Black-White Mortality Crossover: New Evidence from Social Security Mortality Records

SSHA 2024
Historical Racial and Socioeconomic Inequalities in Health and Mortality

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Black-White Mortality Crossover

- ▶ Black-White mortality crossover is a well-studied demographic **paradox**

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▶ White mortality is lower than Black mortality until advanced ages, when Black mortality becomes lower than White mortality

Black-White Mortality Crossover

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▶ White mortality is lower than Black mortality until advanced ages, when Black mortality becomes lower than White mortality
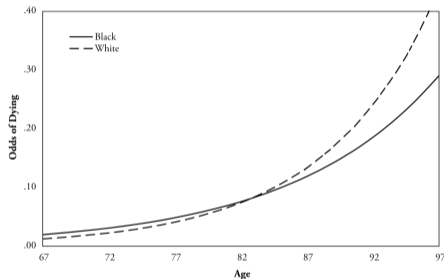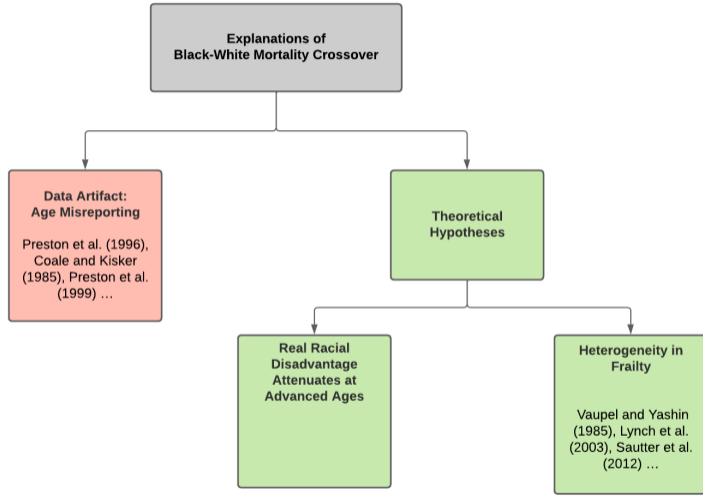

Dupre 2006. *Demography.*

Black-White Crossover repeatedly documented

Data Source	Age of Crossover	Covariates	Age Verification	Citation
Tennessee Vital Statistics	74			Sibley (1930)
Evans County Study	85 (f); 80 (m)			Wing et al. (1985)
Medicare Enrollment	88 (f); 86 (m)			Kestenbaum (1992)
U.S. Death Certificates	90 (f); 85 (m)		✓	Preston (1996)
Medicare Enrollment	85–86			Parnell and Owens (1999)
Survey on Asset and Health Dynamics Among the Oldest Old	81			Johnson (2000)
Berkeley Mortality Database	79–87		✓	Lynch, Brown and Harmsen (2003)
Medicare Enrollment	80–85			Arias (2006)
Established Populations for Epidemiologic Studies of the Elderly	83 (f); 79 (m)	Religious Attendance		Dupre, Franzese and Parrado (2006)
Americans' Changing Lives study	80	Education, Income, Neighborhoods		Yao and Robert (2011)
National Health Interview Survey-Linked Mortality Files	85			Masters (2012)
Established Populations for Epidemiologic Studies of the Elderly	83 (f); 79 (m)			Sautter et al. (2012)
NCHS Multiple Cause-of-Death public-use files	87	Education, Income		Fenelon (2013)
National Longitudinal Mortality Study	85			Şahin and Heiland (2017)

No consensus on explanation...

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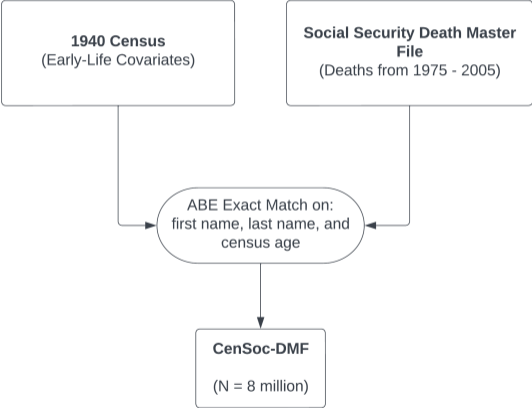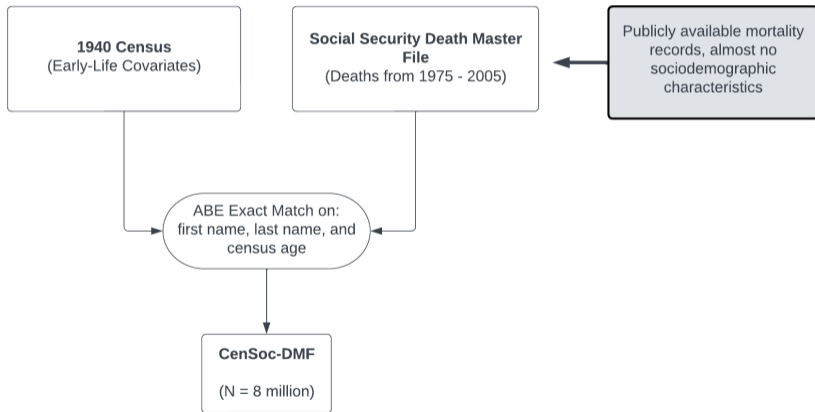
Research Question

▶ Is the Black-White mortality crossover a data **artifact**?

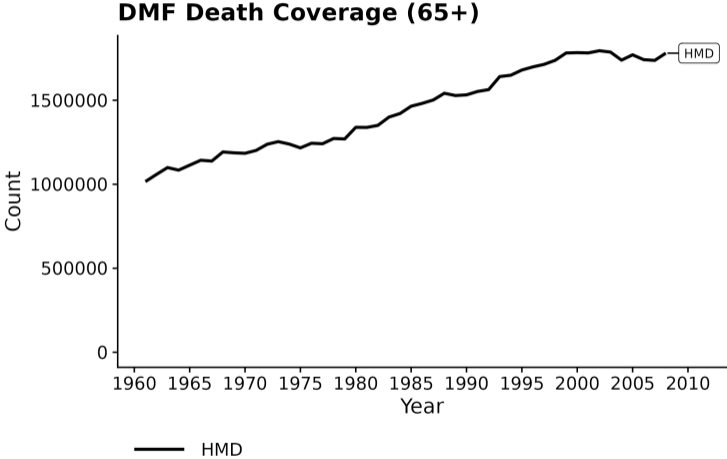▶ Does heterogeneity in frailty explain Black-White crossover? To what extent do we observe mortality selection?

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CenSoc-DMF: Linked IPUMS 1940 Census and mortality records

1940 Census
(Early-Life Covariates)

Social Security Death Master File
(Deaths from 1975 - 2005)

ABE Exact Match on:
first name, last name, and census age

CenSoc-DMF

(N = 8 million)

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CenSoc-DMF: Linked IPUMS 1940 Census and mortality records

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Coverage DMF (Public)

DMF Death Coverage (65+)

Coverage DMF (Public)

DMF Death Coverage (65+)

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95% death coverage 1975-2005
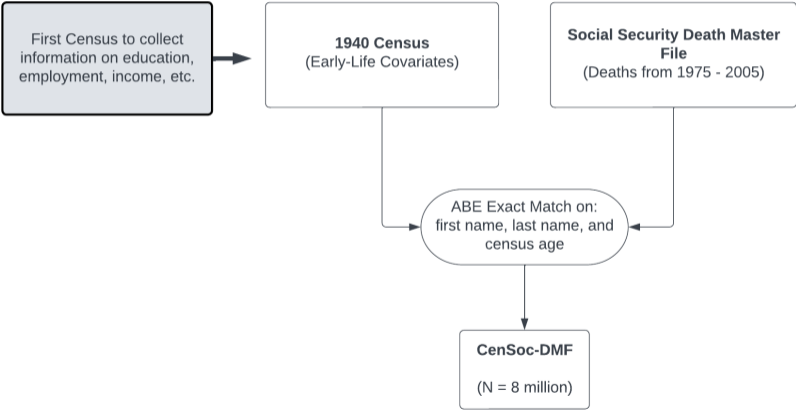
DMF Death Coverage (65+)

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CenSoc-DMF: Linked IPUMS 1940 Census and mortality records

First Census to collect information on education, employment, income, etc.

1940 Census
(Early-Life Covariates)

Social Security Death Master File
(Deaths from 1975 - 2005)

ABE Exact Match on:
first name, last name, and census age

CenSoc-DMF

(N = 8 million)

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1940 Census

▶ 1940 Census reflected heightened
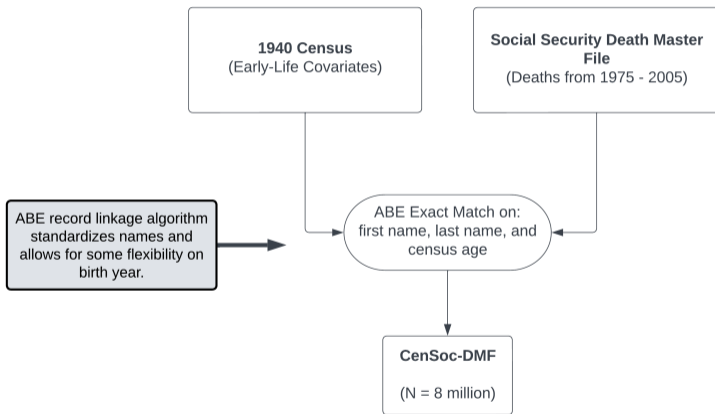time of social awareness brought
about by Great Depression

1940 Census

- ▶ 1940 Census reflected heightened time of social awareness brought about by Great Depression

- ▶ First decennial census to include question on educational attainment, wage and salary income, and detailed questions on employment

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1940 Census

► 1940 Census reflected heightened time of social awareness brought about by Great Depression

► First decennial census to include question on educational attainment, wage and salary income, and detailed questions on employment

1940 Census Form

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CenSoc-DMF: Linked census and mortality records

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CenSoc data

- Publicly available for download: **censoc.berkeley.edu**

- **CenSoc Users Conference**:
  - Dec 6th, Berkeley, California
  - Travel funds available

scientific **data**

Check for updates

CenSoc: Public Linked Administrative Mortality Records for Individual-level Research

Casey F. Breen[1,2 ✉], Maria Osborne[1] & Joshua R. Goldstein[1 ✉]

In the United States, much has been learned about the determinants of longevity from survey data and aggregated tabulations. However, the lack of large-scale, individual-level administrative mortality records has proven to be a barrier to further progress. We introduce the CenSoc datasets, which link the complete-count 1940 U.S. Census to Social Security mortality records. These datasets—CenSoc-DMF (N = 4.7 million) and CenSoc-Numident (N = 7.0 million)—primarily cover deaths among individuals aged 65 and older. The size and richness of CenSoc allows investigators to make new discoveries into geographic, racial, and class-based disparities in old-age mortality in the United States. This article gives an overview of the technical steps taken to construct these datasets, validates them using external aggregate mortality data, and discusses best practices for working with these datasets. The CenSoc datasets are publicly available, enabling new avenues of research into the determinants of mortality disparities in the United States.

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Analytic Samples

1. Birth cohorts of 1890-1905
   - ▶ Extinct cohort method

2. Birth cohorts 1906-1915 (not extinct)
   - ▶ Gompertz parametric maximum likelihood estimation

Gompertz Model + Maximum Likelihood Estimation Method

$$h(x) = \mathbf{a}e^{\mathbf{b}x} \tag{1}$$

- $h(x)$ = hazard at age x. "Force of mortality"

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Gompertz Model + Maximum Likelihood Estimation Method

$$h(x) = \mathbf{a}e^{\mathbf{b}x} \tag{1}$$

- $h(x)$ = hazard at age x. "Force of mortality"

- **a is baseline mortality**

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Gompertz Model + Maximum Likelihood Estimation Method

$$h(x) = \mathbf{a}e^{\mathbf{b}x} \tag{1}$$

▶ $h(x)$ = hazard at age x. "Force of mortality"

▶ **a is baseline mortality**

▶ **b is rate of increase of mortality**

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Black-White Crossover (extinct cohort method)

a **Mortality Crossovers (Men)**

Pooled cohorts of 1890 - 1905

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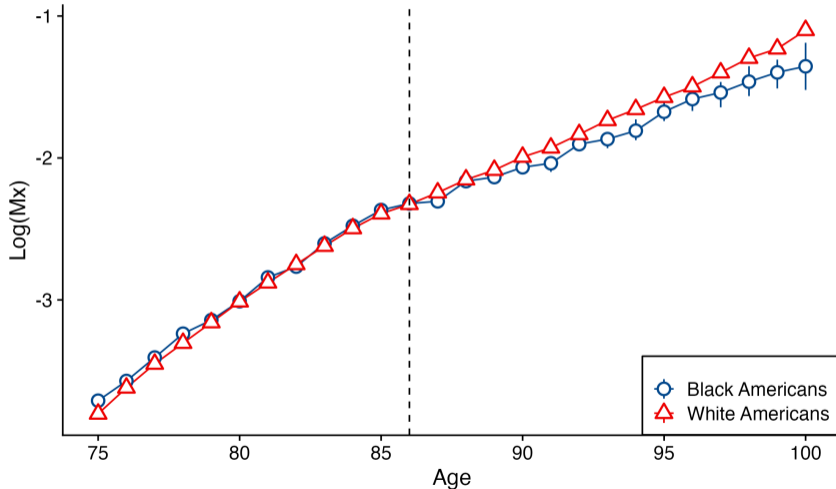
Is this a data artifact?

Background: Age of death calculated from date of birth and date of death

1. Date of death gets reported immediately (no heaping)

2. Minimal age heaping on birth year...

3. Institutional incentive: Social Security wants to accurately track birth date

4. Linkage requires close (exact) match on year of birth with 1940
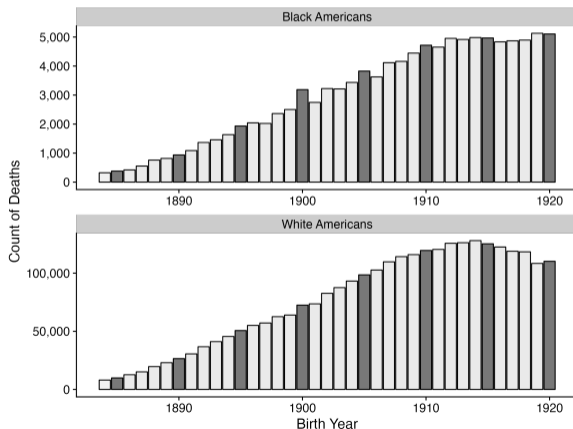
Black-white crossover (extinct cohort method)

b **Mortality Crossovers (Men)**

Pooled cohorts of 1891-1894, 1896-1899, 1901-1904

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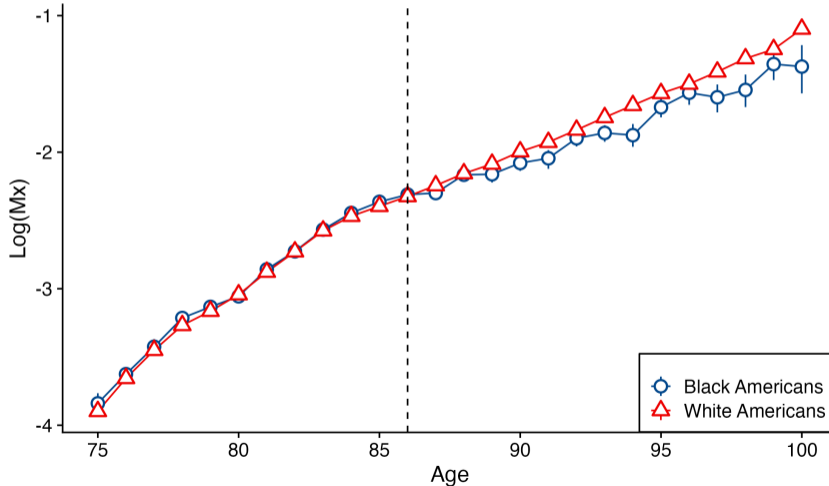
Black-white crossover (Gompertz Parametric Approach)

Mortality Crossovers (Men)

Cohorts of 1906-1915
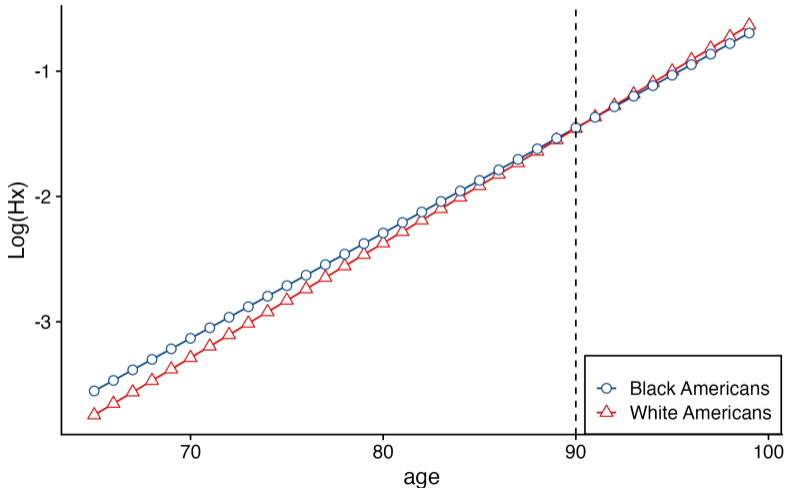
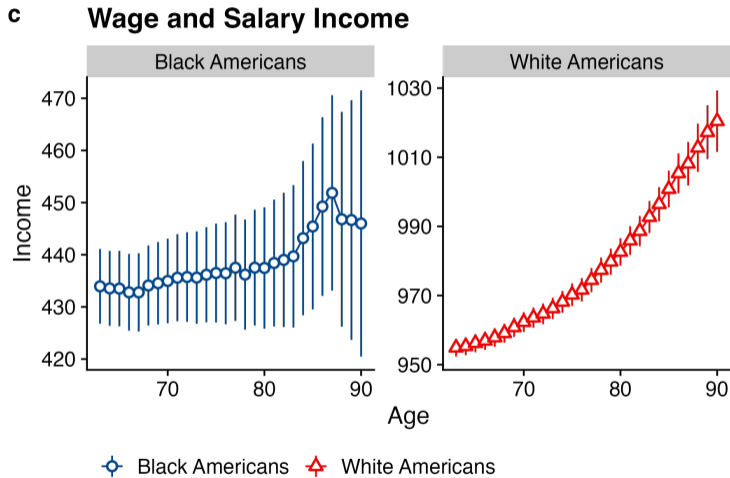# Is this driven by heterogeneity in frailty?

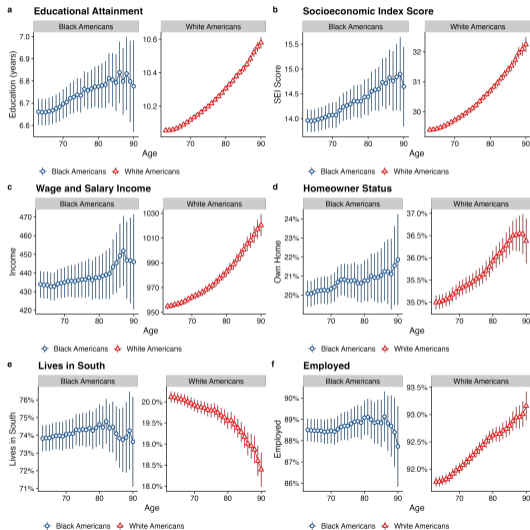First, how much **mortality selection** do we actually observe...?

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Changing composition of survivors

a   **Educational Attainment**
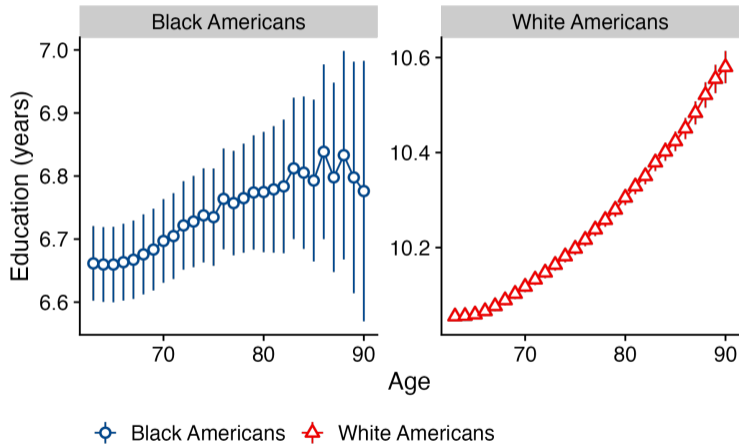
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Changing composition of survivors

c **Wage and Salary Income**

Changing composition of survivors

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Education of the living...

Education of the living by age

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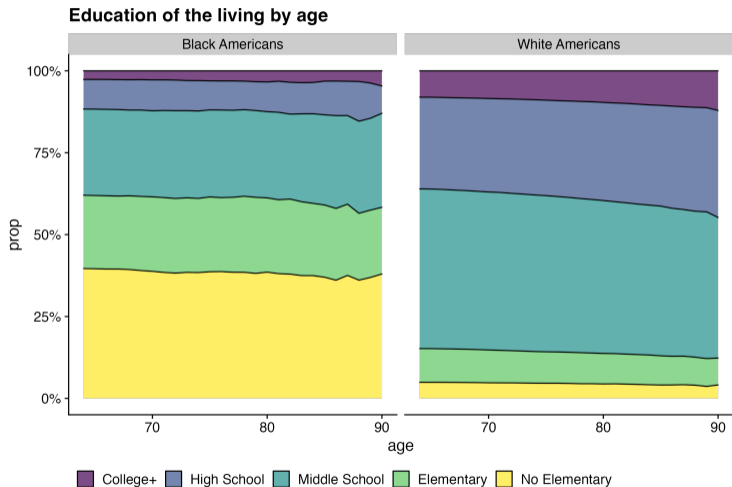
Stratifying by dimensions of frailty

a **Mortality Crossovers (<8 years education)** **b** **Mortality Crossovers (8+ years education)**
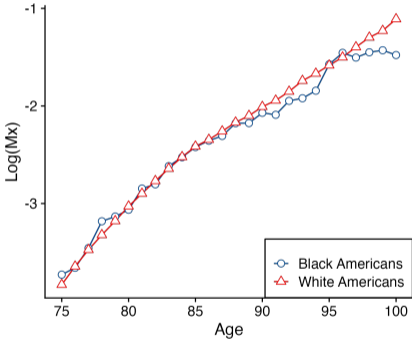
Pooled cohorts of 1890 - 1905

Stratifying by dimensions of frailty

Stratifying on risk score
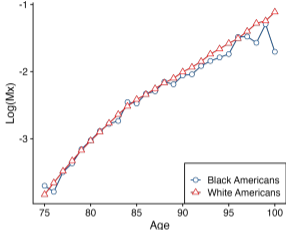

a   **Mortality Crossovers by Risk Score**

Pooled cohorts of 1890 - 1905
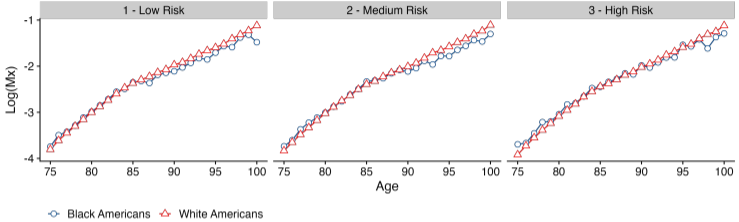
b   **Difference in Log Hazards (White - Black)**
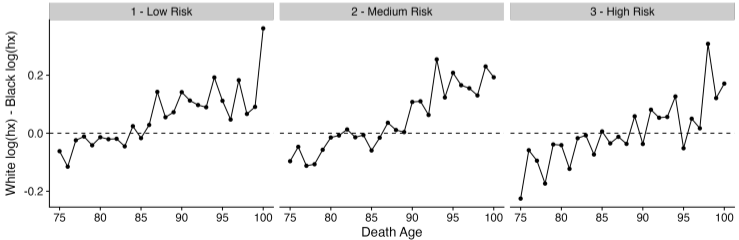
Conclusions

▶ **Key finding**: Black-White crossover is not a data artifact

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▶ Observed heterogeneity – socioedemographic characteristics – cannot explain the Black-White crossover
  ▶ Modest but clear evidence of mortality selection

Conclusions

- **Key finding**: Black-White crossover is not a data artifact

- Observed heterogeneity – socioedemographic characteristics – cannot explain the Black-White crossover
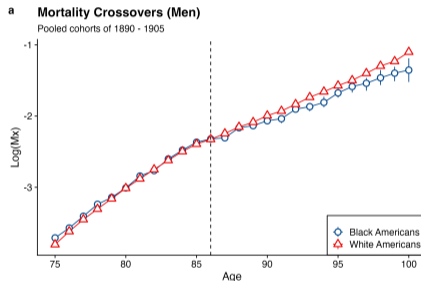   - Modest but clear evidence of mortality selection

- **Open Questions**
    - Some real attenuation of racial disadvantage at most advances ages?

    - Not capturing most important pieces of heterogeneity that constitute frailty?

Thank You

▶ Questions?

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Representativeness of samples

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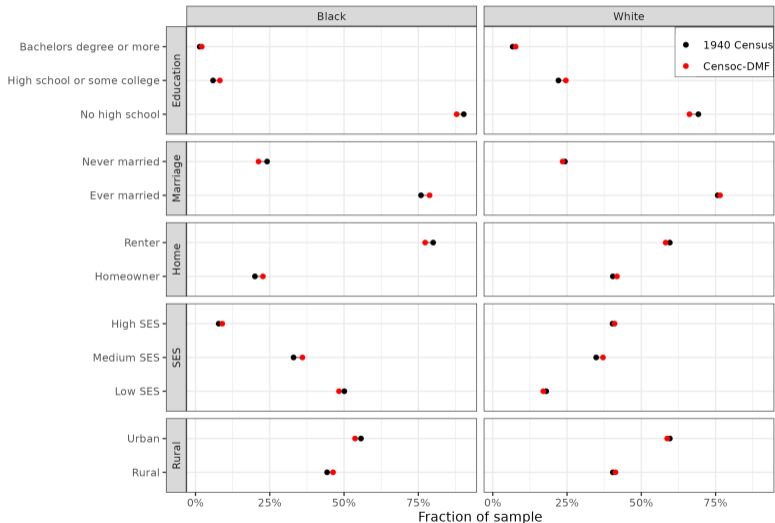
Representativeness of samples

	General Pop		CenSoc-DMF		CenSoc-DMF Siblings	
	No.	%	No.	%	No.	%
Educational Attainment						
<High School	4951782	67.3	608639	64.7	26137	66.7
High School or some college	1783203	24.3	247103	26.3	10133	25.9
Bachelors Degree	339072	4.6	48024	5.1	1664	4.2
Advanced Degree	162122	2.2	24559	2.6	820	2.1
NA	117086	1.6	12091	1.3	441	1.1
Race						
Black	656027	8.9	34159	3.6	278	0.7
Other	27778	0.4	3296	0.4	43	0.1
White	6669460	90.7	902961	96.0	38874	99.2
Marital Status						
Married	7013184	95.4	905924	96.3	38102	97.2
Not married	340081	4.6	34492	3.7	1093	2.8
Homeownership						
Homeowner	1780906	24.2	249379	26.5	11553	29.5
Not Homeowner	5572359	75.8	691037	73.5	27642	70.5
Socioeconomic Status Indicator						
Sei 1-9	1293523	17.6	138209	14.7	5513	14.1
Sei 10-14	1170543	15.9	149673	15.9	7962	20.3
Sei 15-25	1862967	25.3	246484	26.2	10028	25.6
Sei 26+	2776321	37.8	380226	40.4	14745	37.6
NA	249911	3.4	25824	2.7	947	2.4
Rural						
Rural	3183160	43.3	397739	42.3	19754	50.4
Urban	4170105	56.7	542677	57.7	19441	49.6

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References

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Yao, Li and Stephanie A. Robert. 2011. "Examining the Racial Crossover in Mortality between African American and White Older Adults: A Multilevel Survival Analysis of Race, Individual Socioeconomic Status, and Neighborhood Socioeconomic Context." *Journal of Aging Research* 2011:1–8.