Health inequality and economic disparities

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One fact and two questions

Fact: Vast inequality in economic outcomes by race, ethnicity, and gender

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- **Q1: How large is health inequality by race, ethnicity, and gender?**
  - Step 1: How should we **measure health**?
  - Step 2: How **unequal is health**?

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  - **Find: huge health inequality**

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- **Q2: To what extent can health inequality be responsible for inequality in other outcomes by race, ethnicity, and gender?**
  - Step 1: How **unequal are other outcomes**?
  - Step 2: To what extent **can health account for their inequality**?

One fact and two questions

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  - Step 1: How **unequal are other outcomes**?
  - Step 2: To what extent **can health account for their inequality**?
  - **Find: health responsible for a lot of inequality in other economic outcomes**

▸ Some literature

How should we measure health

by race, ethnicity, and gender?

Data: the Health and Retirement Study (HRS), from 1996 to 2018

- Sample:
  - Men and women age 51 to 100
  - **Non-Hispanic White, non-Hispanic Black, and Hispanic men and women**
- **Has measure of self-reported health status** " How would you rate your health: excellent, very good, good, fair, or poor?"
- **Has data on many health deficits that can be used to construct a health measure proposed by the medical literature (frailty)**

▸ Sample Composition

Health deficits

Deficit	Deficit
ADLs	Difficulty lifting a weight heavier than 10 lbs
Difficulty bathing	Difficulty lifting arms over the shoulders
Difficulty dressing	Difficulty picking up a dime
Difficulty eating	Difficulty pulling/pushing large objects
Difficulty getting in/out of bed	Difficulty sitting for two hours
Difficulty using the toilet	
Difficulty walking across a room	**Diagnoses**
Difficulty walking one block	Diagnosed with high blood pressure
Difficulty walking several blocks	Diagnosed with diabetes
	Diagnosed with cancer
IADLs	Diagnosed with lung disease
Difficulty grocery shopping	Diagnosed with a heart condition
Difficulty making phone calls	Diagnosed with a stroke
Difficulty managing money	Diagnosed with psychological or psychiatric problems
Difficulty preparing a hot meal	Diagnosed with arthritis
Difficulty taking medication	
Difficulty using a map	**Healthcare Utilization**
	Has stayed in the hospital in the previous two years
Other Functional Limitations	Has stayed in a nursing home in the previous two years
Difficulty climbing one flight of stairs	
Difficulty climbing several flights of stairs	**Addictive Diseases**
Difficulty getting up from a chair	Has BMI larger than 30
Difficulty kneeling or crouching	Has ever smoked cigarettes

▸ Prevalence for women ▸ Prevalence for men

Candidates to measure health by race, ethnicity, and gender

- **Self-reported health status (SRHS)**
- **Frailty** ▸ Literature
  - ⇒ **Fraction of health deficits that one has as a function of total possible health deficits, including diagnosed ones**

Candidates to measure health by race, ethnicity, and gender

- **Self-reported health status (SRHS)**
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  - ⇒ **Fraction of health deficits that one has as a function of total possible health deficits, including diagnosed ones**
- **What could their problems be?**
  - **Self-reported health not necessarily comparable across these groups** ▸ Limitations
  - **Frailty might be under-measured for groups less likely to have medical care** ▸ Limitations

A good measure of health should help explain future outcomes

- **Outcomes: disability, retirement, nursing home entry, death**

A good measure of health should help explain future outcomes

- **Outcomes: disability, retirement, nursing home entry, death**
- Logistic regressions
- Basic regressors: age, education, cohort, and marital status
- Other regressors: health measure (SRHS or frailty), interations of health and age and health and education

▸ Details on outcome variables ▸ Details on regressions

Do our health measures help explain outcomes? Mc-Fadden's Pseudo-R^2

		Women			Men		
		White	Hispanic	Black	White	Hispanic	Black
SDI Recipient Next Wave	Basic Controls	0.048	0.046	0.036	0.045	0.022	0.032
	SRHS	0.212	0.122	0.129	0.186	0.112	0.122
	Frailty	0.244	0.193	0.185	0.245	0.222	0.175
	Frailty and SRHS	0.268	0.202	0.199	0.264	0.241	0.196
SS Benefits Recipient Next Wave	Basic Controls	0.118	0.081	0.083	0.134	0.101	0.120
	SRHS	0.128	0.110	0.102	0.140	0.128	0.126
	Frailty	0.126	0.091	0.097	0.142	0.112	0.139
	Frailty and SRHS	0.132	0.123	0.114	0.147	0.145	0.145
NH Entry Next Wave	Basic Controls	0.241	0.172	0.169	0.220	0.144	0.122
	SRHS	0.285	0.209	0.206	0.266	0.194	0.176
	Frailty	0.315	0.231	0.214	0.303	0.272	0.234
	Frailty and SRHS	0.319	0.250	0.227	0.308	0.291	0.244
Death Next Wave	Basic Controls	0.166	0.157	0.120	0.140	0.157	0.109
	SRHS	0.240	0.194	0.169	0.219	0.212	0.151
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	Frailty and SRHS	0.276	0.230	0.201	0.251	0.253	0.182

- **SRHS is an important predictor of economic outcomes**

▸ Percentage change

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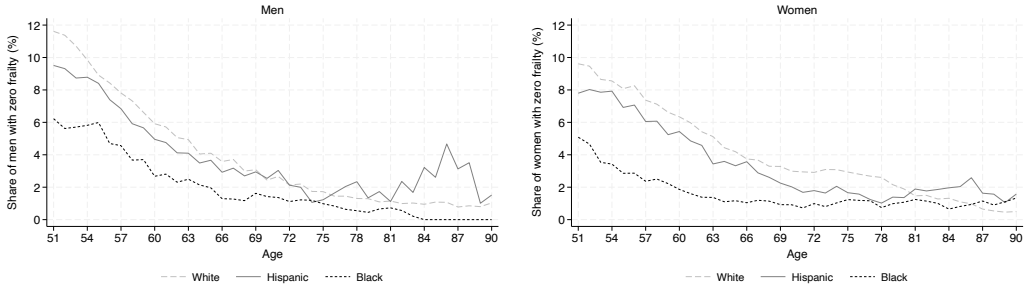
- **Frailty does slightly better than SRHS and has a quantitative interpretation. Let's use it!**

▸ Percentage change

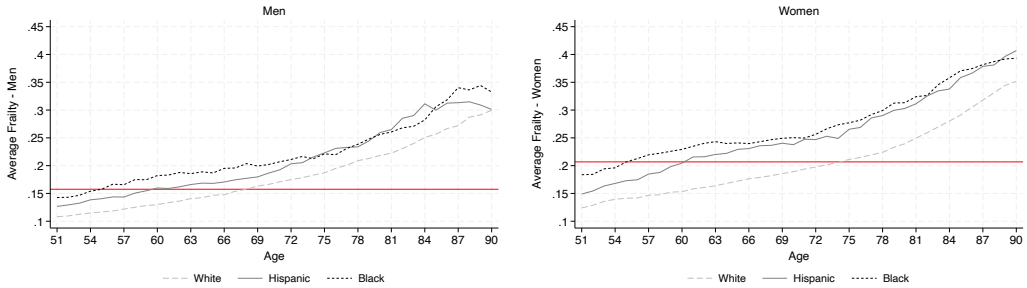
Q1. How much inequality is there by race, ethnicity, and gender?

Measuring health inequality. Share of people with zero frailty



- White people have the highest share of healthiest people (up to age 75)
- Hispanic people second highest healthiest share
- Black people lowest share of healthiest people
- Age 55, 8.1%, 6.9%, 2.6% of White, Hispanic, and Black women have zero frailty

Measuring health inequality. Average frailty

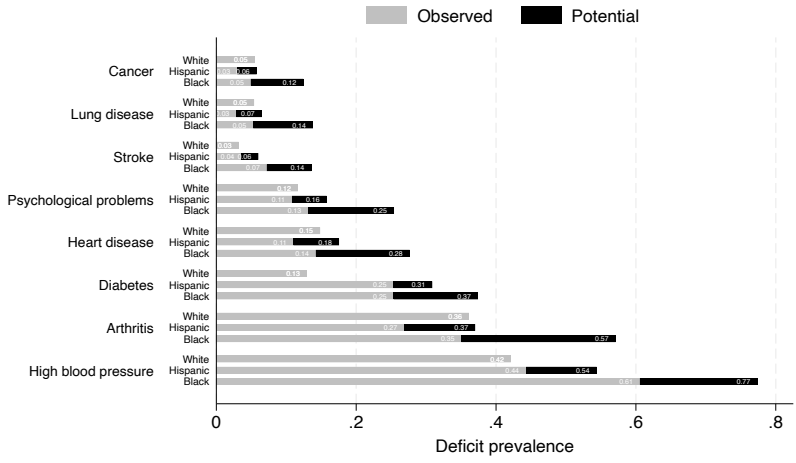


- White people have lowest frailty, Black people the highest
- At 55, Black women have the frailty of 61-year-old Hispanic women and 75-year-old White women
- **Enormous health inequality (differences in biological age)**

▸ Standard deviation of frailty ▸ Percentiles of frailty

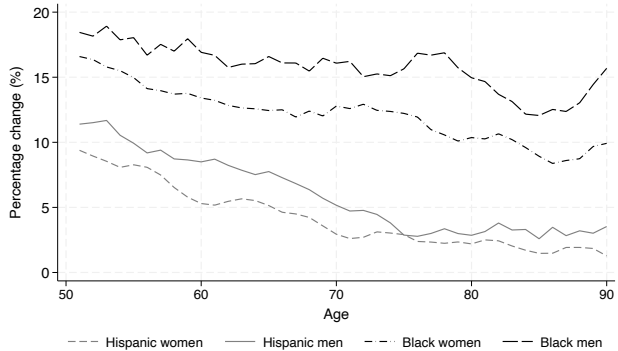
Could frailty be underestimating health inequality because of under-diagnosis?

Prevalence of imputed potential deficits for men aged 55 to 59



▸ Imputation procedure ▸ Women

Percentage change between potential and observed frailty



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- At 55, Black women have the potential frailty of
  - 75-year-old Hispanic women (61 with observed frailty)
  - 80-year-old White women (75 with observed frailty)
- **Even larger health inequality (differences in biological age)**

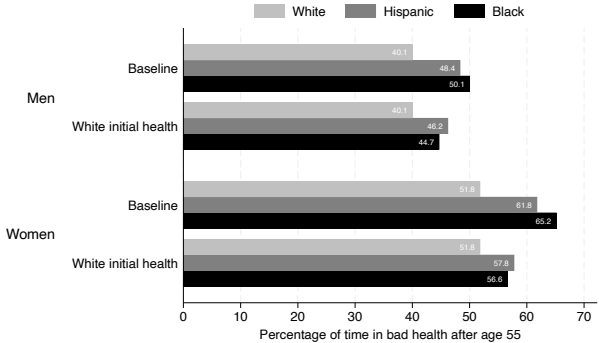
Q2. To what extent does health inequality drive inequality in other key economic outcomes?

To what extent does health inequality at age 55 drive inequality in other key economic outcomes?

- Use estimated process for frailty and its effects on economic outcomes
- Assign everyone the initial frailty distribution of White people
- Evaluate changes in outcomes

▸ Frailty discretization ▸ Simulation details

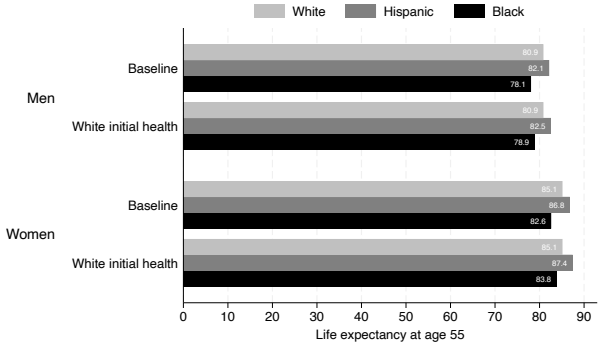
Time spent in poor or fair health ($>$ 6 health deficits) after age 55



- **If Black people had the age 55 health of White people**
  - **Gap in health span between Black and White people would be cut by half for Black men and 60% for Black women**

▸ Details on health transition probabilities

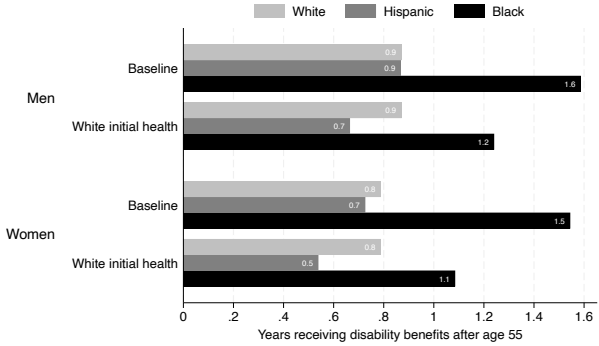
Life expectancy at age 55



- **If Black people had the age 55 health of White people**
  - **Gap in life expectancy between Black and White people would be cut almost in half**

▸ Details on probabilities ▸ Marginal effects

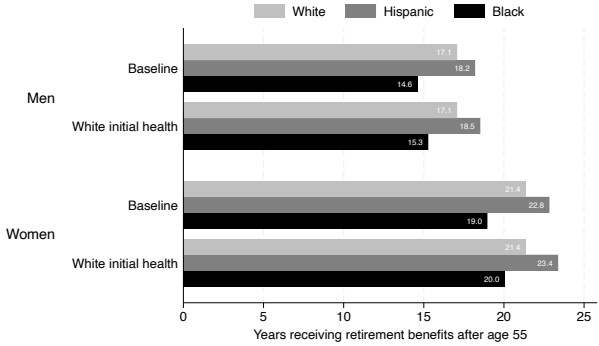
Number of years receiving disability benefits after age 55



- **If Black people had the age 55 health of White people**
  - **Black people shorten their duration on disability by 0.3 and 0.5 of a years, reducing their gap with White people by 43% for men and by 71% for women**

▸ Details on probabilities ▸ Marginal effects

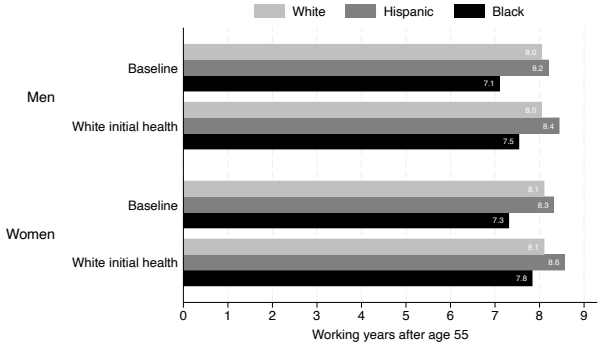
Number of years receiving retirement benefits after age 55



- **If Black people at age 55 had the health of White people**
  - **Black people would receive Social Security benefits 0.7 to 1.1 years longer, thus closing almost half of the gap in retirement benefits recipiency duration**

▸ Details on probabilities ▸ Marginal effects

Number of working years after age 55



- If Black people at age 55 had the same health of White people
  - **Black people would work 0-4 to 0.5 more years, thus closing almost half of the gap in working life duration**

Conclusions

- **Large inequality in frailty**. At age 55
  - Hispanic men = average frailty of 62-year-old White men
  - Hispanic women = average frailty of 65-year-old While women
  - Black men = average frailty of 68-year-old White men
  - Black women = average frailty of 75-year-old White women
- **Even larger inequality in potential frailty**

Conclusions

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  - Hispanic men = average frailty of 62-year-old White men
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  - Black women = average frailty of 75-year-old White women
- **Even larger inequality in potential frailty**
- **Health in middle age is a crucial determinant of future economic inequality**
  - Hispanic and Black people spend more time in bad health, mostly due to initial health itself, rather than education or marital status
  - If Hispanic and Black people had the initial frailty as White people, they would spend 20-30% less time on disability, would work 0.2 and 0.4 years longer, and would live for 0.4 to 1.2 years longer
- **Very important to study health, its consequences, and its formation, including to understand inequality in other economic outcomes**

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Appendix

Related economics literature and contributions

- **Effects of health in a structural context**

  French (2005), De Nardi, French, and Jones (2009), Attanasio, Kitao, and Violante (2010), Pashchenko and Porapakkarm (2013),Jung and Tran (2014), Kopecky and Koreshkova (2014), Capatina (2015), De Nardi, Pashchenko, and Porapakkarm (2017), Nygaard (2021), Hosseini, Kopecky, and Zhao (2022), Russo (2022)

  ⇒ Determine a good measure of health by race, ethnicity, and gender

  ⇒ Study health inequality by race, ethnicity, and gender

- **Measuring health inequality**

  Kitagawa and Hauser (1973), Cutler, Deaton, and Lleras-Muney (2006), Bosworth and Burke (2014), Pijoan-Mas and Ríos-Rull (2014), Currie and Schwandt (2016), Elo and Preston (1996), Preston and Elo (1995), Meara, Richards, and Cutler (2008), Jianakoplos, Menchik, and Irvine (1989),Menchik (1993),Attanasio and Hoynes (2000),Halliday (2011),Wang, Wang, and Halliday (2018)

  ⇒ Use frailty to study inequality

  ⇒ Evaluate the implications of systematic under-diagnosis

- **Comparison of health measures**

  Idler and Benyamini (1997), Crossley and Kennedy (2002), Zajacova and Dowd (2011),Dowd and Todd (2011), Cook and Manning (2009), Dieleman et al. (2021), Hill, Artiga, and Haldar (2022), Darden and Macis (2024), Okosun and Dever (2002),Geiger (2003), Kim et al. (2018), Lin et al. (2021)

  ⇒ Compare SRHS and frailty

  ⇒ New measure of frailty to overcome systematic under-diagnosis

◂ Back

Literature on frailty

- **Medical literature**
  Mitnitski, Mogilner, and Rockwood (2001), Mitnitski, Graham, Mogilner, and Rockwood (2002), Mitnitski et al. (2005), Goggins, Woo, Sham, and Ho (2005), Searle et al. (2008)

- **Economics literature**
  Hosseini, Kopecky, and Zhao (2020), Nygaard (2021), Hosseini, Kopecky, and Zhao (2022), Russo (2022)

Back

SRHS limitations

- Measurement error may vary by race and ethnicity

  $\Rightarrow$ Crossley and Kennedy (2002), Zajacova and Dowd (2011)

- Differential reporting by race and ethnicity

  $\Rightarrow$ Dowd and Todd (2011)

Back

Frailty limitation: differential reporting by race and ethnicity

- Due to different healthcare utilization and access

  ⇒ Cook and Manning (2009), Dieleman, Chen, Crosby, Liu, McCracken, Pollock, Sahu, Tsakalos, Dwyer-Lindgren, Haakenstad, Mokdad, Roth, Scott, and Murray (2021), Darden and Macis (2024)

- Due to different health insurance availability

  ⇒ Hill, Artiga, and Haldar (2022)

- Due to systemic racial disparities in treatment and diagnosis

  ⇒ Okosun and Dever (2002), Geiger (2003), Kim, Kim, Conigliaro, Liebschutz, Paasche-Orlow, and Hanchate (2018), Lin, Daly, Olchanski, Cohen, Neumann, Faul, Fillit, and Freund (2021)

Back

Sample composition

	White		Hispanic		Black		
	Men	Women	Men	Women	Men	Women	All
Age 51-54	4,620	7,231	1,292	1,907	1,524	2,698	19,272
	0.24	0.38	0.07	0.10	0.08	0.14	1.00
Age 55-59	10,572	13,098	2,463	3,111	3,096	4,796	37,136
	0.28	0.35	0.07	0.08	0.08	0.13	1.00
Age 60-64	11,068	13,494	2,092	2,738	2,796	4,426	36,614
	0.30	0.37	0.06	0.07	0.08	0.12	1.00
Age 65-69	10,576	12,731	1,510	1,948	2,157	3,298	32,220
	0.33	0.40	0.05	0.06	0.07	0.10	1.00
Age 70-74	10,195	12,566	1,174	1,438	1,656	2,514	29,543
	0.35	0.43	0.04	0.05	0.06	0.09	1.00
Age 75-79	8,908	11,421	928	1,196	1,304	2,115	25,872
	0.34	0.44	0.04	0.05	0.05	0.08	1.00
Age 80-84	6,136	8,851	515	796	818	1,460	18,576
	0.33	0.48	0.03	0.04	0.04	0.08	1.00
Age 85-89	3,360	5,644	222	467	400	848	10,941
	0.31	0.52	0.02	0.04	0.04	0.08	1.00
Age 90-94	1,226	2,626	95	217	139	388	4,691
	0.26	0.56	0.02	0.05	0.03	0.08	1.00
Age 95-100	232	795	22	69	31	152	1,301
	0.18	0.61	0.02	0.05	0.02	0.12	1.00
Total	66,893	88,457	10,313	13,887	13,921	22,695	216,166
	0.31	0.41	0.05	0.06	0.06	0.10	1
Individuals	11,361	13,994	2,119	2,628	2,953	4,291	37,346
Average birth year	1937	1936	1943	1943	1942	1942	1938

Back

Deficits prevalence - Women, 55-59

	White	Hispanic	Black	White - Hisp.	White - Black
Has ever smoked cigarettes	0.545	0.406	0.553	0.140***	-0.007
Diagnosed with arthritis	0.474	0.430	0.521	0.044***	-0.047***
Diff. climbing several flights of stairs	0.388	0.515	0.535	-0.127***	-0.148***
Diff. kneeling or crouching	0.380	0.439	0.471	-0.059***	-0.091***
Diagnosed with HBP	0.352	0.448	0.672	-0.097***	-0.321***
Has BMI $\geq$ 30	0.336	0.443	0.554	-0.107***	-0.218***
Diff. getting up from chair	0.325	0.410	0.434	-0.085***	-0.108***
Diagnosed with psych. problem	0.213	0.201	0.175	0.012	0.038***
Diff. pull/pushing large objects	0.212	0.295	0.332	-0.084***	-0.121***
Diff. walking several blocks	0.198	0.266	0.332	-0.069***	-0.135***
Diff. sitting for two hours	0.184	0.276	0.256	-0.092***	-0.072***
Diff. lifting >10 pounds	0.180	0.290	0.320	-0.110***	-0.140***
Hospital stay	0.133	0.148	0.199	-0.015*	-0.066***
Diff. climbing flight of stairs	0.118	0.202	0.220	-0.084***	-0.103***
Diagnosed with diabetes	0.110	0.261	0.253	-0.151***	-0.143***
Diff. lifting arms over shoulders	0.106	0.192	0.217	-0.086***	-0.111***
Diagnosed with heart condition	0.104	0.087	0.156	0.016**	-0.053***
Diagnosed with cancer	0.100	0.068	0.067	0.032***	0.033***
Diff. using map	0.098	0.224	0.216	-0.126***	-0.118***
Diff. walking one block	0.081	0.091	0.163	-0.009	-0.081***
Diagnosed with lung disease	0.079	0.048	0.079	0.032***	0.000
Diff. grocery shopping	0.055	0.075	0.114	-0.019***	-0.059***
Diff. dressing	0.038	0.103	0.111	-0.065***	-0.073***
Diff. getting in/out of bed	0.037	0.107	0.097	-0.070***	-0.060***
Diff. picking up dime	0.036	0.040	0.055	-0.004	-0.018***
Diff. walking across room	0.034	0.042	0.080	-0.008*	-0.046***
Diagnosed with a stroke	0.030	0.033	0.067	-0.003	-0.037***
Diff. bathing	0.028	0.050	0.082	-0.022***	-0.054***
Diff. preparing hot meal	0.027	0.030	0.067	-0.003	-0.040***
Diff. using toilet	0.025	0.037	0.083	-0.012***	-0.058***
Diff. managing money	0.024	0.043	0.051	-0.019***	-0.027***
Diff. eating	0.012	0.021	0.024	-0.009***	-0.012***
Diff. taking medication	0.011	0.028	0.032	-0.017***	-0.021***
Diff. making phone calls	0.007	0.025	0.020	-0.017***	-0.012***
Nursing home stay	0.004	0.004	0.010	0.000	-0.006***

* p<.1, ** p<.05, *** p<.01

Back

Deficits prevalence - Men, 55-59

	White	Hispanic	Black	White - Hisp.	White - Black
Has ever smoked cigarettes	0.650	0.657	0.678	-0.007	-0.028**
Diagnosed with HBP	0.424	0.437	0.608	-0.012	-0.184***
Diagnosed with arthritis	0.365	0.267	0.358	0.098***	0.007
Has BMI $\geq$ 30	0.327	0.404	0.354	-0.077***	-0.028**
Diff. kneeling or crouching	0.296	0.311	0.365	-0.016	-0.069***
Diff. getting up from chair	0.253	0.272	0.322	-0.020*	-0.070***
Diff. climbing several flights of stairs	0.233	0.330	0.355	-0.097***	-0.122***
Diagnosed with heart condition	0.152	0.114	0.146	0.038***	0.006
Hospital stay	0.148	0.146	0.207	0.002	-0.060***
Diff. walking several blocks	0.147	0.181	0.246	-0.034***	-0.099***
Diff. sitting for two hours	0.138	0.197	0.222	-0.059***	-0.084***
Diagnosed with diabetes	0.133	0.247	0.253	-0.114***	-0.120***
Diagnosed with psych. problem	0.119	0.112	0.134	0.008	-0.014*
Diff. pull/pushing large objects	0.118	0.187	0.233	-0.069***	-0.114***
Diff. lifting arms over shoulders	0.095	0.141	0.168	-0.045***	-0.072***
Diff. lifting >10 pounds	0.083	0.145	0.190	-0.062***	-0.107***
Diff. climbing flight of stairs	0.067	0.122	0.120	-0.055***	-0.053***
Diff. walking one block	0.066	0.073	0.114	-0.007	-0.047***
Diagnosed with lung disease	0.057	0.029	0.054	0.028***	0.003
Diagnosed with cancer	0.056	0.030	0.051	0.025***	0.005
Diff. dressing	0.050	0.107	0.090	-0.057***	-0.040***
Diff. using map	0.033	0.120	0.106	-0.086***	-0.073***
Diagnosed with a stroke	0.033	0.039	0.079	-0.006	-0.046***
Diff. picking up dime	0.032	0.039	0.045	-0.007	-0.013***
Diff. grocery shopping	0.032	0.052	0.065	-0.020***	-0.034***
Diff. getting in/out of bed	0.028	0.085	0.059	-0.057***	-0.031***
Diff. managing money	0.026	0.059	0.053	-0.033***	-0.027***
Diff. walking across room	0.025	0.033	0.054	-0.008*	-0.029***
Diff. bathing	0.022	0.040	0.047	-0.018***	-0.024***
Diff. using toilet	0.018	0.037	0.038	-0.019***	-0.020***
Diff. preparing hot meal	0.015	0.031	0.042	-0.016***	-0.027***
Diff. taking medication	0.013	0.031	0.028	-0.018***	-0.015***
Diff. making phone calls	0.011	0.041	0.026	-0.030***	-0.015***
Diff. eating	0.008	0.016	0.022	-0.008***	-0.014***
Nursing home stay	0.004	0.009	0.011	-0.005**	-0.007***

* p<.1, ** p<.05, *** p<.01

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Details on outcome variables

Variable	Description	Values
SDI Recipient Next Wave	In wave t, this variable tells us if the respondent will receive SDI in wave t+1	0 if does not receive SDI in t+1, and did not in t 1 if receives SDI in t+1, but did not in t missing if received SDI in t
Receiving Social Security Benefits Next Wave	In wave t, this variable tells us if the respondent will claim SS benefits in t+1 (ages 60 and older)	0 if no income from SS in t+1 and none in t 1 if positive income from SS in t+1 and none in t missing if claiming SS benefits in t
Nursing Home Entry Next Wave	In wave t, this variable tells us if the respondent will enter a nursing home in wave t+1	0 if does not live in a NH in t+1 and did not in t 1 if lives in a NH in t+1 but did not in t 1 if dies in a NH in t+1 but did not live in it in t missing if lived in a NH in t
Being in a Nursing Home in Current Wave	In wave t, this variable tells us if the respondent lives in a NH in wave t	0 if does not live in a NH in t 1 if lives in a NH in t
Death Next Wave	In wave t, this variable tells us if the respondent will die in wave t+1	0 if alive in t+1 1 if dead in t+1 missing if dead in t

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Details on regressions

Variable	Age Range	Regressors Other than Health and Basic
SDI Recipient Next Wave	51-FRA	3-order poly in age
Receiving SS Benefits Next Wave	60-75	Age dummies + FRA dummy
Nursing Home Entry Next Wave	51-100	3-order poly in age
Being in a Nursing Home in Current Wave	51-100	3-order poly in age
Death Next Wave	51-100	3-order poly in age

- Basic regressors: age, years of education, and cohort and marital status dummies
- Interactions of health with age, age squared, age cubed, and years of education
- Age = actual age - 50
- Drop interactions of SRHS, age squared, and age cubed for SDI recipiency for Hispanic women and Nursing Home Entry for Hispanic men

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Results, Mc-Fadden's Pseudo-R^2 - Percentage change from baseline

		Women			Men		
		White	Hispanic	Black	White	Hispanic	Black
SDI Recipient Next Wave	Basic Controls	0.048	0.046	0.036	0.045	0.022	0.032
	Percentage change from basic controls						
	SRHS	341%	166%	260%	318%	412%	283%
	Frailty	407%	320%	416%	450%	916%	449%
	Frailty and SRHS	458%	341%	454%	492%	1,005%	514%
SS Benefits Recipient Next Wave	Basic Controls	0.118	0.081	0.083	0.134	0.101	0.120
	Percentage change from basic controls						
	SRHS	9%	37%	23%	5%	27%	5%
	Frailty	7%	13%	17%	6%	11%	16%
	Frailty and SRHS	12%	53%	38%	10%	43%	21%
NH Entry Next Wave	Basic Controls	0.241	0.172	0.169	0.220	0.144	0.122
	Percentage change from basic controls						
	SRHS	18%	21%	22%	21%	35%	44%
	Frailty	31%	34%	27%	38%	89%	92%
	Frailty and SRHS	32%	45%	34%	40%	102%	102%
Currently in a NH	Basic Controls	0.284	0.226	0.212	0.226	0.129	0.153
	Percentage change from basic controls						
	SRHS	19%	15%	18%	31%	72%	40%
	Frailty	85%	83%	94%	116%	311%	179%
	Frailty and SRHS	88%	93%	97%	118%	320%	320%
Death Next Wave	Basic Controls	0.166	0.157	0.120	0.140	0.157	0.109
	Percentage change from basic controls						
	SRHS	45%	24%	41%	57%	35%	39%
	Frailty	60%	41%	57%	69%	55%	62%
	Frailty and SRHS	66%	47%	67%	79%	61%	61%

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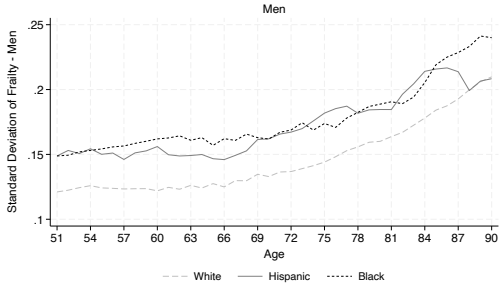
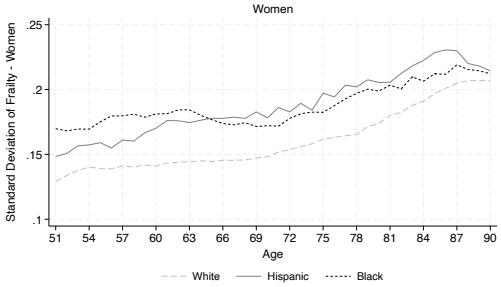
Standard deviation of frailty





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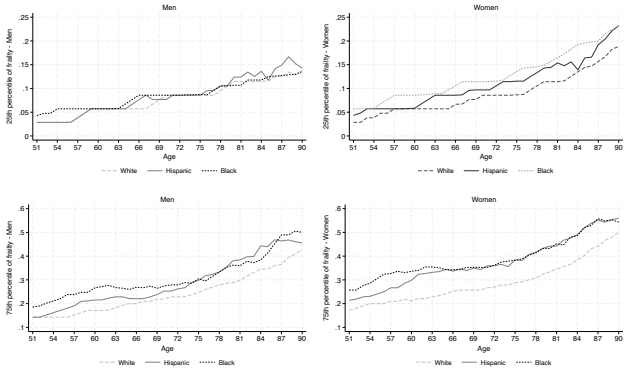
Percentiles of frailty



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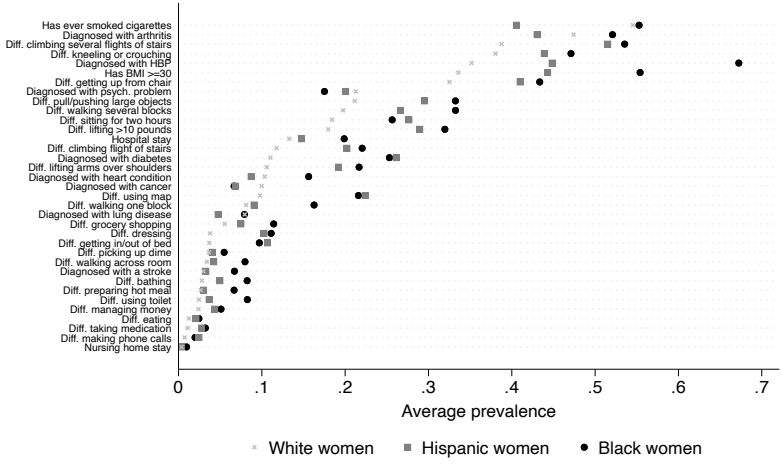
Prevalence of health deficits for women between 55 and 59



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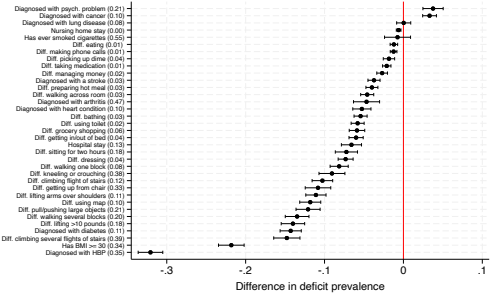
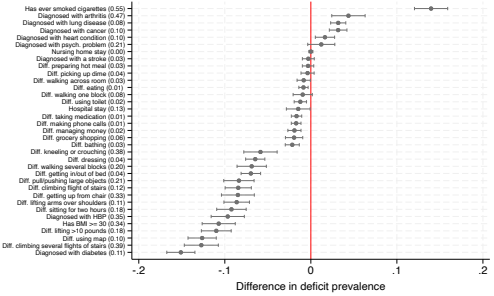
Differences in prevalence between White and non-White men between 55 and 59





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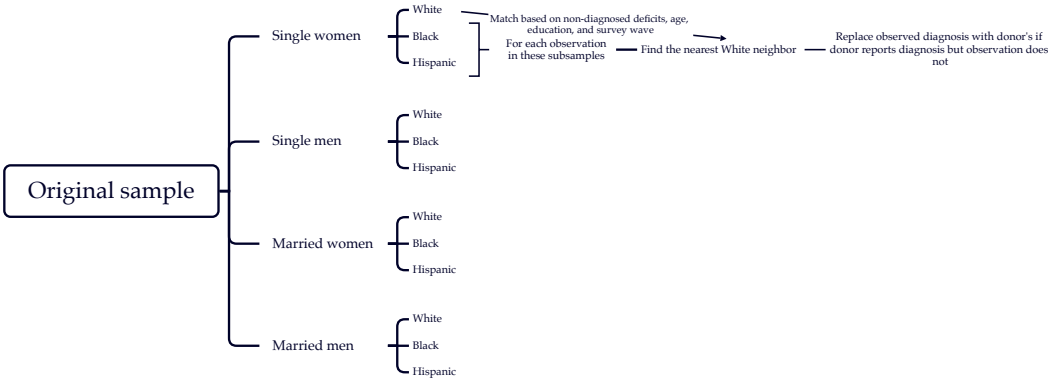
Constructing potential frailty

- Impute diagnosed conditions for Hispanic and Black people
- Procedure
  1. Assume no-underdiagnosis for White people
  2. Divide sample by gender and marital status
  3. Find nearest-White-neighbor for each Black and White observation
  4. Replace diagnosed deficit anytime White donor reports it, and non-White does not
  5. Construct frailty using imputed diagnosed deficits

▸ Imputation details ▸ Imputation validation ◂ Back to main

Imputation details



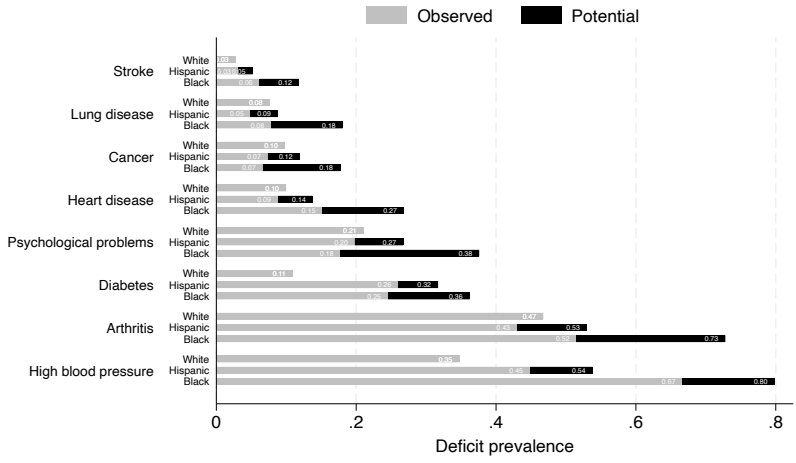
◂ Back ◂ Back to main

Imputation validation - Correct classification rates for White people

Diagnosis	White Prevalence	Correct Classification Rate		
		Overall	Has Condition	No Condition
High blood pressure	0.504	0.830	0.803	0.856
Diabetes or high blood sugar	0.172	0.936	0.782	0.968
Cancer	0.144	0.932	0.745	0.964
Chronic lung disease	0.091	0.975	0.859	0.987
Heart Condition	0.231	0.920	0.815	0.952
Stroke	0.073	0.977	0.854	0.987
Psych. problems	0.150	0.955	0.800	0.982
Arthritis	0.548	0.843	0.838	0.848

◂ Back ◂ Back to main

Prevalence of potential deficits for women aged 55 to 59



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Frailty discretization

- Discretize observed frailty into 5 groups based on the frailty distribution quintiles
- Use the same labels of SRHS: Excellent, very good, good, fair, and poor

	Mean	Min	Max	Count
Excellent	0.04	0.00	0.06	51,477
Very Good	0.10	0.06	0.11	42,592
Good	0.15	0.12	0.18	33,359
Fair	0.25	0.18	0.31	43,646
Poor	0.48	0.32	0.97	40,483
Total	0.20	0.00	0.97	211,557

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Simulation details

- Select the first observation for people between 53 and 57
- Simulate histories of health, death, disability and retirement benefits recipiency, and nursing home stays using regression results
- Perform counterfactual by assigning each non-White person a random draw from the gender-specific distribution of initial health for White people

Back

Details on health transition probabilities

- Model health transition probabilities as

$$Prob(h_{i,t+1} = j) = H(h_{it}, X_{it}), \quad \text{for } j = \{\text{Excellent, Very good, Good, Fair, Poor}\},$$

where X includes cohort dummies, race dummies, the interactions of race and discretized frailty, gender dummies and their interactions with discretized frailty, a second-order polynomial in age and its interactions with gender, marital status dummies, a second-order polynomial in years of education, and the interaction between years of education and age.

- Estimated using an ordered logit

Back

Health transition probabilities - Regression results

Discretized frailty		
Very Good	3.527***	(0.0264)
Good	5.931***	(0.0302)
Fair	8.554***	(0.0332)
Poor	12.36***	(0.0474)
Black	0.268***	(0.0352)
Hispanic	0.104***	(0.0399)
Black × Very Good	-0.234***	(0.0459)
Black × Good	-0.260***	(0.0473)
Black × Fair	-0.206***	(0.0460)
Black × Poor	-0.275***	(0.0651)
Hispanic × Very Good	-0.141***	(0.0524)
Hispanic × Good	-0.190***	(0.0547)
Hispanic × Fair	-0.124**	(0.0544)
Hispanic × Poor	-0.237***	(0.0770)
Male	-1.235**	(0.506)
Male × Very Good	-0.00426	(0.0317)
Male × Good	0.0413	(0.0333)
Male × Fair	-0.00261	(0.0336)
Male × Poor	-0.177***	(0.0543)
Age	-0.0963***	(0.0106)
Age^2	0.000877***	(0.0000744)
Male × Age	0.0328**	(0.0149)
Male × Age^2	-0.000214**	(0.000107)
Partnered	0.117***	(0.0301)
Single	0.105***	(0.0126)
Years of education	-0.0389***	(0.0148)
Years of education × Years of education	-0.00208***	(0.000335)
Years of education × Age	0.000773***	(0.000176)
1895-1909 cohort	0.110	(0.0831)
1910-1929 cohort	-0.0583**	(0.0261)
1930-1949 cohort	-0.0362**	(0.0178)
Pseudo R^2	0.516	

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Probability of receiving disability benefits

- Model probabilities as

$$\Pr(di_{it} = 1) = \begin{cases} DI(h_{it}, di_{i,t-1}, X_{it}), & \text{if } age_{it} < FRA_i, \\ 0, & \text{if } age_{it} \geq FRA_i, \end{cases}$$

  taking into account the fact that disability benefits convert into retirement benefits once the recipient reaches their full retirement age (FRA)

- Estimate these using a logit

Back

Probability of receiving disability benefits - Regression results

Disability benefits recipient		
Very Good	1.986***	(0.306)
Good	2.574***	(0.300)
Fair	3.617***	(0.287)
Poor	4.604***	(0.286)
Black	0.594**	(0.276)
Hispanic	-0.564	(0.478)
Black × Very Good	-0.138	(0.321)
Black × Good	-0.133	(0.308)
Black × Fair	-0.444	(0.289)
Black × Poor	-0.737***	(0.285)
Hispanic × Very Good	0.131	(0.556)
Hispanic × Good	0.648	(0.511)
Hispanic × Fair	0.276	(0.492)
Hispanic × Poor	0.0313	(0.487)
Male	19.01	(13.42)
Male × Very Good	-1.096***	(0.336)
Male × Good	-0.711**	(0.325)
Male × Fair	-0.814***	(0.311)
Male × Poor	-0.905***	(0.309)
Age	1.284***	(0.299)
Age^2	-0.0104***	(0.00250)
Male × Age	-0.601	(0.453)
Male × Age^2	0.00509	(0.00381)
Partnered	0.275***	(0.0885)
Single	0.216***	(0.0472)
Years of education	0.307**	(0.141)
Years of education × Years of education	-0.00690***	(0.00145)
Years of education × Age	-0.00265	(0.00224)
Past disability recipient	3.983***	(0.0467)
1930-1949 cohort	-0.188***	(0.0477)
Constant	-46.99***	(9.016)
Pseudo R^2	0.543	

Back

Marginal effects for disability recipiency

Very Good	0.0218***	(0.00224)
Good	0.0460***	(0.00251)
Fair	0.0839***	(0.00257)
Poor	0.146***	(0.00409)
Black	0.00368**	(0.00173)
Hispanic	-0.0109***	(0.00209)
Male	0.0164***	(0.00151)
Age	0.000375*	(0.000208)
Partnered	0.00892***	(0.00302)
Single	0.00692***	(0.00154)
Years of education	-0.000564**	(0.000267)
Past disability recipient	0.126***	(0.00131)
1930-1949 cohort	-0.00597***	(0.00153)

Back

Probability of receiving retirement benefits

- Model probabilities as

$$\Pr(ss_{it} = 1) = \begin{cases} 0 & \text{if } age_{it} \leq 60, \\ SS(h_{it}, X_{it}, t), & \text{if } 60 \leq age_{it} \leq 75 \text{ and } ss_{i,t-1} = 0, \\ 1, & \text{if } age_{it} > 75 \text{ or } ss_{i,t-1} = 1, \end{cases}$$

  where X_{it}, also includes a dummy for full retirement age.

- Estimate these using a logit

Back

Probability of receiving retirement benefits - Regression results

Social Security retirement benefits recipient		
Very Good	0.0918*	(0.0541)
Good	0.118**	(0.0596)
Fair	0.0973*	(0.0568)
Poor	-0.0655	(0.0631)
Black	-0.182**	(0.0760)
Hispanic	-0.355***	(0.0854)
Black × Very Good	0.107	(0.105)
Black × Good	-0.00504	(0.112)
Black × Fair	0.143	(0.105)
Black × Poor	0.0830	(0.106)
Hispanic × Very Good	0.0582	(0.118)
Hispanic × Good	0.107	(0.131)
Hispanic × Fair	0.315***	(0.121)
Hispanic × Poor	0.304**	(0.122)
Male	-22.17**	(9.882)
Male × Very Good	0.106	(0.0722)
Male × Good	0.109	(0.0806)
Male × Fair	0.0311	(0.0774)
Male × Poor	0.188**	(0.0856)
Age	7.687***	(0.198)
Age^2	-0.0566***	(0.00150)
Male × Age	0.599**	(0.301)
Male × Age^2	-0.00401*	(0.00228)
Partnered	0.116*	(0.0683)
Single	-0.00839	(0.0297)
Years of education	0.270***	(0.0891)
Years of education × Years of education	-0.0115***	(0.000767)
Years of education × Age	-0.00127	(0.00133)
FRA dummy	0.226***	(0.0326)
1910-1929 cohort	0.530***	(0.133)
1930-1949 cohort	0.426***	(0.0323)
Constant	-261.3***	(6.575)
Pseudo R^2	0.198	

Back

Marginal effects for retirement benefits recipiency

Very Good	0.0262***	(0.00601)
Good	0.0293***	(0.00669)
Fair	0.0280***	(0.00643)
Poor	0.0105	(0.00722)
Black	-0.0197***	(0.00579)
Hispanic	-0.0352***	(0.00716)
Male	-0.0248***	(0.00431)
Age	0.0732***	(0.000664)
Partnered	0.0183	(0.0115)
Single	-0.00131	(0.00488)
Years of education	-0.0169***	(0.000788)
FRA dummy	0.0332***	(0.00537)
1910-1929 cohort	0.0958***	(0.0243)
1930-1949 cohort	0.0697***	(0.00514)

Back

Probability of staying in a nursing home

- Model probabilities as

$$\Pr(nh_{it} = 1) = NH(h_{it}, nh_{i,t-1}, X_{it})$$

- Estimate these with a logit

Back

Probability of staying in a nursing home

Living in a nursing home		
Very Good	1.210**	(0.580)
Good	2.226***	(0.539)
Fair	3.017***	(0.524)
Poor	4.939***	(0.519)
Black	-0.327***	(0.0677)
Hispanic	-0.701***	(0.103)
black=1 × Very Good	-0.0425	(0.623)
black=1 × Good	0.0547	(0.359)
black=1 × Fair	0.00505	(0.202)
black=1 × Poor	0	(.)
Male	10.52***	(2.537)
Male × Very Good	-0.895	(0.681)
Male × Good	-0.756	(0.616)
Male × Fair	-1.073*	(0.593)
Male × Poor	-0.927	(0.582)
Age	0.127***	(0.0441)
Age^2	-0.000430	(0.000272)
Male × Age	-0.227***	(0.0641)
Male × Age^2	0.00136***	(0.000409)
Partnered	0.199	(0.189)
Single	0.771***	(0.0546)
Years of education	-0.170***	(0.0599)
Years of education × Years of education	-0.000710	(0.00124)
Years of education × Age	0.00236***	(0.000663)
Previously living in a nursing home	4.649***	(0.0790)
1895-1909 cohort	0.876***	(0.202)
1910-1929 cohort	0.536***	(0.176)
1930-1949 cohort	0.364**	(0.159)
Constant	-15.92***	(1.858)
Pseudo R^2	0.524	

◂ Back

Marginal effects for nursing home residence

Very Good	0.00173**	(0.000870)
Good	0.00611***	(0.000864)
Fair	0.0104***	(0.000798)
Poor	0.0454***	(0.00119)
Black	-0.00383***	(0.000729)
Hispanic	-0.00758***	(0.000927)
Male	0.00292***	(0.000663)
Age	0.00101***	(0.0000489)
Partnered	0.00194	(0.00196)
Single	0.00927***	(0.000630)
Years of education	0.0000771	(0.0000931)
Previously living in a nursing home	0.0587***	(0.00103)
1895-1909 cohort	0.0111***	(0.00246)
1910-1929 cohort	0.00597***	(0.00170)
1930-1949 cohort	0.00381***	(0.00148)

Back

Probability of dying next wave

- Model probabilities as

$$\Pr(d_{i,t+1} = 1) = D(h_{it}, X_{it})$$

- Estimate these with a logit

Back

Probability of dying next wave - Regression results

Death next wave		
Very Good	0.546***	(0.101)
Good	0.968***	(0.0959)
Fair	1.532***	(0.0878)
Poor	2.774***	(0.0845)
Black	0.460***	(0.127)
Hispanic	-0.409*	(0.209)
Black × Very Good	0.00648	(0.156)
Black × Good	-0.198	(0.152)
Black × Fair	-0.423***	(0.140)
Black × Poor	-0.645***	(0.132)
Hispanic × Very Good	0.407*	(0.247)
Hispanic × Good	0.196	(0.246)
Hispanic × Fair	0.167	(0.225)
Hispanic × Poor	-0.0241	(0.215)
Male	0.854	(0.915)
Male × Very Good	0.0918	(0.122)
Male × Good	0.165	(0.117)
Male × Fair	0.195*	(0.108)
Male × Poor	0.0378	(0.104)
Age	-0.00810	(0.0182)
Age^2	0.000433***	(0.000117)
Male × Age	-0.0107	(0.0248)
Male × Age^2	0.000102	(0.000166)
Partnered	0.181***	(0.0663)
Single	0.238***	(0.0235)
Years of education	0.0505*	(0.0270)
Years of education × Years of education	-0.00338***	(0.000592)
Years of education × Age	0.000203	(0.000290)
1895-1909 cohort	0.759***	(0.0856)
1910-1929 cohort	0.503***	(0.0636)
1930-1949 cohort	0.293***	(0.0541)
Constant	-7.052***	(0.721)
Pseudo R^2	0.222	

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Marginal effects for death next wave

Very Good	0.0112***	(0.00106)
Good	0.0228***	(0.00123)
Fair	0.0461***	(0.00129)
Poor	0.137***	(0.00200)
Black	0.000814	(0.00153)
Hispanic	-0.0149***	(0.00186)
Male	0.0381***	(0.00120)
Age	0.00311***	(0.0000815)
Partnered	0.00886***	(0.00343)
Single	0.0119***	(0.00119)
Years of education	-0.000584***	(0.000171)
1895-1909 cohort	0.0387***	(0.00469)
1910-1929 cohort	0.0234***	(0.00269)
1930-1949 cohort	0.0126***	(0.00213)

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