REPLACEMENT RATES FOR RETIREES:
WHAT MAKES SENSE FOR PLANNING AND EVALUATION?

by Stephen Goss, Michael Clingman, Alice Wade, and Karen Glenn

This actuarial note analyzes different approaches to developing Social Security benefit replacement rates for new retirees.

Introduction

Benefit replacement rates are intended to help answer the question "how much of my pre-retirement income will my retirement income replace?" For individuals with steady, consistent earnings up to retirement, we generally consider the ratio of their retirement income to their income immediately before retirement. This approach compares retirement income to the standard of living of the retiree before retirement, understanding that this standard of living has generally increased (relative to price levels of goods and services) across the retiree's working career.

Based on our comparison of several approaches to computing benefit replacement rates for Social Security using a large sample of actual retirees, we conclude that a comparison of benefits relative to wage-indexed career-average earnings provides the most useful and accurate approach for a diverse population with career earnings patterns that vary greatly.

Background

Starting in 1989 and continuing through 2013, the annual Old-Age and Survivors Insurance and Disability Insurance (OASDI) Trustees Reports contained benefit replacement rates[1] for several hypothetical workers. These rates illustrated the expected level of retirement income from scheduled Social Security benefits in relation to the wage-indexed career-average OASDI taxable earnings. The career-average earnings level used for the hypothetical workers is the average of the 35 highest years of wage-indexed earnings. Initially, the hypothetical workers were "steady" workers — that is, workers with earnings at the same wage-indexed level throughout their career. More recently, however, "scaled" earnings patterns developed by the Office of the Chief Actuary (OCACT) have been used to reflect more realistic earnings patterns by age for retirees with various levels of career-average earnings. In making this change, the career-average earnings levels of the hypothetical workers were retained so that the resulting benefit replacement rates would be the same as those for the steady workers at each career-average earnings level.[2]

For the 2014 Trustees Report, the Trustees removed replacement rates from the table that includes illustrative benefit levels. However, OCACT will continue to publish benefit replacement rates based on the updated assumptions in future Trustees Reports. The recurring annual Actuarial Note 2014.9, which provides replacement rates consistent with the intermediate assumptions of the 2014 Trustees Report, is located at www.socialsecurity.gov/oact/NOTES/ran9/index.html.

Definition of Replacement Rate

Replacement rates are generally considered in two contexts. The individual context relates to the personal retirement savings or employer-provided pensions of individuals who consult with financial planners or participate in defined benefit pension plans. The national context relates to national pension plans such as Social Security, where benefit replacement rates are important in guiding public policy.

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[1] Replacement rates are also referred to as replacement ratios.
[2] For more information on scaled factors, refer to Actuarial Notes 2013.3 and 2004.3 at www.socialsecurity.gov/OACT/NOTES/ran3/index.html

In the individual context, workers generally have consistent, stable employment prior to retirement. Financial planners generally work with individuals who have consistent employment and above average earnings levels. In addition, many employers use actuaries and other advisers to help design employer-sponsored pension or savings arrangements that will contribute to income after retirement for their employees. In both of these instances, the planner or adviser calculates replacement rates that compare total income (often net of taxes) just before retirement to that just after retirement. The individuals under consideration are usually active full-time employees and are most often at the prime earnings levels of their careers. In the individual context, planning for retirement generally relies on the percent of the current income or standard of living that the individual desires to maintain in retirement. The following link from Aon Consulting provides an example of a financial planner or retirement consultant presentation on this basis: www.aon.com/about-aon/intellectual-capital/attachments/human-capital-consulting/RRStudy070308.pdf.

In the context of national pensions, career earnings patterns of individuals vary widely. Many individuals have earnings patterns that differ markedly from the patterns of individuals with stable careers and high compensation (those who are most likely to consult financial planners) or who have long careers at one company and have substantial defined benefit pensions through their employers. For national pensions, the concept of benefit replacement rates requires a different approach to present meaningful analysis for the great variety of career paths represented by workers throughout the economy. The following "definition" of benefit replacement rate for national pension plans comes from the Organisation for Economic Co-operation and Development (OECD) publication, "Pensions at a Glance 2011, Retirement-Income Systems in OECD and G20 Countries."[3]

> "Often, the replacement rate is expressed as the ratio of the pension to final earnings (just before retirement). Here, however, pension benefits are shown as a share of individual lifetime average earnings (revalued in line with economy-wide earnings growth). Under the baseline assumptions, workers earn the same percentage of economy-wide average earnings throughout their career. In this case, lifetime average revalued earnings and individual final earnings are identical."

This approach is widely accepted internationally for national pensions covering diverse populations. In addition, our analysis in this note shows that this approach is consistent with a "late career" or "final-earnings" approach to replacement rates for steady, consistent earners who are most likely to have access to financial planners.

However, for the larger group of workers in a national pension plan, earnings patterns vary and it would be inappropriate and misleading to evaluate their replacement rates in relation to final pay prior to benefit eligibility. For many workers covered under a national pension plan, their earnings in the year before benefit eligibility are either zero due to exit from the labor market, or severely reduced due to a movement to part-time or lower compensated work late in career. We find that 14 percent of Social Security retired workers newly entitled for benefits in 2008 (just before the recent recession) had no earnings in any of the 5 years immediately prior to benefit entitlement. Additionally, 46 percent of these workers had average indexed earnings for the 5 years prior to benefit entitlement that were less than 70 percent of their career-average earnings level. Therefore, for a national pension covering workers with highly varied career earnings patterns, the earnings level immediately before benefit entitlement is inappropriate for a meaningful comparison to benefit level.

Standard Approach for National Pensions

The OECD presents the approach widely accepted and adopted for evaluation of benefit replacement rates for national (social insurance) pension plans. The U.S. Social Security program has used this approach, which is entirely consistent with the formulas for computing benefit levels under current law based on career-average earnings levels.

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[3] This definition is located on page 118 of the publication at:
www.oecd-ilibrary.org/finance-and-investment/pensions-at-a-glance-2011/gross-pension-replacement-rates_pension_glance-2011-15-en

The U.S. Social Security program provides benefits using a graduated benefit formula applied to the average indexed monthly earnings (AIME). Earnings throughout the career are indexed by the national average wage index (AWI), and the highest 35 of these years are averaged to obtain the AIME, the basis for the pension amount. The AIME value provides a measure of the average "standard of living" throughout the worker's career. The use of average wage indexing is significant as it effectively equates earnings levels over time relative to the standard of living of workers of the day. As the standard of living rises over time, using wage-indexed career-average earnings brings the average up to date to the standard of living at the end of career. This is consistent with the logic of using final pay for steady earners who use financial planners and retirement consultants.

Alternative Possible Approaches

Benefit replacement rates can be computed in different ways with varying results by comparing the benefits provided under the law to different measures of earnings. One variation on the standard wage-indexed career-average earnings approach is to use CPI-indexed career-average earnings. This method has the effect of comparing retirement benefits to the average purchasing power of earnings throughout a worker's career (including earnings as many as 40 years earlier), without regard to changes in the general standard of living over that time. Another approach, one that more nearly approximates the intent of benefit replacement rates for steady, consistent workers, considers actual earnings levels late in career. We consider two approaches to late-career-average earnings: (a) the last 6 years of significant non-zero earnings, excluding the last year (as this year likely represents a partial year of work), and (b) the last 5 calendar years prior to benefit entitlement, including years with no earnings.

We computed benefit replacement rates for each of these approaches for a 10-percent random sample of Social Security retired worker beneficiaries newly entitled for benefits in 2011 (over 200,000 retirees). The sample excludes workers who previously received disabled worker benefits. Benefit levels are in all cases equal to the benefit computed under the current-law benefit formulas. Only the denominator of the replacement rate (specified earnings level) varies. The average age at benefit entitlement for this group was 63.75 years, and so the computed benefit replacement rates reflect both actuarial reductions for those with early entitlement, and delayed retirement credits for those with later initial entitlement.

Average-Wage-Indexed Career-Average Earnings (Standard Approach)

Benefit replacement rates computed on this basis are the ratio of the Social Security retired worker benefit in the first 12 months of benefit entitlement, to the average of the high 35 years of OASDI taxable earnings, indexed using the AWI to the year prior to the year of initial benefit entitlement. For our sample of retired worker entitlements in 2011, we find that the median benefit replacement rate on this basis is 38.8 percent.

It is not surprising that this result is consistent with the benefit replacement rates shown in the 2013 Trustees Report. For a worker who starts benefit entitlement at age 63.75 years and has "scaled earnings" that produce a career-average wage-indexed earnings level at the median level of actual retirees, the computed benefit replacement rate is 39.3 percent.[4]

CPI-Indexed Career-Average Earnings

Instead of the standard wage-indexed career-average earnings, one can construct a price-indexed career-average earnings level. Assuming a roughly 35 to 40 year career and average annual earnings growth about 1 percent higher than for prices across the economy, this approach results in career-average earnings levels that are about 10 to 20 percent lower than the wage-indexed approach (depending on earnings patterns). Benefit replacement rates are commensurately higher. This approach is inconsistent with the benefit provisions and intent of the Social Security Act and with generally accepted international standard for computing bene-

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[4] We note that the 2013 Trustees Report shows benefit replacement rates on this basis for several specified "scaled earners" assuming benefit entitlement at age 65. See table V.C7 in the report at: www.socialsecurity.gov/oact/TR/2013/V_C_prog.html#997444.   This table shows a benefit replacement rate of 41.7 percent for a retiree in 2013 at age 65 with a "medium" scaled earnings level, which would be at the 56th percentile of actual retirees.   Adjusting for further reduction of benefit level, assuming entitlement at age 63.75 produces a benefit replacement rate of 38.0 percent. Further adjusting for the scaled earner with career earnings at the 50th percentile, we get a replacement rate of 39.3 percent.

fit replacement rates for national pension plans. This approach is also inconsistent with the intent that replacement rates should be based on late career or final pay, which fully reflects the increased standard of living in the economy over a worker's career.

On this basis of CPI-indexed career-average earnings, we find a median benefit replacement rate of 44.4 percent in our sample of new retired worker entitlements in 2011. This is 14 percent higher than the replacement rate computed using wage-indexed career-average earnings (44.4 / 38.8 = 1.144).

Recent 5 Years of Significant Non-zero Earnings

In an attempt to develop a meaningful measure of late career earnings for the diverse earnings patterns of workers in the national economy, we have concluded that the following definition is appropriate: *average of the last 5 years of significant non-zero earnings.* For this average, we consider the last 6 years of non-zero earnings, excluding years where earnings were $100 or less. We index these earnings to the year prior to benefit entitlement and then exclude the last of these 6 years, because this year represents, on average, work for only about one-half of the year. Even this measure is inadequate, because many workers change to part-time or lower-paying jobs several years before Social Security retired worker benefit entitlement. However, this approach seems to address many of the concerns associated with "final pay" for workers with highly varied earnings patterns in the national economy.

This approach produces a median benefit replacement rate from the sample of new retirees that is very close to the median replacement rate from the sample of new retirees using career-average wage-indexed earnings (38.8 percent). The median benefit replacement rate on this 5-year basis for the sample of new retired worker entitlements in 2011 is 39.2 percent if we wage-index the earnings and 39.7 percent if we CPI-index the earnings. Both results are very close to the replacement rate of 39.3 percent for the median scaled worker based on career-average wage-indexed earnings. This finding confirms the appropriateness of the standard approach to benefit replacement rates for national pensions.

Last 5 Calendar Years before Benefit Entitlement, Including Zero Years

We include this approach as a point of comparison because some researchers have used this approach to analyze benefit replacement rates for workers in the national economy. For example, Biggs and Springstead [5] highlighted this approach, citing that the median benefit replacement rate for Social Security retired workers was 64 percent on an individual basis and 69 percent on a "shared lifetime earnings" basis. In addition, Biggs and Springstead noted that the median replacement rate on an individual basis for the lowest quintile of earners was "infinite," because they had no earnings in the last 5 calendar years prior to benefit entitlement. This is consistent with our finding that 14 percent of new retired worker entitlements in 2008 had no earnings in the last 5 calendar years prior to benefit entitlement.

Our sample of new retired worker entitlements in 2011 shows a median benefit replacement rate of 56.0 percent on this basis, somewhat lower than the 64 percent found by Biggs and Springstead. We believe, however, that this approach is inappropriate for computing benefit replacement rates because the last 5 calendar years prior to benefit entitlement too often include years with no earnings.

Results from 10-Percent Sample of New Retired Worker Entitlements in 2011

The examples cited above show computed median benefit replacement rates using several different approaches for a 10-percent sample (over 200,000 cases) of retired worker beneficiaries newly entitled for benefits in 2011, the most recent sample available at the time of this note. The sample excludes individuals with prior disability entitlements. For these new retired worker entitlements in 2011, earnings through 2010 are considered both for computation of the Social Security retired worker benefit and for computation of the selected earnings measure used for the particular replacement rate approach.

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[5] This report by Biggs and Springstead is located at www.socialsecurity.gov/policy/docs/ssb/v68n2/v68n2p1.html.

Table 1 shows the distribution of new retirees from this sample by their computed benefit replacement rates for each of the approaches described above.

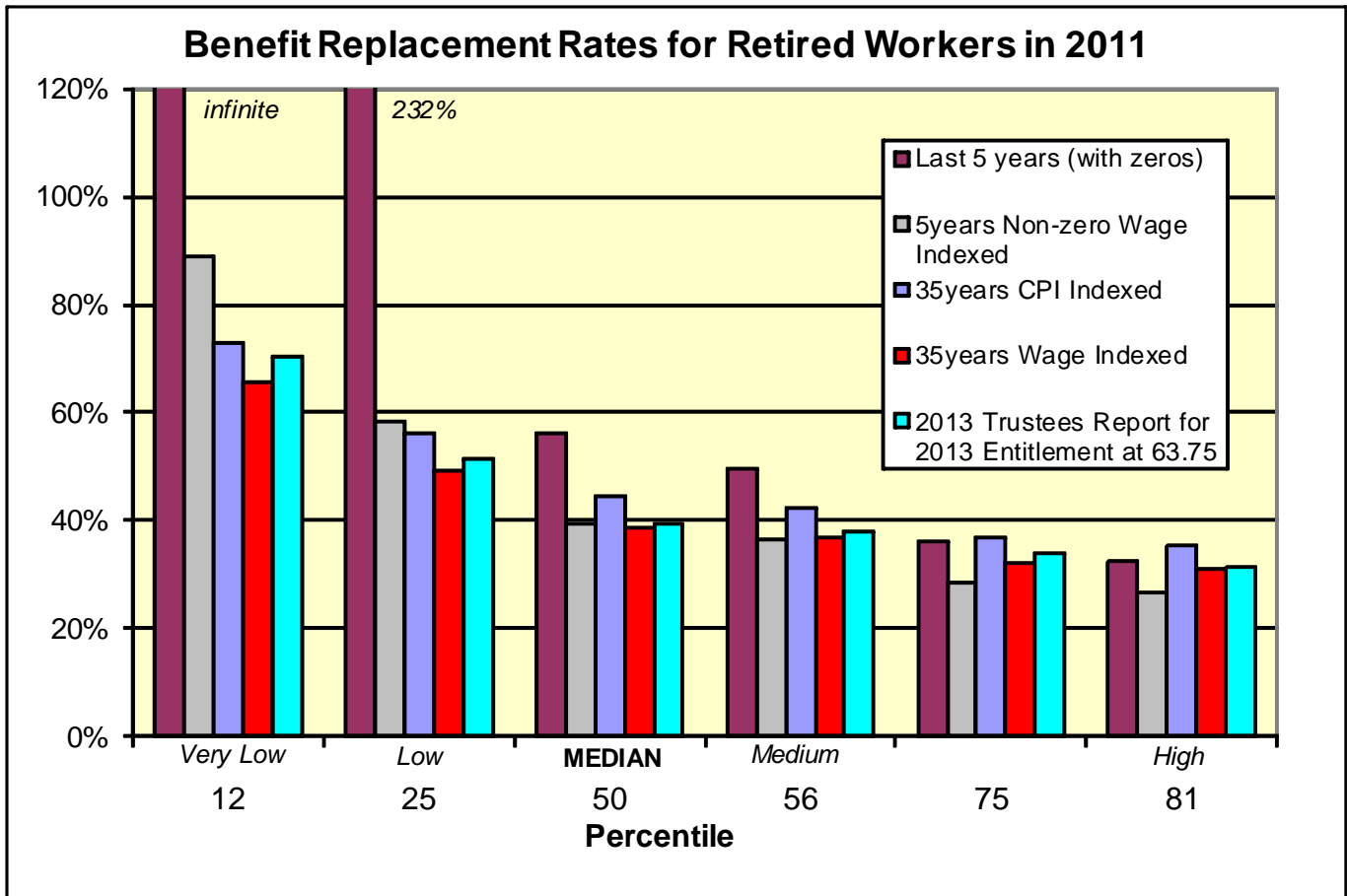**Table 1—Benefit Replacement Rates for Newly Entitled Social Security Retired Worker Beneficiaries**

| | 10-Percent Sample of New Entitlements in 2011--Average Age 63.75 | | | | | Values Consistent with 2013 Trustees Report Table V.C7 | | | |
| | High 35 years Career-average Earnings | | Last 5 Years of Non-Zero Earnings[1] | | Last 5 Years Including Zeros | Scaled Earnings Level at | Benefit Entitlement at | Benefit Entitlement at | Earnings as Percent of |
Percentile[2]	AWI Indexed	CPI Indexed	AWI Indexed	CPI Indexed	Nominal	Percentile	Age 63.75	Age 65	AWI
12	65.5%	72.9%	89.0%	90.9%	infinite	Very Low	70.5%	77.4%	25.0%
25	49.3%	56.3%	58.5%	59.4%	231.8%	Low	51.3%	56.3%	45.0%
50	38.8%	44.4%	39.2%	39.7%	56.0%	Median	39.3%	43.2%	89.2%
56	36.9%	42.4%	36.4%	36.8%	49.5%	Medium	38.0%	41.7%	100.0%
75	32.2%	37.0%	28.4%	28.9%	36.1%	75th	33.8%	37.1%	142.4%
81	31.0%	35.4%	26.5%	26.9%	32.6%	High	31.5%	34.6%	160.0%

[1] Last 6 years of earnings above $100, excluding the last year.
[2] For sample calculations, ordered by replacement rate. For scaled earner calculations, ordered by career-average earnings.

Table 1 also provides a comparison to the replacement rates for new benefit entitlements at age 65 in 2013 as shown in the 2013 Trustees Report, expanded to include replacement rates for additional scaled earner levels and for assuming new entitlement at age 63.75 (the average age for new entitlements in 2011). This comparison between the 2011 sample distribution and the 2013 Trustees Report scaled earner examples is imperfect because the sample distribution is ordered by level of replacement rate, while the scaled earner examples are ordered by the career-average earnings level. This ordering difference is of little consequence when comparing the distribution of replacement rates for scaled earners to the distribution for the sample, using 35-year career-average earnings levels as the denominator. However, the difference is substantial when comparing replacement rate distributions for scaled earners to the distributions using the 10-percent sample for the 5-year earnings approaches. This is because there is substantial variation in the relative level of career-average earnings versus the relative level of late-career earnings for all but consistent very high earners.

The bar chart below illustrates these replacement rates. The values for scaled earners based on the 2013 Trustees Report are virtually the same as (only slightly higher than) the sample distribution of replacement rates for the 35-year wage indexed approach. As seen in Table 1, the 5-year non-zero distribution is also very close to the 35-year approach around the median, deviating higher for low earners and lower for high earners. Finally, the levels for the last-5-year approach are much higher around the median, and rise far above all others for low earners.

Benefit Replacement Rates for Retired Workers in 2011

Chart legend:
- Last 5 years (with zeros)
- 5 years Non-zero Wage Indexed
- 35 years CPI Indexed
- 35 years Wage Indexed
- 2013 Trustees Report for 2013 Entitlement at 63.75

X-axis (Percentile):
- Very Low — 12 (infinite)
- Low — 25 (232%)
- MEDIAN — 50
- Medium — 56
- High — 75
- 81

Earnings for "Scaled Earners"

A further analysis of the scaled-earner career earnings pattern is useful for better understanding the appropriateness of using these hypothetical examples for replacement rate analysis. The methodology for developing the earnings scale is documented and updated annually by OCACT in the recurring Actuarial Note at www.socialsecurity.gov/oact/NOTES/ran3/index.html. The scale is based on actual earnings patterns for workers who have attained insured status and have or are expected to become entitled for retired worker benefits. For each age, the scale patterns reflect the probability of having had earnings in covered employment at that age and the average level of taxable earnings for those who worked at that age.

Because the scale is developed based on OASDI taxable earnings limited by the annual taxable maximum amount, the increasing dispersion of earnings levels over the last several decades is greatly dampened in the scale. Without this dampening, the scale would reflect the increase in average earnings experienced in recent decades due to very high increases for the highest earners. Due to this "top coding" of earnings from the historical database, the earnings scale developed here is reasonable for application to earners at all career-average taxable-earnings levels.

Table 2 shows, based on the scale developed for the 2013 Trustees Report:

1. The percent of workers in the historical data base with OASDI taxable earnings at each age.

2. The average level of taxable earnings for those who do have earnings at each age, expressed as a percentage of the AWI.

3. The scale factor for each age, which is the product of (1) and (2) above.

The summary statistics at the bottom of Table 2 show the average value for each column, both over the highest 35 years and over the last 5 calendar years (ages 57 through 61). While the average percent of insured workers with earnings remains at about 85 percent for ages 21 through 46, the percentage drops significantly at higher ages, as the earliest eligibility age of 62 for retired worker benefits is approached. This decline underscores the inappropriateness of using the average earnings over the last 5 calendar years before benefit entitlement for the denominator of a replacement rate. Table 2 shows that the probability of having earnings at ages 57 through 61 (averaged over these ages) is 74.8 percent, versus a probability of having earnings over the 35 years with the highest likelihood of work (again, averaged over these ages) of 82.9 percent.

More significant is the fact that when zero years are excluded, the average relative earnings level for those with earnings at ages 57 to 61 is virtually the same (99.3 percent) as the average earnings level over the highest 35 years. Thus, on a wage-indexed basis, the standard for benefit replacement rates, the 35-year average of the highest years of career earnings is very similar to the average levels for years of work late in career.

Table 2—Scale Factors: Earnings Level and Percent with Earnings

Age	Percent with Earnings	Average earnings as % of AWI for those with earnings	Scale Factor
21	0.845	0.317	0.268
22	0.850	0.379	0.322
23	0.853	0.468	0.399
24	0.854	0.550	0.470
25	0.854	0.618	0.528
26	0.854	0.677	0.578
27	0.853	0.730	0.623
28	0.854	0.775	0.662
29	0.853	0.817	0.697
30	0.852	0.852	0.726
31	0.851	0.884	0.752
32	0.850	0.911	0.774
33	0.850	0.933	0.793
34	0.850	0.953	0.810
35	0.850	0.971	0.825
36	0.850	0.986	0.838
37	0.851	1.000	0.851
38	0.851	1.013	0.862
39	0.852	1.023	0.872
40	0.852	1.034	0.881
41	0.852	1.045	0.890
42	0.852	1.054	0.898
43	0.852	1.063	0.906
44	0.851	1.073	0.913
45	0.850	1.081	0.919
46	0.849	1.088	0.924
47	0.846	1.096	0.927
48	0.843	1.101	0.928
49	0.840	1.106	0.929
50	0.837	1.108	0.927
51	0.832	1.108	0.922
52	0.826	1.107	0.914
53	0.820	1.102	0.904
54	0.813	1.097	0.892
55	0.806	1.084	0.874
56	0.794	1.065	0.846
57	0.782	1.047	0.819
58	0.769	1.026	0.789
59	0.753	1.005	0.757
60	0.733	0.978	0.717
61	0.705	0.948	0.668
Average High 35	0.829	1.008	0.835
Average 57-61	0.748	1.001	0.750
Ratio last 5 to high 35	0.902	0.993	0.898

Conclusion

For national pension plans, the well-established best practice is to compute benefit replacement rates using the career-average wage-indexed earnings levels as the point of reference (the denominator). For the general population, with wide variation in earnings patterns through a career, this approach reflects well the relative standard of living experienced by a worker over a career.