THE UNIVERSITY OF CHICAGO

A NATIONAL ASSESSMENT OF SCHOOL DISTRICT VARIATION IN BLACK STUDENT ACADEMIC ACHIEVEMENT

A DISSERTATION SUBMITTED TO

THE FACULTY OF THE CROWN FAMILY SCHOOL

OF SOCIAL WORK, POLICY, AND PRACTICE

IN CANDIDACY FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

BY

DARNELL LEATHERWOOD

CHICAGO, ILLINOIS

DECEMBER 2021

DEDICATION

For Family,

the loves of my life.

For the People,

we are our own best solution.

For Progress,

for young lives deserve more than incremental change,

they deserve revolution.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ACKNOWLEDGEMENTS

It is with deep sincerity that I say thank you to the many who have assisted me along this journey. Professor Payne, you have been a consistent mentor and example. I have the deepest respect for your character, care, and work. Your towering status as an intellectual is complemented by a remarkably humble spirit and clear dedication to justice. I am proud to call you teacher, and because of you, I have the light of freedom. Professor Raudenbush, working with you has been one of the great joys of my life. I have learned so much from you. It almost seems unfair that I would be blessed with such amazing mentorship during my time at the University of Chicago. You have poured into me, taught me, and allowed me to bring my authentic self into all our engagements. You have spent countless hours working closely with me to ensure that this work is not only thorough but also impactful and substantive. Thank you for seeing me as more than a researcher. Thank you for caring about my family, my wellbeing, and even my aspirations that transcend academic spaces. Thank you from the bottom of my heart. Professor Henly, I am deeply appreciative of you stepping in at a most critical moment in my process. You have been a voice of reason, held me accountable, and supported this work in a way that reflects your commitment not only to me but all the doctoral students at Crown. May I also support students in ways that support them realizing their goals and aspirations.

In addition to the love and support of my committee, I am floored by the love and support of my family during this process. I want to take a moment to write to my sons. Darnell and Kian, you both inspire me to greatness. You are brilliant, strong, beautiful, kind, resilient, honorable, and so much more. I am so proud to be your dad. This excellence, my boys, is on purpose. You will surpass me but, in the meantime, watch your dad work. Thank you, Mom, Toosie, Janie, Edgar, and Chris, for always believing in me. Your support and accountability made the difference. In particular, thank you, Mom, for making sure I was actually writing, and thank you, Chris, for our dissertation accountability group. Thank you, Janie, Jackson, and Grandma, for loving me. May you rest in peace.

Finally, I am grateful to the following individuals who have seen me to and through this work: Drs. Margaret Beale Spencer, Melissa Roderick, Deborah Gorman-Smith, Dexter Voisin, Waldo Johnson, Muh-Chung Lin, William Trent, and Olanipekun Laosebikan. I am honored to do this work and thankful to all those who have assisted in bringing this moment to fruition. Onward to service . . . all Glory to God.

ABSTRACT

Black student academic outcomes have been examined in a plethora of innovative and interesting ways. Scholars have examined Black student outcomes such as academic identity (Welch & Hodges, 1997), student belongingness (Booker, 2007), student connectedness (Voight et al., 2015), and student grit (Strayhorn, 2014). However, no Black student academic outcome in the United States is discussed more widely than Black student academic achievement on standardized test scores, and typically in the context of the racial/ethnic achievement gap. We know that there are differences in average academic achievement between Black students and other racial/ethnic groups (Reardon et al., 2019). However, often overlooked are two facts: (a) there is more heterogeneity in academic outcomes within racial/ethnic groups than between them, and (b) students from racial/ethnic backgrounds find themselves in a diversity of educational spaces nationally. Examining this heterogeneity may broaden our understanding of Black student academic outcomes.

In this study, I analyzed standardized test score data from the Stanford Education Data Archive version 2.1, which also includes population data on educational contexts and outcomes for public school districts in the United States, to address the following two research questions: (1) How much do districts vary with respect to the academic outcomes of the Black students they serve? (2) What school and environmental factors are correlated with Black student academic outcomes. I studied academic outcome in three ways in this dissertation to describe in as much detail as possible the educational productivity of Black students in the United States and to combat the pitfall of heralding grade-level academic achievement as the single marker of Black student academic success. In particular, I examined average district level Black student academic achievement (grade level achievement), average district level Black student improvement rate

(the rate at which scores change across student cohorts, within a grade), and average district level Black student learning rate (the rate at which scores change across grades, within a student cohort).

For Black students grades 3-8 for academic years 2008/2009-2014/2015 on standardized test scores in both mathematics and English language arts, I found substantial heterogeneity in average district-level Black student academic achievement, average district-level Black student improvement rate, and average district-level Black student learning rate nationally. Across the approximately 3000 districts in the United States that service Black students and report Black student academic outcomes, 95% of these districts reported average district-level Black student academic achievement between the 2.5 and 6.0 grade levels, average district-level Black student improvement rate between −0.169 and 0.203 (average per year grade-level improvement for students in the same grade across cohorts), and average district-level Black student learning rate between 0.65 and 1.17 (average per year grade-level improvement for students in the same cohort across grades).

Additional findings in this study suggested there are correlates to district-level Black student academic outcomes for Black students grades 3-5 for academic years 2008/2009-2014/2015 on standardized test scores in mathematics. Key predictors of interest included in this study were composite indices of district location (reference group: urban districts), district racial composition (reference group: proportion Black students in district), district size, district resources, Black concentrated advantage of district, and Black concentrated disadvantage of district. There were several statistically significant predictors associated with each of the 3 academic outcomes of interest. Where there is some overlap there are unique associations for each of the outcomes.

Districts as educational units varied on Black student academic outcomes in important ways. These findings expand a sparse literature on the role of districts in student academic achievement (Whitehurst et al., 2013). Districts varied substantially on Black student academic outcomes. Additionally, school and environmental factors appear to be associated with these differences in various ways and magnitudes. Further research is needed to deepen the understanding of district-level variation in student academic outcomes and the potential to leverage resources and opportunities at the district level to best support students nationally.

The research reported here was supported by the Institute of Education Sciences, U.S. Department of Education, through Grant Number: R305B140048 at the University of Chicago. The opinions expressed are those of the author and do not represent views of the Institute or the U.S. Department of Education.

CHAPTER ONE INTRODUCTION

1.1 Problem Statement and Significance

School districts (districts) in the United States public school system have a considerable amount of autonomy over such things as the distribution of resources among schools, instruction, student assignment, teacher hiring, and curricula. In part, due to this autonomy, variation in academic achievement is broad across districts, and variation in racial/ethnic disparities in academic performance is broad within and between districts (Reardon et al., 2019; Reardon, 2016a). District management is also largely autonomous and may influence differences in the academic performance of students (Childress et al., 2007; Elmore, 2007). Beyond differences at the district level, we know from intervention research that some teachers are far more effective than others in teaching Black children and that some schools are especially effective for Black children (Hassrick et al., 2017).

The question of concern in this dissertation was whether entire districts are especially effective (or ineffective) for Black children. Some districts may be educating Black children really miserably, while others are doing much better. If so, this challenges individual- and school-level arguments for the success or challenge of Black student educational progress. The poor outcomes of some Black students may be attributable to the deeply troubled districts in which they attend school, just as the positive outcomes of other Black students may be fueled by positive actions at the district level. If so, this would be new evidence suggesting that overcoming low achievement among Black students can occur systemically, on a larger scale than the individual, family, or school level. This should motivate an intense search to understand how entire districts can organize themselves to encourage academic learning on a comparatively large scale. This would not only contribute to what is known about the impact of districts on the academic achievement of Black students, filling a gap in the extant literature, but may also have implications for the level at which policy interventions should occur.

Bearing that in mind, we know there are differences in average academic achievement between Black students and other racial/ethnic groups (Reardon et al., 2019). However, often overlooked are two facts: (a) there is more heterogeneity in academic outcomes within racial/ethnic groups than between them, and (b) students from racial/ethnic backgrounds find themselves in a diversity of educational spaces nationally. In literature concerning district influence on student academic achievement, the academic outcomes of Black students are often examined as a monolith and/or used as a means of comparison, usually presenting said academic outcomes through a lens of failure and/or deficit (Henderson-Hubbard, 2013; Howard, 2013; Williams et al., 2020). Additionally, it is often given that Black students attend schools with other Black students (Tatum, 2017). This dissertation pushed past these assertions by delineating variation in the educational experience and outcomes of Black students nationally. A monolith no more, what happens to the American imagination when national academic outcomes of Black students are described with nuance and in context, statistically? This study begs the question.

Given that heterogeneity exists in academic achievement within racial/ethnic groups (Davis-Kean & Jager, 2014; Reardon, 2011), a key question becomes whether such variation reflects variability in the educational input children receive in classrooms, schools, and districts as opposed to variation in the internal qualities of the students themselves or their families. To answer this question, we must reckon with the fact that the most advantaged students (in terms of family background or neighborhood resources) are those who send their children to schools that show good results (Lareau & Goyette, 2014). In this case, the apparent effectiveness of certain districts may be attributable to these advantages and not to the superior educational inputs the children receive. However, if some districts display particularly good results for students whom we would expect, based on national data, to perform much less well, then we would be keenly interested in how these districts carry out their work.

1.2 Dissertation Goals and Study Aims

The objective of this study was to describe and assess district variation in Black student academic achievement, improvement rate, and learning rate. This includes delineating nationally where and under what conditions are districts doing well given these Black student academic outcomes. Additionally, given a search for higher-performing districts for Black students, this study assessed average district-level Black student academic outcomes that may speak to the effectiveness of entire districts for Black students and potentially aid in providing evidence for district-level interventions that intend to buttress the educational experiences and academic outcomes of millions of students nationally.

Using population data from the Stanford Education Data Archive (SEDA), this study delineated district level Black student academic achievement (grade level achievement), average district level Black student improvement rate (the rate at which scores change across student cohorts, within a grade), and average district level Black student learning rate (the rate at which scores change across grades, within a student cohort). While its primary goal was not to provide a causal explanation, this dissertation also assessed which school and environmental factors were related to these three district-level measures of Black student academic outcome. Key predictors considered were composite indices of urbanicity, racial composition, district size, school resource, community advantage, community disadvantage and have been selected based on extant literature. On the former objective, I not only assessed variation in average district-level Black student academic outcome but also identified high-performing districts (with respect to my three outcomes of interest. This work was conducted in the spirit of the classic work of Ronald

Edmonds (1979). Where he searched for unusually effective schools, I searched for unusually effective districts for Black students (I call them higher-performing districts in this dissertation).

By highlighting heterogeneity in average district-level Black student academic outcome nationally, this study contributes to discourses centered on improving educational opportunity and reducing educational inequity and inequality. This study may serve as a launching point for rigorous analysis of heterogeneity in educational outcomes for groups historically treated as monolithic with the expressed intent to strengthen educational opportunities for students by intervening at the system level.

1.3 Research Questions

Student populations belonging to historically marginalized groups are often overrepresented in conditions associated with depressed academic achievement and/or live in impoverished conditions (Reardon, 2011). That said, Black student populations are often viewed as a monolithic group, but it can be suggested that they are not, and there might be important subgroup differences that can yield important insights. This study addressed the following specific research questions:

(1) How much do districts vary with respect to the average academic achievement, average improvement rate (the rate at which scores change across student cohorts, within a grade), and average learning rate (the rate at which scores change across grades, within a student cohort) of the Black students they serve?

(2) What school and environmental factors are correlated with average district-level Black student academic achievement, average district-level Black student improvement rate, and average district-level Black student learning rate?

In accordance with research question one, analyses were conducted to identify heterogeneity in the average district-level Black student academic achievement, average district-level Black student improvement rate, and average district-level Black student learning rate using a two-level hierarchical linear model (Bryk & Raudenbush, 1992; Raudenbush & Bryk, 2002). Investigating this heterogeneity was important in helping delineate the national context of Black student academic outcomes.

In accordance with research question two, a three-level hierarchical linear model (Bryk & Raudenbush, 1992; Raudenbush & Bryk, 2002) was used to assess the correlation of school and environmental factors and their influence on average district-level Black student academic achievement, average district-level Black student improvement rate, and average district-level Black student learning rate. This analysis revealed the relationship of school and environmental factors to district-level Black student academic achievement, average district-level Black student improvement rate, and average district-level Black student learning rate.

1.4 Organization of Dissertation

This dissertation is organized into six chapters. Chapter One introduces the problem statement, specific objectives, and research questions guiding the work in this study. Chapter Two presents extensive literature on district-level variation in student academic achievement and the relationship of school and environmental factors to said variation. Research questions and hypotheses are described in Chapter Three. The methods, including study design, sample, measures, and analytic plan, are presented in Chapter Four. Chapter Five describes the dissertation findings. Chapter Six reviews key findings in light of the study limitations, highlighting the contributions to the literature and implications for scholarship and practice.

CHAPTER TWO LITERATURE REVIEW

Historically, Black students have been compared to White students on academic outcomes in standardized test scores, the race difference that is observed is often referred to as the racial achievement gap (Reardon et al., 2014). Taking that into account, when we think about the perpetuation of negative stereotypes and caricatures of Black life, we often think of overt expressions of structural, institutional, interpersonal, and internalized racism (Jones, 2000; "Race forward," 2015) and their direct link to the perpetuation of these stereotypes at various levels of the ecological systems (Bronfenbrenner, 1992) of Black people. Some may also specify media as another primary perpetuator of said negative stereotypes (Nicolas et al., 2008). However, what may also be true is that academics have aided in the distribution of damning characterizations of Black student potential, capacity, and accomplishment. Empirical research on the racial achievement gap, which is often touted as rigorous and objective (Howard, 2013), often attributes an outsized role to individual and cultural explanations while ignoring the historical, sociopolitical, institutional, and interpersonal racism shaping Black educational experience.

Nevertheless, some scholars have delineated the academic experience of Black students and engaged Black student academic outcomes from a strengths-based perspective (Brooms, 2016; Butler-Barnes et al., 2013; Harper, 2009; Nicolas et al., 2008; Warren, 2021). This strengths-based work is more often qualitative than quantitative in approach. I aim to fill this gap in extant quantitative literature and contribute to the study of student academic achievement in innovative, contextualized, and affirming ways. I do so by examining district level heterogeneity and identifying high performing districts that serve Black students.

I included three district-level Black student academic outcomes in this dissertation to describe in as much detail as possible, and from a strength-based perspective, the educational productivity of Black students in the United States and to combat the pitfall of heralding grade-level academic achievement as the single marker of Black student academic success. It can be argued that examining whether changes are occurring over time may point to strengths or weaknesses that one cannot see with a cross-sectional outcome. Focusing on a number of academic outcomes can extend the literature on the national context of Black student academic outcomes. This may be important for policy/practice because it informs potential points of intervention across multiple contexts of district-level Black student academic outcomes. Heterogeneity of Black student academic outcomes may imply heterogeneity of policies.

2.1 District Variation in Academic Outcomes

2.1.1 District Variation in Academic Achievement

Districts have been and continue to be located in popular discourse concerning education reform. However, according to Whitehurst et al. (2013):

> Little is known about the impact of school districts on student achievement. And what seems to be known rests on a highly questionable set of methods and assumptions. Among the handful of studies that have addressed the importance of school districts, most have focused on district leadership" (p. 5)

Whitehurst et al. (2013) used population data to assess the relationship of districts to student academic achievement for students in Florida and North Carolina. Using data from the Florida Department of Education's K-20 Education Data Warehouse and the North Carolina Education Research Data Center, they obtained observations for every student who took state assessments in mathematics and reading from 1998/1999 to 2009/2010 in both Florida and North Carolina. Limiting their analysis to students in fourth and fifth grade, they used variance decomposition techniques based on hierarchical linear modeling to measure how much student achievement varied at different levels (i.e., students within classrooms, classrooms within schools, schools within districts, and districts within Florida and North Carolina). Via their four-level hierarchical linear model, they found that districts accounted for 1-2% of the total variation in student achievement. However, the difference between lower- and higher-performing districts accounted for ~ 9 weeks of schooling (1 *SD* difference in district effectiveness corresponded to about 0.11 *SD*s in student achievement). This substantial difference did not imply that districts were unimportant.

More recently, Fahle and Reardon (2018) authored the first academic paper using population-based evidence to delineate variation in standardized test scores among public school districts within each state. Using ~300 million test score records in mathematics and English language arts (ELA) from grades 3-8 from every U.S. public school district during the 2008/2009-2014/2015 school years, they estimated intraclass correlations as a measure of between-district variation in academic achievement via standardized test scores. Fahle and Reardon (2018) found that between-district variation was greatest in states with high levels of racial and economic segregation. That said, according to Fahle and Reardon (2018), "There is little work, however, exploring how much between-district test score variations exist and what factors explain this variation. Only one paper to our knowledge uses population data from a set of states to estimate between-district variation" (p. 6) and does not explore the relationship of explanatory factors and this variation. That study was conducted by Hedberg and Hedges (2014), who examined between-school and between-district intraclass correlations (ICC) in a single year for 11 states, across multiple grades and 2 subjects (i.e., mathematics and ELA).

Hedberg and Hedges (2014) found that between-district ICCs are generally smaller than between-school ICCs and that meaningful variation exists among states in between-district ICCs. In some states, average student performance was quite uniform but in others, quite heterogeneous. Additionally, they found that ICCs were generally larger in mathematics than in reading and that between-district ICCs were on average larger in later grades than earlier ones. As stated above, Hedberg and Hedges (2014) did not explore the relationship of explanatory factors and this variation. Given the work of Hedberg and Hedges (2014), Whitehurst et al. (2013), and Fahle and Reardon (2018), there seem to only be a handful of papers that used population data to estimate between-district variation in academic achievement. Only the Fahle and Reardon (2018) study used population-based evidence to explore the relationship of explanatory factors and district-level variation among school districts in every state.

2.1.2 District Variation in Improvement Rate

Reardon and Hinze-Pifer (2017) showed in their report from the Stanford Center for Education Policy Analysis that students grades 3-8 for academic years 2008/2009-2014/2015 in the Chicago Public School district (CPS; the third largest district in the nation with ~370,000 students) improved substantially more than that of the average student in the United States in test scores across successive student cohorts. This was also true across racial/ethnic groups. They also highlighted that more recent cohorts of CPS students in grade three have higher mathematics and ELA skills than earlier cohorts of CPS students in grade three.

2.1.3 District Variation in Learning Rate

Using a sample of 11,315 districts, Reardon (2019) showed that there was variation in what he termed the growth rate (referred to as learning rate in the present study). The learning/growth rate is the rate at which scores change across grades, within a cohort of students grades 3-8 for academic years 2008/2009-2014/2015 nationally. He showed that the third-grade growth rate was around 0.97 grade level per grade nationally, and third-grade average score and growth rate had a very weak but negative correlation. This means that the average score explained little to nothing about the growth rate for students' academic outcomes nationally. He noted that across districts, average growth rates varied considerably. Additionally, Reardon and Hinze-Pifer (2017) showed that students in CPS grade 3-8 for academic years 2008/2009-2014/2015 had a growth rate higher than 96% of all school districts in the United States and among the 100 largest school districts in the country, CPS had the highest growth rate.

The learning rate was predicated on assumptions regarding changes in the school population over time. Reardon and Hinze-Pifer (2017) could not account for misleading estimates based on the possibility that students may move in and out of the district, one year to the next, because they did not have student-level data. To deal with this, they examined retention data and student demographic changes across time and grade in Chicago.

This dissertation fills gaps in the extant literature by describing and explaining district level heterogeneity in student academic outcomes for a specific racial group nationally. I did this using population data. I also assessed school and environmental factors and their association to average district level Black student academic outcomes.

2.2 Relation of Academic Outcomes and School and Environmental Factors

Literature pertinent to the six key predictors of interest in this study and their relationship to student academic outcome is reviewed here. I did not restrict this review only to studies examining the impact of school and environmental factors on district-level student academic achievement because there was a dearth of studies at the district level. Considering that, instead of restricting this review, I included studies that may provide evidence that makes selecting these predictors of interest reasonable for my analysis. Though most of these studies were not elevated to the district level, they examined schools, classrooms, teachers, students, families, neighborhoods, etc. These all made up the educational unit assessed in this study—districts.

The six predictors of interest include composite indices of district location (urbanicity), district racial composition, district size, district resource, Black concentrated advantage of district, and Black concentrated disadvantage of district. The literature on the relationship of student academic outcomes and school and environmental factors can be contentious. In many cases, the correlations are not in doubt, but the causal interpretations regarding the effects of school and environmental factors on student academic outcomes are debated. In this study, I examined correlates and did not deal directly with the question of causality. Correlation without causation is interesting because correlation allows for the opportunity to make predictions. The higher the correlation, the more accurate the prediction. Additionally, even though correlation does not imply causation, causation implies correlation. Evidence from a correlational study may give credence to conducting a study with an experimental research design.

2.2.1 Urbanicity

I included urbanicity in my examination of the factors that may influence average district-level Black student academic outcomes in U.S. public school districts because geographical settings have been shown to be associated with academic outcomes (Reardon, 2016a). According to the National Center for Education Statistics Common Core of Data, districts can fall into one of four geographic categories: urban, suburban, town, and rural. Urban is defined as a territory inside an urbanized area and inside a principal city. Suburban is defined as a territory outside a principal city and inside an urbanized area. A town is defined as a territory inside an urban cluster (an urbanized area with a population between 2,500 and 50,000). Rural is defined as Census-defined rural territory.

Utilizing SEDA version 2.1, across the ~13,600 districts where there were data on district location/urbanicity, Black students can be found in sizable numbers across districts in each geographic area. On average, between academic years 2008/2009-2014/2015, there were over 1.6 million Black students in urban districts, 1.2 million Black students in suburban districts, 250 thousand Black students in districts located in towns, and 440 thousand Black students in rural districts (see Table 2.1).

Table 2.1

National District Demographics by Urbanicity

	Urbanicity			
	Urban	Suburban	Town	Rural
Percent of U.S. districts	5.9%	19.8%	17.9%	56.4%
Number of all students	6,808,027	8,305,292	2,620,918	4,434,394
Number of Black students	1,664,518	1,214,151	262,466	441,182
Percent of Black students	24.4%	14.6%	10.0%	9.9%

Table 2.1 provides evidence that Black students find themselves in a diversity of educational spaces nationwide, and this diversity of location may imply diversity of average district-level Black student academic outcomes.

2.2.2 Racial Composition

Given the segregated nature of schooling for Black students in the United States (Owens, 2018; Reardon, 2011), the racial composition may matter in understanding heterogeneity in average district-level Black student academic outcomes. Even though the effects of school segregation are challenging to estimate, evidence suggests that school segregation has the potential to increase differences in racial, educational outcomes and adult income (Ashenfelter et al., 2005; Card & Rothstein, 2007; Guryan, 2004; Johnson, 2011; Reardon, 2016a). Racial segregation is also linked to racial differences in family economic circumstances (Ananat & Washington, 2009; Card & Rothstein, 2007; Cutler & Glaeser, 1997; Lareau & Goyette, 2014). On average, Black and Hispanic children live in much poorer neighborhoods than expected based on family income, relative to the White child reference group (Logan, 2011; Pattillo, 2013; Sharkey & Faber, 2014), and these racially segregated poorer communities tend to have weaker non-school social institutions (e.g., safe parks, clubs, high-quality child care; Small & McDermott, 2006).

Reardon et al. (2019) estimated racial/ethnic achievement gaps across the United States using data from several thousand school districts, which enrolled 92-93% of the Black and Hispanic populations attending public schools. Analyzing approximately 200 million standardized mathematics and ELA test scores, they found that the strongest correlates of achievement gaps were local racial/ethnic differences in parental income and educational attainment, local average parental educational levels, and racial/ethnic segregation patterns. Additionally, two-thirds of all racial/ethnic school segregation is due to between-district patterns of segregation (Reardon et al., 2000; Stroub & Richards, 2013). Thus, the racial composition of districts may matter and I included this in my analysis to further engage the question of its influence on the academic achievement of Black students.

2.2.3 District Size

In the United States, districts can differ vastly in size and that variation may influence between- and within-district academic opportunities and outcomes (Reardon et al., 2019). The number of school districts fell dramatically between 1940 and 1990. This decrease in school districts occurred because of nationwide school district consolidation efforts (Strang, 1987). This begs the question of the influence of district size on district-level Black student academic outcome.

According to Driscoll et al. (2003), district size may have two confounding impacts on student academic achievement. First, if district-level decisions limit the autonomy of local schools, then perhaps the larger the district, the less likely students in large districts will have their heterogeneous needs met. Second and conversely, a centralized administration may provide large districts with the infrastructure to allocate greater resources to classroom instruction. In their study examining the impact of district size on student academic achievement in California, Driscoll et al. (2003) found that district size may hinder academic achievement, with the largest impact being on middle school academic achievement. The authors used standardized test score data from the California Department of Education to assess the relation of district size to student academic achievement on standardized test scores. Controlling for student characteristics and environmental factors they found that the larger a district the lower the standardized test scores of students in California.

Kiesling (1967) examined the relationship between district size and academic achievement for 100 school districts in New York State. Depending on grade, he found either no effect or a negative effect on academic achievement. Kiesling did not include environmental factors in his analysis. Additionally, utilizing a sample of 293 high schools in New Jersey, Fowler and Walberg (1991) found that district size is negatively related to academic achievement (test scores). Similarly, in a study including samples from 38 states, Walberg and Walberg (1994) found that district size is inversely related to achievement, while Diaz (2008) found that for 82 school districts in Washington State, there was no statistically significant association between district size and academic achievement. Hirsch (1968) argued that the very conditions that aid private industry to benefit from economies of scale may hinder the ability of large districts to move forward. He further noted that bureaucracy and unions in districts may produce diseconomies of scale.

2.2.4 School Resources

The influence of school resources (e.g., pupil funding, number and variety of school personnel) on academic achievement has been contested in the extant literature (Greenwald et al., 1996; Hanushek, 1994). Some scholars have argued that resources matter, while others argued their role has been overemphasized. I attend to both positions. The relationship between resource inputs and school outcomes, like student academic achievement, has been debated in the literature. Some scholars argued that resource inputs have little if any impact on school outcomes, especially when controlling for socioeconomic status. Given the education production function, the combination of school and family factors (inputs) that produce a given set of outcomes (typically measured by achievement scores and graduation rate), Hanushek (1994, 2010) argued that the accumulated research surrounding estimations of the education production function does not reveal a relationship between resources and student outcomes.

Conversely, empirical evidence suggests that resource inputs are correlated with student academic achievement and are directly related to teacher quality, school resources, and services (Hedges et al., 1994; Thorson et al., 2005). Hedges et al. (1994) via meta-analysis found a systematic positive relationship between resource inputs and school outcomes. Again in 1996, Greenwald et al. conducted a meta-analysis of the universe of studies that utilized the education production function to assess the relationship between school inputs and student achievement. At the district level, they found that school resources were positively related to student outcomes. Again in 1997, Hanushek (1997) rebutted that via his meta-analysis of over 400 studies; there is no strong or consistent relationship between school resources and academic outcomes. Given the mixed and contested literature, it seems only appropriate to assess the influence of school resources on average district-level Black student academic outcomes. Understanding the influence of school resources on average district-level Black student academic outcomes adds to this debate and what we know about the role of school resources in the lives of Black students.

2.2.4.1 Per-Pupil Funding

School districts with majority-minority student populations are, on average, poorer and receive less per-pupil funding than school districts with majority White student populations (Reardon, 2016b). With that in mind, according to a recent literature review by Jackson (2020):

> The recent quasi-experimental literature that relates school spending to student outcomes overwhelmingly support a causal relationship between increased school spending and student outcomes. All but one of the several multi-state studies find a strong link between spending and outcomes, indicating that money matters on average. Importantly, this is true across studies that use different data sets, examine different periods, rely on different sources of variation, and employ different statistical techniques. While one can poke holes in each individual study, the robustness of the patterns across a variety of settings is compelling evidence of a real positive causal relationship between increased school spending and student outcomes on average. However, an examination of single-state studies suggests that, on average, money matters, but that this is not always so in all settings or in all contexts. (p. 13)

2.2.4.2 Teacher-Student Ratio

The teacher-student ratio has long been thought to impact the academic achievement of students. As highlighted by McMillian (2016), “The Institute of Educational Sciences, which is the research division of the U.S. Department of Education, determined, through randomized experiments, that class size reduction was one of only four evidence-based reforms proven to increase student achievement” (p. 13). The other three reforms include one-on-one tutoring in first through third grade, life skills training in middle school, and phonics instruction for early readers. According to Frank (2010), class size reduction or improved teacher-student ratio has been debated in the literature for decades. Districts have spent millions of dollars to fund mandates to set a maximum number of students per teacher/class, and states have even passed constitutional amendments to set student per teacher/class maximums. The “golden mean” is generally delineated as 20 students per teacher, but lower elementary grades try to keep the ratio even lower. Not only has the teacher-student ratio been a focal point of some scholars, but the belief that a reduced teacher-student ratio improves academic achievement is well supported by government officials and the general public (Strauss, 2010).

Additionally, Shin and Raudenbush (2011) reanalyzed data from the Tennessee Student/Teacher Achievement Ratio study of 1985 via a three-level multivariate simultaneous equation model with an instrumental variable and estimation via maximum likelihood to analyze the data under an assumption of data missing at random. Their findings supported the hypothesis that reduced class size improved academic achievement, and this sentiment is expressed via multiple other studies (see Finn & Achilles, 1990; Goldstein & Blatchford, 1998; Goldstein et al., 2000; Krueger, 1999; Krueger & Whitmore, 2001; Mosteller, 1995; Nye et al., 1999, 2000). However, opposing views exist concerning this hypothesis (see Hanushek, 1999; Milesi & Gamoran, 2006). Shin (2012) also provided causal evidence that Black students benefit more than other racial groups from smaller class sizes. From kindergarten to third grade, this was true across four outcomes (i.e., reading, mathematics, listening, and word recognition skills). He also found that these outcomes were homogenous across schools.

2.2.4.3 Teacher Aides

Evidence presented in the extant literature on the impact of teacher aides on student academic outcomes is mixed. Park (1956) analyzed the Bay City Michigan Teacher's Aide experiment and found no impact of teacher aides on student academic outcomes for similarly sized classrooms. Additionally, using data from the Teacher Achievement Ratio study, Krueger (1999) did not find a statistically significant impact of teacher aides on his model's average percentile student test scores. Gerber et al. (2001) used a hierarchical linear model to assess data from Project STAR and found few statistically significant differences in ELA test scores and no difference in mathematics test scores between classes with and without teacher aides.

With that said, Goralski and Kerl (1968) conducted an experiment in Minneapolis Public Schools meant to assess the effectiveness of teachers aids on the reading readiness of kindergarteners. They compared three groups of three classes each: one group without a teacher aide, one group with one teacher aide, and one group with five teacher aides. They found that the presence of one teacher aide in a classroom had benefits for kindergarten reading readiness scores. Using an experimental design, Penney (2018) randomized kindergarten and first-grade teachers and students into classrooms with or without a full-time teacher aide. He found that classrooms with full-time teacher aides saw increased student achievement, albeit most pronounced for more affluent and White students.

2.2.4.4 Instructional Coordinators and Supervisors

Empirical evidence is absent in the extant literature on the influence of instructional coordinators and supervisors on student academic achievement. Upon reviewing the literature on instructional coordinators and supervisors, it became clear that scholarship in this area focuses primarily on describing what an instructional coordinator is and their role in a school system.

According to Dillon (2001), instructional coordinators "evaluate school curricula, develop educational materials, and recommend and monitor curriculum and material changes introduced into school systems" (p. 20). Additionally, in her dissertation, Halstead (2002) examined the role of the instructional coordinator at four elementary schools in Georgia. Based on this case study, she found that instructional coordinators fulfill leadership roles, conflicted with central office and building-level personnel, thought their primary role was to provide support to teachers, did not feel supported by school administration, and believed paperwork negatively impacted their role.

Instructional coordinators have the potential to support teachers who may improve students' academic achievement. From a practice perspective and based on the finding in Halstead (2002) that instructional coordinators believe their primary role is to provide support to teachers, I believe it hasty to dismiss the potential role they play in student academic achievement. This is completely speculative and not empirically supported but is assessed at the district level in this study.

2.2.4.5 Guidance Counselors

The role of guidance counselor has historically been understood to involve helping children adjust and become involved in the school setting (Lee, 1993). Shaw (2016) posited that counselors and teachers tend to have more long-term relationships with the families and communities they serve, which may allow for deeper understandings of the needs of their service population. Ungar (2003) posited that counselors may assist in creating positive school climates, which may be associated with student academic achievement and resilience. In addition to these assertions, the literature on the relationship between guidance counselors and students' academic outcomes is large and positive, ranging back over 30 years (Gerler & Anderson, 1986; Gerler et al., 1985, 1990; Guerrero, 1987; St. Clair, 1989). More recently, according to Sink (2008):

> First, there is now sufficient evidence to suggest that school counselors are helping other educators (i.e., teachers, administrators, etc.) promote academic-educational outcomes on four levels: school, classroom, small group, and one-to-one. To underscore this conclusion, an American Psychological Association (2002) policy briefing statement on the importance of elementary and secondary school counseling programs argued that "over 20 years of research demonstrates that school counseling and mental health services can significantly improve student achievement and school attendance, and reduce disruptive behavior." More recently, the American Counseling Association's (2007) policy statement based on decades of research on the effectiveness of school counseling-related educational interventions further documented this assertion. (p. 446)

There is also a policy supporting the presence of guidance counselors. As posited by Thornton (2018), the Individuals with Disabilities Education Act (IDEA) of 2004 increases supports for school counselors, specifically as it concerns individual education plans (IEPs). IDEA promotes collaboration between counselors and special educators to better promote positive student outcomes (Milsom et al., 2007).

2.3 Community Advantage and Disadvantage

As organizational units, districts have clear geographic boundaries and salient brands (one can observe the characteristics of the districts [e.g., average test score, sports team prowess, student body composition]) that allow flexibility for families with the resources to choose the best districts for their students. This leads to high levels of resource and economic variation within the geographic boundaries of a district (Owens, 2016; Owens et al., 2016).

Given said variation, there is evidence to suggest that neighborhood factors outside of the school setting play a role in the academic outcomes of students (Sanbonmatsu et al., 2006) and that neighborhood effects on a child's long-term outcomes are in part determined by the amount of time a child spends in said neighborhood (Jencks & Mayer, 1990; Wilson, 1987).

The amount of time a child spends in a high-poverty area is negatively correlated with high school completion (Crowder & South, 2011; Wodtke et al., 2011). Sampson et al. (2008) showed that Black students who live in under-resourced neighborhoods have depressed verbal ability equivalent to missing a year or more of schooling. They asserted that the funding of the American public school system is geographically determined, and the school environment and quality of the school are often related to the residential location. Because of the segregated nature of the American landscape, some students may be exposed to different speech environments and lack access to academic English, a set of skills that may be important for school success and the labor market (Grogger, 2011; Ogbu, 1999; Snow et al., 1998). Additionally, some spaces may have isolating physical landscapes, be associated with distrust, and/or be characterized by violence (Klinenberg, 2015). It is not difficult to imagine the role and impact of concentrated community advantage, not only for Black students but for all students.

Conversely, using quasi-experimental methods, Chetty and Hendren (2015) showed in their study of more than five million families that every year spent in a better area during childhood is associated with increased college attendance rates and adult earnings. Using tax data to analyze the Moving to Opportunity experiment's impact on the children's long-term outcomes, Chetty et al. (2016) went on to show that for children below the age of 13, moving to a lower-poverty neighborhood is associated with increased college attendance, earnings, and reduces single parenthood rates. However, children who moved to lower-poverty neighborhoods during adolescence did not see these gains. In fact, moving during adolescence was associated with slightly negative impacts. Developmental stage may matter.

Black children are overrepresented in conditions associated with underserved communities (Reardon, 2011). Understanding the influence of community advantage and disadvantage on district-level Black student academic achievement may not only advance the literature but also aid in the pursuit to reduce inequity and inequality in the educational experiences of Black students through both policy and practice.

2.3.1 Community Education Level

Several studies have shown that parent/caregiver education is associated with youth academic achievement (Anick et al., 1981; Mullis et al., 1990; Stewart, 2006). For instance, using data from the National Educational Longitudinal Study of 1988 (NELS:88), Stewart (2006) showed a positive and statistically significant relationship between caregiver education and 12th-grade academic achievement among Black students. In addition, Gross (1993) found that the college experiences of minority parents influence the academic participation and career choices of their children. It is likely that educated parents are better able to provide the informational and social capital to navigate school systems, prepare for test-taking, etc. It is also likely that children from these families see more successful academic possibilities for themselves, given their parents' educational attainment.

Some psychology literature suggests that youths are more likely to become what they see (Toldson, 2019). According to Toldson (2019), "In *Breaking Barriers*, findings produced compelling evidence that modeling is an important component of academic achievement of Black males and females" (p. 67). I elevate this concept to the district level and speculate that more adults in the community with bachelor degrees or higher correlate with higher Black student academic achievement.

2.3.2 Community Advantage and Disadvantage

The wealthier a community, the more access to educational opportunities (Reardon, 2011). That said, over the last 30 years, there has been a vast body of research focusing on youths and families living in underserved urban communities in particular (Jencks & Peterson, 1991; Massey & Denton, 1993; Wilson, 1987, 1993, 1996). The increased attention to those living in urban neighborhoods characterized by high poverty rates and related social problems was largely spurred by the publication of William Julius Wilson's (1987) seminal volume, *The Truly Disadvantaged*. In this volume, Wilson (1987) argued that the decline of the manufacturing sector and Black middle-class flight from inner-city neighborhoods resulted in concentrated poverty and the emergence of a new underclass in those neighborhoods (Small & Newman, 2001). According to Wilson (1987), the new underclass was characterized by welfare dependence, joblessness, and single-parent families; these communities also consisted largely of racial and ethnic minorities, especially African-Americans and Latinxs.

Among the host of risks associated with living in underserved urban neighborhoods is lower academic achievement and higher high school dropout rates (Crane, 1991; Crowder & South, 2003, 2011). Students who attend school in underserved urban areas graduate at rates 15-18% lower than students who attend school elsewhere (Chung, 2005), with the highest rates of dropout being among African-American and Latino males. Additionally, according to Reardon (2011), the income gap in academic achievement, defined as the difference between children whose families were at the 90th and 10th percentile, respectively, is twice as large as the Black-White achievement gap. Via the Economic Policy Institute and using national data sets, Carnoy and Garcia (2017) showed that the percentage of children in the United States receiving free or reduced lunch increased dramatically between the 1990s and 2013. They showed that more than half of all eighth-graders in public schools receive free or reduced lunch. Income plays a profound role in reinforcing and replicating disparities in educational outcomes, but it must be noted that racial disparities in academic outcomes persist beyond socioeconomic status (Levy et al., 2016). Furthermore, racism adversely impacts the academic outcomes of minority children (Ford, 2011; McBee, 2010).

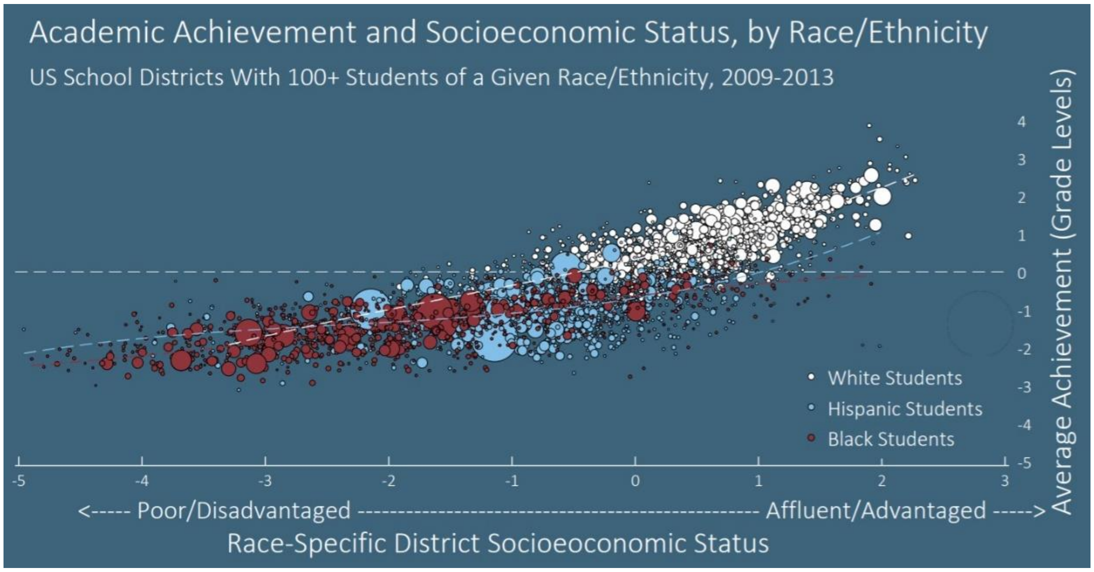
With all that in mind and given that districts with majority-minority student populations are, on average, less-resourced than school districts with majority White student populations (Reardon, 2016b), in her case study of six low-income academically successful Black students, O'Connor (1997) showed that the students used their limiting opportunity structure (education in specific geographic context, in this case, underserved district/educational environments) to show resilience and build their agency and academic motivation. Urban Black students are presented with more risk-promoting conditions than students from other populations (Borman & Overman, 2004; Wilson-Sadberry et al., 1991). However, these conditions can be used to build resilience and protect students from the ills of academic failure. O'Connor (1997) showed that risk conditions can interact with personal motivation and give students something to strive for, the need to overcome or make it out. So, the presence of risk-promoting conditions is not decisively predictive of academic failure for Black students. It actually has the potential to encourage said students to do their best, ultimately leading to academic success and school completion.

Despite the high risk associated with living in underserved urban neighborhoods, I do not assert that all youths living in these neighborhoods have poor outcomes. Many youths are still actively engaged in high school, achieve impressive academic performance, and successfully graduate. However, based on my preliminary descriptive analysis of SEDA version 2.1, Black students at the district level are overrepresented in impoverished conditions. All individuals are vulnerable in one way or another, but in this dataset, only three states (i.e., New Hampshire, Hawaii, and Arkansas) had districts where the average Black household socioeconomic status (SES) was at or above the national average for all households. This is not to assert that all Black students are exposed to impoverished conditions. However, it highlights national trends that show that Black students are disproportionately impacted by poverty.

Black students are also much more likely to attend districts where the average academic achievement of the district is depressed compared to the average academic achievement of districts with their racial peers. As seen in a graphic presented by Sean Reardon at the 2016 Social Inequality in the 21st Century Conference at Stanford University (Figure 2.1), Black students are much more likely to attend districts that are not only academically underperforming compared to their peers but are also poorer. Additionally, vast numbers of Black students are being educated in completely different worlds than other students. Note, a substantial fraction of Black students are in districts below −2.5 *SD*s in district socioeconomic status where virtually no White students live, and a substantial number of White students are in districts above 0.5 *SD*s in district socioeconomic status where there seem to be almost no Black students.

Figure 2.1

District-Level Academic Achievement and Socioeconomic Status, by Race/Ethnicity



SOURCE. Educational inequality in the 21st-century conference presentation; (Reardon, 2016b).

2.3.3 Household Composition

Household composition is associated with the academic success of Black students (Patterson et al., 1990). Patterson et al. (1990) compared two-parent and female-headed single-parent homes for 868 Black and White primary school children. The authors analyzed three aspects of school-based competence: conduct, peer relations, and academic achievement. One finding was that household composition was associated with the academic success of Black students.

Thompson et al. (1988) examined the effects of various household configurations on primary school children's cognitive performance. They found that household composition influenced academic outcomes, particularly in reading. These effects were pronounced and most consistent for Black students. The presence of a second adult, not just the father, positively influenced academic achievement. Thompson et al. (1988) also presented evidence that household configurations influenced continual academic achievement in reading and mathematics test scores for Black students.

Utilizing SEDA version 2.1, across the 12,002 districts with data on household composition, the overall female-headed household percentage was 22% (see Table 2.1). In my preliminary descriptive analyses, the results indicated that Black students were disproportionately likely to come from female-headed households. For example, across the 6,001 school districts with Black household data, 43% of Black households were female-headed households on average. In contrast, across 11,967 districts with White household data, 20% of White households were female-headed households on average. For Hispanic households, this figure was 24% across the 8,764 districts with Hispanic household data. Household composition may matter concerning district-level Black student academic outcomes.

Table 2.2

Percent of Single Female-Headed Households Nationally, by Race/Ethnicity

Race	Percent of Household with Children, Single Female Head across Districts Nationally
Black	42.6%
White	19.5%
Hispanic	23.8%
All	22.1%

2.4 Contributions of Present Study

The findings in this study may help to illuminate heterogeneity in Black student academic outcomes and what factors are associated with said variation nationally using population data-based evidence from nearly every district in the United States. Moreover, by including three district-level Black student academic outcomes in this dissertation, I more fully delineate the educational productivity of Black students in the United States. I show whether there are districts characterized by high levels of disadvantage (and/or low levels of advantage) where Black students are nonetheless learning and/or achieving at high rates and/or where schools serving those students are improving.

An additional consideration can be seen in Figure 2.1; Black students and White students appear to be schooled in two different worlds. As stated above, a substantial fraction of Black students are in districts below −2.5 *SD*s in district socioeconomic status where virtually no White students live, and a substantial number of White students are in districts above 0.5 *SD*s in district socioeconomic status where there seem to be almost no Black students. This throws doubt on the meaning of Black-White comparisons in outcomes and provides further support for an intentional study into the national academic outcomes of students and Black students specifically. With that in mind, additional findings in this study also identified where and under what conditions a particularly vulnerable student population prospers. This study supports context-specific intervention/prevention and serves as fertile ground for additional research into the "why" and "how" of Black student academic success. The implications for future research, policy reform, and/or real supports for children are bountiful.

CHAPTER THREE RESEARCH QUESTIONS AND HYPOTHESES

Based on budding extant literature, this study addressed gaps in the knowledge of variation in district-level student academic outcomes and the role of school and environmental factors on said outcomes. Population data were used to address the following research questions:

(1) How much do districts vary with respect to the average academic achievement, average improvement rate (the rate at which scores change across student cohorts, within a grade), and average learning rate (the rate at which scores change across grades, within a student cohort) of the Black students they serve?

(2) What school and environmental factors are correlated with average district-level Black student academic achievement, average district-level Black student improvement rate, and average district-level Black student learning rate?

3.1 Research Question One

How much do districts vary with respect to the average academic achievement, average improvement rate (the rate at which scores change across student cohorts, within a grade), and average learning rate (the rate at which scores change across grades, within a student cohort) of the Black students they serve?

Hypothesis one: There are statistically significant differences in average district-level Black student academic achievement, average district-level Black student improvement rate, and average district-level learning rate among districts that serve Black students.

Earlier studies may underemphasize the potential of examining variation in district-level student academic outcomes, preferring to focus on the role of family and community on student outcomes (Coleman, 1966). Given advances in statistical techniques (Bryk & Raudenbush, 1992) and the development of comprehensive datasets (Fahle et al., 2017), we can now assess academic outcomes for students nationally in new and innovative ways.

I obtained an approximation of the improvement and learning rates by following multiple student cohorts over time. This approximation may not be perfect because of mobility into and out of districts. However, if demographic changes occur slowly, I would expect such change to be a weak explainer of within-cohort change.

3.2 Research Question Two

What school and environmental factors are correlated with average district-level Black student academic achievement, average district-level learning rates for Black students, and average district-level improvement rates for Black students?

Hypothesis two: The location of a district (urbanicity), its racial composition, its size, its resources, its concentrated advantage for the Black people in said district, and its concentrated disadvantage for the Black people in said district all correlate with district-level Black student academic achievement, district-level average learning rates for Black students, and district-level average improvement rates for Black students.

Empirical literature supports the idea that school and environmental factors influence student academic achievement (Coleman, 1966; Hassrick et al., 2017; Sampson et al., 2008). I obtained an approximation of the improvement rate and learning rate by following multiple student cohorts over time, and my hierarchal linear model enabled me to adjust for demographic shifts that might obscure these rates. Overall, this question sought to identify how school and environmental factors examined operate on district-level Black student academic outcomes.

CHAPTER FOUR STUDY DESIGN AND ANALYTIC PLAN

4.1 Data

This study utilized standardized test score data from SEDA. SEDA includes data on educational contexts and outcomes for nearly every public district (13,200 or 98% of the total) across the United States and includes estimates of average test scores by district, grade, year, subject, and race/ethnicity (Reardon et al., 2018). It is population data comprised of geographic districts and includes hundreds of millions of mathematics and ELA standardized test scores for tens of millions of public school students across grades 3-8 for academic years 2008/2009-2014/2015 (Fahle & Reardon, 2018). SEDA was utilized in this study to both directly address the aforementioned research questions and because the objective of SEDA is to harness data to assist scholars, practitioners, policymakers, parents, and other stakeholders in the improvement of the educational outcomes and prospects of children, an unequivocal objective of this study.

To compare test scores across states and time, Reardon, Kalogrides et al. (2017) placed academic achievement data on a common scale using the National Assessment of Educational Progress (NAEP) and showed that it is possible to equate the NAEP mean and *SD* to the distribution of district-level academic achievement data estimated from state-specific standardized assessments. This allows for within- and between- state, county, and district comparisons of academic achievement over time. According to Fahle et al. (2017):

> SEDA 2.1 achievement data is constructed using data from the ED*Facts* data system at the U.S. Department of Education (USEd), which collects aggregated test score data from each state's standardized testing program as required by federal law. The data include assessment outcomes for seven consecutive school years from the 2008-09 school year to the 2014-15 school year in grades 3 to 8 in ELA and mathematics. Under federal legislation, each state is required to test every student in grades 3 through 8 and in one

high school grade in mathematics and ELA each year (high school data are not currently included in SEDA 2.1 due to differences across states in what grade they are administered). The ED*Facts* database reports the number of students disaggregated by subgroup scoring in each ordered performance category for each grade, year, and subject. The student subgroups include race/ethnicity, gender, socioeconomic disadvantage, among others . . . The measures included in the covariates files come primarily from two sources: the 2006-2010 Education Demographic and Geographic Estimates (EDGE) and the Common Core of Data (CCD).3 EDGE is a special school district-level tabulation of American Community Survey (ACS) data. It includes tabulations of demographic and socioeconomic characteristics of families who live in each school district in the U.S. and who have children enrolled in public school. The CCD is an annual survey of all public elementary and secondary schools and school districts in the United States. The data includes basic descriptive information on schools and school districts, including demographic characteristics. (pp. 4-5)

A detailed explanation of data construction and underlining assumptions for said data construction can be found in the following technical document (Fahle et al., 2017).

4.2 Measures

4.2.1 Measures and Descriptive Information

Variables under consideration in this study were selected based on relevance to the population and extant literature. For research question one, the dependent variable in this multilevel analysis was average district-level Black student academic achievement and was measured by mathematics and ELA standardized test scores administered across grades 3-8 for academic years 2008/2009-2014/2015. This variable was expressed as the conditional average district-level standardized test score in mathematics and ELA of Black students in a given district. For research question two, the dependent variable in this multilevel analysis was average district-level Black student academic achievement measured by mathematics standardized test scores administered across grades 3-5 for academic years 2008/2009-2014/2015. This variable was expressed as the conditional average district-level standardized test score in mathematics of Black students in a given district.

I used the younger grades for research question two because there was evidence to suggest that students may experience achievement loss as they transition between elementary and middle school, and it may also be the case that the way students engage in schooling across grades three to five differ from the way students across grades six to eight engage in schooling. On the former point, Alspaugh (1998) compared 3 groups of 16 school districts and found a statistically significant achievement loss associated with students transitioning from elementary to middle school at sixth grade. These findings were consistent with an earlier study by Alspaugh and Harting (1995) that established there are consistent achievement losses in reading, mathematics, science, and social studies during the transition from elementary to middle school at sixth grade. This achievement loss was measured on standardized test scores in both studies. On the latter point, according to Randall and Engelhard (2009):

> Traditional elementary schools use a system in which students remain with one academic lead teacher through the day . . . The traditional middle school operates quite differently. Students routinely move from class to class, receiving instruction from teachers who specialize in specific academic subjects. (p.175)

A diversity of schooling experiences/systems may lead to a diversity of academic outcomes. Given the two aforementioned potential educational realities, I focused on students grades three to five and their mathematics achievement for research question two.

The key predictors in this study were composite indices of urbanicity, racial composition, district size, district resource, Black concentrated advantage of district, and Black concentrated disadvantage of district.

Urbanicity was measured as one variable with four different values: urban, rural, suburban, town. There is no measurement error. Each variable is defined via the National Center for Education Statistics (NCES) CCD. The NCES CCD provides a listing of all schools and agencies providing free public elementary and secondary education, basic descriptive statistical information on each school, and includes all settings in which free public education is provided to children. Via the NCES CCD, urban is defined as a territory inside an urbanized area and inside a principal city. Suburban is defined as a territory outside a principal city and inside an urbanized area. A town is defined as a territory inside an urban cluster (an urbanized area with a population between 2,500 and 50,000). Rural is defined as Census-defined rural territory.

Racial composition was a construct with five separate variables: proportion of Black students in a district, proportion of Hispanic students in a district, proportion of Indigenous students in a district, proportion of Asian students in a district, and proportion of White students in a district. Each of these variables can take on a value between 0-1.

District size was measured by one variable: natural logarithm of total enrollment across grades three to eight in a district.

The following three composite indices were derived via factor analysis (Kline, 2014). See Appendix A for principal component analysis and factor analysis for each of the following composite indices.

District (school-related) resources was a composite item consisting of seven indicators that assess the (a) teacher-student ratio (all teachers and students in a district), (b) number of elementary student grades three to eight per elementary teachers in a district, (c) number of elementary student grades three to eight per all teachers in a district, (d) number of elementary student grades three to eight per teacher aide in a district, (e) number of elementary student grades three to eight per instructional coordinators and supervisors in a district, (f) number of elementary student grades three to eight per elementary guidance counselors in a district, (g) and total expenditures per student in a district. This indicator has been standardized, and the internal consistency was .71.

To provide context for interpreting values of the district "school-related" resource composite, see the following average values of the indicator variables at different values of the district "school-related" resource composite. A 0 is interpretable as average district "school-related" resource across all districts in the United States. A 1 and/or −1 is interpretable as one *SD* from the standardized average. Table 4.1 reports the average values of the indicator variables at different standardized values of the "school-related" resource composite, and Table 4.2 reports the average values of the indicator variables at different percentile values of the district "school-related" resource composite.

Table 4.1

District Resource Composite Construction, Indicator Variables Standardized

	District "School-Related" Resource Composite (Standardized)		
SDs	−1	0	1
All students/all teachers ratio	26.8	14.8	2.8
Elementary student/elementary teacher ratio	15.6	11.1	6.6
Elementary student/all teacher ratio	5.9	4.5	3.1
Elementary student/teacher aide ratio	13.6	12.5	11.4
Elementary student/instructional coordinator and supervisor ratio	159.6	142.9	126.2
Elementary student/elementary guidance counselor ratio	833.3	500	166.7
Per-pupil funding total expenditure	$8,482	$13,212	$17,942

Note. *N* = 13,098 districts.

Table 4.2

District Resource Composite Construction, Indicator Variables in Percentiles

	District "School-Related" Resource Composite (Percentiles)						
Percentiles	5%	10%	25%	50% median	75%	90%	95%
All students/all teachers ratio	20.0	20.0	16.7	14.3	12.5	10.0	7.7
Elementary student/elementary teacher ratio	25.0	20.0	16.7	14.3	10.0	7.7	5.9
Elementary student/all teacher ratio	12.5	10.0	8.3	6.7	5.3	4.2	3.1
Elementary student/teacher aide ratio	200.0	100.0	50.0	33.3	20.0	12.5	9.1
Elementary student/instructional coordinator and supervisor ratio	—	—	5000.0	1000.0	333.3	142.9	100.
Elementary student/elementary guidance counselor ratio	—	—	—	1111.1	500.0	250.0	200.0
Per-pupil funding total expenditure	$8,358	$8,960	$10,021	$11,854	$15,031	$19,250	$22,500

Note. *N* = 13,098 districts.

As can be seen in Tables 4.1 and 4.2, there was vast variation in the resources of districts across the United States. On average, in the most resourced districts, students attended districts with 10 or fewer students per teacher, 20 or fewer students per teacher aide, and the district spent nearly $23,000 per student per year. On average, in less-resourced districts, students attended districts with 20 students per teacher, 200 students per teacher aide, and the district spent around $8,500 per student. Clearly, districts were not resourced equally, and this variation could be large across the district.

Black concentrated advantage of district was a composite item consisting of four indicators that assess the percentage of Black people in a district (a) with professional occupations, (b) a bachelor's degree or higher, (c) who have lived in the same home since the prior year, and (d) with income at or above the national 50th percentile. This indicator was standardized, and the internal consistency was .52.

To provide context for interpreting values of the Black concentrated advantage of district composite, see the following average values of the indicator variables at different values of the Black concentrated advantage of district composite. A 0 is interpretable as the average Black concentrated advantage of a district for all districts in the United States with Black people. A 1 and/or −1 is interpretable as one *SD* from the standardized average. Table 4.3 reports average values of the indicator variables at different standardized values of the Black concentrated advantage of district composite, and Table 4.4 reports average values of the indictor variables at different percentile values of the Black concentrated advantage of district composite.

Table 4.3

Black Concentrated Advantage of District Composite Construction, Indicator Variables Standardized

	Black Concentrated Advantage of District (Standardized)		
Standard Deviations	−1	0	1
% of Black people with professional occupations in a district	0.4%	32%	63%
% of Black people with a bachelor's degree or higher	0%	20%	46%
% of Black people who lived in the same house as last year	52%	80%	100%
Mean income at or above the 50th percentile for Black people in a district	$10,591	$51,327	$92,063

Notes. % = percentage; *N* = 5,275 districts.

Table 4.4

Black Concentrated Advantage of District Composite Construction, Indicator Variables in Percentiles

	Black Concentrated Advantage of District (Percentiles)						
Percentiles	5%	10%	25%	50% median	75%	90%	95%
% of Black people with professional occupations in a district	0%	0%	0%	25%	46%	86%	100%
% of Black people with bachelor degree or higher	0%	0%	0%	11%	29%	53%	80%
% of Black people who lived in the same house as last year	0%	40%	72%	89%	100%	100%	100%
Mean income at or above the 50th percentile for Black people in a district	$10,834	$16,591	$24,687	$39,166	$67,500	$104,000	$126,705

Notes. % = percentage; *N* = 5,275 districts.

On average, there was substantial variation in Black concentrated advantage across districts where there were data on the resources of the Black people in those districts. At the bottom of the distribution of Black concentrated advantage of districts, some districts had no Black people with professional occupations. While at the top of the distribution, there were districts with 80 to 100% of Black people with professional occupations. Similarly, for undergraduate degrees or higher, there were districts where not one Black person reported having a bachelor's degree or higher. Conversely, there were districts where nearly one-quarter or more Black people reported holding a bachelor's degree or higher. There were districts where Black people mad less than $25,000 per year at the 50th percentile in a district and districts where Black people mad over $65,000 per year at the 50th percentile. The Black concentrated advantage of districts varied widely, and this heterogeneity may imply that some Black students do schooling in completely different worlds than their Black peers.

Black concentrated disadvantage of district was a composite index consisting of five indicators of socioeconomic disadvantage: the (a) percentage of children living in poverty for Black 5- to 17-year-olds in a district, (b) Black welfare (Supplemental Nutrition Assistance Program [SNAP]) receipt in a district, (c) Black people who rent their home in a district, (d) houses with children and headed by a Black woman in a district, and (e) the Black unemployment rate in a district. This indicator was standardized, and the internal consistency was .64.

To provide context for interpreting values of the Black concentrated disadvantage of district composite, see the following average values of the indicator variables at different values of the Black concentrated disadvantage of district composite. A 0 is interpretable as the average Black concentrated disadvantage of the district for all districts in the United States with Black people. A 1 and/or −1 is interpretable as one *SD* from the standardized average. Table 4.5 reports average values of the indicator variables at different standardized values of the Black concentrated disadvantage of district composite, and Table 4.6 reports average values of the indictor variables at different percentile values of the Black concentrated disadvantage of district composite.

Table 4.5

Black Concentrated Disadvantage of District Composite Construction, Indicator Variable Standardized

	Black Concentrated Disadvantage of District (Standardized)		
SDs	−1	0	1
% of children living in poverty for Black 5- to 17-year-olds	0%	28%	60%
% Black welfare (SNAP receipt)	0%	28%	58%
% Black people who rent their home	14%	48%	83%
% Households with children and headed by a Black woman	10%	43%	76%
Black unemployment rate	0%	9%	25%

Notes. % = percentage; *N* = 5,729 districts.

Table 4.6

Black Concentrated Disadvantage of District Composite Construction, Indicator Variables in Percentiles

	Black Concentrated Disadvantage of District (Percentiles)						
Percentiles	5%	10%	25%	50% median	75%	90%	95%
% of children living in poverty for Black 5- to 17-year-olds	0%	0%	0%	19%	46%	81%	100%
% Black welfare (SNAP receipt)	0%	0%	0%	21%	45%	72%	100%
% Black people who rent their home	0%	0%	17%	50%	75%	100%	100%
% households with children and headed by a Black woman	0%	0%	0%	45%	64%	100%	100%
Black unemployment rate	0%	0%	0%	3%	11%	20%	33%

Notes. % = Percentage; *N* = 5,729 districts.

On average, there was substantial variation in Black concentrated disadvantage across districts that had data on the resources of the Black people in those districts. At the bottom of the distribution of Black concentrated disadvantage of districts, there were districts where no Black children live in poverty. There were districts at the top of the distribution where 80 to 100% of Black children live in poverty. There were districts where not one Black home was headed by a Black single mother, but there were also districts where 100% of the Black homes were headed by a Black single mother. Additionally, there were districts where every Black person reported that they had a job, and there were districts when a fifth of the Black people reported that they were unemployed. The Black concentrated disadvantage of districts varies widely nationally, and this heterogeneity implies that some Black students do schooling in different contexts than their Black peers.

4.3 Analytic Sample

The analytic sample drawn from SEDA and used in this study included all districts that served Black students grades 3-8 (~3.5 million Black students) and had available mathematics and ELA test score data for Black students, approximately 3000 districts. The analytic sample included districts that were not missing district-level academic achievement data for academic years 2008/2009-2014/2015. For research question two, I only examined districts that served Black students between grades three to eight and had mathematics test score data. Table 4.8 presents descriptive statistics.

Table 4.7

Sample Descriptive Statistics

Variable	*M*	*SD*
Average district-level Black student academic outcomes (grade 3-8; mathematics and ELA)		
Academic achievement	4.2	0.73
Improvement rate	0.017	0.08
Learning rate	0.91	0.12
Average district-level Black student academic outcomes (grade 3-5; math)		
Academic achievement	2.8	0.68
Improvement rate	0.022	0.10
Learning rate	0.87	0.17
Independent variables		
District location		
Urban	20%	40%
Suburban	39%	49%
Town	17%	37%
Rural	24%	43%
Racial composition of students in a district		
Proportion Black	.25	25%
Proportion Hispanic	.18	20%
Proportion Indigenous	0.007	2%
Proportion Asian	.04	7%
Proportion White	.53	27%
District size	5,311	13,421
District resource (standardized)	−0.19	0.26
Black concentrated advantage of district (standardized)	−0.15	0.73
Black concentrated disadvantage of district (standardized)	0.15	0.73

Notes. Outcomes are empirical Bayes estimates and on the grade scale; *N* = 2988 districts.

4.4 Analysis/Design

Via secondary data analysis, this study was primarily descriptive and utilized an inductive approach based on observed associations to identify potentially relevant contributors to district-level differences in Black student academic outcomes. In an attempt to conduct a national examination of variation in district-level Black student academic outcomes using population data and the factors that influence said variation, I first compared districts serving Black children with respect to their average district-level academic achievement, average district-level improvement rate, and average district-level learning rate (research question one). I then proposed and studied a model to assess district differences in average district-level Black student academic achievement, average district-level Black student improvement rate, and average district-level Black student learning rate (research question two). All district-specific adjusted means, learning rates, and improvement rates were empirical Bayes estimates, regression coefficients that showed correlates were estimated via maximum likelihood, and all estimates were presented on the grade scale. Referencing the corresponding technical document associated with the dataset used in this study (SEDA), compiled by Fahle et al. (2017), in this study, grade scale means:

> Standardized relative to the average difference in NAEP scores between students one grade level apart in a given cohort. A one-unit difference in this grade-equivalent unit scale is interpretable as equivalent to the average difference in skills between students one grade level apart in school . . . [district] means reported on the [grade] scale have an overall average near 5.5 and tend to range from 1 to 10 . . . A [district] with a mean of 6 on the [grade] scale represents a [district] where the average student scored at about the same level as the average 6th grader in the national reference cohort. (p. 9).

For a more detailed interpretation of this scale, see Fahle et al. (2017) and/or Reardon, Kalogrides et al. (2017).

To answer research question one, I used the following two-level hierarchal linear model to derive empirical Bayes estimates of average district-level Black student academic achievement, average district-level Black student improvement rate, and average district-level Black student learning rate. These estimates were conditional expected averages and used descriptively to compare districts serving Black students across the United States. Average district-level Black student academic achievement was the conditional expected average district-level Black student grade-level score in mathematics and ELA via standardized test scores for students who started kindergarten in 2006.5 and were in grade 5.5 within a district. Average district-level Black student improvement rate was the conditional expected average district-level Black student linear cohort trend in mathematics and ELA via standardized test scores, the rate at which scores change across Black student cohorts 2001-2012 for Black students who were grade 5.5 within a district. The average district-level Black student learning rate was the conditional expected average district-level Black student linear grade slope in mathematics and ELA via standardized test scores, the rate at which Black student scores change across grades three to eight for Black students who started kindergarten in 2006.5 within a district. The model for deriving these estimates was as follows:

$$\mathrm{BlackAA}_{ij} = \beta_{0j} + \beta_{1j}(\mathrm{C}ohort_{ij}-2006.5) + \beta_{2j}(\mathrm{G}rade_{ij}-5.5) + \beta_{3j}(M\mathrm{ath}_{ij}-.5) + r_{ij}$$

$$\beta_{0j} = \gamma_{00} + u_{0j}$$
$$\beta_{1j} = \gamma_{10} + u_{1j}$$
$$\beta_{2j} = \gamma_{20} + u_{2j}$$
$$\beta_{3j} = \gamma_{30} + u_{3j}$$
$$r_{ij} \sim N(0,\sigma^2)$$

In this model, i represents time, and j represents district. A cohort was defined as year-grade, so this pseudo-cohort and pseudo-grade represented the center of the data’s grade and cohort ranges since the middle year is 2012, and the middle grade is 5.5 (see Table 4.9). BlackAA was average district-level Black student academic achievement. That said, this model allowed each district to have a district-specific intercept (average score, pooled over subjects; β_{0j}), a district-specific cohort trend (the rate at which scores change across student cohorts, within a grade, pooled over subjects; β_{1j}), a district-specific linear grade slope (the rate at which scores change across grades, within a cohort, pooled over subjects; β_{2j}), and a district-specific math-ELA difference (β_{3j}).

Table 4.8

District Observations by Cohort and Grade Level (Grade Three to Eight)

	Grade Level					
Cohort	3	4	5	6	7	8
2001	0	0	0	0	0	12,811
2002	0	0	0	0	12,790	12,818
2003	0	0	0	13,094	12,799	12,801
2004	0	0	13,125	13,073	12,788	12,781
2005	0	13,122	13,077	13,056	12,751	12,777
2006	13,141	13,103	13,084	13,037	12,766	12,760
2007	13,091	13,080	13,045	13,033	12,738	12,779
2008	13,062	13,033	13,045	12,997	12,743	0
2009	13,027	13,035	13,022	13,022	0	0
2010	13,056	13,043	13,053	0	0	0
2011	13,024	13,045	0	0	0	0
2012	13,041	0	0	0	0	0

To answer research question two, I explored a three-level hierarchal model and derived empirical Bayes estimates to assess district differences in average district-level Black student academic achievement, average district-level Black student improvement rate, and average district-level Black student learning rate. I assessed the influence of the following explanatory factors on average district-level Black student academic achievement, average district-level Black student improvement rate, and average district-level Black student learning rate: urbanicity, district racial composition, district size, district resource, Black concentrated advantage of the district, and Black concentrated disadvantage of the district.

Average district-level Black student academic achievement was the conditional true average district-level Black student grade-level score in mathematics via standardized test scores for students who started kindergarten in 2008 and were in grade four within an urban district with typical racial composition, district size, district resource, Black concentrated advantage of the district, and Black concentrated disadvantage of the district.

Average district-level Black student improvement rate was the conditional true average district-level Black student linear cohort trend in mathematics via standardized test scores, the rate at which scores changed across Black student cohorts 2004-2012 for Black students who were grade four within an urban district with typical racial composition, district size, district resource, Black concentrated advantage of the district, and Black concentrated disadvantage of the district.

The average district-level Black student learning rate was the conditional true average district-level Black student linear grade slope in mathematics via standardized test scores, the rate at which Black student scores change across third to fifth grades, for Black students who started kindergarten in 2008 within an urban district with typical racial composition, district size, district resource, Black concentrated advantage of the district, and Black concentrated disadvantage of the district. The model for deriving these estimates was as follows:

Level 1

$$BlackAA_{mij} = TrueBlackAA_{ij} + e_{mij}, \; e_{mij} \sim N(0, v_{mij}), \; v_{mij} \text{ Known}$$

Level 2

$$TrueBlackAA_{ij} = \beta_{0j} + \beta_{1j}(Cohort_{ij} - 2008) + \beta_{2j}(Grade_{ij} - 4) + r_{ij}$$

Level 3

$$\beta_{0j} = \gamma_{00} + \gamma_{01}(Suburb_j) + \gamma_{02}(Town_j) + \gamma_{03}(Rural_j) + \gamma_{04}(PercentIndigenous_j) +$$

$$\gamma_{05}(PercentAsian_j) + \gamma_{06}(PercentHispanic_j) + \gamma_{07}(PercentWhite_j) + \gamma_{08}(DistrictSize_j) +$$

$$\gamma_{09}(DistrictResource_j) + \gamma_{010}(BlackConcentratedAdvantageofDistrict_j) +$$

$$\gamma_{011}(BlackConcentratedDisadvantageofDistrict_j) + u_{0j}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}(Suburb_j) + \gamma_{12}(Town_j) + \gamma_{13}(Rural_j) + \gamma_{14}(PercentIndigenous_j) +$$

$$\gamma_{15}(PercentAsian_j) + \gamma_{16}(PercentHispanic_j) + \gamma_{17}(PercentWhite_j) + \gamma_{18}(DistrictSize_j) +$$

$$\gamma_{19}(DistrictResource_j) + \gamma_{110}(BlackConcentratedAdvantageofDistrict_j) +$$

$$\gamma_{111}(BlackConcentratedDisadvantageofDistrict_j) + u_{1j}$$

$$\beta_{2j} = \gamma_{20} + \gamma_{21}(Suburb_j) + \gamma_{22}(Town_j) + \gamma_{23}(Rural_j) + \gamma_{24}(PercentIndigenous_j) +$$

$$\gamma_{25}(PercentAsian_j) + \gamma_{26}(PercentHispanic_j) + \gamma_{27}(PercentWhite_j) + \gamma_{28}(DistrictSize_j) +$$

$$\gamma_{29}(DistrictResource_j) + \gamma_{210}(BlackConcentratedAdvantageofDistrict_j) +$$

$$\gamma_{211}(BlackConcentratedDisadvantageofDistrict_j) + u_{2j}$$

The aforementioned model allowed each district to have a district-specific intercept (β_{0j}), a district-specific cohort trend (β_{1j}), and a district-specific linear grade slope (β_{2j}). That said, m represented the measure used to derive mathematics achievement, i represented time (I = 1 . . . 21), and j represents district (j = 1 . . . 2858). Cohort was defined as year-grade, so this pseudo-cohort and pseudo-grade represented the center of the data's grade, and cohort ranges since the middle year was 2012 and the middle grade was four (see Table 4.10).

Table 4.9

District Observations by Cohort and Grade Level (Grade 3-5)

	Grade Level		
Cohort	3	4	5
2004	0	0	13,125
2005	0	13,122	13,077
2006	13,141	13,103	13,084
2007	13,091	13,080	13,045
2008	13,062	13,033	13,045
2009	13,027	13,035	13,022
2010	13,056	13,043	13,053
2011	13,024	13,045	0
2012	13,041	0	0

$BlackAA_{mij}$ was average district-level Black student mathematics achievement on measure m on occasion i in district j. $TrueBlackAA_{ij}$ was the true average district-level Black student mathematics achievement on occasion i in district j. Urban, suburb, town, and rural were dummy variables for district location. Urban was the reference group for this set of variables. There was no measurement error. *PercentBlack*, *PercentIndigenous*, *PercentAsian*, *PercentHispanic*, and *PercentWhite* were variables reflecting the percentage of each racial group in district j. Each of these variables could take on a value between 0-1. *PercentBlack* was the reference group for this set of variables, and these values were centered in the model. *DistrictSize* was the natural log of total student enrollment in district j and was centered in the model. *DistrictResource* was a composite item that represented district resources within district j and was centered in the model. This variable was a non-negative integer. *BlackConcentratedAdvantageofDistrict* was a composite item representing the amount of advantage Black people had within district j and was centered in the model. *BlackConcentratedDisadvantageofDistrict* was a composite item representing the amount of disadvantage Black people had within district j and was centered in the model.

This chapter presents the methods, including study design, sample, measures, and analytic plan. To describe and conduct multilevel analysis of average district-level Black student academic outcomes, I utilized standardized test score data from the SEDA version 2.1. The analytic sample drawn from SEDA and used in this study includes all districts serving Black students grades 3-8 (~3.5 million Black students) that had available mathematics and ELA test score data for Black students, approximately 3000 districts.

My outcomes of interest included the conditional average district-level standardized test score in mathematics and ELA of Black students in a given district (measured by mathematics and ELA standardized test scores administered across grades 3-8 for academic years 2008/2009-2014/2015) and the conditional average district-level standardized test score in mathematics of Black students in a given district (measured by mathematics standardized test scores administered across grades 3-5 for academic years 2008/2009-2014/2015). My key predictors were composite indices of urbanicity, racial composition, district size, district resource, Black concentrated advantage of district, and Black concentrated disadvantage of district and were factor analyzed and standardized where appropriate. I also described and defined my three composite indices derived via factor analysis in detail.

Additionally, via hierarchical linear modeling, I constructed two multilevel models used to return results corresponding to my research questions. The first model was used to generally describe district-level Black student academic outcome in mathematics and ELA for Black students grades 3-8 for academic years 2008/2009-2014/2015, and the second model was used to assess the relation of school and environmental factors on average district-level Black student academic outcome in mathematics across grades 3-5 for academic years 2008/2009-2014/2015.

CHAPTER FIVE RESULTS

This chapter presents results for research questions one and two. For question one, I reported the empirical Bayes district-specific results of the descriptive analyses. For question two, I presented the multilevel descriptive analyses describing the association of school and environmental factors to the district-level academic outcomes of Black students. In all cases, for both research questions one and two, estimates of average district-level Black student academic achievement, average district-level Black student improvement rate, and average district-level Black student learning rate were empirical Bayes estimates on the grade scale. For this study, grade scale means an average one-grade-level difference in standardized test scores between students in districts (Fahle et al., 2017).

5.1 Research Question One Results: Average District-Level Black Student Academic, Improvement Rate, and Learning Rate-Descriptive Analysis

In this study, average district-level Black student academic achievement was the conditional expected average district-level Black student grade-level score in mathematics and ELA via standardized test scores for students who started kindergarten in 2006.5 and were in grade 5.5 within a district.

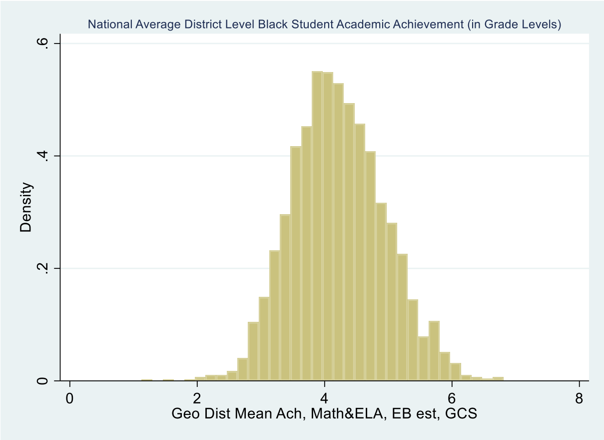
Average district-level Black student improvement rate was the conditional expected average district-level Black student cohort trend in mathematics and ELA via standardized test scores, the rate at which Black student scores change across Black student cohorts 2001-2012 for Black students who were grade 5.5 within a district. The average district-level Black student learning rate was the conditional expected average district-level Black student linear grade slope in mathematics and ELA via standardized test scores, the rate at which scores change across grades 3-8 for students who started kindergarten in 2006.5. The model for deriving estimates of average district-level Black student academic achievement (β_{0j}), average district-level Black student improvement rate (β_{1j}), and average district-level Black student learning rate (β_{2j}) was as follows:

$$\text{BlackAA}_{ij} = \beta_{0j} + \beta_{1j}(\text{C}ohort_{ij}–2006.5) + \beta_{2j}(\text{G}rade_{ij}–5.5) + \beta_{3j}(M\text{ath}_{ij}–.5) + \text{r}_{ij}$$
$$\beta_{0j} = \gamma_{00} + u_{0j}$$
$$\beta_{1j} = \gamma_{10} + u_{1j}$$
$$\beta_{2j} = \gamma_{20} + u_{2j}$$
$$\beta_{3j} = \gamma_{30} + u_{3j}$$
$$\text{r}_{ij} \sim N(0,\sigma^2)$$

The distribution of average district-level Black student academic achievement is illustrated by the histogram in Figure 5.1.

Figure 5.1

National Distribution of Average District-Level Black Student Academic Achievement



Notes. Empirical Bayes estimates; grade scale.

Average district-level Black student academic achievement was at the 4.2 grade level. The corresponding *SD* associated with average district-level Black student academic achievement was 0.76. Of all districts that reported average district-level Black student academic achievement, 95% had average Black student academic achievement between the 2.5 and 6.0 grade levels. As can be seen in Table 5.1, the random effect on the intercept (β_{0j}), given my multilevel model, revealed that there was a statistically significant difference (p-value <0.001) in average district-level Black student academic achievement across districts that served Black students and reported Black student academic outcomes in the United States. These findings provide evidence for hypothesis one that there is variability in average district-level Black student academic achievement.

Table 5.1

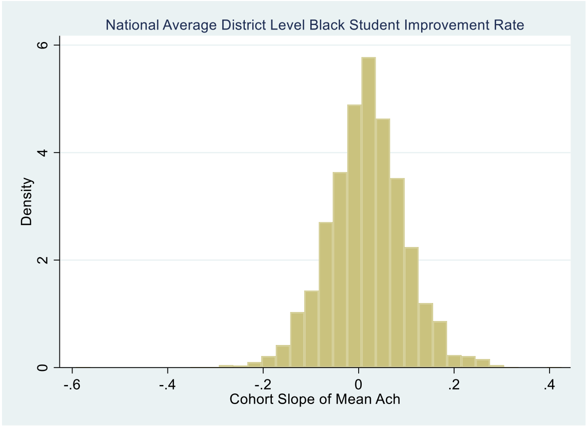
Variation in District-Level Black Student Academic Achievement

Fixed Effect	Coefficient	Standard Error	*t*-ratio	Approx. *df*	*p*-value
For INTRCPT1, π_0					
INTRCPT2, β_{00}	4.241053	0.014039	302.098	2987	< 0.001
Random Effect	*SD*	Variance Component	*df*	χ^2	*p*-value
INTRCPT1, r_0	0.75594	0.57144	2808	296112.22557	< 0.001

The distribution of average district-level Black student improvement rate is illustrated by the histogram in Figure 5.2.

Figure 5.2

National Distribution of Average District-Level Black Student Improvement Rate



Notes. Empirical Bayes estimates; grade scale.

The average district-level Black student improvement rate was 0.017. At the district level, Black students could be expected to improve around two hundredths of a grade level from one cohort to the next across cohorts 2001-2012. The corresponding *SD* associated with the average district-level Black student improvement rate was 0.093. Of all districts that reported average district-level Black student improvement rate, 95% had an average district-level Black student improvement rate between −0.169 and 0.203. The gap between the highest and lowest districts on average district-level Black student improvement rate was nearly 0.4 grade levels. In some districts, Black students could be expected to improve one-fifth of a grade level over the district's previous cohort of Black students, while in other districts, Black students could be expected to decline by nearly one-fifth of a grade level compared to the previous cohort of Black students in a district. To put this into perspective, if these rates persist across five years, Black students in the fifth cohort in a district may be in a district where they are one grade level ahead or behind of the Black students in the first cohort in that district. This heterogeneity is substantial.

As can be seen in Table 5.2, the random effect on the intercept (β_{1j}), given my multilevel model, reveals that there was a statistically significant difference (p-value < 0.001) in average district-level Black student improvement rate across districts that served Black students and reported Black student academic outcomes in the United States.

Table 5.2

Variation in District-Level Black Student Improvement Rate

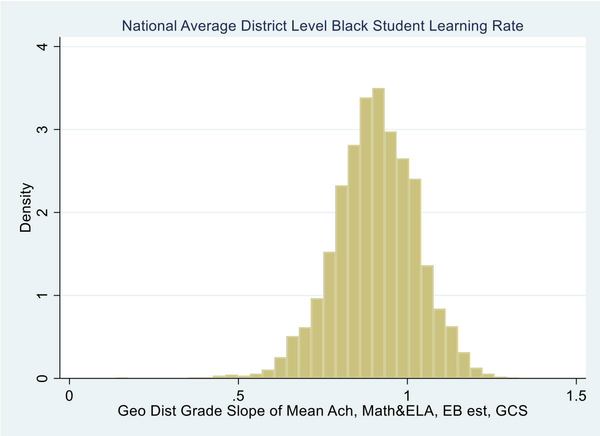
Fixed Effect	Coefficient	Standard Error	*t*-ratio	Approx. *df*	*p*-value
For COHORT_C slope, π_1					
INTRCPT2, β_{10}	0.016812	0.001943	8.654	2987	<0.001
Random Effect	*SD*	Variance Component	*df*	χ^2	*p*-value
COHORT_C slope, r_1	0.09329	0.00870	2808	20000.79669	<0.001

These findings provide evidence for hypothesis one that there was variability in the average district-level improvement rate of Black students.

The distribution of the average district-level Black student learning rate is illustrated by the histogram in Figure 5.3.

Figure 5.3

National Distribution of Average District-Level Black Student Learning Rate



Notes. Empirical Bayes estimates; grade scale.

The average district-level Black student learning rate was 0.91 (1.0 equates 1 grade level of growth from one academic year to the next). At the district level, Black students could be expected to grow less than one grade level as they transitioned from one academic year to the next. The corresponding *SD* associated with the average district-level Black student learning rate was 0.14. Of all districts that reported average district-level Black student learning rates, 95% had an average district-level Black student learning rate between 0.65 and 1.17. The gap between the highest and lowest districts on average district-level Black student learning rate was half a grade level. In some districts, Black students could be expected to grow over one grade level per year, while in other districts, Black students could be expected to grow less than three-fourths of a grade level per year. To put this into perspective, if these rates persist across five years, Black students in the highest-performing districts could be expected to grow near six grade levels. Conversely, Black students in the lowest-performing districts could be expected to grow just over three grade levels per year. This heterogeneity is also substantial.

As can be seen in Table 5.3, the random effect on the intercept (β_{2j}), given my multilevel model, reveals that there was a statistically significant difference (p-value < 0.001) in average district-level Black student learning rate across districts that served Black students and reported Black student academic outcomes in the United States.

Table 5.3

Variation in District-Level Black Student Learning Rate

Fixed Effect	Coefficient	Standard Error	*t*-ratio	Approx. *df*	*p*-value
For GRADE_C slope, π_2					
INTRCPT2, β_{20}	0.905375	0.002898	312.362	2987	< 0.001
Random Effect	*SD*	Variance Component	*df*	χ^2	*p*-value
GRADE_C slope, r_2	0.14021	0.01966	2808	19796.50599	< 0.001

These findings provide evidence for hypothesis one that there is variability in the average district-level learning rate of Black students.

Across each of the three aforementioned average district-level Black student academic outcomes, there was no evidence against the assumption of linearity, normality, or homogeneity of variance (see Figures B.1, B.2, and B.3 in Appendix B).

5.2 Higher-Performing Districts for Black Students

In a search for higher-performing districts for the approximately 3.5 million Black students served by districts in the United States, I highlight here that there were 135, 1404, and 776 districts where the average district-level Black student academic achievement, average Black student improvement rate, and average Black student learning rate (respectively) was at or above the national average for all students in mathematics and ELA on standardized test scores across the United States. Across the 135 districts where average district-level Black student academic achievement was at or above the national average academic achievement for all students, 81% were suburban districts, Black students made up 11% of the students in these districts representing ~49,000 Black students, and total enrollment across grades 3-8 in these districts was ~580,000 with an average district enrollment of 4294 students (*SD* = 4294, min = 218, max = 29,267).

Across the 1404 districts where the average district-level Black student improvement rate was at or above the national average improvement rate for all students, 17% were urban districts, 41% were suburban districts, 16% were districts in towns, and 25% were rural districts. Black students made up 24% of the students in these districts, representing ~1,7350,000 Black students, total enrollment across grades 3-8 in these districts was ~8,040,000, with an average district enrollment of 5309 students (*SD* = 15894, min = 157, max = 430,463).

Across the 776 districts where the average district-level Black student learning rate is at or above the national average learning rate for all students, 20% are urban districts, 44% are suburban districts, 13% are districts in towns, and 23% are rural districts. Black students make up 24% of the students in these districts representing ~805,000 Black students, total enrollment across grades 3-8 in these districts is ~4,540,000, with an average district enrollment of 5851 students (*SD* = 9918, min = 208, max = 175,036).

Bearing that in mind, there were 54 districts in the nation where district-level Black student academic achievement, district-level Black student improvement rate, and district-level Black student academic achievement were at or about the national average. Of these 54 districts, 83% were suburban districts. Additionally, Black students made up 11% of the students in these districts representing ~31,000 Black students. Total enrollment across grades 3-8 in these districts was ~285,000, with an average district enrollment of 5280 students (*SD* = 5205, min = 631, max = 29,267).

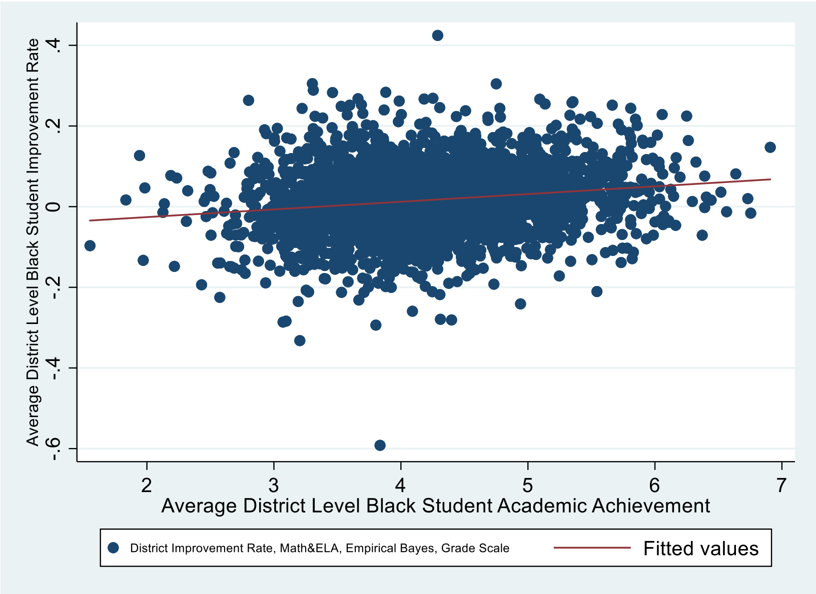
Average district-level Black student academic outcomes at or above the national average for all students seemed to be occurring across districts in varying degrees. For instance, the average district-level Black student improvement rate was at or above the national average improvement rate for all students across a variety of district locations and represents over half of the average total number of Black students enrolled in districts across grades 3-8 for academic years 2008/2009-2014/2015. Similarly, the average district-level Black student learning rate was at or above the national average learning rate for all students across a variety of district locations and represented nearly one-quarter of the average total number of Black students enrolled in districts across grades 3-8 for academic years 2008/2009-2014/2015. Alternatively, average district-level Black student academic achievement at or above the national average academic achievement for all students was clustered in suburban districts and only represented around 49,000 Black students. This provided evidence that these average district-level Black student academic outcomes did not necessarily function the same and that average district-level Black student academic outcomes could vary from one district context to another. It also appears that there may be something happening during early childhood that is better preparing a sizable number of Black students for schooling. Moreover, it seems some districts were doing a reasonable job of growing their Black students. However, with these gains in improvement and learning rates, it seems districts are overwhelmingly still failing to get Black students testing at or above grade level. This is further elaborated on in the discussion section.

5.3 Improvement and Learning Rates by Initial Academic Achievement

The average district-level Black student improvement rate was correlated with district-level Black student academic achievement. On average, the higher the district-level Black student academic achievement, the higher the average district-level Black student improvement rate. As shown in Figure 5.4, there was evident variation in average district-level Black student improvement rate at each level of average district-level Black student academic achievement. Based on my hierarchal linear model, the correlation between district-level Black student improvement rate and academic achievement was 0.16.

Figure 5.4

Improvement Rate by Academic Achievement



Also, on average, districts where Black students were testing on grade level are also improving faster than the expected average district improvement rate for all students. In districts where average district-level Black student academic achievement was near or above the national average district-level academic achievement for all students, the average district-level Black student improvement rate was above the national average district-level improvement rate for all students (see Table 5.4; national average district-level improvement rate for all student = 0.023).

Table 5.4

Average District-Level Black Student Improvement Rate by Average District-Level Black Student Academic Achievement

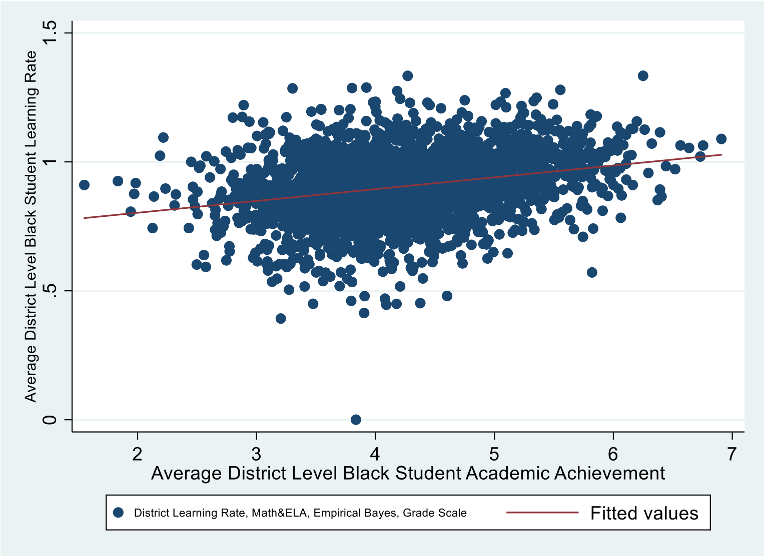
Initial Average District-Level Black Student Academic Achievement	Average District-Level Black Student Improvement Rate	Number of Districts
1.9-3	−0.014 (*SD* = 0.089)	107
> 3-4	0.008 (*SD* = 0.088)	1068
> 4-5	0.017 (*SD* = 0.076)	1340
> 5-6	0.043 (*SD* = 0.076)	436
> 6-7	0.047 (*SD* = 0.078)	37

Notes. Empirical Bayes estimates; grade scale.

The average district-level Black student learning rate was correlated with district-level Black student academic achievement. On average, the higher the district-level Black student academic achievement, the higher the average district-level Black student learning rate. As shown in Figure 5.5, there was evident variation in average district-level Black student learning rate at each level of average district-level Black student academic achievement. Based on my hierarchal linear model, the correlation between district-level Black student learning rate and academic achievement was 0.25.

Figure 5.5

Learning Rate by Academic Achievement



Also, on average, districts where Black students were testing on grade level were also growing faster than the expected learning rate for all students. In districts where average district-level Black student academic achievement was near or above the national average district-level academic achievement for all students, the average district-level Black student learning rate was above the national average district-level learning rate for all students (see Table 5.5; national average district-level learning rate for all student = 0.96).

Table 5.5

Average District-Level Black Student Learning Rate by Average District-Level Black Student Academic Achievement

Average District-Level Black Student Academic Achievement	Average District-Level Black Student Improvement Rate	Number of Districts
1.9-3	0.87 (*SD* = 0.12)	107
> 3-4	0.88 (*SD* = 0.13)	1068
> 5	0.90 (*SD* = 0.12)	1340
> 5-6	0.97 (*SD* = 0.11)	436
> 6-7	1.02 (*SD* = 0.11)	37

Note. Empirical Bayes estimates; grade scale.

I developed a dual-axis model (see Figure 5.6) to help make sense of the relationship between average district level Black student academic achievement and average district level Black student learning rate. By categorizing these districts, we could further assess the characteristics of each type of district individually. We could also compare district characteristics across quadrants.

Below I described the four quadrants of the model. In addition to using the dual-axis model to conduct future research, I also articulated potential interventions to give examples of how the dual-axis model could be implemented as a practical tool for supporting districts. Note, higher is defined as average district-level Black student academic outcome at or above that national grade-level average for all students, and lower is defined as average district-level Black student academic outcome below the national grade-level average for all students.

- High learning rate/high academic achievement (exemplary district): Exemplary districts were districts where Black students, on average, are growing at least one grade level per year and testing at or above grade level. A district that fell into this quadrant was functioning and may benefit from resources that buttress their current activity.
- High learning rate/low academic achievement (investment opportunity district): Investment opportunity districts were districts where Black students, on average, are growing at least one grade level per year and testing below grade level. A district that fell into this quadrant may benefit from an infusion of supports for their students during early childhood.
- Low learning rate/high academic achievement (wasted opportunity district): Wasted opportunity districts were districts where Black students, on average, are

growing below one grade level per year and testing at or above grade level. A district that fell into this quadrant may benefit from supports that strengthen instruction and curriculum.

- Low learning rate/low academic achievement (state of emergency district): State of emergency districts were districts where Black students, on average, were growing below one grade level per year and testing below grade level. A district that fell into this quadrant may have needed intensive supports across multiple areas of activity.

Figure 5.6

Average District-Level Black Student Learning Rate by Average District-Level Black Student Academic Achievement Dual-Axis Model

		Average District-Level Black Student Academic Achievement	
		High	Low
Average District-Level Black Student Learning Rate	High	Exemplary District	Investment Opportunity District
	Low	Wasted Opportunity District	State of Emergency District

As can be seen from Figure 5.5, a number of districts fell into each of the quadrants displayed in Figure 5.6. There were 107 districts that fell into the exemplary district quadrant, 864 districts that fell into the investment opportunity district quadrant, 55 districts that fell into the wasted opportunity district quadrant, and 1962 districts that fell into the state of emergency district quadrant. The dual-axis model may further future research and buttress practical interventions in districts.

5.4 Research Question Two Results: Average District-Level Black Student Academic Achievement, Improvement Rate, Learning Rate, and Explanatory Factors

For research question two, average district-level Black student academic achievement was the conditional expected average district-level Black student grade-level score in mathematics via standardized test scores for students who started kindergarten in 2008 and were in grade four within a district with typical racial composition, district size, district resource, Black concentrated advantage of the district, and Black concentrated disadvantage of the district.

Average district-level Black student improvement rate was the conditional expected average district-level Black student cohort trend in mathematics via standardized test scores, the rate at which Black student mathematics scores changed across Black student cohorts 2004-2012 for Black students who were grade four within a district with typical racial composition, district size, district resource, Black concentrated advantage of the district, and Black concentrated disadvantage of the district. There was no evidence against the assumption of linearity, normality, or homogeneity of variance (see Figures B.4 and B.6 in Appendix B).

The average district-level Black student learning rate was the conditional expected average district-level Black student linear grade slope in mathematics via standardized test scores, the rate at which mathematics scores changed across grades three to five, for students who started kindergarten in 2008 within a district with typical racial composition, district size, district resource, Black concentrated advantage of the district, and Black concentrated disadvantage of the district. There was no evidence against the assumption of linearity, normality, or homogeneity of variance (see Figures B.5 and B.6 in Appendix B).

The model for deriving estimates of average district-level Black student academic achievement (β_{0j}), average district-level Black student improvement rate (β_{1j}), and average district-level Black student learning rate (β_{2j}) was as follows. All estimates were empirical Bayes estimates, regression coefficients are estimated via maximum likelihood, and estimates were on the grade scale. For this study, grade scale meant the average one-grade-level difference in standardized test scores between students in districts (Fahle et al., 2017):

Level 1

$$\text{BlackAA}_{mij} = \text{TrueBlackAA}_{ij} + e_{mij},\ e_{mij} \sim N(0, v_{mij}),\ v_{mij}\ \text{Known}$$

Level 2

$$\text{TrueBlackAA}_{ij} = \beta_{0j} + \beta_{1j}(Cohort_{ij} - 2008) + \beta_{2j}(Grade_{ij} - 4) + r_{ij}$$

Level 3

$$\beta_{0j} = \gamma_{00} + \gamma_{01}(\text{Suburb}_j) + \gamma_{02}(\text{Town}_j) + \gamma_{03}(\text{Rural}_j) + \gamma_{04}(\text{PercentIndigenous}_j) + \gamma_{05}(\text{PercentAsian}_j) + \gamma_{06}(\text{PercentHispanic}_j) + \gamma_{07}(\text{PercentWhite}_j) + \gamma_{08}(\text{DistrictSize}_j) + \gamma_{09}(\text{DistrictResource}_j) + \gamma_{010}(\text{BlackConcentratedAdvantageofDistrict}_j) + \gamma_{011}(\text{BlackConcentratedDisadvantageofDistrict}_j) + u_{0j}$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}(\text{Suburb}_j) + \gamma_{12}(\text{Town}_j) + \gamma_{13}(\text{Rural}_j) + \gamma_{14}(\text{PercentIndigenous}_j) + \gamma_{15}(\text{PercentAsian}_j) + \gamma_{16}(\text{PercentHispanic}_j) + \gamma_{17}(\text{PercentWhite}_j) + \gamma_{18}(\text{DistrictSize}_j) + \gamma_{19}(\text{DistrictResource}_j) + \gamma_{110}(\text{BlackConcentratedAdvantageofDistrict}_j) + \gamma_{111}(\text{BlackConcentratedDisadvantageofDistrict}_j) + u_{1j}$$

$$\beta_{2j} = \gamma_{20} + \gamma_{21}(\text{Suburb}_j) + \gamma_{22}(\text{Town}_j) + \gamma_{23}(\text{Rural}_j) + \gamma_{24}(\text{PercentIndigenous}_j) + \gamma_{25}(\text{PercentAsian}_j) + \gamma_{26}(\text{PercentHispanic}_j) + \gamma_{27}(\text{PercentWhite}_j) + \gamma_{28}(\text{DistrictSize}_j) + \gamma_{29}(\text{DistrictResource}_j) + \gamma_{210}(\text{BlackConcentratedAdvantageofDistrict}_j) + \gamma_{211}(\text{BlackConcentratedDisadvantageofDistrict}_j) + u_{2j}$$

I used the younger grades (students across grades three to five) for research question two because there was evidence to suggest that students may experience achievement loss as they transition between elementary and middle school (Alspaugh, 1998; Alspaugh & Harting, 1995), and it may be the case that the way students do schooling in grades three to five differs from the way students in grades six to eight do schooling (Randall & Engelhard, 2009).

5.4.1 National

The national average district-level Black student academic achievement for students who started kindergarten in 2008 and were in grade 4 in mathematics across urban districts with typical racial composition, district size, district resource, Black concentrated advantage of the district, and Black concentrated disadvantage of the district was approximately 2.8 grade levels. The national average district-level Black student improvement rate for students across cohorts 2004-2012 who were grade 4 in mathematics across urban districts with typical racial composition, district size, district resource, Black concentrated advantage of the district, and Black concentrated disadvantage of the district was 0.005. The national average district-level Black student learning rate for students across grades 3-5 who started kindergarten in 2008 in mathematics across urban districts with typical racial composition, district size, district resource, Black concentrated advantage of the district, and Black concentrated disadvantage of the district was 0.88.

5.4.2 Urbanicity

It appears that Black students who attended districts in suburban and town locations score higher than Black students who attended districts in urban and rural settings. Holding constant the other predictors in my model, average district-level Black student academic achievement in suburban districts was 0.16 grade levels higher than average district-level Black student academic achievement in urban districts, and this difference was statistically significant with a *p*-value of < 0.001. Similarly, average district-level Black student academic achievement in districts in towns was 0.14 grade levels higher than average district-level Black student academic achievement in urban districts, and this difference was statistically significant with a *p*-value of < 0.001. There was no statistically significant difference in average district-level Black student academic achievement between Black students attending districts in rural and urban settings.

It appears that cohorts of Black students who attended districts in towns and rural districts were improving at higher rates than Black students who attended districts in urban and suburban settings. The average district-level Black student improvement rate in districts in towns was 0.037 grade levels higher than the average district-level Black student improvement rate of urban districts, and this difference was statistically significant with a *p*-value of < 0.001. The average district-level Black student improvement rate in rural districts was 0.047 grade levels higher than the average district-level Black student improvement rate in urban districts, and this difference was statistically significant with a *p*-value of < 0.001. There was no statistically significant difference in average district-level Black student learning rate between Black students attending suburban and urban districts.

There was no statistically significant difference in average district-level Black student learning rate between Black students attending suburban, town, rural, and urban districts.

5.4.3 Racial Composition

In districts that reported average district-level Black student academic achievement, a district at the 75th percentile of the proportion of Asian students in the district was 0.045 Asian, while a district at the 25th percentile of the proportion of Asian students in the district was 0.006 Asian. My model suggests that holding constant the other predictors in my model, this difference was associated with a 0.022 grade-level increase in average district-level Black student academic achievement. The association between the proportion of Asian students in the district and average district-level Black student academic achievement was statistically significant with a *p*-

value of 0.002. I concluded that the proportion of Asian students in the district was an unimportant explainer of district differences in average district-level Black student academic achievement. A district at the 75th percentile of the proportion of White students in the district was 0.75 White while a district at the 25th percentile of the proportion of White students in the district was 0.32 White. My model suggests that holding constant the other predictors in my model, this difference was associated with a 0.31 grade-level increase in average district-level Black student academic achievement. The association between the proportion of White students in the district and average district-level Black student academic achievement was statistically significant with a *p*-value of < 0.001. I concluded that the proportion of White students in the district was a large explainer of district differences in average district-level Black student academic achievement. There was no statistically significant relationship between the proportion of Indigenous students in the district or the proportion of Hispanic students in the district and average district-level Black student academic achievement.

In districts that reported average district-level Black student improvement rate, a district at the 75th percentile of the proportion of Hispanic students in the district was 0.25, while a district at the 25th percentile of the proportion of Hispanic students in the district was 0.03. My model suggests that holding constant the other predictors in my model, this difference was associated with a 0.01 grade-level decrease in average district-level Black student improvement rate. The association between the proportion of Hispanic students in the district and the average district-level Black student improvement rate was statistically significant with a *p*-value of 0.002. I concluded that the proportion of Hispanic students in the district was an unimportant explainer of district differences in average district-level Black student improvement rate. There was no statistically significant relationship between the proportion of Indigenous students in the district, the proportion of Asian students in the district, or the proportion of White students in the district, and the average district-level Black student improvement rate.

In districts that reported average district-level Black student learning rate, a district at the 75th percentile of proportion Indigenous student in the district was 0.005 Indigenous while a district at the 25th percentile of proportion Indigenous students in the district was 0.001 Indigenous. My model suggests that holding constant the other predictors in my model, this difference was associated with a 0.002 grade-level decrease in average district-level Black student learning rate. The association between the proportion of Indigenous students in the district and the average district-level Black student learning rate was statistically significant with a *p*-value of 0.006. I concluded that the proportion of Indigenous students in the district was an unimportant explainer of district differences in average district-level Black student learning rate. A district at the 75th percentile of the proportion of Asian students in the district was 0.045, while a district at the 25th percentile of the proportion of Asian students in the district was 0.006. My model suggests that holding constant the other predictors in my model, this difference was associated with a 0.01 grade-level increase in average district-level Black student learning rate. The association between the proportion of Asian students in the district and the average district-level Black student learning rate was statistically significant with a *p*-value of < 0.001. I concluded that the proportion of Asian students in the district was an unimportant explainer of district differences in average district-level Black student learning rate. A district at the 75th percentile of the proportion of White students in the district was 0.75 Asian, while a district at the 25th percentile of the proportion of White students in the district was 0.32 White. My model suggests that holding constant the other predictors in my model, this difference was associated with a 0.06 grade-level increase in average district-level Black student learning rate. The association between the proportion of White students in the district and the average district-level Black student learning rate was statistically significant with a *p*-value of < 0.001. I concluded that the proportion of White students in the district was an unimportant explainer of district differences in average district-level Black student learning rate. There was no statistically significant relationship between the proportion of Hispanic students in the district and the average district-level Black student learning rate.

5.4.4 District Size

Holding constant the other predictors in my model and on average, a 1% increase in district size (natural log of district size) was associated with a statistically significant increase of 0.0007 grade levels in average district-level Black student academic achievement. The corresponding *p*-value was < 0.001.

There was no statistically significant relationship between district size and average district-level Black student improvement rate.

There was no statistically significant relationship between district size and average district-level Black student learning rate.

5.4.5 District Resource

Holding constant the other predictors in my model and on average, a one *SD* increase in district resource was associated with a statistically significant increase of 0.41 grade levels in average district-level Black student academic achievement. The corresponding *p*-value was < 0.001. A 1 *SD* increase from the mean in district resource, on average, equated to a reduction of around 5 elementary students per teacher in a district, 1 elementary student per teacher aide in a district, 30 elementary students per instructional coordinator, and supervisor in a district, around 330 elementary students per guidance counselor in a district, and an increase of around $5,000 in per-pupil funding per year in a district (see Table 4.1).

A one *SD* increase in district resources was associated with a statistically significant decrease of 0.032 grade levels in the average district-level Black student improvement rate. The corresponding *p*-value was 0.001.

There was no statistically significant relationship between district resources and average district-level Black student learning rate.

5.4.6 Black Concentrated Advantage of District

Holding constant the other predictors in my model and on average, a one *SD* increase in Black concentrated advantage of the district was associated with a statistically significant increase of 0.28 grade levels in average district-level Black student academic achievement. The corresponding *p*-value was < 0.001. A one *SD* increase from the mean in district resource, on average, equated to of 31% increase in the percent Black people with professional occupations in a district, 26% increase in the percentage of Black people with a bachelor's degree or higher in a district, 20% increase in the percentage of Black people who lived in the same home as the prior year in a district, and a $40,000 increase in the average income at the 50th percentile in a district (see Table 4.3).

There was no statistically significant relationship between the Black concentrated advantage of district and average district-level Black student improvement rate.

A one *SD* increase in the Black concentrated advantage of the district was associated with a statistically significant increase of 0.05 grade levels in average district-level Black student learning rate. The corresponding *p*-value was < 0.001.

5.4.7 Black Concentrated Disadvantage of District

Holding constant the other predictors in my model and on average, a one *SD* increase in Black concentrated disadvantage of the district was associated with a statistically significant decrease of 0.17 grade levels in average district-level Black student academic achievement. The corresponding *p*-value was < 0.001. A one *SD* increase from the mean in district resource, on average, equated to a 32% increase in the percentage of Black children living in poverty aged 5-17 in a district, 20% increase in the percent of Black people who receive SNAP benefits, 35% increase in the percentage of Black people who rented their home in a district, a 33% increase in the number of households with children and headed by a Black woman, and a 16% increase in the Black unemployment rate (see Table 4.5).

A one *SD* increase in Black concentrated disadvantage of the district was associated with a statistically significant decrease of 0.011 grade levels in average district-level Black student improvement rate. The corresponding *p*-value was 0.038.

There was no statistically significant relationship between the Black concentrated disadvantage of the district and average district-level Black student learning rate.

Findings that district differences in average district-level Black student academic achievement correlated with district location (urbanicity), district racial composition, district size, district resource, Black concentrated advantage of district Black people, and Black concentrated disadvantage of the district provided evidence for hypothesis two (see Table 5.6).

Table 5.6

Relation of District-Level Black Student Academic Achievement and All Explanatory Factors and Variance Components

Fixed Effect	Coefficient	Standard Error	*t*-ratio	Approx. *df*	*p*-value
For INTRCPT1, π_0					
For INTRCPT2, β_{00}					
INTRCPT3, γ_{000}	2.789962	0.026405	105.661	2846	< 0.001
SUBURB, γ_{001}	0.162101	0.032152	5.042	2846	< 0.001
TOWN, γ_{002}	0.146807	0.038961	3.768	2846	< 0.001
RURAL, γ_{003}	0.039588	0.037295	1.061	2846	0.289
PERIND, γ_{004}	0.243684	0.413107	0.590	2846	0.555
PERASN, γ_{005}	0.573592	0.182979	3.135	2846	0.002
PERHSP, γ_{006}	0.126599	0.068277	1.854	2846	0.064
PERWHT, γ_{007}	0.733245	0.050293	14.579	2846	< 0.001
NATLOGTE, γ_{008}	0.068874	0.012192	5.649	2846	< 0.001
DISTSCHR, γ_{009}	0.411604	0.052687	7.812	2846	< 0.001
CONABLK, γ_{0010}	0.282715	0.025580	11.052	2846	< 0.001
CONDBLK, γ_{0011}	−0.169681	0.023061	−7.358	2846	< 0.001

Note. DISTSCHR = district "school-related" resource.

Findings on the relation of average district-level Black student improvement rate and the explanatory factors of interest in this study did not completely support hypothesis two. Urbanicity matters but only for districts in towns and rural districts. Only one racial group (Hispanic) was associated with variation in average district-level Black student improvement rate. District size and Black concentrated advantage of the district were not associated with average district-level Black student improvement rate (see Table 5.7).

Table 5.7

Relation of District-Level Black Student Improvement Rate and All Explanatory Factors and Variance Components

Fixed Effect	Coefficient	Standard Error	*t*-ratio	Approx. *df*	*p*-value
For COHORT_M, β_{02}					
INTRCPT3, γ_{020}	0.005083	0.005861	0.867	2846	0.386
SUBURB, γ_{021}	−0.003030	0.006895	−0.439	2846	0.660
TOWN, γ_{022}	0.037199	0.009123	4.077	2846	< 0.001
RURAL, γ_{023}	0.046957	0.008156	5.757	2846	< 0.001
PERIND, γ_{024}	−0.120601	0.082912	−1.455	2846	0.146
PERASN, γ_{025}	0.046254	0.043844	1.055	2846	0.292
PERHSP, γ_{026}	−0.045991	0.014907	−3.085	2846	0.002
PERWHT, γ_{027}	0.015914	0.011904	1.337	2846	0.181
NATLOGTE, γ_{028}	0.002293	0.002595	0.884	2846	0.377
DISTSCHR, γ_{029}	−0.032016	0.009918	−3.228	2846	0.001
CONABLK, γ_{0210}	0.003705	0.005987	0.619	2846	0.536
CONDBLK, γ_{0211}	−0.011230	0.005412	−2.075	2846	0.038

Note. DISTSCHR = district "school-related" resource.

Finally, findings on the relationship of average district-level Black student learning rate and the explanatory factors of interest in this study did not completely support hypothesis two. Urbanicity did not seem to be associated with the average district-level Black student learning rate. Additionally, district size, district resource, and Black concentrated disadvantage of the district did not seem to be associated with the average district-level Black student learning rate (see Table 5.8).

Table 5.8

Relation of District-Level Black Student Learning Rate and All Explanatory Factors and Variance Components

Fixed Effect	Coefficient	Standard Error	*t*-ratio	Approx. *df*	*p*-value
For GRADE_C, β_{01}					
INTRCPT3, γ_{010}	0.879999	0.010136	86.817	2846	< 0.001
SUBURB, γ_{011}	−0.011472	0.011655	−0.984	2846	0.325
TOWN, γ_{012}	−0.006635	0.017478	−0.380	2846	0.704
RURAL, γ_{013}	−0.017766	0.015063	−1.179	2846	0.238
PERIND, γ_{014}	−0.475524	0.173866	−2.735	2846	0.006
PERASN, γ_{015}	0.252452	0.072528	3.481	2846	< 0.001
PERHSP, γ_{016}	0.029759	0.027454	1.084	2846	0.278
PERWHT, γ_{017}	0.132166	0.023120	5.717	2846	< 0.001
NATLOGTE, γ_{018}	0.005953	0.004879	1.220	2846	0.223
DISTSCHR, γ_{019}	−0.032784	0.018550	−1.767	2846	0.077
CONABLK, γ_{0110}	0.045326	0.011616	3.902	2846	< 0.001
CONDBLK, γ_{0111}	−0.003240	0.010920	−0.297	2846	0.767

Note. DISTSCHR = district "school-related" resource.

In this chapter, I established that there was heterogeneity in average district-level Black student academic achievement, improvement rate, and learning rate. Districts varied widely on these three academic outcomes, and this variation was statistically significant in each case. I also detailed average district-level Black student academic improvement and learning rates via initial average district-level Black student academic achievement, a dual-matrix model, and higher-performing districts. Finally, I showed that there were school and environmental factors that had a statistically significant association with district-level Black student academic achievement, improvement rate, and learning rate. I describe and speculate on these findings more in the discussion chapter.

CHAPTER SIX DISCUSSION AND CONCLUSION

This dissertation described and assessed district variation in Black student academic achievement, improvement rate, and learning rate. I delineated nationally where and under what conditions districts are doing well given Black student academic outcomes. The overall intent was to serve as a launching point for future rigorous analysis of the meaning of this heterogeneity in educational outcomes for groups historically treated as monolithic. Such a program of research has the potential to strengthen educational opportunities for Black students. This dissertation adds to the literature on district heterogeneity in student academic outcomes. I used population data from the SEDA to address the following two research questions: (1) How much do districts vary with respect to the average academic achievement, average improvement rate (the rate at which scores change across student cohorts, within a grade), and average learning rate (the rate at which scores change across grades, within a student cohort) of the Black students they serve? (2) What school and environmental factors are correlated with average district-level Black student academic achievement, average district-level Black student improvement rate, and average district-level Black student learning rate?

Findings in this dissertation may provide important evidence to material efforts to combat stereotypes about the academic capacity and outcomes of Black students and the places they do schooling. They also may hold the potential to ignite a conversation about the role of districts in reducing educational inequality and inequity in the educational experiences of Black students. Finally, they may disrupt age-old narratives about the monolithic underperformance of Black students via standardized test scores.

6.1 Patterns of Variation and Higher-Performing Districts for Black Student Academic Outcomes

The first question identified how much districts vary with respect to the average academic achievement, average improvement rate (the rate at which scores change across student cohorts, within a grade), and average learning rate (the rate at which scores change across grades, within a student cohort) of the Black students they served. This distinction is important because it delineates the national context of Black student academic outcome in new and innovative ways. Additionally, it is important because earlier studies may underemphasize the potential of examining variation in district-level student academic outcomes. Not only did this study address this gap in the extant literature, but I also narrowed this examination to within-group differences in Black student academic outcomes nationally. As hypothesized, there was a statistically significant difference in average district-level Black student academic achievement, average district-level Black student improvement rate, and average district-level learning rate among districts that served Black students. Not only was this variation statistically significant, but it was also substantial. For example, a one *SD* difference in average district-level Black student academic achievement was equivalent to a 1.5 grade-level gap in standardized test scores in mathematics and ELA. A two *SD* difference was equivalent to a 3.1 grade-level gap in test scores. We see similarly substantial gaps for average district-level Black student improvement and learning rates, albeit not in the same way (see Tables 5.2 and 5.3, respectively). Thus, we observe that districts as educational units varied concerning Black student academic outcomes in unique ways not previously anticipated.

In addition to Black student academic outcome variation, districts varied widely on district resource, Black advantage, and Black disadvantage. On average, in the most resourced districts, students attended districts with 10 or fewer students per teacher, 20 or fewer students per teacher aide, and the district spent nearly $23,000 per student per year. On average, in less-resourced districts, students attended districts with 20 students per teacher, 200 students per teacher aide, and the district spent around $8,500 per student. Additionally, at the bottom of the distribution of Black concentrated advantage of districts, some districts had no Black people with professional occupations. While at the top of the distribution, there were districts with 80 to 100% of Black people with professional occupations. Similarly, for undergraduate degrees or higher, there were districts where not one Black person reported having a bachelor's degree or higher. Conversely, there were districts where nearly one-quarter or more Black people reported holding a bachelor's degree or higher. There were districts where Black people made less than $25,000 per year at the 50th percentile in a district and districts where Black people made over $65,000 per year at the 50th percentile. Last, at the bottom of the distribution of Black concentrated disadvantage of districts, there were districts where no Black children lived in poverty. There were districts at the top of the distribution where 80 to 100% of Black children lived in poverty. There were districts where not one Black home was headed by a Black single mother, but there were also districts where 100% of the Black homes were headed by a Black single mother. Additionally, there were districts where every Black person reported that they had a job, and there were also districts where a fifth of the Black people reported that they were unemployed. These findings expand a sparse literature on the relationship of the district to student academic achievement (see Whitehurst et al., 2013) and detail heterogeneity in both district-level Black student academic outcomes and district characteristics. In the implication section, I further expand on the impact of these findings.

An additional contribution of this study was the delineating of districts where Black students grades 3-8 for academic years 2008/2009-2014/2015 have academic achievement, improvement rate, and learning rate were all at or above the national average for all students on standardized test scores in both mathematics and ELA. This was important because we now know all the districts in the United States where Black students were scoring at or above the national average for all students on standardized tests in mathematics and ELA on three salient academic outcomes. Specifically, at the time of this study, there were 135 districts across the nation where average district-level Black student academic achievement was at or above the national average for all students, 1404 districts where average district-level Black student improvement rate was at or above the national average for all students, 776 districts where average district-level Black student learning rate was at or above the national average for all students. That said, there were 54 higher performing districts in the nation where district-level Black student academic achievement, district-level Black student improvement rate, and district-level Black student academic achievement were at or about the national average. Where Ronald Edmonds (1979) searched for "effective schools" for Black students, I have delineated what I call "higher-performing districts" for Black students nationally.

Furthermore, given my descriptive analysis, we now know there was a positive relationship between average district-level Black student academic achievement and average district-level Black student improvement and learning rate. For districts that had average district-level Black student academic achievement at or above the national average, the improvement rate and learning rate of those districts—on average—was above the national average for both average district-level Black student learning rate for all students and average district-level Black student improvement rate for all students. The question here becomes: What was driving these important outcomes and why? Can districts that show competitive outcomes for Black students attract more advantage, Black families? Maybe it is the case that resources were being allocated differently in these districts? Future research can address these potential explanations and others.

Given my average district-level Black student learning rate by average district-level Black student academic achievement dual-axis model, we can now categorize districts via the intersection of two academic outcomes. I choose to focus on learning rates and not improvement rates in this dual-axis model because I believe the relationship between average district level Black student academic achievement and average district level Black student learning rate is more informative and may be more applicable in an intervention/policy setting. With that in mind, by naming these districts via the dual-axis model, we can further assess the characteristics of each type of district individually. We can also compare district characteristics across quadrants (see Figure 5.6). Here I present a few thoughts on these quadrants and the districts that fall into them. First, there are districts where Black students may be playing catch up. In investment opportunity districts ($N = 864$), the issue that arose was if Black students were testing below grade level, then even if they were growing at least one grade level per year, they may never catch up and test on grade level. Conversely, some districts had Black students who appeared to be falling behind. In wasted opportunity districts ($N = 55$), the issue that arose was that Black students were testing on grade level but not growing at least one grade level per year. Something was happening in the districts where they received students on grade level but failed to grow these students year to year, even when they came into the district on grade level. In these districts, Black students fell behind. State of emergency districts ($N = 1962$) were unacceptable in any form. Districts where students were growing below one grade level per year, and testing below grade level marks an affront to the children of this country and a stain on our democracy. Over half of the districts in the United States that reported Black student academic outcomes fell into this category. How do we overcome this state of emergency for Black students in United States public school districts? Finally, there were exemplary districts (*N* = 107) where Black students grew at least one grade level per year and tested at or above grade level. Assessing and understanding these districts in future studies may play a crucial role in reducing inequity and inequality in the educational experiences of Black students.

6.2 Relation of Variation and School and Environmental Factors

The second question addressed was to identify what school and environmental factors were correlated with average district-level Black student academic achievement, average district-level Black student improvement rate, and average district-level Black student improvement rate in mathematics achievement for Black elementary school students grades 3-5 for academic years 2008/2009-2014/2015. I included six key predictors in my analysis, comprised of indicators that had been shown to influence student academic outcomes in the extant literature, and restricted my analysis to mathematics achievement for elementary school students. The six key predictors in my analysis were composite indices of district location: urbanicity, district racial composition, district size, district resource, Black concentrated advantage of district, and Black concentrated disadvantage of district. I found that these key predictors did not function the same across the three outcomes in this study. For example, while suburban districts were associated with differences in district level Black student academic achievement, districts in towns and rural districts were associated with differences in district level Black student improvement rate. None of the district locations were associated with differences in district level Black student learning rate. Additionally, district resource was associated with average district level Black student academic achievement but not average district level Black student learning rate.

In addition to variation across academic outcomes, in some cases the relationship of the aforementioned factors and district-level Black student academic outcomes were statistically significant and substantial. For example, if we consider the racial composition of districts serving Black students nationally and its relation to district-level Black student academic achievement, the gap between districts at the 75th percentile of the proportion of White students in district and districts at the 25th percentile of proportion White was associated with a 0.31 grade-level increase in average district-level Black student academic achievement. Additionally, when we consider the influence of district resource on Black student academic achievement nationally, we see that for every one *SD* increase in district resource, we can expect nearly a one-half grade-level increase in average district-level mathematics achievement of Black students. Similarly, for every one *SD* increase in the Black concentrated advantage of the district, we see a one-third grade level increase in average district-level mathematics achievement of Black students.

In the extant literature there is empirical evidence that supports the idea that school and environmental factors influence student academic achievement (Coleman, 1966; Hassrick et al., 2017; Sampson et al., 2008). In this study, I showed that school and environmental factors appear to be associated with district level academic outcomes. Additionally, these factors appear to vary across outcomes and in magnitude. I further expand on the impact of these findings in the implication section.

6.3 Implications for Practice/Policy

A focus on heterogeneity in this study may help to change the policy discourse about Black achievement. Findings from this study extend previous work on heterogeneity in Black student academic achievement. This study advances knowledge in three key areas. First, unlike much of the research in this area that has considered academic achievement, via standardized test scores in mathematics and ELA, by comparing ethnic groups; this study extends previous research by identifying the tremendous amount of heterogeneity in academic outcome for a specific ethnic group and doing so with a strength-based perspective in mind. We now know how

Black students are performing on three specific academic outcomes in United States public school districts nationally, where this performance is subpar, and where this performance is stellar. Additionally, by establishing that average district-level Black student improvement and learning rates vary on average district-level Black student academic achievement, I have constructed a dual-axis model that may be used to categorize districts in a way that potentially encourages practical resource allocation and district-specific policy recommendation. Furthermore, in a search for higher-performing districts, I have identified both unusually effective and unusually ineffective districts. These differences in district-level Black student academic achievement, improvement rate, and learning rate between the highest- and lowest-performing districts are substantial across the nation and provide real opportunity on multiple fronts to do work that reduces inequity and inequality in the educational experience of Black students. Findings in this study help delineate the national context of Black student academic achievement, and this is important if we as a nation are serious about maximizing the educational experiences and outcomes of all of our nation's students.

Second, this study establishes that there were a number of higher-performing districts that served Black students across the nation. Districts where average district-level Black student academic achievement, average district-level Black student improvement rate, and average district-level Black student learning rated at or above the national average for all students in each of those categories respectively revealed that education has the potential to work for Black students in the United States. I also found that some districts did well on average district-level Black student improvement and learning rate despite lackluster average district-level Black student academic achievement scores. Finally, I defined and described a dual-axis model that may aid in appropriate categorization and resource allocation associated with United States public school districts. If districts are to shoulder the responsibility of being great equalizers in the United States through their public schools, then understanding the why and how of higher-performing districts that serve Black students is essential.

Third, this dissertation considered school and environmental factors that could be associated with the academic achievement (mathematics standardized test scores) of Black students nationally. Given the segregated nature of public schools in the United States and disparity in academic achievement across ethnic groups (Reardon, 2016b), this study presented findings that may have practical utility for developing district- and community-based prevention and intervention programs for a historically underserved and disenfranchised student population. Findings reported here could assist entities at every level of the district structure to better support the academic outcome of Black students across the nation. Similarly, entities within a district community (e.g., community stakeholders, policymakers) may use the findings here to buttress and/or reinforce resources, access, and opportunity for Black students in districts all across the nation. For example, a district may use results from this study to support the hiring of guidance counselors or to lobby for resources that will improve the condition of their student's families. Government officials could use the results in this study to commission a study on suburban districts and how they support Black elementary student math achievement. The opportunities are bountiful.

In light of these contributions to the literature on districts and student academic outcomes, the study's key findings on variation in district-level Black student academic outcome and school and environmental influences on said variation are important. Evidence on heterogeneity presented in this study points to a need for future research. This future research will be useful for intervention, policy design, and the remedying of inequity and inequality in the educational experience of Black students nationally.

6.4 Limitations

Findings from this research must be interpreted with consideration of the study limitations. Academic outcomes presented in this study may not correspond to a constant group of students. Students enter and exit districts for a number of reasons. Additionally, some students may have been retained, and other students may have been promoted early and skipped grades. According to Reardon (2019), "This is a limitation inherent in the raw EDFacts data, which do not include student longitudinal records" (p. 48).

Additionally, the multilevel analysis utilized in this study was not causal. Therefore, we can only speak in terms of association when discussing the relations of district-level Black student academic outcomes and school and environmental factors.

6.5 Areas for Future Research

There are notable areas for future research that could build on this study and future policy implications. A follow-up study could be conducted to describe variation in the average district-level academic outcomes of other groups historically treated as monolithic. Delineating the academic outcomes of Hispanic, Indigenous, minoritized Asian populations, etc., individually and nationally may reveal similar patterns of heterogeneity and opportunity in our nation.

Future studies could also investigate how the 54 higher-performing districts delineated in this study are effectively serving Black students. A mixed-methods or qualitative examination of these district settings might reveal much about the effectiveness of these 54 higher-performing districts.

A follow-up study could also be conducted to investigate if the factors that influence district-level Black student academic outcomes also influence the academic outcomes of other racial/ethnic groups. In addition to identifying the relationship of academic outcomes to district-level school and environmental factors, these studies should focus on identifying higher-performing districts for populations historically underserved by the United States public school system (e.g., Hispanic, Indigenous, minoritized Asian populations).

Finally, though I did not expressly examine achievement gaps in this dissertation, I established that nationally, district-level heterogeneity exists in Black student academic outcomes. I coin this variation Black-Black achievement gaps and define these gaps as a disparity in academic performance between groups of Black students. A study could be conducted to assess what contributes to variation between districts that do better and districts that do worse on the three district-level Black student academic outcomes of interest in this dissertation: average district-level Black student academic achievement, average district-level Black student learning rate, and average district-level Black student improvement rate.

I conclude this dissertation with more facts about average district-level Black student academic outcome than I could have imagined, some insights into what factors may correlate with the substantial variation I have uncovered in average district-level Black student academic outcome, and a collection of more questions about average district-level Black student academic outcome. Ronald Edmonds (1979) attempted to stimulate a more robust conversation about variation across schools and did so through an equity lens that focused on fairness in our social order. Equity was the center of his discussion about schools over 40 years ago. I hope to also stimulate a more robust conversation about variation across districts. However, may a time in the next 40 years find us realizing the equity that is the inalienable right of all children. Opportunities for future research abound, and so does the opportunity to contribute to the improved condition of a people.

APPENDIX A VARIABLE CREATION, STANDARDIZATIONS, AND FACTOR LOADINGS FOR COMPOSITE INDEX CONSTRUCTION

Figure A.1

Generating of Indicator Variables for District Resource Composite Construction (Syntax)

```
. ***Generate Variables in Per Student Terms***
. *Total Number of Elementray Teacher Per Student (elmtch)*
. gen elmtchperstu=elmtch/totenrl
(708 missing values generated)

.
. *Total Number of Teachers Per Student (tottch)*
. gen tottchperstu=tottch/totenrl
(708 missing values generated)

.
. *Total Number of Teacher Aides Per Student (aides)*
. gen aidesperstu=aides/totenrl
(708 missing values generated)

.
. *Total Number of Instructional Coordinators and Supervisors Per Student (corsup)*
. gen corsupperstu=corsup/totenrl
(708 missing values generated)

.
. *Total Number of Elementary Guidance Counselors Per Student (elmgui)*
. gen elmguiperstu=elmgui/totenrl
(708 missing values generated)

.
. *Teacher Student Ratio (Make the inverse of what is in the dataset, student teacher ratio)
. gen tchstu_all=1/stutch_all
(773 missing values generated)
```

Note. totenrl=the total enrollment of students grades 3-8 in a district.

District Resource Composite Construction-Indictor Variable Standardization

Figure A.2.1

Standardization of Indicator Variable Teacher (all teachers in a district)/Pupil (all students in a district) Ratio for District Resource Composite Construction

```
. *Teacher-Pupil Ratio (tchstu_all, inverse of what is in dataset, stutch_all)*
. sum tchstu_all
```

Variable	Obs	Mean	Std. Dev.	Min	Max
tchstu_all	13,599	.0771864	.0438086	.0010233	2.040816

```
. gen tchstu_allZ=(tchstu_all-0.0771864)/0.0438086
(773 missing values generated)

. sum tchstu_allZ
```

Variable	Obs	Mean	Std. Dev.	Min	Max
tchstu_allZ	13,599	5.15e-07	1	-1.738542	44.82293

Figure A.2.2

Standardization of Indicator Variable Elementary Teacher/Elementary Student Ratio for District Composite Construction

```
. *Total Number of Elementray Teacher Per Student (elmtchperstu)*
. sum elmtchperstu
```

Variable	Obs	Mean	Std. Dev.	Min	Max
elmtchperstu	13,664	.0930869	.2171764	0	15.565

```
. gen elmtchperstuZ=(elmtchperstu-0.0930869)/0.2171764
(708 missing values generated)

. sum elmtchperstuZ
```

Variable	Obs	Mean	Std. Dev.	Min	Max
elmtchpers~Z	13,664	1.57e-07	.9999998	-.4286235	71.24123

Figure A.2.3

Standardization of Indicator Variable Teacher (all teachers in a district)/Elementary Student Ratio for District Resource Composite Construction

```
. *Total Number of Teachers Per Student(tottchperstu)*
. sum tottchperstu
```

Variable	Obs	Mean	Std. Dev.	Min	Max
tottchperstu	13,664	.2155842	.6981707	0	32

```
. gen tottchperstuZ=(tottchperstu-0.2155842)/0.6981707
(708 missing values generated)

. sum tottchperstuZ
```

Variable	Obs	Mean	Std. Dev.	Min	Max
tottchpers~Z	13,664	-3.83e-08	1	-.3087844	45.52528

Figure A.2.4

Standardization of Indicator Variable Teacher Aid/Elementary Student Ratio for District Resource Composite Construction

```
. *Total Number of Teacher Aides Per Student(aidesperstu)*
. sum aidesperstu
```

Variable	Obs	Mean	Std. Dev.	Min	Max
aidesperstu	13,664	.0804983	.9393975	0	95.25

```
. gen aidesperstuZ=(aidesperstu-0.0804983)/0.9393975
(708 missing values generated)

. sum aidesperstuZ
```

Variable	Obs	Mean	Std. Dev.	Min	Max
aidesperstuZ	13,664	-1.86e-08	1	-.0856914	101.3091

Figure A.2.5

Standardization of Indicator Variable Instructional Coordinators and Supervisors/Elementary Student Ratio for District Resource Composite Construction

```
. *Total Number of Instructional Coordinators and Supervisors Per Student (corsupperstu)*
. sum corsupperstu

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
corsupperstu |     13,664    .0067242    .0590839          0   3.538889

. gen corsupperstuZ=(corsupperstu-0.0067242)/0.0590839
(708 missing values generated)

. sum corsupperstuZ

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
corsuppers~Z |     13,664    4.40e-07           1  -.1138077   59.78219
```

Figure A.2.6

Standardization of Indicator Variable Elementary Guidance Counselors/Elementary School Student Ratio for District Resource Composite Construction

```
.
. *Total Number of Elementary Guidance Counselors Per Student (elmguiperstu)*
. sum elmguiperstu

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
elmguiperstu |     13,664    .0015659     .002744          0   .1011905

. gen elmguiperstuZ=(elmguiperstu-0.0015659)/0.002744
(708 missing values generated)

. sum elmguiperstuZ

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
elmguipers~Z |     13,664    .0000126    1.000008  -.5706633   36.30633
```

Figure A.2.7

Standardization of Indicator Variable Per-Pupil Expenditure for District Resource Composite Construction

```
. *Per Pupil Total Expenditures (ppexp_tot)*
. sum ppexp_tot

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
   ppexp_tot |     13,102    13211.57    4730.303    4161.11   51090.62

. gen ppexp_totZ=(ppexp_tot-13211.57)/4730.303
(1,270 missing values generated)

. sum ppexp_totZ

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
  ppexp_totZ |     13,102   -7.76e-07           1  -1.913294   8.007742
```

Black Concentrated Advantage of District Composite Construction Indicator Variable Standardization

Figure A.3.1

Standardization of Indicator Variable % of Black People in a District with Professional Occupations for Black Concentrated Advantage of District Composite Construction

```
. *Percent of Black People in Professional Occupations (profocc_blk)*
. sum profocc_blk
```

Variable	Obs	Mean	Std. Dev.	Min	Max
profocc_blk	5,877	.3162157	.3119063	0	2

```
. gen profocc_blkZ=(profocc_blk-0.3162157)/0.3119063
(8,495 missing values generated)

. sum profocc_blkZ
```

Variable	Obs	Mean	Std. Dev.	Min	Max
profocc_blkZ	5,877	3.75e-08	1	-1.013816	5.398366

Figure A.3.2

Standardization of Indicator Variable % of Black People in a District with a Bachelor's Degree or Higher for Black Concentrated Advantage of District Composite Construction

```
.
. *Percent of Black People with BA or Higher (baplus_blk)*
. sum baplus_blk
```

Variable	Obs	Mean	Std. Dev.	Min	Max
baplus_blk	9,520	.201866	.2534315	0	1

```
. gen baplus_blkZ=(baplus_blk-0.2093055)/0.2304658
(4,852 missing values generated)

. sum baplus_blkZ
```

Variable	Obs	Mean	Std. Dev.	Min	Max
baplus_blkZ	9,520	-.0322801	1.099649	-.9081846	3.430854

Figure A.3.3

Standardization of Indicator Variable % of Black People in the Same Home as Last Year in a District for Black Concentrated Advantage of District Composite Construction

```
. *Percent of Black People in Same House as Last Year (samehouse_blk)*
. sum samehouse_blk

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
samehouse_~k |      7,132    .7966229    .2763304          0          1

. gen samehouse_blkZ=(samehouse_blk-0.7966229)/0.2763304
(7,240 missing values generated)

. sum samehouse_blkZ

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
samehouse_~Z |      7,132    1.38e-07    .9999998  -2.882864   .7359925
```

Figure A.3.4

Standardization of Indicator Variable for Black People with Income at the 50th Percentile in a District for Black Concentrated Advantage of District Composite Construction

```
. *Income at 50th Percentile for Black People (inc50blk)*
. sum inc50blk

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
    inc50blk |      5,981    51326.63    40736.35     4999.5     260000

. gen inc50blkZ=(inc50blk-51326.63)/40736.35
(8,391 missing values generated)

. sum inc50blkZ

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
   inc50blkZ |      5,981   -7.83e-08           1  -1.137243   5.122535
```

Black Concentrated Disadvantage of District Composite Construction Indicator Variable Standardization

Figure A.4.1

Standardization of Indicator Variable % of Black Children 5-17 Living in Poverty in a District for Black Concentrated Advantage of District Composite Construction

```
. *Percent of Black Children 5-17 Living in Poverty (poverty517_blk)*
. sum poverty517_blk
```

Variable	Obs	Mean	Std. Dev.	Min	Max
poverty517~k	6,950	.2820734	.3168174	0	1

```
. gen poverty517_blkZ=(poverty517_blk-0.2820734)/0.3168174
(7,422 missing values generated)

. sum poverty517_blkZ
```

Variable	Obs	Mean	Std. Dev.	Min	Max
poverty517~Z	6,950	5.16e-08	.9999999	-.8903343	2.266058

Figure A.4.2

Standardization of Indicator Variable % of Black People receiving SNAP/Welfare benefits in a District for Black Concentrated Advantage of District Composite Construction

```
. *Percent of Black People Receiving Snap Benefits (snap_blk)*
. sum snap_blk
```

Variable	Obs	Mean	Std. Dev.	Min	Max
snap_blk	6,001	.2792167	.3018805	0	1

```
. gen snap_blkZ=(snap_blk-0.2792167)/0.3018805
(8,371 missing values generated)

. sum snap_blkZ
```

Variable	Obs	Mean	Std. Dev.	Min	Max
snap_blkZ	6,001	1.06e-07	.9999999	-.9249246	2.387645

Figure A.4.3

Standardization of Indicator Variable % of Black People Who Rent in a District for Black Concentrated Advantage of District Composite Construction

```
. *Percent of Black People who Rent (rent_blk)*
. sum rent_blk
```

Variable	Obs	Mean	Std. Dev.	Min	Max
rent_blk	6,001	.48346	.346699	0	1

```
. gen rent_blkZ=(rent_blk-0.48346)/0.346699
(8,371 missing values generated)

. sum rent_blkZ
```

Variable	Obs	Mean	Std. Dev.	Min	Max
rent_blkZ	6,001	1.47e-08	1	-1.394466	1.48988

Figure A.4.4

Standardization of Indicator Variable % of Households with Children and Female-Headed in a District for Black Concentrated Advantage of District Composite Construction

```
. *Percent of Households with Children and Female Headed (singmom_blk)*
. sum singmom_blk
```

Variable	Obs	Mean	Std. Dev.	Min	Max
singmom_blk	6,001	.4257127	.3270992	0	1

```
. gen singmom_blkZ=(singmom_blk-0.4257127)/0.3270992
(8,371 missing values generated)

. sum singmom_blkZ
```

Variable	Obs	Mean	Std. Dev.	Min	Max
singmom_blkZ	6,001	-1.21e-07	1	-1.301479	1.755698

Figure A.4.5

Standardization of Indicator Variable % of Black People Unemployed in a District for Black Concentrated Advantage of District Composite Construction

```
.
. *Percent of Black People Unemployed (unemp_blk)*
. sum unemp_blk
```

Variable	Obs	Mean	Std. Dev.	Min	Max
unemp_blk	9,664	.0859116	.1637676	0	2.666667

```
. gen unemp_blkZ=(unemp_blk-0.0859116)/0.1637676
(4,708 missing values generated)

. sum unemp_blkZ
```

Variable	Obs	Mean	Std. Dev.	Min	Max
unemp_blkZ	9,664	-2.47e-07	1	-.5245946	15.75864

Figure A.5

Factor Analysis and Loadings for District Resource Composite Construction

```
. summarize $xlist
```

Variable	Obs	Mean	Std. Dev.	Min	Max
elmtchpers~Z	13,664	1.57e-07	.9999998	-.4286235	71.24123
tottchpers~Z	13,664	-3.83e-08	1	-.3087844	45.52528
aidesperstuZ	13,664	-1.86e-08	1	-.0856914	101.3091
corsuppers~Z	13,664	4.40e-07	1	-.1138077	59.78219
elmguipers~Z	13,664	.0000126	1.000008	-.5706633	36.30633
tchstu_allZ	13,599	5.15e-07	1	-1.738542	44.82293
ppexp_totZ	13,102	-7.76e-07	1	-1.913294	8.007742

```
. corr $xlist
(obs=13,098)
```

	elmtch~Z	tottch~Z	aidesp~Z	corsup~Z	elmgui~Z	tchstu~Z	ppexp_~Z
elmtchpers~Z	1.0000						
tottchpers~Z	0.6557	1.0000					
aidesperstuZ	0.5119	0.7951	1.0000				
corsuppers~Z	0.4994	0.7043	0.6565	1.0000			
elmguipers~Z	0.3913	0.2461	0.2405	0.1996	1.0000		
tchstu_allZ	0.5405	0.2425	0.1411	0.0546	0.2213	1.0000	
ppexp_totZ	0.2794	0.1343	0.1500	0.0855	0.1095	0.5085	1.0000

Figure A.5 Continued

```
. *Principal Component Analysis (PCA)*
. pca $xlist

Principal components/correlation                 Number of obs    =     13,098
                                                 Number of comp.  =          7
                                                 Trace            =          7
    Rotation: (unrotated = principal)            Rho              =     1.0000
```

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	3.2819	1.81376	0.4688	0.4688
Comp2	1.46813	.58632	0.2097	0.6786
Comp3	.881814	.306866	0.1260	0.8045
Comp4	.574948	.213988	0.0821	0.8867
Comp5	.360959	.0974198	0.0516	0.9383
Comp6	.26354	.0948296	0.0376	0.9759
Comp7	.16871	.	0.0241	1.0000

Principal components (eigenvectors)

Variable	Comp1	Comp2	Comp3	Comp4	Comp5	Comp6	Comp7	Unexplained
elmtchpers~Z	0.4626	0.1542	0.1066	-0.4255	0.2525	-0.6520	-0.2845	0
tottchpers~Z	0.4853	-0.2343	-0.1226	-0.1082	-0.2343	-0.0947	0.7868	0
aidesperstuZ	0.4489	-0.2815	-0.1417	0.1800	-0.6138	0.1040	-0.5283	0
corsuppers~Z	0.4161	-0.3492	-0.1356	0.1681	0.7003	0.3967	-0.1023	0
elmguipers~Z	0.2511	0.1359	0.8898	0.3343	-0.0320	0.0938	0.0719	0
tchstu_allZ	0.2683	0.6141	-0.0666	-0.4440	-0.0918	0.5837	-0.0111	0
ppexp_totZ	0.2021	0.5697	-0.3728	0.6616	0.0678	-0.2195	0.0716	0

Figure A.5 Continued

Factor Analysis and Loadings for District Resource Composite Construction

```
. *Principal Component Analysis*
. pca $xlist, mineigen(1)

Principal components/correlation                 Number of obs    =     13,098
                                                 Number of comp.  =          2
                                                 Trace            =          7
    Rotation: (unrotated = principal)            Rho              =     0.6786
```

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	3.2819	1.81376	0.4688	0.4688
Comp2	1.46813	.58632	0.2097	0.6786
Comp3	.881814	.306866	0.1260	0.8045
Comp4	.574948	.213988	0.0821	0.8867
Comp5	.360959	.0974198	0.0516	0.9383
Comp6	.26354	.0948296	0.0376	0.9759
Comp7	.16871	.	0.0241	1.0000

```
Principal components (eigenvectors)
```

Variable	Comp1	Comp2	Unexplained
elmtchpers~Z	0.4626	0.1542	.2628
tottchpers~Z	0.4853	-0.2343	.1466
aidesperstuZ	0.4489	-0.2815	.2223
corsuppers~Z	0.4161	-0.3492	.2527
elmguipers~Z	0.2511	0.1359	.766
tchstu_allZ	0.2683	0.6141	.2101
ppexp_totZ	0.2021	0.5697	.3894

Figure A.5 Continued

Factor Analysis and Loadings for District Resource Composite Construction

```
. pca $xlist, comp($ncomp)

Principal components/correlation                 Number of obs    =     13,098
                                                 Number of comp.  =          2
                                                 Trace            =          7
    Rotation: (unrotated = principal)            Rho              =     0.6786
```

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	3.2819	1.81376	0.4688	0.4688
Comp2	1.46813	.58632	0.2097	0.6786
Comp3	.881814	.306866	0.1260	0.8045
Comp4	.574948	.213988	0.0821	0.8867
Comp5	.360959	.0974198	0.0516	0.9383
Comp6	.26354	.0948296	0.0376	0.9759
Comp7	.16871	.	0.0241	1.0000

Principal components (eigenvectors)

Variable	Comp1	Comp2	Unexplained
elmtchpers~Z	0.4626	0.1542	.2628
tottchpers~Z	0.4853	-0.2343	.1466
aidesperstuZ	0.4489	-0.2815	.2223
corsuppers~Z	0.4161	-0.3492	.2527
elmguipers~Z	0.2511	0.1359	.766
tchstu_allZ	0.2683	0.6141	.2101
ppexp_totZ	0.2021	0.5697	.3894

```
. pca $xlist, comp($ncomp) blank(.3)

Principal components/correlation                 Number of obs    =     13,098
                                                 Number of comp.  =          2
                                                 Trace            =          7
    Rotation: (unrotated = principal)            Rho              =     0.6786
```

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	3.2819	1.81376	0.4688	0.4688
Comp2	1.46813	.58632	0.2097	0.6786
Comp3	.881814	.306866	0.1260	0.8045
Comp4	.574948	.213988	0.0821	0.8867
Comp5	.360959	.0974198	0.0516	0.9383
Comp6	.26354	.0948296	0.0376	0.9759
Comp7	.16871	.	0.0241	1.0000

Principal components (eigenvectors) (blanks are abs(loading)<.3)

Variable	Comp1	Comp2	Unexplained
elmtchpers~Z	0.4626		.2628
tottchpers~Z	0.4853		.1466
aidesperstuZ	0.4489		.2223
corsuppers~Z	0.4161	-0.3492	.2527
elmguipers~Z			.766
tchstu_allZ		0.6141	.2101
ppexp_totZ		0.5697	.3894

Figure A.5 Continued

Factor Analysis and Loadings for District Resource Composite Construction

```
. *Component Rotations*
. rotate, varimax

Principal components/correlation                  Number of obs    =     13,098
                                                  Number of comp.  =          2
                                                  Trace            =          7
    Rotation: orthogonal varimax (Kaiser off)     Rho              =     0.6786
```

Component	Variance	Difference	Proportion	Cumulative
Comp1	2.92301	1.096	0.4176	0.4176
Comp2	1.82701	.	0.2610	0.6786

Rotated components

Variable	Comp1	Comp2	Unexplained
elmtchpers~Z	0.3457	0.3439	.2628
tottchpers~Z	0.5388	0.0060	.1466
aidesperstuZ	0.5273	-0.0524	.2223
corsuppers~Z	0.5280	-0.1276	.2527
elmguipers~Z	0.1645	0.2334	.766
tchstu_allZ	-0.0329	0.6693	.2101
ppexp_totZ	-0.0724	0.6001	.3894

Component rotation matrix

	Comp1	Comp2
Comp1	0.8956	0.4448
Comp2	-0.4448	0.8956

```
. rotate, varimax blanks(.3)

Principal components/correlation                  Number of obs    =     13,098
                                                  Number of comp.  =          2
                                                  Trace            =          7
    Rotation: orthogonal varimax (Kaiser off)     Rho              =     0.6786
```

Component	Variance	Difference	Proportion	Cumulative
Comp1	2.92301	1.096	0.4176	0.4176
Comp2	1.82701	.	0.2610	0.6786

Rotated components (blanks are abs(loading)<.3)

Variable	Comp1	Comp2	Unexplained
elmtchpers~Z	0.3457	0.3439	.2628
tottchpers~Z	0.5388		.1466
aidesperstuZ	0.5273		.2223
corsuppers~Z	0.5280		.2527
elmguipers~Z			.766
tchstu_allZ		0.6693	.2101
ppexp_totZ		0.6001	.3894

Component rotation matrix

	Comp1	Comp2
Comp1	0.8956	0.4448
Comp2	-0.4448	0.8956

Figure A.5 Continued

Factor Analysis and Loadings for District Resource Composite Construction

```
. rotate, promax

Principal components/correlation                 Number of obs    =     13,098
                                                 Number of comp.  =          2
                                                 Trace            =          7
    Rotation: oblique promax (Kaiser off)        Rho              =     0.6786
```

Component	Variance	Proportion	Rotated comp. are correlated
Comp1	2.87613	0.4109	
Comp2	1.79346	0.2562	

Rotated components

Variable	Comp1	Comp2	Unexplained
elmtchpers~Z	0.3320	0.3341	.2628
tottchpers~Z	0.5395	-0.0103	.1466
aidesperstuZ	0.5304	-0.0686	.2223
corsuppers~Z	0.5342	-0.1439	.2527
elmguipers~Z	0.1550	0.2289	.766
tchstu_allZ	-0.0608	0.6718	.2101
ppexp_totZ	-0.0974	0.6036	.3894

Component rotation matrix

	Comp1	Comp2
Comp1	0.8787	0.4186
Comp2	-0.4828	0.9110

```
. rotate, promax blanks(.3)

Principal components/correlation                 Number of obs    =     13,098
                                                 Number of comp.  =          2
                                                 Trace            =          7
    Rotation: oblique promax (Kaiser off)        Rho              =     0.6786
```

Component	Variance	Proportion	Rotated comp. are correlated
Comp1	2.87613	0.4109	
Comp2	1.79346	0.2562	

Rotated components (blanks are abs(loading)<.3)

Variable	Comp1	Comp2	Unexplained
elmtchpers~Z	0.3320	0.3341	.2628
tottchpers~Z	0.5395		.1466
aidesperstuZ	0.5304		.2223
corsuppers~Z	0.5342		.2527
elmguipers~Z			.766
tchstu_allZ		0.6718	.2101
ppexp_totZ		0.6036	.3894

Component rotation matrix

	Comp1	Comp2
Comp1	0.8787	0.4186
Comp2	-0.4828	0.9110

Figure A.5 Continued

Factor Analysis and Loadings for District Resource Composite Construction

```
. *Loadings/Scores of the Components*
. estat loadings

Principal component loadings (unrotated)
    component normalization: sum of squares(column) = 1
```

	Comp1	Comp2
elmtchpers~Z	.4626	.1542
tottchpers~Z	.4853	-.2343
aidesperstuZ	.4489	-.2815
corsuppers~Z	.4161	-.3492
elmguipers~Z	.2511	.1359
tchstu_allZ	.2683	.6141
ppexp_totZ	.2021	.5697

```
. predict pc1 pc2 pc3 pc4 pc5, score
(extra variables dropped)

Scoring coefficients
    sum of squares(column-loading) = 1
```

Variable	Comp1	Comp2
elmtchpers~Z	0.4626	0.1542
tottchpers~Z	0.4853	-0.2343
aidesperstuZ	0.4489	-0.2815
corsuppers~Z	0.4161	-0.3492
elmguipers~Z	0.2511	0.1359
tchstu_allZ	0.2683	0.6141
ppexp_totZ	0.2021	0.5697

```
.
. *KMO Measure of Sampling Adequacy*
. estat kmo

Kaiser-Meyer-Olkin measure of sampling adequacy
```

Variable	kmo
elmtchpers~Z	0.7679
tottchpers~Z	0.7420
aidesperstuZ	0.7748
corsuppers~Z	0.8396
elmguipers~Z	0.8205
tchstu_allZ	0.5841
ppexp_totZ	0.6324
Overall	0.7456

Figure A.5 Continued

Factor Analysis and Loadings for District Resource Composite Construction

```
. *Factor Analysis*
. factor $xlist
(obs=13,098)

Factor analysis/correlation                        Number of obs    =     13,098
    Method: principal factors                      Retained factors =          3
    Rotation: (unrotated)                          Number of params =         18
```

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor1	2.88642	1.95525	0.8231	0.8231
Factor2	0.93117	0.79645	0.2655	1.0887
Factor3	0.13472	0.15931	0.0384	1.1271
Factor4	-0.02459	0.02127	-0.0070	1.1201
Factor5	-0.04586	0.10702	-0.0131	1.1070
Factor6	-0.15288	0.06946	-0.0436	1.0634
Factor7	-0.22234	.	-0.0634	1.0000

```
    LR test: independent vs. saturated:  chi2(21) = 4.2e+04 Prob>chi2 = 0.0000

Factor loadings (pattern matrix) and unique variances
```

Variable	Factor1	Factor2	Factor3	Uniqueness
elmtchpers~Z	0.7864	0.2414	-0.1681	0.2950
tottchpers~Z	0.8733	-0.2265	0.0373	0.1847
aidesperstuZ	0.7852	-0.2798	0.1108	0.2930
corsuppers~Z	0.7033	-0.3208	0.0264	0.4017
elmguipers~Z	0.3587	0.1292	-0.2261	0.8036
tchstu_allZ	0.4228	0.6376	0.0395	0.4131
ppexp_totZ	0.2945	0.4660	0.1985	0.6567

```
. *Factor Analysis*
. factor $xlist, mineigen(1)
(obs=13,098)

Factor analysis/correlation                        Number of obs    =     13,098
    Method: principal factors                      Retained factors =          1
    Rotation: (unrotated)                          Number of params =          7
```

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor1	2.88642	1.95525	0.8231	0.8231
Factor2	0.93117	0.79645	0.2655	1.0887
Factor3	0.13472	0.15931	0.0384	1.1271
Factor4	-0.02459	0.02127	-0.0070	1.1201
Factor5	-0.04586	0.10702	-0.0131	1.1070
Factor6	-0.15288	0.06946	-0.0436	1.0634
Factor7	-0.22234	.	-0.0634	1.0000

```
    LR test: independent vs. saturated:  chi2(21) = 4.2e+04 Prob>chi2 = 0.0000

Factor loadings (pattern matrix) and unique variances
```

Variable	Factor1	Uniqueness
elmtchpers~Z	0.7864	0.3816
tottchpers~Z	0.8733	0.2373
aidesperstuZ	0.7852	0.3835
corsuppers~Z	0.7033	0.5053
elmguipers~Z	0.3587	0.8714
tchstu_allZ	0.4228	0.8212
ppexp_totZ	0.2945	0.9133

Figure A.5 Continued

Factor Analysis and Loadings for District Resource Composite Construction

```
. factor $xlist, comp($ncomp)
(obs=13,098)

Factor analysis/correlation                        Number of obs    =     13,098
    Method: principal factors                      Retained factors =          2
    Rotation: (unrotated)                          Number of params =         13
```

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor1	2.88642	1.95525	0.8231	0.8231
Factor2	0.93117	0.79645	0.2655	1.0887
Factor3	0.13472	0.15931	0.0384	1.1271
Factor4	-0.02459	0.02127	-0.0070	1.1201
Factor5	-0.04586	0.10702	-0.0131	1.1070
Factor6	-0.15288	0.06946	-0.0436	1.0634
Factor7	-0.22234	.	-0.0634	1.0000

```
    LR test: independent vs. saturated:  chi2(21) = 4.2e+04 Prob>chi2 = 0.0000

Factor loadings (pattern matrix) and unique variances
```

Variable	Factor1	Factor2	Uniqueness
elmtchpers~Z	0.7864	0.2414	0.3233
tottchpers~Z	0.8733	-0.2265	0.1860
aidesperstuZ	0.7852	-0.2798	0.3052
corsuppers~Z	0.7033	-0.3208	0.4024
elmguipers~Z	0.3587	0.1292	0.8547
tchstu_allZ	0.4228	0.6376	0.4147
ppexp_totZ	0.2945	0.4660	0.6961

```
. factor $xlist, comp($ncomp) blank(.3)
(obs=13,098)

Factor analysis/correlation                        Number of obs    =     13,098
    Method: principal factors                      Retained factors =          2
    Rotation: (unrotated)                          Number of params =         13
```

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor1	2.88642	1.95525	0.8231	0.8231
Factor2	0.93117	0.79645	0.2655	1.0887
Factor3	0.13472	0.15931	0.0384	1.1271
Factor4	-0.02459	0.02127	-0.0070	1.1201
Factor5	-0.04586	0.10702	-0.0131	1.1070
Factor6	-0.15288	0.06946	-0.0436	1.0634
Factor7	-0.22234	.	-0.0634	1.0000

```
    LR test: independent vs. saturated:  chi2(21) = 4.2e+04 Prob>chi2 = 0.0000

Factor loadings (pattern matrix) and unique variances
```

Variable	Factor1	Factor2	Uniqueness
elmtchpers~Z	0.7864		0.3233
tottchpers~Z	0.8733		0.1860
aidesperstuZ	0.7852		0.3052
corsuppers~Z	0.7033	-0.3208	0.4024
elmguipers~Z	0.3587		0.8547
tchstu_allZ	0.4228	0.6376	0.4147
ppexp_totZ		0.4660	0.6961

```
    (blanks represent abs(loading)<.3)
```

Figure A.5 Continued

Factor Analysis and Loadings for District Resource Composite Construction

```
. *Factor Rotations*
. rotate, varimax

Factor analysis/correlation                        Number of obs    =     13,098
    Method: principal factors                      Retained factors =          2
    Rotation: orthogonal varimax (Kaiser off)      Number of params =         13
```

Factor	Variance	Difference	Proportion	Cumulative
Factor1	2.52235	1.22711	0.7193	0.7193
Factor2	1.29524	.	0.3694	1.0887

```
    LR test: independent vs. saturated:  chi2(21) = 4.2e+04 Prob>chi2 = 0.0000

Rotated factor loadings (pattern matrix) and unique variances
```

Variable	Factor1	Factor2	Uniqueness
elmtchpers~Z	0.6052	0.5571	0.3233
tottchpers~Z	0.8855	0.1726	0.1860
aidesperstuZ	0.8290	0.0864	0.3052
corsuppers~Z	0.7729	0.0141	0.4024
elmguipers~Z	0.2678	0.2713	0.8547
tchstu_allZ	0.1063	0.7577	0.4147
ppexp_totZ	0.0646	0.5475	0.6961

```
Factor rotation matrix
```

	Factor1	Factor2
Factor1	0.9021	0.4315
Factor2	-0.4315	0.9021

```
. rotate, varimax blanks(.3)

Factor analysis/correlation                        Number of obs    =     13,098
    Method: principal factors                      Retained factors =          2
    Rotation: orthogonal varimax (Kaiser off)      Number of params =         13
```

Factor	Variance	Difference	Proportion	Cumulative
Factor1	2.52235	1.22711	0.7193	0.7193
Factor2	1.29524	.	0.3694	1.0887

```
    LR test: independent vs. saturated:  chi2(21) = 4.2e+04 Prob>chi2 = 0.0000

Rotated factor loadings (pattern matrix) and unique variances
```

Variable	Factor1	Factor2	Uniqueness
elmtchpers~Z	0.6052	0.5571	0.3233
tottchpers~Z	0.8855		0.1860
aidesperstuZ	0.8290		0.3052
corsuppers~Z	0.7729		0.4024
elmguipers~Z			0.8547
tchstu_allZ		0.7577	0.4147
ppexp_totZ		0.5475	0.6961

```
    (blanks represent abs(loading)<.3)

Factor rotation matrix
```

	Factor1	Factor2
Factor1	0.9021	0.4315
Factor2	-0.4315	0.9021

Figure A.5 Continued

Factor Analysis and Loadings for District Resource Composite Construction

```
. rotate, promax

Factor analysis/correlation                        Number of obs    =     13,098
    Method: principal factors                      Retained factors =          2
    Rotation: oblique promax (Kaiser off)          Number of params =         13

    --------------------------------------------------------------------------
         Factor  |     Variance   Proportion    Rotated factors are correlated
    -------------+------------------------------------------------------------
        Factor1  |      2.71572       0.7744
        Factor2  |      1.70612       0.4865
    --------------------------------------------------------------------------
    LR test: independent vs. saturated:  chi2(21) = 4.2e+04 Prob>chi2 = 0.0000

Rotated factor loadings (pattern matrix) and unique variances

    -------------------------------------------------
        Variable |  Factor1   Factor2 |   Uniqueness 
    -------------+--------------------+--------------
    elmtchpers~Z |   0.4944    0.4988 |      0.3233  
    tottchpers~Z |   0.8845    0.0449 |      0.1860  
    aidesperstuZ |   0.8469   -0.0380 |      0.3052  
    corsuppers~Z |   0.8062   -0.1063 |      0.4024  
    elmguipers~Z |   0.2126    0.2471 |      0.8547  
     tchstu_allZ |  -0.0785    0.7908 |      0.4147  
      ppexp_totZ |  -0.0696    0.5734 |      0.6961  
    -------------------------------------------------

Factor rotation matrix

    --------------------------------
                 | Factor1  Factor2 
    -------------+------------------
         Factor1 |  0.9554   0.6296 
         Factor2 | -0.2955   0.7770 
    --------------------------------


. rotate, promax blanks(.3)

Factor analysis/correlation                        Number of obs    =     13,098
    Method: principal factors                      Retained factors =          2
    Rotation: oblique promax (Kaiser off)          Number of params =         13

    --------------------------------------------------------------------------
         Factor  |     Variance   Proportion    Rotated factors are correlated
    -------------+------------------------------------------------------------
        Factor1  |      2.71572       0.7744
        Factor2  |      1.70612       0.4865
    --------------------------------------------------------------------------
    LR test: independent vs. saturated:  chi2(21) = 4.2e+04 Prob>chi2 = 0.0000

Rotated factor loadings (pattern matrix) and unique variances

    -------------------------------------------------
        Variable |  Factor1   Factor2 |   Uniqueness 
    -------------+--------------------+--------------
    elmtchpers~Z |   0.4944    0.4988 |      0.3233  
    tottchpers~Z |   0.8845           |      0.1860  
    aidesperstuZ |   0.8469           |      0.3052  
    corsuppers~Z |   0.8062           |      0.4024  
    elmguipers~Z |                    |      0.8547  
     tchstu_allZ |             0.7908 |      0.4147  
      ppexp_totZ |             0.5734 |      0.6961  
    -------------------------------------------------
    (blanks represent abs(loading)<.3)

Factor rotation matrix

    --------------------------------
                 | Factor1  Factor2 
    -------------+------------------
         Factor1 |  0.9554   0.6296 
         Factor2 | -0.2955   0.7770 
    --------------------------------
```

Figure A.5 Continued

Factor Analysis and Loadings for District Resource Composite Construction

```
. estat common

Correlation matrix of the common factors
```

Factors	Factor1	Factor2
Factor1	1	
Factor2	0	1

```
. *Scores of the Components*
. predict f1 f2 f3 f4 f5
(regression scoring assumed)
(excess variables dropped)

Scoring coefficients (method = regression)
```

Variable	Factor1	Factor2
elmtchpers~Z	0.25389	0.29302
tottchpers~Z	0.38836	-0.28863
aidesperstuZ	0.21817	-0.17839
corsuppers~Z	0.13774	-0.19961
elmguipers~Z	0.05265	0.04149
tchstu_allZ	0.10772	0.46005
ppexp_totZ	0.06635	0.22828

```
. *KMO Measure of Sampling Adequacy*
. estat kmo

Kaiser-Meyer-Olkin measure of sampling adequacy
```

Variable	kmo
elmtchpers~Z	0.7679
tottchpers~Z	0.7420
aidesperstuZ	0.7748
corsuppers~Z	0.8396
elmguipers~Z	0.8205
tchstu_allZ	0.5841
ppexp_totZ	0.6324
Overall	0.7456

```
.
. *Average Interitem Covariance*
. alpha $xlist

Test scale = mean(unstandardized items)

Average interitem covariance:     .2588997
Number of items in the scale:            7
Scale reliability coefficient:      0.7098
```

Figure A.6

Factor Analysis and Loadings for Black Concentrated Advantage of District Composite Construction

```
. summarize $xlist
```

Variable	Obs	Mean	Std. Dev.	Min	Max
profocc_blkZ	5,877	3.75e-08	1	-1.013816	5.398366
baplus_blkZ	9,520	-.0322801	1.099649	-.9081846	3.430854
samehouse_~Z	7,132	1.38e-07	.9999998	-2.882864	.7359925
inc50blkZ	5,981	-7.83e-08	1	-1.137243	5.122535

```
. corr $xlist
(obs=5,275)
```

	profoc~Z	baplus~Z	sameho~Z	inc50b~Z
profocc_blkZ	1.0000			
baplus_blkZ	0.4059	1.0000		
samehouse_~Z	0.0517	0.0517	1.0000	
inc50blkZ	0.3528	0.4651	0.1246	1.0000

```
. *Principal Component Analysis (PCA)*
. pca $xlist

Principal components/correlation                  Number of obs    =      5,275
                                                  Number of comp.  =          4
                                                  Trace            =          4
    Rotation: (unrotated = principal)             Rho              =     1.0000
```

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	1.83841	.850487	0.4596	0.4596
Comp2	.987922	.336097	0.2470	0.7066
Comp3	.651825	.129979	0.1630	0.8695
Comp4	.521845	.	0.1305	1.0000

Principal components (eigenvectors)

Variable	Comp1	Comp2	Comp3	Comp4	Unexplained
profocc_blkZ	0.5395	-0.1540	0.8034	-0.1993	0
baplus_blkZ	0.5917	-0.1455	-0.2376	0.7565	0
samehouse_~Z	0.1557	0.9768	0.1075	0.0999	0
inc50blkZ	0.5784	0.0296	-0.5352	-0.6149	0

Figure A.6 Continued

Factor Analysis and Loadings for Black Concentrated Advantage of District Composite Construction

```
. *Principal Component Analysis*
. pca $xlist, mineigen(1)

Principal components/correlation                Number of obs    =      5,275
                                                Number of comp.  =          1
                                                Trace            =          4
    Rotation: (unrotated = principal)           Rho              =     0.4596
```

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	1.83841	.850487	0.4596	0.4596
Comp2	.987922	.336097	0.2470	0.7066
Comp3	.651825	.129979	0.1630	0.8695
Comp4	.521845	.	0.1305	1.0000

```
Principal components (eigenvectors)
```

Variable	Comp1	Unexplained
profocc_blkZ	0.5395	.4649
baplus_blkZ	0.5917	.3563
samehouse_~Z	0.1557	.9554
inc50blkZ	0.5784	.3849

```
. pca $xlist, comp($ncomp)

Principal components/correlation                Number of obs    =      5,275
                                                Number of comp.  =          2
                                                Trace            =          4
    Rotation: (unrotated = principal)           Rho              =     0.7066
```

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	1.83841	.850487	0.4596	0.4596
Comp2	.987922	.336097	0.2470	0.7066
Comp3	.651825	.129979	0.1630	0.8695
Comp4	.521845	.	0.1305	1.0000

```
Principal components (eigenvectors)
```

Variable	Comp1	Comp2	Unexplained
profocc_blkZ	0.5395	-0.1540	.4415
baplus_blkZ	0.5917	-0.1455	.3354
samehouse_~Z	0.1557	0.9768	.01274
inc50blkZ	0.5784	0.0296	.384

Figure A.6 Continued

Factor Analysis and Loadings for Black Concentrated Advantage of District Composite Construction

```
. pca $xlist, comp($ncomp) blank(.3)

Principal components/correlation                 Number of obs    =      5,275
                                                 Number of comp.  =          2
                                                 Trace            =          4
    Rotation: (unrotated = principal)            Rho              =     0.7066
```

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	1.83841	.850487	0.4596	0.4596
Comp2	.987922	.336097	0.2470	0.7066
Comp3	.651825	.129979	0.1630	0.8695
Comp4	.521845	.	0.1305	1.0000

```
Principal components (eigenvectors)  (blanks are abs(loading)<.3)
```

Variable	Comp1	Comp2	Unexplained
profocc_blkZ	0.5395		.4415
baplus_blkZ	0.5917		.3354
samehouse_~Z		0.9768	.01274
inc50blkZ	0.5784		.384

```
. *Component Rotations*
. rotate, varimax

Principal components/correlation                 Number of obs    =      5,275
                                                 Number of comp.  =          2
                                                 Trace            =          4
    Rotation: orthogonal varimax (Kaiser off)    Rho              =     0.7066
```

Component	Variance	Difference	Proportion	Cumulative
Comp1	1.81696	.807587	0.4542	0.4542
Comp2	1.00937	.	0.2523	0.7066

```
Rotated components
```

Variable	Comp1	Comp2	Unexplained
profocc_blkZ	0.5571	-0.0664	.4415
baplus_blkZ	0.6073	-0.0497	.3354
samehouse_~Z	-0.0014	0.9892	.01274
inc50blkZ	0.5664	0.1211	.384

```
Component rotation matrix
```

	Comp1	Comp2
Comp1	0.9873	0.1588
Comp2	-0.1588	0.9873

Figure A.6 Continued

Factor Analysis and Loadings for Black Concentrated Advantage of District Composite Construction

```
. rotate, varimax blanks(.3)

Principal components/correlation                  Number of obs    =      5,275
                                                  Number of comp.  =          2
                                                  Trace            =          4
    Rotation: orthogonal varimax (Kaiser off)     Rho              =     0.7066
```

Component	Variance	Difference	Proportion	Cumulative
Comp1	1.81696	.807587	0.4542	0.4542
Comp2	1.00937	.	0.2523	0.7066

Rotated components (blanks are abs(loading)<.3)

Variable	Comp1	Comp2	Unexplained
profocc_blkZ	0.5571		.4415
baplus_blkZ	0.6073		.3354
samehouse_~Z		0.9892	.01274
inc50blkZ	0.5664		.384

Component rotation matrix

	Comp1	Comp2
Comp1	0.9873	0.1588
Comp2	-0.1588	0.9873

```
. rotate, promax

Principal components/correlation              Number of obs    =      5,275
                                              Number of comp.  =          2
                                              Trace            =          4
    Rotation: oblique promax (Kaiser off)     Rho              =     0.7066
```

Component	Variance	Proportion	Rotated comp. are correlated
Comp1	1.81648	0.4541	
Comp2	1.00921	0.2523	

Rotated components

Variable	Comp1	Comp2	Unexplained
profocc_blkZ	0.5572	-0.0668	.4415
baplus_blkZ	0.6074	-0.0501	.3354
samehouse_~Z	-0.0032	0.9892	.01274
inc50blkZ	0.5662	0.1207	.384

Component rotation matrix

	Comp1	Comp2
Comp1	0.9870	0.1582
Comp2	-0.1606	0.9874

Figure A.6 Continued

Factor Analysis and Loadings for Black Concentrated Advantage of District Composite Construction

```
. rotate, promax blanks(.3)

Principal components/correlation                 Number of obs    =      5,275
                                                 Number of comp.  =          2
                                                 Trace            =          4
    Rotation: oblique promax (Kaiser off)        Rho              =     0.7066
```

Component	Variance	Proportion	Rotated comp. are correlated
Comp1	1.81648	0.4541	
Comp2	1.00921	0.2523	

Rotated components (blanks are abs(loading)<.3)

Variable	Comp1	Comp2	Unexplained
profocc_blkZ	0.5572		.4415
baplus_blkZ	0.6074		.3354
samehouse_~Z		0.9892	.01274
inc50blkZ	0.5662		.384

Component rotation matrix

	Comp1	Comp2
Comp1	0.9870	0.1582
Comp2	-0.1606	0.9874

Principal component loadings (unrotated)
    component normalization: sum of squares(column) = 1

	Comp1	Comp2
profocc_blkZ	.5395	-.154
baplus_blkZ	.5917	-.1455
samehouse_~Z	.1557	.9768
inc50blkZ	.5784	.02959

```
. predict pc1 pc2 pc3 pc4 pc5, score
(extra variables dropped)
```

Scoring coefficients
    sum of squares(column-loading) = 1

Variable	Comp1	Comp2
profocc_blkZ	0.5395	-0.1540
baplus_blkZ	0.5917	-0.1455
samehouse_~Z	0.1557	0.9768
inc50blkZ	0.5784	0.0296

Figure A.6 Continued

Factor Analysis and Loadings for Black Concentrated Advantage of District Composite Construction

```
. *Factor Analysis*
. factor $xlist
(obs=5,275)

Factor analysis/correlation                        Number of obs    =      5,275
    Method: principal factors                      Retained factors =          2
    Rotation: (unrotated)                          Number of params =          6
```

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor1	1.08421	1.06577	1.4349	1.4349
Factor2	0.01843	0.15125	0.0244	1.4593
Factor3	-0.13281	0.08142	-0.1758	1.2835
Factor4	-0.21423	.	-0.2835	1.0000

```
    LR test: independent vs. saturated:  chi2(6)  = 2539.48 Prob>chi2 = 0.0000

Factor loadings (pattern matrix) and unique variances
```

Variable	Factor1	Factor2	Uniqueness
profocc_blkZ	0.5417	-0.0286	0.7058
baplus_blkZ	0.6360	-0.0255	0.5949
samehouse_~Z	0.1279	0.1278	0.9673
inc50blkZ	0.6083	0.0253	0.6294

```
.
. *Scree plot of the eigenvalues*
. screeplot

. screeplot, yline(1)

.
. *Factor Analysis*
. factor $xlist, mineigen(1)
(obs=5,275)

Factor analysis/correlation                        Number of obs    =      5,275
    Method: principal factors                      Retained factors =          1
    Rotation: (unrotated)                          Number of params =          4
```

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor1	1.08421	1.06577	1.4349	1.4349
Factor2	0.01843	0.15125	0.0244	1.4593
Factor3	-0.13281	0.08142	-0.1758	1.2835
Factor4	-0.21423	.	-0.2835	1.0000

```
    LR test: independent vs. saturated:  chi2(6)  = 2539.48 Prob>chi2 = 0.0000

Factor loadings (pattern matrix) and unique variances
```

Variable	Factor1	Uniqueness
profocc_blkZ	0.5417	0.7066
baplus_blkZ	0.6360	0.5955
samehouse_~Z	0.1279	0.9836
inc50blkZ	0.6083	0.6300

Figure A.6 Continued

Factor Analysis and Loadings for Black Concentrated Advantage of District Composite Construction

```
. factor $xlist, comp($ncomp)
(obs=5,275)

Factor analysis/correlation                     Number of obs    =      5,275
    Method: principal factors                   Retained factors =          2
    Rotation: (unrotated)                       Number of params =          6
```

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor1	1.08421	1.06577	1.4349	1.4349
Factor2	0.01843	0.15125	0.0244	1.4593
Factor3	-0.13281	0.08142	-0.1758	1.2835
Factor4	-0.21423	.	-0.2835	1.0000

```
    LR test: independent vs. saturated:  chi2(6)  = 2539.48 Prob>chi2 = 0.0000

Factor loadings (pattern matrix) and unique variances
```

Variable	Factor1	Factor2	Uniqueness
profocc_blkZ	0.5417	-0.0286	0.7058
baplus_blkZ	0.6360	-0.0255	0.5949
samehouse_~Z	0.1279	0.1278	0.9673
inc50blkZ	0.6083	0.0253	0.6294

```
. factor $xlist, comp($ncomp) blank(.3)
(obs=5,275)

Factor analysis/correlation                     Number of obs    =      5,275
    Method: principal factors                   Retained factors =          2
    Rotation: (unrotated)                       Number of params =          6
```

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor1	1.08421	1.06577	1.4349	1.4349
Factor2	0.01843	0.15125	0.0244	1.4593
Factor3	-0.13281	0.08142	-0.1758	1.2835
Factor4	-0.21423	.	-0.2835	1.0000

```
    LR test: independent vs. saturated:  chi2(6)  = 2539.48 Prob>chi2 = 0.0000

Factor loadings (pattern matrix) and unique variances
```

Variable	Factor1	Factor2	Uniqueness
profocc_blkZ	0.5417		0.7058
baplus_blkZ	0.6360		0.5949
samehouse_~Z			0.9673
inc50blkZ	0.6083		0.6294

```
    (blanks represent abs(loading)<.3)
```

Figure A.6 Continued

Factor Analysis and Loadings for Black Concentrated Advantage of District Composite Construction

```
. *Factor Rotations*
. rot

Factor analysis/correlation                        Number of obs    =      5,275
    Method: principal factors                      Retained factors =          2
    Rotation: orthogonal varimax (Kaiser off)      Number of params =          6
```

Factor	Variance	Difference	Proportion	Cumulative
Factor1	1.08101	1.05939	1.4307	1.4307
Factor2	0.02163	.	0.0286	1.4593

```
    LR test: independent vs. saturated:  chi2(6)  = 2539.48 Prob>chi2 = 0.0000

Rotated factor loadings (pattern matrix) and unique variances
```

Variable	Factor1	Factor2	Uniqueness
profocc_blkZ	0.5424	0.0011	0.7058
baplus_blkZ	0.6364	0.0093	0.5949
samehouse_~Z	0.1207	0.1346	0.9673
inc50blkZ	0.6060	0.0585	0.6294

Factor rotation matrix

	Factor1	Factor2
Factor1	0.9985	0.0547
Factor2	-0.0547	0.9985

```
. rotate, varimax blanks(.3)

Factor analysis/correlation                        Number of obs    =      5,275
    Method: principal factors                      Retained factors =          2
    Rotation: orthogonal varimax (Kaiser off)      Number of params =          6
```

Factor	Variance	Difference	Proportion	Cumulative
Factor1	1.08101	1.05939	1.4307	1.4307
Factor2	0.02163	.	0.0286	1.4593

```
    LR test: independent vs. saturated:  chi2(6)  = 2539.48 Prob>chi2 = 0.0000

Rotated factor loadings (pattern matrix) and unique variances
```

Variable	Factor1	Factor2	Uniqueness
profocc_blkZ	0.5424		0.7058
baplus_blkZ	0.6364		0.5949
samehouse_~Z			0.9673
inc50blkZ	0.6060		0.6294

(blanks represent abs(loading)<.3)

Factor rotation matrix

	Factor1	Factor2
Factor1	0.9985	0.0547
Factor2	-0.0547	0.9985

Figure A.6 Continued

Factor Analysis and Loadings for Black Concentrated Advantage of District Composite Construction

```
. rotate, promax

Factor analysis/correlation                        Number of obs    =      5,275
    Method: principal factors                      Retained factors =          2
    Rotation: oblique promax (Kaiser off)          Number of params =          6

    --------------------------------------------------------------------------
         Factor  |     Variance   Proportion    Rotated factors are correlated
    -------------+------------------------------------------------------------
        Factor1  |      1.08363       1.4341
        Factor2  |      0.43813       0.5799
    --------------------------------------------------------------------------
    LR test: independent vs. saturated:  chi2(6)  = 2539.48 Prob>chi2 = 0.0000

Rotated factor loadings (pattern matrix) and unique variances

    -------------------------------------------------
        Variable |  Factor1   Factor2 |   Uniqueness
    -------------+--------------------+--------------
    profocc_blkZ |   0.5545   -0.0202 |      0.7058
     baplus_blkZ |   0.6446   -0.0134 |      0.5949
    samehouse_~Z |   0.0244    0.1648 |      0.9673
       inc50blkZ |   0.5772    0.0498 |      0.6294
    -------------------------------------------------

Factor rotation matrix

    --------------------------------
                 | Factor1  Factor2
    -------------+------------------
         Factor1 |  0.9997   0.6275
         Factor2 | -0.0233   0.7786
    --------------------------------
```

```
. rotate, promax blanks(.3)

Factor analysis/correlation                        Number of obs    =      5,275
    Method: principal factors                      Retained factors =          2
    Rotation: oblique promax (Kaiser off)          Number of params =          6

    --------------------------------------------------------------------------
         Factor  |     Variance   Proportion    Rotated factors are correlated
    -------------+------------------------------------------------------------
        Factor1  |      1.08363       1.4341
        Factor2  |      0.43813       0.5799
    --------------------------------------------------------------------------
    LR test: independent vs. saturated:  chi2(6)  = 2539.48 Prob>chi2 = 0.0000

Rotated factor loadings (pattern matrix) and unique variances

    -------------------------------------------------
        Variable |  Factor1   Factor2 |   Uniqueness
    -------------+--------------------+--------------
    profocc_blkZ |   0.5545           |      0.7058
     baplus_blkZ |   0.6446           |      0.5949
    samehouse_~Z |                    |      0.9673
       inc50blkZ |   0.5772           |      0.6294
    -------------------------------------------------
    (blanks represent abs(loading)<.3)

Factor rotation matrix

    --------------------------------
                 | Factor1  Factor2
    -------------+------------------
         Factor1 |  0.9997   0.6275
         Factor2 | -0.0233   0.7786
    --------------------------------
```

Figure A.6 Continued

Factor Analysis and Loadings for Black Concentrated Advantage of District Composite Construction

```
. estat common

Correlation matrix of the common factors
```

Factors	Factor1	Factor2
Factor1	1	
Factor2	0	1

```
. *Scores of the Components*
. predict f1 f2 f3 f4 f5
(regression scoring assumed)
(excess variables dropped)

Scoring coefficients (method = regression)
```

Variable	Factor1	Factor2
profocc_blkZ	0.27169	-0.03405
baplus_blkZ	0.36709	-0.03604
samehouse_~Z	0.05312	0.12662
inc50blkZ	0.33506	0.03829

```
. *KMO Measure of Sampling Adequacy*
. estat kmo

Kaiser-Meyer-Olkin measure of sampling adequacy
```

Variable	kmo
profocc_blkZ	0.6993
baplus_blkZ	0.6292
samehouse_~Z	0.6321
inc50blkZ	0.6488
Overall	0.6541

```
.
. *Average Interitem Covariance*
. alpha $xlist

Test scale = mean(unstandardized items)

Average interitem covariance:     .2021926
Number of items in the scale:            4
Scale reliability coefficient:      0.4824
```

Figure A.7

Factor Analysis and Loadings for Black Concentrated Disadvantage of District Composite Construction

```
. summarize $xlist

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
poverty517~Z |      6,950    5.16e-08    .9999999  -.8903343   2.266058
   snap_blkZ |      6,001    1.06e-07    .9999999  -.9249246   2.387645
   rent_blkZ |      6,001    1.47e-08           1  -1.394466    1.48988
 singmom_blkZ |      6,001   -1.21e-07           1  -1.301479   1.755698
   unemp_blkZ |      9,664   -2.47e-07           1  -.5245946   15.75864

. corr $xlist
(obs=5,729)

             | povert~Z snap_b~Z rent_b~Z singmo~Z unemp_~Z
-------------+---------------------------------------------
poverty517~Z |   1.0000
   snap_blkZ |   0.5221   1.0000
   rent_blkZ |   0.3153   0.3670   1.0000
singmom_blkZ |   0.3620   0.3804   0.3635   1.0000
  unemp_blkZ |   0.1402   0.1886   0.0826   0.1043   1.0000


.
. *Principal Component Analysis (PCA)*
. pca $xlist

Principal components/correlation                 Number of obs    =      5,729
                                                 Number of comp.  =          5
                                                 Trace            =          5
    Rotation: (unrotated = principal)            Rho              =     1.0000

    --------------------------------------------------------------------------
       Component |   Eigenvalue   Difference         Proportion   Cumulative
    -------------+------------------------------------------------------------
           Comp1 |      2.21675      1.25814             0.4434       0.4434
           Comp2 |       .95861      .237258             0.1917       0.6351
           Comp3 |      .721352      .088704             0.1443       0.7793
           Comp4 |      .632648      .162011             0.1265       0.9059
           Comp5 |      .470637            .             0.0941       1.0000
    --------------------------------------------------------------------------

Principal components (eigenvectors)

    ------------------------------------------------------------------------------
        Variable |    Comp1     Comp2     Comp3     Comp4     Comp5 | Unexplained
    -------------+--------------------------------------------------+-------------
    poverty517~Z |   0.5066   -0.0322   -0.5643   -0.0728    0.6470 |           0
       snap_blkZ |   0.5307    0.0293   -0.3618   -0.1642   -0.7481 |           0
       rent_blkZ |   0.4454   -0.2493    0.6318   -0.5697    0.1257 |           0
    singmom_blkZ |   0.4678   -0.1889    0.3200    0.8019   -0.0063 |           0
      unemp_blkZ |   0.2109    0.9488    0.2217    0.0125    0.0768 |           0
    ------------------------------------------------------------------------------
```

Figure A.7 Continued

Factor Analysis and Loadings for Black Concentrated Disadvantage of District Composite Construction

```
. *Principal Component Analysis*
. pca $xlist, mineigen(1)

Principal components/correlation                  Number of obs    =      5,729
                                                  Number of comp.  =          1
                                                  Trace            =          5
    Rotation: (unrotated = principal)             Rho              =     0.4434
```

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	2.21675	1.25814	0.4434	0.4434
Comp2	.95861	.237258	0.1917	0.6351
Comp3	.721352	.088704	0.1443	0.7793
Comp4	.632648	.162011	0.1265	0.9059
Comp5	.470637	.	0.0941	1.0000

Principal components (eigenvectors)

Variable	Comp1	Unexplained
poverty517~Z	0.5066	.431
snap_blkZ	0.5307	.3757
rent_blkZ	0.4454	.5602
singmom_blkZ	0.4678	.5149
unemp_blkZ	0.2109	.9014

```
. pca $xlist, comp($ncomp)

Principal components/correlation                  Number of obs    =      5,729
                                                  Number of comp.  =          2
                                                  Trace            =          5
    Rotation: (unrotated = principal)             Rho              =     0.6351
```

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	2.21675	1.25814	0.4434	0.4434
Comp2	.95861	.237258	0.1917	0.6351
Comp3	.721352	.088704	0.1443	0.7793
Comp4	.632648	.162011	0.1265	0.9059
Comp5	.470637	.	0.0941	1.0000

Principal components (eigenvectors)

Variable	Comp1	Comp2	Unexplained
poverty517~Z	0.5066	-0.0322	.43
snap_blkZ	0.5307	0.0293	.3749
rent_blkZ	0.4454	-0.2493	.5007
singmom_blkZ	0.4678	-0.1889	.4807
unemp_blkZ	0.2109	0.9488	.03834

Figure A.7 Continued

Factor Analysis and Loadings for Black Concentrated Disadvantage of District Composite Construction

```
. pca $xlist, comp($ncomp) blank(.3)

Principal components/correlation                  Number of obs    =      5,729
                                                  Number of comp.  =          2
                                                  Trace            =          5
    Rotation: (unrotated = principal)             Rho              =     0.6351
```

Component	Eigenvalue	Difference	Proportion	Cumulative
Comp1	2.21675	1.25814	0.4434	0.4434
Comp2	.95861	.237258	0.1917	0.6351
Comp3	.721352	.088704	0.1443	0.7793
Comp4	.632648	.162011	0.1265	0.9059
Comp5	.470637	.	0.0941	1.0000

Principal components (eigenvectors) (blanks are abs(loading)<.3)

Variable	Comp1	Comp2	Unexplained
poverty517~Z	0.5066		.43
snap_blkZ	0.5307		.3749
rent_blkZ	0.4454		.5007
singmom_blkZ	0.4678		.4807
unemp_blkZ		0.9488	.03834

```
.
. *Component Rotations*
. rotate, varimax

Principal components/correlation                  Number of obs    =      5,729
                                                  Number of comp.  =          2
                                                  Trace            =          5
    Rotation: orthogonal varimax (Kaiser off)     Rho              =     0.6351
```

Component	Variance	Difference	Proportion	Cumulative
Comp1	2.15844	1.14151	0.4317	0.4317
Comp2	1.01693	.	0.2034	0.6351

Rotated components

Variable	Comp1	Comp2	Unexplained
poverty517~Z	0.5017	0.0776	.43
snap_blkZ	0.5119	0.1429	.3749
rent_blkZ	0.4886	-0.1476	.5007
singmom_blkZ	0.4975	-0.0837	.4807
unemp_blkZ	0.0017	0.9720	.03834

Component rotation matrix

	Comp1	Comp2
Comp1	0.9765	0.2153
Comp2	-0.2153	0.9765

Figure A.7 Continued

Factor Analysis and Loadings for Black Concentrated Disadvantage of District Composite Construction

```
. rotate, varimax blanks(.3)

Principal components/correlation                 Number of obs    =      5,729
                                                 Number of comp.  =          2
                                                 Trace            =          5
    Rotation: orthogonal varimax (Kaiser off)    Rho              =     0.6351
```

Component	Variance	Difference	Proportion	Cumulative
Comp1	2.15844	1.14151	0.4317	0.4317
Comp2	1.01693	.	0.2034	0.6351

Rotated components (blanks are abs(loading)<.3)

Variable	Comp1	Comp2	Unexplained
poverty517~Z	0.5017		.43
snap_blkZ	0.5119		.3749
rent_blkZ	0.4886		.5007
singmom_blkZ	0.4975		.4807
unemp_blkZ		0.9720	.03834

Component rotation matrix

	Comp1	Comp2
Comp1	0.9765	0.2153
Comp2	-0.2153	0.9765

```
. rotate, promax

Principal components/correlation                 Number of obs    =      5,729
                                                 Number of comp.  =          2
                                                 Trace            =          5
    Rotation: oblique promax (Kaiser off)        Rho              =     0.6351
```

Component	Variance	Proportion	Rotated comp. are correlated
Comp1	2.16157	0.4323	
Comp2	1.01784	0.2036	

Rotated components

Variable	Comp1	Comp2	Unexplained
poverty517~Z	0.5021	0.0784	.43
snap_blkZ	0.5128	0.1437	.3749
rent_blkZ	0.4878	-0.1468	.5007
singmom_blkZ	0.4970	-0.0829	.4807
unemp_blkZ	0.0073	0.9720	.03834

Component rotation matrix

	Comp1	Comp2
Comp1	0.9778	0.2169
Comp2	-0.2097	0.9762

Figure A.7 Continued

Factor Analysis and Loadings for Black Concentrated Disadvantage of District Composite Construction

```
. rotate, promax blanks(.3)

Principal components/correlation                 Number of obs    =      5,729
                                                 Number of comp.  =          2
                                                 Trace            =          5
    Rotation: oblique promax (Kaiser off)        Rho              =     0.6351
```

Component	Variance	Proportion	Rotated comp. are correlated
Comp1	2.16157	0.4323	
Comp2	1.01784	0.2036	

Rotated components (blanks are abs(loading)<.3)

Variable	Comp1	Comp2	Unexplained
poverty517~Z	0.5021		.43
snap_blkZ	0.5128		.3749
rent_blkZ	0.4878		.5007
singmom_blkZ	0.4970		.4807
unemp_blkZ		0.9720	.03834

Component rotation matrix

	Comp1	Comp2
Comp1	0.9778	0.2169
Comp2	-0.2097	0.9762

```
. *Loadings/Scores of the Components*
. estat loadings

Principal component loadings (unrotated)
    component normalization: sum of squares(column) = 1
```

	Comp1	Comp2
poverty517~Z	.5066	-.03219
snap_blkZ	.5307	.0293
rent_blkZ	.4454	-.2493
singmom_blkZ	.4678	-.1889
unemp_blkZ	.2109	.9488

```
. predict pc1 pc2 pc3 pc4 pc5, score
(extra variables dropped)

Scoring coefficients
    sum of squares(column-loading) = 1
```

Variable	Comp1	Comp2
poverty517~Z	0.5066	-0.0322
snap_blkZ	0.5307	0.0293
rent_blkZ	0.4454	-0.2493
singmom_blkZ	0.4678	-0.1889
unemp_blkZ	0.2109	0.9488

Figure A.7 Continued

Factor Analysis and Loadings for Black Concentrated Disadvantage of District Composite Construction

```
. *KMO Measure of Sampling Adequacy*
. estat kmo

Kaiser-Meyer-Olkin measure of sampling adequacy
```

Variable	kmo
poverty517~Z	0.7160
snap_blkZ	0.7026
rent_blkZ	0.7806
singmom_blkZ	0.7799
unemp_blkZ	0.8031
Overall	0.7391

```
.
.
. *Factor Analysis*
. factor $xlist
(obs=5,729)

Factor analysis/correlation                    Number of obs    =      5,729
    Method: principal factors                  Retained factors =          2
    Rotation: (unrotated)                      Number of params =          9
```

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor1	1.49159	1.45433	1.3164	1.3164
Factor2	0.03727	0.08540	0.0329	1.3493
Factor3	-0.04813	0.09614	-0.0425	1.3068
Factor4	-0.14427	0.05909	-0.1273	1.1795
Factor5	-0.20336	.	-0.1795	1.0000

```
    LR test: independent vs. saturated:  chi2(10) = 4491.67 Prob>chi2 = 0.0000

Factor loadings (pattern matrix) and unique variances
```

Variable	Factor1	Factor2	Uniqueness
poverty517~Z	0.6364	0.0420	0.5933
snap_blkZ	0.6796	0.0510	0.5356
rent_blkZ	0.5194	-0.0944	0.7213
singmom_blkZ	0.5542	-0.0757	0.6872
unemp_blkZ	0.2189	0.1352	0.9338

Figure A.7 Continued

Factor Analysis and Loadings for Black Concentrated Disadvantage of District Composite Construction

```
. *Factor Analysis*
. factor $xlist, mineigen(1)
(obs=5,729)

Factor analysis/correlation                        Number of obs    =      5,729
    Method: principal factors                      Retained factors =          1
    Rotation: (unrotated)                          Number of params =          5
```

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor1	1.49159	1.45433	1.3164	1.3164
Factor2	0.03727	0.08540	0.0329	1.3493
Factor3	-0.04813	0.09614	-0.0425	1.3068
Factor4	-0.14427	0.05909	-0.1273	1.1795
Factor5	-0.20336	.	-0.1795	1.0000

```
    LR test: independent vs. saturated:  chi2(10) = 4491.67 Prob>chi2 = 0.0000

Factor loadings (pattern matrix) and unique variances
```

Variable	Factor1	Uniqueness
poverty517~Z	0.6364	0.5950
snap_blkZ	0.6796	0.5382
rent_blkZ	0.5194	0.7302
singmom_blkZ	0.5542	0.6929
unemp_blkZ	0.2189	0.9521

```
. factor $xlist, comp($ncomp)
(obs=5,729)

Factor analysis/correlation                        Number of obs    =      5,729
    Method: principal factors                      Retained factors =          2
    Rotation: (unrotated)                          Number of params =          9
```

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor1	1.49159	1.45433	1.3164	1.3164
Factor2	0.03727	0.08540	0.0329	1.3493
Factor3	-0.04813	0.09614	-0.0425	1.3068
Factor4	-0.14427	0.05909	-0.1273	1.1795
Factor5	-0.20336	.	-0.1795	1.0000

```
    LR test: independent vs. saturated:  chi2(10) = 4491.67 Prob>chi2 = 0.0000

Factor loadings (pattern matrix) and unique variances
```

Variable	Factor1	Factor2	Uniqueness
poverty517~Z	0.6364	0.0420	0.5933
snap_blkZ	0.6796	0.0510	0.5356
rent_blkZ	0.5194	-0.0944	0.7213
singmom_blkZ	0.5542	-0.0757	0.6872
unemp_blkZ	0.2189	0.1352	0.9338

Figure A.7 Continued

Factor Analysis and Loadings for Black Concentrated Disadvantage of District Composite Construction

```
. factor $xlist, comp($ncomp) blank(.3)
(obs=5,729)

Factor analysis/correlation                        Number of obs    =      5,729
    Method: principal factors                      Retained factors =          2
    Rotation: (unrotated)                          Number of params =          9

    --------------------------------------------------------------------------
         Factor  |   Eigenvalue   Difference        Proportion   Cumulative
    -------------+------------------------------------------------------------
        Factor1  |      1.49159      1.45433            1.3164       1.3164
        Factor2  |      0.03727      0.08540            0.0329       1.3493
        Factor3  |     -0.04813      0.09614           -0.0425       1.3068
        Factor4  |     -0.14427      0.05909           -0.1273       1.1795
        Factor5  |     -0.20336            .           -0.1795       1.0000
    --------------------------------------------------------------------------
    LR test: independent vs. saturated:  chi2(10) = 4491.67 Prob>chi2 = 0.0000

Factor loadings (pattern matrix) and unique variances

    -------------------------------------------------
        Variable |  Factor1   Factor2 |   Uniqueness 
    -------------+--------------------+--------------
    poverty517~Z |   0.6364           |      0.5933  
       snap_blkZ |   0.6796           |      0.5356  
       rent_blkZ |   0.5194           |      0.7213  
    singmom_blkZ |   0.5542           |      0.6872  
      unemp_blkZ |                    |      0.9338  
    -------------------------------------------------
    (blanks represent abs(loading)<.3)

. 
. *Factor Rotations*
. rotate, varimax

Factor analysis/correlation                        Number of obs    =      5,729
    Method: principal factors                      Retained factors =          2
    Rotation: orthogonal varimax (Kaiser off)      Number of params =          9

    --------------------------------------------------------------------------
         Factor  |     Variance   Difference        Proportion   Cumulative
    -------------+------------------------------------------------------------
        Factor1  |      1.49062      1.45239            1.3155       1.3155
        Factor2  |      0.03824            .            0.0337       1.3493
    --------------------------------------------------------------------------
    LR test: independent vs. saturated:  chi2(10) = 4491.67 Prob>chi2 = 0.0000

Rotated factor loadings (pattern matrix) and unique variances

    -------------------------------------------------
        Variable |  Factor1   Factor2 |   Uniqueness 
    -------------+--------------------+--------------
    poverty517~Z |   0.6372   -0.0256 |      0.5933  
       snap_blkZ |   0.6806   -0.0334 |      0.5356  
       rent_blkZ |   0.5168    0.1078 |      0.7213  
    singmom_blkZ |   0.5520    0.0900 |      0.6872  
      unemp_blkZ |   0.2223   -0.1295 |      0.9338  
    -------------------------------------------------

Factor rotation matrix

    --------------------------------
                 | Factor1  Factor2 
    -------------+------------------
         Factor1 |  0.9997          
         Factor2 |  0.0258  -0.9997 
    --------------------------------
```

Figure A.7 Continued

Factor Analysis and Loadings for Black Concentrated Disadvantage of District Composite Construction

```
. rotate, varimax blanks(.3)

Factor analysis/correlation                        Number of obs    =      5,729
    Method: principal factors                      Retained factors =          2
    Rotation: orthogonal varimax (Kaiser off)      Number of params =          9
```

Factor	Variance	Difference	Proportion	Cumulative
Factor1	1.49062	1.45239	1.3155	1.3155
Factor2	0.03824	.	0.0337	1.3493

LR test: independent vs. saturated: chi2(10) = 4491.67 Prob>chi2 = 0.0000

Rotated factor loadings (pattern matrix) and unique variances

Variable	Factor1	Factor2	Uniqueness
poverty517~Z	0.6372		0.5933
snap_blkZ	0.6806		0.5356
rent_blkZ	0.5168		0.7213
singmom_blkZ	0.5520		0.6872
unemp_blkZ			0.9338

(blanks represent abs(loading)<.3)

Factor rotation matrix

	Factor1	Factor2
Factor1	0.9997	
Factor2	0.0258	-0.9997

```
. rotate, promax

Factor analysis/correlation                        Number of obs    =      5,729
    Method: principal factors                      Retained factors =          2
    Rotation: oblique promax (Kaiser off)          Number of params =          9
```

Factor	Variance	Proportion	Rotated factors are correlated
Factor1	1.49038	1.3153	
Factor2	0.09096	0.0803	

LR test: independent vs. saturated: chi2(10) = 4491.67 Prob>chi2 = 0.0000

Rotated factor loadings (pattern matrix) and unique variances

Variable	Factor1	Factor2	Uniqueness
poverty517~Z	0.6412	-0.0239	0.5933
snap_blkZ	0.6859	-0.0317	0.5356
rent_blkZ	0.4984	0.1109	0.7213
singmom_blkZ	0.5365	0.0929	0.6872
unemp_blkZ	0.2441	-0.1305	0.9338

Factor rotation matrix

	Factor1	Factor2
Factor1	0.9996	0.1921
Factor2	0.0289	-0.9814

Figure A.7 Continued

Factor Analysis and Loadings for Black Concentrated Disadvantage of District Composite Construction

```
. rotate, promax blanks(.3)

Factor analysis/correlation                        Number of obs    =      5,729
    Method: principal factors                      Retained factors =          2
    Rotation: oblique promax (Kaiser off)          Number of params =          9
```

Factor	Variance	Proportion	Rotated factors are correlated
Factor1	1.49038	1.3153	
Factor2	0.09096	0.0803	

```
    LR test: independent vs. saturated:  chi2(10) = 4491.67 Prob>chi2 = 0.0000

Rotated factor loadings (pattern matrix) and unique variances
```

Variable	Factor1	Factor2	Uniqueness
poverty517~Z	0.6412		0.5933
snap_blkZ	0.6859		0.5356
rent_blkZ	0.4984		0.7213
singmom_blkZ	0.5365		0.6872
unemp_blkZ			0.9338

```
    (blanks represent abs(loading)<.3)

Factor rotation matrix
```

	Factor1	Factor2
Factor1	0.9996	0.1921
Factor2	0.0289	-0.9814

```
. rotate, clear

.
. estat common

Correlation matrix of the common factors
```

Factors	Factor1	Factor2
Factor1	1	
Factor2	0	1

Figure A.7 Continued

Factor Analysis and Loadings for Black Concentrated Disadvantage of District Composite Construction

```
. *Scores of the Components*
. predict f1 f2 f3 f4 f5
(regression scoring assumed)
(excess variables dropped)

Scoring coefficients (method = regression)
```

Variable	Factor1	Factor2
poverty517~Z	0.29545	0.05491
snap_blkZ	0.34714	0.07641
rent_blkZ	0.20879	-0.11566
singmom_blkZ	0.23189	-0.09643
unemp_blkZ	0.07059	0.13265

```
.
. *KMO Measure of Sampling Adequacy*
. estat kmo

Kaiser-Meyer-Olkin measure of sampling adequacy
```

Variable	kmo
poverty517~Z	0.7160
snap_blkZ	0.7026
rent_blkZ	0.7806
singmom_blkZ	0.7799
unemp_blkZ	0.8031
Overall	0.7391

```
.
. *Average Interitem Covariance*
. alpha $xlist

Test scale = mean(unstandardized items)

Average interitem covariance:     .2441902
Number of items in the scale:            5
Scale reliability coefficient:      0.6177
```

Standardization of District Resource, Black Concentrated Advantage of District, and Black Concentrated Disadvantage of District Composite Indices

Figure A.8.1

Standardization of District Resource Composite Index

```
. sum DistrictResourcesSchoolRelated

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
DistrictRe~d |     13,098    5.40e-11    .9439128  -1.053589   56.70736

. gen DistrictResourcesSchoolRelatedZ=(DistrictResourcesSchoolRelated-5.40e-11)/0.9439128
(1,274 missing values generated)

. sum DistrictResourcesSchoolRelatedZ

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
DistrictRe~Z |     13,098    9.20e-11           1  -1.116193   60.07691
```

Figure A.8.2

Standardization of Black Concentrated Advantage of District

```
. sum ConcentratedAdvEnvironment

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
C~AdvEnvir~t |      5,275    6.84e-10    .7689092  -1.285869   3.971839

. gen ConcentratedAdvEnvironmentZ=(ConcentratedAdvEnvironment-6.84e-10)/0.7689092
(9,097 missing values generated)

. sum ConcentratedAdvEnvironmentZ

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
Concentrat~Z |      5,275   -1.75e-10           1  -1.672329    5.16555
```

Figure A.8.3

Standardization of Black Concentrated Disadvantage of District

```
. sum ConcentratedDisadvEnvironment
```

Variable	Obs	Mean	Std. Dev.	Min	Max
C~DisadvEn~t	5,729	-9.79e-11	.8223889	-1.306918	2.939434

```
. gen ConcentratedDisadvEnvironmentZ=(ConcentratedDisadvEnvironment- -9.79e-11)/0.8223889
(8,643 missing values generated)

. sum ConcentratedDisadvEnvironmentZ
```

Variable	Obs	Mean	Std. Dev.	Min	Max
Concentrat..	5,729	3.83e-10	1	-1.589173	3.574263

Table A.9

Correlation Matrix of Independent Variables

	urban	suburb	town	rural	perblk	perhsp	perind	perasn	perwht	Distr~ze	Distr~ce	ConAdv	ConDis~v
urban	1.0000												
suburb	-0.2921	1.0000											
town	-0.1908	-0.3732	1.0000										
rural	-0.2593	-0.5072	-0.3313	1.0000									
perblk	0.0943	-0.0606	0.0116	-0.0155	1.0000								
perhsp	0.2142	0.0391	-0.0176	-0.1812	-0.1472	1.0000							
perind	-0.0161	-0.1074	0.0668	0.0661	-0.0794	-0.0358	1.0000						
perasn	0.1642	0.2611	-0.1742	-0.2413	-0.1433	0.0980	-0.0611	1.0000					
perwht	-0.2651	-0.0225	0.0317	0.1888	-0.6151	-0.6431	-0.0672	-0.1753	1.0000				
DistrictSize	0.4177	0.1604	-0.1454	-0.3455	0.0246	0.2571	-0.0904	0.2627	-0.2527	1.0000			
DistrictRe~e	-0.0334	0.0045	0.0034	0.0167	0.0440	-0.0464	-0.0183	-0.0286	0.0100	-0.2177	1.0000		
ConAdv	-0.0552	0.3014	-0.1860	-0.1137	-0.2465	-0.0497	-0.0470	0.3149	0.1641	0.0942	0.0142	1.0000	
ConDisAdv	0.1404	-0.1473	0.1272	-0.0580	0.2672	0.0143	0.0019	-0.1438	-0.1844	0.0250	-0.0075	-0.5549	1.0000

*Note*s. District Size is the natural log of total Black student enrollment, grades 3-8, in a district; District Re~e = district “school-related” resource composite.

APPENDIX B TESTS FOR LINEARITY, NORMALITY, AND HOMOGENEITY OF VARIANCE ASSUMPTIONS

Figure B.1

Test of Linearity and Homogeneity of Variance Assumptions 2 Level HLM Model; Research Question 1; Cohort Predictor Cohort 2001-2012, Grade 3-8, Average District-Level Black Student Academic Outcomes (ELA and Mathematics)

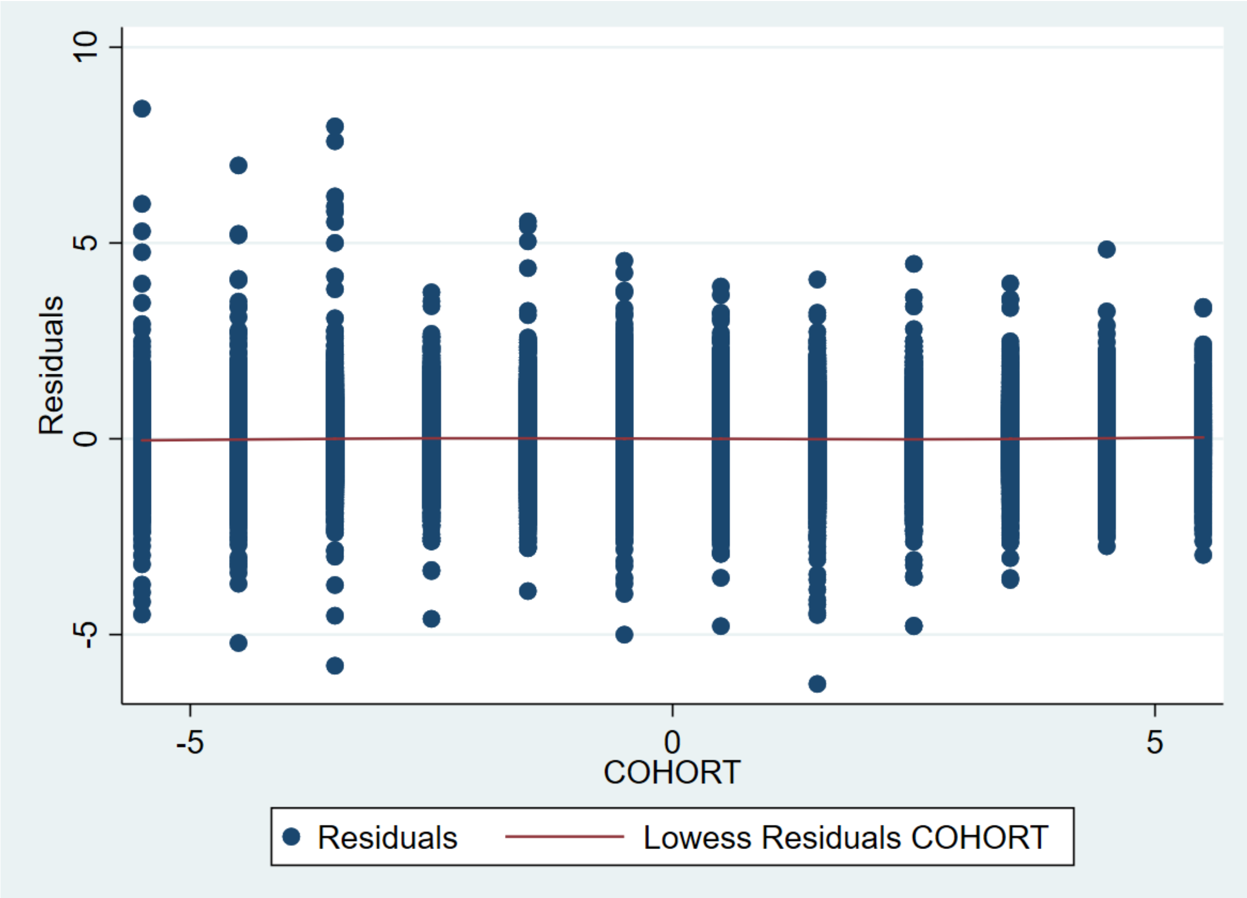


Figure B.2

Test of Linearity and Homogeneity of Variance Assumptions 2 Level HLM Model; Research Question 1; Grade Predictor Cohort 2001-2012, Grade 3-8, Average District-Level Black Student Academic Outcomes (ELA and Mathematics)

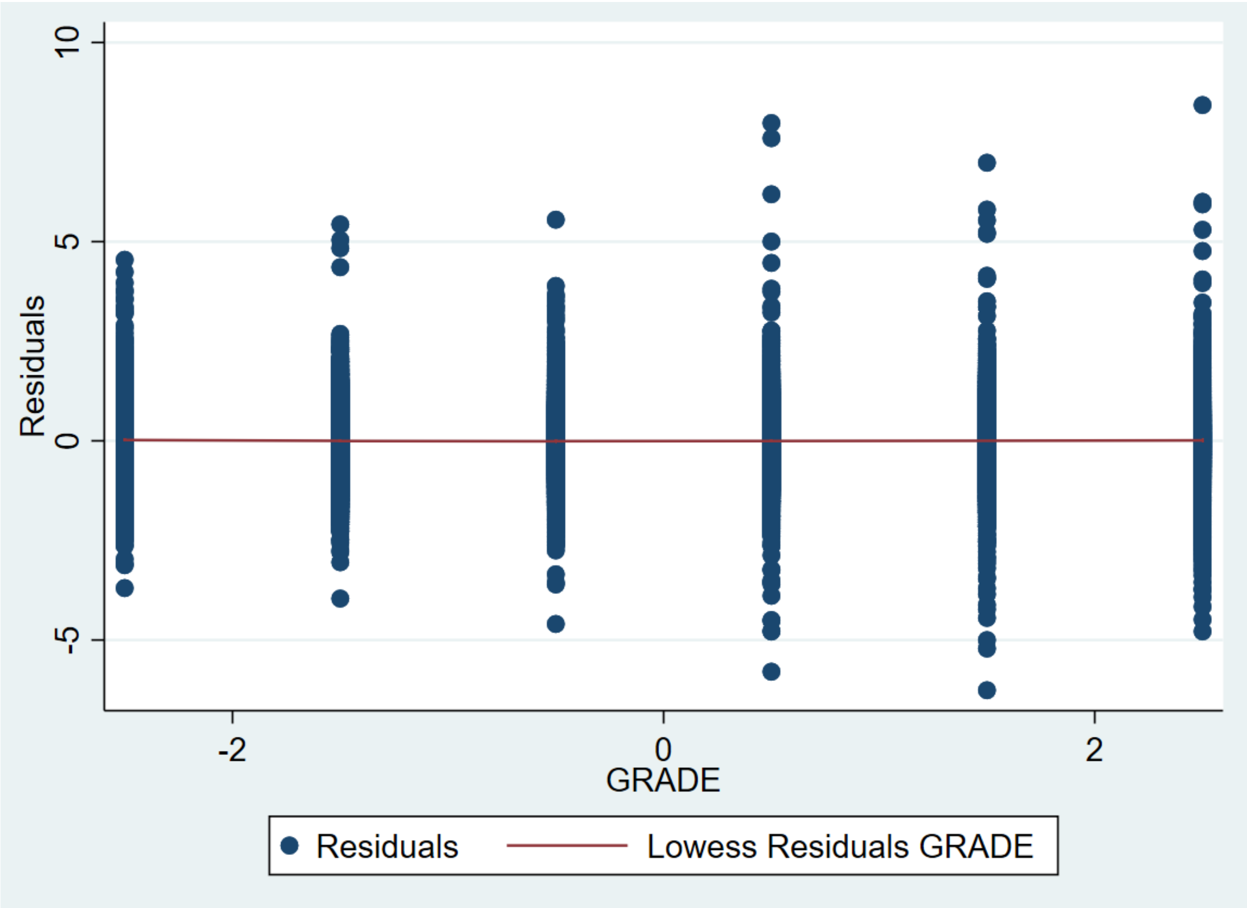


Figure B.3

Test of Normality Assumption 2 Level HLM Model; Research Question 1 Cohort 2001-2012, Grade 3-8, Average District-Level Black Student Academic Outcomes (ELA & Mathematics)

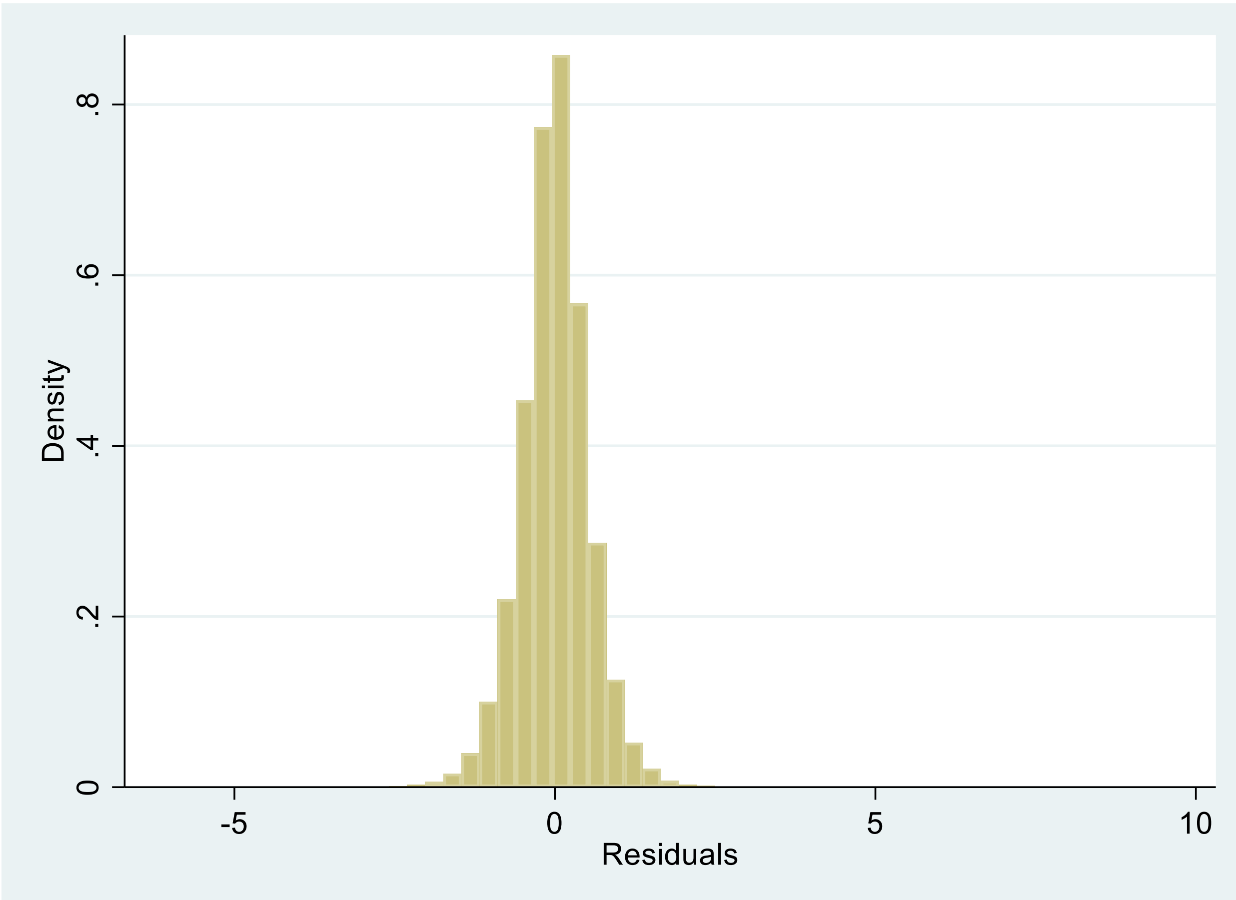


Figure B.4

Test of Linearity and Homogeneity of Variance Assumptions 3 Level HLM Model; Research Question 2; Cohort Predictor Cohort 2004-2012, Grade 3-5, Average District Level Black Student Academic Outcomes (Mathematics)

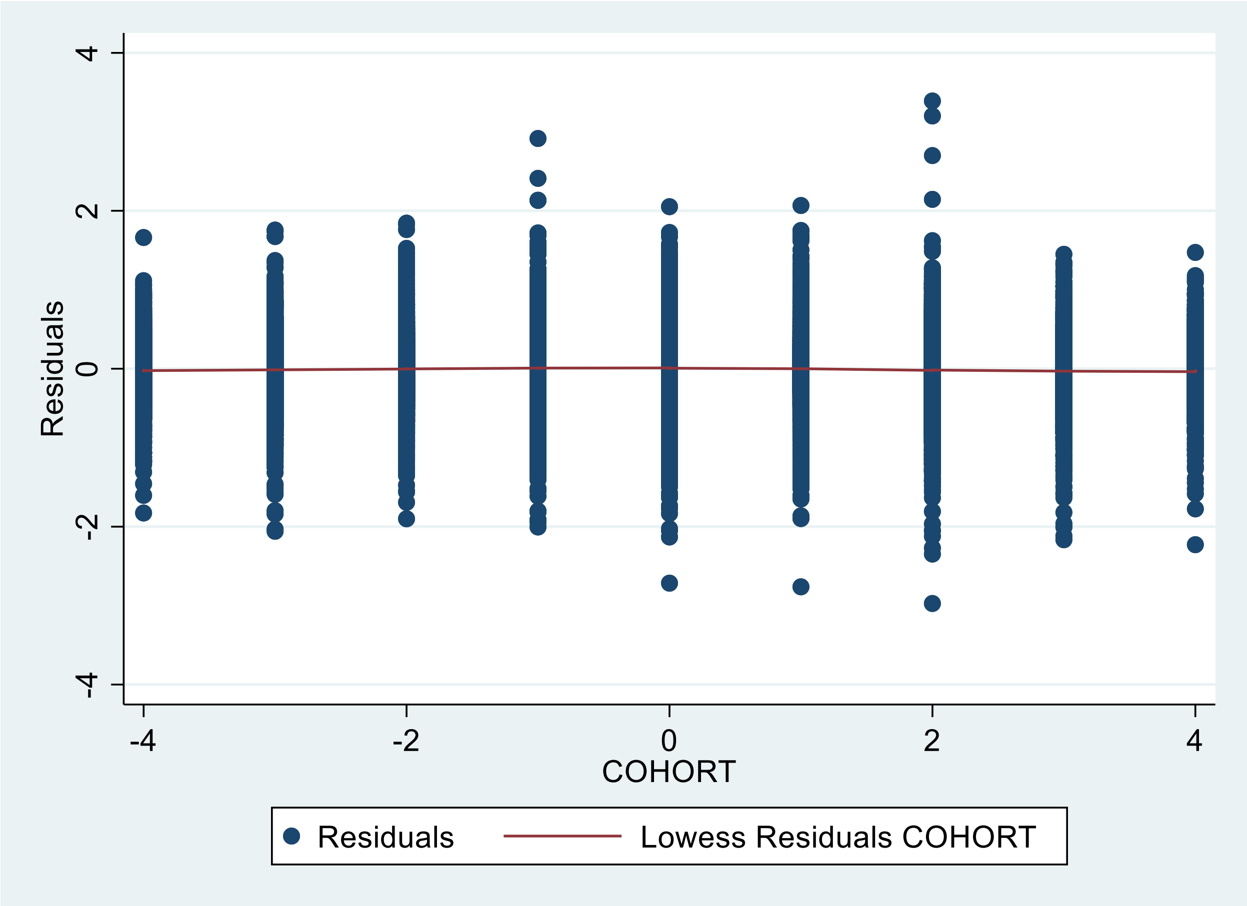


Figure B.5

Test of Linearity and Homogeneity of Variance Assumptions 3 Level HLM Model; Research Question 2; Grade Predictor Cohort 2004-2012, Grade 3-8, Average District-Level Black Student Academic Outcomes (Mathematics)

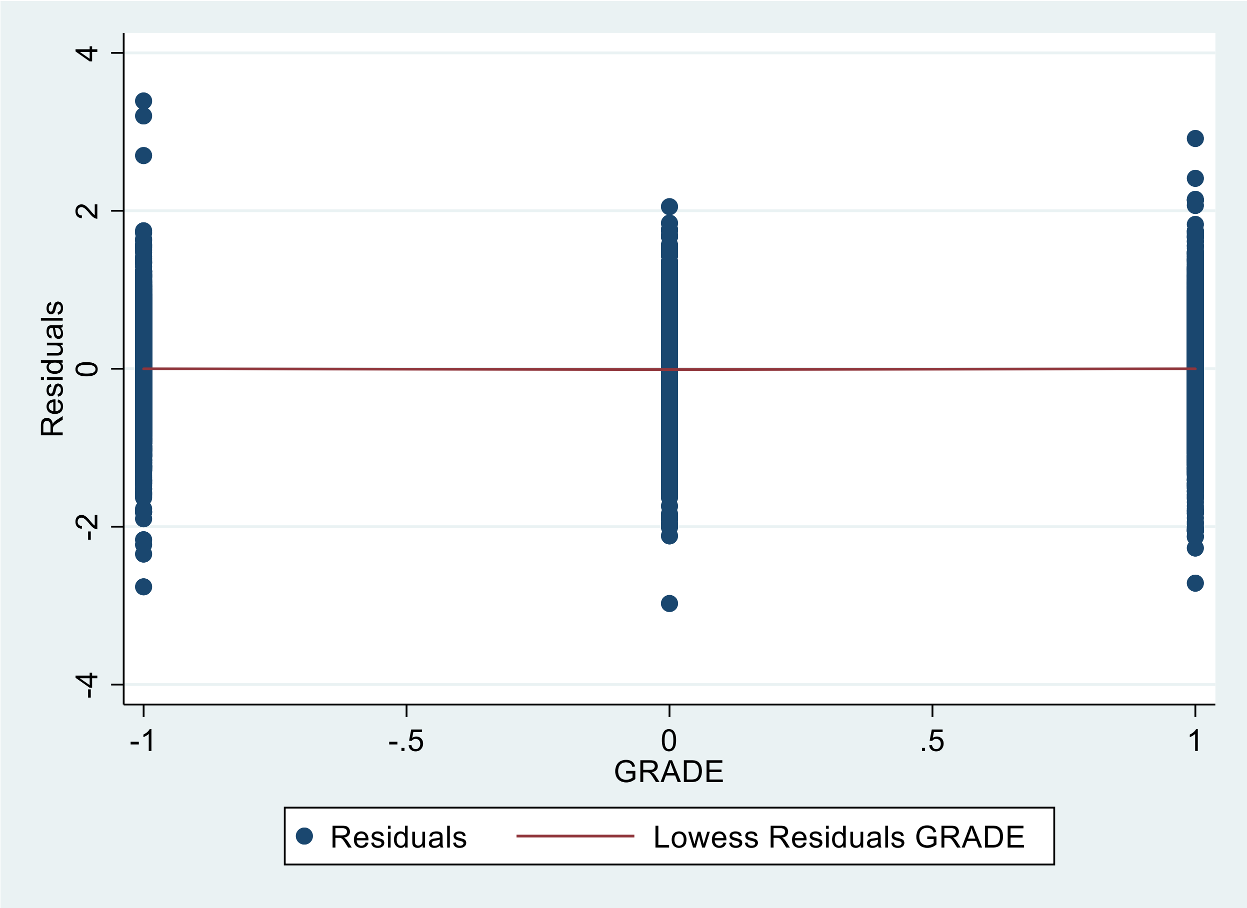
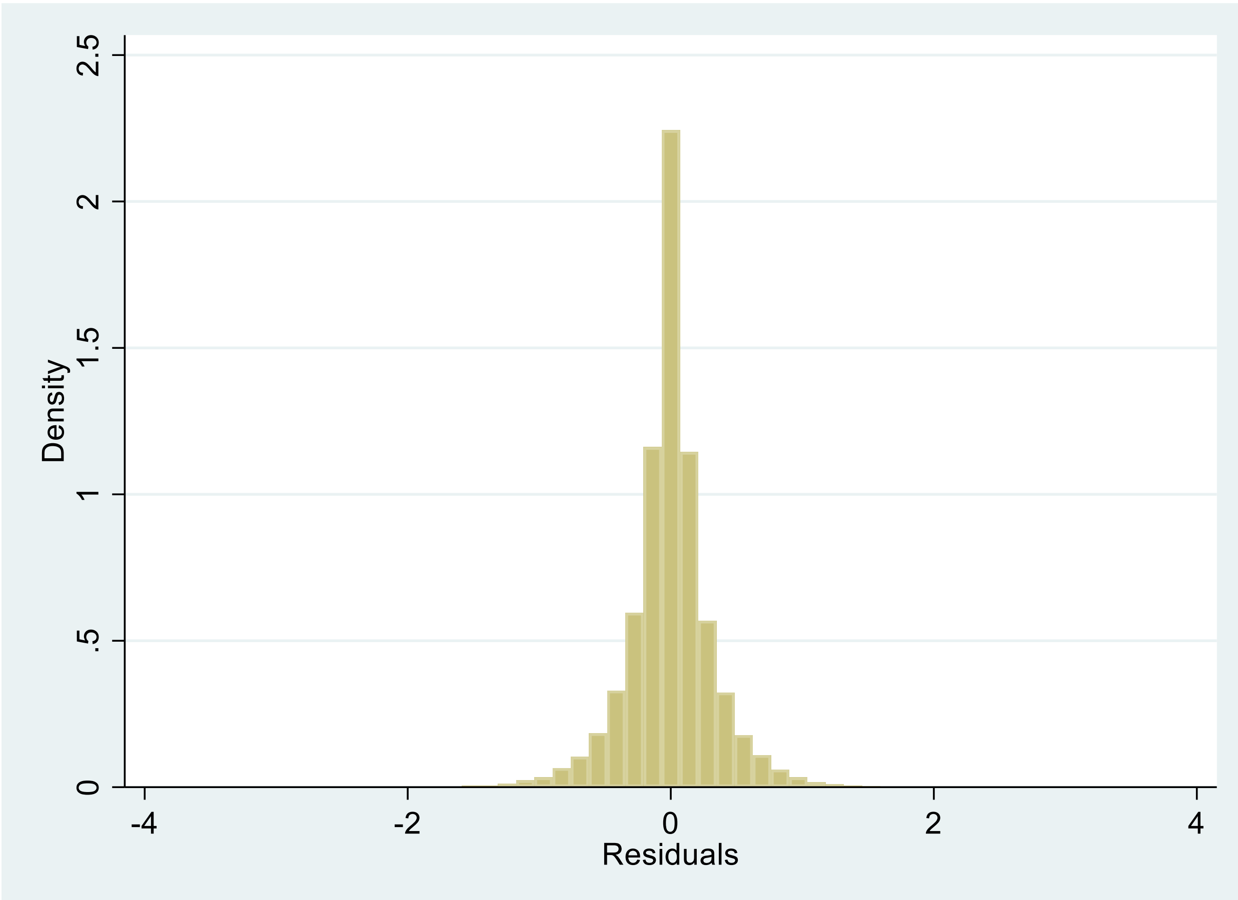


Figure B.6

Test of Normality Assumption 3 Level HLM Model; Research Question 2 Cohort 2004-2012, Grade 3-8, Average District-Level Black Student Academic Outcomes (Mathematics)



REFERENCES

Alspaugh, J. W. (1998). Achievement loss associated with the transition to middle school and high school. *The Journal of Educational Research*, *92*(1), 20-25.

Alspaugh, J. W., & Harting, R. D. (1995). Transition effects of school grade-level organization on student achievement. *Journal of Research & Development in Education*.

American Counseling Association. (2007). *Effectiveness of school counseling*. American Counseling Association, Office of Public Policy and Legislation.

American Psychological Association. (2002). *APA briefing sheet: Elementary and secondary school counseling program* [Online]. http://www.apa.org/ppo/issues/peseacouns03.html

Ananat, E. O., & Washington, E. (2009). Segregation and Black political efficacy. *Journal of Public Economics*, *93*(5-6), 807-822.

Anick, C. M., Carpenter, T. P., & Smith, C. (1981). Minorities and mathematics: Results from the national assessment of educational progress. *The Mathematics Teacher*, *74*(7), 560-566.

Ashenfelter, O., Collins, W. J., & Yoon, A. (2005). *Evaluating the role of Brown vs. Board of Education in school equalization, desegregation, and the income of African Americans*. Vanderbilt University.

Booker, K. C. (2007). Perceptions of classroom belongingness among African American college students. *College Student Journal*, *41*(1), 178-187.

Borman, G. D., & Overman, L. T. (2004). Academic resilience in mathematics among poor and minority students. *The Elementary School Journal*, *104*(3), 177-195.

Bourdieu, P., & Passeron, J. C. (1977). *Reproduction in education, culture and society*.

Bronfenbrenner, U. (1992). *Ecological systems theory*. Jessica Kingsley Publishers.

Brooms, D. R. (2016). *Being Black, being male on campus: Understanding and confronting Black male collegiate experiences*. SUNY Press.

Bryk, A. S., & Raudenbush, S. W. (1992). *Hierarchical linear models: Applications and data analysis methods*. SAGE.

Butler-Barnes, S. T., Chavous, T. M., Hurd, N., & Varner, F. (2013). African American adolescents' academic persistence: A strengths-based approach. *Journal of Youth and Adolescence*, *42*(9), 1443-1458.

Card, D., & Rothstein, J. (2007). Racial segregation and the Black-White test score gap. *Journal of Public Economics*, *91*(11), 2158-84.

Carnoy, M., & Garcia, E. (2017). *Five key trends in US student performance*. Economic Policy Institute.

Chetty, R., & Hendren, N. (2015). The impacts of neighborhoods on intergenerational mobility: Childhood exposure effects and county-level estimates. *Harvard University and NBER*, 1-144.

Chetty, R., Hendren, N., & Katz, L. F. (2016). The effects of exposure to better neighborhoods on children: New evidence from the Moving to Opportunity experiment. *American Economic Review*, *106*(4), 855-902.

Childress, S., Elmore, R. F., Grossman, A., & Johnson, S. M. (2007). *Managing school districts for high performance: Cases in public education leadership*. Harvard Education Press.

Chung, D. (2005). *Analysis of urban schools*. http://sitemaker.umich.edu/chung.356/graduation_rates

Coleman, J. S. (1966). *Equality of educational opportunity* [summary Report] (Vol. 1). U.S. Department of Health, Education, and Welfare, Office of Education.

Crane, J. (1991). Effects of neighborhoods on dropping out of school and teenage childbearing. *The Urban Underclass*, *299*.

Crowder, K., & South, S. J. (2003). Neighborhood distress and school dropout: The variable significance of community context. *Social Science Research*, *32*(4), 659-698.

Crowder, K., & South, S. J. (2011). Spatial and temporal dimensions of neighborhood effects on high school graduation. *Social Science Research*, *40*(1), 87-106.

Cutler, D. M., & Glaeser, E. L. (1997). Are ghettos good or bad? *The Quarterly Journal of Economics*, *112*(3), 827-872.

Davis-Kean, P. E., & Jager, J. (2014). Trajectories of achievement within race/ethnicity: “Catching up” in achievement across time. *The Journal of Educational Research*, *107*(3), 197-208.

Diaz, V. (2008). Relationships between district size, socioeconomics, expenditures, and student achievement in Washington. *The Rural Educator*, *29*(3).

Dillon, H. (2001). Instructional coordinators. *Occupational Outlook Quarterly*, *45*(1), 20-22.

Driscoll, D., Halcoussis, D., & Svorny, S. (2003). School district size and student performance. *Economics of Education Review*, *22*(2), 193-201.

Edmonds, R. (1979). Effective schools for the urban poor. *Educational Leadership*, *37*(1), 15-24.

Elmore, R. F. (2007). Local school districts and instructional improvement. *The keys to effective schools: Educational reform as continuous improvement*, 189-200.

Fahle, E. M., & Reardon, S. F. (2018). How much do test scores vary among school districts? New estimates using population data, 2009-2015. *Educational Researcher*, *47*(4), 221-234.

Fahle, E. M., Shear, B. R., Kalogrides, D., Reardon, S. F., DiSalvo, R., & Ho, A. D. (2017). *Stanford education data archive technical documentation*, Version 2.

Finn, J. D., & Achilles, C. M. (1990). Answers and questions about class size: A statewide experiment. *American Educational Research Journal, 27*, 557-577.

Ford, D. Y. (2011). *Multicultural gifted education* (2nd ed.). Prufrock Press.

Frank, S. (2010, August 23). *The numbers game: Why class size mandates miss the point*. http://educationnext.org/thenumbersgame-why-class-size-mandates-miss-the-point/

Gerber, S. B., Finn, J. D., Achilles, C. M., & Boyd-Zaharias, J. (2001). Teacher aides and students' academic achievement. *Educational Evaluation and Policy Analysis, 23*(2), 123-143.

Gerler Jr., E. R., & Anderson, R. F. (1986). The effects of classroom guidance on children's success in school. *Journal of Counseling & Development*, *65*(2), 78-81.

Gerler, E. R., Drew, N. S., & Mohr, P. (1990). Succeeding in middle school: A multimodal approach. *Elementary School Guidance & Counseling*, *24*(4), 263-271.

Gerler, E. R., Kinney, J., & Anderson, R. F. (1985). The effects of counseling on classroom performance. *Journal of Humanistic Counseling, Education & Development*.

Goldstein, H., & Blatchford, P. (1998). Class size and educational achievement: A review of methodology with particular reference to study design. *British Educational Research Journal, 24*, 255-268.

Goldstein, H., Yang, M., Omar, R., Turner, R., & Thompson, S. (2000). Meta-analysis using multilevel models with an application to the study of class size effects. *Journal of Reliability and Statistical Studies, 49*, 399-412

Goralski, P., & Kerl, J. (1968). Kindergarten teacher aides and reading readiness Minneapolis public schools. *The Journal of Experimental Education, 37*(2), 34-38. Retrieved July 2, 2021, from http://www.jstor.org/stable/20157010

Greenwald, R., Hedges, L. V., & Laine, R. D. (1996). The effect of school resources on student achievement. *Review of Educational Research, 66*(3), 361-396.

Grogger, J. (2011). Speech patterns and racial wage inequality. *Journal of Human Resources,* 46(1), 1-25.

Gross, S. (1993). Early mathematics performance and achievement: Results of a study within a large suburban school system. *The Journal of Negro Education*, *62*(3), 269-287.

Guerrero, F. (1987). *Chapter I clinical and guidance program 1985-86*. OEA Evaluation Report.

Guryan, J. (2004). Desegregation and Black dropout rates. *American Economic Review, 94*(4), 919-943.

Halstead, K. S. (2002). *The role of the elementary instructional coordinator related to teacher leadership: a case study* [Doctoral dissertation, University of Georgia].

Hanushek, E. A. (1994). Money might matter somewhere: A response to Hedges, Laine, and Greenwald. *Educational Researcher, 23*(4), 5-8.

Hanushek, E. A. (1997). Assessing the effects of school resources on student performance: An update. *Educational Evaluation and Policy Analysis, 19*(2), 141-164.

Hanushek, E. A. (1999). Some findings from an independent investigation of the Tennessee STAR experiment and from other investigations of class size effects. *Educational Evaluation and Policy Analysis, 21*, 143-163.

Hanushek, E. A. (2010). Education production functions: Evidence from developed countries. *Economics of Education*, 132-136.

Harper, S. R. (2009). Niggers no more: A critical race counter-narrative on Black male student achievement at predominantly White colleges and universities. *International Journal of Qualitative Studies in Education*, *22*(6), 697-712.

Hassrick, E. M., Raudenbush, S. W., & Rosen, L. (2017). *The ambitious elementary school*. University of Chicago Press.

Hedberg, E. C., & Hedges, L. V. (2014). Reference values of within-district intraclass correlations of academic achievement by district characteristics: Results from a meta-analysis of district-specific values. *Evaluation Review*, *38*(6), 546-582.

Hedges, L. V., Laine, R. D., & Greenwald, R. (1994). An exchange: Part I: Does money matter? A meta-analysis of studies of the effects of differential school inputs on student outcomes. *Educational Researcher*, *23*(3), 5-14.

Henderson-Hubbard, L. (2013). *Urban African-American single mothers using resiliency and racial socialization to influence academic success in their young sons* [Doctoral Dissertation, Texas A&M University].

Hirsch, W. Z. (1968). *The supply of urban public services*. John Hopkins Press.

Howard, T. C. (2013). How does it feel to be a problem? Black male students, schools, and learning in enhancing the knowledge base to disrupt deficit frameworks. *Review of Research in Education*, *37*(1), 54-86.

Jackson, C. K. (2020). *Does school spending matter? The new literature on an old question*. American Psychological Association.

Jencks, C., & Mayer, S. E. (1990). The social consequences of growing up in a poor neighborhood. *Inner-city Poverty in the United States*, *111*, 186.

Jencks, C., & Peterson, P. (Eds.). (1991). *The urban underclass.* The Brookings Institute.

Johnson, R. C. (2011). *Long-run impacts of school desegregation & school quality on adult attainments* (No. w16664). National Bureau of Economic Research.

Jones, C. P. (2000). Levels of racism: a theoretic framework and a gardener's tale. *American Journal of Public Health*, *90*(8), 1212.

Kiesling, H. J. (1967). Measuring a local government service: a study of school districts in New York State. *The Review of Economics and Statistics*, *49*(3), 356-367.

Kline, P. (2014). *An easy guide to factor analysis*. Routledge.

Klinenberg, E. (2015). *Heatwave: A social autopsy of disaster in Chicago*. University of Chicago Press.

Krueger, A. B. (1999). Experimental estimates of education production functions. *Quarterly Journal of Economics*, *114*, 497-532.

Krueger, A. B., & Whitmore, D. M. (2001). The effect of attending a small class in the early grades on college-test taking and middle school test results: Evidence from project STAR. *The Economic Journal, 111*, 1-28.

Lareau, A., & Goyette, K. (Eds.). (2014). *Choosing homes, choosing schools: Residential segregation and the search for a good school.* Russell Sage Foundation.

Lee, R. S. (1993). Effects of classroom guidance on student achievement. *Elementary School Guidance & Counseling*, *27*(3), 163-171.

Levy, D. J., Heissel, J. A., Richeson, J. A., & Adam, E. K. (2016). Psychological and biological responses to race-based social stress as pathways to disparities in educational outcomes. *American Psychologist*, *71*, 455-473. doi:10.1037/a0040322

Logan, J. R. (2011). Separate and unequal: The neighborhood gap for blacks, Hispanics and Asians in Metropolitan America. *Project US2010 Report*, 1-22.

Massey, D., & Denton, N. A. (1993). *American apartheid: Segregation and the making of the underclass*. Harvard University Press.

McBee, M. T. (2010). Examining the probability of identification for gifted programs for students in Georgia elementary schools: A multilevel path analysis. *Gifted Child Quarterly*, *54*, 283-297.

McMillian, A. (2016). *A study on the effects of class size on grade level achievement in grades three to five in southeast Missouri school districts* [Doctoral dissertation, William Woods University].

Milesi, C., & Gamoran, A. (2006). Effects of class size and instruction on kindergarten achievement. *Educational Evaluation and Policy Analysis*, *28*, 287-313.

Milsom, A., Goodnough, G., & Akos, P. (2007). School counselor contributions to the individualized education program (IEP) process. *Preventing School Failure*, *52*(1), 19-24.

Mosteller, F. (1995). The Tennessee study of class size in the early school grades. *The Future of Children: Critical Issues for Children and Youths, 5*, 113-127.

Mullis, I. V., Owen, E. H., & Phillips, G. W. (1990). *America's challenge: Accelerating academic achievement*. Office of Educational Research and Improvement, U.S. Department of Education.

Nicolas, G., Helms, J. E., Jernigan, M. M., Sass, T., Skrzypek, A., & DeSilva, A. M. (2008). A conceptual framework for understanding the strengths of Black youths. *Journal of Black Psychology*, *34*(3), 261-280.

Nye, B., Hedges, L. V., & Konstantopoulos, S. (1999). The long-term effects of small classes: A five-year follow-up of the Tennessee class-size experiment. *Educational Evaluation and Policy Analysis*, *21*, 127-142.

Nye, B., Hedges, L. V., & Konstantopoulos, S. (2000). The effects of small classes on academic achievement: The results of the Tennessee class-size experiment. *American Educational Research Journal, 1*, 123-151.

O'Connor, C. (1997). Dispositions toward (collective) struggle and educational resilience in the inner city: A case analysis of six African-American high school students. *American Educational Research Journal*, *34*(4), 593-629.

Ogbu, J. U. (1999). Beyond language: Ebonics, proper English, and identity in a Black-American speech community. *American Educational Research Journal*, *36*(2), 147-184.

Owens, A. (2016). Inequality in children's contexts: Income segregation of households with and without children. *American Sociological Review, 81*(3), 549-74.

Owens, A. (2018). Income segregation between school districts and inequality in students' achievement. *Sociology of Education*, *91*(1), 1-27.

Owens, A., Reardon, S. F., & Jencks, C. (2016). Income segregation between schools and school districts. *American Educational Research Journal*, *53*(4), 1159-1197.

Park, C. B. (1956). The Bay City experiment . . . As seen by the director. *Journal of Teacher Education*, *7*(2), 101-110.

Patterson, C., Kupersmidt, J., & Vaden, N. (1990). Income level, gender, ethnicity, and household composition as predictors of children's school-based competence. *Child Development*, *61*(2), 485-494.

Pattillo, M. (2013). *Black picket fences: Privilege and peril among the black middle class*. University of Chicago Press.

Penney, J. (2018). Dynamic treatment effects of teacher's aides in an Experiment with multiple randomizations. *Economic Inquiry*, *56*(2), 1244-1260.

Portes, A. (1998). Social capital: Its origins and applications in modern sociology. *Annual Review of Sociology*, *24*(1), 1-24.

Race forward: The center for racial justice innovation. Race reporting guide, version 1.1. (2015, June). https://www.raceforward.org/reporting-guide. Accessed 17 July 2020.

Randall, J., & Engelhard, G. (2009). Differences between teachers' grading practices in elementary and middle schools. *The Journal of Educational Research*, *102*(3), 175-186.

Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods* (Vol. 1). SAGE.

Reardon, S. F. (2011). The widening academic achievement gap between the rich and the poor: New evidence and possible explanations. *Whither Opportunity*, 91-116.

Reardon, S. F. (2016a). School segregation and racial academic achievement gaps. *RSF: The Russell Sage Foundation Journal of the Social Sciences*, *2*(5), 34-57.

Reardon, S. F. (2016b). The landscape of socioeconomic and racial/ethnic educational inequality. *Educational Inequality in the 21st Century Conference Presentation*. Stanford University.

Reardon, S. F. (2019). Educational opportunity in early and middle childhood: Using full population administrative data to study variation by place and age. *The Russell Sage Foundation Journal of the Social Sciences*, *5*(2), 40-68. https://doi.org/10.7758/RSF.2019.5.2.03

Reardon, S. F., & Hinze-Pifer, R. (2017). *Test score growth among public school students in Chicago, 2009-2014*. Stanford Center for Education Policy Analysis. https://cepa.stanford.edu/content/test-score growth-among-chicago-public-school students-2009-2014

Reardon, S. F., Ho, A., Shear, B., Fahle, E., Kalogrides, D., & DiSalvo, R. (2017). *Stanford education data archive* (version 2.1). http://purl.stanford.edu/db586ns4974

Reardon, S. F., Kalogrides, D., Fahle, E. M., Podolsky, A., & Zárate, R. C. (2018). The relationship between test item format and gender achievement gaps on mathematics and ELA tests in fourth and eighth grades. *Educational Researcher*, *47*(5), 284-294.

Reardon, S. F., Kalogrides, D., & Ho, A. D. (2017). *Linking U.S. school district test score distributions to a common scale.* CEPA working paper No. 16-09. Stanford Center for Education Policy Analysis.

Reardon, S. F., Kalogrides, D., & Shores, K. (2019). The geography of racial/ethnic test score gaps. *American Journal of Sociology*, *124*(4), 1164-1221.

Reardon, S. F., Robinson-Cimpian, J. P., & Weathers, E. S. (2014). Patterns and trends in racial/ethnic and socioeconomic academic achievement gaps. In H. F. Ladd, M. E. Goertz (Eds.). *Handbook of research in education finance and policy* (pp. 507-525). Routledge.

Reardon, S. F., Yun, J. T., & Eitle, T. M. (2000). The changing structure of school segregation: Measurement and evidence of multiracial metropolitan-area school segregation, 1989 1995. *Demography*, *37*(3), 351-364.

Sampson, R. J., Sharkey, P., & Raudenbush, S. W. (2008). Durable effects of concentrated disadvantage on verbal ability among African-American children. *Proceedings of the National Academy of Sciences*, *105*(3), 845-852.

Sanbonmatsu, L., Kling, J. R., Duncan, G. J., & Brooks-Gunn, J. (2006). Neighborhoods and academic achievement results from the Moving to Opportunity experiment. *Journal of Human Resources*, *41*(4), 649-691.

Sharkey, P., & Faber, J. W. (2014). Where, when, why, and for whom do residential contexts matter? Moving away from the dichotomous understanding of neighborhood effects. *Annual Review of Sociology*, *40*, 559-579.

Shaw, A. (2016). Collaborative connections: strengthening partnership with today's school counselor. *The Exceptional Parent*, (5), 44.

Shin, Y. (2012). Do black children benefit more from small classes? Multivariate instrumental variable estimators with ignorable missing data. *Journal of Educational and Behavioral Statistics*, *37*(4), 543-574.

Shin, Y., & Raudenbush, S. W. (2011). The causal effect of class size on academic achievement: Multivariate instrumental variable estimators with data missing at random. *Journal of Educational and Behavioral Statistics*, *36*(2), 154-185.

Sink, C. A. (2008). Elementary school counselors and teachers: Collaborators for higher student achievement. *The Elementary School Journal*, *108*(5), 445-458.

Small, M. L., & McDermott, M. (2006). The presence of organizational resources in poor urban neighborhoods: An analysis of average and contextual effects. *Social Forces*, *84*(3), 1697-1724.

Small, M. L., & Newman, K. (2001). Urban poverty after the truly disadvantaged: The rediscovery of the family, the neighborhood, and culture. *Annual Review of Sociology*, *27*(1), 23-45.

Snow, C. E., Burns, M. S., & Griffin, P. (1998). *Preventing reading difficulties in young children: Executive summary*.

St. Clair, K. L. (1989). Middle school counseling research: A resource for school counselors. *Elementary School Guidance & Counseling*, *23*(3), 219-226.

Stewart, E. B. (2006). Family-and individual-level predictors of academic success for African American students: A longitudinal path analysis utilizing national data. *Journal of Black Studies*, *36*(4), 597-621.

Strang, D. (1987). *The administrative transformation of American education: School district consolidation, 1938-1980*.

Strauss, V. (2010, October 27). *Washington Post: The answer sheet*. *Washington Post* website: http://voices.washingtonpost.com/answer-sheet/classsize/7-class-size-myths----and-the.html

Strayhorn, T. L. (2014). What role does grit play in the academic success of black male collegians at predominantly white institutions? *Journal of African American Studies*, *18*(1), 1-10.

Stroub, K. J., & Richards, M. P. (2013). From resegregation to reintegration: Trends in the racial/ethnic segregation of metropolitan public schools, 1993-2009. *American Educational Research Journal*, *50*(3), 497-531.

Tatum, B. D. (2017). *Why are all the Black kids sitting together in the cafeteria?: And other conversations about race*. Basic Books.

Thompson, M., Alexander, K., & Entwisle, D. (1988). Household composition, parental expectations, and school achievement. *Social Forces, 67*(2), 424-451.

Thornton, F. F. (2018). Counselors and special educators in rural schools working together to create a positive school community. *International Electronic Journal of Elementary Education*, *10*(3), 385-389. doi:10.26822/iejee.2018336197

Thorson, G. R., Edmondson, J., & Maxwell, N. J. (2005). Towards a better understanding of the origins and consequences of inequality in public school funding: Measuring the consequences of fixed per-pupil funding formulas on small, rural schools. *Conference Papers--Midwestern Political Science Association*, 1-55.

Toldson, I. A. (2019). *No BS (bad stats): Black people need people who believe in Black people enough not to believe every bad thing they hear about Black people*. Brill Sense.

Ungar, M. (2003). Qualitative contributions to resilience research. *Qualitative Social Work*, *2*(1), 85-102.

Voight, A., Hanson, T., O'Malley, M., & Adekanye, L. (2015). The racial school climate gap: Within-school disparities in students' experiences of safety, support, and connectedness. *American Journal of Community Psychology*, *56*(3), 252-267.

Walberg, H. J., & Walberg III, H. J. (1994). Losing local control. *Educational Researcher*, *23*(5), 19-26.

Warren, C. A. (2021). *Urban preparation: Young Black men moving from Chicago's South Side to success in higher education*. Harvard Education Press.

Welch, O. M., & Hodges, C. R. (1997). *Standing outside on the inside: Black adolescents and the construction of academic identity*. SUNY Press.

Whitehurst, G. J., Chingos, M. M., & Gallaher, M. R. (2013). *Do school districts matter?* Brookings Institution.

Williams, K. L., Coles, J. A., & Reynolds, P. (2020). (Re)creating the script: A framework of agency, accountability, and resisting deficit depictions of black students in P-20 education. *The Journal of Negro Education*, *89*(3), 249-266.

Wilson, W. J. (1987). The truly disadvantaged: The inner city. *The Underclass, and Public Policy*, *119*.

Wilson, W. J. (Ed.). (1993). *The ghetto underclass*. SAGE.

Wilson, W. J. (1996). The poorest of the urban poor: Race, class and social isolation in America's inner-city ghettos. *Citizenship today: The contemporary relevance of T.H. Marshall*, 223-248.

Wilson-Sadberry, K. R., Winfield, L. F., & Royster, D. A. (1991). Resilience and persistence of African-American males in postsecondary enrollment. *Education and Urban Society*, *24*(1), 87-102.

Wodtke, G. T., Harding, D. J., & Elwert, F. (2011). Neighborhood effects in temporal perspective: The impact of long-term exposure to concentrated disadvantage on high school graduation. *American Sociological Review*, *76*(5), 713-736.