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

MORTAL Conference

Casey F. Breen[1]

[1]University of Oxford | Nuffield College

July 4, 2024

# Black-White Mortality Crossover

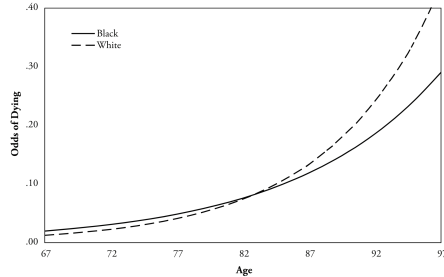
- Black-White mortality crossover is a well-studied demographic **paradox**

# Black-White Mortality Crossover

- Black-White mortality crossover is a well-studied demographic **paradox**
- White mortality is lower than Black mortality until advanced ages, when Black mortality becomes lower than White mortality

# Black-White Mortality Crossover

- Black-White mortality crossover is a well-studied demographic **paradox**
- White mortality is lower than Black mortality until advanced ages, when Black mortality becomes lower than White mortality

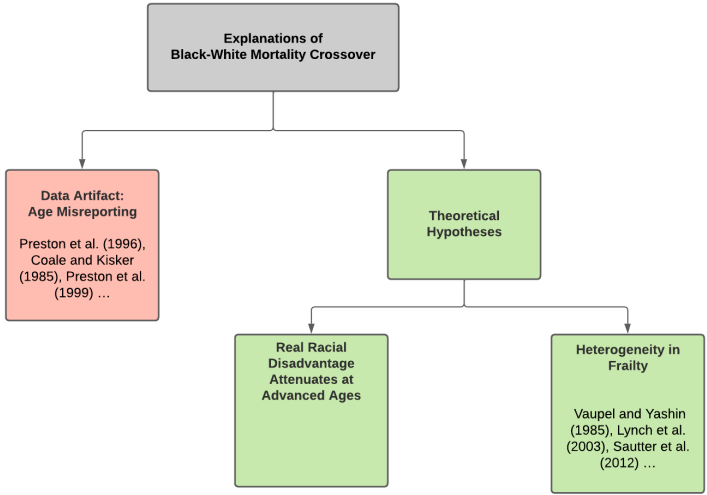



Dupre 2006. *Demography.*

# 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) |

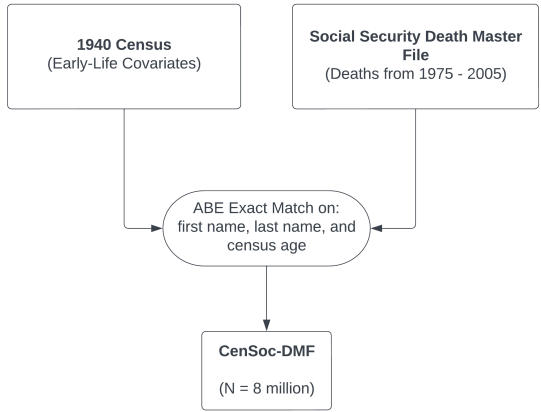
# No consensus on explanation...



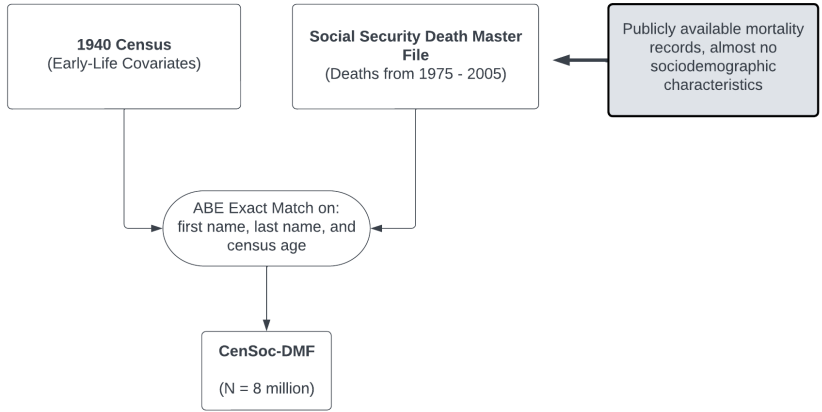
# Research Question

- 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?

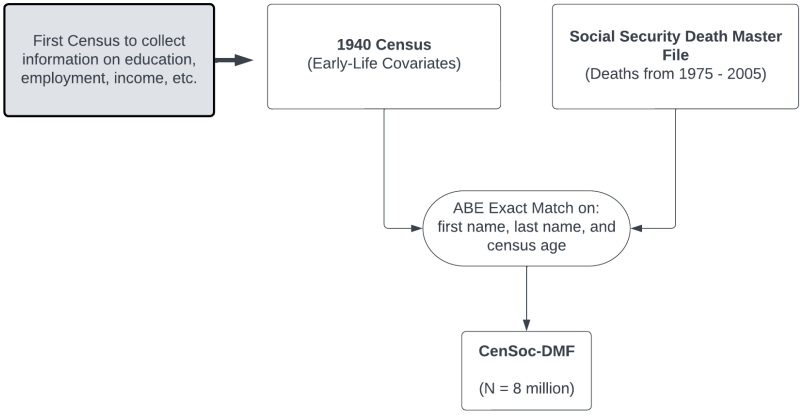
# CenSoc-DMF: Linked IPUMS 1940 Census and mortality records (CenSoc Project, PI: Joshua Goldstein)



# CenSoc-DMF: Linked IPUMS 1940 Census and mortality records



# CenSoc-DMF: Linked IPUMS 1940 Census and mortality records



# 1940 Census

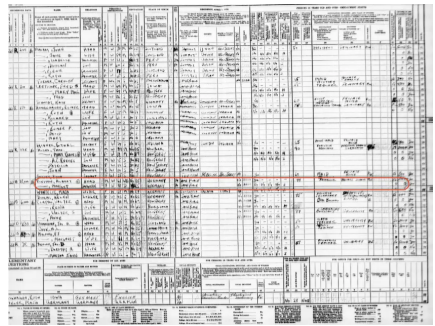
- 1940 Census reflected heightened time of social awareness brought about by Great Depression

# 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

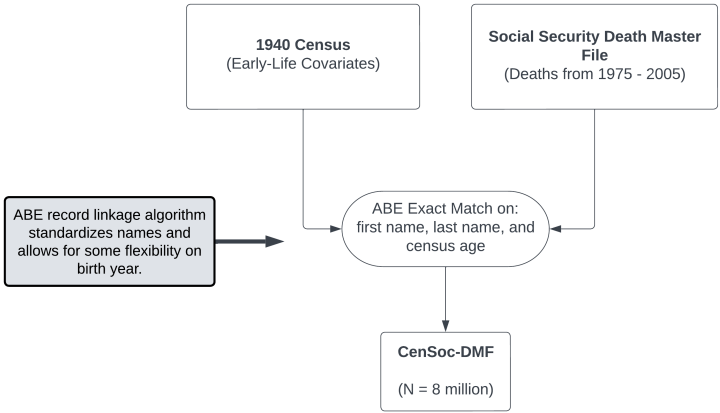
# 1940 Census

- 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

# CenSoc-DMF: Linked census and mortality records



# 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"

# Gompertz Model + Maximum Likelihood Estimation Method

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

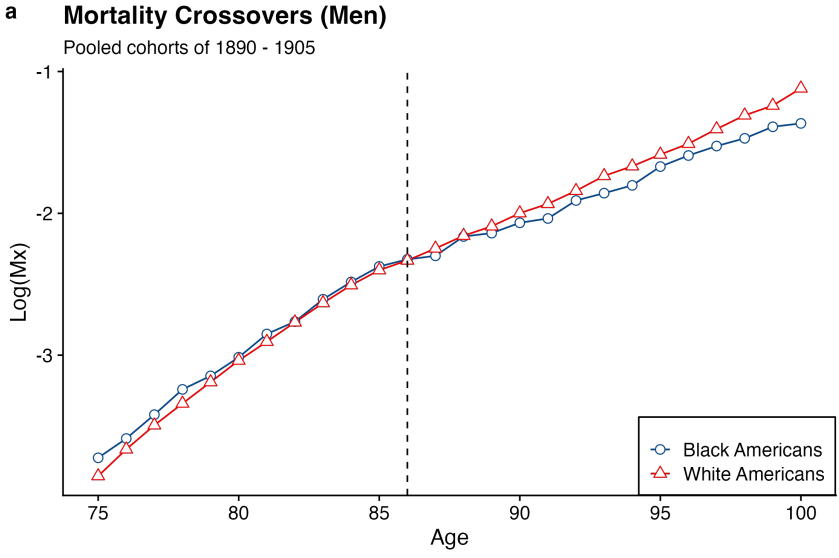
- $h(x)$ = hazard at age $x$. "Force of mortality"
- **a is baseline mortality**

# 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**

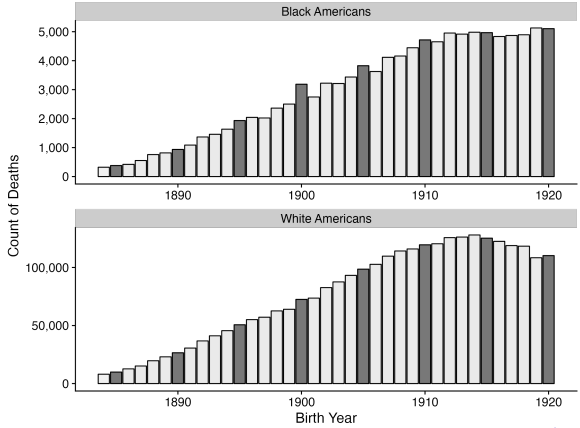
# Black-White Crossover (extinct cohort method)



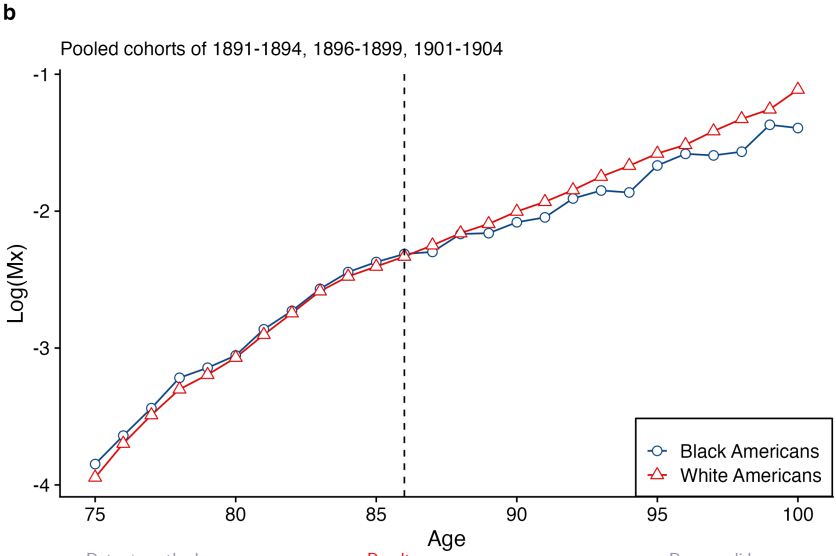
# Is this a data artifact?

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

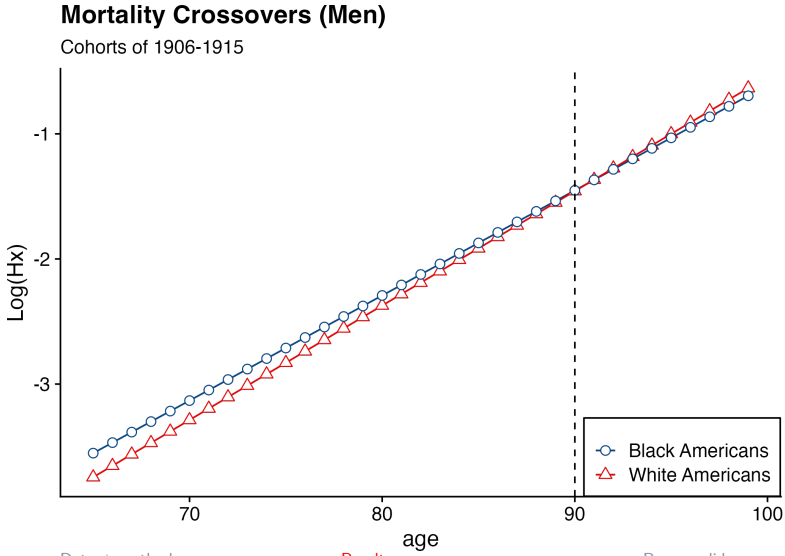
1. Date of death gets reported immediately (no heaping)
2. Minimal age heaping on birth year...
3. Institutional incentive: Social Security wants to accurately track birth date
4. Linkage requires exact match on year of birth with 1940



# Black-white crossover (extinct cohort method)



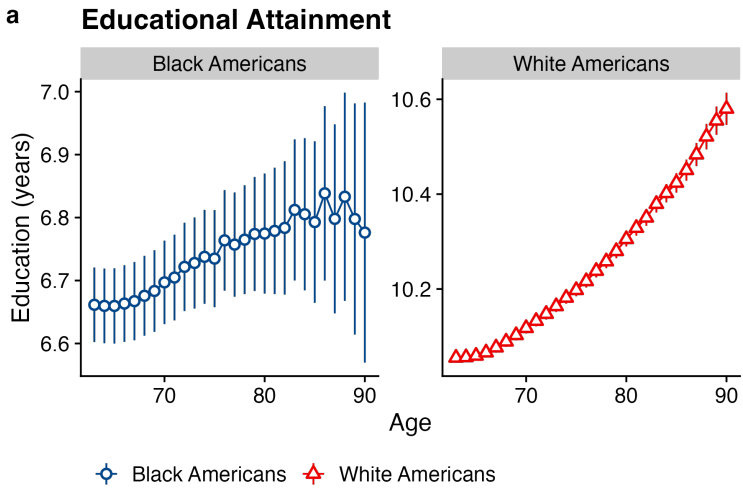
# Black-white crossover (Gompertz Parametric Approach)



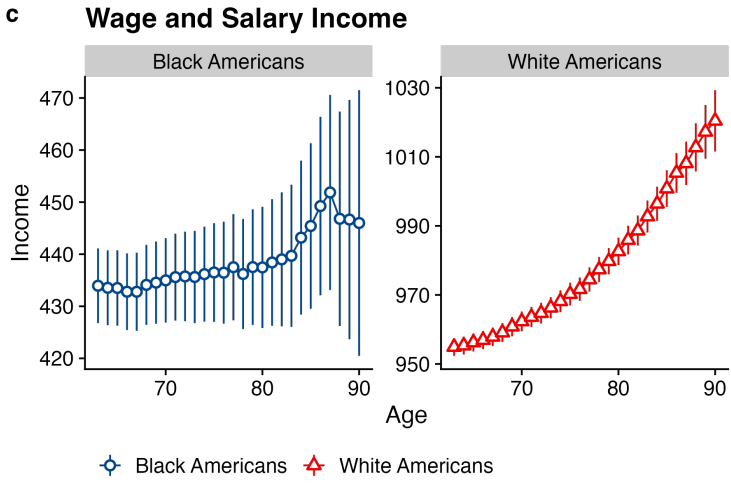
# Is this driven by heterogeneity in frailty?

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

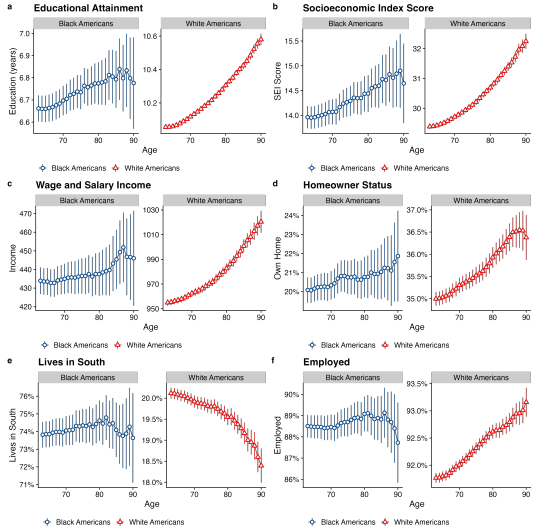
# Changing composition of survivors



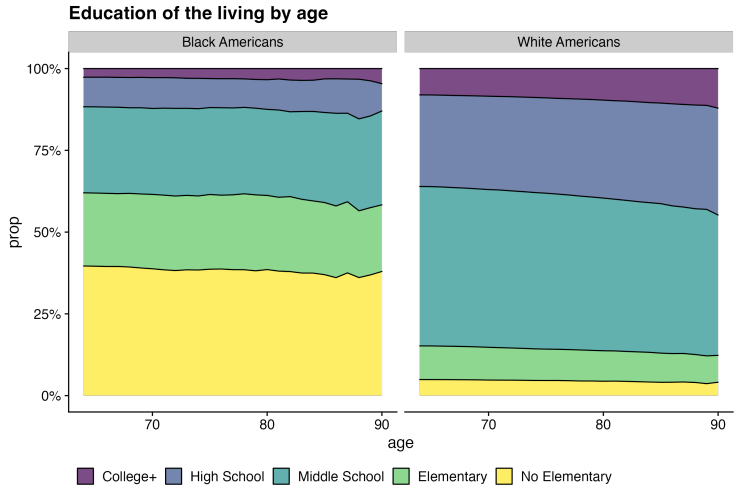
# Changing composition of survivors



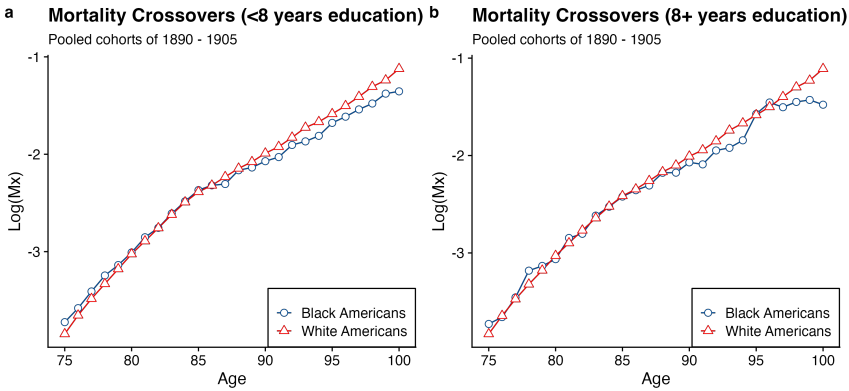
# Changing composition of survivors



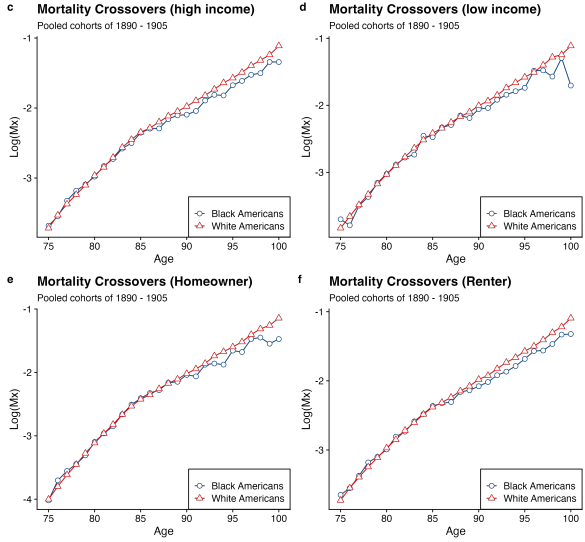
# Education of the living...



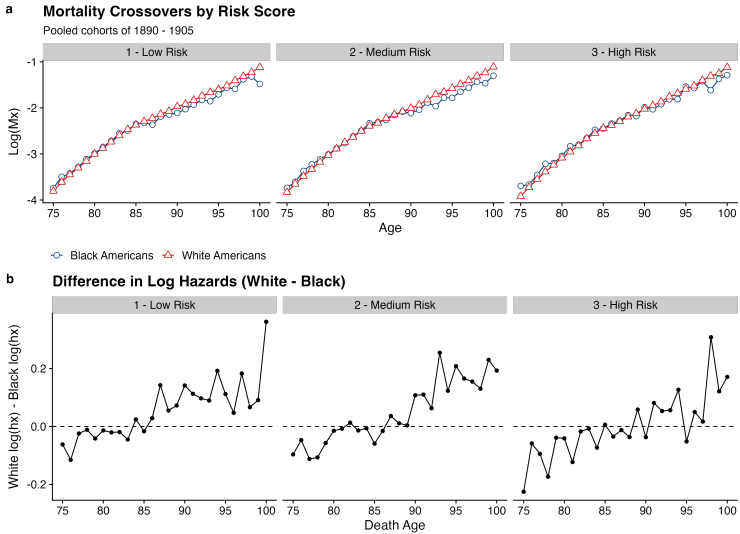
# Stratifying by dimensions of frailty



# Stratifying by dimensions of frailty



# Stratifying on risk score



# Conclusions

- Black-White crossover is (probably) not a data artifact

# Conclusions

- Black-White crossover is (probably) not a data artifact
- Observed heterogeneity – socioedemographic characteristics – cannot explain the Black-White crossover
  - Modest but clear evidence of mortality selection

# Conclusions

- Black-White crossover is (probably) 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?


caseyfbreen

casey.breen@demography.ox.ac.uk

# Reserve Slides

# 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 |

# References


Arias, Elizabeth. 2006. "National Vital Statistics Reports, Vol. 54, No. 14 ( 4/19/2006).".

Dupre, Matthew E., Alexis T. Franzese and Emilio A. Parrado. 2006. "Religious Attendance and Mortality: Implications for the Black-White Mortality Crossover." *Demography* 43(1):141–164.

Fenelon, Andrew. 2013. "An Examination of Black/White Differences in the Rate of Age-Related Mortality Increase." *Demographic Research* 29:441–472.

Johnson, N. E. 2000. "The Racial Crossover in Comorbidity, Disability, and Mortality." *Demography* 37(3):267–283.

Kestenbaum, B. 1992. "A Description of the Extreme Aged Population Based on Improved Medicare Enrollment Data." *Demography* 29(4):565–580.

Lynch, Scott M., J. Scott Brown and Katherine G. Harmsen. 2003. "Black-White Differences in Mortality Compression and Deceleration and the Mortality Crossover Reconsidered." *Research on Aging* 25(5):456–483.

Masters, Ryan K. 2012. "Uncrossing the U.S. Black-White Mortality Crossover: The Role of Cohort Forces in Life Course Mortality Risk." *Demography* 49(3):773–796.

Parnell, Allan M. and Cynthia R. Owens. 1999. "Evaluation of U.S. Mortality Patterns at Old Ages Using the Medicare Enrollment Data Base." *Demographic Research* 1:2.

Preston, Samuel H. 1996. "Population Studies of Mortality." *Population Studies* 50(3):525–536.

Şahin, Duygu Başaran and Frank W. Heiland. 2017. Black-White Mortality Differentials at Old-Age: New Evidence from the National Longitudinal Mortality Study*. In *Applied Demography and Public Health in the 21st Century*, ed. M. Nazrul Hoque, Beverly Pecotte and Mary A. McGehee. Applied Demography Series Cham: Springer International Publishing pp. 141–162.

Sautter, Jessica M., Patricia A. Thomas, Matthew E. Dupre and Linda K. George. 2012. "Socioeconomic Status and the Black–White Mortality Crossover." *American Journal of Public Health* 102(8):1566–1571.

Sibley, Elbridge. 1930. *Differential Mortality in Tennessee, 1917-1928*. Fisk University Press.

Wing, Steve, Kenneth G. Manton, Eric Stallard, Curtis G. Hames and H. A. Tryoler. 1985. "The Black/White Mortality Crossover: Investigation in a Community-Based Study1." *Journal of Gerontology* 40(1):78–84.

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.