Colorado Office of the State Auditor

Colorado Public Employees' Retirement Association Hybrid Defined Benefit Plan Study

Produced by Cheiron
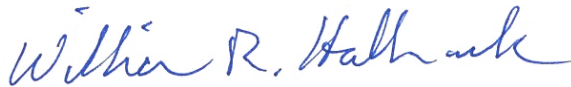
July 2025

Report # 2461P

July 21, 2025

Members of the Legislative Audit Committee:

The purpose of this report is to present the results of our study of the cost and effectiveness of the Colorado Public Employees' Retirement Association (PERA) Hybrid Defined Benefit Plan. This study was conducted pursuant to Section 24-51-614, C.R.S. (Colorado House Bill 24-1427).

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

This report was prepared for the Colorado Office of the State Auditor for the purposes described herein. It is for the use of the Colorado General Assembly, the Governor's Office of State Planning and Budgeting, the Colorado Office of the State Auditor, and Colorado PERA. This report is not intended to benefit any third party, and Cheiron assumes no duty or liability to any such party.

William R. Hallmark, ASA, EA, MAAA, FCA
Consulting Actuary

Anne D. Harper, FSA, EA, MAAA
Principal Consulting Actuary

Jake Libauskas, FSA, EA, MAAA, FCA
Consulting Actuary

Table of Contents

Section   **Page**

Section I – Executive Summary

Overview of the Colorado Public Employees' Retirement Association (PERA)

PERA administers a comprehensive retirement system that acts as a substitute for Social Security coverage for employees of more than 500 government and public entities in Colorado. PERA offers a Hybrid Defined Benefit (Hybrid DB) Plan and a Defined Contribution (DC) Plan. Participation in one of these two plans is mandatory for all covered employees.

The Hybrid DB Plan provides a defined, guaranteed, monthly benefit throughout retirement. The DC Plan, which is available to specific categories of covered employees, allows members to control their investments. DC account balances grow with contributions and investment earnings throughout the members' careers, and members choose how and when to withdraw their funds.

As of December 31, 2024, the PERA Hybrid DB Plan had about 219,000 active employees and 141,000 members receiving retirement benefits. The DC Plan had about 7,600 members and 1,300 members received full payouts of their accounts during 2024.

Study Scope and Methodology

This study was conducted through a contract with the Office of the State Auditor (OSA), in accordance with Section 24-51-614, C.R.S., to address three objectives: (1) to compare the benefits, costs, and portability of the PERA Hybrid DB Plan to alternative plan designs; (2) to analyze the impact on employers, members, and taxpayers of changing to an alternative plan design; and (3) to compare the PERA Hybrid DB and DC Plans, including how each attracts workers to Colorado state government.

For this study, all comparisons use provisions that apply to new members. We calculated income replacement ratios (the ratio of the retirement benefit to the member's salary immediately before retirement) for hypothetical employees. We also calculated real income replacement ratios, which reflect changes in the purchasing power of benefits throughout retirement due to inflation and post-retirement benefit increases. We structured each alternative plan design in this study to have the same expected cost as the PERA Hybrid DB Plan in a baseline economic scenario.

To gauge how retirement benefits affect job decisions, we reviewed surveys and studies, analyzed data on members offered the choice between the PERA Hybrid DB Plan and the DC Plan, and surveyed almost 3,000 current and former Colorado state employees.

This Executive Summary provides our key findings related to these objectives, and a summary of our analyses.

Key Findings

✓ **No single retirement plan design is superior for all plan members.** Most differences among plan designs are based on how benefits accrue over a member's career and how risks, such as mortality and investment returns, are shared between employees, retirees, and employers. These differences reflect policy choices available to the General Assembly.

✓ **The PERA Hybrid DB Plan provides income replacement ratios for career employees that are similar to, or higher than, the alternative plan designs.** Some alternative plan designs provide higher income replacement ratios for non-career employees, but then, for a similar cost, cannot provide as high an income replacement ratio for career employees.

✓ **Some alternative plan designs provide higher real income replacement ratios throughout retirement or have more stable costs across a range of economic scenarios.** However, these advantages have trade-offs, either by providing lower income replacement ratios to some employees or by requiring employees and retirees to bear a greater share of risks.

✓ **The PERA Hybrid DB Plan is expected to provide higher income replacement ratios than the PERA DC Plan for career employees.** Income replacement ratios in the PERA Hybrid DB Plan are predictable, while in the PERA DC Plan, they depend significantly on investment returns.

✓ **The PERA DC Plan is expected to provide higher income replacement ratios for members who terminate employment before age 55.**

✓ **The PERA Hybrid DB Plan has a lower expected cost than the PERA DC Plan for new members.** A significant portion of the current Hybrid DB Plan contribution is used to pay for the unfunded liability attributable to historical experience and not for benefits earned today.

✓ **According to our survey, most state employees prefer the PERA Hybrid DB Plan over the PERA DC Plan.** Of those who gave their choice "a great deal of thought," 77% enrolled in the PERA Hybrid DB Plan. Employees reported valuing the guaranteed lifetime income benefits the Hybrid DB Plan provides.

✓ **Among employees who chose the PERA DC Plan, the primary benefit cited was its portability if they no longer participated in PERA.**

Section I – Executive Summary

Cost and Effectiveness of PERA's Hybrid DB Design Compared to Alternative Plans

Any retirement plan reflects a policy choice for balancing various objectives and distributing the plan's risks and benefits. Our analysis suggests that the PERA Hybrid DB Plan is a cost-effective retirement system design that provides relatively high income replacement ratios at retirement and throughout retirement compared to the alternative designs studied. While certain alternative designs may offer advantages in specific areas, these often come at the expense of shortcomings in other aspects of the plans, producing a different balance between the various objectives for Colorado PERA, which may or may not be viewed as an improvement.

Social Security and Colorado PERA

A defining characteristic of PERA membership is the absence of Social Security coverage for virtually all employees during PERA-covered employment. PERA serves as the member's primary retirement and social safety net. There are key differences between Social Security and the PERA Hybrid DB Plan. In particular, Social Security is funded on a pay-as-you-go basis, meaning that today's contributions pay for today's benefits. Colorado PERA, in contrast, invests today's contributions to pay for retirement benefits in the future. As a result, PERA's investment earnings cover a large portion of the cost of the retirement benefits it provides, while contributions paid into Social Security have to cover nearly the entire cost of Social Security benefits.

In addition, Social Security allocates its resources to provide higher benefits for the lowest-paid workers. Because Colorado PERA members' salaries are higher than the lowest-paid workers in the U.S., higher benefits can be provided to them outside of Social Security.

Since PERA is a substitute for Social Security, the PERA Hybrid DB Plan, the PERA DC Plan, and all alternative plan designs in this study meet federal safe harbor requirements to replace Social Security.

Accrual Patterns

The General Assembly's choice of accrual pattern directly shapes workforce dynamics and the value of the pension for employees with different periods of employment. In a defined contribution plan with a fixed contribution percentage, employees earn more of their retirement benefit early in their career when the contributions have many years before retirement to accumulate investment earnings. This creates a "front-loaded" accrual pattern that benefits non-career employees and may offer more flexibility to a mobile workforce.

In contrast, a traditional defined benefit plan uses the highest average salary, usually shortly before retirement, to determine the benefit earned for each year of service. This creates a "back-loaded" accrual pattern that benefits career employees and helps to retain experienced employees.

Section I – Executive Summary

The PERA Hybrid DB Plan blends these accrual patterns, using both a traditional defined benefit formula and a money purchase formula that provides an accrual pattern closer to a traditional defined contribution plan. The alternative plan designs in this study vary from "front-loaded" accrual patterns that provide higher benefits than the PERA Hybrid DB Plan to non-career employees, to "back-loaded" accrual patterns that provide lower benefits than the PERA Hybrid DB Plan to non-career employees and similar benefits to career employees. Some alternative plan designs blend these accrual patterns.

Post-Retirement Benefit Increases

After retirement, inflation may erode the purchasing power of retirement income. To help combat this erosion, the PERA Hybrid DB Plan provides annual post-retirement benefit increases that vary depending on PERA's funding. Similarly, the alternative plan designs in this study provide levels of post-retirement benefit increases that may vary by inflation or investment returns. Some of the alternative designs provide greater post-retirement benefit increases than the PERA Hybrid DB Plan, resulting in higher income at some point in retirement. To provide higher post-retirement benefit increases without increasing costs, the initial benefit at retirement would need to be lower.

Managing Retirement Plan Risks

Retirement plan designs can differ in how they manage the risks inherent in accumulating sufficient resources to pay retirement benefits to plan members. Traditional defined benefit plans provide a lifetime benefit paid to the member regardless of investment returns, inflation, or longevity (how long the member lives), and the employer (or taxpayer, for public retirement plans) costs are adjusted to compensate for any differences from the original expectations or assumptions. Traditional defined contribution plans, in contrast, have a fixed cost regardless of investment returns, inflation, or longevity, and the retirement benefits are adjusted to compensate for any differences from the original expectations or assumptions.

Managing these various risks is a policy choice about how much of each risk members versus employers can and should take on. In the PERA Hybrid DB Plan, statute establishes an automatic adjustment provision to balance the cost of these various risks by adjusting, when necessary, employee contributions, employer contributions, State contributions, and post-retirement benefit increases. The alternative plan designs offer various risk-sharing options, such as post-retirement benefit increases and active member accrued benefits that vary based on investment performance. For a plan with no Social Security backstop, pooling some or all of the longevity risk, as in the PERA Hybrid DB Plan, may make sense to ensure some level of lifetime income for employees.

Impacts of Transitioning to an Alternative Plan Design

If an alternative plan design was adopted as a new tier in the PERA Hybrid DB Plan, as a separate new plan, or both, our analysis assumes that the new design would apply only to employees hired on or after its effective date. Furthermore, if the design adopted is one of the alternative designs developed for this report, the expected costs for new members would be the

same as under the PERA Hybrid DB Plan, but the retirement benefits may be lower than in the PERA Hybrid DB Plan for some employees and higher for others.

The alternative plan designs have varying administrative requirements beyond our study's scope. At a minimum, if an alternative plan design was adopted, PERA's recordkeeping and administrative systems would need to be updated to accommodate both the current plan for existing members and the alternative plan design for new members. These changes may be minimal for some designs, while the changes would be more extensive for others.

Most of the alternative plan designs could be adopted to include a new tier in the PERA Hybrid DB Plan, rather than requiring a closure of the PERA Hybrid DB Plan. Keeping the current PERA Hybrid DB Plan open would avoid some additional costs and enable the current plan to continue to fully amortize the Unfunded Actuarial Accrued Liability without interruption.

However, two of the alternative plan designs would require the PERA Hybrid DB Plan to be closed to new members. Currently, unfunded liability amortization payments are collected as a percentage of the PERA Hybrid DB Plan's payroll. If the plan is closed, the payroll would be expected to decline, making the current rates inadequate, and the mechanism to collect unfunded liability amortization payments would need to change. In addition, the assets will be drawn down as benefit payments are made, gradually requiring more liquidity in the investment portfolio, likely affecting the investment return that can be achieved, leading to additional costs.

Comparing the PERA Hybrid DB Plan to the PERA DC Plan

Our analysis and research indicate that the PERA Hybrid DB Plan and the PERA DC Plan are likely to attract different types of workers. The former is a significant attraction and retention mechanism for career-oriented employees, while the latter appeals to members with shorter expected tenures. The PERA DC Plan does not work as a retention tool given its lower influence on long-term commitment.

The PERA Hybrid DB Plan provides greater benefits for long-service, career employees and protection from various risks for employees. It provides a guaranteed lifetime income, and benefits are mostly protected from the impact of investment returns. It also provides automatic cost-of-living adjustments in retirement, subject to limits based on the plan's funding. Finally, the PERA Hybrid DB Plan provides disability income protection and lifetime survivor benefits. These characteristics make the PERA Hybrid DB Plan particularly attractive to career employees and those seeking retirement benefits protected from these risks.

The PERA DC Plan provides greater benefits in the early service years, particularly for younger employees, and its benefits are fully portable. These characteristics make the PERA DC Plan especially attractive for those who do not work in PERA-covered employment for their full careers.

The PERA Hybrid DB Plan has a lower expected cost for new members than the PERA DC Plan. The expected cost for the PERA DC Plan is the contribution rate deposited into the DC Plan. The

Section I – Executive Summary

expected cost for the PERA Hybrid DB Plan is the contribution rate that is expected to accumulate with investment earnings so that the plan has sufficient assets to provide benefits for the member's lifetime, assuming all assumptions are met. While current employer contributions to the PERA Hybrid DB Plan are higher than those deposited in the DC Plan, a significant portion of the contributions to the PERA Hybrid DB Plan are to pay for the unfunded liability attributable to the past and not for benefits earned today.

The Role of Retirement Plans in Job Decisions

Academic Studies and Surveys

The studies and industry surveys we reviewed generally agree that retirement benefits are a significant factor in attracting and retaining workers to public sector employment and that changes to plan design can affect employee behavior. However, studies suggest younger workers focus less on retirement benefits than older workers, placing more importance on other factors such as job security, work-life balance, health insurance, personal satisfaction, salary, and the ability to serve the community. Younger workers also have a greater appreciation for the portability of retirement benefits. Higher pay, bonuses, and more appreciation were generally cited as reasons that employees leave public sector employment rather than benefits.

DB/DC Choice Experience

Since the PERA DC Plan was first implemented in 2006, the percentage of eligible members electing the DC option has steadily declined from roughly 15% to about 6% in 2023. The choice varies significantly by the employee's age and salary at hire. Generally, members hired between the ages of 20 and 30 had higher DC enrollment rates, while members hired between the ages of 30 and 50 had lower DC enrollment rates. Interestingly, members hired after age 50 and members with higher salaries had higher DC enrollment rates.

Members who elect the PERA DC Plan exhibit higher termination rates during the first 5 years of service than members who enroll in the PERA Hybrid DB Plan. After the first 5 years of service, the termination rates between the DB and DC plan members are similar.

Section I – Executive Summary

Survey of Colorado State Employees

We conducted an online survey of current and former Colorado state employees who chose between the PERA Hybrid DB and the PERA DC Plan. The survey asked questions about how respondents think about their retirement benefits and how they chose between retirement plan options. Key results were:

- 81% of respondents cited retirement benefits as a factor in their decision to work for the state government (44% cited them as a major factor), and 83% cited them as a factor in choosing to remain in Colorado state employment (52% cited them as a major factor).

- More PERA Hybrid DB Plan members plan to remain state employees until retirement than PERA DC Plan members (46% vs. 23%), while more PERA DC Plan members than DB Plan members expect to leave state employment within 5 years (26% vs. 8%).

- 57% of respondents reported giving the decision between the two plans some or a great deal of thought, and 77% of those who gave it a great deal of thought chose the PERA Hybrid DB Plan.

- Employees who chose the PERA Hybrid DB Plan overwhelmingly cited the guarantee of lifetime income as the primary reason; employees who chose the PERA DC Plan overwhelmingly cited portability as the primary reason.

Section II – Study Authority and Scope

House Bill 24-1427, which revised Section 24-51-614, C.R.S., required the Office of the State Auditor (OSA) to contract with a nationally recognized and enrolled actuarial firm to perform a comprehensive study of the cost and effectiveness of the Colorado Public Employees' Retirement Association (PERA) Hybrid Defined Benefit Plan (PERA Hybrid DB Plan) to alternative plan designs.

To conduct the study, the OSA, with PERA's concurrence, contracted with Cheiron, an actuarial consulting firm with extensive experience providing actuarial consulting services to public pension plans. In addition to experience analyses, actuarial valuations, and projections, Cheiron's expertise includes performing legislative impact studies of the financial and benefit impact of proposed legislative changes, including analysis of defined benefit plan design changes and transitions from defined benefit to defined contribution programs, comparing the costs and benefits provided by pension plans in a peer group, and designing pension plans, including designs that share risks to varying degrees between the members and the employers. The Cheiron team assigned to this study includes three credentialed actuaries with extensive experience, all of whom meet the qualification requirements of the American Academy of Actuaries to perform this analysis.

Section 24-51-614, C.R.S., outlined three objectives for the study as shown in Exhibit II-1, along with the report sections where the objectives are addressed.

Exhibit II-1 - Study Objectives Per Statute

Statutory Objective	Report Section
Compare the benefits, cost, and portability of benefits provided by the PERA Hybrid DB Plan with those provided by alternative plan designs, including other statewide and private sector plans. [Section 24-51-614 (2)(a)(I) & (II), C.R.S.]	Section IV compares the income replacement ratios and costs under four economic scenarios for nine alternative plan designs ranging from a typical private sector plan to designs similar to those employed by other statewide retirement systems.
Analyze the cost and impact on employers, members, and taxpayers of changing from the current Hybrid DB Plan design to alternative plan designs. This should include the effect on retirement benefits for current and future retirees and on PERA's ability to fully amortize its unfunded accrued liability. [Section 24-51-614 (2)(a)(III), (IV), (V), & (VI), C.R.S.]	Section IV illustrates the impact on benefits of the alternative plan designs and concludes with a discussion of potential cost impacts of transitioning to the alternative designs, including any impact on PERA's ability to fully amortize its unfunded accrued liability.

Section II – Study Authority and Scope

Statutory Objective	Report Section
Compare the PERA Hybrid DB and the PERA Defined Contribution (DC) Plans to determine (1) how members with different job classifications and salaries benefit differently from each plan; (2) which plan is more advantageous for state employees and retirees; and (3) the extent to which the PERA Hybrid DB Plan, as opposed to the PERA DC Plan, attracts workers to Colorado state government instead of the private sector or other government entities. [Section 24-51-614 (2)(b)(I), (II), & (III), C.R.S.]	Section V compares the income replacement ratios and costs under four economic scenarios for the PERA Hybrid DB Plan to the PERA DC Plan. Section VI examines the role of retirement plans in job decisions, including a review of published studies and surveys, an analysis of PERA's experience of members choosing between the PERA Hybrid DB Plan and the PERA DC Plan, and a survey of current and former Colorado state employees who were offered this choice.

The study was conducted from October 2024 through July 2025.

Overview of Study Methodology

In conducting this study, we relied on information supplied by Colorado PERA and its actuary, Segal. This information includes, but is not limited to, the plan provisions, employee data, and total normal cost rates. We performed an informal examination of the obvious characteristics of the data for reasonableness and consistency in accordance with Actuarial Standard of Practice No. 23, Data Quality.

This study assumes that any alternative plan design would only apply to employees hired after it is adopted. Consequently, all comparisons of income replacement ratios and costs use the provisions of the PERA Hybrid Defined Benefit Plan (PERA Hybrid DB Plan) that currently apply to new members. For example, the highest average salary used to calculate benefits in the PERA Hybrid DB Plan is based on different averaging periods depending on the employee's hire date. However, our analysis uses a 5-year averaging period (3 years for the Judicial Division) because that is the averaging period that currently applies to any new member.

The expected costs of defined benefit plans in this analysis are based on the total normal cost rates for a similar plan design calculated by PERA's actuary, Segal, using the demographic profile for new members and actuarial assumptions from their December 31, 2023 actuarial valuation, which was the most recent valuation available at the time of this study. The expected cost does not include the payment on the unfunded liability incorporated in current statutory rates for the PERA Hybrid DB Plan. There were some assumption changes incorporated in the December 31, 2024 actuarial valuation but these changes would not materially affect the results of this study. We adjusted these total normal costs using standard actuarial techniques for the different details of the specific plan design.

Section II – Study Authority and Scope

Income replacement ratios were calculated for hypothetical employees hired at various ages, terminating employment at various ages, and retiring at various ages. These ratios were calculated assuming salary increases throughout their period of employment exactly match the assumptions used in PERA's 2023 actuarial valuation. The income replacement ratio is the annual lifetime benefit at retirement, reflecting the projected highest average salary, divided by the final year's salary. For account-based plan designs, the account balance was converted to an actuarially equivalent annuity either using factors specified by the plan design or assumed prices to purchase an annuity from an insurance company.

Real income replacement ratios were calculated for various ages after retirement. These ratios start with the income replacement ratio at retirement and adjust the ratios for each year after retirement for the impact of assumed inflation compared to the post-retirement benefit increase provided by the plan design. For this analysis, withdrawals from defined contribution account balances were assumed to be made to match the benefits provided by the PERA Hybrid DB Plan until the account balance was exhausted.

Income replacement ratios in this report and cost estimates under alternative economic scenarios were developed using proprietary software. Because this software does not perform a full valuation of each scenario for each alternative plan design, the cost estimates may differ if a full valuation were performed.

We reviewed published studies and surveys on the role of retirement benefits in job decisions, focusing on general government employees. We also analyzed data provided by PERA on individual members who were offered the choice between the PERA Hybrid DB Plan and the PERA Defined Contribution Plan (PERA DC Plan).

The published studies and PERA's experience provide important but limited insight into the motivations and viewpoints of employees making job decisions. We supplemented this information with a 10-minute online survey of current and former Colorado state employees who had been offered the choice between the PERA Hybrid DB Plan and the PERA DC Plan. Under contract with Cheiron, Greenwald Research conducted the survey between January 9, 2025, and January 27, 2025. A link to the survey was sent to 86,375 email addresses provided by PERA, and we received 2,923 responses (1,670 current employees and 1,253 former employees).

We appreciate the cooperation and assistance provided by PERA during this study, which included providing data and pertinent records, reviewing the proposed alternative plan designs used in Section IV, obtaining normal costs for hypothetical plan designs from their actuary (Segal), and providing feedback on the analyses and conclusions. We also appreciate the Governor's Office of State Planning and Budgeting's involvement in reviewing the study results. Finally, we especially appreciate the extensive guidance provided by the OSA in conducting the study and reviewing, clarifying, and communicating the study findings.

Section III – PERA Hybrid DB Plan Background

Overview of PERA Programs

Established in 1931, PERA provides retirement and other benefits to employees across more than 500 Colorado government agencies and public entities. The Colorado Public Employees' Retirement Association (PERA) administers a comprehensive retirement system for public employees within the state that acts as a substitute for Social Security coverage. PERA's retirement system includes the PERA Hybrid Defined Benefit Plan (PERA Hybrid DB Plan) and the PERA Defined Contribution Plan (PERA DC Plan). Participation in one of these two plans is mandatory for all covered employees. PERA also offers various voluntary savings programs for covered employees.

PERA Hybrid Defined Benefit Plan

The PERA Hybrid DB Plan is the retirement system's cornerstone and is used by most members. It defines a monthly benefit payable commencing at retirement that continues throughout the member's life.

In addition to lifetime retirement income, the PERA Hybrid DB Plan automatically includes disability and survivor coverage for its members. Disability benefits provide a crucial safety net for those who experience unforeseen circumstances that prevent them from continuing their public service careers. The disability benefit provides a monthly benefit payable commencing when a member becomes totally and permanently disabled and continuing throughout the member's life as long as the member remains disabled. Furthermore, the plan includes survivor benefits, which are designed to provide financial assistance to eligible spouses, dependent children, or other designated beneficiaries in the event of the member's death. Since Social Security does not cover most PERA members, these benefits offer essential financial protection for members and their families.

PERA Defined Contribution Plan

Alongside the PERA Hybrid DB Plan, PERA also administers the PERA DC Plan, which offers an alternative retirement savings option for specific categories of state and local government employees. In contrast to defined benefit plans, which define a monthly benefit payable at retirement, defined contribution plans define an amount that is contributed to the members' accounts. A defined contribution (DC) plan allows members to control their retirement savings by directing their contributions into various available investment funds. The members' DC account balances grow with contributions and investment earnings throughout their careers. When members retire, the account continues to grow with investment earnings, and members decide when and how much to withdraw to provide retirement income. The ultimate retirement benefit received under a DC plan depends on the total contributions made by the employee and the employer, and the investment earnings or losses incurred throughout the member's lifetime.

Section III – PERA Hybrid DB Plan Background

Eligibility for the PERA DC Plan has evolved to include:

- State of Colorado employees hired on or after January 1, 2006,
- Certain community college employees hired on or after January 1, 2008,
- Local Government Division employees hired on or after January 1, 2019,
- State-classified college or university employees hired on or after January 1, 2019, and
- District Attorneys, and Deputy District Attorneys or Assistant District Attorneys whose Board of County Commissioners have authorized such participation.

Voluntary Programs

PERA provides several voluntary retirement savings and benefit programs that members can participate in to enhance their financial security further.

The PERAPlus 401(k) and 457 Plans are supplemental retirement savings plans that allow PERA members to make additional contributions on a pre-tax or Roth basis. Enrollment in the PERAPlus 401(k) Plan is open to all employees of PERA-affiliated employers at any time, while the PERAPlus 457 Plan is available to all employees of employers that have adopted the Plan.

PERA also offers its members a voluntary life insurance program, providing additional financial protection for their families. This program typically features decreasing-term group life insurance with fixed premiums, where the death benefit amount gradually decreases as the insured individual ages.

Members who retire under PERA are eligible to enroll in PERACare, which includes health care premium subsidies based on the member's years of service.

PERA Hybrid DB Plan Divisions and Demographics

PERA's membership is organized into five distinct divisions for administrative and funding purposes: the State Division, the School Division, the Local Government Division, the Judicial Division, and the Denver Public Schools (DPS) Division. Exhibit III-1 summarizes the active employee membership of the PERA Hybrid DB Plan as of December 31, 2024. Active employees are those who are currently employed in PERA-covered positions, earning a salary, and accruing benefits in the PERA Hybrid DB Plan.

Section III – PERA Hybrid DB Plan Background

Exhibit III-1

Active Employee Membership
December 31, 2024

	State Division	School Division	Local Government Division	Judicial Division	Denver Public Schools Division	Total
Count of Employees	55,584	134,080	12,982	351	16,207	219,204
Average Age	44.8	44.5	43.8	53.0	41.3	44.3
Average Years of Service	8.8	9.0	7.6	11.7	7.7	8.8
Average Salary	$69,878	$50,291	$71,081	$180,826	$54,797	$57,031

Source: PERA's Actuarial Valuation and Review as of December 31, 2024.

Exhibit III-2 summarizes the retirees and survivors receiving benefits from the PERA Hybrid DB Plan as of December 31, 2024.

Exhibit III-2

Retirees and Survivors
December 31, 2024

	State Division	School Division	Local Government Division	Judicial Division	Denver Public Schools Division	Total
Count	44,999	79,228	9,404	476	7,331	141,438
Average Age	73.3	73.0	71.7	75.5	75.3	73.1
Average Annual Benefit	$41,383	$37,040	$39,014	$78,640	$39,352	$38,813

Source: PERA's Actuarial Valuation and Review as of December 31, 2024.

Section III – PERA Hybrid DB Plan Background

PERA Hybrid DB Plan Benefit Design

The term "Hybrid" in the PERA Hybrid DB Plan describes the internal design of the plan itself, which incorporates two benefit formulas. The retirement benefit is the greater of: the Traditional DB Formula and the Money Purchase Formula; the final benefit is capped at 100% of the member's Highest Average Salary (HAS). A member's HAS is an average of their highest years of earnings while working for a PERA employer. It is a monthly average, calculated using periods of 12 consecutive months of service. The calculation of HAS has changed over time, with different averaging periods applied based on the member's division and when a member first became covered by PERA. For new members hired on or after January 1, 2020 (referred to as "new members" throughout the report), salaries are averaged over 5 years (3 years for judges) to calculate the HAS.

The retirement benefits are calculated as follows for each formula:

- Traditional DB: the member's HAS is multiplied by 2.5% and their years of service.
- Money Purchase: the member's accumulated account balance multiplied by a factor to convert the balance into an annuity to provide monthly lifetime income. The member's account balance includes their contributions, the interest credited to those contributions at a fixed annual compound rate of 3%, and an employer match of 100% of the member's account balance.

The Traditional DB Formula usually produces a greater benefit for members with more years of service, while the Money Purchase Formula is more likely to produce a greater benefit for members with fewer years of service.

Exhibit III-3 (Example 1) shows the retirement benefit calculation under the Traditional DB Formula for a hypothetical member retiring after 30 years of service with a highest average salary of $100,000.

Exhibit III-3

Example 1: Traditional DB Formula

1. Benefit Multiplier	2.5%
2. Highest Average Salary	$ 100,000
3. Years of service	30
4. Annual retirement benefit: 1. x 2. x 3., but no greater than 2.	$ 75,000

Source: Cheiron analysis.

Section III – PERA Hybrid DB Plan Background

Exhibit III-4 (Example 2) shows the retirement benefit calculation under the Money Purchase Formula for a hypothetical member retiring at age 65 with an account balance of $300,000.

Exhibit III-4

Example 2: Money Purchase Formula

1. Member's accumulated contributions with interest	$ 300,000
2. Employer's 100% match	$ 300,000
3. Total money purchase account balance: 1. + 2.	$ 600,000
4. Hypothetical age 65 PERA money purchase factor[1]	0.00766
5. Annual retirement benefit: 3. x 4. x 12, but no greater than HAS	$ 55,152

[1] These factors vary by the member's age and are regularly updated to reflect PERA's expected investment returns, mortality rates, and demographics.
Source: Cheiron analysis.

In the two examples on the previous page and above, the Traditional DB Formula resulted in the greater benefit amount at age 65, so the member would receive $75,000 per year. The benefit amount may also be reduced depending on the specific optional form of payment selected by the member. Members choose among three optional forms of payment: Option 1 offers the highest benefit but provides no benefit to a beneficiary after the retiree's death; Option 2 offers a lower benefit amount, but provides a 50% benefit to a beneficiary after the retiree dies; Option 3 offers the lowest benefit, but provides a 100 % benefit to a beneficiary after the retiree dies.

The benefit calculated at retirement is independent of market fluctuations, providing retirees with a predictable and secure income stream. Upon meeting the specified age and service requirements, members become eligible to receive these monthly payments, ensuring a foundational level of financial security throughout their retirement.

Retirement Eligibility

Members eligible for an unreduced service retirement have their Traditional DB Formula benefits calculated as shown in Exhibit III-3 (Example 1) without a reduction for retiring early. New members are eligible for unreduced service retirement upon meeting any of the following conditions:

Section III – PERA Hybrid DB Plan Background

Exhibit III-5

PERA's Eligibility for Unreduced Service Retirement
New Members

Non-Safety Officers	Safety Officers
Any age with 35 years of service	Any age with 35 years of service
Age 64 with 30 years of service	Age 55 with 25 years of service or age plus service equals 80 or more
Age 65 with 5 years of service	Age 65 with 5 years of service

Source: copera.org.

Members can retire before becoming eligible for the unreduced service retirement if they meet the eligibility requirements for the reduced service retirement. The Traditional DB Formula benefit is calculated as shown in Exhibit III-3 (Example 1), but the benefit amount is reduced to account for the member retiring earlier. The Money Purchase Formula uses a factor based on the age at retirement to convert the account balance to an annuity, so no further adjustment is necessary. New members are eligible for reduced retirement benefits if they have met either of these conditions:

Exhibit III-6

PERA's Eligibility for Reduced Service Retirement
New Members

Non-Safety Officers	Safety Officers
Age 55 with 25 years of service	Age 55 with 20 years of service
Age 60 with 5 years of service	Age 60 with 5 years of service

Source: copera.org.

Members who have reached retirement eligibility with 5 or more years of service are entitled to the greater of the Traditional DB Formula and the Money Purchase Formula. Members aged 65 with less than 5 years of service are generally entitled only to the Money Purchase Formula.

Income Replacement Ratios

An income replacement ratio is the ratio of the retirement benefit to the member's salary immediately before retirement. This may differ from the highest average salary (HAS) used to calculate benefits. In Example 1, the 5-year HAS was $100,000, but assuming the member's salary had increased $3,500 per year during the last 5 years before retirement, the member's salary would be $107,000 immediately before retirement (i.e., ($93,000 + $96,500 + $100,000 + $103,500 + $107,000) ÷ 5 = $100,000). The income replacement ratio would equal the $75,000 benefit divided by the $107,000 salary immediately before retirement, or 70%. In Example 1, the member has 30 years of service, so the benefit equals 75% (30 x

> **Income Replacement Ratio**
>
> The ratio of the retirement benefit to the Member's salary immediately before retirement.

Section III – PERA Hybrid DB Plan Background

2.5%) of HAS. The 70% income replacement ratio is slightly less than the 75% of HAS because the income replacement ratio is based on the salary at retirement, and the HAS for new members is a 5-year average (3-year average for judges) of the member's highest annual salaries.

Exhibit III-7 shows income replacement ratios for members (other than safety officers) at various hire and retirement ages who are "career employees," meaning they work in PERA-covered employment until they retire. Income replacement ratios under the Traditional DB Formula are shown on the left, and the Money Purchase Formula on the right. Only members hired at ages 45 or 55 and retiring at age 60 receive a higher income replacement ratio under the Money Purchase Formula.

Exhibit III-7

Income Replacement Ratios for Career Employees
State Division (Other Than Safety Officers)

		Traditional DB Formula Retirement Age			Money Purchase Formula Retirement Age		
		60	65	70	60	65	70
Hire Age	25	**82%**	**94%**	**94%**	46%	58%	74%
	35	**39%**	**70%**	**82%**	36%	48%	63%
	45	**22%**	**47%**	**59%**	23%	34%	47%
	55	**7%**	**23%**	**35%**	8%	18%	29%

Note: Dark shades with bold text indicate the formula that provides a higher income replacement ratio, light shades with normal text indicate the formula that provides a lower income replacement ratio, and white backgrounds with bold text indicate the two formulas provide similar income replacement ratios.
Source: Cheiron analysis based on assumptions used in PERA's December 31, 2023 actuarial valuation.

In the exhibits throughout this report, dark shades with bold text indicate the formula that provides a higher income replacement ratio, light shades with normal text indicate the formula that provides a lower income replacement ratio, and white backgrounds with bold text indicate that the two formulas provide similar income replacement ratios. Income replacement ratios are considered "similar" if they are within 10% of each other. For example, in Exhibit III-7, the income replacement ratio for members hired at age 35 who retire at 60 under the Traditional DB formula is 8% higher (39% / 36%) than the ratio under the Money Purchase formula, so these ratios are considered "similar."

Section III – PERA Hybrid DB Plan Background

Conversely, non-career employees – those leaving PERA-covered employment before retirement – often find the Money Purchase Formula more advantageous. Exhibit III-8 shows income replacement ratios for members (other than safety officers) who leave PERA-covered employment before retirement and commence their PERA retirement benefits at age 65, at various hire and termination ages, under the Traditional DB Formula on the left and the Money Purchase Formula on the right. Income replacement ratios for non-career employees are calculated based on a projected salary immediately before retirement, assuming the member works in non-PERA-covered employment until retirement. Only non-career members who work until age 55 receive a higher income replacement ratio under the Traditional DB Formula.

Exhibit III-8

Income Replacement Ratios for Non-Career Employees Who Retire at Age 65
State Division (Other Than Safety Officers)

		Traditional DB Formula Termination Age				Money Purchase Formula Termination Age		
		35	45	55		35	45	55
Hire Age	25	6%	21%	**49%**		**10%**	**24%**	40%
	35		11%	**33%**			**14%**	30%
	45			**16%**				16%

Note: Dark shades with bold text indicate the formula that provides a higher income replacement ratio, light shades with normal text indicate the formula that provides a lower income replacement ratio, and white backgrounds with bold text indicate the two formulas provide similar income replacement ratios.
Source: Cheiron analysis based on assumptions used in PERA's December 31, 2023 actuarial valuation.

Because the Traditional DB Formula uses the highest average salary for all years of service, a significant portion of the member's benefit almost always accrues in the last few years before retirement, when members typically earn their highest salaries. This accrual pattern is often referred to as back-loaded and favors older, longer-service employees.

Section III – PERA Hybrid DB Plan Background

The back-loaded accrual pattern can be seen in Exhibit III-9 as the benefit accruals for the first 3 years of service are relatively small compared to the benefit accruals for the last 3 years.

Exhibit III-9

Traditional DB Formula Benefit Accruals

Year of Service	Highest Average Salary (HAS)	Accrued Retirement Benefit: 2.5% x HAS x Service	Benefit Accrual: Increase in Annual Retirement Benefit
1	$ 35,000	$ 875	$ 875
2	$ 36,000	$ 1,800	$ 925
3	$ 37,000	$ 2,775	$ 975
…	…	…	…
28	$ 94,000	$ 65,800	$ 4,375
29	$ 97,000	$ 70,325	$ 4,525
30	$ 100,000	$ 75,000	$ 4,675

Source: Cheiron analysis.

In contrast, the Money Purchase Formula defines an amount credited to the member's account based on each year's salary (not the highest average), which produces higher benefit accruals for younger, shorter-service employees than the Traditional DB Formula. This accrual pattern is less back-loaded than the Traditional DB Formula. Exhibit III-10 shows this accrual pattern for a member hired at age 35 who retires at age 65, assuming for ease of calculation a member contribution rate of 10% of pay. The benefit accrual for the first year of service for the retirement benefit at age 65 is substantially greater than under the Traditional DB Formula shown above, and the benefit accrual for the last year of service is less than half of the accrual under the Traditional DB Formula.

Exhibit III-10

Money Purchase Formula Benefit Accruals

Year of Service	Salary	Member Contribution: 10% x Salary	Member Contribution Accumulated to Age 65 with 3% Interest + 100% Employer Match	Increase in Annual Retirement Benefit At Age 65
1	$ 35,000	$ 3,500	$ 16,742	$ 1,539
2	$ 37,000	$ 3,700	$ 17,183	$ 1,579
3	$ 39,000	$ 3,900	$ 17,584	$ 1,616
…	…	…		…
28	$ 100,000	$ 10,000	$ 21,534	$ 1,979
29	$ 103,500	$ 10,350	$ 21,638	$ 1,989
30	$ 107,000	$ 10,700	$ 21,719	$ 1,996

Note: For ease of calculation, this exhibit assumes the member contribution rate is 10% of pay.
Source: Cheiron analysis.

Section III – PERA Hybrid DB Plan Background

Exhibit III-11 compares the benefit accrual between the two formulas for each year of service for a member hired at age 35 who retired at age 65. This comparison assumes salary increases according to the assumptions used in the 2023 actuarial valuation. For the first 10 years of service, the increase in the life annuity benefit commencing at age 65 is greater under the Money Purchase Formula than the Traditional DB Formula. However, after 10 years, the Traditional DB Formula provides increasingly greater accruals in the benefit commencing at age 65 for each additional year of service.

Exhibit III-11

Increase in Age 65 Retirement Benefit by Year of Service
Traditional DB Formula Versus Money Purchase Formula
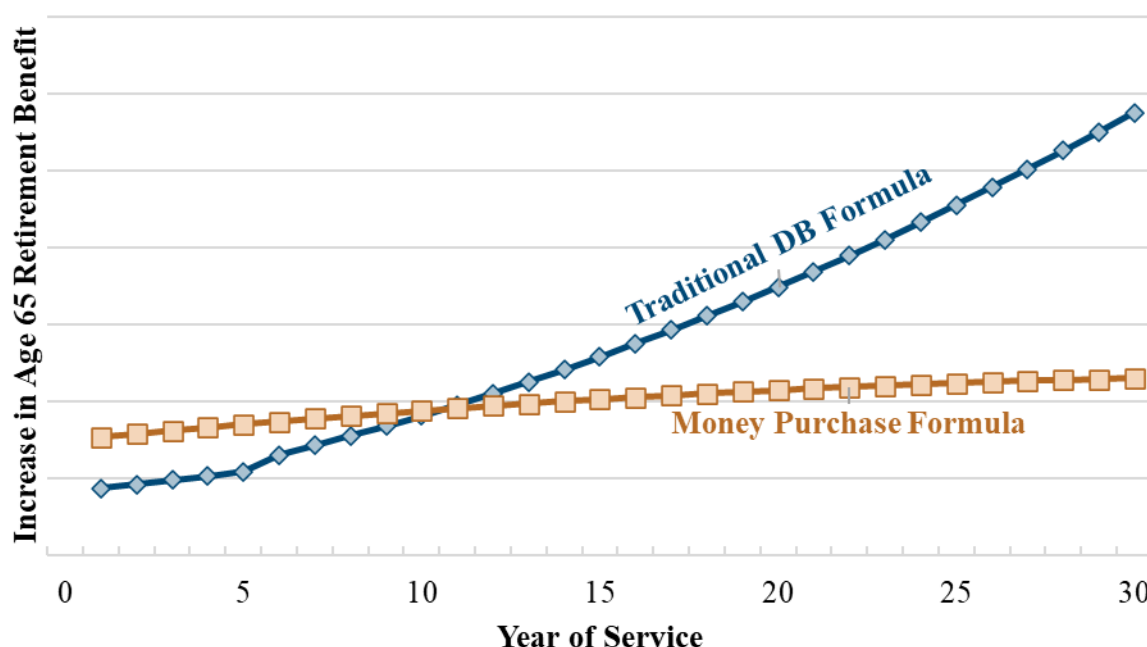
Source: Cheiron analysis.

The choice of accrual pattern reflects the General Assembly's strategic goals regarding workforce management. Backloaded patterns – such as those offered by the Traditional DB Formula – align well with retaining experienced, career employees. Conversely, designs with more level accrual patterns – such as those provided by the Money Purchase Formula – where credits are often a consistent percentage of pay each year, may be perceived as fairer to a more mobile workforce but might offer weaker retention incentives. By combining these two accrual patterns in the PERA Hybrid DB Plan, the General Assembly appears to be seeking a balance between the two approaches. Plan design choices about benefit accrual patterns directly shape workforce dynamics and the relative value proposition of the pension for employees with different career paths.

Post-Retirement Benefit Increases

Effective July 1 each year, after receiving benefits for 36 months, unreduced service retirees, disability retirees, and beneficiaries under the PERA Hybrid DB Plan receive annual increases

Section III – PERA Hybrid DB Plan Background

(AI) to their monthly benefits to help mitigate the effects of inflation. Reduced-service retirees are only eligible for automatic increases once they attain age 60 or the applicable age and service rule for unreduced service retirement. For new members, the annual increase is the lesser of the automatic increase cap (which can range from 0.5% to 2.0% based on the Automatic Adjustment Provisions discussed below) or the average monthly inflation for the previous calendar year. The present value of this increase for all members cannot exceed 10% of the division's AI reserve.

A member hired at age 25 who works 40 years and retires at age 65 is expected to have a retirement benefit that replaces 94% of their salary immediately before retirement (as shown in Exhibit III-7). However, the purchasing power of this retirement income erodes to the extent that automatic increases do not keep up with inflation. The Real Income Replacement Ratios in Exhibit III-12 illustrate how the 94% initial income replacement ratio at age 65 is expected to erode during retirement. By age 75, for example, the Real Income Replacement Ratio is expected to have declined from 94% to 82%.

Exhibit III-12

Real Income Replacement Ratios in Retirement
Hired at Age 25, Retired at Age 65

Age							
65	**70**	**75**	**80**	**85**	**90**	**95**	**100**
94%	86%	82%	78%	74%	70%	67%	63%

Assumes 2.30% annual inflation and 1.25% annual benefit increases commencing after 36 months of retirement.
Source: Cheiron analysis.

The Real Income Replacement Ratio provides a more complete picture of retirement income adequacy by accounting for the impact of inflation and the benefit adjustments the plan offers throughout a member's retirement years. A seemingly sufficient nominal replacement ratio at retirement might not maintain its value over a long retirement if inflation outpaces the annual increases.

Contribution Rates and Expected Cost for New Members

Total Normal Cost

The estimated amount needed to fund the pension benefits earned by active employees during the current year, usually reported as a percentage of payroll. It represents the ongoing, year-to-year cost of the pension plan for active member benefit accruals.

The expected long-term cost of providing benefits under the PERA Hybrid DB Plan is represented by the "total normal cost," a key metric derived from the actuarial valuation. The total normal cost is the level percentage of pay contribution that, if contributed each year throughout a member's career, is expected to accumulate with investment earnings, so that when the member retires, the plan has sufficient assets to provide the monthly benefits for the member's lifetime, assuming all actuarial assumptions are met. The

Section III – PERA Hybrid DB Plan Background

total normal cost is usually expressed as a rate of payroll. The total normal cost rate minus the employee contribution rate is the employer's normal cost rate.

The total employer contribution rates for PERA are defined in statute and consist of several components, including a base statutory contribution, the Amortization Equalization Disbursement (AED), the Supplemental Amortization Equalization Disbursement (SAED), and the DC Supplement contribution. In addition, the State makes an annual Direct Distribution of $225 million until all divisions are 100% funded. Finally, the Automatic Adjustment Provision (AAP) can increase or decrease contribution rates depending on the funding of the Plan. The AED, SAED, DC Supplement, AAP adjustments, and the State's Direct Distribution, are designed to address the Unfunded Actuarial Liability (UAL) arising from past experience and are not part of the normal cost of current benefit accruals. The base statutory contribution pays the employer's normal cost plus a portion of the unfunded liability. Exhibit III-13 compares the statutory contribution rates for the State Division from the 2023 actuarial valuation to the normal cost rate for new members, with any excess in the statutory rates used to pay down the UAL.

Exhibit III-13

State Division Contribution Rates Based on the 2023 Actuarial Valuation
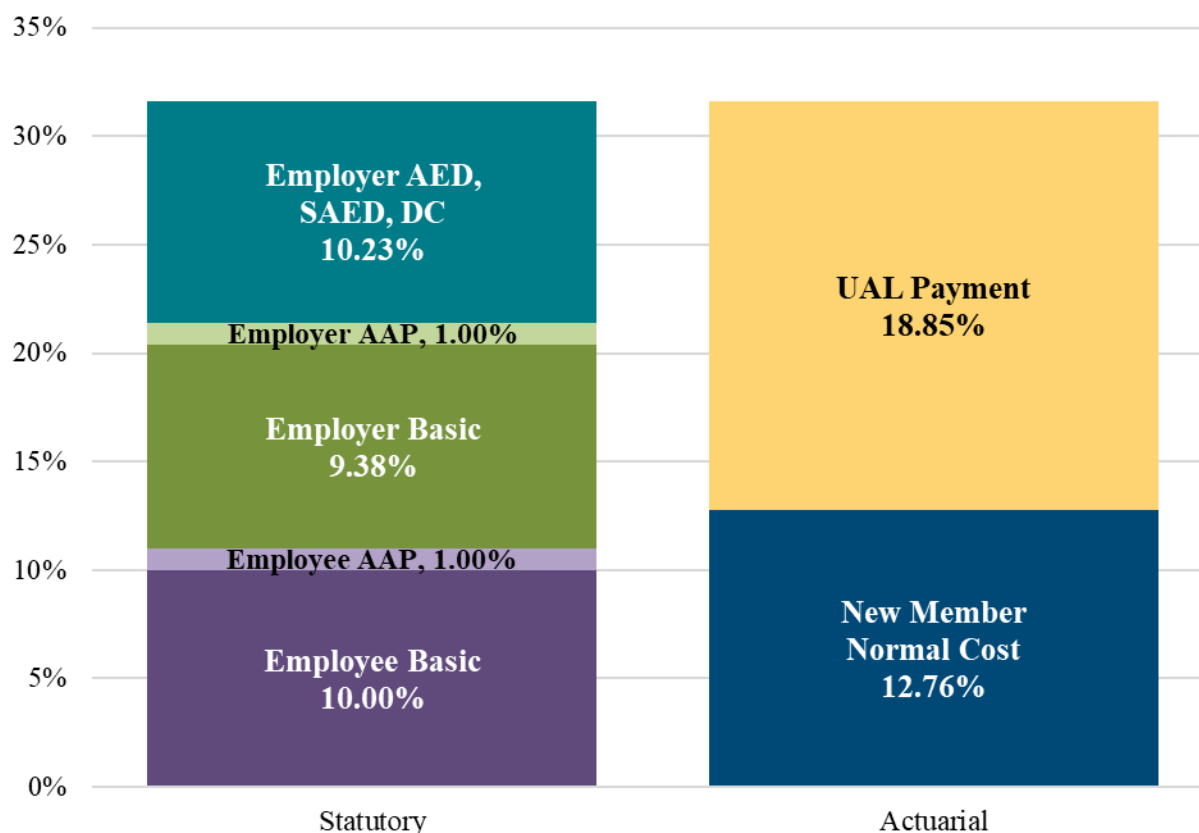
Source: Segal Consulting, PERA's actuary.

Section III – PERA Hybrid DB Plan Background

For purposes of this study, which is focused solely on the cost of benefits for new members, the employer's cost equals the employer's normal cost since any contributions above the employer's normal cost are used to pay for unfunded liabilities arising from past experience and are not associated with the cost of benefits for new members.

The expected cost analyses focus on the benefit provisions for new members, ignoring the costs associated with the unfunded liability, which is attributable to the past. PERA's contracted actuarial consulting firm, Segal, provided us with normal cost calculations for new members in each of PERA's divisions. The State and Local Government Divisions include Safety Officers, who have different benefit provisions and employee contribution rates, so the Safety Officers have different expected costs, which are shown separately. For purposes of this study, in consultation with PERA and Segal, we have assumed that the current AAP rates of 1.0% will be reduced to 0.5% over the long term.

Exhibit III-14

Expected Cost for New Members by Division

Division	Employee Rate	Employer's Normal Cost Rate	Total Expected Cost
State Division (Other Than Safety Officers)	10.5%	2.3%	12.8%
Local Government Division (Other Than Safety Officers)	8.5%	4.3%	12.8%
Denver Public Schools Division	10.5%	2.3%	12.8%
Schools Division	10.5%	3.8%	14.3%
Judicial Division	10.5%	8.5%	19.0%
State & Local Government Divisions (Safety Officers)	12.5%	6.8%	19.3%

Note: These calculations reflect an expected long-term cost using an annual investment return of 7.25%, an annual increase of 1.25%, employee contribution rates of 0.50% of pay lower than those used in the 2023 actuarial valuation, and the new member demographics in Appendix A.
Source: Segal Consulting, PERA's actuary.

Note that the total expected costs for the State Division (other than Safety Officers), the Local Government Division (other than Safety Officers), and the Denver Public Schools Division are the same. Consequently, these divisions have been combined for the analysis in this report, except when employee and employer contributions need to be separated.

Section III – PERA Hybrid DB Plan Background

Automatic Adjustment Provisions

The PERA Hybrid DB Plan includes Automatic Adjustment Provisions (AAP) designed to ensure the fund's long-term financial stability by sharing investment, longevity, and inflation risks among different parties. These provisions, established through Senate Bill 18-200, can trigger contribution and benefit changes based on the fund's performance relative to its funding goals. When triggered, the AAP aims for adjustments that have an equitable impact on active members, retirees, employers, and the State. These adjustments can include changes to member and employer contribution rates, direct state contributions, and the Annual Increase (AI) cap for post-retirement benefits.

If adjustments are necessary, member and employer contribution rates can increase or decrease by up to 0.50% annually, subject to statutory limits. Furthermore, these rates cannot fall below the levels established in 2018. These adjustments are determined annually based on PERA's funding progress and take effect on July 1 of the following year.

Senate Bill 18-200 also requires the State of Colorado to provide an annual direct contribution to PERA to support its funding. The Automatic Adjustment Provision can also affect this contribution, with a maximum annual change of $20 million and a maximum annual contribution of $225 million.

The AI cap for post-retirement benefits is also subject to adjustment under the AAP. If PERA's funding status is ahead of schedule, the AI cap increases by up to 0.25%, but not above 2.00%. Conversely, if PERA's funding status is behind schedule, the AI cap decreases by up to 0.25% but not below 0.50%.

Section IV – Cost and Effectiveness of the PERA Hybrid DB Plan Compared to Alternative Plan Designs

Overview

Statute required this study to compare the benefits, cost, and portability of benefits provided by the PERA Hybrid DB Plan with those provided by alternative plan designs. [Section 24-51-614 (2)(a)(I) & (II), C.R.S.] This section provides that comparison. In addition, this section compares how the different plan designs share or pool various risks.

For our analysis, each alternative design, except Social Security, has been structured to cost the same as the PERA Hybrid DB Plan if all its actuarial assumptions are met.

Our analysis compares the benefits provided by the different plan designs based on the income replacement ratios (the ratio of the annual retirement benefit to the member's annual salary immediately before retirement) for various hypothetical periods of employment and retirement ages. This analysis also discusses the portability of each design.

To understand how each design shares investment, longevity, and inflation risks, the costs and income replacement ratios for the different designs are compared under four economic scenarios, and real income replacement ratios are compared throughout retirement.

Comparison to Social Security

A defining characteristic of PERA membership is the absence of Social Security coverage during PERA-covered employment. PERA serves as the member's primary retirement and social

Key Findings

✓ **Regardless of the plan design, the benefits paid ultimately equal contributions plus investment returns less administrative expenses.** The differences between the designs are primarily driven by a few key factors:

  o **Accrual pattern** – how much benefit is paid to non-career employees versus career employees.

  o **Risk-sharing** – how much risk is borne by plan sponsors versus active plan members versus retired plan members.

  o **Pooling of risks** – how much risk is shared among plan members versus being borne separately by individual plan members.

✓ **No single plan design is superior to all others for all plan members.** The ideal plan design inevitably involves a compromise and balance to meet different employee groups' diverse needs and preferences.

✓ **The PERA Hybrid DB Plan is a cost-effective plan design that performs well overall compared to alternative designs.** Some alternatives perform better than the PERA Hybrid DB Plan in certain areas, but those designs do not perform as well in other areas. Selecting among these plan designs is a matter of policy preference to balance various objectives and risks.

Section IV – Cost and Effectiveness of the PERA Hybrid DB Plan Compared to Alternative Plan Designs

safety net, necessitating that its benefits provide comparable or better security to that offered by Social Security.

Social Security is a federal program designed to provide a foundational retirement income level and protection against old age poverty. Exhibit IV-1 shows several key benefits that contribute to this goal, and that the PERA Hybrid DB Plan provides similar benefits.

Exhibit IV-1

Key Benefits of Social Security and the PERA Hybrid DB Plan

Key Benefit	Social Security	PERA Hybrid DB Plan	Design Differences
Lifetime Income	Monthly income to eligible retirees that continues for their lifetime.	Monthly income to eligible retirees that continues for their lifetime.	None. Both provide lifetime income.
Survivor and Disability Benefits	Monthly lifetime income to eligible survivors of deceased workers and to individuals who become disabled and are unable to work.	Monthly lifetime income to eligible survivors of deceased workers and to individuals who become disabled and are unable to work.	None. Both provide survivor and disability benefits.
Cost-of-Living Adjustments	Monthly income is adjusted annually based on the Consumer Price Index (CPI) to ensure that retiree purchasing power is maintained over time in the face of inflation.	Monthly income is adjusted annually after 3 years of retirement based on the Consumer Price Index (CPI), subject to certain caps.	Social Security benefits keep pace with inflation. Due to its 3-year delay and caps on annual adjustments, PERA benefits may not, potentially diminishing purchasing power over a long retirement.

Section IV – Cost and Effectiveness of the PERA Hybrid DB Plan Compared to Alternative Plan Designs

Key Benefit	Social Security	PERA Hybrid DB Plan	Design Differences
Indexed Earnings	Benefits are calculated based on a worker's career indexed earnings. This indexing ensures that earnings from earlier in a worker's career are adjusted to current wage levels when calculating their retirement benefit.	Most benefits are calculated based on the "Highest Average Salary" (HAS) (typically a 3 or 5-year average).	Social Security's career indexing adjusts wages early in one's career for average wage increases since the wages were earned. This indexing omits the impact of any promotions during one's career, which are captured by PERA's HAS formula. As a result, PERA is more effectively designed to replace a percentage of a member's income just before retirement.
Benefit Formula Weighted to Income Levels	The benefit formula is progressive, providing a higher income replacement ratio for lower-income workers than higher-income workers.	The benefit formula does not incorporate any weighting based on income levels.	Unlike PERA's benefit formula, Social Security aims to provide a stronger safety net for those with lower lifetime earnings.

Source: Cheiron summary of benefits according to copera.org and SSA.gov.

Since PERA is a substitute for Social Security for its members, its retirement plans are subject to federal regulations to ensure they provide comparable benefits. This obligation applies to the PERA Hybrid DB and DC Plans. The federal regulations offer specific "safe harbor" designs that meet the requirements of a Social Security replacement plan. Both the PERA Hybrid DB Plan and the PERA DC Plan satisfy the safe harbor requirements as follows:

- A DB plan with a 5-year high average salary (HAS) and a normal retirement age of 65, such as the PERA Hybrid DB Plan, meets the safe harbor for replacing Social Security if the benefit multiplier is at least 1.6% of HAS per year of service. The PERA Hybrid DB Plan provides a benefit multiplier of 2.5% of HAS per year of service, so the PERA Hybrid DB Plan exceeds this safe harbor requirement.

- A DC plan with total contributions to the member's account of at least 7.5% of pay meets the safe harbor requirement for replacing Social Security. The PERA DC Plan provides total member and employer contributions to the member's account ranging from 20% to

Section IV – Cost and Effectiveness of the PERA Hybrid DB Plan Compared to Alternative Plan Designs

26.85% of pay, depending on the member's Division and job classification, so the PERA DC Plan exceeds this safe harbor requirement.

PERA generally provides higher income replacement ratios than Social Security at a similar cost. For example, the income replacement ratio under the PERA Hybrid DB Plan for a state non-safety member hired at age 25 and retiring at age 65 is about 94% compared to 33% for Social Security, assuming the member was hired today at a salary of $35,000. The expected cost (i.e., the total normal cost rate) of the PERA Hybrid DB Plan benefits for state non-safety employees is about 12.8% of payroll, comparable to Social Security's current payroll tax of 12.4%. Two primary factors contribute to this outcome:

1. PERA is pre-funded, so investment earnings pay for a significant portion of the benefits.

2. Social Security's progressive benefit formula effectively uses a portion of the payroll taxes collected from higher wage earners to enhance benefits for lower wage earners. For example, for someone who turns age 62 in 2025, Social Security provides the following income replacement ratios:

   - 90% on average indexed wages up to $14,712,
   - 32% on average indexed wages between $14,712 and $88,692, and
   - 15% on average indexed wages above $88,692 per year.[1]

Because the vast majority of Colorado PERA members earn more than $14,712 annually, and many earn more than $88,692, for the same cost, higher benefits can be provided to them outside of Social Security.

Offsetting these factors, it should be noted that Social Security provides full cost-of-living adjustments, while PERA's annual increases are limited and may not keep pace with inflation. Even so, PERA's income replacement ratios at retirement are much higher than Social Security and will only gradually lose purchasing power over time, so PERA's retirement benefits are extremely unlikely to drop to the level of Social Security.

---

[1] This Primary Insurance Amount is adjusted for retirement prior to Social Security Normal Retirement Age and for inflation from age 62 to the year of retirement.

Section IV – Cost and Effectiveness of the PERA Hybrid DB Plan Compared to Alternative Plan Designs

Summary of Alternative Plan Designs

We developed nine alternative plan designs to assess the cost and effectiveness of the PERA Hybrid DB Plan. These alternatives are meant to cover a range of plan designs used in the public and private sectors. The alternative plan designs differ primarily in their benefit accrual patterns and how various risks are managed. The Social Security Plus Defined Contribution alternative is the only plan design that includes Social Security coverage. The other alternatives are Social Security replacement plans like the current PERA plans.

Alternative Plan Designs

Standalone Defined Contribution (Standalone DC) – A defined contribution plan in which contributions are invested, often at the direction of the employee, and the benefit equals the accumulated account balance at retirement.

Social Security Plus Defined Contribution (Soc Sec + DC) – A typical private sector plan design combining Social Security with a defined contribution plan.

Variable Defined Benefit (Variable DB) – A defined benefit plan designed to mimic a defined contribution plan except that the longevity risk is pooled at a plan level and investment returns are credited based on a 5-year average.

Defined Contribution (Social Security Safe Harbor) Plus Traditional Defined Benefit (7.5% DC + DB) – A combination of DC and DB plans in which the DC plan meets the safe harbor requirements for replacing Social Security by providing a 7.5% contribution rate.

Variable Cash Balance – A plan that accumulates pay and interest credits (based on actual investment earnings) until retirement, when the balance is converted to a lifetime annuity.

Traditional Defined Benefit (Social Security Safe Harbor) Plus Defined Contribution (1.6% DB + DC) – A combination of DB and DC plans in which the DB plan meets the safe harbor requirements for replacing Social Security by providing a 1.6% benefit multiplier for age 65 retirements.

Money Purchase Plus Traditional Defined Benefit (Money Purchase + DB) – A combination of (1) a Money Purchase plan in which employee contributions accumulate with investment earnings and the balance at retirement is converted into a lifetime annuity plus (2) a defined benefit plan funded by employer contributions.

Traditional Defined Benefit with Gainsharing COLA (DB Gainsharing COLA) – A defined benefit plan that provides a post-retirement cost-of-living adjustment (COLA) when investment returns exceed the expected return.

Traditional Defined Benefit with Maximum COLA of 3% (DB Max 3% COLA) – A traditional defined benefit plan that provides a post-retirement cost-of-living adjustment equal to inflation up to a maximum of 3.0%. Any inflation above 3.0% is recorded in a bank that can be used to increase the COLA when inflation is below 3.0%.

Section IV – Cost and Effectiveness of the PERA Hybrid DB Plan Compared to Alternative Plan Designs

Accrual Patterns

Traditional defined benefit (DB) plans calculate retirement benefits as a monthly income starting at retirement. The value of the monthly income increases as the employee gets closer to retirement when the monthly benefit commences. For example, the value of a retirement benefit of $4,000 per month beginning at age 65 is much greater if the employee is 65 than if the employee is only 35 and would have to wait 30 years for the monthly benefit to commence.

In addition, traditional DB plan benefits are calculated based on the member's highest average salaries, often from the final years of employment. When an employee's salary increases later in their career, those higher earnings are applied to all prior years of service, increasing the benefit significantly more than if the higher salary were only applied to the current year of service, as in a DC plan. For example, when the first year of service is earned, the highest average salary may be $35,000, producing an accrued annual retirement benefit of $875 (2.5% x $35,000) for that first year of service. However, at retirement, the highest average salary may be $100,000, resulting in an annual retirement benefit of $2,500 (2.5% x $100,000) for each year of service, including that first year. As a result, a significant portion of the member's benefit almost always accrues in the last few years before retirement.

The combination of the time until the benefit commences and the use of the highest average salary for all years of service creates a backloaded accrual pattern where employees earn relatively modest benefits early in their careers when their salaries are lower and retirement is distant, but much more substantial benefits later as their salaries peak and they are closer to retirement. This backloading provides significant retention incentives for mid- to late-career employees. However, it also means that traditional DB benefits are less portable. If employees change jobs under a traditional DB plan, the benefit they receive upon retirement from the traditional DB plan is based on their HAS at the time they changed jobs. It does not increase for later salary increases that they might earn after changing jobs, or if they had not changed jobs. Consequently, even if an identical traditional DB plan covers their new job, their ultimate retirement benefit from the two plans will be less than if they had remained in the first plan for their entire career.

Portability

All plan designs allow employees to retain their accrued vested retirement benefit if they terminate employment before retirement. However, traditional DB plans are often not considered portable because employees who terminate employment before retirement generally receive lower benefits for their years of service than employees who continue employment to retirement.

Section IV – Cost and Effectiveness of the PERA Hybrid DB Plan Compared to Alternative Plan Designs

Exhibit IV-2 illustrates this dynamic for two hypothetical employees: one works a 30-year career in one DB plan while the other works 15 years in one DB plan and 15 years in a second identical DB plan.

Exhibit IV-2

Impact of Career in One Versus Two Traditional DB Plans

Plan	Benefit Multiplier		Highest Average Salary	Years of Service		Annual Retirement Benefit
30-Year Career in One DB Plan						
Plan #1	2.5%	x	$100,000	x 30	=	$75,000
30-Year Career in Two DB Plans						
Plan #1	2.5%	x	$60,000	x 15	=	$22,500
Plan #2	2.5%	x	$100,000	x 15	=	$37,500
Total						$60,000

Source: Cheiron analysis.

The employee who works a full 30-year career in one DB plan gets to apply the HAS at retirement to all 30 years of service while the employee who changes jobs after 15 years only gets to apply the HAS at retirement to 15 years of service. The benefit from the other 15 years of service is calculated using the HAS when the employee changes jobs, which is almost always lower. This dynamic in traditional DB plans incentivizes employee retention.

In contrast, DC plans put a set percentage of employees' pay into an individual account each year. All contributions stay in the account and grow with investment earnings. Because money added earlier in an employee's career has more time to grow, those early career contributions are more valuable than contributions made closer to retirement.

Section IV – Cost and Effectiveness of the PERA Hybrid DB Plan Compared to Alternative Plan Designs

Exhibit IV-3 illustrates this accrual pattern for a sample member who retires at age 65 after 30 years of service.

Exhibit IV-3

Defined Contribution Benefit Accruals

Year of Service	Salary	Total Contribution: 20% x Salary	Contribution Accumulated to Age 65 with Investment Earnings	Increase in Annual Retirement Benefit At Age 65[1]
1	$ 35,000	$ 7,000	$ 47,956	$ 2,805
2	$ 37,000	$ 7,400	$ 47,269	$ 2,765
3	$ 39,000	$ 7,800	$ 46,456	$ 2,717
…	…	…	…	…
28	$ 100,000	$ 20,000	$ 23,136	$ 1,353
29	$ 103,500	$ 20,700	$ 22,591	$ 1,321
30	$ 107,000	$ 21,400	$ 22,033	$ 1,289

Note: For ease of calculation and consistency with the Money Purchase Formula example in Exhibit III-10, this exhibit assumes the total contribution rate is 20% of pay.
[1] Based on converting the accumulated contributions at age 65 to a lifetime annuity.
Source: Cheiron analysis.

DC plans create a "front-loaded" accrual pattern, where more of the retirement benefit is built up earlier in a career. Unlike DB plans, DC plans do not incentivize retention by rewarding employees for staying with the same employer long-term. The DC benefit is fully portable, meaning when an employee changes jobs, their DC retirement benefit continues to grow with investment earnings (whether the employee takes their account balance with them or leaves it in the DC plan) just as it would if they remained with a single employer. There is no impact on their ultimate retirement benefit due to their decision to change jobs, as long as they are fully vested when they change jobs.

Section IV – Cost and Effectiveness of the PERA Hybrid DB Plan Compared to Alternative Plan Designs

Exhibit IV-4 compares the annual benefit accrual between a traditional DB plan and a DC plan for each year of service for a member hired at age 35 who retired at age 65. This comparison assumes salary increases according to the assumptions used in PERA's 2023 actuarial valuation. The benefit accruals in the traditional DB plan increase with each year of service while they decrease in the defined contribution plan even though salaries and contributions increase. This comparison is similar to that shown in Exhibit III-11, but notice how front-loaded the accruals are in a DC plan even compared to the more level accruals in the Money Purchase Formula in the PERA Hybrid DB Plan.

Exhibit IV-4

Increase in Age 65 Retirement Benefit by Year of Service
Traditional DB Plan Versus Defined Contribution Plan
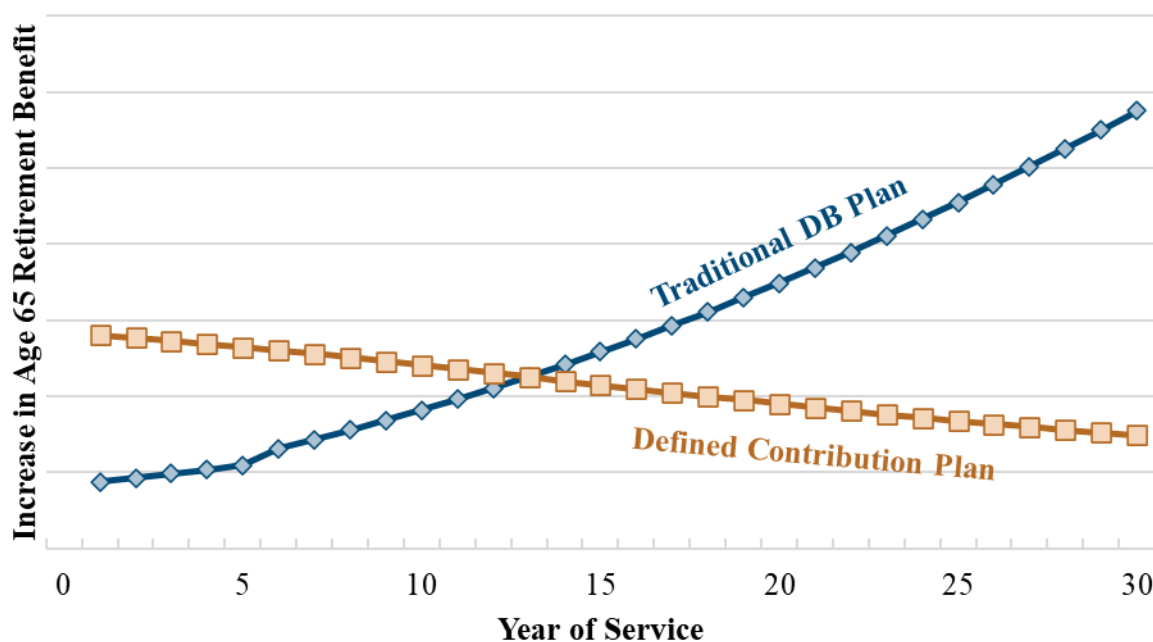
Source: Cheiron analysis.

The alternative plan designs offer a range of accrual patterns, including fully backloaded defined benefit plans, fully front-loaded defined contribution plans, and various blended accrual patterns.

By offering a DB plan, the General Assembly has chosen to offer a plan with a backloaded accrual pattern that results in retaining experienced, career employees. Offering only a DC or Cash Balance plan would offer more flexibility to a mobile workforce, but also would likely result in lower retention of an experienced workforce and less predictability in employee turnover and retirement. Plan design choices about benefit accrual directly shape workforce dynamics and the relative value proposition of the pension for employees with different career paths.

Section IV – Cost and Effectiveness of the PERA Hybrid DB Plan Compared to Alternative Plan Designs

Longevity Risk

Longevity risk is the risk of outliving your retirement benefits, and it can be borne by individual members in a plan or pooled across all members in the plan. If it is borne individually, it is very difficult to predict and can result in a member making cautious withdrawals of retirement assets to guard against running out of money. It may also affect investment allocations. Pooling this risk across the entire plan produces a much more efficient and predictable range of outcomes, as the funding for members who die earlier than expected pays for the continuing benefits of those who live longer.

The PERA Hybrid DB Plan, like other defined benefit plans, pools longevity risk. In contrast, defined contribution plans place the longevity risk on individual members. Since PERA members are not covered by Social Security, pooling some or all of the longevity risk may make sense to ensure some level of lifetime income.

Investment Risk

Plan designs can allocate investment risk (i.e., higher or lower than anticipated investment earnings) by adjusting either the benefits provided or the contributions to the Plan. In a traditional defined contribution plan, for example, changes in investment earnings directly affect benefits. In contrast, for a traditional defined benefit plan, changes in investment earnings affect plan costs, usually the employer contributions needed to fund the plan.

The PERA Hybrid DB Plan allocates investment risk by adjusting benefits and contributions via the Automatic Adjustment Provisions (AAP). These adjustments, which are primarily driven by investment returns, affect employee and employer contributions and the annual increases provided to retirees. The alternative plan designs offer a range of options for sharing investment risk.

- In the Variable DB Plan and the DC components of other alternative designs, changes in investment earnings affect the income replacement ratio at retirement and annual increases throughout retirement but do not affect employee or employer contributions.

- In the Variable Cash Balance Plan, changes in investment earnings only affect the income replacement ratio at retirement but do not affect post-retirement annual increases. Instead, adjustments to contributions are made to compensate for the impact of changes in investment earnings on post-retirement benefits.

- In the DB with Gainsharing COLA design, changes in investment earnings do not affect the income replacement ratio at retirement, but post-retirement annual increases are only provided when investment returns exceed expected investment returns; otherwise, contributions are adjusted to compensate for investment earnings.

- Finally, in the traditional DB components, changes in investment returns affect contributions but not benefits.

Section IV – Cost and Effectiveness of the PERA Hybrid DB Plan Compared to Alternative Plan Designs

Inflation Risk

The alternative plan designs index benefits for inflation in various ways. Traditional DB plans effectively index the benefit for inflation during an employee's working years by calculating the benefit amount based on salary at or near retirement, which typically has increased for inflation, longevity, and promotions over the employee's career. As a result, any additional cost for these higher benefits is reflected in plan costs. Defined contribution and the other alternative plan designs that do not calculate benefits based on the highest average salary provide no indexing to ensure the benefits keep pace with inflation during the employee's career. Instead, employees covered by these designs rely on investment returns to mitigate the erosion of income replacement ratios at retirement caused by inflation.

After retirement, plans may provide annual increases or cost-of-living adjustments to help keep pace with inflation. These annual increases may be based on inflation, as with the PERA Hybrid DB Plan, Social Security, and the other traditional DB components of the alternative plan designs. Changes in inflation affect the costs of the plan. However, except for Social Security, these annual increases are capped at some level to control costs, so the benefits are only indexed up to the cap. The cap on the COLA for the PERA Hybrid DB Plan varies based on the plan's funding sufficiency.

Other alternative plan designs, explicitly or implicitly, base their post-retirement annual increases on investment returns. Such designs include the defined contribution components of many alternatives and the Variable DB and DB with Gainsharing COLA. This approach mitigates the cost impact of inflation but only maintains real income replacement ratios to the extent that high investment returns and high inflation are correlated.

Exhibit IV-5 summarizes the key characteristics of the alternative plan designs using the following designations:

Accrual patterns: **Front-loaded** like a traditional DC plan versus **Back-loaded** like a traditional DB plan. Some of the alternative designs blend these accrual patterns by providing a combination of formulas: one with a front-loaded accrual pattern and one with a back-loaded accrual pattern.

Investment risks: Investment returns higher or lower than assumed can impact either the plan **Costs** (for employers, employees, or both) or member **Benefits**. The table differentiates between "pre-retirement" investment risk, meaning that investment returns may impact members' **Benefits** earned before retirement, and "post-retirement" investment risk, meaning that investment returns may impact members' **Benefits** during retirement.

In a traditional DC plan, the individual member bears the investment risks. Younger members who have longer investment horizons can afford to take on more investment risk to seek a better return because there is time to recover from an investment loss, but as the member approaches retirement,

Section IV – Cost and Effectiveness of the PERA Hybrid DB Plan Compared to Alternative Plan Designs

their investment horizon shortens, and it becomes more difficult to recover from an investment loss. As a result, the member is advised to invest more conservatively as retirement approaches, reducing the expected investment return.

In a traditional DB plan, the investment horizon is perpetually long, allowing the plan to bear more investment risk to seek higher investment returns. The PERA Hybrid DB Plan maintains a long investment horizon while sharing some risk with employees and retirees through its Automatic Adjustment Provision.

The alternative plan designs offer varying methods and degrees of sharing investment risk. Some share investment risk only with active employees, while others share some or all of the investment risk with both active employees and retirees.

Inflation risks: To protect against inflation, plans can provide **Benefits Indexed** for inflation, or plan benefits can **Depend on Investment Returns** to keep up with inflation. Some DB plans index benefits for inflation before retirement ("pre-retirement") by using a Highest Average Salary (HAS) formula, providing a benefit at retirement that is adjusted for inflation as reflected in salary increases that occurred over a member's career. Some DB plans provide "post-retirement" **Benefits Indexed Up to Cap** for inflation by providing annual Cost-of-Living-Adjustments, subject to an annual cap, to members' benefits during retirement. Only Social Security provides **Benefits Indexed** with no cap.

Longevity risks: Longevity risk can be borne by **Individual** members in a plan or **Pooled** across all members in the plan. Designs that pool longevity risk are more efficient in providing lifetime benefits. These designs, usually a DB plan, use the resources accumulated for members who die earlier than expected to pay for the members who live longer than expected. Traditional DC plans, in contrast, distribute any remaining assets when a member dies to the member's heirs, which means those assets are not available to pay for the retirement benefits of those who live longer than expected. These longer-living members would need to either accumulate more assets, reduce their annual benefits throughout retirement, or potentially run out of money. For a plan with no Social Security backstop, pooling some or all of the longevity risk may make sense to ensure some level of lifetime income.

Section IV – Cost and Effectiveness of the PERA Hybrid DB Plan Compared to Alternative Plan Designs

Exhibit IV-5

Summary of Alternative Plan Design Accrual Patterns and Risk Sharing

Alternative Plan Design	Accrual Pattern	Pre-Retirement Risks		Post-Retirement Risks		
		Investment	Inflation	Investment	Inflation	Longevity
PERA Hybrid DB	Blend	**Costs**	**Benefits Indexed**	Blend	**Benefits Indexed Up to Cap**	**Pooled**
Standalone DC	**Front-Loaded**	**Benefits**	**Depends on Investments**	**Benefits**	**Depends on Investments**	**Individual**
Soc Sec + DC	Blend	Blend	Blend	Blend	Blend	Blend
Variable DB	**Front-Loaded**	**Benefits**	**Depends on Investments**	**Benefits**	**Depends on Investments**	**Pooled**
7.5% DC + DB	Blend	Blend	Blend	Blend	Blend	Blend
Variable Cash Balance	**Front-Loaded**	**Benefits**	**Depends on Investments**	**Costs**	**Benefits Indexed Up to Cap**	**Pooled**
1.6% DB + DC	Blend	Blend	Blend	Blend	Blend	Blend
Money Purchase + DB	Blend	Blend	Blend	**Costs**	**Benefits Indexed Up to Cap**	**Pooled**
DB Gainsharing COLA	**Back-Loaded**	**Costs**	**Benefits Indexed**	**Costs**	**Depends on Investments**	**Pooled**
DB Max 3% COLA	**Back-Loaded**	**Costs**	**Benefits Indexed**	**Costs**	**Benefits Indexed Up to Cap**	**Pooled**

Note: Characteristics that are one end of the spectrum or the other are shown in bold with a colored background. Characteristics that are a blend of the two ends of the spectrum are shown in normal text with a gray background.

Source: Cheiron analysis.

Section IV – Cost and Effectiveness of the PERA Hybrid DB Plan Compared to Alternative Plan Designs

Income Replacement Ratio Comparison Methodology

For our analysis, we have structured the alternative plan designs to have the same expected cost as the PERA Hybrid DB Plan if all actuarial assumptions from the PERA Hybrid DB Plan's 2023 actuarial valuation are met (i.e., the baseline scenario); in other words, we have made the expected cost of each of the plans the same, which allows for the direct comparison of each design's effectiveness and risk allocation.

We analyzed accrual patterns by comparing income replacement ratios for theoretical members hired at various ages, terminating PERA-covered employment at various ages, and commencing retirement benefits at various ages. For example, we calculated income replacement ratios for members hired at ages 25, 35, 45, and 55 and retiring at ages 60, 65, and 70. For plans with a defined contribution component, we converted the accumulated account balances at retirement to a life annuity with an appropriate cost-of-living adjustment (COLA) to estimate the income replacement ratio, allowing for a comparison to the monthly annuity benefits provided by defined benefit plans.

To estimate accumulated account balances, defined contribution accounts are assumed to be invested in the Target Retirement Date Funds PERA offers. These funds are expected to provide annual investment returns ranging from 7.25% for members under age 40 to 6.00% for members age 60 and older. These varying returns reflect the changes in asset allocation in the Target Retirement Date Funds as members approach retirement age. The conversion to

> **Target Retirement Date Funds (TDF)**
>
> Target retirement date funds automatically adjust their asset allocation over time according to a predetermined "glide path." A TDF far from its target retirement date will hold a higher percentage of equities (stocks) for growth potential. As the fund's target retirement date approaches, the fund gradually and automatically shifts its allocation towards more conservative investments, such as bonds and cash equivalents, to reduce risk and preserve capital.

an annuity is based on the estimated cost of purchasing an annuity from an insurance company. The actual cost of buying an annuity when a member retires will depend on interest rates and mortality assumptions in use at that time. Appendix A of this report provides more detail on the investment return and annuity conversion assumptions.

Section IV – Cost and Effectiveness of the PERA Hybrid DB Plan Compared to Alternative Plan Designs

Comparison of Income Replacement Ratios at Retirement

This section of the report presents our analyses for members in the State and Local Government Divisions (other than Safety Officers) and Denver Public Schools (DPS). These three groups have the same benefit provisions and approximately the same cost in the PERA Hybrid DB Plan. The analyses for other divisions and for Safety Officers are shown in Appendix F.

Exhibits IV-6 through IV-8 show the income replacement ratios for the PERA Hybrid DB Plan and each alternative plan design. Each table cell is color-coded to show the degree to which the alternative design produces a higher or lower income replacement ratio than the PERA Hybrid DB Plan. Dark orange cells with bold text indicate that the alternative plan design provides a higher income replacement ratio than the PERA Hybrid DB Plan, and light orange cells with normal text indicate that the PERA Hybrid DB Plan provides a higher income replacement ratio than the alternative plan. Cells with white background and bold text indicate that the alternative plan provides income replacement ratios similar to the PERA Hybrid DB Plan.

Section IV – Cost and Effectiveness of the PERA Hybrid DB Plan Compared to Alternative Plan Designs

Income Replacement Ratios for Career Employees

We first compared the income replacement ratios for "career" employees – those who work in PERA-covered employment from when they are hired until they retire at 60, 65, or 70. Exhibit IV-6 illustrates that the PERA Hybrid DB Plan provides similar or higher income replacement ratios for career employees hired at age 25 in almost all cases.

Exhibit IV–6

Income Replacement Ratios for Career Employees
State and Local Government Divisions (Other than Safety Officers) and DPS
Hired at Age 25

	Retirement Age		
	60	**65**	**70**
PERA Hybrid DB	**82%**	**94%**	**94%**
Standalone DC	35%	49%	71%
Soc Sec + DC	1%	34%	49%
Variable DB	52%	67%	**97%**
7.5% DC + DB	46%	58%	74%
Variable Cash Balance	54%	76%	**109%**
1.6% DB + DC	63%	75%	**89%**
Money Purchase + DB	62%	79%	**101%**
DB Gainsharing COLA	**79%**	**90%**	**94%**
DB Max 3% COLA	**74%**	**85%**	**94%**

Note: A dark orange shade with bold text indicates the alternative plan design provides a higher income replacement ratio than the PERA Hybrid DB Plan; a white background with bold text indicates the alternative plan design provides a similar income replacement ratio to the PERA Hybrid DB Plan; and a light orange shade indicates the alternative plan design provides a lower income replacement ratio than the PERA Hybrid DB Plan. Social Security cannot be claimed before age 62, so the income replacement ratio for "Soc Sec + DC" at retirement age 60 only includes the DC benefit.
Source: Cheiron analysis using a salary at hire of $35,000 and December 31, 2023 actuarial valuation assumptions.

For a member hired at age 25 who works in PERA-covered employment until retiring at age 70, the Variable Cash Balance Plan provides an income replacement ratio of 109% compared to 94% for the PERA Hybrid DB Plan. The Variable Cash Balance Plan does not have a benefit limit, while the PERA Hybrid DB Plan benefit is limited to 100% of HAS, which, based on the highest 5-year average salary, results in a maximum income replacement ratio of 94%.

Section IV – Cost and Effectiveness of the PERA Hybrid DB Plan Compared to Alternative Plan Designs

Traditional defined benefit plan formulas are backloaded, prioritizing benefits for older, longer-service, or career employees. Consequently, alternative plan designs with a traditional defined benefit component, including the PERA Hybrid DB Plan, generally provide higher income replacement ratios for career employees.

Traditional defined benefit plans also provide greater benefits than DC plans to employees hired at older ages because the DC account balance has a shorter investment period for the account balance to grow. Exhibit IV-7 illustrates that the PERA Hybrid DB Plan provides similar or higher income replacement ratios for career employees hired at age 45 in all cases.

Exhibit IV–7

Income Replacement Ratios for Career Employees
State and Local Government Divisions (Other than Safety Officers) and DPS
Hired at Age 45

	Retirement Age		
	60	**65**	**70**
PERA Hybrid DB	**23%**	**47%**	**59%**
Standalone DC	12%	20%	31%
Soc Sec + DC	0%	33%	52%
Variable DB	16%	30%	42%
7.5% DC + DB	14%	26%	37%
Variable Cash Balance	18%	30%	46%
1.6% DB + DC	18%	36%	47%
Money Purchase + DB	19%	35%	49%
DB Gainsharing COLA	**21%**	**45%**	**57%**
DB Max 3% COLA	20%	**43%**	**54%**

Note: A dark orange shade with bold text indicates the alternative plan design provides a higher income replacement ratio than the PERA Hybrid DB Plan; a white background with bold text indicates the alternative plan design provides a similar income replacement ratio to the PERA Hybrid DB Plan; and a light orange shade indicates the alternative plan design provides a lower income replacement ratio than the PERA Hybrid DB Plan. Social Security cannot be claimed before age 62, so the income replacement ratio for "Soc Sec + DC" at retirement age 60 only includes the DC benefit.
Source: Cheiron analysis using a salary at hire of $35,000 and December 31, 2023 actuarial valuation assumptions.

Section IV – Cost and Effectiveness of the PERA Hybrid DB Plan Compared to Alternative Plan Designs

Income Replacement Ratios for Non-Career Employees

The PERA Hybrid DB Plan does not always produce the highest income replacement ratios for employees who do not work in PERA-covered employment until retirement. For the same cost level, traditional defined benefit plan designs cannot provide higher income replacement ratios for both younger, shorter-service employees and older, longer-service employees. Exhibit IV-8 illustrates this dynamic for employees hired at age 25 who terminate their PERA-covered employment at various ages, and then commence their retirement benefits at age 65.

Exhibit IV–8

Income Replacement Ratios for Non-Career Employees
State and Local Government Divisions (Other than Safety Officers) and DPS
Hired at Age 25

Termination Age	30	35	40	45	50	55
PERA Hybrid DB	**5%**	**10%**	**17%**	**24%**	**33%**	**49%**
Standalone DC	8%	15%	23%	29%	35%	41%
Soc Sec + DC	6%	12%	18%	21%	24%	28%
Variable DB	11%	21%	31%	41%	49%	56%
7.5% DC + DB	5%	11%	17%	24%	31%	39%
Variable Cash Balance	12%	24%	36%	46%	55%	63%
1.6% DB + DC	4%	9%	15%	23%	32%	44%
Money Purchase + DB	7%	15%	24%	33%	43%	54%
DB Gainsharing COLA	2%	6%	12%	20%	32%	47%
DB Max 3% COLA	2%	6%	11%	19%	30%	45%

Note: A dark orange shade with bold text indicates the alternative plan design provides a higher income replacement ratio than the PERA Hybrid DB Plan; a white background with bold text indicates the alternative plan design provides a similar income replacement ratio to the PERA Hybrid DB Plan; and a light orange shade indicates the alternative plan design provides a lower income replacement ratio than the PERA Hybrid DB Plan.
Source: Cheiron analysis using a salary at hire of $35,000 and December 31, 2023 actuarial valuation assumptions.

Accrual patterns like those of a defined contribution plan are not backloaded, so they tend to provide greater benefits to younger, shorter-term employees. While the Money Purchase Formula in the PERA Hybrid DB Plan has an accrual pattern somewhat similar to a DC plan and provides higher income replacement ratios for younger, shorter-term employees than a traditional defined benefit plan, the alternative plans with accrual patterns more like a defined contribution plan (e.g., the Variable Cash Balance or the Variable DB plans) provide substantially higher income replacement ratios for younger, shorter-service employees. Consequently, for the same cost, these plans cannot provide as high an income replacement ratio for full-career employees.

Section IV – Cost and Effectiveness of the PERA Hybrid DB Plan Compared to Alternative Plan Designs

Comparison of Real Income Replacement Ratios Throughout Retirement

After retirement, inflation erodes the purchasing power of retirement income. The alternative plan designs provide varying levels of post-retirement benefit increases to combat this erosion of purchasing power. This portion of the analysis illustrates how the purchasing power of the initial income replacement ratio is expected to change throughout retirement due to inflation offset by post-retirement benefit increases (referred to as Annual Increases or AI by PERA) provided by the plan design. We call this the Real Income Replacement Ratio.

In the section above, we calculated income replacement ratios at retirement for defined contribution plans by assuming the members use their account balance at retirement to purchase a lifetime annuity. However, when calculating the real income replacement ratio throughout retirement for defined contribution plans, we assume members leave their DC accounts invested and make monthly withdrawals to match the benefit provided by the PERA Hybrid DB Plan until the account runs out. This assumption is not intended to reflect a typical withdrawal pattern for DC members, but it illustrates how long the DC plan could match the PERA Hybrid DB Plan before running out of assets.

Exhibit IV-9 starts with the income replacement ratio for a member hired at age 25 who retired at age 65 and shows how that income replacement ratio erodes over time based on the annual increases provided by the plan compared to annual inflation of 2.30% (PERA's assumed inflation). The AI assumed to be provided by each plan are shown in the first column.

The PERA Hybrid DB Plan provides an annual increase in the benefit after 3 years of retirement. While the annual increase varies based on the plan's funding, PERA advised us to assume an annual increase of 1.25% over the long term. As a result, the PERA Hybrid DB Plan's real income replacement ratio gradually declines from 94% at age 65 to 78% at age 80 and 67% at age 95.

Section IV – Cost and Effectiveness of the PERA Hybrid DB Plan Compared to Alternative Plan Designs

Exhibit IV–9

Real Income Replacement Ratios in Retirement
State and Local Government Divisions (Other than Safety Officers) and DPS
Hired at Age 25, Retired at Age 65

Age	AI	65	70	75	80	85	90	95	100
PERA Hybrid DB	**1.25%**	**94%**	**86%**	**82%**	**78%**	**74%**	**70%**	**67%**	**63%**
Standalone DC	1.25%	**94%**	**86%**	**82%**	0%	0%	0%	0%	0%
Soc Sec + DC	2.30%	57%	33%	33%	33%	33%	33%	33%	33%
Variable DB	2.25%	67%	67%	67%	66%	66%	**66%**	**66%**	**66%**
7.5% DC + DB	1.25%	**94%**	**86%**	38%	26%	25%	23%	22%	21%
Variable Cash Balance	1.25%	76%	72%	68%	65%	62%	59%	56%	53%
1.6% DB + DC	1.25%	**94%**	**86%**	**79%**	51%	49%	46%	44%	42%
Money Purchase + DB	1.25%	79%	75%	71%	67%	64%	61%	58%	55%
DB Gainsharing COLA	1.75%	**90%**	**88%**	**86%**	**83%**	**81%**	**79%**	**77%**	**75%**
DB Max 3% COLA	2.30%	**85%**	**85%**	**85%**	**85%**	**85%**	**85%**	**85%**	**85%**

Note: A dark orange shade with bold text indicates the alternative plan design provides a higher real income replacement ratio than the PERA Hybrid DB Plan; a white background with bold text indicates the alternative plan design provides a similar real income replacement ratio to the PERA Hybrid DB Plan; and a light orange shade indicates the alternative plan design provides a lower real income replacement ratio than the PERA Hybrid DB Plan.
Source: Cheiron analysis using PERA's December 31, 2023 actuarial valuation inflation assumption of 2.3%.

As shown in Exhibit IV-9, the Standalone DC plan can match the PERA Hybrid DB benefit payments for a limited period before the account is depleted. Plans that blend a DB plan with a DC plan follow a similar pattern, but to a lesser extent. The various DC plan account balances are expected to be depleted at the following ages.

- Standalone DC: Age 77
- Soc Sec + DC: Age 65
- 7.5% DC + DB: Age 75
- 1.6% DB + DC: Age 75

The shortfalls in the DC plans can be attributed to several factors:

- Providing better benefits to shorter-term employees can reduce the amount available for full-career employees and post-retirement increases.
- DB plans pool longevity risk, while DC plans allocate assets individually, potentially leading to some individuals outliving their savings.

Section IV – Cost and Effectiveness of the PERA Hybrid DB Plan Compared to Alternative Plan Designs

- DB plans often have a longer investment horizon, potentially leading to higher expected returns than a retiree's DC plan portfolio.

The DB plans with a maximum 3% COLA or a Gainsharing COLA start with lower income replacement ratios at retirement compared to the PERA Hybrid DB Plan, but their higher annual increases can lead to higher real income replacement ratios within 5 to 10 years of retirement. This highlights a trade-off between initial benefit levels and long-term inflation protection.

The Variable DB plan starts with a lower income replacement ratio at age 65 due to its accrual pattern favoring shorter-term employees. However, its design aims to generate greater annual increases than the PERA Hybrid DB Plan based on investment returns, potentially keeping the real replacement ratio relatively stable throughout retirement.

Section IV – Cost and Effectiveness of the PERA Hybrid DB Plan Compared to Alternative Plan Designs

Sensitivity to Economic Scenarios

The analysis so far has compared the alternative plan designs using the Baseline assumptions shown in Exhibit IV-10 along with all other assumptions from PERA's December 31, 2023 actuarial valuation. While the baseline assumptions may be reasonable expectations, there can be significant variations in how the future unfolds. Each plan design adapts to different economic scenarios by adjusting one or more of the following:

- Income replacement ratios,
- Annual post-retirement benefit increases, and/or
- Contributions from employees and employers.

To assess the sensitivity of each plan design to different market conditions, we developed three scenarios to compare to the Baseline scenario – a low investment return scenario, a high investment return scenario, and a high inflation scenario. Exhibit IV-10 summarizes the key assumptions for each scenario.

Exhibit IV-10

Economic Scenarios

	Low Return	Baseline	High Return	High Inflation
Inflation	2.30%	2.30%	2.30%	3.30%
PERA Hybrid DB Plan Annual Increase	0.50%	1.25%	2.00%	1.25%
Investment Return for all DB plans	5.75%	7.25%	8.75%	7.25%
Investment Return for all DC Plans - by Age Range				
<40	5.25%	7.25%	9.25%	7.25%
40 – 44	5.25%	7.00%	9.00%	7.00%
45 – 49	5.25%	7.00%	8.50%	7.00%
50 – 54	5.25%	6.75%	8.00%	6.75%
55 – 59	5.25%	6.50%	7.75%	6.50%
60+	5.00%	6.00%	7.00%	6.00%
DC Plan Annuity Purchase Interest Rate	3.50%	3.50%	3.50%	4.50%

Source: PERA Hybrid DB Plan Annual Increases were provided by PERA. Investment Returns are based on Cheiron analysis using capital market assumptions from Horizon's 2024 survey. DB Plan Investment Returns are based on PERA's target asset allocation, and DC Plan Investment Returns are based on the asset allocations in various Target Retirement Date Fund options available in PERA's DC plan. The low and high return assumptions approximate the 25th and 75th percentiles of expected returns, respectively. See Appendix A for more details.

Section IV – Cost and Effectiveness of the PERA Hybrid DB Plan Compared to Alternative Plan Designs

Sensitivity of Income Replacement Ratios

Exhibit IV-11 shows the income replacement ratios of each plan design under each scenario. To simplify the presentation, the exhibit is only for a member hired at age 25 who works in PERA-covered employment until retiring at age 65. The black squares represent the income replacement ratio in the baseline scenario, and the bars extend from the income replacement ratio in the low investment return scenario (dark blue bottom of the bars) to the income replacement ratio in the high investment return scenario (light blue top of the bars). The gold triangles are the income replacement ratio in the high inflation scenario.

The primary emphasis in this chart is the range between the low and high investment return scenarios. The specific income replacement ratios for the Baseline and High Inflation scenarios are not labeled on the chart. The PERA Hybrid DB Plan shows stability across all scenarios, with the same income replacement ratio of 94% in the Baseline, Low Return, and High Return scenarios, and only a slightly lower ratio in the High Inflation scenario due to higher salary increases during the highest average salary period. Similar stability is also observed in the other traditional DB plans like the DB Gainsharing COLA and the DB Max 3% COLA designs, as well as the Social Security + DC design. In contrast, the Variable Cash Balance plan's income replacement ratios are highly sensitive to investment returns, as illustrated by the bar ranging from 60% in the low return scenario to 105% in the high return scenario. The Variable Cash Balance plan's income replacement ratio is also highly sensitive to high inflation, which can be seen by the gold triangle being much lower than the black square.

Section IV – Cost and Effectiveness of the PERA Hybrid DB Plan Compared to Alternative Plan Designs

Exhibit IV–11

Sensitivity of Income Replacement Ratios
State and Local Government Divisions (Other than Safety Officers) and DPS
Hired at Age 25, Retired at Age 65
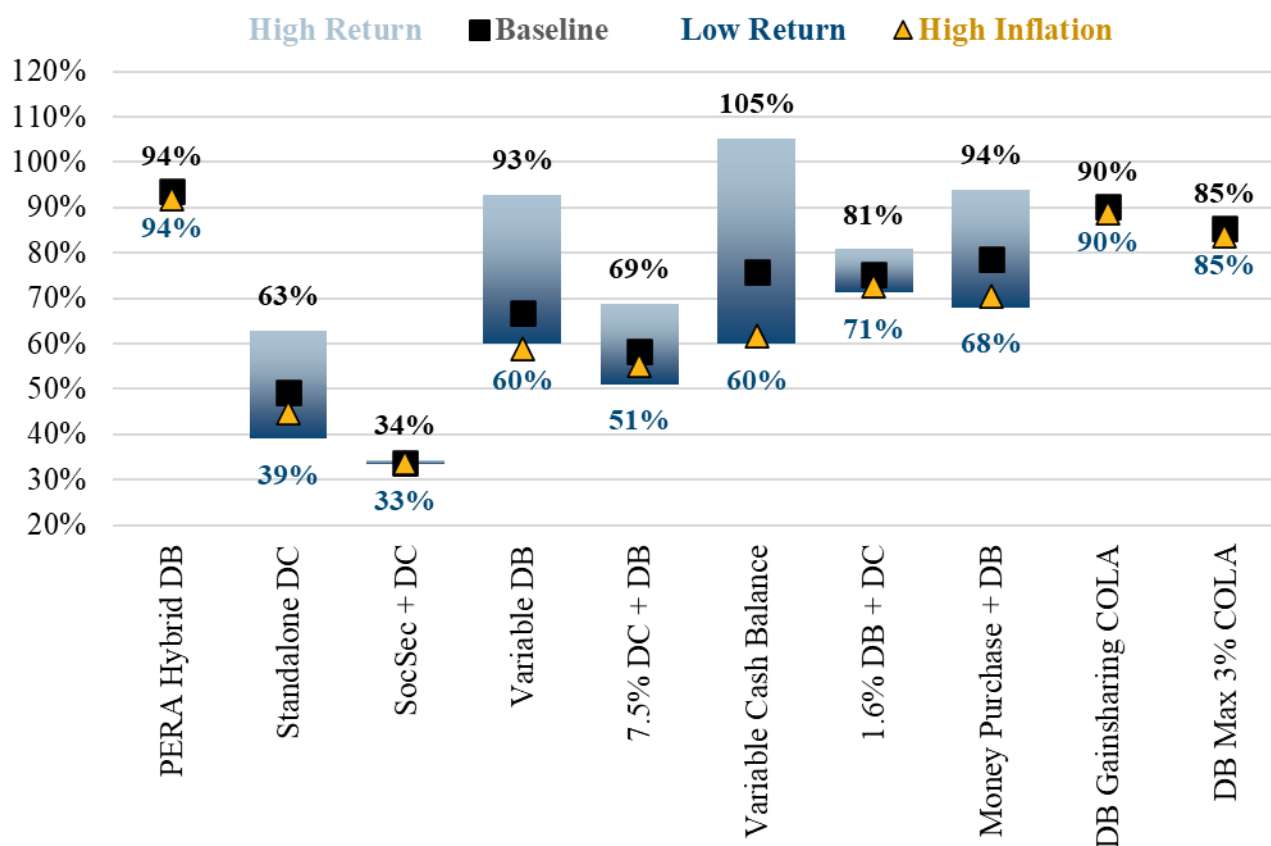
Source: Cheiron analysis.

Income replacement ratios for DC plans can fluctuate significantly with investment returns. Similarly, the Variable DB and Variable Cash Balance plans also show considerable variation as investment returns directly impact the benefits provided. However, the Variable DB and Variable Cash Balance Plans have a minimum benefit equal to the defined benefit safe harbor under Federal regulations for Social Security replacement plans. These plans are also generally more sensitive to inflation. The plans that blend a DC approach with a DB approach have more moderate variations in income replacement ratios according to the economic scenario.

Sensitivity of Real Income Replacement Ratios Throughout Retirement

Real Income Replacement Ratios vary throughout retirement as the alternative plan designs adjust or do not adjust post-retirement benefit increases for the economic scenario. Some plan designs adjust the annual increase based on inflation, some adjust the annual increase based on investment returns, while others provide the same annual increase across all economic scenarios.

Section IV – Cost and Effectiveness of the PERA Hybrid DB Plan Compared to Alternative Plan Designs

Exhibit IV-12 summarizes the assumed annual increases in each scenario for each alternative plan design. For DC plans, the income replacement ratios at retirement are calculated by assuming the members use their account balance at retirement to purchase a lifetime annuity with the corresponding annual post-retirement increase shown in Exhibit IV-12. However, when calculating the real income replacement ratio throughout retirement for DC plans, we assume members leave their DC accounts invested and make monthly withdrawals to match the benefit provided by the PERA Hybrid DB Plan until the account runs out. This assumption is not intended to reflect a typical withdrawal pattern for DC members, but it illustrates how long the DC plan could match the PERA Hybrid DB Plan before running out of assets.

Exhibit IV-12

Assumed Annual Post-Retirement Increases

Plan	Low Return	Baseline	High Return	High Inflation
Inflation	**2.30%**	**2.30%**	**2.30%**	**3.30%**
PERA Hybrid DB Plan[1]	0.50%	1.25%	2.00%	1.25%
Standalone DC[1]	0.50%	1.25%	2.00%	1.25%
Soc Sec + DC	2.30%	2.30%	2.30%	3.30%
Variable DB	0.75%	2.25%	3.75%	2.25%
7.5% DC + DB	1.25%	1.25%	1.25%	1.25%
Variable Cash Balance	1.25%	1.25%	1.25%	1.25%
1.6% DB + DC	1.25%	1.25%	1.25%	1.25%
Money Purchase + DB	1.25%	1.25%	1.25%	1.25%
DB Gainsharing COLA	1.75%	1.75%	1.75%	1.75%
DB Max 3% COLA	2.30%	2.30%	2.30%	3.00%

[1]First annual increase occurs 3 years after retirement.
Note: The DB Gainsharing COLA design determines the annual increase each year based on actual investment returns for that year compared to the expected investment return within each scenario; therefore, the average annual increase remains the same across all economic scenarios.
Source: Cheiron analysis.

Section IV – Cost and Effectiveness of the PERA Hybrid DB Plan Compared to Alternative Plan Designs

High Investment Return Scenario

In this scenario, the PERA Hybrid DB Plan and the Variable DB Plan apply higher annual increases than in the baseline scenario, providing better inflation protection. At the same time, the alternative designs with a DC or Variable component accumulate larger balances that can be used to raise their annual increases or extend the period they provide retirement income. For example, the Variable Cash Balance plan uses its larger balance to provide a higher income replacement ratio at retirement, but does not change its annual increases in retirement.

Exhibit IV-13 shows the Real Income Replacement Ratios for each alternative design for a career member who was hired at age 25 and retired at age 65. In this high investment return scenario, the Variable Cash Balance Plan provides the highest income replacement ratio at retirement, and the Variable DB Plan provides the highest Real Income Replacement Ratios throughout retirement.

Exhibit IV–13

Real Income Replacement Ratios in Retirement
High Return Scenario
State and Local Government Divisions (Other than Safety Officers) and DPS
Hired at Age 25, Retired at Age 65

Age	AI	65	70	75	80	85	90	95	100
PERA Hybrid DB	**2.00%**	**94%**	**88%**	**87%**	**85%**	**84%**	**83%**	**82%**	**80%**
Standalone DC	**2.00%**	**94%**	**88%**	**87%**	**85%**	26%	0%	0%	0%
Soc Sec + DC	**2.30%**	66%	33%	33%	33%	33%	33%	33%	33%
Variable DB	**3.75%**	**93%**	**100%**	**107%**	**115%**	**123%**	**132%**	**142%**	**152%**
7.5% DC + DB	**1.25%**	**94%**	**88%**	**87%**	**85%**	25%	23%	22%	21%
Variable Cash Balance	**1.25%**	**105%**	**100%**	**95%**	**90%**	**86%**	**81%**	**77%**	**73%**
1.6% DB + DC	**1.25%**	**94%**	**88%**	**87%**	**85%**	49%	46%	44%	42%
Money Purchase + DB	**1.25%**	**94%**	**89%**	**85%**	**80%**	**76%**	73%	69%	65%
DB Gainsharing COLA	**1.75%**	**90%**	**88%**	**86%**	**83%**	**81%**	**79%**	**77%**	**75%**
DB Max 3% COLA	**2.30%**	**85%**	**85%**	**85%**	**85%**	**85%**	**85%**	**85%**	**85%**

Note: A dark orange shade with bold text indicates the alternative plan design provides a higher real income replacement ratio than the PERA Hybrid DB Plan; a white background with bold text indicates the alternative plan design provides a similar real income replacement ratio to the PERA Hybrid DB Plan; and a light orange shade indicates the alternative plan design provides a lower real income replacement ratio than the PERA Hybrid DB Plan.
Source: Cheiron analysis using PERA's December 31, 2023 actuarial valuation inflation assumption of 2.3%.

Section IV – Cost and Effectiveness of the PERA Hybrid DB Plan Compared to Alternative Plan Designs

Low Investment Return Scenario

In this scenario, the PERA Hybrid DB Plan and the Variable DB Plan apply lower annual increases than in the baseline scenario, providing less inflation protection. At the same time, the alternative designs with a DC or variable component accumulate smaller balances that either reduce their annual increases or shorten the period they provide retirement income. For example, the Variable Cash Balance plan reduces its income replacement ratio at retirement due to the smaller accumulated balance, but does not change its annual increases in retirement.

Exhibit IV-14 shows the Real Income Replacement Ratios for each alternative design for a career member hired at age 25 and retired at age 65 in this low investment return scenario. The PERA Hybrid DB Plan provides the highest income replacement ratio at retirement, and the DB Max 3% COLA Plan provides the highest Real Income Replacement Ratios throughout retirement.

Exhibit IV–14

Real Income Replacement Ratios in Retirement
Low Return Scenario
State and Local Government Divisions (Other than Safety Officers) and DPS
Hired at Age 25, Retired at Age 65

Age	AI	65	70	75	80	85	90	95	100
PERA Hybrid DB	**0.50%**	**94%**	**85%**	**77%**	**71%**	**65%**	**59%**	**54%**	**50%**
Standalone DC	0.50%	94%	85%	0%	0%	0%	0%	0%	0%
Soc Sec + DC	2.30%	51%	33%	33%	33%	33%	33%	33%	33%
Variable DB	0.75%	60%	56%	51%	48%	44%	41%	38%	35%
7.5% DC + DB	1.25%	94%	85%	27%	26%	25%	23%	22%	21%
Variable Cash Balance	1.25%	60%	57%	54%	51%	49%	46%	44%	42%
1.6% DB + DC	1.25%	94%	85%	54%	51%	49%	46%	44%	42%
Money Purchase + DB	1.25%	68%	65%	61%	58%	55%	53%	**50%**	**47%**
DB Gainsharing COLA	1.75%	90%	88%	**86%**	**83%**	**81%**	**79%**	**77%**	**75%**
DB Max 3% COLA	2.30%	85%	85%	**85%**	**85%**	**85%**	**85%**	**85%**	**85%**

Note: A dark orange shade with bold text indicates the alternative plan design provides a higher real income replacement ratio than the PERA Hybrid DB Plan; a white background with bold text indicates the alternative plan design provides a similar real income replacement ratio to the PERA Hybrid DB Plan; and a light orange shade indicates the alternative plan design provides a lower real income replacement ratio than the PERA Hybrid DB Plan.
Source: Cheiron analysis using PERA's December 31, 2023 actuarial valuation inflation assumption of 2.3%.

Section IV – Cost and Effectiveness of the PERA Hybrid DB Plan Compared to Alternative Plan Designs

High Inflation Scenario

In this scenario, Social Security and the DB Max 3% COLA Plan apply higher annual increases than in the baseline scenario, providing better inflation protection than the other alternative designs that either never adjust their annual increases or only adjust them in response to investment returns. At the same time, the alternative designs with an accrual pattern similar to a DC plan do not keep pace with inflation before retirement, providing a lower replacement income at retirement. The DB plans that determine benefits based on the highest average salary maintain their income replacement ratios at retirement with a small decrease based on the length of the salary averaging period.

Exhibit IV-15 shows the Real Income Replacement Ratios for each alternative design for a career member hired at age 25 and retired at age 65 in this high inflation scenario. The PERA Hybrid DB Plan provides the highest income replacement ratio at retirement, and the DB Max 3% COLA Plan provides the highest Real Income Replacement Ratios throughout retirement.

Exhibit IV–15

Real Income Replacement Ratios in Retirement
High Inflation Scenario
State and Local Government Divisions (Other than Safety Officers) and DPS
Hired at Age 25, Retired at Age 65

Age	AI	65	70	75	80	85	90	95	100
PERA Hybrid DB	**1.25%**	**92%**	**81%**	**73%**	**66%**	**60%**	**54%**	**49%**	**44%**
Standalone DC	**1.25%**	92%	81%	0%	0%	0%	0%	0%	0%
Soc Sec + DC	**3.30%**	53%	33%	33%	33%	33%	33%	33%	33%
Variable DB	**2.25%**	59%	56%	53%	50%	48%	46%	43%	**41%**
7.5% DC + DB	**1.25%**	92%	81%	24%	22%	20%	18%	16%	15%
Variable Cash Balance	**1.25%**	62%	56%	50%	46%	41%	37%	34%	31%
1.6% DB + DC	**1.25%**	92%	81%	48%	44%	39%	36%	32%	29%
Money Purchase + DB	**1.25%**	70%	64%	58%	52%	47%	43%	39%	35%
DB Gainsharing COLA	**1.75%**	89%	82%	76%	71%	66%	**61%**	**56%**	**52%**
DB Max 3% COLA	**3.00%**	84%	83%	**81%**	**80%**	**79%**	**78%**	**77%**	**76%**

Note: A dark orange shade with bold text indicates the alternative plan design provides a higher real income replacement ratio than the PERA Hybrid DB Plan; a white background with bold text indicates the alternative plan design provides a similar real income replacement ratio to the PERA Hybrid DB Plan; and a light orange shade indicates the alternative plan design provides a lower real income replacement ratio than the PERA Hybrid DB Plan.
Source: Cheiron analysis using an inflation assumption of 3.3%.

Section IV – Cost and Effectiveness of the PERA Hybrid DB Plan Compared to Alternative Plan Designs

Sensitivity of Plan Costs

Plan designs in which benefits are less sensitive to investment returns or inflation exhibit greater cost variability. Conversely, plans with benefits more directly linked to investment returns or inflation experience less cost volatility. The Variable Cash Balance Plan is a combination, as pre-retirement investment returns affect benefits, but post-retirement investment returns do not.

In Exhibit IV-16, the black squares represent the total expected cost as a percentage of payroll (i.e., total normal cost rate) in the baseline scenario, and the bars extend from the total expected cost in the high investment return scenario (light blue bottom of bars) to the total expected cost in the low investment return scenario (dark blue top of bars). The gold triangles are the total expected cost in the high inflation scenario. For example, the PERA Hybrid DB Plan's expected cost is sensitive to investment returns, as illustrated by the bar ranging from 9.4% in the high return scenario to 17.7% in the low return scenario. The PERA Hybrid DB Plan's expected cost is also sensitive to high inflation, which can be seen by the gold triangle being higher than the black square.

Exhibit IV–16
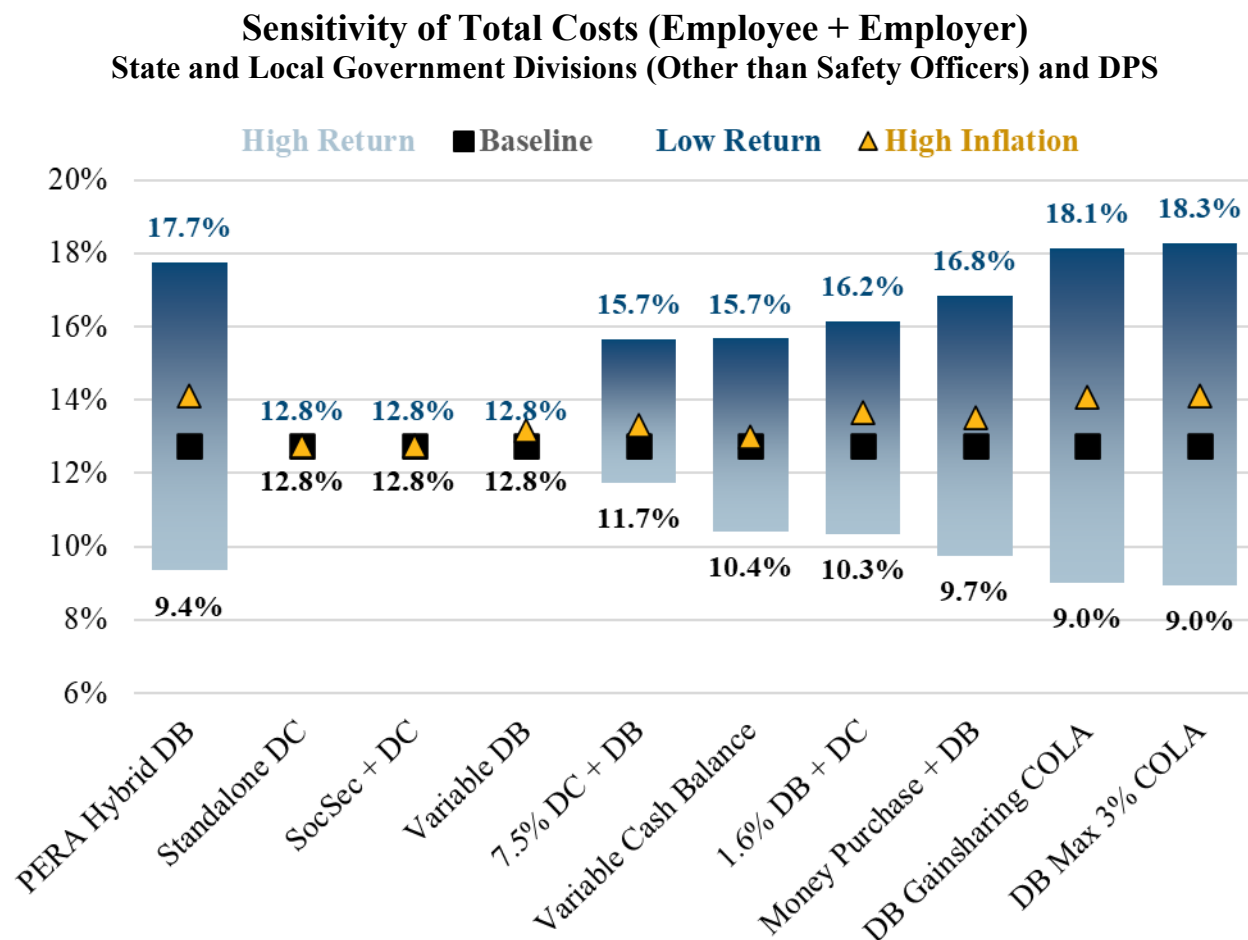
Sensitivity of Total Costs (Employee + Employer)
State and Local Government Divisions (Other than Safety Officers) and DPS

Source: Cheiron analysis.

Section IV – Cost and Effectiveness of the PERA Hybrid DB Plan Compared to Alternative Plan Designs

Conclusion

Our analysis suggests that the PERA Hybrid DB Plan is a cost-effective retirement system design that performs well, providing relatively high income replacement ratios at retirement and throughout retirement compared to the alternative designs studied. While certain alternative designs may offer advantages in specific areas, these often come at the expense of shortcomings in other critical aspects of the plans. Selecting among these alternative plan designs reflects a policy preference for balancing the various objectives and distributing the plan's risks and benefits. It is worth considering whether any features of the alternative plan designs would improve this balance for Colorado PERA.

Impacts of Transitioning to an Alternative Plan Design

As part of comparing the benefits, cost, and portability of the PERA Hybrid DB Plan with those of alternative plan designs, statute specifically required us to analyze the impact of transitioning to an alternative plan design in terms of the following [Section 24-51-614(2)(a)(III) – (VI), C.R.S.]:

1. Retirement benefits,
2. Costs to employees, employers, and taxpayers, as well as other effects, and
3. PERA's ability to fully amortize the Unfunded Actuarial Accrued Liability of each Division.

In this section, we assume that PERA will continue the existing PERA DC Plan, regardless of any changes related to the current PERA Hybrid DB Plan. This discussion addresses both an alternative plan design where (1) the PERA Hybrid DB Plan is closed, and all employees hired after the transition date must join the alternative plan, and (2) the PERA Hybrid DB Plan is modified but remains open to new employees. In either case, the PERA Hybrid DB Plan's current Unfunded Actuarial Liability would continue to be the same dollar amount, which requires future contributions to pay it off.

Impact on Retirement Benefits

PERA told us that, historically, when new benefit tiers were established in the PERA Hybrid DB Plan, those tiers applied only to employees hired on or after the effective date of the new tier. Therefore, if an alternative plan design were adopted, it is likely that the same approach would be used, with the new design applying only to those employees hired on or after the effective date of the new design. The analysis in this Section IV of the report shows that if the State transitioned to an alternative design with expected costs that are equal to the PERA Hybrid DB Plan's, the retirement benefits would be lower than in the PERA Hybrid DB Plan for some employees and higher for others.

- Exhibits IV-6 and IV-7 show that the PERA Hybrid DB Plan provides similar or higher benefits for career employees except that the Variable Cash Balance design provides higher benefits for a career employee hired at age 25 who retires at age 70.

Section IV – Cost and Effectiveness of the PERA Hybrid DB Plan Compared to Alternative Plan Designs

- Exhibit IV-8, however, shows that for many non-career employees, the PERA Hybrid DB Plan provides lower benefits than several of the alternative designs. The degree to which the benefits are lower depends on the alternative design, the age at hire, the age the employee leaves the plan, and the age the employee commences retirement benefits.
- Exhibit IV-9 shows that the PERA Hybrid DB Plan provides similar or higher real income replacement ratios throughout retirement compared to most alternative plan designs for a career employee hired at age 25 who retired at age 65. The only exceptions are the DB Gainsharing COLA and DB Max 3% COLA plan designs that provide similar but higher real income replacement ratios beginning around age 70 that become more than 10% higher by age 85 for the DB Max 3% COLA and before age 90 for the DB Gainsharing COLA.
- Exhibit IV-11 shows that the PERA Hybrid DB Plan provides stable income replacement ratios regardless of economic scenarios and that for a career employee hired at age 25 who retires at age 65, the income replacement ratio provided by the PERA Hybrid DB Plan is similar or higher than all alternative plans in all economic scenarios except that the Variable Cash Balance Plan provides a higher income replacement ratio in the high return scenario.
- Exhibits IV-13 through IV-15 show the real income replacement ratios throughout retirement under the different economic scenarios for an employee hired at age 25 who retired at age 65. In the High Return scenario, the Variable DB Plans provides similar or higher real income replacement ratios than all other plans except that the Variable Cash Balance Plan provides a higher real income replacement ratio at age 65. In the Low Return and High Inflation scenarios, the DB Gainsharing COLA and the DB Max 3% COLA plans provide similar or higher real income replacement ratios than the PERA Hybrid DB Plan.

In general, alternative plan designs that provide lower benefits for career employees and higher benefits for non-career employees than the PERA Hybrid DB Plan include:

- Standalone Defined Contribution,
- Social Security plus Defined Contribution,
- Variable Defined Benefit,
- Variable Cash Balance, and
- Money Purchase Plus Traditional Defined Benefit.

Alternative plan designs that tend to offer a lower benefit at retirement and higher post-retirement benefit increases to better protect against inflation in retirement include:
- Traditional Defined Benefit with Gainsharing COLA, and
- Traditional Defined Benefit with Maximum COLA of 3%.

Finally, the alternative plan designs share risks between members and employers to different extents. The degree to which the alternative plan design provides a better or worse benefit than the PERA Hybrid DB Plan depends on the economic scenario experienced by the member. The analyses above illustrated these impacts for four economic scenarios.

Section IV – Cost and Effectiveness of the PERA Hybrid DB Plan Compared to Alternative Plan Designs

Cost Impact on Employees, Employers, Taxpayers, and PERA

Over time, the contributions to any retirement plan plus the investment earnings have to equal the benefits paid plus the administrative expenses. A change to any element of this equation requires a change to another element to

Retirement Plan Balance Equation
Contributions + Investment Earnings = Benefits + Expenses

maintain the balance equation. The alternative plan designs were structured to have the same expected cost for new members as the PERA Hybrid DB Plan in the baseline economic scenario. Assuming the investment returns and administrative expenses are the same, the alternative plans would also be expected to provide the same aggregate level of benefits. However, the DC plan designs assume the asset allocation becomes more conservative as the member grows older and consequently is not expected to produce the same investment earnings as a DB plan. If the State were to make up for the lower expected investment earnings through additional contributions, the State would incur higher costs.

As discussed above, the alternative plan designs provide higher benefits for some employees and lower benefits for other employees. If the State were to adopt one of these alternative designs and modify it to improve the benefits for employees who are expected to receive lower benefits, it would incur higher costs. The amount of the higher costs would depend on the specific alternative design and the degree to which the lower benefits were improved. If the State transitioned to one of the alternative plan designs included in this study without modification, the total expected cost would not change regardless of which alternative plan design is adopted.

One aspect of the cost of an alternative plan design is how the costs of the alternative plan designs would be divided between the members and the employers (taxpayers). In most cases, the costs could be divided in the same proportions as in the PERA Hybrid DB Plan, as shown in Exhibit III-14. This ranges from employees paying a low of 55% (Judicial Division) of the combined cost to a high of 82% (State, DPS, and Schools Divisions). However, two of the alternative plan designs require a different division of the expected cost.

The Soc Sec + DC design would require the employer and the employee to each make contributions of 6.2% of pay to Social Security as required by law. This would necessarily increase the employer normal cost contribution for all divisions except the Judicial Division and for Safety Officers in the State and Local Government Divisions. Even if employees made the full DC contribution (the percentage necessary to make this alternative plan design have the same expected cost as the PERA Hybrid DB Plan), the employer normal cost contribution for the State (non-safety officers) and DPS Divisions would increase by 170% and the employer normal cost contributions for the Schools and Local Government Divisions would increase by 63% and 44%, respectively.

The Money Purchase Plus Traditional Defined Benefit plan is designed to split the expected costs equally between members and employers. Consequently, this alternative plan design would

Section IV – Cost and Effectiveness of the PERA Hybrid DB Plan Compared to Alternative Plan Designs

increase the employer normal cost contribution for all divisions. This alternative plan design, however, could be modified to use the same proportions as the PERA Hybrid DB Plan.

The alternative plan designs have varying administrative requirements beyond our study's scope. At a minimum, PERA's communication materials would need to be updated for the new plan design, and more importantly, PERA's recordkeeping and administrative systems would need to be updated to accommodate both the current plan for existing members and the alternative plan design for new members. These changes may be minimal for some designs, while the changes would be more extensive for others. For example, the Variable DB plan would require procedures for updating active and vested member accounts for the 5-year average investment return and changing the annual increase applied to any retirement benefits. We recommend thoroughly reviewing the administrative implications before adopting any alternative plan design.

Finally, the alternative plan designs share risks between members and employers to different extents. Consequently, while the expected costs are the same, regardless of design, the actual costs may differ significantly depending on the economic scenario as shown in Exhibit IV-16. In general, designs like the Standalone Defined Contribution or the Variable Defined Benefit Plan that pass the risks through to the benefits (e.g., lower investment returns result in lower benefits) will have stable costs regardless of the economic scenario. In contrast, the designs that protect benefit amounts from the various risks will have more variable costs.

Impact on PERA's Ability to Fully Amortize the Unfunded Actuarial Liability of Each Division If the Hybrid DB Plan is Closed to New Employees

While not recommended, closing the PERA Hybrid DB Plan would be an option if any of the alternative plan designs were adopted. However, only the Standalone Defined Contribution and the Social Security Plus Defined Contribution plan designs would require closing the PERA Hybrid DB Plan to new members. All the other alternative plan designs include a defined benefit component that could be structured as a new tier in the PERA Hybrid DB Plan.

If the PERA Hybrid DB Plan were closed to new members, the current mechanism for collecting amortization payments would no longer be sufficient, and some additional costs would be incurred.

As of December 31, 2023, the total Unfunded Actuarial Liability (UAL) for all five of PERA's divisions was $27.6 billion. While the dollar amount needed to fully amortize the UAL does not change if the Hybrid DB Plan is closed, the payroll on which the amortization payments are collected will decline, and the currently scheduled amortization payment rates will be insufficient. As a result, the mechanism for collecting amortization payments will need to change to collect the same dollar amount. One common approach would be to collect the same percentage of pay from employers for amortization payments on all payroll, regardless of which plan the employee participates in. Other methods may also be used, including charging employers specific dollar amounts for the amortization payments.

Section IV – Cost and Effectiveness of the PERA Hybrid DB Plan Compared to Alternative Plan Designs

While the UAL would not change, closing the PERA Hybrid DB Plan to new members would accelerate the timeline for fully funding it and would gradually require additional liquidity in the investment portfolio, which will eventually impact investment returns.

Plans need to have sufficient assets to pay benefits when they are due. When a plan is closed to new members, this deadline becomes closer. When the plan is initially closed, these benefit payments extend many years into the future. As shown in Exhibit IV-17, the current schedule to fully amortize the UAL would be completed within 27 years, long before the last benefits are paid. As long as this schedule is not extended, we would not expect this to be an issue.

When a plan is closed, the assets will eventually be drawn down as benefit payments are made. Each year, the proportion of the remaining assets needed to pay for the following year's benefit payments will increase, gradually requiring additional liquidity in the investment portfolio, limiting the types of assets the plan can invest in, which may affect the investment return that can be achieved.

As of December 31, 2023, PERA Board had adopted an asset allocation policy in which 77% of the assets in the PERA Hybrid DB Plan should be invested in liquid assets (global equities, fixed income, short-term investments, and cash) and the remaining 23% in non-liquid assets (private equities, real estate, and alternatives). Over time, PERA would need to shift assets out of non-liquid investments, which could reduce its overall investment earnings.

The current actuarial valuation assumes there will be no changes to the asset allocation in the future, but if the plan is closed, the actuarial valuation will eventually need to anticipate lower investment returns due to the liquidity needs. Assumed or actual lower investment returns would increase the UAL, and the contributions needed to fully amortize it. However, we would not expect a noticeable change for a decade or two.

Impact on PERA's Ability to Fully Amortize the Unfunded Actuarial Liability of Each Division if the PERA Hybrid DB Plan Remains Open to New Employees

If an alternative plan design other than the Standalone Defined Contribution or the Social Security Plus Defined Contribution were adopted, a more efficient transition would implement the DB portion of the alternative plan design as a new tier in the PERA Hybrid DB Plan, allowing PERA to continue to use the current mechanism to fully amortize the UAL.

Section IV – Cost and Effectiveness of the PERA Hybrid DB Plan Compared to Alternative Plan Designs

Based on the existing statutory contribution rates for the PERA Hybrid DB Plan and the current actuarial assumptions, the PERA Hybrid DB Plan is projected to fully amortize the UAL for each division in the period shown in Exhibit IV-17.

Exhibit IV-17

Projected Years Until PERA Hybrid DB Plan Reaches 100% Funded

Division	Years
State	23
School	27
Local Government	14
Judicial	8
Denver Public Schools (DPS)	9

Source: PERA's December 31, 2023 Annual Comprehensive Financial Report.

The alternative plan design does not affect the current UAL or the amortization payments needed to amortize it fully. The UAL is attributable to the historical experience of the PERA Hybrid DB Plan, and any changes to future benefits for new employees have no impact on it.

If the DB portion of the alternative plan design is adopted as a new tier of benefits within the PERA Hybrid DB Plan, new members will continue to join the plan, the plan's projected payroll will not change, and the UAL can be fully amortized following the same schedule as currently planned.

Conclusion

Our analysis shows that a transition to an alternative plan design need not incur significant additional costs or jeopardize the ability to fully amortize the UAL provided that the PERA Hybrid DB Plan remains open with a new tier of benefits that provides the DB portion of the alternative plan design. In order for an alternative plan design to be cost-neutral relative to the current PERA Hybrid DB Plan, the alternative plan design would need to be substantially the same as one of those used in the study, meaning that it is likely that some new members would receive lower benefits than they would receive under the current PERA Hybrid DB Plan and some new members may receive higher benefits than they would receive under the current PERA Hybrid DB Plan. Adjusting the alternative plan design so that no new member received less than they would under the current PERA Hybrid DB Plan could be very expensive, depending on the alternative plan design and how it was modified.

Section V– Comparison of PERA Hybrid DB and DC Plans

Overview

Statute required this study to compare the PERA Hybrid DB and the PERA DC Plans to determine how members with different job classifications and salaries benefit differently from each plan and which plan is more advantageous for state employees and retirees [Section 24-51-614 (2)(b)(I) & (II), C.R.S.]. This section provides that comparison.

Some PERA members are offered a choice between the PERA Hybrid DB Plan and the PERA DC Plan. When hired, these members choose a plan and have a one-time option to change their election between their second and fifth year of employment. This section of the report compares the costs and income replacement ratios of these two plan designs.

Employee contribution rates for the PERA DC Plan are set in statute to equal those of the PERA Hybrid DB Plan. Consequently, as the Automatic Adjustment Provisions of the PERA Hybrid DB Plan change employee contribution rates for that plan, they also change employee contribution rates for the PERA DC Plan. However, the employer contribution rates for the PERA DC Plan remain constant, while the Automatic Adjustment Provisions change employer contribution rates for the PERA Hybrid DB Plan.

Key Findings

✓ **The PERA Hybrid DB Plan has a lower expected cost than the PERA DC Plan for new members.** While current employer contributions for the PERA Hybrid DB Plan are higher than for the DC Plan, a significant portion of the DB plan contribution is to pay for the unfunded liability attributable to the past and not for benefits being earned today.

✓ **The PERA Hybrid DB Plan generally provides higher income replacement ratios for career employees.** The PERA DC Plan generally provides higher income replacement ratios for younger, shorter-service employees.

✓ **The PERA DC Plan is fully portable, while the Hybrid DB Plan is not.** If a DC Plan member leaves PERA-covered employment for another employer with an identical DC plan, their retirement benefits will not be affected. However, if a Hybrid DB Plan member leaves for an employer with an identical DB Plan, their retirement benefits will be lower. This dynamic incentivizes DB Plan members to remain in PERA-covered employment.

✓ **The PERA DC Plan exposes employees to greater risk.**
  ○ **Investment returns** have a significant impact on the benefits provided.
  ○ There are **no death or disability benefits** beyond the accumulated account balance.
  ○ Members must manage withdrawals in retirement to not outlive their assets, or purchase an annuity to have a **guaranteed lifetime income**.

Section V– Comparison of PERA Hybrid DB and DC Plans

Background on PERA DC Plan

As shown in Exhibit V-1, since 2006, PERA has offered certain new members a choice between the PERA Hybrid DB Plan and the PERA DC Plan. These employees also have a one-time option to transfer from the plan elected at hire to the other plan between the second and fifth year of employment.

Exhibit V-1

Eligibility for PERA Choice

PERA Division	Employee Group	Hired on or after
State	State Employees, including safety officers	1/1/2006
State	District Attorneys' Offices	1/1/2006[1]
State	Community College Employees	1/1/2008
State	Classified Employees of State Colleges or Universities	1/1/2019
Local Government	Local Government Employees, including safety officers	1/1/2019

[1] In addition to new members, district attorneys already serving on January 1, 2006, were offered a one-time choice to join the PERA DC Plan.
Source: Sections 24-51-305.5, 1501 (4) and 1502, C.R.S.

PERA DC Plan Costs

Both the employee and the employer make contributions to the PERA DC Plan. Employee contribution rates are the same as in the PERA Hybrid DB Plan, which vary based on the Hybrid DB Plan's funding. Employer contributions are set in statute and vary by Division. Exhibit V-2 shows the employee and employer contribution rates to the DC plan accounts. For purposes of this study, in consultation with PERA and Segal, we have assumed that the current AAP rates of 1.0% will be reduced to 0.5% over the long term, which reduces the employee contribution rates to the DC plan accounts by 0.5% compared to the current contribution rates.

Exhibit V-2

PERA DC Plan Employer Contribution Rates

Division	Employee Rate	Employer Rate
State (non-Safety Officer)	10.50%	10.15%
Local Government (non-Safety Officer)	8.50%	10.00%
State and Local Government Safety Officers	12.50%	12.85%

Source: copera.org.

Section V– Comparison of PERA Hybrid DB and DC Plans

Investment Options

Participants in the PERA DC Plan direct how their account balance is invested. PERA offers a variety of investment fund options with different risk and return profiles. These options include stock funds, bond funds, and Target Retirement Date Funds. If a participant does not make an active investment election, their funds are placed into a Target Retirement Date fund based on their age and an assumed retirement date.

Target Retirement Date funds automatically manage the asset allocation based on the estimated years until the employee is expected to retire. At younger ages, the asset allocation provides a higher expected return and greater risk. As an employee approaches retirement age, the asset allocation becomes more conservative, reducing the risk level and lowering the expected return.

Vesting

Employee contributions are 100% vested immediately. This means that when a member terminates PERA-covered employment, the full account balance attributable to employee contributions is always payable to the employee.

Employer contributions have a vesting schedule and are only 50% vested immediately. This percentage increases 10% per year of service until the employer contributions are 100% vested after 5 years of service.

Retirement Benefits

The retirement benefit in the PERA DC Plan is based solely on the total contributions made to the participant's account, plus or minus any investment earnings or losses, and minus any administrative fees. Unlike the PERA Hybrid DB Plan, there is no guaranteed lifetime monthly benefit. The benefit amount depends on investment performance and withdrawal timing.

Upon terminating PERA-covered employment, participants can access their vested account balance through options like a lump-sum distribution or a rollover to another qualified retirement account. These options are available if you terminate PERA-covered employment because you become disabled, but no additional disability benefits are available under the PERA DC Plan.

In-service distributions (while still working for a PERA employer) are generally not allowed. Loans and hardship withdrawals are not permitted.

In the event of the participant's death before retirement, the balance in their PERA DC Plan account will be paid to their named beneficiary(ies) as a lump-sum distribution. There are no continuing monthly survivor benefits from the PERA DC Plan itself.

Income Replacement Ratio Comparison Methodology

We analyzed accrual patterns by comparing income replacement ratios for theoretical members hired at various ages, terminating PERA-covered employment at various ages, and commencing retirement benefits at various ages. For example, we calculated income replacement ratios for

Section V– Comparison of PERA Hybrid DB and DC Plans

members hired at ages 25, 35, 45, and 55 and retiring at ages 60, 65, and 70. For the PERA DC Plan, we converted the accumulated account balances at retirement to a life annuity with an appropriate cost-of-living adjustment (COLA) to estimate the income replacement ratio, allowing for a comparison to the monthly annuity benefits provided by the PERA Hybrid DB Plan. The conversion to an annuity is based on the estimated cost of purchasing an annuity from an insurance company. The actual cost of buying an annuity when a member retires will depend on interest rates and mortality assumptions in use at that time.

To estimate accumulated account balances, PERA DC Plan accounts are assumed to be invested in the Target Retirement Date Funds PERA offers. These funds are expected to provide annual investment returns ranging from 7.25% for members under age 40 to 6.00% for members age 60 and older. These varying returns reflect the changes in asset allocation in the Target Retirement Date Funds as members approach retirement age. Appendix A of this report provides more detail on the investment return and annuity conversion assumptions.

Comparison of Income Replacement Ratios at Retirement

This section only analyzes the Income Replacement Ratios at retirement for the State Division (other than Safety Officers) to simplify the presentation. The analyses for the Local Government Division (other than Safety Officers) and for State and Local Government Divisions Safety Officers are shown in Appendix B.

The exhibits in this section show the income replacement ratios for the PERA Hybrid DB Plan compared to the PERA DC Plan. Each exhibit cell is color-coded. The Hybrid DB Plan cells are shades of blue (left side of the table), and the DC Plan cells are shades of orange (right side). Dark shades with bold text indicate the plan that provides a higher income replacement ratio; white backgrounds with bold text indicate the two plans provide similar income replacement ratios (i.e., within 10%); and light shades with normal text indicate the plan that provides a lower income replacement ratio.

Section V– Comparison of PERA Hybrid DB and DC Plans

Career Employees

The analysis first compares the income replacement ratios for "career" employees – those who work in PERA-covered employment from various hire ages until they retire at 60, 65, or 70. Exhibit V-3 shows that the PERA Hybrid DB Plan provides higher income replacement ratios for career employees in almost all cases.

Exhibit V-3

Income Replacement Ratios for Career Employees
State Division (Other than Safety Officers)

Hire Age	PERA Hybrid DB Plan Retirement Age			PERA DC Plan Retirement Age		
	60	65	70	60	65	70
25	**82%**	**94%**	94%	57%	80%	**114%**
35	**39%**	**70%**	**82%**	37%	55%	81%
45	**23%**	**47%**	**59%**	20%	32%	51%
55	**8%**	**23%**	**35%**	6%	14%	26%

Note: Dark shades with bold text indicate the plan that provides a higher income replacement ratio; white background with bold text indicates the two plans provide similar income replacement ratios; and light shades with normal text indicate the plan that provides a lower income replacement ratio.
Source: Cheiron analysis based on PERA's 2023 actuarial valuation assumptions and other assumptions described in Appendix A.

The only scenario in this analysis where the PERA DC Plan provides a greater income replacement ratio than the PERA Hybrid DB Plan is for a member hired at age 25 who works in PERA-covered employment until retiring at age 70. This occurs primarily because the PERA Hybrid DB Plan benefit is capped at 100% of HAS, which for the 5-year highest average salary is estimated to be 94% of the final salary. The PERA DC Plan has no cap, so after 45 years of contributions and investment earnings, it is expected that the account balance will be sufficient to purchase an annuity that is greater than 100% of final salary. Members hired at age 35 who work until retirement at age 60 or 70 have similar income replacement ratios from either plan.

Traditional defined benefit plan formulas are backloaded, prioritizing benefits for older, longer-service, or career employees. Consequently, the PERA Hybrid DB Plan generally provides higher income replacement ratios for career employees, even at the lower expected cost.

Section V– Comparison of PERA Hybrid DB and DC Plans

Non-Career Employees

The analysis next compares the income replacement ratios for employees who do not work in PERA-covered employment until retirement. Exhibit V-4 shows income replacement ratios for employees hired at various ages who terminate their PERA-covered employment at 35, 45, or 55 and commence their retirement benefits at age 65. In contrast to career employees, in all cases, the PERA Hybrid DB Plan provides lower income replacement ratios than the PERA DC Plan for these employees.

Exhibit V-4

Income Replacement Ratios for Retirement at Age 65
State Division (Other than Safety Officers)

Hire Age	PERA Hybrid DB Plan Termination Age			PERA DC Plan Termination Age		
	35	**45**	**55**	**35**	**45**	**55**
25	10%	24%	49%	**25%**	**47%**	**66%**
35		14%	33%		**22%**	**41%**
45			16%			**18%**

Note: Dark shades with bold text indicate the plan that provides a higher income replacement ratio; white background with bold text indicates the two plans provide similar income replacement ratios; and light shades with normal text indicate the plan that provides a lower income replacement ratio.
Source: Cheiron analysis based on PERA's 2023 actuarial valuation assumptions and other assumptions described in Appendix A.

Combining the front-loaded accrual pattern of the PERA DC Plan with its higher expected cost (described in detail below) produces higher expected income replacement ratios for members who do not work in PERA-covered employment until retirement. Note, for example, that a member hired at age 25 who terminates PERA-covered employment 10 years later at age 35 is expected to receive a benefit from the PERA DC Plan that is 2.5 times greater than the benefit they would have received from the PERA Hybrid DB Plan. As age and service increase, the PERA Hybrid DB Plan income replacement ratios increase and become closer to those of the PERA DC Plan.

Section V– Comparison of PERA Hybrid DB and DC Plans

Comparison of Costs

The expected cost of the PERA Hybrid DB Plan equals its total normal cost, which is expressed as a rate (a percentage of pay) that, if contributed each year throughout a member's career, is expected to accumulate with investment earnings, to have sufficient assets to provide monthly retirement benefits for the member's lifetime, assuming all actuarial assumptions are met. It does not include the costs to reduce the UAL attributable to the plan's historical experience. The expected cost of the PERA DC Plan is the total contribution rate (employer and employee) under the Baseline scenario.

Exhibit V-5

Comparison of Total Expected Costs for PERA Plans
Baseline Scenario

Division	PERA Hybrid DB Plan	PERA DC Plan	Difference Between PERA DC and Hybrid DB Plans
State (non-Safety Officers)	12.76%	20.65%	7.89%
Local Government (non-Safety Officers)	12.82%	18.50%	5.68%
Safety Officers	19.31%	25.35%	6.04%

Note: The employee contribution rate for both plans is 10.50% for State (non-Safety Officers), 8.50% for Local Government (non-Safety Officers), and 12.50% for Safety Officers**.** The employer's expected cost is the difference between the total expected cost and the employee contribution rates.
Source: Cheiron analysis based on employer DC Plan contribution rates from copera.org and PERA Hybrid DB Plan Total Normal Cost rates calculated by PERA's actuarial firm, Segal.

Section V– Comparison of PERA Hybrid DB and DC Plans

Sensitivity to Economic Scenarios

To assess each plan's sensitivity to different market conditions, we used three economic scenarios to compare with the Baseline scenario. The table below summarizes the key assumptions for each scenario.

Exhibit V-6

Economic Scenarios

	Low Return	Baseline	High Return	High Inflation
Inflation	2.30%	2.30%	2.30%	3.30%
Hybrid DB Plan Annual Increase	0.50%	1.25%	2.00%	1.25%
Hybrid DB Plan Investment Return	5.75%	7.25%	8.75%	7.25%
Hybrid DB and DC Plan Employee Contribution Rate (State Division Other Than Safety Officers)	12.00%	10.50%	9.00%	10.50%
DC Plan Investment Return by Age Range				
<40	5.25%	7.25%	9.25%	7.25%
40 – 44	5.25%	7.00%	9.00%	7.00%
45 – 49	5.25%	7.00%	8.50%	7.00%
50 – 54	5.25%	6.75%	8.00%	6.75%
55 – 59	5.25%	6.50%	7.75%	6.50%
60+	5.00%	6.00%	7.00%	6.00%
DC Plan Annuity Purchase Interest Rate	3.50%	3.50%	3.50%	4.50%

Source: Cheiron assumptions. Appendix A – Methods and Assumptions provides the rationale for these assumptions.

Section V– Comparison of PERA Hybrid DB and DC Plans

The PERA Hybrid DB Plan and the PERA DC Plan adapt to different economic scenarios by making the contribution and benefit adjustments shown in the table below.

Exhibit V-7

Adjustments to Different Economic Scenarios

	PERA Hybrid DB	PERA DC
Employee Contribution Rate	Adjusted by Automatic Adjustment Provision	Same as the Hybrid DB Plan
Employer Contribution Rate	Adjusted by Automatic Adjustment Provision	No adjustment
Income Replacement Ratios	No adjustment except in the High Inflation scenario	Adjusts to reflect the contributions and investment returns of the economic scenario
Post-Retirement Benefit Increases	Adjusted by Automatic Adjustment Provision	Adjusts to reflect the investment returns of the economic scenario

Source: Cheiron analysis.

Section V– Comparison of PERA Hybrid DB and DC Plans

Sensitivity of Income Replacement Ratios

To simplify the analysis' presentation, the only employment scenario shown in Exhibit V-8 is for a member hired at age 25 who works in PERA-covered employment until retiring at ages 60, 65, or 70. There is one row for each economic scenario. For this career employee, the analysis shows that the income replacement ratios in the PERA Hybrid DB Plan are stable across different investment return scenarios, while the income replacement ratios in the PERA DC Plan fluctuate significantly with investment returns.

Exhibit V-8

Income Replacement Ratios by Scenario
State Division (Other than Safety Officers)
Career Employee Hired at Age 25

| | PERA Hybrid DB Plan | | | PERA DC Plan | | |
| | Retirement Age | | | Retirement Age | | |
Scenario	60	65	70	60	65	70
Baseline	**82%**	**94%**	94%	57%	80%	**114%**
High Return	**82%**	**94%**	94%	65%	**94%**	**141%**
Low Return	**82%**	**94%**	**94%**	50%	68%	**94%**
High Inflation	**80%**	**92%**	**92%**	54%	72%	**99%**

Note: Dark shades with bold text indicate the plan that provides a higher income replacement ratio; white background with bold text indicates the two plans provide similar income replacement ratios; and light shades with normal text indicate the plan that provides a lower income replacement ratio. **Source:** Cheiron analysis.

The income replacement ratios in the PERA Hybrid DB Plan are only slightly reduced in the high inflation scenario, which is due to the higher assumed salary increases, causing the highest 5-year average salary used in calculating the retirement benefit to be a smaller percentage of the final year's salary.

In contrast, the income replacement ratios for the PERA DC Plan fluctuate significantly with investment returns. For retirement at age 65, the income replacement ratio ranges from a low of 68% in the low return scenario to a high of 94% in the high return scenario, matching the income replacement ratio provided by the Hybrid DB Plan. In the high inflation scenario, income replacement ratios are lower because high inflation produces a higher final salary.

Section V– Comparison of PERA Hybrid DB and DC Plans

Exhibit V-9 shows a comparable analysis for a non-career employee hired at age 25, terminating PERA-covered employment at ages 35, 45, or 55, and commencing retirement benefits at age 65. While the PERA DC Plan income replacement ratios fluctuate significantly across the scenarios, the DC plan provides higher expected income replacement ratios than the PERA Hybrid DB Plan for this non-career employee, particularly in the High-Return Scenario. Even in the Low-Return Scenario, the income replacement ratios are higher under the DC plan than those provided by the PERA Hybrid DB Plan, except that they are similar for age 55 terminations.

Exhibit V-9

Income Replacement Ratios for Retirement at Age 65 by Scenario
State Division (Other than Safety Officers)
Non-Career Employee Hired at Age 25

	PERA Hybrid DB Plan Termination Age			PERA DC Plan Termination Age		
Scenario	**35**	**45**	**55**	**35**	**45**	**55**
Baseline	10%	24%	49%	**25%**	**47%**	**66%**
High Return	10%	22%	49%	**36%**	**63%**	**82%**
Low Return	11%	25%	**49%**	**17%**	**35%**	**52%**
High Inflation	7%	18%	44%	**20%**	**40%**	**57%**

Note: Dark shades with bold text indicate the plan that provides a higher income replacement ratio; white background with bold text indicates the two plans provide similar income replacement ratios; and light shades with normal text indicate the plan that provides a lower income replacement ratio.
Source: Cheiron analysis.

In contrast to the career employee, the income replacement ratios for the PERA Hybrid DB Plan fluctuate somewhat based on the scenario. This fluctuation is due to the benefit from the Money Purchase Formula varying as the employee contribution rate changes in the different economic scenarios. For employees hired at age 25 who terminate from PERA-covered employment at age 45, the income replacement ratio drops from 24% in the Baseline Scenario to 22% in the High Return Scenario. It increases to 25% in the Low Return Scenario. These changes may seem counterintuitive, but they reflect that the employee contribution rate goes down in the High Return Scenario, resulting in a smaller benefit under the Money Purchase Formula, and the employee contribution rate goes up in the Low Return Scenario, resulting in a larger benefit under the Money Purchase Formula. At the same time, the interest credited to member accounts remains 3.0% per year in all scenarios.

Sensitivity of Real Income Replacement Ratios Throughout Retirement

As discussed in Section III, inflation erodes the purchasing power of retirement income after retirement. Above, we calculated income replacement ratios at retirement for defined contribution plans by assuming the members used their account balance at retirement to purchase a lifetime annuity. In this portion of the analysis, we assume the members leave their DC

Section V– Comparison of PERA Hybrid DB and DC Plans

accounts invested and make withdrawals to match the benefit provided by the PERA Hybrid DB Plan until the account is depleted. This assumption is not intended to reflect a typical withdrawal pattern for DC plan members, but it illustrates how long the DC plan could match the PERA Hybrid DB Plan before running out of assets.

Exhibit V-10 shows how the income replacement ratio for a member hired at age 25 who retired at age 65 erodes over time in both the PERA Hybrid DB Plan and the DC Plan based on the annual increases provided by the plan and the annual inflation assumed for that scenario.

Exhibit V-10

Real Income Replacement Ratios in Retirement
State Division (Other than Safety Officers)
Hired at Age 25, Retired at Age 65

Age	65	70	75	80	85	90	95	100
Baseline Scenario	(Inflation = 2.30%, Annual Increase = 1.25%, DC Plan Return = 6.0%)							
PERA Hybrid DB Plan	94%	86%	82%	78%	74%	70%	67%	63%
PERA DC Plan	94%	86%	82%	78%	74%	35%	0%	0%
High Return Scenario	(Inflation = 2.30%, Annual Increase = 2.00%, DC Plan Return = 7.0%)							
PERA Hybrid DB Plan	94%	88%	87%	85%	84%	83%	82%	80%
PERA DC Plan	98%	98%	98%	98%	98%	98%	98%	98%
Low Return Scenario	(Inflation = 2.30%, Annual Increase = 0.50%, DC Plan Return = 5.0%)							
PERA Hybrid DB Plan	94%	85%	77%	71%	65%	59%	54%	50%
PERA DC Plan	94%	85%	77%	71%	0%	0%	0%	0%
High Inflation Scenario	(Inflation = 3.30%, Annual Increase = 1.25%, DC Plan Return = 6.0%)							
PERA Hybrid DB Plan	92%	81%	73%	66%	60%	54%	49%	44%
PERA DC Plan	92%	81%	73%	66%	0%	0%	0%	0%

Note: Dark shades with bold text indicate the plan that provides a higher real income replacement ratio; white background with bold text indicates the two plans provide similar real income replacement ratios; and light shades with normal text indicate the plan that provides a lower real income replacement ratio.
Source: Cheiron analysis.

In the High-Return Scenario, the PERA DC Plan can sustain the higher income replacement ratio adjusted for inflation through age 100. In the other scenarios, the PERA DC Plan can only maintain the same benefit level as the PERA Hybrid DB Plan for 15 to 25 years after retirement. The PERA DC Plan account balance is expected to be fully depleted at the following ages.

- Baseline Scenario: Age 90
- Low Return Scenario: Age 81
- High Inflation Scenario: Age 83

Section V– Comparison of PERA Hybrid DB and DC Plans

For the Baseline Scenario, the PERA DC Plan account balance is depleted during the year the member is age 90 and, as a result, only provides a replacement ratio of 35% during that year.

Sensitivity of Plan Costs

Exhibit V-11 compares the costs of the PERA Hybrid DB Plan to those of the PERA DC Plan in each economic scenario.

The employee costs (dark shaded blue and orange bars) equal employee contributions, which vary for both plans under the Automatic Adjustment Provisions of the PERA Hybrid DB Plan.

The employer costs for the PERA DC Plan (light orange bars) are the contribution rates set in statute and do not change with the economic scenario. The employer costs for the PERA Hybrid DB Plan (light blue bars) are the expected employer costs for newly earned benefits, calculated as the total normal cost minus the employee contribution rate for each scenario. These employer costs do not include the current costs to reduce the Unfunded Actuarial Liability (UAL) attributable to the plan's historical experience. Currently, employers pay significantly more than the DB employer rates shown in the chart to pay down the UAL.

Exhibit V-11

Estimated Plan Cost as a Percentage of Payroll
State Division (Other than Safety Officers)
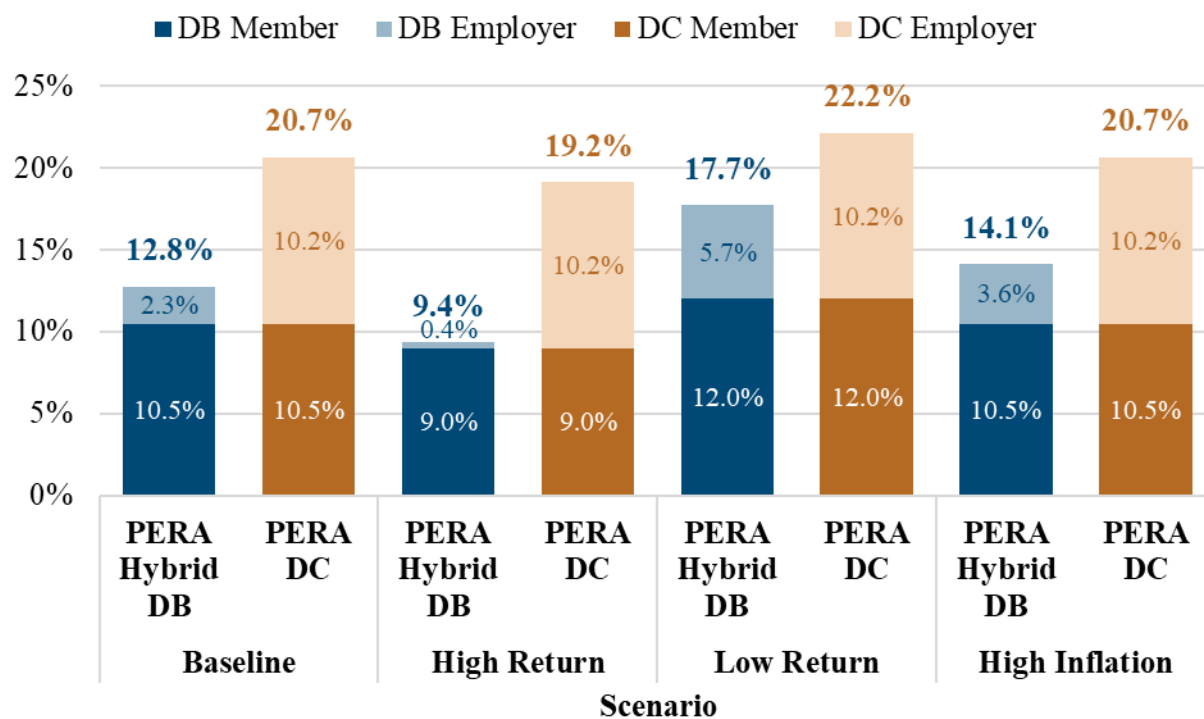
Source: Cheiron analysis. The Hybrid DB Plan Employer Costs are calculated as the total normal cost minus the employee contribution rate for each scenario.

Section V– Comparison of PERA Hybrid DB and DC Plans

The PERA DC Plan costs more than the PERA Hybrid DB Plan in all four economic scenarios. This difference appears to have been part of the design of the PERA DC Plan. The employee contributions to the DC Plan are set equal to those of the PERA Hybrid DB Plan [Section 24-51-1505(1), C.R.S.]. The employer contributions to the DC Plan are statutorily set equal to the employer contribution rates for the PERA Hybrid DB Plan that were in effect prior to July 1, 2019 [Section 24-51-401 (1.7)(a), C.R.S.] That rate covers the employer normal cost plus an amount to pay down the UAL. The higher employer cost for the PERA DC Plan may have been unintentional, or it may have been viewed as compensation to employees in the DC Plan for bearing the investment, longevity, and inflation risks.

The fluctuation of employer costs and employee costs across economic scenarios for the PERA Hybrid DB Plan illustrates the risk that costs may differ from what is expected in the Baseline Scenario. For the PERA DC Plan, employer costs do not fluctuate regardless of the scenario, while the employee costs are set equal to those in the PERA Hybrid DB Plan.

Conclusions

Different Members Benefit Differently from the PERA Hybrid DB Plan Versus the PERA DC Plan

The PERA DC Plan provides greater benefits in the early service years, particularly for younger employees, and its benefits are fully portable. These characteristics make the PERA DC Plan especially attractive for those who do not expect to work in PERA-covered employment for their full careers. The PERA DC Plan also appeals to employees familiar with private sector retirement plans and those who appreciate the flexibility in investment choices and the potential to earn higher investment returns by taking on greater investment risks.

The PERA Hybrid DB Plan provides greater benefits for long-service, career employees and protection from various risks. It provides a guaranteed lifetime income, and benefits are mostly protected from the impact of investment returns. It also provides automatic cost-of-living adjustments in retirement, subject to limits based on the plan's funding. Finally, the PERA Hybrid DB Plan provides disability income protection and lifetime survivor benefits. These characteristics make the PERA Hybrid DB Plan particularly attractive to career employees and those seeking retirement benefits protected from these risks.

Which Plan is More Advantageous for State Employees and Retirees?

Given how members may benefit differently from the two plans, neither the PERA Hybrid DB Plan nor the PERA DC Plan is uniformly more advantageous for all state employees and retirees. Employees who work a significant number of years and retire from a Colorado PERA-covered position benefit more from the PERA Hybrid DB Plan than the PERA DC Plan. Employees who work for shorter periods, particularly at younger ages, tend to benefit more from the PERA DC Plan.

Section V– Comparison of PERA Hybrid DB and DC Plans

The PERA Hybrid DB Plan is more advantageous for retirees who live long, providing a guaranteed lifetime income with automatic increases to offset inflation. Even retirees who do not live long may appreciate the security of the guaranteed lifetime income, the protection from their retirement income varying with investment returns, and the simplicity of receiving a monthly check from PERA.

Retirees who do not live as long may benefit more from the PERA DC Plan through a higher income for a shorter period or the ability to leave an inheritance. Retirees who enjoy managing their investments and fluctuating income from year to year to match varying expenses may also prefer the PERA DC Plan. However, as retirees get older, there is an increased likelihood of cognitive decline, which may reduce retirees' ability to make prudent investment decisions.

While neither plan is optimal for all employees, according to our survey of Colorado state employees and former employees (discussed more in Section VI), 77% of employees who spent a "great deal of time" considering the DB/DC choice decided on the PERA DB Plan. We find this data compelling evidence of which plan most employees find more advantageous.

Section VI – The Role of the Retirement Plan in Job Decisions: Evidence from Studies, Surveys, and PERA Member Elections

Overview

Statute required this study to determine the extent to which the PERA Hybrid DB Plan and the PERA DC Plan attract workers to Colorado state government instead of other government, or private sector, employers. [Section 24-51-614 (2)(b), C.R.S.] In this section, our analysis of how retirement plans affect job seekers' decisions starts with a review of academic studies and recent industry surveys, focusing on the different impacts of defined benefit versus defined contribution retirement plans. Then, we analyzed Colorado PERA's members' experience choosing between the PERA Hybrid DB Plan and the PERA DC Plan. Finally, we surveyed current and former employees of the State of Colorado to better understand how the retirement benefits offered affected their employment decisions.

The key findings indicate that Colorado's experience is consistent with the findings of academic studies and national surveys. Defined benefit (DB) and defined contribution (DC) plans are attractive to different employees due to the inherent advantages the different designs provide. Notably, DB plans provide a guaranteed lifetime income while DC plans are fully portable.

Employees also appear to recognize intuitively, at least in part, which plan design is more advantageous for them. Younger, shorter-service employees gravitate toward DC plans while longer-service, career employees appear to prefer DB plans. These preferences are consistent with the analysis in the prior sections of what types of employees benefit the most from the different plan designs.

Key Findings

✓ **Retirement benefits are a key factor in employment decisions.** Nationally, 86% of government workers cited retirement benefits as a key reason for taking their current job. In our survey of Colorado state employees, 81% cited retirement benefits as a factor in their job-related decisions, and 44% cited them as a major factor. Retirement benefits are less of a factor for younger workers.

✓ **Most employees prefer the PERA Hybrid DB Plan,** including 77% of those who gave the decision between the PERA Hybrid DB Plan and the PERA DC Plan a "great deal of thought." The primary reason cited for this preference is the guaranteed lifetime income benefits.

✓ **DC plans are more attractive to members who expect a shorter period of employment.** Members who elect the PERA DC Plan are more likely to leave their jobs within the first 5 years than those who elect the PERA Hybrid DB Plan. This pattern is consistent with national studies, and our survey of Colorado employees found that those who expected to work for the State less than 5 years were more likely to select the PERA DC Plan.

✓ **DB plans provide strong incentives for retaining public sector workers.** In addition to national studies, 84% of PERA Hybrid DB Plan members in our survey cited the plan as a retention factor.

✓ **Colorado state employees may not be aware of the importance of Social Security coverage when choosing plans.** 3 in 4 survey respondents said lack of Social Security coverage was not a factor in the DB vs. DC decision, and 25% did not realize Social Security did not cover them.

Section VI – The Role of the Retirement Plan in Job Decisions: Evidence from Studies, Surveys, and PERA Member Elections

Offering a choice between these two retirement plan designs provides a broad incentive to attract employees of different types.

Review of Academic Studies and Surveys on Factors Important to Job Seekers

We reviewed academic studies and industry surveys that focused on the role of defined benefit and defined contribution retirement plans in employee decisions to accept a job with an employer and to remain with that employer throughout their career. These studies and surveys set the context for our additional analysis of Colorado PERA's experience. Appendix C contains a bibliography of the studies and surveys we reviewed in depth for this analysis.

Studies and surveys that address the importance of retirement benefits in job decisions indicate that they are a significant factor in attracting and retaining workers to public sector employment and that changes to plan design can affect employee behavior. According to one national survey, 86% of state and government workers cited retirement benefits as a key reason for taking their current job – ranking 3rd out of seventeen categories – just behind job security (92%) and personal satisfaction (87%), and ahead of salary (84%) *(Mission Square Survey, March 2023).*

Exhibit VI-1

Top Factors Attracting Government Workers to Public Sector Jobs
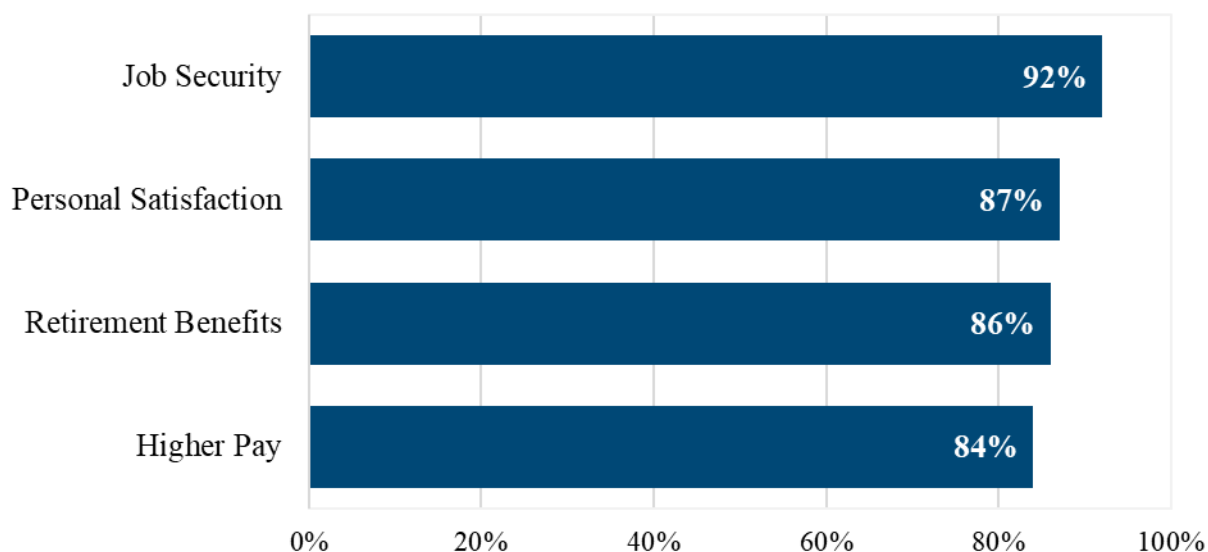
Source: Mission Square Survey, March 2023.

In one survey conducted in October 2023, over one-third of American workers who responded said that retirement benefits had become even more important over the last year, and over half would choose a job with a defined benefit plan over one with a defined contribution plan, all else being equal *(NIRS, Retirement Insecurity, February 2024).*

Section VI – The Role of the Retirement Plan in Job Decisions: Evidence from Studies, Surveys, and PERA Member Elections

Job Attraction

While there is general agreement on the importance of retirement plans in recruiting employees, there are also some points of divergence in the research. Studies suggest that younger workers may focus less on retirement benefits than older workers. Younger public sector employees (age 35 or less) ranked multiple factors – job security, work-life balance, health benefits, personal satisfaction, salary, and serving their community, over retirement benefits. *(Mission Square Survey, September 2023).* These younger workers prioritize the portability of retirement benefits when changing jobs, but also prioritize guaranteed lifetime income. However, in a 2017 report, Pew concluded that their survey "results suggest that younger workers choose jobs in government more for the day-to-day benefits, including the peace of mind that comes from having stable employment and the ability to balance work and family demands, than factors that improve long-term well-being, such as retirement benefits or opportunities for advancement." *(Pew Charitable Trusts, May 2017)*.

Employee Retention

Among the studies and surveys we reviewed, pension benefits are not cited as a primary reason for wanting to leave public sector employment. When asked what could be done for better employee retention, in one national survey of state and local government employees, improving the benefits package (39%) was ranked 4th out of 20 categories. Only higher salaries (71%), offering or increasing bonuses (54%), and showing more appreciation and recognition toward employees (45%) ranked higher. *(Mission Square Survey, March 2023).*

Exhibit VI – 2

Top Factors Government Workers Say Would Improve Retention

Source: Mission Square Survey, March 2023.

Section VI – The Role of the Retirement Plan in Job Decisions: Evidence from Studies, Surveys, and PERA Member Elections

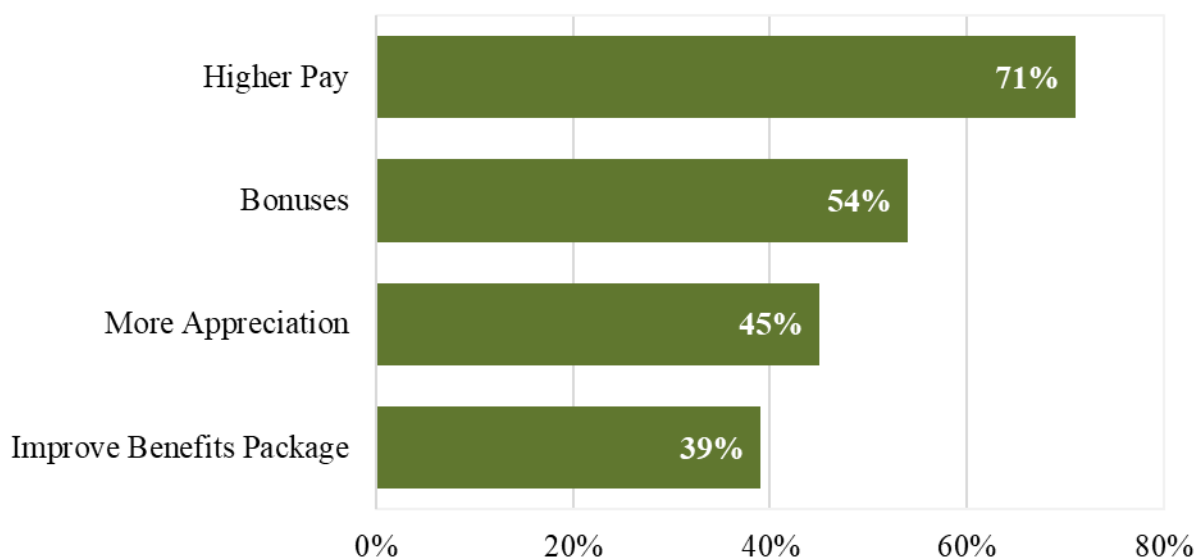According to a 2017 report, for younger workers, having a better benefits package was not as crucial for retention, ranking 7th (24%). The two top factors were salary (71%) and career advancement (42%). Interestingly, there is a level of trust in the public sector retirement systems, with younger workers expressing confidence that they will receive the full retirement benefits promised by their employer *(Pew Charitable Trusts, May 2017)*.

The Rand Corporation developed a model to predict retention behavior based on individual-level data of South Carolina public employees from 2010 to 2019, during which time a range of pension reforms were enacted (*Rand Corporation, March 2021)*. Their main finding was that changes in pension design impact both employee retention decisions and employee choices to participate in the DB versus the DC plan at hire. Overall, retention behavior is more sensitive to changes in the DB plan than changes in the DC plan, such as employer contribution rates and vesting schedules.

South Carolina offers employees a choice between a DB plan and an alternative DC plan. The two most impactful changes are increases in the DB Benefit Multiplier (i.e., a percentage multiplied by the employee's highest average salary and their years of credited service to calculate their annual retirement benefit) and increases in the employee's contribution rate. Specifically:

- Increasing the DB Benefit Multiplier improves retention of early to mid-career employees, who are influenced to stay to retirement age by the promise of a higher benefit.
- Increasing the DB Benefit Multiplier may shorten the tenure of late-career employees, who may leave as soon as they become eligible to retire to take advantage of the higher benefit.
- Increasing mandatory DB employee contributions increases turnover, especially among younger employees.

Changes to retirement eligibility and the number of years used to determine the final average pay have less of an impact on retention behavior.

The study also showed that offering a choice between a DB plan and a DC plan positively affects retention. If benefits in the DB plan are reduced, more employees opt to participate in the DC plan rather than leave employment. If there is a DB/DC plan choice, retention is magnified when the DB plan is made more generous. Also, reductions in retention are more moderate when there are cuts to the DB plan.

It is a common hypothesis that DC plans have higher turnover than DB plans, but where a choice is offered, the appearance of higher turnover in the DC plan may be a "selection effect" (*Shah Goda, Jones, Flaherty, Manchester, 2017).* This study of a large university that introduced a choice between a DB and a DC plan found that employees with higher mobility tendencies self-select into the DC plan. This dynamic is known as the "selection effect." Employees who prefer a DC plan may also be more likely to change jobs. Once the selection effect is accounted for, the DC

Section VI – The Role of the Retirement Plan in Job Decisions: Evidence from Studies, Surveys, and PERA Member Elections

plan is not associated with higher turnover for the overall population (*Shah Goda, Jones, Flaherty, Manchester, 2017)*.

Recent research highlights the crucial role that retirement plans play in job decisions. Retirement plans influence employee attraction, retention, and overall financial well-being. However, all of these academic studies and industry surveys are based on populations similar to those of Colorado PERA in some ways, but also different. The following two subsections explore Colorado PERA's experience specifically.

PERA's Experience with DB/DC Choice

Trends in DB/DC Choices Over Time

The PERA DC Plan was established at different times for different PERA-covered employees, as follows:

- Employees in the State Division hired on or after January 1, 2006. This includes the elected District Attorney (DA) and, if authorized by the county and the DA, employees of the DA.
- Employees in most community colleges hired on or after January 1, 2008.
- Classified employees in State colleges and universities hired on or after January 1, 2019.
- Employees of Local Government Division employers hired on or after January 1, 2019.

Since the PERA DC Plan was first implemented in 2006, the percentage of eligible members electing the DC option has steadily declined. Immediately following its introduction, roughly 15% of eligible employees chose the PERA DC Plan. 17 years later, by 2023, this figure had dropped to approximately 6%. Employees who do not make an election default into the Hybrid DB Plan, so this default could partly explain the low percentage in the PERA DC Plan.

Section VI – The Role of the Retirement Plan in Job Decisions: Evidence from Studies, Surveys, and PERA Member Elections

Exhibit V-3 shows the election rates by year since the PERA DC Plan was implemented in 2006.

Exhibit VI-3

PERA Hybrid DB Plan and DC Plan Election Rates
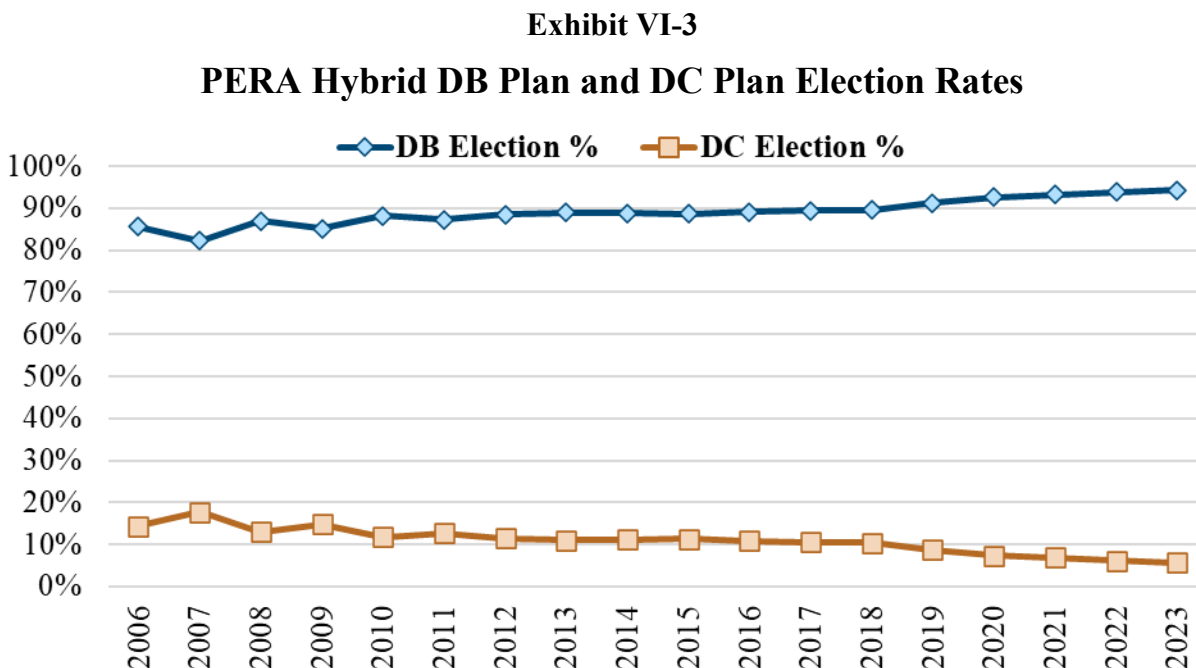
Source: Cheiron analysis based on data provided by PERA for members eligible to make a choice.

Age-at-Hire Effects on DB/DC Choice

The choice between the PERA Hybrid DB Plan and the PERA DC Plan varies significantly by the employee's age at hire:

- **Early-career hires (before age 20)** have lower DC election rates than any other age group, possibly due to the default to the DB plan if they give minimal active consideration to retirement plan choices.
- **Early-career hires (age 20 to 30)** tend to have high DC election rates, at about 8.5% to 10%. DC plans offer greater portability, which may appeal more to younger workers. Younger members may also accurately perceive DC benefit accruals to be more valuable relative to DB benefit accruals at younger ages.
- **Mid-career hires (age 30–50)** have lower DC election rates, ranging from about 6% to 8%. As members approach their 40s, they may focus more on the retirement benefits offered and may also accurately perceive that DB benefit accruals become more valuable than DC benefit accruals.
- **Late-career hires (after age 50)** tend to have the highest DC election rates, with about 12% of those hired at age 60 or older electing the PERA DC Plan, possibly reflecting a desire for flexible, portable benefits when their time to retirement is shorter, or simply a more familiar option due to prior experience with DC plans.

Section VI – The Role of the Retirement Plan in Job Decisions: Evidence from Studies, Surveys, and PERA Member Elections

Exhibit VI-4 shows the PERA DC Plan election rates in 5-year bands from hire ages 20 to 60. The black diamond represents the rate observed in the data, and the gray bar represents the confidence interval, which is expected to include the true election rate 90% of the time. Age ranges with more members have smaller confidence intervals, and age ranges with fewer members have larger confidence intervals. The election rates for age ranges with confidence intervals that do not overlap are considered statistically different.

Exhibit VI-4

PERA DC Plan Election Rates by Hire Age
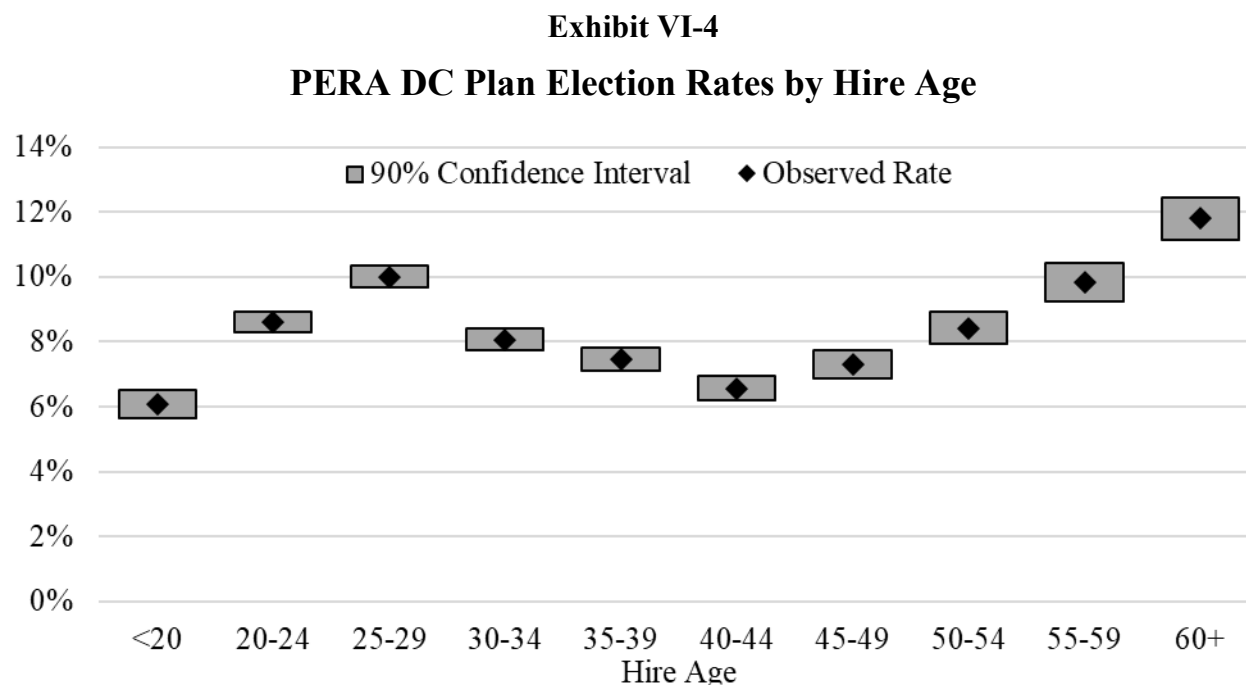
Source: Cheiron analysis based on data provided by PERA.

Salary-Based Effects on DB/DC Choice

Higher-paid employees are more likely to elect the PERA DC Plan. Their greater financial resources may enable them to bear more investment risk and maintain confidence in their ability to manage investments in the DC plan. It is also worth noting that members hired at older ages (55+) tend to have higher salaries, making it difficult to separate the age effects shown above

Section VI – The Role of the Retirement Plan in Job Decisions: Evidence from Studies, Surveys, and PERA Member Elections

from the salary effects. Exhibit VI-5 highlights the relationship between individual financial resources and their plan selection.

Exhibit VI-5

PERA DC Plan Election Rates by Salary

Note: The black diamonds represent the rate observed in the data, and the gray bars represent the confidence interval, which is expected to include the true rate 90% of the time. Groups with more members have smaller confidence intervals. Larger confidence intervals (i.e., gray bars) represent a larger uncertainty in the true rate. Groups with confidence intervals that do not overlap are considered to have statistically different election rates.
Source: Cheiron analysis based on data provided by PERA.

Section VI – The Role of the Retirement Plan in Job Decisions: Evidence from Studies, Surveys, and PERA Member Elections

Employer Type and DB/DC Choice

Choices between the PERA Hybrid DB and DC Plans also differ by employer type. Members employed by judicial and legal employers, as well as legislative staff, are more likely to elect the PERA DC Plan than the average member. Conversely, state public safety officers as well as individuals employed by local governments, institutions of higher education, and district attorneys, and public safety officers are less likely to elect the PERA DC Plan than the average member. These differences may reflect cultural and recruitment differences across employer types. These election rate differences may also be explained by other causes, such as higher-paid employees being more likely to elect the PERA DC Plan.

Exhibit VI-6

PERA DC Plan Election Rates by Employer

Note: The black diamonds represent the rate observed in the data, and the gray bars represent the confidence interval, which is expected to include the true rate 90% of the time. Groups with more members have smaller confidence intervals. Larger confidence intervals (i.e., gray bars) represent a larger uncertainty in the true rate. Groups with confidence intervals that do not overlap are considered to have statistically different election rates.
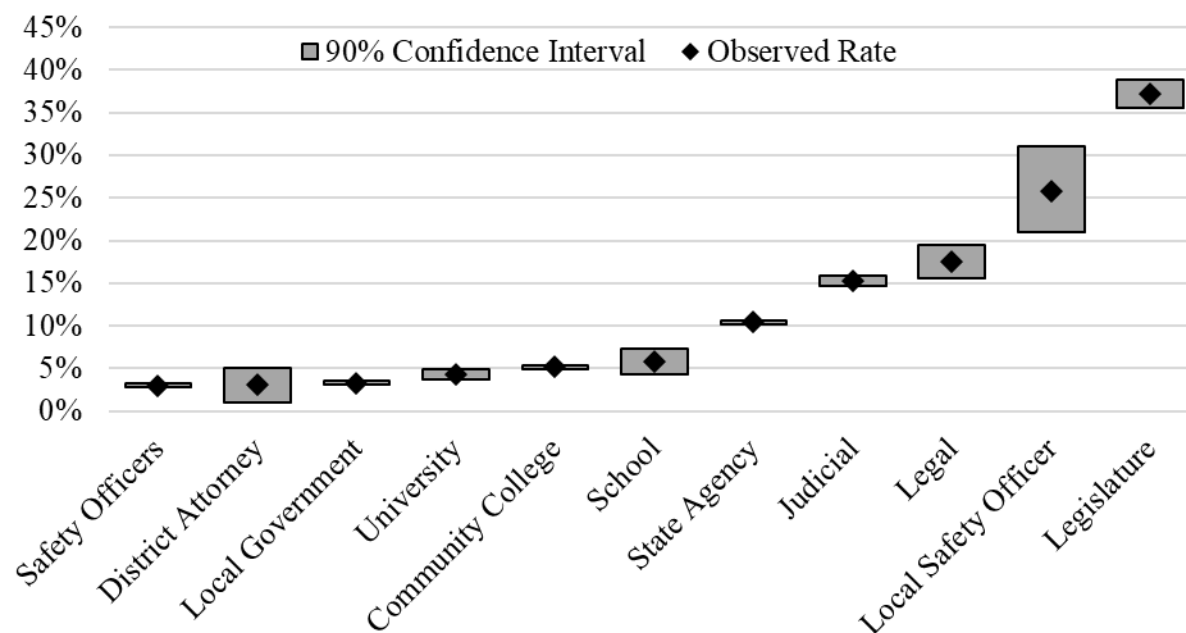**Source:** Cheiron analysis based on data provided by PERA.

Section VI – The Role of the Retirement Plan in Job Decisions: Evidence from Studies, Surveys, and PERA Member Elections

Employee Retention by Plan Choice

Members who elect the PERA DC Plan exhibit higher termination rates than members who elect the PERA Hybrid DB Plan during the first 5 years of service. Exhibit VI-7 shows the termination rates for PERA Hybrid DB Plan members (black diamond and gray confidence interval bars) and PERA DC Plan members (yellow diamond and blue confidence interval bars) by year of service. For members with 5 or fewer years of service, the termination rates for PERA DC Plan members (blue bars) are higher than and do not overlap with the termination rates for PERA Hybrid DB Plan members (gray bars), which means that the PERA DC Plan member termination rates are statistically significantly higher than PERA Hybrid DB Plan members within the first 5 years. After the first 5 years of service, the termination rates between the PERA Hybrid DB and PERA DC Plan members are similar.

Exhibit VI-7

PERA Hybrid DB Plan vs. PERA DC Plan Termination Rates
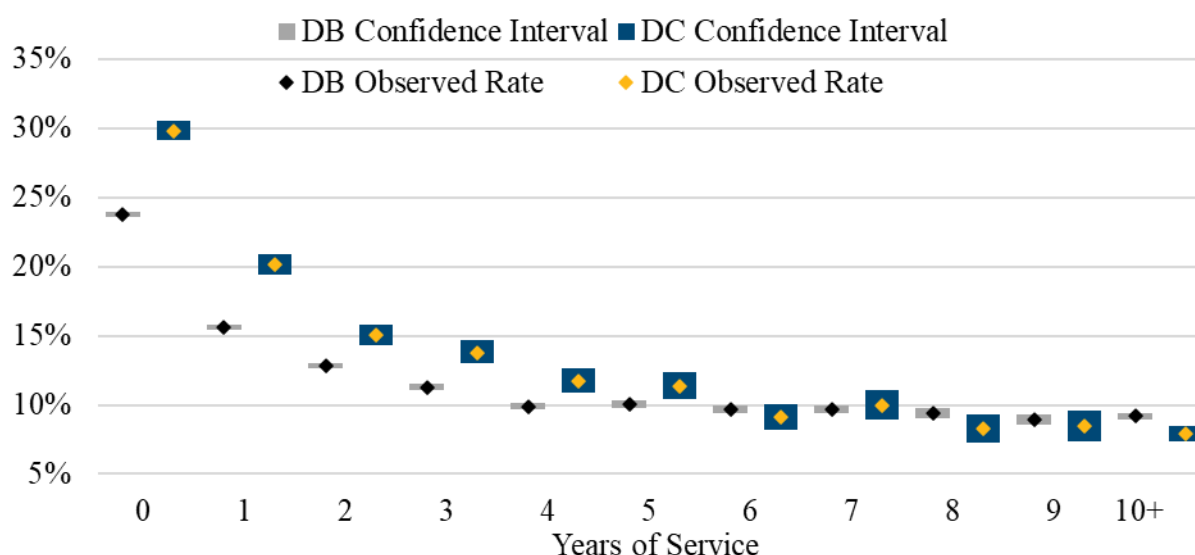
Source: Cheiron analysis based on data provided by PERA.

Transfers Between PERA Hybrid DB and PERA DC Plans

Members who are given a choice at hire between the PERA Hybrid DB and PERA DC Plans can also make a one-time election to transfer to the other plan during their second through fifth year of service. However, very few plan transfers have occurred. Between 2007 and 2023, there were fewer than 700 members who transferred plans:

- 321 transfers from the PERA Hybrid DB Plan to the PERA DC Plan, representing an annual transfer rate of less than 0.1% of eligible PERA Hybrid DB Plan members.
- 371 transfers from the PERA DC Plan to the PERA Hybrid DB Plan, representing an annual transfer rate of about 0.6% of eligible PERA DC Plan members.

Section VI – The Role of the Retirement Plan in Job Decisions: Evidence from Studies, Surveys, and PERA Member Elections

Survey of Colorado State Employees

Survey Overview

Part of the study included an online survey of current and former Colorado state employees who were hired after the choice between the PERA Hybrid DB and PERA DC Plans was made available in 2006. The purpose of the survey was to better understand how Colorado state employees (and former employees) think about their retirement benefits and how they chose between retirement plan options. The survey was conducted from January 9 – 27, 2025. The survey link was sent to 86,375 email addresses provided by PERA, and we received 2,923 responses. Details on the survey methodology and results can be found in Appendix D.

Respondent demographics mirrored the overall employee population in terms of plan election, age, agency type, and salary. Below are some notable demographic breakdowns.

Employment Status: 57% current employees; 43% former employees

Current Plan: 87% in the PERA Hybrid DB Plan; 13% in the PERA DC Plan

Current Age: 4% under age 30; 41% age 30-49; 55% age 50 or older.

Key Survey Findings

Retirement benefits as a factor in attracting employees. 81% of survey respondents indicated that retirement benefits were a factor in their decision to work for the State of Colorado; 44% cited it as a major factor. PERA Hybrid DB Plan members were more likely than PERA DC Plan members to say that retirement benefits were a factor (82% vs. 72%) and a major factor (47% vs. 30%) in their decision to work for the State. For both PERA Hybrid DB Plan and PERA DC Plan members, retirement benefits were ranked fifth in importance in attracting employees after personal job satisfaction, job security, ability to serve the community, and work–life balance.

Retirement benefits as a factor in retaining employees. 83% of survey respondents indicated that retirement benefits were a factor in their decision to remain in Colorado state employment; 52% called it a major factor. PERA Hybrid DB Plan members were more likely than PERA DC Plan members to say that retirement benefits were a factor (84% vs. 69%) and a major factor (55% vs. 27%) in their decision to remain in Colorado state employment.

More PERA Hybrid DB Plan members planned to stay a Colorado state employee until retirement than PERA DC Plan members (46% vs. 23%), while more PERA DC Plan members expected to leave state employment within 5 years, compared to DB Plan Members (26% vs. 8%). These results are consistent with the higher termination rates Colorado has experienced with PERA DC Plan members and the selection effect, in which members who are more likely to terminate employment prefer a DC plan.

Section VI – The Role of the Retirement Plan in Job Decisions: Evidence from Studies, Surveys, and PERA Member Elections

Only 14% of former employees who left for another job listed retirement benefits among their top three departure reasons. This suggests that retirement benefits are rarely the reason employees leave Colorado state employment.

Choosing between plans. The decision between a DB and a DC plan can be complex, but 69% of survey respondents found the DB vs. DC choice very or somewhat easy. Many (57%) reported giving the decision some or a great deal of thought, and 77% of those who gave it a great deal of thought chose the PERA Hybrid DB Plan. As might be expected with the PERA Hybrid DB Plan as the default, the less thought members gave to the choice, the more likely they were to be enrolled in the PERA Hybrid DB Plan (85% who gave it some thought, and 89% who gave it a small amount or no thought).

Colorado state employees are not covered by Social Security, which might be expected to tilt the choice toward the PERA Hybrid DB Plan to secure lifetime income and insulate members from investment risks. However, 75% of respondents did not consider the lack of Social Security coverage a factor in their decision, and 24% were unaware that Social Security did not cover them. This lack of awareness is concerning, especially for PERA DC Plan members since they will not have any guaranteed lifetime income in retirement unless they have Social Security coverage from a spouse or other employer.

Employees who selected the PERA Hybrid DB Plan overwhelmingly cited the guarantee of lifetime income as the primary reason for their choice. In contrast, employees who selected the PERA DC Plan overwhelmingly cited portability as the primary reason for their choice.

See Appendix D for a complete listing of survey results.

Conclusions

There is a key question as to how the PERA Hybrid DB Plan, as opposed to the PERA DC Plan, entices individuals to work for the State government instead of working in the private sector or for another governmental entity not covered by PERA. Based on our analysis and the survey of Colorado state employees, retirement benefits in general are a significant factor in attracting workers to public sector employment, ranking 3rd out of seventeen job-decision categories – just behind job security and personal satisfaction, and ahead of salary *(Mission Square).* For Colorado, both plans are an important factor that attracts individuals to state employment. According to our survey, the PERA retirement plans influenced more than 70% of the respondents toward state employment. Further, for both PERA Hybrid DB Plan and PERA DC Plan members, retirement benefits were ranked fifth in importance in attracting employees, after personal job satisfaction, job security, ability to serve the community, and work–life balance.

Our analysis and research indicate that the PERA Hybrid DB Plan and the PERA DC Plan are likely to attract different types of workers, with the former being a significant attraction and retention mechanism for career-oriented employees and the latter appealing to members with shorter expected tenures.

Appendix A – Assumptions and Methods

General

The assumptions used in this study were based on the assumptions used in the December 31, 2023 actuarial valuation for the PERA Hybrid Defined Benefit Plan, the most recent actuarial valuation available at the time of our study. Additional assumptions for alternative plan designs and for alternative economic scenarios are described below. We believe these assumptions are reasonable for the purpose of this study.

All cost-of-living adjustments (COLAs) in this study are compound COLAs, meaning that the COLA is based on the current benefit amount including any previously granted COLAs.

Converting Defined Contribution Account Balance into Lifetime Annuity

For purposes of comparing income replacement ratios at retirement, we estimated the amount of a lifetime annuity that could be purchased using a DC plan account balance by dividing the account balance by a single life annuity factor payable immediately at the specified retirement age. The single life annuity factor is based on the mortality rates used to calculate the PERA Hybrid DB Plan's 2022 money purchase factors (i.e., the mortality rates used in PERA's Money Purchase Benefit formula based on the most recent factors available at the time this analysis was completed), the interest rate for the economic scenario as shown in Exhibit A-1, and the annual increase assumption for the plan design and economic scenario as shown in Exhibit A-2. The annuity purchased from a DC plan account balance has the same annual increase as is assumed to occur in the DB portion of the plan design. The only exceptions are the PERA DC Plan and the Standalone DC, which do not have DB components, so we used the same annual increase as assumed for the PERA Hybrid DB Plan for a better direct comparison to the PERA Hybrid DB Plan.

Exhibit A-1

Assumed Annuity Purchase Interest Rates
For Economic Scenarios

	Low Return	Baseline	High Return	High Inflation
DC Plan Annuity Purchase Interest Rate	3.50%	3.50%	3.50%	4.50%

Source: Cheiron assumptions.

Appendix A – Assumptions and Methods

Exhibit A-2

Assumed Annual Post-Retirement Increases

Plan	Low Return	Baseline	High Return	High Inflation
PERA DC Plan[1]	0.50%	1.25%	2.00%	1.25%
Standalone DC1	0.50%	1.25%	2.00%	1.25%
Soc Sec + DC	2.30%	2.30%	2.30%	3.30%
7.5% DC + DB	1.25%	1.25%	1.25%	1.25%
1.6% DB + DC	1.25%	1.25%	1.25%	1.25%

[1]First annual increase occurs 3 years after retirement, consistency with the PERA Hybrid DB Plan.
Source: Cheiron assumptions.

Expected Cost of Plan Designs

The expected cost of each plan design is based on the total normal cost rate of the DB benefit, when applicable, plus the total contribution rate for the DC plan, when applicable. The total normal cost rate is calculated using the Entry Age Actuarial Cost Method so that it represents a level percentage of payroll to be contributed over an employee's career.

PERA's contracted actuary, Segal Consulting ("Segal"), provided total normal cost rates based on the expected new member population for each division. Exhibit A-3 shows the expected new member population, which is the same as assumed in PERA's December 31, 2023 actuarial valuation report.

Exhibit A-3

	State (Other Than Safety Officers)	Local Government (Other Than Safety Officers)	State & Local Government Safety Officers	School Division	Judicial Division	Denver Public Schools Division
Average Age	36.2	37.5	31.0	37.4	45.9	32.9
Average Salary	$ 46,029	$ 42,320	$ 63,520	$ 29,313	$ 164,141	$ 40,602

Source: PERA Hybrid DB Plan's December 31, 2023 actuarial valuation report.

Appendix A – Assumptions and Methods

Exhibit A-4 shows the total normal cost rates calculated by Segal for the PERA Hybrid DB Plan.

Exhibit A-4

PERA Hybrid DB Plan's Total Normal Cost Rates for New Members by Division under each Economic Scenario

	State (Other Than Safety Officers)	Local Government (Other Than Safety Officers)	State & Local Government Safety Officers	School Division	Judicial Division	Denver Public Schools Division
Low Return	17.74%	17.64%	26.13%	19.81%	24.07%	18.24%
Baseline	12.76%	12.82%	19.31%	14.33%	19.04%	12.82%
High Return	9.36%	9.58%	14.34%	10.52%	15.20%	9.12%
High Inflation	14.13%	14.27%	21.53%	15.97%	20.49%	14.29%

Source: Provided by Segal Consulting, at our request.

We assumed the relationship between the total normal cost rates for the State Division (Other Than Safety Officers), the Local Government Division (Other Than Safety Officers), the School Division, and the DPS Division would remain the same for the alternative DB benefit designs. That is, the State Division (Other Than Safety Officers), Local Government Division (Other Than Safety Officers), and DPS Division would have approximately the same total normal cost rates and the School Division total normal cost rate would be approximately 12.3% higher than the total normal cost rate for State Division (Other Than Safety Officers).

As requested, Segal provided the total normal cost rates for the State (Other Than Safety Officers), State and Local Government Safety Officers, and the Judicial Division for alternative DB benefit designs as shown in Exhibit A-5. The alternative DB benefit designs have the same eligibility requirements and benefit provisions as the PERA Hybrid DB Plan except as noted below. These alternative DB benefit designs were structured to provide sufficient information to allow us to estimate the cost impact of various combinations and variations of these DB plan designs.

Appendix A – Assumptions and Methods

Exhibit A-5

Total Normal Cost Rates for New Members by Division for Alternative DB Benefit Designs

Alternative DB Plan Design	State (Other Than Safety Officers	State & Local Government Safety Officers	Judicial Division
Traditional DB plan[1] with 1.0% multiplier and no COLA (7.25% discount rate and 2.30% inflation)	5.46%	7.13%	7.25%
Traditional DB plan[1] with 1.6% multiplier and no COLA (7.25% discount rate and 2.30% inflation)	7.79%	11.06%	11.21%
Traditional DB plan[1] with 1.6% multiplier and no COLA (7.25% discount rate and 3.30% inflation)	8.58%	12.41%	12.17%
Traditional DB plan[1] with 1.6% multiplier and no COLA (5.75% discount rate and 2.30% inflation)	10.83%	15.85%	14.80%
Traditional DB plan[1] with 1.6% multiplier and a 1.75% immediate COLA (7.25% discount rate and 2.30% inflation)	9.08%	13.38%	13.28%
Traditional DB plan[1] with 1.6% multiplier and a 1.75% immediate COLA (7.25% discount rate and 3.30% inflation)	10.03%	15.03%	14.42%
Traditional DB plan[1] with 1.6% multiplier and a 1.75% immediate COLA (5.75% discount rate and 2.30% inflation)	12.91%	19.62%	17.80%
Variable DB plan[2] with a 5.0% hurdle rate - 2.25% implied COLA (7.25% discount rate and 2.30% inflation)	13.65%	20.31%	20.54%
Variable DB plan[2] with a 5.0% hurdle rate - 2.25% implied COLA (7.25% discount rate and 3.30% inflation)	14.07%	20.39%	20.70%
Money purchase plan[3] with a 1.25% immediate COLA (7.25% discount rate and 2.30% inflation)	13.12%	19.66%	19.91%
Money purchase plan[3] with a 1.25% immediate COLA (7.25% discount rate and 3.30% inflation)	13.37%	19.76%	20.06%
Money purchase plan[3] with a 1.25% immediate COLA (5.75% discount rate and 2.30% inflation)	16.11%	23.45%	23.19%

[1] Does not include PERA's Money Purchase Benefit.

[2] Benefit at retirement is the greater of a traditional DB formula with a 1.6% multiplier or a money purchase formula with total contribution rates credited to the money purchase account equal to the total normal cost for each division under the Baseline economic scenario. See Appendix E for additional details on the Variable DB Plan design.

[3] Similar to the Variable DB Plan except that, at retirement, the money purchase account is converted to an annuity assuming a 1.25% COLA and a 7.25% interest rate. See Appendix E for additional details on the Money Purchase design.

Source: Segal Consulting.

Appendix A – Assumptions and Methods

We used Segal's total normal cost rates shown in Exhibit A-5 to create the alternative plan designs discussed in Section IV and Appendix E that have the same expected cost as the PERA Hybrid DB Plan. We reviewed Segal's total normal cost rates for reasonability but did not replicate their calculations.

To estimate the expected cost of plan designs with COLAs that vary from those listed in Exhibit A-5, we calculated a COLA duration for each division based on the relationship between the change in the total normal cost rate and the change in the COLA between two plan designs that only differed by the COLA provided.

To estimate the expected cost of plan designs with discount rates that vary from those listed in Exhibit A-5, we calculated a discount rate duration for each division based on the relationship between the change in the total normal cost rate and the change in the discount rate between two plan designs that only differed by the discount rate.

To estimate the expected cost of Traditional DB plans with benefit multipliers that vary from those listed in Exhibit A-5, we interpolated and extrapolated the total normal cost rates of the 1.0% and 1.6% benefit multipliers, after adjusting for any COLA and discount rate differences.

To estimate the expected cost of Money Purchase benefits with contribution rates that vary from those listed in Exhibit A-5, we adjusted the total normal cost rate and proportionally adjusted the contribution rates that are credited to the money purchase benefit based on the percentage change in the total normal cost rate. Only minor adjustments were necessary for the Money Purchase benefit, so the impact of the minimum benefit (i.e., the Traditional 1.6% of HAS) was not factored into this adjustment.

Appendix A – Assumptions and Methods

Assumptions used in Economic Scenarios

Exhibit A-6 summarizes the assumptions used in the various economic scenarios throughout this report. The inflation assumptions are the same as used in the PERA Hybrid DB Plan's December 31, 2023 actuarial valuation, except that it was increased by 1% for the High Inflation scenario.

Exhibit A-6

Economic Scenarios

	Low Return	Baseline	High Return	High Inflation
Inflation	2.30%	2.30%	2.30%	3.30%
PERA Hybrid DB Plan Annual Increase	0.50%	1.25%	2.00%	1.25%
Investment Return for all DB plans	5.75%	7.25%	8.75%	7.25%
Investment Return for all DC Plans - by Age Range				
<40	5.25%	7.25%	9.25%	7.25%
40 – 44	5.25%	7.00%	9.00%	7.00%
45 – 49	5.25%	7.00%	8.50%	7.00%
50 – 54	5.25%	6.75%	8.00%	6.75%
55 – 59	5.25%	6.50%	7.75%	6.50%
60+	5.00%	6.00%	7.00%	6.00%
DC Plan Annuity Purchase Interest Rate	3.50%	3.50%	3.50%	4.50%

Source: PERA Hybrid DB Plan Annual Increases were provided by PERA. Investment Returns are based on Cheiron analysis using capital market assumptions from Horizon's 2024 survey.

The investment return assumptions are based on our analysis using capital market assumptions from Horizon's 2024 Survey of Capital Market Assumptions. The investment return assumptions for the DB plans are based on the PERA Hybrid DB Plan's target asset allocation and the investment return assumptions for the DC plans are based on the asset allocation of various Target Retirement Date Fund options available in PERA's DC plan. The Low Return, Baseline, and High Return assumptions approximate the 25th, 50th, and 75th percentiles of expected returns, respectively.

The PERA Hybrid DB Plan's Annual Increase assumptions were provided by PERA, in consultation with their actuary, based on their long-term expectation of annual increases payable using the assumed PERA Hybrid DB Plan's investment return in each economic scenario.

Appendix A – Assumptions and Methods

Exhibit A-7 shows the expected return and standard deviation used for each asset class.

Exhibit A-7

Expected Return and Standard Deviation by Asset Class

Asset Class	Arithmetic Return	Standard Deviation
US Equity – Large Cap	8.25%	16.5%
US Equity – Small/Mid Cap	9.50%	20.6%
Non-US Equity – Developed	9.08%	18.1%
Non-US Equity – Emerging	11.00%	23.6%
US Corp Bonds – Core	5.04%	5.9%
TIPS	4.48%	6.1%
Real Estate	7.38%	16.6%
Hedge Funds	6.52%	8.0%
Infrastructure	8.56%	16.0%
Private Equity	12.33%	22.6%

Source: Horizon's 2024 Survey of Capital Market Assumptions.

Appendix A – Assumptions and Methods

The top of Exhibit A-8 shows the target asset allocation for the PERA Hybrid DB Plan and for the various Target Retirement Date Funds and the bottom of Exhibit A-8 shows each portfolio's standard deviation and compound annual expected returns over 30 years at the 25th, 50th, and 75th percentiles.

Exhibit A-8
Target Asset Allocations and Compound Annual Returns over 30 Years

Asset Class	PERA Hybrid DB Plan	Target Date 2055	Target Date 2050	Target Date 2045	Target Date 2040	Target Date 2035	Target Date 2030	Target Date 2025	Income Fund
US Equity – Large Cap	20.3%	61.0%	59.0%	55.0%	48.0%	41.0%	34.0%	27.0%	25.0%
US Equity – Small/Mid Cap	9.9%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Non-US Equity – Developed	18.5%	33.0%	32.0%	30.0%	26.0%	23.0%	18.0%	13.0%	12.0%
Non-US Equity – Emerging	6.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
US Corp Bonds – Core	23.6%	1.0%	4.0%	10.0%	21.0%	32.0%	44.0%	57.0%	60.0%
TIPS	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Real Estate	8.5%	5.0%	5.0%	5.0%	5.0%	4.0%	4.0%	3.0%	3.0%
Hedge Funds	1.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Infrastructure	1.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Private Equity	8.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Portfolio Standard Deviation	12.67%	15.81%	15.38%	14.52%	12.96%	11.35%	9.94%	8.43%	8.10%
25th Percentile Annual Return over 30 Years	5.89%	5.41%	5.42%	5.42%	5.41%	5.32%	5.28%	5.14%	5.10%
50th Percentile Annual Return over 30 Years	7.42%	7.31%	7.27%	7.17%	6.98%	6.69%	6.49%	6.17%	6.09%
75th Percentile Annual Return over 30 Years	8.98%	9.25%	9.15%	8.95%	8.57%	8.09%	7.72%	7.21%	7.09%

Source: Cheiron analysis and copera.org.

Appendix B – Additional Comparisons of PERA's Hybrid DB and DC Plans

This appendix shows our comparisons for hypothetical employees in the PERA Divisions that offer the DC choice, other than the State Division, which is included in the body of the report.

Local Government Division (Other than Safety Officers)

Exhibits B-1 through B-6 contain the analysis comparing income replacement ratios at retirement, real income replacement ratios in retirement, and expected plan costs between the PERA Hybrid DB Plan and the PERA DC Plan for the Local Government Division (other than Safety Officers) which mirrors the analysis for the State Division (Other than Safety Officers) shown in Exhibits V-3, V-4, V-8, V-9, V-10, and V-11.

This analysis uses the same sample member hire ages, termination ages, and retirement ages as the State Division. The Local Government Division analysis has similar results as the State Division, except that the Local Government Division has a lower member contribution rate. Therefore, the PERA DC Plan has a lower total expected cost and provides a correspondingly smaller benefit due to the lower contributions credited to the DC account balance. The Local Government Division's lower member contribution rate does not impact the benefit provided under the PERA Hybrid DB Plan; it just changes the portion of the expected cost covered by the employer versus the member.

Exhibit B-1

Income Replacement Ratios for Career Employees
Local Government Division (Other than Safety Officers)

| | PERA Hybrid DB Plan | | | PERA DC Plan | | |
| | Retirement Age | | | Retirement Age | | |
Hire Age	60	65	70	60	65	70
25	**81%**	**93%**	**94%**	48%	67%	**96%**
35	**38%**	**70%**	**82%**	32%	46%	69%
45	**22%**	**46%**	**59%**	17%	28%	44%
55	**7%**	**23%**	**35%**	5%	12%	23%

Note: Dark shades with bold text indicate the plan that provides a higher income replacement ratio; white background with bold text indicates the two plans provide similar income replacement ratios; and light shades with normal text indicate the plan that provides a lower income replacement ratio. **Source:** Cheiron analysis.

Appendix B – Additional Comparisons of PERA's Hybrid DB and DC Plans

Exhibit B-2

Income Replacement Ratios for Non-Career Employees Who Retire at Age 65
Local Government Division (Other than Safety Officers)

| | PERA Hybrid DB Plan | | | | PERA DC Plan | | |
| | Termination Age | | | | Termination Age | | |
Hire Age	**35**	**45**	**55**		**35**	**45**	**55**
25	8%	20%	47%		**21%**	**39%**	**55%**
35		10%	**31%**			**19%**	34%
45			**16%**				15%

Note: Dark shades with bold text indicate the plan that provides a higher income replacement ratio; white background with bold text indicates the two plans provide similar income replacement ratios; and light shades with normal text indicate the plan that provides a lower income replacement ratio.
Source: Cheiron analysis.

Exhibit B-3

Income Replacement Ratios by Scenario
Local Government Division (Other than Safety Officers)
Career Employee Hired at Age 25

| | PERA Hybrid DB Plan | | | | PERA DC Plan | | |
| | Retirement Age | | | | Retirement Age | | |
Scenario	**60**	**65**	**70**		**60**	**65**	**70**
Baseline	**81%**	**93%**	94%		48%	67%	**96%**
High Return	**81%**	**93%**	94%		58%	83%	**124%**
Low Return	**81%**	**93%**	**94%**		43%	57%	80%
High Inflation	**79%**	**91%**	**92%**		46%	61%	**84%**

Note: Dark shades with bold text indicate the plan that provides a higher income replacement ratio; white background with bold text indicates the two plans provide similar income replacement ratios; and light shades with normal text indicate the plan that provides a lower income replacement ratio.
Source: Cheiron analysis.

Appendix B – Additional Comparisons of PERA's Hybrid DB and DC Plans

Exhibit B-4

Income Replacement Ratios for Retirement at Age 65 by Scenario
Local Government Division (Other than Safety Officers)
Non-Career Employee Hired at Age 25

	PERA Hybrid DB Plan Termination Age			PERA DC Plan Termination Age		
Scenario	35	45	55	35	45	55
Baseline	8%	20%	47%	**21%**	**39%**	**55%**
High Return	8%	20%	47%	**31%**	**55%**	**71%**
Low Return	8%	20%	**47%**	**14%**	**29%**	**44%**
High Inflation	6%	16%	42%	**17%**	**33%**	**48%**

Note: Dark shades with bold text indicate the plan that provides a higher income replacement ratio; white background with bold text indicates the two plans provide similar income replacement ratios; and light shades with normal text indicate the plan that provides a lower income replacement ratio.
Source: Cheiron analysis.

Exhibit B-5

Real Income Replacement Ratios in Retirement
Local Government Division (Other than Safety Officers)
Hired at Age 25, Retired at Age 65

Age	65	70	75	80	85	90	95	100
Baseline Scenario	(Inflation = 2.30%, Annual Increase = 1.25%, DC Plan Return = 6.0%)							
Hybrid DB	93%	88%	84%	80%	76%	72%	68%	65%
DC Plan	93%	88%	84%	80%	0%	0%	0%	0%
High Return Scenario	(Inflation = 2.30%, Annual Increase = 2.00%, DC Plan Return = 7.0%)							
Hybrid DB	93%	92%	90%	89%	88%	86%	85%	84%
DC Plan	93%	92%	90%	89%	88%	86%	85%	0%
Low Return Scenario	(Inflation = 2.30%, Annual Increase = 0.50%, DC Plan Return = 5.0%)							
Hybrid DB	93%	85%	78%	71%	65%	60%	55%	50%
DC Plan	93%	85%	78%	0%	0%	0%	0%	0%
High Inflation Scenario	(Inflation = 3.30%, Annual Increase = 1.25%, DC Plan Return = 6.0%)							
Hybrid DB	91%	83%	75%	68%	61%	55%	50%	45%
DC Plan	91%	83%	75%	0%	0%	0%	0%	0%

Note: Dark shades with bold text indicate the plan that provides a higher real income replacement ratio; white background with bold text indicates the two plans provide similar real income replacement ratios; and light shades with normal text indicate the plan that provides a lower real income replacement ratio.
Source: Cheiron analysis.

Appendix B – Additional Comparisons of PERA's Hybrid DB and DC Plans

Exhibit B-6

Estimated Plan Cost as a Percentage of Payroll
Local Government Division (Other than Safety Officers)

Source: Cheiron analysis. The Hybrid DB Plan Employer Costs are calculated as the total normal cost minus the employee contribution rate for each scenario. The total normal costs were provided by PERA's actuary, Segal.

Appendix B – Additional Comparisons of PERA's Hybrid DB and DC Plans

State and Local Government Safety Officers

Exhibits B-7 through B-12 contain the analysis comparing income replacement ratios at retirement, real income replacement ratios in retirement, and expected plan costs between the PERA Hybrid DB Plan and the PERA DC Plan for the State and Local Government Safety Officers, which mirrors the analysis for the State Division (Other than Safety Officers), shown in Exhibits V-3, V-4, V-8, V-9, V-10, and V-11.

This analysis uses sample members with younger retirement ages than those used for non-Safety Officers because Safety Officers have lower retirement eligibility requirements and are more likely to retire at younger ages. The Safety Officer analysis has similar results as the State Division, except that the PERA DC Plan is expected to provide slightly lower income replacement ratios because Safety Officers are expected to retire earlier. The earlier retirement provides both a shorter period for contributions and investment earnings to accumulate, and the cost of purchasing an annuity is greater at younger retirement ages since the annuity is expected to be paid over a longer period.

Exhibit B-7

Income Replacement Ratios for Career Employees
State and Local Government Safety Officers

| | PERA Hybrid DB Plan | | | PERA DC Plan | | |
| | Retirement Age | | | Retirement Age | | |
Hire Age	**55**	**60**	**65**	**55**	**60**	**65**
25	**69%**	**81%**	93%	48%	68%	96%
35	**38%**	**58%**	70%	30%	45%	66%
45		**28%**	**47%**		24%	39%

Note: Dark shades with bold text indicate the plan that provides a higher income replacement ratio; white background with bold text indicates the two plans provide similar income replacement ratios; and light shades with normal text indicate the plan that provides a lower income replacement ratio.
Source: Cheiron analysis.

Appendix B – Additional Comparisons of PERA's Hybrid DB and DC Plans

Exhibit B-8

Income Replacement Ratios for Non-Career Employees Who Retire at Age 60
State and Local Government Safety Officers

	PERA Hybrid DB Plan				PERA DC Plan		
	Termination Age				Termination Age		
Hire Age	**35**	**45**	**55**		**35**	**45**	**55**
25	11%	26%	**57%**		**23%**	**44%**	61%
35		15%	**38%**			**21%**	38%
45			**18%**				17%

Note: Dark shades with bold text indicate the plan that provides a higher income replacement ratio; white background with bold text indicates the two plans provide similar income replacement ratios; and light shades with normal text indicate the plan that provides a lower income replacement ratio.
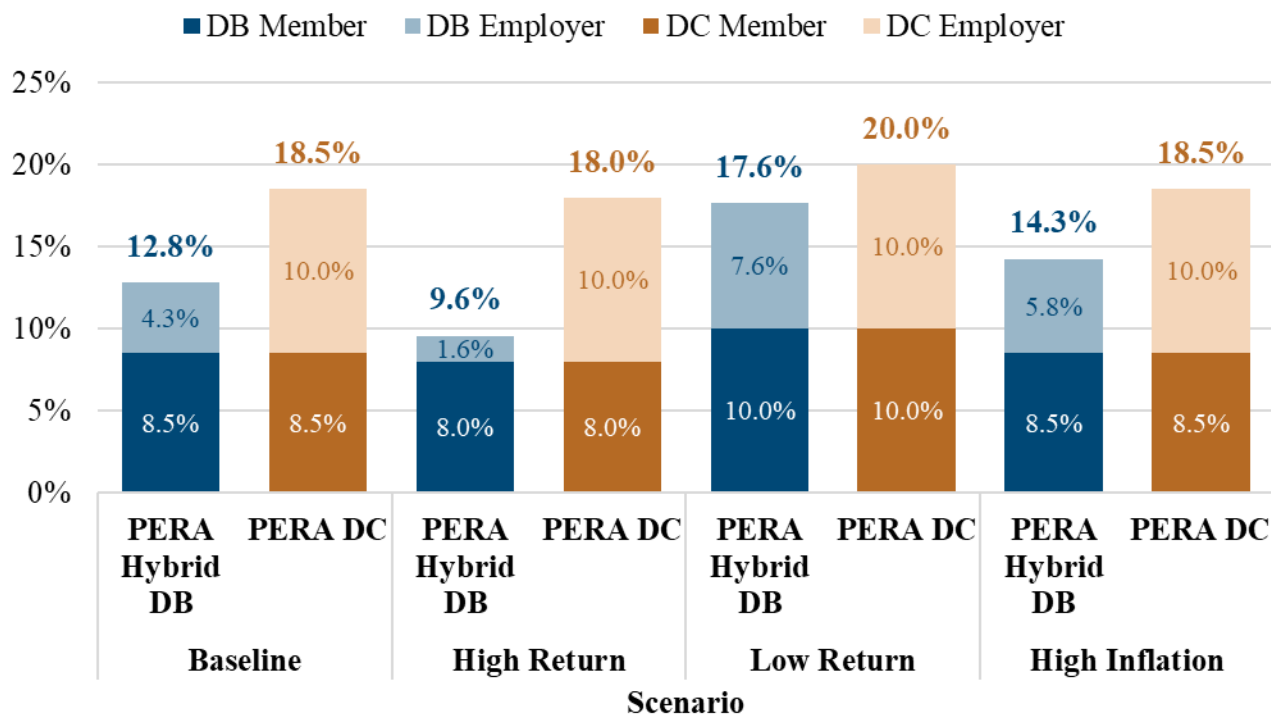**Source:** Cheiron analysis.

Exhibit B-9

Income Replacement Ratios by Scenario
State and Local Government Safety Officers
Career Employee Hired at Age 25

	PERA Hybrid DB Plan				PERA DC Plan		
	Retirement Age				Retirement Age		
Scenario	**55**	**60**	**65**		**55**	**60**	**65**
Baseline	**69%**	**81%**	93%		48%	68%	**96%**
High Return	**69%**	81%	93%		54%	**79%**	**115%**
Low Return	**69%**	**81%**	**93%**		43%	59%	80%
High Inflation	**68%**	**80%**	92%		48%	65%	**87%**

Note: Dark shades with bold text indicate the plan that provides a higher income replacement ratio; white background with bold text indicates the two plans provide similar income replacement ratios; and light shades with normal text indicate the plan that provides a lower income replacement ratio.
Source: Cheiron analysis.

Appendix B – Additional Comparisons of PERA's Hybrid DB and DC Plans

Exhibit B-10

Income Replacement Ratios for Retirement at Age 60 by Scenario
State and Local Government Safety Officers
Non-Career Employee Hired at Age 25

	PERA Hybrid DB Plan			PERA DC Plan		
	Termination Age			**Termination Age**		
Scenario	**35**	**45**	**55**	**35**	**45**	**55**
Baseline	11%	26%	**57%**	**23%**	**44%**	61%
High Return	11%	25%	57%	**32%**	**56%**	**73%**
Low Return	12%	27%	**57%**	**16%**	**34%**	51%
High Inflation	9%	21%	**54%**	**20%**	**39%**	57%

Note: Dark shades with bold text indicate the plan that provides a higher income replacement ratio; white background with bold text indicates the two plans provide similar income replacement ratios; and light shades with normal text indicate the plan that provides a lower income replacement ratio.
Source: Cheiron analysis.

Exhibit B-11

Real Income Replacement Ratios in Retirement
State and Local Government Safety Officers
Hired at Age 25, Retired at Age 60

Age	60	65	70	75	80	85	90	95
Baseline Scenario	(Inflation = 2.30%, Annual Increase = 1.25%, DC Plan Return = 6.0%)							
Hybrid DB	**81%**	**77%**	**73%**	**70%**	**66%**	**63%**	60%	57%
DC Plan	**81%**	**77%**	**73%**	**70%**	**66%**	**63%**	44%	0%
High Return Scenario	(Inflation = 2.30%, Annual Increase = 2.00%, DC Plan Return = 7.0%)							
Hybrid DB	81%	80%	79%	78%	77%	76%	74%	73%
DC Plan	**95%**	**95%**	**95%**	**95%**	**95%**	**95%**	**95%**	**95%**
Low Return Scenario	(Inflation = 2.30%, Annual Increase = 0.50%, DC Plan Return = 5.0%)							
Hybrid DB	**81%**	**74%**	**68%**	**62%**	57%	52%	48%	44%
DC Plan	**81%**	**74%**	**68%**	**62%**	0%	0%	0%	0%
High Inflation Scenario	(Inflation = 3.30%, Annual Increase = 1.25%, DC Plan Return = 6.0%)							
Hybrid DB	**80%**	**72%**	**65%**	**59%**	**53%**	48%	44%	40%
DC Plan	**80%**	**72%**	**65%**	**59%**	**53%**	0%	0%	0%

Note: Dark shades with bold text indicate the plan that provides a higher real income replacement ratio; white background with bold text indicates the two plans provide similar real income replacement ratios; and light shades with normal text indicate the plan that provides a lower real income replacement ratio.
Source: Cheiron analysis.

Appendix B – Additional Comparisons of PERA's Hybrid DB and DC Plans

Exhibit B-12

Estimated Plan Cost as a Percentage of Payroll
State and Local Government Safety Officers
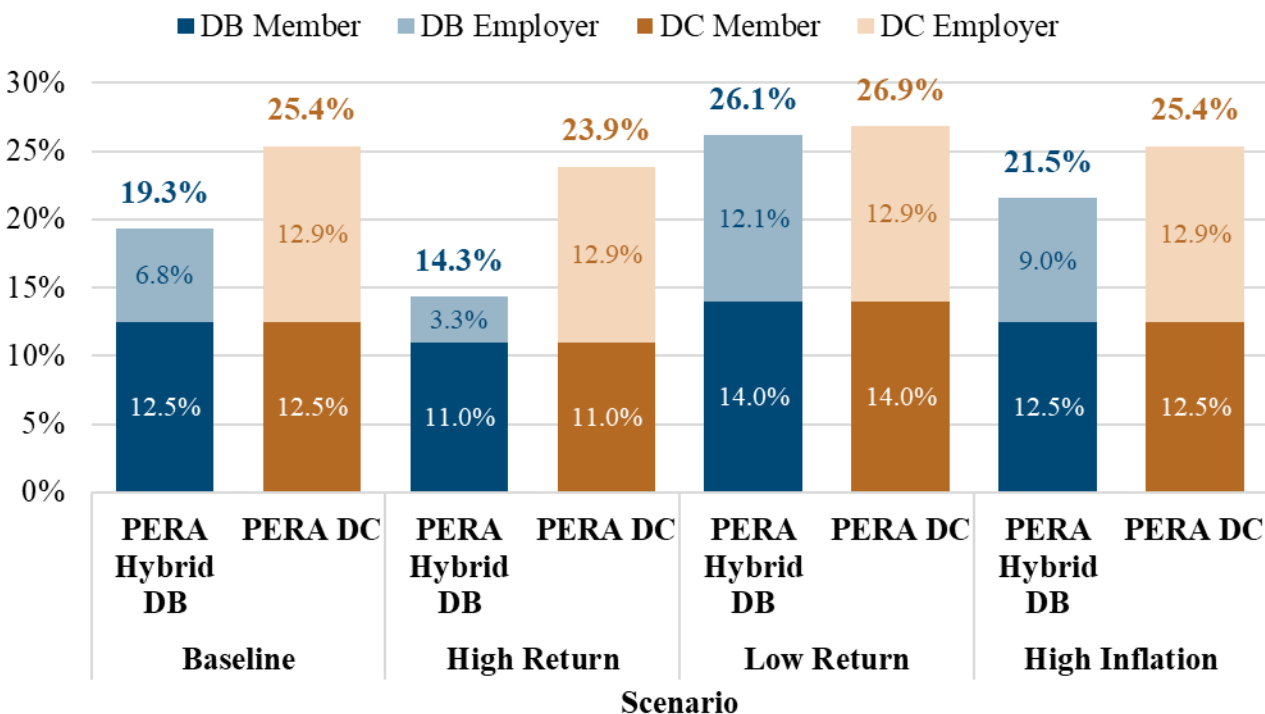
Source: Cheiron analysis. The Hybrid DB Plan Employer Costs are calculated as the total normal cost minus the employee contribution rate for each scenario. The total normal costs were provided by PERA's actuary, Segal.

Appendix C – Bibliography of Studies and Surveys

Selection of Studies and Surveys

One requirement of this study is to review studies or surveys from reputable sources on the factors important to job seekers to help assess whether a DB or DC plan is more likely to attract qualified employees. Based on our familiarity with the industry, we compiled a list of academic studies and surveys that address the impact of retirement benefits in the labor market. We worked with the OSA, PERA, and OSPB to select 12 reports for review that discuss the importance of different retirement plans in attracting and retaining employees. Given the differences in labor markets, studies that focused specifically on teachers or public safety employees were excluded even though teachers and public safety employees are a subset of the PERA membership.

The studies shown in the bibliography below were selected through this process.

Bibliography

National Institute on Retirement Security. "What Do Americans Think About Pensions for Public Employees?" October 2024

National Institute on Retirement Security – "Employees' Retirement System of Rhode Island: Examination of Turnover Trends Since Retirement Reforms" – February 2024

National Institute on Retirement Security – "Retirement Insecurity 2024: Americans' Views of Retirement." – February 2024

Mission Square Survey – "35 & Under in the Public Sector: Why Younger Workers Enter and Why They Stay (or Don't)" – September 2023

Mission Square Survey – "State and Local Government Employees: Morale, Public Service Motivation, Financial Concerns, and Retention" – March 2023

National Institute on Retirement Security – "Generational Views of Retirement in the United States" – July 2021

National Institute on Retirement Security – "Americans' Views of State & Local Employee Retirement Plans" – March 2021

RAND Corporation – "Public Employee Retention Responses to Alternative Retirement Plan Design: South Carolina Teachers and State Public Employees" – March 2021

Quinby, Laura D. and Gal Wettstein. 2021. "Do Deferred Benefit Cuts for Current Employees Increase Separation?" *Labour Economics* 73: 102081.

Quinby, Laura D. 2019. "Do Deferred Retirement Benefits Retain Government Employees?" *Journal of Policy Analysis and Management* (forthcoming).

Appendix C – Bibliography of Studies and Surveys

Goda, Gopi Shah, Damon Jones, and Colleen Flaherty Manchester. 2017. "Retirement Plan Type and Employee Mobility: The Role of Selection." *Journal of Human Resources* 52(3): 654-679.

Pew Charitable Trusts. 2017. "Retirement Needs and Preferences of Younger Public Workers." Issue Brief. Available at: pewtrusts.org/pensions.

Appendix D – Additional Survey Results

Survey Overview and Methodology

Greenwald Research and Cheiron conducted a survey of current and former Colorado state employees from January 9 to January 27, 2025, as part of this study.

A link to a 10-minute online survey was sent to 86,375 email addresses provided by PERA of current and former state employees who, when they were hired, were offered a choice between the PERA Hybrid DB Plan and the PERA DC Plan. The objective of the survey was to better understand how the retirement benefits provided affected employment decisions for state employees. Former employees were an important target group to gain information on how retirement benefits may have affected their decisions to leave state employment.

In total, 2,923 current and former employees responded to the survey, comprising 1,670 current employees and 1,253 former employees (which includes those who left for another job, those who retired, those laid off/fired, and other circumstances).

In this appendix, references to the "original DB/DC plan" represent the plan the employee was enrolled in upon being hired, and the "current DB/DC plan" represents the plan they are currently enrolled in.

Note: percentages in each chart may not add up to 100% due to rounding or multi-select questions.

Appendix D – Additional Survey Results

Detailed Survey Findings

Motivation for Taking Job

Retirement benefits rank 5th among 11 factors that attract people to Colorado state jobs.

35% rank retirement benefits in the top three.

Exhibit D-1

Most Attractive Factors of Colorado State Jobs
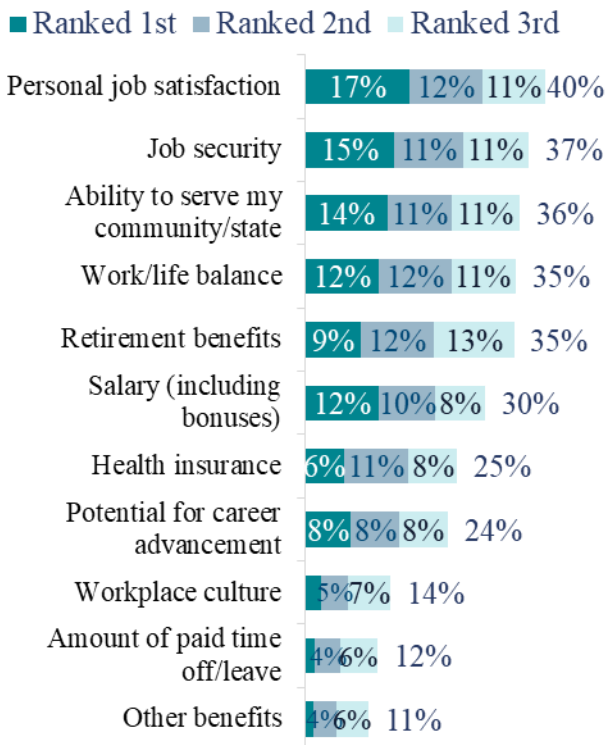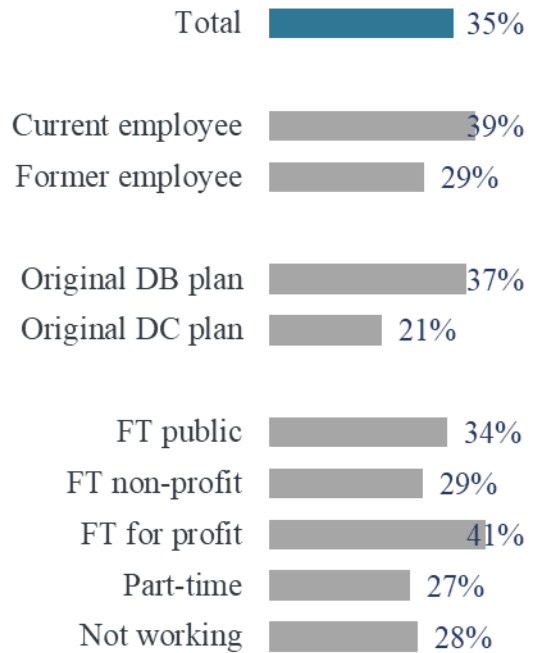
Question: Think back to when you decided to take the job as a Colorado state employee. Please rank the top 3 factors that initially attracted you to the job. Rank 1-3, where 1=most important factor. (n=2923)

Appendix D – Additional Survey Results

8 in 10 say retirement benefits were a factor in their decision to become a state employee. Those who chose the PERA Hybrid DB Plan were more likely to say retirement benefits were a major factor.

Exhibit D-2

Extent Retirement Benefits Were a Factor in Employment
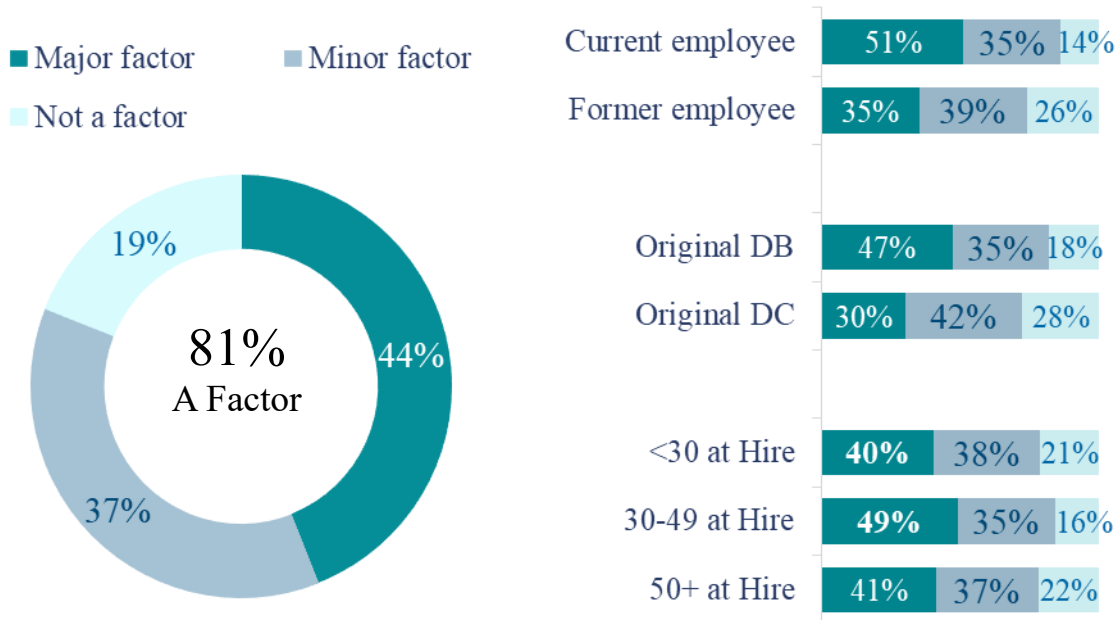
Question: Regardless of your top 3 considerations chosen in the prior question, to what extent were retirement benefits a factor in your decision to take the job as a Colorado state employee? (n=2923)

Appendix D – Additional Survey Results

4 in 10 had at least some understanding of the benefits offered when they were hired; of those, half say these benefits were more attractive than other employers' offerings.

Exhibit D-3

Initial Understanding of Retirement Benefits Offered

41%
At least some

41% of Original DB Plan 41% of Original DC Plan

38% of those <30 at hire
40% of those 30-49 at hire
45% of those 50+ at hire

46% of male employees
38% of female employees

11%	30%	37%	21%
I had a detailed understanding of the retirement benefits	I had some understanding of the retirement benefits	I had a general sense of what public employees receive, but nothing specific	I was unaware of the retirement benefits before taking the job

Question: When you were accepting the position, how well did you understand the retirement benefits offered to Colorado state employees? (n=2923)

Exhibit D-4

Colorado Retirement Benefits As Compared to Competitors

They were significantly more attractive than other employers	22%
They were somewhat more attractive than other employers	27%
About the same as other employers	15%
They were somewhat less attractive than other employers	8%
They were significantly less attractive than other employers	6%
Not sure	9%
Not applicable	13%

49% More attractive
51% of Original DB Plan
40% of Original DC Plan

14% Less attractive
14% of Original DB Plan
16% of Original DC Plan

Question: How did the retirement benefits for Colorado state employees compare to other employers you considered at the time? (If had awareness n=2301)

Appendix D – Additional Survey Results

4 in 10 respondents intended to stay as long as possible when they took the job. Those who chose the PERA Hybrid DB Plan were much more likely to think this.

Exhibit D-5

Expectation of Tenure as State Employee at Start

Category	Percentage	
Less than 5 years	11%	8% of Original DB Plan 26% of Original DC Plan
5-10 years	20%	
More than 10 years but not for entire career	5%	
As long as possible/Until retirement	42%	46% of Original DB Plan 23% of Original DC Plan
Not sure/Did not have any expectations	22%	
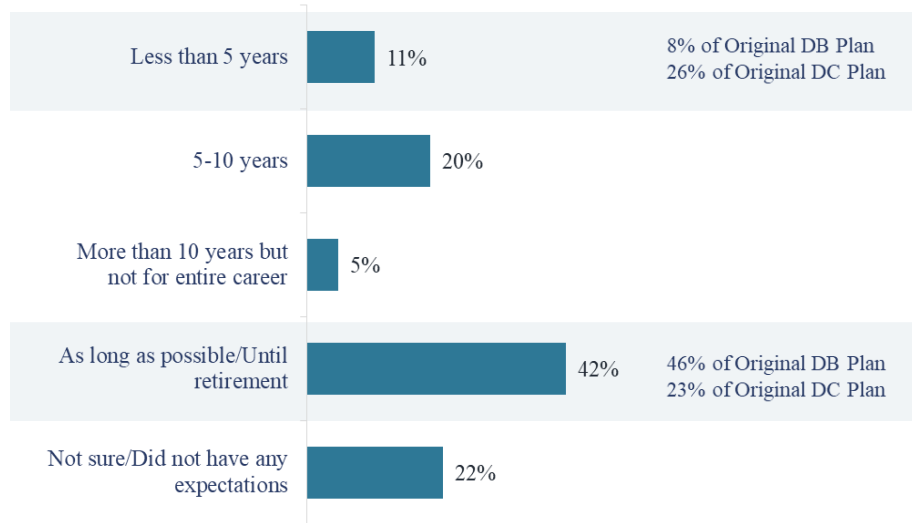
Question: When you first took the job, how long did you expect to remain a Colorado state employee? (n=2923)

Exhibit D-6

Current Expectation of Remainder of Tenure as State Employee

Category	Percentage	
Less than 5 more years	19%	17% of Current DB Plan 31% of Current DC Plan
5-10 more years	14%	
More than 10 more years but not for entire career	4%	
As long as possible/Until retirement	50%	53% of Current DB Plan 31% of Current DC Plan
Not sure/Do not have any expectations	13%	
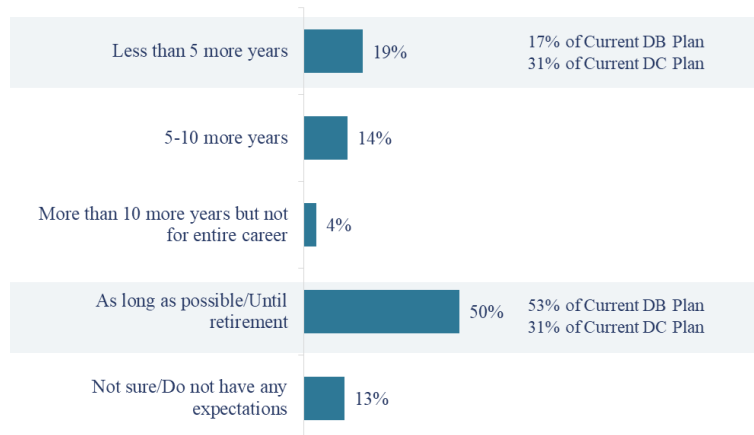
Question: Now think about how you feel right now. How long do you expect to remain a Colorado state employee at this point? (n=1670)

Appendix D – Additional Survey Results

Evaluating Current Benefits and Satisfaction

Retirement benefits ranked 6th in satisfaction among 11 job factors queried. Half are extremely/very satisfied with their retirement benefits.

Exhibit D-7
Satisfaction With Aspects of Job

■ Extremely satisfied   ■ Very satisfied

Aspect	Extremely satisfied	Very satisfied	Total
Ability to serve my community/state	27%	41%	68%
Job security	22%	40%	62%
Work/life balance	21%	36%	57%
Personal job satisfaction	20%	37%	56%
Amount of paid time off/leave	17%	36%	53%
Retirement benefits	14%	34%	48%
Health insurance	15%	31%	46%
Workplace culture	14%	28%	42%
Other benefits	11%	31%	42%
Salary (including any bonuses)	6%	21%	27%
Potential for career advancement	6%	19%	25%

Question: How satisfied are/were you with the following aspects of your job? (n=2923)

Exhibit D-8
Satisfied with Retirement Benefits by Subgroup
(% Extremely or Very Satisfied)
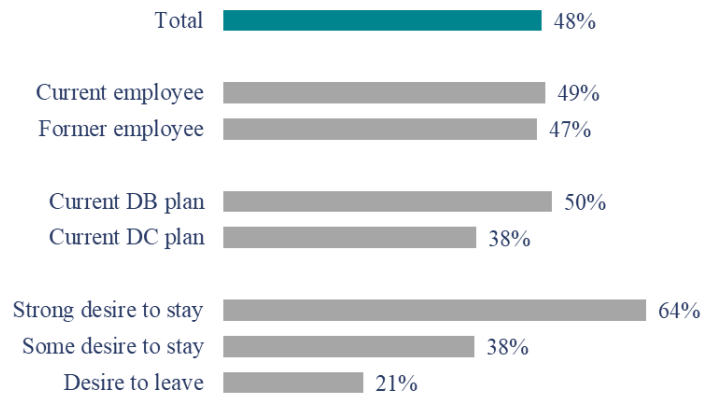
Subgroup	Percent
Total	48%
Current employee	49%
Former employee	47%
Current DB plan	50%
Current DC plan	38%
Strong desire to stay	64%
Some desire to stay	38%
Desire to leave	21%

Question: How satisfied are/were you with the following aspects of your job? (n=2923)

Appendix D – Additional Survey Results

3 in 4 say the retirement benefits offered by Colorado are competitive with other employers.

Exhibit D-9

Competitiveness of Colorado State Benefits

■ Very competitive   ■ Somewhat competitive

	Very competitive	Somewhat competitive	Total	
Retirement benefits	33%	41%	74%	77% of Current Employees 69% of Former Employees
Health insurance	29%	40%	69%	
Salary (including any bonuses)	11%	36%	47%	
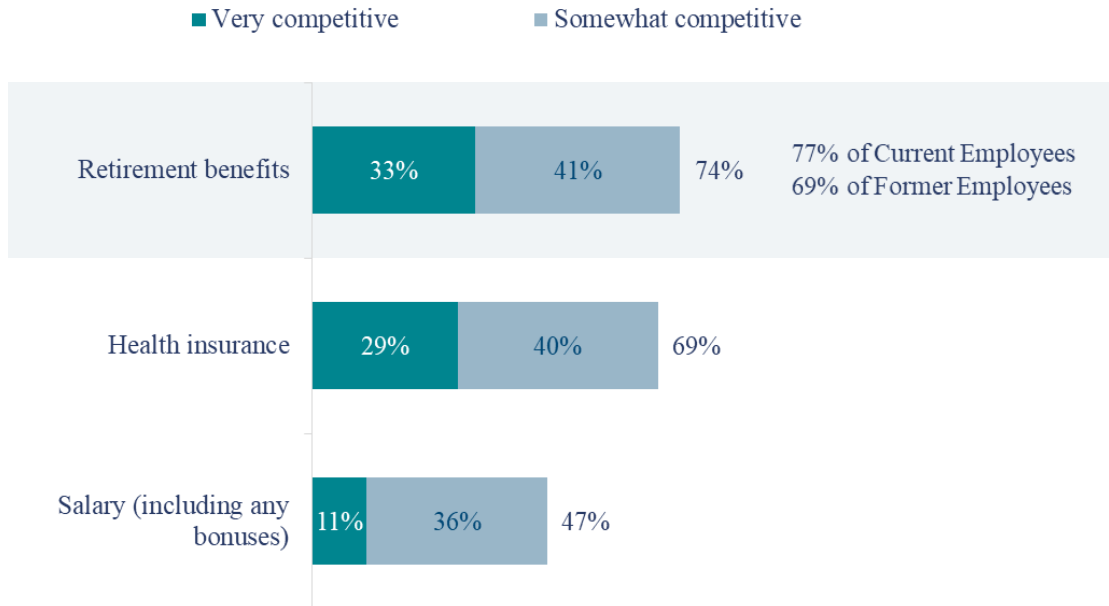
Question: How competitive is/was your employer on the following aspects in comparison to other employment options you would realistically consider? (n=2923)

Appendix D – Additional Survey Results

Retirement Plan Choice

More than half gave the DB vs. DC plan choice "some" or "a great deal" of thought. If members did not make a choice, they were automatically enrolled in the PERA Hybrid DB Plan. Of those that made a choice, 7 in 10 found the decision easy.

Exhibit D-10
Amount of Consideration of Retirement Plan Choice
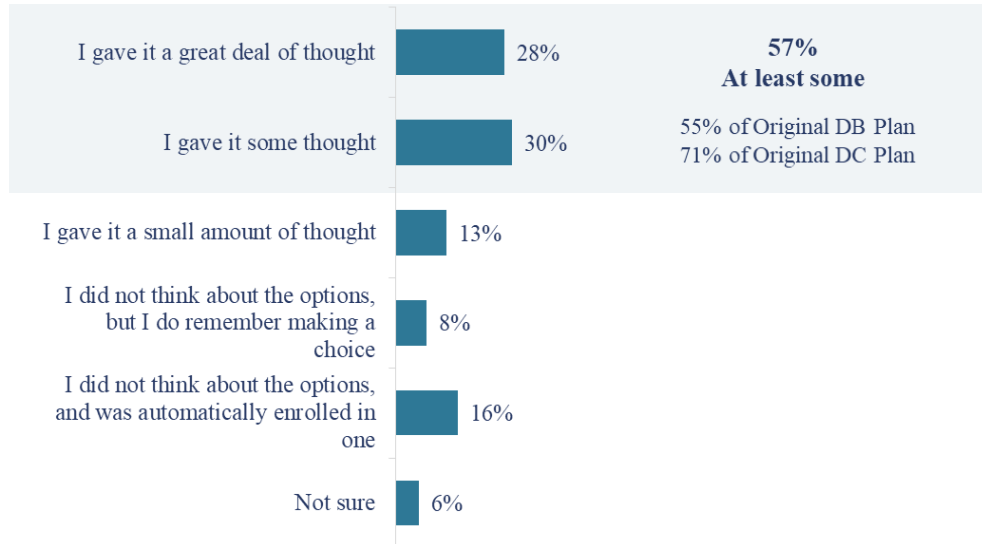
Question: At the time, how much consideration did you give to the two retirement plan options when making your choice? (n=2923)

Exhibit D-11
Difficulty of Choice
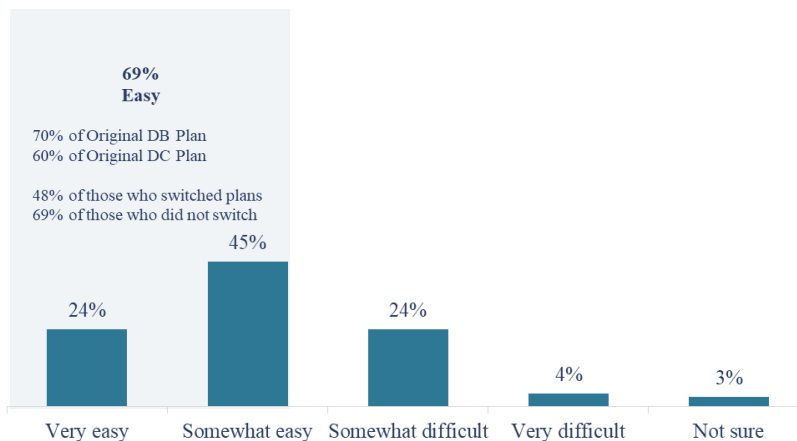
Question: Was it an easy choice or a difficult choice? (n=2065)

Appendix D – Additional Survey Results

Access to guaranteed lifetime income is by far the biggest draw for the PERA Hybrid DB Plan, followed by the DB benefit being less affected by market fluctuations and a belief that the DB plan provides a higher benefit.

Exhibit D-12

Reasons for Enrolling in DB Plan

		Current Employer	Former Employer
Guaranteed monthly income for the remainder of your and your beneficiary's lives	57%	62%	50%
DB guaranteed benefit is less impacted by stock market downturns and volatility	33%	37%	27%
Belief that the DB plan provides higher overall retirement benefits	33%	35%	29%
Easier to understand how the DB plan works	27%	29%	24%
DB plan includes an annual benefit increase to help offset inflation	25%	26%	25%
Wanted professional investment managers to manage the money	25%	26%	22%
Access to the PERACare Health Benefits Program for retirees	18%	19%	17%
Access to survivor benefits	16%	19%	13%
Access to disability benefits	9%	11%	7%
Advice from a financial professional or HR representative	8%	9%	8%
Have a DB plan from another employer (so it's more familiar and compatible)	5%	5%	6%

Question: Which of the following are reasons why you enrolled in the Defined Benefit (DB) Plan? Please select all that apply. (n=2463)
Note: Response options of "other", "not sure", and "N/A" not shown.

Appendix D – Additional Survey Results

Half of those who enrolled in the PERA DC Plan did so believing it would be easier to manage if they changed jobs. About a third wanted flexibility in how they withdraw their money, wanted to manage their own investments, perceived a potential to earn greater returns, or were concerned about the long-term stability of the Hybrid DB Plan.

Exhibit D-13

Reasons for Enrolling in DC Plan

		Current Empl.	Former Empl.
Easier to manage if I change jobs (more portable/flexible)	48%	55%	41%
More choice/flexibility in how I withdraw the money in retirement	34%	39%	29%
Wanted to manage my own investments	31%	36%	27%
Potential to benefit from higher returns on investments	30%	34%	27%
Concerns about the long-term stability of the DB plan	30%	33%	27%
Belief that the DC plan provides higher overall retirement benefits	23%	24%	23%
Have a DC plan from another employer (so it's more familiar and compatible)	13%	13%	12%
Easier to understand how the DC plan works	12%	13%	11%
Advice from a financial professional or HR representative	10%	12%	7%

Question: Which of the following are reasons why you enrolled in the Defined Contribution (DC) Plan? Please select all that apply. (n=423)
Note: Response options of "other", "not sure", and "N/A" not shown.

Appendix D – Additional Survey Results

Plan Change Rationale

Those who switched from the PERA DC Plan to the Hybrid DB Plan had the same top three reasons as those who selected the DB plan initially.

Exhibit D-14

Reasons for Switching to DB Plan

Reason	Percentage
Guaranteed monthly income for the remainder of your and your beneficiary's lives	56%
Belief that the DB plan provides higher overall retirement benefits	43%
DB guaranteed benefit is less impacted by stock market downturns and volatility	38%
Access to the PERACare Health Benefits Program for retirees	21%
DB plan includes an annual benefit increase to help offset inflation	19%
Access to survivor benefits	17%
Wanted professional investment managers to manage the money	10%
Access to disability benefits	10%
Easier to understand how the DB plan works	8%
Advice from a financial professional or HR representative	6%
Have a DB plan from another employer (so it's more familiar and compatible)	2%

Note: Small Sample Size, n=63

Question: Which of the following are reasons why you switched the Defined Benefit (DB) Plan? Please select all that apply. (n=63)
Note: Response options of "other," "not sure," and "N/A" not shown.

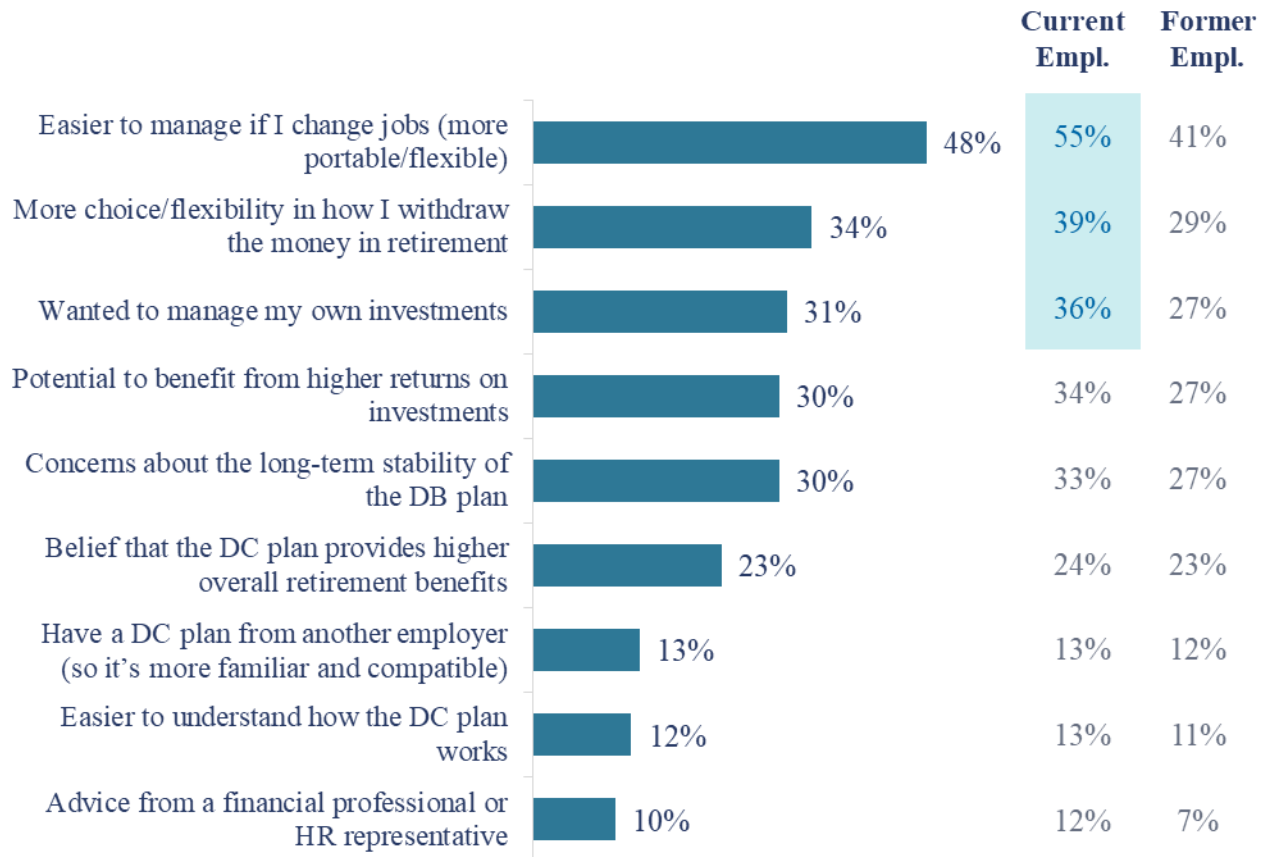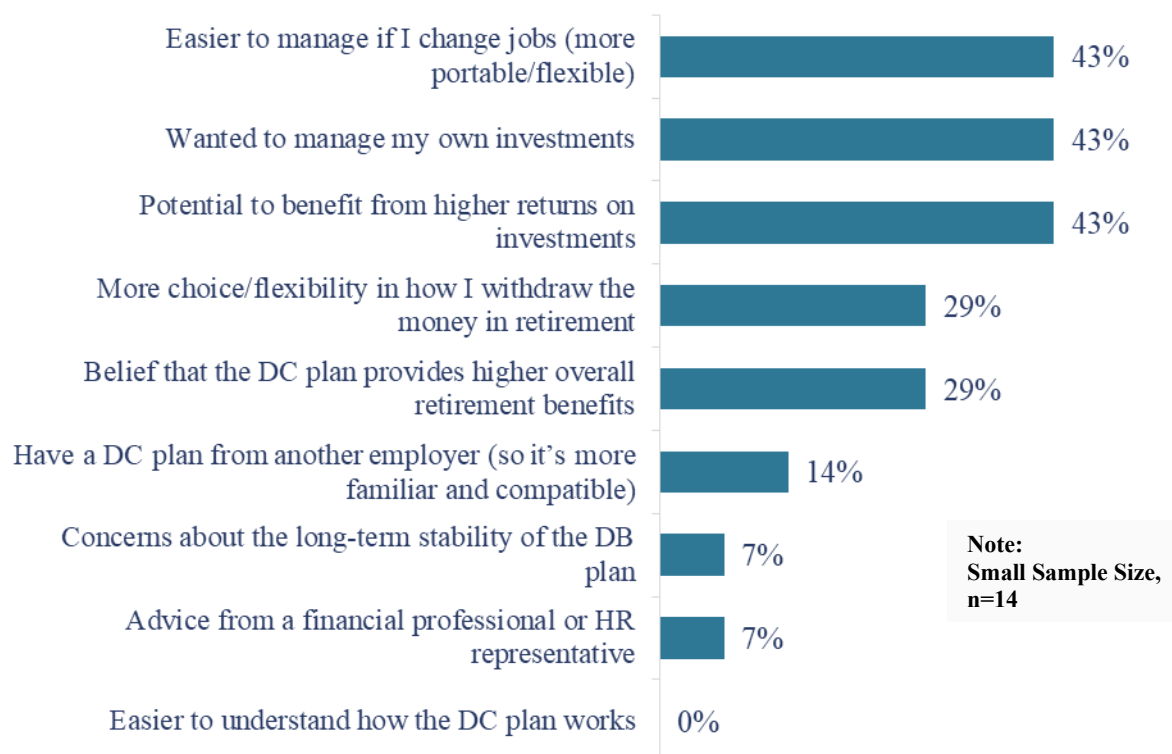# Appendix D – Additional Survey Results

Of the few who switched from the PERA Hybrid DB Plan to the PERA DC Plan, the top reasons were the perception that it would be easier to manage their funds, portability of the benefit, wanting to manage their own investments, and the potential for higher returns.

Exhibit D-15

Reasons for Switching to DC Plan

Reason	Percentage
Easier to manage if I change jobs (more portable/flexible)	43%
Wanted to manage my own investments	43%
Potential to benefit from higher returns on investments	43%
More choice/flexibility in how I withdraw the money in retirement	29%
Belief that the DC plan provides higher overall retirement benefits	29%
Have a DC plan from another employer (so it's more familiar and compatible)	14%
Concerns about the long-term stability of the DB plan	7%
Advice from a financial professional or HR representative	7%
Easier to understand how the DC plan works	0%

Note: Small Sample Size, n=14

Question: Which of the following are reasons why you switched to the Defined Contribution (DC) Plan? Please select all that apply. (n=14)
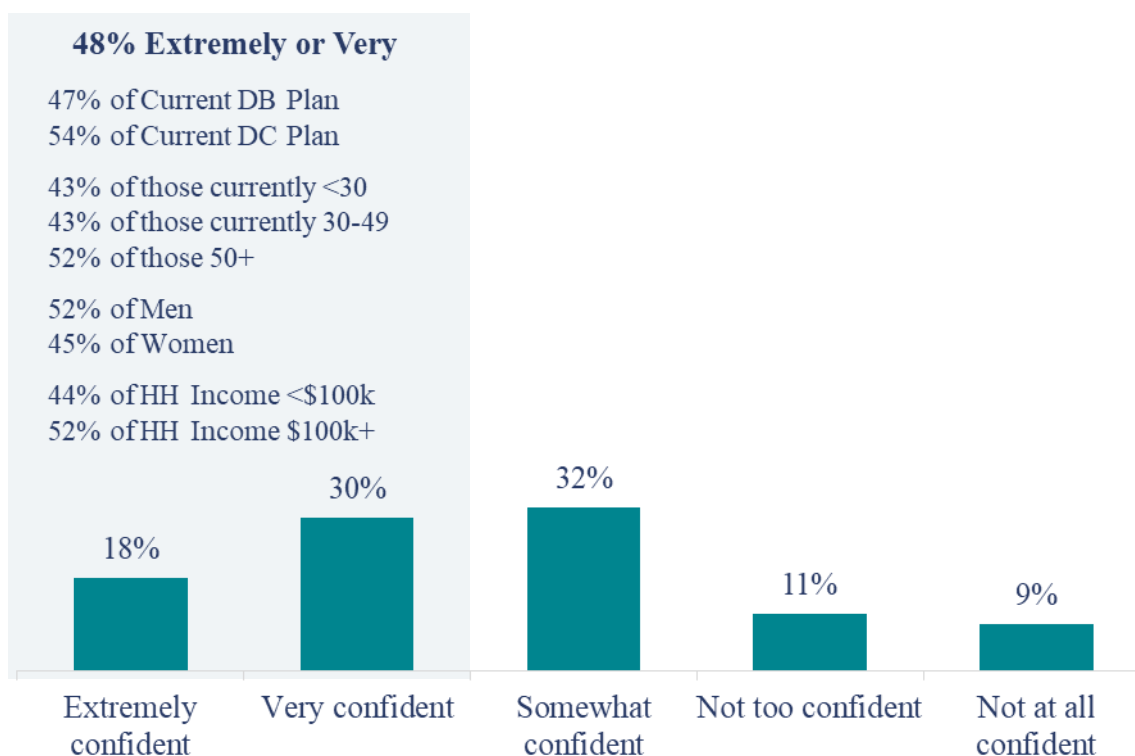**Note**: Response options of "other," "not sure," and "N/A" not shown.

Appendix D – Additional Survey Results

Satisfaction with Choice and Confidence

Half are extremely/very confident that they are in the right retirement plan. Those in the PERA DC Plan were somewhat more likely to feel this way.

Exhibit D-16

Confidence About Being in the Right Type of Retirement Plan

48% Extremely or Very

47% of Current DB Plan
54% of Current DC Plan

43% of those currently <30
43% of those currently 30-49
52% of those 50+

52% of Men
45% of Women

44% of HH Income <$100k
52% of HH Income $100k+

Extremely confident	Very confident	Somewhat confident	Not too confident	Not at all confident
18%	30%	32%	11%	9%

Question: How confident are you that you are in the right type of plan for you? (n=2923)

Appendix D – Additional Survey Results

While nearly half think that their employer and PERA provided enough information and resources for their decision between the PERA Hybrid DB and DC Plans, a third thought more should have been provided.

Exhibit D-17

PERA/Employer Resources Sufficient to Help Make Decision on Retirement Plan?
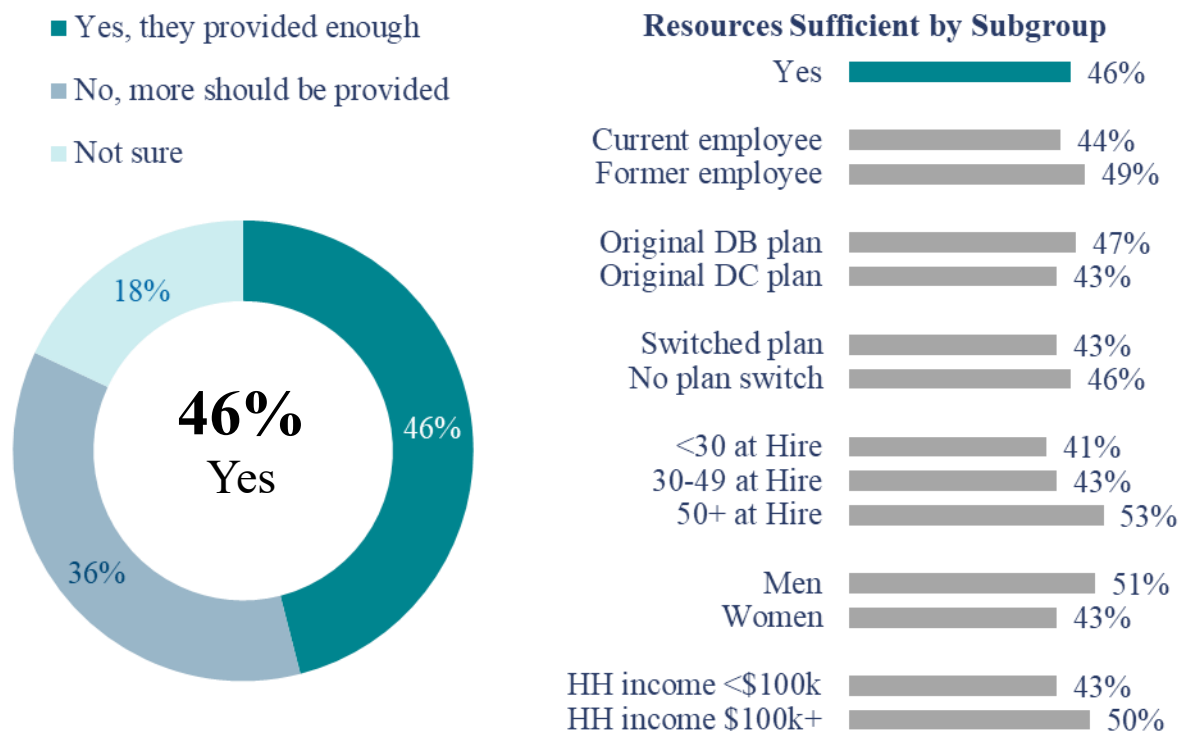
Question: Were the resources/advice/information provided by your employer and by PERA sufficient to help you make this decision? (n=2923)

Appendix D – Additional Survey Results

About one-third are highly confident that they will be able to retire when they want, with those in the PERA DC Plan reporting greater confidence.

Exhibit D-18

Confidence About Retirement Security
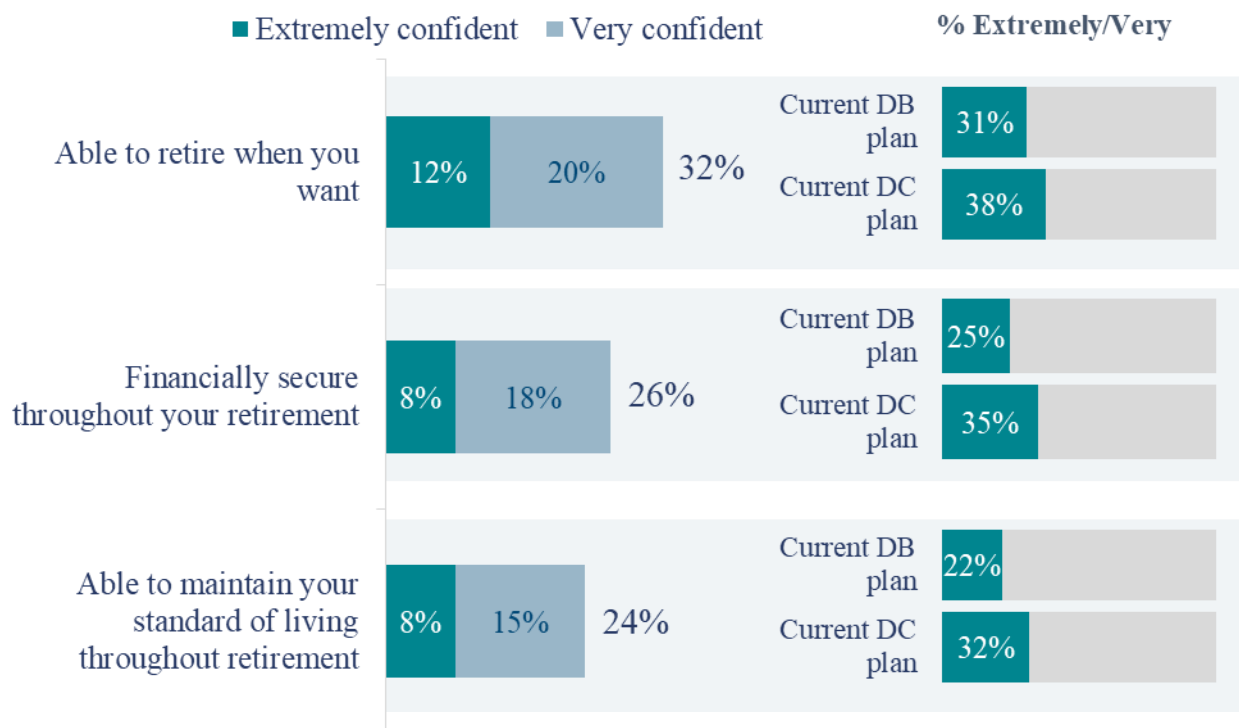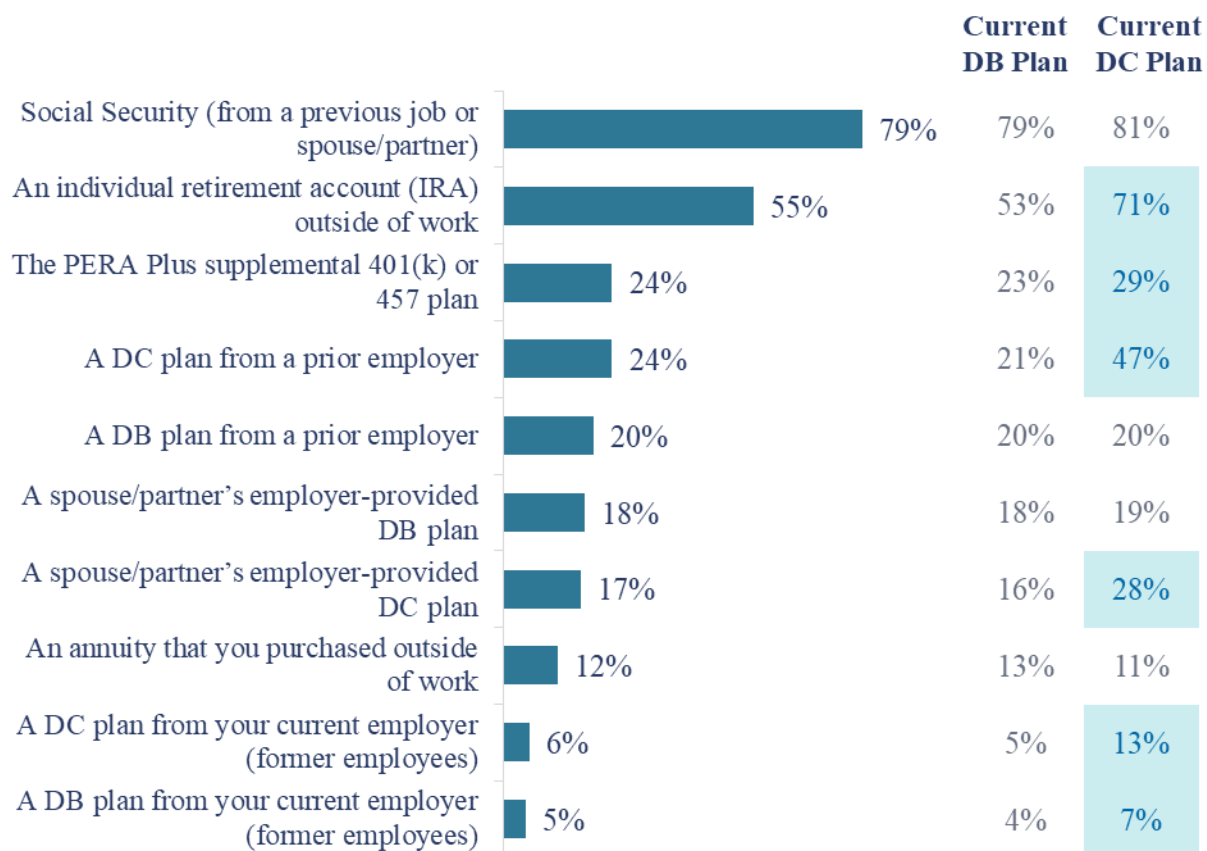

Question: How confident are you that you'll be…? (n=2923)

Appendix D – Additional Survey Results

Beyond their PERA retirement plan, 8 in 10 expect to receive Social Security (from another job or spouse/partner) and over half have an IRA outside of work.

Exhibit D-19

Additional Sources of Retirement Income (% Yes)

		Current DB Plan	Current DC Plan
Social Security (from a previous job or spouse/partner)	79%	79%	81%
An individual retirement account (IRA) outside of work	55%	53%	71%
The PERA Plus supplemental 401(k) or 457 plan	24%	23%	29%
A DC plan from a prior employer	24%	21%	47%
A DB plan from a prior employer	20%	20%	20%
A spouse/partner's employer-provided DB plan	18%	18%	19%
A spouse/partner's employer-provided DC plan	17%	16%	28%
An annuity that you purchased outside of work	12%	13%	11%
A DC plan from your current employer (former employees)	6%	5%	13%
A DB plan from your current employer (former employees)	5%	4%	7%

Question: Other than your PERA retirement plan, which of the following sources of retirement income do you have? (n=2923)

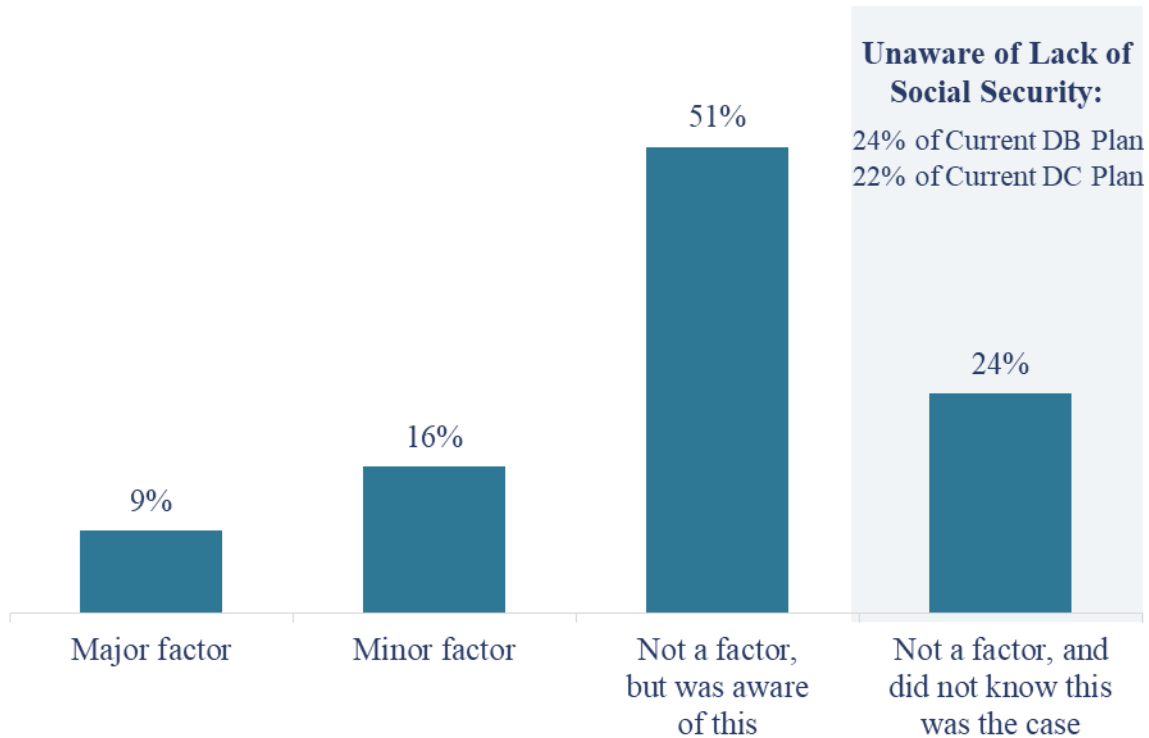# Appendix D – Additional Survey Results

One quarter cite the lack of Social Security as a factor in choosing their plan.

Exhibit D-20

Social Security as Factor for Choosing Plan

Unaware of Lack of Social Security:
24% of Current DB Plan
22% of Current DC Plan

Major factor: 9%
Minor factor: 16%
Not a factor, but was aware of this: 51%
Not a factor, and did not know this was the case: 24%

Question: Colorado state employees who have a PERA retirement plan do not pay into Social Security and therefore, do not receive a Social Security benefit for the years the state employs them. To what extent was this a factor in your decision to choose the PERA retirement plan you did? (n=2923)
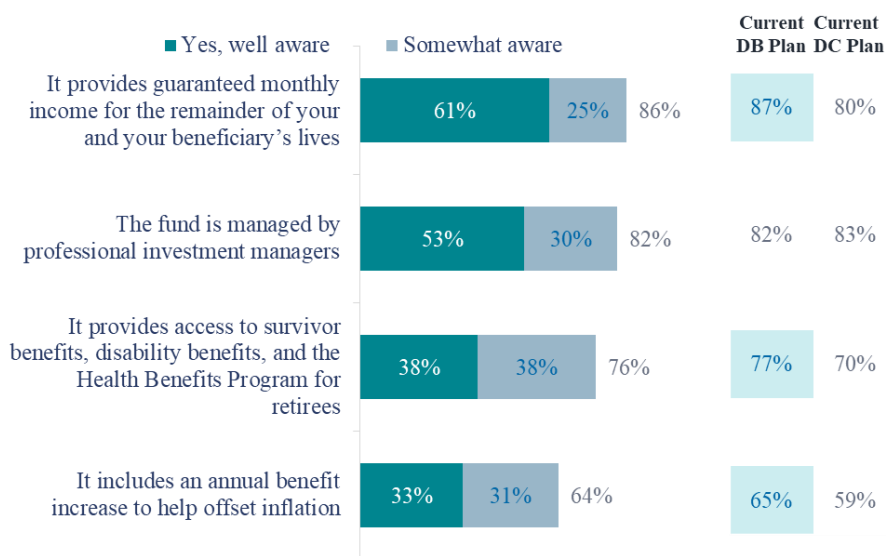
Appendix D – Additional Survey Results

Knowledge of Key Aspects of Plans

A majority are at least somewhat aware of the PERA Hybrid DB Plan facts; the PERA DC Plan facts are less known, especially among PERA Hybrid DB Plan participants.
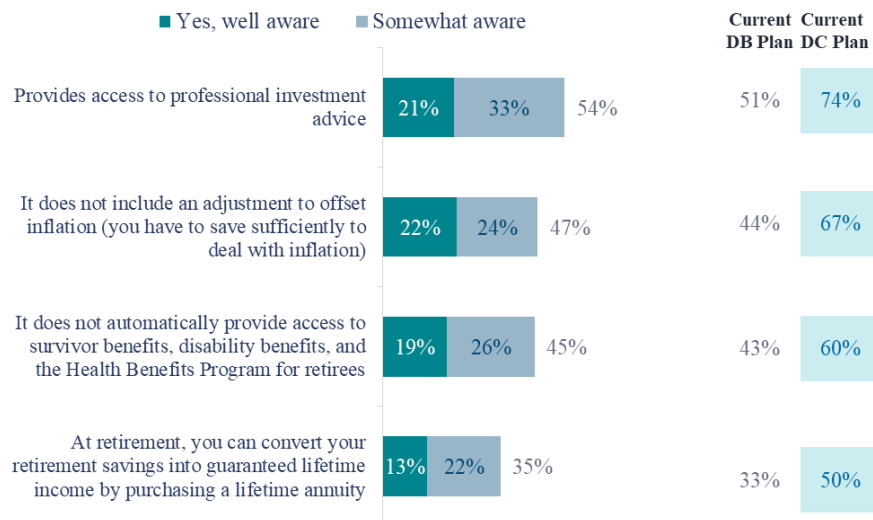
Exhibit D-21

Awareness of Facts About DB Plan

	Yes, well aware	Somewhat aware		Current DB Plan	Current DC Plan
It provides guaranteed monthly income for the remainder of your and your beneficiary's lives	61%	25%	86%	87%	80%
The fund is managed by professional investment managers	53%	30%	82%	82%	83%
It provides access to survivor benefits, disability benefits, and the Health Benefits Program for retirees	38%	38%	76%	77%	70%
It includes an annual benefit increase to help offset inflation	33%	31%	64%	65%	59%

Question: Before taking this survey, were you aware of these facts about the PERA Defined Benefit (DB) plan? (n=2923)

Exhibit D-22

Awareness of Facts About DC Plan

	Yes, well aware	Somewhat aware		Current DB Plan	Current DC Plan
Provides access to professional investment advice	21%	33%	54%	51%	74%
It does not include an adjustment to offset inflation (you have to save sufficiently to deal with inflation)	22%	24%	47%	44%	67%
It does not automatically provide access to survivor benefits, disability benefits, and the Health Benefits Program for retirees	19%	26%	45%	43%	60%
At retirement, you can convert your retirement savings into guaranteed lifetime income by purchasing a lifetime annuity	13%	22%	35%	33%	50%

Question: Before taking this survey, were you aware of these facts about the PERA Defined Contribution (DC) plan? (n=2923)

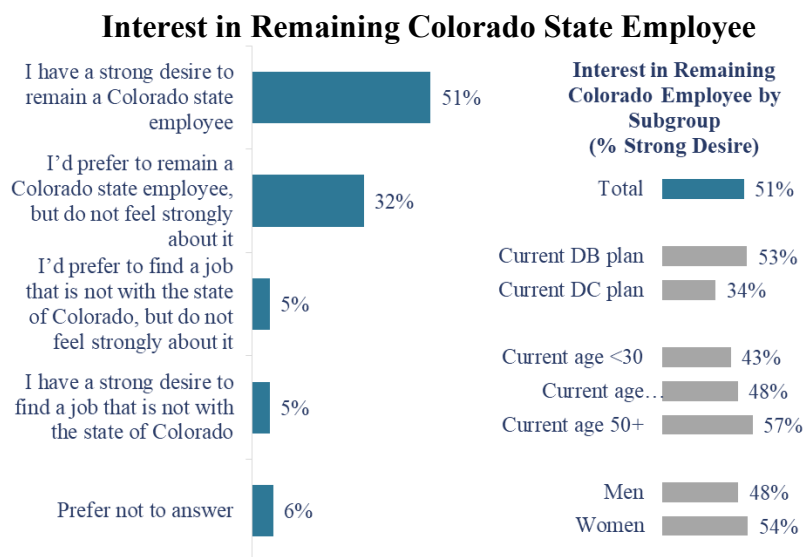# Appendix D – Additional Survey Results

Reasons for Leaving for Another Job

8 in 10 current employees want to remain employed with the State, with half having a strong desire to stay. Those in the PERA Hybrid DB Plan are more likely to a have strong desire to stay.

Exhibit D-23

Interest in Remaining Colorado State Employee

Question: Keeping in mind that your response is confidential and won't be linked to any identifying information about you, which statement best reflects your interest in remaining a Colorado state employee? (n=1670)

Half of current employees say retirement benefits are a major factor in wanting to stay.

Exhibit D-24

Role of Retirement Benefits In Staying Colorado Employee
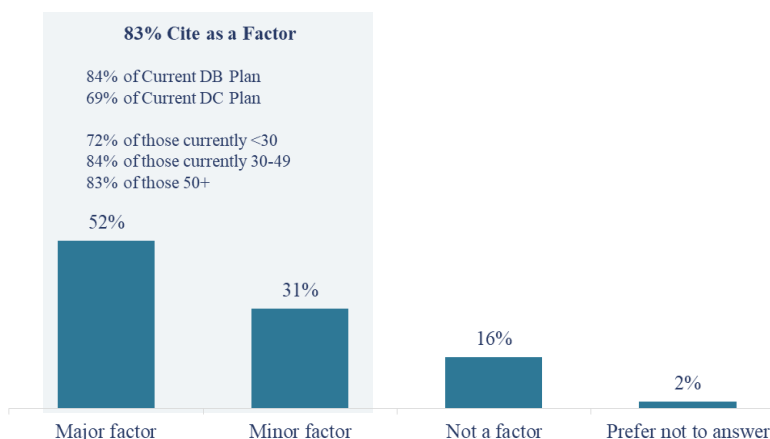
Question: To what extent are your retirement benefits a factor in why you have remained a Colorado state employee to this point? (n=1670)
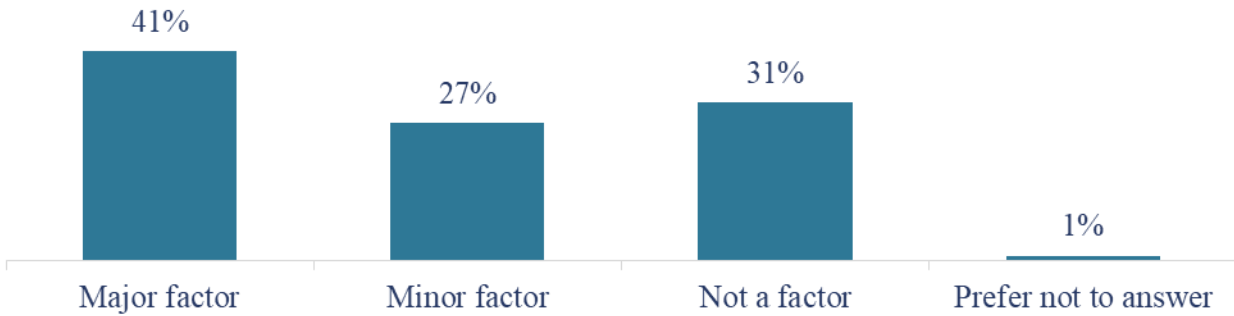
Appendix D – Additional Survey Results

About 6 in 10 of those wanting to leave cite reasons other than retirement benefits.

Exhibit D-25

Role of Retirement Benefits In Leaving Colorado Employ

Question: To what extent is the desire to have better retirement benefits a factor in why you'd like to find a job that is not with the state of Colorado? (n=171)
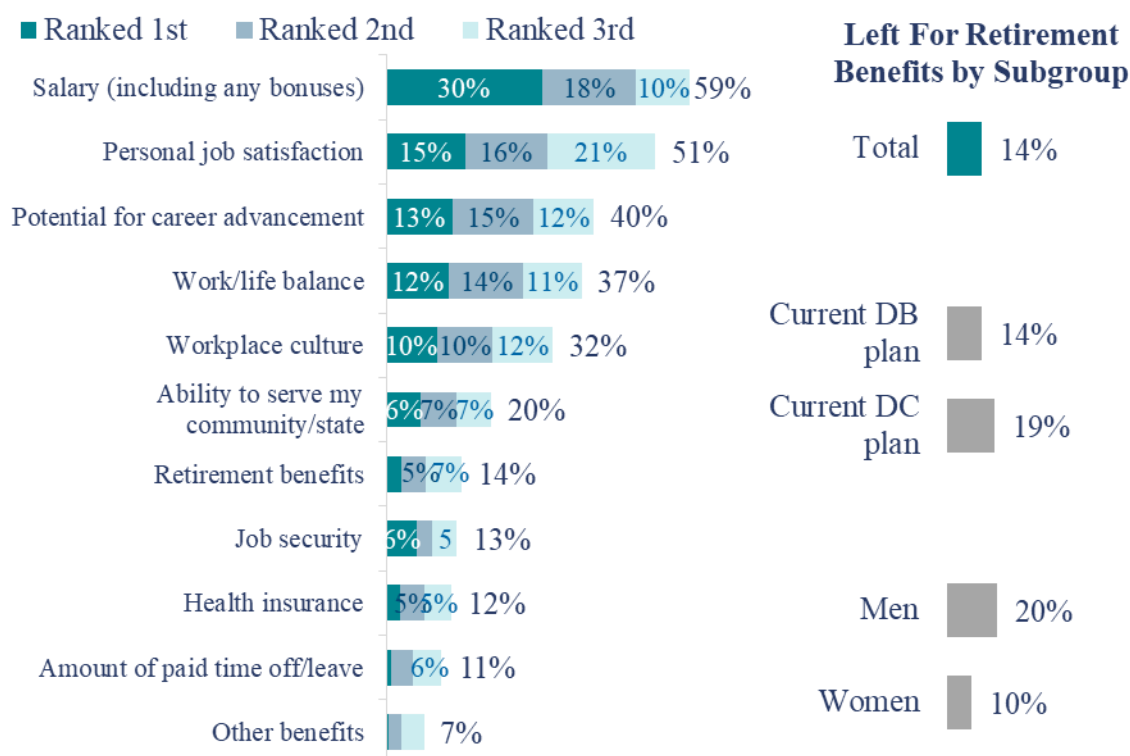

Appendix D – Additional Survey Results

A quarter who left for another job say retirement benefits did play a major role, with half of those saying the competitor offered a more valuable retirement benefit overall.
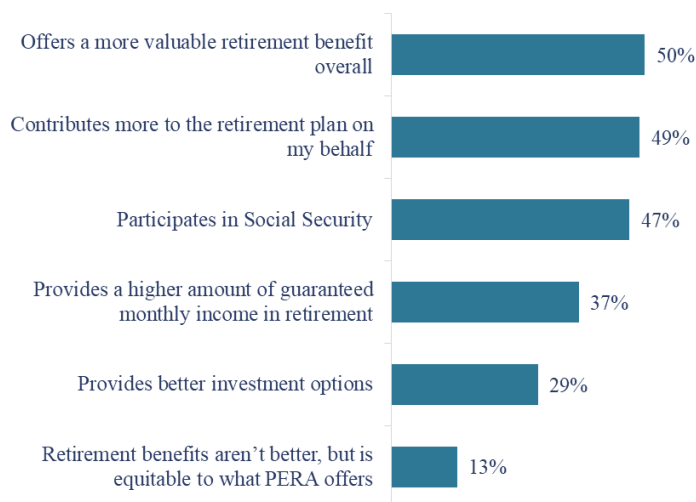
Exhibit D-27

Role of Retirement Benefits In Decision of Former Employee To Leave
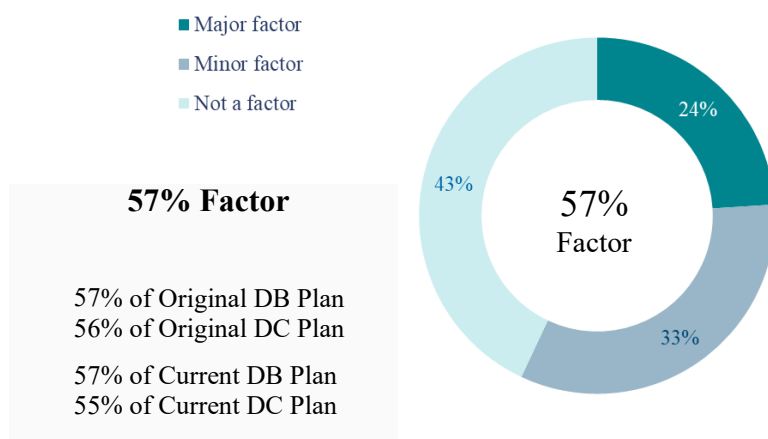
Legend:
- Major factor
- Minor factor
- Not a factor

57% Factor

57% of Original DB Plan
56% of Original DC Plan

57% of Current DB Plan
55% of Current DC Plan

Donut chart values: 24%, 33%, 43%, center: 57% Factor

Question: Regardless of your top 3 considerations chosen in the prior question, to what extent were retirement benefits a factor in your decision to take the new job? (n=479)

Exhibit D-28

Reasons Why Retirement Benefits Was Major Factor

Reason	Percentage
Offers a more valuable retirement benefit overall	50%
Contributes more to the retirement plan on my behalf	49%
Participates in Social Security	47%
Provides a higher amount of guaranteed monthly income in retirement	37%
Provides better investment options	29%
Retirement benefits aren't better, but is equitable to what PERA offers	13%

Question: In the prior question, you mentioned the new employer's retirement plan being a major factor for taking the new job. Which of the following describes why the retirement plan was attractive to you? Please select all that apply. (n=113)
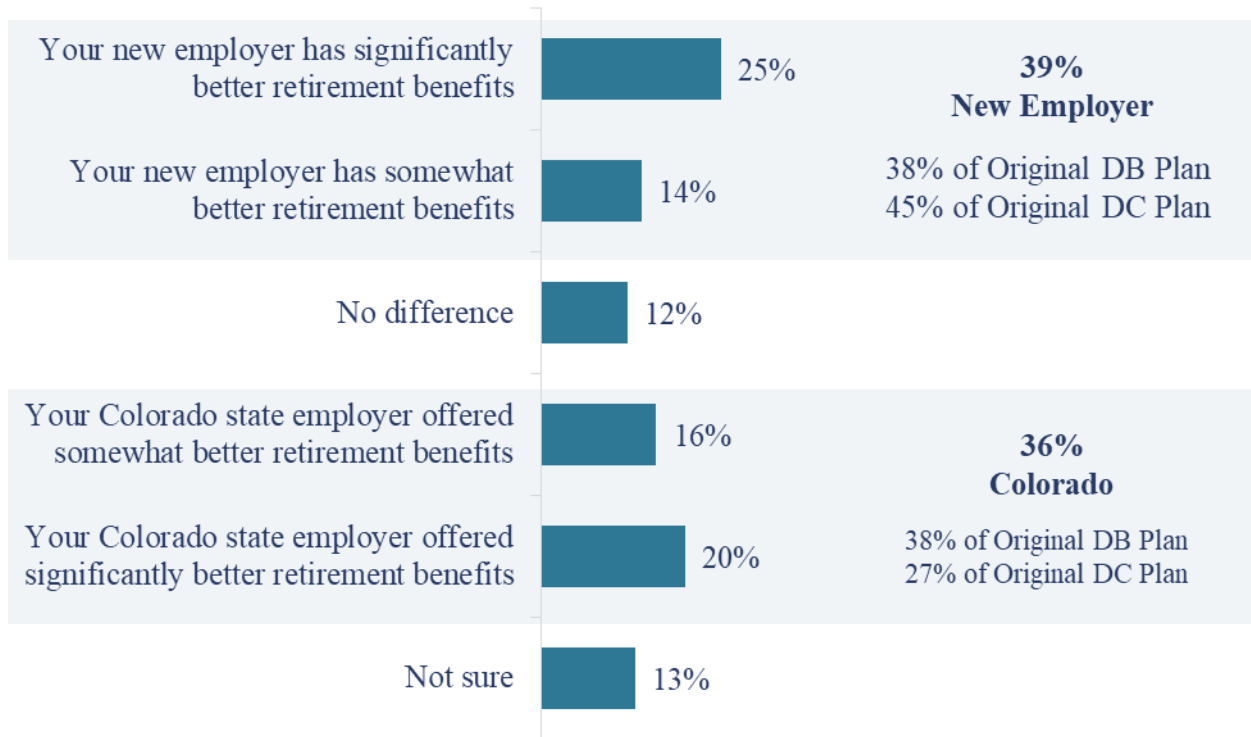
Appendix D – Additional Survey Results

Employees who left for other jobs are split on whether their current employer or the State offers a better retirement benefit.

Exhibit D-29

Which Employer Offers Better Retirement Benefits

Response	Percentage
Your new employer has significantly better retirement benefits	25%
Your new employer has somewhat better retirement benefits	14%
No difference	12%
Your Colorado state employer offered somewhat better retirement benefits	16%
Your Colorado state employer offered significantly better retirement benefits	20%
Not sure	13%

39%
New Employer
38% of Original DB Plan
45% of Original DC Plan

36%
Colorado
38% of Original DB Plan
27% of Original DC Plan

Question: Now that you have a point of comparison, which employer offers better retirement benefits? (n=479)

Appendix D – Additional Survey Results
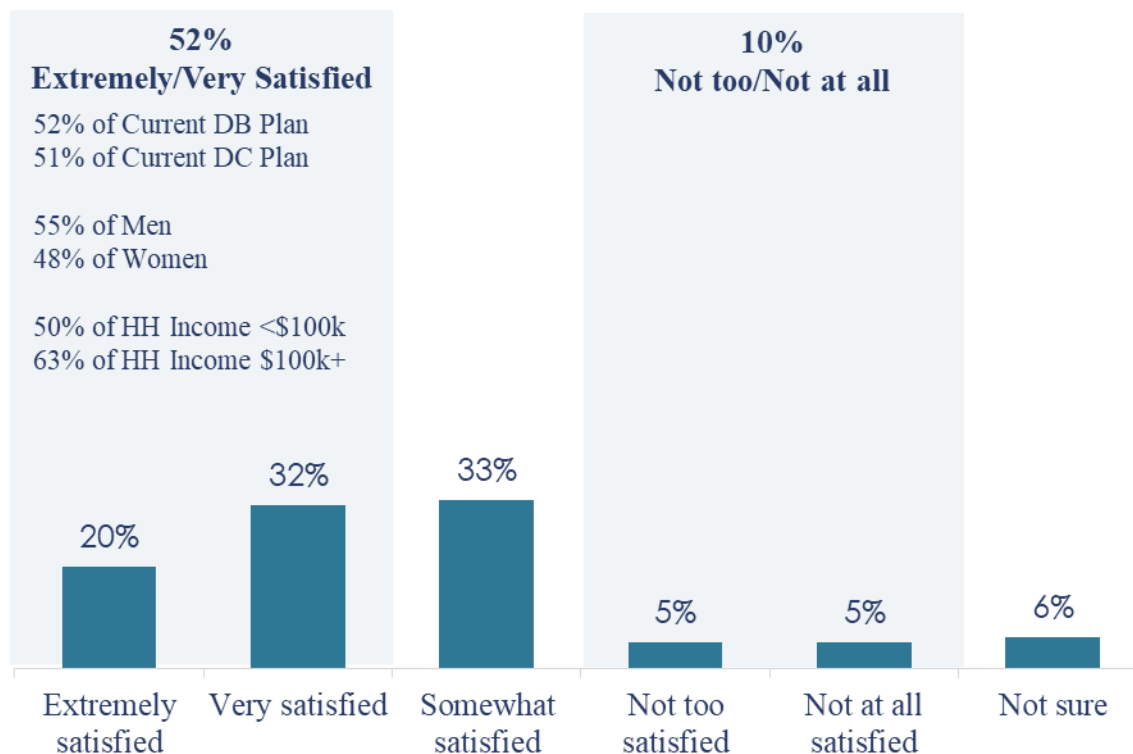
Half of retired employees are very or extremely satisfied with their PERA retirement benefits. One third are somewhat satisfied. Only 10% are not satisfied.

Exhibit D-30

Retiree Satisfaction with Retirement Benefits

52%
Extremely/Very Satisfied

52% of Current DB Plan
51% of Current DC Plan

55% of Men
48% of Women

50% of HH Income <$100k
63% of HH Income $100k+

10%
Not too/Not at all

20% — Extremely satisfied
32% — Very satisfied
33% — Somewhat satisfied
5% — Not too satisfied
5% — Not at all satisfied
6% — Not sure

Question: Now that you are retired, how satisfied have you been with the Colorado PERA retirement benefits you are receiving? (n=327)

Appendix D – Additional Survey Results

Respondent Demographics

Employee Type			Age at Hire	
Current employee	57%		18-29	19%
Former employee	43%		30-49	45%

Original Plan Choice			Current Age	
DB plan	85%		18-29	4%
DC plan	15%		30-49	41%

Plan Switch			Gender	
No switch	97%		Male	43%
Transfer	2%		Female	57%

Current Plan	
DB plan	87%
DC plan	13%

Tenure As Colorado Employee			Prior Employment Sector (if applicable)	
Less than one year	9%		Public sector (local government)	16%
1-4 years	32%		Public sector (federal government)	6%
5-9 years	26%		Public sector (in a different state)	9%
10-14 years	21%		Not-for-profit, private sector	14%
15-19 years	9%		For profit, public sector	50%
20 years or more	4%		Other	5%

Prior Employment Status			Total Household Income in 2024	
Full-time	81%		Less than $50,000	12%
Part-time (or seasonally)	8%		$50,000 to $99,000	33%
Not working, but had worked previously	8%		$100,000 to $149,000	23%
			$150,000 to $199,999	12%
Not working (this was first job)	1%		$200,000 or more	12%
Other	1%		Prefer not to say	8%

Expected Retirement Age			Reason for Termination (former employees)	
Under 60	14%		Left for another job (public sector)	13%
60 – 64	20%		Left for another job (private sector)	17%
65 – 69	36%		Left for another job (non-profit sector)	8%
70 or older	11%		Retired	26%
Will never retire	4%		Laid off/Fired	8%
Not sure/Can't even guess	14%		Left the workforce entirely	4%
			Other	23%

Preferred Investment Risk				
Very high (very aggressive)	3%		**Currently Works With Financial Professional**	
High (aggressive)	16%		Yes	39%
Moderate	48%		No	59%
Low (conservative)	24%		Not Sure	2%
Very low (very conservative)	9%			

Appendix D – Additional Survey Results

Respondent Employer Categories

State Agency	55%
Community College	20%
Safety Officer	11%
Judicial	6%
Legal	2%
Legislature	1%
District Attorney	<0.5%
Local Government	<0.5%
School	<0.5%
Unknown	4%

Appendix E – Detailed Description of Alternative Retirement Plan Designs

Overview

For our comparison of the PERA Hybrid DB Plan to alternative retirement plan designs, we structured all the alternative plan designs to have the same expected cost as the PERA Hybrid DB Plan under the baseline assumption scenario. The baseline scenario assumes all actuarial assumptions from the PERA Hybrid DB Plan's 2023 actuarial valuation are met (annual inflation of 2.3%; annual investment returns of 7.25%; and annual increase for retirement benefits of 1.25%). Other than Social Security, the alternative defined benefit plans use the PERA Hybrid DB Plan's eligibility requirements for retirement, death, and disability benefits.

Standalone Traditional Defined Contribution (DC)

Employees and employers contribute to the employee's DC retirement account based on the employee's salary and the set contribution rates. The total combined employee and employer contribution rate equals the PERA Hybrid DB Plan's total normal cost rate for new members. Exhibit E-1 shows the total contribution rate for each Division. The proportion of the contribution rate contributed by employees versus employers does not affect our analysis.

Exhibit E-1

Combined Employee and Employer Contribution Rates

State, and Local Government (Other than Safety Officers) and DPS	State and Local Government Safety Officers	School Division	Judicial Division
12.8%	19.3%	14.3%	19.0%

Source: Cheiron analysis using total normal cost rates for new members calculated by PERA's contracted actuary, Segal.

These contribution rates satisfy the safe harbor requirements for a Social Security Replacement Plan, so if this alternative plan were adopted, PERA-covered employees could continue to be exempt from Social Security.

We also assumed the employee's account balance is invested in the Target Retirement Date Funds used by the PERA DC Plan. If the employee terminates employment before retirement, the account balance continues to grow with investment earnings, but no additional contributions are deposited into the account. In retirement, employees can withdraw money from their account balance as needed until the account is depleted. The remaining account balance during retirement depends on the withdrawals and investment earnings. The account balance is converted to an annuity to calculate income replacement ratios at retirement.

Appendix E – Detailed Description of Alternative Retirement Plan Designs

Social Security plus Traditional Defined Contribution

This is a common private sector design where employees must be covered by Social Security, and the employer also provides a traditional DC plan. Because Social Security does not cover PERA members, this design is not readily available to PERA.

The total cost of Social Security and the traditional DC plan is set equal to the PERA Hybrid DB Plan's total normal cost rate for new members. Social Security's current cost is 12.4% of salary, so the contributions deposited into the traditional DC plan equal the PERA Hybrid DB Plan's total normal cost rate for new members minus 12.4% as shown in Exhibit E-2. The proportion of the contribution rate contributed by employees versus employers does not affect our analysis.

Exhibit E-2

Combined Employee and Employer Contribution Rates

	State, and Local Government (Other than Safety Officers) and DPS	State and Local Government Safety Officers	School Division	Judicial Division
Social Security	12.4%	12.4%	12.4%	12.4%
Traditional DC	0.4%	6.9%	1.9%	6.6%
Total Expected Cost	12.8%	19.3%	14.3%	19.0%

Source: Cheiron analysis using total normal cost rates for new members calculated by PERA's actuary, Segal.

Social Security provides a monthly income stream to eligible retirees that continues for their lifetime. To qualify for Social Security retirement benefits, employees must earn at least 40 work credits, which is about 10 years of service. Social Security retirement benefits are calculated based on the individual's highest 35 years of indexed career earnings. Each year's wages are indexed to reflect changes in average wages over time. For example, wages of $35,000 earned in 1989 would be indexed to $116,011 in 2023 based on the Average Wage Index (AWI) of $20,099.55 in 1989 and $66,621.80 in 2023. Social Security benefits are adjusted annually based on the Consumer Price Index (CPI) to ensure that their purchasing power is maintained over time in the face of inflation.

Social Security's benefit formula is progressive, meaning it provides a higher replacement rate (the percentage of pre-retirement earnings replaced by retirement benefits) for lower-income workers compared to higher-income workers.

Social Security's full retirement age is age 67 for those born in 1960 or later. Employees can start collecting Social Security as early as age 62 but monthly payments are reduced if claimed

Appendix E – Detailed Description of Alternative Retirement Plan Designs

before full retirement age. Additional details on Social Security benefits can be found at
www.ssa.gov.

The traditional DC component of this alternative plan design operates the same as the Standalone
DC plan described previously. The employee's total retirement benefit equals the Social Security
benefit plus the DC account balance at retirement.

Variable Defined Benefit

The Variable Defined Benefit plan provides a lifetime annuity retirement benefit equal to the
greater of two formulas:

- A Money Purchase account with the pay credits (i.e., notional contributions equal to a
  percentage of each member's pay) shown in Exhibit E-3. The account is credited with
  interest each year based on the 5-year geometric average investment return earned by the
  plan. The money purchase account is converted to an annuity at retirement based on a 5%
  interest rate, the assumed PERA mortality rates, and no COLA. This formula is designed
  to mimic a DC plan except that the longevity risk is pooled at a plan level and investment
  returns are credited based on a 5-year average.
- A traditional DB formula equal to 1.6% of the 5-year highest average salary per year of
  service at age 65. This formula satisfies the safe harbor for a Social Security replacement
  plan, so if this alternative plan were to be adopted, PERA-covered employees could
  continue to be exempt from Social Security.

Exhibit E-3

Money Purchase Pay Credit Rates

State, and Local Government (Other than Safety Officers) and DPS	State and Local Government Safety Officers	School Division	Judicial Division
11.9%	18.4%	13.4%	17.6%

Source: Cheiron analysis using total normal cost rates for new members
calculated by PERA's contracted actuary, Segal.

The annual post-retirement benefit adjustments equal the 5-year geometric average investment
return earned by the plan minus 5%. While a negative adjustment may be made in an individual
year, the benefit amount can never be less than the initial benefit at retirement. Under the
baseline scenario, which assumes 7.25% annual investment returns, the annual post-retirement
benefit adjustment is an increase of 2.25% per year.

The expected cost (normal cost) of this plan is equal to the PERA Hybrid DB Plan's normal cost
for new members.

Appendix E – Detailed Description of Alternative Retirement Plan Designs

DC (Social Security Safe Harbor) plus Traditional DB

A combination of DC and DB plans in which the DC plan meets the safe harbor requirements for replacing Social Security by providing a 7.5% contribution rate, so if this alternative plan were to be adopted, PERA-covered employees could continue to be exempt from Social Security. The DC component of this alternative plan design operates the same as the Standalone Traditional DC Plan described above.

The traditional DB component of this alternative plan design provides a lifetime annuity benefit at retirement equal to the 5-year highest average salary multiplied by service and a benefit multiplier. The benefit multiplier is determined so that the normal cost of this traditional DB plan equals the PERA Hybrid DB Plan's total normal cost rate minus 7.5%. The resulting benefit multiplier is shown in Exhibit E-4.

Exhibit E-4

Traditional DB Plan Multiplier

State, and Local Government (Other than Safety Officers) and DPS	State and Local Government Safety Officers	School Division	Judicial Division
0.8%	1.5%	1.0%	1.5%

Source: Cheiron analysis using total normal cost rates for new members calculated by PERA's actuary, Segal.

The Traditional Defined Benefit plan provides an annual post-retirement benefit increase of 1.25% per year commencing immediately after retirement.

The employee's total retirement benefit is equal to the Traditional Defined Benefit plus the DC account balance at retirement.

Appendix E – Detailed Description of Alternative Retirement Plan Designs

Variable Cash Balance

The Variable Cash Balance plan provides a lifetime annuity benefit equal to the greater of two benefit formulas:

- A cash balance account with pay credits (i.e., notional contributions equal to a percentage of each member's pay) at the rate shown in Exhibit E-5. The cash balance account is credited with interest each year equal to the actual investment return earned by the plan. This pre-retirement accumulation is designed to mimic a DC plan. The cash balance account is converted to an annuity at retirement based on a 7.25% interest rate, 1.25% annual post-retirement benefit increase, and the assumed PERA mortality rates.
- A Traditional Defined Benefit formula of 1.6% of the 5-year highest average salary per year of service at age 65. This formula satisfies the safe harbor for a Social Security replacement plan, so if this alternative plan were to be adopted, PERA-covered employees could continue to be exempt from Social Security.

The pay credits are set so that this alternative plan's expected cost (normal cost) equals the PERA Hybrid DB Plan's normal cost for new members.

Exhibit E-5

Cash Balance Pay Credits

State, and Local Government (Other than Safety Officers) and DPS	State and Local Government Safety Officers	School Division	Judicial Division
12.4%	19.0%	13.9%	18.2%

Source: Cheiron analysis using total normal cost rates for new members calculated by PERA's contracted actuary, Segal.

This plan provides an automatic increase commencing immediately after retirement equal to inflation, but no more than 1.25% in a year.

Traditional DB (Social Security Safe Harbor) plus DC

A combination of DB and DC plans in which the DB plan meets the safe harbor requirements for replacing Social Security Safe by providing a lifetime annuity retirement benefit of 1.6% 5-year highest average salary per year of service with retirement at age 65. If this alternative plan were to be adopted, PERA-covered employees could continue to be exempt from Social Security. The traditional DB component provides an annual post-retirement benefit increase of 1.25% per year commencing immediately after retirement.

Appendix E – Detailed Description of Alternative Retirement Plan Designs

The DC component of this alternative plan design is a traditional DC plan with contribution rates set equal to the PERA Hybrid DB Plan's total normal cost rate for new members minus the total normal cost rate for the traditional DB plan as shown in Exhibit E-6. This component operates the same as the Standalone Traditional DC Plan described previously.

Exhibit E-6

Combined Employee and Employer Contribution Rates

	State, and Local Government (Other than Safety Officers) and DPS	State and Local Government Safety Officers	School Division	Judicial Division
DB Normal Cost Rate	8.7%	12.7%	9.7%	12.6%
DC Contribution Rate	4.1%	6.6%	4.6%	6.4%
Total Expected Cost	12.8%	19.3%	14.3%	19.0%

Source: Cheiron analysis using total normal cost rates for new members calculated by PERA's actuary, Segal.

The employee's total retirement benefit is equal to the traditional DB benefit plus the DC account balance at retirement.

Money Purchase plus Traditional DB

A combination of (1) a Money Purchase formula in which employee contributions accumulate with investment earnings and the account balance at retirement is converted into a lifetime annuity benefit plus (2) a traditional DB formula funded by employer contributions. The Money Purchase account is credited with employee contributions at the rates shown in Exhibit E-7, and interest credits equal the actual investment returns earned by the plan. The money purchase account balance is converted to a lifetime annuity at retirement using the valuation interest rate, 1.25% annual post-retirement benefit increases, and the PERA mortality rates. This Money Purchase benefit is designed to provide approximately 50% of the total benefit.

Appendix E – Detailed Description of Alternative Retirement Plan Designs

Exhibit E-7

Employee Contributions to Money Purchase Account

State, and Local Government (Other than Safety Officers) and DPS	State and Local Government Safety Officers	School Division	Judicial Division
6.50%	9.75%	7.25%	9.50%

Source: Cheiron analysis using total normal cost rates for new members calculated by PERA's contracted actuary, Segal.

The traditional DB component of this plan provides a lifetime annuity retirement benefit equal to the employee's 5-year highest average salary multiplied by service and a benefit multiplier. The benefit multiplier is set such that the normal cost rate equals that of the Hybrid DB Plan minus the employee's money purchase contribution rate. Exhibit E-8 shows the resulting benefit multipliers.

Exhibit E-8

Traditional DB Plan Multiplier

State, and Local Government (Other than Safety Officers) and DPS	State and Local Government Safety Officers	School Division	Judicial Division
1.0%	1.2%	1.0%	1.2%

Source: Cheiron analysis using total normal cost rates for new members calculated by PERA's contracted actuary, Segal.

The combination of the Money Purchase and traditional DB components must provide a minimum retirement benefit of 1.6% of the 5-year highest average salary per year of service with an age 65 normal retirement age. This minimum formula satisfies the safe harbor requirements for a Social Security replacement plan, so if this alternative plan were to be adopted, PERA-covered employees could continue to be exempt from Social Security.

Both the Money Purchase and traditional DB provide an annual increase in retirement equal to inflation up to a maximum of 1.25% per year.

Appendix E – Detailed Description of Alternative Retirement Plan Designs

Traditional DB with Gainsharing COLA

This traditional DB plan only provides a post-retirement cost-of-living adjustment when actual investment returns exceed the assumed return. This alternative plan design provides a lifetime annuity retirement benefit equal to the employee's 5-year highest average salary multiplied by service and a benefit multiplier. The benefit multiplier is set such that the normal cost rate equals that of the PERA Hybrid DB Plan. Exhibit E-9 shows the resulting benefit multipliers.

Exhibit E-9

Multiplier for Defined Benefit with Gainsharing COLA

State, and Local Government (Other than Safety Officers) and DPS	State and Local Government Safety Officers	School Division	Judicial Division
2.4%	2.3%	2.4%	2.3%

Source: Cheiron analysis using total normal cost rates for new members calculated by PERA's contracted actuary, Segal.

The Gainsharing COLA in this plan provides an automatic annual increase commencing immediately after retirement equal to the actual rate of investment return earned by the plan for the year minus the assumed rate of investment return, with a maximum increase of 4.0% and a minimum increase of 0.0%. On average, we expect the automatic increase to be 1.75% per year.

Appendix E – Detailed Description of Alternative Retirement Plan Designs

Traditional Defined Benefit with Maximum COLA of 3%

This traditional DB plan provides an annual post-retirement cost-of-living adjustment equal to inflation up to a maximum of 3.0%. This alternative plan design provides a lifetime annuity retirement benefit equal to the employee's 5-year highest average salary multiplied by service and a benefit multiplier. The benefit multiplier is set such that the normal cost rate equals that of the PERA Hybrid DB Plan. The resulting benefit multiplier is shown in Exhibit E-10.

Exhibit E-10

Multiplier for Defined Benefit with Max 3% COLA

State, and Local Government (Other than Safety Officers) and DPS	State and Local Government Safety Officers	School Division	Judicial Division
2.3%	2.2%	2.3%	2.2%

Source: Cheiron analysis using total normal cost rates for new members calculated by PERA's contracted actuary, Segal.

This plan provides an automatic annual increase commencing immediately after retirement equal to inflation, but no more than 3% in a year. Any inflation over 3% is put in a bank, which is used to raise the automatic increase above inflation when inflation is below 3.0%.

Appendix F – Additional Comparisons to Alternative Plan Designs

This appendix shows our comparisons of the PERA Hybrid DB Plan to alternative plan designs for hypothetical employees in the PERA School and Judicial Divisions, and for state and local government safety officers. Comparisons for employees in the State and Local Government Divisions (other than safety officers) are included in the body of the report.

School Division

Exhibits F-1 through F-9 contain the analysis comparing income replacement ratios for career and non-career employees at retirement, real income replacement ratios in retirement under various economic scenarios, and the sensitivity of income replacement ratios and the sensitivity of the expected plan costs between the PERA Hybrid DB Plan and the alternative plan designs for the School Division. This analysis mirrors the analysis for the State and Local Government Divisions (Other than Safety Officers) shown in Exhibits IV-6 through IV-9, Exhibit IV-11, and Exhibits IV-13 through IV-16.

This analysis uses the same sample member hire ages, termination ages, and retirement ages as the State and Local Government Divisions. The School Division analysis has similar results as the State and Local Government Divisions.

Appendix F – Additional Comparisons to Alternative Plan Designs

Exhibit F-1

Income Replacement Ratios for Career Employees
School Division
Hired at Age 25

	Retirement Age		
	60	**65**	**70**
PERA Hybrid DB	**81%**	**93%**	**94%**
Standalone DC	36%	51%	72%
Soc Sec + DC	4%	36%	52%
Variable DB	52%	69%	**99%**
7.5% DC + DB	51%	63%	79%
Variable Cash Balance	56%	78%	**111%**
1.6% DB + DC	63%	75%	**90%**
Money Purchase + DB	63%	79%	102%
DB Gainsharing COLA	**78%**	**90%**	**94%**
DB Max 3% COLA	**74%**	**85%**	**94%**

Note: A dark orange shade with bold text indicates the alternative plan design provides a higher income replacement ratio than the PERA Hybrid DB Plan; a white background with bold text indicates the alternative plan design provides a similar income replacement ratio to the PERA Hybrid DB Plan; and a light orange shade indicates the alternative plan design provides a lower income replacement ratio than the PERA Hybrid DB Plan. Social Security cannot be claimed before age 62, so the income replacement ratio for "Soc Sec + DC" at retirement age 60 only includes the DC benefit.
Source: Cheiron analysis using a salary at hire of $35,000 and December 31, 2023 actuarial valuation assumptions.

Appendix F – Additional Comparisons to Alternative Plan Designs

Exhibit F–2

Income Replacement Ratios for Career Employees
School Division
Hired at Age 45

	Retirement Age		
	60	**65**	**70**
PERA Hybrid DB	**23%**	**47%**	**58%**
Standalone DC	13%	21%	34%
Soc Sec + DC	2%	33%	52%
Variable DB	18%	30%	45%
7.5% DC + DB	16%	29%	41%
Variable Cash Balance	20%	32%	50%
1.6% DB + DC	18%	36%	48%
Money Purchase + DB	20%	36%	51%
DB Gainsharing COLA	**21%**	**45%**	**56%**
DB Max 3% COLA	20%	**43%**	**53%**

Note: A dark orange shade with bold text indicates the alternative plan design provides a higher income replacement ratio than the PERA Hybrid DB Plan; a white background with bold text indicates the alternative plan design provides a similar income replacement ratio to the PERA Hybrid DB Plan; and a light orange shade indicates the alternative plan design provides a lower income replacement ratio than the PERA Hybrid DB Plan. Social Security cannot be claimed before age 62, so the income replacement ratio for "Soc Sec + DC" at retirement age 60 only includes the DC benefit.
Source: Cheiron analysis using a salary at hire of $35,000 and December 31, 2023 actuarial valuation assumptions.

Appendix F – Additional Comparisons to Alternative Plan Designs

Exhibit F-3

Income Replacement Ratios for Non-Career Employees
School Division
Hired at Age 25, Terminated Before Retirement, Retired at Age 65

	Termination Age					
	30	**35**	**40**	**45**	**50**	**55**
PERA Hybrid DB	4%	9%	15%	21%	31%	47%
Standalone DC	8%	15%	22%	29%	35%	41%
Soc Sec + DC	6%	12%	17%	21%	25%	29%
Variable DB	10%	21%	31%	40%	49%	56%
7.5% DC + DB	5%	10%	16%	22%	30%	40%
Variable Cash Balance	12%	24%	35%	46%	55%	64%
1.6% DB + DC	4%	8%	14%	21%	31%	43%
Money Purchase + DB	7%	15%	23%	32%	42%	53%
DB Gainsharing COLA	2%	5%	10%	19%	30%	45%
DB Max 3% COLA	2%	5%	10%	18%	28%	43%

Note: A dark orange shade with bold text indicates the alternative plan design provides a higher income replacement ratio than the PERA Hybrid DB Plan; a white background with bold text indicates the alternative plan design provides a similar income replacement ratio to the PERA Hybrid DB Plan; and a light orange shade indicates the alternative plan design provides a lower income replacement ratio than the PERA Hybrid DB Plan.

Source: Cheiron analysis using a salary at hire of $35,000 and December 31, 2023 actuarial valuation assumptions.

Appendix F – Additional Comparisons to Alternative Plan Designs

Exhibit F-4

Real Income Replacement Ratios in Retirement
School Division
Hired at Age 25, Retired at Age 65

Age	AI	65	70	75	80	85	90	95	100
PERA Hybrid DB	**1.25%**	**93%**	**86%**	**81%**	**77%**	**73%**	**70%**	**66%**	**63%**
Standalone DC	1.25%	**93%**	**86%**	**81%**	0%	0%	0%	0%	0%
Soc Sec + DC	2.30%	**93%**	30%	30%	30%	30%	30%	30%	30%
Variable DB	2.25%	69%	69%	68%	**68%**	**68%**	**68%**	**68%**	**68%**
7.5% DC + DB	1.25%	**93%**	**86%**	68%	32%	30%	29%	27%	26%
Variable Cash Balance	1.25%	78%	74%	70%	67%	63%	60%	57%	54%
1.6% DB + DC	1.25%	**93%**	**86%**	**81%**	51%	48%	46%	44%	42%
Money Purchase + DB	1.25%	79%	75%	72%	68%	65%	61%	58%	55%
DB Gainsharing COLA	1.75%	**90%**	**88%**	**85%**	**83%**	**81%**	**79%**	**76%**	**74%**
DB Max 3% COLA	2.30%	**85%**	**85%**	**85%**	**85%**	**85%**	**85%**	**85%**	**85%**

Note: A dark orange shade with bold text indicates the alternative plan design provides a higher real income replacement ratio than the PERA Hybrid DB Plan; a white background with bold text indicates the alternative plan design provides a similar real income replacement ratio to the PERA Hybrid DB Plan; and a light orange shade indicates the alternative plan design provides a lower real income replacement ratio than the PERA Hybrid DB Plan.
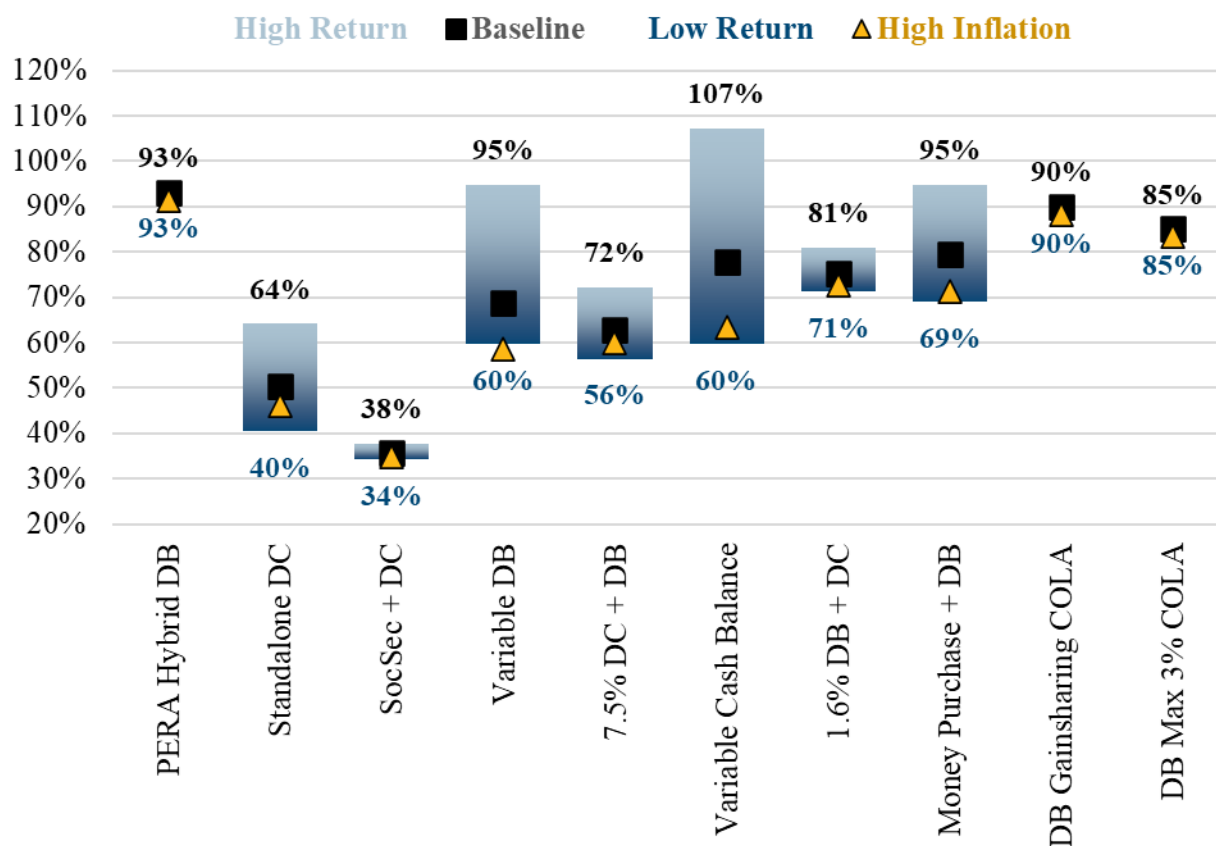
Source: Cheiron analysis using PERA's December 31, 2023 actuarial valuation inflation assumption of 2.3%.

Appendix F – Additional Comparisons to Alternative Plan Designs

Exhibit F-5

Sensitivity of Income Replacement Ratios
School Division

Source: Cheiron analysis.

Appendix F – Additional Comparisons to Alternative Plan Designs

Exhibit F-6

Real Income Replacement Ratios in Retirement
High Return Scenario
School Division
Hired at Age 25, Retired at Age 65

Age	AI	65	70	75	80	85	90	95	100
PERA Hybrid DB	**2.00%**	**93%**	**87%**	**86%**	**85%**	**84%**	**82%**	**81%**	**80%**
Standalone DC	2.00%	93%	87%	86%	85%	84%	0%	0%	0%
Soc Sec + DC	2.30%	93%	30%	30%	30%	30%	30%	30%	30%
Variable DB	3.75%	95%	**102%**	**109%**	**117%**	**125%**	**135%**	**144%**	**155%**
7.5% DC + DB	1.25%	93%	87%	86%	85%	30%	29%	27%	26%
Variable Cash Balance	1.25%	**107%**	**102%**	**97%**	92%	87%	83%	79%	75%
1.6% DB + DC	1.25%	93%	87%	86%	85%	48%	46%	44%	42%
Money Purchase + DB	1.25%	95%	90%	85%	81%	77%	73%	70%	66%
DB Gainsharing COLA	1.75%	90%	88%	85%	83%	81%	79%	76%	74%
DB Max 3% COLA	2.30%	85%	85%	85%	85%	85%	85%	85%	85%

Note: A dark orange shade with bold text indicates the alternative plan design provides a higher real income replacement ratio than the PERA Hybrid DB Plan; a white background with bold text indicates the alternative plan design provides a similar real income replacement ratio to the PERA Hybrid DB Plan; and a light orange shade indicates the alternative plan design provides a lower real income replacement ratio than the PERA Hybrid DB Plan.
Source: Cheiron analysis using PERA's December 31, 2023 actuarial valuation inflation assumption of 2.3%.

Appendix F – Additional Comparisons to Alternative Plan Designs

Exhibit F-7

Real Income Replacement Ratios in Retirement
Low Return Scenario
School Division
Hired at Age 25, Retired at Age 65

Age	AI	65	70	75	80	85	90	95	100
PERA Hybrid DB	**0.50%**	**93%**	**84%**	**77%**	**70%**	**64%**	**59%**	**54%**	**49%**
Standalone DC	0.50%	93%	84%	0%	0%	0%	0%	0%	0%
Soc Sec + DC	2.30%	93%	30%	30%	30%	30%	30%	30%	30%
Variable DB	0.75%	60%	55%	51%	47%	44%	41%	38%	35%
7.5% DC + DB	1.25%	93%	84%	34%	32%	30%	29%	27%	26%
Variable Cash Balance	1.25%	60%	57%	54%	51%	48%	46%	44%	42%
1.6% DB + DC	1.25%	93%	84%	54%	51%	48%	46%	44%	42%
Money Purchase + DB	1.25%	69%	66%	62%	59%	56%	**53%**	**51%**	**48%**
DB Gainsharing COLA	1.75%	90%	88%	**85%**	**83%**	**81%**	**79%**	**76%**	**74%**
DB Max 3% COLA	2.30%	85%	85%	**85%**	**85%**	**85%**	**85%**	**85%**	**85%**

Note: A dark orange shade with bold text indicates the alternative plan design provides a higher real income replacement ratio than the PERA Hybrid DB Plan; a white background with bold text indicates the alternative plan design provides a similar real income replacement ratio to the PERA Hybrid DB Plan; and a light orange shade indicates the alternative plan design provides a lower real income replacement ratio than the PERA Hybrid DB Plan.
Source: Cheiron analysis using PERA's December 31, 2023 actuarial valuation inflation assumption of 2.3%.

Appendix F – Additional Comparisons to Alternative Plan Designs

Exhibit F-8

Real Income Replacement Ratios in Retirement
High Inflation Scenario
School Division
Hired at Age 25, Retired at Age 65

Age	AI	65	70	75	80	85	90	95	100
PERA Hybrid DB	**1.25%**	**91%**	**80%**	**73%**	**66%**	**59%**	**54%**	**49%**	**44%**
Standalone DC	1.25%	91%	80%	0%	0%	0%	0%	0%	0%
Soc Sec + DC	3.30%	91%	30%	30%	30%	30%	30%	30%	30%
Variable DB	2.25%	59%	56%	53%	50%	48%	45%	43%	**41%**
7.5% DC + DB	1.25%	91%	80%	30%	27%	24%	22%	20%	18%
Variable Cash Balance	1.25%	64%	57%	52%	47%	43%	38%	35%	32%
1.6% DB + DC	1.25%	91%	80%	48%	43%	39%	35%	32%	29%
Money Purchase + DB	1.25%	71%	65%	58%	53%	48%	43%	39%	35%
DB Gainsharing COLA	1.75%	88%	82%	76%	70%	65%	**60%**	**56%**	**52%**
DB Max 3% COLA	3.00%	83%	82%	**81%**	**80%**	**79%**	**78%**	**76%**	**75%**

Note: A dark orange shade with bold text indicates the alternative plan design provides a higher real income replacement ratio than the PERA Hybrid DB Plan; a white background with bold text indicates the alternative plan design provides a similar real income replacement ratio to the PERA Hybrid DB Plan; and a light orange shade indicates the alternative plan design provides a lower real income replacement ratio than the PERA Hybrid DB Plan.

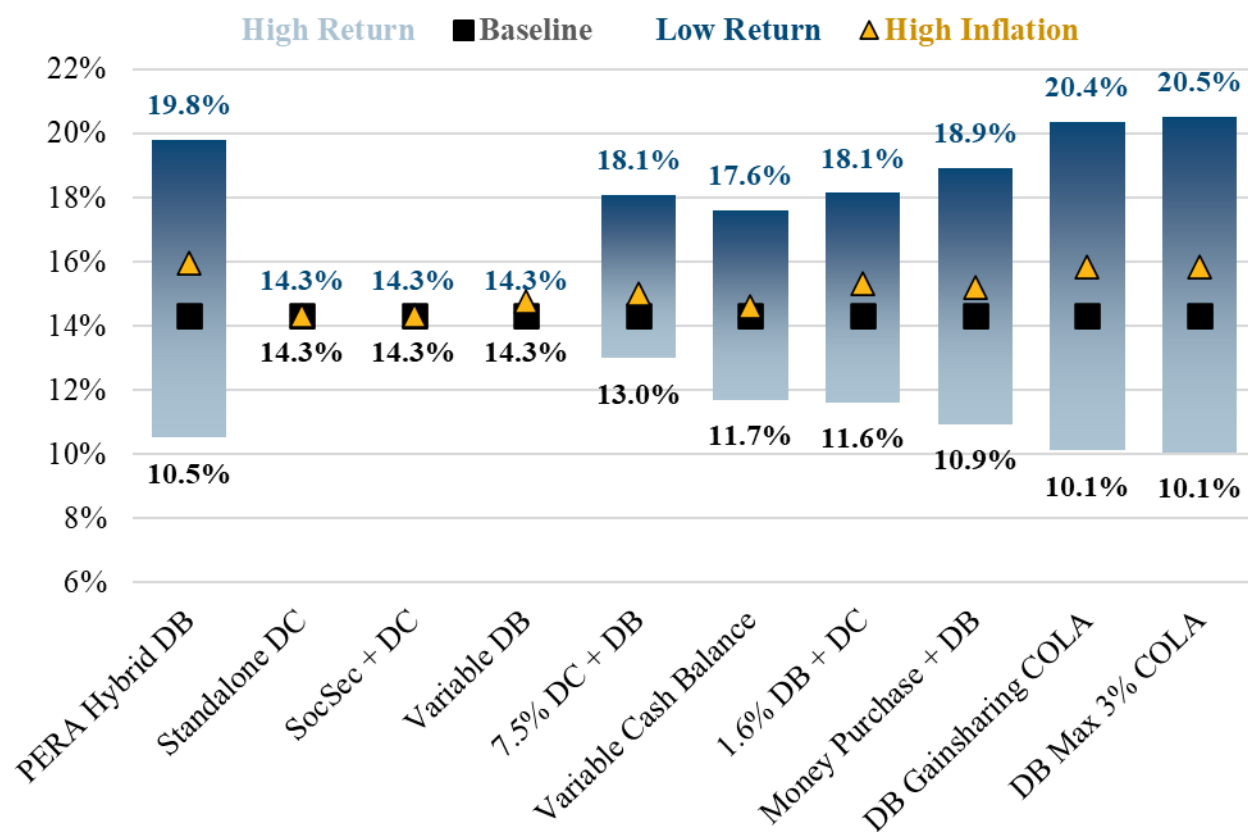**Source:** Cheiron analysis using an inflation assumption of 3.3%.

Appendix F – Additional Comparisons to Alternative Plan Designs

Exhibit F-9

Sensitivity of Total Costs (Employee + Employer)
School Division

Source: Cheiron analysis.

Appendix F – Additional Comparisons to Alternative Plan Designs

State and Local Government Safety Officers

Exhibits F-10 through F-18 contain the analysis comparing income replacement ratios for career and non-career employees at retirement, real income replacement ratios in retirement under various economic scenarios, and the sensitivity of income replacement ratios and the sensitivity of the expected plan costs between the PERA Hybrid DB Plan and the alternative plan designs for the State and Local Government Safety Officers. This analysis mirrors the analysis for the State and Local Government Divisions (Other than Safety Officers) shown in Exhibits IV-6 through IV-9, Exhibit IV-11, and Exhibits IV-13 through IV-16.

This analysis uses sample members with a higher starting salary and younger retirement ages than those used for the State Division (Other than Safety Officers) because Safety Officers generally have higher starting salaries, have lower retirement eligibility requirements, and are more likely to retire at younger ages. The Safety Officer analysis has somewhat different results than the State Division (Other than Safety Officers) which are primarily due to differences in retirement eligibilities and expected plan costs. For example, the expected cost of the PERA Hybrid DB Plan is higher for Safety Officers than non-safety officers in the State Division, so most alternative plan designs with DC components have higher DC plan contribution rates than the State Division (Other than Safety Officers). The higher DC plan contribution rates at least partially offset the impact of Safety Officers retiring earlier, as the earlier retirement provides both a shorter period for DC plan contributions and investment earnings to accumulate, and the cost of purchasing an annuity is greater at younger retirement ages since the annuity is expected to be paid over a longer period.

Appendix F – Additional Comparisons to Alternative Plan Designs

Exhibit F-10

Income Replacement Ratios for Career Employees
State and Local Government Safety Officers
Hired at Age 25

	Retirement Age		
	55	**60**	**65**
PERA Hybrid DB	**69%**	**81%**	**93%**
Standalone DC	37%	52%	73%
Soc Sec + DC	11%	16%	47%
Variable DB	51%	71%	**101%**
7.5% DC + DB	55%	68%	83%
Variable Cash Balance	58%	**81%**	**113%**
1.6% DB + DC	57%	69%	84%
Money Purchase + DB	**63%**	**80%**	**102%**
DB Gainsharing COLA	**65%**	**76%**	**88%**
DB Max 3% COLA	61%	72%	83%

Note: A dark orange shade with bold text indicates the alternative plan design provides a higher income replacement ratio than the PERA Hybrid DB Plan; a white background with bold text indicates the alternative plan design provides a similar income replacement ratio to the PERA Hybrid DB Plan; and a light orange shade indicates the alternative plan design provides a lower income replacement ratio than the PERA Hybrid DB Plan. Social Security cannot be claimed before age 62, so the income replacement ratio for "Soc Sec + DC" at retirement ages 55 & 60 only includes the DC benefit.
Source: Cheiron analysis using a salary at hire of $65,000 and December 31, 2023 actuarial valuation assumptions.

Appendix F – Additional Comparisons to Alternative Plan Designs

Exhibit F–11

Income Replacement Ratios for Career Employees
State and Local Government Safety Officers
Hired at Age 35

	Retirement Age		
	55	**60**	**65**
PERA Hybrid DB	**38%**	**58%**	**70%**
Standalone DC	23%	34%	50%
Soc Sec + DC	7%	10%	43%
Variable DB	31%	47%	**69%**
7.5% DC + DB	31%	47%	61%
Variable Cash Balance	**36%**	**53%**	**77%**
1.6% DB + DC	32%	49%	62%
Money Purchase + DB	**36%**	**55%**	**73%**
DB Gainsharing COLA	**35%**	**55%**	**66%**
DB Max 3% COLA	33%	51%	62%

Note: A dark orange shade with bold text indicates the alternative plan design provides a higher income replacement ratio than the PERA Hybrid DB Plan; a white background with bold text indicates the alternative plan design provides a similar income replacement ratio to the PERA Hybrid DB Plan; and a light orange shade indicates the alternative plan design provides a lower income replacement ratio than the PERA Hybrid DB Plan. Social Security cannot be claimed before age 62, so the income replacement ratio for "Soc Sec + DC" at retirement ages 55 & 60 only includes the DC benefit.
Source: Cheiron analysis using a salary at hire of $65,000 and December 31, 2023 actuarial valuation assumptions.

Appendix F – Additional Comparisons to Alternative Plan Designs

Exhibit F-12

Income Replacement Ratios for Non-Career Employees
State and Local Government Safety Officers
Hired at Age 25, Terminated Before Retirement, Retired at Age 60

	Termination Age					
	30	**35**	**40**	**45**	**50**	**55**
PERA Hybrid DB	5%	11%	18%	26%	39%	57%
Standalone DC	9%	18%	26%	34%	40%	47%
Soc Sec + DC	3%	5%	8%	10%	12%	14%
Variable DB	12%	24%	36%	47%	56%	64%
7.5% DC + DB	4%	9%	17%	27%	38%	52%
Variable Cash Balance	14%	28%	41%	53%	63%	73%
1.6% DB + DC	4%	9%	16%	27%	38%	52%
Money Purchase + DB	8%	16%	26%	39%	51%	65%
DB Gainsharing COLA	1%	4%	11%	23%	36%	54%
DB Max 3% COLA	1%	4%	10%	22%	34%	51%

Note: A dark orange shade with bold text indicates the alternative plan design provides a higher income replacement ratio than the PERA Hybrid DB Plan; a white background with bold text indicates the alternative plan design provides a similar income replacement ratio to the PERA Hybrid DB Plan; and a light orange shade indicates the alternative plan design provides a lower income replacement ratio than the PERA Hybrid DB Plan. Social Security cannot be claimed before age 62, so the income replacement ratio for "Soc Sec + DC" only includes the DC benefit.

Source: Cheiron analysis using a salary at hire of $65,000 and December 31, 2023 actuarial valuation assumptions.

Appendix F – Additional Comparisons to Alternative Plan Designs

Exhibit F-13

Real Income Replacement Ratios in Retirement
State and Local Government Safety Officers
Hired at Age 25, Retired at Age 60

Age	AI	60	65	70	75	80	85	90	95
PERA Hybrid DB	1.25%	81%	75%	71%	68%	64%	61%	58%	55%
Standalone DC	1.25%	81%	75%	71%	68%	0%	0%	0%	0%
Soc Sec + DC	2.30%	81%	36%	25%	25%	25%	25%	25%	25%
Variable DB	2.25%	71%	71%	71%	71%	70%	70%	70%	70%
7.5% DC + DB	1.25%	81%	75%	71%	68%	39%	37%	35%	34%
Variable Cash Balance	1.25%	81%	77%	73%	69%	66%	62%	59%	56%
1.6% DB + DC	1.25%	81%	75%	71%	68%	42%	40%	38%	36%
Money Purchase + DB	1.25%	80%	76%	72%	69%	65%	62%	59%	56%
DB Gainsharing COLA	1.75%	76%	74%	72%	70%	69%	67%	65%	63%
DB Max 3% COLA	2.30%	72%	72%	72%	72%	72%	72%	72%	72%

Note: A dark orange shade with bold text indicates the alternative plan design provides a higher real income replacement ratio than the PERA Hybrid DB Plan; a white background with bold text indicates the alternative plan design provides a similar real income replacement ratio to the PERA Hybrid DB Plan; and a light orange shade indicates the alternative plan design provides a lower real income replacement ratio than the PERA Hybrid DB Plan. Social Security is assumed to be claimed at age 65, so the real income replacement ratio for "Soc Sec + DC" at age 60 only includes the DC benefit.
Source: Cheiron analysis using a salary at hire of $65,000 and PERA's December 31, 2023 actuarial valuation inflation assumption of 2.3%.

Appendix F – Additional Comparisons to Alternative Plan Designs

Exhibit F-14

Sensitivity of Income Replacement Ratios
State and Local Government Safety Officers

Source: Cheiron analysis.

Appendix F – Additional Comparisons to Alternative Plan Designs

Exhibit F-15

Real Income Replacement Ratios in Retirement
High Return Scenario
State and Local Government Safety Officers
Hired at Age 25, Retired at Age 60

Age	AI	60	65	70	75	80	85	90	95
PERA Hybrid DB	**2.00%**	**81%**	**76%**	**75%**	**74%**	**73%**	**72%**	**71%**	**70%**
Standalone DC	2.00%	81%	76%	75%	74%	73%	72%	71%	70%
Soc Sec + DC	2.30%	81%	76%	25%	25%	25%	25%	25%	25%
Variable DB	3.75%	94%	101%	108%	116%	124%	133%	143%	154%
7.5% DC + DB	1.25%	81%	76%	75%	74%	73%	72%	49%	34%
Variable Cash Balance	1.25%	107%	101%	96%	91%	87%	82%	78%	74%
1.6% DB + DC	1.25%	81%	76%	75%	74%	73%	72%	38%	36%
Money Purchase + DB	1.25%	93%	89%	84%	80%	76%	72%	68%	65%
DB Gainsharing COLA	1.75%	76%	74%	72%	70%	69%	67%	65%	63%
DB Max 3% COLA	2.30%	72%	72%	72%	72%	72%	72%	72%	72%

Note: A dark orange shade with bold text indicates the alternative plan design provides a higher real income replacement ratio than the PERA Hybrid DB Plan; a white background with bold text indicates the alternative plan design provides a similar real income replacement ratio to the PERA Hybrid DB Plan; and a light orange shade indicates the alternative plan design provides a lower real income replacement ratio than the PERA Hybrid DB Plan. Social Security is assumed to be claimed at age 65, so the real income replacement ratio for "Soc Sec + DC" at age 60 only includes the DC benefit.
Source: Cheiron analysis using a salary at hire of $65,000 and PERA's December 31, 2023 actuarial valuation inflation assumption of 2.3%.

Appendix F – Additional Comparisons to Alternative Plan Designs

Exhibit F-16

Real Income Replacement Ratios in Retirement
Low Return Scenario
State and Local Government Safety Officers
Hired at Age 25, Retired at Age 60

Age	AI	60	65	70	75	80	85	90	95
PERA Hybrid DB	**0.50%**	**81%**	**74%**	**67%**	**62%**	**56%**	**52%**	**47%**	**43%**
Standalone DC	0.50%	**81%**	**74%**	**67%**	0%	0%	0%	0%	0%
Soc Sec + DC	2.30%	**81%**	25%	25%	25%	25%	25%	25%	25%
Variable DB	0.75%	55%	51%	47%	43%	40%	37%	35%	32%
7.5% DC + DB	1.25%	**81%**	**74%**	**67%**	41%	39%	37%	35%	34%
Variable Cash Balance	1.25%	62%	59%	56%	53%	50%	**48%**	45%	43%
1.6% DB + DC	1.25%	**81%**	**74%**	**67%**	45%	42%	40%	38%	36%
Money Purchase + DB	1.25%	70%	**67%**	**64%**	**60%**	**57%**	**54%**	**52%**	**49%**
DB Gainsharing COLA	1.75%	**76%**	**74%**	**72%**	**70%**	**69%**	**67%**	**65%**	**63%**
DB Max 3% COLA	2.30%	72%	**72%**	**72%**	**72%**	**72%**	**72%**	**72%**	**72%**

Note: A dark orange shade with bold text indicates the alternative plan design provides a higher real income replacement ratio than the PERA Hybrid DB Plan; a white background with bold text indicates the alternative plan design provides a similar real income replacement ratio to the PERA Hybrid DB Plan; and a light orange shade indicates the alternative plan design provides a lower real income replacement ratio than the PERA Hybrid DB Plan. Social Security is assumed to be claimed at age 65, so the real income replacement ratio for "Soc Sec + DC" at age 60 only includes the DC benefit.

Source: Cheiron analysis using a salary at hire of $65,000 and PERA's December 31, 2023 actuarial valuation inflation assumption of 2.3%.

Appendix F – Additional Comparisons to Alternative Plan Designs

Exhibit F-17

Real Income Replacement Ratios in Retirement
High Inflation Scenario
State and Local Government Safety Officers
Hired at Age 25, Retired at Age 60

Age	AI	60	65	70	75	80	85	90	95
PERA Hybrid DB	**1.25%**	**80%**	**70%**	**63%**	**57%**	**52%**	**47%**	**42%**	**38%**
Standalone DC	1.25%	**80%**	**70%**	**63%**	22%	0%	0%	0%	0%
Soc Sec + DC	3.30%	**80%**	26%	26%	26%	26%	26%	26%	26%
Variable DB	2.25%	60%	57%	54%	51%	**49%**	**46%**	**44%**	**42%**
7.5% DC + DB	1.25%	**80%**	**70%**	**63%**	41%	32%	29%	26%	24%
Variable Cash Balance	1.25%	68%	61%	55%	50%	45%	41%	37%	34%
1.6% DB + DC	1.25%	**80%**	**70%**	**63%**	46%	34%	31%	28%	25%
Money Purchase + DB	1.25%	73%	66%	59%	54%	49%	44%	40%	36%
DB Gainsharing COLA	1.75%	**75%**	**70%**	**64%**	**60%**	**55%**	**51%**	**48%**	**44%**
DB Max 3% COLA	3.00%	71%	**70%**	**69%**	**68%**	**67%**	**66%**	**65%**	**64%**

Note: A dark orange shade with bold text indicates the alternative plan design provides a higher real income replacement ratio than the PERA Hybrid DB Plan; a white background with bold text indicates the alternative plan design provides a similar real income replacement ratio to the PERA Hybrid DB Plan; and a light orange shade indicates the alternative plan design provides a lower real income replacement ratio than the PERA Hybrid DB Plan. Social Security is assumed to be claimed at age 65, so the real income replacement ratio for "Soc Sec + DC" at age 60 only includes the DC benefit.
Source: Cheiron analysis using a salary at hire of $65,000 and an inflation assumption of 3.3%.

Appendix F – Additional Comparisons to Alternative Plan Designs

Exhibit F-18

Sensitivity of Total Costs (Employee + Employer)
State and Local Government Safety Officers

Source: Cheiron analysis.

Appendix F – Additional Comparisons to Alternative Plan Designs

Judicial Division

Exhibits F-19 through F-27 contain the analysis comparing income replacement ratios for career and non-career employees at retirement, real income replacement ratios in retirement under various economic scenarios, and the sensitivity of income replacement ratios and the sensitivity of the expected plan costs between the PERA Hybrid DB Plan and the alternative plan designs for the Judicial Division. This analysis mirrors the analysis for the State Division (Other than Safety Officers) shown in Exhibits IV-6 through IV-9, Exhibit IV-11, and Exhibits IV-13 through IV-16.

This analysis uses sample members with a higher starting salary and older hire ages than those used for the State Division (Other than Safety Officers) because judges generally have higher starting salaries and the career path to becoming a judge takes longer than most other jobs. The Judicial Division analysis has somewhat different results than the State Division (Other than Safety Officers) which are primarily due to differences in career length, expected plan costs, and expected salary growth. For example, the expected cost of the PERA Hybrid DB Plan is higher for the Judicial Division than the State Division, so most alternative plan designs with DC components have higher DC plan contribution rates than the State Division. The higher DC plan contribution rates at least partially offset the impact of judges being hired at older ages, as older hire ages result in a shorter period for DC plan contributions and investment earnings to accumulate over the judge's career. In addition, since judges are hired at a relatively high salary, they have a lower expected salary growth from hire age to retirement age. This lower expected salary growth reduces the value of the high average salary (HAS) formula in the PERA Hybrid DB Plan and other traditional DB plan designs.

Appendix F – Additional Comparisons to Alternative Plan Designs

Exhibit F-19

Income Replacement Ratios for Career Employees
Judicial Division
Hired at Age 35

Retirement Age	60	65	70
PERA Hybrid DB	**42%**	**73%**	**85%**
Standalone DC	**41%**	61%	**91%**
Soc Sec + DC	12%	43%	65%
Variable DB	**55%**	**82%**	**123%**
7.5% DC + DB	**39%**	66%	**84%**
Variable Cash Balance	**62%**	**92%**	**136%**
1.6% DB + DC	**39%**	**67%**	**84%**
Money Purchase + DB	**51%**	**82%**	**111%**
DB Gainsharing COLA	38%	**68%**	**80%**
DB Max 3% COLA	36%	65%	75%

Note: A dark orange shade with bold text indicates the alternative plan design provides a higher income replacement ratio than the PERA Hybrid DB Plan; a white background with bold text indicates the alternative plan design provides a similar income replacement ratio to the PERA Hybrid DB Plan; and a light orange shade indicates the alternative plan design provides a lower income replacement ratio than the PERA Hybrid DB Plan. Social Security cannot be claimed before age 62, so the income replacement ratio for "Soc Sec + DC" at retirement age 60 only includes the DC benefit.

Source: Cheiron analysis using a salary at hire of $165,000 and December 31, 2023 actuarial valuation assumptions.

Appendix F – Additional Comparisons to Alternative Plan Designs

Exhibit F–20

Income Replacement Ratios for Career Employees
Judicial Division
Hired at Age 45

Retirement Age	60	65	70
PERA Hybrid DB	**25%**	**49%**	**61%**
Standalone DC	20%	32%	52%
Soc Sec + DC	6%	30%	48%
Variable DB	**26%**	42%	**68%**
7.5% DC + DB	21%	41%	**55%**
Variable Cash Balance	**29%**	**48%**	**75%**
1.6% DB + DC	21%	42%	**56%**
Money Purchase + DB	**26%**	**48%**	**68%**
DB Gainsharing COLA	22%	**45%**	57%
DB Max 3% COLA	20%	43%	54%

Note: A dark orange shade with bold text indicates the alternative plan design provides a higher income replacement ratio than the PERA Hybrid DB Plan; a white background with bold text indicates the alternative plan design provides a similar income replacement ratio to the PERA Hybrid DB Plan; and a light orange shade indicates the alternative plan design provides a lower income replacement ratio than the PERA Hybrid DB Plan. Social Security cannot be claimed before age 62, so the income replacement ratio for "Soc Sec + DC" at retirement age 60 only includes the DC benefit.
Source: Cheiron analysis using a salary at hire of $165,000 and December 31, 2023 actuarial valuation assumptions.

Appendix F – Additional Comparisons to Alternative Plan Designs

Exhibit F-21

Income Replacement Ratios for Non-Career Employees
Judicial Division
Hired at Age 35, Retired at Age 65

Termination Age	40	45	50	55	60
PERA Hybrid DB	**9%**	**19%**	**28%**	**37%**	**53%**
Standalone DC	**16%**	**28%**	**39%**	**48%**	**55%**
Soc Sec + DC	**13%**	**21%**	**29%**	**35%**	39%
Variable DB	**21%**	**39%**	**53%**	**65%**	**74%**
7.5% DC + DB	**9%**	**19%**	**29%**	**40%**	**52%**
Variable Cash Balance	**24%**	**44%**	**60%**	**73%**	**83%**
1.6% DB + DC	**9%**	**18%**	**28%**	**39%**	**52%**
Money Purchase + DB	**15%**	**29%**	**43%**	**55%**	**68%**
DB Gainsharing COLA	6%	13%	23%	**34%**	**50%**
DB Max 3% COLA	5%	12%	21%	33%	47%

Note: A dark orange shade with bold text indicates the alternative plan design provides a higher income replacement ratio than the PERA Hybrid DB Plan; a white background with bold text indicates the alternative plan design provides a similar income replacement ratio to the PERA Hybrid DB Plan; and a light orange shade indicates the alternative plan design provides a lower income replacement ratio than the PERA Hybrid DB Plan.

Source: Cheiron analysis using a salary at hire of $165,000 and December 31, 2023 actuarial valuation assumptions.

Appendix F – Additional Comparisons to Alternative Plan Designs

Exhibit F-22

Real Income Replacement Ratios in Retirement
Judicial Division
Hired at Age 35, Retired at Age 65

Age	AI	65	70	75	80	85	90	95	100
PERA Hybrid DB	1.25%	73%	67%	64%	61%	58%	55%	52%	49%
Standalone DC	1.25%	73%	67%	64%	61%	58%	0%	0%	0%
Soc Sec + DC	2.30%	73%	67%	24%	24%	24%	24%	24%	24%
Variable DB	2.25%	82%	81%	81%	81%	81%	81%	80%	80%
7.5% DC + DB	1.25%	73%	67%	64%	61%	58%	33%	31%	30%
Variable Cash Balance	1.25%	92%	87%	83%	78%	75%	71%	67%	64%
1.6% DB + DC	1.25%	73%	67%	64%	61%	58%	36%	34%	33%
Money Purchase + DB	1.25%	82%	78%	74%	70%	67%	64%	60%	57%
DB Gainsharing COLA	1.75%	68%	66%	65%	63%	61%	60%	58%	56%
DB Max 3% COLA	2.30%	65%	65%	65%	65%	65%	65%	65%	65%

Note: A dark orange shade with bold text indicates the alternative plan design provides a higher real income replacement ratio than the PERA Hybrid DB Plan; a white background with bold text indicates the alternative plan design provides a similar real income replacement ratio to the PERA Hybrid DB Plan; and a light orange shade indicates the alternative plan design provides a lower real income replacement ratio than the PERA Hybrid DB Plan.
Source: Cheiron analysis using a salary at hire of $165,000 and PERA's December 31, 2023 actuarial valuation inflation assumption of 2.3%.
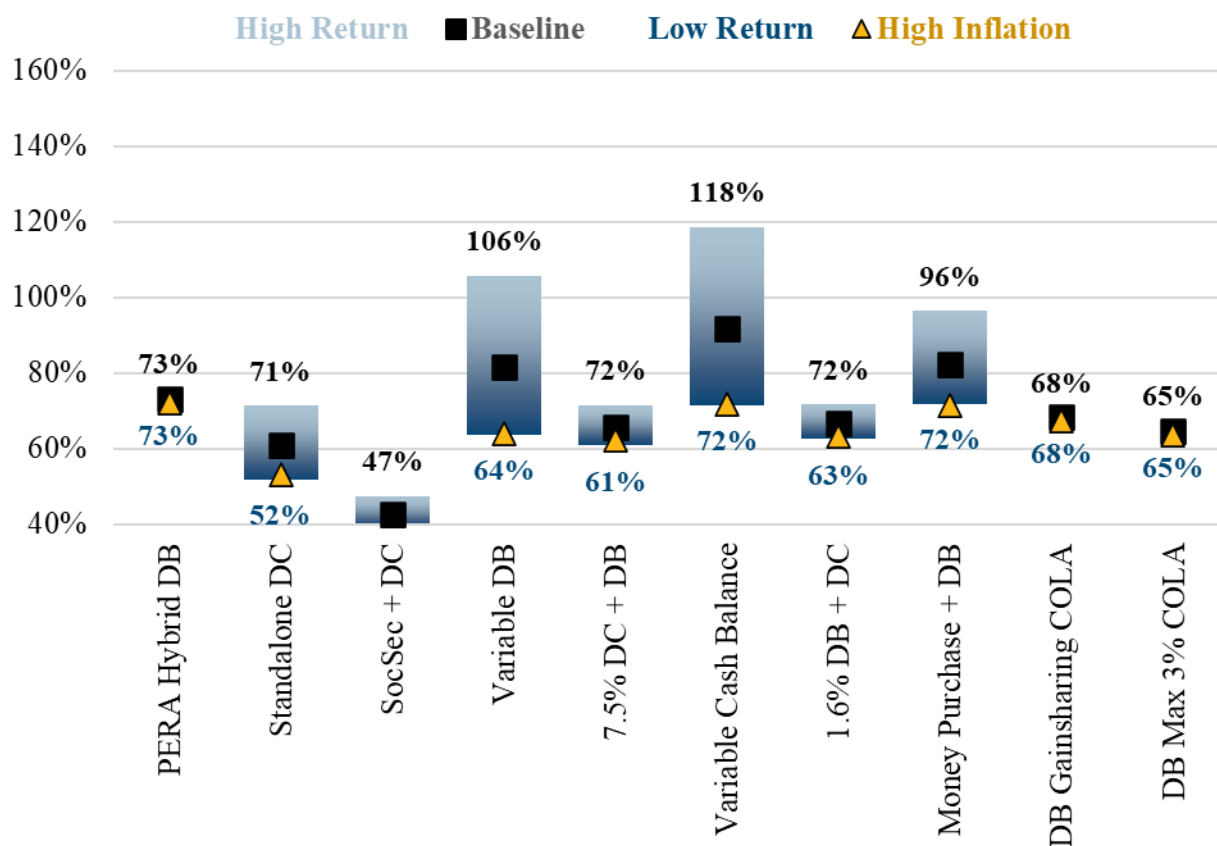
Appendix F – Additional Comparisons to Alternative Plan Designs

Exhibit F-23

Sensitivity of Income Replacement Ratios
Judicial Division

Source: Cheiron analysis.

Appendix F – Additional Comparisons to Alternative Plan Designs

Exhibit F-24

Real Income Replacement Ratios in Retirement
High Return Scenario
Judicial Division

Age	AI	65	70	75	80	85	90	95	100
PERA Hybrid DB	**2.00%**	**73%**	**68%**	**67%**	**66%**	**65%**	**65%**	**64%**	**63%**
Standalone DC	2.00%	73%	68%	67%	66%	65%	65%	64%	63%
Soc Sec + DC	2.30%	73%	68%	67%	24%	24%	24%	24%	24%
Variable DB	3.75%	106%	113%	122%	130%	140%	150%	161%	173%
7.5% DC + DB	1.25%	73%	68%	67%	66%	65%	65%	64%	30%
Variable Cash Balance	1.25%	118%	113%	107%	101%	96%	92%	87%	83%
1.6% DB + DC	1.25%	73%	68%	67%	66%	65%	65%	64%	33%
Money Purchase + DB	1.25%	96%	91%	87%	83%	78%	74%	71%	67%
DB Gainsharing COLA	1.75%	68%	66%	65%	63%	61%	60%	58%	56%
DB Max 3% COLA	2.30%	65%	65%	65%	65%	65%	65%	65%	65%

Note: A dark orange shade with bold text indicates the alternative plan design provides a higher real income replacement ratio than the PERA Hybrid DB Plan; a white background with bold text indicates the alternative plan design provides a similar real income replacement ratio to the PERA Hybrid DB Plan; and a light orange shade indicates the alternative plan design provides a lower real income replacement ratio than the PERA Hybrid DB Plan.

Source: Cheiron analysis using a salary at hire of $165,000 and PERA's December 31, 2023 actuarial valuation inflation assumption of 2.3%.

Appendix F – Additional Comparisons to Alternative Plan Designs

Exhibit F-25

Real Income Replacement Ratios in Retirement
Low Return Scenario
Judicial Division

Age	AI	65	70	75	80	85	90	95	100
PERA Hybrid DB	0.50%	73%	66%	60%	55%	51%	46%	42%	39%
Standalone DC	0.50%	73%	66%	60%	55%	0%	0%	0%	0%
Soc Sec + DC	2.30%	73%	66%	24%	24%	24%	24%	24%	24%
Variable DB	0.75%	64%	59%	55%	51%	47%	44%	40%	37%
7.5% DC + DB	1.25%	73%	66%	60%	55%	34%	33%	31%	30%
Variable Cash Balance	1.25%	72%	68%	65%	61%	58%	55%	52%	50%
1.6% DB + DC	1.25%	73%	66%	60%	55%	38%	36%	34%	33%
Money Purchase + DB	1.25%	72%	68%	65%	62%	58%	55%	53%	50%
DB Gainsharing COLA	1.75%	68%	66%	65%	63%	61%	60%	58%	56%
DB Max 3% COLA	2.30%	65%	65%	65%	65%	65%	65%	65%	65%

Note: A dark orange shade with bold text indicates the alternative plan design provides a higher real income replacement ratio than the PERA Hybrid DB Plan; a white background with bold text indicates the alternative plan design provides a similar real income replacement ratio to the PERA Hybrid DB Plan; and a light orange shade indicates the alternative plan design provides a lower real income replacement ratio than the PERA Hybrid DB Plan.

Source: Cheiron analysis using a salary at hire of $165,000 and PERA's December 31, 2023 actuarial valuation inflation assumption of 2.3%.

Appendix F – Additional Comparisons to Alternative Plan Designs

Exhibit F-26

Real Income Replacement Ratios in Retirement
High Inflation Scenario
Judicial Division

Age	AI	65	70	75	80	85	90	95	100
PERA Hybrid DB	**1.25%**	**72%**	**63%**	**57%**	**52%**	**47%**	**42%**	**38%**	**35%**
Standalone DC	1.25%	72%	63%	57%	52%	0%	0%	0%	0%
Soc Sec + DC	3.30%	72%	63%	22%	22%	22%	22%	22%	22%
Variable DB	2.25%	64%	61%	58%	55%	**52%**	**49%**	**47%**	**45%**
7.5% DC + DB	1.25%	72%	63%	57%	52%	28%	25%	23%	21%
Variable Cash Balance	1.25%	72%	65%	59%	53%	48%	43%	39%	36%
1.6% DB + DC	1.25%	72%	63%	57%	52%	31%	28%	25%	23%
Money Purchase + DB	1.25%	71%	65%	58%	53%	48%	43%	39%	35%
DB Gainsharing COLA	1.75%	67%	62%	58%	54%	50%	46%	**43%**	**40%**
DB Max 3% COLA	3.00%	64%	63%	62%	**61%**	**60%**	**59%**	**58%**	**57%**

Note: A dark orange shade with bold text indicates the alternative plan design provides a higher real income replacement ratio than the PERA Hybrid DB Plan; a white background with bold text indicates the alternative plan design provides a similar real income replacement ratio to the PERA Hybrid DB Plan; and a light orange shade indicates the alternative plan design provides a lower real income replacement ratio than the PERA Hybrid DB Plan.

Source: Cheiron analysis using a salary at hire of $165,000 and an inflation assumption of 3.3%.

Appendix F – Additional Comparisons to Alternative Plan Designs

Exhibit F-27

Sensitivity of Total Costs (Employee + Employer)
Judicial Division
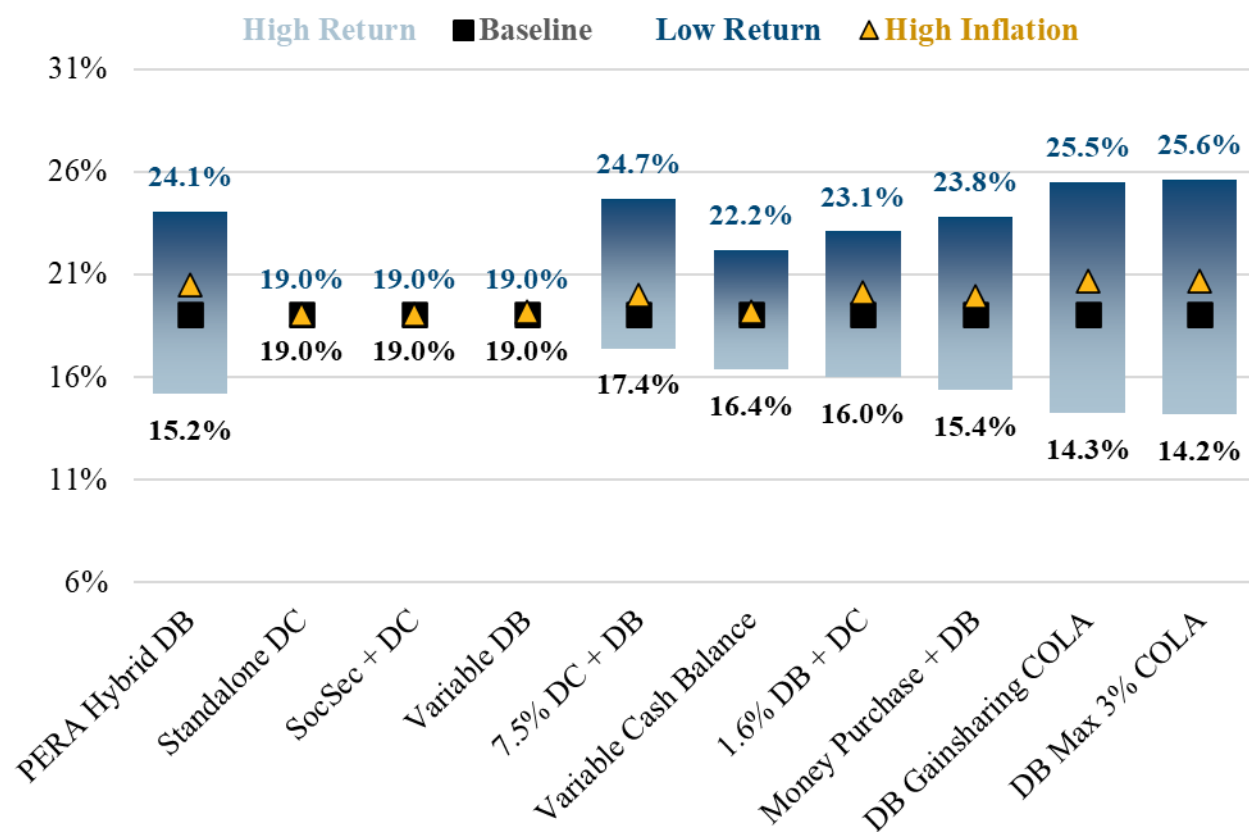
Source: Cheiron analysis.

Appendix G – Glossary of Terms

Accrued Benefit

The retirement benefit earned by a plan participant as of a specific date, based on their service and compensation up to that point, according to the plan's terms. In a Defined Contribution (DC) plan, the accrued benefit is the total balance in the participant's account at that time. In a Defined Benefit (DB) plan, the accrued benefit is the amount earned to date under the plan's formula, often expressed as the annual pension benefit that would commence at the plan's normal retirement age. The accrued benefit may or may not be fully vested (non-forfeitable) depending on the plan's vesting schedule.

Actuarial Liability (AL) / Actuarial Accrued Liability (AAL)

The estimated present value of all pension benefits for current employees and retirees attributed to service already rendered. It is calculated by actuaries using specific assumptions about future events, including projected salary increases, employee turnover rates, disability rates, mortality rates (life expectancy), retirement ages, and the expected long-term rate of return on plan investments. The AL represents the amount of money the plan should theoretically have on hand, the funding target, which, combined with expected future investment earnings, would be sufficient to pay all benefits attributed to past service.

Actuarially Equivalent

Two different benefit payment options with the same present value based on actuarial assumptions (interest rates, life expectancy). For example, when a plan converts an account balance to an annuity, the monthly annuity amount is calculated so that the expected stream of future monthly payments is actuarially equivalent to the account balance.

Annual Increases

Colorado PERA uses this term to mean a post-retirement benefit increase, which is any upward adjustment to a retiree's pension benefit after payments have already begun. Such increases help the pension maintain its value over time, particularly in the face of inflation, or sometimes to allow retirees to share in favorable plan experience (like strong investment returns). These increases can be granted automatically based on a formula or an ad hoc basis. In PERA's Hybrid DB Plan, Annual Increases equal to inflation, up to a cap based on the plan's funding, are granted automatically starting 36 months after retirement for full-service retirees, disability retirees, and beneficiaries.

Backloaded Accrual Pattern

A benefit accrual pattern where pension benefits build up more slowly in the early years of service and accelerate significantly in later years. This pattern is common in traditional final average pay DB plans. Backloaded accrual patterns strongly reward long service and incentivize employees to remain with the employer until retirement. However, it can disadvantage employees who leave mid-career, as the value of their accrued benefits might be substantially lower than if benefits had accrued more evenly over their career.

Appendix G – Glossary of Terms

Benefit Accrual Pattern

The rate at which an employee earns or accumulates their pension benefit throughout their career. This pattern influences the value of the pension earned each year, which can affect the portability of the benefit and employee retention.

The choice of accrual pattern reflects the General Assembly's or the employer's strategic goals regarding workforce management. Backloaded patterns align well with retaining experienced, career employees. Conversely, plans with more level accruals, such as DC or Cash Balance plans, where credits are often a consistent percentage of pay each year, may be perceived as fairer to a more mobile workforce but might offer weaker retention incentives. Plan design choices about benefit accrual directly shape workforce dynamics and the relative value proposition of the pension for employees with different career paths.

Benefit Multiplier

A percentage typically multiplied by the employee's highest average salary and their years of credited service to calculate their annual retirement benefit. For example, a plan with a 2.0% multiplier means that for each year of service, the employee earns an annual pension credit equal to 2.0% of their highest average salary. An employee retiring after 30 years with a highest average salary of $70,000 under such a plan would receive an annual pension of $42,000 ($70,000 x 30 years x 2%). The benefit multiplier is a key element in all DB plan formulas.

Career Employee

Generally, an employee who spends a substantial portion of their entire working life with a single employer or within the same retirement system. For purposes of this study, a Career Employee is an employee who works in PERA-covered employment until they retire, regardless of their age at hire.

Cash Balance Plan

A type of DB plan that defines the benefit using a hypothetical individual account balance. Each year, this hypothetical account is credited with two components: a "pay credit," typically expressed as a percentage of the employee's salary (e.g., 10% of pay), and an "interest credit," which is a rate of return specified by the plan (this rate can be fixed or variable, linked to an index like Treasury bill rates or investment performance). It is important to note that these are bookkeeping accounts; the plan's assets are pooled and managed collectively, not held in actual individual accounts.

Because it is a DB plan, employers must ensure sufficient funds to provide the promised account balances, regardless of the actual investment returns earned on the pooled assets. If actual investment returns exceed the interest credit, the surplus can reduce future employer contributions. Cash Balance plans are more likely than traditional DB plans to offer participants the option of taking their benefit as a lump-sum distribution upon termination or retirement, which can then be rolled over into an IRA or another retirement plan. Alternatively, Cash

Appendix G – Glossary of Terms

Balance plans can convert the account balance at retirement to an actuarially equivalent lifetime annuity.

Cost-of-Living Adjustments (COLA)

A type of Post-Retirement Benefit Increase explicitly designed to counteract the erosion of a pension's purchasing power caused by inflation. COLAs are often calculated based on changes in a recognized inflation measure, such as the Consumer Price Index (CPI). The plan rules might specify that the annual increase equals the CPI change, but frequently include a cap, such as limiting the annual increase to a maximum of 3%, even if inflation is higher. Providing regular, automatic COLAs significantly enhances the long-term financial security of retirees but also adds substantially to the plan's long-term liabilities and costs.

Defined Benefit (DB) Plan

A retirement plan promising a specific benefit at retirement, usually a lifetime monthly payment calculated by a predetermined formula. Common formulas base the benefit on a combination of the employee's years of service with the employer and their salary level, often averaged over the final few years of employment (Final or Highest Average Salary). A typical formula might be: 2.5% ×Years of Service × Final Average Salary = Annual Pension.

Funding a DB plan involves pooling contributions from employers and employees into a trust fund. These assets are professionally managed to generate investment returns to help cover the cost of future benefits. The employer typically bears the primary responsibility for ensuring that sufficient funds are available to pay all promised benefits as they come due, irrespective of how well the plan's investments perform. For public pension plans like the PERA Hybrid DB Plan, this means the employers—and by extension, taxpayers —assume the Investment Risk (the risk that assets earn less than expected) and the Longevity Risk (the risk that retirees as a group live longer than projected).

Defined Contribution (DC) Plan

A retirement plan with individual accounts for each participating member. Unlike DB plans, DC plans do not promise a specific benefit amount at retirement. Instead, benefits depend on contributions, plus investment returns.

In a DC plan, the contribution amounts are typically defined (e.g., the employee contributes 10% of salary, and the employer also contributes 10%). The financial risks associated with a DC plan fall primarily on the employee. The employee bears the Investment Risk, meaning their account balance will fluctuate based on market performance. If investments perform poorly, the retirement savings will be lower. The employee also bears the Longevity Risk – the risk of outliving their savings – as they must manage withdrawals from their account to last throughout their retirement years. Participants in DC plans often have the responsibility of choosing how their account balances are invested, selecting from a menu of options provided by the plan sponsor.

Appendix G – Glossary of Terms

Employer's Normal Cost

The total normal cost minus the employees' contributions. It represents the employers' share of the expected cost of pension benefits attributed to active employees' current year of service.

Front-Loaded Accrual Pattern

A benefit accrual pattern where pension benefits build up more rapidly in the early years of service relative to later years. Such a pattern is typical of DC plans and makes the plan more valuable to employees early in their careers and employees anticipating shorter tenures.

Gainsharing COLA

A type of Post-Retirement Benefit Increase where the adjustment is directly tied to the pension plan achieving investment returns that exceed the plan's assumed rate of return. This mechanism directly links benefit enhancements and the plan's ability to afford them, effectively sharing positive performance outcomes between the plan sponsors and the retirees. It represents a form of risk-sharing, contrasting with guaranteed COLAs, where the sponsor bears the full cost regardless of plan experience.

Income Replacement Ratio

A common benchmark used to assess whether a retirement income is sufficient to maintain a person's pre-retirement standard of living. It is calculated as the individual's gross (pre-tax) annual retirement income divided by their gross annual income immediately before retirement.

For this study, the member's final salary before retirement, not their highest average salary, is used to measure their gross pre-retirement income. As a result, the income replacement ratio will be slightly lower than the percentage applied to the highest average salary.

Inflation Risk

The risk that retirement income's real value, or purchasing power, will diminish over time due to a general increase in prices. For example, a $2,000 monthly pension received today will buy less in 10 or 20 years if the cost of living rises. The allocation of this risk between plan members and employers depends heavily on plan design.

Investment Risk

The possibility that the assets held in the pension fund will outperform or underperform expectations, earning more or less than the rate of return assumed in the actuarial calculations. Poor investment performance can lead to funding shortfalls in DB plans or lower account balances in DC plans.

In traditional DB plans, employers bear the investment risk. If investment returns fall short of the assumed rate used to calculate contribution requirements, employers are typically obligated to fund the difference through higher future contributions to ensure promised benefits can still be

paid. In DC plans, the individual employee bears the investment risk directly. Investment gains increase their account balance and potential retirement income, while losses decrease it. Hybrid designs often share investment risk between employers and employees.

Longevity Risk

The risk that retirees will live longer than expected as a group or individually.

In DC plans, the individual retiree bears the longevity risk. They face the personal financial challenge of making their accumulated savings last for an uncertain lifespan, risking the possibility of outliving their assets.

In traditional DB plans that provide lifetime income, employers bear the longevity risk for the plan members as a group. If retirees live longer than assumed, lifetime pension benefits must be paid out for more years than anticipated, and the total cost of providing benefits increases, potentially requiring higher employer contributions. However, a key advantage for DB plans is their ability to pool this longevity risk across a large group, making the cost more predictable and manageable than if each individual had to self-insure against living an exceptionally long time.

Money Purchase Formula

As used in this report, a Money Purchase Formula is a formula in a DB plan that functions like a Money Purchase Plan in that it specifies fixed, mandatory contribution rates that are credited to a hypothetical individual account within the DB plan, accumulate interest at a rate specified by the plan, and are converted to an actuarially equivalent annuity at retirement. This type of formula is like a cash balance plan.

Money Purchase Plan

A type of DC plan requiring fixed, mandatory employer contributions each year based on a set percentage of employee compensation. As with other DC plans, the final retirement benefit is based on the accumulated value in the participant's account, which includes all contributions plus any investment gains or losses. The employee bears the Investment Risk.

Non-Career Employee

An employee who works for an employer for a shorter duration, potentially changing jobs multiple times. For purposes of this study, a Non-Career Employee is one who terminates PERA-covered employment sometime before they retire, regardless of their age at hire.

Pay-As-You-Go Plan Cost

A funding approach where current contributions cover only current benefit payments, with no pre-funding of future obligations. The Social Security system operates on a modified pay-as-you-go basis, relying on current workers' taxes to pay current retirees' benefits. However, this approach is considered fiscally unsustainable and inappropriate for state and local government

pension plans. It is also regarded as inefficient because no investment earnings help pay for benefits.

Portability

A characteristic of a retirement plan wherein an employee can change jobs (and retirement plans) without affecting their retirement benefits, assuming the new employer offers a retirement plan design that is the same as the previous employer's (e.g., both the previous and the new employer offer DC plans with the same contribution rates). DC plans are portable because the account balance in the previous employer's plan continues to earn investment returns, and the contributions to the new employer's plan are assumed to be the same as the prior employer's plan. At retirement, the employee would receive the same benefit regardless of whether they changed jobs or remain employed by their first employer for their entire career.

Traditional DB plans are less portable: employees who change jobs generally receive lower benefits than employees who continue in the same job to retirement. This is because the years of service under the first employer's plan is multiplied by the highest average salary at that employer, which is likely lower than the employee's highest average salary at the second employer at retirement. For example, an employee who works a full 30-year career in one DB plan gets to apply the HAS at retirement to all 30 years of service, while an employee who changes jobs after 15 years only gets to apply the HAS at retirement to the last 15 years of service. The benefit from the first 15 years of service is calculated using the HAS from the first job, which is almost always lower.

Purchasing Power

The amount of goods and services that a given amount of money can buy. In the context of pensions, maintaining purchasing power means ensuring that retirement benefits keep pace with inflation over the long term. It is usually measured over time compared to the benefit at retirement, regardless of the income replacement ratio. Cost-of-Living Adjustments (COLAs) are the primary mechanism in pension plans to preserve the purchasing power of retirement benefits. Without such adjustments, the real value of a fixed pension payment steadily decreases yearly due to inflation.

Real Income Replacement Ratio

This metric refines the Income Replacement Ratio by adjusting for the effects of inflation after retirement. It measures how well retirement income maintains its purchasing power throughout retirement compared to pre-retirement earnings. A declining Real Income Replacement Ratio indicates that inflation is eroding the value of the retirement benefit.

Reduced Service Retirement (Early Retirement)

Retirement of an employee before they meet the criteria for unreduced service retirement (normal retirement). A reduced service pension benefit is permanently reduced to account for the fact that benefits will likely be paid out over a longer period compared to normal retirement. The reduction factor is intended to make the reduced service retirement benefit Actuarially

Appendix G – Glossary of Terms

Equivalent to the normal retirement benefit. However, sometimes plans offer subsidized early retirement options where the reduction is less than the full actuarial adjustment.

Social Security Replacement Plan

A retirement plan provided by a state or local government specifically for employees who are not covered by the federal Social Security system for their government employment. The primary purpose of these replacement plans is to provide a baseline level of retirement, disability, and survivor benefits intended to be broadly comparable to those offered by Social Security. These plans can be structured as either DB or DC plans.

These replacement plans must meet minimum standards to satisfy federal requirements that allow public employers to opt out of Social Security coverage for certain employee groups. For DC replacement plans, this typically involves a total contribution (employer and/or employee) of at least 7.5% of the employee's compensation. For DB replacement plans, the benefit formula must meet specific minimum thresholds outlined in federal guidance.

The state or local government pension plan takes on heightened importance for employees covered by Social Security Replacement Plans. Since the employees will not receive Social Security benefits based on their government service, their public pension must provide the foundation of their retirement income security, effectively replacing two legs of the traditional "three-legged stool" of retirement (Social Security, employer retirement benefits, and personal savings). Consequently, the adequacy of benefit levels, the presence and structure of cost-of-living adjustments, and the overall financial health of these specific plans are particularly critical for their retirees.

Target Retirement Date Fund (TDF)

A type of investment fund commonly offered within Defined Contribution (DC) plans. These funds automatically adjust their asset allocation mix over time according to a predetermined "glide path." Typically, a TDF designed for a participant far from retirement will hold a higher percentage of equities (stocks) for growth potential. As the fund's target retirement date (e.g., 2050) approaches, the fund gradually and automatically shifts its allocation towards more conservative investments, such as bonds and cash equivalents, to reduce risk and preserve capital.

The primary purpose of TDFs is to provide a diversified, professionally managed investment solution that aligns the level of investment risk with the participant's remaining time horizon until retirement. TDFs are frequently used as the default investment option for participants who do not make an active investment election in their DC plan.

Total Expected Cost

The total expected cost of a defined benefit plan is the total normal cost of the plan. It is the "expected" cost because it relies on many assumptions, including the expected return on assets. To the extent that the plan's actual experience differs from these assumptions, the plan's cost may turn out to be higher or lower than the total normal cost.

Appendix G – Glossary of Terms

Total Normal Cost

The estimated amount needed to fund the pension benefits earned by active employees during the current year, usually reported as a percentage of payroll. It represents the ongoing, year-to-year cost of the pension plan for active member benefit accruals. For most public pension plans, the total normal cost for an individual is designed to be a level percentage of their salary throughout their career that, if contributed each year, is expected to accumulate to the present value of the member's benefits when they retire.

Traditional Defined Benefit Formula

The retirement benefit calculation used in most traditional DB plans: (Years of Service) x (Benefit Multiplier) x (Final or Highest Average Salary).

UAL Amortization Payment

The portion of the contribution used to pay down an existing UAL over time. When a plan's funding policy does not specifically calculate an amortization payment, the UAL Amortization Payment is the total contribution minus the total normal cost minus administrative expenses.

Unfunded Actuarial Liability (UAL)

The amount by which the Actuarial Liability exceeds the value of plan assets; a funding shortfall. A UAL signifies that the plan currently lacks sufficient assets to cover all benefits attributed to past service. This shortfall typically arises from one or more factors: past contributions being lower than actuarially recommended amounts, investment returns falling short of assumptions, changes in actuarial assumptions (e.g., people living longer), or benefit increases being granted without corresponding funding increases. A significant UAL indicates potential financial stress for the pension plan and its government sponsor, as this shortfall represents a debt of the plan sponsor that generally must be paid off over time.

Unreduced Service Retirement (Normal Retirement)

This signifies reaching the age and/or service requirements needed to retire with a full pension benefit calculated according to the plan's formula, without any reduction for early commencement.

Variable Defined Benefit Plan

A hybrid plan design that attempts to blend desirable features of DB plans, such as asset and longevity pooling and the provision of lifetime income, with risk-sharing mechanisms more characteristic of DC plans. In a typical Variable DB structure, there might be a baseline or "floor" benefit, potentially calculated using conservative actuarial assumptions (e.g., a low assumed rate of return). Above this floor, there is typically a variable component where benefits can adjust upwards or downwards based on the plan's actual investment performance compared to a predetermined benchmark. This structure explicitly shares investment risk between plan costs and plan benefits. Employers may benefit from more stable and predictable contributions

than in traditional DB plans. At the same time, employees gain the potential for benefit increases during good investment years but face the risk of benefit reductions during downturns. Longevity risk, however, is typically still pooled, retaining a key efficiency of the DB model.

Variable DB plans attempt to navigate the tensions between traditional pensions' security and the associated cost volatility. However, the success and fairness of such designs depend heavily on their specific parameters, including the level of the floor benefit and the mechanisms for benefit adjustments.