THE UNIVERSITY OF CHICAGO

POSTSECONDARY PATHWAYS IN CHICAGO PUBLIC SCHOOLS

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ABSTRACT

This dissertation hypothesizes that school feeder patterns are a hidden mechanism of pervasive inequalities in four-year college completion rates for marginalized students including students of color, students with disabilities, and students from higher poverty neighborhoods. Specifically, this dissertation examines the relationship between elementary to high school feeder patterns and college enrollment on the four-year college completion rates of 8th graders in Chicago Public Schools. To do so, this dissertation seeks to identify the role that elementary to high school to college feeder patterns play in shaping inequities in college graduation for marginalized students and whether elementary school type predicts later college outcomes. This dissertation also examines high school graduation, four-year college enrollment and four-year college completion for male students, who increasingly, are less likely than their female counterparts to complete a 4-year college degree.

The overall sample for this dissertation includes all Chicago Public Schools (CPS) eighth-graders (n=156,292) enrolled in CPS between 2004 and 2010, including students who are sometimes omitted from analysis, such as students attending alternative schools, and students with Individual Education Plans (IEPs). Including all students allows for a closer examination of differences in four-year college completion across a more diverse set of students, not excluded through the use of a more restricted sample.

Chapter II provides a macro-level view of the longitudinal college outcomes of all CPS students enrolled in the eighth-grade between the years of 2004 and 2010, including students with disabilities, students attending alternative schools, and students attending charter schools. To do so, descriptive statistics and logistic regression models are used to estimate differences in high

school graduation, four-year college enrollment, and four-year college completion by race and ethnicity, gender, disability status, and neighborhood poverty level. Chapter III examines the variation in college completion across elementary schools in the district for academically similar students of differing demographic and disability groups. Chapter III introduces a novel indicator, High School College Completion Indicator, to estimate the extent to which high schools are sending and connecting students to four-year colleges where they are likely to earn a four-year degree. Finally, Chapter IV utilizes multi-level modeling, and regression analysis to estimate the mean, cumulative, school fixed-effects students in a given elementary school experience between 8th grade and college; a novel concept referred to as Postsecondary Pathway. This chapter also examines elementary school type as a predictor of positive or negative Postsecondary Pathway.

The three studies that comprise this dissertation use Chicago Public Schools administrative data to examine the relationship between elementary school to college enrollment patterns on students' four-year college completion rates. This dissertation posits that – given elementary to high school to college enrollment patterns— disparities in postsecondary opportunities for marginalized students and male students—are likely detectable as early as 8th grade (the last year of elementary school in Chicago Public Schools). If such discrepancies exist at such an early point in students' academic careers, there might also exist a potentially valuable point of intervention to improve the college completion prospects of these students before they ever step foot in a high school.

CHAPTER 1: INTRODUCTION

Common is the narrative that where a child begins school will have long-term effects on their education and later life (Department of Education, 2007; The Ounce of Prevention Fund, 2016). Yet, despite this widely held belief surprisingly little research on the relationship between elementary school of attendance and four-year college completion has been conducted. More common are studies examining the relationship between student demographics or academic performance and college completion (Garcia & Weiss, 2017). Focusing only on student characteristics-- such as academic performance, gender, race and ethnicity, and family income—places the onus of disparities in college completion for marginalized students at the feet of students and families, and not at the school system within which students learn. Therefore, this dissertation includes the role of schools as a system, rather than relying solely on individual student characteristics, as a factor in college outcomes. Identifying the cumulative advantages and disadvantages associated with school feeder patterns is currently an overlooked aspect of inequity in public education, and could have great implications for understanding why inequities in college completion rates for marginalized students persist over time.

This dissertation focuses on the *education pathways* students take as one aspect of the broader role of school systems, from elementary school to high school, and how four-year college completion rates differs across education pathways by race, ethnicity, gender, disability status and socio-economic status. This dissertation defines education pathways as the unique combination of schools students attend from elementary school through college. It is important to note that this dissertation does not attempt to measure college outcomes as a function of individual student characteristics, or a single intervention or experience, but instead seeks to understand how

enrollment patterns within a school system are related to disparate college outcomes for marginalized students and male students. Such a question requires examining the elementary school to high school to college enrollment patterns of students, and determining whether patterns exist that provide marginalized students and male students with less opportunity for four-college completion than their non-marginalized and female peers.

Theoretical Framework: Opportunity Gap Theory

The impetus for this dissertation is the longstanding inequities in college completion for students of color, students from low income families, and students with disabilities. These inequities are well documented, and literature aimed at understanding these inequities are prolific (The Education Trust, 2020; Jack, 2019; Taylor & Cantwell, 2019; Barrow, Sartain, de la Torre, M., 2018; Musu-Gillette et l., 2017; Carrell & Sacerdote, 2017; Fletcher & Tienda, 2010; Johnson et al., 2014; Anstine, 2013; Smith, Pender & Howell, 2013; Ross et al., 2012; Hoxby & Avery, 2012; Bastedo & Jaquette, 2011; Bowen, Chingos, & McPherson, 2009; Hoekstra, 2009; Grant, 2009). Nationally, Black and Latino college enrollees are approximately 24 and 9 percentage, points less likely to earn a bachelor's degree than their White peers (U.S Department of Education, 2018). In recent years, there has also been a growing divide in two-year and four-year college completion for male students (Buchmann & DiPrete, 2013). Buchmann and DiPrete, (2013) document this national trend, and lay out the case that gender inequities in education attainment are happening steadily throughout K-12 schooling, even before male students apply to college. Currently, male college enrollees are approximately ten percentage points less likely to earn a bachelor's degree than their female counterparts, and (U.S Department of Education, 2018).

Inequities in postsecondary outcomes for marginalized students can be examined through a number of theoretical lenses. Common, especially within the economics literature, are theories of cumulative advantage. Cumulative advantage theory is based upon "The Matthew Effect" as proposed by Merton in 1968 to explain the proliferation of publications for a small group of academics in the sciences. Merton observed that academics who had early publications in high profile journals experienced increasing publications in similar journals throughout their career, compared to their colleagues who did not experience such early publications. In the years to follow Dannefer (2003, 1987, 2003) would expand the theory of cumulative advantage and apply it to the realm of social inequalities over the life course.

DiPrete (2006) defines cumulative advantage as an early advantage that receives increasing returns; as a result, inequities between groups of people increases over time. DiPrete (2006) describes two key components in theories of cumulative advantage. First, the outcome must be a resource—whether that be wealth, health, or education—that is socially stratified, and thus have limited availability. Another component to cumulative advantage theory dictates that differences in returns on investments must grow over time as a consequence of previous status. For instance, students with similar high school GPAs and test-scores must experience different college graduation prospects due to previous academic standing, such as their elementary school test-scores. Such a phenomenon would require previous test-scores to influence student's outcomes regardless of later test-scores. Such a situation is not altogether inconceivable. For instance, if a student's 8th grade test-scores gained them access to a higher performing high school, it would not be unreasonable to expect those 8th grade test-scores to be predictive of increased postsecondary outcomes, assuming relative test performance to their peers at lower performing high schools.

Figure 1 illustrates a hypothetical scenario in which differences in students' probabilities of completing college widen over time as a function of their previous status. In this scenario students in Path A are enrolled in elementary schools that feeds into high schools that feed into colleges that outperform expectations given the qualifications of students. Thus, the 40 point gain in probability of completing college that students in Path A experience as they transition from high school to college is partially a function of student inputs, but as this dissertation posits, is also partially a function of institutional effects, specifically, attending "Path A" high schools. Whereas, students on Path C experience losses in predicted probability as they transition from high school to college. Equally important, these losses are also the result from a combination of student inputs and the institutional effects of attending "Path C" high schools.

However, studies in Chicago suggest the relationship between 8th grade test-scores and four-year college enrollment and completion is not a clearly cumulative relationship (Allensworth et al., 2014; Barrow, Sartain, de la Torre, 2016; Barrow, Sartain, de la Torre, 2018). As appealing as theories of cumulative advantage are, there are inherent assumptions within cumulative advantage that call into question its application to college completion. For instance, cumulative advantage theory makes no mention of the reality that access to education opportunities early on may not be equal for marginalized individuals.

Instead, this dissertation is better conceptualized under the theoretical framework of 'opportunity gap' as described by Flores (2007), Lanson-Billings (2013) and Putnam (2016). The term opportunity gap reframes the concept of achievement gap away from individual inputs and onto inequalities in the education system. The term opportunity gap was first applied to postsecondary outcomes in 1998 by Rendon in a report for the National Center for Educational

Statistics entitled *Reconceptualizing access in post-secondary education: Report of the Policy Panel on Access.* This report was an early application of the opportunity gap theory to explain gaps in college completion rates for students of color. However, it wasn't until almost a decade later that Flores (2007) reconceptualized the more prevalent concept of "achievement gap" as not a gap in achievement, but a gap in opportunity to achieve. This shift, though slight in language was revolutionary in its acknowledgement of bias and assumptions in how we conceptualize systematic difference in student outcomes. Lanson-Billings elaborates on the concept of opportunity gap in Carter and Welner's (2013) edited volume *Closing The Opportunity Gap, What America Must Do to Give Every Child an Even Chance*. Here Lanson-Billings describe the outcome of opportunity gaps as an "education deficit", a compounding debt that our children inherit. The concept of education deficit attempts to acknowledge the intergenerational nature of education inequities. Robert Putnam (2016) illustrates the growing intergenerational gap in opportunities *Our Kids: The American Dream in Crisis*. Discrepancies in educational opportunities are strikingly clear in Chapter 4 where Putnam details case studies of Orange County families sending their children to different public high schools mere miles from each other.

Similar to cumulative advantage theory, opportunity gap theory attempts to explain the growing discrepancies in educational outcomes for students. However, opportunity gap theory involves two key components that distinguishes it from cumulative advantage theory. First, the outcomes in question must not only be different, they must be systematically different. This means groups that experience lesser or greater returns must be disadvantaged or advantaged in other ways as well. Second, inequities in outcomes must be at least partially explained by differences in access to resources.

With respect to this dissertation, examining disparities in access to education pathways for marginalized students meets both of these criteria. First, marginalized students are not only disadvantaged in equal access to education, but in a multitude of other social systems as well. Second, this dissertation proposes that education pathways, as defined in this dissertation as the combination of elementary schools, high schools, and colleges students attend, are resources, and that given the limited capacity of enrollment at any given school, opportunity to acquire more desirable education pathways is not equal for all students.

Throughout this dissertation, references to opportunity gap theory are prevalent and fundamental to the methodological decisions made in Chapters 2 through 4. Details of the research questions and methodological approach for each research question is outlined in a later section of this chapter.

Current Study

All of the bodies of work mentioned previously in this chapter contribute valuable knowledge to the literature on inequities in education attainment. However, this dissertation makes a unique contribution in its evaluation of disparities in four-year college completion, not solely as a function of individual student inputs, but also as a function of existing, and inequitable school feeder patterns. Feeder patterns are defined as the pattern of schools in which students enroll as they move from one level of schooling to the next. This dissertation specifically focuses on the feeder patterns from elementary school to high school and later on to college. It should be noted, that while two-year colleges serve an important role in preparing students for the transition to four-year college and the workforce, this dissertation examines four-year college completion

specifically, as the economic return from earning a bachelor's degree is substantially greater than those of earning a two-year degree (Torpey, 2018).

Given the highly segregated nature—racially, ethnically, and socio-economically—of many urban school districts, considerable overlap exists between school demographics and the postsecondary prospects of students (Black et al., 2015; Stephens et al., 2015; Logan & Burdick-Will, 2015; Ross et al., 2012; Fletcher, & Tienda, 2010), making it difficult to disentangle the relationship between students level variables (such as demographics and academic performance), school system variables (such as prevalence of charter schools, per pupil spending), and four-year college completion outcomes. To these ends, this dissertation uses longitudinal Chicago Public Schools administrative data, census data, and college attendance data from National Student Clearinghouse to examine the relationship between students' education pathways and inequities in four-year degree completion. The main goals of this dissertation is to examine the extent to which differences in students' education pathways account for disparities in four-year college completion for marginalized students and male students.

The setting for this dissertation is the City of Chicago, and in particular, Chicago Public Schools (CPS). Chicago Public Schools is a large, racially and ethnically diverse urban school district with great heterogeneity in college completion for students across racial, ethnic and socio-economic categories. The vast majority of Chicago Public Schools seniors (83 %) express ambitions for completing a four-year degree, and yet there remains a dramatic discrepancy between aspirations and college enrollment, especially for students living in lower socio-economic neighborhoods, and Black and Latino students (Roderick, M., Coca, V., Nagaoka, J., 2011). Based on historical trends, 19 % of Chicago Public Schools freshmen in 2017 are anticipated to earn a

four-year college degree, but the disparities across racial and ethnic groups are vast. Black and Latino male students are estimated to earn a four-year college degree at approximately 1/3 the rates for White, male students (10 and 13 % vs 34 %)(Nagaoka and Seeskin, 2017). Similar differences in expected four-year college completion are found for Black, Latino and White female students (17 and 23 % vs 53 %).

The college going and completion disparities found in Chicago are not an anomaly-- they are similar to national outcomes. According to the National Center for Education Statistics (Ross, 2012), more than 90 % of high school seniors nationally express college ambitions and yet only about 25 % of those students will earn a four-year degree within six years. Asian and White high school graduates are far more likely to enroll in college (whether two-year or four-year) than their Black or Latino peers (63 and 42 % versus 35, and 37 respectively), and more likely to obtain a bachelor's degree within six-years of enrolling in a four-year college (71 and 63 % versus 54 and 41 % respectively) (Musu-Gillette et al., 2017). To better understand these disparities this dissertation looks to college enrollment and college completion literature, particularly as it applies to students from families from lower SES neighborhoods, and marginalized student groups. This dissertation also considers the literature on the college completion outcomes for first-generation college students, as students of color and students from low income families are more likely to be first-generation college-going students (NCES, 2012).

Part of the disparities we see in college completion, may in part, be due to differences in the colleges marginalized students attend. In a school district like Chicago Public Schools—where 85 % of students are students of color, and 80 % of students are economically disadvantaged—means a large number of CPS students are also likely to be the first in their family to earn a college

degree. Students from lower-income families, first-generation college students, and students of color are all more likely to undermatch—that is attend a college with lower academic qualifications relative to the student's achievements (Smith et al., 2013; Hoxby & Avery, 2012; Bastedo & Jacquette, 2011; Roderick et al., 2011; Bowens et al., 2009). These patterns are important, as college selectivity and college type (2yr vs 4yr, private vs public etc.) are notable predictors of college completion and future earnings (Anstine, 2013; Smith, 2013; Hoekstra, 2009).

While socio-economic and racial discrepancies in college selection and attendance are well documented, the mechanisms that drive students to select certain colleges remain less clear. Research indicates that the tendency for first-generation college students, and students from lower-SES families to select colleges below their academic qualifications is partially driven by a disconnect in knowledge about the college application, selection, and enrollment process (Hoxby & Avery, 2015, Hoxby & Avery, 2012, Roderick et al., 2011). Research also suggests that high schools can increase college enrollment rates for marginalized students, by providing guidance counseling supports in school (Carrell & Sacerdote, 2017; Stephen & Rosenbaum, 2013). Hoxby and Avery (2012) found that providing high achieving students from low-income families with detailed knowledge about the college application and enrollment process increased their likelihood of enrolling in a college that matched their academic profile by 5 percentage points. Castleman, Page, & Schooley (2014) found similar results. More intensive interventions appear to have even greater impacts. Carrell and Sacerdote (2017), found that providing in-person mentoring increased college enrollment rates for female, urban, high school students by 30 percentage points, although notably, they found much smaller effects for male students.

The previous studies highlight ways that high schools can impact the college-going behaviors of their students. What is largely missing from the literature is *an examination of the role elementary schools play in shaping the college outcomes* of their students, and whether *there are ways elementary schools can influence the high school enrollment opportunities and choices of their students*. For instance, if high schools can influence the college selection choices of their students through counseling and access to information, can elementary schools impact their students' high school enrollment choices in similar ways, thus indirectly impacting their college outcomes? If so, are there characteristics at the elementary school level that are predictive of such mechanisms? Potential mechanisms of influence at the elementary school level include shaping students' high school attendance choices, establishing a strong college-going culture, and better preparing students academically for high school.

This dissertation compares student outcomes across 8th grade test scores in reponse to the ubiquitous use of student test scores in allocating educational opportunities and resources in the United States. In addition, this dissertation controls for student demographics and test scores, not to identify student inputs that can be leveraged to increase high school completion or degree attainment, but to directly address, and dismantle, the pervasive myth that inequalities in education outcomes are solely related to student characteristics and standardized test scores. In doing so, this dissertation contributes to the knowledge of how school systems, as opposed to only individual student characteristics, relate to disparities in high school completion and four-year degree attainment.

The three studies that comprise this dissertation use Chicago Public Schools administrative data to examine the relationship between elementary school to college enrollment patterns on

students' college outcomes. Chicago Public Schools predominantly use an elementary to high school enrollment system, largely omitting what is typically known as middle school or junior high in other districts. As such, 8th grade is the last year of elementary school for Chicago Public Schools students. This dissertation posits that – given elementary to high school to college enrollment patterns— differences in postsecondary opportunities for some students—are likely detectable as early as 8th grade (the last year of elementary school). If such discrepancies exist at such an early point in students' academic careers, there might also exist a potentially valuable point of intervention to improve the college completion prospects of students before they ever step foot on a high school campus.

The broader goal of this dissertation is to expand the evidence-base of inequities in K-12 education by analyzing the college graduation rates of similarly qualified 8th graders across the city of Chicago. Specifically, this study seeks to identify the role that elementary to high school to college feeder patterns play in shaping inequities in college graduation, and whether we can use characteristics of elementary schools to predict disparities in these feeder patterns. In this dissertation, I hypothesize that distinct educational pathways beginning in elementary schools exist within Chicago Public Schools that result in different college completion prospects for students. My dissertation contributes to the literature in this area by accounting for potential differences in feeder pattern inequities prior to high school of which the vast majority of extant literature has overlooked, despite its potential importance to college completion outcomes. It is also the hypothesis of this dissertation that such postsecondary pathways are reflective of discrepancies in the learning environment at the elementary-school level as measured by elementary school type (neighborhood, magnet, charter, and middle school-high school combination schools). If such

pathways exist, and if elementary school type is predictive of such pathways, then elementary school type may serve a useful proxy for targeting additional supports for students. Being able to proactively identify, not just what students may benefit from additional college going supports, but where those students are physically located, as early as 8th grade, carries significant implications for increasing the long-term education outcomes of marginalized students and male students in Chicago Public Schools and across the nation.

As the three studies of this dissertation address distinct areas of research within education, more specific literature will be reviewed within each chapter.

Overview of the Dissertation

This dissertation posits that disparities in the education pathways for students of differing demographic backgrounds constitute a gap in opportunity for higher education attainment. To lay out this argument, this dissertation breaks down the abstract and complicated concept of disparities in education pathways into three subsets of analysis. Chapter 2 first examines disparities in education attainment across demographic and disability subgroups by comparing mean differences in high school completion, four-year college enrollment, and four-year college completion by race, ethnicity, gender, socio-economic status, and disability status. Because student academic performance may function as a confound for disparities in education attainment, mean differences are examined for students with similar standardized test scores. Logistic regression analysis, controlling for race or ethnicity, gender, socio-economic status, test scores, and disability status, is also employed. Controlling for multiple student demographics at one time is vital to parsing out how much of the disparity in four-year college completion rate can be accounted for by each individual demographic characteristic, especially when multiple demographic characteristics, such

as race or ethnicity and socio-economic status may be highly correlated with each other and with four-year college completion. The analysis in Chapter 2 is straightforward and fundamental to all subsequent analysis in Chapters 3 and 4.

Once disparate outcomes in higher education across demographic groups are examined, determining the extent to which those differences can be accounted for by differences in students' education trajectories—versus characteristics of individual student—undergirds the research questions asked in Chapter 3. Examining students' primary school educational trajectory and its relationship to their four-year college completion rates may seem difficult, but it is possible. The use of multi-level modeling allows researchers to examine the extent to which outcomes are different for students within a given school versus between schools, controlling for student demographics and characteristics. The differences between schools, after all student characteristics and demographics are accounted for, are then identified as school fixed effects. Because this dissertation is interested in differences in four-year college completion, the elementary school fixed effects presented in Chapter 3 represent the difference in probability of earning a four-year degree for students at a given elementary school compared to the district as a whole, after accounting for differences in the student population at that school. Comparing these school fixed effects between demographic subgroups then illuminates whether marginalized students are attending schools with better or worse opportunity for college completion than their non-marginalized peers. Controlling for test scores and demographics removes factors that could potentially be used to justify these differences, and fortifies the argument that there is in fact distinct differences in opportunity for college completion for marginalized and non-marginalized students, based on their elementary school of attendance.

The aim of Chapter 3 is to determine whether there are differences in the college completion rates for the elementary schools marginalized students attend, after controlling for test scores and demographics. Comparing elementary school fixed effects provides a succinct way to address this question. By including elementary school fixed effects, but not including high school or college fixed effects, the entirety of the differences in college completion are captured within the elementary school fixed effect. The second aim of Chapter 3 is to determine the extent to which any between elementary school differences in college completion rates can be accounted for by the high schools and colleges to which students from a given elementary school eventually attend. Multi-level modeling provides a way to disentangle elementary school fixed effects from the fixed effects of high schools and colleges. This is important, as the premise of this dissertation is not merely that marginalized students have different college completion outcomes than their non-marginalized peers, but that education trajectories account for at least some of these differences.

Lastly, Chapter 4 seeks to identify whether elementary schools type —charter, magnet, neighborhood, or middle school-high school combination schools—is predictive of higher or lower than expected four-year college completion rates for marginalized students. It is possible that certain types of elementary schools do a better or worse job connecting students to high schools and colleges where they will go no to earn a four-year college degree. It is important to note, that Chapter 4 is not seeking to make a causal statement that elementary school type is the cause for the increased or decreased college completion prospects of its students. Rather, Chapter 4 is concerned with whether elementary school type is associated with increased or reduced college completion rates for marginalized students. If school type is a significant predictor of increased or decreased college completion rates for marginalized students, the question still remains as to what

policies, practices or norms within said school type might account for such disparities. As such, Chapter 4 is best suited to identify potential points of intervention or support at the school and student level, and not as an assessment of the value of any given school type as compared to others.

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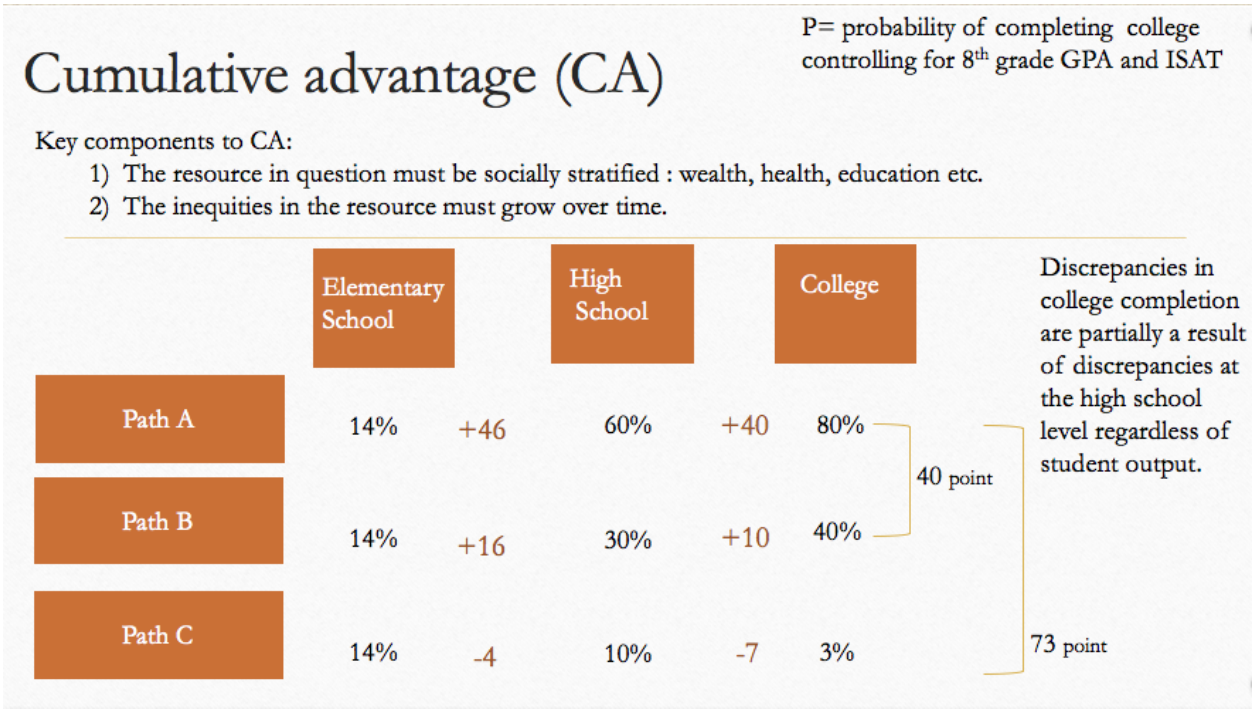
APPENDIX IA: CHAPTER I TABLES AND FIGURES

Figure I.1. Example of Inequalities in Postsecondary Outcomes According to Theory of Cumulative Advantage



CHAPTER II. THE EDUCATION ATTAINMENT GAP OF ACADEMICALLY SIMILAR EIGHTH GRADERS IN CHICAGO PUBLIC SCHOOLS

Abstract

Chapter 2 uses descriptive statistics and logistic regression analysis to provide a macro-level view of differences in the longitudinal education outcomes of academically similar 8th graders across demographic groups. The sample includes all Chicago Public Schools (CPS) eighth-graders (n=156,292) between 2004 and 2010, including students who are usually omitted from analysis, such as students attending alternative schools, and students with Individual Education Plans (IEPs). Including these students allows for a wider breadth of disparities in education attainment to be captured as compared to using a restricted sample. Data include CPS administrative records, census tract concentration of poverty, and college enrollment and completion data obtained from National Student Clearinghouse. Results indicate, after controlling for test scores, race and ethnicity, gender, special education status, and neighborhood concentration of poverty, 8th graders with emotional or behavioral disabilities experience significantly reduced high school graduation, four-year college enrollment, and four-year college completion prospects compared to their peers. Results also indicate that the education attainment gap widens by race and neighborhood poverty as 8th graders move from high school graduation to four-year college enrollment, and eventually four-year college completion. Lastly, the largest differences in high school graduation, four-year college enrollment and four-year college completion were found between 8th graders in the bottom versus top 20th percentile of test scores.

This paper contributes to the field of education research and scholarship in numerous ways. Frist, this study is the only study I am aware of to follow complete cohorts of public school students from elementary school through college and to examine differences in educational attainment based on disability status, race, gender and socio-economic status. This study also highlights the differences that exist across subgroups of students net of tested achievement levels, and raises questions about the connection between test scores and later educational attainment. Lastly, this study lays the foundation for a larger body of work that contributes to the opportunity gap and cumulative advantage literature by positing the original concept of Postsecondary Pathway, defined as the unique combination of schools students attend between elementary school and college.

Background

For more than half a century, education researchers and practitioners have sought answers to the enduring racial education attainment gap in the United States. In the 1960s, The National Center for Educational Statistics commissioned James Coleman's (1966) "Equality of Education Opportunity", the first major study to evaluate inequalities in education systems in the United States. Coleman was the first researcher to capture disparities in education attainment between Black and White students, what we now commonly refer to as the achievement gap. An important and unexpected finding of The Coleman Report was the importance of peers, specifically the benefits of attending schools with students from a wide range of backgrounds. Coleman's findings were used as evidence to support desegregation of public schools in the United States. Nearly sixty year later, many districts remain highly segregated (Orfield & Frankenberg, 2014), and the nation still faces an achievement gap between its Black and White students (Musu-Gillette et al., 2017).

According to The National Center for Education Statistics 97 % of Asian students, 95 % of White students, 92 % of Black students, and 88 % of Latino students between the ages of 18 and 25 have either earned a high school diploma or a GED certificate (Musu-Gillette et al., 2017). By this comparison, the racial attainment gap for high school completion is nominal between Black and White students, and 7 percentage points between White and Latino students. However, as Heckman (2010) finds, the racial and ethnic attainment gaps are much wider when we only consider those students who receive a high school diploma as opposed to a GED. This is an important distinction as Heckman's previous research (2006) found no marked economic return to receiving a GED, but did find marked economic return to receiving a high school diploma. Using census data, Heckman (2010) estimates the high school graduation rate to be 81 % for White students, 62 % for Black students, and 65 % for Latino students.

These racial gaps in education attainment are confounded by disparities in educational experiences for Black students, for instance, the disproportionate rate at which Black students are identified for special education services (Artiles et al., 2010). Whether identification for special education services is helpful or a hinderance to the education outcomes of Black students is still debated (Morgan, 2017, Artiles et al., 2010). However, new research suggests that much of the relationship between race and special education status can be accounted for by differences in family income (Morgan, 2017). Given the highly correlated nature of race and income (Akee, 2019), this study examines high school graduation, four-year college enrollment, and four-year college completion by race, disability status, and socio-economic status to provide an overview of potential disparities by each of these measures. It is important to acknowledge that being able to account for racial disparities in special education status by income does not "undue" the potential

affect that overrepresentation in special education status may have on the educational experiences of Black students.

The gap in education attainment compounds as we examine higher education benchmarks. Asian and White high school graduates are far more likely to enroll in college (whether two-year or four-year) than their Black or Latino peers (63 and 42 % versus 35, and 37 respectively). Differences by race and ethnicity grow when we examine the percent of four-year college enrollees who obtain a bachelor's degree within six-years of enrolling in a four-year college, with 71 % of Asian students and 63 % of White students earning a degree versus 54 % of Latino students and 41 % of Black students (Musu-Gillette et al., 2017). Differences in high school completion, college enrollment, and college completion are clearly visible across racial and ethnic groups, but differences in education attainment by gender are not negligible. In 2018 White, Black and Latino males had four-year college completion rates that were 9.6, 7.5 and 4.8 percentage points lower than their female counterparts (NCES, 2018).

In some cases, the gender gap in education attainment can exceed education gaps by race and ethnicity. According to Musu-Gillette et al. (2017), in 2015, high school dropout rates for Black and Latino youth between the ages of 18 and 25 were 8 and 11 % respectively. However, the gender gap in high school dropout rate for Latinos was four percentage points (13 % for Latino males versus 9 % for Latino females), a difference that exceeds the overall difference between Latino and Black students. This trend is even more pronounced in college enrollment. Musu-Gillette et al. (2017) report an 8 point difference nationally, in college enrollment rates between Latino males and Latino females (33 % vs 41 %); exceeding the difference between Black and Latino students overall (35 % vs 37 %).

The compounding effect of racial/ethnic and gender differences in high school graduation, college enrollment, and college completion become most pronounced when we examine the percent of high school freshmen who go on to earn a bachelor's degree after high school. It is estimated that just 10 % of Black, male, Chicago Public Schools freshmen will earn a bachelor's degree within ten years of starting high school, versus 59 % of Asian females (Nagaoka and Seeskin, 2018). Chicago is a highly segregated city, along racial, ethnic, and socio-economic lines. Of the district's 10 highest performing neighborhood elementary schools[1] (schools available to residents based on attendance boundary), eight of the ten are located in neighborhoods that are predominantly White (see Table II.16), and none are located in neighborhoods that are predominantly Black. As such, Black students lack the same opportunity to access these high performing schools, and are at a distinct disadvantage in that they must take on the undue burden of applying to, and traveling to, schools many White students have access to by default of where they live.

In an effort to provide "equal access" Chicago uses an application system to enroll students in schools other than their designated, neighborhood school. The most highly engaged point for school choice is 9th grade. In 2017, 91 % of CPS 8th graders applied to either a selective-enrollment high school or an academic program at a school other than their neighborhood high school, indicating that the vast majority of students in Chicago Public Schools want access to high performing high schools (Barrow, Sartain & de la Torre, 2018). While the majority of students may want access to these schools, the majority of students will not gain access to these schools.

[1] Highest performing is defined by average 2014 ISAT score and the percent of students attending selective-enrollment high schools.

Many programs use test scores as a component of the application process. Test scores comprise two-thirds of a student's application score for admissions to the district's selective-enrollment high schools, schools that boast some of the district's highest rates for high school graduation, college enrollment, and college completion (see Table II.15). Given the strong correlation between race and test scores, it should come as no surprise that White students are overrepresented in selective-enrollment high schools, despite the district's efforts to increase equitable admissions. A recent study of the selective-enrollment high school application and admissions process indicated that 34 % of seats at selective enrollment high schools were offered to White students, despite White students only comprising 11 % of the district (Barrow, Sartain &de la Torre, 2018; Chicago Public Schools, 2019). In contrast only 11 % were offered to Black students, despite Black student comprise 36 % of the district, and Latino students were only offered 39 % of seats despite comprising 47 % of district students.

Disparities in Education Outcomes

The pursuit of a clear measure of the racial and ethnic attainment has continued for more than half a century since The Coleman Report. But our measure of inequality in education attainment can only be as accurate as our measure of education attainment itself. Nationally, there are two main measures of education attainment: the annual high school attainment level reported by The National Center for Education Statistics, and high school graduation rate reported in The Current Population Survey. As Heckman (2010) illustrates, both of these measures have their drawbacks. The annual high school attainment level includes those individuals who obtained a GED certificate in its measure of high school completion, an alternative education track disproportionately pursued by students of color. According to a recent report from the National

Center for Education Statistics (Malkus & Sen, 2011), Black and Latino students are more likely to get a GED than earn a high school diploma, while White students are more likely to earn a high school diploma than a GED certificate. Using a measure of high school graduation that combined GED attainment and diploma attainment overinflates impressions of high school completion for Black and Latino students by equating a GED with a high school diploma. The Current Population Survey omits key populations of individuals from their measure of education attainment, specifically individuals in incarceration and the military. In addition to the sources of error cited by Heckman, an additional source of potential error lies in that both measures published by The National Center for Education Statistics and The Current Population Survey are self-report surveys, and in the case of The Current Population Survey, a single individual reports for an entire household. Heckman (2010) estimates the National Center for Education Statistics and the Current Population survey to overestimate high school completion rates for Black students by 8.8 and 15 percentage points respectively.

Research on the gender gap in education attainment consistently indicates male students to lag behind their female counterparts. Jacob's (2002) longitudinal study of 8th graders illustrates the clear gender gap in higher education attainment. DiPrete and Buchmann (2013) confirm and expand upon Jacob's findings in their seminal work "The Rise of Women: The Growing Gender Gap in Education and What it Means for American Schools". DiPrete and Buchmann (2013) find that in nearly every common measure of education achievement and attainment, over the past 30 years, females have increasingly outperformed and outscore their male peers.

While there is a well-established body of literature on inequalities in education by race, ethnicity and gender, there is a dearth of research on education attainment for students with

disabilities, especially with regards to college completion. What does exist presents incomplete or conflicting results. Data from the 2009 National Longitudinal Transition Study indicate that 18.5 and 43.9 % of 21 to 29 year olds with disabilities had attended a four-year or two-year college after high school, relatively on par with national averages. However, these results are for all students classified as disabled, and not disaggregated by disability subtype. Grouping all students with disabilities together misses potentially important between group differences by disability type. Students who are visually impaired may have vastly different educational experiences, and subsequently different four-year college graduation rates than students with cognitive disabilities. Disaggregating students by disability type allows for the examination of these differences and can shed light onto potentially different education experiences for students with disabilities. The little available research seems to indicate that not all students with disabilities fair equally with regards to college completion. Murray and colleagues (2000) find that students with learning disabilities are less likely to attend a four-year college, and much less likely to earn a postsecondary certificate or degree than students without learning disabilities.

Focus on 8th Grade

Using 8th grade cohorts is a theoretical, methodological, and practical decision. From a theoretical standpoint, it makes sense to examine secondary and postsecondary outcomes starting with the 8th grade as the transition from 8th to 9th grade provides a wealth of opportunity to shape where and how students experience their 9th grade year. Students may be enrolled in a number of different school types, such as neighborhood schools, charter schools or magnet schools. Students may also be enrolled in a variety of different types of courses, such as honors, Advanced Placement, or International Baccalaureate courses. Whether a student is placed in a more or less

academically rigorous program in 9th grade can impact the future coursework options available as a sophomore, junior, and senior, and ultimately set them up for different college options when they graduate. Thus, schools' dependency on previous course placement to determine students' current course placement, may have lasting impacts on students' education trajectories (Schiller, 1999). In addition to the impacts of being placed in a specific academic track, literature on the transition to high school suggests shifts in students' peer groups in school may be an important factor in shaping their high school success (Felmlee, Rodis, & Osgood, 2018). Schiller (1999) describes the transition between 8th and 9th grade as particularly critical as it offers students the opportunity to alter their education trajectories and peer groups. Thus, the 8th grade year serves as a potentially important point of intervention for high school success.

Recent research from Sattin-Bajaj et al. (2018) found that middle-school counselors play a significant role in shaping the high school attendance choices of their students, and that students with counselors who did not provide advice or supports in selecting high schools were more likely to attend lower-performing high schools, even after controlling for student achievement and counselor caseload. The transition from 8th grade to 9th grade is also unique in that students become academically and socially vulnerable as they experience a dramatic change in academic and social environment. These vulnerabilities manifest as declining grades and an increased likelihood of dropping out of school (Allensworth et al., 2014; Roderick, 1999;).

Given what we know of the potential role of middle-schools in shaping students' high school outcomes, examining high school completion and college enrollment using 8th grade cohorts makes sense. Lastly, as this study does not seek to identify rates of 8th grade graduation, as nearly all Chicago Public Schools students complete the 8th grade, there is little reason to use

cohorts earlier than the 8th grade when examining high school and college outcomes. In Chicago, the majority of elementary schools are K-8 schools, with students largely missing a separate middle-school experience. Therefore, from a practical standpoint, using 8th grade cohorts allow for the maximum number of cohorts possible to be included in the analysis while keeping the lag time between elementary school cohort and college completion as short as possible.

The Use of Test Scores

The racial and ethnic gap in standardized test scores is well documented, both nationally and in Chicago. Chicago's Black and Latino 8th graders are estimated to score three and two grade levels (respectively) below White students in both math and reading, despite substantial growth over time (Readon & Heinz-Pifer, 2017). The argument that past grades are better predictors of students' future academic performance calls into question the use of standardized test scores as the basis for academic comparison. Research indicates that 8th grade GPA is a better predictor of whether a student is on track to graduate high school by the end of 9th grade than test scores, and also a better predictor of whether a student will be likely to earn As and Bs in their freshman year of high school (Allensworth et al., 2014). If the purpose of this study were to compare students who are anticipated to have similar future grades in high school then the use of cumulative GPA would arguably be a better comparison point than standardized test-scores. However, this study is not predicting high school grades, but instead seeks to compare the proportion of students from various demographic groups that earn a four-year college degree. Given the high correlation between previous test scores and future test scores, and as college admissions still rely heavily on standardized test scores, this study chooses to use standardized test scores as the academic indicator of comparison. The use of test scores in this dissertation should not be construed as an

endorsement of test scores as a basis of measuring academic ability, but rather an acknowledgement of norms in allocating education opportunities in The United States.

Standardized test scores remain an integral component of the 8th grade application process for selective-enrollment high schools and other competitive academic programs across Chicago, comprising two-thirds of the point system used to determine admissions. While grades also must be reported as a component of the high school application process, grades only account for one-third of the total points for admissions. It is crucial, for the purposes of this study, to identify whether students with similar academic prospects in the 8th grade have systematically different education outcomes. Given this objective, and the reality that test scores account for two-thirds of student's application prospects for the city's highest performing high schools, this study elects to use 8th grade test-scores as a point of academic comparison in lieu of student grades.

Despite the pervasive use of standardized tests in education assessment and admissions, the use of test scores as proxies for academic ability should be approached with caution. Standardized test scores are highly correlated with race and socio-economic status (Readon & Heinz-Pifer, 2017; Artiles, 2010), potentially conflating extraneous factors with academic ability. In addition, any given test score is a combination of a student's true performance, and error, at the measurement level and the student level (Boyd, 2013). In response to these cautions, this study does the following. First, the use of test scores in this study should not be conflated with an endorsement of test scores as measures of academic ability. Instead, the use of test scores in this study should be viewed as a response to the pervasive use of test scores as an indicator in school systems. Second, to address concerns regarding potential error and bias that arises in the use of a

single test score, a sensitivity analysis is conducted using latent test scores. Results are described later in this chapter.

The Importance of High Schools

The reliance of high school admissions on standardized test -scores would be of little consequence if high schools themselves had little role in shaping students' college prospects, and if racial, ethnic, and gender disparities in standardized test-scores weren't so pronounced (Readon & Heinz-Pifer, 2017). But recent research indicates that high schools can play a sizable role in shaping students' college completion prospects, and differences in test scores by race, ethnicity, and gender are well documented.

With regard to the role of high schools, some of this difference is due to differences in academic preparation, and potential differences in grades between high schools (Allensworth et al., 2017; Allensworth and Clark, 2020), and differences in the types and quality of colleges to which high schools send their students (Roderick et al., 2018; Wolniak & Engberg, 2007). A recent report from Roderick et al. (2018) illustrates as much. Roderick's analysis of four-year college completion prospects for Chicago Public Schools graduates estimates that about half of the between-school difference in college completion rates for students with similar GPAs can be accounted for by the high-school specific, college-feeder patterns of its students. They also found similar patterns when comparing students with similar ACT scores (Roderick et al., 2018). Such evidence indicates that there are other mechanisms at work, whether active or passive, within high schools that shape students' college completion prospects.

Allensworth et al.'s (2014) analysis found that where a student attends high school accounts for greater variation in academic performance in the 9th grade than where a student attended the 8th grade. The question remains whether existing enrollment patterns between 8th and 9th grade suggest certain groups of students are connected to higher performing high schools-- and subsequently colleges-- by default, and whether those students differ systematically by demographics.

There is some evidence to support systematic differences in high school enrollment by demographics. According to a recent report from The Federal Reserve Bank of Chicago (Barrow & Sartain, 2017), high school enrollment patterns in Chicago Public Schools differ substantially by race and ethnicity. Only 14.4 % of Black students enrolled in their neighborhood high school, compared to 32.1 % of Latino students and 29.9 % of non-Black and non-Latino students. However, Black and Latino students were both far more likely to enroll in charter schools (35.9 and 24.7 % respectively), compared to their non-Back and non-Latino peers (6.7 %). Lastly, non-Black and non-Latino students were three times more likely (38.4 %) to enroll in a selective-enrollment school than their Black or Latino peers (11.5 and 10.5 % respectively)

The growing evidence that high schools play an important role in shaping students' college outcomes, and the weighted importance of test scores in the high school admissions process, places heightened importance on understanding the potential role between students' 8th grade test scores and their college prospects. If 8th grade test-scores have little or no relationship to high school completion, college enrollment, and college completion, there begs the question as to whether such test scores should be used at all in determining access to higher performing high schools. If test scores are predictive of college enrollment and completion, this begs the question as to the extent

to which the relationship between 8th-grade test-scores and college completion is reflective of how the system itself uses test-scores to connect students to high schools where students have greater college completion prospects.

Current Study

According to opportunity gap theory (Flores, 2007), in order for a phenomenon to constitute a gap in opportunity, the outcomes in question must differ systematically by subgroup. This chapter seeks to illuminate the potential relationship between elementary school test-scores and longitudinal education outcomes; specifically, high school completion, four-year college enrollment, and four-year college completion. This study also seeks to identify whether the potential relationship between test-scores and education outcomes significantly differs by student demographics. In addition to evaluating systematic differences by race, ethnicity and gender—demographic groups often examined in education equity research—this study also seeks to identify potential disparities in education outcomes for students with disabilities, who have largely been largely overlooked in postsecondary education research.

Research Questions

In an effort to identify the potential inequities in postsecondary outcome for academically similar 8th graders, this study posits the following research questions:

- RQ1: To what extent do high school graduation rates differ for similarly academically qualified 8th graders across Chicago Public Schools?
- RQ2: To what extent do college enrollment rates differ for similarly academically qualified 8th graders across Chicago Public Schools?

- RQ3: To what extent do college completion rates differ for similarly academically qualified 8th graders across Chicago Public Schools?

Sample

The analytic sample for this study is comprised of all 8th graders enrolled in Chicago Public Schools between the academic years of 2003-2004 and 2009-2010 who enrolled in a CPS high school for 9th grade, and did not exit the district due to transfer or incarceration (n=156,292) (see Table II.1**,** Figure II.1). Students who repeated the 8th grade were placed in the 8th grade cohort that corresponded to their last year of 8th grade. Overall, 13.18 % (n=28,205) of 8th graders (n=214,027) transferred out of the district before 9th grade and were thus excluded from the analytic sample due to lack of outcome data. Table II.3 presents the breakdown of loss of students by the subgroups examined in this study. The 8th grade cohort sizes for the analytic sample range from a high of 31,825 in 2005 to a low of 29,116 in 2010 (see Table II.1). The overall racial and ethnic composition of analytic sample 1 is as follows: Black (n=77,256, 49. 61 %); Latino (n=60,515, 38.84 %), White (n=12,130, 7.82 %), Asian/Pacific Islander (n=5593, 3.63 %); and Native American (n=229, 0.15 %). Due to the small number of Native American students in the sample, not all education outcomes for these students are presented due to small cell sizes.

Gender is captured on a binary scale, with 51.89 % of students are female and 48.11 % of students being male. 16.55 % of students in the analytic sample received special education services (n=25,769). Of students with documented disabilities, 62.40 % are documented as having a learning disability (n=16,081), 8.54 of students are documented as having an Emotional or Behavioral disability (n=2,199), 7.61 % (n=1962) have a 504 modification, which insures

accommodations (such as preferential seating), but not specialized instruction. A breakdown of the number of students in each subcategory is available in Table II.6.

Student loss between 8th and 9th grade, due to transferring out of the district was substantial. Of the 214,027 8th graders between 2004 and 2010, 13.18% (n=28,205) transferred out of the district before 9th grade. Rate of transfer between 8th and 9th grade varied by students' race and ethnicity. Black, Asian/Pacific Islander, and Latino students experienced similar rates of transfer between 8th and 9th grade of 12.65 %, 10.99 %, and 11.44 % respectively. In comparison, white students had a much higher rate of transfer between 8th and 9th grade of 24.04 %. Transfer rates for Native American students are not reported due to small sample size. Of the original 214,027 8th graders, 30,703 students (14.35 %) transferred out of the district after the beginning of their freshman year (Table II.3). Loss of students due to transferring out of the district after freshman year gradually declines, from 15.60 % in 2004 to 11.33 % in 2010. White, Latino, and Black students had similar 9th-12th grade transfer rates of 14.01 %, 15.63 %, and 13.75 % respectively. Asian and Pacific Islander students experienced a relatively smaller transfer rate after 9th grade of 9.30 %. Again, due to the small number of Native American students in the sample, transfer rates for Native American students will not be reported. Of students who remained in the district, 77.17 % (n=117,277) earned their high school diploma within six years of entering high school, although these rates varied substantially by race as will be discussed further in this paper.

Variables

Dependent variables for the three models examined in this chapter include high school completion, enrollment in a four-year college, and earning a four-year degree in six years. High school completion is defined as earning a high school diploma within six years of entering high

school as a first-time freshman. Using a six-year high school completion rate may seem unusual given the expectation that students should complete high school in four years, but reporting a six-year high school graduation rate is standard procedure for the Illinois State Board of Education, and is intentional in this study as not to exclude graduation outcomes for students with disabilities who may have extended time for high school completion. Using a six-year rate captures the vast majority of students who earn a diploma. Using a four-year high school graduation rate would miss high school diplomas earned by 10,358 students over the seven cohorts, and disproportionately affect estimates for students with disabilities, and Latino students (see Table II.19). Comparatively, less than half of a percent of students in the analytic sample (n=859) earned a high school diploma in seven or more years, supporting the use of a six-year measure of high school graduation. Enrolling in a four-year college is defined as being enrolled in a four-year college or university the fall immediately after high school graduation, as reported by National Student Clearinghouse. Four-year college enrollment is not conditional on high school graduation, thus allowing the full extent of education disparities to be observed. Of the 156,292 8th graders in the analytic sample, 31.70 % enrolled in a four-year college within six years of entering high school. Students who were enrolled for any number of units at a four-year college are counted as enrolling in a four-year college as long as they were not enrolled full-time at a two-year college. Four-year college completion is defined as earning a four-year college degree within six-years of starting at a four-year college or university, regardless of what four-year institution from which the student earns their degree. Similar to four-year college enrollment, four-year college completion is not conditional on high school graduation or four-year college enrollment, thus allowing the full extent of education disparities for 8th graders by test score and demographic categories to be observed.

Student-level variables include race or ethnicity, gender, special education status, neighborhood concentration of poverty level, and 8th grade standardized test score. During the years of this study, Chicago Public Schools administered the Illinois Standards Achievement Test (ISAT) math and reading subsections to all third through eighth grade students in the district. Each student's standardized math and reading scores were then averaged to create a composite, standardized test score for each student. Scores were then assigned a percentile rank category as follows: below 20th percentile, 20th-39th percentile, 40th-59th percentile, 60th-79th percentile, and 80th percentile and above (see Table II.4).

In an effort to assess potential bias and error introduced by comparing students along a single test score indicator, Chapter 2 includes a sensitivity analysis using students' latent ability test scores, composite measure of math and reading latent ability indicators. The latent ability math and reading scores are derived through a combination of Rasch analysis (a statistical technique used in surveys which converts a raw score to account for item difficulty) and hierarchical linear modeling which accounts for individual and measurement error. Detailed information regarding the methods used to calculate students' latent math and latent reading scores can be found in Appendix II.B.

During the years of this study, Chicago Public Schools recorded students' race and ethnicity under six categories (Black, Latino, White, Asian, Native American, and Multiracial) and gender as binary (male/female), with 51.89 % of students are female and 48.11 % male. No students were missing gender codes. Less than one-quarter of one percent of students were reported as Native American. Only one student is identified as multiracial. As a result, the multi-racial category was dropped from the analysis.

Special education status includes the following categories: cognitive disability, emotional/behavioral disturbance, language disability, learning disability, physical disability, and students with a 504 plan. Students who have a documented 504 plan receive accommodations in the classroom, such as extended time and preferential seating, but do not receive modifications to the curriculum. With the exception of students with a 504 Plan, students in all other special education subcategories receive services through an Individualized Education Program (IEP) that may include both accommodations in the classroom and modification to the curriculum. A breakdown of composition of students receiving special education serviced by subtype is presented in Table II.6.

The most commonly used individual-level measure of student socio-economic status in education research is eligibility for free or reduced lunch. However, eligibility for free or reduced lunch is a dichotomous indicator that does not capture the variation in economic, family and community resources to which students may have access. This study elects to use neighborhood concentration of poverty, which provides a more granular measure of economic and social resources. Neighborhood concentration of poverty is based on census data, and captures the percent of adult males employed and the percent of families with incomes above the poverty line within the census block the student resides. While not a perfect measure, neighborhood concentration of poverty values are continuous, and relative to other census blocks in CPS. This means a value of 0 indicates the student resides in a census block with an "average" measure of poverty relative to other census blocks in CPS. Using a relative measure introduces greater heterogeneity in socio-economic status, allowing for a relative comparison amongst students that otherwise would not have been possible with the free or reduced lunch indicator. As more students

reside in neighborhoods that have higher levels of poverty, the student-level mean of neighborhood concentration of poverty differs from the mean by census block (which is zero). Students are placed into quartiles of neighborhood concentration of poverty based on their relative position to their peers (see Table II.5). As such, any potential relationship between neighborhood concentration of poverty and academic outcome should be interpreted as relative to students' CPS peers, and not absolute.

Methods

To compare differences in high school graduation, college enrollment, and college completion by student demographics, a series of logistic models are employed. Each model is conditional on students' classification within a single subgroup at a time, while controlling for the student's composite test score. The choice to run models by each demographic variable alone is strategic due to the correlations between demographic groups and other explanatory variables (see Table II.18). By examining each demographic group separately, the totality of any potential disparity in education outcome can be evaluated, as well as the degree to which differences in students' test-scores account for such disparities. Fully adjusted models are also run to examine significant differences between groups after controlling for covariates. To account for potential non-linear relationship between test score and education attainment, models also include student's test score decile and continuous measure of test score. It is possible that the relationship between test scores and outcome may differ for students of different subgroup classification—male students vs female students for instance—therefore interaction terms for test composite score and demographic classification are included in each model. Finally, a model including all student

demographic groups is run for each education outcome to parse out the variation in outcome attributed to each subgroup classification controlling for other factors.

Model :

$$\textit{Dependent Variable} = \beta_0 + \beta_1 (\textit{Test decile}) + \beta_2 (\textit{ISAT avg}) + \beta_3 (\textit{poverty}) + \beta_4 (\textit{poverty*test}) + \beta_{5\text{-}9} (\textit{cohort}) + \beta_{10\text{-}14} (\textit{cohort*test}) + \beta_{15\text{-}18} (\textit{race}) + \beta_{19\text{-}22} (\textit{race*test}) + \beta_{23} (\textit{gender}) + \beta_{24} (\textit{gender*test}) + \beta_{25\text{-}30} (\textit{disability}) + \beta_{31\text{-}36} (\textit{disability*test}) + r$$

Results

Research Question 1: High school completion

Table II.7 summarizes mean differences in six-year high school graduation by subgroup (Table II.19 summarizes mean differences in high school graduation between four year and six year measures for comparison purposes), while Table II.10 provides a summary of logistic regression models that control for differences in student test scores, and demographics. The most pronounced differences in overall high school graduation rate were found for students receiving special education services, although graduation rates varied substantially by disability subtype.

Students with emotional or behavioral disabilities (n=2,199) had a six-year high school graduation rate of 40 %, 39 % points lower than students not receiving special education services (see Table II.7). When comparing differences in high school graduation for students of similar test scores, students with emotional or behavioral disabilities still graduate at far lower rates than their academically similar peers (see Figure II.3), and logistic regression analysis controlling for test scores and demographics estimates students with emotional or behavioral disabilities have a

decrease in likelihood to graduate equivalent to 17.49 percentage points (OR=-0.363, p<.001)(see Table II.10).

Differences in high school graduation by gender, race and ethnicity, and neighborhood concentration of poverty were also found (see Figure II.4). 82 % of female 8th graders earned a high school degree in six years versus 72 % of male students. After controlling for academic achievement and demographics (see Table II.10) male 8th graders remained 8.06 percentage points (OR=0.585, p<.001) less likely than females to graduate from high school. Differences by race and ethnicity were also substantial (Figure II.5), and were most pronounced for students below the 20th percentile in ISAT average. Black (n=17,662) and Asian (n=216) students with ISAT scores below the 20th percentile had the greatest gap in high school completion rates (56 % and 83 % respectively, see Table II.7). On the higher end of the ISAT spectrum (students with ISAT scores in the 80th percentile and above) differences in high school completion by race and ethnicity are substantially less than for students with ISAT scores below the 20th percentile (see Table 11.7). After controlling for academic achievement and demographics, 8th grade Asian students remain 7.94 percentage points more likely to earn a high school diploma than their Latino peers (OR=2.376, p<.001), while Black students (OR= .8666, p<.001), and White students (OR=.761, p,.001) are 1.90 and 3.76 percentage points less likely than their Latino peers to complete high school.

Differences in high school completion by neighborhood concentration of poverty are also most pronounced for students with ISAT scores below the 20th percentile. Students with ISAT scores below the 20th percentile who live in the highest poverty neighborhoods (n=9,514) see high school graduation rates 12 percentage points below students with similar ISAT scores who live in

neighborhoods with the lowest concentrations of poverty (n=4,713). The gap in graduation rates by neighborhood concentration of poverty drops from 12 points to 2 points for students with ISAT scores in the 80th and above percentile. After controlling for academic achievement and demographics, the difference between students in the lowest quartile of neighborhood concentration of poverty and the highest quartile is equivalent to 3.78 percentage points (OR= 0.76, p<.001).

Research Question 2: Enrollment in a Four-year College

Much of the gap in expected high school graduation between 8th graders with emotional or behavioral disabilities remains for four-year college enrollment rate. Approximately 35 % of 8th graders with no documented disability (n=126,955) enrolled in a four-year college compared to 5 % of students with emotional or behavioral disabilities (n=2,199. When comparing differences in four-year college enrollment for students of similar ISAT score, students with emotional or behavioral disabilities enrolled in a four-year college at rates far below their peers without documented disabilities (see Figure II:7**,** II.8). Logistic regression analysis controlling for student achievement and demographics indicates four-year college enrollment prospects for 8th graders with emotional and behavioral disabilities with average ISAT scores to be a modest 4.36 percentage points lower than their peers (OR=.775, p<.05) (see Table I.11**)**. However, as ISAT scores increase students with emotional or behavioral disabilities are significantly less likely to enroll in college than their peers. A standard deviation increase in ISAT score equates to a 21.41 percentage point increase in four-year college enrollment prospects for students without disabilities, but only an 11.48 percentage point increase for students with emotional or behavioral disabilities (OR=.522, p<.001).

In contrast to high school graduation outcomes—where students with emotional or behavioral disabilities had the lowest high school graduation rates--, the largest differences found in four-year college enrollment are differences by race and ethnicity (see Table I.11). 8th grade White students experience a modest gain of 4.71 percentage points (OR=1.273, p<.001) in four-year college enrollment, compared to their Latino peers, when not conditioning on high school graduation. However, 8th grade Asian and Black students are estimated to be 26.82 percentage points more likely (OR=1.933, p<.001), and 13.97 percentage points more likely (OR=3.26, p<.001), to enroll in a four-year college than their Latino peers, without conditioning on high school graduation. This difference for Asian students exceeds the 21.41 percentage point gain expected from a standard deviation increase in ISAT score (OR= 2.624, p<.001). The substantial difference in four-year college enrollment associated with increased 8th grade ISAT scores is not surprising given the established predictive relationship between earlier and later test-scores, and the heavy reliance on test-scores for determining admissions to four-year college.

Statistically significant differences by gender, and neighborhood concentration of poverty were also found, although these differences are substantially less than those found by race/ethnicity and ISAT score (see Table II.11 and II.8**)**. After controlling for academic achievement and demographics the difference in likelihood of male 8th graders versus female 8th graders to enroll in a four-year college is equivalent to 6.17 percentage points (OR=.689, p<.001) (see Table I.11**)**. Mean differences in four-year college enrollment by concentration of poverty were slightly less pronounced in comparison to high school graduation. Logistic regression analysis (see Table I.11) suggests students living in neighborhoods in the highest quartile of poverty are 4.69 percentage

points less likely than their equally qualified peers in the lowest poverty quartile to enroll in a four-year college (OR=.76, p<001).

Results Research Question 3: Four-year college completion

Similar to four-year college enrollment, mean differences in six-year degree completion for 8th graders by race and ethnicity far exceed mean differences seen by other demographic subgroups. Following trends previously discussed in high school graduation and four-year college enrollment by race, Asian 8th graders have significantly higher college completion rates than their Latino peers (50 vs 13 %, see Table II.9**,** Figure II.9). Results from logistic regression analysis (see Table II.12) controlling for ISAT score and demographics indicate a significant overall difference between Asian and Latino 8th graders (OR 3.59, p<.001) equivalent to 23.60 percentage points in predicted degree attainment. While White students were only moderately more likely than their Latino peers to enroll in a four-year college, they are substantially more likely to earn a four-year degree. The mean difference in four-year degree attainment between White and Latino students is 21 percentage points (34% vs 13%). After controlling for test score and demographics this difference remains a notable 7.51 percentage points (OR=1.65, p<.001). In contrast, where Black 8th graders were substantially more likely to enroll in a four-year college compared to Latino 8th graders, Black 8th graders have only a marginal increased likelihood of earning a four-year degree equivalent to 3.48 percentage points (OR=1.29, p<.01).

Clear trends in college completion by neighborhood concentration of poverty are illustrated in Figures II.11 and II.12. For 8th graders in the 80th and above percentile of ISAT score, those in the highest quartile of poverty were 20 percentage points less likely than their peers in the lowest quartile of poverty to earn a four-year degree (31 vs 51 %). Mean differences by neighborhood

poverty level drop dramatically for students in all other ISAT percentiles. Logistic regression results indicate that after controlling for test scores and demographics, overall differences in college completion by neighborhood poverty are a modest 4.37 percentage points (OR=.67, p<001)(see Table II.12).

Sensitivity Analysis

This dissertation intentionally uses 8th grade ISAT scores as they are the most recent test scores available before students enter high school, and serve as a signal of academic ability to teachers and administrators at their future high school of attendance. Because this dissertation is concerned with how policies in school systems might exacerbate existing inequalities for students of certain demographic subgroups, in many ways the signal of academic ability is more important than an accurate measure of students' academic ability.

Even still, it is prudent to acknowledge potential error introduced into results due to bias associated with using a single test score. Students' test scores can fluctuate for a host of reasons aside from academic ability, including measurement error (Boyd, 2103). Despite best efforts to ensure state standardized tests are comparable from year to year, and from one student demographic to another, tests may measure subgroups of students differently. In an effort to account for student-level error and measurement bias, researchers at The UChicago Consortium on School Research developed a latent indicator for student academic ability using numerous standardized test scores between 3rd and 8th grade. Students' latent ability math and reading scores are derived through hierarchical linear modeling, with level-1 being the measurement model, level-2 representing students over time, and level-3 being the student level. Models used to calculate students' latent math and latent reading scores can be found in Appendix II.B1.

At the time of this dissertation, latent test scores were only available for cohorts 2004 and 2005. Thus, a subsample of 8th graders from 2004 and 2005 are used to compare high school graduation, four-year college enrollment, and four-year college completion outcomes by ISAT score and latent test score. Small mean differences by test score range are visible across all education benchmarks, most likely due to students on the margin who shifted from one ISAT test score grouping to a higher or lower test score grouping for latent test score. Nearly all high school completion, four-year college enrollment, and four-year college completion outcomes did not differ overall, for subgroups, when comparing students by ISAT score and latent test score bin. However, there are some instances of slight differences due to small differences in sample size. Latent test scores can still be estimated in the event of a single missing test score, and therefore a small number of subgroups differ by a point or two. Despite small observable mean differences, no substantial differences were found between regression estimates using 8th grade ISAT scores and latent test scores. In fact, estimated probabilities differed by less than half a percentage point for all coefficients in the logistic model (see Table Appendices II.B2-II.B8).

Despite practice standards for the Illinois State Board of Education to report six-year high school graduation rates, potential differences in four-year versus six-year high school graduation by subgroup were explored and are reported in Table II.19. Students with disabilities experienced the greatest discrepancy between four and six year graduation outcomes. Students with behavioral disabilities in the 60^{th} to 79^{th} percentile of 8^{th} grade ISAT score saw an 18 percentage point difference in high school graduation by using a six-year measure of high school completion versus a four-year measure. Students with physical disabilities with 8^{th} grade ISAT scores below the 20^{th} percentile mark, saw an increase of 17 percentage points in high school graduation by using a six-

year measure. Given the intentional inclusion of students with disabilities in this study, the results of this additional analysis substantiate the decision to use a six-year measure of high school graduation.

In addition to standard logistic regression, all models were run using OLS. While no substantive differences were found, a few key results are presented here. With regards to high school graduation after controlling for test scores and demographics, students with emotional and behavioral disabilities (β= -.19, $p<.001$) experience the greatest reduction in high school graduation of any demographic group. The next greatest difference in high school graduation by demographic group remained between Latino and Asian students ((β= .09, $p<.001$). With regards to four-year college enrollment, Asian (β= .23, $p<.001$) and Black (β= .15, $p<.001$) students remained more likely to enroll in a four-year college than their academically and demographically similar peers; an increase that exceeds the estimated gain in four-year college enrollment by increasing a student's 8th grade ISAT scores from the 40th percentile to the 80th percentile (β= .14, $p<.001$).

Discussion

This study provides a first look at the descriptive differences in the education attainment of 8th graders in Chicago Public Schools by demographics and standardized test scores. The picture that unfolds highlights a number of important factors that contribute to the final total disparity in four-year college completion for certain subgroups of students.

For some groups of students, disparities in education attainment are visible early on and remain substantial as youth progress into adulthood. Disparities in education attainment for

students with emotional or behavioral disabilities are an example of such a phenomenon, as are disparities in education attainment by gender (see Figures II.3 and II.4). As illustrated in Figure II.4, students with emotional or behavioral disabilities are meeting education benchmarks far below their academically similar peers across early adulthood, and these differences are compounding. Results show that students with emotional or behavioral disabilities are statistically less likely to meet all the three education benchmarks, even after controlling for differences in test scores and demographics. The most dramatic difference is the likelihood of completing high school. Such a finding is surprising, given the greater legal obligations to provide education supports to students with disabilities in high school compared to later on in college. Such results suggest that students with emotional or behavioral disabilities are not receiving the supports they need to graduate from high school at rates similar to their academic peers, and may be dropping off the higher education trajectory early on.

A similar, although less pronounced, phenomenon can be seen in the gender disparity in education attainment. Mean differences in education attainment by gender indicate male 8th graders are meeting education benchmarks at significantly lower rates than their academically similar female counterparts. While male students are significantly less likely to meet education benchmarks across all test score categories (Tables II.14) the size of the gender gap differs depending on the education benchmark in questions. With regards to high school completion, the gender gap is lowest for male students in the 80th percentile of latent test score (3 percentage points), and greatest for male students in the bottom 20th percentile (10 percentage points) (Figure II.13). With regards to college completion the gender gap is greatest for students in the 80th percentile of test score (13 percentage points, 37% for males and 50% for females), and negligible

for students in the bottom 20th percentile of test score. This suggests that while male students consistently experience lower education attainment outcomes than their female peers, certain subgroups of male students are disproportionately affected by the gender gap at different points in their education trajectory.

For some demographics subgroups disparities in outcome are concentrated for students with certain bands of test scores. For instance, Figure II.14 illustrates how high school graduation, college enrollment, and college-completion rates vary by students' poverty level. While there is a clear relationship between test score and education benchmarks, the relationship between poverty and education outcome is most stark for students in the top 80th percentile of test scores, a relationship that remains significant even after controlling for a host of student characteristics. There is something happening systematically for students from high poverty neighborhoods, in the top 80th percentile of ISAT score, during the high school years that is resulting in those students connecting to and graduating from four-year colleges at rates below their more affluent peers. Chapter four of this dissertation hypothesizes that students from high poverty neighborhoods are enrolling in a distinctly different set of high schools and colleges than their peers with similar test scores, and that these enrollment patterns explain a significant portion of the disparity in outcome for students from high poverty neighborhoods.

Lastly, differences in education trajectories by 8th grade ISAT score are indisputable, pronounced, and in some cases quite troubling. Differences in education attainment by ISAT score are significant in every model presented in this paper, all else equal. On its face, such a finding would appear to support the notion that early test scores are solid predictors of students' later academic achievement. However, such a finding should raise a number of concerns. The education

literature suggests the correlation between prior and subsequent standardized test scores is strong, making 8th grade test scores a good predictor of a student's high school test scores (Huchton, 2011; Woodruff, 2003). Research also indicates that the relationship between standardized test scores and college completion may be more reflective of the colleges students attend rather than academic ability. If the predictive relationship between standardized tests and college completion is actually a measure of college effects, what is to say a similar phenomenon is not also at work in the transition from 8th grade to 9th grade? If so, to what extent are education attainment differences by ISAT score reflective of the high schools and colleges students subsequently attend as opposed to their academic ability?

Take for example, the racial and ethnic attainment gap illustrated in Figure II.15. The difference by race is clear for students in the upper band of ISAT scores, as depicted by the solid lines. This disparity is most clearly seen at the college enrollment and completion benchmarks. Results of the previously discussed regression analysis show these differences to remain significant after controlling for ISAT score and other demographics. While students in the 80th percentile and above for ISAT score exceed district averages for students of all racial categories, the racial gap in college enrollment and completion is quite stark. Part of the reason for this is due to a floor effect in high school graduation rates amongst Chicago Public Schools high schools. In 2017, the district-wide high school graduation rate was estimated to be 75 %, whereas the district-wide four-year college enrollment rate dropped to 47 %, and the four-year college completion rate to 49 % (Nagaoka & Seeskin, 2018). This trend is not unique to Chicago, but reflective of national trends in education attainment. For students in the 80th percentile and above, the racial gap in high school completion, although significant, is far less than is found in four-year college enrollment

and four-year college completion simply because the vast majority of these students graduate high school, regardless of where they attend school. This is not the case for college enrollment and completion. School-level variation in four-year college enrollment is substantially greater than school-level variation in high school completion.

There are two main mechanisms in Chicago Public Schools which may contribute to the substantial talent loss for students of color occurring at the college enrollment and completion points: the high school selective enrollment process; and neighborhood attendance boundaries which currently dictate a student's neighborhood high school. As discussed in the opening of this paper, differences in neighborhood and school demographics are pronounced in the city's top elementary schools. Simply looking at the racial and ethnic demographic makeup of Chicago Public Schools selective-enrollment high schools portrays a much more racially and ethnically diverse student body than is seen at the elementary level. However, this view can be misleading.

Chicago's selective enrollment high schools are sizeable institutions, serving over a thousand students each, more than enough supply to meet the demand of White students in the district, whom only comprise approximately 8.7 % of the district's high schoolers (Nagaoka and Seeskin, 2018), and the current admissions structure is set up to benefit that 8.7 %. As previously discussed, CPS White students score, on average, three grade levels above Black students, and two grade levels above Latino students in both Math and Reading. Given that test scores account for two-thirds of the point system for admissions to selective-enrollment high schools, it should come as no surprise that the proportion of White students attending the city's top 10 selective enrollment high schools is four times that of Black and Latino students (see Table II.13).

It is crucial to note, that the district does make considerable effort, at least on its face, to increase racial and ethnic equity in the selective enrollment process by requiring a certain proportion of slots be allocated to students to students based on neighborhood poverty level. However, even with the current system 45 % of Chicago Public Schools students who are White attend one of the city's top 10 selective enrollment schools, despite only comprising 8.7 % of the high school population. For White students who do not make it into one of the city's selective-enrollment schools, it is likely that they will still be served by one of the city's top neighborhood high schools, based exclusively on their neighborhood of residence. As Table 6 shows, 77 % of Chicago Public Schools Students who are White attend either one of the city's top selective-enrollment or top neighborhood high schools, compared to 18 % of Black students and 29 % of Latino students.

Understanding whether these inequities are the product of extraneous factors, or the byproduct, intentional or not, of the school system itself is fundamental to understanding what steps will be necessary and fruitful in ameliorating existing inequities in education attainment. The following chapter takes this challenge head-on, by examining the extent to which differences in education outcome by students' 8th grade test scores are related to the particular schools students attend, and whether the use of test scores produces an inequitable pattern of access to quality high schools and colleges for Chicago Public Schools students.

Limitations and Future Research

The results from this study should be considered within the context of a number of limitations. First, this study cannot speak to the extent to which differences in high school graduation, four-year college enrollment or four-year college completion are biased by the

inequitable loss of students transferring out of the district between 8th and 9th grade. It is possible, that more highly resourced students transferred out of the district before high school and therefore altering the sample in a way that does not accurately reflect the larger pool of 8th graders in Chicago Public Schools. Secondly, this study cannot account for the outcomes of the notable portion of CPS students who do not graduate and do not officially drop out (see "other" category in Table II.1). There is some indication that the increases over time in the number of students designated as "other" is a reflection of increased enrollment in alternative schools in CPS. Whether these students have unofficially dropped out, or if they are slowly making progress towards graduation is unknown. If these students have unofficially dropped out, the role of alternative schools in predicting high school graduation would arguably change. The increasing enrollment of students in alternative schools in CPS is a critical question that future research should examine.

Thirdly, this study cannot speak to why students with emotional and behavioral disabilities, male students, and Black and Latino students experience lower high school graduation, four-year college enrollment, and four-year college completion rates than their peers with similar test scores. Additionally, while the use of test score percentile groups in the descriptive analysis provides an easily interpretable comparison point for "similar test scores", there is potentially important nuance lost in the use of such percentile groups. The use of percentile groupings of 20 percentage points is just one of many analytic decisions that could have been made. Narrower percentile groupings would provide a more granular comparison point, but would also potentially increase the number of data points in any given figure or table to a level that loses interpretability. Lastly, the use of neighborhood concentration of poverty is limited in its ability to serve as a proxy for students' access to economic and social resources. It is possible, that some of the relationships found

between high schools graduation, four-year college enrollment, and four-year college completion would differ by another measure, such as self-reported family income. This may be especially true with regards to the college enrollment and completion measures as students' financial aid is derived from family income, not neighborhood measures of economic stability. However, obtaining students' financial aid information requires collecting self-reported information or working directly with individual college and universities, and is not feasible for a study of this size.

Future research should look to the experiences of students with disabilities, male students, Black students, and Latino students to understand better why students from these demographic groups are experiencing lower high school graduation, four-year college enrollment, or four-year college completion rates than their peers. Questions remain as to whether these students are being disproportionately disciplined, or systematically excluded from educational opportunities that might contribute to such stark differences in high school completion. A key element for future research to examine is why controlling for test scores reduces disparities in high school graduation, college enrollment, and college completion for marginalized students. What is it about test scores, or how they are used in schools, that accounts for so much of the disparities we see in high school graduation, four-year college enrollment, and four-year college completion for marginalized students? Future research should examine whether there are potential policies, or policies already in place, that could change how test scores are used in K-12 schooling to reduce inequities in high school graduation, four-year college enrollment, and four-year college completion for marginalized students.

Policy and Practice Implications

Identifying inequities in high school completion, four-year college enrollment, and four-year college completion is a fundamental first step to understanding the extent of potential differences in educational opportunities for marginalized students. At the school level, administrators should be encouraged to examine metrics of education attainment by disability status, gender, and race and ethnicity. Disparities can signal potential students to target for additional supports, or areas of focus for professional development for teachers and staff. Disparities can also be tracked longitudinally across the district, or state, and prompt larger policy initiatives to close existing opportunity gaps for marginalized groups, such as students with emotional or behavioral disabilities that have been historically overlooked.

Chapter II References

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APPENDIX IIA: CHAPTER II TABLES AND FIGURES

Table II.1. Sample by Cohort

All 8th graders in Chicago Public Schools between 2004 and 2010								
Spring cohort	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**Total Sample**
8th graders	30623	31825	31441	29783	31408	29831	29116	214027
9th graders	26414	27205	27200	26045	27280	26348	25330	185822
not enrolled in 9th	4209	4620	4241	3738	4128	3483	3786	28205
	30623	31825	31441	29783	31408	29831	29116	214027
HS Diploma in 6yrs	15003	16032	16586	16607	18111	18318	18048	118705
No diploma in 6 yrs	11411	11173	10614	9438	9169	8446	8293	67685
								185822
No diploma (n=67,685)								
Official Dropout	5481	4717	4305	3483	3087	1308	641	23022
Transfer out of district	4751	4978	4755	4260	4069	3119	1833	27765
Correction Institution	421	425	363	317	297	196	55	2074
Deceased	40	45	49	45	43	25	12	259
Other	515	783	919	1125	1673	3798	5752	14565
								67685
Analytic Sample: Research Question 1: High school graduation (n=151,965)								
HS Diploma in 6yrs	15003	16032	16586	16607	18111	18318	18048	118705
Official Dropout	5481	4717	4305	3483	3087	1308	641	23022
Other	515	783	919	1125	1673	3798	5752	14565
	20999	21532	21810	21215	22871	23424	24441	**156292**

Note: Students' 8th grade cohort is determined by the year time the student was enrolled as an 8th grader. Thus, students who repeated the 8th grade will be included in the cohort for their repeater year. Approximately one percent of 8th graders had repeated the 8th grade. Students in the "other" category include students who have not graduated, but who also have not officially dropped out, transferred, or been detained. It is likely a substantive portion of these students are enrolled in alternative schools and more detailed records about their attendance is unknown. Increases in the number of students designated as "other" parallels increases in alternative schools enrollment across the district.

Table II.2. Analytic Sample by Subgroup and Test Score Percentile. Cohorts 2004 and 2010

ISAT Decile												
	Overall		Bottom 20		20th-39th		40th-59th		60th-79th		80th above	
Female	80799	52%	12051	8%	15122	10%	16029	10%	16766	11%	17129	11%
Male	74925	48%	15112	10%	13232	8%	13390	9%	13773	9%	14846	10%
White	12130	8%	890	1%	959	1%	1388	1%	2166	1%	5892	4%
Black	77256	50%	17662	11%	17028	11%	15614	10%	13888	9%	10129	7%
Native American	229	0%	24	0%	23	0%	27	0%	42	0%	97	0%
Asian	5593	4%	216	0%	289	0%	491	0%	920	1%	3197	2%
Latino	60515	39%	8371	5%	10055	6%	11899	8%	13523	9%	12659	8%
Spec Ed. No	129955	83%	13412	9%	23949	15%	27174	17%	29209	19%	30823	20%
504 Plan	1962	1%	167	0%	340	0%	355	0%	407	0%	641	0%
Behavioral Disability	2199	1%	1274	1%	337	0%	166	0%	102	0%	43	0%
Cognitive Disability	3948	3%	2045	1%	100	0%	46	0%	37	0%	41	0%
Learning Disability	16081	10%	9820	6%	3320	2%	1423	1%	590	0%	236	0%
Physical Disability	950	1%	337	0%	157	0%	130	0%	88	0%	79	0%
Language Disability	629	0%	108	0%	151	0%	125	0%	106	0%	112	0%
Highest poverty	38142	24%	9514	6%	8783	6%	7616	5%	6411	4%	4177	3%
High average poverty	38404	25%	7428	5%	7567	5%	7566	5%	7338	5%	6516	4%
Low average poverty	37906	24%	5508	4%	6319	4%	7187	5%	7951	5%	8592	6%
Lowest poverty	41272	27%	4713	3%	5685	4%	7050	5%	8839	6%	12690	8%

Table II.3. Percent of 8th Graders Exiting the District by Subgroup

		Dropout	Transfer before 9th grade	Transfer after 9th grade
White	%	7.07	24.04	14.01
	n	1363	4637	2702
Black	%	14.65	12.65	13.75
	n	15509	13394	14561
Native Am	%	8.66	21.23	13.97
	n	31	76	50
Asian	%	3.52	10.99	9.30
	n	244	762	645
Latino	%	10.53	11.44	15.63
	n	8588	9330	12744
Has Disability	%	14.33	12.53	21.82
	n	25451	3795	38756
No Disability	%	18.71	12.88	22.98
	n	6815	20560	8370
Highest Poverty	%	19.78	10.9	18.56
	n	10411	4890	9770
High Poverty	%	15.82	11.82	21.25
	n	8321	5489	11179
Lower Poverty	%	13.61	12.46	23.07
	n	7179	5908	12167
Lowest Poverty	%	11.21	15.92	25.21
	n	5887	7623	13235
Male	%	16.81	11.82	19.84
	n	18105	11426	21089
Female	%	13.32	13.88	24.17
	n	14161	12929	26037

Table II.4. Test Score Percentile (cohorts 2004-2010)

	N	Percent	Cumulative Frequency	Cumulative Percent
Test Score Percentile				
below 20th percentile	27163	18.42%	27163	18.42%
20th-39th percentile	28354	19.23%	55517	37.65%
40th-59th percentile	29419	19.95%	84936	57.60%
60th-79th percentile	30539	20.71%	115475	78.31%
80th percentile and a	31975	21.69%	147450	100.00%

Note: Missing 8842

Table II.5. Neighborhood Concentration of Poverty (cohorts 2004-2010)

Neighborhood concentration of poverty	N	Percent	Cumulative Frequency	Cumulative Percent
Highest poverty	38142	24.49%	38142	24.49%
High average poverty	38404	24.66%	76546	49.15%
Low average poverty	37906	24.34%	114452	73.50%
Lowest poverty	41272	26.50%	155724	100.00%

Note: missing 568

Table II.6. Percent of Students Receiving Special Education Services by Disability Subtype

8th grade year (n=156,292)			
Disability Category	Subcategory	N	Percent
Modifications (504 plan)		1,962	7.61%
Behavioral Disability	Behavior Disorder	2	0.01%
	Emotional and Behavior Disorder	2,199	8.53%
Cognitive Disability	Educable Mental Handicap	2,084	8.09%
	Autistic	720	2.79
	Mental Handicap	7	0.03
	Severe/Profound Handicap	262	1.02
	Traumatic Brain Injury	109	0.42
	Trainable Mental Handicap	766	2.97
Learning Disability		16081	62.4
Physical Disability	Deaf	39	0.15
	Hearing Impaired	216	0.84
	Other Health Impairment	398	1.54
	Physical Handicap	201	0.78
	Visual Impairment	94	0.36
Speech and Language		629	2.44
Total		25,769	

Table II.7. High School Graduation Rates by Demographic Group and Test Score Percentile

	ISAT Test Score Percentile					
	Overall	< 20th	20th-39th	40th-59th	60th-79th	80th above
Female	82%	66%	76%	84%	90%	95%
Male	72%	56%	67%	75%	83%	92%
White	85%	66%	71%	78%	85%	95%
Black	72%	57%	69%	78%	85%	91%
Native American	81%	56%	50%	79%	92%	92%
Asian/ Pacific Islander	94%	84%	86%	92%	94%	98%
Latino	81%	66%	75%	82%	89%	93%
Spec Ed. No	79%	57%	71%	80%	87%	93%
504 Plan	80%	62%	70%	77%	85%	94%
Behavioral Disability	40%	38%	47%	53%	67%	75%
Cognitive Disability	47%	65%	85%	90%	91%	90%
Learning Disability	71%	67%	78%	85%	90%	89%
Physical Disability	74%	72%	83%	81%	82%	96%
Language Disability	79%	68%	79%	82%	85%	90%
Highest poverty	69%	55%	68%	77%	84%	90%
High average poverty	76%	61%	72%	80%	86%	93%
Low average poverty	80%	64%	75%	82%	88%	94%
Lowest poverty	83%	67%	75%	82%	89%	95%

Cells with less than 25 students are omitted.

Table II.8. Four-year College Enrollment by Demographic Group and Test Score Percentile

	ISAT Test Score Decile					
	Overall	<20th	20th-39th	40th-59th	60th-79th	80th above
Female	36%	10%	20%	33%	49%	71%
Male	27%	7%	15%	24%	36%	61%
White	48%	6%	16%	26%	44%	73%
Black	30%	9%	20%	34%	49%	67%
Native American	39%	11%	____	28%	33%	64%
Asian / Pacific Isl.	67%	12%	37%	51%	62%	83%
Latino	27%	6%	13%	22%	36%	57%
Spec Ed. No	35%	9%	18%	29%	43%	66%
504 Plan	39%	7%	16%	31%	43%	69%
Behavioral Disability	7%	4%	10%	15%	29%	42%
Cognitive Disability	5%	5%	17%	36%	51%	70%
Learning Disability	12%	7%	17%	26%	40%	52%
Physical Disability	21%	11%	17%	30%	44%	74%
Language Disability	32%	18%	22%	26%	47%	60%
Highest poverty	26%	9%	18%	30%	45%	62%
High average poverty	30%	8%	18%	29%	44%	64%
Low average poverty	33%	8%	17%	28%	42%	65%
Lowest poverty	38%	8%	16%	28%	43%	69%

Cells with less than 25 students are omitted.

Table II.9. Four-year College Degree Attainment by Demographic Group and Test Score Percentile

	Test Score Decile					
	Overall	< 20th	20th-39th	40th-59th	60th-79th	80th above
Female	18%	3%	7%	13%	24%	50%
Male	12%	2%	4%	8%	15%	37%
White	34%	3%	9%	13%	27%	57%
Black	11%	2%	5%	11%	20%	37%
Nat American	21%	___	___	___	___	41%
Asian/ Pacific Isl.	50%	5%	20%	29%	41%	68%
Latino	13%	2%	5%	10%	18%	36%
Spec Ed. No	17%	2%	6%	11%	20%	44%
504 Plan	22%	2%	5%	12%	20%	50%
Behavioral Disability	1%	1%	2%	4%	6%	18%
Cognitive Disability	1%	1%	6%	___	___	___
Learning Disability	4%	2%	6%	10%	21%	32%
Physical Disability	10%	4%	8%	9%	27%	45%
Language Disability	16%	3%	9%	8%	29%	40%
Highest poverty	9%	2%	5%	9%	17%	31%
High average poverty	13%	2%	5%	11%	19%	40%
Low average poverty	17%	2%	6%	11%	20%	43%
Lowest poverty	23%	2%	6%	12%	23%	51%

Cells with less than 25 students are omitted.

Table II.10. High School Graduation Controlling for Demographics and Test Scores

		Cohorts 2004-2010																	
		Model 3.A1 R2=.1273			Model 3.A2 R2=.1325			Model 3.A3 R2=.1358			Model 3.A4 R2=.1396			Model 3.A5 R2=.1542			Model 3.A6 R2=.1659		
		B		OR	B		OR	B		OR	B		OR	B		OR	B		OR
Intercept		1.41	***	4.11	1.59	***	4.92	1.43	***	4.17	1.48	***	4.38	1.73	***	5.66	1.75	***	
ISAT decile (vs below 40th-59th percentile)	<20th	-0.27	***	0.76	0.55	***	1.73	0.50	***	1.65	0.46	***	1.58	-0.27	***	0.76	-0.10	**	0.91
	20th-39th	-0.22	***	0.80	-0.26	***	0.77	-0.25	***	0.78	-0.26	***	0.77	-0.22	***	0.80	-0.08	**	0.93
	60th-79th	0.23	***	1.26	-0.21	***	0.81	-0.20	***	0.82	-0.21	***	0.81	0.23	***	1.26	0.06	*	1.06
	80th=<	0.53	***	1.69	0.22	***	1.24	0.22	***	1.24	0.22	***	1.24	0.54	***	1.71	0.07	0.13	1.07
ISAT average		0.56	***	1.75	0.50	***	1.64	0.50	***	1.65	0.48	***	1.62	0.50	***	1.65	0.88	***	2.42
Neighborhood concentration of poverty (vs lowest poverty)	High ave				-0.19	***	0.82	-0.18	***	0.84	-0.14	***	0.87	-0.15	***	0.86	-0.13	***	0.88
	Highest				-0.41	***	0.66	-0.40	***	0.67	-0.28	***	0.75	-0.30	***	0.74	-0.27	***	0.76
	Low ave				-0.08	***	0.93	-0.07	**	0.94	-0.06	**	0.94	-0.07	**	0.94	-0.05	*	0.95
ISAT * neighborhood poverty	High ave				0.00		1.00	0.00	0.96	1.00	-0.01	0.73	0.99	-0.01	0.69	0.99	-0.02	0.50	0.98
	Highest				-0.02		0.98	-0.01	0.59	0.99	-0.02	0.46	0.98	-0.02	0.45	0.98	-0.03	0.35	0.97
	Low ave				-0.02		0.99	-0.01	0.60	0.99	-0.02	0.39	0.98	-0.02	0.43	0.98	-0.02	0.47	0.98
8th grade cohort (vs 2004)	2005							0.15	***	1.16	0.15	***	1.16	0.16	***	1.17	0.16	***	1.18
	2006							0.05	**	1.05	0.05	0.07	1.05	0.06	*	1.07	0.04	0.15	1.04
	2007							0.10	***	1.11	0.10	***	1.11	0.12	***	1.12	0.08	**	1.09
	2008							0.37	***	1.45	0.37	***	1.45	0.39	***	1.47	0.36	***	1.43
	2009							0.33	***	1.39	0.33	***	1.39	0.35	***	1.41	0.32	***	1.38
	2010							0.07	*	1.07	0.05	*	1.06	0.08	**	1.08	0.04	0.18	1.04

Table II.10. High School Graduation Controlling for Demographics and Test Scores

		Cohorts 2004-2010															
		Model 3.A1 R2=.1273			Model 3.A2 R2=.1325			Model 3.A3 R2=.1358			Model 3.A4 R2=.1396			Model 3.A5 R2=.1542			Model 3.A6 R2=.1659		
		B		OR	B		OR	B		OR	B		OR	B		OR	B		OR
ISAT * 8th grade cohort	2005							0.03	0.33	1.03	0.03	0.38	1.03	0.03	0.29	1.03	0.02	0.43	1.02
	2006							0.02	0.58	1.02	0.01	0.70	1.01	0.01	0.70	1.01	0.03	0.36	1.03
	2007							0.03	0.32	1.03	0.03	0.38	1.03	0.02	0.60	1.02	0.05	0.14	1.05
	2008							0.09	**	1.09	0.09	**	1.09	0.08	*	1.08	0.09	**	1.09
	2009							0.11	***	1.12	0.11	***	1.12	0.11	**	1.11	0.12	***	1.13
	2010							0.09	**	1.09	0.09	**	1.10	0.09	**	1.09	0.11	***	1.12
Race/Ethnicity (vs Latino)	White										-0.16	***	0.85	-0.21	***	0.81	-0.27	***	0.76
	Black										-0.18	***	0.84	-0.16	***	0.86	-0.14	***	0.87
	Nat. Am										-0.34	0.08	0.71	-0.44	0.11	0.65	-0.42	0.13	0.66
	Asian										0.83	***	2.29	0.87	***	2.39	0.87	***	2.38
ISAT * Race/Ethnicity interaction	White										0.05	0.10	1.06	0.05	0.15	1.05	0.04	0.23	1.04
	Black										0.04	0.07	1.04	0.02	0.43	1.02	0.02	0.35	1.02
	Nat. Am										0.36	0.10	1.43	0.35	0.12	1.41	0.33	0.14	1.39
	Asian										0.05	0.49	1.05	0.05	0.49	1.05	-0.04	0.62	0.97
Male (vs Female)	Male													-0.52	***	0.59	-0.54	***	0.59
ISAT_ave* gender														-0.11	***	0.90	-0.08	***	0.92
Gender*Race/ Ethnicity (vs Latino fem)	White													0.11	0.09	1.11	0.12	0.07	1.12
	Black													-0.07	*	0.93	-0.07	*	0.94
	Nat. Am													0.13	0.74	1.14	0.06	0.87	1.07
	Asian													-0.01	0.92	0.99	-0.02	0.91	0.98

Table II.0. High School Graduation Controlling for Demographics and Test Scores

		Cohorts 2004-2010													
		Model 3.A1 R2=.1273		Model 3.A2 R2=.1325		Model 3.A3 R2=.1358		Model 3.A4 R2=.1396		Model 3.A5 R2=.1542		Model 3.A6 R2=.1659			
		B	OR	B	OR	B	OR	B	OR	B	OR	B		OR	
Student's disability subtype	504 Plan											-0.03		0.59	0.97
	Cognitive											0.50	***		1.64
	Emot/Beh											-1.01	***		0.36
	Language											0.29	***		1.33
	Learning											0.36	***		1.44
	Physical											0.30	*		1.35
ISAT * disability subtype	504_plan											-0.07		0.40	0.93
	Cognitive											-0.31	***		0.73
	Emot/Beh											-0.51	***		0.60
	Language											-0.43	**		0.65
	Learning											-0.28	***		0.76
	Physical											-0.52	***		0.60

Table II.11. 4yr College Enrollment Conditional on Demographics and Test Score

		Cohorts 2004-2010																	
		Model 3.A1 R2=.13			Model 3.A2 R2=.13			Model 3.A3 R2=.14			Model 3.A4 R2=.14			Model 3.A5 R2=.15			Model 3.A6 R2=.17		
		B		OR	B		OR	B		OR	B		OR	B		OR	B		OR
Intercept		-0.88	***	0.42	-0.92	***	0.40	-1.03	***	0.36	-1.29	***	0.28	-1.14	***	0.32	-1.14	***	0.32
ISAT decile (vs below 40th-59th percentile)	<20th	-0.31	***	0.74	-0.33	***	0.72	-0.33	***	0.72	-0.41	***	0.67	-0.38	***	0.68	-0.40	***	0.67
	20th-39th	-0.19	***	0.83	-0.20	***	0.82	-0.19	***	0.83	-0.22	***	0.80	-0.22	***	0.80	-0.22	***	0.80
	60th-79th	0.15	***	1.16	0.16	***	1.17	0.14	***	1.15	0.17	***	1.19	0.17	***	1.19	0.17	***	1.19
	80th=<	0.23	***	1.26	0.24	***	1.27	0.20	***	1.22	0.24	***	1.27	0.25	***	1.29	0.25	***	1.28
ISAT average		1.03	***	2.79	1.08	***	2.93	1.01	***	2.75	0.91	***	2.49	0.96	***	2.60	0.96	***	2.62
Neighborhood concentration of poverty (vs lowest poverty)	High ave				0.07	***	1.08	0.06	***	1.06	-0.09	***	0.92	-0.09	***	0.91	-0.09	***	0.91
	Highest				0.08		1.09	0.07	***	1.07	-0.26	***	0.77	-0.28	***	0.76	-0.27	***	0.76
	Low ave				0.01		1.01	-0.01		0.99	-0.05	*	0.95	-0.05	*	0.95	-0.05	**	0.95
ISAT * neighborhood poverty	High ave				-0.09	***	0.92	-0.07	***	0.93	-0.02		0.98	-0.02		0.98	-0.02		0.98
	Highest				-0.07	**	0.93	-0.05	*	0.95	-0.03		0.97	-0.03		0.97	-0.03		0.97
	Low ave				-0.08	***	0.93	-0.06	**	0.94	-0.03		0.97	-0.03		0.97	-0.03		0.97
8th grade cohort (vs 2004)	2005							0.08	**	1.08	0.09	***	1.09	0.09	**	1.10	0.09	***	1.10
	2006							0.33	***	1.40	0.35	***	1.42	0.36	***	1.44	0.36	***	1.44
	2007							0.24	***	1.27	0.26	***	1.29	0.27	***	1.31	0.27	***	1.31
	2008							0.26	***	1.30	0.29	***	1.34	0.30	***	1.35	0.30	***	1.35
	2009							-0.07	*	0.94	-0.05		0.96	-0.04		0.96	-0.04		0.96
	2010							-0.05		0.95	0.00		1.00	0.02		1.02	0.01		1.01

Table II.11. 4yr College Enrollment Conditional on Demographics and Test Score

		Cohorts 2004-2010															
		Model 3.A1 R2=.13			Model 3.A2 R2=.13			Model 3.A3 R2=.14			Model 3.A4 R2=.14			Model 3.A5 R2=.15			Model 3.A6 R2=.17		
		B		OR	B		OR	B		OR	B		OR	B		OR	B		OR
ISAT * 8th grade cohort	2005							-0.10	***	0.90	-0.09	***	0.91	-0.09	**	0.92	-0.09	**	0.92
	2006							0.03		1.03	0.06		1.06	0.06	*	1.07	0.06		1.06
	2007							0.11	***	1.12	0.14	***	1.15	0.13	***	1.14	0.13	***	1.14
	2008							0.14	***	1.15	0.16	***	1.18	0.16	***	1.18	0.17	***	1.18
	2009							0.18	***	1.20	0.21	***	1.24	0.22	***	1.24	0.22	***	1.24
	2010							0.19	***	1.21	0.23	***	1.25	0.23	***	1.25	0.23	***	1.26
Race/Ethnicity (vs Latino)	White										0.23	***	1.26	0.24	***	1.28	0.24	***	1.27
	Black										0.62	***	1.85	0.66	***	1.93	0.66	***	1.93
	Nat. Am										0.18		1.20	0.42		1.52	0.43		1.53
	Asian										1.18	***	3.26	1.18	***	3.26	1.18	***	3.26
ISAT * Race/Ethnicity interaction	White										0.11		1.12	0.10	**	1.11	0.10	**	1.11
	Black										0.03		1.03	0.01		1.01	0.00		1.00
	Nat. Am										-0.10		0.91	-0.12		0.89	-0.12		0.89
	Asian										-0.12	**	0.89	-0.13	**	0.88	-0.13	**	0.88
Male (vs Female)	Male													-0.37	***	0.69	-0.37	***	0.69
ISAT_ave* gender														-0.08	***	0.92	-0.08	***	0.92
Gender* Race/Ethnicity (vs Latino fem)	White													0.00		1.00	0.00		1.00
	Black													-0.11	***	0.90	-0.11	***	0.90
	Nat. Am													-0.63		0.54	-0.63		0.53
	Asian													0.06		1.06	0.06		1.06

Table II.11. 4yr College Enrollment Conditional on Demographics and Test Score

		Cohorts 2004-2010											
		Model 3.A1 R2=.13		Model 3.A2 R2=.13		Model 3.A3 R2=.14		Model 3.A4 R2=.14		Model 3.A5 R2=.15		Model 3.A6 R2=.17	
		B	OR	B	OR	B	OR	B	OR	B	OR	B	OR
Student's disability subtype	504 Plan											-0.02	0.98
	Cognitive											0.17	1.18
	Emot/Beh											-0.01	0.99
	Language											-0.25 *	0.78
	Learning											-0.06	0.94
	Physical											-0.18	0.84
ISAT * disability subtype	504_plan											0.06	1.06
	Cognitive											0.24	1.27
	Emot/Beh											-0.65 ***	0.52
	Language											0.19 *	1.21
	Learning											0.02	1.02
	Physical											0.26 *	1.30

Table II.12. 4yr College Completion Conditional on Demographics and Test Scores

		Cohorts 2004-2008																	
		Model 3.A1 R2=0.28			Model 3.A2 R2= 0.28			Model 3.A3 R2=0.28			Model 3.A4 R2= 0.29			Model 3.A5 R2= 0.31			Model 3.A6 R2=. 0.31		
		B		OR	B		OR	B		OR	B		OR	B		OR	B		OR
Intercept		-2.09	***	0.12	-1.94	***	0.14	-1.74	***	0.18	-1.96	***	0.14	-1.75	***	0.17	-1.75	***	0.17
ISAT decile (vs below 40th-59th percentile)	<20th	-0.31	***	0.73	-0.36	***	0.70	-0.45	***	0.64	-0.51	***	0.60	-0.47	***	0.63	-0.48	***	0.62
	20th-39th	-0.17	***	0.85	-0.18	***	0.84	-0.21	***	0.81	-0.23	***	0.79	-0.22	***	0.80	-0.22	***	0.80
	60th-79th	0.16	***	1.18	0.17	***	1.19	0.18	***	1.19	0.20	***	1.22	0.19	***	1.21	0.19	***	1.21
	80th=<	0.25	***	1.28	0.26	***	1.29	0.25	***	1.29	0.27	***	1.31	0.27	***	1.31	0.27	***	1.31
ISAT average		1.22	***	3.38	1.21	***	3.34	1.10	***	3.02	0.99	***	2.70	1.07	***	2.91	1.07	***	2.92
Neighborhood concentration of poverty (vs lowest poverty)	High ave				-0.19	***	0.83	-0.18	***	0.83	-0.17	***	0.85	-0.18	***	0.84	-0.18	***	0.84
	Highest				-0.36	***	0.70	-0.36	***	0.70	-0.39	***	0.68	-0.40	***	0.67	-0.40	***	0.67
	Low ave				-0.09	**	0.91	-0.09	**	0.91	-0.06		0.94	-0.06	0.06	0.94	-0.06		0.94
ISAT * neighborhood poverty	High ave				-0.04	0.23	0.96	-0.04		0.96	-0.02		0.98	-0.03		0.98	-0.03		0.97
	Highest				-0.10	*	0.91	-0.10	*	0.91	-0.07		0.94	-0.07		0.93	-0.08		0.93
	Low ave				-0.07	*	0.93	-0.07	*	0.93	-0.06		0.94	-0.07		0.94	-0.07		0.94
8th grade cohort (vs 2004)	2005							-0.05		0.95	-0.05		0.96	-0.04		0.96	-0.04		0.96
	2006							-0.26	***	0.78	-0.24	***	0.79	-0.23	***	0.80	-0.23	***	0.80
	2007							-0.30	***	0.74	-0.28	***	0.76	-0.27	***	0.76	-0.27	***	0.76
	2008							-0.33	***	0.72	-0.30	***	0.74	-0.30	***	0.74	-0.30	***	0.75
ISAT * 8th grade cohort	2005							0.00		1.00	0.00		1.00	0.01		1.01	0.01		1.01
	2006							0.15	***	1.16	0.16	***	1.17	0.16	***	1.17	0.16	***	1.17
	2007							0.16	***	1.18	0.17	***	1.18	0.16	***	1.18	0.16	***	1.18
	2008							0.20	***	1.22	0.21	***	1.23	0.22	***	1.24	0.22	***	1.24
																	0.50	***	1.65

Table II.12. 4yr College Completion Conditional on Demographics and Test Scores

		Cohorts 2004-2008														
		Model 3.A1 R2=0.28			Model 3.A2 R2= 0.28			Model 3.A3 R2=0.28			Model 3.A4 R2= 0.29			Model 3.A5 R2= 0.31			Model 3.A6 R2=. 0.31		
		B		OR	B		OR	B		OR	B		OR	B		OR	B		OR
Race/Ethnicity (vs Latino)	White										0.50	***	1.66	0.50	***	1.65			
	Black										0.25	***	1.28	0.25	***	1.28	0.25	***	1.29
	Nat. Am										0.01		1.01	0.12		1.13	0.12		1.13
	Asian										1.30	***	3.68	1.28	***	3.60	1.28	***	3.59
ISAT * Race/Ethnicity interaction	White										0.00		1.00	-0.01		0.99	-0.01		0.99
	Black										0.04		1.04	0.02		1.02	0.01		1.01
	Nat. Am										-0.03		0.97	-0.08		0.93	-0.08		0.92
	Asian										-0.18	***	0.84	-0.20	***	0.82	-0.20	***	0.82
Male (vs Female)	Male													-0.53	***	0.59	-0.53	***	0.59
ISAT_ave* gender														0.15	-0.10	***	-0.10	***	0.90
Gender* Race/Ethnicity (vs Latino fem)	White													0.05		1.05	0.06		1.06
	Black													-0.04		0.97	-0.03		0.97
	Nat. Am													-0.35		0.71	-0.35		0.71
	Asian													0.15		1.17	0.16		1.17
Student's disability subtype	504 Plan																0.07		1.07
	Cognitive																-0.11		0.90
	Emot/Beh																-0.95	***	0.39
	Language																0.30		1.35
	Learning																0.00		1.00
	Physical																0.32	*	1.38
ISAT * disability subtype	504_plan																-0.02		0.98
	Cognitive																-0.08		0.92
	Emot/Beh																-0.03		0.97

Table II.12. 4yr College Completion Conditional on Demographics and Test Scores

	Cohorts 2004-2008											
	Model 3.A1 R2=0.28		Model 3.A2 R2= 0.28		Model 3.A3 R2=0.28		Model 3.A4 R2= 0.29		Model 3.A5 R2= 0.31		Model 3.A6 R2=. 0.31	
	B	OR	B	OR	B	OR	B	OR	B	OR	B	OR
Language											-0.22	0.80
Learning											-0.05	0.96
Physical											-0.22	0.81

Table II.13. Demographic Composition of Chicago's Top 10 Selective-Enrollment High Schools

	Percent White	Percent Black	Percent Latino	Percent Asian
Northside College Prep	27%	8%	30%	20%
Walter Payton College Prep	44%	11%	22%	17%
Whitney Young Magnet	28%	21%	29%	17%
Lindblom Math and Science	3%	71%	24%	1%
Lane Tech	37%	8%	40%	11%
Jones College Prep	39%	12%	30%	14%
Brooks College Prep	1%	80%	18%	0%
Westinghouse College Prep	2%	53%	40%	5%
King High School	0%	94%	4%	1%
Von Steuben	17%	10%	57%	13%

Table II.14. Percent of District Students Attending Top Selective Enrollment and Neighborhood High Schools in Chicago by Race and Ethnicity

High School	Type	Zip Code	Percent of the district's White high school students	Percent of the district's Black high school students	Percent of the district's Asian high school students	Percent of the district's Latino high school students	2016 ACT	College enrollment	College persistence
Northside College Prep	selective	60625	3%	0%	5%	1%	29.5	96.00%	91%
Walter Payton	selective	60610	5%	0%	4%	1%	29.6	92.30%	85%
Whitney Young	selective	60607	7%	1%	9%	1%	27.9	89.40%	84%
Lindblom Math & Science	selective	60636	0%	2%	0%	1%	22.9	94.60%	83%
Lane Tech	selective	60618	18%	1%	11%	4%	25.6	92.60%	83%
Jones College Prep	selective	60605	8%	1%	6%	1%	26.2	88.80%	83%
Brooks College Prep	selective	60628	0%	2%	0%	0%	22.5	85.00%	76%
Westinghouse	selective	60624	0%	2%	1%	1%	20.7	90.50%	76%
King High	selective	60653	0%	1%	0%	0%	20.6	85.40%	69%
Von Steuben	selective	60625	3%	0%	5%	2%	21.3	80.30%	65%
Lincoln Park	neighborhood	60614	6%	1%	6%	1%	22.3	88.60%	77%
Kenwood	neighborhood	60615	1%	4%	1%	0%	19.2	83.10%	67%
Taft High	neighborhood	60631	17%	0%	6%	3%	18.9	78.50%	65%
Prosser	neighborhood	60639	0%	1%	0%	2%	18.1	72.60%	57%
Senn High	neighborhood	60660	2%	1%	6%	1%	18.3	75.30%	57%
Amundsen	neighborhood	60625	2%	0%	3%	1%	18.2	70.70%	52%
Kennedy High	neighborhood	60638	3%	0%	0%	2%	18.1	69.40%	50%
Solorio	neighborhood	60632	0%	0%	0%	3%	18.4	74.40%	49%
Washington High	neighborhood	60617	1%	0%	0%	2%	17.7	69.70%	47%
Infinity Math Science	neighborhood	60623	0%	0%	0%	1%	18.8	79.70%	46%
Total Percent			77%	18%	65%	29%			

Table II.15. Mean Demographics and Achievement of Chicago Public Schools Top Performing High Schools

Top 10 Selective Enrollment High School							
	Type	Zip Code	Neighborhood Percent White	2016 Composite ACT	College enrollment	College Persistence	Percent of Graduates Enrolled 2 years later
Northside College Prep	selective	60625	67.54%	29.5	96.00%	94.60%	91%
Walter Payton College Prep	selective	60610	76.46%	29.6	92.30%	92.50%	85%
Whitney Young Magnet	selective	60607	72.80%	27.9	89.40%	94.10%	84%
Lindblom Math and Science	selective	60636	2.29%	22.9	94.60%	88.20%	83%
Lane Tech	selective	60618	83.60%	25.6	92.60%	89.50%	83%
Jones College Prep	selective	60605	64.10%	26.2	88.80%	93.30%	83%
Brooks College Prep	selective	60628	4.00%	22.5	85.00%	89.30%	76%
Westinghouse College Prep	selective	60624	3.46%	20.7	90.50%	83.70%	76%
King High School	selective	60653	5.84%	20.6	85.40%	80.30%	69%
Von Steuben	selective	60625	67.54%	21.3	80.30%	81.50%	65%
Top 10 Neighborhood High School	Type	Zip Code	Neighborhood Percent White	2016 Composite ACT	College enrollment	College Persistence	Percent of Graduates Enrolled 2 years later
Lincoln Park High School	neighborhood	60614	89.60%	22.3	88.60%	87.10%	77%
Kenwood High School	neighborhood	60615	28.89%	19.2	83.10%	80.50%	67%
Taft High School	neighborhood	60631	93.16%	18.9	78.50%	83.40%	65%
Prosser	neighborhood	60639	37.27%	18.1	72.60%	78.10%	57%
Senn High School	neighborhood	60660	67.00%	18.3	75.30%	75.20%	57%
Amundsen High School	neighborhood	60625	67.54%	18.2	70.70%	74.20%	52%
Kennedy High School	neighborhood	60638	78.38%	18.1	69.40%	72.40%	50%
Solorio	neighborhood	60632	50.90%	18.4	74.40%	65.20%	49%
Washington High School	neighborhood	60617	36.72%	17.7	69.70%	67.50%	47%
Infinity Math Science	neighborhood	60623	38.68%	18.8	79.70%	58.20%	46%

*Top performing as determined by the school-level mean ACT score and the percent of students who enroll in college.

Table II.16. Neighborhood Demographics for Chicago's Top Neighborhood and Selective-enrollment Elementary Schools

Selective Enrollment Elementary School	Type	Zip Code	Neighborhood Percent Black**	Neighborhood Percent White**	School Percent White*	Percentage Points White Above District Average*	2014 ISAT Composite Meets or Exceeds*
Edison Gifted	selective	60625	4%	43%	60%	49%	100%
Lenart Gifted	selective	60620	98%	0%	17%	6%	97%
Keller Gifted	selective	60655	8%	84%	23%	13%	100%
Skinner West	selective	60607	3%	5%	26%	16%	97%
Bell	selective	60618	4%	44%	60%	49%	76%
Coonley	selective	60618	4%	44%	66%	55%	71%
South Loop	selective	60605	19%	59%	26%	15%	74%
Pritzker	selective	60622	8%	58%	29%	19%	57%
Greeley	selective	60613	8%	75%	10%	-1%	62%
Beaubien	selective	60630	1%	60%	39%	28%	72%
Neighborhood Elementary Schools	**Type**	**Zip Code**	**Neighborhood Percent Black****	**Neighborhood Percent White****	**School Percent White***	**Percent White above district average**	**2014 ISAT Composite Meets or Exceeds***
Alcott	neighborhood	60614	4%	83%	63%	52%	47%
Burley	neighborhood	60657	3%	82%	66%	55%	78%
Sauganash	neighborhood	60646	1%	76%	52%	41%	84%
Lincoln	neighborhood	60614	4%	83%	60%	50%	96%
Hamilton	neighborhood	60657	3%	82%	69%	59%	61%
Wildwood Magnet	neighborhood	60646	1%	76%	63%	52%	76%
Audubon	neighborhood	60618	4%	22%	65%	54%	57%
Blaine	neighborhood	60613	8%	75%	65%	54%	85%
Waters	neighborhood	60625	4%	43%	54%	44%	56%
Agassiz	neighborhood	60657	3%	82%	40%	30%	63%

Top selective-enrollment and neighborhood elementary schools were selected based on the percent of students meeting or exceeding state testing standards, and the percent of students enrolling in a selective-enrollment high school. Elementary

* Source: Chicago Public Schools, Stats and Facts (2019). ** Source: American Fact Finder, Community Facts, 2010 Census.

Table II.17. Trends in Mean Elementary School Demographics (2004-2010)

Elementary School Demographics	2004	2005	2006	2007	2008	2009	2010
School average enrollment	835.56	821.84	809.64	779.62	757.85	758.62	775.56
Average kindergarten class size	23.24	23.78	23.65	23.97	24.93	25.22	24.65
Average first grade class size	24.36	24.32	24.30	24.04	23.31	23.54	24.63
Average third grade class size	25.53	24.89	24.68	24.39	23.99	24.10	25.66
Average sixth grade class size	26.76	26.45	26.93	26.76	25.91	26.23	26.49
Average eighth grade class size	26.73	26.74	27.37	26.97	25.57	25.90	26.68
% Limited English	14.55	14.10	14.10	14.20	14.88	16.89	16.08
Mobility rate	23.53	24.06	23.19	23.01	22.28	23.23	18.58
% Asian	3.54	3.32	3.24	3.31	3.28	3.46	3.87
% Black	50.47	51.05	50.45	47.99	48.38	44.92	43.82
% Latino	36.22	36.56	37.51	37.74	38.24	40.70	43.08
% White	9.60	8.85	8.62	8.15	7.55	7.68	9.05
% Native American	0.17	0.20	0.18	0.15	0.12	0.18	0.16
% Low income	84.91	85.31	85.90	86.41	86.23	85.23	85.16
Truancy rate	2.24	2.27	2.40	1.63	2.30	2.23	5.73

Table II.18. Correlation Table for Analytic Sample 2004-2010

Correlation Table for Analytic Sample						
Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
ISAT_ave	147450	0.00237	0.9294	349.61095	-3.4477	5.3054
Black	155724	0.49611	0.49999	77256	0	1
White	155724	0.07789	0.26801	12130	0	1
Latino	155724	0.3886	0.48743	60515	0	1
Asian	155724	0.03592	0.18608	5593	0	1
Native American	155724	0.00147	0.03832	229	0	1
Gender	155724	0.48114	0.49965	74925	0	1
Special ed.	155724	0.16548	0.37161	25769	0	1
SCON	153086	0.25343	0.78251	38796	-3.8649	4.9808

Variable	ISAT_ave	cohort	Gender	Special ed.	Poverty
ISAT_ave	1	0.14525***	-0.06113***	-0.42608***	-0.25416***
Cohort	0.14525***	1	0.01432***	-0.01928***	-0.03277***
Gender	-0.06113***	0.01432***	1	0.13262***	-0.01316***
Special ed.	-0.42608***	-0.01928***	0.13262***	1	0.01676***
Poverty	-0.25416***	-0.03277***	-0.01316***	0.01676***	1
Black	-0.24582***	-0.0527***	-0.02177***	0.04776***	0.5078***
White	0.22309***	-0.0115***	0.01164***	0.02384***	-0.2864***
Latino	0.05435***	0.05945***	0.01162***	-0.04282***	-0.32103***
Asian	0.19858***	0.00239	0.01195***	-0.05131***	-0.10531***
NatAm	0.02087***	0.00019	-0.00341	0.00411	-0.02276***

Table II.19. Percentage Point Difference in Four Year Versus Six Year High School Graduation Rate by Student Subgroup 2004-2010

	8th grade Test Score Percentile					
	Overall	Below 20th	20th-39th	40th-59th	60th-79th	80th and above
Female	6%	9%	8%	6%	4%	2%
Male	9%	10%	10%	9%	6%	4%
White	6%	11%	7%	7%	5%	2%
Black	8%	9%	8%	6%	5%	3%
Native American	5%	0%	5%	4%	5%	3%
Asian	3%	9%	3%	4%	2%	1%
Latino	9%	12%	11%	10%	8%	4%
Spec Ed. No	7%	10%	11%	9%	7%	3%
504 Plan	7%	11%	14%	10%	7%	5%
Behavioral Disability	11%	12%	13%	9%	18%	3%
Cognitive Disability	12%	15%	15%	7%	0%	0%
Learning Disability	10%	11%	10%	9%	7%	7%
Physical Disability	13%	17%	8%	9%	13%	6%
Language Disability	6%	10%	9%	7%	3%	2%
Highest poverty	8%	9%	8%	7%	7%	7%
High average poverty	8%	10%	9%	7%	4%	3%
Low average poverty	8%	11%	8%	8%	5%	2%
Lowest poverty	7%	11%	10%	8%	5%	2%

Figure II.1. High School Outcomes for CPS 8th Graders. Cohorts 2004-2010 (n=214,027)

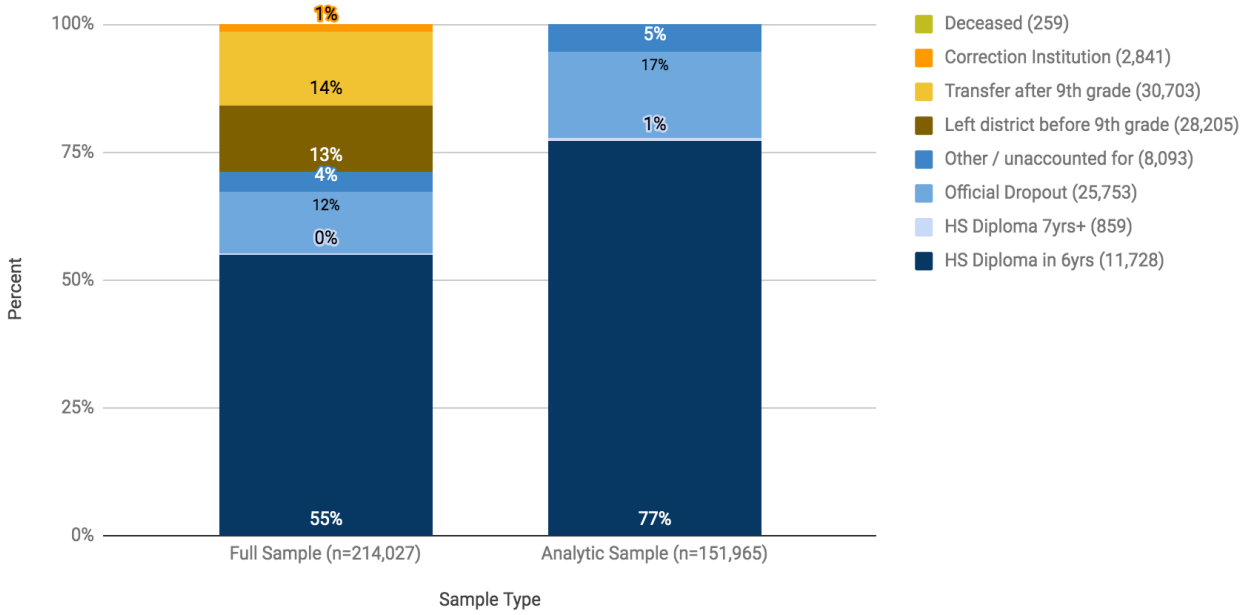
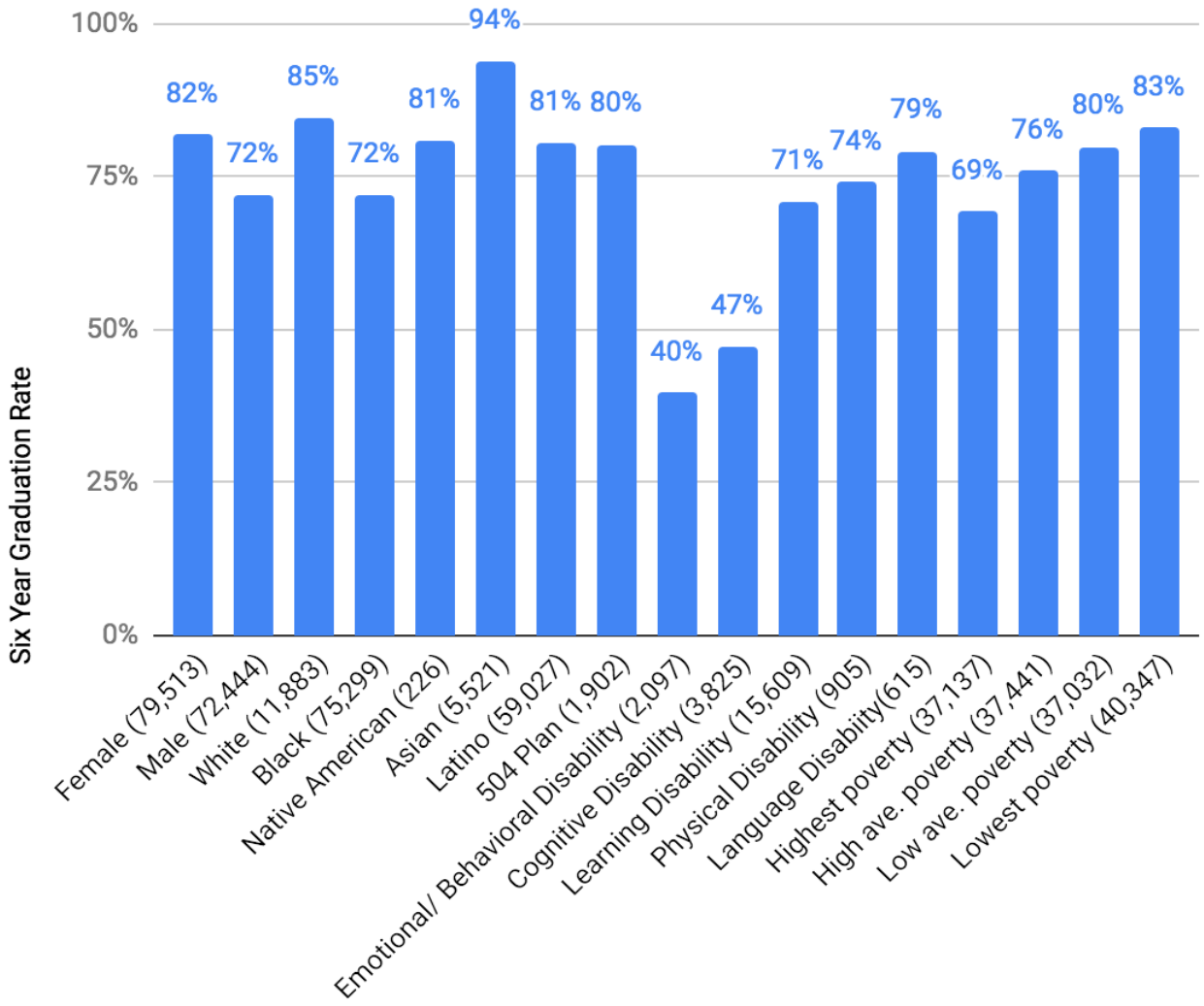
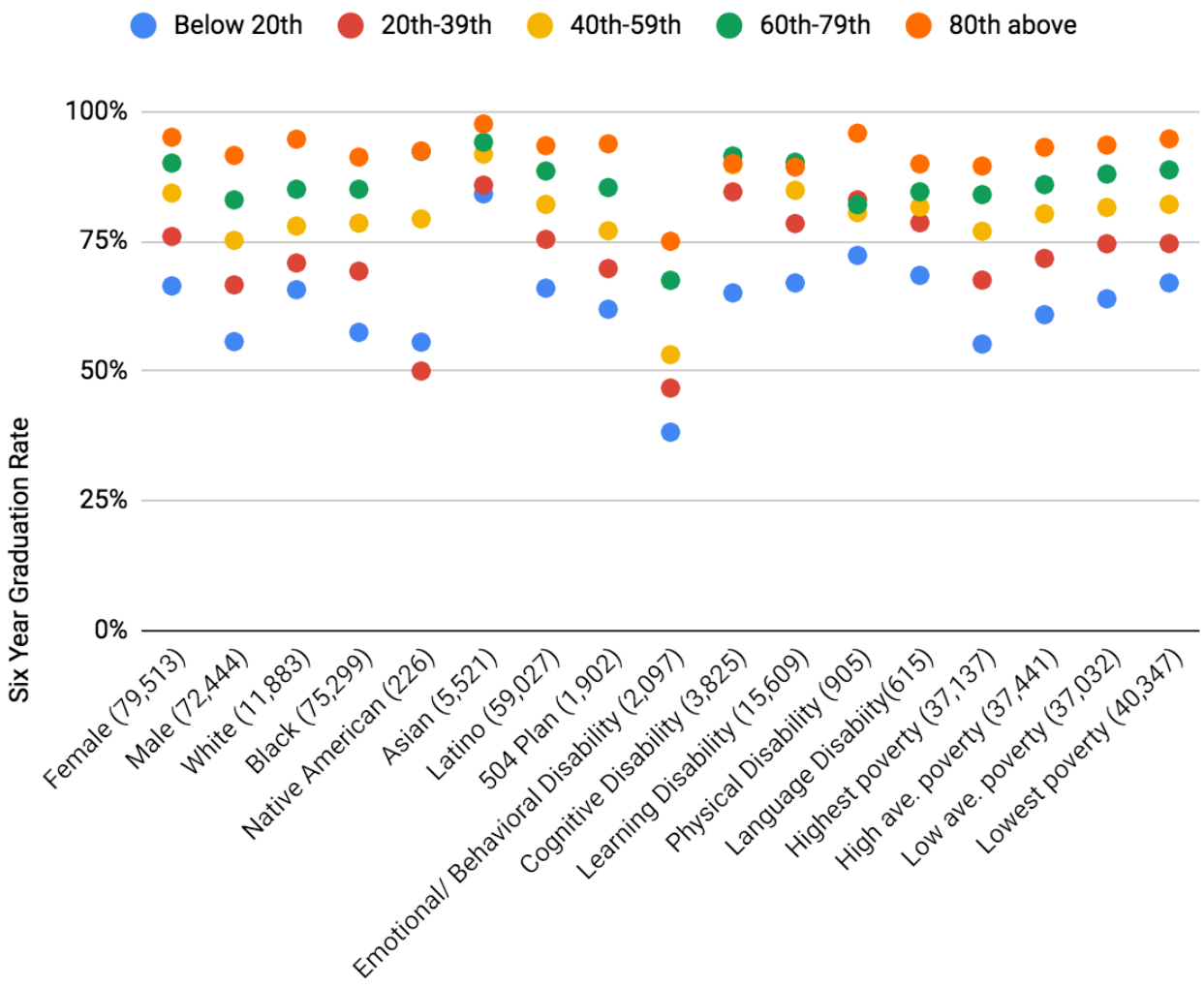


Figure II.2. High School Graduation by Subgroup. Cohorts 2004-2010.



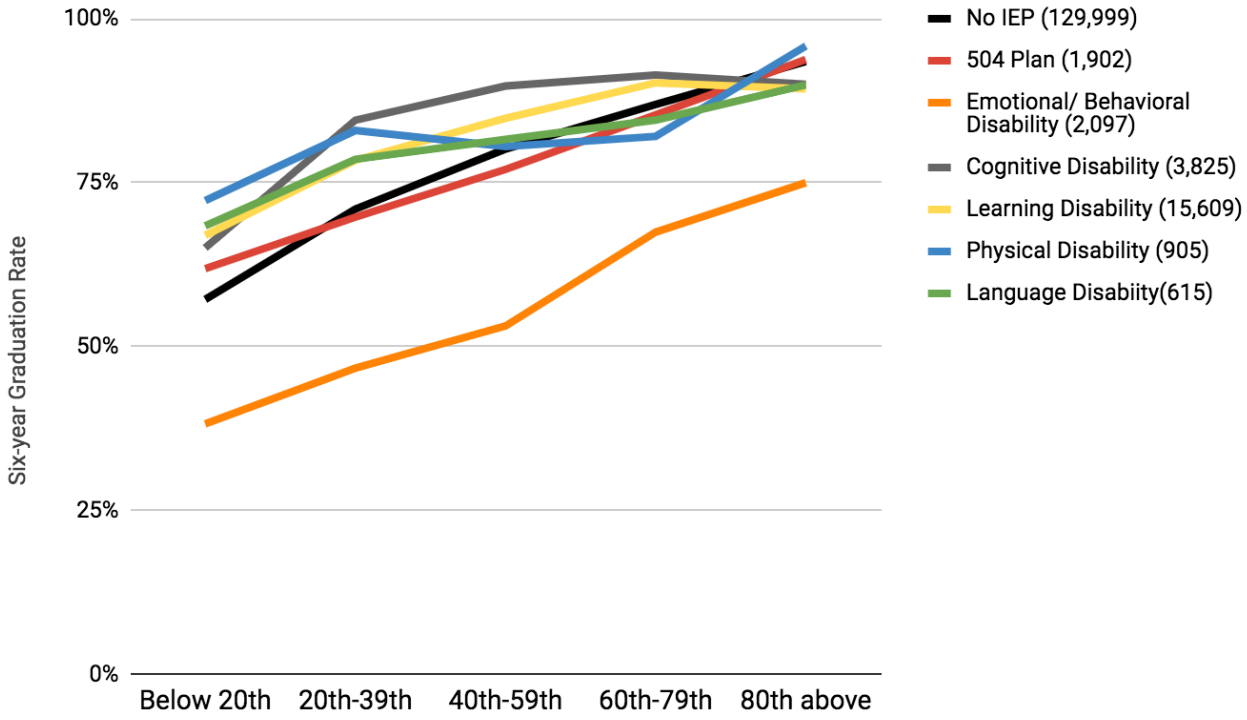
Note: High school graduation refers to earning a high school diploma within six years of entering high school, including students who earned an alternative diploma or GED.

Figure II.3. High School Graduation by Subgroup and ISAT Percentile. Cohorts 2004-2010



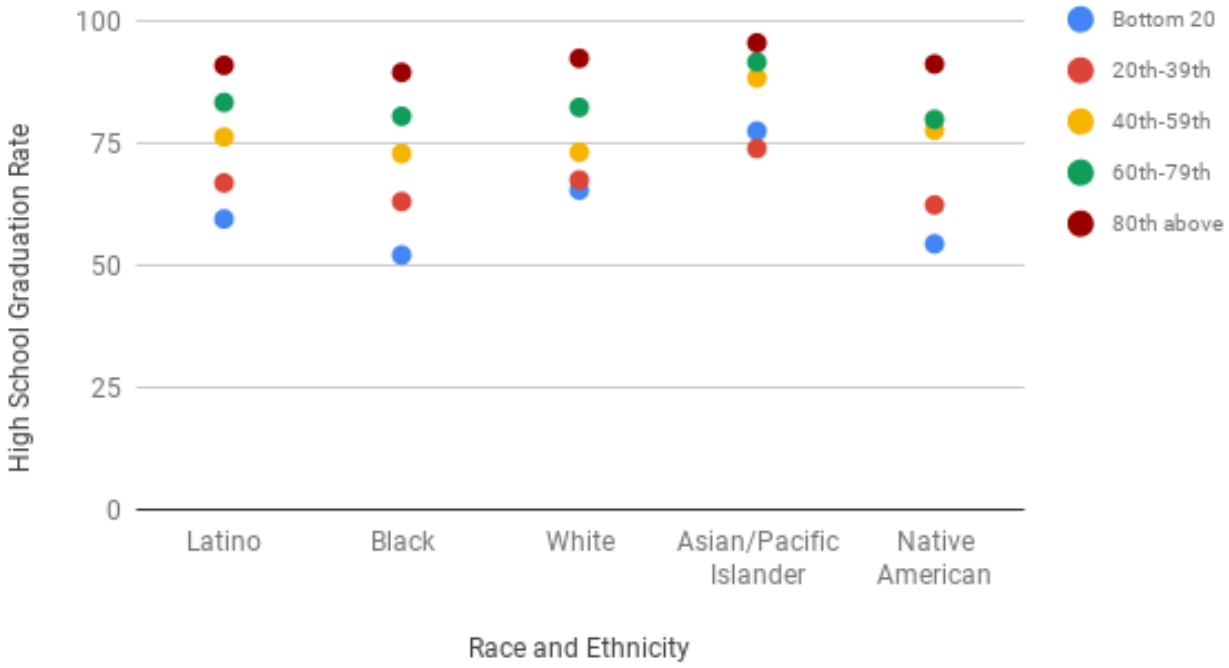
Note: High school graduation refers to earning a high school diploma within six years of entering high school, including students who earned an alternative diploma or GED.

Figure II.4. High School Graduation by Student Subgroup and 8th Grade Test Score Percentile (2004-2010)



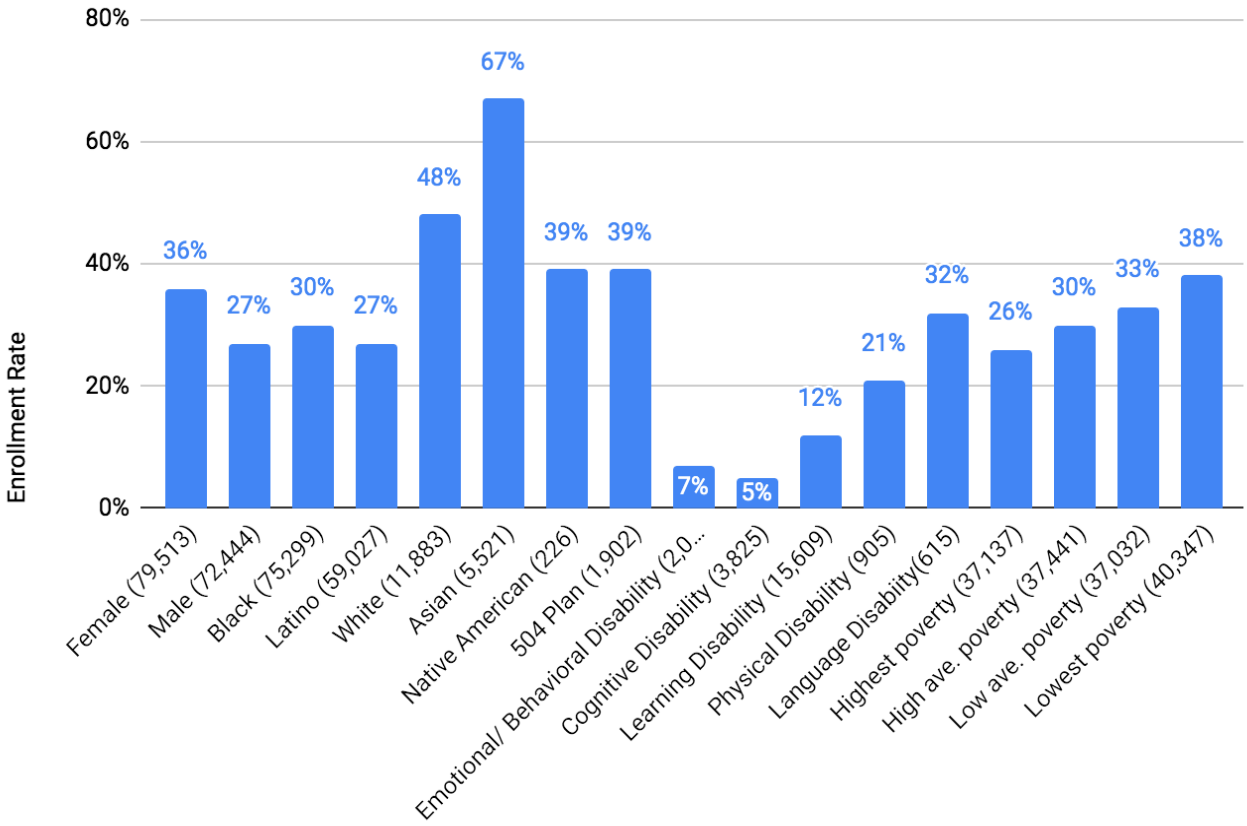
Note: High school graduation refers to earning a high school diploma within six years of entering high school, including students who earned an alternative diploma or GED.

Figure II.5. High School Graduation by Race/Ethnicity and Test Score Percentile



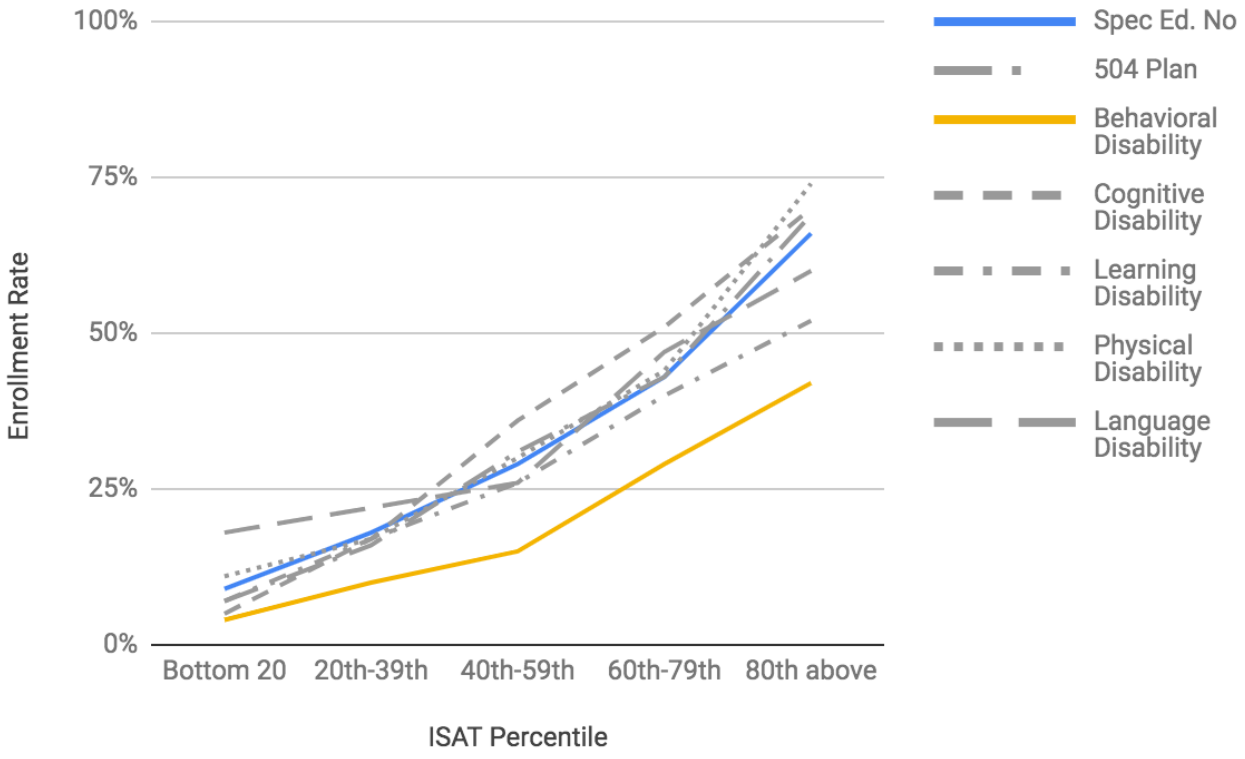
Note: High school graduation refers to earning a high school diploma within six years of entering high school, including students who earned an alternative diploma or GED.

Figure II.6. Four Year College Enrollment Rates for 8th Graders by Subgroup (not conditional on high school graduation) (2004-2010)



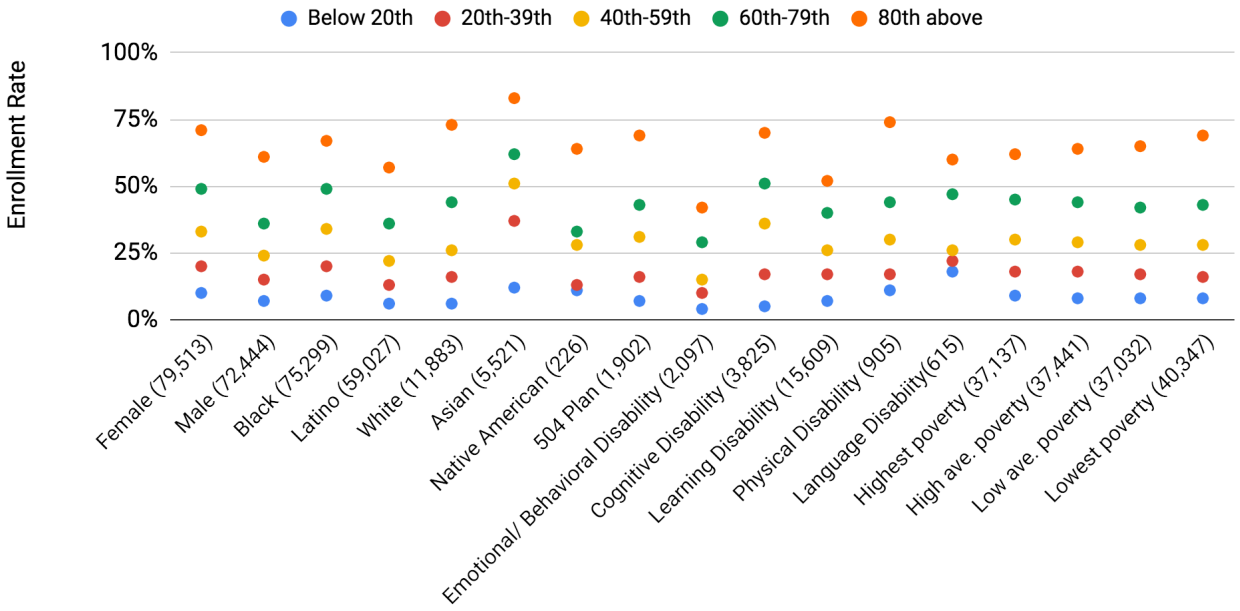
Note: Four-year college enrollment refers to enrolling in a four-year college the fall immediately following high school graduation, per data obtained through National Student Clearinghouse. Students who did not graduate from high school are counted as not enrolling in a four-year college.

Figure II.7. Four-year College Enrollment by Disability Subtype and Test Score Percentile for CPS 8th Graders (not conditional on HS graduation)



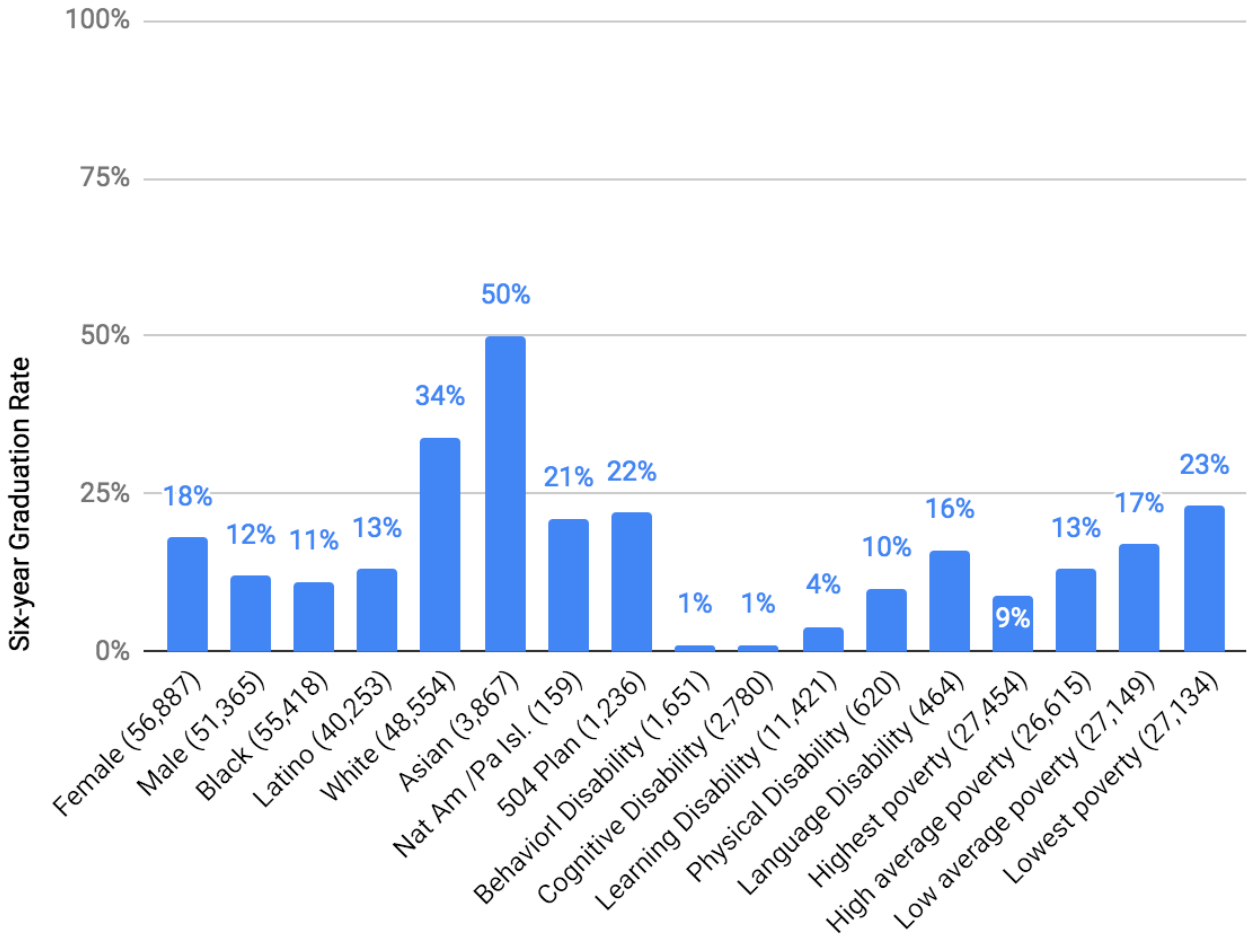
Note: Four-year college enrollment refers to enrolling in a four-year college the fall immediately following high school graduation, per data obtained through National Student Clearinghouse. Students who did not graduate from high school are counted as not enrolling in a four-year college.

Figure II.8. Four Year College Enrollment Rate of 8th Graders by Subgroup and Test Score Percentile (not conditional on high school graduation)(2004-2010)



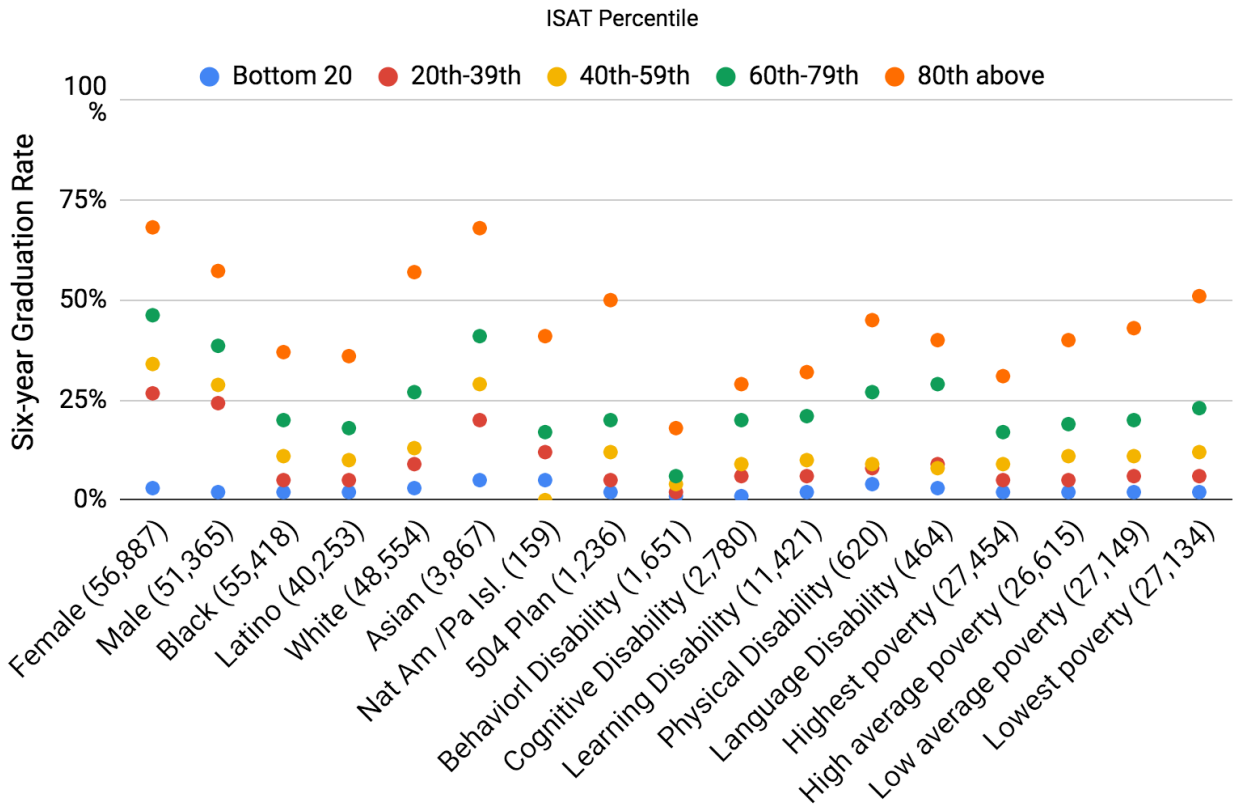
Note: Four-year college enrollment refers to enrolling in a four-year college the fall immediately following high school graduation, per data obtained through National Student Clearinghouse. Students who did not graduate from high school are counted as not enrolling in a four-year college.

Figure II.9. Four Year College Completion Rates of 8th Graders by Subgroup



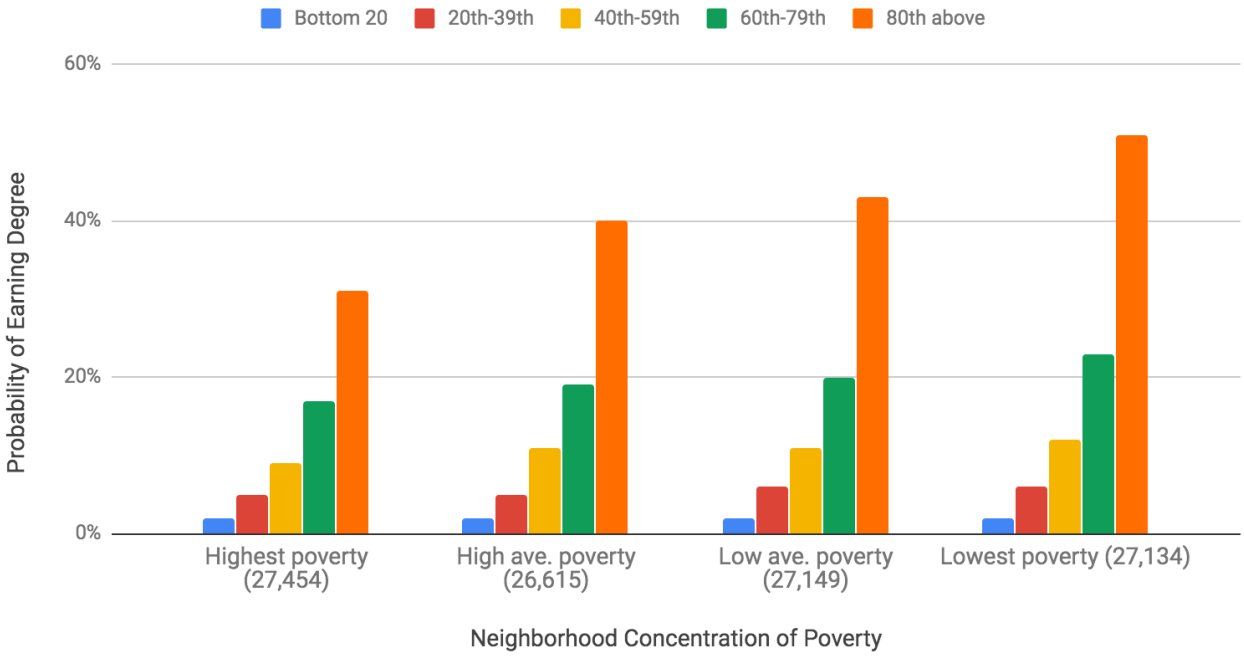
Note: Four-year college completion refers to earning a four-year college degree within six years of graduating high school, per data obtained through National Student Clearinghouse. Students who did not graduate from high school or enroll in a four-year college are counted as not earning a four-year degree.

Figure II.10. 4yr College Completion Rate of 8th Graders by Subgroup and Test Score Percentile (not conditional on high school graduation or college enrollment) (2004-2008)



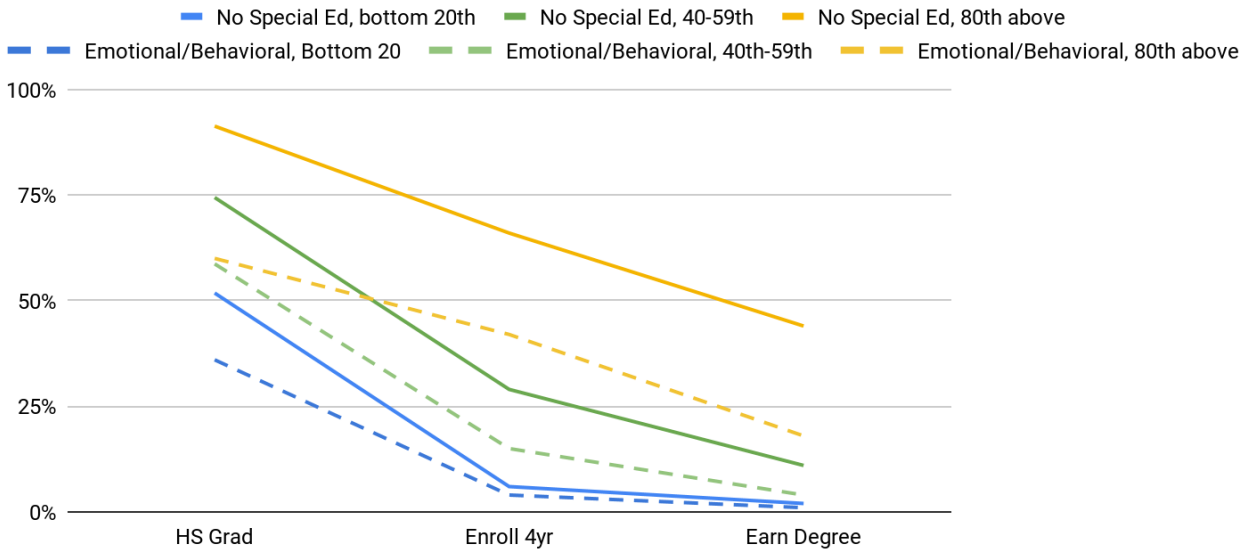
Note: Four-year college completion refers to earning a four-year college degree within six years of graduating high school, per data obtained through National Student Clearinghouse. Students who did not graduate from high school or enroll in a four-year college are counted as not earning a four-year degree.

Figure II.11. Four-year College Completion by Test Score and Neighborhood Poverty for 8th Graders (not conditional on high school graduation or college enrollment) (2004-2008)



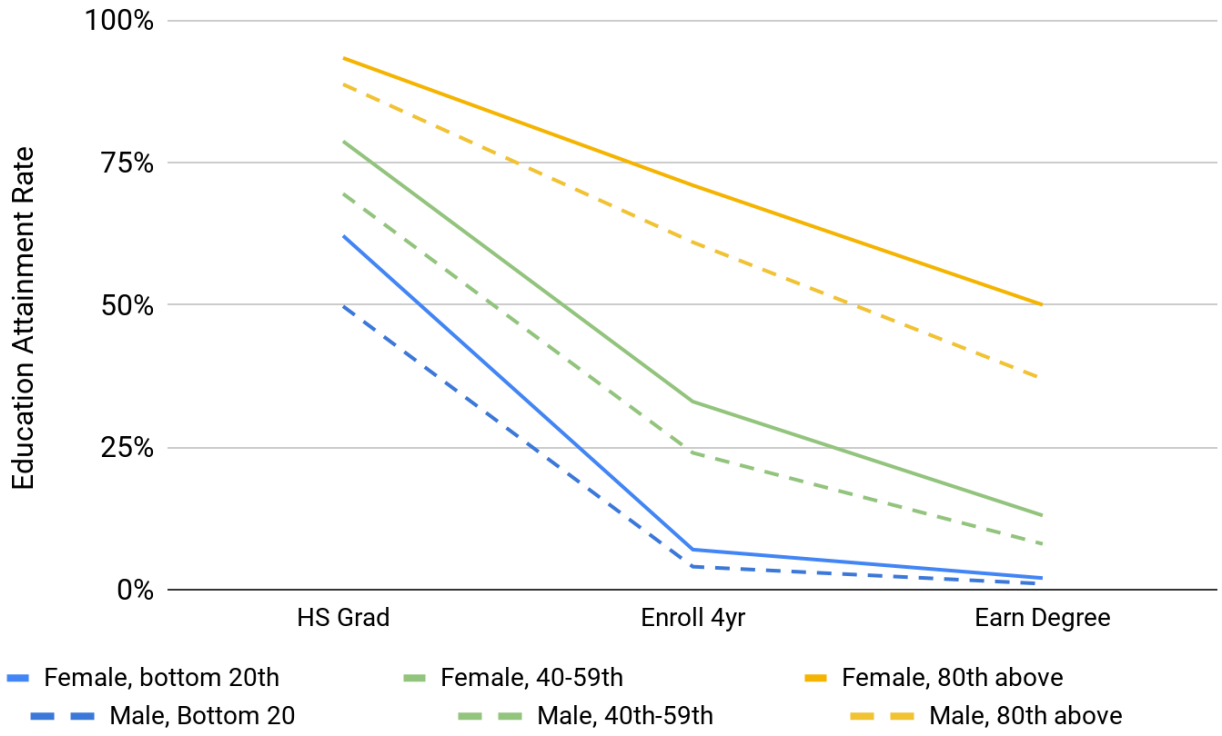
Note: N=108,252. Four-year college completion refers to earning a four-year college degree within six years of graduating high school, per data obtained through National Student Clearinghouse. Students who did not graduate from high school or enroll in a four-year college are counted as not earning a four-year degree.

Figure II.12. Education Attainment Benchmark by Disability Subtype and Test Score Percentile



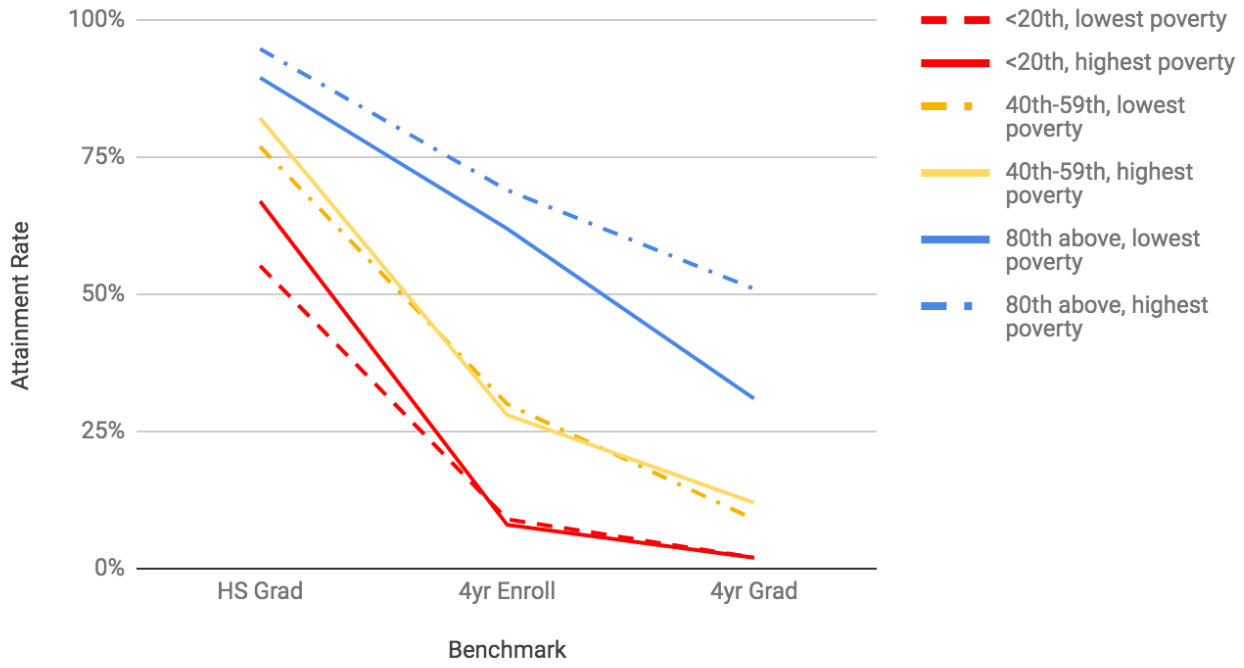
Note: College completion rates are based on cohorts 2004-2008 to allow for enough time for six-year college completion rates. High school graduation and college enrollment rates are based on cohorts 2004-2010.

Figure II.13. Education Attainment Benchmarks by Gender and Test Score Percentile



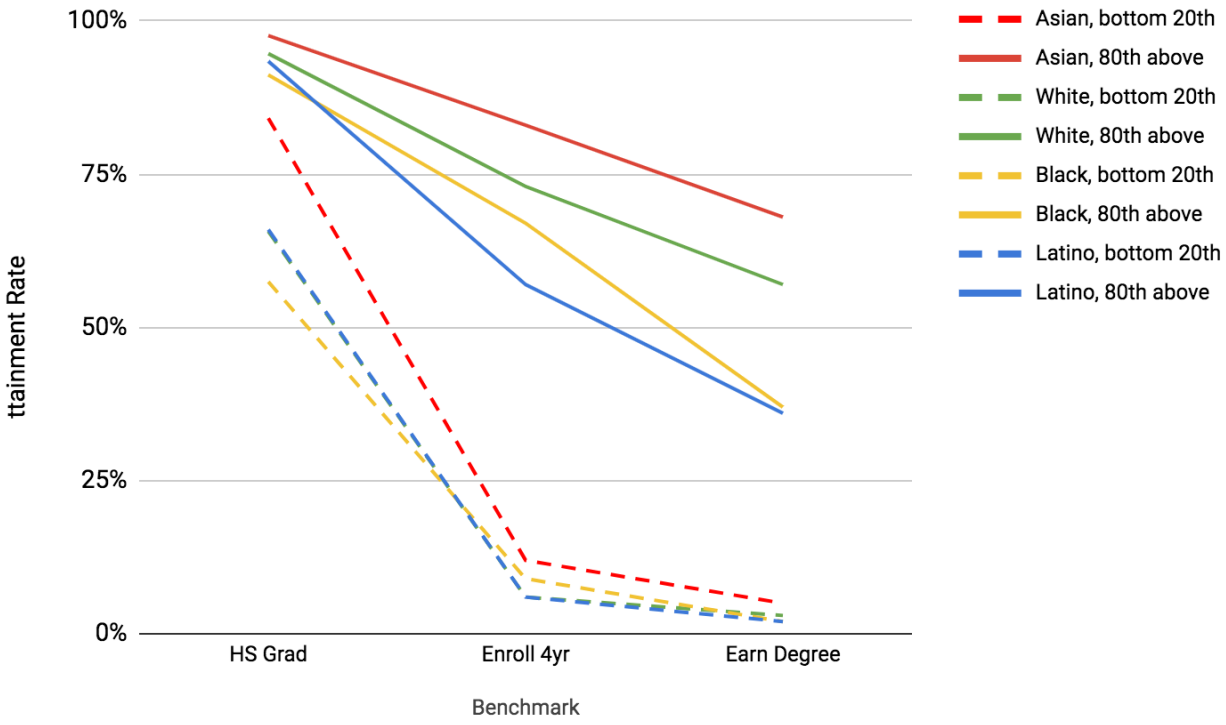
Note: College completion rates are based on cohorts 2004-2008 to allow for enough time for six-year college completion rates. High school graduation and college enrollment rates are based on cohorts 2004-2010.

Figure II.14. Education Attainment Benchmarks by Poverty and Test Score Percentile (2004-2005)



Note: College completion rates are based on cohorts 2004-2008 to allow for enough time for six-year college completion rates. High school graduation and college enrollment rates are based on cohorts 2004-2010.

Figure II.15. Education Attainment Benchmarks by Race/Ethnicity and Test Score Percentile



Note: College completion rates are based on cohorts 2004-2008 to allow for enough time for six-year college completion rates. High school graduation and college enrollment rates are based on cohorts 2004-2010.

APPENDIX II.B: CHAPTER II DATA APPENDIX

APPENDIX II.B1

Latent Ability Test Score Model: UChicago Consortium on School Research

Level 1: Measurement model

$$y^*_{ti} = \gamma_{ti}\, a^*_{ti} + u_{ti}$$

u_{ti} is student *i*'s true score at time *t*

y^*_{ti} is the rash score (y_{ti}) divided by the standard error of measurement (s_{ti}) $y^*_{ti} = y_{ti} / s_{ti}$

a^*_{ti} is one over the standard error of measurement ($1 / s_{ti}$)

Level 2: Students over time

$$\gamma_{ti} = \pi_{0i} + \pi_{1i}\,GRADE_{ti} + \pi_{2i}\,GRADESQ_{ti} + \pi_{3i}\,CUMRETAIN_{ti} + \pi_{4i}\,CUMSKIP_{ti} + e_{ti}$$

π_{0i} is the average test score for student *i*

$GRADE_{ti}$ is the grade of student *i* at time *t* centered around 6th grade

$GRADESQ_{ti}$ is the grade of student *i* at time *t* centered around 6th grade squared

$CUMRETAIN_{ti}$ is defined as the number of times student *i* has been retained at time *t*.

$CUMSKIP_{ti}$ is defined as the number of times student *i* has skipped a grade at time *t*.

Level 3: Student model

$$\pi_{0i} = \beta_{00} + r_{0i}$$
$$\pi_{1i} = \beta_{10} + r_{1i}$$
$$\pi_{2i} = \beta_{20} + r_{2i}$$
$$\pi_{3i} = \beta_{30} + r_{3i}$$
$$\pi_{4i} = \beta_{40,}$$

where $u_{ti} \sim N(0,1)$, $e_{ti} \sim N(0,\sigma^2)$ and the normal assumptions applied for the error terms in the third level[1].

APPENDIX II.B2

Comparing Estimates using 8th Grade ISAT Score to Latent Test Score as Predictors of High School Graduation, Controlling for Demographics (Cohorts 2004 and 2005)

Cohorts 2004-2005							
		ISAT			Latent		
		B		OR	B		OR
Intercept		1.69	***	5.43	1.67	***	5.29
ISAT docile (vs below 40th-59th percentile)	<20th	0.04		1.04	0.00		1.01
	20th-39th	-0.03		0.97	-0_03		0.97
	60th-79th	-0.01		1.0	-0.0		1.0
	80th=<	-0.04		0.97	-0.07		0.94
ISAT average		0.78	***	2.18	0.89	***	2.40
Neighborhood concentration of poverty (vs lowest poverty)	High ave	-0.14	**	0.87	-0.10	•	0.91
	Highest	-0.32	***	0.73	-0.22	***	0.80
	Low ave	-0.14	***	0.87	-0_12	**	0.89
ISAT * Neighborhood poverty	High ave	0.00		1.00	0.02		1.02
	Highest	-0.10	*	0.90	-0.07		0.93
	Low ave	-0.11	*	0.90	-0.10	•	0.91
8th grade cohort (vs 2004)	2005	0.16	***	1.17	0.17	***	1.18
ISAT* 8th grade cohort	2005	0.05		1.05	0.03		1.03
Race/Ethnicity (vs Latino)	White	-0.20	*	0.82	-0.22	*	0.80
	Black	-0.01		0.99	-0.04		0.96
	Nat Am	0.46		1.58	0.75		2.13
	Asian	0.71	***	2.04	0.69	**	1.99
ISAT * Race/Eth.	White	0.015		1.02	-0.03		0.97
	Black	0.08	*	1.08	0.03		1.03
	Nat. Am	0.86		2.37	1.12		3.06
	Asian	0.02		1.02	-0.04		0.96
Male (vs Female)		-0.56	***	0.57	-0.54	***	0.58
ISAT_ave* gender		-0.04		0.96	-0.03		0.97

APPENDIX II.B2

Comparing Estimates using 8th Grade ISAT Score to Latent Test Score as Predictors of High School Graduation, Controlling for Demographics (Cohorts 2004 and 2005)

Cohorts 2004-2005							
		ISAT			Latent		
		B		OR	B		OR
Gender*Race	White	0.23	*	1.25	0.22	*	1.25
	Black	-0.04		0.96	-0.05		0.95
	Nat Am	-1.42		0.24	-2.04		0.13
	Asian	-0.06		0.94	-0.09		0.92
Student's disability subtype	504 Plan	0.23		1.26	0.19		1.21
	Cognitive	0.36		1.44	0.36		1.43
	Emot/Beh	-0.91	***	0.40	-0.91	***	0.40
	Language	0.22		1.24	0_17		1.19
	Learning	0.24	**	1.27	0.22	**	1.25
	Physical I	0.35		1.43	0.28		1.33
1SAT " disability Subtype	504_plan	-0.11		0.89	-0.13		0.88
	Cognitive	-0.37	*	0.69	-0.34	*	0.71
	Emot/Beh	-0.48	***	0.62	-0.42	***	0.66
	Language	-0.39		0.674	-0.35		0.71
	Learning	-0.28	***	0.758	-0.26	***	0.77
	Physical	-0.67	***	0_51	-0.63	***	0.53

APPENDIX II.B3

Comparing Estimates using 8th Grade ISAT Score to Latent Test Score as Predictors of Four-year College Enrollment, Controlling for Demographics (Cohorts 2004 and 2005)

Cohorts 2004-2005							
		ISAT			Latent		
		B		OR	B		OR
Intercept		-1.04	***	0.35	-1.04	***	0.36
ISAT docile (vs below 40th-59th percentile)	<20th	-0.35	***	0.70	-0.41	***	0.66
	20th-39th 60th-79th	-0.21	***	0.81	-0.23	***	0.80
	80th=<	0.04		1.04	0.06		1.06
ISAT average		0.02		1.02	0.04		1.04
Neighborhood concentration of poverty (vs lowest poverty)	High ave Highest	1.30	***	3.68	1.01	*** *	2.75
	Low ave	-0.15	***	0.87	-0.09		0.91
ISAT * neighborhood poverty	High ave	-0.30	***	0.74	-0.16		0.85
	Highest	-0.07		0.94	-0.04		0.96
	Low ave	-0.08		0.92	-0.09		0.92
8th grade cohort (vs 2004)	2005	-0.08		0.93	-0.09		0.92
		-0.09	*	0.91	-0.09	*	0.91
ISAT* 8th grade Cohort	2005	0.08	**	1.09	0.09	***	1.10
Race/Ethnicity (vs Latino)	white	-0.08	•	0.93	-0.08	*	0.93
	Black	0.03		1.03	-0.02		0.98
		0.73	***	2.08	0.64	***	1.91
	Nat Am	0.82	*	2.27	0.76		2.13
	Asian	1.00	***	2.72	0.82	***	2.28
ISAT * Race/Eth.	White	0.10		1.11	0.05		1.05
	Black	0.05		1.05	-0.02		0.98
	Nat. Am	-0.05		0.95	-0.04		0.97
	Asian	-0.02		0.98	-0.06		0.94
Male (vs Female)		-0.46	***	0.63	-0.44	***	0.64
I SAT_ave* gender		-0.03		0.97	-0.03		0.97

APPENDIX II.B3

Comparing Estimates using 8th Grade ISAT Score to Latent Test Score as Predictors of Four-year College Enrollment, Controlling for Demographics (Cohorts 2004 and 2005)

Cohorts 2004-2005							
		ISAT			Latent		
		B		OR	B		OR
Gender* Race	White	0.23	*	1.26	0.22	*	1.25
	Black	-0.14	*	0.87	-0.14	*	0.87
		-2.96	*	0.05	-3.21	**	0.04
	Nat Am	0.17		1.18	0.15		1.16
	Asian	-0.02		0.98	-0.11		0.90
Student's disability subtype	504 Plan	0.25		1.28	0.24		1.27
	Cognitive	-0.65	**	0.52	-0.73	*** *	0.48
	Emot/Beh	0.37	*	1.44	0.34		1.41
	Language						
	Learning	0.04		1.04	0.01		1.01
	Physical I	0.32		1.38	0.28		1.33
1SAT " disability subtype	504_plan	-0.01		0.99	0.02		1.02
	Cognitive	0.20		1.22	0.22		1.24
	Language	-0.13		0.87	-0.10		0.91
	Learning	-0.18		0.84	-0.21		0.81
	Emot/Beh	0.06		1.06	0.07		1.08
	Physical	-0.26		0.77	-0.15		0.86

APPENDIX II.B4

Comparing Estimates using 8th Grade ISAT Score to Latent Test Score as Predictors of Four-year College Completion, Controlling for Demographics (Cohorts 2004 and 2005)

Cohorts 2004-2005							
		ISAT			Latent		
		B		OR	B		OR
Intercept		-1.79	***	0.17	-1.81	***	0.16
ISAT docile (vs below 40th-59th percentile)	<20th	-0.41	***	0.67	-0.44	***	0.65
	20th-39th						
	60th-79th	-0.17	*	0.85	-0.19	**	0.83
	80th=<	0.08		1.09	0.11		1.11
ISAT average	0.07		1.07	0.11		1.11	
Neighborhood concentration of poverty (vs lowest poverty)	High ave		***	3.18		***	3.13
	Highest	1.16			1.14		
	Low ave	-0.14	**	0.87	-0.08		0.93
ISAT * neighborhood poverty	High ave	-0.37	***	0.69	-0.23	***	0.79
	Highest	-0.04		0.96	-0.01		0.99
	Low ave	-0.10		0.90	-0.13	*	0.88
8th grade cohort (vs 2004)	2005	-0.14	*	0.87	-0.18	*	0.84
		-0.15	**	0.86	-0.16	**	0.86
ISAT* 8th grade cohort	2005	-0.05		0.95	-0.04		0.96
Race/Ethnicity (vs Latino)	White	0.01		1.01	0.02		1.02
	Black	0.48	***	1.61	0.43	***	1.54
	Nat Am	0.36	***	1.43	0.29	***	1.33
	Asian	0.46		1.59	0.49		1.64
		1.30	***	3.67	1.17	***	3.21
ISAT * Race/Eth.	White	0.01		1.01	-0.03		0.98
	Black	0.07		1.08	0.03		1.03
	Nat. Am	-0.13		0.88	-0.17		0.85
	Asian	-0.13		0.88	-0.15		0.86
Male (vs Female)		-0.44	***	0.65	-0.43	***	0.65
I SAT_ave* gender		-0.07		0.93	-0.07		0.93

APPENDIX II.B4

Comparing Estimates using 8th Grade ISAT Score to Latent Test Score as Predictors of Four-year College Completion, Controlling for Demographics (Cohorts 2004 and 2005)

Cohorts 2004-2005							
		ISAT			Latent		
		B		OR	B		OR
Gender*Race	White	-0.04		0.96	-0.05		0.95
	Black	-0.20	**	0.82	-0.20	**	0.82
		-1.87		0.15	-2.08		0.12
	Nat Am	0.08		1.08	0.06		1.06
	Asian	0.28		1.32	0.23		1.26
Student's disability subtype	504 Plan	-0.09		0.92	0.00		1.00
	Cognitive	-0.71	*	0.49	-0.68	*	0.51
	Emot/Beh		*	1.56		*	1.54
	Language	0.44			0.43		
	Learning	-0.08		0.93	-0.09		0.91
	Physical I	0.08		1.09	0.01		1.01
1SAT " disability subtype	504_plan	-0.21		0.81	-0.21		0.81
	Cognitive	-0.25		0.78	-0.20		0.82
	Emot/Beh						
	Language	0.07		1.07	0.09		1.09
	Learning	-0.24		0.78	-0.27		0.76
		-0.09		0.91	-0.07		0.93
	Physical	-0.15		0.86	-0.03		0.97

APPENDIX II.B5

Percentage Point Difference in Estimates using 8th Grade ISAT Score to Latent Test Score for Education Benchmarks , Controlling for Demographics (Cohorts 2004 and 2005).

		HS Grad	4yr Enroll	4yr Degree
Intercept		0.003	-0.001	0.002
ISAT decile (vs below 40th-59th percentile)	<20th	__	0.001	0.006
	20th-39th	__	0.001	0.003
	60th-79th	__	__	__
	80th=<	__	__	__
ISAT average		-0.005	-0.004	0001
poverty (vs lowest poverty)	High ave	-0.001	__	__
	Highest	-0.002	-0.001	-0.036
	Law ave	-0.001	__	__
ISAT * neighborhood poverty	High ave	__	__	0.006
	Highest	__	__	0.007
	Low ave	-0.001	0.000	0.000
8th grade cohort (vs 2004)	2005	-0.001	0.000	__
ISAT * 8th grade cohort	2005	__	0.015	__
Race/Ethnicity (vs Latino)	White	0.000	__	0.008
	Black	__	0.001	0.015
		__	__	__
	Nat. Am	__	__	__
	Asian	-0.001	0.000	0.006
ISAT* Race/Ethnicity (vs Latino)	White	__	__	__
	Black	__	__	__
	Nat. Am	__	__	__
	Asian	__	__	__
Male (vs Female)		-0.001	0.000	-0.004
ISAT_ave* gender		__	__	__
Gender*RaceiEthnicity (vs Latino fern	White	-0.001	0.000	__
	Black	__	0.001	-0.002
	Nat. Am	__	0.001	__
	Asian	__	__	__

APPENDIX II.B5

Percentage Point Difference in Estimates using 8th Grade ISAT Score to Latent Test Score for Education Benchmarks , Controlling for Demographics (Cohorts 2004 and 2005).

		HS Grad	4yr Enroll	4yr Degree
Special Education Status	504 Plan	__	__	__
	Cognitive	__	__	__
	Emot/Beh	0.000	0.001	-0.009
	Language	__	0.001	0.001
	Learning	-0.001	__	__
	Physical	__	__	__
ISAT* Special Education Status	504_plan	__	__	__
	Cognitive	-0.001	__	__
	Emot/Beh	-0.001	__	__
	Language	__	__	__
	Learning	-0.001	__	__
	Physical	-0.001	__	__

APPENDIX II.B6

Comparing Mean Four Year College Enrollment Rate by 8th Grade ISAT Score and Latent Test Score (Cohorts 2004 and 2005)

Percent of CPS 8th Graders Completing High School in 6 years (2004-2005)												
	ISAT Decile											
	Overall		< 20th		20th-39th		40th-59th		60th-79th		80th above	
	ISAT	Latent	ISAT	Latent	ISAT	Latent	ISAT	Latent	ISAT	Latent	ISAT	Latent
Female	29	30	10	7	20	15	33	24	45	39	65	63
Male	20	21	6	4	13	9	22	16	32	27	55	51
White	38	40	5	5	14	10	18	16	39	28	66	62
Black	24	25	9	6	20	15	33	24	45	39	62	60
Native Am.	28	30	-	-	-	-	-	-	-	-	-	-
Asian	58	60	13	10	34	19	44	36	54	50	78	76
Latino	19	20	6	4	13	8	22	16	30	26	49	47
Spec Ed. No	28	29	10	7	17	12	28	21	39	34	61	58
504 Plan	32	32	7	8	14	8	30	21	42	36	61	57
Emot/Beh. Dis.	5	6	4	4	8	5	14	15	20	10	44	27
Cog. Dis.	3	5	4	3	-	-	-	-	-	-	-	-
Learn Dis.	8	9	6	5	18	13	24	22	38	31	46	52
Phys. Dis.	17	17	12	5	14	9	-	-	-	-	-	-
Lang. Dis.	31	31	17	8	20	21	33	29	48	41	59	56
Highest pov.	20	21	8	5	18	13	30	22	40	36	57	54
High ave. pov.	23	24	8	6	18	13	28	20	40	35	57	55
Low ave. pov.	26	27	8	6	17	13	28	20	38	32	59	57
Lowest pov.	31	32	7	6	15	10	26	20	39	32	64	60

Only cells with a minimum of 20 students are reported

APPENDIX II.B7

Comparing Mean Four-Year College Completion Rate by 8th Grade ISAT Score and Latent Test Score (Cohorts 2004 and 2005)

Percent of CPS 8th Graders Completing High School in 6 years (2004-2005)												
	ISAT Decile											
	Overall		< 20th		20th-39th		40th-59th		60th-79th		80th above	
	ISAT	Latent	ISAT	Latent	ISAT	Latent	ISAT	Latent	ISAT	Latent	ISAT	Latent
Female	17	18	3	2	8	5	15	10	26	20	52	48
Male	11	11	2	1	5	3	9	6	17	14	38	35
White	32	33	3	2	10	6	13	11	29	22	57	53
Black	11	11	2	2	7	4	13	9	22	18	39	36
Native Am.	17	18	-	-	-	-	-	-	-	-	-	-
Asian	48	50	6	3	24	13	31	25	42	35	69	67
Latino	11	12	3	2	6	4	11	7	18	14	36	34
Spec Ed. No	16	17	3	2	7	4	13	8	22	17	46	42
504 Plan	22	23	2	3	9	3	21	10	27	32	48	41
Emot/Beh. Dis.	2	2	1	1	2	0	7	11	13	3	22	20
Cog. Dis.	1	2	1	2	-	-	-	-	-	-	-	-
Learn Dis.	3	4	2	2	8	5	10	12	20	15	31	43
Phys. Dis.	3	9	4	3	3	6	-	-	-	-	-	-
Lang. Dis.	17	18	5	5	10	4	11	13	36	22	41	42
Highest pov.	8	8	3	1	7	4	13	6	20	16	41	29
High ave. pov.	12	12	2	2	6	4	11	8	19	17	34	38
Low ave. pov.	15	16	3	2	8	5	14	10	22	17	44	42
Lowest pov.	21	22	3	2	7	4	13	10	25	19	52	48

Only cells with a minimum of 20 students are reported

APPENDIX II.B8

Comparing Mean High School Graduation Rate by 8th Grade ISAT Score and Latent Test Score (Cohorts 2004 and 2005)

Percent of CPS 8th Graders Completing High School in 6 years (2004-2005)												
	ISAT Decile											
	Overall		< 20th		20th-39th		40th-59th		60th-79th		80th above	
	ISAT	Latent	ISAT	Latent	ISAT	Latent	ISAT	Latent	ISAT	Latent	ISAT	Latent
Female	78	79	65	62	75	70	83	79	88	86	95	93
Male	66	68	52	50	65	58	73	70	81	78	90	89
White	82	83	65	66	70	68	75	73	85	82	94	92
Black	68	69	57	52	68	63	78	73	84	81	91	90
Native Am.	77	77	-	-	-	-	-	-	-	-	-	-
Asian	91	92	82	78	81	74	89	88	90	92	97	96
Latino	75	76	62	60	74	67	79	76	86	83	91	91
Spec Ed. No	75	75	58	52	70	64	79	74	85	82	93	91
504 Plan	80	82	63	67	78	64	86	82	88	90	92	92
Emot/Beh. Dis.	38	40	38	35	48	45	60	59	60	57	67	60
Cog. Dis.	60	62	61	60	-	-	-	-	-	-	-	-
Learn Dis.	64	65	62	61	73	74	82	81	90	90	87	93
Phys. Dis.	75	76	78	71	76	66	-	-	-	-	-	-
Lang. Dis.	76	76	71	67	73	68	85	73	76	84	91	90
Highest pov.	65	66	56	51	66	63	77	71	81	79	89	87
High ave. pov.	71	72	58	54	70	66	78	74	86	83	93	91
Low ave. pov.	75	76	62	60	74	66	78	76	85	82	92	91
Lowest pov.	79	80	63	61	74	66	80	79	88	85	94	93

Only cells with a minimum of 20 students are reported

CHAPTER III. POSTSECONDARY PATHWAYS IN CHICAGO PUBLIC SCHOOLS: BETWEEN ELEMENTARY SCHOOL DIFFERENCES IN COLLEGE COMPLETION FOR STUDENTS WITH SIMILAR 8TH GRADE TEST SCORES.

Abstract

The previous chapter established that students with emotional and behavioral disabilities, male students and students of color experience substantially reduced attainment in four-year college completion. This chapter examines the extent to which college completion prospects differ by elementary school of attendance for students with similar academic qualifications, and how much of that between school difference can be accounted for by the high schools and colleges students attend. At the root of this question is an investigation of how much of the disparity in four-year college completion for marginalized students and male students can be accounted for by their elementary school, high school and college enrollment patters. To do so, this chapter utilizes cross-nested hierarchical linear models to estimate the between elementary school variance in college completion for students by race and ethnicity, gender, disability status and neighborhood concentration of poverty. A series of models are then employed to determine how much of this between elementary school variance can be attributed to the high schools and colleges students at a given elementary school ultimately attend. The sample for this study are Chicago Public School 8^{th} graders, who remain enrolled in the district in the 9^{th} grade (N= 156,292). To overcome a number of methodological challenges, a unique construct is introduced in this chapter: High School College Connection Index or HS CCI. Results indicate substantial racial and ethnic differences in the four-year college completion prospects across elementary schools. The most dramatic of these differences are found for high achieving Black and Latino students.

Background

The previous chapter established the extent of overall disparities in education attainment for CPS 8th graders between the years of 2004 and 2010. Significant differences in high school graduation, four-year college enrollment, and four-year college completion were observed for 8th grade males, and students with emotional and behavioral disabilities, even when controlling for test scores and demographics. Significant differences were also found by race and ethnicity. Asian students were far more likely than their Latino peers, currently the largest ethnic demographic group in CPS, to meet all three education benchmarks. While demographic disparities were prominent, the greatest differences in education attainment were found by student's 8th grade test scores. Students in the bottom 20th percentile of 8th grade test score graduated high school, enrolled in a four year college, and completed four-year college at rates far behind their peers in the 80th percentile, even after controlling for race, ethnicity, gender, socio-economic status, and disability status.

Some may argue that students' elementary school test scores are simply strong indicators of students' academic ability, and therefore substantial differences in academic achievement by test score are not surprising. Such a belief is reflected in the prolific use of test scores in assessing school performance, admissions to academically selective education opportunities, and admissions to college. However, new research on the predictive validity of standardized test scores challenges these assumptions (Allensworth & Clark, 2020), and a small, but growing number of colleges are no longer requiring standardized test scores for admissions. If test scores are not strong measures of college readiness, then why does there exist such clear stratification in higher education attainment by test scores? And how do we explain existing racial and ethnic achievement gaps in

both test scores and college completion? This chapter posits that school feeder patterns may be the hidden mechanism through which standardized test scores produce higher education inequities.

The Current Study.

To test this hypothesis, this chapter expands upon the analysis presented in Chapter 2 by comparing differences in the college completion prospects of academically similar 8th graders based on their elementary school of attendance. The role of high school and college attendance patterns are then examined to estimate how much of the difference in 8th graders' four-year degree prospects are associated with elementary-school specific high school and college attendance patterns. This chapter contributes substantially to the college choice and college enrollment literature by illuminating the potential role of elementary schools and high schools in shaping students' college choice and enrollment patterns. As to date, there is no literature that I am aware of that examines how elementary schools may shape students' college selection and enrollment outcomes despite conceptualization of primary school enrollment as important to education outcomes.

Literature Review

In the last decade, research on college completion has shifted focus away from student characteristics and onto the characteristics of colleges, specifically how college quality and college characteristics impact students' likelihood of earning a college degree. Using regression discontinuity, Hoekstra's (2009) study of male students who marginally gained access to public, flagship universities showed these students to have higher likelihoods of earning a degree than their peers who marginally did not gain access. Access to institutions of higher selectivity is a theme that has been continuously supported in the higher education literature over the past decade.

In *Crossing The Finish Line*, Bowen, Chingos and McPherson (2009) detail the longitudinal college outcomes of a cohort of students who entered numerous public universities in 1999. The results illuminate the importance of institutional selectivity on students' likelihood of completing college, and highlight the disproportionate likelihood of students of color, and students from lower income families to attend colleges below their academic qualifications. Smith et al. (2013) expand these findings with a nationally representative sample, and found that 41 % of four-year college students attend a college below their qualifications.

While socio-economic and racial disparities in college selection and enrollment are well documented (Fletcher & Tienda, 2010; Bailey & Dynarski, 2011; Haley, Nagaoka, and Michelman, 2015), the mechanisms that drive students to select certain colleges remain less clear. Research indicates that the tendency for students from lower-income families to select colleges below their academic qualifications is partially driven by a disconnect in knowledge about the college application, selection, and enrollment process (Hoxby & Avery, 2015, Hoxby & Avery, 2012, Roderick et al., 2011), and that guidance in helping students transition to college may be especially beneficial for students of color and students from low-income families (Carrell & Sacerdote, 2017; Stephen & Rosenbaum, 2013). Robert Putnam (2016) documents this divide in access to college support in *Our Kids: The American Dream in Crisis.* Through the use of case studies, Putnam illustrates the clear gap in access to higher education knowledge and resources in high school, and how those gaps translate to inequalities in higher education attainment.

One such way high schools can impact the college outcomes of their students is by influencing students' decision-making processes around where to attend college (Roderick, Holsapple & Clark, 2018, Bryan et al., 2017; Hoxby & Turner, 2015; Stephen, & Rosenbaum,

2013; Hoxby & Avery, 2012, Roderick et al., 2008, Perna, 2006). Stephan and Rosenbaum's (2013) analysis of the College Coaching program in Chicago Public Schools provides causal support for the role of high schools in shaping students' college of attendance. Stephan and Rosenbaum examined the college outcomes of approximately 44,000 CPS graduates from 58 different schools, some of which employed college coaches to provide students with support through the college application and enrollment process. Using a difference in difference analysis while controlling for changes in student population, and previous college-enrollment behaviors, Stephan and Rosenbaum (2013) found that college coaches significantly impacted the college matriculation patterns of students often underserved by school counselors.

Research clearly indicates that high schools can have significant impacts on students' college completion prospects. This paper builds upon these previous findings and posits that elementary schools can have a similar impact on students' education trajectories, and new research suggests as much. Hassrick, Raudenbush and Rosen's (2017) use of lottery admissions to The University of Chicago Charter School (UCCS) finds a widening achievement gap between students offered admissions to UCCS and students who were not offered admissions. UCCS students not only fared better academically in elementary school relative to their peers who did not win lottery admissions, these gaps grew as students entered middle school. The authors suggest at least part of the middle-school gains elementary school lottery winners experienced was due to guidance counseling UCCS students received to aid them in connecting to higher performing middle schools relative to their counterparts who did not win lottery admissions to UCCS.

This dissertation focuses on the potential ways elementary schools may impact students' college completion prospects indirectly, through the high school and colleges to which elementary

schools send their students. This dissertation posits that – given elementary to high school to college enrollment patterns— differences in postsecondary opportunities for some students are detectable as early as 8th grade. If such discrepancies exist at such an early point in students' academic careers, there might also exist a potentially valuable point of intervention to improve the college completion prospects of students before they ever step foot on a high school or college campus.

A theoretical foundation of this dissertation posits that at least some of the difference in postsecondary completion for certain groups of students is a function of a systems-level gap in opportunity for postsecondary completion. According to opportunity gap theory (Flores, 2007), in order for a phenomenon to constitute a gap in opportunity, the outcomes in question (in this case college completion) must differ systematically by subgroup (as established in Study 1), *and* inequities in outcomes must be at least partially explained by differences in access to resources.

For the current study, the resource in question is Postsecondary Pathway, measured as the relationship between school feeder patterns and students' likelihood of college completion. Analysis in this chapter examines whether discrete pathways of postsecondary opportunity exist, and whether students from certain racial, ethnic, gender, special education status, and socio-economic status have significantly different opportunities for Postsecondary Pathways.

Research Questions

2A: To what extent do college completion prospects differ by elementary school of attendance for students with similar academic qualifications?

2B: How much of the between elementary school difference can be attributed to the high schools and colleges students ultimately attend?

2C: Do between school differences constitute a gap in postsecondary opportunity for students of certain race, ethnicity, gender, special education status?

Sample

This study uses a six year measure of college completion, which is standard in most higher education research, and thus each 8th grade cohort requires a decade to elapse in order to accurately measure college completion. As such, the sample for Chapter III is a subsample of the overall sample used for analysis in Chapter 2, and is restricted to students in cohorts 2004 through 2008 (n= 108,252) (see Table III.1). Given the sample for the analysis in this chapter is largely overlapping with the sample used in Chapters 2 and 3, demographic composition is very similar to the analytic sample as previously reported. Gender breakdown is 52.55% female (n=56,887) and 47.45% male (n=51,365). The sample is 51.19% Black (n=55,418), 37.18% Latino (40,253), 7.90% White (8,554), 3.57% Asian (3,867), and less than one percent Native American or Pacific Islander. 16.79% of students in the sample have a diagnosed disability. As illustrated in Chapter 2, the largest subgroup of students with disabilities are students with learning disabilities. Chapter 2 established that students with learning disabilities did not experience reduced education outcomes compared to their peers once demographics and test scores were controlled for. Unfortunately, the ability to examine outcomes for students with emotional and behavioral disabilities is not possible in this chapter, due to reduced sample size and the low rate of college enrollment for these students. Instead, overall differences for students with disabilities are examined in this chapter. Neighborhood concentration of poverty is evenly distributed across the

sample, with 27,454 students living in neighborhoods with the highest poverty, 26,615 living in neighborhoods with moderately high poverty rates, 27149 students living in neighborhoods with moderately low poverty levels, and 27,134 students living in neighborhoods with low relatively poverty levels.

Variables

This chapter examines a single dependent variable, four-year college completion using a 6-year timeframe. Data include students administrative files from Chicago Public Schools and college enrollment and completion data obtained through National Students Clearinghouse. Four-year college completion is defined as earning a four-year college degree within six-years of starting at a four-year college or university, regardless of what four-year institution from which the student earns their degree. Four-year college completion is not conditional on high school graduation or four-year college enrollment, thus allowing the full extent of education disparities for 8th graders by test score and demographic categories to be observed.

Student-level variables include race or ethnicity, gender, special education status, bilingual education services, neighborhood concentration of poverty level, and 8th grade composite test score. During the years of this study, Chicago Public Schools administered the Illinois Standards Achievement Test (ISAT) math and reading subsections to all third through eighth grade students in the district. Each student's standardized math and reading scores were then averaged to create a composite, standardized test score for each student. Scores were then assigned a percentile rank category as follows: below 20th percentile, 20th-39th percentile, 40th-59th percentile, 60th-79th percentile, and 80th percentile and above (see Table II.4).

During the years of this study, Chicago Public Schools recorded students' race and ethnicity under six categories (Black, Latino, White, Asian, Native American, and Multiracial) and gender as binary (male/female). Less than one-quarter of one percent of students were reported as Native American. Only one student is identified as multiracial. As a result, the multi-racial category was dropped from the analysis.

As previously discusses in Chapter 2, this dissertation uses neighborhood concentration of poverty as a proxy for students' access to economic and social resources. Neighborhood concentration of poverty is based on census data, and captures the percent of adult males employed and the percent of families with incomes above the poverty line within the census block the student resides (see Table II.5).

High School College Connection Index.

Given the research questions for Chapter 3, ideally, the analysis in this chapter would employ a cross-nested model where 8th graders were cross-nested in elementary schools, high schools, and colleges, requiring a four-level cross-nested model to partition the variance across elementary schools, high schools and colleges. However, at the time of this dissertation, a four-level cross nested model is not possible. Neither is the use of college-level fixed effects, as students in this sample attended hundreds of colleges across the United States, and not all students attend college. Instead this paper presents an original concept, High School College Connection Index, to capture the high school to college transition, and therefore isolate how much of the between elementary school variance in four-year college completion can be accounted for by the proportion of students connected to four-year colleges, and the race and ethnicity specific college completion rates of the colleges students are connected to.

High School College Connection Index (HS CCI) is similar to an existing index used by the UChicago Consortium To and Through Project, called Bachelor Degree Attainment Index. The Bachelor Degree Attainment Index represents the proportion of students at a given high school who earned a bachelor's degree within six-years of graduation based on historical data for students at that given school. The Bachelor Degree Attainment Index is a highly useful tool to compare differences in college completion across high schools. However, Bachelor Degree Attainment Index does not take into account the specific enrollment patterns of students at a given point in time, or potential changes in college enrollment patterns over time. As this chapter seeks to estimate the potential impact of the actual colleges students attend, use of the Bachelor Degree Attainment Index is not appropriate.

A potential alternative to using college fixed effects would be to control for the institutional graduation rates of the colleges students actually attend. However, this method also poses a number of problems. First, while most students do, not all students graduate from high school. In the sample, 76 % of 8th graders in the analytic sample graduated from high school. Furthermore, only about 31 % of 8th graders in the analytic sample enrolled in a four-year college in the fall after high school graduation. This presents some methodological and theoretical issues with estimating how much of the between elementary school variance can be attributed at the high school and college level, as not all students graduated high school or attended a four-year college. For students who drop-out of high school, it can safely be argued that their lack of a four-year degree should not be considered an effect of colleges, as they most likely never applied to college. For these students it makes sense that variation in college completion prospects should be assigned to the elementary and high school level, but not the college level.

For students who do graduate from high school, but do not enroll in college, the story is more complicated. It is possible that a student may accept an offer of admissions to a four-year college, but not show up to campus in the fall, a concept referred to as "summer melt" (Arnold et al., 2009). There is no clear place to assign responsibility for summer melt. One can argue that summer melt is a function of high schools not providing the appropriate support to seniors to ensure they fully matriculate to college. One can also argue that if a college admits a student and accepts their enrollment deposit as an intent to attend, the responsibility falls on the college to ensure students are aware of the necessary steps and resources to get from "intends to attend" to "attends in the fall". Whatever one's perspective, national data sets, such as National Student Clearinghouse data used in this analysis, do not track intentions to enroll, but rather actual enrollment. Therefore, it is impossible to assign specific institutional graduation rates to students who do not actually show up on campus in the fall, regardless of intentions to attend.

A solution to this problem is simply to remove any students from the sample who did not graduate from high school or enroll in a four-year college. While this approach would allow for a more accurate estimate of the portion of between elementary school variance that can be attributed to the high school and college level for students who enroll in a four-year college, these estimates would have no interpretable meaning for nearly 75,000 students in the sample who do not enroll in a four-year college.

High School College Connection Index (HS CCI) is a useful indicator, proposed in this dissertation, to capture the extent to which students in a given high school transition to colleges where they are likely to earn their degree. As HS CCI is a high-school level indicator, it captures the college connection prospects for all students in a given high school, not just those that go on

to enroll in a four-year college. In this way, all students remain in the analysis, and are assigned the specific college completion index for their high school of attendance.

To account for the fact that not all students transition to a four-year college, HS CCI is calculated in two steps. First, for each high school in the sample, the mean, race specific, institutional graduation rate is calculated for all students who enroll in a four-year college. This value is then multiplied by the high school specific, mean four-year college enrollment rate. This provides an index of the four-year college completion prospects of all students at high school X, based solely on the four-year college enrollment patterns of students in the high school.

High School College Completion Index

$$\text{HS}x \quad \text{ICGR} = \frac{\Sigma\, 1-n \ \text{(Race Specific College Grad Rate)}}{\text{N}} \times \frac{\Sigma\, 1-n \ \text{(4yr College Enrollment)}}{\text{N}}$$

*HSS CCI is only calculated for high schools with at least 20 students.

Research Question 2A: To what extent do college completion prospects differ by elementary school of attendance for students with similar academic qualifications?

Methods

To compare the difference in college prospects of similar students across elementary schools requires comparing the variance in elementary school fixed effects for the entire sample. To do so, a two level HLM model is employed, with students nested in elementary schools controlling for ISAT score, race/ethnicity, socio-economic status, gender, cohort affiliation, and special education status. The intercept for the HLM model is a Black, female student, not receiving

special education status, attending "an average" elementary school, with average ISAT scores, in the 2008 cohort. To account for potential non-linear relationship between ISAT score and college completion, a squared term for ISAT score is also included. The intercept was selected as black female students are the largest race/ethnicity by gender subgroup in the sample.

Model A: Predicting each student's likelihood of earning a four-year degree in six years given their 8th grade characteristics

$$\eta_{ij} = \gamma_{00} + \gamma_{10}*GEND_{ij} + \gamma_{20}*SCON_{ij} + \gamma_{30}*SSOC_{ij} + \gamma_{40}*COHORT04_{ij} + \gamma_{50}*COHORT05_{ij} + \gamma_{60}*COHORT06_{ij} + \gamma_{70}*COHORT07_{ij} + \gamma_{80}*SPEDD_{ij} + \gamma_{90}*DLATINO_{ij} + \gamma_{100}*DWHITE_{ij} + \gamma_{110}*DASIAN_{ij} + \gamma_{120}*DNATAM_{ij} + \gamma_{130}*ISAT\_AVE_{ij} + \gamma_{140}*ISATSQ_{ij} + u_{0j}$$

In the above model, η_{ij} is the predicted probability for each student where γ_{00} represents the mean likelihood of a Black, female student, not receiving special education status, attending "an average" elementary school, with average ISAT scores, in the 2008 cohort, of earning a four-year college degree. The beta values for γ_{10} through γ_{120} represent the variable specific deviation from the overall mean predicted probability. For instance γ_{10} represent the difference in likelihood for male versus female students to complete a four-year college degree holding all else constant. Lastly, u_{0j} represents the elementary school fixed effect, holding all else constant. Using the model above, the variance component for elementary school fixed effects can then be interpreted as the standard deviation in log-odds for earning a college degree based upon elementary school of attendance.

The above approach illuminates the differences in the college completion prospects overall for students at a given elementary school. However, it does not shed much light on whether students in different ISAT deciles experience different ranges in elementary school fixed effects. What we really want to know from Research Question 2 is given a student's ISAT decile, how

different are the college completion prospects *of their academically similar peers* across elementary schools?

To answer this question, a series of two-level HLMs are run on subgroups of students by ISAT decile category, with bins as follows: below the 20th percentile, 20th to 39th percentile, 40th to 59th percentile, 60th to 79th percentile and 80th and above percentile. The intercept represents the mean college completion rate for a Black, female student, not receiving special education status, attending "an average" elementary school in 2008, with average ISAT score. However, this time within a given ISAT bin. In this way, coefficients are allowed to differ within each ISAT bin, and the between school variance is specific to students within the given ISAT bin.

Results

Coefficients from the two-level HLM, with students nested in elementary schools, using the analytic sample are presented in Table III.2. The intercept suggests that a Black, female student, not receiving special education status, attending "an average" elementary school in 2008, with average ISAT scores attends an elementary school, where on average, 11.83 % of 8th graders are expected to go on to earn a four year college degree. A one standard deviation around the mean puts 68 % of such students in elementary schools where between 8.31 and 19.85 % of students are predicted to earn a four year degree. Figure III.1 illustrates how the between elementary school variance differs by test score bin. In the "overall" group, the orange dot corresponds to the school-level mean expected college completion rate for the peers of an average student in the sample, in this case 11.83 %. The inner blue bars represent a one standard-deviation range in between elementary-school fixed effects, and the outer blue bars represent a two standard deviation range in between elementary-school fixed effects.

For the overall sample, a two standard deviation range in elementary schools fixed effects is equivalent to 16.93 percentage points. Meaning, all else held constant, a Black, female student, not receiving special education status, attending elementary school in 2008, with average ISAT scores could be expected to attend an elementary school where her peers' college completion prospects could vary by as much as 17 percentage points. However, not all students have average ISAT scores, and the variation between schools is not equal for students at all students.

ISAT percentile groups in Figure III.1 represent the between school variance for the series of HLM models that were run on subsamples of students with different ranges of ISAT scores. Model coefficients and variance components for each of the subsamples are available in Table III.5. Figure III.1 illustrates two key findings. First, school-level mean predicted probability of earning a college degree increases as students' ISAT scores increase. The second, is that as students' ISAT scores increase so does the between elementary school variance in predicted college completion for their academically similar peers.

For instance, students with ISAT scores in the bottom 19th percentile are attending elementary schools where other students in the bottom 19th percentile have very similar college completion prospects. Given the relationship between earlier and later test scores, and the reliance of four-year college admissions on standardized test scores, this finding, while disheartening, is not altogether surprising. Alternatively, students with test scores in the 80th percentile and above are attending elementary schools where their academically similar peers have the widest range of college completion prospects. Why the variability in college completion prospects widens as student ISAT score increases is an empirical question that is explored further in the following section.

Research Question 2B: How much of the between elementary school difference can be attributed to the high schools and colleges students ultimately attend?

Methods

In order to assess how much of the variation in elementary school-level mean college completion is related to the high schools and colleges students ultimately attend, a series of hierarchical models were again employed. Ideally, as students may enroll in any number of elementary schools, high schools and colleges, a four-level cross-classified hierarchical model would be used. However, as previously discussed, there are a number of issues with such an approach. At this time a four-level cross-classified model is not possible. An alternative might be to use a standard mixed model without cross nesting students in elementary schools and high schools, but this is less than ideal as we know students from numerous elementary schools may enroll into any number of different high schools. Lastly, students in the sample attended hundreds of different colleges across the US, and it is unreasonable to use a fixed effects model for elementary, high school, and college effects. Instead, a three-level cross classified model is used to estimate the variation at the elementary school and high school level. Once the between school variance is partitioned between elementary schools and high schools, High School College Connection Index is added to the model. Changes in the school variance components can then be attributed to the inclusion of the HS CCI indicator, a proxy for the high school to college transition.

Model B: Students cross nested in elementary schools and high schools

$$\eta_{ijk} = \theta_0 + \theta_1 * GEND_{ijk} + \theta_2 * SCON_{ijk} + \theta_3 * SSOC_{ijk} + \theta_4 * SPEDD_{ijk} + \theta_5 * DLATINO_{ijk} + \theta_6 * DWHITE_{ijk} + \theta_7 * DASIAN_{ijk} + \theta_8 * DNATAM_{ijk} + \theta_9 * ISAT\_AVE_{ijk} + \theta_{10} * ISATSQ_{ijk} + b_{00j} + c_{00k}$$

Model C: Students cross nested in elementary schools and high schools controlling for HS CCI

$$\eta ijk = \theta 0 + \theta 1*GENDijk + \theta 2*SCONijk + \theta 3*SSOCijk + \theta 4*SPEDDijk + \theta 5*DLATINOijk + \theta 6*DWHITEijk + \theta 7*DASIANijk + \theta 8*ISAT\_AVEijk + \theta 9*ISATSQijk + \theta 10*HSCCIijk + b00j + c00k$$

Results

Mean HS CCI for the sample is 14.66, meaning the average student is attending a high school that is connecting graduates to college in a way where we can expect about 15 % of those students to earn a four-year degree. However, the distribution of HS CCI is positively skewed, and the majority of students are attending high schools with an HS CCI far below the mean. The median student-level HS CCI is 10.64 with an interquartile range between 6.43 and 17.65 (see Table III.6). Meaning half of all students in the sample attend high schools that are connecting students to college in a way where we would expect between 6 and 18 % of students would earn a four-year degree.

After cross-nesting students in high schools, the variation at the elementary school level drops from 16.93 percentage points to 11.50 percentage points (see Table III.3). Thus, about one-third of the overall, between elementary school differences in college completion can be associated with the high schools students ultimately attend. Including HS CCI, reduces the between elementary school variance by 58% to 7.08 percentage points (β =.0.2911). Meaning, nearly all of the difference between elementary schools, in college completion for demographically similar students with similar test scores, is associated with the high schools and colleges students attend.

Even more interestingly, nearly all of the between high school variance in college completion is related to patterns in how well high schools connect students to colleges where they

are likely to graduate, a trend consistent across ISAT subsamples (see Figure III.7). Asian students are the one subsample of students for which this trend is not reflected.

Research Question 2C: Do between school differences constitute a gap in postsecondary opportunity for students of certain race, ethnicity, gender, special education status?

Results

Figure III.1 clearly illustrates that students with similar ISAT scores attend elementary schools where their peers have vastly different college completion prospects, however these differences vary dramatically by race and ethnicity. Table III.5 summarizes the between elementary school difference in college completion for subsamples of students. For each of the demographic subsamples, the elementary school level probability of college completion is presented as the intercept probability. A two standard deviation range in probability is also presented. The model intercept for each racial and ethnic subgroup is a female student with average ISAT scores, attending an average elementary school, from a neighborhood with average levels of neighborhood poverty, in the 2008 cohort. Results for Black students reveal that an average Black, female in the 8th grade, attends an elementary school where only 8.45 % of her peers will go on to earn a four-year degree. A one standard deviation range puts 68 % of average Black, female 8th graders in elementary schools where between 3.70 and 18.16 % of their peers are expected to earn a four-year college degree. Latino students' peers have similar, although marginally higher prospects. The average Latino female student will attend an elementary school where 10.56 % of their peers will go on to earn a four-year degree, and a one standard deviation range puts an average Latino female in a school where between 5.48 % and 19.37 % of their peers will earn a four-year degree. The average White or Asian student attends an elementary school where their peers have

substantially higher mean four-year college completion prospects, 36.00 % and 55.77 % respectively. A one standard deviation range puts an average White female in a school where between 21.16 % and 54.11 % of their peers will earn a four-year degree, and a one standard deviation range puts an average Asian female in a school where between 34.87 % and 74.80 % of their peers will earn a four-year degree.

While overall differences by race and ethnicity are substantial, the racial and ethnic differences by ISAT score are even more dramatic. As shown in Figure III.6, across race and ethnicity, as ISAT percentile increases so does the overall disparity in probability that one's peers will earn a four-year degree, but differences by ISAT vary substantially by race and ethnicity. Asian students have the greatest increase in variation as ISAT score increases, suggesting that while Asian students with higher ISAT scores are much more likely than their peers from other racial and ethnic groups to attend a school where a higher percentage of their peers will earn a four-year degree, there is a great deal of variation in how much of an increase Asian students with higher ISAT scores experience relative to their peers from other racial and ethnic groups. Although, it should be noted, that even on the lower end, Asian students with ISAT scores in the 80th percentile and above are attending elementary schools where their peers have college completion prospects equal to the upper end of Black students with similar ISAT scores. This means the majority of Asian students and Black students in the 80th percentile and above are not attending elementary schools with remotely similar college completion prospects. Differences between White and Latino students in the 80th percentile and above of ISAT score, while reduced, are not negligible.

The extent to which the racial and ethnic inequalities in elementary school level four-year college completion prospects presented in this chapter are related to inequalities in school feeder patterns is presented in Table III.5 and illustrated in Figure III.7. The proportion of between elementary school variance associated with elementary school to college enrollment patterns is around 50 % for Black, Latino and White students. However, the actual percentage point change is substantially different for White students versus Black and Latino students. Black and Latino students see a 7.88 and 6.44 reduction respectively in between elementary school variance after controlling for high school fixed effects and HS CCI. White students, on the other hand, see an 18.14 percentage point reduction in between elementary school variance once high school fixed effects and college enrollment patterns are controlled for. This means, not only do White students attend elementary school, where on average their peers have higher college completion prospects, much of that difference can be attributed to the high schools students attend and the college enrollment patterns of students in those high schools.

Results for Asian students are substantially different than those for White, Black and Latino students. First, Asian students attend elementary school, where on average nearly 40 % of their peers are expected to earn a four-year degree. This is higher than any other group. Second, and most unexpectedly, a much smaller proportion of Asian students' peers' college completion prospects can be attributed to high school and college enrollment patterns. Accounting for high school fixed effects and HS CCI reduces between elementary variance in four-year college completion by 5.37 percentage points, or 13.46 %, not the 50% seen for students of all other racial and ethnic groups. These results indicate the between elementary school variance that is seen for Asian students is largely not related to high school and college matriculation patterns, unlike sample students from other racial and ethnic groups.

Discussion

Results from the analysis presented in this chapter indicate that 8th graders in Chicago Public Schools are attending elementary schools where their peers have vastly different college completion prospects depending on the student's race/ethnicity, and ISAT scores. If students of different races/ethnicities and test scores were evenly distributed across elementary schools in the district, there would be no noticeable difference in the college completion prospects of students' peer groups by race/ethnicity or test score. However, there are noticeable racial and ethnic differences, and these differences are most profound for students with higher standardized test scores. The fact that Chicago Public Schools are highly segregated is not new to researchers or residents, nor is the reality that test scores are highly correlated with race. What is new is a deeper understanding of how decisively different the longitudinal education trajectories of highly achieving students' peer groups are depending on their race and ethnicity. High achieving Black and Latino CPS students are largely attending elementary schools where few students will earn a four-year college degree, and based on the lack of variation at the high school level, they are not likely to enroll in high schools that greatly improve these prospects.

The story is quite different for White students. White 8th graders are largely enrolled in elementary schools where their peer groups are three and four times (respectively) more likely to earn a four-year college degree than their Latino and Black peers. And while the between school variation in mean college completion prospects is greater for White students, even on the lower end (-2SD) of mean elementary school fixed effects, White students are attending schools where their peers have higher college completion prospects than Black students at the upper range of elementary school fixed effects (+2SD). More fundamental to the hypothesis of this dissertation,

while White students attend elementary schools where students are more likely to earn a four year degree, much of this increase is related to the high schools they end up attending and the HS CCI of those high schools. Lastly, White students experience a much greater percentage point reduction in between elementary school variance in college completion prospects once high school of attendance and HS CCI are controlled for. This means White students not only are attending elementary schools where their peers are more likely to attend college, they have a wider range of possible outcomes, and much of that advantage can be accounted for by the high schools and colleges students will ultimately attend. In short, White students have a wider range of education pathways, and the majority of those pathways lead to better four-year college completion prospects relative to their similarly achieving Black and Latino peers.

Even greater disparities were found when examining outcomes for Asian students. Asian students are the only racial or ethnic group to attend elementary schools where more than half of students go on to earn a four-year degree (55.77 %). Controlling for high school fixed effects and HS CCI reduces mean elementary school college completion by 18.81 percentage points or 33.72 %. This means the high schools Asian students are attending, and the ability of those high schools to connect Asian students to colleges where they will do well, accounts for a good deal of the racial and ethnic gap in mean college completion prospects. Lastly, high school fixed effects and HS CCI only reduce the between elementary school variation in college completion prospects for Asian students by 5.37 percentage points, equivalent to 13.46 %. Similarly to White students, Asian students are attending elementary schools where their peers will earn a four year degree, and are going on to high schools that improve their college completion prospects in ways that Black and Latino students are not.

The basis of this dissertation is the assertion that early inequitable education pathways exist in Chicago Public Schools that lead to an opportunity gap in higher education attainment for marginalized students. Chapter 2 established the extent of inequitable outcomes in college completion, and this chapter presented evidence that there are most certainly inequitable education pathways. One could potentially argue that students are selecting into different education pathways for reasons that cannot be captured in the student-level variables included in this analysis. Even if this is true, this does not negate the presence of an opportunity gap in postsecondary pathway. This chapter makes no causal statements about why students experience inequitable education pathways for a number of reasons. First, this is the first body of work to examine students' higher education trajectories from elementary school to college by demographic subgroup. Establishing the basis for future research is the goal of this chapter, not a determination of causality. Attempting to make a causal statement at this point seems premature and quite frankly, oblivious to the complex experiences of Chicago's students and families as they navigate the public education system. This chapter establishes the existence of discrete education pathways, and outlines how drastically four-year college completion rates of students' academic peer groups differ by race and ethnicity. How and why these pathways exist is quite another empirical question.

Limitations and Future Research.

This study has a number of limitations that impact how the results should be interpreted. First, while it is mathematically possible to disentangle the amount of variation in four-year college completion that can be accounted for by the elementary to college enrollment patterns of 8th graders, this study does not reveal what is happening within elementary schools, high schools, and colleges, or what aspect of attending a certain school, might shape these enrollment patterns. This

is an important caveat to keep in mind when examining the between elementary school differences in four-year college completion. It could be that certain schools have access to greater resources, and that non-marginalized students are more likely to attend better resources schools. It could also be that families of marginalized students are selecting schools for their children on criteria that, while important to parents such as proximity to home, may not be related to increased four-year college completion rates, or even negatively related to four-year college completion rates.

Future research should examine what factors are shaping the enrollment choices of families of Chicago public Schools students, and what constraints or benefits are influencing their decisions on where their children will attend elementary school, high school and college. Future research should also consider alternative ways to examine elementary to college enrollment patterns beyond fixed effects and HS CCI. Alternative methodologies may find results that either challenge or support the findings of this study, and further the understanding of the role of education pathways on four-year college completion rates. Lastly, this study chooses to examine four-year college completion as earning a four-year college degree has a greater degree of financial return than earning an associate's degree, or college certificate (Torpey, 2018). However, there may be benefits to earning an associate degree not captured in annual income. It would be prudent for future research to examine whether disparities found in this study for four-year college enrollment and completion are also found for two-year enrollment and completion, and whether there are social or developmental benefits in pursuing a two-year degree that are distinct from earning a four-year degree.

Policy and Practice Implications

The policy and practice implications for this chapter are most strongly aligned at the school, district and state level. At the school level, counselors can use HS CCI to better predict what percent of their graduating class is expected to earn a four-year college degree, and identify subgroups of students with low expected four-year college completion prospects, in order to better target additional or alternative resources to these students. School administration and counselors may also choose to compare their school's HS CCI to schools they feel have similar constraints and resources, in an effort to gain a more macro view of how well their school is facilitating the transition to four-year college. At the district level, identifying elementary schools and high schools where students have lower than expected four-year college completion rates provides an important point of intervention. Students within such schools may be identified for additional resources and supports to aid in the transition to high school and eventually college. At the state level, comparing how districts perform with regards to variation in HS CCI for marginalized groups, can help states identify district that may need additional supports in order to ensure all students have equal opportunity for college completion.

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APPENDIX IIIA: CHAPTER III TABLES AND FIGURES

Table III.1. Analytic Sample Demographics by Cohort

	N= 108,252					
	2004	2005	2006	2007	2008	Total
HS Diploma in 6yrs	15000	16030	16585	16606	18110	82331
Official Dropout	5440	4633	4201	3440	3097	20811
Enroll in 4yr college	5121	5564	7602	7703	7938	33928
Earn 4yr degree	3009	3037	3326	3530	3479	16381
Black	11142	11379	11261	10473	11163	55418
Latino	7440	7803	8083	8170	8757	40253
White	1786	1726	1774	1704	1564	8554
Asian / Pacific Isl	773	739	761	810	784	3867
Native American	31	32	29	36	31	159
below 20th percentile	5812	6184	4055	3108	3571	22730
20th-39th percentile	4101	4400	4219	3488	4398	20606
40th-59th percentile	3185	3308	4159	4234	4766	19652
60th-79th percentile	2826	2984	4168	4716	4687	19381
80th percentile and a	3068	3196	3962	4457	426	15109
highest poverty	5701	5711	5598	5053	5391	27454
high average poverty	5120	5421	5398	5183	5493	26615
low average poverty	5240	5283	5490	5436	5700	27149
lowest poverty	5111	5264	5422	5521	5716	27034
Special Education	3839	3688	3642	3479	3524	18172

Students' 8th grade cohort is determined by the year the student was enrolled as an 8th grader. Thus, students who repeated the 8th grade will be included in the cohort for their repeater year. Approximately one percent of 8th graders had repeated the 8th grade.

Table III.2. Between School Variance in Four-year College Completion for 8th Graders in Chicago Public Schools. Students Nested in Elementary Schools.

N=99,253, Cohorts 03/04-07/08								
Effect		Estimate	SE	t-value	df	p	Odds Ratio	Effect size in percentage points
Intercept		-2.0091	0.0340	-59.12	537	<0.001	0.1341	
Gender	Male	-0.5922	0.0228	-25.971	98705	<0.001	0.5531	-4.92
Special Education		-0.0292	0.0420	-0.695	98705	0.487	0.9712	-0.30
Race/Ethnicity	White	0.2754	0.0504	5.462	98705	<0.001	1.3171	3.19
	Latino	-0.1097	0.0401	-2.734	98705	0.006	0.8961	-1.10
	Asian/ PI	0.8217	0.0876	9.382	98705	<0.001	2.2745	11.55
	Native Am	-0.2456	0.2343	-1.048	98705	0.295	0.7823	-2.33
Test score		1.3648	0.0233	58.464	98705	<0.001	3.9150	22.60
Test score squared		-0.1176	0.0140	-8.422	98705	<0.001	0.8891	-1.17
Poverty		-0.1077	0.0206	-5.226	98705	<0.001	0.8979	-1.08
Social Stability		0.0199	0.0211	0.944	98705	0.345	1.0201	0.21
Variance Components	SD	Df	X2	p-value	Odds Ratio	+/- 2 sd range in percentage points		
Elementary schools	0.39197	537	2097.9723	<0.001	1.4799	16.93		

Table III.3. Between School Variance in Four-year College Completion for 8th Graders in Chicago Public Schools. Students Nested in Elementary Schools and High Schools

Effect		Estimate	SE	t-value	df	p	Odds Ratio	Effect size in percentage points
Intercept		-2.1170	0.0572	-37.043	98560	<0.001	0.120	
Gender	Male	-0.5681	0.0211	-26.984	98560	<0.001	0.567	4.36
Special Education		-0.1528	0.0436	-3.506	98560	<0.001	0.858	1.70
Race/Ethnicity	White	0.2761	0.0453	6.089	98560	<0.001	1.318	-2.63
	Latino	-0.0676	0.0383	-1.767	98560	0.077	0.935	
	Asian/ Pacific	0.7475	0.0565	13.219	98560	<0.001	2.112	-9.20
	Native Am	-0.2605	0.2383	-1.093	98560	0.274	0.771	
Test score		1.0689	0.0217	49.301	98560	<0.001	2.912	-14.89
Test score squared		-0.158292	0.011691	-13.54	98560	<0.001	0.854	1.75
Poverty		-0.0456	0.0195	-2.336	98560	0.02	0.955	0.75
Social Stability		0.0529	0.0186	2.84	98560	0.005	1.054	-0.20
Variance Components								
	SD		df	X2	p-value	Odds Ratio	+/-2 sd range in percentage points	
Elem schools	0.29279		522	2324.2485	<0.001	1.3402	11.50	
High schools	0.57732		162	2565.507	<0.001	1.7813	23.98	

N=99,454, Cohorts 03/04-07/08

Table III.4. Between School Variance in Four-year College Completion for 8th Graders in Chicago Public Schools. Students Nested in Elementary Schools and High Schools, Controlling for High School Specific College Transition Patterns (HS CCI)

Effect		Estimate	SE	t-value	df	p	Odds Ratio	Effect size in percentage points
Intercept		-2.7063	0.0483	-55.996	98779	<0.001	0.067	
Gender	Male	-0.5663	0.0210	-26.922	98779	<0.001	0.568	2.61
Special Education		-0.15719	0.0435	-3.61	98779	<0.001	0.855	5.67
Race/Ethnicity	White	0.27386	0.0445	6.155	98779	<0.001	1.315	2.99
	Latino	-0.0671	0.0370	-1.811	98779	0.07	0.935	5.19
	Asian/ Pacific	0.7382	0.0559	13.2	98779	<0.001	2.092	-1.19
	Native Am	-0.2605	0.2383	-1.093	98560	0.274	0.771	6.17
Test score		1.0558	0.0216	48.812	98779	<0.001	2.874	-5.04
Test score squared		-0.1644	0.0116	-14.182	98779	<0.001	0.848	5.70
Poverty		-0.0442	0.0194	-2.277	98779	0.023	0.957	5.06
Social Stability		0.0494	0.018526	2.666	98779	0.008	1.051	4.51
HS CCI		0.0437	0.002282	19.157	98779	<0.001	1.045	4.55

Variance Components

	SD	df	X2	p-value	Odds Ratio	+/-2 sd range in percentage points
Elem schools	0.2911	522	1393.37	<0.001	1.3379	7.08
High schools	0.24219	162	657.713	<0.001	1.2740	5.83

N=99,454, Cohorts 03/04-07/08

Table III.5. Between School Variance in Four-year College Completion for 8th Graders in Chicago Public Schools by Demographic Subgroup

	Controlling for:	Model intercept	Between school variance	Intercept prob	Plus 2SD	Minus 2SD	(+/-) 2SD Range
Overall	SES, gender, race/ethnicity, cohort	-2.0091	0.39197	0.1183	0.2270	0.0578	0.1693
	Plus high school fixed effects	-2.1170	0.29279	0.1075	0.1778	0.0629	0.1149
	Plus HS CCI	-2.7063	0.2911	0.0626	0.1068	0.0360	0.0708
<20th	SES, gender, race/ethnicity, cohort	-3.9093	0.50876	0.0197	0.0526	0.0072	0.0454
	Plus high school fixed effects	-3.8635	0.47777	0.0206	0.0518	0.0080	0.0437
	Plus HS CCI	-4.1601	0.34425	0.0154	0.0301	0.0078	0.0224
20th-39th	SES, gender, race/ethnicity, cohort	-2.8175	0.40487	0.0564	0.1184	0.0259	0.0925
	Plus high school fixed effects	-2.7934	0.36002	0.0577	0.1117	0.0289	0.0828
	Plus HS CCI	-3.4062	0.34832	0.0321	0.0624	0.0163	0.0462
40th-59th	SES, gender, race/ethnicity, cohort	-2.0636	0.44737	0.1127	0.2371	0.0493	0.1877
	Plus high school fixed effects	-2.0728	0.39018	0.1118	0.2154	0.0545	0.1609
	Plus HS CCI	-2.6640	0.34924	0.0651	0.1229	0.0335	0.0894
60th-79th	SES, gender, race/ethnicity, cohort	-1.2496	0.44098	0.2228	0.4091	0.1061	0.3030
	Plus high school fixed effects	-1.4258	0.35548	0.1938	0.3285	0.1056	0.2230
	Plus HS CCI	-2.0491	0.32333	0.1141	0.1974	0.0632	0.1342
80th=>	SES, gender, race/ethnicity, cohort	-0.0732	0.42809	0.4817	0.6863	0.2831	0.4033
	Plus high school fixed effects	-0.6016	0.3413	0.3540	0.5202	0.2168	0.3034
	Plus HS CCI	-1.1809	0.3317	0.2349	0.3734	0.1365	0.2369
Black	SES, gender, race/ethnicity, cohort	-2.3828	0.43863	0.0845	0.1816	0.0370	0.1446
	Plus high school fixed effects	-2.3806	0.33979	0.0847	0.1543	0.0448	0.1095
	Plus HS CCI	-2.8541	0.3065	0.0545	0.0961	0.0303	0.0659
White	SES, gender, race/ethnicity, cohort	-0.5752	0.37	0.3600	0.5411	0.2116	0.3295
	Plus high school fixed effects	-0.9512	0.23542	0.2786	0.3822	0.1943	0.1878
	Plus HS CCI	-1.5043	0.24799	0.1818	0.2673	0.1192	0.1481
Asian	SES, gender, race/ethnicity, cohort	0.2317	0.42815	0.5577	0.7480	0.3487	0.3993
	Plus high school fixed effects	0.0015	0.33827	0.5004	0.6633	0.3374	0.3259
	Plus HS CCI	-0.5340	0.38535	0.3696	0.5589	0.2134	0.3455
Latino	SES, gender, race/ethnicity, cohort	-2.1366	0.35532	0.1056	0.1937	0.0548	0.1389
	Plus high school fixed effects	-2.0869	0.29322	0.1104	0.1824	0.0646	0.1178
	Plus HS CCI	-2.5083	0.26084	0.0753	0.1206	0.0461	0.0745

N=99,454, Cohorts 03/04-07/08

Table III.6. Distribution of Student level High School to College Connection Index

mean	14.66	
SD	12.35	
Median	10.64	
100%	Max	63.78
99%		60.53
95%		34.65
90%		31.60
75%	Q3	17.65
50%	Median	10.64
25%	Q1	6.43
10%		5.04
5%		3.89
1%		0.80
0%	Min	0.00

Figure III.1. Two Standard Deviation Range in elementary School-level Predicted Probability of Four-year College Completion by ISAT Percentile Bin

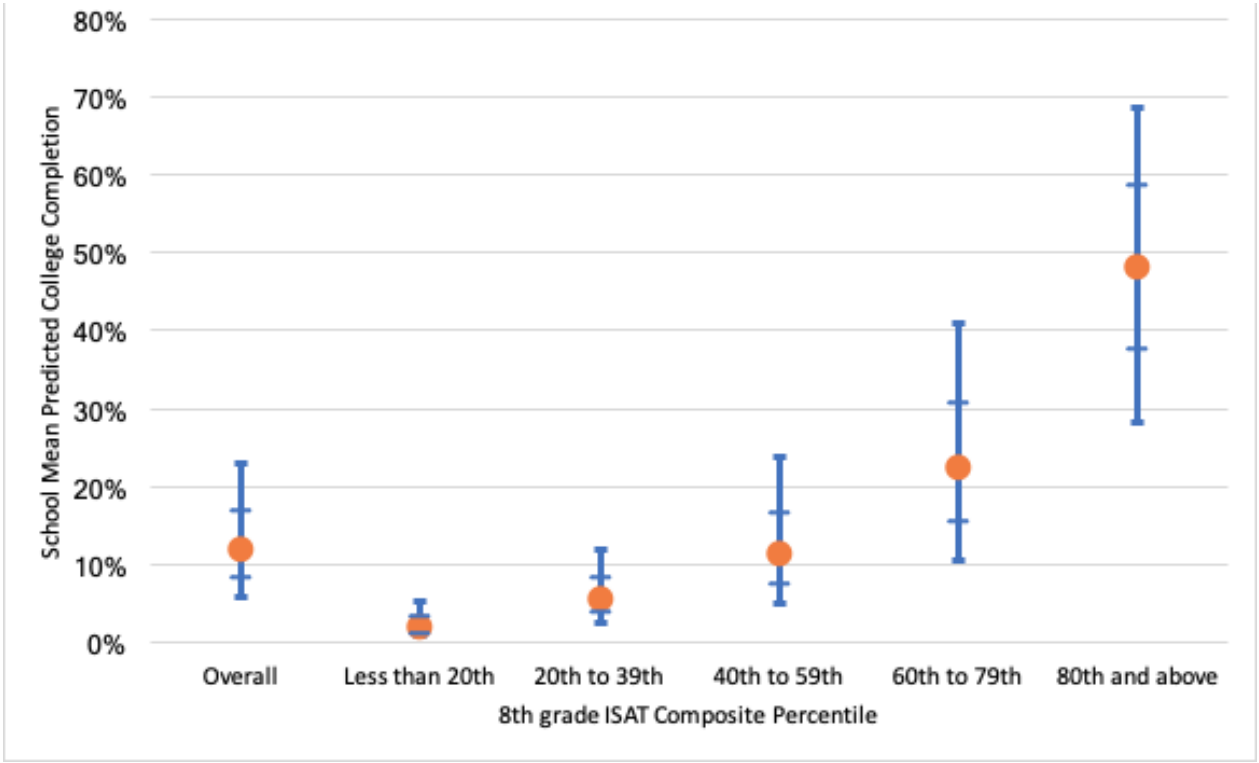


Figure III.2. Between Elementary School Variance in Four-year College Completion for 8th Graders of Similar ISAT Percentile

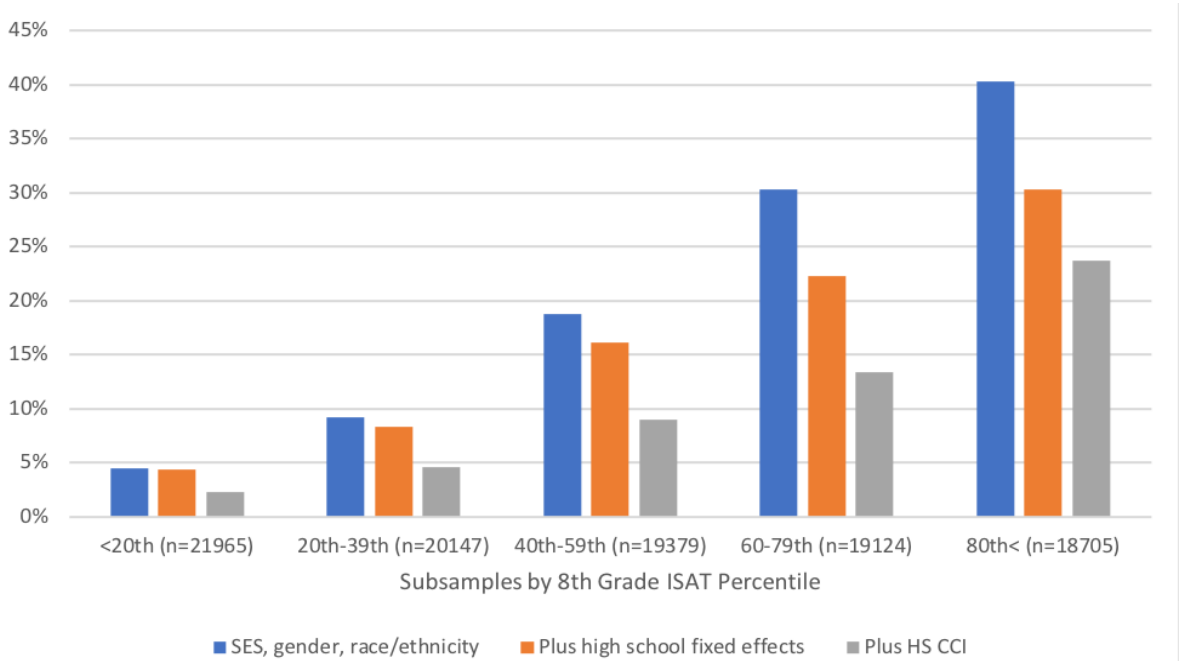


Figure III.3. Between High School Variation in Four-year College Completion for 8th Graders with Similar ISAT Scores Before and After Controlling for High School Specific College Transition Patterns (HS CCI)

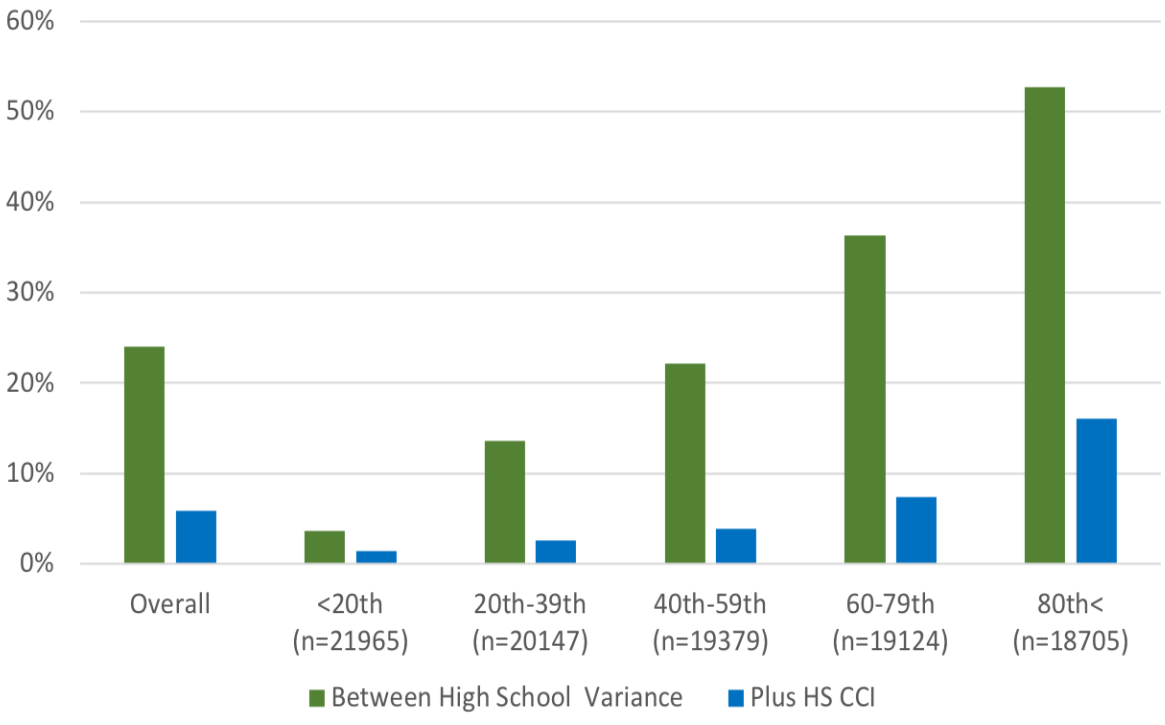


Figure III.4. Between Elementary School Variance in Four-year College Completion for 8th Graders by Special Education Status ISAT Percentile Bin (+/- 2SD around the mean)

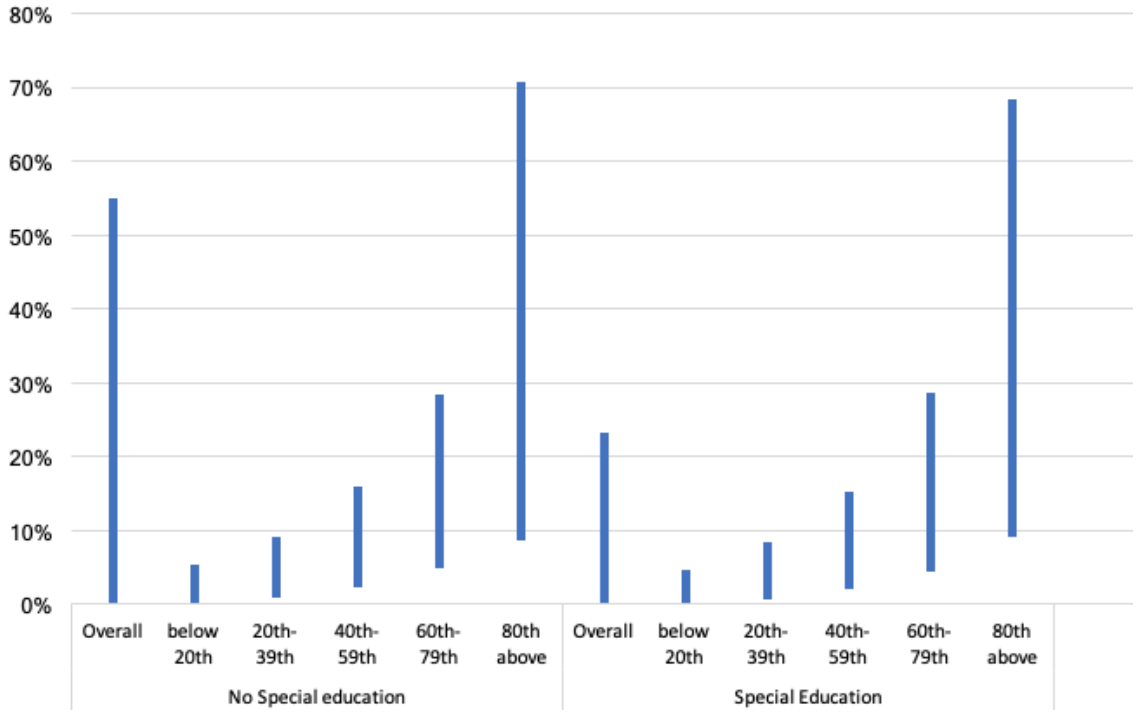


Figure III.5. Between Elementary School Variance in Four-year College Completion for 8th Graders by Gender and ISAT Percentile Bin (+/- 2SD around the mean)

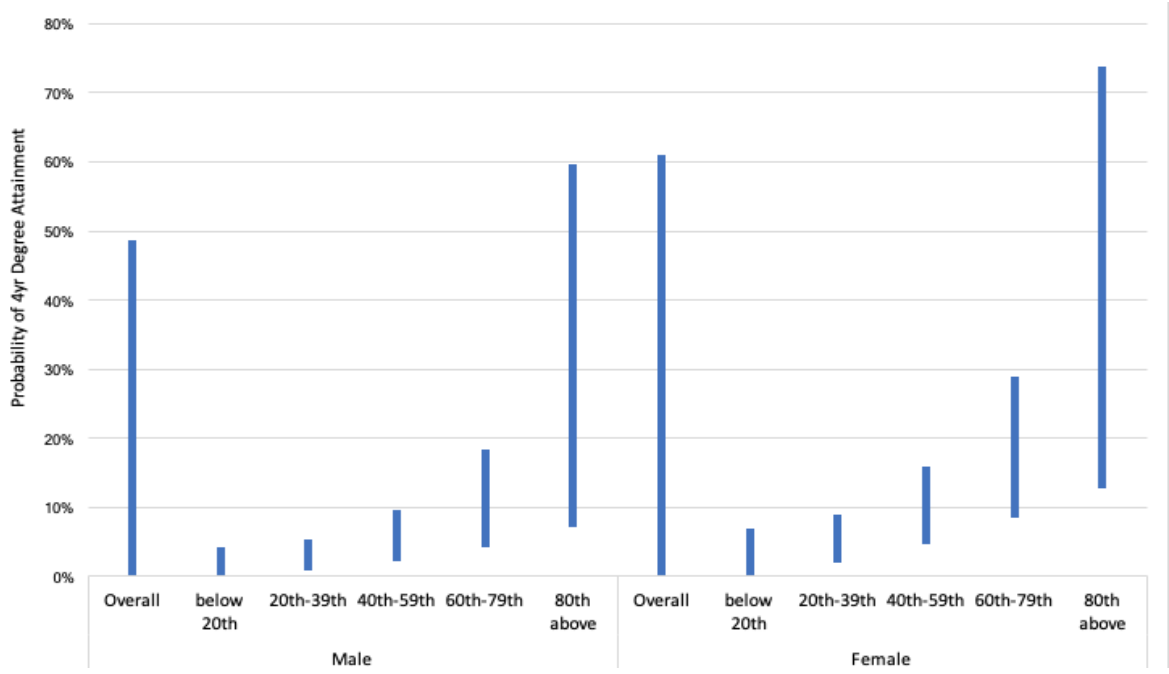


Figure III.6. Between Elementary School Variance in Four-year College Completion for 8th Graders by Race/Ethnicity and ISAT Percentile Bin (+/- 2SD around the mean)

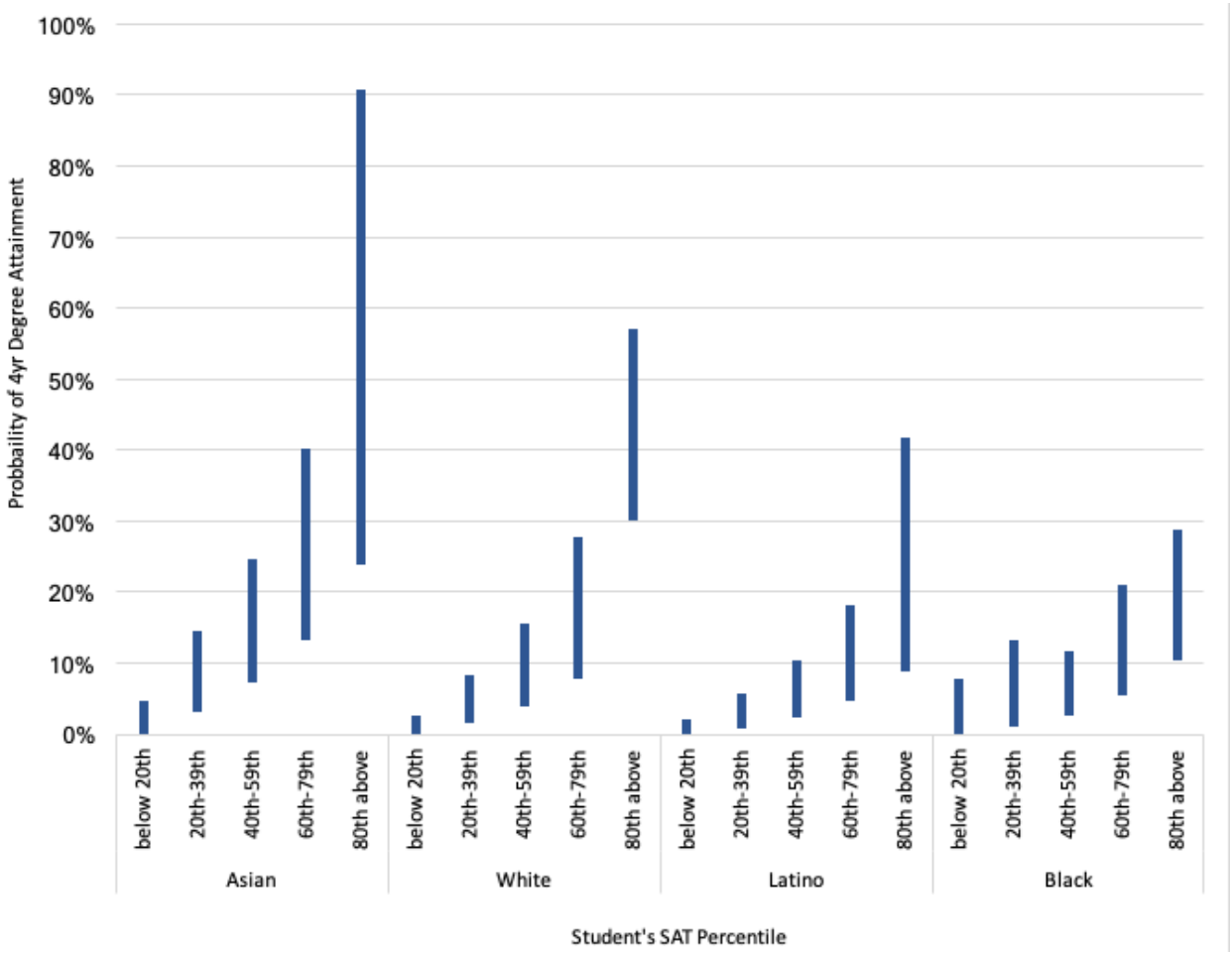
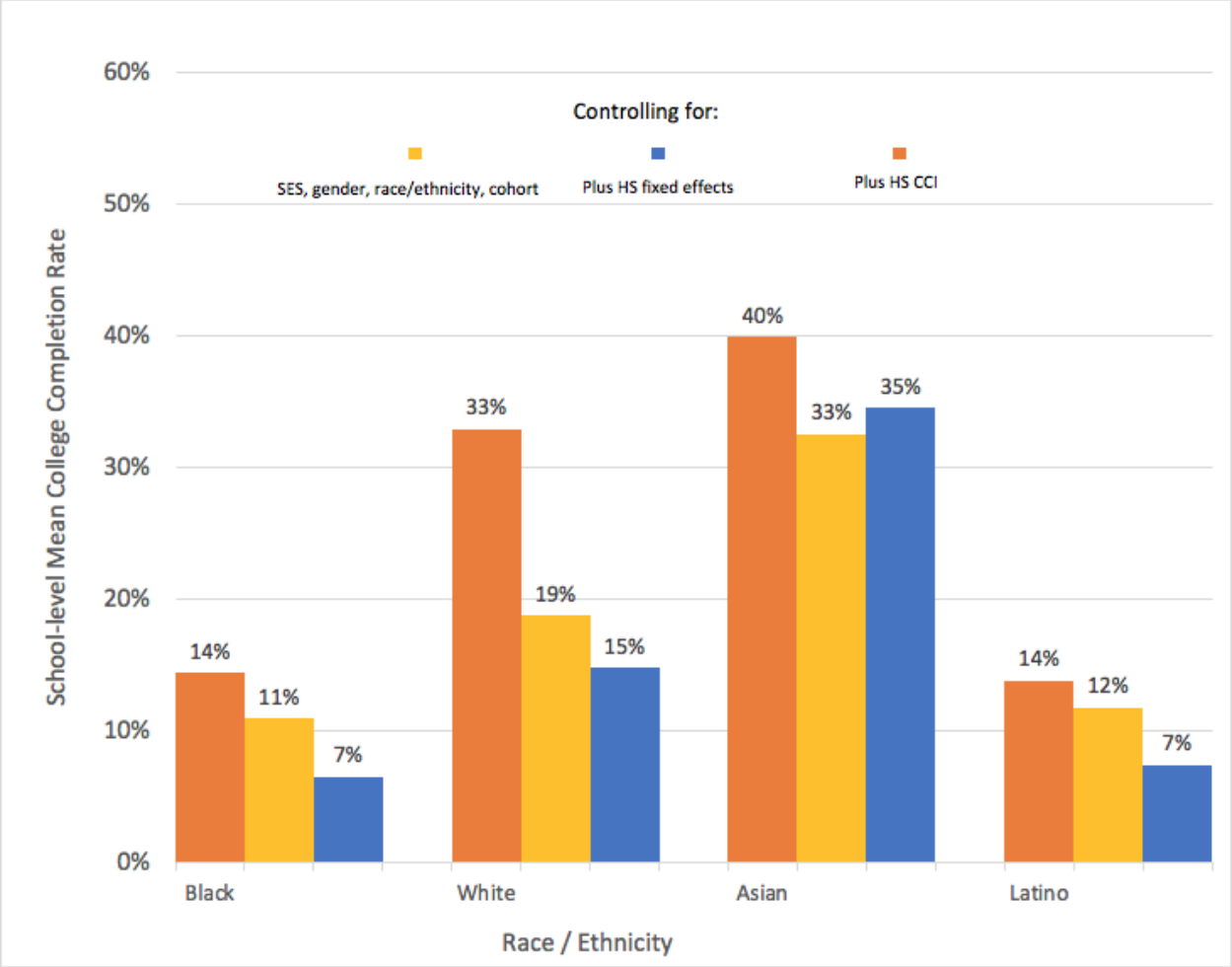


Figure III.7. Reduction in Between Elementary School Variance in Four-year College Completion for 8th Graders Across Race and Ethnicity After Controlling for HS CCI



CHAPTER IV. POSTSECONDARY PATHWAYS IN CHICAGO PUBLIC SCHOOLS: PREDICTING POSTSECONDARY PATHWAY BY SCHOOL TYPE

Abstract

Chapter 1 laid the foundation for inequitable outcomes in four-year college completion for marginalized students. Chapter 2 examined the relationship between school enrollment patterns and disparities in four-year college completion for these students, and the relationship between inequities in college completion and HS CCI. This chapter uses multi-level modeling, and regression analysis to estimate the mean, cumulative, and school fixed-effects students in a given elementary school experience between 8th grade and college; a novel concept referred to as Postsecondary Pathway. This chapter also identifies elementary school types associated with positive and negative Postsecondary Pathways. The sample includes all Chicago Public Schools (CPS) eighth-graders (n=108,273) who remain enrolled during 9th grade, including students who are usually omitted from analysis, such as students attending alternative schools, and students with Individual Education Plans (IEPs). Data include CPS administrative records and college enrollment outcomes obtained for National Student Clearinghouse. Results indicate that students attending academic centers or magnet schools in the 8th grade experience postsecondary pathways that equate to 13.24 and 9.27 percentage points higher college completion prospects than their peers attending neighborhood schools. Results also indicate that White students are more likely to enroll in academic centers and magnet schools compared to their Black and Latino peers. Lastly, results indicate that schools that combine middle school and high school –referred to as middle-

highs in this dissertation—are substantially more likely to have a low Postsecondary Pathway, relative to other schools serving similar students.

Background

As previously established in Chapters 2 and 3 of this dissertation, students with similar test scores in 8th grade go on to have vastly different four-year college completion outcomes a decade later, even after controlling for student demographics and test scores. It is likely that some of these differences are due to factors outside of the classroom and outside of the school. Poverty, social stability, and the numerous additional challenges correlated with race and ethnicity, undoubtedly contribute to the disparities in college completion visible in Chicago and across the nation. However, it is also reasonable to believe that schools, or more accurately school systems, may play a role in shaping inequities in higher education attainment.

Every parent who compares preschools, attends a kindergarten open house, or enrolls their child in an elementary school other than their designated public school is acting on the belief that where their child attends school now will impact their long term education prospects. And it is not only academics that parents are considering. While many parents do consider test scores or other academic measures of a school's performance, parents also consider other aspects of the learning environment such as parent involvement, student satisfaction, and location (Goldrink & Phillips, 2008; Jacob & Lefgren, 2007; Hastings, Kane & Staiger, 2005). Research indicates that in some circumstances, these non-academic characteristics matter more to parents than mean test scores.

The importance parent place on the non-academic aspects of the learning environment is not unfounded. Harvard's Graduate School of Education (2017) outlines five key things parents should look for when selecting a preschool: Nurturing communication, supporting not punishing

students, joyful learning, physical activity, and supported staff. Notably absent are any measures of children's academic performance. The importance of non-academic measures is not relegated solely to early childhood education. Research out of the UChicago Consortium on School Research (Bryk et al., 2010) identifies five domains, known as the Five Essentials, as key components to organizing schools for academic success. Of these five (Effective Leaders, Collaborative Teachers, Involved Families, Supportive Environment, and Ambitious Instruction), only one domain, Ambitious Instruction, directly measures what occurs inside the classroom. The other four domains measure aspects of the relational school environment.

This paper posits that part of the non-academic impact of elementary schools is related to the education transitions students make as they move from one level of schooling to the next, and that these transitions differ systematically across elementary schools. There is some evidence to suggest as such. Hassrick, Raudenbush and Rosen (2017) used lottery admissions to The University of Chicago Charter School (UCCS). UCCS students not only fared better academically in elementary school relative to their peers who did not win lottery admissions, these gaps grew as students entered middle school. The authors suggest at least part of the middle-school gains elementary school lottery winners experienced was due to counseling UCCS students received to attach students to higher performing middle schools relative to their counterparts who did not win lottery admissions to UCCS.

It is not difficult to imagine that where a student attends college might impact their career or graduate school prospects. Aside from academic preparation and degree attainment, students may also benefit in numerous other ways that may impact their long-term education and career trajectories. For instance, a college may take an active role in connecting students to research

opportunities in preparation for graduate school, or provide robust internship opportunities to prepare for the job market. Neither of these resources are captured in test scores or grades, and yet may have substantial impact on what happens to students as they graduate and transition to the next phase of their life. There is evidence of a similar mechanism playing out in high schools. Nationally, 42 % of recent high school graduates enroll in a four-year college immediately after graduation (Current Population Survey, 2017). And yet this number varies substantially between states, districts, and schools. In California, the four-year college enrollment rate is just 26 % (Kurleander et al., 2018), while Illinois the four-year college-going rate is largely on par with the national average at 40.2 % (ISBE, 2019). Within the same district, Chicago Public Schools for example, two schools can have vastly different four-year college going rates. Lincoln Park High School, a racially diverse neighborhood high school in the affluent Lincoln Park neighborhood, has a four-year college enrollment rate of 73.2 %, whereas George Washington High School, a predominantly Latino high school in the working class East Side neighborhood has a four-year college going rate of 36.0 %. Both of these schools exceed the 15.3 % four-year college going rate at Tilden High School, a racially diverse high school in the struggling Back of the Yards neighborhood.

Some of these differences can be accounted for by school-level differences in demographics and test scores. However, there are individual schools, and even entire districts that exceed expectations for the students they serve. This paper seeks to identify the extent to which characteristics of the school students attend in the 8th grade, predict the mean cumulative school fixed-effects for students in those schools, referred to as Postsecondary Pathway.

Research Question

Do characteristics of the elementary school learning environment predict different postsecondary opportunities for similar students?

Research Question 1: Does elementary school Postsecondary Pathway differ significantly by type of school?

Hypothesis 1: It is the hypothesis of this study that elementary school Postsecondary Pathway measures will be higher for elementary school types that utilize admissions criteria, even after controlling for demographics and test scores. These school types include academic centers, magnet schools and charter schools.

Literature

Chapter II of this dissertation examines the extent of racial, ethnic, gender, socio-economic, and disability disparities in four-year college completion for CPS 8th graders between the years of 2004 and 2005. Significant differences in four-year college completion were observed for 8th graders with emotional and behavioral disabilities (7.54 percentage points) and male 8th graders (5.64 percentage points), even when controlling for test scores, race, gender, and socio-economic status. Significant differences were also found by race and ethnicity. Asian students were far more likely than their Latino peers, the largest ethnic demographic in CPS, to earn a four-year degree, even after controlling for test scores, disability status, gender, and socio-economic status (19.09 percentage points). Results from Chapter III suggested similar students may attend elementary schools where their college completion prospects vary by 17 percentage points or more. Chapter III also revealed that more than half (58.18 %) of the between-elementary school variation in four-

year college completion could be attributed to the high schools, and the characteristics of the colleges which students ultimately attended. Chapter III was foundational in establishing that the between elementary school difference in students' college completion prospects is related to school-level factors, not student-level factors. This paper builds upon the two previous papers in this dissertation by examining the mean, cumulative, school fixed effects for students at a given elementary school as they progress from 8th grade through college. This mean, cumulative, school fixed-effect is referred to as Postsecondary Pathway. Finally, this paper examines the extent to which school type is a predictor whether a school presents a positive, neutral, or negative Postsecondary Pathway for its students.

School Type.

Research indicates that high schools can play an important role in shaping students college completion prospects via differences in the types and quality of colleges to which high schools send their students (Roderick et al., 2018; Wolniak & Engberg, 2007). A recent report from Roderick et al. (2018) illustrates as much. Roderick's analysis of four-year college completion prospects for Chicago Public Schools graduates estimates that about half of the between-school difference in college completion rates for students with similar GPAs can be accounted for by the high-school specific, college-feeder patterns of its students. The researchers also found similar patterns when comparing students with similar ACT scores. Such evidence indicates that there are mechanisms at work, whether active or passive, within high schools that shape students' college completion prospects.

This paper posits that school type may be a significant predictor of Postsecondary Pathway. This hypothesis is informed by research that suggests students attending different types of schools

(i.e. selective schools, vocational schools, charter schools etc) experience significantly different education outcomes compared to their peers. Multiple studies indicate increased academic performance, high school graduation, and college enrollment rates for students attending selective enrollment schools. Pop-Eleches & Urquiola (2013) used regression discontinuity to study marginal admissions to selective secondary schools in Romania. Their results indicate that students who marginally gained admissions to higher performing secondary schools had higher test scores on standardized tests required for graduation. Deming's et al. (2014) study of lottery admissions in North Carolina reveal that female students from lower-income neighborhoods who gained access to high-quality high schools had substantially higher college completion rates than their peers who attended neighborhood schools. In similar fashion, Clark (2010) used regression discontinuity to make a causal claim that students attending selective enrollment high schools in the UK experience increased college enrollment and college completion than their peers at traditional high schools.

Interestingly, Clark doesn't find any test-score advantage to selective schools, a finding echoed by Barrow, Sartain and de la Torre (2018) in their examination of students who marginally gained admissions to Chicago selective enrollment high school. In fact, Barrow, Sartain and de la Torre find that students from the lowest SES neighborhoods, who marginally gained access to selective enrollment high schools, actually had lower GPAs and less probability of attending a selective college after graduation compared to their peers who did not gain access. However, Angrist, Pathak, & Zarate (2019) reveal that this apparent dip is actually driven by increased academic outcomes for students who marginally missed admissions to selective enrollment schools who ultimately attended a campus of the Noble Network of Charter Schools. Fortunately, the years of this study are prior to the large-scale expansion of Noble Campuses in Chicago. If this study

took place a decade later, an entire school type dedicated to Noble schools would be prudent to obtain accurate fixed effects for school type, and disentangle charter school fixed effects from Noble school fixed effects.

Research on the effects of school type can be confounded, especially when it comes to the potential effects of charter schools. Not all studies have found positive effects for charter school attendance, and some have even found negative effects for charter school students (Sass, 2006; Bifulco & Ladd 2006). However, more recent causal studies, indicate that not all charter schools are equal, and that the type of charter school may play a role in whether students outperform their peers. For instance, studies show students' who attend urban charter schools fair significantly better in terms of test score gains and college enrollment than their peers at noncharter, urban schools or at rural charter schools (Davis & Heller, 2019; Angrist et al., 2016; Angrist, Pathak & Walters, 2013; Curto & Fryer, 2011; Hoxby, Murarka & Kang, 2009; Gleason et al. 2010; Angrist, Pathak, and Walters 2011). But what makes urban charter schools so different from traditional public schools and other types of charter schools? Angrist, Pathak and Walters (2013) suggest it is the high accountability for educators and high expectations for students found in "no excuses" urban charters, that make urban charters like Harlem Children's Zone so successful. Dobbie and Fryer's (2011) comparison of "no excuse" charters and non "no excuse" charter schools supports such a theory. Urban charter schools appear to use a unique approach that sets them apart from their rural equivalents.

Opportunity Gap.

Research documents that the standardized test-score gap between Black and White students is present from an early age (Burchinal et al., 2011). Despite this mean gap in test scores, the

Black and White test score gap in early childhood all but disappears once student demographics are controlled for (Burchinal et al., 2011; Fryer & Levitt, 2004). Unfortunately, the existing gap widens over time, suggesting Black students are attending elementary schools of less academic opportunity than their White peers (Hanushek, & Rivkin, 2006; Fryer & Levitt, 2004).

What kind of school a child attends is reflective of a constellation of environmental, family, and student factors. Comparing students' school choice sets is difficult, as each family has different criteria for enrollment and different resource constraints to access schools. Preference is certainly a factor, but so are awareness and access. It is not difficult to imagine that students of certain demographic groups may have restricted school choices due to lack of exposure, geographic constraints, economic constraints, admissions criteria, or lack of support in the application process. Whatever the mechanisms at play in shaping school access, we do know that school selection differs systematically by race and ethnicity.

According to a recent report from The Federal Reserve Bank of Chicago (Barrow & Sartain, 2017), high school enrollment patterns in Chicago Public Schools differ substantially by race and ethnicity. Only 14.4 % of Black students enrolled in their neighborhood high school, compared to 32.1 % of Latino students and 29.9 % of White and Asian. However, Black and Latino students were both far more likely to enroll in charter schools (35.9 and 24.7 % respectively), compared to their White and Asian peers (6.7 %). Lastly, White and Asian students were three times more likely (38.4 %) to enroll in a selective-enrollment school than their Black or Latino peers (11.5 and 10.5 % respectively).

The belief that students of color have inequitable education resources is not a new concept. As discussed in the introduction to this dissertation, James Coleman’s report for the Department

of Education first documented inequitable resources between schools serving predominantly White and predominantly Black students back in 1966. Coleman's report was fundamental to the success of Brown vs The Board of Education, resulting in desegregation as federal law. However, what policy makers failed -- and continue to fail-- to see is that simply outlawing segregation is not synonymous with ensuring equal access. Since the passing of Brown, education research has largely been focused on examining aspects of teaching and learning, and far less focused on the impacts of education systems. With the exception of studies on the potential effects of school choice, there is a dearth of research on how access to quality schooling is interconnected with school systems. The little bit of research available indicates that school districts, and the policies they enact, play an important role in shaping inequitable access to quality schooling.

Jackson's 2009 causal study of the effects of ending integration efforts in North Carolina demonstrate as much. In 2002, the North Carolina district of Charloette-Mechlenberg ended busing efforts to ensure racial balancing across the district. This policy shift provided a natural experiment to better understand how racial composition of schools impacts access to quality schooling, without neighborhood demographics or school-level variables confounding results. Jackson (2009) found that after bussing ended in the district, Black students were less likely to have access to high quality teachers compared to their non-Black peers. Without policies to actively enroll Black students equally across schools, both Black and White teachers self-selected out of schools with higher proportions of Black students, regardless of neighborhood. Thus, if left unchecked, the teacher labor market has the potential to actively discriminate against students of color by withholding equal access to high quality teachers.

This chapter examines whether existing enrollment patterns between 8th and 9th grade are connecting certain groups of students to higher performing high schools, and subsequently colleges, and whether those students differ systematically by demographic group.

Current Study.

The current study contributes to the literature on inequities in four-year college completion by examining whether marginalized students are overrepresented in elementary schools where they have lower than expected four-year college completion rates, given school demographic and test score composition. To do so this chapter first calculates an elementary school-level measure of expected to observed college completion, called Postsecondary Pathway. Then, the relationship between school type, demographics, test score, and Postsecondary Pathway are examined using logistic regression analysis.

Variables

The dependent variable of interest in this study is Postsecondary Pathway. Postsecondary Pathway Indicator is an elementary-school level measure of the mean cumulative school fixed-effects of students at a given elementary school as they transition from 8th grade to high school and eventually to college. For example, consider two groups of demographically and academically similar 8th graders, one group attending school A and the other attending school B. Students at school A enroll in a particular set of high schools, and students in school B enroll in a different set of high schools. The specific high schools in each enrollment set may differ by type, prestige, available resources, academic performance, and college-going culture. If students in school A are more likely to connect to high resourced high schools with higher academic performance, these differences may translate into greater college completion prospects than students at school B. In

this case, school A would have a higher Postsecondary Pathway Indicator than charter school B. Postsecondary Pathway Indicator, in essence, is a measure of the difference in four-year college completion prospects of students at a given elementary school associated with attending that specific elementary school after controlling for differences in demographics and test scores.

Student-level variables included in the analysis in this chapter include race, ethnicity, gender, special education status, neighborhood concentration of poverty level, and 8th grade test score. During the years of this study, Chicago Public Schools administered the Illinois Standards Achievement Test (ISAT) math and reading subsections to all third through eighth grade students in the district. Per district records, race and ethnicity are coded under six categories (Black, Latino, White, Asian, Native American, and Multiracial) and gender as binary (male/female). No students were missing gender codes. Less than one-quarter of one percent of students were reported as Native American. Only one student is identified as multiracial. As a result, the multi-racial category was dropped from the analysis.

Special education status is included in this paper as a dummy variable instead of as individual subcategories, as done in Chapter II. While no overall difference by special education was found in Study One, once test scores were controlled for, special education status is included in this analysis with caution. Also, while there are statistically significant differences in mean high school graduation and four-year enrollment rates for students with emotional and behavioral disabilities, the analysis in this paper requires nesting students in elementary schools and high schools, and controlling for college characteristics. As so few students with emotional and behavioral disabilities make it to high school graduation, and college enrollment, isolating individual school fixed-effects is unreasonable.

As is the case in the first two papers of this dissertation, neighborhood-level concentration of poverty is used as a proxy for student socioeconomic status. Neighborhood concentration of poverty is based on census data, and captures the percent of adult males employed and the percent of families with incomes above the poverty line within the census block the student resides. Values are relative to other census blocks in CPS, so a value of 0 means the student resides in a census block with an "average" measure of poverty relative to other census blocks in CPS. As such, any potential relationship with neighborhood concentration of poverty should be interpreted as relative to the student's CPS peers, and not absolute.

School-level variables include type of school. Only school types that served a total of 100 or more students over the years of the study were included. Schools who served less than 100 students were omitted due to small sample sizes when examining subsamples of students across cohorts. The school type included in this analysis are: neighborhood school (n= 96,606), magnet school (n=6,783), charter school (3,600), alternative schools (including detention center schools) (n=309), and special education schools (n=331). A total of 118 students had school types that were not included in analysis due to small ns, such was the case with vocational schools where only 31 students were enrolled at a single school, or due to apparent errors in the school type coding where school type did not match the known type for the school name listed. In addition, approximately half of one percent of students (n=526), were labeled as "processing". The vast majority of these students were missing an assigned school, although 44 had school names listed in their file which appeared to refer to generic special education schools or alternative schools. As such, the meaning of the processing code is not reliably interpretable. It is possible the code refers to students in the process of changing schools, exiting the district, entering the district, or transitioning between school types. In addition, all students with "processing" school codes were missing demographic

information. The decision was made to remove these students from analysis where school type is examined.

In addition to the district-specified school types, two additional school-level variables were designated in this study: academic centers and middle-high schools. Academic Centers serve middle school students in grades 7 and 8 at host high schools across the city. Host high schools can be magnet schools, charter schools, or neighborhood high schools. Even though the host high school may not require testing for admissions, all 7th and 8th graders who attend an academic center must submit test scores for admissions. To disentangle the fixed effects of the 7th and 8th grade academic center from its high school host, separate school codes were assigned to distinguish the 7th and 8th grade years from the 9th through 12th grade years. In this study there were 10 academic centers in Chicago serving 2,325 students. In addition to academic centers, there are also schools that serve a mix of students between 6th grade and high school. These schools sometimes started as middle schools and expanded as students aged into high school. As such, these schools are distinct from academic centers, and are thus referred to as middle-high schools. These schools do not require test scores for admissions, although four out of the eight middle-high schools in this study were charter schools that requires some kind of initiative to enroll. Of the 2,646 students enrolled at a middle-high school in the sample, 42 % were enrolled in a charter school.

Methods

This chapter posits that students who enroll in different elementary school types are exposed to different postsecondary opportunities. To determine whether there is evidence to support such a hypothesis, the distribution of elementary school fixed effects are examined. A mixed model, with students nested in elementary schools is used to obtain elementary school fixed

effects, while controlling for differences in student demographics and 8th grade test scores. The intercept for the model below represents, on average, the likelihood of earning a four-year degree for an 8th grade Latino female, in the year 2003, with ISAT scores in the 40th-59th percentile, living in a low-poverty neighborhood, not receiving special education services and attending an average neighborhood school.

Model (students nested in elementary schools)

$$\eta_{ij} = \gamma_{00} + \gamma_{10\text{-}}\ \gamma_{40}*ISAT\_decile_{ij} + \gamma_{50}*SCON_{ij} + \gamma_{60\text{-}}\ \gamma_{90}*COHORT_{ij} + \gamma_{100}*SPEDD_{ij} + \gamma_{110}*\mathrm{D}BLACK_{ij} + \gamma_{120}*DWHITE_{ij} + \gamma_{130}*DASIAN_{ij} + \gamma_{140}*DNATAM_{ij} + u_{0j}$$

In the above model, η_{ij} refers to the probability of earning a four-year degree in six years. γ_{00} represents the mean four-year college completion rate for the intercept student. Each of the coefficients for the included variables represents the variable specific deviation in mean four-year college completion for a one unit change in the variable. As all variables are dummy variables, this variation can be interpreted as the change in four-year college completion prospects, relative to the intercept, for members of that demographics group, holding all else constant. Coefficients for u_{0j} are the elementary specific fixed effects, which represents the school-level mean variation in probability of four-year college completion for students at a given school holding all else constant.

This study is focused on inequitable access to postsecondary opportunities, thus establishing that students who attend certain elementary schools have systematic differences in outcome, even after controlling for demographics and test scores is fundamental to the argument of inequitable access. Because this model nests students in elementary schools, but does not control for the high school and colleges students ultimately attend, the cumulative relationship between

students' elementary to college trajectory and likelihood of college completion are captured in the elementary school fixed effect. This is critical, as this study does not seek to make a causal statement about how or why different school patterns may impact students' college completion prospects, simply, that after controlling for demographics and test scores, there are education factors related to where students attend elementary school that predict students' likelihood of completing college.

All schools with fixed effects that did not differ significantly from zero were assigned a Postsecondary Pathway of "standard". Schools with fixed effects that were significantly positive were assigned a Postsecondary Pathway of "high", and schools with fixed effects that were significantly negative were assigned a Postsecondary Pathway of "low". Each student was then assigned their elementary school specific fixed effect, so that every student in the same elementary school has the same Postsecondary Pathway score. Assigning the school-level Postsecondary Pathway measure as a student level variable allows for school-level composition of Post Secondary Pathway and student-level exposure to Postsecondary Pathway to be compared across the district. School-level and student-level composition of Postsecondary Pathway is depicted in Table IV.1.

To determine whether school characteristics predict Postsecondary Pathway, a series of regressions are employed. The model below estimates the likelihood of a school having a high or low Postsecondary Pathway compared to a standard Postsecondary Pathway based solely on the five school types designated by the district (traditional, charter, magnet, alternative, and special education), and the two additional types (middle-high and academic center) assigned in this study.

Model

$$\text{Postsecondary\_Pathway}_j = \gamma_0 + \gamma_1 * Academic\_Center_j + \gamma_2 * Middle\_High_j + \gamma_3 * Charter_j + \gamma_4 * Magnet_j + \gamma_5 * Alternative_j + \gamma_6 * Special\_Educaiton_j + e$$

Multinomial regression analysis is used to predict school-level Postsecondary Pathway from school type. As there are six designated school types, the intercept for the model is a neighborhood elementary school. The five other district categories are included as dummy variables. In addition to the district specified types, the two additional types of schools specified in this study (academic center and middle-high) are also included as dummy variables. Thus, the intercept for the model specified below ends up being a neighborhood elementary school that is neither an academic center nor a middle-high. Lastly, to gain a better understanding of how enrollment in school type varies by race, ethnicity, disability status, and socio-economic status, a series of Chi Square analyses are conducted, comparing expected versus observes enrollment rates, for each school type by the subgroups specified above.

Results

Results from the nested model to isolate elementary school fixed effects indicate that differences in students' probability of earning a four-year college degree are substantial across elementary schools, even after controlling for student demographics and test scores. While the majority of elementary schools do not vary significantly from zero, where differences are significant, they were also quite pronounced. Of the 510 elementary schools in the sample, 400 (78.43 %) do not have significant fixed effects and thus have standard Postsecondary Pathways, 71 (13.92 %) have positive, statistically significant fixed effects and thus are designated high

Postsecondary Pathways. Lastly, 39 (7.65 %) have negative, significant fixed effects and are thus labeled as low Postsecondary Pathways. Students in the sample are disproportionately concentrated in schools with high or low pathways, resulting in 16.78 % of students enrolled in an elementary school with a high Postsecondary Pathway, and 10.43 % of students enrolled in an elementary school with a low Post Secondary Pathway (see Table IV.2).

Logits for school fixed effects ranged between -.8710 and 1.5761. Schools with a negative fixed effects ranged from -.2730 and -.8710, corresponding to a reduction in probability of earning a four-year degree of 3.02 to 7.73 percentage points respectively. Coefficients for schools with positive fixed effects ranged from .2808 and 1.5761, corresponding to an increase in probability of earning a four-year degree of 3.78 to 30.28 percentage points respectively. To put this in perspective, students attending a school with the highest Postsecondary Pathway indicator ($\beta = 1.5761$), on average have increased college completion prospects that exceed moving every student in that school from the 40th-59th percentile in 8th grade test score to the 80th and above percentile of 8th grade test scores. No other variable in the model has potentially as large of a positive relationship to Postsecondary Pathway as elementary school of attendance. However, when comparing factors that are negatively correlated with students' probability of completing college, test scores appear to have the greatest relationship to reduction in students' college completion prospects. Moving from the 40th-59th percentile to the bottom 19th percentile is associated with a reduction in students' college completion prospects of 10.71 percentage points, exceeding even the high end of potential negative school fixed effects of 3 percentage points.

After estimating school fixed effects, and categorizing those fixed effects into Postsecondary Pathways, a series of multinomial regressions were employed to determine whether

school type is a significant predictor of Postsecondary Pathway. Results indicate that being an academic center or a magnet school, substantially increases the log odds of a school falling in the high Postsecondary Pathway (β =3.0805, p<.0001; and 3.5275, p<.0001) equating to a 63 and 85 percentage point increase respectively. Results also indicate that being a middle-high substantially increases the logodds of falling in the low Postsecondary Pathway designation by 31 percentage points (β =1.6845, p.<.0001), and is the only significant predictor of low Postsecondary Pathway amongst the school types examined. Interestingly, being a charter school significantly increases the likelihood of falling in the high Postsecondary Pathway by 9 percentage points (β =.6599, p, .0001).

The previous results support a significant relationship between school type and Postsecondary Pathway. To examine whether enrollment in school type differs significantly by race, ethnicity, disability status, and socio-economic status, a series of Chi-Square tests were conducted. As reported in Table IV.5, there is significant variation in enrollment by school type and race. Specifically, White or Asian students are more likely to be enrolled in magnet schools compared to their Black or Latino peers (12.86% and 16.76% vs 5.96% and 4.25% respectively) X^2 (20, 108,271)=2125.16, p<.001. Students with disabilities are less likely to be enrolled in charter and magnet schools than their peers without disabilities (2.27% and 5.15% vs. 3.45% and 6.5% respectively), X^2 (15, 108,271) =3892, p<.001. Lastly, students who live in low poverty neighborhoods are twice as likely to attend a magnet school than their peers in the highest poverty neighborhoods (8.5% vs 4.44%), X^2 (15, 108,271) =5888.38, p<.001. These relationships are important to note as there is a strong correlation between magnet and academic center school type and Postsecondary Pathway, (r (108,271) =.51, p<.001 and .45, p<.001 respectively). It should be

noted, that while differences in enrollment by gender are statistically significant, the size of this difference is marginal (less than one percent).

Sensitivity Analysis

Given the small number of students enrolled in alternative schools (including detention centers) and special education programs, a separate regression was run, omitting these schools, to examine whether the relationship between the four, more populated school types and postsecondary pathway remained consistent. Results were not changed. Due to the redundant nature of the results, a table is not included.

Discussion

The results presented above detail the extent to which Black, Latino, lower income students, and students with disabilities in Chicago Public Schools are more likely to attend elementary schools where their peers are earning four-year college degrees at rates lower than expected, given the racial, ethnic, socio-economic, disability, gender, and test score composition of the school. This, is not occurring to the same degree for White, Asian, higher income students, and students without disabilities. These results are troubling. But, results also indicate that school type may serve as a valuable indicator for identifying students who may need additional help in the transition to high school and college. Specifically, middle-high combination schools are more likely to have a low Postsecondary Pathway, thus students attending these schools (n=2,646) have peers who are less likely to earn a four-year college degree than expected given the demographic and test score composition of the school. Results also indicate that students attending magnet schools and academic centers are attending schools where their peers are more likely than

expected, given their academic and demographic profile, to go on to earn a four-year college degree (high Postsecondary Pathway).

District administrators should conduct a thorough needs assessment of middle-high students, and provide targeted supports to students in middle-high combination schools. District administrators should also conduct a comparison of district provided and external resources available to students at low Postsecondary Pathway schools and high Postsecondary Pathway schools. Such an evaluation not only helps identify needs that students in low Postsecondary Pathway schools may have, but also can help inform funding structures at the state and district level to be more equitable.

Limitations and Future Research

The results presented above make a strong case for disparities—by race, ethnicity, socio-economic and disability status—in equal opportunity for four-year college completion. However, they are limited in their ability to answer *why* disparities exists, and what aspect of the elementary school environment might contribute to whether a school has a high or low Postsecondary Pathway. It is possible that guidance counseling, basic needs services, academic rigor, leadership or college enrollment norms might all play a role in determining whether students will be on a path for four-year college completion. Future research should also examine whether Postsecondary Pathway differs by two-year and four-year college enrollment. It may be possible that a schools might be more successful in connecting their students to two-year college degrees than four-year college degrees. Examining how these patterns may align or diverge is important for ensuring a greater understanding between school feeder patterns and inequities in college completion. Lastly, future research should examine whether the district's new application process

for high school enrollment has altered enrollment patterns between elementary schools and high schools, and potentially altered the composition of elementary school Postsecondary Pathways across the district.

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APPENDIX IVA: CHAPTER IV TABLES AND FIGURES

Table IV.1. Student Enrollment by Elementary School Type

School Type	Frequency	Percent
Neighborhood	96606	89.32
Magnet	6783	6.27
Charter	3600	3.33
Middle-High	2646	2.44
Academic Center	2325	2.15
Processing	526	0.49
Special Ed	331	0.31
Alternate/ Jail	309	0.29
Missing=119		

*Note: cumulative frequency and percentages are not reflected as this figure represents the five district classifications and the two school type classifications specified in this study (academic center and middle-high), therefor schools can be classified into multiple categories.

Table IV.2. Prevalence of District Specified Elementary School Type

School Type	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Neighborhood	440	86.96	440	86.96
Magnet	29	5.73	469	92.69
Charter	25	4.94	494	97.63
Alternate/ Jail	5	0.99	499	98.62
Special Ed	5	0.99	504	99.6
Processing	2	0.4	506	100
Missing= 4				

*Note: This table omits the classifications of Middle-high and academic center as these categories are not exclusionary to classification in one of the other categories listed above.

Table IV.3. School-level and student-level composition of Postsecondary Pathway

		Student Level		
Pathway	Frequency	Percent	Cumulative	Cumulative
			Frequency	Percent
high	18171	16.78	18171	16.78
low	11297	10.43	29468	27.22
standard	78806	72.78	108274	100
		School level		
pathway	Frequency	Percent	Cumulative	Cumulative
			Frequency	Percent
high	71	13.92	71	13.92
low	39	7.65	110	21.57
standard	400	78.43	510	100

Table IV.4. Four-year College Degree as a Function of Student Demographics and Test Scores

	Logit Estimate	Point Estimate	Std Error	t	Value
Intercept	-1.7969	0.1422	0.0470	-38.24	<.0001
20th-39th	-0.6605	-0.0633	0.0390	-16.96	<.0001
60th-79th	0.6719	0.1029	0.0301	22.32	<.0001
80th and above	1.5326	0.2921	0.0297	51.53	<.0001
below 20th	-1.5175	-0.1071	0.0562	-27	<.0001
high average	-0.1227	-0.0143	0.0325	-3.78	0.0002
highest poverty	-0.2364	-0.0264	0.0390	-6.07	<.0001
low average	-0.0506		0.0283	-1.79	0.0733
2004	-0.03382		0.0329	-1.03	0.3046
2005	-0.1374	-0.0159	0.0322	-4.26	<.0001
2006	-0.157	-0.0181	0.0320	-4.9	<.0001
2007	-0.168	-0.0193	0.0319	-5.27	<.0001
White	0.4704	0.0675	0.0368	12.78	<.0001
Black	0.08063	0.0102	0.0348	2.32	0.0204
Native Am.	-0.1694		0.2268	-0.75	0.4553
Asian/PI	0.998	0.1681	0.0497	20.08	<.0001
Male	-0.5867	-0.0578	0.0204	-28.73	<.0001
504 plan	-0.03947		0.0816	-0.48	0.6287
cognitive/behav	-0.5449	-0.0545	0.1914	-2.85	0.0044
emotional	-1.0636	-0.0881	0.2204	-4.83	<.0001
language	0.2055		0.1501	1.37	0.1711
Learning	-0.2128	-0.0240	0.0573	-3.71	0.0002
Physical	0.09126	0.1893	0.1609	0.57	0.5706

Type III Tests of Fixed Effects

Effect	DF	F	Pr
ISAT_decile	4	1497.81	<.0001
Poverty	3	12.92	<.0001
Cohort	4	11.16	<.0001
Race/Ethnicity	4	118.81	<.0001
Gender	1	825.32	<.0001
Special Ed	6	7.49	<.0001

N=108,273

Table IV.5. Predicting Postsecondary Pathway From School Type and Demographics

Versus standard pathway (in LogOdds)					
	DF	Estimate	StdErr	t-value	p,.05
Intercept	hig	-1.9703	0.01	35093.97	<.0001
Intercept	low	-1.9246	0.01	34544.77	<.0001
Acad. center	hig	3.0805	0.06	3036.86	<.0001
Acad. center	low	-13.8657	134.10	0.01	0.92
Middle-high	hig	0.1843	0.06	8.38	<.0001
Middle-high	low	1.6845	0.05	969.11	<.0001
Charter	hig	0.6599	0.05	200.94	<.0001
Charter	low	-14.5779	48.12	0.09	0.76
Magnet	hig	3.5275	0.03	10272.49	<.0001
Magnet	low	-15.017	144.40	0.01	0.92
Alternative	hig	-14.1621	165.30	0.01	0.93
Alternative	low	-14.5042	211.20	0.00	0.95
Special ed	hig	-14.0023	161.10	0.01	0.93
Special ed	low	-14.5608	196.20	0.01	0.94

N=108,273

Table IV.6. Differences in School Type Enrollment by Demographics

	Neighborhood	Magnet	Charter	Academic Center	Middle-High	Chi Square	DF	p
White	7257	1095	94	488	29	2125.16	20	<.001
	84.95	12.82	1.1	5.71	1.1			
Black	49000	3306	2301	1273	2358			
	88.48	5.96	4.15	2.29	4.25			
Asian	3166	648	43	357	25			
	81.87	16.76	1.19	9.23	0.65			
Latino	37055	1709	1158	201	231			
	92.16	4.25	2.88	0.5	0.57			
Disability	16001	938	414	154	317	3892	5	<.001
	87.81	5.15	2.27	0.84	1.74			
No Disability	80605	5845	3186	2171	2319			
	83.44	6.5	3.54	2.41	2.59			
Highest Pov	24893	1219	972	435	1046	588.38	15	<.001
	90.63	4.44	3.54	1.58	3.8			
High Ave	23825	1526	939	525	837			
	89.64	5.74	3.53	1.97	3.15			
Low Ave	24006	1740	1083	506	549			
	88.62	6.42	4	1.87	2.03			
Lowest Pov	23882	2298	606	859	214			
	88.38	8.5	2.24	3.18	0.79			
Female	50761	3695	2016	1409	1491	286.22	5	<.001
	89.31	6.5	3.55	2.48	2.62			
Male	45845	3088	1584	916	1155			
	89.86	6.02	3.09	1.78	2.25			

N=108,273

Table IV.7. Correlation between School Type, Demographics and Postsecondary Pathway

Correlation Table for Analytic Sample					
Variable	Pathway(cont.)	Academic Center	Middle-High	Charter	Magnet
Pathway (cont.)	---	0.44964***	-.06265***	.02257***	.50874***
Black	-.08989***	.03118***	.12912***	.05346***	-.01326***
%Latino	-.12799***	-.09627***	-.10864***	-.02766***	-.07868***
%Asian	.37461***	.11840***	-.04356***	-.04353***	.13603***
%White	.31430***	.07643***	-.06840***	-.06343***	.12925***
Neighborhood Poverty	-0.20731***	-.04222***	.05818***	.02064***	-.07168***
Disability	-.04148***	-.04042***	-.02052***	-.02643***	-.02075***

N=108,273

CHAPTER V. CONCLUSION

This dissertation makes the case that inequitable access to four-year college opportunity starts early by establishing three important criteria. First, Chapter 2 demonstrates that outcomes in high school graduation, four-year college enrollment, and four-year college completion are not equitable for students of color, students from lower income neighborhoods, students with disabilities, and male students. In doing so, Chapter 2 meets the first criteria of Opportunity Gap theory by establishing that outcomes are not equitable across demographic groups. Second, Chapter 3 examines the relationship between elementary school, high school, and college enrollment patterns, and four-year college completion. In doing so, Chapter 3 established that the inequities we see in four-year college completion are at least, in part, related to school enrollment patterns. This is fundamental, as school enrollment is a limited resource, and not all students have access to all schools. Establishing that inequities in outcome are related to resource constraints is the second criteria of establishing a gap in opportunity. Lastly, Chapter 4 establishes that students enrolled in some school types have lower college completion rates than expected given their school's demographics and test score composition by presenting a novel measure called Postsecondary Pathway. Chapter 4 also establishes that enrollment in schools that tend to have higher Postsecondary Pathways is not equitable across race, ethnicity, disability status and neighborhood poverty level. These inequities place Black, Latino, disabled, and lower income students at a distinct disadvantage in elementary school with regards to four-year college completion. Together, these elements establish a strong case for an opportunity gap for four-year college completion for similarly achieving marginalized students compared to their more advantaged peers in Chicago Public Schools.

While the results presented in this dissertation hold the possibility for important policy and practice implications, they should be viewed cautiously. This dissertation does not present causal evidence that any particular experience or policy is the cause of the inequities observed in this dissertation. What this dissertation does, is provide a basis and a framework for understanding how school enrollment patterns from elementary school through college may contribute to the longitudinal inequities we see in four-year completion, and help identify points of intervention in elementary school to reduce these inequities.

This dissertation sought to identify whether elementary school students of differing demographic groups in Chicago Public Schools experienced disparities in opportunity for college completion, and whether the school system could account for at least part of those disparities. Results from the analysis presented in Chapter 2, solidly establish that there are substantial gaps in college completion for students of similar test scores from different demographic groups. Inequalities in education attainment for students with emotional and behavioral disabilities were consistent and pronounced across education benchmarks, even when controlling for test scores and demographics. Smaller, although significant differences were also found for male students, and Latino students.

Chapter 4 sought to identify whether elementary school type is predictive of a high or low Postsecondary Pathway. Results indicated that 17 % of students in the sample attended elementary schools where their peers had Postsecondary Pathways associated with higher college completion prospects than expected, and 10 % attended elementary schools where their peers had Postsecondary Pathways associated with lower college completion prospects than expected. Results from analysis in Chapter 4 also indicated that elementary school type was a significant

predictor of whether students in that school would experience a high or low Postsecondary Pathway. Specifically, magnet school status and academic center status were associated with a higher probability of positive Postsecondary Pathway. Middle-high schools were associated with decreased likelihood of positive postsecondary pathway.

It is important that future research build upon the results presented in this dissertation and ask the telling and rigorous questions that still remain. Why do students with behavioral disabilities experience such lower educational attainment than their academically similar peers without disabilities? Are part of these differences due to disparities in disciplinary practices for students with emotional and behavioral disabilities? Is the classification of students as having a behavioral or emotional disability being used appropriately, and are these students receiving the support they need to learn in the least restrictive environment possible? Are there practices happening within classrooms that place students with emotional and behavioral disabilities at a distinct disadvantage?

Beyond the experiences of students with emotional and behavioral disabilities, there remain additional questions regarding enrollment. What are the factors influencing the enrollment patterns of students? Does Chicago's new One Application enrollment process, which encourages all students to participate in a singular high school application process, alleviate or exacerbate inequities in postsecondary pathway? What causes students and families to apply to some schools and not others? Are families across all demographic groups engaging the elementary school enrollment process in similar ways?

For far too long, college completion has been examined as a function of individual students, not institutions. Research over the last decade has opened up this view to question the role of

colleges in the success of the students they serve, a pivot that was seen as revolutionary. But there exists a dearth of research, and even conversation, about college success as a function of the education system students engage in K-16. College success is not solely the function of a singular experience at a particular moment. It is the culmination of experiences over an academic career, from kindergarten through college that provide a constellation of support and risk factors for students. These experiences are not crafted by students and families alone. Decisions about students' education experiences are being made by teachers, principals, superintendents, mayors, governors and by those at the federal level. These decisions are not haphazard. They are made to protect the interests of the constituents and stakeholders with the most power. To pretend that education systems provide equal opportunity is to pretend that parents with resources and the political players they influence would willingly, and systematically design an education system not in their own best interests.