

The Effect of School Quality on Black-White Health Differences:  
Evidence from Segregated Southern Schools<sup>\*</sup>

David Frisvold<sup>†</sup>  
Emory University

Ezra Golberstein<sup>‡</sup>  
University of Minnesota

May 30, 2011

**Abstract**

This paper assesses the effect of black-white differences in school quality on black-white differences in health in later life due to the racial convergence in school quality for cohorts born between 1910 and 1950 in southern states with segregated schools. Using data from the 1984 through 2007 National Health Interview Surveys linked to race-specific data on school quality, we find that reductions in the black-white gap in the pupil-teacher ratio and term length led to reductions in the black-white gap in self-rated health, disability, and body mass index.

Keywords: Education, Health Status, School Quality, Health Disparities

JEL Codes: I12, I21, J24

---

<sup>\*</sup> This project was funded, in part, by the National Institute of Mental Health, the Robert Wood Johnson Foundation, Emory University Woodruff Funds, and the Emory Global Health Institute. We thank Al Headen, Ellen Meara, Frank Sloan, Jim Walker, Ty Wilde, seminar participants at the University of Wisconsin, and participants at the American Society of Health Economists biennial conference, the Association for Public Policy Analysis and Management annual conference, and the Southeastern Health Economics Study Group for helpful comments. We thank David Card for sharing school quality data. We are especially grateful to Stephanie Robinson and Deborah Rose at the National Center for Health Statistics for their assistance with the restricted-access National Health Interview Survey data.

<sup>†</sup> Emory University, Department of Economics, 1602 Fishburne Drive, Atlanta, GA 30322-2240; Phone: 404-727-7833; Fax: 404-727-4639; E-mail: david.frisvold@emory.edu

<sup>‡</sup> University of Minnesota, Division of Health Policy and Management, 420 Delaware St. SE, MMC 729, Minneapolis, MN 55455; Phone: 612-626-2572; Fax: 612-624-2196; E-mail: egolber@umn.edu

## 1. Introduction

It is well-documented that blacks have significantly poorer health outcomes than whites and this pattern has persisted over an extended period of time, in spite of active policy attention to reducing racial differences in health (U.S. Department of Health and Human Services, 2000; Levine et al., 2001; Williams and Jackson, 2005). Much of racial differences in health are hypothesized to result from factors outside the health care system. For example, racial differences in educational attainment explain a significant fraction, but not all, of the racial differences in health outcomes (Williams and Jackson, 2005). However, little is known about the impact of differences in educational quality on racial disparities in health. In this paper, we examine the influence of differences in school quality on black-white health differences. This paper builds on a small but growing literature that suggests that school quality may be a significant determinant of later health outcomes.

To identify the effects of school quality on black-white health differences, we build upon Card and Krueger's (1992) research on racial differences in earnings and examine changes in black and white differences in school quality for cohorts born between 1910 and 1950 in southern states with segregated schools. Throughout the 1900s prior to the desegregation of southern schools in the mid-1960s, there were dramatic reductions in the pupil-teacher ratio and increases in the length of the school year and average teachers' wages in the schools attended by black students and schools attended by white students in the 18 segregated southern states.<sup>1</sup> In this analysis, we focus on these three measures – the pupil-teacher ratio, length of the school year, and average teachers' wages – as proxies for school quality because these inputs plausibly influenced the increase of human capital during a year of completed schooling and these

---

<sup>1</sup> Although the Supreme Court decision *Brown v. Board of Education of Topeka* ruled that the system of separate, racially segregated schools was unequal in 1954, southern schools remained racially segregated until the mid-1960s (Ashenfelter, Collins, and Yoon, 2006).

measures were the primary components of per pupil expenditures (Margo, 1990). During this period, there was a significant convergence in school quality between white and black schools as the quality of black schools improved by a greater amount than the quality of white schools (Margo, 1990; Card and Krueger, 1992).

Our identifying assumption is that the convergence in school quality within states and over time was conditionally uncorrelated with unobserved variables that also affected the differences in the health status of blacks and whites later in life. This assumption is premised on previous research which suggests that the determinants of the convergence in school quality during this time are primarily the historical demographics of the state, which led to litigation and private philanthropy that improved the quality of schools attended by black students, all of which are plausibly unrelated to health disparities more than 30 years later except through changes in school quality (Margo, 1990; Card and Krueger, 1992; Donohue, Heckman, and Todd, 2002).

We model black-white differences in health outcomes measured between 1984 and 2007 using data from the National Health Interview Surveys (NHIS). Using the restricted-access files, we link the NHIS data to average measures of the pupil-teacher ratio, annual teacher pay, and length of the school year for black and white schools in southern states from Card and Krueger (1992). We use race-specific data on infant mortality rates to control for other factors that may have been correlated with changes in black-white school quality and black-white health outcomes later in life. The results are robust to excluding infant mortality rates, which provides suggestive evidence of the validity of our identifying assumption.

We find that reductions in the black-white gap in school quality, and more specifically in pupil-teacher ratio and term length, led to reductions in the black-white gap in self-rated health, disability, and body mass index. These results are robust to excluding states most affected by the

hookworm eradication campaign in the early 1900s, which suggests that the reductions in health disparities are the result of the convergence in school quality as opposed to improvements in public health. This project provides some of the first evidence of the influence of improvements in school quality on long-run population health disparities.

## **2. Background**

It is well-documented that blacks have significantly poorer outcomes than whites in the U.S. for most health and health behavior indicators. These racial health differences are hypothesized to be due to a number of factors, including racial differences in socioeconomic status.<sup>2</sup> In particular, educational attainment has been shown to explain a substantial proportion of racial differences in health, although the magnitude of that proportion varies depending on the health outcome and population (Guralnik et al. 1993). This paper considers the relationship between racial differences in school quality and long-run racial differences in health.

Fundamental to understanding how racial differences in school quality affect racial differences in health is understanding how school quality might affect health in the first place. The Grossman model of health capital posits that more human capital makes individuals more efficient producers of health capital (Grossman 1972). Within the context of this model, school quality may affect health through several distinct mechanisms. First, improvements in school quality may lead to increased educational attainment (Card and Krueger, 1996), and there is evidence to suggest a causal effect of educational attainment on health (Lleras-Muney 2005).

---

<sup>2</sup> Many explanations for the causes of racial differences have been explored, including physician discrimination (Balsa and McGuire, 2003), sorting of races into different quality health care providers (Baicker, Chandra, and Skinner 2005), the availability and type of insurance (Currie, Decker, and Lin 2008; Balsa and McGuire 2007), patient compliance with therapy (Simeonova 2008), medical knowledge (Aizer and Stroud 2010), residential segregation (Williams and Jackson 2005), income (Williams and Jackson 2005), and education (Williams and Jackson 2005).

Second, improvements in school quality may increase the marginal health returns to schooling. This may occur if better quality schooling leads to greater marginal improvements in cognitive or noncognitive skills that matter for health outcomes, relative to lower quality schooling. In addition, if better quality schools increase the marginal returns to schooling in terms of wages or occupational status, there may also be increased marginal health returns as income and occupational conditions are hypothesized to affect health. For example, Frisvold and Golberstein (2010) find that for southern-born blacks, improvements in school quality increase the marginal health returns to schooling for a number of health and health behavior outcomes. Thus, to the extent that there are differences in school quality between blacks and whites, one might expect there to be resulting health differences between blacks and whites.

Our research focuses on changes in school quality that happened in the southern U.S. in the first half of the 20<sup>th</sup> century. This was an era of racially segregated schools – although Brown vs. the Board of Education in 1954 ruled that “separate but equal” schools were unconstitutional, for the most part schools remained segregated until the Civil Rights Act of 1964 (Ashenfelter, Collins, and Yoon, 2006). Three points about southern segregated schools are particularly salient. First, on average, white students attended schools that had far greater quality than black students. This disparity existed, in large part, because blacks were disenfranchised from school finance decision-making (Margo, 1990). Following the Reconstruction period, blacks were disenfranchised throughout most of the South and whites appropriated more of their states’ total school resources to themselves, which increased the quality of white schools and increased the demand for schooling among whites (Margo, 1990).

Second, between 1915 and 1966 there was an overall convergence of school quality between blacks and whites. Although school quality in the South improved in white schools

following the Reconstruction period in the late 1800s, it was not until around 1915 that school quality improved for black schools in the South (Margo, 1990). After 1915, measures of school quality improved for both whites and blacks, and blacks experienced relatively greater improvements than whites. For example, Card and Krueger (1992) document that in 1915 the average pupil-teacher ratio in black schools was 61, while it was 38 in white schools. By 1966, the average pupil-teacher ratios had nearly converged (26 for black schools and 24 for white schools). Based on data from Card and Krueger (1992), Figure 1 displays the convergence in the pupil-teacher ratio, teachers' wages, and the length of the school year between 1915 and 1966, which are three commonly used proxies for the quality of schooling in the early- and mid-twentieth century. As shown in the graph, the convergence in the pupil-teacher ratio was reasonably constant, with the largest decline occurring in the 1920s, while the convergence in the length of the school year occurred most dramatically in the 1930s and the majority of the convergence in teachers' wages occurred in the 1940s.

Third, the aggregate trend of racial convergence in school quality masks considerable variation in black-white school quality both across southern states and over time (Margo, 1990; Card and Krueger, 1992, 1996). For example, in 1916, the pupil-teacher ratio was 37 for whites and 72 for blacks in South Carolina. On the other hand, in North Carolina the pupil-teacher ratio was higher for whites at 41 but lower for blacks at 47 students per teacher (Card and Krueger, 1996). Figure 2 displays the variation in school quality differences across states and over time by showing the black minus white average pupil-teacher ratio for all southern states in 1920, 1940, and 1960. In 1920, Alabama, Florida, Louisiana, Mississippi, and South Carolina each averaged 20 more students per teacher in black schools than white schools. By 1960, this difference was reduced almost to zero in Alabama and Florida. The difference in the pupil-

teacher ratio in Arkansas, Georgia, and Virginia was about 15 students in each state in 1920, but by 1960, the difference has fallen to about 2 students in Georgia and Virginia while it had fallen to only 7 students in Arkansas. Thus, there is considerable variation in racial school quality differences across states and over time and this is the variation that we focus on in this paper.

Key reasons for the convergence in school quality throughout the South were private philanthropy from the North (and specifically from the Rosenwald Fund) and the National Association for the Advancement of Colored People's (NAACP) legal campaign to enforce "separate but equal" standards, both of which were directed towards states with the highest percentages of blacks in the population (Card and Krueger 1992; Heckman, Donohue, and Todd 2002).<sup>3</sup> In an effort to maximize the impact of the contributions, the Rosenwald Fund targeted states that provided the least amount of funding to black school districts (Donohue, Heckman, and Todd, 2002), which were the states with the historically highest proportion of blacks in the population.<sup>4</sup> After achieving early victories in Maryland and Virginia, the NAACP targeted states with the most unequal financing between black and white schools, which violated the equality provisions of the separate-but-equal doctrine established in *Plessy v. Ferguson* (Donohue, Heckman, and Todd, 2002); these states were the seven states with the highest percentages of blacks in the population around the turn of the century.

Thus, as described by Margo (1990) and Card and Krueger (1992, 1996), the primary determinant of the variation in school quality both across states and within-states over time was

---

<sup>3</sup> As noted by Heckman, Donohue, and Todd (2002), migration from urban to rural areas within the South explains little of the convergence in school quality between blacks and whites.

<sup>4</sup> The Rosenwald Fund provided matching grants to build schools and required minimum standards for teachers' wages and the length of the school year in order to receive funding (Donohue, Heckman, and Todd, 2002). Thus, the Fund required commitment from blacks in the local communities, which could reflect preferences for education; however, Aaronson and Mazumder (2010) find that the socioeconomic conditions of blacks are unrelated to the locations of Rosenwald schools. Since the Rosenwald Fund contributed to the building of new schools, the improved sanitation in these new schools could be correlated with the improvements in school quality for blacks during the 1920s.

the relative historical size of the black population in the state, which influenced the timing and location of Northern philanthropy and the NAACP's legal actions. For example, Card and Krueger (1996) note that the percentage of the population that was black was nearly twice as high in South Carolina compared to North Carolina. The relative size of the black population in southern states in the early 1900s was primarily determined by the differing use of slave labor across states based on the type of crops farmed, and thus the geography and weather of the state (Fogel and Engerman, 1974; Wright, 1986; Cooper and Terrill, 1991; Card and Krueger, 1992, 1996).<sup>5</sup>

Prior research investigates the role of school quality in explaining racial differences in income. Card and Krueger (1992) study within-state over time variation in state-level school quality and find that the convergence in school quality between blacks and whites born in the South between 1910 and 1950 led to a significant convergence in the racial wage gap for working males. More recently, Aaronson and Mazumder (2010) study the effect of the expansion of Rosenwald schools in the South that played an important role in improving school quality for blacks. They find that the expansion of these schools led to gains in educational attainment, cognitive skills, and wages for blacks relative to whites.<sup>6</sup> Finally, Johnson (2010) studies the effects of racial differences in school quality that emerged out of the timing of school desegregation for the 1950-1970 birth cohorts. He finds that the racial convergence in school quality led to a convergence in years of schooling, earnings, and self-rated health (the only health outcome he observes). We build on this previous research by examining the influence of the

---

<sup>5</sup> Cotton, which relied significantly on slave labor, was the primary crop in the states with relatively large black populations, while tobacco was the primary crop in states with relatively smaller black populations (Fogel and Engerman, 1974; Wright, 1986).

<sup>6</sup> They also find that it increased the probability of blacks migrating to the North after completing their schooling, relative to whites, motivating our reduced form empirical approach, where we do not condition on migration.

convergence in school quality among segregated schools in the South on a variety of long-run health behaviors and outcomes.

### 3. Econometric Strategy

To identify the impact of differences in the quality of schools attended, we compare the average health outcomes of blacks and whites who were born in the same state in different cohorts and experienced differences in school quality.<sup>7</sup> Specifically, we estimate the following specification:

$$H_{sctg}^b - H_{sctg}^w = \beta(Q_{sc}^b - Q_{sc}^w) + \phi_c + \mu_t + \delta_g + \varepsilon_{sctg}, \quad (1)$$

where  $H_{sctg}^b$  is the average value of the health measure for blacks born in state  $s$  in the South of cohort  $c$  measured at time  $t$  of sex  $g$ ,  $H_{sctg}^w$  is the corresponding measure for whites,  $Q_{sc}^b$  is the average school quality for black schools in state  $s$  of cohort  $c$ ,  $Q_{sc}^w$  is the corresponding measure for white schools,  $\phi$  represents cohort fixed effects,  $\mu$  represents survey year fixed effects,  $\delta$  represents a dummy for sex, and  $\varepsilon$  denotes random error. We focus on cohorts born between 1910 and 1950 in the 18 segregated states in the South and examine health outcomes measured between 1984 and 2007. The parameter of interest is  $\beta$ , which is identified from changes over time in state-specific and cohort-specific differences in quality between black and white schools.

By focusing on within-state over-time variation in the difference in school quality for blacks and whites, we control for time-invariant state and region characteristics that influence health as well as time-varying state characteristics that influence the health of blacks and whites similarly, such as the changes in compulsory schooling laws that occurred during this period.

---

<sup>7</sup> In a complementary paper, Frisvold and Golberstein (2010) examine the impact of school quality on the relationship between schooling and health outcomes for blacks.

Additionally, as noted by Card and Krueger (1992), taking the black-white difference on both sides of equation (1) is equivalent to a specification in levels that includes state-by-cohort-by-survey year-by-sex fixed effects. Nevertheless, given the social changes that occurred in the South during this period, there is a possibility that changes in school quality could have been correlated with changes in contemporary conditions that may have affected health. Thus, our models also include the black-white difference in state- and cohort-specific measures of infant mortality rates (IMR) as a measure of black-white differences in contemporaneous health conditions. IMR is a useful covariate for several reasons. First, IMR has been shown to be sensitive to changes in local health care resources (Almond, Chay, and Greenstone, 2009) and environmental conditions (Chay and Greenstone, 2003), implying that if there were changes in health care resources or environmental conditions that were correlated with changes in school quality and might affect health later in life, we would expect it to be reflected in IMR. Second, IMR is also responsive to social and economic conditions (Fishback, Haines, and Kantor, 2001), implying that if there were changes in social or economic conditions that may have been correlated with changes in school quality, we would also expect that to be reflected in IMR. Thus, we augment equation (1),

$$H_{sctg}^b - H_{sctg}^w = \beta(Q_{sc}^b - Q_{sc}^w) + \gamma(I_{sc}^b - I_{sc}^w) + \phi_c + \mu_t + \delta_g + \varepsilon_{sct}, \quad (2)$$

where  $I_{sc}^b$  and  $I_{sc}^w$  are the state-specific, cohort-specific infant mortality rates for blacks and whites.

In order to bias our estimates of  $\beta$  in equation (2), there would need to be unobserved variables that affect health later in life, vary within states and over time in a way that is correlated with the changes in black-white school quality, and are uncorrelated with changes in the black-white difference in IMR. Historical evidence does not suggest that based on these

conditions,  $\beta$  will be biased. For example, the geographic patterns of convergence in school quality are not correlated with the introduction of food programs in schools (Mazumder, 2007), vaccination requirements for school attendance (Mazumder, 2007), the establishment of state boards of health (Cooper and Terrill, 1991), or increases in the number of black hospitals (Rice and Jones, 1994). The introduction of water filtration and chlorination systems in major U.S. cities between 1900 and 1936 reduced infant mortality and there is some evidence that suggests that minority neighborhoods received clean water later than white neighborhoods, although there is no evidence that the local introduction of this technology mirrored local school quality changes (Cutler and Miller, 2004; Troesken, 2002). Nevertheless, we control for black and white differences in infant mortality rates to reduce the possibility that this public health initiative or any other improvement in public health biases our results.

Four major diseases that were prominent in the South were largely eradicated in the first half of the 1900s were yellow fever, pellagra, malaria, and hookworm (Humphreys, 2009). Hookworm eradication in the South during the first decades of the 1900's has been shown to have affected human capital accumulation, and has also been shown to have had greater effects on black populations than white populations (Bleakley 2007). Unfortunately, data on hookworm prevalence and eradication are not available at the state and race level over our study period, preventing us from directly including it as a covariate. To further examine whether our estimates of the influence of changes in school quality reflect changes in the health conditions among states, we examine the robustness of the results from equation (2) to excluding states most

affected by the hookworm eradication campaign in the early 1900s. In these models, we exclude the six states with estimates of hookworm prevalence in 1918 that was at least 25 percent.<sup>8</sup>

We also examine the robustness of our results to bias from selective mortality. If the convergence in school quality affects racial differences in mortality, then the health of the surviving population would differ from the health of the population in the absence of the effect on mortality. Since the bias from selective mortality should be most severe among older cohorts, we examine the sensitivity of our results to excluding the 1910 cohort.

Further, as noted above, prior research finds that improvements in school quality for southern-born blacks relative to whites led to a convergence in the black-white difference in income (Aaronson and Mazumder 2009; Card and Krueger 1992). Since income is hypothesized to be an important determinant of health (see Meer, Miller, and Rosen (2003) for a discussion and review), we examine whether our results are mediated by family income. To do this, we modify equation (2) by adding a term for the black-white difference in average family income ( $Y$ ) as measured in the NHIS:

$$H_{sctg}^b - H_{sctg}^w = \beta(Q_{sc}^b - Q_{sc}^w) + \gamma(I_{sc}^b - I_{sc}^w) + \delta(Y_{sc}^b - Y_{sc}^w) + \phi_c + \mu_t + \delta_g + \varepsilon_{sct}.^9 \quad (3)$$

We note that there are a few important limitations to this exercise, including the potential endogeneity of average family income and the lack of a better measure of permanent income, so that we view the results of equation (3) as merely suggestive of the potential influence of income.

---

<sup>8</sup> The six excluded states are Alabama, Florida, Georgia, Louisiana, Mississippi, and North Carolina. The prevalence estimates, which are also used in Bleakley (2007), are reported by Kofoid and Tucker (1921) and are based on a survey of army recruits.

<sup>9</sup> This exercise is similar in spirit to the investigation of the mechanisms linking years of schooling and health behaviors in Cutler and Lleras-Muney (2010).

As a final note, all of our regression models are weighted by the total number of observations (both black and white) represented by each cell, and we estimate all models with heteroskedasticity-robust standard errors clustered on the state of birth.

#### **4. Data**

Our data come from the 1984 through 2007 National Health Interview Surveys (NHIS). The NHIS is conducted annually by the National Center for Health Statistics and collects extensive survey data on health status and sociodemographic information. The NHIS is nationally-representative, and has large sample sizes, collecting data from between 60,000 and 120,000 individuals per year between 1984 and 2007. We use the restricted-use versions of the NHIS, which allows us to link respondents with their state of birth and with detailed mortality information. The state of birth data are self-reported, and the mortality data track mortality status through the end of 2006 from the National Death Index. State of birth was not collected prior to 1984.

We restrict our sample to include only blacks and whites who were born between 1910 and 1950 in southern states.<sup>10</sup> We then aggregate the data into cells for analysis of black-white differences in health outcomes. We aggregate the data based on race, sex, state of birth, 10-year birth cohort (1910-1920, 1921-1930, 1931-1940, 1941-1950), and NHIS survey year (using four 6-year categories). Within each cell, we take the mean of our health outcome variables, the IMR covariate, and our school quality variables (described below), and then take the difference between the analogous cell means between blacks and whites. After dropping cells with fewer than 10 blacks and 10 whites, we are left with 462 cells for our analyses.

---

<sup>10</sup> The southern states in our sample include Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, Missouri, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia.

We focus our analyses on several domains of health outcomes. The first domain is mortality, where the dependent variable is the black-white difference between the proportion of individuals who died by the end of 2006. Our second domain is general health status. We first look at the black-white difference in the cell mean of the 5-level self-rated health measure (1=excellent health, 5=poor health). We also test for whether school quality affects black-white differences in self-rated health at different points of the self-rated health distribution by looking at the black-white differences in the proportion reporting excellent or very good health, and in the proportion reporting fair or poor health. Our third domain is disability, where the dependent variable is the black-white difference in the proportion reporting any activity limitations due to chronic health conditions. Our fourth domain is weight-related outcomes. We look at the black-white difference in mean BMI, but also in the black-white differences in proportions underweight (BMI<18.5), overweight or obese (BMI>25), obese (BMI>30), and morbidly obese (BMI>35). Our final domain is smoking behavior, where we look at black-white differences in the proportion reporting that they ever smoked (whether respondents smoked at least 100 cigarettes in their lifetime) and in the proportion reporting being a current smoker.

We use three measures of school quality in our analyses: average pupil-teacher ratio, average term length (measured in days per school year), and average teacher wages (expressed in 1967 dollars) for grades K-12 in public schools.<sup>11</sup> These measures are used in Card and Krueger (1992) and are derived from data in the Biennial Surveys of Education, state education reports, and annual reports from the Southern Education Reporting Service.<sup>12</sup> Due to the segregated nature of schools in the South between 1915 and 1966, these school quality measures are

---

<sup>11</sup> The average number of days per school year could be viewed as a measure of the quantity of schooling; however, as noted above, we consider term length as a measure of school quality because the number of days per school year is a determinant of the amount of human capital gained within a year of completed schooling.

<sup>12</sup> We thank David Card for providing the detailed data used to construct the 10 year averages published in Card and Krueger (1992), which include state averages for 1915 and biennially from 1918 to 1966.

available separately for black and white students. To construct the measures of educational quality, we follow Card and Krueger (1992) and use data from the 1970 census to derive the average of the quality measures based on the years that each individual in each race-state-cohort attended school, which is determined based on the number of years of schooling attended, state-of-birth, and the year in which the individual was 6 years old. These values for individuals are then averaged to determine the school quality for each cohort within each state.<sup>13</sup>

We also include the black-white differences in infant mortality rates (IMR) as covariates in our models. These data are state-, cohort-, and race-specific, and collected from U.S. vital statistics records and are publicly available in various years of the Statistical Abstracts of the United States and Vital Statistics of the United States. For cases where there are missing IMR data and it was possible to interpolate, we did so using linear interpolation. In our analyses, we consider the state-, cohort-, and race-specific IMR when each cohort was six years old as a proxy for the stock of health resources that were available when cohorts were entering school, with the understanding that there are numerous inputs to health stock, including access and quality of health care, along with social, economic, and environmental inputs.

Table 1 documents the school quality and health measures for blacks and whites and the differences between the two races among individuals born between 1910 and 1950 in the segregated southern states. On average, blacks attended schools with nearly six more students

---

<sup>13</sup> Card and Krueger (1992) note that the average teacher wages reported in the school quality data are nearly identical to the state- and race-specific average wages for teachers in the 1940, 1950, and 1960 Census; however, the authors acknowledge the possibility of measurement error in these data, particularly in the early years. Since the school quality measures are assigned to individuals based on their years of schooling attended and then aggregated for each cohort in each state, the school quality measures are weighted averages of 20 years of school quality data, which reduces the influence of measurement error from a specific year. Related to measurement error concerns, the average pupil-teacher ratio is based on enrollment, instead of attendance, so that these reported statistics may not accurately reflect the number of students present in a classroom. As noted by Card and Krueger (1996) and Heckman, Layne-Farrar, and Todd (1996), the use of state-level measures of school quality could reduce the attenuation bias from school-level measures of school quality that are potentially measured with error or that do not reflect the quality of schooling received throughout all years of schooling. Further, as described by Donohue, Heckman, and Todd (2002), the use of state averages of school quality masks variation in school districts within states, which will lead to a downward bias in the estimated impact of school quality.

per teacher, with teachers who were paid almost \$500 less (in 1967 dollars), and with a school year that was 7.5 days shorter than among schools attended by whites. Blacks are also disadvantaged, compared to whites, for nearly all health measures. For example, blacks are more likely to be limited in their daily activities, have a higher average BMI, have a BMI that is higher throughout the right side of the BMI distribution, are more likely to currently smoke, and have lower quality self-reported health.

## 5. Results

Table 2 documents the trends in school quality and health differences between blacks and whites among individuals born in the segregated southern states by cohort for individuals between the ages of 60 and 64.<sup>14</sup> For individuals between the ages of 60 and 64 between 1984 and 1987, who were born between 1920 and 1927, the mean quality of schools for blacks was substantially lower than for whites: there were 11 more students per teacher, teachers were paid \$1100 less per year, and the length of the school year was 25 days less in schools attended by blacks. Throughout the early twentieth century, the quality of schools attended by blacks had improved relative to whites so that, for individuals between the ages of 60 and 64 between 2004 and 2007, who were born between 1940 and 1947, there were 4.5 more students per teacher, teachers were paid \$542 less per year, and the length of the school year was nearly equivalent in schools attended by blacks. The trends in health differences vary according to the health measure, with some differences remaining constant and others decreasing (such as self-reported health, limitations, and BMI). However, these aggregate trends mask the variability within states, which we further examine in the regression analysis below.

---

<sup>14</sup> We limit to this age range to control for age differences in health across cohorts in this comparison.

To estimate the relationship between within-state differences in school quality and differences in health outcomes net of time trends and trends in racial differences in infant health, we estimate equation (2). The results for measures of self-reported health status, health behaviors, disability, and mortality are shown in Tables 3 through 12. For each table, panel A displays the results for the pupil-teacher ratio, panel B displays the results for teachers' wages, and panel C displays the results for term length. The first column displays the main results ( $\beta$  and its standard error) of equation (2) for the sample of individuals born between 1910 and 1950 in all southern states.

As shown in Table 3, an improvement in school quality improves the self-rated health of blacks, relative to whites. One fewer pupil per teacher in black schools, relative to white schools, improves the self-rated health of blacks by 0.01 more than whites. Thus, a one standard deviation decrease in the black – white pupil-teacher ratio of 6.2 would decrease the racial differences in self-rated health by 0.07, which is one-third of the standard deviation in black-white differences. An increase in the length of the school year in black schools by 10 more days than white schools improves the self-rated health of blacks by 0.05 more than whites and a one standard deviation increase in the relative term length of black schools would decrease the racial differences in self-rated health by 0.06. The coefficient for the difference in teachers' wages among black and white schools is not statistically significant. The results displayed in Tables 4 and 5 demonstrate that these relationships occur throughout the distribution of self-rated health, where relative improvements in the quality of black schools lead to relative increases in the likelihood of being in excellent or very good health and decreases in the likelihood of being in fair or poor health for blacks.

A relative improvement in school quality decreases BMI for blacks, relative to whites, as shown in Table 6. One fewer pupil per teacher in black schools, relative to white schools, reduces the BMI of blacks by 0.03 more than whites. Put differently, a one standard deviation decrease in the racial differences in the pupil-teacher ratio leads to a convergence in the racial differences in BMI of 10 percent of a standard deviation. The point estimates are consistent with a decrease in relative BMI throughout the right tail of the BMI distribution, as shown in Table 7, but the estimates are not measured precisely.<sup>15</sup>

As shown in Tables 8 and 9, school quality differences are related to racial differences in having ever smoked but not to current smoking status. One fewer pupil per teacher in black schools, relative to white schools, increases the likelihood of having ever smoked among blacks by 0.04 more than whites. In contrast, the estimates for current smoking are much smaller in magnitude and not statistically significant.

Relative improvements in school quality are related to differences in disability status, as shown in Table 10. One fewer pupil per teacher in black schools, relative to white schools, reduces the likelihood of having a disability for blacks by 0.02 more than whites. An increase in the length of the school year in black schools by 10 more days than white schools reduced the probability of disability for blacks by 0.01 more than whites. Finally, as shown in Table 11, there are no statistically significant relationships between differences in school quality and differences in mortality.

To examine the robustness of these relationships, the second column in each of these tables restricts the sample to exclude individuals born in states with initially high hookworm rates to examine whether these results are driven by the public health improvements resulting

---

<sup>15</sup> The (unreported) estimates for overweight or obese and for morbid obesity are similar to the estimates for obesity shown in Table 7. The (unreported) estimates for underweight are small in magnitude and imprecisely measured.

from the near eradication of hookworm. The third column in these tables restricts the sample to exclude the 1910 cohort to examine the potential influence of selective mortality. The fourth column shows the results from models that do not include difference in IMR as a covariate. If the coefficients are greater in magnitude after dropping the IMR term, that would suggest that unobserved contemporaneous social, economic, or health-related factors may have been correlated with relative school quality and might be explaining our results.

As shown in these columns, these relationships are largely robust for these restricted samples and specifications. To summarize, for pupil-teacher ratio, the convergence in school quality through a relative improvement in the quality of black schools decreases the probability of having a disability, decreases BMI, increases the likelihood of having ever smoked, and increases the probability of reporting health as excellent or very good for blacks, relative to whites. For teacher wages, we do not find that the convergence in school quality significantly affects black-white health differences. For term length, the convergence in school quality leads to a convergence in disability and self-rated health (measured continuously, measured as the probability of excellent/very good health, or measured as the probability of fair/poor health).

We next examine whether these results are mediated by family income and the estimates from these specifications are shown in the fourth column of Tables 3 through 11. For most of our outcomes, including black-white differences in income attenuates the coefficients on the black-white school quality differences. However, a statistically significant relationship between school quality and self-reported health, having ever smoked, and disability status remains. These results suggest that income does play an important mediating role but does not completely explain the relationship between difference in school quality and differences in health.

## 6. Conclusion

In this paper, we present one of the first investigations of the effect of school quality on long-run racial differences in health. As racial differences in health have been a recalcitrant policy issue in the U.S., it is important to understand how different social policy changes may affect health differences. Although there have been major changes in racial patterns of school quality in the U.S., the effect of school quality on racial health differences has rarely been studied. Using within-state and over time variation in school quality from segregated southern states, we find that convergence in school quality between blacks and whites led to statistically significant, though modest, effects of reducing racial gaps in disability, self-rated health, and BMI. For example, the black-white gap in percent with any disability for 60-64 year olds grew from 0.059 in 1984-1987 to 0.091 in 2004-2007. Based on our regression results, the gap would have grown to 0.109 in 2004 if the average gap in the pupil-teacher ratio had stayed constant at the levels of the 1984-1987 cohorts and would have grown to 0.120 in 2004 if the average gap in term length had stayed constant at the levels of the 1984-1987 cohorts.

We also find that a convergence in pupil-teacher ratio led to a divergence in the probability of having ever smoked, which may seem, at first, contrary to our other empirical findings and to the hypothesis that improvements in school quality lead to improved health. However, this result is actually consistent with both conceptual models of health production and emerging empirical evidence on the relationship between education and smoking. An implication of the Grossman (1972) model is that education will lead to better health only if there is information on how to produce health that can be more readily consumed and acted upon by those with better education. The vast majority of our sample reached adulthood before information on the dangers of smoking became widely known due to the landmark 1964 Surgeon

General report on smoking. De Walque (2010) finds that prior to the late-1950s, higher education was actually correlated with higher levels of smoking. Aizer and Stroud (2010) find that low-education women lagged behind higher-education women in adopting new information on the negative health effects of smoking, thus opening up the education gap in smoking that persists to present day. That we find that the convergence in school quality led to a divergence in the probability of ever smoking but no effect on current smoking is consistent with the notion that better school quality resulted in more smoking during an era when there was no information on the health risks of smoking, and that conditional on that pattern, the convergence in school quality led to a convergence in quitting behavior after the information on smoking risks became available.

One potential limitation of our analysis is that public health initiatives or other unobserved changes in family or individual characteristics could bias our results. For this to occur, these changes would have to mirror the changes within-states over time in the racial convergence in school quality. To minimize this potential source of bias, we control for racial differences in the infant mortality rate and we compare those results with models that exclude the IMR covariate. We also examine the robustness of our results to excluding states with initially high hookworm rates that were most affected by the hookworm eradication campaign in the early 1900s. Our results suggest that the potential influences on our results from these concerns are likely to be minimal.

Another potential limitation of our analyses is the possibility that our results are biased by selective mortality. For the older cohorts in our sample, if racial differences in school quality led to differential mortality between blacks and whites, then we would expect that our results may actually understate the effects of school quality on racial differences in health. This direction of

bias would emerge because we do not observe effects of racial differences in school quality among those who died prior to being interviewed in the NHIS, and because the black survivors represented in the cells may be in relatively better health than the white survivors. However, we also expect that our use of weights based on cell size will minimize this latter source of bias since the cells which experienced significant attrition prior to the NHIS are relatively less populated and thus receive relatively smaller weights in our analyses. Additionally, our results that show a small and statistically insignificant relationship between racial differences in school quality and mortality, as well as the robustness of our results to excluding the eldest cohort, suggests that any bias from selective mortality is likely to be minimal.

Our results imply that improving school quality for blacks relative to whites may lead to some modest reductions in black-white health differences later in life. Even though on average racial differences in school quality have dropped significantly from the period that we study, there is still room for improvement in the context of current school quality. For example, Clotfelter, Ladd, and Vigdor (2005) find that black students were more likely than whites to be in school districts with less-experienced teachers, and within districts are more likely than whites to attend schools with less-experienced teachers. Although the magnitude of our results are relatively modest, they are still of importance given that in spite of considerable policy attention to reducing black-white differences in health, these disparities have not shown much change.

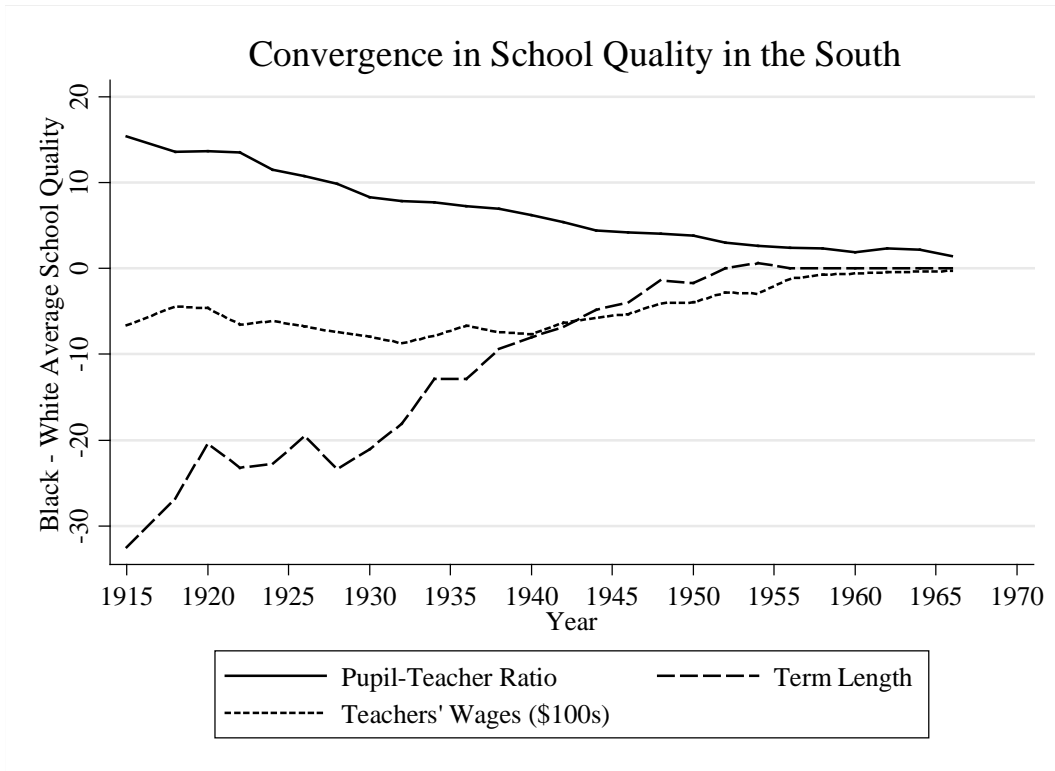
## References

- Aaronson and Mazumder (2010). The Impact of Rosenwald Schools on Black Achievement. Federal Reserve Bank of Chicago Working Paper 2009-26.
- Aizer, Anna and Laura Stroud (2010). Education, Knowledge and the Evolution of Disparities in Health. NBER Working Paper 15840.
- Almond, Douglas, Kenneth Chay, Michael Greenstone (2009). Civil Rights, the War on Poverty, and Black-White Convergence in Infant Mortality in the Rural South and Mississippi.”
- Ashenfelter, Orley, William J. Collins, and Albert Yoon (2006) “Evaluating the Role of *Brown v. Board of Education* in School Equalization, Desegregation, and the Income of African Americans, *American Law and Economics Review*, 8(2), 213-248.
- Baicker, K., Chandra, A., Skinner, J. S. (2005). “Geographic Variation in Health Care and the Problem of Measuring Racial Disparities.” *Perspectives in Biology and Medicine* 48(1, supplement):S42-S53.
- Balsa, Ana I. and Thomas G. McGuire (2003). Prejudice, Clinical Uncertainty and Stereotyping as Sources of Health Disparities. *Journal of Health Economics* 22:89-116.
- Balsa, Ana I., Zhun Cao, and Thomas G. McGuire (2007). Does Managed Health Care Reduce Health Care Disparities between Minorities and Whites? *Journal of Health Economics* 26:101-121.
- Bleakley, Hoyt (2007). “Disease and Development: Evidence from Hookworm Eradication in the American South.” *Quarterly Journal of Economics* 122(1):73-117.
- Card, D., Krueger A.B. 1992. “School Quality and Black-White Relative Earnings: A Direct Assessment.” *Quarterly Journal of Economics* 107(1):151-200.
- Card, David and Alan B. Krueger (1996) “Labor Market Effects of School Quality: Theory and Evidence,” in Gary Burtless (ed.) *Does Money Matter? The Effect of School Resources on Student Achievement and Adult Success*, Washington, DC: Brookings Institution Press.
- Chay, Kenneth Y. and Michael Greenstone (2003). “The Impact of Air Pollution on Infant Mortality: Evidence from Geographic Variation in Pollution Shocks Induced by a Recession.” *Quarterly Journal of Economics*, 118(3), 1121-1167.
- Clotelter, C. T., H. F. Ladd, J. Vigdor (2005). “Who Teaches Whom? Race and the Distribution of Novice Teachers.” *Economics of Education Review*, 24:377-392.
- Cooper, William J. and Thomas E. Terrill (1991). *The American South: A History*. Volume II. New York: McGraw Hill, Inc.
- Currie, Janet, Sandra Decker, and Wanchuan Lin (2008). Has Public Health Insurance for Older Children Reduced Disparities in Access to Care and Health Outcomes? *Journal of Health Economics* 27:1567-1581.
- Cutler, David and Grant Miller (2005). The Role of Public Health Improvements in Health Advances: The Twentieth-Century United States. *Demography*, 42(1):1-22.
- Cutler, David and Adriana Lleras-Muney (2010). “Understanding Differences in Health Behaviors by Education.” *Journal of Health Economics* 29(1): 1-28.
- de Walque, Damien (2010). Education, Information, and Smoking Decisions: Evidence from Smoking Histories in the United States, 1940-2000. *Journal of Human Resources* 45(3):682-717.

- Donohue, John J., James J. Heckman, Petra E. Todd (2002). "The Schooling of Southern Blacks: The Roles of Legal Activism and Private Philanthropy, 1910-1960." *The Quarterly Journal of Economics* 117(1):225-268.
- Fishback, Price V., Michael R. Haines, and Shawn Kantor (2001) "The Impact of the New Deal on Black and White Infant Mortality in the South," *Explorations in Economic History*, 38, 93-122.
- Frisvold, David and Ezra Golberstein (2010) "The Effects of School Quality on Health," Working Paper.
- Grossman, M. (1972) "On the Concept of Health Capital and the Demand for Health," *Journal of Political Economy*, 80, 223-255.
- Guralnik, J. M., Land, K. C., Blazer, D., Fillenbaum, G. G., Branch, L. G. (1993). "Educational Status and Active Life Expectancy among Older Blacks and Whites." *New England Journal of Medicine*, 329:110-116.
- Heckman, James J., Anne Layne-Farrar, Petra Todd (1996). "Human Capital Pricing Equations with an Application to Estimating the Effect of Schooling Quality on Earnings." *Review of Economics and Statistics* 78(4):562-610.
- Humphreys, Margaret (2009). "How Four Once Common Diseases Were Eliminated From the American South." *Health Affairs*, 28(6), 1734-44.
- Johnson, Rucker (2010). "Long-Run Impacts of School Desegregation and School Quality on Adult Attainments." Working Paper.
- Kofoed, Charles A. and John P. Tucker (1921). *On the Relationship of Infection by Hookworm to the Incidence of Morbidity and Mortality in 22,842 Men of the United States Army.* *American Journal of Hygiene* 1: 79-117.
- Levine, Robert S., James E. Foster, Robert E. Fullilove, Mindy T. Fullilove, Nathaniel C. Briggs, Pamela C. Hull, Baqar A. Husaini, and Charles H. Hennekens(2001). *Black-White Inequalities in Mortality and Life Expectancy, 1933-1999: Implications for Healthy People 2010.* *Public Health Reports* 116:474-483.
- Lleras-Muney, A. 2005. "The Relationship Between Education and Adult Mortality in the United States." *Review of Economic Studies* 72: 189-221.
- Margo, Robert A. (1990). *Race and Schooling in the South, 1880-1950: An Economic History.* Chicago: University of Chicago Press, 1990.
- Mazumder, Bhashkar. (2007). "How Did Schooling Laws Improve Long-Term Health and Lower Mortality?" *Federal Reserve Bank of Chicago Working Paper* 2006-23
- Meer, J., D. Miller, H. S. Rosen (2003). "Exploring the Health-Wealth Nexus." *Journal of Health Economics* 22:713-730.
- Rice, Mitchell F. and Woodrow Jones, Jr. (1994). *Public Policy and the Black Hospital: From Slavery to Segregation to Integration.* Westport, CT: Greenwood Press.
- Satcher, D., Fryer, G. E., McCann, J., Troutman, A., Woolf, S. H., Rust, G. (2005). "What if We Were Equal? A Comparison of the Black-White Mortality Gap in 1960 and 2000." *Health Affairs* 24(2):459-464.
- Schoeni, R. F., Martin, L. G., Andreski, P. M., Freedman, V. A. (2005). "Persistent and Growing Socioeconomic Disparities in Disability Among the Elderly: 1982-2002." *American Journal of Public Health* 95(11):2065-2070.
- Simeonova, Emilia (2008). *Doctors, Patients, and the Racial Mortality Gap: What Are the Causes?* Working paper.

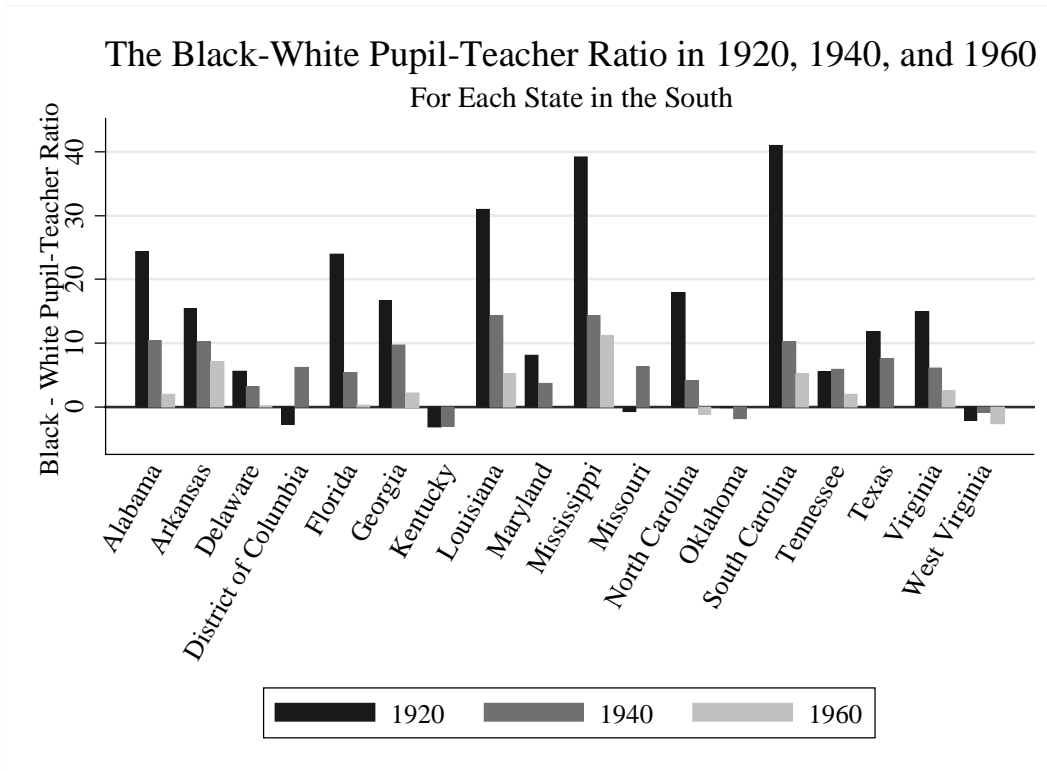
- Troesken, Werner (2002) "The Limits of Jim Crow: Race and the Provision of Water and Sewerage Services in American Cities, 1880-1925," *The Journal of Economic History* 62(3) 734-772.
- U.S. Department of Health and Human Services. 2000. *Healthy People 2010: Understanding and Improving Health*. 2nd ed. Washington, DC: U.S. Government Printing Office.
- Williams, D.R., Jackson, P.B. 2005. "Social Sources of Racial Disparities in Health." *Health Affairs* 24(2):325-334.

Figure 1



Source: Card and Krueger (1992).

Figure 2



Source: Card and Krueger (1992).

Table 1: Summary Statistics of School Quality and Health Measures for Blacks and Whites

Variable	Blacks		Whites		Black - White	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Pupil-Teacher Ratio	34.916	(7.939)	29.109	(3.065)	5.807	(6.212)
Teachers' Wages (000s)	2.709	(1.505)	3.205	(1.213)	-0.495	(0.461)
Term Length	163.657	(19.481)	171.165	(9.536)	-7.508	(13.189)
Mortality	0.299	(0.226)	0.255	(0.233)	0.044	(0.068)
Self-Reported Health	2.993	(0.288)	2.634	(0.329)	0.358	(0.199)
Excellent or Very Good Self-Reported Health	0.333	(0.096)	0.469	(0.120)	-0.136	(0.082)
Fair or Poor Self-Reported Health	0.347	(0.106)	0.239	(0.095)	0.108	(0.070)
Any Limitations	0.345	(0.122)	0.284	(0.108)	0.061	(0.071)
Body Mass Index	27.874	(1.311)	26.065	(1.081)	1.809	(1.634)
Underweight	0.014	(0.016)	0.023	(0.019)	-0.009	(0.022)
Overweight	0.684	(0.087)	0.548	(0.124)	0.136	(0.140)
Obese	0.290	(0.103)	0.178	(0.059)	0.112	(0.100)
Morbidly Obesity	0.099	(0.062)	0.047	(0.025)	0.051	(0.055)
Ever Smoked	0.565	(0.171)	0.573	(0.156)	-0.009	(0.099)
Currently Smoke	0.302	(0.144)	0.252	(0.100)	0.050	(0.101)
Infant Mortality Rate	70.571	(25.122)	44.732	(15.330)	25.869	(12.333)
Income	26687.28	(9901.21)	37276.98	(12026.13)	-10589.70	(4467.41)
Number of Observations	508		508		508	

Notes: This table displays the means, with the standard deviations in parentheses, for blacks, whites, and the mean for blacks minus the mean for whites in health and school quality for individuals born in the 18 southern states between 1910 and 1950.

Sources: National Health Interview Survey 1984-2007; Card and Krueger (1992).

Table 2: Trends in School Quality and Health for Blacks and Whites, Ages 60-64

	1984-1987			1994-1997			2004-2007		
	Black	White	B-W	Black	White	B-W	Black	White	B-W
Pupil-Teacher Ratio	42.747 (0.338)	31.547 (0.107)	11.20	35.378 (0.246)	28.425 (0.067)	6.95	31.956 (0.264)	27.503 (0.065)	4.45
Teachers' Wages (000s)	1.172 (0.038)	2.272 (0.019)	-1.100	1.790 (0.046)	2.692 (0.020)	-0.902	3.365 (0.080)	3.907 (0.038)	-0.542
Term Length	141.913 (1.161)	167.014 (0.334)	-25.10	163.423 (0.787)	173.332 (0.203)	-9.91	175.140 (0.596)	176.504 (0.174)	-1.36
Mortality	0.567 (0.031)	0.497 (0.020)	0.07	0.296 (0.027)	0.199 (0.015)	0.10	0.059 (0.018)	0.023 (0.008)	0.04
Self-Reported Health	3.209 (0.079)	2.805 (0.050)	0.40	3.173 (0.070)	2.684 (0.046)	0.49	2.923 (0.089)	2.781 (0.062)	0.14
Excellent or Very Good Self-Reported Health	0.297 (0.028)	0.412 (0.019)	-0.12	0.282 (0.027)	0.469 (0.019)	-0.19	0.361 (0.037)	0.440 (0.025)	-0.08
Fair or Poor Self-Reported Health	0.464 (0.031)	0.285 (0.018)	0.18	0.408 (0.029)	0.242 (0.016)	0.17	0.290 (0.035)	0.301 (0.023)	-0.01
Any Limitations	0.490 (0.031)	0.387 (0.019)	0.10	0.454 (0.030)	0.326 (0.018)	0.13	0.325 (0.036)	0.314 (0.024)	0.01
Body Mass Index	27.545 (0.341)	25.611 (0.184)	1.93	28.859 (0.347)	26.548 (0.174)	2.31	28.764 (0.368)	27.660 (0.252)	1.10
Underweight	0.008 (0.005)	0.037 (0.007)	-0.03	0.014 (0.007)	0.013 (0.004)	0.00	0.006 (0.006)	0.008 (0.004)	0.00
Overweight	0.620 (0.030)	0.517 (0.020)	0.10	0.739 (0.026)	0.593 (0.019)	0.15	0.793 (0.031)	0.681 (0.024)	0.11
Obese	0.262 (0.027)	0.139 (0.014)	0.12	0.366 (0.029)	0.201 (0.015)	0.17	0.331 (0.036)	0.301 (0.023)	0.03
Morbidly Obesity	0.087 (0.017)	0.036 (0.007)	0.05	0.134 (0.020)	0.043 (0.008)	0.09	0.089 (0.022)	0.093 (0.015)	0.00
Ever Smoked	0.570 (0.031)	0.596 (0.019)	-0.03	0.570 (0.029)	0.619 (0.018)	-0.05	0.485 (0.039)	0.550 (0.025)	-0.06
Currently Smoke	0.335 (0.029)	0.291 (0.018)	0.04	0.257 (0.026)	0.248 (0.016)	0.01	0.213 (0.032)	0.206 (0.021)	0.01
Infant Mortality Rate	94.014 (0.970)	60.895 (0.296)	33.12	76.723 (0.700)	51.692 (0.323)	25.03	47.614 (0.516)	34.069 (0.283)	13.55
Observations	263	646		284	703		169	389	

Notes: Standard errors in parentheses. Individuals between the ages of 60 and 64 between 1984 and 1987 were born between 1920 and 1927 and attended school between 1926 and 1945. Individuals between the ages of 60 and 64 between 1994 and 1997 were born between 1930 and 1937 and attended school between 1936 and 1955. Individuals between the ages of 60 and 64 between 2004 and 2007 were born between 1940 and 1947 and attended school between 1946 and 1965.

Table 3: The Influence of Black – White Differences in School Quality on Black – White Differences in Self-Rated Health  
(1=Excellent, 5=Poor)

	All Southern States	Excluding States with High Hookworm Rates	Excluding the 1910 Cohort	Not Controlling for IMR	Controlling for Income
<i>Panel A: Pupil-Teacher Ratio</i>					
Pupil-Teacher Ratio	0.0108* (0.00588)	0.00965 (0.00718)	0.0111 (0.00729)	0.00901 (0.00602)	0.00468 (0.00452)
Observations	462	296	406	462	462
R-squared	0.216	0.185	0.188	0.208	0.364
<i>Panel B: Teachers' Wages</i>					
Teachers' Wages	-0.0837 (0.0591)	-0.0518 (0.0711)	-0.0839 (0.0594)	-0.0764 (0.0653)	-0.0237 (0.0372)
Observations	462	296	406	462	462
R-squared	0.188	0.161	0.166	0.186	0.357
<i>Panel C: Term Length</i>					
Term Length	-0.00462** (0.00192)	-0.00515** (0.00219)	-0.00524** (0.00237)	-0.00379* (0.00212)	-0.00251* (0.00142)
Observations	462	296	406	462	462
R-squared	0.209	0.193	0.191	0.202	0.368

Notes: Heteroskedasticity-robust standard errors that allow for clustering within state of birth are in parentheses. Each coefficient estimate is based on a separate regression. Additional covariates that are not shown include the black/white difference in infant mortality rate, cohort fixed effects, and survey year fixed effects.

Sources: National Health Interview Survey 1984-2007; Card and Krueger (1992).

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 4: The Influence of Black – White Differences in School Quality on Black – White Differences in Excellent or Very Good Self-Rated Health

	All Southern States	Excluding States with High Hookworm Rates	Excluding the 1910 Cohort	Not Controlling for IMR	Controlling for Income
<i>Panel A: Pupil-Teacher Ratio</i>					
Pupil-Teacher Ratio	-0.00388* (0.00206)	-0.00396 (0.00232)	-0.00401 (0.00249)	-0.00299 (0.00201)	-0.00196 (0.00168)
Observations	462	296	406	462	462
R-squared	0.271	0.244	0.227	0.259	0.357
<i>Panel B: Teachers' Wages</i>					
Teachers' Wages	0.0260 (0.0226)	0.0173 (0.0273)	0.0265 (0.0223)	0.0216 (0.0250)	0.00668 (0.0154)
Observations	462	296	406	462	462
R-squared	0.244	0.217	0.204	0.241	0.349
<i>Panel C: Term Length</i>					
Term Length	0.00137* (0.000680)	0.00142* (0.000675)	0.00156* (0.000839)	0.00102 (0.00077)	0.000688 (0.000557)
Observations	462	296	406	462	462
R-squared	0.254	0.231	0.216	0.246	0.354

Notes: See Table 3.

Sources: National Health Interview Survey 1984-2007; Card and Krueger (1992).

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 5: The Influence of Black – White Differences in School Quality on Black – White Differences in Fair or Poor Self-Rated Health

	All Southern States	Excluding States with High Hookworm Rates	Excluding the 1910 Cohort	Not Controlling for IMR	Controlling for Income
<i>Panel A: Pupil-Teacher Ratio</i>					
Pupil-Teacher Ratio	0.00298 (0.00182)	0.00232 (0.00245)	0.00301 (0.00227)	0.00245 (0.00196)	0.000958 (0.00139)
Observations	462	296	406	462	462
R-squared	0.116	0.090	0.108	0.111	0.245
<i>Panel B: Teachers' Wages</i>					
Teachers' Wages	-0.0240 (0.0185)	-0.0137 (0.0234)	-0.0233 (0.0185)	-0.0215 (0.0205)	-0.0045 (0.0121)
Observations	462	296	406	462	462
R-squared	0.100	0.080	0.096	0.099	0.243
<i>Panel C: Term Length</i>					
Term Length	-0.00152** (0.000643)	-0.00175** (0.000766)	-0.00181** (0.000739)	-0.00123* (0.000645)	-0.000846* (0.000477)
Observations	462	296	406	508	462
R-squared	0.124	0.110	0.128	0.122	0.254

Notes: See Table 3.

Sources: National Health Interview Survey 1984-2007; Card and Krueger (1992).

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 6: The Influence of Black – White Differences in School Quality on Black – White Differences in Body Mass Index

	All Southern States	Excluding States with High Hookworm Rates	Excluding the 1910 Cohort	Not Controlling for IMR	Controlling for Income
<i>Panel A: Pupil-Teacher Ratio</i>					
Pupil-Teacher Ratio	0.0287* (0.0149)	0.0347*** (0.00858)	0.0360* (0.0202)	0.0243** (0.00850)	0.0231 (0.0169)
Observations	462	296	406	462	462
R-squared	0.772	0.727	0.783	0.771	0.773
<i>Panel B: Teachers' Wages</i>					
Teachers' Wages	-0.175 (0.135)	-0.243 (0.196)	-0.194 (0.149)	-0.164 (0.125)	-0.107 (0.153)
Observations	462	296	406	462	462
R-squared	0.768	0.723	0.778	0.768	0.771
<i>Panel C: Term Length</i>					
Term Length	-0.00699 (0.00531)	-0.00989** (0.00320)	-0.00947 (0.00731)	-0.00599 (0.00416)	-0.00450 (0.00582)
Observations	462	296	406	462	462
R-squared	0.768	0.723	0.779	0.768	0.771

Notes: See Table 3.

Sources: National Health Interview Survey 1984-2007; Card and Krueger (1992).

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 7: The Influence of Black – White Differences in School Quality on Black – White Differences in Obesity

	All Southern States	Excluding States with High Hookworm Rates	Excluding the 1910 Cohort	Not Controlling for IMR	Controlling for Income
<i>Panel A: Pupil-Teacher Ratio</i>					
Pupil-Teacher Ratio	0.00161 (0.00105)	0.00227** (0.000888)	0.00183 (0.00144)	0.00145** (0.000639)	0.000964 (0.00113)
Observations	462	296	406	462	462
R-squared	0.557	0.486	0.572	0.557	0.563
<i>Panel B: Teachers' Wages</i>					
Teachers' Wages	-0.00709 (0.00824)	-0.0101 (0.0167)	-0.00671 (0.00939)	-0.00765 (0.00775)	-0.000209 (0.00892)
Observations	462	296	406	462	462
R-squared	0.553	0.480	0.568	0.553	0.562
<i>Panel C: Term Length</i>					
Term Length	-0.000496 (0.000310)	-0.000812*** (0.000207)	-0.000615 (0.000423)	-0.000466* (0.000247)	-0.000258 (0.000320)
Observations	462	296	406	462	462
R-squared	0.554	0.483	0.570	0.554	0.562

Notes: See Table 3.

Sources: National Health Interview Survey 1984-2007; Card and Krueger (1992).

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 8: The Influence of Black – White Differences in School Quality on Black – White Differences in Having Ever Smoked

	All Southern States	Excluding States with High Hookworm Rates	Excluding the 1910 Cohort	Not Controlling for IMR	Controlling for Income
<i>Panel A: Pupil-Teacher Ratio</i>					
Pupil-Teacher Ratio	-0.00363* (0.00201)	-0.00460* (0.00221)	-0.00390 (0.00259)	-0.00466*** (0.00159)	-0.00412** (0.00188)
Observations	462	296	406	462	462
R-squared	0.084	0.072	0.075	0.074	0.088
<i>Panel B: Teachers' Wages</i>					
Teachers' Wages	0.0201 (0.0170)	-0.00303 (0.0387)	0.0211 (0.0172)	0.0335* (0.0171)	0.0222 (0.0154)
Observations	462	296	406	462	462
R-squared	0.066	0.045	0.058	0.043	0.067
<i>Panel C: Term Length</i>					
Term Length	0.000920 (0.000706)	0.00145* (0.000731)	0.000985 (0.000893)	0.00154** (0.000683)	0.00100 (0.000677)
Observations	462	296	406	462	462
R-squared	0.068	0.057	0.059	0.052	0.069

Notes: See Table 3.

Sources: National Health Interview Survey 1984-2007; Card and Krueger (1992).

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 9: The Influence of Black – White Differences in School Quality on Black – White Differences in Currently Smoking

	All Southern States	Excluding States with High Hookworm Rates	Excluding the 1910 Cohort	Not Controlling for IMR	Controlling for Income
<i>Panel A: Pupil-Teacher Ratio</i>					
Pupil-Teacher Ratio	-0.000809 (0.00224)	-0.00248 (0.00285)	-0.000747 (0.00256)	-0.00191 (0.00210)	-0.00181 (0.00224)
Observations	462	296	406	462	462
R-squared	0.185	0.140	0.175	0.173	0.200
<i>Panel B: Teachers' Wages</i>					
Teachers' Wages	-0.0109 (0.0182)	-0.0193 (0.0364)	-0.0115 (0.0178)	0.00172 (0.0186)	-0.00356 (0.0171)
Observations	462	296	406	462	462
R-squared	0.185	0.135	0.176	0.165	0.195
<i>Panel C: Term Length</i>					
Term Length	0.000151 (0.000815)	0.000784 (0.00102)	9.20e-05 (0.000927)	0.000716 (0.000753)	0.000454 (0.000769)
Observations	462	296	406	462	462
R-squared	0.184	0.136	0.174	0.170	0.197

Notes: See Table 3.

Sources: National Health Interview Survey 1984-2007; Card and Krueger (1992).

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 10: The Influence of Black – White Differences in School Quality on Black – White Differences in Any Disability

	All Southern States	Excluding States with High Hookworm Rates	Excluding the 1910 Cohort	Not Controlling for IMR	Controlling for Income
<i>Panel A: Pupil-Teacher Ratio</i>					
Pupil-Teacher Ratio	0.00248* (0.00123)	0.00263* (0.00128)	0.00203 (0.00170)	0.00249** (0.00111)	0.00137 (0.00115)
Observations	462	296	406	462	462
R-squared	0.138	0.122	0.122	0.138	0.176
<i>Panel B: Teachers' Wages</i>					
Teachers' Wages	-0.0152 (0.0136)	-0.0172 (0.0175)	-0.0126 (0.0136)	-0.0178 (0.0131)	-0.00379 (0.0107)
Observations	462	296	406	462	462
R-squared	0.123	0.110	0.114	0.121	0.171
<i>Panel C: Term Length</i>					
Term Length	-0.00120** (0.000475)	-0.00160*** (0.000393)	-0.00111* (0.000621)	-0.00118** (0.000484)	-0.000821* (0.000457)
Observations	462	296	406	462	462
R-squared	0.140	0.133	0.127	0.140	0.181

Notes: See Table 3.

Sources: National Health Interview Survey 1984-2007; Card and Krueger (1992).

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 11: The Influence of Black – White Differences in School Quality on Black – White Differences in Mortality

	All Southern States	Excluding States with High Hookworm Rates	Excluding the 1910 Cohort	Not Controlling for IMR	Controlling for Income
<i>Panel A: Pupil-Teacher Ratio</i>					
Pupil-Teacher Ratio	0.000834 (0.000739)	0.00151 (0.00148)	0.000487 (0.000753)	0.000318 (0.000669)	0.000206 (0.000781)
Observations	462	296	406	462	462
R-squared	0.174	0.145	0.118	0.168	0.188
<i>Panel B: Teachers' Wages</i>					
Teachers' Wages	-0.00282 (0.00864)	-0.0149 (0.0173)	0.00016 (0.00740)	0.000788 (0.00889)	0.00345 (0.00832)
Observations	462	296	406	462	462
R-squared	0.171	0.142	0.117	0.167	0.188
<i>Panel C: Term Length</i>					
Term Length	-0.000294 (0.000341)	-0.000494 (0.000728)	-0.000194 (0.000332)	-0.0000634 (0.000325)	-7.68e-05 (0.000363)
Observations	462	296	406	462	462
R-squared	0.172	0.141	0.118	0.167	0.188

Notes: See Table 3.

Sources: National Health Interview Survey 1984-2007; Card and Krueger (1992).

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1