Black/White Differences in U.S. Adult Mortality:
An Examination of Recent Period and Cohort Trends

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Overview

This paper uses the most currently available national-level data to examine contemporary period and cohort based trends in black-white differences in U.S. adult mortality. We do so with regard to all-cause mortality as well as for several specific underlying causes of death. The need for such continued attention to race disparities in U.S. adult mortality is pressing. On the one hand, a recent report from the National Center for Health Statistics indicates that the life expectancy gap between African Americans and non-Hispanic white Americans was reduced to less than five years in 2007, seemingly the narrowest in U.S. history (Miniño et al. 2009). Thus, a better understanding of why that disparity is closing—i.e., among specific birth cohorts, within specific periods of time, and/or within specific causes of death—is imperative toward our understanding of this positive trend. On the other hand, the *Healthy People 2010* objective of eliminating health disparities between subgroups of the population has not been met, and much work remains to be done to accomplish that goal (*www.HealthyPeople.gov* 2010). In short, this is a very important time to continue to devote significant scholarly attention to race-based mortality disparities and to help inform both the academic and policy audiences regarding how black-white mortality trends are unfolding. In this paper, we (1) develop an updated conceptual model that outlines the ways in which the social histories of African Americans and non-Hispanic whites have led each group to exhibit unique contemporary adult mortality patterns and trends (2) use recently developed hierarchical age-period-cohort models to empirically examine the extent to which black and white adult all-cause mortality risks have changed over the last 20 years across both period time and across birth cohorts, and (3) empirically examine the extent to which the period and cohort trends exhibited for all-cause mortality differ when specific causes of death are examined.

Brief Conceptual Background

The model developed in the first portion of this paper gives specific attention to the social forces that have led to differing mortality patterns and trends among African Americans and non-Hispanic whites. Far too often, research in this area attempts to understand race/ethnic health and mortality disparities with no attention to each group's unique social history. Our model relies on each group's unique recent history to best understand their contemporary mortality patterns and trends. The conceptual model also devotes some attention to specific causes of death. It is well known, for example, that race mortality disparities vary a great deal by cause of death. The extent to which trends in cause of death differences are unfolding across period time and/or by birth cohort remains an open question.

Data and Methods

We use data from the latest public use version of the National Health Interview Survey Linked Mortality File (NHIS-LMF). This data set consists of approximately 1,500,000 NHIS adult survey participants from 1986-2004 linked with mortality follow-up through December 31, 2006. With file restrictions (age range of 35 and above, non-Hispanic blacks and non-Hispanic whites only), our analytic sample is composed of just over 1,000,000 with over 100,000 deaths occurring to these individuals over the course of the follow-up period. There are three key features of the NHIS-LMF that are notably favorable for this paper. First, the data are the most current available to analyze U.S. adult mortality risks. Second, the 1986-2004 NHIS included significant over-samples of African Americans throughout the time frame, and thus provide the numerical depth that is needed to effectively and thoroughly analyze this population subgroup. Finally, the NHIS-LMF contains self-reports of age and racial identity, which is a major advantage in comparison to official U.S. mortality data that necessarily relies on proxy reports of race and age among decedents. In all, the data allow us to accomplish our study aims in a fashion that is current, innovative, and with substantial statistical power. Moreover, while mortality ascertainment is based primarily on a probabilistic match between NHIS participants and death certificate records in the National Death Index (NDI), the quality of match information between survey respondents and death information has been determined to be very high among both African Americans and non-Hispanic whites. Thus, the deaths matches are of very high quality and include information on date of death and underlying cause of death.

The focus on both period time and birth cohorts necessitates complex age-period-cohort (APC) modeling techniques. To model age, period, and cohort patterns of U.S. race mortality disparities, we first collapse the individual-level NHIS-LMF data into five-year age-period-cohort cells, separately by sex and race. We then use recently developed hierarchical age-period-cohort (HAPC) models for repeated cross-sectional survey data (Yang and Land 2006; Masters et al. 2010). These methods utilize a cross-classified random effects model (CCREM) to embed each respondent within both a time period and birth-cohort at a given age. Because the 1986-2006 NHIS-LMF follows individual mortality risk as respondents age across periods, each respondent can occupy several age-period-cohort combinations. Thus, while collinearity between the three effects is very high, these data do not suffer the classic "identification problem" when there is absolute linear dependency between age, period, and cohort among individuals.

Preliminary Results

We begin by estimating 4 Poisson regression models for each race-sex combination: one fixed effects age model (A), two two-factor models for age-period (AP) and age-cohort (AC), and the full age-period-cohort (APC) model. Goodness of fit statistics were calculated and are presented in Table 1. For both black and white females as well as white males, the AIC and BIC statistics unanimously indicate that the full APC model is a better fit for the data than the models with fewer parameters. For black males, the BIC is actually larger for the APC model than for the age-cohort model, but this is likely a function of the small size for black males.

Table 1. Goodness-of-Fit Statistics for Age-Period-Cohort Log Linear Models of U.S. Adult Mortality

	Male				Female			
	A	AP	AC	APC	A	AP	AC	APC
White								
Deviance	1,307	841	373	144	875	718	627	176
AIC	2,240	1,782	1,334	1,113	1,795	1,645	1,574	1,131
BIC	2,280	1,832	1,413	1,203	1,834	1,696	1,653	1,221
Black								
Deviance	276	181	118	109	225	184	161	103
AIC	1,008	921	878	877	969	936	933	884
BIC	1,048	972	957	967	1,008	987	1,012	974
Df	110	106	96	92	110	106	96	92

Note: The smaller the AIC and BIC, the better the model fit

Looking at results from the APC models in Table 2, mortality risk is lowest at the youngest ages and continues to increase with age. Women have slightly lower mortality rates and the effect sizes for age are consistent with prior research (Yang 2008). Comparing effect sizes of cohort and period, we find that the cohort estimates for mortality are larger than the period estimates, providing preliminary evidence that it is cohort effects, rather than period effects, that are driving recent reductions in mortality for both blacks and whites.

Table 2. HAPC-CCREM Estimates for U.S. non-Hispanic White and non-Hispanic Black Adult Mortality Rates

		Men		Women	
		White	Black	White	Black
Age	Intercept	-4.571	-3.925	-5.093	-4.512
	35-39	-1.516	-1.221	-1.509	-1.209
	40-44	-1.298	-1.147	-1.277	-1.071
	45-49	-1.066	-0.971	-0.967	-0.821
	50-54	-0.764	-0.681	-0.705	-0.547
	55-59	-0.496	-0.495	-0.442	-0.401
	60-64	-0.221	-0.288	-0.181	-0.171
	65-69	0.000	0.000	0.000	0.000
	70-74	0.223	0.233	0.253	0.208
	75-79	0.444	0.441	0.500	0.465
	80-84	0.692	0.718	0.829	0.704
	85-89	1.004	0.937	1.181	0.990
	90-94	1.208	1.188	1.543	1.182
	95-99	1.127	0.713	1.663	0.988
	100-104	0.360	0.179	1.032	0.017
Cohort	1900-1904	1.789	1.044	1.733	1.459
	1905-1909	1.704	1.017	1.592	1.259
	1910-1914	1.559	0.949	1.473	1.060
	1915-1919	1.378	0.843	1.312	0.955
	1920-1924	1.139	0.785	1.117	0.850
	1925-1929	0.947	0.597	0.938	0.720
	1930-1934	0.672	0.501	0.707	0.564
	1935-1939	0.440	0.338	0.488	0.416
	1940-1944	0.196	0.211	0.215	0.262
	1945-1949	0.000	0.000	0.000	0.000
	1950-1954	-0.113	-0.061	-0.226	-0.124
	1955-1959	-0.271	-0.295	-0.394	-0.292
	1960-1964	-0.510	-0.548	-0.425	-0.640
	1965-1969	-0.565	-0.840	-0.601	-0.703
	1970-1974	-0.882	-1.141	-0.817	-1.065
Period	1985-1989	-0.288	-0.150	-0.415	-0.388
	1990-1994	-0.148	-0.065	-0.206	-0.146
	1995-1999	0.000	0.000	0.000	0.000
	2000-2004	0.135	0.041	0.199	0.133
	2005-2006	0.149	0.020	0.201	0.107

Note: standard errors have been omitted due to space limitations