



OREGON PUBLIC EMPLOYEES RETIREMENT SYSTEM

2020 Experience Study

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July 20, 2021

Board of Trustees
Oregon Public Employees Retirement System

Re: 2020 Experience Study – Oregon Public Employees Retirement System

Dear Members of the Board:

The results of an actuarial valuation are based on the actuarial methods and assumptions used in the valuation. These methods and assumptions are used in developing employer contribution rates, disclosing employer liabilities pursuant to GASB requirements, and for analyzing the fiscal impact of proposed legislative amendments.

This experience study report has been prepared exclusively for the Oregon Public Employees Retirement System (PERS) and its governing PERS Board (Board). **The study recommends to the Board the actuarial methods and assumptions to be used in the December 31, 2020 and 2021 actuarial valuations of PERS. The latter actuarial valuation will be used to determine employer contribution rates for the 2023-2025 biennium.**

Except where otherwise noted, the analysis in this study was based on data for the experience period from January 1, 2017 to December 31, 2020 as provided by PERS. PERS is solely responsible for the validity, accuracy, and comprehensiveness of this information; the results of our analysis can be expected to differ and may need to be revised if the underlying data supplied is incomplete or inaccurate.

This analysis also relied, without audit, on information (some oral and some in writing) supplied by PERS staff as well as a capital market outlook provided by Meketa, survey capital market outlook information published by Horizon Actuarial Services, and information presented to the Oregon Investment Council. This information includes, but is not limited to, statutory provisions, employee data, and financial information. We found this information to be reasonably consistent and comparable with information used for other purposes. The results depend on the integrity of this information. If any of this information is inaccurate or incomplete our results may be different and our calculations may need to be revised. In assessing the Milliman capital market outlook presented in this report, per Actuarial Standards of Practice we disclose reliance upon a model developed by Milliman colleagues who are credentialed investment professionals with expertise in capital outlook modeling.

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recipients should engage qualified professionals for advice appropriate to their own specific needs.

The consultants who worked on this assignment are retirement actuaries and, for the analysis of the RHIPA program, healthcare actuaries. Milliman's advice is not intended to be a substitute for qualified legal or accounting counsel.

The signing actuaries are independent of the plan sponsor. We are not aware of any relationship that would impair the objectivity of our work.

On the basis of the foregoing, we hereby certify that, to the best of our knowledge and belief, this report is complete and accurate and has been prepared in accordance with generally recognized and accepted actuarial principles and practices which are consistent with the principles prescribed by the Actuarial Standards Board and the *Code of Professional Conduct and Qualification Standards for Actuaries Issuing Statements of Actuarial Opinion in the United States* published by the American Academy of Actuaries. We are members of the American Academy of Actuaries and meet the Qualification Standards to render the actuarial opinion contained herein. Assumptions related to the healthcare trend rates for the RHIPA program discussed in this report were determined by Milliman actuaries qualified in such matters.

Sincerely,



Matt Larrabee, FSA, EA, MAAA
Principal and Consulting Actuary



Scott Preppernau, FSA, EA, MAAA
Principal and Consulting Actuary



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1. Executive Summary

This experience study report has been prepared exclusively for the Oregon Public Employees Retirement System (PERS) and the PERS Board (Board) in order to analyze the system's experience from January 1, 2017 through December 31, 2020 and to recommend actuarial methods and assumptions to be used in the December 31, 2020 and 2021 actuarial valuations of PERS.

A summary of the recommended method and assumption changes contained in this report as well as items reviewed at the May 2021 and/or July 2021 Board meetings follows:

Economic Assumptions

- Reduce the long-term inflation assumption from the current 2.50% to **2.40% or lower**.
- Reduce the system payroll growth assumption from the current 3.50% to **3.40% or lower**, paralleling the change in inflation.
- In our professional opinion, the current investment return assumption of 7.20% per year should be lowered **at least 0.20%**, based on an analysis of PERS's current target asset allocation using several capital market outlook models. In addition, we recommend the PERS Board consider reducing the assumption further to more closely reflect the current range of outlooks. The median annualized geometric return for the 20-year outlook developed by the Oregon State Treasury staff in collaboration with Oregon Investment Council advisors Meketa and Aon was **6.6%**, with an underlying inflation assumption of 2.1%. Using the implied 4.5% real return from that model along with a 2.40% inflation assumption based on Social Security's outlook would produce an expected return of **6.9%**. The median annualized geometric return for a 20-year time horizon based on Milliman's December 31, 2020 capital market outlook real return and a 2.40% underlying inflation assumption was 6.27%.
- Update the assumption for future administrative expenses and use a combined assumption amount for the Tier 1/Tier 2 and OPSRP programs.
- Update the RHIPA health cost trend (i.e., healthcare cost inflation) assumption.

Demographic Assumptions

- Adjust the base mortality table assumption for School District males and make a routine update to the mortality improvement scale for all groups, based on 60-year unisex average Social Security experience.
- Adjust retirement rates for certain member categories and service bands to more closely align with recent and expected future experience and increase the age of 100% likelihood of assumed retirement by five years for all groups; reduce the percentage of future retirees assumed to elect a partial lump sum; increase the percentage of members assumed to purchase credited service at retirement.
- Increase the merit component of the individual member salary increase assumption for all member categories based on observations of the last eight years of experience. The individual member salary increase assumption consists of the sum of inflation, real wage growth, and merit components, with the latter varying by member.
- Update pre-retirement termination of employment assumptions for one member category.
- Lower assumed rates of ordinary (non-duty) disability and general service duty disability incidence.
- Increase the Tier 1 unused vacation cash out assumption for three member categories.
- Increase the Tier 1/Tier 2 unused sick leave assumption for all member categories to reflect recently observed experience and to more heavily weight experience from higher liability retirees.
- Decrease the healthy and disabled likelihood of program participation assumptions for the RHIA retiree healthcare program.
- Decrease the RHIPA likelihood of program participation assumption for most service bands.

Actuarial Methods

- Revise the parameters of the rate collar methodology to only restrict changes in the Unfunded Actuarial Liability (UAL) Rate contribution rate component and to narrow the width of allowable changes. Collar width will vary depending on the rate pool. No decrease in UAL Rate will be allowed unless a funded status threshold is met, using funded status excluding side accounts.
- Introduce a methodology for UAL Rate amortization in the RHIA or RHIPA programs when one or both are in an actuarial surplus position (over 100% funded). The methodology will create a UAL Rate credit that could partially or fully offset the Normal Cost Rate if the program is in actuarial surplus.
- Update the assumed system-average level of member redirect contributions to Tier 1/Tier 2 and OPSRP reflecting the projected effects of HB 2906, which was passed in June 2021.

2. Actuarial Methods and Allocation Procedures

Overview

Actuarial methods and allocation procedures are used as part of the valuation to determine actuarial accrued liabilities, to determine normal costs, to allocate costs to individual employers and to amortize unfunded liabilities. The following Board guiding objectives were considered in developing recommended actuarial methods and allocation procedures:

- Transparency of shortfall and funded status calculations
- Predictable and stable employer contribution rates
- Protection of the plan’s funded status to enhance benefit security for members
- Equity across generations of taxpayers funding the program
- Actuarial soundness - crafting policy that will fully fund the system if assumptions are met
- Compliance with GASB (Governmental Accounting Standards Board) requirements

The actuarial methods used for the December 31, 2019 actuarial valuation and the changes recommended for the December 31, 2020 and 2021 actuarial valuations are shown in the table below.

Method	December 31, 2019 Valuation	December 31, 2020 and 2021 Valuations
Cost method	Entry Age Normal (EAN)	No change
UAL Amortization method	UAL amortized as a level percent of combined Tier 1/Tier 2 and OPSRP payroll	No change
UAL Amortization period	<ul style="list-style-type: none"> ▪ UAL bases – Closed amortization from the first rate-setting valuation in which experience is recognized <ul style="list-style-type: none"> – Tier 1/Tier 2 – UAL re-amortized over 22 years effective December 31, 2019 as directed by Senate Bill 1049 – OPSRP – 16 Years – RHIA/RHIPA charges – 10 years – RHIA/RHIPA credits – not amortized ▪ Newly established side accounts – Aligned with the new Tier 1/Tier 2 base from the most recent rate-setting valuation ▪ Newly established transition liabilities or surpluses – 18 years from the date joining the SLGRP (State & Local Government Rate Pool) 	<p>No change to OSRP and RHIA/RHIPA UAL charges, side accounts, and transition liabilities or surpluses.</p> <p>RHIA/RHIPA credits – amortized over a rolling 20 year period when in actuarial surplus (funded status > 100%)</p> <p>Future Tier 1/Tier 2 UAL gains or losses will be amortized over 20 years. The closed period amortization under Senate Bill 1049 will continue to decline, and will have 20 years remaining as of the December 31, 2021 rate-setting valuation.</p>
Asset valuation method	Market value	No change

Method	December 31, 2019 Valuation	December 31, 2020 and 2021 Valuations
Exclusion of reserves from valuation assets	Contingency Reserve, Capital Preservation Reserve, and Tier 1 Rate Guarantee Reserve (RGR) excluded from valuation assets. RGR is not excluded from valuation assets when RGR is negative (i.e., when the RGR is a deficit reserve).	No change
Allocation of Benefits in Force (BIF) Reserve	The BIF is allocated to each rate pool in proportion to the retiree liability attributable to the rate pool.	No change
Rate collar	<p>Change in the sum of Normal Cost Rate and UAL Rate base contribution rate components limited (i.e., collared) to greater of 20% of the sum of the current base rate components or 3% of payroll. Size of collar doubles if funded percentage excluding side accounts falls below 60% or increases above 140%. If the funded percentage excluding side accounts is between 60% and 70% or between 130% and 140%, the size of the rate collar is increased on a graded scale. Exclude RHIA and RHIPA (retiree medical) rates from the rate collar calculation.</p> <p>Collar calculations are done separately for each rate pool.</p>	<p>Change in UAL Rate contribution rate component limited to:</p> <ul style="list-style-type: none"> • 3% of payroll for Tier 1/Tier 2 SLGRP (State & Local Government Rate Pool) and Tier 1/Tier 2 School District Rate Pool • 1% of payroll for OPSRP • 4% of payroll for Tier 1/Tier 2 UAL Rate of independent employers, but not less than one-third of the difference between the uncollared and collared UAL Rate <p>Additionally, the UAL Rate would not be allowed to decrease for a rate pool until the pool's funded percentage excluding side accounts is over 87% and would not reflect the full collar width until reaching 90% funded.</p>
Liability allocation for actives with multiple employers	<ul style="list-style-type: none"> ▪ Allocate Actuarial Accrued Liability 10% (0% for police & fire) based on account balance with each employer and 90% (100% for police & fire) based on service with each employer 	No change
	<ul style="list-style-type: none"> ▪ Allocate Normal Cost to current employer 	No change
System-average offset for member redirect contributions	<ul style="list-style-type: none"> ▪ 2.45% of Tier 1/Tier 2 payroll ▪ 0.70% of OPSRP payroll 	<ul style="list-style-type: none"> ▪ 2.40% of Tier 1/Tier 2 payroll ▪ 0.65% of OPSRP payroll

The methods and procedures are described in greater detail on the following pages.

Actuarial Cost Method

The total contribution cost of the program, over time, will be equal to the benefits paid less actual investment earnings and is not affected directly by the actuarial cost method. The actuarial cost method is simply a tool to allocate projected costs to past, current or future years and thus primarily affects the timing of cost recognition.

The December 31, 2019 valuation used the Entry Age Normal (EAN) actuarial cost method, which allocates costs as a level percentage of payroll across the full projected working career. EAN is the required method under governmental financial reporting standards, though the Board could choose to use a different method for employer contribution rate calculations. Oregon PERS adopted EAN for all purposes with the December 31, 2012 valuation. Employing a consistent cost allocation method for both financial reporting and contributions is more understandable to interested parties as only one set of liability and normal cost calculations will be made for each member, employer, and rate pool. The EAN approach is widely used in the actuarial and public plan sponsor community because it provides an actuarially sound estimate of the projected long-term contribution costs of a retirement program as a level percentage of payroll if all assumptions are met. The benefits of this method are unchanged from when the Board previously adopted it, and we recommend continuing to use the EAN actuarial cost method.

Amortization Method

Unfunded Actuarial Liability

The unfunded actuarial liability (UAL) is amortized as a level percentage of projected combined payroll (Tier 1/Tier 2 plus OPSRP) in order to better maintain level contribution rates as payroll for the closed group of Tier 1/Tier 2 members declines and payroll of OPSRP members increases. We recommend this methodology continue.

The Board-selected method in recent years has been to amortize UAL over the following closed periods as a level percent of projected payroll from the first rate-setting valuation in which the experience is recognized:

- Tier 1/Tier 2 – 20 years
- OPSRP – 16 years
- RHIA/RHIPA charges when funded status is below 100% – 10 years

As part of a collection of method changes made with the 2012 Experience Study, the Board made a policy decision to re-amortize all existing Tier 1/Tier 2 unfunded actuarial liability (UAL) at the December 31, 2013 rate-setting actuarial valuation. Since then, Tier 1/Tier 2 gains and losses between subsequent rate-setting valuations have been amortized as a level percentage of payroll over a closed 20-year period from the rate-setting valuation in which they were first recognized.

Senate Bill 1049 was signed into law in June 2019 and required a one-time re-amortization of Tier 1/Tier 2 UAL over a closed 22-year period at the December 31, 2019 rate-setting actuarial valuation which set actuarially determined contribution rates for the 2021-2023 biennium. The remaining amortization period of this closed amortization base will continue to decrease, and we recommend the Board maintain the 20-year closed amortization period for new Tier 1/Tier 2 gains or losses in future valuations.

RHIA & RHIPA Actuarial Surplus Amortization

Due to a combination of the shorter 10-year UAL amortization period for the RHIA and RHIPA programs and recent experience, the funded status for both programs has increased significantly in recent years. At December 31, 2019 RHIA was 159% funded and RHIPA was 87% funded. For RHIA, recent policy has been

to adopt a 0.00% of payroll RHIA UAL Rate when the plan is over 100% funded and to still require a Tier 1/Tier 2 contribution rate equal to the program's full RHIA Normal Cost Rate.

RHIA and RHIPA benefits are only available to now-closed groups, since only Tier 1/Tier 2 members are eligible for the programs (RHIPA is further restricted to state employees). As a result, continuing to contribute the full Normal Cost Rate when the program is in an actuarial surplus position may not be necessary or advisable. We recommend that when either RHIA or RHIPA is in an actuarial surplus position that the actuarial surplus for that program is amortized over Tier 1/Tier 2 payroll using a rolling 20-year amortization basis. The resulting negative UAL Rate would be allowed to partially or fully offset the Normal Cost Rate of the program, but not below a combined contribution rate of 0.0%. If the program subsequently were to fall below 100% funded, the newly arising UAL would then be amortized over combined Tier 1/Tier 2 and OPSRP payroll following the existing 10-year closed, layered amortization policy for RHIA and RHIPA.

Side Accounts and Transition Liabilities/Surpluses

Prior to the 2010 Experience Study, side accounts and transition liabilities/surpluses were amortized over a fixed date period ending on December 31, 2027. To better match the amortization periods for new side accounts and new transition liabilities with the amortization of the Tier 1/Tier 2 UAL, and to avoid issues related to a shortening amortization period, as part of the 2010 Experience Study the PERS Board adopted the following amortization procedures which are not tied to a fixed date:

- In general, newly established side accounts have been amortized over a 20-year period aligned with the new Tier 1/Tier 2 UAL base from the most recent rate-setting valuation. For example, a side account created in July 2023 would have an amortization period ending on December 31, 2041, which would align with the 20-year Tier 1 /Tier 2 UAL base created in the December 31, 2021 rate-setting valuation that will establish 2023-2025 employer contribution rates. Employers who make lump sum payments in accordance with the rules under OAR 459-009-0086(9) may select a shorter amortization period of either 6, 10, or 16 years since the most recent rate-setting valuation.
- New transition liabilities/surpluses are amortized over the 18-year period beginning when the employer joins the SLGRP. This amortization period aligns with the last Tier 1/Tier 2 amortization base established as an independent employer.

We recommend no additional changes to the amortization method or periods of side accounts and new transition liabilities/surpluses.

Asset Valuation Method

Effective December 31, 2004, the Board adopted market value as the actuarial value of assets, replacing the four-year smoothing method previously used to determine the actuarial asset value, which is used for shortfall (UAL) calculations. Although asset smoothing is a common method for smoothing contribution rates in public sector plans, the smoothed asset value does not provide a transparent measure of the plan's funded status and UAL. Market value provides more transparency to members and other interested parties regarding the funded status of the plan. Instead of smoothing assets, a rate collar method (described below) is used to smooth contribution rates and systematically spread large rate increases across several biennia.

We recommend no change to the asset valuation method.

Excluded Reserves

Statute provides that the Board may establish Contingency and Capital Preservation reserve accounts to mitigate gains and losses of invested capital and other contingencies, including certain legal expenses or judgments. In addition, statute requires the establishment and maintenance of a Rate Guarantee or Deficit reserve to fund earnings crediting to Tier 1 member regular accounts when actual earnings are below the investment return assumption selected by the Board.

The Contingency and Capital Preservation reserves are excluded from the valuation assets used for employer rate-setting calculations. We recommend no change to the treatment of the Contingency and Capital Preservation reserves.

The Rate Guarantee Reserve (RGR) was positive as of December 31, 2019 but can become negative (in deficit status) if, over time, the required crediting on Tier 1 member accounts exceeds the investment earnings actually achieved on those accounts. The RGR was negative from the December 31, 2008 valuation to the December 31, 2012 valuation. All else being equal, excluding a negative reserve increases the level of valuation assets used in employer rate-setting calculations. This occurs because subtracting a negative amount is mathematically equivalent to adding a positive amount of the same magnitude. If the negative reserve was larger in absolute value than the sum of the other reserves, this approach would lead to the actuarial value of assets used in shortfall (UAL) calculations being larger than the market value of assets.

As part of the 2010 Experience Study, the Board decided to only exclude the RGR from assets when it is in positive surplus position, and not to subtract a negative RGR (which would increase the actuarial value of assets) when it is in deficit status. We recommend this treatment of the RGR continue.

Rate Collar Method

Effective December 31, 2004, a rate collar method was adopted that limits biennium to biennium changes in contribution rates to be within a specified “collar” range. Average system contribution rates are at a higher level currently than when the rate collar was originally designed. Due to the nature of the existing rate collar methodology, this higher starting point leads to a larger allowable change in rates each biennium. The PERS Board reviewed the components of the rate collar methodology over the course of several Board meetings in 2020 and 2021 to determine whether any changes to the parameters of the rate collar would be desirable. As a result of that process, we recommend changing the rate collar as follows:

Existing Rate Collar Method: The existing rate collar method restricts the change in an employer’s “base” total Tier 1/Tier 2 or OPSRP contribution rate (i.e., the rate before contemplation of side account rate offsets or rate adjustments for any pre-pooled obligations) to the greater of 20% of the current rate or 3% of payroll. If the funded status excluding side accounts is less than 60% or greater than 140%, the size of the rate collar is doubled. If the funded percentage excluding side accounts is between 60% and 70% or between 130% and 140%, the size of the rate collar is increased on a graded scale.

Proposed Rate Collar Method: The rate collar will restrict the change in the Unfunded Actuarial Liability (UAL) Rate component, rather than the sum of the Normal Cost Rate and UAL Rate components. Other parameters of the rate collar are as follows:

- **Collar width:**
 - Tier 1/Tier 2 State & Local Government Rate Pool (SLGRP) and Tier 1/Tier 2 School District Rate Pool: 3% of payroll

- OPSRP: 1% of payroll (the OPSRP UAL Rate is pooled at a state-wide level)
- Tier 1/Tier 2 UAL Rates for independent employers: greater of 4% of payroll or one-third of the difference between the employer's collared and uncollared UAL Rate at the last rate-setting valuation. In addition, the UAL Rate would not be allowed to be less than 0.00% of payroll for any independent employer with a funded status (excluding side accounts) less than 100%.
- **Decrease restrictions:** the UAL Rate for any rate pool will not be allowed to decrease if the pool's funded status is 87% (excluding side accounts) or lower; the allowable decrease will phase in to the full collar width from 87% funded to 90% funded.

The rate collar is applied for each rate pool (or independent employer) prior to any adjustments to the employer contribution rate for side accounts, transition liabilities, or pre-SLGRP pooled liabilities. The rate collar only applies to employer contribution rates for pension benefits. A graphical representation of the rate collar is shown in our June and July presentations to the PERS Board. Rates attributable to RHIA and RHIPA (retiree medical) programs are not subject to the collar.

Liability Allocation for Actives with Multiple Employers

Over the course of a member's working career, a member may work for more than one employer covered under the Tier 1/Tier 2 program. Since employer Tier 1/Tier 2 contribution rates are developed on an individual employer basis, while also considering any rate pooling structures, the member's liability should be allocated between the member's various Tier 1/Tier 2 employers. If all of the member's employers participate in the same rate pool, the allocation has no effect on rates, but if the employers in question are in different rate pools, or some are independent, the method to allocate liability among employers can have an impact on the employers' calculated contribution rates.

When a member retires, PERS allocates the cost of the retirement benefit between the employers the member worked for based on the calculation approach that produces the member's retirement benefit. If the member's benefit is calculated under the Money Match approach, the cost is allocated in proportion to the member's account balance attributable to each employer. If the member's benefit is calculated under the percent of final average pay Full Formula approach, the cost is allocated in proportion to the service attributable to each employer.

In the period prior to the 2003 system reforms and shortly thereafter, the vast majority of retirement benefits were calculated under the Money Match approach, so the member liability in valuations prior to December 31, 2006 had been allocated in proportion to the member's account balance attributable to each employer. With no new member contributions to Tier 1/Tier 2, however, this procedure meant no liability was allocated to employers for service after December 31, 2003 in the valuation. As Money Match approach calculations became less predominant and retirements under the Full Formula approach become more prevalent, a change in the procedure to allocate liability among employers was warranted.

Effective with the December 31, 2006 valuation, a change was made to allocate a member's actuarial accrued liability among employers based on a weighted average of the Money Match methodology, which utilizes member account balance, and the Full Formula methodology, which utilizes service. The methodologies were weighted according to the percentage of the system-wide actuarial accrued liability for new retirements projected to be attributable to the Money Match and Full Formula approaches, respectively, as of the next rate-setting valuation. For the December 31, 2018 and December 31, 2019 valuations, the Money Match method was weighted 10% for general service members and 0% for police & fire members.

The total actuarial liability for Tier 1/Tier 2 active members estimated to be attributable to the Money Match approach as of December 31, 2020 is 9% for general service members and less than 1% for police & fire members. This continues the decreasing trend of Money Match benefits seen in prior Experience Studies.

We recommend the Money Match approach continue to be weighted 10% for general service members. This weighting will continue to be reviewed with each experience study and updated as necessary. For police & fire members we recommend the allocation continue to be based entirely on the Full Formula approach, an assumption first adopted in the 2014 Experience Study after the Money Match portion of future police & fire retirements fell below 5%.

As in prior valuations, the member's normal cost will continue to be assigned fully to their current employer.

Offset for Member Redirect Contributions

Senate Bill 1049 from the 2019 legislative session provided that a portion of the 6% of pay member contribution would be redirected from the Individual Account Program (IAP) to the Employee Pension Stability Account (EPSA) beginning July 1, 2020. The EPSA amounts will be used to help fund Tier 1/Tier 2 and OPSRP defined benefits. Absent modification to governing law, the redirect to EPSA will remain in effect until the system-wide funded status including side accounts in a rate-setting actuarial valuation is 90% or greater.

The member redirect only applies to members whose pay exceeds a specified monthly salary threshold. This threshold was originally set at \$2,500 per month (\$30,000 per year for a 12-month employee) for 2020, increased for inflation in future years. House Bill 2906 from the 2021 legislative session subsequently increased this to \$3,333 per month (\$40,000 per year for a 12-month employee) effective in 2022.

For members with pay above the monthly threshold, the amount redirected to EPSA is as follows:

- Tier 1/Tier 2: 2.50% of pay
- OPSRP: 0.75% of pay

Beginning with the 2021-2023 biennium rates which were set in 2020, the PERS Board has adopted employer contribution rates that are based on a total actuarially calculated contribution rate along with an assumed offset for the average level of member redirect contribution for each tier. For the 2021-2023 biennium, the projected system-average member redirect offset was 2.45% of pay for Tier 1/Tier 2 and 0.70% of pay for OPSRP. Those projected offsets were based on the \$2,500 per month threshold in the 2019 legislation. The 0.05% of pay difference between the redirect amount for an individual and the assumed offset was due to the amount of pay expected to fall below the redirect threshold.

Based on our updated analysis reflecting individual member pay from the December 31, 2019 actuarial valuation and the revised pay threshold from House Bill 2906, we recommend the following assumed member redirect offset amounts for the 2023-2025 biennium:

- Tier 1/Tier 2: 2.40% of pay
- OPSRP: 0.65% of pay

Other Considerations Related to Methods

In 2019, the Oregon Secretary of State engaged a third-party firm to prepare an actuarial audit. In a written response dated October 8, 2019, the PERS Director noted certain aspects of the recommendations and considerations from that audit which would be reflected in this Experience Study. For the most part, any such items are incorporated directly into the relevant sections of this report. However, there are a few points relevant to actuarial methods not discussed elsewhere, which are addressed below:

- The audit recommended considering amortizing UAL as a level annual dollar amount, rather than as a level percent of projected pay. While annual level dollar amortization amounts are actuarially determinable, our understanding is that practice would not be feasible for Oregon PERS since all PERS' administrative systems are designed for contributions assessed as a percent of pay. In addition, since all UAL Rate contributions are paid on the combined Tier 1/Tier 2 and OPSRP payrolls, the payroll base underlying the calculated amortization has consistently grown in the past and is reasonably expected to continue to increase in future years. We thus recommend Oregon PERS maintain the level percent of pay amortization approach, which is the amortization approach used by almost all public systems.
- The audit discussed the possibility of applying an adjustment to contribution rates for the 18-month delay between the rate-setting valuation date at which new contribution rates are calculated and the July 1 date on which rates first take effect. When contribution rates increase, such an adjustment would add a small additional rate increase to account for the fact the new higher contribution rate did not take effect immediately at the valuation date. When contribution rates decrease, a similar dynamic would lead to an additional rate decrease from the adjustment. Any delay adjustments would not be expected to have a material effect in total if System experience has gains and losses that approximately offset over time.

While the practice of adjusting for a delay period has intuitive appeal, previous experience for Oregon PERS led to the elimination of such adjustment in the past. Given the complexities of a system with several hundred employers receiving individually determined contribution rates that reflect various combinations of pooling and individual employer experience, a delay adjustment would not be one simple calculation for the system. Our understanding is the prior experience with such an approach led to persistent differences in contribution rate components paid by employers in the same pool, difficulty for stakeholders in reconciling rate changes from biennium to biennium, and increased difficulty for employers to understand how their rates were determined. Based on that understanding, we do not currently recommend adopting a delay adjustment methodology as part of the rate calculation policy.

- The audit suggested adopting explicit assumptions for potential UAL losses due to liability increases from future data corrections and for liability arising from future new entrants in OPSRP. A large share of the data correction loss in the period reviewed by the audit was driven by resolution of a one-off issue. We do not have reason to expect persistent, predictable UAL losses from data corrections in the future. Similarly, the discussion in the audit report which led to the recommendation of an OPSRP new entrant UAL loss assumption was tied to a reconciliation exhibit that identified the **only** the liability effects of the year's OPSRP new entrants. Both Normal Cost Rate and UAL Rate contributions are made to system assets for each year's OPSRP new entrants. Thus, while future OPSRP new entrants will generate new liability in their year of entry they are **not** expected to generate the type of UAL losses that were suggested in the actuarial audit due to the addition to system assets from Normal Cost and UAL Rate contributions on payroll of those members. As has been done in the past, we will continue to monitor experience related to both items in our annual liability reconciliations. However, for the reasons discussed above we do not recommend adding an explicit anticipated UAL loss assumption for either item.

3. Economic Assumptions

Overview

Actuarial Standard of Practice (ASOP) No. 27, *Selection of Economic Assumptions for Measuring Pension Obligations*, provides guidance on selecting economic assumptions used in measuring obligations under defined benefit pension plans. ASOP No. 27 suggests that economic assumptions be developed using the actuary's professional judgment, taking into consideration past experience and the actuary's expectations regarding the future. The process for selecting economic assumptions involves:

- Identifying components of each assumption and evaluating relevant data
- Considering factors specific to the measurement along with other general factors
- Selecting a reasonable assumption

Under ASOP No. 27, an assumption is considered reasonable if:

- It is appropriate for the purpose of the measurement,
- It reflects the actuary's professional judgment,
- It takes into account relevant historical and current economic data,
- It reflects the actuary's estimate of future experience, the actuary's observation of estimates inherent in market data, or a combination thereof, and
- It has no significant bias, except when provisions for adverse deviation are included and disclosed.

A summary of the economic assumptions used for the December 31, 2019 actuarial valuation and those recommended for the December 31, 2020 and 2021 actuarial valuations is shown below:

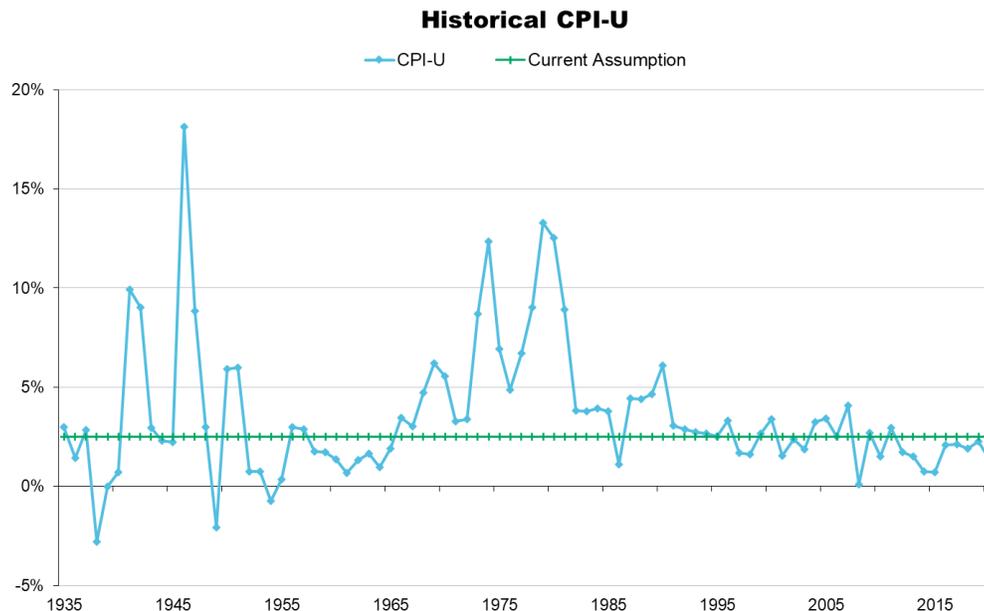
Assumption	December 31, 2019 Valuation	December 31, 2020 and 2021 Valuations
Inflation (other than healthcare)	2.50%	2.40% or lower
Real wage growth	1.00%	No Change
System payroll growth	3.50%	3.40% or lower
Regular investment return	7.20%	We think it is necessary to lower the assumption at least 0.20%. We recommend the Board consider reducing the assumption further to more closely reflect current outlooks. The Board will select the assumption at its July 23, 2021 meeting
Variable account investment return	Same as regular investment return	Same as regular investment return
Tier 1/Tier 2 administrative expenses	\$32.5 million/year	\$59 million/year combined Tier 1/Tier 2 and OPSRP assumption
OPSRP administrative expenses	\$8.0 million/year	

Assumption	December 31, 2019 Valuation	December 31, 2020 and 2021 Valuations
RHIPA health cost trend rates		
▪ 2021 cost trend rate	5.20%	5.90%
▪ Ultimate cost trend rate	4.10%	3.90%
▪ Year reaching ultimate rate	2094	2074

The recommended assumptions shown above, in our opinion, were selected in a manner consistent with the requirements of ASOP No. 27. Each of the above assumptions is described in detail below and on the following pages.

Inflation

The assumed inflation rate is a basis for all other economic assumptions. It affects assumptions including investment return, system payroll growth, and the RHIPA health cost trend rate.



In selecting an appropriate inflation assumption, we consider both historical data and the breakeven inflation rates implied by recent yields of long-term Treasury Inflation Protection Securities (TIPS) and Treasury bonds. The chart above shows the historical annual inflation rate for the years ending December 31 from 1935 through 2020 as reported by the Bureau of Labor Statistics. The mean and median annual rates over this period are **3.56** percent and **2.88** percent respectively.

Historical inflation rates vary significantly from period to period and may not be an indication of future inflation rates. With the development of a TIPS market, we can calculate an estimated breakeven inflation rate by comparing yields on regular Treasury securities to the yields on TIPS. The table below shows yields as of December 31, 2020 and April 30, 2021, for 10-year and 30-year Treasury bonds and TIPS.

	As of 12/31/2020		As of 4/30/2021	
	10-Year	30-Year	10-Year	30-Year
Treasury Yield	0.93%	1.65%	1.65%	2.30%
TIPS Yield	(1.06%)	(0.37%)	(0.76%)	0.02%
Breakeven Inflation	1.99%	2.02%	2.41%	2.28%

We also considered three other inflation measures in our analysis: Social Security’s intermediate inflation projection average of 2.39 percent over the period 2020-2030 (with an ultimate rate of **2.40** percent), the Medicare Trustees’ intermediate assumption of 2.40 percent inflation for ten years and **2.40** percent thereafter, and the Congressional Budget Office’s projection of CPI of an average of 2.22 percent inflation over the period 2020-2030 (with an ultimate rate of **2.40** percent). These measures were taken from, respectively, the 2020 OASDI Trustees Report, the 2020 Annual Report of the Boards of Trustees of the Federal Hospital Insurance and Federal Supplementary Medical Insurance Trust Funds, and *Additional Information about the Economic Outlook: 2021 to 2031* published by the CBO in February 2021.

Based on the information shown above, while the current assumption of 2.50% may still be reasonable, we recommend lowering the assumption to **2.40 percent or lower** to better align with current consensus expectations for long-term average future inflation.

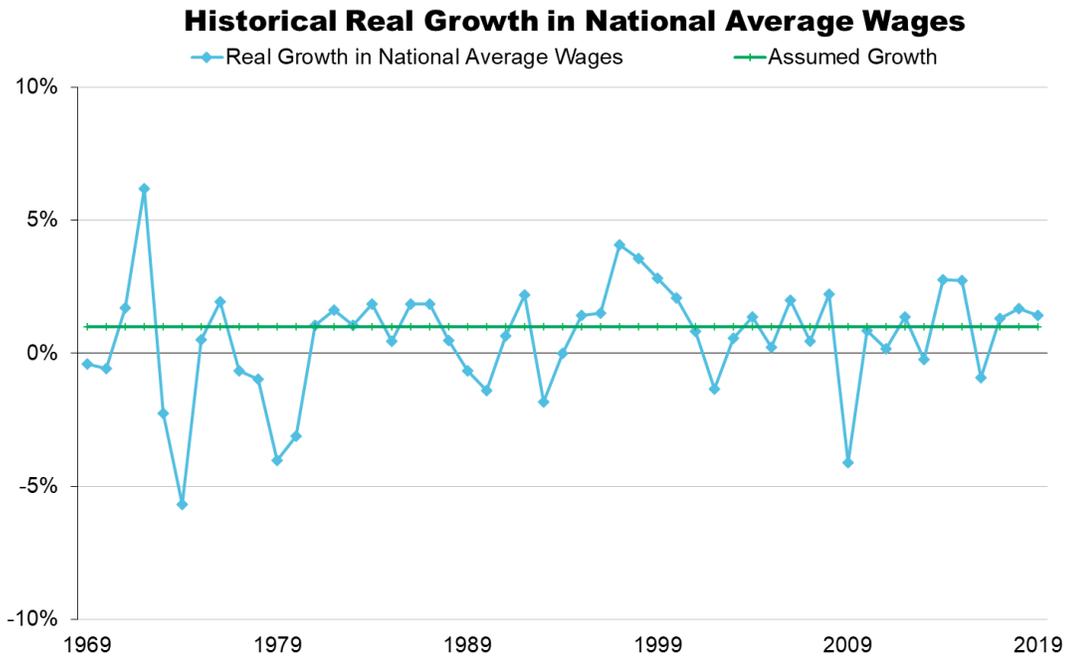
Real Wage Growth

The assumed individual salary increase assumption for each member is the sum of three components:

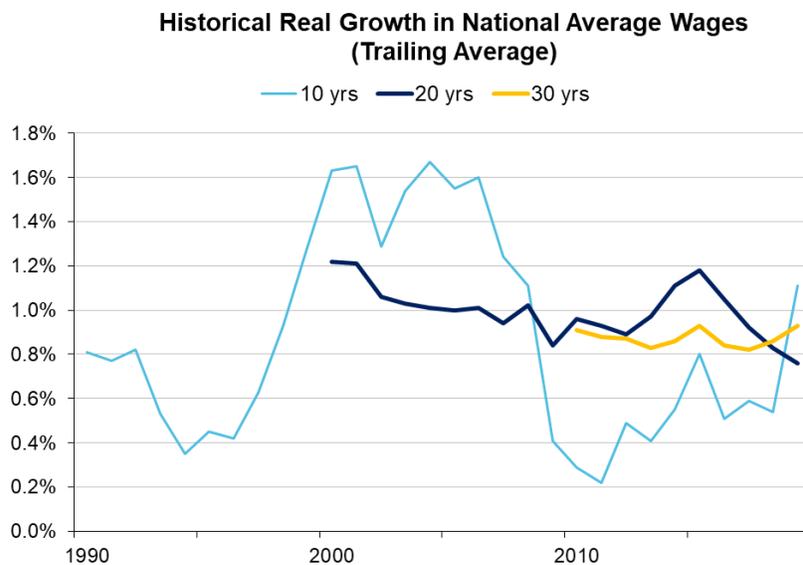
- Inflation,
- Real wage growth, and
- Merit and longevity wage growth.

Real wage growth represents the increase in wages above inflation for an entire population due to improvements in productivity and competitive pressures. Merit and longevity wage growth, in contrast, represent the increases in wages for an individual due to factors such as performance, promotion, or seniority.

The chart below shows the real growth in national average wages over the past fifty years based on data compiled by the Social Security Administration.



While the change in any one year has been volatile, the change over longer periods of time is more stable as shown in the chart below, which depicts the 10, 20, and 30 year trailing average reflecting data since 1981.



While the 10-year trailing average is still somewhat volatile, the 20- and 30-year averages have generally remained between 0.80% and 1.20% during the period shown. The table below shows the trailing average over various periods as of December 31, 2019, which was the most recently available data at the time of this report’s development.

Length of Period Ending December 31, 2019	Average Real Growth in National Average Wages
10 years	1.11%
20 years	0.76%
30 years	0.93%
40 years	0.86%
50 years	0.60%

We also considered the Social Security Administration’s current long-term intermediate wage growth assumption of 1.14 percent in our analysis.

Based on the combination of historical data and Social Security’s outlook for future experience, we consider the current assumption of 1.00 percent to continue to be reasonable and appropriate. We recommend no change to the assumption.

System Payroll Growth

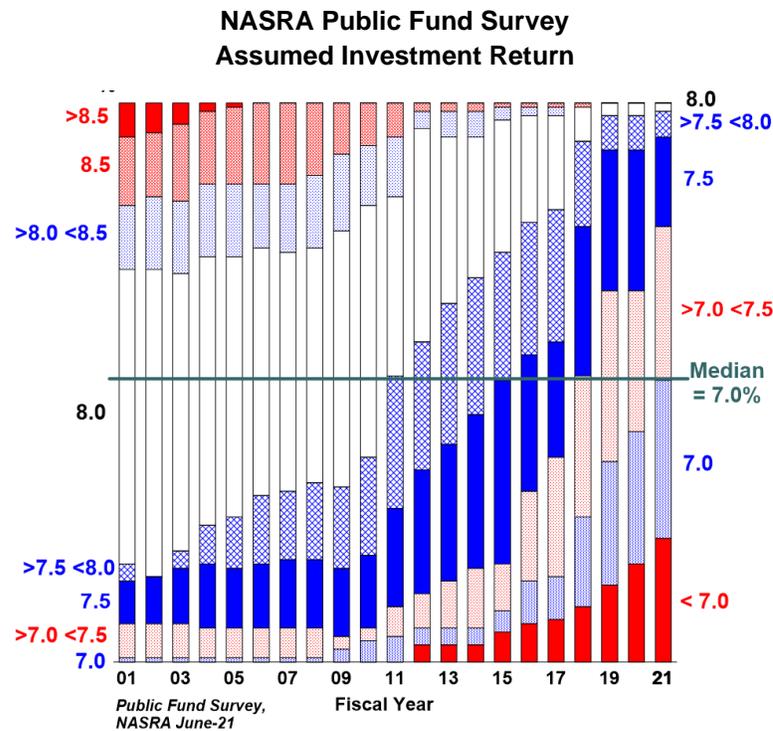
Real wage growth combined with inflation represents the expected growth in total system payroll for a stable active employee population. Changes in payroll due to an increase or decline in the headcount of the active employee population are not captured by this assumption. The system payroll growth assumption is used to develop the annual amount necessary to amortize the unfunded actuarial liability as a level percentage of projected future system payroll.

Since we are recommending the inflation assumption be reduced to 2.40% or lower and the real wage growth assumption remain at 1.00%, we recommend that the payroll growth assumption be lowered to 3.40% or lower.

Investment Return

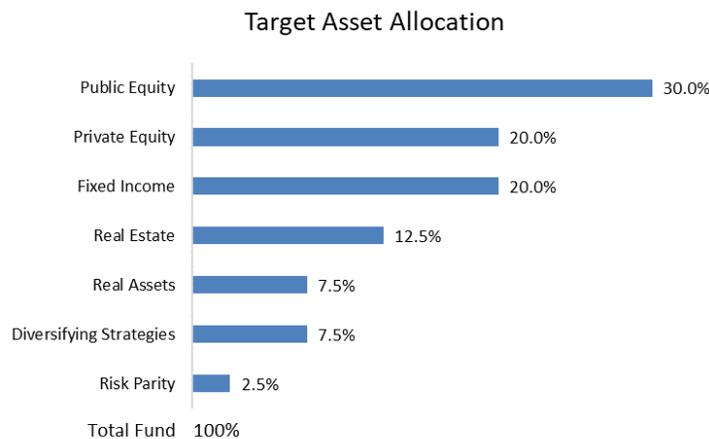
The assumed rate of investment return is used to calculate the present value as of the actuarial valuation date of future projected system benefit payments, to project interest credits applied to member accounts until retirement, to convert member accounts to a monthly retirement allowance under the Money Match formula, and to convert the retirement allowance to optional joint & survivor benefits. As such, it is the most important assumption used in valuing the plan’s liabilities and developing contribution rates. The assumption is intended to reflect the long-term expected future return on the portfolio of assets that fund the benefits.

To provide some perspective on this assumption, the chart below shows the assumptions used by the 131 largest US public sector systems in a regularly updated survey published by the National Association of State Retirement Administrators (NASRA). As can be seen from the chart (updated by NASRA in June 2021), the Oregon PERS assumption of 7.20% used in the prior valuation is currently higher than the median assumption for large US public sector systems, which is 7.00%. The arithmetic average (mean) of the return assumptions in the chart is 7.13%. Given the consensus view among investment professionals regarding both low long-term expected returns for fixed income investments (relative to historical averages) and low expected levels of average future inflation (also relative to historical averages), we believe that this downward trend in the survey will continue in the future as systems periodically revisit their investment return assumptions.



Regular Accounts

Based on the Oregon Investment Council’s (OIC) Statement of Investment Objectives and Policy Framework for the Oregon Public Employees Retirement Fund, including revisions adopted at the OIC meeting on June 2, 2021, we understand the current target asset allocation is as follows:



To develop an analytical basis for the Board’s selection of the investment return assumption, we use long-term real return outlooks developed by Milliman’s capital market outlook team for each of the asset classes in which the plan is invested based on the OIC’s long-term target asset allocation, and combined those real return outlooks with a 2.40% inflation assumption to develop nominal expected returns. Since the OIC uses broader asset classes than those for which Milliman’s investment professionals develop long-term return assumptions, we received assistance from Meketa, OIC’s primary consultant, to map each OIC asset class to the classes shown below. Each asset class assumption is based on a consistent set of underlying assumptions, including the inflation assumption. These assumptions are not based on average historical

returns, but instead are based on a forward-looking capital market outlook economic model. Based on the target allocation and investment return assumptions for each of the asset classes, our model's 50th percentile output is developed as follows:

Asset Class	Target Allocation	Annual Arithmetic Mean	20-Year Annualized Geometric Mean	Annual Standard Deviation
Global Equity	30.62%	7.11%	5.85%	17.05%
Private Equity	25.50%	11.35%	7.71%	30.00%
Core Fixed Income	23.75%	2.80%	2.73%	3.85%
Real Estate	12.25%	6.29%	5.66%	12.00%
Master Limited Partnerships	0.75%	7.65%	5.71%	21.30%
Infrastructure	1.50%	7.24%	6.26%	15.00%
Commodities	0.63%	4.68%	3.10%	18.85%
Hedge Fund of Funds - Multistrategy	1.25%	5.42%	5.11%	8.45%
Hedge Fund Equity-Hedge	0.63%	5.85%	5.31%	11.05%
Hedge Fund – Macro	5.62%	5.33%	5.06%	7.90%
US Cash	(2.50%)*	1.77%	1.76%	1.20%
Portfolio – Net of Investment Expenses	100.00%	7.06%	6.31%**	13.08%

*Negative allocation to cash represents levered exposure from allocation to Risk Parity strategy.

**The Milliman model's 20-year annualized geometric median is 6.27%.

Based on capital market outlook for real returns developed by credentialed investment professionals at Milliman and assumed inflation of 2.40%.

We compared the expected return to the range of returns developed using a mean-variance model and the capital market assumptions developed by Milliman to a similar analysis presented by at the June OIC meeting that we understood was developed collaboratively by Oregon State Treasury staff and their two investment consultants, Meketa and Aon. These capital market outlooks were developed based on year-end 2020 market conditions. In addition, we modeled the returns projected for the OIC's asset allocation using the 10-year capital market outlook from the 2020 Survey of Capital Market Assumptions published by Horizon Actuarial Services, LLC in July 2020. Returns shown below are net of passive investment expenses. In our modeling, we assumed that expenses incurred for active management are offset by additional returns gained from active management.

The table below compares the median of expected annualized returns calculated on a geometric basis for regular accounts based on Milliman's analysis detailed above, the OIC capital market outlook, and the consensus outlook from the Horizon survey.

	OIC	Horizon	Milliman
Median annualized geometric return	6.6%	6.80%	6.27%
Assumed inflation	2.1%	1.98%	2.40%
Timeframe modeled	20 years	10 years	20 years

It is common practice among public pension systems for the investment return assumption to be a multiple of either a tenth- or quarter-point (i.e., 0.10% or 0.25%). The lack of additional precision in selected assumptions is justified and reasonable due to the inability to have precise knowledge in advance regarding future investment returns. The median annualized return for the 20-year outlook from the OIC (reflecting input from their advisors Meketa and Aon) was 6.6%. The median annualized return for a 20-year time horizon based on Milliman's real return capital market outlook and a 2.4% inflation outlook was 6.27%. Those model outputs are based on the forward-looking return expectations of the investment professionals from those firms, and before any potential active management adjustments. Actual future investment returns are not determined by the assumed rate of return. Selecting an assumed return materially above the 50th percentile implies a materially greater than 50% chance of actual long-term future experience falling short of the selected assumption.

Both the OIC and Milliman models use capital market assumptions developed shortly after the end of 2020 and reflect the significant market gains during the latter part of 2020 in the underlying starting point. Our understanding is the relatively high asset prices and P/E ratios as of December 31, 2020 would work to decrease the forward-looking expected real returns in many asset classes, based upon the analytical framework of both models. Note that the Horizon survey results were based on expectations in the first half of 2020. Since equity markets subsequently increased significantly in late 2020, we expect the next annual update of the Horizon survey will produce lower expected future returns.

Based on the capital market outlooks reviewed, we believe the current investment return assumption should be lowered at least 0.20%. In addition, we recommend the PERS Board consider reducing the assumption further to more closely reflect the outlook of the OIC and its retained investment advisors.

Variable Account

The variable account is invested entirely in global equity. As a result, the annual expected arithmetic return is significantly higher than for the regular account, but so is the standard deviation. The result is a long-term compounded geometric annual return similar to the regular account, based on Milliman's capital market outlook. Prior to the December 31, 2012 valuation, the compound geometric variable account return was assumed to be higher than the regular account return. Beginning with that valuation, the variable account return assumption was set equal to the regular account return assumption, as the relationship between the various asset classes no longer warranted such a distinction in our opinion. We recommend continuing to set the variable account return assumption equal to the regular account return assumption.

Administrative Expenses

In accordance with GASB Statements No. 67 and No. 68, the long-term investment return assumption is considered to be gross of administrative expenses. In order to account for expected administrative expenses, in the past we have developed separate assumptions for Tier 1/Tier 2 and OPSRP with specific dollar amounts based on recent and expected future experience. The assumed administrative expenses for each program were added to the normal cost in the calculation of contribution rates in order to fund administrative expenses each year as they occur. With this study, we recommend modifying this approach to develop a total system-wide dollar amount (Tier 1/Tier 2 and OPSRP) and then allocate the assumed administrative expense to normal cost for each tier in proportion to payroll.

The Tier 1/Tier 2 assumed administrative expenses in the December 31, 2019 valuation were \$32.5 million per year and the OPSRP assumed administrative expenses were \$8.0 million, for a total combined assumption of \$40.5 million. A summary of recent actual administrative expenses for the system is shown below.

Year	System-Wide (Tier 1/Tier 2 + OPSRP) Pension Administrative Expense		
	Dollar Amount (\$ millions)	Percentage of Beginning of Year Assets	Percentage of Projected Payroll
2016	\$41.7	0.08%	0.44%
2017	\$41.0	0.07%	0.42%
2018	\$36.7	0.06%	0.36%
2019	\$44.5	0.07%	0.41%
2020	\$56.5	0.09%	0.49%

Based on discussion with PERS staff, we understand the increase in 2019 and 2020 was driven largely by work required for the implementation of Senate Bill 1049, and that this higher level of expenses is expected to persist for at least the near future. As a result, we recommend setting the assumed system-wide administrative expenses for the December 31, 2020 and December 31, 2021 actuarial valuations at \$59 million. This amount reflects recent historical experience with an expectation of inflation-related growth for the next two years.

RHIPA Subsidy Cost Trend Rates

Trend rates are used to estimate increases in the employer cost of the RHIPA subsidy. Based on analysis performed by Milliman's healthcare actuaries, we recommend the following change to the healthcare cost trend assumption. The healthcare cost trends are based on the Society of Actuaries (SOA) periodically updated report on long-term medical trends. That report includes detailed research performed by a committee of economists and actuaries (including a Milliman representative) utilizing the "Getzen Model" named after the professor who developed the model. We believe that the research and the model are fundamentally and technically sound and advance the body of knowledge available to actuaries to project long-term medical trends more accurately. Milliman uses the Getzen Model as the foundation for the trend that we recommend to our clients for OPEB valuations. The model produces long-range trend assumptions built on long-term relationships between certain key economic factors.

The trend rates developed in the previous study reflected consideration of the excise tax scheduled to be introduced by the Affordable Care Act. The Further Consolidated Appropriations Act passed in December 2019 repealed the excise tax, and as a result no adjustment is required for the proposed trend assumption.

Given the substantial uncertainty regarding the impact of COVID-19 on plan costs, including whether the pandemic will increase or decrease costs during the term of our projections, we have chosen not to make an adjustment in the expected plan costs or in the trend assumptions. It is possible that the COVID-19 pandemic could have a material impact on the projected costs.

Note that the following chart shows sample rates. A full chart can be found in the appendices.

Year	December 31, 2018 and 2019 Valuations	December 31, 2020 and 2021 Valuations
2019	7.1%	N/A
2020	5.8%	N/A
2021	5.2%	5.9%
2022	5.0%	5.5%
2023	5.0%	5.1%
2024	5.0%	5.0%
2025	5.1%	4.9%
2026	5.0%	4.9%
2027	5.0%	4.8%
2028	5.0%	4.7%
2029	5.0%	4.7%
2030	5.4%	4.7%
2035	5.9%	4.7%
2040	5.7%	4.8%
2045	5.6%	4.8%
2050	5.4%	4.8%
2060	5.1%	4.7%
2070	4.5%	4.2%
2080	4.2%	3.9%
2090	4.2%	3.9%
2094+	4.1%	3.9%

4. Demographic Assumptions

Overview

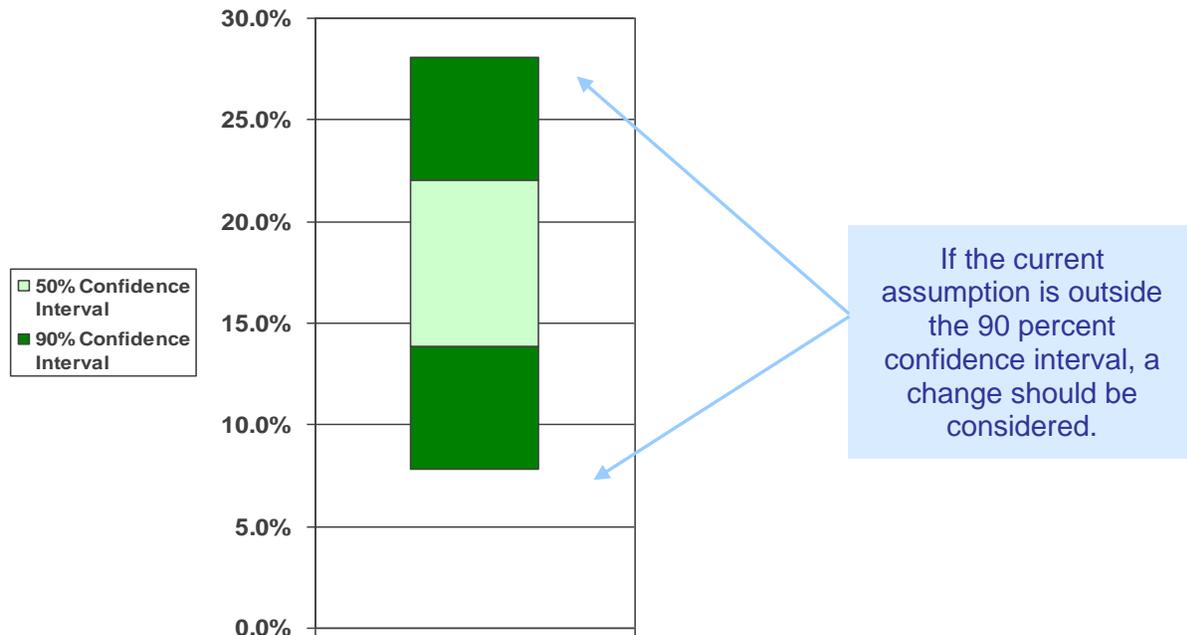
Actuarial Standard of Practice (ASOP) No. 35, *Selection of Demographic and Other Noneconomic Assumptions for Measuring Pension Obligations*, provides guidance on selecting demographic assumptions used in measuring obligations under defined benefit pension plans. The general process for recommending demographic assumptions as defined in ASOP No. 35 is as follows:

- Identify the types of assumptions;
- Consider the relevant assumption universe;
- Consider the assumption format;
- Select the specific assumptions; and
- Evaluate the reasonableness of the selected assumption.

The purpose of the demographic experience study is to compare actual experience against expected experience based on the assumptions used in the most recent actuarial valuation. The observation period used in this study is January 1, 2017 through December 31, 2020, and the current assumptions are those adopted by the Board for the December 31, 2019 actuarial valuation. If the actual experience differs significantly from the overall expected experience, or if the pattern of actual experience by age, sex, or duration does not follow the expected pattern, new assumptions are considered.

Confidence intervals have been used to measure observed experience against current assumptions to determine the reasonableness of the assumption. The floating bars represent the 50 percent and 90 percent confidence intervals around the observed experience. The 90 percent confidence interval represents the range around the observed rate that could be expected to contain the true rate during the period of study with 90 percent probability. The size of the confidence interval depends on the number of observations and the likelihood of occurrence. If an assumption is outside the 90 percent confidence interval and there is no other information to explain the observed experience, a change in assumption should be considered. A change may also be considered when the observed experience is within the 90 percent confidence interval, depending on the specific situation. A sample graph with confidence intervals is shown below:

Overview (continued)



The demographic assumptions used for the December 31, 2019 actuarial valuation and the recommended assumptions for the December 31, 2020 and December 31, 2021 actuarial valuations are shown in detail in the following sections.

A summary of the changes recommended to the Board are as follows:

- Adjust the base mortality table assumption for School District males and make a routine update to the mortality improvement scale, which is based on 60-year unisex average Social Security experience.
- Adjust retirement rates for certain member categories and service bands to more closely align with recent and expected future experience and increase the age of 100% likelihood of assumed retirement by five years for all groups; reduce the percentage of future retirees assumed to elect a partial lump sum; increase the percentage of members assumed to purchase credited service at retirement.
- Increase the merit component of the individual member salary increase assumption for all member categories based on observations of the last eight years of experience. The individual member salary increase assumption consists of the sum of inflation, real wage growth, and merit components, with the latter varying by member.
- Update pre-retirement termination of employment assumptions for one member category.
- Lower assumed rates of ordinary (non-duty) disability and general service duty disability incidence.
- Increase the Tier 1 unused vacation cash out assumption for three member categories.
- Adjust the Tier 1/Tier 2 unused sick leave assumption for all member categories to reflect recently observed experience and to more heavily weight experience from higher liability retirees.
- Decrease the healthy and disabled likelihood of program participation assumption for the RHIA retiree healthcare program.
- Decrease the RHIPA likelihood of program participation assumption for most service bands.

The recommended assumptions, in our opinion, were selected in a manner consistent with the requirements of ASOP No. 35.

Mortality

Mortality rates are used to project the length of time benefits will be paid to current and future retirees and beneficiaries. The selection of a mortality assumption affects plan liabilities because the estimated present value of retiree benefits depends on how long the benefit payments are expected to continue. There are clear differences in the mortality rates among healthy retired members, disabled retired members, and non-retired members. As a result, experience for each of these groups is reviewed independently and each group receives its own mortality assumptions.

For the current study, we reviewed mortality during 2020 separately and observed modestly higher mortality rates than in other years of the study. This 2020 experience may be driven by COVID-19 and not representative of anticipated future mortality experience. As a result, we have excluded 2020 mortality data from the results of our analysis shown below.

A summary of the current assumed mortality rates and recommended changes is shown below:

Assumption	Recommended December 31, 2018 and 2019 Valuations	Recommended December 31, 2020 and 2021 Valuations
Healthy Annuitant Mortality	Pub-2010 Healthy Retiree, Sex Distinct, Generational Projection with Unisex Social Security Data Scale	Pub-2010 Healthy Retiree, Sex Distinct, Generational Projection with Unisex Social Security Data Scale
▪ School District male	Teachers, no set back	Blend 80% Teachers and 20% General Employees, no set back
▪ Other General Service male (and male beneficiary)	General Employees, set back 12 months	No change
▪ Police & Fire male	Public Safety, no set back	No change
▪ School District female	Teachers, no set back	No change
▪ Other General Service female (and female beneficiary)	General Employees, no set back	No change
▪ Police & Fire female	Public Safety, set back 12 months	No change
Disabled Retiree Mortality	Pub-2010 Disabled Retiree, Sex Distinct, Generational Projection with Unisex Social Security Data Scale	Pub-2010 Disabled Retiree, Sex Distinct, Generational Projection with Unisex Social Security Data Scale
▪ Police & Fire male	Blended 50% Public Safety, 50% Non-Safety, no set back	No change
▪ Other General Service male	Non-Safety, set forward 24 months	No change
▪ Police & Fire female	Blended 50% Public Safety, 50% Non-Safety, no set back	No change
▪ Other General Service female	Non-Safety, set forward 12 months	No change
Non-Annuitant Mortality	Pub-2010 Employee, Sex Distinct, Generational Projection with Unisex Social Security Data Scale	Pub-2010 Employee, Sex Distinct, Generational Projection with Unisex Social Security Data Scale
▪ School District male	120% of same table and set back as Healthy Annuitant assumption	125% of same table and set back as Healthy Annuitant assumption
▪ Other General Service male	115% of same table and set back as Healthy Annuitant assumption	No change

Mortality (*continued*)

Assumption	Recommended December 31, 2018 and 2019 Valuations	Recommended December 31, 2020 and 2021 Valuations
▪ Police & Fire male	100% of same table and set back as Healthy Annuitant assumption	No change
▪ School District female	100% of same table and set back as Healthy Annuitant assumption	No change
▪ Other General Service female	125% of same table and set back as Healthy Annuitant assumption	No change
▪ Police & Fire female	100% of same table and set back as Healthy Annuitant assumption	No change

Mortality Improvement Scale

Mortality rates are expected to continue to decrease in the future, and the resulting increased longevity should be anticipated in the actuarial valuation. For Oregon PERS, this is done through the use of a generational mortality assumption, which combines a base mortality table and a separate mortality improvement scale to project the pace of future life expectancy increases. The base mortality table defines the mortality rates assumed at each age in a single specific calendar year, while the mortality improvement scale projects how quickly the mortality rates at each individual age are assumed to improve in future calendar years.

The current mortality improvement scale is based on 60-year unisex average mortality improvement rates by age, calculated using Social Security data through 2015, which was the most recent publicly available data at the time of the prior experience study. Our recommendation is to update the mortality improvement scale based on Social Security data through 2017 (the most recent publicly available data). We believe this meets the “best actuarial information on mortality at the time” standard mandated by ORS 238.607. A full listing of the recommended mortality improvement scale rates is included in the appendix.

Healthy Annuitant Mortality

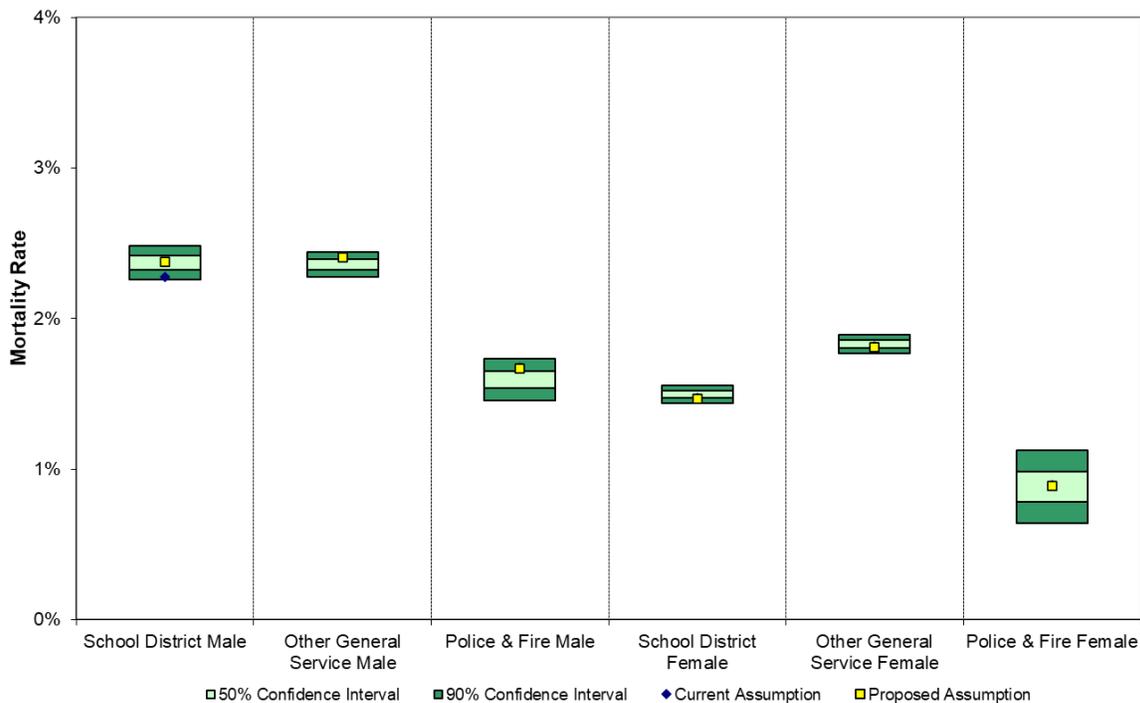
Mortality assumptions for healthy retired members are separated into six groups based on employment category and gender (school district males, school district females, police & fire males, police & fire females, other general service males, other general service females). Beneficiaries were combined with non-school district general service members of the same gender.

To assist in review of the current mortality assumptions’ reasonability, we calculated the ratio of actual deaths to expected deaths (A/E ratio) during the experience study’s data observation period for each of the six groups described above. In the prior study, mortality assumptions were targeted to achieve an A/E ratio of approximately 100 percent on a benefits-weighted basis. In the current study, A/E ratios for most groups remained near 100 percent, though school district males showed a relatively high A/E ratio for the second study in a row. Since the aggregate mortality rate experience for this group has been at the edge of the 90% confidence interval for two consecutive studies, we recommend modifying that group’s base mortality table to reflect a blend of standard national tables for teachers and general employees. For all other groups, the current assumption basis continues to match experience reasonably well and we recommend no changes.

Mortality (continued)

	Benefits-Weighted (\$1,000s of monthly benefits)		Current Assumption		Recommended Assumption	
	Exposures	Actual Deaths	Expected Deaths	A/E Ratio	Expected Deaths	A/E Ratio
School District male	163,428	3,877	3,718	104%	3,883	100%
Other General Service male (and male beneficiary)	280,446	6,613	6,769	98%	6,744	98%
Police & Fire male	89,686	1,432	1,501	95%	1,495	96%
School District female	258,003	3,864	3,796	102%	3,782	102%
Other General Service female (and female beneficiary)	264,203	4,835	4,796	101%	4,777	101%
Police & Fire female	11,199	99	100	99%	100	99%

Healthy Retiree Mortality Aggregate Confidence Intervals and Rates



We recommend continued use of the Pub-2010 base mortality tables (published by the Society of Actuaries in January 2019) as the underlying base mortality tables for generational mortality assumptions in the current study. The Pub-2010 mortality tables reflect observed experience from calendar years 2008-2013, with 2010 as the middle of the observation period. The tables are based exclusively upon data gathered from large public sector pension systems (including Oregon PERS) for the first modern study specific to the mortality experience of US public pension plans.

Mortality (*continued*)

In the Pub-2010 study, different gender-distinct base mortality tables were published for three separate job categories: teachers, public safety, and general employees. When selecting a table to match the mortality rates of Oregon PERS, we started from the category table most applicable to the portion of the population under consideration, and then adjusted, if needed, to more closely align with recent Oregon PERS experience. At times we use a “set back” to adjust the mortality rates. A “set back” of 12 months, for example, treats all members as if they were 12 months younger than they really are when applying the mortality table, which results in lower assumed mortality rates for members.

We recommend updating the assumption for school district males to reflect an 80%/20% blend of the relevant base mortality tables for teachers and general employees from the Pub-2010 study. This blend more closely follows recent observed experience for this group than that of the teachers table and is also consistent with the fact that Oregon PERS school district employees include non-teaching staff, while the Pub-2010 teachers base mortality table included only teacher experience in its development.

A summary of the current and recommended healthy retiree mortality assumptions is shown below:

	Recommended December 31, 2018 and 2019 Valuations	Recommended December 31, 2020 and 2021 Valuations
Basic Table	Pub-2010 Healthy <u>Retiree</u>, Sex Distinct, Generational Projection with Unisex Social Security Data Scale	Pub-2010 Healthy <u>Retiree</u>, Sex Distinct, Generational Projection with Unisex Social Security Data Scale
School District male	Teachers, no set back	Blend 80% Teachers, no set back and 20% General Employees, no set back
Other General Service male (and male beneficiary)	General Employees, set back 12 months	No change
Police & Fire male	Public Safety, no set back	No change
School District female	Teachers, no set back	No change
Other General Service female (and female beneficiary)	General Employees, no set back	No change
Police & Fire female	Public Safety, set back 12 months	No change

Disabled Retiree Mortality

Disabled members are expected to experience higher mortality rates at a given age than non-disabled retired members. As a result, disabled member mortality experience is analyzed separately from that of non-disabled annuitants and beneficiaries. We recommend continued use of the Pub-2010 Disabled Retiree base mortality tables and the 60-year average unisex Social Security mortality improvement scale as the starting point for setting disabled mortality assumptions in the current study. This will maintain a consistent basis for disabled and non-disabled retiree assumptions, as has been the case in prior studies.

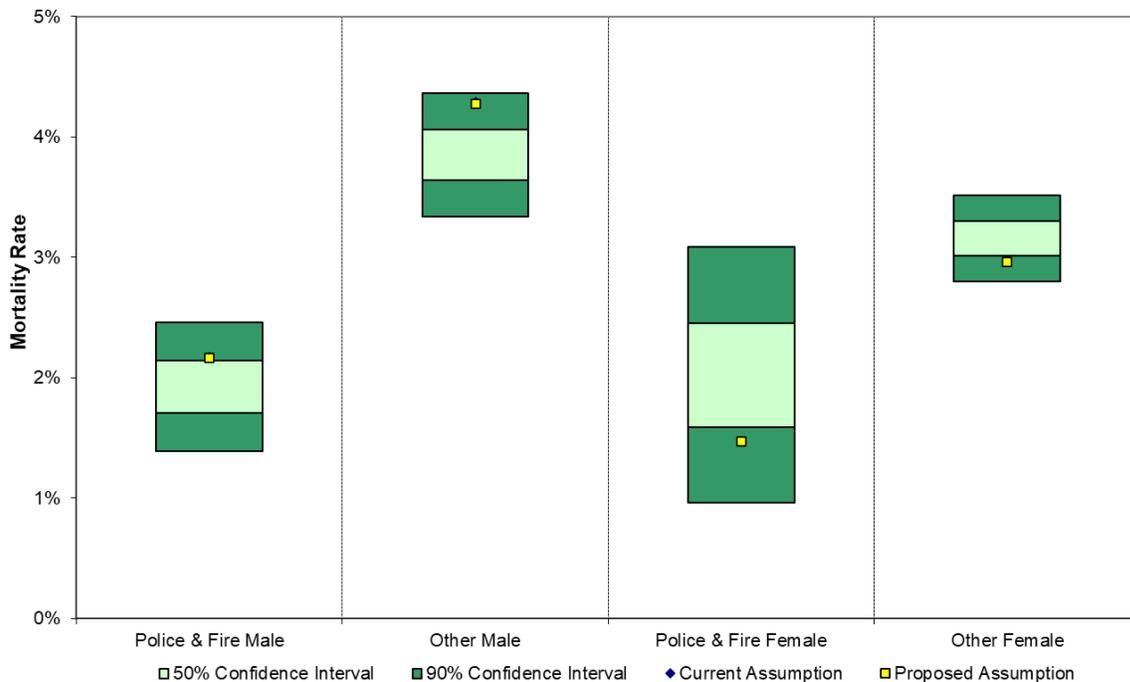
As in the most recent study, we recommend applying adjustments to the underlying Pub-2010 Disabled Retiree mortality tables where needed to more closely match assumptions to recent Oregon PERS experience on a benefits-weighted approach.

Mortality (continued)

	Benefits-Weighted (\$1,000s of monthly benefits)		Current Assumption		Recommended Assumption	
	Exposures	Actual Deaths	Expected Deaths	A/E Ratio	Expected Deaths	A/E Ratio
Disabled Police & Fire male	6,181	119	134	89%	134	89%
Disabled General Service male	7,891	304	338	90%	337	90%
Disabled Police & Fire female	1,256	25	19	137%	18	138%
Disabled General Service female	11,362	359	338	106%	336	107%

Prior to the publication of the Pub-2010 tables, disabled police & fire members were not rated separately due to the relatively small amount of experience for such members. However, the Pub-2010 report includes tables developed specifically for disabled police & fire members based on statistically credible national data sets for these populations, so we were able to refine this assumption first effective with the 2018 Experience Study. Using a benefits-weighted approach, the selected variations of the Pub-2010 Disabled Retiree mortality tables fell within a 90 percent confidence interval around observed experience for all groups.

Disabled Retired Mortality
Aggregate Confidence Intervals and Rates



Mortality (*continued*)

A summary of current and recommended disabled retiree mortality assumptions is shown below:

	Recommended December 31, 2018 and 2019 Valuations	Recommended December 31, 2020 and 2021 Valuations
Basic Table	Pub-2010 Disabled Retiree, Sex Distinct, Generational Projection with Unisex Social Security Data Scale	Pub-2010 Disabled Retiree, Sex Distinct, Generational Projection with Unisex Social Security Data Scale
Disabled Police & Fire male	Blended 50% Public Safety, 50% Non-Safety, no set back	No change
Disabled General Service male	Non-Safety, set forward 24 months	No change
Disabled Police & Fire female	Blended 50% Public Safety, 50% Non-Safety, no set back	No change
Disabled General Service female	Non-Safety, set forward 12 months	No change

Non-Annuitant Mortality

The non-annuitant mortality assumption applies to active members and dormant members (those members who have terminated employment but have a vested right to a future benefit). As with the other mortality assumptions, we recommend continued use of the Pub-2010 base mortality tables and the 60-year average unisex Social Security mortality improvement scale as the starting point for setting mortality assumptions for this group. This will maintain a consistent basis for mortality assumptions, as has been the case in prior studies.

For a given age and gender, an employed person is on average less likely to die in a given year than a retired person of the same age and gender. We recommend using separate Pub-2010 Healthy Retiree and Pub-2010 Employee mortality tables for healthy annuitants and non-annuitants, respectively. Each Healthy Retiree table published by the SOA has a corresponding Employee table, which reflects differences in the anticipated mortality rates for the retiree and employee populations.

For each population subgroup, we recommend using the Pub-2010 Employee base mortality table (including adjustments) that corresponds to the Healthy Retiree table selected for that subgroup, and then adjusting the mortality rates with a scaling factor if needed to better match recent Oregon PERS experience. For example, mortality for non-annuitant General Service females will be assumed to follow the Pub-2010 Employee base mortality table for the general employees job category, with no set back, and will be projected generationally using the Social Security unisex mortality improvement scale (all of which parallels treatment for the corresponding retiree group), and will then be scaled by a factor of 125% to better match the aggregate Oregon PERS-specific experience of the relevant employee group.

The relative values of corresponding Pub-2010 Employee and Healthy Retiree base mortality tables were developed by the SOA based on a much larger population than that of Oregon PERS. As a result, we believe it is preferable to reflect that relationship as the starting point when developing non-annuitant versions of the recommended healthy annuitant mortality tables for Oregon PERS. The analysis below compares recent experience in aggregate for the non-annuitant population under this approach. This comparison was done on a headcount-weighted basis only since the final level of retirement benefits cannot be predicted with certainty for current active members.

Mortality (continued)

	Headcount-Weighted		Current Assumption		Recommended Assumption	
	Exposures	Actual Deaths	Expected Deaths	A/E Ratio	Expected Deaths	A/E Ratio
Total Non-Annuitant Experience	637,425	795	730	109%	739	108%

In aggregate, using the recommended Pub-2010 Employee base mortality tables corresponding to the relevant recommended Healthy Retiree mortality tables for each subgroup and adjusted as noted below produces an A/E ratio of 108 percent. For a headcount-weighted analysis, we prefer an A/E ratio near 110 percent to approximate an outcome similar to targeting 100 percent on a benefits-weighted basis. The actual A/E ratio of 108 percent shown is sufficiently close to that 110 percent target.

A summary of the current and recommended non-annuitant mortality assumptions is shown below:

	Recommended December 31, 2018 and 2019 Valuations	Recommended December 31, 2020 and 2021 Valuations
Basic Assumption	Pub-2010 Employee, Sex Distinct, Generational Projection with Unisex Social Security Data Scale	Pub-2010 Employee, Sex Distinct, Generational Projection with Unisex Social Security Data Scale
School District male	120% of Employee table with same job category and set back as Healthy Retiree assumption	125% of Employee table with same job category and set back as Healthy Retiree assumption
Other General Service male	115% of Employee table with same job category and set back as Healthy Retiree assumption	No change
Police & Fire male	100% of Employee table with same job category and set back as Healthy Retiree assumption	No change
School District female	100% of Employee table with same job category and set back as Healthy Retiree assumption	No change
Other General Service female	125% of Employee table with same job category and set back as Healthy Retiree assumption	No change
Police & Fire female	100% of Employee table with same job category and set back as Healthy Retiree assumption	No change

Retirement Assumptions

The retirement assumptions used in the actuarial valuation include the following assumptions:

- Retirement from active status
- Probability a member will elect a lump sum option at retirement
- Percentage of members who elect to purchase credited service at retirement.
- Probability a member will remain an Oregon resident during retirement.

Retirement from Active Status

Members are eligible to retire as early as age 55 (50 for police & fire members), or earlier if the member has 30 years of service. In our analysis, we have found significant differences in the retirement patterns based on length of service, employment category (general service or police & fire), and current eligibility for immediate unreduced benefits.

A summary of the early, normal, and unreduced retirement dates under the plan are as follows:

Employment Category	Tier	Normal Retirement Age	Early Retirement Age	Unreduced Retirement
General Service	1	58	55	30 years of service
General Service	2	60	55	30 years of service
General Service	OPSRP	65	55	Age 58 with 30 years
Police & Fire	1 and 2	55	50	30 years of service, or age 50 with 25 years of service
Police & Fire	OPSRP	60	50	Age 53 with 25 years
State Judiciary	N/A	65	60	60 if Plan B; N/A if Plan A

Structure for Retirement Rates

The structure of the PERS retirement rate assumption separates rates by job classification and by service level. General service rates differ across three service bands: less than 15 years, 15 to 29 years, and 30 or more years of service. Each service band has different assumptions for school districts versus all other general service members. Police & fire rates employ the following three service bands: less than 13 years, 13 to 24 years, and 25 or more years of service. Previously, we applied a 100% likelihood of retirement assumption starting at age 65 for police & fire members and age 70 for general service members. While the large majority of members continue to retire prior to those ages, in order to recognize a gradual trend toward longer working careers we recommend increasing the age at which the 100% likelihood of retirement assumption applies to age 70 for police & fire and age 75 for general service.

The service band structure anticipates that many members’ retirement decisions will contemplate the amount of the retirement benefit and the affordability of retirement.

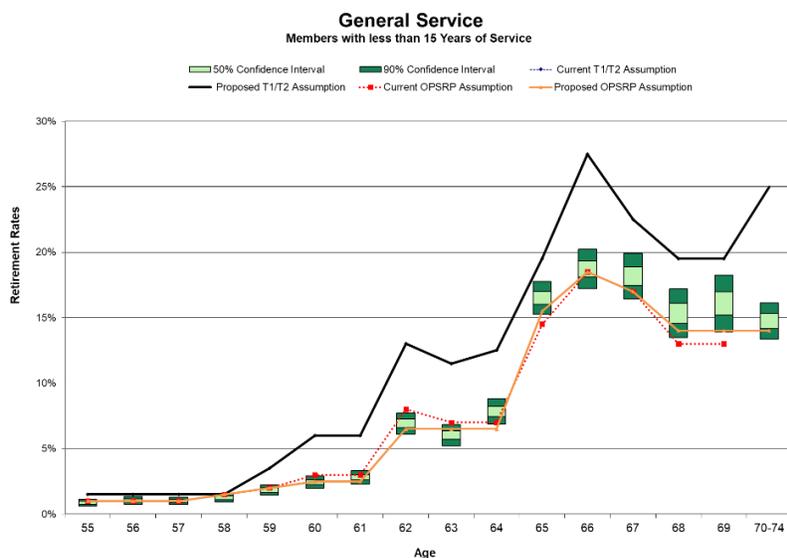
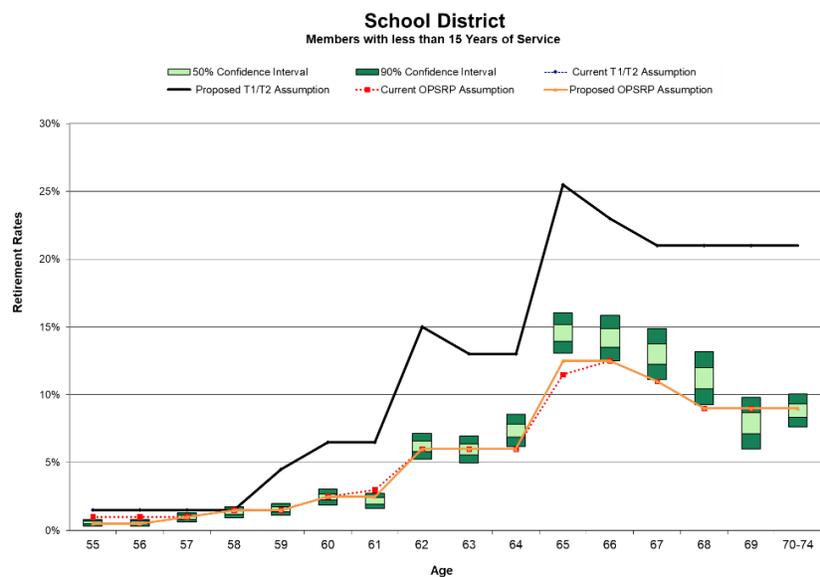
School District and General Service Retirement Rates

Members with Less Than 15 Years of Service

Retirement decisions by members with less than 15 years of service are likely to be heavily influenced by the availability of resources other than PERS benefits, including Social Security, prior employment, spousal benefits, and savings.

Retirement Assumptions (continued)

The following charts show the current assumed rates of retirement, the confidence interval around observed experience, and the recommended retirement rate assumption for school district and general service members retiring with less than 15 years of service. Given that all new entrants since August 2003 are in OPSRP, most recent experience in this service band is for OPSRP members.

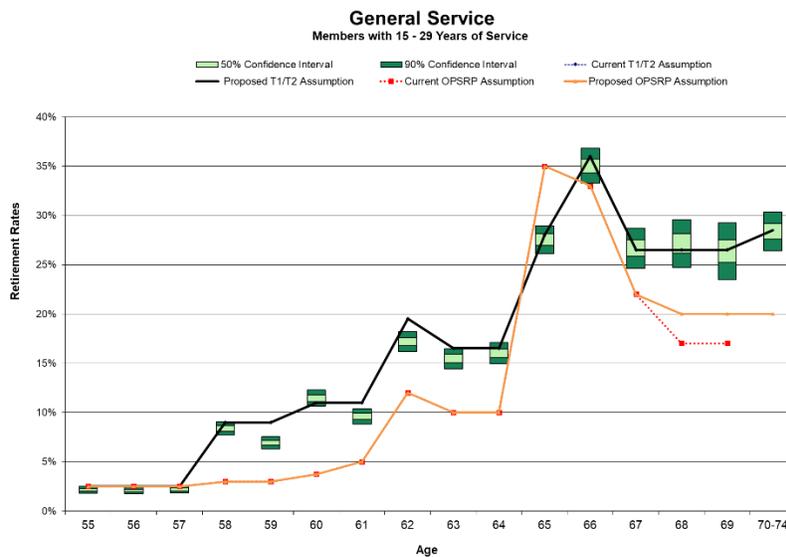
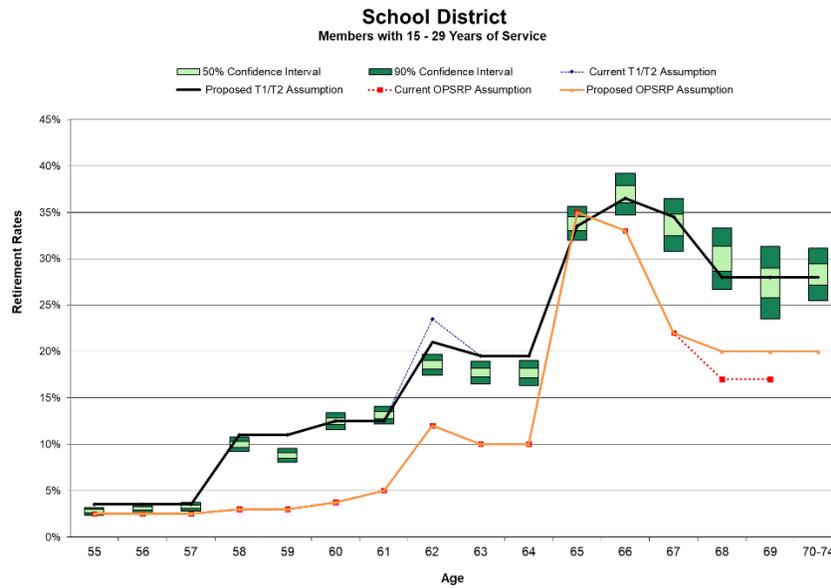


Retirement Assumptions (continued)

Members with 15 to 29 Years of Service

Retirement decisions by members with 15 to 29 years of service are likely to be influenced by the structure of PERS benefits as well as the availability of other resources, including Social Security, prior employment, spousal benefits, and savings.

The following charts show the current assumed rates of retirement, the confidence interval around observed experience, and the recommended retirement rate assumption for school district and general service members retiring with 15 to 29 years of service. Almost all recent experience for members in this service band is for Tier 1 and Tier 2 members.

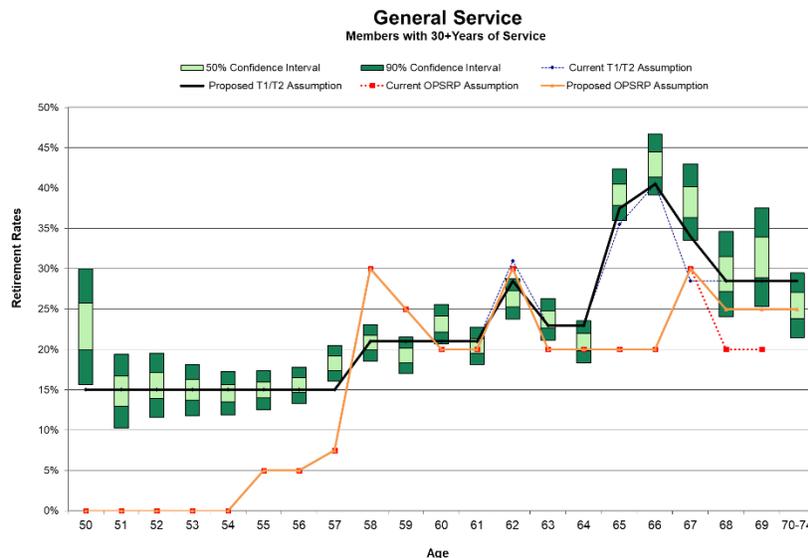
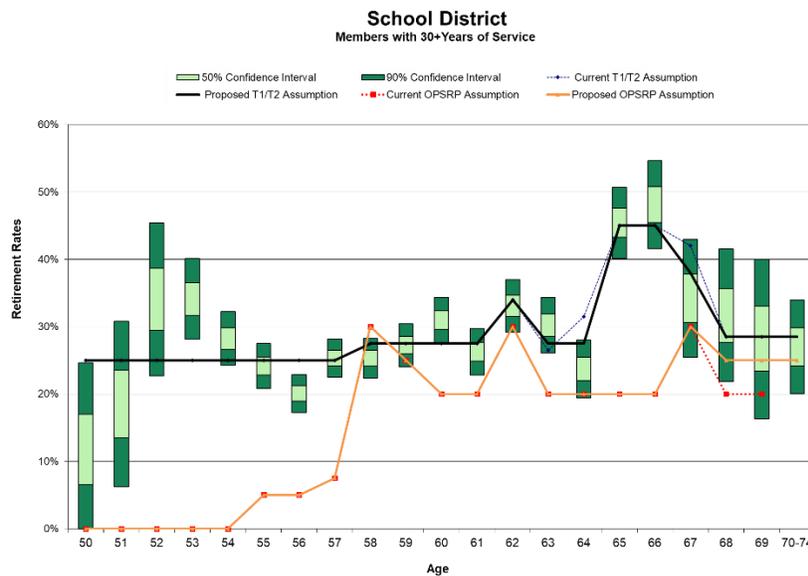


Retirement Assumptions (continued)

Members with 30 or More Years of Service

Members with 30 or more years of service are eligible for unreduced PERS benefits at any age (age 58 for OPSRP). As a result, retirement rates at all ages are relatively high, with a spike when Social Security benefits become available.

The following charts show the current assumed rates of retirement, the confidence interval around observed experience and the recommended retirement rate assumption for school district and other general service members retiring with 30 or more years of service. All recent experience is for Tier 1 members.



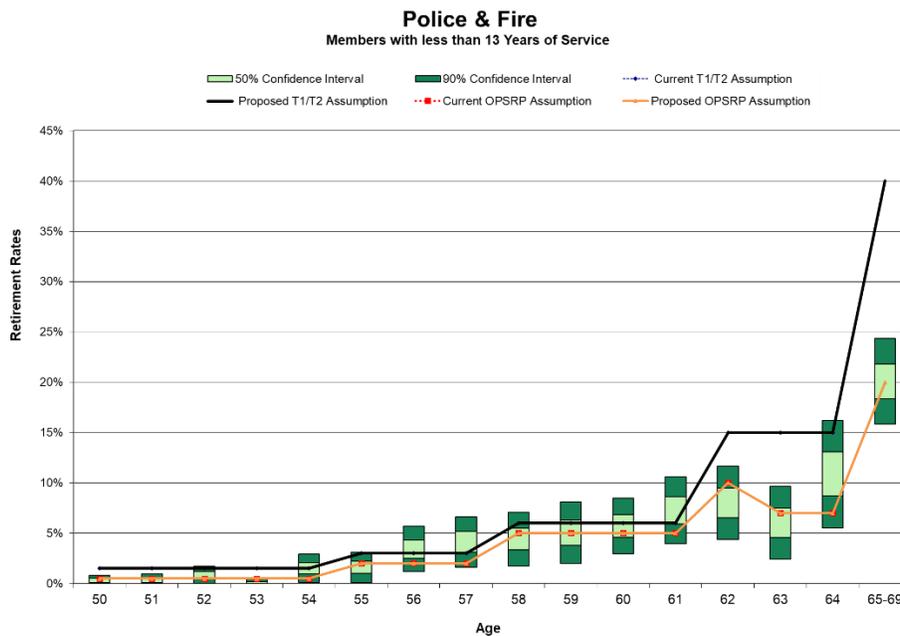
Retirement Assumptions (continued)

Police & Fire

Members with Less Than 13 Years of Service

The retirement assumption for police & fire members differs for members retiring with less than 13 years of service, those retiring with 13 to 24 years of service, and those retiring with 25 or more years of service. Retirement decisions by members with less than 13 years of service are likely to be heavily influenced by the availability of resources other than PERS benefits, including Social Security, prior employment, spousal benefits, and savings.

The following graph shows the current assumed rates of retirement, the confidence interval around observed experience and the recommended retirement rate assumption for police & fire members retiring with less than 13 years of service. Given that all new entrants since August 2003 are in OPSRP, almost all recent experience in this service band is for OPSRP members.

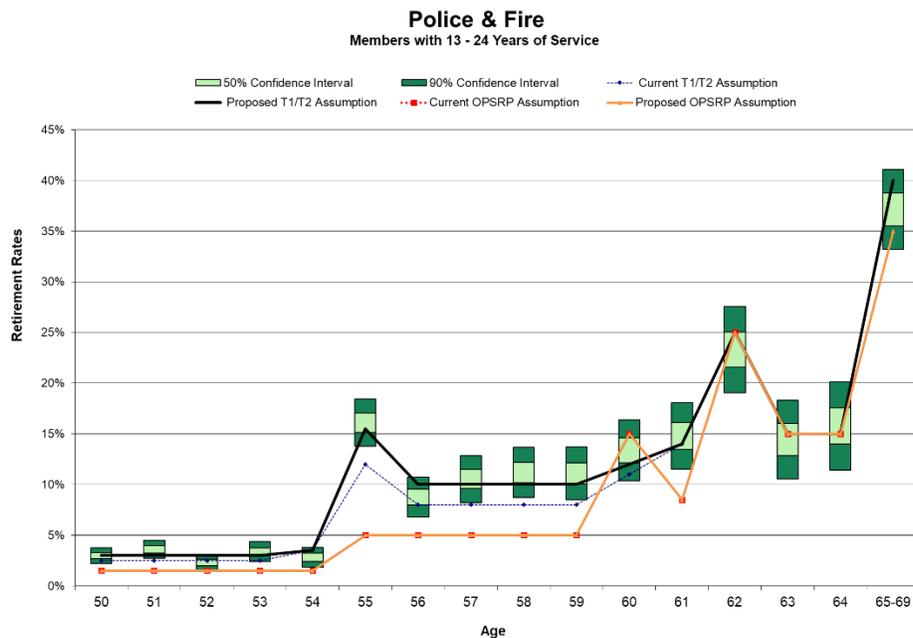


Retirement Assumptions (continued)

Members with 13 to 24 Years of Service

Retirement rates for members with 13 to 24 years of service are likely to be influenced by the structure of PERS benefits as well as the availability of other resources, including Social Security, prior employment, spousal benefits, and savings.

The following chart shows the current assumed rates of retirement, the confidence interval around observed experience, and the recommended retirement rate assumption for police & fire members retiring with 13 to 24 years of service. Most recent experience for members in this service band is for Tier 1 and Tier 2 members.

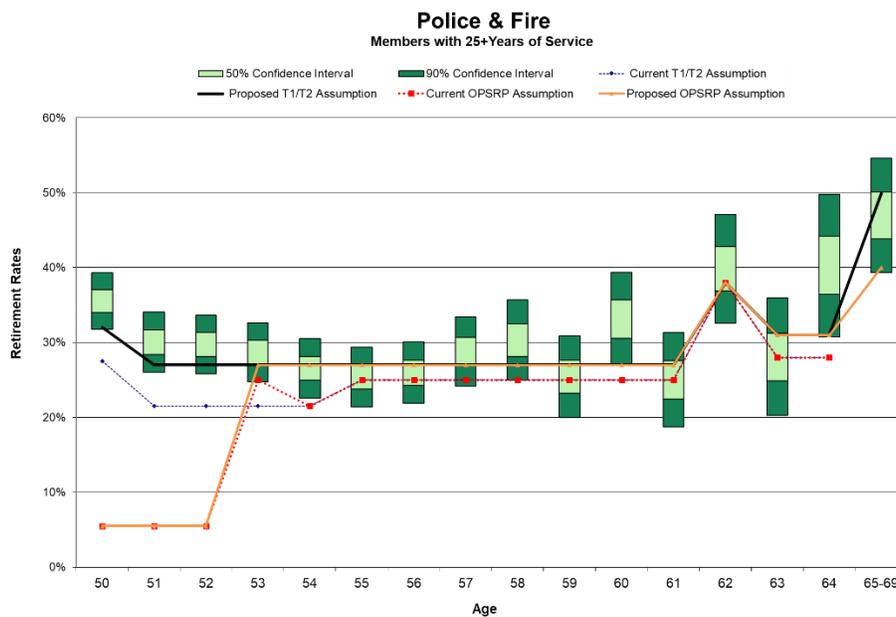


Retirement Assumptions (continued)

Members with 25 or More Years of Service

Police & fire members with 25 or more years of service can retire immediately at age 50 (53 for OPSRP) with unreduced retirement benefits. As a result, retirement rates at all ages are relatively high, with a spike at first eligibility for unreduced benefits, and another increase when Social Security benefits first become available.

The following chart shows the current assumed rates of retirement, the confidence interval around observed experience, and the recommended retirement rate assumption for police & fire members retiring with 25 or more years of service. All recent experience for members in this service band is for Tier 1 members.

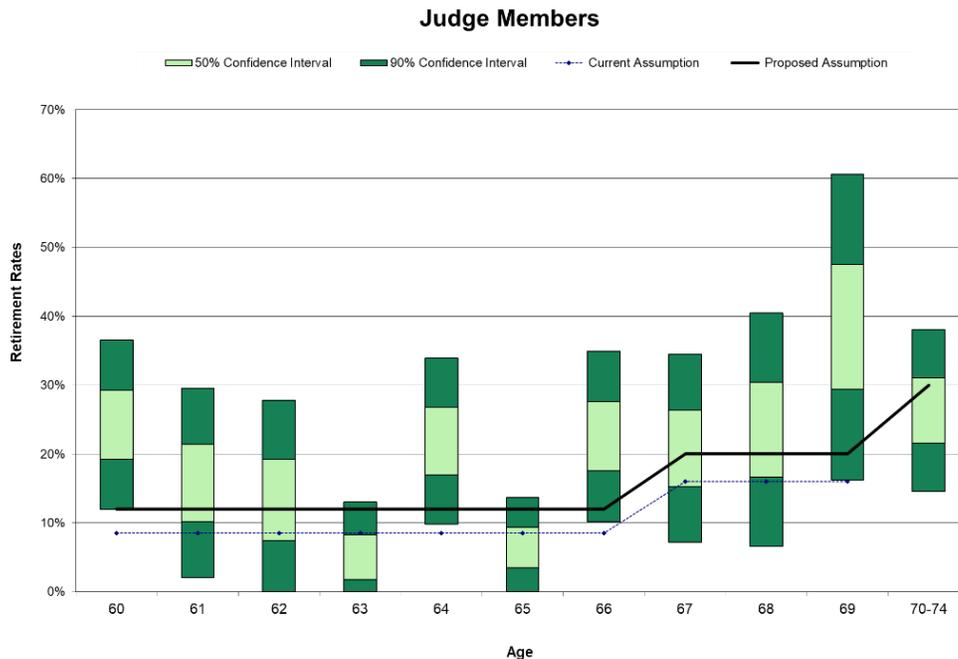


Retirement Assumptions (*continued*)

Judges

The vast majority of members of the State Judiciary elect to receive PERS benefits under Plan B. These benefits are available on an unreduced basis immediately upon retirement eligibility at age 60. As a result, there is relatively little variation in retirement rates by age for these members.

The following chart shows the current assumed rates of retirement, the confidence interval around observed experience, and the recommended retirement rate assumption for members of the State Judiciary.



Retirement Assumptions (continued)

Summary of Recommended Retirement Rates

The following table summarizes our recommended Tier 1/Tier 2 retirement rates:

Tier 1/Tier 2 Recommended December 31, 2020 and 2021 Valuations										
	Police & Fire			General Service			School Districts			Judges
Age	< 13 yrs	13-24 yrs	25+ yrs	<15 yrs	15-29 yrs	30+ yrs	<15 yrs	15-29 yrs	30+ yrs	
Less than 50						15.0%			25.0%	
50	1.5%	3.0%	32.0%			15.0%			25.0%	
51	1.5%	3.0%	27.0%			15.0%			25.0%	
52	1.5%	3.0%	27.0%			15.0%			25.0%	
53	1.5%	3.0%	27.0%			15.0%			25.0%	
54	1.5%	3.5%	27.0%			15.0%			25.0%	
55	3.0%	15.5%	27.0%	1.5%	2.5%	15.0%	1.5%	3.5%	25.0%	
56	3.0%	10.0%	27.0%	1.5%	2.5%	15.0%	1.5%	3.5%	25.0%	
57	3.0%	10.0%	27.0%	1.5%	2.5%	15.0%	1.5%	3.5%	25.0%	
58	6.0%	10.0%	27.0%	1.5%	9.0%	21.0%	1.5%	11.0%	27.5%	
59	6.0%	10.0%	27.0%	3.5%	9.0%	21.0%	4.5%	11.0%	27.5%	
60	6.0%	12.0%	27.0%	6.0%	11.0%	21.0%	6.5%	12.5%	27.5%	12.0%
61	6.0%	14.0%	27.0%	6.0%	11.0%	21.0%	6.5%	12.5%	27.5%	12.0%
62	15.0%	25.0%	38.0%	13.0%	19.5%	28.5%	15.0%	21.0%	34.0%	12.0%
63	15.0%	15.0%	31.0%	11.5%	16.5%	23.0%	13.0%	19.5%	27.5%	12.0%
64	15.0%	15.0%	31.0%	12.5%	16.5%	23.0%	13.0%	19.5%	27.5%	12.0%
65	40.0%	40.0%	50.0%	19.5%	28.0%	37.5%	25.5%	33.5%	45.0%	12.0%
66	40.0%	40.0%	50.0%	27.5%	36.0%	40.5%	23.0%	36.5%	45.0%	12.0%
67	40.0%	40.0%	50.0%	22.5%	26.5%	34.0%	21.0%	34.5%	38.0%	20.0%
68	40.0%	40.0%	50.0%	19.5%	26.5%	28.5%	21.0%	28.0%	28.5%	20.0%
69	40.0%	40.0%	50.0%	19.5%	26.5%	28.5%	21.0%	28.0%	28.5%	20.0%
70	100.0%	100.0%	100.0%	25.0%	28.5%	28.5%	21.0%	28.0%	28.5%	30.0%
71	100.0%	100.0%	100.0%	25.0%	28.5%	28.5%	21.0%	28.0%	28.5%	30.0%
72	100.0%	100.0%	100.0%	25.0%	28.5%	28.5%	21.0%	28.0%	28.5%	30.0%
73	100.0%	100.0%	100.0%	25.0%	28.5%	28.5%	21.0%	28.0%	28.5%	30.0%
74	100.0%	100.0%	100.0%	25.0%	28.5%	28.5%	21.0%	28.0%	28.5%	30.0%
75+	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Retirement Assumptions (continued)

The following table summarizes our recommended OPSRP retirement rates:

OPSRP Recommended December 31, 2020 and 2021 Valuations									
	Police & Fire			General Service			School Districts		
Age	< 13 yrs	13-24 yrs	25+ yrs	<15 yrs	15-29 yrs	30+ yrs	<15 yrs	15-29 yrs	30+ yrs
50	0.5%	1.5%	5.5%						
51	0.5%	1.5%	5.5%						
52	0.5%	1.5%	5.5%						
53	0.5%	1.5%	27.0%						
54	0.5%	1.5%	27.0%						
55	2.0%	5.0%	27.0%	1.0%	2.5%	5.0%	0.5%	2.5%	5.0%
56	2.0%	5.0%	27.0%	1.0%	2.5%	5.0%	0.5%	2.5%	5.0%
57	2.0%	5.0%	27.0%	1.0%	2.5%	7.5%	1.0%	2.5%	7.5%
58	5.0%	5.0%	27.0%	1.5%	3.0%	30.0%	1.5%	3.0%	30.0%
59	5.0%	5.0%	27.0%	2.0%	3.0%	25.0%	1.5%	3.0%	25.0%
60	5.0%	15.0%	27.0%	2.5%	3.75%	20.0%	2.5%	3.75%	20.0%
61	5.0%	8.5%	27.0%	2.5%	5.0%	20.0%	2.5%	5.0%	20.0%
62	10.0%	25.0%	38.0%	6.5%	12.0%	30.0%	6.0%	12.0%	30.0%
63	7.0%	15.0%	31.0%	6.5%	10.0%	20.0%	6.0%	10.0%	20.0%
64	7.0%	15.0%	31.0%	6.5%	10.0%	20.0%	6.0%	10.0%	20.0%
65	7.0%	35.0%	40.0%	15.5%	35.0%	20.0%	12.5%	35.0%	20.0%
66	7.0%	35.0%	40.0%	18.5%	33.0%	20.0%	12.5%	33.0%	20.0%
67	7.0%	35.0%	40.0%	17.0%	22.0%	30.0%	11.0%	22.0%	30.0%
68	7.0%	35.0%	40.0%	14.0%	20.0%	25.0%	9.0%	20.0%	25.0%
69	7.0%	35.0%	40.0%	14.0%	20.0%	25.0%	9.0%	20.0%	25.0%
70	100.0%	100.0%	100.0%	14.0%	20.0%	25.0%	9.0%	20.0%	25.0%
71	100.0%	100.0%	100.0%	14.0%	20.0%	25.0%	9.0%	20.0%	25.0%
72	100.0%	100.0%	100.0%	14.0%	20.0%	25.0%	9.0%	20.0%	25.0%
73	100.0%	100.0%	100.0%	14.0%	20.0%	25.0%	9.0%	20.0%	25.0%
74	100.0%	100.0%	100.0%	14.0%	20.0%	25.0%	9.0%	20.0%	25.0%
75+	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Retirement Assumptions (*continued*)

Lump Sum Option at Retirement

At retirement, a member has the option of electing a total lump sum distribution equal to two times the member's account balance, a partial lump sum distribution equal to the member's account balance with a reduced monthly allowance, or a monthly allowance with no lump sum distribution. The percentage of active members electing a lump sum distribution at retirement has declined slightly from the prior experience study. The results of our analysis are as follows:

Election at Retirement	Number of Retired Members	Percentage of Retirements	December 31, 2019 Valuation Assumption	Recommended December 31, 2020 and 2021 Valuations
Partial Lump Sum	443	2.1%	3.0%	2.0%
Total Lump Sum				
• 2015	110	2.0%	3.0%	N/A
• 2016	98	1.9%	2.5%	N/A
• 2017	103	1.6%	2.0%	N/A
• 2018	69	1.4%	1.5%	N/A
• 2019	38	0.7%	1.0%	N/A
• 2020	50	1.0%	0.5%	N/A
• 2021+	TBD	TBD	0.0%	0.0%

When a member elects a total or partial lump sum under Money Match or a partial lump sum under Full Formula, they give up the value of future COLAs (cost of living allowances) on the lump sum amount. A total lump sum election under Full Formula may cause the member to give up significantly more. Because there are no new contributions to member accounts and the system is projected to become dominated by Full Formula over time, we expect the total lump sum rate to decline over time.

Based on the data shown above, we recommend lowering the partial lump sum assumption of 3.0 percent to 2.0 percent. For the total lump sum assumption, in general we have seen a continuation of the long-term decrease in utilization of this option, despite a slight uptick in 2020. Given that recent experience has been at or below 1.0 percent and that a lower rate for this assumption is conservative (produces higher valuation liabilities), we recommend assuming no future total lump sum elections by members.

Retirement Assumptions (*continued*)

Purchase of Credited Service

A member has the option of purchasing service at retirement to enhance their retirement benefits. Service may be purchased under one or more of the following categories:

- Purchase of forfeited service
- Credit for waiting time
- Credit for educational service
- Credit for military service
- Credit for seasonal positions
- Credit for police officers and firefighters
- Purchase of retirement credit for disability time

Most purchases are full cost purchases, meaning the member pays both the member and employer cost to obtain the service. Since the member pays the full cost of the service purchased, the purchase produces no impact or only a small impact on projected Tier 1/Tier 2 employer costs. The most common, and predictable, non-full cost service purchase made by members is purchasing credit for the six-month waiting period. Thus, for valuation purposes, we have included an adjustment to account for those members who are expected to make the waiting period service purchase.

For Money Match retirements, the purchase of credited service is generally cost-neutral to the system, because the member is depositing both the member and employer contributions. Therefore, in reviewing actual experience, we examined non-Money Match retirements. The following table shows the number of members who retired in the experience period and elected to purchase credit for the six-month waiting period:

	Count	Number Electing to Purchase Waiting Time Service	Percentage of Retirements	December 31, 2019 Valuation Assumption	Recommended December 31, 2020 and 2021 Valuations
Non-Money Match Retirements	12,439	9,218	74%	70%	75%

We recommend increasing the assumption of non-Money Match retirements purchasing credited service for the six-month waiting period from 70 percent to 75 percent.

Retirement Assumptions (*continued*)

Oregon Residency Status

Members who are eligible for a tax remedy benefit adjustment under Senate Bill 656 or House Bill 3349 may only receive the adjustment if they remain residents of Oregon for tax purposes while retired. Since a member’s residency status may change multiple times during retirement, the residency status of a newly retired member may not be representative of that member’s probability of remaining resident later in retirement. As such, we analyzed the entire current population of retired members and beneficiaries who are eligible for a tax remedy and compared to the number who are currently receiving a tax remedy. The results of that analysis are as follows:

Number Eligible for Tax Remedy	Number Receiving Tax Remedy	Percentage Receiving Tax Remedy	December 31, 2019 Valuation Assumption	Recommended December 31, 2020 and 2021 Valuations
117,274	98,854	84%	85%	85%

Disability Incidence Assumptions

The Plan provides duty and non-duty disability benefits to members. Members are eligible to receive duty disability benefits if they become disabled as a direct result of a job-related injury or illness, regardless of length of service. Members are eligible for non-duty disability benefits (also referred to as ordinary disability) if they become disabled after ten years of service (six years if a judge), but prior to normal retirement eligibility.

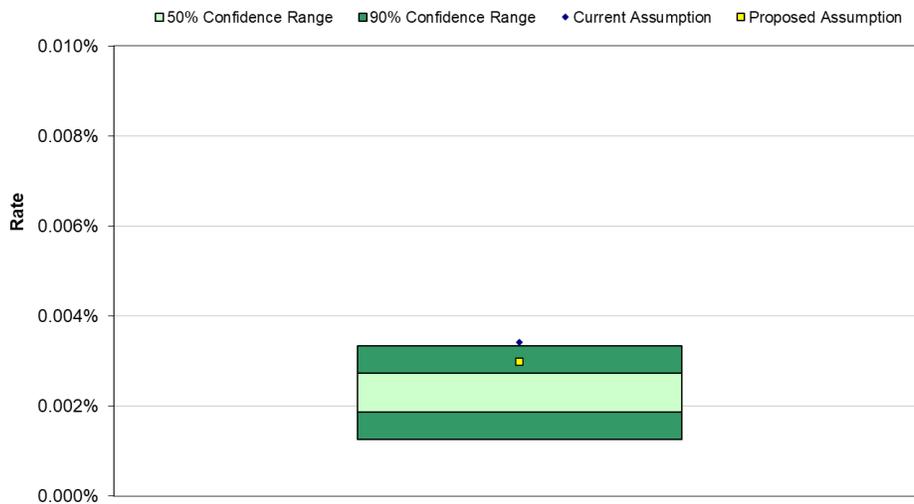
Duty disability incidence rates are developed separately for police & fire and general service members. Ordinary (non-duty) disability rates are developed for the system as a whole.

Duty Disability

Due to the limited amount of experience data available at some ages, this assumption employs a standard table adjusted to fit within the aggregate confidence interval.

The current assumed aggregate rate for the general service assumption is just above the 90 percent confidence interval of the disability rates experienced. As such, we recommend updating the assumption.

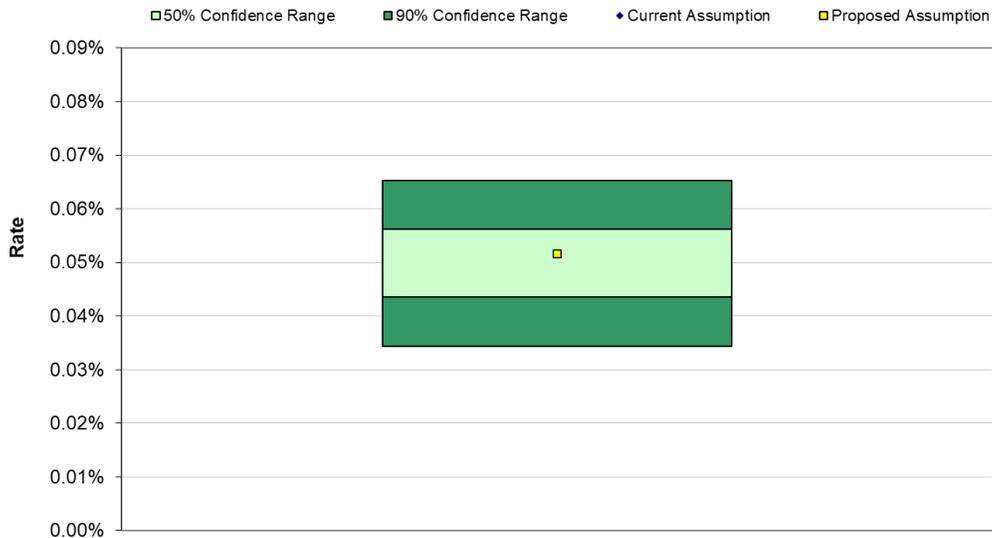
Duty Disability Rates - General Service
Aggregate Confidence Intervals and Rates



The current assumed aggregate rate for police & fire members is within the 50 percent confidence interval. As such, we recommend maintaining the current assumption and continuing to monitor experience in the next study.

Disability Incidence Assumptions (continued)

Duty Disability Rates - Police & Fire Aggregate Confidence Intervals and Rates

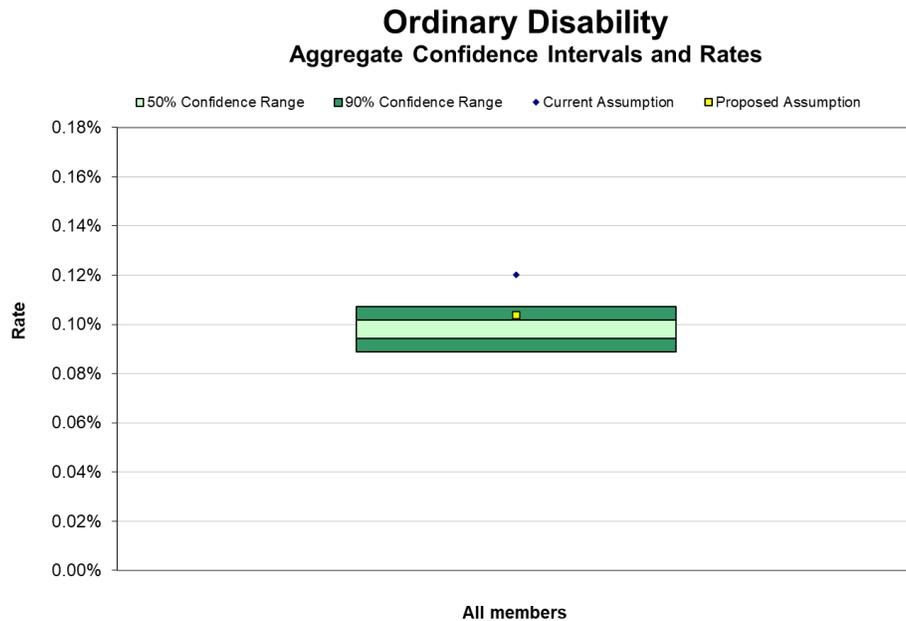


Ordinary (Non-Duty) Disability

As with duty disability, the experience data for ordinary disability was very limited at specific ages. Therefore, this assumption also uses a standard table adjusted to fit within the aggregate confidence interval. Based on the disability rates experienced in the observation period, we recommend lowering the ordinary disability incidence assumption at this time.

The data underlying the ordinary disability study showed a pattern wherein a member’s record would only be recognized as a disability retirement (rather than a service retirement or other separation from service) after a lag period that could span over a year. Because such lagged experience is not yet available for 2020, the final year of our study, we included in our analysis an assumption as to additional disabilities occurring in 2020 that will not be apparent until the subsequent reporting period. This assumption was based on an average of such records observed in the first three years of the study.

Disability Incidence Assumptions (continued)



The following table summarizes our recommended disability incidence rate assumptions:

	Percentage of the 1985 Disability Class 1 Rates (sample rates shown for ages 20–55)	
	December 31, 2019 Valuation	Recommended December 31, 2020 and 2021 Valuations
Duty Disability		
• Police & Fire	20% (0.0060%–0.1690%)	No change
• General Service	0.8% (0.0002%–0.0068%)	0.7% (0.0002%–0.0059%)
Ordinary Disability	30% with 0.18% cap (0.0090%–0.1800%)	25% with 0.16% cap (0.0075%–0.1600%)

Termination Assumptions

Not all active members are expected to continue working for covered employers until retirement. Termination rates represent the probabilities that a member will leave covered employment for causes other than retirement, disability or death at any given point during their working career.

Termination rates have been developed as service-based assumptions. The service-based assumptions reflect the experience of Tier 1, Tier 2, and OPSRP members, with each group affecting the period of the table relating to the relevant service amount.

Assumptions are developed for the following groups:

- School District males
- School District females
- Other General Service males
- Other General Service females
- Police & Fire (single table for both males and females)

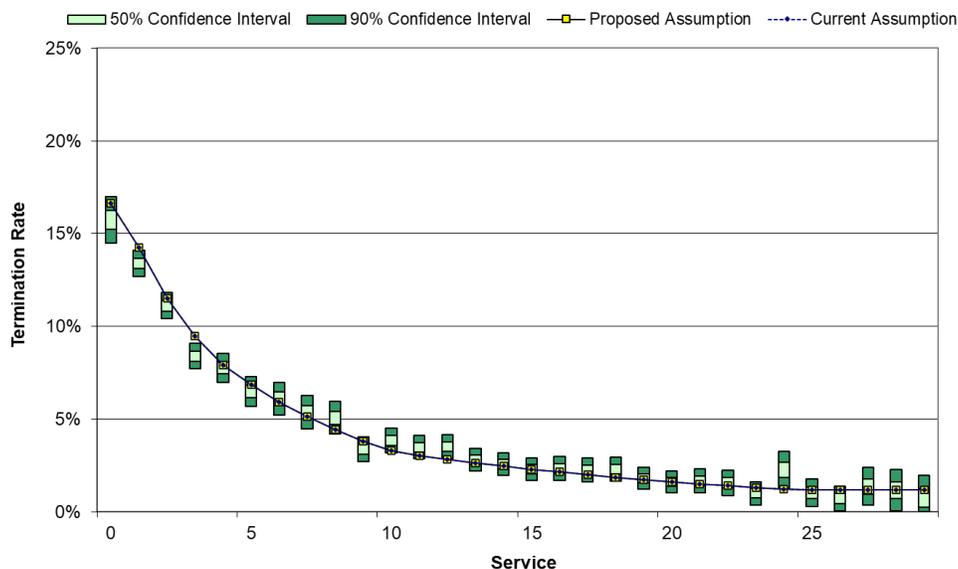
Termination Rates

The following charts show the confidence interval around observed experience and the recommended rates of termination by year of service. These charts are based on the observed experience of members in the relevant group during the study period. We recommend changes to the assumption for non-school district general service females. For the other four groups, we recommend maintaining the current assumption and evaluating again with the next study.

Full listings of recommended termination assumptions are included in the appendix.

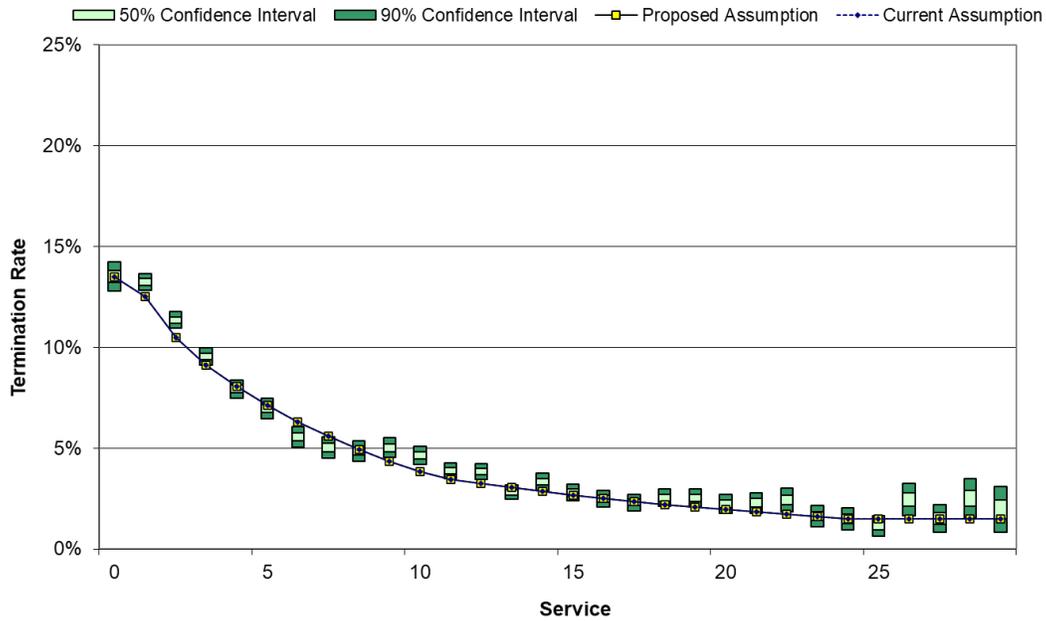
School Districts

School District Male



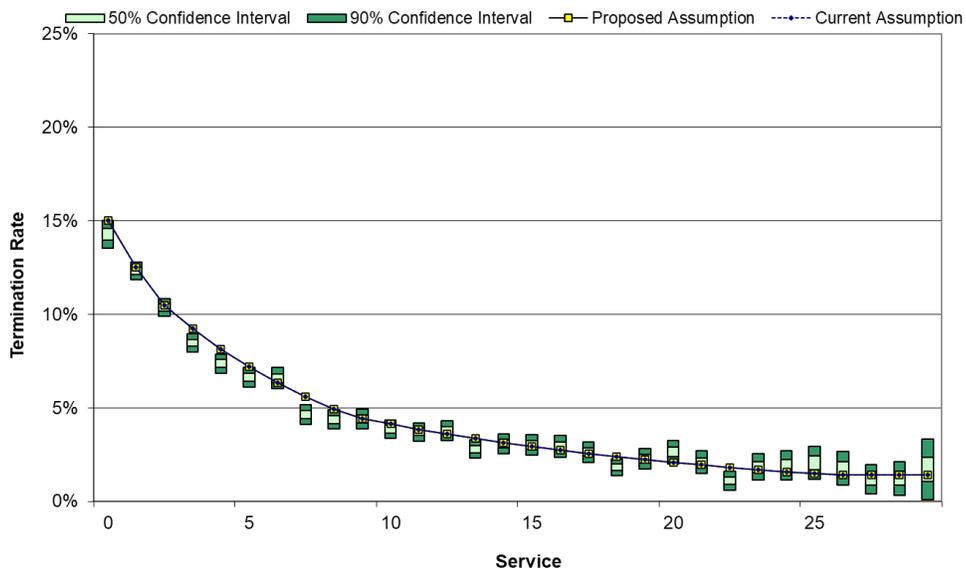
Termination Assumptions (continued)

School District Female



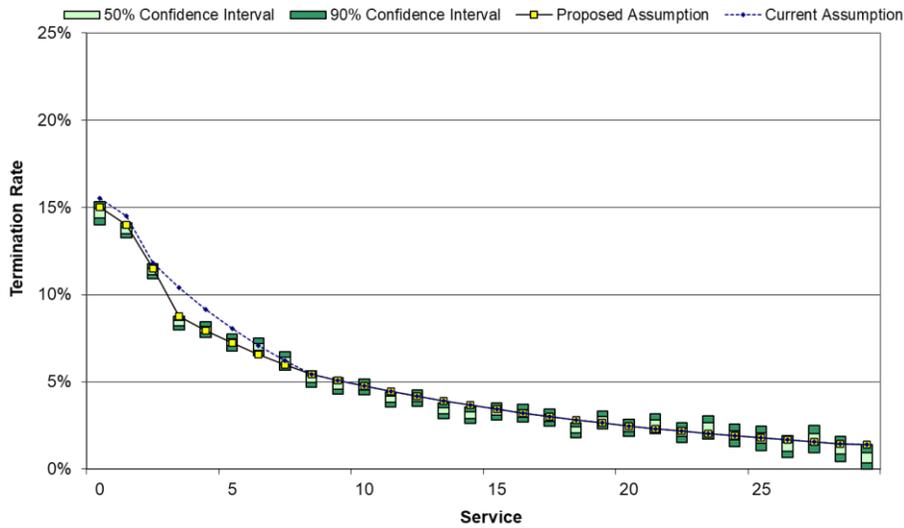
General Service

Other General Service Male



Termination Assumptions (*continued*)

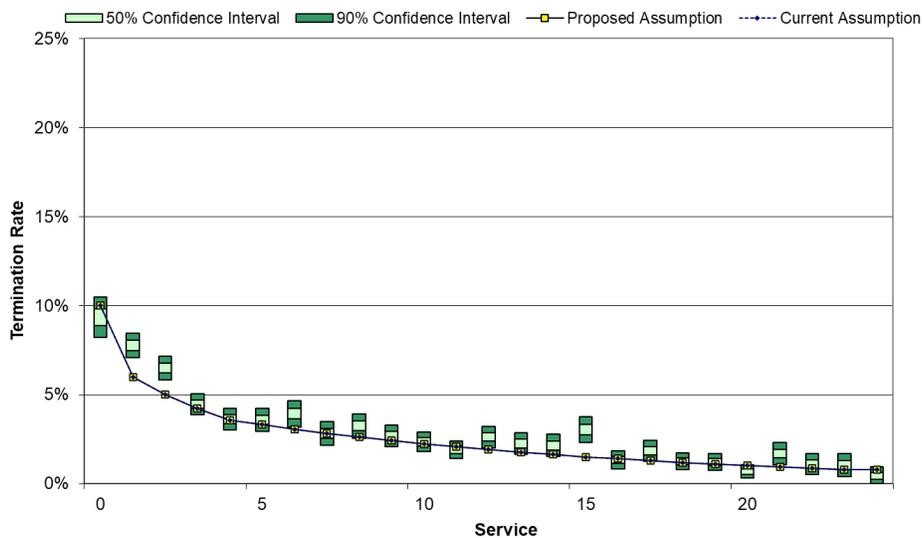
Other General Service Female



Police & Fire

All police & fire members were rated together, with no variation by group or gender. While actual terminations were higher than the current assumptions for current service of one and two years, this was primarily driven by outlier experience during 2020. Since this may not be predictive of future experience and the overall assumption still fit well, we are not recommending a change in assumption at this time.

Police & Fire



Salary Increase Assumptions

The salary increase assumptions analyzed with demographic experience were:

- Annual individual member salary increases
- Unused sick leave adjustments to final average salary at time of retirement for eligible members
- Unused vacation cash out adjustments to final average salary at time of retirement for eligible members

Annual Individual Member Salary Increases

The merit scale component of the annual individual member salary increase assumption is used in conjunction with the inflation and real wage growth assumptions to project annual individual member salary increases. In developing this assumption, our analysis first focused on the gross salary increases received by members during the observation period. The assumed merit (or longevity) component of the overall annual increase was then determined by backing out assumed inflation and real wage growth.

In order to capture experience across a broader range of budget, collective bargaining, and economic cycles, our initial analysis covered observed salary experience from 2012 through 2020. However, after discussion with PERS staff, certain data points were excluded due to the existence of one-off salary changes that are not expected to be indicative of anticipated future salary experience. These were:

- School district salary experience for 2020 was lower than most other years in the study. We understand at least part of the reason was due to furloughs effective in Spring 2020 during the early months of the pandemic.
- Salary increases for Other General Service in 2017 and 2019 and for police & fire in 2019 were affected by bargained changes wherein the 6% member contribution would no longer be “picked up” for a large number of members, and those members received a 6.95% salary increase when the change occurred.

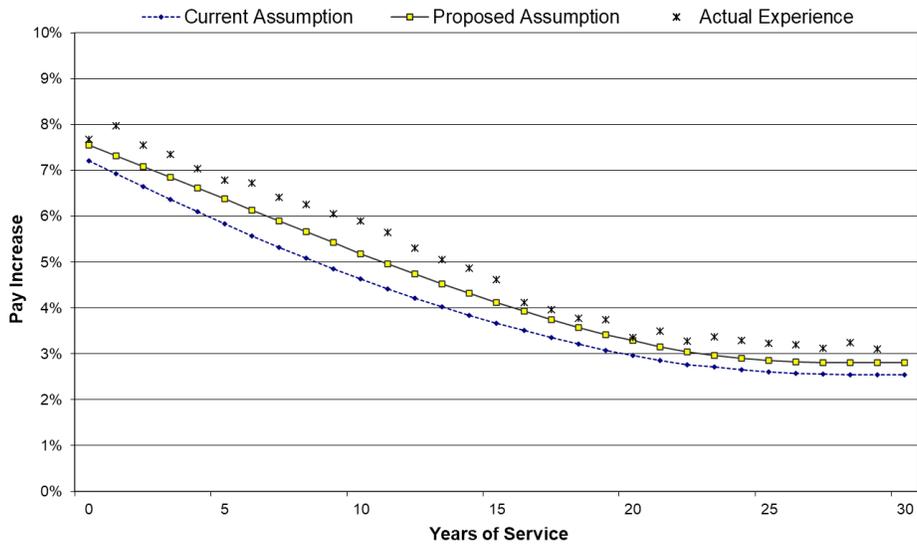
Assumptions are developed for the following groups:

- School Districts
- Other General Service
- Police & Fire

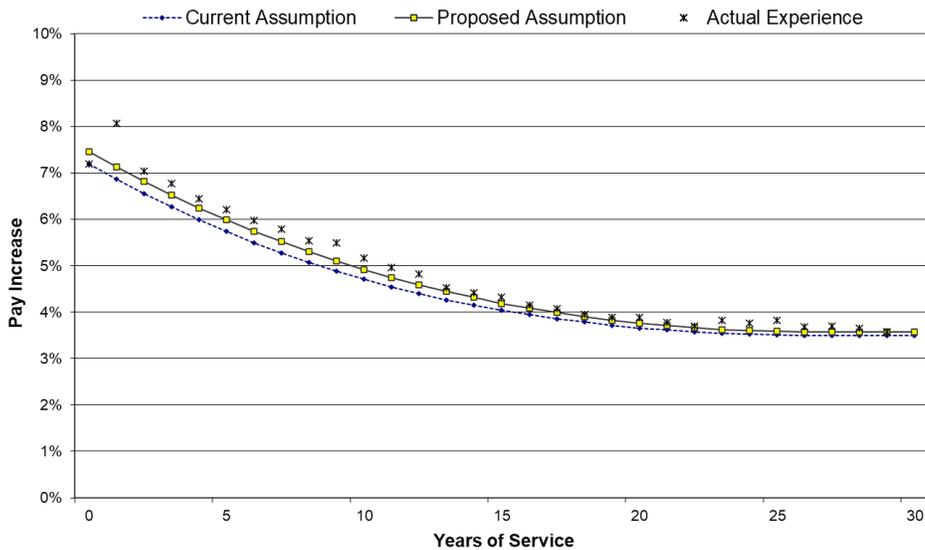
The following charts show the current assumed rates of gross salary increases, the average of salary increases based on the included experience (per the discussion above) over the study’s experience observation period, and the recommended rates of assumed gross individual member annual salary increases. We recommend increasing the current individual member salary increase assumption for all groups. The proposed rates strike a balance between the previous assumptions and the included experience from the study’s experience observation period.

Salary Increase Assumptions (*continued*)

School Districts

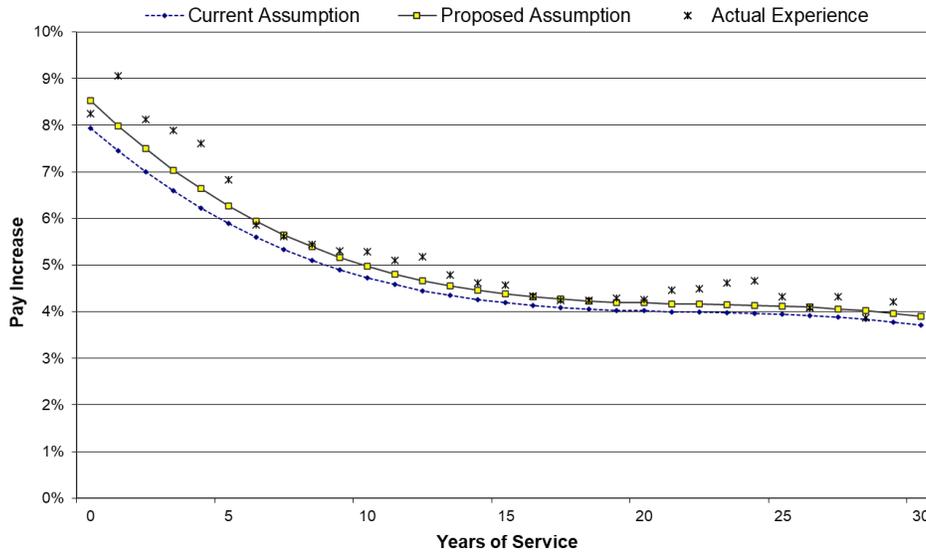


Other General Service



Salary Increase Assumptions (*continued*)

Police & Fire

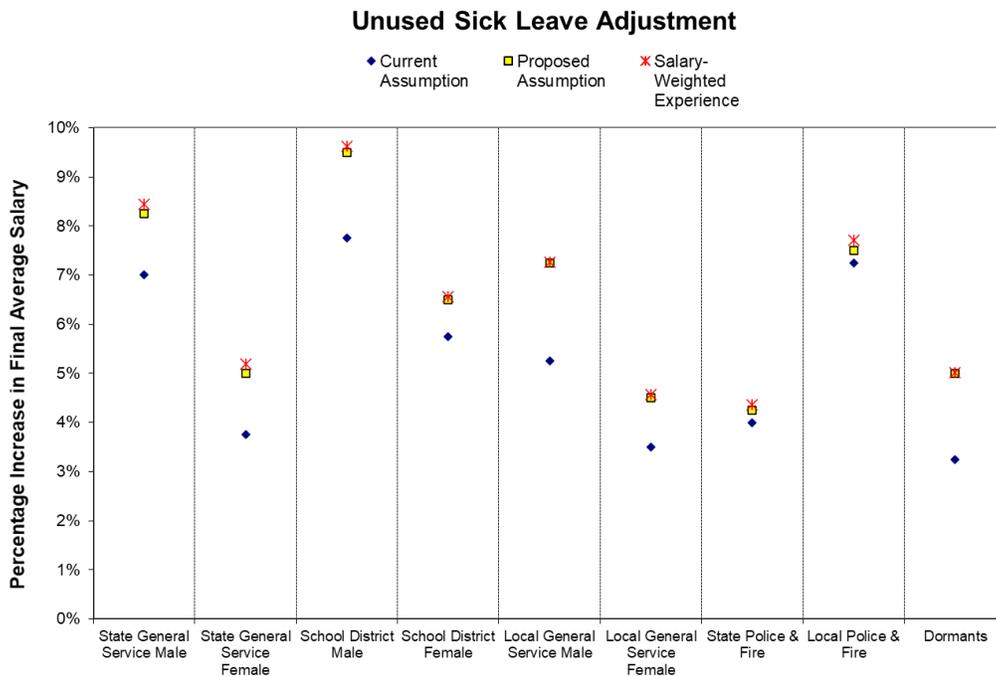


Salary Increase Assumptions (*continued*)

Unused Sick Leave Adjustment at Time of Retirement

Employers may elect to participate in the Unused Sick Leave Program. This program allows Tier 1/Tier 2 members to convert the value of one-half of their accumulated sick leave into additional retirement benefits. The assumption represents the percentage increase in a member’s final average salary due to the inclusion of the value of 50 percent of the member’s accumulated sick leave, and is only applied to employers who participate in the program.

For active members, there are currently eight sets of rates developed by employer group, employment category (general service or police & fire), and gender. In addition, a single rate is developed for eligible dormant members. The chart below shows the current assumption, the four-year average of the observed experience, and the recommended assumption for each of the groups studied.

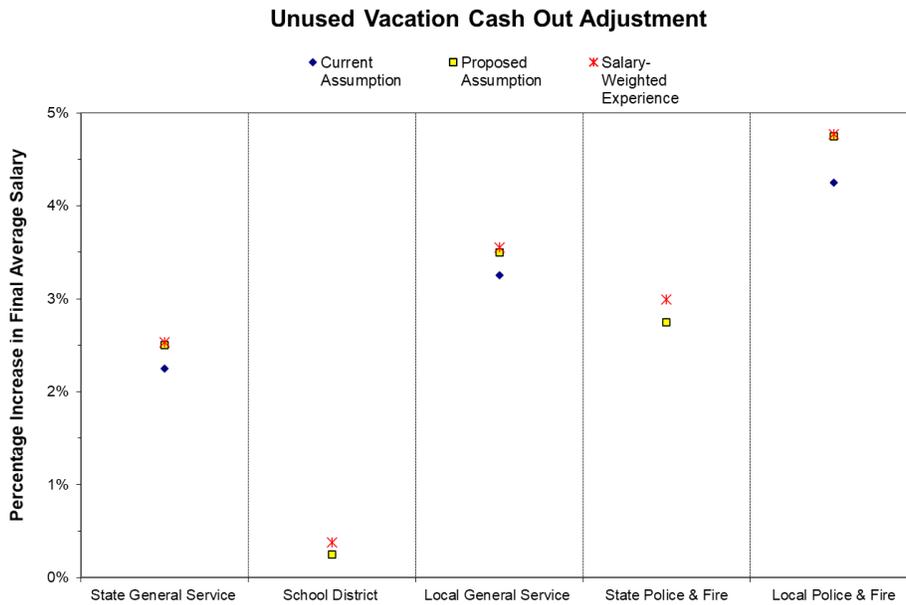


The non-retired Tier 1/Tier 2 population continues to decrease in size. While decreasing in number, the remaining group over time will have an increasing level of average service. As a result of these factors, we have continued to see the average unused sick leave adjustment per eligible member increase. To reflect that in this study, we have adjusted our analysis to more heavily weight experience for higher salary members, which has led to recommended increases to this assumption for all groups. While the recommended assumptions are higher, the assumption will apply to a smaller group over time.

Salary Increase Assumptions (*continued*)

Unused Vacation Cash Out Adjustment

Tier 1 members are eligible to include the value of any lump sum payment of unused vacation pay in the calculation of their final average salary. The assumption shown below represents the percentage increase in a member's final average salary expected to result from this provision. Similar to the unused sick leave adjustment we have adjusted our analysis to more heavily weight experience for higher salary members, though for the unused vacation cash out adjustment this led to recommended assumption updates for three of five groups, rather than all groups.



Retiree Healthcare Assumptions

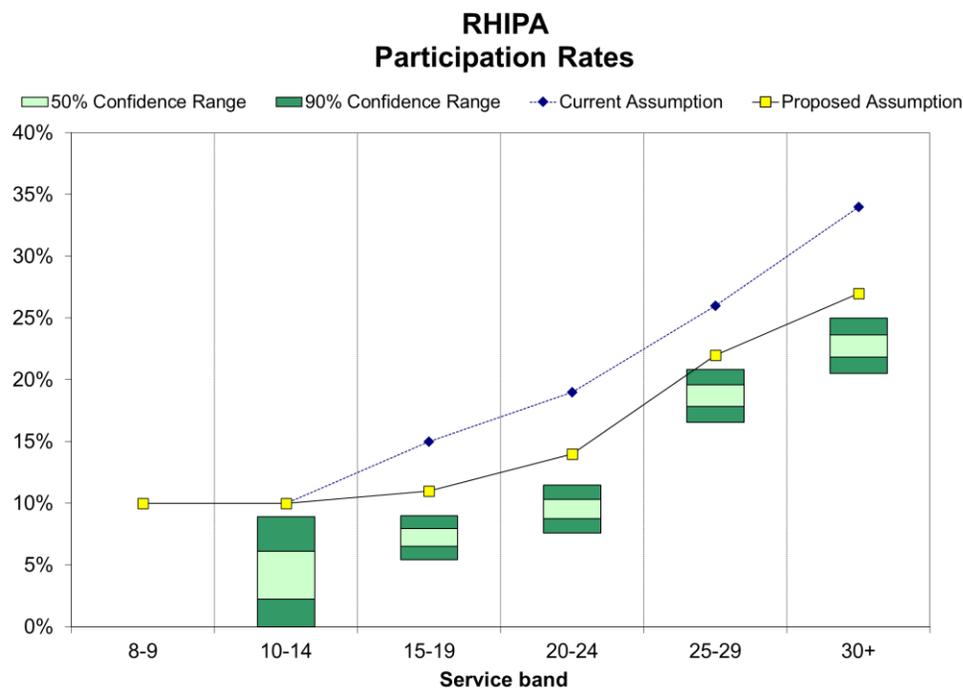
There are two retiree healthcare programs offered to eligible Tier 1/Tier 2 members, the Retiree Health Insurance Premium Account (RHIPA) and the Retiree Health Insurance Account (RHIA).

RHIPA

RHIPA is a program for eligible retirees from State of Oregon employment that provides a subsidized pre-Medicare insurance plan. In the previous valuation, the participation rate assumption for future eligible retirees varied based on service at the time of retirement, as the level of employer-paid benefits in the RHIPA program varies by service level. We recommend continuing this structure for the assumption.

The current participation assumptions are consistently higher than recent observed participation experience. We recommend decreasing the assumed participation level at most age ranges, as shown below. The level of participation in RHIPA may be affected, at least in part, by economic conditions, cost of coverage, competition from alternative programs available to retirees, and the impact of healthcare reform legislation becoming effective. Since changes in these factors could change participation rates in RHIPA quickly, we recommend that PERS monitor RHIPA participation levels of future eligible retirees on a regular basis.

The data underlying this study showed a pattern wherein members would sometimes not appear until one or two years following retirement. This may be due to a combination of participant behavior and administrative delay. Because such lagged experience is not yet available for the final two years of our study, we included in our analysis an assumption as to the number of additional enrollments not yet reported for members who retired during 2019 or 2020. This assumption was based on the number of such records observed in the first two years of the study.

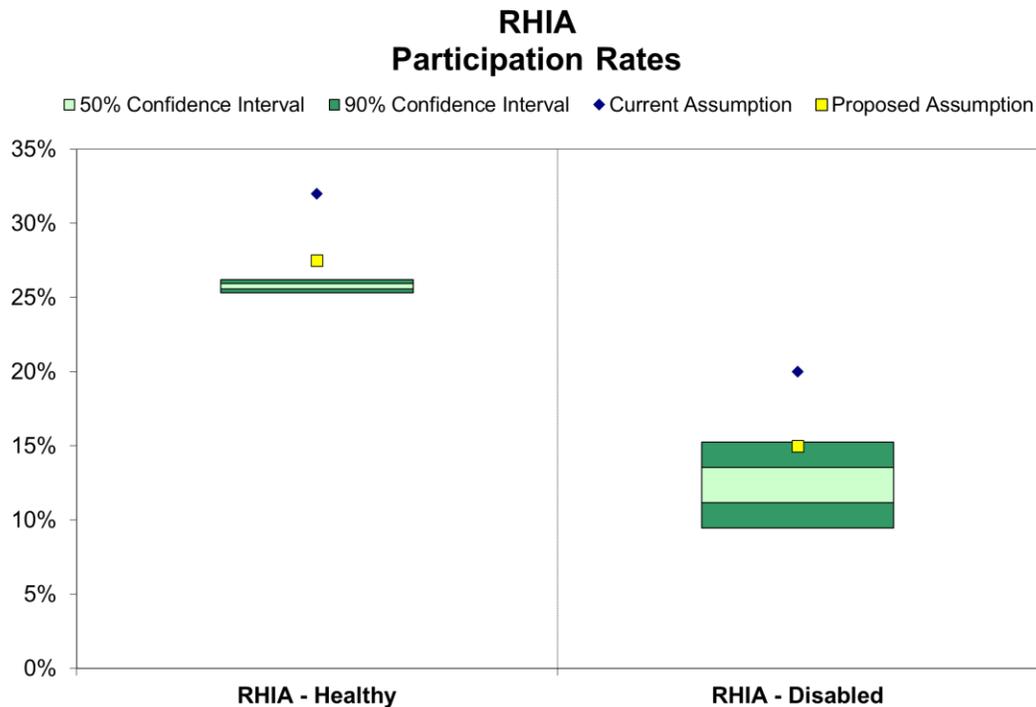


Retiree Healthcare Assumptions (*continued*)

RHIA

RHIA is a subsidized Medicare supplemental insurance program offered to all eligible Tier 1/Tier 2 retirees. Actual participation rates during the period of study were approximately 26 percent for healthy (i.e., non-disabled) retirees, compared to the current assumption of 32 percent. For disabled retirees, actual participation rates were approximately 12 percent compared to the current assumption of 20 percent. As shown in the table below, we recommend decreasing the healthy assumption to 27.5 percent and decreasing the disabled assumption to 15 percent.

The data underlying this study showed a pattern wherein members would sometimes not appear until one or two years following retirement (or reaching age 65 if already retired). This may be due to a combination of participant behavior and administrative delay. Because such lagged experience is not yet available for the final two years of our study, we included in our analysis an assumption as to the number of additional enrollments not yet reported for members who retired (or reached age 65 if already retired) during 2019 or 2020. This assumption was based on the number of such records observed in the first two years of the study.



5. Appendix

Data

Except where noted, the analysis in this study was based on data for the experience period from January 1, 2017 to December 31, 2020 as provided by the Oregon Public Employees Retirement System (PERS). PERS is solely responsible for the validity, accuracy and comprehensiveness of this information; the results of our analysis can be expected to differ and may need to be revised if the underlying data supplied is incomplete or inaccurate.

The member data was summarized according to the actual and potential member decrements for each year in the study. Actual and potential decrements were grouped according to age or service depending on the demographic assumption.

Assumption Tables

A complete listing of all the assumptions, methods and procedures presented to the Board for review on July 23, 2021 that are recommended to be used in the December 31, 2020 and December 31, 2021 actuarial valuations are summarized on the following pages.

Methods and Procedures

Actuarial cost method: Entry Age Normal

UAL amortization method: Level percent of combined Tier 1, Tier 2, and OPSRP payroll

UAL amortization period:

- Closed amortization from the first rate-setting valuation in which the experience is recognized
 - Tier 1/Tier 2 – 20 years
 - OPSRP – 16 years
 - RHIA/RHIPA – 10 years
 - Senate Bill 1049 was signed into law in June 2019 and requires a one-time re-amortization of Tier 1 /Tier 2 UAL over a closed 22-year period at the December 31, 2019 rate-setting actuarial valuation. This base will continue to be amortized as a closed period, with 20 years remaining as of the December 31, 2021 rate-setting actuarial valuation.
- In general side accounts are aligned with a 20-year period from the most recent rate-setting valuation. Employers who make lump sum payments in accordance with the rules under OAR 459-009-0086(9) may select a shorter amortization period of either 6, 10, or 16 years since the most recent rate-setting valuation.
- When RHIA or RHIPA is in an actuarial surplus position with a negative UAL, the actuarial surplus for that program is amortized over Tier 1/Tier 2 payroll using a rolling 20-year amortization basis. The resulting negative UAL Rate would be allowed to offset the Normal Cost Rate of the program, but not below a combined contribution rate of 0.0%.
- New transition liabilities are amortized over the 18-year period beginning when the employer joins the SLGRP.

Asset valuation method: Market value

Excluded reserves: Contingency Reserve, Capital Preservation Reserve. Rate Guarantee Reserve is excluded only when it is positive.

Contribution Rate Stabilization Method: The UAL Rate contribution rate component for a rate pool (e.g. Tier 1/Tier 2 SLGRP, Tier 1/Tier 2 School Districts, OPSRP) is confined to a collared range based on the prior biennium’s collared UAL Rate contribution rate component (prior to consideration of side account offsets, SLGRP transition liability or surplus rates, or pre-SLGRP liability rate charges or offsets).

Collar Width: the rate pool’s new UAL Rate contribution rate component will generally not increase or decrease from the prior biennium’s collared UAL Rate contribution rate component by more than the following amount:

- Tier 1/Tier 2 SLGRP and Tier 1/Tier 2 School District Pool: 3% of payroll
- OPSRP: 1% of payroll
- Tier 1/Tier 2 rates for independent employers: greater of 4% of payroll or one-third of the difference between the collared and uncollared UAL Rate at the prior rate-setting valuation. In addition, the UAL Rate will not be allowed to be less than 0.00% of payroll for any Tier 1/Tier 2 independent employer with a funded status (excluding side accounts) less than 100%.

UAL Rate decrease restrictions: the UAL Rate for any rate pool will not be allowed to decrease if the pool’s funded status is 87% (excluding side accounts) or lower; the allowable decrease will phase in to the full collar width from 87% funded to 90% funded.

Liability Allocation for Actives with Several Employers: Allocate Actuarial Accrued Liability 10% (0% for police & fire) based on account balance with each employer and 90% (100% for police & fire) based on service with each employer.

Allocate Normal Cost to current employer.

Projected System Average Level of Member Redirect Contributions:

- Tier 1/Tier 2 – 2.40% of payroll
- OPSRP – 0.65% of payroll

Allocation of Benefits-In-Force (BIF) Reserve: The BIF is allocated to each rate pool in proportion to the retiree liability attributable to the rate pool.

Recommended Economic Assumptions

Inflation	2.40% or lower
Real wage growth	1.00%
Payroll growth	3.40% or lower
Investment return	We recommend the Board reduce the assumption by at least 0.20% from the current level of 7.20%, based on current data from capital market outlook models. The Board will select the assumption at its July 23, 2021 meeting.
Interest crediting	
▪ Regular account	Equal to investment return assumption
▪ Variable account	Equal to investment return assumption
RHIPA subsidy cost trend rates	
▪ 2021 trend rate	5.90%
▪ Ultimate trend rate	3.90%
▪ Year reaching ultimate trend	2074

Demographic Assumptions

Mortality

Healthy Retiree Mortality												
Age	Other General Service				Other General Service							
	School District Male	Male	Police & Fire Male	School District Female	Female	Police & Fire Female						
Year of Birth	1950	1960	1950	1960	1950	1960	1950	1960	1950	1960		
50	0.001658	0.001484	0.001538	0.001380	0.002145	0.001920	0.000815	0.000730	0.002480	0.002220	0.001494	0.001340
51	0.001789	0.001600	0.003292	0.002947	0.002333	0.002087	0.000873	0.000781	0.002576	0.002304	0.001646	0.001474
52	0.001918	0.001718	0.003510	0.003139	0.002524	0.002259	0.000940	0.000841	0.002688	0.002406	0.001826	0.001633
53	0.002064	0.001850	0.003739	0.003347	0.002732	0.002448	0.000993	0.000890	0.002797	0.002506	0.002010	0.001799
54	0.002212	0.001987	0.003973	0.003560	0.002965	0.002663	0.001056	0.000948	0.002901	0.002605	0.002211	0.001981
55	0.002360	0.002125	0.004202	0.003780	0.003227	0.002901	0.001119	0.001000	0.003017	0.002712	0.002438	0.002189
56	0.002508	0.002253	0.004438	0.004013	0.003455	0.003127	0.001182	0.001052	0.003124	0.002825	0.002692	0.002420
57	0.002656	0.002381	0.004673	0.004243	0.003690	0.003351	0.001245	0.001104	0.003231	0.002934	0.002803	0.002575
58	0.002804	0.002509	0.004908	0.004473	0.003925	0.003576	0.001308	0.001162	0.003338	0.003047	0.002912	0.002683
59	0.002952	0.002627	0.005143	0.004698	0.004160	0.003807	0.001371	0.001215	0.003445	0.003154	0.003027	0.002800
60	0.003100	0.002745	0.005378	0.004933	0.004395	0.004032	0.001434	0.001277	0.003552	0.003261	0.003134	0.002858
61	0.003248	0.002870	0.005613	0.005168	0.004626	0.004263	0.001497	0.001339	0.003659	0.003368	0.003241	0.002916
62	0.003396	0.002991	0.005848	0.005403	0.004861	0.004498	0.001560	0.001391	0.003766	0.003475	0.003348	0.003024
63	0.003544	0.003073	0.006083	0.005648	0.005094	0.004731	0.001623	0.001443	0.003873	0.003582	0.003455	0.003130
64	0.003692	0.003191	0.006318	0.005883	0.005312	0.004949	0.001686	0.001495	0.003980	0.003691	0.003564	0.003246
65	0.003840	0.003309	0.006553	0.006128	0.005557	0.005174	0.001749	0.001549	0.004087	0.003800	0.003673	0.003352
66	0.003988	0.003417	0.006788	0.006363	0.005796	0.005413	0.001812	0.001591	0.004194	0.003905	0.003778	0.003460
67	0.004136	0.003525	0.007023	0.006608	0.006032	0.005649	0.001875	0.001631	0.004301	0.004012	0.003881	0.003568
68	0.004284	0.003633	0.007258	0.006843	0.006276	0.005891	0.001938	0.001683	0.004408	0.004119	0.003990	0.003676
69	0.004432	0.003751	0.007493	0.007078	0.006511	0.006152	0.002001	0.001734	0.004515	0.004226	0.004101	0.003784
70	0.004580	0.003869	0.007728	0.007313	0.006745	0.006386	0.002064	0.001785	0.004622	0.004333	0.004218	0.003892
71	0.004728	0.003977	0.007963	0.007548	0.006978	0.006619	0.002127	0.001837	0.004729	0.004440	0.004325	0.003940
72	0.004876	0.004086	0.008198	0.007783	0.007212	0.006853	0.002190	0.001889	0.004836	0.004547	0.004432	0.004028
73	0.005024	0.004195	0.008433	0.008018	0.007447	0.007082	0.002253	0.001941	0.004943	0.004654	0.004539	0.004134
74	0.005172	0.004284	0.008668	0.008253	0.007682	0.007317	0.002316	0.001993	0.005050	0.004761	0.004646	0.004242
75	0.005320	0.004376	0.008903	0.008488	0.007917	0.007552	0.002379	0.002045	0.005157	0.004868	0.004753	0.004350
76	0.005468	0.004467	0.009138	0.008723	0.008152	0.007787	0.002442	0.002097	0.005264	0.004975	0.004860	0.004458
77	0.005616	0.004559	0.009373	0.008958	0.008382	0.008017	0.002505	0.002149	0.005371	0.005078	0.004963	0.004561
78	0.005764	0.004651	0.009608	0.009193	0.008617	0.008252	0.002568	0.002201	0.005478	0.005185	0.005070	0.004668
79	0.005912	0.004743	0.009843	0.009428	0.008852	0.008487	0.002631	0.002253	0.005585	0.005292	0.005177	0.004776
80	0.006060	0.004835	0.010078	0.009663	0.009087	0.008722	0.002694	0.002306	0.005692	0.005400	0.005285	0.004884
81	0.006208	0.004927	0.010313	0.009898	0.009322	0.008957	0.002757	0.002358	0.005800	0.005507	0.005392	0.004991
82	0.006356	0.005019	0.010548	0.010133	0.009557	0.009192	0.002820	0.002410	0.005907	0.005615	0.005500	0.005099
83	0.006504	0.005111	0.010783	0.010368	0.009791	0.009426	0.002883	0.002462	0.006014	0.005722	0.005607	0.005206
84	0.006652	0.005203	0.011018	0.010603	0.010010	0.009645	0.002946	0.002514	0.006121	0.005829	0.005714	0.005313
85	0.006800	0.005295	0.011253	0.010838	0.010240	0.009880	0.003009	0.002566	0.006228	0.005936	0.005821	0.005420
86	0.006948	0.005387	0.011488	0.011073	0.010475	0.010110	0.003072	0.002618	0.006335	0.006043	0.005948	0.005547
87	0.007096	0.005479	0.011723	0.011308	0.010710	0.010345	0.003135	0.002670	0.006442	0.006150	0.006065	0.005664
88	0.007244	0.005571	0.011958	0.011543	0.010945	0.010580	0.003198	0.002722	0.006550	0.006258	0.006173	0.005782
89	0.007392	0.005663	0.012193	0.011778	0.011180	0.010815	0.003261	0.002774	0.006658	0.006366	0.006281	0.005890
90	0.007540	0.005755	0.012428	0.012013	0.011415	0.011050	0.003324	0.002826	0.006766	0.006474	0.006389	0.005998
91	0.007688	0.005847	0.012663	0.012248	0.011650	0.011285	0.003387	0.002878	0.006874	0.006582	0.006497	0.006106
92	0.007836	0.005939	0.012898	0.012483	0.011885	0.011520	0.003450	0.002930	0.006982	0.006690	0.006605	0.006214
93	0.007984	0.006031	0.013133	0.012718	0.012120	0.011755	0.003513	0.002982	0.007090	0.006800	0.006715	0.006324
94	0.008132	0.006123	0.013368	0.012953	0.012345	0.011980	0.003576	0.003034	0.007198	0.006908	0.006823	0.006432
95	0.008280	0.006215	0.013603	0.013188	0.012580	0.012215	0.003639	0.003086	0.007306	0.007016	0.006931	0.006540
96	0.008428	0.006307	0.013838	0.013423	0.012815	0.012450	0.003702	0.003138	0.007414	0.007124	0.007039	0.006648
97	0.008576	0.006399	0.014073	0.013658	0.013050	0.012685	0.003765	0.003190	0.007522	0.007232	0.007147	0.006756
98	0.008724	0.006491	0.014308	0.013893	0.013285	0.012920	0.003828	0.003242	0.007630	0.007340	0.007255	0.006864
99	0.008872	0.006583	0.014543	0.014128	0.013520	0.013155	0.003891	0.003294	0.007738	0.007448	0.007363	0.006972
100	0.009020	0.006675	0.014778	0.014363	0.013755	0.013390	0.003954	0.003346	0.007846	0.007556	0.007471	0.007080
101	0.009168	0.006767	0.015013	0.014598	0.013990	0.013625	0.004017	0.003398	0.007954	0.007664	0.007579	0.007188
102	0.009316	0.006859	0.015248	0.014833	0.014225	0.013860	0.004080	0.003450	0.008062	0.007772	0.007687	0.007296
103	0.009464	0.006951	0.015483	0.015068	0.014460	0.014095	0.004143	0.003502	0.008170	0.007880	0.007795	0.007404
104	0.009612	0.007043	0.015718	0.015303	0.014695	0.014330	0.004206	0.003554	0.008278	0.008000	0.007915	0.007524
105	0.009760	0.007135	0.015953	0.015538	0.014930	0.014565	0.004269	0.003606	0.008386	0.008108	0.008023	0.007632
106	0.009908	0.007227	0.016188	0.015773	0.015165	0.014800	0.004332	0.003658	0.008494	0.008216	0.008131	0.007740
107	0.010056	0.007319	0.016423	0.016008	0.015390	0.015025	0.004395	0.003710	0.008602	0.008324	0.008239	0.007848
108	0.010204	0.007411	0.016658	0.016243	0.015625	0.015260	0.004458	0.003762	0.008710	0.008432	0.008347	0.007956
109	0.010352	0.007503	0.016893	0.016478	0.015860	0.015495	0.004521	0.003814	0.008818	0.008540	0.008455	0.008064
110	0.010500	0.007595	0.017128	0.016713	0.016092	0.015730	0.004584	0.003866	0.008926	0.008648	0.008563	0.008172
111	0.010648	0.007687	0.017363	0.016948	0.016337	0.015975	0.004647	0.003918	0.009034	0.008756	0.008671	0.008280
112	0.010796	0.007779	0.017598	0.017183	0.016572	0.016210	0.004710	0.003970	0.009142	0.008864	0.008779	0.008388
113	0.010944	0.007871	0.017833	0.017418	0.016807	0.016445	0.004773	0.004022	0.009250	0.008968	0.008883	0.008492
114	0.011092	0.007963	0.018068	0.017653	0.017042	0.016680	0.004836	0.004074	0.009358	0.009076	0.008991	0.008599
115	0.0											

Demographic Assumptions (continued)

Age	Beneficiary Mortality				Disabled Retired Mortality			
	Male		Female		Police & Fire	Police & Fire	General Service	General Service
	Male	Female	Male	Female	Male	Female	Male	Female
	Pub2010 Retiree, General Employees, Generational w/Social Security Data Scale, 1 year setback		Pub2010 Retiree, General Employees, Generational w/Social Security Data Scale, 0 year setback		Blended 50% Pub2010 Public Safety Disabled Retiree/50% Non-Safety Disabled Retiree, Generational w/Social Security Data Scale, 0 year setback		Disabled Retiree, Generational w/Social Security Data Scale, 2 year setfor ward	
	Pub2010 Retiree, General Employees, Generational w/Social Security Data Scale, 1 year setback		Pub2010 Retiree, General Employees, Generational w/Social Security Data Scale, 0 year setback		Blended 50% Pub2010 Public Safety Disabled Retiree/50% Non-Safety Disabled Retiree, Generational w/Social Security Data Scale, 0 year setback		Disabled Retiree, Generational w/Social Security Data Scale, 1 year setfor ward	
Year of Birth	1950	1960	1950	1960	1950	1950	1950	1950
50	0.001538	0.001380	0.002480	0.002220	0.010935	0.009980	0.020306	0.017163
51	0.003292	0.002947	0.002576	0.002304	0.011527	0.010310	0.021201	0.017531
52	0.003510	0.003139	0.002688	0.002406	0.012089	0.010630	0.022015	0.017903
53	0.003739	0.003347	0.002797	0.002506	0.012638	0.010959	0.022777	0.018243
54	0.003973	0.003560	0.002901	0.002605	0.013163	0.011285	0.023449	0.018570
55	0.004232	0.003800	0.003017	0.002712	0.013680	0.011618	0.024036	0.018860
56	0.004498	0.004043	0.003140	0.002825	0.014176	0.011944	0.024585	0.019121
57	0.004779	0.004300	0.003282	0.002954	0.014662	0.012267	0.025092	0.019355
58	0.005076	0.004568	0.003433	0.003083	0.015158	0.012598	0.025595	0.019564
59	0.005388	0.004838	0.003619	0.003244	0.015661	0.012926	0.026135	0.019780
60	0.005730	0.005135	0.003840	0.003434	0.016190	0.013275	0.026770	0.020000
61	0.006082	0.005439	0.004113	0.003671	0.016773	0.013644	0.027519	0.020272
62	0.006461	0.005767	0.004435	0.003947	0.017424	0.014053	0.028375	0.020601
63	0.006885	0.006127	0.004824	0.004279	0.018161	0.014509	0.029322	0.020993
64	0.007340	0.006512	0.005256	0.004648	0.018975	0.015014	0.030351	0.021462
65	0.007862	0.006954	0.005759	0.005084	0.019871	0.015582	0.031454	0.022019
66	0.008471	0.007478	0.006320	0.005568	0.020838	0.016213	0.032658	0.022691
67	0.009178	0.008085	0.006950	0.006116	0.021887	0.016935	0.033936	0.023508
68	0.010003	0.008803	0.007671	0.006757	0.023040	0.017763	0.035333	0.024469
69	0.010965	0.009659	0.008483	0.007480	0.024280	0.018694	0.036828	0.025603
70	0.012063	0.010637	0.009393	0.008299	0.025659	0.019757	0.038500	0.026879
71	0.013318	0.011767	0.010406	0.009204	0.027154	0.020921	0.040316	0.028362
72	0.014697	0.013000	0.011550	0.010236	0.028865	0.022238	0.042373	0.030005
73	0.016274	0.014424	0.012812	0.011367	0.030765	0.023674	0.044672	0.031905
74	0.018005	0.015973	0.014239	0.012658	0.032961	0.025299	0.047293	0.034045
75	0.019982	0.017763	0.015831	0.014102	0.035449	0.027096	0.050158	0.036502
76	0.022197	0.019773	0.017629	0.015751	0.038293	0.029145	0.053261	0.039192
77	0.024731	0.022097	0.019621	0.017566	0.041400	0.031379	0.056721	0.042123
78	0.027542	0.024658	0.021821	0.019556	0.044722	0.033906	0.060544	0.045375
79	0.030654	0.027472	0.024293	0.021794	0.048322	0.036892	0.065006	0.048965
80	0.034147	0.030633	0.027096	0.024332	0.052199	0.040196	0.070054	0.053142
81	0.038086	0.034202	0.030405	0.027387	0.056636	0.044038	0.075772	0.057896
82	0.042698	0.038460	0.034278	0.031000	0.061637	0.048418	0.082045	0.063315
83	0.048030	0.043437	0.038811	0.035278	0.067342	0.053432	0.089077	0.069334
84	0.054165	0.049234	0.044063	0.040254	0.073725	0.059043	0.096772	0.076209
85	0.061072	0.055793	0.050252	0.046187	0.081100	0.065490	0.104953	0.083561
86	0.068991	0.063410	0.057440	0.053114	0.089350	0.072585	0.114216	0.091036
87	0.077827	0.071965	0.065535	0.060905	0.098622	0.080111	0.125638	0.099064
88	0.087423	0.081247	0.074939	0.070067	0.109228	0.088534	0.138491	0.107182
89	0.098309	0.091917	0.085301	0.080157	0.121484	0.097479	0.152000	0.115757
90	0.110031	0.103396	0.096768	0.091391	0.135261	0.107323	0.166052	0.125006
91	0.122894	0.116066	0.109179	0.103632	0.149743	0.118001	0.180697	0.135105
92	0.136853	0.129901	0.122464	0.116828	0.164779	0.129564	0.195456	0.146306
93	0.151900	0.144910	0.136658	0.131026	0.180609	0.142119	0.211064	0.158351
94	0.168064	0.161137	0.151362	0.145708	0.195976	0.155325	0.226988	0.171879
95	0.184738	0.177836	0.167096	0.161501	0.211681	0.169781	0.242365	0.186438
96	0.202470	0.195690	0.183365	0.177760	0.227291	0.185015	0.258716	0.201431
97	0.220471	0.213731	0.199341	0.193441	0.242067	0.200321	0.275039	0.217578
98	0.237603	0.230571	0.216239	0.210049	0.257827	0.216705	0.293132	0.234042
99	0.255275	0.247968	0.233167	0.226493	0.273634	0.233296	0.311698	0.252430
100	0.272315	0.264520	0.251723	0.244763	0.291493	0.251723	0.330164	0.271627
101	0.290677	0.282640	0.270894	0.263668	0.310018	0.270894	0.346957	0.291037
102	0.309181	0.300933	0.290280	0.282820	0.328450	0.290280	0.364692	0.309212
103	0.327596	0.319177	0.308408	0.300483	0.345156	0.308408	0.381945	0.328481
104	0.344258	0.335412	0.327660	0.319560	0.362870	0.327660	0.398626	0.347498
105	0.361963	0.353015	0.346664	0.338433	0.380114	0.346664	0.414658	0.366118
106	0.379202	0.370198	0.365276	0.356961	0.396794	0.365276	0.428006	0.384224
107	0.395882	0.386870	0.383378	0.375027	0.412836	0.383378	0.442479	0.399807
108	0.411927	0.402954	0.398927	0.390237	0.426124	0.398927	0.454188	0.416454
109	0.425187	0.415925	0.415579	0.406934	0.440622	0.415579	0.465511	0.432338
110	0.439697	0.430550	0.431474	0.422922	0.452373	0.431474	0.476929	0.447417
111	0.451469	0.442520	0.446566	0.438154	0.463782	0.446566	0.488306	0.456106
112	0.452919	0.444387	0.455285	0.447156	0.465285	0.455285	0.489663	0.455285
113	0.454466	0.446351	0.454466	0.446351	0.466784	0.454466	0.491020	0.456544
114	0.456013	0.448315	0.456013	0.448315	0.468282	0.456013	0.492377	0.457801
115	0.457560	0.450279	0.457560	0.450279	0.469780	0.457560	0.493734	0.459058
116	0.459107	0.452243	0.459107	0.452243	0.471278	0.459107	0.495091	0.460315
117	0.460654	0.454307	0.460654	0.454307	0.472776	0.460654	0.496448	0.461572
118	0.462201	0.456371	0.462201	0.456371	0.474274	0.462201	0.497805	0.462829
119	0.463748	0.458435	0.463748	0.458435	0.475772	0.463748	0.499162	0.464110
120	0.465295	0.460500	0.465295	0.460500	0.477270	0.465295	0.500519	0.465391

This work product was prepared solely for Oregon Public Employees Retirement System for the purposes stated herein, and may not be appropriate to use for other purposes. Milliman does not intend to benefit and assumes no duty or liability to other parties who receive this work. Milliman recommends that third parties be aided by their own actuary or other qualified professional when reviewing the Milliman work product.

Demographic Assumptions (continued)

Non-Annuitant Mortality												
Age	School District		Other General		School District		Other General		Police & Fire		Police & Fire	
	Male		Service Male		Police & Fire Male		Female		Service Female		Female	
	125% of Pub2010 Employee, Blended 80% Teachers/20% General Employees, Generational w /Social Security Data Scale, 0 year setback		115% of Pub2010 Employee, General Employees, Generational w /Social Security Data Scale, 1 year setback		100% of Pub2010 Employee, Public Safety, Generational w /Social Security Data Scale, 0 year setback		100% Pub2010 Employee, Teachers, Generational w /Social Security Data Scale, 0 year setback		125% of Pub2010 Employee, General Employees, Generational w /Social Security Data Scale, 0 year setback		100% of Pub2010 Employee, Public Safety, Generational w /Social Security Data Scale, 1 year setback	
Year of Birth	1950	1960	1950	1960	1950	1960	1950	1960	1950	1960	1950	1960
30	0.000336	0.000327	0.000420	0.000410	0.000445	0.000433	0.000152	0.000148	0.000203	0.000198	0.000269	0.000262
31	0.000365	0.000355	0.000448	0.000436	0.000458	0.000445	0.000164	0.000159	0.000218	0.000212	0.000292	0.000284
32	0.000384	0.000371	0.000475	0.000461	0.000472	0.000456	0.000176	0.000170	0.000247	0.000239	0.000305	0.000296
33	0.000414	0.000399	0.000503	0.000487	0.000486	0.000469	0.000188	0.000181	0.000263	0.000253	0.000328	0.000317
34	0.000434	0.000416	0.000532	0.000513	0.000501	0.000481	0.000211	0.000203	0.000292	0.000280	0.000352	0.000340
35	0.000467	0.000447	0.000561	0.000538	0.000526	0.000503	0.000224	0.000214	0.000322	0.000308	0.000377	0.000362
36	0.000502	0.000477	0.000602	0.000576	0.000553	0.000526	0.000248	0.000236	0.000352	0.000335	0.000401	0.000383
37	0.000538	0.000508	0.000645	0.000614	0.000569	0.000538	0.000273	0.000258	0.000398	0.000377	0.000426	0.000406
38	0.000590	0.000554	0.000690	0.000652	0.000610	0.000572	0.000299	0.000281	0.000432	0.000405	0.000464	0.000439
39	0.000631	0.000587	0.000750	0.000703	0.000652	0.000606	0.000338	0.000314	0.000480	0.000447	0.000492	0.000461
40	0.000688	0.000635	0.000811	0.000754	0.000694	0.000640	0.000365	0.000336	0.000529	0.000488	0.000532	0.000494
41	0.000754	0.000690	0.000886	0.000817	0.000733	0.000671	0.000402	0.000368	0.000591	0.000541	0.000572	0.000527
42	0.000819	0.000746	0.000957	0.000876	0.000793	0.000722	0.000438	0.000399	0.000636	0.000579	0.000610	0.000558
43	0.000894	0.000811	0.001038	0.000945	0.000838	0.000760	0.000484	0.000439	0.000693	0.000629	0.000656	0.000598
44	0.000969	0.000876	0.001116	0.001012	0.000893	0.000807	0.000517	0.000467	0.000749	0.000677	0.000690	0.000626
45	0.001067	0.000963	0.001203	0.001088	0.000956	0.000863	0.000560	0.000505	0.000816	0.000737	0.000733	0.000662
46	0.001166	0.001051	0.001301	0.001174	0.001019	0.000918	0.000614	0.000553	0.000883	0.000795	0.000773	0.000698
47	0.001275	0.001146	0.001410	0.001270	0.001091	0.000981	0.000666	0.000599	0.000948	0.000852	0.000813	0.000733
48	0.001397	0.001254	0.001516	0.001363	0.001161	0.001042	0.000717	0.000644	0.001010	0.000907	0.000864	0.000776
49	0.001516	0.001360	0.001644	0.001476	0.001251	0.001122	0.000766	0.000687	0.001085	0.000973	0.000900	0.000809
50	0.001656	0.001483	0.001769	0.001587	0.001340	0.001200	0.000815	0.000730	0.001159	0.001038	0.000947	0.000850
51	0.001797	0.001607	0.001893	0.001695	0.001426	0.001276	0.000873	0.000781	0.001244	0.001113	0.001005	0.000900
52	0.001931	0.001729	0.002037	0.001822	0.001530	0.001369	0.000940	0.000841	0.001325	0.001186	0.001061	0.000949
53	0.002087	0.001870	0.002175	0.001947	0.001630	0.001461	0.000993	0.000890	0.001417	0.001270	0.001113	0.000996
54	0.002237	0.002009	0.002321	0.002080	0.001728	0.001552	0.001056	0.000948	0.001507	0.001353	0.001164	0.001043
55	0.002392	0.002150	0.002464	0.002212	0.001846	0.001659	0.001129	0.001014	0.001622	0.001458	0.001224	0.001099
56	0.002566	0.002309	0.002628	0.002363	0.001982	0.001783	0.001200	0.001079	0.001734	0.001560	0.001284	0.001154
57	0.002753	0.002478	0.002801	0.002521	0.002116	0.001904	0.001280	0.001152	0.001858	0.001672	0.001352	0.001217
58	0.002961	0.002659	0.002995	0.002695	0.002278	0.002046	0.001379	0.001239	0.001992	0.001789	0.001430	0.001287
59	0.003185	0.002854	0.003197	0.002871	0.002457	0.002202	0.001486	0.001332	0.002148	0.001925	0.001496	0.001343
60	0.003438	0.003074	0.003404	0.003051	0.002640	0.002361	0.001610	0.001440	0.002325	0.002079	0.001580	0.001416
61	0.003727	0.003327	0.003628	0.003245	0.002847	0.002542	0.001750	0.001562	0.002509	0.002239	0.001661	0.001486
62	0.004042	0.003597	0.003867	0.003452	0.003077	0.002738	0.001915	0.001704	0.002711	0.002412	0.001740	0.001553
63	0.004382	0.003888	0.004120	0.003666	0.003319	0.002944	0.002093	0.001857	0.002942	0.002610	0.001835	0.001633
64	0.004763	0.004213	0.004396	0.003900	0.003570	0.003158	0.002304	0.002038	0.003201	0.002832	0.001926	0.001708
65	0.005186	0.004578	0.004683	0.004142	0.003852	0.003400	0.002537	0.002239	0.003476	0.003068	0.002022	0.001788
66	0.005630	0.004959	0.004994	0.004408	0.004309	0.003796	0.002799	0.002465	0.003788	0.003337	0.002116	0.001867
67	0.006117	0.005383	0.005325	0.004691	0.004810	0.004233	0.003091	0.002720	0.004138	0.003641	0.002397	0.002112
68	0.006645	0.005854	0.005689	0.005007	0.005394	0.004752	0.003433	0.003025	0.004518	0.003980	0.002708	0.002383
69	0.007220	0.006366	0.006094	0.005369	0.006036	0.005323	0.003831	0.003378	0.004934	0.004350	0.003078	0.002711
70	0.007818	0.006908	0.006551	0.005777	0.006768	0.005980	0.004285	0.003787	0.005401	0.004772	0.003492	0.003079
71	0.008438	0.007463	0.007056	0.006234	0.007584	0.006708	0.004805	0.004250	0.005908	0.005226	0.003962	0.003501
72	0.009103	0.008068	0.007612	0.006733	0.008513	0.007545	0.005407	0.004792	0.006467	0.005731	0.004496	0.003977
73	0.009798	0.008692	0.008227	0.007292	0.009543	0.008466	0.006077	0.005391	0.007072	0.006274	0.005111	0.004530
74	0.010544	0.009373	0.008899	0.007895	0.010711	0.009522	0.006861	0.006099	0.007749	0.006889	0.005801	0.005147
75	0.011358	0.010117	0.009649	0.008577	0.012039	0.010724	0.007743	0.006897	0.008491	0.007564	0.006596	0.005864
76	0.012810	0.011446	0.010475	0.009330	0.013545	0.012102	0.008819	0.007879	0.009322	0.008329	0.007504	0.006685
77	0.014440	0.012928	0.011395	0.010181	0.015229	0.013635	0.010034	0.008983	0.010212	0.009143	0.008555	0.007643
78	0.016263	0.014575	0.012392	0.011095	0.017101	0.015326	0.011403	0.010219	0.011186	0.010024	0.009744	0.008723
79	0.018326	0.016440	0.013447	0.012051	0.019209	0.017232	0.012952	0.011619	0.012244	0.010984	0.011084	0.009933
80	0.020664	0.018557	0.014605	0.013102	0.021572	0.019372	0.014725	0.013223	0.013407	0.012039	0.012603	0.011306

Demographic Assumptions (continued)

Mortality Improvement Scale

Unisex Social Security Data Mortality Projection Scale					
Based on 60-year average of experience through 2017					
Age	Improvement Rate	Age	Improvement Rate	Age	Improvement Rate
15	1.41%	50	1.10%	85	0.84%
16	1.32%	51	1.11%	86	0.78%
17	1.21%	52	1.10%	87	0.73%
18	1.08%	53	1.09%	88	0.67%
19	0.94%	54	1.07%	89	0.62%
20	0.81%	55	1.06%	90	0.57%
21	0.71%	56	1.05%	91	0.52%
22	0.62%	57	1.05%	92	0.47%
23	0.54%	58	1.07%	93	0.42%
24	0.46%	59	1.09%	94	0.38%
25	0.37%	60	1.11%	95	0.34%
26	0.30%	61	1.13%	96	0.31%
27	0.25%	62	1.16%	97	0.30%
28	0.23%	63	1.19%	98	0.29%
29	0.24%	64	1.22%	99	0.29%
30	0.27%	65	1.24%	100	0.28%
31	0.30%	66	1.26%	101	0.27%
32	0.33%	67	1.27%	102	0.26%
33	0.37%	68	1.26%	103	0.26%
34	0.41%	69	1.25%	104	0.25%
35	0.45%	70	1.23%	105	0.24%
36	0.50%	71	1.22%	106	0.23%
37	0.56%	72	1.20%	107	0.22%
38	0.64%	73	1.19%	108	0.22%
39	0.72%	74	1.17%	109	0.21%
40	0.81%	75	1.15%	110	0.20%
41	0.88%	76	1.12%	111	0.19%
42	0.93%	77	1.10%	112	0.18%
43	0.97%	78	1.09%	113	0.18%
44	1.00%	79	1.08%	114	0.17%
45	1.02%	80	1.07%	115	0.16%
46	1.04%	81	1.04%	116	0.16%
47	1.06%	82	1.00%	117	0.16%
48	1.07%	83	0.95%	118	0.16%
49	1.08%	84	0.90%	119	0.16%

Demographic Assumptions *(continued)*

Retirement Assumptions

Retirement from Active Status *(Tier 1/Tier 2)*

Age	Police & Fire			General Service / School Districts						Judges	
	<13 Years	13 - 24	25+ Years	General Service			School Districts				
				< 15 years	15-29 Years	30+ Years	< 15 years	15-29 Years	30+ Years		
< 50						15.0%				25.0%	
50	1.5%	3.0%	32.0%			15.0%				25.0%	
51	1.5%	3.0%	27.0%			15.0%				25.0%	
52	1.5%	3.0%	27.0%			15.0%				25.0%	
53	1.5%	3.0%	27.0%			15.0%				25.0%	
54	1.5%	3.5%	27.0%			15.0%				25.0%	
55	3.0%	15.5%	27.0%	1.5%	2.5%	15.0%	1.5%	3.5%		25.0%	
56	3.0%	10.0%	27.0%	1.5%	2.5%	15.0%	1.5%	3.5%		25.0%	
57	3.0%	10.0%	27.0%	1.5%	2.5%	15.0%	1.5%	3.5%		25.0%	
58	6.0%	10.0%	27.0%	1.5%	9.0%	21.0%	1.5%	11.0%		27.5%	
59	6.0%	10.0%	27.0%	3.5%	9.0%	21.0%	4.5%	11.0%		27.5%	
60	6.0%	12.0%	27.0%	6.0%	11.0%	21.0%	6.5%	12.5%		27.5%	12.0%
61	6.0%	14.0%	27.0%	6.0%	11.0%	21.0%	6.5%	12.5%		27.5%	12.0%
62	15.0%	25.0%	38.0%	13.0%	19.5%	28.5%	15.0%	21.0%		34.0%	12.0%
63	15.0%	15.0%	31.0%	11.5%	16.5%	23.0%	13.0%	19.5%		27.5%	12.0%
64	15.0%	15.0%	31.0%	12.5%	16.5%	23.0%	13.0%	19.5%		27.5%	12.0%
65	40.0%	40.0%	50.0%	19.5%	28.0%	37.5%	25.5%	33.5%		45.0%	12.0%
66	40.0%	40.0%	50.0%	27.5%	36.0%	40.5%	23.0%	36.5%		45.0%	12.0%
67	40.0%	40.0%	50.0%	22.5%	26.5%	34.0%	21.0%	34.5%		38.0%	20.0%
68	40.0%	40.0%	50.0%	19.5%	26.5%	28.5%	21.0%	28.0%		28.5%	20.0%
69	40.0%	40.0%	50.0%	19.5%	26.5%	28.5%	21.0%	28.0%		28.5%	20.0%
70	100.0%	100.0%	100.0%	25.0%	28.5%	28.5%	21.0%	28.0%		28.5%	30.0%
71	100.0%	100.0%	100.0%	25.0%	28.5%	28.5%	21.0%	28.0%		28.5%	30.0%
72	100.0%	100.0%	100.0%	25.0%	28.5%	28.5%	21.0%	28.0%		28.5%	30.0%
73	100.0%	100.0%	100.0%	25.0%	28.5%	28.5%	21.0%	28.0%		28.5%	30.0%
74	100.0%	100.0%	100.0%	25.0%	28.5%	28.5%	21.0%	28.0%		28.5%	30.0%
75 +	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%		100.0%	100.0%

Lump Sum Option at Retirement

Partial Lump Sum	2%
Total Lump Sum	0%

Purchase of Credited Service at Retirement

Money Match Retirements	0%
Non-Money Match Retirements	75%

Oregon Residency Status

For purposes of determining eligibility for SB 656/HB 3349 benefit adjustments, 85% of retirees are assumed to remain Oregon residents after retirement.

Demographic Assumptions (continued)

Retirement from Active Status (OPSRP)

Age	Police & Fire			General Service / School Districts					
	<13 Years	13 - 24	25+ Years	General Service			School Districts		
				< 15 years	15-29 Years	30+ Years	< 15 years	15-29 Years	30+ Years
50	0.5%	1.5%	5.5%						
51	0.5%	1.5%	5.5%						
52	0.5%	1.5%	5.5%						
53	0.5%	1.5%	27.0%						
54	0.5%	1.5%	27.0%						
55	2.0%	5.0%	27.0%	1.0%	2.5%	5.0%	0.5%	2.5%	5.0%
56	2.0%	5.0%	27.0%	1.0%	2.5%	5.0%	0.5%	2.5%	5.0%
57	2.0%	5.0%	27.0%	1.0%	2.5%	7.5%	1.0%	2.5%	7.5%
58	5.0%	5.0%	27.0%	1.5%	3.0%	30.0%	1.5%	3.0%	30.0%
59	5.0%	5.0%	27.0%	2.0%	3.0%	25.0%	1.5%	3.0%	25.0%
60	5.0%	15.0%	27.0%	2.5%	3.8%	20.0%	2.5%	3.8%	20.0%
61	5.0%	8.5%	27.0%	2.5%	5.0%	20.0%	2.5%	5.0%	20.0%
62	10.0%	25.0%	38.0%	6.5%	12.0%	30.0%	6.0%	12.0%	30.0%
63	7.0%	15.0%	31.0%	6.5%	10.0%	20.0%	6.0%	10.0%	20.0%
64	7.0%	15.0%	31.0%	6.5%	10.0%	20.0%	6.0%	10.0%	20.0%
65	7.0%	35.0%	40.0%	15.5%	35.0%	20.0%	12.5%	35.0%	20.0%
66	7.0%	35.0%	40.0%	18.5%	33.0%	20.0%	12.5%	33.0%	20.0%
67	7.0%	35.0%	40.0%	17.0%	22.0%	30.0%	11.0%	22.0%	30.0%
68	7.0%	35.0%	40.0%	14.0%	20.0%	25.0%	9.0%	20.0%	25.0%
69	7.0%	35.0%	40.0%	14.0%	20.0%	25.0%	9.0%	20.0%	25.0%
70	100.0%	100.0%	100.0%	14.0%	20.0%	25.0%	9.0%	20.0%	25.0%
71	100.0%	100.0%	100.0%	14.0%	20.0%	25.0%	9.0%	20.0%	25.0%
72	100.0%	100.0%	100.0%	14.0%	20.0%	25.0%	9.0%	20.0%	25.0%
73	100.0%	100.0%	100.0%	14.0%	20.0%	25.0%	9.0%	20.0%	25.0%
74	100.0%	100.0%	100.0%	14.0%	20.0%	25.0%	9.0%	20.0%	25.0%
75 +	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Disability Assumptions

Age	Duty Disability		
	Police & Fire	General Service	Ordinary Disability
20	0.0060%	0.0002%	0.0075%
25	0.0086%	0.0003%	0.0108%
30	0.0128%	0.0004%	0.0160%
35	0.0196%	0.0007%	0.0245%
40	0.0316%	0.0011%	0.0395%
45	0.0518%	0.0018%	0.0648%
50	0.0896%	0.0031%	0.1120%
55	0.1690%	0.0059%	0.1600%
60	-	0.0084%	0.1600%
65	-	-	-

Demographic Assumptions (continued)

Termination Assumptions

Duration	School District	School District	General	General	Police & Fire
	Male	Female	Service Male	Service Female	
0	16.63%	13.50%	15.00%	15.00%	10.00%
1	14.25%	12.50%	12.50%	14.00%	5.97%
2	11.50%	10.50%	10.46%	11.50%	5.02%
3	9.50%	9.13%	9.23%	8.74%	4.22%
4	7.93%	8.07%	8.15%	7.95%	3.54%
5	6.86%	7.13%	7.19%	7.23%	3.31%
6	5.93%	6.31%	6.35%	6.57%	3.06%
7	5.12%	5.58%	5.60%	5.98%	2.83%
8	4.43%	4.93%	4.94%	5.44%	2.61%
9	3.82%	4.36%	4.42%	5.09%	2.41%
10	3.31%	3.85%	4.13%	4.77%	2.23%
11	3.04%	3.45%	3.85%	4.47%	2.06%
12	2.84%	3.24%	3.60%	4.18%	1.90%
13	2.65%	3.04%	3.36%	3.92%	1.76%
14	2.47%	2.85%	3.13%	3.67%	1.63%
15	2.30%	2.68%	2.93%	3.43%	1.50%
16	2.15%	2.51%	2.73%	3.22%	1.39%
17	2.00%	2.36%	2.55%	3.01%	1.28%
18	1.87%	2.21%	2.38%	2.82%	1.19%
19	1.74%	2.08%	2.22%	2.64%	1.10%
20	1.62%	1.95%	2.08%	2.47%	1.01%
21	1.52%	1.83%	1.94%	2.32%	0.94%
22	1.41%	1.72%	1.81%	2.17%	0.87%
23	1.32%	1.61%	1.69%	2.03%	0.80%
24	1.23%	1.50%	1.58%	1.90%	0.80%
25	1.20%	1.50%	1.47%	1.78%	0.80%
26	1.20%	1.50%	1.40%	1.67%	0.80%
27	1.20%	1.50%	1.40%	1.56%	0.80%
28	1.20%	1.50%	1.40%	1.46%	0.80%
29	1.20%	1.50%	1.40%	1.40%	0.80%
30 +	1.20%	1.50%	1.40%	1.40%	0.80%

Demographic Assumptions *(continued)*

Merit Salary Increase Assumptions

Duration	School	Other General	
	District	Service	Police & Fire
0	4.15%	4.06%	5.13%
1	3.92%	3.73%	4.59%
2	3.69%	3.42%	4.10%
3	3.46%	3.13%	3.64%
4	3.22%	2.85%	3.24%
5	2.98%	2.60%	2.87%
6	2.74%	2.35%	2.55%
7	2.50%	2.12%	2.25%
8	2.26%	1.91%	1.99%
9	2.03%	1.71%	1.77%
10	1.79%	1.52%	1.58%
11	1.56%	1.35%	1.41%
12	1.34%	1.19%	1.27%
13	1.13%	1.05%	1.15%
14	0.92%	0.92%	1.06%
15	0.72%	0.79%	0.98%
16	0.53%	0.69%	0.92%
17	0.35%	0.59%	0.87%
18	0.18%	0.51%	0.83%
19	0.02%	0.43%	0.80%
20	-0.11%	0.36%	0.79%
21	-0.24%	0.31%	0.77%
22	-0.35%	0.27%	0.76%
23	-0.43%	0.23%	0.75%
24	-0.50%	0.21%	0.74%
25	-0.55%	0.19%	0.72%
26	-0.58%	0.18%	0.70%
27	-0.59%	0.18%	0.66%
28	-0.59%	0.18%	0.62%
29	-0.59%	0.18%	0.57%
30 +	-0.59%	0.18%	0.50%

Demographic Assumptions *(continued)*

Unused Sick Leave Adjustment

Actives	
• State General Service Male	8.25%
• State General Service Female	5.00%
• School District Male	9.50%
• School District Female	6.50%
• Local General Service Male	7.25%
• Local General Service Female	4.50%
• State Police & Fire	4.25%
• Local Police & Fire	7.50%
Dormants	5.00%

Unused Vacation Cash Out Adjustment

Tier 1	
• State General Service	2.50%
• School District	0.25%
• Local General Service	3.50%
• State Police & Fire	2.75%
• Local Police & Fire	4.75%
Tier 2	0.00%

Retiree Healthcare Assumptions

Retiree Healthcare Participation

RHIPA	
• 8 – 9 years of service	10.0%
• 10 – 14 years of service	10.0%
• 15 – 19 years of service	11.0%
• 20 – 24 years of service	14.0%
• 25 – 29 years of service	22.0%
• 30+ years of service	27.0%
RHIA	
• Healthy Retired	27.5%
• Disabled Retired	15.0%

RHIPA Subsidy Cost Trend Rates

Year	Rate
2021	5.90%
2022	5.50%
2023	5.10%
2024	5.00%
2025-2026	4.90%
2027	4.80%
2028-2036	4.70%
2037-2045	4.80%
2046-2049	4.90%
2050-2051	4.80%
2052-2060	4.70%
2061-2064	4.60%
2065-2066	4.50%
2067	4.40%
2068	4.30%
2069-2070	4.20%
2071	4.10%
2072-2073	4.00%
2074+	3.90%