education policy analysis archives

A peer-reviewed, independent,
open access, multilingual journal

Arizona State University

Volume 22 Number 14 March 10th, 2014 ISSN 1068-2341

Adverse Impact of Racial Isolation on Student Performance: A Study in North Carolina

Andy Sharma
University of Denver
United State of America

Ann Moss Joyner
Cedar Grove Institute
United State of America
&
Ashley Osment
University of North Carolina at Chapel Hill
United State of America

Citation: Sharma, A., Joyner, A.M., & Osment, A. (2014). Adverse impact of racial isolation on student performance: A study in North Carolina. *Education Policy Analysis Archives, 22* (14). http://dx.doi.org/10.14507/epaa.v22n14.2014

Abstract: This study examines the impact of racial isolation on high school student performance in North Carolina, a state in the southeast United States. Our research goal is to investigate if increased isolation negatively impacts Black students' academic performance. Employing the North Carolina State Department of Public Instruction (NCDPI) dataset, we test for this using Algebra I and English I scores on End-of-Course exams for ninth graders (N = 134,646) during the 2007-2008 school year. We control for student-level characteristics, such as race and ethnicity, economic disadvantage (eligibility for free and reduced-price lunch), and designation as gifted. We also analyze

Journal website: http://epaa.asu.edu/ojs/
Facebook: /EPAAA
Twitter: @epaa_aape

Manuscript received: 2/28/2013
Revisions received: 8/26/2013
Accepted: 1/2/2014

the effect of school-level characteristics, such as teacher experience, teacher training (advanced degree), teacher accreditation (fully licensed), and the percentage of students who were Black or Latino. Our results suggest racial isolation adversely impacts student performance on Algebra I by as much as three points. With our restricted hierarchical dataset and multi-level modeling, we (a) contribute to the growing body of literature, which finds a negative association between racial isolation/segregation and student performance, and (b) find teacher attributes can moderate some of the adverse student outcomes.
Keywords: student achievement gaps; improving Black student performance; North Carolina.

El impacto Adverso del Aislamiento Racial en el rendimiento de los estudiantes: un estudio en Carolina del Norte.

Resumen: Este estudio examina el impacto del aislamiento racial en el desempeño de estudiantes de escuelas secundarias en Carolina del Norte, un estado en el sureste de Estados Unidos. Nuestra objetivo de investigación fue investigar si el mayor aislamiento repercute negativamente en el rendimiento académico de los estudiantes negros. Empleando datos del Departamento de Instrucción Pública del Estado de Carolina del Norte (NCDPI) de puntuaciones Álgebra I y Inglés I en exámenes de Fin de Curso para estudiantes de noveno grado (N = 134.646) durante el año escolar 2007-2008. Controlando las características a nivel estudiantil, como raza y origen étnico, desventaja económica (la elegibilidad para programas de almuerzo gratis o a precio reducido), y su designación como intelectualmente dotado. También se analizó el efecto de las características a nivel de la escuela, como experiencia docente, formación del profesorado (título avanzado), la acreditación del profesorado (con licencia), y el porcentaje de estudiantes Negros o Latinos. Nuestros resultados sugieren que el aislamiento racial afecta negativamente en hasta tres puntos el desempeño estudiantil en Algebra I. Con nuestra base de datos jerárquica y modelización multinivel, contribuimos al creciente cuerpo de literatura que (a) encuentra una asociación negativa entre el aislamiento racial segregación y rendimiento de los estudiantes, y (b) que ciertos atributos de los docentes pueden moderar algunos de los resultados adversos en los estudiantes.
Palabras clave: brecha de rendimiento estudiantil; mejora de rendimiento de los estudiantes negros; Carolina del Norte.

O impacto adverso do isolamento racial no desempenho dos alunos: um estudo na Carolina do Norte.

Resumo: O presente estudo analisa o impacto do isolamento racial no desempenho de estudantes de ensino médio na Carolina do Norte, um estado no sudeste dos Estados Unidos. Nosso objetivo de pesquisa foi investigar se o aumento do isolamento afeta negativamente o desempenho acadêmico dos estudantes negros. Utilizamos dados do Departamento de Instrução Pública da Carolina do Norte (NCDPI) das avaliações de Álgebra I e Inglês I em exames de Fim de do curso para os calouros (N = 134.646) para o ano letivo de 2007-2008. Controlando pelas características de nível estudantil, tais como raça e etnia, desvantagem econômica (elegibilidade para os programas de almoço gratutitos ou de prezo reduzidos), e a designação como intelectualmente dotado. Também se controlo o efeito das características do nível da escola, tais como experiência de ensino , formação de professores (nível avançado) , credenciamento de professor (licenciado), e o percentual de estudantes negros ou latinos também foi analisada. Nossos resultados sugerem que o isolamento racial afeta negativamente até em três pontos o desempenho dos alunos em Álgebra I. Com o nosso banco de dados hierárquico e modelagem multinível, contribuímos para o crescente corpo de literatura indicando que (a) a uma associação negativa entre a segregação racial e isolamento no

desempenho do aluno, e (b) que certos atributos dos professores podem moderar alguns dos resultados adversos para os alunos.
Palavras-chave: brecha de desempenho; melhoria do desempenho de estudantes negros; Carolina do Norte.

Introduction

Over the past two decades, the United States Supreme Court has issued rulings that severely limit the ability of school boards to use race as a factor in student assignment policies as a way to foster diversity. To increase our understanding of the impact of these rulings, the Poverty and Race Research Action Council commissioned this study to address a single question: *What is the effect of racial isolation on student performance?* In answering this question, we recognized the need to also address the following: *If the effect of racial isolation on student performance is negative, can additional resources improve student achievement?*

Our decision to study racial isolation in student populations was based on North Carolina's high poverty levels (particularly in urban areas and in the coastal plain and mountains) and the significant impact of economic isolation on student performance. A large number of North Carolina students in ninth grade attend schools that are more than 75% Black and many of these schools are also high-poverty and low-performing schools.

Another motivating factor for studying North Carolina can be attributed to history. As we further discuss in the Background section, North Carolina was among the first states to consider "mandatory busing as a remedy for segregation" and the Charlotte-Mecklenburg Schools (CMS) in Charlotte, North Carolina have long been considered to be "one of the nation's premier desegregated school systems" (Mickelson, 2001, p. 216). In fact, the CMS system served as a model for nearly 20 years. In short, North Carolina has a rich history surrounding desegregation and, as a result, provides an interesting setting for applied policy research.

Demographic factors also favor North Carolina. A recent article by Morris and Monroe (2009) shows the South experienced the largest net growth in the Black population from 1990-2000. Consequently, this explosive internal migration of Blacks has not occurred since the Great Black Migration from 1915-1960. As Morris and Monroe (2009) highlight, "although Black people represent 12.9% of the total U.S. population, 10 states in the South (Alabama, Florida, Georgia, Louisiana, Maryland, Mississippi, North Carolina, South Carolina, Texas, and Virginia), when combined, comprise 47% of the country's total Black population" (p. 22).

Finally, a recent article by Clotfelter, Ladd, and Vigdor (2009) used administrative records from the North Carolina's Department of Public Instruction to examine achievement gaps between White and minority students in grades 3-8 and found sizeable and persistent gaps for Black students. Our study follows by examining such a gap for ninth graders in racially isolated areas.

Background

In 1954, the Supreme Court ruled in favor of *Brown v. Board of Education* and overturned the *Plessy v. Ferguson* (1896) decision allowing segregated schools. The underlying assumption of *Plessy* was that segregated schools (and other segregated public facilities) were permissible as long as they were equal. In *Brown*, the Supreme Court ruled that segregated schools, by definition, violated Black students' constitutional rights. Most recently, the Supreme Court has moved away from *Brown*, constraining school boards' ability to pursue diversity, resulting in the increasing re-segregation of public schools. According to Gary Orfield in *Schools More Separate* (2001), "School segregation intensified through the 1990s, during which time three major Supreme Court decisions authorized a

return to segregated neighborhood schools. Though the U.S. South is much more integrated now than before the civil rights revolution, it is moving backward" at an accelerating pace (p. 1).

In 2007, in *Meredith v. Jefferson County Board of Education* and *Parents Involved in Community Schools vs. Seattle School District No. 1* (hereafter referred to as *PICS*), the United States Supreme Court substantially limited the permissibility of voluntary race-conscious student assignment plans. During the presentation of ***PICS***, Justice Kennedy expressed his support for the race conscious objective of integrated schools, but also his strong doubts about the permissibility of policies directly turning on the individual race of individual students. In the end, the Court ruled that race *cannot* be used to decide where individual students go to school except in limited circumstances.

In *PICS,* the Court made clear that a range of other measures remain available to pursue integration and inclusion in our schools. These include allowing districts to draw race-conscious boundaries based on residential patterns, establishing magnet schools, and locating new schools to reach the race-conscious objective of integration without assignment decisions turning on an individual student's race. In addition, other individual student characteristics might well be used to achieve additional forms of diversity that have the secondary affect of improving racial diversity, including consideration of socioeconomic status, academic proficiency levels, and parental educational attainment. Since 1999, school boards and communities lived under legal uncertainty as to whether integrated schools served a compelling governmental interest. In *PICS,* five Justices recognized that diversity and avoiding the harm of segregation is a compelling governmental interest, and Justice Kennedy's controlling opinion underscored the Court's support for pursuing this interest in race-conscious ways.

Besides the legal (i.e., Constitution) consideration, attending racially integrated schools has been shown to have positive economic consequences for students. In *Diversity Challenged* (2001), Janet Schofield lists the many benefits of integrated elementary and secondary schools, including their long-term economic advantages. She cites the academic progress of African American and Hispanic students, the reduction of the dropout rate (thus eliminating the substantial negative economic consequences of failing to complete high school), and the improvement of long-term occupational outcomes for African Americans. More specifically, increased employment in under-represented professions, modestly higher earnings, and more consistent career planning. These facts summarize several decades of research (see Schofield, 1995, Mickelson et al., 2013).

Historical Developments in North Carolina

The current trend toward re-segregation in North Carolina's schools is illustrated by the experience of the Charlotte-Mecklenburg School System (CMS). From 1974 to 2002, CMS was under federal court order to use busing or other techniques to achieve racially balanced schools. In 2001, the 4th U.S. Circuit Court of Appeals held that CMS had dismantled its race-based dual system and had eliminated, as much as possible, the vestiges of prior discrimination. This ruling prohibited CMS from continuing to assign students to schools solely based on race. During the 2001-02 school year and prior to this ruling, 29.1% of CMS elementary schools were racially isolated (i.e., 80% or more minority) schools. By the 2005-2006 school year, the percentage of racially isolated schools increased to 49.4%.[1]

Another case in point refers to the consolidated Winston-Salem/Forsyth district in Forsyth County (see Clotfelter et al., 2013, and Holley-Walker, 2010, for a good discussion). Much like CMS, it utilized a busing plan as early as 1971 to achieve racial integration. After twenty years, no school within this district maintained a racial composition that exceeded 90% non-White. However, in 1995, the incoming school board replaced busing with attendance zones and allowed parental

[1] "CMS Elementary Schools – Racially Isolated Elementary Schools 2001-2006," Center for Civil Rights, UNC-CH, excel sheet and graph, via email, March, 2007.

choice. According to Clotfelter (2011), "the percentage of black students attending 90-plus percent nonwhite schools increased from 0 in fall of 1994, to 6 percent in 1996, 13 percent in 1998, 21 percent in 2000, and 22 percent in 2002" (p. 2).

Despite our initial analysis and other studies that indicated that there are negative outcomes associated with racial isolation for Black students, North Carolina continues to moves towards racially imbalanced schools. In December of 2009, the school board in Wake County voted to eliminate the word "diversity" in its description of its goals.[2] New board member John Tedesco said that the National Association for the Advancement of Colored People (NAACP) was "mired in a time when an emphasis on race was needed to overcome the vestiges of legal segregation." Now, he said, "Wake has transcended race…."[3] This move away from diversity was the first action of the newly-elected Board majority, which had campaigned under the flag of *neighborhood schools* and parental choice. This change is a reversal of Wake County's former school assignment plan, which considered family income and student proficiency in making student assignments. This earlier policy was considered a national model for creating and maintaining diversity. According to Grant (2009), Wake "reduced the gap between rich and poor, black and white, more than any other large urban educational system in America" (p. 92). Unfortunately, Wake's new school board exemplifies a growing acceptance of increasing levels of segregation, an outcome sanctioned by the nation's courts.

Recent work by Clotfelter et al. (2013) provides additional insight into the ever-increasing racial isolation throughout North Carolina. These scholars construct an imbalance index to measure differences between racial composition of public schools and the county as a whole. The index ranges from 0-1 where lower scores signify balance while higher scores reflect isolation. For the five largest counties, their calculations show the following increases from 1995 to 2012: Mecklenburg from 0.12 to 0.33, Wake from 0.06 to 0.13, Guilford from 0.24 to 0.25, Cumberland from 0.11 to 0.13, and Forsyth from 0.07 to 0.27. Clotfelter et al. (2013) also find a greater percentage of lesser qualified and fewer board certified teachers at racially imbalanced schools.

Data

This analysis uses the North Carolina State Department of Public Instruction (NCDPI) dataset for the 2007-2008 academic year. The North Carolina Education Research Data Center (NCERDC) at the Center for Child and Family Policy at Duke University manages and stores this data. This rich dataset is frequently used for education research for it contains information on student achievement, student socio-economic characteristics, teacher qualifications, and various other characteristics at the school and district-level.

[2] Wake County's school district includes Raleigh and the suburban towns which ring the city, as well as some rural areas.

[3] "NAACP Renews Schools Crusade," News and Observer, January 10, 2010.

Analytic Sample

Our analysis examined: (a) all ninth graders in North Carolina who completed either the Algebra I or English I exams and (b) characteristics of their schools. Although our main objective was to examine the outcomes for Black students, we also included Latino, Asian, Native American, and Multiracial children in the student universe. Charter schools were excluded from the analysis due to missing information on teacher characteristics. More specifically, variables corresponding to years of teaching experience and teachers with advanced degree lack complete data. Given the research question, the sample also contains information regarding limited English proficiency, gifted Math/Reading, and economic disadvantage: free/reduced lunch.

While most ninth graders take English I, the number of ninth graders taking Algebra I is much smaller. Some students may take Algebra I in middle school while others take general math in high school. This would affect our results, but we select Algebra I and English I as representative of ninth grade core courses. We consider a school as segregated if student enrollment exceeds 50% Black students. We draw this definition in part from the findings of Brown's (1997) analysis of the 1990 National Educational Longitudinal Study (NELS), which suggests that schools with 61 to 90% White students and 10 to 39% Black and Hispanic students "show the highest average academic achievement for all racial groups and the smallest gap between the races in test scores" (Mickelson 2001, p. 220).

Dependent Variable

Algebra I and English I End-of-Course exam scores serve as the outcome variables. Algebra I measures a student's mastery of content standards in numbers and operations, algebra, functions, geometry, and statistics and probability. English I measures mastery of content standards in argumentation, communication, reflection and reaction to print and non-print text, literary genres and concepts, grammar, and language usage. For both exams, scores range from 118-180. In general, scores below 148 demonstrate inconsistent mastery and minimal preparation for advanced content. Scores equal to or greater than 148 demonstrate mastery and suggest adequate preparation for advanced content while scores that exceed 158 demonstrate high proficiency and suggest excellent preparation for advanced content.

Independent Variables

The main independent variables at the student-level include race/ethnicity and economic disadvantage. Race/ethnicity is a set of dummy variables corresponding to Black, Latino, Asian American, Native American, and Multiracial with White as the omitted group. Economic disadvantage is captured as participation in free and reduced-price lunch. In order to be eligible for this National School Lunch Program, families at or below 130% of the poverty level receive free meals while those between 130-185% receive reduced price meals.

The main independent variables at the school-level include teaching experience, teachers with advanced degree, fully licensed teachers, percent poverty, and percent black. We further refine teaching experience into two groups: percentage of teachers in the school which have instructed for 0-3 years and percentage of teachers in the school which have instructed for 11+ years. These measures serve to distinguish between novice and veteran teachers. The teachers with advanced degree variable reflects individuals with academic credentials beyond a bachelor, such as master, professional, or doctorate. Such individuals maintain greater content expertise than required by state certification. Fully licensed teacher signifies individuals who have met all of North Carolina's State Board of Education requirements and standards in their respective area. Percent poverty and percent Black are school-level demographic variables.

To better understand the adverse impact of racial isolation, we construct an interaction based on individual race (student-level) and average racial composition (school-level). This variable, which is denoted *Black x percent Black*, estimates the effect of attending a predominantly Black school by Black students on exam scores.

Methods

Since the Coleman Report (1966), scholars have used quasi-experimental methods and employed advanced econometric techniques to uncover the casual mechanisms underlying the achievement gap between Black and White students. According to Orfield and Lee (2005), "Race is deeply and systematically linked to many forms of inequality in background, treatment, expectations and opportunities. From an educational perspective, perhaps the most important of those linkages is with the level of concentrated poverty in a school" (p. 5). We conduct a pilot project examining the consequences of racial isolation in public schools across North Carolina. Our research goal is also aimed at contributing to the body of literature in the area of racial isolation and student outcomes, particularly since some studies suggest desegregation has a positive impact on minority students while others show insignificant or no impact (see Mickelson and Nkomo, 2012).

National analyses of school segregation have tended to focus on enrollment patterns, relying on surveys at the national level. Our analysis uses individual, school, and district-level data within a single state, which allows us to compare segregated schools to racially balanced schools. School-based data were prepared by the North Carolina Education Research Data Center (NCERDC) and population estimates were drawn from the Census and American Community Survey. [4] Using these data, we examine key student-level and school-level indicators in order to capture a range of conditions in the school systems.

Our analytic techniques include: (1) descriptive statistics by percent Black in school, (2) t-tests by race for exam outcomes, and (3) Mixed-Level Modeling (MLM) regression. The MLM provides multivariate control for the effects of specified variables, such as the socio-economic status of the students and teacher characteristics.

We use MLM modeling because Ordinary Least Squares regression (OLS) does not account for the clustering of individuals within schools. As such, OLS results are not accurate. More specifically, the combination of student and school data requires a mixed-level approach because individual student-level data is Level One, school-level data is Level Two, and district-level data is Level Three. MLM is an appropriate model to account for correlated errors because observations may not be independent.[5]

The econometric specification for the MLM model is as follows:

$$Y_{ij} = \beta_{0j} + \beta_{1j} X_{ij} + u_j + \varepsilon_{ij}$$

where *i* denotes student-level and *j* denotes school-level.

[4] www.pubpol.duke.edu/centers/child/ep/nceddatacenter/index.html

[5] We initially used this framework. However, due to technical issues relating to concavity, we used district-level dummy variables in place of district id at Level Three to control for unobserved characteristics. Therefore, school id functions as the random effects or moderator variable at Level Two. In simple terms, this means school-level characteristics moderate the effects of racial characteristics at the individual-level to impact student performance on Algebra I and English I exams.

$B_{0j} = \gamma_{00} + u_{0j}$ represents intercept equation and

$B_{1j} = \gamma_{10} + u_{1j}$ represents slope equation.

Formal models:

$Y_{ij} = \beta_{0j} + \beta_{1j}$ (Black) + β_{2j} (Latino) + β_{3j} (Asian) + β_{4j} (Native American) + β_{5j} (Multi Racial) + β_{6j} (Limited English) + β_{7j} (Economic Disadvantage) + β_{8j} (Male) + β_{9j} (Academically Gifted) + β_{ij}

$\beta_{0j} = \gamma_{00} + \gamma_{01}$ (Teacher Experience 0-3) + γ_{02} (Teacher Experience 11+) γ_{03} (Advanced Degree) + γ_{04} (Fully Licensed Teacher) + γ_{05} (Percent Poverty) + γ_{06} (Percent Black) + γ_{07} (Percent Latino) + γ_{08} (Alternative School) + u_{0j}

Since areas of high poverty are often correlated with a greater concentration of minority populations, we test for multicollinearity. For our sample the correlation between percent poverty and percent black, which are both school-level variables, equals 0.58. This signifies a moderate degree of correlation. Meanwhile, the variance inflation factor (VIF) equals 1.50, well below the 10.0 threshold.

There are factors that affect student performance, which we have not addressed in this analysis (such as feeder school, parental education, etc.) and we recognize these as limitations. Despite this, we believe our analysis contributes to understanding some of the factors related to racial isolation and the achievement gap.

Results

While only 25% of school-age children in North Carolina are Black, the average Black ninth grader attends a school that is 46% Black (see Table 1). [6] In many segregated schools (i.e., those more than 50% Black), the mean Percent Black for high schools exceeds 60% (see Table 2).

Not only do many minority students attend predominantly Black schools, but the level of segregation in these schools is stark (see Table 2). For example, 8,353 ninth graders (6% of the sample) attend a school that is largely Black. The mean Percent Black for these severely segregated schools is 86% and the mean Percent Latino is five percent for a population that is at least 90% minority. This is all the more striking when one considers that a large portion of the state (e.g., the mountainous western region) is almost completely White.

[6] 2006-2008 American Community Survey.

Table 1
Descriptive Statistics for Entire Sample

	Black Mean	White Mean	Total Mean
Student-level			
Algebra I	148.40	155.80	153.50
English I	148.90	155.10	153.20
Black			0.31
Economic disadvantage	0.62	0.19	0.32
Male	0.46	0.50	0.49
Gifted Math/Read	0.04	0.17	0.13
School-level			
Teacher 0-3 yrs. %	0.25	0.21	0.22
Teacher 11+ yrs. %	0.49	0.53	0.52
Teacher Advanced Degree	0.23	0.25	0.25
Teacher Fully Licensed	0.87	0.91	0.90
Poverty %	0.44	0.32	0.36
Black %	0.46	0.20	0.28
Latino %	0.07	0.06	0.07
Alternative School	0.01	0.01	0.01
N			134,646

Table 2
Descriptive Statistics by Percent Black of School

	Percent Black/Quartile			
	<25% Mean	25-50% Mean	51-75% Mean	>75% Mean
Student-level				
Algebra I	154.81	151.91	148.95	146.64
English I	152.67	150.49	148.61	146.46
Black	0.13	0.40	0.62	0.84
Economic disadvantage	0.34	0.47	0.57	0.62
Male	0.53	0.53	0.53	0.56
Gifted Math/Read	0.10	0.08	0.04	0.02
School-level				
Teacher 0-3 yrs. %	0.20	0.24	0.28	0.31
Teacher 11+ yrs. %	0.54	0.51	0.45	0.44
Teacher Advanced Degree	0.26	0.24	0.22	0.21
Teacher Fully Licensed	0.91	0.89	0.84	0.77
Poverty %	0.29	0.42	0.55	0.65
Black %	0.12	0.38	0.60	0.86
Latino %	0.06	0.08	0.09	0.05
Alternative School	0.01	0.01	0.06	0.14
N	64,645	42,796	18,852	8,353

Student Performance Declines in Segregated Schools

Racial isolation has negative consequences on the academic performance of North Carolina students. Although the descriptive summaries do not control for covariates, they illustrate the essential patterns found throughout this analysis – patterns which show that racial isolation is associated with lower average test scores (see Table 2). More specifically, as schools become more racially isolated, mean End-of-Course scores decrease by eight points for Algebra I and seven points for English I. This outcome is to the disadvantage of those attending predominantly Black schools. Our findings corroborate the study by Henry et al. (2008), which found:

> …higher concentrations of poor and minority students within a high school reduce average EOC scores. In other words, low-income students perform worse on EOC exams when they are in schools with high percentages of other low-income students. Additionally, …a high percentage of African-American and American Indian students in a school also predict lower test scores.

Differences between Exam Scores for Black Students are Statistically Significant

We conducted t-tests and found that the differences in exam scores between Black and White students are statistically significant (see Tables 3A and B). White students average nearly 155 on Algebra I while Black students average 148 points. For English I, White students score approximately 153 while Black students score 147 points (for both exams, the range is 118-180.) We also conduct t-tests to examine differences in exam scores between Black students in racially integrated vs. racially isolated schools. A racially integrated or balanced school is defined as no more than 50% Black while an isolated school maintains a student population that exceeds this threshold. Our statistically significant results show Black students in isolated schools score five points lower on Algebra I and four points lower on English I End-of-Course exams (see Tables 3C and D).

Table 3A
Two-Sample t test for Algebra I

Group	Observations	Mean	Std. Err.	Std. Dev.	95% C.I.	
White	59,130	154.78	0.03	9.44	154.71	154.86
Black	22,934	147.79	0.04	8.50	147.68	147.90
Difference		6.98	0.07		6.84	7.12

Table 3B
Two-Sample t test for English I

Group	Observations	Mean	Std. Err.	Std. Dev.	95% C.I.	
White	74,345	152.90	0.03	8.68	152.84	152.96
Black	32,106	147.11	0.04	7.79	147.03	147.20
Difference		5.78	0.06		5.67	5.89

Table 3C
Two-Sample t test for Algebra I by Percent Black School Composition

Group	Observations	Mean	Std. Err.	Std. Dev.	95% C.I.	
Integrated	68,718	153.72	0.04	9.59	153.65	153.79
Isolated	13,346	148.29	0.08	8.99	148.14	148.44
Difference		5.43	0.08		5.25	5.61

Table 3D
Two-Sample t test for English I by Percent Black School Composition

Group	Observations	Mean	Std. Err.	Std. Dev.	95% C.I.	
Integrated	87,641	151.84	0.03	8.76	151.79	151.90
Isolated	18,810	147.99	0.06	8.46	147.86	148.11
Difference		3.86	0.07		3.72	4.00

Predominantly Black Schools Have a Lower Percentage of Qualified Teachers

Teacher qualifications are known to have a major effect on student success, and racially and economically isolated schools tend to have teachers who have less experience and lower levels of credentials or training, especially in the area of licensure. A 2005 study by Ladd et al., which also reviewed North Carolina Department of Public Instruction data, determined that:

> in any grade, a black student in North Carolina is more likely than a white student to be taught by a novice teacher. For example, a typical black 7th grader is 54% more likely to have a novice teacher in math than a white 7th grader, and is 38% more likely to have a novice teacher in English than a white student.

Our findings show this disparity was still evident in 2007-08. Across the state, the percentage of inexperienced teachers increases as the percent Black increases in the school (i.e., less than 3.1 years of teaching experience). Similarly, the percentage of veteran teachers decreases as the percent Black increases in the school (i.e., greater than 11 years of teaching experience). The disparity is severe at the most segregated schools. As illustrated in Table 2, nearly one-in-three teachers have taught less than four years in North Carolina schools which are more than 75% Black.

The same pattern holds for the (1) percentage of fully licensed teachers and the (2) percentage of teachers holding advanced degrees (school-level variables). We find that predominantly Black schools have a much lower percentage of teachers who are fully-licensed and a lower percentage of teachers with advanced degrees. More specifically, students attending such schools have fewer than one-in-five teachers with an advanced degree.

Multivariate Analysis Confirm Descriptive Quartile Findings

The patterns in Table 2 suggest that there is a negative relationship between racial isolation and ninth grade exam scores in Algebra I and English I. To extend and confirm this analysis, we estimate a set of Multi-Level (MLM) regression models. The models are estimated for ninth grade students and schools in the entire state. Algebra I and English I End-of-Course exam scores are the dependent variables in our model.

Student-level Characteristics

The MLM results show Black students score significantly lower relative to White students, the omitted group (Table 4). More specifically, Black students scored nearly five points lower in both Algebra I and English I, all else equal. Our findings also suggest Native American students score nearly three points lower on both exams while Latino students show minimal differences relative to White students. Consistent with previous research, we find that Asian/Asian American

students score higher than all groups in Algebra I by nearly three points. These students also score higher in English I. However, this difference is not practically significant. Finally, economically disadvantaged students score lower on both exams. Such students score two points lower on Algebra I and nearly three points on English I, all else equal.

School-level Characteristics

The MLM analysis shows *fully-licensed teachers* can significantly improve student performance by as much as 5.07 points for Algebra I and 3.24 points for English I. This means that as the percentage of teachers with licensure increases, test scores also increase. For example, a 20% increase in teachers with licensure at a school increases the average ninth grader's math score by approximately a point. These findings corroborate the High School Resource Allocation Study (Henry et al., 2008), which found that teachers with temporary, provisional, or emergency licenses are associated with lower EOC scores. The *teachers with advanced degree* estimate also shows a positive impact, all else equal. Note that in this case, "Advanced Degree" does not necessarily indicate that the degree is in the subject taught. Some studies indicate that having a degree in the subject taught further increases scores (see Rice, 2003; Wayne and Youngs, 2003). Although Harris and Sass (2011) do not find evidence for this, their results find support for advanced degrees in the area of middle school mathematics. Our results suggest the effect of an advanced degree is quite pronounced for English I with scores increasing by over two points if half of the teachers in the school maintain such a credential.

Characteristics of the student bodies of the schools also affect test scores. Consistent with Hanushek, Kain, and Rivkin (2009), we also find that an increase in the percentage of Black students significantly decreases individual students' Algebra I scores. We do not find a statistically significant effect for English I scores.

The MLM estimates also suggest that as the percentage of poor students in a school increases, individual students' performance on standardized tests decrease. More specifically, an increase of 50% of students in poverty lowers test scores by approximately one point in Algebra I and 1.70 points in English I. This is consistent with Borman and Dowling (2010), who find students attending high-poverty schools experience lower verbal achievement scores. Our results also confirm those of the US Department of Education, which found:

> …the level of poverty school wide also has an effect on an individual student's achievement--whether or not that student is in poverty. Research shows that test scores of all students, both poor and non-poor, decline as they are in schools with increasing numbers of fellow students in poverty. The U.S. Department of Education's Prospects report (Puma, Jones, Rock & Fernandez, 1993) finds that even though non-poor students perform consistently better than their low-income classmates, the performance of non-poor students nevertheless declines as the proportion of their classmates below the poverty line increases…. Overall, the report finds that "students in low-poverty schools score from 50 to 75 percent higher in reading and math than students in high-poverty schools" (Puma et al., 1993). Further, the report finds a "tipping point" of sorts, where school poverty begins to seriously effect student performance. (Stone et al. 1999)

Table 4
MLM for North Carolina 9th Graders

	(1) Algebra 1 Score b/se	(2) English 1 Score b/se
Student-level		
Black/African American student	-4.39***	-4.33***
	(0.16)	(0.12)
Latino student	-0.54***	-1.14***
	(0.13)	(0.11)
Asian/Asian American student	2.61***	0.43**
	(0.20)	(0.17)
Native American student	-2.93***	-3.24***
	(0.30)	(0.23)
Multi Racial student	-1.00***	-0.86***
	(0.18)	(0.14)
Economically Disadvantaged: Free/Reduced Lunch	-2.02***	-2.85***
	(0.07)	(0.05)
Limited English proficient student	-4.28***	-7.00***
	(0.18)	(0.14)
Academically Gifted in Math/Read student	9.75***	8.59***
	(0.09)	(0.08)
Male student	-0.03	-2.16***
	(0.06)	(0.04)
School-level		
Teaching Experience 0-3 yrs Percent	-1.90	-1.10
	(1.98)	(1.34)
Teaching Experience 11+ yrs Percent	0.68	-3.08**
	(1.66)	(1.12)
Fully Licensed Teachers Percent	5.07*	3.24*
	(1.99)	(1.36)
Teachers with Advanced Degrees Percent	2.50+	4.36***
	(1.42)	(0.96)
Percent poverty	-1.81*	-3.41***
	(0.71)	(0.48)
Percentage of Black Students in School	-2.79***	0.42
	(0.70)	(0.47)
Percentage of Latino Students in School	-1.26	0.11
	(2.20)	(1.49)
Black x percent Black	0.76*	0.36
	(0.38)	(0.29)
Alternative School	-6.12***	-4.19***
	(0.59)	(0.39)
Constant	150.13***	153.18***
	(2.18)	(1.47)
Log likelihood	-279826.07	-352499.42
Observations	80,316	103,859

Significance levels: + .10 * .05 ** .01 *** .001

The combined effects of students' individual characteristics and the overall composition of a high school's student population may be extremely powerful influences on the average level of academic performance in that school. To examine this, we include an interaction effect for Black students and percentage Black in the schools, which is denoted as *Black x percent Black*. Our results suggest this interaction has no significant effect on the English I scores and a practically insignificant effect on Algebra I scores.

Discussion

The Supreme Court indicated that some individual student characteristics may be used to achieve other forms of diversity, such as consideration of socioeconomic status and academic proficiency levels. These considerations often have the secondary effect of improving racial diversity. Our analysis suggests three complementary and key strategies for improving academic performance in North Carolina's high schools: (1) create school attendance areas that are racially and economically balanced; (2) require highly racially segregated schools to hire teachers who are fully-licensed; and (3) provide funding to hire teachers with advanced degrees. Although the school board may encounter difficulty in proposing (1), the latter two approaches may be feasible.

Henry et al. (2008) discuss the costs of solutions to address the problems of low-performing schools, including: extra funds to high schools that serve higher concentrations of students living in poverty.... Increasing expenditures for regular instruction—especially increasing compensation in order to recruit and retain more effective teachers –appears likely to produce performance improvements. An increase of expenditures for regular instruction of $1,000 per student could improve average EOC scores in a high school by about 1 point – one fifth of the difference between average scores in the state's lowest and highest-performing high schools.

One can assign a general dollar amount to the cost of racially isolated schools. If we add the loss in academic performance associated with racially isolated schools and then multiply by the cost of increasing average EOC scores by one point, we can approximate what it would cost to offset the penalty of attending these schools. As an example, consider Goldsboro High School in Wayne County. The total percentage of children in Wayne County enrolled in the FRPL program in 2007 was 66% while Goldsboro High School's FRPL enrollment was 81%, for a difference of 15 percentage points. [7] As shown above, Algebra I scores decrease 2.02 points for economically disadvantaged students (see Appendix, Table 4). Using Henry et al.'s cost of $1,000 per student to increase average EOC scores by one point, we can assign a cost for racial and economic segregation. A crude approximation suggests .15 x 2.02 x $1,000 x 616 students = $186,648 for the 2007-2008 academic year. These short-run costs may be a worthwhile investment given work by Levin et al. (2007). These scholars undertake a comprehensive analysis regarding the costs and benefits of academic performance (in this case, high school graduation). They conclude a *net benefit* of $166,000 per 20-year-old graduated Black male. In sum, the long-term gains exceed the up-front costs.

In addition, there are other costs of attending racially and economically isolated schools, such as higher dropout rates and the well-documented social costs associated with lack of success in school. For example, recent work by Palardy (2013) found a significant and positive association with socioeconomic segregation and high school graduation. More specifically, students attending schools with a high socioeconomic composition were much more likely to attend a 4-year college. Palardy's (2013) work offers additional support for our analysis because his conclusion highlights school

[7] Kids Count Data Center, Anna E. Casey Foundation, http://datacenter.kidscount.org/data/bystate/Map.aspx?state=NC&ind=2239 accessed 1/11/10.

integration as a policy instrument for overcoming the adverse outcomes associated with socioeconomically segregated schools.

Finally, these are costs that are being borne by everyone—the costs to society of not educating our children to succeed in a global economy. [8] These costs are incurred daily and can be inter-generational. Over the long-term, they also include long-term patterns of school failure and community instability. More immediate, short-term losses include monies spent to increase student performance (Henry et al., 2008) and higher teacher turnover and the costs associated with training new teachers.

Primarily, however, these are costs paid by students' who attend racially isolated schools. And there is a greater likelihood that economically disadvantaged students will remain in such a condition during their life course. Hardaway and McLoyd (2009) shed light on this phenomenon by drawing on "extant research from the disciplines of psychology, sociology, and economics to identify linkages between individual, family, community, and structural factors related to social mobility for African Americans during the transition to adulthood" (page 242). Certainly, high school academic achievement is an integral component in social mobility and one way to escape poverty. If minority students do not receive an equal education, then breaking the cycle of intergenerational poverty may be unlikely.

Specific Policies for North Carolina

In addition to monetary resources, there are other strategies/policies specific to North Carolina. McMillen (2004) examines the impact of *school size* on achievement. This research is noteworthy because McMillen also employs the North Carolina Department of Public Instruction data, as well as End-of-Grade (EOG) scores, for the 1997-1998 high school cohort. His results suggest "the benefits of size at the high school level, however, appeared to accrue disproportionately (or in some cases entirely) to higher-achieving students, White students, and students whose parents had more education, especially in mathematics" (p. 18). The Common Core of Data (National Center for Education Statistics, US Department of Education) shows North Carolina high schools enrolled 984 students while the US averaged 752 during 1999 school year. For 2008, the year of our analysis, North Carolina high schools enrolled 996 while the US averaged 871. This is important to note because a small part of the achievement gap for North Carolina may be directly attributed to its larger school size relative to the nation. As McMillen (2004) suggests, creating a small-school atmosphere and undertaking a more varied approach to instruction could be beneficial to minority students. Although focusing on early mathematics achievement, Chatterji's (2005) analysis also indicates larger classes and school sizes adversely impact African American children's math scores.

Results from Wenglinsky's (2004) research provide additional solutions. For example, encouraging teachers to spend more time on task can improve math scores. In conjunction, "conducting routine exercises also proved helpful across the board" and "by emphasizing certain forms of instruction, school administrators can indeed succeed at closing the racial achievement gap in their schools" (p. 17). Chatterji (2005) also finds additional instructional time has a positive effect on reading and math scores for high poverty students. These pedagogical changes are imperative given the recent article by Mickelson et al. (2013). Results from their metaregression analysis suggest minority concentration is associated with worse outcomes in mathematics and this effect is even more pronounced as students' progress through their educational life course. As such, these scholars re-emphasize the importance of structuring a school's attendance pattern in order to create a diverse student body.

[8] On average, Low Performing and Priority high schools are spending about $105 per student on supplementary instruction and $456 per student on student services. (Henry et al., 2008).

Limitations

Although our analysis contributes to a better understanding of racial isolation and ninth grade student performance, we recognize data limitations do not allow us to control for some important characteristics. For one, we are unable to account for neighborhood attributes. This is a significant variable given recent work by Card and Rothstein (2007). Using scores from the Scholastic Aptitude Test (SAT) from 1998-2000, these scholars find school segregation has no independent effect on test scores. More specifically, model specifications that distinguish between both neighborhood and school show *neighborhood segregation* "has a consistently negative impact" on student achievement (p. 2158). Cook and Evans (2000) draw a similar conclusion using the National Assessment of Educational Progress (NAEP) scores from 1970-1988. In terms of our analysis, including neighborhood characteristics (e.g., poverty, racial composition, income, etc.) as another level to the MLM analysis would help distinguish if adverse performance on Algebra I and English I is due to the school or other factors.

Conclusion

Like the rest of the nation, North Carolina is moving towards segregated and economically isolated schools. The Supreme Court has approved school boards' ability to use a limited set of techniques to achieve racial integration (i.e., seek a race-conscious objective of integration) as long as assignment decisions do not turn on an individual student's race.

We find that attendance at racially isolated schools is associated with lower performance on both Algebra I and English I End-of-Course exams, and these associations are quantifiable and statistically significant. We also find that while teacher quality can improve performance, high quality teachers are less likely to be found at segregated schools. However, the North Carolina Department of Education can undertake several approaches to ensure Black students receive a more equal education. Some of these initiatives can be implemented in a relatively short timeframe (in one academic year) and may not require significant additional costs. In the long-run, this would benefit minority students and society-at-large.

References

Borman, G., & Dowling, M. (2010). Schools and inequality: A multilevel analysis of Coleman's Equality of Educational Opportunity data. *The Teachers College Record*, *112*(5), 1-2.

Brown, S. (1999). High school racial composition: Balancing excellence and equity. Paper presented at the meetings of the American Sociological Association, Chicago.

Card, D. and Rothstein, J. (2007). Racial Segregation and the Black-White Test Score Gap. *Journal of Public Economics*, 91: 2158-2184.

Chatterji, M. (2005). Achievement gaps and correlates of early mathematics achievement: Evidence from the ECLS K-first grade sample. *Education Policy Analysis Archives*, 13(46). Retrieved Jan. 10, 2012 from http://epaa.asu.edu/epaa/v13n46.

Clotfelter, C.T., Ladd, H.F., and Vigdor, J.L. (2009). The Academic Achievement Gap in Grades 3 to 8. *The Review of Economics and Statistics*, 91(2): 398-419.

Clotfelter, C. T. (2011). After "Brown": The rise and retreat of school desegregation. Princeton University Press.

Clotfelter, C.T., Ladd, H.F., and Vigdor, J.L. (2013). Racial and Economic Diversity in North Carolina's Schools: An Update. *The Sanford Working Paper Series*. Sanford School of Public Policy, Duke University.

Coleman, J.S., Campbell, E.Q., Hobson, C.J., McPartland, J., Mood, A.M., Weinfeld, F.D., and York. R.L. (1966). Equality of educational opportunity. Washington, DC: Government Printing Office.

Cook, M. D. and Evans, W.N. (2000). Families or schools? Accounting for the convergence in white and black academic performance. *Journal of Labor Economics*, 18(4): 729-754.

Grant, G. (2009). Hope and Despair in the American City: Why There Are No Bad Schools in Raleigh. Harvard University Press.

Hanushek, E.A., Kain, J.F., and Rivkin, S.G. (2009). New Evidence about Brown v. Board of Education: The Complex Effects of School Racial Composition on Achievement. *Journal of Labor Economics*, 27(3): 349-383.

Hardaway, C.R. and McLoyd, V.C. (2009). Escaping Poverty and Securing Middle Class Status: How Race and Socioeconomic Status Shape Mobility Prospects for African Americans During the Transition to Adulthood. *Journal of Youth Adolescence*, 38: 242-256.

Harris, D. N., & Sass, T. R. (2011). Teacher training, teacher quality and student achievement. *Journal of public economics*, *95*(7), 798-812.

Henry, G.T., Thompson C.L., Brown, K., Cunningham, E., Kainz, K., Montrosse, B., Sgammato, A., and Pan, Y. (2008). The High School Resource Allocation Study. Carolina Institute for Public Policy. University of North Carolina at Chapel Hill.

Holley-Walker, D. (2010). After Unitary Status: Examining Voluntary Integration Strategies for Southern School Districts. *North Carolina Law Review, 88,* 3, 877-910.

Ladd, H.F., Clotfelter, C. and Vigdor, J. (2005). Who Teaches Whom? Race and the Distribution of Novice Teachers. *Economics of Education Review*, Vol. l, 24(4).

Levin, H., Belfield, C., Muennig, P., and Rouse, C. (2007). The public returns to public educational investments in African-American males. *Economics of Education Review,* 26, 699-708.

McMillen, B.J. (2004). School size, achievement, and achievement gaps. *Education Policy Analysis Archives*, Vol. 12 (58). Retrieved Jan. 10, 2012 from http://epaa.asu.edu/epaa/v12n58/.

Mickelson, R.A. (2001). Subverting Swann: First- and Second-Generation Segregation in the Charlotte-Mecklenburg Schools. *American Educational Research Journal*, 38: 215.

Mickelson, R. A., & Nkomo, M. (2012). Integrated Schooling, Life Course Outcomes, and Social Cohesion in Multiethnic Democratic Societies. *Review of Research in Education*, *36*(1), 197-238.

Mickelson, R.A., Bottia, M.C., and Lambert, R. (2013). Effects of Racial Composition on K-12 Mathematics Outcomes: A Metaregression Analysis. *Review of Educational Research,* 83: 121-158.

Morris, J.E. and Monroe, C.R. (2009). Why Study the U.S. South? The Nexus of Race and Place in Investigating Black Student Achievement. *Educational Researcher*, 38: 21-36.

National Research Council. (2002). *Minority Students in Special and Gifted Education*. Committee on Representation of Minority Children in Special Education and Gifted Programs, Division of Behavioral and Social Sciences and Education. M. Suzanne Donovan and Christopher T. Cross, Editors. National Academy Press.

North Carolina Department of Public Instruction. Preliminary Report, (March 2000). Administrator and Teacher Qualifications and Training Needs, Alternative Schools and Programs.

North Carolina Department of Public Instruction. (2005). Alternative Learning Programs and Schools Standards and Implementation Procedures.

Orfield, G. (2001) Schools More Separate: Consequences of a Decade of Resegregation. *Civil Rights Project.* Cambridge, Massachusetts.

Orfield, G. and Lee, C. (2005). Why Segregation Matters: Poverty and Educational Inequality. *Civil Rights Project.* Cambridge, Massachusetts.

Palardy, G. J. (2013). High School Socioeconomic Segregation and Student Attainment. *American Educational Research Journal*, 50(4): 714-754.

Rice, J. K. (2003). *Teacher quality: Understanding the effectiveness of teacher attributes*. Economic Policy Institute, 1660 L Street, NW, Suite 1200, Washington, DC 20035.

Schofield, J.W. (1995). Review of Research on School Desegregation's Impact on Elementary and Secondary School Students. *Handbook of Research on Multicultural Education*. James A. Banks & Cherry A. McGee Banks eds.

Schofield, J.W. (2001). Maximizing the Benefits of Student Diversity: Lessons from School Desegregation Research. *Diversity Challenged: Evidence on the Impact of Affirmative Action.*

Stone, C., Orr, M. and Stumbo, C. (April 15-17, 1999). Five Princes and a Pauper. Paper presented at the Annual Meeting of the Urban Affairs Association, Louisville, KY.

Wayne, A. J., & Youngs, P. (2003). Teacher characteristics and student achievement gains: A review. *Review of Educational research*, *73*(1), 89-122.

Wenglinsky, H. (2004). Closing the racial achievement gap: The role of reforming instructional practices. *Education Policy Analysis Archives*, 12(64). Retrieved Jan. 10, 2012 from http://epaa.asu.edu/epaa/v12n64/.

About the Authors

Andy Sharma
University of Denver
andy.sharma@du.edu
Andy Sharma, PhD, MS, MA is the senior economist/policy analyst at the University of Denver. His research interests relate to population studies (aging, health, and migration), policy analysis, quantitative methods, and spatial analysis. He is the co-author of *Brave New World of Health Care Revisited,* which discusses the importance of education in improving population health and potentially limiting increasing health care costs.

Ann Moss Joyner
Cedar Grove Institute
Ann Moss Joyner, MBA, is president of Cedar Grove Institute, a non-profit social science research firm.

Ashley Osment
Center for Civil Rights at University of North Carolina at Chapel Hill
Ashley Osment, JD, was a staff attorney for the Center for Civil Rights. She was instrumental in bringing nationally prominent scholars of educational inequality with legal experts and activists across North Carolina. She was passionate about her work, which allowed her to engage with communities represented by low-income, African American, and Latino families across the state.

Acknowledgment

I would like to dedicate this work to Ashley Osment, who passed away on May 28, 2010. Although I never met her, I understand she was a caring and passionate individual in her professional life as the senior attorney at the Center for Civil Rights and in her personal life as wife and mother. I would also like to acknowledge Tim Van Acker and Jessica Pearlman at the Carolina Population Center for assisting with data management. In addition to thanking the editorial team and reviewers at *EPAA* for their commitment and hard work, I would like to recognize Jeanne Powers for her encouragement and support.

Andy Sharma

education policy analysis archives

Volume 22 Number 14 March 10, 2014 ISSN 1068-2341