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# Can Class-Based Substitute for Race-Based Student Assignment Plans? Evidence From Wake County, North Carolina

Urban Education

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**M. Monique McMillian<sup>1</sup>, Sarah Fuller<sup>2</sup>, Zoelene Hill<sup>3</sup>,  
Kate Duch<sup>3</sup>, and William A. Darity Jr.<sup>3</sup>**

## Abstract

This study uses a North Carolina administrative data set to analyze racial segregation and student achievement in Wake County during race-based and income-based school assignment plans. We find a modest increase in the level of racial segregation in Wake schools during the income-based plan, but compared with other large districts in the state, Wake County remained relatively desegregated. We also find a small increase in reading and math test scores and a narrowing of the Black-White test score gap. Our analysis indicates that the improvement in math scores may be *partially* due to school composition changes attributable to the income-based assignment plan.

## Keywords

desegregation, social, achievement gap, African American students, urban education

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<sup>1</sup>Morgan State University, Baltimore, MD, USA

<sup>2</sup>University of North Carolina, Chapel Hill, USA

<sup>3</sup>Duke University, Durham, USA

## Corresponding Author:

M. Monique McMillian, Morgan State University, 1700 East Cold Spring Lane, Baltimore, MD 21251, USA.

Email: [drmmcmillian@gmail.com](mailto:drmmcmillian@gmail.com)

## Introduction

A series of court rulings have signaled the end of the era of using race-conscious school assignment policies to achieve racial diversity in schools (*Dowell v. Oklahoma City*, 1991; *Belk v. Charlotte-Mecklenburg Board of Education*, 1999; *Parents Involved in Community Schools v. Seattle School District No. 1*, 2007). As a result, policy makers increasingly have turned to income-conscious school assignment policies to maintain diversity within schools. Two beliefs underlie the implementation of these policies. The first belief is that income-desegregated schools will promote higher student achievement than economically polarized schools. The second belief is that income-desegregated schools can frequently prevent racial polarization.

The Wake County Public School System (WCPSS) in central North Carolina has become a national test case for the movement toward socioeconomic desegregation (Brown, 2010; McCrummen, 2011). A number of previous studies have attempted to examine Wake County's income-based school assignment policy. Some of these studies suggest that the policy was successful in maintaining racial integration and improving academic achievement (Flinspach & Banks, 2005; Kahlenberg, 2007). However, these studies rely on descriptive data comparing the period before the introduction of the socioeconomic-based assignment plan with the period just after the plan was implemented with few controls for potential confounding factors. These simple comparisons can be misleading because Wake County experienced dramatic population growth and demographic shifts during the relevant time period.

This study contributes to the existing literature by using estimation strategies that account for demographic changes in Wake County and make use of more years of data. Therefore, our article provides an improved analysis of the effects of Wake County's socioeconomic-based assignment plan on racial and ethnic integration in schools and on student achievement.

Specifically, the first estimation strategy we use is a dissimilarity index (DI). A DI is a measure of racial distribution that shows the effect of the socioeconomic plan on racial and ethnic integration in Wake County schools over time. In addition, we present dissimilarity indices for other large school districts in North Carolina with varying types of school assignment policies. These districts afford counterfactual examples of the racial and ethnic distribution patterns we might expect in the absence of a socioeconomic assignment plan.

Our second estimation strategy is an interrupted time-series analysis, which provides a robust estimate of the effect of the socioeconomic plan on achievement, again using other large school districts in the state as a counterfactual. The interrupted time-series method makes use of several years of

data and enables us to control for secular trends in the data. This estimation strategy provides more accurate estimates of the effect of the socioeconomic assignment policy than has been previously provided using simple pre- and post-policy comparisons without adjusting for confounding factors. These two estimation strategies, coupled with the use of more years of data, disentangle the effects of the socioeconomic-based plan from the effects of population growth and other considerations that may have affected school racial and ethnic composition and student performance.

Our literature review situates this study in the body of work about the impact of school composition and diversity (i.e., race-based and socioeconomic-based) assignment plans on racial desegregation and student achievement. Then, we provide a brief overview of the historical context of segregation and desegregation efforts in North Carolina schools with particular attention to Wake County. We also report on the specific terms of the Wake County socioeconomic-based assignment plan.

Next, using administrative data from the North Carolina Education Research Data Center (NCERDC), this article uses dissimilarity indices and interrupted time-series analyses to estimate the effect of the socioeconomic-based plan on racial and ethnic integration and student academic performance. These analyses answer the following four research questions:

**Research Question 1:** Were Wake County schools more racially integrated under the race-based or the socioeconomic-based plan?

**Research Question 2:** Was overall student achievement higher under the race-based or socioeconomic-based plan?

**Research Question 3:** Did achievement gaps increase or decrease under the race-based or socioeconomic-based plan?

**Research Question 4:** Was school racial composition correlated with changes in performance under the race-based or socioeconomic assignment plan?

Finally, the “Discussion” section summarizes our findings and provides recommendations for future research.

## Literature Review

### *Effects of School Composition*

Previous studies on racial and ethnic school composition have identified a negative relationship between the proportion of Black students in a school and Black student achievement. Nationally representative data show that as racial isolation within schools increases, achievement gaps also increase

(Bankston & Caldas, 1996; Berends & Penaloza, 2010; Brown-Jeffy, 2006; Condrón, Tope, Steidl, & Freeman, 2013; Hanushek, Kain, & Rivkin, 2009; Mickelson & Bottia, 2009; van Ewijk & Slegers, 2010).

Studies on the socioeconomic composition of schools have found a positive relationship between the aggregate socioeconomic status (SES) of students in a school and student achievement. Students in low SES schools are more likely to have lower levels of academic achievement regardless of their family background (Anderson, 1993; Perry & McConney, 2010; Ransdell, 2012; Rumberger & Palardy, 2005). Previous studies also suggest that schools serving students from low SES backgrounds provide a lower quality of education because of lower levels of school funding and fewer resources that support academic achievement (Condrón & Roscigno 2003; Kozol, 1991; Ladson-Billings, 2006).

Many studies have identified teacher quality as a mechanism that mediates the relationship between school composition and student achievement. Studies show that Black students regardless of SES background and students of all races from lower SES backgrounds are less likely to have qualified teachers (Clotfelter, Ladd, & Vigdor, 2005; Clotfelter, Ladd, Vigdor, & Wheeler, 2006; Lankford, Loeb, & Wyckoff, 2002). Furthermore, studies show that White teachers systematically opt out of schools that serve high proportions of minority students (Hanushek, Kain, & Rivkin, 2004; Scafidi, Sjoquist, and Stinebrickner, 2007).

Studies show that teachers hold lower expectations for Black and low-income students, which can affect the level instructional rigor they provide to students (McKown & Weinstein, 2008; Rumberger & Palardy, 2005). Richard Valencia's (2012) historical review of the American educational system finds that the tendency for teachers and administrators to hold lower expectations for Black students is reflective of long-standing racist ideologies. Those ideologies were instrumental in promoting segregated schools based on Blacks' alleged genetic, cultural, and cognitive inferiority and Whites' alleged genetic, cultural, and cognitive superiority. Valencia (2012) theorizes that teachers and administrators in predominantly Black schools and teachers of Black students continue to operate using a deficit model; they hold lower expectations for the students they serve, thereby contributing to lower levels of student performance.

Another commonly held perspective is that student body characteristics affect academic achievement. Studies suggest that school composition may affect achievement through peer effects. Children from low SES backgrounds tend to have more untreated health, psychological, and behavioral needs vis-a-vis middle and upper class students (Becker & Luthar, 2002; Children's Defense Fund, 2011). These needs may present in the classroom and detract from instruction and student academic performance. Some research provides evidence that students' academic performance is influenced by the academic behaviors and habits of their peers (Caldas & Bankston, 1997; Zimmer & Toma, 2000). However, Vigdor

and Nechyba (2007) questioned the causal nature of classroom peer effects on achievement suggesting that many studies do not adequately control for endogenous effects of the home and neighborhood environments.

This literature offers some insight on the relationship between school composition and student achievement and the potential causal mechanisms. However, an important limitation of this literature in the context of diversity-based school assignment policies is that it is not clear from these studies whether an assignment policy intended to create racially or socioeconomically integrated schools would trigger the same mechanisms that affect academic achievement.

### *Effects of Race-Based Integration Plans*

Previous studies have also examined the effects of desegregation plans on the level of racial integration, student achievement, and student enrollment. Studies of early efforts to racially integrate schools found that school desegregation plans increased racial integration in schools but also led to “white flight” from districts implementing these programs (Coleman, Kelly, & Moore, 1975; Farley, Richards, & Wurdock, 1980; Rivkin, 1994; Taeuber & Wilson, 1978; Welch & Light, 1987). Recent investigations found that court-ordered racial desegregation increases school racial diversity but has had a variety of effects on academic achievement.

Specifically, researchers have found that dismissal from court-ordered racial desegregation plans increases segregation, suggesting that court-ordered racial desegregation was successful at producing racial integration in schools (Frankenberg & Lee, 2002; Lutz, 2011; Mickelson, 2003; Reardon, Grewal, Kalogrides, & Greenberg, 2012). Similarly, Billings, Deming, and Rockoff (2012) found that the disbanding of race-based busing in Charlotte-Mecklenburg led to a sudden and dramatic resegregation of schools. In addition, White and Black students who attended schools with a high proportion of Black students scored lower on high school exams, and Whites in these schools also experienced lower rates of high school graduation and 4-year college attendance (Billings et al., 2012). These findings suggest that Charlotte-Mecklenburg’s race-based assignment policy promoted racial integration and higher levels of academic achievement.

### *Effects of Socioeconomic-Based Integration Plans*

Although socioeconomic-based plans are still relatively rare in practice, some investigators have examined the success of socioeconomic-based policies at achieving two goals: racial integration and raising student achievement. Reardon

and Rhodes (2011) examined the effect of income-conscious school assignment policies on racial diversity in 40 school districts, including Wake County. They concluded that the degree to which income-conscious school assignment plans affected racial diversity depended on whether the strategy was strong (e.g., included considerations of racial balance between schools or using attendance zones) or weak (e.g., used SES for school choice or transfer policies). The authors categorized Wake County's plan as a strong plan; however, they did not provide data on the specific effects of Wake's plan.

Kahlenberg (2007) analyzed descriptive data for 12 districts that used income-conscious school assignment plans, including Wake County, and found that these plans often resulted in racially diverse schools. The author suggests that these plans were effective because income and race were highly correlated. Kahlenberg (2007) also found evidence that income-based school assignment policies were associated with higher academic achievement across the districts. However, these results are descriptive and do not address whether simultaneous changes in demographics or other factors could be responsible for changes in school composition and academic achievement.

Flinspach and Banks (2005) conducted a 3-year study of Wake County's race- and income-conscious assignment policies and concluded that the income-based plan maintained racially balanced schools. Their study found that 64.6% of Wake County public schools were racially desegregated during the 1999-2000 school year, the last year of the race-conscious policy era, and 63.3% were racially desegregated during the 2001-2002 school year, 1 year after the implementation of the income-conscious policy (Flinspach & Banks, 2005). They noted that the income- and the race-conscious policies tended to identify the same students for re-assignment. Although informative, their study was limited to only the first 2 years of the socioeconomic-based plan and does not provide information on longer-term effects of the policy or potential confounding factors.

Using a longer time span of data, Siegel-Hawley (2011) found that Wake County schools became more racially segregated under the socioeconomic-based plan in the period between 1999 and 2006. Siegel-Hawley (2011) also found that during the socioeconomic-based regime all racial and ethnic groups in Wake County performed better on state tests than their statewide counterparts, and that Black students in Wake had higher rates of graduation when compared with other students in the state. Although the author is able to compare the academic performance of Wake County students against other students in the state, it is not clear whether Wake students' superior performance came about as a result of the new plan, nor is there a comparative analysis of achievement during the race-conscious and socioeconomic-conscious eras.

Studies evaluating the impact of socioeconomic-based assignment policies exhibit considerable disagreement about the effect of these policies on racial segregation, even though many of the studies include some or all of the same districts. Specific to Wake County, Kahlenberg (2007) and Flinspach and Banks (2005) found that the income-based policy maintained racial integration, while Siegel-Hawley (2011) found that the plan led to more racially segregated schools.

Furthermore, studies looking at the effects of such policies on student performance are typically limited to using descriptive statistics and do not account for confounding factors that may explain changes in student performance. Finally, because many of the districts implementing socioeconomic-based assignment policies previously had race-based assignment plans, many studies fail to fully explore the question of how the effectiveness of the new policies compares with both the former race-based policies and, perhaps more relevant, with conditions where there are no diversity policies at all.

This study overcomes the limitations of previous studies by controlling for many simultaneous changes in the district and providing more robust estimates of the effect of the Wake County socioeconomic-based plan on racial segregation and on student achievement. In addition, this study provides comparisons between Wake and other large North Carolina districts that serve as counterfactual examples of what we might expect in the absence of an income-conscious assignment policy. Finally, by using more years of data, this study is better able to disentangle the effects of the policy change from other secular effects.

## Background

### *School Integration in North Carolina*

North Carolina schools have experienced periods of segregation and desegregation, and are now experiencing resegregation (Ayscue, Woodward, Kucsera, & Siegel-Hawley, 2014; Boger, 2002; Frankenberg, Lee, & Orfield, 2003). Similar to other regions in the South, North Carolina initially resisted desegregation. The state's policy makers initially favored token integration plans such as freedom of choice plans; however, in the late 1960s, under federal pressure, North Carolina merged White and Black school districts within each county and implemented race-conscious school assignment policies. In the 1990s, in a series of rulings, courts found that many districts had achieved unitary status struck down the use of race-based assignment plans that were not narrowly tailored. Most North Carolina districts moved away from race-based plans, a move that mirrored other regions of the country and resulted in resegregated schools.



Prior to *Brown v. Board of Education*, 347 U.S. 483 (1954), North Carolina schools were racially segregated and schools for Black children were significantly underfunded compared with schools for White children (Ayscue et al., 2014). Following the ruling of the *Supreme Court in Brown v. Board of Education*, 347 U.S. 483 (1954), North Carolina's lawmakers adopted legislation to avoid integration. The State passed the Pupil Assignment Act (1955) and the Pearsall Plan (1956) to circumvent the mandate of the Supreme Court to desegregate schools. The Pupil Assignment Act (1955) transferred school assignment authority from the state to local school boards, which absolved the state from liability in case of a lawsuit and established provisions for school assignment that perpetuated segregated schools (Chafe, 1981). To further preserve school segregation, the Pearsall Plan (1956) allowed for the closing of public schools in the event of integration and provided state tuition aid for students to attend private schools if they were subjected to integrated schools.

North Carolina's efforts to maintain segregated schools were challenged by the passage of the Civil Rights Act (1964), which prohibited discrimination on the basis of race, color, and national origin, and carried the threat of loss of federal assistance. A year later, the passage of the Elementary and Secondary Education Act (1965) made it even more difficult for states to maintain segregated schools. In 1965, the U.S. Office of Education of the Department of Health, Education, and Welfare developed guidelines for school desegregation, and by the late 1960s, districts across the state had desegregation plans.

North Carolina policies encouraged the consolidation of school districts in major metropolitan areas to produce greater efficiency in the provision of educational programs. The move also improved integration efforts by combining predominantly White districts and predominantly Black districts into one unified district (Ayscue et al., 2014). By the 1980s, only 4.8% of Black students in North Carolina attended intensely segregated schools, that is, 90% to 100% Black student population (Orfield, 1983).

However, in the 1990s schools in North Carolina and throughout the nation began to resegregate and continue to resegregate today (Ayscue et al., 2014; Frankenberg et al., 2003; Orfield & Lee, 2007). Key factors that contribute to this resegregation include changes in federal law and local boards' movement toward non-diversity-based assignment plans (Boger, 2002).

Three judicial cases that initiated the resegregation of schools in the early 1990s were the *Board of Education of Oklahoma City v. Dowell*, 498 U.S. (1991), *Freeman v. Pitts*, 503 U.S. 467 (1992), and *Missouri v. Jenkins*, 115 S. Ct. 2038 (1995; Orfield & Lee, 2007). In these cases, the Supreme Court ruled that race-based school integration plans were meant to be temporary

solutions to rectify the effects of former discrimination, and if districts achieved unitary status, they no longer needed federal supervision, or the use of race-based school assignment plans. In *Tuttle v. Arlington County School Board* (1999), the Supreme Court further dismantled the use of race-based assignment policies ruling that such policies need to be narrowly tailored to meet diversity goals. In response to these rulings, many school districts abandoned their race-based assignment policies, some implemented other diversity-based policies, but most moved toward non-diversity-based plans. For example, among the five largest districts in North Carolina (Charlotte-Mecklenburg, Cumberland County Public Schools, Guilford County, Wake County, and Winston-Salem/Forsyth County), only Wake County maintained a district-wide diversity-based assignment plan.

### *North Carolina's Five Largest School Districts*

Table 1 provides a summary of the demographics and school assignment plans for the five largest school districts in the state from 1995 to 2005. All five school districts used race-based assignment plans for a period of time following the end of legal segregation in their school districts. However, in recent decades, all five school districts have implemented varying non-race-based plans.

In 1995, Winston-Salem/Forsyth County implemented a controlled-choice plan where students could attend their neighborhood school or choose a school before entering kindergarten, sixth grade, or high school; however, transportation was not offered for students who chose a high school outside of their residential area (Jones-Sanpei, 2006). In 1998, Cumberland County Public Schools implemented a controlled-choice plan where students could attend their neighborhood schools or a school with a particular theme (e.g., performing arts and IB academy; S. McNeill, Manager Student Assignment, Cumberland County Public Schools, personal communication, March 6, 2015). In 2000, Guilford County implemented an attendance-zone plan with some choice in which students were guaranteed their neighborhood schools but could choose among magnet and high schools (D. Craven, Director of Student Assignment, Guilford County Schools, personal communication, February 20, 2015). In 2000, Wake County implemented a socioeconomic diversity plan in which no more than 25% of students at any school performed below grade level and no more than 40% of students assigned to any school would be eligible for free-or-reduced lunch (Boger, 2002). In 2002, Charlotte-Mecklenburg implemented a controlled-choice plan where students were guaranteed a space in their neighborhood schools, although additional resources and supports were given to high poverty, lower performing schools (Ayscue et al., 2014).

**Table 1.** Assignment Policy and Demographics of Five Largest School Districts in North Carolina.

District School Assignment Policy Between 1995 and 2005	Total Students <sup>a</sup> (1995/2005)	Percent Racial/Ethnic Enrollment <sup>a</sup> (1995/2005)
Wake County Public Schools System used a race-conscious policy between 1995 and 2000 and an income-conscious policy between fall 2000 and 2005.	81, 438/120, 996	White (69%/55%) Black (26%/30%) Latino (2%/9%)
Charlotte-Mecklenburg Schools used a race-conscious policy between 1995 and 2002 and mainly attendance-zone plan (with some choice) between fall 2002 and 2005.	89, 544/ 124,005	White (53%/38%) Black (41%/46%) Latino (2%/12%)
Cumberland County Schools used a race-conscious plan between 1995 and 1998, then a controlled choice between the fall 1998 and 2005.	51, 148/ 53, 201	White (48%/39%) Black (45%/51%) Latino (4.5%/6%)
Guilford County Schools used a race-conscious plan between 1995 and 1999 and an attendance-zone (with some choice) plan between 2000 and 2005.	57, 211/ 68, 951	White (57%/43%) Black (38%/45%) Latino (1%/7%)
Winston-Salem/Forsyth County Schools used a controlled-choice plan between 1995 and 2005.	40, 895/ 50, 165	White (59%/48%) Black (38%/37%) Latino (2.3%/14%)

Note. These figures were calculated using data from the Common Core of Data (<http://nces.ed.gov/ccd/bat/>).

### *School Integration in WCPSS*

Wake County is home to the largest school district in North Carolina and the 16th largest school district in the nation with 146,687 students during the 2011-2012 school year (McMillian, Fuller, Hill, Duch, & Darity, 2012). The student body is quite diverse. In the 2011-2012 school year, approximately 49% of the students were White, 25% were Black, 15% were Latino, 6% were Asian, 0.4% were Native American, and 33.3% qualified for free or reduced price lunch (McMillian et al., 2012).

The WCPSS is the product of the 1976 merger between the Raleigh City Schools and Wake County Schools—a merger undertaken, in part, to desegregate the predominantly White county school system and the predominantly Black city school system. The new Wake County school district instituted a “15/45” race-conscious school assignment rule: Black students should make up neither less than 15% nor more than 45% of any school. The county divided residential neighborhoods into nodes and assigned nodes to specific schools to meet the race-based targets.

However, in the fall of 2000, in response to the series of court rulings against race-based school assignment policies, and in attempt to maintain some degree of integration, Wake County’s Board of Education voluntarily replaced its race-conscious school assignment policy with an income- and achievement-conscious assignment policy. The income-conscious plan included a school-level income indicator that no more than 40% of students in any school should be eligible for free-or-reduced price lunch and an achievement indicator that no more than 25% of students in any school should be performing below grade level. Specifically, the assignment policy mandated that “no more than 25% of the students assigned to any school will be performing below grade level on state tests, when averaged across a two year period;” and (2) “no more than 40% of the students assigned to any school will be eligible for free or reduced price lunch” (Boger, 2002).

Leading up to and during the income-conscious school assignment policy era, Wake County experienced significant population growth. Between 1990 and 2000, the county population grew from 423,352 to 627,846, and between 2000 and 2010, the population grew to 900,993 (U.S. Census Bureau, n.d.-a). The ethnic composition of the population also changed with the Latino population increasing from 5% in 2000 to nearly 9% in 2010 (U.S. Census Bureau, n.d.-b).

The change in the demographics of Wake schools was even more pronounced. Enrollment rose from just over 70,000 in 1993 to nearly 140,000 in 2009 (McMillian et al., 2012). During the same time, the percentage of White students declined from 69% to 52%, the percentage of Latino students rose from 1% to 12%, and the percentage of Black students remained relatively stable. The share of students qualifying to receive free or reduced price lunch rose from about 16% in 1993 to 31% in 2009 (McMillian et al., 2012). Furthermore, much of the population growth after 2000 occurred closer to the outer edges of the 835 square mile county.

These demographic changes, specifically the increase in the number and percentage of students eligible for free and reduced price lunch and population growth at the edges of the county the put a strain on the socioeconomic-based assignment policy as it became more difficult to meet the school socioeconomic

composition targets without busing students long distances. As the years under the income-conscious school assignment policy progressed, the number and percentage of schools that were in violation of the income indicator increased.

In 1999-2000, the year before the implementation of the income-conscious assignment policy, 18% of the schools had more than 40% of their student population receiving free and reduced priced lunch (McMillian et al., 2012). By the 2004-2005 academic year, the fourth year of the income-conscious policy, 26% of schools were in violation of the income quota (McMillian et al., 2012). Under the income-conscious school assignment regime, a larger number and a higher percentage of schools were in violation of the income indicators established in the policy than before the establishment of the policy. However, it is important to note that implementation of the race-based assignment plan was not perfect either. During the 1999-2000 school year, the last year of its operation, 28% of the schools were outside the 15% to 45% range for Black students with about an equal number of schools below 15% and above 45% (McMillian et al., 2012).

## Method

### *Data*

This study uses data from the NCERDC. The data include school-level demographic data from the 1992-1993 school year to the 2008-2009 school year. The data also include student-level demographics and End-of-Grade test scores for third through eighth graders from the 1994-1995 school year through the 2004-2005 school year. This study uses more than 1.6 million student-years of data. Students included in the data were in third through eighth grade in North Carolina public schools, in Wake County Public Schools, or in one of the four comparison districts (Charlotte-Mecklenburg Schools, Cumberland County Schools, Guilford County Schools, and Winston-Salem/Forsyth County Schools). The years included in the study span the final years of the race-based assignment plan and the first 5 years of the socioeconomic-based plan. The detailed data allow us to examine overall changes in school demographics, individual student test scores, and which students changed schools after the change of assignment plans.

### *Analytic Approach*

This study uses descriptive and inferential statistics to measure the effect of Wake County's socioeconomic-based school assignment plan on racial integration in schools and on academic performance. The analysis takes place in

three stages. In the first stage of analysis, we use descriptive statistics and figures to measure the effect of socioeconomic-based assignment plan on the level of racial segregation in Wake County schools and to compare the level of racial segregation in Wake with that of other large school districts in North Carolina. These descriptive statistics include the Duncan segregation index (DI). A DI is a measure commonly used to judge the degree of residential segregation in a city, and is calculated as follows:

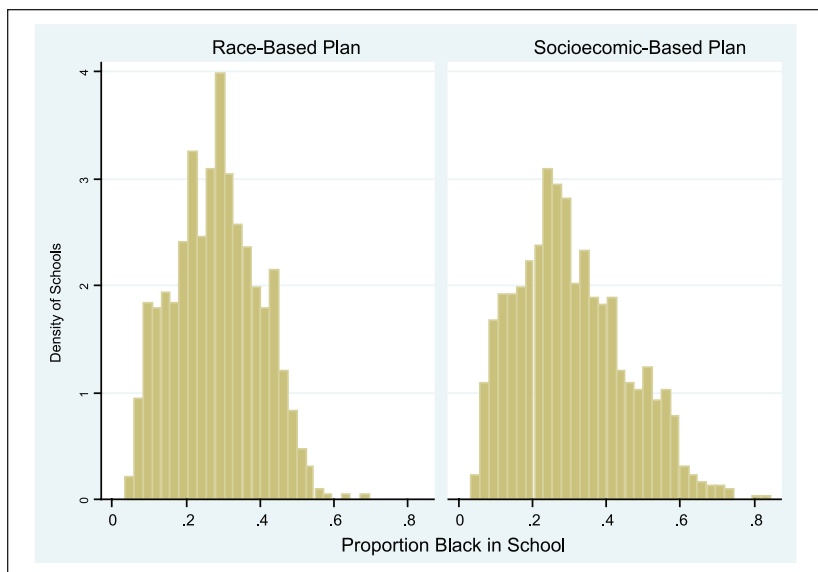
$$DI = \frac{1}{2} \times \sum \left| \frac{B_i}{B} - \frac{W_i}{W} \right|$$

Where B = Black enrollment of school district, W = White enrollment of school district,  $B_i$  = Black enrollment at school  $i$ , and  $W_i$  = White enrollment at school  $i$ .

The DI in this case may be understood as the proportion of White students who would have to change schools so that the proportion of Black students to White students in schools is reflective of the proportion of Black students to White students in the district. As such, numbers closer to 0 indicate greater integration, and numbers closer to 1 indicate greater segregation.

The second stage of analysis measures the effect of the socioeconomic-based plans on overall achievement as well as on the achievement level of racial and ethnic subgroups. These analyses use student-level test data for the years 1995 to 2005 for all students enrolled in Grades 3 through 8 in WCPSS and in the four other large districts discussed previously. Student achievement is measured using End-of-Grade test scores in math and reading. These test scores are standardized at the state level to have a mean of zero and a standard deviation of one. Therefore, all increases and decreases in scores are measured relative to the state of North Carolina as a whole.

The first set of analyses in this stage uses multivariate regression models with standardized test scores as the outcome variables. The next set of analyses uses an interrupted time-series design that regresses student test scores on an indicator equal to zero if the test was taken during the race-based assignment regime and equal to one if the test was taken during the non-race-based assignment regimes. These analyses include data from the aforementioned five largest districts in North Carolina. The independent variables in all these models are indicators for the non-race-based assignment plan in each district. Some models also include interactions between the indicator for the assignment plan and indicators for Black and Latino racial/ethnic groups. All models include controls for the students' race/ethnicity, gender, free-or-reduced price lunch status, limited English proficiency, parental education level, as well as linear and quadratic time trends. The interrupted time-series design is



**Figure 1.** Distribution of schools by proportion Black under each assignment plan. Note. This graph includes all schools in the Wake County Public School System in the years 1993-2009. The years 1993-2000 are included in the race-based plan, and the years 2001-2009 are included in the socioeconomic-based plan. The y axis represents the number of schools in Wake County during the relevant years.

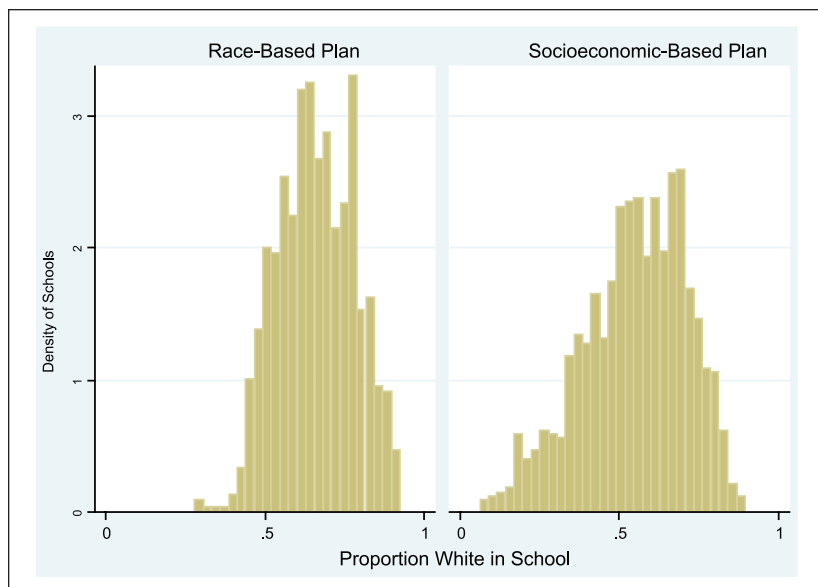
also run for subgroups of students divided by race/ethnic category to compare the size of the coefficients between groups.

The third and final stage of analysis measures the extent to which the relationship between assignment plan and test scores is mediated by changes in school racial composition. This analysis replicates the interrupted time-series design in the previous section but adds controls for school racial composition. Racial composition is measured as the percentage of students in the school in each racial and ethnic category with White as the omitted category.

## Results

### *Effect of Assignment Plan on Racial Segregation*

Figure 1 contains two panels showing the distribution of schools by their proportions of Black students during the race-based assignment plan and during the socioeconomic assignment plan. The panels show a shift toward more schools having a higher proportion of Black students during the socioeconomic



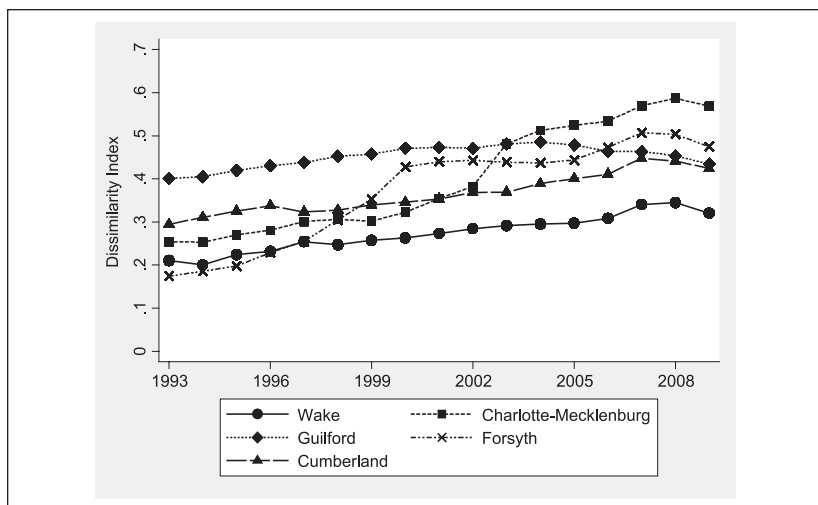
**Figure 2.** Distribution of schools by proportion White under each assignment plan.

*Note.* This graph includes all schools in the Wake County Public School System in the years 1993-2009. The years 1993-2000 are included in the race-based plan, and the years 2001-2009 are included in the socioeconomic-based plan. The y axis represents the number of schools in Wake County during the relevant years.

assignment plan. Figure 2 shows a similar pattern for the distribution of the proportion of White students in schools. These changes in the distribution of the proportion of Black students and the proportion of White students in schools suggest that Wake schools have become more racially segregated under the socioeconomic-based plan. However, analyses of the racial composition of schools must take into account the significant shift in the demographics of the school district over this period. Specifically, in 1993, 69% of the students enrolled in the district were White, but by 2009, only 52% of students enrolled in the district were White (McMillian et al., 2012). This significant change in the overall composition of the population makes it difficult to judge the change in the degree of racial segregation simply by looking at the change in school composition of each racial group.

A racial DI provides a more accurate measure of the change of the degree of segregation in schools. Recall that numbers closer to one indicate greater segregation. The DI for Wake County Schools increased over time from .27



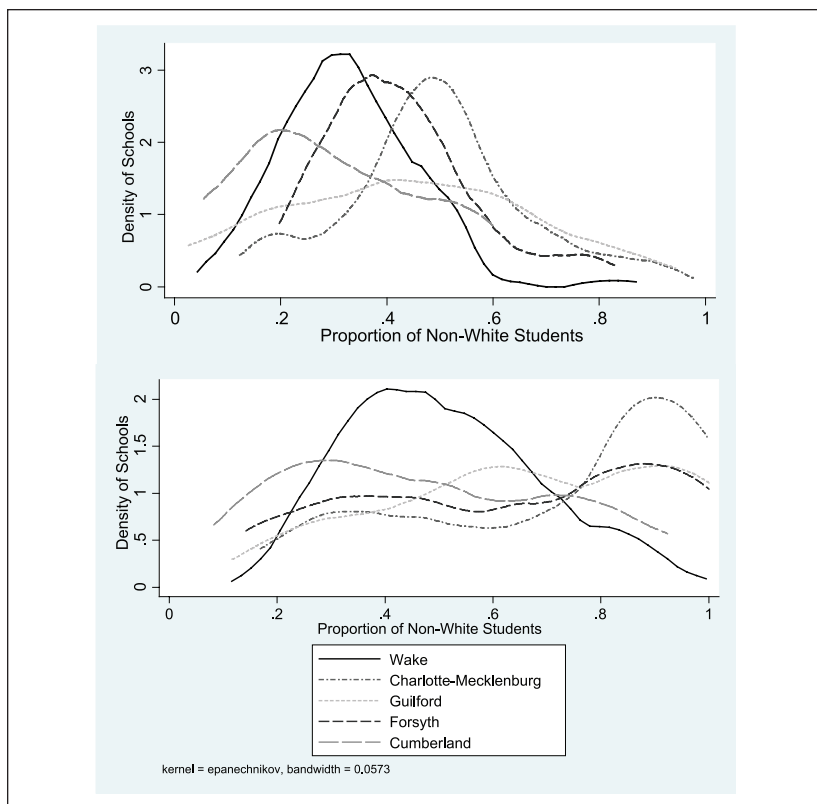


**Figure 3.** Racial dissimilarity in the five largest school districts in North Carolina from 1993 to 2009.

in 1999 to .35 in 2009. The dissimilarity indices of 1999 and 2009 suggest a modest increase in the degree of Black-White segregation across Wake County schools under the socioeconomic-based plan.

The preceding analysis compares racial segregation under the socioeconomic-based assignment plan and the race-based assignment plan, but it does not provide information about the degree of racial segregation that would have been likely to occur in Wake County schools if there was no diversity assignment plan at all. Many other school districts in the state of North Carolina replaced race-based assignment plans with a variety of other types of school assignment plans. By comparing the degree of segregation in Wake County schools to that of other large districts in the state, it is possible to get a better idea of what the racial and ethnic compositions in Wake County schools might have looked like without the socioeconomic-based integration plan.

Figure 3 shows the Black-White DI in the five largest school districts from 1993 to 2009. All five districts display an upward trend in their dissimilarity indices during the period when racial integration plans were replaced with other types of school assignment plans. In 1995, the DI of Wake County schools appears to be similar to the dissimilarity indices of Charlotte-Mecklenburg and Forsyth County public schools. However, by 2009, the dissimilarity indices rose sharply in Charlotte-Mecklenburg and Forsyth schools, leaving Wake County as an outlier with the lowest DI of all five school districts.



**Figure 4.** Distribution of schools by percent of non-White students in the five largest school districts in North Carolina in 1995 (top panel) and 2009 (bottom panel).

Figure 4 provides another approach to comparing the degrees of segregation across the five largest school districts in the state. The top panel of Figure 4 shows the distribution of schools by the proportion of non-White students in each of the five districts in 1995, and the bottom panel shows the same distribution in 2009. The only district other than Wake County to use any form of income-conscious school assignment policy during this time was Guilford County, which used a weak, transfer priority plan (Reardon & Rhodes, 2011). In 1995, all of the districts except Guilford County show a similar pattern—schools clustered around a median proportion of non-White students for the district. However, by 2009, there is no longer evidence of a tendency for schools to cluster around a median composition level in any of

the districts except Wake County. Indeed, some of the other counties show a tendency toward a concentration of schools with very high non-White populations. The pattern in Wake County is starkly different. In Wake County, the schools remain concentrated around a median proportion of non-White students with only a modest change in how tightly the schools are clustered.

Another way to look at the effect of the change in assignment plan on school racial composition is to focus on students who change schools. If students are redistricted in large numbers because of the new assignment plan, we should observe variations in the number and type of students who change schools from year to year. A total of 13.4% of students moved between the 2000 and 2001 school year, the years that coincided with the start of the plan (McMillian et al., 2012). This number is very similar to the 13.2% of students who moved the previous year (McMillian et al., 2012). There are substantial average differences between racial groups in the likelihood of moving schools, but those differences do not follow a clear pattern accompanying the change in assignment plan. In addition, there is no significant difference in the racial or socioeconomic composition between the schools that the movers left and the schools to which they transferred. These data suggest that the change in assignment plan did *not* significantly change the number or type of students who were redistricted between schools.

Together, the results of the descriptive analyses indicate that while Wake Schools experienced some increase in the level of segregation after the introduction of the socioeconomic-based assignment plan, that increase was less than the increase in segregation experienced by other large school districts that replaced their race-based assignment policies during the same time period. This suggests that in a district such as Wake County, a race-based assignment plan may be more effective at reducing racial segregation than a socioeconomic-based assignment plan. However, the socioeconomic assignment plan may limit the degree of resegregation to a level much lower than might occur under conditions with no diversity plan at all, a circumstance suggested by the experience of other school districts in the state.

### *Change in Student Achievement Under the New Plan*

The analysis presented in Table 2 uses a multivariate regression model to regress Wake student test scores on an indicator equal to zero if the test was taken during the race-based assignment regime and equal to one if the test was taken during the socioeconomic-based assignment regime. The basic regression model, presented in columns 1 and 3 for reading and math, respectively, measures the relationship between the socioeconomic assignment plan and overall student test scores. These positive coefficients suggest that student

**Table 2.** Regressions of Reading and Math Scores on an Indicator for Assignment Plan.

	1	2	3	4
	Reading		Math	
SES Plan	0.089*** (0.008)	0.067*** (0.008)	0.118*** (0.008)	0.101*** (0.009)
Black × SES Plan		0.069*** (0.007)		0.040*** (0.008)
Latino × SES Plan		0.101*** (0.018)		0.106*** (0.019)
Black	−0.614*** (0.004)	−0.664*** (0.007)	−0.716*** (0.004)	−0.745*** (0.007)
Latino	−0.213*** (0.008)	−0.293*** (0.017)	−0.235*** (0.008)	−0.320*** (0.018)
Constant	0.672*** (0.015)	0.687*** (0.015)	0.732*** (0.016)	0.743*** (0.016)
Observations	330,076	330,076	330,996	330,996
R <sup>2</sup>	.323	.323	.332	.332

Note. Full models also include indicators and interaction terms for Asian, Native American, and mixed race students that are not reported here due to small sample sizes; full results with all controls are available upon request. SES = socioeconomic status.  
\**p* < .05. \*\**p* < .01. \*\*\**p* < .001.

performance increased in both subjects during the socioeconomic plan when compared with student performance during the race-based plan. The size of the difference is approximately 9% of a standard deviation in reading and 12% of a standard deviation in math; these effect sizes are substantial when considering that the entire size of the Black-White test score gap in these analyses is 60% to 70% of a standard deviation.

A second model includes interactions between the indicator for the assignment plan and race for Black and Latino students. Like the first model, this model measures relationship between the socioeconomic assignment plan and overall student test scores in reading and math; however, this model also measures the interactive relationship between the socioeconomic plan for Black students and the interactive relationship between the socioeconomic plan for Latino students. Presented in columns 2 and 4 for reading and math, respectively, the positive coefficients on the interaction terms indicate that while performance improved for all students, the performance of Black and Latino students improved at a faster rate, narrowing the achievement gap between racial groups.

The basic model displayed in columns 1 and 3 for reading and math, respectively, shows that overall student performance increased in both subjects during the socioeconomic regime as compared with the race-based plan. Columns 2 and 4 also include interactions between the assignment plan and race for Black and Latino students. The coefficients on the interaction terms indicate that while performance improved for all students, the performance of

Black and Latino students improved at a faster rate, narrowing the achievement gap. Although these initial results suggest that students performed relatively better during the socioeconomic-based plan than during the race-based plan, the results do not rule out other factors that could explain the change in student performance.

The next set of analyses use an interrupted time-series design with the other four large districts in the state serving as a comparison group. The first model shows whether scores were higher or lower during the non-race-based assignment regime across all five districts. The second model includes an interaction term between the non-race-based assignment regime and Wake County and shows whether Wake scores were different from the other four districts during the non-race-based assignment plan. This comparison to the other four large districts in North Carolina provides a counterfactual for what student performance in Wake County might have been under a different assignment plan. The third model includes an interaction for time trends before and after the change to non-race-based assignment to show whether the trend in the counties was altered by the change in assignment plan. The fourth model includes interactions for Wake County and time trends. The models include controls for students' race, gender, free or reduced price lunch status, limited English proficiency, and parental education level as well as linear time trends. Table 3 shows the results of these regressions for all students as well as for subgroups of White, Black, and Latino students.

The basic model displayed in columns 1 and 4 for reading and math, respectively, shows that, on average, student performance in the five districts decreased in both subjects during the non-race-based regime compared with the race-based plans. However, the interaction between the indicator and Wake County shows that this general decrease is not seen in Wake; instead, Wake students seem to perform better than students in the other four districts. The time trends under the non-race-based assignment plan suggest that, in general, there was an overall improvement in scores over time during this era for all five districts. The subgroup regressions displayed in the other six columns show that the drop in scores in counties other than Wake seems to occur across the board, although the point estimates are smallest for White students.

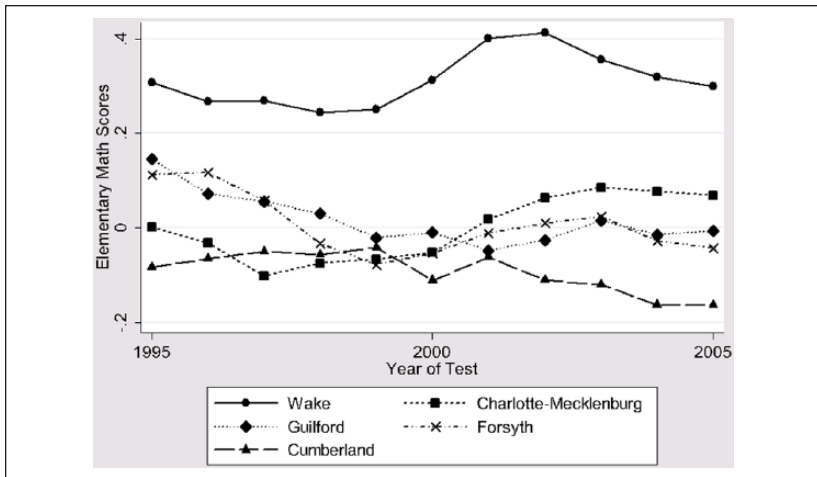
This basic time-series analysis is highly suggestive that the effect of the socioeconomic-based assignment plan utilized in Wake Schools had a significantly stronger, positive impact on student achievement than the non-race-based assignment plans utilized in the other districts. Figures 5 through 8 are visual representations of the elementary and middle school reading and math scores of the five largest districts. These figures show that during and after race-conscious assignment plans, Wake students tended to have higher levels

**Table 3.** Interrupted Time-Series Regressions of Reading and Math Scores With an Interaction for Wake County.

	1	2	3	4	5	6	7	8
	Reading				Math			
	All	White	Black	Latino	All	White	Black	Latino
Non-race-based plan	-0.056*** (0.005)	-0.036*** (0.007)	-0.064*** (0.007)	-0.101*** (0.024)	-0.018*** (0.005)	-0.011 (0.007)	-0.023*** (0.007)	-0.005 (0.023)
Non-Race-Based x Wake	0.094*** (0.009)	0.077*** (0.012)	0.129*** (0.018)	0.039 (0.047)	0.079*** (0.009)	0.069*** (0.012)	0.107*** (0.017)	0.040 (0.046)
Non-Race-Based x Time	0.010*** (0.001)	0.002 (0.001)	0.013*** (0.001)	0.042*** (0.004)	0.021*** (0.001)	0.020*** (0.001)	0.019*** (0.001)	0.027*** (0.004)
Non-Race-Based x Time x Wake	0 (0.002)	0.006* (0.002)	-0.006 (0.004)	0.001 (0.011)	-0.001 (0.002)	0 (0.003)	-0.009* (0.003)	0.012 (0.011)
Constant	0.828*** (0.004)	0.804*** (0.005)	-0.065*** (0.007)	0.290*** (0.022)	0.890*** (0.004)	0.907*** (0.005)	-0.162*** (0.007)	0.271*** (0.022)
County Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County Time Trend	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
School Composition	No	No	No	No	No	No	No	No
Controls								
Observations	1,666,563	878,080	623,159	74,514	1,671,937	879,083	625,786	75,827
R <sup>2</sup>	.303	.155	.113	.200	.316	.160	.092	.144

Note. Full models also include indicators and interaction terms for Asian, Native American and mixed race students which are not reported here due to small sample sizes; full results with all controls are available upon request.

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .



**Figure 5.** Elementary math scores in five largest districts in North Carolina (1995-2005).

of performance than students in the other districts. However, this analysis cannot rule out the possibility that other changes in district policies during the same time period were responsible for the improvement in performance.

Notably, the No Child Left Behind Act (NCLB), which focused heavily on eliminating achievement gaps, was passed in the year following the introduction of the new assignment plan. Differences in district implementation of NCLB or other policies could be responsible for the differences we observe between WCPSS and the other four districts. The next section of the analysis will focus on the question of whether changes in student achievement can be attributed to changes in school racial composition resulting from the new student assignment plan.

### *The Role of the New Assignment Plan in Achievement Gains*

The next set of analyses replicates the regressions shown in Table 3 with the addition of controls for school racial composition. If changes in school racial composition due to the change in assignment plan are responsible for the increase in performance observed under the socioeconomic assignment plan, controlling for the racial composition of the schools should reduce the magnitude of the coefficient on the indicators for assignment plans in the regressions.

Table 4 shows the regressions with the addition of school composition controls. The results for reading test scores show some slight changes in the

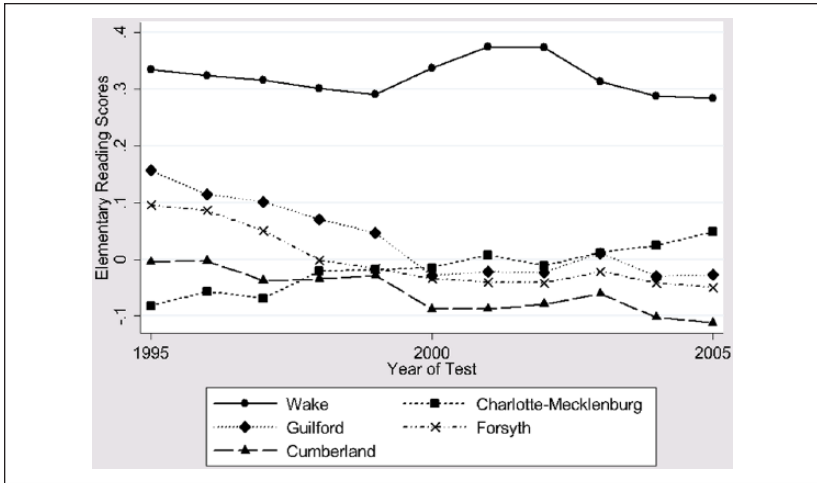
**Table 4.** Interrupted Time-Series Regressions With an Interaction for Wake County With Student Fixed Effects.

	1	2	Reading			4	5	6	7	8
			White	Black	Latino		All	White	Black	Latino
Non-race-based plan	-0.055***	(0.009)	-0.001 (0.013)	-0.083***	(0.015)	-0.280***	0.119***	0.149***	0.100***	0.152**
Non-Race-Based x Wake	0.112***	(0.019)	0.071** (0.023)	0.119***	(0.037)	0.194 (0.117)	0.036 (0.019)	-0.002 (0.025)	0.061 (0.035)	-0.032 (0.112)
Non-Race-Based x Time	0.008***	(0.002)	-0.007** (0.003)	0.016***	(0.003)	0.071***	-0.027***	-0.036***	-0.023***	-0.014 (0.010)
Non-Race-Based x Time x Wake	-0.011	(0.006)	-0.002 (0.007)	-0.006 (0.013)		-0.021 (0.039)	0.001 (0.006)	0.012 (0.008)	-0.005 (0.012)	0.016 (0.037)
Constant	1.057***	(0.012)	1.003***	0.225***	(0.019)	0.692***	1.032***	1.074***	-0.014 (0.018)	0.319***
County FE	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes
County time trend	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes
School composition controls	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes
Observations	1,183,284		598,312	451,026		63,548	1,187,952	599,199	453,236	64,784
R <sup>2</sup>	.312		.163	.116		.201	.328	.175	.099	.148

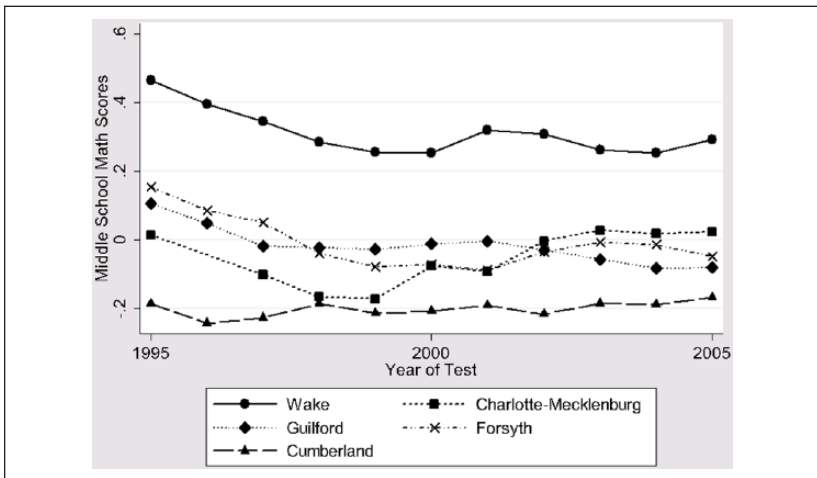
Note. Full models also include interaction terms for Asian, Native American and mixed race students which are not reported here due to small sample sizes; full results with all controls are available upon request; models do not include controls, such as race and gender, that do not vary within students across years.

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .



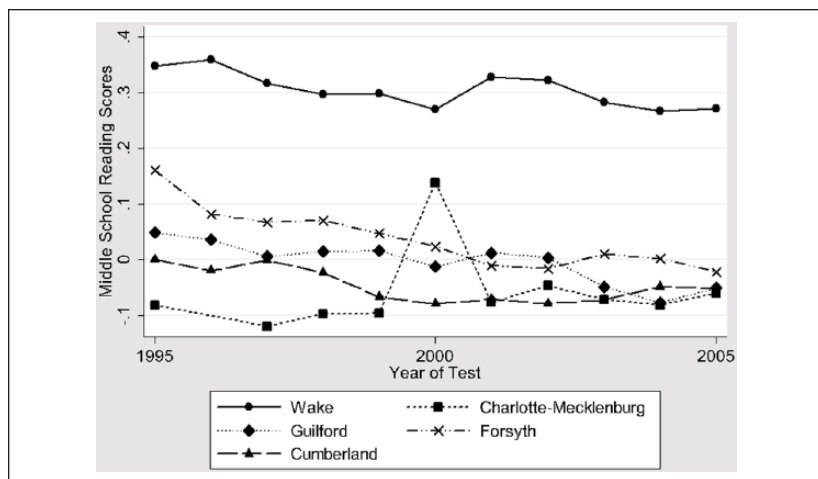


**Figure 6.** Elementary reading scores in five largest districts in North Carolina (1995-2005).



**Figure 7.** Middle school math scores in five largest districts in North Carolina (1995-2005).

magnitude of the coefficients, but no substantive changes in the effects relative to the same regressions shown in Table 3. However, the results for math test scores are markedly different once school composition controls are included.



**Figure 8.** Middle school reading scores in five largest districts in North Carolina (1995-2005).

Rather than a small negative change under the non-race-based assignment plans, we see large increases in test scores during this era. However, rather than a small upward trend over time, there is now a small downward trend. In addition, the effects of the change in the assignment plan in WCPSS no longer differ significantly from the new assignment plans in the other four districts.

The results of this analysis suggest that the change in student composition resulting from the changes in assignment plans played a role in the change in math scores in the five districts. The new assignment plan in Wake County appears to have had more positive effects than the alternatives used by the other districts. However, changes in reading scores do not appear to be associated with changes in school composition and, therefore, are unlikely to be due to the assignment plans. Those changes are more likely to be related to other initiatives in the five districts or across the state as a whole.

## Discussion

This study suggests that many previous evaluations of the socioeconomic-based assignment plan in Wake County that relied upon limited descriptive data have overstated its benefits. Although it is true that Wake County Public Schools remained relatively more racially integrated compared with other large districts in the state, it is simply not the case that it maintained the same level of racial integration that was previously achieved in the district.

This study of the WCPSS suggests that the patterns of racial integration during the race- and income-conscious eras were similar, but schools were slightly more racially integrated under the race-based plan. Overall, reading and mathematics scores increased under the income-conscious plan and the achievement gaps between White and Black students and between White students and Latino students narrowed. Comparisons with the student performance observed in the other four large districts show that WCPSS achievement scores improved relative to the other districts under the non-race-based assignment era. Finally, evidence suggests that for math scores, this improvement may have been due to differences in school composition.

To evenly distribute Blacks and Whites under the race-conscious plan, approximately 24% to 28% of the White population would have had to move. In contrast, during the income-conscious era, approximately 28% to 35% of White students would have had to move. However, it is important to note that the socioeconomic-based plan was not implemented perfectly (the same is true for the race-based plan), so the increase in segregation may be attributable to a failure in implementation rather than a conceptual deficiency in the plan.

Despite the increase in racial segregation, comparisons with other large districts within the state show that the socioeconomic-based plan was probably better for producing racially diverse schools than *no* diversity-based plan. Wake County Public Schools tended to be more integrated than Charlotte-Mecklenburg, Cumberland, Forsyth, and Guilford school districts. As these other districts moved away from race-based integration plans, they selected either controlled-choice or neighborhood school plans rather than plans explicitly designed to promote diversity. A comparison of the Wake County schools with these other districts suggests that Wake County's socioeconomic-based assignment plan promoted a greater level of racial integration than would have been expected without such a plan.

Students in Wake County had higher levels of achievement than students in other districts under the non-race-based assignment plans. Research suggests that students tend to perform better in racially and economically diverse schools (Anderson, 1993; Berends and Penaloza, 2010; Caldas & Bankston, 1997; Hanushek et al., 2009; Rumberger & Palardy, 2005; van Ewijk and Slegers, 2010). Also, schools with a concentration of impoverished students or Black students regardless of their SES, have difficulty attracting and retaining better trained teachers and typically have fewer resources than schools with a more White or economically advantaged student population (Clotfelter, Ladd, Vigdor, & Wheeler, 2006; Jacob & Ludwig, 2008; Murnane, 2007; Roza, Hill, Sclafani, & Speakman, 2004).

Although we cannot establish whether the socioeconomic-based assignment plan in Wake County *caused* all the observed increase in student test

scores, the plan is clearly associated with higher math test scores and with a rise in scores relative to the other large districts in the state. Although the reason for an effect on math scores and not reading scores is not immediately clear, previous studies have found that it is common with educational interventions to see a more immediate response in math than in reading (Clotfelter, Ladd, & Vigdor, 2007; Dobbie & Fryer, 2011).

The literature review explored frameworks (i.e., teacher quality, deficit model, peer effects) that explain why school assignment plans that maintain diversity will tend to have better performing students and smaller achievement gaps. Our results for Wake County are consistent with the predictions of these frameworks. However, our work is unable to determine whether the outcomes associated with the more diverse schools in Wake County are a result of better resources, more advantaged peers or some other factor.

Future research should examine potential mediators in the relationship between school assignment policies and achievement, including teacher quality, class composition, and racial attitudes of teachers. Although establishing that socioeconomic-based school assignment policies can provide racial diversity and potentially improved academic outcomes is an important first step, additional research is needed to explore the experience of students in these schools compared with students in schools with more traditional assignment mechanisms.

Furthermore, specific, unique circumstances of the district may have been important contributors to the success of the socioeconomic-based assignment plan. Wake County has a relatively high correlation between race and free or reduced price lunch status, which makes the latter variable a better proxy for race than in some other locations. In addition, Wake County is somewhat unusual insofar as the city of Raleigh and its suburbs all are in the same district, resulting in a large district. Finally, Wake County has a lower level of racial residential segregation than many other metropolitan areas in the country, which means that fewer students have to be moved to create balanced schools. Although these local conditions contribute to the success of the plan, for districts with similar conditions to Wake County, a socioeconomic-based assignment plan may be a reasonable option for maintaining racial integration if a race-based plan is not practical or legal.

Schools across the nation are becoming increasingly segregated along racial and class lines, and school assignment policies that promote integration within schools are direly needed. Although Wake County does indeed present an interesting test case of the effects of a socioeconomic-conscious school assignment plan on racial integration and student achievement, future studies should measure the effect of such plans in other districts to determine whether these observed positive effects are unique to Wake County, or whether they

are reflective of SES plans in general. Furthermore, policies to integrate schools and studies that assess the effectiveness of these policies can no longer rely on Black-White racial binaries. The Latino population is growing in many regions of the country, and Latino students are subjected to highly segregated neighborhoods and schools.

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### Author Biographies

**M. Monique McMillian** is an associate professor at Morgan State University. She holds a PhD in Educational Psychology from the University of North Carolina – Chapel Hill. McMillian has research interests in academic engagement, school-assignment policies and school composition.

**Sarah Fuller** is a research assistant professor at the University of North Carolina - Chapel Hill. She holds a PhD in Public Policy from the Sanford School of Public Policy at Duke University. Fuller has research interests in education policy, early childhood development, social stratification, and quantitative research methods.

**Zoelene Hill** is a PhD candidate at the Sanford School of Public Policy at Duke University. Her research interests are in early childhood education, school readiness, and social stratification.

**Kate Duch** is the director of Political Research at the Analyst Institute, where she designs, manages, and analyzes randomized controlled experiments. Prior to joining the Analyst Institute, Kate earned a PhD in Public Policy at Duke University, along with MS in Labor Economics and BS in Industrial and Labor Relations at Cornell University. She has served as a voting member of the Board of Trustees at Duke University and at Cornell University.

**William A. Darity Jr.** is the Samuel DuBois Cook professor of Public Policy, African and African American Studies, and Economics; and the director of the Samuel DuBois Cook Center on Social Equity at Duke University.