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Appendix A. Definition of Adequacy

There is no one-size-fits-all retirement plan design that will work best for every type of individual, public sector or private. Similarly, there is no true universal definition of “adequate” retirement income for all people. The reason is simple: Human beings are unique, complex, personality-driven individuals with wide-ranging preferences and needs. Any fixed definition of adequate retirement income will necessarily leave some portion of the workforce out. Defining “adequate retirement income” with a single benchmark number, such as a project like the Retirement Security Report (RSR) has to take on, requires thinking about wide applicability and adaptability for a healthy majority of people.

For the purposes of this report, Equable defines "adequate retirement income," or "adequacy," as a benefit value of at least 70% replacement of pre-retirement salary by age 67. However, we recognize that adequacy will vary from person to person based on the specific needs of the individual or household.

We’ve chosen to use replacement rate targets as the basis for our definition of adequacy because it allows us to leverage pre-existing research about retirement income as well as to present some common ideas about how to think about adequacy. Replacement rate targets are an easy-to-understand concept that most users of the RSR tool can relate to when looking through the metrics we have chosen. While there are limits to simplified concepts and there have been some evolving ideas about the shortcomings of replacement rate methodologies to assess the quality of retirement benefits, we argue there is still a lot of validity in using a fixed replacement rate target when doing broadscale measurement projects like the RSR.

Retirement plans have different kinds of people enrolled, with different salary ranges and different lifestyle circumstances. When examining the benefits provided across all available retirement systems and plans, there are countless ways to assess the value of benefits. For practical purposes, the methodological approach when doing this kind of high-level analysis is to limit the scope of circumstances being covered. Our measurement of the value of benefits provided by a retirement plan is focused on the average salary accrual path and two entry-age points. The use of a single adequacy target for the definition of adequacy is the most appropriate means to measure against those average-based assessments of retirement plan benefits.

We believe that these measurements of state retirement plans at their averages do provide helpful guidance on how well they are working for a majority of the members of the plan. The analysis does not provide a range of assessments by income level, but it does focus on variance in duration of employment, entry age, and occupation-based salary accrual. Collectively, this gives us a lot of insight into the ways different cohorts of individuals are served by a retirement plan, even if we don’t have data on individuals versus households or on outside levels of personal retirement savings.

A1. DEFINING PRE-RETIREMENT INCOME

The RSR methodology (discussed in Appendices B and C) allows each retirement plan to set its own definition for pre-retirement income. For most plans, this is defined as the average of the final three to five years of employment, and for others it is the average of the highest three to five years of salary at any point in a worker’s career.[1] Retirement plans have various caps on how income can be defined in these contexts as well as on how quickly it can grow from year to year (for the purposes of measuring pre-retirement income). Retirement plans without pre-retirement income definitions, like Defined Contribution (DC) plans, use just the final year of salary as the point of measurement. This forces that retirement plan to generate a larger benefit amount than if we arbitrarily measured their pre-retirement income as an average of the final five years or as a career average.

[1] Note that there are more options for a final average salary (FAS) calculation than just a three- or five-year FAS or three- or five-year highest average salary (HAS).

Social Security utilizes a career average approach for defining pre-retirement income, which is more consistent with the approaches being adopted in the retirement literature (see Retirement System Risk Management, edited by Olivia S. Mitchell, Raimond Maurer, and J. Michael Orszag). But there isn't consistency in whether this definition should account for inflation adjustment of benefits over time (i.e., with cost-of-living adjustments [COLAs]).

Ultimately, our approach creates some flexibility in the definition of adequacy, insofar as each retirement system has a slightly different measurement of their denominator in the calculation of a replacement rate. This is appropriate because the primary purpose of the RSR is to consider each retirement plan on its own terms. In our aggregate analyses we do show how the scores of some plans stack up against one another; however, this is only possible because each plan's assessment is allowed to reflect its own salaries, benefit provisions, and other assumptions. To this end, our analyses offer a fair comparison of each plan's benefits but do not offer an assessment of how generous plans are relative to one another.

A2. IDENTIFYING AN ADEQUACY TARGET

The idea of thinking about retirement income targets in replacement rate terms dates back at least to the 1981 President's Commission on Pension Policy. It is not particularly surprising, then, that several decades on, researchers have made attempts to develop more sophisticated methods of defining retirement income adequacy.

Aon Consulting, an organization that does analytical work for U.S. public retirement systems, describes "adequate retirement income" as a relationship between "retirement resources" and "retirement needs." Resources are Social Security, employer-provided retirement plans, and personal savings. Needs are "the amount that would allow the employee the same amount of spendable income before and after retirement." They argue in a 2018 study that the use of "replacement ratios" (the approach that the RSR takes) is focused too much on the income earned right before retirement, which, as such, might lead to a definition of adequacy that is too tightly measured.[2] Instead, they use a "multiple-of-pay" approach that tries to define all retirement needs, adds up all resources necessary, and then translates that into an equal amount of money that should be saved every working year as a percentage of salary.[3]

This follows a similar recommendation from the financial services company TIAA, for a 10% to 15% of salary annual savings target toward retirement. For those without Social Security, the recommendations shift up to between 15% and 20% of salary as the targeted savings amount.

Ultimately, it is not feasible to adopt an expense-oriented approach for adequacy for the RSR, largely due to the scope of the project which is intended to reflect all current and legacy retirement plans. Estimating the needs of individual plan members would require the use of significantly more assumptions than a replacement rate approach, as we would need to consider various factors like family size, health care costs, and much more. A replacement rate approach is appropriate for the high-level, generalized assessments of how well a retirement plan is working for its members — and from this place, more tailored analyses can be developed on a plan-by-plan basis.

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[2] We recognize the validity in this approach, which may be a better way to think about adequacy in the context of less even salary accrual patterns. The typical private sector salary trend varies by profession, but many of them look like inverted U-shaped parabolas rather than straight lines trending upward (see Alicia H. Munnell and Mauricio Soto's 2005 analysis of replacement rates for further details). In the public sector, these trends may be similar, but the assumption patterns used by public retirement systems are predicated on steady upward salary accrual. As such, our use of a replacement rate methodology inherently focuses on the highest paid portion of an individual's career, meaning we either are defining adequacy appropriately or are overdefining adequacy. Since our methodology does not fully account for medical costs, a growing share of retiree savings, we are comfortable with this approach, which at worst will be incorporating this greater share of medical costs into the adequacy definition than we've estimated.

[3] Aon Consulting's analysis finds that to achieve adequate income, individuals, on average, should be saving 11.1% of their salaries for retirement. This number assumes retiring at age 67 with Social Security, and those without access to the federal retirement plan should aim for 16.4% of pay savings. These "savings" rates could be contributions to an employer-sponsored retirement account, a pre-tax IRA, or after-tax savings. The same study also suggests that these percentage-of-salary savings rates can go down slightly as income rises, and that they should go up a few percentage points for those with incomes below the national average (around $60,000 at the time of the study).

A3. A RANGE OF REPLACEMENT RATE TARGETS

There is no clear consensus on other approaches to measuring adequate retirement income, and perhaps there never will be given how many variables there are to consider as well as the range of types of individuals and households. Similarly, even among analyses looking at replacement rate targets, there is no firm consensus.

A study written by a research team at Georgia State University and published by Aon in 2008 concluded that a typical retiree at age 65 should be aiming for 78% replacement of their "gross income before retirement." This factored in that income taxes typically decline after retirement, that deductions for Social Security are no longer coming out of pay checks, and other savings for retirement are no longer necessary. This also accounted for a significant increase in health care costs from working years to retirement years, in some cases by as much as 50% on an annualized basis.

Both the 2008 and 2018 Aon studies pointed out that savings rates and replacement ratios should vary somewhat based on pre-retirement income levels. For example, Aon's "multiple-of-pay" model states that individuals making $30,000 of pre-retirement income should be aiming for closer to 15% replacement before accounting for Social Security (4 percentage points above the average). And the 2008 Georgia State/Aon "replacement ratio" model puts the target at 90% replacement (12 percentage points above the average).

Similar analysis by the Society of Actuaries in 2011 found that an appropriate "target gross replacement rate" for an average earnings group ranged between 50% and 80%. They looked at earnings groups broken out as $20k–35k, $35k–80k, and $80k+ and then measured what percentage of those samples had adequate retirement savings at different replacement rates.[4]

Research from Alicia H. Munnell and Mauricio Soto also points out that thinking about replacement rates in terms of households can lead to very different understandings of adequacy. Couples where one spouse works, versus two, can lead to different pre-retirement earnings patterns but a typical couple in retirement might have similar costs irrespective of those pre-retirement income patterns. This would lead to different ways of thinking about replacement rates based on pre-retirement income.

Analysis from the Congressional Budget Office in 2017 noted that the "common rule of thumb" for replacement rate targets is 70% but added that this "specific goal is not appropriate for all people. To better capture the diversity of people's circumstances, researchers have developed a range of target rates that vary with individual characteristics, such as marital status, lifetime income, and homeownership."

Social Security has highlighted a 70% replacement rate target as the most common recommendation. But this is not their formal recommendation because of the wide variance in individual circumstances. They've highlighted this, though, to emphasize that for many individuals Social Security monthly payments on their own will not be sufficient to reach a definition of adequacy.

It is clear that the specific replacement rate for any given individual may vary based on their specific needs. Ultimately, what's important for measuring any retirement plan over time is whether it keeps individuals *on a path toward* a selected measurement of retirement income adequacy.

Collectively, we believe a reasonable definition of adequate retirement income is somewhere in the range of 60% to 80% replacement of pre-retirement income, based on current academic literature and within the framework of needing to select a target benchmark for a broad cohort of retirement plan members. So, for the purposes of the RSR, we built around the middle of that range (70% replacement rate) and measured scores for the upper and lower bounds.

We've included a range of caveats around these figures both within this paper and in our digital presentation of the material. Future editions of the RSR may attempt to provide scores with a range of household income quartiles and/or health care cost expenditure levels.

[4] A key part of their conclusion said, "According to Figure 4, if individuals were able to replace 70% of their average last five years of earnings over a 35-year career, then this would meet or exceed the target replacement rates for approximately 58% of our entire 'successful' sample, particularly when combined with other sources of retirement income."

A4. SOCIAL SECURITY AND ADEQUACY

Participation in Social Security, to the surprise of many, is not a given for all public employees. Although nearly all workers in the private sector are enrolled, a significant share of public employees (particularly teachers) are NOT. As a result, the benefits they require from their retirement system must be higher to provide a meaningful retirement.

Social Security income typically provides up to 40% replacement rate on average career income and between 20% and 33% replacement of income in the few years before retirement. In prior iterations of the Retirement Security Report (prior to our 2023 update), we assumed that Social Security provides 33% of the replacement rate goal for individuals enrolled in the federal program. We recognized that this was a shortcoming in our approach, as, in practice, the actual share of pre-retirement income replaced by Social Security will not only depend on how that income is defined (e.g., average of final five years versus career average) but also the income level of the household or individual being considered. For example, Social Security could conceivably replace 60% or more of the career income for someone averaging $20,000 a year, or as little as 30% replacement for someone with a $90,000 career average.

Given the variable nature of Social Security, we now use a model to estimate the value of an individual's Social Security benefits following the definitions as outlined by the Social Security Administration. These benefits are translated into a replacement rate using the estimated salary accrual scale as assumed by the retirement systems. These Social Security benefit replacement rates are then subtracted from a replacement savings target to calculate the value a retirement benefit would need to offer to provide a secure retirement. For more on the specifics regarding the modeling of Social Security benefits, please see the "Modeling Social Security Benefits" section in Appendix C.

Appendix B. Scoring Methodology

The Retirement Security Report's assessments of each individual retirement plan are divided into three sections. The first (Plan Information) offers an overview of basic plan details and is not scored. These metrics are provided purely for informational purposes. The second (Retirement Benefits Scores) scores the benefits offered by the retirement system. These are provided based on three different types of workers and on duration of public service: Short-Term Workers, Medium-Term Workers, and Full-Career Workers. The third (Plan Sustainability Scores) is attentive to public workers' interest in having their retirement plan meet its promises, namely that the plan is on a secure financial footing and will have sufficient funds to provide plan members with the promised benefits. Over the following pages we present a detailed description of each of the measures employed in both the scored and unscored sections of the RSR.

The Retirement Benefits Scores are based on how plans stack up relative to known best practices and whether members are placed on a path to a secure retirement, defined as reaching the 70% replacement target identified in Appendix A. Scores are provided for each metric and totaled within a given profile. We also offer averaged scores across the various profiles for the sake of this paper and in order to glean aggregate findings, but we advise readers to focus on the profile scores as they will offer a more accurate evaluation targeted to each group of members.

Note that all worker types are evaluated out of a possible 30 points in each profile for pension, Guaranteed Return (GR), and hybrid plans. Defined Contribution (DC) plans have fewer common policy features to evaluate (specifically, built-in cost-of-living-adjustments [COLAs]), so they are scored out of a possible 25 points in each profile.[5] This is because we did not want to overinflate the scoring on income adequacy just to have symmetry in the final scoring number.

APPENDIX B OUTLINE:

B1. CONTEXT AND PLAN INFORMATION

It is essential for everyone interested in retirement systems to possess a baseline level of knowledge about the plan offered, the members served, and the broader state or municipal context in order to make an informed assessment. For the sake of the RSR, we have identified several basic pieces of information that are useful to know (and that will have a sizable impact on how we assess the plan). However, none of the items identified in this section factor into the scoring or overall assessment of each plan. Instead, they are presented to provide the appropriate context to help public workers understand their plans and some of the elements of how they work.

[5] Note that Medium-Term Workers only have 20 available points for DC plans as the vesting metric is no longer included in their assessment.

RETIREMENT BENEFIT TIER HIRE DATES

Benefits offered to employees within a retirement plan often will vary based on when people were hired. This metric shows the applicable start date (and end date when relevant) for the plan being considered here. Individuals hired before this date are most likely enrolled in an earlier version of the plan that is no longer available to new hires joining the retirement system. Individuals hired on or after this date can still join this plan.[6]

Benefits offered will commonly be quite similar from tier to tier, but they differ enough to warrant separate assessments. Benefit values are notably different for new plans and tiers of benefits created following the financial crisis of 2007–09.

OCCUPATION(S) COVERED BY THE PLAN

While some public retirement systems specify clearly which employees they cover in the plan name, in many cases the full scope of who they provide benefits for is not entirely clear. The purpose of this metric is to offer additional clarity regarding which types of public employees receive benefits from this plan. Broadly speaking, we categorize these employees into the following groups:

- General employees: This category is intended to reflect the myriad of public employees that fill most government positions. General employees can range widely across different agencies, roles, and job classifications.

- Public safety employees: This category is intended to reflect police, firefighters, correctional officers, public safety officers, and all other public employees whose primary role is to ensure the safety of the general public. Note that we specify police, firefighter, and other groups within this broader category where possible as they often have plans designed specifically for each respective occupation.

- Elected officials: This category includes the benefits being provided to elected officials, regardless of office. Note that this category will sometimes contain judges, and, in some cases, judges are identified separately as they often have their own plans.

- Public school employees: This category includes public school teachers, administrators, counselors, and support staff involved in the operation of schools. Much like our other categories, we specify “teachers,” “non-instructional,” or other groups within this category, whenever possible, as there are frequently different benefits offered to different classifications of employees.

- Higher education employees: This category includes the faculty, administrators, and support staff involved in providing public higher education. Whenever possible we have again differentiated between each respective role when benefits are known to differ by occupation.

In addition to offering a description of a plan’s membership according to these categories (or more specifically whenever possible), we also designate here whether the plan is intended to provide benefits for employees of state government, local government, or all public employees within a state (in either state or local administered positions).

[6] Note that in some cases, tiers of benefits differ not by date of hire but, instead, by date of retirement. In these cases, we estimate the hire dates based on our assumed 25- and 40-year-old entrant profiles. This is not an exact estimate but allows us to get a rough sense of how long different tiers have been available.

RETIREMENT PLAN OPTIONS AVAILABILITY

Today's public workforce comprises a wealth of different people, all with varied interests and drive toward public service. Because of the differing needs of workers it is important to understand whether there is flexibility in the retirement plan(s) afforded to them.

This is not meant to argue that one plan design is universally ideal or that there is an optimal number of retirement choices. Rather, this metric is intended only to answer a single question: Are all new members enrolled in one default retirement plan or do they have a choice between different primary retirement plans?

AVAILABILITY OF SUPPLEMENTAL RETIREMENT SAVINGS OPTIONS

Frequently, public retirement systems do not aim to provide all of the retirement income an individual will need. Other anticipated sources typically include personal savings and (in some instances) Social Security.

To support personal savings, many public retirement systems offer an option for members to enroll in a voluntary supplemental retirement savings program. These plans can be set up to collect distributions from regular paychecks on a pre-tax or after-tax basis. These plans are not the primary means of putting an individual on a path toward a secure retirement, and they are not evaluated as such in the Retirement Security Report.[7] However, supplemental retirement savings options can be a useful feature for those who have retirement income goals that the primary retirement plan is not designed to provide. Further, having supplemental savings options administered by a member's primary retirement system can help remove barriers or complications that might otherwise prevent an individual from setting aside enough savings to ensure they enjoy a secure retirement.

ENROLLMENT IN SOCIAL SECURITY

Participation in Social Security, to the surprise of many, is not a given for all public employees. Although nearly all workers in the private sector are enrolled, a significant share of public employees (particularly teachers) are NOT enrolled. As a result, the benefits they require from their retirement system must be higher to provide a meaningful retirement.

EMPLOYEE/MEMBER CONTRIBUTION RATE

One of the most important elements of a retirement plan for any worker is the amount that will come out of their pockets to pay for their benefits. These employee contribution rates vary widely from plan to plan, with some plans even offering the option for members to choose how much they will contribute. And, to make these even more complicated, contribution rates will vary significantly depending on whether plan members are enrolled in Social Security.

This measure is useful to include in this section of the RSR for several reasons. First, the value of benefits is linked directly to the contributions plan members pay into their benefits. By reporting these rates, we offer an insight into one of the driving factors included in our models of plan benefits. Second, from a more practical perspective, plan members may often be confused or otherwise unclear as to what they are paying toward their future retirement benefits.

We do not assess the contribution rates paid by plan members in our metrics as there is no single objective contribution rate inherently too high or too low. In some cases, low contribution rates can be a good thing, meaning that benefits are not taking much out of plan members' paychecks. In other cases, low member contribution rates can signal that benefits are not as generous or are not as valuable for Short-Term and Medium-Term Workers. A similar case can be made for higher member contribution rates, where

[7] One notable exception to this rule is CalSTRS's GR Option, a plan offered to part-time and substitute teachers in California. The plan is not intended to provide a secure retirement alone, as it does not cover full-time employees; however, as it can be considered a primary retirement benefit for these members, we provide an assessment of its offerings. For the sake of our analyses, we include it selectively for illustrative purposes, but ultimately we will not call this plan out for failing to place its members on a path to a secure retirement as it simply is not intended to reach that bar.

they are more expensive and cut directly into plan members' bottom line, but they can result in more generous benefits both in the short and long term.

For the sake of the RSR, we report the member contribution rates to provide an added insight for plan members. We also offer the context of the surrounding rates and average rates for plans broken down by their Social Security enrollment status.

INVESTMENT MANAGEMENT AND FEES (APPLICABLE TO PENSION, GUARANTEED RETURN, AND HYBRID PLANS)

It is helpful to know what investment fees are being paid by retirement systems for the management of their investments, but interpreting the nature of this information shouldn't be overstated. It is important to understand that, in many cases, these fees are not going to dramatically affect the benefits plan members can expect or the overall fiscal health of the retirement system.

In this section, we report a few pieces of information on the investments for all pension, guaranteed return, and hybrid plans. Note that we do not do this for defined contribution plans because they do not operate with centralized investments that would incur fees to the retirement system. Instead, defined contribution plans use individual investment accounts that assign fees to each member based on the types of investment, strategy, management, and other factors.

One major narrative around public pensions centers around the notion that the retirement systems are being fleeced by investment managers with overpriced fees or that Wall Street is, in some way, "robbing" plan members of their benefits. There is no question there have been many instances of questionable fees paid by many public retirement systems. In some cases, financial firms have oversold their capacity to offer high returns. In other cases, financial firms have undersold the risk that pension trustees are taking on by giving a portion of a retirement fund portfolio to certain money managers. On a meta level, there is an open question about how actively pension fund assets should be managed since, in principle, the assets are intended for a long-term use case: paying future benefits.

All of that said, the question of whether public retirement systems are paying too much in fees is one that can be addressed directly. We include measures of the assets held, returns, and fees paid by each retirement system in the RSR to illustrate that this particular narrative is likely overblown. High fees or being oversold by "Wall Street" is not a significant reason that public retirement systems are, on average, poorly funded. The scale of investment fees relative to total pension assets is small and the meta narrative usually inappropriately lumps together the complications of fees that vary considerably by asset class.

DEFAULT INVESTMENT PORTFOLIO (APPLICABLE TO DEFINED CONTRIBUTION AND HYBRID PLANS)

In cases where public employees are enrolled in defined contribution or hybrid plans (with a defined contribution component), it is important to understand whether their retirement savings are being placed in good investment options by default or if they must actively choose the strategy that suits their needs best. Simply put, most plan members do not have significant experience with investing and will allow their retirement savings to fall into the default options. As a result, plans that have good defaults will provide better retirement security to members.

For the sake of the RSR, we include information for plan members to learn what the default investment options are for their defined contribution plan (or defined contribution component of hybrid plans). We do not perform any scoring using these data points and they do not factor into any of the scored elements of the RSR.

ACCESS TO GUARANTEED LIFETIME INCOME ANNUITIES WITHIN THE PLAN (APPLICABLE TO DEFINED CONTRIBUTION PLANS)

Annuities provide guaranteed lifetime income. Individuals provide a lump sum of cash up front in exchange for a particular promise of certain monthly income.

Pension plans are designed to produce lifetime income automatically (though many offer lump sum options). Guaranteed return plans typically have built-in processes to convert account balances into lifetime income upon retirement. But for both defined contribution plans and the DC portions of hybrid plans, there is often an additional step required to get to lifetime income. Any individual enrolled in a defined contribution plan can purchase an annuity, either during their working years as part of their investment portfolio or upon retirement, with a portion (or all) of their account balance. The question this metric considers is whether such annuities are offered through the retirement system itself. Such an offering could provide seamless service and make the transition from working to retirement the same whether a public employee is enrolled in a pension or DC plan.

B2. RETIREMENT BENEFITS SCORES: WORKER TYPES

Today's public workforce is a diverse group of individuals with varied experiences, goals, and, ultimately, career paths. Moreover, today's employees are more mobile than previous generations. And that is not to say that different jobs covered by the same retirement system might have different periods of expected employment duration. As a result, it is unreasonable to assume that there is a one-size-fits-all retirement plan that will meet the benefit needs of every public employee equally. In fact, the variation in employee needs and desires means that there will always be trade-offs that make each retirement option better for some workers, but not ideal for others.

To account for these variances, we have designed the Retirement Benefits Scores to be adaptive based on years of service and starting age of employment. The scores are broken into three main profiles: Short-Term Workers, Medium-Term Workers, and Full-Career Workers and are measured using a 25-year-old entrant and a 40-year-old entrant. We define each group as follows:

- **Short-Term Workers** are defined as employees who either will or intend to leave their retirement system with 10 or fewer years of service.
- **Medium-Term Workers** are defined as employees who either will or intend to leave their retirement system after serving between 10 and 20 years.
- **Full-Career Workers** are defined as employees who either will or intend to work for 20+ years and are expected to reach normal retirement eligibility.

Using these three profiles, the RSR examines retirement security using a set of metrics that best reflects the concerns of those employees at each stage of their careers.

SHORT-TERM WORKERS

Short-Term Workers represent a wide array of public servants. On one end of the spectrum are those employees who have just taken their first steps into a career in public service, while on the other end are nine- and ten-year veterans who are stepping away wondering if they will be better served by exploring other career options.

Short-Term Workers may be those considering career changes or who may relocate out of the retirement system as they start a family and shift jobs. These members are more likely to be attentive to the vesting period requirements for a plan or the rules pertaining to refunding employee contributions if they leave their retirement system.

Because we define Short-Term Workers as those public employees who will or intend to serve for 10 or fewer years, their priorities are very different from those who are expected to remain in their retirement system for a full career. As with any other employees at the start of their career, Short-Term Workers are likely less interested in the final value of what their retirement benefits could be, and instead are more interested in learning whether they are starting off on a path toward a secure retirement income.

Perhaps most important, Short-Term Workers likely value the flexibility and mobility of their benefits, as they contemplate what career paths they will take and how best to build their adult lives. As a result, Short-Term Workers will have greater interest in vesting and potential mobility of benefits than the actual value of benefits accrued.

MEDIUM-TERM WORKERS

Medium-Term Workers represent the core veteran employees who have dedicated a meaningful portion of their lives to public service but who either do not spend their entire career enrolled in the same state retirement plan or leave when they are still several years from normal retirement. Because we define Medium-Term Workers as those public employees who will or intend to serve between 10 and 20 years, these members have vested in their retirement benefits and aren't worried about eligibility.

However, for those who have changing priorities mid-career, the mobility of their benefits is still a critical concern. Like Short-Term Workers they should be cognizant of refunding policies. But, as retirement transforms into a more tangible idea, their interest in the quality of the benefits they have earned to this point becomes a more primary focus. They should place a larger premium on the value of the benefits they have accrued (than Short-Term Workers might), as it may be worthwhile to leave their credited service in the retirement system to claim when they reach retirement age.

FULL-CAREER WORKERS

Full-Career Workers represent those who have dedicated their entire careers to public service, spending more than 20 years in their retirement systems and who will or intend to reach normal retirement age. While Short-Term and Medium-Term Workers value potential mobility plan features, Full-Career Workers are close enough to retirement that they should care most about the actual end value of their benefits — as they are the most likely to reach normal retirement age. Beyond that, Full-Career Workers should be interested in other policies related to their retirement — namely, early retirement options, employment past retirement (if they so choose), payout options for their benefits, and cost-of-living-adjustments.

B3. RETIREMENT BENEFITS SCORES: ELIGIBILITY

ELIGIBILITY: VESTING (APPLICABLE TO SHORT-TERM WORKERS)

Employees want to know when they will be vested into their retirement benefits. There is no formal set of vesting rule guidelines that informs all state retirement systems, but there are rules for private sector plans. As a result, we use as our benchmark the federal standards for private sector retirement plans (known as ERISA), which specify that employees should be 100% vested after five years of service.

We assign points to each plan based on how many years of service are required to be fully vested. We also account for the differences between "graded vesting," where a member becomes increasingly vested in their benefits until they reach full vesting, and "cliff vesting," where members are not entitled to benefits until they have reached the full vesting point.

SCORING RUBRIC:

5 points = 0–4 years
4 points = 4–5 years (graded)
3 points = 4–5 years (cliff)
2 points = 6 years or more (graded)
1 point = 6–9 years (cliff)
0 points = 10 years or more (cliff)

B4. RETIREMENT BENEFITS SCORES: INCOME ADEQUACY

INCOME ADEQUACY: BENEFIT VALUE (APPLICABLE TO SHORT-TERM AND MEDIUM-TERM WORKERS)

One way to assess the adequacy of plan benefits is to compare them against a simplified path to reach a given replacement rate. In the case of the RSR, we define a secure retirement income as one that replaces 70% of pre-retirement income at age 67, when individuals are first eligible for full, unreduced benefits under Social Security. To do this we generate two measures: 1) the value of the benefits offered by the plan; and 2) the accrual path that would reach the 70% target at age 67.

For the value of the plan's provisions, we calculate the net present value of benefits over the course of a member's career, accounting for plan design, contributions, and various other elements, using as few assumptions as possible. The result is an accrual path that documents what the plan's benefits are worth after each year is completed. We repeat this process for both 25- and 40-year-old entrants. These values are then converted using a standardized annuitization function to translate the total value of benefits into estimates of annual retirement income. These annuitized figures are then converted into replacement rates that can then be scored by comparing them against the adequacy benchmarks using our scale outlined below. For more details on the modeling of public retirement plans, see Appendix C.

For the target accrual path, our approach is much simpler. While all retirement plans capitalize on the power of compounding interest to offer benefits at a reduced present cost, there was no clear design for the threshold that would both account for interest while not showing bias toward one plan design or another. As a result, we calculate what 70% of the members' pre-retirement income will be using the plan's designated salary accrual assumptions, and then we draw a straight line from 0% at the start of the member's career to the 70% replacement target. The result of this approach is a line that reflects an equal increase from year to year that will eventually reach the 70% target at age 67. From this we can then calculate scores. For more details on how we calculate these thresholds, see Appendix C.

The scoring approach we use is more complicated than the other metrics in the RSR because of the nature of capturing the adequacy of a plan's benefits. We measure the difference between the accrual lines for the adequacy target path and the benefit offerings for the state retirement plan.

- For Short-Term Workers: We calculate scores for the first 10 years of service and examine how close the benefits offered are putting members on a path to reach the replacement rate target. We average scores across all 10 years to calculate the score.

- For Medium-Term Workers: We calculate scores for each year between 10 and 20 years of service and then average those to produce the final benefit score.

Plans are awarded full points if they are keeping employees at or above the replacement rate target, 0 points if they offer no value, and partial points if the value of their benefits offered is somewhere between.

SCORING RUBRIC:

15 points = Benefits meet or exceed the targeted adequacy benchmark

Partial points = Benefits are less than the target but are greater than zero

0 points = Benefits are equal to zero

It is easiest to illustrate how this adequacy scoring works using an example: A hypothetical plan offers benefits equal to 0.75% that increases with each year of service for the first five years, but then slows to 0.5% for each year after that such that the replacement rate would be 3.75% at five years of service and 6.25% at 10 years of service. The adequacy targets increase at 1% for each year of service such that the target would be 1%, 2%, and so on up to 10% at 10 years of service. In this example, the plan would score 75% for each of the first five years and less for each year following until getting 62.5% at year 10 (6.25%/10%). All 10 scores are averaged to give a score of 70.6%. That final share is then multiplied by the 15 available points to produce a score for the plan. The final result in this example is that the plan would score 10.59 of the 15 available points (15*0.65).

INCOME ADEQUACY: REPLACEMENT RATE AT RETIREMENT (APPLICABLE TO FULL-CAREER WORKERS)

Retirement plan members want to be on a path to an adequate retirement benefit and secure retirement income. We have been assessing the adequacy of benefits for each plan by comparing the value of what a plan member has earned against a 70% replacement adequacy target. Whereas with Short-Term Workers and Medium-Term Workers we needed to look at the path of getting to this stage and assessing how benefits stack up, with Full-Career Workers we can now focus on the final value of benefits offered by a retirement plan.

For Full-Career Workers, we score retirement plans based on the replacement rate at the age of 67. We chose this age (instead of the normal retirement age designated by a retirement plan) because it is the point where a new worker (anyone born after 1960) becomes eligible to retire without any benefit reduction under Social Security. This may not be an ideal approach, as many public employees will retire upon reaching normal retirement age. However, by withholding our scoring until age 67 we are offering assessments that only run a risk of being more favorable to plans than had we scored at normal retirement age. Moreover, while our benefit models technically can show a reduction in the value of net present benefits for a plan if normal retirement age is prior to age 67, we address this in our annuitization process where we do not allow the annuitized value (and in turn the replacement rate) to decline at any point after reaching normal retirement age.

The benefits of this approach are numerous, but most importantly it ensures comparability against our prior measures of adequacy for Short- and Medium-Term Workers. Looking at age 67 allows us to utilize methods that do not offer any favoritism toward any plan design while also reflecting what is likely to be the work experience of many public employees who will avoid choosing between two separate retirement dates or will just continue to work until they are ready to finish their career.

Whereas other adequacy measurements are adjusted to account for the fact that they are pre-retirement and without a projection on Social Security benefits, this metric accounts for Social Security in both the adequacy target and retirement plan benefits. We do so by adjusting the target replacement threshold down by the estimated Social Security benefit for each individual plan member. Individuals who work their career in a plan without Social Security will not have this adjustment applied to their replacement rate target. (For more details on the modeling of public retirement plans, calculation of thresholds, or adjustments for Social Security enrollment, see Appendix C.)

To score the Full-Career Worker benefits, we apply a similar methodology as for Short- and Medium-Term Workers. Whereas the other profiles average the scores between two different year-of-service milestones, for Full-Career Workers we compare the benefits against the 70% replacement rate target at age 67. In the event a plan meets or exceeds the target, it receives a full 25 available points. If it does not meet the target, then we once again multiply the available points by how well the plan's benefits stack up against the benchmark.

There are two additional considerations to recognize for the Full-Career Worker benefit adequacy measure. First, the total number of points is higher for this profile than for the other two. This is because Full-Career Workers should be most concerned with the value of the benefits they have earned. While there are other considerations, namely the COLA policy, they are not weighted as much relative to the benefit value assessment. Second, we acknowledge that some public employees may seek to achieve a higher replacement rate of retirement income than the adequacy threshold we have identified. This is a case where more generous

benefits are directly better for public workers. To reflect this, we offer an additional five potential bonus points if a plan's replacement rate at age 67 exceeds 80% of pre-retirement income. However, we do not allow plans to achieve total scores above 100% of available points. As a result, a plan that receives the bonus points here is able to offset lost points due to a poor COLA offering or other policy shortcoming and can still achieve a perfect score.

SCORING RUBRIC:

25 points = Benefits meet or exceed the 70% target adequacy benchmark at age 67
0.5 to 24.5 points = Benefits are less than the 70% target adequacy benchmark but are greater than zero
0 points = Benefits are equal to zero
+5 bonus points = Benefits meet or exceed an 80% adequacy benchmark at age 67

INCOME ADEQUACY: COLA POLICY (APPLICABLE TO MEDIUM-TERM AND FULL-CAREER WORKERS)

In addition to understanding the replacement value of a plan's benefits, Medium-Term Workers should be starting to think about how long those benefits will last once they retire. That naturally leads to consideration of the cost-of-living adjustments (COLAs) applied to earned benefits for retirees to ensure that their retirement income is not devalued over time by inflation and rising expenses.

There are a variety of COLA designs and benefits offered across public retirement systems; however, the best COLAs are those guaranteed to occur and that will, at a minimum, protect members' benefits from inflation. As a result, automatic COLAs that are fixed are a gold standard policy from the perspective of a retiree drawing regular income. COLAs linked directly to inflation are good as they balance the need for inflation protection of benefits with plan sustainability and costs, but these are not as generous from the perspective of the employee. COLAs with a fixed rate below the Federal Reserve's 2% inflation target are likely to offer less value to retirees than inflation-targeted COLAs over time.

Meanwhile, COLAs linked to the funded status of a retirement plan are good policy from the perspective of plan sustainability but are less generous than any of the designs previously mentioned. Retirees may prefer the trade-offs of ensuring that their retirement plan is fully funded with slightly less inflation adjustment of benefits and, as such, they may subjectively rate such arrangements higher than the points we've ascribed below. That degree of subjectivity and balance of trade-offs is one reason the RSR avoids formal grading of retirement plans and, instead, provides scores among which users can tease out how much any one factor really matters to them to have a more subjective assessment of their retirement security.

SCORING RUBRIC:

5 points = Automatic annual COLA at a fixed rate above 2%
4 points = Automatic annual COLA linked to a measure of inflation
3 points = Automatic annual COLA at a fixed rate below 2%
2 points = Automatic annual COLA linked to plan funded status
1 point = Non-guaranteed/Ad hoc COLA
0 points = No COLA

B5. RETIREMENT BENEFITS SCORES: FLEXIBILITY AND MOBILITY

For Short-Term Workers there is more to consider than just the value of the benefits they are being provided and when they can retire, as both of those are so many years away that they are not primary concerns. Labor market mobility is an increasingly valued characteristic for younger generations. It is therefore important to also assess how a retirement plan functions as one piece in an individual's career-long retirement income saving process.

For Medium-Term Workers there is an increased focus on the value of the benefits they are being provided upon retirement, as they should be fully vested in their retirement systems and may have an option to defer their benefits until they reach normal retirement age. However, we define Medium-Term Workers as those who will or intend to leave their retirement system with between 10 and 20 years of service. This means that the flexibility and mobility of their benefits are still a key factor for consideration.

An important way that any retirement plan contributes to these paths is by allowing those who do not expect to work a full career in the same retirement plan (i.e., they leave before applying for normal or early retirement) to take with them part or all of the benefits accrued during their membership in that retirement plan. Note that in this context, by "benefit" we mean employee contributions, employer contributions, and investment returns on total contributions.

Our scoring approach is to measure the policies regarding what portion of benefits are refundable upon withdrawal from the system, and then separately (see next score in this Flexibility and Mobility category) to measure any interest rate, crediting rate, or minimum guarantee investment return rate applied to member contributions (and employer contributions, if applicable) if individuals seek a refund from their retirement system.

The specific policies being evaluated for Flexibility and Mobility will vary depending on the plan design. This means that traditional pension plans and hybrid plans will be assessed using the refunding policy and crediting interest rate provided. Meanwhile, defined contribution plans are examined based on the refunding policy as it relates to a member's access to employer contributions. Guaranteed return plans are measured based on the refunding policy and the minimum guarantee being offered for their savings.

FLEXIBILITY AND MOBILITY: REFUNDING POLICY FOR PENSION, GUARANTEED RETURN, AND HYBRID PLANS (APPLICABLE TO SHORT-TERM AND MEDIUM-TERM WORKERS)

Under federal law, any individual enrolled in a defined benefit plan (e.g., a pension plan or guaranteed return plan) is entitled to take out the money they have contributed (on a pre-tax basis) if they leave their job and do not want to become an inactive member of the retirement system. Individuals with defined contribution plans also always have access to the money they have contributed to an individual account, albeit with specific tax requirements (and assuming they have not had the investments in their account decline below the value of contributions).

What retirement plans can offer, though, is to refund departing individuals more than just member contributions. They can offer interest and/or investment returns on member contributions, a portion of employer contributions, and interest and/or investment returns on those employer contributions.

SCORING RUBRIC:

5 points = 100% of employer contributions + all employee contributions refunded with interest/returns

4 points = Share of employer contributions + all employee contributions refunded with interest

2 points = All employee contributions refunded with interest

0 points = All employee contributions refunded, without interest

FLEXIBILITY AND MOBILITY: REFUNDING POLICY FOR DEFINED CONTRIBUTION PLANS (APPLICABLE TO SHORT-TERM AND MEDIUM-TERM WORKERS)

As we noted previously, members enrolled in defined contribution plans have access to their individual retirement account balances at any point if they choose to leave their retirement plan. However, many plans still require a member to remain in their plan for a set amount of time to receive the employer contributions into their retirement account. In most cases, this translates into a graded vesting schedule whereby the member receives a portion of the employer contributions with each additional year of service up to a set point where they are "fully vested" and can depart with the total balance available from both employee and employer contributions.

To score this policy, we apply a similar scale to that we used for the Eligibility portion of the Short-Term Worker profile, but with a greater emphasis on the vesting schedule.

SCORING RUBRIC:

5 points = Immediate vesting of employer contributions
4 points = Employer contributions vest in one year or less
3 points = Graded vesting schedule of three years or less
2 points = Graded vesting schedule of four to five years
1 point = Graded vesting schedule of six to nine years
0 points = Graded vesting schedule of 10 years or more

FLEXIBILITY AND MOBILITY: CREDITING INTEREST RATE FOR PENSION AND HYBRID PLANS (APPLICABLE TO SHORT-TERM AND MEDIUM-TERM WORKERS)

The interest rate offered by a retirement system on refunded contributions in the event of a withdrawal is another key factor in determining the mobility of a plan's benefits. If the interest rate is generous, this will ensure that the employee will depart the system with at least some savings (which could then help them continue saving for retirement). However, if the system does not offer interest or offers a low interest rate, then the member will leave with minimal savings and it will be much harder to reach a secure retirement.

SCORING RUBRIC:

5 points = Crediting interest rate is 200 basis points or more (2.0% or more) above the plan's assumed rate of inflation
4 points = Crediting interest rate is 100 to 199 basis points (1.0–1.99%) above the plan's assumed rate of inflation
3 points = Crediting interest rate is equal to the plans assumed rate of inflation or up to 99 basis points (up to 0.99%) higher
2 points = Crediting interest rate is lower than the plan's inflation assumption, but higher than 0%
0 points = No credit

FLEXIBILITY AND MOBILITY: MINIMUM GUARANTEED INVESTMENT RATE FOR GUARANTEED RETURN PLANS (APPLICABLE TO SHORT-TERM AND MEDIUM-TERM WORKERS)

Guaranteed return plans differ from defined contribution plans in that they still offer a defined benefit to their members. This benefit comes in the form of the minimum investment return the plan guarantees each member's retirement account will be credited each year, regardless of whether the retirement system's investments achieve those returns. In cases when the plan's investments perform well, typically there is a policy in place that designates how much of the additional revenue is allocated to member accounts; when investment returns are poor, the guaranteed rate sets the floor for a member's gains.

The minimum rate here is essential for assessing both the value of a guaranteed return plan's benefits, but also to understand the flexibility of those benefits if a member chooses to withdraw. Higher guaranteed return rates mean a member's savings will grow more quickly and will offer more progress on the path toward a secure retirement. Meanwhile, lower return rates mean members will have less set aside should they leave. However, assessing these rates is more complicated than for the normal crediting rate, as they should be considered relative to both the plan's assumed rate of inflation and the plan's assumed investment return.

SCORING RUBRIC:

5 points = Minimum guaranteed return rate is 50 basis points or more (0.5% or more) above the plan's assumed investment rate of return

4 points = Minimum guaranteed return rate is between 150 basis points (1.5%) below and 50 basis points (0.5%) above the plan's assumed investment rate of return

3 points = Minimum guaranteed return rate is greater than the plan's assumed rate of inflation, but more than 150 basis points (1.5%) below the assumed investment rate of return

2 points = Minimum guaranteed return rate is greater than 0% but less than the plan's assumed rate of inflation

0 points = No minimum rate or a rate equal to 0%

B6. PLAN SUSTAINABILITY SCORES

It is also important to evaluate the financial security of the benefit guarantees being made to employees throughout their careers. If a plan is not sustainable or otherwise is forced to change benefits over time to address persistent underfunding, then it is impossible for public employees to feel secure in their retirement (even though nearly all public retirement benefits are constitutionally or legally protected to some degree).

From the perspective of plan members, the sustainability of a plan is rarely a primary concern. However, if a plan is not sustainable, it is possible that the benefits will be changed for new employees, while retirement ages and contribution rates can rise for current employees — essentially cutting the benefits promised. Retirement systems struggling with their funding levels are less likely to offer strong inflation adjustment of benefits and more likely to have the sponsoring state legislature raise contribution rates on existing members (perhaps alongside increasing their own contributions, which reduces available state funding for other priorities such as public employee salaries).

The Retirement Security Report is not intended to provide a comprehensive assessment of retirement plan sustainability. However, since sustainability does matter for retirement income security it is important to score a few key metrics alongside the Benefits Scores. Our approach here is to offer a few high-level ways for public workers to understand the sustainability of their plans. We keep these Sustainability Scores separate from the Benefits Scores as they ultimately do not have a direct effect, other than the looming threat of policy changes or benefit reductions, on whether the benefits promised will provide a secure retirement income. It is possible to aggregate these Sustainability Scores with Benefit Adequacy Scores, but we have not explored how they might be weighted relative to one another. We believe the separation will both allow users to easily set aside these metrics if they are only interested in the benefits side of the equation and provide important contextual information about the funded status of their plans.

Plan Sustainability Scores for pension, guaranteed return, and hybrid plans are evaluated out of a possible 27 points. Defined contribution plans, by design, do not face issues of sustainability as they cannot incur unfunded liabilities and do not guarantee any benefits beyond the immediate contributions. As a result, defined contribution plans do not have Plan Sustainability Scores.

IS THE PLAN ON A PATH TO FULL FUNDING?

While there are very few public retirement systems in any near-term (within the next 10 to 15 years) danger of becoming insolvent, it is still important for plan members to have a clear understanding of the stability behind the retirement benefits they are being guaranteed.

Defined benefit plans — whether pensions, guaranteed returns, or hybrids — not on a near-term path to full funding can carry significant unfunded liability amortization costs. This matters for active members of a retirement plan as those costs are often partially passed on to them in the form of higher contribution rates and/or reductions in future COLAs (in states where this is legal). Poor funded levels also matter for new members of a retirement plan as their future benefits are the most at risk of being affected by rising costs.

A common metric for assessing funded status is the "funded ratio" of a defined benefit plan. This metric definitely has its place in the analysis of sustainability and solvency. We have offered a detailed funded ratio analysis in other elements of our research; in particular, Equable's "State of Pensions" analysis reviews funded ratios over time and offers insights on the broader funding challenges facing public pensions.

However, funded ratios have limited uses as their snapshot effect only reflects a single point in time and does not capture many other factors that could offer signals about a plan's sustainability. Some alternative options include investment assumptions, prior year funded status, Government Accounting Standards Board (GASB) discount rate, pension debt–to–state gross domestic product (GDP) analysis, and more).

To assess the overall funding stability of retirement plans, we have opted to examine whether the plan is on a path toward full funding in the near term. We do this by asking if the plans have a significant period of time to get back to full funding or if they are losing ground with an infinite amortization period. Many plans with 25 to 30 years or longer in their amortization schedule are technically in a period of negative amortization, though with a path back to full funding feasible if their investment assumptions are realistic (note this analysis does not make a judgment call on negative amortization). Those plans that are losing ground or that have infinite amortization periods are more troubling as they do not show a clear path to where benefits can be fully guaranteed without causing strain to the underpinning guarantor of the plan (most commonly the state).

The scores for this measure are based on actuarially accepted best practices (as articulated by the Society of Actuaries Blue Ribbon Panel on Public Pension Plan Funding) for how long it should take a plan to amortize its unfunded liabilities. We assign points based on the stated amortization period in each plan's actuarial valuation report.

SCORING RUBRIC:

5 points = Amortization period of 5 years or less
4 points = Amortization period of 5 to 15 years
3 points = Amortization period of 15 to 25 years
2 points = Amortization period of 25 to 35 years
1 point = Amortization period longer than 35 years but less than infinite
0 points = Infinite amortization period or on a path to insolvency as determined by GASB67 reporting

ARE GOVERNMENT EMPLOYERS PAYING THEIR BILLS?

Retirement plans generally get funded through contributions (made by members and employers) plus investment returns on those contributions. Member contributions are typically automatically withheld from paychecks to ensure the full amount is paid in a given year. Employer contributions, however, are frequently funded at the discretion of state legislatures or the administering level of government (such as a city or school district). This can lead to issues for plan funding if the government sponsoring the retirement plan does not fully pay its actuarially determined employer contribution (ADEC).

The ADEC is a contribution rate calculated by plan actuaries who consider benefit provisions, demographics for a plan, and a wide range of assumptions about investment returns, mortality, payroll growth, and more. There is no federal set of regulations about how the ADEC is calculated, but the Government Accounting Standards Board (GASB) provides guidance that many states adopt.[8]

A natural question all plan members should want to know is whether their employer is paying the full amount determined each year by plan actuaries. To assess this question, we examine contributions made by employers relative to their respective ADEC. We recognize that budgetary pressures can arise that may prevent sponsoring governments and employers from paying their full

[8] Note that until the past few years, GASB provided guidance about the "annual required contribution," or ARC, payment. Recent guidance has slightly changed how contribution rates should be calculated and has removed the word "required" as it created some legal confusion. For the purposes of our analysis here, we will measure the ARC payments until states switch over to measuring ADEC payments.

pension bill in a given year and therefore use an approach that examines the payment of the ADEC over a 10-year period. This allows for any underpayments to be offset by later overpayment to address unfunded liabilities.

The target score in this category is 10 points, which would indicate that the state paid its ADEC in full every year. However, we use a scoring approach that allows for plans to earn bonus points in years they overpay the ADEC, while losing points when they do not pay the full ADEC. As a result, this affords plans the opportunity for their score to catch up using overpayments if there were previous years of underpayment. We limit the score here to a maximum of 10 points but also a minimum of 0 points as we do not want this metric to have an overwhelming influence on the Sustainability Scores as a whole.

We score each year using the rubric detailed below and then sum across the past 10 years (or as many years as possible).

SCORING RUBRIC:

+2 points = The ADEC was overpaid for the year (over 100% paid)
+1 point = The ADEC was paid in full for the year (100% paid)
-1 point = The ADEC was underpaid for the year (99.9% or less paid)

DOES THE RETIREMENT SYSTEM BOARD HAVE SPECIAL TOOLS TO MANAGE THROUGH TOUGH TIMES?

One element of defined benefit plan designs is the fact that the state or administering government carries the risk of plan underfunding (or, more precisely, taxpayers carry the risk of increased costs associated with underfunding). While this element of plans largely works in favor of members, as their benefits are guaranteed regardless of budgetary pressures or investment performance, funding pressures can affect the sustainability of retirement systems, lead to increased costs on active members, reduce inflation adjustments for retirees, and, in extreme cases, raise threats of insolvency.

Risk-sharing tools are ways that retirement system trustees and legislatures can distribute the gains or costs that might arise related to investment experience, contribution policies, or changes to benefits. It is particularly important for retirement systems to have these kinds of tools available to help balance the sustainability of a fund in the case of a sharp economic shock.

This strategy has proven beneficial in other contexts, such as the various Canadian retirement systems, as the shared risk creates an environment where plans are more sustainable and better funded overall. This is because plan members are more actively engaged in ensuring their plans are fully funded and sustainable — both because they have more at risk (typically through increased contributions or reduced COLAs) and because such engagement can ensure their benefits are secure.

A long-standing risk-sharing tool used by the Wisconsin Retirement System uses a variable benefit structure. The retirement system board can increase pension benefits in years where investment returns are strong and decrease them in bad times — but no further than a fixed floor. During the market increases between 2001 and 2008, benefits steadily increased. And then after the financial crisis, the retirement system board was able to maintain the overall funded status of the pension plan by slightly reducing benefits for a few years. This tool spread the risks of an economic shock across both taxpayers and retirees.

Another common risk-sharing tool is automatic contribution rate increases. A number of retirement systems have policies built in that will ratchet up contribution rates on active members and government employers if they are necessary because of changes to actuarial assumptions about mortality, adjustments to payroll growth expectations, or downturns with investments.

Guaranteed return plans inherently include risk-sharing mechanisms because there is a system for sharing investment gains above whatever rate of return is promised by the retirement plan. Hybrid plans also can be considered risk-sharing tools by default because part of the investment risk is put on taxpayers/employers (the pension portion of a benefit) and part of the investment risk is put on members (the defined contribution plan or guaranteed return plan portion of the benefit).

Other risk-sharing tools measured for this score include: automatically adjusted COLAs based on the funded status of a pension plan; and automatically adjusted COLAs based on investment returns.

As these sorts of risk-sharing policies are relatively new and can vary widely, we apply a simple scoring approach. In cases where a plan does not have any risk-sharing policies, we award the plan zero points. However, if any risk-sharing policies are in place, the plan receives two points.

SCORING RUBRIC:

2 points = The plan includes risk-sharing policies or employs a plan design with risk-sharing elements

0 points = The plan does not have any risk-sharing policies

ARE THE PLAN'S INVESTMENTS EARNING WHAT THEY SHOULD?

Retirement plans generally get funded through contributions (made by members and employers) plus investment returns on those contributions. The most important assumption that retirement system trustees (and occasionally legislatures) make with respect to ensuring long-term sustainability is the assumed rate of return on investments. When assumptions about returns are overly optimistic, the likelihood increases that the plan's actual investment earnings will fail to meet the mark, meaning that contribution rates will have to increase to make up the difference. Moreover, missed investment targets lead to losses that can result in unfunded liabilities (which can then also lead to higher contribution rates as the plan needs to catch up).

A natural question that all plan members should want to know is whether their retirement plan is earning the necessary investment revenue needed to be sustainable over the long term. Plans whose investments provide sufficient earnings to meet their designated funding assumptions will be more likely to achieve full funding and long-term stability without increasing contribution rates. Meanwhile, plans whose investments cannot consistently achieve their assumed returns are more likely to accumulate unfunded liabilities, struggle to pay down any pension debt, and generally reflect less stability.

The assumed rate of return is a long-term measure that accounts for the fact that there will be up and down years in the marketplace. As such, it is inappropriate to view a single year's return (good or bad) as a bellwether of the retirement plan's sustainability.

Similarly, looking at the 10-year average return in any one year also has limitations, as depending on the specific decade being measured, the average could fluctuate considerably as one year of good or bad returns rolls off the front end or back end of the window of time averaged. When considering multiple timeframes or when looking at an average return on a rolling period of time, averages can be useful; however, scoring such rolling averages does not fit the approach of the RSR.

To assess the investment performance of a retirement system in a way that is both intuitive and reasonable, our scoring approach looks at the last decade of returns. Specifically, we measure fiscal years 2010 to 2019 — meaning we are not including either the Great Recession or the market volatility caused by Covid-19. We look at the annual investment performance for each plan over the course of 10 years and score the plan based on the number of years in which the investment returns were able to achieve (or exceed) their assumed returns.

It is unlikely for any plan to exceed their assumed returns every year, but we have designed our scoring system to account for this and to reward overperformance. The target score here is 10 points, as that would mean that the plan's investments earned the amount it assumed (or, in the case of over- and underperformance, 10 points would mean the plan overperformed its assumption more than it underperformed). But bonus points are available for any years of strong investment performance. If a plan earned exactly its assumed return every year, it would score 10 points in this category. Using our rubric, a plan could earn up to 20 points if its return exceeded assumptions every year, but we cap the total points here at 10.

We score each of the 10 years' returns relative to the plan assumptions and then take the sum of those scores to produce the eventual score for the plan.[9]

SCORING RUBRIC:

+2 points = Investment returns in a given year were 50 basis points or more (0.5% or more) higher than the plan's assumed investment rate of return

+1 point = Investment returns in a given year were within 50 basis points (0.5%) of the plan's assumed investment rate of return in either direction

-1 point = Investment returns in a given year were 50 basis points or more (0.5% or more) lower than the plan's assumed investment rate of return

B7. EQUABLE ASSESSMENTS OF PLAN SCORES

Aside from a technical Benefit Adequacy Scores, one objective of the RSR is to provide an intuitive, approachable assessment of the benefits offered by each public retirement plan. Recognizing the subjective nature of this process, we opted for a simple, but robust, approach for our Equable Assessments for each of our worker type profiles (and retirement plans more generally, as outlined in the paper).

Plans that receive fewer than 50% of the available points receive an assessment of "do not serve workers well." This is justified because the Income Adequacy Scores comprise roughly half the available points for Retirement Benefit Scores. A plan with a low-to-medium score when it comes to adequacy could still score quite well if it employs the other policies or design features highlighted in our other metrics.

Plans that score between 50% and 75% of the available points receive an assessment of "serve workers moderately well." This assessment is intended to indicate that, from a worker's perspective, the benefit offerings from that plan are not terrible. In many cases these workers are on a path toward a secure retirement income adequacy even if other features like refunding rates and inflation adjustment are poor. In other cases, plans carry strong refunding policies and eligibility policies, but with lower Income Adequacy Scores.

Plans that score 75% or more of the available points receive an assessment of "serve workers well." This is intended to benchmark the retirement plans doing a good job at providing a path toward a secure retirement income for each of our worker profiles or that have strong policies supporting a moderate benefit.

Our upper bound measurement of assessment could be viewed as very conservative as there is a reasonable difference between scoring 23 points out of 30 and 30 out of 30. Other subjective measures might say scoring 90% or greater of available points is "excellent" or could say that this is the minimum threshold to be considered "serving workers well." The reality is that there is no perfectly objective way to draw this measurement.

What is important is that these assessments are not benchmarking plans against one another or grading on a curve. We've designed a methodological approach for scoring all plans, developed a threshold measurement of adequate retirement income, and assessed all retirement plans based on those standardized benchmarks. To the degree that any of our scoring rubrics are considered overly "harsh" in determining the number of points earned by metric, this assessment approach is more generous in its analysis of retirement plans in their entirety.

[9] It is worth pointing out that retirement systems with variable benefit designs or other risk-sharing tools are less dependent on getting their investment return assumptions correct every single year. Other sections of the RSR account for this.

Appendix C. Modeling Methodology

In this appendix we will walk through the assumptions, data, and processes we used to calculate benefits offered by each retirement plan and the 70% replacement target adequacy thresholds. In an effort to provide transparency on both of these processes, as it is the core of the RSR, we will also post the source data files and scripts (in both Stata and R) that were used to produce these benefit estimates and the target thresholds. Those files will be made available both on our website and through GitHub.

C1. DATA SOURCES

All data used in our benefit models are derived from publicly available documents published by public retirement systems. Usually, these include actuarial valuations, comprehensive annual financial reports, audited financial statements, experience studies, and member handbooks. All reasonable efforts were made to ensure that all benefit data were drawn from contemporary materials that offered information as of fiscal year 2021,[10] as that was the most recent year of complete data available for many plans (both financial and otherwise) at the time we completed our most recent update to our benefit data.

Before doing original data collection work, we first reviewed a secondary source of benefit provision data: the State and Local Employee Pension Plan (SLEPP) Database from the Urban Institute (available here). These data include 661 pension plans broken out by benefit tier and detail hire dates, occupations, and a variety of data points related to the benefits offered to members of public pensions. The data had not been updated for the past five fiscal years and were missing roughly half of the plans in our dataset, once we factored in all hybrid plans, guaranteed return plans, and defined contribution plans within our scope. We thoroughly reviewed, confirmed, and corrected the SLEPP data while going through the process of adding variables and plans to our underlying dataset.

The Equable research team then reviewed the existing plans and identified the different occupations covered by each plan. We compared these occupations against the mortality tables that would be used for our modeling and, in cases where necessary, designated new "plans" to address each occupation that would require different mortality assumptions. For example, if we initially recorded a plan covering "all employees" in our data, we assessed whether it would cover public safety personnel in addition to general employees. Because we utilize different mortality assumptions for public versus general employees, if the plan did include public safety personnel, we would separate that plan into two versions — one for general employees and one for public safety employees. This process was also repeated for public school teachers.

The final step in the data collection process involved identifying and collecting benefit data related to defined contribution plans. We note that most guaranteed return and hybrid plans were already captured in the process of building out our own internal Equable data. To identify the population of available defined contribution plans, Equable's research team reviewed the websites for each public retirement system across the country to discern whether a defined contribution plan was offered (noting that most systems that operate defined contribution plans either currently offer a pension plan or offered one in the past). This review identified a total of 57 defined contribution plans to be included in our analyses.

The end result of this process was the compilation of full benefit data for a total of 1,963 plans, with 617 tiers of benefits currently available to new hires and another 1,342 legacy plans. Broken out by plan type, there are a total of 1,769 pension plans, 57 defined contribution plans, 40 guaranteed return plans, and 97 hybrid plans in the data used to populate the RSR. However, we note that this is a reduced version of the full Equable benefit database which provides coverage across 3,150 tiers of retirement plan offerings (with 2,888 pension plans, 65 defined contribution plans, 40 guaranteed return plans, and 157 hybrid plans). Both the full Equable benefit design dataset and the reduced RSR benefit dataset are publicly available on our website (available here).

[10] Note that the majority of our benefit data reflect plan provisions as documented through the end of the 2021 fiscal year. However, several new tiers of benefits passed by their respective state legislatures only came into effect starting in the 2022 fiscal year. Those new tiers are also included in our data, despite technically being one year more recent than the majority of our data coverage.

These newly updated Equable benefit datasets reflect a significant expansion upon their initial iterations, which did not include legacy tiers of benefits or municipally administered retirement systems. The addition of legacy tiers of benefits alone accounts for 1,342 new tiers to the RSR database and an even larger number among the full Equable benefit database. The addition of the municipally administered plans accounts for another 613 benefit tiers in the RSR database. Among the legacy benefit tiers, there are 1,316 additional pension plans, two defined contribution plans, one guaranteed return plan, and 23 hybrid plans no longer offered to new hires but that can now be explored via the RSR.

The collection and subsequent organization and cleaning of these data mark a significant improvement in our, and other scholars', ability to examine the evolution of public retirement benefits. We note that the reduced version of our Equable benefit database, which populates the RSR interactive, has nearly three times as many tiers of pension benefits as were included in the SLEPP database and more than five times as many pension tiers as we included in our initial iteration of the RSR. The full Equable benefit design dataset is even more expansive. Moreover, these data reflect the same root tiers of benefits captured in the SLEPP database and our initial RSR analyses, but they were expanded to account for additions, different employment types, variable benefit provisions, corrections, and new tiers made available by the start of fiscal year 2022.

IDENTIFYING PLANS TO INCLUDE AND EXCLUDE

As outlined in the prior section, the end result of our data collection efforts produced two separate datasets: the Equable benefit design dataset and the RSR dataset. Both contain the same variables but provide coverage across a differing number of retirement plans and tiers of benefits. While the Equable benefit design dataset contains the most complete compilation of public retirement benefit provision data available to our knowledge, the RSR dataset reflects a streamlined, reduced version of those data for our modeling and analyses. The decision of which plans to include in the RSR was motivated by several factors:

- First, there was a purely technical need to reduce the number of tiers of benefits included for the sake of the online interactivity associated with the RSR. While our generalized modeling approach outlined in this appendix is able to handle all of the benefit tiers we have captured in the Equable benefit design dataset, the simple reality is that the nearly 2,000 tiers of benefits included in the RSR are already an overwhelming number of plans to sift through for even the most passionate user or public retirement advocate.

- Second, we chose to reduce the number of plans such that we could provide a clear set of different tiers of benefits that would be somewhat understandable and approachable by our audience. While some retirement systems were found to have offered dozens, and sometimes even hundreds of combinations of variable plan provisions, we opted to select those with the largest membership or that would most clearly reflect the broad variations of the benefit tiers. For instance, it would be possible for us to include all 324 of the benefit tiers we identified for the Michigan Municipal Retirement System; however, for the sake of both general clarity and the user experience, we have reduced the RSR database to only include 18 tiers of benefits, each of which varies in a significant way across one or more benefit provisions.

However, there were numerous cases where the decision to include or exclude a tier was not as simple as just looking at the variations across benefit provisions. In those cases, we used the following process for identifying which tiers should be included in the RSR:

- First, we identified whichever tiers were likely to offer the most generous benefit;[11]
- Second, we designated that we would not collapse tiers of benefits if there were variations in the benefit multiplier, normal retirement age, employee occupation or type, and Social Security enrollment status;[12]
- Third, in cases where we opted to consolidate tiers of benefits, we would drop the original class used in the prior iterations of the RSR for more detailed, updated data.
- Lastly, we chose to place less emphasis on tiers of benefits where members retired prior to 1980, as any remaining retired members of those classes have been retired for more than 40 years.

Once we narrowed our field to be included in the RSR from the initial 3,150 classes to 1,963, the next challenge was to build a naming strategy that would allow for differentiation between classes across the various benefit provisions in a way that would, hopefully, be somewhat intuitive and accessible to our audience. To this end, we developed the following typology for building out our class name designations:

- Each class name begins with a two-letter state abbreviation, followed by a retirement system abbreviation or short form (so saying CA CalPERS rather than California Public Employees' Retirement System, for instance).
- Then we list the plan designation or plan type (if it varies).
- This is followed by an identification of the member primary occupation (if it varies) and then any geographical references (if those vary).
- This is followed by a tier designation provided by the retirement system and any other modifiers identified (most commonly by the retirement systems themselves).
- Then we offer an indication of the hire date for those plans where tiers differ along those lines, Social Security enrollment status (for plans where coverage is mixed).
- Last, we offer any other information needed to further differentiate the classes (again, this is typically a reference provided by the retirement system).

The result is a class naming system that, while cumbersome in some cases, provides a clear reference to the tier being addressed without having to rely on the unique numeric identifier we use in the datasets.

As one final note, we would like to point out that the data for the RSR's Sustainability Scores are incomplete for numerous of the municipal tiers captured in the RSR database. This is because those plans were not above the $1 billion threshold in accrued liabilities when we compiled the Equable Finance Database and, as such, we do not have data recording their contributions paid, ADEC, investment returns, and more. However, we are currently endeavoring to expand the Equable Finance Database to include these additional municipal plans for our 2024 State of Pensions report and will update the RSR data accordingly once their full RSR Sustainability Scores data are complete.[13]

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[11] In this case a retirement benefit being "generous" means that we were selecting the tiers most likely to receive high scores so as to provide plans with the benefit of the doubt in our assessments. Often this would translate into identifying the tiers with the highest COLA values, highest member contribution rates, shortest vesting points, and shortest final average salary (FAS) calculation requirements.

[12] There is one exception to our decision not to collapse tiers based on the benefit multiplier— MD Montgomery County Employees' Retirement System. Here, we opted to utilize the flat 2.0% multiplier that applies to several tiers of benefits as opposed to using the variable multiplier that differs on both a member's age and their Social Security wage base. This decision was made purely on technical grounds, as our Social Security benefit estimation process occurs later in the modeling process than when benefit multipliers are applied, meaning that extraordinary effort would be required to adjust the multiplier for only this one plan.

[13] In one instance we opted to simply lump a separate benefit tier in with the broader retirement system. Plans in the Colorado Public Employees' Retirement Association are typically broken out among their respective employee divisions (state, schools, local, and Denver Public Schools). While we did not have finance data

PLAN-SPECIFIC CAVEATS

Across the total 1,963 plans, we have taken multiple steps to ensure that data were recorded consistently, including undergoing multiple rounds of review and a thorough examination of the outputs of the RSR at each stage. If any plan received abnormal outputs from our benefit modeling or scoring metrics, we returned to the source documents to verify that all data were collected properly before engaging in a review of our modeling. Any plan-specific adjustments are recorded in the Equable Benefit Data plan documentation. There are, however, five instances out of the total number of plans that are unique enough that they should be noted here:

- CA California Public Employees Retirement System Safety Risk Pool

Within CalPERS, the retirement system differentiates between the state, schools, miscellaneous, industrial, and safety risk pools. While these are distinct groupings of employees by occupation, the safety risk pool is largely duplicative of the state risk pool in terms of the tiers being offered. Specifically, the classes have near-perfect overlap in terms of the specific benefit provisions. However, the inclusion of the safety risk pool would also have required additional layers of complexity in both data organization and modeling adjustments that we deemed unnecessary for capturing the overall quality of benefits offered by CalPERS as, again, the benefit provisions for the classes included in the state pool are almost identical to those in the safety risk pool.

- CA Marin County South Marin Fire Tier 1 and Marin County Courts Tier 1

Both tiers of benefits offered in Marin County California required some minor adjustments on our part due to insufficient data reporting in their publicly available plan documents. Specifically, we were forced to modify both the member and employer normal cost contribution rates for both tiers to reflect those rates for Tier 2. This adjustment was due to the fact that there are no active members in either of these legacy tiers and, as such, contribution rates for those tiers are not included in the Marin County Employees' Retirement System actuarial valuation reports.

- Florida Retirement System — Teachers "Plan E"

Within FRS, there have been 23 classes of benefits offered to public employees in the state. Of those, eight legacy classes were offered prior to the current lineup of benefits for different classifications of employees. One of the legacy classes is a teacher plan that existed before the creation of FRS. Specifically, the Florida Teachers' Retirement System was established in 1939, merging into FRS in December 1970. This old Teachers' Retirement System covered teachers, employees of professional non-profit teachers' associations, county superintendents, state Department of Education employees, and staff who ran the pension fund. The retirement plan is now classified within FRS as "Teachers Plan E (no Social Security)" in the 2021 member handbook.

As of this writing, there are only five active members still enrolled in FRS Teachers Plan E (which stopped adding members at the end of 1970). Based on our usual rules of incorporating plans into FRS, we would have kept this in the dataset. However, there are few plan documents available that provide sufficient detail of the various benefit provisions necessary for us to accurately offer an assessment for the RSR (even after reviewing member handbooks and actuarial valuations). As such, we have opted to omit FRS Teachers Plan E from the RSR.

- **Pennsylvania Municipal Employees Retirement System — All 12 PA Muni Classes**

The Pennsylvania Municipal Employees Retirement System is a collection of municipally managed plans administered by the state of Pennsylvania. Participating municipalities hire employees and offer them retirement benefits with varying benefit provisions but, ultimately, those benefits are administered by the state's municipal retirement system. The result of this tricky configuration is that the benefits afforded to these municipal employees can vary from city to city, despite being under the umbrella of the statewide system.

From a benefit modeling and assessment perspective, this is an insurmountable challenge as the number of permutations of benefit offerings would result in needing to assess hundreds, if not thousands, of different benefit offerings. This challenge is complicated

for the CO PERA State Troopers at the time of compiling the 2023 RSR update, we opted to report the Sustainability Scores data for CO PERA State General in place of the State Troopers division, as all of the CO PERA divisions tend to correlate highly in terms of their broader fiscal health and contribution behavior.

even further by the fact that PA Municipal Retirement System's publicly available documentation is both incomplete in disclosing benefit provisions and several years behind in publishing actuarial valuations and annual comprehensive financial reports.

To resolve this issue, we have, unfortunately, been forced to refrain from modeling the benefits offered by PA Municipal Retirement System. There are 12 classes currently listed in the RSR that detail some of the broad differences in plan offerings (specifically highlighting how different plan types are available) for employees both enrolled and not enrolled in Social Security.

- **Oregon Public Employees Retirement System — Tier 1, Tier 2, and OPSRP**

The Oregon Public Employees Retirement System is unique in one clear way: the introduction of their Individual Account Program (IAP) in 2004. The IAP is a defined contribution plan added to all pre-existing tiers of benefits, effectively transforming Tiers 1 and 2 into hybrid plans. While the OPSRP has been a hybrid plan featuring the IAP since its introduction, Tiers 1 and 2 were originally stand-alone pensions. The introduction of the IAP brought a redirection of 3.5% of members' 6.0% total contributions to these new DC accounts.

While both Tier 1 and 2 members were pushed into participation in the IAP, the issue for the RSR is that the two tiers are largely indistinguishable once the IAP is accounted for. Moreover, applying the IAP changes to both tiers prevents any sort of comparison between the legacy pension benefits and the OPSRP hybrid plan. As such, we have made an independent decision to only apply the IAP to Tier 2, leaving Tier 1 as a pure pension plan. This decision was motivated both to improve the illustrative power of the RSR and because Tier 1 was phased out on December 31, 1995, meaning that it had been closed for nearly a decade before the IAP was introduced.

C2. MAJOR OVERARCHING ASSUMPTIONS

With our benefit data in hand, the next challenge was to identify the areas where we would need to make assumptions to build a benefit model that could be generalizable across each plan design and context. The simplifying assumptions we identified are as follows:

- We assume all plan members to be new female entrants who start eligible work under their retirement plan at either age 25 or 40.
  - This decision was made to reduce the variation in mortality rates required to estimate plan benefits.

- We assume all entrants will start their positions at the average salary for 25- and 40-year-old plan members with zero years of service as reported in plan actuarial valuation reports.
  - In cases where average salary data were not reported in actuarial valuation reports, we utilized external data. For instance, Florida Retirement System lists very few teachers in their member data, such that we have reason to question the accuracies of the salaries being reported. To address this, average starting salary data were located and obtained from the Florida Department of Education website.

- We assume all salary increases will follow the accrual paths assumed by each respective retirement system as reported in their actuarial valuation reports.
  - We recognize that the experience of each member will likely differ from those set forth in the valuation reports; however, in the absence of more accurate applied data recording the merit and wage inflation increases in each retirement system, we rely on the same data the plan actuaries use when estimating plan liabilities and contribution rates.

- We assume that all members will not utilize any early retirement options. Instead, members will work until reaching eligibility for unreduced normal retirement.
  - This decision was made to simplify the calculation of benefit values, as early retirement reductions can add numerous layers of complexity to those calculations. Future iterations of the RSR may feature the addition of early retirement to provide more accurate benefit estimates.

- For pension, guaranteed return, and hybrid plans, this means that members are modeled as reaching normal retirement eligibility. We note, however, that for these plan types, we perform our adequacy assessments for Full-Career Workers at age 67, regardless of what the tier-specific normal retirement age is. For defined contribution plans, we assume members will work until age 67, the age at which one can claim an unreduced benefit from Social Security.

While there are other minor assumptions made in our modeling, these are the largest, most impactful decisions made at the front end of the process. Each additional assumption or generalization will be explained as we move forward.

C3. MORTALITY RATES

One necessary component to our benefit modeling beyond the benefit data described above are the mortality rates for public employees. While retirement systems vary widely in terms of the mortality assumptions they draw upon for their valuations, we opted to identify a single set of mortality rates for the RSR. After consulting with multiple actuaries and several other subject experts, we were directed to use the PUB-2010 mortality rates, as they reflected what the actuaries believed to be the most accurate current rates.

As of the update in late 2023, we found that the PUB-2010 rates remain the most current set of overarching mortality rates available from the Society of Actuaries. We note that there are numerous proposed methodologies that would allow the PUB-2010 rates to be modified in order to be more current, but also found those adjustments were not in widespread use by retirement systems and, as such, did not warrant use for the RSR.

As a result, we compiled the PUB-2010 rates for three different classes of public employees — General, Teachers, and Public Safety. We collected the rates for new female entrants for each of these three groups and then designated which occupations would fall into each mortality category.

These mortality rate data were then used to calculate survival rates and life expectancies that could then be applied to our models. For more detail on how these were calculated, please contact the authors.

C4. PENSION PLAN BENEFIT MODELING

With our mortality rates, benefit data, and assumptions in place, it was possible to estimate the net present value of benefits for each pension plan in the RSR. This process utilized the following steps:

1. We began by calculating an adjusted survival probability that applies each plan's respective discount rate. This was then converted into an annuity factor that accounts for the COLA and allows for an accurate adjustment to the estimated pension wealth that results from the simple pension benefit formula.
    - Note that these adjustments included the application of different formulas depending on whether the COLA offered by the plan is a simple COLA (that adjusts benefits based on the initial value of the pension at retirement) or a compounding COLA (that adjusts benefits based on the value of the pension in the prior year).

2. After calculating the annuity factor, we estimated the value of employee and employer contributions over the course of a member's full career from age 25/40 up to age 70 using the reported fiscal 2022 or 2023 member and employer normal cost contribution rates (pending data availability) and each year's estimated salary.

- It was at this point that we applied any limits that would define the maximum pensionable salary. In cases where the maximum pensionable salary is defined by the plan, we apply that limit. In cases where there is no limit, we apply the $265,000 cap designated by the IRS.[14]

3. From this point, we calculated the final average salaries (FAS) for each plan using the benefit formulas provided by the valuation reports. In cases where a non-integer number of years was applied, we rounded the value up to the next year.
    - For instance, if the FAS formula averages the last 30 months (2.5 years), we round that up to 3 years. This decision is entirely driven by the annual nature of the salary data that made it overly complex to correctly estimate partial-year FAS values for the relatively few plans that do not use whole-year totals in their FAS formulas.

4. Then we calculated the simple pension wealth using the benefit formulas defined in each respective pension plan's actuarial valuation reports. Note that we did include adjustments to account for plans that employ several multipliers that vary by years of service.
    - Note that we do account for variable multipliers, both those that differ by years of service as well as between retroactive and additive components, using special scripting for the plans where these issues arise. A listing of the classes that required special adjustments is provided in the "Specific Plan Modeling Adjustments" section below.

5. Using the simple pension wealth and the annuity factors, we then calculated pension benefits that account for mortality assumptions, discount rates, and COLAs.
    - Note that pension wealth is also adjusted at this point to provide the greater value of either: 1) employee contributions plus the crediting interest rate; or 2) the net adjusted pension wealth.
    - The final adjustment is for the composite pension wealth measure for inflation, such that each year's value reflects the true net pension value accounting for all other confounding factors.

For a more detailed breakdown of the formulas used to calculate each step of this process, please reference either the scripts that compile these data or contact the authors for additional details.

We note that numerous plans required specific modeling adjustments to account for specific variable plan provisions ranging from employee and employer contribution rates to multipliers to crediting interest rates to combinations of all of the above. Please see the "Specific Plan Modeling Adjustments" section below for more details.

DEFINED CONTRIBUTION PLAN BENEFIT MODELING

For defined contribution plans, the process involves calculating both employer and employee contributions and then applying a base interest rate assumption for how quickly those combined totals will grow from year to year. For these plans, we assume the DC benefits will accumulate interest equal to the retirement system's assumed rate of investment returns for a related pension plan,

[14] IRS Defined Benefit Pensionable Salary Cap: The IRS puts a cap on the amount of salary that can be used in the calculation of a defined benefit pension. For the calendar year 2002 this amount was $160,000. For the calendar year 2021, this amount was $230,000. The IRS periodically adjusts this number up to account for inflation. While there is no strict cost-of-living adjustment, over the past two decades, on average the cap has been moved up 1.5% a year, always in $5,000 increments. Since the growth in the cap at 1.5% a year is sometimes less than $5,000, the IRS doesn't always adjust the cap every year. For the purposes of the RSR modeling, we projected growth in the IRS-defined benefit limit to pensionable compensation using a 1.5% annual inflation adjustment, but we didn't attempt to keep the steps to just $5,000 increments. The net effect is that the cap grows at about 30% every two decades. This adjustment ensures that as our model projects the growth in salary for a new entrant over the next 35+ years that we don't overestimate the size of their future benefit. States have various approaches to how they deal with highly compensated employees who reach this threshold, but since our model is looking at an average employee, we do not need to account for them.

minus 50 basis points (0.50%) under the assumption that DC plans do not enjoy the same institutional advantages as the broader retirement system when it comes to managing the investments to maximize gains.[15]

For each year, the defined contribution plan wealth is equal to the employer and employee contributions plus the prior year's benefit wealth multiplied by the interest assumption.

GUARANTEED RETURN PLAN BENEFIT MODELING

While guaranteed return plans are a type of defined benefit plan, the process to estimate their benefits for the purposes of the RSR is far more akin to that of defined contribution plans than pension plans. To estimate GR benefits, we use the same process as for DC plans, but with a few minor modifications.

For GR plans, we use the guaranteed rate of investment return offered by the plan with a minor adjustment to account for each plan's investment upside sharing policies. Specifically, we assume the GR plans will earn the retirement system's assumed rate of investment return and then calculate the upside share beyond the base guaranteed rate. In cases where the upside is clearly defined at a fixed rate, we simply calculate the fixed amount that would be added to the base rate and apply that as the interest rate for the benefit calculation (for example, a plan that guarantees a 4% return with 2/3 upside share and that assumes a 7% return will yield a 6% return for the purposes of modeling GR benefit accumulation). In cases where gain sharing policies are variable or determined by a board of trustees, we assume there will be a 3/4 share on the upside returns, and then we apply that to the same methodology approach for fixed gain sharing rates.

HYBRID PLAN BENEFIT MODELING

Hybrid models are, by definition, a combination of a defined benefit plan (typically a pension) and either a defined contribution plan or a guaranteed return plan. To model these plan benefits, we simply apply the methodologies outlined in the preceding pages for each respective plan type and then sum them at the end to give a total benefit value prior to adjusting for inflation.

We note that as of the 2023 update, we have included the Memphis Hybrid General Plan and Memphis Hybrid Police and Fire Plan, which are both hybrid plans that combine defined contribution and guaranteed return plan components. To our knowledge these are the only plans that combine these two plan designs in their hybrid structure and, as such, they required adjustments to how we organized our data structure. Ultimately, however, the approach to modeling each of the separate components follows the same process as we have applied for other defined contribution plans and guaranteed return plans. Additionally, the approach we employ to combine the benefits from each of the separate components for the total hybrid plan benefit value also uses the same procedures as other hybrid plans.

JUDGE PLAN MODELING ADJUSTMENTS

In addition to the plan-specific adjustments outlined in the next section, we reviewed the data and plan provisions surrounding most of the 74 judge plans included in the RSR database. The challenge related to these plans, in addition to several abnormal benefit provisions, stemmed from the fact that our modeling approach focuses primarily on examinations of a 25-year-old entrant and a 40-year-old entrant. For judge plans, however, there are seldom, if ever, cases where someone as young as 25 would be appointed or elected to the bench since many judges serve long terms or even lifetime appointments.

[15] For example, Michigan Public School Employees' Retirement System's defined contribution plan is assumed to earn a 5.5% return over time, 50 basis points below the 6% assumed rate of return for the Pension Plus 2 plan managed by the same retirement system. All public sector DC plans in our dataset are optional and related to active pension plans or hybrid plans with the exception of plans in Alaska, Arizona, and Oklahoma. For each of these exceptions, there is a legacy pension plan from which we derive the comparative assumed rate of return.

To address this, we have modified our approach to remove all examinations of 25-year-old entrants for judge plans, as they would invariably show disproportionately better benefits than other plans while also reflecting an unrealistic scenario. These would have biased aggregate assessments or otherwise would have required omission from our analyses. However, with the omission of 25-year-old entrant profiles for judge plans, it is now possible to include the judge plans in our analyses without concern that they will artificially outperform all other benefits offered.

PLAN-SPECIFIC MODELING ADJUSTMENTS

As noted previously, several tiers of benefits feature unique plan provisions that required special attention in our modeling. Specifically, while our generalized models are applicable to most tiers of benefits offered, we needed to adjust the outputs of the models at different stages to ensure that these tiers of benefits are accurately reflected.

The list of plans that we compiled special code to address includes the following (and the specific adjustments):

Class Name	Adjustment Required
AR PERS General Assembly	Dropped from analysis due to missing data.
AZ CORP Tier 1 (2 classes)	Adjusted member contributions to reflect variation by years of service.
AZ CORP Tier 2 (2 classes)	Adjusted crediting interest to reflect five-year treasury rate.
AZ EORP Tier 2	Adjusted crediting interest to reflect five-year treasury rate.
AZ PSPRS Tier 1 (8 classes)	Adjusted member contributions to reflect variation by years of service.
AZ PSPRS Tier 2 (4 classes)	Adjusted crediting interest to reflect five-year treasury rate.
CA CalPERS Industrial Tier 1 (4 classes)	Adjusted multiplier to reflect age and career factors.
CA CalPERS Misc Tier 1 (4 classes)	Adjusted multiplier to reflect age and career factors.
CA CalPERS Schools All Classes (4 classes)	Adjusted multiplier to reflect age and career factors.
CA CalPERS State and Local Industrial Tier 1 (2 classes)	Adjusted multiplier to reflect age and career factors.
CA CalPERS State and Local Misc Tier 1 (2 classes)	Adjusted multiplier to reflect age and career factors.
CA CalSTRS Classic 2% at 60	Adjusted multiplier to reflect age and career factors.
CA CalSTRS PEPRA 2% at 62	Adjusted multiplier to reflect age and career factors.
CA JRF 1	No multiplier, members receive a fixed 75% of last judicial office held pay.
CA LA City Police & Fire Tier 2 (2 classes)	Adjusted multiplier for mixed retroactive and additive multipliers.
CA LA County General (6 classes)	Adjusted replacement rates to reflect age factors.
CA LA County Safety (2 classes)	Adjusted multiplier for service over age 55.
CA LA County Safety Plan C	Adjusted replacement rates to reflect age factors.
CA San Francisco City & County Police & Fire	Flat 55% replacement up to 25 years of service, with an additive 4.0% per year afterward.
GA ERS Pension Judges (2 classes)	No multiplier, members receive a fixed 75% of last judicial office held pay.
KY TRS K–12 Pre-2008	Adjusted multiplier for mixed retroactive and additive multipliers.
MD SPRS Judges (2 classes)	No multiplier, members receive a fixed 66.67% of last judicial office held pay.
MO DOT (4 classes)	Adjusted crediting interest to be 0% as members do not make contributions.
NH RS General (4 classes)	Adjusted for variable multiplier based on age, not years of service.
NJ PERS Judges (2 classes)	No multiplier, members receive a fixed 75% of last judicial office held pay.
NJ PFRS Tiers (6 classes)	Adjusted multiplier for mixed retroactive and additive multipliers.
NY NYC General Tier 4 (5 classes)	Adjusted multiplier for mixed retroactive and additive multipliers.
NY NYC General Tier 6 (4 classes)	Member contributions vary by salary.
NY NYC General Tier 6 (2 additional classes)	Member contributions vary by salary. Also adjusted multiplier for mixed retroactive and additive multipliers.
NY NYC Teachers Tier 3	Adjusted multiplier for mixed retroactive and additive multipliers.
NY NYC Teachers Tier 4	Adjusted multiplier for mixed retroactive and additive multipliers.
NY NYC Teachers Tier 6	Member contributions vary by salary.
NY SLRS ERS Tier 6	Adjusted multiplier for mixed retroactive and additive multipliers.
NY SLRS ERS Tiers 3, 4, and 5 (5 Classes)	Adjusted multiplier for mixed retroactive and additive multipliers.
NY STRS Tier 6	Member contributions vary by salary. Also adjusted for mixed retroactive and additive multipliers.
NY STRS Tiers 1, 4, and 5 (3 classes)	Adjusted multiplier for mixed retroactive and additive multipliers.
NYC Ed Board (10 classes)	Adjusted multiplier for mixed retroactive and additive multipliers.
OH STRS All Classes (7 classes)	Adjusted crediting interest rate and member contributions to reflect variable withdrawal provision.

OH STRS Pre-2015	Adjusted crediting interest rate and member contributions to reflect variable withdrawal provision. Also adjusted replacement rate to reflect variable additive multiplier.
RI Providence Police (2 classes)	Adjusted multiplier for mixed retroactive and additive multipliers.
TX ERS All GR Classes (6 classes)	Applied employer match to GR accounts at normal retirement age.
TX LECOS All GR Classes (2 classes)	Applied employer match to GR accounts at normal retirement age.
UT RS Tier 2 Hybrid (8 classes)	Adjusted employer DC contribution rates to assumed 1.5%.

C5. NET PRESENT VALUE BENEFIT ESTIMATES

The result of the processes outlined in this section are a set of benefit adjustments unique to each of the 1,963 plans included in the RSR. Each plan's benefit estimates reflect the plan's benefit policies, plan assumptions, mortality assumptions, COLAs, and inflation adjustments to provide the most accurate benefit estimate currently available. We note that these generalized model results can be adjusted further using more pointed data provided by retirement systems or including additional features as needed; however, as those added refinements were not necessary for the RSR, we utilize this streamlined approach.

ANNUITIZATION

The result of our benefit models is a set of net present value estimates for each retirement plan included in the RSR. However, net present value is not an intuitive measure, both because it reports the total value of the benefit (which can often be large numbers that might raise suspicion) and because net present value can decline after a member reaches normal retirement — as the number of years of potential benefit payments declines so, too, can the value of the benefit. In fact, this is the case for 1,072 classes of benefits in our data where the net present value of benefit is lower at age 67 (when we score the value of benefits relative to our 70% replacement target) than they would be at normal retirement (as defined by plan provisions).

To address any concerns over the use of net present value and to translate estimated benefits into a more intuitive measure, we apply a standard annuitization process to produce what the estimated annual benefit would be for each plan. While pensions are, by definition, an annuity, guaranteed return plans, hybrid plans, and defined contribution plans are not as easily understood. With this in mind, we take the estimated net present value for each plan and apply the same annuitization transformation to avoid any potential plan design bias.

To calculate the annuitized benefit, we assume all plans buy into an annuity that has a 3.6% growth parameter and then we calculate an annuitization rate that varies from plan to plan based on their own inflation assumption. We assume all plans will provide annuitized benefits until age 86 but adjust the total number of annual payments made by each plan's normal retirement age.

For example, Alabama Employees Retirement System Regular State Employees Tier 1 is the first plan in our data, sorted alphabetically. The estimated net present value of benefits for the plan at age 50, the normal retirement age for a 25-year-old entrant, is $344,018.60. To annuitize this total, we multiply that by the annuitization rate (which includes the plan's 2.75% inflation rate assumption) and then annuitize it over 36 years. The result is an estimated annuitized benefit of $11,571.15 at age 50.[16]

REPLACEMENT RATES

Once we have calculated an annuitized benefit value, we then convert it into a replacement rate using an inflation-adjusted, calculated final average salary (or inflation-adjusted final salary at age 67 for defined contribution plans).

[16] We note that in many cases the value of a retirement benefit will continue to grow in the years beyond normal retirement. For our analyses, we allow the value of benefits to continue to grow beyond normal retirement age. With this in mind, the value of benefits for AL ERS Regular State Tier 1 continues to grow all the way through age 70, meaning that members who remain will continue to get a better benefit if they work long past normal retirement. In cases where the value of a benefit begins to decline, we hold it constant at its peak value for all later years as we assume members will leave with the maximum possible benefit.

In the case of Alabama ERS Regular State Tier 1, the $11,571.15 annual annuitized benefit at age 50 would be divided by the inflation-adjusted FAS at age 67, which totals $61,112.40. This then is translated into an 18.93% replacement rate from the benefit at normal retirement age, but the benefit does continue to grow if the member remains past their earliest normal retirement age. While this value may seem low, we note that at this point we do not account for the value of Social Security income, which will reduce the 70% replacement target at age 67 as outlined in the following sections.

As one last point on annuitization, we note that the net present value of benefits for a plan can, and frequently does, decline in the years following normal retirement eligibility. This is the result of several factors, most notably any remaining expected salary increases, the value of any COLA, and the number of payments the member is expected to receive. However, unlike the net present value of a benefit, an annuitized benefit cannot decrease. Annuities represent guaranteed annual income purchased from a third party (or provided by a retirement system). As such, as part of our annuitization, we check to see whether the value of the annuitized net present value will decline from year to year. In the event the annuitized value is expected to decline, we instead replace that value with the maximum observed value to that point. In practical terms, this freezes benefits at their highest possible value and holds them there until reaching age 67, at which point the maximum value of a plan's benefits can then be compared against our replacement rate target.

OTHER MODELING CONSIDERATIONS

Our approach to scoring full-career adequacy at age 67 is past the normal retirement age for many of the plans in the RSR. In cases where the value of the benefit might decline following normal retirement as noted above, we hold the value of the benefit fixed at its maximum estimated value. In cases where the value of the benefit will continue to accrue with additional years of service (either through continued salary increases or additional years of service applied to the benefit formula), we allow those benefits to continue to increase through age 67. This, if anything, offers an even more favorable assessment of many plans than they might receive if we were to assess their benefit offerings relative to a 70% replacement target at normal retirement age.

This is especially relevant for some public safety plans designed with younger retirement ages such that members do not have to work past ages 50, 55, or 57, which would be very early compared to other plans. While we use age 67 for the scoring of Full-Career Workers, we adjust for the potential loss of benefit value using the approach outlined above. Specifically, once a member reaches normal retirement age, we estimate a recursive process for the annuitized value such that if the value were to decline from one year to the next, we instead report the prior year's value. This essentially forces a plateau of annuitized benefit value (and replacement rates) as we assume that all plan members will claim the highest possible value of their benefits for the sake of measuring their adequacy.

At no point in the estimation of benefits or annuitization of those estimates do we include adjustments for Social Security income or any potential prior personal savings (in the case of 40-year-old entrants). To account for those, we adjust the adequacy target threshold as outlined in the next section.

We engaged in thorough review of these estimates that included multiple rounds of peer review with both actuaries and quantitative retirement experts with other research institutions. In each case, we solicited feedback regarding the simplifying assumptions we had adopted as well as the basic mathematical approaches we applied to modeling benefits. After receiving their feedback, we adjusted our methodology accordingly to ensure that our models would provide a clear, unbiased, objective estimate of the benefits offered by each plan.

We also engaged in several rounds of sensitivity analyses and stress-testing to explore the potential implications for any changes to our modeling or broader methodology. For additional information regarding the specifics of these robustness checks, please contact the authors.

C6. MODELING SOCIAL SECURITY BENEFITS

As documented in the "Social Security and Adequacy" section in Appendix A, Social Security income typically provides up to 40% replacement rate on average career income, and between 20% to 33% replacement of income in the few years before retirement. In the iterations of the Retirement Security Report prior to our 2023 update, we assumed that Social Security would provide a fixed 33% replacement rate that we subtracted from the 70% replacement rate target. In essence, this meant that any plan where members are also enrolled in Social Security was reaching for a 37% replacement rate at age 67, with each prior year reflecting a reduced straight-line path toward that point.

However, we recognized that assuming a fixed Social Security replacement rate was a shortcoming in our approach as, in practice, the actual share of pre-retirement income replaced by Social Security will not only depend on how that income is defined (e.g., average of final five years versus career average) but also on the income level of the household or individual being considered. Social Security could conceivably replace 67% of the career income for someone averaging $20,000 a year, or as little as 20% or 30% replacement for someone with a $100,000 career average.

To address these concerns about the variable nature of Social Security, we have built a simplified model that estimates the value of an individual's Social Security benefits following the definitions outlined by the Social Security Administration (SSA). Specifically, this translates into a benefit model that assumes an individual begins Social Security–eligible employment at age 20 and then calculates the total Social Security–eligible wages using the estimated salary accrual scale as assumed by the retirement systems.

However, modeling Social Security benefits comes with several challenges that need to be addressed. First, we note that Social Security benefits are calculated based on Social Security–eligible wages, which differ from the raw salary an individual receives. Specifically, Social Security–eligible wages are determined using a rolling 35-year average salary, which is intended to capture an individual's career earnings. But because our benefit models operate on the base assumption of a 25-year-old female entrant, we technically do not have an individual's wages from their employment prior to starting their career under each given retirement system. To resolve this issue, we assume the salary for the prior employment is equal to half of the starting wage for the new career. This decision is based on the assumption that employment by individuals from ages 20 to 25 would likely be part-time or would otherwise entail less established positions that an individual would willingly leave for their new employment as covered by the retirement system.[17]

Once we have calculated the Social Security–eligible wages, we calculate an individual's Social Security benefit using the 90%, 32%, and 15% bend points used by the Social Security Administration to gauge how much of an individual's Social Security–eligible wages would be covered. The bend points are current as of fiscal year 2023, the time of the most recent update, but they are adjusted for each year moving forward, as we are modeling the benefits as if members were joining each retirement system today. To roll the bend points forward, we assume that each value will increase at 1.14% per year, which is the growth assumption identified by Social Security for their funding projections.[18]

Once Social Security benefits are calculated using the bend points, we then translate those estimated benefits into a replacement rate provided by Social Security benefits for each year of an individual's career using the final average salary target we calculate for the plan's final replacement rate. While this differs slightly from how Social Security defines an individual's final pre-retirement income for the sake of determining a replacement rate (as they use their rolling 35-year average), this suits our needs as it gives a replacement rate directly comparable to our benefit estimates. In turn, we are able to adjust our replacement target threshold.

C7. ACCOUNTING FOR SOCIAL SECURITY WHERE RELEVANT

As outlined in the prior section, we have updated our methodology to model each member's Social Security benefit value and replacement rate as opposed to assuming a fixed replacement rate, as we did in prior iterations of the RSR. We note that this rate is

[17] For 40-year-old entrants, this is further complicated as an individual making the change to a public position at that age would have more than a part-time job or other work from their early twenties to start their wage rate. To address this challenge, we assume they have the same SSA benefits as a 25-year-old entrant up to that point and then further adjust our estimation using starting benefits as described in the "Adjusting for Starting Personal Savings" section below.
[18] We also apply the same growth adjustment to the maximum eligible wages for Social Security benefits, which start at $160,200 per year as of fiscal year 2023. However, it is important to note that this maximum value seldom ever reduces the benefit estimates, as public employee salaries typically do not get that high.

variable both across plans and over time within the same plan; however, we also identified several cases where our Social Security model was estimating that the benefit would provide replacement rates north of 50%, 60%, and, in some instances, even more than 70%.

While it is possible that Social Security may provide a benefit in some instances that might replace a more significant share of an individual's pre-retirement income, we felt the RSR would be an unfair assessment of the quality of retirement systems where we allow the estimated Social Security replacement rate to operate without some boundaries. In essence, in cases where our Social Security model estimated that the program's benefits would provide a replacement rate above 70%, that would mean that any retirement benefits offered by the state or municipal retirement system would always be deemed in excess of the replacement rate target. This posed a problem for the RSR as those plans would have received artificially inflated scores when we know that Social Security is unlikely to replace that much of an individual's pre-retirement income. As such, we applied an artificial cap to the Social Security benefit estimate such that it can only replace a maximum of 50% of an individual's pre-retirement income. In these cases, the benefit target for the retirement system would only need to reach a 20% replacement rate target by age 67.

One result of our updated Social Security modeling approach is that the replacement rate target will vary from plan to plan according to the Social Security enrollment status of plan members. In cases where members are NOT enrolled in Social Security, we examine to see whether the retirement system offers benefits sufficient to reach a 70% replacement rate. However, in cases where members are enrolled in Social Security, the target replacement rate that retirement systems would need to reach is the initial 70% replacement rate adequacy target minus the estimated replacement rate from Social Security. As a result, those plans operate with a reduced replacement rate target for their benefits, with a lower bound of 20% as detailed previously. We apply this approach regardless of whether the state retirement plan is a pension plan, defined contribution plan, hybrid plan, or guaranteed return plan.

Obviously, different replacement rate targets will have larger or smaller demands on state and municipal retirement systems to make up the gap above Social Security. Many retirement plans assume that an individual is providing their own savings to make up this gap — though for the purposes of our scoring, we are not factoring in any personal savings, except when considering 40-year-old entrants to the retirement system. To provide a more thorough assessment of retirement benefits, we examine the adequacy of benefits for both 25-year-old and 40-year-old entrants. In the case of 40-year-old entrants, we assume they have prior retirement savings that further augment the final replacement target for our adequacy threshold through a process described in the "Adjusting for Starting Personal Savings" section below.

C8. MODELING LEGACY PLANS

One additional note of explanation regarding our modeling relates to how we handle legacy plans. Although these plans are no longer available to newly hired public employees, modeling their estimated retirement benefits for assessment in the RSR is both useful and informative. By including these plans, we are able to examine the evolution of retirement benefits within a given retirement system over time. This does introduce a few added technical considerations but generally does not complicate significantly the RSR.

Among these considerations are the differences in salaries, retention, mortality, and inflation — each of which would have a sizable impact on the value of the benefits being offered by each tier of benefits. To address these challenges, we have adopted an approach toward modeling legacy plans that allows us to disregard those differences. Because we are aiming to maximize comparability of the benefits and assessments within a given retirement system, we model legacy plans as though they were still open and available to new hires. As such, we model their estimated benefits using the same starting salaries, salary merit increase scales, and mortality assumptions that we use for the plans currently available. This ensures that the only differences in the results between the legacy and current tiers are from changes to the benefit provisions.

C9. MODELING RETIREMENT BENEFIT ADEQUACY

Beyond modeling the estimated retirement benefits for each of the plans included in the RSR, the next looming task was to generate an estimated benchmark to compare plans against. However, this is challenging for both technical and non-technical reasons.

On a technical front, the question of what a reasonable accrual path that would reach our 70% replacement rate target at age 67 is not an easy one. We explored numerous options, ranging from using types of defined contribution accrual models with varying assumed returns on benefits to adopting the straight-line accrual method we ultimately opted for. In each of our prior approaches, efforts to incorporate interest accruals into the accumulation of the adequacy target made the overall assessment of the benefits offered by each plan overly sensitive to whatever we assumed for interest rate for the adequacy line. When we reached a 0% estimated interest (which is wholly unrealistic), we recognized the better technical approach was to simply estimate a straight line from a starting point of 0% replacement at the start of the member's career to the end target, which itself was quite variable depending on whether we were adjusting for Social Security income or personal savings prior to a member's entry, as is the case for 40-year-old entrants.

On a more practical front, we identified that any effort to build a threshold that included an interest component to the adequacy benchmark would ultimately result in favoritism toward a particular plan design. Given that we want to offer an objective assessment of each plan's benefits, regardless of the underlying plan design, we opted to take an approach that does not account for interest.

As a result of these considerations, the adequacy benchmark used for scoring Short-Term and Medium-Term Workers during their careers reflects a somewhat unrealistic target, as it is unlikely that a plan will provide benefits sufficient to keep pace with the benchmark. However, the benchmark we use offers a truly objective, intuitive measure that all plans can be compared against regardless of plan design, policies, or other considerations.

BUILDING THE BENCHMARK

The process by which we calculate our 70% replacement target benchmark is relatively straightforward and simple, especially when considered against the complexity of the benefit modeling. For any given plan, we begin this process by calculating the inflation-adjusted final average salary at age 67 (or inflation-adjusted final salary in the case of defined contribution plans) and then multiply that total by 0.7. The result of this process is a replacement rate target in inflation-adjusted dollars against which the annuitized benefit totals can be compared.

Once we have our final replacement target, the next challenge is to calculate the accrual curve that will take a member from 0% at entry age to 70% at age 67. This is done by simply breaking the final average salary/replacement rate into equal pieces depending on entry age, which works out to 42 equal steps for 25-year-old entrants or 27 equal steps for 40-year-old entrants.

This process becomes complicated, however, by the need to adjust for Social Security and starting personal savings, as in the case of 40-year-old entrants. The process by which we address each of these items is detailed below.

ADJUSTING FOR SOCIAL SECURITY

For the members of retirement systems NOT enrolled in Social Security, there is no need to adjust their adequacy accrual beyond the steps outlined above. In those cases, it is up to their retirement plan to provide benefits that would reach a target replacement rate of 70% for a secure retirement income.

However, for those enrolled in Social Security, we need to adjust our expectations for the benefits that will be provided by their retirement plan. As stated previously, we estimate the Social Security income and replacement rate of final average salary (for a more detailed discussion, please see the "Modeling Social Security Benefits" and "Accounting for Social Security" sections above).

The way we account for this added retirement income in our assessment is to adjust the final 70% replacement rate target down by the estimated Social Security replacement rate. This new, lower target reflects the total amount of a member's final average salary that their retirement plan will be responsible for providing.

From a technical perspective, this then requires a minor adjustment to the accrual curve. Instead of dividing the 70% replacement into equal steps, we now parse the reduced target into equal steps for each plan following the same process outlined above.

Note that we use these reduced thresholds and the raw estimated benefit totals for the sake of scoring. We do not want the scores for those plans to be driven primarily by Social Security, which is what would happen if the estimated Social Security benefits were to be added to the benefit replacement rates and threshold.

Additionally, for the sake of the graphical analyses offered in the RSR, we display Social Security income with the benefit estimates so that all figures start at 0% and reach 70% at age 67. In this case, we have simply adjusted the benefits and threshold by parsing the estimated Social Security benefit into equal parts in the same fashion as we subdivide the threshold outlined above and then add that Social Security value to both the benefit and threshold each year.

ADJUSTING FOR STARTING PERSONAL SAVINGS

For 25-year-old entrants we assume that members enter their position with no prior savings, as most recent college graduates or very early career workers are unlikely to have accumulated a significant nest egg. However, this is not the case for 40-year-old entrants, who have worked almost half of their career in another position prior to entering their retirement plan.

It is difficult to ascertain how much the average 40-year-old has set aside for retirement. It is very likely that there is a significant amount of variation that could be attributed to the prior jobs held, lifestyle, family status, and more. However, for the sake of the RSR, we need to have some estimate to apply to our thresholds, otherwise all 40-year-old entrants will simply score lower than 25-year-old entrants across the board due to having fewer years of service available before reaching age 67.

To identify a universal starting personal savings, we adopt a generous, simple approach. We look to the 70% replacement target accrual path for a 25-year-old entrant and identify the target replacement rate they would be expected to have by age 40. This replacement rate is then applied to the 40-year-old entrant's final salary target to produce a dollar estimate of what their starting personal savings should be. This is then converted into a replacement rate that can be used to adjust the threshold.

Because we do not model an accrual path for 25-year-old entrants for judge plans, we assume a fixed 20% replacement rate provided by personal savings at age 40. While we recognize that this is a much higher savings total than most 40-year-olds have, we are willing to assume this level due to the fact that judges are typically more affluent, having served many years as practicing attorneys before seeking election/appointment/selection for a position as a judge. As such, we believe it is a fair assumed level of personal savings, but we are open to adjusting that assumption should there be sufficient pushback by the judge community that we have misrepresented their average financial standing at that point in their careers.

The adjustment for starting personal savings is the same as we apply for Social Security income, only, the application of starting personal savings can result in the eventual end replacement rate target lowering even further below the reduced target for Social Security–enrolled members. For instance, a 40-year-old entrant to AL ERS Regular State Tier 1 has a starting personal savings of 7.75%, meaning that the eventual replacement target is reduced from 70% to 22.04% at age 67 (this reduced target also includes an adjustment for Social Security benefits for this plan).

For the sake of scoring, we do not include the starting personal savings in the estimate of plan benefits and we do not adjust the threshold up to include them either. Instead, the scoring is the result of comparing this reduced target threshold against the benefit estimate. However, for graphical representation we also adjust for these starting personal savings in the same fashion as outlined in the Social Security section above.

From a non-technical perspective, an argument could be made that a 40-year-old entrant is unlikely to have accumulated enough savings prior to starting their position in public service to be on the threshold accumulation line from a 25-year-old entrant. We recognize this point, but without any empirical guidance to what a more reasonable starting personal savings adjustment would be (or what share of this initial starting personal savings would be a workable total), we have opted to provide the more generous approach.

To this end, we have performed sensitivity analyses to see how much the starting personal savings have impacted the benefit scores across plans and find that, on average, 40-year-old entrants appear to be scoring roughly two points higher for Short-Term and Medium-Term Worker Benefit Adequacy Scores. We acknowledge that this is likely the result of the starting personal savings; however, as it biases our results toward a more positive assessment of plans, we have opted to maintain this approach.

ESTIMATING 60% AND 80% BENCHMARKS

For the graphical presentation of the RSR, we have also included 60% and 80% benchmarks. To calculate these, we use the same processes outlined in the preceding pages but, instead, use end targets of 60% and 80%, respectively. These do not factor into the scoring or assessments of any plan, rather they are only calculated for the sake of presentation.

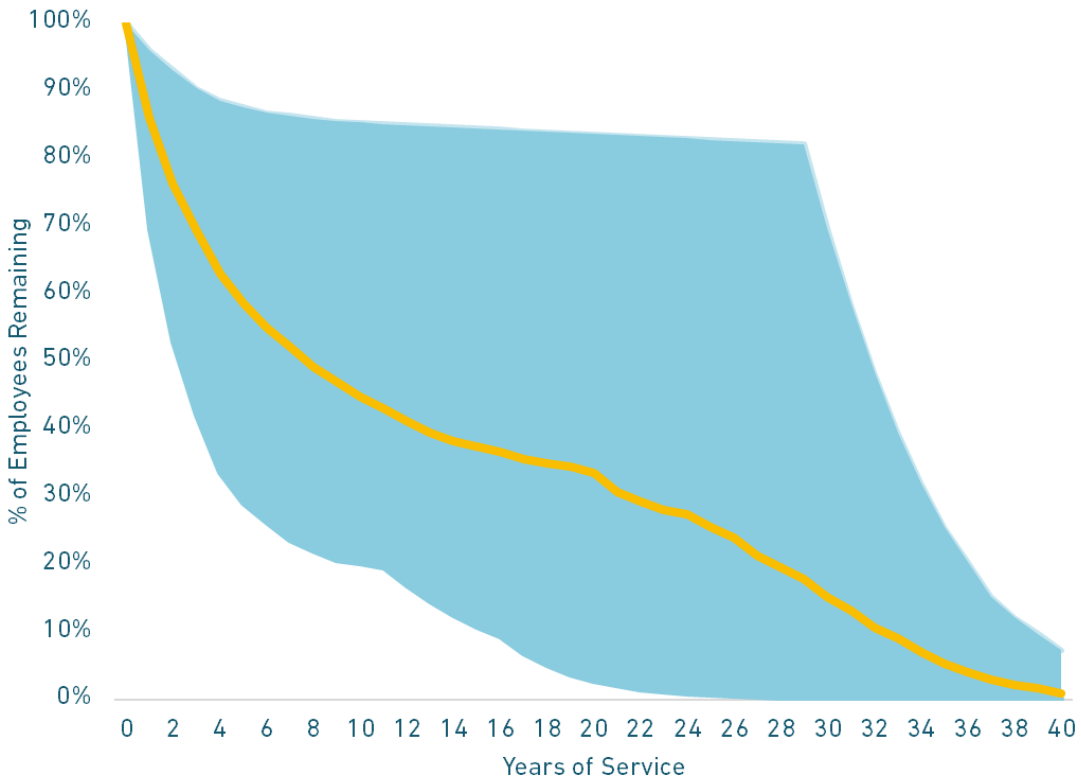
Note that the target used to award bonus points to Full-Career Worker profiles for plans that provide more than 80% replacement rate in benefits does not entail the calculation of a full accumulation path. Rather, those points are awarded entirely based on whether the age 67 replacement rate of benefits is above 80% or not.

Appendix D. Definition of Worker Group Types

Public pension plans typically publish within their actuarial valuations or periodic experience studies an estimation on the probability of termination for members of the retirement system. These are often broken down by age and years of service. We collected this data for all public pension plans in the RSR dataset. Figure D1 shows the average turnover pattern projected for a new 25-year-old entrant into public service:

- The yellow bold line shows the average turnover pattern for all public workers combined.
- The shaded area behind the line shows the range from slowest turnover pattern by 10 years of service (Pennsylvania SERS State Police/Hazardous Duty) to fastest turnover pattern by 10 years of service (Louisiana SERS Corrections/Hazardous Group).

FIGURE D1. NATIONAL AVERAGE TURNOVER PATTERN FOR PUBLIC PENSION PLANS



Depending on the state, occupation, and retirement plan, a 25-year-old hired today will have a 20%-to-86% chance of leaving their job for another one within 10 years of service. For teachers, most fall within a range of 40%-to-60% chance of leaving before reaching a decade. And the median expected turnover rate at 10 years of service for all occupations in all states is 44.8%. That is a large number of entrants into the public sector workforce for which measurement of how well the retirement plan is working for them is going to be important on their own terms.

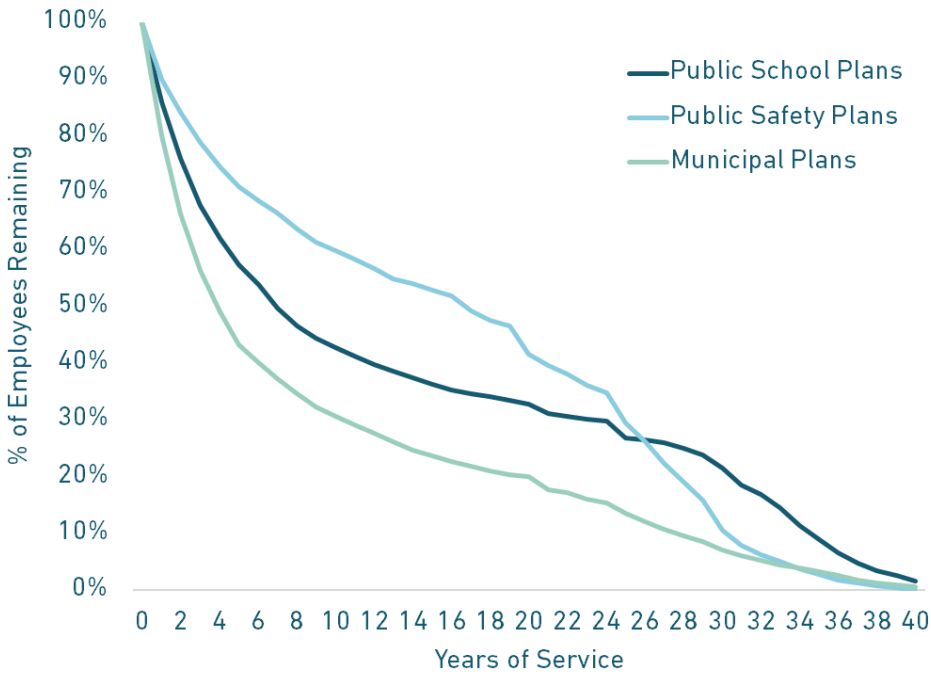
Turnover patterns typically level off somewhere after 10 years of service and gradually decline until a retirement plan's normal retirement eligibility age. At that point, typically between ages 55 and 65 or around 30 years of service, there is a sharp decline in turnover as most individuals still in the retirement plan will leave when they first can start drawing retirement income.

For the median retirement plan (all states, all occupations) about a quarter of individuals who make it to 10 years of service (44.8%) will leave by 20 years of service (a median expected retention of 33.5%). This attrition may be entirely normal for a large population of workers or be considered a retention problem, depending on the perspective retirement policy experts want to take. For the purposes of the RSR, we don't make any value judgments, rather we simply draw from these patterns reasonable places to break public workers into three groups.

There is also variance in turnover pattern by occupation, as we've noted above. This is driven both by the nature of certain kinds of public sector work (e.g., turnover for state legislative staff is frequently much higher than for municipal employees) and the benefit provisions of a given plan design (e.g., public safety plans typically have earlier retirement eligibility ages than public school teacher plans). Figure D2 shows the average turnover pattern for the three occupation categories to demonstrate how some of the variance in these patterns works:

- The dark blue line shows the average turnover pattern for public school teachers (either from plans covering only teachers or plans covering teachers plus public school workers).
- The light blue line shows the average turnover pattern for police and firefighter plans.
- The mint green line shows the average turnover pattern for municipal employee plans.

FIGURE D2. NATIONAL AVERAGE TURNOVER PATTERN BY OCCUPATION TYPE



Appendix E. Retirement Plans in the RSR

Please visit https://equable.org/data-research/public-retirement-research-database/ to see a complete list of plans in our dataset, including information about the parent system, plan type, occupations covered, and Retirement Benefits Scores for all three worker categories, which includes both starting ages and Plan Sustainability Scores.