Long-Term Impacts of KIPP Middle and High Schools on College Enrollment, Persistence, and Attainment

Final Report

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Executive Summary

The Knowledge Is Power Program (KIPP) is the nation's largest network of public charter schools. KIPP began as a network of charter middle schools designed to serve underserved communities, with the goal of closing achievement gaps and preparing students to succeed in college. KIPP has since expanded its model to include elementary and high schools in most regions, and expanded its goals to include preparing students to persist in multiple postsecondary pathways.

Prior research has demonstrated that KIPP has large positive impacts on student achievement (Angrist et al. 2010; Tuttle et al. 2013; Gleason et al. 2014; Tuttle et al. 2015; Knechtel et al. 2017). However, less is known about the network's impacts on longer-term outcomes, such as entry into and success in college. Prior studies have examined whether the success of other charter school networks like KIPP in improving student test scores can translate into success in improving longer-term college outcomes; the results were mixed, with findings that vary across charter school operators and grade levels (Greene 2016; Angrist et al. 2016; Davis and Heller 2019; Place and Gleason 2019).

In this report, we present the results of the second phase of a long-term tracking study that follows 2,066 students who applied to enter 21 oversubscribed KIPP middle schools through an admission lottery in 2008, 2009, or 2011. The first phase of our study examined the impacts of KIPP middle schools on enrollment and early persistence in four-year colleges using the first two of these three cohorts (Coen et al. 2019). This report builds on the 2019 study in two important ways: We increased the study's statistical power by adding a third cohort of students, and we tracked the students over a longer period. For all three of the study cohorts, we can observe college enrollment and college persistence patterns for three years; for the first two study cohorts, we can also examine college persistence and college graduation rates over five years. In addition, this phase of the study introduces a new analysis that separately examines the effects of attending both a KIPP middle school and a KIPP high school, providing a more detailed picture of how college outcomes vary across students who attended KIPP for varying lengths of time.

The study uses a randomized controlled trial design to ensure that students who were offered admission to a KIPP middle school (the treatment group) are similar on average to students who did not receive an offer of admission (the control group) on both observable characteristics, such as prior test scores, and unobservable characteristics, such as levels of motivation and parental support. The study focuses on two primary research questions:

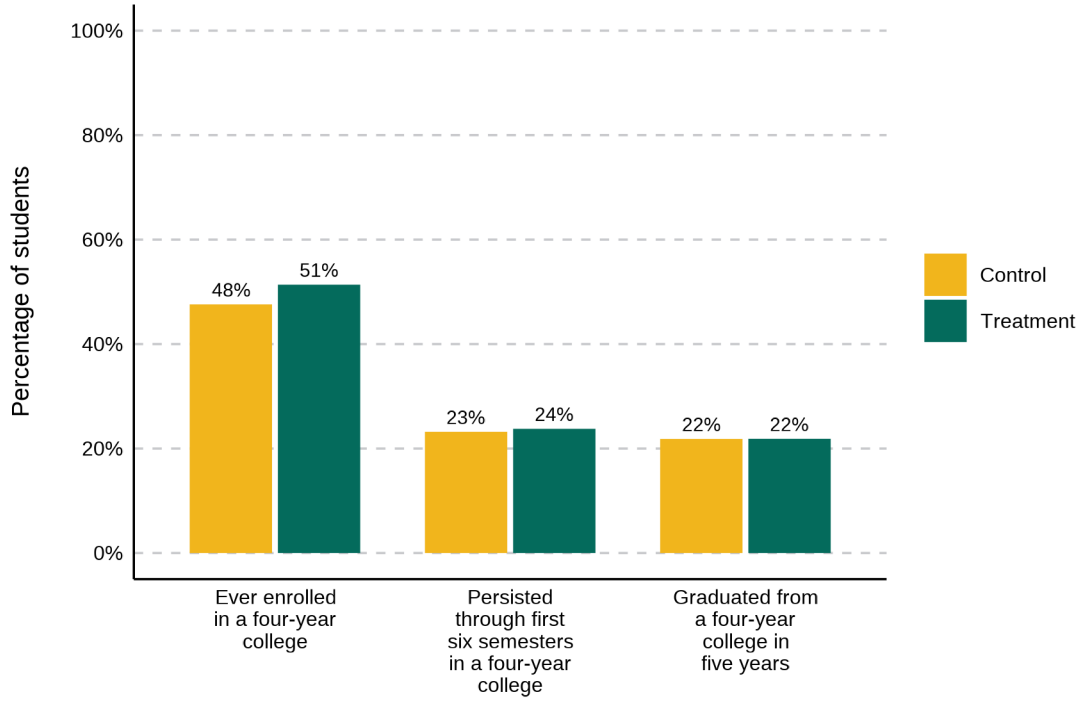
1. What impact do KIPP middle schools have on students' enrollment in a four-year college during the first three years after high school graduation?
2. What impact do KIPP middle schools have on persistence in four-year college programs during the first three years after high school graduation?

Because we can track our first two cohorts over a longer period (five years after high school graduation), we also explored the impacts of KIPP middle schools on four-year college degree completion. To collect information about these outcomes, we gathered data from the National Student Clearinghouse on college enrollment and graduation. Our primary impact estimates of KIPP middle schools compare students who received an admission offer through the lottery with students who did not receive an offer. These intent-to-treat (ITT) impact estimates use a conservative approach that includes students in the treatment group even if they declined to enroll in a KIPP school after receiving an admission offer.

KIPP middle schools had a positive impact on enrollment in four-year college programs, but the effect was not statistically significant. On average, students who received an admission offer to a KIPP middle school were 3.8 percentage points more likely to enroll in a four-year college than students who applied to KIPP but were not offered admission (p-value = 0.123) (Figure ES.1). Students who received

an admission offer had a rate of persistence in four-year colleges that was very similar (within 1 percentage point) of those who were not offered admission (p-value = 0.784). Among our first two cohorts, students who received an admission offer to a KIPP middle school also graduated from a four-year degree program at rates similar to those of students not offered admission (p-value = 0.992). In an exploratory analysis, we also adjusted each impact estimate by accounting for which students ended up attending a KIPP middle school (this is often referred to as a "treatment-on-the-treated" impact estimate). With this adjustment, the impact estimates generally increase in magnitude but still do not reach statistical significance.

Figure ES.1. Impact of KIPP middle schools on four-year college enrollment, persistence, and graduation



Note: Study includes 2,066 students who applied to enter KIPP through middle school admission lotteries. The college graduation outcomes includes 1,177 students from the first two cohorts. The model pools all 21 lottery schools (13 lottery schools for the college graduation outcome) and estimates outcome means by regressing the outcome measure on treatment status using inverse probability weights and controlling for student-level covariates and the lottery school, year, and grade. The control mean is unadjusted, and the treatment mean is the sum of the control mean and the regression-adjusted difference between groups.

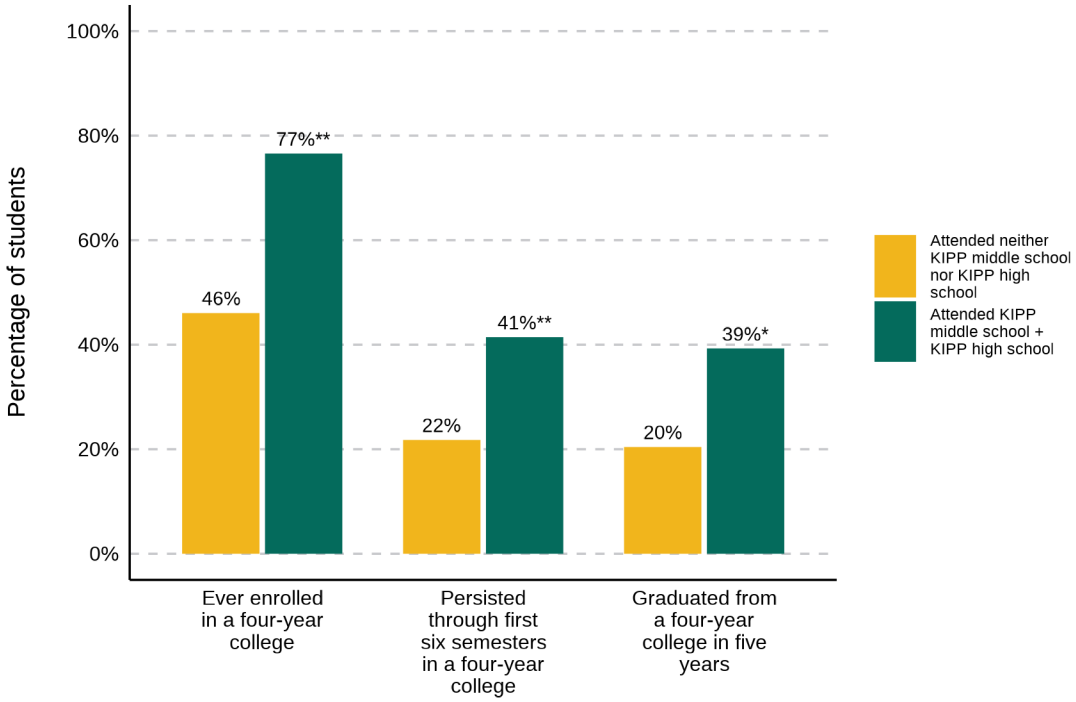
In a separate exploratory analysis, we also examined the combined effect of attending KIPP for both middle school and high school compared with never attending KIPP. Because many of KIPP's college-preparation and support programs take place in KIPP high schools, it is plausible that the direct effects of attending a KIPP middle school on college-related outcomes could differ substantially from the combined effect of attending KIPP for both middle and high school. To examine this issue, we estimated an instrumental variables (IV) model based not only on the randomized admission lotteries described above, but also on the differences between KIPP regions in the availability of KIPP high schools—in other words, differences in KIPP middle school students' opportunities to go on to attend a KIPP high school. We measured the availability of KIPP high schools in a region using what we refer to as the high school ratio (*HSR*) which represents the capacity of the region's KIPP high schools relative to the capacity of KIPP middle schools at the time the student was making the transition from middle to high school. Approximately half of the students in our study's treatment group who attended KIPP middle schools went on to attend a KIPP high school, and a much smaller share of students in the control group attended

a KIPP high school. Because this analysis deviates from our primary analysis in several ways, the analysis is considered exploratory.

Attending both a KIPP middle school and a KIPP high school had large, positive impacts on students' college enrollment and college persistence rates (Figure ES.2). Compared to students who did not attend KIPP, students who attended both a KIPP middle and high school were 30.5 percentage points more likely to enroll in a four-year college within three years of graduating high school (p-value < 0.000) and 19.7 percentage points more likely to persist for at least three years in a four-year college upon graduating high school (p-value < 0.000).

KIPP middle and high schools also had a large and statistically significant combined effect on college graduation rates. Compared to students who did not attend KIPP schools, students who attended KIPP middle and high schools were 18.9 percentage points more likely to graduate from a four-year college within five years after high school (p-value = 0.025).

Figure ES.2. Impact of KIPP middle and high school attendance on four-year college enrollment, persistence, and graduation



Note: Study includes 2,066 students who applied to enter KIPP through middle school admission lotteries. The college graduation outcome includes 1,177 students from the first two cohorts. Estimates use the lottery and *HSR* as instruments for whether a student ever attended a KIPP middle school and a KIPP high school. The model pools all 21 lottery schools (13 lottery schools for the college graduation outcome) and estimates outcome means by regressing the outcome measure on treatment status using inverse probability weights and controlling for student-level covariates and the lottery school, year, and grade. The control mean is unadjusted, and the treatment mean is the sum of the control mean and the regression-adjusted difference between groups.

*Impact estimate is significantly different from zero at the .05 level, two-tailed test.

**Impact estimate is significantly different from zero at the .01 level, two-tailed test.

HSR = high school ratio.

The magnitude of these impact estimates is large, and effects of this size have substantial policy relevance. For example, these impacts match or exceed the gaps in college attainment rates in the United States among Black and Hispanic students, compared to White students. Nationally, among students ages

25 to 29, 45 percent of White Americans have a bachelor's degree compared to only 26 percent of Black Americans and 23 percent of Hispanic Americans—degree completion gaps of 19 and 22 percentage points, respectively (National Center for Education Statistics 2022). Our study shows that KIPP middle and high schools have a combined effect of approximately 19 percentage points on college completion rates, for a group of students that is almost entirely composed of Black or Hispanic students from low-income families. An effect of this size, extrapolated nationwide, would be large enough to nearly close the degree-completion gap for Hispanic students or entirely close the degree-completion gap for Black students in the United States.

Previous research on KIPP high schools and interviews with KIPP college support staff suggest that these findings may be driven by the college preparatory culture at network high schools, as well as college-related supports delivered to KIPP high school students and alumni. To prepare students for the intellectual challenges of college, KIPP high schools make rigorous coursework (including Advanced Placement [AP] courses) available to all students ("KIPP High School Excellence Blueprint" 2019). Prior research has shown that KIPP middle school students who have the opportunity to attend a KIPP high school enroll in more AP courses and, correspondingly, take or intend to take more AP exams than KIPP middle school students without access to a KIPP high school (Tuttle 2015). KIPP high schools also work to establish a "college-going culture" by providing a range of college-related supports to high school students and alumni. For example, every KIPP high school student is paired with a college counselor who provides support in identifying and applying to college programs that are well matched to students' capabilities, goals, and needs ("Match Matters in Your Region" 2014). KIPP regions also help students and families with financial aid applications and support students in identifying and applying to precollege summer programs, like enrichment programs on college campuses. Further, KIPP regions also provide alumni with additional advice and support after they graduate from high school. For example, advisors or peer mentors meet with alumni to check in on their academic progress through virtual counseling and on-campus visits. In recent years, KIPP has broadened supports for students and alumni to include career-centered counseling and supports for multiple viable postsecondary pathways, including four-year degree programs as well as associate degree programs, career and technical education (CTE) programs, and the military. These college- and career-related supports are largely directed to KIPP high school students and high school alumni. For students who attend a KIPP middle school but do not attend a KIPP high school (including those in regions without any KIPP high schools), these support programs are more limited and the lack of consistent contact with KIPP during high school can make accessing services more challenging. The academic preparation and breadth of college-related services directed to KIPP high school students and, to a lesser extent, the advising supports provided to high school alumni could help to explain why attendance at a KIPP high school is so central to the impacts we observed in this study.

The study has important implications for KIPP, as well as for other charter-school networks and school districts seeking to support student success in college. For example, our findings suggest that KIPP could deliver large, long-term benefits to its students by continuing to expand access to KIPP high schools and encouraging its middle school students to remain enrolled at KIPP through high school graduation. However, it remains to be seen whether KIPP's impacts on college enrollment and persistence will ultimately translate into improved employment and earnings outcomes for these KIPP alumni. Prior research suggests charter high school attendance may have some positive effects on long-term earnings (Sass et al. 2016; Dobbie and Fryer 2020), but such a study does not exist for KIPP schools in particular. As KIPP alumni pursue four-year college programs as well as alternative pathways, further research may also examine whether KIPP middle and high schools are affecting the earnings and employment outcomes of alumni who choose to pursue other options after high school, such as employment or military service, alongside those who choose to pursue a college degree before entering the labor market.

I. Introduction

A. The Knowledge Is Power Program

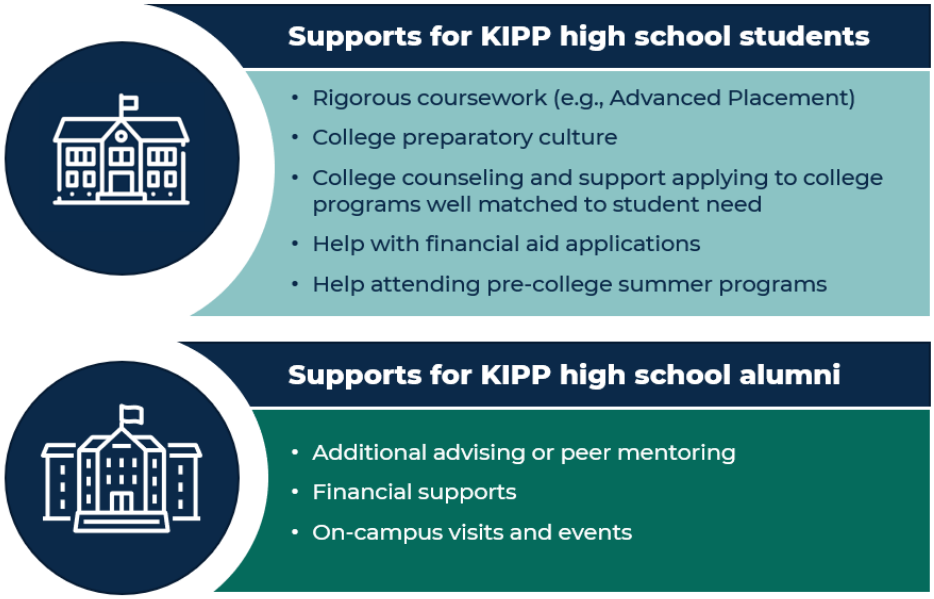
The Knowledge Is Power Program (KIPP) is the nation's largest network of public charter schools, serving nearly 120,000 students across a network of 280 schools located throughout the United States in the 2022-2023 school year. KIPP schools largely enroll students of color from low-income households: approximately 88 percent of KIPP students qualify for free or reduced-price school meals and 94 percent are African American or Hispanic. KIPP's model focuses on preparing these students for success in college and career, with an approach that emphasizes academic excellence, strong counseling and advising, and empowering effective teachers and school leaders.

To support students' efforts to choose and prepare for a postsecondary pathway that fits their goals, KIPP provides access to rigorous, college preparatory coursework (including Advanced Placement courses) as well as counseling and other college and career-related supports to students and alumni through the KIPP Forward program. With direction and resources from the national KIPP Foundation, regional KIPP Forward teams coordinate the delivery of various forms of support for local KIPP students (generally high school students) and KIPP alumni (generally alumni attending or planning to attend postsecondary institutions).

In the current study, all students who attended a KIPP high school had access to these college-related supports (Figure I.1). Most students received services through KIPP's former postsecondary support program known as "KIPP through College," which primarily supported students to prepare and succeed in traditional college pathways, with a focus on four-year college degrees. However, in recent years, the KIPP network expanded its mission, tasking schools to "prepare students with the skills and confidence to pursue the paths they choose—*college, career and beyond*." In 2021, KIPP rebranded the network's postsecondary support program as "KIPP Forward," marking a formal, networkwide shift to provide counseling and support for multiple viable postsecondary pathways (including four- and two-year degree programs, career and technical education programs, and the military). While all students in our study sample who attended KIPP high schools had access to the general supports listed in Figure I.1, some students in the sample may have experienced more career-related services because of the shift to KIPP Forward.[1] Additional details about the college-related supports offered to students in our study sample can be found in Appendix D.

[1] Students in our sample who attended KIPP and were still in high school in 2017 and 2018 may have had access to more career-related services and information about alternative postsecondary pathways than older students in our sample.

Figure I.1. College-related supports offered to KIPP high school students and alumni during the study period



Source: Interviews with KIPP staff from 10 KIPP regions, conducted in summer 2022, and KIPP Foundation materials.

B. KIPP's early impacts on student achievement

Prior research has shown that KIPP schools have large positive impacts on student achievement, as measured by standardized test scores (Angrist et al. 2010; Tuttle et al. 2013; Gleason et al. 2014; Tuttle et al. 2015; Knechtel et al. 2017). For example, Tuttle et al. (2013) used a random assignment design to estimate the impacts of 13 oversubscribed KIPP middle schools on student achievement. The design used the schools' admission lotteries to identify a treatment group of students who received a lottery-based admission offer and compared their outcomes to an equivalent control group of students who did not receive a lottery-based admission offer. For students who attended KIPP, the study found that these KIPP middle schools produced a large and statistically significant gain in students' math achievement of 0.36 standard deviations after two years and a gain in English language arts (ELA) achievement of 0.15 standard deviations, which was positive but not statistically significant. That study concluded when these students were still in middle school, but now enough time has elapsed to observe whether these students entered college and are completing or have completed college degrees.

The Tuttle et al. (2013) study also paired the lottery study with a nonexperimental analysis and verified that a matched comparison group design produced estimates of KIPP's achievement impacts that were similar to the lottery-based estimates for schools where both approaches were possible. Further, the study used the matched comparison group approach to examine the impacts of a broader sample of 41 KIPP middle schools and found that KIPP's achievement impacts were positive and statistically significant in both reading and math throughout four years of middle school. These middle schools also had positive and statistically significant impacts on test scores in the subjects of science and social studies.

Other studies have also provided evidence that KIPP schools have positive impacts on student achievement for elementary and high school students. A study of KIPP elementary schools found that a

lottery-based admission offer to KIPP resulted in positive and statistically significant impacts on three of four measures of students' reading and mathematics skills after three years (Tuttle et al. 2015). Additional evidence from that study suggested that KIPP prekindergarten programs positively affected student achievement above and beyond the effect of KIPP elementary schools (Knechtel et al. 2017). There is also evidence of positive effects in KIPP high schools. In a matched comparison group analysis, Tuttle et al. (2015) found that KIPP high schools had a positive and statistically significant impact on new KIPP entrants (students who did not transition from a KIPP middle school) in the subjects of math, ELA, and science (but not social studies). The study also found that KIPP high schools have positive effects on several aspects of college preparation, including exposure to guidance counseling about college, applying to college, and taking Advanced Placement (AP) courses and exams. Specifically, the study found KIPP has an 11-percentage point impact on the likelihood of students having in-depth discussions at school about how to pay for college (p-value = 0.00). KIPP students were also 5 percentage points more likely to apply to at least one college or university by spring of senior year (p-value = 0.04). Lastly, students with the opportunity to attend a KIPP high school enrolled in 0.9 more AP courses (p-value = 0.00) and, correspondingly, have taken or intend to take 0.82 more AP exams (p-value = 0.00).

C. Prior research on long-term charter school effects

While the evidence of KIPP's effectiveness in improving student test scores is widely known, less is known about the network's impacts on longer-term outcomes, such as entry into and success in college. These are important questions given that success in college, career, and beyond is a central pillar of KIPP's mission. There are also questions about whether the success of charter school networks like KIPP in improving student test scores can translate into success in improving longer-term college outcomes (Greene 2016). Doubts about this have been bolstered by the mixed results from other recent studies of charter schools' long-term effects, which may differ across charter school operators and grade levels. For example, one study found that a set of charter high schools in Boston had large positive impacts on test scores and on enrollment in four-year college programs (Angrist et al. 2016). Another study found similar positive impacts on college enrollment of a Chicago charter high school (Davis and Heller 2019). However, a national study of charter middle schools found that there were no long-term effects of attending a charter middle school on college enrollment, on average (Place and Gleason 2019). Moreover, that study found no relationship between the schools' effects on middle school test scores and the schools' effects on college enrollment. In other words, the schools in that study that were successful in improving middle school test scores did not improve students' postsecondary outcomes as well.

D. Current study on KIPP's long-term effects

This study is the first randomized controlled trial to estimate the long-term impact of receiving an admission offer at a KIPP middle school. The first phase of our study, completed in 2019, revealed that KIPP middle schools have a positive and statistically significant impact on students' enrollment in four-year colleges, as well as a positive—but not statistically significant—impact on college persistence over two years (Coen et al. 2019). This analysis included two cohorts of KIPP students who applied to enter 1 of 13 KIPP middle schools in 2008 or 2009.

This report presents the results of the study's second phase, which builds on the 2019 study in several important ways. First, we increase the precision of the study's impact estimates by adding a third cohort of students who applied to 14 KIPP middle schools in 2011, nearly doubling the study's sample size. Second, we track the students over a longer period (through spring 2022): for all three of the study cohorts, we can observe college enrollment and college persistence patterns for three years after high

school graduation; for the two older study cohorts, we can also examine college persistence and college graduation rates over five years. Finally, this phase of the study includes new exploratory analyses that examine the effect of KIPP high schools alongside the effect of KIPP middle schools, providing a more detailed picture of how college outcomes vary across students who attended KIPP for varying lengths of time.

II. Research Methods

In this chapter, we describe the data and methods we used to estimate the effects of KIPP middle schools on students' postsecondary outcomes. We begin by summarizing our research questions and estimation approach before defining the study sample, data sources, primary and secondary outcomes, and analytical model.

A. Research questions and overview of estimation methods

The study aimed to answer the following primary research questions:

1. What is the impact of KIPP middle schools on students' enrollment in a four-year college?
2. What is the impact of KIPP middle schools on persistence in four-year college programs for at least three years?

To answer these research questions, we used a lottery-based study design derived from the admission process at oversubscribed KIPP middle schools. When a KIPP school had more applicants than the number of available seats, it used a random lottery to determine who received an admission offer. The study used the school lotteries to form treatment and control groups, making it essentially a randomized experiment—the gold standard for estimating impacts. In a properly conducted random assignment study, the treatment group is similar to the control group at the time of the lottery on both observable characteristics (such as prior test scores) and unobservable characteristics (such as levels of motivation and parental support).

During the study period, KIPP continued to expand, with several regions opening new high schools or expanding existing ones, affording some KIPP middle school graduates with more opportunities to remain a part of KIPP beyond eighth grade. Other regions, however, had not opened a KIPP high school by the time the students in our sample graduated middle school. To better understand experiences of students after they applied to a KIPP middle school, we explored the effects of attending a KIPP middle school *and* a KIPP high school on our primary four-year college enrollment and persistence outcomes. To distinguish the effects of attending both KIPP middle and high schools with the effect of attending just a KIPP middle school, the study used an instrumental variables (IV) model that took advantage not only of the randomized admission lotteries described above, but also of the differences between KIPP regions in the availability of KIPP high schools. More specifically, in each region we measured students' opportunity to attend a KIPP high school by the ratio of the number of 9th-grade seats available at KIPP in the region relative to the number of KIPP 8th-grade graduates in that region. In regions where a larger number of high school seats were available, the opportunity to attend a KIPP high school was assumed to be higher. Because this analysis deviates from our primary analysis in several ways, the analysis is considered exploratory.

The study's analyses of the combined effects of KIPP middle and high schools aimed to answer the following exploratory research questions:

- What is the combined impact of KIPP middle and high school attendance compared with no KIPP attendance on students' enrollment in a four-year college?
- What is the combined impact of KIPP middle and high school attendance compared with no KIPP attendance on persistence in four-year college programs for at least three years, or graduation from four-year college programs in five years?

The study includes three cohorts of students who participated in admission lotteries across 21 different KIPP middle schools (Table II.1). The first two cohorts of students participated in the first nationwide randomized controlled trial of KIPP middle schools (Tuttle et al. 2013), while the third cohort participated in Mathematica's evaluation of KIPP's federal Investing in Innovation (i3) grant (Tuttle et al. 2015). In the two original studies, we compared the achievement outcomes of students who received a KIPP admission offer to the achievement outcomes of students who did not receive an admission offer through the lotteries. This follow-up study estimates the impacts of these middle schools on students' entrance into college and persistence in postsecondary programs approximately 12 to 14 years after the lottery.

Table II.1. KIPP middle schools included in analytic sample

State	City	KIPP school	Year opened	2008 lottery	2009 lottery	2011 lottery
CA	Los Angeles	Academy of Opportunity	2003		X	
CA	Los Angeles	Los Angeles College Prep	2003		X	X
CA	San Lorenzo	Summit Academy	2003	X	X	
DC	Washington	DC KEY Academy	2001		X	
DC	Washington	DC WILL Academy	2006		X	
GA	Atlanta	WAYS Academy	2003		X	X
GA	East Point	South Fulton Academy	2003	X	X	X
MD	Baltimore	Ujima Village Academy	2002			X
MA	Lynn	Academy Lynn	2004	X	X	X
NY	New York City	Academy New York	1995		X	X
NY	New York City	Infinity Middle School	2005			X
NY	New York City	STAR Harlem Middle School	2003			X
NC	Gaston	Gaston College Preparatory	2001			X
PA	Philadelphia	Philadelphia Charter School	2003			X
PA	Philadelphia	West Philadelphia Preparatory	2009			X
TX	Austin	Austin College Preparatory	2002		X	
TX	Austin	Austin College Prep with Austin Academy of Arts	2009			X
TX	Dallas	TRUTH Academy	2003		X	X
TX	Houston	Academy Middle	1995	X	X	
TX	Houston	Sharpstown College Prep	2007			X
TX	San Antonio	Aspire Academy	2003		X	

B. Study sample and data collection

The study sample consists of 2,066 students who applied to enter grade 5 or grade 6 at an oversubscribed KIPP middle school for either the 2008–2009, 2009–2010, 2010–2011, or 2011–2012 school year. The

study includes data from a total of 36 admission lotteries at the 21 schools, with each lottery representing a distinct combination of school, cohort, and entry grade. As of summer 2022, all students in the sample would have been old enough to have completed at least their third year of college if they followed a standard grade progression through middle and high school (Table II.2). In addition, 57 percent of the sample was old enough to observe college persistence and graduation outcomes for at least five years.

For a KIPP school to be eligible for the study, it had to (1) be oversubscribed—have more applicants than open seats—for 5th or 6th grade by its scheduled lottery date, (2) conduct a lottery to randomly select students for admission offers and produce a randomly ordered waitlist of students not selected for admission via the lottery, (3) make subsequent offers of admission to fill additional open seats following the randomly ordered waitlist, and (4) not exhaust the randomly ordered waitlist of original lottery participants through the start of the school year.

Table II.2. Overview of possible college semester exposure by cohort

Year cohort entered KIPP	Entry grade	Number of lotteries	Potential college semesters by summer 2022	Treatment (N)	Control (N)	Percentage of sample
2008	5	3	12	76	100	9
2008	6	1	14	33	33	3
2009	5	6	10	276	230	24
2009	6	9	12	150	279	21
2011	5	11	6	359	268	30
2011	6	6	8	99	163	13
Total		**36**		**993**	**1,073**	

Note: Because we do not directly observe high school graduation in our study sample, we assume a standard grade progression to estimate a student's potential number of college semesters.

The two original studies excluded students from the sample if they were automatically admitted to the school without participating in the lottery, as would typically happen for students who had a sibling already enrolled in the school. As a result, no students in the study's treatment or control group had any siblings enrolled at KIPP at the time of the lottery. Parental consent was obtained for eligible applicants to participate in the study prior to the schools' admission lotteries, which ensured that there was no systematic relationship between the likelihood of consent for given students and whether they received an admission offer to the school (and thus were in the treatment group) or did not receive an admission offer (and thus were in the control group). The average consent rate among lottery participants was 75 percent and was statistically equivalent for treatment and control students (74 percent and 76 percent, respectively).

To help confirm that the lotteries resulted in treatment and control groups with similar characteristics, we tested for differences between the two groups on key baseline student characteristics. Of the 23 baseline indicators available for the sample, the treatment and control group differ by less than 0.11 standard deviations in all cases. There were no statistically significant differences on the study's four baseline and pre-baseline achievement measures, and there was a statistically significant difference on only 1 of 19 measures of the students' demographic characteristics (Table II.3). These small differences are consistent with the random amount of variation we would expect in a sample of this size. In our regression model to estimate impacts, we also control for any remaining differences in baseline characteristics.

These baseline characteristics also provide a picture of how the students in the study compare to broader populations of students. Most of the sample consists of students of color from low-income households. Among the treatment group, approximately 48 percent of the students are Hispanic, 43 percent are Black, 77 percent are eligible for free or reduced-price lunch, 61 percent of families have incomes of less than $35,000 a year, 43 percent speak another language than English at home, and 43 percent of the mothers of students never enrolled in any type of postsecondary program. In terms of academic achievement, treatment group students had baseline test scores that were close to the average for their school district (scoring at the 46th percentile in reading and the 48th percentile in math).[2]

Table II.3. Baseline equivalence for the analytic sample

Baseline characteristic	Treatment	Control	Difference	Number with valid data
Baseline reading score (z-score)	-0.106	-0.149	0.043 (0.054)	1,161
Baseline math score (z-score)	-0.050	-0.121	0.070 (0.058)	1,167
Pre-baseline reading score (z-score)	-0.111	-0.171	0.059 (0.057)	1,073
Pre-baseline math score (z-score)	-0.116	-0.127	0.011 (0.060)	1,078
Student is female	0.502	0.488	0.015 (0.028)	1,879
Age relative to cohort (in years)	-0.004	-0.028	0.024 (0.025)	1,893
Student is Hispanic	0.479	0.485	-0.006 (0.019)	1,875
Student is White	0.024	0.033	-0.009 (0.008)	1,865
Student is Black	0.435	0.411	0.025 (0.017)	1,865
Student is other ethnicity	0.064	0.075	-0.012 (0.012)	1,865
Student has an Individualized Education Program	0.118	0.140	-0.022 (0.020)	1,584
Student received free or reduced-price lunch	0.773	0.750	0.023 (0.021)	1,696
Primary language at home is English	0.575	0.570	0.004 (0.021)	1,850
Household has only one adult	0.275	0.243	0.032 (0.024)	1,939
Family income is less than $15,000	0.193	0.183	0.010 (0.022)	1,568
Family income is $15,000 to less than $25,000	0.217	0.225	-0.008 (0.024)	1,568
Family income is $25,000 to less than $35,000	0.196	0.227	-0.032 (0.028)	1,568

[2] This sample of students at oversubscribed KIPP middle schools is also broadly representative of the overall population of KIPP schools at the time the studies began. See Appendix A for additional detail.

Baseline characteristic	Treatment	Control	Difference	Number with valid data
Family income is $35,000 to less than $55,000	0.203	0.177	0.026 (0.023)	1,568
Family income is greater than $55,000	0.191	0.188	0.004 (0.025)	1,568
Mother has less than a high school education	0.165	0.210	-0.045* (0.020)	1,735
Mother completed high school education	0.261	0.235	0.026 (0.024)	1,735
Mother has some college education	0.259	0.291	-0.033 (0.027)	1,735
Mother has at least a college education	0.316	0.264	0.052 (0.026)	1,735

Note: Standard errors reported in parentheses. The difference between lottery winners and nonwinners is based on a regression of the characteristic on treatment status and site indicators for the original analytic sample of 2,066. The lottery nonwinner mean is unadjusted, and the lottery winner mean is the sum of the lottery nonwinner mean and the regression-adjusted difference between groups. Missing data were not imputed: sample sizes differ by row, due to variation in data availability by site. All the baseline characteristics in this table are included as covariates in the study's primary impact model.

*Significantly different from zero at the 0.05 level, two-tailed test.

C. Data sources

Our data source for measuring students' college outcomes is the National Student Clearinghouse (NSC), which provides data on college enrollment, persistence, and degree completion at colleges and universities enrolling more than 97 percent of all public and private students in the United States (Dundar and Shapiro 2016). We requested data from the NSC on postsecondary enrollment patterns through the spring 2022 semester for 1,177 of the 1,179 students in the original randomized controlled trial study and 889 of the 891 students from the i3 evaluation for whom we have valid birthdates (for a total of 2,066 of the 2,070 students, or 99.8 percent). The NSC provides information on whether the students in our sample match a student in their database of those who attended a postsecondary institution. Students for whom there is a match are considered to have enrolled in a postsecondary institution. Students for whom there is no NSC match are defined as not having attended any postsecondary institution. In addition to using NSC enrollment data, we also used the NSC's indicator for college graduation to measure graduation rates for the first two cohorts of students in the study. (We did not measure college graduation rates for cohort 3 because most of the students in this cohort did not have enough time to complete four years of college by spring 2022, the final semester in our NSC data set).

It is possible that some students in our sample attended college but were not successfully matched in the NSC database due to data errors in names or birthdates, as well as colleges or students withholding enrollment data to the NSC (Dynarski et al. 2015). We used several approaches to mitigate this risk. We crosschecked multiple sources of students' birthdates in our sample, and if there was a discrepancy, we submitted both birthdates to the NSC. If a student had a middle name or a hyphenated last name, we submitted permutations of student names to the NSC to ensure that our request included each student's official name in the NSC database. Finally, the NSC reported the number of student matches that were blocked by the school or student and thus not included in our analysis (and coded as not enrolling). The rates were similar in the treatment and control groups (4 percent for the control group and 2 percent for the treatment group). Appendix A provides more information on our NSC data request.

In addition to the NSC database, we downloaded administrative data from the Integrated Postsecondary Education Data System, which provides information on college enrollment, graduation, financial aid, and demographics. The KIPP Foundation also provided student rosters for KIPP schools for the duration of the follow-up period, so we could ascertain the number of years that each student in the sample (including those in the treatment and control groups) attended a KIPP middle school or high school. For baseline data on the sample (measuring the characteristics of students before they applied to a KIPP middle school lottery), we used data collected for the original KIPP study and the i3 study, including lottery application records; a baseline survey of parents, which included demographic and socioeconomic information; and administrative records from states, districts, or schools that provided baseline and pre-baseline test score data for the study sample.[3]

Finally, to better describe the extent of college supports provided to KIPP students and alumni across study cohorts and schools in different regions, we conducted interviews with KIPP staff in regions served by the KIPP middle and high schools in our sample. Through these interviews, we collected information about the types of college-related support services available to students and alumni during the study period. We also asked staff about changes to programming over the last ten years, including changes related to the COVID-19 pandemic and the KIPP network's evolution to support diverse postsecondary pathways in addition to four-year college programs. Interviews took place in summer 2022 and included staff from 10 of the 13 regions served by KIPP schools in our study. The interviews cover regions that include 86 percent of the KIPP middle schools and 83 percent of the students in the study sample.

D. Outcomes

Our analysis focused on two primary outcomes: college enrollment and college persistence.[4] We define our primary measures as:

- ***Ever enrolled in a four-year college.*** Student was enrolled in a four-year college within three years following the student's expected high school graduation date.
- ***Persisted through first six semesters in a four-year college.*** Student was enrolled in a four-year college for six consecutive semesters, following the student's expected high school graduation date.

While the KIPP network seeks to counsel and support students who may choose a variety of career pathways, it is heavily focused on helping students to enroll and succeed in four-year postsecondary programs with relatively high graduation rates, particularly among first-generation, Pell Grant-eligible students of color. As such, the study's primary analyses focus on enrollment and persistence in four-year postsecondary programs (rather than two-year programs).

Because we do not directly observe high school graduation in the data collected for this study, we assume each student followed a standard grade progression from the date of their middle school admission lottery through to the end of high school.[5] As a result, patterns of grade retention among students in the sample

[3] In coordination and agreement with NSC and Arnold Ventures, a restricted use file containing the data used to conduct the impact analyses is available to external researchers upon request. Requests for the restricted use file can be sent to researchrequests@kipp.org.

[4] Prior to collecting any data or performing data analyses, we preregistered the study's choice of primary outcomes and analytical methods through the Open Science Framework, hosted by the Center for Open Science (Nichols-Barrer et al. 2021).

[5] If the NSC data reported that a student was enrolled in college full time one year prior to their expected high school graduation date, we assumed the student graduated high school one year early and adjusted their high school (continued)

could introduce bias into our outcome measures if grade-retention rates differ significantly between the treatment and control groups. If grade-retention rates differed in the two groups, this could be a source of bias because those who were held back a year in middle or high school would not have an opportunity to enroll in college "on time" in the fall after their *expected* high school graduation date (because they remained in secondary school for at least one year longer than expected).

In our sample, we can observe grade-retention rates among students who attended a KIPP school using data provided by the KIPP Foundation. Across both middle and high school, 7 percent of students who ever enrolled in a KIPP school repeated a grade while enrolled at KIPP. We cannot directly observe grade-retention rates outside of KIPP, and therefore we cannot directly compare the retention rates of the treatment and control groups. However, prior studies have shown that students at KIPP middle schools have tended to repeat a grade at higher rates than students at traditional public schools (Nichols-Barrer et al. 2016; Tuttle et al. 2013; Tuttle et al. 2015). If a larger share of treatment students than control students repeated a grade in their middle or high school years, this could lead to higher rates of on-time college enrollment in the control group even if the two groups were equally likely to proceed to college immediately following their high school graduation.

To help address this issue, this study's primary measure of college enrollment considers a student to have enrolled in college if they appear in a four-year college program at any point within the first three years after high school graduation (the longest follow-up period available for all of the study's cohorts).[6] The three-year window is more likely to capture the college enrollment outcomes of students who were held back in middle school or high school (and we also estimate the effects of KIPP on "on-time" college enrollment as a secondary outcome).

Our first study examining the long-term effects of KIPP middle schools (Coen et al. 2019) was limited to a two-year follow-up period, and only examined two cohorts of KIPP middle school students. The outcomes examined in this study use a three-year follow-up period. Tracking students for an additional year allows us to identify patterns in delayed enrollment—for instance, if the comparison group "catches up" to the treatment group— as well as rates of persistence over a longer period. In addition, this study has added a third cohort of KIPP middle students, nearly doubling the study's sample size.

Using data through spring 2022, we are also able to measure college degree completion rates for our first two cohorts.[7] Our primary college graduation outcome measures four-year degree completion within five years of expected high school graduation. We also defined an outcome identifying whether a student had either graduated or remained "on-track" to complete a four-year degree program (students were defined as being "on-track" if they were enrolled in college on a part-time or full-time basis in the tenth semester after high school).

graduation date accordingly. If a student was enrolled part-time in college prior to their expected high school graduation, we classified the student as being dual-enrolled in both high school and college and did not adjust their high school graduation date.

[6] The NSC data allow us to identify whether students withdrew or completed each college semester in which they enrolled. Our primary measure of college enrollment includes all students who enrolled in college during the first three years after high school, irrespective of whether they withdrew in their first semester. As a sensitivity test, we also examine a secondary version of this outcome that excludes withdrawals (requiring that the student completes their first enrolled semester).

[7] There is evidence that the NSC database is more likely to omit graduation indicators from two-year college programs compared to four-year programs (Dynarski et al. 2015). As a result, we do not estimate impacts on graduation rates for two-year degree programs.

To better understand and contextualize results for our primary outcome measures, we also estimated impacts on secondary measures of college enrollment and persistence. This included examining enrollment and persistence at any type of college, including two-year programs. Examining other types of colleges allows the study to explore the postsecondary trajectories of students who began in a two-year program before transferring to a four-year program. We also measured several alternative ways of defining college persistence, including the total number of semesters enrolled over three years (and five years for the first two cohorts) and the total number of consecutive semesters enrolled, among others. A full list of secondary outcome measures of college enrollment and persistence is included in Appendix B.

Lastly, in addition to these alternative ways of defining enrollment and college persistence, we examined whether KIPP affects the types of colleges that students select. To do so, we used measures of each college's selectivity, average graduation rate, and the socioeconomic makeup of the student body.[8] Details about these outcome measures are provided in Appendix B as well.

E. Analytical approach

Intent-to-treat impacts. Our primary impact estimates compare students who received an admission offer through the lottery to students who did not receive an admission offer at the time of the lottery. These "intent to treat" (ITT) impact estimates use a conservative approach that includes students in the treatment group even if they declined to enroll in a KIPP school after receiving an admission offer. Therefore, the estimates capture the impact of receiving an admission offer. We estimated the impacts of KIPP on postsecondary outcomes using the regression model in equation (1), which compares outcomes of treatment and control students while adjusting for differences in their baseline characteristics:

$$(1) \qquad y_{ik} = \alpha + \delta * T_{ik} + \beta * X_{ik} + \gamma_k + \varepsilon_{ik}$$

In this model, i and k index students and school lotteries, respectively, and y is the student-level outcome of interest (either binary or continuous). T is a binary treatment status variable indicating whether the student received an admission offer by lottery to the KIPP school to which they applied, and X is a set of control variables that capture student-level characteristics. These control variables include baseline and pre-baseline math and reading test scores; gender; age (standardized by grade and year to reflect whether a student is young or old for their grade); race/ethnicity; household income; mother's education; whether a household has only one adult; and if the student receives free or reduced-priced lunch, has an individual education plan, and primarily speaks English at home. The regression model also controls for the school to which the student applied, the year, and the grade they were in (sometimes referred to as *lottery fixed effects).*

The regression model also includes a set of dummy variables, one for each covariate, indicating whether the value of a covariate is missing for each student. Missing data in baseline control variables were primarily imputed using single stochastic regression imputation as part of the original two studies. This approach was selected as it represents the most rigorous method of accounting for missing covariate data without biasing the magnitude or standard error of the impact estimates. Specifically, imputation of missing values was conducted separately by treatment status, and included all of the covariates in the regression used for our main impact analysis. The model also included a stochastic component randomly selected from the set of all residuals in the imputation regression to ensure that the variance of the

[8] Our analysis of college program attributes included the first college attended after high school graduation for students who enrolled in multiple colleges during the study period. For the impact analyses, students who did not attend college received a value of zero for each college program attribute outcome.

imputed values is the same as the variance of observed values in the treatment or control group, respectively. In addition, there were some students for whom this regression imputation procedure was not possible because they were excluded from the original two studies (due to missing outcomes, for instance) or who were missing the covariate data needed to conduct this procedure. For these students, we used a dummy imputation approach by setting all missing covariates to a value of zero and including imputation indicators in the regression model.[9]

To estimate the impact model (equation 1), we used a linear probability model for any binary outcomes and incorporated sample weights that account for the fact that some students have a higher probability of receiving an admission offer (either based on their inclusion in a particular lottery stratum defined by a student characteristic or because they have a sibling in the lottery).

Our model is the same one used to estimate achievement impacts in the initial two studies of KIPP middle schools. We tested the model by successfully replicating the middle school achievement impacts from the original KIPP middle school study, using the follow-up study's updated and merged data files. We also conducted a series of sensitivity analyses to check if our results were sensitive to our model specification. We estimated impacts using models without covariates, without imputation for baseline covariates, and using a logit instead of a linear probability model for binary outcomes. In addition, we checked results using two alternative weighting approaches: (1) inverse-variance weights, which give greater weight to the lottery sites with more precise site-level impact estimates; and (2) equal site weights, which estimate the impact of the average KIPP lottery site. Our primary approach weights the KIPP lottery sites according to each site's weighted sample size, so it effectively yields an estimate of the impact of KIPP on the average lottery participant. Results from our sensitivity analyses are included as Appendix B.1 and show that the primary impacts are not sensitive to any of these modeling decisions.

In addition to our primary analyses for the full study sample, we conducted several exploratory subgroup analyses. First, we examined whether KIPP's impacts differed for key subgroups of students, including subgroups defined by a student's race, gender, socioeconomic status, and baseline achievement level. Due to small sample sizes these subgroup analyses are only exploratory, and the results can be found in Appendix B. To examine other potential underlying patterns in the impact estimates, we also tested whether the impact of KIPP differed by the grade level of the lottery applicant (grade 5 or 6) as well as by study cohort. Additional details and summary of findings for these analyses can also be found in Appendix B.

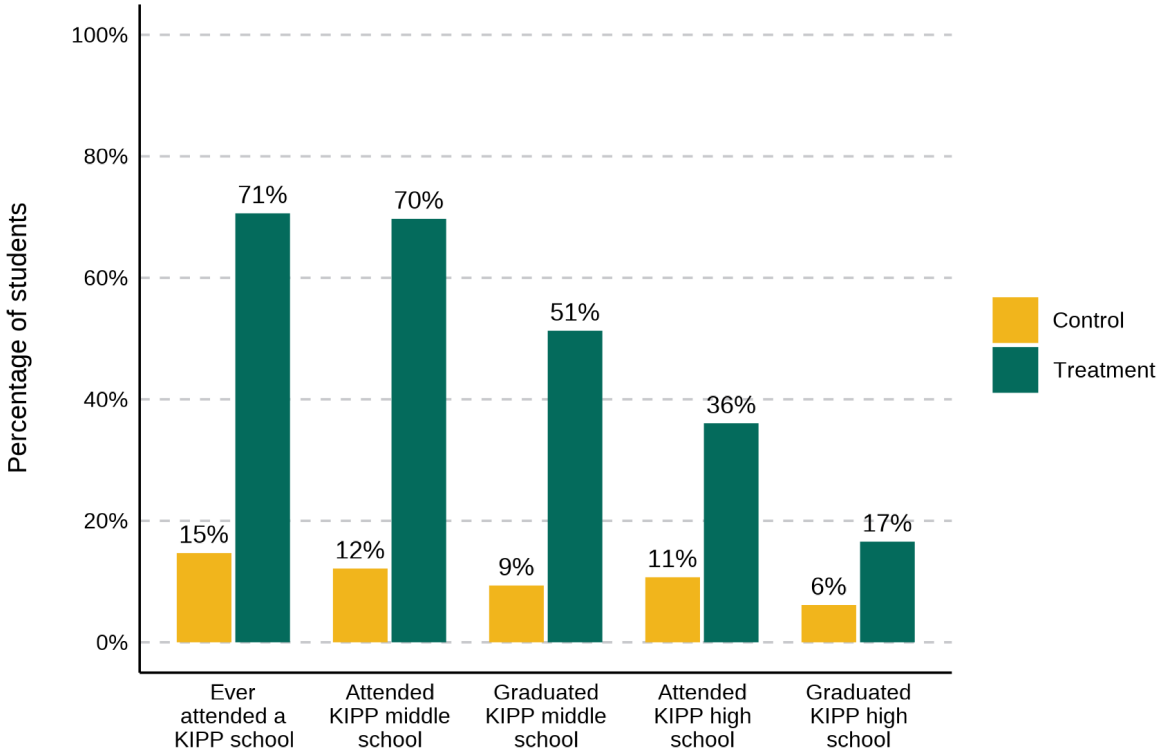
Treatment-on-the-treated impacts. Our primary impact estimates (the ITT impacts) measure the effect of receiving an admission offer to a KIPP middle school, regardless of whether treatment group students actually attended a KIPP middle school (or, conversely, whether control-group students who did not receive an admission offer attended KIPP in a later year). In our sample, a significantly larger proportion of treatment students attended a KIPP school (71 percent) than control students (15 percent), as shown in Figure II.1. In terms of years of attendance, the average treatment student attended KIPP schools for 3.62 years, compared to 0.76 years for the average control student. In other words, students in the treatment group attended KIPP for about 2.9 years longer on average than students in the control group.

While treatment students attended KIPP schools longer than students in the control group, only 36 percent of treatment students attended a KIPP high school for any length of time. The relatively low prevalence of

[9] While we use these imputed baseline covariates in our analysis of KIPP's impacts, none of the imputed values were included in the tests of baseline equivalence discussed previously in this chapter. For the analysis of baseline equivalence, students missing data on a given variable were simply treated as being missing from the sample.

KIPP high school attendance in the sample could be related to several different factors. For instance, some students who received admission offers to KIPP never enrolled in a KIPP middle school, or they enrolled but did not graduate from a KIPP middle school—decreasing their likelihood of ever attending a KIPP high school. In addition, some students who completed middle school at KIPP did not continue to a KIPP high school because KIPP did not have an operational high school in their region at the time, or the region had one or more high schools but did not have the capacity to enroll all rising 9th-grade KIPP students. Still other students may have graduated from a KIPP middle school and had the opportunity to continue in the KIPP network but declined the opportunity to attend a KIPP high school. Nevertheless, compared with the control group a significantly larger proportion of the treatment group attended a KIPP high school (36 percent compared to 11 percent) and graduated from a KIPP high school (17 percent compared to 6 percent).

Figure II.1. Exposure to KIPP middle and high schools, by lottery group



Note: We estimated sample means by regressing KIPP attendance on treatment status using inverse probability weights. The control mean is unadjusted, and the treatment mean is the sum of the control mean and the regression-adjusted difference between groups. The difference for each indicator is statistically significant (p-value < 0.01). Sample size = 2,066.

To estimate the effect of attending a KIPP middle school, as opposed to having the opportunity to attend, we conducted an exploratory analysis that involved estimating an IV model, which used the outcome of a KIPP admission lottery as an instrument for whether a student ever attended a KIPP middle school. This "treatment-on-the-treated" (TOT) model requires additional assumptions that are not needed to estimate ITT impacts.[10] Specifically, to adjust for the patterns of KIPP middle school attendance in both the

[10] The TOT estimates are sometimes referred to as complier average causal effect (CACE) estimates. Technically, they provide an estimate of the effect of attending a KIPP middle school for students who comply with the lottery outcome. In other words, these compliers attend a KIPP middle school if they receive an admission offer and do not attend KIPP if they do not receive an admission offer.

treatment group and the control group, the analysis assumes that the impact of attending KIPP experienced by students in the treatment group is the same on average as the impact of attending KIPP experienced by students in the control group. Our estimating equation follows the model used in the original KIPP study. We used two-stage least squares to first estimate the effect of receiving an admission offer on KIPP middle school attendance (IV equation 1), and in the second stage estimated the impact of KIPP middle school attendance (as predicted by the lottery) on student outcomes (IV equation 2).

(IV equation 1) $$attendKIPPMS_i = \mu + \rho * T + \sigma * X_{ik} + v_k + j_{ik}$$

(IV equation 2) $$y_{ik} = \alpha + \delta * \widehat{attendKIPPMS}_{ik} + \beta * X_{ik} + \gamma_k + \varepsilon_{ik}$$

In IV equation 2, δ is the parameter of interest, representing the impact of attending a KIPP middle school at any point after the initial school lottery. Because students who attend a KIPP middle school have an increased likelihood of attending a KIPP high school, part of this estimated impact for a portion of the sample may reflect the influence of also attending a KIPP high school. In other words, the KIPP middle school impact captures any effects on college outcomes of these middle schools for the full sample as well as any additional effects of KIPP high schools for a portion of the sample.

Estimating the combined effect of KIPP middle and high schools. As discussed above (Figure II.1) approximately half of the students in the treatment group who attended a KIPP middle school also attended a KIPP high school. As a result, estimates from the TOT model represented by IV equations 1 and 2 reflect the combined effect of KIPP middle and high schools for about half of the treatment group, and the effect of KIPP middle schools alone for the remaining half of the treatment group. Because many of KIPP's college-preparation and support programs are concentrated on students in KIPP high schools, it is plausible that the direct effects of attending a KIPP middle school on college-related outcomes could differ substantially from the combined effect of attending KIPP for both middle and high school. To examine this issue, we estimated the following IV model designed to measure the effects of attending KIPP middle and high schools:

(IV equation 3) $$attendKMS_{ik} = \mu + \rho_{M1} * T_{ik} + \rho_{M2} HSR_{ik} + \sigma_M * X_{ik} + v_{kM} + j_{ikM}$$

(IV equation 4) $$attendKHS_{ik} = \mu + \rho_H * T_{ik} + \rho_{H2} HSR_{ik} + \sigma_H * X_{ik} + v_{kH} + j_{ikH}$$

(IV equation 5) $$y_{ik} = \alpha + \delta_1 * \widehat{attendKMS}_{ik} + \delta_2 * \widehat{attendKHS}_{ik} + \beta * X_{ik} + \gamma_k + \varepsilon_{ik}$$

In this model, we first predicted attendance at a KIPP middle school (*attendKMS*) and attendance at a KIPP high school (*attendKHS*) using two first-stage equations (3 and 4). We then estimated the impact of KIPP middle school attendance (δ_1) and high school attendance (δ_2) on college outcomes in the second stage. Although attending a KIPP middle and high school are included separately in this equation, it is important to note that nearly all students in the treatment group who attended a KIPP high school had previously attended a KIPP middle school. In interpreting the results of this model, we therefore focus on the combined effect of attending a KIPP middle school and then a KIPP high school, relative to attending neither (that is, no KIPP attendance). This combined effect is represented by the sum of δ_1 and δ_2.

There are two key instrumental variables included in the first-stage equations.[11] The first, *T,* is a student's treatment status (whether they received a lottery-based, middle school admission offer). The second, *HSR,* represents the capacity of the region's KIPP high schools relative to the capacity of KIPP middle schools at the time the student was making the middle to high school transition. *HSR* is defined as follows:

$$HSR_{ik} = \left(\frac{\#of\ 9th\ graders\ in\ KIPP\ high\ schools\ in\ the\ region\ in\ student's\ 9th\ grade\ year}{\#of\ 8th\ graders\ in\ KIPP\ middle\ schools\ in\ the\ region\ in\ student's\ 8th\ grade\ year} \right)$$

We used the HSR variable as an instrument in this model because it measures the extent to which a KIPP middle school student had "the opportunity to attend a KIPP high school." A ratio greater than 1 signifies that KIPP high schools had the capacity to enroll more students than the number of graduating 8th graders at KIPP middle schools in that region. When this was the case, a student who graduated from a KIPP middle school would be guaranteed a seat in a KIPP high school if they desired one. A ratio less than 1 signifies that there was an insufficient number of seats in KIPP high schools to enroll all of the region's rising 9th-grade students. Around the time students in our study were entering high school, KIPP was in the process of broadly expanding from a network of middle schools to a K–12 model. Moreover, the timing of expansion (for example, the number of new KIPP high schools that opened in a given year) varied from region to region, and some regions did not open any high schools in time for the students in our sample to attend a KIPP high school. In other regions, a KIPP high school was able to accommodate a large portion of the students in the study who wanted to continue at KIPP after middle school. For example, one region participating in our study (KIPP Northern California) had opened two high schools by fall 2011, in time to enroll the first two cohorts in our study. At that time, the high schools in this region had capacity to enroll approximately three-fourths of the graduates from KIPP middle schools, so the HSR variable was equal to approximately 0.75 for the students in these two cohorts. In contrast, a region like KIPP Baltimore did not open any KIPP high schools in time to serve the three cohorts in our study, so the HSR variable there was equal to 0.

To provide valid impact estimates, this IV model must satisfy two important conditions. First, IV equations 3 and 4 (the first stage of model) must provide strong predictions about which students attend KIPP middle schools and which students attend KIPP high schools. Second, the instruments used in the model must satisfy the assumption that they are not correlated with the study's outcomes of interest (college enrollment and persistence) through any channel other than their influence on the endogenous variables of KIPP middle and high school attendance. In Appendix C, we present the results of a variety of empirical tests assessing the extent to which the model satisfies these two conditions.

[11] In practice there are five instruments in total, because *T* and *HSR* are also interacted with each other, and each is interacted with an indicator for whether a student was in grade 5 or grade 6 when they applied to enter KIPP.

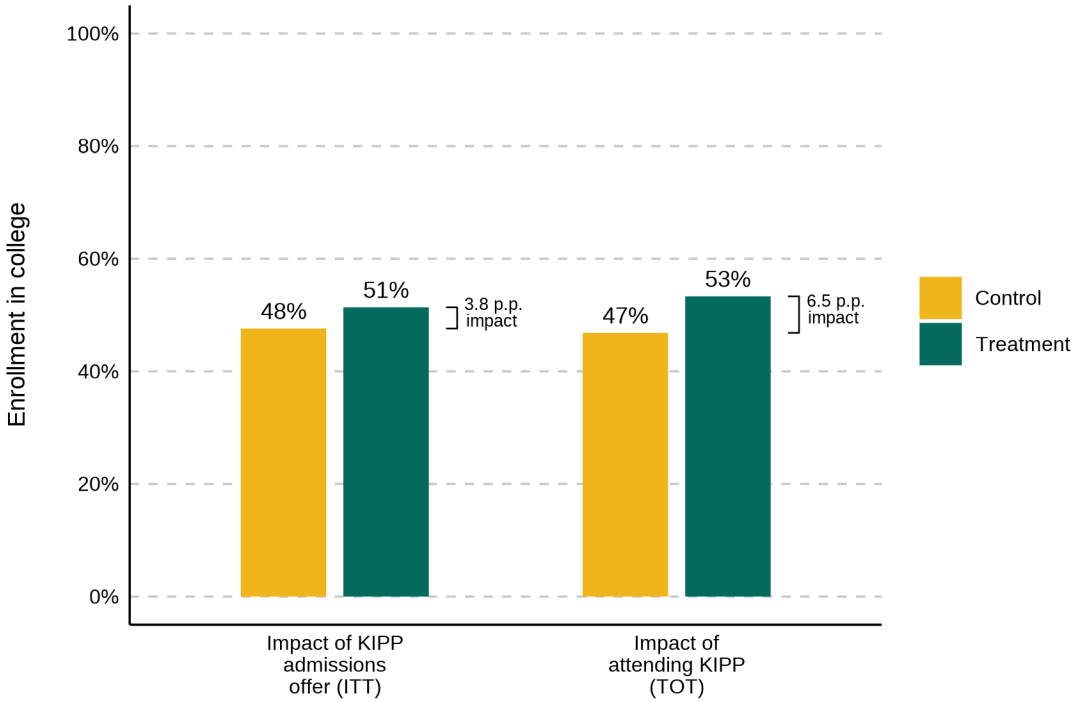
III. KIPP's Impact on College Enrollment and Persistence

In this section we present three sets of findings from our analyses of the impact of KIPP on college outcomes. First, we present the impacts of KIPP middle schools on our primary college enrollment and college persistence outcomes. We estimate these outcomes for the full sample, on key subgroups of students and by study cohort, and under different model assumptions in a series of sensitivity analyses (findings from the sensitivity analyses are provided in Appendix B). Second, we estimate the impact of KIPP middle schools on college graduation rates, as well as impacts on the outcome of being "on-track" for degree completion five years after high school. Finally, we build on these analyses to examine the joint effect of attending both a KIPP middle school and a KIPP high school on college enrollment, college persistence, and college graduation outcomes.

A. Primary impacts of KIPP middle schools on college enrollment and persistence

KIPP middle schools had a positive impact on enrollment in four-year colleges, but the effect was not statistically significant. On average, students who received a lottery-based admission offer to a KIPP middle school were 3.8 percentage points more likely to enroll in a four-year college than students who applied to KIPP but did not receive an admission offer (*p*-value 0.123). In particular, 51.4 percent of treatment students enrolled in a four-year college within three years of high school graduation, compared with 47.6 percent of control students (Figure III.1).

Figure III.1. Impact of KIPP middle schools on four-year college enrollment



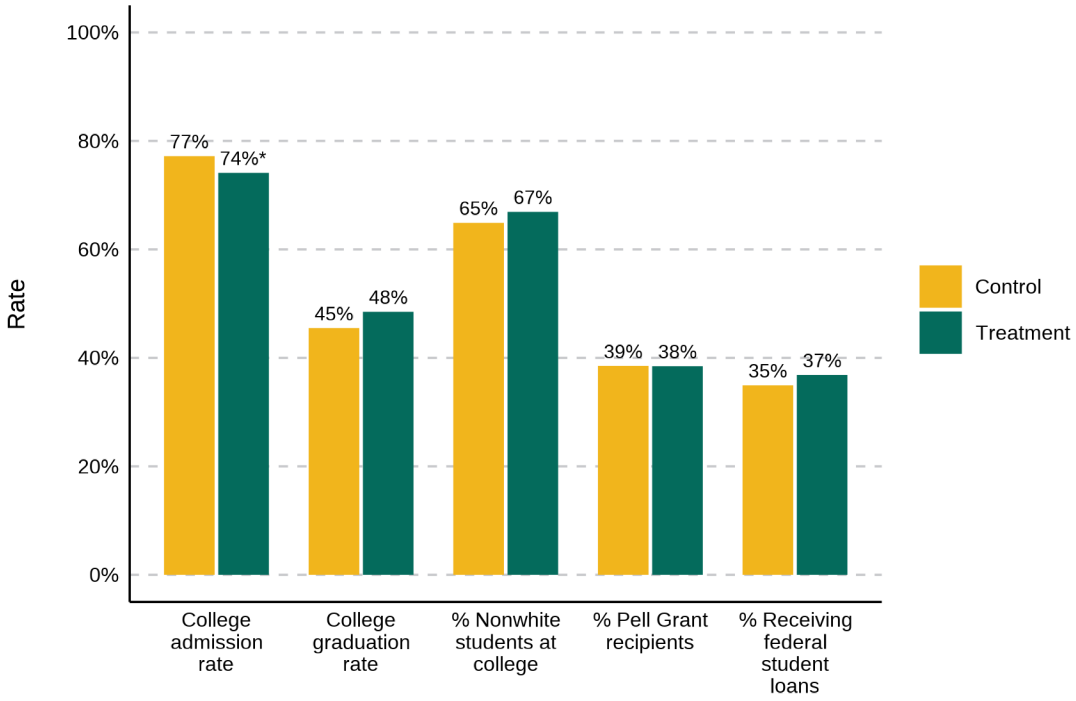
Note: Study includes 2,066 students who applied to enter KIPP through middle school admission lotteries, and compares the outcomes of students who received an admission offer to KIPP (treatment group) to those who did not receive an admission offer (control group) at the time of the lottery. Exploratory estimates of the impact of KIPP attendance use the lottery as an instrument for whether a student ever attended a KIPP middle school. The model pools all 21 lottery schools, controls for baseline covariates, and includes weights to account for probability of assignment to the treatment or control group.

ITT = intent-to-treat; p.p. = percentage points; TOT = treatment-on-the-treated.

In our exploratory analysis estimating impacts among students who ended up attending a KIPP middle school, we find that the impact estimate is almost twice the size of the impact estimate based on admission offers alone, but this still does not reach statistical significance.[12] The impact of attending a KIPP middle school on enrolling in a four-year college is 6.5 percentage points and represents an increase from 46.8 percent in the control group to 53.3 percent in the treatment group (*p*-value 0.116).

While KIPP middle schools did not have a detectable impact on college enrollment rates, they did have a modest (but statistically significant) positive effect on the selectivity of college programs that students attend. Students admitted to KIPP middle schools attend more selective colleges, on average, compared to control-group students. Among students in the study sample who went to college, the average college attended by a college-going treatment student had an admission rate of 74 percent, compared to 77 percent for control-group students. However, we saw no significant differences between the treatment and control groups on other college-program attributes, such as college graduation rates, the percentage of students who are non-White, the percentage of students who received Pell Grants, or the percentage of students who received federal loan grants (Figure III.2). In Appendix B we also estimate the effect of KIPP middle schools on alternative measures for these college attributes and find no significant differences.

Figure III.2. Types of colleges attended for the treatment and control groups



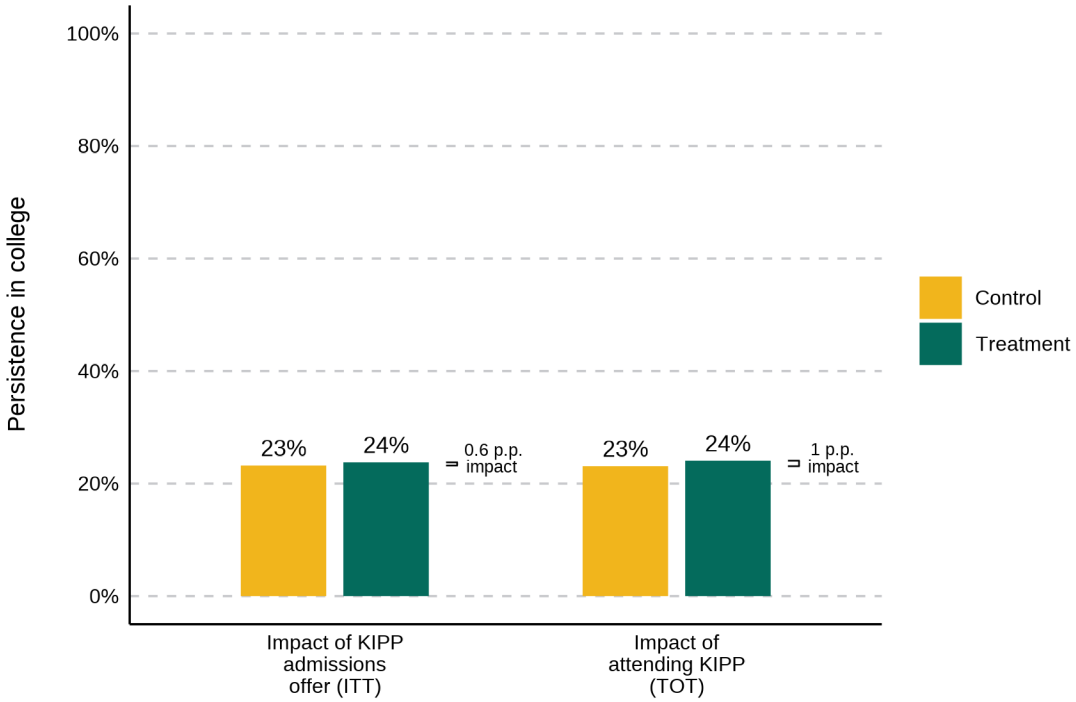
Note: Sample size contains students who ever attended a postsecondary institution. All measures have a sample size of 1,359 except college graduation rate, where the rate was missing from colleges attended by four students.

*Difference is significantly different from zero at the .05 level, two-tailed test.

[12] Our treatment-on-the-treated model adjusts for the rate of KIPP middle school attendance in both the treatment group (70 percent) and the control group (12 percent). Implicitly, this model assumes that attending KIPP has the same impact on college outcomes for the students from the treatment group and control group who attended a KIPP middle school. An alternative, outlined in Bloom (2006), avoids this assumption by adjusting only for rates of KIPP middle school attendance in the treatment group and ignoring attendance patterns in the control group. Under this alternative model, the estimated impact of attending KIPP would be 5.1 percentage points for enrollment in four-year colleges and the impact estimate remains statistically insignificant.

Next, we measured whether KIPP middle schools had an impact on rates of persistence in four-year college programs. As shown in Figure III.3, we did not find evidence that KIPP middle schools impact college persistence rates over three years. Here we define "persistence" as enrollment in a four-year college beginning in the fall after high school graduation and continuing without interruption for three years (or six semesters). In our sample, 23.8 percent of students who received an admission offer to a KIPP middle school ended up entering and persisting in a four-year college through their first six semesters, compared to 23.3 percent of students who did not receive an admission offer to a KIPP middle school—a difference of 0.6 percentage points (*p*-value 0.785). Even after accounting for which students ended up attending a KIPP middle school, the difference between the treatment and control group remains small and statistically insignificant.

Figure III.3. Impact on persistence through six semesters in a four-year college



Note: Study includes 2,066 students who applied to enter KIPP through middle school admission lotteries, and compares the outcomes of students who received an admission offer to KIPP (treatment group) to those who did not receive an admission offer (control group) at the time of the lottery. Exploratory estimates of the impact of KIPP attendance use the lottery as an instrument for whether a student ever attended a KIPP middle school. The model pools all 21 lottery schools, controls for baseline covariates, and includes weights to account for probability of assignment to the treatment or control group.

ITT = intent-to-treat; p.p. = percentage points; TOT = treatment-on-the-treated.

We summarize the study's primary intent-to-treat and exploratory treatment-on-the-treated impact estimates for college enrollment and persistence in Table III.1, with standard errors for each impact estimate reported in parentheses. We also examined whether our findings on four-year college enrollment and early persistence were sensitive to the specifications of our impact model and found that the impact estimates remained consistent when using alternative estimation models, different approaches to dealing with missing baseline data, or alternative sample weights. The full results of these sensitivity analyses can be found in Appendix B.

Table III.1. Primary impact estimates for college enrollment and persistence

Primary outcome	Impact of KIPP middle school admission offer (primary results)				Impact of attending a KIPP middle school (exploratory results)			
	Treatment mean	Control mean	Impact estimate	*p*-value	Treatment mean	Control mean	Impact estimate	*p*-value
Ever enrolled in a four-year college	51.4%	47.6%	3.8 p.p. (2.4 p.p.)	0.123	53.3%	46.8%	6.5 p.p. (4.1 p.p.)	0.116
Persisted through first six semesters (four-year college)	23.8%	23.2%	0.6 p.p. (2.1 p.p.)	0.785	24.1%	23.1%	1.0 p.p. (3.5 p.p.)	0.781

Note: Standard errors are reported in parentheses under each impact estimate. Study includes 2,066 students who applied to enter KIPP through middle school admission lotteries, and compares the outcomes of students who received an admission offer to KIPP (treatment group) to those who did not receive an admission offer (control group) at the time of the lottery. Estimates of the impact of KIPP attendance use the lottery as an instrument for whether a student ever attended a KIPP middle or high school. The model pools all 21 lottery schools, controls for baseline covariates, and includes weights to account for probability of assignment to the treatment or control group.

p.p. = percentage points.

In addition to our full lottery sample, we also investigated whether the impact of KIPP middle schools differed for subgroups of students, such as students with lower family income or lower baseline academic achievement. While subgroup sample sizes were small, we found no evidence that the long-term effects of KIPP middle schools differed for groups of students based on race, gender, income, mother's education, or baseline test scores. There was some suggestive evidence that KIPP's impacts on primary outcomes may have been somewhat lower for low-income students and students with low baseline math scores; however, after adjusting for multiple comparisons across subgroup findings, these impacts were no longer statistically significant (see Appendix B).

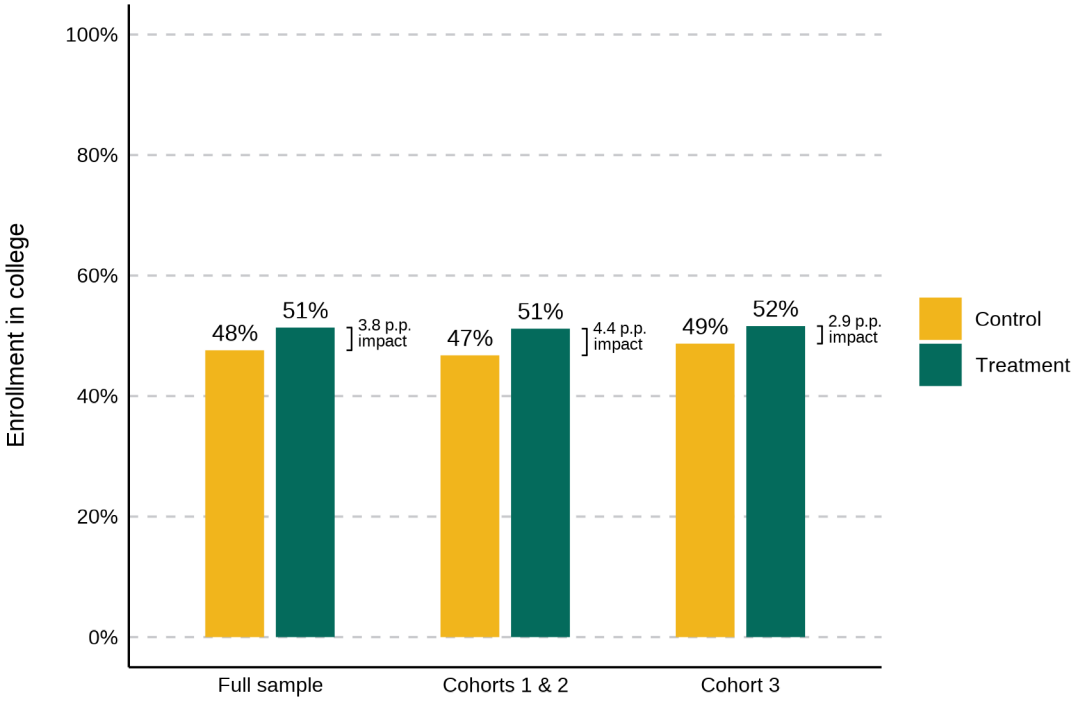
Finally, to better understand how KIPP impacts may have changed over time (and assist in comparing the results in this report to the study's earlier report [Coen et al. 2019], which focused only on cohorts 1 and 2), we estimated impacts on our primary outcomes for cohort 3 (applicants to KIPP middle schools in 2011) separately from cohorts 1 and 2 (applicants in 2008 or 2009). This allows us to track the earlier cohorts' educational outcomes over a longer period as well as compare KIPP's effects between the earlier and later cohorts.

While the estimated impacts of KIPP middle schools on both four-year college enrollment and persistence were larger in magnitude for cohorts 1 and 2 than for cohort 3, the estimates for the two groups were not statistically distinguishable from one another. For instance, although treatment students in cohorts 1 and 2 enrolled in four-year colleges at similar rates as treatment students in cohort 3 (51 percent compared to 52 percent; Figure III.4), cohort 1 and 2 treatment students were 4.4 percentage points more likely to enroll in college than their peers in the control group (*p*-value = 0.202), whereas cohort 3 treatment students were 2.9 percentage points more likely to enroll in college than their peers in the control group (*p*-value = 0.383). However, the difference in impacts across cohorts was not statistically significant (*p*-value = 0.746).

Similarly, estimated impacts on college persistence rates were more positive for students in cohorts 1 and 2, relative to cohort 3, but none of the cohorts experienced an impact that was statistically significant (Figure III.5). Cohort 1 and 2 treatment students were 2.8 percentage points more likely to persist in college than their peers in the control group (*p*-value = 0.343), whereas cohort 3 treatment students were 2.3 percentage points less likely to persist in college than their peers in the control group (*p*-value =

0.416). The difference in impacts across cohorts was not statistically significant (*p*-value = 0.199). Appendix B provides a complete set of cohort-level impact estimates for these outcomes.

Figure III.4. Impact of KIPP middle schools on four-year college enrollment, by cohort

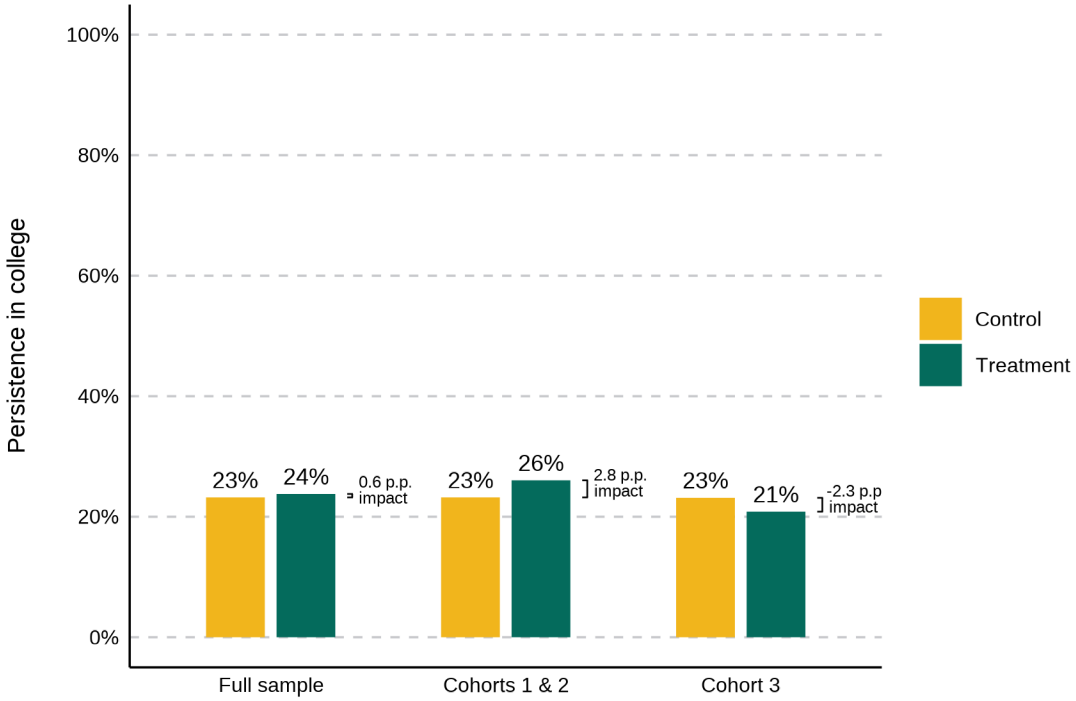


Note: Study includes 2,066 students who applied to enter KIPP through middle school admission lotteries (1,177 students who applied in 2008 or 2009 [Cohorts 1 and 2] and 889 students who applied in 2011 [Cohort 3]) and compares the outcomes of students who received an admission offer to KIPP (treatment group) with those who did not receive an admission offer (control group) at the time of the lottery. The model pools all 21 lottery schools and estimates outcome means by regressing the outcome measure on treatment status using inverse probability weights and controlling for student-level covariates and the lottery school, year, and grade. The control mean is unadjusted, and the treatment mean is the sum of the control mean and the regression-adjusted difference.

p.p. = percentage points.

It is important to note that the study's estimates on college enrollment rate for cohorts 1 and 2 from the previous phase (Coen et al. 2019) are slightly smaller in magnitude than the findings presented in this report. The results differ because the enrollment outcome used in the current report tracks students for three years after high school, whereas the previous report tracked students for only two years after high school. After following cohorts 1 and 2 for a third year, the impact of KIPP middle schools on college enrollment became smaller because, in their third year after high school, students in the comparison group entered college at a slightly higher rate than students in the treatment group who had not entered college previously. In other words, students who attended KIPP middle schools were more likely to enter college one or two years after high school, rather than waiting until the third follow-up year.

Figure III.5. Impact on persistence through six semesters in a four-year college, by cohort



Note: Study includes 2,066 students who applied to enter KIPP through middle school admission lotteries (1,177 students who applied in 2008 or 2009 [Cohorts 1 and 2] and 889 students who applied in 2011 [Cohort 3]) and compares the outcomes of students who received an admission offer to KIPP (treatment group) with those who did not receive an admission offer (control group) at the time of the lottery. The model pools all 21 lottery schools and estimates outcome means by regressing the outcome measure on treatment status using inverse probability weights and controlling for student-level covariates and the lottery school, year, and grade. The control mean is unadjusted, and the treatment mean is the sum of the control mean and the regression-adjusted difference between groups.

p.p. = percentage points.

B. Impacts on four-year degree completion

KIPP middle schools had little to no impact on four-year degree completion rates among the first two cohorts in the study. On average, 21.9 percent of cohort 1 and 2 students who received a lottery-based admission offer to a KIPP middle school completed a four-year degree within five years of their expected high school graduation date, compared to 21.8 percent of students who applied to KIPP but did not receive an admission offer. The 0.1 percentage point difference is not statistically significant (*p*-value = 0.992).

We also estimated if KIPP middle schools had an impact on whether students remained "on-track" to graduate college five years after high school. In addition to students who completed a four-year degree within five years, this outcome also includes students who remained enrolled in a four-year degree program in the tenth semester after high school. Our findings for this outcome suggest students in the treatment group remained on-track for graduation at higher rates than the control group after five years (35.5 percent of treatment students, versus 34.3. percent of control students), but the 1.3 percentage point difference is not statistically significant (*p*-value = 0.698; Table III.2). In our exploratory analysis accounting for which students ended up attending a KIPP middle school, the impact estimates for degree completion (and being on-track for degree completion) remain small and statistically insignificant.

Table III.2. Impact estimates for college graduation and longer-term college persistence

Outcome	Impact of KIPP middle school admission offer (primary results)				Impact of attending a KIPP middle school (exploratory results)			
	Treatment mean	Control mean	Impact estimate	*p*-value	Treatment mean	Control mean	Impact estimate	*p*-value
Graduated from a four-year college in five years	21.9%	21.8%	0.0 p.p. (2.7 p.p.)	0.992	21.9%	21.8%	0.0 p.p. (4.8 p.p.)	0.992
Enrolled in a four-year program in 10th semester (or graduated in 10 semesters or fewer)	35.5%	34.3%	1.3 p.p. (3.2 p.p.)	0.698	36.2%	34.0%	2.3 p.p. (5.7 p.p.)	0.691

Note: Standard errors are reported in parentheses under each impact estimate. Sample includes 1,177 students who applied to enter KIPP through middle school admission lotteries in 2008 and 2009 and compares the outcomes of students who received an admission offer (treatment group) to those who did not receive an admission offer (control group) at the time of the lottery. Estimates of the impact of KIPP attendance use the lottery as an instrument for whether a student ever attended a KIPP middle school. The model pools 13 lottery schools, controls for baseline covariates, and includes weights to account for probability of assignment to the treatment or control group.

p.p. = percentage points.

C. Exploratory analysis of the combined impact of attending a KIPP middle school and a KIPP high school

Thus far, we have observed that KIPP middle schools have a modest positive effect on college enrollment, but the estimated impacts are not statistically significant (either for the overall sample or for subgroups of interest). We also did not find evidence that KIPP middle schools affect college persistence or graduation rates. However, the students in our study's treatment group who attended KIPP middle schools fall into two groups: approximately half attended KIPP only for middle school, and the other half went on to attend a KIPP high school. Among this latter group, the joint effect of attending KIPP for both middle and high school could differ substantially from the effect of attending KIPP for middle school alone. To investigate this question, we estimated the combined impact of KIPP middle and high schools on the college outcomes of students who attended both types of schools.

There are strong reasons to hypothesize that KIPP high schools could be especially important in driving college outcomes. KIPP's college-support programs and services tended to be strongly concentrated at the high school level. At the time the students in the study sample were attending high school, these services included rigorous, college-preparatory coursework; individualized college counseling, including support identifying schools well matched to students' needs; support throughout the college application and financial aid application process; and help applying to and attending precollege summer programs. In contrast, only a small number of regions offered college-related programs and services to students in middle school (such as high school placement support and college tours). In addition, staff in all regions reported that it was much more difficult to maintain contact with and provide support to middle school alumni who did not also attend a KIPP high school.

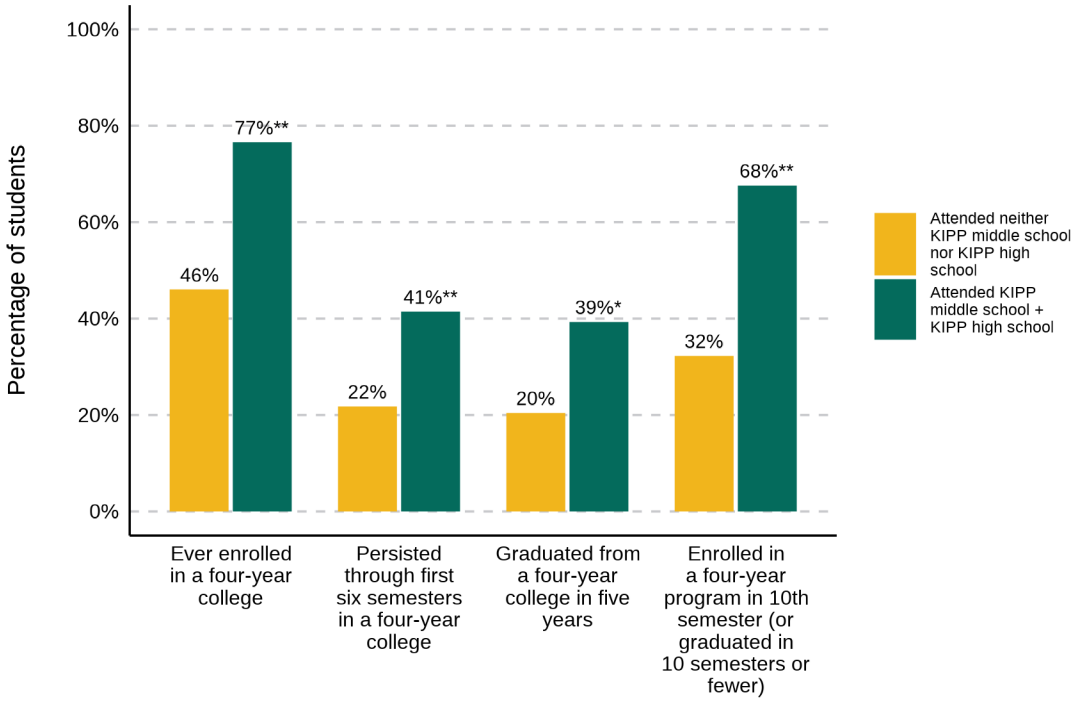
Prior literature on charter schools also suggests that the combined effect of attending a charter middle and high school may be greater than the effect of attending a middle school alone. Booker et al. (2011) compare college outcomes for students in Florida who attended both a charter middle and high school with those who attended only a charter middle school. They find a statistically significant impact of 8 percentage points on college attendance within five years of graduation for students who attended both a

charter middle and high school. Using a larger sample of Florida students, Sass et al. (2016) replicate these findings, reporting a similar impact on college attendance within six years of graduation. Sass et al. also find a statistically significant impact of 12 percentage points on college persistence in at least two consecutive years for students who went on to attend a charter high school. In addition, one study found positive (but not significant) effects of a New York City charter middle school on students' college enrollment in a setting where nearly half the students who received an admission offer to the charter middle school also attended the network's charter high school (Dobbie and Fryer 2015). Further, among studies that have found a positive effect of charter schools on college outcomes, almost all have examined the effect of charter high schools (Angrist et al. 2016; Davis and Heller 2019). In contrast, prior research on the long-term effects of charter middle schools suggests that attending a charter middle school alone may not have an effect on college enrollment (Place and Gleason 2019).

Consistent with this prior literature, we found that attending both a KIPP middle school and a KIPP high school had large, positive impacts on students' college enrollment, college persistence, and college graduation rates. Estimates of the combined impact of attending KIPP for both middle and high school are shown in Figure III.6, and detailed findings are provided in Table III.3. Compared to students who did not attend KIPP, students who attended both a KIPP middle and high school were 30.5 percentage points more likely to enroll in a four-year college within three years of graduating high school (p-value < 0.000) and 19.7 percentage points more likely to persist for at least three years in a four-year college upon graduating high school (p-value < 0.000). Seventy-seven percent of students who attended a KIPP middle and high school went on to enroll in a four-year college, compared to 46 percent of students who attended neither. We found similar impacts on the study's primary persistence outcome: 41 percent of students who attended a KIPP middle and high school enrolled in college immediately after high school and persisted for at least three years—this is almost double the share of students who did not attend KIPP (22 percent).

KIPP middle and high schools also had a large and statistically significant combined effect on college graduation rates. Compared to students who did not attend KIPP, students who attended KIPP middle and high schools were 18.9 percentage points more likely to graduate from a four-year college within five years after high school (p-value = 0.025). Accounting for students who remained enrolled in college five years after high school, the difference in college persistence rates is even larger: KIPP middle and high school attendees were 35.3 percentage points more likely to either graduate from college or to continue pursuing a degree after five years, relative to students who never attended KIPP (p-value < 0.000).

Figure III.6. Impact of KIPP middle and high school attendance on four-year college enrollment, persistence, and graduation



Note: Study includes 2,066 students who applied to enter KIPP through middle school admission lotteries. College graduation and "on-track" graduation outcomes include 1,177 students from the first two cohorts. Estimates use the lottery and *HSR* as instruments for whether a student ever attended a KIPP middle and a KIPP high school. The model pools all 21 lottery schools (13 lottery schools for the college graduation and "on-track" graduation outcomes) and estimates outcome means by regressing the outcome measure on treatment status using inverse probability weights and controlling for student-level covariates and the lottery school, year, and grade. The control mean is unadjusted, and the treatment mean is the sum of the control mean and the regression-adjusted difference between groups.

*Impact estimate is significantly different from zero at the .05 level, two-tailed test.

**Impact estimate is significantly different from zero at the .01 level, two-tailed test.

HSR = high school ratio.

Table III.3. Impact of KIPP middle and high school attendance on four-year college enrollment, persistence, and graduation

Outcome	Mean (attended KIPP MS + KIPP HS)	Mean (attended neither KIPP MS nor KIPP HS)	Impact estimate	*p*-value
Ever enrolled in a four-year college	76.6%	46.0%	30.5 p.p.** (6.7 p.p.)	0.000
Persisted through first six semesters (four-year college)	41.4%	21.8%	19.7 p.p.** (5.6 p.p.)	0.000
Graduated from a four-year college in five years	39.3%	20.4%	18.9 p.p.* (8.4 p.p.)	0.025
Enrolled in a four-year program in 10th semester (or graduated in 10 semesters or fewer)	67.6%	32.3%	35.3 p.p.** (9.5 p.p.)	0.000

Note: Standard errors are reported in parentheses under each impact estimate. The enrollment and persistence outcomes include 2,066 students from all three cohorts. College graduation and "on-track" graduation

outcomes include 1,177 students from the first two cohorts. Estimates of the impact of attending a KIPP middle and high school using the KIPP admission lottery as an instrument for the ratio of 9th-grade seats to 8th-grade seats within each region. The model pools all 21 lottery schools (13 lottery schools for the college graduation and "on-track" graduation outcomes) and estimates outcome means by regressing the outcome measure on treatment status using inverse probability weights and controlling for student-level covariates and the lottery school, year, and grade. The control mean is unadjusted, and the treatment mean is the sum of the control mean and the regression-adjusted difference between groups.

*Impact estimate is significantly different from zero at the .05 level, two-tailed test.

**Impact estimate is significantly different from zero at the .01 level, two-tailed test.

HS = high school; MS = middle school; p.p. = percentage points.

The magnitude of these impact estimates is large, and effects of this size have substantial policy relevance. The combined impact of attending KIPP for both middle and high school is strongly positive for college enrollment (30.5 percentage points), persistence (19.7 percentage points), graduation rates (18.9 percentage points), and "on-track" for graduation rates (35.3 percentage points). For example, these impacts match or exceed the gaps in college attainment rates in the United States among Black and Hispanic students, compared to White students. For example, nationally among 25- to 29-year-olds, 45 percent of White Americans have a bachelor's degree compared to only 26 percent of Black Americans and 23 percent of Hispanic Americans—degree completion gaps of 19 and 22 percentage points, respectively (National Center for Education Statistics 2022). Our study shows that KIPP middle and high schools have a combined effect of approximately 19 percentage points on college completion rates among our sample, which is almost entirely comprised of Black or Hispanic students from low-income families. An effect of this size, extrapolated nationwide, would be large enough to nearly close the degree-completion gap for Hispanic students or entirely close the degree-completion gap for Black students in the United States.

IV. Discussion

This study provides new evidence about how KIPP affects the long-term college outcomes of its students. Viewed in isolation, the KIPP middle schools in our sample had modest positive effects on college enrollment but little effect on college persistence rates or college graduation rates. However, during the period of our study, the KIPP network was undergoing a major wave of expansion, opening KIPP high schools in more regions and delivering intensive college-support and college-related alumni services to the students who attended those high schools. For the subset of students who attend a KIPP middle and high school, the results are dramatic. Compared with otherwise equivalent non-KIPP students, these students were 30.5 percentage points more likely to enroll in a four-year college within three years of graduating high school and 19.7 percentage points more likely to persist for at least three years in a four-year college. Similarly, students who attended a KIPP middle and high school were 18.9 percentage points more likely to graduate from a four-year college within five years after high school, compared to students who attended neither.

This pattern in our results aligns well with the prior literature on the long-term effects of charter high schools relative to charter middle schools. Studies of other charter high schools find positive impacts on four-year college enrollment (Angrist et al. 2016; Davis and Heller 2019). For example, Angrist et al. (2016) find that students who attended a set of six charter high schools in Boston were 18 percentage points more likely to enroll in a four-year college. Further, studies that compare students who attend both a charter middle school and charter high school to students who only attend a charter middle school find positive impacts of charter high schools on college attendance and persistence (Booker et al. 2011; Sass et al. 2016). For example, Sass et al. (2016) find statistically significant impacts of 9 percentage points on college attendance and 12 percentage points on college persistence for students who attended both a

charter middle school and charter high school. Meanwhile, studies of charter middle schools suggest a marginal impact on college outcomes. For example, Place and Gleason (2019) find a small and not statistically significant impact of 3 percentage points on four-year college enrollment for students admitted to a nationwide sample of 30 oversubscribed charter middle schools. Dobbie and Fryer (2015) examined the long-term effects of a New York City charter middle school on college enrollment. Like our study, a portion of these charter middle school students could attend the local charter high school, and the long-term effects of attending the charter middle school alone were positive but insignificant.

While our findings are not surprising, the magnitude of the combined KIPP middle and high school effect is dramatic and exceeds what has been found in this prior literature. It is possible that this large effect results from combining the well-established benefits of attending a KIPP middle school (a substantial boost to students' academic achievement) with the strong emphasis on college-related supports found in KIPP high schools. To prepare students for the intellectual challenges of college, KIPP high schools make rigorous coursework (including Advanced Placement [AP] courses) available to all students ("KIPP High School Excellence Blueprint" 2019). Prior research has shown that KIPP middle school students with the opportunity to attend a KIPP high school enroll in more AP courses and, correspondingly, take or intend to take more AP exams than KIPP middle school students without access to a KIPP high school (Tuttle 2015). KIPP high schools also foster a college-going culture by aligning academic policies and courses of study to college standards and offering a range of college-related supports through the KIPP Forward program ("KIPP High School Excellence Blueprint" 2019). For example, all KIPP high school students are paired with a college counselor who provides support throughout the college application process through workshops and individual counseling sessions. KIPP college counselors are trained to support students in identifying and applying to college programs that are well matched to students' capabilities, goals, and needs, and have relatively high graduation rates (particularly for first-generation, Pell Grant-eligible students of color) ("Match Matters in Your Region" 2014). KIPP Forward staff also help students and families with financial aid applications and support students in attending precollege summer programs, like enrichment programs on college campuses. Further, the KIPP Forward program also provides alumni additional advising in the form of advisors or peer mentors who meet with alumni to check-in on their academic progress through virtual counseling and on-campus visits.

One implication of our findings is that KIPP could deliver large potential benefits to its middle school students by expanding access to KIPP high schools and encouraging its middle school students to remain enrolled at KIPP through high school graduation. There is evidence that the KIPP network is making efforts in this direction: 80 percent of KIPP regions currently operate at least one KIPP high school. Most KIPP regions also now offer elementary schools as well, and it is possible that the combined effects of attending KIPP for grades K–12 on a continuous basis could differ meaningfully from what we observed for the students in this study sample.

While the combined impacts of KIPP middle and high schools are dramatic and substantial, it remains to be seen whether they will ultimately translate into improved employment and earnings outcomes for these KIPP alumni. Prior research suggests that there may be potentially positive effects of charter high school attendance on long-term earnings. Sass et al. (2016) find a statistically significant increase of 12 percentage points (or $2,318) on maximum annual earnings five to seven years after high school graduation for students who attended both charter middle schools and high schools, relative to students who only attended charter middle schools. Dobbie and Fryer (2020) find a similarly positive but not statistically significant effect of attending a No Excuses charter school (defined by high behavioral expectations and an extended school day) in Texas on annual earnings nine years after high school graduation. It would be valuable to learn if the alumni of KIPP middle and high schools are able to

translate success in college into even longer-run success in the workforce. As KIPP alumni pursue four-year college programs as well as alternative pathways, further research may also examine if KIPP middle and high schools are affecting the earnings and employment outcomes of alumni who choose to pursue other options after high school, such as employment or military service, alongside those who choose to pursue a college degree before entering the labor market.

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References

Angrist, J. D., S. R. Cohodes, S. M. Dynarski, P. A. Pathak, and C. R. Walters. "Stand and Deliver: Effects of Boston's Charter High Schools on College Preparation, Entry, and Choice." Journal of Labor Economics, vol. 34, no. 2, 2016, pp. 275–318.

Angrist, Joshua D., Susan M. Dynarski, Thomas J. Kane, Parag A. Pathak, and Christopher R. Walters. "Inputs and Impacts in Charter Schools: KIPP Lynn." American Economic Review: Papers & Proceedings, vol. 100, May 2010, pp. 1–5.

Benjamini, Y., and Y. Hochberg. "Controlling the False Discovery Rate: A Practical and Powerful Approach to Multiple Testing." Journal of the Royal Statistical Society: Series B Methodological, vol. 57, no. 1, 1995, pp. 289–300.

Bloom, Howard. "The Core Analytics of Randomized Experiments for Social Research," MDRC Working Papers on Research Methodology. New York, NY: MDRC, August 2006.

Booker, Kevin, Tim R. Sass, Brian Gill, and Ron Zimmer. "The Effects of Charter High Schools on Educational Attainment." Journal of Labor Economics, vol. 29, no. 2, 2011, pp. 377–415.

Bound, J., D.A. Jaeger, and R.M. Baker. "Problems with Instrumental Variables Estimation When the Correlation Between the Instruments and the Endogenous Explanatory Variable Is Weak." Journal of the American Statistical Association, vol. 90, 1995, pp. 443–450.

Coen, Thomas, Ira Nichols-Barrer, and Philip Gleason. "Long-Term Impacts of KIPP Middle Schools on College Enrollment and Early College Persistence." Cambridge, MA: Mathematica, September 26, 2019.

College Board. "Trends in Higher Education: Undergraduate Enrollment and Percentage Receiving Pell Grants over Time." 2022. Available at https://trends.collegeboard.org/student-aid/figures-tables/undergraduate-enrollment-and-percentage-receiving-pell-grants-over-time. Accessed March 10, 2022.

Davis, Matthew, and Blake Heller. "No Excuses Charter Schools and College Enrollment: New Evidence from a High School Network in Chicago." Education Finance and Policy, vol. 14, no. 3, 2019, pp. 414–440.

Dobbie, W., and R. G. Fryer, Jr. "The Medium-Term Impacts of High-Achieving Charter Schools." Journal of Political Economy, vol. 123, no. 5, 2015, pp. 985–1037.

Dobbie, Will, and Roland G. Fryer. "Charter Schools and Labor Market Outcomes." Journal of Labor Economics, vol. 38, no. 4, 2020, pp. 915–957.

Dundar, A., and D. Shapiro. "The National Student Clearinghouse as an Integral Part of the National Postsecondary Data Infrastructure." Herndon, VA: National Student Clearinghouse Research Center, May 2016.

Dynarski, S. M., S. W. Hemelt, and J. M. Hyman. "The Missing Manual: Using National Student Clearinghouse Data to Track Postsecondary Outcomes." Educational Evaluation and Policy Analysis, vol. 37, no.1S, 2015, pp. 53S–79S.

Gleason, Philip, Melissa Clark, Christina Clark Tuttle, and Emily Dwoyer. "The Evaluation of Charter School Impacts." Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, June 2010.

Gleason, Philip M., Christina Clark Tuttle, Brian Gill, Ira Nichols-Barrer, and Bing-ru Teh. "Do KIPP Schools Boost Student Achievement?" Education Finance and Policy, vol. 9, no. 1, 2014, pp. 36–58.

Greene, Jay. "Evidence for the Disconnect Between Changing Test Scores and Changing Later Life Outcomes." Blog post, November 5, 2016. Available at https://jaypgreene.com/2016/11/05/evidence-for-the-disconnect-between-changing-test-scores-and-changing-later-life-outcomes/. Accessed August 20, 2019.

KIPP Foundation. "KIPP Report Card 2008." n.d., Available at https://www.kipp.org/results/national/#question-1:-who-are-our-students. Accessed August 3, 2023.

KIPP Foundation. "KIPP Report Card 2009." n.d., Available at https://www.kipp.org/results/national/#question-1:-who-are-our-students. Accessed August 3, 2023.

KIPP Foundation. "KIPP Report Card 2010." n.d., Available at https://www.kipp.org/results/national/#question-1:-who-are-our-students. Accessed August 3, 2023.

KIPP Foundation. "KIPP Report Card 2011." n.d. Available at., https://www.kipp.org/results/national/#question-1:-who-are-our-students. Accessed August 3, 2023.

KIPP Foundation. "KIPP Report Card 2012." n.d., Available at https://www.kipp.org/results/national/#question-1:-who-are-our-students. Accessed August 3, 2023.

"KIPP High School Excellence Blueprint: 2019–2020 Edition." 2019.

Knechtel, Virginia, Thomas Coen, Pia Caronongan, Nickie Fung, and Lisbeth Goble. "Pre-Kindergarten Impacts Over Time: An Analysis of KIPP Charter Schools." Report submitted to the Laura and John Arnold Foundation. Washington, DC: Mathematica Policy Research, August 2017.

"Match Matters in Your Region: Reflection and Planning for Strong Matches." KIPP School Summit, 2014.

National Center for Education Statistics. "Educational Attainment of Young Adults." Washington, DC: Institute of Education Sciences, May 2022. Available at https://nces.ed.gov/programs/coe/indicator_caa.asp. Accessed April 24, 2023.

National Student Clearinghouse Research Center. "Term Enrollment Estimates: Fall 2020." 2020. Available at https://nscresearchcenter.org/wp-content/uploads/CTEE_Report_Fall_2020.pdf. Accessed August 28, 2023.

Nichols-Barrer, Ira, Philip Gleason, Brian Gill, and Christina Clark Tuttle. "Student Selection, Attrition, and Replacement in KIPP Middle Schools." Educational Evaluation and Policy Analysis, vol. 38, no. 1, March 2016, pp. 5–20.

Nichols-Barrer, Ira, Philip Gleason, Alicia Demers, and Maria Bartlett. "Long-Term Impacts of KIPP Middle Schools: Phase II." June 11, 2021. https://doi.org/10.17605/OSF.IO/ATZH9

Place, Kate, and Philip Gleason. "Do Charter Middle Schools Improve Students' College Outcomes?" Evaluation brief. Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, April 2019.

Sass, Tim R., Ron W. Zimmer, Brian P. Gill, and T. Kevin Booker. "Charter High Schools' Effects on Long-Term Attainment and Earnings." Journal of Policy Analysis and Management, vol. 35, no. 3, 2016, pp. 683–706.

Stock, J., and M. Yogo. Testing for Weak Instruments in Linear IV Regression. In Identification and Inference for Econometric Models: Essays in Honor of Thomas Rothenberg, edited by Donald W. K. Andrews, pp. 80–108. New York: Cambridge University Press, s2005.

Tuttle, Christina Clark, Brian Gill, Philip Gleason, Virginia Knechtel, Ira Nichols-Barrer, and Alexandra Resch. "KIPP Middle Schools: Impacts on Achievement and Other Outcomes." Final report. Washington, DC: Mathematica Policy Research, February 27, 2013.

Tuttle, Christina Clark, Philip Gleason, Virginia Knechtel, Ira Nichols-Barrer, Kevin Booker, Gregory Chojnacki, Thomas Coen, and Lisbeth Goble. "Understanding the Effect of KIPP as It Scales: Volume I, Impacts on Achievement and Other Outcomes." Washington, DC: Mathematica Policy Research, September 2015.

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Appendix A

Additional Information on Study Sample and NSC Data Requests

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The study sample consists of 2,066 students who applied to enter grade 5 or grade 6 at an oversubscribed KIPP middle school for the 2008–2009, 2009–2010, or 2011–2012 school year. The study includes data from 21 KIPP middle schools holding a total of 36 admission lotteries, with each lottery representing a distinct combination of school, cohort, and entry grade. Sample sizes differ considerably by school, as some schools had more eligible seats for the lottery and/or had more applicants to those seats. Because of this, we present aggregated impact estimates for the overall sample rather than estimating school-level impacts. Table A.1 provides treatment and control group sample sizes for each KIPP middle school that students applied to in our study sample.

Table A.1. Sample sizes by KIPP middle schools

State	City	KIPP School	Treatment sample size	Control sample size
CA	Bay Area	Summit Academy	160	76
CA	Los Angeles	Academy of Opportunity	17	66
CA	Los Angeles	LA College Preparatory School	63	148
DC	Washington, DC	KEY Academy	16	17
DC	Washington, DC	WILL Academy	6	11
GA	Atlanta	South Fulton Academy	216	96
GA	Atlanta	WAYS Academy	27	17
MD	Baltimore	Ujima Village Academy	12	24
MA	Massachusetts	Academy Lynn Middle School	92	140
NY	New York City	Academy Middle School	113	34
NY	New York City	Infinity Middle School	45	44
NY	New York City	STAR Harlem Middle School	13	24
NC	Eastern North Carolina	Gaston College Preparatory	20	9
PA	Philadelphia	Philadelphia Charter School	36	18
PA	Philadelphia	West Philadelphia Preparatory	17	20
TX	Austin	Austin College Prep	11	45
TX	Austin	Austin College Prep with Austin Academy of Arts & Letters[a]	28	56
TX	Dallas-Fort Worth	TRUTH Academy	40	43
TX	Houston	Academy Middle School	46	153
TX	Houston	Sharpstown College Prep	6	20
TX	San Antonio	Aspire Academy	9	12
Total			**993**	**1,073**

[a] In Cohorts 1 and 2, the KIPP Austin sample includes only students from Austin College Prep. In Cohort 3, the KIPP Austin sample includes students from two distinct schools (Austin College Prep and Austin Academy of Arts & Letters) that were treated analytically as one site in this cohort due to elevated rates of joint application and crossover enrollment patterns among lottery participants in the two schools.

Table A.2 provides additional information on our data request to the National Student Clearinghouse (NSC). In particular, we provide the postsecondary data opt-out rates reported by the NSC for the treatment and control groups. Students and institutions have the option of refusing to share records through the NSC database; these cases consist of students who were matched to a college according to the NSC, but either they or their school opted out of allowing their data to be shared. In our data set, we cannot differentiate between a student who blocked their enrollment data from being shared and a student who did not go to college. However, we can identify whether opt-out rates are biasing our impact estimates by examining the overall opt-out rates separately by the treatment and control group. We find that the rates are similar and thus should not be biasing our impact estimates: 2.3 percent of the treatment group and 3.6 percent of the control group opted out of sharing their college enrollment data.

We also examined match rates separately by treatment and control group for the cases when we included a single record request for a student, as compared to cases when we included multiple record requests for the same student. We used the same process for both the treatment and control groups to determine which students warranted submitting multiple records. Specifically, when a student had a hyphenated name or multiple first and/or last names, we submitted a batch of multiple records for that student with the different name permutations in the NSC submission file. There were also a few students in both the treatment and control groups that listed multiple birth dates in our sample file. In those cases, we submitted records with each of the recorded birth dates in our data set. If the NSC provided any matched postsecondary records for a student with multiple submissions, we classified the student as having enrolled in a postsecondary program.

We find that the match rates were slightly higher for the students with multiple record submissions compared to a single record submission. Overall, for any college type and all years of available data, 72.8 percent of students with multiple submitted records matched to the NSC, compared to 68.1 percent of students with a single submitted record. (This overall match rate is substantially higher than the enrollment rate in four-year college programs cited in the study's primary findings, because a considerable portion of the matched students only enrolled in two-year college programs and because some of the students in older cohorts enrolled in college after the study's three-year follow-up period.) The slightly higher match rate for students with multiple submitted records compared to a single record persists when examining the results separately by treatment status: The difference in match rate between multiple and single record requests is 3.9 percentage points and 5.0 percentage points for the treatment and control groups, respectively. Overall, these differences are still relatively low and do not indicate that submitting multiple or single records for students appreciably affected the match rates used to define the study's outcomes in the treatment and control group.

Table A.2. Summary of postsecondary data requested and returned

Characteristic	Full sample	Treatment group	Control group
Percentage of students who opted out of sharing data with the NSC	3.0%	2.3%	3.6%
Match rate from submitting single records	68.1%	70.1%	66.3%
Number of single record requests	1,695	789	906
Match rate from submitting multiple records	72.8%	74.0%	71.3%
Number of multiple record requests	371	204	167
Overall sample size	**2,066**	**993**	**1,073**

Note: The NSC reports a count of the number of students in the data request file who were found in NSC records but had opted out of sharing their data. The means presented in the first row of this table represent the raw

proportion of the treatment or control group students in the data request who opted out and are not adjusted for selection probability or site. The match rates reported cover any college type and all years of available data. They are also raw means that are not adjusted for each student's KIPP-lottery selection probability or lottery site.

The study's sample of KIPP middle schools is broadly representative of the overall population of KIPP students at the time the study began. For example, 93 percent of students in sample schools were either Black or Hispanic compared with 95 percent of students attending KIPP schools in 2008, 2009, or 2011 (Table A.3). Approximately 51 percent of both sample school students and those in the overall KIPP population were male. However, the study does include a substantially larger number of Hispanic students and a smaller number of Black students compared to the overall KIPP network. The study conducted subgroup analyses to test whether the pattern of college impacts among Black students is similar to the pattern observed among Hispanic students in our sample.

Table A.3. Characteristics of study schools compared to the national KIPP network

Baseline characteristic	KIPP middle schools in the study sample	All KIPP network middle schools
Student is male	49%	49%
Student is female	51%	51%
Student is Hispanic	45%	31%
Student is White	3%	2%
Student is Black	48%	64%
Student is other race/ethnicity	4%	3%
Student has an Individualized Education Program	9%	9%
Student received free or reduced-price lunch	82%	84%
Number of middle schools (2008–2009)	**4**	**52**
Number of middle schools (2009–2010)	**13**	**55**
Number of middle schools (2011–2012)	**15**	**61**
Number of students (2008–2009)	**1,382**	**14,337**
Number of students (2009–2010)	**4,406**	**16,123**
Number of students (2011–2012)	**5,254**	**19,123**

Source: KIPP Report Cards 2008–2012.

Note: KIPP Report Cards include data for students enrolled in the fall of the school year for all schools that were operational during the previous school year. For schools that were operational for the first time in either the 2008, 2009, or 2011 school year, we used data reported in the following year's Report Card. The averages presented in this table are weighted based on school enrollment in the respective year. The number of middle schools in the study sample for 2011–2012 is 15 because Austin College Prep and Austin Academy of Arts & Letters were two distinct schools in the KIPP network; however, they were treated analytically as one site in Cohort 3 due to elevated rates of joint application and crossover enrollment patterns among lottery participants in the two schools.

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Appendix B

Supplementary Analyses: Middle School Impacts

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1. Sensitivity analyses

We conducted a series of sensitivity analyses for the study's primary analysis estimating the impacts of KIPP middle schools. These analyses tested whether the results are robust to different approaches to regression modeling, covariate selection, baseline imputation, and sample weights. Table B.1 presents impact estimates for each of these analyses, as well as the estimates from our primary impact model for ease of comparison.

Logit model. To estimate our primary impacts, we used an ordinary least squares (OLS) regression model. When estimating impacts on binary outcomes (that is, the outcome has two possibilities, such as enrolled in college or not enrolled in college), an OLS regression model is also known as a linear probability model (LPM). Different model forms can plausibly produce different results, so we reestimated impacts on our primary outcomes using a logit model to test how sensitive our findings are to the model type. We used the same covariates as our primary impacts model. To compare findings between logit and LPM results, we converted our logit results to treatment and control means and reported the marginal impact (the difference between the treatment and control means), which is directly comparable to the impact estimate from an LPM.

We find that the logit impact estimates are almost identical to the LPM impact estimates. For our logit results, we find a positive but statistically insignificant impact of KIPP middle schools on four-year college enrollment of 3.9 percentage points (compared to 3.8 percentage points for the LPM result) and a positive but not significant difference of 0.4 percentage points for persisting through a student's first six college semesters (compared to 0.6 percentage points for the LPM result).

Baseline imputation. Our primary impact model uses baseline data on test scores, socioeconomic characteristics, and demographic characteristics as covariates. For students missing data for some of the covariates, we imputed values by conducting single stochastic regression imputation. Imputation was conducted separately by treatment status, and each imputation included a stochastic component randomly selected from the set of all residuals in the imputation equations to ensure that the variance of the imputed values is the same as that of the observed values (see Chapter II of this report and Tuttle et al. [2013] for more information on the imputation process).

To test whether our imputation method affected any of the study's primary findings, we estimated results using two alternative models. First, we replaced all imputed baseline values with a value of 0 (zero imputation model) but kept the model identical to our primary approach otherwise (including using imputation flags as covariates). Second, we estimated impacts without including any baseline covariates (no covariates model). These models still controlled for the school, grade, and year of the student's application to a KIPP middle school.

We find that the magnitude and directionality of the impacts are similar between our primary model and our alternative imputation models. The zero-imputation model resulted in slightly lower impact estimates for college enrollment and persistence: The enrollment impact fell from 3.8 percent to 3.0 percent, and the persistence impact fell from 0.6 percent to 0.0 percent. However, for the no covariates model, the enrollment impact estimate decreased by only 0.1 percentage points and the persistence impact estimate increased by 0.5 percentage points.

Sample weights. Our primary impact model includes sample weights, known as inverse probability weights, to account for the fact that not all students in the lottery have the same probability of being admitted to the KIPP school (that is, being selected into the treatment group). Some students have a

higher probability of admission, either based on their inclusion in a priority group defined by a student characteristic or because they have a sibling in the lottery. The primary sample weights follow the original RCT studies (Tuttle et al. 2013; Tuttle et al. 2015) and are based on the procedure used in Gleason et al. (2010).

In the simple case, where all students interested in attending a particular KIPP school enter the lottery and no preferences are given for siblings or other characteristics, the sample weight for a given student is based on the probability that he or she ended up in the treatment or control group. This probability is used in the calculation of each student's base weight. In particular, the base weight assigned to treatment (or control) group members is set to the inverse of the probability of being selected into the treatment (or control) group. We then normalize this weight to account for the fact that the sample will be representative of the set of all consenting lottery participants at that site. We set this normalization factor such that the weights of each experimental group sum to one-half of the total sample size within the site. Thus, the sum of all students' weights within a site will be equal to the overall sample size in that site (that is, the number of consenting lottery participants), with the sum of weights among treatments equal to that among controls.

In sites with sibling preference rules (that is, siblings of students already enrolled in a KIPP school have a higher likelihood of winning the lottery), the basic approach to calculating sample weights is the same as in the simple case above. The difference, however, is in the calculation of the probability of admission. No longer can we simply use the number of admitted students divided by the number of lottery participants. This is because the exact probabilities of admission depend on the number of sets of siblings who participate in the lottery at the school, as well as the number of students within each sibling set.

To test whether our impact results are being driven by our choice of sample weights, we reestimated our primary impacts using two alternative weighting approaches that alter the relative weight of sites in the estimation—the treatment and control groups continue to contribute equally within sites, but these normalizations affect the relative weight of different sites in the analysis. First, we weight school impacts equally (known as equal site weights). Second, we weight schools by the treatment group sample size, which is an alternative version of inverse-variance weights in the sense that it still provides greater weight to the lottery sites with more precise site-level impact estimates. Within each site, the alternative weights still account for differences between applicants in their probability of being offered admission (based on factors such as whether they have siblings applying to the school). Besides the change in weighting approach, the model is identical to our primary impacts model.

We find that these alternative weighting approaches do not change the size of the impact estimates in meaningful ways. The impact estimate for the primary enrollment outcome slightly increases when we weight schools equally and slightly decreases when we weight schools proportional to the treatment group sample size. Both of the alternative approaches slightly increase the magnitude of the impact estimates for the primary persistence measure. The difference between the main sample weights and the alternative ones is how sites are weighted relative to one another. Thus, the change in estimated impacts implies that sites with larger persistence impacts are being weighted somewhat more heavily when using the alternative approaches (either weighting schools equally or weighting by treatment group sample size).

Table B.1. Impact estimates on primary outcomes using alternative model specifications

Outcome	Model	Treatment mean	Control mean	Impact estimate	*p*-value
Ever enrolled in four-year college	**Linear probability model (primary)**	**51.4%**	**47.6%**	**3.8 p.p. (2.4 p.p.)**	**0.123**
Persisted through first six semesters (four-year college)	**Linear probability model (primary)**	**23.8%**	**23.2%**	**0.6 p.p. (2.1 p.p.)**	**0.785**
Ever enrolled in four-year college	Logit	51.4%	47.5%	3.9 p.p. (2.4 p.p.)	0.101
Persisted through first six semesters (four-year college)	Logit	23.7%	23.3%	0.4 p.p. (2.0 p.p.)	0.863
Ever enrolled in four-year college	Zero imputation	51.0%	48.0%	3.0 p.p. (2.5 p.p.)	0.230
Persisted through first six semesters (four-year college)	Zero imputation	23.5%	23.5%	0.0 p.p. (2.1 p.p.)	0.982
Ever enrolled in four-year college	No covariates	51.3%	47.6%	3.7 p.p. (2.6 p.p.)	0.163
Persisted through first six semesters (four-year college)	No covariates	24.0%	23.0%	1.1 p.p. (2.3 p.p.)	0.632
Ever enrolled in four-year college	Weight schools equally	49.8%	46.8%	3.0 p.p. (2.8 p.p.)	0.280
Persisted through first six semesters (four-year college)	Weight schools equally	22.6%	21.1%	1.6 p.p. (2.2 p.p.)	0.476
Ever enrolled in four-year college	Weight schools by treatment group sample size	54.2%	49.7%	4.5 p.p. (2.5 p.p.)	0.075
Persisted through first six semesters (four-year college)	Weight schools by treatment group sample size	26.2%	24.9%	1.3 p.p. (2.4 p.p.)	0.579

Note: Standard errors are reported in parentheses under each impact estimate. The study includes 2,066 students who applied to enter KIPP through a middle school via admission lotteries, and compares the outcomes of students offered admission to KIPP (treatment group) to those not offered admission (control group) at the time of the lottery.

p.p. = percentage points.

2. Subgroup analyses

We also explored whether KIPP impacts differed for key subgroups for our primary outcome measures. We examined subgroups defined for students with low baseline math or reading scores (below district mean), low household income (less than $35,000 a year), and low mother's education (completed high school or less); as well as for students who are male, mainly speak another language than English at home, and are Hispanic, Black, or eligible for free or reduced-price lunch. Given our sample size, the subgroup sizes are small, and results should be interpreted with caution. Our overall sample size is only powered to detect college enrollment impacts of around 5.4 percentage points. Most of the subgroups are less than half the size of our overall sample, so the true impacts would need to be much larger for us to be able to reliably detect these effects as being statistically different from zero.

To estimate subgroup impacts, we use the same model as our primary specification (see Equation [1] in Section II.E of the report) but add in a term that represents the interaction between a subgroup indicator and the treatment variable. The coefficient on the interaction term represents how the estimated effect of KIPP on a given outcome among that subgroup differs from the effect among students who are not in the

subgroup. A positive estimate for the interaction effect indicates that KIPP has a more positive effect on college enrollment or persistence among the subgroup than among other students. Similarly, a negative estimate indicates that KIPP has a more negative effect among the subgroup than among other students. Estimates that are indistinguishable from 0 imply that KIPP's effect is no different for students in the subgroup than for those not in the subgroup. As with our primary model, we control for baseline student achievement, demographics, socioeconomic factors, the school to which the student applied, the year, and the grade they were in. We also use inverse probability weights to account for students having different probabilities of being offered admission to a KIPP middle school.

Table B.2 presents our subgroup findings. In general, we do not find any significant subgroup-level differences in the effects of KIPP middle schools on college enrollment or persistence. That said, there is some evidence that KIPP has a more negative effect on college enrollment among students with low baseline math scores and a more negative effect on college persistence among students from low-income households. Due to the large number of significance tests in these subgroup analyses, we also performed a multiple comparison adjustment across all subgroup findings, by outcome measure.[13] After we applied the multiple comparison adjustment, none of the subgroup-level results remained statistically significant. In other words, although the magnitudes and directionality of the subgroup interaction effects vary widely, this appears to be a byproduct of "noise" in the data related to the small sample sizes in these subgroup analyses. These results imply that the effect of KIPP middle schools does not appear to be concentrated among particular subgroups of students.

[13] The multiple comparison correction assessed the significance of findings across subgroups for each outcome. We first ranked subgroups by *p*-value, calculated the Benjamini-Hochberg critical value for each *p*-value (equal to the rank of the finding divided by the total number of findings, then multiplied by 0.05). Any statistically significant finding with an impact *p*-value smaller than its critical *p*-value is considered to maintain its statistical significance (Benjamini & Hochberg, 1995).

Table B.2. Impact estimates on primary outcomes on student subgroups

Outcome	Subgroup	Interaction effect	*p*-value	Treatment subgroup size
Ever enrolled in four-year college	Low baseline math scores	-14.8 p.p.** (5.7 p.p.)	0.009[a]	271
Persisted through first six semesters (four-year college)	Low baseline math scores	-3.4 p.p. (4.9 p.p.)	0.496	271
Ever enrolled in four-year college	Low baseline reading scores	-1.1 p.p. (5.8 p.p.)	0.852	277
Persisted through first six semesters (four-year college)	Low baseline reading scores	-5.4 p.p. (4.8 p.p.)	0.262	277
Ever enrolled in four-year college	Low household income	9.5 p.p. (5.8 p.p.)	0.099	449
Persisted through first six semesters (four-year college)	Low household income	5.9 p.p. (4.9 p.p.)	0.230	449
Ever enrolled in four-year college	Low mother's education	4.8 p.p. (5.2 p.p.)	0.359	323
Persisted through first six semesters (four-year college)	Low mother's education	-0.2 p.p. (4.4 p.p.)	0.967	323
Ever enrolled in four-year college	Male	8.9 p.p. (5.1 p.p.)	0.079	451
Persisted through first six semesters (four-year college)	Male	0.9 p.p. (4.2 p.p.)	0.839	451
Ever enrolled in four-year college	Main language at home not English	8.6 p.p. (5.0 p.p.)	0.089	341
Persisted through first six semesters (four-year college)	Main language at home not English	0.3 p.p. (4.2 p.p.)	0.950	341
Ever enrolled in four-year college	Hispanic	2.3 p.p. (5.0 p.p.)	0.650	384
Persisted through first six semesters (four-year college)	Hispanic	-6.7 p.p. (4.3 p.p.)	0.118	384
Ever enrolled in four-year college	Black	-4.6 p.p. (5.1 p.p.)	0.368	438
Persisted through first six semesters (four-year college)	Black	2.2 p.p. (4.4 p.p.)	0.621	438
Ever enrolled in four-year college	Eligible for FRPL	-5.8 p.p. (6.4 p.p.)	0.368	606
Persisted through first six semesters (four-year college)	Eligible for FRPL	-11.2 p.p.* (5.5 p.p.)	0.041[a]	606
Ever enrolled in four-year college	Black males	-2.9 p.p. (5.3 p.p.)	0.588	204
Persisted through first six semesters (four-year college)	Black males	-2.1 p.p. (4.3 p.p.)	0.628	204
Ever enrolled in four-year college	Hispanic males	8.8 p.p. (5.5 p.p.)	0.105	187
Persisted through first six semesters (four-year college)	Hispanic males	-1.9 p.p. (4.2 p.p.)	0.647	187

Note: We used nonimputed baseline data to identify each subgroup. Standard errors are reported in parentheses. The study compares the outcomes of students offered admission to KIPP (treatment group) to outcomes of students not offered admission (control group) at the time of the lottery. Impacts are based on a regression model that pools all lottery schools, controls for baseline covariates, and includes weights to account for probability of assignment to the treatment or control group. Low math and reading scores = below-average test scores (z-scores < 0); FRPL = free or reduced-price lunch; Low income = less than $35,000 in household income a year; Low mother's education = high school degree or lower.

[a] Finding is not statistically significant at the 0.05 level of significance after correcting for multiple comparisons across subgroups within outcome measure.

p.p. = percentage points; FRPL = free or reduced-price lunch.

* Significantly different from zero at the .05 level, two-tailed test.

** Significantly different from zero at the .01 level, two-tailed test.

3. Cohort analyses

Table B.3 presents detailed findings by study cohort. In this analysis, we estimated impacts on our primary outcomes for Cohort 3 (applicants to KIPP middle schools in 2011) separately from Cohorts 1 and 2 (applicants in 2008 or 2009) using the same model as our primary specification (equation 1 in Section II.E). With the addition of a third cohort and another year of outcome data, this analysis enables us to track the earlier cohorts' educational outcomes over a longer period and compare KIPP's effects between the earlier and later cohorts.

As noted in Chapter III, impacts of KIPP middle schools on both four-year college enrollment and persistence were larger in magnitude for Cohorts 1 and 2 than for Cohort 3, although the estimates for the two groups were not statistically distinguishable from one another. Table B.3 shows that the impact estimate on college enrollment for Cohorts 1 and 2 was 1.5 percentage points larger than for Cohort 3, whereas the estimated impact on college persistence rates was 5.1 percentage points larger among Cohorts 1 and 2 than for Cohort 3. Despite the potential change in effects, differences between impacts were not statistically significant for enrollment (p-value = 0.416) or persistence (p-value = 0.199).

Nonetheless, any differences across cohorts may be explained by several factors including disruptions to learning during the COVID-19 pandemic, related changes in KIPP's alumni support model during the study period, and changes across cohorts in the KIPP schools included in the analysis or in the types of colleges students selected. Our follow-up period tracks college outcomes during the 2019–2020 and 2020–2021 school years, which were heavily disrupted by the COVID-19 pandemic. Cohort 3 students, just having begun their postsecondary careers at the time (on-track 5th grade applicants would have enrolled in college in fall 2019 and 6th grade applicants in fall 2018), may have felt the effects of the pandemic on their postsecondary education to a greater extent than students in the earlier cohorts (who would have been further along in college or would have graduated when the pandemic began).

Table B.3. Primary impact estimates of KIPP middle school admission offer for college enrollment and persistence, by cohort

Primary outcome	Cohorts 1 & 2 (2008 and 2009 lotteries)				Cohort 3 (2011 lottery)				Difference between Cohorts 1 & 2 and Cohort 3	
	Mean (treatment)	Mean (control)	Impact estimate	*p*-value	Mean (treatment)	Mean (control)	Impact estimate	*p*-value	Difference between impact estimates	*p*-value of difference
Ever enrolled in four-year college	51.2%	46.8%	4.4 p.p. (3.5 p.p.)	0.202	51.6%	48.7%	2.9 p.p. (3.3 p.p.)	0.383	-1.5%	0.746
Persisted through first six semesters (four-year college)	26.0%	23.2%	2.8 p.p. (3.0 p.p.)	0.343	20.8%	23.1%	-2.3 p.p. (2.8 p.p.)	0.416	-5.1%	0.199

Note: Standard errors are reported in parentheses under each impact estimate. The study includes 1,177 students who applied to enter KIPP through a middle school via admission lotteries in 2008 and 2009 (Cohorts 1 and 2) and 889 students who applied in 2011 (Cohort 3) and compares the outcomes of students offered admission to KIPP (treatment group) to outcomes of those not offered admission (control group) at the time of the lottery. Estimates of the impact of KIPP attendance use the lottery as an instrument for whether a student ever attended a KIPP middle or high school. The model pools all 13 lottery schools in Cohorts 1 and 2 and all 14 lottery schools participating in Cohort 3, controls for baseline covariates, and includes weights to account for probability of assignment to the treatment or control group. The *p*-value of the difference in impacts measures whether the difference in Cohorts 1 and 2 impact and Cohort 3 impact is statistically significantly different than zero.

p.p. = percentage points.

The pandemic also disrupted KIPP's alumni support model in important ways. Although many KIPP regions had intended to expand alumni support services in 2020 and 2021, qualitative data from our interviews with KIPP Forward staff suggest that KIPP students actually began receiving fewer and less intensive supports during the first two years of the pandemic; for example, KIPP Forward limited or discontinued in-person activities, college visits from KIPP staff, and KIPP alumni gatherings during college breaks. In Appendix D, we provide additional information learned through our qualitative interviews of KIPP staff related to services offered to KIPP students and alumni and how services changed over time or were disrupted during the pandemic.

4. Entrance grade-level analyses

Table B.4 presents the impact estimates of KIPP for our primary enrollment, persistence, and graduation outcomes by the grade in which students applied for admission to KIPP. In this analysis, we estimated impacts on our primary outcomes for students who applied for admission in grade 5 separately from those of students who applied in grade 6 using the same model as our primary specification (equation 1 in Section II.E).

The purpose of this analysis is to quantify differences in impacts of KIPP between students who applied for admission in grade 5 compared to grade 6. When the lotteries took place, most KIPP middle schools had atypical grade configurations (enrolling grades 5 through 8) compared with most traditional public middle schools, which typically enroll grades 6 through 8. Therefore, grade 5 applicants would have sought to transfer into KIPP before their school's natural final grade. Grade 6 applicants, meanwhile, sought to enroll in KIPP a year after most of their cohort, during a more natural transition year out of

traditional public schools. This may mean that grade 6 entrants to KIPP experienced challenges acclimating to KIPP or may have fallen further behind others in their cohort who entered in grade 5.

We found that KIPP had more favorable impacts on college enrollment, persistence, and graduation among students who applied and received an admission offer to KIPP via lottery in grade 5 compared to grade 6. In fact, KIPP middle schools had positive impacts among students who received an admission offer to a KIPP middle school in grade 5 and negative impacts among students who received an admission offer in grade 6, although only the impact of college enrollment among grade 5 applicants was statistically significant. For this finding, students who received a lottery-based admission in grade 5 were 7.2 percentage points more likely to enroll in a four-year college three years after high school than students who applied but did not receive an offer in grade 5 (p-value = 0.018). Meanwhile students who received an admission offer in grade 6 were 3.2 percentage points less likely to enroll in a four-year college than grade 6 applicants who were not offered admission (p-value = 0.429). In other words, the impact of KIPP middle schools on college enrollment was 10.4 percentage points higher among grade 5 treatment students than grade 6 treatment students, a difference in impacts that is statistically significant (p-value = 0.034).

The impact of KIPP middle schools on college persistence was small but favorable among students in the grade 5 treatment group and small and negative among the grade 6 treatment group. Grade 5 treatment students were 2.5 percentage points more likely to persist through three years at a four-year college compared to grade 5 control students (p-value = 0.359), whereas grade 6 treatment students were 2.8 percentage points less likely to persist in college compared to students in the grade 6 control group (p-value = 0.369). The difference in impacts (5.3 percentage points) is not statistically significant (p-value = 0.187).

We do not find any significant differences between KIPP's effect on four-year college graduation among students who were offered admission to KIPP in grade 5 compared to grade 6. In our sample of Cohorts 1 and 2 students, those who were offered admission to a KIPP middle school in grade 5 were 2.4 percentage points more likely to graduate from a four-year college in five years than students who were not offered admission to a KIPP middle school in grade 5 (p-value = 0.500). KIPP had the opposite effect among students offered admission in grade 6, decreasing the likelihood of graduating from a four-year college by 2.7 percentage points (p-value = 0.426). The difference in impacts, 5.1 percentage points, is also not statistically significant different than zero (p-value = 0.280). However, when we consider students who are on-track to graduate (enrolled at a four-year college in the 10th semester after high school graduation) in addition to those who had graduated in that time, we see the pattern strengthen: KIPP had a 7.8 percentage point impact on being enrolled in the 10th semester or having graduated by the 10th semester among students who were offered admission to KIPP in grade 5 (p-value = 0.064) and a negative 6.6 percentage point impact among students offered admission in grade 6 (p-value = 0.151). Although neither impact is statistically significant, the difference between impacts (14.4 percentage points) is significantly different (p-value = 0.016).

Table B.4. Impact estimates of KIPP middle school admission offer for college enrollment, persistence, and graduation, by lottery entrance grade

Primary outcome	Grade 5 applicants				Grade 6 applicants				Difference between grade 5 and grade 6 applicants	
	Mean (treatment)	Mean (control)	Impact estimate	*p*-value	Mean (treatment)	Mean (control)	Impact estimate	*p*-value	Difference between impact estimates	*p*-value of difference
Ever enrolled in four-year college	54.8%	47.6%	7.2 p.p.* (3.0 p.p.)	0.018	44.9%	48.1%	-3.2 p.p. (4.1 p.p.)	0.429	-10.4%*	0.034
Persisted through first six semesters (four-year college)	26.1%	23.7%	2.5 p.p. (2.7 p.p.)	0.359	19.7%	22.5%	-2.8 p.p. (3.1 p.p.)	0.369	-5.3%	0.187
Graduated from a four-year college in five years	26.2%	23.7%	2.4 p.p. (3.6 p.p.)	0.500	16.3%	19.0%	-2.7 p.p. (3.3 p.p.)	0.426	-5.1%	0.280
Enrolled in a four-year program in 10th semester (or graduated in 10 semesters or fewer)	41.9%	34.2%	7.8 p.p. (4.2 p.p.)	0.064	27.3%	33.91%	-6.6 p.p. (4.6 p.p.)	0.151	-14.4%*	0.016

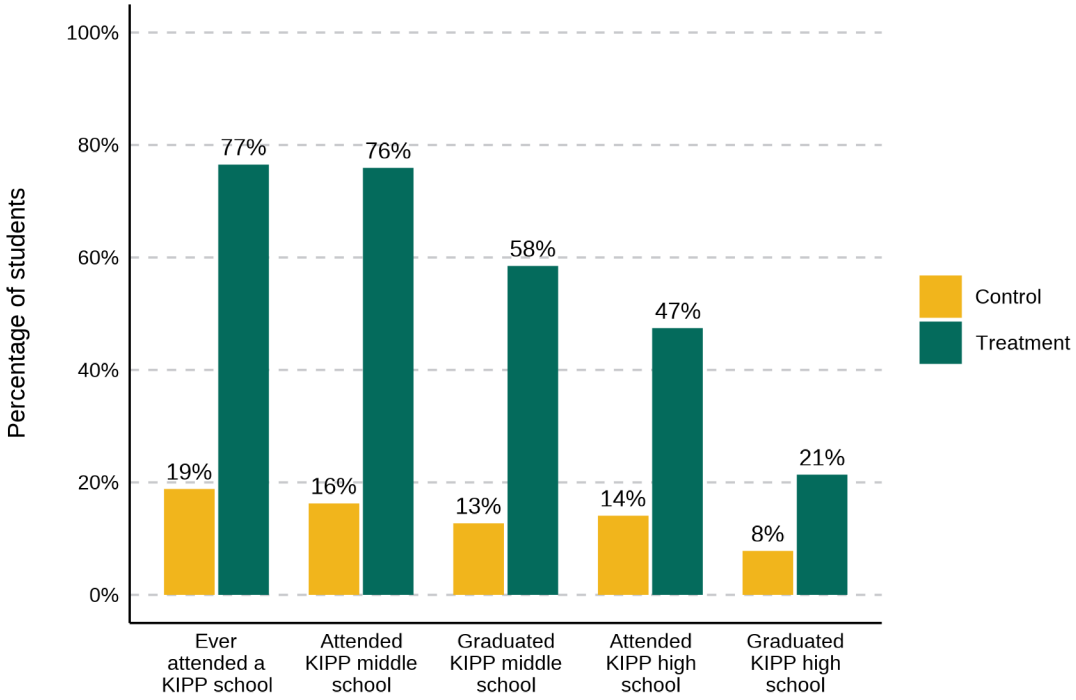
Note: Note: Standard errors are reported in parentheses under each impact estimate. The college enrollment and persistence outcomes include 1,309 students who applied to enter KIPP through a middle school via admission lotteries in grade 5 and 757 students who applied in grade 6, and compares the outcomes of students offered admission to KIPP (treatment group) to outcomes of students not offered admission (control group) at the time of the lottery. The college graduation and "on-track" to graduate outcomes include 682 students in Cohorts 1 and 2 who applied to enter KIPP through a middle school via admission lotteries in grade 5 and 495 students who applied in grade 6 in Cohorts 1 and 2, and compares the outcomes of students offered admission to KIPP (treatment group) to outcomes of students not offered admission (control group) at the time of the lottery. Estimates of the impact of KIPP attendance use the lottery as an instrument for whether a student ever attended a KIPP middle or high school. The model pools all 13 lottery schools in Cohorts 1 and 2 and all 14 lottery schools participating in Cohort 3, controls for baseline covariates, and includes weights to account for probability of assignment to the treatment or control group. The *p*-value of the difference in impacts measures whether the difference in impacts for grade 5 and grade 6 lottery applicants is statistically significantly different than zero.

p.p. = percentage points.

When interpreting the differences in impacts across lottery grade, it is important to keep in mind that grade 6 applicants were entering at a natural transition grade. Grade 5 applicants, on the other hand, were presumably established at a school outside of KIPP while seeking to transfer to KIPP, which suggests that these students may have been unsatisfied with the traditional public school system, more committed to KIPP, or both. Entrance grade, therefore, could be considered a proxy measure of one's commitment and desire to attend KIPP. In fact, while we know that, overall, students in our study who were offered admission to KIPP went on to attend and graduate from KIPP middle schools and KIPP high schools at higher rates compared to students not offered admission (Figure II.1), we further see that grade 5 applicants attended and graduated from KIPP middle and KIPP high schools at higher rates than grade 6 applicants (Figures B.1 and B.2, respectively). Seventy-six percent of treatment students who applied for admission in grade 5 went on to attend a KIPP middle school, compared to 60 percent of students in the grade 6 lottery, and 58 percent of treatment students in grade 5 lotteries graduated from a KIPP middle school, compared to 39 percent of grade 6 treatment students. This pattern persisted through high school, where 47 percent of treatment students who applied for admission in grade 5 lotteries attended a KIPP high school with 21 percent graduating from a KIPP high school, compared to just 16 percent of treatment students who applied in grade 6 attending and 8 percent graduating from a KIPP high school.

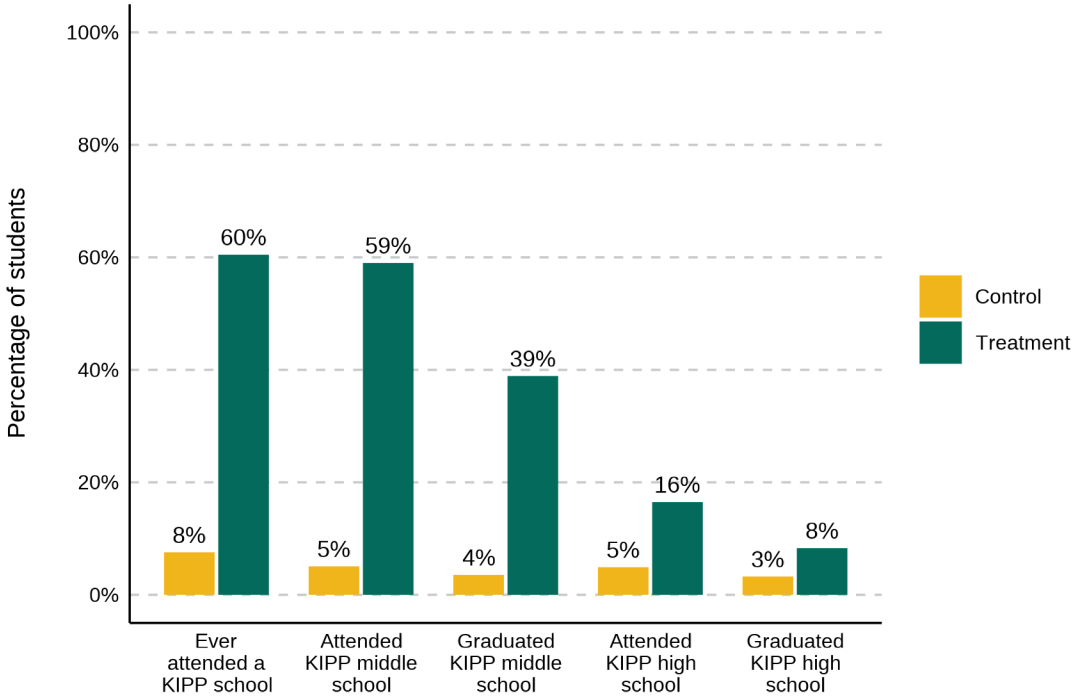
As we saw in our analysis of KIPP attendance in Chapter III, students in our study who attended both a KIPP middle school and a KIPP high school experienced positive and statistically significant impacts on college enrollment, persistence, and graduation. These findings, coupled with the fact that grade 5 students tend to enroll and remain in KIPP longer than grade 6 applicants, explains the differential effects of KIPP by student entry grade. For instance, students who enter KIPP in grade 6 but leave before completing middle school (about 20 percent of students in our sample) likely experienced two transitions during this time—into KIPP and then back into a traditional public school—which may contribute to their weaker college attainment outcomes later on.

Figure B.1. Exposure to KIPP middle and high schools, by lottery group (grade 5 lottery applicants)



Note: We estimated sample means by regressing KIPP attendance on treatment status using inverse probability weights. The control mean is unadjusted, and the treatment mean is the sum of the control mean and the regression-adjusted difference between groups. The difference for each indicator is statistically significant (*p*-value < 0.01). Sample size = 1,309.

Figure B.2. Exposure to KIPP middle and high schools, by lottery group (grade 6 lottery applicants)



Note: We estimated sample means by regressing KIPP attendance on treatment status using inverse probability weights. The control mean is unadjusted, and the treatment mean is the sum of the control mean and the regression-adjusted difference between groups. The difference for each indicator is statistically significant at the 0.01 level of significance, except for the difference between KIPP high school graduation rates, which is statistically significant at the 0.05 level. Sample size = 757.

5. Impacts on secondary measures of college enrollment and persistence

Table B.5 presents definitions for the study's secondary measures of college enrollment and persistence. For secondary enrollment measures, we estimated the impact of KIPP middle schools for "on-time" college enrollment in the fall after high school graduation, enrollment in a two-year college, or enrollment in any type of college. To measure if students' initial enrollment represented a serious effort to continue in the program, we also included a version of the enrollment outcome that also requires students to remain enrolled through the end of their first semester.

Because we had a limited follow-up period in which to observe persistence patterns among the entire study sample, we examined persistence in multiple ways that allowed for flexibility around late entry into college, noncontinuous enrollment, and different follow-up periods across cohorts. For one measure (the percentage of possible semesters that a student enrolled in college), we also included more than three years of college data from the first two cohorts (which had a chance to persist in college for up to seven years). We estimated impacts separately for two-year and four-year colleges, as well as for overall college persistence, since students may shift from two-year to four-year programs. We also estimated the average number of consecutive semesters enrolled, the shares of students enrolled in the third and fifth semester following high school graduation, and the number of semesters enrolled out of the number of total possible semesters a student could attend college (depending on their cohort and the grade in which they applied to KIPP).

Table B.5. Overview of secondary outcome measures of college enrollment and persistence

Outcome	Definition
Enrollment outcomes	
Ever enrolled in any college	Student enrolled in college within the study at any point after high school graduation and within the three-year follow up period, separately for students enrolled in any college or in a two-year college.
Enrolled in four-year college without withdrawing	Student enrolled in a four-year college within three years after expected high school graduation and did not withdraw from the first semester they enrolled in.
Enrolled on time in college	Student enrolled in college in the fall after their expected high school graduation date. We measured this outcome separately for students who enrolled in any college, in a four-year college, or in a two-year college.
Persistence outcomes	
Enrolled in college for at least three consecutive years and in a four-year program in sixth semester	Student was enrolled in a four-year postsecondary program in the sixth semester following expected high school graduation, and any two-year or four-year postsecondary program between the first and fifth semester.
Enrolled in college in sixth semester	Student was enrolled in any postsecondary program in the sixth semester following expected high school graduation. We measured this outcome separately for students enrolled in any college, in a four-year college, or in a two-year college.
Persisted through first 10 semesters at a four-year college (or graduated in 10 semesters or fewer)	Student was continuously enrolled in a four-year college on a part-time or full-time basis for five years—10 semesters—after expected high school graduation or had graduated from a four-year program within 10 semesters. We measured this outcome for Cohorts 1 and 2 only, as Cohort 3 has only up to four years of enrollment data.
Enrolled in four consecutive semesters with the first three years following high school graduation	Continuous enrollment for at least four semesters in one or more postsecondary programs, during the first three years after their expected high school graduation date. We measured this outcome separately for students enrolled in any college, in a four-year college, or in a two-year college.
Total number of semesters enrolled in three years	This measure counts the number of semesters a student enrolled within the first three years after high school graduation.
Total number of semesters enrolled in five years	This measure counts the number of semesters a student enrolled within the first five years after high school graduation. We measured this outcome for Cohorts 1 and 2 only, as Cohort 3 has only up to four years of enrollment data.
Number of consecutive semesters enrolled	This measure counts the number of consecutive semesters a student enrolled, beginning the fall after their expected high school graduation and continuing for six semesters. If a student did not enroll in college in the first semester following high school graduation, they received a zero for this variable. We measured this outcome separately for students who persisted in any college, persisted only in a four-year college, or persisted only in a two-year college.
Percentage of possible semesters enrolled	This is the share of semesters that a student was enrolled in college following expected high school graduation for all available years of data. This outcome is set equal to 100 percent if the student graduated from a four-year program within five years of expected high school graduation. The denominator for Cohort 1 and 2 is top coded to 10 semesters. The denominator for Cohort 3 5th and 6th grade students is six and eight semesters, respectively.

Intent-to-treat (ITT) impacts on secondary outcome measures. Tables B.6 and B.7 present the exploratory ITT impact estimates for our secondary outcome measures. The ITT impacts are estimated using the same regression model used for the primary impacts (equation 1 in section II.E) and thus represent the impact of an admission offer to a KIPP middle school.

We do not find evidence that receiving an admission offer to a KIPP middle school affects these other measures of college enrollment. The estimated impacts on these secondary outcomes are positive but not statistically significant (Table B.6). For example, 67.3 percent of the treatment group and 64.6 percent of the control group enrolled in any type of college within three years of high school graduation, but the difference is not statistically significant (*p*-value = 0.261). The rates are similar when looking at students who did not withdraw from the first semester at any school: 66.4 percent of the treatment group and 63.5 percent of the control group did not withdraw (*p*-value = 0.231). In the case of on-time enrollment at four-year colleges, the estimated impact is again not significant (*p*-value = 0.098), although the magnitude of the estimated impact is similar to the estimated impact on our primary enrollment outcome: 4.3 percentage points for on-time enrollment and 3.8 percentage points for any enrollment.

We also find no significant impacts of KIPP on measures of enrollment in two-year college programs (typically community college or associates degree programs). The rate of enrollment in a two-year college within three years of expected high school graduation was similar among students offered admission to a KIPP middle school (24.7 percent) and those not offered admission (22.3 percent).

Table B.6. Impact estimates on secondary college enrollment measures (intent-to-treat)

Outcome	Treatment mean	Control mean	Impact estimate	Sample size	*p*-value
Ever enrolled					
Any college	67.3%	64.6%	2.7 p.p. (2.4 p.p.)	2,066	0.261
Four-year colleges	51.4%	47.6%	3.8 p.p. (2.4 p.p.)	2,066	0.123
Two-year colleges	24.7%	22.3%	2.4 p.p. (2.1 p.p.)	2,066	0.265
Ever enrolled without withdrawing					
Any college	66.4%	63.5%	2.9 p.p. (2.4 p.p.)	2,066	0.231
Four-year colleges	50.8%	46.7%	4.0 p.p. (2.4 p.p.)	2,066	0.098
Two-year colleges	23.8%	21.8%	2.0 p.p. (2.1 p.p.)	2,066	0.342
On-time college enrollment					
Any college	57.7%	54.3%	3.4 p.p. (2.5 p.p.)	2,066	0.171
Four-year colleges	44.6%	40.2%	4.3 p.p. (2.4 p.p.)	2,066	0.073
Two-year colleges	13.1%	14.0%	-0.9 p.p. (1.7 p.p.)	2,066	0.594

Note: Standard errors are reported in parentheses under each impact estimate. The study includes 2,066 students who applied to enter KIPP through a middle school via admission lotteries, and compares the outcomes of students offered admission to KIPP (treatment group) to outcomes of students not offered admission (control group) at the time of the lottery. Impacts are based on a regression model that pools all lottery schools, controls for baseline covariates, and includes weights to account for probability of assignment to the treatment or control group.

p.p. = percentage points.

Similar to the results for enrollment, for these secondary measures of college persistence. we continue to find a pattern of small (albeit positive) and statistically insignificant KIPP middle school impacts (Table B.7). For example, students offered admission to KIPP persisted continuously for one-tenth of a semester longer at four-year colleges (1.93 semesters versus 1.84 semesters in the control group), although this impact was not significantly significant (*p*-value = 0.437).

Because entering and persisting in college would result in students being enrolled at the end of the three-year follow-up period, we also examined impacts on enrollment in the third spring after expected high school graduation. Again, the estimated impact of KIPP was positive but not statistically significant—32.6 percent of the treatment group and 30.5 percent of the control group was enrolled in a four-year college in that semester (*p*-value = 0.366). Among the first two cohorts, 24.7 percent of the treatment group and 24.6 percent of the control group was continuously enrolled in a four-year college for 10 semesters after high school graduation, or had graduated within that time (*p*-value = 0.971).

Our final persistence measure—the percentage of possible semesters enrolled—takes advantage of all available years of data for each cohort. However, as with our other measures, we find no significant differences between the treatment and the control group. Students offered admission to a KIPP middle school enrolled in a four-year college in 45.3 percent of possible college semesters compared with 44.4 percent among the control group (*p*-value = 0.655).

Table B.7. Impact estimates on secondary college persistence measures (intent-to-treat)

Outcome	Treatment mean	Control mean	Impact estimate	Sample size	*p*-value
Persisted through first six semesters					
Four-year colleges	23.8%	23.2%	0.6 p.p. (2.1 p.p.)	2,066	0.785
Any college, ending in a four-year college in sixth semester	25.6%	24.8%	0.8 p.p. (2.1 p.p.)	2,066	0.701
Enrolled in fifth spring after high school graduation or graduated from a four-year program					
Four-year college	24.7%	24.6%	0.1 p.p. (2.8 p.p.)	1,177	0.971
Enrolled three springs after high school graduation					
Any college	40.4%	38.1%	2.3 p.p. (2.3 p.p.)	2,066	0.328
Four-year colleges	32.6%	30.5%	2.0 p.p. (2.2 p.p.)	2,066	0.366
Two-year colleges	7.9%	7.6%	0.3 p.p. (1.3 p.p.)	2,066	0.822
Enrolled in four consecutive semesters in three years					
Any college	38.8%	37.6%	1.3 p.p. (2.4 p.p.)	2,066	0.589
Four-year colleges	31.6%	29.8%	1.8 p.p. (2.3 p.p.)	2,066	0.422
Two-year colleges	4.9%	6.1%	-1.2 p.p. (1.1 p.p.)	2,066	0.249

Outcome	Treatment mean	Control mean	Impact estimate	Sample size	*p*-value
Consecutive semesters enrolled in three years					
Any college	2.41	2.33	0.08 (0.12)	2,066	0.526
Four-year colleges	1.93	1.84	0.10 (0.12)	2,066	0.437
Two-year colleges	0.33	0.41	-0.08 (0.05)	2,066	0.145
Percentage of possible semesters enrolled					
Any college	45.3%	44.4%	0.9 p.p. (2.0 p.p.)	2,066	0.655
Total semesters enrolled					
In three years, any college	2.90	2.80	0.10 (0.12)	2,066	0.431
In five years, any college	4.16	3.92	0.25 (0.26)	1,177	0.350
In five years, four-year colleges	3.23	3.00	0.22 (0.25)	1,177	0.378

Note: Standard errors are reported in parentheses under each impact estimate. The study includes 2,066 students who applied to enter KIPP through a middle school via admission lotteries, and compares the outcomes of students offered admission to KIPP (treatment group) to outcomes of students not offered admission (control group) at the time of the lottery. Impacts are based on a regression model that pools all lottery schools, controls for baseline covariates, and includes weights to account for probability of assignment to the treatment or control group.

p.p. = percentage points.

Treatment-on-the-treated (TOT) impacts on secondary outcome measures. Tables B.8 and B.9 present exploratory TOT impact estimates for our secondary outcome measures (for completeness we also include our two primary outcome measures in the table as well). The TOT impacts use the KIPP admission lottery as an instrument for whether a student ever attended a KIPP middle school. Thus, the effect estimates represent the impact of *attending* a KIPP middle school, rather than the intent-to-treat (ITT) impacts that represent the impact of an *admission offer* to a KIPP middle school. Because only 77 percent of treatment group students attended a KIPP middle school, while 12 percent of control students ended up attending a KIPP middle school, the TOT impacts increase the magnitude of the effect size compared to the ITT impacts.

Similar to an admission offer to a KIPP middle school (ITT model), *attending* a KIPP school (TOT model) did not have a statistically significant impact on any of our secondary enrollment and persistence measures at the 5 percent level. Under the TOT model, attending a KIPP school increased the likelihood of on-time college enrollment in any type of college by 7.4 percentage points; however, the impact was just shy of reaching statistical significance (*p*-value = 0.069).

Table B.8. Impact estimates on secondary college enrollment measures (treatment-on-the-treated)

Outcome	Treatment mean	Control mean	Impact estimate	Sample size	*p*-value
Ever enrolled					
Any college	68.8%	64.0%	4.7 p.p. (4.1 p.p.)	2,066	0.252
Four-year colleges	53.3%	46.8%	6.5 p.p. (4.1 p.p.)	2,066	0.116
Two-year colleges	25.9%	21.8%	4.1 p.p. (3.6 p.p.)	2,066	0.257
Ever enrolled without withdrawing					
Any college	67.9%	62.9%	5.0 p.p. (4.1 p.p.)	2,066	0.223
Four-year colleges	52.9%	45.9%	6.9 p.p. (4.1 p.p.)	2,066	0.092
Two-year colleges	24.8%	21.4%	3.4 p.p. (3.6 p.p.)	2,066	0.334
On-time college enrollment					
Any college	59.4%	53.6%	5.9 p.p. (4.2 p.p.)	2,066	0.163
Four-year colleges	46.8%	39.4%	7.4 p.p. (4.1 p.p.)	2,066	0.069
Two-year colleges	12.6%	14.2%	-1.6 p.p. (2.9 p.p.)	2,066	0.588

Note: Standard errors are reported in parentheses under each impact estimate. The study includes 2,066 students who applied to enter KIPP middle schools via admission lotteries and compares the outcomes of students offered admission to KIPP (treatment group) to outcomes of students not offered admission (control group) at the time of the lottery. Estimates of the impact of KIPP attendance use the lottery as an instrument for whether a student ever attended a KIPP middle or high school. The regression model pools all 21 lottery schools, controls for baseline covariates, and includes weights to account for probability of assignment to the treatment or control group. Standard errors are reported in parentheses under each impact estimate. Sample for college graduation rate variables = 2,062. Sample for five-year outcomes = 1,177.

p.p. = percentage points.

Table B.9. Impact estimates on secondary college persistence measures (treatment-on-the-treated)

Outcome	Treatment mean	Control mean	Impact estimate	Sample size	*p*-value
Persisted through first six semesters					
Four-year colleges	24.1%	23.1%	1.0 p.p. (3.5 p.p.)	2,066	0.781
Any college, ending in a four-year college in sixth semester	26.0%	24.6%	1.4 p.p. (3.6 p.p.)	2,066	0.697
Enrolled in fifth spring after high school graduation or graduated from a four-year program					
Four-year college	24.8%	24.6%	0.2 p.p. (5.0 p.p.)	1,177	0.970

Outcome	Treatment mean	Control mean	Impact estimate	Sample size	*p*-value
Enrolled three springs after high school graduation					
Any college	41.6%	37.7%	3.9 p.p. (4.0 p.p.)	2,066	0.320
Four-year colleges	33.6%	30.1%	3.4 p.p. (3.7 p.p.)	2,066	0.358
Two-year colleges	8.0%	7.5%	0.5 p.p. (2.1 p.p.)	2,066	0.819
Enrolled in four consecutive semesters in three years					
Any college	39.5%	37.3%	2.2 p.p. (4.0 p.p.)	2,066	0.583
Four-year colleges	32.6%	29.5%	3.1 p.p. (3.8 p.p.)	2,066	0.415
Two-year colleges	4.2%	6.4%	-2.1 p.p. (1.8 p.p.)	2,066	0.243
Consecutive semesters enrolled in three years					
Any college	2.45	2.31	0.14 (0.21)	2,066	0.519
Four-year colleges	1.98	1.82	0.16 (0.21)	2,066	0.430
Two-year colleges	0.29	0.42	-0.13 (0.09)	2,066	0.140
Percentage of possible semesters enrolled					
Any college	45.8%	44.3%	1.5 p.p. (3.3 p.p.)	2,066	0.650
Total semesters enrolled					
In three years, any college	2.95	2.78	0.17 (0.21)	2,066	0.423
In five years, any college	4.30	3.86	0.44 (0.46)	1,177	0.337
In five years, four-year colleges	3.36	2.95	0.41 (0.45)	1,177	0.366

Note: Standard errors are reported in parentheses under each impact estimate. The study includes 2,066 students who applied to enter KIPP middle schools via admission lotteries and compares the outcomes of students offered admission to KIPP (treatment group) to outcomes of students not offered admission (control group) at the time of the lottery. Estimates of the impact of KIPP attendance use the lottery as an instrument for whether a student ever attended a KIPP middle or high school. The regression model pools all 21 lottery schools, controls for baseline covariates, and includes weights to account for probability of assignment to the treatment or control group. Standard errors are reported in parentheses under each impact estimate. Sample for college graduation rate variables = 2,062. Sample for five-year outcomes = 1,177.

p.p. = percentage points.

6. Impacts on measures of college type

In Chapter III of this report, we highlight differences in the types of colleges students in the treatment and control groups attend. Most notably, we found that (among students who went to college) students in the treatment group attend more selective colleges, as measured by the average college admission rate.

To examine the direct impact of KIPP middle schools on whether students attend a college with certain attributes, we separately estimated impacts on enrollment rates in various types of college programs for all students in the study sample (including students who never enrolled in college). To do so, we defined a set of binary outcomes for college attributes including a college's selectivity, average graduation rate, and the socioeconomic makeup of the student body. Table B.10 presents definitions for the study's measures of college program attributes.

Table B.10. Overview of college program attributes measures

Outcome	Definition
College admission rate	Four binary variables measuring whether a student enrolled in a college with an admission rate of (1) 25 percent or lower, (2) greater than 25 percent and less than or equal to 50 percent, (3) greater than 50 percent and less than or equal to 75 percent, or (4) greater than 75 percent. We used the admission rate at the college in which the student was most recently enrolled.
College graduation rate	Four binary variables measuring whether a student enrolled in a college with a graduation rate falling in different ranges (for the college in which the student most recently enrolled). We used the same cut-points as for the college admission variables described previously.
Share of Pell Grant recipients	Two binary variables measuring whether a student enrolled in a college with a low or high percentage of students who received Pell Grants during the 2018–2019 school year (College Board 2022). One variable measured whether a student went to a college with above-average recipients of Pell Grants (school average was greater than 31 percent). The second variable measured whether a student went to a college with below-average recipients of Pell Grants (school average was less than or equal to 31 percent).

We find no evidence that KIPP middle schools impacted students' rates of enrollment across these types of college programs (Table B.11). Admission to a KIPP middle school did not result in students being more likely to enroll in highly selective colleges, colleges with higher graduation rates, or colleges with higher rates of Pell Grant recipients.

Table B.11. Secondary impact estimates on college type (intent-to-treat)

Outcome	Treatment mean	Control mean	Impact estimate	*p*-value
College admission rate				
Went to college with admission rate <=25%	4.1%	2.6%	1.4 p.p. (0.9 p.p.)	0.103
Went to college with admission rate >25% and <=50%	9.7%	7.7%	2.0 p.p. (1.4 p.p.)	0.163
Went to college with admission rate >50% and <=75%	16.5%	15.5%	1.0 p.p. (1.8 p.p.)	0.570
Went to college with admission rate >75%	37.1%	38.8%	-1.7 p.p. (2.6 p.p.)	0.508
College graduation rate				
Went to college with grad rate <=25%	16.1%	17.3%	-1.2 p.p. (1.8 p.p.)	0.509
Went to college with grad rate >25% and <=50%	19.4%	20.1%	-0.7 p.p. (2.0 p.p.)	0.732
Went to college with grad rate >50% and <=75%	20.3%	18.4%	1.9 p.p. (2.0 p.p.)	0.350
Went to college with grad rate >75%	11.5%	8.8%	2.7 p.p. (1.7 p.p.)	0.117

Outcome	Treatment mean	Control mean	Impact estimate	*p*-value
Pell Grants rate				
Went to college with above average rate of recipients	42.6%	42.3%	0.3 p.p. (2.5 p.p.)	0.908
Went to college with below average rate of recipients	24.7%	22.3%	2.5 p.p. (2.2 p.p.)	0.275

Note: Standard errors are reported in parentheses under each impact estimate. The study includes 2,066 students who applied to enter KIPP through a middle school via admission lotteries, and compares the outcomes of students offered admission to KIPP (treatment group) to outcomes of students not offered admission (control group) at the time of the lottery. Impacts are based on a regression model that pools all lottery schools, controls for baseline covariates, and includes weights to account for probability of assignment to the treatment or control group.

p.p. = percentage points.

Appendix C

Supplementary Analyses: Combined Middle and High School Impacts

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1. Testing the validity of the instrumental variable model

To examine the impact of attending a KIPP middle school and a KIPP high school, we estimated a two-stage least squares (2SLS) model designed to measure the effects of attending KIPP middle and high schools. The "first stage" of the 2SLS model is presented as Equations (3) and (4) below (and in Chapter II of this report), in which the model's instrumental variables predict KIPP middle and high school attendance; the second stage of the 2SLS model is presented in Equation (5) (also in Chapter II), which is used to estimate the impact of KIPP middle and high school attendance on college outcomes:

(IV equation 3) $attendKMS_{ik} = \mu + \rho_{M1} * T_{ik} + \rho_{M2} HSR_{ik} + \sigma_M * X_{ik} + v_{kM} + j_{ikM}$

(IV equation 4) $attendKHS_{ik} = \mu + \rho_{H} * T_{ik} + \rho_{H2} HSR_{ik} + \sigma_H * X_{ik} + v_{kH} + j_{ikH}$

(IV equation 5) $y_{ik} = \alpha + \delta_1 * \widehat{attendKMS}_{ik} + \delta_2 * \widehat{attendKHS}_{ik} + \beta * X_{ik} + \gamma_k + \varepsilon_{ik}$

In this model, we first predicted attendance at a KIPP middle school (*attendKMS*) and attendance at a KIPP high school (*attendKHS*) using two first-stage equations (Equations [3] and [4]). We then estimated the impact of KIPP middle school attendance (δ_1) and high school attendance (δ_2) on college outcomes in the second stage (Equation [5]). In interpreting the results of this model, we focus on the combined effect of attending a KIPP middle school and then a KIPP high school, relative to attending neither (that is, no KIPP attendance). This combined effect is represented by the sum of δ_1 and δ_2.

In this appendix, we detail the steps taken to test the model's validity. Specifically, we assess the extent to which the model satisfies the following two conditions: (1) the first stage of the model must provide strong predictions about which students attend KIPP middle schools and about which students attend KIPP high schools; and (2) the instruments used in the model must satisfy the assumption that they are not correlated with students' college outcomes through any channel other than their influence on the endogenous variables of KIPP middle and high school attendance.

To test the first condition, we used F-tests to measure the combined strength of the model's instrumental variables in predicting, separately, KIPP middle school attendance and KIPP high school attendance. To assess the second condition, we conducted a placebo test to examine the validity of the model's instrumental variables, including treatment status and the high school ratio (HSR) instrumental variable.[14] The placebo test estimated the same 2SLS model represented by Equations (3) through (5), but it used students' *middle school test scores* as the dependent variable in the second stage. In other words, the placebo test checked whether the model produces results that imply that KIPP high schools have an impact on students' earlier middle school test scores (which is implausible, because students completed middle school before enrolling in a KIPP high school). Conversely, if the instruments in the 2SLS model are working as intended, we would expect this placebo test to show that attending a KIPP high school does not affect students' earlier middle school test scores.

As we explain below, we found that the model's instrumental variables are very strong predictors of KIPP middle school attendance and KIPP high school attendance. However, the placebo test revealed some

[14] The *HSR* measures the capacity of the region's KIPP high schools relative to the capacity of KIPP middle schools at the time the student was making the transition from middle to high school. *HSR* is calculated separately for each region, cohort, and entrance grade as the number of 9th grade students in KIPP high schools in the region in the student's 9th grade year divided by the number of 8th grade students in middle schools in the region in the student's 8th grade year.

evidence that the HSR instrument is correlated with students' earlier middle school achievement levels for the study's full sample. To address this potential source of bias, we also present the results of two sensitivity tests. The first sensitivity test shows that the overall pattern of impact estimates in the main model remains highly consistent after restricting the sample to a set of KIPP regions that do not produce problematic results in the placebo test. The second sensitivity test includes region-level fixed effects in both the Stage 1 and Stage 2 equations, which effectively removes any between-region variation in the HSR instrument. This test examines whether the HSR instrument could be biased by any selective region-level patterns in where KIPP chose to open high schools during the study period (for example, the possibility that KIPP might have prioritized opening high schools in regions where KIPP middle schools were especially successful). This test does not reveal evidence of bias in the HSR instrument: Most of the relevant variation in *HSR* likely comes from within-region variation in access to a KIPP high school, rather than across-region variation that could potentially be correlated with the quality of KIPP middle schools.

Condition 1: Predictive strength of the instrumental variables

We assessed the strength of the model's instrumental variables (including the student's middle school lottery result and *HSR*)[15] in predicting the model's two endogenous variables (KIPP middle school and KIPP high school attendance). When 2SLS models rely on weak instruments—those that are not strongly correlated with the endogenous variables—the resulting estimated effects of those variables from the Stage 2 equation may be biased (Bound et al. 1995). Stock and Yogo (2005) provide a test of weak instruments based on the *F*-statistic from a test of the null hypothesis that the coefficients on the instruments are jointly equal to 0 in the Stage 1 equation. For example, they suggest that a set of five instruments in a model in which two endogenous variables are being predicted should be considered sufficiently strong if the *F*-statistic exceeds 19.45. The joint significance of the instrumental variables in the first stage of our 2SLS greatly exceeded this benchmark for both the equation predicting KIPP middle school attendance ($F[5, 2020] = 184.96$; p-value = 0.000) and the equation predicting KIPP high school attendance ($F[5, 2020] = 96.44$; p-value = 0.000) (Table C.1). Notably, it appears that each of our two primary instruments (the lottery result and *HSR*) is strongly related to the endogenous variables.

Table C.1. First-stage regression coefficients on primary instruments and F-test results, full sample

First-stage outcome	Impact estimate	Impact estimate *p*-value	Sample size	*F*-statistic	*F*-statistic *p*-value
Attended a KIPP middle school					
Receiving admission offer (treatment indicator)	62.3 p.p.** (5.0 p.p.)	0.000	2,066	184.96	0.000
HSR	17.3 p.p.** (4.0 p.p.)	0.000	2,066		
Attended a KIPP high school					
Receiving admission offer (treatment indicator)	16.7 p.p.** (4.0 p.p.)	0.000	2,066	96.44	0.000
HSR	30.6 p.p.** (3.0 p.p.)	0.000	2,066		

[15] In practice, there are five instruments in total: student middle school lottery result (treatment indicator), *HSR*, treatment indicator interacted with *HSR,* treatment indicator interacted with entry grade, and *HSR* interacted with entry grade.

Note: Standard errors are reported in parentheses under each impact estimate. The impact estimates represent the estimated effect of these instrument on the likelihood of attending KIPP in the first-stage equations. These equations controlled for five instrumental variables (treatment indicator, the *HSR* at the time the student entered high school, the treatment indicator interacted with *HSR*, the treatment indicator interacted with lottery grade level, and *HSR* interacted with the lottery grade level), as well as student characteristics. The *F*-statistic is a measure of the joint significance of the full set of instrumental variables.

p.p. = percentage points; *HSR* = high school ratio.

Condition 2: Instrumental variables are not correlated with college outcomes, except through their influence on attendance at KIPP middle schools and KIPP high schools

To produce unbiased impact estimates, the instruments in the 2SLS model should not be correlated with the study's long-term college outcomes of interest, except through their influence on the endogenous variables of KIPP middle school attendance and KIPP high school attendance. The assumption would be violated if, for instance, the HSR instrument (the ratio between the number of available grade 9 seats in a KIPP region and the number of graduating KIPP 8th graders in that region) is also related to the underlying quality of KIPP middle schools in the region. We are more concerned with the possibility that the instruments related to *HSR* might violate this assumption.[16]

Although we cannot directly test this assumption, we conducted several placebo tests to examine whether the instruments are correlated with outcomes that might be related to students' later college outcomes and on which one would not expect KIPP high school attendance to have any direct effect. To test the validity of the HSR instrument, we estimated the 2SLS model with various measures of students' middle school test scores serving as the dependent variable in Stage 2. The idea here is that *HSR* should not be correlated with middle school achievement (that is, it should not be correlated with those outcomes through its influence on KIPP high school attendance, because students' middle school tests are completed before they reach high school). If *HSR* is significantly related to middle school test scores, that would suggest that it may be proxying for unobserved characteristics correlated with students' academic performance, and hence may be an unreliable instrument.

We conducted the placebo test using four different middle school test outcomes—students' math and English language arts (ELA) scores both one and two years after the admission lottery to a KIPP middle school. For each middle school test outcome, the main analysis uses the sample of students with valid data for that outcome (meaning the sample sizes vary by outcome).

The results of the placebo test were mixed (Table C.2). As expected, attendance at a KIPP middle school was positively and significantly related to middle school test scores, as was shown in the original KIPP studies (Tuttle et al. 2013, 2015). Also as expected, in three of the four placebo tests, KIPP high school attendance was not significantly related to students' middle school test scores. However, the remaining (fourth) placebo test found that KIPP high school attendance was negatively and statistically significantly related to Year 1 middle school mathematics scores. To the extent that one focuses on the results of this fourth placebo test rather than the other three placebo tests, the results suggest that the HSR variable (which could be a proxy for a region's capacity or demand for opening KIPP high schools) may be negatively correlated with factors affecting students' college outcomes (assuming that students' middle school math scores are positively correlated with their college outcomes). Such patterns could have arisen

[16] Earlier studies of KIPP (Tuttle et al. 2013, 2015) assessed the validity of the treatment indicator, showing that the result of the middle school lottery was not correlated with a large set of baseline student and family characteristics.

by chance or through strategic decisions made by KIPP about where to place high schools (for instance, in places where KIPP middle school graduates were in greater need of supports).

Table C.2. Second-stage impacts of attending a KIPP middle school or a KIPP high school on middle school academic achievement, full sample

Outcome	Impact estimate of middle school attendance	Impact estimate *p*-value	Impact estimate of high school attendance	Impact estimate *p*-value
Year 1 mathematics achievement	0.44** (0.10)	0.000	-0.44** (0.13)	0.001
Year 1 ELA achievement	0.21* (0.10)	0.032	-0.24 (0.14)	0.091
Year 2 mathematics achievement	0.33** (0.12)	0.006	0.20 (0.16)	0.221
Year 2 ELA achievement	0.36** (0.12)	0.003	-0.19 (0.15)	0.221

Note: Standard errors are reported in parentheses under each impact estimate. The model estimates the impact of KIPP middle school and high school attendance on early academic achievement, controlling first-stage estimates of middle and high school attendance and student characteristics. First-stage estimates predicting KIPP attendance use the treatment indicator, the *HSR* at the time the student entered high school, the treatment indicator interacted with *HSR*, and lottery grade level interacted separately with the treatment indicator and *HSR* as instruments for whether a student ever attended a KIPP middle or high school.

HSR = high school ratio.

2. Sensitivity analyses

Because the placebo test produced a different set of results for Year 1 middle school test scores compared to Year 2 middle school test scores, we tested whether the results would be robust under different modeling specifications. First, we tested whether the results would be robust when using a more consistent sample—specifically, students in KIPP regions that were able to provide valid middle school test score data for both Year 1 and Year 2. In practice, there was one region (KIPP Southern California) that was able to provide Year 1 but not Year 2 test scores. We included data from this region in our main placebo test analysis but excluded them from a test of the sensitivity of the placebo test results, to create a consistent sample of regions across the middle school test score outcomes in the placebo test. As it turned out, this was a region in which there were no KIPP high schools (*HSR* = 0).

Second, we tested the validity of the HSR instrument as an instrumental variable by including region-level fixed effects in the Stage 1 and Stage 2 equations. In our primary model, variation in the *HSR* comes from both the differences between regions and differences over time within KIPP regions. Between-region variation in *HSR* could potentially be affected by selective patterns in where KIPP opened high schools during the study period if the regions with more-successful middle schools tended to open or expand KIPP high schools more rapidly. Including region fixed effects in the model addresses this issue directly, by limiting the analysis to within-region variation in *HSR*.

In this section, we describe the Stage 1 and 2 results of these sensitivity analyses. The consistent-sample analysis passes the placebo test and produces impact estimates that are consistent with the results we reported for the full sample in Chapter III of the main report. The region-level fixed effects analysis produced findings smaller in magnitude, but these, too, pass the placebo test.

Condition 1: Predictive strength of the instrumental variables (sensitivity analyses)

As in the original model, we found that when excluding KIPP Southern California from our analysis sample, the model's full set of instruments still strongly predicted KIPP middle school attendance (F[5, 1828] = 183.64; p-value = 0.000) and KIPP high school attendance (F[5, 1828] = 85.89; p-value = 0.000) in Stage 1 (Table C.3). In the region fixed effects analysis, the model's full set of instruments also strongly predicted KIPP middle school attendance (F[5, 2008] = 170.67; p-value = 0.000) and KIPP high school attendance (F[5, 2008] = 44.96; p-value = 0.000) in Stage 1.

Table C.3. First-stage regression coefficients on primary instruments and *F*-test results, sensitivity analyses

First-stage outcome	Impact estimate	Impact estimate *p*-value	Sample size	*F*-statistic	*F*-statistic *p*-value
Excluding KIPP Southern California					
Attended a KIPP middle school					
Receiving admission offer (treatment indicator)	61.7 p.p.** (5.1 p.p.)	0.000	1,874	183.64	0.000
HSR	20.2 p.p.** (4.4 p.p.)	0.000	1,874		
Attended a KIPP high school					
Receiving admission offer (treatment indicator)	18.1 p.p.** (3.8 p.p.)	0.000	1,874	85.89	0.000
HSR	32.7 p.p.** (3.5 p.p.)	0.000	1,874		
Including region fixed effects					
Attended a KIPP middle school					
Receiving admission offer (treatment indicator)	62.2 p.p.** (5.0 p.p.)	0.000	2,066	170.67	0.000
HSR	3.3 p.p. (11.1 p.p.)	0.767	2,066		
Attended a KIPP high school					
Receiving admission offer (treatment indicator)	16.3 p.p.** (3.8 p.p.)	0.000	2,066	44.96	0.000
HSR	-13.2 p.p. (11.1 p.p.)	0.234	2,066		

Note: Standard errors are reported in parentheses under each impact estimate. The impact estimates represent the estimated effect of these instruments on the likelihood of attending KIPP in the first-stage equations. These equations controlled for five instrumental variables (treatment indicator, the *HSR* at the time the student entered high school, the treatment indicator interacted with *HSR*, the treatment indicator interacted with lottery grade level, and *HSR* interacted with the lottery grade level), as well as student characteristics. The *F*-statistic is a measure of the joint significance of the full set of instrumental variables.

HSR = high school ratio; p.p. = percentage points.

Condition 2: Instrumental variables are not correlated with outcomes, except through their influence on middle and high school attendance (sensitivity analyses)

In the second stage, we reestimated impacts of KIPP middle school and KIPP high school attendance using each alternative model specification. For our analysis on the same subsample of regions with valid

test score data as Stage 1, we re-estimated impacts on Year 1 math and ELA scores.[17] In our region fixed effects model, we re-estimated Stage 2 impacts on all four test score outcomes. In both instances, the estimated relationship between *HSR* and Year 1 math scores fell substantially in magnitude and was no longer statistically significant at the 5 percent level (Table C.4). The impacts on Year 1 ELA scores also remained statistically insignificant. The lack of significant findings in these sensitivity analyses suggests the main placebo test is sensitive to the sample of included KIPP regions as well as to the influence of between-region variation in the *HSR*. In other words, limiting the sample to regions that had data on middle school test scores in both Year 1 and Year 2 or controlling for any bias in the model that may arise from which regions had KIPP high schools lessens any concerns raised by the placebo test results in the main sample.

Table C.4. Second-stage impacts of attending a KIPP middle school or a KIPP high school on middle school academic achievement, sensitivity analyses

Outcome	Impact estimate of middle school attendance	Impact estimate *p*-value	Impact estimate of high school attendance	Impact estimate *p*-value
Excluding KIPP Southern California				
Year 1 mathematics achievement	0.29** (0.11)	0.006	-0.27 (0.15)	0.061
Year 1 ELA achievement	0.08 (0.11)	0.471	-0.03 (0.15)	0.868
Year 2 mathematics achievement	0.33** (0.12)	0.006	0.20 (0.16)	0.221
Year 2 ELA achievement	0.36** (0.12)	0.003	-0.19 (0.15)	0.221
Including region fixed effects				
Year 1 mathematics achievement	0.39** (0.11)	0.000	-0.31 (0.19)	0.110
Year 1 ELA achievement	0.19 (0.11)	0.093	-0.23 (0.22)	0.287
Year 2 mathematics achievement	0.28 (0.16)	0.070	0.27 (0.26)	0.301
Year 2 ELA achievement	0.34* (0.16)	0.033	-0.14 (0.25)	0.570

Note: Standard errors are reported in parentheses under each impact estimate. The model estimates the impact of KIPP middle school and high school attendance on early academic achievement, controlling first-stage estimates of middle and high school attendance and student characteristics. First-stage estimates predicting KIPP attendance use the treatment indicator, the *HSR* at the time the student entered high school, lottery grade level, and lottery grade level interacted separately with the treatment indicator and *HSR* as instruments for whether a student ever attended a KIPP middle or high school.

HSR = high school ratio.

[17] Because KIPP Southern California did not report Year 2 test scores, this region is already excluded in the Year 2 impacts presented in Table C.2. Given that the placebo test on Year 2 scores demonstrated no relationship between the *HSR* and test scores using the full sample, no additional sensitivity analyses were conducted on Year 2 achievement outcomes.

Combined impact of KIPP middle and high school attendance on college enrollment, persistence, and graduation (sensitivity analyses)

As a final step to assess the validity of the model, we also repeated the impact analysis (IV Equations [3] through [5]) for the study's main college enrollment and persistence outcomes, to understand whether the impact estimates are sensitive to the decision to restrict the data to the alternative sample of regions with valid test score data or to include region fixed effects in the model—two decisions that pass the study's placebo test. Findings from these analyses are provided in Table C.5 (our primary impacts are presented in the first set of columns for reference). Overall, the sensitivity analysis that included the subsample of regions with valid test score data yielded similarly large, positive, and statistically significant results. With the restricted sample, the combined middle school plus high school impact estimates remained positive and statistically significant for the outcomes of college enrollment, college persistence for three years, and college persistence for five years. For the college graduation outcome, the combined impact of KIPP middle and high schools increased from 18.9 to 20.4 percentage points when excluding KIPP Southern California; due to the smaller sample size in the restricted sample, the impact estimate for this outcome also became statistically insignificant at the 0.05 level (the *p*-value increased from 0.025 to 0.080). When removing within-region variation in the *HSR* in the fixed effects model, the combined middle school plus high school impact estimates remained positive and statistically significant for the outcomes of college enrollment, college graduation in five years, and college persistence for five years. For the college persistence outcome, the combined impact of KIPP middle and high schools decreased from 19.7 to 15.7 percentage points, becoming statistically insignificant at the 0.05 level (the *p*-value increased from 0.000 to 0.075).

Table C.5. Impact of KIPP middle school and high school attendance on four-year college enrollment, persistence, and graduation: Full sample and sensitivity analyses

	Full sample		Sample excluding KIPP Southern California		Full sample with region fixed effects	
Primary outcome	Impact estimate of attending KIPP MS + KIPP HS	*p*-value	Impact estimate of attending KIPP MS + KIPP HS	*p*-value	Impact estimate of attending KIPP MS + KIPP HS	*p*-value
Ever enrolled in four-year college	30.5 p.p.** (6.7 p.p.)	0.000	26.5 p.p.** (6.9 p.p.)	0.000	28.0 p.p.** (10.0 p.p.)	0.005
Persisted through first six semesters (four-year college)	19.7 p.p.** (5.6 p.p.)	0.000	18.8 p.p.** (5.8 p.p.)	0.001	15.7 p.p. (8.8 p.p.)	0.075
Graduated from a four-year college in five years	18.9 p.p.* (8.4 p.p.)	0.025	20.4 p.p. (11.7 p.p.)	0.080	24.0 p.p.* (10.7 p.p.)	0.025
Enrolled in a four-year program in 10th semester (or graduated in 10 semesters or fewer)	35.3 p.p.** (9.5 p.p.)	0.000	33.3 p.p.** (12.6 p.p.)	0.008	38.4 p.p.** (13.0 p.p.)	0.003

Note: Standard errors are reported in parentheses under each impact estimate. Estimates of the impact of attending a KIPP middle school and a KIPP high school using the KIPP admission lottery as an instrument for the ratio of 9th grade seats to 8th grade seats within each region. The models that use the full sample pool all 21 lottery schools (13 lottery schools for the college graduation and "on-track" graduation outcomes); the model that excludes KIPP Southern California pools 20 lottery schools (12 lottery schools for the graduation outcomes). All models estimate outcome means by regressing the outcome measure on treatment status using inverse probability weights and controlling for student-level covariates and the lottery school, year, and grade. The control mean is unadjusted, and the treatment mean is the sum of the control mean and the regression-adjusted difference between groups.

HS = high school; MS = middle school; p.p. = percentage points.

* Impact estimate is significantly different from zero at the .05 level, two-tailed test.
** Impact estimate is significantly different from zero at the .01 level, two-tailed test.

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Appendix D

Findings from KIPP Staff Interviews

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Introduction

To contextualize the quantitative impact findings described in the main report, we conducted interviews with KIPP staff from regions that participated in our study. Specifically, in a subset of the KIPP regions in the study sample, we interviewed one staff member per region who had a strong familiarity with their region's college-related supports.

This appendix highlights regional approaches to supporting KIPP students and alumni to prepare for and apply to college and then persist in college to earn a college degree, as described by staff from each region. Although KIPP's postsecondary programming continues to evolve, the interview data we collected focused primarily on the supports offered to KIPP students and alumni during our study period. This includes supports offered in KIPP middle schools between the 2008–2009 and 2014–2015 school years, high school supports offered between the 2012–2013 and 2018–2019 school years, and postsecondary supports offered between 2016 and 2022 (Table D.1). For this analysis, we were particularly interested in facets of the programs that may explain the importance of KIPP high school access for college outcomes, as well as any changes to these support programs that could help to explain differences between the KIPP impact estimates observed for the first two study cohorts (students who applied to KIPP middle schools in 2008 or 2009) relative to the third study cohort (students who applied to KIPP middle schools in 2011). In particular, the estimates suggested somewhat more favorable effects of KIPP on college outcomes in the first two cohorts.

Table D.1. School years applicable to the full study sample and to each cohort of students

School level/ Cohort	2008–09	2009–10	2010–11	2011–12	2012–13	2013–14	2014–15	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22	2022
Full sample															
Middle school	MS	MS	MS	MS	MS	MS	MS								
High school					HS	HS	HS	HS	HS	HS	HS				
College									C	C	C	C	C	C	C
By cohort															
Cohort 1	MS	MS	MS	MS	HS	HS	HS	HS	C	C	C	C			
Cohort 2		MS	MS	MS	MS	HS	HS	HS	HS	C	C	C	C		
Cohort 3				MS	MS	MS	MS	HS	HS	HS	HS	C	C	C	C

Note: This table lists only the school years applicable to students who entered KIPP middle schools in grade 5, followed a standard grade progression in middle school and high school, and proceeded to college immediately after high school graduation. Some students in our sample also entered KIPP middle schools for the first time in grade 6 and would have started high school and college one year earlier.

MS = middle school; HS = high school; C = college.

In the sections that follow, we begin by describing the procedures used to conduct interviews with staff from KIPP study regions. Next, we detail findings about the college-related supports available to our study sample, including in what grade levels services were offered, types of services, engagement with services, and services KIPP staff identified as most important for promoting college enrollment and persistence outcomes. We then conclude with a discussion about how college-related supports changed over the course of the study period, including disruptions and adaptations made related to the COVID-19 pandemic and the KIPP network's evolution to support diverse postsecondary pathways in addition to four-year college programs.

Overview of regional staff interviews

Although the KIPP Foundation, which serves as the central office for the KIPP network, provides frameworks and resources for college support programming, regional KIPP staff are ultimately responsible for coordinating service delivery for students in their region. Accordingly, to understand the scope of college support programming across regions, we aimed to speak with at least one staff member from each region included in our study sample. The KIPP Foundation connected us with staff who could speak to the college-related support services offered during the study period in their region. In some cases, we spoke with staff who had left their role in the region or who were newer to their role or region, but who had knowledge of the services offered during the study period.

In total, we interviewed staff from 10 of the 13 regions in our study sample. Interviewed regions covered 86 percent of schools in the study sample and 83 percent of students in the study sample. On average, staff had nearly 11 years of experience working in their region, and all had held a leadership role in their region's college support program during the study period. Specifically, during the study period, most of the staff we interviewed (8 regions) directed their region's college support program—overseeing all middle school, high school, and postsecondary programming—while the other two staff led smaller teams delivering specific services (high school counseling and postsecondary programs, respectively).

We conducted 30-minute interviews with these 10 KIPP staff in the summer of 2022. Before the interviews, staff were also asked to fill out a spreadsheet recording information about services in their region, including the span of years and grades in which each service was offered and the level of engagement with each service (for example, whether all, most, or some students accessed the service).

During the interviews, we asked KIPP staff to describe the service offerings in their region in greater detail, explain how these service offerings varied across middle school and high school, describe their postsecondary programming, and provide additional information about student engagement with these services. We also asked about changes to programming over the last ten years. Staff who were not in their roles for the entirety of the study period relied on institutional memory to report on their region's service offerings in certain years, and most staff could only provide estimated dates for service changes.

College Support Programming Characteristics

To identify the most common college-related support services available to students in the study sample, we asked staff to describe the services offered in middle school, high school, and after high school during the study period. Further, we asked them questions about which grade levels were offered services, student engagement with services, and which services were most critical in promoting college enrollment and persistence.

Interview findings underscore the importance of attending a KIPP high school for receiving college support services.

During the study period, most regions provided college-related support services starting in high school.

During the years Cohort 3 students were in high school and college, most regions with a KIPP high school discontinued or limited support services for students who did not attend a regional KIPP high school.

Program structure

Staff described the typical service timeline in their region, including at what grade level services were first offered. **Most regions (seven of 10) began providing college-related supports in high school**, with about half first offering services in 9th grade. Only three regions offered programming beginning in middle school,[18] and two of these did not operate any KIPP high schools during the study period. In these two regions, KIPP staff continued to provide support to middle school alumni while they attended a non-KIPP high school and in college.

We also asked staff about which students were eligible for college-related supports during the study period, including whether students who attended a KIPP middle school but did not attend a KIPP high school could still receive services. **Between 2018 and 2020, most regions with a KIPP high school (five of eight) reduced or eliminated services for KIPP middle school alumni who did not go on to attend a KIPP high school.** Three of these regions shifted to an opt-in model for KIPP middle school alumni services, in which program staff delivered services upon request but did not actively reach out to students, and two regions discontinued services for middle school alumni altogether. Regions described similar reasons for the shift, including that they did not have the staff capacity to support all the KIPP middle school alumni, especially as the number of alumni continued to grow; that the region wanted to encourage families to stay in the KIPP network for high school; and that middle school alumni had low levels of engagement with services before the shift. In some regions, for example, fewer than half of middle school alumni had been engaging with services before the region decided to scale back middle school programming.

"We discontinued the KIPP middle school program in 2020 … the choice was really because of capacity. Our alumni base is exponentially growing. For the KIPP Forward team to continue to fund and support [these students]; it became more difficult.

Three regions with a KIPP high school did offer services to middle school alumni during the full study period. However, two of them also noted limitations in their service offerings for these students; for example, one region noted that donors preferred that competitive services, like college scholarships, go to students who graduated from a KIPP high school. Another region described challenges engaging middle

[18] Although several other regions identified that some services like college fairs and high school course selection supports may have been available to middle school students, they emphasized that formal programming (in which college support staff were directly involved) started only in high school.

school alumni because they had left the KIPP network and were no longer attending school on KIPP campuses, and noted that these students received only a portion of typical college support services.

Service offerings

To understand the prevalence of specific college-related supports and when they were provided, we asked staff to describe the supports available to students during middle school, during high school, and after high school during the study period.

In the three regions that offered college-related supports during middle school, the most common service offering was high school placement support (Table D.2). Both regions without a high school offered high school placement services, including support identifying high schools that had demonstrated success sending students to college and completing high school applications. In addition, one region offered career assessments for 8th graders; another offered selective summer programs and several lessons for middle school students on college topics; and another offered college tours to middle school students.

Across all regions, including those without KIPP high schools, students were offered college-related supports during high school, including college counseling services and support with financial aid applications (Table D.2). All regions offered college counseling, including matching students with a college counselor, providing support throughout the college application process for students and families through workshops or individual counseling sessions, and support with college essay writing. Further, all regions offered support with financial aid applications, including making FAFSA forms available in counselors' offices, sending FAFSA forms home to families, and offering workshops for families to support them with completing the forms. Finally, all regions offered students support on enrolling in pre-college summer programs, such as enrichment programs and internships.

Similarly, across all regions, supports were available to students during college, including academic progress check-ins, financial supports, and on-campus visits (Table D.2). All regions offered college students opportunities to meet with a counselor or peer mentor to check in on their academic progress or review their academic transcript. Similarly, all regions offered students opportunities to receive financial supports, which could range from small awards ($200–$300) to buy books and other supplies, to larger scholarships of several thousand dollars or more. Financial incentives or supports often required students to meet with a KIPP advisor or submit their college transcript to KIPP to demonstrate their investment and progress in college and help KIPP advisors pinpoint their support. Most regions (nine of 10) reported that only some alumni took advantage of financial supports (as opposed to most or all alumni). Further, all regions offered on-campus visits from an advisor or peer, which could include one-on-one visits or meeting up with other alumni on the same campus or in the region; opportunities for virtual mentoring; and various holiday or school break events hosted by the region.

"We have the Book Fellowship program. …It's $200. In exchange for that money, kids share their transcripts with us. It's been a wide-reaching program. We've been able to get it out to a lot of kids. It also helps us to see their transcripts."

Table D.2. Proportion of regions that offered specific college-related supports during middle school, high school, and college during the study period

College-related support	Proportion of regions that offered
Supports offered during middle school	
High school placement support	20%
Career assessments	10%
Selective summer programs	10%
College open houses	10%
Supports offered during high school	
College counseling	100%
Support with financial aid applications	100%
Pre-college summer programs	100%
Career assessments	90%
College open houses, tours, and trips	90%
Career and college fairs	90%
Dual enrollment coursework	90%
Standardized test preparation support	80%
High school course selection	70%
Standardized tests hosted at KIPP school (or KIPP provides transport)	60%
Supports offered in the period between high school and college	
Summer melt mitigation supports	60%
Supports offered during college	
Academic progress discussions with a counselor or peer	100%
Financial supports	100%
On-campus visits with a counselor or peer	100%
Virtual mentoring with a counselor or peer	100%
Holiday or school break events	100%
Formal “Near peer” advisor system	40%
Other peer support systems	40%
Internship support and career coaching	30%

Source: Interviews with KIPP staff from 10 KIPP regions, conducted in summer 2022.

Note: This table shows the proportion of interviewed regions that offered the support for at least two years during the applicable reference period, namely 2008–2014 for middle school supports, 2012–2018 for high school supports, and 2016–2022 for college supports.

Engagement with services

We asked staff to describe the share of students who engaged with each service offering during middle school, high school, and college during the study period and to describe successes and challenges engaging students with services.

Across all regions, the share of students engaging with high school services varied. For example, all 10 regions reported that all or most students accessed college counseling and financial aid application support during high school. In contrast, of the nine regions that organized college tours, including travel, only six regions reported that most or all students accessed this opportunity. Similarly, although dual

enrollment coursework was accessible in nine regions, only five regions actively endorsed dual enrollment coursework for high school students. Even in regions where dual enrollment was endorsed, student participation varied widely; for example, one region reported 80 percent of students took dual enrollment courses, whereas another reported only 10 to 15 percent took these courses. Staff reported that some services were required and others were voluntary for high school students; however, even when staff reported that services were required, they noted that not all students participated.

To engage students with services during high school, staff mentioned specific programmatic strategies, including prioritizing rapport-building with students and families, and offering programming during the summer. Specifically, one region described the importance of building individual relationships with students, including in the earlier years of high school. Another region mentioned the importance of including parents in the college preparation process, rather than telling them what to do to prepare for college. Several regions offered intensive programming in the summer between high school and college; two of these regions emphasized this offering as a critical engagement strategy. Summer programming included activities such as transition days, where staff would meet with students to finalize financial aid paperwork and look at their course schedules, and extensive follow-up with students in the summer before college matriculation.

Both regions that did not have KIPP high schools during the study period reported challenges providing college-related supports to middle school alumni. These regions reported challenges keeping in contact with students after middle school, especially as students were no longer physically present in a KIPP school. They also described how the large caseloads of their college counseling staff made it challenging, if not impossible, to engage with all middle school alumni. One region described offering most college-related supports starting in 11th grade, noting that staff typically had little contact with middle school alumni in the first two years of high school.

"There has never been a KIPP high school in our region … We lose contact with them in high school, that's the biggest challenge ... When kids go to college is when we're most connected … We've tried to do a better job communicating with them early on, but that's not the case."

Regions reported that student engagement with services during college tended to drop off after two to four semesters. A few regions reported engagement dropping off after the first year of college, and others reported engagement declining after the first two years. In contrast, one region reported increased engagement in the latter years of college, explaining that students sought out services more when they were closer to graduating. Even in the first two years of college, however, regions described challenges engaging students with programming. Two regions noted that some students found the college supports too intrusive or inappropriate given their age (they felt they were adults now and did not want further support from their middle or high school provider) and were hesitant to engage with KIPP because they did not want to share their grades or appear like they needed help. Three regions highlighted that some students did not need the supports because they were receiving services from their college or other selective scholarship programs, and two regions described challenges in communicating available services to students and having to rely on individual outreach.

Most critical services to promote college enrollment and persistence

We asked staff to reflect on which services offered during the study period were most critical for promoting student college enrollment and persistence. **To promote college enrollment, staff most frequently described the importance of connecting college planning to career aspirations and providing supports for identifying best-match colleges.** Some regions described how connecting college planning to career goals helped motivate students and made the results of their college planning feel more tangible. Other regions described the importance of helping students identify colleges that match their interests, goals, and financial needs so that students' applications are successful, and students are more likely to enroll if accepted. Regions described various strategies for helping students build strong lists of colleges they planned to apply to, including exposing students to schools that they may not have heard of; guiding students to consider the costs of attending schools when choosing schools of interest; and focusing students on the need to identify good-fit schools earlier in the application process.

"If [students have] never heard of [a college], it is hard to convince [them] to look at it and think about it. The thing we try to do is introduce schools that are unknowns that we think are good fits on their wish lists."

Regions also mentioned other impactful strategies. For example, regions highlighted the importance of college support staff building rapport with students when helping them navigate the complex college planning process. Other regions described the importance of encouraging students to apply to schools through Early Decision, a process offered by some colleges that enables students to apply early with a commitment to enroll if accepted. Staff felt applying using Early Decision helped increase student engagement in pre-college activities and made their applications more competitive. In addition, staff highlighted other region-specific services that they thought were critical to promoting college enrollment, including standardized test prep boot camps; instant admission days, in which colleges interviewed students at their school building and made same-day admission decisions; office hours with counselors, in which groups of students worked with counselors on college applications; and intensive, region-funded summer programs for students on college campuses.

"Our matriculation numbers are pretty high. I would attribute that to our 1:1 advising—[counselors] spend a lot of time with students over those two years, following up with students and families, lots of conversations and support. It takes that much to articulate what they want to do and where they want to go."

To promote college enrollment and persistence, staff most frequently highlighted the importance of financial supports during college and supports in the transition from high school to college. Most staff described the importance of specific financial supports: these included $200 awards for books and supplies, larger scholarships funded by local donors, and the KIPP Foundation microgrants program started in 2020 to help prevent students from leaving college in response to the COVID-19 pandemic. Staff noted higher rates of persistence in students who received these awards, and shared that students felt the awards made a difference in their financial situations during college. Staff also described the effectiveness of other related strategies in boosting persistence, including supporting students and families to understand their financial awards letters, and sending students small care packages during college to keep them connected to a KIPP advisor.

Most staff also highlighted the positive impacts of supports in the college transition period on college enrollment and persistence outcomes. Many regions (five of 10) match students with a transition counselor or peer mentor who works with students in 12th grade and continues to support them throughout the summer before students move to alumni advisor caseloads; in some regions, transition counselors continue to work with students through their first semester or two of college. Transition support staff may work with students to apply for financial awards, complete matriculation paperwork and other transition tasks, build confidence and other interpersonal skills, and introduce students and families to their persistence advisor and other available supports during college. Regions reported these supports limited "summer melt," when students do not matriculate in the fall after high school, by enabling staff to identify and alleviate barriers to matriculation early by providing targeted supports. Staff also described how the continuity of supports built student trust in their advisors and the program, encouraging students to continue engaging with supports later in college.

"Our [summer] melt has decreased based on that college transition specialist (CTS), even in the midst of COVID … With the CTS being on campuses and meeting with the college team and students each week, [we are] able to learn much earlier students who are going to be at high risk of melt, and triage those students, meet with them and talk about [their goals] … That has been a tremendous impact."

Some staff also described how strong relationships between students and program staff increase students' comfort in seeking support and the ability of staff to provide tailored services, thus promoting persistence. Further, some staff reported that on-campus college visits from advisors, peer mentors, and other local alumni promoted persistence by solidifying connections to the program and encouraging students' sense of belonging on campus.

Changes to Programming Over Time

To identify how college-related supports may have evolved during the study period, we asked staff to describe changes in their support programs over the last 10 years, and, where possible, to identify the years in which changes occurred. We also asked staff about changes to the types and intensity of services prompted by the COVID-19 pandemic. Finally, many staff reported changes prompted by the networkwide evolution to support more diverse postsecondary pathways beyond supporting only students' transitions to a four-year college.[19]

Students in Cohort 3 may have experienced different types of supports in high school and college, compared to students in the first two cohorts.

In high school, Cohort 3 students had access to expanded service offerings, including services oriented toward diverse postsecondary pathways.

In the early years of college, Cohort 3 students had access to additional financial supports but also experienced service disruptions and other changes due to the COVID-19 pandemic. Cohort 1 and 2 students experienced these changes in the later years of college, when students are typically less engaged with supports.

[19] We did not ask staff to describe changes in programming related to alternative career pathways explicitly; however, we were able to glean information on these changes from staff responses to other questions.

Expansion of services offered in high school and college

Between roughly 2015 and 2018, the years in which Cohort 3 students were in high school, **regions reported expanding the college-related supports offered during high school, including additional supports during the transition from high school to college and expanded college preparatory coursework (Table D.3).**

As discussed previously, many regions identified college transition supports as critical to promoting enrollment and persistence. Further, all these regions described implementing these supports, or making significant changes to these supports, between 2015 and 2019. For example, many regions described changes they made to their counselor staffing structures, including adding summer transition counselors or ensuring that transition or persistence advisors had more frequent touchpoints with students while still in high school.

"A few years ago, we changed how the persistence team operated…Before, [the college transition specialist (CTS)] was working in the regional office and would come in now and then and kids didn't know or trust [them] … now the CTS works with them through their first full year of college, as their main contact person, checking transcripts, doing benchmarks, checking if they are on the right track and the ones visiting campuses."

Since 2015, regions also reported expanding high school coursework offerings and college preparatory supports. During this time, the KIPP network supported regions to expand access to and student participation in Advanced Placement (AP) classes as part of a networkwide "AP for All" effort. In addition, some regions (four of 10) described adding or expanding dual enrollment course offerings, further increasing students' access to advanced coursework. Others added career assessments to facilitate goal-setting discussions, or increased supports for standardized test preparation and test-taking.

Regions also mentioned varied programmatic shifts to increase student engagement with services during and after high school. Namely, a few regions reported attempts to deepen service offerings for 9th and 10th grade students, including increased supports to help students understand their academic transcripts and build soft skills at an earlier stage in high school. Other regions mentioned efforts to deepen parental involvement with college supports during high school and to build support networks of alumni during college.

Between roughly 2018 and 2022, when most Cohort 3 students first had the opportunity to make the transition to college, **most regions (seven of 10) also expanded financial supports for college students (Table D.3).** Two regions described adding or expanding Book Scholarship or Book Fellowship programs, in which students received $200 for books and supplies in exchange for sharing their transcript or meeting with a KIPP college advisor. Other regions reported students making use of KIPP Foundation Bridge Fund and KIPP network microgrant funds, made available in 2020 and 2022, respectively; because of both KIPP network programs, staff described students having access to more funds to support college persistence than previously offered in the region. Further, two other regions used regional and local donor funds to expand financial support offerings, including persistence scholarships and larger stipends.

"When we first started, there was not a lot [of money] for scholarships … We had students who probably dropped out because of a few thousand dollars … Now we have persistence scholarships and micro grants."

Table D.3. Proportion of regions that expanded specific college-related supports for high school students between 2015 and 2018, and for college students between 2018 and 2022

College-related support	Proportion of regions that expanded
Supports offered during high school	
Dual enrollment	40%
Support for standardized test prep and test taking	40%
Career assessments	30%
College support classes	20%
Supports offered in the period between high school and college	
Summer melt mitigation supports	60%
Supports offered during college	
Microgrants and other financial supports	70%

Source: Interviews with KIPP staff from 10 KIPP regions, conducted in summer 2022.

Note: This table shows the proportion of interviewed regions that offered the support for the first time or improved or increased the support during the applicable reference period.

Reduction of services offered in high school and college

While regions largely expanded high school and college supports over the last 10 years, **staff also described discontinuing specific services that were not beneficial to students or were too costly or burdensome on staff to administer**. For example, one region discontinued its dual enrollment course offerings in 2017, due to inconsistencies in the quality of course instruction from community college professors. One region discontinued college and career fairs in high school, and another stopped holiday break events in college, both citing the cost and staff capacity associated with coordinating the events. Two regions ended their formal peer-to-peer advisory programs, in which KIPP alumni attending college provided support to high school students interested in their college or other KIPP alumni on campus; both regions decided to prioritize supports from a KIPP college advisor rather than a peer, and one region also cited ending the program because funding had ended. In response to declining engagement with services after the first few years of college, one region described focusing college supports on first- and second-year students at four-year colleges and third- and fourth-year students at community colleges.

Changes related to the COVID-19 pandemic

We asked staff to reflect on changes to postsecondary programming over the last five years related to the COVID-19 pandemic. When the COVID-19 pandemic began in the spring of the 2019–2020 school year, college-going students in the third study cohort were early in their college careers (typically completing just their second semester), whereas students in the first two study cohorts had already been in college for several years (completing their third or fourth years). Because student engagement is highest with KIPP supports during the first few semesters of college and these semesters are critical for later persistence, changes to KIPP supports due to the COVID-19 pandemic may have affected students in the third study cohort most acutely.

Changes in services offered in college

"Before COVID, persistence advisors' goal was to visit every student at least once … [this was] highly successful: The most engagement from alumni before COVID [was] when counselors were able to go see them. During COVID they did virtual coffees or lunches … but [these were] not as effective as in-person visits."

Understandably, many students in our sample experienced disruptions in their postsecondary careers due to the COVID-19 pandemic. In response, KIPP staff cited several programmatic changes to provide students the supports they needed to remain on-track while minding the importance of public safety. Of the five regions that described programming changes related to the pandemic, **three regions reported disruptions to in-person postsecondary programming, and two regions reported expanded services to meet student need.** As discussed earlier, several regions identified on-campus visits from an advisor or peer as an important strategy in promoting college persistence. Three regions, however, reported pausing in-person visits during the pandemic due to health and safety concerns.

Other regions described expansions in services in response to the pandemic. For example, two regions reported increasing virtual mentoring supports for high school and college students. Other regions mentioned using funds from the KIPP Foundation microgrants program, which was established at the start of the pandemic to provide emergency support to alumni enrolled in college and certificate programs, giving their college students unprecedented financial support for tuition and materials. Another region reported adding extensive wraparound services for students in the period between high school and college to address food insecurity, child care needs, and other financial challenges exacerbated by the pandemic.

Changes in alumni enrollment and persistence in college

Consistent with declines in college enrollment observed nationwide (National Student Clearinghouse Research Center, 2020), **all 10 regions described declines in college matriculation rates related to the COVID-19 pandemic.** Regions attributed these declines to various pandemic-related factors, including learning loss and lower standardized test scores because of learning disruptions; lower in-person exposure to college campuses before college; affordability concerns, especially for four-year programs away from home; and financial challenges that motivated students to delay enrollment or choose working over attending school.

"We are seeing more and more of our families start at two-year programs, or going to work, or choosing a different degree pathway because of finances."

Half of regions reported declines in four-year college enrollment, specifically. They described increased hesitancy to invest in four-year programs and an uptick in interest in enrolling first in two-year programs. Two regions reported that all types of college enrollment had declined, including enrollment in four- and two-year programs.

Of the four regions that commented on changes in college persistence related to the pandemic, three described persistence challenges. For example, one region reported their students were not able to access mental health resources during the pandemic and generally "did not thrive in the virtual space," which affected persistence. Another region reported that students were persisting, but often taking longer to complete college.

Changes related to the networkwide transition to support diverse postsecondary pathways

In the early years of the study period, the KIPP network promoted supports that prepared and encouraged students to pursue traditional four-year college pathways. However, in 2017, with the input of families and school communities, the network expanded its mission, tasking schools to "prepare students with the skills and confidence to pursue the paths they choose—*college, career and beyond*—so they can lead fulfilling lives and build a more just world." In 2021, the KIPP network rebranded the KIPP Through College support program as KIPP Forward, marking a formal, networkwide commitment to support diverse postsecondary pathways. As described in the 2022 summer training for KIPP Forward staff, the network now encourages regions to implement the following postsecondary-related supports:

- Counseling and support for multiple viable postsecondary pathways—including bachelor's program matriculation and graduation as well as matriculation to associate degree programs, career and technical education (CTE) programs, and the military[20]—while continuing to emphasize the value of a bachelor's degree
- Career-centered counseling, in which students are supported to consider postsecondary pathways through the lens of their highest career aspirations (this marks a departure from counseling that started with the students' academic profile and identified feasible options from there)
- Efforts to track more expansive long-term outcomes of postsecondary supports, such as alumni fulfillment (including happiness and well-being) and career success

To do this, the network is providing counselors and other KIPP Forward staff with the following:

- Information on the kinds of non-bachelor programs, partners, and trainings students may explore
- Direction and structure for counseling toward diverse postsecondary outcomes, including consistent use of career matching tools to support all students toward their career
- Direction and structure for ensuring positive student experience, including methods for ensuring students understand the choices available to them and feel empowered by their counselor

During interviews, regional staff described programmatic changes over the last five years in line with this network-wide evolution. **Staff most commonly reported shifts in how they talked about career planning with high school students (five of 10 regions).** These regions described consistently coupling college planning with career discussions, including two regions that described starting high school supports with career exploration and goal setting before talking about college and other postsecondary pathways. These five regions also described providing additional information about different postsecondary pathways so students could understand their options. Two regions, however, reported that they were still figuring out how to include career discussions during high school. For example, in one region, staff reported noticing a gap in

> *"A couple things have changed … [now] we don't initiate conversations with college, but with career, and what [students] need to be successful. This is more tangible and tactile for students on the fence [of college and career]."*

[20] Counselors are not encouraged to counsel toward joining the workforce immediately following high school if the student does not have plans for further credentialing.

students' ability to connect their reason for being in school with their long-term plans, but that the region was still tackling how to incorporate career discussions.

A few staff described changes to staffing models to accommodate counseling toward diverse postsecondary pathways. Two regions mentioned they had added or were planning to add additional staff, including career advisors, to expand their career counseling services. Another region described a complete reorganization of their postsecondary programming team, to include staff and services intended to reengage students who had not chosen college immediately following high school.

It remains to be seen whether KIPP's more recent efforts to support alternative postsecondary pathways—while still emphasizing the value of bachelor's programs—will affect the pattern of long-term impacts observed among students in this study. This shift to support a more diverse set of postsecondary pathways began in 2017 when most Cohort 3 students were in their final years of high school, so any changes made right away could have affected students' postsecondary outcomes. For example, a larger proportion of KIPP high school graduates may have decided to enroll in a two-year program rather than a four-year program immediately after graduation. On the other hand, the full set of changes in postsecondary support services provided to KIPP students may not have occurred until more recent years and so may not have influenced sample members' immediate postsecondary outcomes. To examine how this evolution in KIPP's postsecondary support model may have affected students, future studies may estimate the effects of KIPP on additional postsecondary outcomes, such as enrollment and persistence in associate degree and career and technical education programs. It may also be valuable to examine KIPP's impacts on broader labor market outcomes (such as employment and earnings) that could be affected by KIPP's evolving approach to supporting alumni in pursuing their aspirations and goals. Finally, studies of KIPP's impacts on later cohorts of middle or high school entrants may more fully capture the effects of this evolution in KIPP's postsecondary support services.

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