Earlier Race Crossover in Mortality in the United States

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Overview

The race crossover in mortality is a central puzzle of modern demography. Although African-Americans in the United States experience much greater mortality than whites at almost all ages from birth, the contrast reverses in old age, and from about age 87, white mortality exceeds black mortality (e.g. Kestenbaum 1992; Johnson 2000; Dupre et al. 2006).

Previous attempts to explain the U.S. race crossover in mortality have focused on data quality issues (Elo and Preston 1994; Preston et al 1996, 1999; Hill et al. 2000), and on selective frailty processes (e.g. Dupre et al. 2006). Specifically, frailty hypotheses suggest that differences in selective pressure on racial groups that are internally heterogeneous may lead to artifactual behavior in standard life-table analyses, as those blacks surviving to older ages are, on average, less frail than surviving whites. Research in this tradition has been predominantly theoretical, focusing on mathematical models of population dynamics; empirical investigation has been hampered by small samples, and by the absence of controls for morbidity at baseline. Most previous research has focused on eliminating the race crossover in mortality using suitable analytic adjustments.

We investigate two questions. First, can the race crossover in mortality be documented descriptively with recent, high-quality, near-population data? Second, does the location of the crossover respond to improved observed controls for key components of frailty, including socio-economic status and detailed measures of morbidity?

We analyze individual level data with rich covariate information on over 28 million elderly Americans, followed longitudinally for 9 years from 1993 to 2002. Data are derived from beneficiary unencrypted Medicare Claims databases, which offer several distinct advantages for the study of the race crossover in mortality. One is the accuracy of reported ages, which are derived from Social Security Administration files that are strictly monitored for age misreporting, as payments depend on age. Another is that highly accurate dates of death are available for all decedents to the day (Sohn et al. 2006). Furthermore, our data provide prospective mortality follow up for over 96 percent of the population aged 66 and older in the United States, and they include rich covariate information, including detailed physician-ascertained medical records to adjust for differential frailty.

Preliminary results do demonstrate two findings. First we find a mortality crossover in the late 80s for both men and women. Second, controlling for baseline morbidity and socio-economic status (both key components of the frailty hypothesis) reduces the mortality of disadvantaged African-Americans compared to whites, thus lowering the age of the crossover to the early 80s for both men and women. These preliminary findings suggest that the race crossover in mortality is “real,” and that – contrary to conventional expectations – adjusting for differential frailty between blacks and whites lowers rather than raises the age of the crossover.

<u>Data</u>

This study uses individual-level data on a cohort of 28.7 million elderly Medicare beneficiaries, followed longitudinally from 1993 to 2002. The data represent 96 percent of all Americans aged 66 and above who were alive on January 1, 1993. This is the first analysis of the race crossover in mortality from these data.

The Medicare Vital Status file, mostly drawn from the Social Security Administration's Master Beneficiary Record (MBR) file, provides daily death-date follow up (Elwert 2008). Recent evaluations suggest that Medicare death reporting provides the closest match with the National Death Index among national mortality databases, surpassing even the SSA Death Master File (Sohn et al. 2006). Kestenbaum (1992) argues the advantages of (older) Medicare data over Census and death certificate data often used in previous research.

We derive race classifications from the race and ethnicity variable in the Vital Status file. This variable was populated from the MBR and has been verified and updated against the self-reported race classifications on beneficiaries' applications for (replacement) social security cards by CMS (Arday et al. 2000). Previous research indicates that the race information in Medicare files is well suited to support comparisons between blacks and whites (Lauderdale and Goldberg 1996; Arday et al 2000; Elwert and Christakis 2006).

The Medicare Provider and Analysis Review file provides in-patient hospitalization records for 1992, from which we extract detailed health information to control for differences in baseline morbidity. Since individuals typically enter Medicare at age 65, we restrict the analysis to individuals who were older than 66 at baseline in order to guarantee the availability of one year of health background controls for the entire sample. We also restrict our sample to those less than 97 years old to avoid possible residual problems with age reporting among the oldest old. Our detailed, physician-ascertained controls for health status confounding significantly exceed the health information available to previous work on race crossover in mortality.

The Medicare Denominator file provides additional individual-level demographic information from Social Security records, including age, sex, area of residence, and a poverty indicator at baseline.

Records from all Medicare files were matched using unique individual level identifiers. The record linkage rate was 100 percent.

<u>Descriptive Statistics</u>

At baseline in 1993, the data contain 11.4 million men and 17.2 million women, of which 8 percent are black and 92 percent are white. By the end of follow up in 2002, 5.7 million men and 7.3 million women have died. The data thus contain enough information for a flexible specification of the relationship between age, race, and mortality.

We observe drastic differences in baseline poverty between black and white individuals. Among men, 18.4 percent of blacks, but only 4.7 percent of whites, were poor. Among women, 36.4 percent of blacks and 10.3 percent of whites were poor. Race differences in baseline chronic disease burden were somewhat smaller. Among men, 9 percent of blacks and 7 percent of whites had at least three severe chronic conditions (as defined by Charlson et al 1987). Among women, 8 percent of blacks and 5 percent of whites were similarly sick.

<u>Methods</u>

We use flexible discrete-time hazard models to model the race crossover in mortality in old age. Individuals are followed from January 1993 to death (or censoring in January 2002). We start by grouping deaths into three-month age intervals. Next, we collapse the data along age at death, birth cohort, race, sex, and the values of all other control variables into a high-dimensional contingency table to render a multivariate analysis of our data computationally feasible.

We model death rates as Poisson counts, adjusted for exposure to the day. Poisson models for duration data approximate complementary log-log hazard models if age is modeled linearly (Kalbfleisch and Prentice 2000). Here, however, we enter age at death as a series of 116 independent three-month-of-age indicators, thus maintaining a high degree of flexibility in the functional form of the relationship between age and death. We model the relationship between age at death and race by including interactions between race and each of the age indicators, thus permitting the relationship between race and age of death to vary freely by age. All other covariates are entered as main effects. We estimate separate models for men and for women.

The estimates combine prospective longitudinal information from 9 years of follow up for several birth cohorts to recover death rates over the entire age range from 66 to 96. Consequently, we adjust all estimates for cohort membership, yielding estimated death rates for men and women who were aged 66 in 1993.

[As next steps in the analysis, we will explore the use of semi-parametric Poisson hazard models to implement the Heckman-Singer (1984) correction for unobserved frailty, as suggested by Land et al. (1996), on a computationally feasible subset of the data. Additionally, we will incorporate further covariates to control for further observed dimensions of frailty, including marital status and detailed zip-code level characteristics of individuals' place of residence.]

<u>Preliminary Results</u>

Figure 1 shows age-specific death rates for black and white men, not adjusted for covariates (besides cohort membership). Black male mortality hovers stably above white male mortality up to about age 80. At age 80, the mortality among white men increases relative to mortality among black men, and consistently exceeds black mortality from age 89. This replicates the conventional finding of the race crossover in mortality for U.S. men. [FIGURE 1]

Figure 2 shows estimated death rates for black and white men that have been adjusted for baseline poverty, morbidity, and region of residence. Adjusting for covariates lowers the age of the crossover by five years from 89 to 84. This represents a large shift in the location of the crossover, exceeding that achieved by Preston and colleagues in cross sectional Census data, and by Dupre et al. (2006) using EPESE data. Critically, however, our adjustments shift the location of the crossover <u>down</u> rather than up. [FIGURE 2]

Figure 3 shows estimated death rates for black and white women, not adjusted for covariates besides cohort membership. This graph replicates the familiar race crossover in mortality for U.S. women at age 86. [FIGURE 3]

Figure 4 shows estimated death rates for black and white women that have been adjusted for baseline poverty, morbidity, and region of residence. Adjusting death rates for black and white women for the key covariates of poverty and mortality shifts the location of the race crossover in mortality by 5 years. As was the case with men, covariate adjustment <u>lowers</u> rather than raises the age of crossover, this time from age 86 to age 81. [FIGURE 4]

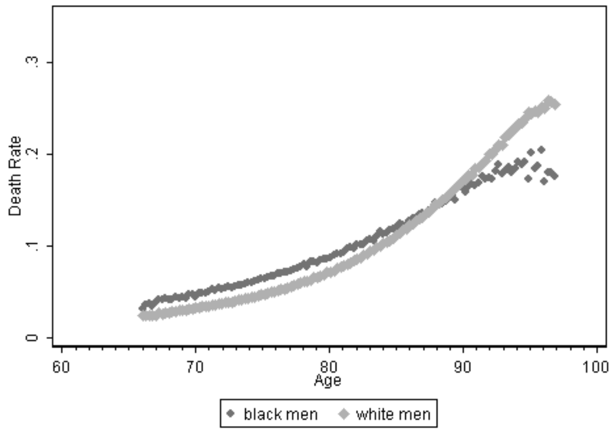

Figure 1. Cohort adjusted estimated death rates for black and white men aged 66-96, followed longitudinally from 1993 to 2002. No covariate adjustment besides cohort membership.

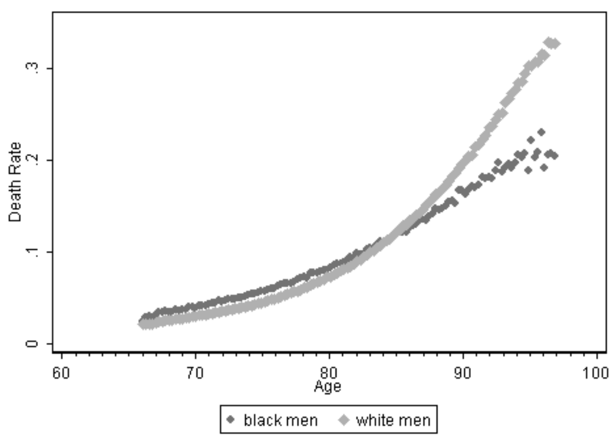

Figure 2. Covariates-adjusted estimated death rates for black and white men aged 66-96, followed longitudinally from 1993 to 2002.

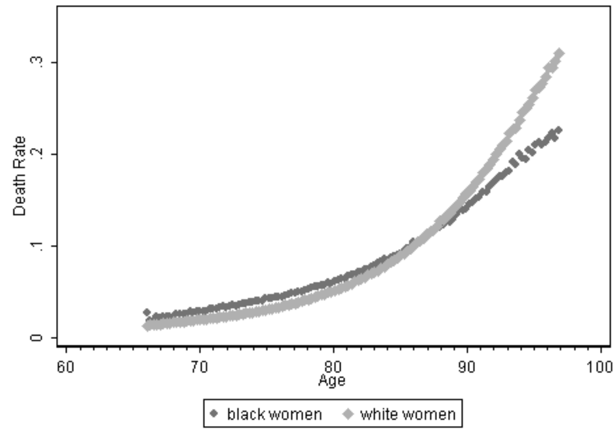

Figure 3. Cohort adjusted estimated death rates for black and white women aged 66-96, followed longitudinally from 1993 to 2002. No covariate adjustment besides cohort membership.

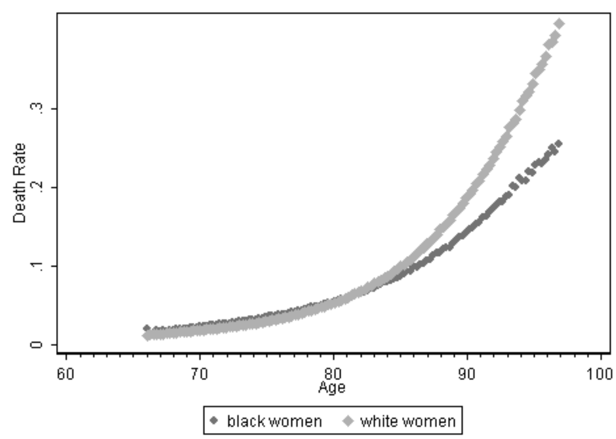

Figure 4. Covariates-adjusted estimated death rates for black and white women aged 66-96, followed longitudinally from 1993 to 2002.