP - Year 2



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	990	1,132	1,415	991
Actual/Expected		87%	70%	100%



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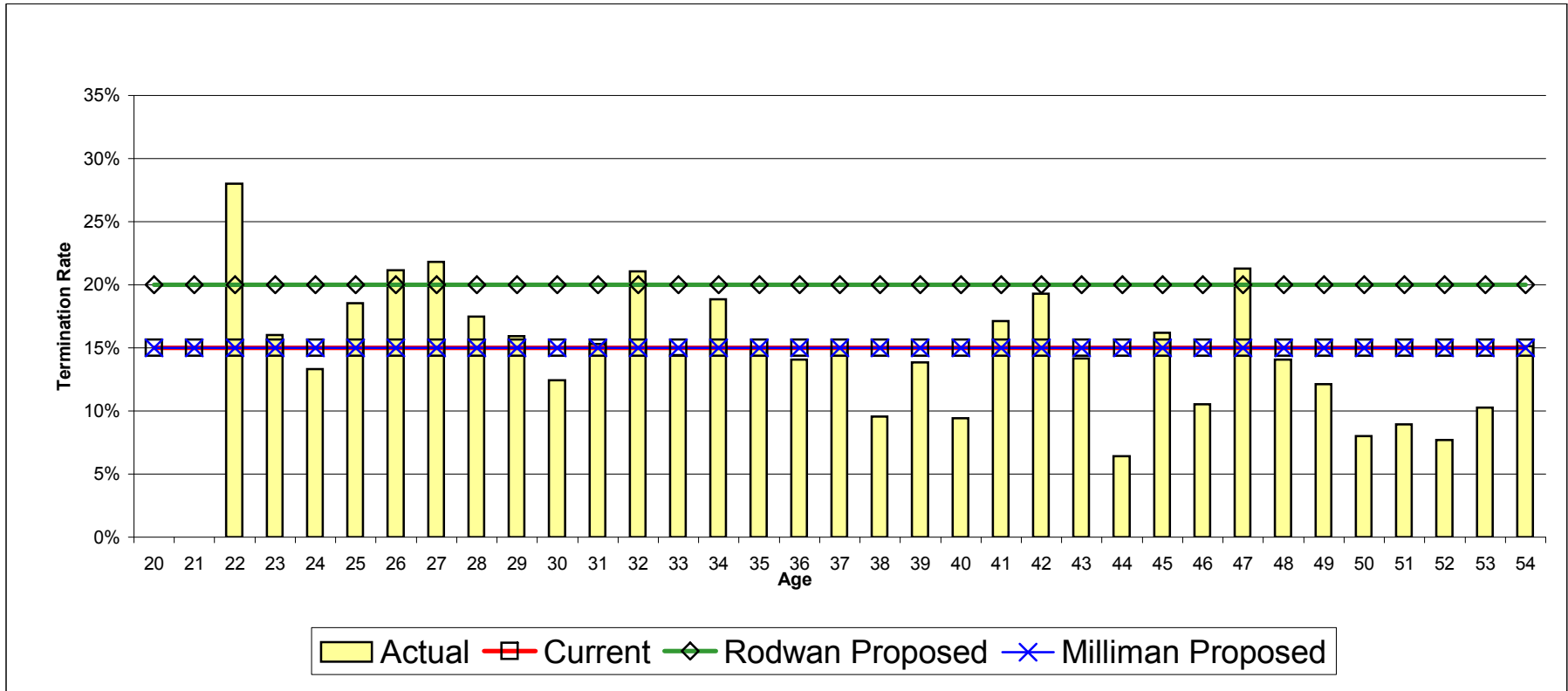
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-50

Termination of Employment

CORP - Year 3



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	682	652	870	652
Actual/Expected		105%	78%	105%



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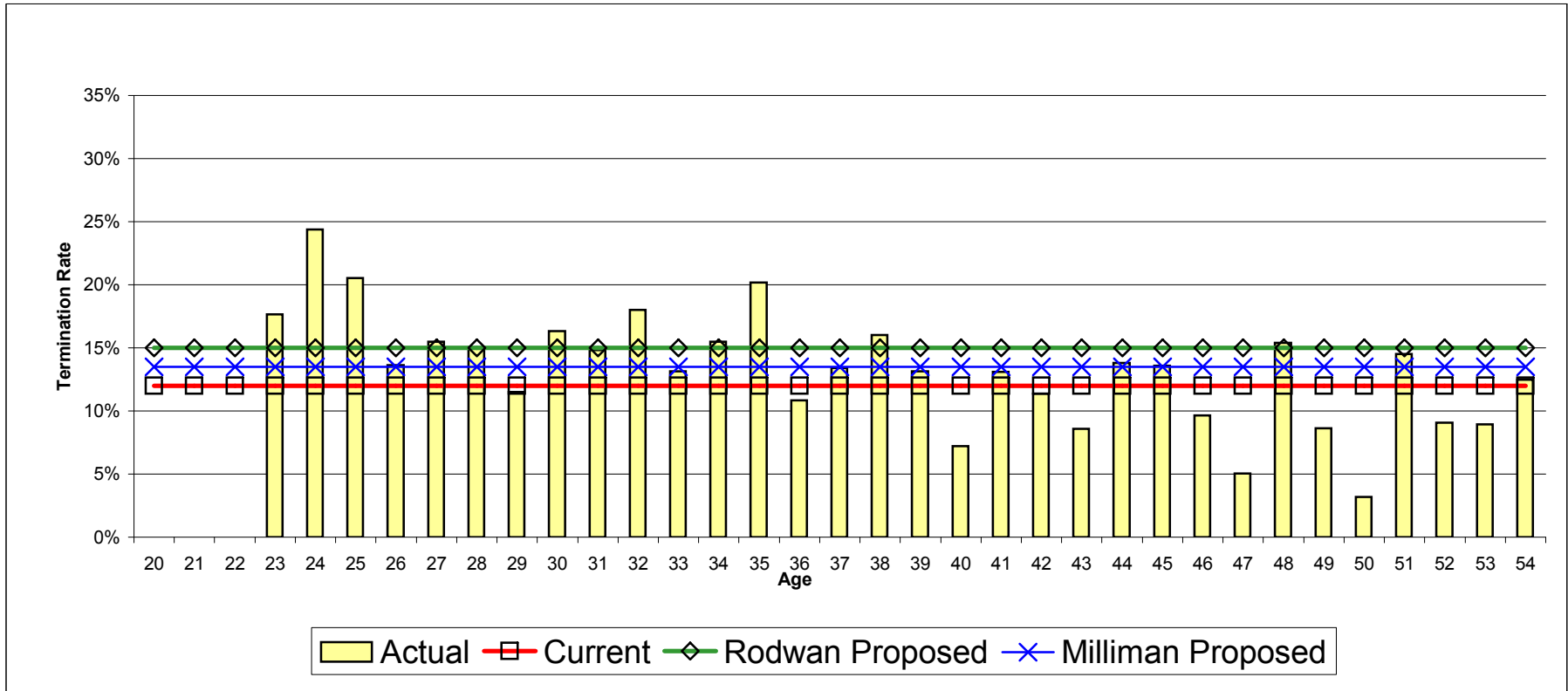
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-51

Termination of Employment

CORP - Year 4



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	499	442	552	497
Actual/Expected		113%	90%	100%



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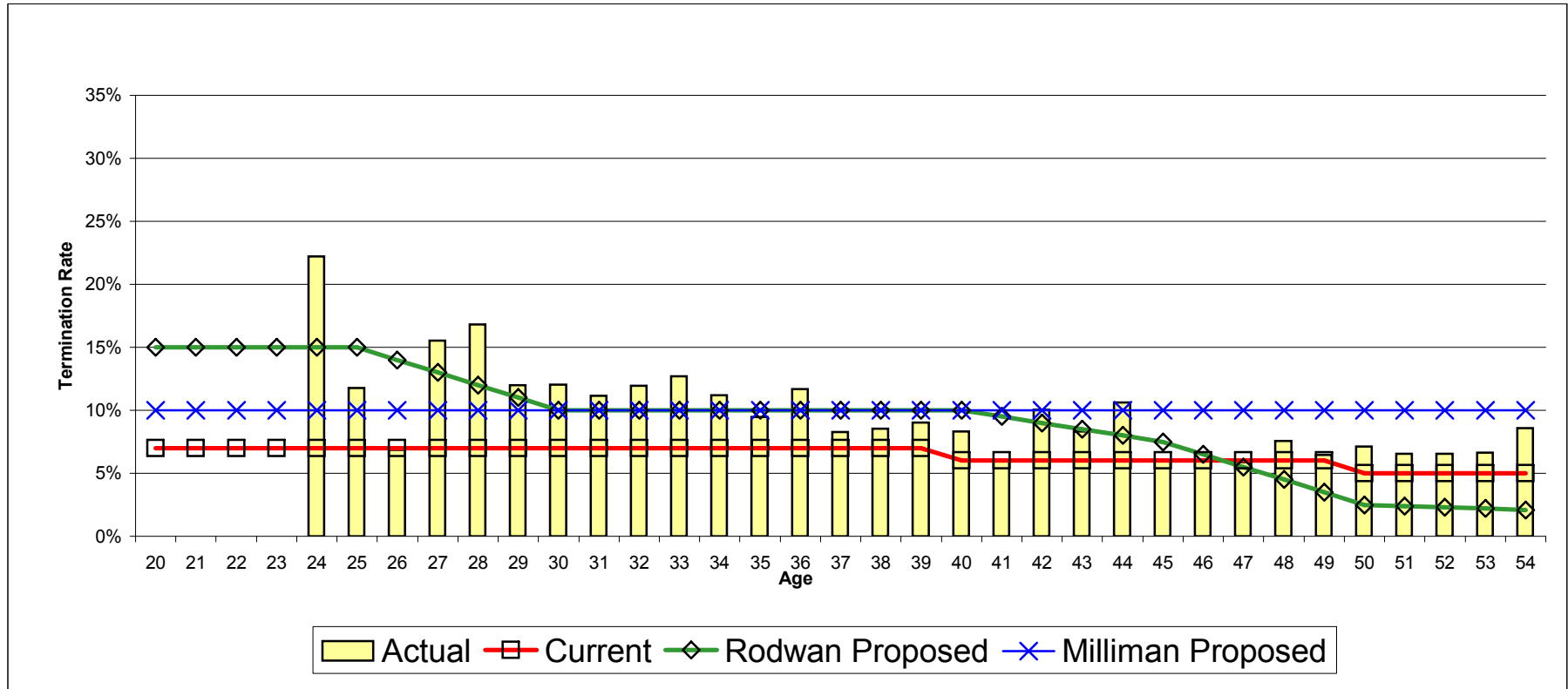
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-52

Termination of Employment

CORP - Years 5-10



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	1,022	678	900	1,047
Actual/Expected		151%	114%	98%



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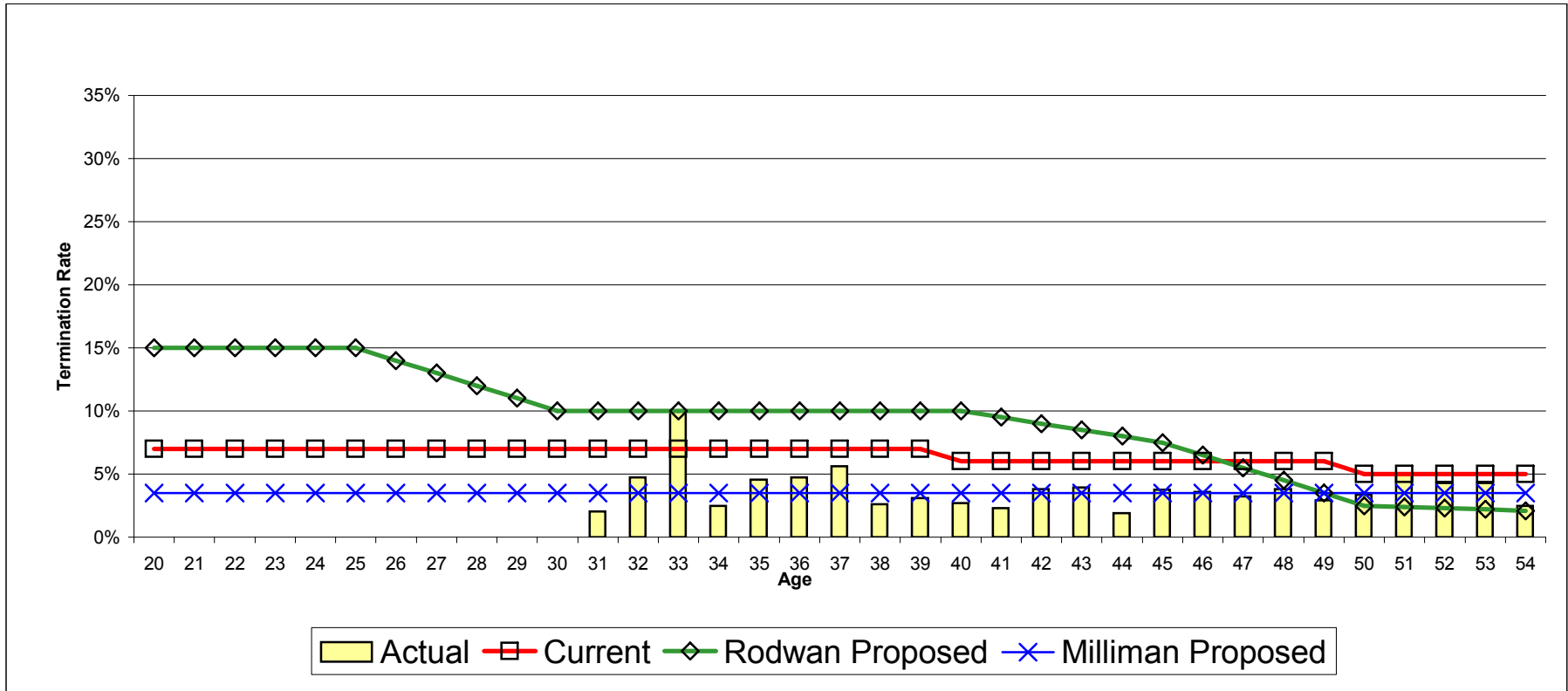
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-53

Termination of Employment

CORP - Years 10+



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	272	457	540	262
Actual/Expected		60%	50%	104%



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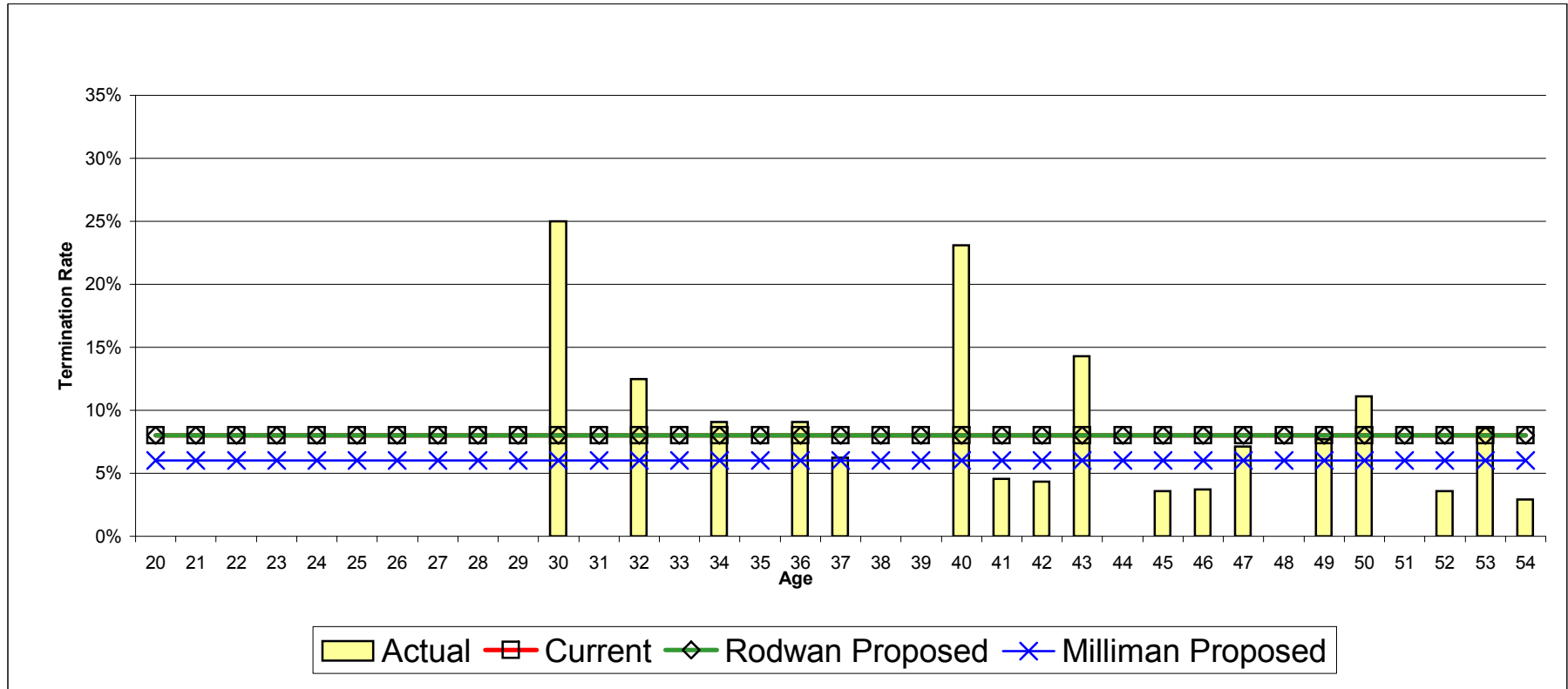
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-54

Termination of Employment

EORP - Years 0 and 1



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	26	38	38	29
Actual/Expected		68%	68%	90%



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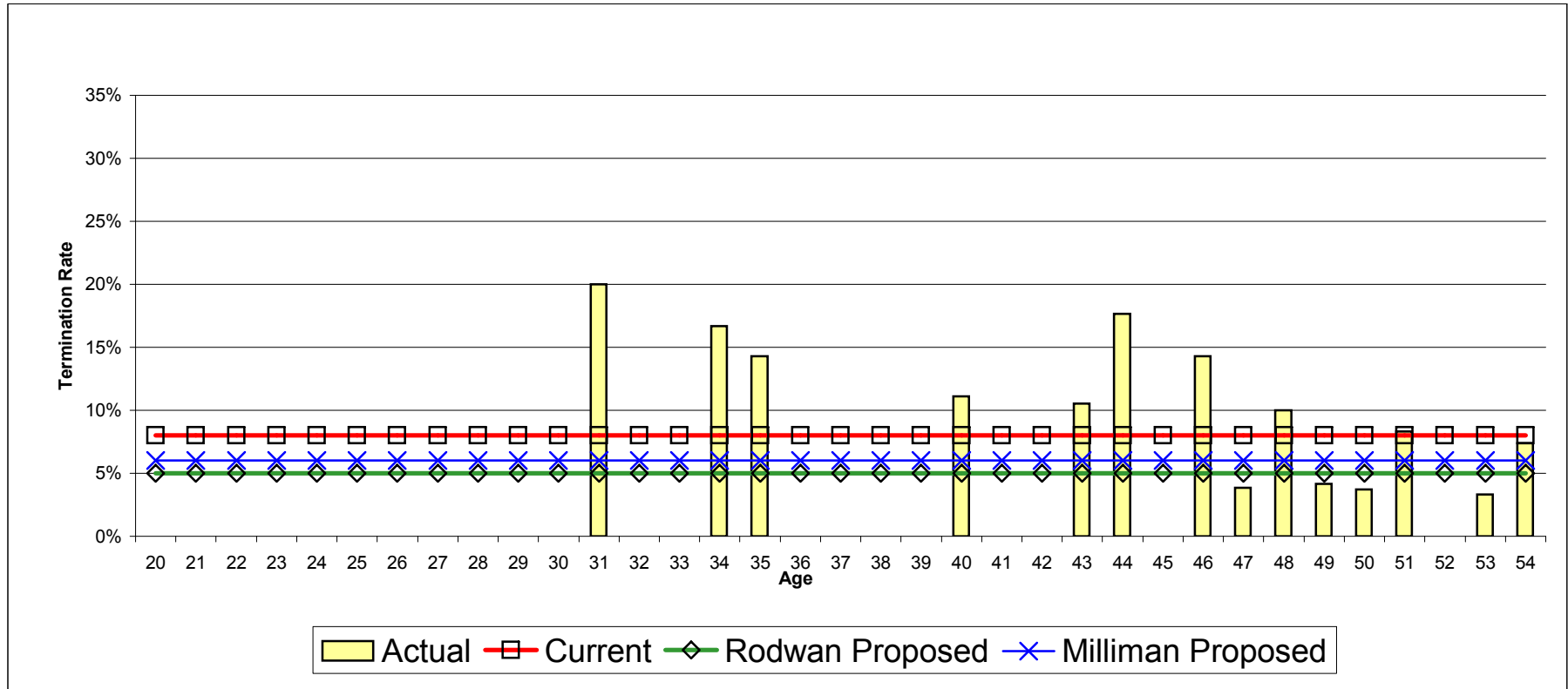
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-55

Termination of Employment

EORP - Years 2 and 3



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	23	30	19	23
Actual/Expected		77%	121%	100%



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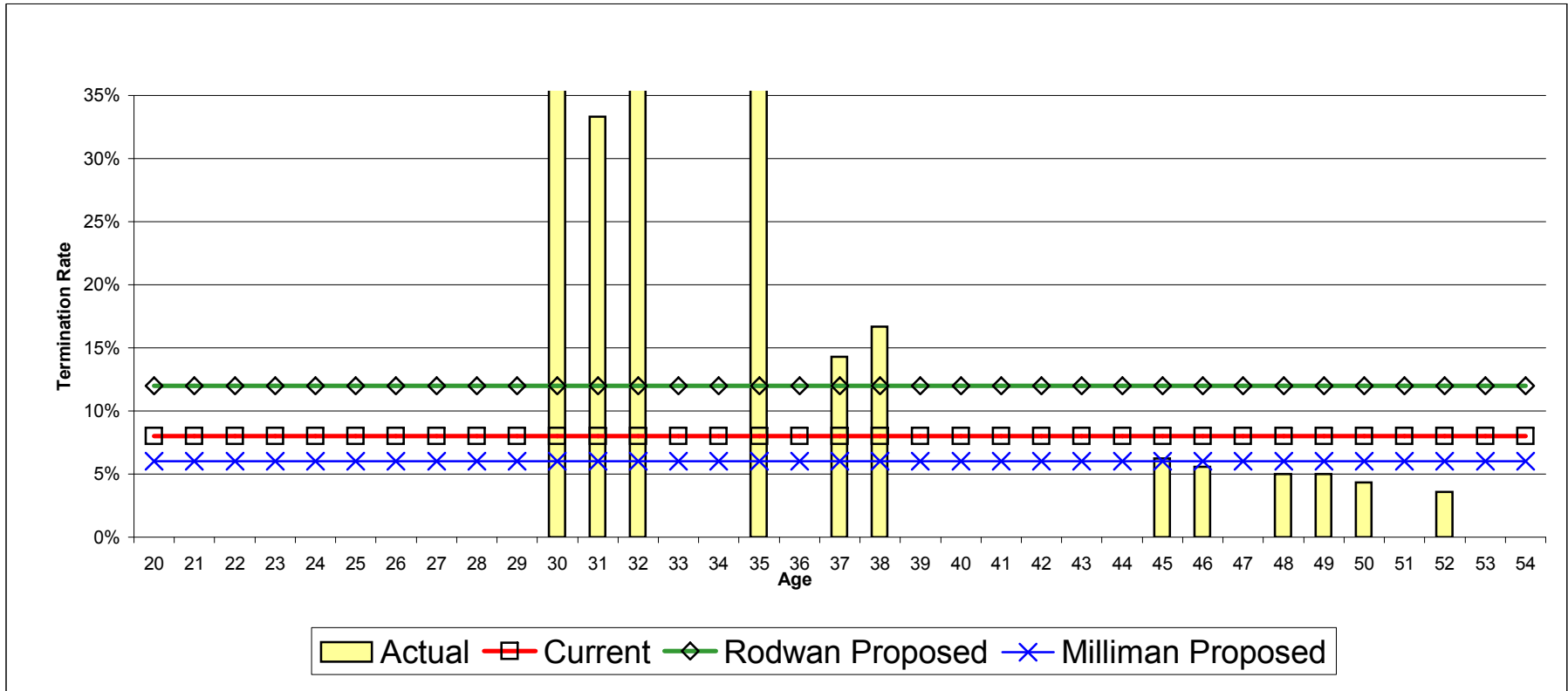
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-56

Termination of Employment

EORP - Years 4 and 5



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	13	24	36	18
Actual/Expected		54%	36%	72%



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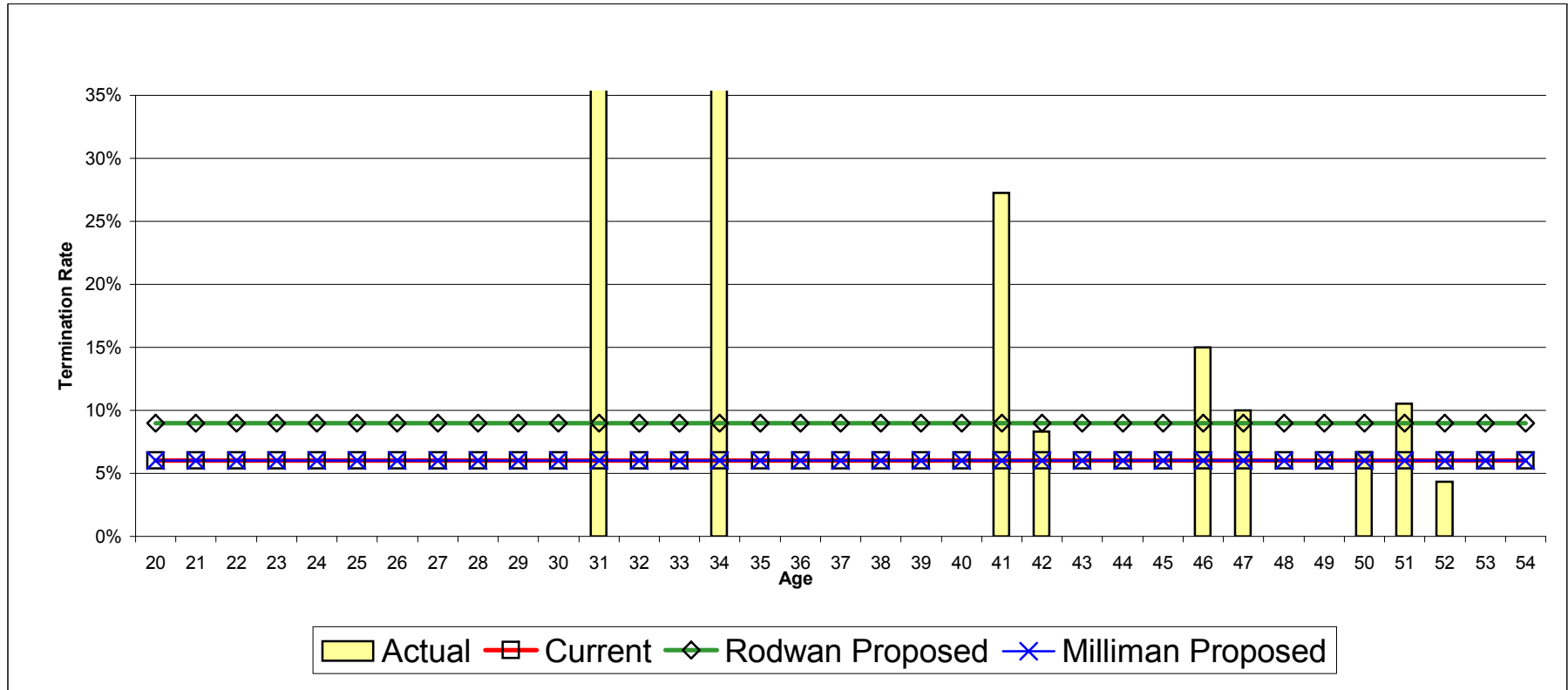
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-57

Termination of Employment

EORP - Years 6 and 7



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	15	16	25	16
Actual/Expected		94%	60%	94%



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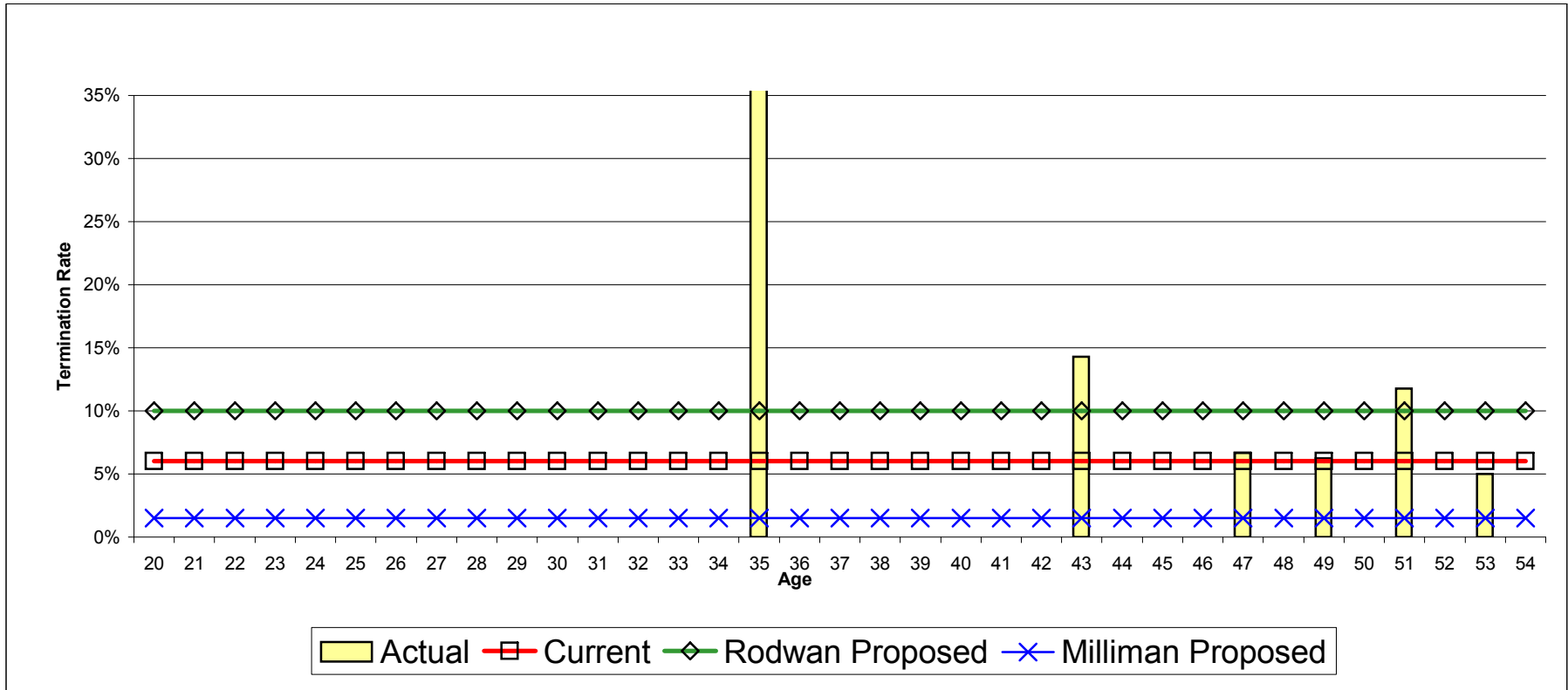
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-58

Termination of Employment

EORP - Years 8 and 9

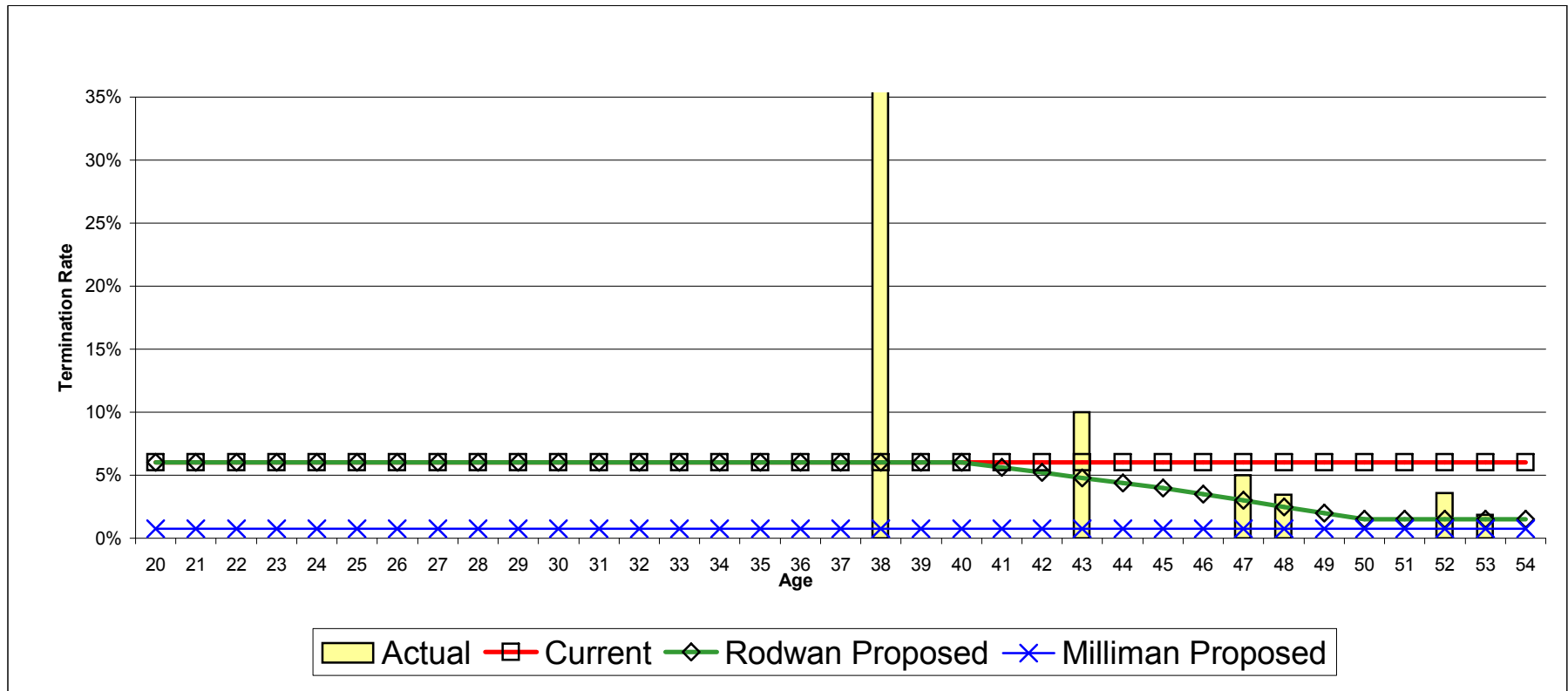


	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	7	11	18	3
Actual/Expected		64%	39%	233%



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Arizona Public Safety Retirement System
Audit of Experience Study 2001-2006
Exhibit C-59
Termination of Employment
EORP - Years 10+



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	7	24	9	3
Actual/Expected		29%	78%	233%



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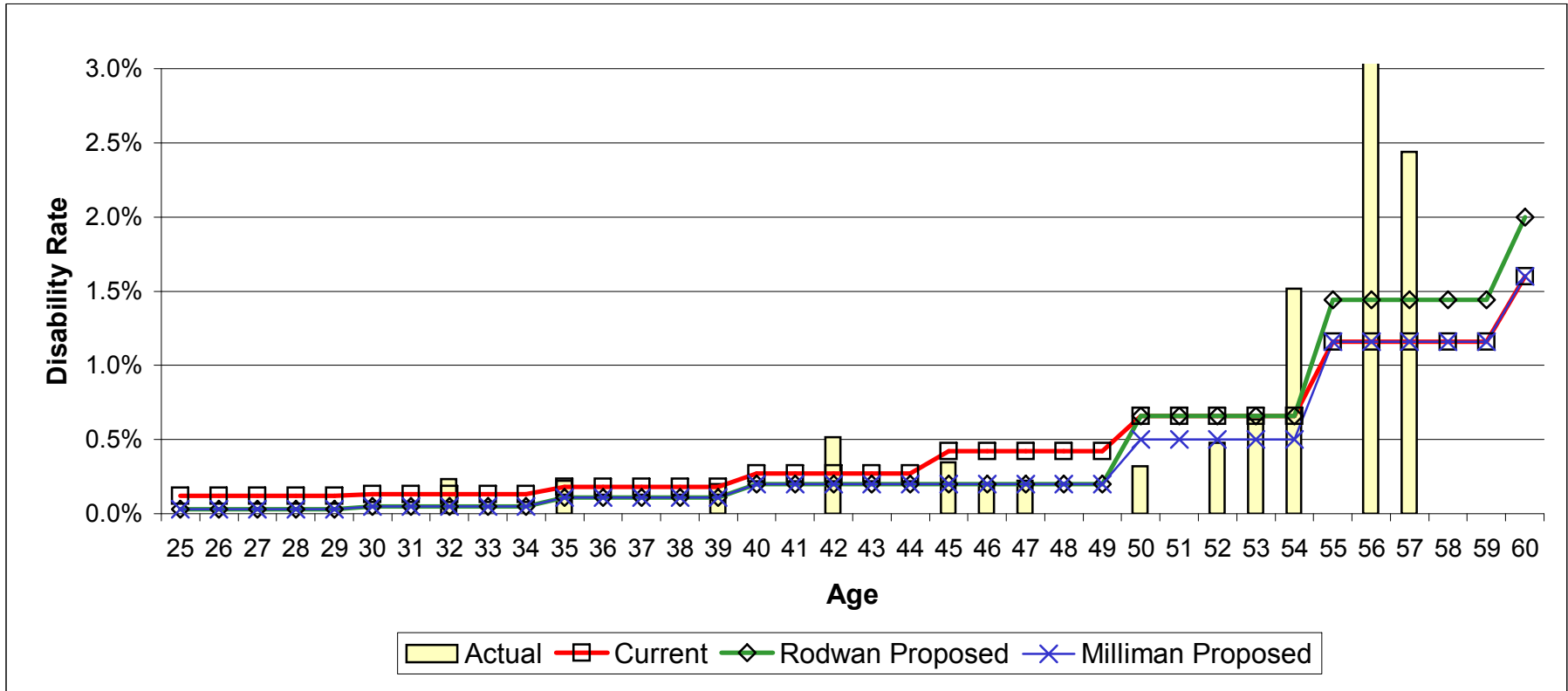
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-60

Rates of Disability

PSRS - Fire - Large



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	18	36	25	23
Actual/Expected		50%	72%	78%



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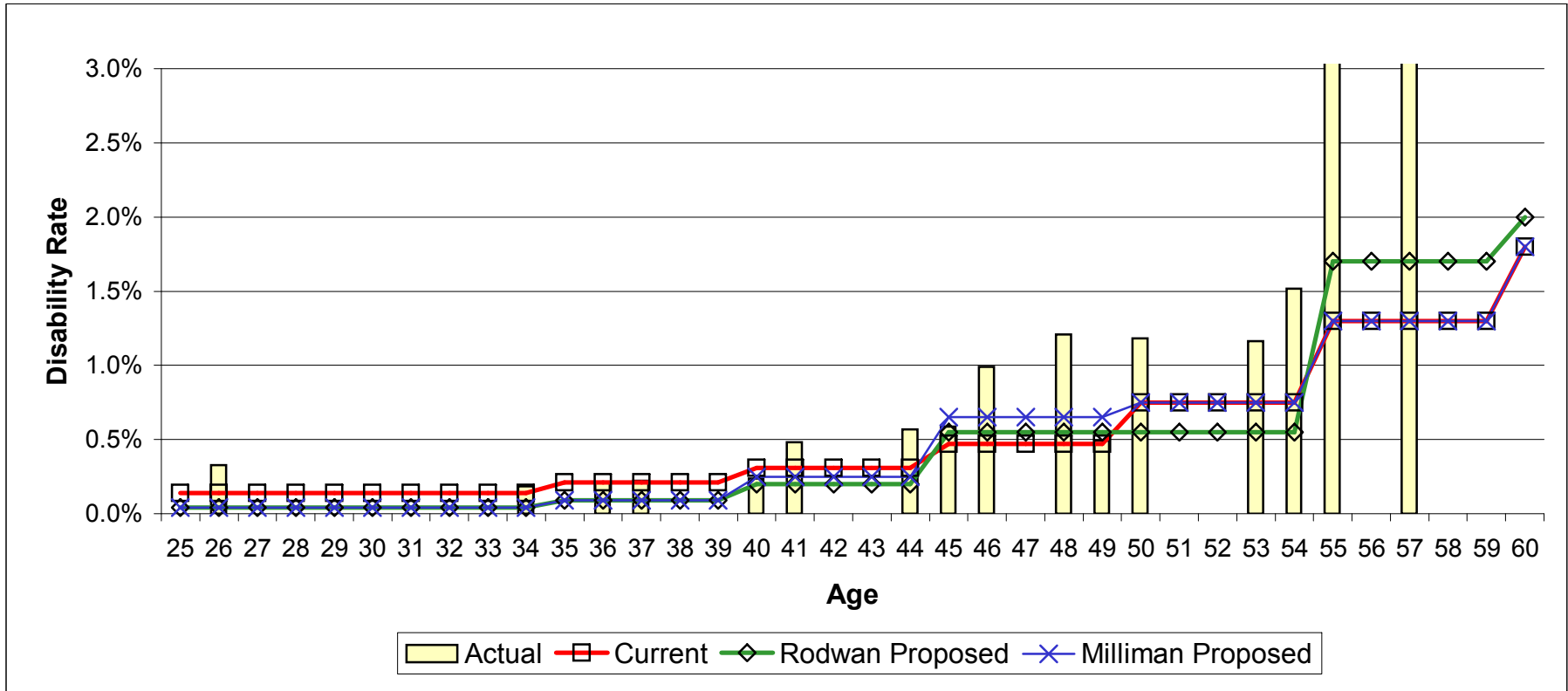
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-61

Rates of Disability

PSRS - Fire - Small



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	25	29	21	24
Actual/Expected		86%	119%	104%



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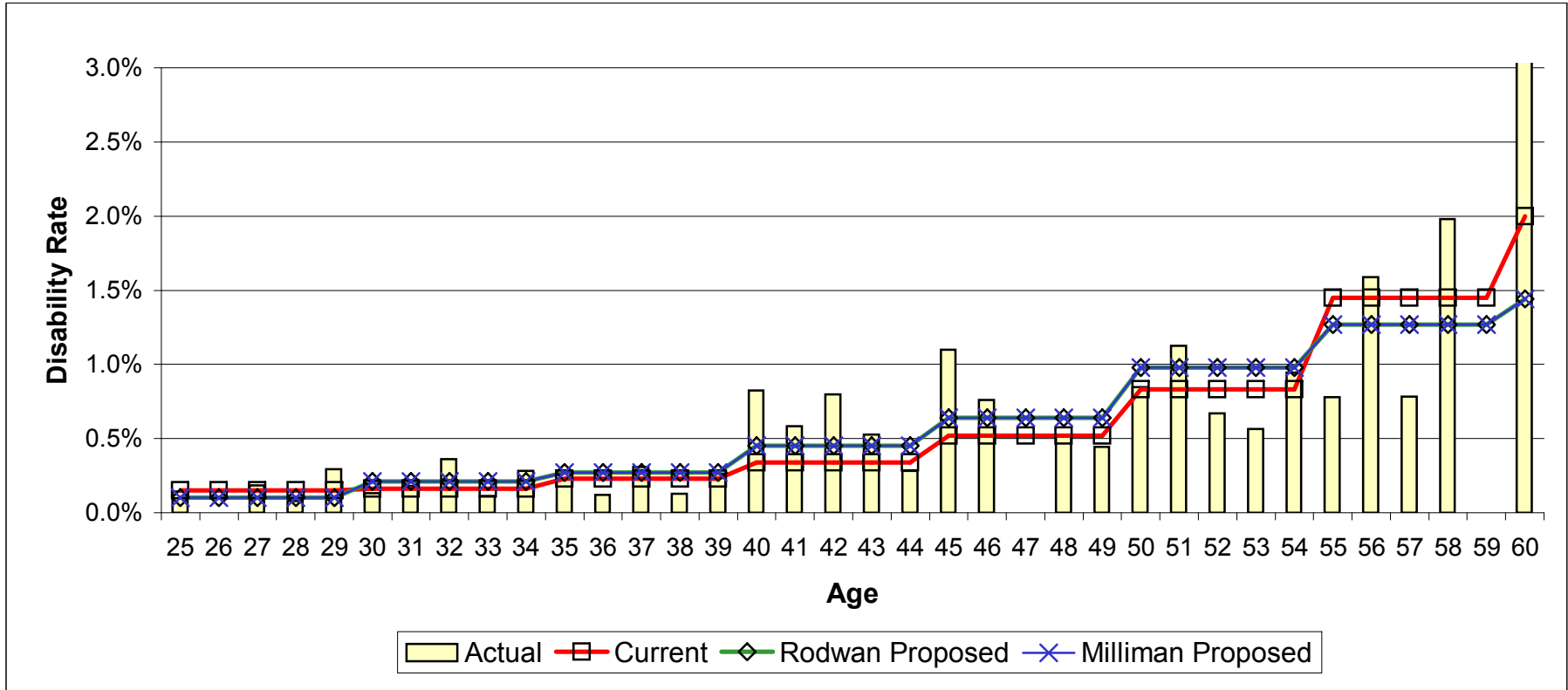
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-62

Rates of Disability

PSRS - Police - Large



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	136	114	132	132
Actual/Expected		119%	103%	103%



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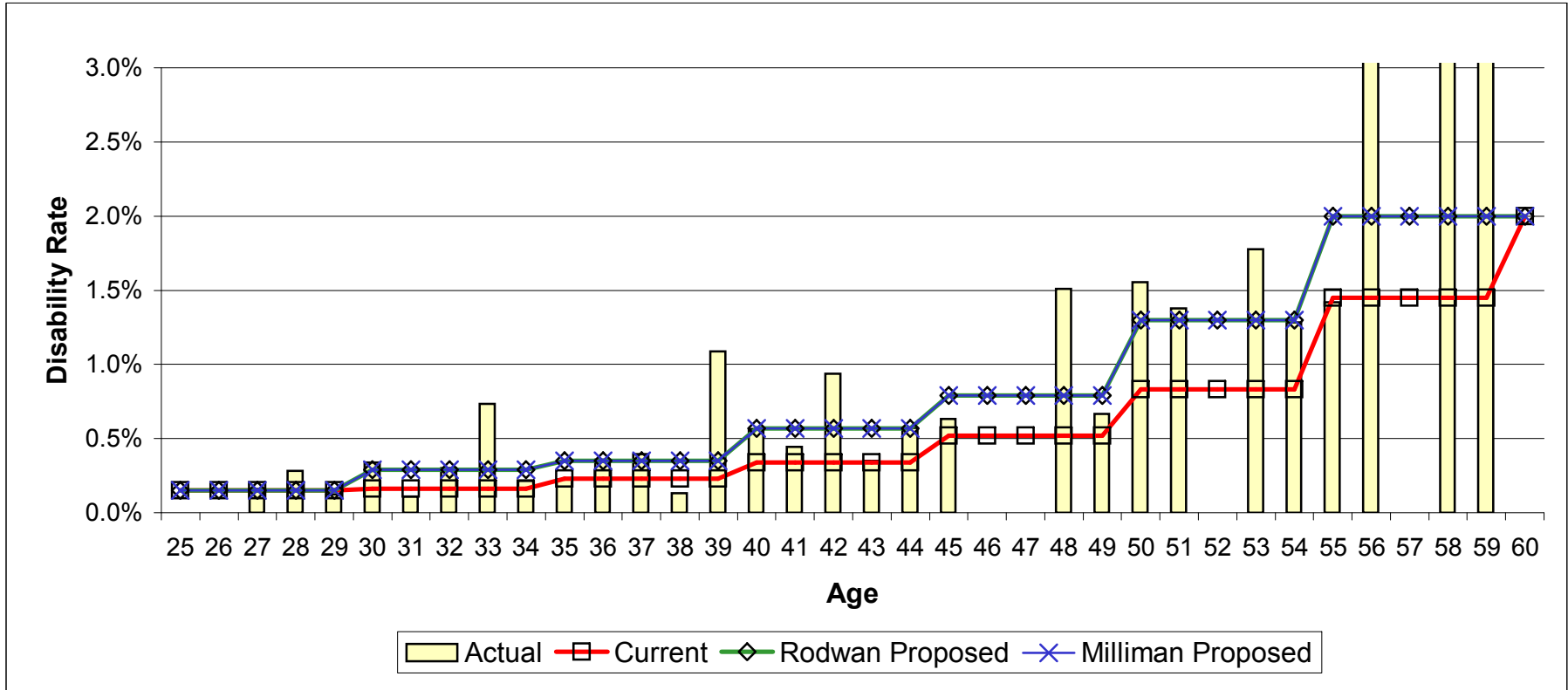
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-63

Rates of Disability

PSRS - Police - Small

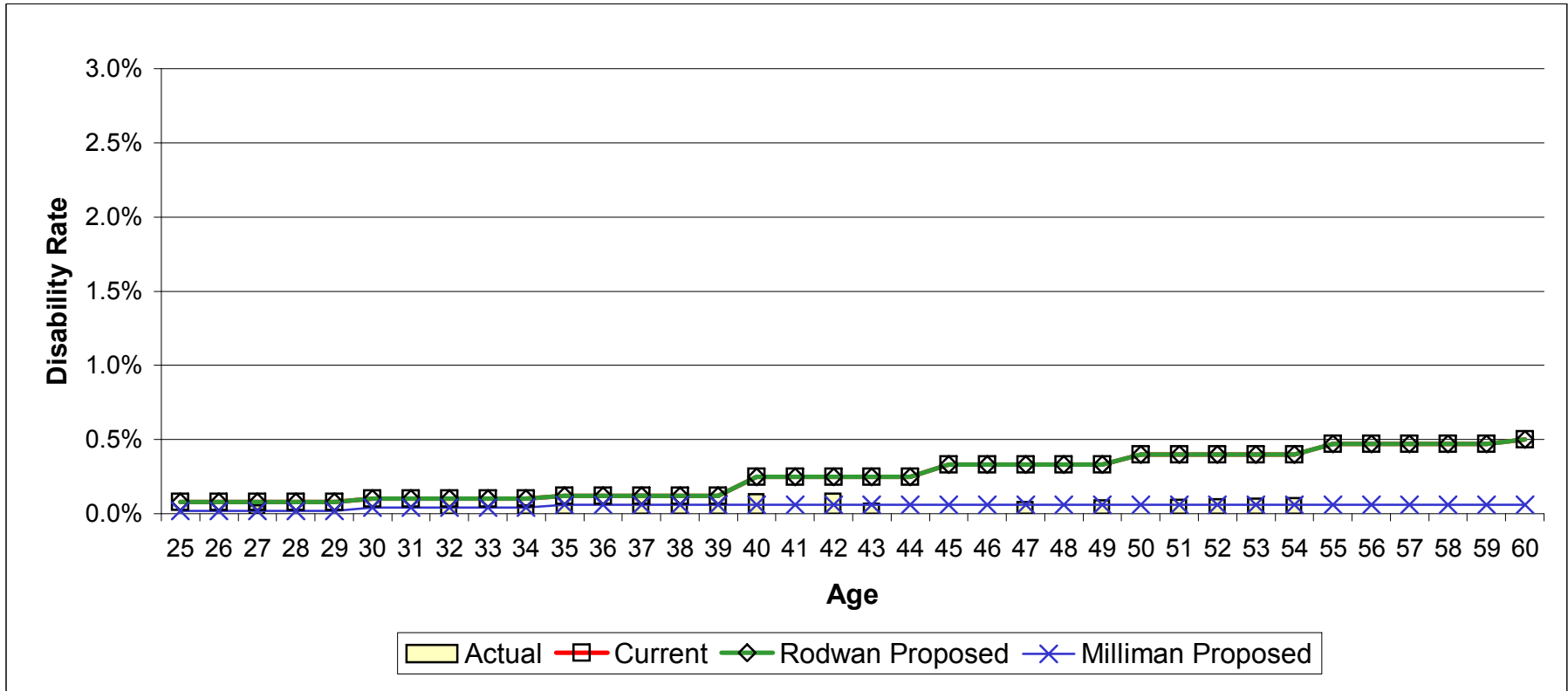


	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	88	58	88	88
Actual/Expected		152%	100%	100%



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Arizona Public Safety Retirement System
Audit of Experience Study 2001-2006
Exhibit C-64
Rates of Disability
CORP



	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	20	108	108	24
Actual/Expected		19%	19%	83%



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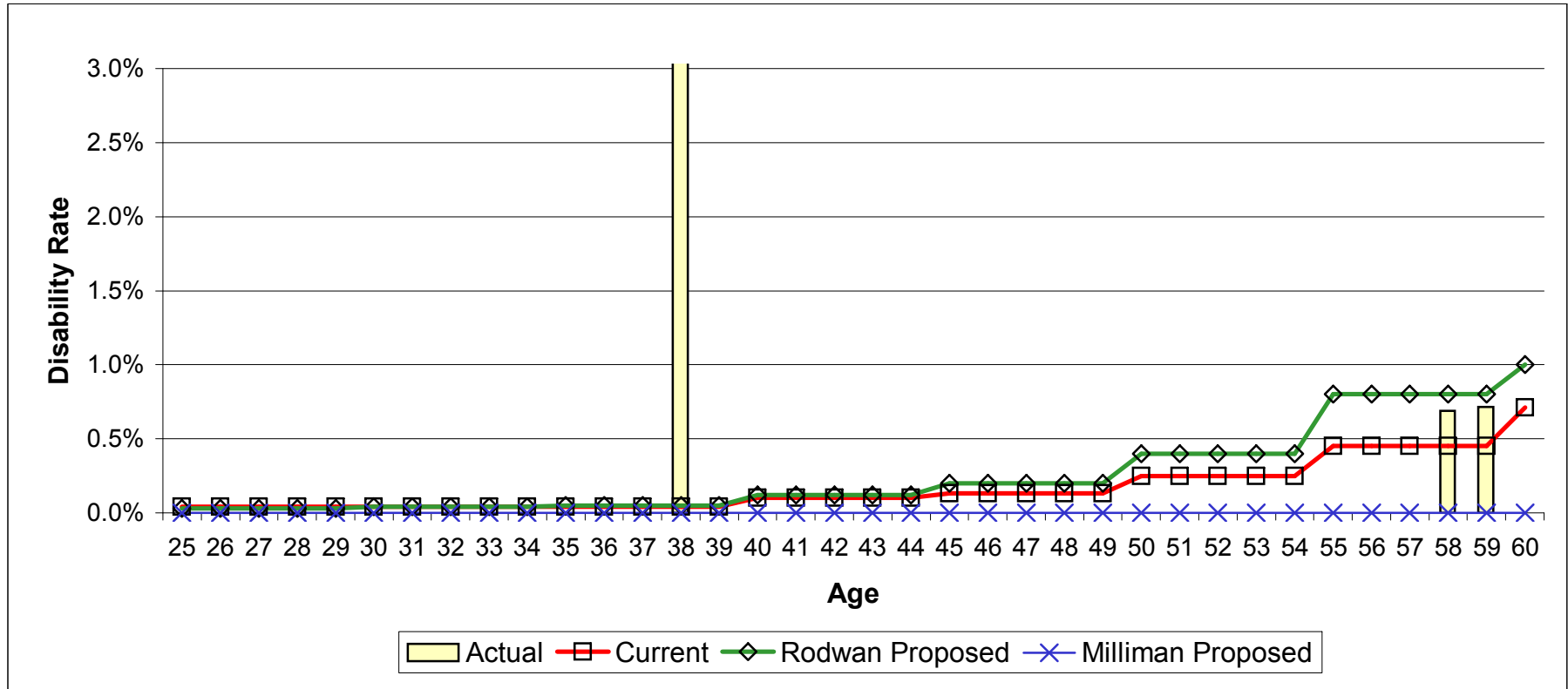
Arizona Public Safety Retirement System

Audit of Experience Study 2001-2006

Exhibit C-65

Rates of Disability

EORP

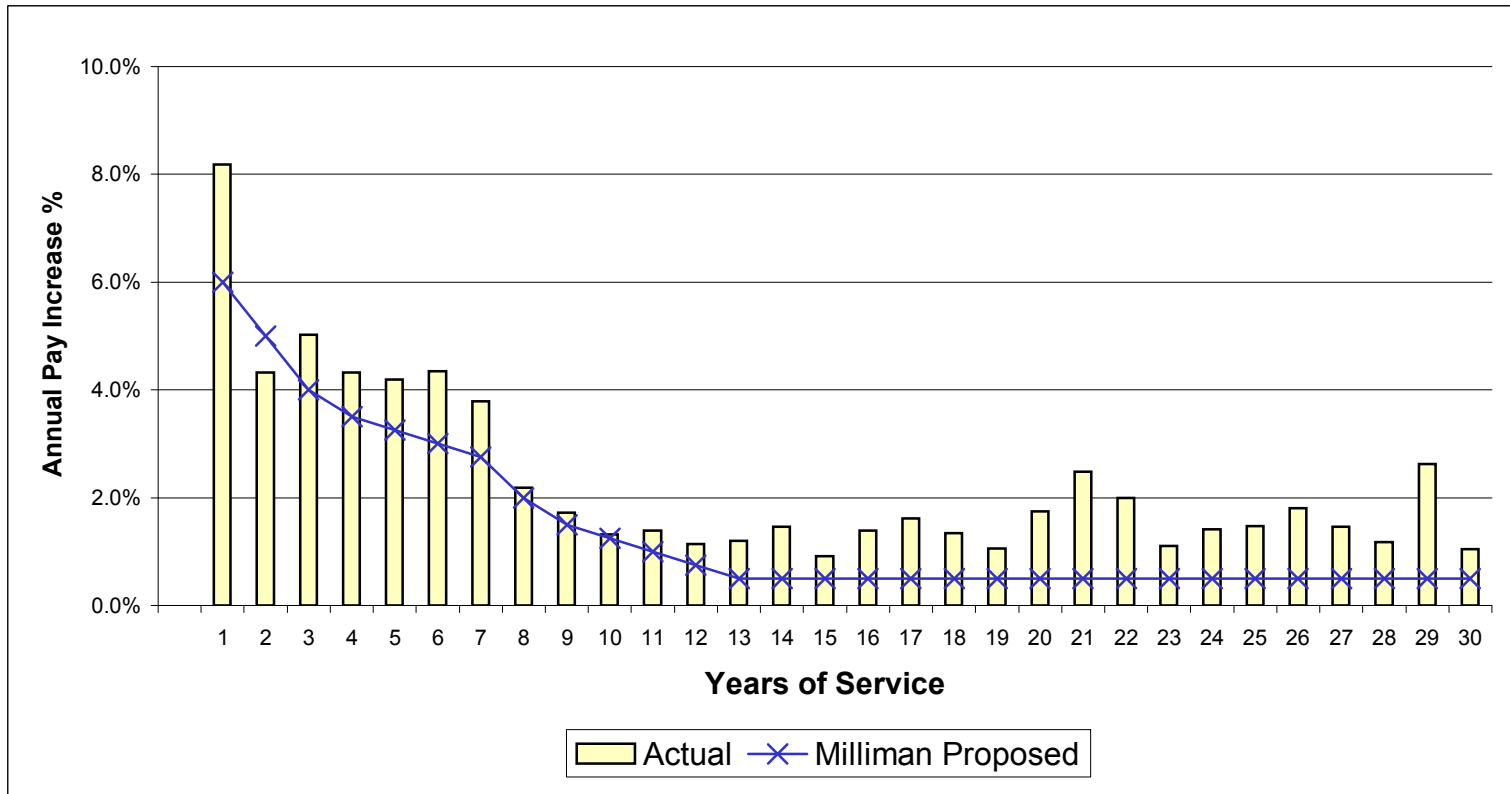


	Actual	Expected - Current Assumptions	Expected - Proposed Assumptions	Expected - Milliman Assumptions
Total Count	3	8	13	-
Actual/Expected		38%	23%	#DIV/0!



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Arizona Public Safety Retirement System
Audit of Experience Study 2001-2006
Exhibit C-66
Merit Salary Scale
PSRS



Arizona Public Safety Retirement System
Audit of Experience Study 2001-2006
Exhibit C-67
Merit Salary Scale
CORP

