The Contribution of Smoking to Black-White Differences in Mortality

Abstract

Smoking has significantly impacted American mortality and continues to be a major cause of morbidity and mortality today. To the best of our knowledge, no previous study has examined the contribution of smoking attributable deaths to mortality trends among African Americans or to black-white mortality differentials in the United States. Cohort data on smoking prevalence, cessation, and duration suggest that the magnitude of smoking attributable mortality may differ between blacks and whites. In this paper, we estimate the contribution of smoking to black-white differences in mortality in 1980-2005 using indirect methods and regression models and vital statistics, census, and survey data. Our preliminary findings indicate that smoking explains an important part of the black-white gap in life expectancy at age 50 for males, especially in the 1980s and 1990s, and a larger portion of the gender gap in life expectancy at age 50 for blacks than for whites.

The Contribution of Smoking to Black-White Differences in Mortality

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Background

The persistence of black-white differences in mortality in the United States is well known. Black-white differences in life expectancy at birth have fluctuated over time, reaching a recent peak at 8.5 years for men and 5.8 years for women in 1993, before declining to 6.1 years for men and 4.3 years for women by 2005 (National Center for Health Statistics [NCHS] 1997; Arias et al. 2005). These black-white health disparities are an important public health concern. Factors that contribute to these disparities include black-white differences in socio-economic status, living conditions, and unequal access to health care (Hayward et al. 2000; Smedley et al. 2003; William and Jackson 2005).

In this paper, we examine the potential role of smoking behavior in explaining black-white differences in mortality above age 50. Several recent studies have investigated the role of differential smoking patterns in explaining mortality trends and sex mortality differentials at older ages in the United States (Ho and Preston 2010; Preston and Wang 2006) and international differentials in life expectancy at age 50 (Preston, Glei, and Wilmoth 2010a), and the contribution of smoking to socioeconomic inequalities in mortality (Jha et al. 2006). To the best of our knowledge, no previous study has examined trends in smoking attributable mortality among African Americans or the contribution of smoking to black-white differences in mortality at older ages. An examination of trends in the black-white gap in life expectancy at age 50 reveals that for males, the gap increased in the late 1980s and decreased slightly in the early 1990s (see Figure 1 below). Between 1995 and 2005, the gap remained fairly stable. In contrast, the black-white gap in life expectancy at age 50 for females has been declining steadily in the recent period. We hypothesize that smoking may be contributing to these trends.

There is reason to believe that the magnitude of smoking attributable mortality differs by race. A reconstruction of cohort smoking histories shows that for the earlier birth cohorts born between 1895 and 1915, white males smoked more than black males. For most cohorts born

between 1915 and 1960, black males were slightly more likely to become smokers than white males (Burns et al. 1997). The prevalence of ever-smoking by sex and race for cohorts born between 1895-1900 and 1945-50 is shown in Figure 2. Slightly higher rates of smoking prevalence and substantially lower rates of smoking cessation resulted in longer durations of smoking among black male smokers than white male smokers. For the earliest birth cohorts, white women also smoked more than black women; rates of ever-smoking later converged so that black females had very similar or only slightly lower rates of peak prevalence of ever-smoking than white females (Ibid; Figure 2). These observations are consistent with evidence from period data on smoking prevalence, cessation, and duration (Gilpin and Pierce 2002; King et al. 2004; NCHS 2010; Siahpush et al. 2010; U.S. Department of Health and Human Services 1998). Other factors which may contribute to racial differences in smoking attributable mortality include differences in the type of cigarettes smoked and variation in nicotine metabolism among different race/ethnic groups (Williams and Collins 1995; Sellers 1998).

This paper has two main goals. We first examine the contribution of smoking attributable mortality to life expectancy trends at age 50 among white and black men and women between 1980 and 2005. These analyses will show whether smoking attributable mortality contributes to black-white differences and to sex differences in life expectancy at age 50. Second, we use National Health Interview Survey (NHIS) data linked to the National Death Index to investigate whether black-white differences in smoking attributable mortality can be explained by differential smoking habits among blacks and whites.

Data and Methods

To address our first aim, we estimate the magnitude of smoking attributable mortality among blacks and whites in the United States using indirect estimation methods developed by Preston, Glei, and Wilmoth (2010b). This approach is based on age- and sex-specific lung cancer death rates as an indicator of the damage from smoking and a regression model that uses lung cancer mortality to predict mortality from other causes of death. The age- and sex-specific coefficients from this regression and information on expected lung cancer death rates among non-smokers can be used to estimate the fraction of deaths attributable to smoking. The authors demonstrate that the method produces results very similar to those obtained from an older widely used method developed by Peto et al. (1992). In a recent application of this method, Fenelon and

Preston (2010) applied it to estimate smoking attributable mortality at the state level in the United States. In this paper, we use the U.S. coefficients published in Fenelon and Preston (2010). In the United States, approximately 90% of deaths from lung cancer are attributable to smoking; thus, the lung cancer death rate serves as a sensitive indicator of smoking damage (Preston, Glei, and Wilmoth 2010a).

In these analyses, we use vital statistics data on deaths and Census Bureau population estimates to calculate age-specific death rates from lung cancer and all other causes combined. We first estimate the fraction of deaths attributable to smoking by age group using the method described above. We then use standard life table procedures to calculate life expectancy at age 50 with and without the inclusion of smoking attributable deaths to determine how much of the mortality among blacks and whites is attributable to smoking. We will also employ decomposition techniques to estimate the contribution of smoking attributable mortality to the trends in the black-white gap in life expectancy at age 50 (Preston, Heuveline, and Guillot 2001).

For our second aim, we will use NHIS supplements linked to the NDI (Centers for Disease Control and Prevention 2010) to examine whether we can explain black-white differences in smoking attributable mortality by smoking histories. The Cancer Control Supplements (1987, 1992), Occupational Health Supplement (1988), Health Promotion and Disease Prevention Supplements (1990-1991), Year 2000 Supplement (1995), and Sample Adult files (1997-2004) contain detailed information on smoking initiation, duration, and frequency. Similar to Rogers et al. (2005), we will use discrete-time hazard models to construct life tables with covariates to estimate deaths attributable to smoking and sex- and race-specific life expectancy.

Preliminary Results

Below we present preliminary results from the first analysis. As seen in Figure 3, the fraction of deaths above age 50 that are attributable to smoking for black males exceeds that of white males in every year from 1980 through 2005. The fractions are much more similar for black and white females, although after 1988, the fraction of deaths attributable to smoking above age 50 is slightly higher for white females. Smoking appears to explain a large proportion of the black-white gap in life expectancy for males, particularly in the 1980s and 1990s (see Figure 4). It explains a much smaller proportion of the black-white gap in life expectancy for

females because smoking histories appear to have been more similar for black women and white women (Burns et al. 1997).

In summary, we find that smoking explains an important part of the race gap in life expectancy for males, and a larger portion of the gender gap in life expectancy for blacks than for whites (see Figure 5).

Consistent with the estimates of the contribution of smoking attributable mortality, age-adjusted lung cancer incidence rates for cases diagnosed in 1992-2007 at ages 50 and above were higher for black men than white men (Surveillance Epidemiology and End Results [SEER] 2010), although the two series appear to be converging over time. Among women aged 50 and above in the same time period, lung cancer incidence rates were very similar for both blacks and whites, although they began diverging in the late 1990s, with black women experiencing higher rates of lung cancer incidence than white women. Five-year relative survival appears to be more variable for blacks than for whites; in general, for the period 1975-2002 and for the registries covered in the SEER database, lung cancer survival is lower for blacks than whites of both sexes (Ibid).

Next Steps

Given that the differences in ever-smoking prevalence between black and white male birth cohorts do not appear to be especially large (Figure 2), it is unclear what accounts for the observed differences in smoking attributable mortality between black men and white men. It is possible that differences in smoking behaviors such as duration and frequency of smoking between black men and white men explain these differences. We will use the NHIS supplements linked to the NDI to explore these explanations.

Figure 1. Black-White Gap in Life Expectancy at Age 50 by Sex, United States 1980-2005

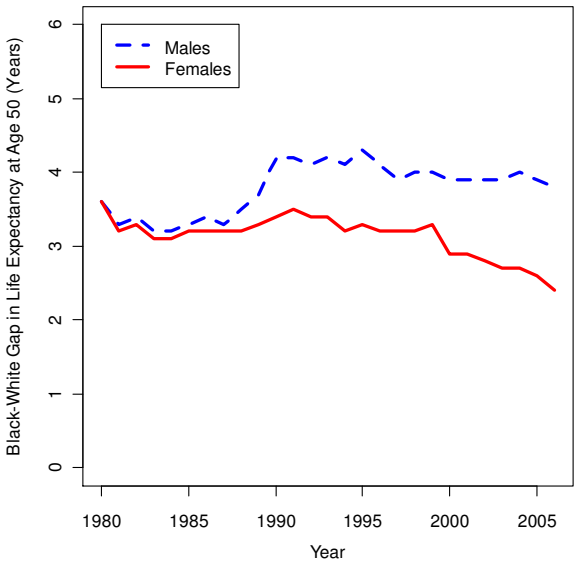

Figure 2. Ever-Smoking Prevalence at Age 40 by Sex and Birth Cohort

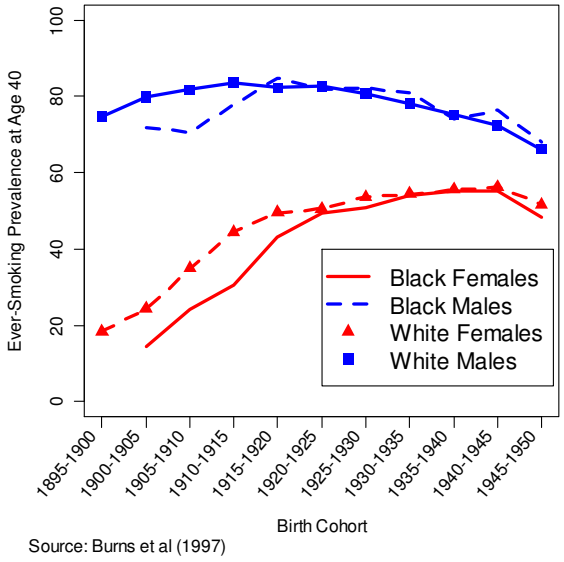

Figure 3. Fraction of Deaths Attributable to Smoking above Age 50 by Sex among Blacks and Whites, United States 1980-2005

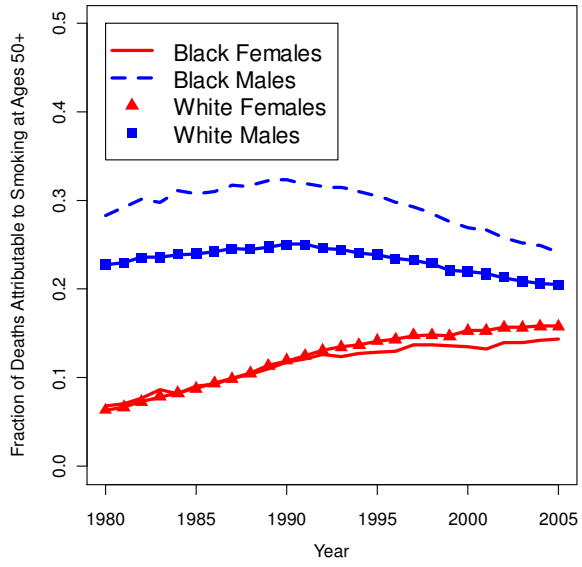

Figure 4. Black-White Gap in Life Expectancy at Age 50 with and without Smoking Attributable Deaths, United States 1980-2005

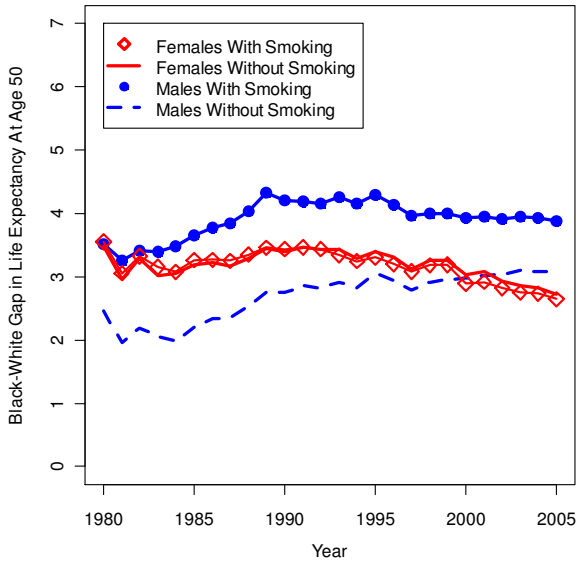

Figure 5. Gender Gap in Life Expectancy at Age 50 with and without Smoking Attributable Deaths, United States 1980-2005

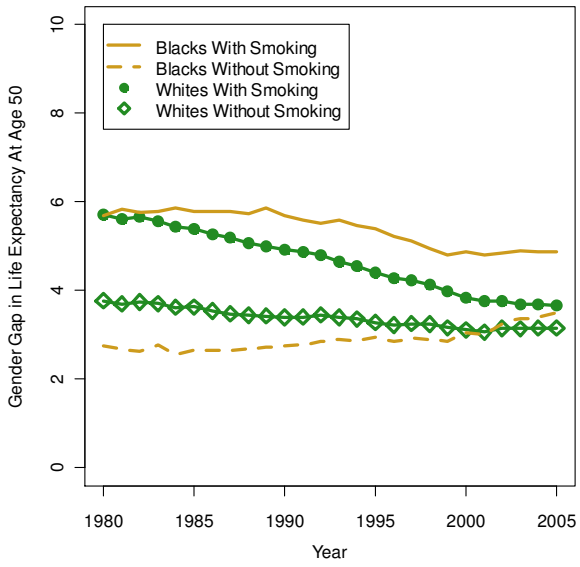

Table 1. Estimated Smoking Attributable Fraction among Deaths at Ages 50+ by Sex, Blacks and Whites, United States 1980-2005

	Male		Female	
Year	White	Black	White	Black
1980	0.228	0.283	0.064	0.068
1985	0.240	0.308	0.088	0.090
1990	0.251	0.323	0.120	0.117
1995	0.238	0.305	0.142	0.129
2000	0.220	0.270	0.153	0.134
2005	0.205	0.242	0.158	0.144

Table 2. Black-White Gap in Life Expectancy at Age 50 with and without Smoking Attributable Deaths, United States 1980-2005

Males	**Original** *(with smoking)*			**Adjusted** *(without smoking)*		
Year	Whites	Blacks	Gap (W-B)	Whites	Blacks	Gap (W-B)
1980	25.206	21.691	3.516	27.946	25.490	2.456
1985	25.801	22.153	3.648	28.682	26.483	2.198
1990	26.755	22.557	4.198	29.784	27.028	2.757
1995	27.407	23.110	4.298	30.263	27.216	3.047
2000	28.225	24.299	3.926	30.826	27.849	2.977
2005	28.977	25.108	3.869	31.385	28.294	3.091
Females						
Year	Whites	Blacks	Gap (W-B)	Whites	Blacks	Gap (W-B)
1980	30.916	27.367	3.549	31.713	28.234	3.480
1985	31.186	27.928	3.258	32.308	29.130	3.178
1990	31.686	28.250	3.436	33.176	29.781	3.395
1995	31.802	28.503	3.299	33.542	30.151	3.390
2000	32.064	29.174	2.890	33.936	30.906	3.030
2005	32.639	29.992	2.647	34.536	31.818	2.718

Table 3. Gender Gap in Life Expectancy at Age 50 with and without Smoking Attributable Deaths, United States 1980-2005

Blacks	**Original** *(with smoking)*			**Adjusted** *(without smoking)*		
Year	Females	Males	Gap (F-M)	Females	Males	Gap (F-M)
1980	27.367	21.691	5.677	28.234	25.490	2.744
1985	27.928	22.153	5.775	29.130	26.483	2.647
1990	28.250	22.557	5.694	29.781	27.028	2.753
1995	28.503	23.110	5.394	30.151	27.216	2.936
2000	29.174	24.299	4.874	30.906	27.849	3.057
2005	29.992	25.108	4.884	31.818	28.294	3.524
Whites	Females	Males	Gap (F-M)	Females	Males	Gap (F-M)
1980	30.916	25.206	5.710	31.713	27.946	3.768
1985	31.186	25.801	5.386	32.308	28.682	3.627
1990	31.686	26.755	4.931	33.176	29.784	3.392
1995	31.802	27.407	4.395	33.542	30.263	3.279
2000	32.064	28.225	3.839	33.936	30.826	3.110
2005	32.639	28.977	3.662	34.536	31.385	3.151

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