

# *What Is the Insurance Value of Social Security by Race and Socioeconomic Status?*

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NBER Summer Institute  
Cambridge, MA  
July 2024

# Disclaimer

The research reported herein was pursuant to a grant from the U.S. Social Security Administration (SSA) funded as part of the Retirement and Disability Research Consortium. The findings and conclusions expressed are solely those of the authors and do not represent the views of SSA, any agency of the federal government, or Boston College. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of the contents of this report. Reference herein to any specific commercial product, process or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply endorsement, recommendation or favoring by the United States Government or any agency thereof. The authors thank Oliver Shih for excellent research assistance.

# Introduction

- The value of OASI benefits is commonly evaluated using money's worth – the present value of expected benefits relative to contributions.
- The distributional effects of OASI are unclear:
  - the progressive benefit formula favors low earners;
  - while higher earners benefit from longer life expectancies.
- Moreover, the money's worth measure neglects the program's longevity insurance value, which favors Black and low SES households who face greater uncertainty about their lifespan.

In this paper we assess the value of OASI for various types of household.

- We first construct stylized households differing by race, education, and marital status.
- We then compare the value of OASI in terms of money's worth and wealth equivalence across the households.

# Households mostly value OASI benefits more than their lifetime contributions to the program.

- In our simple model, almost all stylized households are willing to pay marginally more taxes for the benefits received.
- Black households value OASI more than White ones, both overall and in terms of excess valuation over expected benefits.
- The valuation of OASI beyond expected benefits strongly correlates with the unpredictability of longevity.

# Relevant literature

- Money's worth of OASI: Geanakoplos, Mitchell, and Zeldes (1998) and Ozawa and Kim (2001)
- Racial disparities of money's worth: Sanzenbacher and Ramos-Mercado (2016)
- Insurance value: Imrohoroglu et al. 1995, Huggett and Parra 2010, Jones and Li 2020, Olovsson 2010, Harnberg and Ludwig (2020). These studies mostly abstract from race and SES.

# Methodology

# We start by defining 12 stylized households.

- Two racial groups: Black and White
- Two education levels: low and high (defined in relative terms)
- Marital status:
  - Singles: male or female
  - Couples: a man and a woman of the same race, education, and age.
- Each household gets the OASI benefits and lifetime tax contributions, financial wealth and annuitized retirement income, and mortality rates based on data.
- Households all retire at age 65 in 2020.



# A lifecycle model is calibrated for these households.

- Assuming no bequest motives, the expected lifetime utility at age 65 is:

$$U = \sum_{t=65}^{115} \beta^{(t-65)} \left( P_t^m * \frac{c_t^{1-\gamma} - 1}{1-\gamma} + P_t^f * \frac{c_t^{1-\gamma} - 1}{1-\gamma} + P_t^{both} * 2 * \frac{(c_t/\zeta)^{1-\gamma} - 1}{1-\gamma} \right)$$

- This is maximized s.t. a budget and liquidity constraint:

$$a_{t+1} = (1 + r) a_t + I_t + SS_t - c_t, \quad \text{where } a_t \geq 0, \forall t$$

- $SS_t$  considers AIME, spousal benefits, and survivor benefits.
- $I_t$  includes annuity income and DB pensions.

Using the model, the wealth equivalence of OASI benefits is calculated in three steps.

- First, we calculate lifetime utility at age 65 for the household with OASI benefits:  $U(a_{65})$ .
- We repeat the calculation in a world without OASI benefits ( $SS_t = 0$  for all  $t$ ):  $U^*(a_{65})$ .
- Finally, we find the asset value  $W$  such that  $U^*(a_{65} + W) = U(a_{65})$ .
- **$W$  is defined as the wealth equivalence** - the amount of additional wealth at age 65 the household would have needed to be just compensated for not having the OASI benefit.

$W$  is then compared to the household's lifetime sum of OASI payroll taxes.

- $w_t$ : taxable earnings;  $\tau_t$ : OASI portion of the payroll tax:

$$PVC_{65} = \sum_{t=20}^{64} (\tau_t * w_t * (1 + r)^{65-t})$$

- The ratio of the wealth equivalence to the lifetime total OASI tax contribution (W-to-C) is calculated for each type of household.
- $W\text{-to-C} > 1$  implies the household values OASI more than what they contributed.

Next, we calculate the money's worth of OASI benefits for each household type.

- **Money's worth:** the ratio of the expected present value of OASI benefits (EPVB) to the present value of the OASI tax payments.
- Money's worth of OASI benefits for single households:

$$MW = \frac{EPVB_{65}}{PVC_{65}},$$
$$\text{where } EPVB_{65} = \sum_{t=65}^{100} \frac{P_t * SS_t}{(1+r)^{t-65}}.$$

- For couples, the money's worth of OASI is calculated using the sum of both spouses' EPVB and present value of contributions (PVC).

The final step in the analysis compares W-to-C and money's worth.

- Both the W-to-C ratio and the money's worth measure the lifetime value of OASI benefits relative to the corresponding tax payments.
- Only the former accounts for the longevity insurance value of OASI.
- Comparing these two measures sheds light on the extent to which neglecting the insurance value underestimates the value of OASI to various types of households.

# Data

# Calculating the W-to-C ratio and money's worth of OASI for the 12 stylized households requires:

- Social Security benefits and tax payments from the *Health and Retirement Study* (HRS) linked to administrative SSA records;
- Household assets at 65 and annuitized retirement income from the HRS;
- And life tables estimated using the *National Vital Statistics System* (NVSS) and the *American Community Survey* (ACS).

# We pool multiple HRS cohorts to increase sample size.

- The stylized households correspond to the cohort turning age 65 in 2020.
- But, using only 65-year-olds surveyed in the 2020 HRS wave results in small sample sizes.
- The sample is therefore expanded by:
  - Including individuals between the ages 63-67;
  - and including HRS waves between 2000 and 2020 (11 waves in total).



# We rely on the link between the HRS and admin. SSA records for OASI benefits and lifetime contributions.

- The linked data provide year-by-year earnings, OASI contributions, and AIME.
  - The data allow estimation of Social Security benefits (including survivor and spousal benefits) at age 65.
  - Earnings are inflated to 2020 dollars with the AWI.
- Assets and annuitized income are also drawn from the HRS.
  - Amounts are inflated to 2020 dollars with the CPI.
- The averages of each marital status-race-gender-education group are assigned to the corresponding stylized household.

# Social Security is the main form of savings for most households, so the value of benefits is crucial.

OASI Benefits and Contributions, Wealth, and Annuitized Income by Race-Gender-Educational Attainment

Household type	Education	Race	Annual OASI benefit at age 65 (1)	Lifetime contributions (2)	Assets at age 65 (3)	Annuitized income at age 65 (4)
Single male	Low	White	\$19,627	\$339,175	\$214,225	\$4,497
	Low	Black	14,055	211,196	52,320	1,652
	High	White	21,232	357,887	807,748	8,290
	High	Black	16,785	218,830	162,248	3,674
Single female	Low	White	12,718	169,818	166,061	2,536
	Low	Black	9,592	108,987	44,523	1,384
	High	White	18,477	271,986	434,640	9,690
	High	Black	15,832	200,145	140,650	7,271
Couple	Low	White	33,106	663,132	489,870	10,873
	Low	Black	27,278	462,378	181,964	5,189
	High	White	39,209	760,210	1,192,635	16,621
	High	Black	32,744	565,859	344,529	12,430

Source: University of Michigan, *Health and Retirement Study* (HRS) (2020).

# We estimate life tables for each SES group in three steps.

1. First, we calculate nonparametric mortality rates by age for each SES group in 2020 using mortality data from the NVSS and demographic and SES information from the ACS.
2. We then fit a Gompertz-Makeham curve to the non-parametric mortality rates.
3. Finally, we adjust the mortality rates for future mortality improvements based on SSA's cohort mortality table.
  - This step transforms the period table we estimate directly into a cohort table.
  - Here, we assume all the SES groups will experience the same relative mortality improvements in the future.

# Black life expectancy is generally lower, but dispersion of age at death is greater.

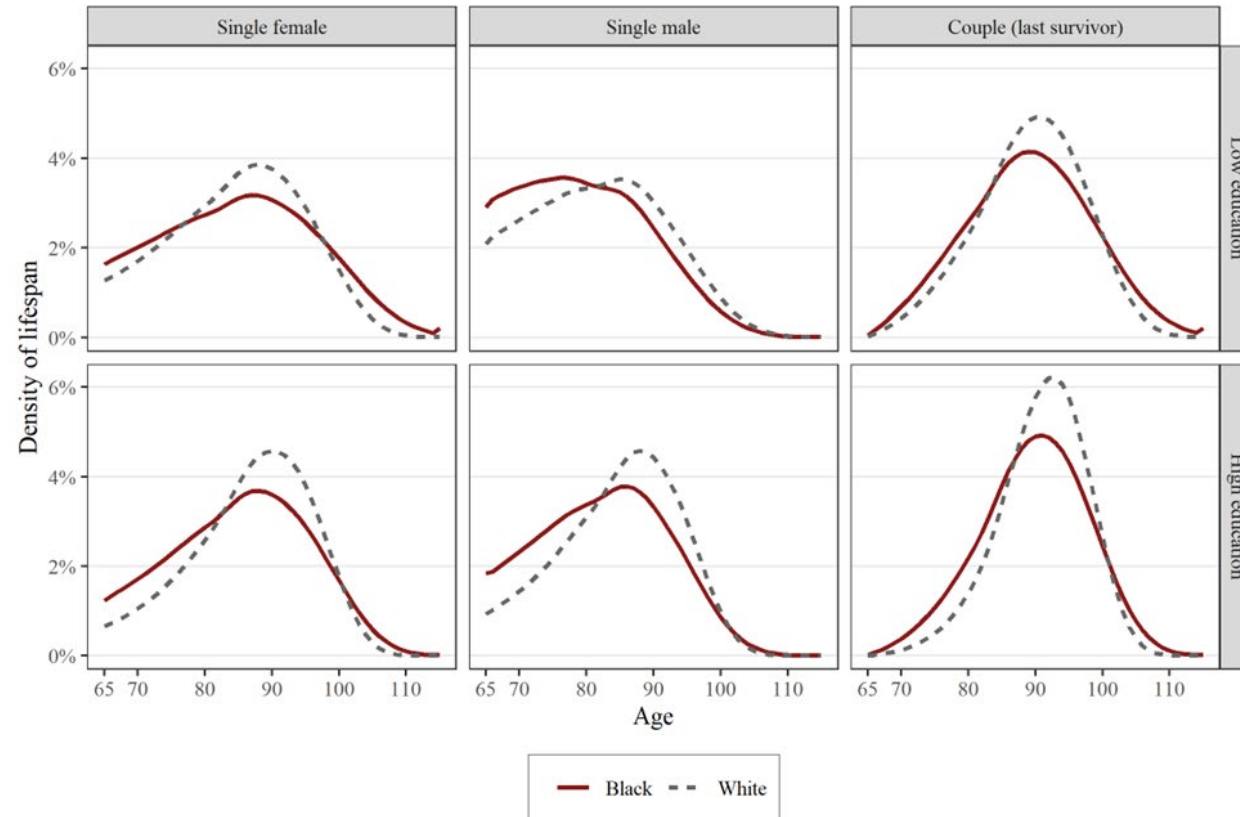
Life Expectancy and Standard Deviation of Lifespan at Age 65 by Gender and Educational Attainment

	Life expectancy		Standard deviation of lifespan	
	Black	White	Black	White
Single female				
Low education	85.5	85.1	11.2	9.7
High education	85.4	87.0	10.1	8.8
Single male				
Low education	80.0	82.1	9.5	9.7
High education	82.6	84.9	9.4	8.7
Couple (last survivor)				
Low education	89.1	89.3	9.3	8.0
High education	89.7	91.0	8.1	6.6

Source: Authors' calculations.

# The greater variance in age at death for Black individuals is visually clear in the full distribution.

Age-at-Death Distribution (Density of Lifespan) by Gender and Educational Attainment at Age 65



Source: Authors' calculations.

# Results

# The money's worth ratios vary around 1, consistent with (approximate) actuarial fairness.

Comparison of Money's Worth and W-to-C Ratio of OASI by Race-Gender-Educational Attainment

Household Type	Education	Race	Wealth equivalence (W)	PV total benefits	Lifetime contributions	W-to-C	Money's Worth	Difference
Single male	Low	White	\$493,400	\$269,831	\$339,175	1.45	0.80	0.66
	Low	Black	344,400	170,841	211,196	1.63	0.81	0.82
	High	White	499,900	318,158	357,887	1.40	0.89	0.51
	High	Black	421,700	201,103	218,830	1.93	0.92	1.01
Single female	Low	White	322,600	197,924	169,818	1.90	1.17	0.73
	Low	Black	242,600	145,796	108,987	2.23	1.34	0.89
	High	White	459,400	303,684	271,986	1.69	1.12	0.57
	High	Black	397,900	219,083	200,145	1.99	1.09	0.89
Couple	Low	White	656,200	605,954	663,132	0.99	0.91	0.08
	Low	Black	531,800	469,792	462,378	1.15	1.02	0.13
	High	White	818,200	725,201	760,210	1.08	0.95	0.12
	High	Black	662,000	534,213	565,859	1.17	0.94	0.23

# The wealth equivalence of OASI is greater than contributions for (almost) all households.

Comparison of Money's Worth and W-to-C Ratio of OASI by Race-Gender-Educational Attainment

Household Type	Education	Race	Wealth equivalence (W)	PV total benefits	Lifetime contributions	W-to-C	Money's Worth	Difference
Single male	Low	White	\$493,400	\$269,831	\$339,175	1.45	0.80	0.66
	Low	Black	344,400	170,841	211,196	1.63	0.81	0.82
	High	White	499,900	318,158	357,887	1.40	0.89	0.51
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Source: Authors' calculations from HRS restricted earnings data.



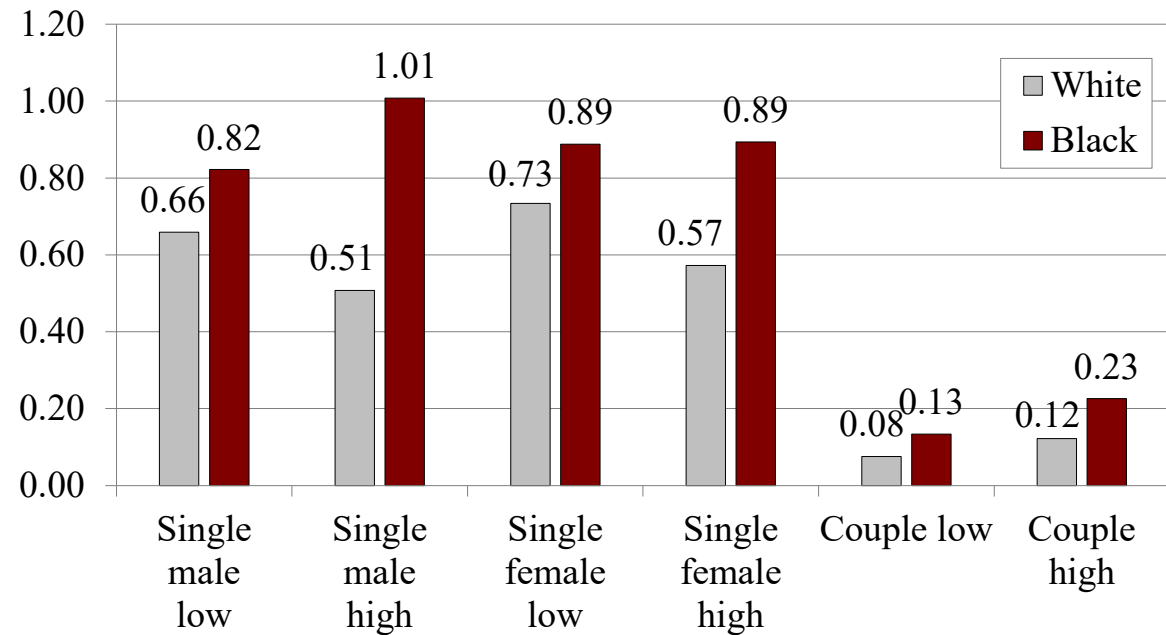
# The difference between W-to-C and money's worth is a measure of the longevity insurance value of OASI.

- The difference controls for two common factors affecting both measures: lifetime earnings and life expectancy.
- Thus, the difference reflects the factors involved solely in the W-to-C: variance of lifespan, initial wealth, and annuitized retirement income.
  - However, we find the latter two have limited impact on the W-to-C.
- Any willingness to pay for OASI in excess of expected benefits must be due to the insurance value of the program.

# The longevity insurance value is higher for singles.

- The insurance is especially valuable for singles (worth ~50-100 percent of total payroll tax).
- For couples, it is worth only ~8-20, consistent with Kotlikoff and Spivak (1981): much of the longevity risk is insured by the family.
- The correlation of insurance values with the standard deviation of lifespan across groups is 0.76.

Longevity Insurance Value as Measured by the Difference Between Money's Worth and W-to-C Ratio

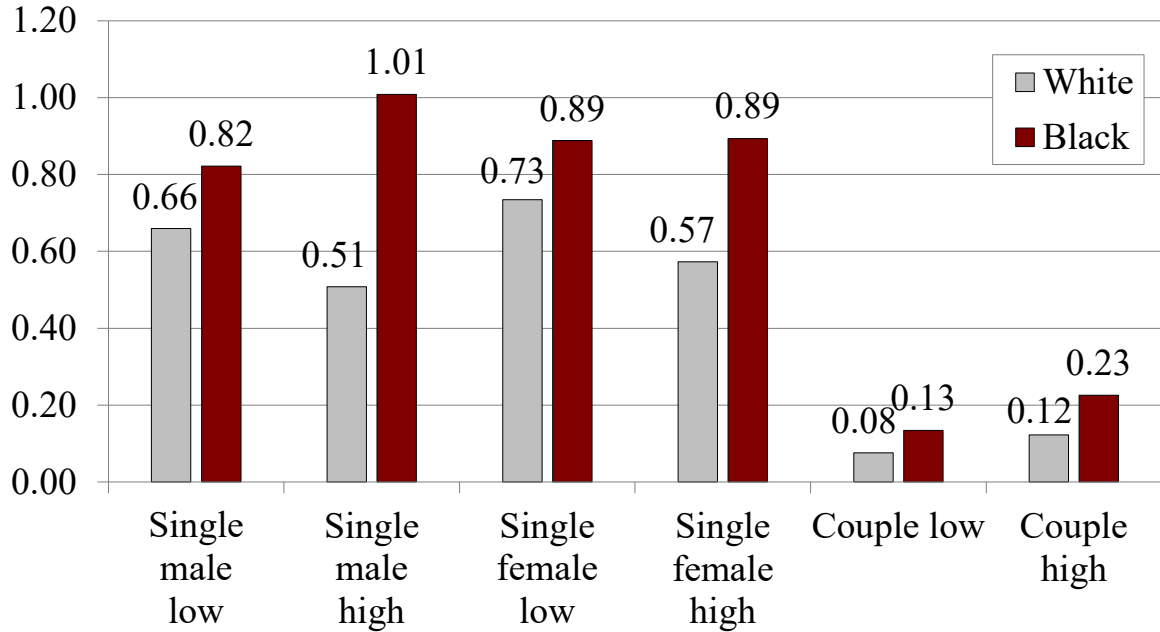


Source: Authors' calculations.

# Black households also derive much more value from OASI's longevity insurance than similar White ones.

- Within each household type, the Black household's insurance value is substantially larger.
- Thus, OASI is even more important for equity in retirement security across racial groups than is suggested by its money's worth.

Longevity Insurance Value as Measured by the Difference Between Money's Worth and W-to-C Ratio



Source: Authors' calculations.

# The similar actuarial value of OASI by race may be misleading.

- The similar money's worth ratios between the racial groups reflect the offsetting effects of both lower earnings and life expectancy of Black beneficiaries.
- But Black households gain much more from the program once longevity insurance value is considered, because of more unpredictable age of death.

Money's Worth and W-to-C Ratio of Blacks as a % of Their White Counterparts

Household type	Education	Black as % of White	
		Money's worth	W-to-C
Single male	Low	102%	112%
	High	103	138
Single female	Low	115	117
	High	98	118
Couple	Low	111	116
	High	99	109

Source: Authors' calculations.

# Conclusion

- Valuing OASI solely on expected benefits neglects the program's longevity insurance value.
- Once longevity insurance value is considered:
  1. Black households generally gain much more from the program.
  2. Singles benefit more than couples (and Black households are more likely single).
  3. The result is largely driven by longevity's uncertainty – little is explained by differences across households in wealth at age 65 or pension income.

# Appendix

# Recursive formulations of the lifecycle model

- The recursive formulation for singles at age  $t$  is:

$$V^{S,g}(a_t, I_t^g, SS_t^g) = \max_{c_t} \{ u^{single}(c_t) + s_{g,t} \beta E [V^{S,g}(a_{t+1}, I_{t+1}^g, SS_{t+1}^g)] \}$$

- The recursive formulation for couples at age  $t$  is:

$$V^C(a_t, I_t^m, I_t^f, SS_t^m, SS_t^f) = \max_{c_t} \left\{ \begin{aligned} &u^{couple}(c_t) + s_{m,t} s_{f,t} \beta E [V^C(a_{t+1}, I_{t+1}^m, I_{t+1}^f, SS_{t+1}^m, SS_{t+1}^f)] \\ &+ s_{m,t} (1 - s_{f,t}) \beta E [V^{S,m}(a_{t+1}, I_{t+1}^m, SS_{t+1}^m)] \\ &+ (1 - s_{m,t}) s_{f,t} \beta E [V^{S,f}(a_{t+1}, I_{t+1}^f, SS_{t+1}^f)] \end{aligned} \right\}$$