OFFICE OF RESEARCH EVALUATION & PROGRAM SUPPORT

RESEARCH REPORT

CUNY Early College Initiative Outcomes: Student Achievement and Momentum

BY

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Executive Summary

The City University of New York's Early College Initiative (CUNY ECI) was established in 2003 to develop and support Early College high schools in New York City. Designed for low-income youth, first-generation college-goers, English language learners, and other groups that have been historically underrepresented in higher education, these schools offer an integrated curriculum that enables students to graduate from high school with one to two years of transferable college credit. This tuition-free, innovative model is based on the belief that: students who are traditionally the least likely to earn a postsecondary degree need early and engaging experiences with college; challenging academic work can be a powerful motivator; and early momentum toward earning college credit increases chances for college success and completion.

The CUNY Office of Research, Evaluation, and Program Support (REPS) conducted a quasi-experimental, longitudinal analysis to explore the effect of CUNY ECI on academic outcomes. A comparison group of statistically similar students from New York City public schools was identified using propensity score matching. Students who entered the ninth grade for the first time at one of eight CUNY ECI schools between 2006 and 2012 were matched with similar students on observable characteristics such as demographic background, academic performance, and school attendance. After matching, the study included 3,771 CUNY ECI students and 3,771 similar comparison students. Tracking students from ninth-grade entry through postsecondary enrollment, the study estimated the effects of attending a CUNY ECI high school on key educational outcomes including on-time high school graduation; college readiness; and postsecondary enrollment, persistence, and degree attainment. Four main findings emerged from this evaluation.

Finding 1. CUNY ECI students graduated from high school on time at a modestly higher rate than similar students, even though their high school course load included college-level classes.

Finding 2. CUNY ECI students were more likely to be considered college ready by high school graduation, compared to similar students. A higher proportion of CUNY ECI students reached or exceeded CUNY college readiness thresholds and, as a result, those who matriculated into a CUNY college were less likely to require remedial coursework.

Finding 3. By earning significantly more college credits, CUNY ECI students were better positioned for college degree completion than similar students. Not only did they graduate from high school with more college credits, their gains increased in college and, on average, put them a semester closer to graduation by the end of their second year.

Finding 4. CUNY ECI graduates who entered CUNY colleges persisted in degree programs at a higher rate than similar students. ECI graduates were more likely to enroll in a CUNY college after high school, to remain enrolled after two years, and to have enrolled in a four-year college.

Subgroup findings were notably positive for Black ECI students; low-performing ECI students (i.e., those who tested below proficiency prior to entering ninth grade) also fared better than similar students. Program effects for White students run counter to the other consistently positive findings and merit further investigation.

These findings on the early years of CUNY ECI are promising, particularly among students traditionally considered most at risk for not completing college. Evidence from this report provides the baseline for subsequent evaluations that will examine outcomes associated with the fully developed model.

CUNY Early College Initiative Outcomes: Student Achievement and Momentum

Background

A college education is critical to success and financial prosperity in today's global economy. Postsecondary degrees are increasingly necessary to gain access to desirable jobs (Carnevale et al., 2011), and bachelor's degree recipients who work full-time have lifetime earnings that are, on average, 65 percent higher than those with only a high school diploma (Baum, Ma, & Payea, 2013). Moreover, college graduates are nearly three times less likely to live below the poverty line than those with only a high school diploma and are nearly six times less likely to live in poverty than individuals who never complete high school (U.S. Census Bureau, 2013). Nonetheless, minority and low-income students are less likely than advantaged students to graduate from high school and to enroll and succeed in college (Balfanz & Legters, 2004; Berger et al., 2013; Karp, 2012; Stetser & Stillwell, 2014).

Although a high school diploma is an important first step toward earning a college degree, it does not guarantee college readiness: graduates may not have the skills needed to meet college-level academic and social demands (Attewell, Lavin, Domina, & Levey, 2006; Greene & Winters, 2002; Roderick, Nagaoka, & Coca, 2009; Sparks & Malkus, 2013). Estimates suggest that just one-quarter to one-third of all high school graduates meet college-readiness standards by the time they matriculate into college (ACT, 2013; Greene & Forester, 2003; Sparks & Malkus, 2013). Racial, ethnic, and socioeconomic class disparities in college readiness underlie these trends: fewer than 1 in 20 Black and 1 in 7 Hispanic students enter college meeting basic college readiness standards (ACT, 2013; Bowen, Chingos, & McPherson, 2011; Greene & Forester, 2003). Given these figures, it is not surprising that the proportion of first-time freshmen who earn a college diploma within four years is very low and that postsecondary degree attainment for minority students is even lower (ACT, 2013).

Dual enrollment programs and research

These troubling educational outcomes have prompted educators and policymakers to rethink the way high schools prepare students for success in both their secondary and postsecondary careers (Bailey, Hughes, & Karp, 2002; Kemple, 2013). Dual and concurrent enrollment programs — including the Early College high school model — promise students a rigorous educational curriculum in high school, an opportunity to acclimate to the challenges of college-level coursework, and the chance to acquire the behaviors and skills that will support access to and success in postsecondary education (Barnett, Maclutsky, & Wagonlander, 2015; Karp, 2012; Speroni, 2011). Research suggests students in dual and concurrent enrollment programs such as Early College schools experience positive effects in college access, readiness, and success (Allen & Dadgar, 2012; Edmunds et al., 2012; Speroni, 2011).

Several large scale, quasi-experimental studies have found evidence for the effectiveness of dual enrollment programs in improving secondary and postsecondary outcomes (Allen & Dadgar, 2012; An, 2013; Karp, Calcagno, Hughes, Jeong, & Bailey, 2007; Speroni, 2011). Karp and colleagues (2007) found that dual enrollment students throughout New York City and Florida were more likely to enroll and persist in college, earn higher college GPAs, and accumulate more college credits than comparison students three years after

graduating from high school. Moreover, Speroni (2011) conducted a study with a large sample of students in Florida's dual enrollment program and found that taking college algebra in eleventh and twelfth grades had a positive effect on students' postsecondary enrollment and college degree completion. In New York, Allen and Dadgar (2012) estimated the effect of dual enrollment among CUNY College Now students. Findings indicated a significant, positive program effect on the number of credits and GPA earned, and showed positive effects on one-year college retention.

Some research has shown dual enrollment is particularly helpful for low-income and minority students. Studies examining whether the effect of dual enrollment differed depending on socioeconomic status (SES) found low-SES students performed as well as middle- and high-SES students (An, 2013). An analysis of subgroup effects found dual enrollment was effective for low-income students and was most effective for Black and Hispanic male students in increasing college credit accumulation and improving GPA (Strumbos, Webber, & Allen, 2014).

The Early College high school model and research

The Early College dual enrollment model was developed with the explicit goal of improving students' secondary school outcomes and increasing their college readiness, enrollment, and completion, with an emphasis on supporting students from groups traditionally underrepresented in higher education. Three key features define the Early College approach to improving students' secondary and postsecondary educational outcomes.

1. Taking a "whole school" approach to dual enrollment in which college courses are embedded within the high school curriculum, meaning that all students have the option to enroll in college courses.
2. Providing high school students with comprehensive socio-emotional and academic supports to facilitate their transition into college life and college-level coursework (Barnett et al., 2015).
3. Fostering a school-wide, college-going culture, which supports high school students as they complete college-level coursework and prepare for matriculation into a postsecondary institution after high school.

The model is based on the premise that by making college-level work and a college-going culture a part of every student's high school experience, Early College high schools reduce the financial, academic, and psychological hurdles that prevent many students from entering and succeeding in college. The schools are structured so that the division between high school and college no longer exists (Barnett et al., 2015; Karp, 2012). Early College practitioners assert that embedding students in a supportive college-going culture while providing access to college-level courses is an ideal catalyst for improving secondary outcomes, and postsecondary transition and success.

Evidence from early research suggests Early College improves secondary and postsecondary academic outcomes. A random-assignment study of Early College students across North Carolina found significantly greater engagement in high school (higher attendance rates, lower suspension rates), improved achievement in college preparatory courses, and increased likelihood of being on track to graduate from high school on time than comparison high school students (Edmunds et al., 2012). Findings from another large-scale, random assignment evaluation (Berger et al., 2013) revealed Early College students were significantly more likely than control group students to earn a high school diploma on time, enroll in college, and earn a college degree. They also found the effectiveness of Early College on high school and college outcomes was consistent across subgroups.

Despite this promising evidence, the generalizability of these results may be limited. Whereas Edwards' (2010) random assignment study design offers strong and internally valid evidence of model effectiveness, those findings may not hold true across Early College programs. Most of the Early College high schools in this study were in rural settings, the design included Early College high schools that were housed predominantly on college campuses, and the sample consisted primarily of White students (60%). As a result, it is not clear whether findings would be applicable to urban settings, to programs not located on a college campus, or to more diverse student populations. Similar questions about generalizability arise regarding the findings of Berger and colleagues (2013): although the initial design included 154 Early College high schools, only 10 schools met study selection criteria and were included in the final sample.

Given these limitations and persistent questions about the effectiveness of Early College for a diverse population, this report adds to the literature by reporting on an evaluation of highly diverse Early College high schools in New York City, the nation's largest public school system.

The CUNY Early College Initiative

The implementation of Early College models has expanded over the past decade: as of 2011, there were over 200 Early College high schools across the United States serving roughly 50,000 students (Nodine, 2011). The City University of New York's Early College Initiative (CUNY ECI), established in 2003, is the largest concentration of Early College high schools in an urban setting. As of the 2014-15 academic year, CUNY ECI had a network of 17 high schools serving over 8,000 students.

CUNY ECI high schools offer an integrated curriculum and provide students with the opportunity to graduate from high school having earned up to two years of college credit or an associate degree, tuition free. The model is designed to scaffold the transition from high school to college with additional supports. Instead of abruptly moving from a high school environment to a college campus, students typically start the transition by enrolling in one college course—often in the tenth grade—and gradually increasing college course enrollments over time.

CUNY ECI is strategically designed to introduce large cohorts of students to a small set of college courses during their early years of high school. Students experience more challenging college-level coursework and a greater number of those courses toward the end of high school. The courses are selected to provide students with transferable college credits that place them on a path to earning a degree in a timely manner. Students are enrolled in credit-bearing courses and receive college and high school academic support (e.g., tutoring and study groups) with fellow students to promote collective and individual success in college courses. This approach helps students develop the skills and habits necessary for success in college. In the twelfth grade, CUNY ECI students can take college courses alongside college undergraduates.

At the time of this study (2014-15), 17 CUNY ECI schools were located throughout New York City: five in Brooklyn, six in Queens, four in Manhattan, and two in the Bronx. Schools in the CUNY ECI network were designed to serve students starting in middle or in high school. A third high school model was recently developed that prepares students for both college and career success: grade 9-14 Early College & Career high schools. These schools were designed to provide students with the opportunity to earn a high school diploma,

acquire an industry-recognized Associate degree[1] and gain relevant work experience in a growing field, all within a six-year timeframe.

CUNY ECI evaluation goals

As part of an ongoing evaluation of CUNY ECI, CUNY's Office of Research, Evaluation, and Program Support (REPS) conducted a longitudinal analysis of secondary and postsecondary outcomes associated with attending CUNY ECI. This report presents findings related to two central research questions:

1. What secondary and postsecondary educational outcomes are associated with CUNY ECI enrollment as compared to similar students enrolled in non-CUNY ECI New York City public high schools?
2. Do outcomes vary across students' race/ethnicity and proficiency level upon entering ninth grade?

Research design and methods

Data sources and sample. This study used administrative records, including student-level demographic and transcript data, from the New York City Department of Education (NYCDOE) and CUNY. To construct the analytic sample, data were drawn from seven cohorts of NYCDOE students who enrolled in the ninth grade for the first time from 2006 to 2012.

The final sample of first-time ninth graders consisted of 435,353 NYCDOE students. Of those, 3,847 students were enrolled in one of eight CUNY ECI high schools and 431,506 were enrolled in 372 different non-CUNY ECI high schools across the city. As described in Appendix A, students from nine CUNY ECI high schools were not included in the study because (1) the schools' approaches to dual enrollment differed substantively from the CUNY ECI model or (2) the school was founded recently and did not yet have a graduating cohort. (See Appendix A for a detailed description of sampling and data sources.)

Students' high school records were linked to CUNY enrollment and performance data. Due to data restrictions, only the postsecondary records of those students who subsequently matriculated at a CUNY college were included. Despite this limitation, the analysis of college outcomes based on CUNY data provides valuable insight into the effects of CUNY ECI as the majority of college-going NYCDOE graduates[2] matriculate into CUNY (about 60%; *Partnering for Educational Success in NYC: NYC DOE & CUNY*, 2014).[3]

Propensity-score matching. As CUNY ECI students were not randomly assigned to high schools, this study relies on a quasi-experimental design to discern evidence of program effects.[4] CUNY ECI students differed from the larger sample of NYCDOE students across demographic characteristics and academic background, as did the CUNY ECI schools from

[1] An industry-recognized credential is sought or accepted by employers within a particular industry or sector; it may be endorsed by a nationally recognized trade association or related organization.

[2] Seventy percent of NYCDOE students who entered ninth grade in 2008 graduated from high school on time, and 45 percent of them entered college in the fall of 2012 (Coca, 2014).

[3] REPS also obtained data on enrollment in postsecondary institutions outside of the CUNY system from the National Student Clearinghouse (NSCH). However, these data are not included in this report.

[4] Students could not be randomly assigned because NYCDOE had adopted a matching algorithm for CUNY ECI school assignment. Prospective students were allocated to schools based on the algorithm that incorporated students' location/neighborhood of residence, feedback from high school administrators, and student preferences.

those attended by non-ECI students (see Appendix A). These differences potentially influenced students' enrollment at CUNY ECI high schools and subsequent outcomes. Therefore, a descriptive comparison would result in an incorrect estimation of program impact.

To address the bias associated with these distinctions, a propensity score matching (PSM) approach was used to identify a comparison group, referred to as "similar students." The propensity score represents students' probability of being assigned to treatment (i.e. enrolling in a CUNY ECI high school) given observable factors. Matching students on their propensity scores and achieving a balanced sample promotes unbiased estimates of average treatment effects (Austin, 2011; Rosenbaum & Rubin, 1983). The PSM model[5] identified 3,771 students who were statistically similar to CUNY ECI students across observable variables (see Table 2; Appendix A includes full sample details). Furthermore, the matching approach substantially reduced differences between the schools attended by study students.

Table 1 provides a count of the matched CUNY ECI students who enrolled in the ninth grade for the first time by year of entry and CUNY ECI high school. The CUNY ECI final sample included eight CUNY ECI high schools; six operated as grade 6 through 12 CUNY ECI high schools and the remaining two were 9 through 12 models.

Table 1. Study sample of first-time ninth grade CUNY ECI students by cohort entry year.

Early College high school	Year of entry into ninth grade							
	2006	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**Total**
Brooklyn College Academy	--	133	126	106	118	145	120	748
City College Academy of the Arts	--	--	72	86	86	87	75	406
Hostos-Lincoln Academy of Science	50	80	60	66	81	71	78	486
Kingsborough Early College Secondary School	--	--	--	76	82	87	84	329
Manhattan Hunter Science High School	80	103	109	99	108	104	94	697
Queens School of Inquiry	--	--	78	87	82	79	77	403
Science, Technology & Research High School	54	49	58	61	76	71	61	430
York Early College Academy	--	--	--	47	74	74	77	272
Total	184	365	503	628	707	718	666	3,771

Note: Because Brooklyn College Academy only adopted the full CUNY ECI model in the fall of 2007, students who entered prior to 2007 were excluded.

Source: New York City Department of Education

Measuring Effect. After using PSM to create a matched comparison group, the impact of CUNY ECI on high school and postsecondary outcomes (i.e., average treatment effect) was estimated by comparing outcomes for CUNY ECI and similar students. Results were tested for significance using t-tests, ANOVA, and logistic regression. Typically, *p* values—the probability that an observed difference between groups is not the result of chance—of these analyses allow researchers to determine if results are significant. In this study, a *p* value less than 0.05 indicated that the difference between CUNY ECI and comparison student outcomes was due to the intervention (CUNY ECI).

[5] Propensity-score matching was done using a one-to-one algorithm, without replacement, and with a caliper restriction.

However, because sample size is a component of *p* value calculations—comparisons based on large groups can yield statistically significant results even when differences between groups are small—significance testing alone is not a reliable indicator of practical significance (Sullivan & Feinn, 2012). To provide a measure of the practical significance in this study of over 7,500 students, findings include effect sizes (Cohen's d), a standardized measurement of an impact's magnitude. Following typically adopted conventions, effect sizes are interpreted to reflect the magnitude differences as: small (d≈0.2); medium (d≈0.5); or large (d≈0.8). These values are not exact but represent guidelines for interpretation. Relying on both *p* values and effect sizes ensures results are both statistically and practically significant.

Outcomes. This study examined short-term high school outcomes and long-term postsecondary results. Outcomes of interest were on-time high school graduation, college readiness in math and English Language Arts (ELA), college matriculation after completing high school, college credit accumulation, college persistence, and college degree attainment.

Findings

Matched sample characteristics. Students in CUNY ECI and the matched comparison group were similar across demographic and academic variables (see Table 2; Appendix A includes full sample details). The majority of students in the sample were female (57.4%), born in New York City (79.6%), native English speakers (61.2%), and low income[6] (82.0%). Nearly 77 percent of students in the matched sample were either Black (41.3%) or Hispanic (35.6%). Students in both groups performed better than the NYCDOE average on standardized eighth grade exams—the test used to established ninth-grade proficiency.[7]

Study findings. Four findings emerged from the analysis, each based on a comparison between CUNY ECI students and a group of similar students who did not attend a CUNY ECI school.[8] Findings are presented chronologically, in the order they would be experienced by students as they complete high school and navigate their way through college. Detailed regression results are included in Appendix B.

Within each finding, the overall result for the full sample appears first, followed by subgroup results based on race/ethnicity (Black, Asian, Hispanic, White) and proficiency level upon entering ninth grade (proficient or below proficiency). Race and ethnicity are based on self-reported data. Ninth-grade proficiency is measured as students' highest scores on the New York State performance level examinations given at the end of eighth grade, where levels 1 and 2 are below proficiency (or low-performing) and levels 3 and 4 are at or above proficiency.

[6] A student was classified as low income if they were eligible for free or reduced-price lunch.

[7] REPS created standardized scores (z-scores) for ELA and math performance for a student by the year in which the student took the state exam. By standardizing scores, we can compare them using their percentile rank along a normal, bell-curve distribution.

[8] All analyses used an "intent-to-treat" approach as a conservative estimation of effects (Gupta, 2011). In other words, estimated effects of enrollment in CUNY ECI do not assume that students who enrolled in ninth grade remained enrolled in that school throughout their secondary school career.

Table 2. Selected characteristics CUNY ECI and matched comparison students

		CUNY ECI students	Comparison group students	All students
Students	**N**	3,771	3,771	7,542
Student characteristics[1]				
Female	%	56.9	57.8	57.4
Asian or Pacific Islander	%	13.0	14.1	13.6
Black	%	41.8	40.8	41.3
Hispanic	%	35.6	35.6	35.6
White	%	8.8	8.8	8.8
Native English speaker	%	62.1	60.2	61.2
Low-income students	%	82.3	81.6	82.0
Prior Student Academic Performance				
8th Grade ELA exam (percentile rank)	**Mean**	66.3	67.4	67.0
8th Grade math exam (percentile rank)	**Mean**	67.4	69.2	68.4
8th Grade Attendance (% days absent)	**Mean**	4.5	4.3	4.4

[1] Race/ethnicity categories follow NYCDOE conventions.

Source: New York City Department of Education.

Finding 1. Overall, CUNY ECI students graduated from high school on time at modestly higher rates than similar students.

Examining the on-time high school graduation rate[9] as an outcome for an initiative that focuses on college success is important for two reasons: first, even though it is not an explicit goal of CUNY ECI, graduating high school is critical for future success and financial security (Baum et al., 2013); second, the model's emphasis on postsecondary achievement is predicated on successful and timely graduation from high school.

ECI students graduated on time at a slightly higher rate than comparison students; the difference in rates was statistically significant. Among CUNY ECI students who enrolled in the ninth grade for the first time between 2006 and 2010 (n=2,387), 86.3 percent graduated high school in four years compared to 83.6 percent of the 2,387 comparison group students. The small effect size associated with this difference (d=0.12) indicates that it is of limited practical significance. Compared to similar students, these results suggest CUNY ECI participation led to 128 more students graduating on time.

This result may be better interpreted in light of two contextual factors: first, both the treatment and comparison groups had higher on-time graduation rates than the citywide average, which ranged from 60.4 percent to 64.2 percent during the study period. These differences indicate that CUNY ECI students—and the matched comparison group—are different from the majority of students in NYCDOE high schools. Second, CUNY ECI students have access to coursework that is above and beyond the traditional high school

[9] On-time high school graduation is defined as earning any of the following degrees within four years of entering the ninth grade for the first time: general equivalency (GED), individualized education plan (IEP), Local, Regents, or Advanced Regents.

course load. Despite likely having a heavier, more rigorous course load, ECI students met on-time graduation requirements at a higher rate than similar students.

High school graduation across subgroups. Differences in on-time graduation rates by race/ethnicity emerged between program and comparison students: CUNY ECI had a significantly positive effect on Black students, a difference of 9.0 percentage points that corresponds to 104 more students (see Table 3). The moderate effect size of d=0.40 indicates this difference has practical significance. Further, with Black students more likely to drop out or underperform academically than their White and Asian peers (Ross et al., 2012), CUNY ECI's impact on Black students' on-time graduation has promising implications for reform efforts that seek to address these gaps.

Table 3. On-time high school graduation rates for CUNY ECI and comparison students, by race/ethnicity.

	CUNY ECI students		Comparison group students		Difference	Effect Size
	N	%	N	%	%	d
Race/Ethnicity						
Asian	310	93.9	302	94.4	-0.5	0.05
Black	980	89.3	970	80.3	+9.0 ***	0.40
Hispanic	884	81.9	884	81.9	+0.0	-
White	193	79.8	217	91.2	-11.4 ***	0.53

Notes: Results shown from propensity-score analysis of first-time ninth grade students. Differences were tested using a two-tailed test; *=p<0.05, **=p<0.01, ***=p<0.001. Effect size (d) magnitudes: small =~ 0.2; medium =~ 0.5; large=~0.8.

Source: Author's calculations using data from the New York City Department of Education.

As shown in Table 3, Asian and Hispanic CUNY ECI and comparison students did not differ statistically in terms of on-time high school graduation. However, the effect of participating in CUNY ECI was reversed among White students, who graduated on time at a significantly lower rate than White comparison students. This result is striking in its size (d=0.53) and in its sharp contrast with other overall and subgroup outcomes in this analysis. White CUNY ECI students fared worse in subsequent findings as well. Longitudinal analyses planned for 2017 will help to understand these differences.

No subgroup differences emerged between groups defined by ninth-grade proficiency status in ELA and math.

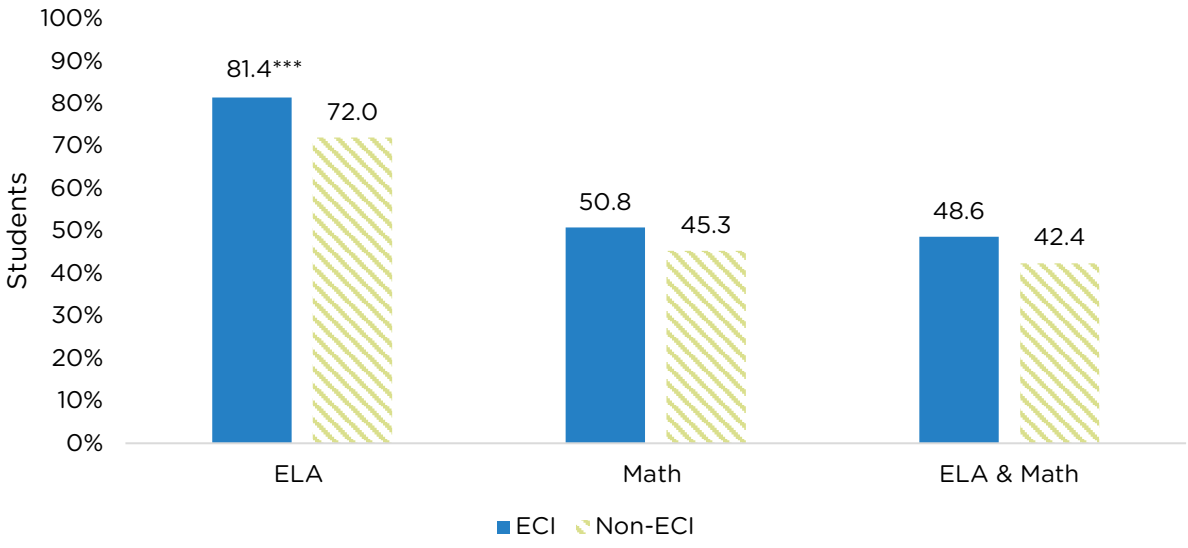
Finding 2. CUNY ECI students were more likely to be considered college ready by high school graduation, compared to similar students.

Student performance on New York State (NYS) Regents Examinations in ELA and mathematics are among the benchmarks considered by CUNY to assess college readiness.[10] The benefits of meeting CUNY college readiness benchmarks are twofold: first, by meeting benchmarks, students are exempted from remedial course work, which influences how quickly a student can progress towards their degree; second, exemption from remediation allows students to allocate financial aid funds to credit-bearing courses rather than the non-credit-bearing remedial courses.

Based on NYS Regents math and ELA scores as measures, CUNY ECI students were more likely to be college ready compared to similar students (see Figure 1). When the subject areas were considered separately, CUNY ECI students met college-readiness benchmarks in ELA and math at rates 9.4 and 5.5 percentage points higher than those of the matched comparison group, respectively. These statistically significant differences corresponded to small effect sizes of 0.29 and 0.12, indicating low practical significance. Compared to similar students, these findings suggest that 422 and 252 more ECI students in this study met CUNY ELA and math college-readiness benchmarks, respectively.

When math and ELA Regents scores were considered together, CUNY ECI students met both college-readiness standards at a rate 6.2 percentage points higher than similar students. This statistically significant difference corresponds to an effect size of 0.14, indicating low practical significance. Relative to comparison students, these results suggest CUNY ECI participation led to 274 more students meeting both ELA and math CUNY college readiness benchmarks.

Figure 1. Proficiency rates of CUNY ECI and comparison students, by subject



Note: Results shown from propensity-score analysis of first-time ninth grade students. Analysis based on scores from 2,277 CUNY ECI and 2,213 comparison students for ELA; 2,344 CUNY ECI and 2,243 comparison students for math; and 2,276 CUNY ECI and 2,140 comparison students for both scores combined. Differences were tested using a two-tailed test; *=p<0.05, **=p<0.01, ***=p<0.001

Source: Author's calculations using data from the New York City Department of Education.

[10] See http://www2.cuny.edu/academics/testing/testing-faqs/ for CUNY's proficiency standards.

College readiness among subgroups. College-readiness rates in both ELA and math were higher for Black and Hispanic CUNY ECI students than similar students. Black students met CUNY's college-readiness benchmarks in ELA at a rate 15 percentage points higher than similar students; and at a rate 10 percentage points higher in math. Similarly, Hispanic students met ELA and math college-readiness benchmarks at rates 9 and 8 percentage points higher, respectively, than similar students.

As in Finding 1, results for White ECI students were reversed: as compared with White students in the comparison group, ECI students met ELA and math college-readiness benchmarks at rates that were 3 and 17 percentage points lower, respectively. Further research will explore these results.

CUNY ECI also had a positive impact on students who entered the ninth grade with scores below proficiency standards in ELA and math. Results showed a modestly positive effect of CUNY ECI for students who successfully met ninth-grade ELA and math proficiency; however, the effects were more robust for students who were not proficient in ninth grade. Relative to comparison students, previously non-proficient CUNY ECI students met college-readiness benchmarks at rates 13 percentage points and 10 percentage points higher in ELA and math, respectively. These results suggest that ECI acts as a catalyst for improving ELA and math proficiency for low-performing students

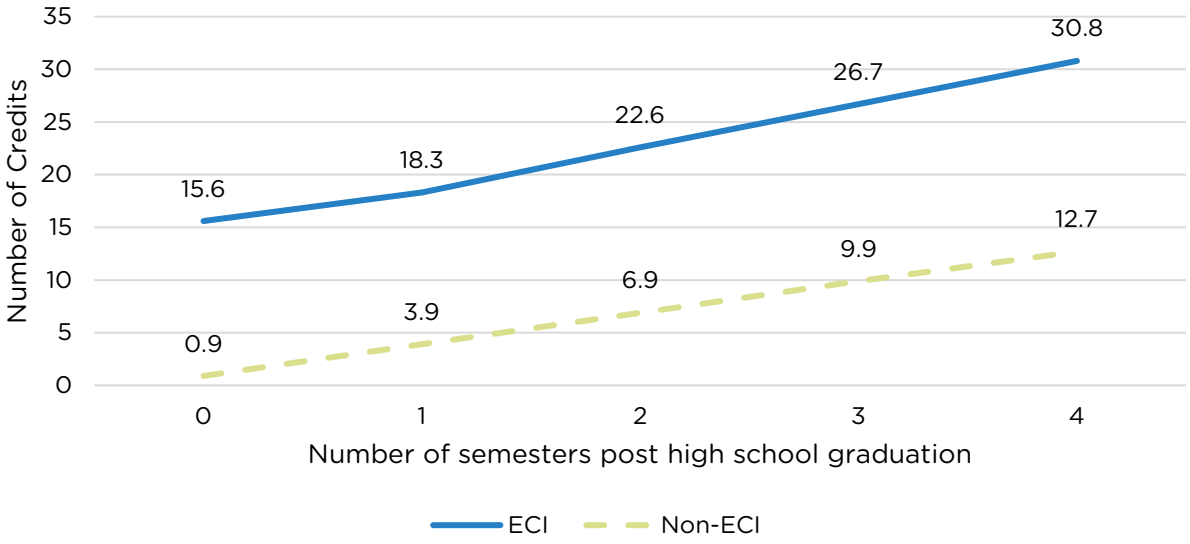
Finding 3. By earning significantly more college credits, ECI students were better positioned for college degree completion than similar students.

Earning college credit during high school is an integral feature of the Early College model. In addition to preparing high-school students for the transition to college, earning college credit before matriculation is an important pathway to success in and of itself. The role of early academic momentum—the speed with which undergraduates initially progress in college—is a strong early predictor of college success: students who earn 20 credits by the end of their first year in college are more likely to earn a degree (Adelman, 2006). College credits earned in and immediately after CUNY ECI, then, are both important outcomes and indicators of future success.

To examine credit accumulation over time, only students from earlier cohorts (2006 through 2008) were considered. At the time of the study, at least two years had passed since the expected date of high school graduation for these students (1,052 CUNY ECI and 1,052 comparison). Within this subsample, 46 percent of CUNY ECI students (n=483) and 31 percent of their peers (n=327) enrolled at CUNY. Maintaining a conservative, "intent-to-treat" approach, all students remained in the analysis.

Upon high-school graduation, CUNY ECI students had earned, on average, 16 credits compared to 1 credit earned by similar students. At the end of their second year, CUNY ECI students had earned an average of 31 credits, significantly more than similar students, who earned an average of 13 credits. This average difference of 18 credits placed CUNY ECI students more than a semester ahead of comparison students. The large effect size associated with this difference (d=0.77) indicates its practical significance.

Figure 2. College credit accumulation of CUNY ECI and comparison students from high-school graduation through the end of fourth term in college



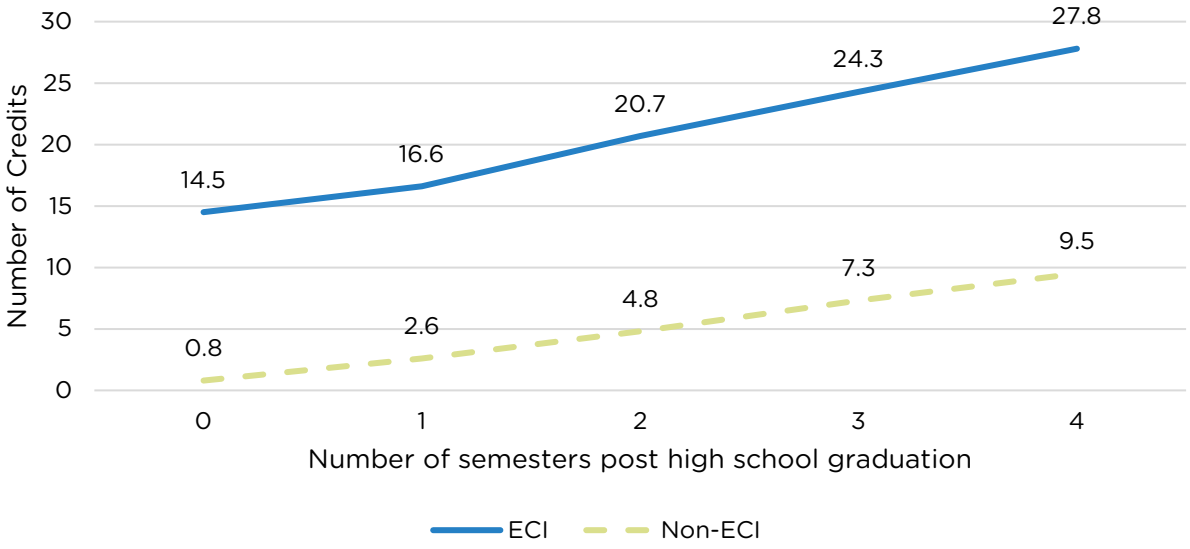
Note: Results shown from propensity-score analysis of first-time ninth grade students. Differences were tested using a two-tailed t-test. Total sample size was 2,104 (1,052 CUNY ECI and 1,052 non-CUNY ECI students).

Source: Author's calculations using data from the CUNY Institutional Research Database and the New York City Department of Education.

Credit accumulation among subgroups. The overall finding held among Black CUNY ECI students, who earned an average total of 28 credits by the end of their second year after on-time high school graduation. This was 18 credits more than comparison Black students, who had only earned 10 credits during the same interval (see Figure 3). CUNY ECI Asian and Hispanic students also earned significantly more credits than similar students; the difference between White student groups was not significant.

CUNY ECI students who were low-performing in math or ELA when they entered ninth grade also outpaced similar students in college credit accumulation (see Figure 4). Two years after on-time high school graduation, low-performing CUNY ECI students had earned an average of 26 credits, nearly half of the credits required to earn an associate degree. In contrast, similar students had earned fewer than half that number (10 credits) over the same interval.

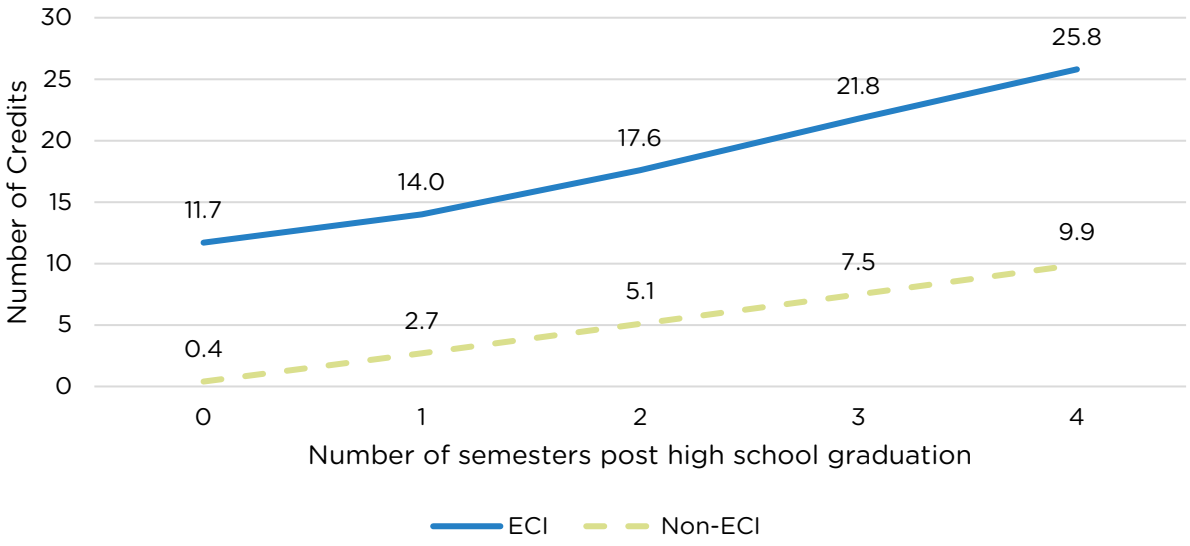
Figure 3. College credit accumulation of Black CUNY ECI and comparison students from high-school graduation through the end of fourth term in college



Note: Results shown from propensity-score analysis of first-time ninth grade students. Differences were tested using a two-tailed t-test. Total sample size was 2,104 (1,052 CUNY ECI and 1,052 non-CUNY ECI students).

Source: Author's calculations using data from the CUNY Institutional Research Database and NYCDOE.

Figure 4. College credit accumulation of low-performing CUNY ECI and comparison students



Note: Results shown from propensity-score analysis of first-time ninth grade students. Differences were tested using a two-tailed t-test. Total sample size was 2,104 (1,052 CUNY ECI and 1,052 non-CUNY ECI students).

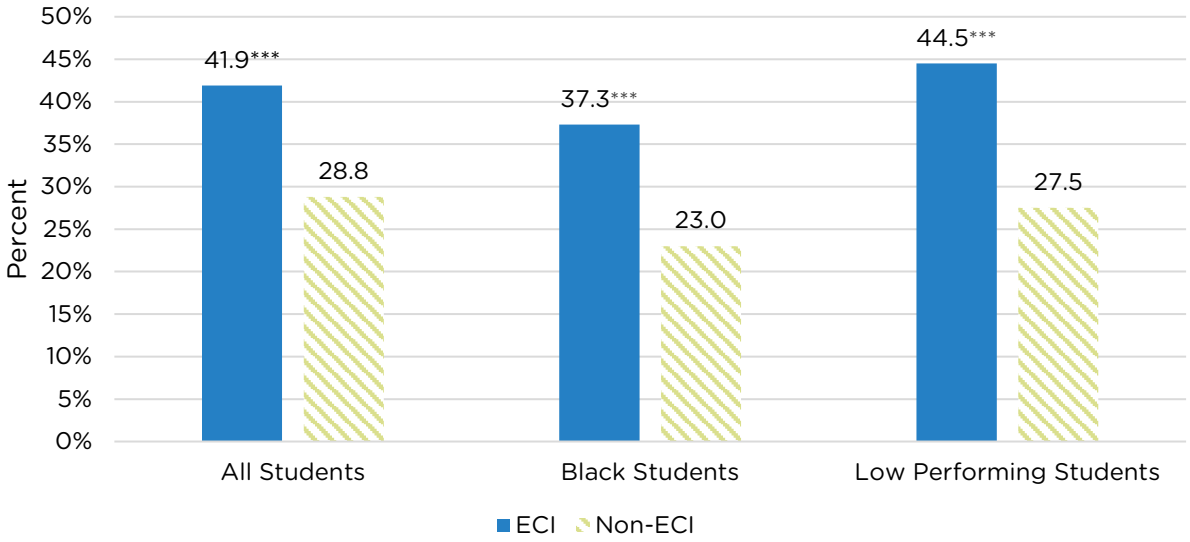
Source: Author's calculations using data from the CUNY Institutional Research Database and NYCDOE.

Finding 4. ECI graduates who entered CUNY persisted in degree programs at higher rates than similar students.

As in Finding 3, this finding is based on only students who had entered ninth grade between 2006 and 2008. Of this subsample, 46 percent of CUNY ECI students (n=483) and 31 percent of their peers (n=327) enrolled at CUNY after graduating from high school.

Two years later, 42 percent of CUNY ECI participants were still enrolled at CUNY, as opposed to 29 percent of similar students (see Figure 5). Although the associated effect size is modest (d=0.32), the 13 percentage point difference suggests 138 more CUNY ECI graduates were enrolled at CUNY two years after high school graduation.

Figure 5. Two-year retention rates of CUNY ECI and comparison students



Note: Results shown from propensity-score analysis of first-time ninth grade students. Differences were tested using a two-tailed test; *=p<0.05, **=p<0.01, ***=p<0.001. Total sample size was 2,104 (1,052 CUNY ECI and 1,052 non-CUNY ECI students).

Source: Author's calculations using data from the CUNY Institutional Research Database and NYCDOE.

As CUNY ECI students were more likely to persist at CUNY and earn more credits, they accordingly earned more degrees than comparison students. These results are preliminary due to the study period and because data are limited to degrees earned at CUNY. However, early results are promising: four percent of CUNY ECI students earned an associate degree at CUNY within two years of graduating, compared to just one percent of similar students. This finding merits further investigation over a longer study period because CUNY ECI students were more likely to enroll in a bachelor's degree program and thus take longer to graduate. Of the students enrolled at CUNY, 71 percent of CUNY ECI students were enrolled at senior colleges compared to 55 percent of their peers. Considering the better career and financial outlook associated with a four-year degree this result is promising despite its modest magnitude (d=0.36).

Persistence among subgroups. In keeping with subgroup results in previous findings in this report, results were markedly positive among Black students. Thirty-seven percent of CUNY ECI Black students remained enrolled at CUNY two years post-high school graduation, significantly more than the 23 percent of Black students in the comparison group. Persistence was also significantly higher among CUNY ECI Asian and Hispanic students; differences among White students were positive, but not statistically significant.

Results also indicated positive results among CUNY ECI students who were non-proficient in ninth grade. Among this group, 45 percent of CUNY ECI students persisted at CUNY two years post-graduation, which is significantly more than the 28 percent of similar students who attended non-ECI high schools. The 17 percentage point difference equates to an additional 179 low-performing ECI students who enrolled in and persisted at CUNY.

Discussion

Despite its critical role in social mobility and economic security, many students do not earn a college degree (Baum et al., 2013; Carnevale et al., 2011). Findings from this study support CUNY ECI as a promising model for improving secondary and postsecondary academic success among students in New York City. Overall, results showed modest gains for program participants; findings indicated the largest effect for Black students. These results are encouraging given that minority and low-income students are less likely to graduate college (Berger et al., 2013; Greene & Forester, 2003). Across outcomes from on-time high school graduation, to college enrollment, to persistence and graduation, CUNY ECI students outperformed similar students. The differences between groups were generally moderate but notable, particularly considering data were from the early years of the program. Both CUNY ECI and comparison students substantially surpassed averages for students in all New York City public schools.

CUNY ECI was also effective for low-performing students, who fared significantly better than matched comparison students across key secondary and postsecondary outcomes. With increasing focus on the cost, consequences, and prevalence of remedial needs among students matriculating at CUNY, these outcomes provide evidence that CUNY ECI is a promising early approach to ameliorating poor academic outcomes among low-performing students.

Several limitations pertain to these findings. First, the study includes only students who were enrolled in the early implementation phases (2006 – 2012) of CUNY ECI. Internal program data suggest that more recent cohorts have experienced more formalized support systems and structure, are earning more college credits in high school, and are enrolling in college at higher rates than earlier cohorts. The influence of implementation stages on cohort effects has been noted in other education research. Bloom, Thompson, & Unterman (2010) found the positive effect of small schools on secondary and postsecondary outcomes were more pronounced for later cohorts of students relative to earlier cohorts. This report, then, is best used as a benchmark for future research on CUNY ECI.

This study focused on students who entered the CUNY system following CUNY ECI. Although most NYCDOE students who go to college go to CUNY, data on students who follow other pathways or go to other colleges are important to understanding the full program impact.

Additional information about White students from both CUNY ECI and the comparison group might help understand results in the present study. Future research could oversample White students and use qualitative inquiry to shed light on their experiences in CUNY ECI high schools and beyond. Learning more about the nature of the different pattern of results will help understand how widely program effects might generalize to other settings and subgroups of students.

Future research will compare the effects of CUNY ECI across entering cohorts of students. In addition, analyses will examine other secondary and postsecondary outcomes such as SAT performance, remediation rates, college GPA, and time to college degree completion. Data from the National Student Clearinghouse will widen the sample to include students who attended other colleges.

Developing educational structures and pathways that help students persist and succeed in college is increasingly important as the attainment of a postsecondary degree is essential to gaining access to desired jobs in the 21st-century economy (Carnevale et al., 2011). The

evidence from this study suggests CUNY ECI is a promising approach to preparing students for a successful college experience that culminates in graduation and more opportunities for upward mobility.

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Appendix A.

Data Sources and Sample

Data obtained through a data-sharing agreement between CUNY and NYCDOE were used to build a student-level dataset of all NYCDOE public school students who had the opportunity to enroll in a CUNY ECI high school from 2006 through 2012. Students typically enter ECI in sixth or ninth grade. These datasets included transcript information (e.g. enrollment, performance on state assessment and standardized tests, graduation results) and demographics (race/ethnicity, gender, country or state of birth, native language, free or reduced priced lunch status). In addition, school-level information such as total enrollment, borough, school accountability measures (e.g., progress report grade), and aggregated demographic characteristics were included.

These NYCDOE data were merged with CUNY administrative data from the Institutional Research Database (IRDB) maintained by the Office of Institutional Research and Assessment. These data included comprehensive postsecondary transcript information (e.g., college credit accumulation, course grades, academic major, degrees earned) on all students enrolled in the CUNY system, as well as CUNY ECI students' enrollment in CUNY courses while attending high school. This study is limited by the inaccessibility of postsecondary data outside of the CUNY system. Student enrollment at other institutions may be tracked through the National Student Clearinghouse, but these data are limited and do not include information on academic performance.

The resulting longitudinal dataset included seven cohorts of NYCDOE students who had enrolled in the ninth grade for the first time from 2006 through 2012. Students who enrolled after November 1 of their first cohort year (i.e., students who repeated ninth grade)[1] were excluded, as were students enrolled in special-education high schools (NYCDOE District 75), alternative high schools (NYCDOE District 79), charter schools, and alternative learning schools or Young Adult Borough Centers (YABC). These school models did not serve the general population of incoming high school students and thus were not an appropriate comparison.

The CUNY ECI model is designed so that students are introduced to a small set of college courses during their early years of high school and then have the opportunity to take a wider range of college courses during their final year. Table A1 includes all CUNY ECI schools as of 2014-15, eight of which were included in the study. Three CUNY ECI high schools diverged substantially from this approach and allowed students to enroll in college courses alongside matriculated students throughout high school. In addition, students at these schools could remain enrolled in high school for five years. Due to these differences, International High School at LaGuardia, Middle College High School at LaGuardia, and City Polytechnic High School were excluded from the study.

A fourth school, Brooklyn College Academy (BCA), only adopted the full CUNY ECI model in the fall of 2007, meaning students who graduated before 2011 had not fully experienced the approach. Therefore, only BCA students who entered the ninth grade for the first time after 2007 were included in this study.

The final sample of first-time ninth graders consisted of 435,353 NYCDOE students. Of those, 3,847 students were enrolled in one of eight CUNY ECI high schools and 431,506 were enrolled in 372 non-CUNY ECI high schools in New York City.

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[1] NYCODE school enrollment counts are considered official on October 31st of each year. Schools were identified as "high schools" for purposes of this research as those with enrollment of at least 10 students in grades 9, 10, 11, and 12 at any point in time while operating as a public school in the NYCDOE between 2006 and 2014. Students with irregular grade-level progression patterns (e.g., a student who progressed from 8th grade into 7th or 6th grade the following year) and irregular discharge data (e.g., a student with a discharge date occurring prior to the date in which the student entered 9th grade) were excluded from the file.

Table A1. Profile of CUNY ECI high schools during the 2014-15 academic year

School name	Borough	Grades	Year founded[1]	Partner college	Total enrollment	Included in report
Brooklyn College Academy	Brooklyn	9-12	2007	Brooklyn College	587	X
Business Technology Early College High School (BTECH)	Queens	9-14	2014	Queensborough Community College	111	
City College Academy of the Arts	Manhattan	6-12	2003	City College	550	X
City Polytechnic High School	Brooklyn	9-13	2009	New York City College of Technology	457	
Energy Tech High School	Queens	9-14	2013	LaGuardia Community College	227	
Health, Education, and Research Occupations High School (HERO)	Bronx	9-14	2013	Hostos Community College	230	
Hostos Lincoln Academy	Bronx	6-12	2004	Hostos Community College	515	X
International High School at LaGuardia Community College	Queens	9-13	2002	LaGuardia Community College	500	
Inwood Early College for Health and Information Technologies	Manhattan	9-14	2014	Guttman Community College	88	
Kingsborough Early College Secondary School	Brooklyn	6-12	2006	Kingsborough Community College	514	X
Manhattan Early College School for Advertising (MECA)	Manhattan	9-14	2014	Borough of Manhattan Community College	95	
Manhattan Hunter Science High School	Manhattan	9-12	2003	Hunter College	449	X
Middle College High School at LaGuardia Community College	Queens	9-13	2002	LaGuardia Community College	505	
Pathways in Technology Early College High School (PTECH)	Brooklyn	9-14	2011	New York City College of Technology	438	
Queens School of Inquiry	Queens	6-12	2005	Queens College	525	X
Science, Technology and Research Early College High School	Brooklyn	6-12	2003	Brooklyn College	493	X
York Early College Academy	Queens	6-12	2006	York College	574	X

[1]The year founded represents the year in which the first 9th grade cohort transitioned to the CUNY ECI college course taking and academic support model.

Methods

As CUNY ECI students were not randomly assigned to high schools, this study relies on a quasi-experimental design to discern evidence of program effects. Although random assignment is considered the most methodologically rigorous approach for estimating the effect of an intervention, it was not feasible or appropriate in this context. At present, limitations inherent in the NYCDOE student high school placement lottery system and the nature and timing of this study precluded random assignment of students to CUNY ECI and comparison schools. As Bloom, Thompson and Unterman (2010) highlighted in their study of small schools, even though the order in which students are assigned into a high school is random, the NYCDOE assigns students by assessing geographic proximity, student preferences, and high school administrator and staff preferences.

Further, the purpose of this study was to understand the effect of CUNY ECI enrollment on students' secondary and postsecondary performance. The longitudinal approach, which examined student enrollment and performance retrospectively, allowed the examination of secondary and postsecondary achievement outcomes of students who had completed high school and had an opportunity to matriculate into college. A random assignment approach would have delayed analyses of key student outcomes for a minimum of four years for high school outcomes and a minimum of five years for analyses of postsecondary enrollment patterns and performance outcomes.

The initial longitudinal sample included all 435,353 NYCDOE students who had enrolled in ninth grade for the first time between 2006 and 2012. Within this pool, CUNY ECI students differed significantly across observable variables from the larger pool of non-ECI NYCDOE students, as did the characteristics of the schools they attended. CUNY ECI students were more likely to be female, more likely to be Black, less likely to be born outside the United States, and were, on average, higher academic achievers prior to high school than the non-ECI students (see Table A3). Furthermore, the ECI high schools were newer, smaller, and significantly different across all demographic characteristics than the non-ECI high schools (see Table A2). These significant differences in both student- and school-level variables precludes a simple comparison between CUNY ECI and non-ECI students as it would likely lead to a misestimation of the program's effect.

Propensity Score Matching. In lieu of random assignment, and in order to decrease bias associated with the differences between CUNY ECI and non-ECI students and schools, REPS adopted a quasi-experimental approach to estimate program effects on students' secondary and postsecondary success. Propensity score matching (PSM), originally introduced by Rosenbaum and Rubin (1983), is a method used to construct a statistically similar group of students who are comparable to a treatment group. The propensity score is a student's conditional probability of being assigned to treatment (i.e. CUNY ECI) based on all observable characteristics (e.g., race/ethnicity, gender, prior academic achievement and engagement, etc.). Matching students based on propensity scores and ensuring the samples are balanced reduces sample bias.

This analysis relied on a two-step approach to PSM. First, school-level characteristics within each academic year were the basis for calculating a school-level propensity score to indicate the probability a given school would adopt the CUNY ECI high school model. Five school-level characteristics were included in the school-level PSM analysis: (1) school progress report grade (i.e., A-F), (2) total number of students enrolled, (3) school age, (4) school borough or location, and (5) school-level demographics (e.g., race/ethnicity, ELL status) for each year between 2006 and 2012. Equation (1) provides the logit model used for estimating the propensity (i.e., probability) that a school, given its characteristics, would be a CUNY ECI high school:

$$(1)\ SCHL_{it} = \beta_0 + \beta_1(DOEGRD_{it}) + \beta_2(ENRLL_{it}) + \beta_3(AGE_{it}) + \beta_4(BORO_{it}) + \beta_5(DEMO_{it}) + \varepsilon_{it}$$

where SCHL is the school-level propensity score for school *i* in academic year *t*; DOEGRD is a series of a dichotomous variables indicating the NYCDOE progress report letter grade for a given year (e.g., A through F); ENRLL indicates the total student enrollment (in numbers of students); AGE is a continuous variable indicating the current age of each school in each year of the study; BORO is a series of dichotomous variables indicating the school borough; DEMO indicates a vector of school-level aggregated student demographic variables (e.g., percentage distributions of race/ethnicity, gender, ELL status); and, ε_{it} represents random error. Table A2 lists all variables used in the school-level match and a comparison between pre- and post-matching sample characteristics.[2]

In step two of the analysis, student-level propensity scores estimated the probability that a student would enroll in the ninth grade at a CUNY ECI high school. Twelve student-level characteristics were included in the model: (1) gender, (2) race/ethnicity, (3) native language, (4) free and reduced priced lunch status, (5) location of birth (e.g., United States, New York City), (6) admissions reason, (7) year of enrollment in ninth grade (e.g., 2006, 2007, etc.), (8) grade-level promotion patterns, (9) attendance patterns, (10) standardized NYS English and math assessment performance patterns, (11) whether or not a student enrolled in a *new* high school upon entering the ninth grade for the first time, and (12) whether or not a student enrolled in a grade six through 12 school model.[3,4] In addition to these student-level variables, the school-level propensity score obtained in step one functioned as an additional covariate. Students were then exact-matched on their year of entry into the ninth grade for the first time. Equation (2) provides the model for estimating the propensity score for enrolling in ninth grade for the first time in a CUNY ECI high school:

$$(2)\ ECI9_i = \beta_o + \beta_1(SCHLPSM_i) + \beta_2(ATTND_i) + \beta_3(ACPERF_i) + \beta_4(PROMO_i) + \beta_5(NEWGRD9_i) + \beta_6(SCH612_i) + \beta_7(DEMO_i) + \varepsilon_i$$

where ECI9 is the student-level propensity score for student *I*; SCHLPSM is the school-level propensity score; ATTND is a student's attendance patterns before entering ninth grade; ACPERF represents a vector of student academic performance (i.e., exam scores that have been standardized for the model) prior to ninth grade; PROMO is a series of dichotomous variables that indicated a student's grade-level promotion patterns prior to ninth grade; NEWGRD is a dichotomous variable that indicated whether a student was enrolled in a different school the year prior to entering ninth grade; SCH612 is a dichotomous variable that indicated whether a student enrolled in a grade six through 12 school; DEMO includes a series of dichotomous variables that indicated student demographic information (e.g., race/ethnicity, gender, ELL status, birth location) and academic history (e.g., school admission reason code); and, ε_i represents random error. Table A2 lists the variables included in the match and a comparison between pre- and post-match sample characteristics.

The goal of the matching process was to create a comparison group that most closely resembled the treatment group—with no or little statistically significant differences across observable variables—while retaining the highest number of CUNY ECI students. We employed a "greedy" (i.e. without replacement) one-to-one matching algorithm with a caliper restriction for the student-level match. We enforced a caliper restriction on the matches of 0.007, one-quarter of a standard deviation of the propensity scores of all students in the total pool, as recommended by Rosenbaum and Rubin (1983). By taking a more conservative matching approach, a small portion of treated students fell outside of the area of common

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2 NYCDOE released report cards for each school in the city, grading them on a scale of A through F. Per the NYCDOE website, progress reports were based on student progress (60%), student performance (25%), and the school environment evaluated based on school audits (15%). Scores were then based on comparing results from one school to a peer group of up to 40 schools with the most similar student population and to all schools citywide.

3 For the 9th grade file, this variable identifies whether a student was promoted from 6th to 7th grade three years before entering 9th grade and whether a student was promoted from 7th to 8th grade two years before entering 9th.

4 Attendance and exam performance patterns for each student were derived by estimating the trajectory (or slope) of attendance and exam performance data across and up to three years prior to entering 9th grade.

support and therefore were excluded from the final study sample: 76 (1.9%) of the CUNY ECI group could not be matched. These unmatched students were dropped from further study.

Results. Prior to matching, CUNY ECI students and schools differed significantly from the remaining pool of NYCDOE students across almost all academic and demographic variables; these differences may be observed in the distribution of propensity scores in Figure A1. The PSM approach explained above identified a subset of NYCDOE students who were statistically similar to CUNY ECI students on the majority of the observable characteristics included in the model (see Figure A2). After matching, only two student-level variables remained statistically significantly different at the five percent level: comparison students' standardized performance on the 8th grade math exam was slightly higher and the comparison group students were absent at a slightly lower rate in 8th grade (see Table A2).

The matching process helped attenuate bias associated with the schools attended by CUNY ECI and other NYCDOE students. We achieved balanced samples on school size, age, and model (i.e. 6- or 9-through-12). Furthermore, while differences in the demographic profile of schools remained statistically significant, they were substantially reduced for variables in which the pre-match differences were the largest, and remained practically small for all others. Geographic balance was harder to achieve; more CUNY ECI students attended school in Brooklyn and fewer in Queens than the matched comparison group (see Table A2).

Figure A1. CUNY ECI and NYCDOE Propensity Score Distribution, Pre-Match

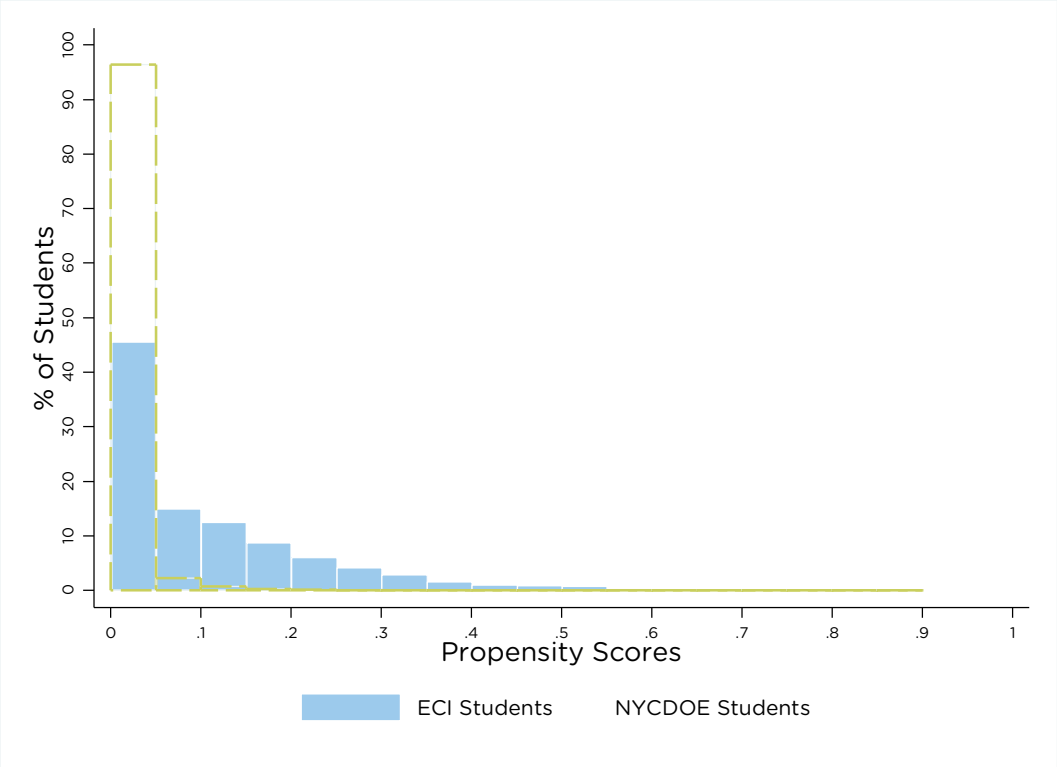

Figure A2. CUNY ECI and NYCDOE Propensity Score Distribution, Post-Match

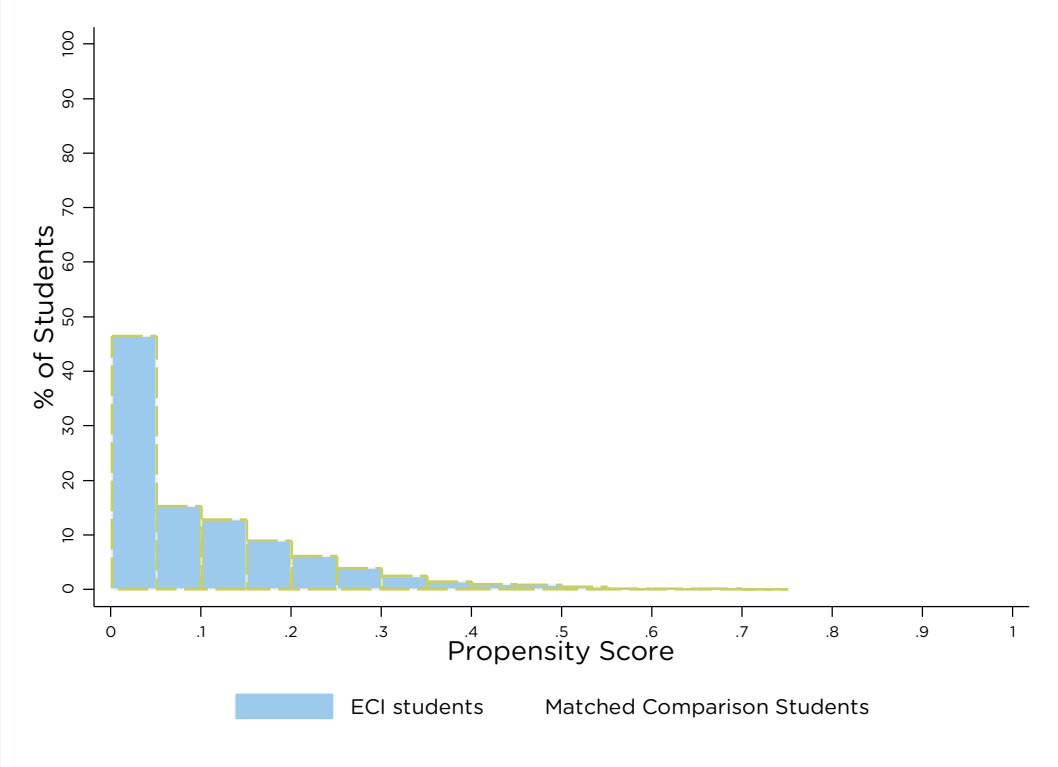

Table A2. School-level characteristics for full NYCDOE student sample (Pre) and matched comparison group (Post).

		Pre-match			Post-match		
Matching variables		**ECI students**	**Total pool of eligible NYCDOE students**	***Diff.***	**ECI students**	**Matched comparison group students**	***Diff.***
	N	**3,847**	**431,506**		**3,771**	**3,771**	
School-level institutional characteristics							
School age (in years)[2]	**mean**	7.4	35.5	*-28.1****	7.4	7.4	*+0.0*
Total student enrollment (upon entry)	**mean**	504.9	1,858.4	*-1,353.5****	506.5	504.9	*+1.6*
Enrolled in a grade 6th-12th grade school model	**%**	62.4	8.8	*53.6****	61.7	60.4	*+1.3*
School-level student demographics[2]							
Percent female students	**mean**	55.5	49.6	*+5.9****	55.6	56.1	*-0.5*
Percent Asian students	**mean**	12.9	15.5	*-2.6****	12.9	14.0	*-1.1 **
Percent black students	**mean**	42.2	31.6	*+10.6****	41.9	38.1	*+3.8 ****
Percent Hispanic students	**mean**	34.8	38.2	*-3.4****	35.0	36.3	*-1.3 **
Percent white students	**mean**	8.6	13.3	*-4.7****	8.8	10.3	*-1.5*
Percent low income students	**mean**	73.5	70.6	*+2.9****	73.4	76.4	*-3.0 ****
Percent of students with special education needs	**mean**	7.6	12.0	*-4.4****	7.6	10.4	*-2.8 ****
Percent students in CTT classes[3,4]	**mean**	20.6	53.6	*-33.0****	20.5	22.1	*-1.6 **
Percent English Language Learners (ELL)	**mean**	2.8	9.8	*-7.0****	2.8	6.3	*-3.5 ****
School borough							
Brooklyn	**%**	39.5	28.5	*+11.0****	39.9	25.3	*+14.6 ****
Bronx	**%**	12.6	19.4	*-6.8****	12.9	17.8	*-4.9 ****
Manhattan	**%**	29.0	20.9	*+8.1****	29.3	23.2	*+6.1 ****
Queens	**%**	18.9	25.0	*-6.1****	17.9	33.2	*-15.3 ****
Staten Island	**%**	0.0	6.2	*-6.2****	0.0	0.1	*-0.1 ****

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

[1] The school level demographics were based upon the year of entry in 9th grade for each student; that is, the school age was calculated by subtracting the year a school opened from the year in which a student entered 9th grade.

[2] Analyses revealed missing data for several schools (i.e., the percent of ELL students, the percent of students receiving FRPL, etc.). We only removed schools where the information was missing for a non-CUNY ECI high school, but not missing for a CUNY ECI-school. Our decision to exclude these non-CUNY ECI high schools as their propensity scores would not have matched with CUNY ECI high schools-all of which we were able to find information.

[3] We found missing data for Collaborative team teaching (CTT) at the school level for both ECI and non-ECI high schools. We imputed the percent of students in CTT using a OLS regression approach.

[4] According to the NYCDOE website, CTT is a service delivery system in which: (1) two (or more) educators or other professionally certified staff, (2) share instructional responsibility, (3) for a single group of students, (4) primarily in a single classroom or workspace, (5) to teach required curriculum, (6) With mutual ownership, pooled resources, and joint accountability, although each individual's level of participation may vary.

Table A3. Student-level characteristics in ninth grade, full NYCDOE student sample (Pre) and matched comparison group (Post).

		Pre-match			Post-match		
Matching variables		**ECI students**	**Total pool of eligible NYCDOE students**	***Diff.***	**ECI students**	**Matched comparison group students**	***Diff.***
	N	**3,847**	**431,506**		**3,771**	**3,771**	
Gender							
Female	%	56.6	49.3	*+7.3****	56.9	57.8	*-0.9*
Race/Ethnicity[1]							
Asian or Pacific Islander	%	12.9	15.6	*-2.7****	13.0	14.1	*-1.1*
Black	%	42.3	31.5	*+10.8****	41.8	40.8	*+1.0*
Hispanic	%	35.3	39.4	*-4.1****	35.6	35.6	*+0.0*
White	%	8.7	12.8	*-4.1****	8.8	8.8	*+0.0*
American Indian or Alaskan Native	%	0.4	0.4	*+0.0*	0.0	0.0	*+0.0*
Multi-Racial	%	0.2	0.1	*+0.1***	0.0	0.0	*+0.0*
Location of birth							
Born in New York City	%	79.8	73.8	*+6.0****	79.8	79.4	*+0.4*
Born in New York State (NYS)	%	1.7	1.7	*+0.0*	1.7	1.6	*+0.1*
Born outside of NYS	%	2.3	3.7	*-1.4****	2.4	2.3	*+0.1*
Born outside the US	%	16.0	20.8	*-4.8****	16.0	16.8	*-0.8*
Native language							
Native English speaker	%	62.4	55.4	*+7.0****	62.1	60.2	*+1.9*
Native Spanish speaker	%	23.3	26.7	*-3.4****	23.5	23.9	*-0.4*
Prior academic performance[2]							
Years of ELA exam data	**mean**	2.71	2.36	*+0.4****	2.73	2.73	*+0.00*
Z-Score 8th Grade ELA Exam Performance	**mean**	0.35	0.09	*+0.3****	0.42	0.45	*-0.03*
Slope - Z-Score ELA Exam Performance	**mean**	0.05	0.01	*+0.0****	0.06	0.06	*+0.0*
Years of Math exam data	**mean**	2.74	2.43	*+0.3****	2.73	2.73	*+0.00*
Z-Score 8th Grade Math Exam Performance	**mean**	0.42	0.15	*+0.3****	0.45	0.49	*-0.04* *
Slope - Z-Score Math Exam Performance	**mean**	0.02	0.00	*+0.0****	0.03	0.02	*+0.01*
Enrolled in 7th grade 2 years prior to entering 9th grade	%	93.0	80.3	*+12.7****	92.8	93.1	*-0.3*
Enrolled in 6th grade 3 years prior to 9th grade	%	80.7	62.7	*+18.0****	80.3	80.5	*-0.2*
Prior attendance[3]							
Years of Attendance data	**mean**	2.74	2.44	*0.3****	2.73	2.73	*+0.0*
8th Grade Absence percentage rate	**mean**	4.06	7.13	*-3.1****	4.50	4.27	*+0.23* *
Slope - Absence percentage rate	**mean**	0.10	0.31	*-0.2****	0.20	0.16	*+0.04*

continued on next page

Matching variables		Pre-match: ECI students	Pre-match: Total pool of eligible NYCDOE students	Pre-match: *Diff.*	Post-match: ECI students	Post-match: Matched comparison group students	Post-match: *Diff.*
Other							
Low income student	%	82.5	82.0	*+0.5*	82.4	81.6	*+0.8*
Enrolled into a new high school in the 9th grade	%	56.5	95.7	*-39.2****	57.6	57.2	*+0.4*

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

[1]Race/ethnicity categories follow NYCDOE naming conventions.

[2]We estimated standardized z-scores for each student's ELA and math exam performance for 1, 2 and 3 years prior to 9th grade. We then calculated z-scores for the intercept and slope of each student's exam performance up to three years prior to entering 9th grade. For a student with only one year of exam data during the time period prior to 9th grade, the intercept equaled the exam z-score available and the slope equaled zero. Intercept and slope estimates were used to estimate each students' performance trajectory (i.e., the slope moving up or down) leading up to 9th grade for the first time. We argue that these are more robust estimates of students' academic performance relative to using the average exam score 1 year prior to entering 9th grade for the first time.

[3] Prior attendance rates were calculated by dividing the total number of days absent by the total number of school days. Once calculated, we then estimated the standardized attendance rates and then calculated an intercept and slope for each student (see exam performance data procedure).

Appendix B.

The following tables display results from ANOVAs and logistic regressions conducted explore the relationships between ECI participation and key outcomes of interest while accounting for the effects of additional relevant factors. Tables are grouped by related report findings.

Finding 1. On-Time High School Graduation

Table B1. Multivariate estimate of the effect of enrollment into a CUNY ECI high school on earning a high school diploma on time.[1, 2]

Variable	β(SE)	Odds Ratio	β(SE)	Odds Ratio
School type				
CUNY ECI	0.207(0.081)*	1.230	0.208(0.081)***	1.231
Student-level characteristics				
Year entering ninth grade				
2006			0.169(1.972)	0.789
2007			0.127(14.214)	0.620
2008			0.117(13.684)	0.649
2009			0.114(6.024)	0.757
Observations	4,771		4,771	
-2 Log Likelihood	4,039.57		4,019.81	
χ^2	6.51*		26.26***	
df	1		5	

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

[1] The sample includes only those students who entered ninth grade for the first time in 2006, 2007, 2008, 2009, and 2010 (CUNY ECI students= 2,387, Matched comparison students = 2,387) as only these student had the opportunity to graduate in four years (or less). Students from the following CUNY ECI high schools were included in this analysis: Brooklyn College Academy; City College Academy of the Arts; Hostos-Lincoln Academy of Science; Kingsborough Early College Secondary School; Manhattan-Hunter Science High School; Queens School of Inquiry; Science, Technology & Research High School; and York Early College Academy.

[2] We included the year in which students entered ninth grade for the first time as a control in the model to account for changes in academic and graduation requirements within the NYCDOE.

Table B2. Multivariate estimate of the effect of enrollment into a CUNY ECI high school on earning a high school diploma on time by student race/ethnicity.[1, 2]

Variable	Asian students		Black students		Hispanic students		White students	
	β(SE)	Odds Ratio	β(SE)	Odds Ratio	β(SE)	Odds Ratio	β(SE)	Odds Ratio
School type								
CUNY ECI	-0.010(0.350)	0.990	0.724(0.131)***	2.062	-0.012(0.124)	0.988	-1.03(0.305)***	0.357
Student-level characteristics								
Year entering ninth grade								
2006	-0.756(0.712)	0.470	-0.290(0.242)	0.748	0.106(0.289)	1.111	-1.03(0.590)	0.357
2007	-1.397(0.540)**	0.247	-0.208(0.194)	0.812	-0.602(0.195)**	0.547	-0.380(0.528)	0.684
2008	-1.17(0.493)*	0.310	-0.109(0.185)	0.897	-0.522(0.178)**	0.593	-0.667(0.441)	0.513
2009	-0.143(0.569)	0.867	0.040(0.180)	1.040	-0.429(0.174)*	0.651	-0.770(0.373)*	0.463

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

[1]The sample includes only those students who entered ninth grade for the first time in 2006, 2007, 2008, 2009, and 2010 as only these students had the opportunity to graduate in four years (or less). Students from the following CUNY ECI high schools were included in this analysis: Brooklyn College Academy; City College Academy of the Arts; Hostos-Lincoln Academy of Science; Kingsborough Early College Secondary School; Manhattan-Hunter Science High School; Queens School of Inquiry; Science, Technology & Research High School; and York Early College Academy.

[2]We included the year in which students entered ninth grade for the first time as a control in the model to account for changes in academic and graduation requirements within the NYCDOE.

Table B3. Multivariate estimate of the effect of enrollment into a CUNY ECI high school on earning a high school diploma on-time by ninth grade proficiency level.[1, 2]

	Meeting Proficiency		Not Meeting Proficiency	
Variable	**β(SE)**	**Odds Ratio**	**β(SE)**	**Odds Ratio**
School model				
Overall	0.151(0.136)	1.163	0.200(0.107)	1.221
Student-level characteristics				
Year entering ninth grade				
2006	-0.591(0.300)	0.554	0.008(0.208)	1.008
2007	-0.400(0.243)**	0.670	-0.539(0.155)**	0.583
2008	-0.622(0.210)**	0.537	-0.417(0.146)**	0.659
2009	-0.585(0.192)	0.557	-0.622(0.156)***	0.537

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

[1]The sample includes only those students who entered ninth grade for the first time in 2006, 2007, 2008, 2009, and 2010 as only these students had the opportunity to graduate in four years (or less). Students from the following CUNY ECI high schools were included in this analysis: Brooklyn College Academy; City College Academy of the Arts; Hostos-Lincoln Academy of Science; Kingsborough Early College Secondary School; Manhattan-Hunter Science High School; Queens School of Inquiry; Science, Technology & Research High School; and York Early College Academy.

[2]We included the year in which students entered ninth grade for the first time as a control in the model to account for changes in academic and graduation requirements within the NYCDOE.

Finding 2. College Readiness

Table B4. Multivariate estimates of the effects of enrollment into a CUNY ECI high school on meeting CUNY proficiency criteria using the New York State Regents ELA exam (best score).[1, 2]

Variable	β(SE)	Odds Ratio	β(SE)	Odds Ratio
School type				
CUNY ECI	0.502(0.073)***	1.653	0.535(0.072***	1.707
Student-level characteristics				
Year entering ninth grade				
2006			-0.185(0.144)	0.831
2007			-0.337(0.11)**	0.714
2008			-0.092(0.103)	0.913
2009			-0.048(0.096)	0.953
Observations	4,490		4,490	
-2 Log Likelihood	4,693.25		4,798.75	
χ^2	48.57***		66.32***	
df	1		5	

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

[1]The sample includes only those students who entered ninth grade for the first time in 2006, 2007, 2008, 2009, and 2010. Students from the following CUNY ECI high schools were included in this analysis: Brooklyn College Academy; City College Academy of the Arts; Hostos-Lincoln Academy of Science; Kingsborough Early College Secondary School; Manhattan-Hunter Science High School; Queens School of Inquiry; Science, Technology & Research High School; and York Early College Academy.

[2]We included the year in which students entered ninth grade for the first time as a control in the model to account for changes in academic and graduation requirements within the NYCDOE.

Table B5. Multivariate estimates of the effects of enrollment into a CUNY ECI high school on meeting CUNY proficiency criteria using the New York State Regents math exam (best score).[1,2]

Variable	β(SE)	Odds Ratio	β(SE)	Odds Ratio
School type				
CUNY ECI	0.223(0.059)	1.250	0.230(0.060)	1.258
Student-level characteristics				
Year entering ninth grade2				
2006			0.318(0.126)*	1.375
2007			-0.661(0.095)***	0.516
2008			-0.626(0.085)***	0.535
2009			-0.482(0.079)***	0.618
Observations	4,587		4,587	
-2 Log Likelihood	6,338.06		6,220.65	
χ^2	14.20***		131.60***	
df	1		5	

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

[1]The sample includes only those students who entered ninth grade for the first time in 2006, 2007, 2008, 2009, and 2010. Students from the following CUNY ECI high schools were included in this analysis: Brooklyn College Academy; City College Academy of the Arts; Hostos-Lincoln Academy of Science; Kingsborough Early College Secondary School; Manhattan-Hunter Science High School; Queens School of Inquiry; Science, Technology & Research High School; and York Early College Academy.

[2]We included the year in which students entered ninth grade for the first time as a control in the model to account for changes in academic and graduation requirements within the NYCDOE.

Table B6. Multivariate estimates of the effects of enrollment into a CUNY ECI high school on meeting CUNY proficiency criteria using the New York State Regents ELA and math exam (best score).[1,2]

Variable	β(SE)	Odds Ratio	β(SE)	Odds Ratio
School type				
CUNY ECI high school	0.249(0.061)**	1.283	0.259(0.061)	1.296
Student-level characteristics				
Year entering ninth grade2				
2006			0.09(0.124)	1.094
2007			-0.714(0.098)***	0.490
2008			-0.61(0.087)***	0.544
2009			-0.485(0.081)***	0.616
Observations	4,416		4,416	
-2 Log Likelihood	6,070.83		5,973.42	
χ^2	16.91***		114.32***	
df	1		5	

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

[1]The sample includes only those students who entered ninth grade for the first time in 2006, 2007, 2008, 2009, and 2010. Students from the following CUNY ECI high schools were included in this analysis: Brooklyn College Academy; City College Academy of the Arts; Hostos-Lincoln Academy of Science; Kingsborough Early College Secondary School; Manhattan-Hunter Science High School; Queens School of Inquiry; Science, Technology & Research High School; and York Early College Academy.

[2]We included the year in which students entered ninth grade for the first time as a control in the model to account for changes in academic and graduation requirements within the NYCDOE.

Table B7. Multivariate estimates of the effects of enrollment into a CUNY ECI high school on meeting CUNY proficiency criteria using the New York State Regents ELA exam (best score) by student race/ethnicity.[1,2]

Variable	Asian students		Black students		Hispanic students		White students	
	β(SE)	Odds Ratio	β(SE)	Odds Ratio	β(SE)	Odds Ratio	β(SE)	Odds Ratio
School type								
Overall	0.203(0.287)	1.225	0.814(0.111)***	2.257	0.465(0.112)***	1.592	-0.213(0.297)	0.808
Student-level characteristics								
Year entering ninth grade								
2006	-0.367(0.592)	0.693	-0.279(0.214)	0.756	0.108(0.232)	1.114	-0.204(0.602)	0.815
2007	-0.645(0.464)	0.525	-0.276(0.164)	0.759	-0.33(0.172)	0.719	0.925(0.647)	2.521
2008	-0.446(0.408)	0.640	0.114(0.162)	1.121	-0.053(0.157)	0.948	-0.373(0.397)	0.689
2009	-0.442(0.379)	0.643	0.070(0.150)	1.072	0.000(0.150)	1.000	0.117(0.369)	1.124

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

[1]The sample includes only those students who entered ninth grade for the first time in 2006, 2007, 2008, 2009, and 2010 and actually sat for the Regents exam. Students from the following CUNY ECI high schools were included in this analysis: Brooklyn College Academy; City College Academy of the Arts; Hostos-Lincoln Academy of Science; Kingsborough Early College Secondary School; Manhattan-Hunter Science High School; Queens School of Inquiry; Science, Technology & Research High School; and York Early College Academy.

[2]We included the year in which students entered ninth grade for the first time as a control in the model to account for changes in academic and graduation requirements within the NYCDOE.

Table B8. Multivariate estimates of the effects of enrollment into a CUNY ECI high school on meeting CUNY proficiency criteria using the New York State Regents math exam (best score) by student race/ethnicity.[1,2]

Variable	Asian students		Black students		Hispanic students		White students	
	β(SE)	Odds Ratio	β(SE)	Odds Ratio	β(SE)	Odds Ratio	β(SE)	Odds Ratio
School type								
Overall	0.144(0.207)	1.155	0.426(0.096)***	1.531	0.337(0.101)***	1.401	-0.884(0.229)***	0.413
Student-level characteristics								
Year entering ninth grade								
2006	0.240(0.515)	1.272	0.335(0.191)	1.398	0.534(0.205)**	1.705	0.864(0.657)	2.373
2007	-1.138(0.328)***	0.321	-0.389(0.147)**	0.678	-0.794(0.163)***	0.452	-0.041(0.395)	0.960
2008	-0.462(0.294)	0.630	-0.245(0.137)	0.782	-0.904(0.143)***	0.405	-1.283(0.319)***	0.277
2009	-0.649(0.269)*	0.523	-0.480(0.131)***	0.619	-0.382(0.132)**	0.683	-0.598(0.276)*	0.550

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

[1]The sample includes only those students who entered ninth grade for the first time in 2006, 2007, 2008, 2009, and 2010 and actually sat for the Regents exam. Students from the following CUNY ECI high schools were included in this analysis: Brooklyn College Academy; City College Academy of the Arts; Hostos-Lincoln Academy of Science; Kingsborough Early College Secondary School; Manhattan-Hunter Science High School; Queens School of Inquiry; Science, Technology & Research High School; and York Early College Academy.

[2]We included the year in which students entered ninth grade for the first time as a control in the model to account for changes in academic and graduation requirements within the NYCDOE.

Table B9. Multivariate estimates of the effects of enrollment into a CUNY ECI high school on meeting CUNY proficiency criteria using the New York State Regents ELA and math exam (best score) by student race/ethnicity.[1, 2]

Variable	Asian students		Black students		Hispanic students		White students	
	β(SE)	Odds Ratio	β(SE)	Odds Ratio	β(SE)	Odds Ratio	β(SE)	Odds Ratio
School type								
Overall	0.266(0.196)	1.305	0.448(0.100)***	1.565	0.354(0.104)***	1.424	-0.639(0.225)**	0.528
Student-level characteristics								
Year entering ninth grade								
2006	-0.060(0.432)	0.942	0.029(0.194)	1.030	0.356(0.203)	1.428	0.457(0.547)	1.579
2007	-1.044(0.316)***	0.352	-0.500(0.152)**	0.606	-0.852(0.170)***	0.427	0.008(0.376)	1.008
2008	-0.449(0.277)	0.638	-0.241(0.141)	0.786	-0.904(0.148)***	0.405	-1.039(0.321)**	0.354
2009	-0.563(0.254)*	0.569	-0.558(0.136)***	0.572	-0.370(0.134)**	0.691	-0.362(0.275)	0.696

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

[1]The sample includes only those students who entered ninth grade for the first time in 2006, 2007, 2008, 2009, and 2010 and actually sat for both Regents exams. Students from the following CUNY ECI high schools were included in this analysis: Brooklyn College Academy; City College Academy of the Arts; Hostos-Lincoln Academy of Science; Kingsborough Early College Secondary School; Manhattan-Hunter Science High School; Queens School of Inquiry; Science, Technology & Research High School; and York Early College Academy.

[2]We included the year in which students entered ninth grade for the first time as a control in the model to account for changes in academic and graduation requirements within the NYCDOE.

Table B10. Multivariate estimates of the effects of enrollment into a CUNY ECI high school on meeting CUNY proficiency criteria using the New York State Regents ELA exam (best score) by proficiency level.[1, 2]

	Meeting Proficiency		Not Meeting Proficiency	
Variable	β(SE)	Odds Ratio	β(SE)	Odds Ratio
School model				
Overall	0.683(0.139)***	1.981	0.552(0.096)***	1.737
Student-level characteristics				
Year entering ninth grade				
2006	-0.365(0.341)	0.694	0.047(0.176)	1.048
2007	-0.763(0.231)**	0.466	-0.279(0.143)	0.756
2008	-0.325(0.23)	0.723	-0.101(0.131)	0.904
2009	-0.877(0.189)***	0.416	-0.425(0.142)**	0.654

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

[1]The sample includes only those students who entered ninth grade for the first time in 2006, 2007, 2008, 2009, or 2010, and actually sat for the Regents exam. Students from the following CUNY ECI high schools were included in this analysis: Brooklyn College Academy; City College Academy of the Arts; Hostos-Lincoln Academy of Science; Kingsborough Early College Secondary School; Manhattan-Hunter Science High School; Queens School of Inquiry; Science, Technology & Research High School; and York Early College Academy.

[2]We included the year in which students entered ninth grade for the first time as a control in the model to account for changes in academic and graduation requirements within the NYCDOE.

Table B11. Multivariate estimates of the effects of enrollment into a CUNY ECI high school on meeting CUNY proficiency criteria using the New York State Regents math exam (best score) by proficiency level.[1, 2]

	Meeting Proficiency		Not Meeting Proficiency	
Variable	β(SE)	Odds Ratio	β(SE)	Odds Ratio
School model				
Overall	0.073(0.083)	1.076	0.565(0.112)***	1.760
Student-level characteristics				
Year entering ninth grade				
2006	0.509(0.242)*	1.663	0.603(0.176)**	1.828
2007	-0.851(0.139)***	.427	-0.866(0.178)***	0.421
2008	-0.997(0.125)***	.369	-0.589(0.150)***	0.555
2009	-1.135(0.112)***	.321	-0.812(0.174)***	0.444

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

[1]The sample includes only those students who entered ninth grade for the first time in 2006, 2007, 2008, 2009, and 2010 and actually sat for the Regents exam. Students from the following CUNY ECI high schools were included in this analysis: Brooklyn College Academy; City College Academy of the Arts; Hostos-Lincoln Academy of Science; Kingsborough Early College Secondary School; Manhattan-Hunter Science High School; Queens School of Inquiry; Science, Technology & Research High School; and York Early College Academy.

[2]We included the year in which students entered ninth grade for the first time as a control in the model to account for changes in academic and graduation requirements within the NYCDOE.

Table B12. Multivariate estimates of the effects of enrollment into a CUNY ECI high school on meeting CUNY proficiency criteria using the New York State Regents ELA and math exam (best score) by proficiency level.[1, 2]

	Meeting Proficiency		Not Meeting Proficiency	
Variable	β(SE)	Odds Ratio	β(SE)	Odds Ratio
School model				
Overall	0.118(0.083)	1.125	0.637(0.122)***	1.892
Student-level characteristics				
Year entering ninth grade				
2006	0.439(0.232)	1.551	0.257(0.188)	1.293
2007	-0.898(0.138)***	0.407	-1.011(0.201)***	0.364
2008	-0.933(0.125)***	0.393	-0.608(0.162)***	0.545
2009	-1.096(0.111)***	0.334	-0.943(0.194)***	0.389

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

[1]The sample includes only those students who entered ninth grade for the first time in 2006, 2007, 2008, 2009, and 2010 and actually sat for both Regents exams. Students from the following CUNY ECI high schools were included in this analysis: Brooklyn College Academy; City College Academy of the Arts; Hostos-Lincoln Academy of Science; Kingsborough Early College Secondary School; Manhattan-Hunter Science High School; Queens School of Inquiry; Science, Technology & Research High School; and York Early College Academy.

[2]We included the year in which students entered ninth grade for the first time as a control in the model to account for changes in academic and graduation requirements within the NYCDOE.

Finding 3. Cumulative Credit Accumulation

Table B13. Cumulative credit accumulation of CUNY ECI and comparison students over a six year period from 9th grade through the end of the second year in a CUNY College.

Semesters after 9th grade	Cumulative college credits: Matched comparison students (N=1,052)	CUNY ECI students (N=1,052)	Difference
	mean	mean	
1	0.0	0.4	+0.4***
2	0.0	1.0	+1.0***
3	0.0	1.7	+1.7***
4	0.0	2.9	+2.8***
5	0.2	5.4	+5.2***
6	0.4	8.3	+7.9***
7	0.7	12.5	+11.8***
8	0.9	15.6	+14.7***
9	3.9	18.3	+14.4***
10	6.9	22.6	+15.7***
11	9.9	26.7	+16.8***
12	12.7	30.8	+18.1***

Table B14. Cumulative credit accumulation of CUNY ECI and comparison students over a six year period from ninth grade through the end of the second year in a CUNY College.

Semester post-high school graduation	Cumulative college credits: Comparison Group Students (N=1,052)	CUNY ECI students (N=1,052)	Difference
	mean	mean	
1	3.9	18.3	+14.4***
2	6.9	22.6	+15.7***
3	9.9	26.7	+16.8***
4	12.7	30.8	+18.1***

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

Table B15. Cumulative credit accumulation of CUNY ECI and comparison students by racial/ethnic subgroup.

Credit Accumulation						
Semester post-high school graduation	Race/Ethnicity	CUNY ECI Students		Comparison Group Students		Difference	Sig
		count	mean	count	mean	mean	
1	Asian	129	20.4	106	7.7	+12.7	***
	Black	472	16.6	443	2.6	+14.0	***
	Hispanic	390	20.5	406	4.0	+16.5	***
	White	56	13.4	92	5.8	+7.7	***
2	Asian	129	27.2	106	12.5	+14.7	***
	Black	472	20.7	443	4.8	+15.8	***
	Hispanic	390	24.1	406	7.0	+17.0	***
	White	56	18.7	92	9.7	+9.0	**
3	Asian	129	34.6	106	17.1	+17.6	***
	Black	472	24.3	443	7.3	+17.0	***
	Hispanic	390	27.7	406	10.1	+17.6	***
	White	56	23.2	92	13.8	+9.4	*
4	Asian	129	42.2	106	21.3	+20.9	***
	Black	472	27.8	443	9.5	+18.4	***
	Hispanic	390	31.4	406	13.1	+18.2	***
	White	56	26.5	92	17.1	+9.4	

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

Table B16. Cumulative credit accumulation of CUNY ECI and comparison students by ninth grade proficiency.

Credit Accumulation							
Semester post-high school graduation	Ninth Grade Proficiency Status	CUNY ECI Students		Comparison Group Students		Difference	Sig
		count	mean	count	mean		
1	Meeting Proficiency	616	21.4	500	5.3	+16.1	***
	Not Meeting Proficiency	436	14.0	552	2.7	+11.3	***
2	Meeting Proficiency	616	26.1	500	8.8	+17.3	***
	Not Meeting Proficiency	436	17.6	552	5.1	+12.5	***
3	Meeting Proficiency	616	30.2	500	12.4	+17.7	***
	Not Meeting Proficiency	436	21.8	552	7.5	+14.3	***
4	Meeting Proficiency	616	34.3	500	15.8	+18.5	***
	Not Meeting Proficiency	436	25.8	552	9.9	+15.9	***

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

Finding 4. Enrollment and Persistence

Table B17. Enrollment and persistence in college-level coursework.

Persistence in college-level coursework							
Semester post-high school graduation	Matched comparison students N=1,052		CUNY ECI students N=1,052		Difference		Odds ratio
	count	%	count	%	count	%	
1	327	31.0	483	45.8	156	+14.8	1.882***
2	328	31.1	486	46.1	158	+15.0	1.896***
3	306	29.0	453	43.0	147	+13.9	1.844***
4	304	28.8	442	41.9	138	+13.1	1.784***

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

Table B18. Enrollment and persistence in college-level coursework by racial/ethnic subgroup.

Persistence in college-level coursework						
Semester post-high school graduation	Race/ Ethnicity	CUNY ECI Students		Comparison Group Students		Difference	Sig
		count	%	count	%	%	
1	Asian	75	58.1	44	41.5	+16.6	*
	Black	204	43.2	110	25.0	+18.4	***
	Hispanic	177	45.4	141	34.7	+10.7	**
	White	26	46.4	32	34.8	+11.6	
2	Asian	76	58.9	43	40.6	+18.3	**
	Black	208	44.1	113	25.5	+18.6	***
	Hispanic	177	45.4	140	34.5	+10.9	**
	White	25	44.6	32	34.8	+9.9	
3	Asian	74	57.4	41	38.7	+18.7	**
	Black	178	37.7	104	23.5	+14.2	***
	Hispanic	176	45.1	132	32.5	+12.6	***
	White	24	42.9	29	31.5	+11.3	
4	Asian	77	59.7	42	39.6	+20.1	**
	Black	176	37.3	102	23.0	+14.3	***
	Hispanic	166	42.6	134	33.0	+9.6	**
	White	22	39.3	26	28.3	+11.0	

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

Table B19. Enrollment and persistence in college-level coursework by ninth grade proficiency.

Persistence in college-level coursework							
Semester post-high school graduation	Ninth Grade Proficiency Status	CUNY ECI Students		Comparison Group Students		Difference	Sig
		count	%	count	%	%	
1	Meeting Proficiency	277	45.0	162	32.4	12.6	***
	Not Meeting Proficiency	206	47.2	165	29.9	17.4	***
2	Meeting Proficiency	273	44.3	160	32.0	12.3	***
	Not Meeting Proficiency	213	48.9	168	30.4	18.4	***
3	Meeting Proficiency	253	41.1	147	29.4	11.7	***
	Not Meeting Proficiency	200	45.9	159	28.8	17.1	***
4	Meeting Proficiency	248	40.3	152	30.4	9.9	***
	Not Meeting Proficiency	194	44.5	152	27.5	17.0	***

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

Table B20. Cumulative degree attainment of CUNY ECI and comparison students.

Students earning a CUNY college degree						
Semesters after 9th grade	Matched comparison students		CUNY ECI students		Difference	
	count	%	count	%	count	%
9	0	0.0	26	2.5	26	2.5***
10	0	0.0	29	2.8	29	2.8***
11	1	0.1	33	3.1	32	3.0***
12	9	0.9	42	4.0	31	3.1***

* Significant < 5.0%. **Significant < 1.0%. ***Significant < 0.1%.