

Supplementary Online Content

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This supplementary material has been provided by the authors to give readers additional information about their work.

eMethods. Estimation of the Inverse Probability Weights

In this study, two inverse probability weights (IPWs) were calculated: the inverse probability of treatment weight (IPTW), which accounts for time-dependent confounding, and the inverse probability of censoring weight (IPCW), which accounts for differential loss to follow-up due to study withdrawal.

The IPTW is proportional to the inverse of the probability of having the observed exposure through that follow-up wave, for each participant i and wave t , among those who are alive, completed an interview, and have not yet experienced a negative wealth shock. To calculate these weights, two pooled logistic models were fitted to output the probability of not experiencing a wealth shock by participant ID and follow-up wave.¹ The first model (the numerator model) included only baseline covariates, while the second model (the denominator model) included both baseline and time-varying covariates. Time-varying variables were lagged by one wave to address temporality issues. Models were fitted using the SAS SURVEYLOGISTIC procedure to account for the complex survey sampling design of HRS.²

Numerator probability model:

$$\text{logit}(\Pr[A_k = 0 \mid \bar{A}_{k-1}, \bar{G}_k = 0, L_0]) = \alpha_{0k} + \alpha_1 L_0$$

Denominator probability model:

$$\text{logit}(\Pr[A_k = 0 \mid \bar{A}_{k-1}, \bar{G}_k = 0, \bar{L}_{k-1}]) = \alpha_{0k} + \alpha_1 L_{k-1}$$

where

- A_k represents the exposure to wealth shock at time k
- \bar{A}_{k-1} equals 0 if the participant has no history of exposure to wealth shock
- \bar{G}_k equals 0 if the participant is alive at time k , and equals 1 if the participant has been censored due to death or withdrawal
- L_0 represents baseline covariates
- L_{k-1} represents baseline and time-varying covariates at time $k-1$
- \bar{L}_{k-1} represents baseline and time-varying covariates up to time $k-1$

To calculate the IPTW, predicted probabilities from the numerator model were divided by the predicted probabilities from the denominator model. This provides a “stabilized” weight (SW^E) for each person i .¹

IPTW Calculation Formula:

$$SW_i^E(t) = \prod_{k=1}^t \frac{\text{pr}(A_k \mid \bar{A}_{k-1}, \bar{G}_k = 0, L_0)}{\text{pr}(A_k \mid \bar{A}_{k-1}, \bar{G}_k = 0, \bar{L}_{k-1})}$$

The IPCW is proportional to the inverse of the probability of having withdrawn from the study through that follow-up wave, for each participant i and wave t . The IPCW was estimated in the same manner as the IPTW, except that the pooled logistic models were fitted to output the probability of not experiencing censoring.

A total IPW that incorporates both adjustment for time-dependent confounding and censoring was calculated by multiplying the IPTW x IPCW. Weights that deviate substantially from 1.0 indicate nonpositivity or misspecification of the model.¹ In this analysis, the total IPW mean was 1.01, with a standard deviation of 0.15 and a range of 0.36-8.10. Weight truncation is sometimes applied in marginal structural modeling to remove the bias introduced from outlier weights,¹ however, the narrow range of our weights indicated truncation was unnecessary.

eTable 1. Baseline Prevalence of Assets and Debt Types and Median Values (in thousands of 2014 US dollars)

	Unweighted Sample						Weighted to Reflect US Population ^a					
	Positive Wealth Without Shock N=5535		Negative Wealth Shock N=2430		Asset Poverty at Baseline N=749		Positive Wealth Without Shock		Negative Wealth Shock		Asset Poverty at Baseline	
Assets ^b	Prevalence No. (%)	Median Value (Q1-Q3)	Prevalence No. (%)	Median Value (Q1-Q3)	PrevalenceNo. (%)	Median Value (Q1-Q3)	Weighted Prevalence (95% CI)	Weighted Median Value (95% CI)	Weighted Prevalence (95% CI)	Weighted Median Value (95% CI)	Weighted Prevalence (95% CI)	Weighted Median Value (95% CI)
Primary residence	5121 (92.5)	144 (93-237)	1705 (70.2)	110 (68-203)	143 (19.1)	59 (25-110)	92.2 (91.1-93.2)	155 (142-168)	70.4 (67.8-72.9)	124 (111-138)	22.2 (17.3-27.1)	62 (40-83)
Other real estate ^c	1654 (29.9)	85 (26-220)	478 (19.7)	70 (20-235)	17 (2.3)	17 (10-144)	30.3 (28.4-32.2)	82 (73-90)	20.5 (18.2-22.7)	78 (61-95)	3.2 (1.1-5.2)	15 (-49-79)
Vehicles ^c	5365 (96.9)	17 (9-31)	2205 (90.7)	11 (4-22)	259 (34.6)	3 (1-9)	97.3 (96.7-97.9)	17 (16-18)	91.9 (90.7-93.1)	11 (10-12)	40 (34.6-45.4)	3 (3-4)
Businesses ^c	842 (15.2)	127 (42-338)	318 (13.1)	93 (34-394)	9 (1.2)	380 (85-676)	15.6 (14.4-16.9)	129 (101-157)	14.6 (12.8-16.3)	91 (59-122)	1.7 (0.1-3.4)	* ^h
IRAs / Keoghs ^d	2928 (52.9)	42 (17-85)	569 (23.4)	25 (9-68)	26 (3.5)	7 (3-25)	56.6 (54.1-59)	41 (38-45)	26.8 (24.4-29.2)	25 (22-27)	4.6 (2.4-6.7)	6 (2-10)
Investments ^e	3030 (54.7)	34 (10-110)	707 (29.1)	17 (5-68)	40 (5.3)	2 (0-4)	57.7 (55.3-60.2)	34 (30-37)	31.5 (29.1-33.9)	18 (14-21)	6.2 (3.8-8.6)	2 (0-3)
Bank accounts	5005 (90.4)	12 (3-34)	1816 (74.7)	5 (1-17)	224 (29.9)	1 (0-2)	92.2 (91.1-93.2)	12 (11-13)	77.7 (75.2-80.1)	6 (5-6)	35.7 (31.4-40)	1 (1-1)
All other assets ^f	1062 (19.2)	25 (14-69)	333 (13.7)	17 (9-51)	10 (1.3)	7 (3-17)	20.3 (18.8-21.8)	25 (22-28)	15.2 (12.9-17.5)	17 (15-19)	1.6 (0.3-3)	9 (-8-26)
Debts^b												
Primary mortgage	2859 (51.7)	49 (20-93)	1055 (43.4)	49 (20-98)	120 (16)	64 (36-126)	51.2 (48.8-53.6)	51 (46-55)	43.2 (40.7-45.7)	51 (45-57)	18 (13.7-22.3)	66 (38-93)
Home equity loans	721 (13)	24 (13-47)	209 (8.6)	34 (16-51)	17 (2.3)	85 (20-240)	14 (12.5-15.6)	24 (21-27)	9.6 (7.8-11.5)	33 (29-38)	3.3 (1.1-5.5)	52 (-58-162)
Unsecured debts ^g	2055 (37.1)	4 (2-10)	1057 (43.5)	5 (2-10)	383 (51.1)	8 (3-25)	36.5 (33.9-39)	4 (4-5)	43.7 (41.1-46.3)	5 (4-6)	54.9 (50.6-59.3)	8 (7-9)
Overall Net Worth^b	-	223 (108-445)	-	76 (19-207)	-	-1 (-7-0)	-	251 (232-269)	-	88 (76-101)	-	-1 (-2,-1)

Abbreviations: IRA, individual retirement account; Q1, first quartile; Q3, third quartile.

^a HRS used complex survey sampling which allow for estimation to represent the US population in the birth cohort born between 1931-1941.

^b Values for net worth and all components reported in 2014 dollars using the Consumer Price Index adjustment.

^c Estimated net value that takes into account debts owed on asset.

^d Individual retirement accounts (IRA) and Keogh accounts are tax-deferred retirement savings plans that are funded through individual contributions. There are multiple types of IRAs, depending on type of employment and household income. Keogh accounts are available only for self-employed small business owners.

^e Investments includes stocks, mutual funds, investment trusts, bonds, bond funds, certificates of deposit, government savings bonds, and treasury bills.

^f Other assets include jewelry, money owed by others, a collection for investment purposes, rights in a trust or estate, or an annuity.

^g Unsecured debts includes credit card balances, medical debts, life insurance policy loans, and loans from relatives.

^h Weighted value could not be estimated due to sparse cell size.

eTable 2. Baseline Prevalence of Assets and Debt Types and Median Values (in thousands of 2014 US dollars), by Net Worth Category

	Unweighted Sample						Weighted to Reflect US Population ^a					
	Net Worth Category 1 <\$100,000 ^b (n=3,388)		Net Worth Category 2 \$100,000-\$300,000 ^b (n=2,700)		Net Worth Category 3 >\$300,000 ^b (n=2,626)		Net Worth Category 1 <\$100,000 ^b		Net Worth Category 2 \$100,000-\$300,000 ^b		Net Worth Category 3 >\$300,000 ^b	
Assets	Prevalence No. (%)	Median Value (Q1-Q3)	Prevalence No. (%)	Median Value (Q1-Q3)	Prevalence No. (%)	Median Value (Q1-Q3)	Weighted Prevalence (95% CI)	Weighted Median Value (95% CI)	Weighted Prevalence (95% CI)	Weighted Median Value (95% CI)	Weighted Prevalence (95% CI)	Weighted Median Value (95% CI)
Primary residence	1843 (54.4)	68 (42-101)	2575 (95.4)	135 (101-186)	2551 (97.1)	237 (152-338)	54.0 (50.2-57.9)	67 (63-72)	94.6 (93.3-95.8)	135 (128-142)	97.2 (96.2-98.1)	252 (235-269)
Other real estate ^c	238 (7.0)	17 (9-34)	640 (23.7)	42 (17-85)	1271 (48.4)	169 (68-372)	7.3 (6.5-8.2)	15 (12-18)	22.9 (19.9-25.8)	34 (29-38)	47.0 (44.2-49.8)	160 (145-175)
Vehicles ^c	2621 (77.4)	7 (3-14)	2614 (96.8)	17 (9-25)	2594 (98.8)	25 (15-42)	80.4 (78.3-82.6)	7 (6-8)	96.9 (96-97.8)	17 (16-18)	98.9 (98.4-99.4)	25 (23-27)
Businesses ^c	93 (2.7)	17 (9-25)	274 (10.2)	42 (17-85)	802 (30.5)	254 (85-507)	3.2 (2.2-4.2)	15 (11-19)	10.3 (8.9-11.8)	38 (33-43)	29.2 (26.7-31.8)	244 (202-285)
IRAs / Keoghs ^d	360 (10.6)	9 (5-24)	1209 (44.8)	25 (13-51)	1954 (74.4)	64 (27-125)	12.9 (11.3-14.5)	10 (7-12)	47.0 (44.2-49.8)	25 (22-27)	75.5 (73.3-77.7)	63 (57-69)
Investments ^e	496 (14.6)	4 (1-13)	1306 (48.4)	17 (5-36)	1975 (75.2)	85 (25-186)	16.2 (14.5-17.9)	4 (3-5)	49.7 (46.8-52.6)	16 (15-18)	75.9 (73.4-78.5)	84 (75-93)
Bank accounts	2029 (59.9)	3 (1-7)	2456 (91)	9 (3-20)	2560 (97.5)	22 (9-51)	64.3 (62.0-66.6)	3 (2-3)	92.2 (90.4-94)	8 (8-9)	97.4 (96.9-98)	22 (18-25)
All other assets ^f	197 (5.8)	9 (3-17)	395 (14.6)	17 (9-34)	813 (31)	51 (17-123)	6.9 (5.4-8.4)	8 (6-11)	15.0 (12.9-17.2)	16 (15-18)	30.7 (28.2-33.2)	49 (40-57)
Debts												
Primary mortgage	1187 (35)	41 (17-76)	1533 (56.8)	46 (18-91)	1314 (50)	63 (25-127)	34.5 (31.7-37.3)	43 (38-49)	56.4 (53.3-59.5)	50 (44-56)	50.3 (46.7-53.8)	65 (58-72)
Home equity loans	153 (4.5)	22 (9-42)	371 (13.7)	24 (12-41)	423 (16.1)	29 (15-61)	5.1 (3.4-6.8)	21 (16-26)	15.0 (13.5-16.4)	22 (17-27)	16.6 (14.0-19.1)	29 (25-33)
Unsecured debts ^g	1559 (46)	5 (2-12)	1127 (41.7)	5 (2-9)	809 (30.8)	5 (2-12)	47.1 (44.3-50)	5 (4-5)	41.7 (39.1-44.3)	4 (4-5)	30.3 (27.4-33.3)	5 (4-6)
Overall Net Worth	-	42 (14-70)	-	174 (134-226)	-	536 (390-934)	-	42 (38-46)	-	177 (172-183)	-	543 (517-569)

Abbreviations: IRA, individual retirement account; Q1, first quartile; Q3, third quartile.

^a HRS used complex survey sampling which allow for estimation to represent the US population in the birth cohort born between 1931-1941.

^b Values for net worth and all components reported in 2014 dollars (in thousands) using the Consumer Price Index adjustment.

^c Estimated net value that takes into account debts owed on asset.

^d Individual retirement accounts (IRA) and Keogh accounts are tax-deferred retirement savings plans that are funded through individual contributions. There are multiple types of IRAs, depending on type of employment and household income. Keogh accounts are available only for self-employed small business owners.

^e Investments includes stocks, mutual funds, investment trusts, bonds, bond funds, certificates of deposit, government savings bonds, and treasury bills.

^f Other assets include jewelry, money owed by others, a collection for investment purposes, rights in a trust or estate, or an annuity.

^g Unsecured debts includes credit card balances, medical debts, life insurance policy loans, and loans from relatives.

eTable 3. Prevalence of Asset Loss, Debt Gain, and Median Value of Loss or Gain due to Negative Wealth Shock by Net Worth Category

	Unweighted Sample						Weighted to Reflect US Population ^a					
	Net Worth Category 1 <\$100,000 ^b (n=3,388)		Net Worth Category 2 \$100,000-\$300,000 ^b (n=2,700)		Net Worth Category 3 >\$300,000 ^b (n=2,626)		Net Worth Category 1 <\$100,000 ^b		Net Worth Category 2 \$100,000-\$300,000 ^b		Net Worth Category 3 >\$300,000 ^b	
Asset Change	Prevalence ^c No. (%)	Median Value ^d (Q1-Q3)	Prevalence ^c No. (%)	Median Value ^d (Q1-Q3)	Prevalence ^c No. (%)	Median Value ^d (Q1-Q3)	Weighted Prevalence ^c (95% CI)	Weighted Median Value ^d (95% CI)	Weighted Prevalence ^c (95% CI)	Weighted Median Value ^d (95% CI)	Weighted Prevalence ^c (95% CI)	Weighted Median Value ^d (95% CI)
Primary residence	348 (25.7)	72 (40-118)	212 (36.4)	145 (92-199)	123 (30.4)	270 (165-540)	26.2 (22.7-29.7)	72 (61-83)	37.2 (31.8-42.5)	155 (133-177)	30.3 (25.2-35.4)	299 (206-392)
Other real estate ^e	142 (10.5)	38 (13-106)	104 (17.9)	91 (32-224)	136 (33.6)	369 (160-1242)	9.1 (7.4-10.8)	40 (27-53)	17.3 (13.8-20.7)	86 (54-118)	32.6 (26.1-39.2)	416 (261-570)
Vehicles ^e	417 (30.8)	7 (2-15)	138 (23.7)	13 (6-26)	84 (20.7)	26 (10-36)	29.6 (26.9-32.3)	7 (5-8)	23.3 (18.5-28.1)	13 (9-17)	21.0 (15.9-26.1)	26 (20-32)
Businesses ^e	59 (4.4)	65 (21-145)	70 (12)	83 (32-290)	143 (35.3)	459 (167-1586)	4.5 (3.1-5.9)	87 (46-128)	11.5 (8.1-15.0)	80 (28-132)	35.2 (30.6-39.8)	501 (119-884)
IRAs / Keoghs ^f	128 (9.5)	24 (8-69)	122 (21)	58 (28-172)	111 (27.4)	98 (22-310)	9.8 (8.2-11.5)	24 (15-33)	22.0 (16.9-27.1)	59 (28-90)	26.2 (21.7-30.8)	72 (19-124)
Investments ^g	140 (10.3)	9 (3-45)	141 (24.2)	33 (12-110)	185 (45.7)	162 (35-604)	11.3 (9.4-13.2)	9 (2-16)	26.7 (22.2-31.2)	34 (16-53)	48 (41.7-54.3)	162 (35-289)
Bank accounts	439 (32.4)	3 (1-12)	228 (39.2)	13 (3-45)	149 (36.8)	17 (6-56)	33.3 (29.9-36.7)	3 (2-4)	39.0 (33.6-44.4)	14 (9-19)	36.4 (29.5-43.3)	21 (9-32)
All other assets ^h	107 (7.9)	16 (6-40)	87 (15)	15 (7-91)	88 (21.7)	71 (20-262)	9.5 (7.4-11.5)	16 (10-22)	14.6 (10.8-18.3)	19 (6-31)	21.5 (15.6-27.4)	104 (53-155)
Debt Change												
Primary mortgage	304 (22.5)	32 (4,74)	205 (35.2)	41 (3,104)	127 (31.4)	33 (0,160)	20.5 (17.3-23.8)	33 (24-41)	34.5 (29.5-39.4)	36 (23-48)	31.9 (26-37.9)	32 (-5-69)
Home equity loans	84 (6.2)	25 (7,58)	51 (8.8)	45 (18,81)	43 (10.6)	26 (7,102)	6.1 (4.1-8.0)	28 (18-38)	9.4 (6.5-12.3)	52 (25-80)	11.1 (7.0-15.2)	27 (2-52)
Unsecured debts ⁱ	626 (46.2)	6 (1,19)	236 (40.6)	11 (3,36)	120 (29.6)	19 (3,60)	45.9 (42.7-49.2)	6 (6-7)	39.8 (34.2-45.4)	11 (7-14)	29.6 (23.6-35.6)	17 (9-26)
Overall Net Worth Change		44 (14,92)		159 (94,289)		755 (334,1712)		42 (37-47)		160 (142-177)		777 (646-909)

Abbreviations: IRA, individual retirement account; Q1, first quartile; Q3, third quartile.

^a HRS used complex survey sampling which allow for estimation to represent the US population in the birth cohort born between 1931-1941.

^b Values for net worth and all components reported in 2014 dollars (in thousands) using the Consumer Price Index adjustment.

^c Considered to have had gain or loss if 75% or more of the value was lost or gain at the time of the negative wealth shock.

^d Value of loss computed only among those who experienced the loss.

^e Estimated net value that takes into account debts owed on asset.

^f Individual retirement accounts (IRA) and Keogh accounts are tax-deferred retirement savings plans that are funded through individual contributions. There are multiple types of IRAs, depending on type of employment and household income. Keogh accounts are available only for self-employed small business owners.

^g Investments includes stocks, mutual funds, investment trusts, bonds, bond funds, certificates of deposit, government savings bonds, and treasury bills.

^h Other assets include jewelry, money owed by others, a collection for investment purposes, rights in a trust or estate, or an annuity.

ⁱ Unsecured debts includes credit card balances, medical debts, life insurance policy loans, and loans from relatives.

eTable 4. Rates and Adjusted Hazard of Death for Negative Wealth Shock Exposure Categories by Whether Shock Occurred During Recession and Whether Loss of Primary Residence Occurred During Shock

	Person-years, No.	All Deaths, No.	Unadjusted rate / 1000 person-years (95% CI)	Unadjusted rate difference (95% CI)	Adjusted hazard ratio ^a (95% CI)
Recession Subgroup Analysis					
Positive Wealth Without Shock	52,788	1617	30.6 (29.1-32.1)	0 (Ref)	1.00 (Ref)
Negative Wealth Shock Outside of Recession	9610	611	63.6 (58.5-68.6)	33.0 (27.7-38.2)	1.51 (1.34-1.70)
Negative Wealth Shock During Recession	3011	208	69.1 (59.7-78.5)	38.5 (28.9-48.0)	1.43 (1.22-1.67)
Loss of Primary Residence Subgroup Analysis					
Positive Wealth Without Shock	52,788	1617	30.6 (29.1-32.1)	0 (Ref)	1.00 (Ref)
Negative Wealth Shock Without Loss of Home	9997	600	60.0 (55.2-64.8)	29.4 (24.4-34.4)	1.37 (1.22-1.53)
Negative Wealth Shock With Loss of Home	2624	219	83.5 (72.4-94.5)	52.8 (41.7-64.0)	1.87 (1.58-2.21)

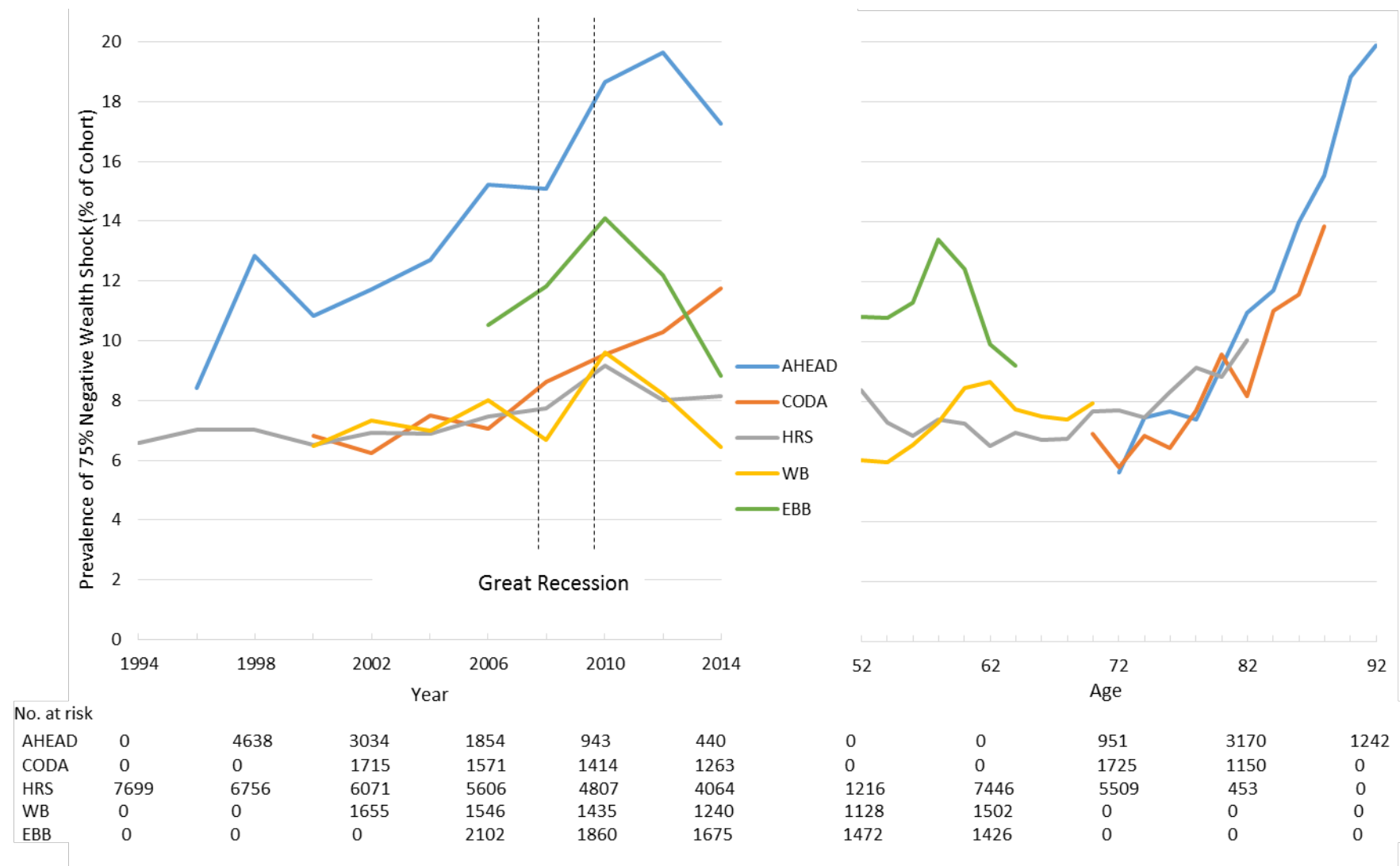
^a Adjusted hazard was derived from the marginal structural hazard model for time to outcome, with both inverse probability of treatment and inverse probability of censoring weights applied.

eTable 5. Rates and Adjusted Hazard of Death for Negative Wealth Shock Exposure Categories by Alternative Cut-Points for Negative Wealth Shock

	Person-years, No.	All Deaths, No.	Unadjusted rate / 1000 person-years (95% CI)	Unadjusted rate difference (95% CI)	Adjusted hazard ratio ^a (95% CI)
Net worth loss of 25% or more					
Positive Wealth Without Shock	24,655	554	22.5 (20.6-24.3)	0 (Ref)	1.00 (Ref)
Negative Wealth Shock	40,939	1889	46.1 (44.1-48.2)	23.7 (20.9-26.5)	1.33 (1.18-1.50)
Net worth loss of 50% or more					
Positive Wealth Without Shock	40,913	1120	27.4 (25.8-29.0)	0 (Ref)	1.00 (Ref)
Negative Wealth Shock	24,607	1321	53.7 (50.8-56.6)	26.3 (23.0-30.0)	1.39 (1.26-1.52)
Net worth loss of 75% or more (Main finding reported in Table 3)					
Positive Wealth Without Shock	52,788	1617	30.6 (29.1-32.1)	0 (Ref)	1.00 (Ref)
Negative Wealth Shock	12,621	819	64.9 (60.4-69.3)	34.3 (29.6-39.0)	1.50 (1.36-1.67)
Net worth loss of 100% or more					
Positive Wealth Without Shock	59,283	1989	33.6 (32.1-35.0)	0 (Ref)	1.00 (Ref)
Negative Wealth Shock	5998	444	74.0 (67.1-80.9)	40.5 (33.4-47.5)	1.52 (1.34-1.73)

^a Adjusted hazard was derived from the marginal structural hazard model for time to outcome, with both inverse probability of treatment and inverse probability of censoring weights applied.

eFigure 1. Prevalence of 75% Negative Wealth Shock by Year, Age, and HRS Cohort



Abbreviation: HRS, Health and Retirement Study.

Five HRS birth cohorts are included in this figure: Asset and Health Dynamics Among the Oldest Old (AHEAD), born before 1924;³ Children of the Depression (CODA), born 1924 to 1930;⁴ original HRS cohort, born 1931-1941;⁵ War Babies (WB), born 1942 to 1947;⁶ and Early Baby Boomers (EBB), born 1948 to 1953.⁷

eTable 6. Rates and Adjusted Hazard of Death for Negative Wealth Shock Exposure Categories in Other HRS Birth Cohorts

	Person-years, No.	All Deaths, No.	Unadjusted rate / 1000 person-years (95% CI)	Unadjusted rate difference (95% CI)	Adjusted hazard ratio ^a (95% CI)
CODA (born 1924-1930)					
Positive Wealth Without Shock	9,017	760	84.3 (78.3-90.3)	0 (Ref)	1.00 (Ref)
Negative Wealth Shock	1,683	268	159 (140-178)	75.0 (55.0-94.9)	1.51 (1.28-1.78)
Asset Poverty at Baseline	611	86	141 (111-171)	56.5 (26.1-86.8)	1.25 (0.95-1.64)
WB (born 1942-1947)					
Positive Wealth Without Shock	9,612	160	16.6 (14.1-19.2)	0 (Ref)	1.00 (Ref)
Negative Wealth Shock	1,986	75	37.8 (29.2-46.3)	21.1 (12.2-30.1)	1.42 (1.04-1.94)
Asset Poverty at Baseline	966	41	42.4 (29.5-55.4)	25.8 (12.6-39.0)	1.77 (1.16-2.70)

Abbreviation: CODA, Children of the Depression; HRS, Health and Retirement Study; WB, War Babies.

Three HRS birth cohorts are included in this figure: Children of the Depression (CODA), born 1924 to 1930;⁴ original HRS cohort, born 1931-1941;⁵ and War Babies (WB), born 1942 to 1947.⁶

^a Adjusted hazard was derived from the marginal structural hazard model for time to outcome, with both inverse probability of treatment and inverse probability of censoring weights applied.

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