2021 CalPERS Experience Study and Review of Actuarial Assumptions

CalPERS

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Executive Summary

The purpose of this experience study is to review actual experience of the system in relation to the current actuarial assumptions, and to recommend changes in actuarial assumptions for the rates of decrement, salary increase rates and economic assumptions, as may be indicated by the review.

The report presents the results of the experience study of the California Public Employees' Retirement System. The report is derived from data collected during fiscal years 2000 to 2019. The last study was completed in December 2017 and reflected the experience between 1997 and 2015. This study reviewed retirement rates (service, industrial related disability and non-industrial related disability retirement), termination rates (vested terminations and refunds), mortality rates (pre- and post-retirement) and rates of salary increase (increases of salary in excess of inflation) and recommends new assumptions for use in actuarial valuations of plans that participate in the California Public Employees' Retirement Fund (State, Schools and Public Agencies).

Significant outcomes of this study include:

- We have seen modest improvements in post-retirement mortality rates for healthy male and female recipients. Recommended mortality rate modifications result in increased life expectancy at age 55 of 0.7 years for males and by 0.4 years for females.
- Some groups experienced lower numbers of retirements than expected including State Miscellaneous, Schools Pool and Public Agency Miscellaneous plans. Other groups such as CHP, State Peace Officers and Firefighters and certain public agency safety groups experienced more retirements than expected.
- Higher than expected salary increases were observed within certain groups including CHP, POFF, State Miscellaneous, State Safety, and the Schools Pool. Other groups experienced slightly lower than expected increases including State Industrial and Public Agency County Peace Officers.
- A new set of assumptions for terminations with vested benefits and refunds is being proposed for all 11 groups. Significant differences were observed between males and females. Females generally terminate at higher rates than males. Separate rates were developed for males and females in this study. The proposed assumptions predict higher rates of termination except for State Industrial.
- Our analysis indicated that in general there have been fewer disability retirements for State Miscellaneous Female, State Industrial, State Safety, Schools and public agency members than expected based on the current assumptions. We are recommending slightly reduced non-industrial disability retirement rates for these groups. For all other groups, actual experience was generally close to expected.
- Mixed results for other assumptions (these are described in detail in this report).

Introduction

The purpose of this experience study was to review the actual experience of the system in relation to the current actuarial assumptions, and to recommend changes to the actuarial assumptions for rates of decrement, salary increase and economic factors as may be indicated by such a review. The report has been prepared in accordance with current board policy which requires that an actuarial experience study be performed every four years. The report presents findings of demographic assumptions of the plans that participate in the California Public Employees' Retirement Fund (State, Schools and Public Agencies) for the 19-year period from 2000 to 2019.

BACKGROUND

An experience study is a summarization of actual experience over a defined period of time. A study can be on past economic experience (such as past inflation, real rates of return on various asset classes, real salary growth, and payroll growth of the active population) and/or on past demographic experience (with an analysis of recent patterns of termination, death, disability, and retirement).

This study includes all the experience of the system for both demographic and economic experience except real rates of investment return. We consider the advancement of salaries due to seniority, merit, and promotion, independent of inflation as demographic experience for the purposes of this study.

Actuaries use the term decrement to describe the circumstances under which individuals leave a population under study. For example, an individual may decrement from the group of active members of the plan due to termination (vested or non-vested), death (industrial related or not), disability (industrial related or not), or service retirement. Exposure is the term used by actuaries to represent the length of time that an individual was exposed to the possibility of leaving the population due to the decrement being studied.

We first compute the raw rates of decrement and salary increases. The raw rate of decrement (for a given decrement and studied population) is defined as the total number of individuals that left the population due to that decrement divided by the total exposure to that decrement for the group. The raw rate of salary increase for a given group is the observed percentage change in salaries for the group from one year to the next. The rates are tabulated based on age and/or length of service. They do not necessarily become new actuarial assumptions about patterns of behavior for the future for two major reasons. First, the raw rates may represent only a sample of what might be a smooth underlying formula that actually predicts behavior; an actuary frequently will smooth or graduate the raw rates to approximate the smoother underlying formula. Second, and more importantly, the future does not necessarily repeat the past; the actuary must use professional judgment to estimate possible future outcomes based on past experience as well as future expectations and select assumptions based upon application of that professional judgment.

PURPOSE OF THE REPORT

The purpose of this experience study is to review the actual experience of the system against the current assumptions and to recommend new actuarial rates of decrement, salary increase (in excess of inflation) and economic assumptions (other than the discount rate) based on that experience.

SCOPE OF THE STUDY

This study focused on demographic experience and economic assumptions. The study reviewed retirement rates (service, industrial related disability and non-industrial related disability retirement), termination rates (vested terminations and refunds), mortality rates (pre- and post- retirement), rates of salary increase (increases of salary in excess of inflation), the proportion of members who are married, and the age difference between a member and their spouse. The study did not investigate other demographic assumptions such as the amount of unused sick leave or the load to account for the use of Norris decision best factors.

COVID-19 IMPLICATIONS

The current pandemic has had an impact on the operation of public retirement systems across the nation and the world. Based on the timing of this study, the member data used for our analysis, which runs through June 30, 2019, does not include impacts of COVID-19. Preliminary analysis of system experience since the beginning of the pandemic has shown demographic experience (e.g., retirements, deaths, etc.) did differ from the current actuarial assumptions in some areas. These differences will be more precisely quantified in actuarial valuations dated June 30, 2021 and beyond. At this time, we do not believe that the demographic impacts of COVID-19 will have a material impact on system experience going forward. Therefore, the experience analyzed through June 30, 2019 in this study is the primary driver of recommended assumptions to be used for future valuations.

Demographic Experience Methodology

Demographic Experience Methodology

A general discussion of the methodology used follows. Additional details about the methods used are included in the description of the findings for each decrement.

DATA SOURCE

The source of the data used in this study was the data stored in the actuarial valuation system. This data consists of a series of snapshots of the member data taken as of the end of each fiscal year.

The data for the experience study was extracted from the actuarial database in the form of 19 annual snapshots as of June 30th of the years 2000 to 2019. The data represents the participants in all the retirement plans included in the California Public Employees' Retirement System.

These consecutive snapshots were used to populate a stand-alone Oracle schema used exclusively for this purpose. Each individual member is tracked from the time they enter the study to the time that they exit or until the final year of data whichever applies. Those who exit are assigned an exit reason.

CALCULATION OF EXPOSURES AND ASSIGNMENT OF DECREMENTS

In general, an individual's exposure to a particular decrement begins only after that individual is eligible to receive benefits should that decrement occur. To reflect this, the exposure of each individual in the study commenced at either the study start date (as outlined in each decrement section) or the eligibility date, whichever was later. Similarly, exposure ended at the study end date or the date at which the eligibility ceased, whichever was earlier. We excluded individuals who decremented before the study start date or were not eligible to receive a benefit by the study end date. The Balducci hypothesis was applied, so if the decrement under study occurred during the observation period, exposure continued to the end of the age and/or service interval in which the decrement occurred.

The calculation of exposures, decrements and rates was applied consistently for all assumptions and was consistent with the method used by the actuarial valuation software. For active members, decrement timing used for age was age nearest birthday on decrement date and the decrement timing used for service calculated as rounded beginning of year attained minus rounded CalPERS entry age, again consistent with the method used by the actuarial valuation software. For post-retirement mortality, exact ages were used for exposure calculations and results were tabulated by age last birthdate consistent with the valuation software.

RATES STUDIED

As was specified in the methodology report, the following demographic assumptions were studied.

Retirement Rates

- Service Retirement
- Industrial Disability Retirement
- Non-Industrial Disability Retirement

Mortality Rates

- Pre-retirement Mortality - Ordinary
- Pre-retirement Mortality - Industrial
- Post-retirement Mortality - Service Retiree
- Post-retirement Mortality - Non-Industrial Disability Retiree
- Post-retirement Mortality - Industrial Disability Retiree

Termination Rates

- Termination (with and without refund)

Non-Decrement Rates

- Salary Increases (due to factors other than wage inflation)

GROUPING FACTORS

Actuarial assumptions are based on several factors, including, but not limited to age, gender, and service. For each decrement, different factors were examined for possible use in setting actuarial assumptions. The decision as to which factor to use was based on CalPERS actuaries' professional judgment.

The factors that were examined are documented in the methodology report. Possible factors included:

- Age nearest birthday on decrement date
- Service (Computed as rounded Attained Age – rounded Entry Age)
- Entry Age (Rounded CalPERS Attained Age)
- Age at Retirement
- Gender
- Retirement Formula
- Organization Category (State, Schools, or Public Agency)
- Membership Category (e.g., Miscellaneous, Industrial, Fire, Police)
- Employer Type (City, County, or Other)

Note that with the passage of Senate Bill 400 in 1999, State Miscellaneous Tier 2 and State Industrial Tier 2 members were given the option to convert their Tier 2 service to Tier 1 any time prior to retirement. Thus, the number of members being covered under Tier 2 plans continue to decrease year after year. Therefore, only Tier 1 assumptions were derived as part of this experience study. Tier 2 assumptions will remain unchanged.

GRADUATION

Various methodologies were used to graduate the results depending on the decrement and the amount of data available ranging from a modified Whittaker-Henderson graduation formula, polynomial, a simple linear fit to a manual adjustment. Details are discussed in the sections dealing with the individual decrements and in the section dealing with the salary scale.

MARGINS

A margin is the difference between the assumption used for a calculation and the corresponding best estimate assumption. The actuarial assumptions recommended in this report represent our best estimate of future experience with no margins for adverse deviation except for the mortality contingency load for terminating plans.

ANALYSIS

The analysis of the demographic experience for this study involved the following general steps:

1. First, the number of decrements and exposures for the decrement under study were calculated and tabulated.
2. Next, the number of members expected to decrement was calculated by multiplying the exposures by the expected rates of decrement (current assumptions).
3. Finally, the number of actual decrements was compared with the number of expected decrements over a given period. The comparison which was expressed as a percentage is called the actual to expected ratio (A/E Ratio).

If the actual experience, based on the A/E ratios differed significantly from the overall expected results, whether by a pattern based on visual graphs, R Squared statistic, or Confidence Intervals (CI), then new assumptions were considered using these tools including using credibility statistics, otherwise, no changes to current rates were recommended.

The findings for each decrement are presented in the tables in the following sections.

Findings

SERVICE RETIREMENT FOR ACTIVE MEMBERS

Summary

The experience over the study period shows that, in general, there were fewer retirements than expected based on the current retirement assumptions for most of the State, Schools Pool and Public Agency Miscellaneous plans.

For most plans, the recommendation is to revise the age and service-based retirement assumptions to more closely align with the actual retirement experience observed during the experience study period for each benefit formula. No changes in assumptions are being proposed for Public Agency Safety members under the 2% at age 55 formula, and the PEPRA formulas.

For the following benefit formulas and/or member classifications the proposed assumptions predict lower numbers of expected retirements as compared with the current assumptions:

- Public Agency Miscellaneous members under the 2% at age 60, 2% at age 55, 2.5% at age 55, 2.7% at age 55 and 3% at age 60 formulas,
- Public Agency Police members under the 2% at age 50 formula,
- Public Agency Fire members under the 3% at age 55,
- State Industrial, State Safety and State Miscellaneous.

For the following benefit formulas and/or member classifications the proposed assumptions predict higher number of expected retirements as compared with the current assumptions:

- Public Agency Fire members under the 3% at age 50 formula,
- Public Agency Police members under the 3% at age 50 and 3% at age 55 formulas,
- State CHP and State POFF.

For the following benefit formulas and/or member classifications the proposed assumptions predict a similar number of expected retirements as compared with the current assumptions, however with a different pattern of retirements:

- Public Agency Fire members under the 2% at age 50 formula

All current and proposed assumptions are based on age and service except for the Public Agency Police and Fire 2% at age 55 plans which are simply age based. The age and service-based retirement assumptions result in more accurate modeling of future retirements and associated liabilities. However, due to the size of the covered population, there is too little experience to develop credible age and service-based assumptions for the Public Agency Safety 2% at age 55 plans.

Method

The retirement rate analysis was based on data collected between June 30, 2007 to June 30, 2019. Other periods within the date range were also studied to identify the effects of certain events on retirement rates.

The data was first grouped by membership category and benefit formula. To assess whether the current assumptions continue to be appropriate we compared the actual number of retirements to the expected number of retirements anticipated by our current assumptions. The expected number of retirements was compared to the actual number of retirements (A/E ratio) for all ages and for all services. Based on this comparison, changes to the current assumptions were made where appropriate using adjustments to current retirement probabilities to achieve overall and age specific (i.e. each and every age) expected retirements that align with the recent actual experience.

Active and terminated members' retirement experience was studied separately. Transferred member records were excluded to prevent potential double counting of exposures and decrements. The proportion of transferred members who do not have an active record elsewhere in the system is so small that excluding such members will not compromise the results of the study. Since most transferred members are also active members with another CalPERS employer, the active retirement rates will be applied to the transferred members.

We also attempted to exclude any experience in the periods before and after an agency experienced an increase in their retirement formula. Experience has shown that members delay retirement from the year before the change in the retirement formula to the year after the improvement. Therefore, any data from these two years was excluded from the study.

Factors used for grouping data:

- Age: The retirement rates display a strong pattern by age, due to influences such as the variance in benefit by age, traditional retirement ages, and eligibility for Social Security.
- Service: Retirement rates generally increase with service.
- Retirement Formula: More generous formulas lead to earlier retirements.
- Organization Category: State and Schools Pool were studied separately.
- Membership Category: Separate retirement rates were developed for Miscellaneous, Police and Fire members.
- Employment Status: Active and terminated were studied separately.

Factors studied but not used for grouping data:

Gender: The data indicated there has been somewhat different retirement experience between males and females over the experience study period. We have chosen not to develop separate retirement rates for males and females, this decision will be reevaluated in the next experience study.

County Peace Officers were studied separately from Public Agency Police, as in the previous study, and the results indicated that it is still appropriate to use the same assumptions for both groups.

Some public agencies may have mandatory retirement policies at certain ages for safety members. No data was available about these policies and it was not possible to identify or exclude the impact of these policies in this study. However, such policies would have affected the results.

Results

The service retirement rates display a strong and consistent pattern by age. This can be attributed to a combination of the psychology of the membership and the structure of the benefits. It has long been observed that members tend to display a preference for retiring at certain ages such as ages 55, and 60, or at the age when the benefit factors no longer increase, or when retiree health coverage becomes available. After age 55 the 2.5% at age 55 and 2.7% at age 55 benefit factors no longer increase. After age 60 the 3% at age 60 benefit factor no longer increases. In addition, retirement rates are also higher at age 62, when Social Security becomes available, age 65, when Medicare becomes available, and age 66, the current Social Security full retirement age.

State and Schools Pool

For the current experience study, data from 2007-2019 was studied. The retirement rates were also studied by four-year periods within the study window to try to isolate the impact certain events might have had on the retirement behavior.

For the Schools Pool, State Miscellaneous, State Industrial and POFF, the actual numbers of service retirements were lower than assumed during the study period. In general, the proposed retirement rates are lower than the current rates to reflect this experience.

For State CHP and State Safety, the actual numbers of service retirements were generally greater than assumed during the study period. In general, the proposed retirement rates are greater than the current rates to reflect this experience. The proposed assumptions were calculated as a blend of the current rates and actual experience.

The PEPRA rates were unchanged as there is not enough data to indicate whether or not the rates should be changed upwards or downwards.

Public Agency Miscellaneous
All Classic Public Agency Miscellaneous plans saw fewer retirements than expected, the proposed assumptions have been adjusted to predict less retirements than expected from the current assumptions over the study period. The 2% at age 60 formula saw the greatest change in actual to expected retirement rates, while the other classic formulas saw some adjustments.

The PEPRA rates were unchanged as there is not enough data to indicate whether or not the rates should be changed upwards or downwards.

Public Agency Safety Fire
For the 3% at age 55 formula, the actual numbers of service retirements were lower than assumed during the study period. In general, the proposed retirement rates are lower than the current rates to reflect this experience.

For 3% at age 50 formula, the actual numbers of service retirements were generally greater than assumed during the study period. In general, the proposed retirement rates are greater than the current rates to reflect this experience. The proposed assumptions were calculated based on actual experience.

For 2% at age 50 formulas, the actual number of service retirements were generally about the same as the assumed number during the study period. However, the pattern of service retirement had changed. There were more service retirements prior to age 55, and from age 55 and higher there were fewer service retirements. Additionally, due to the limited number of individuals in this formula, the rates were based on age and service prior to age 55 and after age 55 was based on age without consideration for the service accrued. In general, the proposed assumptions were made to reflect this shifting in retirement patterns.

The PEPRA rates were unchanged as there is not enough data to indicate whether or not the rates should be changed upwards or downwards.

Public Agency Safety Police
For the 2% at age 50 formulas, the actual numbers of service retirements were lower than assumed during the study period. In general, the proposed retirement rates are lower than the current rates to reflect this experience.

For 3% at age 55 and 3% at age 50, the actual numbers of service retirements were generally greater than assumed during the study period. In general, the proposed retirement rates are greater than the current rates to reflect this experience. The proposed assumptions were calculated as a blend of the current rates and actual experience.

The PEPRA rates were unchanged as there is not enough data to indicate whether or not the rates should be changed upwards or downwards.

The table below compares the actual number of retirements due to service retirement with the expected number of such retirements under both the current and proposed assumptions for active members by plan for the State plans and by benefit formula for Public Agencies.

State and Schools

	Actual	Expected (Current)	Expected (Proposed)
CHP	2,400	2,073	2,413
POFF	17,174	17,042	17,156
Schools	96,639	113,658	97,085
State Industrial	3,955	4,415	3,945
State Miscellaneous	70,123	82,909	69,861
State Safety	9,827	11,208	9,839

Public Agency Miscellaneous

	Actual	Expected (Current)	Expected (Proposed)
2% at Age 60	2,710	3,965	2,709
2% at Age 55	26,125	28,627	26,117
2.5% at Age 55	18,693	19,390	18,689
2.7% at Age 55	21,086	22,691	21,088
3% at Age 60	9,518	11,072	9,517

Public Agency Fire

	Actual	Expected (Current)	Expected (Proposed)
2% at Age 50	75	75	75
3% at Age 55	903	971	903
3% at Age 50	3,933	3,754	3,933

Public Agency Police

	Actual	Expected (Current)	Expected (Proposed)
2% at Age 50	493	530	493
3% at Age 55	781	836	781
3% at Age 50	8,965	7,833	8,965

SERVICE RETIREMENT FOR TERMINATED MEMBERS

Summary

When an active member is projected to terminate, it is assumed that the benefit will commence at a single age (59 for Miscellaneous and 54 for Safety). Staff recommends no change to this assumption (single age) for all terminated members. The methodology is common practice for public retirement systems due, in part, to the relatively small liability associated with this decrement.

Method

The development of the terminated member single average retirement age for Miscellaneous and Safety members was based on the actual number of service retirements by age and a weighted average of each plan’s exposure.

Results

The average retirement ages for terminated members are 59 and 54 for Miscellaneous and Safety members, respectively. Staff recommends no change to the retirement assumption for members in terminated status on the valuation date.

NON-INDUSTRIAL DISABILITY RETIREMENT

Summary

The actual number of non-industrial disability retirements during the study period was lower than the expected number in all cases. As a result, the proposed rates produce either the same or lower numbers of disability retirements. No changes in assumptions are being proposed for State Miscellaneous Male, State Safety or State POFF. Lower overall rates are being proposed for State Miscellaneous Female, State Industrial, CHP, Schools Miscellaneous, Public Agency Miscellaneous, Public Agency Police, Public Agency Fire members and Public Agency CPO members.

Method

The decrement study reviewed the non-industrial disability retirement (NIDR) experience over the 15-year period 2004 to 2019. The last decrement study was performed four years ago using experience from 2000 to 2015. During the period following the last decrement study, 2015 to 2019, the change in the incidence of NIDR varied depending on the group. This 4-year period was deemed too short to be fully reflected in the proposed rates. Where changes have been recommended, the proposed rates were derived using the results of 15 years of experience from 2004 to 2019.

Transferred members were excluded from the study of this decrement. Factors used for grouping data:

- Age: Rates displayed a strong and fairly consistent pattern by age.
- Gender: For some groups, male and female disability rates differed significantly, and separate tables were produced. For other groups, the male and female rates did not differ significantly, or there was insufficient data to determine if rates were materially different, and the results were combined.
- Membership Category: There are substantial differences in the disability rates by membership category.

Results

No changes in assumptions are being proposed for State Miscellaneous Male, State Safety and State POFF. New lower rates are being proposed for all other groups. In the recent past, State Miscellaneous Tier 2 had not been studied, and Tier 1 rates had been used for this member group. Tier 2 is about 2% of the State Miscellaneous active population and will shrink in the future until no active members remain. For this reason, Tier 1 and Tier 2 experience was combined for this study. PEPRA members are not differentiated in any group.

For the Schools pool, males had higher disability rates; in State Miscellaneous, females had higher disability rates; in Public Agency Miscellaneous, disability rates were slightly higher for females prior to initial retirement ages (50 to 55) and then trended below disability rates for males at high ages (60 and above). These results are consistent with the results from the previous experience study.

For Miscellaneous groups, disability rates at high ages (60 and above) are at or lower than the rates at initial retirement ages (50 to 55). This pattern was observed in multiple groups where substantial portions of the active population work beyond age 60 (e.g. State Miscellaneous, Public Agency Miscellaneous, and Schools Pool). We believe that an explanation for this effect could be that, beyond age 55, the service retirement benefit is greater than the disability benefit, which encourages people to choose service retirement.

The table below compares the actual number of NIDR with the expected number of such retirements under both the current and proposed assumptions. The counts are for 2004-2019.

Non-Industrial Disability Retirement

	Actual	Expected (Current)	A/E Ratio	Expected (Proposed)	A/E Ratio
State					
Miscellaneous Female	2,676	2,911	92%	2,765	97%
Miscellaneous Male	1,571	1,617	97%		No Changes
Industrial	498	614	81%	498	100%
Safety	478	519	92%		No Changes
POFF	380	380	100%		No Changes
CHP	12	14	84%	12	100.0%
Schools					
Schools Female	2,423	2,691	90%	2,530	96%
Schools Male	1,492	1,609	93%	1,542	97%
Public Agency					
Miscellaneous Female	1,335	1,513	88%	1,406	95%
Miscellaneous Male	1,173	1,368	86%	1,247	94%
Fire	43	54	80%	43	100%
Police	91	161	57%	91	100%
CPO	93	105	89%	94	99%

INDUSTRIAL DISABILITY RETIREMENT

Summary

Modified Industrial Disability Retirement (IDR) rates are being recommended for only State Industrial and State Safety. State Industrial has proposed rates that are lower than the previous rates and State Safety has proposed rates that are higher than the previous rates.

Method

The decrement study reviewed the IDR experience over (a) the 4-year period 2015 to 2019, (b) the 10-year period 2009 to 2019, and (c) the 15-year period 2004 to 2019. The last decrement study was performed four years ago covering experience from 2005 to 2015. By examining and comparing these 3 periods, trends emerged indicating that rates should be revised for State Industrial and State Safety.

Transferred and terminated members were excluded from the study for the same reasons listed in the study of the service retirement decrement.

Factors used for grouping data:

- Age: Rates increase with age. There were very few decrements below age 30 while some groups had very high IDR rates close to or at service retirement eligibility ages.
- Employee Category: The IDR rates differed by employee category. Therefore, separate rates are used for State Industrial, State Safety, State POFF, State CHP, Public Agency Fire, Public Agency Police and Public Agency CPO members.

The data indicated there is a difference in IDR rates for male and female members. There were also indications that rates varied by length of service. However, there is not sufficient credible experience to produce male/female specific IDR rates on age and service.

Discussion

There are significant variations in the patterns of industrial related disability between the various membership categories. It is believed that these differences represent real underlying differences in the behavior of members. For example, three of the groups (Public Agency Police, Public Agency Fire and California Highway Patrol) show a very substantial increase in the rates of industrial disability at or shortly after age 50. Three other groups (State Safety, State POFF and Public Agency CPO's) do not display this effect. This difference is believed to be due to how strictly the disability criteria are enforced for the different groups.

The State Industrial group has much lower IDR rates at all ages than the other groups. This is believed to reflect a difference in the nature of the work performed by this group as compared to the nature of the work performed by the other groups.

Results

The IDR rates remain unchanged for all employee categories except for State Industrial and State Safety. The proposed State Industrial rates are 60% lower than the current rates. The proposed State Safety rates are higher than the current rates beginning at age 49.

The basic IDR benefit is 50% of final compensation plus an annuity purchased pursuant to statute. If the employee is eligible for service retirement, the service retirement benefit is payable, if greater. The rates of IDR are highest over age 50. As many members are eligible for service retirement at this age, they receive the larger service retirement pension in the event of IDR. The IDR's at these higher ages has minimal impact on pension costs.

Pension Reform legislation (PEPRA), effective January 1, 2013, added a provision for safety members who qualify for IDR under age 50. In some circumstances, an IDR pension larger than 50% of final compensation may be payable at ages less than 50. IDR experience will be monitored to see if the change in legislation has any impact on reporting of IDR events. The data available for this experience study did not contain enough credible data to examine the impact of the PEPRA legislation.

The table below compares the actual number of IDR decrements with the expected number of such decrements under both the current and proposed assumptions for the period of 2015 to 2019.

Industrial Related Disability Retirements

	Actual	Expected (Current)	A/E Ratio (Current)	Expected (Proposed)	A/E Ratio (Proposed)
State					
Industrial	7	18	40%	7	100%
Safety	616	555	111%	596	103%
POFF	1,217	1,247	98%		No Changes
CHP	211	201	105%		No Changes
Public Agency					
Fire	478	496	96%		No Changes
Police	1,317	1,383	95%		No Changes
CPO	291	274	106%		No Changes

TERMINATIONS WITH VESTED BENEFITS AND TERMINATIONS WITH REFUND

Summary

A new set of assumptions for terminations with vested benefits is being proposed for all 11 groups. During this experience study ten of the eleven unisex groups were separated into male/female groups. The actual versus expected ratios for the period of 2000 through 2019 ranged from 90% to 269%. After graduating the new assumptions, the actual versus expected ratios for the period of 2000 through 2019 ranged from 101% to 118%.

In addition, a new set of assumptions for terminations with refunds is being proposed for all 11 groups. The actual versus expected ratios ranged from 88% to 171%. After graduating the new assumptions, the actual versus expected ratios for the period of 2000 through 2019 ranged from 98% to 138%.

Method

Terminations with vested benefits and terminations with refunds were looked at separately. All terminated members having less than 5 years of service before termination were considered refunds. Vested terminations are assumed to retire at age 59 and 54 for miscellaneous and safety, respectively. Therefore, in this study, the decrements and exposures beyond the assumed retirement age for vested terminations was excluded since they were assumed to retire. For simplicity and to avoid double counting, only data from active members was included in the study.

Factors used for grouping data:

- Entry Age: Termination rates declined as age increased. Entry age was used as a grouping factor for State Miscellaneous, Schools, Public Agency Miscellaneous and State Industrial categories. However, Safety groups generally have less variance in the age at date of hire than do Miscellaneous groups. This results in a higher correlation with service and makes this factor less useful in predicting terminations. Given this effect and the lesser amount of data available for safety groups, entry age was not used as a grouping factor for safety categories.
- Service: Termination rates declined as service increased. Service is used as a grouping factor in the current rates for all employee categories.
- Employee Category: Significant differences were observed in the termination rates applicable to different employee categories. Separate tables of termination rates were used for Miscellaneous, Police, Fire and CPO members.
- Gender: Significant differences were observed between males and females. Females generally terminate at higher rates than males, Separate rates were developed for males and females in this study, except for State Industrial where we did not observe significant differences.

Factors studied but not used for grouping data:

- None

The raw rates were smoothed using the following methods or a combination of the methods: Whittaker-Henderson, log-normal, polynomial, exponential and manual adjustment.

Results

Overall, termination rates with vested benefits and refunds decrease as age and service increase. The proposed assumptions predict higher rates of termination except for State Industrial.

The table below compares the actual versus expected number of terminations with vested benefits.

Termination with Vested Benefits

		A/E Ratio (Current)	A/E Ratio (Proposed)
Miscellaneous Tier 1	Male	100%	100%
	Female	117%	100%
Miscellaneous Tier 2	Male	113%	103%
	Female	123%	101%
State Industrial	Male & Female	113%	102%
State Safety	Male	114%	101%
	Female	152%	101%
POFF	Male	97%	100%
	Female	156%	100%
CHP	Male	91%	103%
	Female	201%	116%
Schools Pool	Male	99%	100%
	Female	119%	100%
PA Miscellaneous	Male	96%	100%
	Female	121%	100%
PA Fire	Male	100%	102%
	Female	264%	107%
PA Police	Male	110%	101%
	Female	218%	102%
CPO	Male	96%	101%
	Female	155%	108%

The table below compares the actual versus expected number of terminations with refunds.

Termination with Refunds

		A/E Ratio (Current)	A/E Ratio (Proposed)
Miscellaneous Tier 1	Male	106%	103%
	Female	114%	103%
Miscellaneous Tier 2	Male	92%	108%
	Female	97%	109%
State Industrial	Male & Female	100%	100%
State Safety	Male	90%	100%
	Female	117%	100%
POFF	Male	107%	100%
	Female	125%	100%
CHP	Male	94%	107%
	Female	121%	138%
Schools Pool	Male	104%	100%
	Female	109%	100%
PA Miscellaneous	Male	88%	102%
	Female	106%	101%
PA Fire	Male	112%	102%
	Female	171%	101%
PA Police	Male	107%	102%
	Female	127%	101%
CPO	Male	92%	101%
	Female	122%	101%

PRE-RETIREMENT MORTALITY (NON-INDUSTRIAL AND INDUSTRIAL)

Summary

Pre-Retirement mortality (Death from Active Status) assumptions have been developed for both Miscellaneous and Safety groups separately by gender. Unlike other active demographic assumptions, which rely solely on plan experience, for pre-retirement mortality standard mortality tables and projection scales developed by the Society of Actuaries serve as references for the development of CalPERS assumptions. Previous CalPERS experience studies used only CalPERS data to develop pre-retirement mortality tables despite the somewhat limited credible mortality data as other published mortality tables did not reflect CalPERS experience and no public sector specific mortality tables were available. The construction of mortality tables requires extensive experience data across the examined population for valid results and even more data than CalPERS history provides.

In 2019 the Retirement Plans Experience Committee (RPEC) of the Society of Actuaries (SOA) published an extensive mortality study[1] and developed a new set of mortality tables for the U.S public pension plans. These Pub-2010 mortality tables are separated for teachers (PubT-2010), safety members (PubS-2010) and other general public employees (PubG-2010). The experience covered 35 public systems encompassing 78 plans with CalPERS also providing data for this study. It has been shown that salaries for active members are a significant predictor of mortality differences, separate tables were developed for Above-Median and Below-Median salary experience. Based on our review, CalPERS experience correlates more strongly with Above-Median Salary mortality tables [PubG-2010(a) & PubS-2010(a)]. We found that the tables matched well with CalPERS mortality experience.

Since our last experience study, which used mortality improvement scale MP-2016, the SOA has released a series of mortality improvement scales the latest of which is MP-2020[2]. MP-2020 incorporates mortality improvement trends with actual recent mortality rates, by using rates that vary not only by age but also by calendar year – known as a two-dimensional approach to projecting mortality improvements. Scale MP-2020 was designed with the intent of being applied to mortality on a generational basis. The effect of this is to build in an automatic expectation of future improvements in mortality. In other words, generational mortality explicitly assumes that members born more recently will live longer than the members born before them thereby capturing the mortality improvement seen in the past and expected continued improvement. Recent reports issued by RPEC suggest that using generational mortality is the preferred approach, as it allows for an explicit declaration of the amount of future mortality improvement included in the assumptions. CalPERS is using new proprietary experience study software which uses generational mortality. RPEC believes that Scale MP-2020 produces a reasonable mortality improvement assumption for measuring obligations for most retirement programs in the United States within the context of the assumption universe as described in Actuarial Standard of Practice No. 35 (ASOP No. 35) (ASB 2014). Consistent with post-retirement mortality improvement analysis pre-retirement mortality improvement will also use 80% of MP 2020.

New sets of pre-retirement mortality rates are being proposed for both male and female plan participants in the Miscellaneous and Safety membership categories. In previous experience studies the pre-retirement rates for Safety members were set equal to those of the Miscellaneous members. Whereas post retirement mortality continues to show no material difference between Safety and Miscellaneous groups the advent of standard public sector mortality tables coupled with credibility techniques allows separate tables for Safety members to be developed despite limited data.

Methodology

Fifteen years of data for active members through June 30, 2019 was used in this study.

Factors used for grouping data:

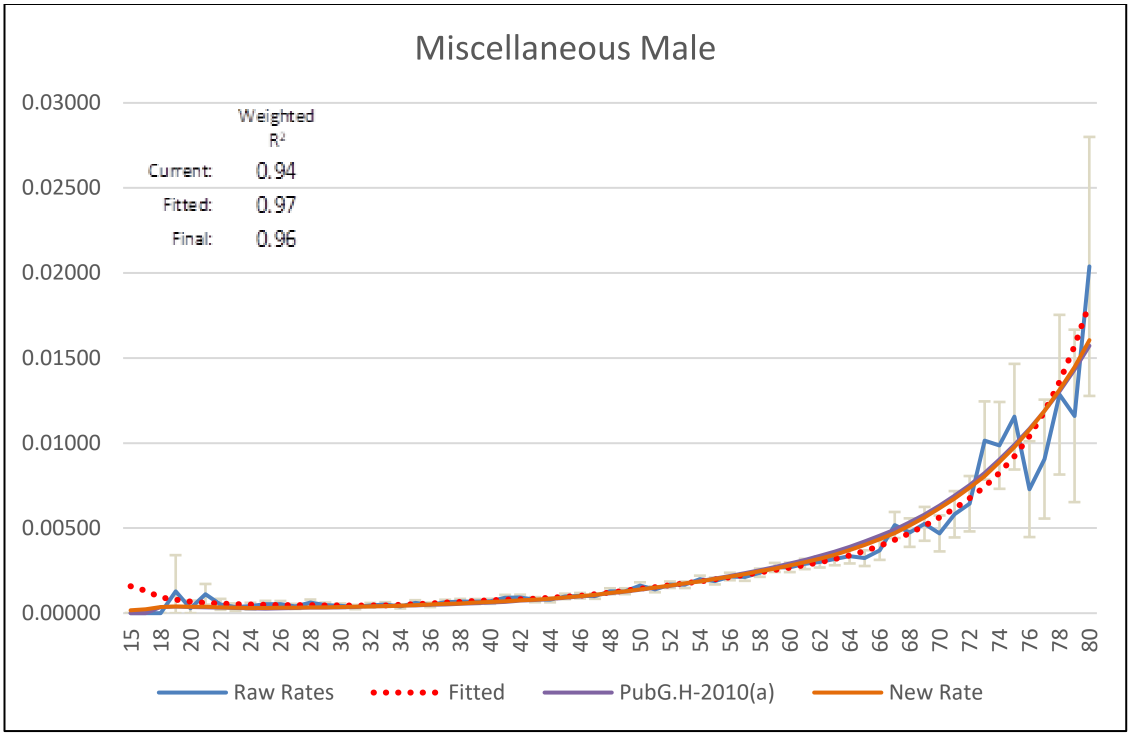
- **Age**: Rates increase with age. Members at older ages have a higher probability of dying than younger members which is consistent with essentially all other mortality studies.
- **Gender**: Male mortality rates are higher than female mortality i.e. male members tend to have a higher probability of dying than their female counterparts. This is almost universally true in all mortality studies.
- **Membership Category**: It was found that for pre-retirement mortality, Safety members have comparatively lower rates of mortality than Miscellaneous members. It is a widely held belief that Safety mortality would be higher than Miscellaneous mortality but that is not borne out in the data. For males the difference in mortality rates from ages 18 to 34 is minimal but beyond age 35 the difference is demonstrable. Although the reason for this is unclear it may be due to the fact that Safety retirement benefit formulas allow for earlier retirement ages and that Safety members have higher rates of disability retirements from active service. In other words, Safety members who are less healthy than the general population may leave active employment sooner with the result that a comparatively healthier cohort remains in active service particularly at ages 50 and above when there is a higher probability of death. The effect is not seen in the female population. Here the Safety female mortality is slightly higher than the Miscellaneous female group up until age 50 and then the Miscellaneous mortality becomes higher. However, there is very little Safety female active deaths to draw a reliable conclusion.

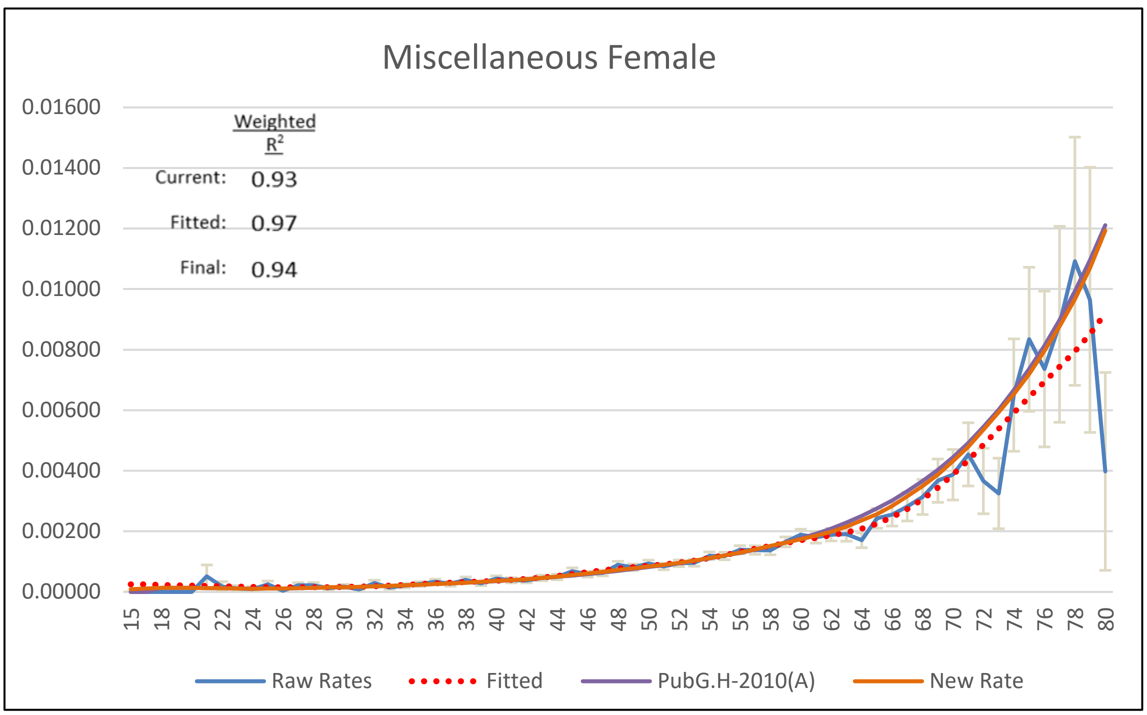
The steps in our analysis are as follows:

1. Raw rates were developed using a Whitaker-Henderson fit.
2. Pub-2010 standard mortality tables that most closely matched the experience of the group were used for comparison.
3. Adjust this standard table either fully or partially depending on the level of credibility for CalPERS experience. We use a credibility ratio of 5% which corresponds to a 90% probability of observed rates is within 5% of true rate. This 90% decrement credibility threshold would require 1082 deaths for full credibility.
4. For ages below 18 where no data was available, we used RPEC gender specific Juvenile mortality rates.
5. MP-2020 mortality improvement projection scale was applied to this adjusted table to create a 2017 base table.
6. Base 2017 table with 80% mortality Improvement using MP-2020 and generational mortality used for pension costing.

Results

The graphs below show the experience study results for the Miscellaneous male and female populations. The graphs compare the raw rates, fitted rates, PubG.2010(A) rates and proposed rates on a headcount weighted basis for healthy lives.





Mortality rates increase with age with male mortality rates higher than female mortality rates. Full tables of rates can be found in the Appendix.

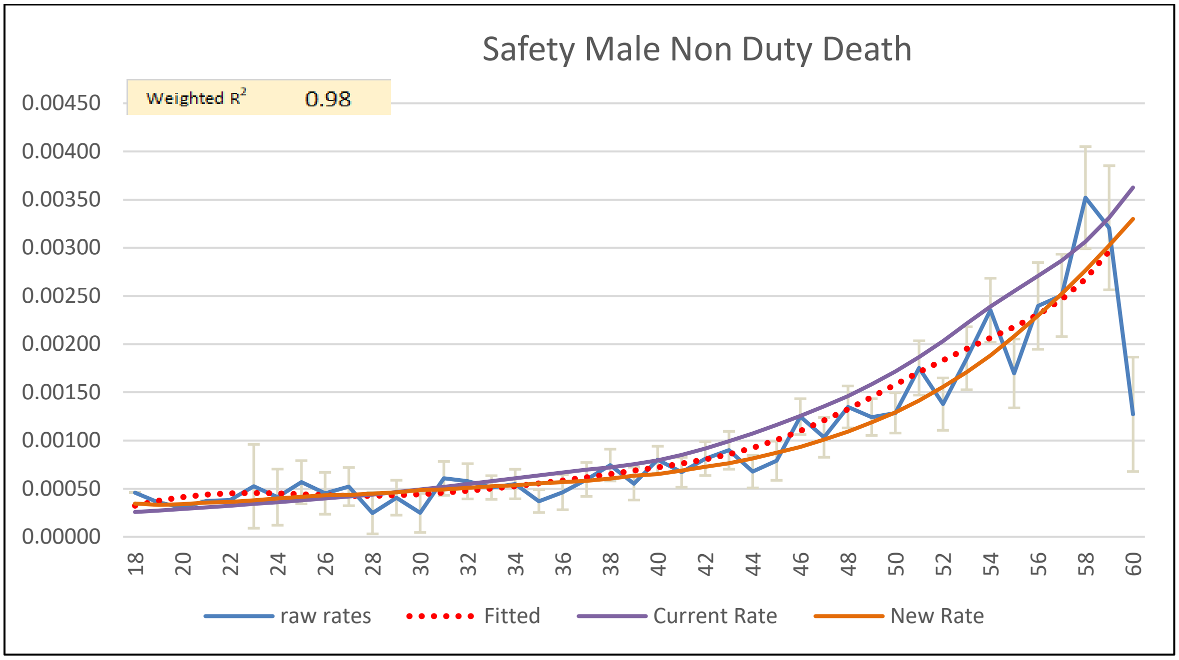
The table below compares the actual number of non-industrial related deaths with the expected number of such deaths under both the current and proposed assumptions.

Miscellaneous Non-Industrial Related Deaths

	Actual	Expected (Current)	Expected (Proposed)	A/E Ratio (Current)	A/E Ratio (Proposed)
Male	5855	5301	5871	110%	100%
Female	5576	5388	5621	103%	99%

The Miscellaneous Industrial Death the mortality rates are set at 1% of the Non-Industrial rates. There are 37 plans that have a Miscellaneous Industrial Death benefit and very few recorded deaths in the data.

The graph below shows the experience study results for the Safety male population. The graph compares the raw rates, fitted rates, PubS.2010(A) rates and proposed rates on a headcount weighted basis for healthy lives.



In prior experience studies we developed combined (Male & Female) Safety Industrial Death (Duty Death) rates from limited data available. Due to this data having insufficient credibility we propose developing rates based on the combined duty and non-duty deaths with 90% of Safety pre-retirement deaths assumed to be non-duty and 10% assumed to be duty deaths. A table of actual versus expected is shown below.

Actual vs. Expected Decrements Safety Duty Death & Non-Duty Death

	Actual	Expected (Current)	Expected (Proposed)	A/E Ratio (Current)	A/E Ratio (Proposed)
Male Total	1398	1286	1307	109%	107%
NDD	1212	1393	1215	87%	100%
DD	186	160	135	116%	138%
Female Total	402	375	379	107%	106%
NDD	391	361	350	108%	112%
DD	10	58	39	17%	26%

References

1. https://www.soa.org/resources/research-reports/2019/pub-2010-retirement-plans/
2. https://www.soa.org/globalassets/assets/files/resources/experience-studies/2020/mortality-improvement-scale-mp-2020.pdf

POST-RETIREMENT MORTALITY FOR HEALTHY RECIPIENTS

Summary

A new set of post-retirement mortality rates is being proposed for both male and female healthy recipients. We have seen modest improvements in post-retirement mortality rates for healthy male and female recipients. In this study, we are making changes to use benefit-weighted experience, adopt a new mortality projection table from the Society of Actuaries and use fully generational mortality calculations. The new projection table MP-2020 has replaced table MP-2016 that was used in the previous experience study. Further analysis was done to demonstrate that 80% of MP-2020 would best represent the mortality improvement of the system over the past 20 years.

Improved mortality leads to an increase in life expectancy. Life expectancy at age 55 is expected to increase from the current rates by 0.7 years for males and by 0.4 years for females.

Previous studies have determined that there are no material differences in the post-retirement mortality rates between retirees from safety groups as compared to retirees from miscellaneous groups. The current study confirmed that there continues to be no significant differences in rates between the two groups.

Method

Factors used for grouping data:

- <u>Age</u>
- <u>Gender</u>

Raw rates weighted by benefit amounts were developed by age and gender and then graduated (by age) using the Whittaker-Henderson method. To ensure fully credible data was used to set final rates, the graduated CalPERS Post-Retirement rates were then blended with different data sources. All blending was done based upon the amount of data underlying CalPERS Post-Retirement rates. For ages where sufficient data existed, graduated rates were entirely based on CalPERS Post-Retirement data. Due to a lack of fully credible data, rates for ages 1 to 17 were exclusively from Juvenile Pub-2010 Tables (published by the Society of Actuaries). For ages 18 to 49, CalPERS Pre-Retirement Mortality rates were blended with CalPERS Post-Retirement rates. For ages 50 and above, rates from the PubG-2010 Tables (published by the Society of Actuaries) were blended with CalPERS Post-Retirement rates. Due to a lack of fully credible data, rates for ages 99 to 120 were set by interpolation.

Mortality rates then were studied by analyzing the annual exposures and decrements over the period from June 30, 1997 through June 30, 2019. In doing so, it became clear that mortality improvements had occurred throughout the entire period. In the last study, graduated rates had 15 years of projected mortality improvement applied using 90% of MP-2016 (published by the Society of Actuaries) to bring the graduated rates from the midpoint of the last study to 2030. This scale consists of expected annual improvements in mortality that vary by age and gender. The expected improvements are greater for males than females.

Since the last study, updated mortality projection Scales MP-2017, MP-2018, MP-2019 and MP-2020 have been published by the Society of Actuaries as a tool for actuaries to project mortality improvement. These scales consist of an expected annual improvement in mortality that vary by age and gender. Scale MP-2020 introduced a change in long-term mortality improvement factors. The long-term improvement rates have been changed to 1.35% for ages 62 and younger, decreasing linearly to 1.10% at age 80, further decreasing linearly to 0.00% at age 115 (and thereafter).

A very useful tool to analyze the trends in mortality is to calculate a Standardized Mortality Ratio (SMR). The SMR compares the actual deaths over a period of years using the same exposures for each year applied to the actual mortality rates by age for each year. This gives us a much better picture of the underlying mortality improvement trends over a longer time period.

In this study, we propose applying 80% of Scale MP-2020 (published by the society of Actuaries) to the graduated rates described above. This proportion of the MP-2020 scale aligns with mortality improvement trends over the past 20 years using the SMR. In addition, we propose using fully generational mortality calculations. These calculations allow for unique mortality rates in each year of the calculation rather than using a static set of rates.

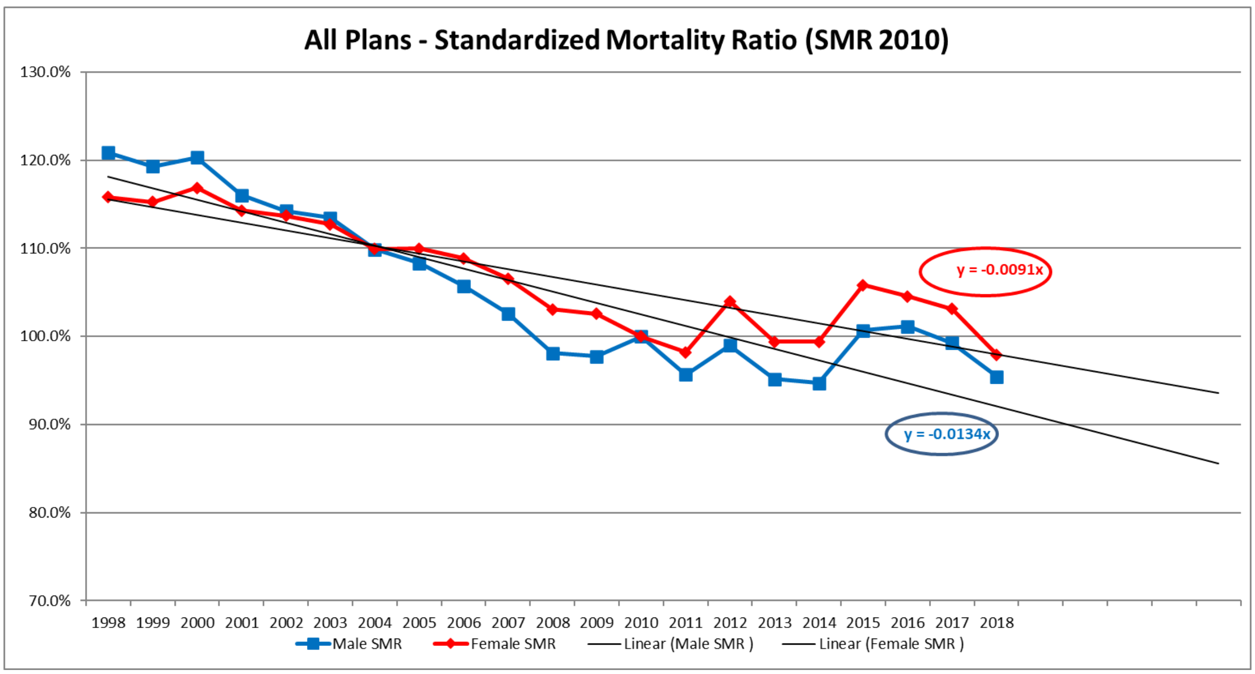
Results

Mortality rates increase with age. Male mortality rates are higher than female mortality rates. When compared to rates from the previous study:

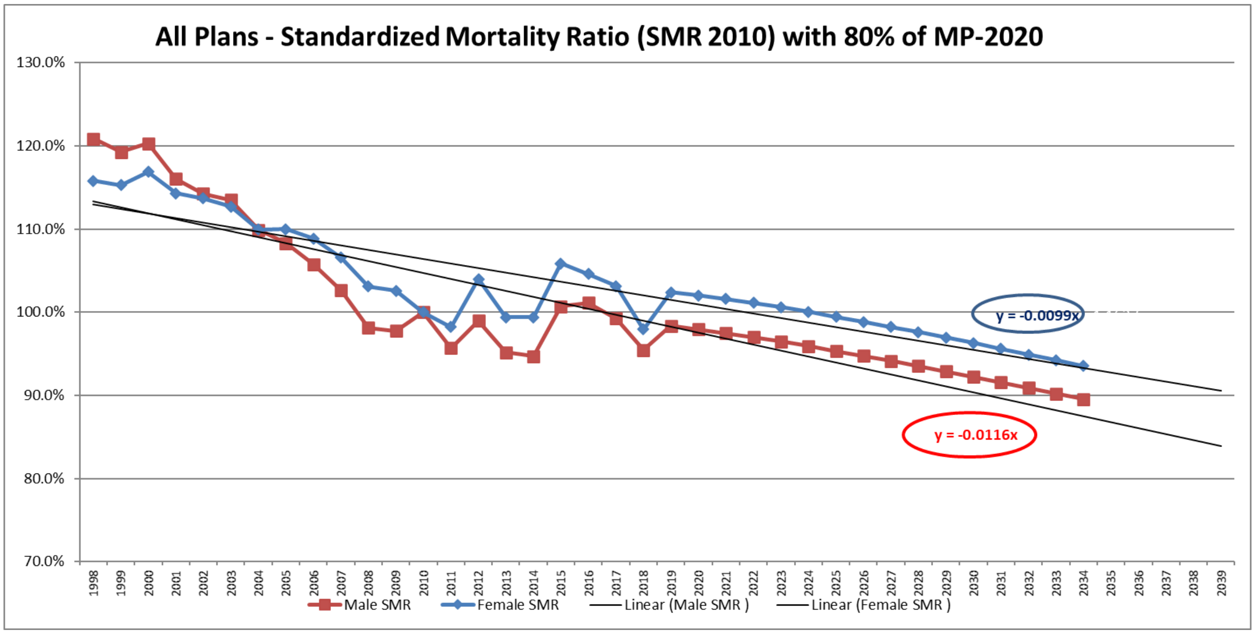
- New male mortality rates are lower at ages 50 through 91, higher for ages 92 through 95, lower at ages 96 through 99, and higher at ages over 99
- New female mortality rates are lower at ages 50 through 85, higher at ages 86 through 87, lower at ages 88 through 91, higher at ages 92 through 102, lower at ages over 102

Standardized Mortality Ratio (SMR)

The Standardized Mortality Ratio for each gender was developed using the exposures for the fiscal year ending 2010 as the base year. Using the 2010 exposures and the actual mortality rates for each year from 1998 through 2019, the following graph provides a comparison of the calculated deaths by year divided by the actual deaths in 2010 to illustrate the improvement in mortality from 1998 to 2019. For example, the data indicates that 20% more males died in 1998 as compared to 2018 with the same assumed exposures. The linear trend lines of best fit show the expected improvement into the future, with annualized improvements of 1.34% for males and 0.91% for females. This is consistent with the national experience that male mortality rates have been decreasing a little more than the female mortality rates.

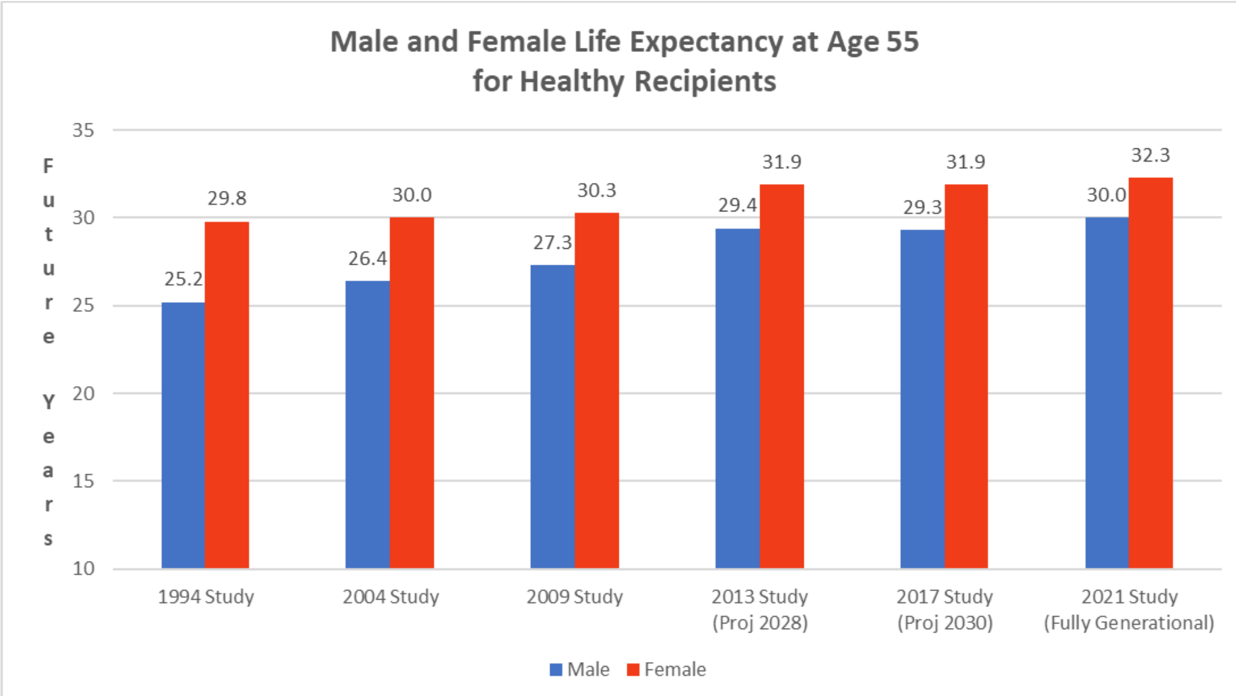


Projecting into the future, it is evident from the following graph that the projected SMR's using 80% of Scale MP-2020 line up very well with the plan experience over the past 20 years and this projection table provides the best estimate for future mortality improvement.



Life Expectancy

Life expectancy is the average remaining number of years a member is expected to live if subjected the rest of their life to the current mortality assumptions. The chart below provides a comparison of life expectancy at age 55 for both male and female healthy recipients, based on prior CalPERS mortality experience. Life expectancy at age 55 remains at basically the same levels as the previous study for healthy recipients. The mortality rates recommended in this 2021 study incorporate fully generational mortality calculations and benefit weighted base rates, whereas past calculations used a fixed period of mortality improvement and headcount weighted base rates.



The table below provides a comparison of the life expectancy for males and females under the current assumptions with 15 years of mortality improvement and the proposed assumptions which have fully generational mortality improvement. For example, based on the current assumptions, you would expect a male age 50 to live 33.7 more years and a female the same age to live 36.2 more years. Under the proposed assumptions a male age 50 is now expected to live 34.8 years, while a female age 50 is expected to live 37.1 years.

Life Expectancy (In Years) Healthy Recipients

Attained Age	Current Assumptions with 15 Years of Mortality Improvement (A)		Benefit Weighted Base Rates with No Improvement (B)		Column B with Fully Generational Mortality Improvement (80% of MP-2020)	
	Male	Female	Male	Female	Male	Female
50	33.7	36.2	33.5	35.8	34.8	37.1
55	29.3	31.9	29.0	31.2	30.0	32.3
60	25.0	27.5	24.6	26.7	25.4	27.5
65	20.9	23.2	20.4	22.4	20.9	23.0
70	16.9	18.9	16.3	18.1	16.7	18.5

POST-RETIREMENT MORTALITY FOR NON-INDUSTRIAL RELATED DISABLED RETIREES

Summary

A new set of post-retirement mortality rates is being proposed for both male and female non-industrial (non-work) related disabled recipients. When compared to rates from the previous study:

- New male non-industrial disability mortality rates are higher at ages 50 through 91, lower for ages 92 through 94, higher at age 95, lower at ages 96 through 99, and higher at ages over 99
- New female non-industrial disability mortality rates are lower at ages 50 through 92, lower at age 93, higher at ages 94 through 102, lower at ages over 102

Method

Factors used for grouping data:

- Age
- Gender

Raw rates were developed by age and gender and then graduated (by age) using the Whittaker-Henderson method. To ensure fully credible data was used to set final rates, the graduated CalPERS Post-Retirement rates were then blended with different data sources. All blending was done based upon the amount of data underlying CalPERS Post-Retirement rates. For ages where sufficient data existed, graduated rates were entirely based on CalPERS Post-Retirement data. Due to a lack of fully credible data, rates for ages 1 through 17 were exclusively from Juvenile Pub-2010 Tables (published by the Society of Actuaries). For ages 18 through 92, rates for disabled lives from the PubG-2010 Tables (published by the Society of Actuaries) were blended with CalPERS Post-Retirement rates for disabled lives. Due to a lack of fully credible data for ages 93 and above, the proposed rates for non-industrial related disabled retirees at those ages are the mortality rates proposed for the healthy recipients.

Just as with mortality rates for healthy and industrial related recipients, mortality rates for industrial disabled retirees were studied by analyzing the annual exposures and decrements over the period from June 30, 1997 through June 30, 2019. In doing so, it became clear that mortality improvements had occurred over the length of the period.

Consistent with the healthy recipients, we propose applying 80% of Scale MP-2020 (published by the Society of Actuaries) to the graduated rates described above. This proportion of the MP-2020 scale aligns with mortality improvement trends over the past 20 years using the SMR. In addition, we propose using fully generational mortality calculations. These calculations allow for unique mortality rates in each year of the calculation rather than using a static set of rates.

Results

Mortality rates increase with age. Male mortality rates are higher than female mortality rates. When compared to rates from the previous study:

- New male non-industrial disability mortality rates are higher at ages 50 through 91, lower for ages 92 through 94, higher at age 95, lower at ages 96 through 99, and higher at ages over 99
- New female non-industrial disability mortality rates are lower at ages 50 through 92, lower at age 93, higher at ages 94 through 102, lower at ages over 102

POST-RETIREMENT MORTALITY FOR INDUSTRIAL RELATED DISABLED RETIREES

Summary

A new set of post-retirement mortality rates is being proposed for both male and female industrial related disabled recipients. When compared to rates from the previous study:

- New male industrial disability mortality rates are lower at age 50, higher for ages 51 through 91, lower at ages 92 through 94, higher at age 95, lower at ages 96 through 99, and higher at ages over 99
- New female industrial disability mortality rates are lower at ages 50 through 52, higher at ages 53 through 89, lower at ages 90 through 93, higher at ages 94 through 102, lower at ages over 102

Method

Factors used for grouping data:

- Age
- Gender

Raw rates were developed by age and gender and then graduated (by age) using the Whittaker-Henderson method. To ensure fully credible data was used to set final rates, the graduated CalPERS Post-Retirement rates were then blended with different data sources. All blending was done based upon the amount of data underlying CalPERS Post-Retirement rates. For ages where sufficient data existed, graduated rates were entirely based on CalPERS Post-Retirement data. Due to a lack of fully credible data, rates for ages 1 through 17 were exclusively from Juvenile Pub-2010 Tables (published by the Society of Actuaries).). For ages 18 through 92, rates for disabled lives from the PubG-2010 Tables (published by the Society of Actuaries) were blended with CalPERS Post-Retirement rates for disabled lives. Due to a lack of fully credible data for ages 93 and above, the proposed rates for industrial related disabled retirees at those ages are the mortality rates proposed for the healthy recipients.

Just as with mortality rates for healthy and non-industrial related recipients, mortality rates for industrial disabled retirees were studied by analyzing the annual exposures and decrements over the period from June 30, 1997 through June 30, 2019. In doing so, it became clear that mortality improvements had occurred over the length of the period.

Consistent with the healthy recipients, we propose applying 80% of Scale MP-2020 (published by the Society of Actuaries) to the graduated rates described above. This proportion of the MP-2020 scale aligns with mortality improvement trends over the past 20 years using the SMR. In addition, we propose using fully generational mortality calculations. These calculations allow for unique mortality rates in each year of the calculation rather than using a static set of rates.

Results

Mortality rates increase with age. Male mortality rates are higher than female mortality rates. When compared to rates from the previous study:

- New male industrial disability mortality rates are lower at age 50, higher for ages 51 through 91, lower at ages 92 through 94, higher at age 95, lower at ages 96 through 99, and higher at ages over 99
- New female industrial disability mortality rates are lower at ages 50 through 52, higher at ages 53 through 89, lower at ages 90 through 93, higher at ages 94 through 102, lower at ages over 102

CONTINGENCY LOAD FOR TERMINATING PLANS

Summary

When a contract with a public agency is terminated, Government Code Section 20576 authorizes the Board to include contingencies for mortality fluctuations when determining the obligations of the System after the effective date of plan termination. If mortality were to improve more than expected, the mortality assumptions would be modified through future experience studies, and contribution rates for ongoing plans would be adjusted. For terminating plans, however, there is no future contribution rate adjustment possible, which is why a contingency load is authorized by statute and recommended by the Actuarial Office.

Method

The Actuarial Office had been using a 7% load for mortality fluctuations since 1985, which means the actuarial liability for terminating plans is first calculated using the mortality assumptions for ongoing plans, then the resulting liability was increased by 7%. At the time the 7% load was established, the mortality assumptions for ongoing plans did not provide for any future mortality improvement. The prior Experience Study added into the base mortality rates, improvements using 90% of Scale MP 2016 through to year 2029. As a result of this change to the mortality rates, the prior Experience Study recommended lowering the 7% load to 5%.

To determine an appropriate mortality adjustment for new plans moving to the Terminated Pool, the actuarial office recommends measuring the impact of using a more conservative mortality improvement assumption. By using 80% of Scale MP 2020, the proposed assumption reflects the fact that mortality improvements for CalPERS members are expected to be slightly less than what is expected nationally. This is primarily because mortality for CalPERS members is already better than the national average. A contingency load for mortality fluctuations can be analyzed by assuming mortality improvements will be more than the national average, that is, by using more than 100% of Scale MP 2020.

Results

Comparing annuity factors under various scenarios for mortality improvement (i.e., 110% to 150% of MP 2020 rates) for different ages, gender, and birth year, we believe the current 5% load continues to be appropriate for this purpose.

SALARY/MERIT INCREASE

Summary

The proposed salary assumptions are updated for all member categories and for all age and service groups. There are 10 different salary increase assumption groups, 4 Miscellaneous groups (State Miscellaneous and Industrial, Schools Miscellaneous, and Public Agencies) and 6 Safety groups (State Safety, POFF, CHP and Public Agency Police, Fire and CPO). The study has shown that:

- Salary increases are generally higher than expected for CHP, POFF, State Miscellaneous, State Safety and Schools Pool since our last 2017 study.
- State Industrial experienced slightly lower than expected salary increases during the study period for services less than 5 years.
- Public Agency Peace County Peace Officer experienced slightly lower than expected salary increases during the study period for services less than 8 years.
- Public Agency Miscellaneous experienced slightly higher than expected salary increases at high level of services. Public Agency Police and Fire did not experience any significant differences than the current assumptions.

Method

The study included data from continuing active members only. Factors used for grouping data:

- Entry Age: Employees with lower entry ages tend to get larger pay increases at the same amount of service.
- Service: Salary increases are generally higher for low-service individuals. Particularly from date of entry to 5-8 years of service depending on member category.
- Membership Category: Generally, Safety members have higher salary increase than Miscellaneous members especially in the first 5 years of service. Among the Safety categories, CHP had higher overall salary increases than the other Safety member categories.
- Periods Studied: Covering last 12, 16, & 20 fiscal years.

Factors not used for grouping data:

Gender: Our analysis has indicated that salary increases for CalPERS members do not depend on gender.

Sources of Salary Increases: Seniority, Merit, and Promotion (SMP) and Inflation

Salary increases can be thought of as the product of two distinct components: increases related to wage inflation and increases related to seniority, merit, and promotion. Salary increases due to wage inflation tend to be driven by global or national economic activities, although they can also be driven by industry specific trends as well. As such, these increases are best treated as an economic assumption and should be considered in conjunction with other economic assumptions such as price inflation, productivity increases etc. The pattern of salary increases due to seniority, merit, and promotion tend to differ due to membership category, geographic location or employer specific factors and are best treated as demographic assumptions. In this section, only the seniority, merit, and promotion component of salary increases are discussed. The merit increases assumptions recommended in this study should be combined with the wage inflation assumption to derive the total expected salary increases.

As part of this study, the data for developing a new set of salary increase assumptions was studied using a closed group method. The closed group study method is described by McGill et al. (2005) in *Fundamentals of Private Pensions (8th ed., p.610)*. This method is the same as was used in the previous study.

Using this method, the way to construct a merit scale is to examine historical increases in compensation of various employees in each member category and ages and service group from the beginning of each fiscal year compared to compensation at the end of the fiscal year. For example, in year 1 of the study period the total salary of members with entry age 30 and 5 years of service had an increase of 110% compared to the total salary for the same members working at the end of the fiscal year (now with 6 years of service), and in the same fiscal year the total active population had an increase in average salary of 5%. Then, the merit scale for entry age 30 with 5 years of service will be 4.76% (110%/105%). We used this method to calculate merit salary increases for each entry age and service cell and for each of the fiscal years from June 30, 2003 to June 30, 2019. Finally, merit salary increases for each separate entry age and service cell in the 16-year study period were weighted based on members compensation in each cell per fiscal year. These average increases were then graphed and fitted using an exponential function splined at years 6 to 9 years depending on the observed curve that resulted. Some curves were fitted using manual smoothing due to known discontinuities such as contractual longevity increases for CHP or at low service years for some member categories.

Results

The current 10 assumption sets vary by service and entry age for all member groups except CHP, POFF & State Safety (depends on service only). The data continues to show salary increases for CHP are far more associated with service rather than entry age. This is true for all safety groups. Combining all entry ages for each safety assumption group allows for greater credibility in the proposed assumptions. Consistent with the last study, the proposed assumptions use service base salary rates for all State Safety categories.

As in the previous study, the data continues to show that members with high service continue to receive salary increases greater than the increase in average salary in most fiscal years, particularly for safety groups. The data is consistent from year to year and indicates that a significant number of members continue to receive merits and promotions after long years of service.

We are recommending small adjustments to the pattern of salary increases and continue to refine the merit assumptions for known or observed seniority pay increases.

Below are tables showing the current and proposed ultimate merit salary increase for each group. Note that the proposed wage inflation of 2.75% is going to be added to these merit increases to obtain the overall assumed salary increase used in the actuarial valuations. For example, if the ultimate rate in the table below is 0.5%, the assumed ultimate salary increase rate used in the actuarial valuations is 3.25%.

Our analysis of recent wage inflation experienced by various CalPERS member groups indicates that the California Highway Patrol (CHP) group appears to have experienced somewhat higher wage inflation than other CalPERS groups over the recent past. While this may continue for some number of years, it is unlikely this or any other group could experience higher wage inflation for an extended period of time into the future. For that reason, we have increased the seniority, merit, and promotion rates for CHP by 0.50% to recognize a portion of this estimated “excess” wage inflation. The rates below and in the appendices for CHP include this adjustment.

Current Assumptions Before Wage Inflation (Ultimate Only)

	Members with Entry Age 25	Members with Entry Age 35	Members with Entry Age 45
State and Schools			
State Miscellaneous	0.50%	0.40%	0.3%
State Industrial	0.50%	0.50%	0.4%
State Safety	0.50%	0.50%	0.5%
State POFF	1.00%	1.00%	1.0%
State CHP	0.70%	0.70%	0.7%
Schools	0.90%	0.70%	0.5%
Public Agency			
Miscellaneous	0.80%	0.70%	0.4%
Fire	1.00%	1.00%	1.0%
Police	1.70%	1.70%	1.7%
CPO	2.00%	2.00%	2.0%

Proposed Assumptions Before Wage Inflation (Ultimate Only)

	Members with Entry Age 25	Members with Entry Age 35	Members with Entry Age 45
State and Schools			
Miscellaneous	0.67%	0.54%	0.45%
Industrial	0.52%	0.45%	0.45%
Safety	0.75%	0.75%	0.75%
POFF	1.38%	1.38%	1.38%
CHP	1.54%	1.54%	1.54%
Schools	0.77%	0.54%	0.20%
Public Agency			
Miscellaneous	0.72%	0.56%	0.21%
Fire	1.15%	0.84%	1.36%
Police	1.82%	1.40%	1.83%
CPO	1.51%	0.85%	0.79%

GENDER BLENDING FOR OPTIONAL FORMS OF BENEFITS

Summary

The purpose of this assumption is to determine the male/female mortality rate blending ratios used for developing unisex mortality tables for optional forms of benefits. Three categories of mortality are applicable in this analysis, Service Retirement (SR), Non-Industrial Disability (NIDR) and Industrial Disability (IDR) and two optional forms Single Life (SL) and Joint and Survivor (J&S) In determining an appropriate blending method two methods of blending were studied, one by number of retirees for a given optional form and one by volumes of benefits being paid to retirees categorized by gender.

Method

By observing the significant difference in results between by count and by benefit volume for each of the categories studied the decision was made to use the benefit weighting method as it more accurately applies the corresponding benefit to the applicable mortality rate.

Results

Under the three categories of mortality studied and two categories of optional forms, one change is recommended.

- Reduce the male weighting portion under the J&S/NIDR combination by 5%.

Data on retirees (retired after 1997) receiving benefits as of June 30, 2003 through June 30, 2019 were tabulated. We counted the number by type of retirement, gender and option elected. The table below shows the tabulation over the last ten years.

Single Life Forms (SL)

Count of Retirees as of Valuation Date	Service Retirement (SR)		Non-Industrial Disability (NIDR)		Industrial Disability (IDR)	
	Count	% Male	Count	% Male	Count	% Male
6/30/2010	122,968	28.3%	10,824	30.7%	6,182	64.7%
6/30/2011	136,732	28.5%	11,414	30.4%	6,717	64.2%
6/30/2012	149,685	28.6%	11,663	30.2%	7,145	63.4%
6/30/2013	162,167	28.7%	12,027	30.0%	7,688	63.4%
6/30/2014	172,672	28.7%	12,922	29.8%	8,528	63.5%
6/30/2015	184,283	28.7%	13,434	29.6%	9,114	63.4%
6/30/2016	198,736	28.4%	13,627	29.4%	9,508	63.5%
6/30/2017	211,025	28.3%	13,825	29.3%	9,907	63.3%
6/30/2018	221,456	28.5%	13,929	29.0%	10,314	63.3%
6/30/2019	234,680	28.5%	14,053	28.7%	10,788	63.2%

Joint and Survivor Forms (J&S)

Count of Retirees as of Valuation Date	Service Retirement (SR)		Non-Industrial Disability (NIDR)		Industrial Disability (IDR)	
	Count	% Male	Count	% Male	Count	% Male
6/30/2010	254,938	38.2%	12,928	34.8%	20,894	71.0%
6/30/2011	297,642	38.4%	14,053	34.6%	24,411	69.2%
6/30/2012	336,542	38.5%	14,706	34.3%	26,544	69.5%
6/30/2013	375,246	38.4%	15,503	34.1%	29,445	69.3%
6/30/2014	408,166	38.3%	16,922	33.7%	33,892	68.8%
6/30/2015	445,637	38.2%	17,926	33.5%	37,211	68.6%
6/30/2016	484,079	37.7%	18,456	33.4%	39,844	68.3%
6/30/2017	526,579	37.6%	19,099	33.3%	42,519	68.1%
6/30/2018	575,699	38.0%	19,663	32.8%	45,877	68.3%
6/30/2019	630,357	38.0%	20,335	32.5%	49,643	68.4%

A mortality blend by a strict count of retirees will not necessarily produce a cost neutral set of option factors. In order to better reflect the value of the benefits being paid, we also looked at the total monthly benefit payable to tabulate the ratio of male and female retirees. The table below shows the tabulation over the last ten years.

Benefit Payments - Single Life Forms (SL)

Benefits in $1,000 as of Valuation Date	Service Retirement (SR)		Non-Industrial Disability (NIDR)		Industrial Disability (IDR)	
	Count	% Male	Count	% Male	Count	% Male
6/30/2010	143,598	38.30%	10,064	36.10%	15,048	70.60%
6/30/2011	165,827	38.30%	10,840	35.90%	16,840	70.10%
6/30/2012	191,034	38.30%	11,450	35.50%	18,460	69.70%
6/30/2013	220,257	38.30%	12,230	35.30%	20,268	69.60%
6/30/2014	254,938	38.20%	12,928	34.80%	20,894	71.00%
6/30/2015	297,642	38.40%	14,053	34.60%	24,411	69.20%
6/30/2016	336,542	38.50%	14,706	34.30%	26,544	69.50%
6/30/2017	375,246	38.40%	15,503	34.10%	29,445	69.30%
6/30/2018	408,166	38.30%	16,922	33.70%	33,892	68.80%
6/30/2019	445,637	38.20%	17,926	33.50%	37,211	68.60%

Benefit Payments - Joint and Survivor Forms (J&S)

Benefits in $1,000 as of Valuation Date	Service Retirement (SR)		Non-Industrial Disability (NIDR)		Industrial Disability (IDR)	
	Count	% Male	Count	% Male	Count	% Male
6/30/2010	410,261	74.0%	6,987	59.2%	39,621	93.0%
6/30/2011	474,341	73.7%	7,680	59.0%	44,848	92.2%
6/30/2012	531,194	73.1%	7,975	58.5%	47,874	92.0%
6/30/2013	587,091	72.7%	8,496	58.3%	52,238	91.9%
6/30/2014	632,628	72.3%	9,462	58.1%	58,691	91.5%
6/30/2015	687,035	71.8%	10,142	57.4%	63,925	91.2%
6/30/2016	737,720	71.2%	10,588	57.0%	68,100	91.0%
6/30/2017	798,001	70.8%	10,990	56.8%	72,455	90.8%
6/30/2018	869,672	70.5%	11,284	56.6%	77,805	90.7%
6/30/2019	938,831	70.2%	11,613	56.0%	82,744	90.5%

Proposed Percentages

Based on the tabulations above, the following table summarizes the proposed male/female percentages. The proposed percentages give more weight to the total monthly benefits payable than the actual counts.

All Single Life Forms

	Weighting of Male Retirees		Weighting of Male Beneficiaries	
	Current	Proposed	Current	Proposed
Service Retirement	35%	No Change	n/a	n/a
Non-Industrial Disability	30%	No Change	n/a	n/a
Industrial Disability	70%	No Change	n/a	n/a

Joint and Survivor Forms

	Weighting of Male Retirees		Weighting of Male Beneficiaries	
	Current	Proposed	Current	Proposed
Service Retirement	70%	No Change	30.0%	No Change
Non-Industrial Disability	60%	55%	40.0%	45%
Industrial Disability	90%	No Change	10.0%	No Change

PERCENTAGE MARRIED AND AGE DIFFERENCE

Summary

The purpose of this assumption is to determine the percentage married and age difference between male and female spouses for purposes of valuing the likelihood of a member having a statutory spouse at retirement. Many plans at CalPERS have either 25% or 50% post retirement survivor allowance benefit in their contract and this assumption serves to estimate the additional payment stream after the death of the member. The results show that the percentage married ranged from 70% to 90% depending on the member category. Generally, 70% of miscellaneous members are married while 80 to 85% of safety members are married. Males on average are three years older than their female spouses. Same gender marriages were not studied due to limited data.

Method

Data on retirees retired after 1997 receiving benefits were tabulated. For the percentage married assumption, married members were tabulated by member category with detail given below. The average age difference between male and female spouses was calculated for each member category.

Results

The table below shows the current and proposed assumptions for the percentage married along with the average percentage of accumulated members married in 2017 and in 2021.

Summary Percent Married

	Current	Proposed	Raw Data (2017)	Raw Data (2021)
State and Schools				
Miscellaneous	70%	70%	69.60%	69.10%
State Industrial	70%	70%	67.20%	66.30%
State Safety	70%	70%	69.70%	69.30%
POFF	80%	80%	79.40%	78.20%
CHP	90%	85%	88.40%	85.20%
Schools	70%	70%	67.50%	68.10%
Public Agency				
Miscellaneous	70%	70%	66.80%	67.60%
Police	85%	85%	82.80%	81.10%
Fire	90%	85%	85.90%	82.60%
Other Safety	70%	70%	67.20%	70.90%
School Police	85%	85%	73.50%	72.90%
CPO	75%	75%	75.20%	74.40%

Generally, the assumptions were unchanged for all categories except CHP and PA Fire. The assumption for CHP and PA Fire were reduced from 90% to 85%. For the purposes of this assumption, State Industrial, State Safety and Other Public Agency Safety (i.e. Lifeguards) were considered to behave more like Miscellaneous than Safety. School Police were considered to be more like Police than the raw data indicated.

For the age difference, count tabulations were done by member category, member gender, and spouse gender. The table below shows the tabulation over the last ten years. The weighted average was determined for each category.

	Gender[1]	Count	Spouse Gender[1]	Average Difference	Weighted Average
State					
Miscellaneous	Female	44,223	Male	(2.23)	
	Male	46,941	Female	3.61	2.94
Industrial	Female	3,890	Male	(2.14)	
	Male	1,262	Female	3.73	2.53
Safety	Female	4,420	Male	(2.08)	
	Male	8,385	Female	3.56	3.05
POFF	Female	4,027	Male	(2.10)	
	Male	21,423	Female	2.84	2.72
CHP	Female	251	Male	(2.67)	
	Male	4,061	Female	2.97	2.95
Schools					
Miscellaneous	Female	86,144	Male	(2.22)	
	Male	35,731	Female	3.20	2.51
Police	Female	19	Male	(4.33)	
	Male	295	Female	3.94	3.96
Public Agency					
Miscellaneous	Female	41,095	Male	(2.25)	
	Male	56,223	Female	3.03	2.70
Other Safety	Female	1	Male	0.59	
	Male	52	Female	3.72	3.64
Police	Female	947	Male	(2.35)	
	Male	14,688	Female	3.01	2.97
Fire	Female	214	Male	(1.90)	
	Male	10,008	Female	2.70	2.68
CPO	Female	935	Male	(2.16)	
	Male	4,688	Female	3.02	2.88
Sheriff	Female	62	Male	(1.02)	
	Male	509	Female	3.08	2.86
Prosecutor	Female	0	Male	N/A	N/A
	Male	1	Female	4.94	N/A

(1) Same gender marriages were not studied due to limited data.

Rounding the weighted average to the nearest whole year for each category resulted in a value of three years with the exception of School Police, Public Agency Other Safety and Prosecutor. The data was less credible in these three categories due to the small populations. Since there were no categories with significant differences, the proposed age difference was unchanged at three years.

Economic Study

To perform actuarial valuations, actuaries use certain economic assumptions to set required contributions. The economic assumptions used by the Actuarial Office to determine liabilities and set contribution requirements are price inflation, wage inflation, payroll growth and the discount rate assumption.

PRICE INFLATION

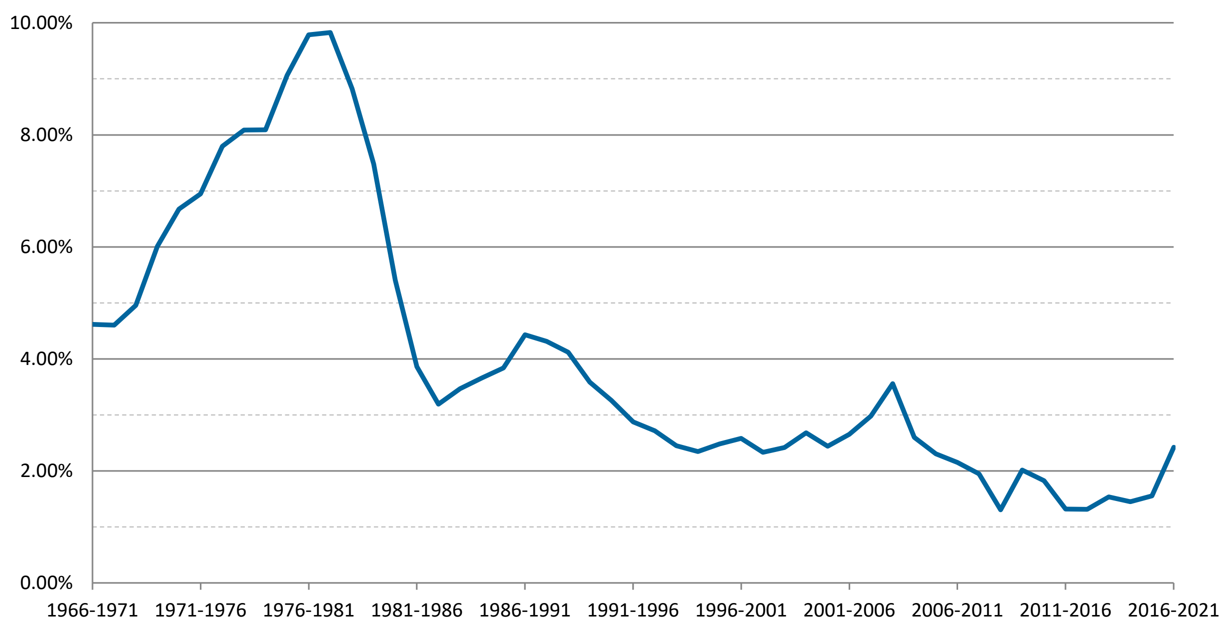
Price inflation is the increase in price over time of some standardized basket of goods and services. The annual increases in the Consumer Price Index (CPI-U) as measured by the Bureau of Labor Statistics is the inflation measure referenced in the State Government Code for determining the annual cost-of-living adjustment (COLA) for CalPERS retirees. The inflation assumption also underlies most of the other economic assumptions used in an actuarial valuation, including the investment return, individual salary increases, and payroll growth. Changing the price inflation assumption would have an impact on employer contribution rates, service credit purchases, Optional Settlements at retirement and possibly employee contribution rates for PEPRA members.

CalPERS currently assumes a 2.50% annual price inflation. The last time the inflation assumption was changed was in 2017 when the assumption was decreased from 2.75% to 2.50%. The following analysis considers historical price inflation, market expectations, forecasts of other economists, and a number of other factors.

Historical Changes in the Consumer Price Index

The chart below shows the five-year moving average annual inflation (June through June) over the last fifty years:

Average Annual Inflation CPI-U, Five-Year Moving Average



Source: Bureau of Labor Statistics, CPI-U, all items (series ID: CUUR0000SA0)

The five-year average as of June 2021 is 2.43% and this average has remained below the CalPERS current inflation assumption of 2.50% for the last 12 years.

The table below shows the average inflation over various periods, ending June 30, 2021:

Periods Ending June 2021	U.S City Average Annual Increase in CPI-U
Last 5 years	2.43%
Last 10 years	1.87%
Last 15 years	1.97%
Last 20 years	2.14%
Last 25 years	2.23%
Last 30 years	2.33%

Source: Bureau of Labor Statistics, CPI-U, all items (series ID: CUUR0000SA0)

The average annual inflation over the last 5, 10, 15, 20, 25 and 30 years have all been lower than CalPERS current inflation assumption of 2.50%. Historical inflation is only one consideration in developing an assumption for future inflation. The inflation assumption, and in fact all actuarial assumptions, should reflect future expectations.

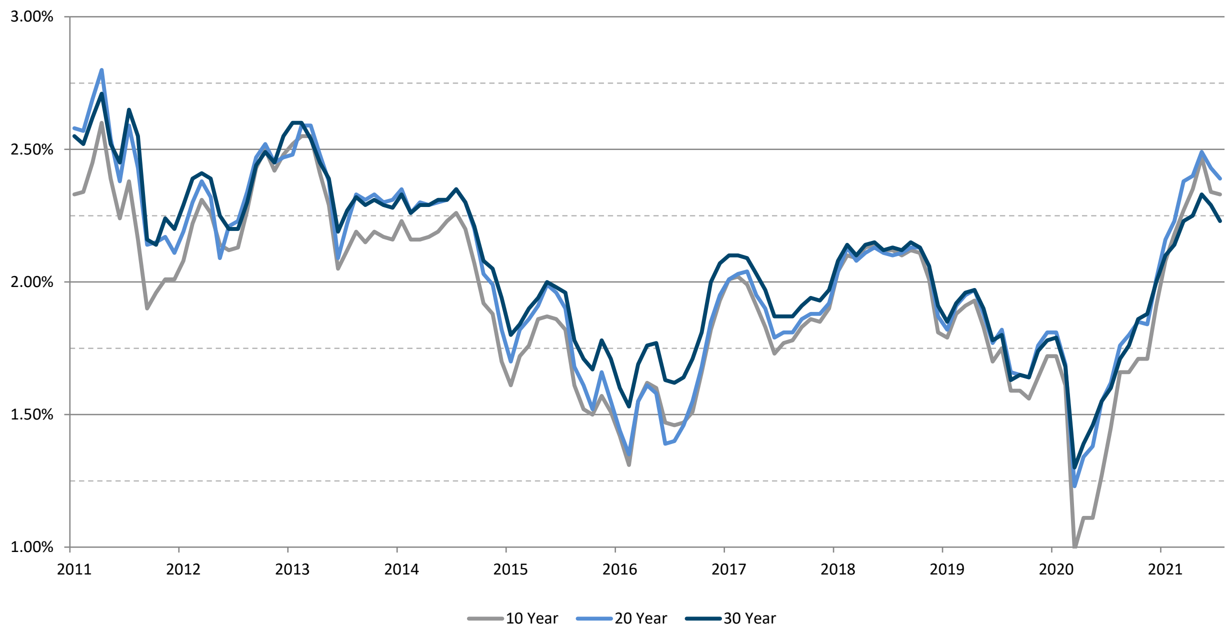
Bond Market

Another source of information about future inflation is the market for US Treasury bonds. Comparing the yields for conventional Treasury securities and Treasury Inflation-Protected Securities (TIPS) can be used to measure the market's expectation of future inflation. Both conventional Treasury securities and TIPS provide investors with a fixed rate yield, but with TIPS the principal is adjusted to reflect the actual change in CPI-U, and the interest payment is calculated using the adjusted principal value of the bond. Since holders of TIPS will receive the yield and an increase in the principal, the yield on TIPS is lower than the yield on conventional securities. Assuming an efficient market, the difference in the yield is the market's inflation expectation, referred to as the "break-even" inflation rate.

For example, if the 20-year Treasury has a yield of 3% and the 20-year TIPS has a yield of 1%, the 20-year break-even inflation rate is 2% per year. An investor who takes a long position in one type and a short position in the other will break even if the inflation rate turns out to be 2% per year. The yields themselves are determined by how much investors are willing to pay to take long positions and asking to receive to take short positions, so the break-even inflation rate is reflective of the average expected inflation rate of every market participant.

Below is a chart with the historical spread between 10, 20 and 30-year conventional and 10, 20 and 30-year inflation-protected Treasury bonds.

Interest Rate Spread Conventional Treasuries versus TIPS



Source: Federal Reserve Bank of St. Louis

Prior to the 2008-09 financial crisis, the spread between the long-term conventional and inflation-protected securities was relatively constant and approximately 2.5%. The resulting collapse of the US investment markets caused a decrease in the spread as well as an increase in the volatility of the spread, making long-term assumption setting difficult for the next few years. Since March 2013 the spread has remained below 2.5% and as of July 2021 the 20-year break-even inflation is 2.39%.

Most actuaries do not set the inflation assumption equal to the break-even inflation rate. The market spread between conventional and inflation-protected Treasuries includes other market factors aside from pure inflation expectations. The market also reflects inflation and liquidity premiums. More complex models have been developed to adjust for these other factors.

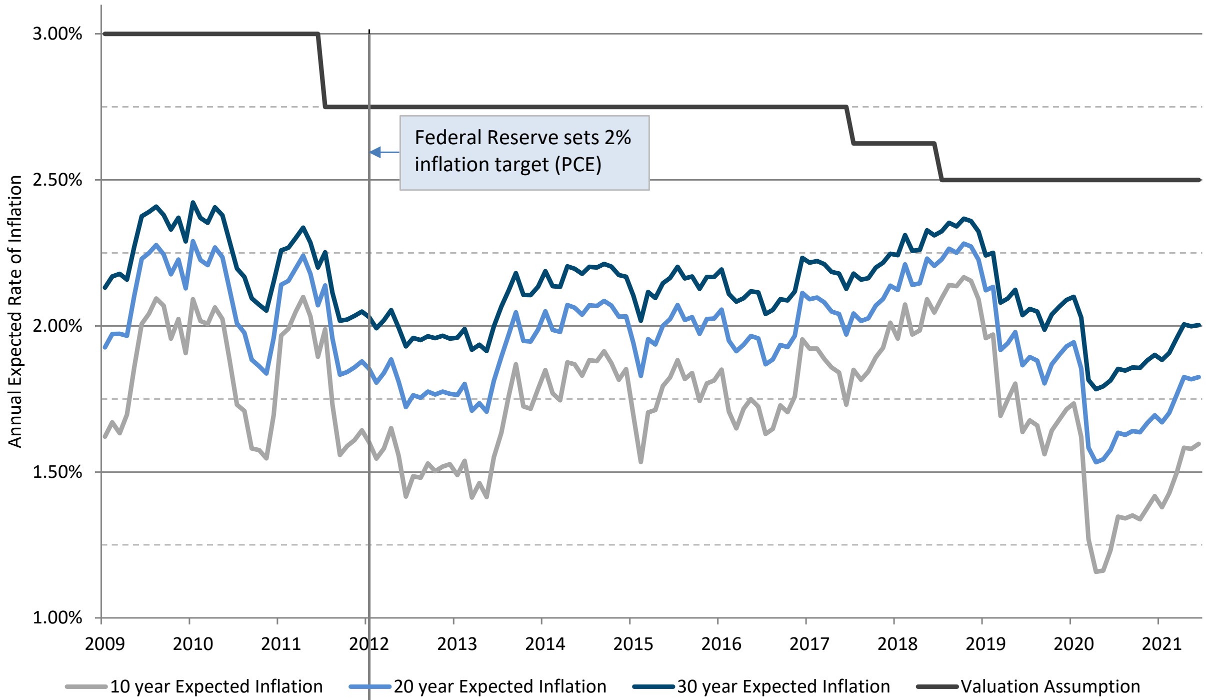
Inflation Forecasts of Economists

Inflation, specifically CPI-U, is an economic statistic, so it can be helpful to look to economists to gain insight into future expected inflation. The Philadelphia Federal Reserve conducts a quarterly survey of the Society of Professional Forecasters. The second quarter 2021 survey, released in May 2021, was for inflation over the next ten years to average 2.30%, roughly what is implied by the break-even inflation rate.

The Federal Reserve Bank of Cleveland has developed a model that combines information from Treasury yields, inflation data, inflation swaps, and survey-based measures of inflation expectations to calculate the expected inflation rate. In its July 13, 2021 release, the Federal Reserve Bank of Cleveland reported a 20-year inflation expectation of 1.84%.

Below is a chart with the Federal Reserve Bank of Cleveland's expected inflation values from January 1, 2009 through July 1, 2021 for 10, 20 and 30 years.

Expected Annual Inflation 10, 20 and 30-year Time Horizons



Source: Federal Reserve Bank of Cleveland

While the Federal Reserve Bank of Cleveland's model removes some of the more extreme volatility implied by the market spreads, the long-term expectations are clearly lower than CalPERS current assumption. The 20-year inflation expectation has been below 2.50% since October 2007.

Inflation Forecasts of Investment Professionals

The CalPERS Asset Liability Management (ALM) Cycle consists of two coordinated activities, a review of actuarial assumptions summarized in this report and a comprehensive strategic asset allocation analysis performed by the Investment Office. As part of its analysis of the candidate portfolios, the Investment Office surveyed a number of investment consulting firms and developed its own price inflation assumption. The Capital Market Assumptions analysis presented to the board in September included a long-term baseline inflation assumption of 2.30%.

Inflation Assumptions of Other Actuaries

In the Social Security Administration's 2020 Trustees Report, the Office of the Chief Actuary is projecting a long-term average annual inflation rate of 2.4% under the intermediate cost assumption, down from 2.6% the prior year. (The inflation assumptions are 3.0% and 1.8% respectively in the low cost and high cost projection scenarios.)

Every pension fund needs an inflation assumption. One source of information about these inflation assumptions is the Public Plans Data that is compiled and maintained through a collaboration of the Center for State and Local Government Excellence (SLGE), the National Association of State Retirement Administrators (NASRA), and the Center for Retirement Research at Boston College. This data set includes the inflation assumption for 200 U.S. public retirement systems from their financial reports for fiscal years 2001 through 2020, including the largest public funds covering state employees or teachers. The most recent data includes the inflation assumption for 199 public pension plans.

As of the most recent data for 2020, the median inflation rate assumed for large public retirement systems in the U.S. was 2.50%%. This was also the most common inflation assumption with 63 of 199 plans (32%) using an inflation assumption of 2.50%. There were also 51 plans using an inflation assumption below 2.50%, up from 34 plans in 2019.

Historically, the CalPERS price inflation assumption has been below the average inflation assumption in the Public Plans Data. One reason for this is that some actuaries use inflation to mean price inflation while others use their inflation assumption as wage inflation, so the data may not correspond precisely to the price inflation assumption being studied here. The CalPERS inflation assumptions are currently 2.50% for price inflation and 2.75% for wage inflation. The wage inflation assumption will be analyzed in the next section. Another limitation of the Public Plans Data is that the most recent data comes from the 2020 financial statements, while the board is selecting an assumption to be used for the 2021 actuarial valuations and beyond. Nevertheless, the Public Plans Data does show a clear trend towards lower inflation assumptions with 30% of plans reducing their inflation assumption in either 2019 or 2020.

Additional Considerations

Since 2012, the Federal Open Market Committee (FOMC) has employed a monetary policy strategy that targets an annual inflation rate of 2% (as measured by the annual change in the price index for personal consumption expenditures, or PCE, which is typically lower than the change in CPI-U). The FOMC has repeatedly stated that the 2% target is most consistent with the Federal Reserve's statutory objective for monetary policy of -- maximum employment, stable prices, and moderate long-term interest rates.

The FOMC keeps inflation expectations from going too high by raising short-term interest rates (the federal funds rate) and keeps inflation expectations from going too low by lowering rates. There is a limit, however, to how low the federal funds rate can go. When the federal funds rate is zero, which it currently is, there can be a significant period when inflation below 2% persists. If there is not an offsetting period when the FOMC allows inflation to remain above 2%, the long-term average will be below 2%. On August 27, 2020, the FOMC made changes to its Statement on Longer-Run Goals and Monetary Policy Strategy to clarify that it "seeks to achieve inflation that averages 2% over time," and that inflation moderately above 2% for a period of time would be permitted. Although this clarification reduced the likelihood of long-term inflation averaging less than 2%, it is still unlikely that long-term inflation will average significantly more than 2%. If the FOMC is successful, the difference between the CalPERS inflation assumption and the FOMC 2% target should only be the difference between CPI-U inflation and PCE inflation.

Recommendation

Based on the most current information, the Actuarial Office recommends that the board decrease the price inflation assumption from 2.50% to 2.30% per year. This would place the assumption closer to the levels expected in the financial markets and predicted by economic models.

WAGE INFLATION

Wage inflation is the portion of a member's total pay increases attributable to price inflation and productivity increases as described below. The current wage inflation assumption is 2.75%.

An individual's total annual increase in salary can be divided into three categories.

1) Price inflation - If salary increases are not as least as much as price inflation, employees will experience a decrease in income in terms of "real" dollars, and a decrease in the standard of living they can afford. Although salaries may not keep pace with inflation over a short period of time, if an employer is to retain employees over the long-term it must allow its employees to at least maintain their standard of living.

Price inflation was discussed in the previous section and the recommendation is for CalPERS to decrease its annual price inflation assumption from 2.50% to 2.30%.

2) Productivity increases - This component is so named, because it represents labor's share of the organization's productivity gains. The bulk of this increase is the result of economies of scales, which is why this component is typically higher with employers or industries that are new and experiencing high growth.

The current CalPERS productivity increase assumption is 0.25% per year and will be analyzed in this section.

3) Seniority, merit, and promotion (SMP) increases - These increases result from step increases and other service-related increases as well as occasional promotions that individual members experience throughout their careers. These increases vary by employment category as well as age and service.

Seniority, merit, and promotion increases are demographic assumptions and are analyzed in the Findings Section of this report under the Salary/Merit Increase subsection.

Productivity increases

In the Social Security Administration's 2020 Trustees Report, the Office of the Chief Actuary is projecting a long-term "real-wage differential" (average salary increase above inflation) of 1.14% per year under the intermediate cost assumption. (The real-wage differential is 1.76% and 0.52% respectively in the low cost and high cost projection scenarios.)

As discussed in the previous Experience Study, information published by the Bureau of Labor Statistics for State and local government workers as well as CalPERS specific data indicated that future productivity increases for CalPERS members might be significantly lower than the national average. For that reason, the productivity increase assumption was set at 0.25% in the previous study.

A review of the average annual compensation increases of CalPERS member groups in the previous Experience Study showed an average annual increase of 2.5% over the previous 15-year period. A similar analysis in this study indicates that the average annual compensation of all CalPERS member groups during the previous 4 years was 3.2%.

Recommendation

Based on this analysis the Actuarial Office recommends that the productivity component of the annual wage inflation assumption increase from 0.25% to 0.50%. Coupled with a decrease in the price inflation assumption from 2.50% to 2.30%, the Actuarial Office is recommending that the wage inflation assumption be set at 2.80% (2.30% price inflation + 0.50% productivity).

Finally, note that since wage inflation is used to project benefit payments and value the liability, we must guard against setting the wage inflation assumption too low, which would lead to increasing costs as time goes on.

PAYROLL GROWTH

The payroll growth assumption represents the expected rate of annual increase in the active payroll for an open plan (where the term "open" means that new active members enter the plan when hired, replacing members who terminate or retire). The payroll growth assumption is used in amortizing the portion of a plan's Unfunded Accrued Liability (UAL) subject to the "level percent of payroll" amortization method. The "level percent of payroll" method was used exclusively for open plans until the board adopted a "level dollar" approach for UAL bases established June 30, 2019 and later. A higher payroll growth assumption means a lower amortization payment today but a faster increase in amortization payments and ultimately a higher amortization payment in the future.

It is common for retirement systems to use the wage inflation assumption as the payroll growth assumption. However, there can be circumstances that might lead to the selection of a different assumption for payroll growth. Such circumstances include expected changes in the number of active members in the future, or in CalPERS case, the limit on pensionable compensation for PEPRA members which is tied to price inflation by statute.

Recommendation

The Actuarial Office recommends a payroll growth assumption of 2.80% per year, which is equal to the wage inflation assumption. The assumption is comprised of a price inflation assumption of 2.30% per year and a productivity increase assumption of 0.50% per year. While the cap on PEPRA member compensation for pension purposes may begin to have an impact on future payroll growth in the future, the effect is minimal at this time.

DISCOUNT RATE

The discount rate is set equal to the long-term expected geometric return on assets, net of both investment and administrative expenses. This assumption is reviewed as part of the Asset Liability Management (ALM) process.

Appendix A - Summary of Proposed Rates

SERVICE RETIREMENT RATES

State Miscellaneous

	Years of Service						
Attained Age	5	10	15	20	25	30	35
50	0.01400	0.01100	0.01000	0.01300	0.01400	0.01400	0.01500
51	0.01900	0.01300	0.01100	0.01300	0.01300	0.01300	0.01400
52	0.01900	0.01300	0.01200	0.01500	0.01500	0.01500	0.01600
53	0.02300	0.01600	0.01400	0.01700	0.01700	0.01700	0.01800
54	0.01400	0.01400	0.01500	0.02100	0.02400	0.02700	0.03000
55	0.02500	0.03100	0.02800	0.05300	0.08000	0.11300	0.18600
56	0.02900	0.03300	0.03100	0.05600	0.07900	0.10500	0.15700
57	0.03200	0.03400	0.03200	0.05600	0.07500	0.10100	0.15500
58	0.02600	0.03500	0.03400	0.06100	0.08500	0.11500	0.16900
59	0.02800	0.04200	0.04100	0.06700	0.08800	0.12000	0.17500
60	0.01700	0.03600	0.06300	0.11300	0.12600	0.16200	0.18900
61	0.04800	0.05800	0.05800	0.09900	0.10800	0.14700	0.20300
62	0.07600	0.11500	0.11800	0.18800	0.19700	0.23800	0.28400
63	0.08900	0.12300	0.13000	0.21200	0.23400	0.29700	0.33800
64	0.09100	0.12300	0.12700	0.20300	0.21100	0.25000	0.28000
65	0.14100	0.16400	0.15500	0.23200	0.21800	0.23200	0.25100
66	0.23000	0.22300	0.20200	0.29700	0.27500	0.29300	0.30900
67	0.24200	0.22000	0.19000	0.27000	0.24200	0.25300	0.26400
68	0.14300	0.18400	0.17300	0.24000	0.22000	0.22500	0.22700
69	0.20900	0.19100	0.16500	0.23600	0.21200	0.22200	0.23200
70	0.15100	0.22600	0.24600	0.30000	0.27800	0.25500	0.26600
71	0.12100	0.19700	0.20900	0.24800	0.19500	0.20100	0.20100
72	0.12600	0.19000	0.20800	0.25300	0.19800	0.20800	0.20800
73	0.09200	0.14500	0.16300	0.20400	0.16300	0.17100	0.17100
74	0.11300	0.16600	0.17700	0.21200	0.16300	0.16900	0.16900
75-79	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

State Industrial Classic

	Years of Service						
Attained Age	5	10	15	20	25	30	35
50	0.00100	0.00900	0.01300	0.01600	0.02300	0.02200	0.02400
51	0.00900	0.01200	0.01400	0.01800	0.02700	0.02600	0.02800
52	0.00400	0.01300	0.01600	0.01800	0.02400	0.02300	0.02500
53	0.00800	0.01800	0.02200	0.02400	0.03100	0.02900	0.03200
54	0.00900	0.02500	0.03200	0.03700	0.04900	0.04700	0.05100
55	0.03100	0.03000	0.05300	0.12500	0.15000	0.18700	0.21500
56	0.00100	0.02800	0.06300	0.14200	0.15700	0.18100	0.20100
57	0.03300	0.04000	0.05100	0.11800	0.12600	0.16400	0.20900
58	0.10700	0.03800	0.04800	0.11600	0.13300	0.15600	0.17400
59	0.01400	0.06000	0.06600	0.11600	0.11600	0.14400	0.17900
60	0.01500	0.06500	0.08400	0.18700	0.19600	0.21600	0.24000
61	0.01800	0.07800	0.10900	0.20800	0.18800	0.19900	0.21900
62	0.03400	0.19000	0.21200	0.37400	0.32100	0.33200	0.36100
63	0.10100	0.16700	0.14900	0.24500	0.34900	0.34900	0.34900
64	0.14000	0.15100	0.13000	0.21700	0.31000	0.31000	0.31000
65	0.29700	0.26100	0.20500	0.21400	0.24300	0.24300	0.24300
66	0.17700	0.40500	0.33600	0.33800	0.38300	0.38300	0.38300
67	0.25000	0.25000	0.25000	0.25000	0.25000	0.25000	0.25000
68	0.18400	0.18400	0.18400	0.18400	0.18400	0.18400	0.18400
69	0.19200	0.19200	0.19200	0.19200	0.19200	0.19200	0.19200
70	0.22700	0.22700	0.22700	0.22700	0.22700	0.22700	0.22700
71	0.19800	0.19800	0.19800	0.19800	0.19800	0.19800	0.19800
72	0.23500	0.23500	0.23500	0.23500	0.23500	0.23500	0.23500
73	0.21600	0.21600	0.21600	0.21600	0.21600	0.21600	0.21600
74	0.25000	0.25000	0.25000	0.25000	0.25000	0.25000	0.25000
75-79	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

State Safety Classic

	Years of Service						
Attained Age	5	10	15	20	25	30	35
50	0.00900	0.01400	0.01800	0.02800	0.02200	0.02400	0.02400
51	0.01200	0.01600	0.01800	0.02700	0.02400	0.02700	0.02700
52	0.01700	0.01900	0.01900	0.02600	0.01800	0.01900	0.01900
53	0.01300	0.01800	0.02200	0.03400	0.02700	0.02900	0.02900
54	0.01200	0.01800	0.02400	0.03800	0.03400	0.04200	0.04200
55	0.01200	0.03600	0.05300	0.13000	0.18300	0.24700	0.29100
56	0.01900	0.04200	0.05800	0.12200	0.16100	0.19600	0.21400
57	0.03700	0.04000	0.05100	0.10400	0.14200	0.17200	0.17800
58	0.05500	0.05000	0.05700	0.11200	0.12700	0.16600	0.20500
59	0.04900	0.04400	0.05800	0.12100	0.12900	0.18300	0.24200
60	0.06200	0.05700	0.07000	0.13600	0.17000	0.20500	0.22200
61	0.06500	0.07100	0.08200	0.13600	0.15900	0.20400	0.23400
62	0.08800	0.10400	0.15100	0.22400	0.21200	0.24500	0.24500
63	0.09900	0.09900	0.12800	0.20100	0.23300	0.29200	0.29200
64	0.09000	0.09700	0.13400	0.24400	0.25600	0.28800	0.28800
65	0.19700	0.16300	0.21300	0.28100	0.22900	0.25000	0.25000
66	0.25700	0.18500	0.21700	0.26700	0.26700	0.26700	0.26700
67	0.21800	0.18500	0.21800	0.25800	0.25800	0.25800	0.25800
68	0.13800	0.18200	0.22600	0.26000	0.26000	0.26000	0.26000
69	0.29400	0.17900	0.21100	0.27100	0.27100	0.27100	0.27100
70	0.12800	0.22300	0.25300	0.26000	0.26000	0.26000	0.26000
71	0.17200	0.17200	0.17200	0.17200	0.17200	0.17200	0.17200
72	0.17200	0.17200	0.17200	0.17200	0.17200	0.17200	0.17200
73	0.27000	0.27000	0.27000	0.27000	0.27000	0.27000	0.27000
74	0.18500	0.18500	0.18500	0.18500	0.18500	0.18500	0.18500
75-79	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

State Peace Officers and Firefighters

	Years of Service						
Attained Age	5	10	15	20	25	30	35
50	0.08900	0.02900	0.04800	0.14900	0.29000	0.38600	0.38600
51	0.00300	0.02500	0.04300	0.11300	0.21200	0.28100	0.28100
52	0.01000	0.02300	0.04000	0.10000	0.17400	0.22500	0.22500
53	0.05000	0.02100	0.04000	0.10700	0.18900	0.24800	0.24800
54	0.14900	0.02600	0.04300	0.11100	0.21400	0.22800	0.24600
55	0.01500	0.02900	0.05600	0.14400	0.21400	0.27500	0.29900
56	0.02600	0.03400	0.05900	0.14800	0.21700	0.28200	0.31600
57	0.04300	0.03400	0.05500	0.15900	0.23700	0.28300	0.29900
58	0.03100	0.04100	0.06800	0.17200	0.23300	0.25500	0.25700
59	0.04700	0.06200	0.08400	0.19900	0.26700	0.28600	0.29000
60	0.06100	0.07500	0.11100	0.20700	0.31900	0.31100	0.32500
61	0.01600	0.07200	0.12900	0.21100	0.28200	0.28200	0.31000
62	0.08000	0.11300	0.17100	0.26200	0.33700	0.33000	0.35900
63	0.15600	0.14200	0.18600	0.26400	0.32400	0.30800	0.33100
64	0.14000	0.10200	0.15200	0.27200	0.33800	0.30300	0.32600
65	0.23500	0.18100	0.21700	0.29300	0.34700	0.32100	0.34100
66	0.28100	0.28100	0.28100	0.28100	0.28100	0.28100	0.28100
67	0.27500	0.27500	0.27500	0.27500	0.27500	0.27500	0.27500
68	0.24300	0.24300	0.24300	0.24300	0.24300	0.24300	0.24300
69	0.30300	0.30300	0.30300	0.30300	0.30300	0.30300	0.30300
70-79	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

California Highway Patrol

	Years of Service						
Attained Age	5	10	15	20	25	30	35
50	0.04300	0.04300	0.04600	0.08700	0.21100	0.37400	0.42300
51	0.03200	0.03200	0.03500	0.06600	0.15900	0.28200	0.31900
52	0.03000	0.03000	0.03200	0.06100	0.14800	0.26300	0.29700
53	0.02900	0.02900	0.03100	0.05900	0.14200	0.25200	0.28500
54	0.03200	0.03200	0.03400	0.06400	0.15500	0.27500	0.31100
55	0.09000	0.09000	0.09000	0.13300	0.21900	0.30400	0.34700
56	0.09100	0.09100	0.09100	0.13500	0.22100	0.30800	0.35100
57	0.09300	0.09300	0.09300	0.13800	0.22600	0.31400	0.35800
58	0.09500	0.09500	0.09500	0.14000	0.23000	0.32000	0.36500
59	0.49200	0.49200	0.49200	0.49200	0.49200	0.49200	0.49200
60-79	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

Schools

	Years of Service						
Attained Age	5	10	15	20	25	30	35
50	0.00300	0.00400	0.00600	0.00700	0.01000	0.01000	0.01100
51	0.00400	0.00500	0.00700	0.00800	0.01100	0.01100	0.01200
52	0.00500	0.00700	0.00800	0.00900	0.01200	0.01200	0.01300
53	0.00700	0.00800	0.01000	0.01200	0.01500	0.01500	0.01600
54	0.00600	0.00900	0.01200	0.01500	0.02000	0.02100	0.02300
55	0.01100	0.02300	0.03400	0.05700	0.07000	0.09000	0.11700
56	0.01200	0.02700	0.03600	0.05600	0.07300	0.09500	0.10800
57	0.01600	0.02700	0.03600	0.05500	0.06800	0.08700	0.10100
58	0.01900	0.03000	0.04000	0.06200	0.07800	0.10300	0.12200
59	0.02300	0.03400	0.04600	0.07000	0.08500	0.10900	0.12800
60	0.02200	0.04300	0.06200	0.09500	0.11300	0.14100	0.16600
61	0.03000	0.05100	0.07100	0.10300	0.12400	0.15400	0.17100
62	0.06500	0.09800	0.12800	0.18800	0.21600	0.24800	0.25600
63	0.07500	0.11200	0.14400	0.19700	0.22200	0.26800	0.29500
64	0.09100	0.11600	0.13800	0.18000	0.19600	0.23100	0.24900
65	0.16300	0.16400	0.19700	0.23200	0.25000	0.27100	0.28900
66	0.20800	0.20400	0.24300	0.28200	0.30100	0.31500	0.32900
67	0.18900	0.18500	0.22100	0.25700	0.27400	0.28700	0.30000
68	0.12700	0.15800	0.20000	0.22700	0.24100	0.24400	0.24900
69	0.16800	0.16200	0.18900	0.21700	0.22900	0.23800	0.24800
70	0.19100	0.19000	0.23700	0.25000	0.24600	0.25400	0.25800
71	0.13800	0.14400	0.19100	0.21500	0.22000	0.22600	0.22600
72	0.16100	0.14600	0.18700	0.19600	0.18600	0.19000	0.19000
73	0.18600	0.15300	0.17300	0.17300	0.16700	0.17100	0.17100
74	0.16900	0.15100	0.18300	0.19400	0.19800	0.20600	0.20600
75-79	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

Public Agency Fire 2% at 50

	Years of Service						
Attained Age	5	10	15	20	25	30	35
50	0.05400	0.05400	0.05600	0.08000	0.06400	0.06600	0.06600
51	0.02000	0.02000	0.02100	0.03000	0.02400	0.02400	0.02400
52	0.03700	0.03700	0.03800	0.05400	0.04300	0.04500	0.04500
53	0.05100	0.05100	0.05300	0.07600	0.06100	0.06300	0.06300
54	0.08200	0.08200	0.08500	0.12100	0.09700	0.10000	0.10000
55	0.13900	0.13900	0.13900	0.13900	0.13900	0.13900	0.13900
56	0.12900	0.12900	0.12900	0.12900	0.12900	0.12900	0.12900
57	0.08500	0.08500	0.08500	0.08500	0.08500	0.08500	0.08500
58	0.11900	0.11900	0.11900	0.11900	0.11900	0.11900	0.11900
59	0.16700	0.16700	0.16700	0.16700	0.16700	0.16700	0.16700
60	0.15200	0.15200	0.15200	0.15200	0.15200	0.15200	0.15200
61	0.17900	0.17900	0.17900	0.17900	0.17900	0.17900	0.17900
62	0.17900	0.17900	0.17900	0.17900	0.17900	0.17900	0.17900
63	0.17900	0.17900	0.17900	0.17900	0.17900	0.17900	0.17900
64	0.17900	0.17900	0.17900	0.17900	0.17900	0.17900	0.17900
65-79	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

Public Agency Fire 3% at 50

	Years of Service						
Attained Age	**5**	**10**	**15**	**20**	**25**	**30**	**35**
50	0.09500	0.04800	0.05300	0.09300	0.13400	0.17500	0.19600
51	0.01600	0.03200	0.05300	0.08500	0.11700	0.14900	0.16500
52	0.01300	0.03200	0.05400	0.08700	0.12000	0.15400	0.17000
53	0.08500	0.04400	0.04900	0.08900	0.12900	0.17000	0.19000
54	0.03800	0.06500	0.07400	0.10500	0.13600	0.16700	0.18200
55	0.04200	0.04300	0.04900	0.08500	0.13200	0.21500	0.27200
56	0.13300	0.10300	0.07500	0.11300	0.15100	0.20900	0.26100
57	0.06200	0.04800	0.06000	0.12400	0.17200	0.21300	0.23800
58	0.12400	0.09700	0.09200	0.15300	0.19400	0.22700	0.25000
59	0.09200	0.07100	0.07800	0.14400	0.19200	0.23300	0.25900
60	0.05600	0.04400	0.06100	0.13100	0.18600	0.23300	0.26200
61	0.28200	0.21900	0.15800	0.19800	0.23300	0.26000	0.28100
62	0.29200	0.22700	0.16400	0.20500	0.24100	0.26900	0.29100
63	0.19600	0.19600	0.19600	0.19600	0.19600	0.19600	0.19600
64	0.19700	0.19700	0.19700	0.19700	0.19700	0.19700	0.19700
65-79	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

Public Agency Fire 3% at 55

	Years of Service						
Attained Age	5	10	15	20	25	30	35
50	0.00300	0.00600	0.01300	0.01900	0.02500	0.02800	0.02800
51	0.00400	0.00800	0.01700	0.02600	0.03400	0.03800	0.03800
52	0.00500	0.01100	0.02200	0.03300	0.04400	0.04900	0.04900
53	0.00500	0.03400	0.02400	0.03800	0.06900	0.13800	0.19100
54	0.00700	0.04700	0.03200	0.05100	0.09400	0.18700	0.25900
55	0.01000	0.06700	0.04600	0.07300	0.13400	0.26600	0.36900
56	0.01000	0.06300	0.04400	0.06900	0.12700	0.25300	0.35100
57	0.13500	0.10000	0.14800	0.19600	0.22000	0.22000	0.22000
58	0.08300	0.06200	0.09100	0.12000	0.13500	0.13500	0.13500
59	0.13700	0.05300	0.08400	0.14600	0.17700	0.17700	0.17700
60	0.16200	0.06300	0.09900	0.17200	0.20800	0.20800	0.20800
61	0.59800	0.23100	0.23100	0.23100	0.23100	0.23100	0.23100
62	0.62100	0.24000	0.24000	0.24000	0.24000	0.2400	0.24000
63	0.23600	0.23600	0.23600	0.23600	0.23600	0.23600	0.23600
64	0.23600	0.23600	0.23600	0.23600	0.23600	0.23600	0.23600
65-79	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

Public Agency Police 2% at 50

	Years of Service						
Attained Age	5	10	15	20	25	30	35
50	0.01800	0.07700	0.05600	0.04600	0.04300	0.04600	0.04600
51	0.02200	0.08700	0.06000	0.04800	0.04400	0.04700	0.04700
52	0.02000	0.10200	0.08100	0.07100	0.06900	0.07500	0.07500
53	0.01600	0.07200	0.05300	0.04500	0.04200	0.04600	0.04600
54	0.00600	0.07100	0.07100	0.06900	0.07200	0.08000	0.08000
55	0.00900	0.04000	0.09900	0.15700	0.18600	0.18600	0.18600
56	0.02000	0.05100	0.10800	0.16500	0.19400	0.19400	0.19400
57	0.03600	0.07200	0.10600	0.13900	0.15600	0.15600	0.15600
58	0.00100	0.04600	0.08900	0.13000	0.15200	0.15200	0.15200
59	0.06600	0.09400	0.11900	0.14300	0.15500	0.15500	0.15500
60	0.17700	0.17700	0.17700	0.17700	0.17700	0.17700	0.17700
61	0.13400	0.13400	0.13400	0.13400	0.13400	0.13400	0.13400
62	0.18400	0.18400	0.18400	0.18400	0.18400	0.18400	0.18400
63	0.25000	0.25000	0.25000	0.25000	0.25000	0.25000	0.25000
64	0.17700	0.17700	0.17700	0.17700	0.17700	0.17700	0.17700
65	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
66	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
67	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
68	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
69	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
70	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
71	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
72	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
73	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
74	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
75-79	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

Public Agency Police 3% at 50

	Years of Service						
Attained Age	5	10	15	20	25	30	35
50	0.12400	0.10300	0.11300	0.14300	0.24400	0.37600	0.43800
51	0.06000	0.08100	0.08700	0.12500	0.20700	0.29400	0.34100
52	0.01600	0.05500	0.11100	0.14800	0.19200	0.23500	0.26000
53	0.07200	0.07400	0.09800	0.14200	0.18900	0.23700	0.26400
54	0.01800	0.04900	0.10500	0.12300	0.18700	0.27100	0.29600
55	0.06900	0.07400	0.08100	0.11300	0.20900	0.30500	0.33600
56	0.06400	0.10800	0.11300	0.12500	0.19000	0.28800	0.34700
57	0.05600	0.10900	0.16000	0.18200	0.21000	0.21000	0.21000
58	0.10800	0.12900	0.17300	0.18900	0.21400	0.21400	0.21400
59	0.09300	0.14400	0.20400	0.22900	0.26200	0.26200	0.26200
60	0.34300	0.18000	0.15900	0.18800	0.24700	0.24700	0.24700
61	0.22100	0.22100	0.22100	0.22100	0.22100	0.22100	0.22100
62	0.21300	0.21300	0.21300	0.21300	0.21300	0.21300	0.21300
63	0.23300	0.23300	0.23300	0.23300	0.23300	0.23300	0.23300
64	0.23400	0.23400	0.23400	0.23400	0.23400	0.23400	0.23400
65	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
66	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
67	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
68	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
69	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
70	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
71	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
72	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
73	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
74	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
75-79	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

Public Agency Police 3% at 55

	Years of Service						
Attained Age	**5**	**10**	**15**	**20**	**25**	**30**	**35**
50	0.01900	0.05300	0.04500	0.05400	0.05700	0.06100	0.06100
51	0.00200	0.01700	0.02800	0.04400	0.05300	0.06000	0.06000
52	0.00200	0.03100	0.03700	0.05100	0.05900	0.06600	0.06600
53	0.02600	0.04900	0.04900	0.08000	0.09900	0.11400	0.11400
54	0.01900	0.03400	0.04700	0.09100	0.12100	0.14200	0.14200
55	0.00600	0.11500	0.14100	0.19900	0.23100	0.25900	0.25900
56	0.01700	0.18800	0.12100	0.17300	0.19900	0.19900	0.19900
57	0.00800	0.13700	0.09300	0.13600	0.15700	0.15700	0.15700
58	0.01700	0.12600	0.10500	0.16400	0.19400	0.19400	0.19400
59	0.02600	0.14600	0.11000	0.16700	0.19500	0.19500	0.19500
60	0.15500	0.15500	0.15500	0.15500	0.15500	0.15500	0.15500
61	0.21000	0.21000	0.21000	0.21000	0.21000	0.21000	0.21000
62	0.26200	0.26200	0.26200	0.26200	0.26200	0.26200	0.26200
63	0.17200	0.17200	0.17200	0.17200	0.17200	0.17200	0.17200
64	0.22700	0.22700	0.22700	0.22700	0.22700	0.22700	0.22700
65	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
66	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
67	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
68	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
69	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
70	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
71	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
72	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
73	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
74	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000
75-79	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

Public Agency Miscellaneous 2% at 60

	Years of Service						
Attained Age	5	10	15	20	25	30	35
50	0.01000	0.01100	0.01400	0.01400	0.01700	0.01700	0.01700
51	0.01700	0.01300	0.01400	0.01000	0.01000	0.01000	0.01000
52	0.01400	0.01400	0.01800	0.01500	0.01600	0.01600	0.01600
53	0.01500	0.01200	0.01300	0.01000	0.01100	0.01100	0.01100
54	0.00600	0.01000	0.01700	0.01600	0.01800	0.01800	0.01800
55	0.01200	0.01600	0.02400	0.03200	0.03600	0.03600	0.03600
56	0.01000	0.01400	0.02300	0.03000	0.03400	0.03400	0.03400
57	0.00600	0.01800	0.03000	0.04000	0.04400	0.04400	0.04400
58	0.02200	0.02300	0.03300	0.04200	0.04600	0.04600	0.04600
59	0.03900	0.03300	0.04000	0.04700	0.05000	0.05000	0.05000
60	0.06300	0.06900	0.07400	0.09000	0.13700	0.11600	0.12500
61	0.04400	0.05800	0.06600	0.08300	0.13100	0.11300	0.12200
62	0.08400	0.10700	0.12100	0.15300	0.23800	0.20500	0.22100
63	0.17300	0.16600	0.16500	0.19100	0.28300	0.23500	0.25000
64	0.12000	0.14500	0.16400	0.14700	0.16000	0.17200	0.17900
65	0.13800	0.16000	0.21400	0.21600	0.23700	0.28300	0.31300
66	0.19800	0.22800	0.24900	0.21600	0.22800	0.23900	0.24500
67	0.20700	0.24200	0.23000	0.23300	0.23300	0.23300	0.23300
68	0.20100	0.23400	0.22500	0.23100	0.23100	0.23100	0.23100
69	0.15200	0.17300	0.16400	0.16600	0.16600	0.16600	0.16600
70	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
71	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
72	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
73	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
74	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000	0.20000
75-79	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

Public Agency Miscellaneous 2% at 55

	Years of Service						
Attained Age	5	10	15	20	25	30	35
50	0.01400	0.01400	0.01700	0.02100	0.02300	0.02400	0.02400
51	0.01300	0.01700	0.01700	0.01800	0.01800	0.01900	0.01900
52	0.01300	0.01800	0.01800	0.02000	0.02000	0.02100	0.02100
53	0.01300	0.01900	0.02100	0.02400	0.02500	0.02600	0.02600
54	0.01700	0.02500	0.02800	0.03200	0.03300	0.03500	0.03500
55	0.04500	0.04200	0.05300	0.08600	0.09800	0.12300	0.16400
56	0.01800	0.03600	0.05600	0.08600	0.10200	0.11900	0.13600
57	0.04100	0.04600	0.05600	0.07600	0.09400	0.12000	0.14700
58	0.05200	0.04400	0.04800	0.07400	0.10600	0.12300	0.14100
59	0.04300	0.05800	0.07300	0.09200	0.10500	0.12600	0.15500
60	0.05900	0.06400	0.08300	0.11500	0.15400	0.17000	0.18600
61	0.08700	0.07400	0.08700	0.10700	0.14700	0.16800	0.18300
62	0.11500	0.12300	0.15100	0.18000	0.22700	0.23700	0.24200
63	0.11600	0.12700	0.16400	0.20200	0.25200	0.26100	0.28200
64	0.08400	0.13800	0.15300	0.19000	0.22700	0.22800	0.23100
65	0.16700	0.18700	0.21000	0.26200	0.28800	0.29100	0.29100
66	0.18700	0.25800	0.28000	0.30800	0.31800	0.31900	0.32600
67	0.19500	0.23500	0.24400	0.27700	0.26900	0.28000	0.28000
68	0.22800	0.24800	0.25000	0.24100	0.24500	0.24500	0.24500
69	0.18800	0.20100	0.20900	0.21900	0.23100	0.23100	0.23100
70	0.22900	0.22900	0.22900	0.22900	0.22900	0.22900	0.22900
71	0.22900	0.22900	0.22900	0.22900	0.22900	0.22900	0.22900
72	0.22900	0.22900	0.22900	0.22900	0.22900	0.22900	0.22900
73	0.22900	0.22900	0.22900	0.22900	0.22900	0.22900	0.22900
74	0.22900	0.22900	0.22900	0.22900	0.22900	0.22900	0.22900
75-79	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

Public Agency Miscellaneous 2.5% at 55

Attained Age	Years of Service						
	5	10	15	20	25	30	35
50	0.01400	0.01700	0.02700	0.03500	0.04600	0.05000	0.05200
51	0.01900	0.02100	0.02500	0.03000	0.03800	0.04000	0.04100
52	0.01800	0.02000	0.02600	0.03400	0.03800	0.03700	0.04000
53	0.01300	0.02100	0.03100	0.04500	0.05200	0.05300	0.05800
54	0.02500	0.02500	0.03000	0.04600	0.05700	0.06800	0.10400
55	0.02900	0.04200	0.06400	0.10900	0.15000	0.22500	0.27600
56	0.03600	0.04700	0.06800	0.10600	0.13400	0.19400	0.23500
57	0.05100	0.04700	0.06000	0.09200	0.11600	0.16600	0.19800
58	0.03500	0.04600	0.06200	0.09300	0.11900	0.17000	0.20100
59	0.02900	0.05300	0.07200	0.11200	0.13900	0.16500	0.19800
60	0.03900	0.06900	0.09400	0.15700	0.17700	0.22100	0.21900
61	0.08000	0.07700	0.08600	0.14000	0.16700	0.20500	0.22500
62	0.08600	0.13100	0.14900	0.22000	0.24400	0.28400	0.26500
63	0.13500	0.13500	0.14700	0.21400	0.22200	0.26200	0.24800
64	0.11400	0.12800	0.15800	0.17700	0.23300	0.22900	0.24900
65	0.11200	0.17400	0.22200	0.20900	0.26800	0.27300	0.29100
66	0.23500	0.25400	0.29700	0.28900	0.32100	0.33700	0.33700
67	0.23700	0.24000	0.26700	0.24900	0.26700	0.27700	0.27700
68	0.25800	0.27100	0.27500	0.20700	0.21000	0.21200	0.21200
69	0.11700	0.20800	0.26600	0.21900	0.25000	0.27000	0.27000
70	0.22900	0.22900	0.22900	0.22900	0.22900	0.22900	0.22900
71	0.22900	0.22900	0.22900	0.22900	0.22900	0.22900	0.22900
72	0.22900	0.22900	0.22900	0.22900	0.22900	0.22900	0.22900
73	0.22900	0.22900	0.22900	0.22900	0.22900	0.22900	0.22900
74	0.22900	0.22900	0.22900	0.22900	0.22900	0.22900	0.22900
75-79	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

Public Agency Miscellaneous 2.7% at 55

	Years of Service						
Attained Age	**5**	**10**	**15**	**20**	**25**	**30**	**35**
50	0.01100	0.01600	0.02200	0.03300	0.03400	0.03800	0.04400
51	0.01800	0.01900	0.02300	0.03200	0.03100	0.03100	0.03200
52	0.01900	0.02000	0.02600	0.03500	0.03400	0.03700	0.04200
53	0.02000	0.02000	0.02500	0.04300	0.04800	0.05300	0.06000
54	0.01800	0.03000	0.04000	0.05200	0.05300	0.07000	0.08800
55	0.04500	0.05800	0.08200	0.13800	0.20800	0.27800	0.34100
56	0.05700	0.06200	0.08000	0.12100	0.17800	0.22200	0.25600
57	0.04500	0.05200	0.07100	0.10600	0.14700	0.18200	0.21100
58	0.07400	0.06000	0.07400	0.11800	0.16300	0.18200	0.20100
59	0.05800	0.06700	0.08600	0.12300	0.15800	0.18700	0.22000
60	0.08700	0.08400	0.09600	0.14200	0.16500	0.19800	0.22300
61	0.07300	0.08400	0.10100	0.13800	0.17300	0.21800	0.23700
62	0.13000	0.13300	0.14600	0.18700	0.21400	0.24900	0.26500
63	0.12200	0.14000	0.16000	0.20400	0.20900	0.24300	0.27900
64	0.10400	0.12400	0.15400	0.20200	0.21400	0.23000	0.23700
65	0.18200	0.20100	0.24200	0.26400	0.29300	0.29300	0.29300
66	0.27200	0.24900	0.27300	0.28500	0.31200	0.31200	0.31200
67	0.18200	0.21700	0.25400	0.24900	0.26400	0.26400	0.26400
68	0.22300	0.19700	0.21800	0.24200	0.27300	0.27300	0.27300
69	0.21700	0.21700	0.21700	0.21700	0.21700	0.21700	0.21700
70	0.22700	0.22700	0.22700	0.22700	0.22700	0.22700	0.22700
71	0.22700	0.22700	0.22700	0.22700	0.22700	0.22700	0.22700
72	0.22700	0.22700	0.22700	0.22700	0.22700	0.22700	0.22700
73	0.22700	0.22700	0.22700	0.22700	0.22700	0.22700	0.22700
74	0.22700	0.22700	0.22700	0.22700	0.22700	0.22700	0.22700
75-79	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

Public Agency Miscellaneous 3% at 60

	Years of Service						
Attained Age	5	10	15	20	25	30	35
50	0.01500	0.02000	0.02500	0.03900	0.04000	0.04400	0.04400
51	0.04100	0.03400	0.03200	0.04100	0.03600	0.03700	0.03700
52	0.02400	0.02000	0.02200	0.03900	0.04000	0.04100	0.04100
53	0.01800	0.02400	0.03200	0.04700	0.04800	0.05700	0.05700
54	0.03300	0.03300	0.03500	0.05100	0.04900	0.05200	0.05200
55	0.13700	0.04300	0.05100	0.06500	0.07600	0.10800	0.13600
56	0.17300	0.03800	0.05400	0.07500	0.08500	0.11700	0.13900
57	0.01900	0.03500	0.05900	0.08800	0.11100	0.13400	0.14700
58	0.01100	0.04000	0.07000	0.10500	0.13300	0.16200	0.17800
59	0.19400	0.05600	0.06400	0.08100	0.11300	0.16300	0.19000
60	0.08100	0.08500	0.13300	0.21500	0.28000	0.33300	0.37800
61	0.08000	0.09000	0.13400	0.17000	0.22300	0.29200	0.32700
62	0.13700	0.15300	0.20100	0.25000	0.27800	0.28800	0.30600
63	0.12800	0.14000	0.18300	0.22700	0.25100	0.26000	0.27500
64	0.17400	0.14700	0.17300	0.22400	0.23900	0.26400	0.31000
65	0.15200	0.20100	0.26200	0.29900	0.32300	0.32300	0.32300
66	0.27200	0.27300	0.31700	0.35500	0.38000	0.38000	0.38000
67	0.21800	0.23700	0.26800	0.27400	0.28400	0.28400	0.28400
68	0.20000	0.22800	0.26900	0.28500	0.29900	0.29900	0.29900
69	0.25000	0.25000	0.25000	0.25000	0.25000	0.25000	0.25000
70	0.24500	0.24500	0.24500	0.24500	0.24500	0.24500	0.24500
71	0.24500	0.24500	0.24500	0.24500	0.24500	0.24500	0.24500
72	0.24500	0.24500	0.24500	0.24500	0.24500	0.24500	0.24500
73	0.24500	0.24500	0.24500	0.24500	0.24500	0.24500	0.24500
74	0.24500	0.24500	0.24500	0.24500	0.24500	0.24500	0.24500
75-79	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000	1.00000

NON-INDUSTRIAL DISABILITY RETIREMENT RATES AS VARYING AGES

	20	30	40	50	60	70	80
State							
Miscellaneous Tier 1 Female	0.00030	0.00044	0.00150	0.00403	0.00238	0.00312	0.00312
Miscellaneous Tier 1 Male	0.00019	0.00019	0.00103	0.00274	0.00200	0.00200	0.00200
Miscellaneous Tier 2 Female	0.00030	0.00044	0.00150	0.00403	0.00238	0.00312	0.00312
Miscellaneous Tier 2 Male	0.00019	0.00019	0.00103	0.00274	0.00200	0.00200	0.00200
Industrial	0.00035	0.00086	0.00239	0.00488	0.00626	0.00626	0.00626
Safety	0.00036	0.00063	0.00072	0.00201	0.00320	0.00459	0.00459
POFF	0.00030	0.00030	0.00040	0.00098	0.00188	0.00233	0.00233
CHP	0.00008	0.00008	0.00008	0.00017	0.00017	0.00017	0.00017
Schools							
Female	0.00015	0.00017	0.00077	0.00214	0.00102	0.00063	0.00062
Male	0.00004	0.00018	0.00098	0.00273	0.00198	0.00193	0.00193
Public Agency							
Miscellaneous Female	0.00004	0.00033	0.00119	0.00193	0.00094	0.00054	0.00035
Miscellaneous Male	0.00007	0.00017	0.00091	0.00154	0.00124	0.00097	0.00097
Fire	0.00008	0.00008	0.00008	0.00040	0.00056	0.00056	0.00056
Police	0.00006	0.00011	0.00023	0.00045	0.00113	0.00113	0.00113
CPO	0.00009	0.00011	0.00059	0.00160	0.00051	0.00051	0.00051

INDUSTRIAL DISABILITY RETIREMENT RATES AT VARYING AGES

	20	30	40	50	60	70	80
State							
Industrial	0.00006	.00006	0.00012	0.00018	0.00023	0.00023	0.00023
Safety	0.00000	0.00121	0.00296	0.00578	0.00963	0.01105	0.01105
POFF	0.00039	0.00167	0.00464	0.01027	0.01966	0.03403	0.05474
CHP	0.00016	0.00068	0.00202	0.01214	0.20431	0.27551	0.27773
Public Agency							
Fire	0.00005	0.00056	0.00225	0.02079	0.04375	0.08221	0.14219
Police	0.00000	0.00476	0.01100	0.01846	0.06024	0.08549	0.11161
CPO	0.00042	0.00249	0.00513	0.00919	0.01740	0.02624	0.07621

TERMINATION WITH REFUND

State Miscellaneous Tier 1 Male

	Entry Age		
Service	**20**	**30**	**40**
0	17.0%	14.2%	11.8%
5	4.4%	3.4%	2.4%
10	0.7%	0.5%	0.3%
15	0.0%	0.0%	0.0%
20	0.0%	0.0%	0.0%
25	0.0%	0.0%	0.0%
30	0.0%	0.0%	0.0%
35	0.0%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

State Miscellaneous Tier 1 Female

	Entry Age		
Service	**20**	**30**	**40**
0	16.9%	11.6%	11.0%
5	4.6%	3.2%	2.5%
10	0.8%	0.6%	0.3%
15	0.0%	0.0%	0.0%
20	0.0%	0.0%	0.0%
25	0.0%	0.0%	0.0%
30	0.0%	0.0%	0.0%
35	0.0%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

State Miscellaneous Tier 2 Male

	Entry Age		
Service	20	30	40
0	13.9%	13.9%	13.9%
5	3.8%	3.8%	3.8%
10	0.0%	0.0%	0.0%
15	0.0%	0.0%	0.0%
20	0.0%	0.0%	0.0%
25	0.0%	0.0%	0.0%
30	0.0%	0.0%	0.0%
35	0.0%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

State Miscellaneous Tier 2 Female

	Entry Age		
Service	20	30	40
0	14.0%	14.0%	14.0%
5	4.3%	4.3%	4.3%
10	0.0%	0.0%	0.0%
15	0.0%	0.0%	0.0%
20	0.0%	0.0%	0.0%
25	0.0%	0.0%	0.0%
30	0.0%	0.0%	0.0%
35	0.0%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

California Highway Patrol Male

	Entry Age		
Service	20	30	40
0	3.3%	3.3%	3.3%
5	0.3%	0.3%	0.3%
10	0.0%	0.0%	0.0%
15	0.0%	0.0%	0.0%
20	0.0%	0.0%	0.0%
25	0.0%	0.0%	0.0%
30	0.0%	0.0%	0.0%
35	0.0%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

California Highway Patrol Female

	Entry Age		
Service	20	30	40
0	8.0%	8.0%	8.0%
5	0.3%	0.3%	0.3%
10	0.0%	0.0%	0.0%
15	0.0%	0.0%	0.0%
20	0.0%	0.0%	0.0%
25	0.0%	0.0%	0.0%
30	0.0%	0.0%	0.0%
35	0.0%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

State Peace Officers and Firefighters Male

	Entry Age		
Service	**20**	**30**	**40**
0	10.1%	10.1%	10.1%
5	2.1%	2.1%	2.1%
10	0.4%	0.4%	0.4%
15	0.2%	0.2%	0.2%
20	0.1%	0.1%	0.1%
25	0.0%	0.0%	0.0%
30	0.0%	0.0%	0.0%
35	0.0%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

State Peace Officers and Firefighters Female

	Entry Age		
Service	**20**	**30**	**40**
0	10.3%	10.3%	10.3%
5	2.7%	2.7%	2.7%
10	0.4%	0.4%	0.4%
15	0.2%	0.2%	0.2%
20	0.1%	0.1%	0.1%
25	0.0%	0.0%	0.0%
30	0.0%	0.0%	0.0%
35	0.0%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

State Safety Male

	Entry Age		
Service	20	30	40
0	11.6%	11.6%	11.6%
5	2.0%	2.0%	2.0%
10	0.5%	0.5%	0.5%
15	0.3%	0.3%	0.3%
20	0.2%	0.2%	0.2%
25	0.1%	0.1%	0.1%
30	0.1%	0.1%	0.1%
35	0.0%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

State Safety Female

	Entry Age		
Service	20	30	40
0	14.3%	14.3%	14.3%
5	2.9%	2.9%	2.9%
10	0.6%	0.6%	0.6%
15	0.4%	0.4%	0.4%
20	0.2%	0.2%	0.2%
25	0.1%	0.1%	0.1%
30	0.0%	0.0%	0.0%
35	0.0%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

State Industrial

	Entry Age		
Service	20	30	40
0	7.2%	7.2%	7.2%
5	2.8%	2.8%	2.8%
10	0.4%	0.4%	0.4%
15	0.3%	0.3%	0.3%
20	0.1%	0.1%	0.1%
25	0.1%	0.1%	0.1%
30	0.0%	0.0%	0.0%
35	0.1%	0.1%	0.1%
40	0.1%	0.1%	0.1%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

Schools Male

	Entry Age		
Service	20	30	40
0	20.5%	17.3%	14.2%
5	8.2%	5.9%	3.8%
10	2.2%	1.6%	0.9%
15	1.1%	0.8%	0.4%
20	0.6%	0.4%	0.1%
25	0.3%	0.2%	0.1%
30	0.1%	0.1%	0.1%
35	0.1%	0.1%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

Schools Female

	Entry Age		
Service	20	30	40
0	21.2%	16.7%	12.1%
5	9.9%	7.1%	4.8%
10	2.2%	1.7%	1.0%
15	1.3%	0.8%	0.4%
20	0.6%	0.4%	0.1%
25	0.3%	0.2%	0.1%
30	0.1%	0.1%	0.0%
35	0.1%	0.1%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

Public Agency Miscellaneous Male

	Entry Age		
Service	20	30	40
0	18.5%	16.3%	14.9%
5	4.6%	3.6%	2.6%
10	1.1%	0.8%	0.5%
15	0.0%	0.0%	0.0%
20	0.0%	0.0%	0.0%
25	0.0%	0.0%	0.0%
30	0.0%	0.0%	0.0%
35	0.0%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

Public Agency Miscellaneous Female

	Entry Age		
Service	20	30	40
0	19.4%	18.2%	17.3%
5	5.5%	4.6%	3.5%
10	1.3%	1.1%	0.7%
15	0.0%	0.0%	0.0%
20	0.0%	0.0%	0.0%
25	0.0%	0.0%	0.0%
30	0.0%	0.0%	0.0%
35	0.0%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

Public Agency Fire Male

	Entry Age		
Service	20	30	40
0	10.2%	10.2%	10.2%
5	0.9%	0.9%	0.9%
10	0.2%	0.2%	0.2%
15	0.0%	0.0%	0.0%
20	0.0%	0.0%	0.0%
25	0.0%	0.0%	0.0%
30	0.0%	0.0%	0.0%
35	0.0%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

Public Agency Fire Female

	Entry Age		
Service	20	30	40
0	13.2%	13.2%	13.2%
5	2.1%	2.1%	2.1%
10	0.0%	0.0%	0.0%
15	0.0%	0.0%	0.0%
20	0.0%	0.0%	0.0%
25	0.0%	0.0%	0.0%
30	0.0%	0.0%	0.0%
35	0.0%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

Public Agency Police Male

	Entry Age		
Service	20	30	40
0	13.0%	13.0%	13.0%
5	1.1%	1.1%	1.1%
10	0.3%	0.3%	0.3%
15	0.0%	0.0%	0.0%
20	0.0%	0.0%	0.0%
25	0.0%	0.0%	0.0%
30	0.0%	0.0%	0.0%
35	0.0%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

Public Agency Police Female

	Entry Age		
Service	20	30	40
0	13.9%	13.9%	13.9%
5	1.3%	1.3%	1.3%
10	0.5%	0.5%	0.5%
15	0.0%	0.0%	0.0%
20	0.0%	0.0%	0.0%
25	0.0%	0.0%	0.0%
30	0.0%	0.0%	0.0%
35	0.0%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

Public Agency County Peace Officer Male

	Entry Age		
Service	20	30	40
0	10.9%	10.9%	10.9%
5	1.9%	1.9%	1.9%
10	0.5%	0.5%	0.5%
15	0.2%	0.2%	0.2%
20	0.0%	0.0%	0.0%
25	0.0%	0.0%	0.0%
30	0.0%	0.0%	0.0%
35	0.0%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

Public Agency County Peace Officer Female

	Entry Age		
Service	20	30	40
0	12.8%	12.8%	12.8%
5	2.8%	2.8%	2.8%
10	0.4%	0.4%	0.4%
15	0.4%	0.4%	0.4%
20	0.0%	0.0%	0.0%
25	0.0%	0.0%	0.0%
30	0.0%	0.0%	0.0%
35	0.0%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

TERMINATION WITH VESTED BENEFITS

Public Agency Miscellaneous Male

	Entry Age		
Service	20	30	40
0	0.0%	0.0%	0.0%
5	3.8%	3.6%	3.0%
10	2.6%	2.5%	2.0%
15	1.8%	1.7%	1.2%
20	1.4%	1.1%	0.0%
25	0.8%	0.6%	0.0%
30	0.5%	0.0%	0.0%
35	0.4%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

Public Agency Miscellaneous Female

	Entry Age		
Service	20	30	40
0	0.0%	0.0%	0.0%
5	5.2%	4.6%	3.8%
10	3.6%	3.3%	2.4%
15	2.5%	2.1%	1.3%
20	1.7%	1.3%	0.0%
25	1.1%	0.8%	0.0%
30	0.6%	0.0%	0.0%
35	0.4%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

State Miscellaneous Tier 1 Male

	Entry Age		
Service	20	30	40
0	0.0%	0.0%	0.0%
5	4.7%	4.0%	2.7%
10	2.4%	2.2%	1.5%
15	1.5%	1.3%	0.7%
20	1.0%	0.8%	0.0%
25	0.5%	0.4%	0.0%
30	0.3%	0.0%	0.0%
35	0.2%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

State Miscellaneous Tier 1 Female

	Entry Age		
Service	20	30	40
0	0.0%	0.0%	0.0%
5	5.3%	4.6%	3.2%
10	3.0%	2.6%	1.6%
15	1.8%	1.5%	0.9%
20	1.1%	0.8%	0.0%
25	0.6%	0.5%	0.0%
30	0.4%	0.0%	0.0%
35	0.2%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

State Miscellaneous Tier 2 Male

	Entry Age		
Service	20	30	40
0	0.0%	0.0%	0.0%
5	4.6%	4.6%	4.6%
10	3.1%	3.1%	3.1%
15	2.0%	2.0%	2.0%
20	1.3%	1.3%	0.0%
25	0.8%	0.8%	0.0%
30	0.4%	0.0%	0.0%
35	0.0%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

State Miscellaneous Tier 2 Female

	Entry Age		
Service	20	30	40
0	0.0%	0.0%	0.0%
5	5.3%	5.3%	5.3%
10	3.7%	3.7%	3.7%
15	2.5%	2.5%	2.5%
20	1.8%	1.8%	0.0%
25	1.1%	1.1%	0.0%
30	0.6%	0.0%	0.0%
35	0.0%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

Schools Male

Service	Entry Age 20	30	40
0	0.0%	0.0%	0.0%
5	3.6%	3.3%	2.7%
10	3.1%	2.7%	1.9%
15	1.9%	1.7%	1.2%
20	1.5%	1.1%	0.0%
25	0.9%	0.7%	0.0%
30	0.6%	0.0%	0.0%
35	0.4%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

Schools Female

Service	Entry Age 20	30	40
0	0.0%	0.0%	0.0%
5	5.0%	4.0%	2.7%
10	4.2%	3.4%	2.3%
15	2.6%	2.2%	1.4%
20	1.8%	1.4%	0.0%
25	1.2%	0.9%	0.0%
30	0.6%	0.0%	0.0%
35	0.5%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

Public Agency Fire Male

	Entry Age		
Service	**20**	**30**	**40**
0	0.0%	0.0%	0.0%
5	0.9%	0.9%	0.9%
10	0.7%	0.7%	0.7%
15	0.5%	0.5%	0.0%
20	0.4%	0.4%	0.0%
25	0.2%	0.0%	0.0%
30	0.1%	0.0%	0.0%
35	0.0%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

Public Agency Fire Female

	Entry Age		
Service	**20**	**30**	**40**
0	0.0%	0.0%	0.0%
5	2.2%	2.2%	2.2%
10	1.6%	1.6%	1.6%
15	1.2%	1.2%	0.0%
20	0.9%	0.9%	0.0%
25	0.6%	0.0%	0.0%
30	0.3%	0.0%	0.0%
35	0.0%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

Public Agency Police Male

	Entry Age		
Service	20	30	40
0	0.0%	0.0%	0.0%
5	1.6%	1.6%	1.6%
10	1.1%	1.1%	1.1%
15	0.8%	0.8%	0.0%
20	0.6%	0.6%	0.0%
25	0.4%	0.0%	0.0%
30	0.2%	0.0%	0.0%
35	0.0%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

Public Agency Police Female

	Entry Age		
Service	20	30	40
0	0.0%	0.0%	0.0%
5	2.7%	2.7%	2.7%
10	2.0%	2.0%	2.0%
15	1.4%	1.4%	0.0%
20	1.1%	1.1%	0.0%
25	0.7%	0.0%	0.0%
30	0.4%	0.0%	0.0%
35	0.0%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

Public Agency County Peace Officer Male

	Entry Age		
Service	20	30	40
0	0.0%	0.0%	0.0%
5	1.8%	1.8%	1.8%
10	1.3%	1.3%	1.3%
15	0.9%	0.9%	0.0%
20	0.6%	0.6%	0.0%
25	0.4%	0.0%	0.0%
30	0.2%	0.0%	0.0%
35	0.0%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

Public Agency County Peace Officer Female

	Entry Age		
Service	20	30	40
0	0.0%	0.0%	0.0%
5	2.7%	2.7%	2.7%
10	1.9%	1.9%	1.9%
15	1.3%	1.3%	0.0%
20	1.0%	1.0%	0.0%
25	0.6%	0.0%	0.0%
30	0.3%	0.0%	0.0%
35	0.0%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

California Highway Patrol Male

	Entry Age		
Service	**20**	**30**	**40**
0	0.0%	0.0%	0.0%
5	0.9%	0.9%	0.9%
10	0.6%	0.6%	0.6%
15	0.4%	0.4%	0.0%
20	0.3%	0.3%	0.0%
25	0.2%	0.0%	0.0%
30	0.0%	0.0%	0.0%
35	0.0%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

California Highway Patrol Female

	Entry Age		
Service	**20**	**30**	**40**
0	0.0%	0.0%	0.0%
5	1.8%	1.8%	1.8%
10	1.2%	1.2%	1.2%
15	0.8%	0.8%	0.0%
20	0.6%	0.6%	0.0%
25	0.4%	0.0%	0.0%
30	0.0%	0.0%	0.0%
35	0.0%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

State Peace Officers and Firefighters Male

	Entry Age		
Service	20	30	40
0	0.0%	0.0%	0.0%
5	1.1%	1.1%	1.1%
10	0.9%	0.9%	0.9%
15	0.7%	0.7%	0.0%
20	0.5%	0.5%	0.0%
25	0.4%	0.0%	0.0%
30	0.2%	0.0%	0.0%
35	0.0%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

State Peace Officers and Firefighters Female

	Entry Age		
Service	20	30	40
0	0.0%	0.0%	0.0%
5	2.3%	2.3%	2.3%
10	1.6%	1.6%	1.6%
15	1.1%	1.1%	0.0%
20	0.7%	0.7%	0.0%
25	0.5%	0.0%	0.0%
30	0.4%	0.0%	0.0%
35	0.0%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

State Safety Male

	Entry Age		
Service	20	30	40
0	0.0%	0.0%	0.0%
5	2.3%	2.3%	2.3%
10	1.7%	1.7%	1.7%
15	1.2%	1.2%	0.0%
20	0.9%	0.9%	0.0%
25	0.7%	0.0%	0.0%
30	0.5%	0.0%	0.0%
35	0.0%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

State Safety Female

	Entry Age		
Service	20	30	40
0	0.0%	0.0%	0.0%
5	3.0%	3.0%	3.0%
10	2.3%	2.3%	2.3%
15	1.7%	1.7%	0.0%
20	1.3%	1.3%	0.0%
25	1.0%	0.0%	0.0%
30	0.7%	0.0%	0.0%
35	0.0%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

State Industrial

	Entry Age		
Service	20	30	40
0	0.0%	0.0%	0.0%
5	2.6%	2.6%	2.6%
10	2.1%	2.1%	2.1%
15	1.6%	1.6%	0.0%
20	1.3%	1.3%	0.0%
25	0.7%	0.0%	0.0%
30	0.4%	0.0%	0.0%
35	0.0%	0.0%	0.0%
40	0.0%	0.0%	0.0%
45	0.0%	0.0%	0.0%
50	0.0%	0.0%	0.0%

PRE-RETIREMENT BASE MORTALITY RATES

Non-Industrial Related Mortality

Age	Female	Male
20	0.00014	0.00039
25	0.00013	0.00033
30	0.00019	0.00044
35	0.00029	0.00058
40	0.00039	0.00075
45	0.00054	0.00093
50	0.00081	0.00134
55	0.00123	0.00198
60	0.00179	0.00287
65	0.00250	0.00403
70	0.00404	0.00594
75	0.00688	0.00933
80	0.01149	0.01515

Industrial Related Mortality

Age	Female	Male
20	0.00002	0.00004
25	0.00002	0.00004
30	0.00003	0.00005
35	0.00004	0.00005
40	0.00005	0.00006
45	0.00006	0.00007
50	0.00008	0.00010
55	0.00012	0.00015
60	0.00017	0.00025
65	0.00022	0.00038
70	0.00040	0.00067
75	0.00078	0.00122
80	0.00157	0.00225

POST-RETIREMENT MORTALITY RATES

Service Retiree and Beneficiary Mortality

Age	Female	Male
20	0.00014	0.00039
25	0.00013	0.00033
30	0.00019	0.00044
35	0.00029	0.00058
40	0.00039	0.00075
45	0.00054	0.00093
50	0.00199	0.00266
55	0.00325	0.00390
60	0.00455	0.00578
65	0.00612	0.00857
70	0.00996	0.01333
75	0.01783	0.02391
80	0.03403	0.04371
85	0.06166	0.08274
90	0.11086	0.14539
95	0.20364	0.24664
100	0.31582	0.36198
105	0.44679	0.52229
110	1.00000	1.00000
115	1.00000	1.00000
120	1.00000	1.00000

Non-Industrial Related Mortality

Age	Female	Male
20	0.00233	0.00411
25	0.00187	0.00346
30	0.00301	0.00482
35	0.00504	0.00644
40	0.00730	0.00807
45	0.01019	0.01114
50	0.01439	0.01701
55	0.01734	0.02210
60	0.01962	0.02708
65	0.02276	0.03334
70	0.02910	0.04001
75	0.04160	0.05376
80	0.06111	0.07936
85	0.09385	0.11561
90	0.14396	0.16608
95	0.20364	0.24664
100	0.31582	0.36198
105	0.44679	0.52229
110	1.00000	1.00000
115	1.00000	1.00000
120	1.00000	1.00000

Industrial Related Mortality

Age	Female	Male
20	0.00053	0.00146
25	0.00069	0.00159
30	0.00099	0.00194
35	0.00136	0.00223
40	0.00177	0.00252
45	0.00227	0.00313
50	0.00311	0.00430
55	0.00549	0.00621
60	0.00868	0.00944
65	0.01190	0.01394
70	0.01858	0.02163
75	0.03134	0.03446
80	0.05183	0.05853
85	0.08045	0.10137
90	0.12434	0.16584
95	0.20364	0.24664
100	0.31582	0.36198
105	0.44679	0.52229
110	1.00000	1.00000
115	1.00000	1.00000
120	1.00000	1.00000

SALARY INCREASE

The following tables list the proposed Seniority, Merit, and Promotion salary increases added to the 2.75%

Miscellaneous

State Miscellaneous

	Entry Age		
Service	20	30	40
0	6.2%	4.0%	3.5%
3	5.2%	3.3%	2.6%
5	4.6%	3.0%	2.1%
10	2.6%	1.5%	1.0%
15	1.8%	1.2%	0.8%
20	1.3%	0.9%	0.7%
25	0.9%	0.7%	0.5%
30	0.7%	0.5%	0.4%

State Industrial

	Entry Age		
Service	20	30	40
0	5.8%	5.5%	5.5%
3	4.7%	3.9%	3.9%
5	4.1%	3.1%	3.1%
10	2.7%	1.6%	1.6%
15	1.8%	1.1%	1.1%
20	1.2%	0.8%	0.8%
25	0.8%	0.6%	0.6%
30	0.5%	0.4%	0.4%

Public Agency Miscellaneous

	Entry Age		
Service	20	30	40
0	7.6%	6.2%	5.2%
3	5.0%	3.8%	2.8%
5	3.8%	2.8%	1.9%
10	2.0%	1.3%	1.1%
15	1.5%	1.0%	0.7%
20	1.2%	0.8%	0.5%
25	0.9%	0.7%	0.3%
30	0.7%	0.5%	0.2%

Schools

Service	Entry Age 20	Entry Age 30	Entry Age 40
0	2.8%	2.8%	2.0%
3	4.2%	3.7%	3.0%
5	3.1%	2.4%	1.8%
10	2.4%	1.6%	1.2%
15	1.8%	1.4%	1.0%
20	1.5%	1.1%	0.8%
25	1.2%	1.0%	0.6%
30	0.7%	0.5%	0.2%

Safety

State Safety

Service	Entry Age 20	Entry Age 30	Entry Age 40
0	5.1%	5.1%	5.1%
3	3.3%	3.3%	3.3%
5	2.3%	2.3%	2.3%
10	1.1%	1.1%	1.1%
15	1.0%	1.0%	1.0%
20	0.9%	0.9%	0.9%
25	0.8%	0.8%	0.8%
30	0.7%	0.7%	0.7%

State Peace Officers and Firefighters

Service	Entry Age 20	Entry Age 30	Entry Age 40
0	11.5%	11.5%	11.5%
3	6.6%	6.6%	6.6%
5	4.3%	4.3%	4.3%
10	1.4%	1.4%	1.4%
15	1.1%	1.1%	1.1%
20	1.2%	1.2%	1.2%
25	1.3%	1.3%	1.3%
30	1.3%	1.3%	1.3%

Public Agency Police

	Entry Age		
Service	20	30	40
0	11.8%	10.5%	6.5%
3	5.8%	4.9%	3.5%
5	3.7%	2.9%	2.3%
10	1.8%	1.5%	1.2%
15	1.8%	1.5%	1.3%
20	1.8%	1.5%	1.5%
25	1.8%	1.4%	1.6%
30	1.8%	1.4%	1.8%

Public Agency County Peace Officer

	Entry Age		
Service	20	30	40
0	12.4%	10.5%	8.9%
3	5.4%	4.7%	3.9%
5	3.1%	2.8%	2.2%
10	1.8%	1.4%	0.7%
15	1.7%	1.2%	0.7%
20	1.6%	1.1%	0.7%
25	1.6%	0.9%	0.8%
30	1.5%	0.8%	0.8%

Public Agency Fire

	Entry Age		
Service	20	30	40
0	15.2%	15.5%	6.3%
3	7.3%	6.1%	3.5%
5	4.5%	3.3%	2.3%
10	1.9%	1.4%	0.8%
15	1.6%	1.2%	0.9%
20	1.4%	1.1%	1.0%
25	1.3%	0.9%	1.2%
30	1.1%	0.8%	1.3%

State Safety

	Entry Age		
Service	**20**	**30**	**40**
0	5.1%	5.1%	5.1%
3	3.3%	3.3%	3.3%
5	2.3%	2.3%	2.3%
10	1.1%	1.1%	1.1%
15	1.0%	1.0%	1.0%
20	0.9%	0.9%	0.9%
25	0.8%	0.8%	0.8%
30	0.7%	0.7%	0.7%

State Peace Officer and Firefighters

	Entry Age		
Service	**20**	**30**	**40**
0	11.5%	11.5%	11.5%
3	6.6%	6.6%	6.6%
5	4.3%	4.3%	4.3%
10	1.4%	1.4%	1.4%
15	1.1%	1.1%	1.1%
20	1.2%	1.2%	1.2%
25	1.3%	1.3%	1.3%
30	1.3%	1.3%	1.3%

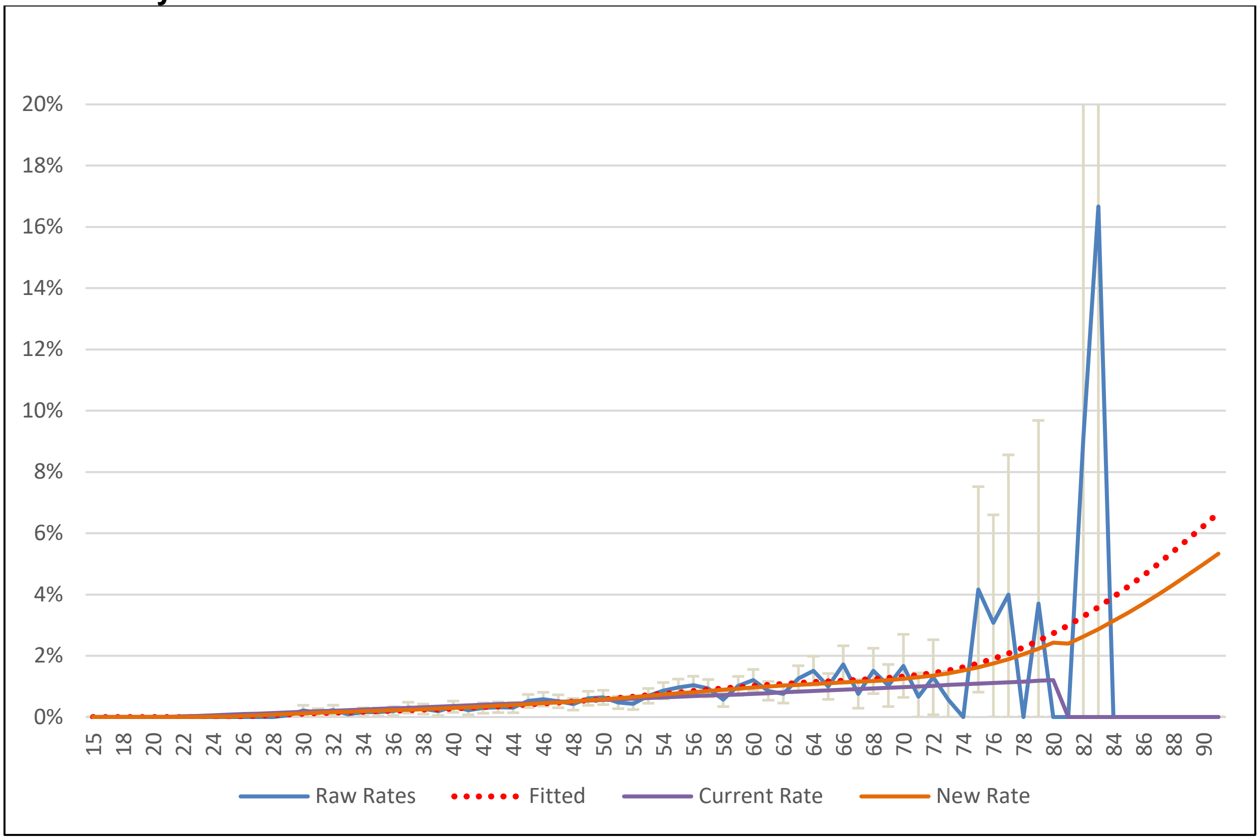
California Highway Patrol

	Entry Age		
Service	**20**	**30**	**40**
0	12.3%	12.3%	12.3%
3	5.3%	5.3%	5.3%
5	2.6%	2.6%	2.6%
10	1.2%	1.2%	1.2%
15	1.4%	1.4%	1.4%
20	2.3%	2.3%	2.3%
25	2.3%	2.3%	2.3%
30	1.5%	1.5%	1.5%

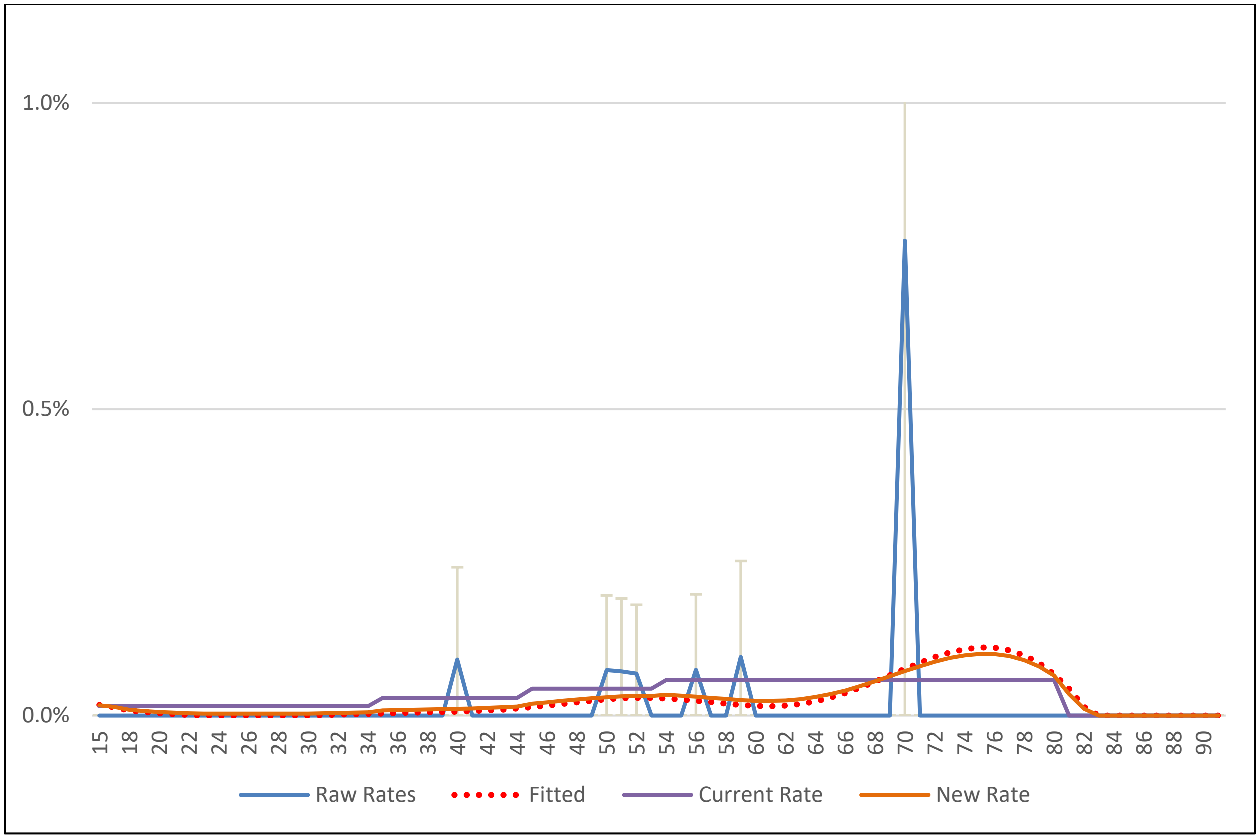
Appendix B - Summary Comparison of Assumptions

INDUSTRIAL DISABILITY RETIREMENT

State Safety

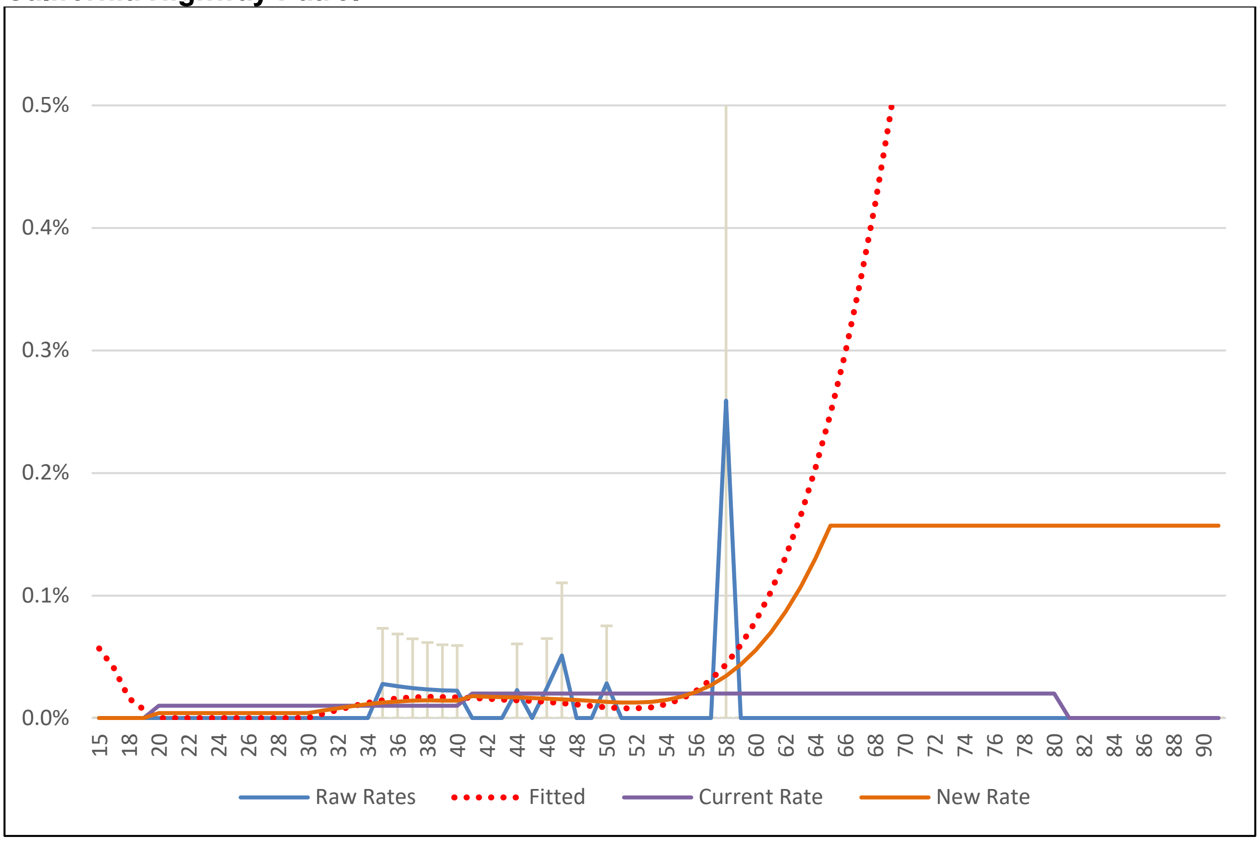


State Industrial

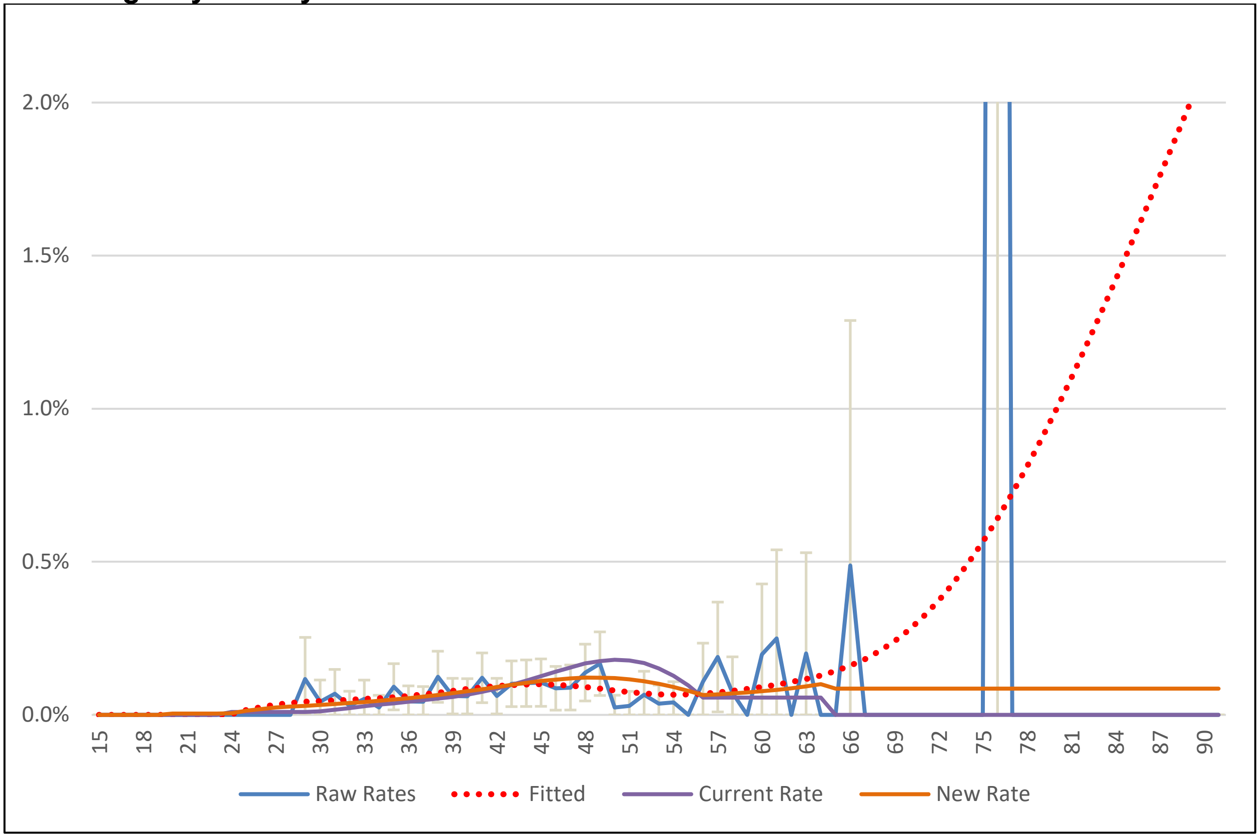


NON-INDUSTRIAL DISABILITY RATES

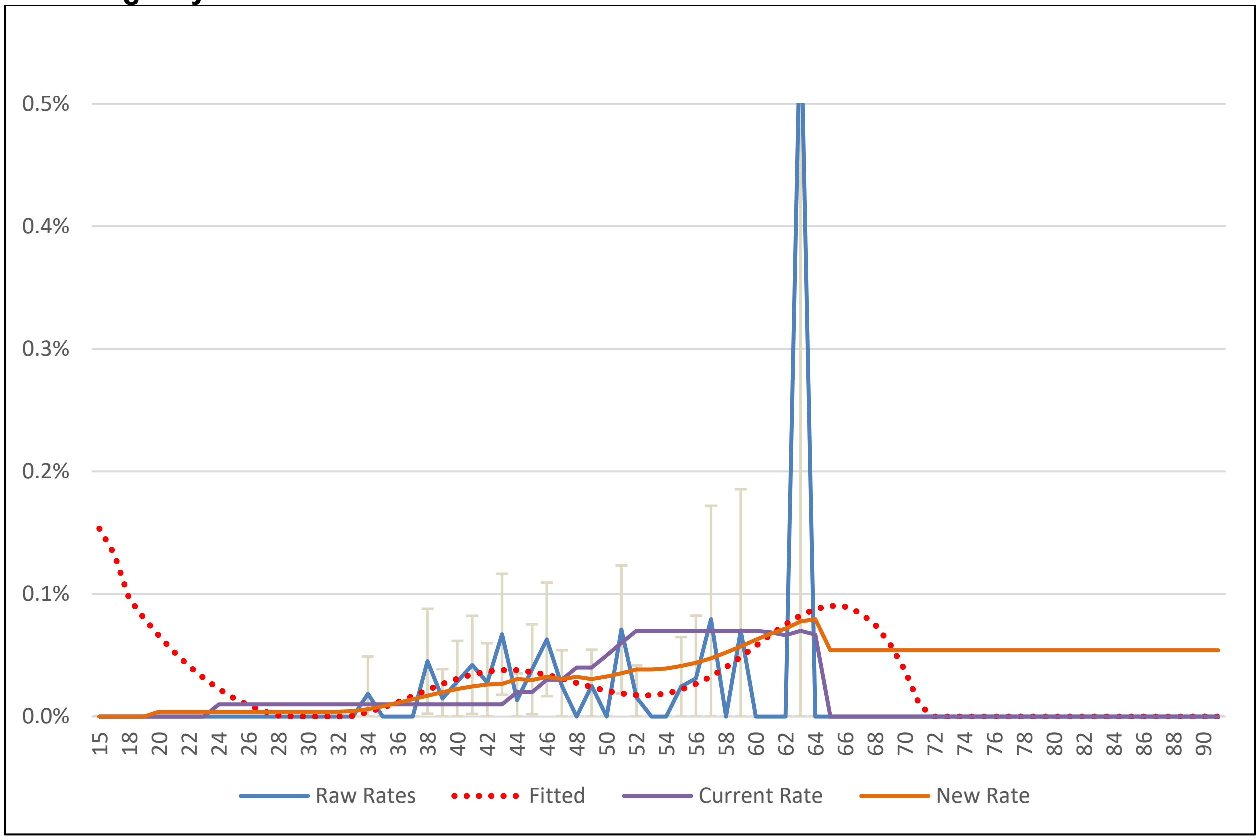
California Highway Patrol



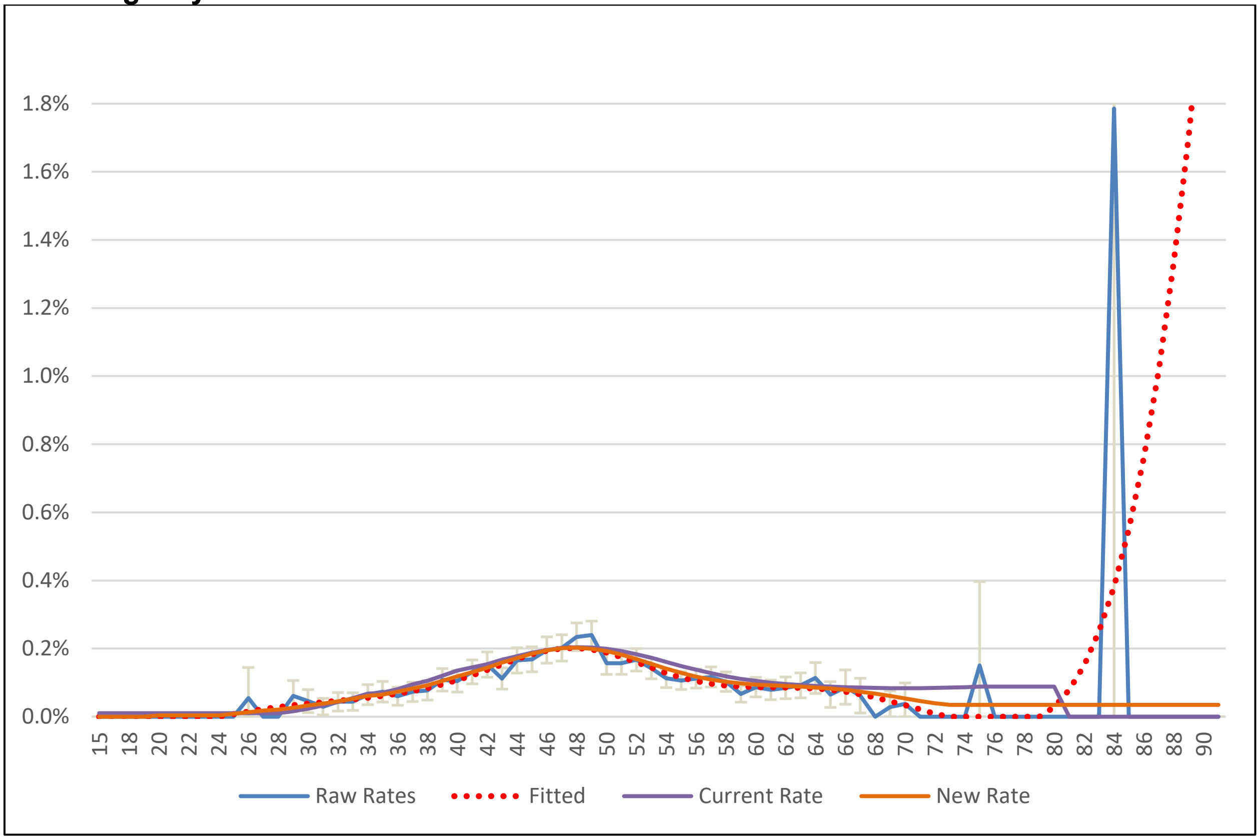
Public Agency County Peace Officer



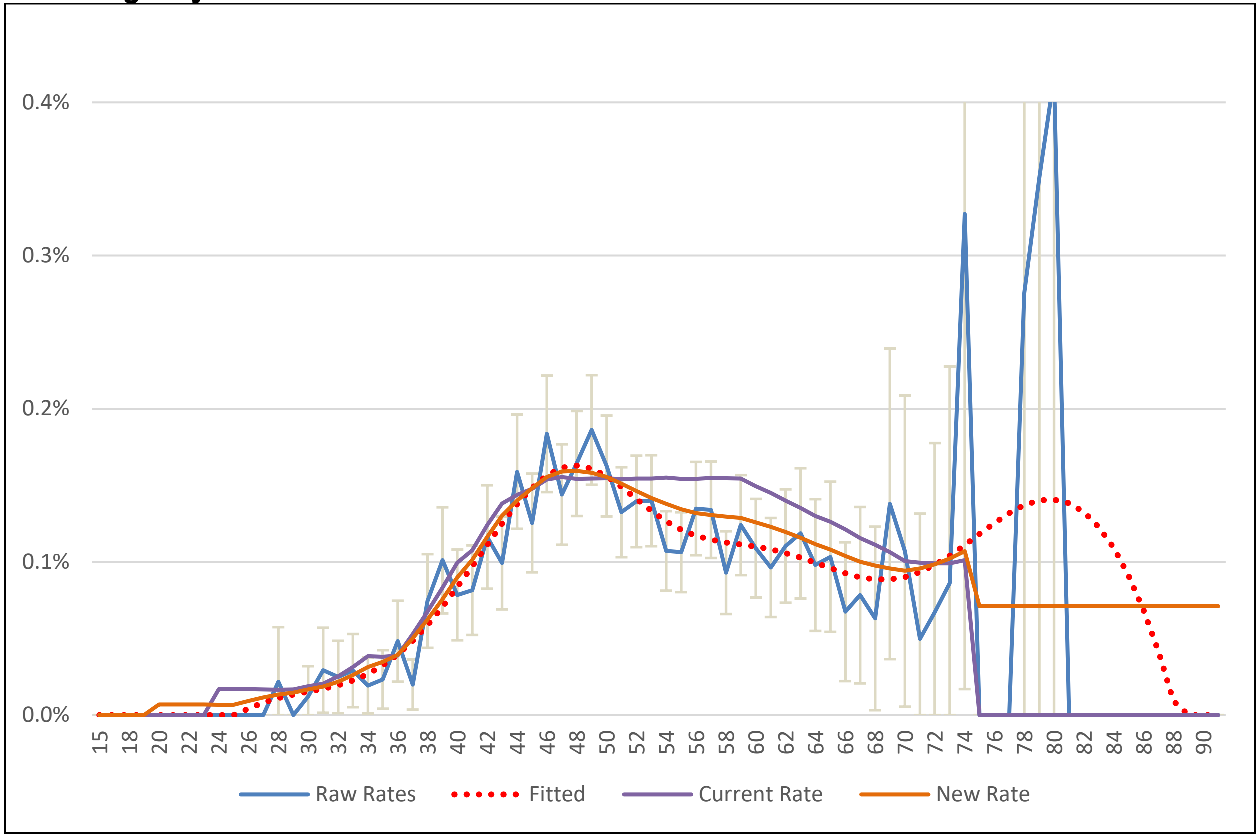
Public Agency Fire



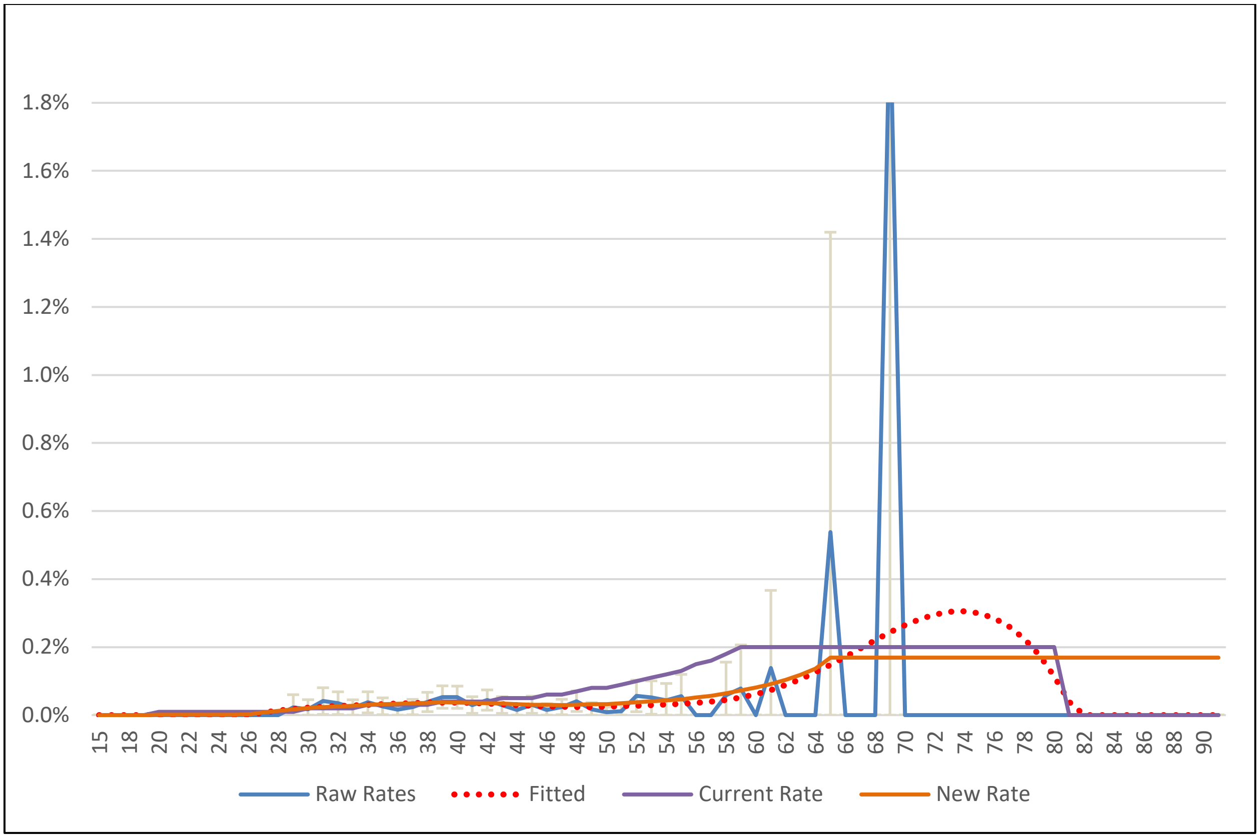
Public Agency Miscellaneous Females



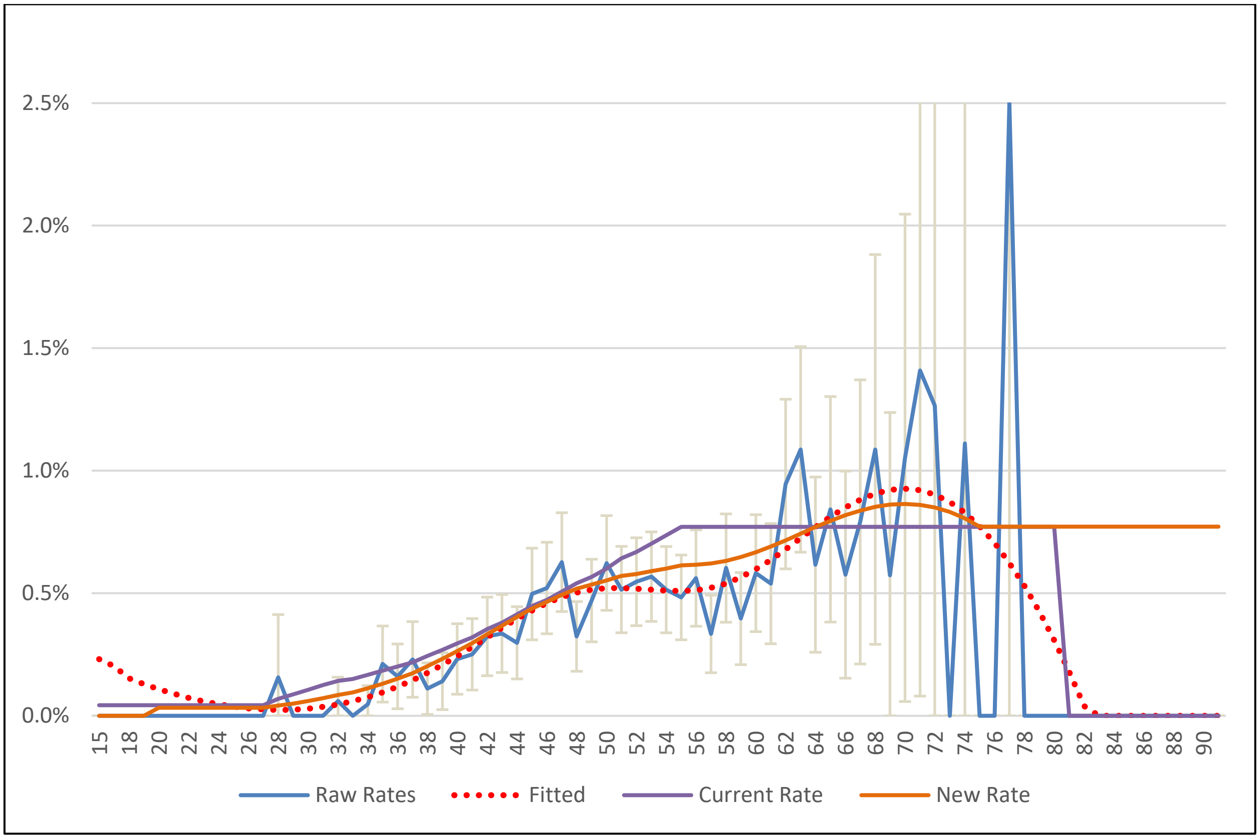
Public Agency Miscellaneous Males



Public Agency Police, Sheriffs, School Police, Other Safety

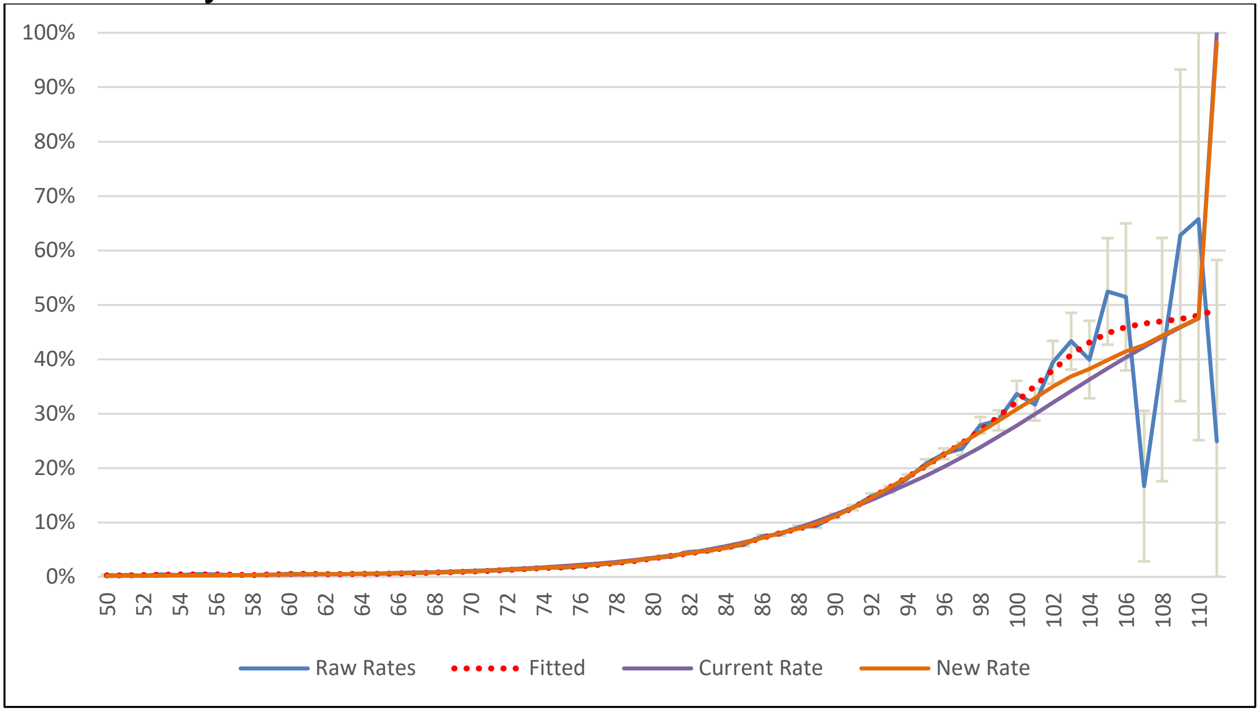


State Industrial

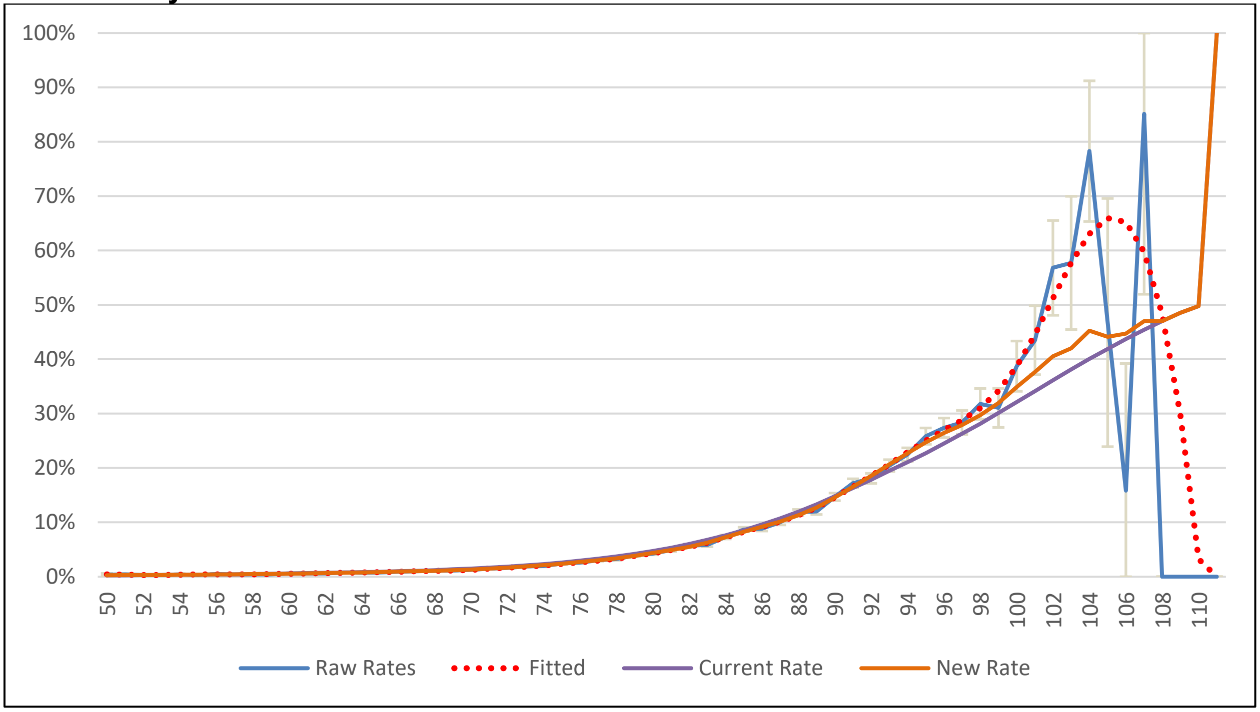


POST RETIREMENT MORTALITY

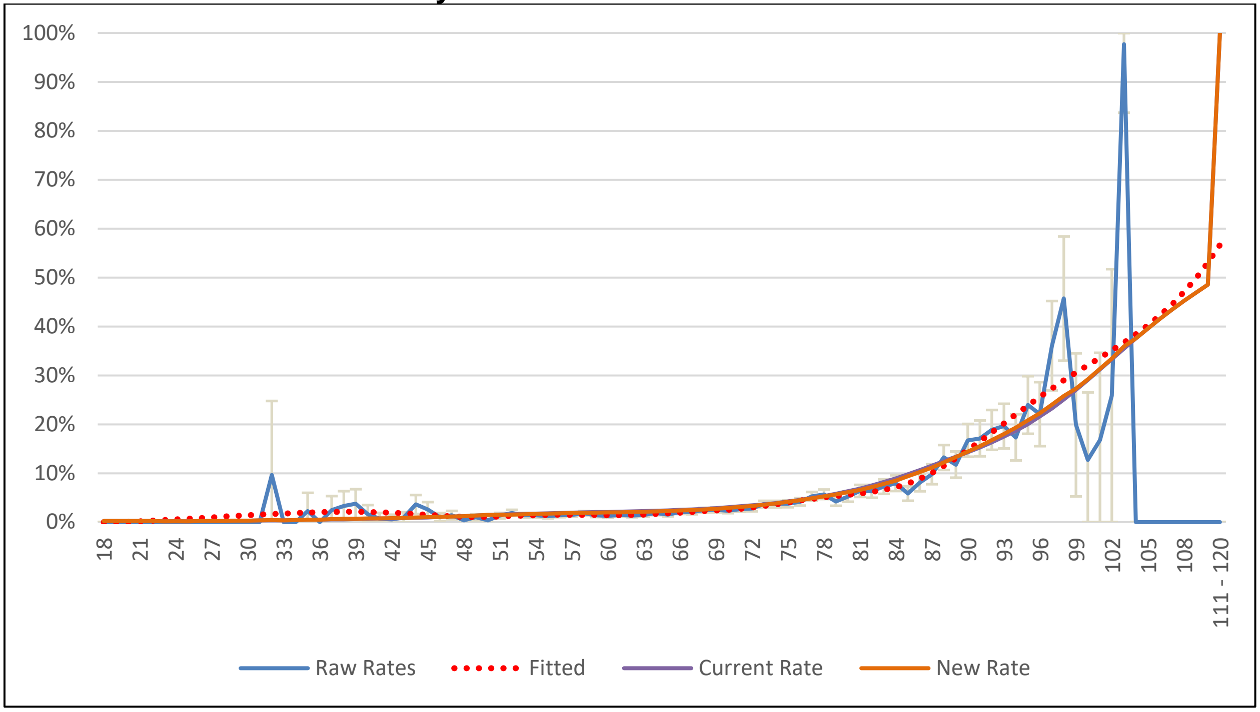
Female Healthy Retirement



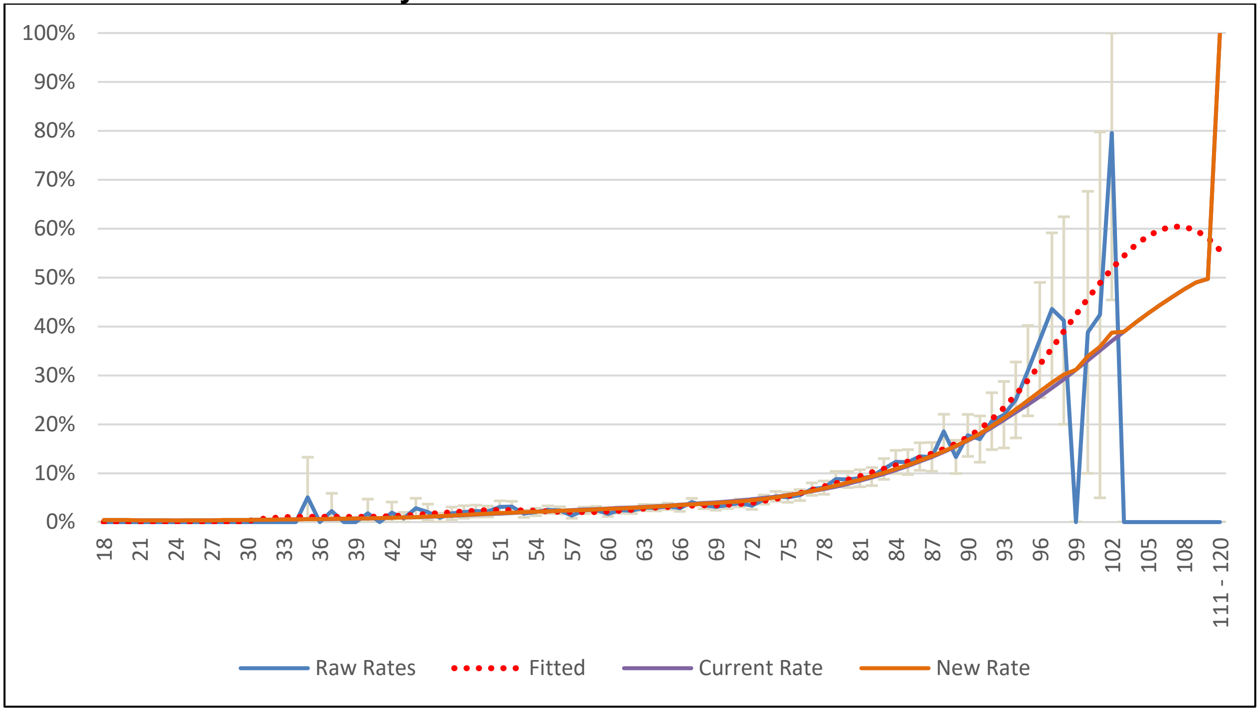
Male Healthy Retirement



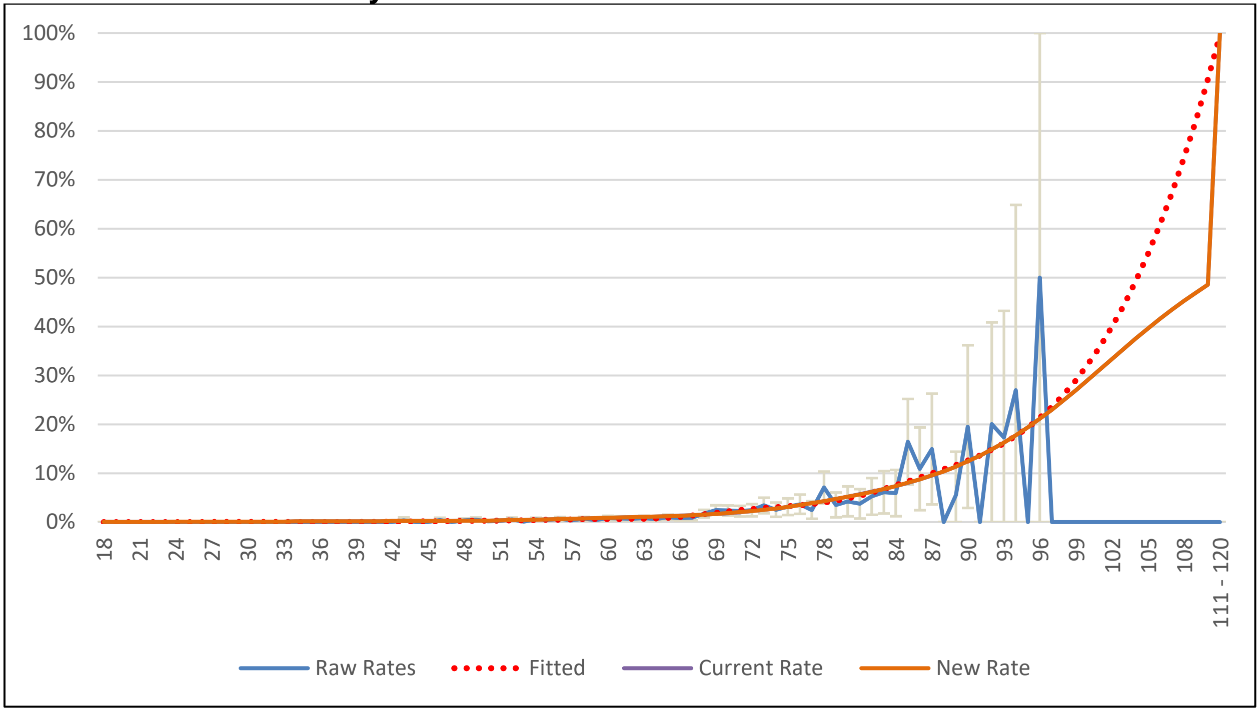
Female Non-Industrial Disability Retirement



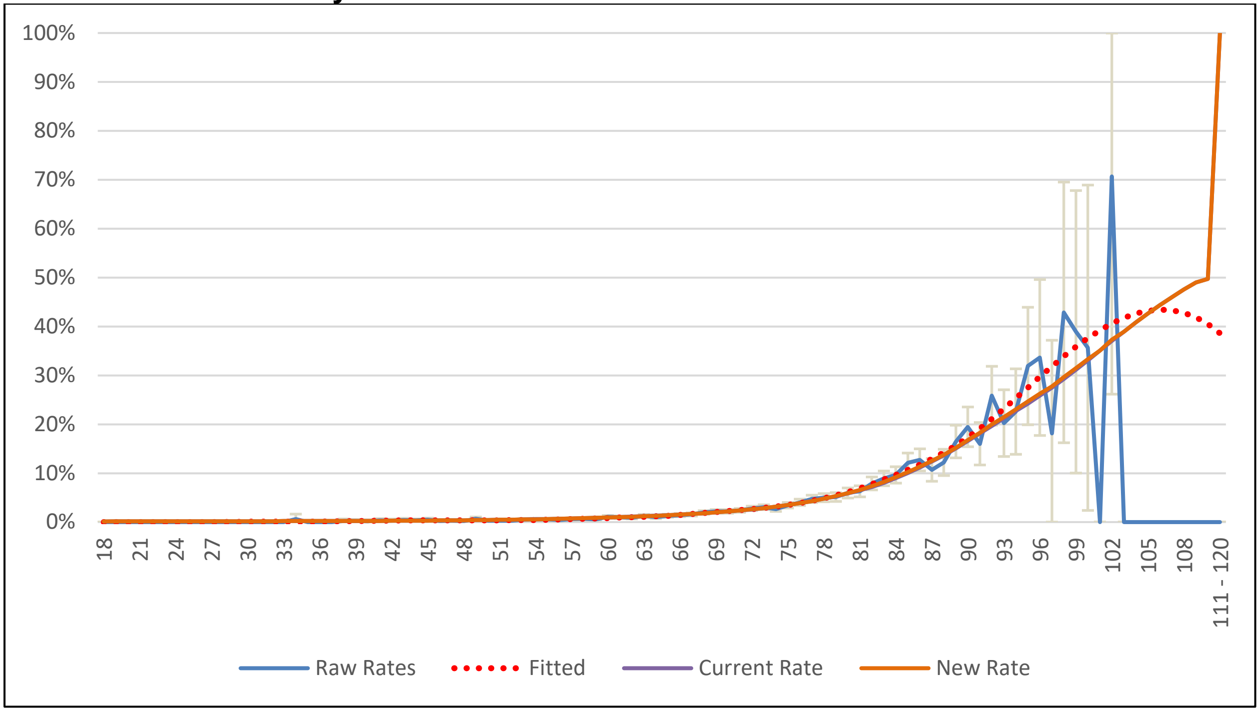
Male Non-Industrial Disability Retirement



Female Industrial Disability Retirement

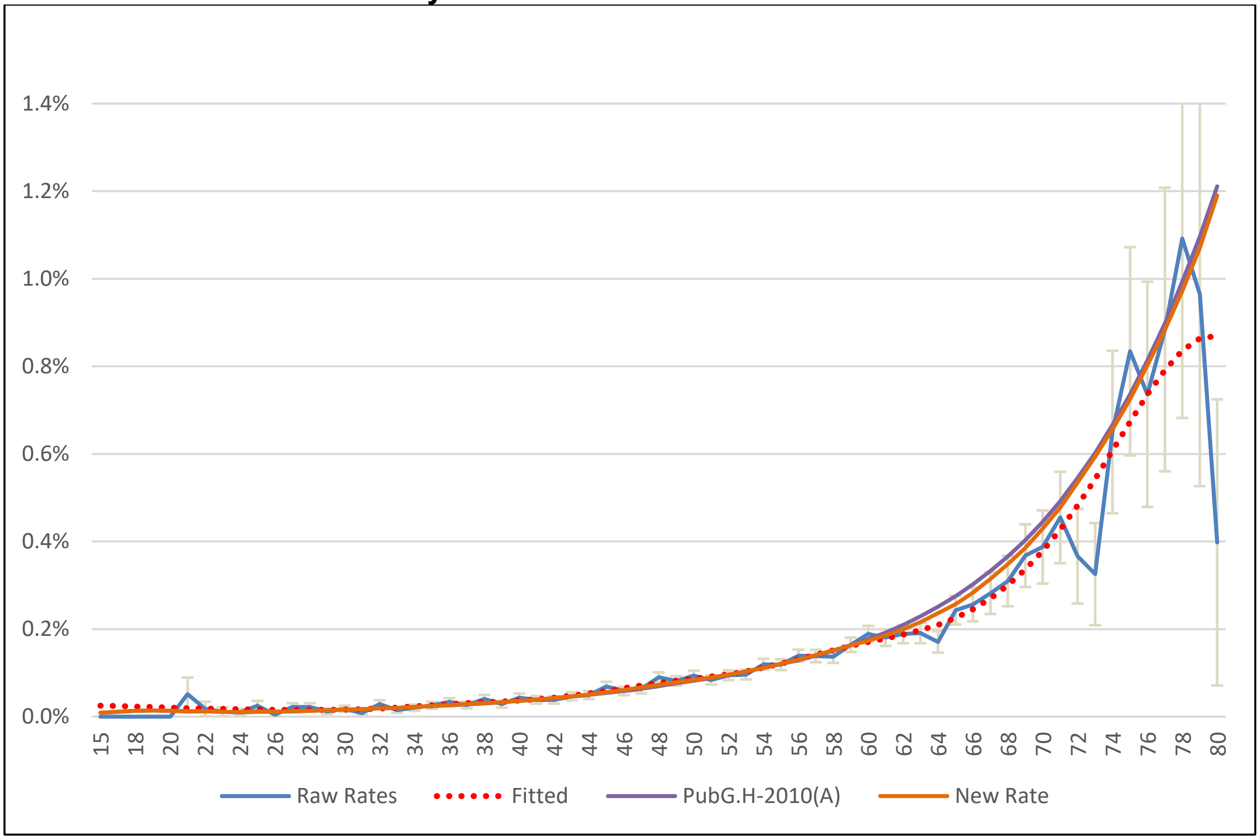


Male Industrial Disability Retirement

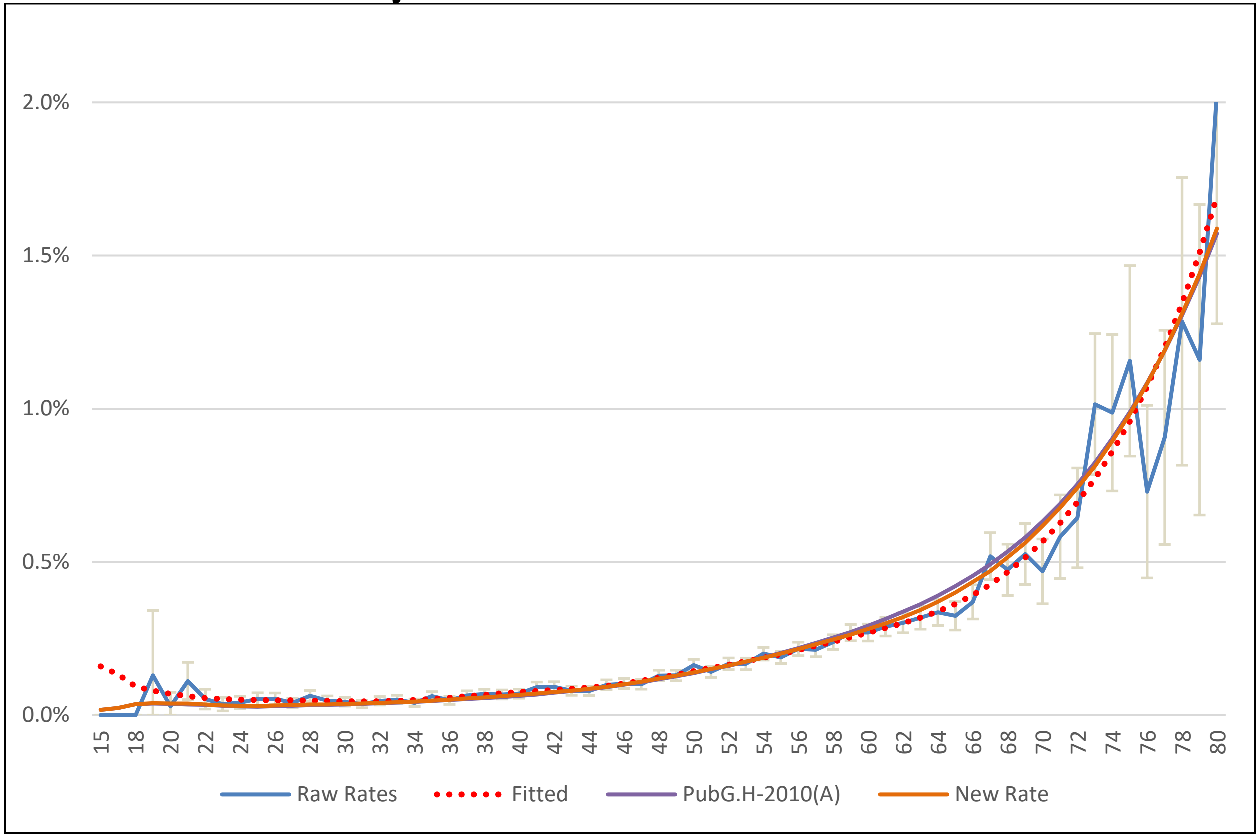


PRE-RETIREMENT MORTALITY

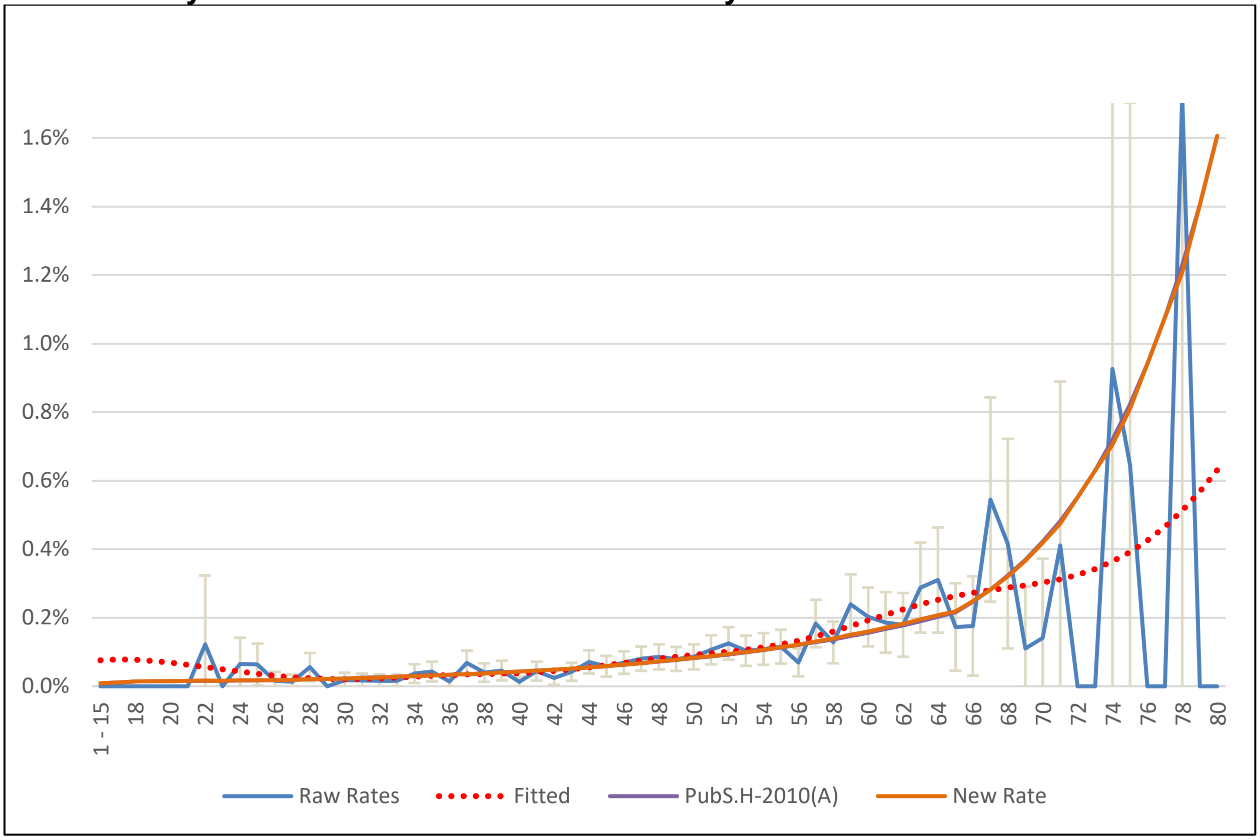
Female Non-Industrial Mortality



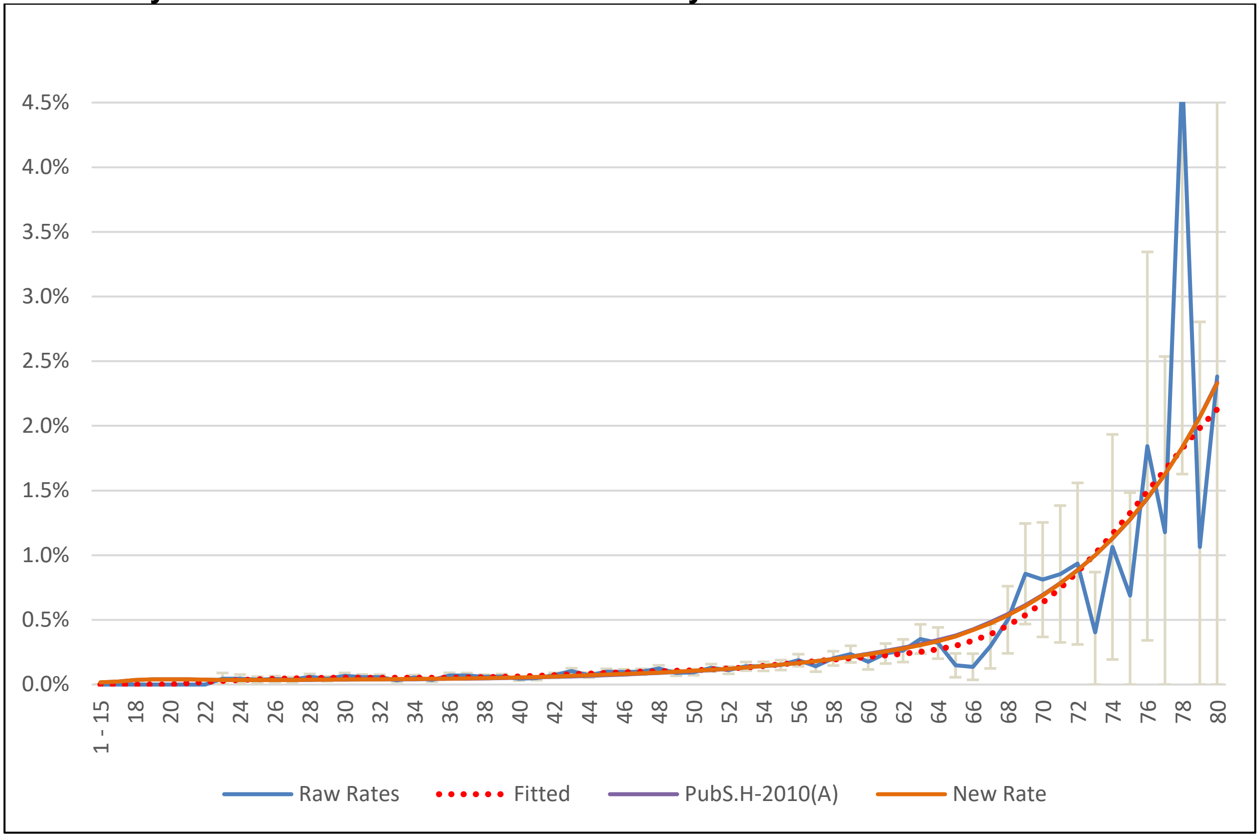
Male Non-Industrial Mortality



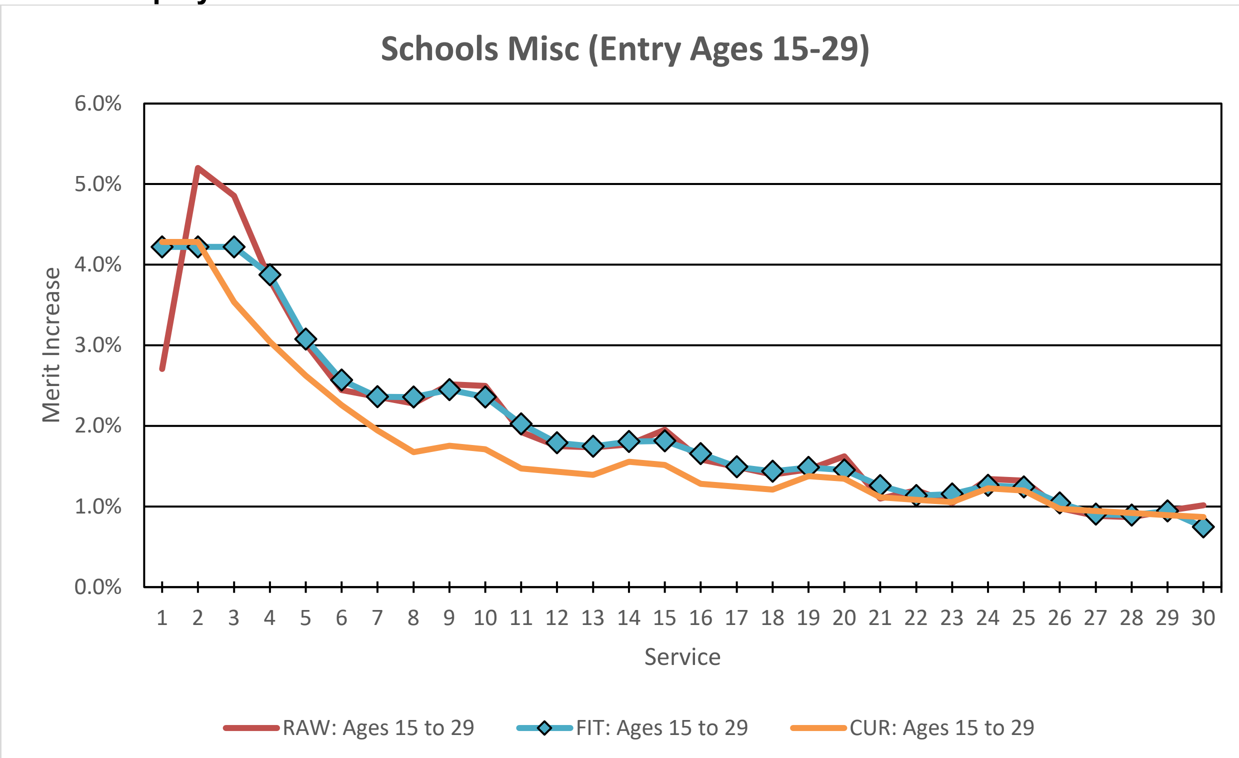
Female Safety Industrial and Non-Industrial Mortality

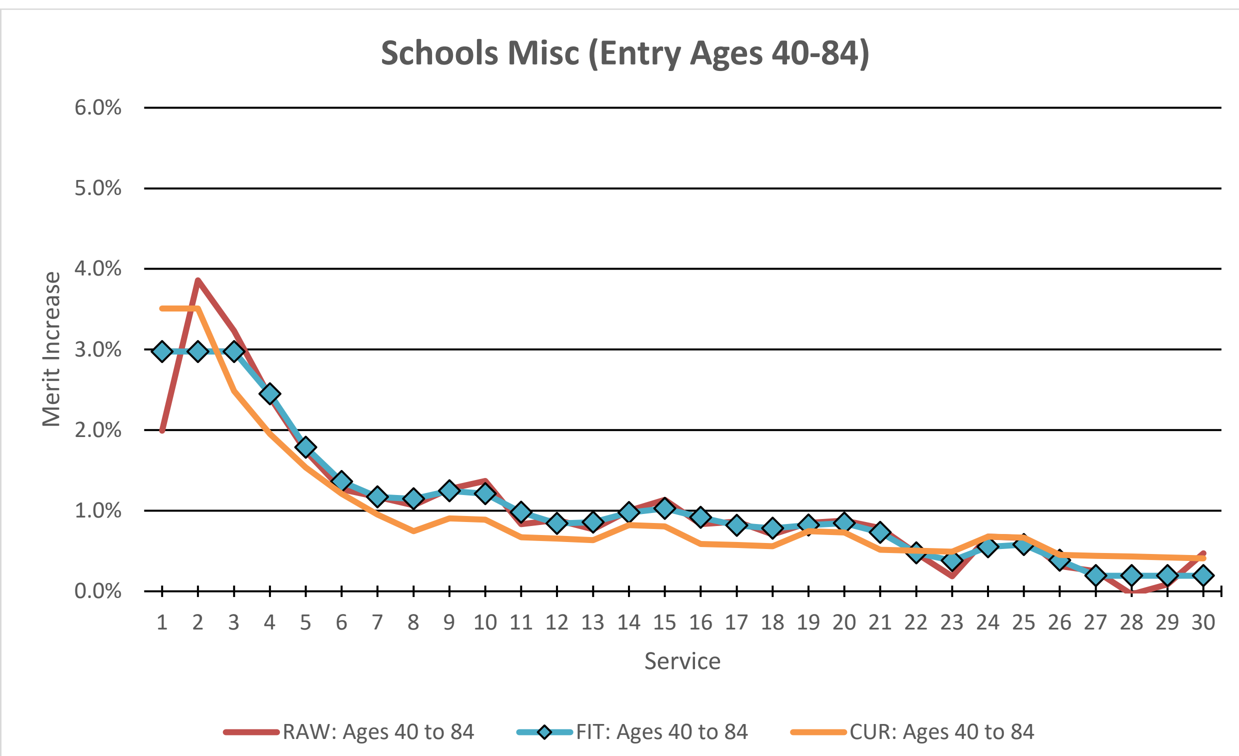


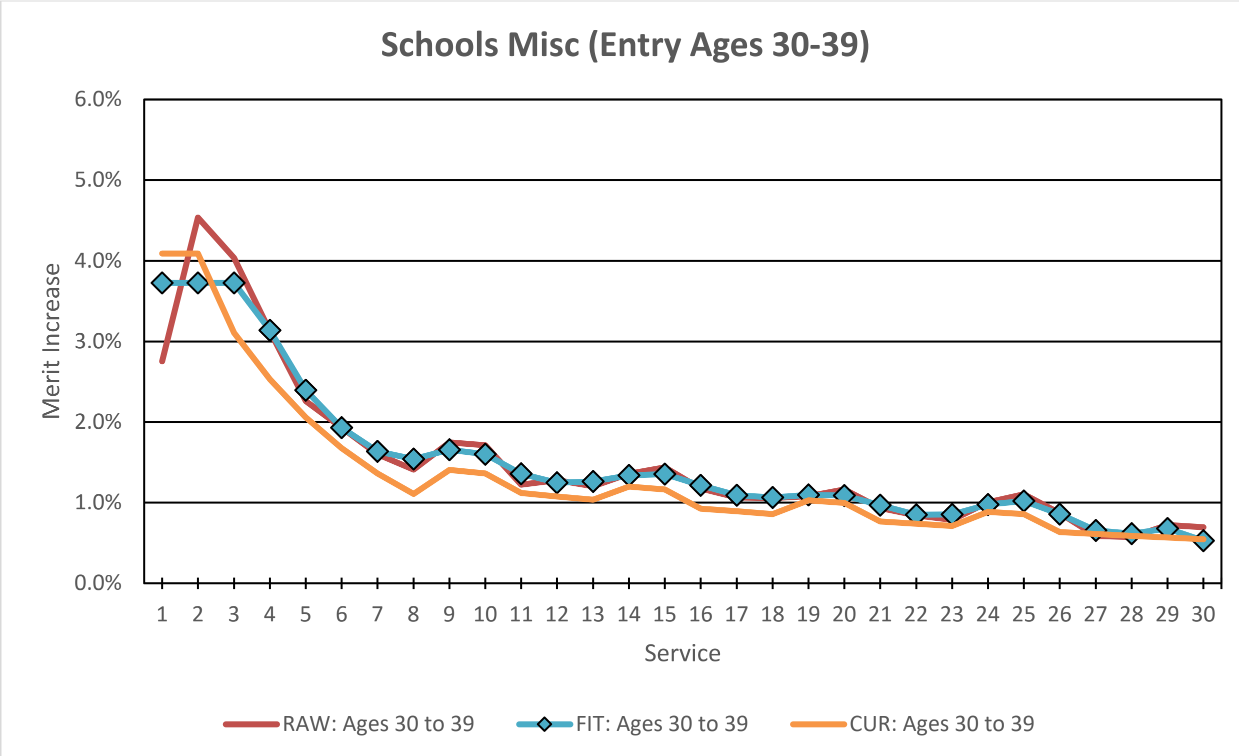
Male Safety Industrial and Non-Industrial Mortality

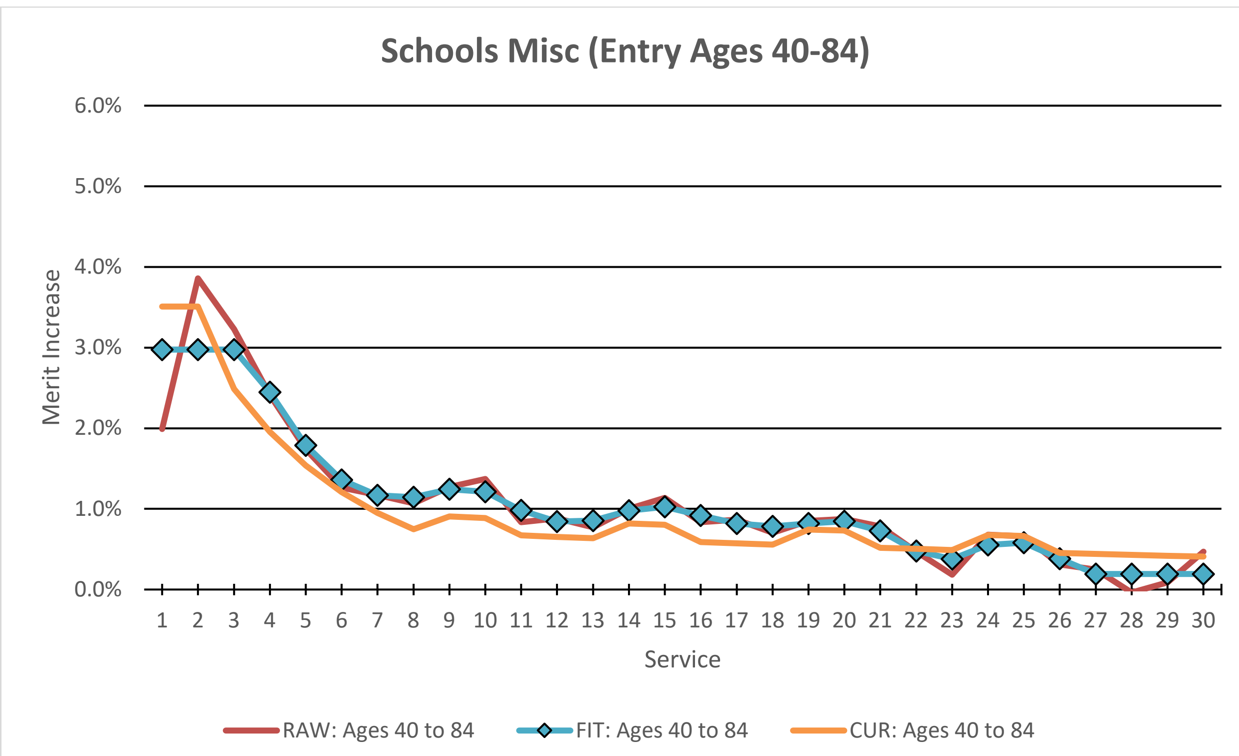


SALARY SCALE
School Employees

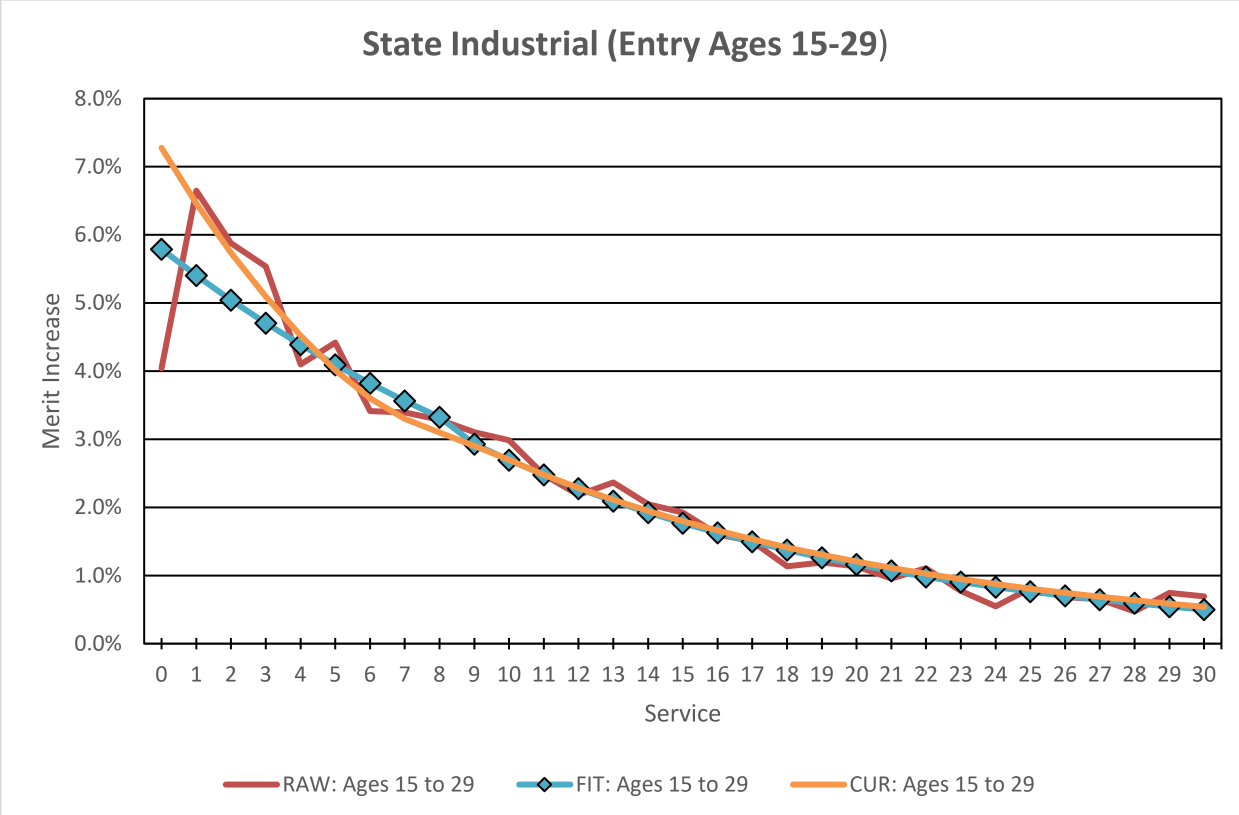


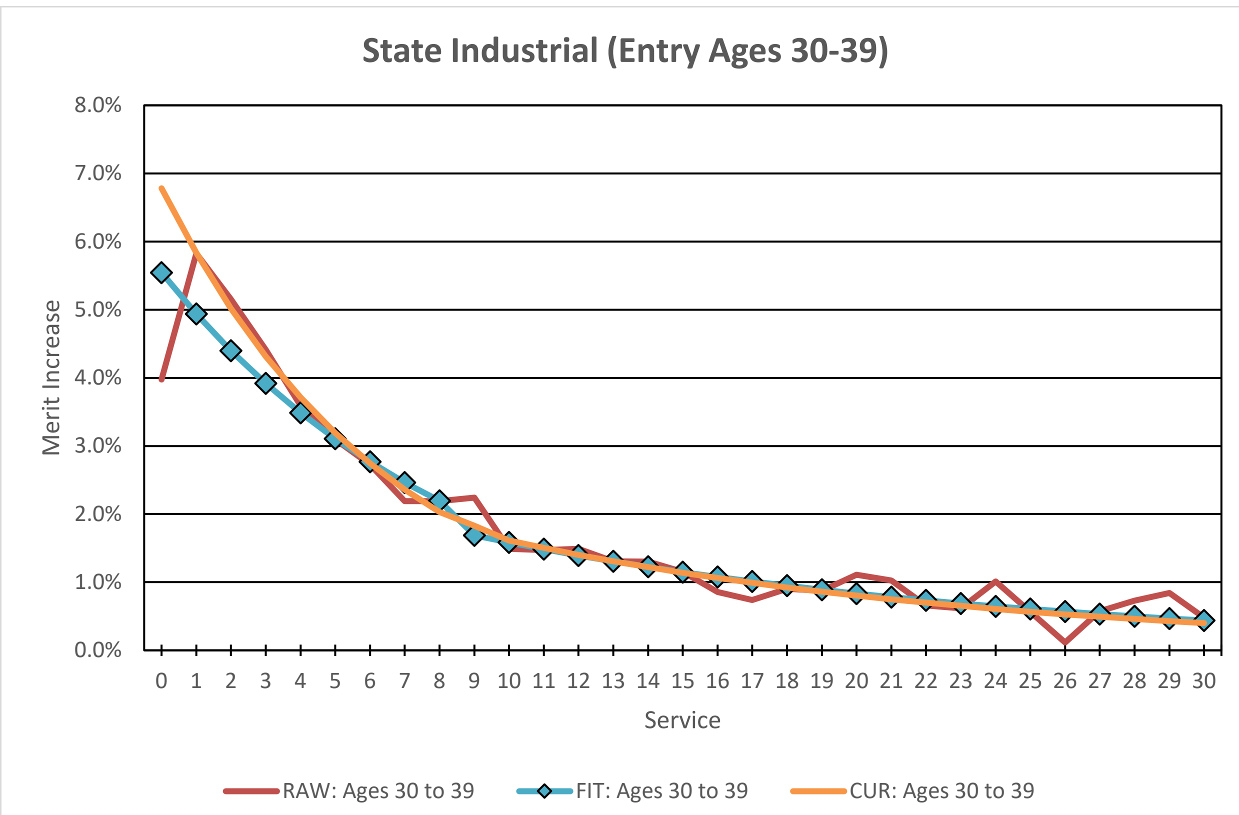


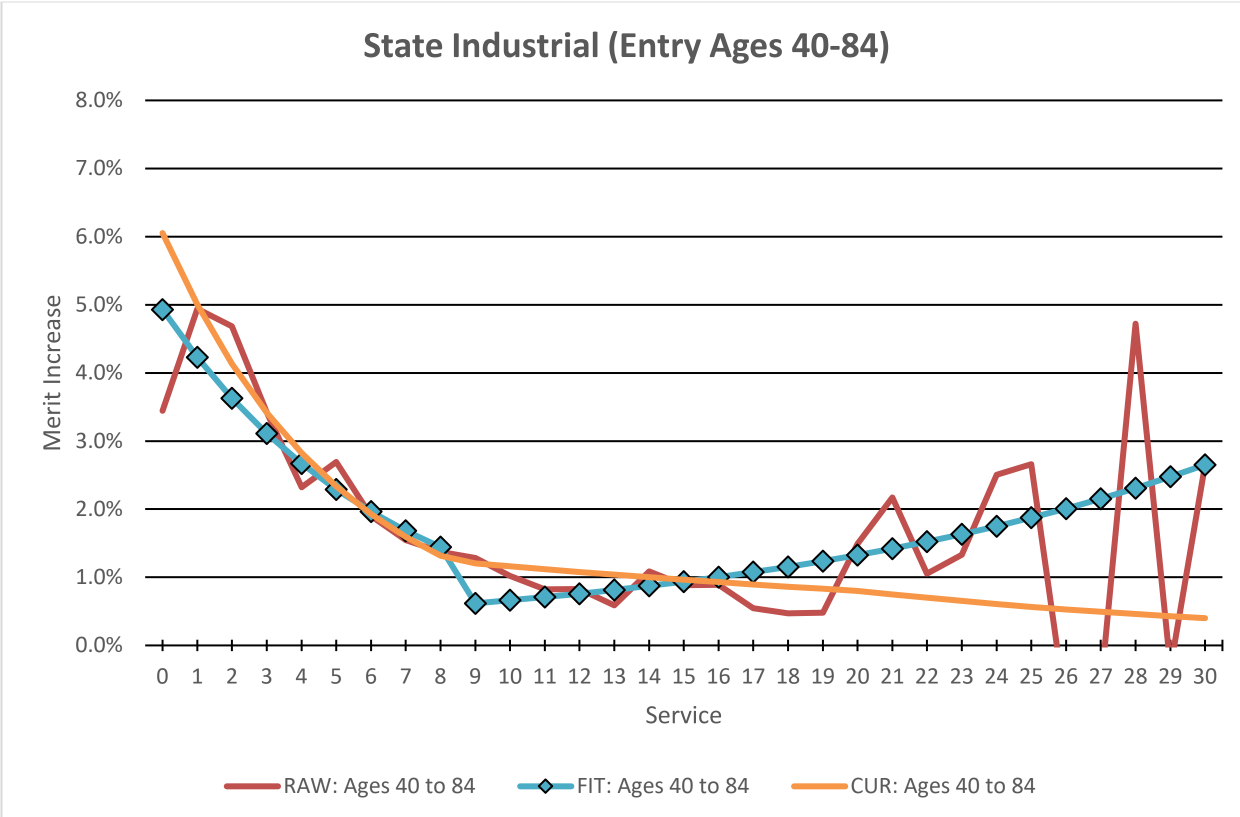

Schools Misc (Entry Ages 30-39)
Merit Increase
6.0%
5.0%
4.0%
3.0%
2.0%
1.0%
0.0%
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Service
RAW: Ages 30 to 39
FIT: Ages 30 to 39
CUR: Ages 30 to 39


Schools Misc (Entry Ages 40-84)
Merit Increase
6.0%
5.0%
4.0%
3.0%
2.0%
1.0%
0.0%
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Service
RAW: Ages 40 to 84
FIT: Ages 40 to 84
CUR: Ages 40 to 84

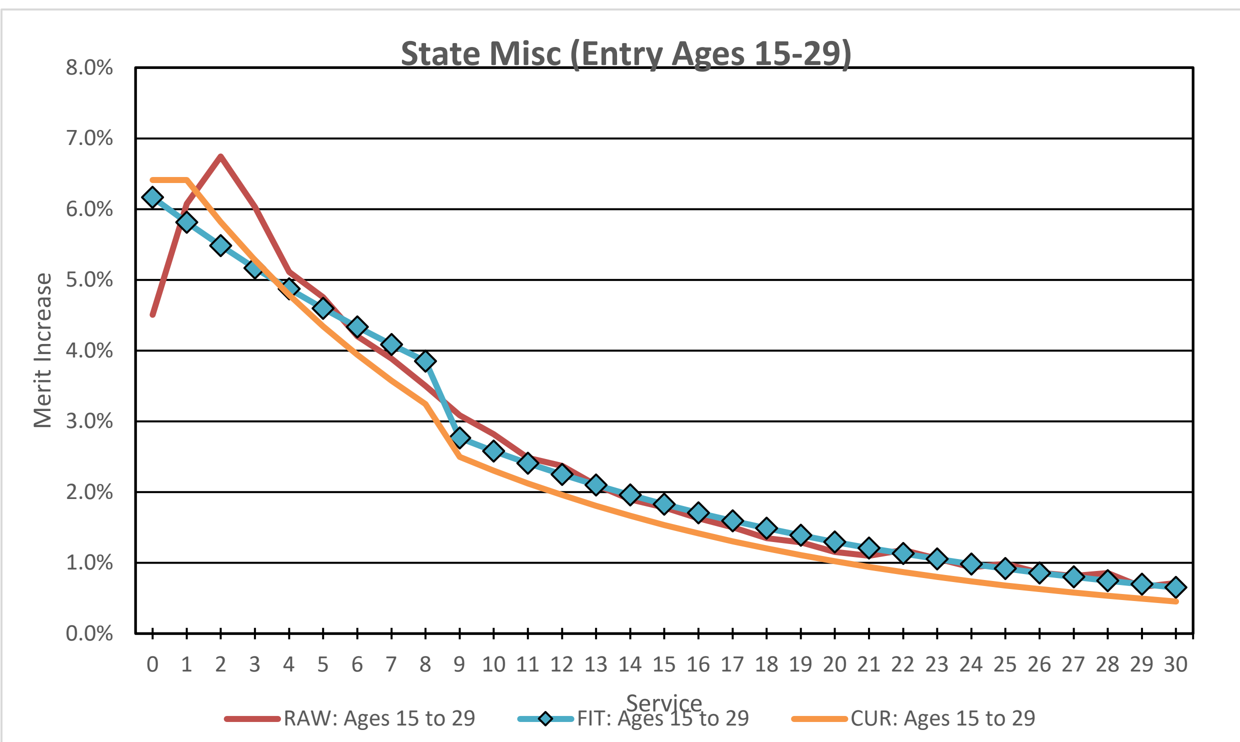
State Industrial

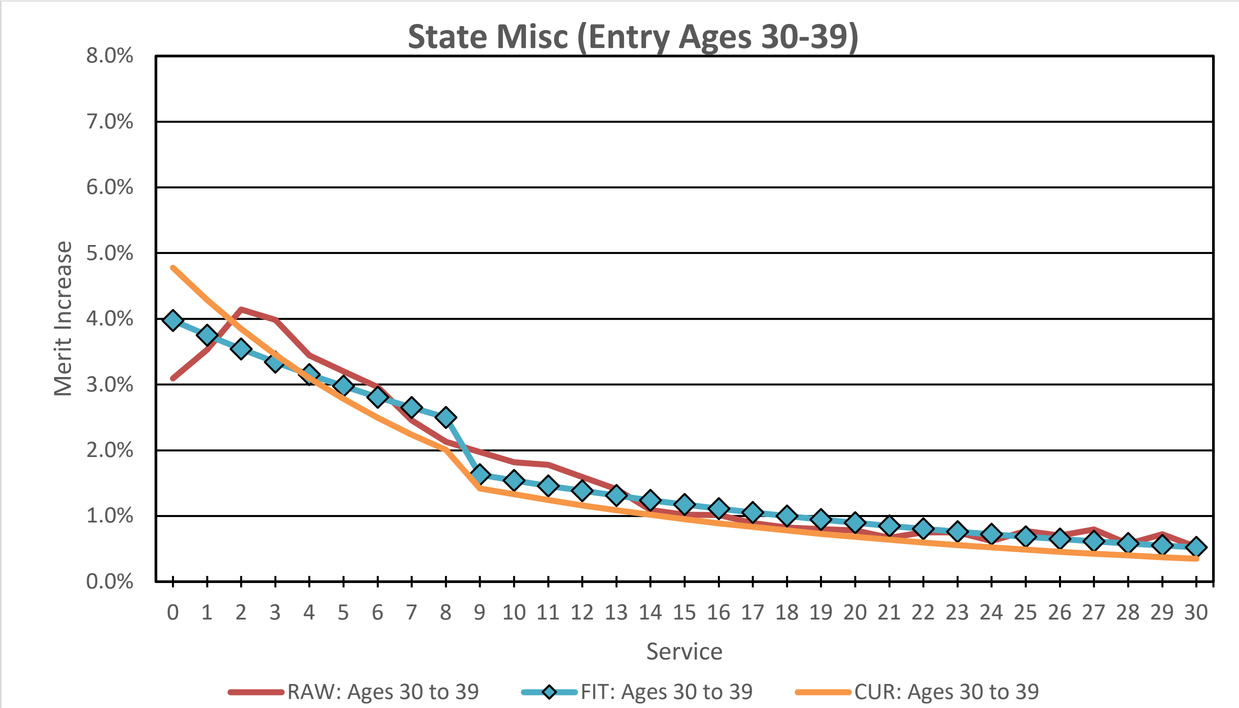


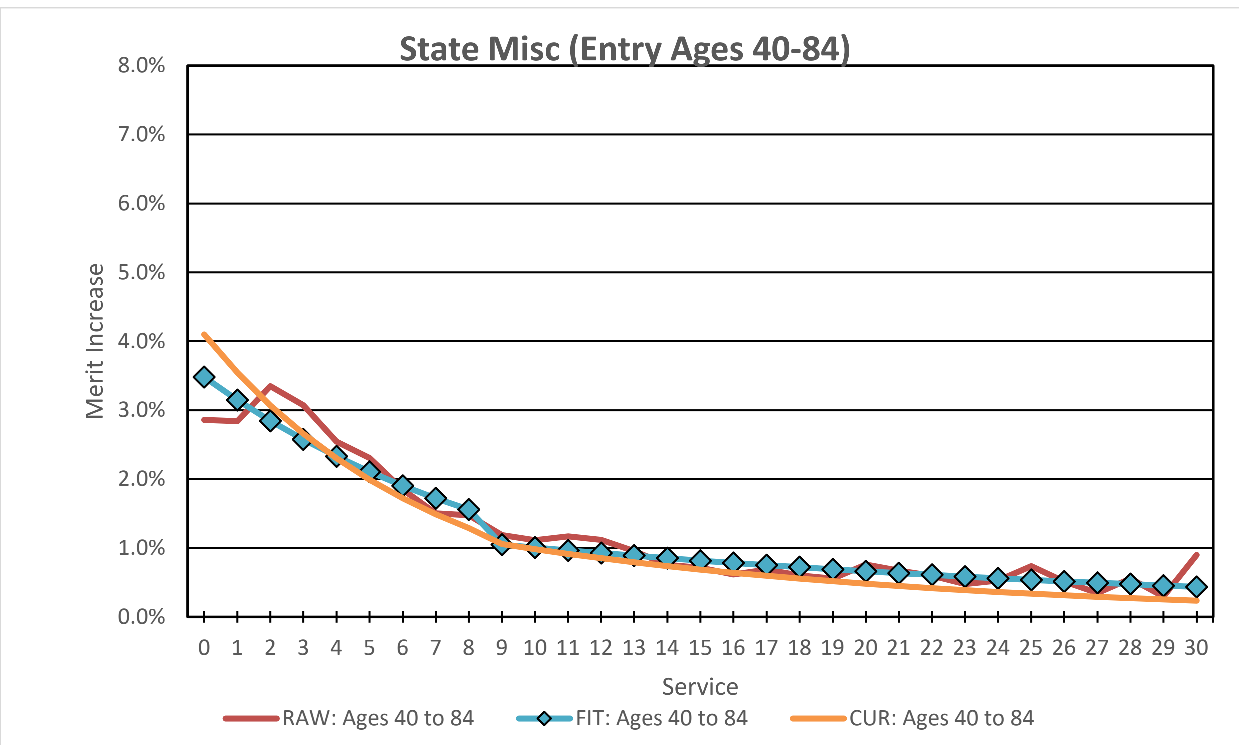




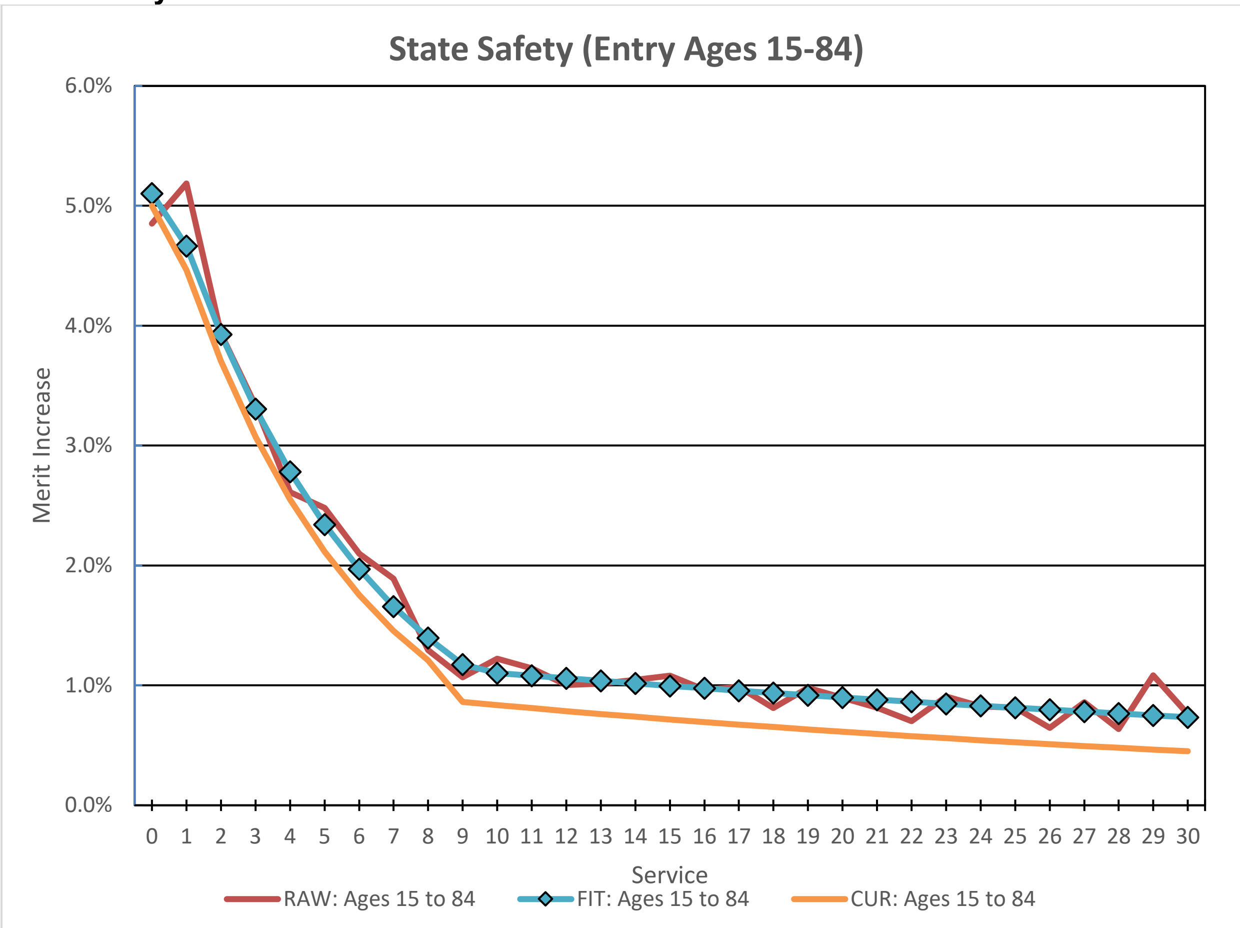
State Miscellaneous



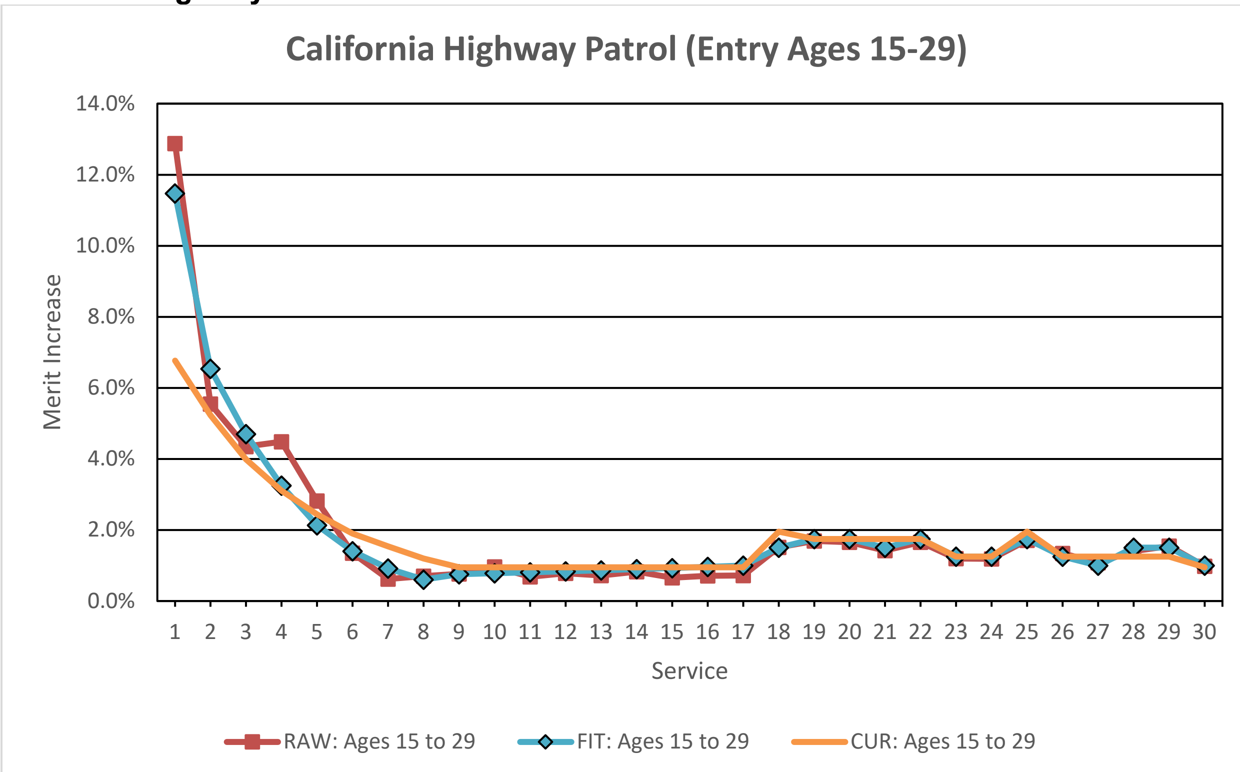

State Misc (Entry Ages 30-39)
Merit Increase
8.0%
7.0%
6.0%
5.0%
4.0%
3.0%
2.0%
1.0%
0.0%
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Service
RAW: Ages 30 to 39
FIT: Ages 30 to 39
CUR: Ages 30 to 39

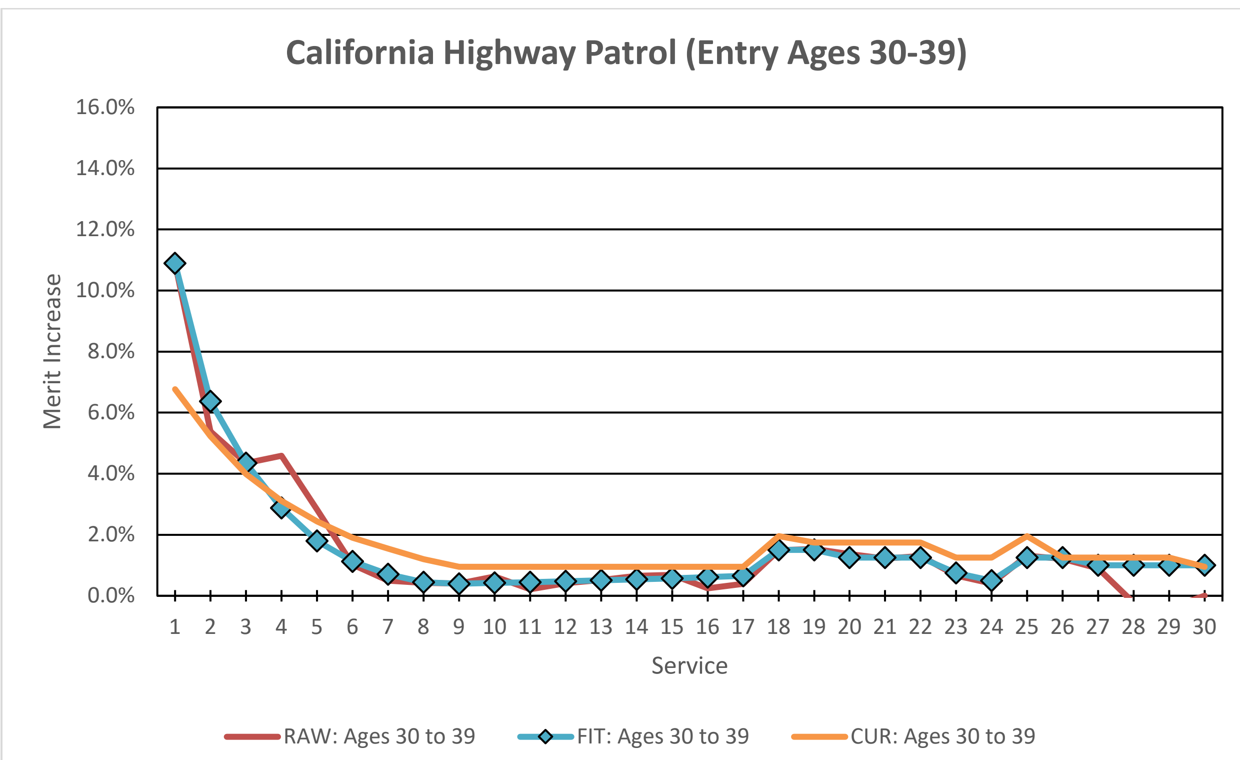

State Misc (Entry Ages 40-84)
Merit Increase
8.0%
7.0%
6.0%
5.0%
4.0%
3.0%
2.0%
1.0%
0.0%
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Service
RAW: Ages 40 to 84
FIT: Ages 40 to 84
CUR: Ages 40 to 84

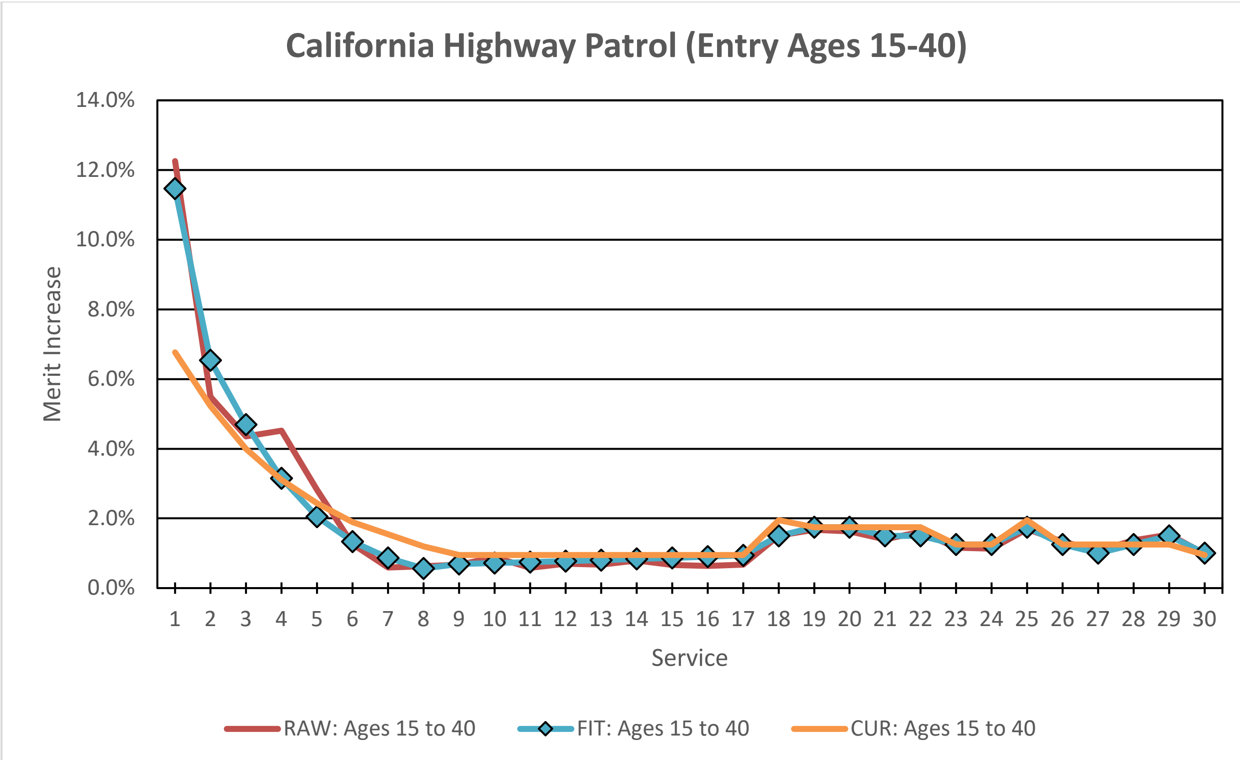
State Safety



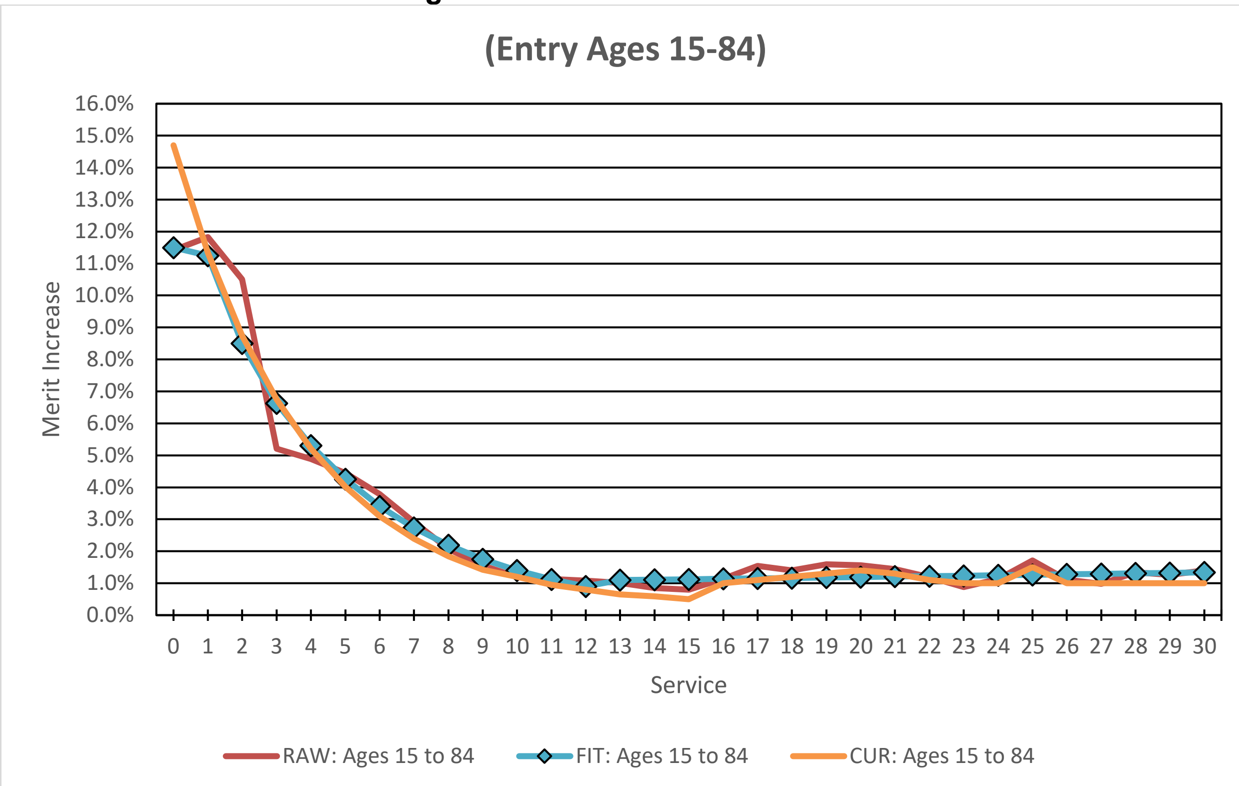
California Highway Patrol



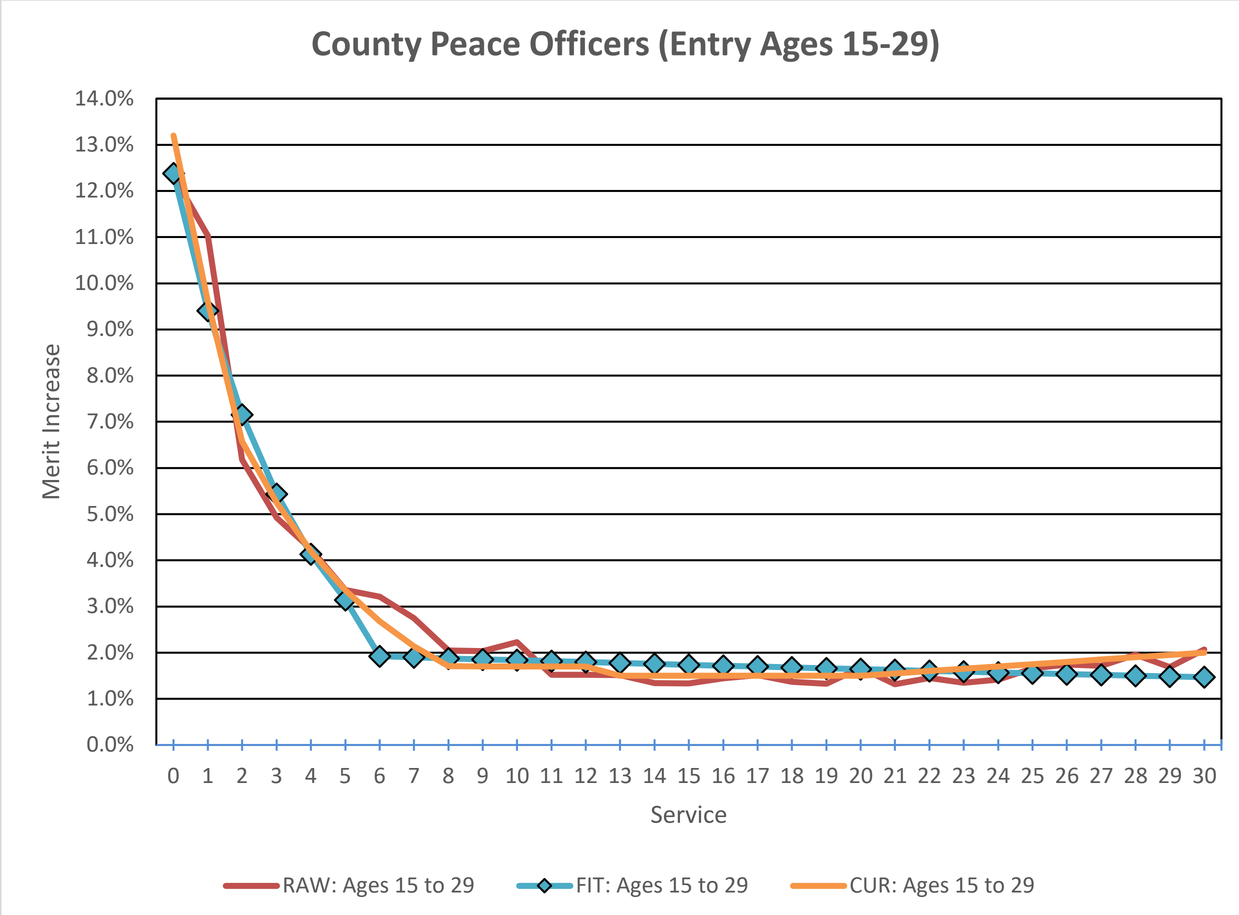


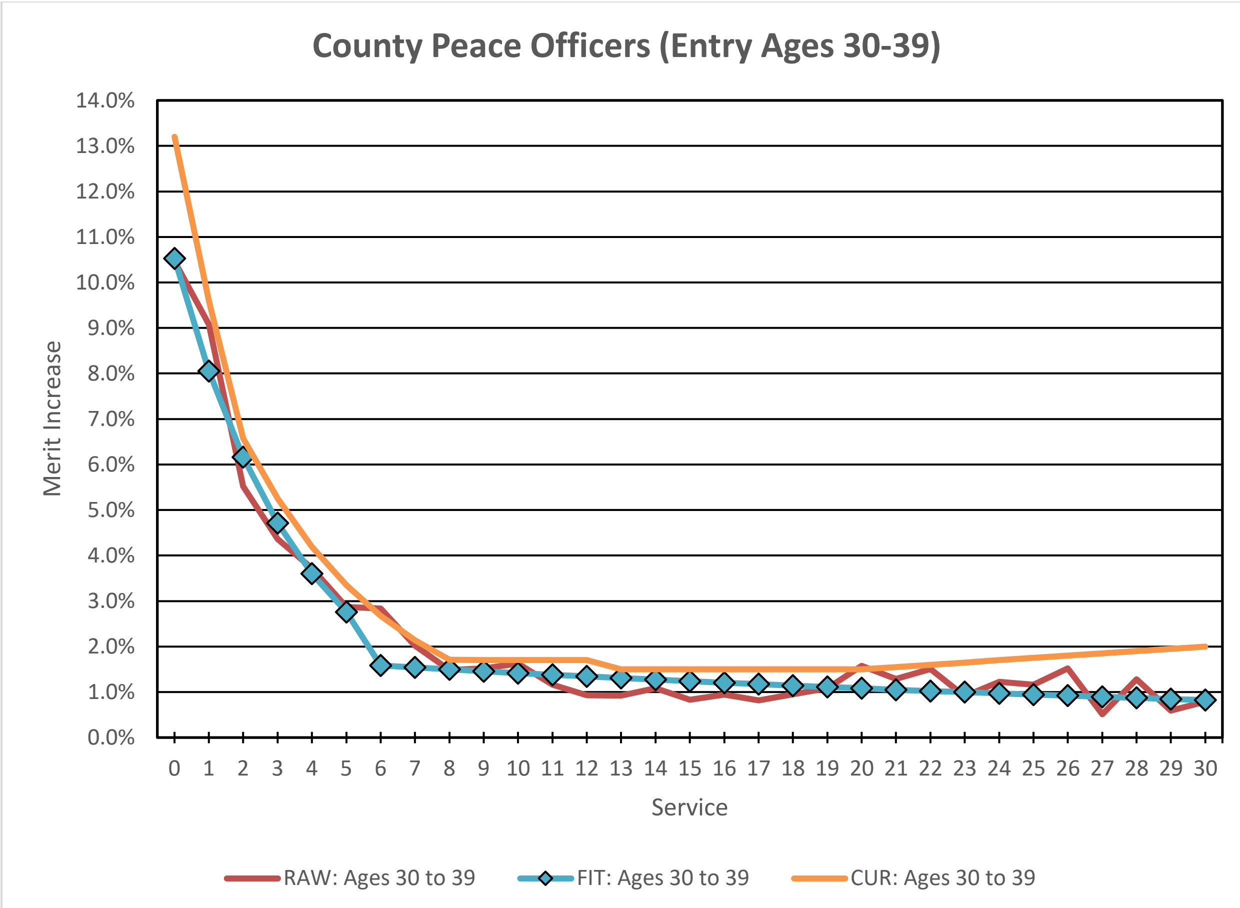

California Highway Patrol (Entry Ages 15-40)
14.0%
12.0%
10.0%
8.0%
6.0%
4.0%
2.0%
0.0%
Merit Increase
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Service
RAW: Ages 15 to 40
FIT: Ages 15 to 40
CUR: Ages 15 to 40

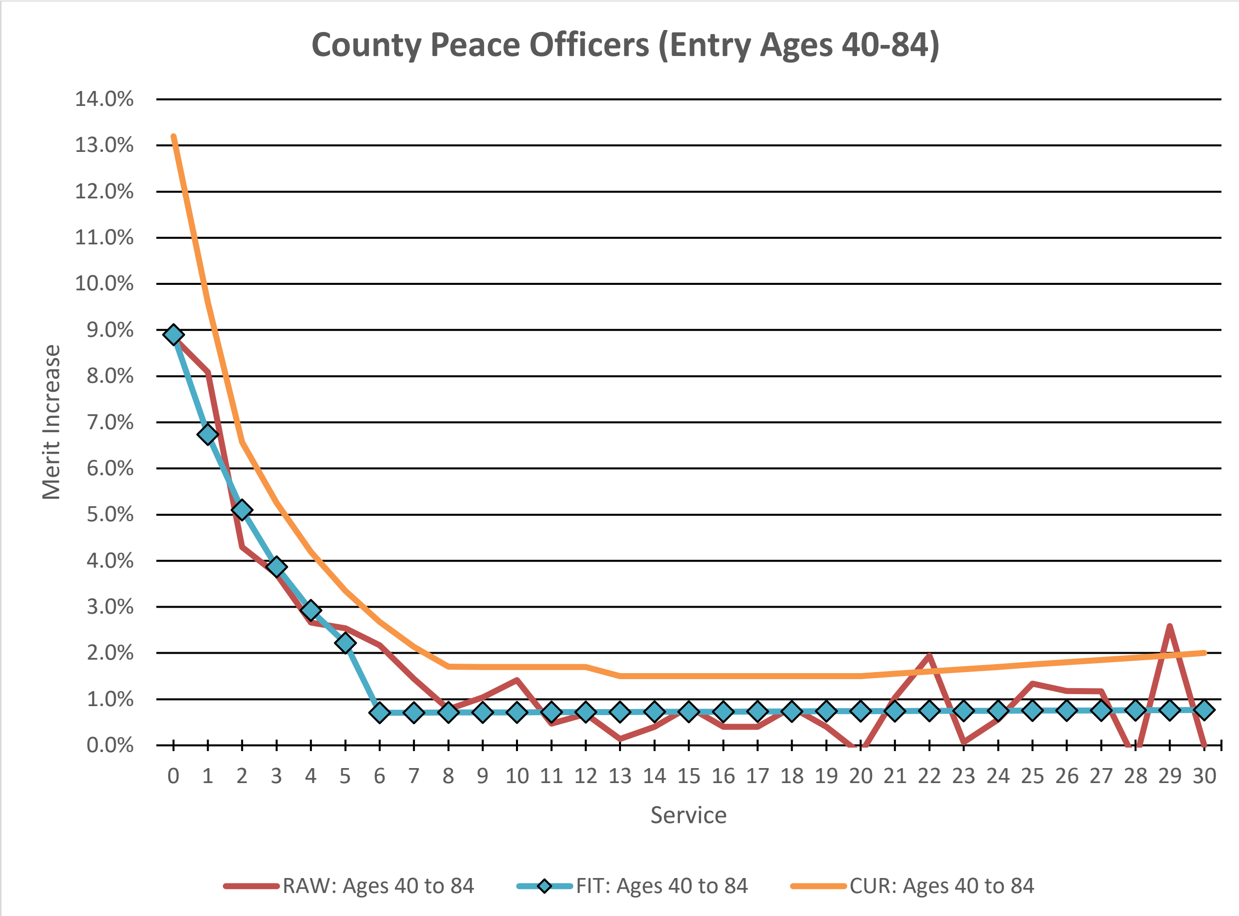
State Peace Officers and Firefighters

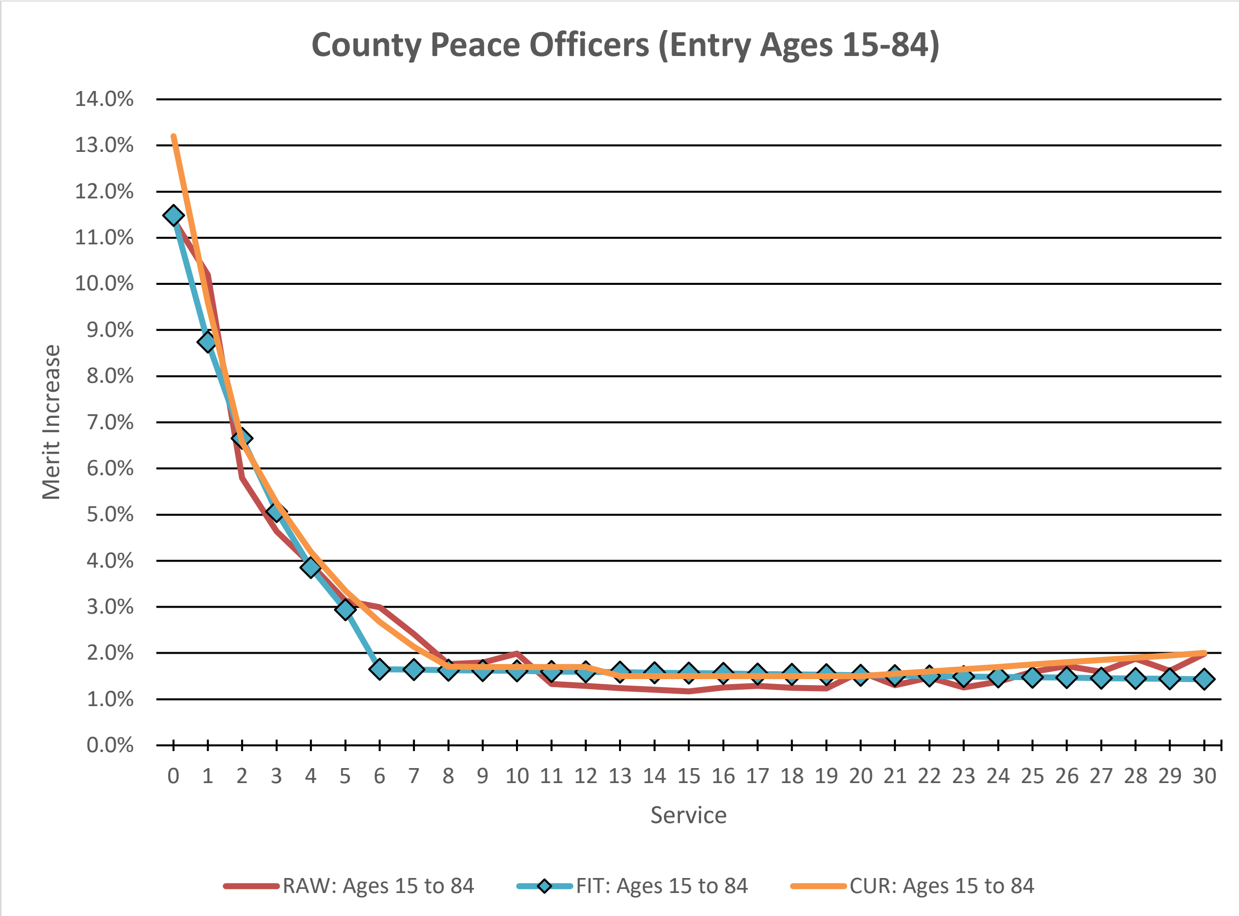


Public Agency County Peace Officers

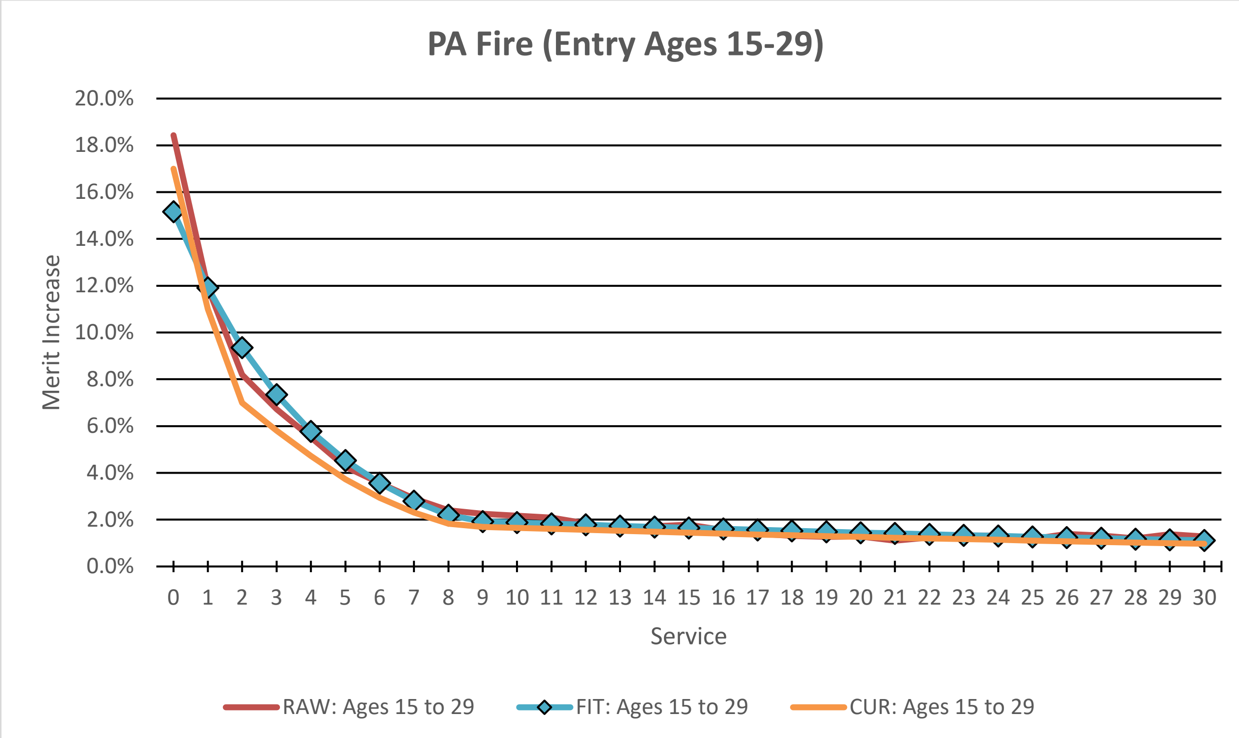


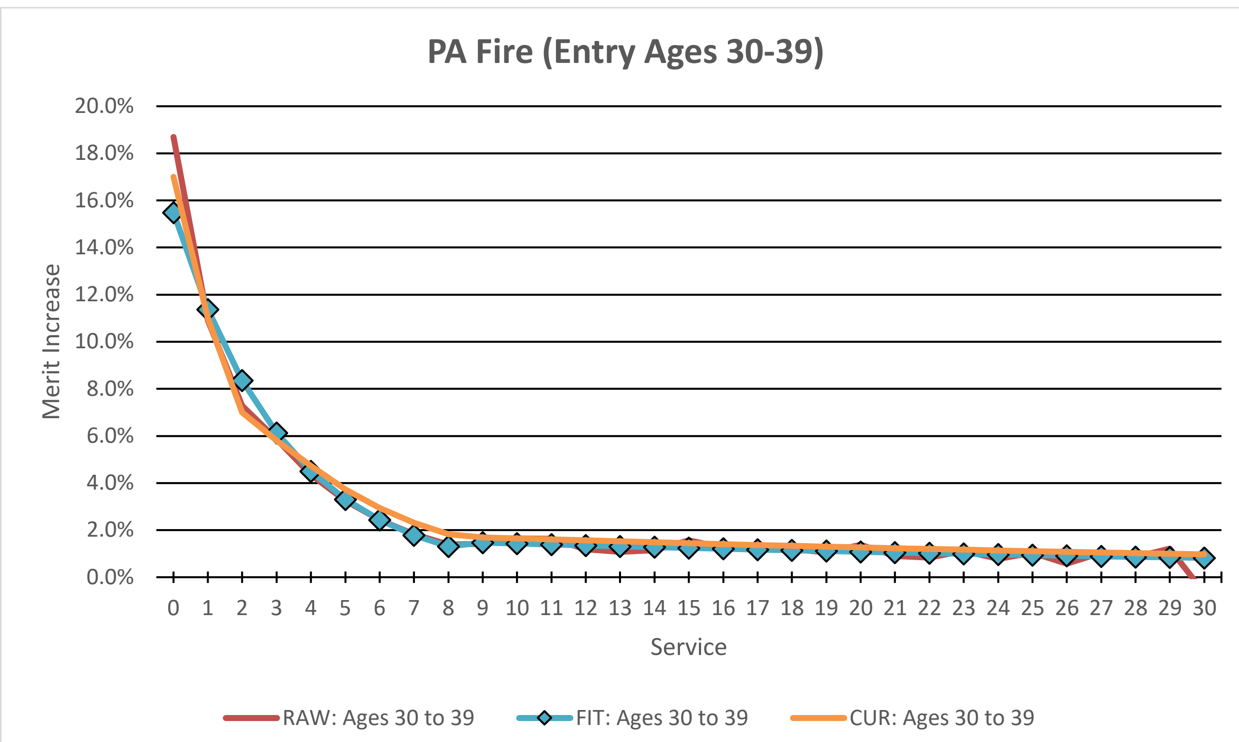

County Peace Officers (Entry Ages 30-39)
Merit Increase
14.0%
13.0%
12.0%
11.0%
10.0%
9.0%
8.0%
7.0%
6.0%
5.0%
4.0%
3.0%
2.0%
1.0%
0.0%
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Service
RAW: Ages 30 to 39
FIT: Ages 30 to 39
CUR: Ages 30 to 39

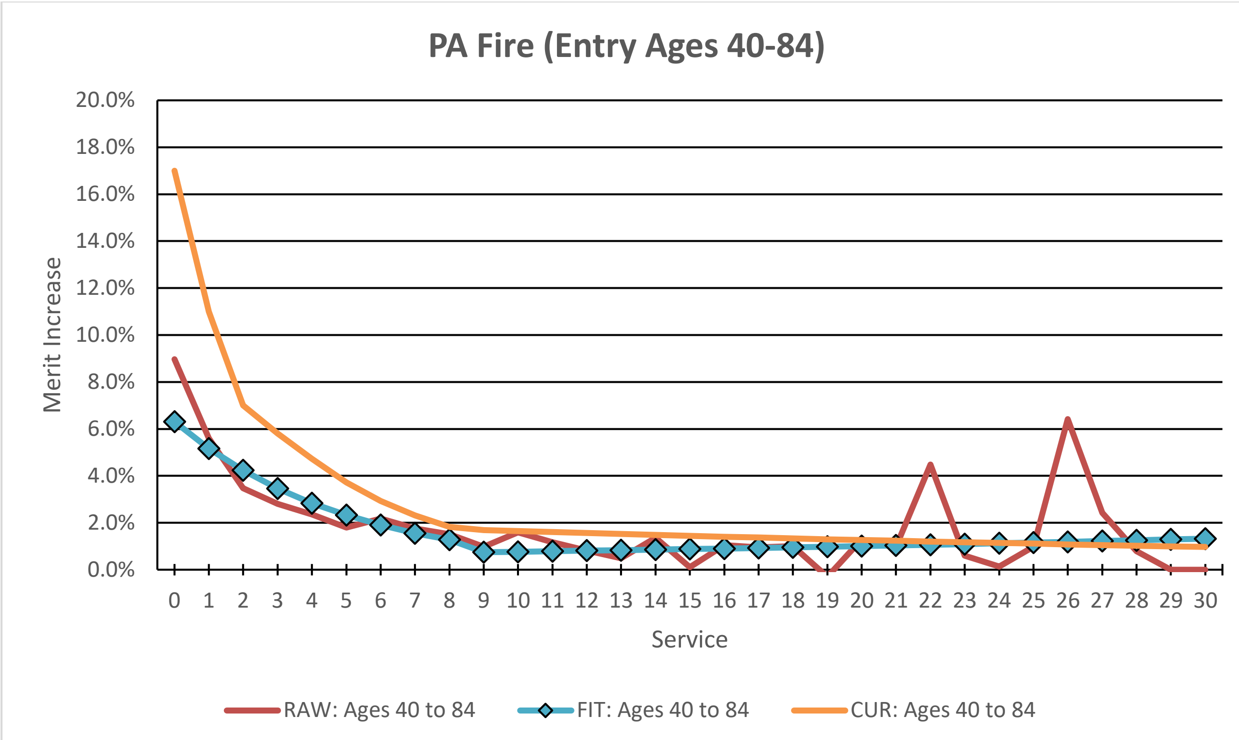

County Peace Officers (Entry Ages 40-84)
14.0%
13.0%
12.0%
11.0%
10.0%
9.0%
8.0%
7.0%
6.0%
5.0%
4.0%
3.0%
2.0%
1.0%
0.0%
Merit Increase
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Service
RAW: Ages 40 to 84
FIT: Ages 40 to 84
CUR: Ages 40 to 84

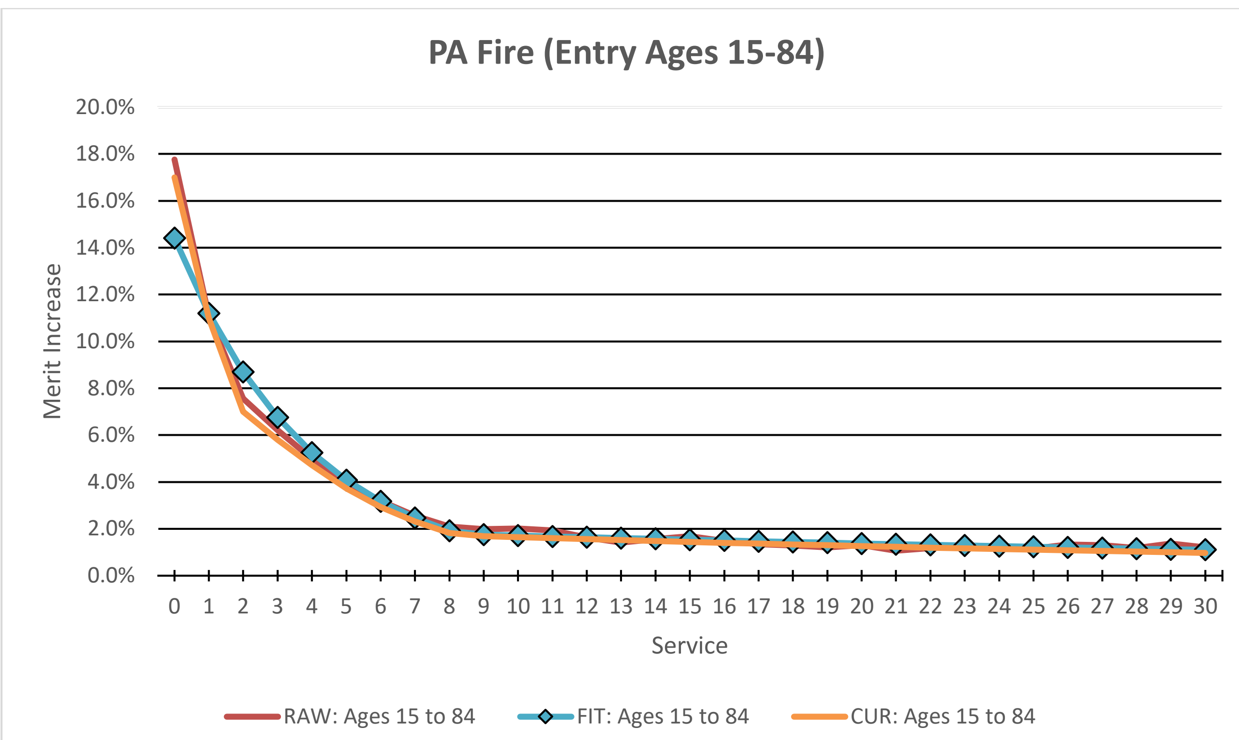

County Peace Officers (Entry Ages 15-84)
Merit Increase
14.0%
13.0%
12.0%
11.0%
10.0%
9.0%
8.0%
7.0%
6.0%
5.0%
4.0%
3.0%
2.0%
1.0%
0.0%
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Service
RAW: Ages 15 to 84
FIT: Ages 15 to 84
CUR: Ages 15 to 84

Public Agency Fire

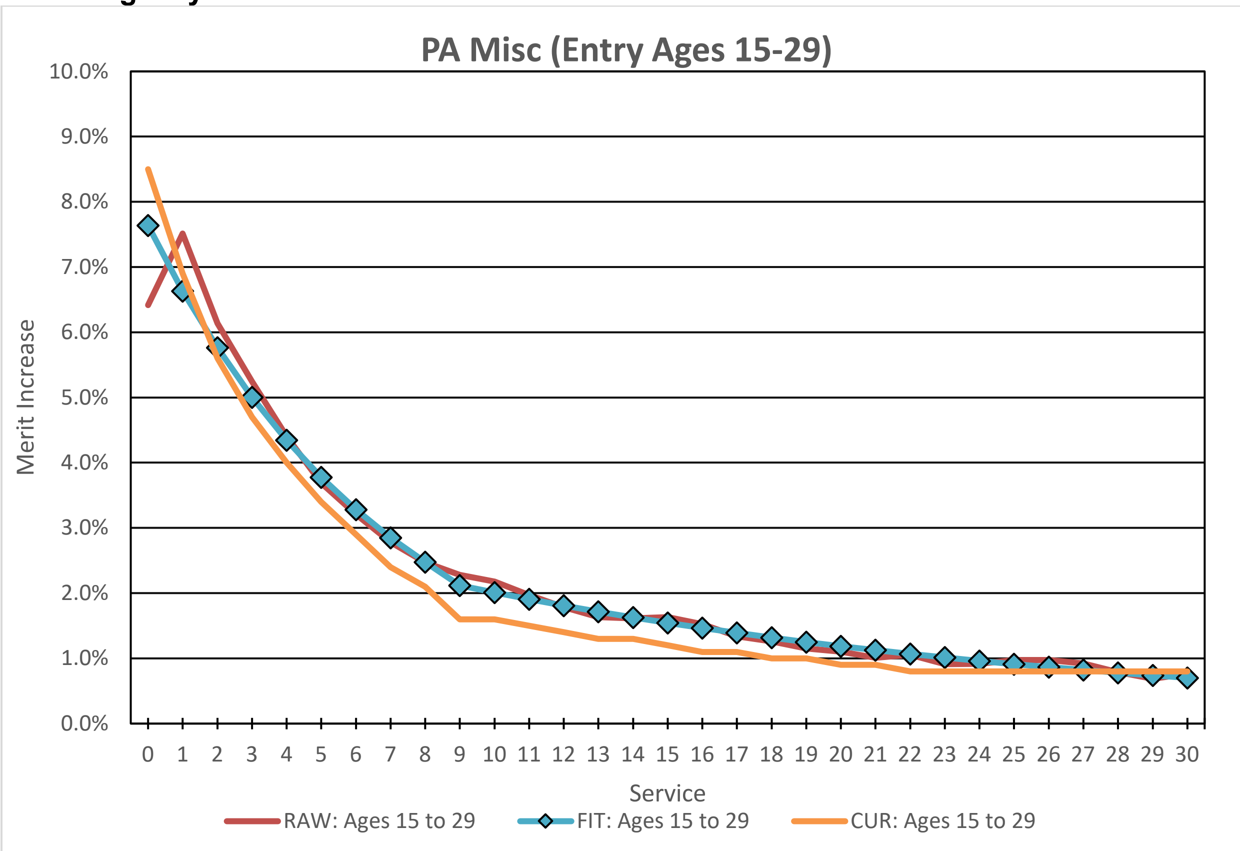


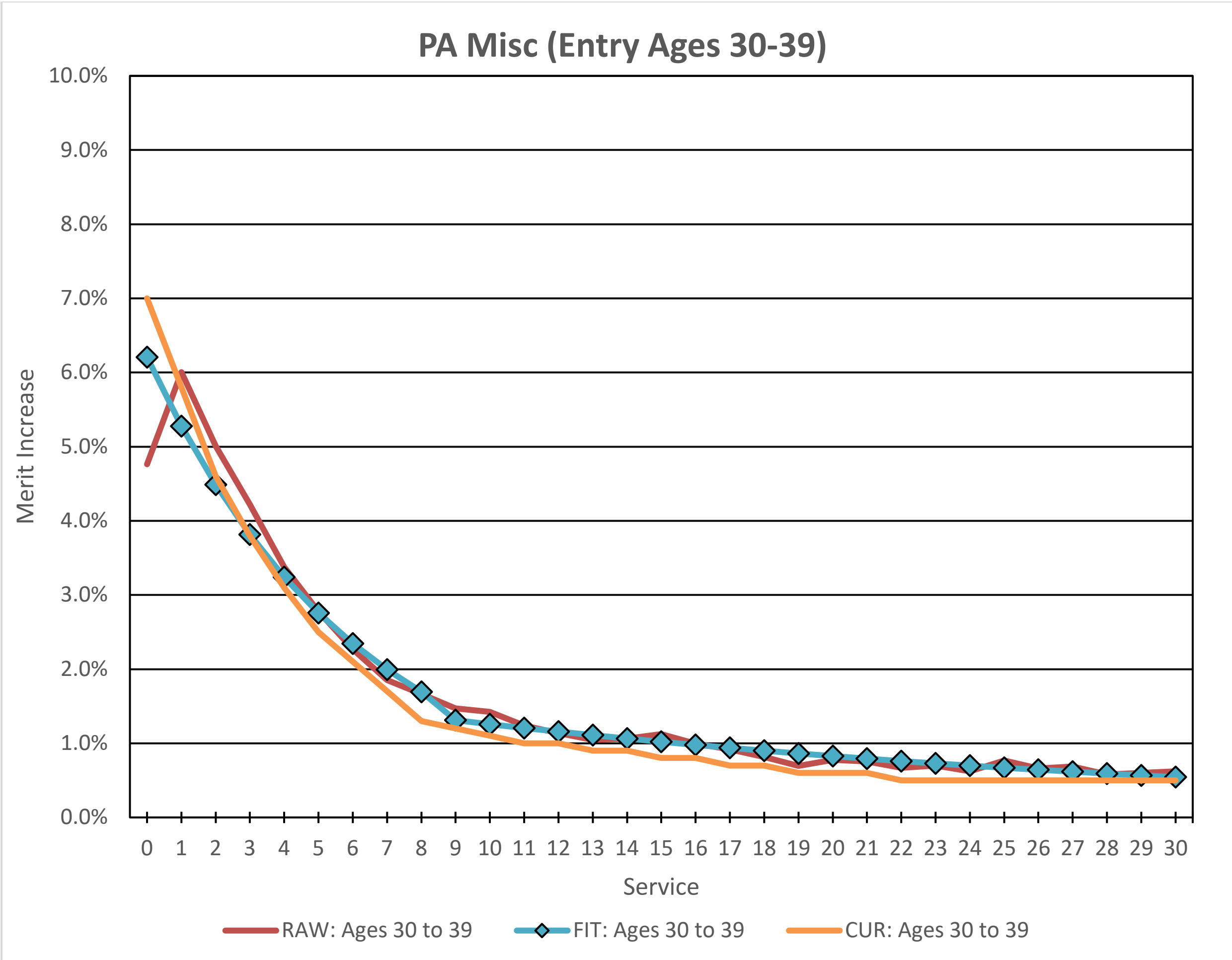


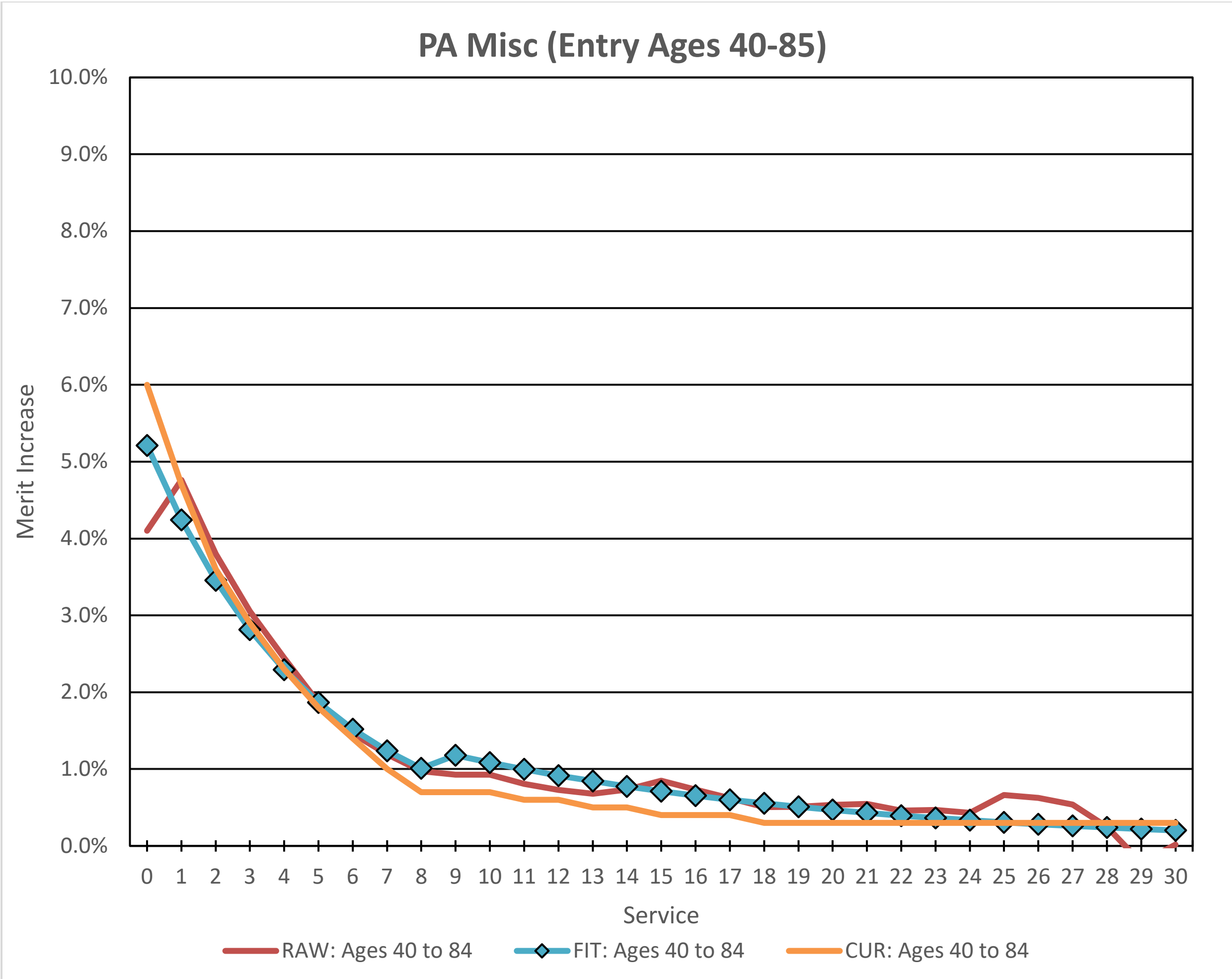

PA Fire (Entry Ages 40-84)
20.0%
18.0%
16.0%
14.0%
12.0%
10.0%
8.0%
6.0%
4.0%
2.0%
0.0%
Merit Increase
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Service
RAW: Ages 40 to 84
FIT: Ages 40 to 84
CUR: Ages 40 to 84


PA Fire (Entry Ages 15-84)
20.0%
18.0%
16.0%
14.0%
12.0%
10.0%
8.0%
6.0%
4.0%
2.0%
0.0%
Merit Increase
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Service
RAW: Ages 15 to 84
FIT: Ages 15 to 84
CUR: Ages 15 to 84

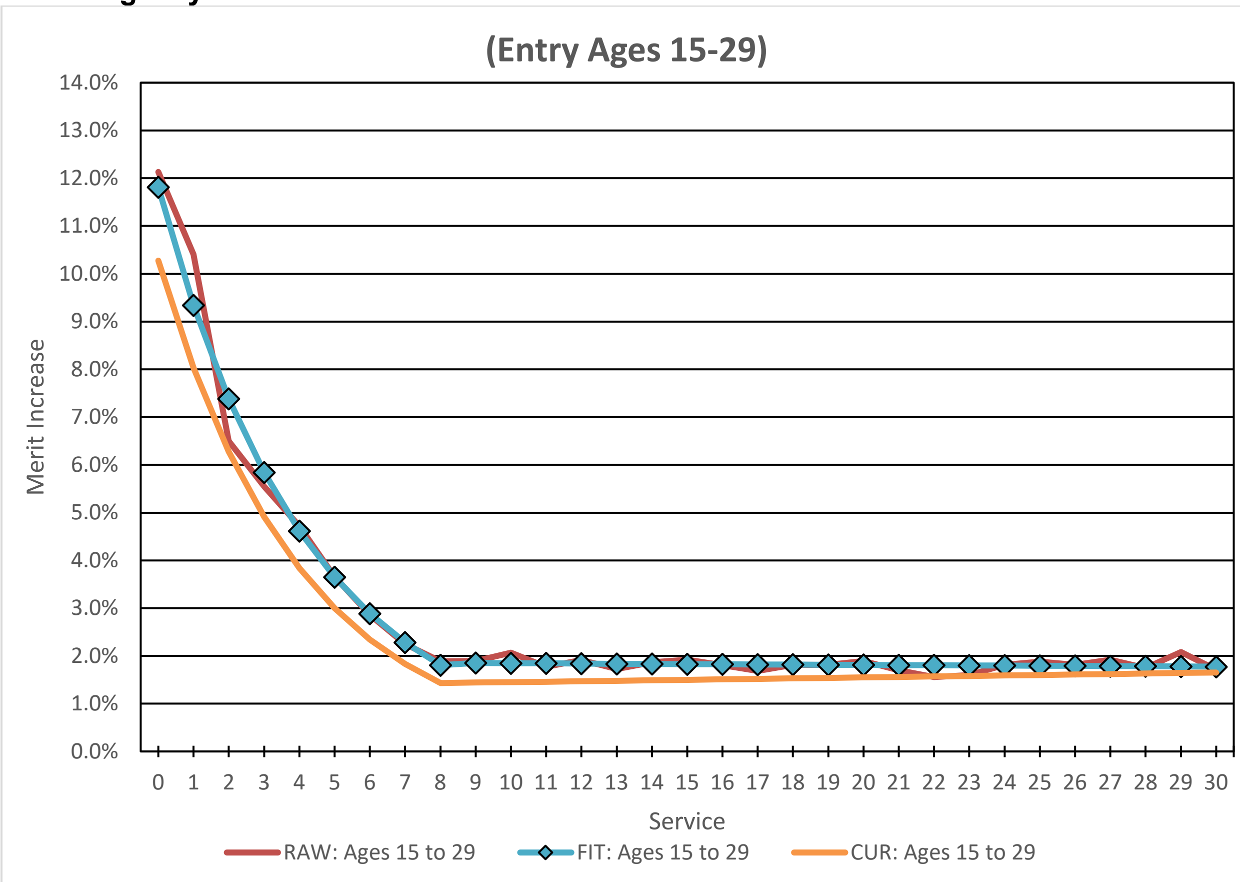
Public Agency Miscellaneous

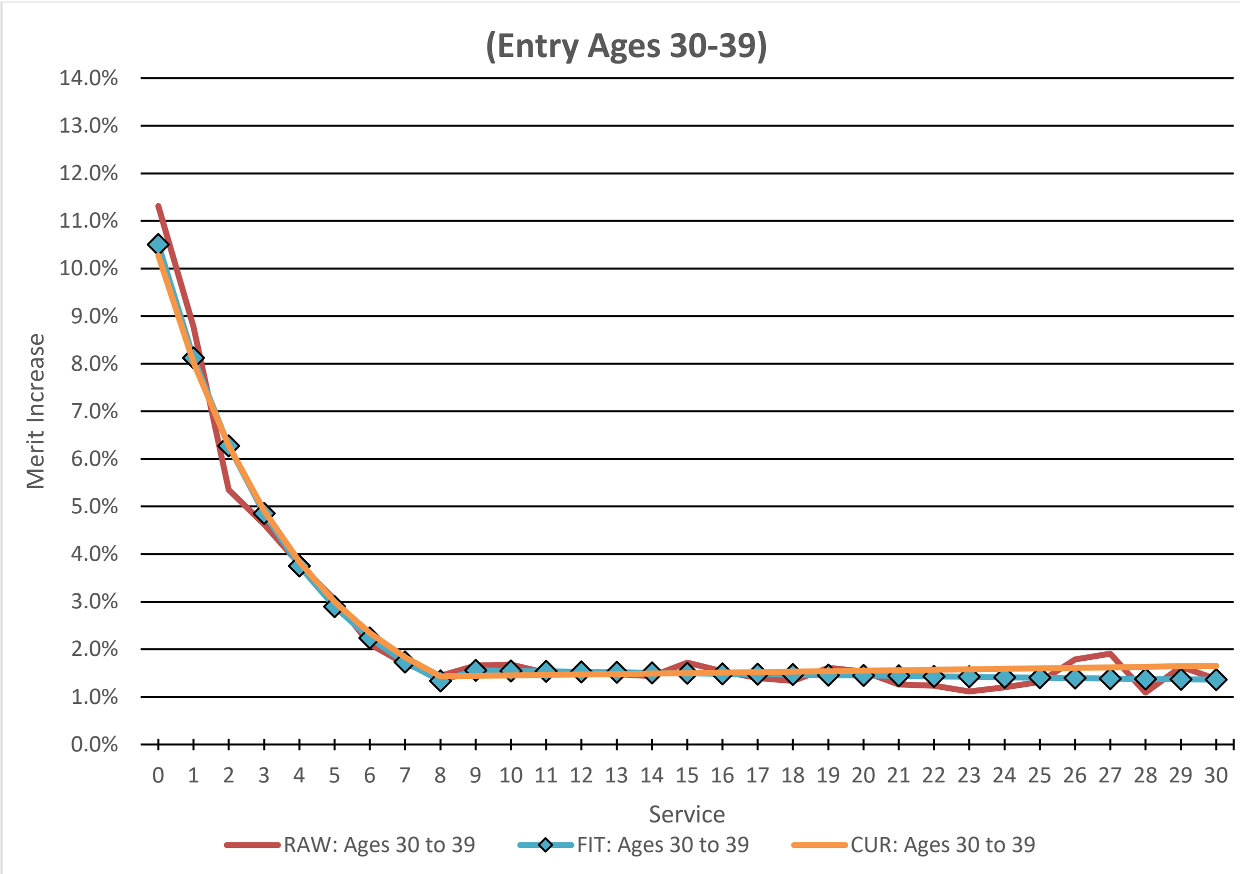


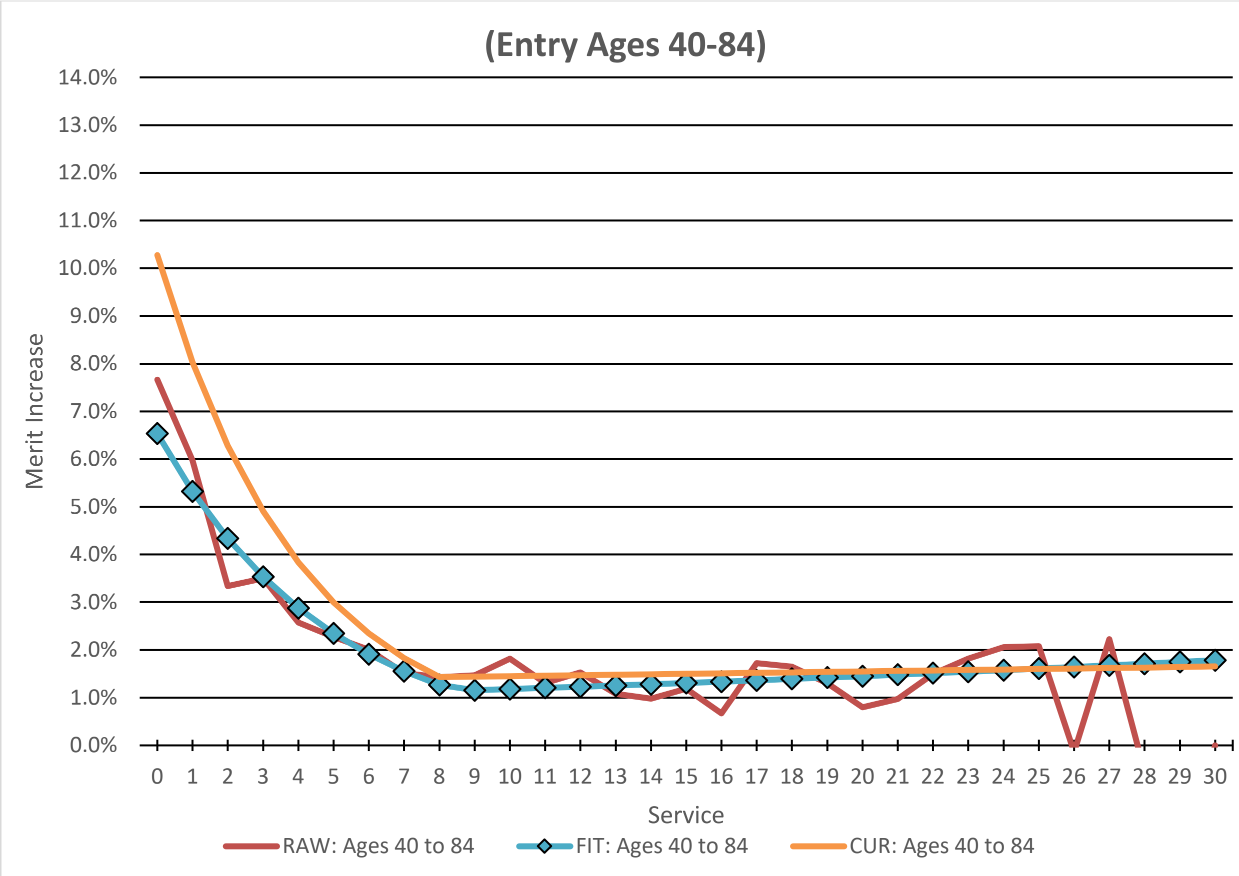

PA Misc (Entry Ages 30-39)
10.0%
9.0%
8.0%
7.0%
6.0%
5.0%
4.0%
3.0%
2.0%
1.0%
0.0%
Merit Increase
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Service
RAW: Ages 30 to 39
FIT: Ages 30 to 39
CUR: Ages 30 to 39

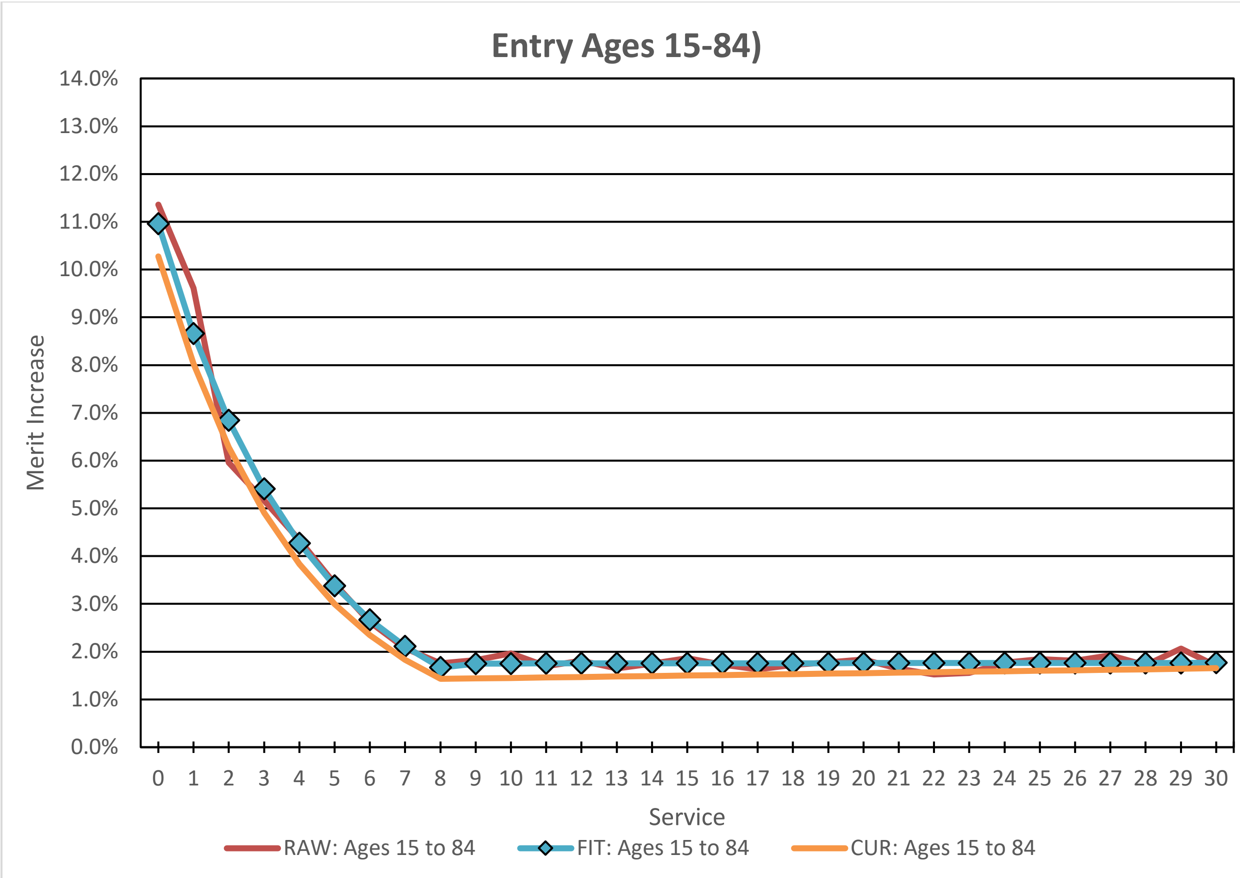

PA Misc (Entry Ages 40-85)
Merit Increase
10.0%
9.0%
8.0%
7.0%
6.0%
5.0%
4.0%
3.0%
2.0%
1.0%
0.0%
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Service
RAW: Ages 40 to 84
FIT: Ages 40 to 84
CUR: Ages 40 to 84

Public Agency Police



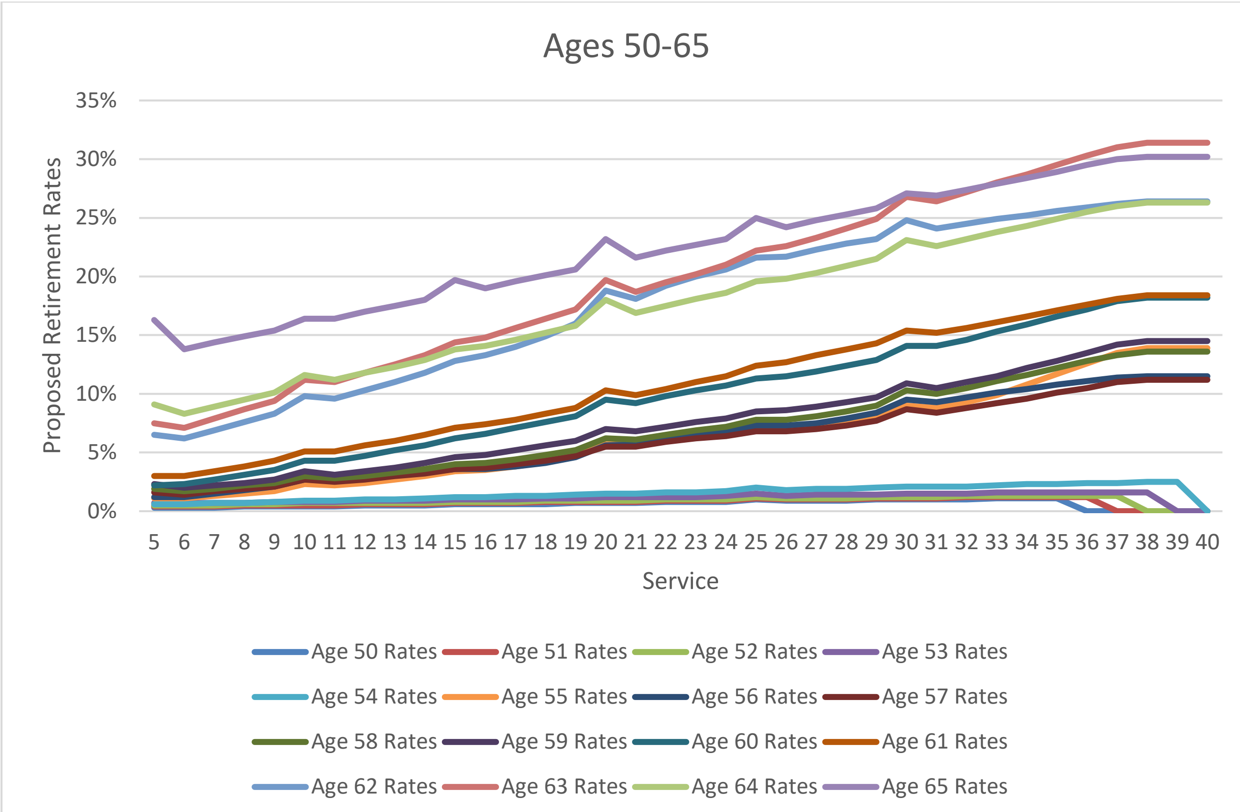

(Entry Ages 30-39)
14.0%
13.0%
12.0%
11.0%
10.0%
9.0%
8.0%
7.0%
6.0%
5.0%
4.0%
3.0%
2.0%
1.0%
0.0%
Merit Increase
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Service
RAW: Ages 30 to 39
FIT: Ages 30 to 39
CUR: Ages 30 to 39


(Entry Ages 40-84)
Merit Increase
14.0%
13.0%
12.0%
11.0%
10.0%
9.0%
8.0%
7.0%
6.0%
5.0%
4.0%
3.0%
2.0%
1.0%
0.0%
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Service
RAW: Ages 40 to 84
FIT: Ages 40 to 84
CUR: Ages 40 to 84

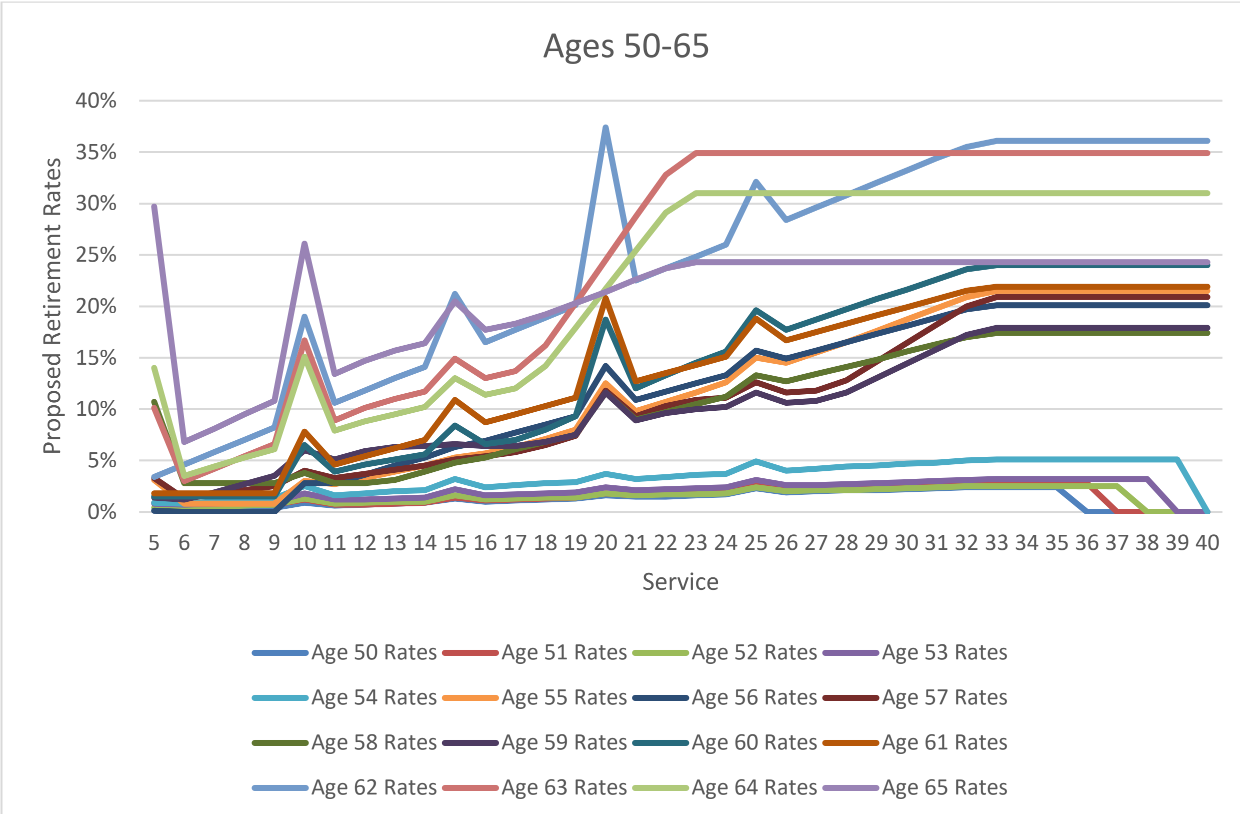

Entry Ages 15-84)
Merit Increase
14.0%
13.0%
12.0%
11.0%
10.0%
9.0%
8.0%
7.0%
6.0%
5.0%
4.0%
3.0%
2.0%
1.0%
0.0%
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Service
RAW: Ages 15 to 84
FIT: Ages 15 to 84
CUR: Ages 15 to 84

SERVICE RETIREMENT

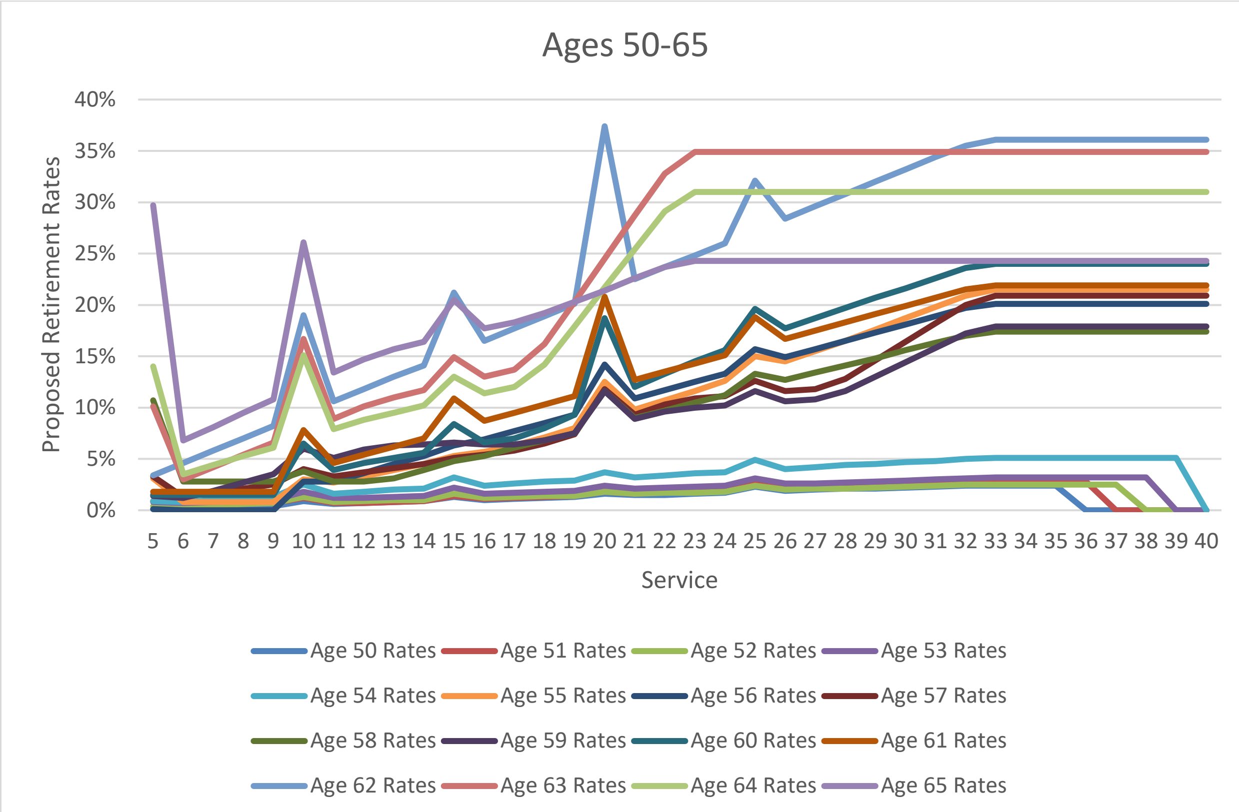
Schools



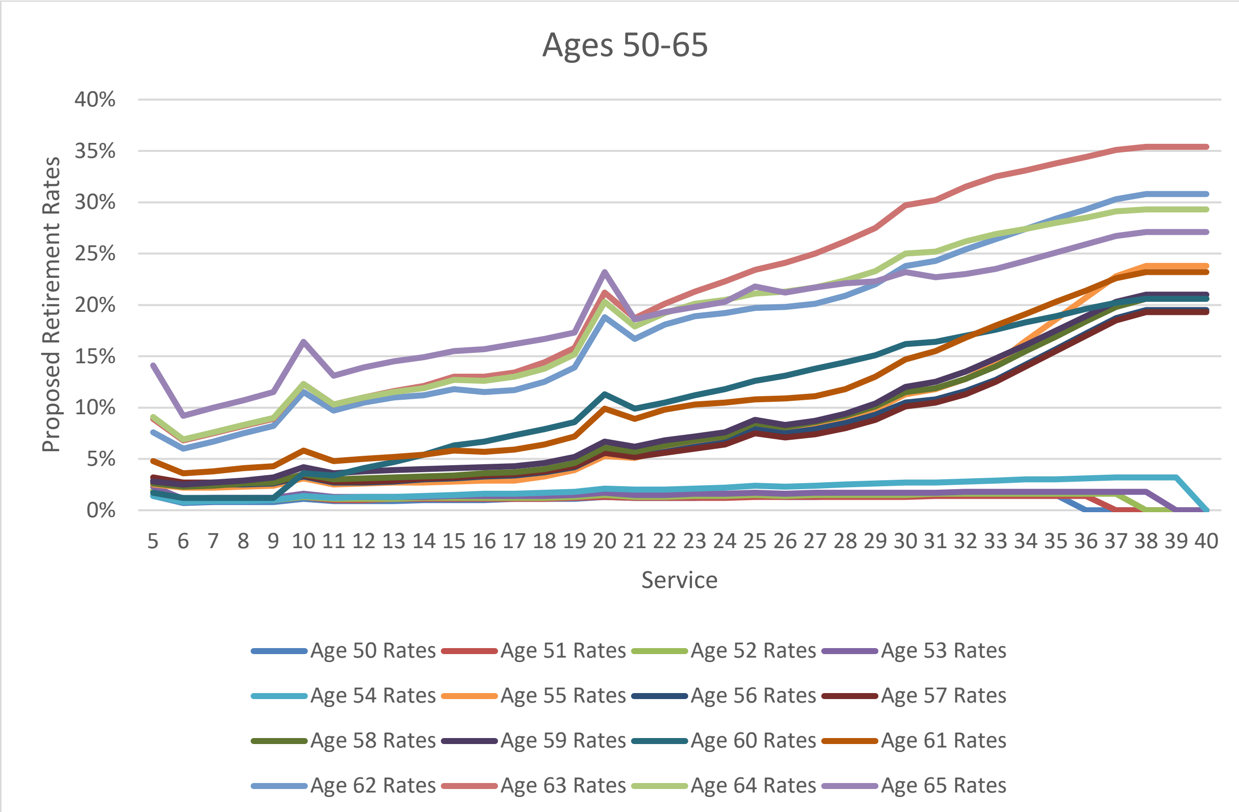
State Industrial



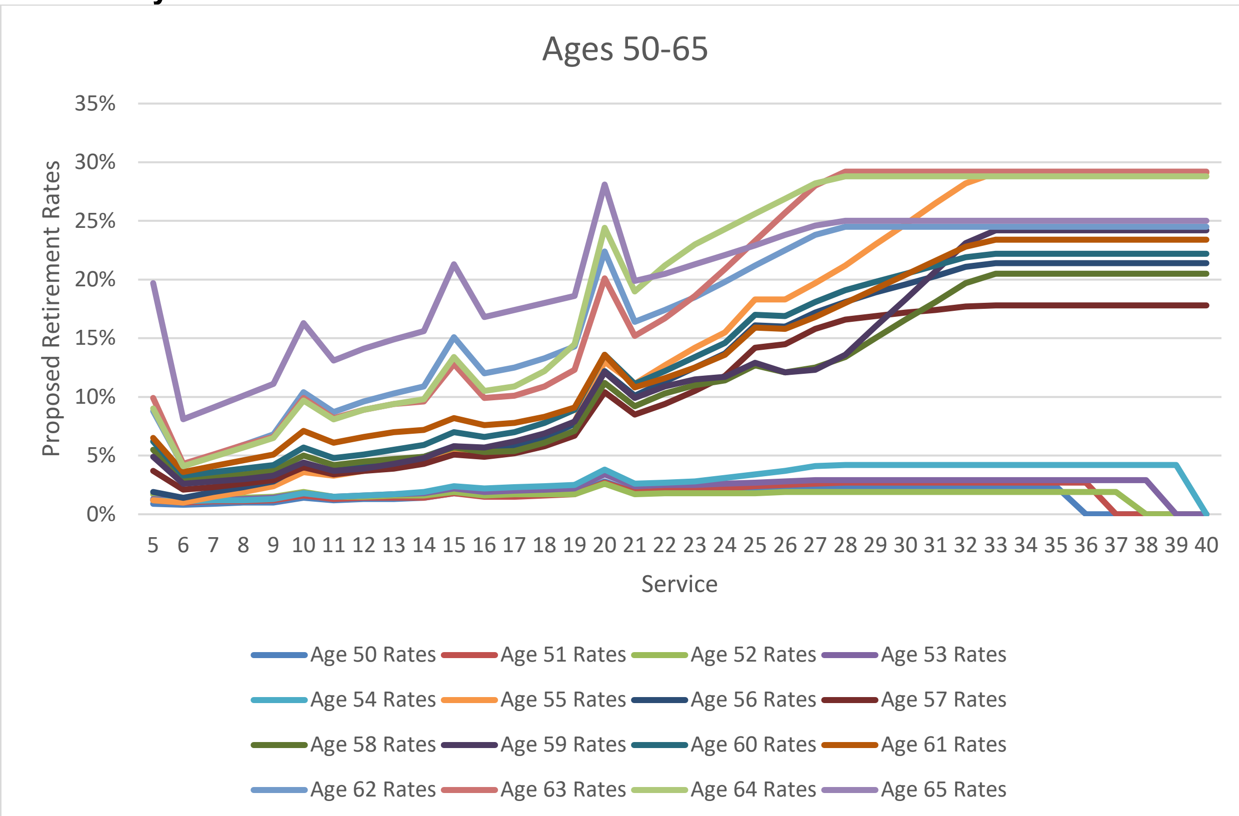
State Industrial



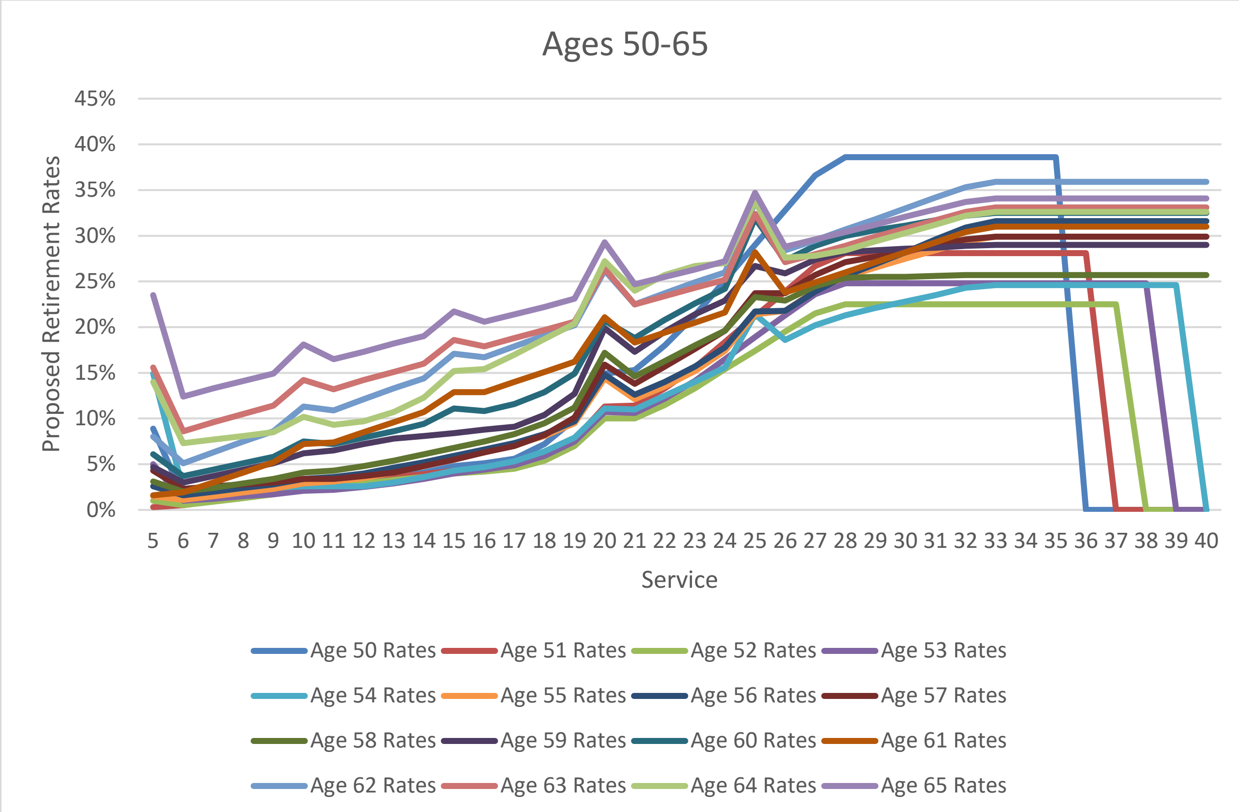
State Miscellaneous



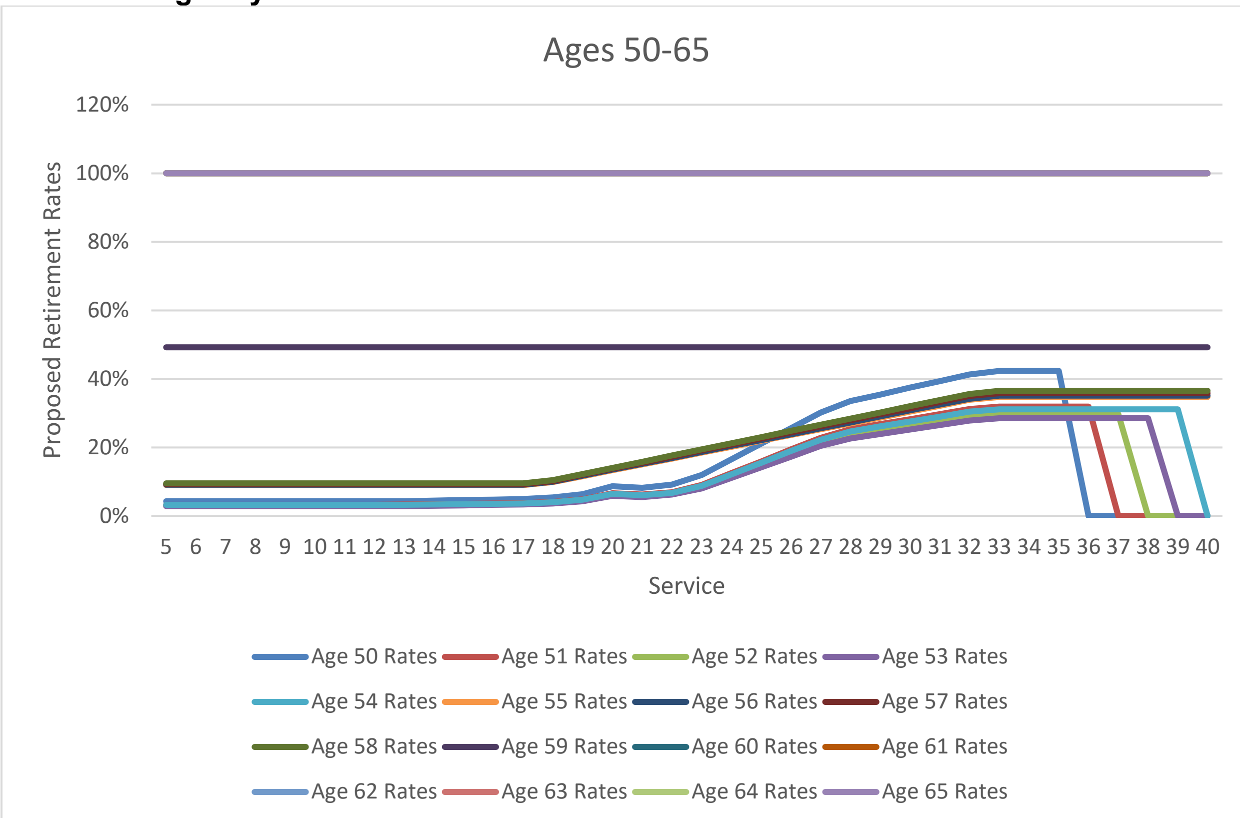
State Safety



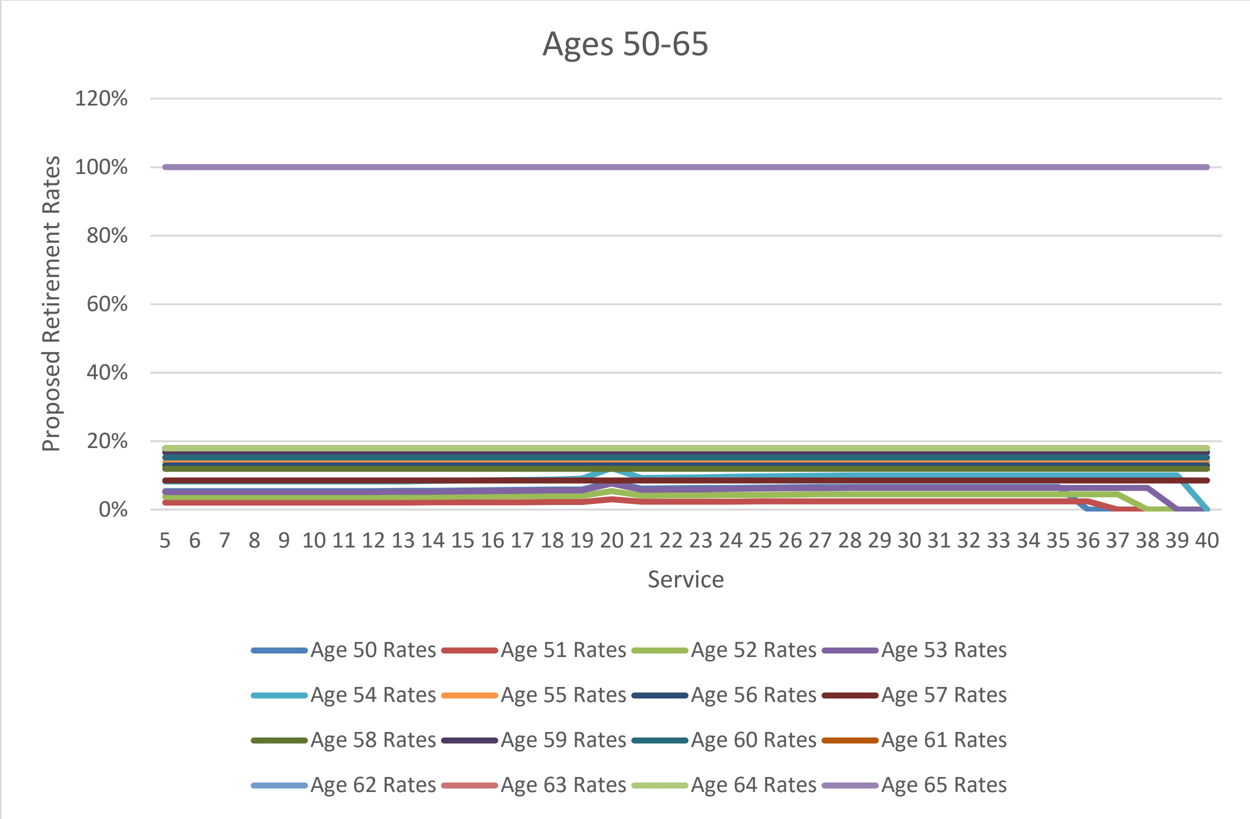
State Peace Officers and Firefighters



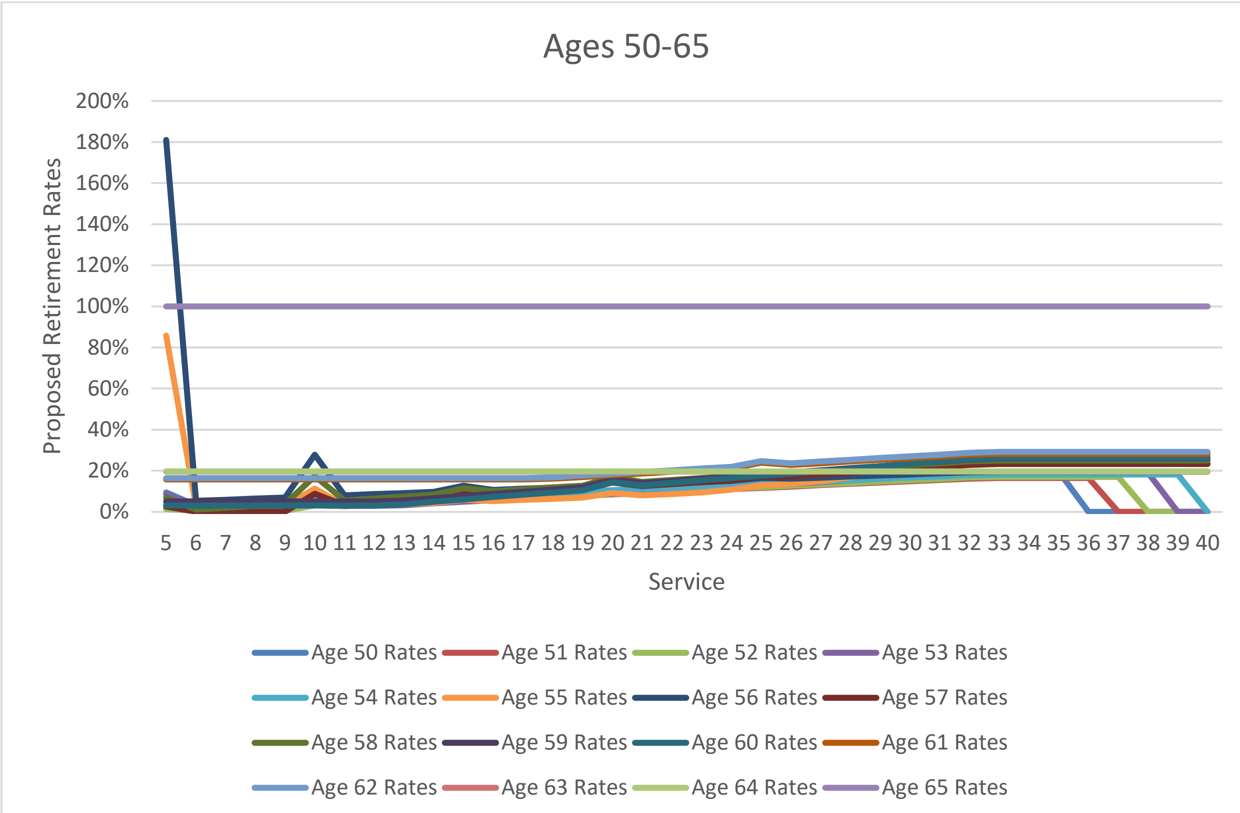
California Highway Patrol



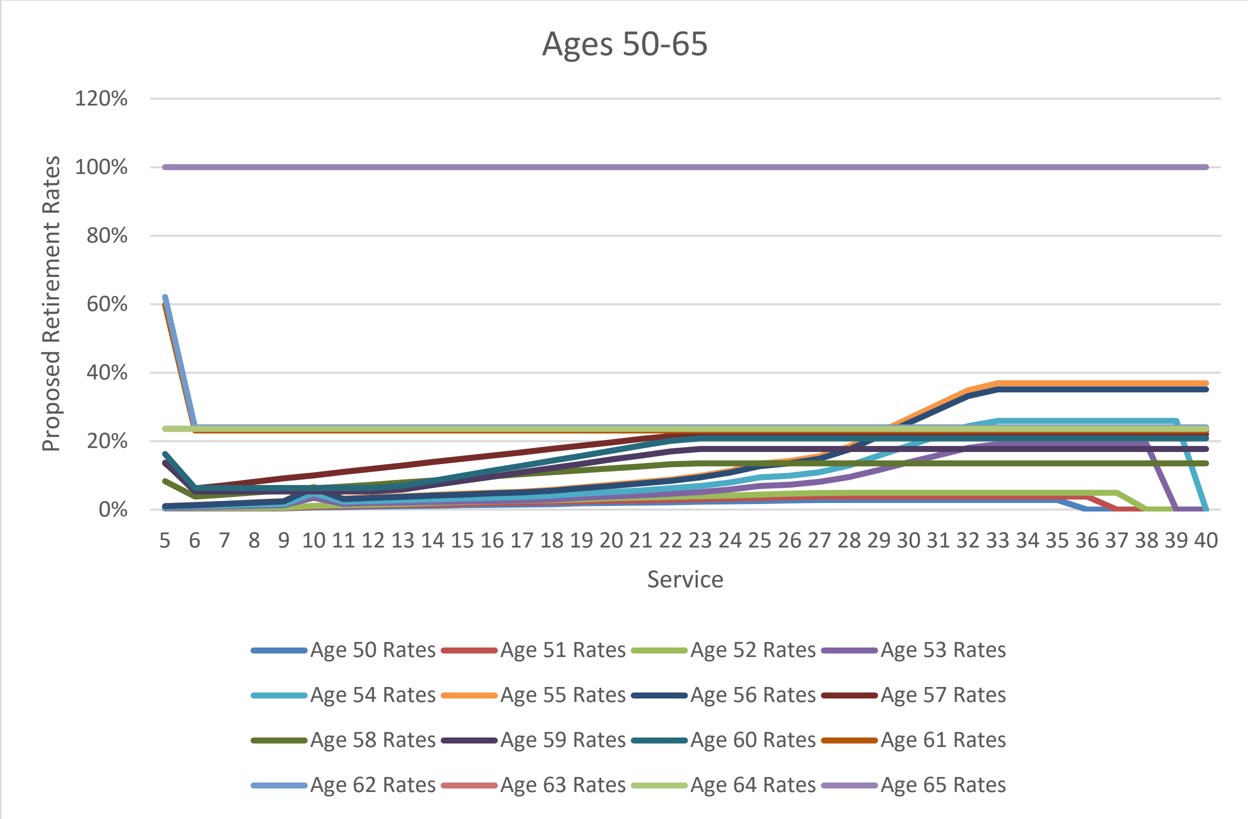
Public Agency Fire 2% at 50



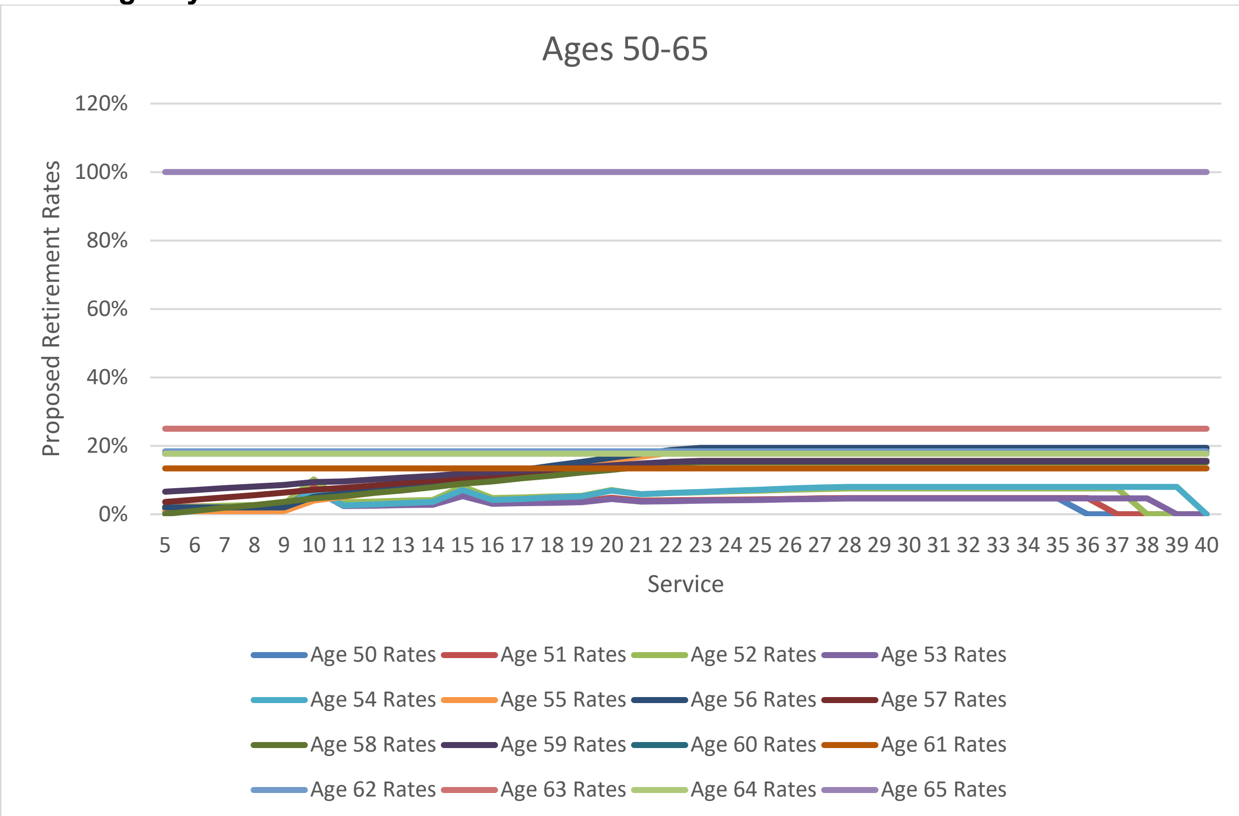
Public Agency Fire 3% at 50



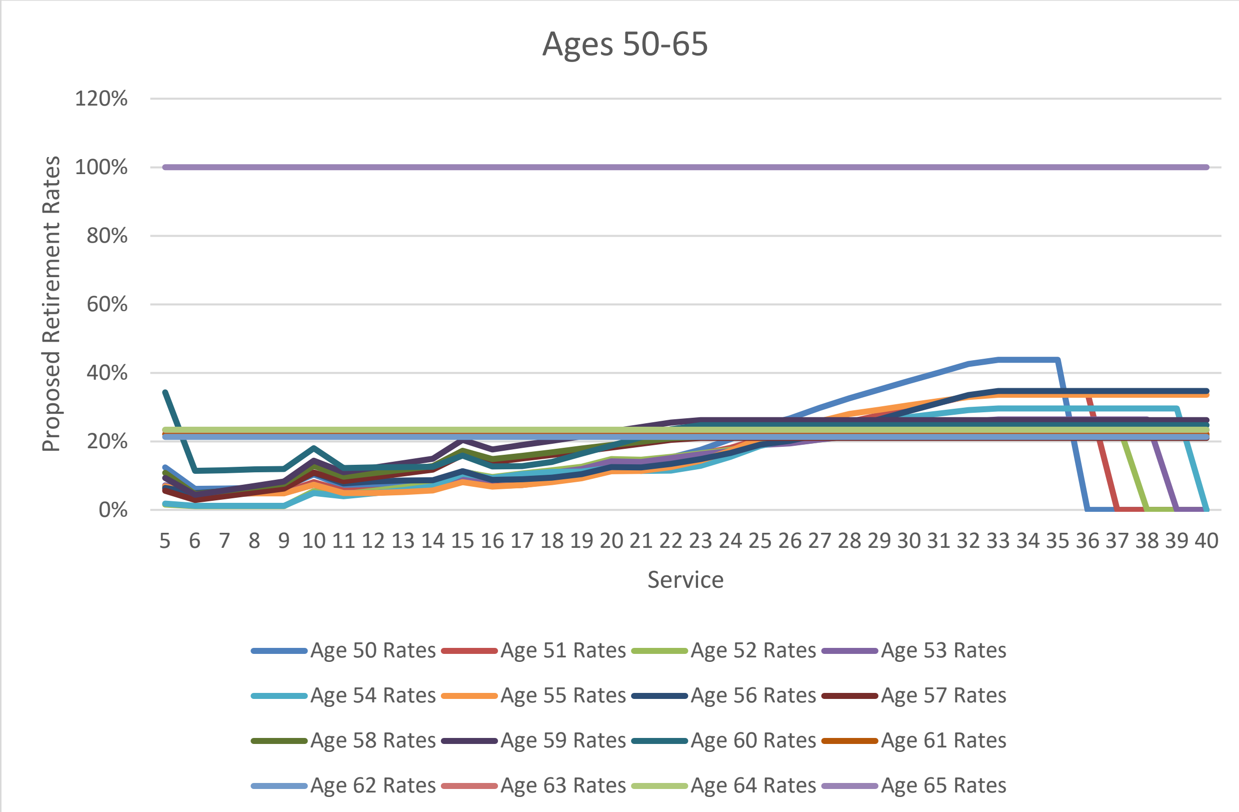
Public Agency Fire 3% at 55



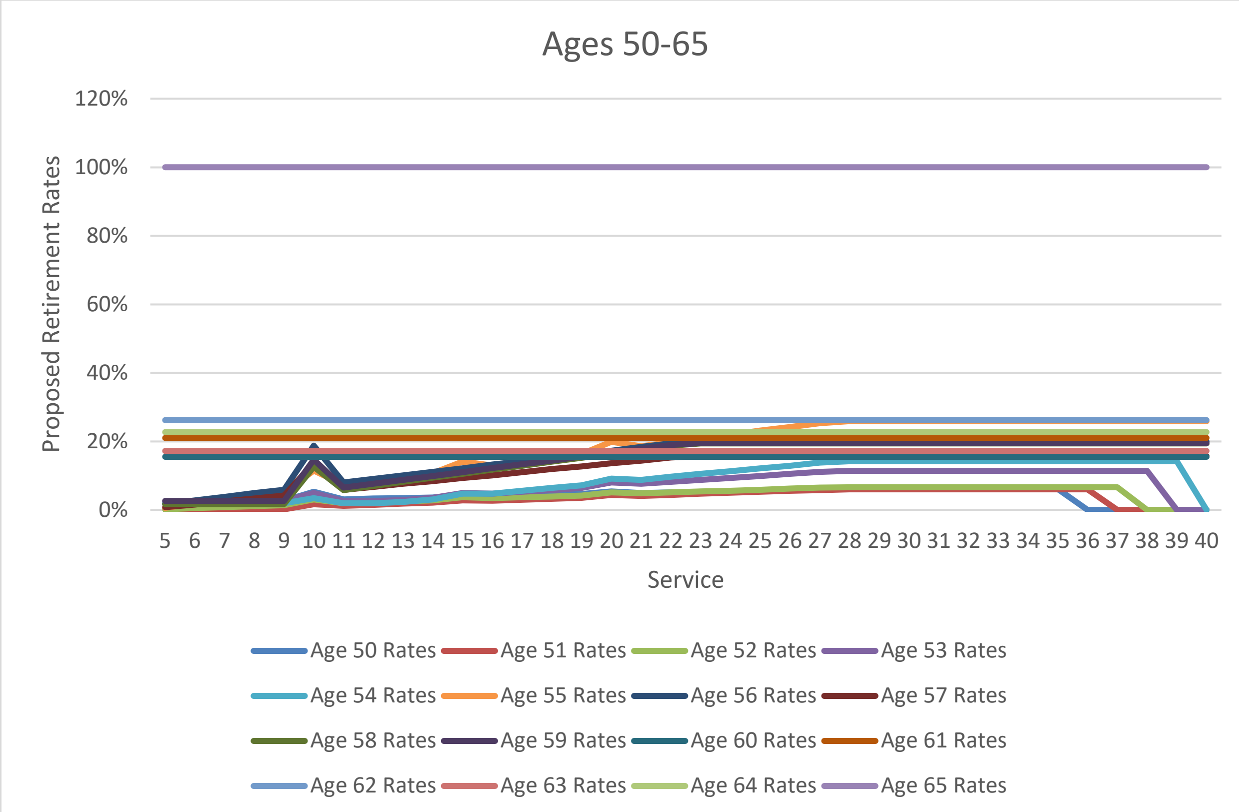
Public Agency Police 2% at 50



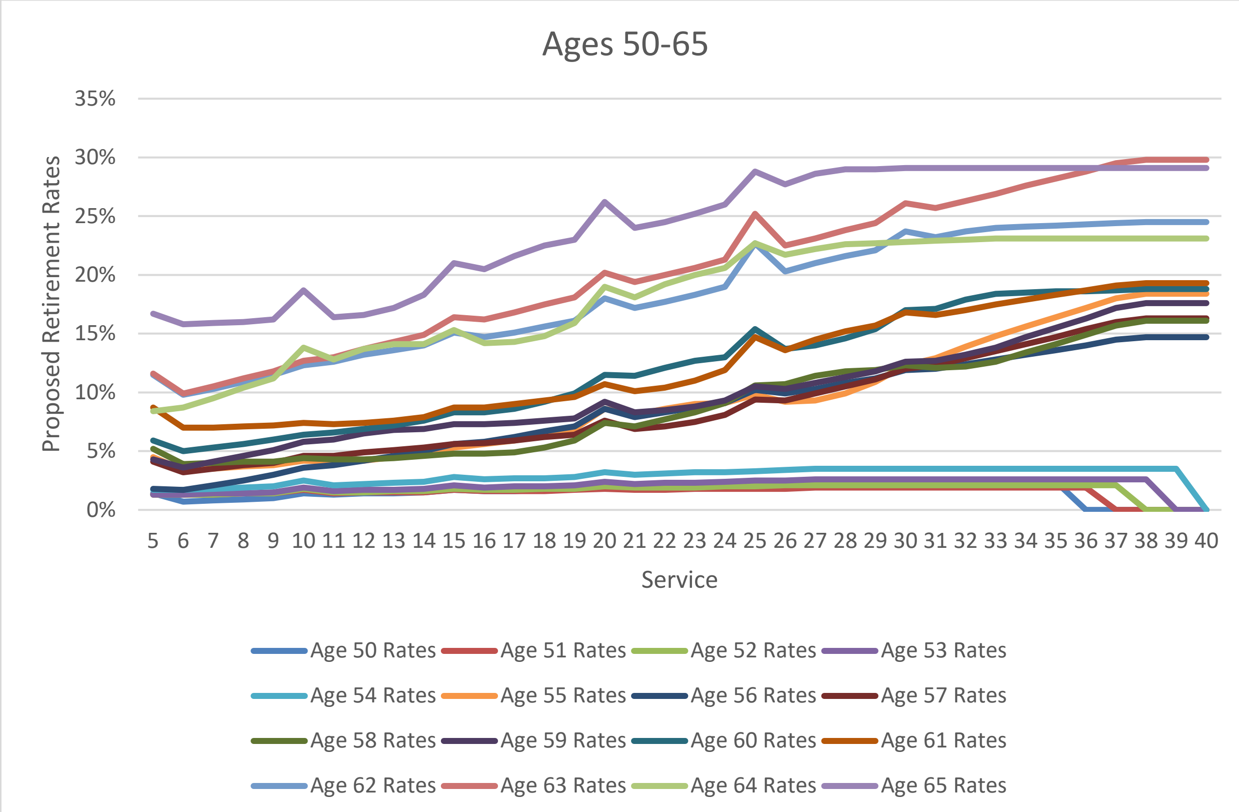
Public Agency Police 3% at 50



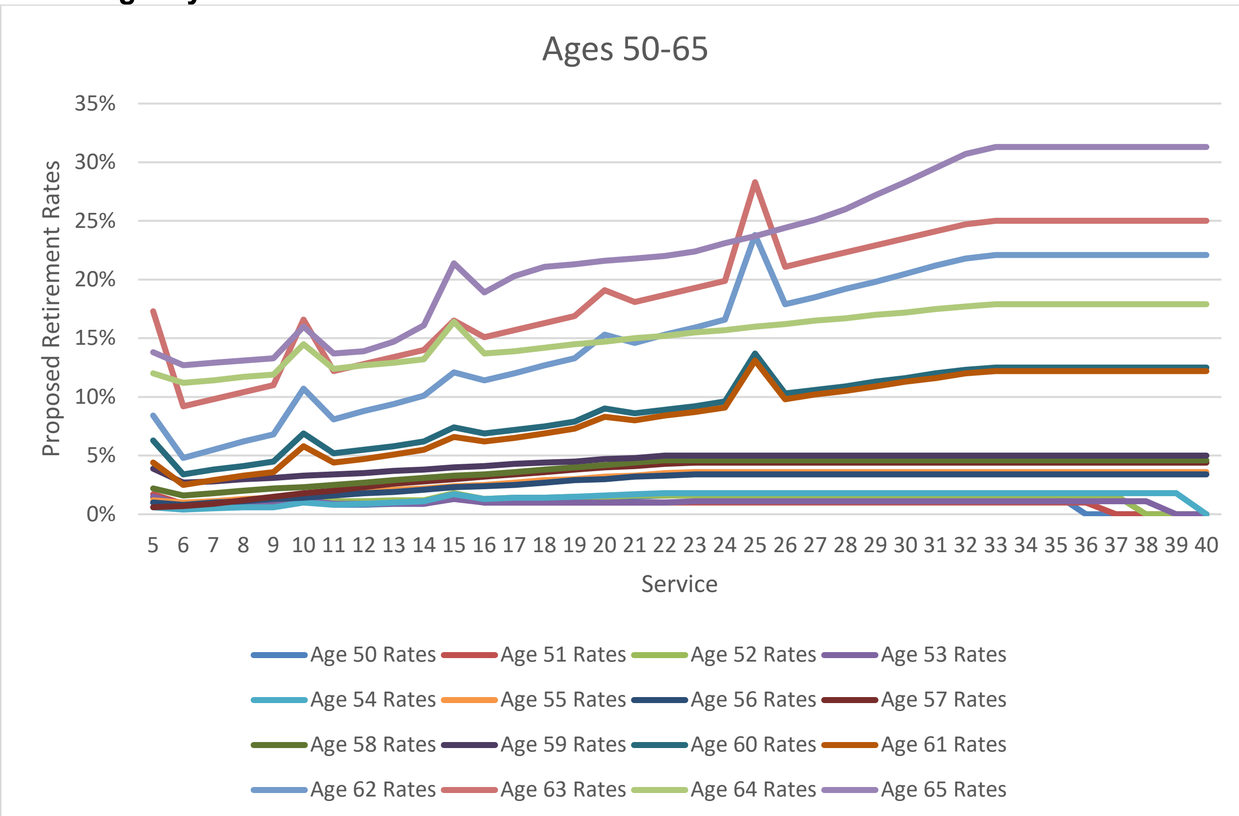
Public Agency Police 3% at 55



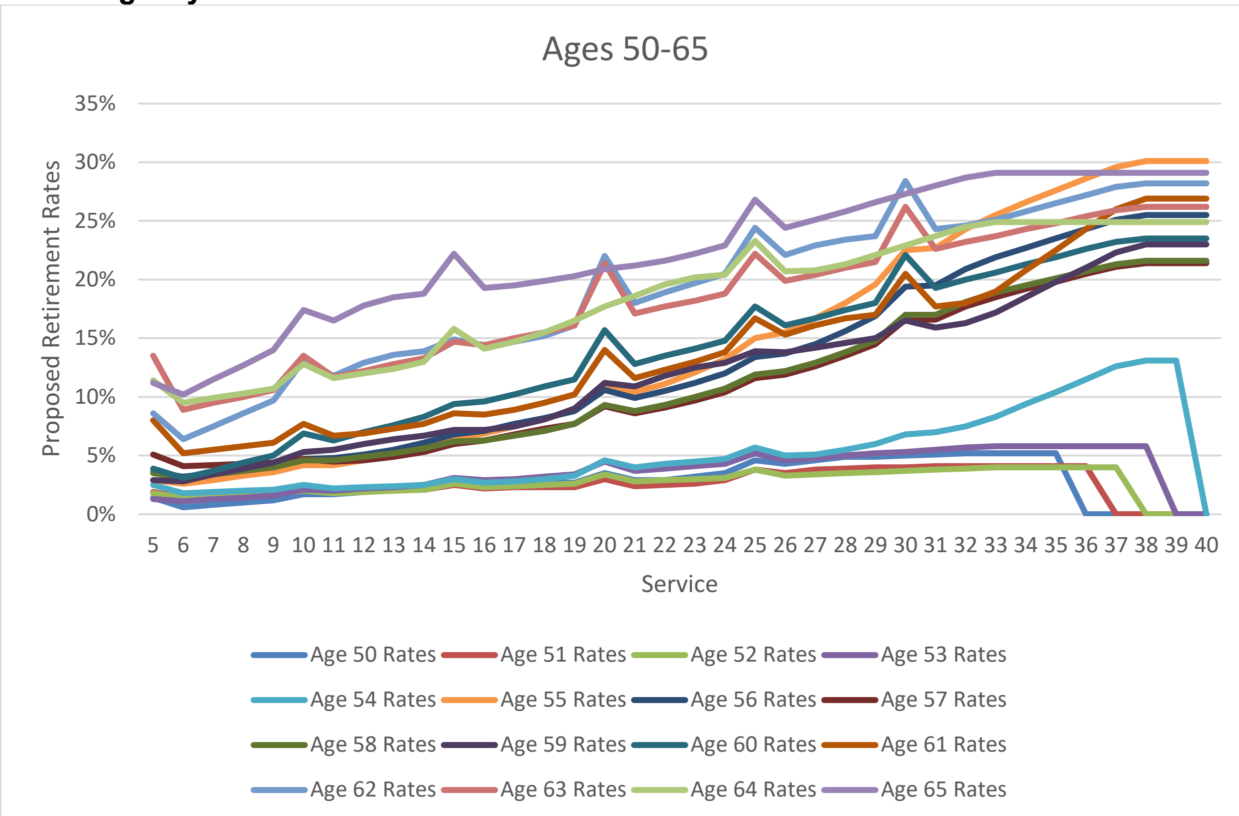
Public Agency Miscellaneous 2% at 55



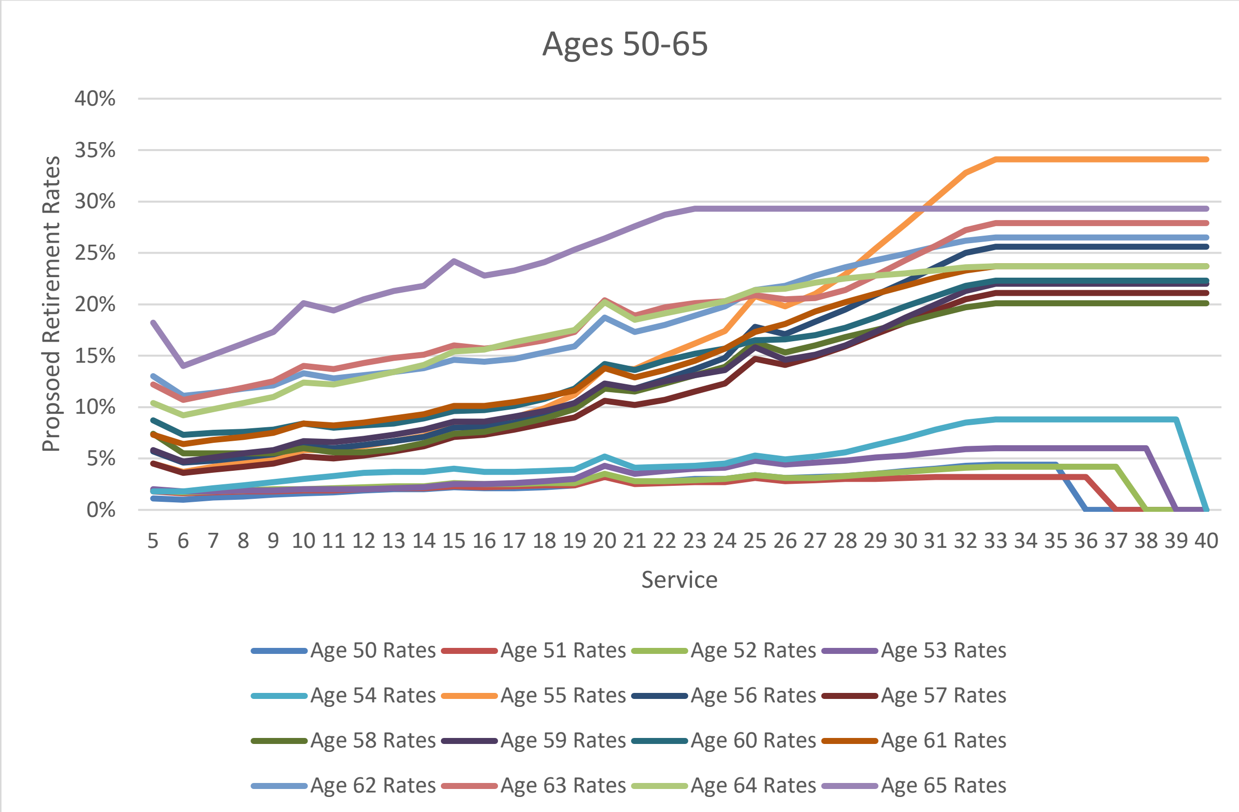
Public Agency Miscellaneous 2% at 60



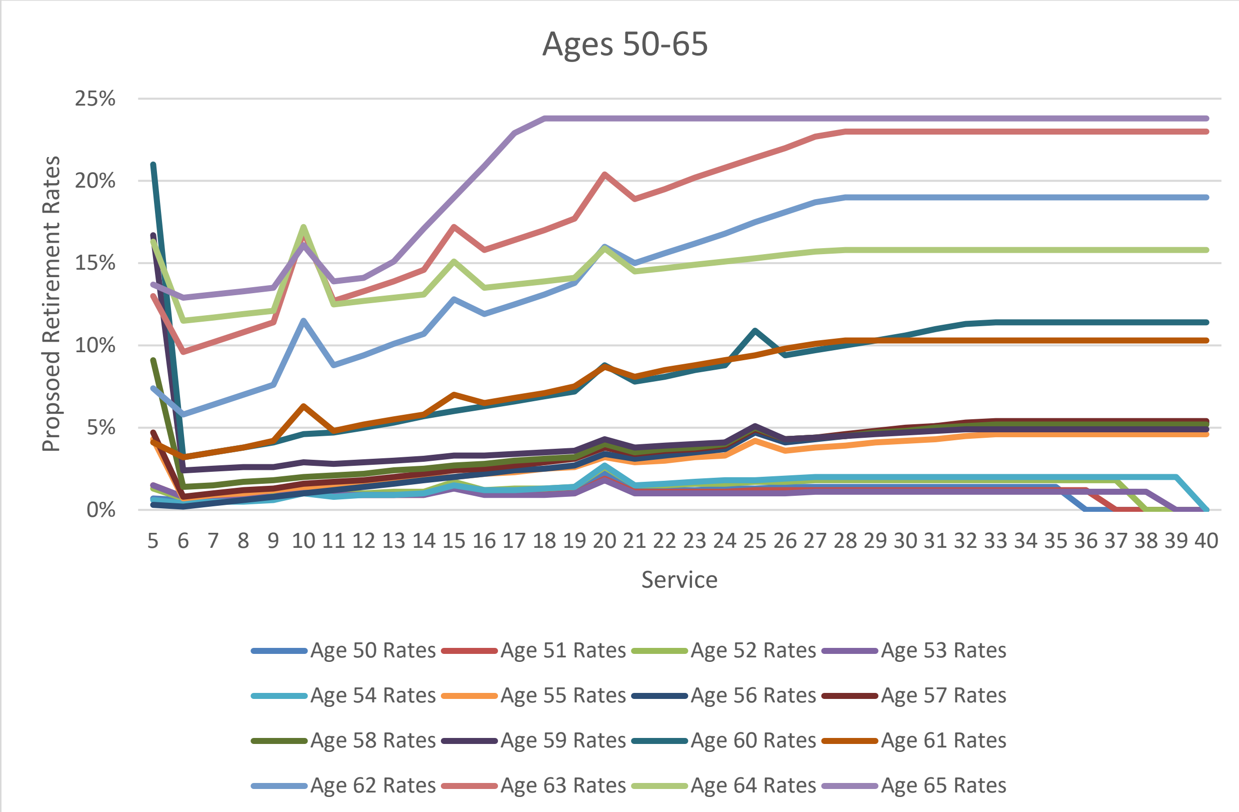
Public Agency Miscellaneous 2.5% at 55



Public Agency Miscellaneous 2.7% at 55

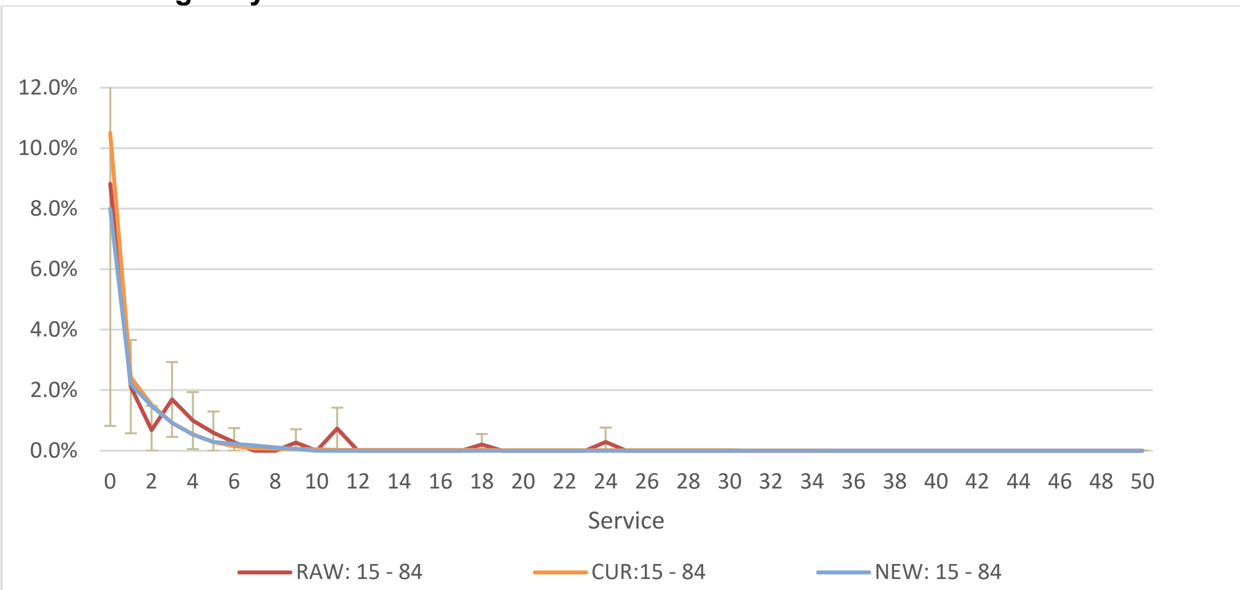


Public Agency Miscellaneous 3% at 60

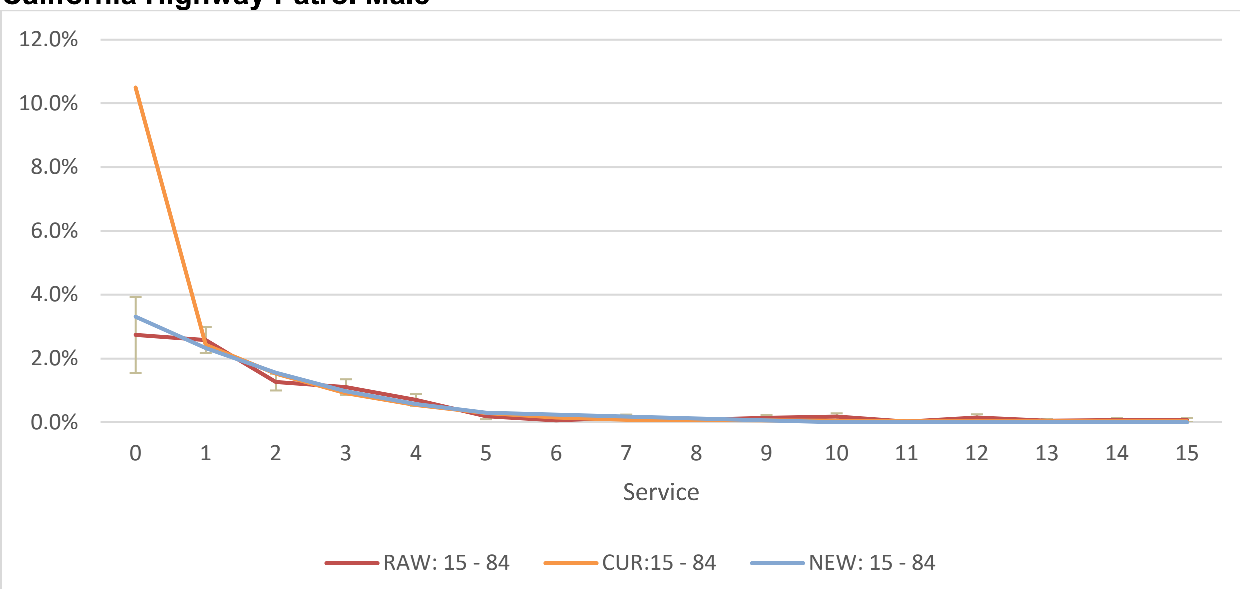


TERM REFUND

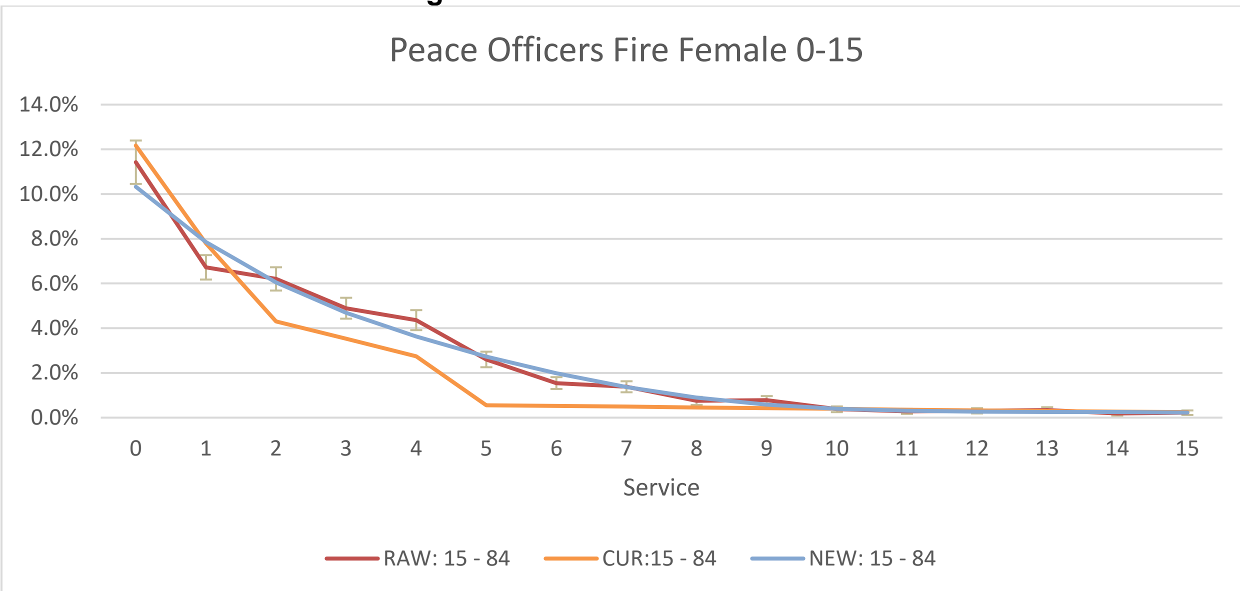
California Highway Patrol Female



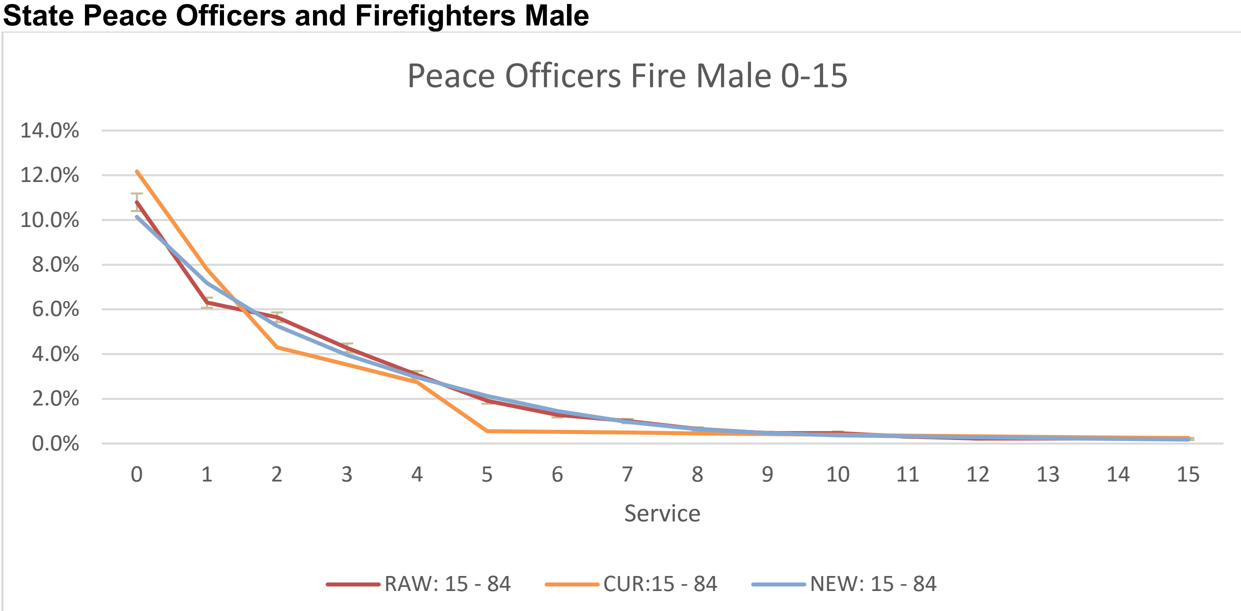
California Highway Patrol Male



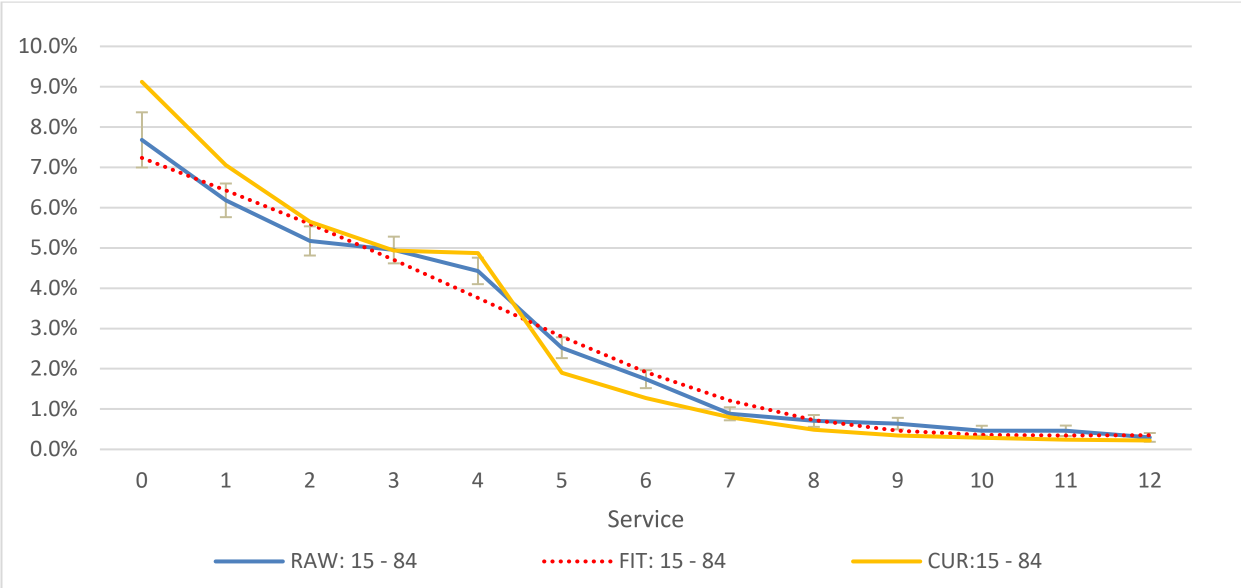
State Peace Officers and Firefighters Female



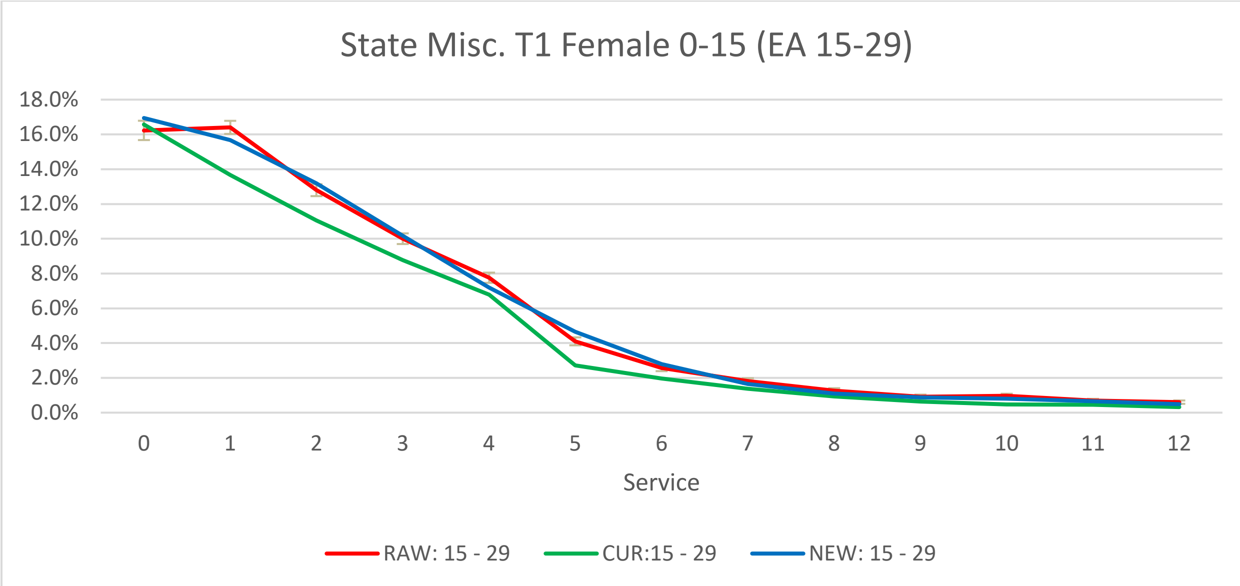
State Peace Officers and Firefighters Male

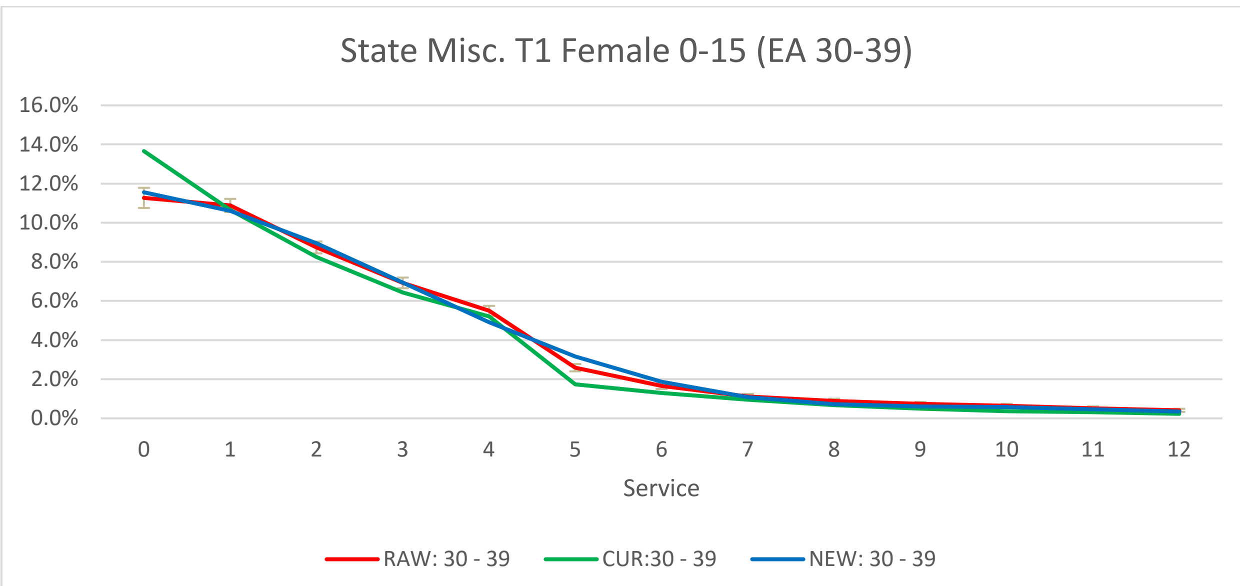


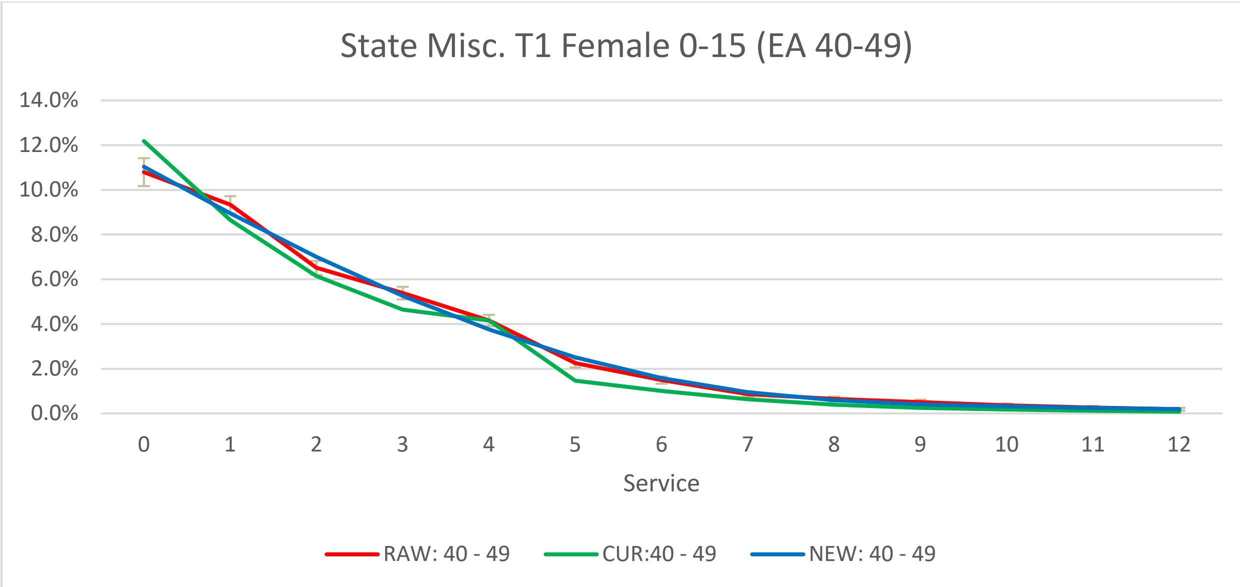
State Industrial



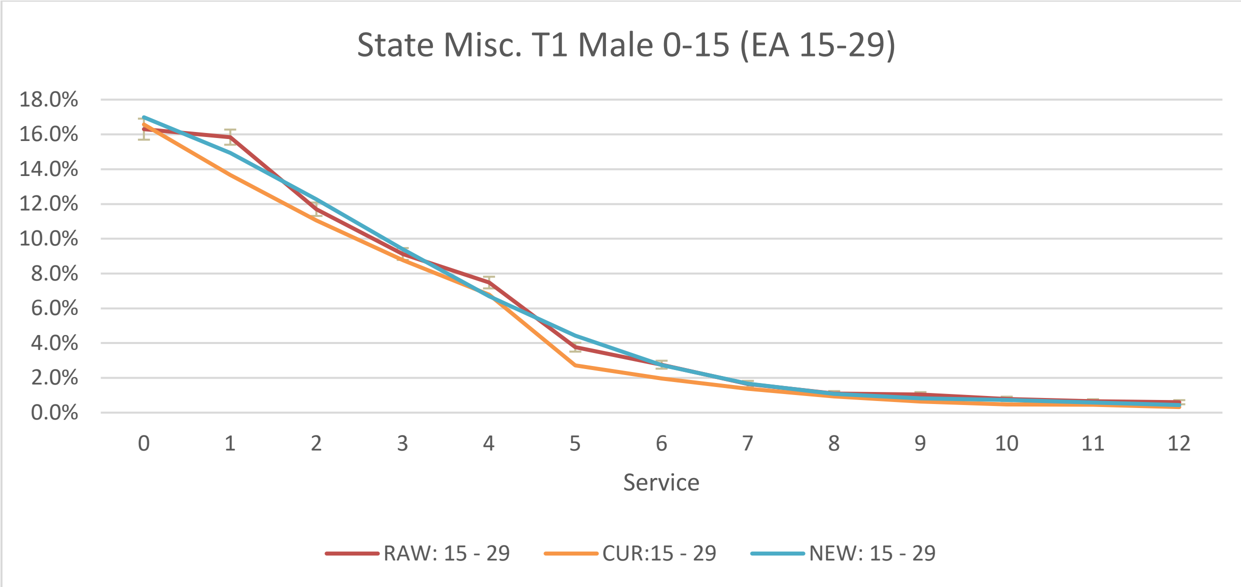
State Miscellaneous Tier 1 Female

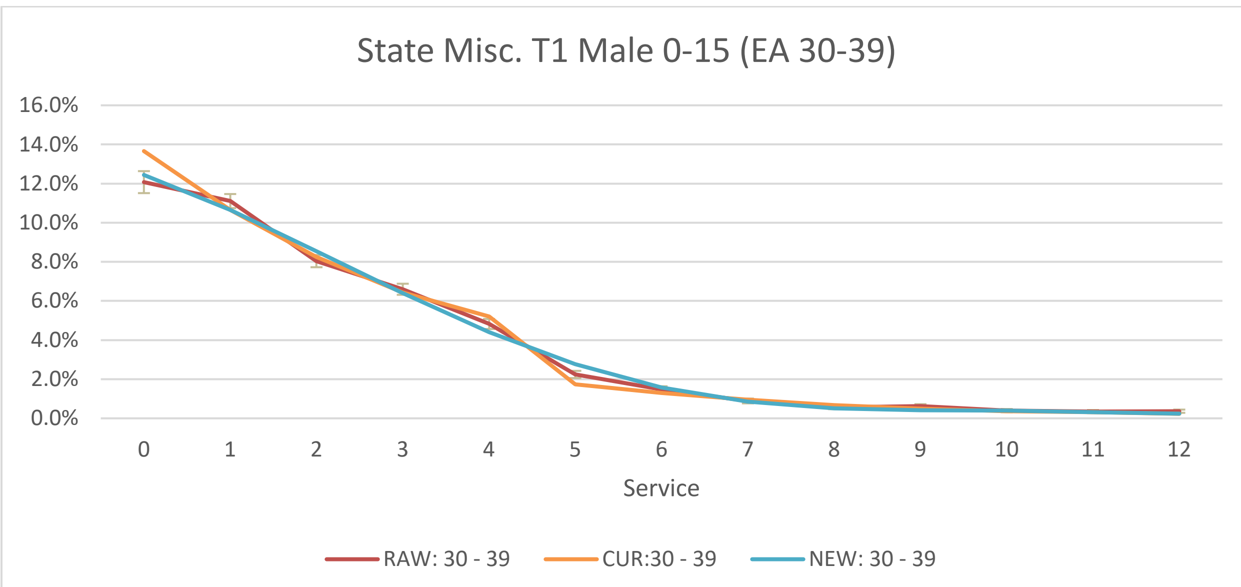


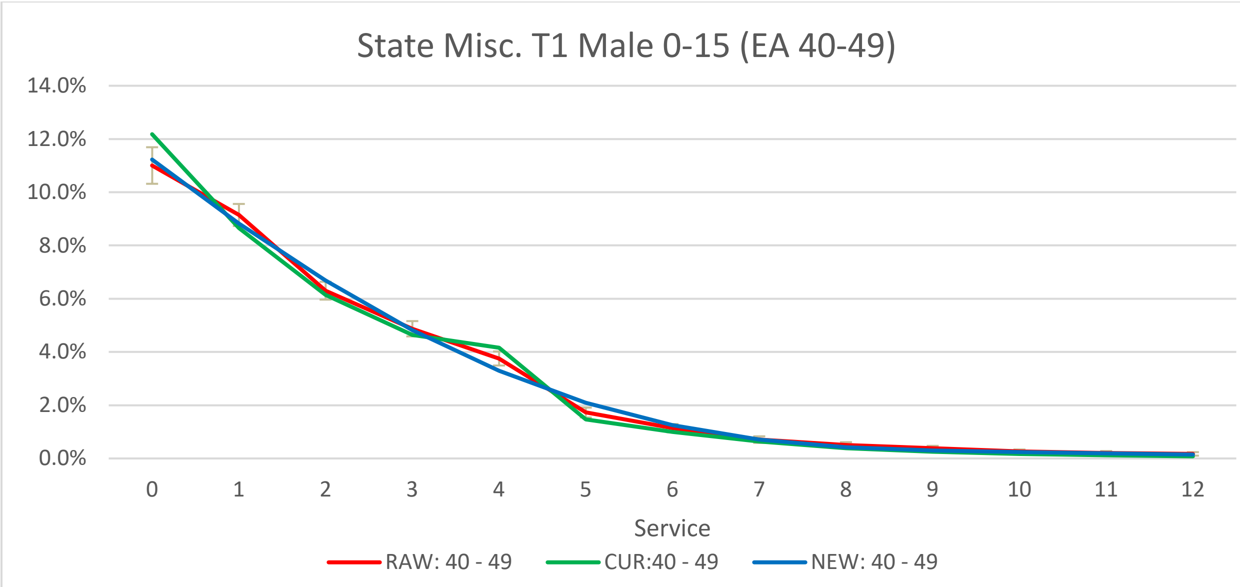



State Misc. T1 Female 0-15 (EA 40-49)
14.0%
12.0%
10.0%
8.0%
6.0%
4.0%
2.0%
0.0%
0
1
2
3
4
5
6
7
8
9
10
11
12
Service
RAW: 40 - 49
CUR:40 - 49
NEW: 40 - 49

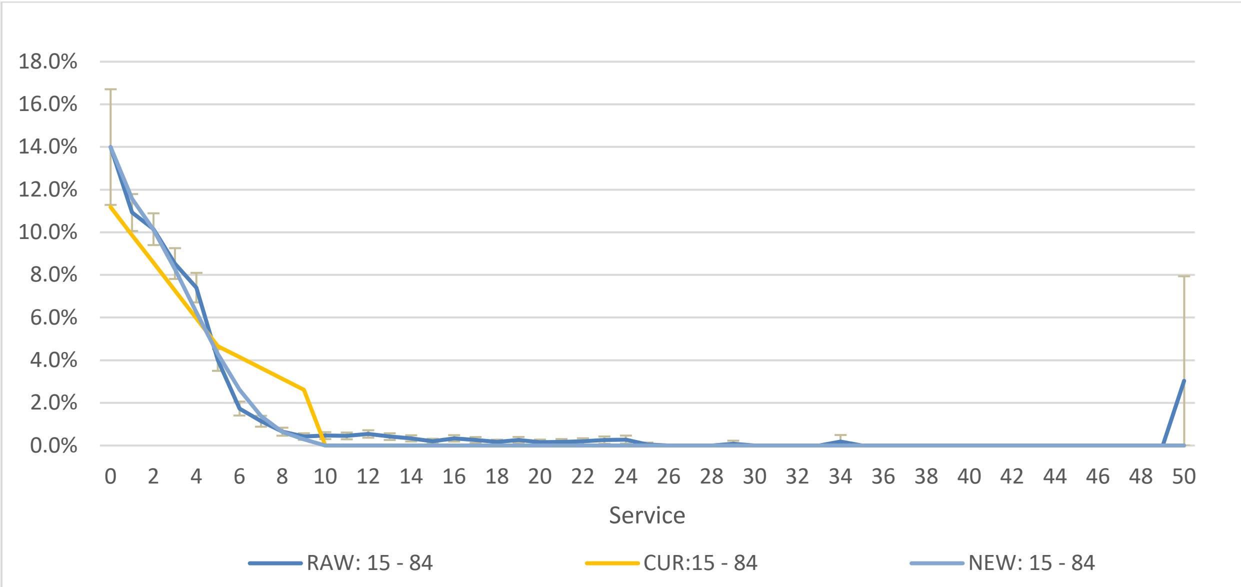
State Miscellaneous Tier 1 Male



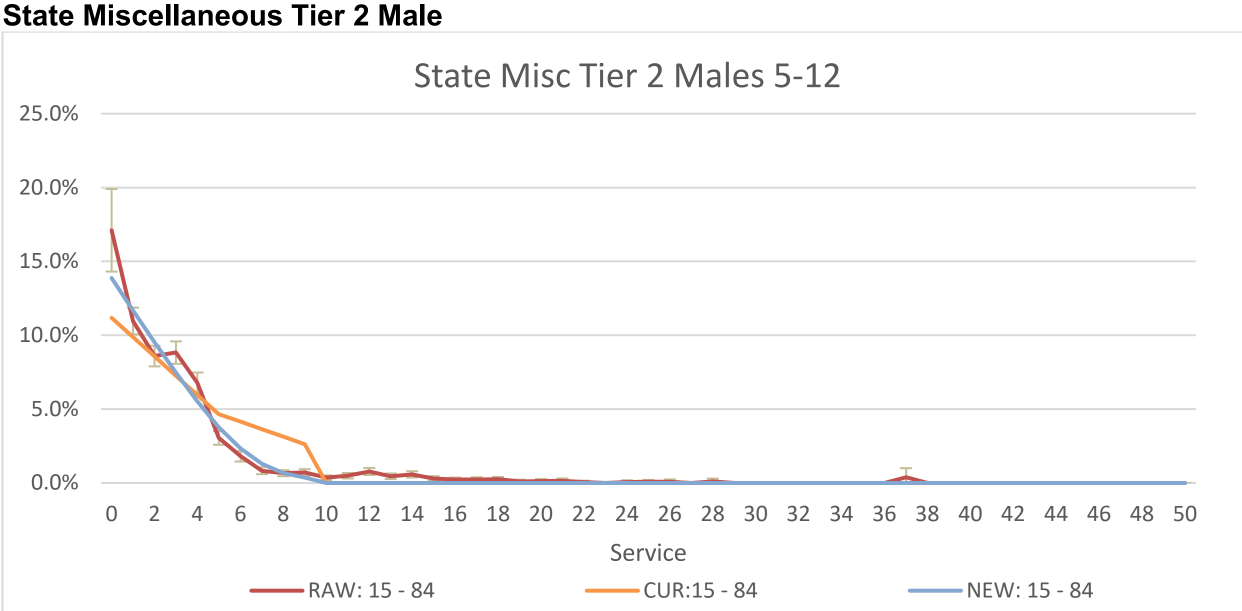



State Misc. T1 Male 0-15 (EA 40-49)
14.0%
12.0%
10.0%
8.0%
6.0%
4.0%
2.0%
0.0%
0
1
2
3
4
5
6
7
8
9
10
11
12
Service
RAW: 40 - 49
CUR:40 - 49
NEW: 40 - 49

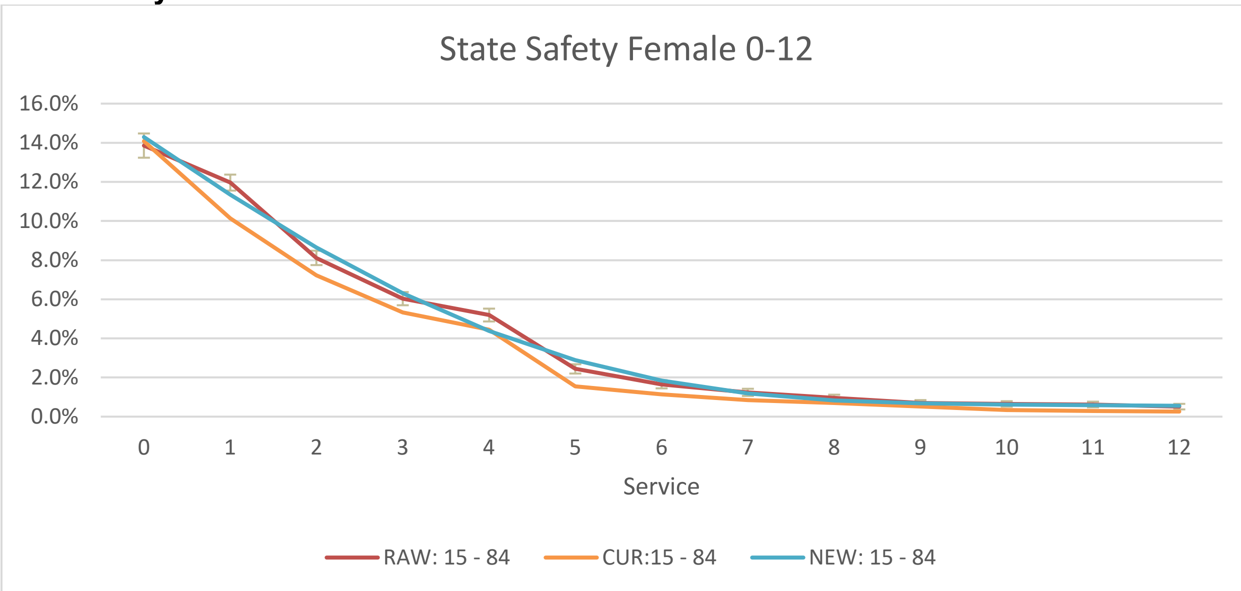
State Miscellaneous Tier 2 Female



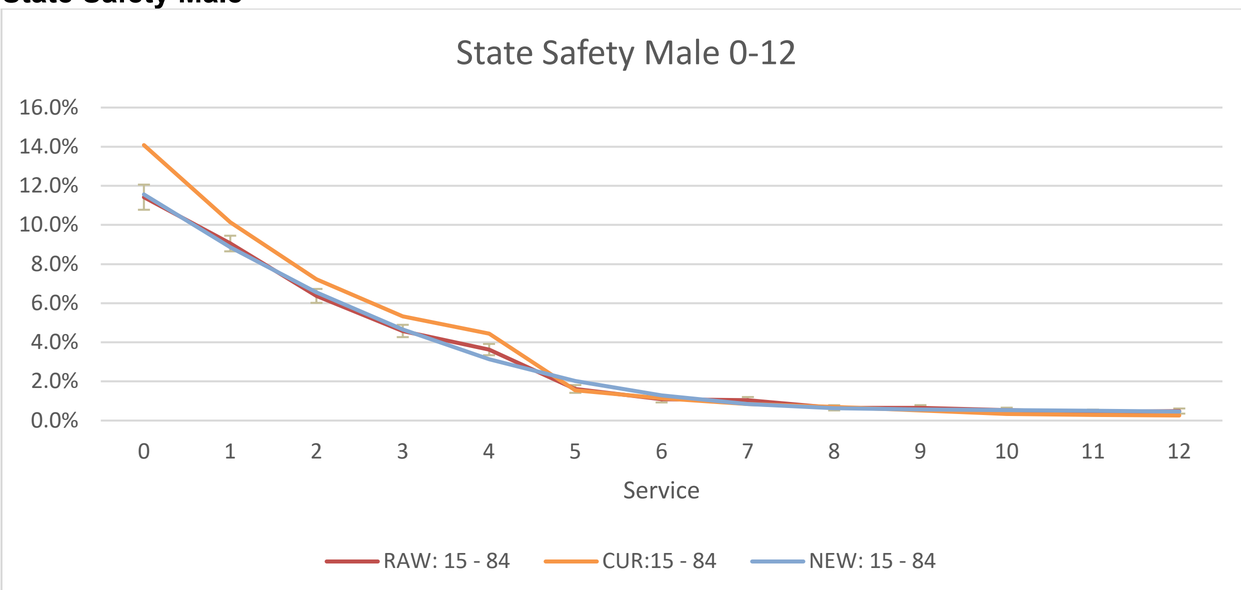
State Miscellaneous Tier 2 Male



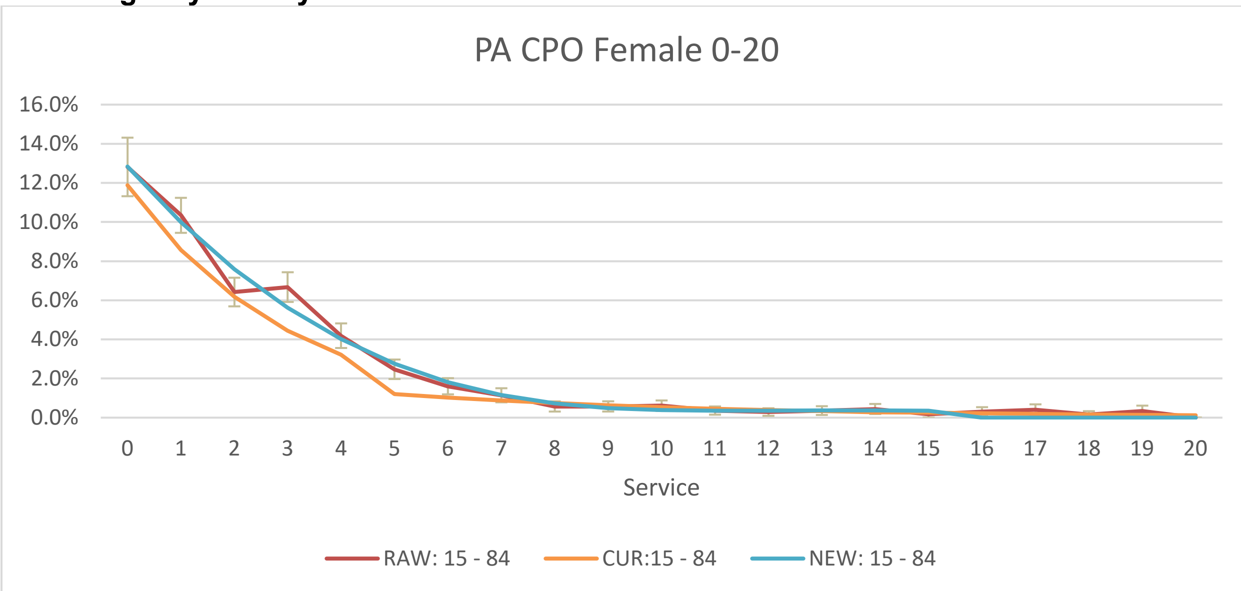
State Safety Female



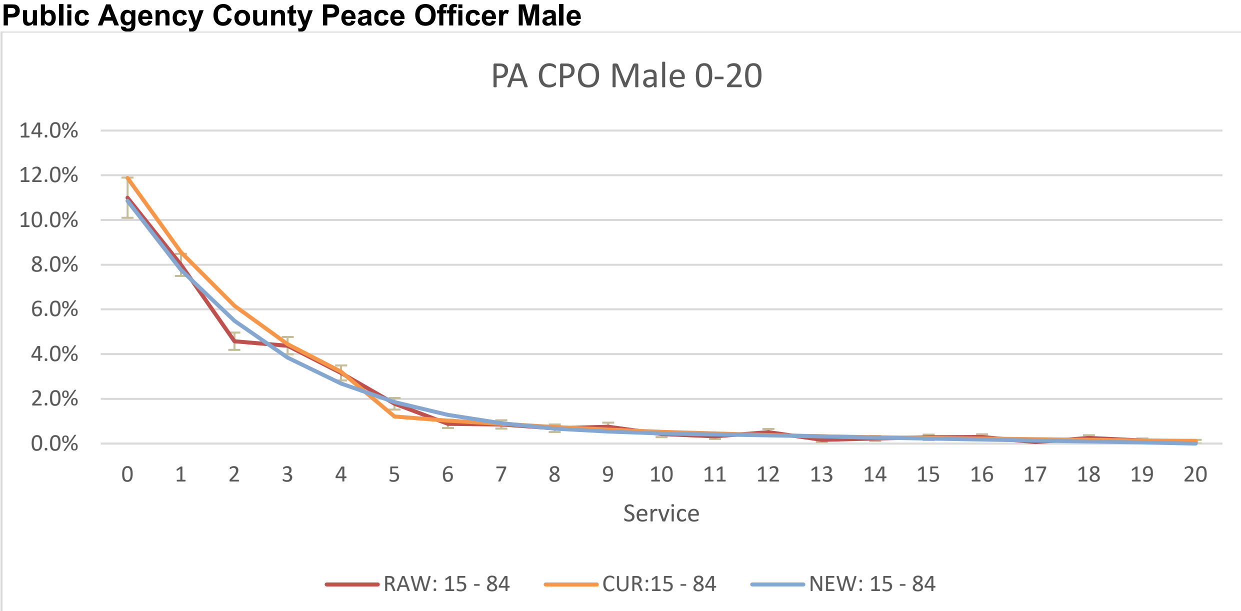
State Safety Male



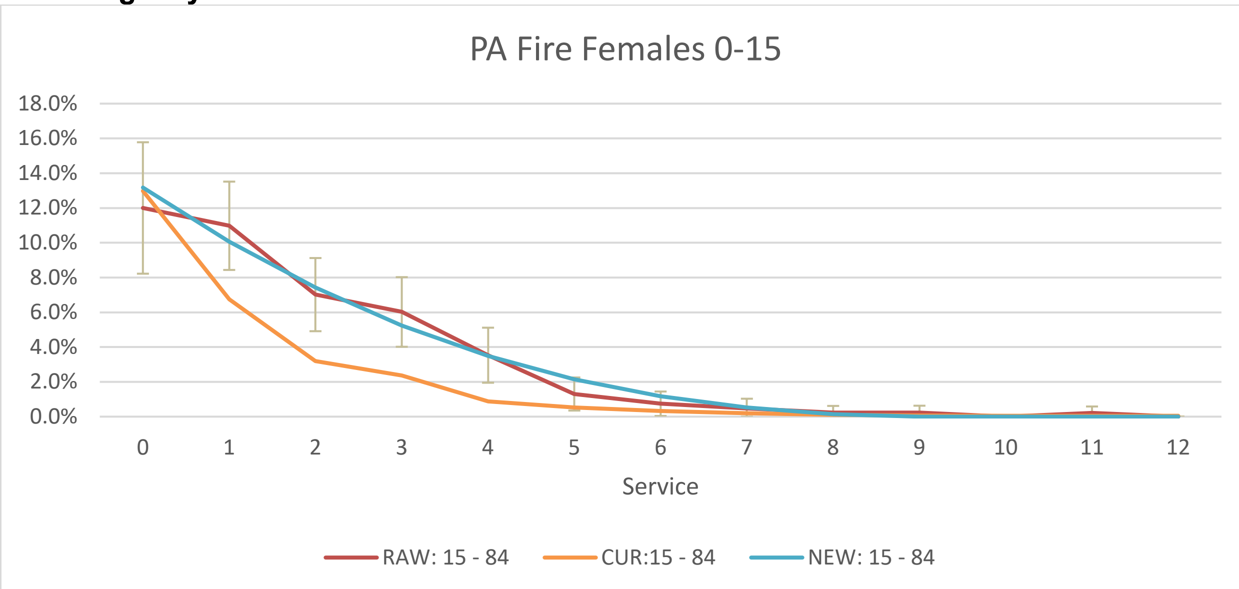
Public Agency County Peace Officer Female



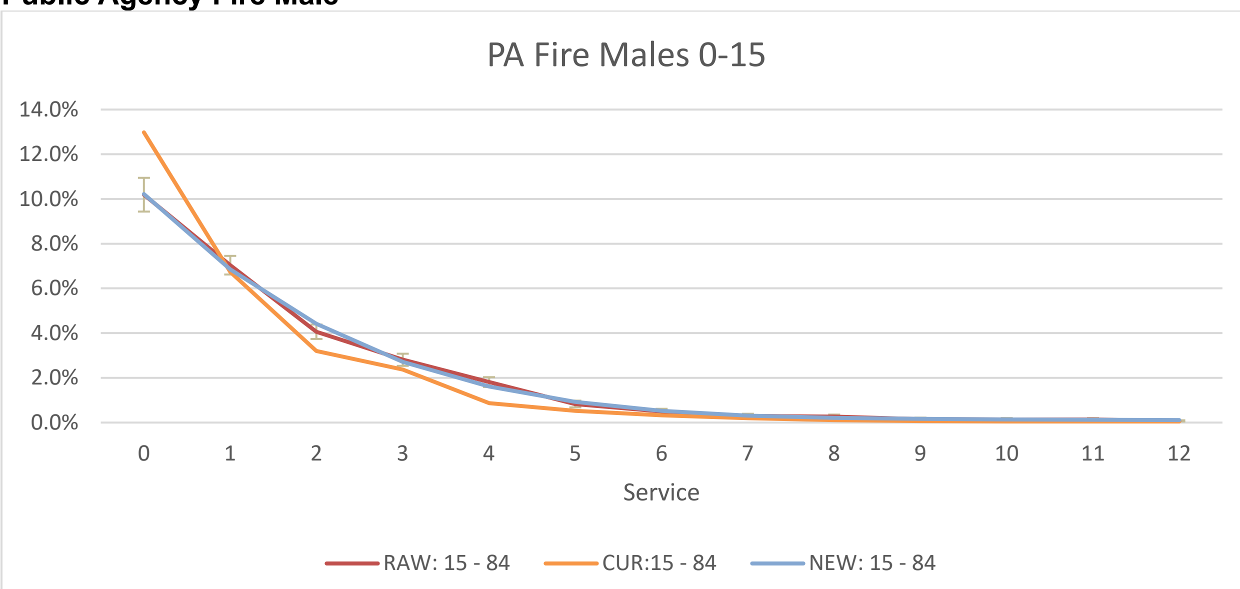
Public Agency County Peace Officer Male



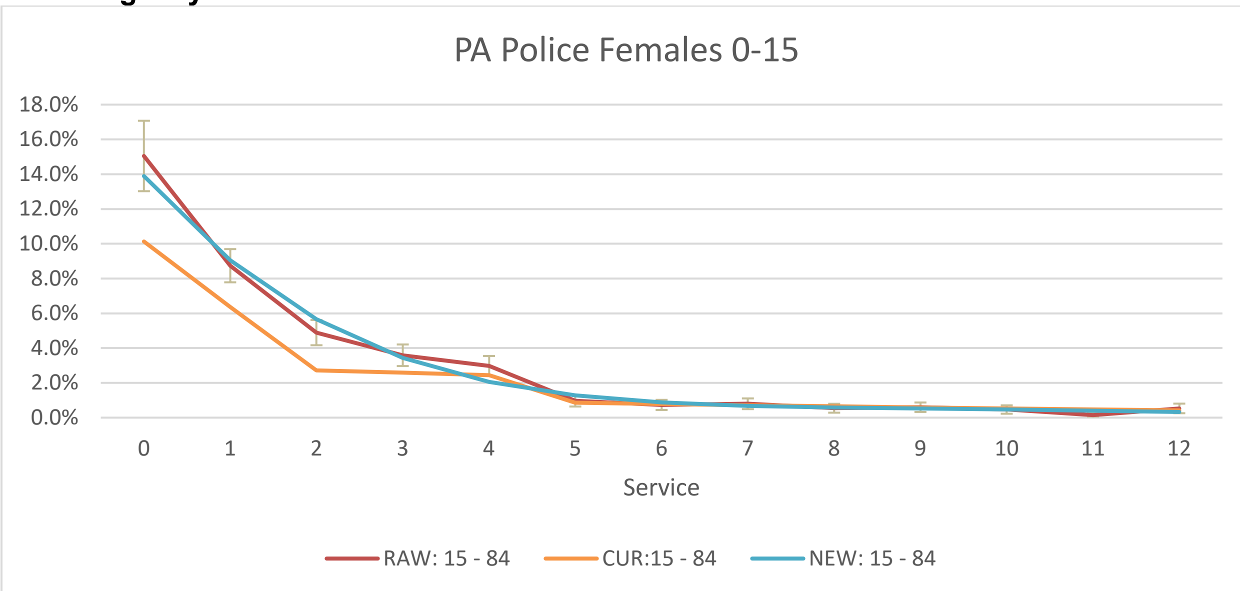
Public Agency Fire Female



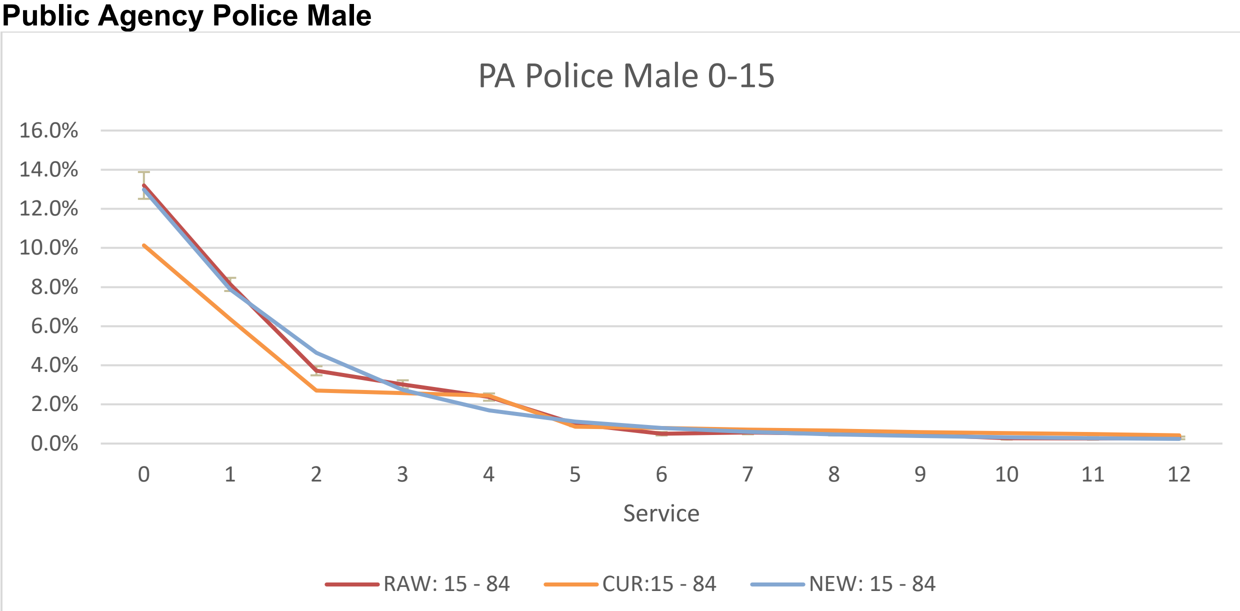
Public Agency Fire Male



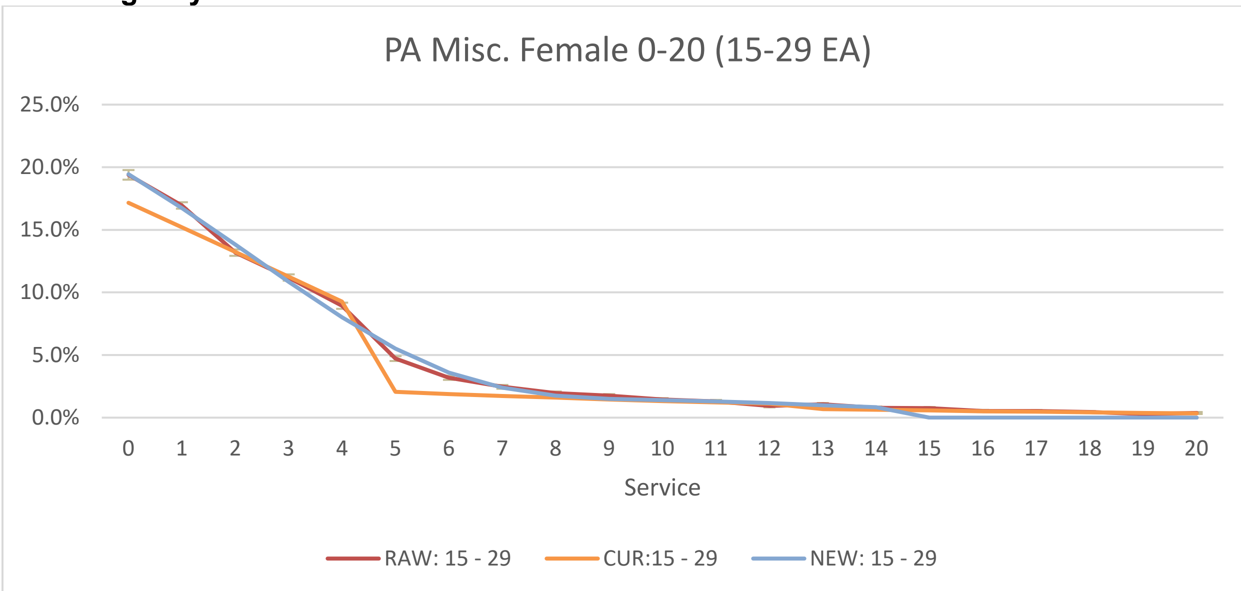
Public Agency Police Female



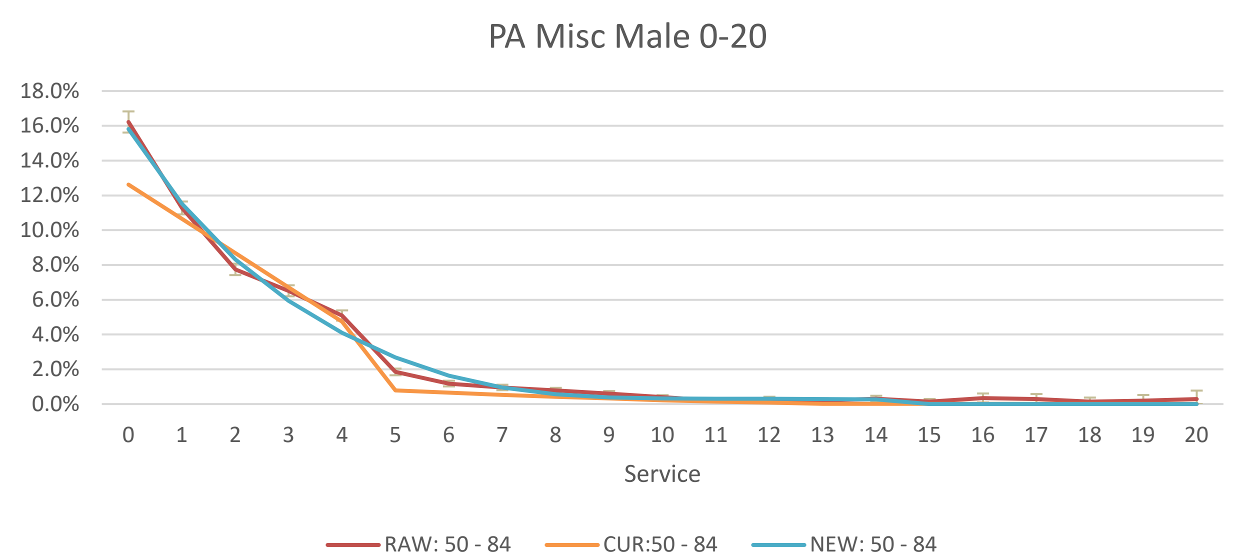
Public Agency Police Male



Public Agency Miscellaneous Female

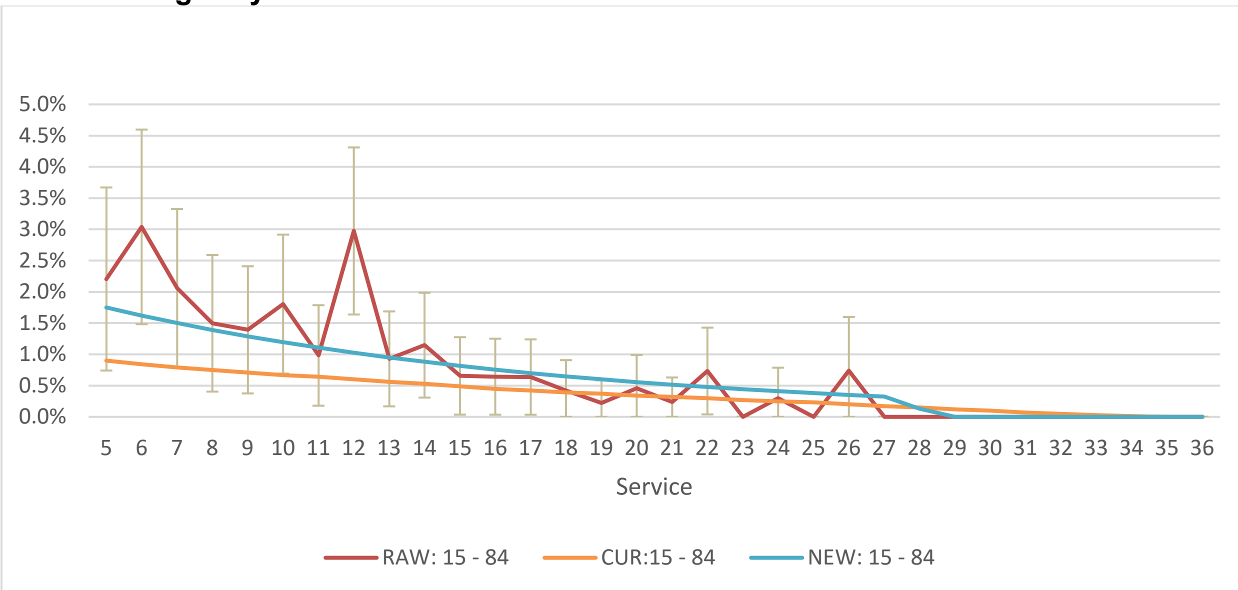


Public Agency Miscellaneous Male

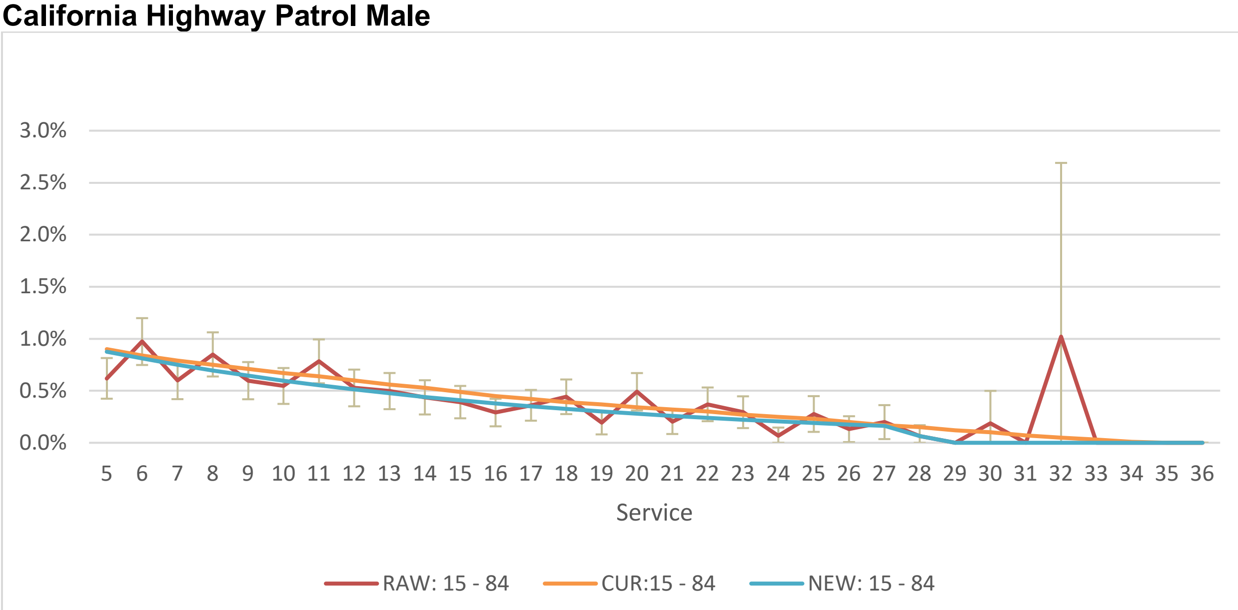


TERMINATED AND VESTED

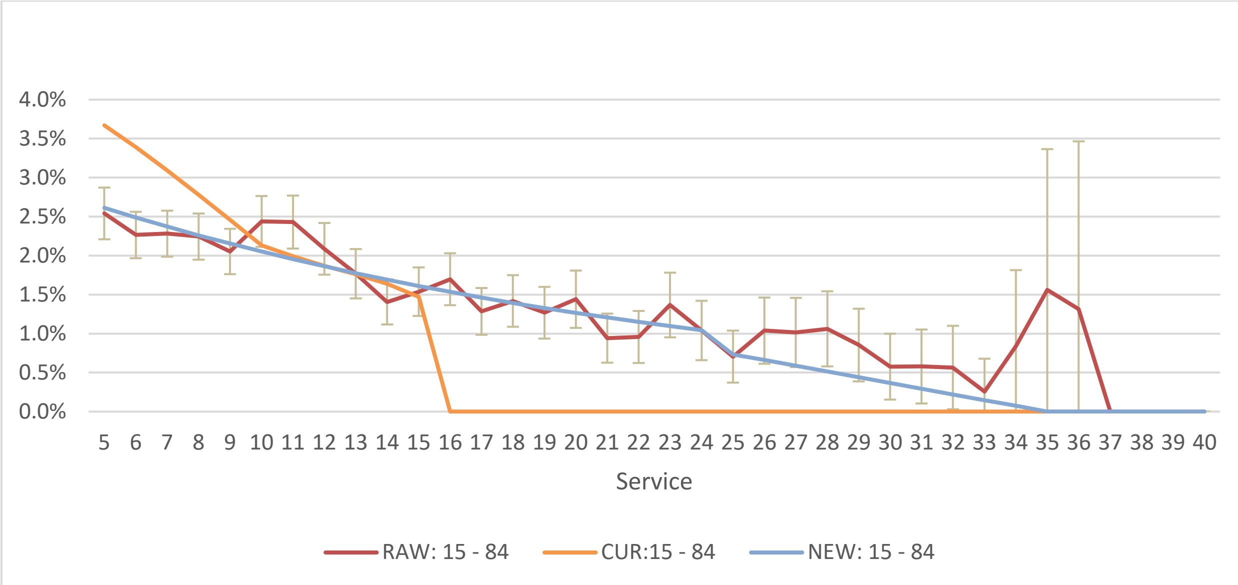
California Highway Patrol Female



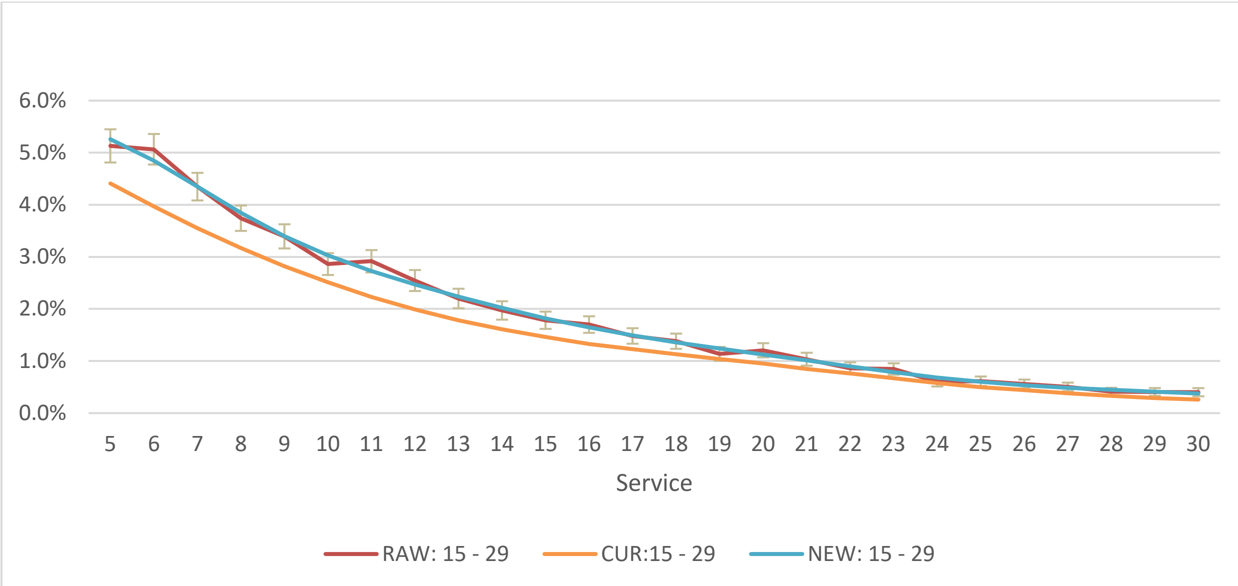
California Highway Patrol Male



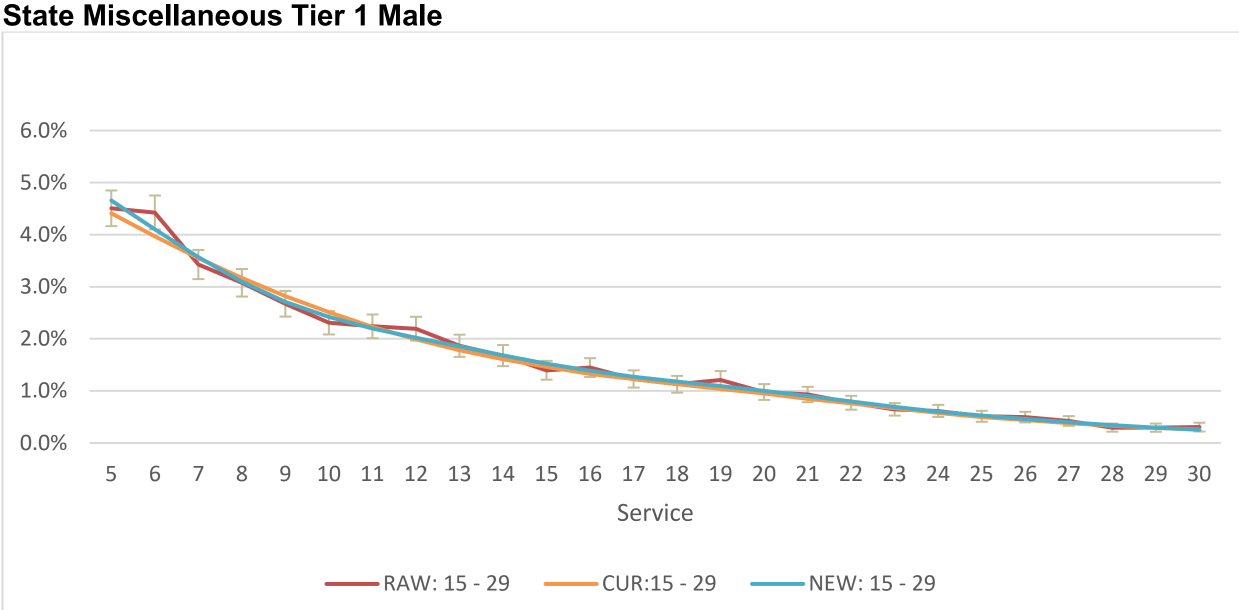
State Industrial



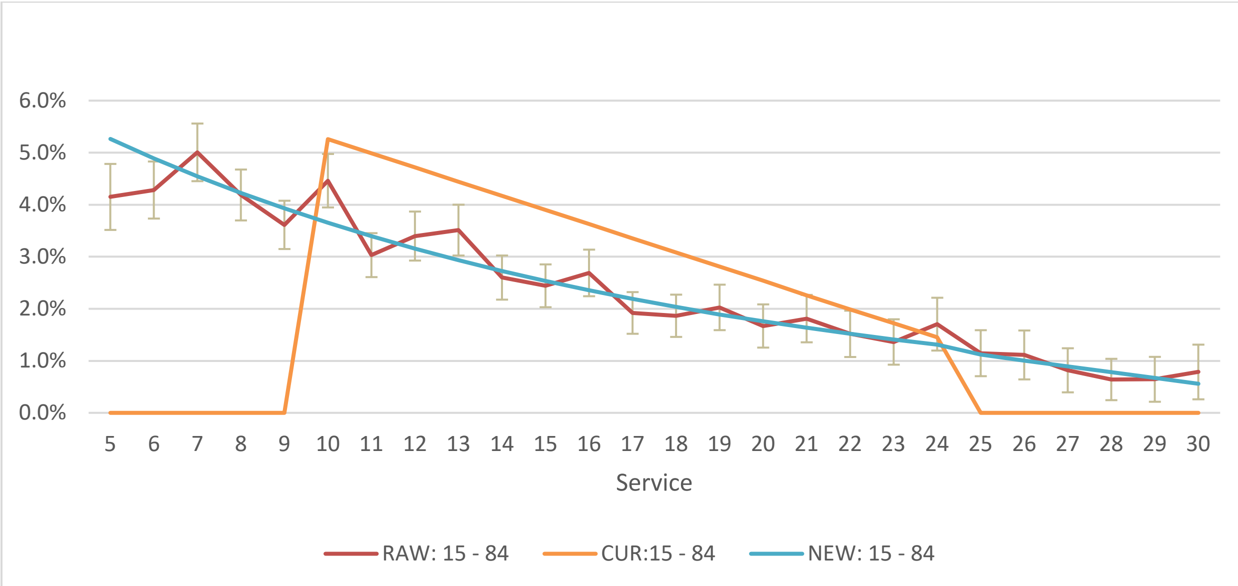
State Miscellaneous Tier 1 Female



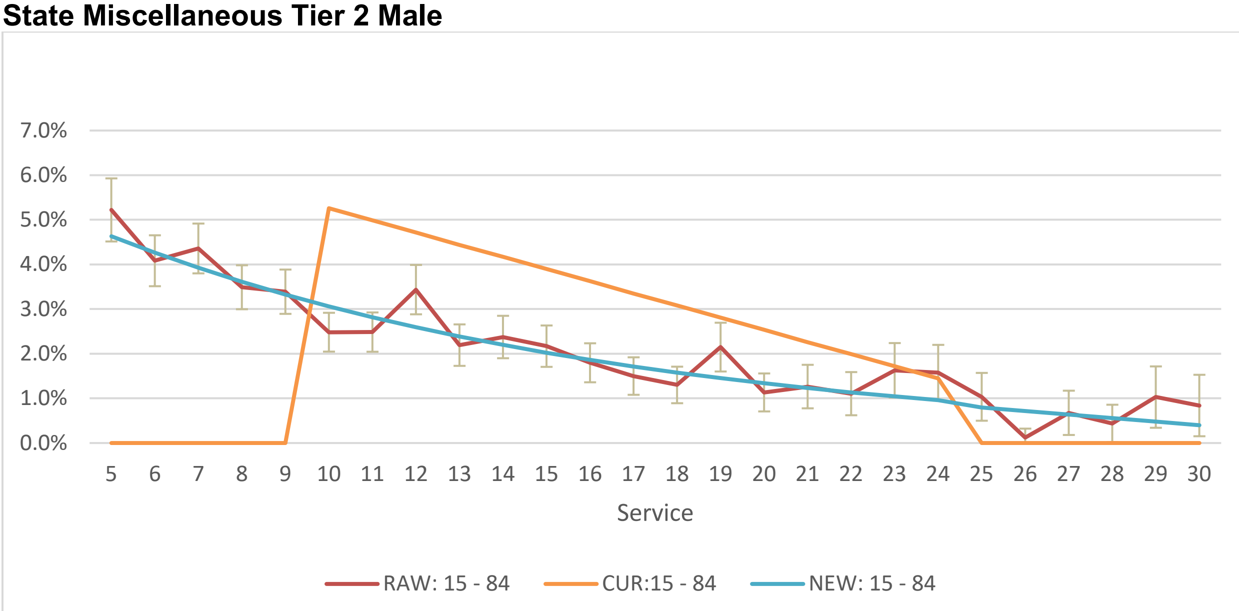
State Miscellaneous Tier 1 Male



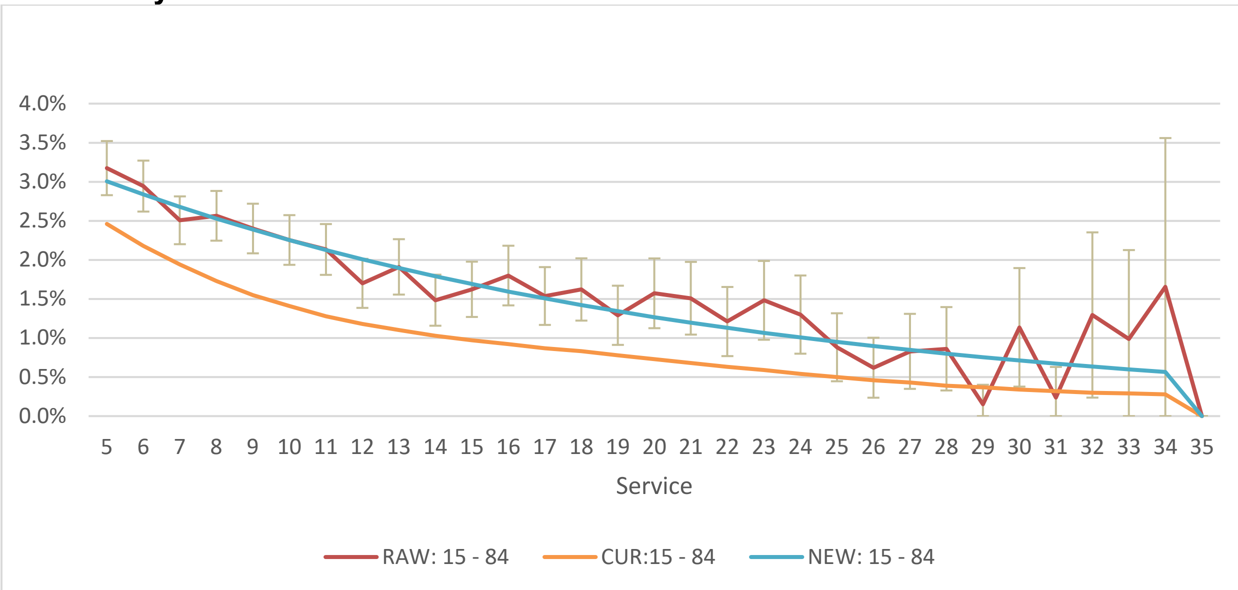
State Miscellaneous Tier 2 Female



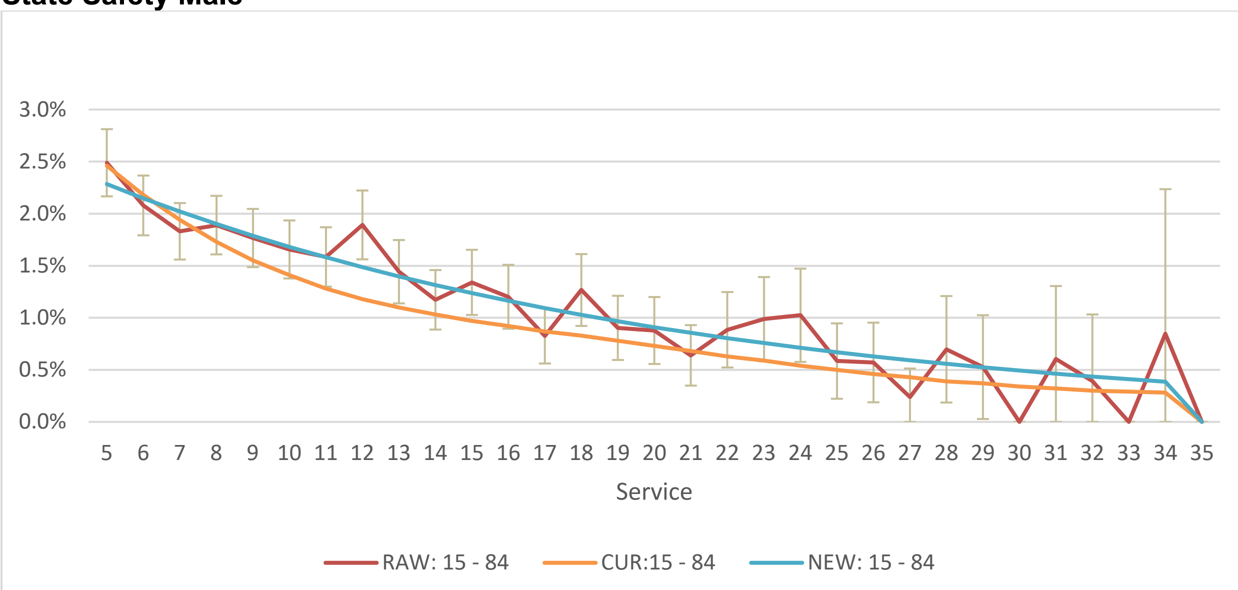
State Miscellaneous Tier 2 Male



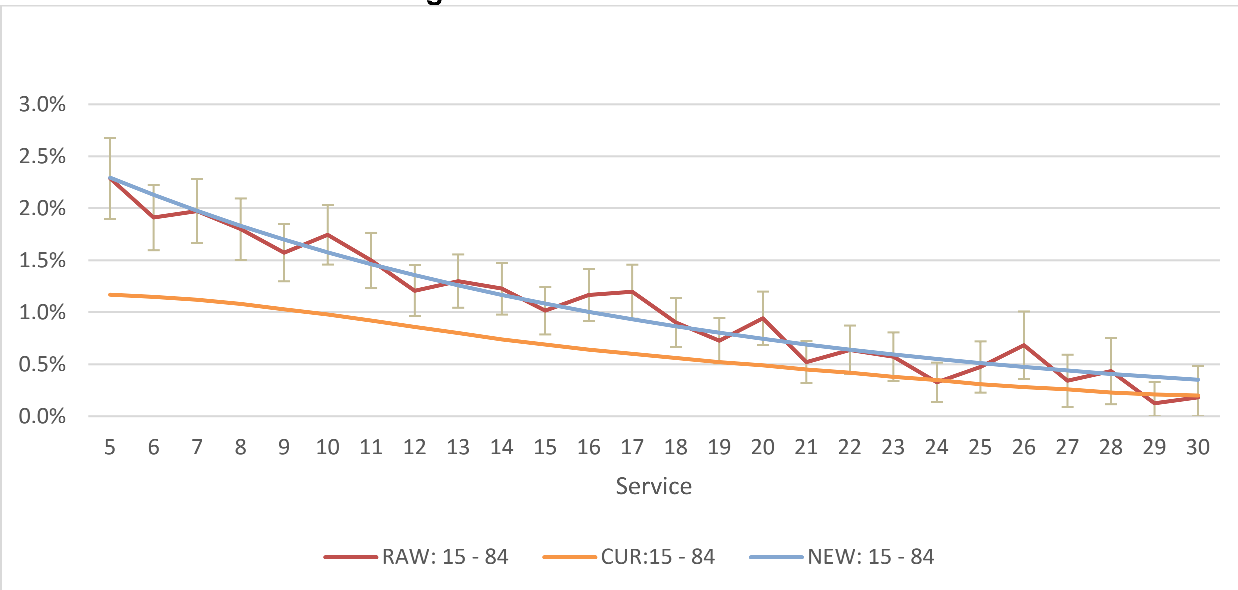
State Safety Female



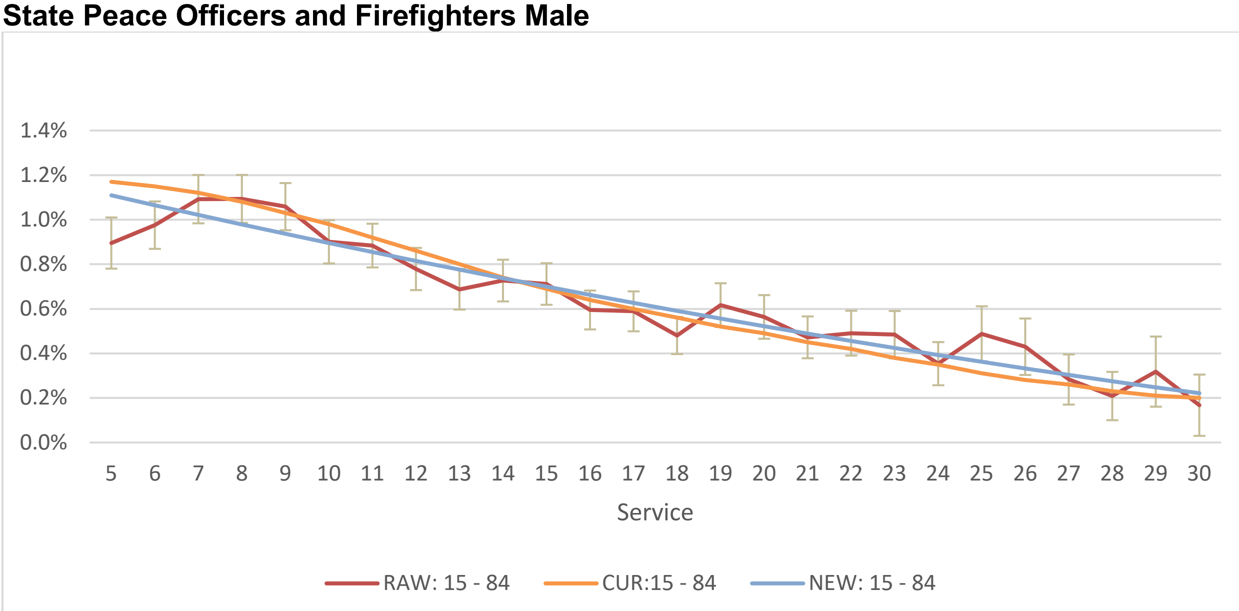
State Safety Male



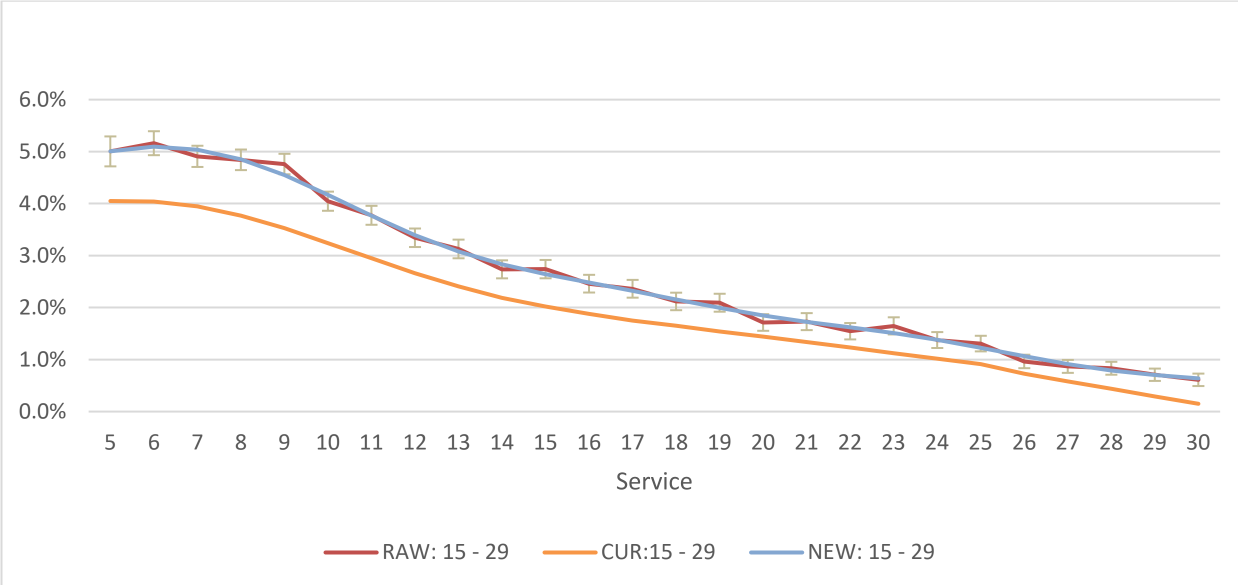
State Peace Officers and Firefighters Female



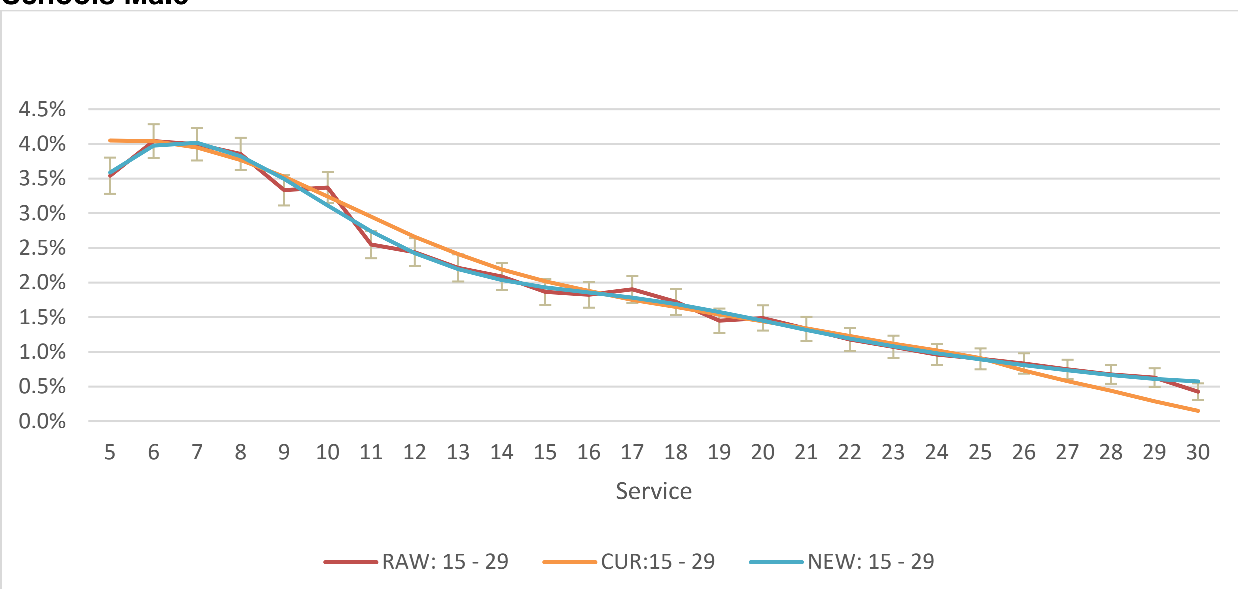
State Peace Officers and Firefighters Male



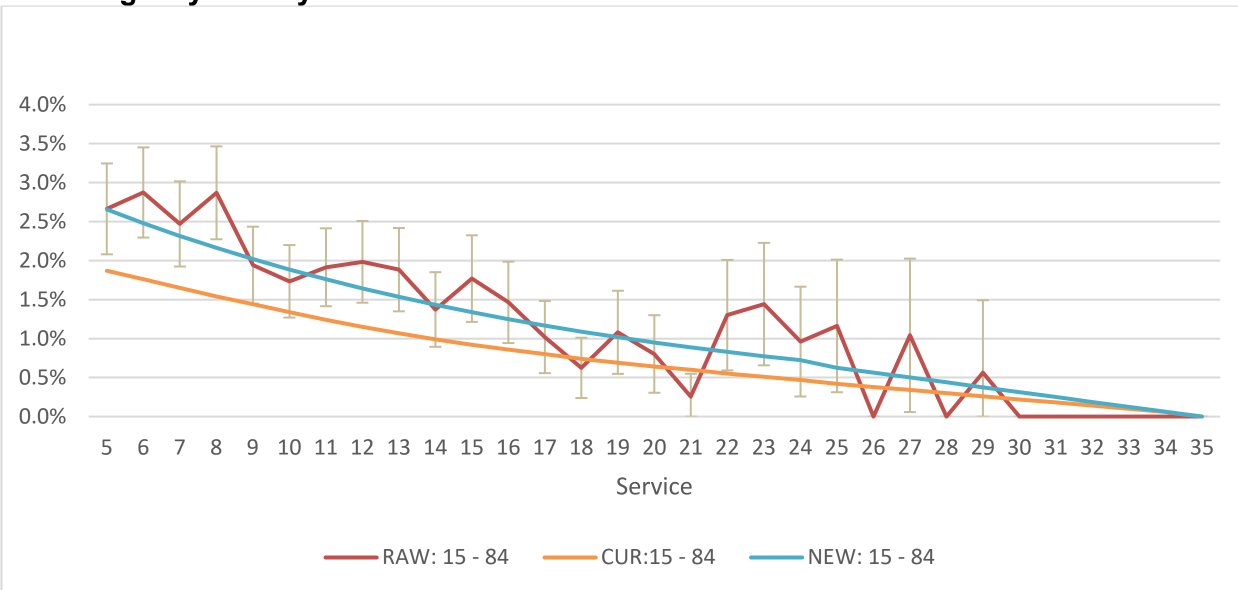
Schools Female



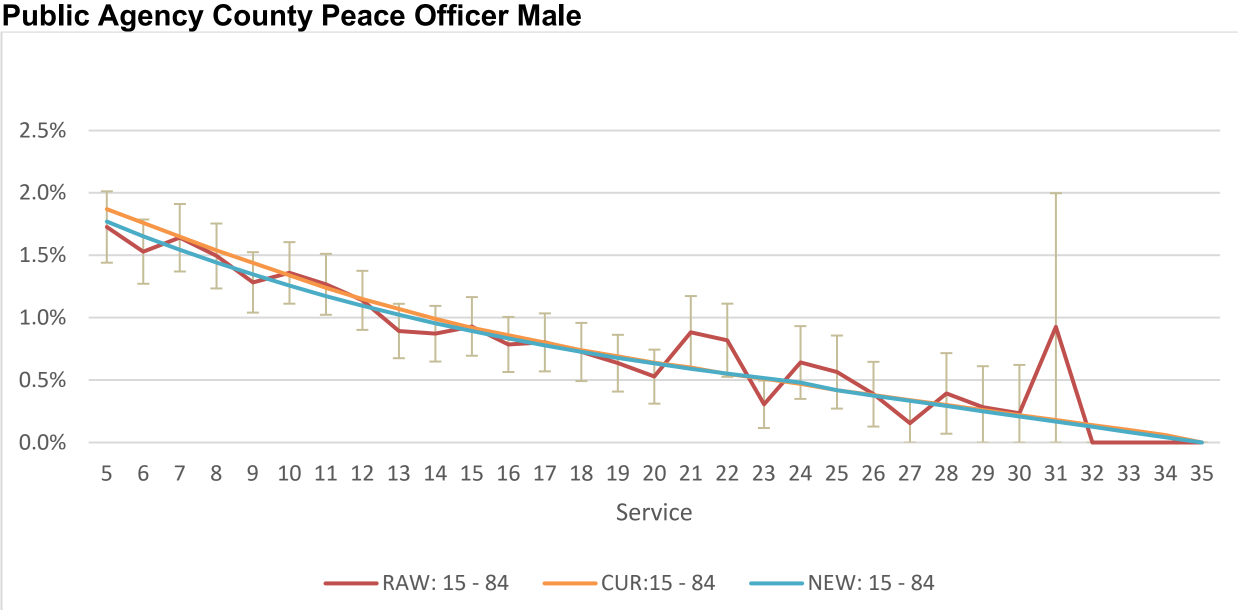
Schools Male



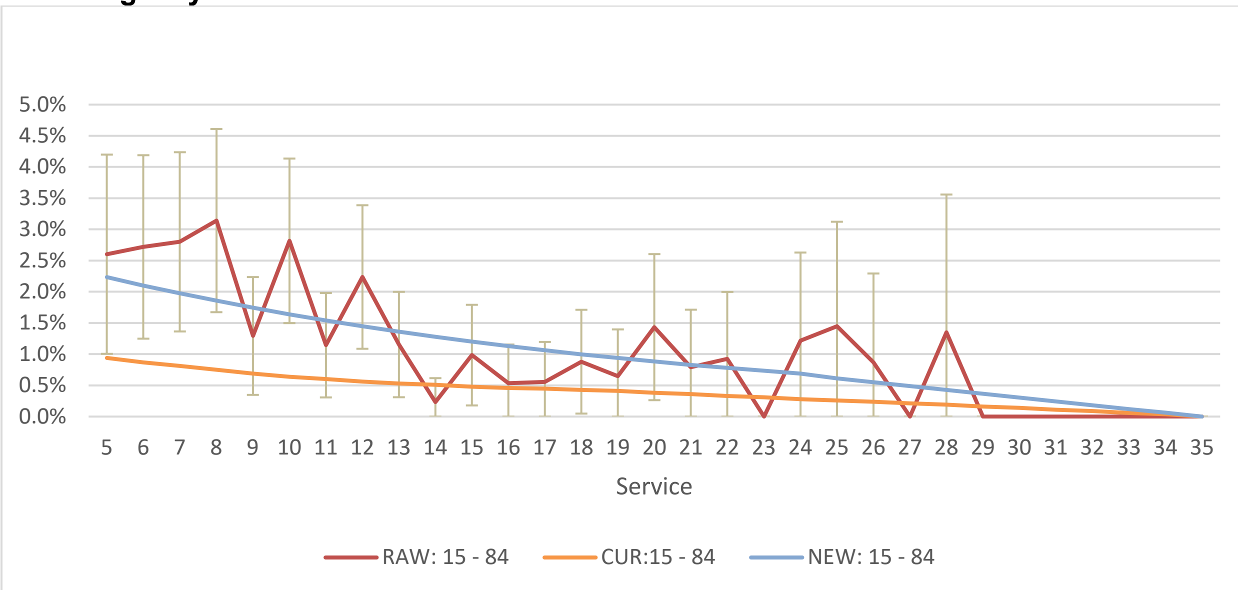
Public Agency County Peace Officer Female



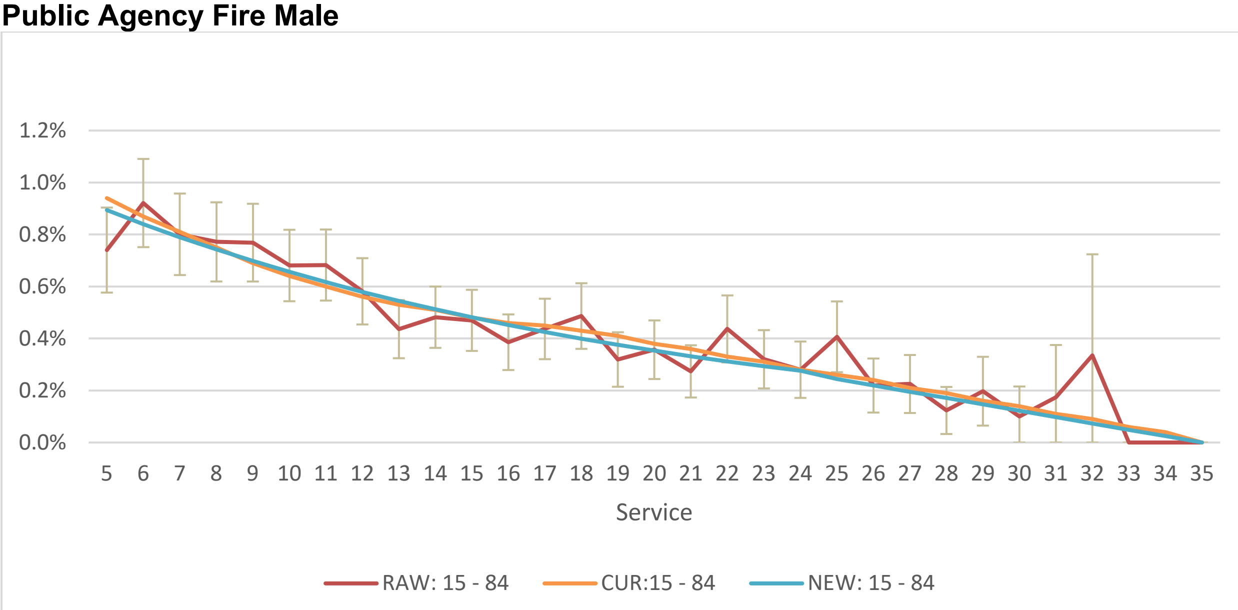
Public Agency County Peace Officer Male



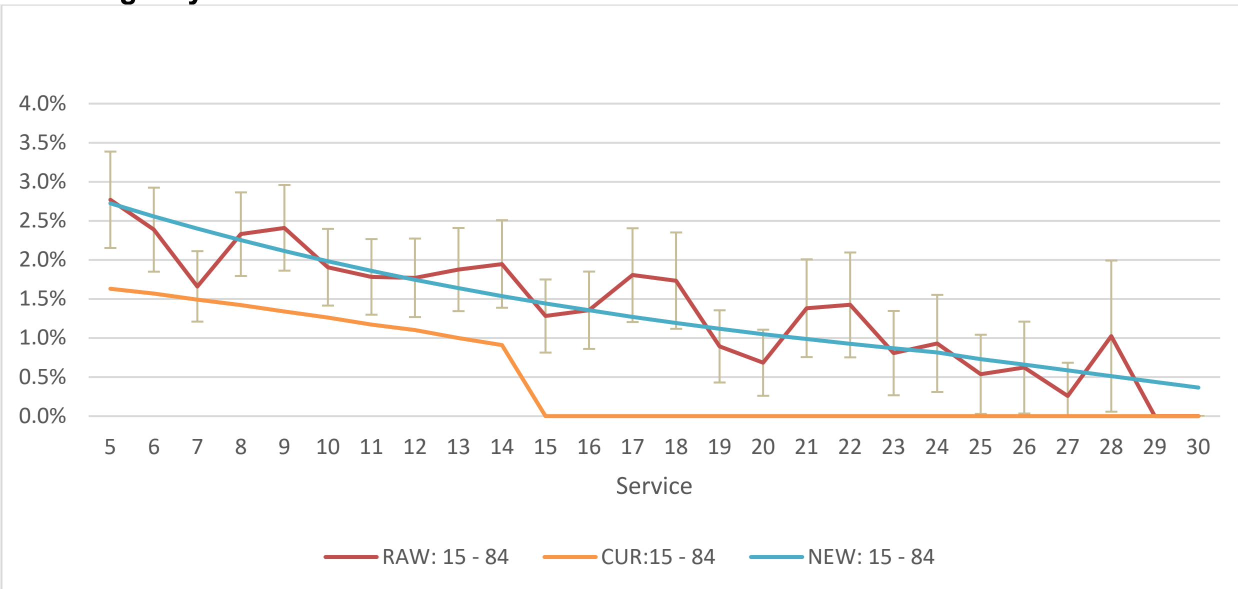
Public Agency Fire Female



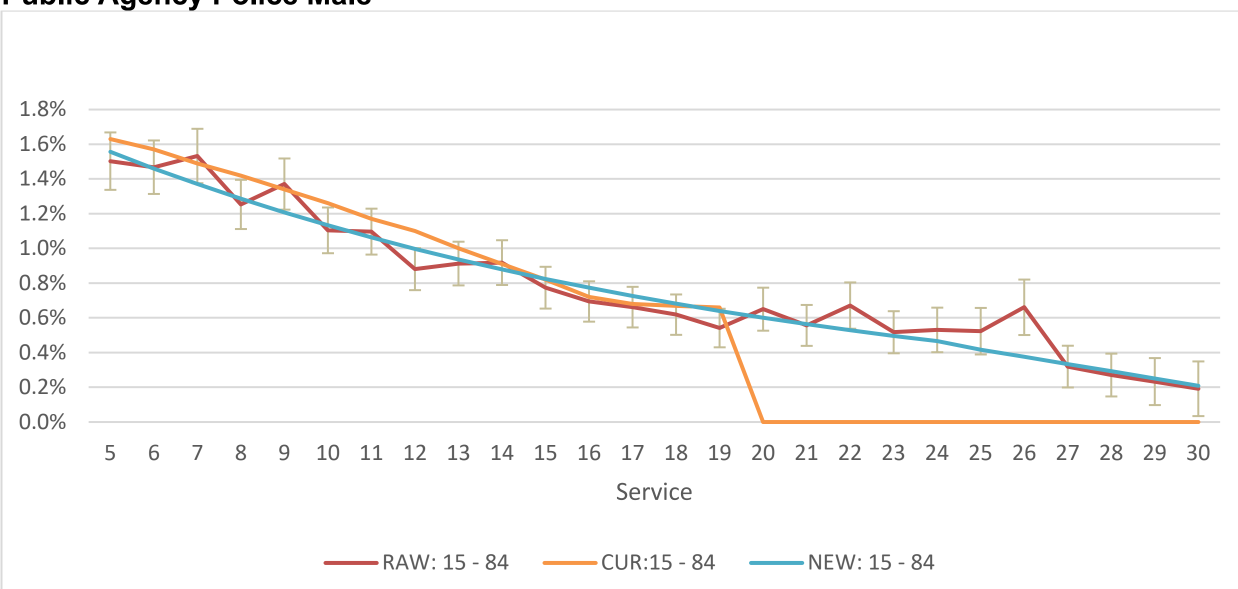
Public Agency Fire Male



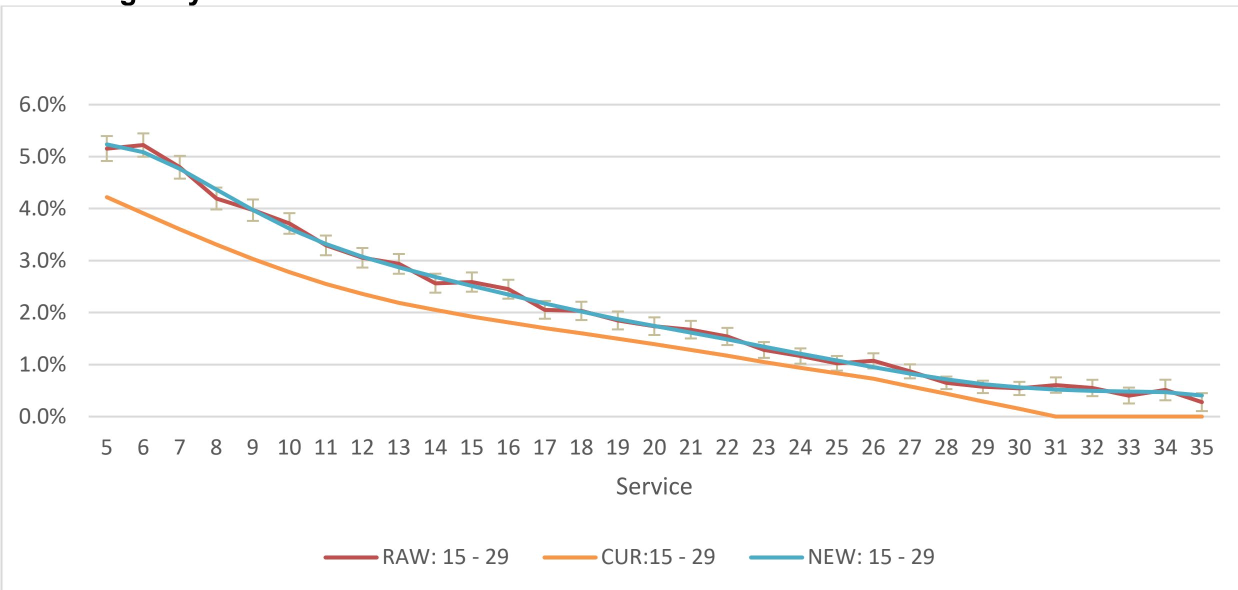
Public Agency Police Female



Public Agency Police Male



Public Agency Miscellaneous Female



Public Agency Miscellaneous Male