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The Effect of US COVID-19 Excess Mortality on Social Security Outlays
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ABSTRACT

The COVID-19 pandemic has resulted in significant direct and indirect excess mortality among the US population, impacting the future outlays of the US Social Security Administration (SSA) Old Age, Survivors, and Disability Insurance (OASDI) program. This study aimed to estimate the net effects of pandemic-induced excess deaths on OASDI liabilities, utilizing dynamic microsimulation models, and examined how these effects vary across different socioeconomic and racial-ethnic groups. Data on excess deaths were obtained from the CDC and processed to account for seasonal variations and demographic disparities. The simulation incorporated demographic and health status variables to project OASDI retirement and disability benefits, and survivors' benefits for spouses and children, for respondents with highest COVID mortality risk. The pandemic resulted in approximately 1.4 million excess deaths among individuals aged 25 and older between 2020 and 2023. These premature deaths mostly reduced future retirement benefits, which increased the Social Security fund by $219 billion. Future disability benefit payments were reduced by $6 billion. However, these gains were partly offset by reductions in future payroll tax flows ($44 billion) and increased payments to surviving spouses and children ($25 billion), resulting in a net impact of $156 billion. Non-Hispanic Black and Hispanic decedents left behind more underage children per capita, yet payments to their surviving family members were lower compared to non-Hispanic White decedents, across all educational levels. Excess mortality during the COVID-19 pandemic has complex implications for the OASDI program. While there is an estimated net positive financial impact due to reduced future retirement benefits, this effect is mitigated by decreased payroll tax contributions and increased survivors' benefits. The differential impact by race and ethnicity highlights existing inequalities and underscores the importance of considering demographic disparities in future projections of Social Security liabilities. These findings provide critical insights for informing SSA trust fund projections and policy decisions.

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Introduction

The COVID-19 pandemic has resulted in approximately 1.4 million excess deaths among the US population as of 2023. The effects of these deaths on the expected future outlays of the US Old-Age, Survivors, Disability Insurance (OASDI) program remains uncertain. The OASDI program, commonly referred to as "Social Security," provides retirement benefits, survivors' benefits, and disability insurance benefits. While excess mortality directly reduces spending on Social Security annuity benefits, the pandemic also resulted in earlier and more widespread survivors' benefits for spouses and children left behind by pandemic decedents. The budgetary implications of these deaths ranks among the larger set of questions surrounding the long-term effects of the COVID-19 pandemic on OASDI liabilities, including the ultimate impacts of long COVID and of the pandemic-induced recession.

Estimating the budgetary effects of COVID-19 solely on the basis of excess deaths and average benefits may misrepresent the net effect on OASDI liabilities if pandemic decedents differ from the average beneficiary. For example, our previous work estimated that 62% of pandemic decedents would have experienced below-average life expectancies for their age-sex-race/ethnicity subgroup, which limits the expected reduction in future outlays, all else equal (1). At the same time, we also showed non-Hispanic Black and Hispanic males lost nearly three times the number of life years as non-Hispanic white males for people under 65 and more than twice the number of life-years among people over age 65. This finding highlights the potential for significant racial disparities in expected future OASDI outlays.

In this study, we use microsimulation modeling to estimate the net effects of excess deaths during the COVID pandemic on the OASDI program's expected future outlays, and we investigate the distribution of these changes across socioeconomic and race-ethnicity groups. Our analysis builds on extensive prior research using the Future Elderly Model (FEM) and the Future Adult Model (FAM), dynamic microsimulation models that have been applied to study a wide range of issues, including the future of Medicare (2) and the effects of chronic illnesses and risk factors such as diabetes, dementia, heart failure, obesity, serious mental illness, and smoking (3-8). These models have been extensively validated for quantity and quality of life, as well as specific risk factors and disease (9, 10). The FEM and FAM model OASDI retirement benefits and disability insurance benefits as a function of demographic, economic and health status variables, and they have previously been used to project COVID-19 mortality by demographic and health status (1). In addition, the FEM and FAM track the health and survival status of spouses, enabling us to project the effects of COVID-19 mortality on spousal survivors' benefits. In this study, we extend FAM to incorporate the presence of minor children eligible for survivors' benefits.

Estimating the effect of the pandemic-era mortality on OASDI finances using the FEM and FAM models helps inform SSA trust fund projections. Moreover, creating estimates by race-ethnicity helps to underscore not only the differential effects of COVID by race-ethnicity but also how different groups may rely on OASDI differently.

Our analysis combined death-record data with FEM and FAM microsimulation models to quantify the effect of excess deaths during the pandemic on life-cycle mortality and expected Social Security outlays for the US population ages 25 and over as of 2020. Our estimates account for the age, sex, and race-ethnicity of decedents based on CDC records, along with COVID-19 risk factors such as obesity, smoking behavior, lung disease, heart disease, diabetes, cancer, stroke, hypertension, dementia, and nursing home residence. We estimate that the approximately 1.4 million pandemic-era excess deaths that occurred as of January 2023 reduced expected future OASDI outlays by $205 billion on net. This reduction is caused primarily by a decrease in future retirement benefits for pandemic decedents, which outweighs a reduction in OASDI payroll taxes and an increase of payments to surviving spouses and children. Non-Hispanic Black and Hispanic decedents leave behind more underage children per capita, and payments to their surviving family members are lower than for non-Hispanic White decedents, for all levels of educational attainment.

Methods

Excess death data

Weekly excess death data from the Centers for Disease Control and Prevention (CDC) were downloaded on July 18, 2023 and processed as described in Reif et al. (1). Deaths were pooled by quarter to account for seasonal variation. Excess deaths occurred between March 28, 2020 and January 21, 2023. This timeframe represents all weeks during which CDC found there to be excess deaths due to the pandemic, providing a complete dataset of excess COVID-19 pandemic mortality estimates. Since our previous publication (1), the CDC has updated its methodology for computing excess deaths. Initially, the CDC compared observed deaths to an expected baseline, computed using mortality data from 2013-2019. As the pandemic continued, however, the CDC switched to using rolling imputed baseline trends for 2020-2023 (11). In this paper we use the distribution of COVID and non-COVID excess deaths by age, race-ethnicity and sex from detailed excess deaths files and scale it to the more recent estimates, to a total of 1,351,620 excess deaths.

Microsimulation

We used microsimulation to estimate life expectancy for a nationally representative set of adults using pre-pandemic data. Relying on methods developed in our prior publication (1), we computed the years of life lost from the pandemic. Specifically, we used empirical information on risk factors for COVID mortality to compute the likelihood of dying during the COVID pandemic. Within each age, sex, and race-ethnicity group, we assigned a COVID mortality risk score based on health comorbidities and other risk factors and distribute reported excess deaths proportionally. Non-COVID excess deaths were assigned using our regular mortality model estimates. The number of life-years lost is then calculated by computing the projected life expectancies of those who died as a result of the pandemic. Projections were constructed using two models, the FAM and the FEM. The FAM, which is based on data from the Panel Study for Income Dynamics (PSID), was used to model individuals who were ages 60 and under as of July 1, 2020. The FEM, which is based on data from the Health and Retirement Study (HRS), was used to model individuals who were over age 60 as of July 1, 2020. Full details about our microsimulation methodology are available in Reif et al. (1). Below, we describe the new outcomes reported in this study as well as adjustments that were made to the original methodology.

FAM and FEM simulations report results biennially, with each simulation wave covering a two-year period. However, to account for seasonal variation in excess deaths, quarterly mortality risk of simulants was preferred. Therefore, we interpolated biennial simulation outcomes to generate quarterly risk factor status for each simulant. This was accomplished by linear interpolation of continuous variables (age, BMI, and regular mortality probability) and by randomly assigning new onset of binary variables (new onset of diseases or changes in smoking status). Subsequently, weighted risk scores and excess deaths were assigned as described in detail by Reif et al. (1). The calibration to account for nursing home deaths was based on a total of 162,107 COVID-19-related deaths in nursing homes, as reported by the Centers for Medicare and Medicaid Services; risk scores for nursing home residents were adjusted to correctly represent quarterly death counts in nursing homes, before adjusting risk scores for community-dwelling simulants. Nursing home status was available in the FEM simulation for people 60 years and older.

Survivors' benefits

Data on children are necessary for accurately calculating survivors' benefits for pandemic decedents. Family and childbirth data were available only for FAM simulants, who are modeled using PSID data. Therefore, we cannot observe minor children of people who are 60 years or older on July 1st 2020, since these individuals are modeled using HRS data in FEM. For example, a newborn child of a 59-year-old would be included and followed to age 18 in our analysis, but a 17-year-old child of a 61-year-old adult would be excluded.

Data on the number of children and their birth years came from the PSID Individual file, which includes IDs for each parent. Children in PSID were dropped if they died after non-response; if they have been adopted by non-sample persons; if they were listed as spouses/cohabitors, ((great)grand)parents, uncles/aunts, (children of) 1st year cohabitors, or miscellaneous "other (non)relatives"; or if they were the reference person themselves. If birth year was missing, information from the PSID Childbirth and Adoption History (CAH) file was used instead. If it was missing from this file as well, birth year was imputed using an ordinary least squares regression model that included parent birth year, parent sex, adoption status of child, and year of last report, using CAH data after 1990. In cases where children were listed multiple times (for each parent in the PSID), we used the floor of the average predicted year of birth to fill in missing birth years.

Children and spouses who take care of a decedent's child under 16 both generally receive 75% of a worker's primary insurance amount (PIA), which is itself a function of average indexed monthly earnings (AIME). The family maximum is generally between 150-188% of the worker's PIA. Calculations follow normal rules set by the Social Security Administration. Briefly, earnings are capped to maximum taxable wages (12) and indexed up to two years before the reference year (13). The AIME for survivors is calculated using a specified number of years of cumulative earnings, with fewer years included for younger decedents. This period starts from age 22, excludes the five lowest-earning years, and includes at least two and at most 35 years of earnings.

The amount of survivors' benefits for decedents' children and spouses taking care of children are calculated and assigned differently by age of the decedent. For those 60 years or older at time of death, we do not estimate benefits, since we do not have family data available to determine survivors' beneficiaries after death. For those between the ages of 50 and 60, we used restricted Social Security covered earnings records from 2018, the most recent year of data available, from the Michigan Center on the Demography of Aging (MiCDA) data enclave. We determined the weighted median income by 5-year age bins, race-ethnicity (NH Black, Hispanic, NH White), sex, and education level (less than high school, high school graduate, BA+) for the 2018 HRS cohort, adjusted for inflation to years 2020 through 2023. We then calculated AIME and PIA based on respondents' historical earnings data as described above and by standard SSA rules. The estimated survivors' benefits and family maxima were exported from the enclave and assigned to decedents in the simulation based on the same demographic categories and year of death (2020-2023).

For decedents under age 50, we used population earnings from the PSID survey to determine AIME, PIA, and survivors' benefits, as PSID does not offer linked Social Security covered earnings data. Reported earnings histories are only available for years that a survey respondent is in the sample. We selected PSID respondents who were alive in 2019 and calculated the weighted median of their earnings reported for 2018 and earlier, by the same age/race-ethnicity/sex/education categories mentioned above. Biennial median earnings were then interpolated to construct yearly earnings, adjusted for inflation, and used as inputs to calculate AIME, PIA, survivors' benefits and family maxima. Benefits were then assigned based on the same demographic categories and year of death.

Survivors' benefits are subject to caps related to the earnings of the decedent's spouse and a family maximum. To compute the capped benefits, we first used PSID survey data to internally match spousal earnings to survey respondents, after adjusting for inflation to 2023 dollars. We then calculated weighted median spousal earnings by 5-year age bins, race (NH Black, Hispanic, NH White), and sex of the PSID respondents. The maximum reduction in spousal survivors' benefits was determined by dividing any median spousal earnings over the 2023 earnings limit of $21,240 by two, since the benefits are reduced by $1 for every $2 over the limit. These reductions were then applied to decedents based on the same demographic categories of the PSID respondents, and the survivors' benefits calculated earlier for spouses were reduced accordingly. Any negative values were treated as $0 benefits.

As with the survivors' benefits amount, the family maximum is also based on the decedent's PIA, following standard Social Security Administration rules. If a family's total amount of survivors' benefits exceeds their family maximum, the benefits are reduced proportionally for all family members.

We also compared the number of underage years for decedents' surviving children as a result of the pandemic to a counterfactual scenario in which the decedent would have lived for their projected life expectancy. Future children were simulated using transition models estimated on new childbirths in the survey data. In rare cases, a simulant who died in the pandemic but could have had children in the counterfactual scenario generated a negative number for this measure.

Earnings and OASDI tax

Earnings in FAM are derived from the PSID as a sum of wages and salaries, bonuses, overtime, tips, commissions, professional practice or trade, additional job income, and miscellaneous labor income (variable ER77315), plus the labor portion of business income (variable ER77296). Earnings in FEM are derived from the HRS as a sum of wage/salary income, bonuses/overtime pay/commissions/tips, 2nd job or military reserve earnings, and professional practice or trade income (RAND HRS variable iearn), and self-employment income (HRS FAT variable isemp)

In each survey wave, respondents reported their earnings from the previous year. Future earnings were simulated based on transition models developed separately for FAM and FEM, accounting for full-time or part-time employment, unemployment, out of labor force, or retirement. See the appendix for model specifications and coefficients. For years between waves, the earnings were interpolated and added to create two-year earnings totals, and adjusted for real wage growth using historical real wage differential data until 2020 (the start of the pandemic). For post-2020 earnings, intermediate projections are used (14). The final results are adjusted for inflation to 2023 dollar values.

OASDI tax was calculated as 12.4% of earnings. For employees, half of this tax (6.2%) is contributed by the employer, while self-employed individuals pay the full tax (12.4%) themselves. Only earnings up to the maximum taxable earnings are taxed. Recent limits are retrieved from the Social Security website (12); projected limits for years 2024-2032 are based on intermediate assumptions in the 2023 Annual Report of the Board of Trustees of the OASDI funds (15); and limits after 2032 are based on carrying forward a 3.9% percentage increase estimated for 2032.

Disability and retirement

Disability benefits for those under age 60 at the start of the pandemic were based on PSID survey questions regarding income from Social Security (variable ER77442) when Social Security type was disability (variable ER34812). This amount was then used to create transition models (see appendix for coefficients) to project future disability benefits using a two-step model for simulants predicted to receive those benefits.

Retirement benefits for those under age 60 at the start of the pandemic were also based on PSID survey questions regarding income from Social Security (variable ER77442), in this case when Social Security type was retirement, survivors' benefit, dependent of disabled recipient, dependent of retired recipient, or other (ER34813 through ER34817). This amount was then used to create transition models for the simulation (see appendix for coefficients) to project future retirement benefits using another two-step model for simulants predicted to retire. Prediction of claiming retirement benefits was limited to simulants not claiming disability benefits. Disability benefits were not assigned to those over 65.

Disability and retirement benefits for those over age 60 at the start of the pandemic were based on restricted Social Security earnings records from 2018 HRS respondents over age 50 obtained from the MiCDA enclave. We calculated AIME and quarters worked based on earnings histories following SSA standard rules, and we created joint estimation models (see appendix for model coefficients) for AIME and quarters worked. Model parameters were exported from the enclave and used to predict AIME and quarters worked for simulants, from which we calculated PIA and benefit amounts following SSA standard rules. Predictions of whether a person was disabled or retired (and subsequently was assigned a disability or retirement benefit amount, respectively) are based on public HRS data (RAND HRS variable ssdi for disability and ioss for retirement; see appendix for coefficients). Prediction of claiming retirement benefits was only done for simulants ages 62 and over who were not claiming disability benefits. Disability benefits were not assigned to those over age 65.

Table 1: Excess deaths and death rates between March 28th 2020 and January 21st 2023 during the COVID pandemic, by age (25+), sex, and race, based on weekly CDC data. Excess death rates are presented per 10,000 people in specific sex, age, race-ethnicity categories.

			Excess deaths			Excess death rate		
Race	**Sex**	**Age**	**COVID deaths**	**Non-COVID deaths**	**Total deaths**	**COVID death rate/10,000**	**Non-COVID death rate /10,000**	**Total death rate /10,000**
Non-Hispanic Black	Female	25-34	997	2,853	3,850	1	2	3
		35-44	2,239	3,642	5,881	2	3	5
		45-54	4,467	1,149	5,616	4	1	5
		55-64	9,768	4,910	14,678	9	5	13
		65-74	13,857	15,607	29,464	18	20	38
		75-84	12,666	9,209	21,875	36	26	61
		85+	11,753	5,891	17,644	80	40	121
	Male	25-34	1,144	8,242	9,386	1	6	7
		35-44	2,549	8,987	11,536	2	9	11
		45-54	5,892	5,760	11,652	6	6	12
		55-64	11,978	10,417	22,395	13	11	24
		65-74	16,070	21,697	37,767	27	36	64
		75-84	12,606	8,538	21,144	55	37	92
		85+	7,207	4,057	11,264	109	61	171
Hispanic	Female	25-34	877	1,636	2,513	0	1	1
		35-44	2,041	1,989	4,030	1	1	2
		45-54	4,291	2,160	6,451	3	1	4
		55-64	8,331	4,112	12,443	7	4	11
		65-74	11,498	7,295	18,793	17	10	27
		75-84	11,323	8,246	19,569	34	24	58
		85+	10,404	11,559	21,963	76	84	160
	Male	25-34	1,921	7,133	9,054	1	3	4
		35-44	5,112	8,374	13,486	3	4	7
		45-54	10,538	6,324	16,862	7	4	11
		55-64	16,673	9,366	26,039	15	9	24
		65-74	18,258	11,089	29,347	31	19	50
		75-84	14,617	7,522	22,139	62	31	92
		85+	9,282	6,072	15,354	124	81	205
Non-Hispanic White	Female	25-34	1,610	2,993	4,603	0	1	1
		35-44	4,081	8,327	12,408	1	1	2
		45-54	10,177	89	10,266	2	0	2
		55-64	26,632	12,061	38,693	4	2	6
		65-74	49,862	43,782	93,644	9	8	16
		75-84	69,830	55,422	125,252	22	17	39
		85+	101,054	5,828	106,882	70	4	74
	Male	25-34	2,469	8,795	11,264	0	1	2
		35-44	6,009	21,011	27,020	1	4	5
		45-54	16,944	3,173	20,117	3	1	4
		55-64	42,601	19,966	62,567	7	3	10
		65-74	75,290	66,088	141,378	15	13	28
		75-84	92,360	68,230	160,590	36	26	62
		85+	80,540	14,201	94,741	95	17	112
Total			817,818	533,802	1,351,620	35	2	59

Results

The pandemic resulted in 1,351,620 excess deaths of people over age 25, with the highest per-capita rates for men, Black and Hispanic populations, and older age groups. This was observed for COVID deaths as well as excess deaths not attributed to COVID (here called non-COVID deaths) (**Table 1**). Considerable fluctuations are present over time, with different proportions of the quarterly excess deaths attributed to different age groups or cause (**Figure 1**).

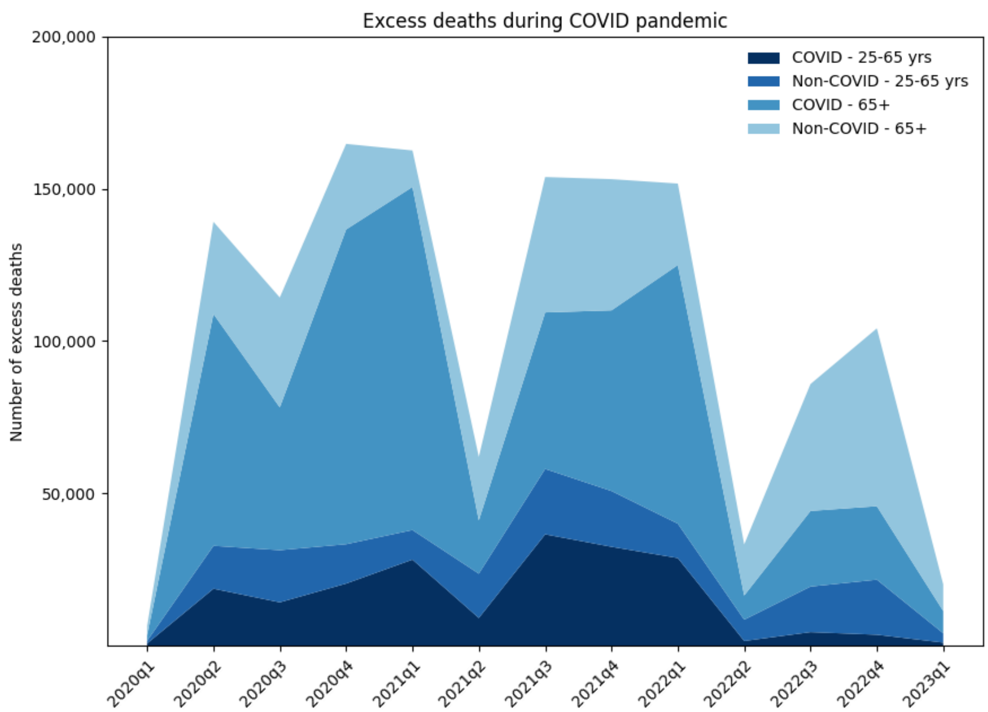


Figure 1: Excess deaths by quarter, cause of death, and age group (under and over 65 years), based on weekly CDC data.

Over one-third of pandemic decedents (36%) were estimated to receive employment or self-employment income at the time of death (**Table 2**). About 4% were receiving disability benefits, and 71% were receiving OASDI benefits. These categories are not mutually exclusive. Decedents who were working lost on average 23.8 life years, of which 9.7 years would have been spent working, 0.5 years receiving disability benefits, and 14.4 years receiving retirement benefits. Without the pandemic, this group would have paid $90K in OASDI tax and would have received $8K and $202K in disability and retirement benefits, respectively (in $2023, discounted).

The 56K decedents receiving disability benefits at time of death were slightly younger (56.7 years vs. 58.5 years for those who were working) and had a counterfactual life expectancy of 18.7 years, of which 4.6 years would have been spent working, 3.2 years on disability, and 11.7 years in retirement. Without the pandemic, these decedents would have paid $34k in OASDI tax and received $55k and $121k in disability and retirement benefits, respectively (in $2023, discounted).

Almost 1 million people were receiving retirement benefits when they died, and were on average the oldest decedents at 79.3 years. They lost 8.9 years of life due to the pandemic, of which 0.8 years would have been working years and 8.0 years would have been in retirement. Their time spent receiving disability benefits was negligible. Without the pandemic, this group would have paid $3k in OASDI tax, and received $300 and $182K in disability and retirement benefits, respectively (in $2023, discounted; **Table 2**).

The pandemic also resulted in 241K additional beneficiaries, including 187K surviving children under 18 and 54K surviving spouses caring for decedents' children under 16 years of age (**Table 3**). Among decedents who were 60 at time of death with children under 18, each had on average 1.5 children under 18, and 42% had a spouse caring for their children under 16. On average, surviving children and spouses will receive 8.4 years and 7.5 years of benefits, with lifetime benefit amounts of $121K and $58K, respectively ($2023, discounted).

Table 2: Average amount decedents would have received (disability or retirement benefits) or paid (OASDI payroll taxes) in the counterfactual scenario, in 2023$. Decedents are categorized by their employment or benefit status at time of death; categories are not mutually exclusive. Values in parentheses are 95% confidence intervals.

During pandemic	Number of decedents (95% CI) [%]	Avg age at death, yrs	Avg life years lost		Avg number of years in future	Avg lifetime $ x 1000, 3% disc.	Avg lifetime $ x 1000
Received employment or self-employment income	488,304			Earnings:	9.7 (9.4 - 10.0)	+90 (87 - 93)*	+130 (125 - 136)*
	(482,953 - 493,654)	58.5 (58.3 - 58.6)	23.8 (23.4 - 24.2)	Disability:	0.5 (0.4 - 0.5)	-8 (7 - 9)	-12 (10 - 13)
	[36%]			Retirement:	14.4 (14.0 - 14.8)	-202 (199 - 206)	-311 (303 - 318)
Received disability benefits	55,639			Earnings:	4.6 (4.3 - 4.9)	+34 (31 - 38)*	+47 (42 - 53)*
	(52,518 - 58,759)	56.7 (56.3 - 57.1)	18.7 (18.2 - 19.1)	Disability:	3.2 (3.1 - 3.4)	-55 (51 - 59)	-61 (56 - 66)
	[4%]			Retirement:	11.7 (11.3 - 12.1)	-121 (116 - 125)	-187 (180 - 195)
Received retirement benefits (>62 yrs)	963,257			Earnings:	0.8 (0.7 - 0.8)	+3 (2 - 3)*	+3 (3 - 3)*
	(961,118 - 965,396)	79.3 (79.3 - 79.4)	8.9 (8.8 - 9.0)	Disability:	0.01 (0.01 - 0.01)	-0.3 (0.3 - 0.3)	-0.3 (0.3 - 0.3)
	[71%]			Retirement:	8.0 (7.9 - 8.1)	-182 (180 - 184)	-219 (216 - 222)

* OASDI tax, calculated as 12.4% of (self-employment) earnings. Amounts not paid because of death

Table 3: Average benefit amounts for surviving children, and spouses who care for child(ren) of decedents, in 2023$. Values in parentheses are 95% confidence intervals.

During pandemic	Number of survivors (1000s)	Avg number of survivors receiving benefits (per decedent)**	Avg number years of benefits	Avg lifetime benefit amount x1000, 3% disc. (per survivor)	Avg lifetime benefit amount x1000 (per survivor)
Child(ren) under 18*	187 (180 - 194)	1.47 (1.44 - 1.51)	8.4 (8.3 - 8.4)	121 (119 - 122)	137 (135 - 138)
(Divorced) spouse with decedent's child(ren) under 16*	54 (51 - 56)	0.42 (0.41 - 0.44)	7.5 (7.3 - 7.7)	58 (56 - 60)	65 (63 - 68)

* Not including those not eligible for benefits or with $0 benefits (e.g. after reduction based on earnings limit for spouse)

** Among decedents with children under 18 at time of death

Table 4: Aggregate OASDI amounts for pandemic decedents, in 2023$. Values in parentheses are 95% confidence intervals.

	Undiscounted		3% discounted	
	Decreases OASDI fund	**Increases OASDI fund**	**Decreases OASDI fund**	**Increases OASDI fund**
OASDI payroll/SE taxes not received	$65 billion (62 - 68)		$44 billion (43 - 46)	
Benefits for surviving (spouses with) children	$28 billion (26 - 29)		$25 billion (24 - 26)	
Unpaid disability benefits		$7 billion (6 - 8)		$6 billion (5 - 6)
Unpaid retirement benefits		$294 billion (289 - 300)		$219 billion (216 - 222)
Total effect on OASDI fund	$209 billion (202 - 216)		$156 billion (151 - 160)	

Overall, excess deaths during the pandemic have a net positive effect on the OASDI fund, mostly because of a reduction in future retirement benefits ($219 billion) that no longer need to be paid to decedents (**Table 4**). This gain was partially offset by new survivors' benefits (-$25 billion) and OASDI payroll taxes (-$44 billion) that will not be received in the future from decedents who were working at the time of their death. The reduction in disability benefits also offsets the gain, but only by a small amount ($6 billion). The total net gain for the OASDI fund is $156 billion ($2023, discounted, **Table 4**).

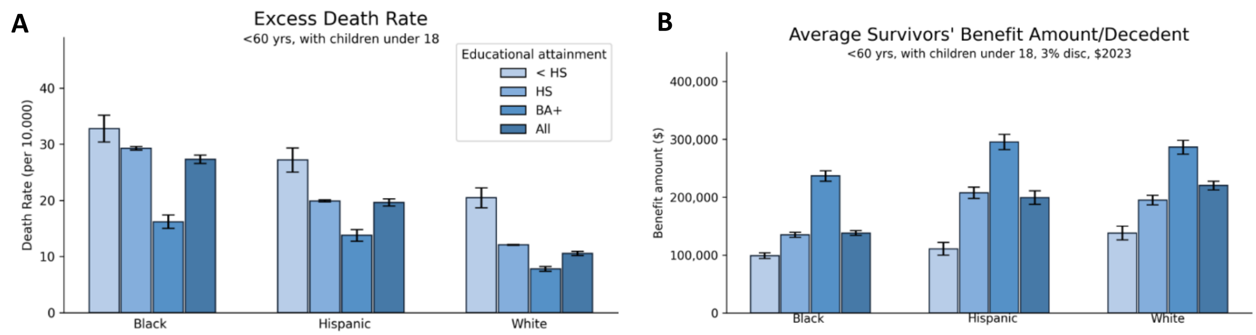
When examining aggregate effects on the OASDI fund by race-ethnicity, the largest share of this gain (83.8%) comes from NH White decedents, who comprised 67.3% of excess deaths (**Table 5**). NH Black and Hispanic decedents account for 11.3% and 5.0% of the net effect on the OASDI fund, with approximately equal shares of excess deaths (16.6% and 16.1% respectively). The net effect for decedents with children under 18 is negative, primarily because of new survivors' benefits. Conversely, the net effect for groups of decedents without children under 18 is positive, driven primarily by unpaid retirement benefits. The negative and positive effects are relatively smaller for Black and Hispanic decedents than for White decedents with respect to the share of excess deaths these groups represent.

Table 5: Excess deaths and net effects on the OASDI funds by race-ethnicity, for decedents with and without children under 18. Dollar amounts in 2023$, 3% discounted. Values in parentheses are 95% confidence intervals.

		Black	Hispanic	White
Without children	Excess deaths, absolute	194,815 (194,245 - 195,385)	179,599 (178,575 - 180,623)	850,407 (848,993 - 851,821)
	Excess deaths, % of total	14.4% (14.4 - 14.5)	13.3% (13.2 - 13.4)	62.9% (62.8 - 63.0)
	Net effect on OASDI fund	$22.3 billion (21.5 - 23.0)	$18.6 billion (18.0 - 19.2)	$149.3 billion (147.2 - 151.4)
With children	Excess deaths, absolute	29,337 (28,767 - 29,907)	38,444 (37,420 - 39,468)	59,018 (57,604 - 60,432)
	Excess deaths, % of total	2.2% (2.1 - 2.2)	2.8% (2.8 - 2.9)	4.4% (4.3 - 4.5)
	Net effect on OASDI fund	$-4.8 billion (-5.3 - -4.2)	$-11.0 billion (-11.7 - -10.2)	$-18.9 billion (-20.2 - -17.6)
All	Excess deaths, absolute	224,152 (224,152 - 224,152)	218,043 (218,043 - 218,043)	909,425 (909,425 - 909,425)
	Excess deaths, % of total	16.6% (16.6 - 16.6)	16.1% (16.1 - 16.1)	67.3% (67.3 - 67.3)
	Net effect on OASDI fund	$17.5 billion (16.4 - 18.7)	$7.6 billion (6.5 - 8.7)	$130.4 billion (127.8 - 133.0)
	Net effect on OASDI fund, % of total	11.3% (10.6 - 11.9)	4.9% (4.3 - 5.6)	83.8% (83.0 - 84.6)

Although the White population represented a larger share of excess deaths among those with children under 18, the per capita excess death rate was higher for Black and Hispanic populations, as well as those with lower educational attainment (**Figure 2A**). Educational attainment and race-ethnicity were also significantly associated with survivors' benefits for decedents' children. For decedents without a high school degree, total family benefits were lower for Black and Hispanic decedents than for White decedents. For those with a high school degree or more, total family benefits were lower for Black decedents than for Hispanic and White decedents (**Figure 2B**).

Because survivors' benefits have a family maximum based on the decedent's PIA, and the decedent's age and average number of children per decedent are lower for Black decedents (**Table 6**), we also estimated the benefit amount per child. For every educational level, the average benefits were lowest for surviving children of both Black and Hispanic decedents, compared to White decedents (**Figure 2C**). Thus, Black decedents' families received the lowest amount of (family) benefits while experiencing the highest excess death rates. For Hispanic decedents, survivors' benefit amounts were more similar to Black or White decedents depending on the measure used (child versus family) and educational attainment, with excess death rates falling between the two groups.



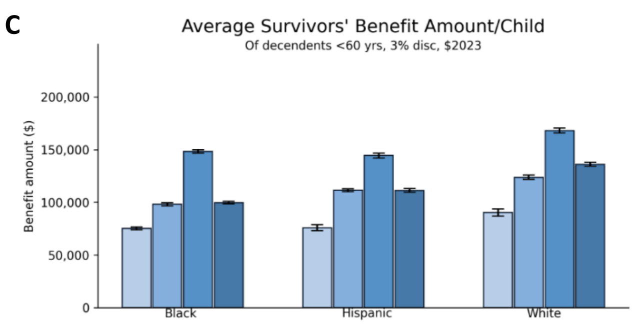


Figure 2: Disparities in survivors' benefits by education and race-ethnicity. Subsample includes decedents under 60 years with children under 18 at time of death. (A) Excess death rate. (B) Average survivors' benefit amount per decedent. (C) Average survivors' benefit amount per child. Error bars represent 95% confidence intervals.

In addition to the racial-ethnic disparities in survivors' benefits, the higher excess death rates among Black and Hispanic populations resulted in a longer average duration that decedents' children have left before reaching 18 years of age, on a per capita basis (**Figure 3**). Children of Black, Hispanic, and White decedents have on average 22.7, 15.0 and 9.4 years left per 1,000 children in the general population. As a result of the pandemic, we estimate that 202K children under age 18 lost a parent, including 43K from Black decedents, 65K from Hispanic decedents, and 94K from White decedents. The average age at death for decedents with underage children was only slightly lower for the Black population (41.0 years) versus Hispanic (42.4 years) and White (42.5 years). However, Hispanic and White decedents with underage children had on average more children per decedent (1.69 and 1.60, respectively) than Black decedents (1.46).

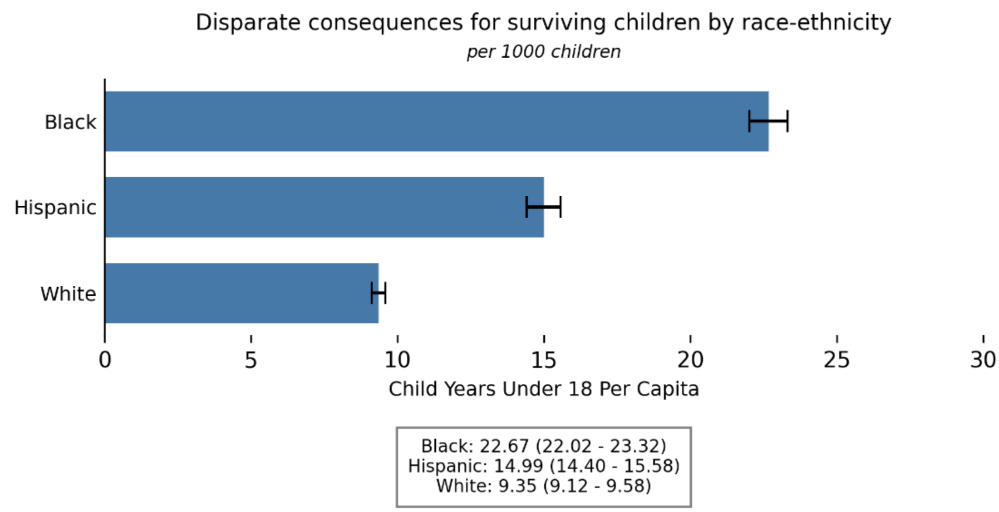


Figure 3: Black and Hispanic decedents leave behind more underage children per capita, illustrated by the average number of years left before a child of a decedent reaches age 18 (per 1000 children).

Table 6: The estimated number of children with a deceased parent as a result of the pandemic, the average age of the deceased parent, and the average number of children per deceased parent. Rates are among simulated decedents under 60 with any children under 18, by race-ethnicity

	Number of children with deceased parent (1000s)	Average age of decedent	Average number of children/decedent
Non-Hispanic Black	43 (41 - 44)	41.0 (40.9 - 41.2)	1.46 (1.43 - 1.49)
Hispanic	65 (61 - 69)	42.4 (42.3 - 42.5)	1.69 (1.63 - 1.75)
Non-Hispanic White	94 (90 - 99)	42.5 (42.4 - 42.6)	1.60 (1.56 - 1.64)

Discussion

From an actuarial standpoint, the excess deaths during the COVID-19 pandemic reduced the liabilities of the OASDI system by $156 billion, or $115K per decedent, on net. The reduction in benefit payouts outweighed the loss of future tax revenues from decedents and new payments of survivors' benefits to decedents' families. However, these public fiscal benefits are extremely modest compared to the broader costs generated by the COVID-19 pandemic.

Our analysis suggests a slight improvement in Social Security's financial health due to excess deaths, driven primarily by the premature death of people who would have received retirement benefits. Offsetting effects, such as the increase in survivors' insurance beneficiaries, are relatively small by comparison. Although the effect of a parent's premature death on the (financial) wellbeing of a family is devastating, only 9.3% of pandemic decedents were estimated to have children under 18 at the time of death. We estimate that 202K children lost a parent in 34 months (5.9K/month) of the pandemic, which is slightly lower than a previous estimate of 105K in the first 14 months of the pandemic (7.5K/month) (16). In addition to this component being relatively small, actual benefits for surviving spouses and children are likely overestimated, since a large fraction of children with a deceased parent do not claim these benefits (17). The other components of our analysis, such as the reduction in the OASDI tax receipts or the discontinuation of retirement and disability benefits, are more likely to be realized. If none of the eligible survivors claimed their benefits, the net effect of excess deaths on the OASDI fund could be up to $25 billion (16%) larger.

That said, the effects on Social Security could also be worse than we forecast, because we do not account for the possible effects of morbidity, such as long COVID. However, it seems unlikely that this omission would reverse our qualitative finding that the excess deaths improved the solvency of Social Security. As of September 2022, approximately 420,000 people (or 0.3% of the workforce) were estimated to have left the workforce due to long-COVID (18). Given that the average yearly disability benefit is $17,797 (19), each former worker would need to claim disability benefits for 21 years to completely offset the net fiscal effect we find. Additionally, Goda et al. (20) reported that disability benefit applications actually decreased in the first two years of the pandemic, and only partially recovered to pre-pandemic levels after the expiration of generous unemployment benefit programs. This suggests that long COVID-related disability is unlikely to substantially affect OASDI finances.

Our findings align with early projections in the 2021 Trustees Report (21), which suggested that excess or premature mortality would increase the projected trust fund ratio and have a positive impact on the solvency. Despite this projection, other factors—such as temporary and permanent reductions in employment, GDP, productivity, earnings, birth rates, and new disability applications—led to a reduction in the overall insolvency by one year, with a projected depletion year of 2034. Subsequent Trustees reports (22-24) adjusted the depletion year to 2035, then 2034, and back to 2035. The latest report from 2024 continues to assume no significant long-term effect of the pandemic on the OASDI fund's solvency.

Our analysis included retired workers, spouses of retired workers, children of deceased workers, widowed mothers/fathers, and disabled workers. Together, these groups comprise 91.4% of beneficiaries and 93.4% of total monthly benefits (25). Several smaller groups were not included in the calculation of the effect of pandemic excess deaths on the OASDI fund. We excluded children of retired workers (1% of beneficiaries) because we were not able to assess whether a child was receiving retirement benefits based on the parent's account and/or whether they were disabled. We also excluded nondisabled and disabled widow(er)s (5.3% and 0.3%) because we were not able to determine whether surviving spouses of deceased workers would receive additional benefits above and beyond their own worker/spousal/disability benefits, and because we lack data on whether widowed spouses would remarry before 60, change financial or career trajectories after experiencing widowhood, or have changes in their disability status. We also excluded spouses and children of disabled workers (0.1% and 1.7%) because we did not have data on whether spouses and children of disabled workers were collecting additional disability insurance benefits. Finally, we excluded parents of deceased workers (0.001%), a group that consists of fewer than 1000 people. While these groups were excluded, they represent a small fraction of beneficiaries. Overall, our analysis captures the major OASDI beneficiary categories, covering the large majority of recipients, to determine the net effect of excess deaths on the OASDI fund.

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